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Z. Z. Sayakova<sup>1</sup>, V. P. Sadovskaya<sup>1</sup>, A. B. Yeszhanov<sup>1</sup>,  
V. G. Meka-Mechenko<sup>1</sup>, T. N. Kunitsa<sup>1</sup>, M. V. Kulemin<sup>2</sup>, I. B. Kim<sup>3</sup>

<sup>1</sup>RSE on REM "Kazakh scientific center of quarantine and zoonotic infections named after Masgut Aikimbaev" of the Ministry of Health of the Republic of Kazakhstan, Almaty, Kazakhstan,

<sup>2</sup>RSI on REI "Shymkent Anti-Plague Station" of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, Shymkent, Kazakhstan,

<sup>3</sup>RSI on REI "Taldykorgan Anti-Plague Station" of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, Taldykorgan, Kazakhstan.

E-mail: zzsayakova@mail.ru; versadovskaya@gmail.com; aidyn.eszhanov@gmail.com; vm\_m@bk.ru; tkunitca@kscqzd.kz; kmaxim.75@mail.ru; vit197803@mail.ru

## DISTRIBUTION OF TICKS OF THE GENUS DERMACENTOR KOCH, 1844 (IXODIDAE, AMBLYOMMINAE) IN THE SOUTH-EASTERN PART OF KAZAKHSTAN

**Abstract.** Based on the analysis of retrospective data (literature sources and collections of ixodid ticks of the RSE "Institute of Zoology" SC MES of the Republic of Kazakhstan and RSE "KSCQZD named after M. Aikimbaev" of the Ministry of Health of the Republic of Kazakhstan), as well as of own collections on the territory of Almaty, Zhambyl and Turkestan regions, the range boundaries of *Dermacentor* genus: *D. marginatus*, *D. niveus*, *D. pavlovskyi*, *D. reticulatus* within the south-eastern part of Kazakhstan were clarified. Significant differences in tick's distribution between modern data and studies of the last century have been identified, which is probably due to the active human activity in this region. In the south-eastern region of Kazakhstan, *D. marginatus* is distributed mainly in foothill zones. Most of it lives in the foothills of Zailiysky and Zhetysu Alatau (Almaty region). This species is less common in the foothills of the Western Tien Shan - the Karatau ridge (Turkestan region) and the Talas ridge (Zhambyl region). The area of *D. niveus* covers desert and semi-desert territories, mainly floodplains of the Shu, Ile, Syrdariya rivers and their tributaries. *D. pavlovskyi* ticks found in the foothills of the Western Tien Shan, Karatau ridge. Their finding in 1944 by the Republican Tropical Station on small cattle in the Almaty region is probably accidental. The range of *D. reticulatus* in south-eastern Kazakhstan is limited only by the foothills of Zailiysky and Zhetysu Alatau. Finding a species in the Zhambyl and Turkestan regions is probably erroneous.

**Key words:** ixodid ticks, pathogens vectors, ectoparasites collections, ticks ranges, parasite fauna.

**Introduction.** It's known that blood-sucking ticks are vectors of especially dangerous for humans and animals bacterial, viral, and protozoal diseases, such as tularemia, borreliosis, babesiosis, tick-borne encephalitis, Lyme disease, and horse and cattle Lyme disease [1].

In addition, in the Kyzylorda region, listeria and pasteurella were isolated from ticks of the *Hyalomma* genus. On the territory of the Volgograd region of Russia adjacent to the West Kazakhstan region, the antigen of the West Nile fever virus was detected in *Hyalomma scupense* ticks. Ticks *Rhipicephalus pumilio* are vectors of rickettsia - pathogens of Astrakhan tick-borne spotted fever.

Currently, the main problem is the lack of modern information on the status of the fauna, ecology and biology of ixodid ticks in the south and south-east of Kazakhstan, which are unsuccessful for especially dangerous zoonotic infections. Intensive studies of ixodid ticks in Kazakhstan and, in particular, in the southern region, were carried out in the middle of the last century. No such studies are currently underway. There is only information on some dangerous zoonotic infections transmitted by ixodid ticks [2]. In foreign countries, ixodid ticks are given close attention [3-5] for the above reasons. However, these studies are regional in nature, the results of which cannot always be used for the territory of South Kazakhstan. One of the urgent tasks of modern acarology is to conduct a complete inventory of the

modern fauna of ixodid ticks with a clarification of the ecology, abundance, distribution and role in biocenoses as vectors of infectious zoonoses. Our studies can form the basis for the development of recommendations for sanitary-epidemiological organizations.

The study of ixodid ticks is of undoubted national and international significance. The range of some species of ticks covers both the territory of Kazakhstan and neighboring regions. In this regard, there is a likelihood of ticks spreading zoonoses of humans and animals, both to the territory of the republic and beyond.

