International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2015): 6.391

Ecological and Faunistic Analysis Ixodidae (Acari: Parasitiformes) Animal Ectoparasites of Uzbekistan

Sojida Kh Umrqulova[1], Adolat U Mirzaeva[2], Feruza D Akramova[3]

Institute of the Gene Pool of Plants and Animals AS RUz, Tashkent 100053, Uzbekistan

Abstract: ***Some specific features of the fauna of ticks Ixodoidea Banks., their landscape distribution and ecology. Total found 24 species ticks belonging to 9 genera: Ixodes, Haemaphysalis, Boophilus, Dermacentor, Rhipicephalus, Hyalomma, Argas, Ornithodoros, Alveonasus and two families - Ixodidae and Argasidae. Determined the habitat distribution of ticks community and seasonal reproductive dynamics in domestic, wild, game animals and birds.***

Keywords: Ixodidae, Argasidae, taxonomy, fauna, Uzbekistan

1. Introduction

Ixodoidea mites - one of the most studied in the medical and veterinarian against groups of parasitic arthropods. It is well known that the nature of relations with the hosts and habitat types among Ixodoidea mites distinguish groups of species with pasture and lie in wait for nested – rodent parasitism types (Beklemishev, 1954; Balashov, 1982; Alekseev, Kondrashova, 1985). According to this concept, argasid ticks attaches nest - strive to parasitism, and their whole life cycle, including the power to the host, going inside burrows, nests, habitat structures populated by them. Ticks peculiar pasture - insidious - parasitism. Ixodoidea mites represented the families of Ixodidae and Argasidae in Uzbekistan. They are widely distributed terrestrial cenoses and parasites in domestic and wild animals (Uzakov, 1972; Kuklina, 1976). Considered, as ticks are carriers of a number of dangerous transmissible diseases of animals and humans (Alekseev, 1993; Lacey, Frutos, 2001; Rasulov, 2003; Abdurasulov, 2006).

Spending most of their life outside the host body, studied mites, as well as other free-living organisms that depend on the joint exposure to a plurality of abiotic and biotic factors. The geographic ranges of species of these mites largely correspond to the distribution in zones suitable for their existence (Agrinskiy, 1962; Balashov, 1982). Landscape image of Uzbekistan consists of plain (irrigation, steppe, and desert), foothill and mountain areas. It is characterized primarily by climatic conditions and is reflected in changes of the zonal type of vegetation and soil cover. The study of faunal assemblages Ixodoidea mites in the modern environmental background is particular relevance.

2. Materials and Methods

The material collected in 2008-2016 years in natural and urban areas of the Republic of Uzbekistan. Research samples were collected by conventional parasitological methods (Agrinskiy, 1962; Balashov, 1967; Beklemishev 1954; Alekseev, Kondrashova, 1985). In total, 59643 copies mites have been collected and studied. Collection of ticks carried out in accordance habitats, directly on the pastures, agricultural, domestic, wild animals and birds. Identification of ticks carried by the determinant of V.N. Beklemishev (1958).

3. Results

The studies identified 24 species of ticks 9 genera belonging to two families - Ixodidae and Argasidae (Fig.1). The family Ixodidae Murr, 1877 is represented by 18 species of 6 genera - *Ixodes, Haemaphysalis, Boophilus, Dermacentor, Rhipicephalus, Hyalomma*. From total number of species (18) ixodids 17 are registered in the flat area, 13 - in the foothills and 10 - on the mountains. Dominating on the species diversity and quantitative distribution of ticks in a flat area were members of the genus *Hyalomma*. This kind of in our collections is the basic background of the fauna of ticks (62.6%) consisting 6 species - *H. asiaticum, H.anatolicum, H. detritum, H. dromedarii, H.scupense* and *H. plumoeum turanikum*. The most common domestic animal parasites are *H. asiaticum* (33.7%), *H. detritum* (22.6%), and *H. anatolicum* (about 20.0%). These species are marked, in practice, in the milestones regions of Uzbekistan. The highest number observed in South, Central and Northeastern regions.

