A SURVEY ON SPECIES COMPOSITION AND DISTRIBUTION OF BEES (HYMENOPTERA: APOIDEA) IN CAO BANG PROVINCE

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ABSTRACT

Bees are the most efficient pollinators among the beneficial insect groups, which help to increase crop yields about 20-30%, even up to 50%. In addition, they have been used as biological indicators to assess habitat quality. However, Vietnamese's bee fauna hasn't received much attention from national and international scientists.

Cao Bang is located in the Northeastern part of Vietnam, near the border between Vietnam and China. This is an area with a diversity of terrains, and with a humid tropical climate that facilitates the development of many bee species. In this study, bee specimens were collected by aerial nets in 2015-2018, at three altitudinal zones (<500 m, 500-1000 m, >1000 m). The results showed that a total of 41 species in 13 genera of 3 families (Apidae, Halictidae and Megachilidae) belonging to superfamily Apoidea were recorded. Among them, Apidae was the most diverse family with the highest number of species. Bees were collected mainly at altitudinal zone 500-1000 m and rarely occurred at altitudinal zone above 1000 m. *Bombus flavescens* Smith was the most common species and particularly prefer flower of *Elsholtzia ciliate* (Thunb.) Hyland. The results of the study contribute important data on the species composition and distribution at different altitudinal zones in Cao Bang province, which is the basis for subsequent studies on biology, ecology, and especially their conservation.

Keywords: *Apoidea, composition, distribution, altitude, Cao Bang.*

INTRODUCTION

The superfamily Apoidea is one of the most diverse and abundant groups in the hymenopteran insect. It is estimated that there are more than 20,000 bee species belonging to 7 families (Andrenidae, Apidae, Colletidae, Halictidae, Melettidae, Megachilidae and Stenotritidae) worldwide. They are distributed and adapted to a variety of habitat types in the world [1], [7].

Bees are effective pollinators for many flowering plants. In particular, in the plants pollinated by bees, yields of fruit and seed crops increased significantly about 20-30%, even up to 50%. The use of bees to pollinate plants with the aim of increasing crop yields has been widely applied in the temperate countries, such as Europe and America. In contrast, in the tropic contries including Vietnam, this issue is less interested.

Cao Bang is located in the Northeastern part of Vietnam, one of the areas with high potential biodiversity. The terrain in this area is mainly limestone plateaus mixed with land mountains, divided by many short streams and narrow valleys, which create three distinct areas, the eastern area is mostly limestone mountains, many land mountains mixed with limestone mountains in the western area, and mainly land mountains in the southwest area. The average altitude is over 300 m, lowering from north to south and from west to east. With diverse terrain combined with a humid tropical climate, Cao Bang is a suitable area for the development of many flowering plants that attract many insects, including bees. However, data on the bee fauna in Cao Bang is extremely limited. The previous studies in Cao Bang province only focused on species of the family Apidae but not the other remaining families [8], [9].

To have more knowledge for understanding the bee fauna in Cao Bang province, we conducted this study to clarify the species composition and distribution of bees at different altitudinal zones. The results of this

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study are the basis for further studies of this group on biology, ecology as well as their biodiversity and conservation.

Table 1. *Bee species composition and distribution at different altitudinal zones in Cao Bang province*

No.	Scientific name	Altitudinal zones		
		< 500 m	**500-1000 m**	**> 1000 m**
	Family Apidae			
1	*Amegilla himalajensis* (Radoszkowski, 1882)	-	+	-
2	*Amegilla zonata* (Linnaeus, 1758)	+	+	-
3	*Amegilla* sp.	+	-	-
4	*Apis cerana* Fabricius, 1793	+	+	+
5	*Apis dorsata* Fabricius, 1793	-	+	-
6	*Apis laborisa* Smith, 1871	-	+	-
7	*Bombus campestris* (Panzer, 1801)	-	-	+
8	*Bombus eximius* Smith, 1852	-	-	+
9	*Bombus flavescens* Smith, 1852	-	-	+
10	*Bombus* sp.	-	+	+
11	*Ceratina* sp.1	-	+	-
12	*Ceratina* sp.2	+	-	-
13	*Thyreus himalayensis* (Radoszkowski, 1893)	-	+	-
14	*Thyreus centrimacula* (Radoszkowski, 1893)	-	+	-
15	*Xylocopa bryorum* (Fabricius, 1775)	-	+	-
16	*Xylocopa dejeanii* Lepeletier, 1841	-	+	-
17	*Xylocopa latipes* (Drury, 1773)	-	+	-
18	*Xylocopa ruficornis* Fabricius, 1804	-	+	-
19	*Xylocopa tenuiscapa* Westwood, 1840	-	+	-
20	*Xylocopa* sp.	+	-	-
	Family Halictidae			
21	*Homalictus* sp.	-	+	-
22	*Lipotriches* sp.	+	-	-
23*	*Nomia curvipes* (Fabricius, 1793)	+	-	-
24*	*Nomia incerta* Gribodo, 1894	+	-	-
25*	*Nomia iridescens* Smith, 1857	+	-	-
26*	*Nomia rustica* Smith, 1853	+	-	-
27*	*Nomia terminata* Smith, 1875	-	-	+
28*	*Nomia thoracica* Smith, 1875	+	-	-
29	*Nomia* sp.1	+	-	-
30	*Nomia* sp.2	+	-	-
31	*Nomioides* sp.	-	+	-
32	*Sphecodes* sp.	-	+	-
	Family Megachilidae			
33**	*Megachile carbonaria* Smith, 1853	-	+	-
34*	*Megachile fluvovestita* Smith, 1853	-	+	-
35	*Megachile* sp.1	-	+	-
36	*Megachile* sp.2	-	-	+
37	*Megachile* sp.3	-	-	+
38	*Megachile* sp.4	-	+	-
39	*Megachile* sp.5	-	+	-
40	*Coelioxys* sp.1	-	+	-
41	*Coelioxys* sp.2	-	+	-

