

## A review of mites and ticks parasitizing rock lizards (Lacertidae: *Darevskia*)

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**ABSTRACT.** Rock lizards of the genus *Darevskia* are interesting research models due to their asexual reproduction. Ectoparasitic mites and ticks of these lizards are poorly known, despite some of these chelicerates being vector pathogens of humans and wildlife. Here we document and curate previously known data on ectoparasitic Acari of rock lizards and, based on our extensive survey, provide an annotated list of these ectoparasitic arthropods (six tick species, one macronyssid species, and seven chigger species). We also provide new host records (*Ixodes ricinus* on *Darevskia caucasica*, *D. dryada*, *D. mixta*, and *D. szczyrbaki*; *Haemaphysalis sulcata* on *D. rudis*; *Odontacarus saxicolis* on *D. brauneri*); and new geographical records (*O. saxicolis* in Russia and Georgia). *Journal of Vector Ecology* 47(1): 19-28. 2022.

**Keyword Index:** Rock lizards, *Darevskia*, *Haemaphysalis*, *Ixodes ricinus*, *Ophionyssus saurarum*, Trombiculidae.

### INTRODUCTION

With 872 papers published since 1834–2021 (<https://lacerta.de/AS/Home.php>, accessed 2021), rock lizards of the genus *Darevskia* Arribas, 1999 are one of the most studied groups of reptiles in the Palaearctic. The genus *Darevskia* is unique in having natural parthenogenesis, a rare phenomenon in amniote vertebrates (Darevsky 1958) having implications in evolutionary biology (Borkin and Darevsky 1980). The genus includes about 33 species distributed from the Balkan Peninsula in the west to the Kopet-Dag, Turkmenistan in the east (Uetz et al. 2019), occurring at altitudes up to 3,200 m above sea level. In many areas, rock lizards are the most numerous vertebrates, but some taxa are endemic, having narrow ranges and are protected species. Rock lizards inhabit a wide variety of biotopes, such as meadows and edges of deciduous forests, tree trunks, dry, stony areas in forests, dry and moderately dry rocks and their foothills on slopes with dry-loving shrub and grassy vegetation, clay cliffs in the mountain-steppe and mountainous meadow zones, rock outcrops, individual boulders, and heaps of large stones in mountain meadows, subalpine, and alpine zones (Doronin 2015).

Here we study ectoparasitic mites associated with rock lizards preserved at the Zoological Institute of the Russian Academy of Sciences (ZISP), which holds the largest collection of these animals in terms of diversity and specimen numbers. To complete this review, we also used literature data on ectoparasites, which inevitably introduced uncertainties associated with historical host taxonomy and incomplete distribution data. For example, many authors followed the old classification placing the majority of rock lizard taxa into *Lacerta saxicola* Eversmann, 1834. In many cases, host records were not accompanied by a locality, depository, or accession

ID. Similarly, historical references did not recognize the division of *D. praticola* (Eversmann, 1834) s.l. (= *Darevskia (praticola)* complex) into the two allopatric subspecies or species: *D. praticola* and *D. pontica* (Lantz & Cyrén 1918) (Tuniyev et al. 2011).

### MATERIALS AND METHODS

Host specimens were collected in Russia (Krasnodar and Stavropol Regions and Kabardino-Balkaria), Georgia, Abkhazia, Azerbaijan, and Turkey, preserved in alcohol, and deposited in ZISP. In 2021, we carefully examined 352 host individuals and found ectoparasites on 25 specimens. Ticks and chiggers were still attached to their lizard hosts, so potential museum cross contamination can be excluded (Figures 1 and 2). The taxa of rock lizards from the *Darevskia (saxicola)* complex were diagnosed using molecular genetic methods (Doronin et al. 2013). Morphological identification of ticks was done by the first author based on keys of Serdyukova (1956), Micherdzinski (1980), Kudryashova (1998), and Estrada-Peña et al. (2017). Chigger mite specimens were mounted on permanent microscopic slides in Faure-Berlese's mounting medium. Specimens were examined by MVO under a compound microscope (AxioImager A2, Zeiss, Germany). For SEM microscopy, alcohol-preserved ticks were freeze-dried and scanned using a TESCAN MIRA3 LMU (Czech Republic). Slide-mounted specimens were deposited in ZISP.

