

PRELIMINARY DATA ON DISTRIBUTION OF AMPHIBIANS AND REPTILES FROM CHI LINH SPECIAL - USE FOREST IN HAI DUONG PROVINCE, NORTHERN VIETNAM

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Abstract. Based on the novel data collected during three field surveys in 2019 and 2020, we herein provided a checklist of 13 amphibian species belonging to 10 genera (five families, one order) and 12 reptile species belonging to 12 genera (7 families, two orders) from Chi Linh Special-Use forest, Hai Duong province. In this study, *Trachemys scripta* is recorded as invasive alien species from the area. In terms of conservation concern, 2 species are listed in the IUCN Red List (2020) as Vulnerable (*Physignathus cocincinus* and *Goniurosaurus lichtenfelderi*) and 1 species is listed in the Vietnam Red Data Book (2007) as Vulnerable (*Physignathus cocincinus*). In terms of herpetological distribution, mostly recorded species were found in the evergreen forest habitat (6 species of amphibians and 7 species of reptiles). Additionally, the largest number of species were recorded in March 2019 (12 amphibian species and 4 reptile species).

Keywords: amphibians, Chi Linh Special-Use forest, distribution, reptiles.

1. Introduction

Vietnam has the highest rate of recent species discovery of amphibians and reptiles from Southeast Asia with 100 new amphibian species described from the country since 2004 (Frost, 2020) [1]. The herpetofauna of many parts of the country remains poorly known and there continues to be a high rate of species discovery (Köhler *et al.*, 2005; Tapley *et al.*, 2018) [2, 3]. The Chi Linh Special-Use forest is located in the north and northeast of Hai Duong Province. Forest area bordering Bac Giang and Quang Ninh provinces. The total area of Chi Linh Natural forest is approximately 1,216.9 ha of disturbed secondary forest. The topography is characterized by low elevation, low slope, descending from North to South (Hai Duong Department of Natural Resource and Environment, 2013) [4].

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In terms of herpetofauna diversity, Hai Duong is one of the most poorly studied provinces in Vietnam. Ho *et al.* (2001) documented 25 species of amphibians and 62 species of reptiles from Chi Linh city [5]. Nguyen *et al.* (2009) reported a total of 25 amphibian species and 54 reptile species [6]. These previous studies only provided species composition, not providing information on species distribution characteristics in this area.

As a result of our field surveys in the habitat types in 2019 and 2020, we herein provide preliminary data on the distribution of amphibians and reptiles from Chi Linh Special-Use forest in Hai Duong province, Northern Vietnam.

2. Content

2.1. Methods

*** Specimen collection**

Field surveys in the Chi Linh Special-Use forest, Hai Duong (Figure 1) in March, June 2019, and May 2020 by TM Doan, HN Tran, HV Tran, LT Nguyen, TT Nguyen, NH Nguyen. Survey transects were set up along streams, ponds, and forest paths. Surveyed sites are situated at elevations between 75 and 225 m above sea level (Figure 1). Specimens were collected by hand or using a snake hook between 8:00 and 23:00 near streams, trails, hills, and around residential areas. After photographing, specimens were euthanized in a closed vessel with a piece of cotton wool containing ethyl acetate, fixed in 96% ethanol for 8 - 10 hours, and subsequently stored in 70% ethanol (Simmons, 2002) [7]. Specimens were deposited in the collections of the Museum of Biology, Hanoi National University of Education.

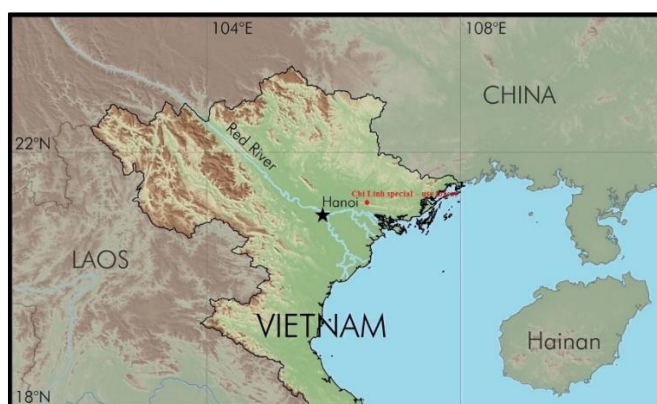


Figure 1. The location of Chi Linh Special-Use forest, Hai Duong province, Northern Vietnam

