

New distribution records of Orthoptera in Georgia and a review of the country's species list

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Abstract. We present recently acquired distribution records of crickets, katydids and grasshoppers for Transcaucasian Georgia. New species records for the country, including a non-native cricket were recorded. Species added to the country's list are *Gryllus bimaculatus*, *Tartarogryllus tartarus*, *Velarifictorus micado*, *Pholidoptera griseoaptera* and *Ramburiella turcomana*. Furthermore we contribute to the optimization of the national faunal list, by critically reviewing current data. Taking into account these additions and revisions, this study arrives at a total of 173 species recorded for Georgia. We also compose a list of species known for adjacent areas in the neighbouring country of Turkey. Many of these species can be expected to occur in Georgia, indicating a potentially higher species richness.

Key words: Transcaucasia, geographical distribution, species list, faunal list, biodiversity, species richness, new records, alien species.

Introduction

Georgia has a very diverse topography on a relatively small surface, ranging from moist subtropical Black Sea coast and dry steppe areas to high mountains in the Caucasus. The Transcaucasian region has been subject to several zoological expeditions and data on Orthoptera can be found in papers of well-known orthopterologists, e.g. W. Ramme (1951) and B.P. Uvarov (1921a+b). Yet, the Georgian Orthopteran fauna has not been studied intensively and publications specifically dealing with the country's biodiversity are rare or not readily accessible compared with neighbouring country Turkey (e.g. Mol et al. 2016, Ünal 2018), causing the information to be scarce and scattered.

Currently a total of 167 species are mentioned for Georgia (Tarkhnishvili 2018, Cigliano et al. 2016). These species belong to the families Gryllidae, Gryllotalpidae, Tridactylidae, Trigonidiidae, Rhabdophoridae, Phaneropteridae, Tettigoniidae, Acrididae, Pamphagidae, Pyrgomorphidae and Tetrigidae.

We report on observations of orthopteran species in Georgia made during a visit to the country in the summer of 2018 and discuss the country's biodiversity. No reviews of the distribution of Orthoptera in this region are available. This work attempts to fill this knowledge gap by providing new records and discussing and comparing current lists, e.g. of online databanks. With this we hope to contribute towards a more representative species list.

Material and Methods

The field survey took place from 19-VII until 6-VIII-2018 and covered a large part of the country and included the Autonomous Republic Ajaria, the city Tbilisi and the regions Imereti, Kakheti, Kvemo Kartli, Mtscheta-Mtianeti, Samegrelo-Zemo Svaneti, Samtskhe-Javakheti and Sjida Kartli. A total of 28 localities were surveyed.

Table 1 gives an overview of all examined localities and their respective provinces/regions, geographical coordinates and dates. Each locality in this table is given a number. These numbers are visually projected on a topographical depiction of Georgia in Figure

2. Two regions, Abkhazia and South Ossetia, lacking control of Georgian government were not visited and indicated on the map in dark colour.

Most records were based on visual observations during active search (strolling around or inspecting bushes) or on auditory observations. Additionally, stones were turned to detect secretive or nocturnal species. The observations are largely supported by photographic evidence. Some sound calls were recorded. Voucher specimens of some difficult groups were caught by hand or sweep net, collected on a limited scale, euthanised by ethyl acetate, dried and deposited in the first author's collection for later identification. They were pinned and individually labelled and catalogued. Detailed information was secured from all observations. Geographical information (places, regions, coordinates in DMS, dates) and pictures or specimen codes can be found in this publication for each species and specimen. If available, images of records are provided of species not supported by voucher specimens.

The gathered field data were compared with the Georgian Biodiversity Database (Tarkhnishvili 2018), further referred to as GBD and the Orthoptera Species File (Cigliano et al. 2016), further referred to as OSF. The OSF Faunal list was obtained through the Complex search function, utilising Geographic level 4 (Georgia). Both online sources were last checked on 14 March 2019. A profound literature review of species occurring close to Georgian territory in Turkey was also conducted. The provinces Ardahan, Artvin, Rize and Kars were checked.

The taxonomic nomenclature follows the online database Orthoptera Species File Version 5.0 (Cigliano et al. 2016). We abstain here from the use of subspecific names.

Sources used for identification include several classic works (Uvarov 1921, Ramme 1951, Bei-Bienko & Mishchenko 1951a+b, Harz 1969 and 1975), some extralimital guides (Olmo-Vidal 2006, Fischer et al. 2016, Willems et al. 2018) and regional or taxonomic literature (Tarbinsky 1931, Salman 1978, Çıplak 2000, Çıplak et al. 2002, Ünal 2006, Massa et al. 2009).

Results

3.1 List of species recorded in 2018

The visually and auditory field observations and identification of voucher specimens resulted in a total of 53 species belonging to 7 families. Detailed data is presented in the section below. Species new to the country's faunal list

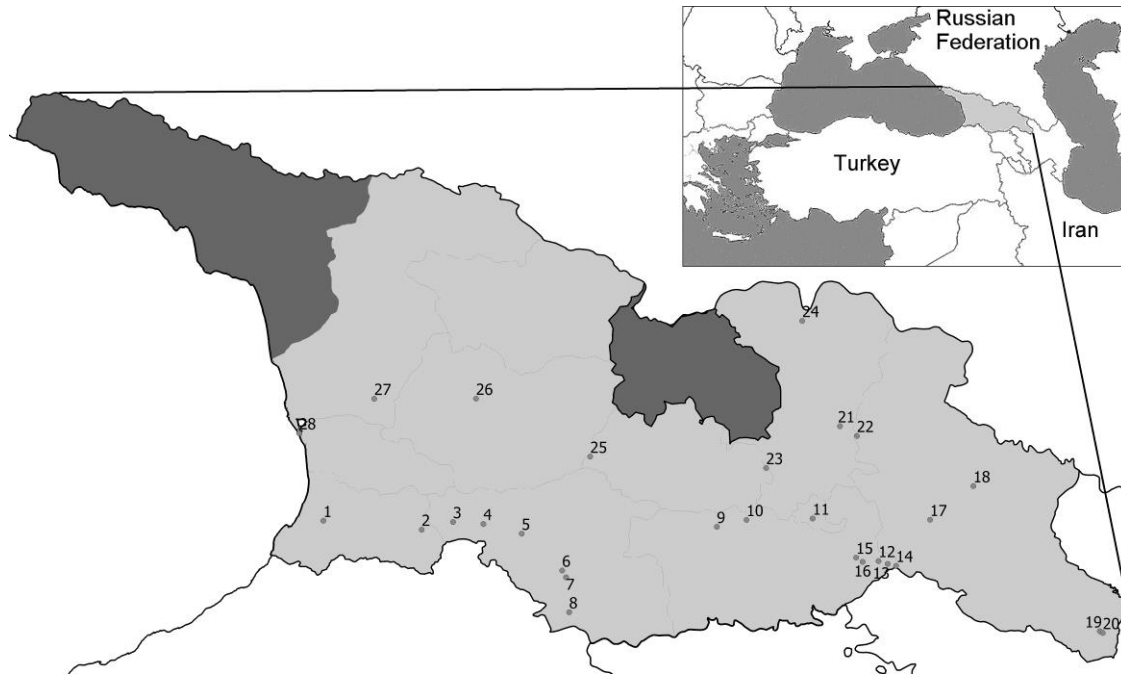


Figure 1. Geographic distribution of the finds and location of Georgia.

