

***Amphiesmoides ornaticeps* (Werner, 1924), an addition to the snake fauna of Vietnam, with a redescription and comments on the genus *Amphiesmoides* Malnate, 1961 (Squamata: Natricidae)**

Quang Truong NGUYEN^{1,7}, Patrick DAVID², Thanh Tung TRAN³, Quang Vinh LUU⁴, Khac Quyet LE⁵, Thomas ZIEGLER^{6,*}

¹Institute of Ecology and Biological Resources, 18 Hoang Quoc Viet St., Hanoi, Vietnam. E-mail: nqt2@yahoo.com

²UMS 602 Taxinomie-collection - Reptiles & Amphibiens, Département Evolution et Systématique, CP 30, Muséum National d'Histoire Naturelle, 57 rue Cuvier, F-75231 Paris Cedex 05, France. E-mail: pdavid@mnhn.fr

³Vinh Phuc College of Education, Phuc Yen, Vinh Phuc, Vietnam.
E-mail: tranthanhtung_cdspvinhphuc@yahoo.com.vn

⁴Forestry University of Vietnam, Xuan Mai, Hanoi, Vietnam.
E-mail: qvinhfuv@yahoo.com.au

⁵College of Science, Vietnam National University Hanoi, 334 Nguyen Trai Str., Hanoi, Vietnam. E-mail: quyet2004@gmail.com

⁶AG Zoologischer Garten Köln, Riehler Str. 173, D-50735 Köln, Germany. E-mail: ziegler@koelnerzoo.de

⁷Zoologisches Forschungsmuseum Alexander Koenig, Adenauerallee 160, D-53113 Bonn, Germany.

*corresponding author

***Amphiesmoides ornaticeps* (Werner, 1924), an addition to the snake fauna of Vietnam, with a redescription and comments on the genus *Amphiesmoides* Malnate, 1961 (Squamata: Natricidae).** - Natricine specimens recently collected in northern Vietnam are referable to *Amphiesmoides ornaticeps*, a barely known species previously recorded only from southeastern China. Besides the first country record for Vietnam, we provide records of the species from the provinces of Bac Giang, Hoa Binh, and Nghe An. Morphological characters of Vietnamese specimens agree well with those of China. The status of the genus *Amphiesmoides* is discussed on the basis of morphological analyses. Preliminary results show that *Amphiesmoides ornaticeps* is morphologically distinct from the genus *Amphiesma* Duméril, Bibron & Duméril, 1854.

Keywords: Indochinese Region - Vietnam - Serpentes - Natricidae - *Amphiesmoides* - *Amphiesma*.

INTRODUCTION

The natricine species *Tropidonotus ornaticeps* was described by Werner (1924) on the basis of a female specimen that was collected in May 1903 on Hainan Island. Obviously not aware of Werner's (1924) description, Schmidt (1925) described *Natrix*

andrewsi also from Hainan. A decade later, Pope (1935) synonymized both taxa. Mell (1931) and Bourret (1936) listed the species in the genus *Macropophis* and Malnate (1961) subsequently created the new genus *Amphiesmoides* based on vertebral, hemipenial and dentitional characters. This position has been accepted by subsequent authors, for example Welch (1988) and Zhao & Adler (1993). Recently, Ziegler & Le (2006) described *Amphiesma andreae*, a phenetically similar natricine species from central Vietnam, and referred to the need of further taxonomic studies to clarify the generic allocation of some water snake species including representatives of *Amphiesma* and the monotypic genus *Amphiesmoides*.

Amphiesmoides ornaticeps is still a poorly known species, recorded to date only from the provinces of Guangxi, Hainan, Guangdong and Fujian in southeastern China (Zhao & Adler, 1993; Zhao *et al.*, 1998; Zhao, 2006). Virtually nothing has been published on the biology of this species in China.

Herein we report about the first record of *Amphiesmoides ornaticeps* from Vietnam. Based on these recent findings from three provinces in the north of the country we provide an expanded description of this species. We further discuss some morphological characters considered diagnostic of the genus *Amphiesmoides* Malnate, 1961.

