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RESEARCH ARTICLE

Taxonomic Study of Arthropod Pests of Livestock in District Peshawar, Khyber Pakhtunkhwa

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ABSTRACT

This study was conducted to explore the arthropod pests of livestock in District Peshawar during the year 2017. An extensive survey was carried out in different localities such as Malakander animal farm, Nasir pur animals mandi, local farms at different area of Peshawar i.e. Palosi, Regi and Peshawar city and more than 400 specimens were collected and examined. A total of 10 Arthropod pest species were reported in the present study from different domestic animals (cattle, sheep, goats). These pests mainly belong to two classes of phylum arthropoda i.e. Arachnida. Arachnid pest collected in this survey belong to sub class Acari comprise of two families Ixodidae (hard ticks) and Argasidae (soft ticks). Five genera *Amblyomma, Dermacentor, Ixodes, Hyalomma* and *Rhipicephalus* were reported in family Ixodidae while Argasidae family represented by single genus *Otobius.* Nine hard tick species including *Amblyomma americanum* Linnaeus, *Dermacentor andersoni* Stiles, *Dermacentor variabilis* Say, *Hyalomma rufipes* Koch, *Ixodes ricinus* Linnaeus, *Rhipicephalus appendiculatus* Neumann, *Rhipicephalus (Boophilus) microplus* Canestrini, *Rhipicephalus sanguineus* Latreille and *Rhipicephalus simus* Zumpt were identified in afore-mentioned genera of Ixodidae. Genus *Otobius* represented by single species *Otobius megnini* Duges in the family Argasidae. Keys to the identification families, genera and species have been constructed for district Peshawar. Host, distribution, synonymy and description have also been provided.

INTRODUCTION

Arthropods of livestock exist in various relations with the host animal. These arthropods may be considered as obligate parasites as they spend most part of their life cycle, closely associated with their host, survives at the host expense and usually do not kill their hosts. The arthropods utilize the host animals to obtain protein for their growth and reproduction. There are various challenges that arthropods may face, including finding a suitable host, extracting nutrition from the host for growth or reproduction or both, finding a safe habitat to digest the blood meal, avoiding defensive behaviors of the host, finding a place for oviposition, and surviving the periods of severe conditions (Ribeiro, 1996).

The ecological grouping of parasitic arthropods consists of hematophagous flies belonging to order Diptera feed periodically on the host have been termed as the free-living blood-suckers (Balashov, 1984), blood feeding dipterous parasite complex (Haufe, 1987), and micro predators (Balashov, 2006). Ectoparasitic arthropods are those which spend most part of their life as free-living organism in the environment, but they must feed on their host for limited period at some stage in their life (Nelson et al., 1975). Members of this group have also been known as temporary ectoparasites with prolonged feeding (Balashov, 2006) or slow-feeding temporary ectoparasites (Balashov, 1984). Nest ecto-parasites have been mentioned in most classification systems of arthropod parasite (Nelson et al., 1975; Balashov, 1984, 2006) but will not be considered here. These parasites dwell in the proximal environment of their host and complete their life cycle within the host's nest.

Ectoparasites such as ticks and mites may involve in transmitting different pathogens, which causes a number of life-threatening diseases (Aslam et al.,

2015). Many ectoparasites suck blood from their hosts (e.g. biting flies, mite, ticks, bugs lice and fleas). Primarily, blood sucking by these pests leads to exsanguinations and transmit deadly disease-causing pathogen to host animals as well, such as ticks; as a vector of stages of Theileria, Babesia, Rickettsiales, bacterial and some of the viral pathogens (Raether and Harder, 2008). Blood-sucking flies act as a vector of bluetongue virus (Mehlhorn et al., 2010; Dettner and Peters, 2010).

Ruminants such as sheep, cattle and goats are globally important domesticated animal (Schnieder, 2008). In tropical and subtropical areas such as Pakistan, ticks are the most important ecto-parasites of livestock; which can cause considerable economic losses (Durrani and Shakoori,2009). Ticks suck blood-serum from cattles and injured their skin and hides; and cause dermatophilosis and myiasis (Mtshali et al., 2004). These insects also induce toxicosis and paralysis; and sometimes cause physical damages to the animals. These insects also play an important role in transmission of a number of pathogenic micro-organisms such as bacteria, protozoans, rickettsiae, spirochetes and viruses (Jongejan and Uilenberg, 2004). In Pakistan, ticks populations have been reported in different frequencies ranging from 6.99 % to 80% in large and small ruminant animals at different areas in the country. The arthropod pests of livestock in District Peshawar of Khyber Pakhtunkhwa (KP) has not been studied extensively except few studies on ticks (Shah et al., 2015; Kashif et al., 2014; Manan et al., 2007). The present study was aimed to explore the arthropod pests of livestock and to construct key to the identification of arthropod pests of Livestock in District Peshawar, Khyber Pakhtunkhwa. Extensive knowledge regarding taxonomy of livestock pests especially ticks are not present in Peshawar besides some scattered information about them. There is no effective study undertaken before to record the livestock pest's fauna of District Peshawar. This study was the first one in this direction.

MATERIALS AND METHODS

The present study was initiated to investigate the arthropod pests of Livestock in District Peshawar, Khyber Pakhtunkhwa. For this purpose, various farm animals were examined for the presence of their associated arthropods pests.

Study site

The present study was conducted at Malakander animal farm, Nasirpur Animals Mandi, local farms at different area of Peshawar i.e. Palosi, Regi and Peshawar city during 2017.

Materials

The materials used in the study includes Farm Animals (Cattles, sheep, goats), Gloves, Masks, Fine Tweezer, Forceps, Collection Bottles, Petri dishes, Glass vials, 70 % Ethanol, Hoyer's solution, Cavity slides and Microscope.

Samples collection

The different cattle herds located in Peshawar were visited at different time intervals. The subsequent preference sites were studied for the existence of ticks and other arthropods: (i) Ears; (ii) Brisket (dewlap in the case of cattle); (iii) Withers; (iv) Knees;(v) Udder in the case of females and testes in males along with the perineum region; and (vi) Tail.

