Bumblebees Collected by the Kyushu University Expeditions to Central Asia (Hymenoptera, Apidae, Genus Bombus)

Paul H. Williams

Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK.

Abstract. The Kyushu University Expeditions to Kyrgyzstan, Kazakhstan, and China (Xinjiang) between 2000 and 2004 collected 757 bumblebees, which are interpreted here as representing 22 species. Males and females are re-associated between Bombus makarjini and B. turkestanicus. The material is listed by species and compared with earlier lists of bumblebees from Central Asia.

Key words: Hymenoptera, Apidae, Bombus, bee taxonomy, bee systematics, pollinators, hotspots

Introduction

Bumblebees are important pollinators for both crops and natural ecosystems, especially in mountainous areas (Dias et al. 1999; Winter et al. 2006). Unfortunately, although bumblebees are well collected, they remain poorly known because they are morphologically homogeneous (Michener 2007) and because different species often variable but mimic one another closely (Williams 2007).

Outside China, one of the richest bumblebee faunas world-wide is in the mountains of Central Asia (Williams et al. 2009: their fig. 1). The major encompassing review of the Central Asian fauna is by Skorikov (1931), although other important contributions from parts of the region have been made by Reinig (1930) and Yefremova (2001). Access to the area has improved in recent years, so a re-assessment is now possible. Between 2000 and 2004, five Kyushu University Expeditions (KUE) visited Kyrgyzstan, Kazakhstan, and neighbouring parts of China (Xinjiang), as part of a programme of research into measures to combat desertification (Tadauchi 2005). This paper gives an account of the bumblebee specimens they collected, using an updated nomenclature, as part of a series of papers on the bees from the KUE (e.g. Tadauchi 2006; Mitai & Tadauchi 2008; Tadauchi 2008; Kuhlmann 2009).

Methods

Locality and food-plant data are copied from labels with minimal interpretation. The subgeneric system follows Williams et al. (2008). The status of some of the taxa as species is re-assessed from cox1 ‘barcode’ data as part of the BEE-BOL campaign to barcode the bees of the world (Packer 2008). Barcoding and analytical procedures followed here are described by Williams et al. (in press) and references therein. Material is deposited in the collection of Kyushu University.

Results

Bombus (Mendacibombus) makarjini Skorikov

Bombus mendax ssp. makarjini Skorikov 1910:329

Most of the Central Asian species of Mendacibombus were described by Skorikov (1910) in a key to females. Illustrations of male genitalia were then associated with these names in a later paper (Skorikov 1931: his figs 16-18). Skorikov (1931:213) commented that associating the sexes in Turkestan was difficult because there are three species with broadly overlapping distributions, so that his proposals were provisional. I have examined a series of females and males with Skorikov’s species determination labels from the Institute of Zoology.
collection, St Petersburg, and can confirm that they match his publications.

In the original descriptions, the darker females of *B. makarjini* were diagnosed by having the pile of the sternum black, whereas this pile is light yellow for *B. turkestanicus*. However, the KUE darker males with black hairs on the anterior margin of the hind tibia have the genitalia with a narrower penis valve, as illustrated for ‘*B. turkestanicus*’ by Skorikov (1931: his fig. 16, in contrast to his fig. 18 for ‘*B. makarjini*’). I infer that in this case the males were incorrectly associated with the name-bearing female types and I am associating here the darker females and the darker males (with dark hind tibial fringes and a narrow penis valve) with the name *B. makarjini*, and the lighter females and the lighter males (with very light hind tibial fringes and a broad penis valve) with the name *B. turkestanicus*.

Unfortunately none of the 19 specimens of *B. makarjini* from this collection yielded sequences for *cox1* barcodes. However, the few barcode results below supporting the re-association of male and female specimens of *B. turkestanicus* support indirectly the interpretation presented here for *B. makarjini* from colour-pattern evidence. Further data will be required to test this more definitively.

**Material examined** (19 specimens, 950-2060m). **China** (Xinjiang): 2♀♀, Sayram lake, Ili, 2030-2060m, 25.08.2002 (O Tadauchi); 1♂, Sayram lake, Ili, 2030m, 25.08.2002 (R Miyanaga). **Kazakhstan**: 1♂, big Almaty lake, 1600-1850m, 28.08.2004 (O Tadauchi); 1♂, big Almaty lake, 1600-1850m, 28.08.2004 (O Tadauchi); 1♀♀, big Almaty lake, 2000m, 19.06.2003 (O Tadauchi); 1♂, big Almaty lake, 2030m, 31.08.2002 (R Miyanaga); 3♀♀, big Almaty lake, 2040m, 31.08.2002 (R Murao). **Kyrgyzstan**: 1♀, Ala-Archa, near Bishkek, 1700-1800m, 21.08.2003 (O Tadauchi); 1♂, Issik-Ata, near Bishkek, 1800m, 22.08.2003 (O Tadauchi).