Table 1. Information on localities of recorded field observations.

Place	Province/Region	Coordinates	Date
1 Chakvistavi	Ajaria	41°40'49"N, 41°51'37"E	19-VII-2018
2 Shuasopeli	Ajaria	41°38'24"N, 42°27'11"E	20-VII-2018
3 Zarzma	Samtskhe-Javakheti	41°40'29"N, 42°38'33"E	21-VII-2018
4 Untsa	Samtskhe-Javakheti	41°39'57"N, 42°49'31"E	22-VII-2018
5 S of Minadze	Samtskhe-Javakheti	41°37'20"N, 43°03'22"E	23-VII-2018
6 Gelsunda	Samtskhe-Javakheti	41°27'19"N, 43°18'01"E	23-VII-2018
7 Nakalakevi	Samtskhe-Javakheti	41°25'26"N, 43°19'26"E	23-VII-2018
8 Bozali	Samtskhe-Javakheti	41°15'57"N, 43°20'33"E	24-VII-2018
9 E of Imera	Kvemo Kartli	41°39'11"N, 44°13'59"E	25-VII-2018
10 Didi Toneti	Kvemo Kartli	41°41'03"N, 44°24'43"E	25-VII-2018
11 Tbilisi	Tbilisi	41°41'25"N, 44°48'38"E	26-VII-2018
12 Lemshveniera	Kvemo Kartli	41°29'53"N, 45°12'28"E	27-VII-2018
13 9 km SW of Udabno	Kvemo Kartli	41°29'07"N, 45°15'47"E	27-VII-2018
14 5 km SW of Udabno	Kakheti	41°28'35"N, 45°18'50"E	27-VII-2018
15 Nagebi-1	Kvemo Kartli	41°30'49"N, 45°04'23"E	27-VII-2018
16 Nagebi-2	Kvemo Kartli	41°29'41"N, 45°06'44"E	27-VII-2018
17 Kakabeti	Kakheti	41°41'05"N, 45°31'08"E	28-VII-2018
18 Velistsikhe	Kakheti	41°50'12"N, 45°46'48"E	29-VII-2018
19 Vashlovani-1	Kakheti	41°10'46"N, 46°32'34"E	29-VII-2018
20 Vashlovani-2	Kakheti	41°10'18"N, 46°33'37"E	29-VII-2018
21 Tianeti	Mtskheta-Mtianeti	42°06'21"N, 44°58'32"E	30-VII-2018
22 E of Tianeti	Mtskheta-Mtianeti	42°03'44"N, 45°04'39"E	30-VII-2018
23 Agaiani	Shida Kartli	41°55'05"N, 44°31'49"E	01-VIII-2018
24 Juta	Mtskheta-Mtianeti	42°34'36"N, 44°44'53"E	01-VIII-2018
25 Kvishkheti	Shida Kartli	41°58'09"N, 43°28'10"E	02-VIII-2018
26 Chognari	Imereti	42°13'46"N, 42°46'52"E	03-VIII-2018
27 Maltakva	Samegrelo-Zemo Svaneti	42°04'29"N, 41°42'50"E	04-VIII-2018
28 Matskhovriskari	Samegrelo-Zemo Svaneti	42°13'45"N, 42°10'01"E	04-VIII-2018

(indicated here with an asterisk) and some other systematic and distributional issues are treated in the Discussion paragraph. The list of observed species is also incorporated in Table 2.

From the family Gryllidae four species were found. From the family Trigonidiidae only one representative was recorded. The family Phaneropteridae was represented by four species. The rather large family Tettigoniidae yielded 18 species. The family Acrididae resulted in 23 species. The family Pyrgomorphidae is only represented here by one species. From the family Tetrigidae three species could be identified. No representatives of the families Gryllotalpidae, Pamphagidae, Rhaphidophoridae and Tridactylidae were observed. We incorporated the visual observation of *Phaneroptera* sp., which could not be identified to species level, in the list, to provide (albeit limited) information on the distribution as it contributes to the number of taxa observed.

Table 2. Comparison of species lists.

* Species new to the country's faunal list.

1 *Isophya* cf. *schneideri*; 2 *Oedipoda* cf. *coerulescens*; 3 *Sphingonotus* cf. *coerulipes*.