For ticks collection, whole animal body was thoroughly examined. Ticks were removed from animals with the help of a fine tweezer to minimize the damage to their mouth parts (Soulsby, 1982), and then transferred to sample collection bottles containing 70% ethyl alcohol and labeled suitably. Afterward collection, samples have been transported to the Department of Entomology, The University of Agriculture, Peshawar, Pakistan for taxonomic identification. Specimens have been recognized via Nikon microscope with magnification up to 400X with the help of available literature (Walker, 2014).

Preservation

The collected specimens were well-kept in 70% alcohol for inhibiting them from injury on becoming drying. The specimens were remained preserved in alcohol; also, the color of specimen was not be changed.

Slides preparation

Cavity slides were prepared of the collected specimens using Hoyer's solution for preservation.

Photographs

The photographs of diagnostic characters of the specimens have been capture through camera attached with microscope and also redrawn manually from A Handbook to the Ticks of Canada (Ixodida: Ixodidae, Argasidae) (Lindquist et al., 2016).

Depository

All the identified samples have been placed in the Insect Museum of Entomology Department, The University of Agriculture Peshawar.

RESULTS AND DISCUSSION

A total of 10 ticks species were reported in the present study from different domestic animals. These pests mainly belong to class of phylum Arthropoda i.e. Arachnida.

Key to the identification of Classes of Arthropod pest in Peshawar.

1 Four pair of legs; two body regions; no antennae (Fig. 1)…..……Arachnida

Class arachnida

Arachnids have six pair of appendages: one pair of chelicerae, used for gathering and feeding; one pair of padipalp, sensory in function; four pair of legs, used for locomotion. As compare to insects, arachnids lack a

clearly defined head, anteriorly chelicerae and palps (gnathosoma) are fused with posterior segment bearing locomotory legs (podosoma) to form prosoma. The 2nd part of the body is known as opisthosoma, bear genital, respiratory and other sensory structure.

The arachnid specimens collected in this survey belong to sub class Acari: show extreme integration of the body segments. The podosome and opisthosoma are fused to form idiosoma. As compare to other arachnids, the acarins have no clear segmentation at opisthosomal region while the mouth parts are joined to form a separate body region gnathosoma known as capitulum in ticks.

The Acari are further divided into two orders Parasitiformes (coxae articulate freely) and Acariformes (coxae fused with ventral body wall). The acarin specimens of this survey belong to suborder Ixodida (Acari: Parasitiformes): have a single pair of stigmata located posterior to the third or fourth pair of coxae in post larval stages; enlarged hypostome, protuberant and bears retrograde denticles for anchoring into hosts tissues and Haller's organ (sensory organ) located on dorsal surface of tarsus 1.

The collected specimens belongs to two families of suborder Ixodida namely Ixodidae (Hard ticks) and Argasidae (soft ticks).

Key to the identification of families of suborder Ixodida in Peshawar

1 Scutum present, mouthparts visible form dorsal view (Fig. 6a)……. Ixodidae

1' Scutum absent, mouthparts not visible form dorsal view (Fig.12c)..Argasidae

Family ixodidae

Hard ticks (Ixodidae) have a hard sclerotised dorsal plate known as scutum, covered the entire dorsal surface (conscutum) in male while in female it covered the anterior one third of dorsal body surface. The folded cuticle (alloscutum) located posterior to the scutum. Entire dorsal body surface (scutum + alloscutum) covered with numerous small setae. Eyes may be present or absent, if present located on the lateral sides of scutum. Mouthparts (capitulum) projected anterior to the scutum and are visible from dorsal view. The mouthparts dorsally comprise a pair of chelicerae and 4-segmented (articles) palps. The 4th terminal article bear tiny sensilla (sensory structure), buried in a cavity on the ventral surface of 3rd segment. The denticulate hypostome located ventrally in the mouthparts. All the mouthparts including chelicerae, palps and hypostome are mounted on capituli, collectively known as capitulum. (Fig. 1-2). In present survey five genera were reported in family Ixodidae.

Key to the identification of genera of family Ixodidae in Peshawar

1 Mouthparts long (Fig. 2b……. 2

1` Mouthparts short-medium (Fig. 2b)……..…3

2 Eyes absent (Fig. 2c) ……... ***Ixodes***

2` Eyes present (Fig. 2c) ……..……...….4

3 Basis capituli rectangular (Fig. 2d) …… ……..…***Dermacentor***

3` Basis capituli hexagonal (Fig. 2d) …… ……***Rhipicephalus***

4 Adanal plates on males absent or very small (Fig. 2e); article 2 at least twice as long as article 3; scutum oranate …….. ***Amblyomma***

4` Adanal plates on males present (Fig. 2e); article 2 less than twice as long as article 3; scutum oranate …….…… ***Hyalomma***

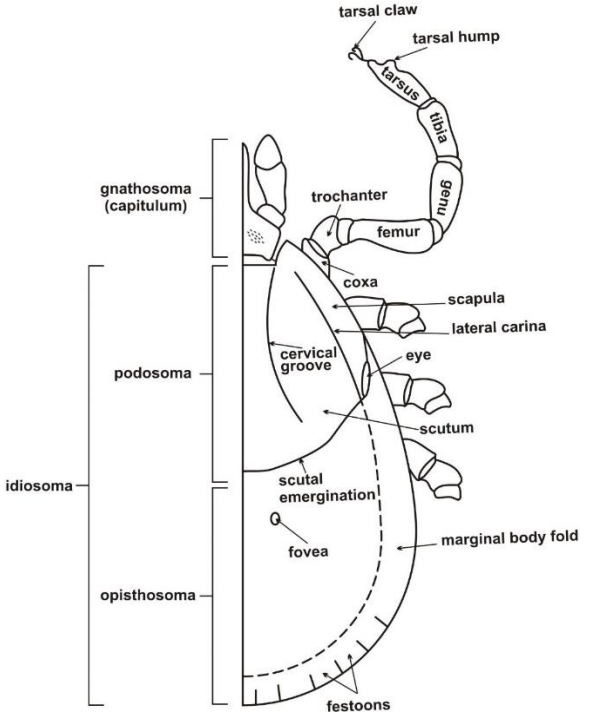

Fig. 1: Diagrammatic attributes of body dorsal of family Ixodidae.

Genus *Amblyomma*

Capitulum (mouthparts) long and fragile, 2nd article (segment) of palps is longer than segment 1 and 3 at least twice as long as 3rd segment, basal part of the capitulum (basis capituli) straight; eyes present but not in sockets may be flat or convex; pale rings and pulvilli always present on legs, asymmetrical paired spurs present on coxae 1; anal grooves clear located posterior to anus; scutum and conscutum ornate (usually with bright pattern); festoons present in both sexes; large spiracular plates positioned posterior to legs; adanal plates in male absent, or very small when present.