### RESULTS

Three hundred fifty-two rock lizards belonging to 20 species (60% of the total species diversity) were examined: *D. armeniaca* (Méhely, 1909), *D. brauneri* (Méhely, 1909), *D. caucasica* (Méhely, 1909), *D. chlorogaster* (Boulenger, 1908),



Figure 1. Ixodid tick attached to the host.

*D. daghestanica* (Darevsky, 1967), *D. dahli* (Darevsky, 1957), *D. derjugini* (Nikolsky, 1898), *D. dryada* (Darevsky & Tuniyev, 1997), *D. lindholmi* (Szczerbak, 1962), *D. mixta* (Méhely, 1909), *D. parvula* (Lantz & Cyrén, 1913), *D. portschinskii* (Kessler, 1878), *D. pontica* (Lantz & Cyrén, 1918), *D. praticola* (Eversmann, 1834), *D. raddei* (Boettger, 1892), *D. rostombekowi* (Darevsky, 1957), *D. rudis* (Bedriaga, 1886), *D. saxicola* (Eversmann, 1834), *D. szczerbaki* (Lukina, 1963), and *D. valentini* (Boettger, 1892). Seventy-two ticks belonging to two species and 21 chigger mites (one species) were collected. Information on each ectoparasite species is given below.

#### Family Ixodidae C.L. Koch, 1844

##### Genus *Haemaphysalis* C.L. Koch, 1844

Distribution of the genus: cosmopolitan.

*Haemaphysalis sulcata* Canestrini et Fanzago, 1878 (Figure 3).

Material: 5 L ex *D. rudis*, Kvemo-Boshury settlement, Georgia, 41°52' N 43°56' E, 23 VII 1963, leg. I.S. Darevsky (collection lot number ZISP 17746).

Distribution: Spain, France, Italia, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Albania, northern Macedonia, Bulgaria, Romania, Greece, Cyprus, Southern Russia (Crimea, Dagestan), Georgia, Azerbaijan, Armenia, Turkey, Iran, Saudi Arabia, India, Algeria, Libya, Tunisia, Morocco (Zolotarev 1949, Pomerantzev 1950, Filippova 1997, Keskin et al. 2013).

Rock lizard hosts: *D. armeniaca* (as *L. armeniaca* – Danielyan 1968), *D. daghestanica* (as *L. saxicola caucasica* – Zolotarev 1949), *D. portschinskii* (Danielyan 1968), *D. pontica* (as *L. praticola* – Lukina 1966, Markov et al. 1964), *D. praticola* (Radchenko et al. 1984), *D. raddei* (as *L. saxicola nairensis*, *L. saxicola raddei* – Danielyan 1968), *D. rudis* (new record).

Other hosts: reptiles and birds are hosts for immature ticks, while large mammals, including cattle and sheep, are



Figure 2. Three ixodid ticks attached to *Darevskia praticola*.

the major hosts for adults of *H. sulcata* (Keskin et al. 2013).

Pathogen transmission: *Babesia* sp. and *Theileria* sp. (Hoogstraal et al. 1981), *Anaplasma ovis* (Walker et al. 2003), *A. phagocytophilum* (Aktas et al. 2012).

##### *Haemaphysalis punctata* Canestrini et Fanzago, 1878

Distribution: Sweden (Gotland, Öland), Denmark, Poland, Russia (including Crimea), Netherlands, Belgium, Great Britain, Switzerland, France (including Corsica), Spain, Portugal, Italy (including Sicilia and Sardinia), Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Kosovo, Northern Macedonia, Ukraine, Moldova, Romania, Bulgaria, Albania, Greece, Cyprus, Turkey, Lebanon, Egypt, Algeria, Libya, Tunisia, Morocco (Raad et al. 2020).

Rock lizard hosts: *D. daghestanica* (as *L. saxicola caucasica* – Zolotarev 1949), *D. dahli* (Danielyan, 1968), *D. raddei* (as *L. saxicola nairensis* – Danielyan 1968), *D. rostombekowi* (Danielyan 1968), *D. saxicola* (Tertyshnikov 2002), *D. valentini* (Danielyan 1968).

Other hosts: small vertebrates, such as hares, hedgehogs, and birds are hosts of immature stages, while adults mainly feed on wild and domestic ungulates, particularly cattle, sheep, and goats (Estrada-Peña et al. 2017).

