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On the fauna of woodlice (Crustacea: Isopoda: Oniscidea) of Sarykum cluster of Dagestan Nature Reserve (Russia)

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ABSTRACT. Dagestan is one of the least studied areas in the south of European part of Russia in terms of terrestrial isopods. The fauna of woodlice of Sarykum cluster of Dagestan Nature Reserve was studied in 2019. In total 6 species belonging to 4 families were collected. The fauna of woodlice of the studied cluster is similar to that of Azerbaijan and Kalmykia.

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KEY WORDS: Biodiversity, Dagestan reserve, isopoda terrestria, soil fauna, woodlice.

К фауне мокриц (Crustacea: Isopoda: Oniscidea) Сарыкумского кластера Дагестанского заповедника (Россия)

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РЕЗЮМЕ. Дагестан — один из наименее изученных районов юга Европейской части России с точки зрения наземных изопод. В 2019 г. изучена фауна мокриц Сарыкумского кластера Дагестанского заповедника. Всего собрано 6 видов, относящихся к 4 семействам. Фауна мокриц изученного кластера сходна с таковой соседних регионов, Азербайджана и Калмыкии.

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КЛЮЧЕВЫЕ СЛОВА: биоразнообразие, Дагестанский заповедник, наземные изоподы, почвенная фауна, мокрицы.

Introduction

The fauna of terrestrial isopods of the Republic of Dagestan has only been studied in the environs of Makhachkala city (Khisametdinova, 2012). One of the main Russian specialists in this group, E.V. Borutsky, conducted studies of woodlice in the south of the European part of Russia (Borutsky, 1951) never examining Dagestan. At the same time, the areas around Dagestan are rich in woodlice diversity. There is some information about Transcaucasia region: at least 19 species of woodlice are known from Azerbaijan (Kuznetsova, Gongalsky, 2012), however, its territory has been studied unevenly, mainly due to materials identified at different times by E.V. Borutsky and H. Schmalfuss (Schmalfuss, 1990, 1996) according to the collections of S.I. Golovach and colleagues. In recent years, there were some studies in the Lower Don and Lower Volga regions: D.D. Khisametdinova (2007, 2014) studied the fauna of woodlice of the Rostov Region, and K.B. Gongalsky did so in the Republic of Kalmykia (Gongalsky, 2017; Gongalsky *et al.*, 2018). In addition, G. Kashani is actively studying the fauna of Iran's terrestrial isopods, which led to the emergence of descriptions of new species (Eshaghi *et al.*, 2015; Kashani, Allspach, 2012). At the present time, there are at least 45 species of woodlice known from Iran, many of which inhabit the southern coast of the Caspian Sea (Kashani, 2018). So, the woodlice fauna of Dagestan remains the least studied on the western coast of the Caspian Sea, and we hypothesize it to be similar to the fauna of Transcaucasia and the Lower Volga region.

Dagestan Nature Reserve is a specially protected natural area consisting of two clusters located in the Kumtorkala and Tarumovsky districts of the Republic of Dagestan, Russia. They are the Sarykum Dunes and the Kizlyar Bay. The total area of the reserve is 19 061 ha, 576 ha of which fall on the Sarykum dunes (Sokolov, Syroechkovsky, 1990). The present work is devoted to survey of the fauna of the woodlice of the reserve, providing initial information on this taxon in Dagestan.

Material and Methods

The material was collected on the territory of the Sarykum Cluster in August 2019 by the first author of this study. Woodlice were caught manually on and in the soil and under shelters, and using 5 pitfall traps (6 cm mouth diameter, 12 cm depth, filled with water to 1/3) per site for three days. In total, 67 individuals of woodlice were collected. The animals were collected at 19 points in and around the reserve, the exact coordinates of which are provided in Table 1. We sampled rocky outcrops of mountains, river beds, steppes, sandy dunes, and settlement areas.

The species were identified at the Laboratory for Ecological Functions of Soils of the A.N. Severtsov Institute of Ecology and Evolution RAS by the authors using special literature (Vandel, 1960; Schmölzer, 1965; Borutsky, 1975; Schmalfuss, 1990, 1996; Khisametdinova, 2014). The material is stored in the Laboratory for Ecological Functions of Soils at A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences (Moscow).

