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## THE VELVET ANTS (HYMENOPTERA: MUTILLIDAE) OF BELARUS, WITH ANALYSIS OF THE FAUNA OF EASTERN EUROPEAN COUNTRIES

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Four species, *Myrmosa a. atra* Panzer, *Mutilla europaea* Linnaeus, *M. marginata* Baer, and *Smicromyrme (Smicromyrme) rufipes* (Fabricius) are recorded from Belarus and three species, *Paramyrmosa brunnipes* (Lepeletier de Saint Fargeau), *Myrmilla (Pseudomutilla) glabrata* (Fabricius), and *Physetopoda halensis* (Fabricius) are expected to be found in Gomel' Province. For each recorded species material, general distribution, hosts, biotopical preferences and seasonal dynamic are given.

The mutillid fauna of Eastern Europe comprises by 49 species in 15 genera. Because of mutillid wasps are thermophilic group the number of species dramatically reduced from south to north. The cluster analysis of faunal similarities among ten countries and regions of Eastern Europe produce two major clusters (index similarity 0.24): 1) South European territory of Russia, Crimea and Ukraine and 2) North and Central European territories of Russia, Belarus, Poland, Lithuania, Latvia, and Estonia. The UPGMA cluster analysis demonstrates the important boundary between zones of steppe and nemoral forest of Euro-Siberian subregion of the Palaearctic. The ordination of mutillid fauna in the Eastern European countries showed the trend which reflects the latitudinal differences between the faunas of steppe and nemoral forest zones of Eastern Europe.

KEY WORDS: Hymenoptera, Mutillidae, velvet ants, Belarus, Eastern Europe.

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Четыре вида, *Myrmosa a. atra* Panzer, *Mutilla europaea* Linnaeus, *M. marginata* Baer и *Smicromyrme (Smicromyrme) rufipes* (Fabricius) указываются для Беларуси; нахождение еще трех видов, *Paramyrmosa brunnipes* (Lepelletier de Saint Fargeau), *Myrmilla (Pseudomutilla) glabrata* (Fabricius) и *Physetopoda halensis* (Fabricius) возможно в Гомельской области. Для каждого вида дается изученный материал, общее распространение, хозяева, биотопы и сезонная динамика.

Фауна ос-немок Восточной Европы включает 49 видов из 15 родов. Из-за термофильности группы число таксонов резко сокращается с юга на север. Сравнение фаун ос-немок 10 стран и регионов Восточной Европы показало наличие двух больших кластеров (индекс сходства 0.24): 1) юг европейской части России, Крым, Украина и 2) север и центр европейской части России, Беларусь, Польша и страны Прибалтики. Кластерный анализ показал значительные различия между зонами степей и неморальных лесов Евро-Сибирской подобласти Палеарктики. В распределении фаун ос-немок стран Восточной Европы просматривается отчетливый тренд, отражающий широтные различия между фаунами степей и неморальных лесов.

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## INTRODUCTION

Belarus is located in Eastern Europe where the forest, steppe and even desert (semidesert around the Caspian Sea) zones are occurring. Because of Mutillidae are thermophilic group the number of taxa (genera and species) are dramatically reduced from south to north (Table 1, Fig. 12). Belarus is located in the zone of nemoral forest and divided in three subzones (Fig. 2). In the northern part of the country a subzone of oak - dark coniferous forests with an appreciable amount of boreal flora is present. In the southern part there is a subzone of broad-leaved - pine forests with a considerable number of West-European flora elements. The central part of the country is occupied by a subzone of hornbeam-oak - dark coniferous forests, with an equal mixture of boreal and West-European flora elements (Yurkevich *et al.*, 1979).

The first records of *Mutilla europaea* Linnaeus, *Mutilla rufipes* Fabricius, *Myrmosa atra* Panzer ((as *Myrmosa melanocephala* (Fabricius)) from Mogil'ov Province [currently Mogil'ov and Gomel Provinces of Belarus, partly Bitesk Province of Belarus and partly Smolensk Province of Russia] of former Russian Empire have been made by Arnold (1901). Later the velvet ant fauna of Belarus was including in Central European part of the former USSR (Lelej, 1978, 1985). In the last decades the new data about these three species from the territory of Belarus were received (Shlyakhtenok, 2002; Lelej, 2002). The fourth species, *Mutilla marginata* Baer, has

been recorded from Belarus recently (Shlyakhtenok, 2013). The record of *Paramyrmosa brunripes* (Lepelletier de Saint Fargeau, 1845) from Belarus (Lelej, 1985, 2002) was based on misinterpretation of the label "Верховка, Могил.[евского] у.[езда], Подольск.[ой] г.[убернии], 12.VI.[19]01", which really belongs to Vinnitsa Province, Ukraine. Moreover, two species, *Myrmilla* (*Pseudomyrmilla*) *glabrata* (Fabricius, 1775) and *Physetopoda halensis* (Fabricius, 1787), may be found in Gomel Province after intensive collecting of the velvet ants in Belarus.

## MATERIAL AND METHODS

In 1985–2014 A.S. Shlyakhtenok collected the aculeate Hymenoptera in Belarus. Among the vast collected material 262 specimens (222 ♂, 40 ♀) of Mutillidae have been sorted and identified. Most of material (65 %) were collected by Malaise trap, Townes modification (Tereshkin & Shlyakhtenok, 1989). The traps were constructed in three subzones, mainly in the territory of reserves: Beresina Biosphere Nature Reserve (subzone I), Belovezhskaya Pushcha National Park (subzone II), Pripjat Nature Reserve and Polesie Radiological Nature Reserve (subzone III) (Fig. 2). During 30 years the material was collected in many biotops that permit us to make the conclusion about the biotopical preferences, seasonal dynamic and richness of the species. This material is deposited in the Scientific and Practical Center for Bioresources, National Academy of Sciences of Belarus, Minsk. In the examined material the following abbreviations are used: **BNR** – Beresina Biosphere Nature Reserve, **BNP** – Belovezhskaya Pushcha National Park, **NR** – Pripjat Nature Reserve, **PRR** – Polesie Radiological Nature Reserve, **MT** – Malaise trap. The collectors are added in the material when it was not collected by A.S. Shlyakhtenok.

