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CONTRIBUTION TO THE FAUNA OF BUMBLE BEES (HYMENOPTERA, APIDAE: *BOMBUS* LATREILLE, 1802) OF THE REPUBLIC OF KHAKASSIA, EASTERN SIBERIA

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An annotated list of nineteen species of bumble bees collected in the Republic of Khakassia in 2012 is given. The list accounts 32 species including one doubtful species. Eleven species: *Bombus barbutellus* (Kirby), *B. confusus* Schenck, *B. filchnerae* Vogt, *B. hortorum* (Linnaeus), *B. patagiatus* Nylander, *B. pseudobai-calensis* Vogt, *B. ruderarius* (Müller), *B. sibiricus* (Fabricius), *B. subterraneus* (Linnaeus), *B. sylvarum* (Linnaeus) and *B. veteranus* (Fabricius) are newly recorded from Khakassia. Patterns of bumble bees diversity in the Khakassia and Siberia are discussed.

KEY WORDS: Apoidea, Apiformes, Palaearctic region, biodiversity, new records.

А. Н. Купянская, М. Ю. Прощалькин, А. С. Лелей. К фауне шмелей (Hymenoptera, Apidae: *Bombus* Latreille, 1802) Республики Хакасия, Восточная Сибирь // Дальневосточный энтомолог. 2013. № 261. С. 1-12.

Приведен аннотированный список 19 видов шмелей, собранных в Республике Хакасия в 2012 г. Список включает 32 вида, включая один сомнительный. Одиннадцать видов: *Bombus barbutellus* (Kirby), *B. confusus* Schenck, *B. filchnerae*

Vogt, *B. hortorum* (Linnaeus), *B. patagiatus* Nylander, *B. pseudobaicalensis* Vogt, *B. ruderarius* (Müller), *B. sibiricus* (Fabricius), *B. subterraneus* (Linnaeus), *B. sylvarum* (Linnaeus) и *B. veteranus* (Fabricius) впервые указываются для фауны Хакасии. Обсуждаются особенности разнообразия шмелей в Хакасии и Сибири.

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INTRODUCTION

Bumble bees number about 250 species worldwide, and are placed in a single genus *Bombus* Latreille, 1802 with 15 subgenera (Williams *et al.*, 2008). They are important pollinator of many vascular plants, especially in temperate and northern areas.

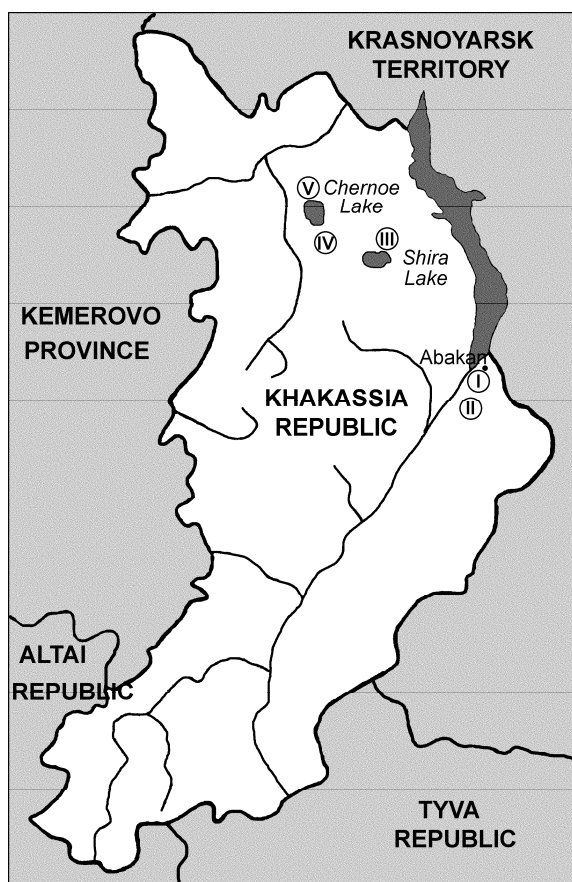


Fig. 1. The collecting sites of the bumble bees in Khakassia. I – Belyi Yar, Abakan River; II – Izykhskie Kopi; III – Zhemchuznnyi, Shira Lake; IV – 20 km NE Chernoe Ozero, Belyi Iyus River; V – Chernoe Ozero, Chernoe Lake.