Results

There are 6 species of woodlice belonging to 4 genera and 4 families recorded in the surveyed area.

Family Armadillidiidae Brandt, 1833
Genus *Armadillidium* Brandt, 1833
Armadillidium vulgare Latreille, 1804

A. vulgare is a Mediterranean species which is introduced to many regions of the world (Schmalfuss, 2003). It is widely distributed on the south of the European part of Russia (Kuznetsova, Gongalsky, 2012), including the environs of Makhachkala (Khisametdinova, 2012).

Records in the study area: [2] under a cobblestone — 1♂; [4] — 1♀; [5] in a pitfall trap — 4♀♀, 2♂♂; [5] under a root of tree — 3♀♀; [7] under a cobblestone — 1♂, 2♀♀; [8] under a tire — 2♂♂, 1♀; [9] under the root in an anthill — 1 juv.; [10] under a cobblestone — 1♀; [11] on a footpath — 1♂; [11] under a stump — 1♀,

Table 1. Localities of woodlice collection in and around the Sarykum cluster of Dagestan Nature Reserve in August, 2019.

Таблица 1. Места сбора мокриц в районе Сарыкумского кластера Дагестанского заповедника в августе 2019 г.

No.	Lat., N	Long., E	Additional information	Major plant species
[1]	42°97'54"	47°25'77"	Markov Gorge, calcareous rocky outcrops of a mountain gap. A slightly disturbed site.	<i>Celtis australis caucasica</i> ; <i>Juniperus communis oblonga</i> ; <i>Rhamnus pallasii</i> ; <i>Rosa gallica</i> ; <i>Cotoneaster integerrimus</i> ; <i>Scorzonera biebersteinii</i> ; <i>Ephedra distachya</i>
[2]	42°99'25"	47°23'49"	The slopes of the foothills of the Narat-Tyube, calcareous rocky outcrops of a mountain gap. Site is disturbed by regular grazing.	Same as on plot [1]
[3]	42°99'90"	47 22'03"	Calcareous rocky outcrops of a mountain gap. Site is disturbed by regular grazing.	Same as on plot [1]
[4]	42°99'96"	47°22'80"	A dirty road in the vicinity of the administration unit, a severely disturbed site.	<i>Anisantha tectorum</i> ; <i>Hordeum murinum</i> ; <i>Euphorbia seguieriana</i> ; <i>Bromus briziformis</i> ; <i>Anthemis sterilis</i> ; <i>Artemisia scoparia</i>
[5]	43°00'01"	47°23'41"	Saline floodplain of the Shuraozen River. Site is disturbed by regular grazing.	<i>Alhagi pseudalhagi</i> ; <i>Capparis spinosa</i> ; <i>Phragmites australis</i> ; <i>H. murinum</i> ; <i>Glycyrrhiza glabra</i> ; <i>Phelipanche arenaria</i> ; <i>Eryngium campestre</i>
[6]	43°00'15"	47°24'18"	The bed of the dry Shuraozen River	No plants
[7]	43°00'18"	47°24'35"	The bed of the dry Shuraozen River	No plants
[8]	43°00'22"	47°24'43"	The bed of the dry Shuraozen River	No plants
[9]	43°00'40"	47°25'16"	The bank of the dry Shuraozen River	No plants
[10]	43°00'24"	47°24'50"	The bed of the dry Shuraozen River	No plants
[11]	43°00'26"	47°23'76"	The territory of the reserve administration unit. Anthropogenic site.	Cultural plantings

Table 1 (continued).
Таблица 1 (продолжение).