The tabular check-list (Table 1) of Mutillidae of Eastern European countries is based on papers of Puławski (1963), Tumšs (1976), Lelej (1985, 2002), Bogusch (2006), Shlyakhtenok (2013) and the original material. The Mutillidae collected in the Eastern European countries which are deposited in the collections of the Zoological Institute, St. Petersburg, Russia, Zoological Museum of Moscow University, Russia, as Institute of Biology and Soil Science, Vladivostok, Russia have been studied also. For the identification of material see Lelej, 1978, 1985; Lelej & Schmid-Egger, 2005. The synonymy of the species follows Lelej (2002). The morphological descriptions of the species are done in Lelej (1985). The regionalization of the European part of Russia follows Lelej (2002, Fig. 1). The distribution maps of species in Belarus is given in modified Universal Transverse Mercator grid (Tereshkin, 2002). UTM data are added in the parentheses after locality name.

Faunal similarities between Belarus and Eastern European countries were evaluated, without regard to differences in country area by using Sorensen's coefficient of similarity (see Legendre & Legendre 1998). The similarity matrix resulting from pair-wise calculations was then subjected to unweighted arithmetic average clustering (UPGMA; PAST program, version 1.57, Hammer *et al.*, 2006).

## LIST OF THE SPECIES FROM BELARUS

The relation of the species by number of specimens is follows: *Myrmosa a. atra* – 54.2%, *Smicromyrme (Smicromyrme) rufipes* – 34.8%, *Mutilla europea* – 9.8%, *M. marginata* – 1.2% (Fig. 1). Such relation is resulted by using of Malaise traps, which are collecting mainly the males of mutillids (the relation males / females is 57 : 1). For the net such relation was 1.6 : 1. *Myrmosa a. atra* and *Smicromyrme rufipes* are most abundant species. The summarized data based on the collecting by net and Malaise trap should be used for the comparative study of fauna in different regions.

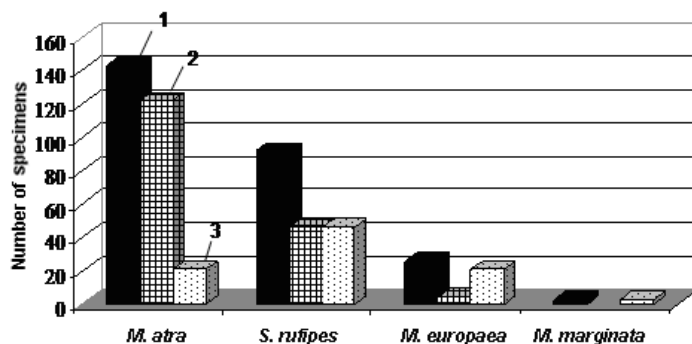


Fig. 1. Number of specimens of Mutillidae collected from Belarus. 1 – total; 2 – by Malaise trap; 3 – by net.

### *Myrmosa atra atra* Panzer, 1801

*Myrmosa atra* Panzer: Lelej, 1985: 51, ♀ ♂; 2002: 19; Shlyakhtenok, 2002: 118; 2013: 59, ♀ ♂.

*Myrmosa melanocephala* (Fabricius): Arnold, 1901: 92, ♀ ♂; Lelej, 1978: 83, ♀ ♂.

**MATERIAL EXAMINED.** 139 ♂, 4 ♀ (MT – 122 ♂; net – 17 ♂, 4 ♀). **BNR:** Domzheritsy (NA-3c), personal plot, 17.VII 1984, 1♂; alder forest, 07.VII 1986, 2 ♂, dry meadow, 15–21.VII 1985, 3 ♂; 21–29.VII 1985, 1 ♂, 5–19.VIII 1985, 1 ♂, 25.V–24.VI 1988, 1 ♂, 16–28.VI 1989, 2 ♂, 29.VI–15.VII 89, 1 ♂, 8.VI–1.VII 2011, 1♂, MT; Postrezh'ye (NA-3d), sandy road, 17.VII 1984, 1 ♂; pine forest, 11.VI–25.VI 1986, 1 ♂, 16–29.VI 1989, 1 ♂, 13–26.VII 1990, 1♂, 26.VII–15.VIII 1990, 1 ♂, 25.VI–23.VII 1993, 3 ♂, 1.VI–1.VIII 1996, 4 ♂, MT; pine forest, 23.VII–30.VIII 1993, 1 ♂, 30.V–6.VIII 2005, 1 ♂, MT. **BNP:** Kamenyuki (FD-4c), spruce forest, 11.VII–13.VIII 1990, 3 ♂, 12.VI–11.VII 1990, 1 ♂; pine forest, 12.VI–11.VII 1990, 2 ♂, MT. **PNR:** Khvoensk (NT-3a), personal plot, 9.VI–7.VII 1987, 1 ♂, MT, 7.VI 1999, 1 ♀ (Prishchepchik); pine forest, 16.VII 1993, 2 ♂; Khlupin (NT-3c), personal plot, 21.VII 1982, 1 ♂ (Molchanova); oak forest, 29.VII–28.VIII 1987, 1 ♂, MT. **PRR:** Babchin (PT-3d), oak forest, 19.VI–24.VII 1990, 1♂; alder forest, 4.VIII–8.IX 1992, 1 ♂; pine forest, 24.VII–28.VIII 1990, 1 ♂, 18.VI–23.VII 1991, 5 ♂, 23.VII–21.VIII 1991, 2♂, 9.VII–4.VIII 1992, 13♂; Dron'ki (PT-4c): personal plot, 24.VII–28.VII 1990,

