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CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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Eighteenth meeting of the Conference of the Parties
Colombo (Sri Lanka), 23 May – 3 June 2019

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of all species of the genus *Paramesotriton* endemic to the Socialist Republic of Viet Nam and People's Republic of China in Appendix II of CITES, with the exception of *P. hongkongensis* which has already been included in CITES Appendix II at CoP17.

This proposed inclusion is in accordance with Article II paragraph 2(a) of the Convention, satisfying the respective criteria of Resolution Conf. 9.24 (Rev. CoP17), as follows:

Annex 2 a:

- criterion A, on the grounds that trade in the species *P. caudopunctatus*, *P. fuzhongensis* and *P. guangxiensis* must be regulated to prevent them to become eligible for listing in Appendix I in the near future;
- criterion B to ensure that the harvest of wild individuals of the species *P. labiatus* and *P. yunwuensis* is not reducing the wild population to a level at which their survival might be threatened;

Annex 2 b:

- criterion A, since individuals of the species *P. aurantius*, *P. caudopunctatus*, *P. fuzhongensis, P. guangxiensis, P. labiatus, P maolanensis*, *P. yunwuensis, P. zhijinensis* are commercially exploited and eligible to be listed in Appendix II, and resemble those species of the remaining genus *Paramesotriton* (*P. chinensis, P. deloustali, P. longliensis, P. qixilingensis, P. wulingensis)*, including *P. hongkongensis* already included in Appendix II and it is unlikely that government officers responsible for trade monitoring will be able to distinguish between them.

B. Proponent

China, European Union, Socialist Republic of Viet Nam.

C. Supporting statement

1. Taxonomy

1.1 Class: Amphibia

1.2 Order: Caudata

1.3 Family: Salamandridae

1.4 Genus: *Paramesotriton* Chang, 1935.

1.5 Species, including author and year:

This proposal seeks to include the following 13 species in Appendix II:

1.5.1. Species endemic to People's Republic of China (Sparreboom 2014, Yuan et al. 2014, Yuan et al. 2016) [excluding the already listed *P. hongkongensis* Myers and Leviton, 1962].

1. *P. aurantius* Yuan, Wu, Zhou, and Che, 2016;
2. *P. caudopunctatus* (Liu and Hu, 1973);
3. *P. chinensis* (Gray, 1859);
4. *P. fuzhongensis* Wen, 1989;
5. *P. labiatus* (Unterstein, 1930);
6. *P. longliensis* Li, Tian, Gu, and Xiong, 2008;
7. *P. maolanensis* Gu, Chen, Tian, Li, and Ran, 2012;
8. *P. qixilingensis* Yuan, Zhao, Jiang, Hou, He, Murphy, and Che, 2014;
9. *P. wulingensis* Wang, Tian, and Gu, 2013;
10. *P. yunwuensis* Wu, Jiang, and Hanken, 2010;
11. *P. zhijinensis* Li, Tian, and Gu, 2008

1.5.2. Species endemic to the Socialist Republic of Viet Nam (Sparreboom 2014).

12. *P. deloustali* (Bourret, 1934).

1.5.3. Species known from both China and Viet Nam (Weisrock et al. 2006).

13. *P. guangxiensis* (Huang, Tang, and Tang, 1983.

1.6 Scientific synonyms: *Pachytriton. labiatus* and *Paramesotriton ermizhaoi* were synonymized with *P. labiatus* (Nishikawa et al. 2011)

*P. guanxiensis* [sic] (Frost 2018)

1.7 Common names: English: Warty Newts (Frank and Ramus 1995)

Chinese:瘰螈 (*Paramesotriton* spp.)

Vietnamese: Cá cóc

German: Warzenmolch

French: Petite salamandre de Chine

Czech: Pačolek

For common names of specific species see Annex I.

1.8 Code numbers: N/A

2. Overview

This proposal aims to list the species of the genus *Paramesotriton*, endemic to the North of the Socialist Republic of Viet Nam and the South and Southwest of People's Republic of China in Appendix II of CITES. At CoP17 *P. hongkongensis* was included in CITES Appendix II in accordance with Annex 2a, criteria B. Due to morphological similarities between *P. hongkongensis* and most of the other *Paramesotriton* species, the necessity to regulate the harvest and trade in some species, and to limit the risk of pathogen pollution, the whole genus is eligible for application. *Paramesotriton* are relative large and robust newts with strong associations to lotic habitats (Sparreboom 2014). *Paramesotriton* species are found in forest streams or in their direct vicinity below the elevation of 2,000 m asl (above sea level). The different species generally have small distribution ranges and in some cases are only known from the type locality (Yuan et al. 2014; for details see Annex II). In addition, they need relatively long time until they reach sexual maturity (average 3-7 years, in some specimens even up to 10 years according to private breeders), which makes the populations especially vulnerable to the removal of individuals. There is a general lack of knowledge on the species ecology in natural populations, besides their taxonomic and phylogenetic status, which is essential for adequate conservation measures.

Wild populations are threatened by habitat loss (e.g. logging, infrastructure development, dam construction) and overexploitation for the pet trade, food and traditional medicine. There is morphological conservatism in the genus, making taxonomic identification difficult. Especially if animals are traded in dried state for traditional medicine, they are beyond recognition at species level (Rowley and Stuart 2014) (Annex III, Fig. 4). The growing tendency in the pet trade for Asian salamanders (Pasmans et al. 2014) represents another important pressure to wild populations. It is very likely that specimens in the trade are frequently offered under wrong species names. There is evidence of animals appearing in the international trade before scientific recognition, for example *P. fuzhongensis* was being commercialized one to two decades prior to description as a new species. Currently there are at least three undescribed taxa recognized in the pet trade (Annex IV, Fig. 5). Wild caught animals appearing in the trade can often be detected by their poor physical condition and stress signs showing that these animals are very sensitive to displacement. It can be assumed that only a small percentage of animals collected for the trade reach their final destination alive.

Only six species are currently listed within IUCN categories, and with one exception, all assessments were made almost 15 years ago. In the same time the genus *Paramesotriton* has experienced a two fold increase in the number of described species partly due to morphological conservationism (Zhao et al. 2008, Wu et al. 2009, Wu et al. 2010) (Annex III, Fig. 2 and Fig. 3).

Considering the small distribution ranges and reproductive output of *Paramesotriton* species, associated with a significant trade for medicinal purposes and the international pet trade (among ongoing habitat loss) and the difficulties in identifying individual species (see Annex I, Table 1 for an overview of the relevant factors affecting the different species) it has been already recommended by several researches (Rowley and Stuart 2014, Rowley et al. 2016) that *Paramesotriton* should be listed in the Appendices of CITES at the genus level.

The inclusion in CITES Appendix II might reduce harvesting, which will have effects not only on wild populations, but will also serve as a preventive measure to safeguard Paleartic and Neartic salamanders from pathogen transfer in their native ranges. Asian salamanders and in particular *Paramesotriton* species are hosts to *Bd* and *Bsal*, two fungus species, lethal to other amphibians.

3. Species characteristics

3.1 Distribution

The genus is distributed throughout mountain regions of Southeast China and North Viet Nam (Sparreboom 2014) (Annex II). Species live associated to lotic systems in forested areas at moderately to high elevations (below 2,000 m asl.). Some species have extremely narrow distribution ranges and are only known from a

single location or a single pool. For example *P. maolanensis* is only known from a 60 m² pool. For detailed information regarding the distribution of single species, see Annex II.

3.2 Habitat

The habitat of *Paramesotriton* species is tropical or subtropical moist lowland or evergreen forests and associated grasslands (IUCN 2018). Adults of *Paramesotriton* are mostly aquatic and usually associated with small rocky streams, with low gradient and clear basins or deep pools. Juveniles are terrestrial and live in the near vicinities of these streams (Raffaëlli 2013). There is also evidence that some species are not exclusively aquatic at adult stage, like *P. caudopunctatus* which may be found up to 15 cm away from water or *P. guangxiensis* that can be often found on land after heavy rains, up to 50 to 100 cm away from water (Sparreboom 2014). For detailed information regarding the habitat type of single species, see Annex II.

3.3 Biological characteristics

As for many of the modern Asian newts, there is still little knowledge about the natural history and distribution of this genus.

In *P. chinensis* sexual maturation seems to occur after 3 to 7 years when animals reach a total body size between 11 and 15 cm, in *P. deloustali* is reported to occur between 6 to 7 years, and there is evidence by private breeders of some species (*P. caudopunctatus*) needing up to 10 years and a total body size of 16 to 17 cm until fully mature. Sexual maturity is accompanied by a change of coloration and a change into a more aquatic life mode (Pasmans et al. 2014, Sparreboom 2014). *Paramesotriton* species are mainly active during night.

*P. hongkongensis,* which is exceptionally well studied (and outside of the scope of this proposal), is terrestrial for 10 months of the year. The breeding adults stay on average 40 days in the breeding pool and the breeding population always rotates (Fu et al. 2013). It can be assumed that other species are also mostly terrestrial and become particularly aquatic during breeding season. In this period animals are found inside the water hiding underneath rocks. Both sexes, but especially males show aggressive and territorial behavior between each other (Pasmans et al. 2014). Observations on behavioral patterns suggest complex social interactions, with some individuals being tolerated (e.g. sexual mate), while others are pushed away or attacked (Pasmans et al. 2014, Sparreboom 2014).

In natural habitats, the breeding season starts around November in *P. caudopunctatus* and *P. deloustali* and last around 3 to 5 months (Sparreboom 2014). Eggs are deposited on land or water depending on the species, attached to vegetation and larvae have an aquatic development. Eggs and larvae are rarely found in nature. Some sort of parental care has been observed by females staying close to eggs after egg-deposition (Sparreboom 1983).

