

Short communication

Estimating the global trade in Southeast Asian newts



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ABSTRACT

The global trade in amphibians is widespread, involves hundreds of species, and has been implicated in amphibian population declines. The pet trade is the primary driver for population declines in one Southeast Asian newt species (*Laotriton laoensis*), and is a known threat to most of the 13 other known species from the region. Despite this, there has been little attempt to assess the impact of collection for the pet trade on Southeast Asian newts. We examined available import data from the US, Europe and Hong Kong, assessed current online trade and surveyed local pet traders within Southeast Asia. Large numbers of Southeast Asian newts are harvested from the wild to meet the demands of the international pet trade, with more than 7500 individual newts imported into the US alone during 2005–2014. Internet trade surveys revealed the global extent of the trade, with Southeast Asian newts for sale as pets in 15 countries throughout Europe, Asia and North America, at between ~ USD30–260 each. The trade in newts within Southeast Asia appears negligible in comparison. Urgent measures are required in order to conserve Southeast Asian newts but the lack of data on the species and number of individuals impacted by the pet trade makes it difficult to monitor and accurately assess its threat. We strongly recommend that all Southeast Asian newts be listed on CITES. This measure should improve monitoring of trade and provides importing countries opportunity to curb trade in species that were illegally harvested, thus helping to safeguard wild populations.

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1. Introduction

The international wildlife trade is one of the leading threats to biodiversity conservation. This threat is disproportionately large in Southeast Asia, a region that is both a centre for the consumption of wildlife products and a major supplier of wildlife to the international market (Nijman, 2010; Sodhi et al., 2004; TRAFFIC, 2008). The unsustainable, and often illegal, harvest of animals from the wild in Southeast Asia has already resulted in species population declines and extirpations (Duckworth et al., 2012; Rao et al., 2014; Stuart et al., 2006; van Schingen et al., 2014).

The global trade in amphibian species is widespread, involves hundreds of species, and has been implicated in driving local amphibian population declines (Jennings and Hayes, 1985; Wang et al., 2004). In Southeast Asia, amphibians are harvested from the wild to supply the demand for food, pets, and traditional medicine (Rowley et al., 2010). The pet trade is a major driving force behind the wildlife trade in Southeast Asia (Sodhi et al., 2004) and has been identified as causing population declines in at least one species of amphibian in Southeast Asia, the Lao Newt *Laotriton laoensis* (Phimmachak et al., 2012; Stuart et al., 2006).

Recently, global attention has been drawn to the international trade in Asian newt species as vectors for the introduction of the pathogen *Batrachochytrium salamandrivorans* (Bsal) into Europe (Martel et al., 2014). This pathogen threatens the survival of newts and salamanders native to Europe, and potentially those in North America (Gray et al., 2015; Martel et al., 2014; Yap et al., 2015). A temporary ban on importing Asian newts has been proposed for the sake of native population of European and North American salamanders (Gray et al., 2015,

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Yap et al., 2015). Thus, curbing trade in Asian newts may have the unintended benefit of also protecting wild salamander populations elsewhere in the world (Stuart et al., 2014).

Fourteen species of newt in three genera (*Laotriton*, *Paramesotriton* and *Tylototriton*) have been reported from four countries in Southeast Asia: Laos, Myanmar, Thailand and Vietnam (Frost, 2016; Table 1). Over 70% are endemic to the region (Frost, 2016). Our understanding of newt diversity in the region has changed dramatically in recent years, with the number of species recognised from the region increasing threefold since 2000 (Frost, 2016). This is a result of increased survey effort and the incorporation of molecular data in resolving species boundaries in morphologically conserved taxa (Le et al., 2015; Nishikawa et al., 2013, 2014; Phimmachak et al., 2015a; Stuart et al., 2010). Undescribed diversity likely remains (Nishikawa et al., 2013; Sparreboom, 2014) and the basic biology, ecology and true conservation status of known Southeast Asian newts remains poorly-known (Phimmachak et al., 2015b).