Food-plant record. *Cirsium sp*.

**Bombus (Kallobombus) soroeensis** (Fabricius)

*Apis soroeensis* Fabricius 1777:246

All individuals have the soroeensis s. str. colour pattern with yellow bands and a white tail, so queens and workers resemble *B. lucorum*.

**Material examined** (40 specimens, 950-2400m). **Kazakhstan**: 1♀, big Almaty lake, 1360-1560m, 22.05.2004 (O Tadauchi); 2♀♀, big Almaty lake, 2000m, 19.06.2003 (O Tadauchi); 1♂, Issik-Ata, near Bishkek, 950m, 22.08.2003 (O Tadauchi); 3♀♀, Issik-Ata, near Bishkek, 1800m, 22.08.2003 (O Tadauchi).

Food-plant record. *Cirsium sp*.

**Bombus (Mendacibombus) turkestanicus** Skorikov

*Bombus mendax* ssp. *turkestanicus* Skorikov 1910:329

See the comments on *B. makarjini*. Only three of the 11 specimens of *B. turkestanicus* from this collection yielded sequences for *cox1* barcodes: one worker and two males (see the database at boldsystems.org). Genetic similarity shows that the two males are more different from one another (0.77% divergence, calculated using tools at boldsystems.org) than either is from the worker (0.15%, 0.61%), which is interpreted provisionally as supporting the inference that the worker and males are indeed conspecific as *B. turkestanicus*. This supports the association of the sexes proposed here on the basis of a shared pale colour pattern (see the comments on *B. makarjini*). Data from more specimens will be required to test this more definitively.

**Material examined** (11 specimens, 950-2060m). **China** (Xinjiang): 1♂, Sayram lake, Ili, 2030-2060m, 25.08.2002 (O Tadauchi); 1♂, Sayram lake, Ili, 2030m, 25.08.2002 (A Dawut). **Kazakhstan**: 1♂, Aksu Valley, 950m, 06.09.2002 (R Murao); 2♀♀, Kashy-Kaindy, Jabagly, 1700m, 05.09.2002 (R Murao); 1♀, Kashi-Ulken-Kaindy, Jabagly, 1700-2000m, 15.06.2003 (K Mitai); 1♂, Ul’ken-Kaindy, Jabagly, 1800m, 05.09.2002 (O Tadauchi). **Kyrgyzstan**: 3♂, Ala-Archa, near Bishkek, 1700-1800m, 21.08.2003 (O Tadauchi); 1♂, Issik-Ata, near Bishkek, 1800m, 22.08.2003 (O Tadauchi).

Food-plant record. *Cirsium* sp.

**P. H. WILLIAMS**

February 28, 2011
Bishkek, 950m, 22.08.2003 (O Tadauchi); 1♀, Issik-Ata, near Bishkek, 1650m, 22.08.2003 (O Tadauchi).

Food-plant records. Cirsium sp., Solidago sp., Taraxacum sp.

**Bombus (Subterraneobombus) melanurus**

Lepeletier

*Bombus melanurus* Lepeletier de Saint-Fargeau [1835]: 469

Both individuals have the typical *melanurus* s. str. colour pattern with no black spot or band on the thorax dorsally between the wing bases.

Material examined (2 specimens, 2030m).

**CHINA** (Xinjiang): 2♂♂, Sayram lake, Ili, 2030m, 25.08.2002 (R Miyanaga).

Food-plant record. *Saussurea* sp.

**Bombus (Megabombus) hortorum** (Linnaeus)

*Apis hortorum* Linnaeus 1761:424

Material examined (29 specimens, 950-2000m).

**KAZAKHSTAN**: 2♀♀, big Almaty lake, 1360-1560m, 22.05.2004 (O Tadauchi); 1♂, big Almaty lake, 1360m, 01.09.2002 (O Tadauchi); 1♀, big Almaty lake, 1600-1850m, 28.08.2004 (O Tadauchi). **KYRGYZSTAN**: 1♀ 1ww 2♂♂, Aksuu, near Karakol, east of lake Issik-Kol, 1850-1900m, 25.08.2004 (O Tadauchi); 9♀♀ Arashan, near Karakol, east of lake Issik-Kol, 1850-1900m, 25.08.2004 (O Tadauchi); 1♀ 1ww, Issik-Ata, near Bishkek, 1300m, 27.05.2000 (O Tadauchi); 1♀, Issik-Ata, near Bishkek, 1650m, 22.08.2003 (O Tadauchi).

No food-plant records.

