A CONRIBUTION TO THE BUMBLE BEE FAUNA OF BURSA PROVINCE (HYMENOPTERA: APIDAE, BOMBINI)

BURSA İLİ BAMBUL ARI TÜRLERİ ÜZERİNDE FAUNİSTİK BİR ARAŞTIRMA (HYMENOPTERA: APIDAE, BOMBINI)

Zeyhan YILMAZ, İsmail Hakkı UĞURTAŞ

Uludağ University, Science and Art Faculty, Department of Biology, Bursa, TURKEY

Abstract: In this study, 10 species of bumble bees were found in Bursa province. Six of these species belong to the genus *Bombus* and the others to the genus *Psithyrus*. The colour pattern and body measurements of these species were studied.

Key Words: *Hymenoptera, Apidae, Bombini,* Fauna, Distribution.

Özet: Bu çalışmada Bursa ilinde özellikle Uludağ'da 10 bambul arı türü kaydedilmiştir. Bu türlerin 6'sı *Bombus*, 4' ü de *Psithyrus* cinslerine aittir. Çalışmada bu türlerin renk ve desen durumları ile vücut ölçüleri verilmiştir.

Anahtar Kelimeler: *Hymenoptera, Apidae, Bombini,* Fauna, Dağılış.

INTRODUCTION

The Bumble bees, the subject of our research are one of the genetic and biological richness. They are a group of insects which are certainly needed because they provide the increase of quality and quantity in agricultural production and more important, many wild plants could survive for generations (Özbek 1968, 1978, 1980, 1983, 1990, 1991, 1997).

The tribe Bombini in the family Apidae comprises two genera, *Bombus* and *Psithyrus*. However, Williams (1998) considered the bumble bees a monophyletic group and recognized a single genus *Bombus* for all bumble bees, to include *Psithyrus* as a subgenus.

There are approximately 250 bumble bee species occurring in the world (Michener 2000). Williams 1998 indicated that most of the names are for taxa below the rank of species, and just 239 taxa are interpreted in his study. In Turkey there are 51 taxa of *Bombus* and 8 taxa of *Psithyrus*, totally 60 taxa (Özbek 2002).

When one looks at the researches for bumblebees what have been done till now, it is realised that there is not much in Turkey.

Therefore, our study aims to determine the taxa of bumblebees and their distribution in the area of Bursa-Uludağ, which is one of the borders in the crossing from Europe to the Middle East. It is also aimed to make a systematic research a certain area in Hymenoptera fauna of Turkey and thus to fill the gap in this area and to expose a step in the comparison between Anatolia and Europe.

MATERIALS AND METHODS

In this study, 300 specimens of bumblebees were collected in Bursa province, mainly Uludag, in the springs and summers of 1995 and 1996.

Although we tried to diagnose the specimens using various sources (Özbek 1980, 1983, 1990, 1991), the definite diagnoses were done by Prof. Dr. Hikmet ÖZBEK.

The insect net was used to collect the bees. The bees which perched on the plants with flowers were caught with net. They were kept in jars until to be determined. Meanwhile the notes were taken on the place where they were caught, the date and the plants. Later, they were put in the killing bottles and subjected to be stretched.

The stretching boards are used to stretch the bees. Every stretched bee is attached a label on which the date and the name of the place are written. They were kept in the stretching boards for about one or four weeks. The dried bees were taken out of the boards and the labels were attached to the specimens. Later they were put in the collection boxes.

RESULTS

Genus: *Bombus* Latreille 1802

Bombus hortorum (Linnaeus, 1761) (Fig.1)

Totally 44 specimens were collected (3 ♂♂, 41 ♀♀).

Kayapa (170 m.): 1 ♀, 14.04.1995; Kirazlıyayla -Uludağ (1525 m.): 1♀

19.05.1995, 12 ♀♀ 25.05.1995, 26 ♀♀ 30.05.1995, 2 ♂♂ 8.08.199, 1 ♀

8.08.1995; Sarıalan-Uludağ (1700 m.): 1 ♂ 19.08.1995.

Queen bee: The body length is 16.80-23.05 mm. the hair out of the interal band in thorax is yellow. The base of T2 and the whole T1 is yellow, apical part of T2, T3 is completely black, T4-T6 is greyish white.

Worker bee: The body length is 12.25-15.60 mm. The other part of his body has the same colouring with the queen bee.

Male bee: The body length is 12.10-12.40 mm. It is in the same colour with thorax and abdomen of female.