At present, global conservation status assessments are available for only about half of all Southeast Asian newt species (IUCN, 2015), and most others have not been assessed in more than a decade (prior to taxonomic revision). Of the eight assessed species, four are considered threatened with extinction, and three are near threatened (Table 1). *Tylototriton verrucosus* is the only species of newt in Southeast Asia that is currently considered Least Concern, but since the assessment was performed (van Dijk et al., 2009), new research has shown that this species actually consists of a complex of several species, each having narrower ranges and thus more likely to be threatened (e.g., Nishikawa et al., 2013, 2014; Phimmachak et al., 2015a; Le et al., 2015). For example, one recently described species previously thought to be *T. verrucosus*, *T. shanorum*, is endemic to Myanmar (Nishikawa et al., 2014), where it is currently known only from a few ponds at risk of development (G. Wogan, pers. comm).

According to the IUCN (2015), collection for the pet trade is considered a threat to all Southeast Asian newt species except *Paramesotriton guangxiensis* and *Tylototriton vietnamensis* (although both species are in the pet trade and so may also be threatened by trade; Sparreboom, 2014). The pet trade is the primary driver for population declines of *Laotriton laoensis* (IUCN SSC ASG 2014; Phimmachak et al., 2012; Stuart et al., 2006). Despite this, there has been little attempt to assess the impact of the collection for the pet trade on wild Southeast Asian newt populations (but see Anonymous, 2013).

To gain a better understanding of the nature and scale of the trade in Southeast Asian newts, we examined import records from the US, EU and Hong Kong, surveyed global online trade and surveyed local pet traders within Southeast Asia.

2. Methods

We obtained records of shipments of Southeast Asian newts into or out of the United States, from 2005 to 2014 (Yap et al., 2015), and from the USFWS Law Enforcement Management Information System (LEMIS). For import records of Southeast Asian newts into the EU, we downloaded available data from the CITES Trade Database (2011–2013; http://trade.cites.org/en/cites_trade, downloaded April 2016). Species in the genera *Laotriton*, *Paramesotriton* and *Tylototriton* have been listed on Annex D of the European Union Wildlife Trade Regulations since 2009. We also obtained records of newts imported into Hong Kong from November 1998 to June 2015 from the Agriculture, Fisheries and Conservation Department of the Hong Kong Special Administrative Region Government (Appendix 1). We used these data because of their availability; similar data were unavailable for other countries, including those that are likely significant importers of Southeast Asian newts, notably Japan and mainland China.

We conducted an online survey for Asian newts in the pet trade by searching via Google and directly via websites and forums selling amphibians (Appendix 2) using scientific species names and common names in English, Vietnamese, Mandarin, Japanese, German, Dutch and Spanish. Although we attempted to be comprehensive, we likely missed non-English language sites as many sites did not list scientific names in identifying animals for sale, and common names were often not species-specific or reliable. When possible, information on prevalence, origin and cost were gathered from websites.

Vietnam contains the highest species diversity of newts of any of the four Southeast Asian countries. As such, we used Vietnam as a case study to assess the local trade in Southeast Asian newts for both pets and traditional medicine. We investigated local trade in Hanoi and Ho Chi Minh City. In Hanoi we surveyed 25 stores (20 pet/aquarium shops, one free-lance trader, and four traditional medicine stores) on 25 to 26 July 2015. In Ho Chi Minh City we visited 10 stores (seven pet/aquarium shops, and three traditional medicine stores) from 29 November to 5 December 2015.

3. Results

Between 2005 and 2014, 7508 individuals of four species of Southeast Asian newts were recorded as being imported live into the US: *Laotriton laoensis*, *Paramesotriton deloustali*, *Tylototriton shanjing* and *T. verrucosus* (Fig. 1). In addition, 1194 specimens reported only to the genus *Paramesotriton* or *Tylototriton*, and therefore potentially from Southeast Asia, were also reported. The Southeast Asian newt species

Table 1

Southeast Asian (Laos, Myanmar, Thailand and Vietnam) newt diversity, distribution, threats, protected status and detected presence in commercial trade.