*** Identification**

Taxonomic identifications were made following Smith (1935) [8], Taylor (1962) [9], Matsui *et al.* (1986) [10], Inger *et al.* (1999) [11], Ziegler (2002) [12], Scalera (2006) [13], Goodall & Faithfull (2010) [14], Nguyen *et al.* (2011) [15], and Hecht *et al.* (2013) [16]. The gender was identified based on external sexual characters, and if required, from the inspection of the gonads after dissection. The classification of invasive reptile species of

Hai Duong Province was based on Circular No. 35/2018/TT-BTNMT [17] and the IUCN document “*The 100 of the World worst invasive alien species*” [18].

Assessment of threatened species according to the Vietnam Red Data Book (VRDB, 2007) and Red List of the International Union for Conservation of Nature (IUCN, 2020).

*** Assessment of distribution characteristics**

Studying the distribution of species according to different habitat types, divided by the level of human impact, includes habitat around residential areas, secondary forest habitats rehabilitate and make the forest habitats less affected.

2.2. Results and discussion

*** Preliminary data on the distribution of amphibians and reptiles from Chi Linh Special-Use forest**

A total of 25 species of the herpetofauna from Chi Linh Special-Use forest belong to 12 families, three orders recorded includes 13 species of amphibians (13 anurans) and 12 species of reptiles (6 lizards and 5 snakes and 1 turtle) (see Table 1, Figures 2-5). For amphibians, we found 1 order (Anura), 5 families, 10 genera, and 13 species. For reptiles, we recorded 2 orders (Squamata, Testudines), 7 families, 12 genera, and 12 species. The families with the highest number of species were Colubridae and Scincidae.

Table 1. List of amphibia and reptile species recorded from Chi Linh Special-Use forest, Hai Duong Province, Vietnam (Habitat types: Residential area: A, Secondary forest: B, Evergreen forest: C)

No.	Species	VRDB 2007	IUCN 2020	Time			Habitat types		
				March 2019	June 2019	May 2020	A	B	C
	AMPHIBIA Gray, 1825								
	ANURA Fischer von Waldheim, 1813								
	I. Megophryidae Bonaparte, 1850								
1.	<i>Megophrys microstoma</i> (Boulenger, 1903)				+				+
	II. Microhylidae Günther, 1858 (1843)								
2.	<i>Kaloula pulchra</i> Gray, 1831			+			+		
3.	<i>Microhyla butleri</i> Boulenger, 1900			+				+	
4.	<i>M. heymonsi</i> Vogt, 1911			+				+	
	III. Dicroglossidae Anderson, 1871								
5.	<i>Fejervarya limnocharis</i> (Gravenhost, 1829)			+				+	

6.	<i>Limnonectes bannaensis</i> Ye, Fei & Jiang, 2007			+	+			+	+
7.	<i>Occidozyga martensii</i> (Peters, 1867)			+				+	
	IV. Ranidae Batsch, 1796								
8.	<i>Rana johnsi</i> Smith, 1921			+				+	
9.	<i>Sylvirana guentheri</i> (Boulenger, 1882)			+				+	
10.	<i>S. maosonensis</i> (Bourret, 1937)			+				+	+
	V. Rhacophoridae Hoffman, 1932 (1858)								
11.	<i>Kurixalus bisacculus</i> (Taylor, 1962)			+					+
12.	<i>Polypedates megacephalus</i> Hallowell, 1861			+	+				+
13.	<i>P. mutus</i> (Smith, 1940)			+	+				+
	REPTILIA Laurenti, 1768								
	SQUAMATA Oppel, 1811								
	VI. Agamidae Gray, 1827								
14.	<i>Acanthosaura lepidogaster</i> (Cuvier, 1829)				+				+
15.	<i>Physignathus cocincinus</i> Cuvier, 1829	VU	VU		+	+	+		+
	VII. Gekkonidae Gray, 1825								
16.	<i>Goniurosaurus lichtenfelderi</i> (Mocquard, 1897)		VU			+			+
	VIII. Scincidae Oppel, 1811								
17.	<i>Eutropis longicaudata</i> (Hallowell, 1857)				+		+		
18.	<i>Sphenomorphus indicus</i> Gray 1853				+	+			+
19.	<i>Tropidophorus sinicus</i> Boettger 1886				+				+
	IX. Typhlopidae Merrem, 1820								
20.	<i>Indotyphlops braminus</i> (Daudin, 1803)			+				+	