3.4 Morphological characteristics

Species diagnoses within the genus *Paramesotriton* are often problematic due to morphological similarities between species (Rowley et al. 2016) including to *P. hongkongensis*, listed on CITES Appendix II at CoP17 (Annex III, Fig. 2). *P. yunwuensis* resembles most *P. guangxiensis* (Wu et al. 2010), and *P. zhijinensis* resembles most *P. chinensis* (Zhao et al. 2008). Insufficient detailed information within the original species description aggravates these discriminations (Sparreboom 2014). Furthermore, some species present substantial phenotypic variation within populations (Yuan et al. 2014) (Annex III, Fig. 3). There is evidence for hidden cryptic diversity within known species. For example *P. chinensis,* formerly known as a single widely distributed species was found to actually encompass several different lineages: the population from Chongqing Province is likely *P. longliensis* (Wu et al. 2010), the population from Guangdong Province was described as *P. yunwuensis* (Wu et al. 2010), the population from Guangxi as *P. fuzhongensis* and *P. labiatus* (Wu et al. 2009, Wu et al. 2010) and the population from Jiangxi Province as *P. qixilingensis* (Yuan et al. 2014); or *P. guangxiensis* was formerly treated as a synonym of *P. deloustali* (Gu et al. 2012b).

Morphological species identification by non-specialist is rather impossible, especially if location data is not or wrongly provided, like it is so often the case in specimens within the trade (Rowley et al. 2016).

*Paramesotriton* species are characterized by a total length of 13 to 20 cm; “habitus slender to very stout; snout truncated, head narrow to large; skin smooth to warty; dorsal coloration usually dull, ventral coloration bright” (Dubois and Raffaëlli 2009); “prominent vertebral ridge; tail high and laterally compressed with bony apophyses extending dorsally and ventrally from the caudal vertebrae; the tips of the maxillary bones do not contact the pterygoid as in *Pachytriton* (sister clade); they instead lie outside and anterior to the pterygoid, thus forming an angle rather than a straight line” (Chan et al. 2001).

Sexual dimorphism is present, with females reaching longer body lengths during breeding season.

For further specific characteristics see Annex III.

3.5 Role of the species in its ecosystem

Adults of the genus *Paramesotriton* are opportunistic feeders with diet consisting of a wide range of freshwater and terrestrial invertebrates depending on the availability and seasonality (Stuart et al. 2008). They are consumers of small insects and their larvae, arthropods, anuran eggs and earthworms, larvae of Odonata and small gastropods (Sparreboom 2014). The larvae of these species are carnivorous. Cannibalism has been reported both in adults and larvae. *Paramesotriton* generally forages or ambushes preys that are identified by sight and odor, and catches them with a rapid bite, followed by struggling until the whole item is ingested (Chen et al. 2013). *Paramesotriton* spp. was found to co-occur with fishes and other amphibians, but there is no evidence that *Paramesotriton* is sympatric with other salamander species. The larvae of *Paramesotriton* are a likely prey to fishes.

4. Status and trends

4.1 Habitat trends

The distribution ranges of most species are generally small with only limited suitable habitat sites and / or not covered by protected areas. Over the last decades, the economic development and human population growth in the region led to an increased consumption of natural resources (e.g. logging), associated with habitat loss and degradation, and increased construction of infrastructures (e.g. water dams, roads), that resulted in high pressure on wildlife (Yiming and Wilcove 2005). Therefore, suitable habitats for *Paramesotriton* will likely decrease further in the future. Logging seems to be a common threat affecting most species within this genus. In China alone, this practice has increased by 18-fold in the past 50 years (Yiming and Wilcove 2005). Slash and burn practices for substitution with more profitable plants (e.g. paper industry or agriculture exploration), dam constructions and pollution, are also common throughout the distribution range and thus affect habitat suitability of *Paramesotriton* spp.

*P. guangxiensis* in China for example, is not occurring within any protected area and therefore this species is assumed to be especially vulnerable (Zhigang et al. 2004a). Furthermore, a continuing decline in area, extent and/or quality of the habitat of *P. deloustali* and *P. fuzhongensis* has been reported, as well as a likely deterioration of the extent and quality of the habitat of *P. caudopunctatus* (Near Threatened), which makes this species close to qualifying it as Vulnerable (Zhigang et al. 2004b).

4.2 Population size

Comprehensive studies on population size and abundance lack. However, most species are reported to have extremely small distribution ranges (Yuan et al. 2014). Some species are only known from single streams (e.g. *P. labiatus*), single pools (e.g. *P. zhijinensis* and *P. maolanensis*), one Nature Reserve (e.g. *P. qixilingensis*), or a single mountain chain (e.g. *P. wulingensis* and *P. yunwuensis*). For this reason alone most species probably have rather small population sizes and are considered to be vulnerable to various impacts (Sparreboom 2014).

In the frame of new species descriptions, authors frequently suggested an endangered (or Near Threatened) classification according to the IUCN Red List Categories and Criteria, like in *P. yunwuensis* (Wu et al. 2010) and *P. qixilingensis* (Yuan et al. 2014).

4.3 Population structure

Comprehensive and comparable studies are lacking. According to surveys in the habitat of *P. deloustali* and *P. guangxiensis* in Viet Nam during the summer monsoons of 2012 to 2014, larvae and juveniles were never seen and the sex ratio seemed in balance (M. Bernardes pers. com.). The same tendency was observed in the literature, where for example, taxonomical descriptions never include information about the presence of larva.

4.4 Population trends

Given that salamanders in general show both low vagility and reproduction potential, by staying in the near vicinity of their breeding habitat and by being long-lived and slow-breeding species, they have a rather low ability to colonize new habitats. If populations experience rapid declines, it can take long to recover (Welsh and Droege 2001, Xie et al. 2007). Most species of *Paramesotriton* have extremely small distribution ranges (Sparreboom 2014, Yuan et al. 2014). At the same time these species are targeted by harvesting, associated with the high population density with a low income which depend on wildlife poaching for additional revenue and animal protein (Ran et al. 2001), with the long Asian history of animal use for traditional medicine (Yiming and Wilcove 2005, Leung 2006) and the currently growing tendency in the interest from the international pet trade (Pasmans et al. 2014). Given the long period for sexual maturation seen in this genus, it can be assumed that the continuous removal of mature adult specimens from the population will cause population declines in the future. According to IUCN (2018), the current populations of *P. guangxiensis, P. deloustali*, *P. caudopunctatus, P. fuzhongensis* and *P. labiatus* are decreasing.

4.5 Geographic trends

In China the most dramatic changes in forest composition have occurred in the past 50 years, with natural occurring forest declining by 30 % (Yiming and Wilcove 2005), while in Viet Nam the extent of primary forest has decreased about 80 % during the last 20 years (FAO 2010). The extent and quality of natural habitats are declining and represent a major threat to biodiversity (Achard et al. 2002, Sodhi et al. 2004, Yiming and Wilcove 2005, Sodhi et al. 2009).

5. Threats

*Paramesotriton* spp. is strongly associated to lotic habitats, with adjacent terrestrial habitats being limited only to a couple of hundred meters away from the water margin (Lau et al. 2017). As *Paramesotriton* spp. generally form large breeding groups in breeding pools, high numbers can be collected from known sites during breeding season with minimal effort (Lau 2017). Throughout the distribution range of *Paramesotriton* spp., over-harvesting has been identified to probably represent the most significant threat to salamanders (Stuart et al. 2008). Animals can be easily captured with the use of nets, baited fishing line (e.g., earthworms), and electrofishing equipment (Wu et al. 2010). Salamanders are harvested for human consumption (especially in rural areas associated with poverty, these animals are an available source of protein, for the use in traditional medicine and to supply the national and international pet trade (Rowley et al. 2010). According to the IUCN (2018), overharvesting is considered as threat for most of the assessed species: *P. fuzhongensis*, *P. labiatus*, *P. deloustali* and *P. caudopunctatus.* Several *Paramesotriton* species already appeared in the international trade before their scientific description. For example *P. fuzhongensis,* had been exported in high numbers as *P. chinensis* 10 to 20 years prior to its scientific description (Sparreboom 2014). At present there are at least three undescribed forms, well known in the international trade (Pasmans et al. 2014) (Annex IV, Fig. 5) and there may be even further ones (Sparreboom 2014) as the interest in keeping Asian newts, particularly in Europe and the U.S.A., continues to grow (Pasmans et al. 2014). Even if harvesting for trade has not been directly reported for all species, due to the fact that all *Paramesotriton*

species are morphologically similar and identification to species level is often challenging, it is likely that almost all species are actually in the trade, in part under incorrect names. Furthermore, animals traded for traditional medicine are often dried, making taxonomical identification impossible (Rowley and Stuart 2014) (Annex III, Fig. 4). Harvesting has been reported even inside of protected areas, negatively impacting *Paramesotriton* spp., like *P. qixilingensis* in Qixiling Nature Reserve (Yuan et al. 2014). At the type locality of *P. yunwuensis*, a scenic park, local people collect and sell this species to tourists as putative "juveniles of *Andrias davidianus"* (Chinese giant salamander), which has been a rather common species 30 years ago (Wu *et al.* 2010). *P. chinensis* is frequently found for sale in Chinese pet markets and is the most common species in the international trade.

Habitat loss and degradation is also of major concern to this genus. According to IUCN (2018) habitat loss affects all assessed species and mostly includes logging (threatening *P. caudopunctatus*, *P. fuzhongensis*, *P. chinensis*, *P. deloustali* and *P. labiatus*), agriculture (threatening *P. guangxiensis, P. deloustali* and *P. labiatus*), dam construction (affecting *P. caudopunctatus* and *P. chinensis*) and pollution (affecting *P. deloustali* and *P. chinensis*).

Other known threats to these species are associated with 1) indirect results of fishing activities, as some species are reported as bycatch by local fishermen's seines e.g. *P. longliensis* (Wu et al. 2010), *P. labiatus* and *P. chinensis* (IUCN 2018); 2) tourism e.g. *P. yunwuensis* is sold as a juvenile of Chinese giant salamanders (Wu et al. 2010); 3) climate change and its association with unusual weather events have been shown to correlate with amphibian declines in a number of ways (Alford and Richards 1999).

6. Utilization and trade

6.1 National utilization

People's Republic of China:

In the People's Republic of China *Paramesotriton* species are intentionally collected from the wild to be consumed either as food (e.g. *P. yunwuensis* are probably consumed as "juveniles of the Chinese giant salamander", and *P. labiatus* is known to be consumed both locally as well as nationally) or in the traditional medicine (e.g. *P. labiatus* is reported to used only locally and *P. caudopunctatus* to be used both locally and nationally), or to serve as pets (e.g. *P. fuzhongensis* is known to be used locally, and *P. chinensis*, *P. caudopunctatus* and *P. labiatus* are used both locally and nationally) (IUCN 2018).