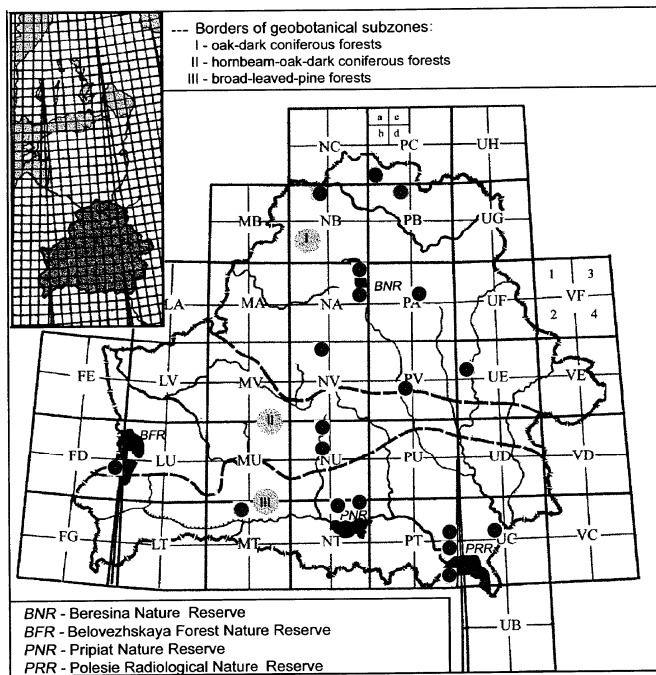


Fig. 2. Distribution of *Myrmosa a. atra* in Belarus.

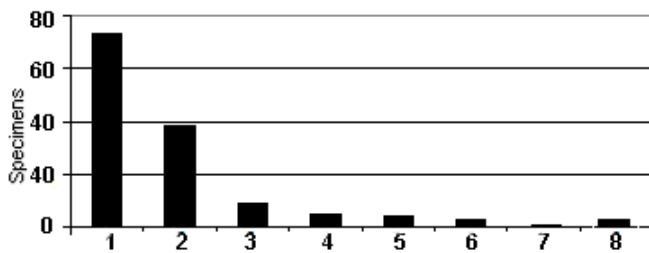


Fig. 3. Biotopical preference of *Myrmosa atra*. 1 – personal plots; 2 – pine forests; 3 – dry meadows; 4 – spruce forests; 5 – raised bogs; 6 – oak forests; 7 – wet meadows; 8 – alder forests.

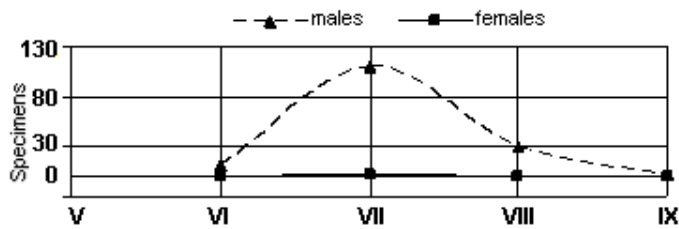


Fig. 4. Seasonal dynamic of *Myrmosa atra*.

11 ♂, 19.VI–24.VII 1990, 2 ♂, 15.VI–3.VIII 1995, 1 ♂, 7.VI–24.VII 1996, 1 ♂; Krasnosel'ye (PT-4d), personal plot, 19.VI–24.VII 1990, 4 ♂; 9.VII–4.VIII 1992, 3 ♂; Orebichi (PT-4c), personal plot, 18.VI–23.VII 1991, 1 ♂, 9.VII–4.VIII 1992, 2 ♂, MT. **Brest Prov.:** Pinsk (MT-1c), 2.VIII 1979, 1 ♂ (Lelej). **Vitebsk Prov.:** Zacherev'ye (NB-1c), pine forest, 9.VII 1994, 1 ♂; Verovoisha (UF-1b), spruce forest, 22.VI 1993, 1 ♂; Krasnopol'ye (PB-1c), wet meadow, 8.VII 1988, 1 ♂; Neshcherdo Lake (PC-2b), sandy bank, 7.VII 1988, 1 ♀. **Gomel' Prov.:** Khoyniki (PT-3d), oak forest, 10.VII 1992, 1 ♀; Krupeiki (UC-1d), personal plot, 29.VII 2006, 1 ♂; Sinyak (UC-1d), pine forest, 29.VII 2006, 1 ♂. **Minsk Prov.:** Minsk (NV-1c), Botanical garden, 30.VI–15.VII 2003, 1 ♂, 15–31.VII 2003, 29 ♂, 31.VII–15.VIII 2003, 10 ♂, MT; personal plot, 24.VII 2004, 1 ♂; Bol'shoye Stiklevo (NV-1c), pine forest, 17.VII 1985, 1 ♂, 20.VII 1985, 2 ♂, pine forest, 24.IX 1989, 1 ♀; Kalinino (NU-1c), personal plot, 9–27.IX 1989, 1 ♂; Dubei (NU-1d), personal plot, 9–27.IX 1989, 1 ♂; Osecheno (PA-3b), dry meadow, 14–28.VII 2007, 1 ♂, MT. **Mogil'ov Prov.:** Nesyata (PV-2c), pine forest, 27.VII 1986, 1 ♂.

**DISTRIBUTION.** Sweden, Finland, United Kingdom, Belgium, the Netherlands, Germany, Poland, Estonia, Latvia, Belarus, Ukraine, Austria, Czechia, Slovakia, Hungary, Switzerland, France, Spain, Portugal, Italy, Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Montenegro, Romania, Russia (northwards to Sankt Petersburg–Kostroma, eastwards Orenburg Prov., Sverdlovsk Prov., Altai Terr., Khakassia, Tuva, Krasnoyarsk Terr., Yakutsk), Turkey, Kazakhstan (except south), Kyrgyzstan, ? Iran (Lelej & Schmid-Egger, 2005; Lelej *et al.*, 2014). In Belarus this species is distributed uniformly in all subzones (Fig. 2).

**HOST.** *Crabro* (*Crabro*) *peltarius* (Schreber, 1784), *Crossocerus* (*Crossocerus*) *p. palmipes* (Linnaeus, 1767), *C. (C.) wesmaeli* (Vander Linden, 1829), *Diodontus tristis* (Vander Linden, 1829), *Oxybelus uniglumis* (Linnaeus, 1758), *Lindenius panzeri* (Vander Linden, 1829), *L. albilabris* (Fabricius, 1793) (Crabronidae) (Bogusch, 2006). The host data recorded by Bogusch (2006) are required the checking, because often it is not reared material. In the Eastern Siberia (Tuva) A. Lelej collected the females of *Myrmosa a. atra* on the mixed colony of bees (several species of *Hylaeus* Fabricius and *Colletes* Latreille (Colletidae)) and small digger wasps (*Diodontus* Curtis and *Crossocerus* Lepeletier de Saint Fargeau et Brullé) (Crabronidae), which may be potential hosts of this species (Lelej *et al.*, 2014).

