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The presence of protected reptiles from Sri Lanka in international commercial trade

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Reptiles are sourced in great volumes for both the legal and illegal markets and for a variety of purposes, including for food, leather, as pets and for use in traditional medicines (Böhm *et al*., 2013; Nijman *et al*., 2012). Demand is increasingly leading to the overexploitation of many reptile species (O'Brien *et al.,* 2003; Rosser and Mainka, 2002), which may result in local extinctions (Janssen and Indenbaum, in press; Stuart *et al*., 2006) and, ultimately, the extinction of entire taxa (Meiri *et al*., 2018). The sourcing of wild reptiles can be especially harmful when coinciding with other frequently occurring conservation threats such as habitat loss (Cushman, 2006; Maxwell *et al*., 2016).

Sri Lanka is a humid tropical island, with many natural ecosystems comprising forests, grasslands, sand dunes, wetlands and mangroves, which support a high diversity of wildlife including 219 reptile species, a large percentage of which are endemic to the country (Altherr, 2014; de Silva and Ukuwela, 2017); collection and trade in all reptile species is prohibited, with a few exceptions.

During the past few years there is evidence of organised animal trafficking in Sri Lanka. Unpublished data provided by the Customs Department and other law enforcement officials, including the navy, police and air force, indicate that at least 3,130 Star Tortoises *Geochelone elegans* were seized between 2015 and 2017 alone (Malsinghe *et al*., 2017; de Silva pers. obs., 2017). Further, some 124 Black-spotted Turtles *Geoclemys hamiltonii* (CITES Appendix I-listed, and non-native to Sri Lanka) being smuggled through Sri Lanka were confiscated by law enforcement agencies in 2015.

There are growing concerns that considerable numbers of reptiles are being smuggled through or out of the country annually (Altherr, 2014; D'Cruze *et al*., 2018). Sri Lankan reptiles have previously been recorded on the European market. In 2010, German pet traders visited Sri Lanka to discuss export options for Sri Lankan reptiles (ZZF, 2010), which were strongly opposed by local stakeholders, and in 2012, six foreigners were caught trying to smuggle Sri Lankan endemic reptiles and amphibians (Rodrigo, 2012). Sri Lankan reptiles are now regularly offered for sale on classified reptile websites (Altherr, 2014), yet very little is known about the scale or extent of this trade.

This study aims to provide evidence of Sri Lankan species currently found in international trade to assess the threat level trade might pose to individual species and, in so doing, evaluate the need for the listing of certain species in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

▲ Sri Lanka Green Pit Viper *Trimeresurus trigonocephalus*

Methods

The authors conducted online monitoring of Facebook (three groups) and classified reptile websites such as Terraristik.com between September 2016 and 31 October 2018. Offers were collected in a random and opportunistic manner using keyword searches (Terraristik.com) and notifications (Facebook) relating to species and genus names. Reptile offers were collected on groups that offered rare and uncommon species, as well as those that mentioned Sri Lankan endemic species or species for which Sri Lanka was the reported origin. For each offer, each species was treated as a separate record. Moreover, if prices differed this was treated as a separate record. Price data were converted to EUR using XE Currency Converter and converted to single animals (prices for a pair were split in two). Price data were multiplied by the total number of animals reported for that species. Records for Pondichéry Fan-throated Lizard *Sitana ponticeriana* and Bahir's Fan-throated Lizard *S. bahira* were merged after Amarasinghe *et al.,* (2015).

Import and export data for the USA were obtained from the US Fish and Wildlife Service (USFWS) Law Enforcement Management Information System (LEMIS) through the *Freedom of Information Act*, covering the period 2000–2015. The authors looked specifically at the data from the USA as that country is considered the main importer of live reptiles (Robinson *et al.,* 2015) and keeps detailed information on all species imported, both CITES- and non-CITES-listed (Schlaepfer *et al.,* 2005). The LEMIS database specifies the content of each shipment either with a species code, a genus code or a more general code (e.g. NONR = non-CITES reptile), with the latter more common in larger shipments (Schlaepfer *et al.,* 2005). The authors requested data specifically labelled as commercial trade (purpose code "T") of Sri Lankan reptile species using genus names, yet excluded the Star Tortoise. This species is widespread and heavily targeted by smugglers in India (D'Cruze *et al*., 2015) and it is not possible morphologically to distinguish the Indian animals from those from Sri Lanka. Star Tortoises found during the online survey were included if it was specifically mentioned that they originated from Sri Lanka.

