

Research article

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Ecology of *Oreasiobia fedtschenkoi* in a mountain site of Eastern Kyrgyzstan (Dermaptera: Forficulidae)

Pierangelo CRUCITTI*¹, Roberto ANTONELLI¹, Sofia NIGRO¹, Roberto BATTISTON^{1, 2}, Dmitry MILKO³

¹ SRSN Società Romana di Scienze Naturali ETS, Via Fratelli Maristi 43, 00137 Rome, Italy – info@srsn.it

² Museo di Archeologia e Scienze Naturali “G. Zannato” piazza Marconi, 17, 36075 Montecchio Maggiore, Italy – roberto.battiston@comune.montecchio-maggiore.vi.it

³ Institute of Biology, Kyrgyz National Academy of Sciences 265, Tchui Avenue, Bishkek 720010, Kyrgyz Republic – dm-milko@yandex.com

* Corresponding author

Abstract

Oreasiobia fedtschenkoi (Saussure, 1874) is a poorly known earwig however widely distributed across Central Asia. We evaluated some aspects of the autecology of this species in the site of Boz-Salkyn south of the endorheic mountain Issyk-Kul Lake near the village of Bokombaevo in Kyrgyzstan. The analysis of the ecological context identified the characteristics of a habitat particularly favorable for this species as high altitude meadows at around 2,500 m surrounded by granite reliefs and extensive forests at the base of high mountains. Data about type, color, texture and hardness of soil have been evaluated. Among biological features of the alpine meadows, the diversity of some groups of species such as vascular plants and insects have been analyzed. Earwigs have been found under small granite stones simply placed on the ground, cow dungs, wooden structures, at the apex of vegetation thin stem and finally under artificial material. In our sample, 120 individuals of which 101 were sexed, females significantly outnumber males. Furthermore, the weight/length data are higher in females. On the basis of bibliographical data and our observations, *O. fedtschenkoi* deserves the attributes of strictly orophilous, largely sublapidicolous, and a mesohygrophilous species. The tourist site of Boz-Salkyn is constantly affected by anthropogenic pressure which may threaten the conservation of its peculiar biological diversity.

Key words: Autecology, orophilous species, Central Asia, sex ratio, distribution, conservation.

Introduction

Oreasiobia Semenov, 1936 is a genus of Dermaptera (Forficulidae: Anechurinae) which is easily distinguished from the other earwig species present in Kyrgyzstan for the peculiar shape of the male cerci long, curved at the base and well-spaced but almost completely straight. This genus includes, up to now, eight species: *Oreasiobia calciatii* (Borelli, 1909), *Oreasiobia chinensis* Steinmann, 1974, *Oreasiobia fedtschenkoi* (Saussure, 1874), *Oreasiobia forcipina* Yang & Zhang, 1988, *Oreasiobia piger* Steinmann, 1983, *Oreasiobia similis* Steinmann, 1983, *Oreasiobia stoliczkae* (Burr, 1912) and the recently described *Oreasiobia meria* (Sakai 1973; Yang & Zhang 1988; Steinmann 1989; Chen 2024; Hopkins et al. 2026). The Fedtschenko's earwig *Oreasiobia fedtschenkoi* (Saussure, 1874) is characterized by its peculiar morphological feature, the apex of the supragenital plate, both triangular or square, and the male genitalia (Battiston et al. 2021). The taxonomy of this species is still debated. Bey-Bienko

(1936) considered *O. calciatii* as subspecies of *fedtschenkoi* with some differences in the shape of pronotum and male paramere, and it was separated as a distinct species only recently (Srivastava 1983) with *O. fedtschenkoi* widely distributed in the upper zones of the mountains throughout Turkestan reaching elevations of 2,500–2,800 m asl with a vicariant representative: *Oreasiobia fedtschenkoi calciatii* (Borelli, 1909) in the mountains of Kashmir (Semenov-Tjan-Shanskij 1935; Bey-Bienko 1936). A genetic revision of the genus is urgent to solve its taxonomy and to clarify the phylogenetic relationships among taxa. The distribution of *O. fedtschenkoi* includes a quite large area of Central Asia: Eastern Kazakhstan and Uzbekistan, Kyrgyzstan, Tajikistan and Western China (Battiston et al. 2021). The highest number of collected records is known from Kyrgyzstan, where *O. fedtschenkoi* shows a notable distribution encompassing the southern margin of the Lake Issyk-Kul (Ysyk-Köl, Ysykköl) Basin in the same region, Fergana area, the Osh Region and the valley of the river Gultsha in the Alay Mts. (Mistshenko 1937; Chelpakova

