

Species composition and zoogeography of the rove beetles (Coleoptera: Staphylinidae) of raised bogs of Belarus

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Abstract. A review of Staphylinidae known from peat bogs of Belarus is presented with data on their distribution at various sites. The staphylinid fauna, as reported here, includes 66 species, 33 genera, and 10 subfamilies. The results showed a low species richness of rove beetles and a high occurrence of a small number of species. The regional zoogeography and composition of rove beetles in the Belarusian peat bogs are examined, and species are grouped in five main zoogeographical complexes and 7 chorotypes, reflecting their distribution. Most species had a European (26.15 %), Holarctic (21.53 %) and also Sibero-European (18.46 %) distribution. The Belarusian peat bogs are important ecosystems for survival of boreal species, including cold adapted beetles occurring in more southern latitudes. These include specialized inhabitants of peat bogs: *Ischnosoma bergrothii*, *Gymnusa brevicornis*, *Euaesthetus laeviusculus* and *Atheta arctica*. The high proportion of boreal and boreo-montane species in the recent Belarusian peat bogs fauna clearly reflects its great proximity to cold habitats.

Key words: Coleoptera, Staphylinidae, geographic range, raised bogs, Belarus.

Introduction

Bogs are peat lands with a high water table and low levels of nutrients (oligotrophic); they are always acidic and dominated by *Sphagnum* mosses. Bogs also bear a number of characteristic ericaceous plants, such as species of *Vaccinium*. Most bogs include patches of sedge (*Carex* sp.), and dwarf shrubs, or certain trees, which are often stunted. Raised bogs are an important element of landscapes south of the tree line between the estimated latitudes 50° and 70° N, where they contain arctic and subarctic plants and specific invertebrates. In this zone, peat bogs are usually fragmented into habitat islands. The isolation of these bog islands is important for entomological research, as emphasized by Spitzer & Danks 2006. Environmental factors that influence the life of ground arthropods are, amongst others, pronounced high amplitude of daily temperatures because of direct insulations and very low pH values as a result of the cation exchange capacity of the *Sphagnum* moss. Owing to these conditions, peat bogs are inhabited by a specialized fauna called tyrphobionts (Peus 1928). Some are presumably relicts from early post-glacial times. As a result, peat bogs in southern boreal and temperate zones form isolated and discrete patches of "edaphic forest tundra" and so are azonal or extrazonal ecosystems relative to the surroundings (Spitzer & Danks 2006). The Belarusian territory belongs to

the Central-East European forest zone and mixed forest zone. The north-western part of Belarus is called Lake District, and it is the region where the majority of raised bogs is located (185 400 ha). The peat bogs were formed after the last glacial period (Yakushko 1971). The postglacial Holocene histories and geographical positions of particular bogs are reflected in the specific composition of their insect assemblages (Sushko 2014). They have high conservation value for subarctic and boreal biota, including cold-adapted species of insects and glacial relicts in Central Europe (Sushko 2014). In the context of global warming, a more determined attempt to evaluate the fauna and its need for conservation is required. Raised bogs in Central Europe are heavily degraded as a consequence of peat cutting, agricultural activities, and drainage. Only few remnants in near-natural conditions remain in this geographical region. Furthermore, the bog remnants are strongly fragmented and isolated. However, five countries of Central Europe, including Belarus, have maintained more than 50% of their peatlands in a relatively natural condition. Most other countries have lost between 70% and 99% of their natural peatland systems. In total, 68.8% of Belarusian wetlands are protected areas (Joosten 1994, Paavilainen & Päivanen 1995, Succow 2000, Bragg et al. 2003, Kozulin et al. 2005). Therefore, study of the biodiversity of natural raised bogs is very important.

Staphylinids (Coleoptera: Staphylinidae) are

one of the largest families of beetles with more than 55,440 species described worldwide (Grebennikov & Newton 2009), and, thus, might give more information about biodiversity than any other arthropod group. The majority of staphylinids is known as non-specific predators, feeding on various soil arthropods such as nematodes, mites, Collembola, etc. Some species of Oxytelinae feed on various organic substances. Species of the genus *Bledius* feed on algae. Species of the large genus *Eusphalerum*, which feed on pollen, are trophic specialists. It is evident that many staphylinid species are mycetophagous (Newton 1984, Boháč 1999). Many staphylinids are living in nests of small mammals. Myrmecophilous and termitophilous staphylinids are highly specialized groups of predators eating ants and termites, respectively, or saprophages living on waste in or near ant or termite hills. Some members of the genus *Aleochara* are known to be parasitoids of fly puparia (Fuldner 1960, Klimaszewski 1984, Balog et al. 2008).