Altherr (2014) highlighted the role of Germany and other European countries with regard to the trade in Sri Lankan reptiles, and in particular the role of the Terraristika reptile fair in Hamm, Germany (http://www.terraristikahamm.de/). The authors therefore analysed the data to see if there was a correlation between the quantities offered for sale in each advertisement and the number of days since, or towards, the quarterly reptile trade fair in Hamm. For this, a Kendall-Rank Correlation test using R Studio Version 1.1.456 (RStudio Team, 2015) was used.

Legislation

Wildlife in Sri Lanka is protected under the *Seventh Amendment to the Fauna and Flora Protection Ordinance* (FFPO) of 1993. In accordance with Section 30 of the FFPO, all reptiles, except five venomous snake species, are protected and collection is prohibited. Export of all reptiles or parts/products of reptiles is prohibited without a permit under Section 40 of the FPPO and only allowed for scientific purposes and for exchanges with zoos. This also includes captive breeding and the ranching of reptiles (Altherr, 2014).

Results

In total, 130 offers were documented for a minimum of 477 individuals of 18 reptile species for international commercial trade. The classified reptile website Terraristik.com was the main source of Sri Lankan reptiles, with 402 of 477 reptiles (16 species) observed on this platform. Facebook posts accounted for 75 animals of 11 species.

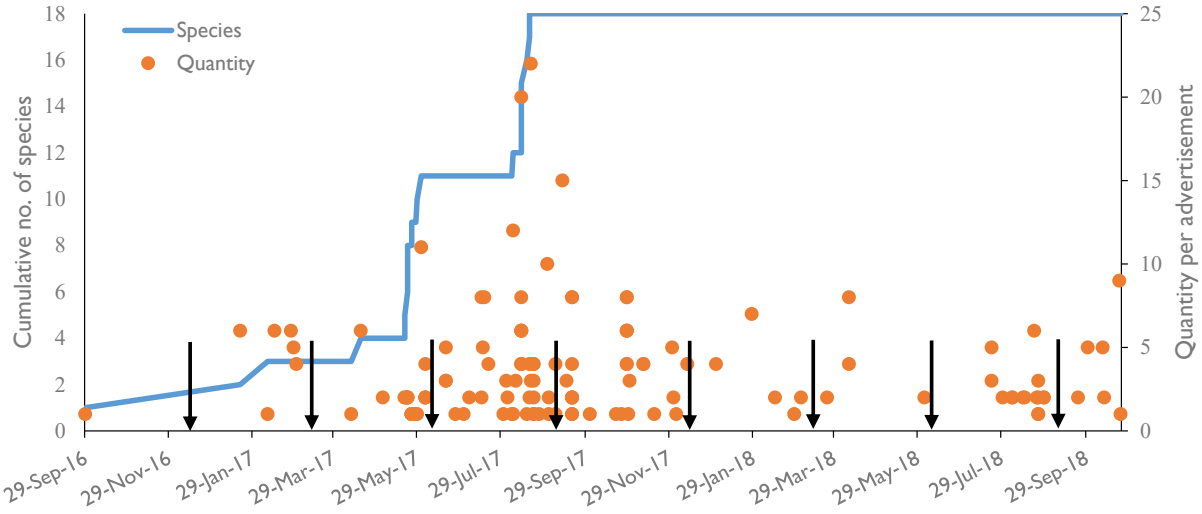
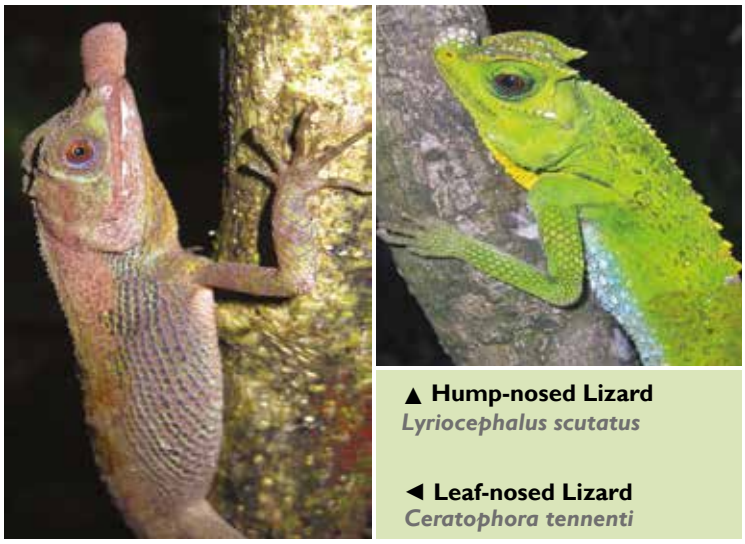