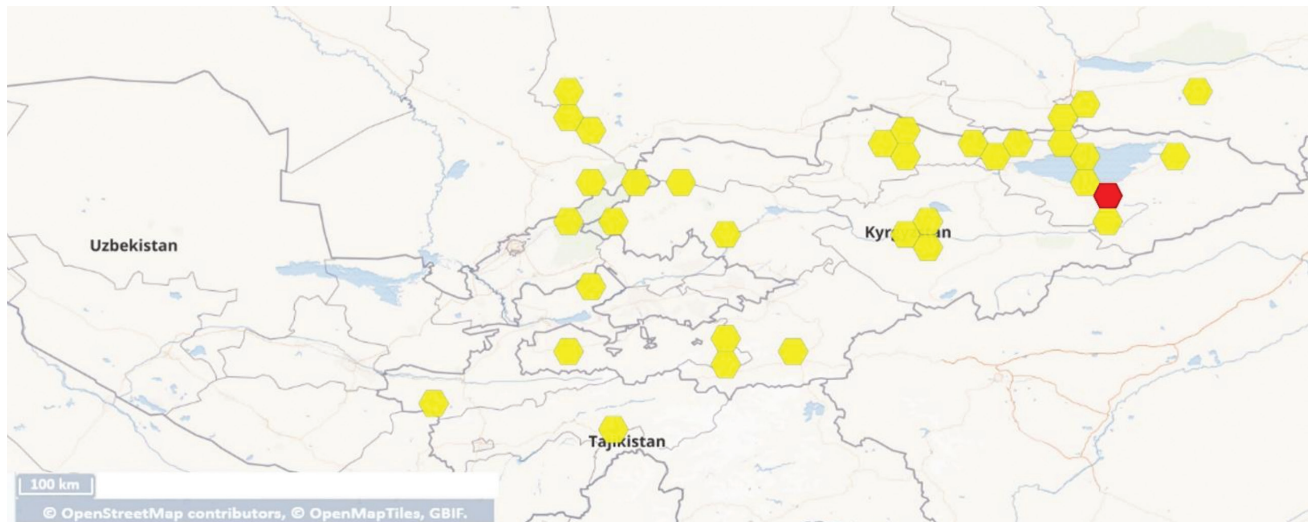


Fig. 1. Distribution of *Oreasiobia fedtschenkoi* in Central Asia (part); the red dot indicates the location of Boz-Salkyn (base map and occurrence data source: GBIF, 2025).

et al. 2011; Battiston et al. 2021) (Fig. 1). Despite its relatively broad distribution, information on the ecology of *O. fedtschenkoi* remains scarce and largely descriptive. There is few information about the feeding, reproduction and harmfulness of this earwig (Bey-Bienko 1936; Lazkov et al. 2016; Battiston 2021; Milko 2021). During the third zoological mission to Central Asia (2024) sponsored by the Società Romana di Scienze Naturali (Roman Society of Natural Sciences; SRSN), a mountain area characterized by a high abundance of Dermaptera near the village of Bokombaevo (Bökönbaev, Bokombaevskoe), in the Issyk-Kul Region of Eastern Kyrgyzstan, was surveyed. In this area, *O. fedtschenkoi* was found to be the only earwig species present. Subsequently, during the fifth SRSN mission (2025), quantitative ecological data, integrated by some biological observations, were collected on *O. fedtschenkoi* in the same area. The results of this research are presented here with the aim of contributing new information on the ecology (autecology) of *O. fedtschenkoi* and filling a current gap in the knowledge of this species.

Materials and methods

Study area. The investigated area is located 12 km East of Bokombaevo (42.6.36N 76.59.24.E; 1809 m a.s.l.) in the Ton District in Issyk-Kul Province. The site consists of a grazed highland plateau reachable from the same village by a winding, uphill dirt road. The current name of the area is Boz-Salkyn, 42.4.52.N 77.8.5.E, about 2500 m a.s.l - coordinates were obtained by finding the mid-point equidistant between the coordinates of all the examined sampling sites of the area (Fig. 2; Gizi Map 2023). Based on the distances covered on foot during field activities, the surface area investigated was roughly estimated to range

between 25000 and 30000 m². Climatic conditions of the Bokombaevo district are illustrated in Fig. 3.