MATERIALS AND METHODS

The description is based upon external morphological characters regarded as taxonomically significant in the genus *Amphiesma* as defined by Malnate (1960, 1961, 1962) and used by Ziegler & Le (2006) and David *et al.* (2007). Maxillary teeth were counted by dissecting the right maxilla of one specimen and, for other specimens, in removing the exterior gum surfaces of the jaw *in situ*. Dentitional data of other species were obtained in the same way (tooth sockets were included in the counts in cases of tooth loss). Measurements, except body and tail lengths, were taken with a slide-calliper to the nearest 0.1 mm; all measurements on body were measured to the nearest millimetre. The number of ventral scales is counted according to Dowling (1951). The numbers of dorsal scale rows are given at one head length behind head, at midbody (i.e. at the level of the ventral plate corresponding to half of the total ventral number), and at one head length before vent respectively. The terminal scute is not included in the number of subcaudals. Values for symmetric head characters are given in left/right order.

Abbreviation of measurements and other meristic characters used in the text are:

Measures and ratios: HL: head length. – SVL: snout-vent length. – TaL: tail length. – TL: total length. – TaL/TL: ratio tail length/total length.

Meristic characters: ATe: anterior temporals. – DSR: formula of dorsal scale rows. – MSR: number of dorsal scale rows at midbody. – PosOc: postoculars. – PreOc: preoculars. – IL: infralabials. – SC: subcaudals. – SL: supralabials. – SupOc: supraoculars. – VEN: ventrals.

Museum abbreviations: IEBR – Institute of Ecology and Biological Resources, Vietnamese Academy of Science and Technology, Hanoi, Vietnam. MHNG – Department of Herpetology and Ichthyology, Muséum d'histoire naturelle, Geneva,

Switzerland. MNHN – Muséum National d'Histoire Naturelle, Paris, France. T.TYT – Vinh Phuc College of Education, Vinh Phuc, Vietnam. VNUH – Vietnam National University, Hanoi, Vietnam. ZFMK – Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany.

RESULTS

MORPHOLOGICAL VARIATION IN *AMPHIESMOIDES ORNATICEPS*

Description: This description is based on Pope (1935), Zhao *et al.* (1998), and 11 examined specimens.

The body is relatively slender, laterally compressed; the head is elongate, distinct from the neck; the snout is long, about 28-30 % of head length, but only 1.1-1.3 times as long as diameter of the very large eye; eye 3.0-3.4 times longer than the distance eye-lip. The tail is long and tapering progressively.

The largest total length known is 874 mm for a male (SVL 559 mm, TaL 315 mm; T.TYT 687; Fan [1931] had recorded a male 873 mm long). The largest known female is 857 mm long (SVL 572 mm, TaL 285 mm; Zhao *et al.*, 1998); however, we examined a female, with a truncated tail, with a SVL of 626 mm (T.TYT 695). Ratio TaL/TL: 0.317-0.379, without clear sexual dimorphism.

Dentition: Based on 5 examined specimens: maxillary teeth: 38-46 gradually enlarged + 2 slightly enlarged teeth posteriorly, without diastema.

DSR: 19-19-17, strongly keeled on DSR 2-10, moderately keeled on 1st DSR. The reductions (DSR 4+5 → 4) appear at VEN 105-116.

VEN: 157-168 (plus 1-2 preventrals), all undivided except for ventrals 3-6 being divided in the juvenile specimen from Nghe An; *SC:* 114-131, all paired; anal shield divided.

There seems to be a weak sexual dimorphism in the number of subcaudals: 1 male with a complete tail has 131 SC, whereas 5 females have 116-127 SC. The values given by Fan (1931) for 3 males (116-119) seem to be quite low.

Head scalation: Rostral hexagonal, wider than high; nasals subrectangular, longer than high, divided below the nostril, with crescentic, laterally opening nostril in its middle; internasals narrowing anteriorly, wider than long and about 0.5-0.6 times as wide anteriorly than posteriorly; prefrontals subrectangular, broader than long, reaching loreal; frontal hexagonal, 1.4-1.5 times longer than wide, with apex directed posteriorly, 2.5-3.0 times longer than suture between prefrontals; parietals long and wide, in contact for a length about as great as the frontal length; 1/1 loreal, rectangular, nearly as high as long, in broad contact with nasal; 1/1 preocular, much higher than wide; 3 or usually 4 postoculars; 8 or 9 supralabials, SL 1-2 in contact with nasal, SL 2-3 in contact with loreal, SL 4-6 (4-7 in one occurrence) entering orbit, 7-8 largest; 2+2 or 2+3, or (1+1)/1 + 3 temporals; 8 or 9 infralabials, 1st IL in contact behind the mental, 5 anterior IL in contact with anterior chin shields; posterior chin shields longer than anterior ones.

