The Trade in Tokay Geckos *Gekko gecko* in South-east Asia: with a case study on Novel Medicinal Claims in Peninsular Malaysia

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A TRAFFIC SOUTHEAST ASIA REPORT

TRAFFIC
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Photograph credit Cover: Tokay Gecko in Northern Peninsular Malaysia (C. Gomes/TRAFFIC)

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A pet shop owner in Northern Peninsular Malaysia showing researchers a Tokay Gecko for sale

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EXECUTIVE SUMMARY

South-east Asia is rich in biodiversity. It is also a global hub for wildlife trade, both as a source and as a consumer. Wildlife trade, for use in Traditional Medicine (TM), as pets and for food, poses a significant threat to the conservation of many species in the region. The Tokay Gecko *Gekko gecko* is one such species potentially threatened by trade. This species is found throughout South-east Asia in both urban and naturally forested environments. It has been traded for traditional medicine for hundreds of years and more recently as a pet, mainly to the EU and North America. In 2009 a novel trade emerged in Tokay Geckos *Gekko gecko* reportedly as a cure for HIV/AIDS. This trade spread throughout South-East Asia with a demand purportedly centred on Peninsular Malaysia.

In late 2011, TRAFFIC was granted funding by WWF and Wildlife Reserves Singapore to investigate the trade related to Novel Medicinal Claims (NMCs) in late 2011 in Peninsular Malaysia and the wider trade in South-east Asia for TM. The aims of the study were to substantiate some of the claims surrounding NMCs; highlight the trade routes and trade hotspots for targeted enforcement action and; provide a regional overview of the trade through a desk top study and provide data to support a CITES Appendix II listing for this species. Informal interviews were held with private dealers and pet shops/aquaria selling Tokay Geckos throughout the peninsula. Nineteen dealers were interviewed and more than 250 Tokay Geckos were observed for sale. Several questions surrounding the recent Tokay Gecko trade spike for NMCs remain unanswered, however; following this study, some of the claims can be substantiated.

There is no evidence to support the claims of an HIV/AIDS cure. Interviews with dealers in Peninsular Malaysia indicate that considerable sums of money have been paid, in particular, for large individuals weighing over 300 g. Several dealers stated that Tokay Geckos weighing over 400 g are valued above USD 1 000 000, however; TRAFFIC does not believe these claims to be true. The significance of this weight-price threshold is unclear. Price data gathered during this study are inconsistent with claims that heavier individuals are more valuable. Additionally, it is doubtful that Tokay Geckos can naturally reach 400 g. This is the likely reason why some dealers are said to have artificially augmented the weight using silicone or metal pieces. There is no evidence that such huge sums of money, as claimed by dealers in Peninsular Malaysia, have been paid for Tokay Geckos weighing over 400 g. TRAFFIC does not believe that these statements are credible. The motivations for dealers to make these claims are not known though it has previously been suggested that it could be part of an elaborate hoax. To what end, however, is not clear.

Based on interviews with Tokay Gecko dealers and seizure records, the trade in Tokay Geckos for NMCs appears to have begun around late 2009 and peaked in 2010/2011. This trade now appears to be in decline. The reasons for this are unclear but could be related to a combination of improved enforcement, realisation among consumers that NMCs are unfounded or the prevalence of scams, as reported by Tokay Gecko dealers and in the media. Results of surveys and interviews with dealers suggest that the online trade in this species is populated by fake sellers. Additionally, private dealers interviewed highlighted that the trade in this species, particularly in Thailand, is dangerous and often involves robberies and hold-ups.

Tokay Geckos traded in Peninsular Malaysia for NMCs appear to be originating in Thailand, as well as in Lao PDR and Myanmar. They are harvested from the wild and transported overland to Malaysia. Seizure records indicate that the Philippines is also an important origin for Tokay Geckos traded for NMCs in Peninsular Malaysia, however; no Tokay Geckos from the Philippines were

encountered during field surveys. The more prominent Tokay Gecko dealers in Peninsular Malaysia appear to be concentrated close to the Thai border and also to be the source of Tokay Geckos entering the country. According to dealers interviewed during surveys, the primary consumers of Tokay Geckos for NMCs appear to be Singaporeans and local Malaysians. Some even claim use of Tokay Geckos by Europeans and North Americans for medical research.

Tokay Geckos were openly sold in 11 pet shops/aquariums across the peninsula. This can be attributed to lax enforcement; however, interviews with pet shop/aquarium staff, as well as information gathered from private dealers, also suggest that there is a lack of awareness of the national law pertaining to the trade in Tokay Geckos. Several private dealers encountered during surveys had licences issued from local Department of Wildlife and National Parks (DWNP) (Malay acronym "PERHILITAN") offices allowing them to trade in Tokay Geckos. However, according to PERHILITAN's head of enforcement, no licences to trade in Tokay Geckos have ever been issued. Given the system in place, whereby state offices report permits issued to the PERHILITAN head office, this observation is surprising and potentially indicative of a miscommunication/lack of coordination between PERHILITAN headquarters and state offices.

The trade in Tokay Geckos for NMCs is reported to have led to localised population declines of wild Tokay Geckos in Bangladesh. Regionally, however, the scale of this trade, in terms of numbers of individual Tokay Geckos removed from the wild, appears to be relatively small. This contrasts directly with the trade in Tokay Geckos for TM.

The international trade in Tokay Geckos for TM is colossal. The vast majority of Tokay Geckos traded for TM originate from Thailand and Java, Indonesia. Customs import data show that Taiwan has imported ~15 000 000 Tokay Geckos since 2004, 71% of which were imported from Thailand with the remainder mostly coming from Indonesia. While this trade appears to be legal but unregulated in Thailand, the trade in Tokay Geckos from Java appears to be entirely illegal.

It is important to note that Taiwan is not the sole consumer of Tokay Geckos for TM. A seizure in 2011 bound for Hong Kong from Indonesia is estimated to have consisted of 1 200 000 dried Tokay Geckos. Aside from Taiwan and Hong Kong, large quantities of Tokay Geckos are also consumed for TM in mainland China and Viet Nam. The extent of this trade is unknown but thought to be substantial. Considerable volumes of Tokay Geckos are also traded beyond Asia: between 1998 and 2004, 8.5 tonnes of dried Tokay Geckos were imported into the USA. Taking this into consideration, it is reasonable to believe that the total trade in Tokay Geckos exceed the already substantial known trade.

Tokay Geckos consumed for TM in Southeast Asia are mostly harvested from the wild. In mainland China and Viet Nam, Tokay Geckos are reportedly bred in captivity to supply the local TM trade; however, the production cannot meet demand. Despite the fact that Tokay Geckos have a large geographical distribution, have high reproductive rates and can thrive in human dominated landscapes, populations are still susceptible to over-harvesting.

The trade for NMCs is relatively small and does not does not appear to pose a threat to the conservation of wild Tokay Geckos. However, as mentioned, the trade for TM is substantial and could likely threaten wild populations of Tokay Geckos. This is evidenced by the reported declines of wild populations in Thailand and Java, as well as the past deterioration of populations in mainland China,

as a result of trade for TM.

Given the substantial volume of international trade in this species and the observed population declines, questions surround the legality and future sustainability of the Tokay Gecko trade, particularly for use in TM. With this in mind, TRAFFIC recommends the following:

RECOMMENDATIONS

- General awareness in Peninsular Malaysia about the laws pertaining to the trade in Tokay Geckos needs to be improved. Awareness materials should be focused on areas outlined in this report where Tokay Geckos are most likely being smuggled into the country.

- PERHILITAN is urged to use the information contained within this report (and detailed information provided directly to them during the course of this research) to clamp down on the illegal trade of Tokay Geckos sold in pet shops and aquaria and prosecute offenders to the full extent of the law.

- PERHILITAN should also address problems surrounding previous issuance of permits by state offices which may have arisen through a lack of internal communication.

- The illegal Tokay Gecko trade from Java needs to be urgently addressed. Indonesian authorities are urged to either; establish and enforce an export quota for dried Tokay Geckos used in TM or; enforce current quotas and shut down existing Tokay Gecko processing facilities so no dried Tokay Geckos are exported.

- Indonesian authorities should also be alert to potentially false claims of captive breeding in the future. Falsely declaring wildlife as bred in captivity has been previously highlighted as a means through which illegally sourced wildlife is laundered on international markets. According to dealers in Indonesia, breeding Tokay Geckos is not financially viable because of the low market value. Companies claiming to breed this species in captivity should be investigated by Indonesian CITES authorities prior to permitting any exports.

- Studies should be carried out to assess the Tokay Gecko trade from Thailand and Java. Work should focus on Tokay Gecko harvesting facilities to gather information on the volume of Tokay Geckos being extracted and exported from the wild. Adaptive management systems should also be established for these facilities whereby harvests are monitored over time and modified depending on the harvest and population trends. In this way, the status of wild populations can be monitored and any significant changes in harvest, resulting from over-exploitation, can be flagged and the future sustainability of the trade improved.

- Targeted field surveys of wild Tokay Gecko populations should be carried out in major Tokay Gecko harvest locations. This should accompany monitoring of harvesting facilities outlined above. This would provide data on the state of wild populations and the impact of trade on them. This information would also support a listing in CITES Appendix II, (Under Annex 2(a), Criteria B of Resolution conf. 9.24) which is required to better regulate and monitor trade in Tokay Geckos.

INTRODUCTION

South-east Asia is a nucleus for the global wildlife trade both as a source and as a consumer (Sodhi *et al*., 2004). The trade in reptiles as pets, for consumption as food or use in traditional medicines poses an increasing threat to the conservation of many squamates native to the region (Gibbons *et al*., 2000; Sodhi *et al*., 2004; Iskandar and Erdelen, 2006; Nijman *et al*., 2012). The trade in South-east Asia's reptiles is for both local and global markets and is comprised of both legal and illegal elements. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is the established framework through which international trade in species listed within the Appendices of the Convention is regulated. Only species that are threatened or potentially threatened by trade are listed in CITES.

The Tokay Gecko *Gekko gecko* is one such reptile species that is heavily exploited; mainly for use in Traditional Medicine (TM) in East Asia but also more recently as a claimed cure for HIV/AIDS and for the pet trade in Europe and USA. Toward the end of 2009, there was a boom in the trade in Tokay Geckos throughout South-east Asia (centred on Peninsular Malaysia) following rumours that derivatives of this species could cure HIV/AIDS and that large Tokay Geckos could be sold for large sums of money (Caillabet, 2011). Shortly after this boom the World Health Organization (WHO) released a statement saying that there is no scientific evidence supporting the claims of a HIV/AIDS cure. Irrespective, the spread of the rumour continued unabated. The emergence of this novel trade in Tokay Geckos warranted further investigation and in late 2011 TRAFFIC secured funds to study this phenomenon at its core in Peninsular Malaysia.

Figure 1:

Tokay Gecko pictured for sale in Northern Peninsular Malaysia.

BACKGROUND

Tokay Gecko ecology and distribution

The Tokay Gecko *Gekko gecko* is the second largest extant Gekko species with adults measuring up to 40 cm in length and over 300 g in weight (Manthey and Grossmann, 1997). Males tend to be larger than females (Meshaka, 2011) and the species is recognized by its blue-grey, orange spotted skin (Figure 1) and characteristic territorial vocalisation which gives rise to the Tokay Gecko's colloquial name in English ("to-kay") (Das, 2010). In Malay, Malaysia's national language, Tokay Geckos are known as "cicak tokek" or "tokeh". The vocalisation is uttered in a loud, barking crescendo and can be heard from several metres away.