The commercial trade of vertebrates in this country concentrates in South China (Li et al. 1996, Lau et al. 1997, Li and Li 1997, Yiming and Wilcove 2005), where most of the species occur, which likely support their introduction into the trade.

Socialist Republic of Viet Nam:

*Paramesotriton* species are harvested from the wild in Viet Nam for use either locally in the traditional medicine (Rowley and Stuart 2014, M. Bernardes per. com.), or to be sold in the domestic trade as pets (Sparreboom 2014). There is evidence that *P. deloustali* is being collected and consumed as a treatment for cholera, after being dried over a fire and turned into powder in Quang Ninh Province (M. Bernardes pers. obs.; Annex III, Fig. 4).

A market analysis of the pet trade in Viet Nam in 2016 revealed evidence for past sales of *P. deloustali* in Ho Chi Minh City and current online sales of this same species for ~USD 7 (VND150,000) each (Rowley et al. 2016). A recent survey in 2018 revealed that both *P. deloustali* and *P. guangxiensis* are being offered at several pet shops in Ha Noi, Ho Chi Minh City and Bien Hoa, Dong Nai Province with new stocks being available every year around the species' breeding season, when animals can most easily be collected from the wild.

6.2 Legal trade

*Paramesotriton* spp. have been kept by hobbyist for many years. Numerous animals were for instance imported to Europe via Hong Kong SAR in the late 1970's and early 1980's. Due to lack of taxonomical description most of these Chinese newts entered the trade labeled as *P. chinensis*, while it turned out later, that many specimens have been actually *P. fuzhongensis* instead, which was only described in 1989 (Sparreboom 2014). Ye et al. (1993) noted the collection of several hundred thousands of *P. chinensis* and related species for export during a field survey in eastern China (Jiang et al. 2014). Species discrimination is challenging and mostly the geographic origin of imported newts is unknown (Rowley et al. 2016). Recent imports continue to misclassify these species, sometimes deliberately to provide easier access in the market since rare and new species can be sold for a high price (Sparreboom 2014, Rowley et al. 2016). Currently, most *Paramesotriton* species still enter the international trade as *P. chinensis* (Sparreboom 2014) or *Paramesotriton* spp. (LEMIS Database of the U.S. Fish & Wildlife Service; exp. Annex IV, Fig. 6).

According to the UNEP-WCMC CITES trade database (from March 10th 2018), a total of 1,771 individuals identified as *P. chinensis* (62 %), *P. labiatus* (37 %) and *P. hongkongensis* (1 %) have been officially imported into the EU between 2009 and 2016. Thereby, Germany (60 %) was the major import destination, followed by Czech Republic (26 %), Spain (13 %), Italy (2 %) and Great Britain (1 %). China and Hong Kong SAR have been the major exporters, holding 63 % and 22 % of total recorded exportations respectively, followed by Singapore (15 %) and the U.S.A. (less than 1 %). The trade of specimens identified as captive breed concerned only 13 % of the total transactions and all had origin from Singapore. The remaining trade (87 %) had unknown source, and most likely involved wild caught specimens. In addition 16 % of these were exported from non-range countries and could indicate a longer "transit system".

According to the LEMIS Database of the U.S. Fish & Wildlife Service, imports to the U.S.A., have involved a total of 38,273 individuals of *Paramesotriton* spp. between 2000 and 2016, from which 50 % were wild caught. The majority of these animals were traded live (90 %), for commercial purposes (97 %), but also for educational and scientific uses (3 %). The most traded species was *P. chinensis* and similar (69 %), followed by *P. caudopunctatus* (10 %), *P.* sp. (8 %), *P. hongkongensis* (6 %), *P. guangxiensis* (4 %), *P. deloustali* (3 %) and *P. fuzhongensis* (less than 1 %). The allegedly trade between range countries and the U.S. represented 38 % of the traded species, while the majority (58 %) had at least one transit country in between (Hong Kong SAR on 99.6 % of the times, but also Europe and Canada), and in smaller percentages (4 %) the recorded trade involved at least two transit countries (usually through India and Canada).

A current market analysis in non-range states using internet platforms with history recordings showed the first evidence of trade within *Paramesotriton* species as a demand interest starting in 2008, followed by a higher offer from 2010 to 2014. In 2015 and 2017 the recorded demand for *Paramesotriton* in the trade was higher than the offer (Annex IV, Fig. 7 and Tab. 2).

Commercial prices depend on numerous variables, like type of species, life stage and sex. Usually the price for adults is higher than for juveniles, females may reach higher prices than males. and the market prices in the U.S. are usually higher than in Europe. In the U.S. prices for a *P. chinensis* adult were around US$10 in 2010, US$15 in 2011, US$20 in 2014 and US$40 in 2016. In Europe the same species cost about US$12 in 2014 (*P. fuzhongensis* about US$15) and currently juveniles cost around 12 €. Eggs are currently sold for about US$2 each. The most commonly advertised species were: *P. caudopunctatus*, *P. chinensis*, *P. deloustali*, *P. fuzhongensis*, *P. guangxiensis, P. labiatus* and *P. longliensis* (Pasmans et al. 2014, Sparreboom 2014, Klocke et al. 2017). The fact that there is no evidence for the remaining and most recently described species in the international trade is not a guarantee that they are not or will not be in the trade given the increasing interest in keeping Asian salamanders (Pasmans et al. 2014).

Evidence suggests that the amount of harvest in *Paramesotriton* is far higher than the limited number of trade statistics might suggest. For example, in the market survey by Rowley et al. (2016) only eight

individuals of *P. deloustali* were officially exported from Viet Nam, despite most export reports of this species being listed as wild caught.

6.3 Parts and derivatives in trade

The trade of this genus includes mainly live or dried animals, as well as animals soaked in alcohol. There is no evidence of any further parts or derivatives in the trade.

6.4 Illegal trade

Even though *Paramesotriton* spp. is locally protected in Viet Nam and China and wild harvest and subsequent sale is generally forbidden, specimens are continuously reported from local markets.

There is evidence for illegal trade occurring within each range country, between range countries and into the international market. Specimens are sold in their native range for relatively low prices (less than US$1 per animal), in comparison to the prices practiced in the international pet trade, which increase depending on the rarity of the species and if it is recently described (Rowley et al. 2010). Lee et al. (2004) recorded *Paramesotriton* spp. being offered for sale in Qingping during surveys at Guangzhou and Senzhen markets, in China. According to a recent market survey in Viet Nam, both *P. deloustali* and *P. guangxiensis* are in the trade and have been found in pet shops in major cities (Ha Noi, Ho Chi Minh City and Bien Hoa) (Annex IV, Fig. 8). The national market is supplied every year with wild caught animals usually collected in Tam Dao (type locality) in the case of *P. deloustali*. Animals are usually on stock from April to September. In Viet Nam, *P. guangxiensis* appears apparently less in the trade than the morphological similar *P. deloustali,* and is sold for higher prices. One pet shop in the South of Viet Nam informed that the origin of *P. guangxiensis* previously on stock had Chinese and not Vietnamese origin, showing a much complex trade network. The trade between range countries occurs usually in the direction of China (Zhang et al. 2008a).

6.5 Actual or potential trade impacts

The high number of undescribed forms of *Paramesotriton* in the pet trade is an indication of the elevated demand for this genus, with species being harvested and sent overseas before scientific description. The evidence for further morphological cryptic species that was already reported for *Paramesotriton* additionally increases the risk, that over-harvesting may affect species complexes comprehending of more than one species (Weisrock et al. 2006, Rowley et al. 2010). Given the low reproductive output and high age of first maturity of *Paramesotriton* species, as well as their low mobility capacities, it is likely that these species cannot easily recover from the continuous collection of mature individuals. It is therefore expected that the international demand for some species within this genus can lead to over-exploitation and even local extinction of populations, especially considering the ones with more narrow distributions.

The transport of salamanders across the planet also moves their parasites and pathogens (Rowley and Stuart 2014). Currently, emerging diseases like *Batrachochytrium dendrobatidis* (*Bd*) and *B. salamandrivorans* (*Bsal*) occurring both in China (Bai et al. 2010), and in Viet Nam are of great concern. A recent survey on the incidence of these pathogens in almost 200 sampled *Paramesotriton* species across 11 breeding habitats distributed in 4 provinces from North Viet Nam, revealed the presence of *Bsal* in *P. deloustali* from Tam Dao and Bac Kan provinces (prevalence up to 11.1 %) and in *P.* sp. from Lao Cai Province (prevalence up to 6.6 %). *P. deloustali* is an actively traded salamander and has been identified as a potential reservoir for *Bsal* (Martel et al. 2014). *Paramesotriton* species showed neither sign of disease, nor an extraordinarily disease prevalence that revealed a pandemic threat. These arguments support the suspicion that these species are mostly resilient to the disease probably due to the long co-existence with the pathogens. Nevertheless, infected newts without symptoms can be use as vector for disease dissemination among naïve species. Thus, uncontrolled trade in *Paramesotriton* spp. might contribute to the spread of *Bsal* in importing countries, which can have lethal impacts on native salamanders.

Furthermore, it can be assumed that those animals, which arrive at the final destination of importing countries alive, represent only a small proportion of the number of animals that had been collected. The mortality rate during transports was found to be high in *Paramesotriton spp.* as animals are extremely sensitive to stress and poor environment conditions. The welfare of animals can be often physically recognized, for example, high nitrite concentration turns color marking into a more dull and brown-like color (Pasmans et al. 2014), apathy and loss of appetite can often lead to death. If many transportation steps, from different stakeholders are involved, or if the transportation is long, the largest amount of animals will not survive, which implies that in order to meet the demand for the species, the number of animals actually collected is in some magnitudes higher.

7. Legal instruments

7.1 National

People's Republic of China.

The State Forestry Administration Order No. 7 from the 1st August 2000, created a *List of terrestrial wildlife under state protection, which are beneficial or of important economic scientific value*, to further implement the "Wild Animal Protection Act of the Republic of China", to strengthen the national and local protection and management of terrestrial wild animals outside the protected wildlife areas, in which *P. caudopunctatus*, *P. chinensis*, *P. fuzhongensis*, *P. guangxiensis* and *P. labiatus* are included.