Investigation methodologies. Field investigations were conducted during two zoological missions. During the 2024 mission, the area was surveyed between 4 and 8 August; the presence of numerous earwigs has been ascertained, and a few specimens from different sites have been collected for identification. During the 2025 mission, local samplings were carried out continuously between 25 July and 3 August, generally during the time slot 8.00 am - 4.00 pm selected by the practical reason to reach Bokombaevo before night. Data on the general environmental characteristics of the site were collected, including its main biological features, supported by extensive photographic documentation. Geological attributes were also recorded, with particular attention to stone characteristics, soil color and texture, and soil hardness, the latter measured using a pocket penetrometer ST308 to rapidly assess resistance to penetration under undrained conditions. Field observations on the population of *Oreasiobia fedtschenkoi* included records of individuals found under a wide variety of substrates on bare ground, such as stones and artificial objects (e.g. fabric fragments). For each punctiform observation site, the presence of earwigs was noted together with the number of individuals and their sex. Battiston et al. (2021) found adults of this species in April 2019 near Kol-Ukok Lake, in the Smaller Naryn valley (Tian Shan Mountains), within a high-mountain environment at 3038 m a.s.l., as well as on humid soil along the banks of the Smaller Naryn River. The IBB collection fund contains materials from all seven administrative provinces and all cadastral divisions of Kyrgyzstan, including a female specimen sampled in Inner Tien Shan at 3840 m a.s.l (Milko 2021). And finally, it may be considered the historical data, according to which the presence of the species is placed in the upper zones of

the mountains throughout Turkestan reaching elevations of 2500–2800 m a.s.l (Semenov-Tjan-Shanskij 1935; Bey-Bienko 1936). The Boz-Salkyn site is characterized by the lowest altimetric value 2500 m a.s.l. Whenever possible – some specimens were not measured because they were lost during handling operations – body weight (measured with a digital scale, accuracy 0.1 g, using a plastic tray as a tare) and total body length (measured with a centimeter ruler, accuracy 1 mm, from the apex of the prosoma to the apex of the forceps) were recorded for each specimen. Sexual dimorphism in *O. fedtschenkoi* is evident in the morphology of the ultimate tergite and forceps: males exhibit widened forceps, whereas in females the forceps are close together and almost parallel (Fig. 4 A, B). Each day, linear transects extending for several hundred meters were walked within the study area; transects differed daily in order to minimize the risk of repeatedly recording the same individuals. Field data were analyzed to investigate patterns of habitat use and sex ratio.

The frequency of individuals associated with different substrate types was calculated and expressed as both absolute counts and relative percentages.

To evaluate deviations from an expected 1:1 sex ratio, an exact binomial test was applied to the subset of individuals for which sex could be determined. Both two-tailed and one-tailed tests were performed: the two-tailed test assessed general deviation from parity, whereas the one-

tailed test specifically evaluated the hypothesis of male underrepresentation.

All statistical analyses were performed in R version 4.2.1 (R Core Team) using RStudio version 2022.07.2+57.

Results

Physical description of the environment. The investigated area consists of a high mountain plateau grazed by livestock (horses, donkeys, cows, sheep, and goats with several dozen cattle heads) with herbaceous and shrubby vegetation (rarely higher than 50 cm) surrounded by mountain elevations. The plateau extends over a large area surrounded by reliefs; with respect to the access through the road from Bokombaevo, rather bare elevations exist on the left; on the right side, at a greater distance, wide spruce forests cover a large belt of the higher mountains representing the main feature of the landscape. The reliefs on the left and of the large blocks of debris, up to 2 meters tall emerging over the plateau, are composed of granite rocks. The debris covering the substrate is quite heterogeneous from a very coarse sands up to gravels, gray to red-brown in color. Soil hardness values ranged from 0.6 and 2.8 kg/cm² (number of measures = 53; $\bar{x}$ = 1.5433). Slopes progressively increase in steepness (exceeding 10°) towards the granite outcrops, while they are less steep on



Fig. 2. Location of Boz-Salkyn (red dot) in relation to the Issyk-Kul Basin, eastern Kyrgyzstan (base map: Google Satellite, 2025; Upper-right inset map: iStock).

