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Taxonomy and distribution of bumblebees (Hymenoptera: Apidae) of district Skardu, Gilgit Baltistan

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Abstract

Survey was conducted in different localities of district Skardu, Gilgit Baltistan during the year of 2016-2017 to record species composition belonging to genus *Bombus* Latreille 1802. It was discovered that 11 species distributed over 8 subgenera of the family Apidae under subfamily Apinae, tribe Bombini occurring in this region. The subgenera, *Alpigenobombus*, *Bombus* and *Melanobombus* were represented by two species namely *Bombus breviceps* Smith, *Bombus kashmirensis* Friese; *Bombus lucorum* subsp *jacobsoni* (Skorikov), *Bombus s. str. tunicatus* Smith; *Bombus rufofasciatus* Smith, *Bombus semenovianus* (Skorikov) respectively. While subgenera *Orientalibombus*, *Psithyrus*, *Pyrobombus*, *Sibircobombus* and *Subterraneobombus* were represented by a single species each namely *Bombus haemorrhoidalis* Smith, *Bombus ferganicus* (Radoszkowski), *Bombus lepidus* Skorikov, *Bombus asiaticus* Morawitz and *Bombus melanurus* Lepeletier respectively in the survey area. Host plants for each species were also recorded from the studied areas. Key to the identification of female bumblebees subgenera and species have been constructed for district Skardu Baltistan.

Keywords: Bumblebee, hymenoptera, *Bombus*, Taxonomy, Gilgit Baltistan

1. Introduction

Bumblebees belong to the genus *Bombus* Latreille, 1802^[5] (Hymenoptera: Apidae) is highly distributed and abundant on flower in temperate, alpine and arctic environment of the northern continents. They are eusocial in nature and are usually found on high altitudes. They are an important pollinator and perform a vital role in the execution of agricultural ecosystems of orchards, crops and wild flowers. Adults feed mainly on nectar, whereas the larvae fed on the honey and mixture of crushed pollen grains, which fulfils their necessities for growth. The active and developmental period of the colony is more than three months in more temperate and mountain regions colonies usually take place in summer (Richards, 1973)^[11] close to the end of developmental season they start producing drones and young queens. After mating, young emerged queens usually overwinter in new nesting sites, and upon of the start of the next developmental season they start establishing new colonies by their self. Workers are having a pollen basket (corbicula) on meta tibia (structure used to gather pollen), this structure is usually absent in males. Workers and Queens bumblebees have sting used for their defense, as compare to honey bees the bumble bees sting repeatedly because the bumblebee's stinger lacks barbs.

Many Bumblebees are confined to the high altitude regions. Different species are restricted to different altitudinal strata starting from 1000m and going up to 5500m asl. These bees construct their nest either abandoned rodent burrows, in or above the, or in tall grasses (Kearns and Thomson 2001)^[5]. It has been reported that the bumblebees regularly cover long distances from their nests for foraging (Osborne *et al.*, 1999; Dramstad 1996)^[8, 2]. These insects are deeply associated with different types of flowers (wild or cultivated) and are found foraging everywhere in different mountainous regions. There are 250 bumblebees species reported worldwide, all these species are placed in a single genus *Bombus* Latreille, 1802^[7], known as 'true' bumblebees, and have a social sterile worker caste (Williams 1998)^[18]. Declining the bumblebees has been attributed due to the agriculture intensive farming, the loss of habitat, insensitive development and collateral pesticide damage. Worldwide, new building constructions on agricultural areas are threatening to the survival of bumblebees.

(Goulson 2003; Williams and Osborne 2009) [4, 21]. Keeping in view the above mentioned importance of *Bombus* species, taxonomic study has been conducted with the following objectives:

1. Collection and identification of bumblebees species of district Skardu.
2. To construct key to the identification of bumblebee species for district Skardu.
3. To make illustrations of important taxonomic characters of bumblebees.

2. Materials and methods

2.1 Survey area

The proposed Study entitled "Taxonomy and Distribution of bumblebees (Hymenoptera: Apidae) of district Skardu, Gilgit Baltistan" was conducted in different localities of Skardu, Gilgit Baltistan i.e. Kharmang valley, Shigar Hashopi, Sadpara nalla and Skardu town. The subsequent methods were followed.

