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CONTRIBUTION TO THE KNOWLEDGE OF BEETLES (COLEOPTERA) INHABITING RODENT BURROWS IN TURKMENISTAN

A. S. Sazhnev[1, 2)], N. M. Ermakov[3)], E. N. Kondratyev[3)]

1) *Papanin Institute for Biology of Inland Waters, Russian Academy of Sciences, 101, Borok, Yaroslavl Region, 152742, Russia. E-mail: sazh@list.ru*

2) *Cherepovets State University, 5 Lunacharskiy av., Cherepovets, 162600, Russia.*

3) *Russian Research Anti-Plague Institute "Microbe", 46 Universitetskaya Str., Saratov, 410005, Russia. E-mail: eugene.n.kondratyev@gmail.com*

Summary. Animal burrows contain peculiar ecosystems. The rodent burrows are often inhabited by many arthropod species, including beetles (Coleoptera). During our research in Turkmenistan (1976–1988) beetle communities of the burrow of two gerbil species (*Meriones libycus* and *Rhombomys opimus*) were studied. A total, 56 beetle species from 11 families were found in gerbil burrows. Among those, 11 species (19.6%) are bothrobionts: *Aleochara jacobsoni*, *Atheta flagellicornis*, *Coprophilus dimidiatipennis*, *Sunius nidicola* (Staphylinidae), *Erebidus vlasovi*, *Pholioxenus phoenix* (Histeridae), *Onthophagus psychopompus*, *Onthophagus vlasovi*, *Orodaliscus transaralicus* (Scarabaeidae), *Attagenus duplex* (Dermestidae) and *Cryptophagus quadrimaculatus* (Cryptophagidae).

Key words: bothrobionts, nest-dwelling arthropods, bothrophiles, Karakum, Kopetdag, consortium, gerbil.

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Резюме. Норы животных – это своеобразные экосистемы. В норах грызунов часто обитают различные беспозвоночные, включая жесткокрылых (Coleoptera). В ходе наших исследований в Туркменистане (1976–1988 гг.) были изучены сообщества жуков нор двух видов песчанок (*Meriones libycus* и *Rhombomys opimus*). Всего в норах песчанок было обнаружено 56 видов жуков из 11 семейств. Среди них 11 видов (19.6%) – это боробионты: *Aleochara jacobsoni*, *Atheta flagellicornis*, *Coprophilus dimidiatipennis*, *Sunius nidicola* (Staphylinidae), *Erebidus vlasovi*, *Pholioxenus phoenix* (Histeridae), *Onthophagus psychopompus*, *Onthophagus vlasovi*, *Orodaliscus transaralicus* (Scarabaeidae), *Attagenus duplex* (Dermestidae) и *Cryptophagus quadrimaculatus* (Cryptophagidae).

INTRODUCTION

Animal burrows and nests, its host(s) and other organisms living in burrows ("bothrobionts" or "nidicolous" or "nest-dwelling arthropods") are peculiar ecosystems. A community

of an animal burrow is called "*heterotrophic consortium*" (Krivokhatsky, 1994). The consortium core includes the host(s) of the burrow and the burrow itself. Other animals (predominantly arthropods) in this consortium have ecological (consortial) connections of various degree with its core.

Studies of burrow ecosystems started in Europe early in the last century (Falcoz, 1915). In the Turkmenistan deserts (Central Karakum Desert), research of burrow consortia (including beetle fauna) in 1932–1941 years were started by Ya.P. Vlasov (Vlason, 1937; Vlasov & Ioff, 1937; Vlasov & Kirichenko, 1937) and continued from 1981 to 1989 by V.A. Krivokhatsky (Krivokhatsky, 1982, 1983, 1985; Krivokhatsky & Kashcheev, 1986) in the East Karakum Desert. The most modern article on the burrow fauna of beetles in Turkmenistan refers to the Central Karakum Desert (Sazhnev *et al.*, 2023), but based on 1987–1988 material.

MATERIAL AND METHODS

In sand deserts of Turkmenistan mammals which dig permanent complex burrows include the great gerbil (*Rhombomys opimus*), the long-clawed ground squirrel (*Spermophylopsis leptodactylus*), some gerbils of the genus *Meriones* (e.g., *M. meridianus* and *M. ibycus*), fox (*Vulpes vulpes*) and hedgehog (*Hemiechinus auritus*) [Krivokhatsky, 1994]. Our studies were focused on colonies of great gerbil *Rhombomys opimus* and libyan jird *Meriones libycus*.

During our research in the Turkmenistan (1976–1988), beetle communities of the burrow were studied in detail in two localities (material was collected by N.M. Ermakov):

1) Akhal Velayat, Gökdepe Etrap, lowland part of the Central Karakum Desert, environs of the city of Gökdepe (before 1993, Geok-Tepe), ridge-cellular sands – 1976 (*Meriones libycus*), 1987–1988 (*Rhombomys opimus*) years;

2) Balkan Velayat, Magtymguly Western Etrap, foothills of the Kopetdag, surroundings of the city of Magtymguly (before 2005, Kara-Kala) – 1982 (*Meriones libycus*) year.

