

## Ecological study the most of important of bumblebees species (*Bombus* spp.) in the coastal region - Syria

Bassem Mustafa Solaiman- Khaled<sup>1</sup>, Abdualnabi Mohammed Basheer<sup>2</sup>, Ali Khaled Alburaki<sup>3</sup>

1 – Ph.D. student Basem\_alkhaled@yahoo.com 2 – Professor, goitkb@scs-net.org, 3 - Associate Professor, ali.alburaki@gmail.com , Department of Plant Protection, Faculty of Agriculture, Damascus University, P. O. Box. 30 621, Damascus, Syria.

### Abstract

This work aims to study the relative abundance and frequency for the two species of bumble bees *Bombus terrestris* and *B. argillaceus* in the Syrian coastal region of Tartus and Latakia during the years 2009 and 2010, which were found in these regions. The obtained results showed that the species *B. terrestris* is an essential species (abundant and very common), for relative average abundance during the years 2009 and 2010 were more than 10% of , 48.03% , 43.55% respectively, and for frequency are more than 50% (87.22%, 94.79%) for the two years together at the two regions of study, while the species *B. argillaceus* has a little abundance 1.97% in 2009 and 6.45% in 2010, according to ecological arrangement it is an accidental species because its abundance was less than 24% and its frequency between sporadic and accidental (5.21%, 12.78%) for the two years (2009, 2010) respectively.

**Keywords:** Ecological study, bumblebees, relative abundance, frequency, Syria.

### Introduction

Within the subfamily Bombinae there are 300 species, 250 species of Eusocial bumblebees (Goulson, 2003), 45 species of Cleptoparasitic bees or Cuckoo bees (Beton, 2004), 50 species of genus *Bombus* (Winter et al., 2006), 48 somewhat in Turkey (Rasmont and Flagothier, 1996), 50 species in North America (Rasmont, 1983). 250 species of bumblebees and newly developed in one genus (Williams et al., 2008).

Bumble bees are the primary pollinators for crop pollination, and therefore they are more important than honey bees, because bumblebees actually pollinate more flowers per bee than honey bees (Goulson, 1994), and Honey bees have short tongues in comparison with bumblebees, This means that honey bees are not so keen to visit deep flowers such as bumblebees (Goulson, 2003). a previous study of bumblebees in Syria, but there are a lot of studies in the world. The studies pointed out that the species *Bombus argillaceus* (L.) in large areas of the world, which is one of the manufacturer of the pockets, was recorded in France, Germany, Switzerland, Austria, Slovakia, Hungary, Greece, Italy, the Caucasus and the EU from Russia, Iran, Turkmenistan, Ukraine and Turkey (Kosior et al, 2007). Studies indicated that *B. argillaceus* live in the dry plains of the Ukraine, and there are a lot of *B. argillaceus* in slope areas , and is one of the endangered species there, so it was keeping samples dry of this species in the Ukrainian Natural History Museum (SMNH), and in the field studies conducted in Ukraine in the period between 2001 and 2006 to investigate this species was not found (Konovalova, 2007 and 2008). Record

of this species in the northern part of Anatolia at an altitude of up to 2500 m (Rasmont and Flagothier, 1996). Studies indicated that this species of bumblebees exist with another species of bumblebees in Turkey, including: *B. vorticosus*, *B. niveatus*, *B. terrestris*, etc., and this species spread at an altitude of 400 - 2855 m about 80% of which are on the rise 900-1870 m (Rasmont and Flagothier, 1996).

In this study, we collected bumblebees using window traps in various landscapes in an area where bumblebees are spread. It was examined the effects of habitat conditions characterized by land use and the local abundance of native bumblebees on the number and body size of trapped bumblebees using statistical models. The morphology of native bumblebees was also analyzed because morphological characters are closely related to floral resource use.

### Objective of the Study

This study aims to:

- 1 – Estimate the relative abundance of the most species of bumblebees (*Bombus* spp. dispersed in the Syrian coastal region.
- 2 – Determine the frequency for these species.