**BIOTOPICAL PREFERENCE.** This species occurs mainly in open and dry localities. The greatest number of specimens is registered in the personal plots (Fig. 3).

**SEASONAL DYNAMIC.** The males and females are active from June to September (Fig. 4), with the peak of activity in July.

### ***Mutilla europaea* Linnaeus, 1758**

*Mutilla europaea* Linnaeus: Arnold, 1901: 92, ♀ ♂; Lelej, 1978: 79, ♀ ♂; 1985: 160, ♀ ♂; 2002: 42; Shlyakhtenok, 2002: 118; 2013: 60, ♀ ♂.

**MATERIAL EXAMINED.** 13 ♂, 13 ♀ (MT – 4 ♂, 1 ♀; net – 9 ♂, 12 ♀). **PNR:** Khvoensk (NT-3a), pine forest, 27.VIII 1987, 2 ♂, 15.05–15.VI 1993, 1 ♂, 1 ♀, MT,

oak forest, 18.05.1989, 1 ♀; Pererov (NT-3a), personal plot, 28.VIII 1987, 1 ♀. **Brest Prov.:** Pinsk (MT-1c), 2.VIII 1979, 1 ♂ (Lelej). **Vitebsk Prov:** Pukanovka (PB-2b), pine forest, 1.VII 1976, 1 ♀ (Tereshkin); Senno (PA-3a), pine forest, 24.VIII 1989, 1 ♂ (Lakotko); Trudy (PB-3a), pine forest, 12.VI 1993, 1 ♀. **Gomel' Prov.:** Lubnya (PT-3a), wet meadow, 27.VII 2001, 1 ♀ (Rud'ko); Mozyr (PT-3a), dry meadow, 07.VIII 2004, 1 ♂ (Rud'ko). **Grodno Prov.:** Lunno (LV-2a), personal plot, 10.VII 2003, 1 ♂, 2 ♀ (Novik). **Minsk Prov.:** Osecheno (PA-3b), dry meadow, 07–14.IX 2008, 1 ♂, MT; Goncharovka (NV-3a), pine forest, 11.VII 1982, 1 ♀, 24.VIII 1982, 1 ♀, 15.V.1983, 1 ♀ (Tereshkin), 25.VIII 1985, 1 ♂; Ugly (MV-3a), sandpit, 24.VII 1998, 1 ♂, 2 ♀ (Prishchepchik). **Mogil'ov Prov.:** Nesyata (PV-2c), spruce forest, 27.VII 1986, 2 ♂.

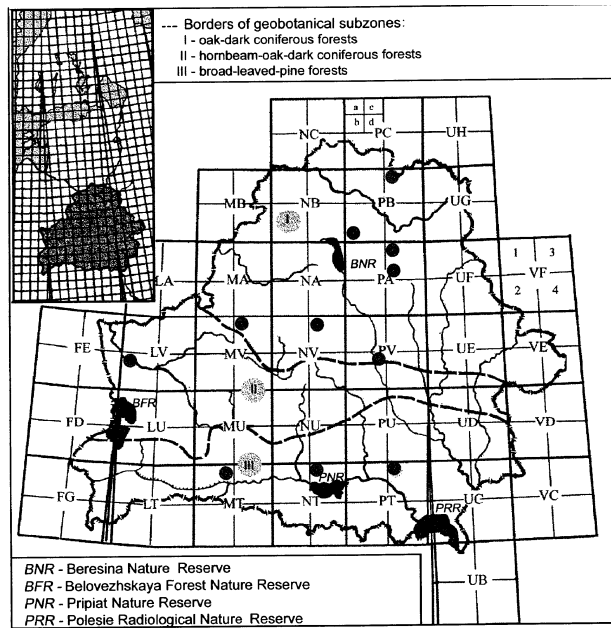


Fig. 5. Distribution of *Mutilla europaea* in Belarus.

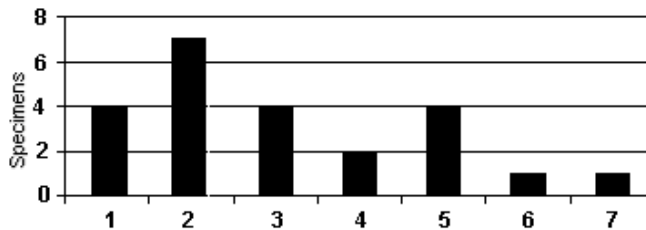


Fig. 6. Biotopical preference of *Mutilla europaea*. 1 – personal plots; 2 – pine forests; 3 – dry meadows; 4 – spruce forests; 5 – raised bogs; 6 – oak forests; 7 – wet meadows.

DISTRIBUTION. Europe: from Sweden and Finland to Spain; Russia (European part, South Ural, Western Siberia); Asia: Kazakhstan, Turkey; North Africa (Lelej & Schmid-Egger, 2005). In Belarus is distributed uniformly in all subzones (Fig. 5).

HOST. Various bumblebees (*Bombus* spp.) and occasionally honey bee (*Apis mellifera* Linnaeus) (Apidae) (Lelej, 1985).

BIOTOPICAL PREFERENCE. This species occurs mainly in open localities. The greatest number of specimens is registered in pine forest (Fig. 6).

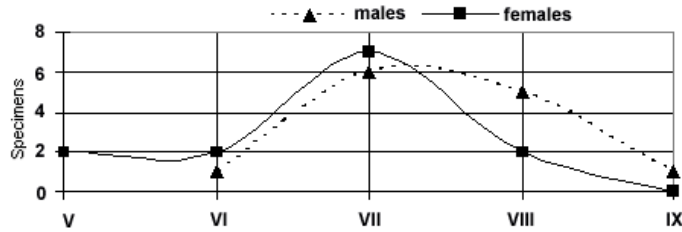


Fig. 7. Seasonal dynamic of *Mutilla europaea*.

