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Grasshoppers (Orthoptera: Acridoidea) of the North-West Caucasus: fauna, ecology, landscape and biotopic distribution

Саранчовые (Orthoptera: Acridoidea) Северо-Западного Кавказа: фауна, экология, ландшафтно-биотопическое распределение

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Ключевые слова: Orthoptera, саранчовые, фауна, биотопическое распределение, жизненные формы, Северо-Западный Кавказ.

Abstract. Sixty one species of grasshoppers from 35 genera and 8 subfamilies are recorded for the North-West Caucasus. The features of biotopic distribution of grasshoppers are analyzed on the main types of landscapes in the region. In the Kuban – Cis-Azov biogeographic province, the highest diversity of grasshoppers is characteristic of steppe biotopes with forb-grass vegetation, where 25 species are noted. The highest diversity is typical for low-mountain meadows and mountain steppes, which number 22 grasshoppers species each in the Black Sea – Kuban province. At the same time, these landscapes are characterized by a low value of the measure of similarity of Sørensen-Chekanovsky (0.51). Gramineous chortobionts (52%) and facultative chortobionts (16%) dominate in the fauna of the North-West Caucasus, the remaining life forms of grasshoppers are represented by a relatively small number of species. Among the grasshoppers, seven endemic species for the North-West Caucasus, as well as two endemic species for the whole Caucasus, are noted.

Резюме. На Северо-Западном Кавказе выявлен 61 вид саранчовых из 35 родов и 8 подсемейств. Проанализированы особенности биотопической приуроченности саранчовых по основным типам ландшафтов в регионе. В Кубано-Приазовской провинции наибольшее разнообразие саранчовых характерно для степных биотопов с разнотравно-злаковой растительностью, где отмечено 25 видов. В Причерноморско-Кубанской провинции наибольшее разнообразие отмечено для низкогорных лугов и горных степей, которые насчитывают по 22 вида саранчовых. Эти ландшафты характеризуются низким значением меры сходства фаун Серенсена – Чекановского (0.51). В фауне Северо-Западного Кавказа преобладают злаковые хортобионты (52%) и факультативные хортобионты (16%), остальные жизненные формы саранчовых представлены сравнительно небольшим числом видов. Среди саранчовых отмечено 7 видов, эндемичных для Северо-Западного Кавказа, а также 2 вида, являющихся эндемиками Кавказа.

The fauna of Orthoptera of the Russian North-West Caucasus was studied fragmentary. Most studies were focused on separated areas or were incomplete. One of the fundamental works on the North Caucasian Orthoptera is the paper of Dovnar-Zapolsky [1927]. Some data on the species distribution are presented in the books of Bey-Bienko, Mistshenko [1951] and Mistshenko [1952]. In addition, some data on the landscape distribution of grasshoppers in the Russian Caucasus were published on Karachay-Cherkess Republic by Kopaneva [1962, 1963] and on the south of Krasnodar Region by several authors [Chernyakhovsky, Gazenko, 1974; Benediktov, 1999; Terskov, 2017; Terskov, Tereshchenko, 2017]. Special studies on the fauna of the grasshoppers of the North-West Caucasus are absent.

Material and methods

The main material for this work was collected by the author in the North-West Caucasus (Fig. 1) in 2005–2018 by generally accepted methods (entomological net, manual collection). In laboratory conditions grasshoppers were kept in terrariums with a natural ground and sufficient lighting. The material is deposited in the author's collection. The system of life forms is given according to Pravdin [1978] with comments of Savitsky [2004]. Statistical data processing and plotting were carried out using the PAST – PAlaeontological STatistics software packages (version 3.14) [Hammer et al., 2001] and Microsoft Excel. The Sørensen-Chekanovsky coefficient was used as a measure of similarity. The statistical reliability of cluster formation was evaluated using bootstrap analysis in 1000 replications.

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Fig. 1. The studied area.
Рис. 1. Регион исследований.

Brief physical-geographical characteristics of the studied region

The territory of the North-West Caucasus is limited by the coast of Black Sea and the Sea of Azov in the west, by the Kuma-Manych depression in the north, by Egorlyk, Kuban and Teberda – Daut river basins in the east, by Psou River basin and the Main Caucasian Range in the south [Kanonnikov, 1977; Sokolov, Tembotov, 1989; Zamotajlov, 1992]. Dovnar-Zapolsky [1927] also indicated similar zoogeographical boundaries of this region. Administratively, this territory covers Krasnodar Region, the Republic of Adygea, the south-western districts of the Rostov Region, the western areas of Stavropol Region, and the western part of the Karachay-Cherkess Republic (Russia). Due to the complexity of the structure of relief, climatic conditions of the North-Western Caucasus are very diverse. Western Ciscaucasia (the largest area of the Western Caucasus) is divided into the Kuban Cis-Azov lowland (north of the valley of the lower Kuban River), the Kuban sloping plain, the Kuban River Delta and the adjacent Taman Peninsula [Milkov, Gvozdetsky, 1986]. According to the physical-geographical characteristic the Western Ciscaucasia includes two geographical provinces: the Kuban – Cis-Azov province and the Black Sea – Kuban province [Chupakhin, 1974; Milkov, Gvozdetsky, 1986].

The Kuban – Cis-Azov geographical province occupies the north-western part of Ciscaucia. Its surface is composed of loose loamy, sandy-argillaceous and sandy rocks of continental origin. A monotonous terrain prevails here: a low-lying, slightly dissected plain with absolute altitudes 50–150 m. Small elevations crossed by valleys of tributaries of the Kuban River are presented only in the southern part of the province, on the territory of the Kuban sloping plain. The Kuban – Cis-Azov province is characterized by a temperate continental climate with unstable humidification. In the past, steppe and meadow landscapes dominated on this area, but now the territory is completely transformed to agricultural fields. Phragmites spp. widely covers seaside in the Kuban River Delta.

The Black Sea – Kuban geographical province is characterized by a system of mountain ridges from 600 m in the west (near Anapa) to 3500–4000 m in the east (Teberda River basin). The most typical orography of the province is asymmetrical ridges and ridges steeply ending to the south and gently descending to the north. The climate is temperate continental, with more rainfall. In contrast with lowlands of the North-West Caucasus, summer is cooler, winter is warmer, forest and alpine landscapes are dominated.

Taxonomic comments to the list of species

The superfamily Acridoidea is the largest group of the suborder Caelifera, which includes a significant number of species of grasshoppers. To the present time balanced unified higher classification of Acridoidea is absent. We use combined system with dividing of the superfamily Acridoidea into two families, Pamphagidae and Acrididae, presented in the North Caucasus.

The family Pamphagidae is divided into two subfamilies, Trinchinae and Pamphaginae. This division is supported by many orthopterologists [Latchininsky et al., 2002; Savitsky, 2009, 2010; Ünal, 2011, 2016; Cigliano et al., 2019].

The classification of the family Acrididae is debatable due to numerous phylogenetic reconstructions based on the cytological and molecular data. Results of these reconstructions are so contradictory that they add confusion and significantly complicate the construction of the family system [Bugrov et al., 1993; Gulyaeva et al., 2005; Wang et al., 2008; Li et al., 2011; Vedenina, Mugue, 2011; Defaut, 2012; Zhang et al., 2013; Dong et al., 2015]. In our opinion, Acrididae includes 6 subfamilies, Pezotettiginae, Melanoplinae, Calliptominae, Acridinae, Gomphocerinae and Oedipodinae. The composition of the subfamily Gomphocerinae is the least controversial among specialists, but opinions slightly differ. In particular, here *Euchorthippus* is traditionally considered as a member of the tribe Gomphocerini [Sergeev, 1986; Storozhenko, 1986; Vickery, 1997; Latchininsky et al., 2002; Storozhenko et al., 2015], because the position of this genus in the tribe Chrysochraontini [Defaut, 2012] is insufficiently argued. At least some morphological characters of *Euchorthippus* don't correspond to Chrysochraontini, and genetic markers of only mDNA is not enough reason to transfer the genus to this tribe. In addition, according to the data placed in the GenBank [http://www.ncbi.nlm.nih.gov/genbank] *Euchortippus* is very close to the genus *Chorthippus* of the tribe Gomphocerini. On the other hand, taxonomic innovations proposed by Defout [2012] are fully justified, such as the selection of representatives of the genus *Ramburiella* into the separate tribe Ramburiellini. The genus *Eremippus*, which was previously included in the tribe Dociostaurini, belongs to Aulacobothrini, that supported by morphological [Jago, 1996], cytological [Bugrov et al., 1993] and molecular-genetic [Gulyaeva et al., 2005] data.