Coloration in preservative: Body and upper tail surfaces are light greyish-brown on their sides, with irregular brown marbling and numerous scales edged with



FIG. 1

Amphiesmoides ornaticeps from Bac Giang Province. Phot. Quang Truong Nguyen.

blackish-brown; upper surface of body with a broad, dark grey or dark greyish-brown dorsal stripe on rows 7-11, with large squarish blotches or irregular darker crossbars. The dorsal series of dark blotches stretches towards the tail. In juvenile specimens, the dark dorsal blotches are conspicuous within the dorsal body band. However, these blotches tend to become indistinct or totally disappear with age. The neck is cream or light grey with one lateral and one dorsal series of large, elongate blackish-brown blotches that tend to fuse especially immediately behind the head; these blotches continues as the dark dorsal band on the body. The tail is as the body on its anterior half; the posterior part of the tail is generally greyish-brown with dark marbling. The dorsal stripe becoming narrower and disappears near the tip of the tail; it is more conspicuous in juvenile specimens.

The head is uniformly brownish-grey to olive-grey, paler on the side of the snout and on the sides of the neck. A conspicuous white or cream vertical streak before and behind the eye, the posterior one much larger. These streaks are edged with black and widen towards the supralabials. The two supralabials below the eye are blackish-brown, with a crescent-shaped cream blotches at their lower edges. The chin and throat are uniformly cream or beige. Posterior infralabials edged with dark vertical stripes.

The venter is cream or beige, light greyish-brown as the body on the tip of ventrals; tips of ventrals with blackish-brown spots, consisting of dark edges and a dark



FIG. 2

Amphiesmoides ornaticeps from Hoa Binh Province. Phot. Quang Vinh Luu.

longitudinal stripe or series of dark blotches, especially distinct behind the neck region. Underside of tail in part mottled with tiny dark blotches in its middle.

Coloration in life (Figs. 1-3): The coloration and pattern are broadly similar to those of the preserved specimens. The dorsal colour is much more vivid. The head is yellowish-orange brown in juveniles and becomes rusty brown with age. The light streaks around the eyes are white to cream in life. The dark neck blotches are red to reddish-brown in juveniles and dark brown in adults. These dark neck blotches are surrounded by white to pale brown scales in juveniles and whitish-brown to greyish-brown scales in adults. Ground colour of body sides is olive-brown to red-brown with more or less distinct dark brown marbling. Upper dorsum consists of a dark olive to grey-brown longitudinal band which shows dark brown cross bars in some specimens. Underside and lower body sides are white to cream. Towards the tail the dorsal pattern becomes more indistinct and is olive-brown to red-brown with in part indistinct dark brown marbling or blotches.

DISTRIBUTION (Fig. 4)

Vietnam: *Amphiesmoides ornaticeps* is currently known from several localities in the provinces (from North to South) of Bac Giang (Tay Yen Tu Nature Reserve: IEBR 3628; MNHN 2009.0251; MHNG 2712.98; T.TYT 24, 687, 695, 727; ZFMK



FIG. 3

Juvenile *Amphiesmoides ornateps* from Nghe An Province. Phot. Khac Quyet Le.

88857, 88858), Hoa Binh (Thuong Tien Nature Reserve: photographic record), and Nghe An (Pu Hoat Nature Reserve: VNUH 5.4.'09-1).

People's Republic of China: known from the provinces of Fujian (Nanjing, or Shanchengzhen, Nanjing County), Hainan Island ("Nodoo", now Dan Xian or Nada, Zhan County; Jianfengling; Dabiancun, Limu Ling Mts., Yinggen County; Linshui, Ledong County), and Guangxi Autonomous Region ("Loshiang", now Louxiang, Jinxiu County); seemingly not recorded from Guangdong Province.