	X. Colubridae Oppel, 1811								
21.	<i>Ahaetulla prasina</i> (Boie, 1827)				+				+
22.	<i>Coelognathus radiatus</i> (Boie, 1827)			+			+		
23.	<i>Lycodon futsingensis</i> (Pope, 1928)				+				+
	XI. Homalopsidae Günther, 1864								
24.	<i>Myrrophis chinensis</i> (Gray, 1842)			+			+		
	TESTUDINES Batsch, 1788								
	XII. Emydidae Rafinesque, 1815								
25.	<i>Trachemys scripta</i> (Thunberg in Schoepff, 1792)			+			+		

The species *Trachemys scripta* was classified as invasive alien species from this area (after the Ministry of Natural Resources and Environment, 2018 [17], Anomynous, 2001 [18]).

The species *Tropidophorus sinicus* was only recorded from Northwestern Vietnam and Guangxi, Guangdong, and Hong Kong in southern China (see Nguyen *et al.* 2010 [19]). In this study, we confirm the distribution of the species *T. sinicus* from Chi Linh Special-Use forest.

In terms of conservation concern, 2 species are listed in the IUCN Red List (2020) as Vulnerable (*Physignathus cocincinus* and *Goniurosaurus lichtenfelderi*) and 1 species is listed in the Vietnam Red Data Book (2007) as Vulnerable (*Physignathus cocincinus*).



Figure 2. a. *Megophrys microstoma*; b. *Kaloula pulchra*; c. *Microhyla heymonsi*; d. *M. butleri*; e. *Fejervarya limnocharis*; f. *Limnonectes bannaensis*



Figure 3. a. *Occidozyga martensii*; b. *Rana johnsi*; c. *Sylvirana guentheri*; d. *S. maasonensis*; e. *Kurixalus bisacculus*; f. *Polypedates megacephalus*

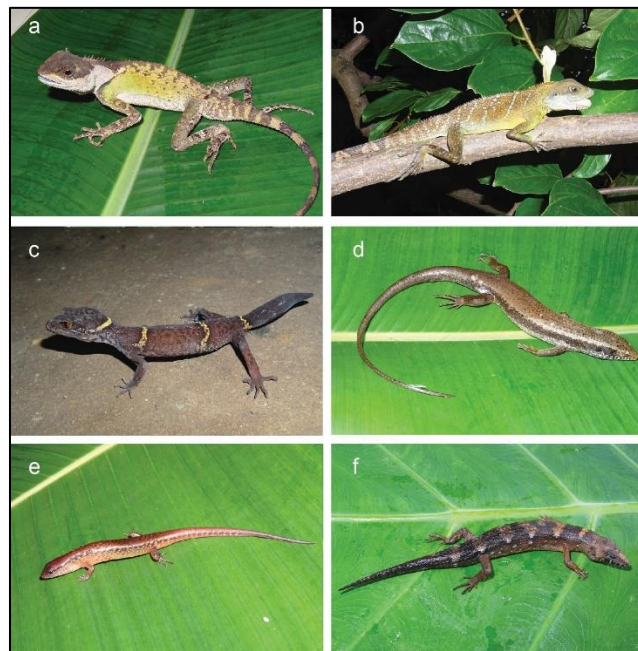


Figure 4. a. *Acanthosaura lepidogaster*; b. *Physignathus cocincinus*; c. *Goniurosaurus lichtenfelderi*; d. *Eutropis longicaudata*; e. *Sphenomorphus indicus*; f. *Tropidophorus sinicus*