Republic of Khakassia is located in the south of Eastern Siberia at the left side of Yenisei River on Sayan-Altay Plateau and in Khakass-Minusinsk Basin. The length of the republic territory from north to south is 400 km, from west to east – 200 km. land area – 61,900 sq. km. Khakassia is divided into two parts: mountainous and steppe ones. The largest rivers of the region are Yenisei and Abakan. More than 40% of Khakassia republic is covered by the forests (Srednyaya Sibir', 1964).

There were no special researches of the bumble bees of Khakassia. Up to now three species *Bombus deuteronymus* Schulz, 1906, *B. fragrans mongol* Skorikov, 1912 (currently is a synonym of *B. amurensis* Radozkowski, 1862), and *B. distinguendus* Morawitz, 1869 have been recorded from this territory (Skorikov, 1922, 1931; Panfilov, 1982). In the Red Data Book of Khakassia (Anyushin *et al.*, 2004) there are five species of bumble bees (Table 1), which are included from the Red Data Books of Krasnoyarsk Territory (1995) and former USSR (1984). Recently 15 species of bumble bees are recorded (Luzyanin, 2004, 2008), based on the material from one site, Balyksa, Western Khakassia, Kuznetsk Alatau (53°24'053"N, 089°07'047"E) (Table 1).

This paper based on the material collected by M.Yu. Proshchalykin and V.M. Loktionov in 2012 in five sites of steppe Khakassia (Fig. 1): **I** – Belyi Yar, Abakan River (53°36'074"N, 091°22'115"E); **II** – Izykhskie Kopi (53°33'146"N, 091°18'016"E); **III** – Zhemchuznyj, Shira Lake (54°30'991"N, 090°08'438"E); **IV** – 20 km NE Chernoe Ozero, Belyj Iyus River (54°36'753"N, 089°41'421"E); **V** – Chernoe Ozero, Chernoe Lake (54°40'642"N, 089°24'984"E). Totally 318 specimens (including 19 ones collected by N.S. Babichev in site **V**) have been studied. All materials are deposited in the collection of the Institute of Biology and Soil Science, Vladivostok, Russia (IBSS). The abbreviations are used in the specimens examined: "q" – queen, "w" – worker. New distribution records for the region are asterisked (*).

The subgeneric classification follows Williams *et al.* (2008); the synonymy of species follows Williams (1998) and Williams *et al.* (2011), except *Bombus saltuarius* Skorikov, 1922 and *B. altaicus* Skorikov, 1910, which are regarded as separate species.

LIST OF THE SPECIES

****Bombus (Bombias) confusus* Schenck, 1861**

SPECIMENS EXAMINED. **III**, 14-15.VII 2012, 1 w, 1 ♂.

DISTRIBUTION. Russia: *Khakassia, south of Western Siberia (Byvaltsev, 2008), Altai (Skorikov, 1931), European part. – Kazakhstan (Panfilov, 1957), Europe (Polaszek, 2004).

****Bombus (Subterraneobombus) subterraneus* (Linnaeus, 1758)**

SPECIMENS EXAMINED. **II**, 13.VII 2012, 3 q, 5 w; **III**, 14-15.VII 2012, 3 w, 1 ♂; **IV**, 17.VII 2012, 1 w.

DISTRIBUTION. Russia: *Khakassia, south of Western and Eastern Siberia, South Ural, European part. – Northern Mongolia, Kazakhstan, Caucasus (Panfilov *et al.*, 1961; Byvaltsev, 2008), Europe (Polaszek, 2004), Iran (Popov, 1967).

