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Status of the collection of amphibians and reptiles in the Museum of Biology, Hanoi National University of Education

Nguyen Lan Hung Son*, Le Trung Dung, Nguyen Thanh Van, Tran Nam Hai

Hanoi National University of Education, 136 Xuan Thuy,Hanoi, Vietnam

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Abstract. The collection of the Museum of Biology (HNUE) includes 102 species of amphibians and reptiles, accounted for 19.21% of the species was known in Vietnam, including 31 species of amphibian and 71 reptile species. Amphibians and reptiles list statistic in this museum show that 23 species (22.55% of the total species) are rare and precious species. Among them, there are: 14 globally threatened species listed in IUCN's Red List, 2011. There are 12 nationally threatened species listed in Red Data Book of Vietnam, 2007. 5 species listed in Decrees N^{o} 32/2006/ND-CP, belonging to Group IIB (Limit on exploitation and use). There are 5 species listed in CITES convention, 2009. 3 species haven't been name yet. There are 386 specimens of amphibians and reptiles on display at the museum. Samples of good quality up to 75%, the samples have average quality and poor tiny percentage of 16% and 9%.

Keywords: amphibian, reptile, collection, museum, status, variety, quality.

1. Introduction

Building a standard collection for Museum of Biology of Hanoi National University of Education is essential to contributing in development of natural museum systems in Vietnam. It is also needed that the Museum of Biology meets the requirement for research, visit and education of natural environment and biodiversity conservation in Vietnam. The museum for learning of students and high schooler, to visit of abroad institutions.

These surveys and studies of Department of Zoology, the Faculty of Biology, Hanoi National University of Education have collected a large amount of specimens. Today, Museum of Biology has the collection of diverse and abundant amphibians and reptiles. They are available in Vietnam.

To build the data for management, conservation, and development of the collection of amphibian, reptile at the museum, we studied the subject. From this reality, we propose orientations and specific measures for the collection, taxidermy and management of specimens in the next time.

* Corresponding author. Tel: 84-4-37549530.
E-mail: sonnlh@hnue.edu.vn

2. Study methodology

2.1. Study site and timing

- Study sites: Amphibians and Reptiles Collection in the Museum of Biology, the Faculty of Biology, Hanoi National University of Education.

- Study timing: During the October and November in 2011.

2.2. Study methodology

To exactly assess the quality and diverse of the collection of amphibians and reptiles at the museum, we used the methods:

Systematic followed Bourret (1936, 1942) [5], [6]; Dao (1978, 1979, 1981, 1982) [4]; Nguyen et al (2009) [7]. Common English names generally follow Nguyen et al. (2009) [7].

To assess rare based on the Decree 32/2006/NĐ-CP of the Government (2006)[3]; CITES, 2009[2]; The Red Data Book of Vietnam (2007) [1], The IUCN Red list of Threatened Species 2011[8].

The status of amphibian, reptile specimens, which is determined by three levels:

- Good: nearly complete specimens or integrity, can recreate the full sample, is properly treated and preserved.

- Medium: specimen form integrity or nearly whole, a resume, but not sufficient information, is handled well preserved (can restore or improve)

- Bad: no profile form, or substantially damaged invalid classification, poor handling and storage has been corrupted. (will be removed in the future)

3. Results and discussions

3.1. Taxonomic diversity

Today, in the collection of the Museum of Biology (HNUE), there are 31 amphibian species belonging to 7 families, 3 orders and 71 reptile species belonging to 16 families, 3 orders (table 1).

Table 1. List of amphibian and reptile composition at Museum of Biology (HNUE)

Order	Scientific name	Common name	The level of conservation			
			IUCN	RB	D. 32	CITES
	AMPHIBIA					
	I. ANURA					
	1. Bufonidae					
1	*Duttaphrynus melanostictus* (Schneider, 1799)	Back - spined toad				
	2. Megophryidae					
2	*Brachytarsophrys feae* (Boulenger, 1887)	Kakhien hill frog				
3	*Xenophrys longipes* (Boulenger, 1886)	Malacca spadefoot toad	NT			
4	*Xenophrys major* (Boulenger, 1908)	Anderson's spadefoot toad				
	3. Microhylidae					
5	*Calluella guttulata* (Blyth, 1855)	Burmese squat frog				

