Persian J. Acarol., 2022, Vol. 11, No. 4, pp. 633–642.
https://doi.org/10.22073/pja.v11i4.76279
Journal homepage: http://www.biotaxa.org/pja

Article

First data on the mites (Mesostigmata, Oribatida) from sea debris of the Caspian Sea (Dagestan coast, Russia)

Olga L. Makarova[1] and Sergey G. Ermilov[2*]

1. *Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia; E-mail: ol_makarova@mail.ru*
2. *Institute of Environmental and Agricultural Biology (X-BIO), Tyumen State University, Tyumen, Russia; E-mail: ermilovacari@yandex.ru*

[*] Corresponding author

ABSTRACT
Mites in seaweeds from two distant sites of the Dagestan State Nature Reserve, namely from the Kizlyar Bay and Samoor Forest, were studied. Total of 31 species of mesostigmatic mites (Acari: Mesostigmata) and 31 species of oribatid mites (Acari: Oribatida) were collected and identified. The other mites (Astigmata, Prostigmata, and Endeostigmata) belong to 19 families. One species of gamasid mites [*Gamasellodes vulgatior* (Athias-Henriot, 1961)] and two species of oribatids [*Austrophthiracarus* cf. *duplex* (Mahunka & Mahunka-Papp, 2010); *Xenillus moyae* Pérez-Íñigo & Peña, 1994] are recorded from Russia for the first time. Among 62 identified species, 28 (including the majority of Mesostigmata) were not previously recorded in Dagestan. The faunistic similarity of species lists from two sites was only 13.1% (Jaccard's coefficient). The input of broadly hydrophilic mite species (15% of the total list) is noticeable. However, no characteristic halophilic (littoral) species were found. Most likely, this is due to the absence of marine macrophytes (and their emissions) in studied soft-ground coastal areas. It is during their decay that a specialized saprophilic complex of invertebrates is commonly formed.

KEY WORDS: Dagestan State Nature Reserve; Kizlyar Bay; littoral mite species; non-tidal sea; Samoor Forest; seaweed.

PAPER INFO.: Received: 17 July 2022, Accepted: 15 August 20222, Published: 15 October 2022

INTRODUCTION

There is virtually no information concerning marine and coastal mites of the Caspian Sea, the largest inland water body globally. On the other hand, mites are the most common, abundant, and diverse group of animals on seashores (Halbert 1920; Luxton 1967; Schuster 1979; Pugh and King 1985; Koehler *et al*. 2008; Haynert *et al*. 2017; Makarova and Bizin 2020; etc.). Most of the available data refer to the coasts of Europe. Acarological studies in the Caspian Sea are confined to armored mites of the northwestern coast (Abdurakhmanov *et al*. 2011, 2013; Grikurova *et al*. 2014), as well as a few records: two species of marine Halacaridae (Bartsch 2009) and one species of gamasid mites (Makarova 1994).

The fauna of the Caspian Sea as a whole is strongly impoverished, comprising 2.5 or five times

How to cite: Makarova, O.L. & Ermilov, S.G. (2022) First data on the mites (Mesostigmata, Oribatida) from sea debris of the Caspian Sea (Dagestan coast, Russia). *Persian Journal of Acarology*, 11(4): 633–642.

fewer species than that of the Black Sea or Barents Sea, respectively, while endemic species of other invertebrates and fishes are known to amount to 46% of their joint list (Zenkevich 1963; Kasymov 1987). Therefore, we plan to study the taxonomic composition of mites on different shores of the Caspian Sea in order to analyze the arealogical structure of the fauna and try to reconstruct its genesis. The first stage of this work was to analyze seaweed mites collected by authors in various protected areas of Dagestan. The species diversity of mites in marine debris is basically much higher than in the littoral or supralittoral grounds (Makarova and Petrova-Nikitina 2008; Makarova and Bizin 2020; Bizin and Makarova 2022).

The diverse, ecologically heterogeneous and abundant complex of free-living mites is among the most appropriate tools for monitoring the coastal ecosystems. Interest in these mites is growing all over the world, however recent surveys (e.g., Procheș and Marshall 2001) virtually fail to consider the coasts of Russia, even in a comparative way. Both control and protection of these particular natural communities require the knowledge about their composition and functioning.