**Bombus (Thoracobombus) laesus** Morawitz

*Bombus laesus* Morawitz in Fedtschenko 1875:3

*Bombus Mocsáryi* Kriechbaumer 1877:253

[Agrobombus (Laesobombus) laesus subsp. mocsáryi var. maculidorsis Skorikov 1922:23, infrasubspecific]

**Bombus (Laesobombus) tianschanicus** Panfilov 1956: 1327

**Bombus (Laesobombus) maculidorsis** Panfilov 1956: 1328

Individuals with the *laesus* s. str. colour pattern, with the thoracic dorsum extensively orange and yellow, resemble *B. muscorum* closely. Distinguishing these two species by morphological criteria may be unreliable for some workers. Other individuals with similar morphology show the *tianschanicus* colour pattern, with black hair on the thoracic dorsum between the wing bases and no orange hair. This black marked colour pattern resembles *B. armeniacus*.

Of eight specimens from this collection extracted for **cox1** barcodes, only four provided sequences. Preliminary analysis of these data in comparison with others for *laesus* and *tianschanicus* in the BOLD database (bold-systems.org) shows: (1) that there is very little **cox1** divergence between individuals with these two colour patterns; and (2) that specimens of *laesus* and *tianschanicus* do not appear to form monophyletic groups. Consequently, at present *laesus* and *tianschanicus* can be considered conspecific, following earlier interpretations from morphological evidence (e.g. Williams et al. 2009).

Material examined (41 specimens, 560-1900m).


P. H. WILLIAMS

**CHINA** (Xinjiang): 1ww, Jeminay county, Altay, 27.08.2002 (R Miyanaga); 1ww, Jeminay county, Altay, 960m, 27.08.2002 (R Murao); 2ww, Jeminay county, Altay, 800m, 27.08.2002 (R Murao). **KAZAKHSTAN**: 2♀, Almaty city, 29.05.2000 (O Tadauchi); 2♀, big Almaty lake, 1360m, 01.09.2002 (O Tadauchi); 1♀, big Almaty lake, 1360m, 01.09.2002 (O Tadauchi); 2♀, Almaty city, 21.05.2004 (R Murao); 2♀, Medeu-Almaty, 21.05.2004 (O Tadauchi); 1♂, Aksu valley, 950m, 06.09.2002 (O Tadauchi); 1♀, east of Chimkent, 560m, 30.05.2003 (O Tadauchi); 3♀♂, Jabagly, 1080-1200m, 27.05.2003 (O Tadauchi, K Mitai); 1♂, Jabagly, 1200-1250m, 04.09.2002 (R Murao); 2♀♂, Karaalma, near Jabagly, 1210m, 17.06.2003 (K Mitai); 1♀, Shayan-Birlik, 08.06.2003 (K Mitai). **KYRGYZSTAN**: 2♀♂, Ala-Archa, near Bishkek, 1700-1800m, 21.08.2003 (O Tadauchi); 3♀♂, Arashan, near Karakol, east of lake Issik-Kol, 1850m, 25.08.2004 (O Tadauchi); 2♀♂, Arashan, near Karakol, east of lake Issik-Kol, 1850-1900m, 25.08.2004 (O Tadauchi); 2♀♂, Issik-Ata, 1300m, 27.05.2000 (O Tadauchi); 4♀♂, Issik-Ata, near Bishkek, 1650m, 22.08.2003 (O Tadauchi); 1♀, Issik-Ata, near Bishkek, 1300m, 22.08.2003 (O Tadauchi); 1♀, Krasnayarichika, 800m, 27.05.2000 (D Ahmatjan); 2♀, Tamga, south of lake Issik-Kol, 1580m, 26.08.2004 (O Tadauchi).

Food-plant records. *Ixiolirion tataricum*, Leguminosae sp., *Rosa kokanica*, *Trifolium pratense*, *Vicia sp*.

**Bombus (Thoracobombus) muscorum** (Linnaeus)

*Apis muscorum* Linnaeus 1758:579

See the comments on *B. laeus*. Of four specimens from this collection extracted for *cox1* barcodes, none provided sequences, so it has not been possible to test the identifications from morphological evidence.

Material examined (53 specimens, 760-1700m).

