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

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 *Gekko gecko* in Appendix II, in accordance with Article II, Paragraph 2 (a) of the Convention and satisfying Criterion B of Annex 2 a of Resolution Conf. 9.24 (Rev. CoP17).

B. Proponent

European Union, India, Philippines and United States of America*:

C. Supporting statement

1. Taxonomy

1.1 Class: Reptilia

1.2 Order: Squamata

1.3 Family: Gekkonidae

1.4 Genus, species or subspecies, including author and year: *Gekko gecko* (Linnaeus, 1758)

Two subspecies are recognised: *Gekko gecko azhari* and *Gekko gecko gecko* (Das, 2010). *G. g. azhari* is mainly restricted to Bangladesh and has been rarely studied since its first description (Wang *et al.*, 2013), whereas the rest of the species' range is inhabited by *G. g. gecko* (Wang *et al.*, 2013).

Within *G. g. gecko* a number of geographic morphotypes have been described, but two particular forms- the "red", or "red-spotted" tokay gecko, and the "black", or "black-spotted" tokay gecko, have long been recognised as distinct (Rösler et *al.*, 2011). "Black" tokay geckos, found in southern China and northern Viet Nam, are darker and smaller than "red" tokay geckos, which are found in southern Viet Nam, Myanmar, Thailand, Malaysia, Indonesia, and other Southeast Asian countries (Peng *et al.*, 2010). The two morphs were thought to occur allopatrically (though there appear to have been introductions of "red" geckos into the "black" gecko's range) (Zhang *et al.*, 2014; Wang *et al.*, 2012), and molecular data has suggested that the two are sufficiently genetically isolated to warrant the elevation of "black" geckos to a separate subspecies or species (Peng *et al.*, 2010; Wang *et al.*, 2013; Qin *et al.*, 2012; Wang *et al.*, 2012). Rösler *et al.* (2011) elevated the black-spotted tokay gecko to the species level, naming it *G. reevesii*.

The CITES Nomenclature Specialist of the Animals Committee considered that "On balance, given the morphological and molecular differences documented between Chinese and other populations of *Gekko gecko* (sensu lato, i.e. including specimens attributed to *reevesii*), a case can be made for

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* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

recognizing the Chinese 'black-spotted' specimens as a distinct taxon. The choice of rank at which the taxon is recognized (species versus subspecies) is determined by the species concept adopted by the authors. I do note that *reevesii* is probably diagnosable in the case of most adult specimens if they are available for detailed inspection, although most of the meristics have overlapping ranges with *G. gecko* (see table 3 in Rösler *et al.* 2011) and the identification key is unlikely to work for many animals unless exact provenance is known. Moreover, the meristics given for *G. gecko* are for topotypical (Javan) specimens only, and thus do not acknowledge whatever variation may be shown by specimens of *G. gecko* from mainland Southeast Asia. Colouration features in geckos are subject to stress/emotion-related colour changes and are obviously of limited use in the case of specimens other than live animals. In conclusion, in my considered opinion the recognition of *reevesii* as a separate species is too recent to be generally known in the biological and trade management communities, and its distinction from the widespread and widely traded *Gekko gecko* appears insufficient for consistent, reliable identification of specimens in trade. Thus, for practical purposes it appears advisable for CITES purposes to retain the traditional concept of *Gekko gecko*, and to include mildly-different peripheral and island populations (including Chinese specimens attributed to *reevesii*) as part of the species until stronger evidence of taxonomic distinctness and practical ability to differentially identify specimens in trade becomes available."

1.5 Scientific synonyms: *Gecko reevesii* Gray, 1831

1.6 Common names: English: Tokay gecko

1.7 Code numbers:

2. Overview

Gekko gecko is a large, colourful gecko with a wide distribution ranging from Southern China through southern and southeast Asia (Das, 2010). The species has been used in Chinese traditional medicine for hundreds of years (Gu *et al.*, 2011) and is sold throughout southeast Asia in dried form or preserved in alcohol; to a lesser extent, it is also kept as a pet (Caillabet, 2013). This proposal does not consider Chinese specimens recently described *G. reevesii* as a separate species (see section 1.4).

International trade in *G. gecko* has been reported to be extremely high; Taiwan alone, for example, was reported to have imported ~ 15 million *G. gecko* individuals between 2004-2013; 71% from Thailand with the remainder predominantly from Indonesia (Caillabet, 2013). In 2006, TRAFFIC estimated that 1.2 million wild-taken individuals were dried and exported from central and eastern Java despite a quota of only 24,000 live specimens for the island (Nijman and Shepherd, 2015). Thailand reported exporting over one million live *G. gecko* 2014-2018 (CITES MA of Thailand *in litt.* to the CITES SA of the United States, 2018), and 1.45 million live and dried specimens in 2017-2018 (CITES MA of Thailand, *in litt*. to European Commission, 2018). Illegal trade has been reported to be issue in several countries (CITES MA of the Philippines *in litt*. to the CITES SA of the United States, 2018; Robin des Bois, 2015; 2017), but particularly in Indonesia (Caillabet, 2013; Nijman *et al.*, 2012; Nijman and Shepherd, 2015).