List of species

Superfamily Acridoidea
Family Pamphagidae
Subfamily Pamphaginae
Tribe Nocarodeini
Nocaracris cyanipes (Fischer von Waldheim, 1846)

Material. Karachay-Cherkess Republic: 2♀, Epchik Mt., 20.07.1992; 1♀, Nazalykol canyon, 12.06.1998; 1♂, 3♀, Zagedan Mt., 10–13.08.2007.

Bionomics. The species occurs alpine meadow landscapes, but stony habitats. Petrobiontic species.

Family Acrididae
Subfamily Calliptaminae
Calliptamus barbarus barbarus (Costa, 1836)

Material. Rostov Region: 1♂, 4♀, Beglitskaya spit, 27.07.2003; 2♂, Nedvigovka, 19.07.2011; 1♀, Azov, 6.07.2017. Krasnodar Region: 1♂, 2♀, Tamarovskiy, 7.08.2013; 2♂, 2♀, Novonekrasovskiy, 9.08.2013; 12♂, 8♀, Achuevskaya spit, 10.08.2013; 2♂, 1♀, Brinkovskaya, 12.08.2013; 1♂, 1♀, 28.11.2015, 2♂, 10.07.2017, Taman; 2♂, Taman Peninsula, Karabetova Mt., 29.11.2015; 1♂, 1♀, Batareyka, 16.09.2016; 1♀, 17.09.2016, 1♂, 1♀, 8.07.2017, Beregovoy; 2♀, Bryukhovetskaya, 7.07.2017; 1♀, Glafirovka, 16.07.2017; 1♀, Dolzhanskaya, 16.07.2017; 1♂, 1♀, Krasnyy Oktyabr, 12.07.2018; 1♂, 1♀, Starominskaya, 22.08.2018. Republic of Adygea: 1♂, Lago-Naki Plateau, 18–22.08.2001; 1♀, Gud Mt., 20.08.2007.

Bionomics. This widespread species prefers xerophytic open patches of soil or places with sparse vegetation, common in psammophytic biotopes of sea coasts, as well as in human-transformed landscapes with ruderal vegetation, including along roadsides and along the edges of agricultural fields. Facultative chortobiont.

Calliptamus italicus italicus (Linnaeus, 1758)

Material. Rostov Region: 10♂, 5♀, Nedvigovka, 19.07.2011; 3♂, 2♀, Rogozhkino, 21.07.2011; 1♀, Rostov-on-Don, 26.08.2017. Krasnodar Region: 4♀, Brinkovskaya, 12.08.2013; 1♂, 28.06.2015, 1♂, 16.09.2016, 1♂, 2♀, 8.07.2017, Taman; 1♀, Beregovoy, 18.09.2016; 1♂, 1♀, Starotitarovskaya, 11.07.2017; 1♂, 1♀, Dzhiginka, 14.07.2018; 1♂, Batareyka, 24.08.2018. Republic of Adygea: 1♂, 1♀, Gud Mt., 20.08.2007. Karachay-Cherkess Republic: 2♂, 1♀, Teberda, 7–14.07.2010.

Bionomics. It is widespread numerous polyzonal species. It lives in various landscapes, including human-transformed ones. Facultative chortobiont.

Subfamily Pezotettiginae
Tribe Pezotettigini
Pezotettix giornae (Rossi, 1794)

Material. Krasnodar Region: 1♂, 3♀, Gelendzhik, 6.09.2006; 12♂, 11♀, Zaporozhskaya, 17.09.2016; 5♂, 3♀, Anapa, 14.07.2018; 4♂, 3♀, Pervenets, 28.08.2018; 5♂, 5♀, Vyselki, 29.08.2018.

Bionomics. This species inhabits forest edges and glades, in thickets and among grassy vegetation. Populations are local, but usually numerous. Previously it was listed only for the Black Sea coast [Mistshenko, 1952]. We found it in several places on the northern macroslope in windbreaks, which possibly are migration corridors for the distribution of this species. Grass-feeding chortobiont.

Subfamily Melanoplinae
Tribe Podismini
Podisma pedestris sviridenkoi Dovnar-Zapolsky, 1927

Note. This species was indicated for the North-West Caucasus by Dovnar-Zapolsky [1927]: Krasnodar Region (Pseashkho), Karachay-Cherkess Republic (Teberda, Klukhor).

Bionomics. The species inhabits the sub-alpine crooked forest at altitudes from 2450 to 2900 m [Kopaneva, 1962]. *Podisma pedestris pedestris* (Linnaeus, 1758) is widely distributed in the Palaearctic, in the south of the European part of Russia the range is limited by the Don River. Grass-feeding chortobiont.

Podisma uvarovi Ramme, 1926

Material. Republic of Adygea: 3♂, 4♀, 22.08.2001, 4♂, 4♀, 26.08.2007, Lago-Naki Plateau; 4♂, 3♀, Abago Mt., 18.08.2015.

Bionomics. This species inhabits alpine meadows in the highlands of Adygea and the south of Krasnodar Region; numerous in places of habitat. Grass-feeding chortobiont.

Podisma teberdina Ramme, 1951

Material. Karachay-Cherkess Republic: 2♂, 3♀, Zagedan Mt., 10–13.08.2007.

Bionomics. This species occurs at altitude of 2700 m [Mistshenko, 1952]. Grass-feeding chortobiont.

Podisma satunini Uvarov, 1916

Note. In the North-West Caucasus, this species was listed for Krasnodar Region and the Karachay-Cherkess Republic (in the vicinity of Arkhyz) by Mistshenko [1952] and for Karachay-Cherkess Republic by Chernyakhovskii [2006].

Bionomics. The species is presented by three subspecies: *Podisma satunini pallipes* Mistshenko, 1950 (Krasnodar Region), *P. s. coerulipes* Mistshenko, 1950 (Krasnodar Region: Krasnaya Polyana near Aibga Mt.), *P. s. fuscipes* Mistshenko, 1950 (Karachay-Cherkess Republic: Arkhyz River). It occurs in the highlands from 1800 m. Grass-feeding chortobiont.

Micropodisma koenigi (Burr, 1913)

Note. This species was listed for the North-West Caucasus by Mistshenko [1952]: Krasnodar Region (Sochi, Krasnaya Polyana, Kishi River).

Bionomics. The species occurs at the altitude 900–1100 m [Mistshenko, 1952]. Grass-feeding chortobiont.

Subfamily Acridinae
Tribe Acridini
Acrida anatolica Dirsh, 1949

Material. Rostov Region: 1♀, Nedvigovka, 15.08.2005; 2♀, Rostov-on-Don, 20.08.2007. Krasnodar Region: 1♀, Armavir, 24.07.2013; 9♂, 4♀, Tamarovskiy, 7.08.2013; 2♂, 6♀, Novonekrasovskiy, 9.08.2013; 3♂, Achuevskaya spit, 10.08.2013; 5♂, 4♀, Brinkovskaya, 12.08.2013; 2♂, 1♀, 27–28.11.2015, 1♂, 16.09.2016, 1♂, 10.07.2017, Taman; 1♂, Taman Peninsula, Karabetova Mt., 29.11.2015; 2♂, 16.09.2016, 3♀, 27–28.08.2018, Chushka spit; 1♀, Batareyka, 16.09.2016; 1♀, Yubileynyy, 16.09.2016; 1♂, 1♀, 18.09.2016, 1♂, 2♀, 23.08.2018, Beregovoy; 1♂, Glafirovka, 6–7.07.2017; 2♂, Bryukhovetskaya, 7.07.2017; 1♂, Krasnyy Oktyabr, 12.07.2018; 1♂, 1♀, Anapa, 13.07.2018; 1♂, 1♀, Dzhiginka, 14.07.2018; 1♀, Starominskaya, 22.08.2018.

Bionomics. This species is distributed in the lowland of the North-West Caucasus. It prefers mesophytic Carex-Poaceae association; occurs mainly on meadows near

numerous reservoirs, including in the coastal marine zone. Somewhere it is a very numerous species. Sedge-gramineous chortobiont.

Subfamily Gomphocerinae
Tribe Arcypterini
Arcyptera (*Arcyptera*) *fusca* (Pallas, 1773)

Material. Karachay-Cherkess Republic: 1♂, Teberda, 5.07.2010; 1♂, Gonachkhir canyon, 26.06.2012; 1♀, Dzhamagat canyon, 15.07.2012.