### Materials and Methods

The study was carried out during the period between the last third of the / 2009 / , and the end of / 2010 / , in the provinces of Latakia and Tartus in the locations spread of bumblebees from sea level to mountain areas. We carried out field visits to work sites by one round every two weeks or three weeks, the number of (visits) in the first season / 2009 / was four, and in the second season / 2010 / was nine. A

number of flowering plants were examined in each round to determine their effect on the bumblebees the bumblebees.

Flying insects were collected by nets and killed using killing insect's pots cases that contain Cianor of sodium or potassium. Killing insects were transferred to a plastics pots attached to a definition nameplate which recorded on them the sample number and all the necessary data such as the location , the host plants and dates of collection. The samples were taken to the laboratory of honey bee research at the Faculty of Agriculture - University of Damascus. A section of the sample was saved in the fridge, and other section was saved in the cases of insects using cubes stapling, crossing insects.

To demonstrate some of the characteristics of environmental species recorded by selecting the relative abundance, frequency and diversity (richness qualitative, to clarify the relationship between the same species and environmental factors and compare the installation of bumblebees fauna in each site and the abundance of species in each site, and to arrange species according to categories of food with an indication of food or the main host , in addition prelered notes of the field environmental factors of every species has been noted. we use the following equations as follows:

Relative abundance: Is the number of members of the species divided the number of individus of each species contained in the same sample. The relative abundance was calculated as follow:

$$A = (N1 / (N1 + N2)) \times 100$$

Where: A=relative abundance

N1= number of individus of first species

N2= number of invidious at al of second species

The species be abundant (exuberant) when relative abundance greater than or equal to the value (2) (Kabakibi, 1989)

Frequency: Is the relationship between the percentage of the number of times that one species is

repeated in the sample and the total number of samples in all sites studied. The frequency was given as follow:

$$F = (Pa / p) \times 100$$

F= Frequency

Pa= the number of sites that the species was recorded in.

P= the total of sites.

Species can be arranged in four categories according to the values of this coefficient:

Constants species:  $F > 50\%$

1- Accessories species:  $25\% < F < 50\%$

2- Accidentelles species:  $10\% < F < 25\%$

3- Sporadiques species  $F < 10\%$  (Kabakibi, 1989)

Classified species according to environmental arranged depending on the abundance and frequency together as follows:

1- Constants Species: the relative abundance is more than 10% and frequency is more than 50%.

2- Accessories species: the relative abundance is less than 10% and the frequency is more than 50% .

3- Accidentelles Species: abundance is less than 10% and frequency is between 20-50% .

Diversity (Qualitative richness): the number of species in each month and the extent of its contribution to biodiversity.

## Results and Discussion

344 individus of bumblebees had been caught in two years, 127 individus in 2009, and al 217 individus in 2010. The results revealed the existence of al two species of bumblebees belong subfamily Bombini they are *B. terrestris* and *B. argillaceus*. 311 individus belong to *Bombus terrestris* they are: 21 Queens, 127 workers and 163 males. The individuals belong to *B. argillaceus* are 33(4 queens and 29 workers) Table (1).

**Table 1.** Bumblebee's numbers caught during the 2009 and 2010

sites studies species of bumblebee	Tartus		Lattakia		Number of individus caught al 2009	Number of individus caught 2010
	2009	2010	2009	2010		
<i>B. terrestris</i>	43	86	79	103	122	189
<i>B. argillaceus</i>	5	25	0	4	5	28
Total	48	110	79	107	127	217

The results for calculating the relative abundance of each species of bumblebees in each year alone and in the two years together, are organized in the Table(2) revale that the relative abundance of *B. terrestris* higher than the relative abundance of *B. argillaceus* in the two study sites in the same year and in two years together:

The relative abundance average of *B. terrestris* is 48.03% for the year 2009, and the relative abundance average is 43.55% for the year 2010, while the

relative average abundance of *B. argillaceus* is 1.97% for the year 2009 and 6.45% for the year 2010. This results are similar to (Rasmont et al., 2008) They noted that the *B. argillaceus* is a widespread bumblebees in the western Palaearctic. According to (Inoue et al., 2008) *B. argillaceus* is the very common species in Japan accounting for the relative abundance 52.5% in 2003, 68.5% in 2004 and 74.2% in 2005. Concering to relative abundance

average of the two years together we can order two species *B. terrestris* and *B. argillaceus* as follow:

