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New records of snakes from Cat Tien National Park, Dong Nai and Lam Dong provinces, southern Vietnam

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Abstract. We report ten new records of snakes from Cat Tien National Park, Dong Nai and Lam Dong provinces, southern Vietnam. The specimen of *Typhlops siamensis* Günther, 1864 from Cat Tien represents the second country record in Vietnam after more than one century. Our new record of *Dendrelaphis ngansonensis* (Bourret, 1935) leads to a considerable range extension of this species, so far known only from northern and central Indochina. Additional specimens of *Oligodon deuvei* David, Vogel & van Rooijen, 2008 are described, along with the first photograph of a living specimen, showing the coloration including the aposematically red-coloured underside of the tail. An updated checklist of snakes of the Cat Tien National Park is also provided.

Key words: Squamata: Serpentes: Typhlopidae, Colubridae, Cat Tien National Park.

INTRODUCTION

Among the 545 species of reptiles and amphibians known from Vietnam, snakes have the highest species diversity (Nguyen et al. 2009). However, many snake species are often recorded only by a single or rather few specimens, and data on their distribution and natural history are still deficient. Though the Cat Tien National Park is the biggest and most important National Park for the lowland rainforests of southern Vietnam (Polet & Ling 2004), its herpetofauna is still poorly studied (Nguyen 1988, Le et al. 1998, Nguyen & Ho 2002, Le 2007, Geissler et al. 2009). The most recent checklist of reptiles and amphibians of the Cat Tien National Park, which was compiled by Nguyen & Ho (2002), reported a total of 42 snake species. We herein provide an updated checklist of snakes from this national park with ten new records and discussion about the status of some rare and poorly known species in Vietnam.

MATERIAL AND METHODS

Field work was conducted by Peter Geissler in July and August 2008 and from March until June 2009; by Nikolay A. Poyarkov from November until December 2007, from February until April 2008, from February to April 2009, and in July 2010 in Cat Tien National Park, Dong Nai Province, southern Vietnam (Fig. 1). Species identifications were also based on the examination of specimens collected by colleagues from the Appalachian State University (North Carolina, USA). A total of 54 specimens were examined and they were subsequently deposited in the collections of the Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam; the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Bonn, Germany; and the Zoological Museum, Moscow State University (ZMMU), Moscow, Russia.

The following measurements were taken with a digital vernier calliper: SVL (snout-vent length); TL (total



Fig. 1. Map showing the study site (black diamond) in southern Vietnam: Cat Tien National Park.

length); TaL (tail length). In addition, several scale counts were taken: VEN (number of ventrals); MD (middorsal scales); MBS (midbody scale rows, including the ventrals); SC (subcaudals); IL (infralabials); SL (supralabials).

TAXONOMIC ACCOUNT

Typhlops siamensis Günther, 1864

Specimen examined: One adult male (ZFMK 88922), collected by P. Geissler on the road in a rainy evening on 31 March 2009, at the Headquarters of Cat Tien National Park, Dong Nai Province (near 11°25'19.3"N, 107°25'42.0"E, 104 m a.s.l.).

Characteristic features: The morphological features of this specimen fit the descriptions of Günther (1864) and

Wallach (2001): SVL 140.2 mm; TL 4.4 mm; preocular separated from nasal; inferior nasal suture contacting second supralabial; superior nasal suture extending horizontally to rostral, not visible from above; 22 scale rows around midbody (including ventral scale rows); 308 paravertebral scales (306–368 according to Wallach 2001); dorsum uniformly dark brown, venter cream (see Fig. 2a).