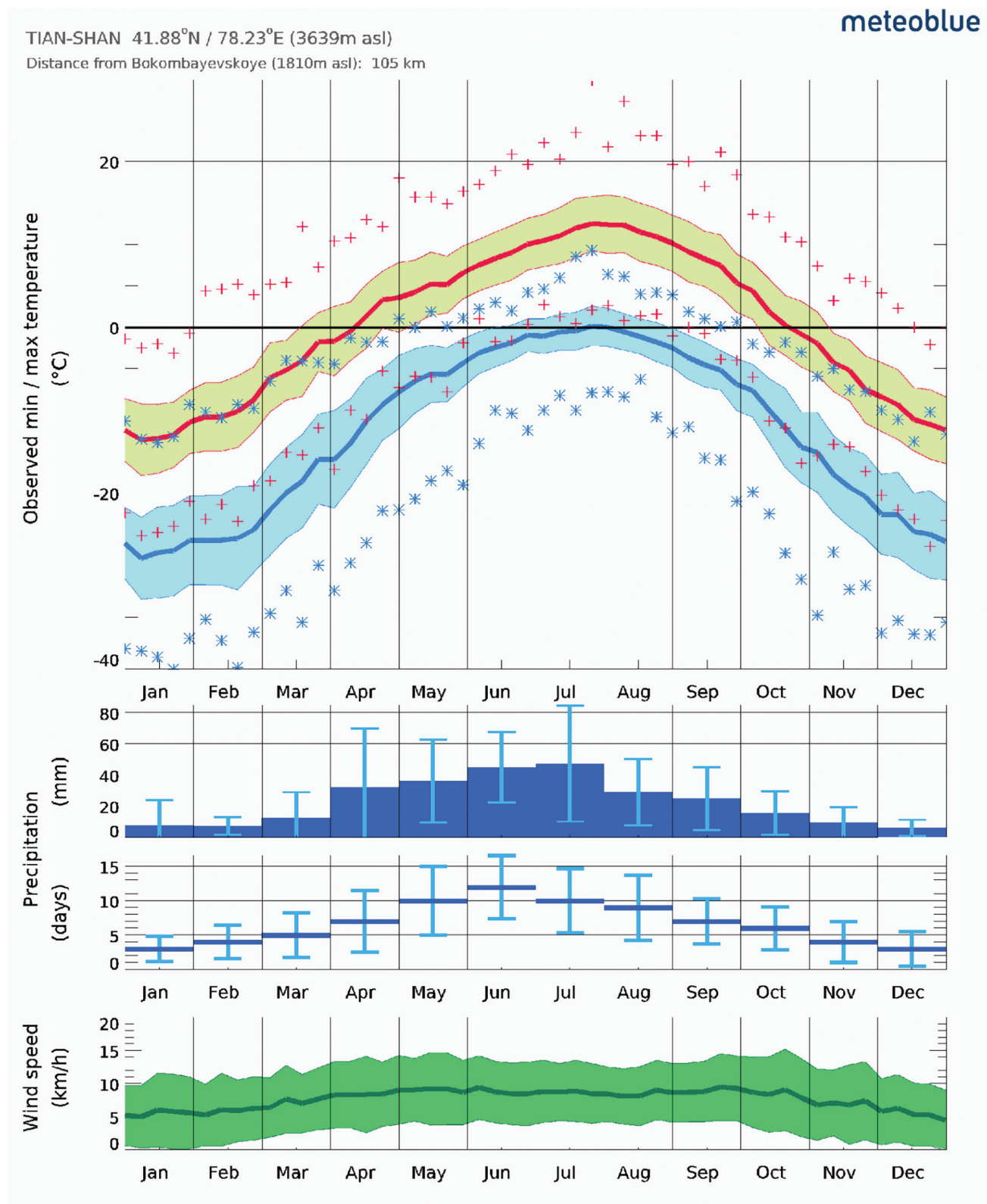


Fig. 3. Climate diagram for Bökönbaev and surrounding areas (source: Meteoblue, “Observed climate”, 2025).



Fig. 4. Adults of *Oreasiobia fedtschenkoi* of the Boz-Salkyn site. A, male; B, female.

the opposite side of the central belt, gradually rising towards the forested mountain slopes. A crenal watercourse, sometimes canalized, crosses the valley on its right, digging a modest furrow of one meter at most. The plateau is crossed by dirt roads and overlooked in its central belt by large power lines. Man-made structures exist on both sides; on the left, buildings with cattle pens; on the right, white yurts generally at the edge of the forest (Figs. 5-6).