2.2 Bumblebee's collection

Bumblebees ranged from 9mm-27mm in size. Therefore sweeping of hand net was used in their habitation mostly include flowering plants.

2.3 Killing

Dry killing jar was used for killing of bumblebees. Cyanide was used as killing agent in killing jar because it is the most quick and effective chemical for killing of insects.

2.4 Pins, Pinning and Labeling

3 numbers scientific insect pins were used for pinning. The collected specimens were pinned on the right side of thorax. A field label including necessary information date, elevation, longitude and latitude was inserted below the specimen in pins. Identification labels were provided after identification.

2.5 Relaxing and spreading

The specimens were placed in relaxing jar for 24-48 hours just for spreading (appendages) purpose of specimens. Antennae, mouth parts, wings and legs were then spread properly. According to Williams this should not be necessary and may degrade DNA for later sequencing work.

2.6 Storage of specimens

After relaxing the specimens were pinned in a wooden insect collection box provided by the Department of Entomology, the University of Agriculture, Peshawar. Naphthalene balls were placed in boxes to protect specimens from an attack of museum pests. Small packs of silica gel were also being kept to absorb the moisture in the boxes to save the specimens from fungus attack.

2.7 Identification

All the collected bumblebees' specimens were studied under Nikon microscope with magnification up to 400X by following the available literature and identification keys of bumblebees (Williams, 199) [17]. The specimens were identified up to the species level. The identified specimen was conformed from world renowned bumblebees taxonomist Prof. Dr. Paul Hugh William, Natural History Museum, London.

2.8 Description

Descriptions were made from most obvious and observable characters. All the collected specimens were described by using the terminologies of Williams, 1991 [17].

2.9 Repository

All the identified specimens were deposited in the Insect Museum, Department of Entomology, The University of Agriculture, Peshawar.

3. Results and discussion

The present study was carried out in different areas of district Skardu during 2016-2017. The survey was started from the month of March to Oct. Different cast of bumblebees were collected and preserved for subsequent identification. A total of 500 specimens were collected during the collection period. The distribution and host plants for each specimen were recorded at the time of collection. The specimens were properly processed after collection and the necessary information for each specimen were provided on field label. The specimens were identified up to specie level and the different cast was provided for each species.

The result shows that species belonging to the following eight subgenera of the bumblebees occurring in the districts Skardu, Gilgit Baltistan. The subgenera include *Psithyrus*, *Alpigenobombus*, *Sibiricobombus*, *Subterraneobombus*, *Orientalibombus*, *Bombus s.str.*, *Pyrobombus*, and *Melanobombus*.

The subgenera can be separated from one another on the basis of the following key of (Williams, 1991) [17].

3.1 Key to the identification of subgenera (female) of the genus *Bombus* for district Skardu, Gilgit Baltistan.

1. Meta tibia with outer surface flat and broad, without moderate hairs on distal half of outer surface, pollen basket present (corbicula), distal margin having comb like structure spines (rastellum) 2
Meta tibia with outer surface strongly, uniformly and uniformly dense cover with moderate to long hairs throughout pollen basket absent (corbicula), distal margin without comb like structure (rastellum) *Psithyrus*
2. Mandible broadly on distally and rounded, anteriorly with 2 teeth often a posterior tooth, longest hairs on meta basitarsus 3
Mandible not broadly on distally and rounded, but with large triangular with six teeth, meta basitarsus with long straight hairs *Alpigenobombus*
3. Meta basitarsus with proximoposterior region plumose dense of moderate long hairs not continuing on to its outer surface shine, often exposed 4
Meta basitarsus with proximoposterior region plumose dense of moderate long hairs continuing on to its outer surface as dense straight hairs...*Sibiricobombus*
4. Clypeus with small puncture scatter large to medium..... 5
Clypeus with predominantly shinning and smooth, central area strongly scatter micro punctures..... *Subterraneobombus*
5. Ocello ocular region unpunctured, shinning area is medium or small 6
Ocello ocular region unpunctured, shinning area is very large *Orientalibombus*
6. Mandible with distally notch (incisura) deep and wide, labrum always with broad medium longitudinal furrow,

- (meta basitarsus with posterior edge strongly evenly convex oculo malar distance shorter than the mandible breadth)) *Bombus s. str.*
Mandible with distally notch (incisura) less than half deep as wide, labrum almost not medium longitudinal furrow 7
7. Ocello ocular region punctuate, inner margin of eye almost with very few small punctures *Pyrobombus*
Ocello ocular region punctuate, inner margin of eye almost with very large punctures *Melanobombus*

3.2 Key to the identification of the species (female) of genus *Bombus* for District Skardu, Gilgit Baltistan. Followed by (Williams, 1991; Raina, 2010) [17, 11].