Species *Amblyomma americanum* (Linnaeus, 1758)

Acarus americanus Linnaeus (1758)

Acarus nigua De Geer (1778)

Ixodes nigua De Geer (1804)

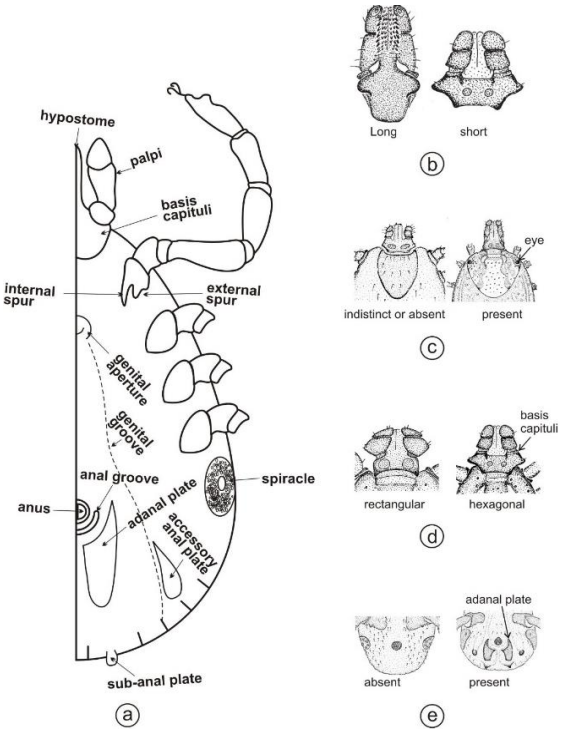

Fig. 2: a-e. 2a, Diagrammatic attributes of body venter of family Ixodidae; 2b, mouthparts 2c, scutum; 2d basis capitula, 2e, ventral plates.

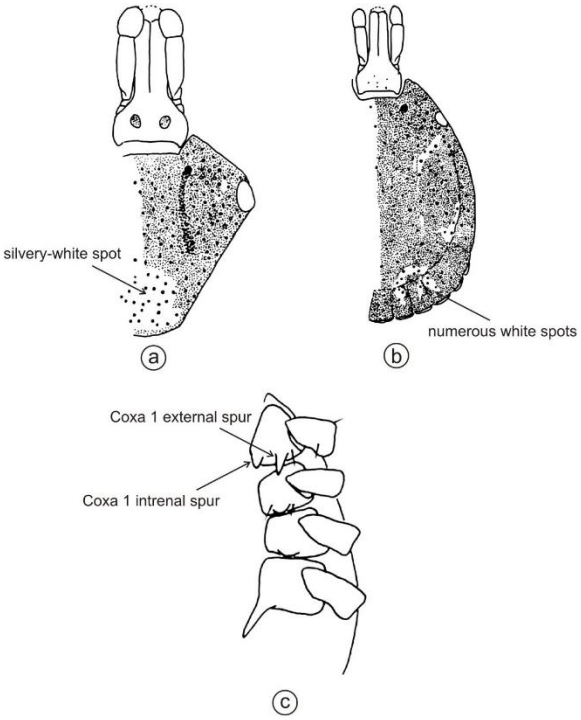

Fig. 3: a-c. *Amblyomma americanum*: 3a, female gnathosoma and scutum; 3b, male gnathosoma and scutum; 3c, Coxae. Figures redrawn from Brinton et al. (1965); Yunker et al. (1986).

Plates

Rhynchoprion americanum Hermann (1804)
Ixodes americanus Fabricius (1805)
Amblyomma americanum Koch (1844)
Ixodes unipunctata Packard (1869)
Amblyomma foreli Stoll (1886–1893)
Amblyomma americanum Cooley and Kohls (1944)

Common Name: Lone star tick

Host

Lone star ticks feed on the blood of various animals. In present study these ticks were collected from cattle. This species was also reported on humans, domesticated animals (e.g. dogs, cattle, goats, horses,), birds (e.g., quail and wild turkeys), and small (e.g. opossums, hares, squirrels) and large wild mammals (Cooley and Kohls, 1944; Bishopp and Trembley, 1945).

Distribution

The lone star tick is distributed throughout the studied area. This species has world distribution (Childs and Paddock, 2003).

Description

Adult has long mouthparts, in body size it is similar to *Dermacentor variabilis* (Say), and *Rhipicephalus sanguineus* Latreille, but larger than *Ixodes scapularis* Say. The female lone star tick has a silvery-white spot on center of posterior-dorsal side of scutum (Fig. 3a); male has numerous white spots around the margins on dorsal side (Fig. 3b); coxa 1 with two spurs, external spur twice longer than internal spur, coxa II to IV with one spur (Fig. 3c).

Remarks

It has consistent seasonal occurrence pattern, larvae abundant greatly in late summer to early autumn, and reach to its peak in August and September. Nymphs usually active from March to October, and achieve it highest abundance in April-June. Overwinter adults become active in March and attain their peak infestation in May-June (Davidson et al. 1994; Jackson et al. 1996; Gerhardt et al. 1998). It also transmit a variety of pathogens to human, several pathogens have been isolated from this tick including *Ehrlichia ewingii*, *Francisella tularensis*, *Coxiella burnettii*, *Rickettsia parkeri*, *Rickettsia amblyommii* etc. It has the potential to transmit many other pathogens to human and other animals therefore, required further investigation (Childs and Paddock 2003; Paddock and Yabsley 2007).

Genus *Dermacentor*

Mouthparts are prognathus, plap segment 2 broad; basis capituli laterally straight and dorsally rectangular; lateral suture absent; legs cylindrical without pale rings, pulvilli present, coxae-4 very large, coxae-1 have large equal internal and external spurs; ornate scutum present in both sexes, conscutum present in male only, enamel forming white pattern on scutum and conscutum; eyes present, usually flat slightly-convex; festoons present; large spiracular plates having scattered goblets, located posterior to legs; ventral plates absent in males; anal groove posterior.