*Notes: * newly recorded spcies for Cao Bang province; ** newly recorded species for Vietnam, +/- present/absent.*

MATERIALS AND METHODS

Collecting methods

The survey was conducted at three different altitudinal zones in Phia Den Commune (Phia Oac National Park, > 1000 m), Thanh Cong Commune (500-1000 m) and Tam Kim Commune (< 500 m) in 2015-2018. Aerial nets consist of three elements, the handles (lengths about 2-6 m), the hoop (diameter about 30-40 cm) and the bag were used to collect bee specimens [10]. The material examined in the present study is deposited in the collection of the Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam.

Indentification methods

The identification based on the following references: Ascher and Pickering (2018) [1], Bigham (1897) [2], Lieftinck (1962) [6], Michener (2007) [7], Warrit et al. (2012) [11].

RESULTS AND DISCUSSIONS

Bee species composition in Cao Bang province

A total of 176 individuals of 41 species in 13 genera belonging to 3 families (Apidae, Halictidae and Megachilidae) at three different altitudinal zones were recorded in Cao Bang province (Table 1).

Megachile carbonaria is a new record for the Vietnamese fauna. In the world, this species has only been found in the Punjab province of India (Ascher and Pickering, 2018 [1]). One species of the genus *Megachile* (*M. fluvovestita*) and six species of the genus *Nomia* (*N. curvipes*, *N. incerta*, *N. iridescens*, *N. rustica*, *N. terminata* and *N. thoracica*) were recorded in Cao Bang province for the first time (Table 1). *Bombus flavescens*, the most common species with 68 individuals was collected during the study time. Especially, this species was attracted by the flower of *Elsholtzia ciliate* (Thunb.) Hyland which was distributed above 1000 m in Phia Oac National Park.

Figure 1. *Habitus of newly records species, habitus and habitat of common species. a. Megachile carbonirata Smith; b. Megachile fluvovestita Smith; c. Bombus flavences Smith; d. Elsholtzia ciliate (Thunb.) Hyland*

Distribution of bee species at different altitudinal zones

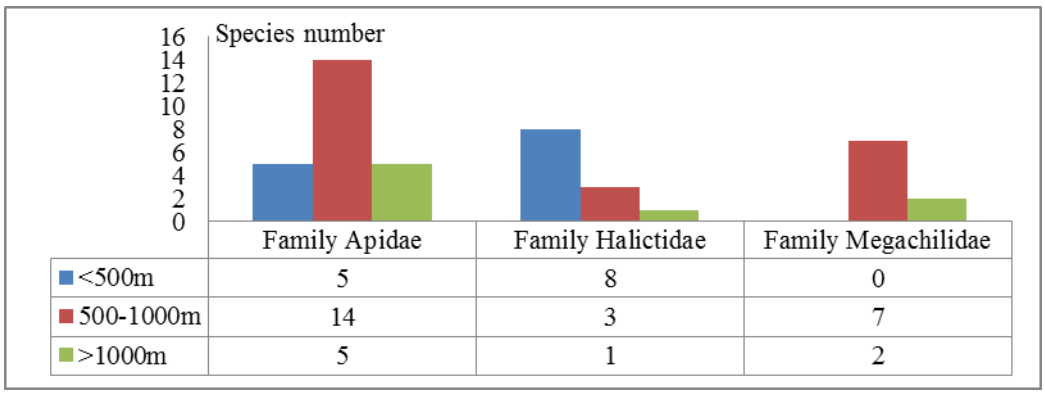

Figure 2. *Distribution of bee speies at three altitudinal zones*

Among 20 species of family Apidae, the highest number of species (14 species) was distributed at 500-1000 m, and the number of species distributed at altitude below 500 m and above 1000 m was equal (5 species). Particularly, *Apis cerana* was recorded at all three altitudinal zones. *Amegilla zonata* was recorded from altitude of 0-1000 m and was not found at altitude above 1000 m at the study sites.

