



BIOGEOGRAPHY AND DISTRIBUTION PATTERN OF SOLITARY WASPS FROM VIETNAM (HYMENOPTERA : VESPIDAE : EUMENINAE)

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INTRODUCTION

The solitary wasps comprises of 3 subfamilies (Euparagiinae, Masarinae, and Eumeninae) in the family Vespidae. The Euparagiinae currently consists of 10 valid species in 1 genera. The Masarinae includes 344 species in 14 genera. The Eumeninae are cosmopolitan with 3579 species in 210 genera (Pickett and Carpenter, 2010). Only one of these three subfamilies Eumeninae, is found in Vietnam and in South-East Asia in general (Carpenter and Nguyen, 2003).

Vietnam, spread from north to south along the eastern margin of the Indochina Peninsula, lies between the latitudes 8° and 24°N and the longitudes 102° and 110°E. It covers a total area of approximately 331210 km² with 4639 km long of the land boundary, and 3444 km long of the coastline. Vietnam's land is mostly hilly and densely forested. Mountains account for 40% of the country's land area, and tropical forests cover around 42%. Vietnam presently has 58 provinces and five municipalities. According to the geographic point of view and climatic conditions (Le, 2005; Vu, 2007), Vietnam is categorized into the following three regions: 1) Northern region, spread from Quang Ninh province to Ninh Binh province, consists of 25 provinces and cities where there is an evidential winter season; 2) Central region, from Thanh Hoa province to Binh Thuan province, consists of 19

provinces and cities where there is a more or less defined winter season; 3) Southern region, from Binh Phuoc province to Ca Mau province, includes 19 provinces and cities where there is not a winter season (As shown in figure 1). Due to diverse geographical and climatic features Vietnam harbors a rich biota (Pham, 2014). Taxonomic



Fig. 1. Zoogeographical map of Vietnam

and faunistic researches on Vietnamese solitary wasps are yet poorly attempted. Thus an account on the zoogeography and distribution pattern of the solitary wasps is provided here.

MATERIALS AND METHODS

In this paper, studies on the Vietnamese eumenid wasps are reviewed based on previous published papers as listed in the reference section (1, 3-13, 17-24, 27, 29, 30). The biogeography and distribution pattern of Vietnamese eumenid wasps are analyzed. New records of distribution of some species are also added. A complete list of the specimens examined is provided in appendix.

RESULTS

A total of 48 species in 27 genera belonging to the subfamily Eumeninae have been recorded from Vietnam. 27 genera are *Allorhynchium*, *Antepipona*, *Anterhynchium*, *Apodynerus*, *Calligaster*, *Coleumenes*, *Delta*, *Ectopioglossa*, *Eumenes*, *Euodynerus*, *Labus*, *Lissodynerus*, *Malayepipona*, *Nortozumia*, *Okinawepipona*, *Omicroides*, *Orancistrocerus*, *Parancistrocerus*, *Pareumenes*, *Phimenes*, *Pseudozumia*, *Pseumenes*, *Rhynchium*, *Stenodyneriellus*, *Subancistrocerus*, *Symmorphus*, and *Zethus* with 2, 1, 4, 3, 1, 1, 3, 2, 2, 4, 2, 1, 4, 1, 1, 1, 1, 3, 1, 1, 1, 1, 2, 1, 1, 1, 2 species respectively.

In the total of 48 species there were four species belonging to four genera that their exact localities were not showed (*Allorhynchium chinense*, *Delta campaniforme campaniforme*, *Eumenes quadratus quadratus*, and *Parancistrocerus assamensis*). 34 species (70.8% of the total of species recorded) in 21 genera (77.8% of the total of genera recorded) distributed in the Northern region, 22 species in 17 genera (45.8% and 62.9% respectively) distributed in the Central region, and 8 species in 8 genera (16.7% and 29.6% respectively) in Southern region. A total of three species in 3 genera (*Anterhynchium*, *Delta* and *Phimenes*) have been recorded in all the three regions. 14 species in 12 genera (*Anterhynchium*, *Apodynerus*, *Calligaster*, *Coeleumenes*, *Delta*, *Ectopioglossa*, *Euodynerus*, *Pareumenes*, *Pseumenes*, *Rhynchium*, *Stenodyneriellus*, and *Zethus*) have been recorded