Species	OSF	GBD	This study
<i>Phonochorion satunini</i>	x	x	
<i>Polysarcus zacharovi</i>	x	x	
<i>Tylopsis liliifolia</i>		x	
Tettigoniidae			
<i>Bicolorana bicolor</i>		x	x
<i>Conocephalus fuscus</i>		x	x
<i>Decticus albifrons</i>	x	x	x
<i>Decticus verrucivorus</i>	x	x	x
<i>Gampsocleis schelkownikovae</i>		x	x
<i>Meconema thalassinum</i>		x	x
<i>Medecticus assimilis</i>	x	x	
<i>Onconotus servillei</i>		x	
<i>Paradrymadusa abchazica</i>	x	x	
<i>Paradrymadusa jakobsoni</i>	x	x	
<i>Paradrymadusa sciadophila</i>	x	x	
<i>Paradrymadusa sordida</i>	x	x	x
<i>Parapholidoptera distincta</i>	x	x	
<i>Parapholidoptera georgiae</i>	x		
<i>Parapholidoptera noxia</i>	x	x	x
<i>Pezodrymadusa magnifica</i>		x	
<i>Pholidoptera kalandadzei</i>	x		
<i>Pholidoptera griseoptera*</i>			x
<i>Phytodrymadusa longipes</i>	x		
<i>Platycleis affinis</i>		x	x
<i>Platycleis intermedia</i>		x	x
<i>Psorodonotus caucasicus</i>		x	
<i>Psorodonotus specularis</i>	x	x	x
<i>Psorodonotus venosus</i>	x	x	
<i>Roeseliana fedtschenkoi</i>		x	x
<i>Roeseliana roeselii</i>		x	x
<i>Ruspolia nitidula</i>		x	x
<i>Saga ephippigera</i>		x	x
<i>Saga pedo</i>		x	
<i>Schizonotinus kerketa</i>	x		
<i>Tessellana veyseli</i>		x	x
<i>Tettigonia caudata</i>		x	
<i>Tettigonia viridissima</i>		x	x
Acrididae			
<i>Acrida bicolor</i>		x	x
<i>Acrotylus insubricus</i>		x	x
<i>Acrotylus patruelis</i>		x	x
<i>Aiolopus strepens</i>		x	
<i>Aiolopus thalassinus</i>		x	x
<i>Anacridium aegyptium</i>		x	x
<i>Arcyptera fusca</i>		x	x
<i>Arcyptera microptera</i>	x	x	
<i>Calliptamus barbarus</i>		x	x
<i>Calliptamus italicus</i>		x	
<i>Calliptamus tenuicercis</i>	x	x	
<i>Caucasippus rufipes</i>		x	
<i>Celes variabilis</i>	x	x	
<i>Chorthippus albomarginatus</i>		x	
<i>Chorthippus apricarius</i>	x	x	
<i>Chorthippus biguttulus</i>	x	x	
<i>Chorthippus bornhalmi</i>		x	x
<i>Chorthippus dichrous</i>		x	x
<i>Chorthippus longicornis</i>		x	
<i>Chorthippus loratus</i>		x	x
<i>Chorthippus macrocerus</i>	x	x	x
<i>Chorthippus miramae</i>	x		
<i>Chorthippus mollis</i>		x	

Species	OSF	GBD	This study
Gryllidae			
<i>Acheta domesticus</i>	x		
<i>Eumodicogryllus bordigalensis</i>	x		
<i>Gryllomorpha rotundipennis</i>	x		
<i>Gryllus bimaculatus*</i>			x
<i>Modicogryllus frontalis</i>	x		
<i>Modicogryllus truncatus</i>	x		
<i>Oecanthus pellucens</i>	x	x	
<i>Tartarogryllus tartarus*</i>		x	
<i>Tartarogryllus lateralis</i>	x		
<i>Velarifictorus micado*</i>			x
Gryllotalpidae			
<i>Gryllotalpa gryllotalpa</i>	x		
Tridactylidae			
<i>Xya variegata</i>	x		
Trigonidiidae			
<i>Pteronemobius heydenii</i>	x	x	
<i>Stenonemobius gracilis</i>	x		
Rhaphidophoridae			
<i>Diestrammena asynamora</i>	x		
<i>Dolichopoda euxina</i>	x		
Phaneropteridae			
<i>Isophya bivittata</i>	x	x	
<i>Isophya nigrosignata</i>	x	x	
<i>Isophya schneideri</i>	x	x	x ¹
<i>Isophya transcaucasica</i>	x	x	
<i>Isophya zernovi</i>	x	x	
<i>Isophya kalishevskii</i>		x	
<i>Isophya redtenbacheri</i>		x	
<i>Leptophyes albovittata</i>	x	x	x
<i>Leptophyes nigrovittata</i>	x	x	
<i>Poecilimon similis</i>	x	x	x
<i>Poecilimon schmidti</i>		x	
<i>Poecilimon flavescens</i>		x	
<i>Phaneroptera falcata</i>		x	
<i>Phaneroptera gracilis</i>		x	
<i>Phaneroptera nana</i>		x	
<i>Phaneroptera</i> sp.			x

Species	OSF	GBD	This study
<i>Chorthippus vagans</i>		x	
<i>Chrysochraon dispar</i>		x	x
<i>Dericorys uvarovi</i>		x	
<i>Doclostaurus brevicollis</i>		x	
<i>Doclostaurus maroccanus</i>		x	
<i>Doclostaurus tartarus</i>		x	
<i>Eremippus costatus</i>		x	
<i>Euchorthippus transcaucasicus</i>		x	x
<i>Eyprepocnemis plorans</i>		x	x
<i>Gomphocerus sibiricus</i>		x	
<i>Heteracris adpersus</i>		x	
<i>Heteracris pterosticha</i>		x	x
<i>Locusta migratoria</i>		x	
<i>Mecostethus parapleurus</i>		x	x
<i>Micropodisma koenigi</i>	x	x	
<i>Micropodisma svanetica</i>		x	
<i>Mioscirtus wagneri</i>		x	
<i>Myrmeleotettix maculatus</i>		x	
<i>Notostaurus albicornis</i>		x	
<i>Notostaurus anatolicus</i>		x	x
<i>Ochrilidia gracilis</i>		x	
<i>Oedaleus decorus</i>		x	x
<i>Oedaleus senegalensis</i>	x	x	
<i>Oedipoda coerulescens</i>		x	x ²
<i>Oedipoda miniata</i>		x	
<i>Oedipoda schochii</i>		x	
<i>Omocestus haemorrhoidalis</i>		x	
<i>Omocestus patraeus</i>		x	
<i>Omocestus viridulus</i>		x	
<i>Pachypodisma lezgina</i>	x	x	
<i>Phlocerus savenkoeae</i>	x	x	
<i>Phlocerus svaneticus</i>	x	x	
<i>Phlocerus zaitzevi</i>	x	x	
<i>Podisma miramae</i>	x	x	
<i>Podisma satunini</i>		x	
<i>Pseudocoles obscurus</i>		x	
<i>Pseudocoles oedipodioides</i>	x	x	
<i>Psophus stridulus</i>		x	x
<i>Ptygippus brachypterus</i>	x	x	
<i>Pyrgodera armata</i>		x	
<i>Ramburiella bolivari</i>		x	
<i>Ramburiella turcomana*</i>			x
<i>Sphingonotus coerulipes</i>		x	x ³
<i>Sphingonotus octofasciatus</i>		x	
<i>Sphingonotus rubescens</i>		x	
<i>Sphingonotus satrapes</i>		x	
<i>Sphingonotus savignyi</i>		x	
<i>Stauroderus scalaris</i>		x	x
<i>Stenobothrus fischeri</i>		x	
<i>Stenobothrus lineatus</i>		x	
<i>Stenobothrus nigrogeniculatus</i>		x	
<i>Stenobothrus nigromaculatus</i>	x	x	
<i>Stenobothrus soiridenkoi</i>		x	
<i>Stenobothrus werneri</i>		x	
<i>Truxalis nasuta</i>		x	
<i>Truxalis robusta</i>		x	
Pamphagidae			
<i>Asiotmethis turritus</i>		x	
<i>Atrichotmethis semenovi</i>	x		
<i>Eremopeza festiva</i>	x		
<i>Eunothotes derjugini</i>		x	

