

A new species of salamander, genus *Tylototriton* (Urodela: Salamandridae), from northern Vietnam

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Abstract. We describe a new species of *Tylototriton* from lowland forest of Bac Giang Province in northern Vietnam. The new species is mainly characterized by skin covered with relatively small warts and glands, flattened head, dorsal colour uniformly greyish tan or light brownish in life without larger orange or red dorsal markings. The species presumably reproduces in forest ponds during the rainy season. Records of *Tylototriton asperrimus* from northern Vietnam are briefly discussed.

Key words. Amphibia: Urodela: Salamandridae: *Tylototriton*; new species; Vietnam.

Introduction

Within the last decades the herpetofauna of Vietnam has received considerable attention from native and foreign researchers. As a result, the number of known species has increased remarkably. New records and species discoveries are the almost inevitable result of every scientific expedition to remote forest areas (e.g. INGER et al. 1999, ZIEGLER et al. 2000, 2004). Concerning salamanders, four species have so far been reported for the country: *Paramesotriton deloustali* (BOURRET, 1934), *Paramesotriton guanxiensis* (HUANG, TANG & TANG, 1983), *Tylototriton verrucosus* ANDERSON, 1871 and *Tylototriton asperrimus* UNTERSTEIN, 1930 (NGUYEN & HO 1996, ORLOV et al. 2002, SELGIE et al. 2003, NGUYEN et al. 2005). However, there are frequent anecdotal reports of supposedly undescribed species from northern Vietnam which sometimes occur in the pet trade (e.g. HERRMANN 2005). Recent field work of two of the authors (T. SCHÖTTLER and Q. T. NGUYEN) discovered the existence of one of these forms in Bac Giang Province, northern Vietnam (SCHÖTTLER 2003). Our investigations revealed that it indeed represents an unnamed species of the genus *Tylototriton* which we describe herein.

Material and methods

Specimens examined are deposited at Zoologisches Forschungsmuseum Alexander Koenig (ZFMK). Terminology and description of characters follow STUART & PAPENFUSS (2002). Abbreviations used are as follows: SVL = snout-vent length measured from tip of snout to anterior edge of vent; TTL = total length; TAL = tail length measured from posterior edge of vent to tail tip; TAD = maximum tail depth; HL = head length measured from posterior edge of parotoid to snout tip; HW = maximum head width; EN = eye-nostril distance measured from anterior corner of eye to nostril; IN = internostril distance; AL = anterior limb length measured from point of body insertion to tip of longest toe; PL = posterior limb length measured from point of body insertion to tip of longest toe. Skeletal characters were assessed using X-ray photography at ZFMK.

Results

Tylototriton vietnamensis sp. n.

Tylototriton asperrimus asperrimus: FLECK, 2003:3 (non UNTERSTEIN, 1930)

Tylototriton sp.: SCHÖTTLER, 2003:23; HERRMANN, 2005:21.

? *Echinotriton asperrimus* (partim): NGUYEN et al., 2005:9 (non UNTERSTEIN, 1930).

Holotype: ZFMK 80637, adult male (Figs. 1-2), from vicinity of Dong Vanh Village, Luc Son Commune, Luc Nam District, Bac Giang Province, northern Vietnam (21°12' N, 106°40' E, approximately 250-300 m a.s.l.), collected on 23 June 2003 by T. Q. NGUYEN and T. SCHÖTTLER.

Paratypes: ZFMK 82971-972, two adult males, from type locality, collected in July 2004 by T. Q. NGUYEN and T. SCHÖTTLER.

Referred specimens: ZFMK 82973-75, three larvae, from type locality, collected in July 2004 by T. Q. NGUYEN and T. SCHÖTTLER.

Diagnosis: The new species is diagnosed by the following combination of characters: relatively stout body; head flattened, broader

than body; parotoids large, elongated; dorsal skin covered with relatively small warts and glands, three tubercular dorsal ridges; slightly flattened rib nodules, moderately developed; dorsal and ventral tail fin developed; tongue pad lacking a free posterior margin; dorsal colour uniformly greyish tan or brownish in life; venter tan in life; rib nodules slightly orange tan in life; ventral tail fin yellow-orange in life; tips of fingers and toes yellow-orange in life.