*Regulations on the Nature Reserves of the People's Republic of China* ban poaching of any individuals distributed within the nature reserves.

Yuan et al. (2014) already suspect that the species qualifies for listing as being protected in China in their publication containing the original description of *P. qixilingensis,*.

Socialist Republic of Viet Nam.

The Governmental Decree No. 32/2006/ND-CP dated on 30 March 2006 by the Government of Viet Nam on the management of endangered wild flora and fauna has included *P. deloustali* in the Group II B, for which there should be limited exploitation and use for commercial purposes. Furthermore this species is considered Endangered in the Viet Nam Red Data Book (Tran et al. 2007). *P. guangxiensis* is not nationally protected. The collection of wild animals including *Paramesotriton* spp. is strictly restricted in protected areas. *Paramesotriton* spp. has proposed to be listed in the Governmental Decree as Group II B, which will be enforced in early 2019.

7.2 International

*Paramesotriton* is included in a list of 20 genera of salamanders present in the international pet trade that pose a risk of spreading of the disease as "injurious wildlife" under the Lacey Act (18 U.S.C. § 42), from 28 January 2016, published by the U.S. Fish and Wildlife Service in order to avoid the introduction of *Bsal* into North America.

In the European Union (EU) the genus *Paramesotriton* have been listed on Annex D of the EU Wildlife Trade Regulations (EC) No 338/97 since 2009. Furthermore, this genus was included in the Decision (EU) 2018/320 of 28 February 2018 on animal health protection measures for intra-Union trade in salamanders and the introduction into the Union of such animals in relation to the fungus *Bsal*.

The species *Paramesotriton hongkongensis* has been included on CITES Appendix II at CoP17.

8. Species management

8.1 Management measures

In Vietnam the distribution range of *Paramesotriton* spp. is located in some protected areas in the North of the country: Tam Dao National Park, Dong Son-Ky Thuong Nature Reserve, Van Ban Proposed Nature

Reserve, and the harvest of these species must be permitted by local authorities (Forest Protection Departments or Protected Areas).

In China some populations of *Paramesotriton* spp. are distributed in protected areas, like the Maolan National Nature Reserve, Qixling Nature Reserve. The populations in nature reserves are protected according to *Regulations on the Nature Reserves of the People's Republic of China*, and illegal harvest is not permitted.

8.2 Population monitoring

In Viet Nam population monitoring has included a screening for presence of chytrid fungus by the VNMN and international colleagues from Gent University (e.g., Laking et al. 2017). Furthermore, several populations of *P. deloustali* and *P. guangxiensis* from Quang Ninh, Bac Kan, Cao Bang and Ha Giang provinces have been investigated between 2012 and 2014: sampling distribution, structure, condition, and threats. Results indicate ongoing habitat degradation and continuous negative pressure on wild populations (M. Bernardes pers. com.).

8.3 Control measures

*8.3.1 International*

See section 7.2.

Inclusion of *P. hongkongensis* on CITES Appendix II on the CoP17.

*8.3.2 Domestic*

See 7.1.

8.4 Captive breeding

*In situ*: in Viet Nam *P. deloustali* and *P. guangxiensis* are subjects of research and are held at the Me Linh Station for Biodiversity for building up an in country captive reserve population (Ziegler 2016).

According to ZIMS (Zoological Information Management System of Species360) a total of eight institutions (six in Europe, one in the U.S. and one in Asia) keep a total of 18 *Paramesotriton* specimens (in Europe: N= 2 *P. chinensis*, N= 2 *P. caudopunctatus*, N= 1 *P. deloustali* and N= 10 *P. guangxiensis;* in the U.S.: N=2 *P. chinensis;* in Asia: N= 1 *P.* sp.). There is evidence of 5 additional institutions keeping *Paramesotriton* species, one in Asia keeping *P. chinensis* and four institutions in Europe keeping *P. chinensis* and *P. fuzhongensis* (www.zootierliste.de). Further captive breeding is made privately by different keepers.

Although present in the pet trade, accurate information on captive breeding of *Paramesotriton* remains limited and most species are reportedly difficult to keep (e.g. *P. fuzhongensis*) and breed (e.g. *P. chinensis*, *P. caudopunctatus*). Animals show aggressive behavior and sensitivity to stress and need specific environmental conditions, like spacious tanks with enough hiding places (to escape from aggressive conspecifics), aerated water, cool temperatures, and small groups of animals) (Sparreboom 2014, Pasmans et al. 2014).

*P. caudopunctatus, P. chinensis, P. deloustali, P. fuzhongensis* and *P. labiatus* have successfully bred in captivity (IUCN 2018, Sparreboom 2014). No published evidence has been found on captive breeding of the remaining species, although *P. guangxiensis* and *P. longliensis* (at least) are known from the trade and there is information on their keeping conditions (Pasmans et al. 2014; Sparreboom 2014).

There are some *Paramesotriton* types introduced in the trade (for which locality is unknown) that still await scientific description. Two of these types however have been successfully bred in captivity (Pasmans et al. 2014).

No further ex situ conservation breeding program seems to exist, such as a studbook.

8.5 Conservation

Several protected areas are present within the range of *P. caudopunctatus*, *P. labiatus* and *P. deloustali* and only a few protected areas overlap the range of *P. fuzhongensis* and *P. chinensis* (IUCN 2018). The range of *P. guangxiensis* in China is not included within any protected area, but partly of its distribution in Viet Nam is under protection. *P. maolanensis* and *P. qixilingensis* are also only known from one protected area. Nevertheless there is poor law enforcement and animals are collected even from protected areas.

9. Information on similar species

*P. hongkongensis* (Myers and Leviton, 1962) was listed in Appendix II of CITES in CoP17.

*Paramesotriton* and other salamanders from the same family Salamandridae like *Pachytriton*, *Cynops* and *Hypselotriton*, all have orange markings in the ventral side, and are similar in morphological characters. It is difficult for non-professional identification to discriminate the different genera, often resulting in misjudgment in the trade management.

10. Consultations

NA

11. Additional remarks

*P. chinensis* was assessed by IUCN (2018) in 2004 from Chongqing, Hunan, Anhui, Zhejiang, Fujian, Guangdong and Guangxi provinces as Least Concern, based on its wide distribution and presumed large population size. Since then, the population from Guangdong Province has been described as *P. yunwuensis* (Wu et al. 2010), as well as the populations from Guangxi, now known as *P. fuzhongensis* and *P. labiatus* (Wu et al. 2009, Wu et al. 2010). The population from Chongqing Province is likely *P. longliensis* instead (Wu et al. 2010), and the new population from Jiangxi Province was described as *P. qixilingensis* (Yuan et al. 2014). Given these taxonomic splits the IUCN assessment for *P. chinensis* must be regarded as in urgent need of update.

*P. labiatus* is still recognized as *Pachytriton labiatus* in the IUCN assessment (from 2004). In fact all literature before 2011 should be read and interpreted with caution.

12. References

Alford RA, Richards SJ (1999) Global amphibian declines: a problem in applied ecology. *Annu Rev Ecol Syst* 30(1999): 133–165.

Bai C, Garner TW, Li Y (2010) First evidence of *Batrachochytrium dendrobatidis* in China: discovery of chytridiomycosis in introduced American bullfrogs and native amphibians in the Yunnan Province, China. *EcoHealth* 7(1): 127–134.

Chan LM, Zamudio KR, Wake DB (2001) Relationships of the salamandrid genera *Paramesotriton*, *Pachytriton* and *Cynops* based on mitochondrial DNA sequences. *Copeia* 4(4): 997–1009.

Chen H, Xie Q, Luo W Wang Y (2013) Observation of feeding behavior of *Paramesotriton zhijinensis* in feeding conditions. *Sich J Zool* 5(2013): 020.

Dubois A, Raffaëlli J (2009) A new ergotaxonomy of the family Salamandridae Goldfuss, 1820 (Amphibia, Urodela). *Alytes* 26(1–4): 1–85.

Ermi Z, Zhigang Y (2004) *Paramesotriton fuzhongensis*. *IUCN Red List Threat. Species 2004 e.T59458A11945297* 8235, http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T59458.

Fei L, Hu S, Ye C, Huang Y (2006) *Fauna Sinica, Amphibia. General accounts of Amphibia. Gymnophiona and Urodela*. Science Press, China.

Frost DR (2018) *Amphibian Species of the World: an online reference*. Version 6 (August.2018). http://research.amnh.org/herpetology/amphibia/index.html. American Museum of Natural History,

New York, USA.

Fu VWK, Karraker NE, Dudgeon D (2013) Breeding dynamics, diet, and body condition of the Hong Kong newt (*Paramesotriton hongkongensis*). *Herpetological Monogr* 27(2013): 1–22.

Gu X, Chen R, Tian Y, Li S, Ran J (2012) A new species of *Paramesotriton* (Caudata: Salamandridae) from Guizhou Province, China. *Zootaxa* 3510(1): 41–52.

Gu X, Wang HUI, Chen R, Tian Y, Li S (2012) The phylogenetic relationships of *Paremesotriton* (Caudata: Salamandridae) based on partial mitochondrial DNA sequences. *Zootaxa* 3150(2012): 59–68.

Hernandez A (2016). *Crocodile newts: The primitive Salamandridae from Asia (the genera* Echinotriton *and* Tylototriton). Edition Chimaira, Frankfurt, Germany.

Huang CM, Yu H, Wu ZJ, Li YB, Wei FW, Gong MH (2008) Population and conservation srategies for the Chinese crocodile lizard (*Shinisaurus crocodilurus*) in China. *Anim Biodivers Conserv* 2(2): 63–70.

Huiqing G, Baorong G, Zhigang Y (2004) *Paramesotriton chinensis*. *IUCN Red List Threat. Species 2004 e.T59457A11945154* 8235, http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T59457.

Huiqing G, Zhigang Y (2004) *Pachytriton labiatus*. *IUCN Red List Threat. Species 2004 e.T59456A11945015* http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T59456.

IUCN (2018) The IUCN RED List of Threatened Species. http://www.iucnredlist.org/

IUCN SSC Amphibian Specialist Group (2017) *Paramesotriton deloustali*. *IUCN Red List Threat. Species 2017 e.T16129A113959728* http://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T16.