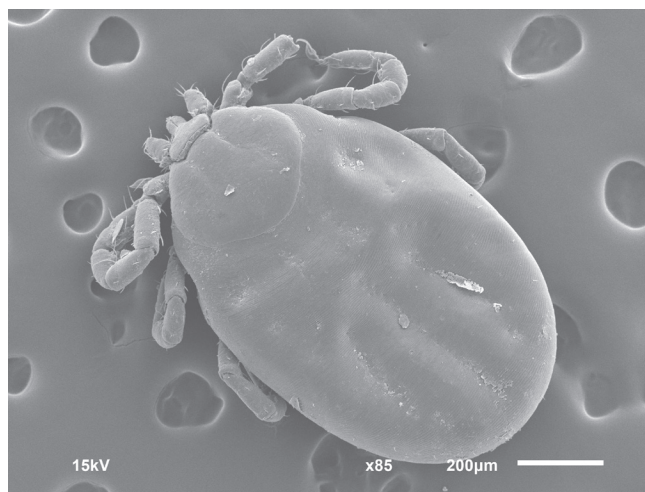


Figure 3. *Haemaphysalis sulcata* larva.



Pathogen transmission: *Babesia bigemina*, *B. major*, *B. motasi*, *Brucella*, *Rickettsia sibirica*, *R. helvetica*, *R. massiliae*, *R. nr hoogstraalii*, *R. monacensis*-like *Rickettsia*, *Anaplasma bovis*, *A. centrale*, *A. phagocytophilum*, *Coxiella burnetii*, *Theileria* spp., *Borrelia burgdorferi* s.l., *Francisella tularensis* (Estrada-Peña et al. 2017).

*Haemaphysalis parva* (Neumann, 1897)

Distribution: Russia (Dagestan Republic, Krasnodar and Stavropol Region), Georgia, Azerbaijan, Turkmenia, Macedonia, Romania, Turkey, Iraq, Syria, Palestine, Jordan (Schulze, 1918, Feldman-Muhsam 1951, Serdyukova 1956, Hoogstraal and Kaiser 1958, 1959, Feider et al. 1958, Kadatskaya and Shirova 1963, El-Rabie et al. 1990).

Rock lizard hosts: *D. daghestanica* (as *Haemaphysalis otophila* – Zolotarev 1949), *D. pontica* (as *H. otophila* – Lukina 1966, Markov et al. 1964), *D. praticola* (as *H. otophila* – Radchenko et al. 1984).

Other hosts: small mammals (hares, hedgehogs), birds, and lizards are hosts for immature stages; adults feed mainly on wild and domestic ungulates, particularly cattle, sheep, and goats. *H. parva* can attack humans (Estrada-Peña et al. 2017).

Pathogen transmission: *Babesia ovis* (Filippova 1997), *Coxiella burnetii* (the causative agent of Q fever) (Filippova 1997), *Francisella tularensis* (Filippova 1997), *Rickettsia hoogstraalii* (Orkun et al. 2014), *Candidatus 'Rickettsia goldwasserii'* (Keysary et al. 2011).

*Haemaphysalis caucasica* Olenov, 1928

Distribution: Ukraine, Russia (Dagestan Republic), Uzbekistan, Tajikistan, Kyrgyzstan (Zolotarev 1949, Serdyukova 1956, Akramova et al. 2016).

Rock lizard hosts: *Darevskia* sp. (as *L. saxicola* – Serdyukova 1956), *D. daghestanica* (as *L. saxicola caucasica* – Zolotarev 1949).

Other hosts: hares are the most common hosts of all life history stages, also occurs on bears, jackals, and foxes. Nymphs can also feed on lizards (Serdyukova 1956).

Pathogen transmission: unknown.

### Genus *Ixodes* Latreille, 1795

Distribution of the genus: cosmopolitan (Filippova 1997).

*Ixodes ricinus* Linnaeus, 1758 (Figure 4).