Staphylinid beetles in the Palaearctic region are found in all terrestrial habitats and in tidal zones of seas, with species representing many different trophic affiliations. About half of species live in the litter and form an important part of the edaphon (Tikhomirova 1973, Harde & Lohse 1974, Laszlo 1983, Boháč 1993, Boháč 2007). Rove beetles are recognised as important components of agroecosystems and are best known for their contribution to biological control as predators of arthropod pests (Balog & Markó 2007, Balog et al. 2008, Balog et al. 2009, Balog et al. 2010, Balog et al. 2011, Pálinkás et al. 2015).

In the Belarusian fauna, approximately 710 species are known (Alexandrovich et al. 1996). Its representatives occur in a broad range of habitats and show diverse trophic specializations. Staphylinid and carabid beetles are sensitive to changes in the environment, and react quickly to increasing management intensity (Khotko 1993, Haila et al. 1994, Lindenmayer et al. 2000, Derunkov 2000). Staphylinid diversity not only informs about the abiotic heterogeneity of the habitat, but also about the heterogeneity produced by animal species. Moreover, species composition may well reflect peat bog history and ecological condition. Unfortunately knowledge of their species composition in peat bogs is sparse. Very few papers so far have been dedicated to the rove beetles of peat bogs. Information on peat bog Staphylinidae can be found in Peus 1928, Skwarra 1929, Rabeler 1931, Roubal 1934, Maavara 1957,

Mossakowski 1971, Mossakowski et al. 2003, Dapkus & Tamutis 2008, Spungis 2008, and Sushko 2012. The aim of the current work is to investigate the species composition of the rove beetles of pristine natural peat bogs in Belarus and to provide biogeographical analysis.

Material and methods

The research was carried out between 1999 and 2014. My research was based on data from 12 raised bogs (Fig. 1) in western, northwestern and northern Belarus (Belarusian



Figure 1. Study area and location of sampling points.

Lake District). There were six main types of study sites: 1) lagg zone at the bog margin (*Eriophorum vaginatum* – *Sphagnum angustifolium*); 2) pine bog (*Pinus sylvestris* – *Eriophorum vaginatum* – *Ledum palustre* – *S. magellanicum* + *S. angustifolium*); 3) hummock-hollow complex (*Rhynchospora alba* – *Sphagnum cuspidatum*); 4) hummock-hollow complex (*Eriophorum vaginatum* – *Oxycoccus palustris* + *Andromeda polifolia* + *Ledum palustre* – *Sphagnum magellanicum* + *S. angustifolium* + *S. fuscum*); 5) dome (*Eriophorum vaginatum* – *Calluna vulgaris* + *Ledum palustre* – *Sphagnum fuscum* + *S. magellanicum*); 6) burned bogs (*Betula pubescens* – *Calluna vulgaris* – *Polytrichum strictum* and *Eriophorum vaginatum* – *Calluna vulgaris* – *Polytrichum strictum*). Staphylinid beetles were collected annually using pitfall traps from the end of April to the beginning of October. During this period, beetles were extracted from the traps twice a month. Plastic cups with an opening diameter of 72 mm and a volume of 250 ml were used as pitfall traps. A 4% formaldehyde water solution was used as a fixation liquid. The subfamilies and genera are listed according to the Catalog of the Staphylinidae (Herman & Smetana 2001). Most common synonyms and subspecies names are included, especially the names used in the Belarusian monograph (Alexandrovich et al. 1996). The species general distribution was analyzed according to Löbl &

Smetana 2004, Herman & Smetana 2001, Khotko 1993, website <http://coleoptera.ksib.pl>. The classification of chorotypes follows the one suggested by Taglianti et al. 1999. Abbreviations of chorotypes are as follows: HOL – Holarctic, PAL – Palearctic, ASE – Asiatic-European, WCPA – West-Central-Palearctic, WPA – West-Palearctic, SIE – Sibero-European, EUR – European.

Results

Species composition

Total recorded were 10 subfamilies, 33 genera and 66 species of staphylinid beetles (Table 1). The staphylinid fauna of the raised bogs represents approximately 9.3% of the known fauna of the Republic of Belarus. Three subfamilies with the highest number of genera and species are Aleocharinae, Staphylininae and Tachyporinae.

Table 1. Number of genera and species of staphylinid beetles recorded from the raised bogs of Belarus.