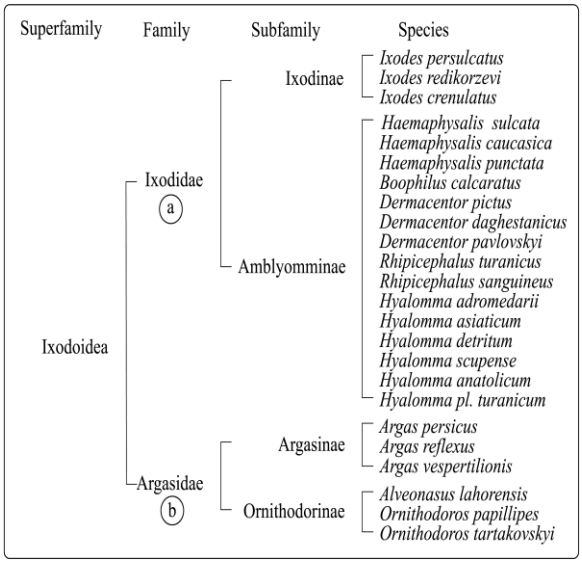

Figure 1: The taxonomic composition and diversity Ixodids mites in the test region and a – ixodids, b - argasids.

The flat area with different climatic factors is also favorable to Ixodes ectoparasites of animals - *Boophilus calcaratus* (16.5%), *Rhipicephalus turanicus* (10.7%) and *Dermacentor*

pictus (2.2%). There are also some common species of tick genera *Ixodes* and *Haemaphysalis* .

A peculiar fauna of ticks, various ecological features, characterizes foothill zone. It marked the representatives of *Ixodes* (1.8%), *Boophilus* (15.6%), *Rhipicephalus* (15.1%) and *Hyalomma* (18.9%).

In the mountain zone registered 10 species of ticks, representatives - *Ixodes* (1.4%), *Boophilus* (32.6%), *Rhipicephalus* (4.2%) and *Hyalomma* (37.0%). This is not the marked species *Haemaphysalis* and *Dermacentor*. In this zone, the number of population exposed to ticks rare fluctuations under the influence of air temperature during the day on the one hand, and a limited number of small animals - feeding - on the other hand, conditions for creating of the essence some species.

It was revealed that species diversity ixodids in different landscape-geographical zones was different. The genus *Ixodes* were found mainly in foothill and mountain areas. Representatives of the genera *Dermacentor, Haemaphysalis* and has shown affinity to the plain.

Most of the species *Boophilus, Rhipicephalus* and *Hyalomma* adapted to all landscaped areas. Consistently, high numbers marked in South, Central and Northeastern regions of Uzbekistan. Presented abundant grassy vegetation in these regions contributes to broad development of cattle breeding and habitation of different groups of animals.

Given below is the description of the discovered dominating species from each of the 5 genera of the subfamily Amblyomminae.
Genus *Haemaphysalis* Koch., 1844.
Haemaphysalis sulcata Can. et Fanz, 1877.
Hosts: cattle, sheep, hare, fox, tortoise, snake, sheltopusik, souslik, roller, sparrow.
Location: body of the animal.

Geographic distribution: Karakalpakstan, Khorezm, Samarkand, Navoi, Bukhara, Kashkadarya and Surkhandarya Provinces.

Biology. *H. sulcata* is a three-host tick, which, however, can develop on two hosts. The development cycle of *Hm. sulcata* lasts for at least one year. The spring maximum of adult ticks is conditioned by imagos that have spent the winter on the animals, as well as by nymphs. The autumn peak of infection with tick is reached through larvae developing during the summer and through nymphs. The maximum rate of infection with ticks in summer is conditioned by spring female ticks, which have produced a new generation. Some of the adult ticks can stay on the animals during the whole winter.