Comparisons: *Tylototriton vietnamensis* differs from *T. kweichowensis* FANG & CHANG, 1932 and *T. shanjing* NUSSBAUM, BRODIE & YANG, 1995 by a more slender body and by lacking orange or yellow tails and a dorsum with orange-yellow markings. Furthermore, *T. verrucosus* differs from the new species by its larger size, head shape, and by exhibiting orange or yellowish colour on dorsum, tail and flanks. *Tylototriton taliangensis* LIU, 1950 mainly differs from *T. vietnamensis* by head shape, a more slender, elongated body and red flecks at the posterior corner of the

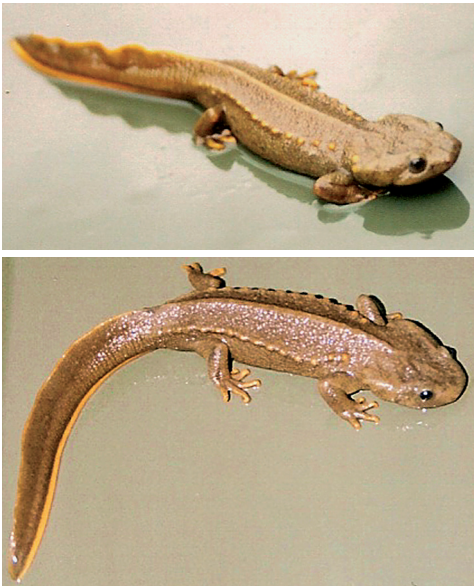


Fig. 1. Male holotype of *Tylototriton vietnamensis* sp. n. (ZFMK 80637) in life.



Fig. 2. X-ray photograph of the preserved holotype of *Tylototriton vietnamensis* sp. n. (ZFMK 80637).



Fig. 3. Larva of *Tylototriton vietnamensis* sp. n. collected at the type locality in June 2003 (total length 45 mm).

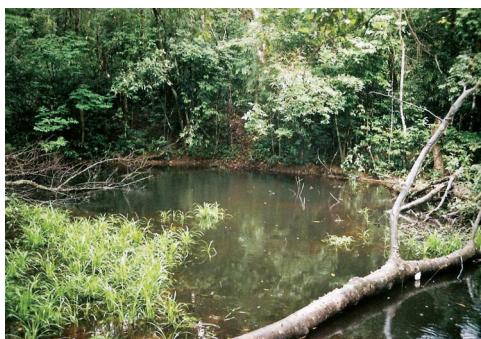


Fig. 4. Habitat of *Tylototriton vietnamensis* sp. n. at the type locality in Bac Giang Province, Vietnam.

parotoids in adults. In external characters, the new species appears most similar to *T. asperrimus*, *T. hainanensis* FEI, YE & YANG, 1984 and *T. wenxianensis* FEI, YE & YANG, 1984. However, *T. vietnamensis* differs from *T. wenxianensis* in the following characters (characters of *T. wenxianensis* in parentheses): greyish to brownish tan dorsal colour (black), truncate snout in dorsal view (rounded), and moderately large, slightly flattened rib nodules forming lateral ridges (rib nodules and ridges indistinct). In contrast to *T. vietnamensis*, *T. asperrimus* exhibits black dorsal colour, very prominent rib nodules, a rounded snout and more prominent bony ridges on head. *Tylototriton hainanensis* differs by larger size, head much wider than long, black dorsal colour and a more rounded snout.

Description of holotype: Habitus moderately stout; head broader than body. Head slightly



Fig. 5. Schematic map of Vietnam showing the known distribution of *Tylototriton vietnamensis* sp. n. in respective provinces: (1) Bac Giang Province (type locality); (2) + (3) Cao Bang Province; (4) Nghe An Province. Question mark indicates locality for *Tylototriton* cf. *vietnamensis* in Lao Cai Province (see text for more precise locality data). Stippled lines indicate limitations of provinces.

sloping in profile. Skull broad with maxillaries oriented angular to body axis. Snout short, truncate in dorsal view, rounded in profile and protruding beyond lower jaw. Nostrils close to snout tip. Upper lips thick, fleshy and overlapping lower lip under eye region. Vomeropalatine teeth in two rows beginning just posterior to the last maxillary tooth at the medium level of the choanae,

diverging from one another. Tongue with poorly developed tongue pad, lacking a free posterior margin. Thirteen trunk vertebrae (Fig. 2). A low vertebral tubercular ridge, extending from top of head to base of tail. Two lateral rows of larger warts, extending from insertion of forearms to base of tail. Glands and warts relatively small, covering most of dorsal surfaces; venter almost smooth. Parotoids greatly enlarged, slightly projecting backwards. Gular fold absent. Fingers without webbing, toes with basal webbing. Tail laterally compressed; dorsal and ventral tail fin moderately developed; tail tip acuminate in profile. For measurements see Table 1. In alcohol, dorsal and ventral surfaces brownish tan. Finger and toe tips cream coloured. Tail brownish tan with ventral tail fin being creamy yellow. Cloacal region bordered with cream-yellow. Life colouration differs only by stronger orange-yellow colour of respective body parts.

