

# The herpetofauna of Copia Nature Reserve, Vietnam

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**Abstract.**—We report the results of a herpetofauna inventory of Copia Nature Reserve, Vietnam conducted between November 2012 and June 2020, comprising 48 species of amphibians and 67 species of reptiles, with 105 of the species recorded directly in this study. Four species, *Gracixalus jinxiuensis*, *Dopasia ludovici*, *Hebius boulengeri*, and *Ovophis makazayazaya*, represent new records for Son La Province, and 25 species are recorded for the first time from the Copia Nature Reserve, comprising 11 species of frogs (*Xenophrys maosonensis*, *Microhyla mukhlesuri*, *Limnonectes bannaensis*, *Odorrana chapaensis*, *O. chloronota*, *O. jindongensis*, *O. graminea*, *O. nasica*, *Kurixalus bisacculus*, *Raorchestes parvulus*, and *Rhacophorus kio*), two species of lizards (*Calotes emma* and *Eutropis multifasciatus*), and 12 species of snakes (*Calamaria pavimentata*, *Dendrelaphis ngansonensis*, *Elaphe moellendorffi*, *E. taeniura*, *Euprepiophis mandarinus*, *Lycodon fasciatus*, *L. futsingensis*, *Oligodon fasciolatus*, *Sibynophis collaris*, *Psammodynastes pulverulentus*, *Trimerodytes percarinatus*, and *Pareas carinatus*). The herpetofauna of Copia Nature Reserve has a high level of conservation concern, including eight species listed in the Governmental Decree No. 84/2021/ND-CP, 17 species listed in the Vietnam Red Data Book (2007), 13 species listed in the IUCN Red List (2023), and eight species listed in the CITES Appendices (2023). In addition, we provide data on distribution, natural history, and figures for all the amphibian and reptile species in Copia Nature Reserve, Vietnam.

**Keywords.** Amphibians, biodiversity, distribution, natural history, new records, reptiles

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## Introduction

The Copia Nature Reserve was established in November 2002 by the the People’s Committee of Son La Province with an area of 11,996 ha. The nature reserve is situated in Thuan Chau District and is one of the five protected areas in Son La Province, northern Vietnam (The People’s Committee of Son La Province 2019). The topography of the nature reserve is characterized by steep and mountainous terrain with elevations from 500 to 1,800 m asl. In terms of the herpetofaunal diversity, Le et al. (2009) provided the first list of 12 amphibian and 35 reptile species from

Copia Nature Reserve (NR). Further new records of reptiles and amphibians from this nature reserve were documented by Pham et al. (2012, 2013, 2014b,c, 2015, 2017, 2018, 2019, 2020, 2022), and by Pham and Nguyen (2018). Most recently, two new species of amphibians and a new snake were described from Copia NR, namely *Tylototriton anguliceps* Le, Nguyen, Nishikawa, Nguyen, Pham, Matsui, Bernardes, and Nguyen, 2015 (Le et al., 2015a), *Gracixalus truongi* Tran, Pham, Le, Nguyen, Ziegler, and Pham, 2023 (Tran et al. 2023), and *Achalinus timi* Ziegler, Nguyen, Pham, Nguyen, Pham, Van Schingen, Nguyen, and Le, 2019 (Ziegler et al. 2019). In addition, six new country

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records of amphibians and reptiles have been reported from Copia NR, namely *Boulenophrys daweimontis*, *Leptobranchella eos*, *L. minima*, *Leptobranchium masatakasatoi*, *Amolops vitreus*, and *Parafimbrios lao* (Pham et al. 2014a, 2016; Le et al. 2015b; Nguyen et al. 2015). As a result of our ongoing research over the past ten years, we herein provide an updated list, with new data on the distribution and natural history of amphibians and reptiles from Copia NR.

## Materials and Methods

Sixteen field surveys were conducted at six sites in Copia NR, Son La Province, Vietnam, including a total of 95 days. Survey sites were set up in the forests near Huoi Pu and Hua Ty A villages, Chieng Bom Commune; near Nong Vai, Pha Khuong, and Co Ma villages, Co Ma Commune; and near Long He Village, Long He Commune by A.V. Pham, T.Q. Nguyen, T.T. Nguyen, N.B. Sung, H.V. Tu, T.V. Nguyen (Fig. 1 and Table 1).

The typical habitats at the study sites were undisturbed evergreen forest, secondary forest, and agricultural areas (Fig. 2). The geographical coordinates (WGS84) of all observations were recorded using a Garmin GPSMAP 62s. Specimens were collected by hand between 0800–2300 h. After they were photographed in life, specimens were identified to the species level, measured, sexed, and released at the collection site. For voucher specimens, a few individuals were anesthetized and euthanized in a closed vessel with a piece of cotton wool containing ethyl acetate (Simmon 2002), fixed in 80% ethanol, and then transferred to 70% ethanol for permanent storage.

Some road-killed specimens were also collected for morphological examination. These specimens were subsequently deposited in the collection of the University of Science, Vietnam National University (VNU), Hanoi, Vietnam.

For taxonomic identification, we referred to the descriptions in Bain et al. (2003), Boulenger (1893), Bourret (1942), Inger et al. (1999), Fei et al. (2012), Hecht et al. (2013), Smith (1935, 1943), and Taylor (1962). For species names, we followed Frost (2023) for amphibians and Uetz et al. (2023) for reptiles.

Conservation status of amphibian and reptile species followed the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2023), the Red List of the International Union for Conservation of Nature (IUCN 2023), the Vietnam Red Data Book (Dang et al. 2007), and the Governmental Decree No 84/2021/ND-CP, issued on 22 September 2021 by the Government of Vietnam, on the management of endangered species of wild flora and fauna.

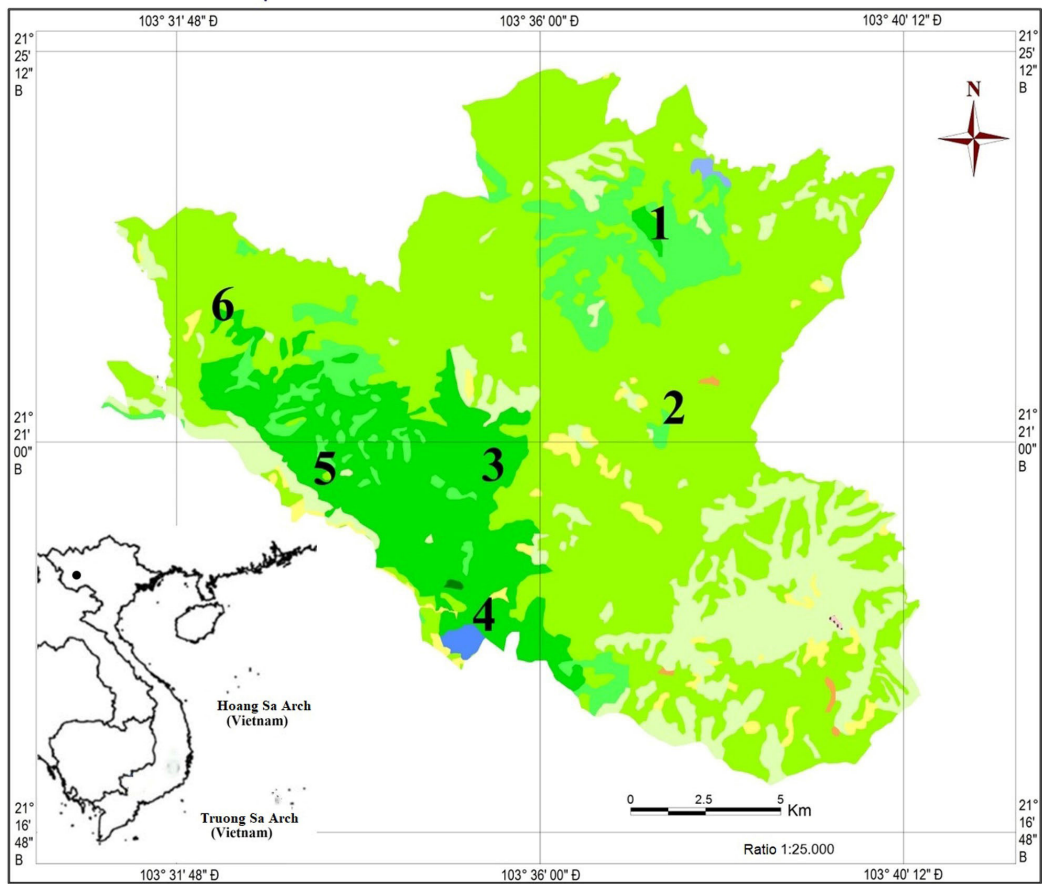
## Results

A total of 115 species belonging to 78 genera and 27 families were recorded from Copia NR, comprising 48 species of amphibians (28 genera, seven families) and 67 species of reptiles (50 genera, 20 families) (Table 2). Remarkably, one species of frog, one species of lizard and two species of snakes are reported for the first time from Son La Province; and 25 additional species are documented for the first time from Copia NR, comprising 11 species of anurans, two species of lizards, and 12 species of snakes.

