RESEARCH ARTICLES
ОРИГИНАЛЬНЫЕ СТАТЬИ

DISTRIBUTION OF SPECIES FROM THE GENUS *PANORPA* (MECOPTERA, PANORPIDAE) IN EUROPEAN RUSSIA EXCEPT THE CAUCASUS

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The study of the insect distribution in geographical areas is relevant since it is important in terms of understanding the global trend of biodiversity decline. The paper presents the results of a study on the distribution of six species of Panorpidae (Mecoptera), carried out in 2008, 2009, 2011, 2015, 2017–2020. One part of data was collected by the authors. Other material was provided by colleagues from 11 regions in Russia. In European Russia, six species of *Panorpa* are reliably known, namely *Panorpa alpina*, *P. cognata*, *P. communis*, *P. germanica*, *P. hybrida*, and *P. vulgaris*. The most common and frequently encountered species are *P. communis* (in 21 regions), *P. hybrida* (in 12 regions), *P. vulgaris* (in 11 regions), and *P. cognata* (in 11 regions). It is assumed that all studied species can be found in other regions of European Russia as a result of further investigations. Among the studied species, *P. alpina* and *P. germanica* are the rarest species, recorded from two and one regions, respectively. *Panorpa vulgaris* was found for the first time in Russia.

Key words: Europe, fauna, Protected Area, rare species, species' range

Introduction

Recently, entomologists have recorded an alarming decline in the number, taxonomic richness and geographical ranges of insects around the world (Forister et al., 2019; Sánchez-Bayo & Wyckhuy, 2019). In many cases, most of the registered facts showing population decline were obtained as a result of geographically limited studies. That is why it is impossible to draw conclusions about the decline in the number of insects on a continental or global scale (Kestemont, 2019; Batschynskaja et al., 2020; Khalimov, 2020; Montgomery et al., 2020; Yang et al., 2021). In this regard, it is relevant to study the insect distribution within regional faunas, by carrying out an inventory of species and individual taxonomic groups that are poorly studied (Wheeler, 1990; Montgomery et al., 2020).

Panorpidae is the largest family of Mecoptera, accounting for 500 species in one extinct and eight extant genera, living mainly in the Northern Hemisphere (Wang & Hua, 2021). In this family, new taxa are regularly described (Bicha & Schiff, 2019; Gao et al., 2020; Li & Hua, 2020; Wang & Gong, 2021). The biology of many species is well studied, but this does not apply to all regions and countries. Adults feed on various substrates, including rotting animal and plant substrates, and on dead insects; some of them are phytophagous (Byers & Thornhill, 1983; Palmer, 2010; Wang & Hua, 2021). It is believed that pollen, leaking plant juices, secretions of various invertebrates make up a small component of the diet of Panorpidae (Byers & Thornhill, 1983). However, many observations show that Panorpidae species often feed on flowering plants (Barnard et al., 1986; Willemstein, 1987; Medan, 1994; Jacquemart et al., 2007; Krivosheina, 2007; Vanparys et al., 2008; Khramov et al., 2020).

The reproduction of Panorpidae is worth studying since these insects have a diverse courtship and mating feeding (Engqvist, 2007; Zhong & Hua, 2013; Hartbauer et al., 2015; Tong & Hua, 2019). Species of the genus *Panorpa* Linnaeus, 1758 are often considered as model animals for the study of insect mating systems, since most male *Panorpa* can alternatively provide salivary secretions or prey as a mating gift according to their nutritional condition

(Engqvist, 2009). Larvae are generally eruciform and edaphic, occurring in the soil or on the ground (Byers, 1997; Jiang et al., 2014). The larvae are mainly saprophages, feeding on dead, decomposed arthropods (Engels & Sauer, 2007; Cai & Hua, 2009; Jiang & Hua, 2015a,b). Adults and larvae of many Panorpidae species are syntopic and can compete with each other (Thornhill, 1980). Certain mechanisms have been developed in the larvae to reduce competitive relations. For example, in the soil, Panorpidae larvae have not only different spatial niches (they are kept in various soil layers), but also are separated by the time of their activity (Jiang et al., 2019).