1. Mandibles with 6 teeth 2
Mandibles less than 6 teeth 3
2. Distoposterior end of mesobasitarsus equal to distoanterior end; thorax black; 4th abdominal tergite half anterior yellow and half posterior black strip..... *B. breviceps* Smith
Distoposterior end of mesobasitarsus shorter than the distoanterior end; thorax bright white with a black-band between wing bases; 4th abdominal tergite entirely brick red *B. kashmirensis* Friese
3. Outer surface of meta tibia completely covered with hairs, corbicula, rastellum and auricle absent, clypeus almost flat. Lateral ocelli just below the post ocular line (apex of tergite VII triangularly notched, surface sculptured but shining, median furrow absent)..... *B. ferganicus* Radoszkowski
Outer surface of meta tibia not completely covered with hairs, corbicula, rastellum and auricle present, clypeus protuberant; lateral ocelli not below the post ocular line; median furrow present 4
4. Distoposterior corner of mesobasitarsus spinosely produced and longer than that of distoanterior corner; margin of the distal posterior half of metabasitarsus concave; Area lateral to lateral ocellus equal to the diameter of latter, unpunctured; band of punctures along eye margin covering 3/5th of ocello ocular length; lateral ocelli are at same level to post ocular line; apex of tergite VII with a significantly raised boss, with median groove, thorax yellow 4th to 7th abdominal tergites black..... *B. melanurus* Lepeletier
Distoposterior corner of mesobasitarsus rounded or bluntly pointed; labral lamella is narrow, only about a 3rd of basal breadth of labrum, clypeus with numerous great punctures, tergum VI has discrete subapically rounded-boss, tooth apically and mandible with deep notch (incisura), pubescence of thoracic black with sometimes with a broad lemon -yellow with a narrow posterior band and tergum V nearly white *B. s. str. jacobsoni* Skorikov
5. Meta basitarsus with opaque pubescence of proximal margin (auricle) ongoing onto outer surface of proximoposterior projection as a dense long brush, posterior margin in the distal half of metabasitarsus concave; Meta tibia with outer surface smooth and shining; thorax dirty white with black band between wing bases; abdominal segment 4th, 5th, 6th black..... *B. asiaticus* Morawitz
Meta basitarsus with dense pubescence of proximal margin (auricle) continuing onto outer surface of proximoposterior projection as just a few sparse hairs.

- Length of auricle longer than its breadth at its base; Meta tibia with outer surface not smooth; abdominal segments not as above 6
6. Malar space longer or equal to the basal breadth of mandible 7
Malar space shorter than the basal breadth of mandible..... 8
7. Malar space equal to the basal breadth of mandible at its base *B. rufofasciatus* Smith
Malar space longer than basal breadth of mandible at its base; area lateral to lateral ocellus unpunctured equal to twice the diameter of ocellus; posterior margin of distal half of metabasitarsus convex; apex of tergite VII truncate with a rounded boss) *B. haemorrhoidalis* Smith
8. Length of distoposterior corner of mesobasitarsus shorter than the distoanterior corner, 3rd abdominal tergite not black 9
Length of distoposterior corner of mesobasitarsus longer than the distoanterior corner, 3rd abdominal tergite black; (apex of tergite VII rounded, subapically nearly flat without a rounded boss, surface sculptured, median groove absent) *B. s.str. tunicatus* Smith
9. Apex of tergite VII concave; posterior margin of distal half of metabasitarsus straight; thorax entirely yellow; 2nd and 3rd abdominal tergites black *B. semenovianus* Skorikov
Apex of tergite VII rounded, posterior margin of distal half of metabasitarsus concave; thorax not entirely yellow, 2nd and 3rd abdominal tergites not black; (Thoracic scutum.mid dorsally with an area as large as tegula around posterior end of longitudinal median groove smooth with few or without punctures; hairs on ventral parts of thorax and gaster predominantly. grey-white, apex and anterior of head often with many pale hairs intermixed *B. lepidus* Skorikov