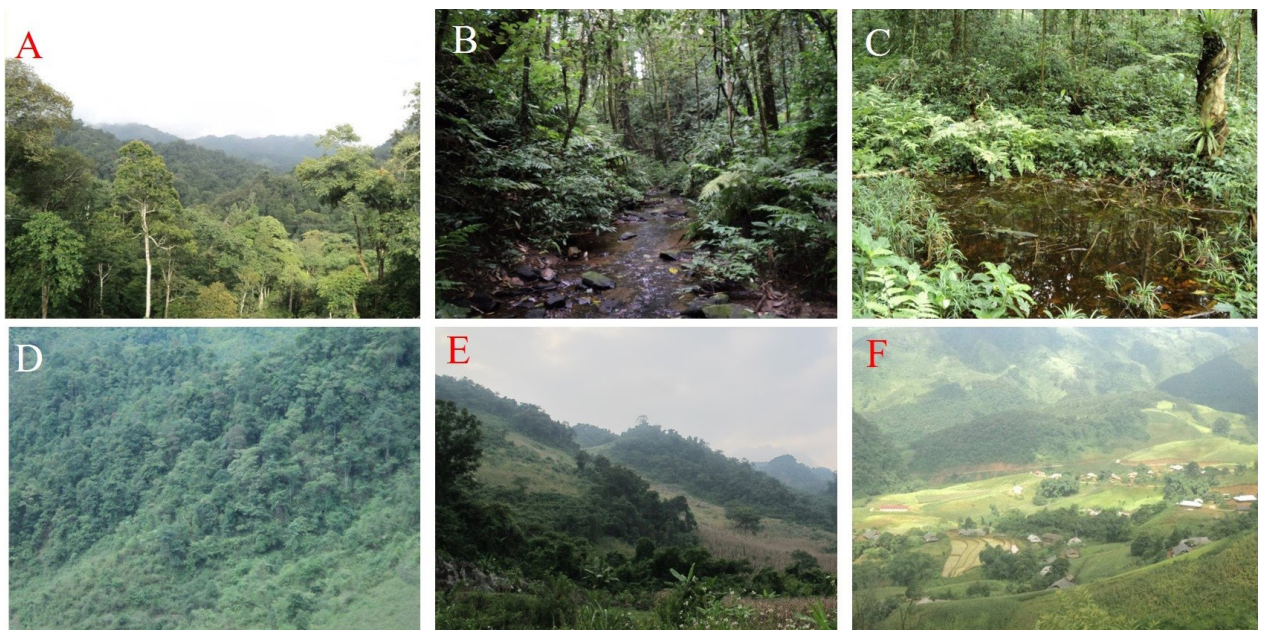
**Table 1.** Information on the survey sites in Copia Nature Reserve, Vietnam.

No	Site	Survey dates	Latitude	Longitude	Elevation (m)
1	Forest near Huoi Pu Village, Chieng Bom Commune, Thuan Chau District	24 to 30 April 2013; 17 to 24 June 2016	21°23.110'N	103°38'522"E	860
2	Forest near Hua Ty A Village, Chieng Bom Commune, Thuan Chau District	20 to 25 November 2012; 20 to 25 March 2013; 2 to 13 September 2016	21°21.210'N	103°35.566"E	960
3	Forest near Nong Vai Village, Co Ma Commune, Thuan Chau District	11 to 19 June 2013; 16 to 22 October 2016	21°18.589'N	103°33.250"E	1,450
4	Forest near Pha Khuong Village, Co Ma Commune, Thuan Chau District	4 to 15 July 2013	21°21.426'N	103°31.230"E	1,260
5	Forest near Co Ma Village, Co Ma Commune, Thuan Chau District	19 to 24 May 2015	21°21.469'N	103°30.380"E	1,090
6	Forest near Long He Village, Long He Commune, Thuan Chau District	22 to 31 August 2014; 18 to 29 April 2020	21°24.130'N	103°29.238"E	1,010

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**Fig. 1.** Survey sites in Copia Nature Reserve, Son La Province, Vietnam. 1. Huoi Pu Village, Chieng Bom Commune; 2. Hua Ty A Village, Chieng Bom Commune; 3. Nong Vai Village, Co Ma Commune; 4. Pha Khuong Village, Co Ma Commune; 5. Co Ma Village, Co Ma Commune; and 6. Long He Village, Long He Commune.



**Fig. 2.** Habitat types in Copia Nature Reserve, Vietnam. (A, B, C) Evergreen forest, (D) Disturbed secondary forest, and (E, F) Agricultural areas.

**Table 2.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2013), 3 = Pham et al. (2014a), 4 = Pham et al. (2014b); 5 = Pham et al. (2014c); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2022).

No	Name		Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
	<b>ANURA</b>									
	<b>Bufo</b>									
1	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)		1–6	2, 3					Photos	1
	<b>Megophryidae Bonaparte, 1850</b>									
2	<i>Boulenophrys dawsoni</i> (Rao and Yang, 1997)		3	1					Specimens (1)	9
3	<i>Boulenophrys palpebralespinosa</i> (Bouret, 1937)		1, 2	1	CR				Specimens (3) Photos	6
4	<i>Boulenophrys cf. parva</i> (Boulenger, 1893)		1	1					Specimens (2)	15
5	<i>Leptobrachella eos</i> (Ohler, Wollenberg, Grosjean, Hendrix, Vences, Ziegler, and Dubois, 2011)		3, 5	1					Specimens (2) Photos	4
6	<i>Leptobrachella minima</i> (Taylor, 1962)		3	1					Specimens (2)	11
7	<i>Leptobrachella ventripunctata</i> (Fei, Ye, and Li, 1990)		1–5	1					Specimens (2) Photos	6
8	<i>Leptobrachium masatakasatoi</i> Matsui, 2013		3, 4	1					Specimens (3)	11
9	<i>Ophryophryne pachyproctus</i> Kou, 1985		1, 3	1					Specimens (2) Photos	6
10	<i>Xenophrys maosonensis</i> (Bouret, 1937)*		1–6	1					Specimens (2) Photos	
	<b>Microhylidae Günther, 1858 (1843)</b>									

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
11	<i>Kaloula pulchra</i> Gray, 1831	1	3					Photos	1
12	<i>Microhyla butleri</i> Boulenger, 1900	1, 2, 4, 6	3					Specimens (2) Photos	1
13	<i>Microhyla heymonsi</i> Vogt, 1911	1-6	2, 3					Specimens (2) Photos	1
14	<i>Microhyla mukhtesuri</i> Hasan, Islam, Kuramoto, Kurabayashi, and Sumida, 2014*	1-6	3					Specimens (2) Photos	
15	<i>Microhyla pulchra</i> (Hallowell, 1861)	1, 2, 4, 5, 6	3					Specimens (3) Photos	1
16	<i>Micrylletta mengtienica</i> (Yang and Su, 1980)	3	2					Specimens (2)	
17	<b>Dicroglossidae Anderson, 1871</b>								
17	<i>Fejervarya limnocharis</i> (Gravenhorst, 1829)	1-6	2, 3					Photos	1
18	<i>Hoplobatrachus chinensis</i> (Osbeck, 1765)	1, 2, 6	3					Photos	1
19	<i>Limnonectes bannaensis</i> Ye, Fei, Xie, and Jiang, 2007*	1-5	1, 2					Specimens (2) Photos	
20	<i>Nanorana aenea</i> (Smith, 1922)	1, 3, 5	1					Specimens (2) Photos	2
21	<i>Quasipaa verrucospinosa</i> (Bourret, 1937)	1-5	1					Photos	1
	<b>Ranidae Batsch, 1796</b>								
22	<i>Amolops cf. compatrix</i> (Bain, Stuart, and Orlov, 2006)	3	1					Specimens (2)	