Figure 2:

Map showing Tokay Gecko distribution

Tokay Geckos are distributed across much of South-east Asia (Cambodia, Indonesia [excluding territory in Borneo and New Guinea] Lao PDR, Peninsular Malaysia, the Philippines, Singapore, Thailand and Viet Nam), Southern China, Hong Kong SAR and North-eastern India and Nepal (Figure 2) (Das, 2010). Tokay Geckos have also been introduced to Belize (Biological-Diversity.info, 2011), the Lesser Antilles (Powell and Henderson, 2005), Madagascar (Lever, 2003), Martinique (Henderson *et al*., 1993) and the United States of America (Hawaii and Florida) (Lever, 2003; Meshaka, 2011). It has been suggested that these introductions occurred via the pet trade, following use of Tokay Geckos as a bio-control agent or through unintentional mechanisms, for example, as cargo stowaways (Lever, 2003). Indeed, according to the New South Wales Department of Industries, Tokay Geckos are one of several

common stowaway species that have a high chance of achieving pest-status in Australia (Anon, 2011).

Tokay Geckos are arboreal and can be found in lowland and sub-montane primary and secondary forests as well as heavily modified human landscapes (Manthey and Grossmann, 1997). This species appears to thrive in towns and cities in some parts of its range, for example, Bangkok (Thailand), Vientiane (Lao PDR) and previously parts of Java, Indonesia, where it can be found on the walls and ceilings of houses. Interestingly, Tokay Geckos appear to be absent from equivalent areas in Peninsular Malaysia (O. Caillabet, pers. obs.) and Borneo. In Borneo, this may be due to competition from two other large congeneric geckos, *G. smithii* and *G. Monarchus* (I. Das, pers. comm.).

Figure 3:

Tokay Gecko feeding on a mouse.

Figure 4:

Tokay Gecko eggs in a cage photographed in Jakarta.

Tokay Geckos are nocturnal, feeding predominantly on invertebrates including moths, grasshoppers, beetles, termites, crickets, cockroaches, mosquitoes and spiders (Aowphol *et al*., 2006; Das, 2010). This species has also been known to prey on other geckos, small rats and mice (Figure 3) and snakes (Love, 2000; Meshaka, *et al*., 2004; Das, 2010; Caillabet, pers. obv.; Lim *et al.*, 2012). Tokay Geckos are a relatively large species and potentially consume large amounts of invertebrate prey. The potential of geckos as bio-control agents has also been previously highlighted (e.g. Canon and Hill, 1997; Ramires and Fraguas, 2003; Lim *et al.*, 2012). Among the prey species consumed by Tokay Geckos are taxa which are vectors of human disease (e.g. mosquitoes, flies) or are otherwise considered as human pests (e.g. cockroaches, termites).

Tokay Geckos have been known to live for up to 10 years in captivity (Bowler, 1975) although longevity in the wild is likely to be shorter. This species is solitary and males and females come together during the mating season which lasts for approximately six months (Manthey and Grossmann, 1997; Corl, 1999).Individuals reach sexual maturity at 1-2 years of age (Mackay, 2006). Females produce clutches of up to two eggs that are laid at intervals of ~30 days (Henkel and Schmidt, 1995; Manthey and Grossmann, 1997). The eggs, which are usually laid on vertical surfaces (Fig. 4), measure 16-20mm, are guarded by both parents and hatch after ~ 64 days (Das, 2010). It has also been suggested that communal nesting can occur (Meshaka *et al.*, 2004). Hatchlings measure approximately 40mm in length (Das, 2010).

National Legislation

The level of national protection afforded to Tokay Geckos varies across their range. The most relevant national legislations, with regard to this study and the trade in this species, are discussed below.

Peninsular Malaysia

Under Peninsular Malaysia's previous wildlife law Protection of Wildlife Act 1972, which was in place at the beginning of the recent Tokay Gecko trade spike, Tokay Geckos were not protected. However, under the new Wildlife Conservation Act 2010, which came into force in 2011, Tokay Geckos are listed as a protected species. Under this Act, one may hunt, sell or own Tokay Geckos provided that they are in possession of an appropriate licence issued by the Department of Wildlife and National Parks (DWNP) (Malay acronym "PERHILITAN"). Licences are issued by the relevant PERHILITAN state office. A record of permits issued is maintained by each state office. Records are sent to the head office and are compiled and published in PERHILITAN's annual report.

Hunting or keeping Tokay Geckos without a licence can lead to a fine of up to MYR 50 000 (USD 16 000) /MYR 200 000 (USD 63 957) (for Juveniles or females) and/or up to two years in prison. In April 2012, an amendment to the Wildlife Conservation Act 2010 was proposed to include Tokay Geckos among a number of other species for which a hunting permit could be sought. This has yet to be implemented. According to PERHILTAN, however, no licences have ever been issued in Peninsular Malaysia to hunt, own or trade in Tokay Geckos (Burhanuddin, pers. comm. April 2012).

East and Southeast Asia

In Cambodia the Tokay Gecko is listed as a "common species" under the Forestry Law 2002. Trading or transporting Tokay Geckos above an amount "necessary for customary use" is not permitted and can incur a fine of up to three times the market value of the species. In mainland China, Tokay Geckos have been protected since 1988 (Zhao, 1998). According to the Regulations for the Conservation of Wild Terrestrial Animals the sale of protected species or derivatives thereof is forbidden (Yinfeng *et al*., 1997). Tokay Geckos are also included in Appendix II of the Wild Animal Protection Law of the People's Republic of China and may only be hunted or traded with a licence (Yinfeng *et al.*, 1997). This species is also listed in Category II of the Regulations on the Conservation and Management of Wild Resources of Medicinal Plants and Animals, which states that collection of Category II species is "subject to the prior grant of a Medicine Collection Permit….approved by medicine departments at higher level" (Yinfeng *et al*., 1997).

In Indonesia, Tokay Geckos are not protected; however, a harvest quota of 50 000 individuals is in place. Ten percent of this quota (5000 individuals) is for local consumption with the remainder (45 000) for export. These may only be harvested from specific provinces or districts designated by the Indonesian Institute of Sciences (LIPI) (Siswomartono, 1998) and collection outside of these areas or surplus to the specified volume is not permitted. There are 23 designated Tokay Gecko collection areas in Indonesia. Java has the largest Tokay Gecko harvest quota of 24 000 individuals, with the remaining harvest divided between the islands of Bali,

Kalimantan, Sulawesi and Sumatra. The purpose of harvest (e.g. for medicine, as pets etc.) is also specified within the quota and according to the quota in place for Tokay Geckos, only live animals destined for the pet trade may be exported.

Quotas for reptile harvest and export are set by LIPI after consulting with various stakeholders, including reptile dealers (Amir *et al.*, 1998; Soehartono & Mardiastuti, 2002) and are often based on the previous year's harvest (Auliya, 2010). Quotas are enforced by the Directorate General of Forest Protection and Nature Conservation (PHKA) via the provincial offices of the Natural Resources Conservation Agency (BKSDA) who issue licences to those wishing to harvest wildlife. Export quotas for reptiles are divided amongst members of the Indonesian Reptile and Amphibian Trade Association (IRATA) and only members of this organization may export wildlife. The export quota for Tokay Geckos is allocated to 17 IRATA-registered exporters and is used up every year (Nijman *et al.*, 2012). The transport of wildlife within Indonesia, whether protected or not, also requires a licence.

In Lao PDR, Tokay Geckos are listed as "common" wildlife species (Category III) which "are able to reproduce widely in nature, and are very important for social-economic development and educational scientific research" (Wildlife and Aquatic Law 2008). Hunting of Category III species is permitted in specified seasons using techniques which are not harmful to wild populations. Permission from the local Forestry and Agriculture Division office is needed to commercially harvest category III species while the export of category III species requires, among others, a certificate of health and permission from the Ministry of Agriculture and Forestry.

In Thailand, Tokay Geckos are listed as Least Concern in Thailand's Red Data Book (Nabhithabata and Chan-Ard, 2005). This species is not protected nationally (WARPA B.E. 2535). Local trade is permitted and appears to be unregulated; however, the export of this species requires a permit issued by the Department of National Parks, Wildlife and Plant Conservation (DNP).

Tokay Geckos are not included in the national list of protected species in Viet Nam but hunting of this species in protected areas is prohibited. Hunting Tokay Geckos outside of protected areas and transporting them in Viet Nam requires a permit issued by the Provincial Forest Protection Department (FPD) (Vuong Tien Manh, Viet Nam CITES SA, *in litt.*).

In the Philippines it is illegal to hunt or trade in Tokay Geckos (Republic Act 9147 or Wildlife Resources Conservation and Protection Act 2001) (Lim *et al.*, 2012) and contravention of this law can lead to a fine of PHP 300 000 (USD 6950) and /or up to four years in prison.

Tokay Geckos are not protected under National legislation in Bangladesh, India and Myanmar.

Conservation status in the wild

Tokay Geckos are often considered to be a common species (Teynie, 2004; Das, 2010), a view which is attributable to their wide distribution, relatively high fecundity and their ability to thrive in human modified landscapes. However, Tokay Geckos have not been assessed by the IUCN Red List of Endangered Species and, in reality, few population studies have actually been carried out: the status of this species in the wild is largely unknown. Where assessments have been made population declines have often been documented.

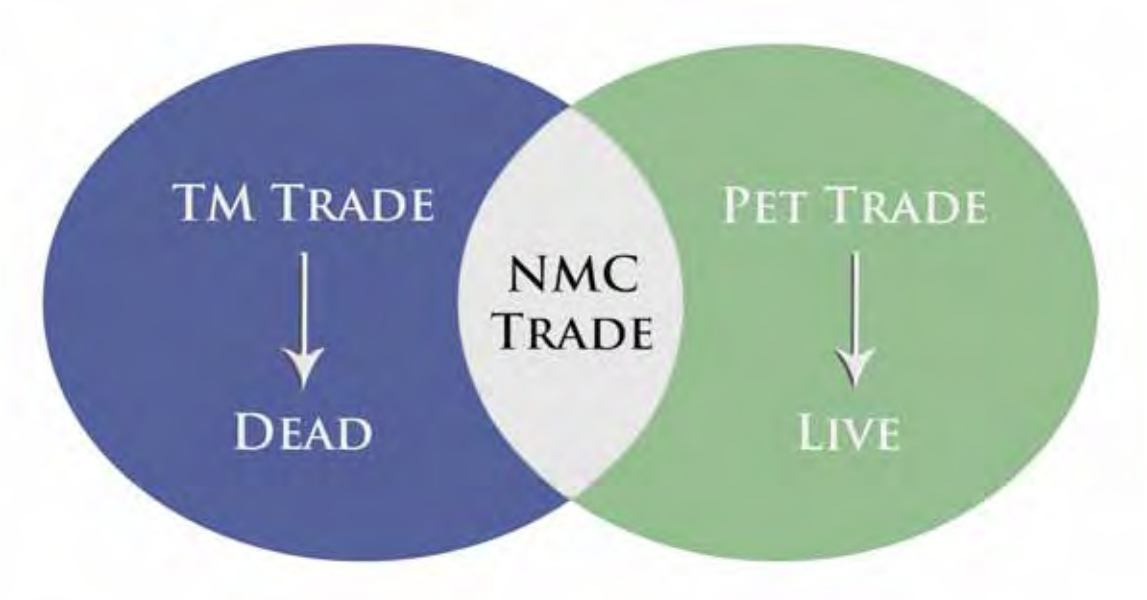
In Bangladesh populations are estimated to have recently declined by 50% as a result of collection for the Novel Medicinal Claims (NMCs) trade (M.H. Khan, in litt). In China, Tokay Geckos are listed as an endangered species in that country's Red Data Book and population declines have been recorded with over-harvesting for TM cited as a contributing factor to their status (Zhao, 1998; Chan *et al*., 2006). Similarly, population declines have also been reported in Java, Indonesia (Anon., 2011a) and north-eastern Thailand (Thongsa-Ard, *in litt.*) following hunting and export for use in TM. Tokay Geckos are considered to be rare in Nepal (Shrestha, 2000) and are listed as a threatened species in Viet Nam's Red Data Book (Ministry of Science, 2000). The status of wild populations in other range States is undocumented.