3.3 *Bombus (Bombus s. str.) tunicatus* Smith, 1852

3.3.1 Diagnostic characters of cast

a. Queen

The queen has black pubescence on head, mesonotum and 3rd abdominal tergum. 1st abdominal tergum, pronotum and metanotum are white; 4th and 5th abdominal tergites are red brick, black band between wings. Population variations in queens show different shades of white and brown color on pronotum; white, brown and black on metanotum; 1st and 2nd abdominal tergum are white and black.

b. Worker

Pronotum and metanotum are white. Head, 3rd abdominal tergum and mesonotum are black; 4th and 5th abdominal tergites are red brick.

c. Male

Head mesonotum, and 2nd abdominal tergum are black, pronotum, metanotum and 1st abdominal tergum white; 3-5th abdominal tergum are brick red.

3.3.2 Material examined 16♂ 60♀

3.3.3 Distribution

This species usually found at 1650-5500m above sea level (asl). Worldwide distributions are Afghanistan, India, Nepal and Pakistan (Williams 2004 and Williams *et al.*, 2010) [19, 20]. In this survey this species was collected from Skardu,

Kharmang Olding and Shigar areas, where they are common habitat, most abundant around the lower mountains coniferous forest.

3.3.4 Host plants

Artemisia absinthium L., *A. spp.*, *Cirsium falconeri* (Hook.f.) Petrak, *Cirsium arvense* (L.) Scop., *Helianthus annuus* L., *Chenopodium botrys* L. (Chenopodiaceae); *Convolvulus arvensis* L. (Convolvulaceae); *Prunella vulgaris* L. (Williams, 1991; Raina, 2010).

3.4 *Bombus (Bombus) subsp. jacobsoni* Skorikov, 1912

3.4.1 Diagnostic characters of cast

a. Queen

In queen pubescence on head, mesonotum, metanotum 1, 3 and 4th abdominal tergites black; pronotum and 2-5th abdominal tergites is yellow; around clypeus long orange hair, little grey feathered hairs on around the face and the antennal base; wings light brown.

b. Worker

Head, mesonotum, metanotum and 3rd and 4th abdominal tergites are black; pronotum, 1st and 2nd abdominal tergites yellow; 5th abdominal tergum is white.

c. Male

Head and mesonotum black, pronotum, metanotum and 1st and 2nd abdominal tergites are yellow; 3rd abdominal tergum black anteriorly and posteriorly yellow; 4th abdominal tergum anteriorly black and posteriorly white; 5th abdominal tergum is white.

3.4.2 Material examined 10♂20 ♀

3.4.3 Distribution

This species found the stratification between the ranges from 2100m to 4800m asl. This species reported from India, Afghanistan, Bhutan, Myanmar, Nepal, Tibet, Alaska, Canada, Northern and central China, Europe, Iran, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkey, Yunnan, Sichuan, Gansu, Heilongjiang, North Korea, Hokkaido in Japan and Kamchatka Gilgit Baltistan, KPK, Punjab in Pakistan (Williams, 1991, 2004; Williams *et al.*, 2010 and Sheikh *et al.* 2015) [17, 19, 20, 13].

3.4.4 Host plants

Allium sp. (Amaryllidaceae); *Artemisia absinthium* L., *A. spp.*, *Taraxacum officinale* Weber. (Asteraceae); *Trifolium repens* L. (Papilionaceae); *Epilobium angustifolium* L. (Onagraceae). (Williams, 1991; Raina, 2010) [17, 11].

3.5 *Bombus (Alpigenobombus) kashmirensis* Friese, 1909

3.5.1 Diagnostic characters of cast

a. Queen

In queen pubescence on head, mesonotum and metanotum black; pronotum and 1st, 2nd tergites of abdomen are yellow; 3rd, 5th tergites of abdomen are red brick.

b. Worker

Head, mesonotum and metanotum are black; pronotum and 1st and 2nd tergites of abdomen are white; 3-5th tergites of abdomen brick red; except on malar space pubescence is thick on head; clypeus, lateral area in front of ocelli narrow stripes on inner and post orbits.

c. Male

Head, mesonotum and 3rd abdominal tergum black; pronotum, metanotum and 1st abdominal tergum are white; 2nd abdominal tergum yellow; 4th abdominal tergum is brick red with anterior corners black; 5th abdominal tergum brick red with a median white band.