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
23	<i>Amolops vitreus</i> (Bain, Stuart, and Orlov, 2006)	3	1		VU			Specimens (2) Photos	9
24	<i>Hylarana macrodactyla</i> Gunther, 1858								1
25	<i>Hylarana taipehensis</i> (Van Denburgh, 1909)								1
26	<i>Odorrana chapaensis</i> (Bourret, 1937)*	5	1					Specimens (2)	
27	<i>Odorrana chloronota</i> (Günther, 1876)*	3, 5	1, 2					Specimens (2) Photos	
28	<i>Odorrana graminea</i> Boulenger, 1900*	3	1		VU			Specimen (1) Photos	
29	<i>Odorrana jingdongensis</i> Fei, Ye, and Li, 2001*	1, 3, 5	1		VU			Specimens (2) Photos	
30	<i>Odorrana nasica</i> (Boulenger, 1903)*	1, 2, 3, 5	1					Specimens (2) Photos	
31	<i>Rana johnsi</i> Smith, 1921								1
32	<i>Sylvirana guentheri</i> (Boulenger, 1882)	1, 2, 4, 5, 6	3					Photos	1
33	<i>Sylvirana nigrovittata</i> (Blyth, 1856)	1-6	1, 2					Specimens (2) Photos	1
	<b>Rhacophoridae Hoffman, 1932 (1858)</b>								
34	<i>Chirixalus doriae</i> Boulenger, 1893	2	2					Specimen (1) Photos	17

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
35	<i>Gracixalus jinxiuensis</i> (Hu, 1978)**	3	1					Specimens (2)	
36	<i>Gracixalus quang</i> Rowley, Dau, Nguyen, Cao, and Nguyen, 2011	3–5	1					Specimens (3)	2
37	<i>Gracixalus truongi</i> Tran, Pham, Le, Nguyen, Ziegler, and Pham, 2023	6	1					Specimens (2)	18
38	<i>Kurixalus bisacculus</i> (Taylor, 1962)*	1–6	1, 2					Specimens (2) Photos	
39	<i>Polypedates megacephalus</i> Hallowell, 1861*	1–6	1–3					Specimens (2) Photos	
40	<i>Raorchestes parvulus</i> (Boulenger, 1893)*	1, 3, 4, 5	1					Specimens (2) Photos	
41	<i>Rhacophorus kio</i> Ohler, and Delorme, 2006*	1–6	1	EN				Photos	
42	<i>Rhacophorus rhodopus</i> Liu and Hu, 1960	3, 4	1					Specimen (1) Photos	12
43	<i>Theلودerma albopunctatum</i> (Liu and Hu, 1962)	1, 3, 5, 6	1					Specimen (1) Photos	13
44	<i>Theلودerma bicolor</i> (Bourret, 1937)	3	1					Specimen (1)	13
45	<i>Theلودerma corticale</i> (Boulenger, 1903)	3	1	EN				Specimen (1)	13
46	<i>Theلودerma gordonii</i> Taylor, 1962	4, 6	1					Specimens (2)	13
47	<i>Zhangixalus dorsovirens</i> (Bourret, 1937)	3	1		VU			Specimens (2)	12
48	<i>Zhangixalus feae</i> (Boulenger, 1893)	3–5	1	EN				Photos	12

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
	<b>CAUDATA</b>								
	<b>Salamandridae Goldfuss, 1820</b>								
49	<i>Tylotriton anguliceps</i> Le, Nguyen, Nishikawa, Nguyen, Pham, Matsui, Bernardes, and Nguyen, 2015	3	1			II	IIB	Photos	8
	<b>SQUAMATA</b>								
	<b>Agamidae</b>								
50	<i>Acanthosaura leptogaster</i> (Cuvier, 1829)	1–6	1, 2					Photos	1
51	<i>Calotes emma</i> Gray, 1845*	1, 2	2, 3					Specimen (1)	
52	<i>Calotes versicolor</i> (Daudin, 1802)	1–6	3					Photos	1
53	<i>Draco maculatus</i> (Gray, 1845)	1, 3, 5	1, 2					Specimen (1)	1
54	<i>Pseudocalotes brevipes</i> (Werner, 1904)	1, 3	1, 2					Specimen (1) Photos	14
	<b>Gekkonidae</b>								
55	<i>Gekko reevesii</i> (Gray, 1831)	1, 3, 5, 6	2					Photos	1
56	<i>Hemidactylus frenatus</i> Duméril and Bibron, 1836	1–6	3					Photos	1
57	<i>Hemidactylus garnotii</i> Duméril and Bibron, 1836	1	2					Specimens (2) Photos	14
	<b>Scincidae</b>								
58	<i>Entropis longicaudatus</i> (Hallowell, 1857)	1, 2, 3, 6	3					Photos	1



**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, NT = Vulnerable, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023): I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
59	<i>Eutropis multifasciatus</i> (Kuhl, 1820)*	4, 5	3					Photos	
60	<i>Plestiodon</i> cf. <i>tamdaoensis</i> (Bouret, 1937)	1	2					Specimen (1)	
61	<i>Scincella devorator</i> Darevsky, Orlov, and Ho, 2004	3	1					Specimen (1)	7
62	<i>Sphenomorphus indicus</i> (Gray, 1853)	1, 3, 4, 6	1, 2					Specimen (1) Photos	1
63	<i>Tropidophorus baviensis</i> Bouret, 1939	4, 6	2					Specimens (2)	1
	<b>Anguidae</b>								
64	<i>Dopasia harti</i> (Boulenger, 1899)	3	1					Specimen (1)	1
65	<i>Dopasia ludovici</i> (Mocquard, 1905)**	1	1					Specimens (2)	
	<b>Varanidae</b>								
66	<i>Varanus salvator</i> (Laurenti, 1768)			EN		II	IIB		1
	<b>Typhlopidae</b>								
67	<i>Indotyphlops braminus</i> (Daudin, 1803)	3	2					Specimens (2)	1
	<b>Pythonidae</b>								
68	<i>Python bivittatus</i> Kuhl, 1820			CR	NT	II	IIB		1
	<b>Xenopeltidae</b>								
69	<i>Xenopeltis unicolor</i> Reinwardt, 1827	1, 6	3					Specimens (2)	1
	<b>Colubridae</b>								

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
70	<i>Ahaetulla prasina</i> (Boie, 1827)	1, 3, 5	2					Photos	1
71	<i>Boiga multomaculata</i> (Boie, 1827)	4	2					Photos	1
72	<i>Calamaria pavimentata</i> Duméril, Bibron, and Duméril, 1854*	5	2					Specimen (1)	
73	<i>Coelognathus radiatus</i> (Boie, 1827)	1, 6	3	EN				Photos	1
74	<i>Dendrelaphis ngansonensis</i> (Bourret, 1935)*	3	2					Specimen (1)	
75	<i>Dendrelaphis pictus</i> (Gmelin, 1789)	1, 3	2					Specimens (2)	3
76	<i>Elaphe moellendorffi</i> (Boettger, 1886)*	5	2	VU	VU			Photo	
77	<i>Elaphe taeniura</i> (Cope, 1861)*	5	2		VU			Photos	
78	<i>Euprepiophis mandarinus</i> (Cantor, 1842)*	1	1	VU				Photos	1
79	<i>Gonyosoma coeruleum</i> Liu, Hou, Lwin, Wang, and Rao, 2021	3	1					Specimen (1)	
80	<i>Gonyosoma frenatum</i> (Gray, 1853)	3	1					Specimen (1)	5
81	<i>Liopeltis frenata</i> (Günther, 1858)	3	1					Specimens (2)	5
82	<i>Lycodon fusingensis</i> (Pope, 1928)*	3	1					Specimen (1)	
83	<i>Oligodon catenatus</i> (Blyth, 1854)	3	1					Specimens (2)	5
84	<i>Oligodon fasciolatus</i> (Günther, 1864)*	1	3					Specimen (1)	
85	<i>Oreocryptophis porphyraceus</i> (Cantor, 1839)	3	1	VU				Photos	1
86	<i>Ptyas korros</i> (Schlegel, 1837)	1, 4, 6	2, 3	EN	NT			Photos	1