6	*Kaloula pulchra* Gray, 1831	Banded bullfrog		
7	*Microhyla fissipes* (Boulenger,1884)	Ornate pigmy frog		
8	*Microhyla pulchra* (Hallowell, 1861)	Guangdong rice frog		
9	*Ophryophryne microstoma* Boulenger, 1903	Asian mountain toad		
	4. Ranidae			
10	*Amolops ricketti* (Boulenger, 1899)	Chinese sucker frog		
11	*Fejervarya limnocharis* (Gravenhorst, 1829)	Grass frog		
12	*Hoplobatrachus rugulosus* (Weigmann, 1835)	Common lowland frog		
13	*Hylarana maosonensis* Bourret, 1937	Mauson frog		
14	*Limnonectes kuhlii* (Tschudi, 1838)	Kuhl's creek frog		
15	*Occidozyga lima* (Gravenhost, 1829)	Green puddle frog		
16	*Occidozyga martensii* (Peters, 1867)	Marten's oriental frog		
17	*Odorrana andersonii* (Boulenger, 1882)	Anderson's frog		
18	*Odorrana bacboensis* (Bain, Lathrop, Murphy, Orlov & Ho, 2003)	Tonkin odorous frog		
19	*Odorrana chloronota* (Gunther, 1876)	Green cascade frog		
20	*Odorrana graminea* (Boulenger, 1900)	Graminea frog		
21	*Paa verrucospinosa* (Buorret, 1937)	Granular spiny frog	NT	
22	*Rana erythraea* (Schlegel, 1837)	Green paddy frog		
23	*Rana guentheri* (Boulenger, 1882)	Gunther's amoy frog		
24	*Rana johnsi* Smith, 1921	Johns' frog		
25	*Rana nigrovittata* (Blyth, 1855)	Black-striped frog		
26	*Taylorana hascheanus* (Stoliczka, 1870)	Hill forest frog		
	5. Rhacophoridae			
27	*Polypedates dennysii* (Blanford, 1881)	Deny's whipping frog		
28	*Polypedates leucomystax* (Gravenhorst, 1829)	Four- lined treefrog		
	II. CAUDATA			
	6. Salamandridae			
29	*Paramesotriton deloustali* (Bourret, 1934)	Vietnamese salamande	VU	IIB
30	*Tylototriton asperrimus* Unterstein, 1930	Granular newt	NT	
	III. GYMNOPHIONA			
	7. Ichthyophiidae			
31	*Ichthyophis bannanicus* Yang, 1984	Banna caecilian		

	REPTILIA				
	IV. SQUAMATA				
	8. Agamidae				
32	*Acanthosaura lepidogaster* (Cuvier, 1829)	Scale - bellied tree lizard			
33	*Calotes versicolor* (Daudin, 1802)	Garden fence lizard			
34	*Calotes* sp.				
35	*Draco maculatus* (Gray, 1845)	Spotted gliding lizard			
36	*Leiolepis reevesii* (Gray, 1831)	Eastern butterfly lizard			
37	*Pseudocalotes floweri* (Boulenger, 1912)	Thai false broodsucker			
	9. Gekkonidae				
38	*Gehyra mutilata* (Wiegmann, 1834)	Four- clawed gecko			
39	*Gekko gecko* (Linnaeus, 1758)	Tockay		VU	
40	*Gekko palmatus* Boulenger, 1907	Palmated gecko			
41	*Hemidactylus frenatus* Schelegel, in Dumeril et Bibron, 1836	Spiny- tailed house gecko			
	10. Lacertidae				
42	*Takydromus sexlineatus* Daudin, 1802	Long-tailed grass lizard			
	11. Scincidae				
43	*Eumeces tamdaoensis* Bourret, 1937	Tamdao blue-tailed skink			
44	*Mabuya chapaensis* (Bourret, 1937)	Sapa mabuya			
45	*Mabuya longicaudata* (Bourret, 1937)	Long- tailed skink			
46	*Scincella reevesii* (Gray, 1838)	Reeves' Smooth Skink			
47	*Sphenomorphus indicus* (Gray, 1853)	Indian forest skink			
48	*Sphenomorphis maculatus* (Blyth, 1853)	Spotted forest shink			
	12. Shinisauridae				
49	*Shinisaurus crocodilurus* Ahl, 1930	Chinese crocodile lizard	VU		II
	13. Varanidae				
50	*Varanus nebulosus* (Gray, 1831)	Clouded monitor		EN	
51	*Varanus salvator* (Laurenti, 1786)	Water monitor		EN	
	14. Typhlopidae				
52	*Ramphotyphlops braminus* (Daudin, 1803)	Common blind snake			
	15. Xenopeltidae				
53	*Xenopeltis unicolor* Reiwardt, in Boie, 1827	Sunbeam snake			
	16. Colubridae				
54	*Achalinus ater* Bourret, 1937	Bourret's odd-scaled snake			
55	*Ahaetulla prasina* (Reinhardt, in Boie, 1827)	Oriental whip snake			
56	*Amphiesma atemporalis* (Bourret, 1934)	Mountain keelback			