Adult forms parasitise mammals, while larvae and nymphs – reptiles and birds.
Genus *Boophilus* Cur, 1891.
Boophilus calcaratus Bir., 1895.

Hosts: cattle, sheep, goat, horse, dog and cat; wild mammals and birds can only be occasional hosts.
Location: parts of the body covered with thick hair, on the dewlap and neck; the ticks are not so frequent on the other parts of the body; however, they can even be found on the eye-lids, legs and tail. The ticks' location is associated with the health of the host's skin.
Geographic distribution: Tashkent, the Fergana Valley, Syrdarya, Samarkand, Navoi, Khorezm, Bukhara, Kashkadarya and Surkhandarya Provinces, Karakalpakstan.

Biology: *B. calcaratus* is a one-host tick; female ticks laying eggs, eggs proper and hungry larvae can be found in the wild, outside a host. After feeding females search for a place to lay eggs, as they drop off their host. Such females can often be found under stones. After dropping off their host the females do not move for some time. *B. calcaratus* can infect an animal almost during a whole year. A female with a live weight of 500-600 mg lays from 4,000 to 5,000 eggs.

The female begins to lay eggs on the 3rd to 6th day after it drops off its host and continues laying for 6 to 10 days.
Genus *Dermacentor* Koch., 1844
Dermacentor pictus Herm, 1804

Hosts: primary hosts – cattle, sheep, goat, horse, dog, cat and wild mammals; secondary hosts – wolf, fox, dog and hare. Ticks at early stages often parasitise voles, rats and mice.

Location
On sheep – on the breast between elbow folds, on the dewlap and on the ears; on horses – on the mane, on the bulb of the tail, on the neck at the base of the forelock, on the legs in smaller quantities; on cattle – on the breast and neck, less on the belly, at the base of the horns, on the forehead, chin and tail; it was noticed that if there were no ticks on the end of the tail, the other parts of the body were not infected either.

Geographic distribution: Tashkent, the Fergana Valley, Syrdarya, Samarkand, Navoi, Khorezm, Bukhara, Kashkadarya and Surkhandarya Provinces, Karakalpakstan.

Biology: *D. pictus* is a three-host tick, the circle of its host varying depending on the stage of development. Adult forms parasitise large domestic mammals, young ones – wild rodents. The parasitising seasons for adult ticks in temperate zones are from late March to early June and late August. Larvae and nymphs parasitise animals from June to August. Females started to lay eggs in 3 to 6 days, when the air temperature was between 20°C and 28°C, while at lower temperatures they did it in 10 to 14 days.

After feeding the weight of a female ranges between 300 and 350 mg. The laying of eggs continues from 6 to 30 days. The number of eggs laid by one female may reach 3,200.
Genus *Rhipicephalus* Koch., 1844
Rhipicephalus turanicus B. Rom, 1940;
Hosts: cattle, sheep, goat, horse, dog, camel, cat, fox, goitered gazelle; the ticks at young stages usually parasitise murine rodents, such as mouse and common rat.
Location: the cochleae, udder and legs, head and neck, all over the body if the animal is heavily infected.

Geographic distribution: Tashkent, the Fergana Valley, Syrdarya, Navoi, Khorezm, Bukhara, Kashkadarya and Surkhandarya Provinces, Karakalpakstan.
Biology: *R. turanicus* is a three-host tick, which, however, can develop in two hosts. After feeding the minimal weight of a female is 200 mg, the maximal weight is 360 mg. After feeding the female lays eggs, from 1,821 to 5,837 in number. The embryo develops for 35-38 days.