The trade in Tokay Geckos

As previously mentioned, aside from the trade for NMCs, Tokay Geckos are also used in TM and traded as pets. The trade for NMCs, which is discussed in greater detail below with regard to surveys in Peninsular Malaysia, occurs at the intersection of the TM

Figure 5:

Diagram detailing the different forms of trade in Tokay Geckos



and pet trades (Figure 5), that is, individuals are required to be alive upon purchase but are killed prior to use. The trade of Tokay Geckos for TM and pets is also discussed below.

Virtually all trade in Tokay Geckos is supplied from animals harvested from the wild (Yinfeng *et al.*, 1997; Nijman *et al.*, 2012; Thongsa-Ard, *in litt*.). Some of the Tokay Geckos in trade, however, are sourced from captive bred animals (see also pet trade section below). Yinfeng *et al.* (1997) reported that over 300 farms, mainly located in Southern China, bred commercially some 415 000 Tokay Geckos for use in TM (Yinfeng *et al.*, 1997). Additionally, an online source (http://www.gxny.gov.cn/web/2005-05/44207.htm) claims to breed over 100 000 geckos, though the species in question is unclear. Tokay Geckos are also reportedly bred in captivity in Viet Nam (Nguyen and Nguyen, 2008). However, in both China and Viet Nam, Tokay Gecko farms are unable to meet the demand for TM (Yinfeng *et al.*, 1997; Nguyen and Nguyen, 2008). In Java, Indonesia there are at least two registered

Tokay Gecko breeders and exporters; however local dealers there are sceptical as to whether the species was being bred in captivity (Nijman *et al*., 2012). At ~USD1 export value per individual, Tokay Geckos are one of the cheapest reptile species exported from Indonesia. According to Indonesian dealers, the low sale price makes captive breeding of Tokay Geckos financially unfeasible.

TM trade

The use of geckos in TM dates back hundreds, if not thousands, of years (Yang and Qi, 2001; Bauer, 2009; Gu *et al.*, 2011). Tokay Geckos figure prominently in Traditional Chinese Medicine (TCM) (Yinfeng *et al*., 1997) where they are used to invigorate the lungs and kidneys (Li *et al.*, 2004) and to treat skin ailments, asthma, diabetes and cancer (Sheu, 1977; Chuang *et al*., 1999). Recently, clinical tests on mice have shown that derivatives from Tokay Geckos have anti-tumor properties (You *et al.*, 2009). In Viet Nam, Tokay Gecko extract is used to treat erectile dysfunction and persistent cough (Nguyen, 1993).

Typically, Tokay Geckos are prepared for use in TM by gutting and stretching the carcasses on bamboo frames (Figure 6) (Liu, 1993; Caillabet, 2011). In Java, Indonesia, the carcasses are dried in large kilns (Nijman *et al.*, 2012) while in other parts of Asia they are

Figure 6.

Tokay Geckos gutted and stretched prior to kiln drying in Java, Indonesia.

© M. Auliya/TRAFFIC

likely sun-dried (Anon. 2002). The dried carcasses, often sold in male-female pairs for yin-yang reasons (Caillabet, pers. obv.), can be either boiled in water and drunk as a tonic or ground to a powder and mixed with food (Connett and Lee, 1994). Extracts of Tokay Geckos can also be purchased in powder or pill form (e.g. http://www.alibaba.com/product-gs/554384840/gecko_extract.html). Interestingly, a recent paper by Gu *et al*. (2011) highlighted the fact that 'adulterants' (impurities) were increasingly being found in Tokay Gecko extracts. According to the authors, reduced availability of this species locally in the wild, as a result of deforestation, has led to suppliers mixing other substances with the Tokay Gecko extract presumably as a cost-saving measure (Gu *et al*., 2011).

In addition to this mode of ingestion, in parts of Southeast Asia Tokay Geckos are also consumed in wine to increase strength and vitality (Bauer, 2009; Caillabet pers. obv.). These tonics can contain whole Tokay Geckos or Tokay Gecko extract along with a suite of other ingredients including ginseng *Panax* spp., goji berries *Lycium* spp., scorpions, seahorses *Hippocampus* spp. and snakes steeped in alcohol. Tokay Gecko wine is sold in small, individual bottles (Figure 7) as well as large vats from which individual servings are made (Figure 8).

Figure 7:

Small bottle of Tokay Gecko wine photo

© O. S. Caillabet/TRAFFIC

Figure 8:

Large vat of Tokay Gecko wine pictured in a restaurant in Viet Nam

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Pet Trade

Tokay Geckos are common in the international pet trade and are typically selling for less than USD25 (UNEP-WCMC, 2009). Many of the Tokay Geckos sold as pets originate in Java, Indonesia, where they are exported abroad (C. R. Shepherd, pers. comm.). Recently, however, the trade in Tokay Gecko "morphs" (colour variants) (Figure 9) has increased along with the price of this species. Several Tokay Gecko dealers located in the UK and USA now specialize in breeding varieties of Tokay Gecko morphs which are sold for several hundred USD each.

Figure 9:

Tokay Gecko morphs offered on a specialist website in the USA.
Source http://www.billewicz.com/Tokay_Hoard/Gallery/Gallery.html

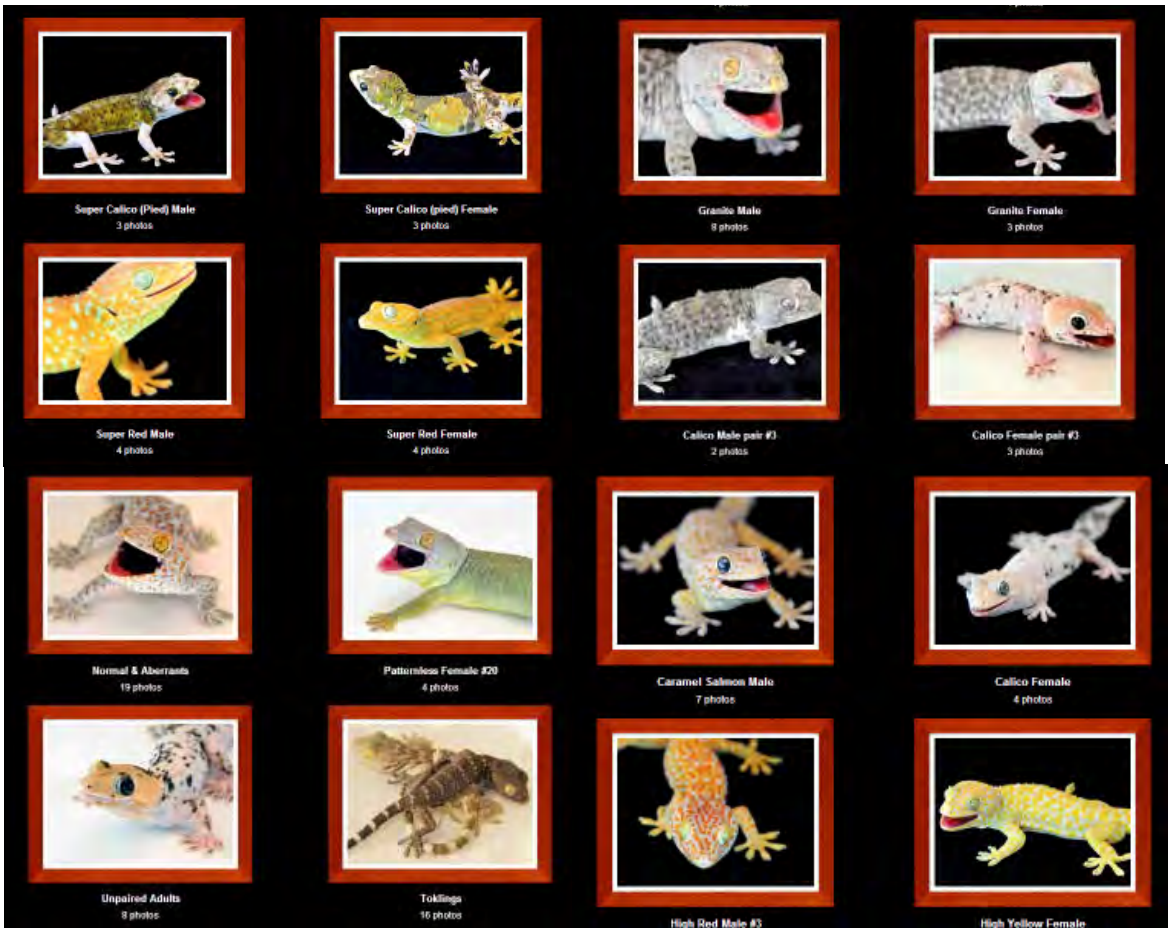


Figure 10:

A specialist Tokay Gecko morph website based in the UK.
Source http://www.tokaygecko.co.uk/#/gallery-my-morphs/4559375539

Novel Medicinal Trade in Peninsular Malaysia

Following a host of seizures and anecdotal reports from dealers and in the media, it became apparent in 2010 that a novel trade in Tokay Geckos was emerging. Unsubstantiated rumours indicated that the trade appeared to have spread throughout South-east Asia with Peninsular Malaysia identified as the main market. TRAFFIC Southeast Asia began following this trade in 2010 and in 2011 undertook focused field research to examine the trade in Peninsular Malaysia.

