

## PRELIMINARY DATA ON CENTIPEDES (Chilopoda: Scolopendromorpha, Scutigeraomorpha) IN THUONG TIEN NATURAL RESERVE, HOA BINH PROVINCE

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**Abstract:** A study on centipedes was conducted in Thuong Tien commune, Thuong Tien Natural Reserve, Hoa Binh in July and November 2017. Samples were collected in four typical habitats: woody forests, bamboo forests, mixed forests and residential area+agricultural lands. As a result, a total of 13 species and subspecies in two orders (Scolopendromorpha and Scutigeraomorpha) was recorded in that region. Of which, the order Scolopendromorpha has 12 recorded species and subspecies belonging to 2 genera, 2 families (Scolopendridae, Scolopocryptopidae). The other order, Scutigeraomorpha, has only one species in one family (Scutigeraidae). The study results also contributed new records of 4 species and subspecies to the centipede fauna of the northwestern part of Vietnam. Among habitats in the study area, woody forest and mixed forest have the highest similarity in species composition (57.21%), the lowest is a bamboo forest with residential area + agricultural land (24.14%). All 13 species were found in the elevation of more than 300 m, and three species were also found in elevation of less than 300m. Mixed forests, woody forests and bamboo forests have relatively high diversity indexes in the centipede; of which, mixed forests are most heterogeneous ( $H' = 2.31$ ), then woody forests ( $H' = 1.76$ ) and the lowest is a bamboo forest ( $H' = 1.61$ ). The residential areas + agricultural land have low centipede diversity ( $H' = 0.68$ ). The density of the centipede is highest in mixed forests at 0.53 ind./m<sup>2</sup>, followed by woody forests and bamboo forests at 0.40 ind./m<sup>2</sup>.

**Keywords:** Centipedes, Chilopoda, Scolopendromorpha, Scutigeraomorpha, Thuong Tien.

### 1. INTRODUCTION

Thuong Tien Nature Reserve located in 3 communes (Thuong Tien, Kim Tien of Kim Boi district and Quy Hoa of Lac Son district) was established following Decision No. 676/QD-UB of Hoa Binh Provincial People's Committee, dated 30 September 1995. The Thuong Tien Nature Reserve is characterised by high-mountainous including the main mountain range (Cot Ca range) and the extra mountain ranges of Cot Ca, the average steepness is 25°-30° and belongs to the Thuong Tien stream basin. Soils of this nature reserve belong to two groups of soils: mountainous soils (elevation of above sea level 300 m) and hill soils (elevation less than 300 m). This is an area that are many precious rare plant and animal gene sources, such as *Cinnamomum balansae*, *Podocarpus fleuryi*, *Podocarpus pilgeri*, *Tsoongiodendron odorum*, *Ursus malayanus*, *Naja atra*... (Hoa Binh Provincial People's Committee, 1994). However, up to date, there are few data on invertebrates and especially no data on centipedes which is an important group. Centipedes play an important role in ecosystems, are natural predators of some harmful insects or carried pathogens, such as cockroaches, termites... Some centipede species have practical significance when using traditional medicine for treating some diseases

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such as hemorrhoids, aches and pains (Do Tat Loi, 2004). In addition, centipede venom as an analgesic, which can be used as a substitute for painkiller morphine in medicine (Yang *et al.* 2013).

This paper presents results of the study on species composition, distribution and similarity of species composition, density, diversity index of centipedes belonging to two orders Scolopendromorpha and Scutigeraomorpha in habitats in the study area of Thuong Tien Nature Reserve, Hoa Binh province.

## 2. MATERIALS AND METHODS

A total of 60 specimens belonging two orders, Scolopendromorpha and Scutigeraomorpha were collected from four habitats (woody forests, bamboo forests, mixed forests (wood and bamboo), residential + agricultural lands). Two following surveyed routes were selected for collecting; each route has four habitat types.

Route 1: (South to West direction) starting from the Khu village (Thuong Tien commune) (20°38'25,4"N - 105°26'45,8"E, H: 294 m), then following a forest trail to the coordinates of 20°37'25,6"N - 104°25'52,5"E, elevation: 618 m. The distance is about 5.5 km.

Route 2: (South to East direction) starting from the Khu village (20°38'25,4"N - 105°26'45,8"E, elevation: 294 m), the following a forest trail to the coordinates of 20°37'58,4"N - 105°24'01,8"E, elevation: 571 m. The distance is about 4 km.

Samples were collected in July and November 2017. Qualitative samples were collected using various ways such as stone flipping, digging leaf litter, digging soil, and Barber trapping method of Mesibov & Churchill (2003). Quantitative sample was collected using the soil-sieving method in a square of 50 cm x 50 cm of Ghiliarov (1976) in woody forests, bamboo forests and mixed forests. 15 squares/habitat were collected in each surveyed route. Each individual was shaped and kept separately in each centrifuge tubes with alcohol 70 degree.