Biological description of the environment. In the sites affected by human activities, synanthropic vegetation occurs, consisting mainly of Graminaeae and Asteraceae of the tribe Cardueae. In less disturbed sites, vegetation with more natural characteristics develops, represented above all by the families Apiaceae, Asteraceae, Boraginaceae, Brassicaceae, Campanulaceae, Dipsacaceae, Fabaceae, Lamiaceae, Orobanchaceae, Poaceae, Ranunculaceae, Solanaceae, and by the genera *Achillea*, *Aster*, *Cirsium*, *Dianthus*, *Gentiana*, *Hyoscyamus*, *Lamium*, *Leontopodium*, *Myosotis*, *Pedicularis*, *Taraxacum* (see for a comparison Shetekauri and Jacoby 2009). Fungi of the family Agaricaceae, genus *Lycoperdon*, are quite common. Spiders are apparently not particularly abundant contrary to insects, especially Coleoptera vagrant over the soil or found on flowers or under stones and inside dung cows. Species of the families Aphodiidae, Carabidae, Cicindelidae, Chrysomelidae, Coccinellidae, Cur-

culionidae, Geotrupidae, Meloidae, Scarabaeidae and Tenebrionidae have been found. Some specimens have been collected: *Harpalus tjanschanicus* Semenov, 1889, *Harpalus brevis* Motschulsky, 1844, *Harpalus calceatus* (Duftschmid, 1812), *Harpalus anxius* (Duftschmid, 1812), *Harpalus smaragdinus* (Duftschmid, 1812), *Harpalus viridanus* (Motschulsky, 1844), *Harpalus salinus agonus* Tschitscherine, 1894, *Agonum* cf. *chalconotum* Ménétriés, 1832, *Amara equestris* (Duftschmid, 1812), *Amara* cf. *harpaloides* Dejean, 1828, *Cymindis mannerheimi* Gebler, 1843 (Carabidae); *Cicindela granulata* Gebler, 1843 (Cicindelidae); *Geotrupes impressus* Gebler, 1841 (Geotrupidae); *Mylabris quadrisignata* Fischer von Waldheim, 1823 (Meloidae); *Galeruca nigrolineata* Mannerheim, 1825 (Chrysomelidae); *Onthophagus* sp. (Scarabaeidae); *Platyscelis* sp., *Prosodes rugulosa* Gebler, 1841 (Tenebrionidae). Among Lepidoptera, a common species in the area is the Erebiidae *Arctia caja* (Linnaeus, 1758). Throughout the plateau are clearly visible mounds of soil dug by the Eastern mole vole *Ellobius tancrei* Blasius, 1884 (Rodentia: Cricetidae), a species already known for the surrounding areas (Head 2022; Lazkov et al. 2016).

Data analysis on the species. A total of 120 adult individuals of *Oreasiobia fedtschenkoi* were recorded. Individuals were found in a variety of microhabitats: under small granite stones; under cow dungs, dry (light, yellow