Bionomics. This species occurs in natural steppe biotopes with mixed grass vegetation. It is known in preserved virgin steppe areas of the Lower Don region. It was listed for North-West Caucasus by Dovnar-Zapolsky [1927], but since that time has not been recorded; common in steppe biotopes. Gramineous chortobiont.

Arcyptera (*Pararcyptera*) *microptera microptera* (Fischer von Waldheim, 1833)

Material. Rostov Region: 1♀, Novyy Egorlyk, 21.05.2012; 1♂, Yulovskiy, 4.06.2012; 1♂, Stepnoy Kurgan, 20.06.2012; 3♀, Rostov-on-Don, 6.06.2014. Krasnodar Region: 3♂, 3♀, Beregovoy, 8.06.2018.

Bionomics. It is early summer species; occurs in natural steppe biotopes with grass vegetation. The species became rare after plowing the steppes. Gramineous chortobiont.

Tribe Ramburiellini
Ramburiella (*Palaeocesa*) *turcomana* (Fischer von Waldheim, 1833)

Material. Krasnodar Region: 1♀, Taman, 28.06.2015.

Bionomics. The species occurs in psammophytic steppe biotopes with grasses vegetation. Gramineous chortobiont.

Tribe Aulacobothrini
Eremippus opacus (Mistshenko, 1951)

Note. This species was described by Mistshenko [Bey-Bienko, Mistshenko, 1951] from Starotitarovskaya (Krasnodar Region, Taman Peninsula).

Bionomics. Microthamnobiont.

Tribe Dociostaurini
Dociostaurus (*Dociostaurus*) *maroccanus* (Thunberg, 1815)

Material. Rostov Region: 1♀, Baraniki, 20.09.2011. Krasnodar Region: 10♂, 3♀, 8.07.2017, 1♀, 7.06.2018, Beregovoy; 2♂, Starotitarovskaya, 11.07.2017. Republic of Adygea: 1♂, Tybga Mt., 2000 m, 2–3.08.2018. Karachay-Cherkess Republic: 1♂, Dombay Mts., 2100 m, 11.07.2010.

Bionomics. Widespread and numerous species on the lowland of the North-West Caucasus. It prefers xerophytic steppe biotopes with mixed vegetation. It also was found in other localities from marine coastal ecosystems to alpine meadows. Facultative chortobiont.

Dociostaurus (*Kazakia*) *brevicollis* (Eversmann, 1848)

Material. Rostov Region: 5♂, 7♀, Rogozhkino, 21.07.2011; 1♂, Baraniki, 20.08.2011; 9♂, 12♀, Yulovskiy, 4–20.06.2012; 1♂, 4♀, Stepnoy Kurgan, 20.06.2012. Krasnodar Region: 4♂, 10♀, Beregovoy, 8.07.2017; 2♂, 3♀, Taman, 10.07.2017; 2♂, 4♀, Starotitarovskaya, 11.07.2017.

Bionomics. This species is common in lowlands of the North-West Caucasus; occurs in steppe biotopes with grasses and grass-wormwood vegetation, also was found on roadsides, in agricultural landscapes, in disturbed ecosystems with ruderal vegetation. Facultative chortobiont.

Tribe Chrysochraontini
Chrysochraon dispar dispar (Germar, 1834)

Material. Republic of Adygea: 1♂, 1♀, 4.07.2006, 1♂, 17–21.06.2008, Nikel; 1♂, 2♀, Dakhovskaya, 24–26.06.2007; 1♀, 15.09.2014, 1♀, 22.08.2015, Guzeripl, subalpine meadow.

Bionomics. Mesophytic vegetation in glades, slopes of beams, subalpine meadows. Specialized phytophil.

Euthystira brachyptera (Ocskay, 1826)

Material. Krasnodar Region: 5♂, 5♀, Nizhnebakanskaya, 13.07.2017. Karachay-Cherkess Republic: 4♂, 5♀, Teberda, subalpine meadow, 14.07.2010; 3♂, 26♀, Chatipara Mt., subalpine meadow, 15–20.07.2012.

Bionomics. Meadow plant communities with grasses; common in the subalpine zone of the North-West Caucasus; local populations were found on the lowland meadows, mainly near reservoirs. Specialized phytophil.

Tribe Gomphocerini
Gomphocerus sibiricus caucasicus Victor, 1840

Material. Republic of Adygea: 30♂, 44♀, Tybga Mt., 2000–2650 m, subalpine and alpine meadows, 2–24.08.2018. Karachay-Cherkess Republic: 4♂, 4♀, Zagedan Mt., 10–13.08.2007; 1♀, Teberda, 7–14.07.2010; 3♀, Gonachkhir canyon, 26.06.2012.

Bionomics. Subalpine and alpine meadows in high mountainous areas. Gramineous chortobiont.

Gomphocerippus rufus (Linnaeus, 1758)

Note. This species was recorded for the North-West Caucasus by Dovnar-Zapolsky [1927] from Krasnogorskaya (Karachay-Cherkess Republic).

Bionomics. Gramineous chortobiont.

Stauroderus scalaris scalaris (Fischer von Waldheim, 1846)

Material. Republic of Adygea: 2♂, near Dakhovskaya, Gud Mt., 20.08.2007.

Bionomics. The species inhabits steppe areas with grasses vegetation. Gramineous chortobiont.

Pseudochorthippus parallelus (Zetterstedt, 1821)

Material. Rostov Region: 1♂, 1♀, Manychskaya, 1.07.2001; 25♂, 13♀, Nedvigovka, 19.07.2011; 6♂, 4♀, Rogozhkino, 21.07.2011; 1♂, Stepnoy Kurgan, 20.06.2012; 2♂, Azov, 6.07.2017. Krasnodar Region: 2♂, 3♀, Armavir, 24.07.2013; 6♂, 6♀, Temryuk, 7.07.2017; 1♀, 8.07.2017, 1♂, 8.06.2018, Beregovoy,; 2♂, 2♀, Primorskiy, 10.07.2017; 2♂, 1♀, Novorossiysk, Markoth Ridge, 12.07.2017; 1♂, Krasnyy Oktyabr, 12.07.2018. Republic of Adygea: 2♂, 2♀, 18.08.2001, 3♂, 10♀, 18.06.2006, 1♂, 1♀, 19.08.2006, Nikel; 1♂, 1♀, Dakhovskaya, 28.06.2006; 11♂, 11♀, Guzeripl, subalpine meadow, 15.09.2014; 1♀, Guzeripl, meadow, 22.08.2015; 11♂, 21♀, Guzeripl, Tybga Mt., subalpine and alpine meadows, 2000–2600 m, 2–20.08.2018. Karachay-Cherkess Republic: 10♂, 9♀, 7–14.07.2010, 1♂, 1♀, 19–25.08.2018, Teberda.

Bionomics. Common throughout all territory of the North-West Caucasus up to 2600 m. The species prefers

mesophytic plant associations; the dominated species on the meadows along the banks of the reservoirs. Gramineous chortobiont.

Chorthippus (*Chorthippus*) *abchasicus* Ramme, 1939

Note. This species was recorded for the North-West Caucasus by Bey-Bienko and Mistshenko [1951] (Krasnodar Region: Chugush and Achishkho Mountains).

Bionomics. It occurs in mixed grass meadows up to 1000 m with dominant vegetation consisting of Rumex sp., Inula grandiflora, Cirsium obvolalum, Dactylus glomerata [Chernyakhovsky, Gazenko, 1974]. Gramineous chortobiont.

Chorthippus (*Chorthippus*) *dichrous* (Eversmann, 1859)

Material. Rostov Region: 1♂, Stepnoy Kurgan, 20.06.2012; 2♂, 3♀, Rostov-on-Don, 15.07.2018; 4♂, 5♀, Rogozhkino, 20.07.2018. Krasnodar Region: 1♀, Novonekrasovskiy, 9.08.2013; 1♂, Brigadnyy, 9.08.2013; 2♂, 2♀, Glafirovka, 6–7.07.2017; 6♂, 16♀, Beregovoy, 8.07.2017; 1♂, 3♀, Taman, 10.07.2017; 1♂, 2♀, Starotitarovskaya, 11.07.2017. Republic of Adygea: 1♀, Nikel, 18.06.2006.

Bionomics. Meadows among mesophytic grasses vegetation; common species in these habitats. Gramineous chortobiont.