***Bombus (Subterraneobombus) distinguendus* Morawitz, 1869**

Bombus distinguendus: Panfilov *et al.*, 1961: 110; Panfilov, 1982: 27 (map); Levchenko, 2012: 74.

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 2 w; **III**, 14-15.VII 2012, 1 q, 15 w; **IV**, 17.VII 2012, 3 w; **V**, 6.VI 2012, 8 w (N. Babichev).

DISTRIBUTION. Russia: Khakassia (Panfilov *et al.*, 1961), south of Western and Eastern Siberia, southern and northern parts of Far East, South Ural, European part. – Mongolia, Northern Kazakhstan (Panfilov, 1982), Europe (Polaszek, 2004), North America (Aleutian Islands, Alaska) (Williams *et al.*, 2011).

****Bombus (Megabombus) hortorum* (Linnaeus, 1761)**

SPECIMENS EXAMINED. **II**, 13.VII 2012, 1 q, 17 w; **IV**, 17.VII 2012, 1 w; **V**, 6.VI 2012, 1 w (N. Babichev).

DISTRIBUTION. Russia: *Khakassia, Yakutia (Davydova & Pesenko, 2002), south of Western and Eastern Siberia, South Ural, European part. – Northern Mongolia, mountains of Central Asia, Caucasus (Panfilov, 1981), Europe (Polaszek, 2004), Iran (Popov, 1967), New Zealand (introduced) (Williams, 1998).

****Bombus (Thoracobombus) filchnerae* Vogt, 1908**

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 3 w; **II**, 13.VII 2012, 3 w; **III**, 14-15.VII 2012, 1 q, 9 w; **V**, 16-19.VII 2012, 2 q, 10 w.

DISTRIBUTION. Russia: *Khakassia, Transbaikalia. – Mongolia, China (Proshchalykin & Kupianskaya, 2009).

***Bombus (Thoracobombus) muscorum* (Linnaeus, 1758)**

Bombus muscorum: Anyushin *et al.*, 2004: 61.

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 2 w; **III**, 14-15.VII 2012, 2 w.

DISTRIBUTION. Russia: Khakassia (Anyushin *et al.*, 2004), Transbaikalia, Yakutia, Western Siberia, southern part of Far East, European part. – Northern Mongolia, North-Eastern China, mountains of Central Asia (Panfilov *et al.*, 1961), Europe (Polaszek, 2004).

***Bombus (Thoracobombus) humilis* Illiger, 1806**

Bombus subbaicalensis: Anyushin *et al.*, 2004: 61.

SPECIMENS EXAMINED. **III**, 14-15.VII 2012, 3 w; **V**, 16-19.VII 2012, 4 w.

DISTRIBUTION. Russia: Khakassia (Anyushin *et al.*, 2004), south of Western and Eastern Siberia, southern part of Far East, European part (Panfilov *et al.*, 1961; Kupianskaya, 1995). – Kazakhstan (Panfilov, 1957), Mongolia, Northern China (Williams *et al.*, 2009), Korea (Ito, 1985), Europe (Polaszek, 2004), Iran (Popov, 1967).

***Bombus (Thoracobombus) deuteronymus* Schulz, 1906**

Bombus deuteronymus: Skorikov, 1922: map 4; Levchenko, 2012: 73.

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 20 w; **II**, 13.VII 2012, 1 w.

DISTRIBUTION. Russia: Khakassia (Skorikov, 1922), south of Eastern Siberia, southern part of Far East, European part (Skorikov, 1922; Proshchalykin & Kupianskaya, 2009), Yakutia (Davydova & Pesenko, 2002), south of Western Siberia (Byvaltsev, 2008). – Mongolia (Tkalců, 1974), Northern China (An *et al.*, 2010, 2011), Japan (Hokkaido) (Tkalců, 1962), Europe (Polaszek, 2004).

