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Cover: Watercolour illustrations—Striped Tiger *Danaus genutia*, Common Silverline *Cigaritis vulcanus*, Tamil Lacewing *Cethosia mahratta*. © Mayur Nandikar.

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COMMUNICATION

Diversity and distribution of large centipedes (Chilopoda: Scolopendromorpha) in Nui Chua National Park, Vietnam

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Abstract. Field surveys on large centipedes of Nui Chua National Park, south-central part of Vietnam, were conducted in September 2023 and February 2024. As a result, a total of 12 species/subspecies belonging to five genera and two families of the order Scolopendromorpha were recorded. Of two families, Scolopendridae has nine species in four genera, while Cryptopidae has only two species in one genus. In addition, the distribution pattern of the large centipedes is discussed based on the season (rainy versus dry), altitudes, and different habitats.

Keywords: Altitudes, biodiversity, bioinvestigation, distribution, habitats, scolopendromorph, season, south-central Vietnam, taxon.

Vietnamese: Các đợt điều tra về rết lớn tại Vườn quốc gia Núi Chúa được thực hiện vào tháng 9 năm 2023 và tháng 2 năm 2024. Kết quả đã ghi nhận được 12 loài và phân loài thuộc 5 giống, 2 họ của bộ rết lớn Scolopendromorpha. Trong đó, họ Scolopendridae đã ghi nhận được 9 loài, họ Cryptopidae đã ghi nhận được 2 loài cùng một giống. Bên cạnh đó, nghiên cứu cũng phân tích, đánh giá về đặc điểm phân bố của các loài theo các mùa (mùa mưa và mùa khô) trong năm, theo độ cao và các sinh cảnh khác nhau.

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Competing interests: The authors declare no competing interests.

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Author contributions: All authors equally contribute to the current paper, including sample collecting, analyzing, photographing and manuscript writing.

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INTRODUCTION

Centipedes are the largest group of terrestrial carnivorous invertebrates and have an important role in balancing the ecosystem or controlling harmful organisms (Lewis 1981). Therefore, it is very essential to have a better understanding of this group. The large centipede fauna (Scolopendromorpha) in Vietnam was initially studied by foreign researchers such as Attems (1930) and Schileyko (1992, 1995, 2007). Recently, Vietnamese systematists started to conduct more research on the taxonomy and diversity of scolopendromorph centipedes, such as Tran et al. (2013), Vu et al (2020, 2022), and Le et al. (2018, 2021, 2023).

Nui Chua National Park (NP) in Ninh Thuan province, south-central Vietnam, has been recognized as a World Biosphere Reserve since 2021 (Figure 1). This is in recognition by the international community of its natural landscape, biodiversity, and indigenous cultural values. The biosphere reserve has a total area of 106,000 ha , including forests, seas, and semi-deserts. With the core area being Nui Chua National Park, this region possesses much biodiversity value for its rare species of animals and plants. In addition, it has a harsh climate, low rainfall, and hot weather all year round, creating for Nui Chua a natural landscape with unique characteristics of the dry climate region of Ninh Thuan. This is also a unique and rare characteristic of Vietnam and southeastern Asia. However, up to now, large centipedes in the Nui Chua NP area are still poorly known. According to Tran et al. (2013), *Scolopendra morsitans* is the only species recorded in Ninh Thuan province. The recorded location is about 20 km south-west of Nui Chua NP.

This study aims to provide the species composition of the large centipedes and their distribution pattern in Nui Chua NP.

MATERIAL AND METHODS

Field surveys were carried out in September 2023 and February 2024 in different habitats in Nui Chua NP, including natural broadleaf forests (NF), planted forests (PF) and coniferous forests (CF). Samples were also collected at different altitudes (including below 300 m, 300–600 m, and 600–1,000 m) according to Vu (2012) and Bain & Hurley (2011).