Fig. 1. Quantity per record (scatterplot) and the cumulative no. of species observed (line) throughout the survey period (September 2016–October 2018). The occurrence of the reptile fair in Hamm (Terraristika) is displayed with an arrow.

The number of animals observed was highest in 2017 with 383 animals, compared to one specimen in 2016 and 93 in 2018. The total number of species observed (18) during this study was reached 352 days into the survey period; no additional species were observed in the remaining 431 days of the study (Fig. 1). The number of species observed increased from four to 11 between April and June 2017, and 7–19 August 2017. During the first peak, the number of species observed increased from three to 11, and during the second peak from 13 to 18. This was, respectively, between 60 and nine days and 33 to 21 days before the Hamm reptile fair. A weak positive correlation was found between quantities offered for sale and the days until the next Hamm fair ($\tau = 0.138$, $Z = 2.156$, $p = <0.05$) and the days after a Hamm fair ($\tau = 0.149$, $Z = 2.307$, $p = <0.05$).

The most commonly encountered species was the Star Tortoise, with 116 specimens reported as originating from Sri Lanka (Table 1). This was followed by the Pygmy Lizard *Cophotis ceylanica* with 69 specimens and the Rhino-horned Lizard *Ceratophora stoddartii* (n=57). The majority of animals observed (n=279, 58%) were reportedly bred in captivity. For seven species, fewer than ten individuals were counted (Table 1) suggesting that these species are rare in captivity. Two pygmy lizards *Cophotis* spp. were documented as F1, which refers to first-generation offspring produced in a controlled environment, of which at least one of the parents was taken from the wild. For 182 of the reptiles observed (38%), no specific origin was mentioned. A wild origin was reported for two species—Star Tortoise (n=2) and Rhino-horned Lizard (n=3)—which constitutes a direct violation of Sri Lanka's FFPO. For nine animals the origin was declared as long-term captive, claiming a wild origin, but the animals had spent considerable time in captivity. Of all observed species, only the Star Tortoise is listed in the CITES Appendices (Appendix II) and only five have been assessed using the IUCN Red List Categories and Criteria (Table 1).

Prices were reported for 30 out of 130 records, comprising 12 species, a Rhino-horned Lizard offered for sale for EUR60 in Germany being the cheapest Sri Lankan species (although the average price for Rhino-horned Lizards during the survey was EUR312). An adult female Star Tortoise was the most expensive reptile at EUR3,200, for sale in Spain, while the average price for this species was EUR1,400. On average, the Knuckles Pygmy Lizard *Cophotis dumbara* was the most expensive reptile offered for sale (EUR1,443), and the Indian Cobra *Naja naja* the cheapest (EUR75). When the average observed price in EUR is multiplied with the total observed quantity, the cumulative average value of these 12 species (n=148) constitutes EUR62,913.