The population status of *G. gecko* is largely unknown, and the species has not been assessed by the IUCN. Declines of *G. gecko* populations have been reported in several of its range countries, including Indonesia (Meijaard and Achdiawan, 2011), Thailand (Thongsa-Ard *in litt.* in Caillabet, 2013) Myanmar (Rahman, 2014), Bangladesh (M.H. Khan *in litt* in Caillabet, 2013) and China (Li *et al.*, 1996 in Peng *et al.*, 2010), but the scale of declines in the majority of range States also appears to be unknown. The only numerical estimates of the scale of decline that could be located was for the' population of Bangladesh, which was reported to have undergone a 50% decrease (M.H. Khan *in litt* in Caillabet, 2013), with declines in Viet Nam of less than 30%. Collection for trade was considered be the principal cause of declines (Meijaard and Achdiawan, 2011; Rahman, 2014; Caillabet, 2013). *G. gecko* has some form of legal protection in Peninsular Malaysia, Bangladesh, Cambodia, Lao People's Democratic Republic[1], China, India, Viet Nam and the Philippines; but it is not protected (outside of protected areas) in Thailand, Myanmar or Indonesia (see section 7.1).

G. gecko is affected by trade according to the definition in Annex 5 ii), and qualifies for inclusion in Appendix II by satisfying the criteria of Annex 2a B of Resolution Conf. 9.24 (Rev. CoP17): "It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of

[1] Hereafter referred to as Lao PDR

specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences."

3. Species characteristics

3.1 Distribution

G. gecko is widely distributed in south-east Asia; its range countries are Bangladesh, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Philippines, Singapore, Thailand and Viet Nam (Das, 2010). There are also introduced populations in the United States of America (Florida, Hawaii and Texas) (Lever, 2003 in Caillabet, 2013; Zhang *et al.* 2014), the Lesser Antilles (Powell and Henderson, 2005) (including Martinique (Henderson *et al.*, 1993)), Madagascar (Lever, 2003 in: Caillabet, 2013), and Belize (Meerman and Garel, 2005). The species' status in Taiwan is disputed; there are very few occurance records, and it is unclear whether they represent introduced individuals (Norval *et al.*, 2011). The species was noted to occur in limited areas in eastern Nepal (CITES MA of Nepal, *in litt.* to SA of United States, 2018).

3.2 Habitat

The species is arboreal and occurs in lowland and submontane primary and secondary forests (Manthey and Grossmann, 1997 cited in Caillabet, 2013) and Karst cliffs (Yu *et al.*, 2011). It is also associated with human-modified environments, and is common in houses in suburbia (Das, 2010; Yu *et al.*, 2011).

3.3 Biological characteristics

G. gecko is nocturnal (Aowphol *et al.*, 2006) and solitary (Manthey and Grossmann, 1997 in Caillabet, 2013), and is principally a sit-and-wait forager that feeds on moths, grasshoppers, beetles, other geckos, small mice and snakes (Das, 2010; Aowphol *et al.*, 2006).

Males and females come together during the breeding season, which lasts for approximately six months (Manthey and Grossmann, 1997 in Caillabet, 2013). Clutches comprise 1-2 eggs which are deposited in tree holes and guarded by both parents (Das, 2010). Tokay geckos give a territorial call, syllabised as 'tok-ay', which is uttered 4-9 times in slow succession and can be heard day and night from several metres away (Das, 2010; Singh and Choudhury, 2016).

In captivity, the species has been known to live for 23 years (Snider and Bowler, 1992), but longetivity in the wild is considered likely to be shorter (Caillabet, 2013).

3.4 Morphological characteristics

G. gecko is a large gecko with a snout-vent length of 185 mm (Das, 2010). Adult individuals can weigh over 300g (Manthey and Grossmann, 1997 in Caillabet, 2013), and males tend to be larger than females (Caillabet, 2013).

The species generally has a slaty or bluish grey body with red or orange spots, a dark-banded tail, and a yellow iris (Das, 2010). However, it is also known to be polytypic, with several different geographic morphotypes described which differ in measurements, colouration and pattern (Rösler *et al.*, 2011). The descriptions of morphotypes are generally based on a low number of specimens collected from scattered locations (Rösler *et al.*, 2011); with the exception of "red", or "red-spotted", or "black" or black-spotted" tokay geckos, which until recently were two widely recognised morphs of *G. g. gecko*. "Red" or "red-spotted" tokay geckos (found in southern Viet Nam, Myanmar, Thailand, Malaysia, Indonesia, and other Southeast Asian countries) are characterised by the colouring described above, whereas "black" or "black-spotted" tokay gekos (found in Guangdong, Guanxi, southern Yunnan and northern Viet Nam), are smaller and darker than those in southeast and southern Asia and possess dark green skin and sundry spots (Yu *et al.*, 2011; Peng *et al.*, 2010).

Morphological, acoustic and molecular differences (e.g. Yu *et al.*, 2011; Qin *et al.*, 2012; Wang *et al.*, 2013) between "red" and "black" geckos led Rösler *et al.* (2011) to elevate the population of "black" tokay geckos in southern China and northern Viet Nam to a full species, naming it *G. reevesii* (common name: Reeves' tokay gecko), although this proposal does not consider *G. reevesii* to be a separate species (see section 1.4).

3.5 Role of the species in its ecosystem

As a relatively large species of gecko, *G. gecko* has been reported as having the potential to eat large amounts of invertebrate prey (Caillabet, 2013). Weterings *et al.* (2018) found that tokay geckos were at the top of terrestrial food webs near buildings and that their abundance was significantly correlated with the abundance of other species (including spiders, house geckos, and *Aedes* mosquitoes) through direct and indirect interactions.

