

**STUDY ON SOLITARY WASPS OF THE SUBFAMILY Eumeninae
(Hymenoptera: Vespidae) IN HUU LIEN AND NA HANG NATURE RESERVES,
WITH NEW RECORDS OF ONE GENUS AND THREE SPECIES**

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ABSTRACT

The composition of solitary wasps belonging to subfamily Eumeninae (Vespidae: Hymenoptera) in Huu Lien and Na Hang Nature Reserves has been surveyed. These are two study sites representing two sub-ecological zones, Cao Bang–Lang Son and Tuyen Quang–Ha Giang, which are at altitude below 300 m. As the results, a total of 29 species in 20 genera was recorded in both study sites, of them, 23 species in 16 genera were recorded in Huu Lien, and 23 species in 18 genera were recorded in Na Hang. Among them, one species *Allorhynchium lugubrinum* (Cameron, 1990) has been recorded only in Tuyen Quang–Ha Giang sub-ecological zone. Among the recorded taxa, the genus *Antodynerus* was newly recorded in Vietnam, and represented by one species *Antodynerus limbatus* (de Saussure, 1852). Another two species, *Allorhynchium lugubrinum* (Cameron, 1990) and *Stenodyneriellua guttulatus* (de Saussure, 1852) were recorded in Vietnam for the first time.

Keywords: Solitary wasp, Eumeninae, distribution, new record, northeastern, Vietnam.

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INTRODUCTION

While the northern part of Vietnam is geographically located in the tropics, it has a monsoon climate and cold winters. Moreover, belonging to the eastern slopes of the Himalayas, which is one of the most diverse centers for biodiversity, this area has a great expectation of biological diversity in Southeast Asia. A typical ecosystem in the northern part of Vietnam is the limestone forest, which contain a rich and unique fauna, including vespidae wasps.

Based on the division of natural geographic areas, and combined with that of ecological forestry regions, the area of limestone mountains in Vietnam is divided into 5 major ecological

regions (Nguyen et al., 1999). Of the five regions, the limestone karst in the Northeastern part is a distinct ecological region that includes Ha Giang, Cao Bang, Tuyen Quang, Bac Kan, Thai Nguyen, Lang Son, Bac Giang, and Quang Ninh provinces, with its natural geographic area consisting of four bowed arcs of the Gam river, Ngan Son, Bac Son and Dong Trieu, which are divided into two major ecological zones: Cao Bang–Lang Son (with the type of low and medium limestone karsts composed of several folded limestone karst highlands with caster activities processes) and Tuyen Quang–Ha Giang (at higher elevations than Cao Bang–Lang Son with limestone karsts forming a discontinuous strip, and sporadically large

blocks) (Fig. 1). The flora of these two regions is comprised of various kinds of plants, but characterized by the native flora of North Vietnam–South China.

Studies on solitary wasps of the subfamily Eumeninae in the Northeastern part are few. The first research work was carried out in 2014 (Nguyen et al., 2014), resulting in the checklist of solitary wasps in Vietnam. This study recorded 17 species in 14 genera in the Northeastern area. Until now, there were only two publications on species composition: one of those (Nguyen et al., 2015) recorded 18 species in 14 genera in the buffer zone of Tam Dao National Park (Vinh Phuc), and 15 species in 13 genera in the buffer zone of Khe Ro Nature Reserve (Bac Giang). The other (Nguyen & Dang, 2017) recorded 20 species in 14 genera in Phia Oac National Park (Cao Bang), and 17 species in 10 genera in Kim Hy Nature Reserve (Bac Kan).

Besides, there were several publications about this group, but focused on some specific genera, such as *Malayepipona*, *Okinawepipona* and *Pararrhynchium* (Nguyen & Carpenter, 2013; Nguyen & Xu, 2014; Nguyen, 2015a, b).

In this study, two sites as representing the two main ecological regions which have been mentioned above were chosen to clarify species composition of solitary wasps in the subfamily Eumeninae: they were Huu Lien Nature Reserve (Lang Son province) and Na Hang Nature Reserve (Tuyen Quang province), both of them were located at low altitude (below 300 m). The results will provide comparative data on the species composition of two sites, which helps to build the baseline data for continuing studies about diversity and conversation of these species in typical limestone karst of Vietnam.