SEASONAL DYNAMIC. The females appear in May. The peak of activity in July is related with the period of copulation (Fig. 7). The females overwinter as adults.

REMARKS. Among 13 males collected in Belarus five have totally black body (f. *obscura* Nylander).

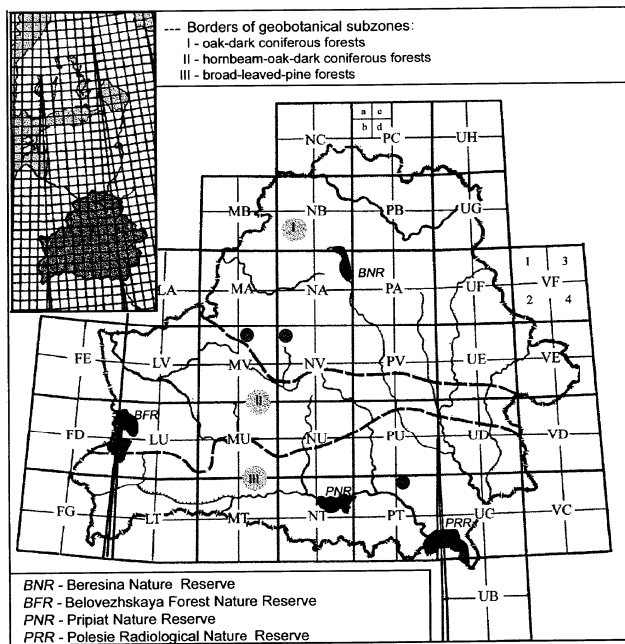


Fig. 8. Distribution of *Mutilla marginata* in Belarus.



### ***Smicromyrme (Smicromyrme) rufipes (Fabricius, 1787)***

*Smicromyrme rufipes* (Fabricius): Arnold, 1901: 92, ♀ ♂; Lelej, 1978: 81, ♀ ♂, 1985: 231, ♀ ♂; 2002: 71; Shlyakhtenok, 2002: 118; 2013: 61, ♀ ♂.

**MATERIAL EXAMINED.** 68 ♂, 22 ♀ (MT – 44 ♂, 2 ♀; net – 26 ♂, 20 ♀). **BNR:** Postrezh'ye (NA-3d), sandy road, 11–25.VI 1986, 6 ♂, 25.07–9.VII 1986, 2 ♂, 6–20.VIII 1986, 2 ♀, MT, 17.VII 1984, 3 ♂, 2 ♀, 11.VI 1986, 5 ♂, 5.VII 1986, 1 ♂, 2 ♀, 6.VII 1986, 1 ♂; Domzheritsy (NA-3c), dry meadow, 15–21.VII 1985, 1 ♂, MT; pine forest, 8.VI 1986, 1 ♂. **PNR:** Khvoensk (NT-3a), sandy bank of Pripyat River, 7.VI 1988, 2 ♀, 10.VI 1998, 1 ♂, personal plot, 7.VI 1999, 3 ♂, 1 ♀ (Prishchepchik); Khlupin (NT-3c), oak forest, 8.VI 1988, 1 ♂. **PRR:** Dron'ki (PT-4c): personal plot, 19.VI–24.VII 1990, 12 ♂, 24.VII–28.VIII 1990, 2 ♂, 15.VI–3.VIII 1995, 1 ♂, 7.VI–24.VII 1996, 1 ♂, 29.VI–5.X 1994, 1 ♂; Orevichi (PT-4c), pine forest, 24.VII–28.VIII 1990, 3 ♂, personal plot, 18.VI–23.VII 1991, 1 ♂; Krasnosel'ye (PT-4d), sandy bank of Pripyat River, 19.VI–24.VII 1990, 6 ♂, 24.VII–28.VIII 1990, 2 ♂; personal plot, 20.IV–25.V 1993, 1 ♂, MT. **Brest Prov.:** Druzhilovichi (LU-4d), personal plot, 10.VI–15.VII 2007, 2 ♂, MT; Yuzefin (LU-1d), dry meadow, 24.VII 1984, 1 ♂; Molchad' (MV-2b), pine forest, 28.VI 1988, 1 ♂, dry meadow, 5.IX 1988, 1 ♀. Pinsk (MT-1c), 2.VIII 1979, 1 ♀ (Lelej). **Vitebsk Prov.:** Ust'ye (NC-4b), personal plot, 3.VII 1987, 1 ♀; Perevoz (PC-4b), pine forest, 16.VII 2006, 1 ♂. **Gomel' Prov.:** Loev (UC-1d), sandpit, 21.VI 1989, 1 ♂, 1 ♀; Krupeiki (UC-1d), pine forest, 21.VI 1989, 1 ♂, 1 ♀, wet meadow, 21.VI 1989, 1 ♂, 1 ♀. **Grodno Prov.:** Smorgon' (MA-4a), dry meadow, 11.VI 1999, 3 ♂. **Minsk Prov.:** Bol'shoye Stiklevo (NV-1c), pine forest, 18.VII 1987, 1 ♂, pine forest, 20.VIII 1996, 1 ♀; Osecheno (PA-3b), pine forest, 16.VII 1988, 2 ♀, 5.VI 1989, 1 ♂, 1 ♀, 22.VI 1990, 1 ♂, 24.VI 2009, 3 ♀; Minsk (NV-1c), personal plot, 19.VII 2003, 1 ♀.

**DISTRIBUTION.** Spain (north), France, Italy (north), Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Montenegro, Switzerland, Austria, Germany, Hungary, Czechia, Slovakia, Ukraine, Belarus, Lithuania, Latvia, Estonia, Sweden, Finland, Great Britain, Russia (European part, South Ural, Altai, Yakutsk), Kazakhstan, Turkey (Lelej & Schmid-Egger, 2005). In Belarus is distributed uniformly in all subzones (Fig. 9).