In this report, we provide the first information on mites found in sea debris in two areas of the Dagestan Nature Reserve, both sharply different in their environmental conditions. One lies on the shores of Kizlyar Bay, northern Dagestan, and the other at Samoor Forest, southern Dagestan (Fig. 1). We aimed at compiling taxonomic lists and presenting a preliminary analysis of the specificity of the species complex found.

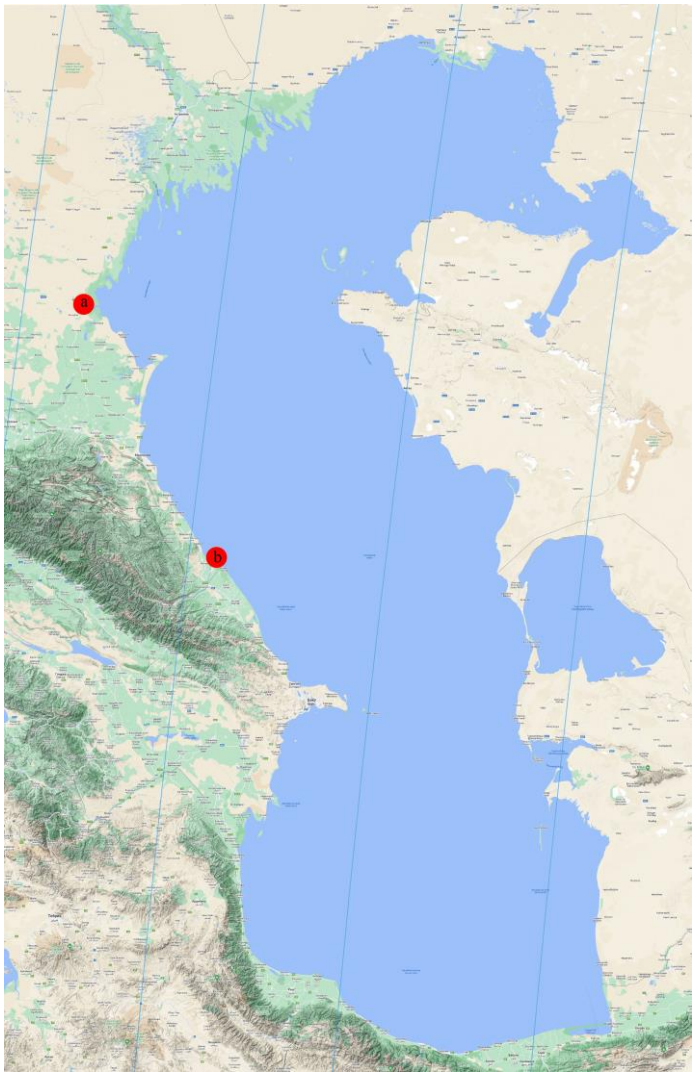

Figure 1. Schematic map of the Caspian Sea and locations (a. Kizlyar Bay; b. Samoor Forest) where the littoral mite fauna was studied.

METHODS

On the non-tidal shores of the Caspian Sea, seaweeds are usually small in size, and are either quickly decomposed or dry up, but these are exactly the habitats to which the specialized littoral mite species are often confined (Makarova and Petrova-Nikitina 2008; Makarova and Bizin 2021). Therefore, material was collected before the onset of the hot period (April and early June 2021).

The study shores are distinguished geomorphologically, being also subjected to different climatic conditions, although the average annual temperatures at both localities are similar (11.1–12.5 °C). **(1)** In the shallow-water Kizlyar Bay with a 23-km wide band of reed (*Fragmites australis*), marine debris was found (June 7th, 2021) only on the bank of a seawater canal, 44° 29' N, 46° 41' E (Fig. 2) and consisted mainly of grass remains (Fig. 3). The mid-July temperature at this locality is 25.2 °C, *vs* the mid-January temperature of −2.4 °C (Ataev 2020); the salinity of sea water in summer is about 9‰. **(2)** On a sandy beach along the edge of the deciduous Samoor Forest, 41° 50'–41° 53' N, 48° 32'–48° 35' E (Fig. 4), storm emissions were collected on April 6th and 7th, 2021, being represented by a mixture of herbaceous and woody debris among large tree trunks cast ashore (Fig. 5). The mid-July temperature there is 24.6 °C, *vs* the mid-January temperature of 1.4 °C (Ataev 2020); the salinity of sea water in summer is about 12‰.

Figures 2–5. Sampling sites – 2, 3. Kizlyar Bay, canal with sea water and storm emissions within reeds; 4, 5. Marine coast in the Samoor Forest and sea debris on the beach.