Every year in Kazakhstan, especially in the south and south-east of the country, hundreds of cases of bites of people by blood-sucking ticks are recorded, among which there are cases with a fatal outcome from the diseases transmitted by them. Therefore, the study of ixodid ticks in Kazakhstan can be significant in solving many socio-economic problems.

Studying the issues of fauna, biology, distribution of ixodid ticks and many others can contribute to the further development of Kazakhstan's acarological science, as well as improving the sanitary-epidemiological situation in the south of the country and increasing the level of public health, as a result of which significant social and economic effects can be achieved [6].

According to the latest data, the world fauna of ticks has 896 species belonging to 3 families, while the Ixodidae family includes 702 species (14 genera) [7].

Deep and detailed research in Kazakhstan was carried out by I.G. Galuzo in the 1940-50s. According to him, the fauna of ixodid ticks of Kazakhstan counted 63 species belonging to 6 genera (*Hyalomma*, *Haemaphysalis*, *Rhipicephalus*, *Dermacentor*, *Ixodes*, *Boophylus*) [8]. Since then, significant changes have occurred in the systematics of ixodid ticks, and according to modern authors, who rely mainly on literature and collection materials in Kazakhstan, 42 species of ixodids belonging to 5 genera are known. Until the mid-70s of the last century, in-depth studies were carried out by G.V. Ushakova, A.V. Levit and other scientists-acarologists of Kazakhstan. On this, information about the study of ixodid ticks in the last century of Kazakhstan is exhausted.

In connection with the aggravation of the situation with tick-borne infections, the study of ixodid ticks has recently been very relevant. It is known that the territory of the south and southeast of Kazakhstan is unsuccessful for some zoonotic infections (tularemia, tick-borne encephalitis, Crimea-Congo hemorrhagic fever, etc.), which are transmitted by ixodid ticks. One of the main vectors of tularemia in the foci are ticks of the genus *Dermacentor* Koch, 1844 (*D. marginatus*, *D. niveus* *D. reticulatus*) [9-12]. In the foci of the Crimea-Congo hemorrhagic fever, along with ticks of the genus *Hyalomma*, *Dermacentor niveus* is one of the main vectors of the virus [13]. In this connection, the study of the distribution of ticks of the genus *Dermacentor* in the south and southeast of Kazakhstan is of no small importance.

**Material and methods.** The material for the work was our own collection of ixodid ticks in the territory of Almaty, Zhambyl and Turkestan regions, research materials on ticks for tularemia, reported data and collections of ticks from Taldykorgan, Zhambyl and Shymkent anti-plague stations, literary sources and collections of RSE "KSCQZD named after M. Aikimbaev" [14] and RSE "Institute of Zoology" MES RK. In our research on the collection and study of ixodid ticks, we use the technique proposed by N.A. Filippova [15]. In total, in 2018 we collected and studied 2460 individuals of *Dermacentor* genus ticks.

The geographic coordinates of tick collection sites were determined by using a GPS navigator. All information on sampling was recorded in workbooks, and then in an electronic database (EDB). Diagnostics of the specific belonging of ticks was carried out using stereoscopic microscopes. The electronic database is compiled in the Excell program. Locations of ticks are reflected on electronic maps using the ArcGIS 10 program.

**Research results.** The world fauna counts 34 species of ticks of the genus *Dermacentor* [7]. In his monograph, I.G. Galuzo for the fauna of Kazakhstan notes 8 species of ticks of the genus *Dermacentor*: *D. daghestanicus* Olen., 1927, *D. marginatus* Sulz., 1776, *D. nuttalli* Olen., 1927, *D. pavlovskyi* Olen., 1927, *D. pictus* Herm., 1804, *D. raskemensis* Pom., 1946, *D. silvarum* Olen., *D. variegatus kamschadalis* Neum., 1908 [8], and the last three are not indicated for the territory of Kazakhstan. Taking into account the changes in the systematics of ixodid ticks that have occurred over the past half century, the fauna of Kazakhstan has 7 species of ticks of this genus: *D. niveus* Neum., 1897, *D. marginatus* Sulz., 1776, *D. nuttalli* Olen., 1927, *D. pavlovskyi* Olen., 1927, *D. reticulatus* Fabr., 1794, *D. silvarum* Olen., *D. ushako-*

vae Fil., Pan., 1987 [16]. In our work, we present information on 4 species of ticks of the genus *Dermacentor* that live in the south and southeast of Kazakhstan: *D. niveus* Neum., 1897, *D. marginatus* Sulz., 1776, *D. pavlovskyi* Olen., 1927, *D. reticulatus* Fabr., 1794.