The present study is aimed to assess the distribution of *Panorpa* species in the European part of Russia (except for the Caucasus). Four species are restricted to the Caucasus but also known from Russia: *Panorpa arcuata* (Navás, 1912), *P. connexa* McLachlan, 1869, *P. nigrirostris* McLachlan, 1882, *P. similis* Esben-Petersen, 1915 (Martynova, 1957; Makarkin & Shchurov, 2019).

Material and Methods

The study has been conducted in 2008, 2009, 2011, 2015, 2017–2020. One part of the material was collected by the authors. Another part of the information was received from our colleagues from 11 regions in Russia. The main part of data was collected in the following Protected Areas: Mordovia State Nature Reserve, National Park «Smolny», Volzhsko-Kamsky State Nature Biosphere Reserve, Prisursky State Nature Reserve, South Ural State Nature Reserve, Chavash varmane National Park, Muromsky Sanctuary, as well as in 17 other regional-level Protected Areas.

Collections were carried out using traditional methods, such as catching insects with a net, light trapping, pitfall traps, window traps (Golub et al., 2012). We actively used crown traps that were set at various heights with baits consisted of beer or wine, sugar, jam and honey (Jalas, 1960; Ruchin et al., 2020, 2021).

Electronic Supplement 1 contains references on each taxon in European Russia. Below, for each *Panorpa* species, the «Material» sub-section indicates the number of studied specimens and the number of regions. The full label data are provided in Electronic Supplement 1. It provides full information about records (collection locations, date of collection, number of collected specimens, and name of the collector). Information about the distribution of taxa in Russia and Europe is given separately. In some cases, there are notes for a species. Species, which are new to the Russian fauna, are marked with an asterisk (*).

Results

In our study, 1456 specimens of six *Panorpa* species were caught (Table 1). The list of species is given below.

Panorpa alpina Rambur, 1842

Material. Seven specimens from two regions were identified (Electronic Supplement 1).

Basic diagnostics. Subcosta in forewings is fusing with costa in about mid-length. Wing membrane is yellowish with brown spots; apex is without dark margin (Fig. 1A). In male, tergum 3 forms a small globate posterior projection; tergum 4 has a small tooth like projection curved slightly backwards.

Table 1. The number of studied specimens of Panorpidae in 11 regions in European Russia

Regions	*Panorpa alpina*	*Panorpa cognata*	*Panorpa communis*	*Panorpa germanica germanica*	*Panorpa hybrida*	*Panorpa vulgaris*	Total number of specimens	Number of species
Chuvash Republic	0	10	49	0	27	55	141	4
Kaluga Region	5	11	20	0	2	27	65	5
Lipetsk Region	0	0	0	0	0	2	2	1
Nizhny Novgorod Region	0	1	31	0	17	34	83	4
Penza Region	0	0	44	0	2	131	177	3
Republic of Bashkortostan	2	0	0	2	0	31	35	3
Republic of Mordovia	0	45	300	0	35	253	633	4
Republic of Tatarstan	0	0	0	0	0	5	5	1
Ryazan Region	0	0	48	0	24	27	99	3
Ulyanovsk Region	0	2	41	0	3	85	131	4
Vladimir region	0	7	62	0	1	15	85	4
Total regions	2	6	8	1	8	11		
Total specimens	7	76	595	2	111	665	1456	