Centipede specimens were classified and identified using morphological comparison according to characteristics of antennomeres, sternites, forcipular plate, terminal legs, spiracles, genitalia, etc. All specimens were observed under microscope Olympus SZX10. The taxonomic documents used for comparison were Attems (1930, 1937, 1953), Schileyko (1992, 1995, 1998, 2007).

The community diversity was calculated using the software Primer Ver.5.2.4. The indexes: number of species, individual abundance, diversity indexes ( $H'$ ,  $d$ ,  $\alpha$ ), homogeneous index ( $J$ ) were also calculated for each habitat type in the study area (Primer-E Ltd. - Version 5.2.4).

### 3. RESULT AND DISCUSSION

#### 3.1. Species composition

A total of 13 species and subspecies belonging to 2 orders Scolopendromorpha and Scutigermorpha are recorded in the study area. Scolopendromorpha has 12 species and subspecies belonging to 4 genera, 2 families (Scolopendridae, Scolopocryptopidae) while Scutigermorpha has only one species belonging to 1 genus, 1 family (Scutigeridae).

In the order Scolopendromorpha, the family Scolopendridae has 3 genera and the family Scolopocryptopidae has only one species. The genus *Otostigmus* is most the diverse with six recorded species, while the genus *Scolopendra* has two species and one subspecies; *Scolopocryptops* has 2 species; *Ethmostigmus* has only 1 subspecies.

These are the first data about species composition of centipedes (Scolopendromorpha and Scutigermorpha) in Thuong Tien Nature Reserve, Hoa Binh.

The results also contributed new records of 4 species and subspecies to the Northwestern Vietnam, *Ethmostigmus rubripesspinosus* (previously known in Dong Nai); *Scolopocryptops melanostomus* (previously known in Lam Dong); *Otostigmus reservatus* (previously known in Ninh Binh, Hai Phong and Cuc Phuong); *Scolopendra gracillima sternostriata* (this species is widely distributed in Vietnam, previously known in Hai Phong, Quang Nam, Gia Lai, Tay Nguyen, Lam Dong) (Tran et al., 2013). To compare with other neighboring areas, Thuong Tien Nature Reserve has a lower diversity in centipedes than Ta Xua and Son La Nature Reserve (Tran et al., 2018).

**Table 1:** Species composition of centipedes in the study area

No.	Taxon	Habitat type				Soil	
		I	II	III	IV	Hill soil group	Forest soil group
	<b>ORDER SCOLOPENDROMORPHA</b>						
	<b>FAMILY SCOLOPENDRIDAE POCOCK, 1895</b>						
	<b>Genus <i>Ethmostigmus</i> Newport, 1845</b>						
1	<i>Ethmostigmus rubripesspinosus</i> (Newport, 1845) *			1			x
	<b>Genus <i>Otostigmus</i> Porat, 1876</b>						
2	<i>Otostigmus aculeatus</i> Haase, 1887	7	2	1	3	x	x
3	<i>O. amballae</i> Chamberlin, 1913		2	2	1		x
4	<i>O. astenus</i> (Kohlrausch, 1878)			2	2		x
5	<i>O. reservatus</i> Schileyko, 1995 *		2		1		x
6	<i>O. scaber</i> Porat, 1876		2	2			x
7	<i>Otostigmus</i> sp.	1		4	4	x	x
	<b>Genus <i>Scolopendra</i> Linnaeus, 1758</b>						
8	<i>Scolopendra calcarata</i> Porat, 1876			4	5		x
9	<i>S. gracillima sternostriata</i> Schileyko, 1995 *			3			x

No.	Taxon	Habitat type				Soil	
		I	II	III	IV	Hill soil group	Forest soil group
10	<i>S. subspinipes</i> Leach, 1815	1		7		x	x
	<b>FAMILY SCOLOPOCRYPTOPIDAE POCOCK, 1896</b>						
	<b>Genus <i>Scolopocryptops</i> Newport, 1844</b>						
11	<i>Scolopocryptops melanostomus</i> Newport, 1885 *			2			x
12	<i>S. spinicaudus</i> Wood, 1862			1	1		x
	<b>ORDER SCUTIGEROMORPHA</b>						
	<b>FAMILY SCUTIGERIDAE LEACH, 1814</b>						
	<b>Genus <i>Thereuopoda</i> Verhoeff, 1904</b>						
13	<i>Thereuopoda longicornis</i> (Fabricius, 1793)		2	4			x
	<b>Number of individuals</b>	<b>9</b>	<b>10</b>	<b>33</b>	<b>17</b>		
	<b>Number of species</b>	<b>3</b>	<b>5</b>	<b>12</b>	<b>7</b>	<b>3</b>	<b>13</b>

I: Residential area + agricultural land; II: Bamboo forest; III: Mixed forest; IV: Woody forest

\*: New records for the Northwestern region, Vietnam.