Material: Russia: 4 N, 22 L ex *D. brauneri*, Absheron forestry (Krasnodar Region) 44°31' N 39°37' E, 13 VII 2019, leg. N.E. Shevchenko (collection lot number ZISP 30499); N ex *D. brauneri* from Otdalenniy settlement (Krasnodar Region) 44°04' N 39°42' E, 8 VII 2019, leg. N.E. Shevchenko (collection lot number ZISP 30498); 6 L ex *D. pontica*, Goryachiy Klyuch (Krasnodar Region) 44°42' N 39°22' E, 21 VII 2016, leg. N.E. Shevchenko (collection lot numbers ZISP 29691, 29692); L ex *D. pontica* from Goryachiy klyuch town (Krasnodar Region) 44°36' N 39°02' E, 3 VIII 2016, leg. N.E. Shevchenko (collection lot number ZISP 29690); N ex *D. praticola* from sanctuary “Debry” (Stavropol' Region)

44°13' N 43°15' E, 28 V 2020, leg. I.V. Doronin (collection lot number ZISP 31086); 2 L ex *D. praticola* from Cherek Gorge, Verkhnee Goluboe Lake (Kabardino-Balkaria Republic) 43°14' N 43°34' E, 11 VIII 2004, leg. K.Yu. Lotiev (collection lot number ZISP 29671); N, 4 L ex *D. praticola*, Novopavlovsk (Stavropol Region) 43°56' N 43°40' E, 12 VII 2013, leg. I.V. Doronin (collection lot numbers ZISP 27012, 27013); 2 L ex *D. szczyrbaki* from cape Idokopas (Krasnodar Region) 44°24' N 38°19' E, 9-10 VIII 2001, leg. D.A. Melnikov (collection lot number ZISP 22217/2). Georgia: N ex *D. caucasica* nr Kazbegi 42°40' N 44°37' E, 14 VI 1964, leg. I.S. Darevsky (collection lot number ZISP 17786); L ex *D. caucasica* from Lagodekhy 41°51' N 46°17' E, 25 VII 1964, leg. I.S. Darevsky (collection lot number ZISP 17819/23); 2 L ex *D. dryada* from gorges of Charnaly and Charkhichely rivers 41°33' N 41°36' E, 12-13 VII 1977, leg. V.I. Vedmederya, Yu.V. Sviridenko (collection lot numbers ZISP 19907/1, 2); 6 L ex *D. dryada* from gorge of Charnaly river 41°33' N 41°36' E, 5 IX 1976, leg. I.S. Darevsky (collection lot numbers ZISP 18809, 18810); L ex *D. mixta* from gorge of Banis-Khevy river 41°52' N 43°25' E, 23 VII 1959, leg. I.S. Darevsky (collection lot number ZISP 17426); N, L ex *D. rudis* from Keda settlement 41°36' N 41°57' E, 12 VII 1058, leg. V. Petrov (collection lot number ZISP 17523). Azerbaijan: 4 L ex *D. chlorogaster* from Bilyasar settlement 38°38' N 48°42' E, 1 VI 1974, leg. I.S. Darevsky (collection lot number ZISP 18510/2).

Distribution: Southern Scandinavia to the Mediterranean Sea, European Russia, Northern Africa (Serdyukova 1956, Pérez and Rodhain 1977).

Rock lizard hosts: *D. brauneri* (as *L. saxicola* – Lukina 1966, Kidov et al. 2014, our data), *D. caucasica* (new record), *D. chlorogaster* (Drozdov 1964, this article), *D. daghestanica* (as *L. saxicola caucasica* – Zolotarev 1949), *D. derjugini* (Timoshina et al. 2013), *D. dryada* (new record), *D. mixta* (new record), *D. pontica* (Kidov et al. 2014), *D. praticola* (as *L. praticola* – Radchenko et al. 1984, Kidov 2018, our data), *D. rudis* (as *L. rudis* – Keskin et al. 2012, this article), *D. saxicola* (Tertyshnikov 2002, Kidov et al. 2019), *D. szczyrbaki* (new record).

Other hosts: larvae and nymphs feed on insectivores

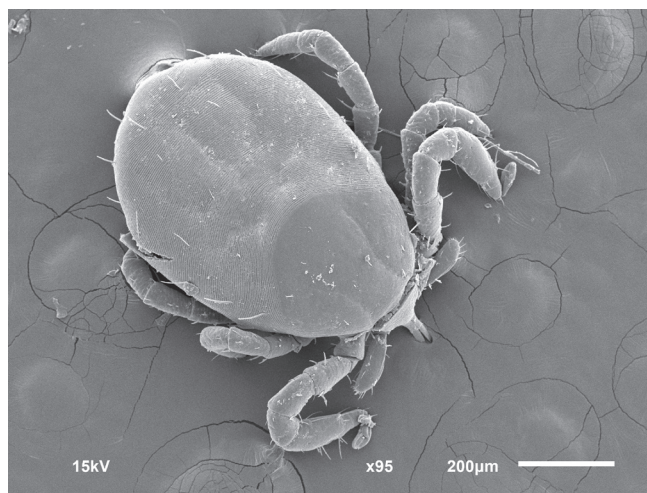


Figure 4. *Ixodes ricinus* larva.