Centipede samples were collected by pitfall trapping (Mesibov & Churchill 2003), leaf-sifting (Górny & Grum 1993) and manually collecting from rotting trees, under rocks, and forest litter. A total of 156 samples were collected during the two field surveys. All specimens were preserved in 75–80 % ethanol and kept at the Joint Vietnam-Russia Tropical Science and Technology Research Centre (VRTC).

Specimens were identified using Attems (1930), Schileyko (2007, 2020), Siriwut et al. (2016), and Vu et al. (2020). Ecological indices including the number of species, Shannon-Weaver (H'), and uniformity (J') were calculated using the software Primer ver. 7.0 for each habitat type and altitude. A similarity index was calculated using the software R ver. 4.0.4.

RESULTS AND DISCUSSION

Diversity composition and distribution of Scolopendromorpha

From 156 specimens collected in the Nui Chua NP, 12 species/subspecies of five genera belonging to two families were identified. Eleven species were new records to the fauna of Nui Chua, including *Scolopendra morsitans, S. subspinipes, S. dehaani, S. japonica, Scolopendra* sp., *Otostigmus spinosus, O. scaber, O. multidens, Asanada brevicornis, Ethmostimus rubripes platycephalus, Cryptops* (*Cryptops*) sp., and *Cryptops* (*Paracryptops*) *indicus* (Table 1).

With the harsh climate in the area, the rainy season is of short duration, from September to November, while the dry season lasts from December to August of the following year. The seasonal diversity of large centipedes in the Nui Chua NP area does not differ significantly. In the rainy season, 10 species were recorded, while in the dry season nine species were recorded. Centipedes are likely to be more active in the rainy season than in the dry season. This is evident from the number of specimens collected in each season, with 106 specimens found during the rainy season compared to 50 during the dry season. This phenomenon can be explained by the characteristic of centipedes to prefer to live in humid environments.

Three species, *Scolopendra morsitans*, *S. dehaani*, and *Scolopendra* sp., were recorded only in the rainy season, while *Scolopendra japonica* and subspecies *Ethmostimus rubripes platycephalus* were found only in the dry season.

Among the habitats, the NF is the most diverse one in terms of species and collected specimens (12 species and 123 individuals). The PF habitat is less diverse with five species and 27 individuals. The lowest number of species and collected specimens was recorded in the CF habitat (four species and only six individuals). This result