Figure 1. Two main sub-ecological zones of the northeastern part of Vietnam (Source: Ngo Dat Tam & Nguyen Quy Thao, 2010) showing two study sites

MATERIALS AND METHODS

Specimens were collected in Lan Nghe and

Lan Trau, Huu Lien Nature Reserve (NR), and surrounding Bac Vang ranger station and Bun. g village, Na Hang Nature Reserve (NR) in 2015

and 2018. The specimens were deposited in Department of Insect Ecology, Institute of Ecology and Biological Resources (IEBR). Photographic images were made with Leica EZ4HD 3.0 MegaPixel Digital Stereo Microscope, using LAS exclusive microscopy software (LAS EZ 2.0.0). The plates were edited with Photoshop CS6.

Solitary wasps in the subfamily Eumeninae were identified based on publications such as Yamane (1990), Nguyen (2015a, b), Tan et al. (2018).

RESULTS AND DISCUSSION

Following the data from table 1, 29 solitary wasp species in 19 genera of the subfamily

Eumeninae were recorded in the two study sites, Huu Lien NR (Lang Son province) and Na Hang NR (Tuyen Quang province). Among them, 23 species in 16 genera were recorded in Huu Lien, and 23 species in 18 genera were recorded in Na Hang. The number of species and genera recorded in Huu Lien and Na Hang was rich and diverse, more diverse than that in other areas, compared with 18 species in 14 genera in the buffer zone of Tam Dao National Park (NP) (Vinh Phuc) and 15 species in 13 genera in the buffer zone of Khe Ro NR (Bac Giang) (Nguyen et al., 2015), and 20 species in 14 genera in Phia Oac NP (Cao Bang), and 17 species in 10 genera in Kim Hy NR (Bac Kan) (Nguyen & Dang, 2017).

Table 1. Species composition of solitary wasps subfamily Eumeninae (Hymenoptera: Vespidae) in Huu Lien and Na Hang Nature Reserves (NR)

No.	Taxon	Huu Lien NR	Na Hang NR
1	<i>Allorhynchium lugubrinum</i> (Cameron, 1900)*	-	+
2	<i>Allorhynchium quadrimaculatum</i> Gusenleitner, 1997	-	+
3	<i>Anterhynchium flavomarginatum flavomarginatum</i> (Smith, 1852)	+	+
4	<i>Anterhynchium punctatum</i> Nguyen, 2014	+	-
5	<i>Antepipona bigutata</i> (Fabricius, 1787)	-	+
6	<i>Antodynerus limbatus</i> (de Saussure, 1852)*	+	+
7	<i>Apodynerus formosensis continentalis</i> Giordani Soika, 1994	-	+
8	<i>Apodynerus troglodytes troglodytes</i> (de Saussure, 1855)	+	+
9	<i>Coeleumenes burmanicus</i> (Bingham, 1897)	-	+
10	<i>Calligaster himalayensis</i> (Cameron, 1904)	+	+
11	<i>Delta esuriense esuriense</i> (Fabricius, 1787)	+	+
12	<i>Delta pyriforme pyriforme</i> (Fabricius, 1775)	+	+
13	<i>Ectoploglossa</i> sp.1	-	+
14	<i>Eumenes inconspicuus</i> Smith, 1858	+	+
15	<i>Eumenes labiatus sinicus</i> Giordani Soika, 1941	+	+
16	<i>Eumenes rubronotatus</i> Pérez, 1905	+	-
17	<i>Eumenes quadratus quadratus</i> Smith, 1852	+	-
18	<i>Euodynerus nipanicus tonkinensis</i> Giordani Soika, 1973	+	-
19	<i>Euodynerus trilobus</i> (Fabricius, 1787)	-	+
20	<i>Euodynerus</i> sp.1	+	-
21	<i>Labus clypeatus</i> van der Vecht, 1935	+	-
22	<i>Orancistrocerus aterimus erythropus</i> (Bingham, 1897)	+	+
23	<i>Pararrhynchium striatum</i> Nguyen, 2015	+	+
24	<i>Pareumenes quadrispinosus acutus</i> Liu, 1941	+	+
25	<i>Phimenes flavopictus continentalis</i> (Zimmermann, 1931)	+	+
26	<i>Rhynchium brunneum brunneum</i> (Fabricius, 1793)	+	+
27	<i>Stenodyneriellus guttulatus</i> (de Saussure, 1852)*	-	+
28	<i>Subancistrocerus sichelii</i> (de Saussure, 1855)	+	-
29	<i>Zethus dolosus</i> Bingham, 1890	+	+
30	<i>Zethus angulatus</i> Nguyen & Carpenter, 2015	+	+