- 1- *B. terrestris*
- 2 - *B. argillaceus*

The results showed that *B. terrestris* is relatively prolific species with an relative abundance average between 43.55 and 48.03% during the two years in the two areas of study (Lattakia and Tartus), while

*B. argillaceus* is a very rare species with an average relative abundance 1.97% in 2009, and 6.45% in 2010 Lattakia during 2009. The statistical analysis showed that there was no significant differences between the average relative abundance of the two *B. terrestris* and *B. argillaceus* between 2009 and 2010 (test  $t=0.0003$ ).

**Table 2.** Relative abundance average of the species of bumblebees in the study sites during 2009 – 2010

sites species of bumblebee	Tartus		Lattakia		Relative abundance average % 2009	Relative abundance average % 2010
	2009	2010	2009	2010		
<i>B. terrestris</i>	33,86%	39.63%	62,2%	47,46%	48,03%	43,33
<i>B. argillaceus</i>	3.94%	11.06%	0	1.84%	1.97%	6.45
Total	37.8%	50.69%	62.2%	49.3%	50%	50%

$t=0.0003$

The frequency of two species *B. terrestris* and *B. argillaceus* are recorded in Table (3). As shown in Table (3), the frequency of *B. terrestris* is relatively constant:  $F > 50$ , his frequency in the first year (2009) was 94.79% , and in second year (2010) was 87.22%, which means that the number of times that reiterates the existence of this species in the sample with the total number of samples is convergent in both regions, and this explains the presence in a certain period (from the beginning of the month of February until the first half of August), while *B. argillaceus* is Accidentalness Species ( $F = 5.21-12.78$  %), and this explains the existence period of time less than *B. terrestris*. (Konovalova, 2007, 2008) has

pointed that *B. argillaceus* is endangered species. The statistical analysis shows no significant differences between the frequency average for both species of bumblebees between 2009 and 2010 (test  $t=0.0001$ ).

Depending on the coefficient of relative abundance and frequency of both, two species are order as follow:

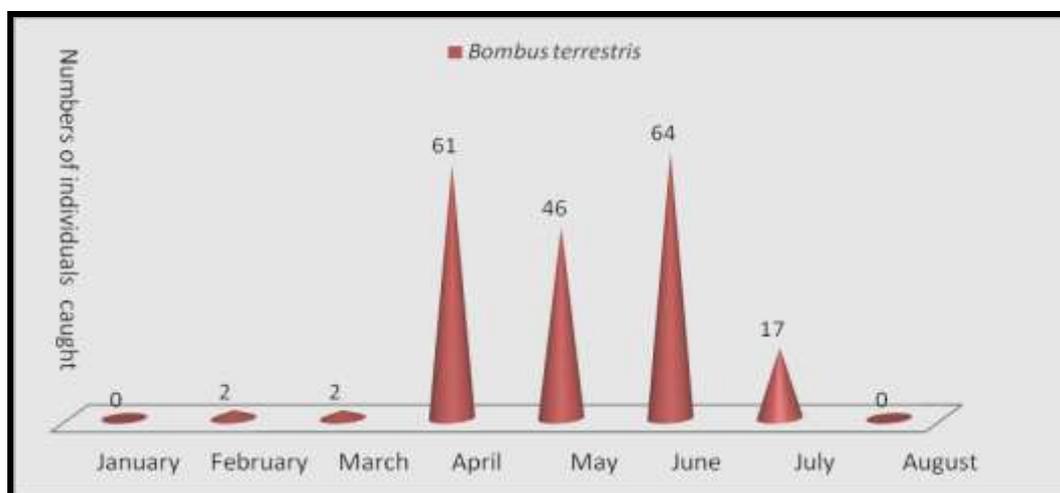
*B. terrestris* is constants species where the relative abundance is more than 10% (43.55-48.03%) and the frequency is more than 50% (87.22-94.79%) in the two years together.