57	*Amphiesma stolatum* (Linnaeus, 1758)	Buff-striped keelback			
58	*Boiga multomaculata* (Boie,1827)	Large-spotted cat snake			
59	*Calamaria pavimentata* Dume'ril & Bibron 1854	Collared reed snake			
60	*Calamaria septentrionalis* Boulenger, 1890	Northern reed snake			
61	*Cyclophiops multicinctus* (Roux, 1907)	Munticincted green snake			
62	*Dinodon meridionale* Bourret, 1935	Southern big-tooth snake			
63	*Enhydris bennettii* (Gray, 1842)	Mangrove water snake			
64	*Enhydris chinensis* (Gray, 1842)	Chinese water snake			
65	*Enhydris plumbea* (Boie, 1827)	Plumbeous water snake			
66	*Oligodon cinereus* (Gunther, 1864)	Ashy kukri snake			
67	*Opisthotropis lateralis* Boulenger, 1903	Bicoloured keelback			
68	*Pareas hamptoni* (Boulenger, 1905)	Hampton's slug snake			
69	*Psammodynastes pulverulentus* (Boie, 1827)	Mock viper			
70	*Pseudoxenodon macrops* (Blyth, 1854)	Big-eyed bamboo snake			
71	*Pseudoxenodon bambusicola* Vogt, 1922	Bamboo snake			
72	*Ptyas korros* (Schlegel, 1837)	Indochinese ratsnake	EN		
73	*Rhabdophis subminiatus* (Schlegel, 1837)	Red-necked keelback			
74	*Sinonatrix percarinata* (Boulenger, 1899)	Mountain water snake			
75	*Xenochrophis flavipunctatus* (Hallowell, 1861)	Yellow-spotted keelback			
76	*Xenochrophis trianguligerus* (Boie, 1827)	Triangle water snake			
	17. Elapidae				
77	*Bungarus bungaroides* (Cantor, 1839)	Common krait			
78	*Bungarus candidus* (Linnaeus, 1758)	Blue krait		IIB	
79	*Bungarus fasciatus* (Schneider, 1801)	Banded krait	EN		
80	*Bungarus multicinctus* Blyth, 1861	Many - banded krait		IIB	
81	*Calliophis maculiceps* (Gunther, 1858)	Small-spotted coral snake			
82	*Hydrophis* sp1.				
83	*Hydrophis* sp2.				
84	*Naja atra* Cantor, 1842	Chinese cobra	EN	IIB	II
	18. Viperidae				
85	*Cryptelytrops albolabris* (Gray, 1842)	White - lipped pitviper			
86	*Ovophis tokinensis* (Bourret, 1934)	Tonkin pitviper			
87	*Protobothrops mucrosquamatus* (Cantor, 1839)	Chinese habu			
88	*Trimeresurus popeorum* M.Smith, 1937	Pope's pit viper			
89	*Trimeresurus stejnegeri* K.schmidt, 1925	Baboo pit viper			

	V. TESTUDINATA					
	19. Geoemydidae					
90	*Cuora galbinifrons* Bourret, 1939	Indochinese box turtle	CR	EN		II
91	*Cyclemys tcheponensis* (Bourret, 1939)	Stripe – necked leaf turtle				
92	*Geoemyda spengleri* (Gmelin,1789)	Black-breasted leaf turtle	EN			III
93	*Pyxidea mouhoti* (Gray, 1862)	Keeled box turtle				II
94	*Sacalia quadriocellata* (Siebenrock, 1903)	Four-eyed turtle	EN			
95	*Trachemys scipta* (Wied-Neuwied, 1839)	Red-eared slider				
	20. Testudinidae					
96	*Indotestudo elongata* (Byth, 1853)	Elongated tortoise	EN		IIB	
97	*Manouria impressa* (Gunther, 1882)	Impressed tortoise	VU	VU		
	21. Trionychidae					
98	*Amyda cartilaginea* (Boddaert, 1770)	Asiatic Softshell Turtle	VU	VU		
99	*Palea steindachneri* (Siebenrock, 1906)	Wattle-necked softshell turtle				
100	*Rafetus swinhoei* (Gray, 1873) (*)	Swinhoe's softshell turtle	CR	CR		
	22. Cheloniidae					
101	*Eretmochelys imbricata* (Linnaeus, 1766)	Hawksbill sea turtle	CR	EN		
	VI. CROCODYLIA					
	23. Crocodylidae					
102	*Crocodylus siamensis* Schneider, 1801	Siamese crocodile	CR	CR		