(hedgehogs, moles, shrews), rodents (squirrels, dormice, black rats, gray rats, house mice), birds (*Accipiter nisus*, *Lyrurus tetrrix*, *Tetrao urogallus*, *Tetrastes bonasia*, *Capella gallinago*), rarely reptiles (*Testudo graeca*, *L. strigata*, *Natrix natrix*, *Vipera ursinii* and others); adults feed on larger mammals, such as foxes, lynxes, horses, wild boars, roe deer, red deer, sika deer, domestic sheep, domestic goats, European mouflons. All three active stages feed on hedgehogs and hares. *I. ricinus* can attack humans (Estrada-Peña et al. 2017).

Pathogen transmission: *Borrelia burgdorferi* s.l. (Lyme borreliosis), *Anaplasma phagocytophilum* (human granulocytic anaplasmosis), *Francisella tularensis* (tularemia), *Rickettsia helvetica* and *Rickettsia monacensis* (spotted fever rickettsiosis), *Babesia divergens* and *Babesia microti* (babesiosis), *Neoehrlichia mikurensis* (neoehrlichiosis), tick-borne encephalitis virus (encephalitis), Louping ill virus (encephalitis), and Tribec virus (encephalitis) (Estrada-Peña et al. 2017).

*Ixodes redikorzevi* Olenev, 1927

Distribution: Southeast Europe, Anterior and Central Asia (Filippova 1997).

Rock lizard hosts: *D. chlorogaster* (as *L. chlorogaster* – Gadzhiev et al. 1982).

Other hosts: larvae, nymphs and females feed on many rodents (*Cricetulus migratorius*, *Microtus* spp., *Apodemus* spp., *Meriones* spp., *Sciurus* spp., *Citellus pygmaeus*, *Marmota bobak*, *Spalax* spp.), insectivores (hedgehogs, shrews) and other mammals (*Lepus europaeus*, *Mustela* spp., *Vormela peregusna*, *Martes martes*, *Meles meles*, *Vulpes vulpes*), birds (*Alectoris kakelik*, *Columba livia*, *Galerida cristata*, *Emberiza* spp., *Oenanthe* spp., *Frithacus rubecula*, *Anthus* spp., *Mergus serrator*, *Phylloscopus* spp., *Pica pica*), rarely reptiles (*Lacerta agilis*, *Pseudopus apodus*) (Filippova 1997).

Pathogen transmission: *Francisella tularensis* (Tiflova 1974), *Coxiella burnetii* (Pchelkina et al. 1968).

### Gamasina Kramer, 1881

#### Family Macronyssidae Oudemans, 1936

#### Genus *Ophionyssus* Mégnin, 1883

Distribution of the genus: semi-cosmopolitan (Eurasia, Africa, North America) (Micherdzinski 1980).

*Ophionyssus saurarum* (Oudemans, 1901)

Distribution: Europe, Russia (Leningrad Province, Moscow Province, Tver Province, Saratov Province, Volgograd Province, Stavropol Region), Kazakhstan, Armenia, Azerbaijan, Korea, Sudan, South Africa (Micherdzinski 1980, Gwiazdowicz and Filip 2009, Mašan et al. 2009, Beron 2014). Rock lizard hosts: *D. braueri* (as *L. saxicola* – Lukina 1966), *D. armeniaca* (as *L. armeniaca* – Danielyan 1968), *D. pontica* (as *L. praticola* – Lukina 1966, Markov et al. 1964), *D. raddei* (as *L. saxicola nairensis* – Danielyan 1968), *D. valentini* (as *L. saxicola valentini* – Danielyan 1968), *D. saxicola* (Beron 2014).

Other hosts: reptiles of the families Lacertidae and Scincidae (Micherdzinski 1980).

Pathogen transmission: *Schellackia* sp. (Micherdzinski 1980), *Karyolysus* sp. (Alvarez Calvo 1978).

### Superorder Acariformes Zakhvatkin, 1952

#### Family Trombiculidae Ewing, 1929

#### Genus *Ericotrombidium* Vercammen-Grandjean, 1966

Distribution of the genus: semi-cosmopolitan (Eurasia, Africa, North America) (Kudryashova 1998).

