

VOL. 28 NO. 1

1

TRAFFIC

B U L L E T I N



PANGOLIN TRADE

SYNTHETIC WILDLIFE SUBSTITUTES

CHINA'S BOTANICALS MARKET

LIZARDS: SPINY-TAILED AND SUNGAZERS

The journal of the TRAFFIC network disseminates information on the trade in wild animal and plant resources

APRIL 2016

TRAFFIC

the wildlife trade monitoring network

TRAFFIC was established in 1976 to perform what remains a unique role as a global specialist, leading and supporting efforts to identify and address conservation challenges and solutions linked to trade in wild animals and plants.



WILD WONDERS OF EUROPE, MARKUS VARESUO / WWF

TRAFFIC's Vision is of a world in which trade in wild plants and animals is managed at sustainable levels without damaging the integrity of ecological systems and in such a manner that it makes a significant contribution to human needs, supports local and national economies and helps to motivate commitments to the conservation of wild species and their habitats.

TRAFFIC

Trade in wildlife is vital to meeting the needs of a significant proportion of the world's population. Products derived from tens of thousands of species of plants and animals are traded and used for the purposes of, among other things, medicine, food, fuel, building materials, clothing and ornamentation.

Most of the trade is legal and much of it sustainable, but a significant proportion is not. As well as threatening these resources, unsustainable trade can also lead to species declining in the wild to the point that they are threatened with extinction. Illegal trade undermines local, national and international efforts to manage wild natural resources sustainably and causes massive economic losses.

TRAFFIC is a strategic alliance of WWF and IUCN, the International Union for Conservation of Nature. The role of

TRAFFIC is to seek and activate solutions to the problems created by illegal and/or unsustainable wildlife trade. TRAFFIC's aim is to encourage sustainability by providing government, decision-makers, traders, businesses, consumers and others with an interest in wildlife trade with reliable information about trade volumes, trends, pathways and impacts, along with guidance on how to respond where trade is illegal or unsustainable. Five regional TRAFFIC offices are co-ordinated by the TRAFFIC headquarters in Cambridge, UK.

TRAFFIC's reports and advice provide a technical basis for the establishment of effective conservation policies and programmes to ensure that wildlife is maintained within sustainable levels and conducted according to national and international laws and agreements. The journal of the TRAFFIC network, *TRAFFIC Bulletin*, is the only publication devoted exclusively to issues relating to international trade in wild plants and animals. Provided free of charge to over 4000 subscribers and freely available from the TRAFFIC website (www.traffic.org), it is a key tool for disseminating knowledge of wildlife trade and an important source of information for those in a position to effect change and improve awareness.



JÜRGEN FREUND / WWF

Much of the content published in the *TRAFFIC Bulletin* arises from investigations carried out by TRAFFIC staff, whose wide-ranging expertise allows for a broad coverage of issues. TRAFFIC has also built up a global network of contacts with, for example, law enforcement agents, scientists, and wildlife experts, some of whom are regular contributors to the *TRAFFIC Bulletin*.

TRAFFIC welcomes articles on the subject of wildlife trade that will bring new information to the attention of the wider public; guidelines are provided in this issue and online to assist in this process. For more information, please contact the editor: Kim Lochen (kim.lochen@traffic.org).



BRENT STIRTON / GETTY IMAGES / WWF-UK



HARTMUT JUNGSIUS / WWF

The *TRAFFIC Bulletin* is a publication of TRAFFIC, the wildlife trade monitoring network, which 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 WWF and IUCN.

The *TRAFFIC Bulletin* publishes information and original papers on the subject of trade in wild animals and plants, and strives to be a source of accurate and objective information.

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Cover photograph:
White-bellied Pangolin *Phataginus tricuspis*
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Photographs this page, from top:
American Ginseng *Panax quinquefolius*
(© Andrea Ottesen)
Black Rhinoceros *Diceros bicornis*
(© Martin Harvey / WWF)
Ivory seizure, Heathrow Airport, UK
(© UK Border Force)
Egyptian Spiny-tailed Lizard *Uromastix aegyptia*
(© Or Oi Ching / TRAFFIC)

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BULLETIN

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The use of spiny-tailed lizards *Uromastix* spp. for medicinal purposes in Peninsular Malaysia

Or Oi Ching and Serene C.L. Chng



The transportation and logistics sector, comprised primarily of passenger and cargo airlines, express couriers, freight forwarders and shipping companies, has long been a critical link in the trade chain for illegal wildlife. As the world becomes increasingly interconnected by advancements in transportation networks for both goods and people, these companies are being exploited by criminal networks to move large volumes of illegal wildlife and wildlife products such as elephant ivory, rhinoceros horn, abalone, pangolin and timber across the globe with increasing efficiency. Despite the fact that the global value of illegal wildlife trade is estimated to be among the top five most lucrative forms of transnational crime, previous engagement by the

EDITORIAL

transportation industry in helping to find solutions has been limited. This lack of engagement was due to numerous reasons ranging from a lack of awareness of the scope and scale of the problem within the wider industry and at the company level, an emphasis on the role of law enforcement, and fears of increased trade regulation, screening and liability, which could impact trade efficiency and profit margins. However, in 2015 TRAFFIC witnessed the most dramatic shift in the transportation industry's commitment to the fight against illegal wildlife trade globally.

This sudden "sea change" can be attributed to several factors. Over the past few years, landmark measures such as President Obama's Executive Order 13648—Combating Wildlife Trafficking in 2013, the London Conference on Illegal Wildlife Trade Declaration in 2014 and the United Nations General Assembly Resolution on Tackling Illicit Trafficking in Wildlife in 2015, to name a few, have solidified the issue at the highest levels of the global political agenda in response to the alarming rates of poaching and trade of some of the world's most iconic species. Central to these pronouncements of political will was the acknowledgement of the need for greater resources aimed at collaboration between public and private sectors. Global initiatives such as the USAID-funded Wildlife Trafficking Response Assessment and Priority Setting (Wildlife TRAPS) project and Reducing Opportunities for Unlawful Transport of Endangered Species (ROUTES) partnership co-ordinated by TRAFFIC, have acted as catalysts for the meaningful engagement of the transportation industry by creating a space for collaboration and dialogue between companies, law enforcement, governments and non-governmental organizations (NGOs) around creative solutions. Similarly, the United for Wildlife International Taskforce on the Transportation of Illegal Wildlife Products, led by the Rt Hon. the Lord Hague of Richmond, through the Royal Foundation of the Duke and Duchess of Cambridge and Prince Harry, has captured the commitments of over 50 CEOs of large transportation companies and agencies through the signing of the recent Buckingham Palace Declaration in March 2016.

An event that proved to be a catalyst for TRAFFIC's wider engagement with the transportation sector came in January 2015, when TRAFFIC convened a ground-breaking workshop in Bangkok, Thailand, through the Wildlife TRAPS project, to raise awareness on the issue of illegal wildlife trade within various supply chains, and identify gaps and opportunities to improve co-ordination and screening of illegal wildlife products with industry players. The event

was attended by industry and transport associations, several airlines, supply chain experts, Customs officials, express courier companies, NGOs and government representatives. In retrospect, the success of the event was certainly influenced by the growing appetite to address this illicit trade as a result of increased media attention and global outcry. However, there were other factors that contributed to securing the participation from such a large cross-section of the industry. First, the workshop concept was grounded in acknowledging the potential risks to industry players including reputational, legal and economic risks due to the growing scale of the trade. Co-hosting the event together with the World Customs Organization (WCO) provided reassurance to participants that discussions would remain within existing agency mandates and would examine the interface between law enforcement and the private sector more closely. The workshop also focused on tangible solutions that could be undertaken by identifying priority actions that could realistically be undertaken by participating agencies in the future. Lastly, the priority actions identified could be supported with sufficient financial resources for implementation over a long-term period to ensure sustained engagement.

The Wildlife TRAPS project is currently advancing collaborative partnerships with several companies and associations including airlines, express couriers and freight forwarders that participated in the workshop in January 2015. The ROUTES partnership is focusing on air passenger and cargo companies globally and will expand to other sector partners such as shipping in subsequent years of implementation. Both initiatives are working with partners to influence change at multiple levels. Specific activity areas include: improving data and analytics on wildlife trafficking with passenger and cargo supply chains for evidence-based action, integration of wildlife trafficking responses into relevant industry standards and protocols, engaging leadership by developing corporate buy-in strategies, improving the ability of transport personnel to assist law enforcement by developing systems for information exchange and screening practices, staff training for companies and increasing passenger and client awareness through targeted campaigns. This multi-level approach is therefore designed to address identified weaknesses and loopholes along the trade chain and achieve significant systemic change from within the industry.

This dramatic shift in the transportation sector's engagement in such a short period of time is remarkable, but is also a result of a growing voluntary commitment by companies and acknowledgement that any solution to the current wildlife trade crisis requires collective action. High-level political attention has greatly assisted in securing buy-in, and activities such as those being undertaken through the Wildlife TRAPS project and ROUTES partnership demonstrate how seemingly insurmountable challenges can be more effectively addressed by fostering industry-led actions and setting realistic expectations across partnerships. This approach is already creating a culture of accountability between agencies which will undoubtedly continue to raise necessary awareness and develop targeted action and creative solutions where it can achieve the greatest impact along the trade chain.

Nick Ahlers, Project Leader, Wildlife TRAPS, TRAFFIC.
E-mail: nick.ahlers@traffic.org

MERWYN FERNANDES joined TRAFFIC in April 2016 as Co-ordinator (Programmes), and is based in Delhi, India.

GUAN JING re-joined TRAFFIC in December 2015 as Programme Officer to work on market monitoring, data analysis and law enforcement in China.

bulletin board

WILSON LAU has been appointed Programme Officer initially focusing on abalone, rhinoceros and ivory issues in Hong Kong and cross-border trade.

MAI NGUYEN who worked on the Medicinal and Aromatic Plants (MAPs) programme from the Viet Nam office, left TRAFFIC in April. CUONG NGUYEN was recruited in January 2016 as Project Officer to assist with the MAPs programme.

MICHELLE OWEN took on the position of ROUTES Lead in February 2016, based at the TRAFFIC office in Cambridge, UK. Michelle has spent the past 12 years in Asia working on wildlife conservation for WWF, Wildlife Alliance and WildAid.

NATALIA PERVUSHINA, Tiger Trade Manager for TRAFFIC and WWF as part of the Tigers Alive Initiative since 2012, left her position at the end of March 2016 to pursue her PhD. Natalia also worked from 2007 to 2010 as Programme Officer for TRAFFIC in Russia.

SARAH STONER, TRAFFIC's Senior Crime Data Analyst left TRAFFIC in April 2016. Sarah made an immense contribution to TRAFFIC's efforts in supporting law enforcement actions and brought TRAFFIC's research, data entry and analysis systems in South-east Asia to a new level of efficiency and professionalism.

BRANDON ZENG was recruited on 1 December 2015 as DFID timber project F&A Associate.

KE ZHANG has been promoted to Project Manager responsible for timber and MAPs projects at the China office, effective 1 May 2016.

traffic websites

www.traffic.org (English); www.traffic.org/news-french (French); www.wwf.ru/traffic (Russian); www.trafficchina.org (Chinese); www.trafficj.org (Japanese)

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OBITUARY

TRAFFIC mourns the loss of colleague Massimiliano "Max" Rocco who passed away suddenly on 11 December 2015 whilst in Cameroon.



J. COMPTON / TRAFFIC

Based in Rome, Italy, Max was in charge of species conservation at WWF Italy and also led the Italian office of TRAFFIC, working for both organizations for almost two decades. He worked for many years on the conservation of wild animal and plant species, in close co-operation with conservation managers and CITES authorities, and with the scientific and law enforcement community.

During his work with TRAFFIC, Max contributed to the conservation and sustainable use of a wide array of biodiversity—from butterflies, red corals, sharks and marine turtles to snakes, parrots, birds of prey, elephants and great apes. In this context, Max was an author of many publications relating to the role of Italy in wildlife trade.

Max also liaised well with the Italian private sector and its role in wildlife trade, advising on aspects of legality and sustainability as well as working with businesses, such as those involved in trading medicinal and aromatic plants, reptile leather skins, and products derived from fish and timber. He helped gather data on ivory seizures and timber landings, and most recently was involved in the protection of Brown Bears, wolves and rare birds of prey including vultures, and the Bonelli's Eagle in Sicily.

His latest work also took him further afield, including to Asia and Latin America, and notably to his beloved Africa, where he helped promote FSC certification for sustainable logging operations, as well as legal and sustainable timber procurement and activities to curb the illegal bushmeat trade in forest concessions in the Congo Basin.

Max was an enthusiastic, passionate, and dedicated conservationist and colleague, who shared a deep concern for protecting wild animals and plants across the world. He was well-known for his personality and charm and would happily converse with people at all levels concerning wildlife trade issues.

Max's warm smile and wonderful sense of humour will be sorely missed by his colleagues and family, to whom we extend our sincere and deepest condolences.

Roland Melisch,
Senior Director—Africa and Europe, TRAFFIC

Occurring exclusively in Africa and Asia, pangolins are among the most heavily illegally traded mammals in the world. Popular for their meat and for the purported medicinal qualities of their scales (Challender and Hywood, 2012; Boakye *et al.*, 2015; Shepherd *et al.*, 2016), they are a much sought-after commodity, both locally and internationally, despite the protective measures that are in place in most countries in which they occur. With China and Viet Nam the key consumers of pangolin derivatives, international trade has historically confined itself to the Asian continent. However, recent seizures data suggest that the trafficking of African pangolin species to meet Asian demand is on the rise. Their mounting occurrence on the international market is alarming and has been attributed to a drastic decline in the four Asian species and increasing economic ties between East Asia and African countries (Challender and Hywood, 2012; Challender, 2015; Nijman *et al.*, 2015; Shepherd *et al.*, 2016). While it has long been suspected that inter-continental pangolin trade occurs, and the possibility of such a trade was raised in Bräutigam *et al.* (1994), there has been little study of its scope and scale. Challender and Hywood (2012) first shed light on the potential threats such trade may pose to African pangolins based on an analysis of seizures data of the four species between 2000 and 2012. Since then, the number of incidents has not increased in a noteworthy way (in fact the number of seizures may seem low to the casual observer). However, this observation may be misleading, for the quantities of seized goods have risen tremendously. Between 2000 and 2012, the weight of scales seized in a single incident ranged from one kilogramme to ca. 200 kg (Challender and Hywood, 2012). These numbers now commonly range from 250 kg to 2000 kg. This short note aims to provide a concise overview of these worrying findings in respect of Nigeria, and to highlight the importance of further research into the shifting trends in the international pangolin trade.

Case Study: Nigeria to Asia

The recent spate of inter-continental pangolin trade originating from Nigeria warranted closer scrutiny of the country's potential role as an important African export hub. Seizures data of pangolin shipments originating in Nigeria were collected and analysed for the period 2011 to 2015. These data were obtained from media reports and the TRAFFIC database. Nine

The trade of African pangolins to Asia: a brief case study of pangolin shipments from Nigeria



Fig. 1. Trade routes of pangolin shipments from Nigeria to Asia, and volumes, 2012.



Fig. 2. Trade routes of pangolin shipments from Nigeria to Asia, and volumes, 2014.

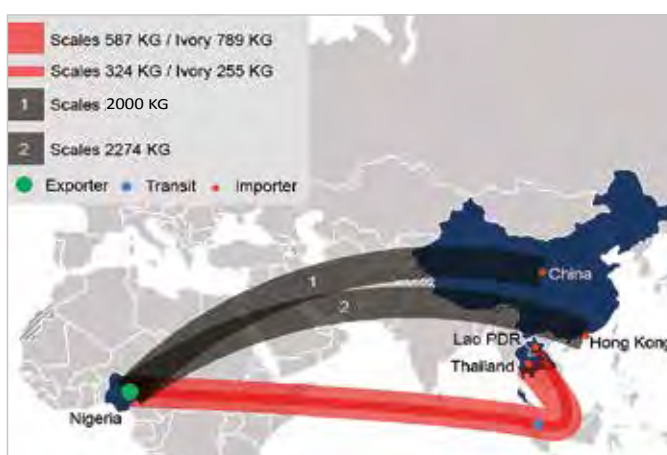


Fig. 3. Trade routes of pangolin shipments from Nigeria to Asia, and volumes, 2015.

records of seizures of pangolin shipments originating in Nigeria were found (Table 1).

Two seizures took place in 2012, one of which was exceptionally large (involving 3000 kg of pangolin meat, 1230 kg of scales and 225 kg of ivory) (Fig. 1). Another large seizure of 250 kg of scales took place in 2014 (Fig. 2). However, the majority of seizures occurred in 2015, with six incidents totalling no less than 5185 kg of scales (Fig. 3), suggesting that the pangolin trade from Nigeria is substantive. No seizure records were found for 2011 and 2013 (although it should be noted that in Challender and Hywood (2012) there is one record of a 2011 seizure in China involving scales and meat from Nigeria). In all incidents, pangolin scales were the main item seized, with the exception of the aforementioned 2012 seizure in which a large amount of pangolin meat was also seized. Interestingly, this seizure included ivory. In two other cases, pangolin derivatives were shipped along with large quantities of elephant ivory. These incidents took place in December 2012 in Singapore and Thailand, where Lao PDR-bound pangolin shipments were found to include a total of 563 elephant tusks. No pre-2012 records of mixed shipments coming from Africa were found in the database (post-2012 data include reports of mixed shipments from other African countries as well, most notably in 2015 a large Ugandan seizure of 2000 kg of scales and 700 kg of ivory destined for Europe took place), implying such shipments have either not previously occurred, or have gone undetected.

The seizures that took place during the study period occurred in China (five recorded incidents), France (one recorded incident, although it must be noted that many more African pangolin shipments, originating in different countries, have been seized in France over the years), Hong Kong (one recorded incident), Thailand (one recorded incident) and Singapore (one recorded incident), with China, Hong Kong and Lao PDR being the designated destinations. In all but one case (a 2015 Shanghai seizure involving 25 kg of scales), the quantity of seized pangolin derivatives was very large, ranging from between 250 kg and 4230 kg. In most cases, the pangolin parts were shipped by air, either in passengers' luggage or freight. The one exception was a shipment by sea that was seized in Hong Kong in March 2015 involving 2000 kg of scales.

The recorded incidents are worrying. While it is still uncertain whether Nigeria functions as a source or a transit country in the inter-continental pangolin trade, it is clear that Asian demand has become a serious threat to the survival of African pangolin species, and that Nigeria is a significant part of the illegal trade chain.

RECOMMENDATIONS

All four African pangolin species (Black-bellied Pangolin *Phataginus tetradactyla*, White-bellied Pangolin *P. tricuspis*, Giant Pangolin *Smutsia gigantea* and Temminck's Ground Pangolin *S. temminckii*) are currently classified as Vulnerable on the IUCN Red List of Threatened Species (Pietersen *et al.*, 2014; Waterman *et al.*, 2014a; Waterman *et al.*, 2014b; Waterman *et al.*, 2014c). International trade in pangolins is likely to be having a detrimental effect on population levels, although such pressure remains unquantified due to the paucity of research carried out on pangolins, and the lack of published information. Further investigation into the source, scale and extent of trade flows of African pangolins to Asia is desperately needed if we are to clamp down on this illicit trade, inform future policy decisions, and identify priority actions to aid in their conservation. Further research is also needed on the apparently novel occurrence of mixed shipments of pangolin and ivory. This brief case study also highlights the need to establish more effective protection measures for African pangolin species. All species of pangolin are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), such that all international trade is regulated through the issuance of export permits. While a zero export quota has been established for the four Asian pangolin species, their African counterparts are subject to no such quota. This is particularly worrying in light of the uncertainty concerning current population sizes of all four African species (Souwu and Ayodele, 2009; Pietersen *et al.*, 2014; Boakye *et al.*, 2015). Moreover, it is highly debateable whether the establishment of a zero quota should be considered an effective conservation tool in the first place, seeing how it has not been able to put a halt to the trade in the Asian species (Challender *et al.*, 2015). Transferral of all eight pangolin species from CITES Appendix II to CITES Appendix I should therefore be seriously considered.