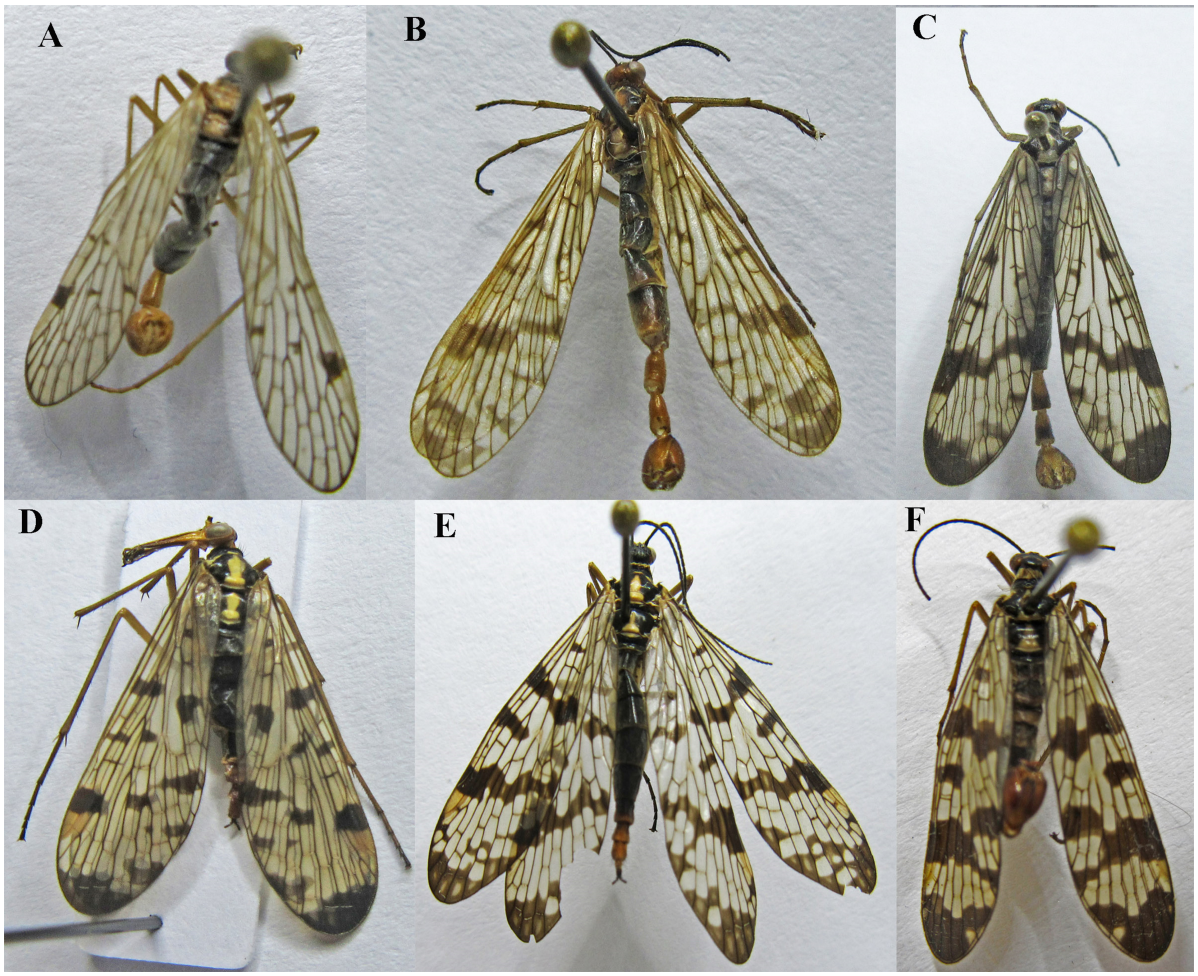

Fig. 1. Photos of collected specimens of *Panorpa* species: A – *Panorpa alpina* male, Kaluga Region, Dmitrovskiy village; B – *Panorpa cognata* male, Vladimir Region, Tatarovo village; C – *Panorpa communis* male, Kaluga Region, Kondrovo town; D – *Panorpa germanica* female, Republic of Bashkortostan, Arka mount; E – *Panorpa hybrida* female, Ryazan Region, Nikolaevka village; F – *Panorpa vulgaris* male, Kaluga Region, Kaluga city (Author: Libor Dvořák).

Published data: Sverdlovsk Region, Permsky Krai (Pankov & Zhuzhgova, 2005), Republic of Karelia (Humala, 2006; Humala & Polevoi, 2009), entire European Russia as well (Martynova, 1957).

New data: Republic of Bashkortostan, Kaluga Region.

Distribution in Europe: It is known in the mainland of Europe from Scandinavia to mid-France, Italy, former Yugoslavia and Bulgaria in the south (Ward, 1979; Tillier et al., 2009; Willmann, 2013).