Centipede species, genera and families composition changes from habitats to habitats: highest in mixed forests (12 species and subspecies, 6 genera, 3 families), following by woody forests (7 species, 3 genera, 2 families), bamboo forests (5 species, 2 genera, 2 families), and the lowest is residential areas + agricultural lands (3 species, 2 genera, 1 family).

Mixed forests are the most diverse in centipedes. This result is similar to the research at Ta Xua Nature Reserve (Tran *et al.*, 2018). It may be due to the diversity of vegetation in this habitat; that leads to the development of animals which are food resources of centipedes.

Only one species, *Otostigmus aculeatus*, has found in all habitats. This species is widely distributed in Vietnam (Tran *et al.*, 2013) and is also distributed in Laos, Hong Kong, Taiwan, China, Java (Attems, 1930, 1938; Chao & Chang, 2003; Schileyko, 2007). There are 2 species found in 3 habitats, 7 species found in 2 habitats. Three species/subspecies, *Ethmostigmus rubripesspinosus*, *Scolopendra gracillima sternostriata*, and *Scolopocryptops melanostomus*, are found only in mixed forests but not in other habitats.

All 13 species are found at altitudes of higher than 300 m; but 3 species are also found at altitudes of lower than 300 m. Of those three species, two species *Otostigmus aculeatus* and *Scolopendra subspinipes* are widely distributed in Vietnam (Tran *et al.*, 2013), and *Otostigmus* sp. is not yet identified to scientific name.

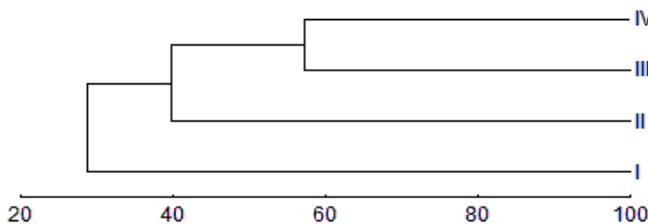
The similarity of species composition between habitats in the study area is presented in table 2 and figure 1.

**Table 2.** The similarity of centipede species composition between habitats in the study area

	<b>I</b>	<b>II</b>	<b>III</b>
<b>I</b>			
<b>II</b>	24.14		
<b>III</b>	25.34	40.16	
<b>IV</b>	36.36	39.12	57.21

I: Residential areas + agricultural lands; II: Bamboo forests; III: Mixed forests; IV: Woody forests

The result shows that there is a low similarity in species composition between habitats in the study area (<40%). Only woody forests and mixed forests are relatively similar in species composition (57,21%) (Table 2). Figure 1 also shows that the residential + agricultural lands is separated into a distinct branch. It is possible this habitat has no litter layer, and is often affected by human activities; therefore, only widely distributed species or species adapted to this condition can exist here.



**Figure 1.** The similarity of species composition of the habitats in study area

I: Residential area + agricultural land; II: Bamboo forest; III: Mixed forest; IV: Woody forest

**Biological indexes:**

Regarding the homogeneous index, the bamboo forests have the highest value (1.00), following by mixed forests (0.93), woody forests (0.90), and residential area + agricultural lands (0.62). However, the highest H' diversity index (2.31) is recorded in mixed forests, lower in woody forests (1.76) and bamboo forests (1.61), lowest in the residential area + agricultural lands (0.68). The Margalef (d), Fisher (α) species diversity indexes show similar results (Table 3).

**Table 3.** The diversity indexes and homogeneous J' of habitats in the study area

	S	N	d	J'	Fisher (α)	H'
I	3	9	0.91	0.62	1.58	0.68
II	5	10	1.74	1.00	3.98	1.61
III	12	33	3.15	0.93	6.78	2.31
IV	7	17	2.12	0.90	4.45	1.76

S: number of species; N: number of individuals.

I: Residential area + agricultural land; II: Bamboo forest; III: Mixed forest; IV: Woody forest

Centipede density in habitats of Thuong Tien Nature Reserve is presented in table 4.