Remarks: Wallach (2001) limited the distribution of this species to Thailand and Cambodia, although it was recorded from Vietnam by Nguyen & Ho (1996), see also Nguyen et al. (2009). The record is based on a specimen (ZISP 5426), which was collected by Tramond in 1879 and subsequently deposited in the collection of the Zoological Institute in St. Petersburg (Tirant 1885). Therefore, our record from Cat Tien National Park represents a rediscovery of this species in Vietnam after 130 years. In mainland Southeast Asia, both *Typhlops diardi* Schlegel, 1839 and *Typhlops muelleri* Schlegel, 1839 are morphologically similar to *Typhlops siamensis*. *T. siamensis* differs from *T. diardi* in having a lower number of scale rows around midbody (22 vs. 24–28). Bourret (1936) synonymized *T. siamensis* with the subspecies *T. diardi nigroalbus* Duméril & Bibron, 1844. *Typhlops diardi nigroalbus* was recently synonymized with *Typhlops muelleri* Schlegel, 1839 by Wallach (2001). *T. siamensis* can be distinguished from *T. muelleri* by having a lower count of MBS (22 vs. 24–30) and by the absence of a sharply bounded yellow ventral surface. However, *T. muelleri* was not included in recent lists of the snake fauna of Vietnam (Ziegler et al. 2007, Nguyen et al. 2009). We thus follow Wallach (2001) to recognize *T. siamensis* as a distinct species. Future research on *Typhlops* from southern Vietnam is required to show whether *T. muelleri* actually occurs in Vietnam as affirmed by Wallach (2001) or these records are based on misidentified specimens of the closely related *T. siamensis*.

Boiga multomaculata (Boie, 1827)

Specimen examined: One adult male (ZFMK 88923), collected by K. D. Le in August 2008 in the bamboo forest, Cat Loc area, Lam Dong Province (near 11°37'22.5"N 107°17'57.2"E, 135 m a.s.l.).

Characteristic features: The morphological features of this specimen agree with the descriptions of Bourret (1936), Smith (1943), and Campden-Main (1970): SVL 588 mm; TaL 158 mm; 1 loreal; 1 preocular; 2 postoculars; 8 SL; 10 IL; 19 MD; 215 VEN; 93 SC; head with two dorsal dark brown stripes, from snout to neck. For colouration in life see Fig. 2b.



Fig. 2. a. *Typhlops siamensis* (ZFMK 88922); b. *Boiga multomaculata* (ZFMK 88923); c. *Calamaria pavementata* (ZFMK 88924); d. *Coelognathus flavolineatus* (ZFMK 88898). Photographs: E. Galoyan & P. Geissler.

Calamaria pavementata Dumeril & Bibron 1854

Specimen examined: One subadult specimen (ZFMK 88924), collected by K. D. Le in June 2008, in Cat Loc area, Lam Dong Province (near 11°37'22.5"N 107°17'57.2"E, 135 m a.s.l.).

Characteristic features: The morphological features of this specimen fit the descriptions of Bourret (1936), Smith (1943), and Ziegler et al. (2007): SVL 208 mm; TaL 15.9 mm; snout obtuse; no supranasals; no loreals; no temporals; 13 MD (smooth); 158 VEN; 17 SC; dorsum dark brown or grey; 6 black dorsolateral stripes; yellow collar, narrowing dorsally; tail with 2 yellow cross bands. For colouration in life see Fig. 2 c.

Remarks: This is the southernmost record of this species from Vietnam (compared with Nguyen et al. 2009).

Coelognathus flavolineatus (Schlegel, 1837)

Specimen examined: One adult female (ZFMK 88898), collected by P. Geissler in April 2009, on the forest floor, in a mixed forest near Bau Sau Lake, Cat Tien National Park, Dong Nai Province (near 11°27'32.9"N 107°20'43.7"E, 167 m a.s.l.).

Characteristic features: The morphological traits of this specimen agree with the descriptions of Bourret (1936) and Smith (1943): SVL 1,307 mm; TaL 374 mm; 1 elongated loreal; 1 preocular; 2 postoculars, 8 SL; 10 IL; 19 MD, keeled; 212 VEN; 96 SC, divided; dorsum brown, with a orange, black edged vertebral stripe; vertebral stripe disappearing in the posterior half of body, which is uniformly dark brown. For colouration in life see Fig. 2d.



Fig. 3. a. *Dendrelaphis ngansonensis* (ZFMK 88913); b. *Lycodon subcinctus* (adult, IEBR A.2010.42); c. *Lycodon subcinctus* (juvenile, ZFMK 91899); d. *Oligodon deuvei* (ZMMU NAP-02811); e. *Oligodon ocellatus* from Cat Tien National Park, Dong Nai Province (e); f. *Xenochrophis flavipunctatus* (ZFMK 88914). Photographs: E. Galoyan, P. Geissler, W. Van Devender.