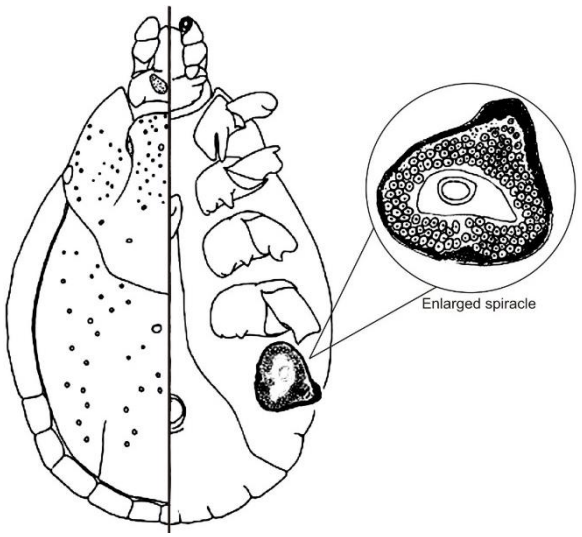

Fig. 4: *Dermacentor andersoni*: gnathosoma and idiosoma, dorsal view (left), ventral view (right). Redrawn from Brinton et al. (1965); Yunker et al. (1986).

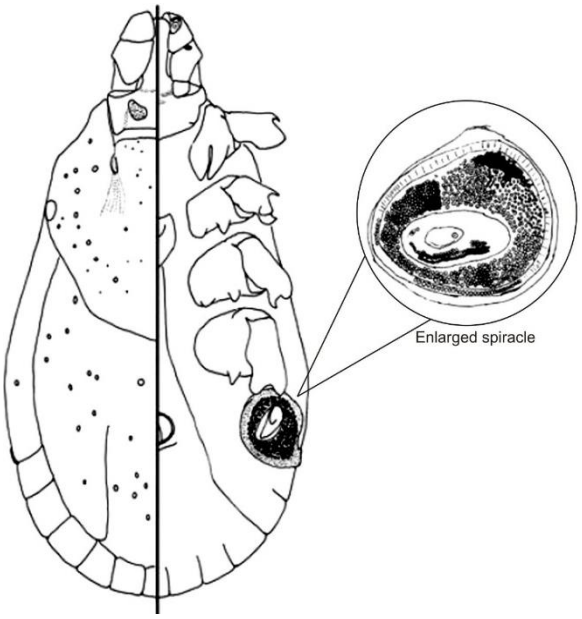

Fig. 5: *Dermacentor variabilis*: gnathosoma and idiosoma, dorsal view (left), ventral view (right). Redrawn from Brinton et al. (1965); Yunker et al. (1986).

Key to the identification of species of Genus *Dermacentor* in Peshawar.

1 Spiracular plate with numerous goblets (greater than 300) and nearly as small as pore-like structures in peripheral rings (Fig. 5); coxa IV without or with faint external spur ..... ***Dermacentor variabilis***

1' spiracular plate with moderately numerous goblets (fewer than 200) and over twice as large as pore-like structures in 1 or 2 peripheral rings (Fig. 4); coxa IV with small but obvious external spur ……..... ***Dermacentor andersoni***

Species *Dermacentor andersoni* (Stiles, 1908)

Dermacentor venustus Marx (1897)
Dermacentor venustus Marx (1908)
Dermacentor andersoni Stiles (1908)
Dermacentor modestus Banks (1909)
Dermacentor andersoni Stiles (1938)
Dermacentor andersoni Stiles (1908)

Common Name: Rocky Mountain Wood tick

Hosts

In this study *D. andersoni* was collected from cats, but the host rage includes humans, cats, dogs and mammals

Distribution

In present study, Rocky Mountain wood ticks were collected from Nasirpur Animal Mandi, Peshawar. This tick has usually been reported from arid areas of the world. This species is distributed in Nebraska, South Dakota, Arizona, New Mexico, California and Canada (Yee, 2006).

Description

These ticks brown or reddish brown in color; female has silver gray ornamentation, males are spotted gray and white; body pear-shape and flattened; basis capituli depressed has oval or bean-shaped porose areas; cornua rounded apically, shorter than width at the base; posterolateral margins of scutum slightly concave, posterior margin distinctly angular; cervical grooves elongate, covered with few, large and deep, and numerous small punctuations; spiracular plate oval, broadly prolonged dorsally; internal and external spurs of coxa I elongate, external spur narrow and elongate than internal spur. coxae II and III have small, rounded internal spur, indistinct or absent on coxa IV, external spur on Coxae II–IV short and bluntly pointed, progressively smaller from II–IV. (See Fig. 4).

Remarks

Soon after droping from host, the engorged females start search for protected locations for egg laying (Brown 1944). 0re-oviposition and oviposition period in *D. andersoni* is greatly influence by temperature (Wilkinson 1967). Both sexes of *D. andersoni* readily bitten humans. (Gregson 1956; Kennedy and Newman 1986). Adults positioned their selves in the "head down" position to the apical portions of low vegetation in search of hosts (Gregson 1960; Burgdorfer 1969; Holland 1940; Brown 1944).

Species *Dermacentor variabilis* (Say, 1821)

Ixodes variabilis Say (1821)
Dermacentor electus Koch (1844)
Ixodes albipictus Packard (1869): Neumann (1911)
Ixodes quinquestriatus + *Ixodes robertsoni* Fitch (1872): Neumann (1911)
Dermacentor americanus Linnaeus (1758): Neumann (1911).

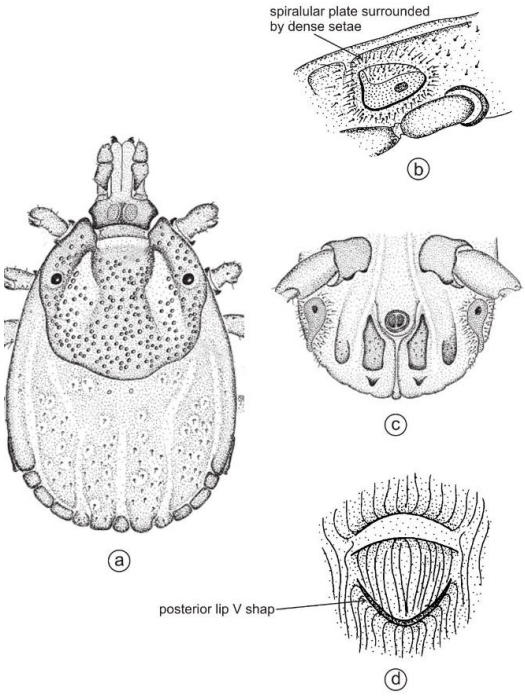

Fig. 6: a-d. *Hyalomma rufipes*: 6a, female gnathosoma and scutum; 6b, spiracle; 6c adanal and sub-anal plates; 6d, genital aperture. Redrawn from Yunker et al. (1986).