Date	Location	Destination	Items seized	Quantity (kg)	Source
15 May 2012	China	China	Scales/meat*	1230/3000	Anon, 2012a
7 December 2012	China	China	Scales	50	Anon, 2012b
2 July 2014	France	Lao PDR	Scales	250	Anon, 2014
16 January 2015	China	China	Scales	2000	Anon, 2015a
17 March 2015	Hong Kong	Hong Kong	Scales	2000	Anon, 2015b
27 March 2015	China	China	Scales	249	Anon, 2015c
7 April 2015	China	China	Scales	25	Anon, 2015c
10 December 2015	Thailand	Lao PDR	Scales*	587	Anon, 2015d
12 December 2015	Singapore	Lao PDR	Scales*	324	Heng, 2015

Table 1. Seizure records of pangolin shipments originating from Nigeria, 2011–2015.

*seized shipments that also contained elephant ivory

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DUROJAYE A SOEWU (PH.D)

A group of White-bellied Pangolins *Phataginus tricuspis* (adult male and female encircling a juvenile pangolin), Nigeria.

LEND YOUR EYES TO THE WILD



South-east Asia serves as an important source, transit point and destination for many of the world's most enigmatic wildlife species (TRAFFIC, 2008). Consumption of threatened species in the region—Tiger *Panthera tigris* for example—as well as species not native to South-east Asia such as the White Rhinoceros *Ceratotherium simum*, for use in traditional medicine products and as symbols of status, as well as the market for rare species for the pet trade such as Malagasy tortoises, remains a conservation challenge (Milliken and Shaw, 2012; Todd, 2011). Furthermore, the role of South-east Asia as a transit route has been identified on a number of occasions, for example in the illegal trade of Black Spotted Turtles *Geoclemys hamiltonii* en route from South Asia to China and Hong Kong, via Thailand and Malaysia (Chng, 2014).

To address this growing problem, Taronga Zoo, based in Sydney, Australia, collaborated with TRAFFIC in South-east Asia to create the free smartphone Wildlife Witness App, which was launched in April 2014 to enable the public to report wildlife trade by taking a photograph, giving the exact location of the incident and sending relevant details to TRAFFIC (see *TRAFFIC Bulletin* 26(2):51). Reports are analysed by a Wildlife Crime Data Analyst, and credible incidents are referred to enforcement agencies for action. Essentially, Wildlife Witness reports aim to help prioritize response action by improving our understanding of illegal wildlife trade, and highlighting areas in need of increased enforcement resources. To complement TRAFFIC's existing strategic monitoring work, the App boosts our insight of where and how wildlife trade routes exist to catalyse and support proactive law enforcement work but also to underpin and strengthen our research.

NEXT STEPS

TRAFFIC and Taronga Zoo are currently looking for partners who will join the campaign to promote the App and support efforts to combat illegal wildlife trade. The strategic promotion of the App through the global zoo community will target zoo visitors and tourists travelling to South-east Asia. To engage wider participation of the App across the zoo community, this promotion will operate under a new campaign called *Lend your Eyes to the Wild*. By building a force of stakeholders that embrace a zero tolerance approach to illegal trade, the aim is to engage more zoo communities. In addition, conservation organizations in the region will be encouraged to make use of the App, particularly in less accessible locations where fewer tourists are likely to venture.

To this end, the Wildlife Witness website <http://wildlifewitness.net/> will enable partners to download materials for promotion of the App at their establishments. TRAFFIC is also working with the Wildlife Reserves in Singapore, San Diego Zoo Global in the USA, and Chester Zoo in the UK, as well as zoo associations such as World Association of Zoos and Aquariums (WAZA) and European Association of Zoos and Aquaria (EAZA) to promote the Wildlife Witness App at conferences and side exhibitions at major events.

Besides the zoo community, it is hoped that support can be enlisted from other stakeholders such as corporations and NGOs to help promote the App and spread awareness about the threat of illegal wildlife trade. TRAFFIC is currently working with well-established tour associations to enable participation at travel fairs in order to promote the App to a large number of tourists: in March 2016, it held a booth at the Malaysian Association of Tour & Travel Agents (MATTA) fair in Kuala Lumpur. On average about 100 000 tourists (both local and foreign) visit the fair annually.

Over the next three years, the project aims to educate and empower two million travellers and local people in the region so that law enforcement is better equipped to combat illegal wildlife trade. Currently the App is only available in English, though its features will be enhanced to allow multi-language translations, with Bahasa Indonesia and Thai available soon. Data hubs in Indonesia and Thailand will support management of incident-reporting and law enforcement support in these key countries, and will further complement existing data hubs in Malaysia and Viet Nam. The Wildlife Witness App is available for download at: <http://wildlifewitness.net/>

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Medicinal uses and trade of Madras Hedgehogs *Paraechinus nudiventris* in Tamil Nadu, India

Recently, Nijman and Bergin (2015) presented a global overview of the trade in hedgehogs for medicinal purposes or meat. They noted that there were reports of 13 of the 16 species being traded, but lamented the paucity of quantitative data on the trade and ethnozoology of hedgehogs. One of the three species for which no information was obtained was the Madras Hedgehog *Paraechinus nudiventris*, a species endemic to the southern part of India (the others were Somali Hedgehog *Atelerix sclateri*, endemic to parts of Somalia, and Brandt's Hedgehog *Paraechinus hypomelas*, a largely montane species from the Middle East and parts of the Arabian Peninsula). Besides the Madras Hedgehog, India is home to two other species of hedgehog: Indian Hedgehog *P. micropus* and Indian Long-eared Hedgehog *Hemiechinus collaris*. Both species occur sympatrically in south-eastern Pakistan and north-western India, with the Indian Long-eared Hedgehog additionally occurring in Pakistan's Khyber Pakhtunkhwa (North West Frontier) Province and the Indian State of Uttar Pradesh (Molur, 2008; Chakraborty *et al.*, 2008a). In India, both species of hedgehog are hunted locally for subsistence food and for medicinal purposes (Molur *et al.*, 2005; Padmanabhan, 2007; Mahawar and Jaroli, 2008) but these, or other threats, are not enough for either species to be considered globally threatened (Molur, 2008; Chakraborty *et al.*, 2008a).

The Madras Hedgehog has a much more restricted distribution than the other two hedgehog species occurring in India, and is endemic to the country. It is known from just five locations—two in northern Tamil Nadu (Salem district) and one from adjoining southern Andhra Pradesh (Chittoor district), and two isolated populations in Cudappah district in Andhra Pradesh and in Palakkad district in Kerala (Molur *et al.*, 2005). Chakraborty *et al.* (2008b), as part of their IUCN Red List assessment, map three disjunct areas: two in Kerala and one in the border areas of southernmost Andhra Pradesh and northernmost Tamil Nadu. Molur *et al.* (2005) noted that habitat loss due to collection of fuelwood, logging, agriculture and urbanization are major threats, but Chakraborty *et al.* (2008b) listed the species as Least Concern in view of its abundance within its restricted distribution, its presumed large population, and because its habitat is unlikely to be declining fast enough to qualify for listing in a more threatened category. In light of its restricted range—in fact the smallest geographic range of any species of hedgehog—and paucity of data, more information on the species's distribution and threats is urgently needed (cf. Molur *et al.* 2005). Although the Madras Hedgehog is only one of about 35 species of mammal that is endemic to mainland India, and one with a very restricted distribution, it is not included on the list of species that are protected under the Indian *Wildlife Protection Act, 1972*. Most rodents and shrews are listed as vermin on this Act (and may indeed be hunted), and it is easy for the general



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public to treat hedgehogs and shrews and rodents alike, thus unwittingly putting more pressure on hedgehogs.

Here the authors present an overview of the ethnozoology of Madras Hedgehogs in parts of Tamil Nadu, as well as report on the trade in the species, to improve our understanding of the conservation status of this Indian endemic. They furthermore present new information on the distribution of the species.



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Fig. 1. Districts in the State of Tamil Nadu, India, where the presence of Madras Hedgehogs has been confirmed, including additional sites identified during this study.

Two districts where Madras Hedgehogs have been confiscated (Madurai and Dindigul) are italicized. In addition the districts where the species has been recorded in the neighbouring States of Kerala and Andhra Pradesh are indicated. Note there is an additional record from Cudappah district, north of Chittoor district (see text for details). **Top:** A boy holding the skin of a Madras Hedgehog. Chennimalai village, Erode District, Tamil Nadu, January 2015.

METHODS

The first author conducted field surveys in the districts of Coimbatore, Thoothukudi, Ramanathapuram, Tiruppur, Tirunelveli, Tuticorin, Erode and Kanyakumari in Tamil Nadu from October 2012 to July 2015 to record the presence of Madras Hedgehogs (including road kills). Selection of these areas was initially based on reports received from older people in Tirunelveli who reported the presence of hedgehogs in their gardens at night; none of the four districts are included in the distribution maps of Madras Hedgehog presented in Molur *et al.* (2005) or Chakraborty *et al.* (2008b) but Erode borders Salem and Coimbatore borders Palakkad, two of the districts from where Molur *et al.* (2005) reported the presence of the species.

Road kill surveys were conducted on motorbike along the ~38 km long Radhapuram–Nagercoil Road, as well as other smaller roads in the region, once every three months (i.e. 11 times for a total of >400 km). Direct surveys on foot using spotlights were conducted during 47 nights (from 23:00–03:00 hrs) in Ooralvaaimozhi (Kanyakumari), Gangaikondan and Paruthipaadu (Tirunelveli), Panaikulam (Ramanathapuram) and Palaniappapuram (Thoothukudi). In addition, sites were checked for hedgehogs where villagers or informants reported their recent presence.

To assess the trade in the species, the authors recorded the number of dried skins they observed in villages, and followed up on reports from villagers or others of trade in hedgehogs or their derivatives. In 68 villages in Tirunelveli, a total of 712 people were asked about their knowledge of the species, and to recount any particulars pertaining to the use of Madras Hedgehogs. On average two villages were visited each month over the 34-month survey period. The interviews were structured, using a questionnaire in Tamil. Given the historic use of hedgehogs for medicinal purposes, there was a bias towards selecting older people and traditional healers or others that dispense traditional medicine.

RESULTS

Occurrence and reported usage of Madras Hedgehogs.

The authors obtained 13 direct sightings of Madras Hedgehogs in Coimbatore (one hedgehog seen), Tiruppur (one), Tirunelveli (eight), Tuticorin (one), Erode (one) and Kanyakumari (one). Additionally, two road kills were observed in Kothapalayam, Tiruppur and Papanasam, Tirunelveli. Hedgehogs were recorded from thorny, bushy deserts as well as introduced mesquite *Prosopis juliflora* dominated shrub lands, and in cultivated areas and the edges of fields and along hedgerows. In the coastal parts of Tuticorin and Kanyakumari it was recorded in the red sandy dunes locally known as *theri*.

Madras Hedgehogs are well known to the local people as they are widely perceived as having medicinal value as a cure for, or offering relief, against coughs, tuberculosis, and asthma. In Tirunelveli, 232 out of 712 informants from 38 out of 68 villages indicated the use of hedgehog skin as a medicine. While the authors do not have information on the ages of all the 712 informants, 27 of

those that indicated their use of hedgehog medicine were under 25 years of age, 81 were between 26 and 50 years of age, and 124 were over 50. Fifty-four respondents said that they used hedgehog skins for relief against whooping cough, 60 as relief for asthma, and 91 for childcare medicine; 27 reported its use to treat tuberculosis. Many of the respondents indicated dual usage of the dried skin, e.g. asthma and childcare medicine. The spines are burned in a fire, crushed and powdered; mixed with honey it is taken as a cure for whooping cough, and mixed with plant extract it is used to relieve stomach pains. The rendered fat of Madras Hedgehogs (hedgehog oil or *muleli kaba sarvaanga thailam*) is used to cure earache and coughs. A total of 217 respondents had eaten the flesh or skin of hedgehogs, apparently because of its flavour and because of its perceived medicinal properties (for conditions outlined above). Finally, dried skins of Madras Hedgehogs are hung on the walls of houses to prevent evil spirits from entering.

Trade in Madras Hedgehogs. Madras Hedgehogs are caught either opportunistically or with the help of hunting dogs. They are largely nocturnal and sleep in underground burrows, making them largely cryptic to humans. The authors are aware of at least 25 local hunting groups in Tirunelveli and Kanyakumari that mostly go out at night with spotlights to catch animals, Indian Hare *Lepus nigricollis*, in particular. If Madras Hedgehogs are encountered (near streetlights or in the dry season near the wetter agricultural fields), these are brought back to the village, with the flesh used for local consumption and the skins traded locally. The nomadic Nari Kuruvaars people are known collectors of hedgehogs and sell live and dried hedgehogs; likewise local wood collectors sometimes offer the species for sale. The authors found nine skins (seven singles, one pair) in the houses of people that prepare hedgehog-based medicine (two in Tuticorin, three in Erode, three in Tirunelveli). In India's southernmost city of Nagercoil, in Kanyakumari, a well-known Ayurveda medical shop was selling hedgehog oil. In the past, hedgehog skins were commonly sold in the weekly markets in Nagercoil and Dindugal Districts (Bharathidasan and Kumaran Sathasivam, pers. comm. to Brawin Kumar), but it is unclear if this practice still takes place.

The price for hedgehogs or their parts depends partially on a buyer's negotiating skills and at which point in the trade chain it is purchased. The Nari Kuruvaar collectors quoted prices for live hedgehogs of IND250–500 (USD3.79–7.59) each, whereas in the markets they are offered typically for INR200–500 (USD3.04–7.59). Dried skins can be purchased for INR150–180 (USD2.28–2.73), and hedgehog oil for INR50 (USD0.75) a bottle.

According to informants, increasingly Madras Hedgehogs are kept as pets, especially in the districts of Tirunelveli, Erode and Kanyakumari; all are presumed to be wild-caught individuals. The authors are aware of three seizures of Madras Hedgehogs in recent years: a single live animal in Madurai on two occasions in September 2014 and Dindugul in August 2015, respectively, and a skin in Erode in December 2014.



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DISCUSSION

The authors report on the use of Madras Hedgehogs by the people of Tamil Nadu, showing that while the number of hedgehogs and the amounts of derivatives in trade are perhaps small, the knowledge of their use and the number of people who indicate that they have consumed hedgehogs or use hedgehog-derived medicine is considerable. While a greater number of informants over the age of 50 were targeted during the survey, more of whom stated their use of hedgehog-derived medicines than the younger informants interviewed, and given that the latter group are perhaps more likely to use non-traditional medicine, it is not possible from this study to assess whether there is a shift away from the use of hedgehog-derived medicine in the younger generation.



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◀ A village man showing the dried skin of a Madras Hedgehog to Brawin Kumar (left), Radhapuram, Tirunelveli District, Tamil Nadu, August 2013.

The authors concur with Molur *et al.* (2005) that habitat loss due to logging (for timber, firewood or charcoal production), expanding agriculture and urbanization are major threats to the survival of Madras Hedgehogs. Large-scale industrial projects, such as the establishment of wind farms, convert once suitable hedgehog habitat into areas where the species can no longer persist. For instance, Tamil Nadu's wind power capacity is now ~35% of India's total, and with a rule of thumb of ~10 ha needed for the production of one megawatt of wind energy, some 1000 km² has been set aside for wind farms in the last two decades. Similarly, the road network density in Tamil Nadu is ~1.5 km per 1 km² (or 200 000 km of roads in Tamil Nadu's 130 000 km²) which inevitably has a negative impact on hedgehog numbers.

The presence of Madras Hedgehogs in Coimbatore, Tiruppur, Tirunelveli, Tuticorin, Erode and Kanyakumari was confirmed during the course of this survey, whereas the seizures of hedgehogs in Madurai and Dindigul may suggest the species occurs in these districts as well (Fig. 1). In addition, Padmanabhan (2007) reported their presence in Mallapuram district in Kerala (in addition to Palakkad district, where Molur *et al.* (2005) already reported their presence). While Marimuthu and Asokan (2014) confirmed the presence of Madras Hedgehogs from Coimbatore, Chakraborty *et al.* (2004) doubted the validity of the record from Cudappah district as it was based on a report by a single local source and no hedgehog was actually observed during four years of fieldwork (Srinivasulu and Nagulu, 2002). Accepting the Cudappah record, the species is now known from at least 10, and possibly 12 districts, in three States (two in Kerala, two in Andhra Pradesh and six in Tamil Nadu). The widespread, albeit localized, distribution in these districts suggests that the species is present over a considerably larger geographic area than suggested by, for instance, Molur *et al.* (2005) and Chakraborty *et al.* (2008b). Still, even acknowledging this larger range and the species's possible presence in districts neighbouring those from where their presence has been established, the Madras Hedgehog has the smallest geographic range of any hedgehog species. It is clear that trade, albeit localized and rarely commercially, occurs throughout this landscape. Prices are low, but given the little effort undertaken to locate hedgehogs (which are collected opportunistically while targeting other species or while conducting other activities), the monetary gains that can be made may be sufficient to keep collectors going. The authors recommend that a reassessment is made of the Madras Hedgehog's conservation status, taking into account the perceived rarity of the species and the impact of trade, in addition to its restricted range, and that appropriate measures are taken to better protect and manage the remaining populations.

◀ Brawin Kumar examining the dried skin of a Madras Hedgehog in a home, Maruthuval Malai village, Kanyakumari District, Tamil Nadu, May 2014.

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Bogus captive-breeding of the South African Sungazer Lizard *Smaug giganteus*

Reptile species that have restricted distributions, high levels of protection and low reproductive rates are rarities in the pet trade, and command premium prices (Auliya, 2003). The protected status of such species encourages dealers to trade captive-bred individuals, but also provides an opportunity for unscrupulous traders to launder wild-caught reptiles as “captive bred” (Lyons and Natusch, 2011; Nijman, 2014). This is particularly concerning when exporting and importing countries do not verify claims about the captive source, effectively leaving the trade in wild-caught individuals unregulated.

The Sungazer Lizard *Smaug* (previously *Cordylus*) *giganteus* is endemic to South Africa, and has a restricted range, narrow environmental niche and a life history characterized by slow reproduction. Sungazers only reach sexual maturity after five years, and females produce one to three offspring only once every two or three years (Van Wyk, 1991). The species was listed as Vulnerable in a national assessment due to habitat loss and poaching (Mouton, 2014), and is consequently a nationally protected species, with collection of wild individuals strictly prohibited. Internationally, the species is listed in Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora).

Although there is no substantiated evidence of captive reproduction, Sungazers are frequently offered for sale

on social media groups, trade websites, and reptile fairs, fetching prices of between USD1000 and USD4000, occasionally as much as USD6000. A single case of captive breeding was reported by Langerwerf (2001), but all other literature on Sungazers in captivity lacks reports of breeding incidences (e.g., Hild, 1988; Fogel, 2000; Gilchrist, 2015). Despite this, virtually all international trade is in individuals reported as produced in captivity (Table 1). With the exception of 12 Sungazers reportedly produced elsewhere, all purportedly captive-produced Sungazers (521 individuals) were exported from South Africa (UNEP-WCMC, 2016). Moreover, South Africa reported the majority of these individuals as captive-bred, i.e. offspring from parents that had also been born in captivity. Importing countries reported only slightly lower quantities, totalling 459 individuals produced in captivity (Table 1). The only wild-caught *S. giganteus* were 50 individuals exported by Mozambique, which is not a range country for the species. Most lizards were imported by Japan (157 individuals), Germany (145 individuals) and the USA (125 individuals).

While the occasional birth of a Sungazer in captivity is not in doubt, there is a clear and alarming discrepancy in the number of substantiated breeding records of captive Sungazers, and the number being traded annually. As has been reported for several other species (Lyons and Natusch, 2011; Nijman, 2014), it is highly likely that the

Importer reported					Exporter reported			
Year	W	F	C	Main importer	W	F	C	Main exporter
2004	0	20	0	Japan	0	23	0	South Africa
2005	0	0	0	-	0	6	0	South Africa
2006	0	0	11	Japan	0	20	13	South Africa
2007	0	26	36	Indonesia	0	26	38	South Africa
2008	0	55	40	Germany	0	43	54	South Africa
2009	0	0	50	Japan	50	0	53	Mozambique
2010	0	2	16	USA	0	0	4	South Africa
2011	0	3	59	Germany	0	3	44	South Africa
2012	0	0	33	Germany	0	0	40	South Africa
2013	0	0	36	USA	0	0	122	South Africa
2014	0	0	72	USA	0	0	44	South Africa
Total	0	106	353		50	121	412	

Table 1. Commercial trade (purpose T) of live Sungazers, excluding re-exports, reported by importing and exporting countries for 2004–2014. Source codes W, F and C represent wild, captive-born and captive-bred, respectively; confiscated individuals were excluded. Source: UNEP-WCMC, 2016.

majority of Sungazers in the pet trade are laundered wild-caught animals. The authors strongly recommend that the export and import countries identified in this paper demand incontrovertible evidence of captive breeding before issuing permits, and that prospective buyers temper their desires against the realities of supporting the poaching of a threatened species.