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2013), 3 = Pham et al. (2014a), 4 = Pham et al. (2014b); 5 = Pham et al. (2014c); 6 = Pham et al. (2014d), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
87	<i>Ptyas mucosa</i> (Linnaeus, 1758)			EN		II	IIB		1
88	<i>Ptyas multicincta</i> (Roux, 1907)	1	1					Photo	5
89	<i>Sibynophis collaris</i> (Gray, 1853)*	3	1					Specimen (1)	
	<b>Elapidae</b>								
90	<i>Bungarus fasciatus</i> (Schneider, 1801)	5	2	EN				Photo	1
91	<i>Bungarus wanghaotingi</i> Pope, 1928	1, 3, 5, 6	2					Photos	1
92	<i>Naja atra</i> Cantor, 1842	4, 6	2	EN	VU	II	IIB	Photos	1
93	<i>Ophiophagus hannah</i> (Cantor, 1836)			CR	VU	II	IB		1
94	<i>Sinomicrurus maclellandi</i> (Reinhardt, 1844)	3	1					Photo	1
	<b>Homalopsidae</b>								
95	<i>Hypsiscopus plumbea</i> (Boie, 1827)	6	3						1
	<b>Pseudaspidae</b>								
96	<i>Psammodynastes pulverulentus</i> (Boie, 1827)*	5	2					Photos	
	<b>Natricidae</b>								
97	<i>Amphiesma stolatum</i> (Linnaeus, 1758)								1
98	<i>Fowlea flavipunctatus</i> (Hallwells, 1861)	1, 6	3					Photos	1
99	<i>Hebius boulengeri</i> (Gressitt, 1937)**	3	1					Specimens (2)	

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
100	<i>Hebius chapaensis</i> (Bouret, 1934)	3	1					Specimen (1)	3
101	<i>Rhabdophis chrysargos</i> (Schlegel, 1837)								1
102	<i>Rhabdophis subminiatus</i> (Schlegel, 1837)	2, 6	2, 3					Photos	1
103	<i>Trimerodytes percarinatus</i> (Boulenger, 1899)*	1–3	1					Photos	
	<b>Pareidae</b>								
104	<i>Pareas carinatus</i> (Boie, 1828)*	6	3					Specimen (1)	
105	<i>Pareas hamptoni</i> (Boulenger, 1905)	1–5	1					Specimen (1) Photos	3
106	<i>Pareas margaritophorus</i> (Jan, 1866)	3	1					Specimens (2)	1
	<b>Pseudoxenodontidae</b>								
107	<i>Pseudoxenodon macrops</i> (Blyth, 1854)	3	1					Specimens (2)	
	<b>Viperidae</b>								
108	<i>Ovophis makazayazaya</i> (Takahashi, 1922)**	3	1					Specimens (2)	
109	<i>Ovophis monticola</i> (Günther, 1864)	4	1					Specimens (2)	3
110	<i>Trimeresurus albolabris</i> Gray, 1842	1–6	2, 3					Specimen (1) Photos	1
	<b>Xenodermatidae</b>								

**Table 2 Continued.** List of amphibian and reptile species recorded from Copia NR, Vietnam: \*\* = new record for Son La Province; \* = new record for Copia NR; Site: Numbering sites from 1 to 6 as shown in Table 1; Habitat: 1 = Evergreen forest, 2 = Disturbed secondary forest, and 3 = Agricultural areas; Red Data Book of Vietnam (Dang et al. 2007); IUCN = The IUCN Red List of Threatened Species (IUCN 2023); CR = Critically Endangered, EN = Endangered, NT = Vulnerable, VU = Vulnerable, NT = Lower Risk/Near Threatened; CITES = CITES appendices (CITES 2023); I, II = Appendix I and II; Decree No. 84 = The Governmental Decree No. 84/2021/ND-CP, dated on 22 September 2021, by the Government of Vietnam: IIB = Group IIB (limited exploitation and use for commercial purpose); Citations in the Previous record column: 1 = Le et al. (2009), 2 = Pham et al. (2012), 3 = Pham et al. (2013), 4 = Pham et al. (2014a); 5 = Pham et al. (2014b); 6 = Pham et al. (2014c), 7 = Pham et al. (2015), 8 = Le et al. (2015a), 9 = Le et al. (2015b), 10 = Nguyen et al. (2015), 11 = Pham et al. (2016), 12 = Pham et al. (2017), 13 = Pham and Nguyen (2018), 14 = Pham et al. (2018), 15 = Pham et al. (2019), 16 = Ziegler et al. (2019), 17 = Pham et al. (2022), 18 = Nguyen et al. (2023).

No	Name	Sites	Habitats	Vietnam Red Data Book	IUCN	CITES	Decree No. 84	Record evidence (this study)	Previous record
111	<i>Achalinus timi</i> Ziegler, Nguyen, Pham, Nguyen, Pham, Van Schingen, Nguyen, and Le, 2019	3	1						16
112	<i>Parafimbrios lao</i> Teynié, David, Lottier, Le, Vidal, and Nguyen, 2015	3	1						10
	<b>TESTUDINES</b>								
	<b>Platysermidae</b>								
113	<i>Platysternon megacephalum</i> Gray, 1831	1, 6	1	EN	CR	I	IB	Photos	I
	<b>Geoemydidae</b>								
114	<i>Mauremys sinensis</i> (Gray, 1834)				CR				I
	<b>Testudinidae</b>								
115	<i>Manouria impressa</i> (Guenther, 1882)	4, 6	1	VU	EN	II	IIB	Photos	I

**Amphibia****Anura****Bufonidae**

*Duttaphrynus melanostictus* (Schneider, 1799) (Fig. 3A): Individuals were observed at night on the ground in croplands, gardens, and road edges near residential areas and disturbed secondary forest.

**Megophryidae**

*Boulenophrys daweimontis* (Rao and Yang, 1997) (Fig. 3B): One specimen was found at night on the ground, near a stream in evergreen forest.

*Boulenophrys palpebralespinosa* (Bourret, 1937) (Fig. 3C): Two specimens were found at night on leaves, at ca. 30–90 cm above the ground near a stream, and many other individuals were observed along streams at night in evergreen forest.

*Boulenophrys cf. parva* (Boulenger, 1893) (Fig. 3D): Two specimens were found at night on the ground, near a stream in evergreen forest. *Boulenophrys parva* seems to be restricted in Myanmar and records of this species in northern Vietnam should be assigned to other named and unnamed species (Manhony et al. 2020).

*Leptobrachella eos* (Ohler, Wollenberg, Grosjean, Hendrix, Vences, Ziegler, and Dubois, 2011) (Fig. 3E): Two specimens were found at night on the ground near streams and many other individuals were observed at night on the ground along streams in evergreen forest.

*Leptobrachella minima* (Taylor, 1962) (Fig. 3F): Two specimens were found at night on the ground near a stream in evergreen forest.

*Leptobrachella ventripunctata* (Fei, Ye, and Li, 1990) (Fig. 3G): Two specimens were found on the ground near streams and many other individuals were observed along streams at night in evergreen forest.

*Leptobrachium masatakasatoi* Matsui, 2013 (Fig. 3H): Three specimens were found at night on the ground near a stream in evergreen forest.

*Ophryophryne pachyproctus* Kou, 1985 (Fig. 3I): Two specimens and many others were found at night on leaves, at ca. 50–120 cm above the ground near streams, and many other individuals were observed on leaves along streams at night in evergreen forest.

*Xenophrys maosonensis* (Bourret, 1937) (Fig. 3J): Two specimens were found at night on the ground near a stream, and many other individuals were observed along streams at night in evergreen forest. This is a new record for Copia NR.

**Microhylidae**

*Kaloula pulchra* Gray, 1831 (Fig. 3K): Two individuals were observed at night on the ground in a garden near a pond.

*Microhyla butleri* Boulenger, 1900 (Fig. 3L): Two specimens were found at night on the ground in meadowlands, and other individuals were observed at night in croplands and small puddle edges near the rice fields and forest edges.

*Microhyla heymonsi* Vogt, 1911 (Fig. 3M): Two specimens were found at night on the ground in croplands, and other individuals were observed at night on the ground in croplands in meadowlands, and along forest trails near forest edges and inside the forest.