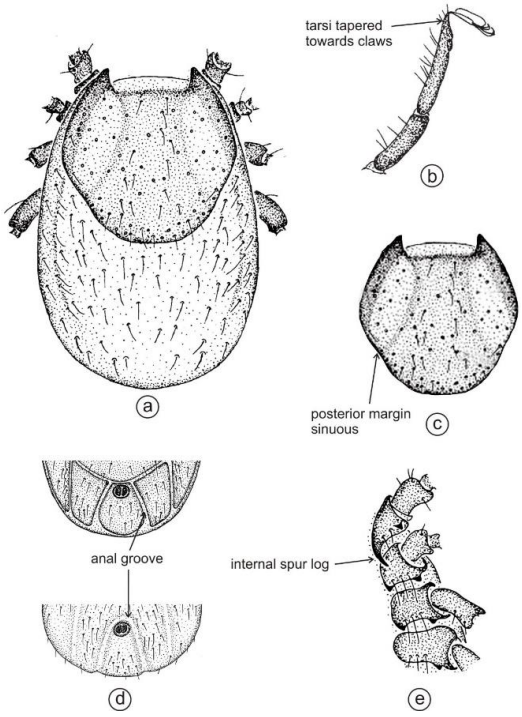

Fig. 7: a-e. *Ixodes Ricinus*: 7a, female gnathosoma and scutum; 7b, tarci; 7c, scutum; 7d anal groove; 7e, coxae. Redrawn from Brinton et al. (1965); Yunker et al. (1986).

Dermacentor variabilis Say: Hooker, Bishopp, and Wood (1912)

Dermacentor variabilis Say: Cooley (1938)

Common Name: American dog tick

Hosts

In the present study *D. variabilis* collected from sheep. This pest prefers to feed on dogs but they also feed on cattle, horses, human and their pets.

Distribution

The species was collected from Sheep mandi near Chargano Chowk, Peshawar.

Description

The color of *D. variabilis* is reddish brown with white markings on dorsal side. Female ticks become larger than male after taking full blood meal from their host. Fully engorged females like a dark pinto bean. Male ticks remain same after feeding. In female porose areas of basis capituli oval or bean-shaped; cornua apically rounded; scutum present, posterolateral margins behind eyes concave, posterior margin bluntly angular; cervical grooves narrow, anteriorly pit-like and shallow posteriorly. Spiracular plate oval, prolong dorsally. Internal and external spurs of coxa I elongate, internal spur broader than external spur; coxae II and III has rounded-small internal spur, absent on coxa IV of female, present in male. (See Fig. 5)

Remarks

Humans are attacked by adult dog ticks (Schwartz et al. 1993), while larvae and nymphs do not attack humans (Felz et al. 1996). Overwintered *D. variabilis* resume their activity in March to May, females usually appear after males (Sonenshine et al. 1966), adult populations attain their peak in May to June (Burachynsky and Galloway 1985). Female required mating before fully engorged (Obenchain et al. 1980). Females *D. variabilis* can lay eggs without mating (Oliver, 1974).

Genus *Hyalomma*

Long mouthparts, article 2 of palps elongate twice as long as wide, basis capituli quadrangular dorsal outline; scutum ornate, pale to dark brown in color, eyes convex; festoons present usually 9 in number; adanal, accessory anal and sub anal plates present in male; banded legs, coxae 1 intensely crack with long posteriorly directed spurs, size increasing from coxae 1 to 4.

Species *Hyalomma rufipes* Koch, 1844

Common Name: large, coarse bont-legged tick

Hosts

Adult *Hyalomma rufipes* ticks were collected from cattle. Other hosts of bont legged tick includes goats, sheep, horses and birds. This tick mostly attack hairless area of around the genitalia and anus. This species were also collected from heads and necks of birds.

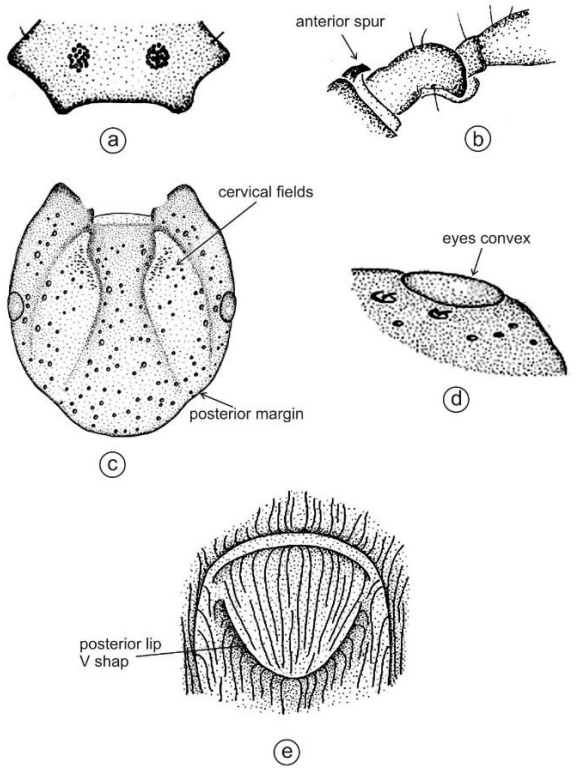

Fig. 8: a-e. *Rhipicephalus appendiculatus*: 8a, basis capitula; 8b, coxa 1; 8c, scutum; 8d, eye; 8e, genital aperture. Redrawn from Yunker et al. (1986); Walker et al. (2003).