4. Status and trends

4.1 Habitat trends

Habitat destruction was considered to have been a contributing factor to the *G. gecko*'s dramatic decline in China (Li *et al.*, 1996 in Peng *et al.*, 2010), and deforestation rates in several range States (such as Indonesia and Malaysia) have historically been noted to be high (Miettinen *et al.*, 2011). Das (2010) however, noted that the species is commonly associated with human-modified environments and can be common in houses in suburbia; though Weterings *et al.* (2018) found that it reached lower densities in urban and agricultural landscapes in a study conducted in Northern Thailand.

4.2 Population size

The population status of *G. gecko* is largely unknown (Caillabet, 2013), and the species has not been assessed by the IUCN. Caillabet (2013) considered the perception of the species as common (e.g. Das, 2010) to be a result of its wide distribution, relatively high fecundity, and ability to thrive in human modified landscapes, but noted that several declines had been recorded (Caillabet, 2013) (see section 4.4).

The CITES MA of Bangladesh reported the species to be common and noted that it presumably had a "large population" in the country (*in litt.* to CITES SA of the United States, 2018). The CITES MA of China considered the population to be large in the country (*in litt.* to CITES SA of the United States, 2018). *G. gecko* was described as 'rare' in a field guide to the reptiles of Nepal (Shrestha, 2000 in Caillabet, 2013). In Lao PDR, it is listed as a category III species in the 2008 Wildlife and Aquatic Law, which is reserved for "common wildlife" that is not "classified in the rare and near extinct categories" (Lao People's Democratic Republic, 2007). In the Malaysian States of Sabah and Sarawak, the species was considered "quite rare" (CITES MA of Malaysia, *in litt*. to United States, 2018).

4.3 Population structure

No information is available concerning the species' population structure.

4.4 Population trends

In Bangladesh, populations of *G. gecko* were estimated to have "recently" declined by 50% due to collection as a result of novel medicinal claims (M.H. Khan *in litt.* in Caillabet, 2013). Declines have also been reported in Indonesia (Meijaard and Achdiawan, 2011). Whilst the species was considered abundant in most countrywide areas in Thailand, the status of the wild population was unknown according to the CITES MA of Thailand (*in litt.* to CITES SA of United States). Declines have been reported in northeastern Thailand (Thongsa-Ard *in litt.* in Caillabet, 2013), and in the Philippines (CITES MA of the Philippines *in litt.* to the CITES SA of the United States, 2018); however numerical estimates of the scale of population decreases in Indonesia, northwestern Thailand and Philippines could not be located. *G. gecko* was classified as a species of 'Least Concern' in Thailand's 2005 Red Data Book (Nabhitabhata and Chanard, 2005). It was reported that "the gecko population has dwindled in Myanmar and Thailand" after years of poaching (Rahman, 2014).

In China, the population of *G. gecko* was reported to have been "drastically reduced" in recent years as a result of habitat destruction and hunting (Li *et al.*, 1996 in Peng *et al.*, 2010; Gu *et al.*, 2011), and the species was categorized as an endangered species in China's 1998 Red Data Book (Zhao, 1998 in Caillabet , 2013). However, the CITES MA of China (*in litt.* to the CITES SA of the United States) reported that the wild population "in recent years" was stable.

G. gecko was listed as Threatened, Vulnerable, and Near Threatened in the 2000, 2007 and 2015 versions of Viet Nam Red Data Book respectively (Dang *et al.*, 2000 in Caillabet, 2013; CITES MA of

Viet Nam *in litt.* to the CITES SA of the United States, 2018). In the 2015 version, the population of was estimated to have declined (but by less than 30%) over the last 10 years, and possible declines in upland areas were noted as a result of small scale harvesting for traditional medicines (CITES MA of Viet Nam *in litt.* to the CITES SA of the United States, 2018).

4.5 Geographic trends

The availability of information on the status of *G. gecko* is geographically patchy. The only numerical estimates of decline that could be located were for Bangladesh (Caillabet, 2013) and Viet Nam (see section 4.4), though population decreases have also been noted in Indonesia (Meijaard and Achdiawan, 2011), northeastern Thailand (Thongsa-Ard *in litt.* in Caillabet, 2013), the Philippines (CITES MA of the Phillippines *in litt.* to the CITES SA of the United States, 2018) and Myanmar (Rahman, 2014), and "drastic" population decreases have been reported in southern China (Li *et al.*, 1996 in Peng *et al.*, 2010; Gu *et al.*, 2011) (see section 4.4).

5. Threats

The principal threat to *G. gecko* is considered to be hunting and collection for use in trade, principally as traditional medicine. Over-collection of the species is thought to be responsible for declines observed in Indonesia (Meijaard and Achdiawan, 2011), Thailand (Thongsa-Ard *in litt.* in Caillabet, 2013; Rhaman, 2014), China (Li *et al.*, 1996 in Peng *et al.*, 2010)), and Myanmar (Rahman, 2014). The majority of tokay geckos traded for traditional medicine were reported to originate from Thailand and Java, Indonesia (Caillabet, 2013).

Habitat destruction was additionally noted to be one of the contributing factors to the species' decline in China (Li *et al.*, 1996 in Peng *et al.*, 2010; Gu *et al.*, 2011), and illegal logging was noted to be a threat to the species in Bangladesh (CITES MA of Bangladesh *in litt.* to CITES SA of the United States, 2018).