***Dermacentor marginatus* (Sulzer, 1776).** Initially, was discovered by D.I. Blagoveshchensky [17] on dogs in the territory of South and South-East Kazakhstan, in 1931 in the city of Dzharkent, then, in 1932 on humans and cattle in the Alakul district (Uch-Aral and Ostrovka villages) of Taldy-Kurgan region and the village. Dzharkent on the dog. In subsequent years (1933-34), the species was found on horses and cattle in the Taldy-Kurgan region, Ili district, Alma-Ata region, the outskirts of the cities of Alma-Ata and Dzharkent and Chui district of the Dzhambul region. In 1937, D.I. Blagoveshchensky found this species on horse and human in the Taldy-Kurgan and October districts of the Taldy-Kurgan region and in the Kegen district of Alma-Ata region. From 1940 to 1948, ticks were found in the Alma-Ata, Aksuysky, Karatalsky, Taldy-Kurgan, Andreevsky, Sarkand, Lepsinsky, Oktyabrsky, Alakulsky districts of Taldy-Kurgan oblast and Alma-Ata, Iliysky, Chiliksky, Kugalinsky and Dzhambulsky districts of Alma-Ata oblast, Kelesky, Leng Tulkubassky, Sairamsky, Dzhualinsky and Karatassky regions of the South Kazakhstan region, and in the Dzhambul region.

Our studies noted the species in the Baidibek (vicinity of Almaty, Baizhansay, Zharyksay), Tolebi (floodplain of the Syrdaria River, SNNP "Sayram-Ugam" Sairam-Su gorge of Turkestan region. In the Almaty region is registered in the Sarkand (foothills of Zhetysay Alatau) and Balkash (upper reaches of the Ile river) regions (figure 1).

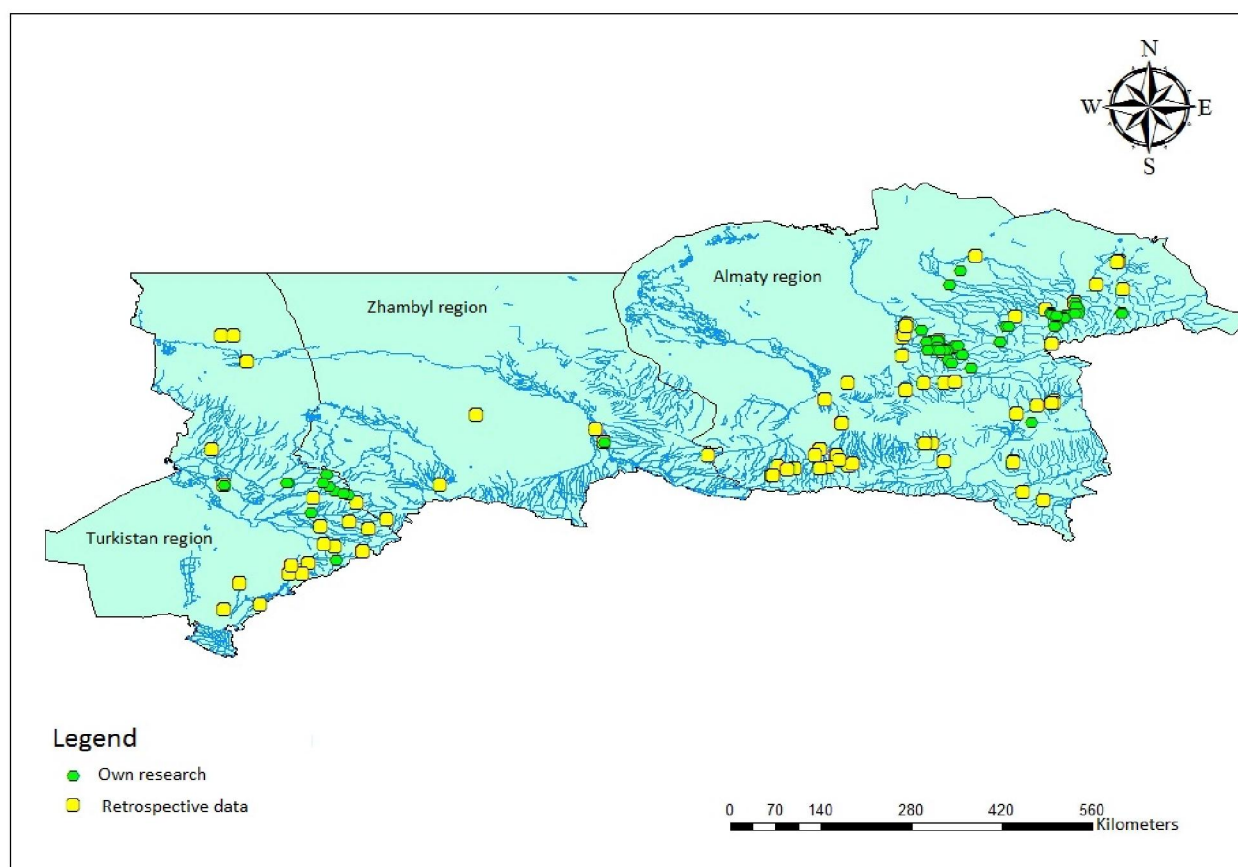


Figure 1 – Locations of finds of ticks *Dermacentor marginatus*

Material: 875♀♀, 832♂♂, 22 N, 58 L. studied. A total of 1787 individuals of *D. marginatus* own collections and from collection funds of the RSE "Institute of Zoology" SC MES of the Republic of Kazakhstan, RSE "KSCQZD named after M. Aikimbaev" Ministry of Health of the Republic of Kazakhstan, RSI "Shymkent Anti-Plague Station" of the Committee for Quality Control of Goods and



Services of the Ministry of Health of the Republic of Kazakhstan, RSE “Taldykorgan Anti-Plague Station” of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan.