****Bombus (Thoracobombus) pseudobaicalensis* Vogt, 1911**

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 8 w; **V**, 16-19.VII 2012, 13 w.

DISTRIBUTION. Russia: *Khakassia, south of Western Siberia, Altai, Yakutia, southern part of Far East. – Mongolia, North-Eastern China, Northern Korea, Japan (Hokkaido) (Panfilov *et al.*, 1961; Ito, 1985; Kupianskaya, 1995).

****Bombus (Thoracobombus) ruderarius* (Müller, 1776)**

SPECIMENS EXAMINED. **I**, 13.VII 2012, 1 ♂, 2 w; **II**, 13.VII 2012, 1 ♂, 2 w; **III**, 14-15.VII 2012, 1 q, 9 w; **IV**, 17.VII 2012, 2 ♂; **V**, 16-19.VII 2012, 5 ♂, 7 w.

DISTRIBUTION. Russia: *Khakassia, south of Eastern Siberia, European part (Panfilov *et al.*, 1961), south of Western Siberia (Byvaltsev, 2008). – Kazakhstan, (Panfilov, 1957), mountains of Central Asia (Skorikov, 1931), Europe (Polaszek, 2004), Caucasus, Northern Africa (Tkalců, 1974), Iran (Baker, 1996).

****Bombus (Thoracobombus) sylvarum* (Linnaeus, 1761)**

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 10 w; **IV**, 17.VII 2012, 3 w.

DISTRIBUTION. Russia: *Khakassia, south of Western Siberia (Byvaltsev, 2008), South Ural, European part (Panfilov, 1982). – Europe (Polaszek, 2004).

****Bombus (Thoracobombus) veteranus* (Fabricius, 1793)**

SPECIMENS EXAMINED. **II**, 13.VII 2012, 1 ♂, 5 w; **V**, 6.VI 2012, 1 w (N. Babichev).

DISTRIBUTION. Russia: *Khakassia, south of Western and Eastern Siberia, South Ural, European part. – Northern Mongolia, North-Eastern Kazakhstan, mountains of Central Asia (Panfilov, 1982), Europe (Polaszek, 2004).

Bombus (Thoracobombus) pascuorum (Scopoli, 1763)

Bombus agrorum: Luzyanin, 2004: 90.

SPECIMENS EXAMINED. **V**, 16-19.VII 2012, 1 w.

DISTRIBUTION. Russia: Khakassia (Luzyanin, 2004), southern and northern parts of Far East (Proshchalykin, 2012), south of Western and Eastern Siberia, Yakutia, South Ural, European part. – Mongolia, Northern Kazakhstan, Caucasus, Northern Iran (Panfilov, 1956, 1981), Northern China (Williams, 2011), Korea (Ito, 1985), Europe (Polaszek, 2004).

****Bombus (Psithyrus) barbutellus (Kirby, 1802)***

SPECIMENS EXAMINED. **III**, 14-15.VII 2012, 1 q.

DISTRIBUTION. Russia: *Khakassia, Aitai (Wnukowski, 1927), Novosibirsk Province (Byvaltsev, 2008), Transbaikalia, South Ural, south of Primorskii Territory, European part. – Kazakhstan, Northern Mongolia, Northern China, Caucasus (Popov, 1931; Tkalců, 1962; Kupianskaya, 1995), Europe (Polaszek, 2004).

Bombus (Pyrobombus) hypnorum (Linnaeus, 1758)

Bombus hypnorum: Luzyanin, 2004: 90.

SPECIMENS EXAMINED. **I**, 11-12.VII 2012, 22 w, 4 ♂; **III**, 14-15.VII 2012, 1 w; **V**, 6.VI 2012, 4 q (N. Babichev).

DISTRIBUTION. Russia: Khakassia (Luzyanin, 2004), south of Western and Eastern Siberia, Ural, European part (Panfilov, 1984), Yakutia (Davydova & Pesenko, 2002), southern and northern parts of Far East (Proshchalykin, 2012). – North-Eastern Kazakhstan (Panfilov, 1984), Korea, Japan (Hokkaido) (Ito, 1985), China (Williams *et al.*, 2009), Europe (Polaszek, 2004), Mongolia, India, Nepal, Myanmar (Williams, 1991).