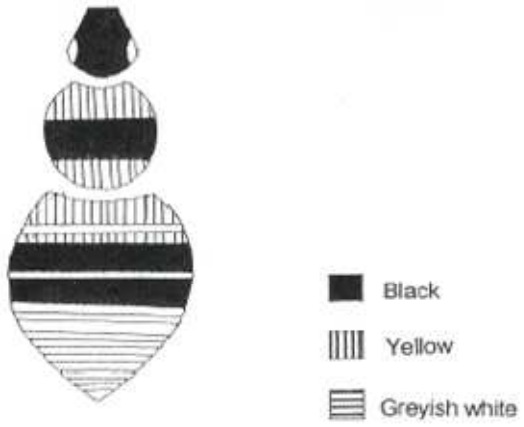


Fig. 1.
The colour and patterns in Bombus hortorum

Bombus pascuorum (Scopoli, 1763) (Fig. 2)

Totally 14 specimens were collected (2 ♂♂, 12 ♀♀).

Kayapa (170 m.): 1 ♀ 14.04.1995; Uludağ (1200 m.): 1 ♀ 25.05.1995;

Kirazlıyayla-Uludağ (1525 m.): 2 ♀♀ 25.05.1995, 2 ♀♀ 30.05.1995, 2 ♂♂,

2 ♀♀ 8.08.1995, 3 ♀♀ 19.05 1996; Yeniceabat (160 m.): 1 ♀ 8.08.1995.

Queen bee: The body length is 14.70-20.05 mm. The head has black hairs. On the honeycomb eyes, there is long pale orange hair. Thorax is reddish brown (orange colour). The ventral of thorax is black or the tips of apical hair are yellow. T1-T2 is black in abdomen, in some of them T1 is black and the upper part of T2 nd T3 is orange colour it gets black towards ventral. The base of T3, T4, and T5 is black and in its apical there is orange hair. In some of them, the surface is plain and shining black. Abdomen's ventral is S1-S2 black, S3, S4, S5 have greyish white hairs.

Worker bee: The body length is between 10.60-11.60 mm. The other parts are as in the queen bee.

Male bee: The body length is between 10.05-11.10 mm. The colourings are as en the queen bee and male bee.

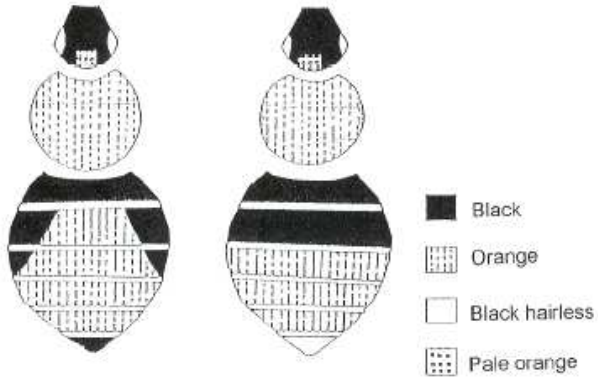


Fig. 2.
The colours and patterns in the bodies of Bombus pascuorum

Bombus haematurus Kriechbaumer 1870 (Fig. 3)

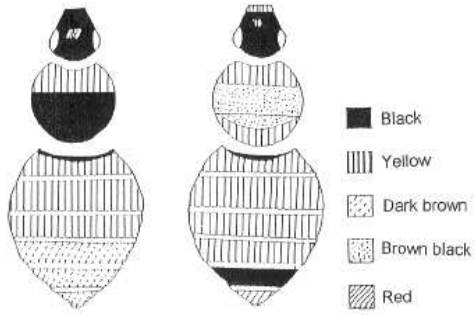
18 specimens were collected (1 ♂, 17 ♀♀).

Misi (Gümüştepe) (220 m.): 1 ♀ 8.04.1995; Kayapa beldesi (170 m.): 7 ♀♀ 14.04.1995; Hamamlıkızık-Uludağ (250 m.): 9 ♀♀ 23.04.1995; Kirazlıyayla-Uludağ (1525 m.): 1 ♂ 8.08. 1995.

Queen bee: The body length is between 10.35-12.30 mm. The head is black and between the honeycomb eyes, there is dark brown hair (brown-black). Prothorax is yellow and the other parts of thorax is black, T1 is black, T1's apical is yellow, T2, T3 is yellow, T4, T5, T6 is dark brown (Fig. 3 a).

Worker bee: The body length is between 10.35-12.30 mm. The head is black and between the honeycomb eyes, there is dark brown hair (brown-black). The prothorax is yellow but the other parts of it are dark brown, as in the Abdomen queen bee.