The larvae appear on animals in large numbers from June to August, much fewer larvae appear in October and November.
Hyalomma Koch., 1844
Hyalomma asiaticum P.Schulze, et Echl, 1929
Hosts: adult ticks parasitise cattle, horses, sheep, camels, donkeys, goats, dogs and goitered dazelles. The larvae and nymphs parasitise cattle, sheep and wild mammals.
Location: groin, udder, hind legs, belly, neck, breast and dewlap, sometimes back and thighs.
Geographic distribution: Tashkent, the Fergana Valley, Syrdarya, Navoi, Khorezm, Bukhara, Kashkadarya and Surkhandarya Provinces, Karakalpakstan

Biology: The tick is a three-host type. The time it parasites animals in its distribution area is mostly from March to October, young forms do it in summer; however, some quantity of adult ticks do not leave their hosts during the whole winter. The maximal weight of females is 1,250 mg, the minimal weight is 1,025 mg. The period of laying eggs depends on the environmental conditions, the shortest having been recorded taking place at a temperature of 26-35°C. The duration of the egg laying is 20-29 days in spring, 25-33 days in summer.

The number of eggs the female lays after feeding ranges between 1,500 and 16,000. The full development cycle, from the beginning of the egg-laying to the adult stage, continues for 60 days.

In the context of the various natural and geographical areas of Uzbekistan identified 6 species argasid ticks belonging to three genera and two subfamilies (Fig. 1). Selected types can invade both in domestic and wild animals.

Argasid ticks we noted in the areas of plains, foothills and mountains. The most popular were the population *Argas persicus* and *Ornithodoros tartakovskyi* in a flat area. To reproductive of ticks in poultry (chickens, turkeys) argasid ticks, reach some farms to 70.0% for the invasion intensity 7-147 copies.
It should be noted also the role of animals - feeding in the resettlement of many species of *Ixodes* mites and argasid in natural and urban areas of Uzbekistan. Pets and wild animals, migrating from one territory to another, very effectively involved in the resettlement of the studied ticks. In this regard, the majority of species of ticks recorded as ectoparasites of animals, inhabitants of the plains, foothills and mountain areas (Table 1).

Table 1: The distribution of ticks Ixodidae and Argasidae on the landscape of Uzbekistan

Genera	Landscape		
	flatness	mountain near	mountain
Argas	+++	++	+
Alveonasus	++	+	-
Ornithodoros	+++	++	-
Ixodes	-	++	+
Haemaphysalis	++	+	-
Boophilus	+++	++	+
Dermacentor	++	+	-
Rhipicephalus	++	+	+
Hyalomma	+++	++	+

+++- mass; ++- numerous; +- minorities; - missing.

The activity of the dominant species ixodids and argasids are dependent on seasons and the landscape. Manifestations of tick activity is observed on the plain from the third decade of February and in early March, in the foothill zone - in March - April and the mountain - in late April and early May.

Season mite parasitism is studied in different zones of different periods of the animal settlement. Mites increasing infection of animals (groups) studied ticks stored in a correlation with the seasons of the year (Fig. 2).

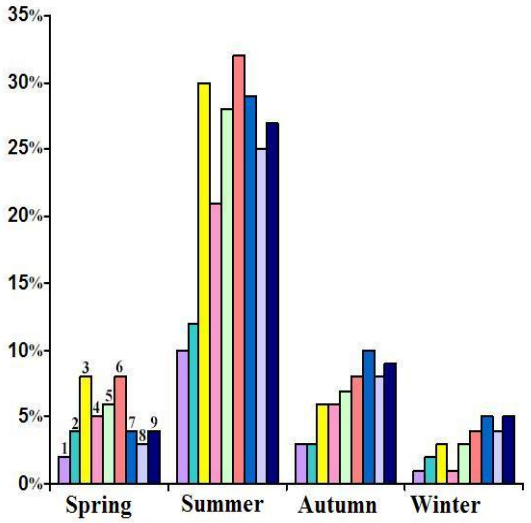

Figure 2: Seasonal dynamics mite infection of ixodids cattle and chickens - argasids in Uzbekistan condition: 1 - *Ixodes persulcatus, 2 – Haemaphysalis sulcata, 3 – Boophilus calcaratus, 4 – Rhipicephalus turanicus, 5 – Dermacentor pictus, 6 – Hyalomma asiaticum, 7 – Argas persicus, 8 – Ornithodoros tartakovskyi, 9 – Alveonasus lahorensis.*

Many infected animals is usually observed summer. High infestation of cattle *H. asiaticum* reached - 32%. Domestic chickens were sent on mission to invade *Argas persicus* - 29%. Reducing mites reproductive of animals observed in all areas - in the fall and significantly - in the winter.