BIOLOGY

Specimens from Bac Giang were found both during the day and at night in April and May 2007 and 2008, near small streams in mixed secondary forest of small wooden trees and bamboo, at elevation of ca. 150-250 m a.s.l. (Fig. 5). The specimen from Hoa Binh was collected in the morning of 27 April 2009, in shrub near a track. The habitat consisted of contiguous stream in secondary forest, altitude ca. 280 m. The juvenile from Nghe An was discovered in the morning of 5 April 2009, in evergreen forest, altitude 720 m (Fig. 6).

Specimen MNHN 2009.0251 from Bac Giang had a distinctly swollen stomach and gut region and thus was subsequently dissected. It had swallowed a *Hylarana* cf. *macroactyla* of ca. 30 mm SVL and additionally seven smaller ranid froglets with 17-20 mm SVL.

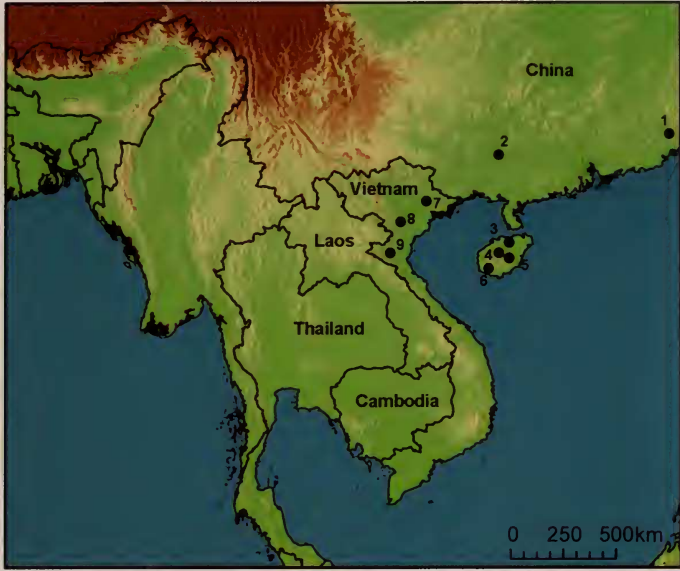


FIG. 4

Known distribution of *Amphiesmoides ornaticeps* in southeastern China (1. Nanjing, 2. Luoxiang, 3. North Hainan, Jianfengling, see Chu & Huang 1992, 4. Nada, 5. Limu Ling, 6. Linshui) and northern Vietnam (7. Yen Tu, 8. Thuong Tien, 9. Pu Hoat).

STATUS OF THE GENUS *AMPHIESMOIDES* MALNATE, 1961

Among the recent authors having discussed the taxonomy of Chinese snakes, Yang & Inger (1986), Zhao & Adler (1993), Zhao *et al.* (1998) and Zhao (2006) followed Malnate (1961) and placed the single species *ornaticeps* in the genus *Amphiesmoides* (see also an overview in Ziegler & Le, 2006). However, *Amphiesmoides* seems to be at least closely associated with *Amphiesma*. Malnate (1961) listed only three differences between *Amphiesmoides ornaticeps* and taxa of the genus *Amphiesma*, namely the higher number of maxillary teeth in *ornaticeps* (more than 40), the larger eye in *ornaticeps* (about 25 % of the head length versus 15-17 % in “*modesta* and allied forms”) and the absence of hypapophyses on the posterior vertebrae in *ornaticeps* (but see discussion in Malnate 1960: 68-69). Two of these characters require some comments. Firstly, the number of teeth in five specimens of *Amphiesmoides ornaticeps* varies from 38 to 46. Malnate (1961) stated that this high count was “approached by *A. deschauenseei*”. However, we counted only 27-30 upper maxillary teeth in five specimens of *A. deschauenseei*, so a value quite far from the number recorded in *A. ornaticeps*. Furthermore, the last two upper maxillary teeth are enlarged in *A. deschauenseei* and other species of *Amphiesma*, sometimes even distinctly (*A. stolatum*, *A. platyceps*, *A. clerki*, for example), whereas they are barely enlarged in *Amphiesmoides ornaticeps*.