Unlike species of family Apidae, the species of family Halictidae were occurred mainly at altitude below 500 m (8 species), followed by 500-1000 m (3 species), and *Nomia terminata* was only collected at altitude above 1000 m. Among 9 recorded species in the family Megachilidae, 7 species were recorded at 500-1000 m, 2 specie s were occurred at above 1000 m and none of them was found at below 500 m (Figure 2).

Figure 3. *Habitus of bee species at each altitude zone, (a, b: <500 m; c, d: 500-1000 m; e, f: >1000 m). a. Nomia iridescens Smith, b. Nomia thoracica Smith, c. Amegilla himalajensis (Radoszkowski), d. Nomioides sp., e. Bombus eximius Smith, f. Nomia terminata Smith.*

Thirty eight species were only recorded at one of three survey altitude zones. Of these, 11 species were only found at altitude below 500 m, 21 species at 500-1000 m and 6 species at above 1000 m (Figure 3).

The results show that bee species in different families have different distribution ranges. And generally, bee species were mainly recorded at altitude of 500-1000 m, then at below 500 m and fewest at altitude above 1000 m.

CONCLUSION

A total of 41 species in 13 genera of 3 families (Apidae, Halictidae and Megachilidae) belonging to the superfamily Apoidea were recorded in Cao Bang province. Apidae was the most diverse family with the highest number of species, followed by family Halictidae and family Megachilidae with the lowest one.

Megachile carborinata was newly recorded for Vietnamese fauna, six species of *Nomia* and *Megachile fluvostista* were recorded for Cao Bang province for the first time.

Bombus flavescens Smith was the most common species and attrated by the flower of *Elsholtzia ciliate* (Thunb.) Hyland.

Bees were mainly collected at altitudinal zone 500-1000m, followed by at altitudinal zone below 500m and rarely collected at altitudinal zone above 1000m.

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TÓM TẮT

KHẢO SÁT VỀ THÀNH PHẦN VÀ SỰ PHÂN BỐ CỦA CÁC LOÀI ONG MẬT (HYMENOPTERA: APOIDEA) Ở TỈNH CAO BẰNG

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Ong mật là tác nhân thụ phấn đem lại hiệu quả kinh tế nhất trong nhóm côn trùng có ích, giúp năng suất cây trồng tăng 20-30%, thậm chí lên tới 50%. Ngoài ra, chúng còn được sử dụng như chỉ thị sinh học để đánh giá chất lượng môi trường sống. Tuy nhiên, khu hệ ong mật ở Việt Nam lại chưa nhận được nhiều sự quan tâm từ các nhà khoa học trong và ngoài nước.
Địa hình Cao Bằng khá đa dạng, kết hợp với nền khí hậu nhiệt đới ẩm là điều kiện thuận lợi cho sự phát triển của nhiều loài ong mật. Các mẫu ong được thu thập bằng phương pháp vợt lưới trong các năm 2015-2018 ở 3 đai độ cao (dưới 500 m, 500-1000 m và trên 1000 m). Kết quả ghi nhận 41 loài và 13 giống của 3 họ (Apidae, Halictidae và Megachilidae) thuộc liên họ Apoidea. Trong đó, họ Apidae đa dạng nhất về số lượng loài. *Bombus flavescens* Smith là loài phổ biến nhất và đặc biệt ưa thích phấn hoa của loài *Elsholtzia ciliate* (Thunb.) Hyland. Các loài ong mật thu thập được chủ yếu ở đai độ cao 500-1000 m và ít bắt gặp ở đai độ cao trên 1000 m. Kết quả đóng góp những dẫn liệu quan trọng về thành phần cũng như sự phân bố của các loài ong mật ở các độ cao khác nhau, là cơ sở cho những nghiên cứu sau này về sinh học, sinh thái cũng như sự đa dạng sinh học đặc biệt là vấn đề bảo tồn chúng.

Từ khóa: *Apoidea, thành phần, phân bố, độ cao, Cao Bằng*

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