*B. argillaceus* is accidentelles species with the relative abundance is less than 10% (1.97-6.45%) and frequency (5.21-12.78%).

**Table 3.** The frequency of species of bumblebees in the study sites during 2009 -2010

sites studies species of bumblebee	Tartus		Lattakia		frequency average 2009%	frequency average 2010%
	2009	2010	2009	2010		
<i>B. terrestris</i>	89.58%	78.18%	100%	96.26%	94.79%	87.22%
<i>B. argillaceus</i>	10.41%	21.82%	00	3.74%	5.21%	12.78%

$t=0.0001$



**Fig (1).** The number of individuals (*B. terrestris*) captured per month

As shown in Fig (1) there were intensive changes at Diversity of *B. terrestris* during the months of study, where it scored the least number of individuals caught two individuals in the second month (February) and third (March), in the period of the emergence of queens, and then increased up to 61 individuals in the fourth month (April) and then peaked in the sixth month least 64, in the period of emergence of young queens and males as well as workers.

Finally we can conclude that the environmental study provided an important linkage between the two species of bumblebees and the area where they live, and the relationships between the distribution of these species and the environment surrounding them, as are studied some transactions to determine the relationship of bumblebees with their environment in terms of standards of numbers and their impact on the distribution of species.

### Proposals and Recommendation

Including the emergence of these species of bumble bees corresponds with the period of bloom of fruit trees (citrus, apples ..) and other types of forest trees, and their role that they play in maintaining biodiversity, it is recommended that:

maintain the species of bumblebees to the work of nature reserves in areas of deployment, in particular endangered species .

-The dissemination of ideas and applications of bumblebees as pollination between farmers normally whether in fields or in protected cultivation, green houses

which calls for the need to preserve all possible means to these species of bumblebees and protection in order to increase abundance and frequency as well .

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## دراسة بيئية لتواجد أهم أنواع النحل الطنان *Bombus spp.* في المنطقة الساحلية- سورية

باسم مصطفى سليمان- خالد1، عبد النبي محمد بشير2، علي خالد البراقي3.

1 - طالب دكتوراه Basem\_alkhaled@yahoo.com ، 2- أستاذ goitkb@scs-net.org ، 3- أستاذ مساعد

ali.alburaki@gmail.com ، قسم وقاية النبات- كلية الزراعة، جامعة دمشق، ص ب 30621، دمشق، سورية.

### الملخص

نفذ البحث في المنطقة الساحلية (طرطوس واللاذقية) خلال عامي 2009 و2010، بهدف دراسة الغزارة النسبية والتواتر والتنوع (الغنى النوعي) لنوعين من النحل الطنان *Bombus terrestris* و *B. B. argillaceus* المنتشران في هذه المناطق. أظهرت النتائج أن النوع *B. terrestris* من الأنواع الأساسية (غزيرة وشائعة الانتشار) إذ بلغ متوسط غزارته النسبية أكثر من 10% (43,55%، 48,03%) خلال عامي 2009 و2010 على التوالي، وتواتره في منطقتي الدراسة أكثر من 50% (94.79%، 87.22%) في العامين 2009 و2010 على التوالي، أما النوع *B. argillaceus* فهو من الأنواع قليلة الغزارة 1.97% خلال عام 2009 و6.45% في عام 2010، وبحسب الترتيب البيئي فهو من الأنواع العرضية لأن غزارته كانت أقل من 24%، كما أن تواتره كان بين المتفرق والعرضي (5.21%، 12.78%) للعامين (2009-2010) على التوالي. وترجع أهمية هذا البحث التطبيقية إلى إمكانية استخدام هذان النوعان في تلقيح الحاصلات في الزراعات المحمية (الصوب) ومحاصيل وأشجار الفاكهة التي تزهر في فترة نشاط النحل الطنان الكلمات المفتاحية: دراسة بيئية، النحل الطنان، الغزارة النسبية، التواتر، سورية.