Male bee: In the head, there is short and yellow hair between the honeycomb eyes. Prothorax is yellow, mesothorax is dark brown, and metathorax (scutellum) is yellow. T1, T2, T3, T4 is yellow, T5 is black, T6 is red. (Fig. 3b)



a b

Fig. 3.
The colours and patterns of Bombus haematurus
a. Queen bee b. Male bee

Bombus soroeensis (Fabricius 1776) (Fig. 4, 5)

38 specimens were collected (18 ♂♂, 20 ♀♀).

Uludağ Hotels area (1865 m.): 1 ♀, 30.05.1995; Kirazlıyayla-Uludağ (1525 m.): 1 ♀ 6.06.1995, 1 ♂, 5 ♀♀ 8.08.1995, 3 ♂♂ 19.08.1995; Çobankaya-Uludağ (1750 m.): 1 ♀ 6.06.1995; Uludağ Lakes Area (2450 m.) 1 ♀ 6.07.1995; Yurt-Uludağ (450 m.) 2 ♂♂, 1 ♀ 8.08 1995; Sarıalan-Uludağ (1700 m.) 4 ♀♀ 18.08.1995, 8 ♂♂ 5 ♀♀ 19.08.1995, Uludağ National park entrance (1300 m.) 4 ♂♂, 1 ♀ 19.08.1995.

Queen bee: The body length is between 14.25-17.00 mm. The hair in the head, the collar and thorax is black. T1, T2, T3 is black sometimes there is yellow hair in the apical of T3. T4, T5, T6 is yellow or reddish yellow. In S5 and S6 there are short and thin (seldom) hair. (Fig. 4)

Worker bee: The body length is between 9.00-12.35 mm. The collar is yellow or black. The other parts are as in the queen bee.

Male bee: The body length is between 10.05-12.10 mm. The collar is yellow or black. Prothorax is light yellow, the other parts of thorax is black. T1, T2, T3 is black, T4, T5, T6 is yellow or red. (Fig. 5)

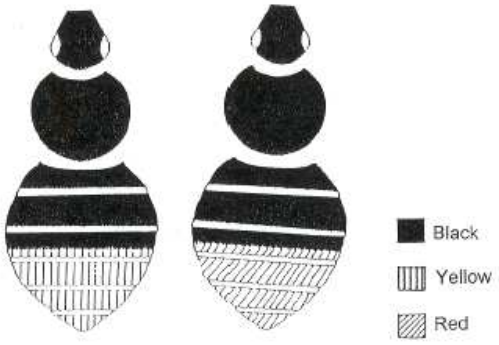
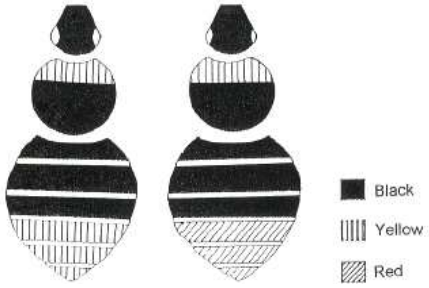


Fig. 4.
The colours and patterns of the queen bee of
Bombus soroeensis



a b

Fig. 5.
The colours and patterns of male bee of
Bombus soroeensis
a. Queen bee b. Male bee

Bombus lucorum (Linnaeus, 1761) (Fig. 6).

15 specimens were collected. (9 ♂♂, 6 ♀♀).

Kirazlıyayla-Uludağ (1525 m.): 3 ♂♂, 3 ♀♀ 8.08.1995; Yurt-Uludağ (450 m.): 1 ♀ 8.08.1995; Uludağ National Park Entrance (1300 m.): 1 ♂, 1 ♀♀ 18.08.1995; Sarıalan-Uludağ (1700 m.): 5 ♂♂, 1 ♀ 19.08.1995.

Queen bee: The body length is between12.70-15.30 mm. The head is black and on it there is yellow hair. The bright yellow collar goes down to dorsolateral. Prothorax is yellow, the other parts of thorax is greyish white (close to black), T1, T2 is yellow, T3 is black, T4, T5 is white, T6 is black in the middle and its sides are white.

Worker bee: The body length is between 9.30-13.60 mm. The head is black and the other parts are as in the queen bee.

Male bee: The body length is between 11.40-13.60 mm. The head has yellow hair. Some of them have black hair. The light yellow collar goes to ventral of thorax. In some of them, mesothorax is black. Metathorax is light yellow. In some, thorax is completely yellow. Abdomen is as in the queen bee. In some of them, T1, T2 is yellow, T3 is black, T4, T5, T6 is red.