The second character is the relative size of the eye. According to our own data, the ratio between the horizontal diameter of the eye and the length of the head varies in six specimens of *Amphiesmoides ornaticeps* from 0.23 to 0.25 ($x = 0.245$), a value



FIGS 5-6

(5) Habitat of *Amphiesmoides ornaticeps* in Bac Giang Province. Phot. Quang Trung Nguyen.
(6) Habitat of *Amphiesmoides ornaticeps* in Nghe An Province. Phot. Khac Quyet Le.

identical with Malnate's (1961) data on Chinese specimens. According to our data (David, unpublished) based altogether on several dozens of *Amphiesma* specimens, this ratio varies as follows: 1) group of *Amphiesma modestum* (*A. modestum*, *A. deschauenseei*, *A. venningi*, *A. taronense*, and other taxa under investigation), 0.12-0.16; 2) group of *Amphiesma parallelum* (*A. parallelum*, *A. bitaeniatum*, *A. platyceps*, and others), 0.16-0.21; and 3) group of *A. khasiense* (*A. khasiense*, *A. boulengeri*, *A. sauteri*, and so on), 0.15-0.21. So, although we agree with Malnate's (1961) values, there is not such a wide difference between *Amphiesmoides ornaticeps* and at least two of the groups of *Amphiesma* with which we are familiar.

Another character was investigated here, namely the position (in number of subcaudals) to which the number of scale rows on the tail reduces from 8 to 6. Malnate (1960) noticed that this character is quite significant in the genus *Amphiesma*. In the three groups of *Amphiesma* considered above, the values (sex related) of the point of reduction are as follows:

A. modestum-group: males: 14-22, females: 4-18,

A. khasiense-group: males: 9-28, females: 5-23,

A. parallelum-group: males: 13-28, females: 9-23.

In *Amphiesmoides ornaticeps*, the ranges, based on six specimens, are: males: 31-38, females: 32-40. Besides the number of upper maxillary teeth, this position of the reduction to 6 tail scale rows is a second character differentiating *Amphiesmoides* from all species of *Amphiesma*.

The tail offers another interesting character. The reduction from 6 to 4 scale rows occurs between the level of subcaudal scales 60 to 70, namely between 51.1 and 57.4 % of the number of subcaudals in the specimens with a complete tail. The position of this reduction posterior to the midnumber of subcaudals is one of the four diagnostic characters used by Malnate & Underwood (1988) to define the genus *Tropidonophis* Jan, 1863. It was resurrected to accommodate natricine species previously placed in the genera *Macropophis* or *Amphiesma*. These authors assigned to this genus natricine species of the Philippines and Australasia which showed at least three of the four following characters: (1) presence of a pit at the outer posterior corner of more than 10 % of the subcaudals; (2) an uniform number of DSR; (3) reduction of the number of caudal scale rows from 6 to 4 posterior to the midnumber of SC and the greatest length of the tail scale rows set is that of 6 rows; and (4) a subchoanal process on the palatine bone (see Malnate & Underwood, 1988: 63-66 for the definition of these characters). *Amphiesmoides ornaticeps* does not share with this definition the following characters (1) the subcaudal pits, which are entirely absent, (2) the DSR formula, with a reduction as 19-19-17 and (3) the length of the tail with 6 scale rows varying between 1.0 and 1.2 times the length of the tail with 4 rows in females, but only 0.6-0.7 in males. Character (4) was not investigated. So, although *Amphiesmoides* shares with *Tropidonophis* the large eyes, the high number of maxillary teeth, and the position of reduction to 6 tail scale rows posterior to the midnumber of subcaudals, both genera differ by at least three other characters considered diagnostic of *Tropidonophis* by Malnate & Underwood (1988).

As a consequence, on the basis of these morphological differences, we preliminary retain *Amphiesmoides* as a distinct, monophyletic genus apart from *Amphiesma*

and *Tropidonophis*. Molecular analyses of these and related natricine genera, which also will deal with this issue are currently under process but not finally resolved, and therefore will be published separately.

DISCUSSION

MORPHOLOGICAL COMPARISONS WITH CHINESE SPECIMENS

According to Pope (1935), Zhao *et al.* (1998) and Zhao (2006), main morphological characters of Chinese specimens are as follows: 19-19-17 DSR, strongly keeled; 157-168 VEN, 116-127 SC, Anal paired; 9 SL; 1 preocular, 4 (rarely 3) postoculars, 2+2 or 2+3 temporals, and 9 infralabials.