Jiang J, Xie F, Li Cheng (2014) Diversity and conservation status of Chinese amphibians (chapter 3) In: *Conservation Biology of Amphibians of Asia – status of conservation and decline of amphibians: Eastern hemisphere.* Volume 11, part 1 of Amphibian Biology. Ed. Heatwole H, Das I.Natural History Publications (Borneo) Sdn. Bhd., Malaysia.

Klocke B, Becker M, Lewis J, Fleischer RC, Muletz-Wolz CR, Rockwood L, Aguirre AA, Gratwicke B (2017) *Batrachochytrium salamandrivorans* not detected in U.S. survey of pet salamanders. *Sci Rep* 7(1): 1–5.

Lau YK (2017) Conservation and population biology of the Hong Kong newt (*Paramesotriton hongkongensis*). *HKU Theses Online (HKUTO).*

Lau YK, Karraker NE, Martelli P, Dudgeon D (2017) Delineation of core terrestrial habitat for conservation of a tropical salamander: The Hong Kong newt (*Paramesotriton hongkongensis*). *Biol Conserv* 209(2017): 76–82.

Lau MW-N, Ades G, Goodyer N, Zhou F (1995) Wildlife Trade in Southern China including Hong Kong and Macao. Unpublished report to China Council for International Cooperation on Environment and Development.

Lee KS, Lau MWN, Chan, Bosco P (2004) Wild animal trade monitoring at selected markets in Guangzhou and Shenzhen, South China, 2000-2003. *Kadoorie Farm and Botanic Garden Corporation, Lam Kam Road, Tai Po, NT, Hong Kong SAR*.

Leung AY (2006) Traditional Toxicity documentation of Chinese materia medica - an overview. *Toxicol Pathol* 34(4): 319–326.

Li S, Tian Y-Z, Gu X-M (2008) A new species of the genus *Paramesotriton* (Caudata, Salamandridae). *Acta Zool Sin* 33(2): 410–413.

Li W, Fuller TD, Wang S (1996) A survey on wildlife trade in Guangxi and Guangdong, China. *Traffic Bulletin-Wildlife Trade Monitoring Unit* 16(1996): 9–16.

Li Y, Li, D (1997) Survey of cross-border trade in live wildlife between China-Vietnam. *Protecting China's Biodiversity* 1(1997):159–175. (In Chinese.)

Martel A, Blooi M, Adriaensen C, Van Rooij P, Beukema W, Fisher MC, Farrer RA, Schmidt BR, Tobler U, Goka K, Lips KR, Muletz C, Zamudio KR, Bosch J, Lötters S, Wombwell E, Garner TWJ,

Cunningham AA, Spitzen-Van Der Sluijs A, Salvidio S, Ducatelle R, Nishikawa K, Nguyen TT, Kolby JE, Van Bocxlaer I, Bossuyt F, Pasmans F (2014) Recent introduction of a chytrid fungus endangers Western Palearctic salamanders. *Science* 346(6209): 630–631.

Nishikawa K, Jiang J-P, Matsui M, Mo Y-M (2011) Unmasking *Pachytriton labiatus* (Amphibia: Urodela: Salamandridae), with description of a new species of *Pachytriton* from Guangxi, China. *Zoolog Sci* 28(6): 453–461.

Pasmans F, Bogaerts S, Janssen H, Sparreboom M (2014) *Molche und Salamander - halten und züchten.* Natur und Tier Verlag, Münster.

Raffaëlli J (2013) *Les Urodèles du monde*. Penclen: Édition.

Ran JC, Chen HM, Chen ZR, Yu DL, Yu P (2001) The present situation of poaching and wildlife conservation measure in Maolan Nature Reserve. *Biodiversity Science* 9(4): 482–486.

Rowley JJL, Brown R, Bain R, Kusrini M, Inger R, Stuart B, Wogan G, Thy N, Chan-Ard T, Trung CT, Diesmos A, Iskandar DT, Lau M, Ming LT, Makchai S, Truong NQ, Phimmachak S (2010) Impending conservation crisis for Southeast Asian amphibians. *Biol Lett* 6(3): 336–8.

Rowley JJL, Shepherd CR, Stuart BL, Nguyen TQ, Hoang HD, Cutajar TP, Wogan GOU, Phimmachak S (2016) Estimating the global trade in Southeast Asian newts. *Biol Conserv* 199(2016): 96–100.

Rowley JJL, Stuart BL (2014) Amphibian Conservation in Vietnam, Laos, and Cambodia. In: *Conservation Biology of Amphibians of Asia – status of conservation and decline of amphibians: Eastern hemisphere.* Volume 11, part 1 of Amphibian Biology. Ed. Heatwole H, Das I. Natural History Publications (Borneo) Sdn. Bhd., Malaysia.

Sparreboom M (1983) On the sexual behaviour of *P. caudopunctatus* (Lui & Hu) (Amphibia: Caudata: Salamandridae). *Amphibia-Reptilia* 4(1): 25–33.

Sparreboom M (2014) *Salamanders of the old world: the salamanders of Europe, Asia and northern Africa*. Brill.

Stuart S, Hoffmann M, Chanson J, Cox N, Berridge R, Ramani P, Young B (2008) Threatened Amphibians of the World. Ed. Stuart S, Hoffmann M, Chanson J, Cox N, Berridge R, Young B. Lynx Edicions, Barcelona, Spain; IUCN, Gland, Switzerland; Conservation International, Arlington, Virginia, USA.

Tran K, Ho CT, Nguyen SV, Pham T (2007) Part I, Animals. In: *Vietnam Red Data Book.* 2nd ed. Ed. Dang NT, Tran K, Dang HH, Nguyen C, Nguyen TN, Nguyen HY, Dang DT. Science and Technics Publishing House, Hanoi, Vietnam.

Weisrock DW, Papenfuss TJ, Macey JR, Litvinchuk SN, Polymeni R, Ugurtas IH, Zhao E, Jowkar H, Larson A (2006) A molecular assessment of phylogenetic relationships and lineage accumulation rates within the family Salamandridae (Amphibia, Caudata). *Mol Phylogenet Evol* 41(2): 368–383.

Welsh H, Droege S (2001) A case for using plethodontid salamanders for using ecosystem integrity monitoring biodiversity and ecosystem integrity of North American forests. *Conserv Biol* 15(3): 558–569.

Wu Y, Jiang KE, Hanken J (2010) A new species of newt of the genus *Paramesotriton* (Salamandridae) from southwestern Guangdong, China, with a new northern record of *P. longliensis* from western Hubei. *Zootaxa* 2494(2010): 45–58.

Wu Y, Rovito SM, Papenfuss TJ, Hhanken J (2009) A new species of the genus *Paramesotriton* (Caudata: Salamandridae) from Guangxi Zhuang Autonomous Region, southern China. *Zootaxa* 2060(2009): 59–68.

Xie F, Lau MWN, Stuart SN, Chanson JS, Cox NA, Fischman DL (2007) Conservation needs of amphibians in China: A review. *Sci China, Ser C: Life Sci* 50(2): 265–276.

Ye, C.Y., Fei, L., Hu, S.Q. (1993) *Rare and economic amphibians of China.* Sichuan Publishing House of Science and Technology, Chengdu (in Chinese).

Yiming L, Wilcove DS (2005) Threats to vertebrate species in China and the United States. *Bioscience*

55(2): 147–153.

Yuan Z, Wu Y, Zhou J, Che J (2016) A new species of the genus *Paramesotriton* (Caudata, Salamandridae) from Fujian, southeastern China. *Zootaxa* 4205(6): 549–563.

Yuan Z, Zhao H, Jiang K, Hou M, He L, Murphy RW, Che J (2014) Phylogenetic relationships of the genus *Paramesotriton* (Caudata: Salamandridae) with the description of a new species from Qixiling Nature Reserve, Jiangxi, Southeastern China and a key to the species. *Asian Herpetol Res* 5(2): 67–79.

Zhang L, Hua N, Sun S (2008) Wildlife trade, consumption and conservation awareness in southwest China. *Biodivers Conserv* 17(6): 1493–1516.

Zhang P, Papenfuss TJ, Wake MH, Qu L, Wake DB (2008) Phylogeny and biogeography of the family Salamandridae (Amphibia: Caudata) inferred from complete mitochondrial genomes. *Mol Phylogenet Evol* 49(2): 586–597..

Zhao H, Che J, Zhou W, Chen Y, Zhao H, Zhang Y-P (2008) A new species of *Paramesotriton* (Caudata: Salamandridae) from Guizhou Province, China. *Zootaxa* 1775(2008): 51–60.

Zhigang Y, Ermi Z, Shunqing L (2004) *Paramesotriton guangxiensis*. *IUCN Red List Threat. Species 2004 e.T59459A11945437* http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T59459.

Zhigang Y, Wai M, Lau N (2004) *Paramesotriton caudopunctatus*. *IUCN Red List Threat. Species 2004 e.T59456A11945015* http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T59456.

Ziegler T (2016) Two decades of herpetodiversity sereach in Vietnam and Laos: A review of a German-Vietnamese long-term cooperation. In ‘Proc. 3rd Natl. Sci. Conf. Amphib. Reptil. Vietnam.