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An adult Sungazer *Smaug giganteus*, Free State Province, South Africa.



SHIVAN PARUSNATH

Almost a third of our planet is covered in forest, providing habitat for more than half the world's terrestrial species. Trade in timber and other forest products is estimated at USD330 billion a year and directly contributes to the livelihoods of around 1.6 billion people (UNEP, 2011), of whom around 60 million are indigenous peoples. However, poor forestry management can drive species to extinction and disrupt entire ecosystems. This jeopardizes the livelihoods of those who depend on wild resources for their living, the water systems that supply our cities and towns, and the security of future generations. As well as damaging forest resources, illegal logging diverts income away from sustainable development and contributes to social conflicts and financial losses for forest-rich developing countries, losing them billions of dollars every year. Illegal logging and land clearance, and illicit timber trade, disrupts forest ecology, carbon storage potential and forest governance, and robs communities and countries of a valuable resource.

Governments are acting to bring timber harvest and trade under better control. Responses include support for, and participation in, World Bank-led Forest Law Enforcement and Governance (FLEG) processes, bans on the import of timber of illegal origin, requirements that importers demonstrate "due diligence" (e.g. through the European Union Timber Regulation EUTR), and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) trade controls. Private companies and consumers are increasingly demanding evidence that wood is from legal and sustainable sources, with civil society organizations also working to defend forests and the rights of forest-dependent peoples.

TRAFFIC is working globally in both source and destination countries around the world to help eliminate illegality in the timber trade chain and promote sustainable forestry practices supporting multi-stakeholder efforts to strengthen the design of national timber "legality frameworks" for timber harvest and trade, and to identify and stop illegal timber trade flows. Through a Memorandum of Understanding with the World Customs Organization (WCO) TRAFFIC is also assisting in the development of timber guidelines (funded by the International Tropical Timber Organization ITTO) to assist Customs officers of WCO members at the border to validate and verify legality of timber products in trade to prevent loss of revenue for timber products with tariffs. This work will allow Customs to support the efforts of national policies and other agencies' mandates in the forestry sector and contribute towards safeguarding social, conservation and environmental needs and services.

Since October 2015, TRAFFIC has embarked on a new and exciting project funded by the UK's Department for International Development

STRENGTHENING TRADE



CHEN HIN KEONG / TRAFFIC

PROJECT TO REDUCE ILLEGAL CAMEROON TO CHINA AND



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IN LEGAL TIMBER



◀▼ Logs and processed timber, Douala, Cameroon, November 2012.

companies that can provide evidence, for example by way of adherence to a Voluntary Partnership Agreement (VPA)¹ timber legality definition, may have an advantage when exporting wood and/or wood products to the EU. The work to be undertaken will contribute to achieving the longer term impact of reducing illegal logging in Cameroon, and stabilizing government revenue from legal timber exports. Although the work is focused along the supply chain from Cameroon to China and the EU, it is expected that the approaches used will be appropriate for application along other supply chains.

The project will harness the growing interest within China's government and private sector to demonstrate compliance with timber trade controls and reinforce the VPA and related processes for timber in Cameroon. The Chinese government's environmental labelling and public procurement policies are expanding dramatically with regard to the volume and variety of products covered, including timber. The government's public procurement approaches are driving associated changes in market opportunities that the private sector is keen to realize through being registered as a government authorized supplier. Project outputs combine delivery of training tools and materials, strengthening China's public and private timber procurement policies and standards and piloting collaborative approaches to supply chain management.

In China, TRAFFIC is collaborating with the China Timber and Wood Products Distribution Association (CTWPDA) whose research suggests that Chinese timber enterprises operating in China and Africa have shown interest in being registered in the Chinese government's public procurement supplier list. In fact, companies are currently placing a higher emphasis on achieving registration than they are in getting Forest Stewardship Council (FSC) certification or participating in many other Corporate Social Responsibility (CSR) schemes. The procurement policy therefore provides an important entry point to leverage changes in supply chain management for trade involving China. This includes not only the practices of the companies themselves, but through them, wider policy-making within China, where changes of this type are currently driven from the bottom up.

Public procurement registration requires suppliers to comply with legislation in place along product supply chains. However, legality requirements are often unclear. Where they are clear, there is often a lack of law compliance monitoring and/or enforcement capacity to ensure they are adhered to. It is therefore a good time to take advantage of the growing market opportunities and incentives to strengthen timber legality verification for exports to, and re-exports from, China.

(DFID) Forest Governance, Markets and Climate (FGMC) programme. This project, entitled *Reinforcing Chinese government and industry action to reduce illegal timber in supply chains originating from Cameroon* is a 30-month endeavour that engages two key timber countries: Cameroon as a producer country, and China as a processing/export country. Lessons learned from the project will also feed back to European Union (EU) Member States to inform stakeholders engaged with the EU FLEGT Action Plan.

This project aims to increase compliance with laws and regulations concerning harvest and trade of timber exported from, or via, Cameroon to China and the EU. For the EU to import timber (including timber from Cameroon that transits or is processed through China), under EUTR rules, EU-companies ("Operators") must conduct due diligence to ensure that the timber is legally harvested and traded. Chinese timber export

¹VPA is a legally binding bilateral trade agreement between the European Union and a timber-producing and/or transit country outside the EU, and one of the key components of the EU Forest Law Enforcement, Governance and Trade (FLEGT) action plan to ensure only legally sourced timber and wood products are allowed onto EU markets from a VPA partner country.

As noted above, the time is also right to support efforts by the Government of Cameroon, the private sector and civil society to strengthen transparency and chain of custody controls in timber supply chains. This project's theory of change is therefore designed around the delivery of four inter-related outputs that, taken together, will achieve the project outcome.

These outputs are:

1. Stakeholders along the timber supply chain from Cameroon to China trained on implementing the VPA legality definition of Cameroon. The project starts with the development of a set of manuals to guide individual stakeholders across the supply chain to implement the VPA legality definition for Cameroon. The manuals will be validated with representatives of key stakeholder groups in Cameroon and China. This will be followed by delivery of training materials to the target stakeholder groups in Cameroon and China in collaboration with a project implemented by the International Institute for Environment and Development (IIED) and WWF and with other DFID-funded projects' activities. The manuals will also be provided to government, industry and civil society actors in the EU. A training manual will be provided for Customs staff, who monitor timber imports, exports and re-exports and who interdict shipments suspected of violating national trade controls.

KEY SPECIES IN TRADE

Some of the main timber species exported from Cameroon as logs are: *Ayous/Obeche* *Triplochiton scleroxylon*, *Awoura* *Julbernardia pellegriniana*, *Dabema* *Piptadeniastrum africanum*, *Azobe* *Lophira alata*, *Kosipo* *Entandrophragma candollei*, *Okan/Adoum* *Cylicodiscus gabunensis*, *Tali* *Erythrophleum suaveolens*, *Bilinga* *Nauclea diderrichii* and *Naga* *Brachystegia cynometroides*.

Ayous/Obeche and *Sapelli* *Entandrophragma cylindricum* are the main species used in the export of sawn woods, with *Ayous* the principal choice for plywood and veneer.

China is also a key destination for precious woods, of note *Ebony* *Diospyros crassiflora* whose recorded exported volume between 2009 and 2014 increased from 30 000 kg to 350 000 kg. China is also the main destination for *Bubinga* *Guibourtia tessmannii*, accounting for nearly 65% of all recorded *Bubinga* exports from Cameroon between 2008 and the first half of 2014.

Adapted from *Status and issues of Chinese investments in forest land in Cameroon*. <http://pubs.iied.org/pdfs/G03944.pdf>

AYOUS TREE, CAMEROON. BRENT STIRTON / GETTY IMAGES / WWF-UK

2. Revised Code of Conduct incorporating VPA legality requirements developed and disseminated for use by CTWPDA members. The second output targets the private sector in China, and in particular the 3000 members of the CTWPDA, many of whom import tropical timber, including from Cameroon. The project will develop and enhance CTWPDA's Code of Conduct for its members by incorporating adherence to legality requirements, such as those included in VPAs, into the Code, using Cameroon's VPA legality as a case study. This revised Code will help member companies ensure legality in their timber supply chain, thereby helping to address EU Operators' due diligence obligations under the EUTR.

3. Agreed guidance on VPA legality definition (with the Cameroon VPA process as a case study) and reflecting these controls also in China's public procurement policy and environmental labelling policy. This third output focuses on enhancing the implementation of China's "Guide on Sustainable Overseas Forest Management and Utilisation by Chinese Enterprises". Activities are designed to help Chinese enterprises operating in Cameroon to meet the VPA requirements, including through advocating for incorporation of elements of the VPA legality definition into the Guide and Chinese public procurement systems and processes.

4. Tools and approaches developed to provide practical guidance on achieving Timber Legality Assurance System (TLAS) compliant chain of custody controls for timber harvested and traded from medium-sized companies in Cameroon to China. The fourth output places an emphasis on strengthening the ability of medium-sized forest companies' owners to produce and trade legal timber in and from Cameroon. A group of "champions" from among this target group and Chinese enterprises trading in and/or from Cameroon, especially those who are members of CTWPDA and supplying EU markets, will be identified and approaches to verifying VPA requirements piloted.

The project is currently at an early stage, but dialogue with stakeholders is concrete and progressive. On its own the project promises to deliver an innovative approach to support the strengthening of supply-side legal timber management through advocating for changes in the demand-driven Chinese management guidelines, codes of conduct and national public procurement. Combined with related timber legality projects, both those funded by DFID's FGMC programme and other initiatives, the project aims to be transformative in providing a working model to support strengthened trade in legal timber globally.

Reference: UNEP (2011). *Branching out for a green economy*. <http://whygreeneconomy.org/information/branching-out-for-a-green-economy-unesp/>

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Forest-grown ginseng verification programme addresses illegal trade

American Ginseng *Panax quinquefolius* has been heavily traded since the 18th century (Robbins, 2003). It was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1975 making international trade in this species subject to specific permitting requirements. Despite regulation at an international level, wild populations of American Ginseng are still rapidly diminishing (Rock *et al.*, 2012), with 95% of ginseng roots harvested in the USA and Canada exported to Hong Kong and East Asia (Sinclair, 2005, p.71). Between 1990 and 2011, in 19 eastern states, CITES export permits were issued for between 20 400 and 72 000 kg of wild ginseng roots by the US Fish and Wildlife Service (Burkhart *et al.*, 2012). However, little is known about the exact provenance of the ginseng being traded, and whether it was harvested on private, state, or federal property, and harvested legally.

The permitting process for ginseng harvesting in the USA is complex and varies from state to state, with different harvesting seasons and implementation of regulations. Ginseng harvesting occurs on private and federal lands. Legal harvesting means that ginseng plants must be at least five years old, come from land where it is legally allowed (e.g. from a National Forest with a permit or from private property, with permission), and collected in the designated season. Rock *et al.* (2012) reported large increases in ginseng harvesting from federal properties, revealing alarming rates of illegal harvest on these lands, especially in National Parks, where all harvesting is illegal. Due to the volumes being collected both legally and illegally in the past five years, ginseng harvest permits have been significantly reduced or totally shut down in most state and National Forests (Forest Service, 2013).

In addition to wild-harvested ginseng, efforts have been put into both the artificial propagation and “forest grown” approaches to relieve the pressure from wild populations. “Forest grown” ginseng uses “non-timber forest product management systems (e.g. woods-cultivated, woods-grown, virtually wild, wild-simulated) in which intentional husbandry practices are used to produce a non-timber forest product in a forest environment” (PCO, 2014, p.8). This practice is in contrast with artificial propagation, in which ginseng is grown under shade cloth and produces a different shaped root and market value. Ginseng from all sources is sold in the international marketplace. Currently CITES only recognizes wild and artificially propagated ginseng, and has no way of tracking what ginseng in trade is truly “wild” versus “forest grown”. So the questions remain, where is the “wild” ginseng coming from, is it truly wild or “forest grown”, is the harvesting sustainable, and how do we know if it has been legally harvested?

The concept of developing an eco-label for ginseng is not new. In 2001, TRAFFIC conducted a study to evaluate the possibility of an eco-labelling programme for wild American Ginseng (Robbins, 2003), which would allow the buyer of ginseng to know that it had been harvested legally and sustainably. Several factors were found necessary for a successful labelling scheme: that it be voluntary; participatory, with ginseng harvesters involved in the decision-making process; and involve information

exchange between older and younger harvesters (Robbins, 2003). The FairWild Standard (FairWild Foundation, 2010) and certification scheme has since been developed to verify sustainable wild-harvesting and equitable trade practices, but it has not yet been used for ginseng.

Encouraging conservation through cultivation

To support the Forest Grown Verification Program, United Plant Savers (UpS) has partnered with Pennsylvania Certified Organic (PCO) in the development and piloting of the PCO Forest Grown Verification Program, primarily targeting the US domestic market, but with plans to expand to the international market. UpS is an organization based in the USA with a mission “to protect native medicinal plants of the United States and Canada and their native habitat while ensuring an abundant renewable supply of medicinal plants for generations to come” (UpS, 2015a).

UpS held a “Ginseng Summit” for stakeholders in 2014 (Board, 2014), which laid the foundation for a subsequent workshop, “Forest Botanicals: Working Together to Build a New Supply Chain,” held in November 2015. The workshop developed a framework for connecting domestic buyers to those producers who are interested in joining the new PCO Forest Grown Verification Program, which encourages conservation through cultivation as a solution of sustainability, quality and ethics (PCO, 2016). The programme and ginseng standards were the result of collaboration between Eric Burkhart (Pennsylvania State University) and stakeholders including growers/harvesters, industry, consumers, and federal and state agencies (Seitz, 2011).

The steps in the verification process are shown in Fig. 1. The term verification was used instead of certification, as requested by the US Fish and Wildlife Service, in order to minimize confusion since ginseng traders are required by CITES to have roots certified for legal export by state or tribal officials.

The establishment of the PCO Program for Forest Grown products that are sustainably and legally produced and harvested is a viable solution to supporting forest farmers and educating consumers. The Forest Grown Verification Program can address the issue of ginseng roots’ origin for consumers who want to choose a source that is sustainable and ethical (Rubinkam, 2015). There is a required annual enrolment and inspection in the year of harvest and development of a property management plan (PCO, 2014). The programme currently focuses on American Ginseng products from private land, and PCO is working to add several other forest products to the list including Black Cohosh *Actaea racemosa*, Goldenseal *Hydrastis canadensis*, Ramps *Allium tricoccum*, Slippery Elm *Ulmus rubra*, and other species currently in demand.

Mountain Rose Herbs of Eugene, Oregon, is the first company to become a verified distributor of Forest Grown ginseng root, leaf and tincture (Mountain Rose Herbs, 2016). Recently, ginseng leaf has been shown to have significant ginsenoside concentrations and is far more sustainable to harvest than roots (Searels *et al.*, 2013). In addition, the USDA awarded a three-year grant to support the Appalachian Beginning Forest Farmer Program to Virginia Polytechnic Institute and State

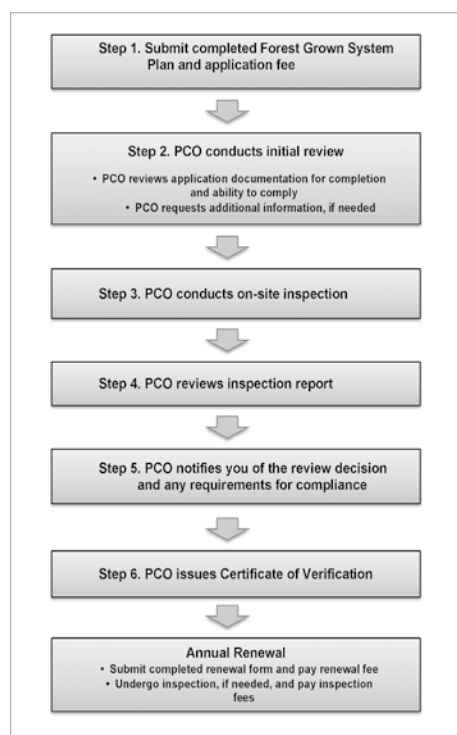


Fig. 1. Steps required to be eligible for a Certificate of Verification.

University (Virginia Tech), which will provide technical training to farmers wanting to grow forest botanicals. UpS is one of six programme partners, who are a mix of organizations, agricultural extensions, and university affiliates.

Getting more producers on board is the main focus of UpS and PCO, which have a collaborative programme designed to incentivize verification by reducing the costs to producers. The Forest Grown Cost Share programme is a joint effort to offset verification fees (UpS pays the cost of the application fee) for PCO Verified Forest Grown production operations and then only has to cover the cost of the inspector (UpS, 2015b). The programme is very similar to the organic certification process and allows the producer also to be certified organic in the same inspection, if they so choose.

Sustainable harvesting of wild-grown medicinal plants is becoming a major objective to reduce the threat to forest plant biodiversity. Wild ecologies can be fragile, and given the demand for medicinal plants, UpS supports efforts to verify the conscientious production and harvest of wild-grown products, including schemes such as the FairWild programme for sustainable harvest. Expansion of the Forest Grown programme to other species can provide critical third-party verified documentation on amounts of ginseng being “forest grown”, can improve understanding of where ginseng is being sourced, and can promote conservation of wild populations and economic value of forest lands. This programme will complement CITES by providing important insight into how much ginseng is being “forest grown” and where it is sourced. While the focus of the Forest Grown programme has been on the US domestic market, further research and sharing of experiences can address the sustainability of the international trade in American Ginseng.

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Study examines market potential for sustainably wild-collected botanicals

China is the world's biggest producer, user and exporter of botanical, algal and fungal substances such as medicinal and aromatic plants (MAPs) that are used in Asian systems of traditional medicine as well as in cosmetics, dietary supplements, food and beverages, and pharmaceutical products worldwide. Although it is not possible to quantify the proportion that is obtained from wild-collection versus cultivation, it is known that hundreds of native Chinese MAP species are wild-collected either entirely or partially. What is China's share of the global MAP export trade? And what is the potential market size for sustainably wild-collected Chinese MAPs if they were to become commercially available with fair and organic certifications? *Sustainable Sourcing: Markets for Certified Chinese Medicinal and Aromatic Plants*, a joint study by the International Trade Centre (ITC) and TRAFFIC carried out in 2014–15 endeavoured to answer these questions. The study was a joint activity of ITC's Trade and Environment Programme (TEP) and the project *Engaging the private sector in sustainable management of medicinal plants—the multiplier effect*, funded through the EU-China Environmental Governance Programme Project on Harvesting of Wild Medicinal and Aromatic Plants (EGP MAPs). The resulting technical paper, published in February 2016, can be found in ITC's online publications catalogue where it is freely available to download (<http://www.intracen.org/publication/Sustainable-Sourcing/>).

This sustainable sourcing study focused on international sustainability standards that can be implemented, audited and certified by independent control bodies in the global MAP value chain such as, for example, the FairWild Foundation's (FWF) *FairWild Standard*, Fairtrade International's (FLO) *Fairtrade Standard for Herbs, Herbal Teas & Spices for Small Producer Organizations* (SPOs), and the US Department of Agriculture's (USDA) *Organic Wild-crop Harvesting Practice Standard*, among other relevant standards.

Firstly the study provided a detailed description of the inclusion criteria and definitions of types of natural ingredients considered in the analyses. The research included the broadest range of known MAP ingredients regardless of their harmonized system (HS) tariff code classification. That is because many important wild-collected MAPs used in traditional Chinese medicine (TCM) are not captured within HS Code 1211 ("Plants and parts of plants, of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes") but are classified in other chapters such as those provided for dried fruits, natural gums & resins, nutritional and medicinal seeds, seaweeds, essential oils, fixed plant oils, and extracts.