Samples (each 125 ml in volume) were taken from the storm emissions, as well as in underlying grounds. Each sample series included five replicates. Mites were extracted in the lab

from the cores using Tullgren funnels by drying the samples for 10 days until their complete desiccation with neither additional heating nor light. Microarthropods were fixed with 96% alcohol. Mesostigmatic mites determined in permanent slides in Hoyer's medium *vs*. oribatid mites were identified in temporary preparations with acid lactic. The material is shared between the collections of the Laboratory of Synecology of the Severtsov Institute of Ecology and Evolution RAS and the X-BIO Institute of the Tyumen State University.

RESULTS

Our material comprised 31 species of gamasid and uropodid mites (Mesostigmata), 31 species of oribatid mites (Oribatida) (Table 1), and 4 species of acaroid mites (Astigmata). Representatives of the suborders Prostigmata and Endeostigmata could not be analyzed due to the extremely poor knowledge of this group as a whole. Here we can only indicate that they are represented in the storm emissions by no less than 17 families.

Table 1. Species composition of mesostigmatic and oribatid mites in sea debris on the shores of the Kizlyar Bay (June 2021) and the Samoor Forest (April 2021), Caspian Sea.

Family	Species	Number of adult ind.		Distribution
		Kizlyar Bay	Samoor Forest	
Uropodidae	*Uropoda orbicularis* (Muller, 1776)*	1	-	Europe, Iran
Parasitidae	*Phorythocarpais hyalinus* (Willmann, 1949)*	122	-	Palaearctic
	Pergamasus crassipes (Linnaeus, 1758)*	-	19	Semicosmopolitan
	Amblygamasus sp.	-	2	?
Rhodacaridae	*Rhodacarus* cf. *denticulatus* Berlese, 1921*	1	-	Semicosmopolitan
Veigaiidae	*Veigaia planicola* Berlese, 1892*	-	1	Holarctic
Ascidae	*Antennoseius* (*Vitzthumia*) sp. ***	3	-	SE Europe, Iran
	Arctoseius cetratus (Sellnick, 1940)*	37	-	Semicosmopolitan
	Gamasellodes vulgatior (Athias-Henriot, 1961)**	-	1	Algeria, Iran, India
	Protogamasellus massula (Athias-Henriot, 1961)*	-	1	Algeria, Kalmykia, Iran
	Protogamasellus mica (Athias-Henriot, 1961)*	-	1	Palaearctic
	Protogamasellus sp.	-	1	?
Blattisociidae	*Lasioseius confusus* Evans, 1958*	1	-	Holarctic
	Cheiroseius curtipes (Halbert, 1923)*	1	14	Semicosmopolitan
	Cheiroseius necorniger (Oudemans, 1904)*	-	19	Cosmopolitan
	Cheiroseius sp. 1	-	3	?
	Cheiroseius sp. 2	-	1	?
	Platyseius cf. *italicus* (Berlese, 1905) *	-	2	Europe, Iran
Phytoseiidae	*Amblyseius meridionalis* (Berlese, 1914)*	1	-	Palaearctic
Digamasellidae	*Dendrolaelaps* aff. *strenzkeiformis* Hirschmann & Wisniewski, 1982**	15	-	?
	Dendrolaelaspis bregetovae Shcherbak, 1977*	1	-	Holarctic
Macrochelidae	*Macrocheles scutatus* (Berlese, 1904) *	21	9	Semicosmopolitan
Laelapidae	*Pseudoparasitus missouriensis* (Ewing, 1909) *	1	-	Semicosmopolitan
	Gaeolaelaps kargi (Costa, 1968)	9	-	Palaearctic
	Gaeolaelaps nolli (Karg, 1962)*	11	-	Holarctic

Note: * – species first found in Dagestan, ** – species first found in Russia, *** – species new to science.

Table 1. Continued.