Dendrelaphis ngansonensis (Bourret, 1935)

Specimens examined: One adult male (ZFMK 88913), collected by P. Geissler on 22 July 2008, in a secondary forest near Bau Sau Lake, Cat Tien National Park, Dong Nai Province (near 11°27'32.9"N, 107°20'43.7"E, 160 m a.s.l.). It was found in the morning, basking on a sunny spot on the lava-rock-covered forest floor.

Characteristic features: The characters of the specimen fit the descriptions given by Bourret (1935, 1936) and Ziegler & Vogel (1999): SVL 824 mm; TaL 419 mm; 25 dentary teeth; 15 MD; 188 VEN (165–199 in the description of Ziegler & Vogel 1999); 153 SC; vertebral dorsals enlarged; dorsum bronze-brown; presence of a distinct black stripe from the posterior margin of the eye to the neck; scales on dorsolateral neck and anterior part of body with bluish margin. For colouration in life see Fig. 3a.

Remarks: According to Ziegler & Vogel (1999) and Nguyen et al. (2009) this species has been known only from northern and central Vietnam and Quang Nam Province has been known to be the southernmost locality of the species' range. Our record from Cat Tien National Park extends the known distribution about 500 km southwards to the lowland forests of southern Vietnam (see Fig. 3). The distribution gap seen in the map leads to the suggestion that *D. ngansonensis* is also present on or along the Central Highlands as well as the Da Lat Plateau. Like in other localities in Vietnam (Ziegler & Vogel 1999), *Dendrelaphis pictus* (Gmelin, 1789) can be found in the same habitats with its congener, affirming the species status of *D. ngansonensis*, which was originally considered as a subspecies of *D. pictus*.

Lycodon subcinctus Boie, 1827

Specimens examined: One adult male (IEBR A.2010.42), collected by W. Van Devender in June 2004, near the headquarters of Cat Tien National Park, Dong Nai Province (near 11°25'19.3"N, 107°25'42.0"E, 104 m a.s.l.). One juvenile (ZFMK 91899), collected by W. Van Devender on 9 June 2004, near Suoi Rang Ranger Station, Cat Tien National Park, Dong Nai Province. One juvenile (IEBR A.2010.43), collected by W. Van Devender in 2006 in Cat Tien National Park, Dong Nai Province.

Characteristic features: The morphological traits of the specimens (data given in the following order: IEBR A.2010.42/ZFMK 91899/IEBR A.2010.43) fit the descriptions of Smith (1943); Daltry & Wüster (2002), and Ziegler et al. (2007): SVL 651 mm / 276 mm / 228 mm; TaL 159 mm / 65 mm / 55 mm; head with broad blunt snout; preocular absent; prefrontal and loreal in contact with the eye; 8 SL, 4 suboculars; 17 MD, smooth; 201/202/201 VEN; precloacal scale divided; 71/72/87 SC, divided; juveniles black above with white cross bands (Fig. 3c); adult darker, cross bands absent on posterior part of body (Fig. 3b).

Oligodon deuvei David, Vogel & van Rooijen, 2008

Specimens examined: One juvenile specimen (IEBR A.2010.16), collected by local people on 29 May 2004. An adult male (IEBR A.2010.17), collected by P. Moler in May 2004. Another adult male (ZFMK 91226), collected by P. Moler in 2005. These specimens were found near the Headquarters of Cat Tien National Park, Dong Nai Province (near 11°27'32.9"N, 107°20'43.7"E). One adult male (ZMMU NAP-02811), collected by N. Po-

yarkov on 8 November 2007, in Cat Tien Village on the eastern bank of the Dong Nai River, Dong Nai Province.