For the MAPs included in this study (both wild-collected and cultivated), China's total 2013 export volume and value exceeded 1.3 billion kg, with a

reported Customs value of more than USD5 billion. This represented about 15.6% of total world exports in terms of reported Customs value. In subset analysis, China had a much higher, approximately 42% share, of total world exports for the aforementioned Customs code HS 1211 (includes Chinese MAPs e.g. *Astragalus* *Astragalus* root, Chinese *Angelica* *Angelica sinensis* root, *Cordyceps* fungus, fritillary bulb, ginseng root, liquorice root, magnolia bark, rhubarb root, and *Schisandra* fruit, among hundreds of others). Precise quantification of China's exports of wild-collected MAPs was not possible due to a lack of differentiation and specificity in the tariff codes used for analysis (especially general codes that may hold hundreds of species). However, using other data sources some reasonable determinations were made as to whether a MAP is primarily wild-collected, cultivated, cultivated and also some wild collection, wild-collected and also some cultivation, or not known.

The study also examined the current scope of organic certification of MAPs in China. This was done because producer groups already participating in ecological sustainability standards and certification schemes such as organic were determined to be the most likely enterprises to consider additional value-adding with other international sustainability standards and certification schemes (e.g. FLO fairtrade for cultivated MAP crops or FWF FairWild for wild MAPs). Based on analyses of market size and trade data obtained from organic and fairtrade organizations, this study determined that there may be a current market for between 5% and 15% of China's total MAP exports (about 65.1 million kg to 195.4 million kg) with organic certification, of which 5% to 10% (3.3 million kg to 19.5 million kg) may have additional market opportunities if further valued-added with dual certification of organic + fair (whether fair trade for cultivated MAPs or FairWild for wild-collected MAPs). From the data reviewed for this study it became clear that the global market for organic products (all product categories) continues to grow year on year (consistently for the past 30+ years) and that the market for fair trade products also continues to grow (consistently for the past 15+ years). Furthermore, the market for ingredients and products with dual certification, i.e. "organic + fair", continues to expand. There may also be an emerging consumer expectation that certain types of products should be labelled with multiple certifications including "fair", "non-Genetically Modified Organism (non-GMO)" and "organic", among other assurances of value chain ethics and sustainability. This seems to be the case especially in the herbal tea sector in the USA where 100% of the FairWild® certified MAPs as well as 100% of the Fair Trade USA fair trade-certified MAPs under the subheading "herbs, herbal teas and spices" imported in 2013 were also certified organic. In 2014, 11.8% of the total retail sales value of all teas (black tea, green tea, herbal beverage teas and herbal medicinal teas) sold in the USA was organic, 7.3% was non-GMO verified, 4.8% was fair trade or FairWild labelled and 2.5% was labelled with triple certifications of organic + fair + non-GMO (Keating *et al.*, 2015).

The scope of research also included the surveying of selected companies in Europe and North America that import and use Chinese MAPs in order to elicit expert opinions on which Chinese MAPs in particular might have the highest export market potential if certified organic and fair. The most frequently mentioned MAPs by the survey respondents were Barbary Wolfberry *Lycium barbarum* fruit, Chinese Angelica *Angelica sinensis* root, Chinese Liquorice *Glycyrrhiza uralensis* root and rhizome, Chinese rhubarb *Rheum palmatum*, *R. tanguticum* and/or *R. officinale*, Chinese Skullcap *Scutellaria baicalensis* root, Cordyceps *Cordyceps sinensis* fungus, Eleuthero *Eleutherococcus senticosus* root and rhizome, Mongolian Dandelion *Taraxacum mongolicum* herb and root, schisandra *Schisandra chinensis* or *S. sphenanthera* fruit and Seabuckthorn *Hippophaë rhamnoides* fruit.

Other key findings of this study:

- The global fair trade product market is at least 11% of the size of the certified organic product market;
- 17% of the organic tea leaf imported into the USA in 2013 was also fair trade certified;
- The top “additional” sustainability certification claim for certified “fair” products is certified “organic”;
- A total of 50 countries (about 26% of all countries) have certified operations producing “fair” certified MAP ingredients for the export market;
- India ranked as #1 for highest number of operations exporting “fair” certified MAPs and highest number of “fair” certified MAP articles being exported.

Of the 129 certified organic Chinese MAP operations identified in this study, 88 have mainly cultivated plants, 27 have mainly wild-collected ones, 11 have wild-collected and some cultivated ones, and three have cultivated and some wild-collected plants. The main export destinations for Chinese MAPs (those classified in HS 1211) are Hong Kong Special Administrative Region (SAR), Japan, Republic of Korea, Viet Nam and Malaysia. For value-added Chinese herbal extracts (classified in HS 1302) the main importers are the USA, Japan, Republic of Korea, Germany and India. For certified organic products (all origins and types) the top destination markets are USA, Germany, France, Canada and the UK.

While China is active in the certified organic MAP subsector, it has only limited exports in the fair trade MAP subsector. Although China is exporting some “fair” certified articles (mainly flax, hemp, and pumpkin seeds and oils with “IBD EcoSocial” certification and some ginger and green tea with “FLO Fairtrade” certification), inspection and certification mechanisms need strengthening. No China-based control bodies are actually authorized to carry out such inspections or issue certificates to producers or traders. In the event that policies were developed and enacted that would

enable China-based control bodies to inspect and certify operations for compliance with selected “fair” standards, this study suggests that China’s share of the global sustainable MAPs market should reach a level comparable to or greater than that of the current market leader India and continue to grow with the annually increasing global demand for dual-certified “organic + fair” herbal products.

The study concludes that it is reasonable to suggest that China, as the largest producer, user and exporter of MAP ingredients worldwide, has an opportunity to participate in a fast growing sub-sector of sustainable MAP products for the global market. Furthermore, even though there are no formal mechanisms yet in mainland China for fair certification, a retail market for “organic + fair” labelled products is already growing fast in Hong Kong. Retail stores in Hong Kong already sell FLO “fair trade”, “organic wild” and “FairWild” labelled finished herbal products and a FLO member is now situated in Hong Kong, the Fair Trade Hong Kong Foundation.

Besides the market opportunities afforded as a result of value-addition through implementation of international sustainability standards that lead to “organic + fair” certifications, there is a long-term benefit of running MAP production operations in compliance with such standards because this activity contributes to improved resource management, biodiversity conservation, and long-term survival of the plant species in a healthy ecosystem, which, in turn, provides local communities with a reliable source of high quality MAP materials to sell at fair prices into the future.

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On scaling up pangolin conservation

INTRODUCTION

Pangolins have until recently received limited biological and ecological research effort and little conservation attention and investment, despite an increasing extinction risk for all eight species (e.g., Challender *et al.*, 2014; Waterman *et al.*, 2014). It is understood populations of Asian pangolins (Chinese Pangolin *Manis pentadactyla*, Sunda Pangolin *M. javanica*, Indian Pangolin *M. crassicaudata* and Philippine Pangolin *M. culionensis*) have declined steeply, trends which are predicted to continue (Challender *et al.*, 2014). This is attributed primarily to overexploitation for international trade, largely to supply demand in East Asia, both historical and contemporary, and legal and illegal, and has involved skins, meat and scales (Challender *et al.*, 2015). It is also due to local use across the geographic range of the species and habitat loss and alteration (Challender *et al.*, 2014).

Although fewer data are available for African pangolins (Black-bellied Pangolin *Phataginus tetradactyla*, White-bellied Pangolin *P. tricuspis*, Giant Pangolin *Smutsia gigantea* and Temminck's Ground Pangolin *S. temminckii*), these species have long been hunted and poached for bushmeat and use in traditional African bush medicine, and recent research suggests exploitation for local consumption is increasing in Africa (Ingram *et al.*, 2016). Furthermore, a growing intercontinental and illegal trade involving African pangolins and their derivatives, primarily their scales, to supply demand in East and South-east Asia is a developing and worrying trend (Challender and Hywood, 2012; Gomez *et al.*, 2016). Other threats include habitat loss and degradation (Waterman *et al.*, 2014) and for Temminck's Ground Pangolin specifically, electrocution from electric fences (see Pietersen *et al.*, 2014).

TRADE DYNAMICS

The current pressure on global pangolin populations seems to have been stimulated by the commercial depletion of populations of pangolins in China (SATCM, 1996; Zhang, 2008), which saw annual harvests of around 160 000 specimens during the 1960s to 1980s (see Zhang, 2008), and a simultaneous trade in tens of thousands of specimens from South-east Asia to Taiwan (see Challender *et al.*, 2015). As a consequence, by the 1990s increasing numbers of pangolins were being imported to China from Lao PDR, Myanmar and Viet Nam (Newton *et al.*, 2008), as well as South Asia (Anon., 1999), a trade that continues today (Challender *et al.*, 2015) and which now includes specimens from Pakistan, the most western reach of the species' range in Asia (Mahmood *et al.*, 2012). The decline of Asian pangolin populations, and crucially, the increasing economic and development ties between East Asia and many African countries in recent years (e.g., see Wang and Bio-Tchané, 2008), has resulted in a growing illegal trade in African

pangolin parts to Asian markets (e.g., Gomez *et al.*, 2016). Since 2009, there have been seizures involving pangolin derivatives implicating Angola, Cameroon, Central African Republic, Republic of Congo, Côte d'Ivoire, Guinea, Kenya, Mozambique, Nigeria, Sierra Leone, Uganda, Zimbabwe and Zambia in the trade.

This trade has taken place despite protection afforded to pangolins through national legislation—though to varying degrees—and through CITES (see Challender *et al.*, 2015; Waterman *et al.*, 2014). Based on seizure data and a comparatively conservative extrapolation parameter, it is estimated that upwards of one million pangolins have been traded illegally since the year 2000 (IUCN SSC Pangolin Specialist Group, 2016). Unfortunately, conservation organizations have been slow to realise this crisis, and even slower to act.

CATALYSING CONSERVATION ACTION

In response to the apparent precarious status of pangolins in the wild and increasing extinction risk, there has been a growing, global pangolin conservation movement in recent years. Here the authors report on some of the activities that have taken place to address the conservation concerns for pangolins, including efforts undertaken since the re-establishment of the IUCN Species Survival Commission (SSC) Pangolin Specialist Group in 2012. The Group recognizes those individuals and organizations who, over the years, have dedicated their invaluable efforts into researching, protecting and safeguarding pangolins, and helping to bring the species to the public's awareness. And how, through the collective capacity of its members, the IUCN SSC Pangolin Specialist Group is contributing to conservation actions for pangolins at the local, national and global scale and enhancing the ability and capacity to respond to the challenges pangolins face.

The hitherto largely overlooked threat of trade to pangolins in Asia was addressed at a workshop convened by TRAFFIC in 2008, which served to focus international attention on the issue for the first time (see Pantel and Chin, 2009). At the meeting, a range of scientists, government and NGO stakeholders set out to examine the extent of illegal trade in pangolins native to the South and South-east Asia region and to devise key conservation actions to address them.

Similarly, in 2011, the African Pangolin Working Group (APWG) was formed to further the conservation and protection of all four African pangolin species by generating knowledge, developing partnerships and creating public awareness and education initiatives. Since that time, the group has undertaken research on the behaviour and ecology of African pangolins, has investigated the molecular structure of pangolin populations in different African countries, and investigated local use and trade, as well as hosted the first international APWG Pangolin Conference in South Africa in October 2015.

Also, in 2014, the Singapore Pangolin Working Group (SPWG) was formed with the aim of better co-ordinating local conservation, research and outreach

efforts for pangolins. The SPWG brings together varied stakeholders in pangolin conservation biannually from both government and non-governmental organizations. Already noticeable impacts are increased public awareness of pangolin conservation. For example, Arts Fission's Young People Environmental Dance-Theatre Production was inspired to raise awareness about the threat of extinction of pangolins in their annual production in The National Library, Singapore, 2015, and a range of other projects have also been initiated.

At the global level, the IUCN SSC Pangolin Specialist Group was re-established in recognition of the deteriorating conservation status of pangolins, and the tangible conservation benefits that could be reaped by engaging researchers, social scientists, biologists, veterinarians and conservation practitioners within a network of expert volunteers under the auspices of an IUCN SSC Specialist Group (see Challender *et al.*, 2012). Since then, there have been a number of advances in consolidating knowledge and understanding of pangolins and the threats they face, and in catalysing conservation action.

First, representatives of the IUCN SSC Pangolin Specialist Group attend CITES meetings to inform the Parties and raise awareness of pangolin trade issues. Since 2013, the Specialist Group has attended each meeting of the CITES Animals Committee, Standing Committee and the Conference of the Parties (CoP), with the aim of informing CITES Parties and Committees in their decision-making. This has taken place through the holding of side-events (at CoP13 (2010) and SC66 (2016)), the making of interventions in plenary sessions, and participation in the CITES inter-sessional working group on pangolins. It has also entailed the submission of information documents to such meetings on the status of, and illegal trade in the species. Similarly, nine members of the Specialist Group attended the First Pangolin Range States meeting, hosted and organized by the Viet Nam and US governments in June 2015, and several members delivered technical presentations and took part in working groups. At the request of range States at this meeting, and coinciding with priorities in the Pangolin Specialist Group Conservation Action Plan (see below), the group is undertaking work to assist range States further in their decision-making and management—namely by producing a series of mapping tools illustrating species' distributions, the protection status of native and non-native pangolin species, and legal and illegal trade dynamics. Similarly, the group is working to assist range States in monitoring pangolin populations, through a body of work to develop standardized survey and monitoring methodologies.

Second, members of the Specialist Group continue to contribute to the evidence and knowledge base on pangolins through publications on the species and the threats they face. This includes scientific papers on trade (including its extent and dynamics), the nature of demand for pangolin products, habitat preferences, diet and ecology, ethno-medicinal use and offtake levels, ectoparasite loads of wild pangolins and genetic research.

The IUCN SSC Pangolin Specialist Group, through the collaborative efforts of its members, has also played a significant role in setting the conservation agenda for pangolins over the next decade. In 2013, it organized the First Pangolin Specialist Group Conservation Conference, which was held at Wildlife Reserves Singapore and brought together more than 45 members and non-members from over 15 countries in order to exchange information, share research and insights and complete revised assessments for the *IUCN Red List of Threatened Species*, which were subsequently published in 2014 (e.g., Waterman *et al.*, 2014). These assessments concluded that all pangolins are now threatened with extinction: the Chinese and Sunda pangolins are classified as Critically Endangered, the Indian and Philippine species as Endangered, and the four African species as Vulnerable. Beyond this, the group launched the first-ever global conservation action plan for pangolins in 2014, titled "Scaling Up Pangolin Conservation", which outlines the range of multifaceted and critical actions that need to be implemented to secure the conservation of pangolins.

The Specialist Group is also dedicated to helping lead conservation efforts in the field. For example, members of the group are world leaders in the rescue, rehabilitation and release of pangolins back into the wild in Africa and Asia, for example in Zimbabwe, Viet Nam and Cambodia. Other members are undertaking vital research into pangolin ecology, distribution and threats in Africa (Benin, Ghana, Namibia, Nigeria and South Africa) and Asia (Malaysia, Pakistan, the Philippines, Singapore, mainland China, Hainan Island, Hong Kong, Taiwan, India, and Indonesia). Specialist Group members are also mentoring and training young African and Asian conservation practitioners to promote pangolin conservation in Central Africa; implementing community-based conservation projects in Nepal; supporting anti-poaching patrols at key sites in Thailand and Cameroon; working with informant networks to gain a deeper understanding of illegal trade in pangolins; and working to reduce demand for pangolins in Viet Nam and China.

The group has also made substantial efforts to raise the profile of pangolins globally, through the print, broadcast and social media, and at special events. In 2014, members of the Pangolin Specialist Group, with the very generous support of PPNAT (Photographers for the Preservation of Nature) highlighted the plight of pangolin species at the International Festival of Nature and Wildlife Photography at Montier-en-Der, France. The emphasis of the festival was on threatened species, in particular on pangolins. Attended by more than 42 000 people, the festival is the largest of its kind in Europe.

CONCLUSIONS

Pangolins are in crisis but a global movement to address this has begun. The membership of the IUCN SSC Pangolin Specialist Group has played an integral role in setting the global conservation agenda for pangolins over the next decade, which recognizes the need for multi-

faceted interventions that reflect the complex reality of the threats facing pangolins. In bringing together the expertise, knowledge and enthusiasm of its individual members, the Specialist Group is able to contribute more effectively to the conservation of pangolins at a global level. Other stakeholders in range States as well as national and international NGOs are also playing critically important roles in these efforts. This increased attention and investment in pangolin conservation is a start but, crucially, it must be sustained if there is to be any notable reduction in the illegal trade and the conservation of the world's pangolins is to be secured.

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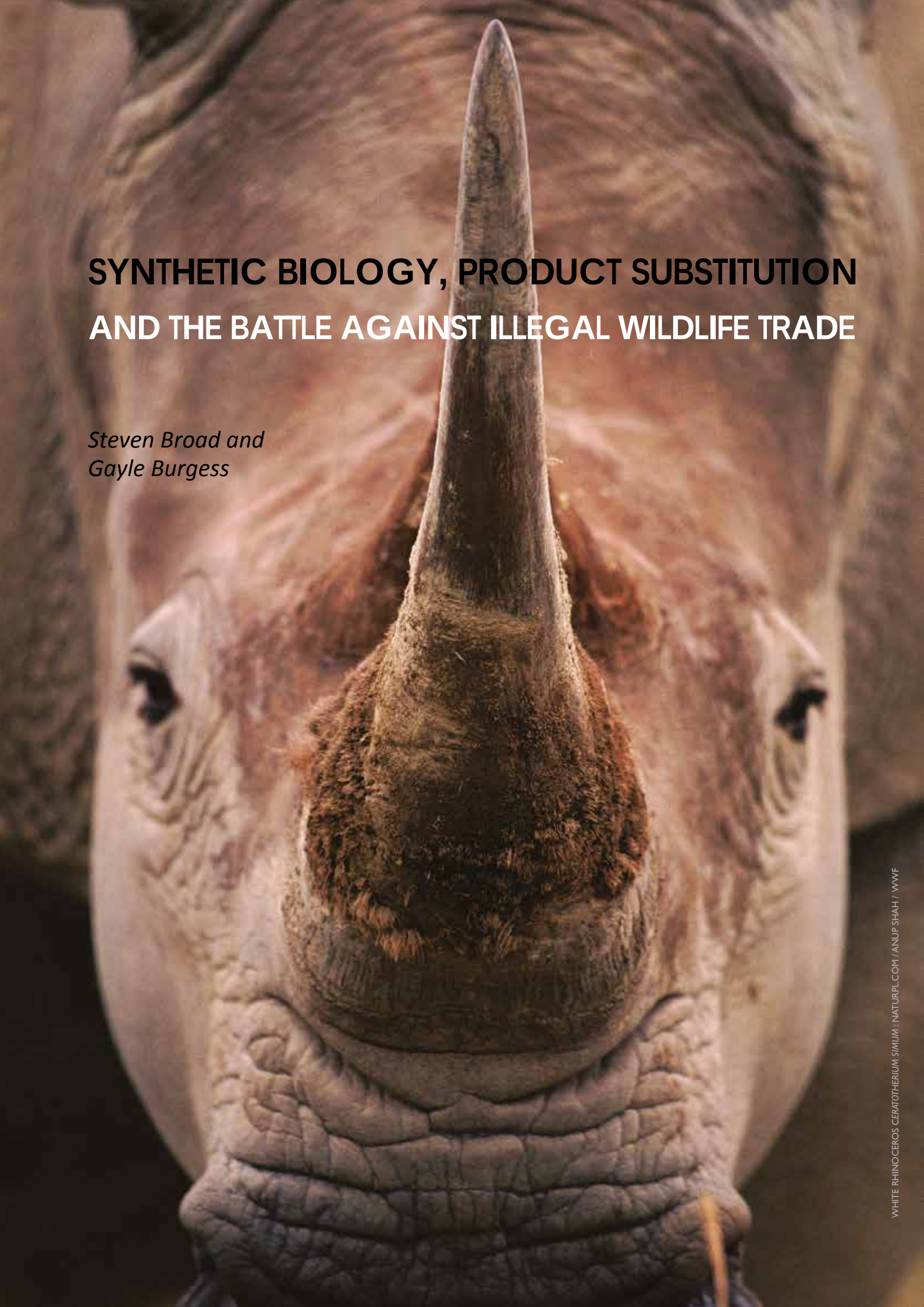
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A close-up, front-facing photograph of a white rhinoceros. The central focus is the large, single, pointed horn, which has a textured, brownish-grey surface. The rhino's face is visible on either side of the horn, showing its thick, wrinkled skin in shades of brown and tan. The eyes are small and dark, and the overall expression is calm. The background is blurred, suggesting a natural habitat.