**CHINA** (Xinjiang): 2ww, east of Jeminay, Altay, 1300m, 28.08.2002 (R Murao); 1ww, Jeminay county, Altay, 960m, 27.08.2002 (A Dawut). **KAZAKHSTAN**: 2♀♂, Almaty city, 26.05.2000 (D Ahmatjan); 1♂, Almaty city, 760m, 31.08.2002 (O Tadauchi); 1♀, Kemertogan, 26.05.2000 (D Ahmatjan); 1♀, near Sternjak, Kochetav district, 30.06.2002 (V Kazenas, A Jdanko, V Rascheev); 1♀, near Sternjak, Kochetav district, 25.07.2002 (V Kazenas, A Jdanko, V Rascheev); 1♀, near Sternjak, Kochetav district, 05.07.2002 (V Kazenas, A Jdanko, V Rascheev). **KYRGYZSTAN**: 2♀♂, Chon-Aksuu, north of lake Issik-Kol, 1700m, 24.08.2004 (O Tadauchi); 1♀, Semonovka, north of lake Issik-Kol, 1700m, 23.08.2003 (O Tadauchi). **KAZAKHSTAN**: 3♀♂, near Bishkek, 1300m, 22.08.2003 (O Tadauchi). **KYRGYZSTAN**: 1♀, Chon-Aksuu, north of lake Issik-Kol, 1700m, 24.08.2004 (O Tadauchi); 2♀♂, Issik-Ata, 1300m, 27.05.2000 (O Tadauchi); 4♀♂, Issik-Ata, near Bishkek, 1650m, 22.08.2003 (O Tadauchi); 1♀, Issik-Ata, near Bishkek, 1300m, 22.08.2003 (O Tadauchi); 1♀, Krasnayarichika, 800m, 27.05.2000 (D Ahmatjan); 2♀, Tamga, south of lake Issik-Kol, 1580m, 26.08.2004 (O Tadauchi).

Food-plant records. *Isioliorn tataricum*, *Leguminosae sp.*, *Rosa kokanica*, *Trifolium pratense*, *Vicia sp*.

**Bombus (Thoracobombus) ruderarius** (Müller)

*Apis ruderaria* Müller 1776:165

*Bombus montanus* Lepeletier de Saint-Fargeau [1835]: 463

All individuals have the *montanus* colour pattern with yellow bands.

Material examined (6 specimens, 1700-1900m).


Material examined (6 specimens, 1700-1900m).

**CHINA** (Xinjiang): 1♀, Jeminay county, Altay, 800m, 27.08.2002 (O Tadauchi).

**KAZAKHSTAN**: 1♀, near Sternjak, Kochetav district, 20.07.2002 (V Kazenas, A Jdanko, V Rascheev);

Material examined (2 specimens, 800m). **CHINA** (Xinjiang): 1♀, Jeminay county, Altay, 800m, 27.08.2002 (O Tadauchi). **KAZAKHSTAN**: 1♀, near Sternjak, Kochetav district, 02.08.2002 (V Kazenas, A Jdanko, V Rascheev).

No food-plant records.

**Bombus (Thoracobombus) humilis** Illiger

*Bombus humilis* Illiger 1806:171

Material examined (2 specimens, 800m). **CHINA** (Xinjiang): 1♀, Jeminay county, Altay, 800m, 27.08.2002 (O Tadauchi). **KAZAKHSTAN**: 1♀, near Sternjak, Kochetav district, 02.08.2002 (V Kazenas, A Jdanko, V Rascheev).

No food-plant records.
**Bombus (Thoracobombus) pascuorum** (Scopoli)

*Apis pascuorum* Scopoli 1763:306

Material examined (2 specimens, 800m). **CHINA** (Xinjiang): 1ww, Jeminay county, Altay, 800m, 27.08.2002 (O Tadauchi); 1♂, Jeminay county, Altay, 27.08.2002 (R Miyanaga).

Food-plant record. *Cirsium sp.*

**Bombus (Psithyrus) morawitzianus** (Popov)

*Psithyrus morawitzianus* Popov 1931:148, 183

Material examined (3 specimens, 1800-2040m). **KAZAKHSTAN**: 1♀, big Almaty lake, 2040m, 31.08.2002 (R Miyanaga); 1♂, big Almaty lake, 2030m, 31.08.2002 (R Miyanaga).

KYRGYZSTAN: 1♀, Issik-Ata, 1800m, 27.05.2000 (D Ahmatjan).

Food-plant records. *Cirsium sp.*, *Trifolium repens*.

**Bombus (Psithyrus) bohemicus** Seidl

*Bombus bohemicus* Seidl 1837:73

Material examined (14 specimens, 1700-2000m). **KAZAKHSTAN**: 3♀♀, big Almaty lake, 2000m, 19.06.2003 (O Tadauchi); 1♀, Kashi-Ulken-Kaindy, Jabagly, 1700-2000m, 15.06.2003 (K Mitai); 2♀♀, Kashy-Kaindy, Jabagly, 1700m, 15.06.2003 (O Tadauchi); 1♀, Kashy-Kaindy, Jabagly, 1700m, 05.09.2002 (R Miyanaga).

KYRGYZSTAN: 7♀♀, Issik-Ata, 1800m, 27.05.2000 (O Tadauchi).