Subfamilies	Genera	Species
Omalinae	2	2
Pselaphinae	1	1
Tachyporinae	6	15
Aleocharinae	8	12
Scaphidiinae	1	1
Oxytelinae	1	1
Steninae	1	3
Euaesthetinae	1	1
Paederinae	2	4
Staphylininae	10	26
Total	33	66

Zoogeographical composition

According to their current distribution, the identified species known from the Belarusian peat bogs can be classified in 7 chorotypes (HOL, PAL, ASE, WCPA, SIE, WPA and EUR), and grouped into five zoogeographical complexes (Holarctic, Palearctic, Asiatic-European, West-Central-Palearctic and West-Palearctic) (Fig. 2). The complexes of the Palearctic species are in accordance with the maps of Gorodkov 1974. The distribution analysis of the rove beetles in the peat bogs reveals that the range of chorotypes is rather wide. Most collected species had a European (26.15 %), Holarctic (21.53 %) and also Sibero-European (18.46 %) distribution pattern. Other species were distributed in Eurasia and North Africa (12.30 %), Europe and North Africa (12.30 %), Eurasia (6.15 %) and West-Central part of Palearctic (3.07 %) (Fig. 3). By the latitudinal component of the range, the staphylinid complex includes especially wide-

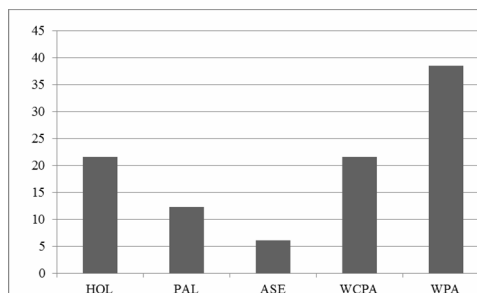


Figure 2. Zoogeographical complexes in the rove beetle fauna of raised bogs in Belarus.

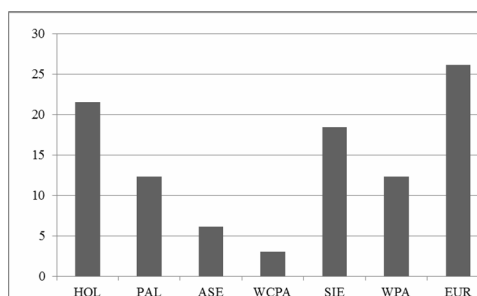


Figure 3. Chorotypes in the rove beetle fauna of raised bogs in Belarus.

spread species associated with the tundra and taiga zones and high-altitude zones of mountains. These included Sibero-European species and also European species such as *Philonthus furcifer*, *Ph. spinipes*, *Gyrohypnus atratus*. In the Holarctic group, some of the species are characterized as circum-boreal. It is *Philonthus atratus*, *Ph. cognatus*, *Omalium caesum*, *Acidota crenata*, *Bolitobius analis*, *Tachyporus chrysolinus*, *Tachinus rufipes*, *Gymnusa brevicornis*. The high proportion of boreal and boreo-mountain species, in recent Belarusian peat bogs fauna, clearly reflect its great affiliation to cold environments. Some are presumably relict from early post-glacial times.

Species review

Staphylinidae Latreille, 1802

Omalinae MacLeay, 1825

Omalini MacLeay, 1825

Omalium Gravenhorst, 1802

Omalium caesum Gravenhorst, 1806

Remarks: Rare species. It occurs in open bogs with *Carex sp.* and *Eriophorum vaginatum*. The species is known from peat bogs of Finland (Renkonen 1938) and the Czech Republic (Roubal 1934).

Distribution: HOL.

Acidota Stephens, 1829

Acidota crenata (Fabricius, 1792)

Remarks: These species were recorded constantly in low numbers, in open bog habitats. It is known from peat bogs of Finland (Renkonnen 1938), Poland (<http://coleoptera.ksib.pl>), the Czech Republic (Roubal 1934), Germany (Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Lithuania (Dapkus & Tamutis 2008), Estonia (Maavara 1957), and Kaliningrad region (Russia) (Skwarra 1929).

Distribution: HOL.

Pselaphinae Latreille, 1802

Brachyglutini Raffray, 1904

Rybaxis Saulcy, 1876

Rybaxis longicornis (Leach, 1815)

Remarks: Very rare with only one record from the hummock.

Distribution: WPA.

Tachyporinae MacLeay 1825

Mycetoporini Thomson, 1859 = **Bolitobiini** Horn, 1877

Ischnosoma Stephens, 1829

Ischnosoma bergrothi Hellen, 1925

Remarks: This tyrphophilous species was recorded to have constantly low numbers in the open bog habitats and pine bogs. It is distributed in peat bogs and heath in Poland (<http://coleoptera.ksib.pl>), Germany (Mossakowski 1971), Latvia (Spungis 2008), Estonia (Mossakowski et al. 2003), and Finland (Renkonnen 1938).

Distribution: SIE.