Notes:

IUCN (*The IUCN Red list of Threatened Species, 2011*), RB (*Red Data Book of Vietnam, 2007*): CR: Critically endangered; EN: Endangered; VU: Vulnerable; NT: Near threatened.

D. 32 (*Decree 32/2006/NĐ-CP of the Vietnam Goverment*) : Group IIB (Limit on exploitation and use).

CITES *(Convention on International Trade in Endangered Species of Wild Fauna and Flora, 2009)*: II = Appendices II, III = Appendices III.

(*): Skull speciment.

Table 1 and Table 2 show that:

- Amphibia: There are 3 orders (50.00% of the statistics), seven families (accounting for 30.44%), 21 genus (27.15%) and 31 species (30.39%) , which dominate is the Ranidae family with 10 genus and 17 species. Next to, Microhylidae family has got 4 genus and 5 species. Megophryidae family with 2 genus and 3 species. The Salamandridae family has 2 genus and two species. The Rhacophoridae family includes 1 genus, Bufonidae and Ichthyophiidae have 1 genus, 1 species.

Table 2. Diversity of the taxon levels of amphibian and reptile specimens at the Museum of Biology

TT	Class	Order	Family		Genus		Species	
			No.	%	No.	%	No.	%
		Anura	5	21.74	18	24.00	28	27.45
1	Amphibia	**Caudata**	1	4.35	2	2.67	2	1.96
		Gymnophiona	1	4.35	1	1.33	1	0.98
		Squamata	11	47.81	41	54.67	58	56.86
2	Reptilia	**Testudinata**	4	17.40	12	16.00	12	11.77
		Crocodylia	1	4.35	1	1,33	1	0.98
3	Total	**6**	23	100.00	75	100.00	102	100,00

- Reptilia: There are three orders (representing 50.00%), 16 families (accounting for 69.56%), 54 genus (accounting for 71.05%) and 71 species (69.61%). In particular, the Squamata order is the most diversesity order about the taxa with 11 families (accounting for 47.83%), 41 genus (accounting for 54.67%), 58 species (56.86%). The Colubridae family dominates with 16 genus and 23 species. The Geoemydidae family has 6 genus and 6 species. Along with a genus and a species, they are Lacertidae, Shinisauridae, Typhlopidae, Xenopeltidae, Cheloniidae and Crocodylidae family.

Thus, the Squamata order is the most diversesity in all orders (11 families, 41 genus, 58 species), Colubridae which is the dominate family. Next, the Anura order with 5 families, 18 genus and 28 species, with their dominant Ranidae. Lower than that of the Gymnophiona order and the Crocodylia order, only one family, a genus, a species.

Assessing to the rich of the gallery collection at the Museum of Biology, we compared with the figures in the checklist of amphibians and reptiles Vietnam in 2009 [7] and obtained fig 1. and fig 2.

Amphibia class of Vietnam are represented in three orders at the Museum of Biology. The exhibition, there are 70% of amphibia families in Vietnam. Three amphibians family do not have represented as Bombinatoridae, Hylidae, Dicroglossidae. The Amphibia genus just 43.18% and accounted for 16.18% of represented genus have been known in Vietnam.

Reptile class of Vietnam has the representatives of the three orders at the Museum. The specimen represents 66.67% of families, 38.93% of the genus, 17.32% of reptile species in Vietnam.

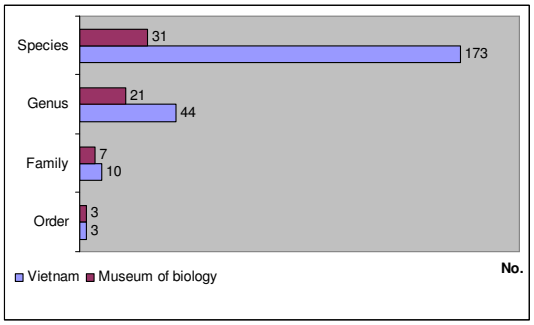

Fig 1. Compare amphibian taxa.