***Dermacentor niveus* Neumann, 1897.** The available information about the initial finds of this species in Kazakhstan dates back to 1905 in the vicinity of the Alma-Ata city. Later, in 1929, the species was found there. In 1934, *D. niveus* was found in the Oktyabrsky, Kegen and Chui districts of the Alma-Ata region. Since the 40s of the last century, a detailed study of this species has begun. A number of researchers found the species in Enbekshi-Kazakh, Alma-Ata, Ili, Chilik, Kegen, Uigur Balkhash and Dzharkent regions of Almaty region, Kelesky, Lenger, Sairam, Turkestan, Suzak, regions of South Kazakhstan region, Aksuysky, Karatalsky, October Alakolsky, Burlyu-Tyube districts of Taldy-Kurgan region, Kurdai district of Dzhambul region. In the 50s Levit A.V. finds this species around Bilyli-Kul lake (Zhambyl region), Enbekshi-Kazakh and Balkhash regions of Almaty region, Zhambyl and Moyunkum regions of Zhambyl region. In the early 60s, Ushakova found ticks in the Balkhash district of Alma-Ata and in the Arys region of the South Kazakhstan region. In the mid-60s, studies of Karabayeva R. the ticks were collected in the Moyunkum district of the Zhambyl region, the Leninsky and Lenger regions of the South Kazakhstan region. In the late 60s, the species was found by G.Gubareva in Balkhash and by V.N. Senotrusova in the Karatalsky districts of the Alma-Ata region. The latest information we have about the findings of *D. niveus* dates back to 1970. I.G. Prygunova, K.A. Dzhankomen, G.A. Kravets and others in the Balkhash district of Alma-Ata region (collections of the RSE “Institute of Zoology” of the National Academy of Science of the Republic of Kazakhstan).

Since 2006 of the present century, our studies of *D. niveus* have been noted in the Kerbulak and Balkhash districts of the Almaty region; in the vicinity of Turkistan, Sozak, Baidibek, Otyrar, Ordabaysynsky, Arys, Maktaralsky districts of the Turkistan region; Sarysu, Moyunkum districts of the Zhambyl region (figure 2).