**HOST.** The digger wasps *Tachysphex* Kohl, 1883, *Oxybelus uniglumis* (Linnaeus, 1758), *O. bipunctatus* Olivier, 1811, *Miscophus spurius* (Dahlbom, 1832) (Crabronidae), and bees from genera *Halictus* Latreille, 1802 (Halictidae) and *Andrena* Fabricius, 1775 (Andrenidae) (Bogusch, 2006). The host data recorded by Bogusch (2006) are required the checking, because often it is not reared material or belong to misidentified species of *Smicromyrme* Thomson.

**BIOTOPICAL PREFERENCE.** This species occurs in open dry areas, mainly in personal plots (pic. 10).

**SEASONAL DYNAMIC.** The males and females are active from May to September, with the peak of activity in June-July (Fig. 11).

**REMARKS.** Among 68 males collected in Belarus 66 have totally black body (f. *nigra* Rossi).

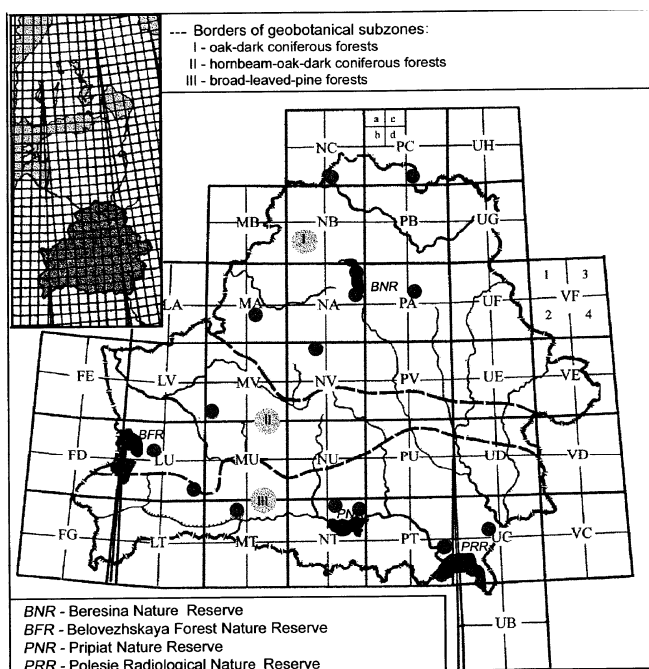


Fig. 9. Distribution of *Smicromyrme rufipes* in Belarus.

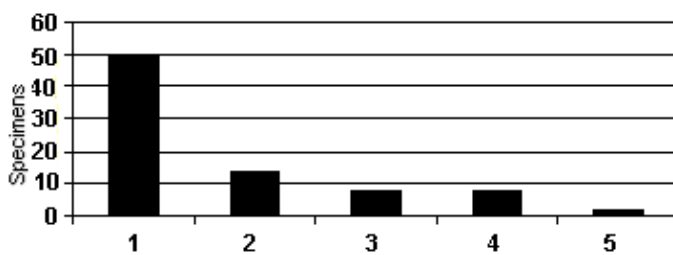


Fig. 10. Biotopical preference of *Smicromyrme rufipes*. 1 – personal plots; 2 – pine forests; 3 – dry meadows; 4 – spruce forests; 5 – upland swamps.

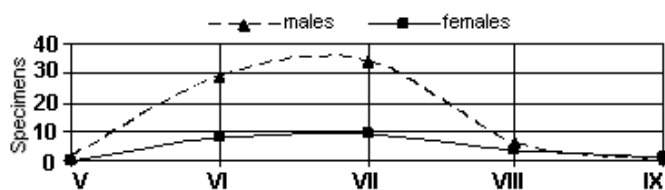


Fig. 11. Seasonal dynamic of *Smicromyrme rufipes*.

Table 1. Taxa of Mutillidae distributed in Russia (North European territory, NT; Central European territory, CT; South European territory, ST; Crimea, CR), Belarus (BE), Ukraine (U), Poland (PL), Lithuania (LI), Latvia (LA), and Estonia (ES)