No.	Lat., N	Long., E	Additional information	Major plant species
[12]	43°00'30"	47°24'88"	Living room on the territory of the reserve administration unit.	No plants
[13]	43°00'34"	47°23'85"	The territory of the reserve administration unit. Anthropogenic site.	Cultural plantings
[14]	43°00'55"	47°23'36"	Stabilized sand near the railway.	<i>Papaver arenarium</i> ; <i>Stipa pennata</i> ; <i>H. murinum</i> ; <i>A. tectorum</i> ; <i>A. scoparia</i>
[15]	43°00'94"	47°25'52"	The bed of the dry Shuraozen River	No plants
[16]	43°00'99"	47°26'00"	Saline floodplain of the river. Site is disturbed by regular grazing.	Same as on plot [5]
[17]	43°00'09"	47°23'47"	Stabilized sand. Site is disturbed by regular grazing.	Same as on plot [14]
[18]	43°00'29"	47°23'75"	The territory of the reserve administration unit. Anthropogenic site.	Cultural plantings
[19]	43°00'23"	47°23'79"	The territory of the reserve administration unit. Anthropogenic site.	Cultural plantings
[20]	43°00'11"	47°21'96"	Steppe. Site is disturbed by regular grazing.	<i>Artemisia caucasica</i> ; <i>A. scoparia</i> , <i>Stipa pulcherrima</i> ; <i>A. pseudalhagi</i> ; <i>Alyssum desertorum</i> ; <i>Aegilops cylindrica</i>

1♂; [12] on the windowsill — dead 1♀; [13] under the concrete slab on the sand — 1♀; [15] on sandstone — 2♀♀ + juv. in marsupium; [17] in a pitfall trap — 1♀, 1♂; [18] under a cobblestone — 1♂; [19] under a wooden board laying on sand — 1♀; [19] under a metal sheet — 1♀, 2♂♂; [20] under dry manure — 2♀♀, 1♂.

Family Armadillidae Brandt, 1831
Genus *Armadillo* Duméril, 1816
Armadillo alievi Schmalzfuss, 1990
Fig. 1A.

A. alievi was described from Azerbaijan (Schmalzfuss, 1990, 2003) and recorded in northern Iran (Bakhshi et al., 2021) and in the envi-

rons of Makhachkala in Dagestan (Khisametdinova, 2012). It was identified by the structure of perion-epimera I and II, telson and uropods (Schmalzfuss, 1990, 1996).

Records in the study area: [1] under a cobblestone — 2♀♀; [2] under a cobblestone — 1♀; [3] in the soil at a depth of 5 cm — 4♀♀, 1 dead (gender is unknown); [15] on a sandstone — 1♀; [16] under a cobblestone — 1♀.

Family Agnaridae Schmidt, 2003
Genus *Protracheoniscus* Verhoeff, 1917
Protracheoniscus major (Dollfus, 1903)
Fig. 2.

P. major is a species that inhabits the territory from south-east of Germany to Central Asia



Fig. 1. General view of *Armadillo alievi*, ♀, 5 mm (A) and *Platyarthrus schoblii*, ♂, 1 mm (B).
Рис. 1. Общий вид *Armadillo alievi*, ♀, 5 мм (A) и *Platyarthrus schoblii*, ♂, 1 мм (B).



Fig. 2. *Protracheoniscus major*, 12 mm, ♂, dorsal view (A), exopod-pleopod I (B), endopod-pleopod I (C) and tip of endopod-pleopod I (D).
Рис. 2. *Protracheoniscus major*, 12 мм, ♂, общий вид (A), экзопод плеопода I (B), эндопод плеопода I (C) и вершина эндопода плеопода I (D).