Family	Species	Number of adult ind.		Distribution
		Kizlyar Bay	Samoor Forest	
Laelapidae	*Gaeolaelaps aculeifer* (Canestrini, 1883)	-	4	Semicosmopolitan
	Gaeolaelaps sp.	2	-	?
	Cosmolaelaps lutegiensis (Shcherbak, 1971)*	-	1	SE Europe,
	Euandrolaelaps karawaiewi (Berlese, 1903)*	3	-	
	Androlaelaps casalis (Berlese, 1887)	1	-	Cosmopolitan
	Ololaelaps placentula (Berlese, 1887)	-	4	Palaearctic
Adelphacaridae	*Aphelacarus acarinus* (Berlese, 1910)	-	1	Semicosmopolitan
Brachychthoniidae	*Eobrachychthonius latior* (Berlese, 1910)	-	3	Holarctic
Cosmochthoniidae	*Phyllozetes emmae* (Berlese, 1910)	-	3	Semicosmopolitan
Haplochthoniidae	*Haplochthonius simplex* (Willmann, 1930)	-	1	Semicosmopolitan
Sphaerochthoniidae	*Sphaerochthonius splendidus* (Berlese, 1904)	-	3	Semicosmopolitan
Epilohmanniidae	*Epilohmannia styriaca* Schuster, 1960*	-	4	Palaearctic
Oribotritiidae	*Mesotritia nuda* (Berlese, 1887)	-	44	Semicosmopolitan
Euphthiracaridae	*Acrotritia ardua* (Koch, 1841)	4	18	Cosmopolitan
Phthiracaridae	*Austrophthiracarus* cf. *duplex* (Mahunka & Mahunka-Papp, 2010)**	-	88	Greece
	Phthiracarus globosus (Koch, 1841)	-	7	Semicosmopolitan
Gymnodamaeidae	*Jacotella frondeus* (Kulijev, 1979)	1	-	Palaearctic
Damaeidae	*Belba* cf. *daghestanica* Bulanova-Zachvatkina, 1962	1	-	Mediterranean, Iran
Peloppiidae	*Pyroppia lanceolata* Hammer, 1955	-	1	Holarctic
Liacaridae	*Xenillus moyae* Pérez-Íñigo & Peña, 1994**	-	6	Canary Islands
Oppiidae	*Oppiella nova* (Oudemans, 1902)	1	-	Cosmopolitan
	Microppia minus (Paoli, 1908)	-	3	Cosmopolitan
Hydrozetidae	*Hydrozetes lacustris parisiensis* Grandjean, 1948	-	13	Cosmopolitan
Passalozetidae	*Passalozetes africanus* Grandjean, 1932	-	4	Semicosmopolitan
Oribatellidae	*Oribatella* cf. *caspica* Shtanchaeva, Grikurova & Subías, 2011	25	1	Holarctic
Zetomimidae	*Zetomimus furcatus* (Warburton & Pearce, 1905)*	-	1	Semicosmopolitan
Punctoribatidae	*Punctoribates insignis* Berlese, 1910*	10	1	Semicosmopolitan
	Punctoribates hexagonus Berlese, 1908	-	1	Semicosmopolitan
Oribatulidae	*Zygoribatula caspica* (Shtanchaeva, Grikurova & Subías, 2011)	-	1	Caucasian
	Zygoribatula cf. *glabra* (Michael, 1890)	-	8	Palaearctic
	Zygoribatula exarata (Berlese, 1916)	16	2	Palaearctic
	Oribatula tibialis (Nicolet, 1855)	5	1	Semicosmopolitan
Scheloribatidae	*Scheloribates* cf. *laevigatus* (Koch, 1835)	5	-	Semicosmopolitan
	Urubambates elongatus (Krivolutsky, 1969)	2	-	Palaearctic
Haplozetidae	*Protoribates capucinus* Berlese, 1908	35	8	Cosmopolitan
Galumnidae	*Trichogalumna nipponica* (Aoki, 1966)	-	2	Semicosmopolitan
	Galumna tarsipennata Oudemans, 1914*	-	1	Semicosmopolitan
Species number		**28**	**42**	-
Total number of adult individuals, spm.		336	309	-
Total number of juvenile individuals, spm.		124	89	-
Total number of mites, spm.		460	398	-

Note: * – species first found in Dagestan, ** – species first found in Russia, *** – species new to science.

The material contains a single, apparently new gamasid mite species, *Antennoseius* (*Vitzthumia*) sp., Ascidae. Earlier, the same species was found by us also in different districts of Kalmykia (new data, unpublished). Its description is currently in progress in cooperation with Iranian colleagues, who also discovered it in saline soils in Iran. One species of gamasid mites (*Gamasellodes vulgatior*) and two species of oribatid mites (*Austrophthiracarus* cf. *duplex* and *Xenillus moyae*) are recorded from Russia for the first time. Among the 62 species, 28 (including the majority of Mesostigmata) have not been found in Dagestan so far (Table 1).