****Bombus (Bombus) patagiatus Nylander, 1848***

SPECIMENS EXAMINED. **III**, 14-15.VII 2012, 1 q, 5 w; **IV**, 17.VII 2012, 3 w; **V**, 16-19.VII 2012, 1 q, 12 w.

DISTRIBUTION. Russia: *Khakassia, Altai, Ural, European part (Panfilov, 1957), south of Western and Eastern Siberia (Popov, 1927; Tkalců, 1967; Byvaltsev, 2008), Yakutia (Davydova & Pesenko, 2002), southern part of Far East (Proshchalykin, 2012). – Korea (Tkalců, 1967), mountains of North-Eastern China (Williams *et al.*, 2009), Europe (Polaszek, 2004).

Bombus (Bombus) lucorum (Linnaeus, 1761)

Bombus lucorum: Luzyanin, 2004: 90.

SPECIMENS EXAMINED. **III**, 14-15.VII 2012, 30 w; **IV**, 17.VII 2012, 4 w; **V**, 6.VI 2012, 2 q (N. Babichev); 16-19.VII 2012, 19 w.

DISTRIBUTION. Russia: Khakassia (Luzyanin, 2004), Western Siberia (Popov, 1923; Byvaltsev, 2008), Eastern Siberia (Bertsch *et al.*, 2010), southern and northern parts of Far East (Proshchalykin, 2012), European part (Panfilov, 1957). – Europe (Polaszek, 2004).

Table 1

The list of bumble bees of Khakassia

№	Species	Reference data					
		I	II	III	IV	V	VI
1	<i>Bombus amurensis</i> Radozkowski, 1862	+					
2	<i>B. armeniacus</i> Radozkowski, 1877			?			
3	<i>B. barbutellus</i> (Kirby, 1802)						+
4	<i>B. bohemicus</i> Seidl, 1838				+		
5	<i>B. confusus</i> Schenck, 1861						+
6	<i>B. consobrinus</i> Dahlbom, 1832				+		
7	<i>B. deuteronymus</i> Schulz, 1906	+				+	+
8	<i>B. distinguendus</i> Morawitz, 1869		+			+	+
9	<i>B. filchnerae</i> Vogt, 1908						+
10	<i>B. flavidus</i> Eversmann, 1852				+		
11	<i>B. hortorum</i> (Linnaeus, 1761)						+
12	<i>B. humilis</i> Illiger, 1806			+			+
13	<i>B. hypnorum</i> (Linnaeus, 1758)				+		+
14	<i>B. lucorum</i> (Linnaeus, 1761)				+		+
15	<i>B. modestus</i> Eversmann, 1852			+	+		
16	<i>B. muscorum</i> (Linnaeus, 1758)			+			+
17	<i>B. norvegicus</i> (Sparre-Schneider, 1918)				+		
18	<i>B. pascuorum</i> (Scopoli, 1763)				+		+
19	<i>B. patagiatus</i> Nylander, 1848						+
20	<i>B. pratorum</i> (Linnaeus, 1761)				+		
21	<i>B. pseudobaicalensis</i> Vogt, 1911						+
22	<i>B. ruderarius</i> (Müller, 1776)						+
23	<i>B. rupestris</i> (Fabricius, 1793)				+		
24	<i>B. saltuarius</i> Skorikov, 1922				+		
25	<i>B. schrencki</i> Morawitz, 1881			+	+		
26	<i>B. sibiricus</i> (Fabricius, 1781)						+
27	<i>B. sichelii</i> Radoszkowski, 1860				+		+
28	<i>B. sporadicus</i> Nylander, 1848				+		
29	<i>B. subterraneus</i> (Linnaeus, 1758)						+
30	<i>B. sylvarum</i> (Linnaeus, 1761)						+
31	<i>B. sylvestris</i> (Lepelletier, 1832)				+		
32	<i>B. veteranus</i> (Fabricius, 1793)						+
Total:		2	1	5	15	3	19

I – Skorikov, 1922, 1931; II – Panfilov *et al.*, 1961; Panfilov, 1982; III – Anyushin *et al.*, 2004; IV – Luzyanin, 2004, 2008; V – Levchenko, 2012; VI – current data.