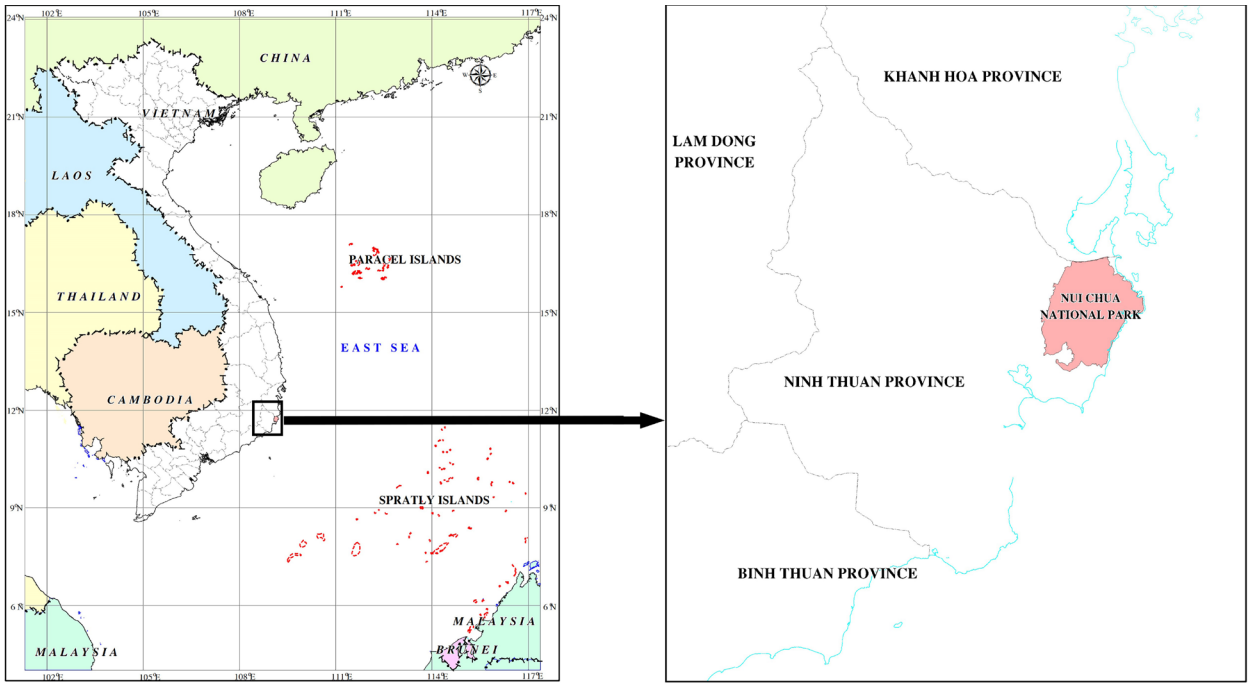

Figure 1. Location of Nui Chua National Park, Vietnam.

Table 1. Species composition and distribution of scolopendromorphs in Nui Chua National Park, Ninh Thuan province.

	Taxon	Season		Elevation range (m)			Habitat		
		Dry	Rain	0–300	300–600	600–1,000	NF	PF	CF
	Family Scolopendridae Pocock, 1895								
	Genus *Scolopendra* Linnaeus, 1758								
1	*Scolopendra morsitans* Linnaeus, 1758		+(6)	+(4)	+(2)		+(2)		+(4)
2	*Scolopendra subspinipes* Leach, 1815	+(13)	+(2)	+(4)	+(7)	+(4)	+(15)		
3	*Scolopendra dehaani* Brandt, 1840		+(1)	+(1)			+(1)		
4	*Scolopendra japonica* Koch, 1878	+(2)				+(2)	+(2)		
5	*Scolopendra* sp.		+(2)	+(2)			+(2)		
	Genus Otostigmus Porat, 1876								
6	*Otostigmus spinosus* Porat, 1876	+(4)	+(26)	+(24)	+(3)	+(3)	+(19)	+(11)	
7	*Otostimus scaber* Porat, 1876	+(6)	+(3)	+(2)	+(1)	+(6)	+(9)		
8	*Otostigmus multidens* Haase, 1887	+(9)	+(5)	+(3)	+(4)	+(7)	+(12)	+(2)	
	Genus *Asanada* Meinert, 1886								
9	*Asanada brevicornis* Meinert, 1886	+(7)	+(24)	+(19)	+(12)		+(26)	+(4)	+(1)
	Genus *Ethmostigmus* Newport, 1845								
10	*Ethmostimus rubripes platycephalus* (Newport, 1845)	+(1)				+(1)	+(1)		
	Family Cryptopidae Kohlrausch, 1881								
	Genus *Cryptops* Leach, 1815								
11	*Cryptops (Cryptops) sp.*	+(6)	+(33)	+(28)	+(7)	+(4)	+(28)	+(10)	+(1)
12	*Cryptops (Paracryptops) indicus* Silvestri, 1924	+(2)	+(4)	+(3)	+(3)		+(6)		
	Total number of individuals	**50**	**106**	**90**	**39**	**27**	**123**	**27**	**6**
	Total species	**9**	**10**	**10**	**8**	**7**	**12**	**5**	**3**

NF—natural broadleaf forests | PF—planted forests | CF—coniferous forests | +—present | The number in parantheses indicates samples collected.

is similar to previous research in other areas, in which the CF habitat has a lower number of species in comparison with the other habitats (Le & Vu 2018; Le et al. 2021). This is even more clearly shown in Nui Chua NP, where the terrain and climate are typical, and coniferous forests are concentrated mainly on the coast, so only species with wide distribution and adaptability can be found. There are only two species, *Asanada brevicornis* and *Cryptops* (*Cryptops*) sp. recorded in all three habitats; *Scolopendra morsistans*, *Otostigmus spinosus*, and *Otostigmus multidens* were recorded in two habitats; the remaining species were only recorded in NF.