in both the Northern region and the Central region. No species (or genera) has been recorded in two regions (the Northern region and the Southern region or the Central region and Southern region). 17 species in 11 genera (*Antepipona*, *Apodynerus*, *Euodynerus*, *Labus*, *Lissodynerus*, *Malayepipona*, *Okinawepipona*, *Parancistrocerus*, *Pseudozumia*, *Symmorphus*, and *Zethus*) have been recorded only in the Northern region. 5 species in 5 genera (*Apodynerus*, *Eumenes*, *Omicroides*, *Parancistrocerus*, *Subancistrocerus*) only in the Central region. 5 species in 5 genera (*Allorhynchium*, *Actopioglossa*, *Nortozumia*, *Orancistrocerus*, and *Rhynchium*) only in the Southern region. In the Northern region, the highest number of species is in three genera *Anterhynchium* with 4 species, *Eudodynerus* with 4 species, and *Malayepipona* with also 4 species. In the Central region, the highest number of species is only in one genus *Anterhynchium* with 4 species. With a difference in comparison with the other two regions, the Southern region is only with 8 species in 8 genera (*Allorhynchium*, *Anterhynchium*, *Delta*, *Ectopioglossa*, *Nortozumia*, *Orancistrocerus*, *Phimenes*, and *Rhynchium*) (table 1, and figure 2).

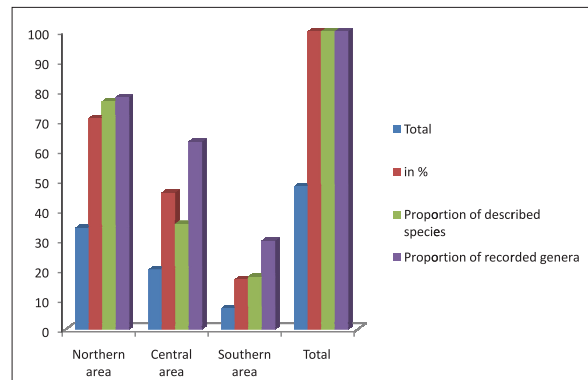


Fig. 2. The number and percentages of the solitary wasps in the zoogeographical regions of Vietnam

DISCUSSION

There are great differences in species composition and richness of eumenid wasps among the biogeographic regions of Vietnam. The highest number of species (34 species in 21 genera) has been recorded for the Northern region. The lowest number of species (8 species in 8 genera) has been recorded for the Southern region.