Remarks. Martynova (1957) pointed out that this species is widespread in the European part of the former USSR. However, the number of references about records of *Panorpa alpina* is limited. It seems to us that the statement of Martynova (1957) does not correspond to reality and it probably reflects the situation in Ukraine and the Baltic countries, but not in European Russia. Dorokhova & Martynova (1987) reported the occurrence from northwest and east of European Russia. According to published and new data, *P. alpina* is a very rare species of cold regions in northwestern (Republic of Karelia) and eastern (Republic of Bashkortostan, Permsky Krai, Sverdlovsk Region) regions of European Russia. Our records from Kaluga Region are situated between 205–232 m a.s.l. This site is located on a northeast slope of a hill on the top of an erosional plain. This is near to the centre of the Russian plain. This site is about 1000 km far of the nearest mountains (Carpathians). *Panorpa alpina* is rather widespread in the Carpathians. In the Republic of Bashkorotan, it was collected at an altitude of 545 m a.s.l., in the Ural mountains, as well as it is known according to the published records from Sverdlovsk Region and Permsky Krai (Pankov & Zhuzhgova, 2005). According to Ward (1979), *P. alpina* is a species occurring mainly in mountains in the centre of the species' range, but on the borders of its distribution area it can be found in comparatively low altitudes. According to our data, *P. alpina* is known from north, centre, and east of European Russia (Electronic Supplement 2).

***Panorpa cognata* Rambur, 1842**

Material. 76 specimens from six regions were identified (Electronic Supplement 1).

Basic diagnostics. It is an extensively orange species including the wing pattern, which is constant in central and eastern European populations. Fore wing has several spots and only two bands: subapical band is wide and dark near costa and fading towards hind margin; inner part of the band fork is visible; outer fork is almost invisible. Apical band is intensively coloured in its central park, fading towards fore and hind wing margins (Fig. 1B). In male, tergum 6 has a tooth-like posterior projection.

Published data: Belgorod Region (Prisniy, 2002), Permsky Krai (Pankov & Zhuzhgova, 2005), Leningrad Region (Martynova, 1957), Kirov Region (Levi, 1974), Moscow Region (Martynova, 1957; Savitsky & Timokhov, 2020).

New data: Chuvash Republic, Kaluga Region, Nizhny Novgorod Region, Republic of Mordovia, Ulyanovsk Region, and Vladimir Region.

Distribution in Europe: This species inhabits mainland Europe to Britain and France to the west, southern Sweden and Norway to the north, Sicily to the south, and the Urals to the east (Ward, 1983; Pankov & Zhuzhgova, 2005; Willmann, 2013).

Remarks: Martynova (1957) noted that *P. cognata* is a rare species. Dorokhova & Martynova (1987) reported the occurrence from the northwest and centre of the European part of the former USSR. According to the present knowledge, the centre of the distribution of *P. cognata* in European Russia is situated into the stripe running through its mild-climate parts from the Kaluga Region to the Urals. It is also known from the Belgorod Region on the border with Ukraine and from the Leningrad Region in the northwest of European Russia (Electronic Supplement 2). The species was caught in a small number of specimens only. The maximum number was seven specimens caught during 14-days exposure of the beer trap.

***Panorpa communis* Linnaeus, 1758**

Material. 595 specimens from eight regions were identified (Electronic Supplement 1).

Basic diagnostics. Fore wing has two wide bands including apex (constant in central and eastern European populations, which are deeply black. Key differences separating this species from *P. vulgaris*: basal spot is often absent; if present, it is widely touching one vein only (it has a rhombic shape); subapical band is not forked or the outer fork is only hinted by a spot (Fig. 1C). Differences on male genitalia between *P. vulgaris* and *P. communis* are present in Sauer & Hensle (1977).

Published data: Sverdlovsk Region, Permsky Krai (Pankov & Zhuzhgova, 2005), Republic of Karelia (Humala, 2006; Humala & Polevoi, 2009), Orenburg Region (Nemkov, 2011), Nizhny Novgorod Region (Anufriev & Bayanov, 2002), Voronezh Region (Negrobov, 2005), Samara Region (Rosenberg, 2007), Kirov Region (Levi, 1974), Lipetsk Region (Dobrovolsky, 2004), Moscow Region (Krivosheina, 2007), Kursk Region (Timonov et al., 2010), Pskov Region (Antipova & Baikova, 2002), Chuvash Republic (Egorov & Podshivalina, 2014), Republic of Mordovia (Plavilshchikov, 1964), Republic of Mari El (Matveev et al., 2008), Smolensk Region (Kosenkov, 2011), Krasnodarsky Krai (Karyakina & Kustov, 2011), Ryazan Region (Cheltsov et al., 2003), Vologda Region (Belova et al., 2017), Republic of Bashkortostan (Bayanov et al., 2015).