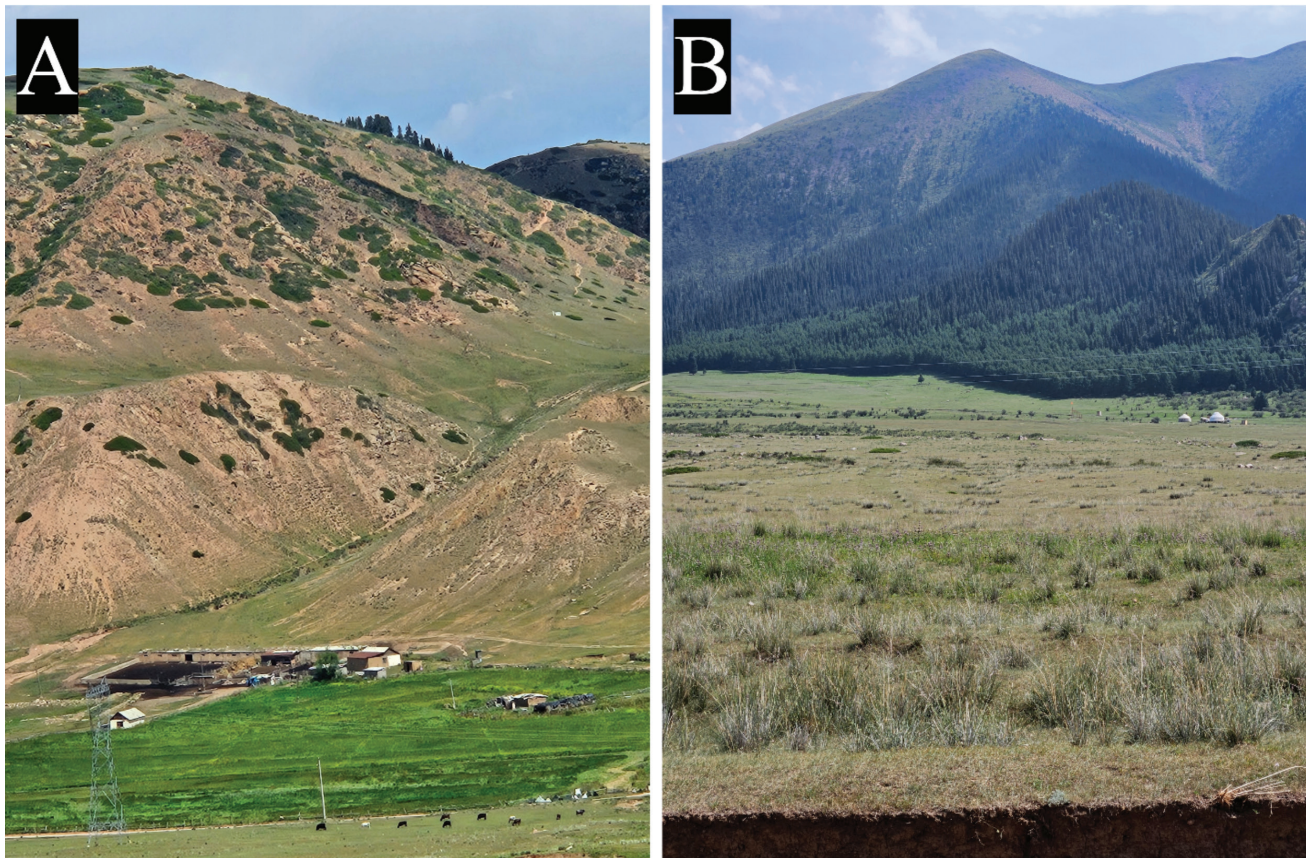


Fig. 5. Environmental context of the Boz-Salkyn plateau entrance: **A**, granite reliefs on the left side; **B**, forest and high mountain landscape on the right side.

in color) or fresh (weighty, dark brown in color); under wood material, generally wooden planks from the dismantling of old buildings; at the apex of thin (*Gramineae*?) stem during the hottest hours of the day; under artificial material (decaying fabric). The frequency of five main typologies to which *O. fedtschenkoi* has been linked is shown in Fig. 9.

Sex-ratio. Among the 101 individuals for which sex was determined, 36 were males (35.6%) and 65 were females (64.4%). An exact two-tailed binomial test revealed that this distribution significantly deviates from an expected 1:1 sex ratio ($p = 0.0051$; 95% CI: 0.264–0.458).

Table 1 - The variability of weight and length in the sample of adults *Oreasiobia fedtschenkoi* from Boz-Salkyn

	N	Min. – Max.	$\bar{x}$	s. d.
Weight (g)				
Total	60	0.06 – 0.19	0.127	0,030065841
MM	15	0.06 – 0.16	0.105	
FF	45	0.08 – 0.19	0.134	
Length (mm)				
Total	88	19 – 30	25.06	1,98475775
MM	30	19 – 28	23.97	
FF	58	22 – 30	25.62	

$\bar{x}$ = average; s.d. = standard deviation

To test the specific hypothesis of male underrepresentation, a one-tailed binomial test was also performed, confirming that the proportion of males was significantly lower than 50% ($p = 0.0025$; 95% CI: 0.000–0.442).

Morphometric characteristics (see Table 1)

A certain number of individuals were lost during the handling operations before being measured, so only the body weight of 60 adult individuals, including 45 females and 15 males, has been recorded; the total body length of 88 individuals, including 58 females and 30 males, has been recorded (Table 1). The linear regression equations describing body length as a function of body weight have been calculated separately in both sexes: males, $\text{length} = 1.983 + 3.710 \times \text{weight}$; females, $\text{length} = 2.242 + 2.441 \times \text{weight}$. Seemingly, males' length increases more rapidly with weight, where females' length increases more moderately than weight (Fig. 10).

Discussion

The Boz-Salkyn site is a mountain plateau characterized by a rather high levels of humidity as confirmed by the climate diagram of Bokombaevo and its surroundings (Fig. 3), which allows to ascertain a continental climate in its mountain feature: harsh winters and relatively mild