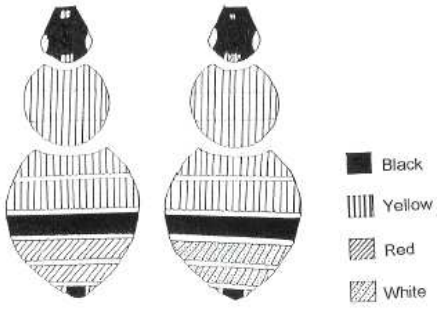


Fig. 6.
The colours and patterns of the bodies in
Bombus lucorum

Bombus terrestris (Linnaeus, 1758) (Fig. 7, 8).

119 specimens were collected (35 ♂♂, 84 ♀♀).

Karacakaya-İznik (30 m.): 7 ♀♀ 13.03.1995; Doğanköy (180 m.): 1 ♂, 2 ♀♀ 7.04.1995; Yeniceabat (160 m.): 26 ♀♀ 8.04.1995; Kayapa (170 m.): 23 ♂♂ 14.04.1995, 4 ♀♀ 23.04.1995; Uludağ Hotels Area (1865 m.): 1 ♂ 14.04.1995, 6 ♀♀ 30.05.1995, 1 ♀ 28.06.1995, 1 ♀ 19.08.1995; Kirazlıyayla-Uludağ (1525 m.): 2 ♀♀ 13.05.1995; Sarıalan-Uludağ (1700 m.): 6 ♂♂, 12 ♀♀ 19.08.1995, 3 ♀♀ 30.05.1995, 4 ♂♂, 10 ♀♀ 8.08.1995; Yurt (450 m.): 8 ♀♀ 8.08.1995.

Queen bee: The body length is between.16.05-23.90 mm. The head has black hair, prothorax is yellow and the other parts of it is black. T1 is black, T2 yellow, T3 black, T4 and T5 is white. T6 is black and it gets white in the sides. S4 and S5 are white, the legs are black. In one of the specimens there is white hair in a certain area in the middle of the yellow band in T2 (Fig. 7a).

Worker bee: The body length is between 10.10-15.90 mm. The other sides are as in the queen bee but rarely, there are few differences in abdomen in some types that we collected. T1 is black and hairy, T2 is yellow but in the middle it is black and hairless. T3, T4, T5, T6 are black and hairless (smooth) (Fig. 7b, 8).

Male bee: The body length is between 9.80-17.60 mm. It looks like the queen bee.

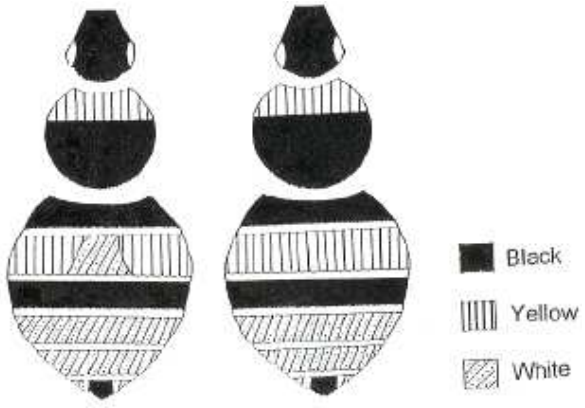


Fig.7.
The colours and pattern of the bodies in
Bombus terrestris
a. Queen bee b. Queen and worker bee

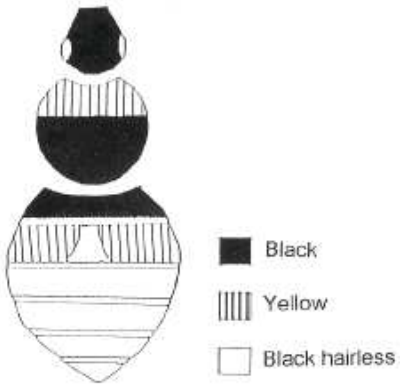


Fig. 8.
The colours and patterns of the worker bee's body in
Bombus terrestris

Genus: ***Psithyrus*** Lepeletier 1832

Psithyrus vestalis **(Fourcroy, 1875)** (Fig. 9).

4 specimens were collected. (1 ♂, 3 ♀♀).

Kayapa (170 m.): 1 ♀ 14.04.1995; Hamamlıkızık-Uludağ (250 m.): 1 ♀ 25.04.1995; Gölbaşı (400 m.): 1 ♀ 5.05.1995; Kirazlıyayla-Uludağ (1525 m.): 1 ♂ 8.08.1995.