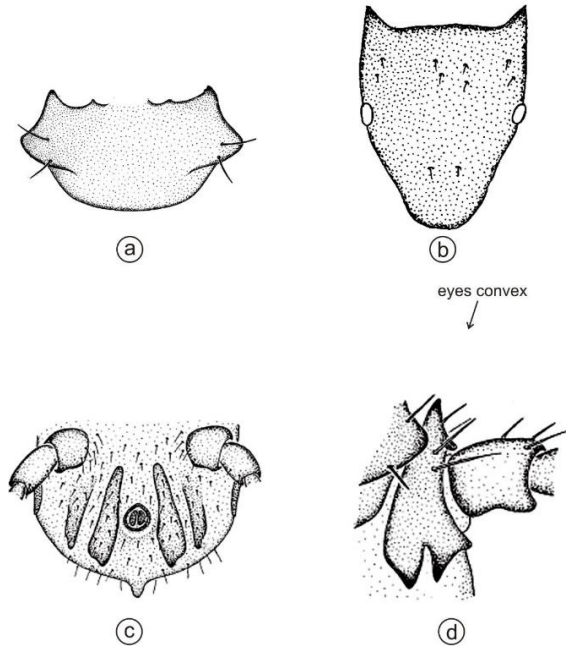

Fig. 9: a-d. *Rhipicephalus (Boophilus) microplus*: 9a, basis capitula; 9b, scutum; 9c, adanal and accessory shields; 9d, coxae. Redrawn from Yunker et al. (1986); Walker et al. (2003).

Distribution

Hyalomma rufipes is widely distributed in studied area. These ticks have distribution record from Africa, Europe and central Asia.

Description

Bont legged ticks are large in size and shiny black in color. Both sexes have dense even punctations on the scutum and conscutum, in male the conscutum evenly rounded without grooves and depression (Fig. 6a); spiralular plate surrounded by dense setae (Fig. 6b). Legs are generally brown with bright-ivory color rings. The adanal plates square posteriorly, and the sub-anal plates distinct but small (Fig. 6c). Posterior lips of *Hy. rufipes* genital aperture are broad and V shaped (Fig. 6d).

Remarks

This species have other names like hairy *Hyalomma* or coarse-legged *Hyalomma*. It is a widely distributed species in genus *Hyalomma*, they transmit Crimean-Congo haemorrhagic fever virus in humans. Both male and female bont legged tick can easily be differentiated from *Hy. turanicum* and *Hy. marginatum* by the dense punctations evenly distributed on scutum and conscutum and dense setae around spiracles.

Genus *Ixodes*

Palpus variable in shape; basis capituli subrectangular in dorsal view; eyes absent; scutum inornate in both sexes with 4-5 pair of setae, usually festoons absent; foveae absent; anal groove present, position anterior; gnathosoma with two pairs of posthypostomal setae; coxa 1 with or without spurs, coxae 1 to 4 equal in size; marginal dorsal setae present, 6-10 pairs in number and 2-6 pairs of central dorsal setae.

***Ixodes ricinus* (Linnaeus, 1758)**

Ixodes rufus Koch (1844)
Ixodes fuscus Koch (1844)
Ixodes fouisseur Megnin (1867)
Ixodes vicinus Verrill (1870)
Ixodes fodiens Murray (1877)

Common Names: Castor bean tick, Sheep tick, Deer tick

Hosts

Ixodes ricinus has a wide host range including small rodents and large mammals. In the present study sheep ticks were collected from cattle.

Distribution

Deer tick distributed throughout the study areas. As this tick has worldwide distribution including; North Africa, British Isles, Scandinavia, central Europe, Spain, France, Italy, the Balkans and east Europe.

Description

Body dark brown to black in color, without enamel; size is relatively small; females mouthparts long, but male have short mouthparts; eyes absent; tarsi tapered towards claws (Fig. 7b); dorsal surface punctated (Fig. 7a); scutum posterior margin sinuous (Fig. 7c); in

female anal groove passes to the anterior of the anus while in male passes between ventral plates (Fig. 7d); coxa 1 internal spur long (Fig. 7e).

Remarks

The common names used for *Ixodes ricinus* are sheep tick, wood tick and deer tick. This tick usually prefers cool humid environments. This tick has been intensively studies as it described earlier and its important role as a vector of many disease of humans and animals. Male deer ticks demonstrate the general distinguishing characters of the genus *Ixodes*. Majority of specimens collected in this survey were females as males are not usually found on the hosts. The males are usually found on the host when they do mating with female. Female of *Ixodes* are larger than the male with obviously long mouthparts.

Genus *Rhipicephalus*

Mouth parts short, hexagonal basis capituli, palps article 2 not longer than wide; eyes present on the scutum, inornate scutum present usually uniformly brown; festoons present; adanal plates and accessory plates usually present on male on either side of the anus, postanal groove present on posterior margins; coxae 1-4 same in size, coxae 1 with equal, prominent, long and directed backward internal and external spurs.

Key to the identification of species of Genus *Rhipicephalus* in Peshawar.

1 Genital aperture has V shape posterior lips (Fig. 8e)…….……2

1' Genital aperture has U shape posterior lips (Fig. 10d) …….……..3

2 Interstitial punctations sparsely distributed (Fig. 8c)……..***Rhipicephalus appendiculatus***

2' Interstitial punctations densely distributed (Fig. 11a)…….....……..***Rhipicephalus simus***

3 Space between gnethosoma and podosoma wide ……***Rhipicephalus (Boophilus) microplus***

3` Space between gnethosoma and podosoma less ……***Rhipicephalus sanguineus***

***Rhipicephalus appendiculatus* (Neumann, 1901)**

Rhipicephalus appendiculatus Neumann (1901)
Rhipicephalus appendiculatus Neumann (1904)
Euripicephalis appendiculatus Lounsbury (1906)
Rhipicephalus appendiculatus Pomerantsev (1936)
Rhipicephalus appendiculatus Santos Dias (1955)

Common Name: Brown ear tick

Hosts

Large numbers of specimen were collected from cattle and goats. The specimens were collected from ears, eyelids, neck, tailbrush and anus of the animals.

Distribution

It was the most common tick collected in the present survey. This tick was distributed throughout the studied area. Its distribution extends to African, Sudan, Uganda, Kenya, Congo, Rwanda, Burundi, Tanzania etc.