**Annex I – General information**

**Table 1.** Common names of species.

| Scientific name | English | Chinese |
|---|---|---|
| *P.aurantius* | Orange colored warty newt | 橙脊瘰螈 |
| *P. caudopunctatus* | Spot-tailed warty newt | 尾斑瘰螈 |
| *P. chinensis* | Chinese warty newt | 中国瘰螈 |
| *P. deloustali* | Tam Dao salamander or Viet Nam warty newt | 越南瘰螈 |
| *P. fuzhongensis* | Wanggao warty newt or Fuzhong warty newt | 富钟瘰螈 |
| *P.guangxiensis* | Guangxi warty newt | 广西瘰螈 |
| *P. labiatus* | Spotless Smooth warty newt or Ermi Zhao warty newt | 无斑瘰螈 |
| *P. longliensis* | Longli warty newt | 龙里瘰螈 |
| *P. maolanensis* | Maolan warty newt | 茂兰瘰螈 |
| *P. qixilingensis* | Qixiling warty newt | 七溪岭瘰螈 |
| *P.wulingensis* | Wulin warty newt | 武陵瘰螈 |
| *P. yunwuensis* | Yunwu warty newt | 云雾瘰螈 |
| *P. zhijinensis* | Zhijin warty newt | 织金瘰螈 |

**Table 2.** Overview about relevant factors, which have been recorded to affect different *Paramesotriton* species. N.i. means "no information" available.

| Species | Habitat loss | Extremely small range | Decreased pop trend | Intentional harvest | Human consump. | Use in medicine | Intern. trade | IUCN cat. (date ass.) |
|---|---|---|---|---|---|---|---|---|
| *P. aurantius* | n.i. | n.i. | n.i. | n.i. | n.i. | n.i. | n.i. | NA |
| *P. caudopunctatus* | Yes | No | Yes | Yes | n.i. | Yes | Yes | NT (2004) |
| *P. chinensis* | n.i. | No | n.i. | Yes | n.i. | n.i. | Yes | LC (2004) |
| *P. deloustali* | Yes | No | Yes | Yes | n.i. | n.i. | Yes | LC (2017) |
| *P. fuzhongensis* | Yes | No | Yes | Yes | n.i. | n.i. | Yes | VU (2004) |
| *P. guangxiensis* | Yes | No | Yes | Yes | n.i. | n.i. | Yes | EN (2004) |
| *P. labiatus* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | LC (2004) |
| *P. longliensis* | n.i. | No | n.i. | n.i. | n.i. | n.i. | Yes | NA |
| *P. maolanensis* | n.i. | Yes | n.i. | n.i. | n.i. | n.i. | n.i. | NA |
| *P. qixilingensis* | n.i. | Yes | n.i. | n.i. | n.i. | n.i. | n.i. | NA |
| *P. wulingensis* | n.i. | Yes | n.i. | n.i. | n.i. | n.i. | n.i. | NA |
| *P. yunwuensis* | n.i. | Yes | n.i. | Yes | Yes | n.i. | n.i. | NA |
| *P. zhijinensis* | n.i. | Yes | n.i. | n.i. | n.i. | n.i. | n.i. | NA |

**Annex II – Habitat and distribution**

**Specific species distributions within the genus *Paramesotriton*:**

1. *P. aurantius*. Endemic to southeastern China, Fujian Province, from Zherong, Luoyuan, Zherong and Putian Counties between 590 and 832 m asl. (Yuan et al. 2016).

2. *P. caudopunctatus*. Endemic to central China, known from southeastern Chongqing, southwestern Hunan, southeastern Guizhou, and Fuchuan in eastern Guangxi provinces, from 500 to 1,800 m asl. with an EOO (extent of occurrence) probably not greater than 20,000 $km^2$ (Zhigang et al. 2004b, Frost 2018). It seems there are two morphogroups: one from East Guangxi and another from Southeast Guizhou (Pasmans et al. 2014).

*3.* *P. chinensis*. Endemic to central China in Hunan, Anhui, Zhejiang and Fujian provinces, from 200 to 1,200 m asl. (Huiqing et al. 2004, Wu et al. 2009, Wu et al. 2010).

4. *P. deloustali*. Endemic to North Viet Nam, found in more than ten localities in Bac Kan, Ha Giang, Yen Bai, Tuyen Quang, Tay Nguyen, Quang Ninh, Vinh Phuc and Lao Cai provinces. It occurs from about 600 to 1,900 m asl. with an estimated EOO of 80,600 $km^2$ projected beyond known sites (Frost 2018).

5. *P. fuzhongensis*. Endemic to China, north-eastern Guangxi Province (Zhongshan, Fuchuan and Gongchen Counties), from 400 to 1,200 m asl. with an EOO less than 20,000 $km^2$ (Ermi and Zhigang 2004).

*6.* *P. guangxiensis*. Known to China, Southwest Guangxi Province, Ningming County, Minjiang Commune, Paiyang Mountain and from Viet Nam, in the northeastern part of Cao Bang Province, Viet Nam, at an elevation of about 470 m asl. (Rafaëlli 2014). Estimates by Zhigang et al. (2004a) calculate an EOO less than 5,000 $km^2$, and AOO (area of occupancy) less than 500 $km^2$ but the assessment only contemplated the Chinese populations.

7. *P. labiatus*. Endemic to China, Guangxi Province, Mount Dayao in Jinxiu and Longshen Counties from 880 to 1,300 m asl. (Frost 2018), known from one unique stream (Sparreboom 2014).

8. *P. longliensis*. Endemic to China, known from central Guizhou Province, Longli County, Shuichang village at 1,142 m altitude (Li et al. 2008), from western Hubei Province, Xianfeng County, Shizilu village at 787 m elevation (Wu et al. 2010) and from southeastern Chongqing (Wu et al. 2010).

9. *P. maolanensis*. Is known only from a 60 $m^2$ deep pool with a connection to an underground river in the Maolan National Nature Reserve in Libo County in southern Guizhou, China (Gu *et al.* 2012a).

10. *P. qixilingensis*. Endemic to Qixling Nature Reserve, Mount Shenyuan, Yongxin County, Ji'an, Jiangxi, China, at 1,924 m elevation (Yuan et al. 2014).

11. *P. wulingensis*. Endemic from Wuling mountains: Youyang, in southeastern Chongqing Province and Jiankou, in northastern Guizhou, China, at elevations between 500 to 1,800 m asl. (Sparreboom 2014).

12. *P. yunwuensis*. Endemic from a scenic park near Nanchong village, Fuhe, Luoding city, Southwest Guangdong Province, China. Probably occurs more widely in the Yunwu Mountains (Wu et al. 2010).

13. *P. zhijinensis*. Endemic from one artificial pool (Shuangyan Pond), with 6,700 $m^2$ area fed by an underground spring in Zhijin County, Guizhou Province, China at 1,310 m asl. (Zhao et al. 2008).

**Habitat characteristics in more detail for the different species:**

*P. chinensis* prefers wide streams with swift running water; *P. longliensis* is known from a wide river (10 to 20 m wide and 1 to 2 m deep) and from large reservoirs and their outflows; *P. maolanensis* is so far only known from a 60 $m^2$ deep pool with warm water temperature, connected to an underground water system with caves in a limestone forest, *P. caudopunctatus* prefers slower stream' current as well as pools with water depth between 10 and 100 cm; *P. deloustali* inhabits smaller streams in lower montane evergreen forest, including small pools and man-made basins; *P. fuzhongensis* inhabits preferably pools of low-gradient montane streams in broadleaf forests; *P. guangxiensis* inhabits low gradient streams under dense forest and bushes; *P. labiatus* is known from one shallow, flowing stream 3 to 4 m in width, in broadleaf forest with floor covered by herbaceous plants and vines; *P. wulingensis* is known from mountain streams with a variety of sizes surrounded by forested areas; *P. yunwuensis* inhabits large pools up to 3 m deep, alongside a montane stream at mid-elevation in broadleaf forest; *P. zhijinensis* is known from one artificial pond fed by a subterranean spring of warm water (Sparreboom 2014) and according to Li et al. (2008) also from slow-flowing, shallow streams.

In Guangxi Province, where *P. labiatus*, *P. fuzhongensis* and *P. guangxiensis* occur, the climate is tropical moist, the terrain mountainous and there are well-preserved old growth forests (Wu et al. 2009). *P. maolanensis*, *P. zhijinensis* and *P. longliensis* live in limestone forests associated with caves and underground water systems (Gu et al. 2012a). *P. aurantius* inhabits moist evergreen forest (Yuan et al. 2016).

**Annex III - Morphology**

Specific morphological characteristics within the genus *Paramesotriton*.

The following identification key synthesizes previous work (Fei et al. 2006, Wu et al. 2009, 2010a, Gu et al. 2012a, 2012b) from Yuan et al. 2014:

1. Skin relatively smooth 2
   Very rough skin 4

2. Few granular warts on the head and body; eyes not reduced 3
   Granular warts absent on the head and body; reduced eyes *P. maolanensis*

3. Body slender and flat; tail long; vertebral ridge inconspicuous *P. labiatus*
   Body not slender and flat; tail short; vertebral ridge conspicuous *P. hongkongensis*

4. Body small; dorsolateral ridge with yellow or orange tint. 5
   Body robust; dorsal ridge is the same color as other parts of the dorsal surface 8

5. Scent glands absent on snout; vestigial gills and gill filaments absent 6
   Scent glands on snout; 3 gill filaments behind head. *P. zhijinensis*

6. No fleshy protuberance present in branchial region; three colored spots on tail of males 7
   Fleshy protuberance present in branchial region; three colored spots on tail of males *P. longliensis*

7. Dorsum olive brown; frontal branch of pterygoid arrived at the posterior edge of maxillary *P. wulingensis*
   Dorsum pale yellow; frontal branch of pterygoid not contacting posterior edge of maxillary *P. caudopunctatus*

8. Small, irregular orange-red spots on its chin, venter, underside of axillae, and cloaca. 9
   Large irregular orange-red spots on its chin, venter, underside of axillae, and cloaca. 10

9. Tail gradually tapers from base to tip without expanding posteriorly; tail fins underdevelopment; dorsal and lateral sides of the trunk with many clustered, conical warts; cloaca of females relatively flat *P. qixilingensis*

| | |
|---|---|
| Tail expands posteriorly to form tail fin; warts small; cloaca of females raised. | *P. chinensis* |
| 10. Vertebral ridge flat or low; few granular warts | *P. yunwuensis* |
| High vertebral ridge; densely granulated warts | 11 |
| 11. Digit tips only overlap when forelimbs and hind limbs adpressed | 12 |
| Palm and tarsus overlap when forelimbs and hind limbs adpressed | *P. fuzhongensis* |
| 12. Extended forelimb reaches midpoint of eye | *P. deloustali* |
| Extended forelimb reaches posterior edge of eye only | *P. guangxiensis* |