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▲ **Hump-nosed Lizard**
Lyriocephalus scutatus

◀ **Leaf-nosed Lizard**
Ceratophora tennenti

Offers to sell were tied to 14 countries, with vendors from Germany offering the largest number of Sri Lankan reptiles for sale, with 248 individuals of 17 species. Vendors from Spain reported the second-highest numbers of Sri Lankan reptiles, with 69 individuals of just three species. Of the 14 countries documented to be selling Sri Lankan reptiles, only three were non-European, with USA (n=39, of seven species) offering the largest number of Sri Lankan reptiles for sale, followed by vendors from Canada (n=15, of four species) and Malaysia (n=6, of two species). Offers for the Star Tortoise and Pygmy Lizard were recorded in six countries, suggesting that these species are relatively widespread in international commercial trade. The Leaf-nosed Lizard *Ceratophora tennetii* and Sri Lanka Green Pit Viper *Trimeresurus trigonocephalus* were offered for sale in five countries. For four species (Table 1), offers were recorded in one country. Spain (n=9), Germany (n=5) and Switzerland (n=1) were the only countries reporting animals with either a wild, or long-term captive origin. A total of 11 of these related to Star Tortoises, and the remaining three were Rhino-horned Lizards.

LEMIS Database

The LEMIS Database contains US records for the import or export of four Sri Lankan species, with a total of 52 animals. The Sri Lanka Green Pit Viper was the most commonly imported, with 30 specimens imported between 2007 and 2013; five animals were exported between 2007 (n=1) and 2008 (n=4). The Rhino-horned Lizard was imported in 2013 (n=2) and 2015 (n=8). All imported animals were declared as bred in captivity. Costa Rica (CR) was the most important source of reptiles imported into the USA, with 28 animals (all Sri Lanka Pit Vipers). Poland was the second-most important source of Sri Lankan reptiles, with two species (n=13) followed by Germany (three species, n=5) and Slovakia (one species, n=2).

Common name	Scientific name	IUCN Red List	Nat. Red List	CITES App.	Year 2016	2017	2018	Total	Countries involved
Black-cheek Lizard	*Calotes nigrilabis*		EN			20		**20**	DE/CA/US
Pethiyagoda's Crestless Lizard	*Calotes pethiyagodai*					4		**4**	DE/CA/US
Rough-horned Lizard	*Ceratophora aspera*	VU	EN			12		**12**	DE
Erdelen's horned-Lizard	*Ceratophora erdeleni*		CR			12		**12**	DE/MY
Karunaratne's horned-Lizard	*Ceratophora karu*		CR			10		**10**	DE/MY
Rhino-horned Lizard	*Ceratophora stoddartii*		EN			44	13	**57**	DE/SK/US/CA
Leaf-nosed Lizard	*Ceratophora tennenti*	EN	CR			28	12	**40**	DE/CZ/ES/SK/US
Pygmy Lizard	*Cophotis ceylanica*		EN			52	17	**69**	DE/US/FR/AT/PL/SK
Knuckles Pygmy Lizard	*Cophotis dumbara*		CR			2	6	**8**	US/DE
Blotch Bowfinger Gecko	*Geckoella yakhuna*		VU			27		**27**	DE/SK
Star Tortoise	*Geochelone elegans*	VU	NT	II	1	101	14	**116**	ES/IT/SK/DE/FR/CH
Merrem's Hump-nosed Viper	*Hypnale hypnale*		LC			5		**5**	DE/US
Hump-nosed Lizard	*Lyriocephalus scutatus*	NT	VU			6	19	**25**	DE/CZ
Indian Cobra	*Naja naja*		LC			2	2	**4**	AT/DE/PL
Common Kukri Snake	*Oligodon arnensis*		LC			1		**1**	N/A
Sri Lankan Kangaroo Lizard	*Otocryptis wiegmanni*		LC			28		**28**	DE/CA/US
Bahir's Fan-throated Lizard	*Sitana bahiri*	LC				6	2	**8**	DE
Sri Lanka Green Pit Viper	*Trimeresurus trigonocephalus*		LC			23	8	**31**	DE/SI/CH/CZ/ES
			Total		**1**	**383**	**93**	**477**	

Table 1. Reptiles native or endemic to Sri Lanka observed for sale on online classified reptile websites between September 2016 and 31 October 2018. IUCN (IUCN global, 2018); National RL (MOE, 2012). *VU=Vulnerable, EN=Endangered, NT=Near Threatened, LC=Least Concern. Countries: DE=Germany, CA=Canada, US=USA, MY=Malaysia, SK=Slovakia, CZ=Czech Republic, ES=Spain, PL=Poland, FR=France, AT=Austria, IT=Italy, SI=Slovenia.*