6. Utilization and trade

6.1 National utilization

G. gecko is principally used for medicinal purposes and is traded either preserved in alcohol or as dried specimens (Wagner and Dittmann, 2014). Virtually all trade in tokay geckos is thought to be in animals that were harvested from the wild (Nijman *et al.*, 2012; Thongsa-Ard *in litt.* in Caillabet, 2013). Although the species is used domestically in Indonesia for various medicinal purposes, the volumes of geckos involved were considered to be negligible compared to those involved in the international trade, whose consumption as traditional medicine is thought to be centered in China and Viet Nam (Nijman *et al.*, 2012; Caillabet, 2013; Stuart, 2004). Geckos harvested in Viet Nam are mainly used domestically rather than exported (CITES MA of Viet Nam *in litt*. to the CITES SA of the United States, 2018).

G. gecko has been used in Chinese traditional medicine for hundreds of years, where it has been reported to be effective in suppressing asthma, treating diabetes and erectile dysfunction, replenishing "the kidney essence", and relieving coughing (Gu *et al.*, 2011; Connett and Lee, 1994; Bauer, 2009; Nguyen, 1993 in Bauer, 2009). A novel trade emerged in 2009, mainly from Thailand for use as a cure for HIV/AIDS; this was centered in Peninsular Malaysia and Singapore and peaked in 2010/2011, but has since declined (Caillabet, 2013). The reasons for this are considered to be unclear, but were thought to be related to a combination of improved enforcement, realization that that the claims were unfounded following World Health Organisation statements outlining the lack of evidence for them, and the prevalence of scams (Caillabet, 2013). By 2013 the trade in tokay geckos for novel medicinal claims was considered to be relatively small and did not appear to pose a threat to the conservation of the species (Caillabet, 2013).

G. gecko meat was also reported to be served in restaurants in cities close to the Viet Nam/China border (Yiming and Dianmo, 1998). To a lesser extent, the species is also exploited for the pet trade (Nijman *et al.*, 2012), where it was reported to be mainly exported to the EU and to North America (Caillabet, 2013).

The CITES MA of Bangladesh (*in litt.* to the CITES SA of the United States) noted that there was no record of local consumption of *G. gecko* in the country.

6.2 Legal trade

Levels of international trade in *G. gecko* are considered to be very high (Nijman *et al.*, 2012; Caillabet, 2013), with the principal destinations for dried exports of tokay geckos (i.e. those which are intended for consumption as traditional medicine) reported to be China and Viet Nam (Nijman *et al.*, 2012; Caillabet, 2013). The volumes of *G. gecko* imported into these countries annually were reported to be unknown but substantial (Caillabet, 2013). Taiwan alone, for example, was reported in 2013 to have imported ~ 15 million *G. gecko* individuals since 2004; 71% from Thailand with the remainder coming mostly from Indonesia (Caillabet, 2013). Zhang *et al.* (2008) reported annual trade levels in *G. gecko* in Pingxiang City of 20,000-30,000 individuals, and Dongxing City of 2,400-6,000 individuals. Dried geckos have additionally been reported to be traded beyond Asia; between 1998-2002, for example, 8503 kg of *G. gecko* were reported imported to the United States for medicinal purposes (Schlaepfer *et al.*, 2005). Information on trade only relates to *G. gecko*, so it is unclear to what extent the "black gecko" (described by some authors as *G. reevesii*) is traded.

The vast majority of global trade in *G. gecko* is thought to originate from Thailand and Java, Indonesia (Caillabet, 2013). However, Lao PDR, Myanmar, Peninsular Malaysia, Cambodia and the Philippines have also been highlighted as important source countries (Shepherd and Nijman, 2007; Caillabet, 2013; Rahman, 2014). Laoong and Sribundit, (2006, in Kongbuntad *et al.*, 2016) estimated that 2-5 million tokay geckos were exported from Thailand to China, Taiwan, Malaysia and the USA each year; whereas Caillabet (2013) reported that, on average, the country exported 40 tonnes of tokay geckos (equivalent to c. 1 467 000 individuals) annually to Taiwan alone. Thailand reported exporting 1 099 178 live geckos 2014-2018 (for unknown purposes) (CITES MA of Thailand *in litt.* to the CITES SA of the United States, 2018), and 1 455 362 "live and dried" specimens in the two years 2017-2018 (CITES MA of Thailand, *in litt.* to European Commission, 2018). It was noted that export volumes had decreased, reportedly as a response to declining demand in destination countries and the increasing costs of export procedures (CITES MA of Thailand *in litt.* to the CITES SA of the United States, 2018; CITES MA of Thailand *in litt*. to European Commission, 2018). The main harvest areas in Thailand were reported to be in northern and north-eastern regions (populations in the latter may be in decline, see section 4.4).

In Indonesia, export of dried individuals of *G. gecko* is not permitted; however, the country does have a quota system for tokay geckos to be consumed domestically and exported live for the pet industry (Caillabet, 2013). In 2006 this quota was reported to be 50 000 individuals, of which 5000 were intended for domestic consumption and 45 000 were intended for export (Nijman *et al.*, 2012). It is not clear whether the export of live geckos exceeded quotas; however, illegal trade in dried geckos was reported to exceed live exports by an order of magnitude (see section 6.4). It was suspected that captive breeding centres, which were legally allowed to export live specimens, were laundering large amounts of wild-caught, dried specimens into the illegal dried-specimen trade (Nijman and Shepherd, 2015).

Wagner and Dittmann (2014) predicted that exports of tokay geckos for the traditional medicine trade to African and Asian countries would increase, mirroring increases in migration of Chinese workers.