***Bombus (Melanobombus) sichelii* Radoszkowski, 1860**

Bombus sichelii: Luzyanin, 2004: 90.

SPECIMENS EXAMINED. **II**, 13.VII 2012, 1 w; **III**, 14-15.VII 2012, 4 w; **V**, 16-19.VII 2012, 1 w.

DISTRIBUTION. Russia: Khakassia (Luzyanin, 2004), south of Western and Eastern Siberia, European part (Reinig, 1935; Panfilov, 1957; Panfilov *et al.*, 1961; Byvaltsev, 2008), Yakutia (Davydova & Pesenko, 2002), southern and northern parts of Far East (Kupianskaya, 1995; Proshchalykin, 2012). – Northern Korea (Ito, 1985), Northern China (Williams *et al.*, 2009), Europe (Polaszek, 2004).

****Bombus (Sibiricobombus) sibiricus* (Fabricius, 1781)**

SPECIMENS EXAMINED. **III**, 14-15.VII 2012, 1 q, 2 w; **V**, 6.VI 2012, 3 q (N. Babichev); 16-19.VII 2012, 1 w.

DISTRIBUTION. Russia: *Khakassia, Transbaikalia, Tuva. – Mongolia, Kazakhstan, North-eastern China (Morawitz, 1876; Skorikov, 1910, 1931; Peters, Panfilov, 1968).

PATTERNS OF DIVERSITY

Nineteen species of bumble bees have been identified based on material collected in 2012, eleven species are newly recorded from Khakassia. The list of the bumble bee species is increased to 32 including one doubtful species (Table 1). In the future additional species which are known from the adjacent territories can be found in Khakassia: *B. altaicus* Skorikov, 1910 (Altay, Irkutsk region, and Northern Mongolia), *B. soroensis* (Fabricius, 1776) (Northern Kazakhstan, south of Western Siberia, and Northern Mongolia), *B. campestris* (Panzer, 1801) (Northern Kazakhstan, south of Western Siberia, Transbaikalia, and Northern Mongolia), *B. semenoviellus* Skorikov, 1910 (Northern Kazakhstan, south of Western Siberia, and Transbaikalia), *B. exil* Skorikov, 1922 (Northern Mongolia, Tuva, Yakutia, and Transbaikalia). In mountain Khakassia *B. lapponicus* (Fabricius, 1793), which is known from mountains of Altay and Transbaikalia, can habits also.

Table 2

Number of the species of bumble bees in the Siberian regions

Region and references	Number of species of bumble bees in this region / Number of species common with Khakassia	Ratio of Khakassian species (in %)
West Siberian Plain (Byvaltsev, 2008)	39/27	69
Kuznetsk-Salair mountain territory (Luzyanin, 2004, 2008)	32/26	81
Republic of Tyva (Panfilov <i>et al.</i> , 1961)	23/18	78
Transbaikalia (Proshchalykin & Kupianskaya, 2009)	34/23	67

The bumble bees fauna of Khakassia has most similarity with ones of Western Siberian Plain (27 common species) and Kuznetsk-Salair Mountains (26), somewhat less with Transbaikalia (23) and Tuva (18) (Table 2). In Kuznetsk-Salair Mountains the ratio of Khakassian species is 81%, in Tuva – 78%, in Western Siberian Plain – 69%, in Transbaikalia – 67%. The bumble bees fauna of Khakassia is a typical fauna of southern Siberia.

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