New data: Republic of Mordovia, Kaluga Region, Penza Region, Ulyanovsk Region, Chuvash Republic, Nizhny Novgorod Region, Vladimir Region, and Ryazan Region.

Distribution in Europe: This species occurs almost throughout the whole of Europe except northernmost and southernmost parts. But, since this taxon has been confused and mis-interpreted for a long time, its exact distribution was not largely reviewed yet.

Remarks. Martynova (1957) indicated *P. communis* as the most widespread species, and Dorokhova & Martynova (1987) reported its distribution as spread everywhere. Sauer & Hensle (1975, 1977), who studied *P. communis*, found some differences in the ecology, ethology and reproductive isolation, and found that *P. vulgaris* is not a synonym of *P. communis*, but a valid species. In addition, Sauer & Hensle (1975, 1977) identified morphological differences making it possible to separate the two species. Molecular studies also indicate that there is a connection *P. communis/vulgaris* species (Hu et al., 2015). We suppose that the authors of many of the published papers cited above did not know the *P. communis/vulgaris* problem and many of the published data on *P. communis* belong to *P. vulgaris* in fact. The data on *P. communis* were published from almost the whole of European Russia. We confirmed its distribution from the western and central parts of European Russia (Electronic Supplement 2). This species is sometimes very abundant, since in one beer trap installed in the Republic of Mordovia, 18 specimens were caught over 2-days exposure.

***Panorpa germanica* Linnaeus, 1758**

Material. Two specimens from one region were identified (Electronic Supplement 1).

Basic diagnostics. Wings have apical band, big spot on pterostigma and several smaller spots. This pattern is constant in central and eastern European populations (Fig 1D).

Published data: Belgorod Region (Prisniy, 2002), Permsky Krai (Pankov & Zhuzhgova, 2005), Republic of Karelia (Humala, 2006), Leningrad Region (Martynova, 1957), Orenburg Region (Martynova, 1957), Republic of Bashkortostan (Bayanov et al., 2015), Kirov Region (Levi, 1974), Moscow Region (Martynova, 1957; Savitsky & Timokhov, 2020).

New data: Republic of Bashkortostan.

Distribution in Europe: This species is known almost in the whole of Europe including the British Isles, but it is absent in the major part of the Iberian Peninsula (Willmann, 2013).

Remarks. Martynova (1957) noted only seven specimens from the former USSR. Dorokhova & Martynova (1987) reported *P. germanica* from the northwest, centre and east of the European part of the USSR. The published papers show that this species is rare (Levi, 1974; Prisniy, 2002; Humala, 2006). Only Pankov & Zhuzhgova (2005) listed records of 13 specimens from the Urals and Pre-Urals. These facts correspond more or less with our data presented in this paper because we have identified only two specimens among almost 1500 ones (see Table 1). According to the present knowledge, *P. germanica* is known from the north, northwest, centre, and east of European Russia (Electronic Supplement 2).

***Panorpa hybrida* MacLachlan, 1882**

Material. 111 specimens from eight regions were identified (Electronic Supplement 1).

Basic diagnostics. Wings have apical and a pterostigmal bands, which are often interrupted. The second wing is divided into two branches in its hind part. The rest part of the wing has smoky spots on cross-veins and vein forks (Fig 1E). In male, tergum 3 has a club-like posterior projection, tergum 4 with an elevation near the middle.

Published data: Sverdlovsk Region, Permsky Krai (Pankov & Zhuzhgova, 2005), Republic of Karelia (Humala, 2006), Samara Region (Dyuzhaeva, 2012; Dyuzhaeva & Lyubvina, 2018). It is distributed throughout European Russia (Martynova, 1957).

New data: Republic of Mordovia, Kaluga Region, Penza Region, Ulyanovsk Region, Chuvash Republic, Nizhny Novgorod Region, Vladimir Region, and Ryazan Region.

Distribution in Europe: It inhabits the central and eastern parts of Europe, from the southern regions of Scandinavia in the north to former Yugoslavia and Bulgaria in the south. The actual distribution is unclear due to the frequent misidentification with atypical specimens of *P. vulgaris* and *P. germanica* (Dvořák et al., 2020a). The westernmost distribution limits of *P. hybrida* are known more precisely: all records from Germany are apparently based on confusions with *P. germanica* (R. Willmann, pers. comm.), while in the Czech Republic *P. hybrida* is documented from more localities mainly in its northern, north-eastern, and eastern parts (Dvořák et al., 2020b).