Food-plant records. *Mentha asiatica*, *Taraxacum sp.*

**Bombus (Pyrobombus) subtypicus** (Skorikov)

*Pratobombus leucopygos* var. *subtypicus* Skorikov 1914: 294

Material examined (13 specimens, 1230-1900m). **KAZAKHSTAN**: 1♂, big Almaty lake, 1230m, 01.09.2002 (R Murao). KYRGYZSTAN: 2ww, Almaty city, 29.05.2000; 1ww 2♀♀, Kordai, 1080m, 27.08.2004 (O Tadauchi); 1ww, near Sternjak, Kochetav district, 10.07.2002 (V Kazenas, A Jdanko, V Rascheev); 1♂, near Sternjak, Kochetav district, 20.07.2002 (V Kazenas, A Jdanko, V Rascheev); 1♂, near Sternjak, Kochetav district, 25.07.2002 (V Kazenas, A Jdanko, V Rascheev); 4♀♀, Aksu valley, 950m, 06.09.2002 (O Tadauchi, R Murao); 2♀♀, Aksu valley, 560m, 06.09.2002 (O Tadauchi, R Murao); 1♀, Jabagly, 1180-1250m, 28.05.2003 (K Mitai); 2♀♀, Jabagly, 1180-1250m, 14.06.2003 (O Tadauchi); 1♀, Jabagly, 1180-1250m, 28.05.2004 (O Tadauchi); 2ww 8♀♀, Jabagly, 1200-1250m, 04.09.2002 (O Tadauchi, R Murao); 1ww, Jabagly, 1180m, 07.09.2002 (O Tadauchi); 2♀♀, Karaalma, near Jabagly, 1210m, 17.06.2003 (O Tadauchi); 2ww 5♀♀.
Karaalma, near Jabagly, 1210m, 07.09.2002 (O Tadauchi, R Murao); 1♂, 3ww 5♀, Kashi-Kaindy, near Jabagly, 1700m, 05.09.2002 (O Tadauchi, R Murao); 1♀, Medeu, 1600m, 21.05.2004 (R Murao); 3ww 8♀, Ul’ken-Kaindy, near Jabagly, 1800m, 05.09.2002 (O Tadauchi, R Murao).

KYRGYZSTAN: 1♂, Chon-Aksuu, north of lake Issik-Kol, 1700m, 24.08.2004 (O Tadauchi); 3ww, Issik-Ata, near Bishkek, 1900m, 22.08.2003 (O Tadauchi); 1♀, Kemin, near Bishkek, 1000m, 23.08.2003 (O Tadauchi); Iww, Tamga, south of lake Issik-Kol, 1580m, 26.08.2004 (O Tadauchi); Iww 2♂♂, Ton, south of lake Issik-Kol, 1580m, 26.08.2004 (O Tadauchi).


**Bombus (Bombus) lucorum** (Linnaeus) complex

Apis lucorum Linnaeus 1761:425
Apis cryptarum Fabricius 1775:379

From coxl barcode evidence, this species complex appears to include several genetically recognisable species in Europe (Murray et al. 2008). However, as yet they cannot be recognized reliably by morphology, especially in Asia, and consequently the group globally has been treated as an unresolved complex in morphological studies as a temporary measure (Williams et al. 2009). Of 19 specimens from this collection extracted for coxl barcodes, only one provided a sequence, so it has not been possible to assess identifications thoroughly. This single worker from Medeu, South Kazakhstan, is identified provisionally to *B. cryptarum*. Other material in this collection shows substantial variation in colour pattern, so other taxa may be present.

Material examined (133 specimens, 800-2060m).

CHINA (Xinjiang): 4♂♂, east of Jeminay, Altay, 1300m, 28.08.2002 (O Tadauchi, A Dawut, R Murao); Iww, Jeminay county, Altay, 800m, 27.08.2002 (O Tadauchi); Iww, Jeminay county, Altay, 27.08.2002 (R Miyanagan); 6♂♂, Jeminay county, Altay, 960m, 27.08.2002 (A Dawut); 2♂♂, Jeminay county, Altay, 800m, 27.08.2002 (O Tadauchi, R Murao); Iww, near Sayram lake, Ilii, 1970m, 25.08.2002 (O Tadauchi); 1♀, old Jeminay, Altay, 27.08.2002 (O Tadauchi); 1♀ Iww 14♀, Sayram lake, Ilii, 2030m, 25.08.2002 (O Tadauchi, A Dawut, R Miyanaga); 8♀♀, Sayram lake, Ilii, 2060m, 25.08.2002 (R Murao); 2♀♀, Sayram lake, Ilii, 2030-2060m, 25.08.2002 (O Tadauchi).