Queen bee: The body length is between 19.10-21.50 mm. The head is black, prothorax is yellow and the other parts of thorax and T1, T2, T3 are black. T4 is yellow but there is a black area like an upright line in the middle of the yellow band. T5 is black, T6 is hairless and black. (Fig. 9).

Male bee: The body length is 13.20 mm. The head is black; the point where the head is joined to the thorax has yellow hair. Prothorax is yellow, mesothorax is black and metathorax is yellow. T1 has yellow and thin hair. T2 is black, T3 and the middle of T4 are black and the sides are yellow. T5 and T6 are completely yellow.

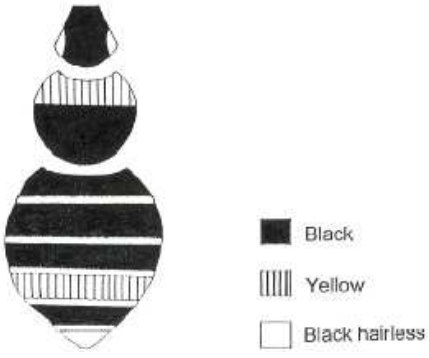


Fig. 9.
The colours and patterns of the queen bee's body in
Psithyrus vestalis

Psithyrus bohemicus (Seidl 1837) (Fig.10).

45 specimens were collected (7 ♂♂, 38 ♀♀).

Kirazlıyayla-Uludağ (1525 m.): 2 ♂♂, 7 ♀♀ 8.08.1995; Uludağ National Park Entrance (1300 m.): 1 ♂, 17 ♀♀ 19.08.1995; Uludağ Hotels Area (1865 m.):

2 ♂♂, 14 ♀♀ 19.08.1995; Sarıalan-Uludağ (1700 m.): 2 ♂♂ 19.08.1995.

Worker bee: The body length is between 11.60-14.55 mm. The head is black, prothorax is yellow, mesothorax is black and there is yellow hair among the black hair in scutellum. And in some specimens there is white hair among the yellow hair in abdomen (Fig. 10).

Male bee: The body length is between13.05-13.90 mm. The colours are as in the queen bee. But there is no pincer in epipygium.

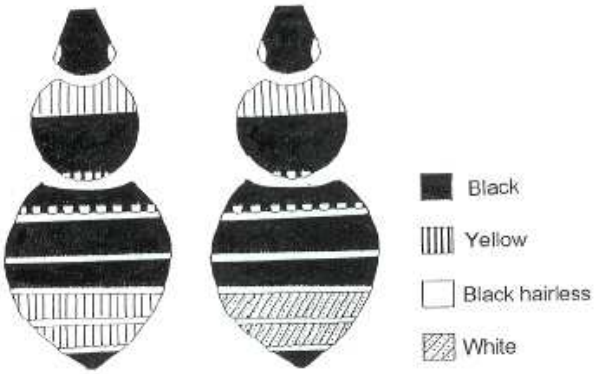


Fig. 10.
The colours and patterns of the worker bee's body in ***Psithyrus bohemicus***

Psithyrus barbutellus (Kirby 1802) (Fig.11)

One specimen was collected (1 ♀).

Uludağ (1200 m.): 1 ♀ 25.05.1995.

Queen bee: Only one specimen with 16.50 mm of height was collected. The head is black; the point where the head is connected to the thorax has yellow hair. Prothorax is yellow, mesothorax is black and metathorax has yellow hair. T1 and T2 are black and hairless; sometimes they have thin and short hair. T3, T4 and T5 are black but there is yellow hair in the area where the tergum is joined to sternum (or to the ventral). Sternum has thin, hardly visible and short black hair (Fig 11).

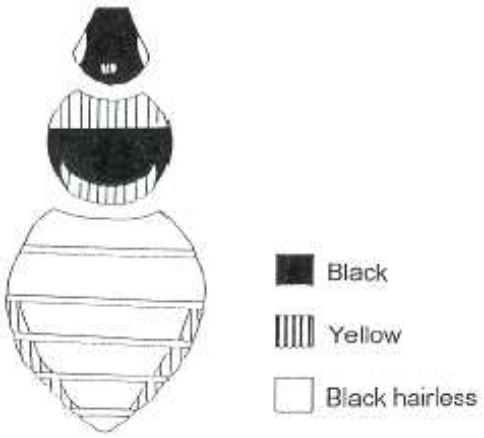


Fig. 11.
The colours and patterns of the queen bee's body in ***Psithyrus barbutellus***

Psithyrus maxillarus (Klug 1817) (Fig.12).