Aims of the study

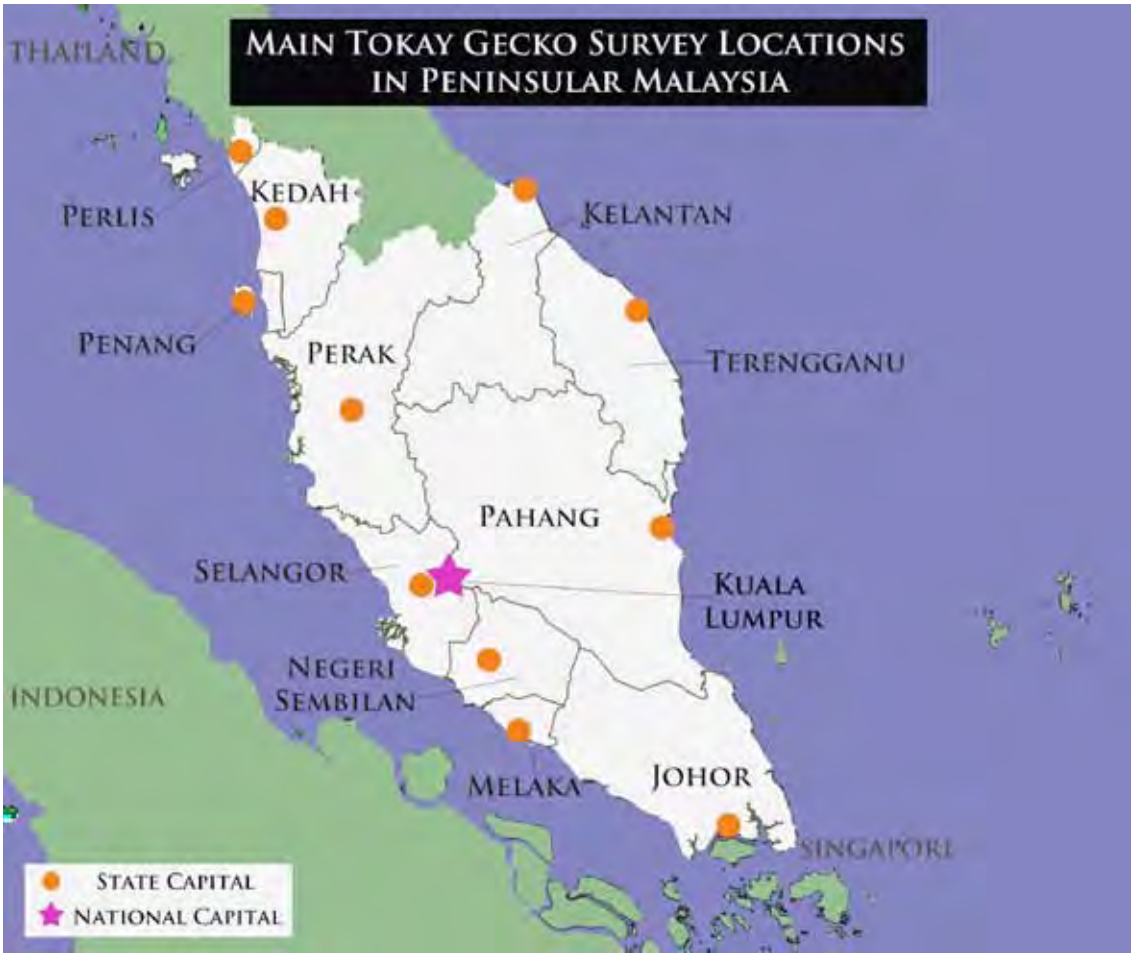
The primary aim of this study was to highlight the dynamics of the Tokay Gecko trade in Peninsular Malaysia following the emergence of NMCs asserting that derivatives of this species cured HIV/AIDS. In so doing; TRAFFIC aimed to document the source of animals being traded and trade routes; identify trade hotspots for targeted enforcement action; and ground truth the rumours surrounding the NMCs, particularly with regard to price. The secondary aim and wider goal of this project was to gather information via a desk study on the regional trade in Tokay Geckos for TM. It is hoped that the information presented within this report will be used as a reference for greater awareness and improved monitoring of the Tokay Gecko trade in the future.

METHODS

The trade in Tokay Geckos in Peninsular Malaysia for NMCs was assessed initially by surveying pet shops and aquariums in major towns and cities that were located using online searches. These establishments were subsequently contacted via telephone to inquire about the availability of Tokay Geckos for sale. Pet shops and aquariums ranged in size from large, upmarket establishments selling a wide variety of species and accessories to small roadside shacks trading in a few select species. If the shops in question had Tokay Geckos in stock researchers visited the premises and, posing as potential buyers, held informal interviews with the staff. In many cases, the addresses and/or phone numbers provided on these websites were inaccurate or wrong. It should be noted that this method is not exhaustive and it is likely that some pet shops and aquariums trading in Tokay Geckos were not surveyed. Traditional Medicine shops in Peninsular Malaysia were not surveyed during this study as this project focused on live Tokay Geckos sold for NMCs and resources in terms of time and money were limited.

Figure 11:

Map showing the States and State capitals surveyed in Peninsular Malaysia



While searching for establishments selling Tokay Geckos, any other pet shops or aquaria encountered en route were also visited opportunistically and the staff there questioned as to the availability of Tokay Geckos. In several instances pet shops which had no Tokay Geckos in stock put the researchers in touch with private dealers who had some available for sale. Subsequently, the researchers organized meetings with these dealers again posing as potential buyers. The researchers also attempted to contact private dealers advertising Tokay Geckos for sale on Malaysian buy and sell websites (e.g. www.mudah.my, www.olx.com.my etc.).

This was done by phone or text message and, in one case, by online chat. However, no Tokay Geckos were encountered for sale in this manner. For the purpose of this study, the term "dealer" refers to any individual selling Tokay Geckos, be they private sellers or pet shops/ aquaria.

Although unstructured, these interviews followed a common theme. Where possible, the researchers gathered information on dealer name, location, number of years in business, price, trends, source of stock, buyer origin, dealer knowledge of law pertaining to owning Tokay Geckos and other peripheral information related to trade. The majority of interviews were carried out in Malay with the use of an interpreter, although some interviews were carried out in English.

To gather data more generally on trade in this species a full literature review was carried out. Information was collected from a variety of sources including peer-reviewed scientific publications as well as a variety of online sources including social media sites (such as Facebook and Youtube) and buying and selling websites. TRAFFIC colleagues in Thailand, Viet Nam, Taiwan, Hong Kong and mainland China also provided valuable information with regard to the trade in Tokay Geckos locally in each area. Seizures of Tokay Geckos in South-East Asia were also examined. The CITES Management Authorities (MAs) of each Tokay Gecko range State were also contacted via email and asked to share any information on seizures, however; Myanmar's MA was the only MA to reply.

RESULTS AND DISCUSSION

Peninsular Malaysia and NMCs

Surveys of individuals and establishments trading in Tokay Geckos were carried out over ten non-consecutive weeks between January and June 2012. Information on the Tokay Gecko trade was also gathered during random and opportunistic interviews with dealers before this period. Each state and state capital in Peninsular Malaysia was surveyed as well as surrounding areas dependant on the apparent availability of Tokay Geckos for sale.

General Findings

Approximately 60 pet shops and aquariums were visited throughout Peninsular Malaysia. In total, 19 dealers were encountered during surveys including both private dealers and pet shops trading in Tokay Geckos. More than 250 Tokay Geckos were observed for sale: 192 (78%) of these were being sold by private dealers and 160 (64%) of the total observed were found in the three northern states of Kelantan, Kedah and Perak. Dealers were mainly male (17/19), estimated to be aged between 30-40 years old (9/19) and of Chinese (10/19) or Malay (7/19) descent.

Most of the Tokay Geckos observed for sale (>80%) were estimated to weigh between 250 and 300 g and ranged in price from MYR 300 (USD 96) to MYR 50 000 (USD 15 984) (see Table 1 footnote 3) per individual. Generally heavier Tokay Geckos were more expensive with those weighing above 400 g purportedly valued at several million ringgit. However, there was no consistency in pricing with regard to weight. This is a cash only trade and cash deposits are often required before securing any deals. According to those dealers interviewed, Thailand was the primary source location for Tokay Geckos traded in Peninsular Malaysia followed by Lao PDR, Myanmar and Peninsular Malaysia itself. Most of the Tokay Geckos observed are thought to have been brought into the country via land border crossings with Thailand.

Private dealer profiles

Interviews with private dealers yielded considerably more information on the Tokay Gecko trade than interviews with staff in pet shops and aquariums. Accordingly, information from interviews with private dealers is expanded upon in greater detail below than those with other dealers (Table 1). Most of those private dealers interviewed had been trading in Tokay Geckos for less than two years and selling Tokay Geckos was a secondary source of income. All of the private dealers traded Tokay Geckos by word of mouth; none used online sites or forums. In most instances this was because either the dealers did not know how to use the internet or avoided it because of widespread cheating and internet scams. Prevalent cheating in the Tokay Gecko trade in Peninsular Malaysia has been previously highlighted (Anon., 2011). Researchers also tried to contact dealers who advertised Tokay Geckos for sale online during surveys. Based on the researcher's interactions with these dealers via text and online chat, they did not appear to be actually selling Tokay Geckos. The motivations for this are unclear; however, this observation supports dealers claims of widespread internet scams.

Five of the seven private dealers interviewed during surveys were from the northern states of Kelantan and Kedah which border Thailand. Two dealers (ID 4 and ID 5), living within several kilometres of each other in Kedah, were the largest dealers encountered during surveys and combined accounted for 140 (56%) of the 251 Tokay Geckos observed for sale during surveys.

The first of these dealers (Dealer ID 4) was previously part of a syndicate of 30 people trading in Tokay Geckos but has since started his own separate car business. This trader had purpose-built "Tokay houses" (Figure 12) and had previously travelled numerous times to Lao PDR by air, collecting up to 1000 Tokay Geckos at a time and returning to Malaysia by car. At the peak of this trade, from 2009-2011, this dealer claimed he was making this trip up to 10 times a year and that he sold 100 Tokay Geckos a week, mainly for consumers in Singapore as well as Malaysia and Europe who were using Tokay Geckos as a cancer treatment. At the time of these surveys a European was purported to be in the area looking to buy Tokay Geckos for medical research. This dealer also highlighted that the Tokay Gecko trade in Thailand and Lao PDR is dangerous and that hold ups and robberies during deals was a real risk. According to him, his syndicate lost over MYR 100 000 (USD 31 968) from bad deals with Thai and Laotian dealers. This dealer had a licence to trade in Tokay Geckos issued by a local branch of PERHILITAN in Kedah (which was shown to researchers) and had approximately 80 Tokay Geckos in stock (Figure 12) that were being sold for ~MYR 19 000 (USD 6074) each. Although trade had slowed considerably, this dealer stated that business was good and that it was relatively easy to sell his stock.

Table 1:

Information collected from the seven private Tokay Gecko dealers encountered during surveys.

Dealer ID	Location (state)	Estimated Age Range	Primary Income Source	No. of Years Selling Tokays	No. of Tokays for Sale	Price/ Individual (MYR)	Source
1	Kelantan	30-40	No	2	2	16-30 000	Thailand
2	Kelantan	30-40	No	<1	30	8000	Thailand
3	Kedah	40+	No	2	12	580	Thailand
4	Kedah	30-40	No[1]	2	80	19 000	Lao PDR Thailand
5	Kedah	30-40	No	2	60	?[2]	Myanmar
6	Penang	40+	No	Unknown	2	15 000	Unknown
7	Terengganu	40+	No	>2	8	50 000[3]	Lao PDR Malaysia Thailand

[1]Dealing in Tokay Geckos used to be the primary income source for this trader; however, at the time of the interview, he had started his own car dealership.

[2]This dealer was no longer selling Tokay Geckos: although he still had many in stock he would not give researchers a price.

[3]The author believes that this price is inflated and not reflective of the actual value of Tokay Geckos.

Figure 12:

(Left) A purpose built tokay house. (Right) A 300 g+ tokay offered for sale for MYR19,000 (USD 6074).