KAZAKHSTAN: Iww, Almaty city, 29.05.2000 (D Ahmatjan); 2ww, Almaty city, 29.05.2000 (O Tadauchi); 1♀, Almaty city, botanical garden, 25.05.2003 (K Mitai); 3ww, big Almaty lake, 1360-1560m, 22.05.2004 (O Tadauchi, R Murao); 3♀♀, big Almaty lake, 2400m, 01.09.2002 (O Tadauchi); 5♀♀, big Almaty lake, 2000-2050m, 01.09.2002 (O Tadauchi, R Murao); 7♀♀, big Almaty lake, 2400m, 31.08.2002 (O Tadauchi); 2♀♀, big Almaty lake, 2030m, 31.08.2002 (R Miyanaga); 1♀, south of Almaty, 1580m, 31.08.2002 (O Tadauchi); 7ww, Kordai, 1080m, 27.08.2004 (O Tadauchi); 3ww, near Sternjak, Kochetav district, 30.06.2002 (V Kazenas, A Jdanko, V Rascheev); Iww, near Sternjak, Kochetav district, 05.07.2002 (V Kazenas, A Jdanko, V Rascheev); 3ww, Aksu valley, 950m, 06.09.2002 (O Tadauchi, R Murao); Iww, Jabagly, 1180m, 07.09.2002 (R Murao); 1♂, Karaalma, near Jabagly, 1210m, 17.09.2002 (O Tadauchi); 1♀ 5ww, Medeu, 24.05.2000 (O Tadauchi); 1♀, Iww, Medeu, 1600m, 21.05.2004 (R Murao).

KYRGYZSTAN: 2♀♀, Aksuu, near Karakol, east of lake Issik-Kol, 2000m, 25.08.2004 (O Tadauchi); 7ww 11♀♀, Ala-Archa, near Bishkek, 1700-1800m, 21.08.2003 (O Tadauchi); Iww, Arashan, near Karakol, east of lake Issik-Kol, 1850m, 25.08.2004 (O Tadauchi); 2♀♀, Arashan, near Karakol, east of lake Issik-Kol, 1850-1900m, 25.08.2004 (O Tadauchi); 1♂, Chon-Aksuu, north of lake Issik-Kol, 1700m, 24.08.2004 (O Tadauchi); 8♀, Issik-Ata, near Bishkek, 950m, 22.08.2003 (O Tadauchi); Iww, Issik-Ata, near Bishkek, 1800m, 27.05.2000 (O Tadauchi); 7♀♀, Issik-Ata, near Bishkek, 1800m, 22.08.2003 (O Tadauchi); 1♂, Issik-Ata, near Bishkek, 950m, 22.08.2003 (O Tadauchi); 1♀, Issik-Ata, near Bishkek, 1300m, 22.08.2003 (O Tadauchi).

Food-plant records. Chondrilla sp., Cichorium intybus, Cirsim sp., Compositae sp., Cosmos sulphureus, Crataegus sp., Mentha asiatica, Saussurea sp., Taraxacum sp., Trifolium repens, Vicia sp.

**Bombus (Melanobombus) keriensis** Morawitz

*Bombus keriensis* Morawitz 1887:199
*Bombus separandus* Vogt 1909:61

The queen and most workers have the *separandus* colour pattern, in which the pale bands are almost white, although a few of the workers are more yellow.

Material examined (60 specimens, 760-2060m).

CHINA (Xinjiang): 3ww 1♂, Jeminay county, Altay, 960m, 27.08.2002 (A Dawut); 13ww 2♀♀, near Sayram...
lake, Ili, 1970m, 25.08.2002 (O Tadauchi, R Murao); 3ww 6♂, Sayram lake, Ili, 2030m, 25.08.2002 (R Miyanaga); 4ww 2♂, Sayram lake, Ili, 2030-2060m, 25.08.2002 (O Tadauchi); 3ww 1♂, Sayram lake, Ili, 2060m, 25.08.2002 (R Murao). KAZAKHSTAN: 1ww, Almaty city, 760m, 31.08.2002 (O Tadauchi); 1♀, big Almaty lake, 1360-1560m, 22.05.2004 (R Murao); 2ww, big Almaty lake, 1360m, 01.09.2002 (O Tadauchi); 3ww 1♂, big Almaty lake, 2000-2050m, 01.09.2002 (O Tadauchi); 1ww 2♂, big Almaty lake, 2400m, 31.08.2002 (O Tadauchi); 2♂, big Almaty lake, 2040m, 31.08.2002 (R Murao); 3ww, south of Almaty, 1580m, 31.08.2002 (O Tadauchi); 2ww, Ul’ken-Kaindy, near Jabagly, 1800m, 05.09.2002 (O Tadauchi, R Murao).

KYRGYZSTAN: 1ww, Aksuu, near Karakol, east of lake Issik-Kol, 2000m, 25.08.2004 (O Tadauchi); 1ww, Chon-Aksuu, north of lake Issik-Kol, 1700m, 24.08.2004 (O Tadauchi).

Food-plant records. Cichorium intybus, Cirsium sp, Compositae sp, ?Hypochoeris sp, Leguminosae sp, Melilotus suaveolens, Mentha asiatica, Saussurea sp, Trifolium repens.