Table 1. Distribution of solitary wasps in three regions of Vietnam

No.	Names of taxa	NR	CR	SR
	Genus <i>Allorhynchium</i>			
1	<i>Allorhynchium chinense</i> (de Saussure, 1862)	0	0	0
2	<i>Allorhynchium snelleni snelleni</i> (de Saussure, 1862)	-	-	+
	Genus <i>Antepipona</i>			
3	<i>Antepipona biguttata</i> (Fabricius, 1787)	+	-	-
	Genus <i>Anterhynchium</i>			
4	<i>Anterhynchium punctatum</i> Nguyen, 2015	+	+	-
5	<i>Anterhynchium mellyi</i> (de Saussure, 1852)	+	+	-
6	<i>Anterhynchium flavolineatum flavolineatum</i> (Smith, 1857)	+	+	-
7	<i>Anterhynchium flavomarginatum flavomarginatum</i> (Smith, 1852)	+	+	+
	Genus <i>Apodynerus</i>			
8	<i>Apodynerus formosensis continentalis</i> Giordani Soika, 1994	+	-	-
9	<i>Apodynerus nitidiclypeus</i> Gusenleitner, 2013	-	+	-
10	<i>Apodynerus troglodytes troglodytes</i> (de Saussure, 1855)	+	+	-
	Genus <i>Calligaster</i>			
11	<i>Calligaster himalayensis</i> (Cameron, 1904)	+	+	-
	Genus <i>Coeleumenes</i>			
12	<i>Coeleumenes burmanicus</i> (Bingham, 1897)	+	+	-
	Genus <i>Delta</i>			
13	<i>Delta campaniforme campaniforme</i> (Fabricius, 1775)	0	0	0
14	<i>Delta esuriens esuriens</i> (Fabricius, 1787)	+	+	+
15	<i>Delta pyriforme pyriforme</i> (Fabricius, 1775)	+	+	-
	Genus <i>Ectopioglossa</i>			
16	<i>Ectopioglossa keiseri</i> van der Vecht, 1963	+	+	-
17	<i>Ectopioglossa sublaevis</i> (Smith, 1857)	-	-	+
	Genus <i>Eumenes</i>			
18	<i>Eumenes multipictus</i> de Saussure, 1855	-	+	-
19	<i>Eumenes quadratus quadratus</i> Smith, 1852	0	0	0
	Genus <i>Euodynerus</i>			
20	<i>Euodynerus dantici violaceipennis</i> Giordani Soika, 1973	+	-	-
21	<i>Euodynerus nipanicus nipanicus</i> (von Schulthess, 1908)	+	-	-
22	<i>Euodynerus nipanicus tonkinensis</i> Giordani Soika, 1973	+	-	-
23	<i>Euodynerus trilobus</i> (Fabricius, 1787)	+	+	-
	Genus <i>Labus</i>			
24	<i>Labus clypeatus</i> van der Vecht, 1935	+	-	-
25	<i>Labus lofuensis</i> Giordani Soika, 1973	+	-	-
	Genus <i>Lissodynerus</i>			
26	<i>Lissodynerus septemfasciatus feanus</i> (Giordani Soika, 1941)	+	-	-
	Genus <i>Malayepipona</i>			
27	<i>Malayepipona clypeata</i> Nguyen & Carpenter, 2013	+	-	-

Table 1. contd.

No.	Names of taxa	NR	CR	SR
28	<i>Malayepipona furna</i> Nguyen & Carpenter, 2013	+	-	-
29	<i>Malayepipona malickyi</i> (Gusenleitner, 2010)	+	-	-
30	<i>Malayepipona seomyty</i> Nguyen & Carpenter, 2013	+	-	-
	Genus Nortozumia			
31	<i>Nortozumia picea</i> van der Vecht, 1963	-	-	+
	Genus Okinawepipona			
32	<i>Okinawepipona nigra</i> Nguyen & Xu, 2014			
	Genus Omicroides			
33	<i>Omicroides singularis</i> (Smith, 1858)	-	+	-
	Genus Orancistrocerus			
34	<i>Orancistrocerus aterrimus nigriceps</i> van der Vecht, 1963	-	-	+
	Genus Parancistrocerus			
35	<i>Parancistrocerus androcles androcles</i> (Meade-Waldo, 1910)	-	+	-
36	<i>Parancistrocerus assamensis</i> Meado-Waldo, 1910	0	0	0
37	<i>Parancistrocerus insolitus</i> Gusenleitner, 2012	+	-	-
	Genus Pareumenes			
38	<i>Pareumenes quadrispinosus acutus</i> Liu, 1941	+	+	-
	Genus Phimenes			
39	<i>Phimenes flavopictus continentalis</i> (Zimmermann, 1931)	+	+	+
	Genus Pseudozumia			
40	<i>Pseudozumia indica indica</i> (de Saussure, 1855)	+	-	-
	Genus Pseumenes			
41	<i>Pseumenes depressus depressus</i> (de Saussure, 1855)	+	+	-
	Genus Rhynchium			
42	<i>Rhynchium brunneum brunneum</i> (Fabricius, 1793)	+	+	-
43	<i>Rhynchium haemorrhoidale haemorrhoidale</i> (Fabricius, 1775)	-	-	+
	Genus Stenodyneriellus			
44	<i>Stenodyneriellus heterospilus</i> (Cameron, 1907)	+	+	-
	Genus Subancistrocerus			
45	<i>Subancistrocerus sichelii</i> (de Saussure, 1855)	-	+	-
	Genus Symmorphus			
46	<i>Symmorphus laoticus</i> Gusenleitner, 2010	+	-	-
	Genus Zethus			
47	<i>Zethus dolosus</i> Bingham, 1897	+	+	-
48	<i>Zethus nigerrimus</i> Gusenleitner, 2001	+	-	-
	Total	34	22	8