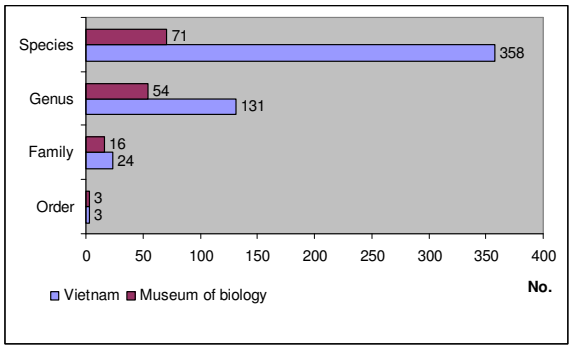

Fig 2. Compare reptile taxa.

Comparing the collection of amphibian and reptile species of the Museum of Biology with corresponding specimens at the Biological Museum, Hanoi University of Science, Vietnam National University, Hanoi, we obtained the table of data:

Table 3. Comparison of the amphibian and reptile taxa at the two museums

TT	Class	Order		Family		Genus		Species	
		HNUE	HUS	HNUE	HUS	HNUE	HUS	HNUE	HUS
1	Amphibia	3	3	7	8	21	13	31	20
2	Reptilia	3	3	16	21	54	79	71	122
	Total	**6**	**6**	**23**	**29**	**75**	**92**	**102**	**142**

Notes:
HNUE: Museum of Biology, Hanoi National University of Education.
HUS: Biological Museum, Hanoi University of Science, Vietnam National University, Hanoi

Through this comparison, we found that the collection of amphibians and reptiles in the museums are fully representative of Vietnam. The amphibian specimens in the Museum of Biology (HNUE) is richer than its in the Biological Museum (HUS), but the reptile specimens at the Biological Museum (HUS) diversity than.

3.2. Rare and endemic

Amphibians and reptiles list statistic in this museum show that 23 species (22.55% of the total species) are rare and precious species. In which, four of amphibian species (3.92%), 19 species of reptile (18.63%). Specifically:

5 species listed in Decrees N^{o} 32/2006/ND-CP belonging to Group IIB (Limit on exploitation and use). In which, including a representative of amphibia *Paramesotriton deloustali* and 4 species of reptilia: *Bungarus candidus, Bungarus multicinctus, Naja atra* and *Indotestudo elongate.*

There are 12 nationally threatened species listed in Red Data Book of Vietnam, 2007; with 2 species in the CR category, 7 species in the category of EN and three species in the VU category. Of which, only one species in the Crocodylia order, 6 species of the Squamata order and five species of the Testudinata order. The reptile specimens in the Museum of Biology accounted for 13.75% of the reptiles in the Red Data Book of Vietnam in 2007. Amphibian class has no representative.

There are 14 globally threatened species listed in IUCN's Red List, 2011. Mainly concentrated in the Testudinata order with 8 species; two species of Anura order; the Caudata, Squamata and Crocodylia order have a representative of each. In the species, there are three species in the NT category of Anura order, 4 species in the section of VU, three species in the EN secsion and four species in the CR category.

There are 5 species listed in CITES convention, 2009. In which, 1 species in the Appendices III (*Geoemyda spengleri*) and 4 species in Appendices II (*Naja atra, Shinisaurus crocodilurus, Coura galbinifrons* and *Pyxidea mouhoti*). In the species, the Testudinata order has 3 species and 2 species in the Squamata order.

3.3. Quality of the amphibian and reptile collection

- Specimen types:

Most of the specimens were soaked in 38% formaldehyt, curled posture or position with the snakes crawl, like a sitting position in the wild

with frogs and placed prone on glass in glass jars or plastic bottles.

Some specimens, they are body parts with a number of species in the Testudinata order as skulls, turtle shell patterns.

With the large reptile specimens like *Varanus salvator*, or *Crocodylus siamensis*, the museum handled and displayed stuffed forms.

- Collect timing:

Most specimens were collected since a long years ago. The specimens were collected in different areas of the country, from north to south, on the field research phase of the staff in Faculty of Biology, graduate students, master and Ph.D students.

In the recently years, along with the development of the preservation in Museum of Biology, the number of amphibian, reptile specimens were collected, processed and displayed in this increasingly richer for day by day.

- Quality of the collection:

In the 386 specimens of amphibians and reptiles is showing at the museum, there are 289 species accounted for 75% good specimens, 62 specimens in average quality (16%) and 35 specimens has bad quality, for 9% less.