As, furthermore, the pattern of the examined Vietnamese specimens agree very well with the original description of Werner (1924) and descriptions given by the authors cited above, we have no hesitation in referring these Vietnamese specimens to *Amphiesmoides ornaticeps*, a species previously considered to be endemic to China. The sole difference is a slightly wider range of subcaudals recorded in Vietnamese specimens (114-131 vs. 116-127) and the occurrence of only 8 SL on one side of one Vietnamese specimen.

MORPHOLOGICAL COMPARISONS WITH OTHER SPECIES

Amphiesmoides ornaticeps is easily distinguishable from other natricine species recorded from Vietnam by (1) its large eyes, about as wide as the distance between the anterior edge of the eye and the tip of the snout; (2) its head pattern, in which the eye is edged with two white vertebral bars; (3) its pattern of the neck, with large blackish-brown blotches or ocelli on a light grey background.

In Vietnam, *Amphiesma atemporale* and *A. sauteri*, beside a totally different pattern, have 17 dorsal scale rows at midbody vs. 19 in *Amphiesmoides ornaticeps*. Among species with 19 rows, *Amphiesma stolatum* and *A. bitaeniatum* have two or more dorsal stripes, a different pattern on the neck, and a much lower number of subcaudal scales. *Amphiesma optatum* shows narrow pale crossbars on a deep bluish-black background color. *Amphiesma andreae* has wide pale crossbands anteriorly. *Amphiesma boulengeri* has two dorsal stripes on a dark background and elongate, white or cream blotches on posterior supralabials forming a postocular stripe extending on the neck. *Amphiesma leucomystax* has a broad, white stripe from the snout tip to the corner of the mouth, extending on the nape and forming a conspicuous chevron on the neck. In *Amphiesma popei*, supralabials are all white or cream, diffusely edged with black, and with a broad pale blotch on the nape, not touching the latest supralabial; furthermore, this species has 130-142 VEN vs. 157-165 VEN in *Amphiesmoides ornaticeps*. Lastly, *Amphiesma craspedogaster* differs by a yellow streak on the nape starting from the latest SL and less than 98 subcaudals, not withstanding a totally different dorsal pattern.

Parahelicops annamensis and *Pararhabdophis chapaensis* are two natricine species inhabiting northern and central Vietnam. Their status is currently being revised, with the description of a new species. All members of this group differ from *Amphiesmoides ornaticeps* by (1) a very dark dorsal pattern, with rusty brown or orange blotches; (2) usually a dark venter; (3) much smaller eyes; and (4) dorsolateral nostrils.

TABLE 1. Morphological characters of examined *Amphiesmoides ornaticeps* from Vietnam

Collection number	Sex	SVL (mm)	TaL (mm)	TaL/ TL	VEN	SC	SL	Tem	IL
T.TYT 687	M	559	315	0.360	161	131	9/9	2+2 / 2+3	8/8
MHNG 2712.98	M	517	—	—	163	—	9/9	2+2 / 2+3	8/8
IEBR 3628	M	542	268	0.331	159	—	9/9	2+3 / 2+3	9/9
MNHN 2009.0251	M	501	276	0.355	165	129	9/9	2+3 / 2+3	9/9
ZFMK 88857	M	378	196	0.341	165	123	9/9	2+3 / 2+4	9/9
T.TYT 727	F	377	199	0.345	165	122	9/9	2+3 / 2+3	8/8
T.TYT 695	F	626	—	—	164	—	9/9	2+3 / 2+3	9/9
T.TYT 24	F	561	285	0.337	166	119	9/9	2+3 / 2+3	9/9
ZFMK 88858	F	416	210	0.335	157	123	9/9	2+3 / 2+3	9/8
VNUH 5.4.09-1	juv.	269	125	0.317	159	114	8/9	2+2 / 2+2	9/8

As discussed above, *Amphiesmoides ornaticeps* shares some morphological characters with the genus *Tropidonophis* Jan, 1863, such as the high number of maxillary teeth and very large eyes. Members of this genus (see Malnate & Underwood, 1988) have all a constant number of dorsal scale rows, either 17 or 15, at the exception of *Tropidonophis negrosensis* (Taylor, 1917) from the Philippines. This species has 19-19-17 rows and 1/1 preocular, but differs by a lower number of subcaudals and a different pattern.