*Ericotrombidium caucasicum* Schluger, 1967

Distribution: Russia (Stavropol Region) (as *Leptotrombidium caucasicum* – Kudryashova 1998, Tertyshnikov 2002), Ukraine (Kudryashova 1998).

Rock lizard hosts: *D. saxicola* (Tertyshnikov 2002).

Other hosts: *L. agilis*, *Eremias arguta* (Kudryashova 1998).

Pathogen transmission: unknown.

#### Genus *Odontacarus* Ewing, 1929

Distribution of the genus: tropical, arid and mountainous regions of Old and New World (Kudryashova 1998).

*Odontacarus hushchai* Kudryashova, 1994

Distribution: Russia (Krasnodar Region), Georgia (Kudryashova, 1994).

Rock lizard hosts: *D. braueri* (as *L. saxicola* – Kudryashova, 1994), *D. derjugini* (as *L. saxicola* – Kudryashova, 1994).

Other hosts: unknown.

Pathogen transmission: unknown.

*Odontacarus saxicolis* Schluger, Hushcha et Kudryashova, 1965

Material: Georgia (Abkhazia): 5 L ex *D. braueri*, Pitsunda-Myussera state natural reserve 43°10' N 40°25'E, 17-19 VII 2010, leg. I.V. Doronin, M.A. Doronina (collection lot number ZISP 25965). Russia: 16 L ex *D. braueri* Tuapse (Krasnodar Region) 44°05' N 39°06' E, 18 VIII 2009, leg. I.V. Doronin, M.A. Doronina (collection lot number ZISP 25737).

Distribution: Russia (Krasnodar Region) (new record), Georgia (Abkhazia) (new record), Azerbaijan (Kudryashova 1998), Armenia (Kudryashova 1998).

Rock lizard hosts: *D. raddei* (Kudryashova 1998), *D. braueri* (new record).

Other hosts: unknown.

Pathogen transmission: unknown.

#### Genus *Lacertacarus* Schluger & Vasilieva, 1977

Distribution of the genus: Caucasus (Russia – Krasnodar Region, Georgia, Armenia, Azerbaijan).

*Lacertacarus latus* Schluger & Vasilieva, 1977

Distribution: Russia (Krasnodar Region), Georgia (Kudryashova 1998).

Rock lizard hosts: *D. derjugini* (Kudryashova 1998).

Other hosts: unknown.

Pathogen transmission: unknown.

Table 1. Host and distribution of mites and ticks parasitizing rock lizards (continued on following pages).

Species	Caucasus						Anatolia (Turkey)	No locality
	Crimea	Stavropol Region	Krasnodar Region	Dagestan Republic	Georgia	Armenia		
<i>Darevskia armeniaca</i> (Méhely, 1909)							<i>Haemaphysalis sulcata</i> <sup>1</sup> Ophionyssus saururum <sup>1</sup> Ixodidae <sup>15</sup>	
<i>Darevskia brauneri</i> (Méhely, 1909)			<i>Ixodes ricinus</i> <sup>4,5,20</sup> <i>Haemaphysalis</i> sp. <sup>5</sup> <i>Ophionyssus saururum</i> <sup>5</sup> <i>Odontacarus hushchai</i> <sup>14</sup>			* <i>Odontacarus saxicolis</i> <sup>*</sup>		
<i>Darevskia caucasica</i> (Méhely, 1909)						<i>Ixodes ricinus</i> <sup>#</sup> <i>Lacertacarus similis</i> <sup>14</sup>		
<i>Darevskia chlorogaster</i> (Boulenger, 1908)							<i>Ixodes ricinus</i> <sup>23, #</sup> <i>I. redikorzevi</i> <sup>13</sup> <i>Ophionyssus</i> sp. (as <i>Sauronyssus</i> sp.) <sup>13</sup>	
<i>Darevskia daghestanica</i> (Darevsky, 1967)				<i>Ixodes ricinus</i> <sup>19</sup> <i>Haemaphysalis parva</i> <sup>19</sup> <i>H. punctata</i> <sup>19</sup> <i>H. sulcata</i> <sup>19</sup> <i>H. caucasica</i> <sup>19</sup>				
<i>Darevskia dahl</i> (Darevsky, 1957)							<i>Haemaphysalis punctata</i> <sup>1</sup> Ixodidae <sup>15</sup>	
<i>Darevskia derjugini</i> (Nikolsky, 1898)			<i>Ixodes ricinus</i> <sup>21</sup>			<i>Lacertacarus similis</i> <sup>14</sup> <i>Lacertacarus latus</i> <sup>14</sup> <i>Odontacarus hushchai</i> <sup>14</sup>		