Species	OSF	GBD	This study
<i>Nocaracris curtus</i>	x	x	
<i>Nocaracris cyanipes</i>			x
<i>Paranocaracris granosus</i>	x	x	
<i>Paranocaracris rimansonae</i>	x	x	
<i>Paranocaracris rubripes</i>			x
<i>Nocarodes sanctidavidi</i>	x		
<i>Nocarodes serricollis</i>			x
<i>Paranorthotes margaritae</i>			x
<i>Tmethis festivus</i>	x		
Pyrgomorphidae			
<i>Pyrgomorpha bispinosa</i>			x
<i>Pyrgomorpha guentheri</i>	x		x
Tetrigidae			
<i>Paratettix uvarovi</i>			x
<i>Tetrix bipunctata</i>			x
<i>Tetrix bolivari</i>			x
<i>Tetrix depressa</i>			x
<i>Tetrix nutans</i>			x
<i>Tetrix subulata</i>			x
<i>Tetrix tenuicornis</i>			x
number of species	39	157	53
unique species	10	80	5

Suborder ENSIFERA

Family GRILLIDAE

Gryllus bimaculatus De Geer, 1773*

♀ Lemshveniera; visual observation; ♀ 9 km SW of Udabno, JM 20180035; ♀ 5 km SW of Udabno, JM 20180026

*Gryllus bimaculatus/campestris**

♂ Shuasopeli, auditory observation; ♂ Velistsikhe, auditory observation

Tartarogryllus tartarus (Saussure, 1874)*

9 km SW of Udabno, JM 20180030

Velarifictorus micado (Saussure, 1877)*

♂ Matskhovriskari, JM 20180043; 3 nymphs same data, JM 20180027 to 20180029

Oecanthus pellucens (Scopoli, 1763)

Nakalakevi, visual observation; Agaiani, visual observation

Family TRIGONIDIIDAE

Pteronemobius heydenii (Fischer, 1853)

♂ Matskhovriskari, JM 20180031

Family PHANEROPTERIDAE

Isophya cf. *schneideri* Brunner von Wattenwyl, 1878

♂ Juta, JM 20180025

Poecilimon similis Retowski, 1889

♂+♀ Didi Toneti, photographic evidence (Figure 2a); ♂+♀ Bozali, photographic evidence

Leptophyes albovittata (Kollar, 1933)

♂+♀ Gelsunda, photographic evidence (Figure 2b); ♀ Didi Toneti, photographic evidence

Phaneroptera sp.

S of Minadze, distant visual observation

Family TETTIGONIIDAE

Conocephalus fuscus (Fabricius, 1793)

♀ Zarzma, photographic evidence (Figure 2c); ♂ Tianeti, photographic evidence

Ruspolia nitidula (Scopoli, 1786)

♀ Matskhovriskari, photographic evidence (Figure 2d)

Meconema thalassinum (De Geer, 1773)

♂ Kvishkheti, photographic evidence (Figure 2e)