In the Kizlyar Bay, 28 species of mesostigmatic and oribatid mites were found in storm emissions. On the shores of Samoor Forest, their acarofauna included 42 species. The faunistic similarity of the lists is 13.1% (Jaccard's similarity coefficient).

Taking into account the unidentified mites of the order Prostigmata, the total abundance of all groups of mites in the sea debris from the Kizlyar Bay coast averaged 1,850 ind./l, *vs* 1,100 ind./l on the Samoor Forest shore. The share of prostigmatic mites in the material from these localities amounted to 61% or 42% of all mite individuals, respectively.

The assemblage of oribatids and mesostigmatic mites in the samples of sea debris is poorly differentiated ecologically and fails to include littoral species properly, the latter being characteristic of algae emissions on open sea shores. Most of the oribatid species found are free-living inhabitants of litter and soil of moderate moisture. Among the mesostigmatic mites, many species (seven) prefer waterlogged substrates (*Lasioseius confusus*, members of the genera *Cheiroseius*, *Platyseius*, and *Ololaelaps*), whereas four species (*Arctoseius cetratus*, *Macrocheles scutatus*, *Phorytocarpais hyalinus*, and *Uropoda orbicularis*) dwell in a wide range of eutrophic habitats. Only two species of oribatid mites represent the hydrophilic complex (*Hydrozetes lacustris parisiensis* and *Zetomimus furcatus*).

DISCUSSION

The storm emissions over the territory of the Dagestan Nature Reserve are inhabited by a rich complex of mites, among which only mesostigmatic and oribatid mites combined number 62 species. The most diverse genera are *Gaeolaelaps*, *Cheiroseius* and *Zigoribatula*. The large number of species belonging to *Gaeolaelaps* and *Zigoribatula* obviously reflects the southern provenance of the acarofauna as a whole (see Chelebiev 1988; Poletayeva 1998; Shtanchaeva and Subías 2010; Mahunka *et al*. 2013). The high diversity of the family Laelapidae in total (Table 1) is characteristic of the soil mesostigmatic population south of the forest belt of the Palaearctic (Makarova 2009).

The above new data reveals a sharp difference in the level of knowledge of various mite groups in Dagestan. Among oribatid mites, only 1/5 species (19%) have not been recorded from the republic (Shtanchaeva and Subías 2010; Shtanchaeva *et al*. 2018), while among the mesostigmatic mites, such species account for 87% (see Bregetova *et al*. 1977; Gazaliev 2011, 2012, 2015; etc.). The gamasid mite, *Gamasellodes vulgatior*, has been reported so far only from Algeria, Iran and India (Athias-Henriot 1961; Bhattacharyya and Sanyal 2002; Agha Alikhan *et al*. 2017). Of particular interest are the two oribatid mite species found on the Caspian coast, namely *Xenillus moyae*, known until now only from the Canary Islands (Pérez-Íñigo and Peña 1994) and *Austrophthiracarus* cf. *duplex* known until now from Greece (Mahunka and Mahunka-Papp 2010).

In storm emissions from the Kizlyar Bay and Samoor Region, the input of hydrophilic mite species (15% of the list) that are inclined to various freshwater habitats, is noticeable. However, no characteristic halophilic (littoral) species have been found in our material. The saprophilic complex includes only three species of predatory mites, namely, *Arctoseius cetratus*, *Macrocheles scutatus*, *Phorytocarpais hyalinus*, and the euryphagous *Uropoda orbicularis*. Besides seaweeds, these are quite common in other temporary decaying substrates such as plant and manure composts, excrements of large vertebrates, etc.

The absence in our material of specialized thalassobiontic species is probably due to the nature of the marine debris in the study areas of the Nature Reserve. They consist of hardly decomposing plant debris of terrestrial origin, mainly reed remnants, coarse hay and woody residues, in which there is no mass reproduction of saprophylic invertebrates as a rule. In other sites of the Dagestan coast (near Makhachkala, Kaspiysk, Izberbash), where there are many large stones on the coast itself and in shallow water (which contributes to the growth of algae and formation of seaweed accumulations), littoral species form the main body of the mite population (our unpublished data). In rapidly decaying seaweeds, an abundant food resource for predatory Mesostigmata is usually formed, including various Diptera, nematodes, enchytraeids, crustaceans, and springtails.