Note: (+) present; (-) absent; (*) new records for Vietnam

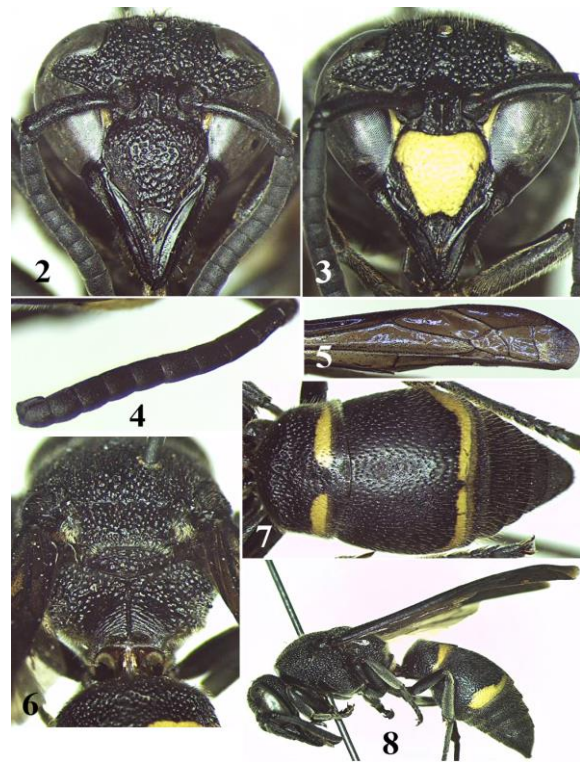
There were 16 species recorded in both study sites, among them, 15 species in 13 genera, *Anterhynchium* (1 species), *Antodynerus* (1 species), *Apodynerus* (1 species), *Coeleumenes* (1 species), *Calligaster* (1 species), *Delta* (2 species), *Eumenes* (2 species), *Orancistrocerus* (1 species), *Pararrhynchium* (1 species), *Pareumenes* (1 species), *Phimenes* (1 species), *Rhynchium* (1 species) and *Zethus* (1 species) were common species in other places in the northern part of Vietnam, such as Me Linh (Vinh Phuc), Khe Ro (Bac Giang), Cai Kinh (Lang Son), Phia Oac (Cao Bang), Kim Hy (Bac Kan) (Nguyen et al., 2015; Nguyen, 2016; Nguyen & Dang, 2017). Especially, *Zethus angulatus*, a new species for science recently described based on a specimen collected in Na Hang (Nguyen & Carpenter, 2017), also was recorded in Huu Lien in this study. This was a new distribution record of *Zethus angulatus* in Vietnam.

There were 6 species recorded in Huu Lien (NR) but not in Na Hang (NR): *Anterhynchium punctatum*, *Eumenes rubronotatus*, *Euodynerus nipanicus tonkinensis*, *Euodynerus* sp.1, *Labus clypeatus* and *Subancistrocerus sichelii*. Of them, *Labus clypeatus* was only recorded in Dien Bien province (Nguyen et al., 2014), and in this study, Lang Son province was a new distribution of this species. In the world, this species has a narrow distribution range, only occurring elsewhere in Indonesia. *Subancistrigerus sichelii* was recorded in Dak Lak and Gia Lai provinces (Nguyen et al., 2014), and in this study, the species was recorded in the northern part of Vietnam for the first time. In the world, this species has been known from Mauritius, Seychelles, India, Sri Lanka, Chagos Archipelago, Nepal, Bangladesh, Myanmar, Thailand, Cambodia, Malaysia and Singapore.

There were 7 species recorded in Na Hang but not in Huu Lien *Allorhynchium lugubrinum*, *Allorhynchium quadrimaculatum*, *Antepipona bigutata*, *Apodynerus formosensis continentalis*, *Ectopioglossa* sp.1, *Euodynerus trilobus* and *Stenodyneriellus guttulatus*. Among them, *Apodynerus formosensis continentalis* was only recorded in Vinh Phuc in a previous study (Nguyen & Dang, 2015), and in this study the species was newly recorded in Tuyen Quang. *Allorhynchium quadrimaculatum* was only

recorded in Ha Giang (Tan et al., 2018), and in this study, the species was newly recorded in Na Hang. Both recorded places were belonged to Tuyen Quang–Ha Giang sub-ecological zone.

In this study, *Allorhynchium lugubrinum* was newly record in Vietnam (Figs 2–8). In addition, *A. lugubrinum* has been recorded in Bac Kan (Nguyen Thi Phuong Lien, unpublished data). So until now, this species has only been recorded in Tuyen Quang–Ha Giang sub-ecological zone. In the world, this species has been known from China and India, and shows a disjunct distribution pattern.