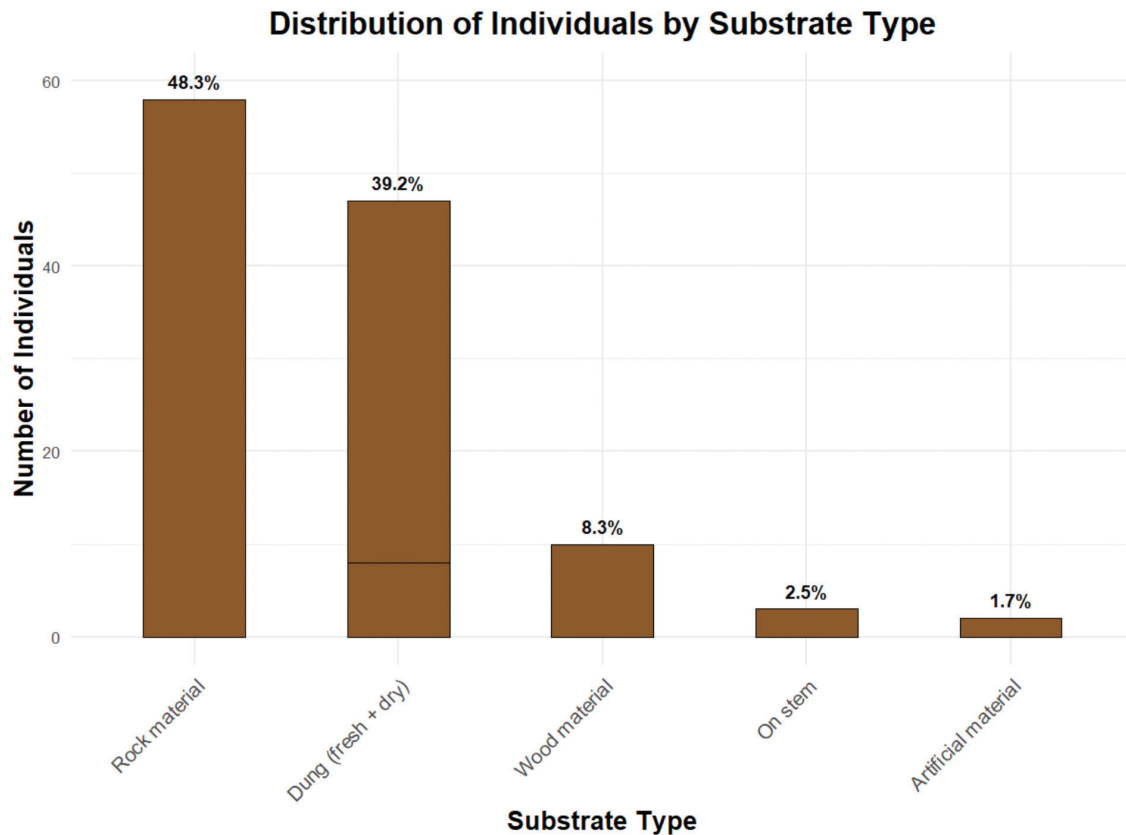


Fig. 6. The frequency of five main typologies to which the presence of *Oreasiobia fedtschenkoi* has been linked.

and rainy summers. During our field surveys, showers occurred almost every day starting from the beginning of August. The proximity of the huge high mountain endorheic Issyk-Kul Lake (178 km long, 60 km wide, 1608 m a.s.l.) represents a further factor of this climatological pattern. The population of *Oreasiobia fedtschenkoi* lives in this site characterized by low vegetation that develops on soils with variable coarse grain size conditioned by the presence of granitoid lithologies. Abundant plant population, represented above all by numerous species of low grasses, determines a particularly diversified insect communities with which *O. fedtschenkoi* may compete or interact; numerous species of Carabidae and Tenebrionidae may be observed wandering on the ground or under stones; or, as for Meloidae, layed on flowers. On the basis of bibliographical data and our observations it is possible to attribute three ecological characteristics to the species as follows.

A) Based on the ascertained altitude range 2500-3840 m (see comments in investigation methods) it is possible to qualify *Oreasiobia fedtschenkoi* as a strictly orophilous species.

B) On the basis of the results shown in Fig. 9 it seems possible to qualify *O. fedtschenkoi* as an essentially eurytopic species although predominantly sublapidicolous considering its liking for shelters made of granite blocks just placed on the ground.

C) On the basis of the habitat features and the altitudinal range it would seem possible to qualify *O. fedtschenkoi* as an essentially hygrophilous species; however, considering the main features of the Boz-Salkyn habitat, an open and sunny site mainly during the summer period, together with the high number of individuals found under piles of dry dung as highlighted in Fig. 9, it seems more appropriate to qualify this species as a mesohygrophilous one.

These results are limited to individuals of the adult phase. However, *O. fedtschenkoi* has never been found under deeply buried stones or within anthills. Eco-physiological needs of the species, which required in-depth research, may represent the basis for the interpretation of these behaviors. Furthermore, our data suggests that the biological cycle of the species has been completed in late summer during which it is possible to observe adults of both sexes only. In our sample, females significantly outnumber males, while the weight/length data are higher in females (Fig. 10). However, it is not yet possible to generalize this result, pending comparison with data collected on other populations of the species.