The low faunistic similarity of seaweed mite assemblages in the studied areas of the Nature Reserve (Jaccard's similarity index 13%) is probably due to differences in the composition of the soil acarofauna of the surrounding habitats such as reed beds in the Kizlyar Bay or the liana forest in the Samoor Region, whence mites randomly enter the marine debris. Specialized littoral mite species usually show phoretic associations with other arthropods (insects, crustaceans), ensuring their emergence in the rapidly decomposing accumulations of marine plants. This suggests that the composition of the seaweed mite fauna in the various rocky areas of Dagestan coast is more similar and predictable.

CONCLUSIONS

Marine debris of the Kizlyar and Samoor sites of the Dagestan State Nature Reserve are inhabited by an abundant and diverse complex of mites, but there are no specialized littoral species. This is most likely due to the absence of rocky substrates in these areas of the Caspian coast, which determine the development of marine macrophytes (Chizhenkova and Zaitsev 2011). It is during their decay that a specialized saprophilic complex of invertebrates is commonly formed.

ACKNOWLEDGEMENTS

The authors are grateful for the all-around support of the field work to G. Dzhamirzoev, Director, and the rangers of the Dagestan State Nature Reserve. We received invaluable advice from U.Ya. Shtanchaeva and O. Joharchi. We are also indebted to K.V. Makarov who prepared the figures for publication. This work was supported by the Russian-Iranian RFBR grant (No. 20-54-56054 Iran_t).

REFERENCES

Abdurakhmanov, G.M., Grikurova, A.A., Shtanchaeva, U.Ya. & Subías, L.S. (2011) Oribatid fauna (Acariformes, Oribatida) of coastal ecosystems and islands in the north-west part of the Caspian Sea and their life forms. *The South of Russia: Ecology, Development*, 2: 24–29.

Abdurakhmanov, G.M., Grikurova, A.A., Subías, L.S., Shtanchaeva, U.Ya. & Kuramagomedov, B.M. (2013) Species composition and zoogeographic characteristic of oribatid mites (Acariformes, Oribatida) of coastal and insular areas in the north-west part of the Caspian Sea. *The South of Russia: Ecology, Development*, 1: 16–21.

Agha Alikhani, H., Ahadiyat, A. & Joharchi, O. (2017) Gamasine mites (Acari: Mesostigmata) in Qom Province, Iran. *In*: Hajiqanbar, H. & Saboori, A. (Eds.), *Abstract book of The Third International Persian Congress of Acarology, University of Tehran, Tehran, Iran*, pp. 3–4.

Ataev, Z., (2020) *Lecture 6. Climate of Dagestan*. Dagestan State Pedagogical University, pp. 1–18. DOI: 10.13140/RG.2.2.17647.18084

Athias-Henriot, C. (1961) Mediterranean edaphic Mesostigmata (Urop. excl.) (Acaromorpha, Anactinotrichida) (collect. Prof. H. Franz et C. Athias-Henriot) First Serie. *Acarologia*, 3(4): 381–509.

Bartsch, I. (2009) Checklist of marine and freshwater halacarid mite genera and species (Halacaridae: Acari) with notes on synonyms, habitats, distribution and descriptions of the taxa. *Zootaxa*, 1998(1): 1–170.

Bhattacharyya, A.K. & Sanyal, A.K. (2002) Three new species and some new records of the genus *Gamasellodes* Athias-Henriot (Acarina: Ascidae) from India. *Acarologia*, 42(3): 229–238.

Bizin, M.S. & Makarova, O.L. (2022) The first data on mesostigmatic mite assemblages (Parasitiformes, Mesostigmata) from a coastal area of the Eastern Black Sea region (Abrau Peninsula, Krasnodar Territory). *Entomological Review*, 102(2): 264–277.

Bregetova, N.G., Wainstein, B.A., Kadite, B.A., Koroleva, E.V., Petrova, A.D., Tichomirov, S.I. & Shcherbak, G.I. (1977) *Key to Soil-Inhabiting Mites. Mesostigmata*. Nauka, Leningrad, 717 pp.

Chelebiev, K.A. (1988) *Gamasid mites of the Central Kazakhstan. Ph.D. Thesis*. Novosibirsk, Biological Institute, Siberian Branch of AN SSSR, 25 pp.