Ixodes belong to the ecological group of ectoparasites with long time diet. The life cycles are the larval, nymph and imaginable stages that feed on the blood of vertebrates, including humans. By the nature of the known life cycle of ticks are usually subdivided into one -, two - and three hosts. The most common is three hosts cycle inherent in all types of labor *Ixodes, Haemaphysalis* and most species

Dermacentor, Rhipicephalus , Hyalomma (Balashov, 1982, 1998; Alekseev, Kondrashova 1985; Haunmante, Patil, 1981).

The presence of a wide variety of animal species in lowland and foothill areas ensures successful reproduction in these mites, developing on two - and three host types. However, as shown by the results of studies in recent years, some genera *Ixodes* ticks and *Hyalomma* observed loss of the original owners of the life cycle. From the development cycle *I. persulcatus, H. asiaticum, H. dromedarii, H. detritum, H. anatolicum* and *H. plumbeum turanikum* dropped wild mammals. Their whole life metamorphosis occurs only on one species of pet. The life cycles of ticks are diverse; their changes are adaptive in nature to the climatic and geographical conditions and the conditions of habitats, characteristic for a specific region. Reported trends in the life cycles of ticks are consistent with the known data of researchers (Balashov, 1998; Denisov, 2008.). The set of factors contributes to a marked faunal assemblages ixodids ticks and in Uzbekistan and operation of a parasitic "ticks - vertebrates» system.

From the research results obtained, we have established that on the territory of Uzbekistan ixodids mites represented by 24 species. Of these ixodids up - 18 species and argasids - 6. In previous studies (Uzakov, 1972; Kuklina, 1976) in domestic, wild and game animals have been identified 40 species ixodids ticks: Ixodidae - 33 species and Argasidae - 7 species. It should be mentioned that most of the species were noted at single finds, single instances or immature individuals. To date, the data previous studies significantly out of date, as confirmed by recent studies acarifaunas region (Rasulov et al,, 2003, Abdurasulov., 2006; Mirzaeva et al,, 2015;. Umrkulova et al, 2016.). According to the results of studies in recent years, we have seen a marked depletion of fauna ixodids mites in Uzbekistan. In our collections, there was no significant number of species of Ixodidae: *Ixodes redikorzevi, Haemaphysalis numidiana, H. pavlovskyi, H. concinna, Dermacentor marginatus, D.silvarum, Rhipicephalus bursa, R. rossicus, R. pumilio, R. leporis, R. schulzei, Hyalomma anatolicum excavatum* and *Ornithodoros cholodkovskyi*, referring to Argasidae. In our opinion, the main factor limiting the habitat of mites in ecosystems of Uzbekistan, a human economic activity - large-scale development of natural areas, which contributes to a change in vegetation cover, temperature, humidity, wildlife habitat – feeding of mites.

The spatial distribution of the studied ticks occupies a special place flat area. Ticks are found in almost all areas with a predominantly agricultural type of development. In maintaining the existence of populations of mites marked our species and providing them with high numbers play an important role domestic mammals and birds, the abundance of which is large. Most of the ticks in agrocenoses pets and birds (cows, sheep, goats, horses, camels, dogs, chickens, turkeys).

The presence of diverse landscape and geography contributes to the functioning of the system and the formation of parasitic fauna complexes modern ixodids mites.

4. Conclusion

We reviewed fauna ixodids mites in the modern environmental background of Uzbekistan. The total number of species studied ticks represented by 24 species, of which 18 species of ticks up and argasid - 6. Some groups of species are marked in all the landscapes of the country, which form stable populations of different generations, invading various species of mammals and birds.