Chorthippus (*Chorthippus*) *loratus* (Fischer von Waldheim, 1846)

Material. Rostov Region: 3♂, 2♀, Baraniki, 20.09.2011; 2♂, 18♀, Krasnyy Manych, 21.09.2011; 1♀, Rostov-on-Don, 26.08.2017. Krasnodar Region: 1♂, 2♀, Sukko, 17.08.2011; 4♂, 5♀, Armavir, 24.07.2013; 12♂, 18♀, Tamarovskiy, 7.08.2013; 12♂, 8♀, Novonekrasovskiy, 9.08.2013; 2♂, Brinkovskaya, 12.08.2013; 2♂, 2♀, 27–28.11.2015, 2♂, 2♀, 16.09.2016, Taman; 1♂, 4♀, Taman Peninsula, Karabetova Mt., 29.11.2015; 2♂, 1♀, Chushka spit, 16.09.2016; 2♂, 2♀, Il'ich, 16.09.2016; 1♂, Batareyka, 16.09.2016; 2♂, 2♀, Yubileynyy, 16.09.2016; 2♂, 1♀, Primorskiy, 16–19.09.2016; 3♀, 17.09.2016, 1 juv., 8.07.2017, Beregovoy; 2♂, 1♀, Zaporozhskaya, 17.09.2016; 1♂, 1♀, Krasnyy Oktyabr, 12.07.2018; 1♂, 1♀, Dzhiginka, 14.07.2018; 6♂, 1♀, Starominskaya, 24.08.2018; 1♂, Chushka spit, 27–28.08.2018. Republic of Adygea: 2♂, 1♀, Prikubansky, 29.08.2018.

Bionomics. This species is distributed mainly in the lowland of the North-West Caucasus. It prefers mesophytic biotopes with grassland vegetation. It is also found in windbreaks, along roadsides, in agricultural and natural steppe biocenoses; common species. Gramineous chortobiont.

Chorthippus (*Chorthippus*) *dorsatus dorsatus* (Zetterstedt, 1821)

Note. This species was listed by Kopaneva [1963] for the North-West Caucasus in the upper reaches of the Teberda River (Karachay-Cherkess Republic).

Bionomics. Moderately humid biotopes in valley meadows (up to 1300 m), on steppe slopes (from 1250 to 2000 m) and in birch glades (from 1300 to 2500 m) [Kopaneva, 1963]. Gramineous chortobiont.

Chorthippus (*Chorthippus*) *albomarginatus albomarginatus* (De Geer, 1773)

Material. Rostov Region: 1♂, Rogozhkino, 20.07.2017.

Bionomics. Meadows among mesophytic grassland vegetation, rare species. Gramineous chortobiont.

Chorthippus (*Glyptobothrus*) *apricarius major* (Pylnov, 1914)

Material. Republic of Adygea: 1♂, 22.08.2001, 1♂, 7♀, 15.08.2007, Lago-Naki Plateau; 1♀, Dakhovskaya, Gud Mt., 24–26.06.2007. Karachay-Cherkess Republic: 34♂, 26♀, Teberda, 6–14.07.2010; 11♂, 9–14.07.2010, 3♂, 3♀, 12–20.07.2012, Teberda, Chatipara Mt.; 5♂, 8♀, Elbrusskiy, 20–21.07.2013.

Bionomics. This species is presented in the North-West Caucasus by three subspecies: nominotypical one occurs in lowlands and in some localities in the mountains; the larger subspecies *Ch. apricarius major* is widely distributed in highlands (almost throughout the Caucasus). *Chorthippus apricarius caucasicus* described from Teberda [Bey-Bienko, Mistshenko, 1951] is probably conspecific to *Ch. apricarius major*, because their hiatus is unclear. The status of these two taxa (*major* and *caucasicus*) needs further study. In our studies, only *Ch. apricarius major* was found. It inhabits a variety of biotopes with grassland vegetation, but prefers more mesophytic habitats. It was found in all types of studied landscapes in the highland. On low-mountain meadows and in the mountain steppe it inhabits mainly near-forest glades and shrub vegetation along streams. In juniper woodland it was found only in juniper thickets, avoiding open spaces. On subalpine meadows this subspecies is the dominant taxon and is observed everywhere. In the alpine belt, it was also found everywhere, but its population is lower here than in the subalpine belt. Gramineous chortobiont.

Chorthippus (*Glyptobothrus*) *macrocerus purpuratus* (Voroncovskij, 1927)

Material. Rostov Region: 1♀, Manychskaya, 1.07.2001; 5♂, 11♀, 15–18.08.2005, 16♂, 14♀, 19.07.2011, Nedvigovka; 1♂, Rogozhkino, 21.07.2011; 2♂, Krasnyy Manych, 21.09.2011; 1♂, Proletarsk, 11.08.2012. Krasnodar Region: 5♀, Tamarovskiy, 7.08.2013; 2♀, Armavir, 24.07.2013; 3♀, Krasnyy Oktyabr, 12.07.2018; 1♂, 1♀, Dzhiginka, 14.07.2018. Republic of Adygea: 1♀, Nikel, 18.06.2006; 1♂, 1♀, Dakhovskaya, Gud Mt., 24–26.06.2007. Karachay-Cherkess Republic: 2♂, Elbrusskiy, 20–21.07.2013.

Bionomics. This species includes two subspecies in the North-West Caucasus: *Ch. macrocerus purpuratus* and *Ch. macrocerus ponticus* Mistshenko, 1951 described by Mistshenko [Bey-Bienko, Mistshenko, 1951] from the vicinity of Tuapse and Gelendzhik (Krasnodar Region). *Chorthippus macrocerus purpuratus* is common throughout the North-West Caucasus, where it occurs in various biotopes. Gramineous chortobiont.

Chorthippus (*Glyptobothrus*) *porphyropterus* (Voroncovskij, 1928)

Note. This species was listed by Benediktov [1999] for the North-West Caucasus from Maykop (Republic of Adygea) and Teberda (Karachay-Cherkess Republic).

Bionomics. Gramineous chortobiont.

Chorthippus (*Glyptobothrus*) *biguttulus biguttulus* (Linnaeus, 1758)

Material. Rostov Region: 2♂, Rostov-on-Don, 15.07.2018. Krasnodar Region: 2♂, 2♀, Beregovoy, 8.07.2017.

Bionomics. This species is widely distributed throughout the territory of the North West Caucasus. It

occurs in xerophytic and moderately xerophytic steppe biotopes. Gramineous chortobiont.

Chorthippus (Glyptobothrus) pullus (Philippi, 1830)

Material. Karachay-Cherkess Republic: 5♂, 12♀, 7–14.07.2010, 1♀, 19–25.08.2018, Teberda; 1♀, Elbrusskiy, 20–21.07.2013; 1♀, Dzhamagat canyon, 19–25.08.2018.

Bionomics. This species is rare in the region and known only by local populations. It occurs in moist mixed grass associations, usually at the borders of tree-shrub communities. Gramineous chortobiont.

Chorthippus (Glyptobothrus) vagans (Eversmann, 1848)

Note. This species was recorded by Kopaneva [1963] for the North-West Caucasus in the upper valley of Teberda River (Karachay-Cherkess Republic).

Bionomics. It was found in mixed grass meadow steppe biotopes [Kopaneva, 1963]. Gramineous chortobiont.

Chorthippus (*Glyptobothrus*) *elbrusianus* Bey-Bienko, 1941

Material. Karachay-Cherkess Republic: 1♂, 2♀, Zagedan Mt., 10.08.2007.

Note. This species is also known from the type locality (Karachay-Cherkess Republic, Elbrus Mt., Malka River) and listed by Chernyakhovsky and Gazenko [1974] for Avadkhara canyon (Abkhazia) and slopes of Aibga Mt. (Krasnodar Region of Russia).

This species is considered by some researchers as a synonym of *Chorthippus fallax* [Cigliano et al., 2019]. In our work *Chorthippus elbrusianus* is interpreted as an independent species, which is supported by some specialists [Bey-Bienko, Mistshenko, 1951; Storozhenko, 2002].

Bionomics. The species occurs in the highlands of the North-West Caucasus and inhabits moist subalpine meadows at an altitude 2000 m [Chernyakhovsky, Gazenko, 1974]. Gramineous chortobiont.