Chizhenkova, O.A. & Zaitsev, V.F. (2011) Peculiarities of macrophyte and zoobenthos development and distribution in different types of sediments in the Northern Caspian. *Vestnik AGTU, Seria Fisheries*, 2: 69–73.

Gazaliev, N.A. (2011) Microarthropod mites of pasture ecosystems of high-mountainous Dagestan. *Problems of development of the agro-industrial complex of the region*, 1(5): 39–46.

Gazaliev, N.A. (2012) To the fauna of microarthropod ecosystems of mountainous Dagestan. *Bulletin of the Dagestan State University*, 6: 208–2011.

Gazaliev, N.A. (2015) The role of environmental components in the formation of microarthropod communities. *Bulletin of the Dagestan State University*, 30(6): 139–144.

Grikurova, A.A., Davudova, E.Z., Subías, L.S. & Shtanchaeva, U.Ya. (2014) Results of the oribatid mite study in the coastal area of the north-west part of the Caspian Sea. *The South of Russia: Ecology, Development*, 3: 158–161.

Halbert, J.N. (1920) The Acarina of the seashore. *Proceedings of the Royal Irish Academy*, 35B: 106–149.

Haynert, K., Kiggen, M., Klarner, B., Maraun, M. & Scheu, S. (2017) The structure of salt marsh soil mesofauna food webs. The prevalence of disturbance. *PLoS One*, 12(12): e0189645.

Kasymov, A.G. (1987) *The Caspian Sea*. Gydrometeoizdat, Leningrad, 152 pp.

Koehler, H., Wohltmann, A., Weigmann, G. & Gerecke, R. (2008) Zur Milbenfauna der Ostfriesischen Inseln (Arachnida, Acari). *In*: Niedringhaus, R., Haeseler, V., Janiesch, P. (Eds.), *Die Flora und Fauna der Ostfriesischen Inseln – Artenverzeichnisse und Auswertungen zur Biodiversität*. Schriftenreihe Nationalpark Niedersächsisches Wattenmeer, 11, pp. 113–122.

Luxton, M. (1967) The zonation of saltmarsh Acarina. *Pedobiologia*, 7: 55–66.

Makarova, O.L. (1994) Gamasid mites of the genus *Crassicheles* (Mesostigmata, Eviphididae) in Russia and ontogenesis of *Crassicheles greeni*. *Entomological Review*, 73(3): 107–117.

Makarova, O.L. (2009) The fauna of free-living gamasid mites (Parasitiformes, Mesostigmata) in the northern taiga: an analysis of the zonal specificity. *Entomological Review*, 89(8): 993–1009.

Makarova, O.L. & Bizin, M.S. (2020) Littoral mesostigmatic mites (Acari, Parasitiformes) from the Kola Peninsula. *Polar Biology*, 43: 1503–1518.

Makarova, O.L. & Petrova-Nikitina, A.D. (2008) Successions of gamasid mites (Parasitiformes, Mesostigmata) in seaweed accumulations on the littoral of the White Sea (Velikaya Salma Strait). *In*: Kirpichnikov, M.P. (Ed.), *Conference to the 70th anniversary of the N.A. Pertsov*

White Sea Biological Station of Moscow University (BBS, August 9–11, 2008). *Grif i K, Moscow, Russia*, pp. 75–79.

Mahunka, S., Horváth, E. & Kontschán, J. (2013) Oribatid mites of the Balkan Peninsula (Acari: Oribatida). *Opuscula Zoologica Budapest*, 44 (Suppl. 1): 11–96.

Mahunka, S. & Mahunka-Papp, L. (2010) New and little known oribatid mites from the Carpathian Basin and the Balkan Peninsula (Acari: Oribatida). *Acta Zoologica Academiae Scientiarum Hungaricae*, 56(3): 211–234.

Perez-Íñigo, C. & Peña, M.A. (1994) Oribátidos edáficos (Acari, Oribatei) de Gran Canaria (I). *Boletín de la Asociación Española de Entomología*, 18(1–2): 65–77.

Petrova, A.D. & Makarova, O.L. (2008) *Order Parasitiformes Zachvatkin 1952. Suborder Mesostigmata G. Canestrini 1819. Biota Catalog of the White Sea Biological Station of Moscow State University*. Association of Scientific Publications KMK, Moscow, pp. 324–327.

Poletayeva, T.G. (1998) *Free-living gamasid mites of the forest-steppe zone of the Trans-Baikal Region and their ecology. Ph.D. Thesis*. Irkutsk State University, Irkutsk, pp. 1–21.