*Microhyla mukhlesuri* Hasan, Islam, Kuramoto, Kurabayashi, and Sumida, 2014 (Fig. 3N): Two specimens were found at night on the ground near small puddle edges near a road, and other individuals were observed at night on the ground near small puddle edges in rice fields, meadowlands, and croplands. This is a new record for Copia NR.

*Microhyla pulchra* (Hallowell, 1861) (Fig. 3O): Three specimens were found at night on the ground in meadowlands near rice fields, and other individuals were observed at night on the ground around small puddle edges and in meadowlands near rice fields.

*Micryletta menglienica* (Yang and Su, 1980) (Fig. 3P): Two specimens were found at night on the ground in meadowlands near limestone mountains. This is a new record for Copia NR.

**Dicroglossidae**

*Fejervarya limnocharis* (Gravenhorst, 1829) (Fig. 3Q): Many individuals were observed at night on the ground, as well as in meadowlands near rice fields, croplands, and small puddles at road edges.

*Hoplobatrachus chinensis* (Osbeck, 1765) (Fig. 3R): Five individuals were observed at night on the ground, and at pond edges and rice field edges.

*Limnnectes bannaensis* Ye, Fei, Xie, and Jiang, 2007 (Fig. 4A): Two specimens were found at night on the ground near a stream, and many other individuals were observed at night on the ground near streams or water edges of streams in evergreen forest. This is a new record for Copia NR.

*Nanorana aenea* (Smith, 1922) (Fig. 4B): Two specimens were found at night on the ground near a stream, and many other individuals were observed at night on the ground near streams in evergreen forest.



**Fig. 3.** Amphibian species recorded in Copia Nature Reserve, Vietnam. (A) *Duttaphrynus melanostictus*, (B) *Boulenophrys daweimontis*, (C–D) *B. Palpebralespinosa*, (E) *Leptobranchella eos*, (F) *L. minima*, (G) *L. ventripunctata*, (H) *Leptobranchium masatakasatoi*, (I) *Ophryophryne pachyproctus*, (J) *Xenophrys maosonensis*, (K) *Kaloula pulchra*, (L) *Microhyla butleri*, (M) *M. heymonsi*, (N) *M. mukhlesuri*, (O) *M. pulchra*, (P) *Micryletta menglienica*, (Q) *Fejervarya limnocharis*, and (R) *Hoplobatrachus chinensis*.



**Fig. 4.** Amphibian species recorded in Copia Nature Reserve, Vietnam. (A) *Limnonectes bannaensis*, (B) *Nanorana aenea*, (C) *Quasipaa verrucospinosa*, (D) *Amolops cf. comptrix*, (E) *A. vitreus*, (F) *Odorrana chapaensis*, (G) *O. chloronota*, (H) *O. graminea*, (I) *O. jingdongensis*, (J) *O. nasica*, (K) *Sylvirana guentheri*, (L) *S. nigrovittata*, (M) *Chirixalus doriae*, (N) *Gracixalus jinxiuensis*, (O) *G. quangii*, (P) *G. truongi*, (Q) *Kurixalus bisacculus*, and (R) *Polypedates megacephalus*.



*Quasipaa verrucospinosa* (Bourret, 1937) (Fig. 4C): Individuals were observed at night on rocks in streams or near waterfalls in evergreen forest.

### Ranidae

*Amolops* cf. *compotrix* (Bain, Stuart, and Orlov, 2006) (Fig. 4D): Two specimens were found at night on tree branches near streams. The surrounding habitat was evergreen forest, composed of small hardwoods, liane, and shrub. This is a new record for Copia NR.

*Amolops vitreus* (Bain, Stuart, and Orlov, 2006) (Fig. 4E): Two specimens were found at night on tree branches near a stream, and six other individuals were observed at night on tree branches near streams in evergreen forest.

*Odorrana chapaensis* (Bourret, 1937) (Fig. 4F): Two specimens were found at night on a rock near a waterfall in evergreen forest. This is a new record for Copia NR.

*Odorrana chloronota* (Günther, 1876) (Fig. 4G): Two specimens were found at night on a rock near a stream, and many other individuals were observed at night on tree branches or on rocks near streams in evergreen forest. This is a new record for Copia NR.

*Odorrana graminea* Boulenger, 1900 (Fig. 4H): One specimen was found at night on a rock near a waterfall in evergreen forest. This is a new record for Copia NR.

*Odorrana jingdongensis* Fei, Ye, and Li, 2001 (Fig. 4I): Two specimens were found at night on a tree branch near a stream, and many other individuals were observed at night on tree branches or on rocks at ca. 0–80 cm above the ground near streams in evergreen forest. This is a new record for Copia NR.

*Odorrana nasica* (Boulenger, 1903) (Fig. 4J): Two specimens were found at night on a tree branch near a waterfall, and many other individuals were observed at night on tree branches or on rocks at ca. 0–90 cm above the ground near waterfalls in evergreen forest. This is a new record for Copia NR.

*Sylvirana guentheri* (Boulenger, 1882) (Fig. 4K): Individuals were observed at night on the ground near pond edges and streams. The surrounding habitat was rice fields.

*Sylvirana nigrovittata* (Blyth, 1856) (Fig. 4L): Two specimens were found at night on the ground near a stream, and other individuals were observed at night on the ground, and on stones near streams or at the water edge in streams. The surrounding habitat was evergreen forest. The call concerts of this species were regularly heard in the evening.

### Rhacophoridae

*Chirixalus doriae* Boulenger, 1893 (Fig. 4M): One specimen was found at night on a tree branch near a puddle, and five individuals were observed at night while sitting on leaves near puddles at ca. 30–80 cm above the ground. The surrounding habitat was mixed evergreen forest of small hardwoods, bamboo, and shrubs.

*Gracixalus jinxiuensis* (Hu, 1978) (Fig. 4N): Two specimens were found at night while sitting on leaves near a stream at ca. 1–2 m above the ground. The surrounding habitat was mixed evergreen forest of small hardwoods, bamboo, and shrubs. This is a new record for Son La Province.

*Gracixalus quangii* Rowley, Dau, Nguyen, Cao, and Nguyen, 2011 (Fig. 4O): Two specimens were found at night on leaves near a stream, and other individuals were observed at night while sitting on leaves near streams at ca. 0.8–1.5 m above the ground. The surrounding habitat was mixed evergreen forest of small hardwoods, bamboo, and shrubs.

*Gracixalus truongi* Tran, Pham, Le, Nguyen, Ziegler, and Pham, 2023 (Fig. 4P): Two specimens were found at night while sitting on leaves at ca. 1–1.5 m above the ground. The surrounding habitat was mixed evergreen forest of small hardwoods, bamboo, and shrubs in limestone mountains.

*Kurixalus bisacculus* (Taylor, 1962) (Fig. 4Q): Two specimens were found at night on the tree branches near puddles, and other individuals were observed at night while sitting on leaves or branches near streams or puddles at ca. 0.2–3.0 m above the ground. The surrounding habitat was cultivated land and mixed evergreen forest of small hardwoods, bamboo, and shrubs. This is a new record for Copia NR.

*Polypedates megacephalus* Hallowell, 1861 (Fig. 4R): Two specimens were found at night on the tree branches near a stream, and other individuals were observed at night while sitting on leaves or branches near streams, puddles, and ponds at ca. 0.3–2.5 m above the ground. The surrounding habitat was cultivated land and mixed evergreen forest of small hardwoods, bamboo, and shrubs. This is a new record for Copia NR.

*Raorchestes parvulus* (Boulenger, 1893) (Fig. 5A): Two specimens were found at night sitting on leaves near streams, and other individuals were observed on the same perch sites at ca. 1.5–4.0 m above the ground in evergreen forest. This is a new record for Copia NR.

*Rhacophorus kio* Ohler and Delorme, 2006 (Fig. 5B): Individuals were observed at night sitting on leaves near puddles at ca. 1–3 m above the ground in evergreen forest.



**Fig. 5.** Amphibian species recorded in Copia Nature Reserve, Vietnam. (A) *Raorchestes parvulus*, (B) *Rhacophorus kio*, (C) *R. rhodopus*, (D) *Theloderma albopunctatum*, (E) *T. bicolor*, (F) *T. corticale*, (G) *T. gordonii*, (H) *Zhangixalus dorsovirens*, (I) *Z. feae*, and (J) *Tylototriton anguliceps*.