Apis sibirica Fabricius 1781:478

Material examined (96 specimens, 130-2060m). CHINA (Xinjiang): 1ww, east of Jeminay, Altay, 1300m, 28.08.2002 (R Murao); 2ww, Jeminay county, Altay, 960m, 27.08.2002 (A Dawut); 5ww, near Sayram lake, Ili, 1970m, 25.08.2002 (O Tadauchi, R Murao, Miyanaga); 3ww 2♂, Sayram lake, Ili, 2030m, 25.08.2002 (A Dawut, R Miyanaga); 1♂, Sayram lake, Ili, 2030-2060m, 25.08.2002 (O Tadauchi). KAZAKHSTAN: 1♀, Alga, near Koradai, 18.06.2003 (K Mitai); 1♀, near Sternjak, Kochetav district, 15.07.2002 (V Kazenas, A Jdanko, V Rascheev); 1ww, near Sternjak, Kochetav district, 03.08.2002 (V Kazenas, A Jdanko, V Rascheev); 2♀, Aksu valley, 130-560m, 16.06.2003 (K Mitai); 3♀, Aksu valley, 1180-1250m, 14.06.2003 (O Tadauchi, K Mitai); 2♀, Jabagly, 1200-1250m, 4.09.2002 (O Tadauchi); 4♀, near Jabagly, 1210m, 17.06.2003 (O Tadauchi, K Mitai); 4♀, Kashy-Kaindy, Jabagly, 1700-2000m, 15.06.2003 (O Tadauchi); 9♀, Kashy-Kaindy, Jabagly, 1700m, 15.06.2003 (O Tadauchi); 1♂, Kashy-Kaindy, Jabagly, 1700m, 05.09.2002 (R Murao); 1♀, Ul’ken-Kaindy, Jabagly, 1800m, 05.09.2002 (O Tadauchi); 1♀, Ul’ken-Kaindy, Jabagly, 1800m, 05.09.2002 (O Tadauchi); 1♀, Ul’ken-Kaindy, Jabagly, 1800m, 05.09.2002 (O Tadauchi).

Bombus (Sibiricobombus) cullumanus (Kirby)

Apis cullumanana Kirby 1802:359
Bombus serrisquama Morawitz 1888:224

Most individuals have the serrisquama colour pattern with yellow bands, although a few have the yellow bands much reduced and so approach the cullumanus s. str. colour pattern. There is very little recent material of cullumanus s. str. (from western Europe), but from a single specimen kindly provided by P. Rasmont, the cox1 barcode sequence is very closely similar to serrisquama (0.16% divergence), providing no evidence that the two are not conspecific (following the interpretation of morphology in Williams 1998).

Material examined (96 specimens, 130-2060m).

Bombus (Sibiricobombus) asiaticus Morawitz

Bombus hortorum var. asiatica Morawitz in Fedtschenko 1875:4

The queens have the tails black. In contrast, the workers have the tails white, as in the asiaticus s. str. colour pattern.

Material examined (12 specimens, 670-2050m). KAZAKHSTAN: 1ww, big Almaty lake, 2000-2050m, 01.09.2002 (R Murao); 5ww, Alga, near Koradai, 18.06.2003 (K Mitai); 2♀, Achisai, Karatau mountains, 670-700m, 06.06.2003 (K Mitai). KRYGYZSTAN: 1ww, Ala-Archa, near Bishkek, 1700-1800m, 21.08.2003 (O Tadauchi); 1ww, Issik-Ata, near Bishkek, 1300m, 22.08.2003 (O Tadauchi); 2ww, Issik-Ata, near Bishkek, 1800m, 22.08.2003 (O Tadauchi).

No food-plant records.
Table 1. Comparison of lists of bumblebee species recorded from Central Asia. Names are shown as used in the original publications. Where these are in parenthesis and/or separated by commas, they are regarded as synonyms (see Williams 1998).