The method installation of burrow traps (glass cylinders filled with 1% formalin) inside and outside of each burrow entrance (a modification of the Barber method of pitfall traps) was using. Cylinders were placed in the burrows at a 25–30-cm distance from the entrance. The total number of cylinders ranged from 5 to 10, depending on the size of the colony. Additional sampling techniques included nests digging and hand collection.

After removal of the cylinders, invertebrates were picked up manually or concentrated onto a fine sieve, then fixed in a 70% alcohol solution. During the field work, 157 samples containing beetles were obtained. The material was stored in alcohol and mounted dry. Most of material is now stored in the collection of invertebrates of the Papanin Institute for Biology of Inland Waters, Russian Academy of Sciences (Borok, Russia). Some specimens were granted to the collection of the Zoological Institute of the Russian Academy of Sciences (St. Petersburg, Russia) and personal collection of V.O. Kozminykh (Perm, Russia).

The nomenclature of species and general data on distribution are based mainly on the latest editions of the Catalogue of Palaearctic Coleoptera (2007, 2010, 2015, 2016, 2017, 2020; Alonso-Zarazaga *et al*., 2022).

The illustrations were made by the first author using a Leica M165C stereo microscope on a Leica MC170 HD (12 MP) digital camera. Photos were processed and stacked in Sketchbook and Helicon Focus 7.7.4.

The beetles were determined by A.S. Sazhnev, particular taxonomic groups were identified by colleagues: K.V. Makarov – some Carabidae, S. Anlaş and A.V. Kovalev – some Staphylinidae, V.O. Kozminykh and T. Lackner – Histeridae, A.V. Frolov, A.A. Gusakov and I.V. Shokhin – some Scarabaeidae, J. Háva – Dermestidae, M.V. Nabozhenko,

A.V. Kovalev and L.V. Egorov – some Tenebrionidae, A.O. Bieńkowski and S.V. Dedyukhin – Chrysomelidae, and I.A. Zabaluev – Curculionidae. The authors express their sincere gratitude to each of them.

RESULTS AND DISCUSSION

A total, 56 beetle species from 11 families were found in gerbil burrows. Some beetles were not identified as a species due to poor preservation and/or lack of serial and comparative material: these are *Microlestes* sp., *Cymindis* sp. (Carabidae), Aleocharinae spp., *Falagria* sp., *Haploglossa* sp., *Oxypoda* spp., *Heterothops* sp., *Bisnius* sp. (Staphylinidae) and *Blaps* sp. (Tenebrionidae). The remaining species are included in the annotated list (Table 1).

Figs 1–4. 1 – *Aleochara jacobsoni*, 2 – *Orodaliscus transaralicus*, 3 – *Thinorycter chlamydatus*, 4 – *Asiocaedius kiseritzkii*. Scale bar – 1 mm.

Table 1. The beetles (Coleoptera) from rodent (gerbil) burrows in Turkmenistan

Taxon	Locality	Gerbil species	*Group
Carabidae			
Acinopus laevigatus Ménétriés, 1832	M	*M. l.*	3, 4
Calathus ambiguus ambiguus Paykull, 1790	M	*M. l.*	3, 4
Cicindela clypeata octussis C.A. Dohrn, 1885	M	*M. l.*	4
Eremosphodrus dvorshaki Casale et Vereschagina, 1986	G	*M. l.*, *R. o.*	2
Taphoxenus goliath (Faldermann, 1836)	M	*M. l.*	2
Zabrus morio klapperichi Jedlička, 1956	M	*M. l.*	3
Staphylinidae			
Aleochara jacobsoni Kirshenblat, 1935 (fig. 1)	G, M	*M. l.*, *R. o.*	1
Atheta flagellicornis G. Benick, 1967	G	*M. l.*, *R. o.*	1
Coprophilus dimidiatipennis Fauvel, 1900	M	*M. l.*	1
Dropephylla caucasica (Kolenati, 1846)	G	*R. o.*	3
Heterothops cf. *praevius* Erichson, 1839	G	*R. o.*	?2
Philonthus cf. *variabilis* Eppelsheim, 1892	G	*R. o.*	?2
Quedius cohaesus (Eppelsheim, 1888)	G	*M. l.*	2
Tachyporus nitidulus (Fabricius, 1781)	G	*R. o.*	3
Sepedophilus rufulus (Hochhuth, 1849)	G	*M. l.*, *R. o.*	2
Sunius nidicola (Kashcheev, 1982)	G	*R. o.*	1
Leiodidae			
Cholevinus pallidus pallidus (Ménétries, 1832)	G, M	*M. l.*	2
Histeridae			
Erebidus vlasovi (Reichardt, 1941)	G	*M. l.*, *R. o.*	1
Hypocacculus atrocyaneus (Schmidt, 1888)	M	*M. l.*	3
Pholioxenus phoenix (Reichardt, 1929)	G, M	*M. l.*, *R. o.*	1
Saprinus aeratus Erichson, 1834	M	*M. l.*	3
Scarabaeidae			
Aethiessa szekessyi Brasavola de Massa, 1939	M	*M. l.*	4
Hemictenius tokgajevi (S.I. Medvedev, 1962)	M	*M. l.*	3
Micropertha variabilis (Ballion, 1871)	M	*M. l.*	4
Onthophagus psychopompus Ziani et Gharakhloo, 2010	M	*M. l.*	1
Onthophagus vlasovi S.I. Medvedev, 1962	M	*M. l.*	1
Orodaliscus transaralicus (Nikolajev, 1983) (fig. 2)	G	*M. l.*	1
Oxythyrea cinctella (Schaum, 1841)	M	*M. l.*	4
Scarabaeus pius (Illiger, 1803)	M	*M. l.*	3
Thinorycter chlamydatus Semenov et Reichardt, 1925 (fig. 3)	G	*M. l.*	3
Dermestidae			
Attagenus duplex (Reitter, 1890)	M	*M. l.*	1
Cryptophagidae			
Cryptophagus quadrimaculatus Reitter, 1877	G, M	*M. l., R. o.*	1
Coccinellidae			
Coccinella septempunctata Linnaeus, 1758	G	*R. o.*	4