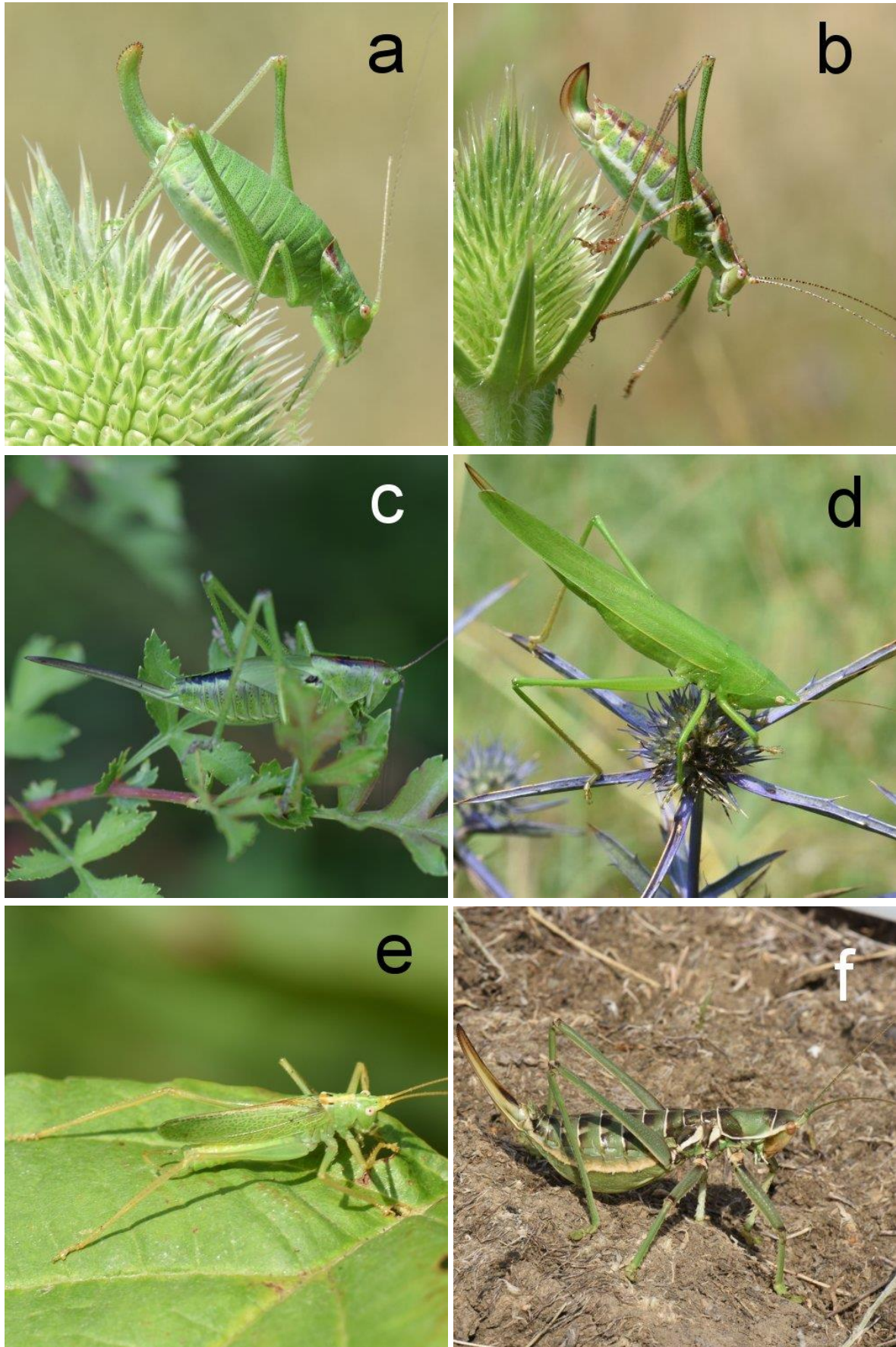


Figure 2. Pictures of species not secured by voucher specimens: a. *Poecilimon similis*; b. *Leptophyes albovittata*; c. *Conocephalus fuscus*; d. *Ruspolia nitidula*; e. *Meconema thalassinum*; f. *Saga ephippigera*.

- Saga ephippigera* Fischer von Waldheim, 1846
♀ 5 km SW of Udabno, photographic evidence (Figure 2f)
- Decticus albifrons* (Fabricius, 1775)
S of Minadze, visual observation; ♀ Gelsunda, photographic evidence (Figure 2g); ♂♂+♀♀ 9 km SW of Udabno, visual observation; 5 km SW of Udabno, visual observation
- Decticus verrucivorus* (Linnaeus, 1758)
Bozali, visual observation; 1 Didi Toneti, visual observation; ♂ Juta, photographic evidence (Figure 2h)
- Gampsocleis schelkownikovae* Adelong, 1916
♂ Nagebi-2, JM 20180032; ♀ Velistsikhe, JM 20180033 and sound recorded
- Paradrymadusa sordida* (Herman, 1874)
♂+♀ Zarzma, photographic evidence (Figure 2i)
- Parapholidoptera noxia* (Ramme, 1930)
♂ Didi Toneti, JM 20180037; ♂+2♀ Didi Toneti, photographic evidence.
- Pholidoptera griseoptera* (De Geer, 1773)*
♀ Chakvistavi, photographic evidence (Figure 2j)
- Platypleis affinis* Fieber, 1853
♀ Velistsikhe, JM 20180053
- Platypleis intermedia* (Serville, 1838)
♀ Zarzma, JM 20180054; ♀ Untsa, JM 20180045
- Tessellana veysseli* (Koçak, 1984)
♀ Untsa, JM 20180008; Didi Toneti, photographic evidence; 5 km SW of Udabno, visual observation; ♀ Velistsikhe, JM 20180056
- Psorodonotus specularis* (Fischer von Waldheim, 1839)
♂+♀ Shuasopeli, photographic evidence; 2♂ Bozali, JM 20180038, 2018009; ♂+♀ same data, photographic evidence
- Roeseliana fedtschenkoi* (Saussure, 1874)
♂ Bozali, photographic evidence (Figure 2k); Didi Toneti, photographic evidence
- Roeseliana roeselii* (Hagenbach, 1822)
Didi Toneti, photographic evidence (Figure 2l)
- Bicolorana bicolor* (Philippi, 1830)
♂+♀ Didi Toneti, photographic evidence (Figure 2m)
- Tettigonia viridissima* (Linnaeus, 1758)
Shuasopeli, visual observation; ♂ Zarzma, photographic evidence; ♀ Gelsunda, photographic evidence; Nakalakevi, visual observation; Bozali, visual observation; ♀ Didi Toneti, photographic evidence; Nagebi-2, visual observation; Tianeti, visual observation
- Suborder CAELIFERA**
- Family ACRIDIDAE**
- Acrida bicolor* (Thunberg, 1815)
Nagebi-1, photographic evidence (Figure 2n); Chognari, visual observation; Matskhovriskari, visual observation; Maltakva, visual observation
- Calliptamus barbarus* (Costa, 1836)
5 km SW of Udabno, photographic evidence
- Anacridium aegyptium* (Linnaeus, 1764)
nymph Nagebi-1, photographic evidence (Figure 2o)
- Eyprepocnemis plorans* (Charpentier, 1825)
2♂ Nagebi-2, JM 20180055, 20180059; ♀ same data as, JM 20180002; ♀ 5 km SW of Udabno, photographic evidence; ♂+♀ Velistsikhe, photographic evidence; ♀ Matskhovriskari, photographic evidence
- Arcyptera fusca* (Pallas, 1773)
♂ Didi Toneti, photographic evidence (Figure 2p)
- Chrysochraon dispar* (Germar, 1834)
E of Imera, visual observation
- Notostaurus anatolicus* (Krauss, 1896)
7♀ 9 km SW of Udabno, JM 20180009, 20180010, 20180015, 20180016, 20180017, 20180018, 20180019; ♂ 5 km SW of Udabno, JM 20180058; ♀ Vashlovani-1, JM 20180011; 3♂ Vashlovani-2, JM 20180012, 20180013, 20180014
- Chorthippus dichrous* (Eversmann, 1859)
3♀ E of Tianeti, JM 20180061, 20180062, 20180065; ♂ same data, JM 20180066; ♀ E of Imera, JM 20180060
- Chorthippus loratus* (Fischer von Waldheim, 1846)
♀ Zarzma, JM 20180064; ♀ Nagebi-2, JM 20180063
- Chorthippus bornhalmi* (Harz, 1971)
♂ Nagebi-1, photographic evidence (Figure 2q)
- Chorthippus macrocerus* (Fischer von Waldheim, 1846)
Shuasopeli, photographic evidence; ♀ Zarzma, JM 20180071; ♂ Untsa, photographic evidence; 2♀ E of Tianeti, JM 20180069, 20180070
- Euchorthippus transcausicus* Tarbinsky, 1930
♀ Untsa, JM 20180006; ♂ Vashlovani-1, JM 20180007
- Stauroderus scalaris* (Fischer von Waldheim, 1846)
♂ Didi Toneti, photographic evidence; ♂ Bozali, JM 20180003; 2♀ same data, JM 20180004, 20180068
- Ramburiella turcomana* (Fischer von Waldheim, 1833)*
♂ 9 km SW of Udabno, JM 20180020; ♀ same data, JM 20180021; ♂ 5 km SW of Udabno, photographic evidence
- Acrotylus insubricus* (Scopoli, 1786)
♂ Kvabiskhevi, photographic evidence; ♂ Maltakva, JM 20180022; ♀ same data, JM 20180023
- Acrotylus patruelis* (Herrich-Schäffer, 1838)
♂ Nagebi-1, JM 20180024
- Aiolopus thalassinus* (Fabricius, 1781)
2♂ Nagebi-2, photographic evidence; Lemshveniera, visual observation; 9 km SW of Udabno, visual observation; ♂ Matskhovriskari, JM 20180057
- Oedaleus decorus* (Germar, 1825)
2♂ Gelsunda, photographic evidence (Figure 2r); Nakalakevi, visual observation; ♂ Nagebi-1, photographic evidence; 9 km SW of Udabno, visual observation; 5 km SW of Udabno, visual observation; Kakabeti, visual observation
- Psophus stridulus* (Linnaeus, 1758)
2♀ Juta, JM 20180034, 20180040; 2♂ same data, JM 20180041, 20180042
- Oedipoda cf caerulea* (Linnaeus, 1758)*
Zarzma, visual observation; Kvabiskhevi, visual observation; Didi Toneti, visual observation; Agaiani, visual observation; Chognari, visual observation
*Only tentatively referred to this species, though blue-winged (could include *O. schochii*).
- Mecostethus parapleurus* (Hagenbach, 1822)
♂+♀ Shuasopeli, photographic evidence; ♂ Nagebi, JM 20180051
- Sphingonotus cf coeruleipes* Uvarov, 1922
♀ Zarzma, photographic evidence (Figure 2s)
- Heteracris pterosticha* (Fischer von Waldheim, 1833)
♀ Nagebi-1, JM 20180001; ♂ same data, JM 20180052; 5 km SW of Udabno, visual observation; ♀ Vashlovani-1, photographic evidence