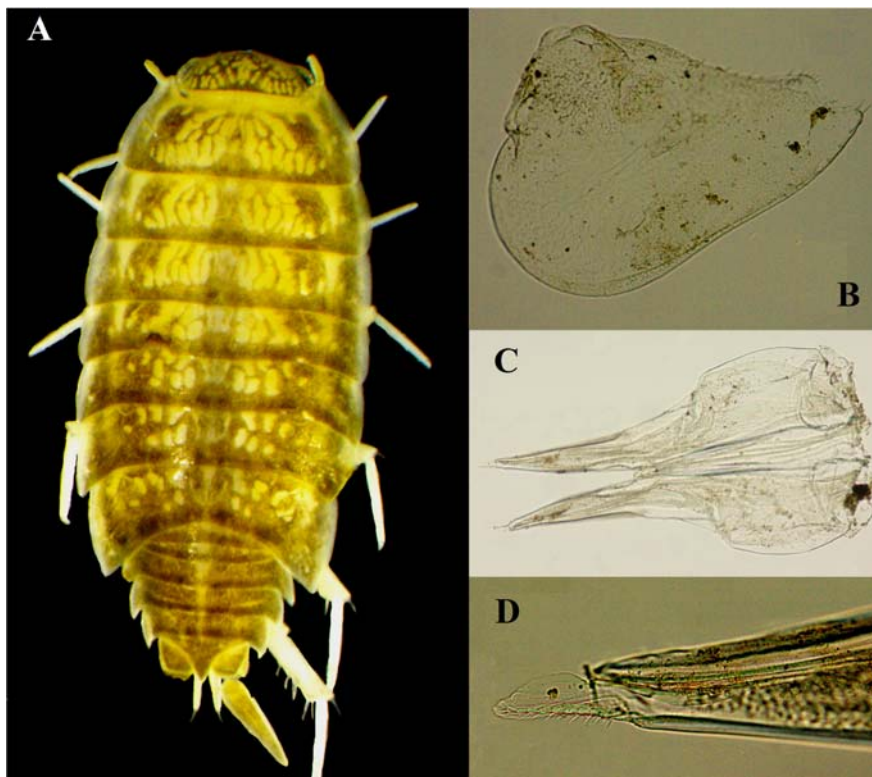


Fig. 3. *Protracheoniscus nogaicus*, 6 mm, ♂, dorsal view (A), exopod-pleopod I (B), endopod-pleopod I (C) and tip of endopod-pleopod I (D).

Рис. 3. *Protracheoniscus nogaicus*, 6 мм, ♂, общий вид (A), экзопод плеопода I (B), эндопод плеопода I (C) и вершина эндопода плеопода I (D).

(Schmalfuss, 2003), one of the most common woodlice of the arid areas of the European part of Russia (Kuznetsova, Gongalsky, 2012). This is the first record of the species to the fauna of Dagestan.

Records in the study area: [11] under a stump — 2♂♂, 2♀♀; [19] under a metal sheet — 2♀♀, 1♂.

Protracheoniscus nogaicus

Demianowicz, 1932

Fig. 3.

P. nogaicus is a species described from Moldova (Demianowicz, 1932). Recently, it was observed in the Rostov Region (Khisametdinova, 2014) and the Republic of Kalmykia

(Gongalsky *et al.*, 2018). The record in Dagestan is both southernmost and easternmost location of this species.

Records in the study area: [6] in the soil at a depth of 10 cm — 2♀♀; [9] under a root in the anthill — 3♀♀, 1♂, 4 juv.; [14] under a fallen tree — 2♀♀.

Protracheoniscus sp.

The only individual cannot be ascribed to any other species of the genus *Protracheoniscus* found in the area based on morphological characters, but it cannot be identified because of the absence of males.

Records in the study area: [12] in a spider-web — dead 1♀.

Family Platyarthridae Verhoeff, 1949
 Genus *Platyarthrus* Brandt, 1833
Platyarthrus schoeblii Budde-Lund, 1885
 Fig. 1B.

P. schoeblii is a myrmecophiles species that inhabits the Mediterranean region, coast of the Black Sea and Macaronesian islands (Schmalfuss, 2003). Previously, from the territory of the former Soviet Union it was found only from the Crimean Peninsula (reviewed in: Kuznetsova, Gongalsky, 2012). This is the first record of the species to the fauna of Dagestan. This record is thus expanding its range to the Caspian Sea coast.

Records in the study area: [9] under a root in the anthill — 1♂.

Discussion

In general, the most abundant species in the catch is *A. vulgare*. The degree of antropogenic habitat disturbance is not affecting this species. This woodlouse is adapted to both human neighborhood and undisturbed sites. On the contrary *A. alievi* similar in life strategy (rolling) is sensitive to human presence and was not recorded on the territory of the administration unit. Species of the genus *Protracheoniscus* are equally common but live separately: *P. major* is tolerant to antropogenic press and drought. *P. nogaicus* is smaller and more sensitive to these factors, so it occurs almost exclusively in the wettest biotope of the area, in the bed of the river. *P. schoeblii* is a small myrmecophiles woodlice that was found only once, in an anthill.

This limited material does not allow generalizing about the fauna of woodlice of Dagestan. The sandy dunes of the reserve provide unique of conditions not often occurring elsewhere in Dagestan. However, its fauna consists of common cosmopolite species and arid species, so it is similar to that of Azerbaijan (2 common species), Kalmykia (2 common species), Rostov Region (3 common species) and Iran (3 common species).

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