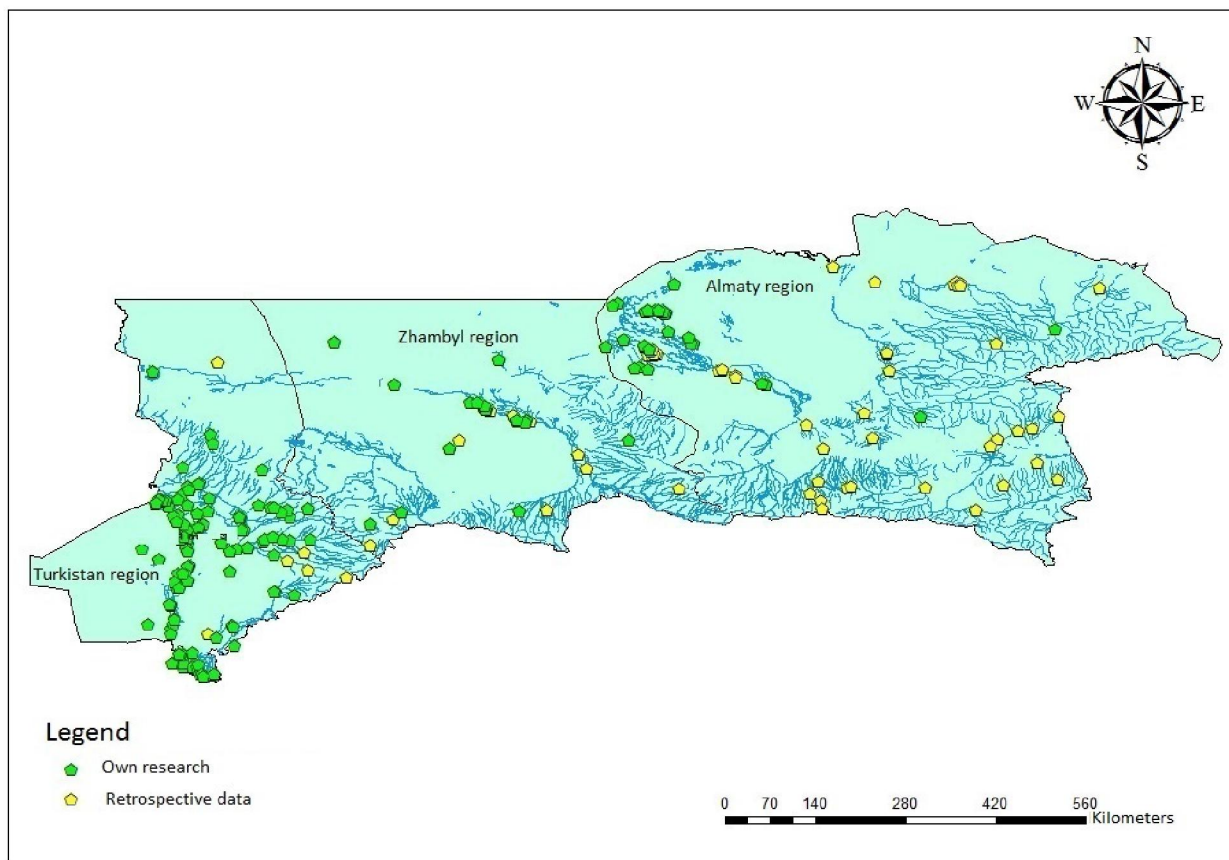


Figure 2 – Locations of finds of ticks *Dermacentor niveus*



Material: 381 ♀♀, 462 ♂♂, 19 N, 2 L. were studied. A total of 864 individuals of *D. niveus* from own collections and from collection funds of the RSE “Institute of Zoology” KN MON of the Republic of Kazakhstan, RSE “KSCQZD named after M. Aikimbaev” Ministry of Health of the Republic of Kazakhstan, RSE “Shymkent Anti-Plague Station” of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, RSE “Taldykorgan Anti-Plague Station” of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan.

***Dermacentor pavlovskyi* Olenov, 1927.** The main habitat of *D. pavlovskyi* is the Tien Shan mountains [15]. I.G. Galuzo gives information about the first findings of the species in 1910 in the Ak-Kekil place of the Karatau ridge on the mountain sheep *Ovis polii nigrimontana*. Later, in 1928, the species was found in Turkistan. *D. pavlovskyi* was noted by the Republican Tropical Station (RTS) in 1941 on Siberian ibex and mountain sheeps in the Aksu-Dzhabagly nature reserve, in 1944 on sheep and goats in the Naydenovka village of the Dzhabul district of the Alma-Ata region. In 1953-55 the RTS finds the species again on Siberian ibex in the Aksu-Dzhabagly reserve, and in 1961 on the Menzbir marmot at the source of the river Badam (Western Tien Shan).

We collected 2 males on the flag in the Baidibek region (Karatau mountains, environs of the village of Kensai) of the Turkistan region (figure 3).