(+): Present; (-): Absent; 0: Unknown distribution locality exactly; NR = Northern region; CR = Central region; SR = Southern region

SUMMARY

Faunistic studies on Vietnamese eumenid wasps are reviewed and biogeography and distribution pattern of eumenid fauna are analyzed for the first time. A total of 48 species in 27 genera of eumenid wasps have been recorded from Vietnam so far. The genus *Anterhynchium*, *Euodynerus* and *Malayepipona* have been recorded with 4 species, the genus *Apodynerus*, *Delta*, and *Parancistrocerus* with 3 species, the genus *Allorhynchium*, *Ectopioglossa*, *Eumenes*, *Labus*, *Rhynchium*, and *Zethus* with 2 species, and the others with only 1 species. Species composition, diversity and proportion of described species vary considerably among three regions of Vietnam.

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APPENDIX

List of specimens of eumenid wasps examined

(All provinces in bold given here are new distributional records for Vietnam)

Female = ♀; male = ♂

Genus *Anterhynchium* de Saussure, 1863

Aterhynchium punctatum Nguyen, 2015

Specimens examined: Quang Ninh: 1 ♀, Hong Thai Tay Commune, Dong Trieu District, 26.VI.2013, P. H. Pham, IEBR Regd. No. 00007/P13; **Hoa Binh:** 1 ♂, Mai Chau town, Mai Chau district, 3.VI.2012, P. H. Pham, IEBR Regd. No. 00008/P13.

Genus *Delta* de Saussure, 1855

Delta esuriens esuriens (Fabricius, 1787)

Specimens examined: Thai Binh: 7 ♀ + 8 ♂, Hong Minh Commune, Hung Ha District, 23-24.vi.2013, P. H. Pham, IEBR Regds. No. 00076, 00078-00081, 00083-00088, 00090-00093/P13; 2 ♀ + 1 ♂, Hung Nhan Town, Hung Ha District, 25.vi.2013, P. H. Pham, IEBR Regd. No. 00082, 00089, 00094/P13; 3 ♀ + 2 ♂, Dong Minh Commune, Tien Hai District, 21.vi.2013, P. H. Pham, IEBR Regds. No. 00075, 00077, 00095-00097/P13.

Delta pyriforme pyriforme (Fabricius, 1775)

Specimens examined: Hanoi: 1 ♀, 19 Group, Nghia Do Precinct, Cau Giay District, 23.ii.2015, P. H. Pham, IEBR Regd. No. 00098/P15.

Genus *Ectoploglossa* Perkins, 1912

Ectoploglossa keiseri van der Vecht, 1963

Specimens examined: Thai Binh: 1 ♀, Hung Nhan Town, Hung Ha District, 25.VI.2013, P. H. Pham, IEBR Regd. No. 00055/P13.

Genus *Euodynerus* Dalla Torre, 1904

Euodynerus nipanicus tonkinensis Giordani Soika, 1973

Specimens examined: Thai Binh: 1 ♀, Dong Minh Commune, Tien Hai District, 21.vi.2013, P. H. Pham, IEBR Regd. No. 00111/P13.

Genus *Phimenes* Giordani Soika, 1992

Phimenes plavopictum continentale (Zimmermann, 1931)

Specimens examined: Quang Ninh: 1 ♂, Hong Thai Tay Commune, Dong Trieu District, 26.VI.2013, P. H. Pham, IEBR Regd. No. 00059/P13.

Genus *Pseumenes* Giordani Soika, 1935

Pseumenes depressus depressus (de Saussure, 1855)

Specimens examined: Hoa Binh: 1 ♀, Mai Chau Town, Mai Chau District, 3.vi.2012, P. H. Pham, IEBR Regd. No. 00017/P12.

Genus *Subancistrocerus* de Saussure, 1855

Subancistrocerus sichelii (de Saussure, 1855)

Specimens examined: Quang Ninh: 1 ♀, Yen Tu National Park, Uong Bi City, 27.vi.2013, P. H. Pham, IEBR Regd. No. 00103/P13.