Many of the tokay geckos destined for the pet trade have been reported to originate in Viet Nam (see data below) and Java, Indonesia (C. R. Shepherd pers. comm. in Caillabet, 2013). Caillabet (2013) reported that the species was mainly exported to the EU and USA; however, *G. gecko* has also been noted to be present, among others, in the pet trades of Taiwan (Shiau *et al.*, 2006) and Malaysia (Caillabet, 2013).

According to trade data from the USFWS Law Enforcement Management Information System (LEMIS), direct imports of *G. gecko* to the United States 2007-2016 mainly comprised 179,681 live geckos, the vast majority of which were wild-sourced (96%) and the remainder reported as captive-bred (Table 1). Live, wild-sourced geckos were imported from Viet Nam and Indonesia (56 and 44%, respectively). Imports of live geckos by the United States declined by over 50% between 2007 and 2016. Of the 173,275 live, wild-sourced geckos imported from Indonesia and Viet Nam, 12% were re-exported by the United States (information on destination of re-exports was not available).

Additionally, imports of bodies (2447 kg and 96 reported by number) and 'medicinal parts or bodies' (8929 kg and 476 reported by number) were reported 2007-2016, most of which were wild-sourced and imported from China, Hong Kong, SAR, and Thailand.

Table 1: Direct imports of *Gekko gecko* to the United States, 2007-2016. All trade was reported by the United States.

Origin	Term	Unit	Source	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
China	body	kg	C	8										8
	Medical part or body	kg	C		138	8		22	54	12			282	516
			R										105	105
			W		3087	299	140	301	175	1402			700	6104
		-	W										20	20
	specimen	-	W	5										5
Hong Kong, SAR	body	kg	C		173									173
	Medical part or body	kg	W						68				900	968
		-	C							2				2
			W									380		380
Indonesia	body	-	C		33									33
	live	-	C	30										30
			W	9609	8914	9080	8843	10324	7531	4566	7494	5713	4192	76266
	skulls	-	C	50										50
	specimen	-	W									5	10	15
Thailand	body	kg	C							460				460
			W		105			376		1325				1806
	Medical part or body	kg	W			560								560
Viet Nam	body	-	W	50	8									58
	live	-	C		714	1340	210			1160	2681			6105
			W	16963	13504	8585	9690	8180	8312	7669	5673	9714	8719	97009
	Medical part or body	-	W									64		64
Other*	body	-	W		5									5
	live	-	C	43	143	31								217
			F								1			1
			W		51	2								53
	Medical part or body	kg	W				646		30					679
		-	C										10	10
	skin	kg	C					8						8
	specimen	kg	C					1						1
		-	W			7	25	7		50	5		5	99

Source: LEMIS database, USFWS, United States. Provided to UNEP-WCMC on 22/11/2018.
*Other includes trade reported from Canada, Myanmar, Taiwan, Timor-Leste, Togo, United Kingdom of Great Britain and Northern Ireland, the United States of America and 'various'.

6.3 Parts and derivatives in trade

Geckos are prepared for use in traditional medicine by gutting and stretching, and then drying the carcasses on bamboo frames (Wagner and Dittmann, 2014). Dried carcasses can then either be boiled in water to be drunk as a tonic (Caillabet, 2013), or ground into a powder and ingested in small quantities over a period of a few days (Connett and Lee, 1994). The species can also be bought as a freeze-dried powder or as tablets (Bauer, 2009). In some parts of Southeast Asia, tokay geckos are consumed in wine where either whole geckos or gecko extract has been added (Bauer, 2009).

6.4 Illegal trade

According to Caillabet (2013), the export of dead, dried specimens of *G. gecko* from Indonesia is not permitted; however, high levels of trade were still considered to take place. Nijman *et al.* (2012) reported that in 2006, the country's three largest traders exported 1.2 million kiln-dried individuals to China, which would require a harvest of approximately 31 000 individuals per week. Illegal exports were thought to be facilitated by the laundering of wild-caught *G. gecko* individuals through legally registered captive-breeding facilities (Nijman and Shepherd, 2015; Caillabet, 2013) (see section 8.4). In 2011, 6.75 tonnes of illegally harvested *G. gecko* were seized en route from Indonesia to Hong Kong (Special Administrative Region of China) (Caillabet, 2013).

In India, *G. gecko* was listed under Schedule IV of the Wildlife (Protection) Act 1972 in 2014 (Government of India, 1972). This prohibited collection of the species from the wild; however, illegal collecting was considered to have continued (Rahman, 2014). In 2014, *The Diplomat* newspaper reported that a crackdown by agencies in several Indian states had led to the arrest of over 300 gecko traffickers in the preceding year, and the seizure of over 1000 tokay geckos (Rahman, 2014). Seizures

of *G. gecko* have been recorded at India's border with Bhutan (en route to China) (Robin des Bois, 2017) and Bangladesh (Robin des Bois, 2015).

In Malaysia, collection, selling, import, export, re-export and ownership of *G. gecko* is prohibited without a licence from the Department of Wildlife and National Parks (PERHILITAN) (see section 7.1). Caillabet (2013) noted that several dealers of *G. gecko* possessed these licences; however, according to PERHILITAN's head of enforcement, no licences to trade in tokay gekos have ever been issued. Rather than evidence of illegal activity, however, Caillabet (2013) considered these contradictions to be evidence of miscommunication or a lack of coordination between PERHILITAN's headquarters and its state offices.