<sup>1</sup>Danielyan 1968, <sup>2</sup>Tertyshnikov 1992, <sup>3</sup>Tertyshnikov 2002, <sup>4</sup>Tertyshnikov 2002, <sup>5</sup>Lukina 1966, <sup>6</sup>Vshivkov, Shluger 1960, <sup>7</sup>Markov et al. 1964, <sup>8</sup>Stanyukovich, Iogansen 2004, <sup>9</sup>Radchenko et al. 1984, <sup>10</sup>Arutyunyan et al. 2013, <sup>11</sup>Yilmaz et al. 2018, <sup>12</sup>Kidov et al. 2019, <sup>13</sup>Gadzhiyev et al. 1982, <sup>14</sup>Kudryashova 1998, <sup>15</sup>Vartanyan et al. 2011, <sup>16</sup>Keskin et al. 2012, <sup>17</sup>Serdyukova 1956, <sup>18</sup>Beron 2016, <sup>19</sup>Zolotarev 1949, <sup>20</sup>Kidov et al. 2014, <sup>21</sup>Timoshina et al. 2013, <sup>22</sup>Kidov 2018, <sup>23</sup>Drozdzov 1964, \*This article, #Recorded for Abkhazia.

Table 1. Host and distribution of mites and ticks parasitizing rock lizards (continued on following pages).

Species	Crimea	Caucasus						Anatolia (Turkey)	No locality
		Stavropol Region	Krasnodar Region	Dagestan Republic	Georgia	Armenia	Azerbaijan		
<i>Darevskia dryada</i> (Darevsky et Tuniyev, 1997)					<i>Ixodes ricinus</i> #				
<i>Darevskia lindholmi</i> (Szczerbak, 1962)	<i>Neotrombicula</i> ( <i>Polymastacitula</i> ) <i>tragardhiana</i> <sup>6</sup>								
<i>Darevskia mixta</i> (Méhely, 1909)					<i>Ixodes ricinus</i> #				
<i>Darevskia parvula</i> (Lantz et Cyrén, 1913)					<i>Odontacarus hushchaj</i> <sup>14</sup>				
<i>Darevskia portschinskii</i> (Kessler, 1878)						<i>Haemaphysalis sulcata</i> <sup>1</sup> Ixodidae <sup>15</sup>			
<i>Darevskia pontica</i> (Lantz et Cyrén, 1918)				<i>Ixodes ricinus</i> <sup>5</sup> , <sup>7,12,20,4</sup> <i>Haemaphysalis parva</i> <sup>5,7</sup> <i>H. sulcata</i> <sup>5,7</sup> <i>Ophionyssus saururum</i> <sup>5,7</sup>					
<i>Darevskia praticola</i> (Eversmann, 1834)	<i>Ixodes ricinus</i> <sup>8,*</sup> <i>Haemaphysalis parva</i> (as <i>H. otophila</i> ) <sup>9</sup> <i>Haemaphysalis sulcata</i> <sup>9</sup>						<i>Ixodes ricinus</i> <sup>22</sup>		
<i>Darevskia (praticola)</i>	<i>Ixodes ricinus</i> <sup>2,3,4</sup> <i>Haemaphysalis parva</i> <sup>3,2,4</sup> <i>Ericotrombidium caucasicum</i> <sup>3</sup> <i>Ophionyssus saururum</i> <sup>2</sup>								

Table 1. Host and distribution of mites and ticks parasitizing rock lizards (continued).