Figure 5. *a. Indotyphlops braminus; b. Ahaetulla prasina; c. Coelognathus radiatus; d. Lycodon futsingensis; e. Myrrophis chinensis; f. Trachemys scripta*



Figure 6. *Habitat types of Chi Linh Special-Use forest: a. Around residential areas; b. Secondary forest; c. Evergreen forest*

*** Distribution of amphibians and reptiles from Chi Linh Special-Use forest**

Habitat distribution: 5 species were recorded in the around residential areas (accounting for 20%); there are 9 species were recorded in the secondary forest habitat (accounting for 36%); there are 13 species were recorded in the evergreen forest (accounting for 52%) in addition to the presence of an exotic species, *Trachemys scripta elegans* (see Figure 7).

A number of species according to the field surveys: The largest number of species recorded in March 2019 (16 species, accounting for 64%), followed by June 2019 with 11 species (accounting for 44%); the smallest number of species was recorded in May 2020 with 3 species (accounting for 12%) (see Fig. 8).

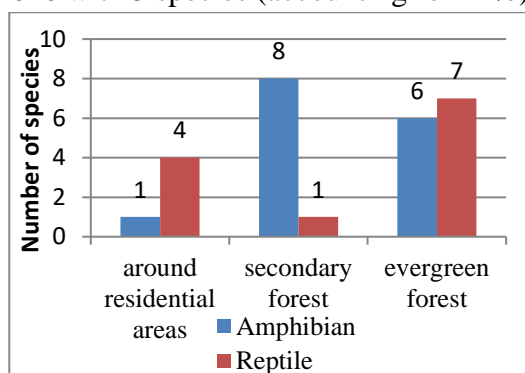


Figure 7. Diagram of distribution of amphibians and reptiles in Chi Linh Special-Use forest

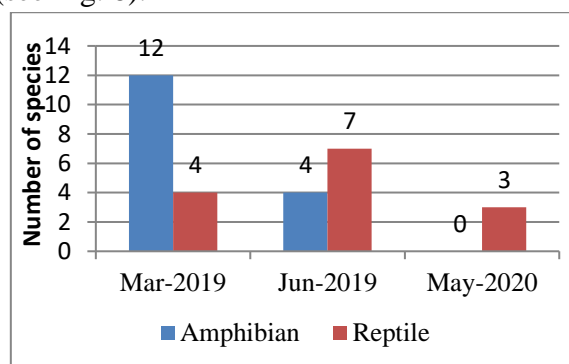


Figure 8. The number of amphibians and reptilian species in the field surveys in Chi Linh Special-Use forest

3. Conclusions

Based on our fieldwork in 2019, 2020, and the previous papers, a total of 25 species were recorded from the Chi Linh Special-Use forest, comprising 13 species of amphibians and 12 species of reptiles. *Trachemys scripta* is recorded as invasive alien species from the area. The families with the highest number of species were Colubridae and Scincidae. In terms of conservation concern, 2 species are listed in the IUCN Red List (2020) as Vulnerable (*Physignathus cocincinus* and *Goniurosaurus lichtenfelderi*) and 1 species is listed in the Vietnam Red Data Book (2007) as Vulnerable (*Physignathus cocincinus*).

Evergreen forest habitat was recorded with the largest number of species (13 species). The habitat around the residential area was recorded with the smallest number of species with 5 recorded species. The largest number of species was recorded in March 2019 (16 species). In May 2020, there was the smallest number of species recorded with 3 species.