The second trader (Dealer ID 5) was a small rubber and oil palm plantation owner and had approximately 60 Tokay Geckos in stock which were housed in purpose built individual enclosures (Figure 13). According to him, all of his Tokay Geckos were bought from a middleman and originated in Myanmar. This dealer had traded in Tokay Geckos for two years; however, he was not selling Tokay Geckos at the time of surveys but was instead keeping them to sell in the future. He did not give researchers a price but noted that Europeans (German) were the main buyers and that more recently Tokay Geckos were being bought by Korean and Japanese consumers. Previously, however, most of his customers were local Malaysians who claimed to be using the Tokay Geckos as a treatment for cancer. This dealer claimed that the species was now difficult to find in Myanmar and that it was similarly rare in Malaysia.

Figure 13:

Tokay Geckos held in individual enclosures

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A third member of this syndicate (Dealer ID 3) was also interviewed. He had been trading in Tokay Geckos for two years but had not sold any during that time. When surveyed he had 12 Tokay Geckos in stock all of which were sourced from a middleman in Thailand. These were being sold altogether for MYR 7000 (USD 2238) (MYR 580/individual); considerably less than the price offered for similar sized individuals by dealer (ID 5) who lived in the same area, knew this dealer and was part of the same syndicate. The reason behind the considerable price difference is unclear, however, could it be explained by the fact that this dealer (ID 3) was unemployed and noticeably less wealthy than the other dealer (ID 5). This trader also mentioned that the trade had declined recently and highlighted the fact that the Tokay Gecko trade in Thailand was dangerous and often involved double-dealings and robberies of interested buyers.

A fourth Tokay Gecko dealer (ID 2) encountered during surveys in Kelantan was a fruit and vegetable merchant who began trading in Tokay Geckos eight months prior to being interviewed (Figure 14). During this period this dealer had sold four Tokay Geckos weighing ~250 g that were sold for MYR 8000 (USD 2557) each to Malaysian buyers. These Tokay Geckos were bought for MYR 1000 (USD 320) as hacthlings and then reared to size. According to this dealer, Tokay Geckos weighing over 400 g could be sold for MYR 7 000 000 (USD 2 237 550). However, there is no evidence that such large sums have been paid for Tokay Geckos and the credibility of such claims is extremely doubtful. Currently this dealer had 30 Tokay Geckos in stock weighing between 250 and

Figure 14:

A private Tokay Gecko dealer showing researchers his Tokay Geckos (shedding their skin in the background) for sale

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300 g, all sourced by a middleman in Thailand. This dealer stated that he had a licence issued by the PERHILTAN office in Kota Bharu. However, it was not shown to researchers. Although lies and deceit were common in the Tokay Gecko trade, this trader noted that he had not encountered any such problems.

Dealer (ID 7) was part of a small Tokay Gecko syndicate operating out of Terengganu and had been trading in Tokay Geckos for a little over two years, during which time he claimed to have sold between 200 and 300 Tokay Geckos. No other members of this syndicate were interviewed. Currently, this dealer had eight Tokay Geckos in stock ranging in size from 200-300 g, but was due to receive a shipment of 200 individuals in the coming months-mainly from Thailand but also from Lao PDR and Peninsular Malaysia. These were to be stored in a purpose built Tokay Gecko-house, however, researchers were not shown these premises.

Figure 15:

A large Tokay Gecko (~300 g) pictured for sale in Terengganu

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The larger Tokay Geckos observed here, estimated to weigh around 300 g, were being sold for MYR 50 000 (USD 15 982) (Figure 15). However, the author believes that this price is inflated. The main buyers of Tokay Geckos were Singaporeans followed by Malaysians and foreigners (EU and USA). According to this dealer, after purchase some buyers would remove the head and entrails or, using a syringe, extract a non-descript liquid from the Tokay Geckos which would be used to treat HIV/AIDS. According to this dealer, the Tokay Gecko trade has declined considerably since its peak between 2009 and 2011. He noted that there is still a high demand for Tokay Geckos weighing over 400g and that buyers in Singapore are apparently willing to pay up to MYR 4 000 000 (USD 1 278 867) for such specimens. As mentioned above, the credibility of such claims, based on the amount of money involved and lack of evidence of such large sums being paid for Tokay Geckos, is extremely doubtful. This dealer also told researchers that the trade in Thailand was dangerous and fraught with fake deals and robberies.

Of the remaining two individuals selling Tokay Geckos, a dealer based in Penang was selling two he had as pets (ID 6), while the other was a small time dealer in Kelantan (ID 2) who had previously acted as a middleman selling to buyers in Johor and Penang. He had two Tokay Geckos on offer which originated in Thailand and were being sold for MYR 16 000 (USD 5115) and MYR 30 000 (USD 9590) each. The latter of these was larger (Figure 15). According to this dealer there were many dishonest dealers of Tokay Geckos. In some instances dealers would inject Tokay Geckos with silicon or force feed them with metal pieces to increase their weight, causing the animals to die shortly after. In other cases, especially in Thailand, prospective buyers are robbed of their money when they go to make a deal.

Figure 16:

Tokay Gecko pictured for sale in Kelantan

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Pet Shops and Aquaria

Information gathered from informal interviews with staff at pet shops and aquariums is presented in Table 2. Compared to private dealers, staff members at these establishments were generally far less knowledgeable about the trade and the information provided by them is considered less reliable.

Perak had the highest number of establishments trading in Tokay Geckos (3) followed by Penang (2) and Kuala Lumpur (2) (Table 2). No Tokay Geckos were found for sale in pet shops/aquariums in Johor, Kedah or Perlis while Tokay Geckos were seen for sale in a single pet shop/aquarium in each of the remaining states (Figure 17). However, as previously mentioned, it is likely that some establishments selling Tokay Geckos were not surveyed.

Figure 17:

Tokay Gecko pictured for sale at a pet shop in Kelantan

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Table 2:

Details of pet shops and aquariums selling Tokay Geckos

State/ Federal Territory	No. of Pet Shops/ Aquariums	No. of Tokays for Sale	Price (MYR)/ Individual	Source
Kelantan	1	7	800	Thailand
Kuala Lumpur	2	1 17	300 300-2 000	Unknown
Melaka	1	1	600	Thailand
Negeri Sembilan	1	3	600	Malaysia
Pahang	1	1	3 000	Unknown
Penang	2	4 3	10 000 800	Unknown
Perak	3	6 5 2	1 000 380 3 000	Lao PDR Malaysia Thailand Unknown
Selangor	1	3	600	Malaysia

Figure 18:

Tokay Gecko for sale in an aquarium shop in

A total of 53 Tokay Geckos were seen for sale in pet shops throughout Malaysia (Figure 18). A single shop, located in Kuala Lumpur, sold 17 of the 53 Tokay Geckos observed. Tokay Geckos were openly sold in 11 out of 12 of these shops. One pet shop owner, located in Penang, no longer displayed Tokay Geckos in his establishment as he said they were protected and he didn't have a licence. When researchers asked the remaining shop owners and staff if a licence was needed to keep this species, they responded that it was either not required or obtainable from PERHILITAN.

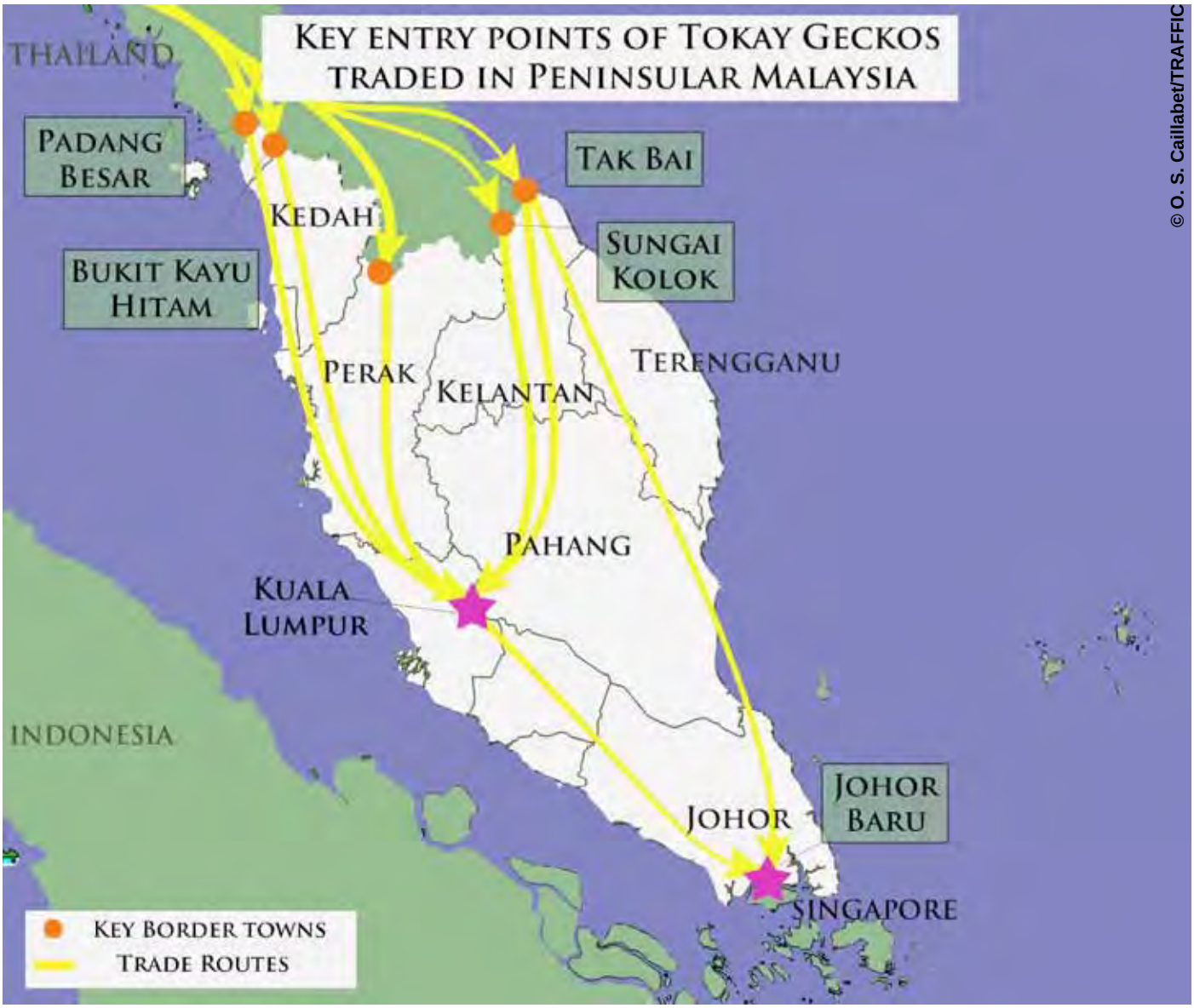
The price range for Tokay Geckos varied between MYR 300-10 000 (USD 96-3196). Although price was often based on weight, in several instances large Tokay Geckos (250-300 g) were being sold for MYR 300-800 (USD 96-256). Where the origin of Tokay Geckos being sold was known, the animals were coming from Thailand, Lao PDR and Peninsular Malaysia. Staff in five of the establishments surveyed stated that there had been a significant decline in trade of late and that Tokay Geckos were difficult to sell. In four instances, dealers told researchers that their Tokay Geckos had been in stock for over

one year without being sold. This, combined with statements from other dealers and the fact that these Tokay Geckos were being sold for a relatively low price (<MYR 1000/USD 319) may further indicate that the demand in this species has recently declined. It should be noted; a greater number of Tokay Gecko dealers and greater availability of Tokay Geckos on the market could lead to increased competition, market saturation and consequently, make it more difficult for dealers to sell their stock. However, given that there were relatively few pet shops in particular selling Tokay Geckos; that Tokay Geckos do not appear to be readily available and that the market does not seem to be over-saturated; a decrease in demand appears to be the most likely reason behind these observations.