Euchorthippus pulvinatus (Fischer von Waldheim, 1846)

Material. Rostov Region: 1♀, Donskoy, 7–11.10.2008; 20♂, 42♀, Nedvigovka, 19.07.2011; 7♂, 11♀, Rogozhkino, 21.07.2011; 2♂, Baraniki, 20.09.2011; 4♂, 3♀, Stepnoy Kurgan, 20.06.2012; 5♂, 7♀, Yulovskiy, 20.06.2012. Krasnodar Region: 2♀, Armavir, 24.07.2013; 1♂, 1♀, Tamarovskiy, 7.08.2013; 1♂, Brinkovskaya, 12.08.2013; 2♂, 1♀, 29.06.2015, 1♀, 10.07.2017, Taman; 2♂, 3♀, Beregovoy, 8.07.2017; 3♂, 2♀, Starotitarovskaya, 11.07.2017. Republic of Adygea: 1♀, Lago-Naki Plateau, 26.08.2007.

Bionomics. This species is widely distributed throughout the territory of the North West Caucasus. It occurs in xerophytic and moderately xerophytic steppe biotopes with obligatory participation of cereal grasses. It prefers Stipa-Poaceae associations, where it is the background species. The species inhabits forest shelter belts and edges of agrarian landscapes and can be found up to 2000 m. Gramineous chortobiont.

Myrmeleotettix antennatus (Fieber, 1853)

Material. Rostov Region: 1♂, Obukhovka, 4.07.2005; 12♂, 10♀, Rogozhkino, 21.07.2011.

Bionomics. Local populations of the species are confined with sand-steppe communities with grassland vegetation. Gramineous chortobiont.

Tribe Stenobothrini

Stenobothrus nigromaculatus (Herrich-Schäffer, 1840)

Material. Republic of Adygea: 1♂, 2♀, Lago-Naki Plateau, 22.08.2001.

Bionomics. This species occurs in areas with forb-fescue-feather grass vegetation. Gramineous chortobiont.

Stenobothrus mistshenkoi Woznessenskij, 1998

Material. Republic of Adygea: 1♂, 2♀, Guzeripl, Tybga Mt., 24.08.2018.

Bionomics. This species occurs in subalpine meadows at an altitude of about 2100 m, where it inhabits xerophytic areas with thickets of blueberries, rhododendron and junipers. Gramineous chortobiont.

Stenobothrus lineatus (Panzer, 1796)

Material. Republic of Adygea: 5♂, 5♀, Lago-Naki Plateau, 20.08.2006. Karachay-Cherkess Republic: 1♀, Dzhamagat canyon, 19–25.08.2018.

Bionomics. This species is represented by the nominatypical subspecies. It occurs in moderately moist steppe biotopes. Gramineous chortobiont.

Stenobothrus fischeri fischeri (Eversmann, 1848)

Material. Rostov Region: 8♂, 8♀, 4.06.2012, 2♂, 11♀, 20.06.2012, Yulovsky; 2♂, Stepnoy Kurgan, 20.06.2012; 5♂, 11♀, Rostov-on-Don, 6.06.2014.

Bionomics. It is an early summer species, which inhabits moderately xerophytic forb-fescue-feather grass steppe areas. Migrations of populations can be related with outbreaks. Such phenomenon was observed in 2014 in the territory of Rostov-on-Don. The main habitat of the species occupies the north of the North West Caucasus, but the species was found within the Kuma-Manych depression (personal author's information). Gramineous chortobiont.

Stenobothrus miramae Dirsh, 1931

Material. Krasnodar Region: 2♂, 3♀, Taman, 28.06.2015; 5♂, 13♀, 8.07.2017, 1♂, 5♀, 8.06.2018, Beregovoy; 3♂, 6♀, Starotitarovskaya, 11.07.2017; 2♂, 2♀, Novorossiysk, Markoth Ridge, 12.07.2017.

Bionomics. Previously this species was recorded by Terskov [2017] for the North-West Caucasus (Taman). It occurs throughout the Taman Peninsula and the Black Sea coast to Novorossiysk, inhabing plains and foothill steppe slopes with grassland vegetation. Gramineous chortobiont.

Omocestus (*Omocestus*) *viridulus* (Linnaeus, 1758)

Material. Republic of Adygea: 3♂, 12♀, 22.08.2001, 1♂, 2♀, 24.08.2007, Lago-Naki Plateau; 10♂, 4♀, Dakhovskaya env., glade near beech-hornbeam forest, 1000 m, 24.06.2006; 4♂, 3♀, Abago Mt., 18.08.2015; 5♂, 8♀, 15.09.2014, 3♀, 22.08.2015, Guzeripl, subalpine meadow; 5♀, Tybga Mt., 2000 m, 2–16.08.2018. Karachay-Cherkess Republic: 1♂, 1♀, Zagedan Mt., 10–13.07.2007; 22♂, 22♀, Teberda, 7–14.07.2010; 1♀, Teberda, alpine and subalpine zones of Malaya Khatipara Mt., 20.07.2012.

Bionomics. This species occurs in mesophytic biotopes among graminoid vegetation throughout the North-West Caucasus, from mixed grass meadows in the foothills to high-alpine meadows. Gramineous chortobiont.

Omocestus (*Omocestus*) *petraeus*
(Brisout de Barneville, 1856)

Material. Krasnodar Region: 6♂, 7♀, Starotitarovskaya, 11.07.2017.

Bionomics. This species was listed by Dovnar-Zapolsky [1927] for Rostov-on-Don and Aksay (Rostov Region); occurs in xerophytic grass fescue steppe biotopes with low grasses vegetation. Gramineous chortobiont.

Omocestus (*Omocestus*) *haemorrhoidalis*
(Charpentier, 1825)

Material. Rostov Region: 1♂, Rogozhkino, 21.07.2011; 5♀, Baraniki, 20.09.2011; 2♂, Stepnoy Kurgan, 20.06.2012. Karachay-Cherkess Republic: 1♂, 4♀, Teberda, 7–14.07.2010; 5♂, 6♀, Elbrusskiy, 20–21.07.2013.

Bionomics. This species is represented by the nominatypical subspecies. It inhabits moderately xerophytic biotopes with graminoid vegetation, common; rare in agrarian landscapes. Gramineous chortobiont.

Subfamily Oedipodinae
Tribe Locustini
Locusta migratoria migratoria (Linnaeus, 1758)

Material. Rostov Region: 1♀, Rostov-on-Don, 30.07.2017; 2♂, 2♀, Kagalnik, 15.10.2018. Krasnodar Region: 1♀, Novonekrasovskiy, 9.08.2013; 1♀, Achuevskaya spit, 10.08.2013; 3♂, 6♀, Brinkovskaya, 12.08.2013; 1♂, 3♀, Sadki, 9.08.2015; 1♀, 8.07.2017, 1♀, 22.08.2018, Beregovoy.

Bionomics. The species occurs among mesophytic vegetation near water reservoirs with the obligatory participation of reeds. Periodically outbreaks are observed. The migratory locust has permanent centers of mass reproduction in agrocenoses in the southern districts of Rostov and Krasnodar regions. As a result the herd phase of *Locusta migratoria* occurs on farmlands and in delta parts of Don and Kuban rivers. The species lives in solitary phase along shores of small rivers and sea coasts. Gramineous chortobiont.

Oedaleus decorus (Germar, 1825)

Material. Rostov Region: 1♂, 1♀, Rogozhkino, 21.07.2011; 2♂, 2♀, Stepnoy Kurgan, 20.06.2012. Krasnodar Region: 2♀, Beregovoy, 8.07.2017.

Bionomics. This species occurs in lowlands of the North West Caucasus. It prefers areas with sparse vegetation well warmed by the sun. Undercovering geophil.

Psophus stridulus (Linnaeus, 1758)

Material. Republic of Adygea: 1♂, Lago-Naki Plateau, 26.08.2007.

Bionomics. The species occurs among mixed grass vegetation in the highlands of the North West Caucasus. It was listed by Chernyakhovsky and Gazenko, [1974] for low-grass meadows on the slopes of Achishkho Mt. (Republic of Adygea). Undercovering geophil.