Ischnosoma lonngicornis Maklin, 1847

Remarks: This species was low in abundance in open habitats and in the burned bog. The data were from peat bogs of Finland (Renkonnen 1938), Latvia, Estonia, and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: WCPA.

Ischnosoma splendidum (Gravenhorst, 1806)

Remarks: These are the common species in open and pine bogs. The eurybiontic species has been mainly recorded from heath lands and raised bogs of Finland (Renkonnen 1938), Poland (<http://coleoptera.ksib.pl>), Germany (Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Estonia (Maavara 1957, Mossakowski et al. 2003), and Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: PAL.

Bolitobius Leach, 1819 = *Bryocharis* Lacordaire, 1835

Bolitobius castaneus (Stephens, 1832) = *analis* auct. nec (Fabricius, 1787)

Remarks: It constantly occurs in a low abundance in pine and burned bogs. The species is known from peat bogs of Germany (Peus 1928, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Estonia (Maavara 1957), Finland (Renkonnen 1938), and Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: HOL.

Parabolitobius Li, Zhao & Sakai, 2000

Parabolitobius formosus (Gravenhorst, 1806)

Remarks: This rare species was recorded only from the burned bog. It is known from the peat bogs of Latvia (Mossakowski et al. 2003, Spungis 2008), and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: EUR.

Parabolitobius inclinans (Gravenhorst, 1806)

Remarks: This rare species was collected from pine and burned bogs.

Distribution: WPA.

Tachyporini MacLeay, 1825

Sepedophilus Gistel, 1856 = *Conosoma* auct. nec Kraatz, 1857

Sepedophilus pedicularius (Gravenhorst, 1802)

Remarks: This eurybiontic species was widely distributed but not abundant on the hummocks with dwarf shrubs. It has been recorded from peat bogs of Germany (Rabeler 1931) and Finland (Renkonnen 1938).

Distribution: PAL.

Sepedophilus testaceus (Fabricius, 1792)

Remarks: It constantly occurred in low abundance in the open bogs with dwarf shrubs, in the open bogs with cotton grass, and in the burned bog. The species has been recorded from the peat bogs of Finland (Renkonnen 1938).

Distribution: HOL.

Tachyporus Gravenhorst, 1802

Tachyporus chrysomelinus (Linnaeus, 1758)

Remarks: Widespread, but certainly not abundant in the open bogs with dwarf shrubs, in the pine bogs and in the burned birch bog. The species is known from peat bogs of Germany (Peus 1928, Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Kaliningrad region (Russia) (Skwarra 1929), Finland (Renkonnen 1938), and the Czech Republic (Roubal 1934).

Distribution: HOL.

Tachyporus hypnorum (Fabricius, 1775)

Remarks: This is a common species collected

in all habitats. It is known to appear in peat bogs from Germany (Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Estonia (Maavara 1957), Finland (Renkonnen 1938), Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003), and the Czech Republic (Roubal 1934).

Distribution: PAL.

Tachyporus nitidulus (Fabricius, 1781)

Remarks: This is a rare species recorded from open bogs. It is known from peat bogs of the Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003) and Latvia (Mossakowski et al. 2003, Spungis 2008).

Distribution: HOL.

Tachyporus pusillus Gravenhorst, 1806. = *macrop-terus* Stephens, 1832

Remarks: Widely distributed, but not abundant in open bogs with dwarf shrubs. This species is known from the peat bogs of Estonia (Maavara 1957).

Distribution: ASE.

Tachinus Gravenhorst, 1802

Tachinus laticollis Gravenhorst, 1802

Remarks: This rare species is collected from open bogs with dwarf shrubs. Known from peat bogs of Germany (Rabeler 1931), Finland (Renkonnen 1938), and the Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: SIE.

Tachinus schneideri Luze, 1900

Remarks: Very rare species, which is collected only from open bog with dwarf shrubs (Sushko et al. 2008).

Distribution: SIE.

Tachinus signatus Gravenhorst, 1802 = *rufipes* auct. nec (Linnaeus, 1758)

Remarks: Common species in the open bogs. It is known from peat bogs of Germany (Rabeler 1931), the Czech Republic (Roubal 1934), and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: HOL.

Aleocharinae Fleming, 1821

Aleocharini Fleming, 1821

Aleochara Gravenhorst, 1802

Aleochara bipustulata (Linnaeus, 1761)

Remarks: This eurybiontic species is very rare and collected only from pine bogs. It has been recorded from the peat bogs of Finland (Renkonnen 1938).

Distribution: HOL.

Oxypodini Thomson 1859

Oxyroda Mannerheim, 1830

Oxyroda funebris Kraatz, 1856 = *laticollis* (Thomson, 1871)

Remarks: Very rare species recorded in pine bogs (Sushko et al. 2008). It is known from peat bogs of Finland (Renkonnen 1938).