The affinities of *Amphiesmoides ornaticeps* remain to be precisely determined but its morphological characters make this species quite different from all other species of the genus *Amphiesma* as currently defined.

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REFERENCES

- BOURRET, R. 1936. Les serpents de l'Indochine. II. Catalogue systématique descriptif. *Henri Basuyau et Cie, Toulouse*, 505 pp.

- CHU, Y. & HUANG, Q. 1992. The herpetofauna of Mt. Jianfengling, Hainan, China, pp. 150-152.-in: JIANG, Y. (Ed.): A collection of papers on herpetology. *Sichuan Publishing House of Science and Technology*, Chengdu, [6]+157 pp.
- DAVID, P., BAIN, R. H., NGUYEN, Q. T., ORLOV, N. L., VOGEL, G., Vu, N. T. & ZIEGLER, T. 2007. A new species of the natricine snake genus *Amphiesma* from the Indochinese Region (Squamata: Colubridae: Natricinae). *Zootaxa* 1462: 41-60.
- DOWLING, H. G. 1951. A proposed standard system of counting ventrals in snakes. *British Journal of Herpetology* 1(5): 97-99.
- FAN, T. H. 1931. Preliminary report of reptiles from Yaoshan, Kwangsi, China. *Bulletin of the Department of Biology College of Science Sun Yatsen University*, 11: 1-154, Pls. 1-9.
- MALNATE, E. V. 1960. Systematic division and evolution of the colubrid snake genus *Natrix*, with comments on the subfamily Natricinae. *Proceedings of the Academy of Natural Sciences of Philadelphia* 112(3): 41-71.
- MALNATE, E. V. 1961. *Amphiesmoides*, a new genus for *Tropidonotus ornaticeps* Werner (Serpentes: Colubridae). *Proceedings of the Academy of Natural Sciences of Philadelphia* 341: 1-7.
- MALNATE, E. V. 1962. The relationships of five species of the Asiatic natricine snake genus *Amphiesma*. *Proceedings of the Academy of Natural Sciences of Philadelphia* 114(8): 251-299.
- MALNATE, E. V. & UNDERWOOD, G. 1988. Australasian natricine snakes of the genus *Tropidonophis*. *Proceedings of the Academy of Natural Sciences of Philadelphia* 140(1): 59-201.
- MELL, R. 1931. List of Chinese snakes. *Lingnan Science Journal* 8 [1929]: 199-219.
- POPE, C. H. 1935. The reptiles of China. Turtles, crocodilians, snakes, lizards. *American Museum of Natural History, New York, Natural History of Central Asia* 10: i-xlii + 1-604, Pls. 1-27.
- SCHMIDT, K. P. 1925. New reptiles and a new salamander from China. *American Museum Novitates, New York* 157 : 1-5.
- WELCH, K. R.G. 1988. Snakes of the Orient: A checklist. *Krieger Publishing Company, Malabar*, 183 pp.
- WERNER, F. 1924. Neue oder wenig bekannte Schlangen aus dem Naturhistorischen Staatsmuseum in Wien. *Sitzungsberichte Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse, Vienna, part 1* 133(1-3): 29-56.
- YANG, D. & INGER, R. F. 1986. Key to the snakes and lizards of China. *Smithsonian Herpetological Information Service* 71: 1-21.
- ZHAO, E. 2006. Zhongguo Shelei [Snakes of China], *Anhui Science and Technology Publishing House Publishing, Hefei (Anhui Province)*, Vol. I, 372 pp; Vol. II, 279 pp. (In Chinese).
- ZHAO, E. & ADLER, K. 1993. Herpetology of China. *Society for the Study of Amphibians and Reptiles, Contribution to Herpetology* 10, 522 pp.
- ZHAO, E. M., HUANG, M. H., ZONG, Y., ZHENG, J., HUANG, Z. J., YANG, D. & LI, D. J. (Eds.) 1998. Fauna Sinica. Reptilia Vol. 3. Squamata Serpentes. *Science Press, Beijing*, xvii + 522 pp., Pls. I-VIII, Col. Pls. I-IV (In Chinese).
- ZIEGLER, T. & LE, K. Q. 2006. A new natricine snake of the genus *Amphiesma* (Squamata: Colubridae: Natricinae) from the central Truong Son, Vietnam. *Zootaxa* 1225: 39-56.