SYNTHETIC BIOLOGY, PRODUCT SUBSTITUTION AND THE BATTLE AGAINST ILLEGAL WILDLIFE TRADE

*Steven Broad and
Gayle Burgess*

Innovation to strengthen the battle against illegal wildlife trade is being nurtured across a range of disciplines, including criminology, forensic science, economics, behavioural sciences and remote sensing. Amongst the emerging ideas are a range of proposals from the private sector to employ synthetic biology to develop substitute products, such as “horn” powder produced from synthetic keratin and rhinoceros DNA, which might match or even improve upon some of the product attributes valued by rhinoceros horn consumers in Asia (Corbyn, 2015; Nuwer, 2015). This paper examines whether disruptive marketing of such substitutes might reduce the pressure on wild populations of species under threat from illegal trade or whether the risks of perverse effects that reinforce or increase demand for the “real thing” outweigh the case for experimentation with synthetic alternatives. Weighing evidence of the opportunities and risks of such decisions in future will clearly require in-depth understanding of the dynamics of specific wildlife trade chains. There is also a clear need for policy attention to how public and private sectors might best interact in deciding when and how any releases of synthetic substitutes should proceed.

Framing the issue

Illegal trade in wild animals and plants is a persistent conservation threat for high profile animals such as elephants *Elephas maximus* and *Loxodonta africana*, Tigers *Panthera tigris* and rhinoceroses *Rhinocerotidae*, along with a wide range of others that do not usually make the news headlines: Radiated Tortoises *Astrochelys radiata*, abalone *Haliotis* spp. and Red Sanders *Pterocarpus santalinus*, to name just a few (Broad *et al.*, 2003). Negative social and economic consequences of this illicit business for communities at source include loss of resource value, conflict, governance failure and exposure to wider problems associated with organized crime (Lawson and Vines, 2014; CITES, 2013). Considerable regulatory and enforcement effort has been invested worldwide in addressing this challenge, particularly since the development in the early 1970s of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). However, demand for some wildlife commodities, especially those sought during periods of high economic growth and increasing disposable income in key consumer markets, has proven to be a formidable driving force for illegal trade (Milliken and Shaw, 2012).

Theories of product substitution

In economic terms, substitute goods are products that a consumer perceives as similar or comparable, so that obtaining more of one product makes them desire less of the other product (or vice versa). By the same principle, economic theory suggests that if the price of the first product increases, demand for the substitute will increase (referred to as a positive cross elasticity of demand). Often quoted examples are tea and coffee, and butter and margarine. The degree of perceived similarity in what is usually termed “utility” (the satisfaction received by the consumer) between the two goods dictates how perfect or imperfect the substitution may be expected to perform (Nicholson and Snyder, 2011).

To use a simplified wildlife trade example, wild-harvested and farmed crocodile skins would be viewed as

substitute goods if their perceived utility for the manufacture of luxury leather products were taken to be roughly equal. An economist might predict that an increase in price of farmed skins, for example because of a rise in farming input costs, would lead to an increase in demand for wild-harvested skins. Similarly, an increase in the price of wild-collected skins, for example owing to scarcity of supply, would lead to an increase in demand for farmed skins. In reality farmed and wild-harvested crocodile skins are not perfect substitutes, since there is a significant difference in perceived quality between these two goods (farmed skins tend to have fewer flaws and are readily and legally available), but the basic relationship described here remains valid (Macgregor, 2006).

By contrast, there are wildlife trade examples for which evidence indicates that goods that may appear at first to be substitutes are in fact rather loosely related in the market. Wild-caught salmon and farmed salmon, both destined for use as food, demonstrate rather imperfect substitution, for example, because they are nowadays perceived to have significantly different utility. Although farmed salmon was initially a close substitute for wild-caught salmon, over time parallel markets for distinct products have evolved, with changes in price for each commodity having a declining degree of impact on prices for the other (Knapp *et al.*, 2007). Similarly, the markets for natural pearls from different oyster species and from artificially cultured supplies remain rather strongly differentiated and evidence indicates that this is at least as much a result of business promotion of distinct segmented markets as it is a reflection of real differences in the intrinsic qualities of pearls from different sources (Tisdell and Poirine, 2007).

Product substitution in the wildlife trade

As availability of supply owing to resource depletion and/or regulatory restrictions has decreased for many wildlife goods in trade and as tastes and consumption trends have changed, traders and consumers have often moved to substitutes.



Fresh salmon for sale at Puerto Montt market, southern Chile.

MEREDITH KOHUT / WWF-US

These include:

- products of the same species from other source countries;
- products of the same species from captive production or artificial propagation;
- products of different wildlife species with similar utility/quality;
- products of already domesticated animal or plant species with similar utility/quality;
- products of inorganic origin with similar utility/quality (such as alternative carving materials used instead of ivory);
- products of synthetic origin with similar utility/quality.

In many cases the shift towards substitutes has arisen through business innovation within the trade chain. The move towards alternative supply countries or similar species has been a common reaction to regulatory restrictions on original supply. Shifts to captive production have also often been triggered by regulation of wild-sourced supply, but have also been driven by basic business imperatives such as improved quality, lower production costs and risk management benefits of vertical supply chain integration. However, there are also cases in which strategic intervention from regulators or NGOs has taken place to encourage use of substitute supply in the hope that pressure of over-harvest on wild populations would reduce.

A regulatory example is the mechanism adopted through CITES that facilitates trade in captive-bred or artificially propagated specimens of wildlife species for which trade in wild-sourced specimens is subject to greater restriction. This has played a significant role in the shift towards “farmed” sourcing of crocodile skins, live parrots, orchids and a wide range of other wildlife goods. Similarly, national government law and policy in some countries—China’s being the most notable—has encouraged other shifts to commercial ex-situ wildlife production of bears, musk deer and other species.

Non-regulatory examples of strategic substitution efforts are less common. Perhaps the most notable examples relate to efforts during the late 1980s and early 1990s aimed to reduce poaching of African and Asian rhinoceroses. Saiga

Antelope *Saiga tatarica* horn was promoted as a substitute for rhinoceros horn use in traditional medicines and a variety of alternative raw materials (including domesticated Water Buffalo *Bubalus bubalis* horn and inorganic substances) were promoted for the manufacture of carved ceremonial dagger handles in Yemen, a market that had previously been a primary driver of illegal rhinoceros horn trade for the same purpose. However, in neither of these cases is it clear that substitution played a pivotal role in the eventual decline of these markets (Milliken, 2014).

Challenges of strategic substitution

Strategic substitution of a wildlife product, as considered in this paper, is an active intervention aimed to shift demand away from an original source of supply that is of conservation concern owing to over-harvesting for trade. In order to have a significant conservation impact, such a substitution needs to be accepted by the market and the level of that acceptance needs to be sufficient to change the economic incentives driving harvest from the original source.

On the question of acceptance, substitution theory hinges on the concept of utility, but this is by no means a straightforward matter to judge or measure, since there are two inter-related forces at play. First, for a specific end use, is the substitute product physically and/or functionally similar enough to serve the desired purpose? Second, will consumers perceive the substitute to be as satisfying, or at least acceptable enough, to sway their choice? The first of these forces should be objectively verifiable, but the latter is a more complex construct of personal attitudes, values and habits, along with social norms and other external influences. Confounding judgements of both of these forces is the fact that wildlife products in trade often have multiple end uses and for some of those uses, even functionality (such as medicinal efficacy or aesthetic appearance) is very hard to measure.

Even if a substitute is accepted, there remains the question of whether the desirability of the original supply will be sufficiently reduced to relieve the conservation threat it was suffering. The most obvious manifestation of this, assuming rational decision-making by those involved, will be reduced demand for the original goods leading to a reduced price, which in turn reduces the incentive to harvest. How much impact this will have depends on the responsiveness of harvesters to price changes, which economists refer to as the price elasticity of supply. In some cases, a 10% reduction in price might lead harvesters to move on to other more lucrative activities. In other cases, even a 50% reduction in price may still leave continued use of the original supply the most lucrative activity for harvesters, because they lack better alternatives.

The rise of synthetic wildlife substitutes

Laboratory production of biological products that serve to substitute for or enhance goods derived from wild animals and plants is not a new concept. Laboratory-produced orchid hybrids have long served as an alternative to naturally-occurring “species” orchids for collectors (Arditti and Krikorian, 1996). Production of chemically synthesized ursodeoxycholic acid (UDCA)—the active ingredient in bear bile used for medicine in Asia—began in the 1950s and had strong acceptance in medicinal use by the 1990s (Boatright *et al.*, 2009). Plant stem cell culture similarly became an important development in the manufacture of cosmetics in the 1990s, with strong connections to the use of wild plants in many of the same products (Barbulova *et al.*, 2014).



MARTIN HARVEY / WWF

Salt-water Crocodiles *Crocodylus porosus* being skinned for their leather and meat at a crocodile farm, Darwin, Northern Territory, Australia.

Over the past 10–15 years, rapid developments in the field of synthetic biology have raised the possibility of a new form of wildlife product substitution: laboratory production of complex biological systems that replicate or even enhance the form and function of the natural substance. Advances in the sequencing (reading) and fabrication (writing) of DNA, and reductions in cost as technologies improve are making the manufacture of synthetic wildlife product substitutes increasingly feasible. And this possibility is now attracting significant private sector interest; with a handful of innovative companies now entering this field and looking to prove the concept that synthetic wildlife products could replace those derived from endangered wildlife species and thereby help reduce the pressure of poaching and illegal trade.

The opportunities and risks of trading synthetic rhinoceros horn – a case example

RHINOCEROS CONSERVATION AND TRADE

Products from Asian and African rhinoceros species, particularly horns, have long been valued in trade and this demand has played a critical role in driving rhinoceros poaching over the past 50 years. This has caused significant declines or even extinctions for some rhinoceros species or subspecies and constrained population growth for other rhinoceros species that were recovering from critically low levels caused by unregulated 19th and early 20th century sport hunting and trade. Today the vast majority of wild rhinoceroses inhabit just a few countries, in Africa: South Africa, Namibia, Zimbabwe and Kenya; and in Asia: India and Nepal (Milliken, 2014).

During the 1970s and 1980s there were two principle markets driving the rhinoceros horn trade: the production of traditional Asian medicine (TAM) in China, Japan, South Korea and Taiwan on the one hand; and dagger handle carving in Yemen on the other. The policy response through CITES and national laws was prohibition of international trade and increasing pressure on individual countries similarly to ban domestic trade in their national markets. By the mid-1990s all key markets had been suppressed through regulatory action, encouragement of use of substitutes for medicines and carving, and strategic interventions with TAM practitioners to gain their support in avoiding use of rhinoceros horn in medicines. As a result, illegal trade and poaching levels in Africa declined drastically and there was a protracted period of recovery of rhinoceros populations that lasted into the mid-2000s (Milliken, 2014).

This period of relative calm in the global rhinoceros horn trade (though poaching levels in South-east Asia sadly continued unabated), was shattered from 2008 onwards when a largely new illegal market for rhinoceros horn emerged in Viet Nam and began to play a central role in driving increased poaching, particularly in South Africa (Milliken, 2014). The international response through CITES policy, anti-poaching, anti-trafficking and demand reduction measures has been stepped up, but as of 2015, poaching in Africa shows no substantial sign of abating.

UNDERSTANDING THE RHINOCEROS HORN MARKET TODAY

Although there has been a long history of rhinoceros horn use in Viet Nam in traditional medicine, TRAFFIC research indicates that the recent increase in demand arises from aggressive marketing of a range of novel uses: as a medicinal cancer treatment apparently triggered by urban myth about

► **Rhinoceros horn cut into smaller pieces to be sold by weight for use by a traditional medicine practitioner, Hanoi, Viet Nam.**

▼ **Rhinoceros horn dagger handle, Yemen.**



ROBERT PATTERSON / WWF



HARTMUT JUNGUIS / WWF

miracle cures; as an expensive detoxicant, including as a hangover cure, associated with overt display of wealth; and as a gift used to curry favour among the elite (Milliken and Shaw, 2012). Other novel uses appear to have been promoted as illegal traders seek new channels for sales. There are indications that these largely non-traditional forms of use are penetrating other markets too, with particular concerns being raised about status-driven consumption of durable collectable goods in China (Milliken, 2014).

A notable and important characteristic of the current rhinoceros horn market in Viet Nam is the presence of a significant proportion of fake goods, commonly derived from buffalo horns. There is therefore already a strong sensitivity to proving authenticity in this trade (Milliken and Shaw, 2012).

Owing to the underground and criminalized nature of today's rhinoceros horn trade, it is difficult to gain up-to-date insights into key market variables, such as trends in the amount of horn being traded into specific end uses or the changes over time in prices paid at key points along the supply chain. Nevertheless, it is known that prices paid at source and in end markets are extraordinarily high. Poachers may earn what would in other occupations locally be many years' salary from involvement in a single operation. Retail prices in Asia have been reported at multiple times the price of gold (Biggs *et al.*, 2013).

At the supply end, such high prices are apparently sufficient to sustain extreme efforts by poachers to overcome the strong protection and enforcement measures introduced by private and public institutions. How much those prices would need to decrease for these motivations to reduce to a level at which pressure on rhinoceros populations is significantly reduced remains unknown.

For the demand side, there is an added concern that the preponderance of luxury end uses may be placing rhinoceros horn as what has been termed a "Veblen Good", for which demand increases as price increases, in apparent contradiction of the normal law of demand, which would predict decreasing demand as price increases. For such goods, high price and its symbolism of exclusivity and social status becomes the overriding element of their utility (Leibenstein, 1950).

Approach	Success factors	Advantages	Disadvantages
1) Overt alternative	i) Consumers must perceive the synthetic substitute products are at least as effective/desirable as those from natural horn (and perhaps that they have additional advantages, such as clean laboratory production) ii) The price of synthetic products must be significantly lower than the price of those from natural horn (and consumers would have to prove to be most motivated by qualities of the product other than how expensive it is) iii) There would need to be a range of synthetic products to supply all of the most important market segments	+ The current market in Viet Nam appears to be “fashion” driven, so new products backed by a convincing marketing pitch might catch on + The products would be identified as synthetic, so would not fall foul of wildlife trade legislation + Sale of differentiated substitutes does not contradict current policy on demand contraction for natural horn + Current product manufacturers or consumers using natural horn might be persuaded to adopt the synthetic substitute on cost grounds	- Product segmentation is complicated and changing, so there is a risk of simply creating a parallel market - Costs of production and marketing of multiple products may challenge the need to keep the price of the substitute products low - Messaging about product benefits may serve to reinforce acceptability of natural horn - Introduction of additional novel products may perversely attract more consumers looking for the “real thing”
2) Covert imitation	i) Traders must be unable to distinguish synthetic whole horns from natural horns ii) After infiltration of synthetic horn into the trade chain, consumers must become convinced that they are likely to be buying an inferior alternative, such that the prices they are willing to pay for any horn reduce significantly iii) Traders must fail to come up with a system to guarantee provenance/quality of natural horns	+ Only one synthetic product is needed – an unprocessed horn + There is no need to gain in depth understanding of end market segmentation as this approach is focused on the supply of raw material + Costs of “marketing” the news about the inferior alternative will be much lower than those for marketing multiple end products	- Traders may quickly work out how to differentiate natural horn from synthetic imitations in the trade chain, as they do already with fake horn, and protect the high price of the “real thing” - Legal issues may arise at the point of insertion into the trade chain - This approach would initially contradict current policy aimed at demand contraction for natural horn - Economic theory is untested in this context – it is not clear how much more inferior the alternative should be perceived to be for the price of natural horn to be significantly undermined - Enforcement and judicial action may be undermined by uncertainty about the identity (synthetic vs natural) of horns in trade; any use of chemical or genetic “markers” to aid enforcers could also be accessed by traders through laboratory testing

Table 1. Comparison of theories of change for introducing synthetic rhinoceros horn to the market.

WHAT IS THE SYNTHETIC RHINOCEROS HORN OPTION?

A number of private sector initiatives have come to light over the past year or so that propose the production of synthetic rhinoceros horn as a substitute for that sourced from the wild (“natural horn”) in order to help relieve pressure on rhinoceros populations caused by trade demand. Although there are differences between approaches being developed by the different companies involved, they have in common the aim to produce through synthetic biology a powder that shares key biological and chemical characteristics with natural horn (Corbyn, 2015). Some companies have made additional claims that they aim to use 3D printing technology to produce solid synthetic “horns” that are physically indistinguishable from natural horns.

None of the companies involved has made public any precise plan for introducing synthetic horn to the market, but media reports and direct correspondence between TRAFFIC and company representatives, indicates that a variety of options are under consideration. These range from covertly injecting synthetic horn into the supply line in source countries as part of a plan to undermine the market price for natural horn, through to demand-side release of products that either purport falsely to contain natural horn or are marketed as containing synthetic horn with claims that it is somehow “better than the real thing”. Companies have engaged consumer research support in Viet Nam and advice on supply-side issues from academics. However, to date there does not seem to have been any commercial release of synthetic horn into the trade chain.



Vials of bear bile products in Malaysia, sold in packaged boxes originating from Jilin, China.

ANALYSIS OF VIABILITY

Without clear-cut proposals about how synthetic horn might be introduced to the trade chain, what impact is envisaged and what the theory of change might be for achievement of such impact, it is difficult to provide a definitive assessment of opportunities and risks. Therefore, at this stage a set of relevant issues are examined from a theoretical standpoint.

Amidst the various reports of the intentions of different companies expressing interest in this business, there appear to be two basic theories of change for introduction of synthetic horn into the market:

- 1) ***To supply an alternative “rhinoceros horn” raw material and/or consumer products identified overtly as being of synthetic origin but promoted as being of at least equal and maybe better utility as natural horn.*** It is hypothesized that if the synthetic substitute is sold at a cheaper price than natural horn, the price paid for natural horn will also decrease and that incentives for illegal supply will decline as a result. Proponents apparently believe that rhinoceros horn goods are subject to the normal rule of demand and that consumers are not attracted primarily by exclusivity and high price.
- 2) ***To supply synthetic imitations of “real” horns covertly into the trade chain of natural horn, with the objective of letting it be known after some time that an inferior substitute has infiltrated the market in order to undermine market confidence that it can discern the real thing.*** It is hypothesized that a consequent reduction in price will occur as traders and consumers are only willing to accept a value based on the worst case that they are obtaining synthetic, not natural horn. Proponents refer to a theory known as “Gresham’s Law”, often stated as “bad money drives out good”, which applies when the “true” value of something is markedly different from the value people accept because they are unable to discern good from bad quality in the marketplace (Phlips, 1983).

Clearly there is a tension between these two approaches since the former requires consumer confidence that the substitute is at least as good as natural horn, while the latter requires consumers to view the infiltration of a synthetic alternative to be significantly less good than natural horn.

Table 1 summarizes the likely success factors for each approach and notes key advantages/disadvantages of each. Of the two approaches examined, the “covert imitation”

option appears to pose the biggest risk of failure. Aside from the challenges of gaining market entry to a business highly sensitized to fakes and imitations, this approach hinges on application of economic theory that is not tested in this field and could seriously undermine, rather than complement, current regulatory efforts.