Discussion

The trade in reptiles native and endemic to Sri Lanka seems to be larger and encompass more species than previously realised (in comparison to Altherr, 2014, for example). Moreover, Sri Lankan species seem to be available across the globe, with the European market the most important market identified so far and where the number of species observed during this study was more than double the number recorded by Altherr (2014). The commercial export of wildlife from Sri Lanka is prohibited, therefore the increase in species observed, especially with many adult specimens being offered for sale, suggests ongoing smuggling and recent introductions into trade.

The authors observed large differences in the number of animals offered for sale in each year. Whereas the low number for 2016 could be explained by the late start of the survey (September 2016), the difference between 2017 and 2018 cannot be as easily attributed to a shorter survey time. Nine species were observed by the authors in 2017 that were not observed in 2016 or 2018. Of these, five were not observed by Altherr (2014), suggesting a potential smuggling event. In total 12 species were documented that were not documented by Altherr (2014), suggesting ongoing smuggling of Sri Lankan reptiles. A smuggling event could also explain the sudden increases in Sri Lankan species observed prior to the Hamm reptile fair, between May and September 2017. The lack of offers for these species in other years suggests that these species

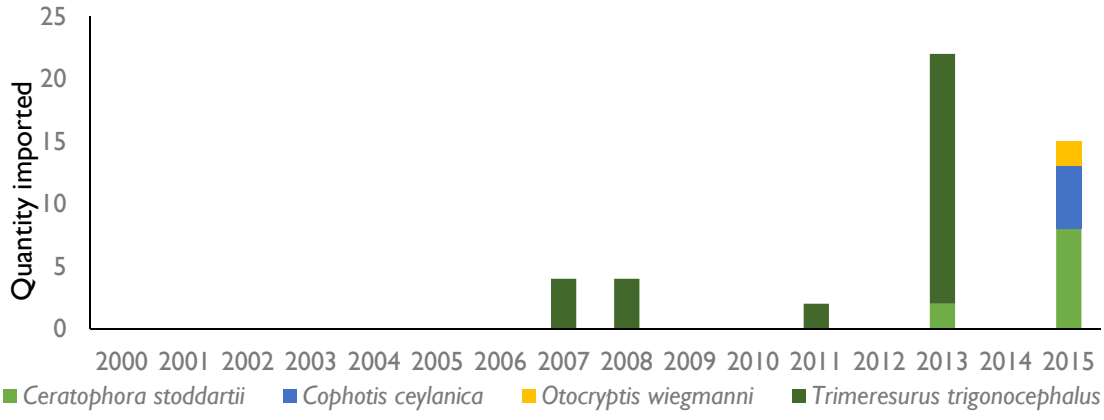

Fig. 2. Imports of Sri Lankan reptile species into the USA between 2000 and 2015. *Source: USFWS LEMIS Database*

are not yet established in trade or are not regularly bred in captivity. While the majority (58%) was reportedly bred in captivity, many specimens on sale are not offspring or juveniles but are adults. The fact that many species were only sold as adults suggests that they may fraudulently have been claimed to be of captive-bred origin. Although sporadic information on captive breeding is reported (e.g. Bartelt, 1995; Krvavac *et al*., 2015), in particular for the Star Tortoise (e.g. Vyas, 2005), captive-breeding of Sri Lankan species appears to be uncommon. Fraudulently declaring wild-sourced animals as bred in captivity creates a false sense of sustainability, as it suggests little to no impact on the wild population. While some animals might have genuinely been bred in captivity, the parental stock likely has an illegal origin. This is supported by the increasing number of endemic species observed in this study, compared to previous studies, despite the fact that export from Sri Lanka has been prohibited since 1993.