3.5.2 Material examined 10♂ 30♀

3.5.3 Distribution

India, Pakistan, Nepal, Sikkim, Bhutan, Tibetan plateau, Xizang, Qinghai, Gansu, Sichuan (Williams, 2004; Williams *et al.*, 2010) [19, 20]. Zhundur, upper Memosh and Ganok were reported in the present study.

3.5.4 Host plants

Allium sp. (Amaryllidaceae); *Saussurea auriculata* (DC.) Sch. Bip., *S. sp.*, *Cirsium arvense*, *Taraxacum officinale* Weber. (Asteraceae); *Aconitum heterophyllum* Wall, *Delphinium* sp (Williams 1991; Raina 2010) [17, 11].

3.6 *Bombus (Alpigenobombus) breviceps* Smith, 1852

3.6.1 Diagnostic characters

Small species, head and mesonotum black; white are pronotum, metanotum and abdominal tergites 1 and 2; abdominal tergum 3 with anterior black and posterior brick red bands; abdominal tergites 4 and 5 brick red.

3.6.2 Material examined 5♂ 10♀

3.6.2 Distribution

Pakistan, Himachal Pradesh, Central and Southern China, Nepal, Thailand, Nepal, Vietnam, Darjiling Bengal, Bhutan, Uttaranchal, Sikkim, Arunachal Pradesh, Myanmar, Meghalaya (Williams, 1991; Raina, 2010) [17, 11].

3.6.3 Host plants unknown

3.7 *Bombus (Orientalibombus) haemorrhoidalis* Smith, 1852

3.7.1 Diagnostic characters of cast

a. Queen

Large sized; pubescence of head and thoracic dorsum entirely black; 1st and 2nd abdominal tergites are white; 3rd abdominal tergum is black; 4-5th abdominal tergites brick red.

b. Workers

Head, thorax and 3rd abdominal tergum are entirely black, 1st and 2nd abdominal tergites are yellow; 4-5th abdominal tergites brick red; wings strongly infuscated; pubescence short and very even.

c. Male

Pubescence of head and thorax entirely black; 1 and 2nd abdominal tergites are bright yellow; 3-5th abdominal tergites brick red.

3.7.2 Material examined 20♂ 80♀

3.7.3 Distribution

It is a low altitude species and is found mainly in altitude between 1000-2600m. This is among the few species in Kashmir Himalayan belt that starts its foraging from 1000m asl. *Bombus haemorrhoidalis* is South East Asian and Himalayan species (Williams, 1991). [17] It was reported from Pakistan, India, Bhutan, Myanmar, Nepal, Tibet, South western China, Thailand, Vietnam (Williams, 2004; Williams

et al., 2010; Raina, 2010) ^[19, 20, 11] in this survey this species was collected from Skardu.

3.7.4 Host plants

Helianthus annuus L. (Asteraceae); *Ipomea tricolor* (Convolvulaceae); *Digitalis purpurea* (Scrophulariaceae). *Impatiens glandulifera*, *Pteracanthus urticifolius*. (Williams, 1991; Raina, 2010) ^[17, 11].

3.8 *Bombus (Pyrobombus) lepidus* Skorikov, 1912

3.8.1 Diagnostic characters of cast

a. Female

Small sized, pubescence of head, pronotum, metanotum and 1st abdominal tergum white; mesonotum is black with lateral aspects white; 2nd abdominal tergum yellow; 3-5th abdominal tergites are brick red; wings light brown; mid basitarsus with the distal posterior corner acute while broadly rounded.

b. Male

Head, pronotum, metanotum 1st and 2nd abdominal tergites yellow, malar space, mesonotum and 3rd abdominal tergum are black; 4-5th abdominal tergites brick red.

3.8.2 Material examined 10♂20♀

3.8.3 Distribution

This species *B. lepidus* is a pre Tibetan species (Yasumatsu, 1954; Skorikov, 1912b) usually found at the altitude from 2400m to 4800m asl. India, Pakistan, Nepal, Bhutan, Himalaya, southwestern China and Tibet are included in its distribution (Williams, 2004; Williams *et al.*, 2010) ^[19, 20].