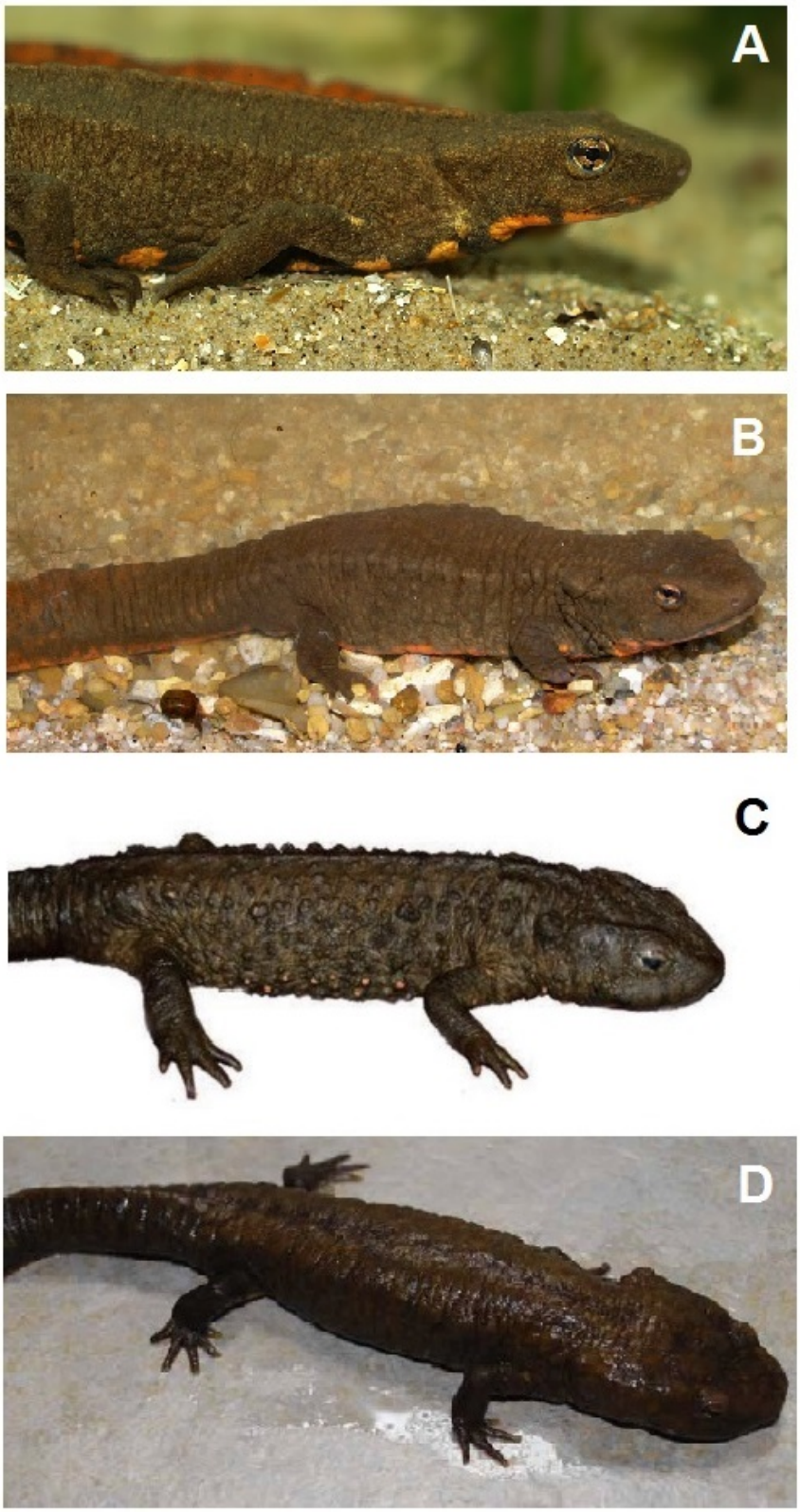


**Figure 2**. Evidence of morphological conservatism within *Paramesotriton* species: A) *P. hongkongensis* (H. Wallays 2007, AmphibiaWeb); B) *P. guangxiensis* (A. Jamin 2010, AmphibiaWeb – same); C) *P. qixilingensis* (Yuan et al. 2014); D*) P. yunwuensis* (Wu et al. 2010).

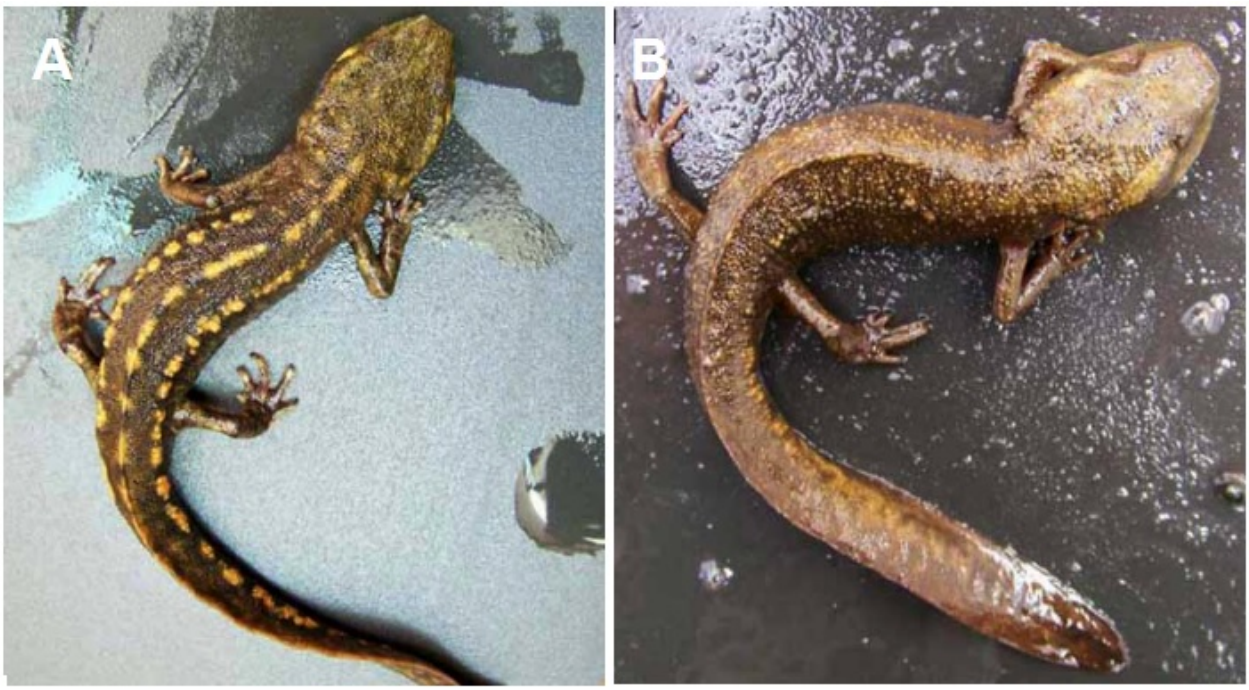


**Figure 3.** Example of phenotipical variation within individuals of the same species of *Paramesotriton* (here paratypes of *P. zhijinensis* [Source: Zhao et al. 2008]).

**Figure 4.** Documentation of a dried specimen of *Paramesotriton* spp. from 2012 to be used locally in traditional medicine in Quang Ninh Province, Viet Nam. (Photo: M. Bernardes).

**Annex IV – Trade**

**Figure 1.** Examples of two undescribed taxa of *Paramesotriton* in the trade: (left) "red *P. hongkongensis"* and (right) an "odd *P. fuzhongensis"* female. Source: Facebook.


**Figure 2.** Example of online advertisements for *Paramesotriton* spp. original from China from an aquarium shop in Germany (assessed on April 2018).

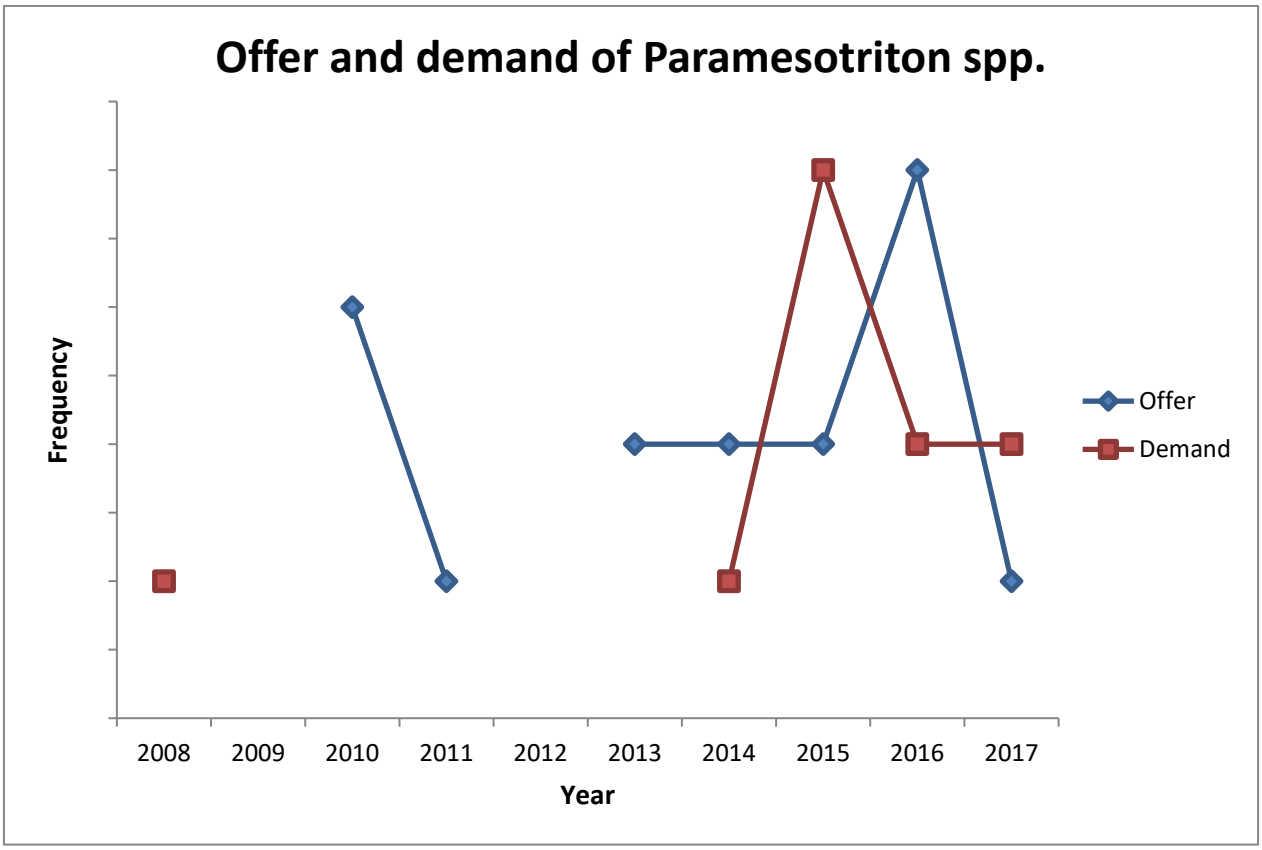


**Figure 3:** Offer and demand tendencies for *Paramesotriton* spp. based on the data from Table 1 (Annex III) for a period between 2008 and 2018.