Most species of ticks environmentally associated with mammals, or more precisely their separate groups. Another part of the specialized to parasitic is mainly on domestic and wild birds.

Degree mite reproductive of animals are dynamic, which is dependent on environmental factors and biocenotic links components of parasitic system.

The complex species composes ixodids mites fauna of Uzbekistan at the present stage involves the systematic monitoring of the number of animal ectoparasites populations with the aim of improving the methods of dealing with them in specific areas.

5. Acknowledgments

The research was carried out under fundamental projects of the F5 FA 0 18 691, YO5-FA-0-17793 of Institute of the Gene Pool of Plant and Animals, Uzbek Academy of Sciences, Tashkent, Uzbekistan.

References

[1] Abdurasulov Sh.A. 2006. Development of cultural strain TAU-219 (*Theileria annulata*) in ticks of the genus *Hyalomma*. Autoabstract of the candidate of biological sciences. Tashkent, 20 p.
[2] Agrinskiy N.I. 1962. Insects and ticks damaging agricultural animals. Moscow, 288 p.
[3] Aleksyev A.N. 1993. The tick – causative agent system and its emergent properties. St Petersburg, 204 p.
[4] Alekseev A.N., Kondrashova Z.N. 1985.The body of arthropods, like habitat pathogens. - Sverdlovsk, - 181 p.
[5] Balashov Yu.S. 1982. The host-parasite relationships between Arthropoda and terrestrial vertebrates. Leningrad, Nauka, 320 p.
[6] Balashov Yu.S. 1998. Ticks parasites and vectors of infections // St. Petersburg: Nauka, P. 287-290.
[7] Balashov Yu.S. 1967. Blood-sucking ticks (Ixodidae) - vectors of human and animal diseases // - L.: Med. Litas., P. 219- 320.
[8] Beklemishev V.N. 1954. Parasitism on terrestrial vertebrates, arthropods. The main directions of its development. Med. Parasitology and parasitic disease., 1: P. 3–20.
[9] Denisov A.A. 2008. Ecological - biological adaptation of parasitic systems blood sucking dipterous and ixodids mites in anthropogenous biocenosis the Bottom Volga region: Materials international scientific-practical conference. 2008 year. Volgograd. P. 1 // Vestnik

RACXN. Moscow, P. 352-354.
[10] Haunmante M.M., Patil P.M, Nagabhushanam R. 1981. Thermobiologi of the Ixodid tick *Hyalomma anatolicum anatolicum* (Koch.,1844) // Riv. parasitol., 42 (1): P. 67-78.
[11] Kuklina T.Ye. 1976. Ticks of the family Ixodidae in Uzbekistan. Tashkent, Fan, 145 p.
[12] Lacey L.A., Frutos R., Kaya H.K. and Vail P. 2001. Insect Pathogens as Biological Control Agents: Do They Have a Future? // Biological Control, (21): P. 230–248.
[13] Mirzaeva A.U, Umrkulova S.H, Akramova F.D. 2015. Argasidae ticks: fauna, distribution and ecology // Uzbek Biological journal. Tashkent, (5): P. 37-39.
[14] Rasulov I.Kh., Abdurasulov Sh.A., Nazrullayeva M.F. 2003. Ixodids fauna and taxonomy of mites vectors piroplasmoses cattle in irrigated areas of the Syrdarya and Jizzakh regions. Burning problems of Parasitology: scientific-practical lectures of conference. Karshi, P. 110–114.
[15] U. Ya. Uzakov. 1972. Ticks of the family Ixodidae in Uzbekistan. Tashkent, Fan, 302 p.
[16] Umrkulova S.Kh., Mirzayeva A.U., Akramova F.D. 2016. Ecological and faunistic researching of ticks of the Amblyomminae [Acari: Parasitiformes, Ixodidae] in Uzbekistan // The Eighth International Conference on European Scientific development. – Austria, Vienna, P. 10–11.