Variation: There are no obvious differences in coloration and body proportions between the three male specimens. However, the two male paratypes seem to exhibit more extensive webbing on toes. In life, specimens caught from ponds exhibited considerably lighter dorsal colour (Fig. 1) compared to specimens captured from the forest floor (see

FLECK 2003:Fig. 6, as *Tylototriton a. asperri-mus*).

Natural history: Specimens were found in ponds within dense bamboo vegetation in secondary forest. One larva collected in June 2003 had a total length of 45 mm (Fig. 3). At the type locality, larvae were found from June to July in 2003 and 2004. However, in June 2005 only a few males were observed in the ponds, whereas no larvae were present. According to information provided by local scientists, larvae collected in October had almost finished metamorphosis. At that time adults already left the ponds. Presumably, mating and reproduction take place within these ponds (Fig. 4) during the rainy season.

Distribution: So far, the new species is known from four localities in northern and north-central Vietnam (Fig. 5). In addition to the type locality these are: Quang Thanh Commune (22°38' N, 105°55' E) and Thanh Cong Commune (22°48' N, 105°44' E), Nguyen Binh District, Cao Bang Province; Pu Hoat Forest, Dong Van Commune, Que Phong District, Nghe An Province (T. SCHÖTTLER pers. obs.). Specimens from Nam Tha Commune (21°55' N, 104°22' E, 850 m a.s.l.), Van Ban District, Lao Cai Province (NGUYEN et al. 2005, T. SCHÖTTLER pers. obs.) exhibit some slight morphological differences and are here tentatively regarded as *T. cf. vietnamensis* (see discussion). *Tylototriton vietnamensis* probably also occurs in adjacent southern China and eastern Laos.

Etymology: The new species is named after the country of its origin, Vietnam.

Discussion

Tylototriton vietnamensis is the fifth known species of salamander and the third known species of *Tylototriton* from Vietnam. NGUYEN & Ho (1996) reported *T. asperri-mus* from Mau Son and Lang Son areas in northern Vietnam. We have seen photographs of *T.*

	ZFMK 80637, male, holotype	ZFMK 82971, male, paratype	ZFMK 82972, male, paratype
SVL	50.1	48.3	53.6
TTL	119.5	113.9	121.8
TAL	63.9	62.4	63.1
TAD	8.0	6.6	7.5
HL	18.6	17.6	15.3
HW	16.7	15.7	17.0
EN	4.0	4.0	4.4
IN	5.4	5.5	6.1
AL	16.0	18.7	19.8
PL	21.3	20.6	20.1

Tab. 1. Measurements of the type series of *Tylototriton vietnamensis* sp. n. in millimetres (mm). For abbreviations see text.

asperrimus-like living specimens from the nearby Tam Dao area in northern Vietnam and concluded that they display some characters unusual for *T. asperrimus*: a very stout body shape and a very broad head with very well-developed bony crests. These characters are generally much more developed in *T. hainanensis* than in *T. asperrimus* (FEI et al. 1984). Thus, it may not be excluded that some records of *T. asperrimus* by NGUYEN & HO (1996) actually correspond to *T. hainanensis*. The geographical distance between Hainan Island and northern Vietnam is less than 400 km and therefore the presence of *T. hainanensis* in northern Vietnam seems at least possible and respective populations deserve further study.

Recently, NGUYEN et al. (2005) reported *T. asperrimus* (as *Echinotriton asperrimus*) from several localities in northern Vietnam. In a colour photograph, NGUYEN et al. (2005:147) figured a specimen from Lao Cai Province, northern Vietnam. This specimen is very similar to *T. vietnamensis* in its general habitus, size, flattened head and colouration. However, the dorsal skin appears to be more warty and darker. These slight differences probably display seasonal variation, since individuals in their aquatic phase were found to exhibit relatively smooth dorsal skin and light colouration, whereas specimens caught from the forest floor showed darker dorsal colour and somewhat more warty skin (see paragraph on variation). However, here we tentatively refer to this population as *Tylototriton* cf. *vietnamensis* unless more specimens from this population become available.

In conclusion, we may suspect that several Vietnamese records referred to as *Tylototriton asperrimus* (or *Echinotriton asperrimus*) in the literature are likely to include other taxa like e.g. *T. cf. hainanensis* (NGUYEN & HO 1996) or *T. vietnamensis* (FLECK 2003, NGUYEN et al. 2005).