Species	Crimea	Caucasus						Anatolia (Turkey)	No locality
		Stavropol Region	Krasnodar Region	Dagestan Republic	Georgia	Armenia	Azerbaijan		
<i>Darevskia raddaei</i> (Boettger, 1892)					<i>Lacertacarus similis</i> <sup>10</sup>	<i>Haemaphysalis sulcata</i> <sup>1</sup> <i>Haemaphysalis punctata</i> <sup>1</sup> <i>Odontacarus saxicolis</i> <sup>14</sup> <i>Ophionyssus saurarium</i> <sup>1</sup> <i>Ixodidae</i> <sup>15</sup>	<i>Odontacarus saxicolis</i> <sup>14</sup> <i>Lacertacarus callosus</i> <sup>14</sup>		
<i>Darevskia rostombekowi</i> (Darevsky, 1957)						<i>Haemaphysalis punctata</i> <sup>1</sup> <i>Ixodidae</i> <sup>15</sup>			
<i>Darevskia rudis</i> (Bedriaga, 1886)					<i>Ixodes ricinus</i> <sup>#</sup> <i>Haemaphysalis sulcata</i> <sup>*</sup> <i>Lacertacarus similis</i> <sup>14</sup>			<i>Ixodes ricinus</i> <sup>16</sup>	
<i>Darevskia saxicola</i> (Eversmann, 1834)		<i>Ixodes ricinus</i> <sup>3</sup> <i>Haemaphysalis punctata</i> <sup>3</sup> <i>Ericotrombidium caucasicum</i> <sup>3</sup>							<i>Ophionyssus saurarium</i> <sup>18</sup>
<i>Darevskia szczerbaki</i> (Lukina, 1963)			<i>Ixodes ricinus</i> <sup>#</sup>						
<i>Darevskia valentini</i> (Boettger, 1892)						<i>Haemaphysalis punctata</i> <sup>1</sup> <i>Ophionyssus saurarium</i> <sup>1</sup>		<i>Hyalomma aegyptium</i> <sup>11</sup>	
<i>Darevskia</i> sp. (without species mention)						<i>Ophionyssus saurarium</i> <sup>10</sup>	<i>Ixodes ricinus</i> <sup>13</sup> <i>Haemataphysalis sulcata</i> <sup>13</sup> <i>Ophionyssus saurarium</i> <sup>13</sup> <i>Lacertacarus callosus</i> <sup>13</sup> <i>Lacertacarus similis</i> <sup>14</sup> <i>Odontacarus saxicolis</i> <sup>13</sup>		<i>Ophionyssus saurarium</i> <sup>8</sup> <i>Neotrombicula (Polymastacula) tragarthiana</i> <sup>14</sup> <i>Haemaphysalis caucasica</i> <sup>17</sup>



*Lacertacarus similis* Schluger & Vasilieva, 1977  
 Distribution: Azerbaijan, Georgia (Kudryashova 1998).  
 Rock lizard hosts: *D. raddei* (Kudryashova 1998), *D. caucasica* ? (as *L. saxicoa* – Kudryashova 1998).  
 Other hosts: unknown.  
 Pathogen transmission: unknown.

*Lacertacarus callosus* (Schluger, 1966)  
 Distribution: Armenia, Azerbaijan.  
 Rock lizard hosts: *D. raddei* (as *L. saxicola* – Kudryashova 1998), *D. raddei* (Kudryashova 1998).  
 Other hosts: *Erinaceus europaeus* (Kudryashova 1998).  
 Pathogen transmission: unknown.

### Genus *Neotrombicula* Hirst, 1925

Distribution of the genus: cosmopolitan.  
 Subgenus *Polymasticula* Vercammen-Grandjean & Kolebinova, 1985

*Neotrombicula (Polymasticula) tragardhiana* (Feider, 1953)  
 Distribution: Russia (Crimea), Azerbaijan, Kyrgyzstan, Tadjikistan, Romania, Turkey (Kudryashova 1998).  
 Rock lizard hosts: *Darevskia* sp. (as *L. saxicolis* – Kudryashova 1998).  
 Other hosts: insectivores (*Crocidura russula*), rodents (*Apodemus sylvaticus*, *Microtus majori*, *M. socialis*, *M. arvalis*, *Alticola roylei*), reptiles (*L. agilis*, *L. strigata*, *Podarcis tauricus*) (Kudryashova 1998).  
 Pathogen transmission: unknown.

### DISCUSSION

We identified fourteen acarine ectoparasite species associated with rock lizards of the genus *Darevskia*: six ticks, one gamasid, and seven chiggers. Of these, ixodid ticks and gamasid mites are known as vectors of pathogens of wild animals and humans. Rock lizards usually serve as hosts of immature ticks, while adult stages of ticks attack large animals, including humans. As a result, rock lizards, where they are abundant, can probably sustain large tick populations. Overall, studies of host-parasite associations, distribution, and patterns of parasite abundance and prevalence can contribute to our understanding of host-parasite-pathogen systems as well as host-parasite co-evolution and co-speciation.

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