Characteristic features: The morphological characters of four specimens from Cat Tien National Park agree with the description given by David et al. (2008b): SVL 283–361 mm; TaL 59.0–68.2 mm; 17 MD, 15 MD before vent; 14 maxillary teeth, the posterior two strongly enlarged; 8–9 IL; 8 SL; no presubocular; a conspicuous, pale yellow vertebral stripe, edged with two darker faint paravertebral stripes or with lines of dark dots in the paravertebral region; 4–5 markings on dorsal head surface: one transverse band across the snout, one sagittal blotch between the orbits, two streaks behind the orbit, directed posteriorly downwards, and one broad arrow shaped blotch on the neck. In one specimen (ZMMU NAP-02811), three nuchal blotches are fused to one butterfly-shaped marking, and a number of small irregular dots are present on the forehead. Measurements and selected scale counts, in comparison with data of the type specimens provided by David et al. (2008b), are given in Table 1.

Colouration: In accordance with Deuve's (1985) unpublished manuscript, our specimens have a grey dorsum. The yellow vertebral stripe is broad on the neck, narrowing backwards, and edged by two dark brown paravertebral stripes. Though not mentioned by Deuve (1985) or David et al. (2008b) our specimens have a dark grey dorsolateral stripe (aligned dark brown dots in preserved specimens). Large dark blotches are present on upper tail surface in the holotype but they are lacking in our specimens. Venter and lower surface of the tail are pinkish red with numerous rectangular and subrectangular blackish-brown spots. These spots are lacking in the posterior half of the tail (Fig. 3d).

Remarks: Here we provide the first record for the Cat Tien National Park and the second collection of the species after the description of David et al. (2008b). Our data support the sexual dimorphism observed by David et al. (2008b). Due to the lower number of subcaudals and the shorter tail length, we assume that the juvenile specimen (IEBR A.2010.16) is a female. The specimens in our collection slightly differ from the type series by having a higher TL/TaL ratio in males and by having eight supralabials (this character only occurs in one of 17 specimens examined by David et al. 2008b). For the first time a colour photograph of a living specimen is provided showing the coloration of the dorsum as well as the red underside of the tail, which is used by the snake for defensive display (Fig. 3d). Our observations in the field indicate that this snake species was mostly active during twilight, but was twice observed actively foraging at day time. *O. deuvei* was found along the riverside and neighbouring rural areas. The stomach of ZMMU NAP-02811 contained

Table 1. Measurements and selected scale counts of *Oligodon deuvei* specimens from Cat Tien National Park in comparison with the type series (for abbreviations see Material and Methods).

	Type specimens (David et al. 2008)	IEBR A.2010.17 (♂)	ZFMK 91226 (♂)	ZMMU NAP-02811 (♂)	IEBRA. 2010.16 (juv.) (♂)
TL (mm)	up to 333 535 (♀)	342	384.2	328.5	108.8
SVL (mm)	up to 275 (♂) 302 (♀)	283	316	271	95.1
TaL (mm)	up to 58 (♂) 51 (♀)	59	68.2	57.5	13.7
TaL/TL	(♂): 0.158–0.172 (♀): 0.132–0.149	0.173	0.178	0.175	0.126
VEN	(♂): 140–147 (♀): 147–155	148	151	144	158
SC	(♂): 36–73 (♀): 31–38	42	40	40	33
SL	7–8	8/8	8/8	8/8	8/8
IL	8–9	9/9	9/9	9/9	9/9

one juvenile frog (*Fejervarya limnocharis*) and two unidentified anuran tadpoles.

Oligodon ocellatus (Morice, 1875)

Specimens examined: Two female specimens (ZFMK 88919–88920), collected by P. Geissler in Cat Tien National Park, Dong Nai Province. One female specimen (IEBR A.2010.54.), collected by W. Van Devender on 28 May 2004, near Bau Sau Lake, Dong Nai Province (near 11°27'32.9"N 107°20'43.7"E, 167 m a.s.l.).

Characteristic features: The morphological traits of the specimens (data given in the following order: ZFMK 88919 / ZFMK 88920 / IEBR A.2010.54) from Cat Tien National Park fit the descriptions of David et al. (2008a): SVL 405 mm / 199 mm / 209 mm; TaL 108 mm / 28.3 mm / 29.7 mm; 1 presubocular; 8 SL; 9 IL; 19 MD; 173 / 159 / 165 VEN; precloacal scale undivided; 59 / 59 / 41 SC; dorsum light brown, with 11–14 dark brown blotches, edged with black; dark brown cross bands along the dorsum; head dark brown. For colouration in life see Fig. 3e.