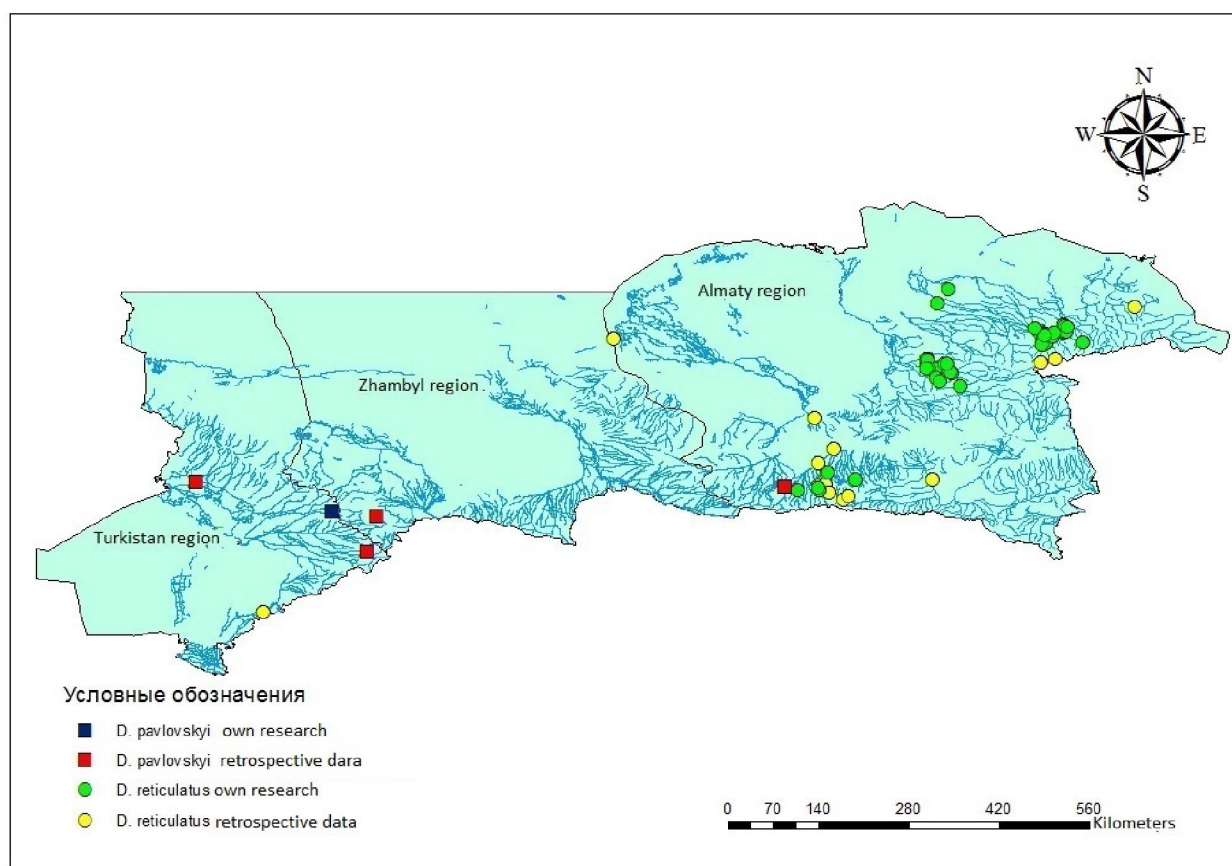


Figure 3 – Locations of ticks *Dermacentor pavlovskyi* and *D. reticulatus*

Material: 25 ♀♀, 59 ♂♂, 62 N, 4 L. of *D. pavlovskyi* were studied from the collection funds of the RSE “Institute of Zoology” KN MES RK, RSE “KSCQZD named after M. Aikimbaev” Ministry of Health of the Republic of Kazakhstan, RSE “Shymkent Anti-Plague Station” of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, RSE “Taldykorgan Anti-Plague Station” of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan.

***Dermacentor reticulatus* (Fabricius, 1794).** The first information about the findings of ticks of this species in 1934 on horses and cattle in the vicinity of the Alma-Ata city was given by D.I. Blagoveshchensky. Later, in 1937, he found ticks on cattle in Ili, and on hares in Alakul districts of the Almaty region [17]. In 1940-46. repeated findings of these ticks on dogs, horses, cattle, Siberian roe deer, shrews, Mongolian pikes, house mice, vegetation and humans in the vicinity of Alma-Ata (Teres-Butak, Small Almaty Gorge, upper Talgar, Broad Shchel, Medeo) and Almaty region (Bartogay, village Naydenovka, Dzhambul region, Ili, Foothills of the Dzungarian Ata-Tau) [8]. There is evidence of the presence of this species by the Republican Tropical Station in cattle in Sary-Agach (probably an accidental caught, since the species was not found in subsequent years).

Thus, information on the distribution of *D. reticulatus* in the south and southeast of Kazakhstan until the end of the 40s of the last century was limited mainly to the territory of the Almaty region [8]. Until the beginning of this century, we don't have information about finding the species in the study area outside the Almaty region.

In 2012-16. ticks were collected from the vegetation on the flag in Almaty (Botanical Garden) and Sarkand ("Zhongar-Alatau GNPP"), Kerbulak (vicinity of Karasu), Talgar, Karasai (vicinity of Yermensay village) districts of the Almaty region. In addition, in 2017-18. ticks were collected in vicinity of Topolevka, Sarkand, Vesely, Shatyrbay, Erkin, Abay, Rudnichny, Aldabergenova, Tekeli, Budyonny, Sarkand districts of Almaty region (figure 3).

Material: 1150 ♀♀, 992 ♂♂ were studied. A total of 2142 individuals of *D. reticulatus* from the collection funds of the RSE "Institute of Zoology" KN MES RK, RSE "KSCQZD named after M. Aikimbaeva" Ministry of Health of the Republic of Kazakhstan, RSI "Shymkent Anti-Plague Station" of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, Shymkent, Kazakhstan, RSI "Taldykorgan Anti-Plague Station" of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan.

**The discussion of the results.** Since the early 2000s of this century, studies have been carried out on the current state of the fauna of ixodid ticks that live in south-eastern Kazakhstan. Based on the studies, it should be assumed that over the past half century, as a result of intensive human economic activity, the tick's fauna underwent changes in the areas we studied. Compared with 30-60 years of the last century, significant changes have occurred in distribution of ticks of the *Dermacentor* genus [18]. Using modern research methods, we have clarified the current boundaries of the *D. marginatus*, *D. niveus*, *D. pavlovskyi*, *D. reticulatus* ranges within south-eastern Kazakhstan. So *D. marginatus* was noticed by us in the territory of Almaty, Zhambyl and Turkestan regions, mainly confined in the south-east to the foothills of Zailiysky and Zhetyssu Alatau, in the south to the foothills of the Western Tien Shan. Ticks were found in mass in the foothills of Zhetyssu Alatau (Almaty region), less often in the foothills of the Western Tien Shan and in single individuals in the Zhambyl region.