By contrast the “overt alternative” approach hinges on much simpler and well-tested economic and marketing theories. However, its success would require a market entry approach that targets multiple product segments and succeeds in convincing consumers that it really is at least as “good as the real thing”. There is a risk that consumer acceptance could be nil or much lower than expected. Although market research in Viet Nam reportedly indicates that some potential consumers claimed a willingness to choose synthetic over natural horn products (Corbyn, 2015), this might not prove to be an accurate prediction of actual consumer behaviour. Experience from other wildlife trade chains in Asia, such as those for bear bile and ginseng medicines, has revealed strong consumer preference for wild-sourced over farmed ingredients (Dutton *et al.*, 2011; Hankins, 2009). A similar preference for natural over synthetic horn could prevail.

Even if the synthetic product gains a significant degree of consumer acceptance, there is a risk that it will be viewed as a distinct alternative commodity, rather than as a substitute. If there were such a high degree of imperfection in the relationship between products of synthetic and natural horn, the lower price of the former may have no impact on demand for the latter and there would be no reason to believe illegal trade and poaching levels would reduce. Arguably, an increasingly visible trade in the synthetic product, if not accepted as a high quality substitute, could even encourage even more consumers to “seek the best” and lead to increasing demand for natural horn.

A variation on the overt alternative approach would be to take a different view of demand dynamics and test the possibility that consumers are actually valuing rhinoceros horn as a Veblen Good. An overt synthetic alternative could be pitched as even better than the real thing for an even higher price. If it were true that a primary motivation for consumers was exclusivity and high price, rather than any distinct utility of natural horn, this could lead to a reduction in demand for natural horn. However, pitching an alternative as superior would be a tough marketing challenge and even if successful the reduction in price for natural horn might not be sufficient to reduce incentives for poaching—layers of segmented products are not uncommon in other luxury markets, such as those for high-end watches or vehicles.

SOME TENTATIVE CONCLUSIONS

The potential approaches for use of synthetic rhinoceros horn outlined here do not provide simple, predictable means to strengthen efforts to undermine demand for natural horn that is driving current high poaching levels in Africa. Nevertheless, with current efforts to reduce poaching, trafficking and consumer demand struggling to have a significant impact, it would be rash to rule out the possibility that trade in synthetic rhinoceros horn could play a role in future conservation strategies.

This initial analysis points to some important questions that need to be addressed in judging the likely viability and impact of any approach to the use of synthetic rhinoceros horn as a strategic intervention to undermine trade in natural rhinoceros horn:

Viability:

- Are production costs of synthetic horn low enough and production volumes high enough for deployment in such market interventions?
- Are there any legal obstacles to the release of synthetic horn into the supply chain?
- Will the synthetic product be accepted by traders and/or consumers at the point of insertion into the trade chain (whether as an imitation or an alternative)?
- Will any financial benefits from the trade in synthetic horn be used to increase incentives for in situ rhinoceros conservation?
- Will the criminals who currently control illegal trade develop ways to undermine the acceptance of synthetic horn?

Impact:

- Will the market react as predicted by the economic theory behind any intervention taken?
- Will the price of natural horn be depressed to a point where incentives for poaching and illegal trade are significantly decreased?

Although it does not appear that any synthetic horn has yet been released commercially into the trade chain, it is quite likely that this will happen before long, since a number of companies are competing to get ahead of the pack with this initiative. Unlike most other conservation interventions aimed to address the rhinoceros horn trade challenge, there is no government or inter-governmental institution with a clear mandate to decide whether synthetic horn should be released. An overt alternative product sold in Viet Nam may have to satisfy local regulation of medicine, cosmetic or food market business, but this is likely to address only human health risks. A covert infiltration of horn at the supply side would by its very nature likely be carried out without government approval. As such, the decision to release synthetic horn lies largely with the individual companies involved. Yet the impact on wider efforts to address this challenge could be profound.

The future of synthetic substitutes in wildlife trade

There is little doubt that the rapidly evolving field of synthetic biology is going to make production of substitute wildlife products an increasingly affordable and accessible option for conservation planning and business development in the future. As in the case of the not-unrelated subject of GMO use in agriculture, there are important opportunities for benefit, but also significant risks. Decision making about synthetic wildlife product release into the market at this point lies with individual companies and there is a high probability that such decisions will be taken on the basis of inadequate understanding of the dynamics of wildlife trade chains and the nature of existing interventions being taken to address unsustainable and illegal trade. Looking ahead, there needs to be strong consideration of how well-informed decisions might best be made about such releases in future that increase the likelihood of positive impact. Future work should include:

- Research on specific wildlife trade chains aimed to improve understanding of supply and demand dynamics, in particular on the likely impact of price changes on incentives for illegal activity and on the factors influencing consumer choice;
- Cross-referencing with research and experience on substitution and synthetics in other commodity trade, for example the significant body on economic impacts of synthetic diamond production and trade;

- Development of collaborative approaches by governments and businesses on assessment of opportunities and risk, and on policy mechanisms that might shape decisions about strategic release of synthetic wildlife products;
- Assessment of market and conservation impacts of any strategic synthetic product releases.

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THE TRAFFIC BULLETIN SEIZURES AND PROSECUTIONS SECTION IS SPONSORED BY THE FORESTRY BUREAU, COUNCIL OF AGRICULTURE, TAIWAN: COMMITTED TO SUPPORTING CITES ENFORCEMENT

The following section features a selection of seizures and prosecutions reported between October 2015 and April 2016. Sources are cited at the end of each country section. Readers are referred to the TRAFFIC website (www.traffic.org/media-reports/) for regular updates on cases reported from around the world.

B E A R S

CANADA: On 4 March 2016, at the provincial court in Port Coquitlam, British Columbia, acupuncturist and traditional Chinese medicine practitioner Yunhee (Sarah) Kim was fined CAD22 400 (USD17 000) for the illegal trade in bear *Ursus* (CITES I/II) gall bladders and paws.

The Province (Canada): <http://bit.ly/1oyfIH7>, 4 March 2016

RUSSIA: On 23 December 2015, it was reported that police in Chuguyevsky district, Primorsky region, had seized 527 bear *Ursus* (CITES I/II) paws, 11 bear gall bladders (and three musk *Moschus* (CITES I/II) deer gall bladders) concealed in bags of sawdust in railway carriages at the premises of a timber processing company.

Siberian Times: bit.ly/1RW44Mj, 3 December 2015

B I R D S

BRAZIL: On 11 January 2016, Jeffrey Lendrum was sentenced to gaol for four and a half years for the illegal trade in Peregrine Falcon *Falco peregrinus* (CITES I) eggs that had been collected days earlier in Patagonia, Chile. He was fined BRL40 000 (USD10 000).

Lendrum, a serial offender previously convicted of trying to smuggle birds of prey eggs out of Britain and elsewhere (see *TRAFFIC Bulletin* 23(1):30), was arrested in October 2015 at São Paulo Airport, in transit to Dubai, with four eggs in his possession after authorities in Chile were alerted by IBAMA, Brazil's federal environmental enforcement agency, that Lendrum was preparing to strike again.

Two of the eggs subsequently hatched but only one chick survived; it was returned to Chile where it was placed on an existing Peregrine Falcon nest.

UK National Wildlife Crime Unit press release: <http://bit.ly/23tRVaa>; *Shanghai Daily:* <http://bit.ly/1WRFPjO>, 29 January 2016; Daniel Eduardo Visciano de Carvalho, IBAMA, in litt. to R. Thomas, *TRAFFIC*, 22 February 2016

CONGO, DEM. REP. OF: On 14 February 2016, some 420 Grey Parrot *Psittacus erithacus* (CITES II) chicks were seized from a holding

facility in Kindu, Maniema, before their shipment to Kinshasa. Two local buyers were arrested and later gaoled; at least 65 birds subsequently perished and 295 live birds were transferred to the Congolese Conservation Institute.

<http://bit.ly/1Wrl407>, 10 March 2016

INDONESIA: On 3 December 2015, authorities in East Java seized 2711 live native birds from a passenger ship at Tanjung Perak port, Surabaya. One person suspected of purchasing the birds from collectors in Kalimantan was arrested. It is believed the birds were destined for Jakarta's Pramuka bird market. The shipment included 1411 Greater Green Leafbirds *Chloropsis sonnerati*, 712 White-rumped Shamas *Copsychus malabaricus*, 557 Hill Mynas *Gracula religiosa*, 20 Australasian Larks *Mirafra javanica*, eight Crested Jays *Platylophus galericulatus*, two Oriental Magpie-robins *Copsychus saularis* and a Red-eyed Bulbul *Pycnonotus brunneus*. 1192 birds died (678

Greater Green Leafbirds); the condition of 1230 birds was being assessed. 308 birds were returned to East Kalimantan.

On 11 November 2015, 200 Greater Green Leafbirds were seized at the same port; 25 were dead. A day earlier, 1014 birds were seized from a passenger vessel arriving from Banjarmasin, South Kalimantan, including 468 White-rumped Shamas, 408 Greater Green Leafbirds, and 24 Hill Mynas, all believed to be destined for Pramuka bird market.

TRAFFIC: <http://bit.ly/1lt8BET>, 4 December 2015; *Surya Online:* <http://bit.ly/1Vou7Qp> (in Indonesian)

E L E P H A N T S

The African Elephant *Loxodonta africana* is listed in CITES Appendix I (except the populations of Botswana, Namibia, South Africa and Zimbabwe, which are included in Appendix II); the Asian Elephant *Elephas maximus* is listed in Appendix I

CAMBODIA: On 4 October 2015, at Siem Reap Airport, a Vietnamese national was arrested after arriving on a flight from Angola with 46 kg of ivory and 11 elephant tails in his suitcase. The buyers were believed to live locally. The suspect awaits trial.

The Phnom Penh Post: <http://bit.ly/1Nnd0KX>, 7 October 2015

CAMEROON: In February 2016, it was reported that three ivory traffickers had been sentenced to one year in gaol and fined USD11 000.

The Eagle Network: [EAGLE_Briefing_February_2016_public.pdf](http://bit.ly/1Nnd0KX)

CHINA: On 10 October 2015, at Lichuan Court, Jiangxi province, Hong Kong resident Xu was sentenced to 10.5 years in gaol and fined CNY200 000 (USD33 333). In November 2014, Lichuan police intercepted a vehicle carrying



Two Peregrine Falcon *Falco peregrinus* chicks which hatched from eggs illegally smuggled out of Chile; only one chick survived.

AGRICULTURAL AND LIVESTOCK SERVICE (SAG), CHILE

22 figurines (13 kg), claimed to be mammoth products but subsequently identified as ivory. During their investigation of another suspect, police found that Xu had rented a certified ivory processing factory but was carrying out business involving ivory from both legal and illegal sources. He was arrested in February 2015 with 600 kg of ivory products.

On 23 November 2015, officials in Xiamen, Fujian province, confiscated 57 elephant tusks, allegedly imported from Uganda, declared as timber, and concealed in a container of wood. One arrest.

In December 2015, suspect Zhao was sentenced in Taiyuan People's Court, Shanxi province, to 11 years in gaol/fined CNY300 000 (USD46 000) and suspect Dongmou was gaoled for three years/fined CNY50 000 (USD7700) for their role in smuggling over 10 kg of ivory from Japan in 2013. Further investigations by Taiyuan Customs anti-smuggling bureau subsequently resulted in the confiscation of over 70 kg of smuggled ivory products, involving 16 suspects.

On 4 March 2016, border guards in Zhuhai, Guangdong province, seized 221 cut ivory pieces (450 kg) being transported by speedboat from Hong Kong; the suspects had fled.

<http://bit.ly/1Sz4Agu> [in Chinese], 18 November 2015; *Daily Mail* (UK): <http://daily.m.ail/1HzrPlx>, 24 November 2015; <http://bit.ly/1Sf9oh2> [in Chinese], 27 January 2016; *Macau Daily Times*: <http://bit.ly/1S9S3TH>, 22 March 2016

CONGO, DEM. REP. OF: During the first quarter of 2016, authorities arrested a dozen people and seized a total of 80 kg of ivory during three separate operations.

WWF–Democratic Republic of Congo media release, 21 March 2016

GABON: In December 2015, a forest official and one other person arrested in possession of 206 kg of ivory, were gaoled for six months and fined USD35 000.

The EAGLE network: www.eagle-enforcement.org/data/files/eagle-briefing-january-2016-public.pdf, January 2016

HONG KONG: During November 2015, Customs officials at Hong Kong International Airport seized a total of 146.5 kg of suspected ivory products from five separate shipments; the ivory had been concealed in tailor-made vests or in hand luggage; one package arrived by courier from Malaysia declared as pet food. A number of arrests; two prosecutions at Tsuen Wan Magistrates' Court both resulted in fines of HKD65 000 (USD8300); another person was fined HKD90 000. All items had been shipped from, respectively, Harare, Zimbabwe; Abuja, Nigeria; Abidjan, Côte d'Ivoire, via Dubai, and one direct from Dubai. A further two shipments (10 kg and 26 kg) from Abidjan, via Dubai, arrived in luggage on 14 March and 16 April 2016, respectively.

Government of the Hong Kong Special Administrative Region press releases: <http://bit.ly/1H6ihEx>, 3 November 2015; <http://bit.ly/1Sf9y85>, 4 November 2015; <http://bit.ly/1Q6uYgh>, 7 November 2015; <http://bit.ly/1S9SiKm>, 14 November 2015; <http://bit.ly/1V0UOu8>, 19 November 2015; <http://bit.ly/1Q6vkmQ>, 14 March 2016; <http://bit.ly/23WINWX>, 17 April 2016

INDIA: On 10 October 2015, officials in New Delhi arrested a key ivory trader known to the authorities and subsequently seized 488 kg of ivory—believed to be the largest haul of ivory in the city; another suspect was arrested when the tusks and ivory artefacts were seized from a house in Maujpur, New Delhi.

The Hindu: <http://bit.ly/1SMp2uD>, 12 October 2015

INDONESIA: On 16 February 2016, it was reported that Customs officers at Soekarno-Hatta Airport had arrested a Chinese citizen smuggling elephant tusks (109 kg) from Abu Dhabi and a Zambian national arriving from Zambia in possession of 163 elephant tusks (and two rhinoceros horns), which he claimed were to be carved into table decorations.

Tempo.co: <http://bit.ly/1NnYGgK>, 16 February 2016

MALAYSIA: On 26 February 2016, at Kuala Lumpur International Airport, in two separate incidents, Customs officials seized a total of 159 kg of ivory tusks: two Vietnamese nationals believed to have been travelling from Angola were found with 101 kg in their luggage; some 58 kg was recovered from unidentified luggage bound for Hanoi, Viet Nam.

The Sun Daily (Malaysia): <http://bit.ly/23tUg40>, 2 March 2016

MOZAMBIQUE: On 3 October 2015, two Chinese nationals bound for Qatar were arrested in Nampula with 104 kg of elephant tusks.

Bloomberg: <http://bloom.bg/1Rs6iSp>, 6 October 2015

MYANMAR: On 1 January 2016, police in Irrawaddy Division arrested two suspected members of an elephant poaching ring in Chaungtha Forest Reserve; 66 pieces of elephant trunks and tails, dried elephant hide and a knife were seized. A skinned elephant and a structure to cure the hide was also found.

The Irrawaddy: <http://bit.ly/1O4TVuY>, 5 January 2016

SINGAPORE: On 12 December 2015, authorities impounded 505 kg of elephant tusks in reportedly one of the largest ivory seizures made in the territory in over a decade. The tusks were found with 324 kg of pangolin scales in an air shipment from Nigeria, bound for Lao PDR, labelled as synthetic wigs.

Asiaone: <http://bit.ly/1mpfjly>, 17 December 2015

TAIWAN: In December 2015 and January 2016, officials seized seven parcels (six from UK; one from France) containing 45 ivory pieces; two suspects claimed to have purchased the items at antique auction websites overseas. Further pieces were recovered from their premises (a total of 400 pieces/28 kg). The suspects were reportedly also selling ivory products on a social media site in Taiwan.

Liberty Times Net: <http://bit.ly/1Wrmj5U>, 19 February 2016; *Taiwan Customs pers. comm.* to J. Wu, TRAFFIC, 11 March 2016

TANZANIA: On 18 December 2015, at Mpanda District Magistrate Court in Katavi Region, two local men Justin Bruno and Philbert Leo were gaoled for 42 years after being apprehended transporting four elephant tusks (47 kg) on a motorbike.

On 22 December 2015, it was reported that authorities had seized 156 ivory tusks (200 kg); two Tanzanian suspects were arrested in Dar es Salaam.

On 29 December 2015 it was reported that Stephano Jonas and Franko Hamisi, Burundian refugees from Katumba refugee camp at Mlele District, Katavi Region, had been sentenced at Mpanda District Court to 20 years in gaol for possession of elephants tusks. Police arrested the duo in May 2015 at the camp, where they found the tusks under a bed.

On 19 March 2016, at Kisutu Resident Magistrate's Court, Dar es Salaam, Chinese nationals Huang Gin and Xu Fujie were each sentenced to 30 years in gaol or ordered to pay a fine of Sh54.3 billion (USD25 million) each following their arrest in 2013 after 707 tusk pieces (1.8 t) were found in sacks of garlic at their house.

The Citizen: <http://bit.ly/1PjMSif>, 19 December 2015; *Voice of America*: <http://bit.ly/1NNkS3W>, 23 December 2015; *allAfrica*: <http://bit.ly/1XuYfam>, 29 December 2015; *Reuters*: <http://reut.rs/1Sz6D-kx>, 19 March 2016; *The Citizen*: <http://bit.ly/1UC-4QIS>, 19 March 2016

UK: On 14 October 2015, Border Force officers at Heathrow Airport seized 110 kg of raw elephant tusks, carved ivory bangles and beads from luggage abandoned in transit from Angola to Hanover, Germany. The items were taken away for forensic analysis and confirmed to be ivory; the case is being investigated by the National Crime Agency.

UK Border Force

UGANDA: In November 2015, at Entebbe International Airport, four Vietnamese nationals were arrested attempting to export 36 kg of ivory (and 3 kg of rhinoceros horn). The contraband was declared as wood samples, destined for Viet Nam. The suspects were gaoled (term not reported).

EAGLE_Briefing_December_20s15_public.pdf

VIET NAM: On 29 November 2015, a container holding 835 (2204 kg) African Elephant *Loxodonta africana* tusks hidden in beans, arriving by sea from Mozambique, was seized.

On 29 January 2016, at Hanoi's Noi Bai Airport 137 kg of elephant tusks and ivory carvings were seized from six checked-in cases arriving from Angola, via Malaysia.

(see also Other / multi-seizures)

Haiquan online: <http://bit.ly/1T3vYb>, 17 December 2015; Thanh Nien News: <http://bit.ly/1S6fE5B>, 30 January 2016; <http://bit.ly/1NnZout>, 30 January 2016

ZIMBABWE: On 24/25 October 2015, at Harare International Airport, Customs officials seized 173 kg of ivory on route to Singapore; three locals and a Malian national were arrested. It is reported that an undisclosed amount of ivory was recently seized at the airport allegedly involving officials at Hwange National Park who were trying to smuggle the ivory out of the country.

Newsdze Zimbabwe: <http://bit.ly/1R95sts>, 26 October 2015

MARINE/FRESHWATER

AUSTRALIA: On 3 February 2016, at the County Court, Victoria, the ringleader [name not reported] of an illegal abalone *Haliotis* syndicate based in Melbourne was gaoled for 23 months and 14 days, with a non-parole period of 12 months. She was also convicted and banned indefinitely from all fishing activity, ordered to pay AUD18 007 (USD13 700) and a vehicle was forfeited. She had pleaded guilty to trafficking commercial quantities of abalone, and also to selling rock lobsters and molluscs without authorization. The 10-month investigation, code-named Operation Quantum, had observed the woman repeatedly selling illegally taken abalone at a discounted price around St Albans and Sunshine, Victoria, supplied by a team of ten divers. Four divers were gaoled on 11 January for periods of up to two months, however those sentences remain under appeal. The other six men were required to complete between 60 and 280 hours of unpaid community work, were banned from all fishing activity indefinitely and ordered to pay between AUD220 and AUD16 500 (USD168 and USD12 600) each.

Fishing World: <http://bit.ly/1KZICka>, 3 February 2016; The Standard: <http://bit.ly/119bboj>, 12 January 2016; <http://bit.ly/1XuYKbf>, 12 January 2016

HONG KONG: On 11 December 2015, officials with a quarantine detector dog at the Air Mail Centre of Hong Kong International Airport seized a shipment containing 9 kg of dried seahorses *Hippocampus* spp. (CITES II).