Remarks: The occurrence in the Cat Tien National Park, Dong Nai Province is the southernmost record of this species in Vietnam (compare with Nguyen et al. 2009).

Xenochrophis flavipunctatus (Hallowell, 1861)

Specimens examined: One juvenile specimen (IEBR A.2010.46), collected by W. Van Devender in 2006, in Cat Tien National Park, Dong Nai Province. One subadult specimen (ZFMK 88914), collected by P. Geissler on 19

May 2009 at the headquarters of the Cat Tien National Park, Dong Nai Province (near 11°25'19.3"N, 107°25'42.0"E, 104 m a.s.l.).

Characteristic features: The morphological characters of the specimens (data given in the following order IEBR A.2010.46 / ZFMK 88914) fit the descriptions of Bourret (1936), Smith (1943), and Ziegler et al. (2007): SVL 206 mm / 244 mm; TaL 76 mm / 119 mm; 1 loreal; 1 preocular; 3 postoculars; 8 SL; 10 IL; 19 MD, keeled; 136 / 125 VEN; precloacal scale divided; 77 / 85 divided SC; head and dorsum grey; light band from the eye to the angle of the mouth, edged with black; parietals with a light blotch, edged with dark brown (in juveniles); lateral sides of neck yellow; flanks with a series of black blotches. For colouration in life see Fig. 3f.

DISCUSSION

In their review of the herpetofauna of the Cat Tien National Park, Nguyen & Ho (2002) listed 42 species of snakes, which is almost 21% of the 203 snake species known from Vietnam (Nguyen et al. 2009, Orlov et al. 2010, Ziegler & Nguyen 2010). These records were based on their unpublished reports and examination of voucher specimens. After reviewing the list, we regard one record as questionable. The record of "*Homalopsis fasciatus*", which is based on an unpublished report, is obviously incorrect as this taxon does not exist in current faunal works in this region (Bourret 1936, Nguyen et al. 2009). Besides nine new records based on voucher specimens, the presence of *Boiga guangxiensis* in the Cat Tien National Park was proven by a photograph taken by W. Van Devender (pers. comm.). Nguyen & Ho (2002) reported the occur-

Table 2. List of snake species recorded from Cat Tien National Park (Dong Nai and Lam Dong provinces).