No.	species/subspecies	BE	NT	CT	ST	CR	U	PL	LI	LA	ES
<b>Myrmosinae</b>											
1.	<i>Krombeinella longicollis</i> (Tourmier, 1889)	-	-	-	+	+	+	-	-	-	-
2.	<i>Krombeinella wolffi</i> (Invrea, 1963)	-	-	-	+	+	+	-	-	-	-
3.	<i>Myrmosa a. atra</i> Panzer, 1801	+	+	+	+	+	+	+	+	+	+
4.	<i>Paramyrmosa brunnipes</i> (Lepeletier, 1845)	-	-	+	+	+	+	+	-	-	-
<b>Kudakrumiinae</b>											
5.	<i>Pseudomyrmosa minuta</i> (Morawitz, 1894)	-	-	-	+	-	-	-	-	-	-
<b>Myrmillinae</b>											
6.	<i>Myrmilla</i> (s. str.) <i>caucasica</i> (Kolenati, 1846)	-	-	-	+	+	+	-	-	-	-
7.	<i>Myrmilla</i> (s. str.) <i>lezginica</i> (Radoszkowski, 1885)	-	-	-	+	+	-	-	-	-	-
8.	<i>Myrmilla</i> ( <i>Pseudomutilla</i> ) <i>glabrata</i> (Fabricius, 1775)	-	-	-	+	+	+	-	-	-	-
9.	<i>Myrmilla</i> ( <i>Pseudomutilla</i> ) <i>meda</i> Skorikov, 1927	-	-	-	+	-	-	-	-	-	-
10.	<i>Myrmilla</i> ( <i>Pseudomutilla</i> ) <i>skorikovi</i> Lelej, 1985	-	-	-	+	-	-	-	-	-	-
11.	<i>Myrmilla</i> ( <i>Pseudomutilla</i> ) <i>vutshetitshi</i> Skor., 1927	-	-	-	-	+	+	-	-	-	-
<b>Mutillinae–Mutillini</b>											
12.	<i>Ctenotilla caeca</i> (Radoszkowski, 1879)	-	-	-	-	+	-	-	-	-	-
13.	<i>Mutilla europaea</i> Linnaeus, 1758	+	+	+	+	+	+	+	+	+	+
14.	<i>Mutilla marginata</i> Baer, 1848	+	+	+	+	+	+	+	-	-	-
15.	<i>Mutilla quinqueaculata</i> Cyrillo, 1787	-	-	-	-	+	-	-	-	-	-
16.	<i>Mutilla saltensis</i> Radoszkowski, 1885	-	-	-	+	-	-	-	-	-	-
17.	<i>Ronisia b. brutia</i> (Petagna, 1787)	-	-	-	+	+	+	-	-	-	-
18.	<i>Tropidotilla grisescens</i> (Lepeletier, 1845)	-	-	-	-	+	-	-	-	-	-
19.	<i>Tropidotilla litoralis</i> (Petagna, 1787)	-	-	-	+	+	+	-	-	-	-
20.	<i>Tropidotilla sareptana</i> (André, 1901)	-	-	-	+	-	-	-	-	-	-
<b>Mutillini–Smicromyrmini</b>											
21.	<i>Nemka v. viduata</i> (Pallas, 1773)	-	-	-	+	+	+	-	-	-	-
22.	<i>Physetopoda cingulata</i> (Costa, 1858)	-	-	-	+	-	-	-	-	-	-
23.	<i>Physetopoda daghestanica</i> (Radoszkowski, 1885)	-	-	-	+	+	+	-	-	-	-
24.	<i>Physetopoda halensis</i> (Fabricius, 1787)	-	-	-	+	+	+	+	-	-	-
25.	<i>Physetopoda portschinskii</i> (Radoszkowski, 1888)	-	-	-	+	-	-	-	-	-	-
26.	<i>Physetopoda similis</i> (Lelej, 1984)	-	-	-	-	+	-	-	-	-	-
27.	<i>Physetopoda turgajensis</i> (Lelej, 1984)	-	-	-	+	-	-	-	-	-	-
28.	<i>Skorikovia elongata</i> (Radoszkowski, 1885)	-	-	-	+	-	-	-	-	-	-
29.	<i>Skorikovia pliginskiji</i> (Lelej, 1984)	-	-	-	+	+	-	-	-	-	-
30.	<i>Skorikovia radoszkovskii</i> (Skorikov, 1935)	-	-	-	+	-	-	-	-	-	-
31.	<i>Smicromyrme</i> ( <i>Astomyrme</i> ) <i>ausonius</i> Invrea, 1950	-	-	-	+	+	-	-	-	-	-
32.	<i>Smicromyrme</i> ( <i>Eremotilla</i> ) <i>nigriceps</i> Nonv., 1959	-	-	-	+	+	-	-	-	-	-
33.	<i>Smicromyrme</i> ( <i>Eremotilla</i> ) <i>nonveilleri</i> Invrea, 1954	-	-	-	+	+	+	-	-	-	-
34.	<i>Smicromyrme</i> ( <i>Eremotilla</i> ) <i>schwarzi</i> Suárez, 1975	-	-	-	-	+	+	-	-	-	-
35.	<i>Smicromyrme</i> ( <i>Eremotilla</i> ) <i>triangularis</i> (Rad. 1865)	-	-	-	+	+	+	-	-	-	-
36.	<i>Smicromyrme</i> ( <i>Erimyrme</i> ) <i>sicanus</i> (De Stefani 1887)	-	-	-	+	+	+	-	-	-	-
37.	<i>Smicromyrme</i> ( <i>Erimyrme</i> ) <i>stepposus</i> Lelej, 1984	-	-	-	+	+	-	-	-	-	-
38.	<i>Smicromyrme</i> (s.str.) <i>r. ruficollis</i> (Fabricius, 1793)	-	-	-	+	+	+	-	-	-	-
39.	<i>Smicromyrme</i> (s.str.) <i>rufipes</i> (Fabricius, 1787)	+	+	+	+	+	+	+	+	+	+
40.	<i>Smicromyrme</i> (s.str.) <i>tristis</i> Lelej, 1984	-	-	-	-	+	+	-	-	-	-
41.	<i>Smicromyrme</i> (s.str.) <i>viktorovi</i> Lelej, 1984	-	-	-	+	-	-	-	-	-	-
<b>Mutillinae–Trogaspidini</b>											
42.	<i>Trogaspidia catanensis</i> (Rossi, 1794)	-	-	-	+	+	-	-	-	-	-

Table 1. Continue

No.	species/subspecies	BE	NT	CT	ST	CR	U	PL	LI	LA	ES
<b>Sphaerophthalminae</b>											
43.	<i>Cystomutilla ruficeps</i> (Smith, 1855)	-	-	-	+	+	+	-	-	-	-
<b>Dasylabrinae</b>											
44.	<i>Dasylabris</i> ( <i>Baltilla</i> ) <i>adversa</i> Skorikov, 1935	-	-	-	+	-	+	-	-	-	-
45.	<i>Dasylabris</i> ( <i>Baltilla</i> ) <i>bicolor</i> (Pallas, 1771)	-	-	-	+	-	-	-	-	-	-
46.	<i>Dasylabris</i> ( <i>Craspedopyga</i> ) <i>m. manderstiernii</i> (Radoszkowski, 1865)	-	-	-	+	+	-	-	-	-	-
47a.	<i>Dasylabris</i> (s. str.) <i>m. maura</i> (Linnaeus, 1758)	-	-	-	-	+	-	+	-	-	-
47b.	<i>Dasylabris</i> (s. str.) <i>m. maura sungora</i> (Pallas, 1773)	-	-	-	+	-	+	-	-	-	-
47c.	<i>Dasylabris</i> (s. str.) <i>m. armeniaca</i> (Kolenati, 1846)	-	-	-	+	-	-	-	-	-	-
48.	<i>Dasylabris</i> ( <i>Inbaltilla</i> ) <i>regalis</i> (Fabricius 1793)	-	-	-	+	-	+	-	-	-	-
49.	<i>Dasylabris</i> ( <i>Inbaltilla</i> ) <i>miogramma</i> Skorikov, 1935	-	-	-	+	+	+	-	-	-	-
<b>Total species</b>		<b>4</b>	<b>4</b>	<b>5</b>	<b>42</b>	<b>35</b>	<b>26</b>	<b>7</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Total genera</b>		<b>3</b>	<b>3</b>	<b>4</b>	<b>15</b>	<b>15</b>	<b>12</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>3</b>

### ANALYSIS OF THE FAUNA OF EASTERN EUROPEAN COUNTRIES

The mutillid fauna of Eastern Europe comprises by 49 species in 15 genera. The distribution of the taxa by countries see Table 1. Because of mutillid wasps are thermophilic group the number of species dramatically reduced from south to north. South European territory of Russia habits 42 species in 15 genera, while Baltic countries (Lithuania, Latvia and Estonia) only 3 widely distributed species in three genera (Fig. 12).