Species	Year described	Endemic to SE Asia	Range	Threat Status	Protected status	In trade 2015 (online)*	In trade (LEMIS 2005–2014)**	In trade (EUWTR 2011–2013)
<i>Laotriton laoensis</i>	2002	Yes	Laos	EN	Laos	259 (7)	Yes	Yes
<i>Paramesotriton deloustali</i>	1934	Yes	Vietnam	VU	Vietnam	7(4)	Yes	
<i>Paramesotriton guangxiensis</i>	1983	No	China, Vietnam	EN				
<i>Tylototriton anguliceps</i>	2015	Yes	Laos, Thailand, Vietnam	NA	Thailand pending?			
<i>Tylototriton asperimus</i>	1930	No	China, Vietnam	NT		70 (5)		Yes
<i>Tylototriton notialis</i>	2010	Yes	Laos, Vietnam	VU				
<i>Tylototriton panhai</i>	2013	Yes	Laos, Thailand	NA	Thailand pending?			
<i>Tylototriton podichthys</i>	2015	Yes	Laos	NA				
<i>Tylototriton shanjing</i>	1995	No	China, Thailand	NT		59 (12)		
<i>Tylototriton shanorum</i>	2014	Yes	Myanmar	NA				
<i>Tylototriton uyanoi</i>	2013	Yes	Thailand	NA	Thailand pending?			
<i>Tylototriton verrucosus</i>	1871	No	Bhutan, China, India, Thailand	LC	Thailand	30 (23)	Yes	Yes
<i>Tylototriton vietnamensis</i>	2005	Yes	Vietnam	NT	Vietnam		Yes	Yes
<i>Tylototriton zieglerei</i>	2013	Yes	Vietnam	NA				
<i>Paramesotriton sp.</i>							Yes	
<i>Tylototriton sp.</i>							Yes	

* Average price per individual in USD (and number of records found).

** Source: Table S3, Yap et al. 2015.

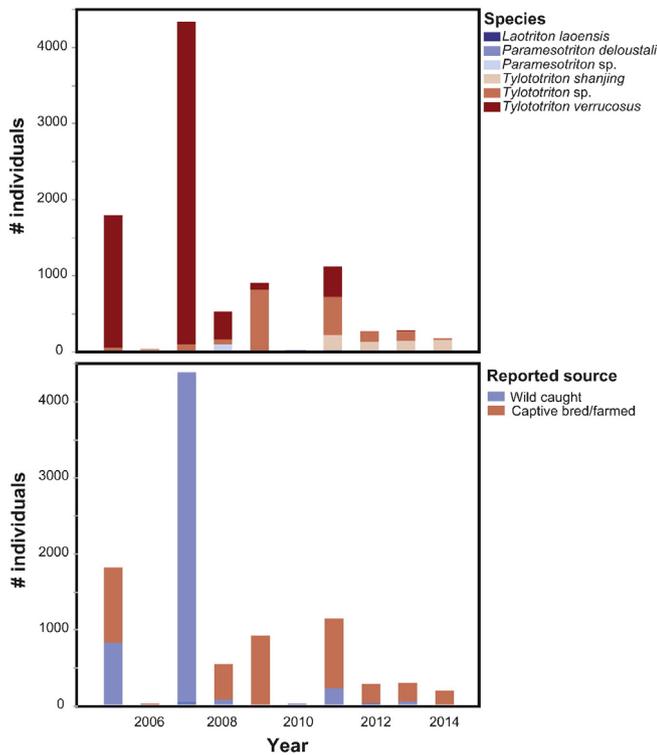


Fig. 1. Number of individuals of Southeast Asian (Laos, Myanmar, Thailand and Vietnam) newts, (or newts potentially from Southeast Asia (*Paramesotriton* sp. and *Tylostotriton* sp.), imported into the US during 2005–2014 (LEMIS) by species and by source (wild caught versus captive or farmed). A total of 15 individuals of *Laotriton laoensis* were recorded as being imported into the US in 2010 and in 2011, all reportedly captive bred.

recorded as being imported into the US in the greatest numbers is *T. verrucosus*, which accounted for 72% of all imports into the US between 2005 and 2014 (6822 individuals); 4240 individuals were imported into the US in 2007 alone.

The vast majority (87%) of Southeast Asian newts imported into the US were identified as wild-caught, with only 11% (imported from Hong Kong, Germany, Canada and Vietnam) identified as captive bred and 2% as farmed. There was no clear trend in the volume of Southeast Asian newts being imported into the US over time, with 2005, 2007 and 2011 being the years of highest imports and 2012–2014 having relatively low numbers imported (Fig. 1).