In Bangladesh, the country's Wildlife Crime Control Unit seized 184 *Gekko* (species unspecified) from July 2012 to July 2018. Myanmar reported seizures of 96 geckos between 2010 and 2013 (CITES MA of Myanmar *in litt.* to CITES SA of the United States, 2018). There have been no recent records of *G. gecko* seizures in Nepal, aside from a single seizure of a few live animals in Kathmandu six or seven years ago (CITES MA of Nepal *in litt.* to CITES SA of the United States, 2018).

The Philippines have made comparatively large confiscations of *G. gecko* from 2010 to date; based on wildlife crime records, 12 confiscations were made involving 1883 *G. gecko* individuals (CITES MA of the Philippines *in litt*. to the CITES SA of the United States, 2018). The country considered it likely that more geckos are being illegally kept in captivity to supply both the local and international demand for the species (CITES MA of the Philippines *in litt*. to the CITES SA of the United States, 2018). Conservation measures in the country are currently limited to information and education campaigns, as well as law enforcement activities, however these measures were considered to have had some positive impacts in terms of addressing illegal harvest and trade (CITES MA of the Philippines *in litt*. to the CITES SA of the United States, 2018).

6.5 Actual or potential trade impacts

Trade in *G. gecko* for traditional medicine was considered likely to threaten wild populations of tokay geckos, as evidenced by (i) the extremely high trade volumes noted, particularly from Thailand and Indonesia (Nijman *et al.*, 2012; Caillabet, 2013; Nijman and Shepherd, 2015), and (ii) reports of declines in Thailand, Indonesia, Bangladesh, Myanmar and the Philippines (Meijaard and Achdiawan, 2011; Gu *et al.*, 2011; Rahman, 2014; M.H. Khan *in litt* in Caillabet, 2013; Thongsa-Ard *in litt.* in Caillabet, 2013; CITES MA of the Philippines *in litt*. to the CITES SA of the United States, 2018), as well as past declines in mainland China (Li *et al.*, 1996 in Peng *et al.*, 2010).

Several authors have also raised concerns that growth in the trade of *G. gecko* coupled with increasing rarity has caused an increase in trade in other reptile species that are sold under the name of *Gekko gecko* (Gu *et al.*, 2011; Wagner and Dittmann, 2014). Wagner and Dittman (2014) argued that the tokay gecko trade has had an impact on agamid lizards, which are sold as "fake geckos" in countries where it is "impossible to collect or import tokay geckos". They cite observations of the sale of *Paralaudakia himalayana* as "*Gekko gecko*" on Chinese markets (Zhu and Ren, 1999 in Wagner and Dittmann, 2014), as well as a photograph taken at a bazaar in Kabul, Afghanistan, which offered a large number of dried agamine lizards that were sold under a label of "geckos" (Wagner and Dittmann, 2014). The specimens were prepared and sold in the same manner as tokay geckos are commonly presented in South East Asia (Wagner and Dittmann, 2014). They were identified as *Paralaudakia caucasia*, which was considered to be one of the most common lizards in Afghanistan; however the authors report that it could not be excluded that other *Paralaudakia* spp. and *Laudakia* spp. were also being traded (Wagner and Dittmann, 2014). In China, sixteen types of gecko counterfeits were reported to have been found in the market (Zhu and Ren, 1999 in Gu *et al.*, 2011).

7. Legal instruments

7.1 National

Bangladesh: *G. gecko* is listed in Schedule II of the Wildlife (Conservation and Security) Act 2012 (Government of Bangladesh, 2012). Under this Act, hunting, export and import of any wild animal requires a licence. Possession of wild animals as well as their parts or derivatives must be registered (Government of Bangladesh, 2012).

Cambodia: *G. gecko* is listed as a common species under the 2002 Forestry Law. Customary use is permitted, but trading or transporting tokay geckos above levels "necessary for customary use" is prohibited, and can incur a fine of up to three times the market value of the species (Caillabet, 2013).

China: *G. gecko* is listed under a number of regulations that afford it protection. It is included in (a) the Regulations for the Conservation of Wild Terrestrial Animals, under which the sale of protected species and their derivatives is forbidden and (b) the Regulations on the Conservation and Management of Wild Resources of Medicinal Plants and Animals, under which it is listed as a Category II species (collection is "subject to the prior grant of a Medicine Collection Permit ….approved by medicine departments at higher level" (Yinfeng *et al.*, 1997 in Caillabet, 2013)). The species is additionally listed in Appendix II of the 1988 Wild Animal Protection Law of the People's Republic of China, which stipulates that, as a class 2 state protected animal (Gu *et al.*, 2011), the species can only be collected, used and traded under licence (People's Republic of China, 1988). In the Guangxi Zhuang Autonomous region it is listed as a class 1 key species (Peng *et al.*, 2010), as a result of which any collection and trade is prohibited unless it is "necessary for scientific research, domestication and breeding, exhibition or other special purposes". Use of the species for any of these exceptional circumstances requires approval from the Department of Wildlife Administration.

India: *G. gecko* was listed under schedule IV of the Wildlife (Protection) Act, 1972 (Government of India, 1972) in 2014, which prohibits collection except for educational purposes and scientific research.

Indonesia: The species is not protected by Indonesian law (Nijman and Shepherd, 2015), but wild specimens are subject to a national annual harvest and export quota (see section 8.1). Breeders wishing to export *G. gecko* (whether captive-bred or wild-caught) must be registered with the Directorate General of Forest Protection and Nature Conservation (PHKA), and breeders supplying specimens to exporters must be registered with the Regional Natural Resource Management Office (BKSDA) offices at a provincial level (Nijman and Shepherd, 2015).