Remarks. Concerning Russia, Martynova (1957) noted that *P. hybrida* is a relatively rare species, and Dorokhova & Martynova (1987) reported the occurrence from the European part of the former USSR except in the north. According to the present knowledge, *P. hybrida* is known from the north, centre, and east of European Russia, but we suppose that it is present in more regions (Electronic Supplement 2). This species is in some regions relatively abundant, in one beer trap installed in the Ryazan region, altogether 18 specimens were caught during 12-days exposure.

****Panorpa vulgaris* Imhoff & Labram, 1845**

Material. 665 specimens from 11 regions were identified (Electronic Supplement 1).

Basic diagnostics. Fore wing has large spots and wide bands including apex, which are deeply black. Key differences separating this species from *P. communis*: basal spot is always present, oblong and widely touching three veins; subapical band is distinctly forked (Fig. 1F). Differences on male genitalia between *P. vulgaris* and *P. communis* are present in Sauer & Hensle (1977).

Published data: This species has been confused for a long time with *P. communis*. That is why no published data are known from Russia.

New data: Republic of Mordovia, Kaluga Region, Penza Region, Ulyanovsk Region, Republic of Bashkortostan, Chuvash Republic, Nizhny Novgorod Region, Vladimir Region, Ryazan Region, Republic of Tatarstan, and Lipetsk Region.

Distribution in Europe: It is a European species, lacking in southernmost parts (Devetak, 1988; Willmann, 2013; Dvořák & Georgiev, 2017).

Remarks. Previously, this species has not been considered separately from *P. communis*. Sauer & Hensle (1975, 1977) studied both species and found differences between them, taking into account dif-

ferences in their ecology, ethology and reproductive isolation. In addition, Sauer & Hensle (1975, 1977) identified morphological differences, which make it possible to separate both species from each other. Molecular-genetic research results also indicate that there are differences between *P. communis* and *P. vulgaris* (Hu et al., 2015). We have not found any published record(s) of *P. vulgaris* from Russia. It is very probable, that non-specialists are not aware with this problem, and many published data (including the recent ones) on *P. communis* belong to *P. vulgaris* in fact. Our material represents the first verified records of *P. vulgaris* from Russia. According to the present knowledge, the centre of its distribution in Russia is situated into the stripe running through mild-climate parts from the Kaluga Region to the southernmost parts of the Urals (Electronic Supplement 2). We suppose that this species occurs in more regions, including the northern parts of European Russia. *Panorpa vulgaris* is often very abundant. From one beer trap installed during 13-days exposure in the Penza Region, we have identified 79 specimens of this species in total.

Discussion

Up to now, there have been known five species of *Panorpa* in European Russia (Martynova, 1957). One of them, *Panorpa communis*, was always mentioned in all regional generalised entomological reports. According to our data, six *Panorpa* species are now reliably known in European Russia. According to the literature data and the results of our study, the most common and frequently encountered species are *Panorpa communis* (in 21 regions), *Panorpa hybrida* (in 12 regions), *Panorpa vulgaris* (in 11 regions), and *Panorpa cognata* (in 11 regions). At the same time, the number of studied individuals of the first two species considerably exceeds the number of all other species. Apparently, these species are the most common. *Panorpa vulgaris* has not yet been indicated by other researchers, because it has only recently been distinguished from *P. communis*. However, given its high abundance in nature and wide distribution according to our information, we expect that this species is present in other regions as well.

The distribution of two taxa, *Panorpa alpina* and *P. germanica germanica*, is especially worth to study. Both species are quite common in Europe. However, their distribution is limited to only a few regions in European Russia. *Panorpa alpina* is expected to occur in mountainous areas and northern regions. On the other hand, the unexpected discovery of *P. alpina* in the Kaluga Region indicates, at least, the need for more thorough research of old-age forests. *Panorpa germanica* was found only in the Republic of Bashkortostan. According to the literature data (Prisniy, 2002), it was also noted in the Belgorod Region, which requires confirmation.