Tribe Epacromiini
Aiolopus thalassinus thalassinus (Fabricius, 1781)

Material. Rostov Region: 2♂, 1♀, Baraniki, 20.09.2011; 2♂, 3♀, Donskoy Island, 16.09.2014. Krasnodar Region: 1♀, Gulkevichi, 19.06.1927; 1♂, Taman, 3.10.1927; 1♀, Sochi, 19.02.2006; 2♂, 5♀, Novonekrasovskiy, 9.08.2013; 2♂, 5♀, Achuevskaya spit, 10.08.2013; 8♂, 13♀, Brinkovskaya, 12.08.2013; 1♀, Sadki, 9.08.2015; 2♀, Taman Peninsula, Karabetova Mt., 29.11.2015; 1♀, Primorskiy, 16–19.09.2016; 1♀, Bryukhovetskaya, 7.07.2017; 2♂, 2♀, Beregovoy, 8.07.2017; 1♂, 1♀, Glafirovka, 16.07.2017.

Bionomics. This species inhabits different mesophytic (including halophytic) biotopes. Facultative chortobiont.

Aiolopus strepens strepens (Latreille, 1804)

Note. This species was recorded by Bey-Bienko and Mistshenko [1951] for the Black Sea coast of the Caucasus.

Bionomics. This species inhabits different mesophytic (including halophytic) biotopes. Facultative chortobiont.

Epacromius pulverulentus
(Fischer von Waldheim, 1846)

Material. Rostov Region: 3♂, 1♀, Baraniki, 20.09.2011; 1♂, 1♀, Donskoy Island, 16.09.2014. Krasnodar Region: 3♂, Novonekrasovskiy, 9.08.2013; 1♂, 5♀, Achuevskaya spit, 10.08.2013; 8♂, 13♀, Brinkovskaya, 12.08.2013; 2♀, Taman Peninsula, Karabetova Mt., 29.11.2015; 1♀, Primorskiy, 16–19.09.2016; 2♂, 2♀, Beregovoy, 8.07.2017.

Bionomics. This species inhabits different mesophytic (including halophytic) biotopes, often together with *Aiolopus thalassinus*. Facultative chortobiont.

Epacromius tergestinus tergestinus
(Megerle von Mühlfeld, 1825)

Material. Rostov Region: 1♂, 2♀, Baraniki, 20.09.2011.

Bionomics. Probably, the main range of the species is located outside the North West Caucasus, but it was found in Kuma-Manych depression. It prefers areas with sparse meadow vegetation, inhabits weak and strong well-moistened salt marshes along the banks of water bodies, arrives at light [Savitsky, 2013]. Facultative chortobiont.

Platypygius crassus (Karny, 1907)

Material. Rostov Region: 1♀, 6.06.1927, 1♀, 6.07.2007, Proletarsk. Krasnodar Region: 2♂, 1♀, Primorsko-Ahtarsk, 10.08.2013; 5♂, 4♀, Achuevskaya spit, 10.08.2013; 9♂, 3♀, Brinkovskaya, 12.08.2013; 1♂, 1♀, 18.09.2016, 9♂, 2♀, 8.07.2017, Beregovoy; 1♀, Glafirovka, 6–7.07.2017; 1♂, 1♀, Taman, 10.07.2017; 3♂, 4♀, Starotitarovskaya, 11.07.2017; 1♀, Batareyka, 24.08.2018.

Bionomics. This species was found in various salt marshes together with *Aiolopus thalassinus* and *Epacromius pulverulentus*; common in the Kuma-Manych depression and in the coastal zone of the east of the Sea of Azov region including numerous firths. Facultative chortobiont.

Paracinema tricolor bisignata (Charpentier, 1825)

Material. Rostov Region: 1♂, Rostov-on-Don, 15.08.2007.

Bionomics. Distribution of the subspecies in the North-West Caucasus is unknown. It occurs in meadows along river banks and other water reservoirs among sedge-grass vegetation. Specialized phytophil.

Tribe Acrotylini
Acrotylus longipes longipes (Charpentier, 1845)

Material. Krasnodar Region: 10♂, 6♀, 16.09.2016, 1♂, 27–28.08.2018, Chushka spit; 7♂, 6♀, Veselovka, 19.09.2016; 1♀, Taman, 10.07.2017; 5♂, 5♀, Anapa, 13.07.2018.

Bionomics. Data on distribution and bionomics of the species were published earlier [Terskov, 2017; Terskov, Tereshchenko, 2017]. Eremobiont.

Tribe Oedipodini

Mioscirtus wagneri wagneri (Eversmann, 1859)

Material. Rostov Region: 1♀, Baraniki, 20.09.2011.

Bionomics. The species occurs in bare salt marshes in Kuma-Manych depression. Eremobiont.

Oedipoda caerulescens caerulescens (Linnaeus, 1758)

Material. Rostov Region: 1♂, Nedvigovka, 19.07.2011; 2♂, Rogozhkino, 21.07.2011; 2♂, 1♀, Krasnyy Manych, 21.09.2011; 1♂, Stepnoy Kurgan, 20.06.2012. Krasnodar Region: 1♀, Sukko, 17.08.2011; 1♂, 2♀, Bolshoy Utrish, 19.08.2011; 1♀, Novonekrasovskiy, 9.08.2013; 4♂, 4♀, Brinkovskaya, 12.08.2013; 1♂, Kabardinka, 8.09.2014; 1♂, 28.11.2015, 3♂, 10.07.2017, Taman; 1♂, 1♀, Chushka spit, 16.09.2016; 1♀, Beregovoy, 18.09.2016; 3 juv., Temryuk, 7.07.2017; 1♂, Dolzhanskaya split, 16.07.2017; 1♂, 1♀, Dzhiginka, 14.07.2018; 1♂, Golubitskaya, 28.08.2018. Karachay-Cherkess Republic: 7♂, 2♀, 7–14.07.2010, 1♀, 19–25.08.2018, Teberda; 1♀, Dzhamagat canyon, 19–25.08.2018.

Bionomics. It is common species in the lowlands of the North-West Caucasus, reaching 2000 m [Kopaneva, 1962]. It prefers open areas of soil with sparse vegetation. Often it is found on roadsides, in agricultural landscapes, as well as in damaged ecosystems with ruderal vegetation. Eremobiont.

Celes variabilis variabilis (Pallas, 1771)

Material. Rostov Region: 5♂, Yulovskiy, 4.06.2012. Krasnodar Region: 13♂, 9♀, 8.07.2017, 1♂, 7.06.2018, Beregovoy; 2♂, Novorossiysk, Markoth Ridge, 12.07.2017.

Bionomics. The species lives in steppe biotopes among mixed grass vegetation. Facultative chortobiont.

Tribe Parapleurini

Mecostethus parapleurus parapleurus (Hagenbach, 1822)

Material. Rostov Region: 1♀, Obukhovka, 4.07.2005; 3♂, 1♀, Rogozhkino, 21.07.2011; 1♀, Donskoy Island, 16.09.2014. Krasnodar Region: 1♂, 2♀, Armavir, 24.07.2013. Republic of Adygea: 1♂, 18.08.2001, 22♂, 20♀, 18.06.2006, 6♂, 3♀, 4.07.2006, Nikel; 2♂, Dakhovskaya, 18.07.2006. Karachay-Cherkess Republic: 1♂, Elbrusskiy, 20–21.07.2013; 1♀, Dzhamagat canyon, 19–25.08.2018; 1♀, Teberda, 19–25.08.2018.

Bionomics. It is a moisture-loving species which inhabits various meadows with grassland vegetation along the banks of water bodies and in the lower reaches of the beams. Gramineous chortobiont.

Stethophyma grossum (Linnaeus, 1758)

Material. Karachay-Cherkess Republic: 1♂, 6♀, Teberda, 19–25.08.2018.

Bionomics. This species occurs in wet meadows. Gramineous chortobiont.

Tribe Sphingonotini

Sphingonotus (*Sphingonotus*) *caerulans caerulans* (Linnaeus, 1767)

Material. Krasnodar Region: 3♂, 2♀, Sukko, 17.08.2011; 25♂, 17♀, Achuevskaya spit, 10.08.2013; 1♂, Brinkovskaya, 12.08.2013; 1♀, Beregovoy, 8.07.2017; 1♂, Taman, 10.07.2017; 2♂, Dolzhanskaya split, 16.07.2017; 2♂, Golubitskaya, 28.08.2018.

Bionomics. The species inhabits sandy coasts of the Black and Azov seas, where it is dominant. It is also found in the psammophytic steppe, where it is common. Eremobiont.

Pseudoceles oedipodioides Bolívar, 1899

Notes. This species was recorded by Bey-Bienko, Mistshenko [1951] for the south of Krasnodar Region (mountains near Anapa and Novorossiysk).