Figure 2. Pictures of species not secured by voucher specimens: g. *Decticus albifrons*; h. *Decticus verrucivorus*; i. *Paradrymadusa sordida*; j. *Pholidoptera griseoptera*; k. *Roeseliana fedtschenkoi*; l. *Roeseliana roeselii*.

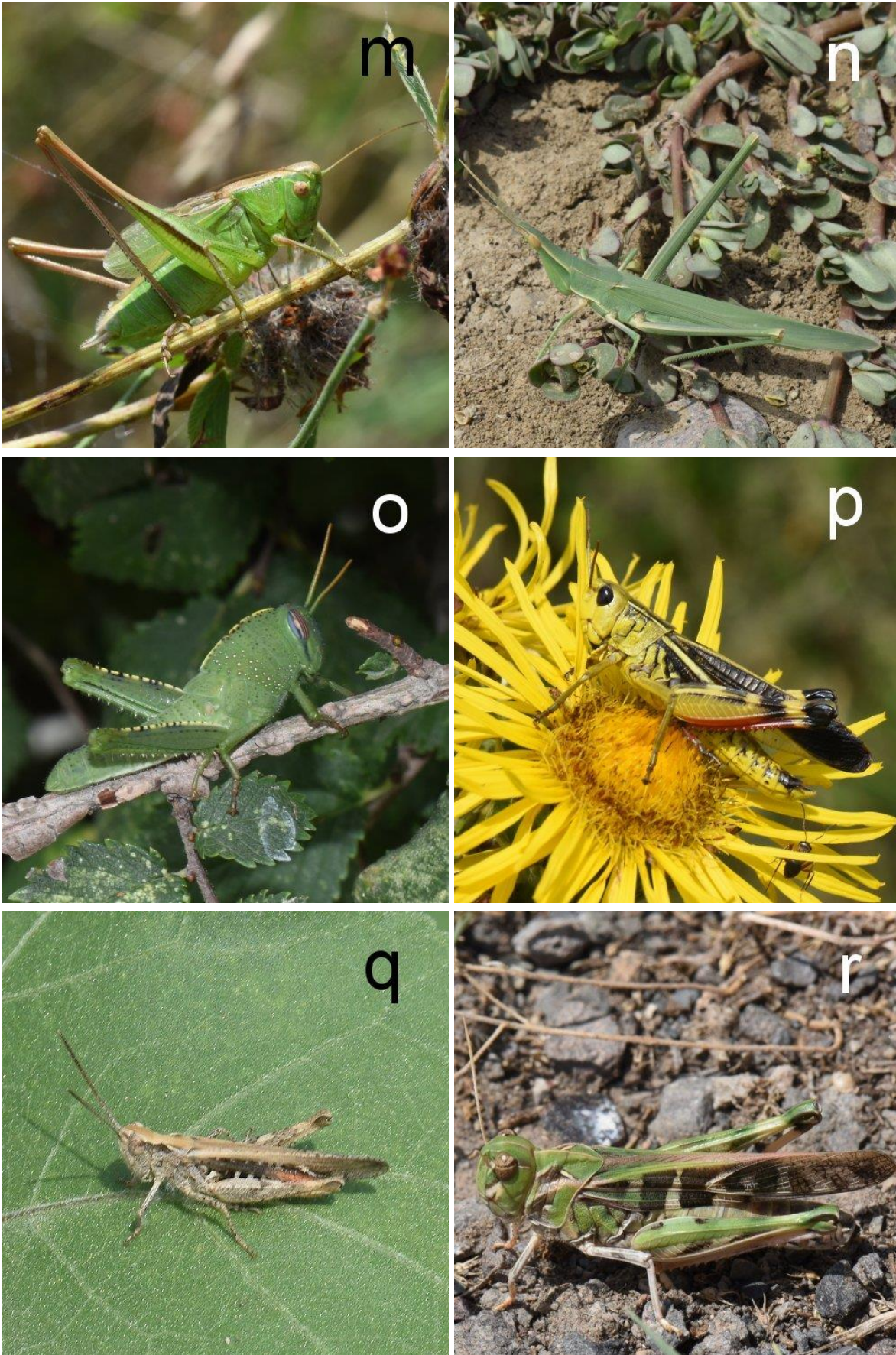


Figure 2. Pictures of species not secured by voucher specimens: m. *Bicolorana bicolor*; n. *Acrida bicolor*; o. *Anacridium aegyptium*; p. *Arcyptera fusca*; q. *Chorthippus brunneus*; r. *Oedaleus decorus*.