As the majority of data presented in this paper was obtained using beer traps, we compared our data with the published sources from other European countries. We were unable to find any relevant papers dealing with bait trapping of *Panorpa* spp. in Europe in such a large number as it was found in our study. In fact, only a few papers are known. All six species included to the manuscript are being attracted by bait traps, and some data were published. Letardi (2003) recorded *P. alpina*, *P. communis*, and *P. germanica* in the northern Apennines, northern Italy, using pitfall traps with vinegar. In the Czech Republic, Dvořák & Bezděčka (2012) caught *P. cognata* using beer traps, and Dvořák & Dvořáková (2012) collected *P. germanica*, *P. vulgaris* using syrup traps, and Dvořák & Dvořáková (2020) and Dvořák et al. (2020b) caught *P. alpina*, *P. communis*, *P. germanica*, *P. hybrida*, *P. vulgaris* using wine traps. From Ukraine, Dvořák et al. (2017, 2019, 2022) published data on collecting *P. alpina*, *P. communis*, *P. germanica*, *P. vulgaris* using beer traps.

Dvořák et al. (2020a) reported a record of *P. germanica* from a beer trap in Bulgaria. In the personal database of Libor Dvořák, there are unpublished data from Austria (*P. communis*, *P. vulgaris*), France (*P. vulgaris*), Germany (*P. communis*, *P. germanica*, *P. vulgaris*), Hungary (*P. communis*, *P. germanica*), Italy (*P. communis*, *P. germanica*), Slovakia (*P. communis*), and Switzerland (*P. communis*). It is evident, that using various bait traps is a very important and easy way for faunistic research on European *Panorpa* spp.

Conclusions

Six species of *Panorpa* are reliably known in European Russia except the Caucasus (*Panorpa alpina*, *P. cognata*, *P. communis*, *P. germanica*, *P. hybrida*, and *P. vulgaris*). *Panorpa communis* (known in 21 regions), *P. hybrida* (known in 12 regions), *P. vulgaris* (known in 11 regions), and *P. cognata* (known in 11 regions) are the most widespread and common species. *Panorpa vulgaris* was recorded for the first time in the fauna of Russia. It is likely that all these species can be observed in other regions of European Russia, which requires further studies. We have noted that *P. alpina* and *P. germanica* are less common than other species. Despite the fact that these two species are com-

mon in Europe, *P. alpina* was recorded only in the Kaluga Region and the Republic of Bashkortostan, and *P. germanica* was noted only in the Republic of Bashkortostan. We propose beer traps as a good tool for studying of Panorpidae.

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Supporting Information

Information about collected specimens of *Panorpa* species (Electronic Supplement 1. Data on *Panorpa* spp. specimens collected in European Russia (except the Caucasus)) and maps of *Panorpa* spp. distribution in European Russia (Electronic Supplement 2. The distribution of some Panorpidae species in European Russia) may be found in the **Supporting Information**.

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О РАСПРОСТРАНЕНИИ ВИДОВ РОДА *PANORPA* (MECOPTERA, PANORPIDAE) В ЕВРОПЕЙСКОЙ РОССИИ (ЗА ИСКЛЮЧЕНИЕМ КАВКАЗА)

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Изучение географического распространения насекомых в различных регионах является актуальной темой, поскольку это важно с точки зрения понимания глобальной тенденции сокращения биоразнообразия. В настоящей работе представлены результаты исследования распространения шести видов семейства Panorpidae (Mecoptera), проведенного в 2008, 2009, 2011, 2015, 2017–2020 гг. Часть данных была собрана авторами. Остальные материалы были предоставлены коллегами из 11 регионов России. В Европейской России достоверно известно шесть видов *Panorpa*, а именно *Panorpa alpina*, *P. cognata*, *P. communis*, *P. germanica*, *P. hybrida*, *P. vulgaris*. Наиболее распространенными и часто встречающимися видами являются *P. communis* (известен в 21 регионе), *P. hybrida* (в 12 регионах), *P. vulgaris* (в 11 регионах) и *P. cognata* (в 11 регионах). Предположительно, все изученные виды могут быть обнаружены в других регионах Европейской России в результате дальнейших научных исследований. Среди изученных видов наиболее редкими являются *P. alpina* и *P. germanica*, отмеченные соответственно в двух и одном регионах Европейской России. *Panorpa vulgaris* обнаружен впервые для фауны России.

Ключевые слова: ареал, Европа, особо охраняемая природная территория, редкий вид, фауна