Customs officials at Hong Kong International Airport have seized five separate shipments of suspected European Eels *Anguilla anguilla* (CITES II) in 2016 to date (total 341 kg) from the check-in luggage of passengers arriving from Spain and Portugal via Abu Dhabi, Paris, Amsterdam and Istanbul without the requisite licences.

On 7 March 2016, at Hong Kong International Airport, an unclaimed bag was found to contain 46 kg of suspected dried fins of Smooth Hammerhead Sharks *Sphyrna zygaena* (CITES II).

On 14 December 2015, some 16 kg of suspected dried shark fins of Sphyrnidae spp. (three species in CITES II) were seized from a passenger arriving from Mozambique via



A shipment of dried seahorses *Hippocampus* (CITES II) was seized at the Air Mail Centre of Hong Kong International Airport in December 2015, with the assistance of a quarantine detector dog.

Johannesburg, South Africa. Both shipments were without the requisite licences.

Government of the Hong Kong Special Administrative Region press releases: <http://bit.ly/1Sz7gL2>; <http://bit.ly/1qHELoj>, 14 December 2015; <http://bit.ly/1qotk4k>, 8 March 2016; <http://bit.ly/1Z5doi1>, 5 January 2016; <http://bit.ly/1XkThx9>, 11 February 2016; <http://bit.ly/1XuZ5Un>, 25 February 2016; <http://bit.ly/1Le8Kxx>, 4 March 2016; <http://bit.ly/1qotk4k>, 8 March 2016

INDIA: On 1 February 2016, at Alanthalai, in Thoothukudi district, two persons were arrested during a vehicle check in possession of 2500 conch shells (protected under Schedule I and II of the Wildlife Protection Act) reportedly bound for tourist destinations such as Kanyakumari and Rameshwaram. They included Horned Helmets *Cassia cornuta*, Horse Conch *Fasciolaria trapezium*, Scorpion Spider Conch, *Lambis scorpius* and *Lambis chiragra arthritica*.

The Hindu: <http://bit.ly/2092xUE>, 3 February 2016

INDONESIA: In early October 2015, authorities at Jakarta International Airport seized some 3000 fins of Oceanic Whitetip Sharks *Carcharhinus longimanus* (CITES II; protected in Indonesia and banned from export) bound for Hong Kong, reportedly from sharks caught in waters around Java island.

Close to 8000 freshwater turtles were confiscated in recent seizures in Indonesia, the majority of them protected Pig-nosed Turtles *Carettochelys insculpta*.

On 21 February, officials at Jakarta's Soekarno Hatta International Airport discovered 3737 Pig-nosed Turtles and 883 Snake-necked Turtles *Macrochelodina rugosa* in boxes headed for Hong Kong. The turtles were placed in quarantine and were to be returned to the wild.

Days earlier, authorities foiled an attempt to smuggle 3230 Pig-nosed Turtles out of Mozes Kilangin Airport in Timika, Papua province, bound for Jakarta, via Jayapura.

<http://yhoo.it/1MeqyqG>, 7 October 2015; TRAFFIC: <http://bit.ly/1SMqg9d>, 23 February 2016

MEXICO: On 11 October 2015, it was reported that 3.5 t of dried shark fins and 529 kg of fish swim bladders had been seized

from a container in Manzanillo, Colima, bound for Hong Kong. The seizure was made because the shipper did not present documents confirming the legal provenance of the products or authorization for harvesting the animal parts.

Fox News: <http://bit.ly/1MtOnwR>, 11 October 2015

PAKISTAN: On 11 March 2016, it was reported that Punjab Wildlife and Parks Department officials at Faisalabad Airport had seized 45 Black-spotted Turtles *Geoclemys hamiltonii* (CITES I) from suitcases ready for loading onto a Malaysia-bound flight.

Customs officials seized two consignments at Lahore Airport earlier this year containing some 184 Black-spotted Turtles.

<http://bit.ly/1S6h8g7>, 11 March 2016

SOUTH AFRICA: On 29 October 2015, an undisclosed amount of abalone (*Perlemoen*) *Haliotis midae* was stolen from the Department of Agriculture, Forestry and Fisheries' storage facility for confiscated abalones in Paarden Island, Cape Town, after armed and masked men overpowered security personnel.

In November 2015, in separate cases, at least four tonnes; 73 bags; 985 kg of abalones *Haliotis midae* were seized in Western/Eastern Cape provinces from vehicles and a number of arrests were made; another 39 627 abalones being processed at a suspected abalone factory were seized and four Mozambicans and three South African nationals were arrested.

Other significant cases in these provinces during 2016 to date include seizures of 620 kg and 8000 abalones from vehicles and from one property; a further 6151 shucked wet and 14014 dry abalones from a property in Atlantis; numerous arrests.

Times Live: www.timeslive.co.za/scitech/2015/11/02Abalone-storage-facility-hit-by-poachers, 2 November 2015; IOL news: <http://bit.ly/1TQTPeL>, 1 November 2015; News24: <http://bit.ly/1MtOt7V>, 1 November 2015; <http://bit.ly/1S6hhAc>, 6 November 2015; IOL News: <http://bit.ly/1oX6lfj>, 5 November 2015; RNews: <http://bit.ly/1o079B2>, 8 February 2016; Eyewitness News: <http://bit.ly/1QhJZRo>; Times Live: <http://bit.ly/21x8nju>, 17 March 2016

SPAIN: On 9 March 2016 it was reported that six people in Galicia had been arrested on charges of illegal fishing of Patagonian Toothfish *Dissostichus eleginoides* in Antarctic waters, reportedly the first illegal fishing investigation involving collaboration between the Spanish Civil Guard, INTERPOL and Europol.

The Guardian: <http://bit.ly/1T3yIKI>, 9 March 2016

TOGO: In January 2016, a Ghanaian fisherman living in Nigeria was arrested as he crossed the Hilla-Condji (Togo-Benin) border en route to Ghana, in possession of almost 80 kg of shark fins.

ANCE (Alliance Nationale des Consommateurs et de l'Environnement) Togo newsletter: <http://bit.ly/1TQUgWA>, 11 January 2016

PANGOLINS

All pangolin species are listed in CITES Appendix II

CAMEROON: On 11 November 2015, a person was arrested at an unnamed airport with 100 kg of Giant Pangolin *Smutsia gigantea* scales contained in sacks stamped with Chinese characters.

In February 2016, a Nigerian ivory trader was arrested with 200 kg of pangolin scales (and 12 ivory tusks).

The Eagle network: <http://bit.ly/1Q6yuqQ>, 11 November 2015; *EAGLE_Briefing_February_2016_public.pdf*

CHINA: On 8 December 2015, at Fangshenggang Intermediate People's Court, Tang Guoli was gaoled for five years and fined CNY50 000 (USD8065); He Bingyuan was gaoled for one year and fined CNY20 000 (USD3226). The duo had reportedly been hired to deliver live pangolins from Dongxing, Guangxi province, to Guangdong province; the animals had arrived by boat from Viet Nam. Dongxing Customs officers intercepted the suspects in April 2015 and seized 20 live Sunda Pangolins *Manis javanica* and six live Chinese Pangolins *M. pentadactyla*.

On 15 January 2016, at Baiyun International Airport, Guangzhou, the luggage of a passenger arriving from Addis Ababa, Ethiopia, was found to contain 30 kg of pangolin scales.

On 17 January 2016, 51 live pangolins were discovered by police in the boot of a car that had been involved in an accident in Yulin City, Guangxi province.

On 19 January 2016, suspect Zhou was sentenced to over five years in gaol/fined CNY100 000 (USD15 385) following his arrest in 2014 after Zizhong forest police in Sichuan province seized 60 kg of pangolin scales from him.

On 28 January 2016, it was reported that one person hired to deliver 960 dead pangolins from Haiquan Bay to Guangchang Market in Zhuhai, Guangdong province, seized by police in May 2014, had been sentenced to five years in gaol/fined CNY20 000 (USD3000).

On 10 April 2016, officials in Guangdong province seized 76 bags containing 1.6 t of pangolin scales from a speedboat in waters off Zhongshan City. One person was detained.

<http://bit.ly/1HA98EK>, 23 October 2015; <http://bit.ly/1WrsfFH> [in Chinese], 9 December 2015; <http://bit.ly/1RMOTpB>, 14 December 2015; *Southcn.com*: <http://bit.ly/1Xv0HgZ> [in Chinese], 15 January 2016; *Eastday.com*: <http://bit.ly/1MtWc5J> [in Chinese], 18 January 2016; *SCOL.com*: <http://bit.ly/1T3yZqP> [in Chinese], 19 January 2016; *SINA*: <http://bit.ly/1oX8U1i>, 28 January 2016; <http://bit.ly/1VzzRan>, 16 April 2016

HONG KONG: On 17 December 2015, marine police arrested eight mainland sailors and confiscated 50 boxes of pangolin meat (weight not reported) after intercepting their mainland-bound boat off Lung Kwu Tan.

On 12 December, police seized another shipment of pangolin scales during an anti-smuggling operation in Sai Kung. During pursuit by police, two speedboats ran aground off Sharp Island. Six crew members fled; no arrests.

South China Morning Post: <http://bit.ly/1Qr7mZR>, 17 December 2015

INDONESIA: On 11 November 2015, police in north Sumatra province seized 91 pangolins from a boat in the waters off Belawan port; the animals were to be smuggled to Malaysia. Nine specimens had perished. Four crew members were arrested.

Malaysiakini: <http://bit.ly/1N8fwFP>, 11 November 2015

MALAYSIA: On 6 November 2015, Penang's Wildlife and National Parks Department (Perhilitan) found 46 pangolins in the boot of an abandoned car in Butterworth.

New Straits Times: <http://bit.ly/1RTNsWG>, 6 November 2015

VIET NAM: On 25 March 2016, 129 suspected Sunda Pangolins *Manis javanica* (535 kg) were seized from a car at Mong Cai, Quang Ninh province. Two people were arrested.

On the same day, in Quang Ninh province, 104 kg of pangolins *Manis* spp. were recovered from a vehicle. One arrest.

(see also Other / multi-seizures)

<http://bit.ly/123xiCL7>, 30 March 2016; <http://bit.ly/123Hq3fg>, 4 April 2016

ZIMBABWE: Zimbabwe imposes a nine-year minimum mandatory gaol sentence for pangolin trade offences.

In November 2015, it was reported that police officers Tinashe Mushaikwa and Albert Gwere from Gokwe had been sentenced to 10 years' imprisonment after being found in possession of a pangolin. The duo had been part of a four-member gang; their accomplices Gordon Chitima, and James Matsungu were sentenced to imprisonment for nine years. They were caught in October 2015 after authorities were tipped off and a detective posed as a buyer.

The police officers will effectively serve nine years: according to the Magistrate, each of the 10 years is suspended for six months on condition the duo do not commit a similar offence in the next five years, and four months suspended on condition of good behaviour.

On 9 December 2015, Osman Friday of Harare was gaoled for nine years for possessing a pangolin. He was arrested after police officers posed as potential pangolin buyers.

On 14 December 2015, two men were each given nine-year gaol sentences for possessing a pangolin after attempting to sell the animal to undercover police officers. Joseph Masakanya went straight to gaol; the court had not decided what action to be taken in the case of the second subject, Stanley Madhaiza, who was unwell.

On 8 February 2016, Moses Gatsi was sentenced to nine years' imprisonment for being in possession of a pangolin. He was arrested after offering a pangolin for sale to police, who were acting as buyers.

(see also Other / multi-seizures)

<http://bit.ly/1GHEEA1>, 2 November 2015; *New Zimbabwe:* <http://bit.ly/125ZGe9S>, 9 December 2015; *New Zimbabwe:* <http://bit.ly/1NQI8Bq>, 14 December 2015; *Newsday:* <http://bit.ly/1TQZrFK>, 9 February 2016

REPTILES / AMPHIBIANS

CHINA: In November 2015, Customs officials at Shanghai Pudong International Airport intercepted a parcel declared as "crabs" arriving from Indonesia. On inspection it was found to contain 2000 live turtles, including 53 Black Pond Turtles *Geoclemys hamiltonii* (CITES I), and the following CITES-II listed species: 1290 South Asian Box Turtles *Cuora amboinensis*, 1002 Pig-nosed Turtles *Carettochelys insculpta*, 30 Asian Leaf Turtles *Cyclanops dentata*, plus 160 *Emydura subglobosa*.

On 29 January 2016, Customs officials in Haikou, Hainan province, seized 68 000 pieces of python skins and arrested 16 suspects during a raid in five cities in Hainan, Fujian and Guangxi provinces. A local company is alleged to have obtained a wild animal import licence to produce folk instruments, but since 2014 had been smuggling python skins from Viet Nam.

<http://bit.ly/125ZHlpZ> [in Chinese] 31 January 2016; *Shanghai Daily:* <http://bit.ly/1VyyzL5>, 18 March 2016

INDIA: On 12 January 2016, at least 5000 tortoises were seized from 75 sacks on a lorry at a check post in Dumka district, Jharkhand, including Indian Star Tortoises *Geochelone elegans* (CITES II); around 107 tortoises were dead. Two people evaded capture. The live animals were released into a lake in Dumka district.

On 20 March 2016, at Mumbai Airport, Customs officials seized 146 tortoises from the luggage of a Nepali in transit from Madagascar who had continued on to Kathmandu leaving the bag behind; it was left undetected for a week. The consignment included 139 Radiated Tortoises *Astrochelys radiata* (two dead), and seven Ploughshare Tortoises *A. yniphora*, both Critically Endangered tortoise species of Madagascar and CITES I-listed. Efforts were under way to return the tortoises to Madagascar.

<http://bit.ly/1KeXBX5>, 13 January 2016; *DNA India:* <http://bit.ly/1pV8rxU>, 20 March 2016; *Mid-day:* <http://bit.ly/1SMuxK3>, 22 March 2016

INDONESIA: In January 2016, a tip-off from the Australian police led to the arrest of two Indonesian students who had smuggled from Papua a Yellow Monitor *Varanus flavescens* (CITES I), 30 Green Tree Pythons *Morelia viridis* (CITES II), three Emerald Tree Monitors *V. prasinus* (CITES II), a Peach-throated Monitor *V. jobiensis* (CITES II), a Blue-tailed Skink *Cryptoblepharus egeriae* and a Frilled-neck Lizard *Chlamydosaurus kingii*. The duo had reportedly been involved in an online international wildlife trafficking operation since 2012, primarily trading in reptiles. Both were sentenced to five months' gaol.

The Sydney Morning Herald (Australia): <http://bit.ly/1QXR3Rv>, 11 February 2016

SINGAPORE: On 14 October 2015, Russian nationals Maksim Pavlychev and Aleksei Radkov were each sentenced to 15 months' in gaol for the attempted smuggling of 206 Black Pond Turtles *Geoclemys hamiltonii* (CITES I). Their sentences were backdated to 9 July when they were detained after the reptiles were found in their luggage as they transited Changi Airport, en route from Bangladesh to Surabaya, Indonesia. The turtles were dehydrated and in poor condition; 27 have since perished or were put down. The remaining specimens were placed under the care of Wildlife Reserves Singapore.

Today: <http://bit.ly/1Lm4xBU>, 14 October 2015

THAILAND: On 22 December 2015, a man was arrested in Prayuen district, Khon Kaen province, after he offered several protected wildlife species for sale over the internet, including Burmese Starred Tortoises *Geochelone platynota* (CITES I) stolen from a Myanmar wildlife conservation centre in October. Also seized were African Spurred Tortoises *Geochelone sulcata* (CITES II) and marmosets.

Markings on the Burmese Starred Tortoise shells matched those of specimens for which the Burmese authorities had sought the co-operation of the Thai authorities in the recovery of the specimens following their theft.

<http://bit.ly/1TROvtd>, 23 December 2015

RHINOCEROSSES

All species of Rhinocerotidae are listed in CITES Appendix I except the South African and Swaziland populations of *Ceratotherium simum simum*, which are listed in Appendix II.

MOZAMBIQUE: On 9 November 2015, at Maputo International Airport, police arrested a Vietnamese national carrying 14 pieces of rhinoceros horn (plus 59 Lion *Panthera leo* (CITES II) claws and 49 teeth believed to be Lion).

On 11 March 2016, police at the airport seized 76 kg of rhinoceros horns from two cases as they were being put on a flight to Kenya.

Star Africa: <http://orangedigital.net/1MtUlse>, 9 November 2015; *Shanghai Daily:* <http://bit.ly/1M49zsU>, 15 March 2016

NAMIBIA: On 21 December 2015, at Opuwo Magistrates' Court, Chinese businessman Xu Jin Den was sentenced to 10 years in gaol (or ordered to pay NAD100 000 (USD6500) for the illegal possession of two rhinoceros horns which the defendant said he had purchased from local people in Sesfontein.

The Namibian: <http://bit.ly/22tYsfD>, 22 December 2015

SOUTH AFRICA: On 27 October 2015, at Nelspruit Regional Court, Andolino Mulcube and Jermano Tive were gaol for 14 years for killing and dehorning a White Rhinoceros *Ceratotherium simum* and for killing a second rhinoceros, in Kruger National Park in January 2013. Their sentences comprised three months for entering South Africa illegally, four years for illegal entry into the park, seven years for killing and dehorning a rhinoceros, and seven years for killing the second rhinoceros (sentences on count one and two to run concurrently, while count three and four would run consecutively).

On 12 November 2015, at Klerksdorp Regional Court, Bennet Navunga of Mozambique was sentenced to eight years' imprisonment after being found in possession of an unlicensed hunting rifle. He was arrested with five other suspects in July 2013 during a road block in Klerksdorp, North West, after authorities established that the suspects were intending to poach rhinoceroses at a game reserve. Three were granted bail and are still at large. Navunga will have to spend two-thirds of his sentence in gaol before he becomes eligible for parole.

On 11 March 2016, at Ladysmith Regional Court, two women received gaol terms for rhinoceros poaching: Confidence "Angel" Mlambo was sentenced to three years for conspiracy to hunt rhinoceroses; four years for illegal possession of a firearm and six months for possession of ammunition. On all counts, half of the imprisonment is suspended, making her effective gaol term two years. Nokwanda Khumalo was sentenced to three years for conspiracy to hunt rhinoceroses; four years for illegal possession of an unlicensed firearm and a further six months for possession of ammunition. On all counts, half of the imprisonment is suspended, making her effective gaol term also two years.

News24: <http://bit.ly/1GlehK8>, 27 October 2015; *Times Live:* <http://bit.ly/1N8hNAI>, 12 November 2015; *Ladysmith Gazette (South Africa):* <http://bit.ly/1P9CRB0>, 11 March 2016

TANZANIA: On 17 December 2015, at Mbeya Resident Magistrates' Court, Chinese nationals Song Lei, Xiao Shaodan, Chen Jianlin, and Hu Liang, were each sentenced to 20 years' imprisonment for smuggling 11 rhinoceros horns into the country from Malawi by car. They were also fined Sh9 billion (USD2.8 m) each.

Reuters: <http://reut.rs/1YqIA9H>, 18 December 2015

UK: On 4/5 April 2016, at Birmingham Crown Court, members of an organized crime gang accused of carrying out raids on museums and auction houses to steal rhinoceros horn and

high-value artefacts from UK museums were given gaol sentences of up to six-and-a-half years. In all, 13 men were sentenced over two days resulting in convictions for a conspiracy that spanned the UK, the Irish Republic, several European countries, Hong Kong and the USA. The gang also recruited others to undertake some of the raids to secure the rhinoceros horn and other artefacts which were reportedly later smuggled to Asia.

Daniel "Turkey" O'Brien of Cottenham, Cambridgeshire, was gaol for 6 years, 8 months. John "Kerry" O'Brien and Michael Hegarty both of Cottenham, Cambridgeshire and Rathkeale, Ireland, were gaol for 6 and a half years. Gaol for 5 and a half years were: Richard "Kerry" O'Brien Jr, of Cottenham, Cambridgeshire; Paul Pammen of Southend-on-Sea; Alan Clarke of London; Richard Sheridan of Cottenham, Cambridgeshire, Patrick Clarke of London and Donald Wong of London. John "Cash" O'Brien of Wolverhampton was sentenced to 5 years, 3 months in gaol, as was Ashley Dad, of Wolverhampton, who did not appear in court; Terrence McNamara of Belfast, and Daniel Flynn of Cottenham, Cambridgeshire, were gaol for 4 years. A 14th man was convicted and sentenced last year for his part in the crime. None of the stolen items has been recovered.