Regarding topological distribution, the highest species diversity was recorded in the elevation range of less than 300 m (10 species), while other elevation ranges had lower diversity, with eight species recorded in the elevation of 300–600 m, and seven in the elevation of 600–1,000 m. Five species were recorded at all three different altitudes, including *Scolopendra subspinipes, Otostigmus spinosus, O. scaber, O. multidens*, and *Cryptops* (*Cryptops*) sp. Two species, *Scolopendra dehaani* and *Scolopendra* sp., were recorded only at altitudes below 300 m, while *Scolopendra japonica* and *Ethmostimus rubripes platycephalus* were recorded only at altitudes of 600–1,000 m. The remaining species were recorded at two altitude ranges below 600 m.

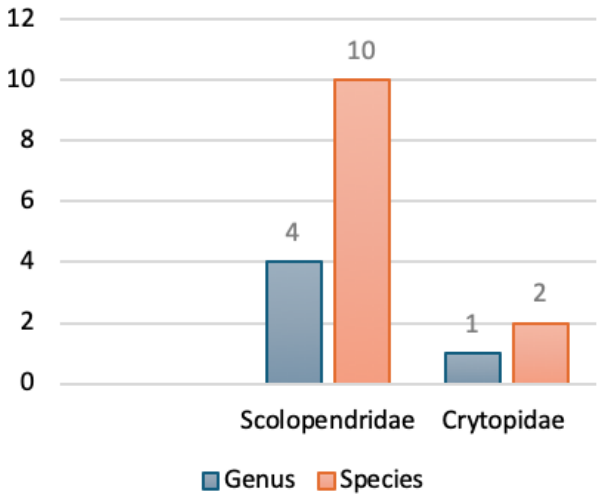

Figure 2. Family taxon diversity - Number of species in families.

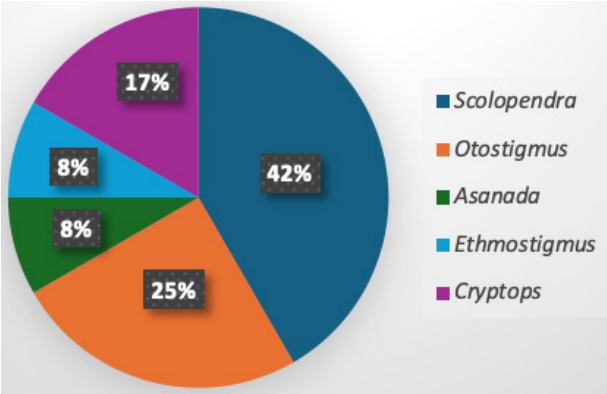

Figure 3. Generic taxon diversity - Percentage of species in genera.

Taxon diversity

Only two families, Scolopendridae and Cryptopidae, were recorded in Nui Chua National Park. Of these, Scolopendridae had a higher diversity in terms of the number of recorded genera and species (four genera and 10 species). Cryptopidae had only one genus and two species recorded (Figure 2). This result is similar to previous studies on large centipede fauna in Vietnam (Tran et al. 2013, 2018; Le & Vu 2018; Nguyen et al. 2019).

Of five genera (Figure 3), *Scolopendra* was the genus with the highest number of species (five species, accounting for 42% of the total number of species), followed by *Otostigmus* with three species (accounting for 25%). The remaining two genera, *Asanada* and *Ethmostigmus*, had only one species each (accounting for 8%).

Table 2. Diversity index and uniformity index by habitat and altitude.