A map showing the likely entry points of Tokay Geckos into Peninsular Malaysia as well as potential trade routes within the peninsula is shown in Figure 19. This trade route map is based on information gathered during surveys, in particular, from the private dealers who were interviewed.

Figure 19:

Suggested trade route map for Tokay Geckos traded for NMCs in Peninsular Malaysia

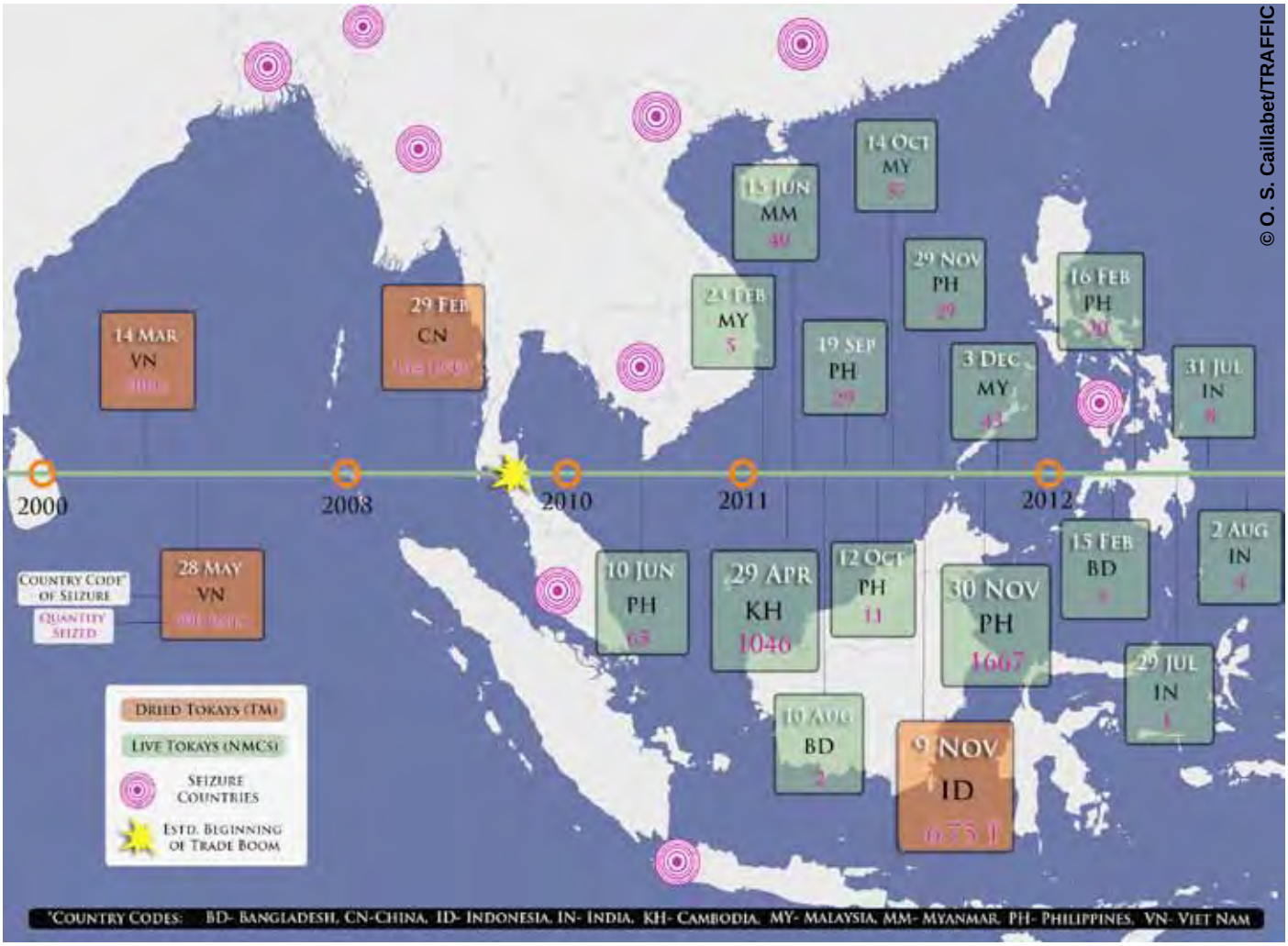


Seizure Analysis

Seizures of both live and dried Tokay Geckos for NMCs and in TM are shown in Figure 20 (information presented here was collected from published, online media sources. References for these can be found in Annex A). Since 2010 there have been at least 16 seizures of live Tokay Geckos ranging from Bangladesh to the Philippines. In most cases the end use and destination for seized Tokay Geckos, according to these sources, was for NMCs in Peninsular Malaysia.

Figure 20:

Tokay Gecko seizure timeline showing the date, location and quantity of past seizures



There have been more seizures in the Philippines than elsewhere both in number (six seizures) and quantity of live Tokay Geckos seized (1821ind.). The largest seizure of live Tokay Geckos was also made in the Philippines totalling 1667 animals. A recent publication by the Protected Area and Wildlife Bureau (PAWB) of the Philippines stated that 1895 live Tokay Geckos had been seized in raids in the Philippines, however; this figure includes other Gekko species which could account for the discrepancy with figures presented here (Lim *et al*., 2012). The second largest seizure of live Tokay Geckos took place in Cambodia and consisted of 1046 Tokay Geckos, 19 of which had died in transit. Again, these Tokay Geckos were destined for the market in Peninsular Malaysia. Most recently, over a four day period at the beginning of August 2012, eight Tokay Geckos were seized in three separate raids in North-east India. According to local media sources, these Tokay Geckos were to be smuggled through Myanmar to consumers in Malaysia.

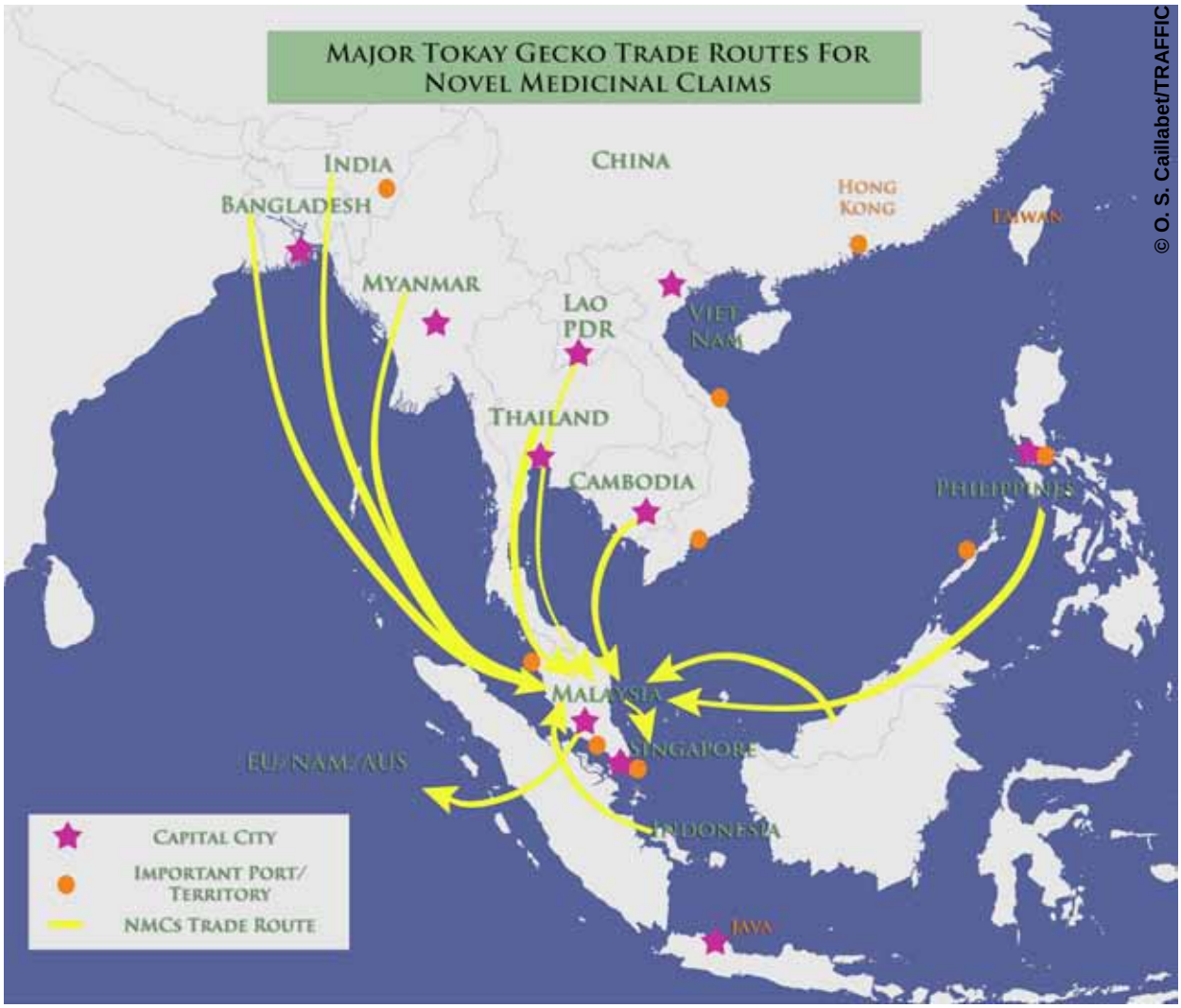
Of the four seizures of dried Tokay Geckos described above, the most recent in 2011 stands out because of the large volume of the shipment which consisted of approximately 6.75 tonnes of Tokay Geckos bound for Hong Kong. Based on the figures presented in Box 1 (below), this equates to approximately 225 000 individuals. Indonesia has an annual export quota of 45 000 live Tokay Geckos. Under Indonesian law, exporting quantities surplus to the quota and/or in a form other than stipulated under the quota (i.e. live), is illegal.

Market Surveys versus seizure data

Given the considerable number of Tokay Gecko seizures in the Philippines (as well as seizures in Bangladesh, India and Myanmar), most of which were purportedly destined for Peninsular Malaysia, it is surprising that none of the Tokay Geckos encountered during surveys originated in the Philippines. The apparent prevalence of online hoaxes within the Tokay Gecko trade is supported by interviews with private dealers and the few attempts made to contact online Tokay Gecko sellers. However, it is possible that there is a substantial trade in this species online that could provide a platform for the sale of Tokay Geckos from the Philippines and elsewhere outside Peninsular Malaysia. A probable trade route map for Tokays traded for NMCs, based on information gathered from surveys and seizure records, is shown below (Figure 21).

Figure 21:

International Tokay Gecko trade routes for NMCs



Trade for Traditional Medicine

Partially as a consequence of not being listed in CITES, much of the trade in Tokay Geckos has gone largely unnoticed and unrecorded. As such, we are reliant upon other sources such as customs data, scientific studies and anecdotal information to quantify and assess the extent of trade in this species for TM.

Box 1. How much do dried Tokay Geckos weigh?