Taxon	Locality	Gerbil species	*Group
Tenebrionidae			
Alcinoeta helopioides helopioides Ménétries, 1849	G	*M. l.*	3
Asiocaedius kiseritzkii G.S. Medvedev, 1966 (fig. 4)	G	*M. l.*	3
Blaps titanus Ménétriés, 1849	G, M	*M. l.*	2
Bradyus pygmaeus (Fischer von Waldheim,1821)	G	*M. l.*, *R. o.*	2
Cheirodes dentipes (Ballion, 1878)	M	*M. l.*	2, 3
Cyphogenia gibba gibba (Fischer von Waldheim, 1820)	M	*M. l.*	2
Dissonomus tibialis (Reitter, 1904)	M	*M. l.*	3
Earophantha serrata (Semenov, 1893)	G	*M. l.*	3
Netuschilia hauseri (Reitter, 1897)	M	*M. l.*	2
Ocnera pilicollis (Faldermann, 1836)	M	*M. l.*	2, 3
Omophlus pilicollis pilicollis (Faldermann, 1832)	M	*M. l.*	2, 3
Pimelia abnormis Reitter, 1915	M	*M. l.*	3
Pimelia cephalotes cephalotes (Pallas, 1781)	M	*M. l.*	2, 3
Pseudopachyscelis galinae (G.S. Medvedev, 1964)	M	*M. l.*	2, 3
Reitterohelops steinbergi (G.S. Medvedev, 1964)	M	*M. l.*	3
Remipedella deserti Semenov, 1907	G	*M. l.*	3
Stalagmoptera ruginota Reitter, 1896	G	*M. l.*	3
Zophosis punctata punctata Brullé, 1832	M	*M. l.*	2, 3
Chrysomelidae			
Aphthona mohri Warchałowski, 1973	M	*M. l.*	4
Chaetocnema tibialis (Illiger, 1807)	M	*M. l.*	4
Curculionidae			
Aulacobaris caerulescens (Scopoli, 1763)	M	*M. l.*	4
Sitona callosus Gyllenhal, 1834	M	*M. l.*	4
Sitona macularius (Marsham, 1802)	G	*R. o.*	4

Abbreviations: G – Gökdepe; M – Magtymguly; *M. l.* – *Meriones libycus*; *R. o.* – *Rhombomys opimus*; * – here we use the following classification system for animals found in rodent burrows: (1) *bothrobionts* – species with permanent (obligatory) burrow connections; (2) *bothrophiles* – species with a strong burrow connection; (3) *bothroxenes* – species with no obligatory connections; and (4) *species alien to the burrow*, and only accidentally found there.

For *Meriones libycus* burrows recorded 49 beetle species, from burrows of *Rhombomys opimus* – 15.

The families that lead in the number of species in collections are: Tenebrionidae – 18 species, Staphylinidae – 10, Scarabaeidae – 9 and Carabidae – 6, but largest numbers of bothrobionts are from Staphylinidae, Histeridae, Scarabaeidae, also for Dermestidae and Cryptophagidae families.

Among those, 11 species (19.6%) are bothrobionts (table): *Aleochara jacobsoni*, *Atheta flagellicornis*, *Coprophilus dimidiatipennis*, *Sunius nidicola*, *Erebidus vlasovi*, *Pholioxenus phoenix*, *Onthophagus psychopompus*, *Onthophagus vlasovi*, *Orodaliscus transaralicus*, *Attagenus duplex* and *Cryptophagus quadrimaculatus*. The proportion of bothrophiles was 28.6%, and percent of bothroxenes and beetle species alien to the burrow – 51.8%.

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