*D. niveus* is widespread in the territory of the three regions studied by us. The area of *D. niveus* within south-eastern Kazakhstan is confined to arid zones - these are mainly floodplains of the large rivers Shu, Ile and Syrdaria and their tributaries. *D. pavlovskyi* is registered by us only in the south of Kazakhstan in the foothills of the western Tien Shan. In Almaty and Zhambyl regions, the species was not found.

**Findings.** In the studies conducted in south-eastern Kazakhstan, we collected 4 species of ticks, ixodid ticks of the genus *Dermacentor*: *D. marginatus*, *D. niveus*, *D. pavlovskyi*, *D. reticulatus*. As a result of the analysis of retrospective data (literary sources and collections of ticks), significant differences were found in the distribution of these species of ticks in the study area compared to the 30-60 years of the last century.

Based on our studies, we can assume that not only natural and climatic conditions, but also the anthropogenic factor play a role in changing the boundaries of habitats. The earlier presence of some tick species in unusual for it territories is probably due to human economic activity - in the second half of the last century, the region was intensively developed, villages appeared and grew, irrigated agricultural enterprises have been developing.

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**З. З. Саякова<sup>1</sup>, В. П. Садовская<sup>1</sup>, А. Б. Есжанов<sup>1</sup>, В. Г. Мека-Меченко<sup>1</sup>,  
Т. Н. Куниша<sup>1</sup>, М. В. Кулемин<sup>2</sup>, И. Б. Ким<sup>3</sup>**

<sup>1</sup>ҚР Денсаулық сақтау министрлігінің "Масғұт Айқымбаев атындағы  
Қазақ карантиндік және зооноздық инфекциялар ғылыми орталығы" ШЖҚ РМК, Алматы, Қазақстан,

<sup>2</sup>ҚР Денсаулық сақтау министрлігі тауарлар мен қызметтердің сапасын бақылау комитетінің  
"Шымкент обаға қарсы күрес станциясы" РМБ, Шымкент, Қазақстан,

<sup>3</sup>ҚР Денсаулық сақтау министрлігі тауарлар мен қызметтердің сапасын бақылау комитетінің  
"Талдықорған обаға қарсы күрес станциясы" РМБ, Талдықорған, Қазақстан

#### **ҚАЗАҚСТАННЫҢ ОҢТҮСТІК-ШЫҒЫС БӨЛІГІНДЕ *DERMACENTOR* КОСН, 1844 (IXODIDAE, AMBLYOMMINAE) ТЕКТІ КЕНЕЛЕРДІҢ ТАРАЛУЫ**

**Аннотация.** Алматы, Жамбыл және Түркістан облыстарының аумағында ретроспективті деректер мен меншікті алымдарды талдау негізінде Қазақстанның оңтүстік-шығыс бөлігі шегіндегі *Dermacentor*: *D. marginatus*, *D. niveus*, *D. pavlovskiyi*, *D. reticulatus* текті кенелердің таралу аймағы нақтыланды. Өткен ғасырдың қазіргі деректері мен зерттеулері арасында кенелердің таралуы бойынша елеулі айырмашылықтар анықталды, бұл адамның белсенді шаруашылық қызметімен байланысты болуы мүмкін. *D. marginatus* Қазақстанның оңтүстік-шығысында негізінен тау бөктеріндегі аймақтарда таралған. Оның негізгі бөлігі Іле және Жетісу Алатауының тау бөктерінде тұрады. Батыс Тянь-Шань – Қаратау жотасы мен Талас жотасының тау бөктерінде сирек кездеседі. *D. niveus* ареалы шөлді және жартылай шөлейтті аумақтарды қамтиды, негізінен Шу, Іле, Сырдария өзендерінің жайылмалары және олардың ағындары. *D. pavlovskiyi* кенелері Батыс Тянь-Шанның тау бөктерінде, Қаратау жотасында табылған. Қазақстанның оңтүстік-шығысындағы *D. reticulatus* ареалы тек Іле және Жетісу Алатауының тау бөктерімен шектеледі.

**Түйін сөздер:** иксод кенелер, қоздырғыштардың таратушылар, эктопаразиттер коллекциясы, кенелер таралу аймағы, паразиттер фаунасы

**З. З. Саякова<sup>1</sup>, В. П. Садовская<sup>1</sup>, А. Б. Есжанов<sup>1</sup>, В. Г. Мека-Меченко<sup>1</sup>,  
Т. Н. Куниша<sup>1</sup>, М. В. Кулемин<sup>2</sup>, И. Б. Ким<sup>3</sup>**

<sup>1</sup>РГП на ПХВ «Казахский научный центр карантинных и зоонозных инфекций им. Масгута Айкимбаева»  
Министерства здравоохранения РК, Алматы, Казахстан,

<sup>2</sup>РГУ «Шымкентская противочумная станция» Комитета контроля качества товаров и услуг  
Министерства здравоохранения РК, Шымкент, Казахстан,