A total of 718 individuals of four species of Southeast Asian newts were recorded as being imported live into the EU from 2011 to 2013: *Laotriton laoensis* (41), *Tylostotriton asperrimus* (367), *T. verrucosus* (300) and *T. vietnamensis* (10). A total of 120 of the *T. asperrimus* were recorded as being wild caught, and the remainder (83%) were recorded as being from an unknown source. Over 90% of the newts recorded as being imported into the EU were imported into Germany. Of the Southeast Asian newts documented as being imported into the EU, 83% were imported from mainland China, 10% from Hong Kong, 6% from Japan and 1% from Vietnam.

Hong Kong appears to be serving as a transit hub for the Southeast Asian newt trade, with 908 wild caught and 2216 reportedly captive-bred or farmed, non-native *Paramesotriton deloustali*, *Tylostotriton shanjing*, and *T. verrucosus* (plus 839 wild caught *Paramesotriton* sp. and *Tylostotriton* sp.). All of these were subsequently imported into the US. Only 20 newts potentially from Southeast Asia (*T. verrucosus*, imported from Japan) were recorded as being imported into Hong Kong via the international airport from November 1998 to June 2015 (of 7815 newts recorded).

We found five Southeast Asian newt species for sale on the internet, *Laotriton laoensis*, *Paramesotriton deloustali*, *Tylostotriton asperrimus*,

T. shanjing and *T. verrucosus* (Table 1). The most commonly advertised species was *T. verrucosus*, which sold for relatively low values (average USD30). Of particular note is *L. laoensis*, which was found for sale on seven sites in three countries (Hong Kong, Japan and the US) at a high price (average USD259).

Southeast Asian newts were found listed for sale online as pets in 15 countries; Austria, Germany, Hong Kong, Italy, Japan, Malaysia, the Netherlands, Poland, Spain, the UK (England, Scotland, Wales), the US and Vietnam. Most records of Southeast Asian newts for sale were in the US (38%) and UK (33%). Of note, *Tylostotriton asperrimus* and *T. shanjing* were both listed for sale in the US but there were no records of their import into the US through the end of 2014.

In Hanoi, of the 25 stores surveyed only nine had any information about newts as pets (none had information about newts for traditional medicine). None of these stores had any newts at the time but several traders said that they could provide the newts if ordered. The traders said they could buy newts from local residents who collect wild animals, and one trader said he could obtain newts from Tay Yen Tu (Bac Giang province, the type locality of *Tylostotriton vietnamensis*). Another trader also reported sending newts to Ho Chi Minh City, a large city in Vietnam that is far outside of the native range of newts (Le et al., 2015). The price of purchasing newts as pets in Hanoi was ~USD13–22 (VND300,000–500,000). In Ho Chi Minh City, of the ten stores surveyed, only one had any newts for sale as pets (>100 individuals of *Cynops orientalis*, a species that is endemic to China), two reported that they used to have newts for sale (*Cynops* spp. and *Paramesotriton deloustali* respectively), and one reported that they could order *Cynops* spp. None of the three traditional medicine stores had newts for sale. *Paramesotriton deloustali* was also found online (on Facebook) for sale as pets in Ho Chi Minh City for ~USD7 (VND150,000) each. Many pet stores and traders in Hanoi said that they had stopped selling newts in recent years due to low demand for pets from both domestic and international markets.

4. Discussion

Large numbers of Southeast Asian newts are harvested from the wild to meet the demands of the international pet trade. This trade is almost all unregulated and unrecorded, and as such we were only able to gain a glimpse into the trade via US, EU and Hong Kong import data and a subset of the online trade. Unfortunately, this is not a unique situation; much of the global trade in wildlife is not recorded in government statistics (Broad et al., 2003), and/or is illegal (Roe, 2008; TRAFFIC, 2008) and any trade figures obtained represent only a fraction of the actual volume of wildlife traded (Sodhi et al., 2004). Countries that we found to have a relatively large presence in the online trade, such as Japan, do not currently have data available on the import or export of newts. In addition, our online searches revealed reportedly wild caught Southeast Asian newts for sale belonging to species that were not recorded as having been imported into the EU (e.g. *Tylostotriton yangi* was advertised for sale online from a supplier in Italy).