Distribution: EUR.

Phloeopora Erichson, 1837 = *Phloedroma* Kraatz, 1856

Phloeopora concolor (Kraatz, 1856)

Remarks: This very rare species was collected in open bog (Sushko et al. 2008).

Distribution: EUR.

Athetini Casey, 1910

Atheta Thomson, 1858

Atheta aeneicollis (Scharp, 1869) = *pertyi* auct. nec (Heer, 1839)

Remarks: Very rare species that was recorded from open bog with dwarf shrubs (Sushko et al. 2008).

Distribution: WPA.

Atheta arctica (Thomson, 1856)

Remarks: A rare species that has been collected from open bogs (Sushko et al. 2008). It prefers peat bogs (tyrphophil) (Freude et al. 1974). In Poland, *Atheta arctica* occurs also in forests and coastal dunes (<http://coleoptera.ksib.pl>). In Russia (Moscow region), it has been reported by Semenov (2007) from mesotrophic bogs and fens.

Distribution: SIE.

Atheta fungii (Gravenhorst, 1806)

Remarks: Very rare species. It was collected in the pine bog. Known from peat bogs of Germany (Mossakowski 1971), Finland (Renkonnen 1938), and Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: HOL.

Atheta strandiella Brundin, 1954

Remarks: It is a rare species collected in open bogs (Sushko et al. 2008). The species has been mainly recorded in Sphagnum bogs, but occurred in carrion (Freude et al. 1974). It is known from the peat bogs of Latvia and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: EUR.

Lomechusini Fleming, 1821 = *Myrmedoniini* Thomson, 1867

Drusilla Leach, 1819 = *Astilbus* Dillwyn, 1829

Drusila canaliculata (Fabricius, 1787)

Remarks: The most common species in all habitats. This species is known from peat bogs of Germany (Peus 1928, Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis

2008), Lithuania (Dapkus & Tamutis 2008), Estonia (Mossakowski et al. 2003, Maavara 1957), Finland (Renkonnen 1938), and the Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: ASE.

Zyras Stephens, 1835

Zyras cognatus (Märkel, 1842)

Remarks: Widely distributed, but not abundant in the open bogs with dwarf shrubs and burned sites. The species has been recorded from peat bogs of Germany, Latvia, Estonia, and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: EUR.

Zyras collaris (Paykull, 1800)

Remarks: Constantly occurred in a low abundance in open bogs. The species is known from peat bogs of Germany (Peus 1928, Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Estonia (Maavara 1957, Mossakowski et al. 2003), and Finland (Renkonnen 1938).

Distribution: WPA.

Homolotini Heer, 1839

Bolitochara Mannerheim, 1830

Bolitochara pulchra (Gravenhorst, 1806)

Remarks: Very rare species. It was collected in the open bog. This species has been recorded from the peat bogs of Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: SIE.

Gymnusini Heer, 1839

Gymnusa Gravenhorst, 1806

Gymnusa brevicornis (Paykull, 1800)

Remarks: These species was widespread, but not abundant in open bogs with dwarf shrubs and burned sites. Usually found in sphagnum carpet (Freude et al. 1974). It prefers peat bogs (tyrphophil) (Peus 1928). In Russia (Moscow region), it was reported by Semenov (2007) from mesotrophic bogs and fens. This species is known from peat bogs of Germany (Peus 1928), the Czech Republic (Roubal 1934), Estonia (Mossakowski et al. 2003), Finland (Renkonnen 1938) and Poland (<http://coleoptera.ksib.pl>).

Distribution: HOL.

Scaphidiinae Latreille, 1806 (Scaphidiidae)

Scaphidiini Latreille, 1806

Scaphidium Olivier, 1790

Scaphidium quadrimaculatum Olivier, 1790

Remarks: Very rare species, which was recorded in decaying wood and leaf litter in burned birch forests. It is known from the peat bogs of Kaliningrad region (Russia) (Skwarra 1929).

Distribution: HOL.

Oxytelinae Fleming, 1821

Oxytelini Fleming, 1821

Anotylus Thomson, 1859

Anotylus rugosus (Fabricius, 1775)

Remarks: Rare species, which was collected from the open bogs. It is known from peat bogs of Germany (Rabeler 1931, Mossakowski 1971), Lithuania (Dapkus & Tamutis 2008), Estonia (Mossakowski et al. 2003), Finland (Renkonnen 1938), Kaliningrad region (Russia) (Skwarra 1929), and the Czech Republic (Roubal 1934).

Distribution: PAL.

Steninae MacLeay, 1825

Stenus Latreille, 1797

Stenus biguttatus (Linnaeus, 1758)

Remarks: Widespread, but local in sphagnum carpet on lakeshores and hollows and also in burned sites.