Bionomics. This species inhabits dry lowlands with stony slopes and screes [Bey-Bienko, Mistshenko, 1951]. However, we did not find *Pseudoceles oedipodioides* in special studies in the vicinity of Anapa and Novorossiysk. Eremobiont.

Pseudoceles obscurus (Uvarov, 1927)

Notes. *Pseudoceles obscurus* was found in central and eastern parts of the Main Caucasian Ridge at heights not less than 1200 m [Bey-Bienko, Mistshenko, 1951], but this species can probably be found in the North-West Caucasus during further investigations. The species was previously recorded for the vicinity of the considered borders of the North-West Caucasus [Terskov, 2014].

Results and discussion

Sixty one species of grasshoppers from 35 genera and 2 families are recorded for the territory of the North-West Caucasus. The obtained data on the biotopic distribution of grasshoppers allows to identify the features of their landscape distribution in the studied region. Details are provided in Table 1.

The highest diversity of grasshoppers in the Kuban – Cis-Azov biogeographic province is observed in steppe biotopes with forb-grass vegetation. Twenty five species (41% of the total number of species) are listed here. Such species as *Celes variabilis*, *Oedipoda caerulescens*, *Calliptamus italicus*, *Arcyptera microptera* are common in the preserved natural areas; *Stenobothrus fischeri* is distributed in the north of the biogeographic province, and *Stenobothrus miramae* in the Black Sea region. *Myrmeleotettix antennatus* and *Ramburiella turcomana* were found in psammophyte steppe. *Chorthippus biguttulus* and *Ch. macrocerus* are dominant species in steppe areas throughout the Kuban – Cis-Azov biogeographic province.

The diversity is visibly lower in the meadows near various water bodies. Only 16 species of grasshoppers (26% of the total number of species) were registered here. The dominant species are *Chorthippus parallelus*, *Ch. dichrous*, *Ch. loratus*. Additionally, *Acrida anatolica* is common in the coastal areas of the Sea of Azov.

Salt marshes are located mainly along the edges of estuaries and sea coasts, as well as in Kuma-Manych depression. Twelve species of grasshoppers (19.5% of the total number of species) are recorded here, from which three species (*Aiolopus thalassinus*, *Epacromius pulverulentus*, *Platypygius crassus*) is widely distributed in the Cis-Azov region. *Aiolopus strepens* is added to the fauna of the Black Sea region among listed species. Halophilic species, such as *Epacromius tergestinus* and *Mioscirtus wagneri*, migrated on the North-West Caucasus from the east through Kuma-Manych depression. Other species recorded for this type of landscape are found only on the periphery of salt marshes.

Table 1. Biotopic distribution and life form of grasshoppers (Orthoptera: Acridoidea) of the North-West Caucasus.
Таблица 1. Биотопическая приуроченность и жизненные формы саранчовых (Orthoptera: Acridoidea) Северо-Западного Кавказа.

	Species / Виды	Types of landscapes / Типы ландшафтов									Life form Жизненная форма
		Psammophyte biotopes of seashores / Псаммофитные биотопы морских побережий	Kuban – Cis-Azov biogeographic province / Кубано-Приазовская провинция			Black Sea – Kuban province Причерноморско-Кубанская провинция					
			Steppe Степи	Meadows Луга	Salt-marsh Солончаки	Low-mountain meadows Низкогорные луга	Mountain steppe Горная степь	Bush woodlands Кустарниковое редколесье	Subalpine meadows Субальпийские луга	Alpine meadows Альпийские луга	
1	*Nocaracris cyanipes*									+	PB
2	*Calliptamus barbarus*	+	+		+		+	+	+		FC
3	*Calliptamus italicus*	+	+		+		+	+			FC
4	*Pezotettix giornae*		+								GFC
5	*Podisma pedestris*							+	+		GFC
6	*Podisma uvarovi*									++	GFC
7	*Podisma teberdina*							+		+	GFC
8	*Podisma satunini*								+	+	GFC
9	*Micropodisma koenigi*					+					GFC
10	*Acrida anatolica*	+	+	+	+						SCC
11	*Arcyptera fusca*					+	+	+			CC
12	*Arcyptera microptera*		+								CC
13	*Ramburiella turcomana*		+								CC
14	*Eremippus opacus*				+						MTB
15	*Dociostaurus maroccanus*	+	+				+		+		FC
16	*Dociostaurus brevicollis*	+	+			+	+	+			FC
17	*Chrysochraon dispar*			+		+		+	+		SP
18	*Euthystira brachyptera*			+		++			++		SP
19	*Gomphocerus sibiricus*							+	+	++	CC
20	*Gomphocerippus rufus*						+				CC
21	*Stauroderus scalaris*		+			+	+	+	+		CC
22	*Pseudochorthippus parallelus*	+		++		++	+	+	+	+	CC
23	*Chorthippus abchasicus*					+					CC
24	*Chorthippus dichrous*	+		++	+	+					CC
25	*Chorthippus loratus*	+	+	++	+	+	+				CC
26	*Chorthippus dorsatus*					+	+	+			CC
27	*Chorthippus albomarginatus*			+							CC
28	*Chorthippus apricarius*		+			+	++	+	++	++	CC
29	*Chorthippus macrocerus*		++	+		+	++	+			CC
30	*Chorthippus porphyropterus*		+								CC
31	*Chorthippus biguttulus*	+	++	+			++				CC
32	*Chorthippus pullus*					+					CC
33	*Chorthippus vagans*						+				CC
34	*Chorthippus elbrusianus*								+		CC
35	*Euchorthippus pulvinatus*		+				+		+		CC
36	*Stenobothrus nigromaculatus*		+			+	+				CC
37	*Stenobothrus mistshenkoi*								+		CC
38	*Stenobothrus lineatus*					+	+		+	+	CC

Table 1 (completion).
Таблица 1 (окончание).

	Species / Виды	Types of landscapes / Типы ландшафтов									Life form Жизненная форма
		Psammophyte biotopes of seashores / Псаммофитные биотопы морских побережий	Kuban – Cis-Azov biogeographic province / Кубано-Приазовская провинция			Black Sea – Kuban province Причерноморско-Кубанская провинция					
			Steppe Степи	Meadows Луга	Salt-marsh Солончаки	Low-mountain meadows Низкогорные луга	Mountain steppe Горная степь	Bush woodlands Кустарниковое редколесье	Subalpine meadows Субальпийские луга	Alpine meadows Альпийские луга	
39	*Stenobothrus fischeri*		+								CC
40	*Stenobothrus miramae*		+				+				CC
41	*Omocestus viridulus*					++		+	+	+	CC
42	*Omocestus petraeus*		+								CC
43	*Omocestus haemorrhoidalis*		+			+	+	+	+		CC
44	*Myrmeleotettix antennatus*		+								CC
45	*Locusta migratoria*	+		+							CC
46	*Oedaleus decorus*	+	+								UG
47	*Psophus stridulus*					+	+	+			UG
48	*Aiolopus thalassinus*	+		+	++						FC
49	*Aiolopus strepens*			+	+						FC
50	*Epacromius pulverulentus*	+		+	++						FC
51	*Epacromius tergestinus*				+						FC
52	*Platypygius crassus*				++						FC
53	*Paracinema tricolor*			+							SP
54	*Acrotylus longipes*	++									EB
55	*Mioscirtus wagneri*				+						EB
56	*Oedipoda caerulescens*	+	+			+	+	+			EB
57	*Celes variabilis*		+								FC
58	*Mecostethus parapleurus*			+		++					CC
59	*Stethophyma grossum*			+		+		+			CC
60	*Sphingonotus caerulans*	++	+								EB
61	*Pseudoceles oedipodioides*						+				EB
Всего видов		16	25	16	12	22	22	18	16	9	

Note. + – registered species; ++ – dominant species. Life forms: PB – petrobiont; FC – facultative chortobiont; CC – gramineous chortobiont; SCC – sedge-gramineous chortobiont; GFC – grass-feeding chortobiont; MTB – microthamnobiont; SP – specialized phytophilous species; UG – undercovering geophilic species; EB – eremobiont.

Примечание. + – присутствующие виды; ++ – доминантные виды. Жизненные формы: PB – петробионт; FC – факультативный хортобионт; CC – злаковый хортобионт; SCC – осоко-злаковый хортобионт; GFC – травоядный хортобионт; MTB – микротамнобионт; SP – специализированный фитофил; UG – подпокровный геофил; EB – эремобионт.