**Table 1.** Trade in *Paramesotriton* spp. based on recent internet survey, market survey and interviews with dealers. W – Wild caught

| Date | Country | Trade type | Species | No. ind. | Price | Purpose | Source | Comment |
|---|---|---|---|---|---|---|---|---|
| March 2018 | Viet Nam | offer | *P. deloustali* | | 7 $ to 10 $ | shop | Pet shop in Bien Hoa, Dong Nai Province | "W" from type locality in Vinh Phuc Province, Viet Nam |
| March 2018 | Viet Nam | offer | *P. guangxiensis* | | 15 $ each | shop | Pet shop in Bien Hoa, Dong Nai Province | Imported from China |
| March 2018 | Viet Nam | offer | *P. deloustali* | | 1 $ to 6 $ each | shop | In 5 pet shop in Hanoi | No stock at the moment. Animals are sold from May to September |
| March 2018 | Viet Nam | offer | *P. deloustali* | | 1 $ to 6 $ each | shop | Dong Xuan Market in Hanoi | No stock at the moment. Animals are sold from May to September |
| March 2018 | Viet Nam | offer | *P. deloustali* | | 1 $ to 3 $ each | shop | In 3 pet shops in Ho Chi Minh city | No stock at the moment. Animals are sold from April to August |
| March 2018 | Viet Nam | offer | *P. deloustali* | | | shop | Facebook | Advertisement from shop in Ho Chi Minh city, Vietnam |
| 2.02.2018 | Sweden | demand | *P. caudopunctatus, P. deloustali* | | | | Facebook | |
| 31.01.2018 | U.S.A. | demand | *P.* spp. | | | | Facebook | |
| 9.01.2018 | U.S.A. | demand | *P.* spp. | | | private | http://www.caudata.org/forum/ | |
| 5.10.2017 | UK | demand | *P. labiatus* | | | private | Facebook | looking for a female |
| 13.09.2017 | CZ | demand | *P.* spp. | | | private | Facebook | |
| 13.04.2017 | Germany | offer | *P. chinensis* | 0.0.3 | 12 € each | private | https://terraristik.com | CB2016 |
| 5.11.2016 | U.S.A. | offer | *P. chinensis* | 1 | 40 $ | private | http://www.caudata.org/forum/ | LTC |
| 18.08.2016 | Portugal | demand | *P. deloustali* | | | private | https://terraristik.com | |
| 19.07.2016 | UK | offer | *P. labiatus* | 1.0.0 | £18 | private | Facebook | |
| 4.04.2016 | U.S.A. | offer | *P. chinensis* | ~ 80 | 2 $ / egg | private | http://www.caudata.org/forum/ | Life stage: eggs |
| 2.03.2016 | Italy | demand | *P. chinensis, P. deloustali* | | | private | Facebook | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 18.01.2016 | Germany | offer | *P. deloustali* | | | private | Facebook | F1 and F2 (2014)<br>*Bsal*. tested |
| 26.12.2015 | U.S.A. | demand | *P. chinensis* | | | private | http://www.faunaclassifieds.com/ | male |
| 9.11.2015 | Italy | demand | *P. deloustali* | 0.1.0 | | private | Facebook | |
| 29.06.2015 | U.S.A. | demand | *P.* spp. | | | private | http://www.faunaclassifieds.com/ | |
| 28.06.2015 | U.S.A. | offer | *P. chinensis* | | 15 $ | private | http://www.faunaclassifieds.com/ | |
| 26.05.2015 | U.S.A. | demand | *P.* spp. | | | private | http://www.faunaclassifieds.com/ | |
| 13.04.2015 | Germany | offer | *P. chinensis* | | | shop | https://www.aquariumglaser.de/ | "W" |
| 16.10.2014 | UK | offer | *P. fuzhongensis,*<br>*P. chinensis* | 2 | £ 25 *P. fuzhongensis* and £ 20 *P. chinensis* | private | http://www.caudata.org/forum/ | |
| 29.06.2014 | UK | demand | *P. chinensis* | 0.0.2 | | private | http://www.caudata.org/forum/ | |
| 8.04.2014 | U.S.A. | offer | *P. chinensis* | | 40 $ both | private | http://www.faunaclassifieds.com/ | 2 LTC female |
| 29.12.2013 | UK | offer | *P. chinensis,*<br>*P. labiatus* | 2 | | private | http://www.caudata.org/forum/ | 3 y. old |
| 29.07.2013 | UK | offer | *P. chinensis,*<br>*P. labiatus* | 2 | | private | http://www.caudata.org/forum/ | LTC |
| 17.12.2011 | U.S.A. | offer | *P. chinensis* | | 15 $ each | private | http://www.caudata.org/forum/ | |
| 28.10.2010 | UK | offer | *P. chinensis,*<br>*P. caudopunctatus* | 4 | | private | http://www.caudata.org/forum/ | *P. caudopunctatus* is WC |
| 2.08.2010 | U.S.A. | offer | *P. chinensis,*<br>*P. hongkongensis* | | 10 $ each | private | http://www.caudata.org/forum/ | seller will be at the Hamburn, Pa Reptile Show or can ship |
| 21.06.2010 | U.S.A. | offer | *P. chinensis,*<br>*P. hongkongensis* | | 10 $ each | private | http://www.caudata.org/forum/ | seller will be in the White Plains Reptile Show in NY or can ship |
| 17.08.2008 | U.S.A. | demand | *P. deloustali*, *P.* spp. | | | private | http://www.caudata.org/forum/ | |

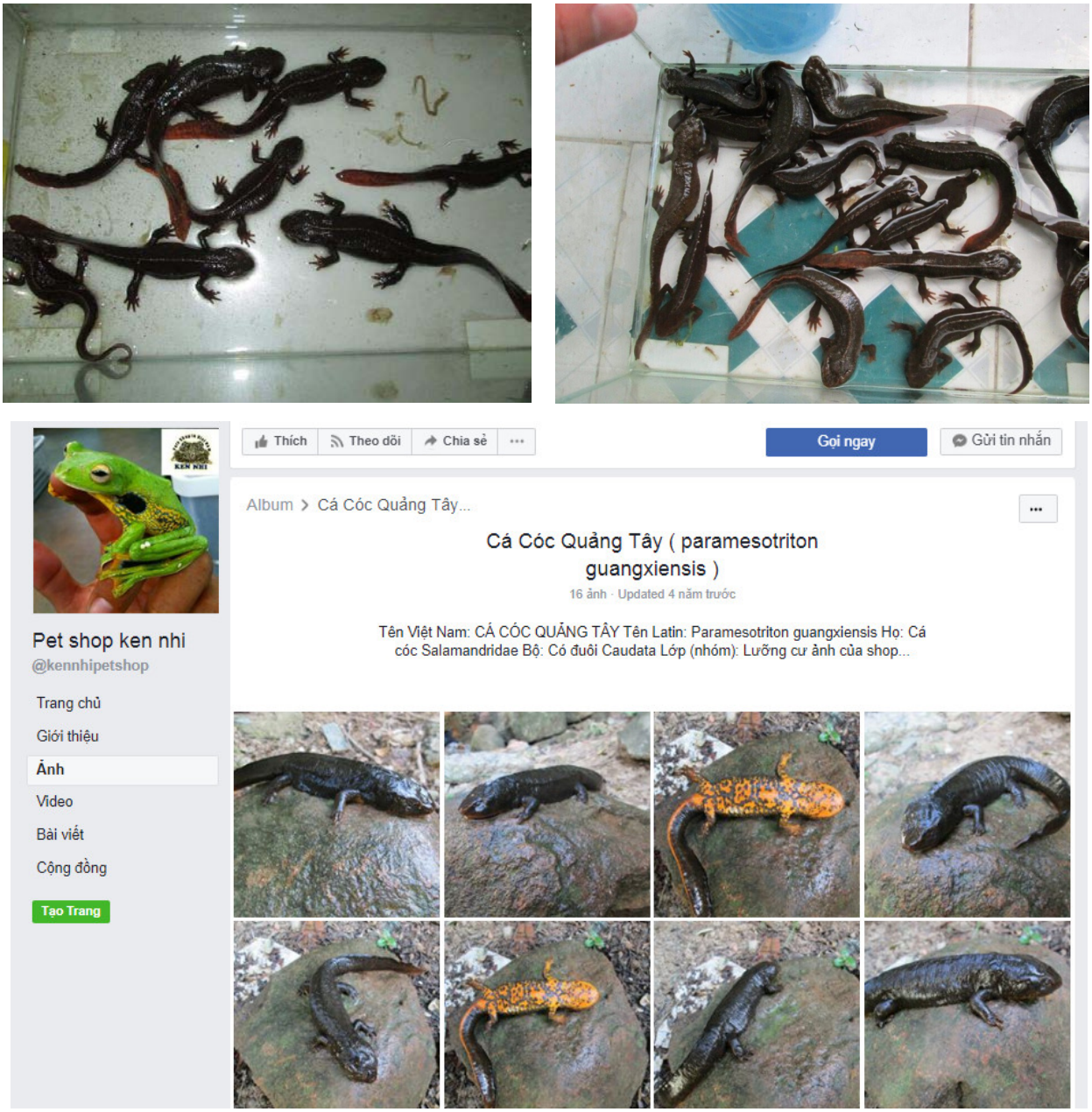


**Figure 4.** Examples of illegal trade within the genus *Paramesotriton*: (above) wild caught *P. deloustali* offered in the internet (Photos by H. N. Ngo) and (below) online advertisement for *P. guangxiensis* from a pet shop in Bien Hoa, Dong Nai Province, Viet Nam (assessed in March 2018).