Procheş, Ş. & Marshall, D.J. (2001) Global distribution patterns of non-halacarid marine intertidal mites: iimplications for their origins in marine habitats. *Journal of Biogeography*, 28(1): 47–58.

Pugh, P.J.A. & King, P.E. (1985) The vertical distribution of the British intertidal Acari – the non halacarid fauna (Arachnida: Acari). *Journal of Zoology*, 207: 21–33. DOI: 10.1111/j.1469-7998.1985.tb04912.x

Schuster, R. (1979) *Soil mites in the marine environment. In*: Rodriguez, J.G.(Ed.), *Recent Advances in Acarology. Vol. 1*. Academic Press, New York, pp. 593–602.

Shtanchaeva, U.Ya. & Subías, L.S. (2010) *Catalog of armored mites of the Caucasus*. DSC RAS, Makhachkala, 276 pp.

Shtanchaeva, U.Ya., Subías, L.S. & Kremenitsa, A.M. (2018) New data on the fauna of shell mites (Oribatida) of the North Caucasus. *South of Russia: ecology, development*, 13(2): 52–63.

Zenkevich, L.A. (1963) *Biology of the Seas of the USSR*. Publishing House of the Academy of Sciences of the USSR, Moscow, 740 pp.

نخستین داده‌ها در مورد کنه‌ها (Mesostigmata, Oribatida) از زباله‌های دریای کاسپین (ساحل داغستان، روسیه)

اولگا ال. ماکاروا[1] و سرگی جی. ارمیلوف[2*]

۱. موسسه بوم شناسی و تکامل سورتسوف، آکادمی علوم روسیه، مسکو، روسیه؛ رایانامه: ol_makarova@ mail.ru

۲. موسسه زیست شناسی محیطی و کشاورزی (X-BIO)، دانشگاه ایالتی تیومن، تیومن، روسیه؛ رایانامه: ermilovacari@yandex.ru

* نویسندهٔ مسئول

چکیده

کنه‌های موجود در جلبک‌های دریایی از دو مکان دوردست ذخیره‌گاه طبیعی داغستان، یعنی خلیج کیزلیار و جنگل سامور، مورد مطالعه قرار گرفتند. در مجموع ۳۱ گونه کنهٔ میان‌ستیگما (Acari: Mesostigmata) و ۳۱ گونه کنهٔ اوریباتید (Acari: Oribatida) جمع‌آوری و شناسایی شدند. سایر کنه‌ها (بی‌استیگمایان، پیش‌استیگمایان و اندئوستیگمایان) به ۱۹ خانواده تعلق داشتند. یک گونه کنهٔ میان‌استیگما [*Gamasellodes vulgatior* (Athias-Henriot, 1961)] و دو گونه از اریباتیدها [*Austrophthiracarus* cf. *duplex* (Mahunka & Mahunka-Papp, 2010) و *Xenillus moyae* Pérez-Íñigo & Peña, 1994] نخستین بار از روسیه گزارش می‌شوند. از میان ٦٢ گونهٔ شناسایی شده، ۲۸ گونه (از جمله بیشتر میان‌استیگمایان) پیش‌تر از داغستان گزارش نشده بودند. شباهت فونستیکی فهرست گونه‌ها از دو محل تنها ۱۳/۱ درصد (ضریب جاکارد) بود. جمع‌آوری گونه‌های کنه به طور گسترده آبدوست (۱۵ درصد از کل فهرست) چشمگیر است. با این حال، هیچ گونه هالوفیل (ساحلی) مشخصی یافت نشد. به احتمال زیاد، این به دلیل نبود ماکروفیت‌های دریایی (و انتشار آنها) در مناطق ساحلی با زمین نرم است. در طی پوسیدگی آنها، به طور معمول یک مجموعه ساپروفیل تخصصی از بی‌مهرگان تشکیل می‌شود.

واژگان کلیدی: ذخیره گاه طبیعی دولتی داغستان؛ خلیج کیزلیار؛ گونه‌های کنه‌های ساحلی؛ دریای غیر جزر و مدی؛ جنگل سامور؛ جلبک دریایی.

اطلاعات مقاله: تاریخ دریافت: ۱٤۰۱/٤/۲٦، تاریخ پذیرش: ۱٤۰۱/٥/۲٤، تاریخ چاپ: ۱٤۰۱/۷/۲۳