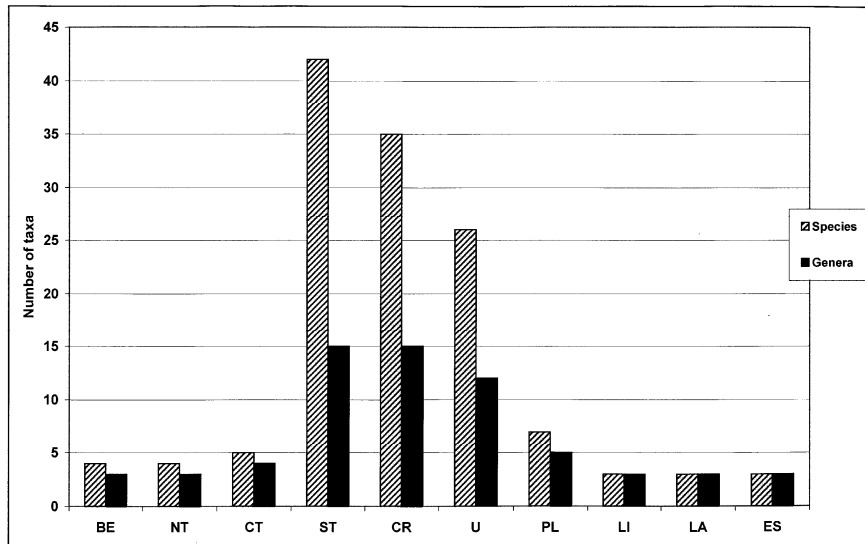


Fig. 12. Number of genera and species of Mutillidae in Eastern European countries. The abbreviations of countries and regions see Table 1.

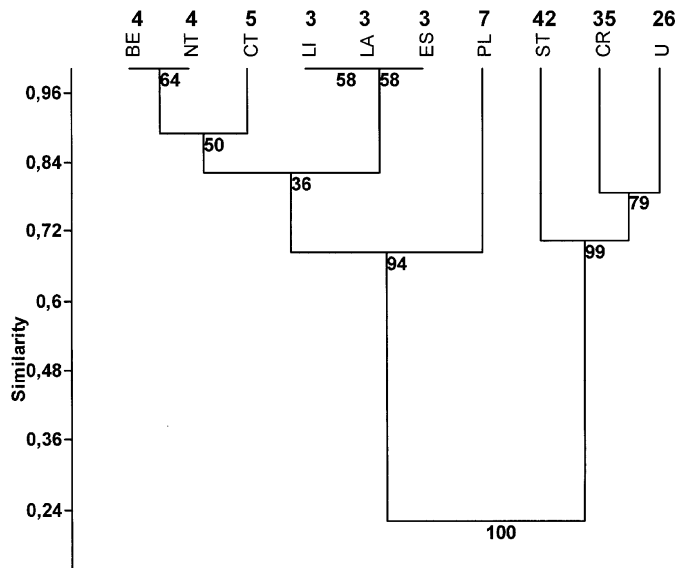


Fig. 13. Similarity of mutillid fauna of Eastern European countries. Method UPGMA, Sorensen's coefficient ( $r = 0,99$ ). Bootstrap probabilities (expressed in percentages) are indicated at node of each cluster. The abbreviations of countries and regions see Table 1. The number of species is given above the abbreviation of countries.

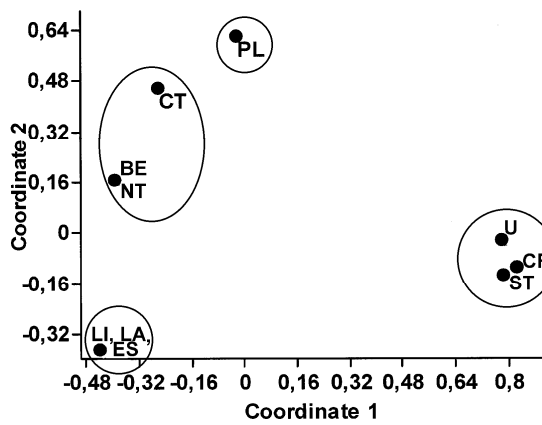


Fig. 14. Ordination of mutillid fauna of Eastern European countries in the reduced space of two principal coordinates. The abbreviations of countries and regions see Table 1.

The cluster analysis of faunal similarities among the four European regions of Russia (North, Central and South European territory, Crimea), Belarus, Ukraine, Poland, Lithuania, Latvia, and Estonia produce two major clusters (index similarity

0.24; Fig. 13): 1) South European territory of Russia, Crimea and Ukraine (index similarity 0.7, bootstrap probability 99 %) and 2) North and Central European territories of Russia, Belarus, Poland, Lithuania, Latvia, and Estonia (with the same index similarity, bootstrap probability 94 %). The UPGMA cluster analysis demonstrates the important boundary between large biogeographical subregions: steppe zone and zone of nemoral forest of Euro-Siberian subregion of the Palaearctic (the division of Palaearctic follows Semenov-Tian-Shanskij, 1935).

The ordination of mutillid fauna in the Eastern European countries (Fig. 14) showed the trend which reflects the latitudinal differences between the faunas of steppe and nemoral forest zones of Eastern Europe.

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