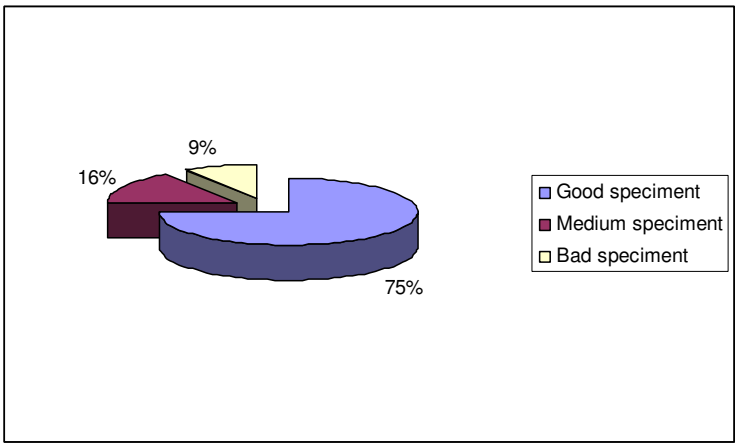

Fig 3. Rate of the specimen qualities.

4. Conclusion

The collection of amphibian, reptile specimens stored in the Museum of Biology (HNUE) are diversity in quantity and species currently. It includes 102 species of amphibians and reptiles, accounted for 19.21% of the species was known in Vietnam, including 31 species of amphibians and 71 reptile species.

Amphibian and reptile list statistic in this museum show that 23 species (22.55% of the total species) are rare and precious species. Among them, there are: 14 globally threatened species listed in IUCN's Red List, 2011. 11 species were listed in Red Data Book of Vietnam, 2007. 5 species listed in Decrees N^{o} 32/2006/ND-CP. There are 5 species listed in CITES convention, 2009. 3 species haven't been name yet.

There are 386 specimens of amphibians and reptiles on display at the museum. Samples of good quality up to 75%, the samples have average quality and poor tiny percentage of 16% and 9%.

In the future, need to complete collection of specimens (the specimen is mistake in the collection or the specimens will be discarded because of due to unsatisfactory). To use of advanced techniques in handling, processing and preserving specimens.

Acknowledgements

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Hiện trạng bộ mẫu lưỡng cư và bò sát tại Bảo tàng Sinh vật, Trường Đại học Sư phạm Hà Nội

Nguyễn Lân Hùng Sơn, Lê Trung Dũng, Nguyễn Thanh Vân, Trần Nam Hải

Trường Đại học Sư phạm Hà Nội, 136 Xuân Thủy, Hà Nội, Việt Nam

Công tác kiểm kê, đánh giá mức độ đa dạng và chất lượng mẫu vật trong các Bảo tàng Sinh vật là một việc làm thường xuyên và cần thiết. Kết quả này giúp chúng ta xác định được hiện trạng bộ mẫu trưng bày của bảo tàng. Trên cơ sở đó đưa ra các giải pháp quản lý và thu thập hợp lý nhằm duy trì và làm tăng tính đa dạng và đại diện của bộ mẫu phục vụ đào tạo và nghiên cứu cũng như trưng bày thăm quan. Bảo tàng Sinh vật, Khoa Sinh học, Trường Đại học Sư phạm Hà Nội có bộ mẫu của 102 loài lưỡng cư và bò sát chiếm 19,21% tổng số loài hiện biết ở Việt Nam, trong đó có 31 loài lưỡng cư thuộc 7 họ, 3 bộ và 71 loài bò sát của 16 họ, 3 bộ. Bộ sưu tập có mẫu vật của các loài có giá trị bảo tồn, bao gồm 14 loài trong Danh lục Đỏ IUCN 2011, 12 loài trong Sách Đỏ Việt Nam 2007, 5 loài trong Nghị định 32 của Chính phủ và 5 loài trong Công ước CITES năm 2009. Trong số 386 mẫu lưỡng cư và bò sát được lưu giữ tại bảo tàng, các mẫu có chất lượng tốt chiếm 75%, 16% mẫu có chất lượng trung bình và 9% mẫu có chất lượng kém. Trong thời gian tới bảo tàng cần tiếp tục thu thập các mẫu vật ở Việt Nam đại diện cho các taxon còn thiếu và tăng cường công tác bảo quản để duy trì bộ mẫu có chất lượng tốt.