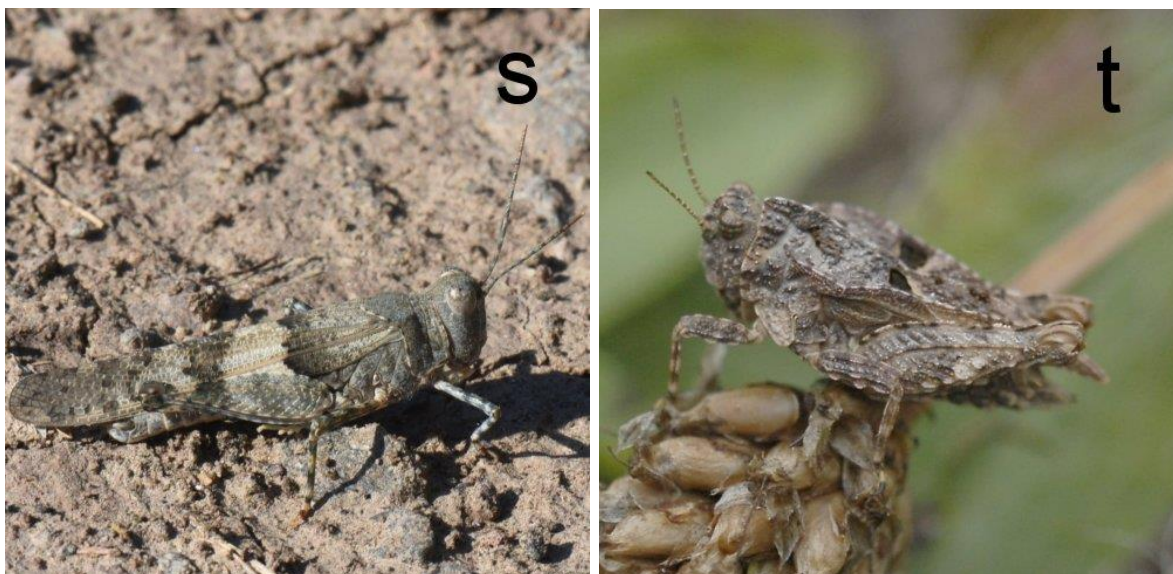


Figure 2. Pictures of species not secured by voucher specimens: s. *Sphingonotus cf coerulipes*; t. *Tetrix depressa*.

Family PYRGOMORPHIDAE

Pyrgomorpha guentheri Burr, 1899

♀ Nagebi-1, JM 20180005; ♀ Vashlovani-2, JM 20180044

Family TETRIGIDAE

Tetrix tenuicornis (Sahlberg, 1891)

4♀ Matskhovriskari, JM 20180047, 20180048, 20180049, 20180050

Tetrix bolivari Saulcy, 1901

♀ Nagebi-2, JM 20180046

Tetrix depressa Brisout de Barneville, 1848

♀ Kvabiskhevi, photographic evidence (Figure 2t)

3.2 Faunal list comparison

The species lists of the Georgian Biodiversity Database (GBD), the Orthoptera Species File (OSF) and the data gathered in the field survey are presented next to each other in Table 2. The species are arranged in alphabetical order within the respective families. The GBD gives 157 species of which 80 are not represented in the other lists. The OSF lists only 39 species, among which 10 are unique, i.e. not in the GBD-list. The current field study revealed an additional 5 species not mentioned in these lists. These species are *Gryllus bimaculatus*, *Tartarogryllus tartarus*, *Velarifictorus micado*, *Pholidoptera griseoaptera* and *Ramburiella turcomana*.

3.3 Species occurrence near Georgia

A lot of information about species occurring close to Georgian territory is available from Turkey. Twelve useful literature sources were consulted (Mistshenko 1951, Karabağ 1958, Demirsoy 1977, Salman 1978, Karabağ et al. 1980, Ünal 2006, Di Russo et al. 2007, Sevgili et al. (2010a), Sevgili et al. (2010b), Mol & Zeybekoglu 2013, Mol et al. 2014 and Ünal 2018). This resulted in a total of 58 species not listed as occurring in Georgia yet. Table 3 shows a list of these species in alphabetical order.

Discussion

The combined species list of the Georgian Biodiversity

Database and Orthoptera Species File describes a total of 167 species for Georgian territory. Assuming aforementioned sources together form an accurate representation of the contemporary knowledge, some of the species found in this study can be considered new finds for the country. Both lists do not mention the genus *Gryllus*. We found *Gryllus bimaculatus* and cannot exclude the presence of *Gryllus campestris* either, especially for the Autonomous Republic Ajaria (we only have sound observations from this region). Another cricket species found by us and not present in the lists is *Tartarogryllus tartarus*. We have to admit that Uvarov (1921b) on page 50 already reported this taxon as *Gryllus tartarus obscurus* from 'Transcaucasia orientalis: Mtskheta', which can be identified as Mtskheta, Georgia. This has been overlooked by the composers of the species lists of GBD and OSF.

We were surprised to find yet another cricket species, which was problematic in identification. With the help of Dr Andrei Gorochov studying the male genital characteristics the species was confirmed to be *Velarifictorus micado* (Mulder & Gorochov 2019). This is a common species in urban surroundings in East Asia (China, Japan, eastern Siberia, Korean Peninsula, etc.). Its natural distribution starts about 5,000 km from this location. The species is known for its invasive potential, having already established itself in many of the southeastern states of the US (Bowles 2018, Walker 1977). Root balls or substrate of plants containing the eggs have been said to be a possible vector.

The widespread Palearctic genus *Pholidoptera* is not mentioned for Georgia in the GBD and the OSF only lists *P. kalandadzei*. In the Autonomous Republic Ajaria we visually recorded and photographed *Pholidoptera griseoaptera*. Based on ecology, habitat conditions and known distribution in adjacent Turkey the species could have been expected to occur in Georgia. From the genus *Ramburiella* only the species *R. bolivari* is in the GBD, but instead the congeneric *Ramburiella turcomana* was found by us, of which Stolyarov (1991) specifically states that it is not found in Georgia. We furthermore noticed a marked difference in wing length for *Notostaurus anatolicus*, with Georgian specimens showing

Table 3. Species occurrence in Turkish provinces near Georgia with literature references.