With the available data, it was not possible to obtain estimates of the numbers of each species exported from Southeast Asian countries. There are no newt export records available from these countries, and most Southeast Asian newt species that were recorded as being imported into the US are native to countries that were not listed on documents. For example, only eight individuals of Vietnam-endemic *P. deloustali* were reported as being exported from Vietnam, despite most being listed as wild caught).

Local reports indicate that the scale of harvest of Southeast Asian newts is far greater than the limited number of trade statistics suggest. For example, in April 2008, villagers in Xiengkhouang Province in Laos reported selling 300–400 individuals of the Laos-endemic *L. laoensis* per year to visiting European or Japanese collectors for LAK5,000–15,000 (~USD0.60–1.76) each (IUCN SSC ASG, 2014; Phimmachak et al., 2012). In June 2009, local residents in Luang Phabang Province also reported selling hundreds of *L. laoensis* in January 2009 to a visiting

Chinese collector for LAK30,000 (~USD3.5) per kg (~USD0.20 per individual; IUCN SSC ASG, 2014). There are also recent (2015) reports of a market in Xiengkhouang Province selling *L. laoensis* for as little as LAK150,000/kg (~USD18/kg), approximately LAK10 000 (~USD1.20) per individual (S. Phimmachak, pers obs). *Laotriton laoensis* have also regularly been observed for sale as pets outside of their native range in Chatuchak market, Bangkok, Thailand (S. Phimmachak, pers. obs.).

The demand for Southeast Asian newts as pets is global in nature, and we found records of Southeast Asian newts for sale throughout Europe, Asia and the Americas. Our online searches revealed most records of Southeast Asian newts for sale in the US and UK but this may be at least partly a reflection of language bias in searches for common names and because scientific names are often not used.

Internet trade surveys conducted in 2011 (Anonymous, 2013) revealed fewer Southeast Asian species in the internet trade. The report listed *L. laoensis*, *T. shanjing*, and *T. verrucosus* in the internet trade, but not two species that we detected, *P. deloustali* and *T. asperimus*, both of which were described at the time. The prices reported in the survey for these species were similar to those recorded by us. In 2011, *L. laoensis* was reported for sale for USD240, similar to the average price we recorded (USD259), *T. shanjing* was USD28 (compared to our average of USD59) and *T. verrucosus* was USD39 (compared to USD30). The number of recorded instances of Southeast Asian newts for sale on the internet was much lower in the 2011 report (Anonymous, 2013), with six records versus 50 in our study, which may indicate an increase in trade, but it is difficult to compare search effort and efficiency.

Species identification is likely to be a significant source of error in any reporting of Southeast Asian newt species. In the LEMIS data, Southeast Asian newts were often not identified to species and were listed as “*Paramesotriton* sp.” and “*Tylosotriton* sp.” Morphological identification in this group is difficult or even impossible by a non-specialist, and to further complicate matters, the origin of the imported animals was often unknown. For example, regardless of specific identity, Chinese newts obtained via the pet trade are often labeled *Paramesotriton chinensis* (Sparreboom, 2014). Several of the newly described *Tylosotriton* species were previously confused with *T. verrucosus* and likely have been, and continue to be, traded under this name, erroneously or deliberately.

The trade in newts within Southeast Asia appears negligible in comparison to the international trade. Newts are used for traditional medicine and pets within Vietnam, Myanmar and Laos (Rowley et al., 2010). However, their use in Vietnam seems to be declining (Anonymous, 2013; T. Q. Nguyen pers. obs.) and they are no longer found commonly in open markets in Vietnam (Anonymous, 2013; Nguyen and Ho, 2004). Species of native newts (*Laotriton* and *Tylosotriton*) are used for traditional medicine in Laos, but at relatively low levels (Phimmachak et al., 2012; Phimmachak et al., 2015b). Systematic surveys of shops in other countries in the region are needed to determine if this trend is widespread.