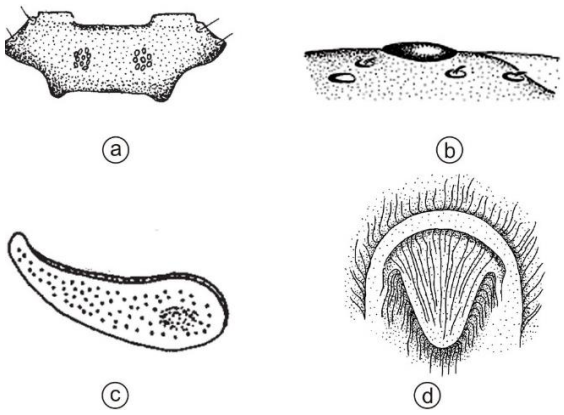

Fig. 10: a-d. *Rhipicephalus sanguineus*: 10a, basis capitula; 10b, eyes; 10c, spiracle plates tapered posteriorly; 10d, genital aperture. Redrawn from Yunker et al. (1986); Walker et al. (2003).

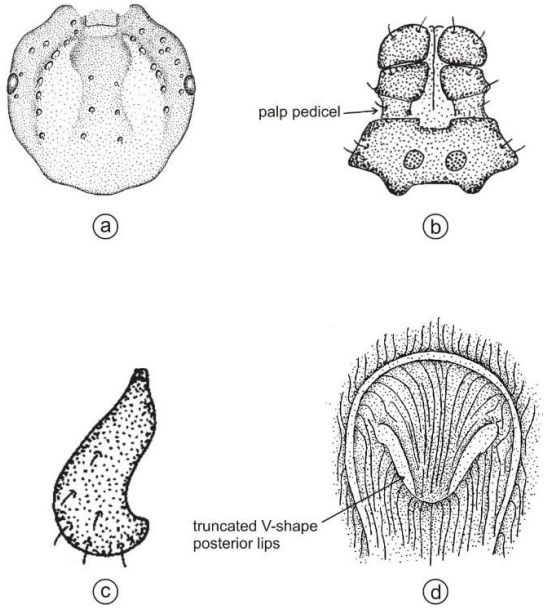

Fig. 11: a-d. Rhipicephalus sinus: 11a, scutum; 11b, capitulum; 11c, adanal plates; 11d, genital aperture. Redrawn from Yunker et al. (1986); Walker et al. (2003).

Description

The brown ear tick is brown in colour; mouthparts short, basis capituli hexagonal (Fig. 8a); anterior spur on coxa 1 visible from dorsal view (Fig. 8b); cervical fields broader with sharply elevated margins and less punctations (Fig. 8c); Interstitial punctation small and sparsely distributed; scutum dark, posterior margin distinctly sinuous (Fig. 8c); eyes convex (Fig. 8d); genital pore has broad V shape posterior lip (Fig. 8e).

Remarks

The brown ear tick got its name because of its brown colour and its feeding on the ears of animals. This

species gains importance due to its association with east coast fever of cattle.

Species *Rhipicephalus (Boophilus) microplus* (Canestrini, 1888)

Boophilus annulatus australis Lahille (1905)
Boophilus annulatus calcaratus Sharif (1928)
Boophilus annulatus caudatus Lahille (1905)
Boophilus annulatus microplus Lahille (1905)
Boophilus caudatus Lahille (1905)

Common Name: the cattle tick

Host

Cattle tick has a wide host range including domestic and wild animals. In the present survey specimens of *Rh.* (*Bo.*) *microplus* were collected from cattle and goats. *Rh.* (*Bo.*) *microplus* were also reported on buffalo, donkeys, horses, sheep, dogs, pigs, deer and some other wild mammals.

Distribution

Rh. (*Bo.*) *microplus* distributed worldwide, it can be found in subtropical and tropical regions of the world. This tick was most abundant in the studied area. *Rh.* (*Bo.*) *microplus* is a common tick species in the tropical and subtropical Asia, India, Australia, Africa and America.

Description

Basis capitulum is hexagonal in shape (Fig. 9a); capitulum short and straight; very short palps, unevenly compressed dorsally and laterally; scutum rectangular to oval in shape, widen anteriorly (Fig. 9b); adanal and accessory shields present on male (Fig. 9c); female lack anal groove, indistinct in male; genital aperture has U shaped posterior lip in female; festoons absent; legs creamy in color, wide space present between gnethosoma and podosoma, coxa 1 has distinct spurs (Fig. 9d), coxa 2 and 3 spurs present.

Remarks

Rh. (*Bo.*) *microplus* closely similar to *Rh.* (*Bo.*) *decoloratus* and *Rh.* (*Boophilus*) *annulatus*. *Rhipicephalus* (*Bo.*) *microplus* can be distinguish from *Rh.* (*Bo.*) *decoloratus* by having 4 + 4 columns of teeth on its hypostome and absence of inner protuberance setae on palp segment 1. It can also be differentiated from *Rh.* (*Bo.*) *annulatus* by presence of caudal appendage.

***Rhipicephalus sanguineus* (Latreille, 1806)**

Ixodes sanguineus Latreille (1806)
Rhipicephalus sanguineus Latreille: Koch (1844)
Rhipicephalus rutilus Koch (1844)
Rhipicephalus limbatus Koch (1844)
Rhipicephalus siculus Koch (1844)
Rhipicephalus rubicundus Frauenfeld (1867)
Rhipicephalus punctatissimus Gerstaecker (1873)
Rhipicephalus stigmaticus Gerstaecker (1873)
Rhipicephalus becarii Pavesi (1883)
Rhipicephalus sanguineus Latreille: Neumann (1897)
Rhipicephalus texanus Banks (1908)
Rhipicephalus sanguineus Latreille: Hooker (1912)
Rhipicephalus sanguineus Latreille: Cooley (1946)

Common Name: Brown dog tick

Hosts

Brown dog ticks were collected from dogs. This species was also reported on other domestic animals and humans.

Distribution

The tick has world-wide distribution, common in warmer habitats. In the present study this species was collected from Palosi, Regi Peshawar.

Description

These ticks small in size, body elongate, has red brown color therefore, also known as red dog tick; ornamentation absent; basis capituli hexagonal, lateral angles sharp (Fig. 10a); eyes somewhat convex (Fig. 10b); cervical fields straight and sharp; scutum pale or dark, sharply curved posterior to eyes; spiracle plates tapered posteriorly (Fig. 10c); genital aperture has broad U shape posterior lip (Fig. 10d).