<table>
<thead>
<tr>
<th>simplified subgenera (Williams et al. 2008)</th>
<th>Reinig (1930) Tajikistan</th>
<th>Skorikov (1931) China (Xinjiang), Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan</th>
<th>Yefremova (2001) Kazakhstan</th>
<th>Kyushu University Expeditions China (Xinjiang), Kazakhstan, Kyrgyzstan</th>
<th>combined species list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mendacibombus</td>
<td>defector, (=?margreiteri)</td>
<td>makarjini/turkestanicus/makarjini maruinus</td>
<td>makarjini</td>
<td>turkestanicus/marussian</td>
<td>defector</td>
</tr>
<tr>
<td>(=mendax macarjini)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=mendax marsuinus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kallobombus</td>
<td>soroeensis</td>
<td></td>
<td></td>
<td></td>
<td>soroeensis</td>
</tr>
<tr>
<td>Subterraneobombus</td>
<td>fedtschenkoi</td>
<td>fedtschenkoi</td>
<td>fedtschenkoi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>melanurus (=melanurus griseofasciatus)</td>
<td>fragrans</td>
<td>melanurus</td>
<td>melanurus</td>
<td>medically</td>
<td></td>
</tr>
<tr>
<td>subterraneus distinguendus</td>
<td>subterraneus</td>
<td></td>
<td>subterraneus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Megabombus</td>
<td>hortorum</td>
<td></td>
<td>hortorum</td>
<td></td>
<td>hortorum</td>
</tr>
<tr>
<td>Thoracobombus</td>
<td>(=elegans)</td>
<td>(=dumoucheli)</td>
<td>armeniacus</td>
<td>armeniacus</td>
<td></td>
</tr>
<tr>
<td>laeus</td>
<td>(=dumoucheli)</td>
<td>laeus</td>
<td>laeaus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>muscorum (=equester)</td>
<td>muscorum</td>
<td></td>
<td>muscorum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=derhamellus)</td>
<td>ruderarius</td>
<td></td>
<td>ruderarius</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=subbaicalensis, solstitialis)</td>
<td>humilis</td>
<td></td>
<td>humilis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=agrorn, michnoi)</td>
<td>pascuorum</td>
<td></td>
<td>pascuorum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psithyrus</td>
<td>branickii</td>
<td></td>
<td>branickii</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rupestris</td>
<td></td>
<td></td>
<td>rupestris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyrobombus</td>
<td>lapponicus</td>
<td></td>
<td>lapponicus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=leucopygus)</td>
<td>(=leucopygus)</td>
<td></td>
<td>subtypicus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>biroi</td>
<td>biroi</td>
<td></td>
<td>biroi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=sylvestris)</td>
<td>biroi</td>
<td></td>
<td>biroi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bombus s. str.</td>
<td>lucorum</td>
<td>terrestris</td>
<td>terrestris</td>
<td></td>
<td>terrestris</td>
</tr>
<tr>
<td>Melanobombus</td>
<td>keriensis, (=alagesianus, separandus, incertoides, anargumentous)</td>
<td></td>
<td>lucorum complex</td>
<td></td>
<td>lucorum complex</td>
</tr>
<tr>
<td>(=separandus)</td>
<td>keriensis, (=kozlovi, separandus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sibiricobombus</td>
<td>morawitzi</td>
<td></td>
<td>morawitzi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>oberti</td>
<td>morawitzi</td>
<td></td>
<td>morawitzi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(=regelii)</td>
<td>asiaticus, (=miniatocaudatus)</td>
<td></td>
<td>asiaticus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cullamanobombus</td>
<td>(=sirrisquama)</td>
<td></td>
<td>cullumanus</td>
<td></td>
<td>cullumanus</td>
</tr>
<tr>
<td>Total species</td>
<td>17</td>
<td>26</td>
<td>29</td>
<td>42</td>
<td></td>
</tr>
</tbody>
</table>
lww, Issik-Ata, near Bishkek, 1650m, 22.08.2003 (O Tadauchi); 1♂, Semenovka, north of Lake Issik-Kol, 1700m, 24.08.2004 (O Tadauchi).

Food-plant records. Achillea sp., Aster canescens, Chondrilla sp., Cichorium intybus, Cirsium sp., Compositae sp., Hypochoeris sp., Melilotus suaveolens, Mentha asiatica, Origanum tyttanthium, Saussurea sp., Trifolium repens, Umbelliferae sp.

Discussion

The species collected by the KUE are listed in comparison with other published lists from Central Asia in Table 1. From this table, the KUE material of B. morawitzianus appears as the first record of this species for the region, although the species has actually been recorded there previously (Morawitz 1875; Popov 1931; Grütte 1937). Those species listed in Table 1 but unrepresented in the KUE collection are often among the more northerly species in the combined list. This may be because there were no KUE collecting sites above 2400m. The KUE data add species of cuckoo bumblebees (a group not included by Skorikov) and the northern grassland species B. humilis and B. pascuorum, as well as recognizing the widespread B. terrestris.

Acknowledgements

I am very grateful to Dr Osamu Tadauchi, Fukuoka, for his generous permission and loan of specimens to study the bumblebees collected by the KUE. Thanks to Prof. L. Packer for arranging the cox1 barcode sequencing as part of the BEE-BOL campaign, to the Biodiversity Institute of Ontario for the barcode sequencing, and to the Canadian Barcode of Life Network and NSERC for funding the barcode sequencing.

References


Fabricius, J. C. 1781. Species insectorum exhibentes eorum differentias specificas, synonyma auctorum, loca natalia, metamorphosin adiectis observationibus, descriptionibus, Hamburg.


Kirby, W. 1802. Monographia apum Angiae; or, an attempt to divide into their natural genera and families, such species of the Linnean genus Apis as have been discovered in England: with descriptions and observations, Ipswich.


Linnaeus, C. 1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, Holmiae.


Scopoli, J. A. 1763. Entomologia Carniolica exhibens insecta Carniolie indigena et distributa in ordines, genera, species, varietates, Vindobonae.