<sup>3</sup>РГУ «Талдықорганская противочумная станция» Комитета контроля качества товаров и услуг  
Министерства здравоохранения РК, Талдықорған, Казахстан

#### **РАСПРОСТРАНЕНИЕ КЛЕЩЕЙ РОДА *DERMACENTOR* КОСН, 1844 (IXODIDAE, AMBLYOMMINAE) В ЮГО-ВОСТОЧНОЙ ЧАСТИ КАЗАХСТАНА**

**Аннотация.** На основе анализа ретроспективных данных (литературных источников и коллекций иксодовых клещей РГП «Институт зоологии» КН МОН РК и РГП «КНЦКЗИ им. М. Айкимбаева» МЗ РК), а также собственных сборов на территории Алматинской, Жамбылской и Туркестанской областей уточнены границы ареалов клещей рода *Dermacentor*: *D. marginatus*, *D. niveus*, *D. pavlovskiyi*, *D. reticulatus* в пределах юго-восточной части Казахстана. Выявлены существенные различия по распространению клещей между современными данными и исследованиями прошлого столетия, что, вероятно, связано с изменением климата и активной хозяйственной деятельностью человека в этом регионе. В юго-восточном регионе Казахстана *D. marginatus* распространен, в основном, в предгорных зонах. Основная масса его обитает в предгорьях Заилийского и Жетысу Алатау (Алматинская область). Несколько реже вид встречается в предгорьях Западного Тянь-Шаня - хребет Каратау (Туркестанская область) и Таласский хребет (Жамбылская область). Ареал *D. niveus* охватывает пустынные и полупустынные территории, в основном это поймы рек Шу, Іле, Сырдария и их притоки. Клещи *D. pavlovskiyi* обнаружены в предгорьях Западного Тянь-Шаня, хребет Каратау. Нахождение их в 1944 году Республиканской тропической станцией на мелком рогатом скоте в Алматинской области вероятно случайно. Ареал *D. reticulatus* на юго-востоке Казахстана ограничен только предгорьями Заилийского и Жетысу Алатау. Нахождение вида в Жамбылской и Туркестанской областях вероятно ошибочно.

**Ключевые слова:** иксодовые клещи, переносчики возбудителей, коллекции эктопаразитов, ареалы клещей, фауна эктопаразитов.

#### **Information about authors:**

Sayakova Z. Z., Candidate of Biological Sciences, Head of the Laboratory of Zoology and Parasitology with a museum and insectariums RSE on REM "Kazakh scientific center of quarantine and zoonotic infections named after Masgut Aikimbaev" of the Ministry of Health of the Republic of Kazakhstan, Almaty, Kazakhstan; zsayakova@mail.ru; <https://orcid.org/0000-0003-1107-6345>



Sadovskaya V. P., Head of the GIS RSE laboratory on PCV "Kazakh Scientific Center for Quarantine and Zoonotic Infections named after Masgut Aikimbayev" of the Ministry of Health of the Republic of Kazakhstan; Almaty, Kazakhstan; versadovskaya@gmail.com; <https://orcid.org/0000-0001-8389-9362>

Yeszhanov A.B., PhD, Leading Researcher at the Laboratory of Zoology and Parasitology with a museum and insectariums RSE on REM "Kazakh scientific center of quarantine and zoonotic infections named after Masgut Aikimbayev" of the Ministry of Health of the Republic of Kazakhstan, Almaty, Kazakhstan; aidyn.eszhanov@gmail.com; <https://orcid.org/0000-0001-6572-5668>

Meka-Mechenko V.G., Ph.D., Leading researcher at the Laboratory of Zoology and Parasitology with a museum and insectariums RSE on REM "Kazakh scientific center of quarantine and zoonotic infections named after Masgut Aikimbayev" of the Ministry of Health of the Republic of Kazakhstan, Almaty, Kazakhstan; vm\_m@bk.ru

Kunitsa T.N., Candidate of Medical Sciences, Leading researcher at the Laboratory of especially dangerous infections RSE on REM "Kazakh scientific center of quarantine and zoonotic infections named after Masgut Aikimbayev" of the Ministry of Health of the Republic of Kazakhstan, Almaty, Kazakhstan; tkunitca@kscqzd.kz; <https://orcid.org/0000-0002-3895-4286>

Kulemin M.V., Head of the Laboratory of Epizootology and Prevention of Especially Dangerous Infections RSI "Shymkent Anti-Plague Station" of the Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, Shymkent, Kazakhstan; kmaxim.75@mail.ru; <https://orcid.org/0000-0002-8839-9276>

Kim I.B., zoologist of Laboratory of Epizootology and Prevention of Especially Dangerous Infections RSI "Taldykorgan Anti-Plague Station" Committee for Quality Control of Goods and Services of the Ministry of Health of the Republic of Kazakhstan, Taldykorgan, Kazakhstan; vit197803@mail.ru; <https://orcid.org/0000-0003-4940-5482>

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