ZHAO & HU (1988) suggested that *Tylototriton asperrimus* should better be placed in the genus *Echinotriton* based on the sharp-tipped ribs which may penetrate the skin at

their apices and because of a reproductive mode with terrestrial egg deposition (compare NUSSBAUM & BRODIE 1982). NUSSBAUM et al. (1995) provided convincing arguments for transferring the species again to *Tylototriton* and this is also corroborated by recent genetic studies (LARSON et al. 2003). As mentioned above, *Tylototriton vietnamensis* shares some external characters with *T. asperrimus*, but its general habitus appears quite different. It does not exhibit extraordinarily sharp-tipped ribs and penetration of the skin could not be observed in the specimens studied by us. The relationships of *T. vietnamensis* remain unknown at this stage, however, both species might be related.

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References

- FEI, L., C. YE & R. YANG (1984): A new species and a new subspecies of the genus *Tylototriton* (Caudata: Salamandridae). – *Acta Zoologica Sinica*, **30**(1): 85-91.
- FLECK, J. (2003): Beobachtungen an *Tylototriton asperrimus* UNTERSTEIN, 1930. – *Amphibia*, **2**(2): 3-6
- HERRMANN, H.-J. (2005): Die Krokodilmolche der Gattung *Tylototriton*. – *Aquaristik-Fachmagazin*, **181**: 21-23.
- INGER, R.F., N. ORLOV & I. DAREVSKY (1999): Frogs of Vietnam: a report on new collections. – *Fieldiana Zool.*, **92**: 1-46.
- LARSON, A., D.W. WEISROCK & K.H. KOZAK (2003): Phylogenetic systematics of salamanders (Amphibia: Urodela), a review. – pp. 31-108 in

- JAMIESON, B.G.M. (ed.): Reproductive biology and phylogeny of Urodela. – Enfield/NH (USA) & Plymouth (UK), Science Publishers Inc.
- NGUYEN, V.S. & T.C. HO (1996): Danh lục bò sát và ếch nhái Việt Nam. – Hanoi, 264 pp.
- NGUYEN, V.S., H.T. CUC & T.Q. NGUYEN (2005): A checklist of amphibians and reptiles of Vietnam. – Hanoi, 180 pp.
- NUSSBAUM, R.A. & E.D. BRODIE, JR. (1982): Partitioning of the salamandrid genus *Tylototriton* Anderson (Amphibia: Caudata) with a description of a new genus. – *Herpetologica*, **38**(2): 320-332.
- NUSSBAUM, R.A., E.D. BRODIE, JR. & Y. DATONG (1995): A taxonomic review of *Tylototriton verrucosus* ANDERSON (Amphibia: Caudata: Salamandridae). – *Herpetologica*, **51**(3): 257-268.
- ORLOV, N.L., R.W. MURPHY, N.B. ANANJEVA, S.A. RYABOV & T.C. HO (2002): Herpetofauna of Vietnam, a checklist. Part I. Amphibia. – *Russian Journal of Herpetology*, **9**(2): 81-104.
- SCHÖTTLER, T. (2003): Eine Molch-Reise nach Nordvietnam. – *Amphibia*, **2**(2): 23-24.
- SELGIE, D., D. ROY, C. GIACOMA & M. MUSAHIDDUNNABI (2003): Distribution and conservation of the Himalayan newt (*Tylototriton verrucosus*, Urodela, Salamandridae) in the Darjeeling District, West Bengal (India). – *Russian Journal of Herpetology*, **10**: 157-162.
- STUART, B.L. & T.J. PAPENFUSS (2002): A new salamander of the genus *Paramesotriton* (Caudata: Salamandridae) from Laos. – *Journal of Herpetology*, **36**: 145-148.
- ZHAO, E. & Q. HU (1988): Studies on Chinese tailed amphibians. – pp. 1-44 in ZHAO, E., Q. HU, Y. JIANG & Y. YANG (eds.), *Studies on Chinese salamanders*. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology, **4**: 1-44.
- ZIEGLER, T., H.-W. HERRMANN, P. DAVID, N.L. ORLOV & O.S.G. PAUWELS (2000): *Triceratolepidophis sieversorum*, a new genus and species of pitviper (Reptilia: Serpentes: Viperidae: Crotalinae) from Vietnam. – *Russian Journal of Herpetology*, **7**(3): 199-214.
- ZIEGLER, T., H.-W. HERRMANN, T.N. VU, Q.K. LE, T. NGUYEN, C.X. CAO, T.M. LUU & T.H. DINH (2004): The amphibians and reptiles of the Phong Nha – Ke Bang National Park, Quang Binh province, Vietnam. – *Hamadryad*, **28**(1/2): 19-42.

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