Species	Border provinces of Turkey			
	Artvin	Ardahan	Rize	Kars
<i>Acrida oxycephala</i>	5		5	
<i>Acrometopa syriaca</i>				1
<i>Aiolopus simulatrix</i>				1
<i>Anadrymadusa adzharica</i>	1			
<i>Bicolorana burri</i>				1
<i>Bucephaloptera bucephala</i>	1			
<i>Calliptamus coelesyriensis</i>				1
<i>Chorthippus bornhalmi</i>			3	
<i>Chorthippus demokidovi</i>	1			1
<i>Chorthippus karelini</i>	3			3
<i>Chorthippus labaumei</i>	1			1
<i>Conocephalus discolor</i>			4	
<i>Dociostaurus genei</i>	1			5
<i>Dociostaurus hauensteini</i>	1			1
<i>Dociostaurus tartarus</i>	10			
<i>Dolichopoda noctivaga</i>	9			
<i>Eremippus zeybekoglu</i>	10			
<i>Eremopeza festiva</i>			5	
<i>Euchorthippus pulvinatus</i>	1	10		1
<i>Gomphoceris transcaucasicus</i>	10	10		
<i>Gryllus campestris</i>	1			
<i>Heliopteryx humeralis</i>	1			1
<i>Incertaina persica</i>				1, 6
<i>Leptopternis gracilis</i>				5
<i>Montana uvarovi</i>		1		
<i>Oedipoda germanica</i>	1			
<i>Omocestus nanus</i>				1
<i>Paradrymadusa aksirayi</i>	1			1, 4
<i>Paradrymadusa brevicerca</i>	1			
<i>Paranocaracris citripes</i>			3	
<i>Paranocaracris elegans</i>	1		3	
<i>Parapholidoptera kosswoigi</i>				1
<i>Parapholidoptera signata</i>	1			1
<i>Parapholidoptera ziganensis</i>	1			
<i>Paratettix meridionalis</i>	1		2	1
<i>Pezodrymadusa lata</i>				1
<i>Pezotettix giorniae</i>			4	
<i>Phonochorion artvinensis</i>	1,11			
<i>Platycleis escalerae</i>	1			1
<i>Poecilimon armeniacus</i>				1
<i>Poecilimon ersisi</i>	1			
<i>Poecilimon azizsancar</i>	1,12			
<i>Poecilimon tschorochensis</i>	1			
<i>Poecilimon variicercis</i>				1,12
<i>Pseudonothrotes levis</i>	8			
<i>Psorodonotus davisi</i>			7	
<i>Pyrgomorpha guentheri</i>	1			1
<i>Rammepodisma natoliae</i>			5	
<i>Roeseliana pylnovi</i>	1			1
<i>Sphingonotus nebulosus</i>				1
<i>Sphingonotus pilosus</i>				1
<i>Sphingonotus turcicus</i>	1			
<i>Stenobothrus sviridenkoi</i>	10	10		
<i>Stenobothrus werner</i>		10		
<i>Stenobothrus zubowskyi</i>		1		1
<i>Troglophilus tatyanae</i>	9			
<i>Turanogryllus lateralis</i>				1
<i>Uvarovistia satunini</i>				1

Sources: 1 Salman (1978), 2 Karabağ (1958), 3 Mol et al. (2014), 4 Karabağ et al. (1980), 5 Demirsoy (1977), 6 Ünal (2006), 7 Ünal (2018), 8 Mistshenko (1951), 9 Di Russo et al. (2007), 10 Mol & Zeybekoglu (2013), 11 Sevgili et al. (2010), 12 Sevgili et al. (2010).

longer wings than those known in for instance Greece (Willemse et al. 2018).

Here we discuss the Orthoptera species lists as presented by the Georgian Biodiversity Database and Orthoptera Species File. At first we have some systematic remarks. The GBD contains the species *Chorthippus longicornis*. This is a junior synonym of *Pseudochorthippus montanus*, which does not even occur in the region (e.g. Distribution Map of Orthoptera Species File). Furthermore, *Tetrix nutans* is included in the GBD next to *T. tenuicornis*, while *nutans* in fact is a synonym of the latter. The species *Chorthippus longicornis* as well as *Tetrix nutans* thus have to be excluded from the species list. In a recent investigation by Grzywacz et al. (2017) the authors resurrected *Tettigonia armeniaca*. The species *Tettigonia caudata* in the GBD probably has to be replaced by this name, though occurrence of both species cannot be ruled out yet.

The cricket species *Stenonemobius bicolor* was added to the Georgian fauna by Gorokhov (1984) and has been overlooked in composing both lists. The species *Podisma uvarovi* and *Podisma teberdina* were mentioned for 'Abkhazia and Svaneti' by Stolyarov (1991).

Several dozen species are known for Turkish areas surprisingly close to Georgia and many of them are to be expected to occur in Georgia as well. For instance, the type localities of *Anadrymadusa adzharica*, *Pseudonothrotes levis*, *Dolichopoda noctivaga* and *Troglophilus tatyanae* are all within 30 km from Georgia (Uvarov 1934, Mistshenko 1951, Di Russo et al. 2007). The list given in Table 3 is an indication of the potential orthopteran species richness of Georgia, possibly exceeding 200 species. Further research is needed to find out which of these species actually occur in Georgia.

There are also species whose database entries need to be critically reviewed or revised. For *Phytodrymadusa longipes* a location is given by Brunner von Wattenwyl (1882) as 'Helenendorf bei Elisabethopol in Grusien'. Grusien means Georgia in German, but this turns out to be the locality Göygöl and actually is located in Azerbaidzjan, about 55km away from Georgia. It is unknown if the incorporation of this species in the GBD has been based solely on this old record.

The available sources for Georgia and many publications for (eastern) Anatolia mention *Chorthippus brunneus* as the representative of the *brunneus* subgroup. The question whether *C. brunneus* or *C. bornhalmi* is present in this region seems to have been cleared by Şirin et al. (2010). According to them, records previously referred to as *C. brunneus* can actually be contributed to *C. bornhalmi* and are listed as such in Table 2, though referred to as *brunneus* in the GBD.

It can be concluded that, when compared to the online faunal lists of the Georgian Biodiversity Database and the Orthoptera Species File, this study adds five new species to the list of Georgian Orthoptera on the basis of our fieldwork. One of them is an exotic species. Two species have to be omitted from the final list due to synonymy; an overseen cricket and two *Podisma* species have to be added and a

katydid added or replaced following a recent resurrection. Taking into account above mentioned additions and revisions, this study arrives at a total of 173 species recorded for Georgia. Furthermore we enumerate a total of 58 species as plausible to inhabit Georgia because of their occurrence near the country's border.

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