The lack of data on the nature and scale of the trade makes it impossible to monitor and accurately assess the threat of the international pet trade on Southeast Asian newts. While several species are protected within their range countries, weak enforcement of this protection is a significant barrier to conservation efforts, and no Southeast Asian newts are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Rosser et al., 2001), the international agreement that monitors and regulates international trade in wildlife. Kaisers Spotted Newt (*Neurergus kaiseri*), endemic to Iran, is the only newt (family Salamandridae) listed in CITES at present. This Critically Endangered species (IUCN 2015) was listed in CITES Appendix I in response to illegal export to Europe and Japan for the pet trade in violation of Iranian national law (CITES 2010).

Regardless of the protection status of the Southeast Asian newt species in their range countries, the fact that none are listed in CITES means that trade in these species is not reported or regulated in all importing states. The Lacey Act in the US aids in prohibiting the import of species

illegally sourced in range states, but is easily circumvented by laundering animals through the EU or other states, and declaring them as being captive-bred there. There is no equivalent legislation in the EU, resulting in the legal import of Southeast Asian newt species regardless of whether or not they were legally sourced (Vinke and Vinke, 2015). Listing all Southeast Asian newt species in Appendix I or II of CITES (or Appendix III for species endemic to a single country) would allow for better monitoring and regulation. All range countries are Party to the Convention, as are the major importing countries.

To understand the impact of the pet trade on Southeast Asian newt species it is necessary to not only understand the level of harvest and trade, but also the link between harvesting levels and population declines. Population monitoring of Southeast Asian newts, and more information on their biology and ecology (e.g. Bernardes et al., 2013; Phimmachak et al., 2015b) is urgently required. The threat of harvesting must also not be considered alone. In all likelihood, the greatest threat to Southeast Asian newts is habitat loss (Rowley et al., 2010), and it is considered a threat to most Southeast Asian newt species that have been assessed (IUCN, 2015). Particularly when combined with habitat loss, climate change and disease, the harvesting of Southeast Asian newts from the wild has the potential to drive species to extinction.

As our understanding of species boundaries in Southeast Asian newts improves, it is becoming apparent that there may be no truly widespread, common species. All Southeast Asian newt species are likely to have relatively restricted ranges and therefore higher risk of extinction than currently understood. Particularly in the face of other threats (Rowley et al., 2010), it is vital that the nature and scale of harvesting of Southeast Asian newts be better understood and managed. Two East Asian newt species have already been extirpated in all or a significant part of their ranges (Lau et al., 2007), and at least one Southeast Asian newt is perilously close to being driven to extinction in the wild primarily due to the pet trade (Stuart et al., 2014). The threat of the illegal pet trade to Asian newts is such that a recent publication describing a new newt species from China, *Echinotriton maxiquadratus*, did not reveal the collection locality and made the specific request that “all hobbyists...refrain themselves from collecting this salamander or leaking locality information if encountered, and boycott any trading” (Hou et al., 2014; pp 89.).

Given that international trade is a major threat, we strongly recommend that all Southeast Asian newts be listed in CITES so that their trade is monitored, and the data can be used to inform conservation decisions and safeguard these species from over-harvesting. Listing these species in the Appendices of CITES would also provide mechanisms to control and regulate the trade in importing countries. Significant difficulties in identifying individual species would greatly hamper implementation of CITES, and therefore we recommend that *Laotriton*, *Paramesotriton* and *Tylosotriton* be listed in the Appendices of CITES at the genus level.

An additional threat is posed by the largely unregulated trade of Asian newts. Three Asian salamander species have been suggested to serve as reservoirs to the recently discovered pathogen Bsal: *Cynops pyrogaster*, *Cynops cyanurus*, and *Paramesotriton deloustali*, while other Asian species (e.g. *Tylosotriton wenxianensis*) are highly vulnerable. Based upon this information and phylogenetic relationships among the Asian newts, it is likely that other Southeast Asian newts are also reservoirs to Bsal (Stuart et al., 2014). As such, the global trade in Asian newts has potential to transport Bsal to naive populations of salamanders elsewhere in the world (Yap et al., 2015; Stuart et al., 2014). Very little is known about the pathogen itself, disease dynamics, and impact on host populations. Additional measures such as disease screening within native ranges for additional newt species will be necessary to understand the potential conservation impacts of this pathogen within Asia as well as to stem the inadvertent import of pathogens on these, and other amphibians, as they are transported around the world.

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