Lao PDR: *G. gecko* is listed as a category III species in the 2008 Wildlife and Aquatic Law ("*wildlife…that are able to reproduce widely in nature, and are very important for social-economic development and educational research)* (Lao People's Democratic Republic, 2007). Hunting of species listed in category III is only permitted in specified seasons, and is only allowed "using tools and equipments not harmful to the animals' population" (Lao People's Democratic Republic, 2007). Hunting and capture for commercial purposes requires permission from the Ministry of Agriculture and Forestry (Lao People's Democratic Republic, 2007). Export of *G. gecko* requires, among other things, an origin certificate, a certificate of health and permission from the Ministry of Agriculture and Forestry (Lao People's Democratic Republic, 2007).

Malaysia: *G. gecko* was protected under the Wildlife Conservation Act 2010, where it is listed as Protected Wildlife under its First Schedule (Government of Malaysia, 2010). Under the act, hunting, selling, import, export, re-export or ownership of tokay geckos (or any derivative of them) is only allowed with the possession of a licence issued by the Department of Wildlife and National Parks (PERHILITAN) (Government of Malaysia, 2010). Possession or hunting of the species without a licence can lead to penalties of up to MYR 50 000 (USD 16 000) (or MYR 200 000 (USD 63 957) for females and juveniles) and up to two years in prison (Caillabet, 2013). According to PERHILTAN (in 2012), no licences had ever been issued in Peninsular Malaysia to hunt, own or trade in tokay geckos (Burhanuddin, pers. comm. April 2012 in Caillabet, 2013)). The species is not protected under the State law of Sabah and Sarawak (Malaysia CITES MA *in litt.* to the European Commission, 2018).

Myanmar: No species-specific measures are in place, but all species within protected areas are protected from harvest in accordance with the Conservation of Biodiversity and Protected Areas Law 2018 (CITES MA of Myanmar *in litt.* to CITES SA of the United States, 2018).

Nepal: Under the National Parks and Wildlife Conservation Act, 2029, wildlife (including *G. gecko*) cannot be hunted without a licence (Government of Nepal, 1973). The species is currently proposed for Schedule III listing in an upcoming amendment to the National Parks and Wildlife Conservation Act, 2029 (CITES MA of Nepal *in litt.* to the CITES SA of the United States, 2018).

Philippines: *Gekko gecko* is nationally protected under the Republic Act 9147 or Wildlife Resources Conservation and Protection Act. In accordance with section 27 of the said law, hunting and trade of *Gekko gecko* in the Philippines can only be allowed subject to certain requirements and prior issuance of permits (e.g. a Wildlife Collector's Permit for commercial breeding, a Gratuitous Permit for scientific research, or a Wildlife Special Use Permit for direct trade purposes) (CITES MA of the Philippines *in*

litt. to the CITES SA of the United States, 2018). No permits have been issued for *G. gecko* so far (CITES MA of the Philippines *in litt.* to the CITES SA of the United States, 2018). A number of private individuals have been permitted to legally possess *G. gecko* provided they were acquired prior to the passage of the Wildlife Conservation and Protection Act (2001) and were registered with the government (CITES MA of the Philippines *in litt.* to the CITES SA of the United States, 2018).

Viet Nam: Hunting of *G. gecko* is prohibited in protected areas (Vuong Tien Manh, Viet Nam CITES SA, *in litt.* in Caillabet, 2013). The species is listed under the 'common forest animal' category whose exploitation is controlled by Circular No. 47/2012/TT-BNNPTNT of 2012 (Viet Nam Ministry of Agriculture and Rural Development, 2012; CITES MA of Viet Nam *in litt.* to CITES SA of the United States). Collection outside of protected areas requires a permit from the country's Provincial Forest Protection Department (Vuong Tien Manh, Viet Nam CITES SA, *in litt.* in Caillabet, 2013), and those requesting a permit must carry out a species population assessment and submit a plan for exploitation (Viet Nam Ministry of Agriculture and Rural Development, 2012). The legal origin of specimens must be certified according to the procedure outlined in Circular No. 01/2012/TT-BNNPTNT (CITES MA of Viet Nam *in litt.* to CITES SA of the United States).

Thailand: The species is not nationally protected (Caillabet, 2013), but exports and imports of the species require a permit (CITES MA of Thailand *in litt.* to the CITES SA of the United States, 2018). Hunting and collection is prohibited in protected areas (CITES MA of Thailand *in litt.* to the CITES SA of the United States, 2018).

7.2 International

No international legal instruments were identified.

8. Species management

8.1 Management measures

Indonesia has a quota for *G. gecko* for domestic consumption and live export for the pet industry (Caillabet, 2013), whose setting and regulation was reported to be managed by the CITES Scientific and Management Authorities respectively (Nijman and Shepherd, 2015). Collection is only permitted from 23 designated sites, mainly in Java but also in Bali, Kalimantan, Sulawesi and Sumatra (Caillabet, 2013). There is no quota for the skin or medicinal trade (Nijman *et al.*, 2012). In 2006 the harvest quota for *G. gecko* was reported to be 50 000 individuals, of which 5000 were intended for domestic consumption and 45 000 were intended for export (Nijman *et al.*, 2012). Most of the quota (24 000 individuals) was for the harvest of *G. gecko* in Java (Nijman *et al.*, 2012). It is unclear whether the export of live individuals was within quota, but in the same year Nijman *et al.* (2012) reported that 1.2 million dried individuals were exported from the country's three largest traders to China, in contravention of (a) the scale of the annual quota and (b) the nature of the quota (which is for the export of live specimens only). In March 2014, the Indonesian Ministry of Forestry gave permission to six companies to export c. 3 million live, captive bred individuals for the pet trade. However, potential issues have been noted relating to the laundering of wild-sourced dried individuals through legal captive breeding facilities (see section 8.4).