The Star Tortoise—the most commonly found species—is also the only species listed in the CITES Appendices. It is frequently targeted by smugglers in neighbouring India (D'Cruze *et al*., 2018, 2015) to meet the demand in South-east Asian markets. As mentioned, animals are smuggled out of Sri Lanka as well. A total of 11 Star Tortoises with Sri Lankan origin was declared as wild-caught, which could indicate smuggling. The UNEP-WCMC CITES Trade Database shows that 248 Star Tortoises were exported for commercial purposes from Sri Lanka between 1978 and 1985, suggesting that a proportion of the animals observed in trade could be offspring of legally exported animals. The Indian Cobra *Naja naja* was also exported from Sri Lanka, but only for zoological ("Z") and Scientific ("S") purposes. This raises suspicions that the available animals could be smuggled, or progeny of smuggled parental stock.

The LEMIS database revealed that at least four Sri Lankan reptile species are available in the USA. The US *Lacey Act* (16 USC 3371-3378) prohibits the import, export or sale of any species in violation of foreign law. Since Sri Lanka does not allow any commercial export of live native reptiles—whether wild-collected or captive-bred—the direct import of Sri Lankan reptiles into the USA is unlawful under this Act. The data show that Europe appears to be an important source for Sri Lankan reptiles imported into the USA. Previous studies suggest that US buyers circumvent the *Lacey Act* by buying these species from European reptile traders (Auliya *et al*., 2016) as they are not protected in the EU. The survey findings show that Europe is the main source for Sri Lankan reptiles for the USA, and provides considerable evidence that the EU is a key player in the international trade in Sri Lankan species.

This study illustrates that trade in Sri Lankan reptiles is booming, and more species seem to have been

CITES listing proposals to include the Pygmy Lizard *Cophotis ceylanica*, Knuckles Pygmy Lizard *C. dumbara*, Black-cheek Lizard *Calotes nigrilabris*, Pethiyagoda's Crestless Lizard *C. pethiyagodai*, the genus *Ceratophora* and Hump-nosed Lizard *Lyriocephalus scutatus* in Appendix I will be discussed at the 18th meeting of the Conference of the Parties. Aforementioned species were recorded for sale during the course of this survey.

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▲ **Rhino-horned Lizard** *Ceratophora stoddartii*

◀ **Rough-horned Lizard** *Ceratophora aspera*

Pygmy Lizard
Cophotis ceylanica

introduced into trade in recent years. Results show that Germany is at the centre of the illegal trade in Sri Lankan reptiles, with 17 species observed during the study period (n=249). Many of these are micro-endemics, occurring in a very restricted area and therefore extremely vulnerable to overexploitation (Lyons and Natusch, 2013), which is reflected by their status in Sri Lanka's National Red List (MOE, 2012, see Table 1). International trade can quickly become a significant threat to these species as they also face other challenges like habitat loss and degradation (Grismer *et al*., 2014; Kiester *et al*., 2013). Authorities in Germany should be aware of the role Germany is playing in this trade and that these practices violate national legislation in the country of origin. As nationally protected species [i.e. species protected in their range States, outside the EU] are not protected in the European Union (EU), the authors urge the EU to recognise the role this market plays as a destination and transit point for nationally protected reptiles. Whereas the European Commission states that the "*EU market should not fuel demand for species that have been harvested illegally or unsustainably*" (European Commission, 2018), the lack of legal protection for nationally protected species makes the EU a key player in the illegal trade in such species (Altherr, 2014; Vinke and Vinke, 2015; Auliya *et al*., 2016). In order to combat illegal trade in species protected in their range States, it is essential that the EU recognises their status and provides the legal framework required for law enforcement to seize such specimens.

Black-cheek Lizard
Calotes nigrilabris

The Sri Lankan authorities have submitted four CITES proposals to the eighteenth meeting of the Conference of the Parties (CoP18) (https://cites.org/eng/cop/18/prop/index.php). The proposals relate to the Black-cheek Lizard *Calotes nigrilabris*, Pethiyagoda's Crestless Lizard *Calotes pethiyagodai*, horned lizards *Ceratophora* spp., Pygmy Lizard, Knuckles Pygmy Lizard and Hump-nosed Lizard *Lyriocephalus scutatus*, all proposed to be included in CITES Appendix I. The findings of this study, which document these species in trade, reinforce the need for consideration of their inclusion in the Appendices. Moreover, this study also shows that the trade in Sri Lankan native species involves many other species whose status in the wild may be at risk from trade.

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