*Rhacophorus rhodopus* Liu and Hu, 1960 (Fig. 5C): One specimen was found at night sitting on leaves near puddles, and other individuals were observed at night while sitting on the same perch sites at ca. 2–3 m above the ground in evergreen forest.

*Theloderma albopunctatum* (Liu and Hu, 1962) (Fig. 5D): One specimen was found at night on edge of the waterhole and six individuals were observed at night at the same perch sites in evergreen forest.

*Theloderma bicolor* (Bourret, 1937) (Fig. 5E): One specimen was found at night on edge of a water filled tree hole in evergreen forest.

*Theloderma corticale* (Boulenger, 1903) (Fig. 5F): One specimen was found at night on edge of a water filled tree hole in evergreen forest.

*Theloderma gordonii* Taylor, 1962 (Fig. 5G): Two specimens were found at night on edge of a water filled tree hole in evergreen forest.

*Zhangixalus dorsovirens* (Bourret, 1937) (Fig. 5H): Two specimens were found at night on the tree branches near a stream in evergreen forest.

*Zhangixalus feae* (Boulenger, 1893) (Fig. 5I): Individuals were observed at night while sitting on tree branches or leaves near streams at 1–4 m above the ground in evergreen forest.

## **Caudata** **Salamandridae**

*Tylototriton anguliceps* Le, Nguyen, Nishikawa, Nguyen, Pham, Matsui, Bernardes, and Nguyen, 2015 (Fig. 5J): Individuals were observed during the daytime underneath the carpet of fallen leaves near small streams in evergreen forest.

## **Reptilia** **Squamata** **Agamidae**

*Acanthosaura lepidogaster* (Cuvier, 1829) (Fig. 6A): Individuals were observed while sitting on trees at ca. 1–2 m above the ground or while crossing a forest path in evergreen forest.

*Calotes emma* Gray, 1845 (Fig. 6B): One specimen was found in the morning on a forest path in evergreen forest. This is a new record for Copia NR.

*Calotes versicolor* (Daudin, 1802) (Fig. 6C): Individuals were observed during the daytime near cultivated lands or bushes in gardens.

*Draco maculatus* (Gray, 1845) (Fig. 6D): A road-killed individual was found on Road 108. The surrounding habitat was mixed evergreen forest of hardwoods and shrubs.

*Pseudocalotes brevipes* (Werner, 1904) (Fig. 6E): One specimen was found at night on a tree branch, and six individuals were observed at night while sitting on the same perch sites at ca. 1–2 m above the ground in evergreen forest.

## **Gekkonidae**

*Gekko reevesii* (Gray, 1831) (Fig. 6F): Individuals were observed at night on limestone cliffs or large trees at ca. 1–6 m above the ground in evergreen forest.

*Hemidactylus frenatus* Duméril and Bibron, 1836 (Fig. 6G): Individuals were observed at night on a wall near a light bulb in a residential area.

*Hemidactylus garnotii* Duméril and Bibron, 1836 (Fig. 6H): Two specimens were found and other individuals were observed at night on limestone karst outcrops at 1–3 m above the ground in secondary forest.

## **Scincidae**

*Eutropis longicaudatus* (Hallowell, 1857) (Fig. 6I): Individuals were observed during the daytime on the ground at road edges, and on shrubs near cultivated land.

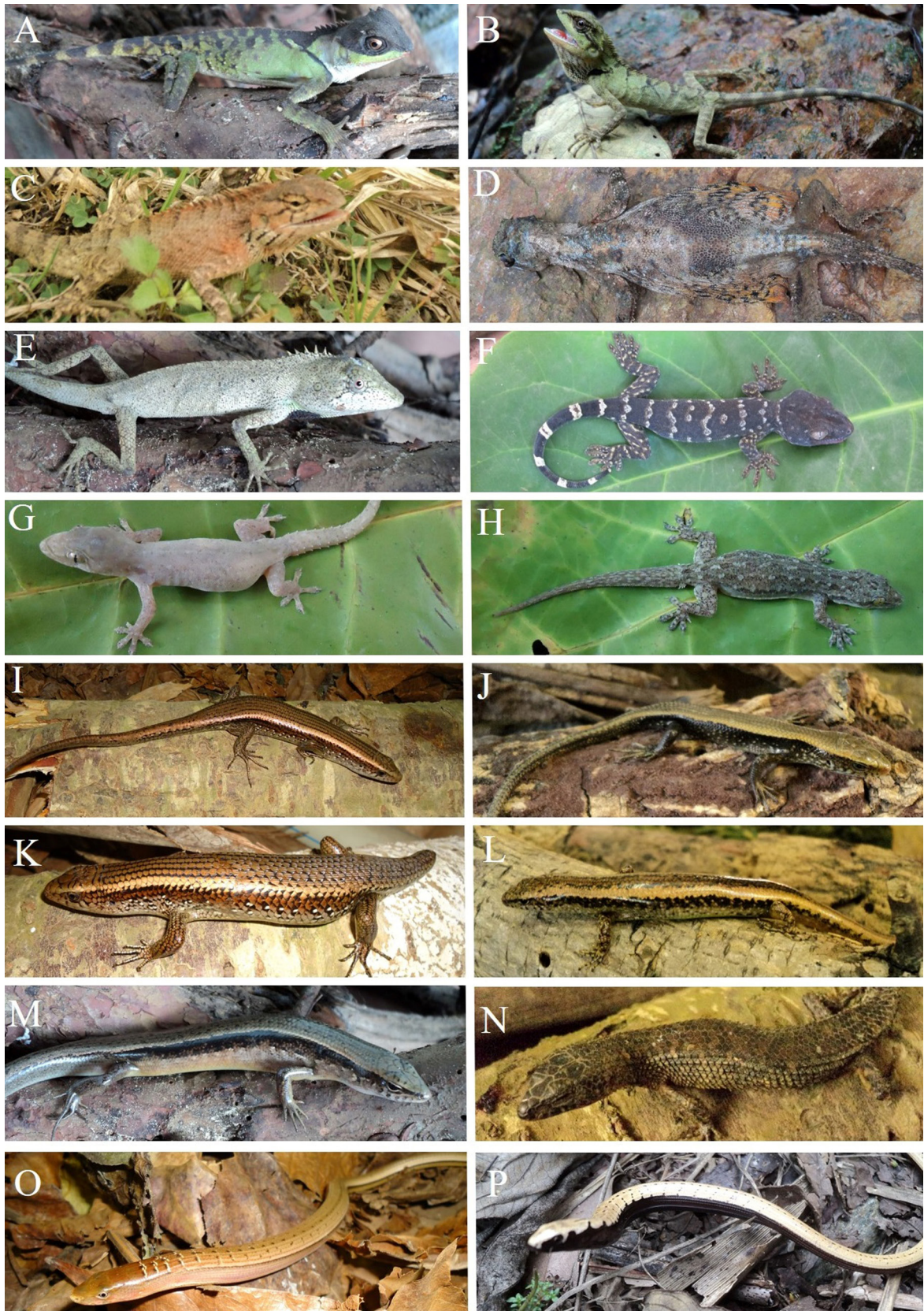
*Eutropis multifasciatus* (Kuhl, 1820) (Fig. 6J): Individuals were observed during the daytime on the ground at road edges, and on shrubs near cultivated land. This is a new record for Copia NR.

*Plestiodon cf. tamdaoensis* (Bourret, 1937) (Fig. 6K): One specimen was found during the daytime on the ground at road edges near cultivated land. This is a new record for Copia NR.

*Scincella devorator* Darevsky, Orlov, and Ho, 2004 (Fig. 6L): One specimen was found in the afternoon on a forest path in evergreen forest.

*Sphenomorphus indicus* (Gray, 1853) (Fig. 6M): One specimen was found in the afternoon on a forest path and other individuals observed on the ground in evergreen forest.

*Tropidophorus baviensis* Bourret, 1939 (Fig. 6N): Two specimens were found under a carpet of fallen leaves, at a forest edge near evergreen forest.



**Fig. 6.** Lizard species recorded in Copia Nature Reserve, Vietnam. (A) *Acanthosaura lepidogaster*, (B) *Calotes emma*, (C) *C. versicolor*, (D) *Draco maculatus*, (E) *Pseudocalotes brevipes*, (F) *Gekko reevesii*, (G) *Hemidactylus frenatus*, (H) *H. garnotii*, (I) *Eutropis longicaudatus*, (J) *E. multifasciatus*, (K) *Plestiodon* cf. *tamdaoensis*, (L) *Scincella devorator*, (M) *Sphenomorphus indicus*, (N) *Tropidophorus baviensis*, (O) *Dopasia harti*, and (P) *D. ludovici*.