3.8.4 Host plants

Cirsium sp., *Saussurea* sp. (Asteraceae); *Mentha longifolia* L., *Salvia* sp. (Lamiaceae); *Epilobium angustifolium* L. (Onagraceae); *Aconitum heterophyllum* Wall. (Williams, 1991; Raina, 2010) ^[17, 11].

3.9 *Bombus (Sibiricobombus) asiaticus* Morawitz, 1875

3.9.1 Diagnostic characters of cast

a. Queen

In queens pubescence of head, mesonotum, 3-5 abdominal tergites black; pronotum, metanotum and 1st abdominal tergum are dirty white; 2nd abdominal tergum dirty yellow with posterior fringe of black hairs.

b. Workers

Head, mesonotum and 2-5 abdominal tergites black; pronotum, metanotum and 1st abdominal tergum are dirty white. Obvious parts of thorax and abdomen consistently cover with thick pubescence.

c. Male

Head, mesonotum, and 1-4 abdominal tergites black except lateral aspects of thorax which are pale white; pronotum and metanotum pale yellow; 5th abdominal tergum brick red; Anterior margin of labrum a little concave, tubercles meeting in the center without any groove and excepting top of tubercles area is covered with macro punctures.

3.9.2 Material examined 10♂20♀

3.9.3 Distribution

Bombus asiaticus is a Tibetan and central-Asian species known as from Mongolia usually found at the range from 1750m – 4800m asl. It was reported from India, Afghanistan,

Pakistan, Nepal, Tibet, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan and China (Williams *et al.*, 2010) ^[20]. In the present survey this species was collected from Kharmang valley and Sadpara nalla.

3.9.4 Host plants

Helianthus annuus L., *Convolvulus arvensis* L. (Convolvulaceae); *Malva* sp. (Malvaceae); *Epilobium hirsutum* L. (Onagraceae); *Delphinium brunonianum* Royle, *D. sp.* (Williams, 1991; Raina, 2010) ^[17, 11].

3.10 *Bombus (subterraneobombus) melanurus* Lepeletier, 1836

3.10.1 Diagnostic characters of cast

a. Queen

In queen pubescence on head, 3-5th abdominal tergites black, pronotum, metanotum and first 2 abdominal tergites are dirty yellow; mesonotum is dirty yellow with black lateral aspects.

b. Worker

Head and 4 and 5 abdominal tergites black; thorax and 1-3rd abdominal tergites are dirty yellow; Except malar space head covered with thick pubescence; clypeus, labrum an area lateral to and in front of ocelli and narrow stripes on inner and post orbits.

c. Male

Head and 3-5 abdominal tergites black, thorax and 1abdominal tergum dirty yellow; 2nd abdominal tergum with anterior dirty yellow and posterior black bands.

3.10.2 Material examined 20♂ 30♀

3.10.3 Distribution

Bombus melanurus is a common, while mainly central-Asian species (Williams, 1991) ^[15] know from Mongolia (Pittioni, 1993; Skorikov, 1933; Bischoff, 1936) ^[7, 13, 11]. Mainly found from these ranges between 2300m to 5500m asl. India, Afghanistan, Pakistan, Nepal, Tibet, Europe, Iran, Uzbekistan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Kazakhstan, Russia, Turkey, Armenia, Lebanon, Syria, Northwestern and Northern China (Williams, 2004; Williams *et al.*, 2010) ^[19, 20]. Skardu.

3.10.4 Host plants

Tanacetum sp. (Asteraceae); *Mentha longifolia* L., *Thymus linearis* Benth. ex Benth. (Lamiaceae); *T. repens* L., *Rumex nepalensis* Spreng. (Polygonaceae); *Aconitum* sp. (Ranunculaceae).