2 specimens were collected (2 ♂♂).

Yurt-Uludağ (450 m.): 1 ♂ 8.08.1995; Kirazlıyayla-Uludağ (1525 m.): 1 ♂ 19.08.1995.

Male bee: Two specimens were collected with 12.70-15.50 mm of height. The head is black and at the back of the honeycomb eyes (where the head is joined to thorax) there is white hair. Prothorax has white hair, mesothorax has black hair and scutellum (metathorax) has white hair. T1 has some white hair. T2 is hairless and black. The apical of T3 and the entire T4 and the lateral part of T5 is covered with white hair, T6 is completely black. There is pincers at the back of abdomen (Fig.12).

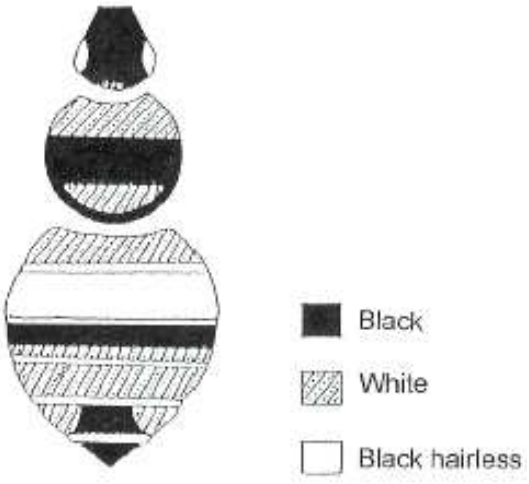


Fig. 12.
The colours and patterns of the male bee's body in ***Psithyrus maxillarus***

DISCUSSION

In this study 10 taxa of bumblebees were recorded from Bursa province especially in Uludağ during 1995 and 1996.

Including the genus *Psithyrus* Lepetier (cuckoo bumblebees), known from Turkey in eight species (Özbek 1987), the number of taxa of the tribe Bombini is about 60 (Özbek 2002). This number is fairly high when compared with the corresponding numbers in various countries, including for former Russia with 143 (Radchenko, V.G. and Y. A. Pesenko cf. 10), the whole of Europe 63 (Reining, W.F. cf. 10**)**, Britain 25 (Free, J.B. and C.G.Butler cf. 10), France and Belgium 46 (Rasmont, P. cf.10), Scandinavia 43 (Loken, A. cf. 10), Poland 37 (Pawlikowski, T. A**.** cf. 10), Austria 40 (Neumayer, J. cf. 10), Kashmir Himalayas 29 (Williams, P.H. cf. 10) and worldwide 239-255 (Williams, P.H. cf. 10). Thus the bumblebee fauna of Turkey is comparatively rich. This is due to its very special location with respect to seas and landmasses, a remarkable diversity of terrain, average altitude about 1100 meters, and favourable climates and habits. In addition, geographically Turkey is located at the Junction of three continents (Özbek 2002).

In this study, 300 specimens collected, *B. terrestris* is the most widespread and most abundant species. Least found specimens are *P. vestalis* (4 specimens), *P. maxillarus* (2 specimens) and *P. barbutellus* (1 specimens).

When the types that were determined in Bursa area, our study and the previous studies were taken into consideration, the following can be said for seasonal activities:

Except the males of *Psithyrus barbutellus* and *Bombus terrestris*, the males of other 8 types were observed to be active in August. For its reason, it can be said that the males are the last members who get out of the nest. The males of *Psithyrus barbutellus* were seen in May. The males of *Bombus terrestris* were seen in April and May. *Psithyrus maxillarus* and *Psithyrus bohemicus* and *Psithyrus maxillarus* types were caught in August only. The other types were caught in different times from April to August. According to our observations, *Bombus terrestris* is the earliest type coming out in the spring. This type comes out in March.

In our study, it was impossible to search thoroughly especially the entire Uludag. However, the areas that we could not search were generally dense forest and rocky places where plant cover existed less.

Bumblebees have been found to be declining dramatically in Turkey since the 1970s. The main reason is the destruction of habitats, caused by the exploding human population with its ever-increasing demands for agricultural land, houses, roads, factories, recreational areas, etc. The use of agricultural chemicals such as pesticides and fertilizers is another important factor in the decline of the bumblebee fauna of Turkey (Özbek 2002).

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