Habitat/elevation (m)	Amount		Index	
	Species	Individual	J'	H'
NF	12	123	0.83	2.06
PF	4	27	0.87	1.21
CF	3	6	0.79	0.87
0–300	10	90	0.77	1.77
300–600	8	39	0.89	1.85
600–1,000	7	27	0.93	1.81

Biological indicators

The results of the biological indicators are presented in Table 2, in which the NF habitat had the highest H' index of 2.06, this value showing that the diversity in this habitat was quite high. In contrast, the CF habitat had very poor diversity (H' = 0.87). The PF habitat presented an average diversity (H' = 1.21). For the altitude, all three altitudes showed moderate diversity with H' ranging from 1.77 (0–300 m) to 1.81 (300–600 m). The uniformity index J' showed that this index did not differ significantly among habitats. The uniformity was highest in the PF habitat (0.87), and lowest in the CF habitat (0.79). Regarding the altitude, J' index expressed more

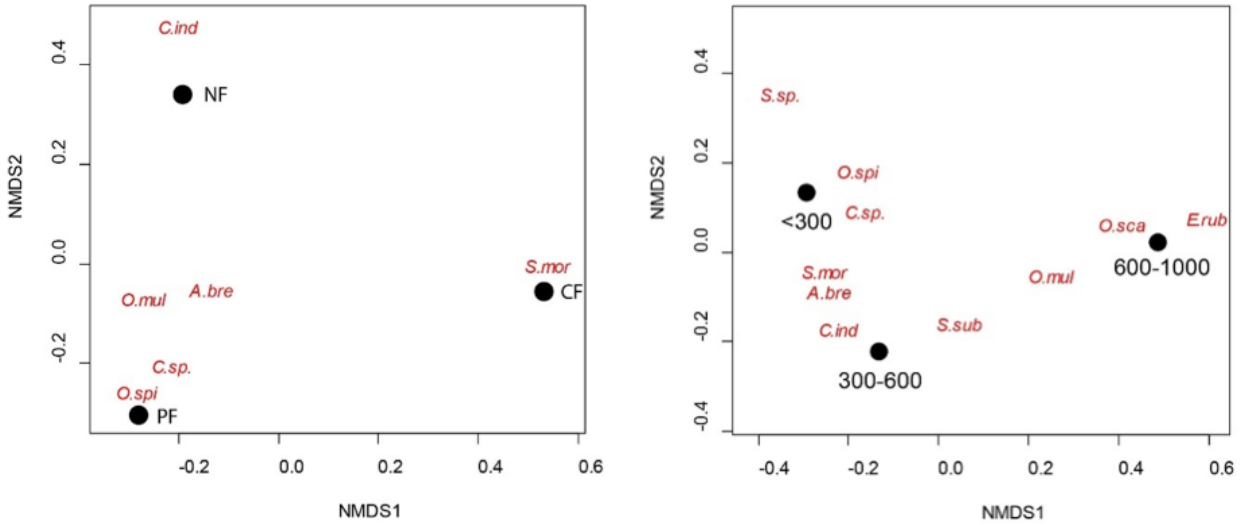

Figure 4. Non-metric multidimensional scaling (NMDS) analysis: A—by habitat | B—by elevation | *A.bre—Asanda brevicornis* | *C.ind—Cryptops* (*Cryptops*) *indicus* | *C.*sp.*—Cryptops* (*Cryptops*) sp. | *E.rub—Ethmostimus rubripes platycephalus* | *O.mul—Otostigmus multidens* | *O.spi—Otostigmus spinosus* | *O.sca—Otostigmus scaber* | *S.deh—Scolopendra dehaani* | *S.jap—Scolopendra japonica* | *S.mor—Scolopendra morsitans* | *S.sp.—Scolopendra* sp. | *S.sub—Scolopendra suspinipes.*

difference, whereby it was highest at altitudes of 600–1,000 m, with 0.89, and lowest at altitudes below 300 m with 0.77. Thus, at an altitude of 300 m, although there was the greatest diversity and richness, the uniformity of species is the lowest. This was due to differences in the number of collected specimens such as *Cryptops* (*Cryptops*) sp. (28 specimens), *Otostigmus spinosus* (24 specimens), while *Scolopendra dehaani* was represented by only one specimen.