Seizures and import records for Tokay Geckos traded for TM are generally measured in weight (kilogramme), not by the number of individuals. This makes it difficult to establish how many individual Tokay Geckos are contained within any one seizure or consignment. An understanding of the mean mass of dried Tokay Geckos has important implications for trade monitoring because it allows determination of the number of individual Tokay Geckos per unit volume. Most Tokay Geckos in trade are harvested from the wild. As such, this information can give empirical insights into the extent and potential sustainability of trade. Between May and June 2012 126 dried Tokay Geckos (including bamboo frame) were weighed to provide an estimated average weight for animals being traded. The results are provided below. No Tokay Geckos were purchased.

It should be noted that these specimens were measured at several different TM shops within Hanoi, Viet Nam. Those staff that knew the origin of specimens indicated that the Tokay Geckos were from Viet Nam as well as Lao PDR and China. As such, the sample size is not representative of all Tokay Geckos traded for TM.

Mean weight: 30.2 g **Max**: 58 g **Min**: 13.5 g
Standard Deviation: 8.9 **Variance**: 78.6

According to Customs import information provided to TRAFFIC by the Taiwanese government, Taiwan has imported over 450 tonnes of dried Tokay Geckos for use in TM since 2004,which represents a value of nearly USD 2 000 000 (Table 3). This equates to ~15 000 000 individual Tokay Geckos (See box 1, above). During this period over 57 tonnes of Tokay Geckos (~1 900 000 ind.) were imported into Taiwan on average every year with nearly 104 tonnes (~3 466 666 ind.) imported in 2008. Thailand is the largest origin state for Tokay Geckos imported into Taiwan accounting for 71% of imports (322.7 tonnes/ ~10 757 000 ind.) followed by Indonesia which accounted for 28% (125.6 tonnes/ ~4 187 000 ind.) of imports. Imports from mainland China were comparatively small and accounted for 1% of the total.

Thailand has exported 40 tonnes (~1 467 000 ind.) on average annually to Taiwan compared to an average ~16 tonnes (~533 000 ind.) exported from Indonesia. However, in 2008 Indonesia exported nearly 66 tonnes (~2 200 000 ind.) of dried Tokay Geckos to Taiwan.

Table 3:

Imports of Tokay Geckos into Taiwan. Source:Taiwan Customs.

Year	Exporting Country	Quantity (Kg)	Value (USD)
2004	Thailand	52 899	169 787
2004	Indonesia	4 525	33 668
2004	China	380	5550
2005	Thailand	47 014	198 017
2005	Indonesia	20 050	156 329
2005	China	120	1 885
2006	Thailand	48 982	182 742
2006	Indonesia	14 855	85 053
2006	China	540	8623
2007	Indonesia	17 796	50 147
2007	Thailand	48 823	176 667
2007	China	670	9459
2008	Indonesia	65 873	182 487
2008	Thailand	37 625	213 358
2008	China	344	3269
2009	Thailand	33 577	123 952
2009	China	1143	7700
2009	Indonesia	2350	5 640
2010	Thailand	31 705	138 933
2010	China	1056	11 955
2010	Indonesia	32	656
2011	Thailand	22 142	191 319
2011	China	924	9201
2011	Indonesia	126	452
	Total	**456 551**	**$1 978 234**

These figures appear to be partially corroborated by the CITES Management Authority (MA) of Thailand who claimed that 2 000 000 Tokay Geckos were exported from there annually (pers. comm. to C. R. Shepherd) as well as a recent publication which estimated that 1 200 000 million Tokay Geckos are exported from Java, Indonesia, annually (Nijman *et al*., 2012).

Dealers in Indonesia are permitted to export 45 000 live Tokay Geckos annually (5000 are designated for local use). This means that, in most years, the export of dried Tokay Geckos (which is not permitted) from Indonesia exceeds the quota for live animals by a factor of 12. In 2008, exports were 48 times greater than the established quota for live Tokay Geckos. It should also be noted that these figures only reflect exports to Taiwan. Including the seizure of 6.75 tonnes of dried Tokay Geckos in 2011 (which was bound for Hong Kong), these figures indicate that the illegal trade in Tokay Geckos from Indonesia is colossal.

Taiwan is just one of several states where large numbers of Tokay Geckos are used in TM. Between 1993 and 1994 Hong Kong imported more than 36 000 dried Tokay Geckos from Thailand (Lau *et al.*, 1996). Based on the seizure information presented above, however, this quantity is small compared to the volume (~225 000 seized in 2010) of Tokay Geckos potentially imported from Indonesia. In mainland China, the consumption of Tokay Geckos for TM is widespread and estimated to involve huge trade volumes (Zhao and Adler, 1993; Lao *et al.*, 1996; Yinfeng *et al.*, 1997) although no trade information is currently available. Tokay Geckos are commonly consumed in Viet Nam for TM also (Nash, 1997; Caillabet pers. obv.), but little information is available detailing this.

Several authors have indicated that many reptiles, imported into mainland China, including Tokay Geckos, originate in Lao PDR and Cambodia and are then transported to China via Viet Nam (Martin, 1992; Nash, 1997; Compton and Le, 1998). Both mainland China and Viet Nam are reported to breed Tokay Geckos in captivity, however, as previously mentioned; the output from captive breeding facilities is apparently unable to meet demand (Yinfeng *et al.*, 1997; Nguyen and Nguyen, 2008). As such, it is somewhat surprising that mainland China exports Tokay Geckos to Taiwan: this could be a result of re-exports from another country, for example, Thailand to mainland China.

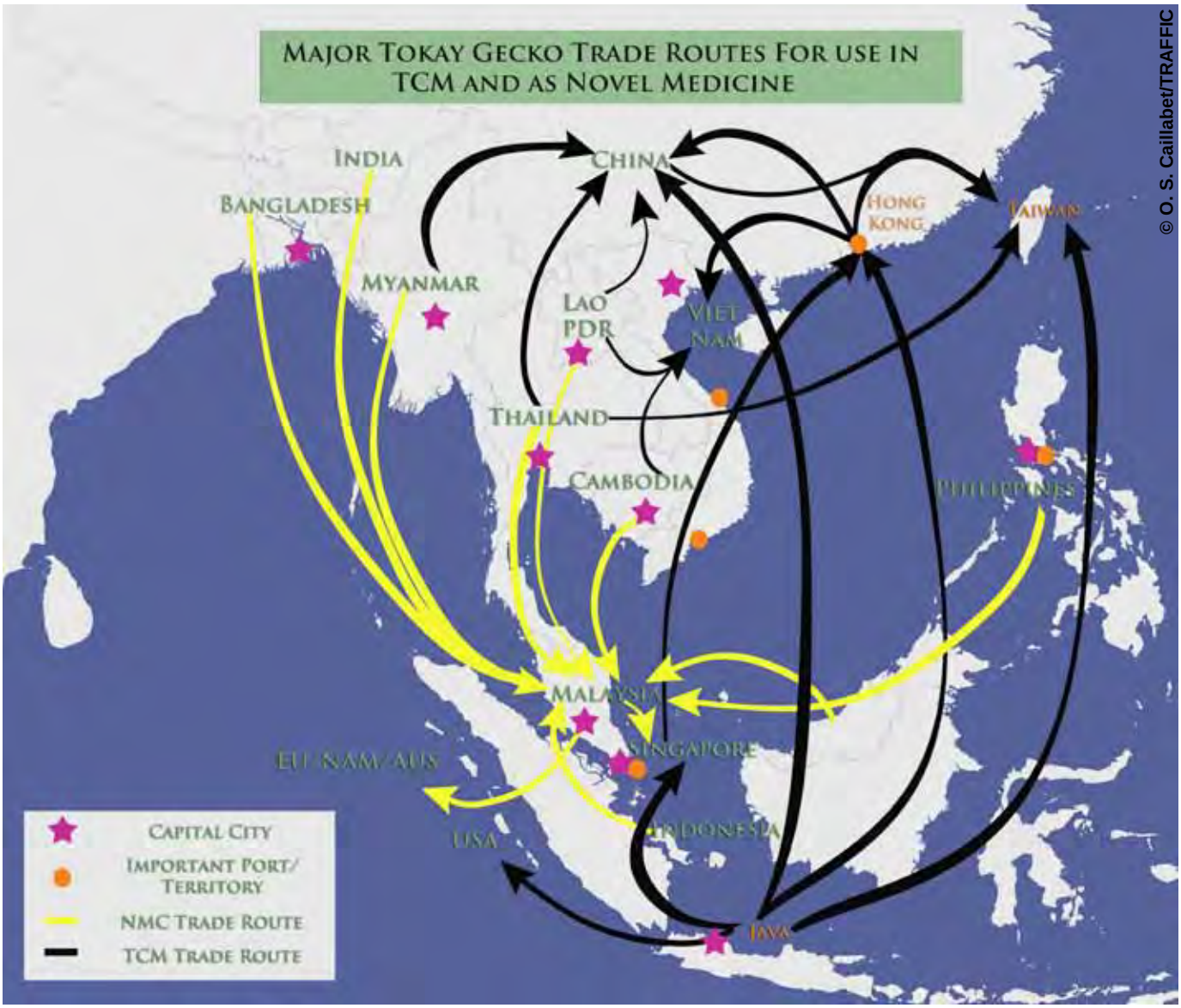
Additionally, the trade in Tokay Geckos for TM is not restricted to Asia but may also extend to Asian communities abroad. A study by Schlaepfer *et al*. (2005) found that between 1998 and 2004 more than 8.5 tonnes of dried Tokay Geckos (~283 000 ind.) were

imported into the USA for use in TM. A map showing likely trade routes for Tokay Geckos used in TM and for NMCs, based on the information gathered from surveys in Peninsular Malaysia, data from seizure records and the literature review, is presented in figure 22.

Considering the widespread use of Tokay Geckos for TM in China, Hong Kong and Viet Nam, and the large imports of Tokay Geckos into neighbouring Taiwan, total imports of Tokay Geckos into these states is likely to be substantial. Given the fact that the majority of Tokay Geckos in trade are harvested from the wild and that population declines have been observed in the primary source areas where they are harvested (Thailand and Indonesia) (Thongsa- Ard and Thongsa-Ard, 2003; Anon, 2011a), considerable questions surround the sustainability of this trade. Unfortunately, however, at present a paucity of information on the trade and ecology of this species precludes any reliable estimation of sustainability from being made.

Figure 22:

Map showing international trade routes for Tokay Geckos used in Medicine.



CITES and the Appendix amendment procedure

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an agreement between governments which aims to ensure that international wildlife trade does not threaten the survival of wild plants and animals. It was brought into force in 1975 and is the main way in which the international trade in wildlife is regulated. Nearly 35 000 species of plants and animals are listed in CITES (UNEP-WCMC, 2012). As previously mentioned, Tokay Geckos are not included in CITES. Taxa are listed in one of three Appendices, according to the perceived degree of threat posed by international trade. The type and level of trade permitted for a CITES-listed species depends on the Appendix in which it is listed (Table 4). Records of trade in CITES–listed species between member States are maintained in the UNEP-WCMC CITES trade database, an online open-access resource. This database contains all records of import, export and re-export reported by the Parties and is the primary mechanism through which trade is monitored and regulated.