3.11 *Bombus (Psithyrus) ferganicus* Radoszkowski, 1893

3.11.1 Diagnostic characters of cast

a. Worker

Pubescence on head, lateral aspects of mesonotum black; malar space, thorax, abdominal tergites 1 and 4 yellow; 2nd abdominal tergum black with dirty yellow posterior corners; 3rd and 5th abdominal tergum medially black with dirty yellow sides; Head covered with thick pubescence except malar space; clypeus, an area lateral to and in front of ocelli and narrow stripes on inner and post orbits. Thorax and abdomen uniformly covered with thick pubescence. Labrum with basal transverse depression extending apically as a deep median furrow between pronounced lateral tubercles, displacing ridge between them to form a lamella that overhangs apical margins. Clypeus almost uniformly flat, only apico-lateral corners, bent back strongly towards occiput.

b. Male

Head and mesonotum black, malar space, pronotum, metanotum and 1st abdominal tergum are yellow, 2nd abdominal tergum black with dirty yellow posterior corners; 3-5th abdominal tergum medially black with dirty yellow sides; Lateral tubercles raised, sloping inward, not meeting each other due to broad but shallow depression.

3.11.2 Material examined 10♂ 20♀

3.11.3 Distribution

Bombus ferganicus is a central Asian species. This species is recognized from Tien Shan (Radoszkowski, 1893). Mostly found in the range from 2500-4000m asl. India, Afghanistan, Pakistan and Kazakhstan, Kyrgyzstan and Northwestern China (Williams, 2004) [19]. Karakorum, Hindu kush (Williams, 1991; Raina, 2010) [17, 11]. Skardu, Baltistan.

3.11.4 Host plants

Trifolium pratense L., *Brassica campestris* L. (Brassicaceae) (Williams, 1991; Raina, 2010) [17, 11].

3.12 *Bombus (Melanobombus) semenovianus* Skorikov, 1914

3.12.1 Diagnostic characters of cast

a. Queen

Head black; thorax and 1st abdominal tergum yellow, 2 and 3rd abdominal tergites black in queens.

b. Workers

First 3 abdominal tergites are black; 4 and 5 abdominal tergites brick red. Except malar space head covered with thick pubescence; clypeus, an area lateral to and in front of ocelli and narrow stripes on inner and post orbits. Mandible illustrated as.

c. Male

Head black with yellow malar space, thorax and 1st abdominal tergum yellow; 2 and 3rd abdominal tergites black; 4 and 5 tergites brick red. Eyes a little enlarged relative to those females, anterior margin of labrum shallowly notched in the middle, lateral tubercles interrupted in center by a median longitudinal groove.

3.12.2 Material examined 30♂ 30♀

3.12.3 Distribution

(*Melanobombus*) *Bombus semenovianus* Skorikov is a central Asian species. It is recognized from Hindu Kush (Reining, 1940; Richard, 1951; Tkalcu, 1969a); Pakistan (Frison, 1935) usually found in the range from 2600-3800m asl. India, Afghanistan and Pakistan (Williams, 2004) [19]. Skardu, Kharmang and Shigar.

3.12.4 Host plants

Cirsium spp, *Ipomoea* sp. (Convolvulaceae); *Hippophae rhamnoides* L.; *Epilobium angustifolium* L., *E. hirsutum* L. (Onagraceae); *Melilotus officinalis* (L.) Pall., *Trifolium pratense* L. (Papilionaceae).

3.13 *Bombus (Melanobombus) rufofasciatus* Smith, 1852

3.13.1 Diagnostic characters of cast

a. Queen

Pubescence on head, mesonotum and 2nd abdominal tergum black; pronotum, metanotum and 1st abdominal tergum white; 3rd abdominal tergum entirely reddish; 4 and 5th abdominal tergites white.

b. Workers

2nd abdominal tergum yellow, 3-4 reddish and 5th abdominal tergum white; wings color are light brown. Boss on 6th abdominal tergum about round and equally convex, only narrow pointed nearby top of tergum; mid basitarsus, with the distal posterior corner forming nearly a right angle and not pointed and sharply; labrum deep median furrow present between pronounced lateral tubercles, lamella overhangs apical margin.

c. Male

Similarly colored as workers; compound eyes strongly enlarged as compared to the females; posteriorly antenna reaching only just to the wings bases; distally mandible is pointed, with one additional tooth; labrum almost anterior margin shorten. Lateral tubercles not assembly in the centre, interrupted by a low depression. Excepting tubercles, rest of the area densely punctured.

3.13.2 Material examined 40♂ 20♀

3.13.3 Distribution

2400–4800m asl. Pakistan, Bhutan, India, Myanmar Nepal, and Tibet and south western China (Williams, 2004; Williams, *et al.*, 2010) [19, 20].