The similarities in species composition among habitats and altitudes are shown in Figure 4 by NMDS analysis. According to the results in Figure 4A, the habitats express little similarity in species composition, made plain by the distance among the habitats in the figure. The close relationship of species to habitats is also clearly shown, whereby the species *Cryptops* (*Cryptops*) *indicus* is close to the NF, the *Scolopendra morsitans* is close to the CF habitat, three species (*Asanda brevicornis* (Image 1), *Cryptops* (*Cryptops*) sp., *Otostigmus multidens*, and *Otostigmus spinosus*) are closer to PF, but *Otostigmus spinosus* was the closest. Other species have not been seen to have associations with habitats.

The similarity by altitude (Figure 4B) shows that altitudes below 300 m are closer to altitudes 300–600 m than to altitudes 600–1,000 m. The recorded species also show close relationships with different altitudes. Among them, *Ethmostimus rubripes platycephalus* and *Otostigmus scaber* are closely related at altitudes of 600–1,000 m, *Cryptops* (*Cryptops*) sp. and *Otostigmus spinosus* are closer to altitudes below 300 m, while *Cryptops* (*Cryptops*) *indicus* and *Scolopendra subspinipes* are closer to altitudes of 300–600 m.

DISCUSSION

Nui Chua NP is located in the hottest and driest area in Vietnam with a very short rainy season, little annual rainfall, and a long dry season. The species diversity of the large centipedes was not very low (12 species). The results are similar to the diversity of Hoang Lien National Park, Thuong Tien, and Xuan Nha Nature Reserve in the northwestern region of Vietnam, where there is more diversity in habitat types, altitudes, and humid climates, more favourable for the growth and development of centipedes (Nguyen et al. 2018, 2019a,b).

In previous studies, it was noted that the genus *Otostigmus* has the highest diversity, but in this study, *Scolopendra* is shown to be the most diverse genus. Notably, the species *Scolopendra japonica* was recorded, previously mentioned by Siriwut (2016), to be distributed in Sapa (altitude above 1,600 m) in the north of Vietnam, in which the climate is completely different from Nui Chua NP. The geographical distance of the two recorded locations is very far apart, which shows that this species is most likely widely distributed in Vietnam. Additional studies are needed for different regions in Vietnam to confirm its distributional pattern.

Image 1. *Asanada brevicornis* Meinert, 1886.

REFERENCES

Attems, C. (1930). *Myriopoda. 2. Scolopendromorpha*. *Das Tierreich* 54. De Gruyter, Berlin, Leipzig, 308 pp.

Bain, R. & M. Hurley (2011). A Biogeographic Synthesis of the Amphibians and Reptiles of Indochina. *Bulletin of the American Museum of Natural History* 360: 1–138.

Górny, M. & L. Grum (1993). *Methods in Soil Zoology*. Elsevier Science, 459 pp.

Le, X.S. & T.H. Vu (2018). Preliminary data on species composition and distribution of the Scolopendromorph centipedes (Chilopoda: Scolopendromorpha) in Kon Ka Kinh National Park and Kon Chu Rang Nature Reserve, Gia Lai province. *VNU Journal of Science: Natural Sciences and Technology* 34(4): 16–20. https://doi.org/10.25073/2588-1140/vnunst.4794

Le. X.S., T.T.A. Nguyen, T.T.B. Tran & A.D. Nguyen (2021). Diversity and distribution of the large centipedes (Chilopoda: Scolopendromorpha) in the Phia Oac - Phia Den National Park, Vietnam. *Journal of Threatened Taxa* 13(8): 19102–19107. https://doi.org/10.11609/jott.7451.13.8.19102-19107

Lewis, J.G.E. (1981). *The Biology of Centipedes*. Cambridge University Press.