Taxon	Nguyen (1988)	Le et al. (1998)	Nguyen & Ho (2002)	This study
Typhlopidae				
<i>Ramphotyphlops braminus</i> (Daudin, 1803)	x		x	IEBR A.2010.51–A.2010.52 ZFMK 88925 ZFMK 88922
<i>Typhlops siamensis</i> Günther, 1864				
Cylindrophiiidae				
<i>Cylindrophis ruffus</i> (Laurenti, 1768)	x		x	—
Pythonidae				
<i>Python bivittatus</i> Kuhl, 1820	x	x	x	—
<i>Python reticulatus</i> (Schneider, 1801)	x	x	x	—
Xenopeltidae				
<i>Xenopeltis unicolor</i> Reinwardt in Boie, 1827			x	—
Colubridae				
<i>Aliaetulla prasina</i> (Reinhardt, 1827)	x		x	IEBR A.2010.53
<i>Boiga cyanea</i> (Duméril, Bibron & Duméril, 1854)			x	—
<i>Boiga guangxiensis</i> Wen, 1998				
<i>Boiga multomaculata</i> (Boie, 1827)				ZFMK 88923
<i>Boiga siamensis</i> Nootpand, 1971			x	—
<i>Calamaria pavementata</i> Duméril, Bibron & Duméril, 1854				ZFMK 88924
<i>Chrysopelea ornata</i> (Shaw, 1802)	x		x	ZFMK 88905–88907 ZFMK 88898
<i>Coelognathus flavolineatus</i> (Schlegel, 1837)				
<i>Coelognathus radiatus</i> (Boie, 1827)	x	x	x	—
<i>Dendrelaphis ngansonensis</i> (Bourret, 1935)				ZFMK 88913
<i>Dendrelaphis pictus</i> (Gmelin, 1789)	x		x	ZFMK 88912
<i>Dryocalamus davisonii</i> (Blanford, 1878)			x	ZFMK 88929–88930, 91898 IEBR A.2010.46
<i>Gonyosoma oxycephalum</i> (Boie, 1827)			x	—
<i>Lycodon laoensis</i> Günther, 1864			x	ZFMK 88928
<i>Lycodon subcinctus</i> Boie, 1827				IEBR A.2010.42–A.2010.43 ZFMK 91899
<i>Oligodon cinereus</i> (Günther, 1864)			x	ZFMK 88921
<i>Oligodon deuvei</i> David, Vogel & van Rooijen, 2008				IEBR A.2010.16–A.2010.17 ZFMK 91226 ZMMU NAP-02811
<i>Oligodon fasciolatus</i> (Günther, 1864)			x*	—
<i>Oligodon ocellatus</i> (Morice, 1875)				IEBR A.2010.54 ZFMK 88919–88920
<i>Ptyas korros</i> (Schlegel, 1837)	x	x	x	ZFMK 88915
<i>Ptyas mucosa</i> (Linnaeus, 1758)	x	x	x	—
<i>Rhabdophis chrysargos</i> (Schlegel, 1837)		x	x	IEBR A.2010.45
<i>Rhabdophis subminiatus</i> (Schlegel, 1837)			x	ZFMK 88908–88909
<i>Sibynophis collaris</i> (Gray, 1853)			x	—
<i>Xenochrophis flavipunctatus</i> (Hallowell, 1861)				IEBR A.2010.46, ZFMK 88914
Homalopsidae				
<i>Enhydris bocourti</i> (Jan, 1865)	x		x	IEBR A. 2010.55–A.2010.56 ZFMK 88926
<i>Enhydris enhydris</i> (Schneider, 1799)	x		x	—
<i>Homalopsis buccata</i> (Linnaeus, 1758)	x		x	ZFMK 88927
Pareatidae				
<i>Pareas carinatus</i> (Boie, 1828)			x	ZFMK 88910–88911
<i>Pareas margaritophorus</i> (Jan, 1866)			x	IEBR A.2010.44
Lamprophiidae (incertae sedis)				
<i>Psammodynastes pulverulentus</i> (Boie, 1827)			x	ZFMK 88900–88904
Elapidae				
<i>Bungarus candidus</i> (Linnaeus, 1758)			x	—
<i>Bungarus fasciatus</i> (Schneider, 1801)	x		x	—
<i>Calliophis maculiceps</i> (Günther, 1858)			x	IEBR A.2010.48, ZFMK 91900
<i>Naja kaouthia</i> Lesson, 1831			x	—
<i>Naja siamensis</i> Laurenti, 1768	x	x	x	—
<i>Ophiophagus hannah</i> (Cantor, 1836)	x	x	x	—
Viperidae				
<i>Calloselasma rhodostoma</i> (Kuhl, 1824)			x	—
<i>Cryptelytrops albolabris</i> (Gray, 1842)	x	x	x	IEBR A.2010.49 ZFMK 91897
<i>Cryptelytrops rubeus</i> Malhotra, Thorpe, Mrinalini & Stuart, 2011 (listed as <i>C. macrops</i> by Nguyen & Ho 2002)			x	IEBR A.2010.50 ZFMK 88916–88918
<i>Viridovipera stejnegeri</i> (Schmidt, 1925)			x	—

rence of *Cryptelytrops macrops* in the Cat Tien National Park. However, Malhotra et al. (2011) recently described the Ruby-eyed Green Pitviper *Cryptelytrops rubeus* from southern Vietnam and Cambodia. The distribution of *Cryptelytrops macrops* is now restricted to Thailand, Cambodia, and Laos (Malhotra et al. 2011). Based on our specimens with the red eye, we herein confirm the presence of *Cryptelytrops rubeus* in the Cat Tien National Park. The updated checklist of 51 species of snakes of Cat Tien National Park is provided in Table 2. For the generic composition of snakes we follow Pyron et al. (2010).

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