Remarks

These ticks mostly prefer sheltered environments. It can attack on dongs and humans and it is a major pest of domestic animals worldwide, it is the most widely distributed species. Its bite not only causes damage and irritation but it also transmits various pathogens of medical importance like *Ehrlichia canis*, *Babesia canis vogeli*, *Hepatozoon canis* and *Rickettsia conorii* (Guglielmone et al. 2014).

***Rhipicephalus simus* Zumpt, 1943**

Rhipicephalus longoides Teneiro (1952)
Rhipicephalus planus complanatus Rageau (1951)
Rhipicephalus simus longoides Zumpt, (1943)
Rhipicephalus simus senegalensis Zumpt, (1949)
Rhipicephalus (Rhipicephalus) senegalensis Morel (1969)

Common Name: Glossy brown tick

Hosts

Adult ticks were collected from cattle, sheep and goats. It was also reported on horses, dogs, large carnivores and rodents.

Distribution

A few specimens of *Rhipicephalus simus* were collected from Nasir Pur Animals Mandi, Peshawar.

Description

It is a large tick with dark to reddish -brown color; interstitial punctations are small and dense which give the scutum a shiny appearance, large setiferous puntactions are arranged in four longitudinal rows down the center of the scutum and conscutum (Fig. 11a); palp pedicels are long (Fig. 11b); posterior grooves indistinct or completely absent; caudal process in male bluntly rounded, adanal plates large, kidney-shaped (Fig. 11c); posterior margin of scutum in female usually smoothly, rounded external margin broad, cervical fields large and curved, with irregular rows of punctuations (Fig. 11a); female genital aperture with hyaline border forming a truncated V-shape posterior lips (Fig. 11d).

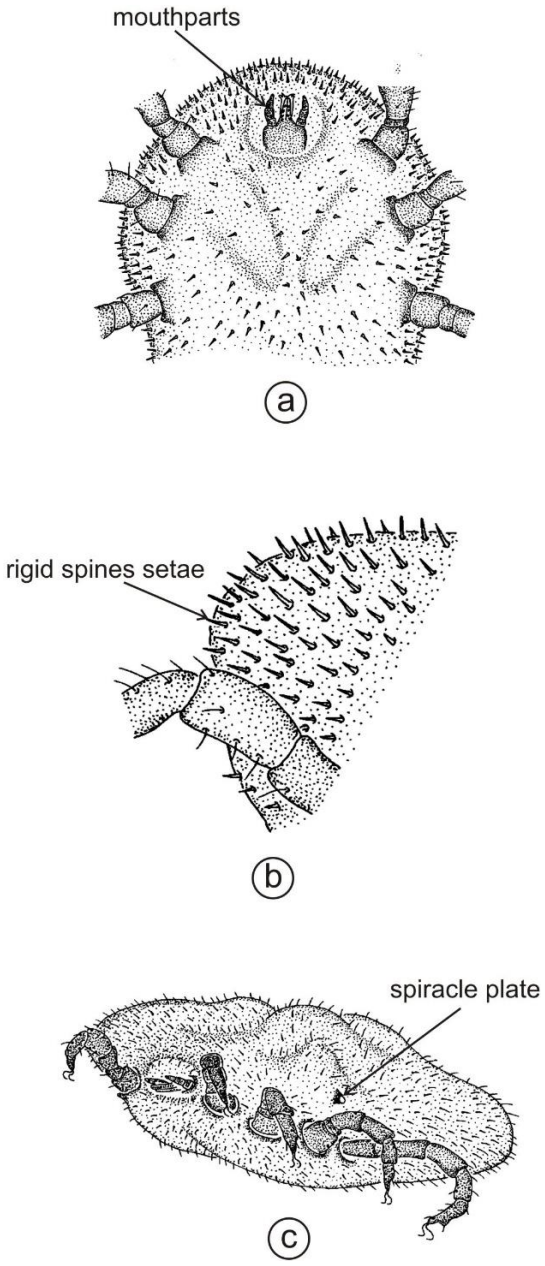

Fig. 12: a-c. *Otobius megnini*: 12a, body venter; 12b, nymph with rigid spines setae; 12c, body lateral view. Redrawn from Yunker et al. (1986); Walker et al. (2003).

Remarks

This species has been confused with *Rhipicephalus senegalensis* and *Rhipicephalus praetextatus* but the female can be distinguished from these two similar ticks by presence of two outermost festoons enclosed by each lateral groove.

Soft tick

Species *Otobius megnini* (Duges, 1884)

Argas megnini Duges (1883)
Otobius megnini Banks (1912)
Argas americana Packard: Townsend (1893)
Rhynchoprium spinosum Marx (1895)
Ornithodoros megnini Duges: Neumann (1896)
Ornithodoros (*Otobius*) *megnini* Duges: Hoffman (1930)
Otobius megnini Banks: Cooley and Kohls (1944)
Otobius megnini Banks: Kohls (1965)

Common name: spinose ear tick

Hosts

The *Otobius megnini* specimens were collected from ears of cattle, horses and sheep. It can also infest goats, donkeys, cats and humans. The majority of the specimens were in nymphal stage a few adults were collected from animal resting sites.

Distribution

The specimens were collected from Palosi and Regi (Peshawar). This species was also reported from South America.

Description

Adult of spinose ear ticks are violin-shaped and dark-grey in colour, mouth parts located ventrally (Fig. 12a); nymphs covered with short, rigid spines setae (Fig. 12b); eyes absent; integument covered with numerous small pits; scutum and conscutum absent; spiracles plates small, situated darso-laterally between 3rd and 4th legs (Fig. 12c); lateral margin thick, indistinct suture line; in nymph's genital aperture absent.

Remarks

It is a major pest of domestic animals like horses, cattle and sheep, and horses. They attack deep inside the ear canal and feed for long periods of time. This tick has been accidentally introduced from America into Africa, and India, where it become serious pest. (Gregson 1956).

Conclusion and recommendation

In present survey 10 pest species on livestock were reported from district Peshawar. These pest species were mainly ticks. Ten tick species including 9 hard ticks and one soft tick were identified. It is recommended that an extensive server should be carried out at country level to catalog all the pest species attack on livestock as these pests have great economic importance. The association of these pest species with disease causing organisms should also be experimented to minimize their losses. Various taxonomic attribute of Arthropod pests attacking livestock should further be elaborated for readily identification in future.

Authors' contributions

All authors contributed equally in research, write-up and final reading of this manuscript before submission.

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