The area presents itself as a semi-natural grassland, high-altitude landscape, a popular touristic destination for climbers and people which take advantage of the traditional horse-riding activities and the hospitality in the yurts on the side of the valley near the forest adjacent to the

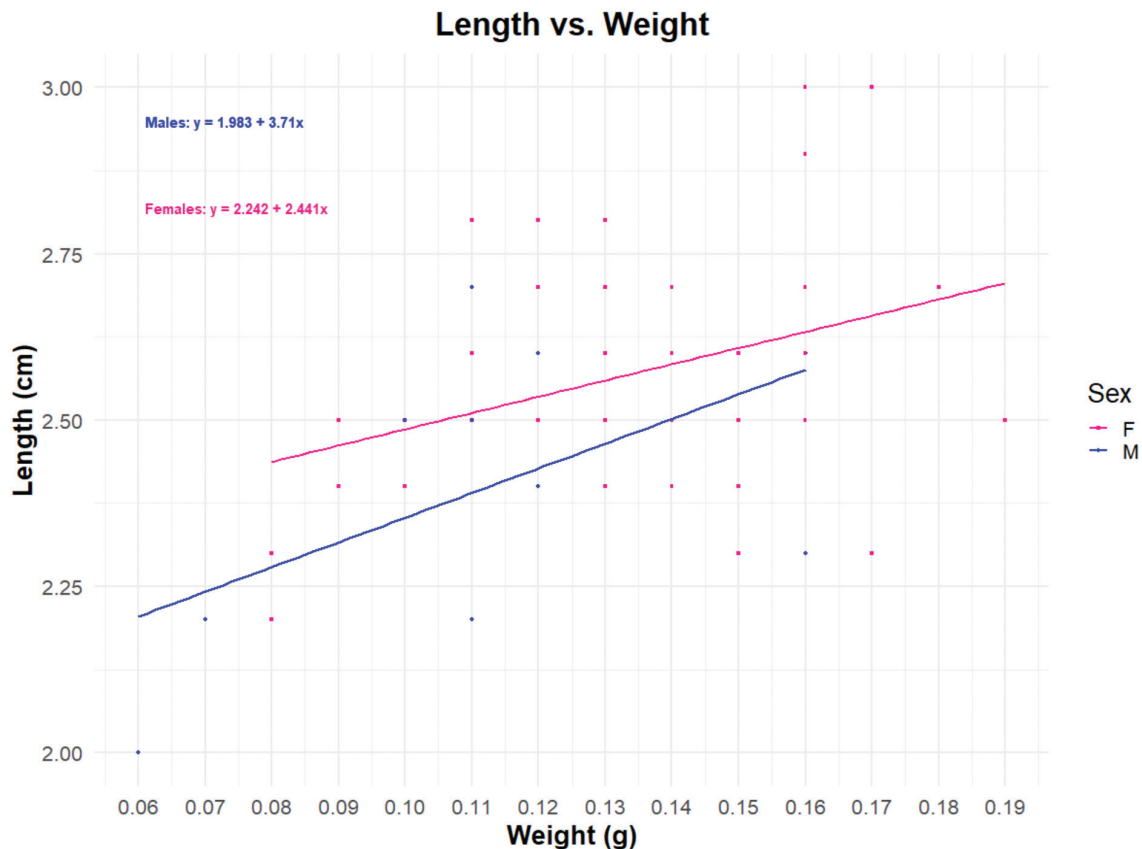


Fig. 7. The length and weight correlation in adult males and females of the sample from Boz-Salkyn.

highest peaks. Nevertheless, in this context, the impact of numerous anthropogenic factors on the territory cannot be underestimated, a detailed list of which is here provided to promote future investigations: 1. pressure exerted on the soil and vegetation by the numerous herds of free-roaming cattle and horses; 2. the power lines, represented in the simplest case by wooden poles, or, alternatively, by enormous high-voltage pylons; 3. yurts buildings which, in the most complex cases, include: a) houses and tents; b) photovoltaic systems; c) livestock pens; d) vehicle parking areas; e) associated services as, for example, toilets and plastic waste collection depots; all fenced; 4. uninterrupted flow of vehicles, loaded with tourists in summer.

Considering the apparent ecological specificity of *O. fedtschenkoi* and the overall biological richness of the area, limiting further anthropogenic impacts would be advisable in order to preserve the integrity and functionality of this fragile mountain ecosystem.

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