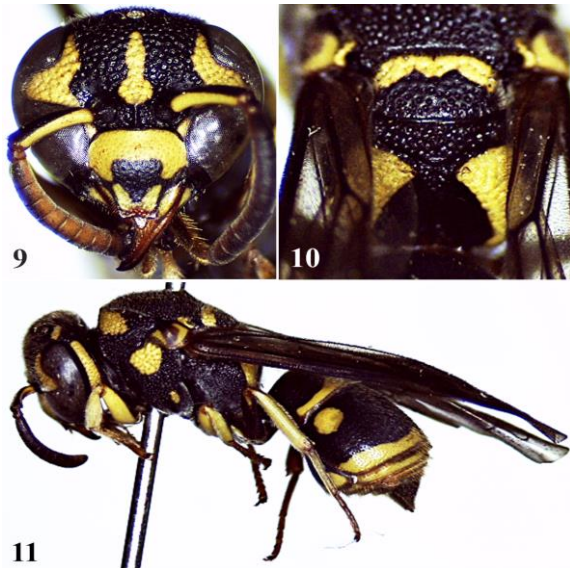


Figures 2–8. *Allorhynchium lugubrinum*. 2, 5–8 female; 3–4 male. 2, 3. Head in frontal view. 4. Left antenna. 5. Forewing. 6. Propodeum in dorsal view. 7. Metasomal terga in dorsal view. 8. Habitus

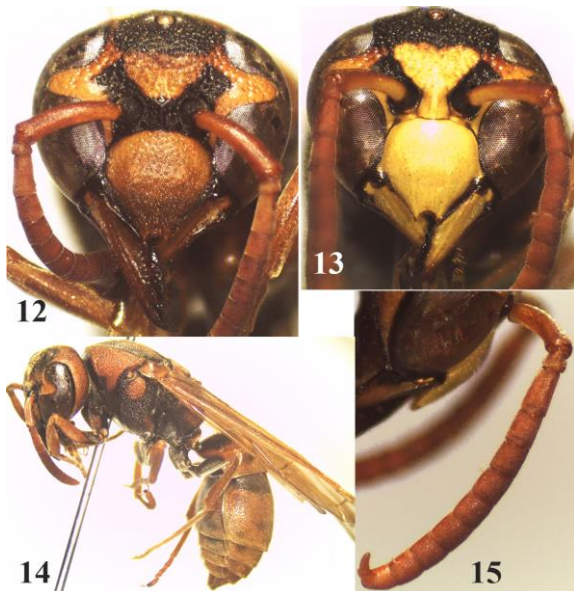
Stenodyneriellus guttulatus was recorded in Vietnam for the first time (Figs. 9–11). In the world, this species has a broad distribution range, occurring in India, Myanmar, Thailand, Malaysia, Singapore and Indonesia.

Among genera recorded in Huu Lien and Na Hang NRs, the genus *Antodynerus* was recorded

in Vietnam for the first time, represented by one species, *A. limbatus* (Figs 12–15). This genus has 50 species worldwide and only 3 species in Oriental region. While two of them have been recorded only in India, *A. limbatus* has been recorded in more areas: India, Nepal, China, Myanmar, Thailand, and Laos.



Figures 9–11. *Stenodyneriellus guttulatus*, female. 9. Head in frontal view. 10. Scutellum, metanotum and propodeum in dorsal view. 11. Habitus.



Figures 12–15. *Antodynerus limbatus*. 12, 14 female; 13, 15 male. 12,13. Head in frontal view. 14. Right antenna. 15. Habitus

From the results published in Nguyen and Dang (2017), it can be seen that, at a altitude of 600 m–1000 m, the species composition of solitary wasps in the subfamily Eumeninae in Phia Oac and Kim Hy was 29 species, it is the same as the number of species in Huu Lien and Na Hang which was at altitude below 300 m, but the number of species and genera recorded were very different. While several genera such as *Parancistrocerus*, *Malayepipona* were only found at altitude above 600 m, several genera such as *Antodynerus* and *Stenodyneriellus* were only found at altitude below 300 m. On the other hand, several species only recorded in Tuyen Quang–Ha Giang sub-ecological zone, such as *Allorhynchium lugubrinum*, *Anterhynchium flavolineatum*, *Zethus trimaculatus*, but several species were only recorded in Cao Bang–Lang Son sub-ecological zone, such as *Pararrhynchium concavum*, *Pararrhynchium striatum*, and *Euodynerus dantici violaceipennis*.

In order to have a more general view of the composition and distribution of solitary wasps in these two sub-ecological zones, comprehensive research is needed in the future.

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