3.14.4 Host plants

Convolvulus arvensis L. (Convolvulaceae); *Allium* sp. (Amaryllidaceae); *Euphorbia wallichii* Hook.f. (Euphorbiaceae); *Aconitum heterophyllum* Wall, *Convolvulus arvensis* L. (Convolvulaceae); *Trifolium repens* L., *T. pratense* (Papilionaceae) (Williams, 1991; Raina, 2010) [17, 11].

4. Summary

Bumblebees belong to the genus *Bombus* Latreille, 1802 of the family Apidae, order Hymenoptera. These insects rank among the most abundant and conspicuous of flower visitors in alpine, temperate and arctic environment of the northern continents. They are called primitively eusocial and are associated with the high lands and play a key role in the functioning of agricultural ecosystems as pollinators of crops, orchards and wild flowers. Bumblebees are mostly confined to the high attitude regions. Different species are restricted to different altitudinal strata starting from 1000m and going up to 5500m asl. These bees nest either in the ground, often in abandoned rodent burrows, or above ground, in tall grasses (Kearns and Thomson, 2001) [5].

In the present study an extensive survey was carried out in diverse areas of district Skardu Baltistan during 2017-2018. The regions include Kharmang valley, Shigar Hashopi, Sadpara Nalla and Skardu town.

The study revealed that the occurrence of the 11 species belonging 8 subgenera in the study area. The recorded subgenera include *Bombus s. str.*, *Orientalibombus*, *Subterraneobombus*, *Alpigenobombus*, *Psithyrus*, *Melanobombus*, *Pyrobombus* and *Sibiricobombus*. Key have been constructed for the species of bumblebees of Skardu.

The subgenera (*Bombus*) was the most abundant in the area of low altitude of nearly 2500 m asl Skardu and Shigar represented by *Bombus tunicatus* and *Bombus lucorum* was recorded during the month of July, August.

Alpigenobombus is represented by two species *Bombus breviceps* and *Bombus kashmirensis*. *Bombus kashmirensis* is widely distributed in the high mountain region in Kharmang valley was recorded while the *Bombus breviceps* was rare in

the study area. These species separate to each other on the base of distoposterior, distoanterior end of mesobasitarsus and color pattern of thorax and abdominal tergite.

Orientalibombus represented by only one species *Bombus haemorrhoidalis* widely distributed in the lower altitude of Skardu. This species also reported from northern areas of Pakistan by (Sheikh *et al.* 2015) [13]. This species was collected during the month of August from Skardu.

Bombus lepidus is very rare group among *Pyrobombus* of Skardu. Single species was recorded in the present survey. The species was collected in the month of September from Skardu.

Sibiricobombus is rare subgenus in the studied area and single species *Bombus asiaticus* was recorded during the month of September. This species can be recognized by other species of the subgenera by its distoposterior corner of mesobasitarsus bluntly pointed.

Subterraneobombus represented by *Bombus melanurus* is rare species in the study area single species was recorded during the month of August.

Bombus ferganicus species was identified in subgenus *Psithyrus*. The species was collected in the month of July from Kharmang valley.

Melanobombus represented by two species *Bombus rufofasciatus* and *Bombus semenovianus*. These species were widely distributed in the study areas and collected during the month of August. These species were separated by each other on the base of mandible, mesobasitarsus and labrum.

5. Conclusion

The study area is much rich in bumblebees fauna. Bumblebees are present everywhere in all localities of study areas. Losses of bumble bees can have far ranging ecological impacts due to their role as pollinators. Different species have different hosts and different active seasons. They have a role as pollinators of low land crops and wild flowers. *B. tunicatus* and *B. haemorrhoidalis* are highly distributed species while the *B. lepidus* is a rare species in the area. Bumblebee populations are declining in the area as species composition and distribution has been checked with previously available literature of the surrounding areas.

6. Recommendations

On the basis of the present study it is recommended that the Gilgit Baltistan region should be extensively sampled for Bumblebees fauna as there are much chances of recording new species and Subgenera. Further study should be conducted on rearing and release of bumblebees in blooming season of different fruits and vegetables in the area. Molecular studies should be carried out for phylogenetic relationship of bumblebees.

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