Table 4:

Explanation of and criteria for listing in the CITES Appendices

CITES Appendix	Criteria	Comments
I	Species threatened with extinction	Trade is not permitted in these species except in extraordinary situations. Both import and export permits are required
II	Species not necessarily facing extinction but for whom trade needs to be controlled	**Some trade permitted** so long as it does not endanger the species, specimens have been legally obtained and appropriate export permits have been issued
III	Species is regulated to prevent over-exploitation in at least one country which sought assistance from other members to control trade	**Some trade permitted** so long as the specimen has been legally obtained and an appropriate export permit/certificate of origin has been issued

New species are added to the appendices of CITES at the Conference of the Parties (CoP), which takes place every three years (Resolution conf. 9.24). Listing proposals are submitted by range states of the species in question to the secretariat at least 150 days before the CoP. After consulting with other parties and interested bodies the Secretariat then responds to proposals within 30 days of the meeting. At the CoP parties vote on whether or not to adopt the amendment. A two thirds majority of parties present at the CoP is required for the amendment to be adopted. If the majority vote is achieved, the amendment is implemented within 90 days of the CoP and the species in question included in the CITES Appendices.

With regard to the potential listing of Tokay Geckos in Appendix II of the Convention, the amendment would apply to Annex 2(a) Criteria B (Resolution conf. 9.24), whereby:

“A species should be included in Appendix II when, on the basis of available trade data and information on the status and trends of the wild population(s), B. It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure

that the harvest of 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."

As previously mentioned, although this species is widespread and is ecologically flexible, trade has led to localised population declines in parts of Bangladesh, China, Indonesia and Thailand. More research is needed to quantify the extent of this trade, however; based on the definition provided above, Tokay Gecko may warrant inclusion in Appendix II of CITES in order to regulate trade in this species and prevent over-harvesting.

CONCLUSION

There is no data to support claims of an AIDS/HIV cure. Dealers in Peninsular Malaysia stated that considerable sums of money have been paid, in particular, for large individuals weighing over 300 g. Several dealers interviewed during surveys also stated that Tokay Geckos weighing over 400 g are valued above USD 1 000 000. The significance of this weight-price threshold is unclear, however; it is unlikely that Tokay Geckos can naturally reach a weight of 400 g or above. Information collected during surveys on price of Tokay Geckos is also inconsistent with claims that heavier individuals are more valuable.

There is no evidence to support dealers claims that Tokay Geckos weighing more than 400 g have been sold for more than USD 1 000 000. TRAFFIC does not believe that these claims are credible. It has been previously suggested that the Novel Medicinal Trade in Tokay Gecko is based on an elaborate hoax; this theory is supported by the non-credible nature of the claims (HIV cure and price) surrounding this trade as well as inconsistency in price data arising from these surveys. However, the motivations and end-game of such a hoax remain unclear.

Irrespective of the nature of the rumours, the trade in Tokay Geckos for NMCs is very real. Based on interviews with Tokay Gecko dealers and seizure records, this trade began around late 2009 and peaked in 2010/2011. Recently, the trade has declined. The reason for this is unclear but could be attributed to a combination of improved enforcement, realisation among consumers that claims are unfounded or the prevalence of scams, as reported by traders and in the media. Results of the study suggest that much of the online trade in this species is fraught with fake sellers. Additionally, private dealers interviewed highlighted that the trade in this species, particularly in Thailand, is dangerous and often involves robberies and hold-ups.

Tokay Gecko traded in Peninsular Malaysia for NMCs appear to be sourced predominantly in Thailand as well as in Lao PDR and Myanmar. These are collected from the wild and then transported to Malaysia overland. Seizure records indicate that the Philippines is also an important source country for Tokay Geckos sold for this trade, however; no Tokay Geckos from the Philippines were encountered during field surveys. The larger Tokay Gecko dealers in Peninsular Malaysia appear to be concentrated in the north of the country close to the Thai border and the source of Tokay Geckos entering the country. According to dealers, Singaporeans and local Malaysians are the main consumers of Tokay Geckos for NMCs. Some even claim use of Tokay Geckos by Europeans and North Americans for medical research.

It is illegal in Peninsular Malaysia to trade in Tokay Geckos without a licence. Eleven pet shops/aquariums openly sold Tokay Geckos without a license. This can be attributed to poor enforcement; however, interviews with pet shop/aquarium staff, as well as information gathered from private dealers, suggest that there is lack of awareness of the national law pertaining to the trade in this species. In some cases, private dealers had licences issued from local PERHILITAN offices allowing them to trade in Tokay Geckos. However, according to the PERHILITAN's head of enforcement, no licences to trade in Tokay Geckos have ever been issued. Given the system in place, whereby state offices report permits issued to the PERHILITAN head office, this observation is surprising and potentially indicative of a miscommunication/lack of coordination between PERHILITAN headquarters and state offices.

The trade in Tokay Geckos for NMCs is reported to have led to considerable population declines of wild Tokay Geckos in Bangladesh. Regionally, however, the scale of this trade, in terms of numbers of individual Tokay Geckos removed from the wild, appears to be relatively small. In addition, the demand seems to be in decline. Given the relatively small scale of the trade for NMCs and the wide range and abundance of this species, it is probable that the trade for NMCs does not threaten wild Tokay Gecko populations. This is in stark contrast to the trade in Tokay Geckos for TM.

The international trade in Tokay Geckos for TM is extensive. The vast majority of Tokay Geckos traded for TM originate from Thailand and Java. Customs import data shows that Taiwan has imported ~15 000 000 Tokay Geckos since 2004, 71% of which were imported from Thailand with the remainder mostly coming from Indonesia. While this trade appears to be legal but unregulated in Thailand, the trade in Tokay Geckos from Indonesia is entirely illegal. Taiwan is not the sole consumer of Tokay Geckos for TM. A seizure in 2011 bound for Hong Kong from Indonesia is estimated to have consisted of 1 200 000 dried Tokay Geckos, Aside from Taiwan and Hong Kong, large quantities of Tokay Geckos are also consumed for TM in mainland China and Viet Nam. The extent of this trade is unknown but thought to be substantial. Taking this into consideration, it is reasonable to conclude that the total trade in Tokay Geckos is greater than the already substantial known trade.

Some of the Tokay Geckos traded for TM are claimed to have been bred in captivity in mainland China and Viet Nam, however, the supply cannot meet demand. The majority of Tokay Geckos consumed as part of this trade are harvested from the wild. Despite the fact that Tokay Geckos have a large geographical distribution, have high reproductive rates and can thrive in human dominated environments, populations are still susceptible to over-harvesting. This is evidenced by the reported declines of wild populations in Thailand and Java as well as the past deterioration of populations in mainland China as a result of trade for TM.

The trade in Tokay Geckos for NMCs is insignificant compared to the trade for TM. Serious questions surround the legality and potentially the sustainability of the Tokay Gecko trade, particularly for use in TM. With this in mind, TRAFFIC recommends the following:

RECOMMENDATIONS

- General awareness in Peninsular Malaysia about the laws pertaining to the trade in Tokay Geckos needs to be improved. Awareness materials should be focused on areas outlined in this report where Tokay Geckos are most likely being smuggled into the country.

- PERHILITAN is urged to use the information contained within this report (and detailed information provided directly to them during the course of this research) to clamp down on the illegal trade of Tokay Geckos sold in pet shops and aquaria and prosecute offenders to the full extent of the law.

- PERHILITAN should also address problems surrounding previous issuance of permits by state offices which may have arisen through a lack of internal communication.

- The illegal Tokay Gecko trade from Java needs to be addressed. Indonesian authorities are urged to either; establish and enforce an export quota for dried Tokay Geckos used in TM or; enforce current quotas and shut down existing Tokay Geckos processing facilities so no dried Tokay Geckos are exported.

- Indonesian authorities should also be alert to potentially false claims of captive breeding in the future. Falsely declaring wildlife as bred in captivity has been previously highlighted as a means through which illegally sourced wildlife is laundered on international markets. According to dealers in Indonesia, breeding Tokay Geckos is not financially viable because of the low market value. Companies claiming to breed this species in captivity should be investigated by Indonesian CITES authorities prior to permitting any exports.

- Studies should be carried out to assess the Tokay Gecko trade from Thailand and Java. Work should focus on Tokay Gecko harvesting facilities to gather information on the volume of Tokay Geckos being extracted and exported from the wild. Adaptive management systems should also be established for these facilities whereby harvests are monitored over time and modified depending on the harvest and population trends. In this way, the status of wild populations can be monitored and any significant changes in harvest, resulting from over-exploitation, can be flagged and the future sustainability of the trade improved.

- Targeted field surveys of wild Tokay Gecko populations should be carried out in major Tokay Gecko harvest locations. This should accompany monitoring of harvesting facilities outlined above. This would provide data on the state of wild populations and the impact of trade on them. This information would also support a listing in CITES Appendix II, (Under Annex 2(a), Criteria B of Resolution conf. 9.24) which is required to better regulate and monitor trade in Tokay Geckos.

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ANNEX A List of Tokay Gecko Seizures

Date	Location/ Country	Information source
14-Mar-00	Viet Nam	TRAFFIC Bulletin Vol. 18 No. 3 pg. 46
28-May-00	Viet Nam	TRAFFIC Bulletin Vol. 18 No. 3 pg. 47
29-Feb-08	China	Traffic website using search term ‘tokay gecko’
10-Jun-10	Philippines	Katala Foundation
23-Feb-11	Malaysia	http://www.selatanonline.net/v1/modules.php?name=News&file=print&sid=5987
29-Apr-11	Cambodia	http://www.wildlifealliance.org/blog/2011/4/29/saving-animals-by-the-thousandliterally.html
15-June-11	Myanmar	http://www.narinjara.com/details.asp?id=2988
10-Aug-11	Bangladesh	http://www.thedailystar.net/newDesign/news-details.php?nid=198271
19-Sep-11	Philippines	http://www.interaksyon.com/article/13732/denr-releases-5-geckos-in-davao-river-to-file-case-vs-traders
12-Oct-11	Philippines	http://www.abs-cbnnews.com/nation/metro-manila/10/12/11/3-tuko-traders-nabbed-quiapo
14-Oct-11	Malaysia	http://www.utusan.com.my/utusan/info.asp?y=2010&dt=1015&pub=Utusan_Malaysia&sec=Utara&pg=wu_07.htm
9-Nov-11	Indonesia	http://www.antaranews.com/berita/283435/hampir-7-ton-tokek-kering-gagal-diselundupkan
29-Nov-11	Philippines	http://www.sunstar.com.ph/davao/local-news/2012/02/14/2-koreans-29-tukos-sued-206095
30-Nov-11	Philippines	http://newsinfo.inquirer.net/103061/police-seize-2000-geckos-in-gensanhttp://
3-Dec-11	Malaysia	http://www.wildlife.gov.my/index.php/en/43-tockay-gecko-seizure
15-Feb-12	Bangladesh	http://www.haveeru.com.mv/south_asia/40284
16-Feb-12	Philippines	http://newsinfo.inquirer.net/146499/20-geckos-seized-in-laguna-12-arrested
29-Jul-12	India	http://kanglaonline.com/2012/07/tokay-gecko-rescued-and-released-at-keibul-lamjao-national-park/
31-Jul-12	India	http://sevensisterspost.com/?p=27277#
2-Aug-12	India	http://timesofindia.indiatimes.com/city/guwahati/Four-tokay-geckos-rescued-from-Imphalt/articleshow/15321089.cms

TRAFFIC, is the leading non-governmental organization working globally on trade in wild animals and plants in the context of both biodiversity conservation and sustainable development. TRAFFIC is a strategic alliance of IUCN and WWF.

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