Distribution: ASE.

Stenus lustrator Erichson, 1839

Remarks: Very rare species collected in the pine bog. It is known from peat bogs of Germany (Peus 1928), Latvia, Kaliningrad region (Russia) (Mossakowski et al. 2003), Estonia (Maavara 1957), Finland (Renkonnen 1938), and the Czech Republic (Roubal 1934).

Distribution: SIE.

Stenus similis (Herbst, 1784)

Remarks: Widespread, but not abundant in open and pine bogs. The species has been recorded from the peat bogs of Kaliningrad region (Russia) (Skwarra 1929) and the Czech Republic (Roubal 1934).

Distribution: WPA.

Euaesthetinae Thomson, 1859

Euaesthetini Thomson, 1859

Euaesthetus Gravenhorst, 1806

Euaesthetus laeviusculus Mannerheim, 1844

Remarks: Very rare species collected in open habitats (Sushko et al. 2008). These tyrphophilous species also occur in shores of water bodies and in meadows (<http://coleoptera.ksib.pl>). It is known from the peat bogs of Poland (<http://coleoptera.ksib.pl>), Germany (Peus 1928, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), and Finland (Renkonnen 1938).

Distribution: SIE.

Paederinae Fleming, 1821

Paederini Fleming, 1821

Lathrobium Gravenhorst, 1802

Lathrobium brunnipes (Fabricius, 1792)

Remarks: Widespread, but not abundant in open and pine bogs, and burned bogs with birch forests. It has been recorded from peat bogs of Germany (Rabeler 1931), Finland (Renkonen 1938), the Czech Republic (Roubal 1934), Latvia, Estonia, and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: EUR.

Lathrobium fovulum Stephens, 1833

Remarks: Very rare species, which were collected in birch forest on the burned bog. It is recorded from peat bogs of Germany (Peus 1928), the Czech Republic (Roubal 1934), and Finland (Renkonen 1938).

Distribution: EUR.

Lathrobium geminum Kraatz, 1857 = *boreale* Hochhuth, 1851 = *volgense* Hochhuth, 1851

Remarks: These highly rare species occur in pine forests and in heather in burned bogs. It has been recorded from the peat bogs of Kaliningrad region (Russia) (Skwarra 1929).

Distribution: SIE.

Ochtheophilum Stephens, 1829 = *Cryptobium* Mannerheim, 1830

Ochtheophilum fracticorne (Paykull, 1800)

Remarks: Widespread, but not abundant in the open and pine bogs, burned sites. The species are known from peat bogs of Germany (Peus 1928, Rabeler 1931, Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Estonia (Mossakowski et al. 2003, Maavara 1957), Finland (Renkonen 1938), and Kaliningrad region (Russia) (Skwarra 1929).

Distribution: SIE.

Staphylininae Latreille, 1802

Xantholinini Erichson, 1839

Gyrophypnus Leach, 1819

Gyrophypnus atratus (Heer, 1839)

Remarks: Very rare species collected in the open bog.

Distribution: EUR.

Xantholinus Dejean, 1821

Xantholinus linearis (Olivier, 1795)

Remarks: Widespread, but not abundant in the open bogs. The species has been recorded from peat bogs of Germany (Peus 1928, Rabeler 1931, Mossakowski 1971), Latvia (Spungis 2008), and the Czech Republic (Roubal 1934).

Distribution: PAL.

Xantholinus tricolor (Fabricius, 1787) = *meyeri* Drugmand, 1994

Remarks: Widespread, but not abundant in the open bogs. The species is known from peat

bogs of Finland (Renkonen 1938), Kaliningrad region (Russia) (Mossakowski et al. 2003), and the Czech Republic (Roubal 1934).

Distribution: EUR.

Othiini Thomson, 1859

Othius Stephens, 1829

Othius subuliformis Stephens, 1833 = *myrmecophilus* Kiesenwetter, 1843

Remarks: These are sporadic species recorded in the pine bogs. Known from peat bogs of Germany (Rabeler 1931, Mossakowski 1971), Finland (Renkonen 1938), Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003), and the Czech Republic (Roubal 1934).

Distribution: EUR.

Staphylinini Latreille, 1802

Bisnius Stephens, 1829

Bisnius subuliformis (Gravenhorst, 1802) = *fuscus* (Gravenhorst, 1802) nec (Gmelin, 1790)

Remarks: Very rare species, which was collected in the heath on burned bog.

Distribution: EUR.

Philonthus Stephens, 1829 = *Spatulonthus* Tottenham, 1955

Philonthus addendus Sharp, 1867

Remarks: Very rare species, which was collected in the open bog with dwarf shrubs.