No other information on national management measures could be identified, other than those relating to national legislation restricting the trade in *G. gecko* that are outlined in section 7.1.

8.2 Population monitoring

No information on population monitoring could be located. The status of *G. gecko* is considered to be largely unknown (Caillabet, 2013).

8.3 Control measures

8.3.1 International

No international control measures were identified.

8.3.2 Domestic

G. gecko is a protected species in several of its range States, and its use and trade is subject to a number of licencing requirements in Bangladesh, China, Indonesia, Lao PDR, Nepal, Peninsular Malaysia, the Philippines, and Viet Nam (see section 7.1).

8.4 Captive breeding and artificial propagation

Tokay geckos consumed for traditional medicine in Southeast Asia were considered by TRAFFIC to be predominantly harvested from the wild (Caillabet, 2013; Nijman and Shepherd, 2015). Individuals were reportedly bred in captivity in mainland China (Yinfeng *et al.*, 1997 in Caillabet, 2013) and Viet Nam (Nguyen and Nguyen, 2008; CITES MA of Viet Nam *in litt.* to the CITES SA of the United States); however, production was not considered to be capable of meeting demand (Caillabet, 2013).

Individuals were also reported to be bred in captivity for live export in Indonesia (Nijman and Shepherd, 2015), and captive breeding was reported to be encouraged by the CITES Management Authority of the country (the Directorate General of Forest Protection and Nature Conservation (PHKA) (Nijman and Shepherd, 2015). However, the low sale price of tokay geckos (for both live export and as dried specimens) and the high financial cost of maintaining breeding facilities meant that large-scale captive breeding was thought to be financially unfeasible (Nijman *et al.*, 2012; Caillabet, 2013; Nijman and Shepherd, 2015). In 2014, the Indonesian Ministry of Forestry granted permission to six companies to export a total of three million captive bred *G. gecko* for the pet trade; however, a TRAFFIC investigation noted that none of the companies were known to have ever bred the species in such considerable numbers and were known to supply wild-caught reptiles for the medicinal and meat trade (Nijman and Shepherd, 2015). The production of such quantities of adult-sized geckos for export was noted to require facilities on a scale that was thought highly unlikely to be financially viable, and the TRAFFIC investigation suspected that (a) wild-caught individuals were being laundered into trade described as captive-bred, and (b) geckos were being exported as dead specimens for the traditional medicine trade rather than as live specimens for the pet trade (Nijman and Shepherd, 2015).

No captive breeding of the species was reported to take place in Myanmar (CITES MA of Myanmar, in *litt*, to SA of United States, 2018).

As of September 2012, less than 10 individuals have been bred in captivity, and no legal trade of captive-bred specimens has been recorded to date (CITES MA of the Philippines *in litt.* to the CITES SA of the United States, 2018).

8.5 Habitat conservation

G. gecko is commonly associated with human-modified environments (Das, 2010) and is considered to have broad ecological tolerances that are advantageous in disturbed areas (Rösler *et al.*, 2011).

However, habitat destruction was considered to have been a contributing factor to the *G. gecko*'s dramatic decline in China (Li *et al.*, 1996 in Peng *et al.*, 2010), and deforestation rates in several of *G. gecko's* range States (such as Indonesia and Malaysia) have historically been noted to be high (Miettinen *et al.*, 2011).

8.6 Safeguards

National legislation is in place in multiple of *G. gecko*'s range states to protect the species (See section 7.1).

9. Information on similar species

Following Rösler *et al.* (2011), the genus *Gekko* consists of 45 named species. *Gekko gecko* is considered to be "easily identifiable" as a result of its orange-spotted, blue-grey skin (Caillabet, 2011) (however, as previously noted, "black geckos" have a different colouration). Their vocalisations are considered to be unmistakable (Caillabet, 2011). It is unclear whether dried tokay geckos maintain a diagnostic feature that allows them to be easily identified from other species.

10. Consultations

A consultation was distributed by the European Union to all range States (Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Lao PDR, Nepal, Philippines, Singapore, Thailand, Viet Nam) in October 2018, and by the United States in June 2018, and range State responses are summarized in Annex 1.

11. Additional remarks

12. References

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Annex 1: Summary of range State reponses

Range State	Response
Bangladesh	Supports listing in Appendix II
Cambodia	Opposes listing in Appendix II
China	Opposes listing in Appendix II
India	Supports listing in Appendix II
Indonesia	Opposes listing in Appendix II
Lao PDR	Consulted on 30/10/2018, no response received
Malaysia	Supports listing in Appendix II
Myanmar	No objection to listing in Appendix II
Nepal	Oppose listing in Appendix II, but supports listing in Appendix III
Philippines	Supports listing in Appendix II
Singapore	Consulted on 30/10/2018, no response received
Thailand	No final decision at the time of proposal submission
Viet Nam	Oppose, at least for the population of Viet Nam