Mesibov, R. & T.B. Churchill (2003). Patterns in pitfall captures of millipedes (Diplopoda: Polydesmida: Paradoxosomatidae) at coastal heathland sites in Tasmania. *Australian Zoologist* 32(3): 431–438. https://doi.org/10.7882/AZ.2002.021

Nguyen, D.H., D.Q. Do, T.T.B. Tran, T.H. Vu, D.A. Nguyen & X.S. Le (2019b). Data on species composition and distribution of centipedes (Chilopoda: Scolopendromorpha, Scutigeromorpha) Hoang Lien National Park, Vietnam. *Journal of Hanoi National University of Education* 64(10A): 82–89. (In Vietnamese). https://doi.org/10.25073/2588–1140/vnunst.4794

Nguyen, D.H., N.A. Hoang, D.Q.C. Tran & T.T.B. Tran (2018). Preliminary data on centipedes (Chilopoda: Scolopendromorpha, Scutigeromorpha) in Thuong Tien Natural Reserve, Hoa Binh province. The 3rd National Conference of Scientists on Biological Research and Teaching in Vietnam: 533–540. (In Vietnamese).

Nguyen, D.H., Q.T.C. Dang, T.T.H. Nguyen, X.S. Le & T.T.B. Tran (2019a). Diversity of centipedes (Chilopoda: Scolopendromorpha and Scutigeromorpha) in Xuan Nha Nature Reserve, Son La province, Vietnam. *Can Tho University Journal of Science* 11(3): 75–82. https://www.doi.org/10.22144/ctu.jen.2019.041

Schileyko, A.A. (1992). Scolopenders of Viet-Nam and some aspects of the system of Scolopendromorpha (Chilopoda: Epimorpha). Part 1. *Arthropoda Selecta* 1: 5–19.

Schileyko, A.A. (1995). The scolopendromorph centipedes of Vietnam (Chilopoda: Scolopendromorpha). Part 2. *Arthropoda Selecta* 4: 73–87.

Schileyko, A.A. (2007). The scolopendromorph centipedes (Chilopoda) of Vietnam, with contributions to the faunas of Cambodia and Laos. Part 3. *Arthropoda Selecta* 16: 71–95.

Schileyko, A.A., V. Vahtera & G.D. Edgecombe (2020). An overview of the extant genera and subgenera of the order Scolopendromorpha (Chilopoda): a new identification key and updated diagnoses. *Zootaxa* 4825(1): 1–64. https://doi.org/10.11646/zootaxa.4825.1.1

Siriwut, W., G.D. Edgecombe, C. Sutcharit, P. Tongkerd & S. Panha (2016). A taxonomic review of the centipede genus *Scolopendra* Linnaeus, 1758 (Scolopendromorpha, Scolopendridae) in mainland southeast Asia, with description of a new species from Laos. *ZooKeys* 590: 1–124. https://doi.org/10.3897/zookeys.590.7950

Tran, T.T.B., D.H. Nguyen, T.K.L. Ha & T.H. Vu (2018). Preliminary data on centipedes (Chilopoda: Scolopendromorpha and Scutigeromorpha) in Ta Xua Natural Reserve, Son La Province, Vietnam. *Academia Journal of Biology* 40(1): 100–107. https://doi.org/10.15625/0866–7160/v40n1.11073

Tran, T.T.B., X.S. Le & A.D. Nguyen (2013). An annotated checklist of centipedes (Chilopoda) of Vietnam. *Zootaxa* 3722(2): 219–244. https://doi.org/10.11646/zootaxa.3722.2.6

Vu, T.L. (2012). *Natural geography of Vietnam, 8th Edition*. Publishing House of Hanoi University of Education, Ha Noi, 340 pp.

Vu, T.H., D.H. Nguyen, X.S. Le, K. Eguchi, A.D. Nguyen & T.T.B. Tran (2020). A review and notes on the phylogenetic relationship of the centipede genus *Otostigmus* Porat, 1876 (Chilopoda: Scolopendromorpha: Scolopendridae) from Vietnam. *Zootaxa* 4808(3): 401–438. https://doi.org/10.11646/zootaxa.4808.3.1

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