Psammophytic biotopes of sea coasts must be discussed especially. Steppe and meadow species from adjacent habitats penetrate this type of landscape. A typical faunistic element is *Acrotylus longipes*, which was not found in other types of landscapes. The dominant species are *Sphingonotus caerulans* and *Acrotylus longipes*. In total, 16 species of grasshoppers (26% of the total number of species) were recorded. In the Black Sea – Kuban biogeographic province, the following types of landscapes are distinguished: low-mountain meadows, mountain steppe, bush woodlands, subalpine meadows, alpine meadows. Twenty two species of grasshoppers (36% of the total number of species) are registered in low-mountain meadows, the absolute height of which does not exceed 1300 m. Half of these species penetrate from the lowland, the rest are represented only in highlands of

the North-West Caucasus. Typical faunistic elements are *Micropodisma koenigi*, *Chorthippus abchasicus*, *Ch. pullus*, found only in this type of landscape. The dominant species is *Chorthippus parallelus*, sub-dominant in the river valleys (Belaya River, Republic of Adygea) are *Mecostethus parapleurus* or *Euthystira brachyptera* and *Omocestus viridulus* (vicinity of Teberda River, Karachay-Cherkess Republic).

Twenty two species of grasshoppers (36% of the total number of species) inhabit steppe slopes, well warmed by the sun, with diapason of heights from 800 to 2000 m. Dominant species are *Chorthippus apricarius*, *Ch. macrocerus*, *Ch. biguttulus*. *Arcyptera fusca*, *Chorthippus parallelus*, *Ch. loratus*, *Ch. parallelus*, *Psophus stridulus* which occur among dense high grass. *Calliptamus barbarus*, *Dociostaurus maroccanus*, *D. brevicollis*, *Stenobothrus nigromaculatus*, *Oedipoda caerulescens*, *Pseudoceles oedipodioides* were found on slopes with open areas. *Calliptamus italicus*, *Gomphocerippus rufus*, *Stauroderus scalaris*, *Chorthippus loratus*, *Ch. dorsatus*, *Ch. vagans*, *Euchorthippus pulvinatus*, *Stenobothrus lineatus*, *S. miramae*, *Omocestus haemorrhoidalis* were also collected in this landscape.

Shrub thickets cover mountains at heights from 1300 to 2500 m and are presented by glades with thickets of junipers, rhododendron, blueberry, birch-beech crooked forest, and glades of the forest belt. Eighteen species of grasshoppers (29.5% of the total number of species) are recorded here. The dominant species is *Chorthippus apricarius*. The remaining species are not numerous.

Sixteen species of grasshoppers (26% of the total number of species) inhabit subalpine meadows from 1700 to 2400 m. The following species, occurring on low-grass moderately wet vegetation, compose the core of this species complex: *Euthystira brachyptera*, *Chorthippus apricarius*. *Calliptamus barbarus*, *Dociostaurus maroccanus*, *Gomphocerus sibiricus*, *Stauroderus scalaris*, *Chorthippus elbrusianus*, *Stenobothrus mistshenkoi*, *Omocestus viridulus*, *Omocestus haemorrhoidalis* are found in low-grass moderately wet vegetation. *Chrysochraon dispar*, *Euthystira brachyptera*, *Chorthippus parallelus*, *Stenobothrus lineatus* are found among dense tall grass.

Alpine meadows cover mountains from 2000 to 3500 m and include low-grass meadows, as well as vegetation of scree slope and rocks (the only representative of the family Pamphagidae in the North-West Caucasus, *Nocaracris cyanipes*, was found on screes and in stony habitats). In total, nine species of grasshoppers (15% of the total number of species) were found in this type of landscape. The dominant taxa are *Gomphocerus sibiricus*, *Chorthippus apricarius*, *Omocestus viridulus*, which are distributed in alpine meadows throughout the studied area. Local, but numerous populations of endemic *Podisma uvarovi*, *P. teberdina* and *P. satunini* are also known in these landscapes.

The highest diversity in the Black Sea – Kuban biogeographical province is observed in low-mountain meadows and mountain steppes, with 22 grasshoppers species accordingly. At the same time, these habitats are characterized by a low value of Sørensen-Chekanovsky index (0.51). These results suggest that different species compose a basis of grasshoppers faunistic complexes in these landscapes. The species diversity decreases markedly with increasing altitudes in other landscapes (Fig. 2).

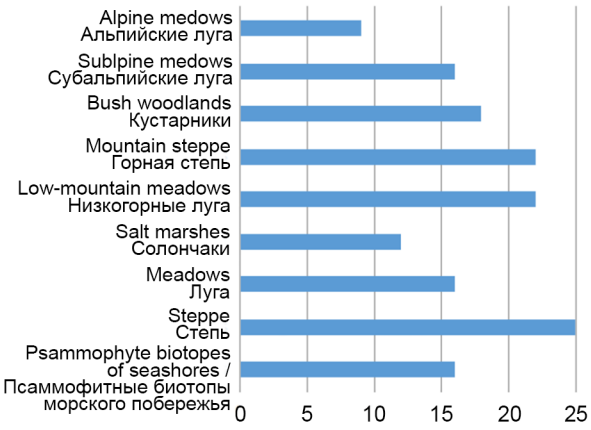

Fig. 2. Diversity of grasshoppers in various types of landscapes in the North-West Caucasus.

Рис. 2. Видовое разнообразие саранчовых в различных ландшафтах Северо-Западного Кавказа.

Similarity of assemblages of grasshoppers in various landscapes of the North-West Caucasus is shown on Fig. 3. Comparison of species composition in different landscapes show that the fauna is clearly divided into two clusters, which correspond to the Kuban – Cis-Azov and the Black Sea – Kuban biogeographic provinces (bootstrap probabilities are 100%).

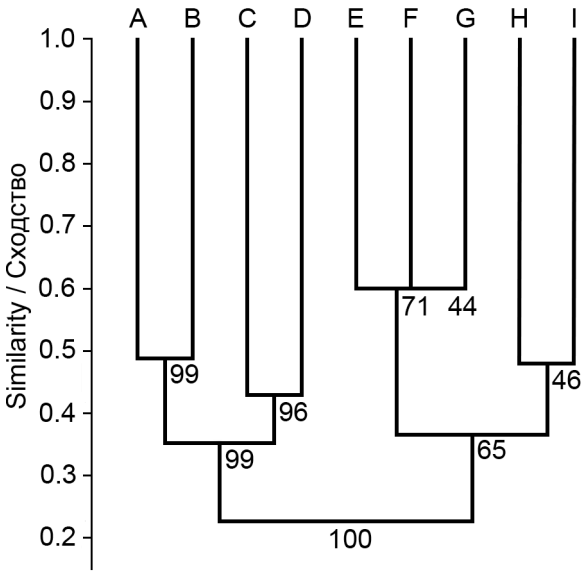

Fig. 3. Similarity of assemblages of grasshoppers in various types of landscapes in the North-West Caucasus. Bootstrap probabilities (expressed in percentage) are indicated at the node of each cluster. A – psammophyte biotopes of seashores; B – steppes; C – meadows; D – salt-marsh; E – low-mountain meadows; F – mountain steppes; G – bush woodlands; H – subalpine meadows; I – alpine meadows.

Рис. 3. Сходство видового состава саранчовых различных ландшафтов Северо-Западного Кавказа. В основании ветвей приведены бутстреп-значения (%). A – псаммофитные биотопы морских побережий; B – степи; C – луга; D – солончаки; E – низкогорные луга; F – горные степи; G – кустарниковое редколесье; H – субальпийские луга; I – альпийские луга.

Analysis of life forms of grasshoppers showed that the most of them are gramineous chortobionts (52%), 10 species (16%) are facultative chortobionts, 6 species (10%) are grass-feeding chortobionts, and 5 species (8%) are eremobionts. Other grasshoppers are presented by a relatively small number of species belonging to the following life forms: specialized phytophils – 3 (5%), undercovering geophilous – 2 (3%), sedge-gramineous chortobionts, microthamnobionts, and petrobionts – 1 species (2%).

Despite the diversity of grasshoppers in the North-West Caucasus, a number of endemic taxa is small here (15% of the total number of species). Among them seven species are endemic for the North-West Caucasus, *Podisma uvarovi*, *P. teberdina*, *P. satunini*, *Eremippus opacus*, *Chorthippus abchasicus*, *Ch. elbrusianus*, *Stenobothrus mistshenkoi*, as well as two species, *Nocaracris cyanipes* and *Micropodisma koenigi*, are endemic of the whole Caucasus.

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