Distribution: ASE.

Philonthus atratus (Gravenhorst, 1802)

Remarks: Very rare species, that was collected in the open bog with dwarf shrubs. It is known from peat bogs of Germany (Rabeler 1931).

Distribution: HOL.

Philonthus carbonarius (Gravenhorst, 1802) = *varius* (Gyllenhal, 1810)

Remarks: Widespread, but not abundant in the open bogs. Known from peat bogs of Germany (Rabeler 1931, Mossakowski 1971), Kaliningrad region (Russia) (Mossakowski et al. 2003, Skwarra 1929) and Estonia (Maavara 1957).

Distribution: SIE.

Philonthus cognatus Stephens, 1832 = *fuscipennis* (Mannerheim, 1830) nec (Block, 1799)

Remarks: This common species was found in all bog habitats. Recorded from peat bogs of Germany (Rabeler 1931, Mossakowski 1971), Estonia (Mossakowski et al. 2003), and Latvia (Spungis 2008).

Distribution: HOL.

Philonthus decorus (Gravenhorst, 1802)

Remarks: Widespread, but not abundant in the open and pine bogs. The species is known from peat bogs of Germany (Rabeler 1931), and

the Czech Republic (Roubal 1934).

Distribution: EUR.

Philonthus furcifer Renkonen, 1937

Remarks: Widespread, but not abundant in pine bogs and boundary parts of the bog.

Distribution: EUR.

Philonthus laminatus (Creutzer, 1799)

Remarks: Rare species. Collected from the pine bogs and heath on the burned bogs.

Distribution: WPA; Europe, Caucasus, and Asia Minor.

Philonthus marginatus (Ström, 1768)

Remarks: Rare species. Collected from the pine bogs and birch forests on burned sites of bogs. It has been recorded from peat bogs of Finland (Renkonen 1938), and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: EUR.

Philonthus nigrita (Gravenhorst, 1806)

Remarks: Common species in open and pine bogs. It is known from peat bogs of Poland (<http://coleoptera.ksib.pl>), Germany (Mossakowski 1971), Latvia (Spungis 2008), Estonia (Mossakowski et al. 2003), Finland (Renkonen 1938), the Czech Republic (Roubal 1934), and Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: WCPA.

Philonthus spinipes Sharp, 1867

Remarks: Very rare species that was collected in the open bog with cotton grass.

Distribution: This species is native to South-east Asia and recorded in Europe (spread and acclimated).

Ontholestes Ganglbauer, 1895

Ontholestes murinus (Linnaeus, 1758)

Remarks: Widespread, but not abundant in carrion, dung, and rotting fungus.

Distribution: PAL.

Ontholestes tessellatus (Geoffroy, 1785)

Remarks: Widespread, but not abundant in carrion and dung.

Distribution: SIE.

Platydracus Thomson, 1858

Platydracus fulvipes (Scopoli, 1763)

Remarks: Common species in pine bogs and birch forests on the burned bogs. It is known from peat bogs of Poland (<http://coleoptera.ksib.pl>), Latvia, Estonia, Kaliningrad region (Russia) (Mossakowski et al. 2003), and Lithuania (Dapkus & Tamutis 2008).

Distribution: SIE.

Platydracus latebricola (Gravenhorst, 1806)

Remarks: Widespread, but not abundant in open and pine bogs and birch forests on burned bogs. The species is known from heaths and peat bogs of Poland (<http://coleoptera.ksib.pl>), Germany (Mossakowski 1971) and Latvia (Mossakowski et al. 2003).

Distribution: EUR.

Staphylinus Linnaeus, 1758

Staphylinus dimidiaticornis Gemminger, 1851 = *parumtomentosus* Stein, 1903

Remarks: Widespread, but not abundant in open and pine bogs, burned sites.

Distribution: EUR.

Staphylinus erythropterus Linnaeus, 1758

Remarks: Common species, collected in open and pine bogs, also burned sites. It is known from peat bogs of Germany (Rabeler 1931, Mossakowski 1971), Latvia (Spungis 2008), Estonia (Mossakowski et al. 2003), Finland (Renkonen 1938), and Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: HOL.

Ocypus Leach, 1819

Ocypus fuscatus (Gravenhorst, 1802)

Remarks: Common species in all habitats. Recorded from peat bogs of Germany (Mossakowski 1971), Latvia (Mossakowski et al. 2003, Spungis 2008), Lithuania (Dapkus & Tamutis 2008), Estonia, and Kaliningrad region (Russia) (Mossakowski et al. 2003).

Distribution: SIE.