The average density of centipedes in Thuong Tien Nature Reserve is 0.44 individuals/m<sup>2</sup>. The highest density is in mixed forests (0.53 individuals/m<sup>2</sup>), decreasing in bamboo forests and woody forests (0.40 individuals/m<sup>2</sup>) (Table 4). The average density of centipedes is similar to Ta Xua Nature Reserve (0.42 individuals/m<sup>2</sup>). However, the centipede density in woody forests in Ta Xua Nature Reserve (0.6 individuals/m<sup>2</sup>) (Tran et al., 2018) is higher than that in Thuong Tien Nature Reserve (0.4 individuals/m<sup>2</sup>). It is possible that woody forests in Ta Xua Nature Reserve are more diverse, with higher coverage than in Thuong Tien Nature Reserve.

**Table 4.** The centipede density of habitats in study area

	Habitat (30 squares (50cm x 50cm)/habitat)		
	II	III	IV
Specimens	3	4	3
Density (individuals/m <sup>2</sup> )	0.4	0.53	0.4
Average	0.44		

II: Bamboo forest; III: Mixed forest; IV: Woody forest

## CONCLUSION

A total of 13 species and subspecies belonging to 2 orders Scolopendromorpha and Scutigermorpha were recorded in four habitats (woody forests, bamboo forests, mixed forests and residential area+agricultural lands). The order Scolopendromorpha has 12 species and subspecies belonging to 4 genera, 2 families (Scolopendridae, Scolopocryptopidae) while the order Scutigermorpha has 1 species belonging to 1 genus, 1 family (Scutigeridae).

Four species/subspecies *Ethmostigmus rubripesspinosus*, *Scolopocryptops melanostomus*, *Otostigmus reservatus*, *Scolopendra gracillima sternostriata* are new records for the northwestern region of Vietnam.

Among habitats in the study area, woody forest and mixed forest have the highest similarity in species composition (57.21%), the lowest is bamboo forest with residential area + agricultural land (24.14%).

All 13 species were found in the elevation of more than 300 m; and three species were also found in elevation of less than 300m.

Mixed forests, woody forests and bamboo forests have relatively high diversity indexes in the centipede; of which, mixed forests are most heterogeneous ( $H' = 2.31$ ), then woody forests ( $H' = 1.76$ ) and the lowest is bamboo forest ( $H' = 1.61$ ). The residential areas + agricultural land have low centipede diversity ( $H' = 0.68$ ). The density of the centipede is highest in mixed forests at 0.53 individuals/m<sup>2</sup>, followed by woody forests and bamboo forests at 0.40 individuals/m<sup>2</sup>.

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## NHỮNG DẪN LIỆU ĐẦU TIÊN VỀ RẾT (Chilopoda: Scolopendromorpha, Scutigermorpha) Ở KHU BẢO TỒN THIÊN NHIÊN THƯỢNG TIẾN, TỈNH HÒA BÌNH

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**Tóm tắt:** Nghiên cứu về rết ở Khu Bảo tồn Thiên nhiên Thượng Tiến, Hòa Bình được tiến hành vào tháng 7 và tháng 11 năm 2017. Mẫu vật được thu tại 4 sinh cảnh của khu vực nghiên cứu bao gồm: rừng cây gỗ, rừng hỗn giao (gỗ và tre nứa), rừng tre nứa, khu dân cư + đất nông nghiệp. Kết quả nghiên cứu đã ghi nhận được 13 loài và phân loài thuộc 2 bộ Scolopendromorpha và Scutigermorpha. Bộ Scolopendromorpha gặp 12 loài và phân loài thuộc 4 giống, 2 họ (Scolopendridae, Scolopocryptopidae). Bộ Scutigermorpha gặp 1 loài thuộc 1 giống, 1 họ (Scutigeridae). Kết quả nghiên cứu này cũng bổ sung cho khu hệ rết Tây Bắc, Việt Nam 4 loài và phân loài. Hầu hết các loài rết trong vùng nghiên cứu đều thích nghi với nhóm đất rừng có độ cao trên 300 m. Chỉ có 3 loài tìm thấy trong nhóm đất đồi và chúng đều thuộc nhóm phân bố rộng. Ở khu vực nghiên cứu, rừng cây gỗ và rừng hỗn giao có sự tương đồng về thành phần loài cao nhất (57,21%), thấp nhất là ở sinh cảnh khu dân cư-đất nông nghiệp và rừng tre nứa có độ tương đồng (24,14%). Chỉ số đa dạng sinh học (H') cao nhất là ở sinh cảnh rừng hỗn giao (2,31), giảm dần ở rừng cây gỗ (1,76), rừng tre nứa (1,61) và khu dân cư + đất nông nghiệp (0,68). Mật độ rết cao nhất trong rừng hỗn giao (0,53 con/m<sup>2</sup>), giảm dần ở rừng tre nứa (0,40 con/m<sup>2</sup>) và rừng gỗ (0,40 con/m<sup>2</sup>).

**Từ khóa:** Chilopoda, Scolopendromorpha, Scutigermorpha, Rết, Thượng Tiến.

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