*Dopasia harti* (Boulenger, 1899) (Fig. 6O): One specimen was found during the daytime on the ground at road edges near evergreen forest.

*Dopasia ludovici* (Mocquard, 1905) (Fig. 6P): Two specimens were found during the daytime on the ground at road edges near evergreen forest. This is a new record for Son La Province.

### Typhlopidae

*Indotyphlops braminus* (Daudin, 1803) (Fig. 7A): Two specimens were found in the afternoon underneath a rotten plank near the forest edge.

### Xenopeltidae

*Xenopeltis unicolor* Reinwardt, 1827 (Fig. 7B): Two individuals were observed at night on the ground near the forest edge.

### Colubridae

*Ahaetulla prasina* (Boie, 1827) (Fig. 7C): Individuals were found at night on tree branches at ca. 1.0–2.5 m above the ground in secondary forest or on a fence near agricultural areas.

*Boiga multomaculata* (Boie, 1827) (Fig. 7D): Three individuals were observed at night on tree branches at ca. 1–3 m above the ground in evergreen forest.

*Calamaria pavementata* Duméril, Bibron, and Duméril, 1854 (Fig. 7E): One specimen was found at night on the ground while moving across a forest trail near evergreen forest. This is a new record for Copia NR.

*Coelognathus radiatus* (Boie, 1827) (Fig. 7F): Two individuals were observed in the afternoon while moving across a road near agricultural areas.

*Dendrelaphis ngansonensis* (Bourret, 1935) (Fig. 7G): One specimen was found during the daytime on the ground on a road edge near the evergreen forest. This is a new record for Copia NR.

*Dendrelaphis pictus* (Gmelin, 1789) (Fig. 7H): Two specimens were found during the daytime on tree branches at road edges near evergreen forest.

*Elaphe moellendorffi* (Boettger, 1886) (Fig. 7I): One individual was observed at 1805 h near the entrance of a cave at a forest edge. This is a new record for Copia NR.

*Elaphe taeniura* (Cope, 1861) (Fig. 7J): Two individuals were observed in the afternoon at the entrance of a cave near a forest edge and agricultural area. This is a new

record for Copia NR.

*Euprepiophis mandarinus* (Cantor, 1842) (Fig. 7K): One individual was observed at night on the ground near a stream in evergreen forest. This is a new record for Copia NR.

*Gonyosoma coeruleum* Liu, Hou, Lwin, Wang, and Rao, 2021 (Fig. 7L): One individual was observed at night on a tree branch near a stream in evergreen forest. Previous records of *Gonyosoma prasinum* in Copia NR by Pham et al. (2014) should be re-identified as *B. coeruleum* after Liu et al. (2021).

*Gonyosoma frenatum* (Gray, 1853) (Fig. 7M): A road-killed specimen was found in the morning on a road near evergreen forest.

*Liopeltis frenata* (Günther, 1858) (Fig. 7N): A road-killed specimen was found in the morning on a road near evergreen forest.

*Lycodon fasciatus* (Anderson, 1879) (Fig. 7O): One specimen was found at night on the ground while catching prey near a road, and five other individuals were observed at night on the ground near streams or forest trails in evergreen forest. This is a new record for Copia NR.

*Lycodon futsingensis* (Pope, 1928) (Fig. 7P): One specimen was found at night on the ground near a stream in evergreen forest. This is a new record for Copia NR.

*Oligodon catenatus* (Blyth, 1854) (Fig. 7Q): One specimen was found at night on the ground near a forest trail in evergreen forest, and a road-killed specimen was found on the road.

*Oligodon fasciolatus* (Günther, 1864) (Fig. 7R): One specimen was found at night on the ground in evergreen forest. This is a new record for Copia NR.

*Oreocryptophis porphyraceus* (Cantor, 1839) (Fig. 8A): One individual was observed at night on the ground while moving near a forest trail in evergreen forest.

*Ptyas korros* (Schlegel, 1837) (Fig. 8B): Two individuals were observed during the daytime on the ground at the roadside near a forest edge.

*Ptyas multicincta* (Roux, 1907) (Fig. 8C): One individual was observed at night on a tree branch in evergreen forest.

*Sibynophis collaris* (Gray, 1853) (Fig. 8D): One specimen was found during the daytime on the ground while moving across the road. This is a new record for Copia NR.



**Fig. 7.** Snake species recorded in Copia Nature Reserve, Vietnam. (A) *Indotyphlops braminus*, (B) *Xenopeltis unicolor*, (C) *Ahaetulla prasina*, (D) *Boiga multomaculata*, (E) *Calamaria pavementata*, (F) *Coelognathus radiatus*, (G) *Dendrelaphis ngansonensis*, (H) *D. pictus*, (I) *Elaphe moellendorffi*, (J) *Elaphe taeniura*, (K) *Euprepiophis mandarinus*, (L) *Gonyosoma coeruleum*, (M) *G. frenatum*, (N) *Liopeltis frenata*, (O) *Lycodon fasciatus*, (P) *L. futsingensis*, (Q) *Oligodon catenatus*, and (R) *O. fasciolatus*.

## Elapidae

*Bungarus fasciatus* (Schneider, 1801) (Fig. 8E): One individual was observed at night on the ground while moving across the road near secondary forest.

*Bungarus wanghaotingi* Pope, 1928 (Fig. 8F): Two individuals were observed near a stream in secondary forest. Previous records of *B. multicinctus* in Copia NR by Le et al. (2009) and in Vietnam by Nguyen et al. (2009) should be re-identified as *B. wanghaotingi* after Chen et al. (2021). Chen et al. (2021) stated that previous records of *B. multicinctus* in Vietnam and southern China should be re-identified as *B. wanghaotingi*. However, these species are difficult to distinguish morphologically. *Bungarus wanghaotingi* differs from *B. multicinctus* by having fewer light cross bands on the body and tail (20–31 and 7–11 versus 31–40 on the body and 9–17 on the tail in *B. multicinctus*, respectively). The specimens from Copia NR have 25–26 and seven light cross bands on the body and tail, respectively.

*Naja atra* Cantor, 1842 (Fig. 8G): Two individuals were observed during the daytime on the ground near bamboo bush in secondary forest.

*Sinomicrurus maccllellandi* (Reinhardt, 1844) (Fig. 8H): One individual was observed at night on the ground while moving near a forest trail in evergreen forest.

## Lamprophiidae

*Psammodynastes pulverulentus* (Boie, 1827) (Fig. 8I): One individual was observed at night on a tree branch in limestone forest. This is a new record for Copia NR.

## Natricidae

*Fowlea flavipunctatus* (Hallwell, 1861) (Fig. 8J): An individual was observed in the afternoon near a pond. The surrounding habitat was secondary forest.

*Hebius boulengeri* (Gressitt, 1937) (Fig. 8K): Two specimens were found at night on the ground near a stream in evergreen forest. This is a new record for Copia NR.

*Hebius chapaensis* (Bourret, 1934) (Fig. 8L): One specimen was found at night in a stream in evergreen forest.

*Rhabdophis subminiatus* (Schlegel, 1837) (Fig. 8M): Three individuals were observed during the daytime on grass near the roadside in an agricultural cultivated area.

*Trimerodytes percarinatus* (Boulenger, 1899) (Fig. 8N): Two individuals were observed at night in streams in evergreen forest. This is a new record for Copia NR.

## Pareatidae

*Pareas carinatus* (Boie, 1828) (Fig. 8O): One specimen was found at night while sitting on a tree branch in the secondary forest. This is a new record for Copia NR.

*Pareas hamptoni* (Boulenger, 1905) (Fig. 8P): One specimen was found at night while sitting on a tree branch, and many other individuals were observed at night on tree branches at ca. 0.6–1.5 m above the ground in evergreen forest.

*Pareas margaritophorus* (Jan, 1866) (Fig. 8Q): Two specimens were found at night while sitting on tree branches at ca. 0.6–1.0 m in evergreen forest.

## Pseudoxenodontidae

*Pseudoxenodon macrops* (Blyth, 1854) (Fig. 8R): Two specimens were found in the morning while moving across a forest trail in evergreen forest.