Ocypus nitens (Schrank, 1781) = *nero* (Faldermann, 1835) = *similis* (Fabricius, 1792) nec (Herbst, 1784)

Remarks: Widespread, but not abundant in open and pine bogs, burned sites.

Distribution: WPA.

Ocypus picipennis (Fabricius, 1792)

Remarks: Very rare species. This species was recorded in the birch forest on burned bogs. It is known from peat bogs of the Czech Republic (Roubal 1934).

Distribution: PAL.

Quedius Stephens, 1829

Quedius fuliginosus (Gravenhorst, 1802)

Remarks: Rare species. Collected from the pine bogs. It is known from peat bogs of Germany (Rabeler 1931), Latvia, Kaliningrad region (Russia) (Mossakowski et al. 2003), and the Czech Republic (Roubal 1934).

Distribution: PAL.

Quedius molochinus (Gravenhorst, 1806) = *picipennis* (Paykull, 1800) nec (Fabricius, 1793)

Remarks: Widespread, but not abundant. Col-

lected from pine bogs and birch forests on burned bogs. Recorded from peat bogs of Finland (Renkonen 1938), the Czech Republic (Roubal 1934), Germany (Mossakowski 1971), Lithuania (Dapkus & Tamutis 2008), Latvia, Estonia (Mossakowski et al. 2003), and the Kaliningrad region (Russia) (Skwarra 1929, Mossakowski et al. 2003).

Distribution: EUR.

Discussion

The results showed a low species richness of rove beetles and a high occurrence of a small number of species, such as *Ischnosoma splendidum*, *Tachyporus hypnorum*, *Tachinus signatus*, *Philonthus cognatus*, *Ph. decorus*, *Ph. nigrita*, *Platydracus fulvipes*, *Staphylinus erythropterus*, *Ocypus fuscatus* and *Drusila canaliculata* (15.15 % of total species number). This distribution with a few highly abundant species and many low abundance species is common on raised bogs in Europe. They are known as extreme habitats for plants and certain groups of animals (Mossakowski et al. 2003, Spitzer & Danks 2006, Dapkus & Tamutis 2008, Sushko 2012). Most collected species (74.24 %) are known from peat bogs of central, eastern and northern European countries. Four species were specialized inhabitants of peat bogs. These included tyrphophils: *Ischnosoma bergrothi*, *Gymnusa brevicornis* and *Euaesthetus laeviusculus* (Peus 1928, Mossakowski 1971, Mossakowski et al. 2003, Spitzer & Danks 2006). They are more common in bogs rather than in adjacent habitats (Spitzer & Danks 2006). Another probably tyrphobiotic species is *Atheta arctica*, which was exclusively found in peat bogs in Belarus. *Atheta arctica*, *Ischnosoma bergrothi* and *Euaesthetus laeviusculus* are distributed predominantly in northern and central Europe and in Siberia. *Gymnusa brevicornis* is widespread in central and northern Europe and in eastern North America it is known from isolated records. On the other hand, the numbers of specialized species were rather small. High abundances were recorded only for some hygrophilous species associated with wet lowlands, marshes, meadows and woodlands, such as *Ischnosoma splendidum*, *Tachyporus hypnorum*, *Tachinus signatus*, *Philonthus cognatus*, *Ph. decorus*, *Ph. nigrita*, *Platydracus fulvipes*, *Staphylinus erythropterus*, *Ocypus fuscatus* and *Drusila canaliculata*. Half of the species had a circum-boreal and boreal distribution. Other species are distributed in both boreal and temperate regions of the Palae-

arctic.

The Belarusian peat bogs have important habitats for the survival of the boreal species, including cold-adapted beetles from the far north in more southern latitudes. By the latitudinal component of the range, the staphylinid complex includes especially widespread species associated with the tundra and taiga zones and high-altitude zones of mountains. I found that the staphylinid fauna of the Belarusian peat bogs includes 66 species, 33 genera, and 10 subfamilies. The results showed a low species richness of rove beetles and a high occurrence of a small number of species. The regional composition and zoogeography of the rove beetles in the Belarusian peat bogs were examined, and the species were grouped into five main zoogeographical complexes and 7 chorotypes reflecting their distribution. Most species had a European (26.15 %), Holarctic (21.53 %) or Sibero-European (18.46 %) distribution. The Belarusian peat bogs have important habitats for the survival of boreal species, including cold-adapted beetles from the far north and distributed in more southern latitudes. These included specialized inhabitants of peat bogs, like *Ischnosoma bergrothi*, *Gymnusa brevicornis*, *Euaesthetus laeviusculus*, and *Atheta arctica*. The high proportion of boreal and boreo-montane species in the recent Belarusian peat bogs fauna clearly reflects its adaptation to cold environments.

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