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REFERENCES

- [1] Frost D.R., 2020. *Amphibian species of the World*: an online reference, Version 6.0, Electronic Database accessible at <http://research.amnh.org/herpetology/amphibia/index.html>. American Museum of Natural History, New York, USA. Last accessed in June 2020.
- [2] Köhler J., Vieites D.R., Bonett R.M., García F.H., Glaw F., Steinke D. & Vences M., 2005. New amphibians and global conservation: a boost in species discoveries in a highly endangered vertebrate group. *Bio. Science*, Vol. 55, No. 8, pp. 693-696.
- [3] Tapley B., Michaels C.J., Gumbs R., Böhm M., Luedtke J., Pearce-Kelly P. & Rowley, J.J.L., 2018. The disparity between species description and conservation assessment: a case study in taxa with high rates of species discovery. *Biological Conservation*, Vol. 220, pp. 209-214.
- [4] Hai Duong Department of Natural Resource and Environment, 2013. Project Report: “Investigating and evaluating the current state of biodiversity”; building a biodiversity action plan for Hai Duong province by 2020 and orientation to 2030, Hai Duong.
- [5] Ho C.T., Lathrop A. & Le N.N., 2001. Species composition of reptile and amphibian from Chi Linh area, Hai Duong province. *J. Biol., Hanoi*, Vol. 23, No. 3B, pp. 137-145 (in Vietnamese).
- [6] Nguyen S.V., Ho C.T., Nguyen T.Q., 2009. *Herpetofauna of Vietnam*. Edition Chimaira, Frankfurt am Main.
- [7] Simmons J.E., 2002. Herpetological collecting and collections management. Revised edition. Society for the Study of Amphibians and Reptiles. *Herpetological Circular*, Vol. 31, pp. 1-153.
- [8] Smith M.A., 1935. *The fauna of British India including Ceylon and Burma. Reptilia and Amphibia*. Vol. II. Sauria, Taylor and Francis, London.
- [9] Taylor E.H., 1962. The amphibian fauna of Thailand. *University of Kansas Science Bulletin*, Vol. 43, pp. 265-599.
- [10] Matsui M., Seto T. & Utsunomiya T., 1986. Acoustic and karyotypic evidence for specific separation of Polypedates megacephalus from P. leucomystax. *Journal of Herpetology*, Vol. 20, No. 4, pp. 483-489.
- [11] Inger R.F., Orlov N.L. & Darevsky I.S., 1999. Frogs of Vietnam: A report on new collections. *Fieldiana Zoology New Series*, Vol. 92, pp. 1-46.
- [12] Ziegler T., 2002. Die Amphibien und Reptilien eines Tieflandfeuchtwald-Schutzgebiets in Vietnam. *Natur. & Tier Verlag*, Münster, pp 342.
- [13] Scalera R., 2006. *Trachemys scripta*. DAISIE (Delivering Alien Invasive Species Inventories for Europe), <http://www.europe-aliens.org> [accessed on 14.7. 2014].
- [14] Goodall D. & Faithfull S., 2010. *U Minh Thuong National Park - Kien Giang Province, Vietnam Amphibian and Reptile Survey 7-21 September 2009*. Wildlife At Risk, Vietnam.

- [15] Nguyen T.Q., Schmitz A., Nguyen T.T., Orlov N.L., Bohme W. & Ziegler T., 2011. Review of the genus *Sphenomorphus* Fitzinger, 1843 (Squamata: Sauria: Scincidae) in Vietnam, with description of a new species from Northern Vietnam and Southern China and the first record of *Sphenomorphus mimicus* Taylor, 1962 from Vietnam. *Journal of Herpetology*, Vol. 45, No. 2, pp. 145-154.
- [16] Hecht V.L., Pham C.T., Nguyen T.T., Nguyen T.Q., Bonkowski M. & Ziegler T., 2013. The first report on the herpetofauna of Tay Yen Tu Nature Reserve, northeastern Vietnam. *Biodiversity Journal*, Vol. 4, No. 4, pp. 507-552.
- [17] Ministry of Natural Resources and Environment, 2018. *Circular No.35/2018/TT-BTNMT: Stipulating criteria for identifying and promulgating the List of invasive alien species*.
- [18] Anonymous, 2001. *The 100 of the World worst invasive alien species*, IUCN Document.
- [19] Nguyen T.Q., Nguyen S.V., Orlov N., Hoang T.Q., Böhme W. & Ziegler T., 2010. A review of the genus *Tropidophorus* (Squamata, Scincidae) from Vietnam with new species records and additional data on natural history. *Zoosyst. Evol.*, Vol. 86, No. 1, pp. 5-19