## Viperidae

*Ovophis makazayazaya* (Takahashi, 1922) (Fig. 9A): Two specimens were found at night while moving across a forest trail in evergreen forest. This is a new record for Son La Province.

*Ovophis monticola* (Günther, 1864) (Fig. 9B): Two specimens were found at night on the ground near streams in evergreen forest.

*Trimeresurus albolabris* Gray, 1842 (Fig. 9C): Individuals were observed during the daytime on tree branches at ca. 0.5–1.2 m above the ground near secondary forest and cultivated agricultural areas.

## Testudines

### Platysternidae

*Platysternon megacephalum* Gray, 1831 (Fig. 9D): Two individuals were observed at night under a rock in a stream in evergreen forest.

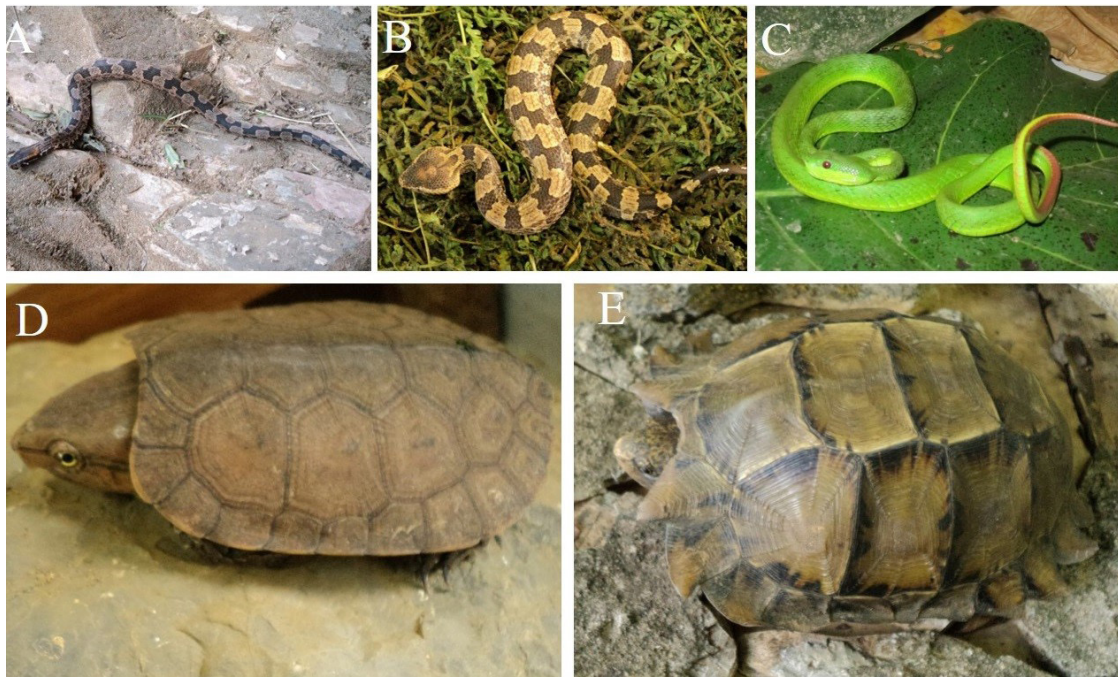
### Testudinidae

*Manouria impressa* (Guenther, 1882) (Fig. 9E): One individual was observed during the daytime in a house of the local people.



**Fig. 8.** Snake and turtle species recorded in Copia Nature Reserve, Vietnam. (A) *Oreocryptophis porphyraceus*, (B) *Ptyas korros*, (C) *P. multicincta*, (D) *Sibynophis collaris*, (E) *Bungarus fasciatus*, (F) *B. wanghaotingi*, (G) *Naja atra*, (H) *Sinomicrurus macclellandi*, (I) *Psammodynastes pulverulentus*, (J) *Fowlea flavipunctatus*, (K) *Hebius boulengeri*, (L) *Hebius chapaensis*, (M) *Rhabdophis subminiatus*, (N) *Trimerodytes percarinatus*, (O) *Pareas carinatus*, (P) *P. hamptoni*, (Q) *P. margaritophorus*, and (R) *Pseudoxenodon macrops*.





**Fig. 9.** Snake and turtle species recorded in Copia Nature Reserve, Vietnam. (A) *Ovophis makazayazaya*, (B) *O. monticola*, (C) *Trimeresurus albolabris*, (D) *Platysternon megacephalum*, and (E) *Manouria impressa*.

## Discussion

Our new findings bring the number of amphibian and reptile species in Copia NR to 115, comprising 48 amphibian and 67 reptile species, and 25 of the species are new records for Copia NR while four are new records for Son La Province.

Among the six survey sites, the forest sites near Nong Vai and Hua Ty villages had the highest level of species richness, with 65 recorded species; followed by Huoi Pu forest with 52 species; Co Ma site with 37 species; Long He site with 36 species; and Pha Khuong site with 32 species (Table 2). The forest sites near Nong Vai and Hua Ty are in the core zone of the Copia NR with a large area of evergreen forest (>2,000 ha) and the habitat quality is relatively good. This explains why the number of recorded species is higher than those of other sites.

In terms of habitat preference, most of the amphibians and reptiles inhabit the evergreen forest (63 species, or 60% of the total recorded species), followed by disturbed secondary forest with 34 recorded species (32.38%), and agricultural areas with 24 recorded species (22.85%) (Table 2).

Concerning its herpetofaunal conservation status, Copia NR harbors many threatened species, including 17 species listed in the Red Data Book of Vietnam (Dang et al. 2007), with three species categorized as CR (*Boulenophrys palpebralespinosa*, *Python bivittatus*, and *Ophiophagus hannah*); 10 species as EN (*Rhacophorus kio*, *Theloderma corticale*, *Zhangixalus feae*, *Varanus salvator*, *Coelognathus radiatus*, *Ptyas*

*korros*, *Ptyas mucosa*, *Bungarus fasciatus*, *Naja atra*, and *Platysternon megacephalum*); and four species as VU (*Elaphe moellendorffi*, *Euprepiophis mandarinus*, *Oreocryptophis porphyraceus*, and *Manouria impressa*). In addition, 13 species are listed in the IUCN Red List (IUCN 2023), with two species categorized as CR (*P. megacephalum* and *Mauremys sinensis*), one species as EN (*M. impressa*), eight species as VU (*Amolops vitreus*, *Odorrana graminea*, *Odorrana jingdongensis*, *Zhangixalus dorsoviridis*, *E. moellendorffi*, *Elaphe taeniura*, *N. atra*, and *O. hannah*), and two species as NT (*P. molurus* and *P. korros*). Eight species are listed in the Vietnam Governmental Decree No. 84/2021/ND-CP (2021), with two species included in Group IB (*O. hannah* and *P. megacephalum*) and six species in Group IIB (*Tylototriton anguliceps*, *V. salvator*, *P. molurus*, *P. mucosus*, *N. atra*, and *M. impressa*). Furthermore, eight species are listed in the CITES appendices, with one species included in Appendix I (*P. megacephalum*) and seven species in Appendix II (*T. anguliceps*, *V. salvator*, *P. molurus*, *P. mucosus*, *N. atra*, *O. hannah*, and *M. impressa*) (Table 2).

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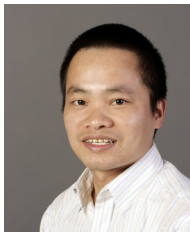
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**Thomas Ziegler** has been the Curator of the Aquarium/Terrarium Department of the Cologne Zoo, Germany, since 2003. He is also the Coordinator of the Biodiversity and Nature Conservation Projects of the Cologne Zoo in Vietnam and Laos. As a Zoo Curator and Project Coordinator, he tries to combine *in situ* and *ex situ* approaches, such as linking zoo biological aspects with diversity research and conservation in the Cologne Zoo, in rescue stations and breeding facilities in Vietnam, and in the last remaining forests in Indochina. Since February 2009, he has been an Associate Professor at the Zoological Institute of Cologne University, Germany, and an Adjunct Professor since 2016. *Photo by Rolf Schlosser.*



**Cuong Thien Tran** has been working on conservation-related issues in Vietnam for more than 10 years. Cuong is currently working on projects which characterize the biodiversity and ecology of Vietnam. In addition, he also carries out work related to environmental education and sustainable development in Vietnam.