The Guardian (UK): <http://bit.ly/1N8rejz>, 4 April 2016; *The Irish Times:* <http://bit.ly/1NobR1m>, 4 April 2016; <http://bit.ly/1XviAML>, 5 April 2016

USA: On 21 October 2015, taxidermist James Hess of Iowa was sentenced to 27 months in gaol for buying and selling Black Rhinoceros *Diceros bicornis* horns, plus three years' supervised release after serving his gaol term. Hess arranged to acquire horns from an Oregon man in August 2011 and ship them to Iowa, where another man was to transfer them to California. He also purchased and resold at least two sets of Black Rhinoceros horns in 2011.

On 16 December 2015, San Francisco art dealer Lumsden Quan was sentenced in Las Vegas to a year in gaol for illegally selling Black Rhinoceros *Diceros bicornis* horns to an undercover agent. He was also given three years of supervision after his gaol sentence has been completed, fined USD10 000, and banned from working in the arts/antiques business for three years.

On 13 January 2016, Irish national Patrick Sheridan was sentenced to one year in gaol for the illegal trade in Black Rhinoceros *Diceros bicornis* horns. British agents, acting on a US warrant, arrested Sheridan in Holyhead, Wales, in 2015 and extradited him to the USA. Along with two others, he illegally bought rhino horns in Texas through a "straw buyer"—someone who makes a purchase for a client—and resold the horns in New York. Sheridan also used false documents to try to hide the illegal purchase. One of the other suspects was gaol for a year in 2014.

<http://yhoo.it/1PlwIQT>, 21 October 2015; *Washington Times:* <http://bit.ly/1Ypp5Qa>, 17 December 2015; *Voice of America:* <http://bit.ly/1TXcL8N>, 13 January 2016

ZIMBABWE: In January 2016, a court in Masvingo sentenced Tawengwa Machona to 35 years' in gaol for the poaching of two rhinoceroses. His sentence will be reduced to 20 years if he pays USD480 000—the estimated value of the animals—within five years.

The animals were killed in 2014/2015 in the Save Valley Conservancy. Two accomplices are being charged separately. The alleged ringleader is reportedly an assistant officer in Zimbabwe's secret service. Two others are on the run.

News 24: <http://bit.ly/1UpPqMV>, 1 January 2016

FLORA

HONG KONG: On 8 October 2015, Customs detected 7015 logs (a reported one million kg) of suspected Malagasy Rosewood *Dalbergia baronii* (CITES II) from incoming cargo from Tanzania.

Hong Kong government press releases: <http://bit.ly/1VISWfs>, 12 October 2015; <http://bit.ly/1Q6Qsth>, 4 February 2016

INDIA: On 4 November 2015, 94 logs (3740 kg) of Red Sanders *Pterocarpus santalinus* (CITES II) were seized from a cattle shed during a raid in Vizianagaram, Andhra Pradesh.

On 24 March 2016, the Red Sanders Anti-Smuggling Task Force seized two tonnes of Red Sanders logs after being notified that woodcutters, after felling trees at Pincha and Rollamadugu on the Chittoor-Kadapa border, were loading the logs into a tipper near Chandragiri.

Business Standard: <http://bit.ly/1WzHg4Y>, 4 November 2015; The Hindu: <http://bit.ly/22QBzVe>, 25 March 2016

USA: On 1 February 2016, at a federal court in Norfolk, Virginia, the largest-ever penalty for violation of the Lacey Act was imposed on Lumber Liquidators Inc. for the illegal importation of hardwood flooring, much of which was manufactured in China from timber that had been illegally logged in Far Eastern Russia. The company was fined more than USD13 million, including USD7.8 million in criminal fines, USD1.23 million in community service and USD969 175 in forfeited assets; they agreed to a five-year term of organizational probation and mandatory implementation of a government-approved environmental compliance plan and independent audits and were also ordered to pay more than USD3.15 million in cash through a related civil forfeiture.

Department of Justice Office of Public Affairs: <http://www.usa.gov/1QCZu2e>, 1 February 2016

OTHER / MULTI-SEIZURES

CHINA: On 21 January 2016, at Jiaocheng District People's Court, Bozhou City, Anhui province, a man and his wife were respectively

sentenced to eight years in gaol/fined CNY800 000 (USD123 000) and eight months/fined CNY2000 for buying wildlife products and selling them in their pharmacy in Bozhou.

In 2015, police confiscated from them 10 kg of pangolin scales, 103 musk *Moschus* (CITES I/II) pods, and Leopard *Panthera pardus* (CITES II) bones.

On 4 February 2016 at the Takeshenken border check point, Altay Prefecture, Xinjiang Uyghur Autonomous Region, police arrested a gang attempting to import wolf *Canis* carcasses. A total of 148 wolf skins, six carcasses and 255 decorative amulets made from wolf bones, meat and offal were discovered after police noticed that several containers smelled of rotting fish. The items were reportedly destined for sale on the exotic animal meat black market.

On 24 March 2016, seven people were gaoled for between 18 months and 12 years for illegally killing, transporting and trading protected species. The investigation began in October 2014 when police were called to a flat in Chengdu, Sichuan province, after a resident reported blood seeping from the ceiling of his flat; after breaking into the room above, police discovered 804 kg of ivory (CITES I), plus rhinoceros horn, five Golden Snub-nosed Monkeys *Rhinopithecus roxellana* (CITES I)—two still alive—Red Pandas *Ailurus fulgens* (CITES I), as well as bear *Ursus* (CITES I/II) body parts (including six heads and 76 limbs and paws) on the blood-soaked floor and in freezers. The two surviving monkeys were sent to a zoo.

China Wildlife Conservation Association: <http://bit.ly/1Mu5wGT>, 21 January 2016; Daily Mail (UK): <http://daily.ai/1XffU5U>, 8 February 2016; South China Morning Post: <http://bit.ly/1S6EDWj>, 27 March 2016

GUINEA: On 9 February 2016, three people were arrested in possession of 106 kg of wild meat, including that of Chimpanzee *Pan troglodytes* (CITES I). A motorbike rider arrested while distributing Chimpanzee meat gave police the identity of the owner of the meat and reportedly the head of a regional network of traffickers in Chimpanzee and ape meat involving poachers and traffickers from Sierra Leone over a 14 year-period. The third member of the gang was arrested in another operation with several bags of meat of Chimpanzees and other protected species.

The EAGLE network: <http://bit.ly/1qHV8Bi>, 9 February 2016

INDIA: On 10 December 2015, in Amravati, Nagpur, Ranjit Bhatia, Dalbir Bawariya and Sarju Bawariya were sentenced to gaol for seven years and fined Rs10 000 (USD150) for involvement in Tiger *Panthera tigris* (CITES I) poaching in Melghat Tiger Reserve in February 2013.

This is one of the first cases in the country where DNA analysis was used to conclude that a Tiger had been poached. Officials had seized an iron trap, rotten Tiger meat and cash and investigations involved preparation of maps of the crime scene, sniffer dogs and metal detectors. The poachers were part of an international racket

to hunt Tigers and smuggle their body parts to China. They were in gaol during the trial where they have already spent two years for previous Tiger poaching incidents.

On 11 February 2016, Customs officials at the Inland Container Depot in Tughlaqabad seized more than 15 000 kg of coral, later identified as Organ-pipe Coral *Tubipora musica* (CITES II) from a container arriving from China, apparently destined for medicinal and ornamental purposes. A Delhi-based importer was arrested. Officials claim this to be the biggest haul of red corals in the South-east Asian region in recent times.

On 13 March 2016, a man was arrested in possession of five Tiger *Panthera tigris* (CITES I) skins and bone (125 kg) in Haridwar district, Uttarakhand. It was reportedly the first case where Tiger skins and bones have been recovered in such quantities in the State.

Times of India: <http://bit.ly/1SRGZJQ>, 11 December 2015; <http://bit.ly/1PzueDv>, 13 February 2016; Kaumidi online: <http://bit.ly/1U3ocQm>, 14 March 2016

INDONESIA: On 20 November 2015, it was reported that a person appearing at the district court of Langsa, Aceh, had been gaoled for two years for trading in Sumatran Orang-utans *Pongo pygmaeus* (CITES I). He was also fined Rp50 million (USD3700) or ordered to serve three more months in gaol. The defendant had been arrested on 1 August and three Orang-utans and a Brahminy Kite *Haliastur indus* (CITES II), among other birds, were seized.

<http://bit.ly/1RU48xr>, 20 November 2015

THAILAND: On 10 December 2015, Customs officials at Samui International Airport in Surat Thani confiscated 280 African Elephant *Loxodonta africana* tusks (789 kg) and 587 kg of pangolin scales from a container labelled as "wigs" that had arrived on a flight from Nigeria via Singapore, destined for Lao PDR.

OANA news: <http://bit.ly/1RqvXxK>, 12 December 2015; Samui-passion.com: <http://bit.ly/1Vp8tvm>, 19 December 2015

VIET NAM: On 22 November 2015, Customs officers at Hoanh Mo Border Gate, Quang Ninh, seized 860 kg of tusks of Indian Elephant *Elephas maximus* (CITES I) and 2116 kg of pangolin (*Manis*, CITES II) scales that had been smuggled into the country from Taiwan in 105 boxes of frozen fish heads, bound for an undisclosed destination.

On 31 March 2016, Customs officials at Noi Bai Airport seized 238 kg of ivory and 248 kg of pangolins *Manis* scales arriving from Nigeria via Turkey by air, described as "hair attachments".

Haiquan online: <http://bit.ly/1SfCdtU>, 23 November 2015; TRAFFIC

The use of spiny-tailed lizards *Uromastyx* spp. for medicinal purposes in Peninsular Malaysia

Or Oi Ching and Serene C.L. Chng

INTRODUCTION

Spiny-tailed lizards *Uromastyx* spp. consist of 20 recognized species that inhabit the deserts and semi-deserts from northern Africa across the Middle East to north-western India (Wilms *et al.*, 2009; Wilms, *et al.*, 2010). Also known as dabb or dhab lizards, they are hunted and traded for their purported medicinal value, as well as for meat and for the pet trade (Mahmood *et al.*, 2011; Subramanean and Vikram Reddy, 2012; Wilms *et al.*, 2012; Das *et al.*, 2013; Pradhan *et al.*, 2014). Large numbers are taken from the wild in Saudi Arabia and sold to middlemen for around SAR1000–1500 (USD9–USD14)¹ (Anon, 2015; Faiza, 2015). Poaching techniques include pouring water or blowing smoke into burrows to force animals out, or shooting them with guns (Reuters, 2013; Faiza, 2015). The lizards are often kept alive until delivery to slaughterhouses, with their spines often broken to prevent them from escaping (Conservation India, 2014; Faiza, 2015).

Of the known *Uromastyx* species, eight are listed in the IUCN Red List of Threatened Species, with two assessed as Vulnerable, three as Near Threatened and three as Least Concern (IUCN, 2015). The entire *Uromastyx* genus has been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1977, prohibiting international commercial trade in wild specimens of the species unless accompanied

by the required CITES export permits. A study on CITES data trade records of *Uromastyx* spp. reported over 200 000 specimens traded internationally, with an increasing trend after 1994 (Knapp, 2004). Spiny-tailed lizard species are also protected by national laws in many range countries.

Unregulated and unsustainable hunting of spiny-tailed lizards may adversely affect the ecosystem (Yom-Tov, 2003), as they are an important prey species (Conservation India, 2014), and their burrows serve as thermal refuges for many other species (Wilms *et al.*, 2010). These lizards feed on plants and insects, providing some degree of pest control, and are also scavengers (Castilla *et al.*, 2011; Subramanean and Vikram Reddy, 2012).

BACKGROUND

The sale of spiny-tailed lizard parts and products used for traditional medicine in Peninsular Malaysia first came to TRAFFIC's attention in the early 1990s, when instances were reported by concerned members of the public (C.R. Shepherd, pers. comm., 2013) and were observed by TRAFFIC staff, with night market stalls selling the products sometimes displaying boards explaining the lizard's purported medicinal values (S. Broad pers. comm., 2015). Such products have reportedly been promoted in Malaysia since at least 1995 as a treatment for over 20 critical illnesses such as diabetes, heart disease, hypertension, gout, kidney problems and sexual dysfunction (Utusan Melayu, 2014) (Fig. 1).



Fig. 1. Material distributed in Malaysia promoting use of spiny-tailed lizard-based traditional medicine as a treatment for over 20 critical illnesses.

¹Exchange rate of USD1=SAR3.75 (OANDA, September 2015).



Fig. 2. Spiny-tailed lizard-based products displayed and promoted at the Malaysian Agriculture, Horticulture and Agrotourism Fair, 2014. Picture shows skins, capsules, coffee-mix, live animals, a video showing how spiny-tailed lizards are being captured in the wild and a photo book describing how the animal is further processed.

In 2012, a vendor was reportedly offering spiny-tailed lizard-based products at the biennial Malaysia Agriculture, Horticulture and Agrotourism (MAHA) Fair. During a visit by the first author to the MAHA Fair in 2014, the vendor was found promoting such products, including capsules, oils, dried skins and coffee-mix sachets, along with six live juvenile spiny-tailed lizards (Figs. 2 and 3) (Or, O.C., pers. obs.). When asked, the vendor stated that animals used for medicinal production were wild-caught Egyptian Spiny-tailed Lizards *Uromastix aegyptia* sourced from Egypt, and that no successful commercial captive breeding facilities currently exist. In 2013, TRAFFIC received photographs from an anonymous source showing a roadside vendor selling spiny-tailed lizard-based products and displaying live spiny-tailed lizards at the National Mosque compound in Kuala Lumpur.

These ad-hoc reports of trade led to a more comprehensive study by TRAFFIC in 2015 to assess the uses and legality of spiny-tailed lizards traded for medicine in Malaysia.

LEGISLATION

In Malaysia, federal laws apply across the nation and take precedence over State laws enacted by State Legislative Assemblies. However, under the constitution of Malaysia, some federal laws are applied differently in Sabah and Sarawak on a number of matters, such as national resource management. As CITES-listed species, international commercial trade in spiny-tailed lizards is regulated by the *International Trade in Endangered Species Act 2008* (federal law). Individuals violating this Act can be fined up to MYR100 000² (USD27299) or sentenced to seven years' imprisonment, or both, upon conviction. Spiny-tailed lizards are further protected as a genus under the

Wildlife Conservation Act 2010 in Peninsular Malaysia, *Wild Life Protection Ordinance 1998* in Sarawak and *Wildlife Conservation Enactment 1997* in Sabah. In Peninsular Malaysia, where the trade is observed in this study, any violation of the *Wildlife Conservation Act 2010* carries a fine of up to MYR50 000 (USD13 650) and/or two years' imprisonment. The penalty is higher where immature or female specimens are involved.

Furthermore, under the *Sales of Drugs Act 1952*, all pharmaceutical products for sale in Malaysia, including traditional medicines, require compulsory registration with the Drug Control Authority under the Ministry of Health's National Pharmaceutical Control Bureau (NPCB). The *Medicines (Advertisement and Sale Act) 1956* requires that all medicines for sale list all active constituents and ingredients in English or Bahasa Malaysia.

METHODS

The availability of spiny-tailed lizard-based products used for medicinal purposes in Kuala Lumpur and the State of Selangor was assessed between January and June 2015. These areas were selected due to previously reported cases of spiny-tailed lizard-based products being offered for sale, and based on background research identifying the highest number of distributors there.

An internet search in Malay and English of websites in Malaysia on the availability of spiny-tailed lizard products was first conducted using key words commonly referenced for such products: "*Ubat Dhabsinai*" (Dhabsinai medicine), and "*ubat dhab*" and "*dhab sinai*", both of which refer to *Uromastix*-based medicine. From this search, a total of 143 spiny-tailed lizard product distributors were found and contacted directly by phone. Researchers used semi-structured methods to enquire about spiny-tailed lizard products sold.

Rapid market surveys were then conducted at locations (Kota Damansara, Shah Alam, Masjid Jamek and Chow Kit) where researchers, posing as potential buyers, investigated traditional medicine shops and night



Fig. 3. A live sub-adult Egyptian Spiny-tailed Lizard *Uromastix aegyptia* displayed at the MAHA Fair, 2014. This species is preferred for medicinal use due to its large size.

²Exchange rate of USD1=MYR3.78 (OANDA, June 2015).

ITEMS	PRICE PER ITEM					
	Kuala Lumpur ¹		Selangor ¹		MAHA 2014 ²	
	MYR	USD	MYR	USD	MYR	USD
Live animal	N/A	N/A	N/A	N/A	7000 ^A	2071
Medicated oil (30 ml)	20–45	16.22–11.90	N/A	N/A	30	8.88
Capsules (60 capsules)	70–90	18.52–23.81	80–90	21.16–23.81	90	26.63
Fats	45–50	11.90–13.23	45–50	11.90–13.23	N/A	N/A
Capsules, with additional herb known as Manjakani*	50–90	13.23–23.81	80–90	21.16–23.81	N/A	N/A
Coffee mix (beverage)	N/A	N/A	N/A	N/A	3	0.89

Table 1. Advertised prices of spiny-tailed lizard-based products recorded in this study from market surveys, direct communications with distributors and at the MAHA Fair, 2014. ^AA price was quoted even though the trader claimed the animals were not for sale; *A new product launched in 2015 for women containing Manjakani, a herbal ingredient.

¹Exchange rate of USD 1=MYR 3.78 (OANDA, June 2015); ²Exchange rate of USD 1=MYR 3.30 (OANDA, November 2014).

markets for medicinal products that were displayed on the shelf. Where possible, vendors were asked about the availability of products, prices and types of product. No products were purchased.

To ascertain the levels of legality, data relating to the number of specimens of spiny-tailed lizard species imported into Malaysia between 1990 and 2014 were extracted from the UNEP-WCMC CITES trade database (UNEP-WCMC, various dates). Information from 1990 was included as reports on the trade in spiny-tailed lizard products first emerged in the 1990s.

RESULTS

Availability of spiny-tailed lizard-based products in Peninsular Malaysia

Direct market observations

Of 25 standalone Malay traditional medicine shops and three night markets visited, spiny-tailed lizard products were only observed for sale at two shops, located in Chow Kit, which held the highest concentration of traditional medicine shops of the areas surveyed. One shop had only one bottle of capsules (60 capsules/bottle) for sale, while the other had a maximum of 52 bottles of capsules stacked on a shelf behind the counter. Neither shop had any other spiny-tailed lizard products, with one trader saying that it was “very hard to get stock”, and that “this is a new thing and other shops are starting to stock it”, signalling a potential increase in future availability. Most of the other traders interviewed were not aware of the existence of this product. Some were unfamiliar with the term “*dhab*” but some recognized the trade term “*dhab sinai*” despite not selling *dhab* products.

In addition to the surveys in Kuala Lumpur and Selangor, spiny-tailed lizard products (capsules, oil and dried skins) were also observed for sale in two locations on separate occasions in the State of Perak during the survey period (Or, O.C., pers. obs; Muhamad, H.S., *in litt.*, May 2015).

Direct communications with listed product distributors

Of the 143 distributors across Peninsular Malaysia found through online searches during the course of the survey, 66 based in Kuala Lumpur and Selangor were contacted, of which 53% (n=35 individuals) responded to questions about the availability of spiny-tailed lizard-based products. Of these, 86% of individuals claimed they had spiny-tailed lizard-based products available for distribution in the form of capsules, fats and oil, while the rest said that they were no longer stocking the product. It was not possible to assess the actual quantities of product types that were available.

Internet research

Spiny-tailed lizard-based medicinal products could be easily purchased online and are promoted on many websites and open Facebook pages. A prominent Facebook page offering spiny-tailed lizard-based medicinal products shows a total of 7210 “Likes” and another with 1978 “Likes” (as of 4 January 2016), suggesting a minimum number of people who have seen the advertisements and could be potential consumers.

Only one brand of spiny-tailed lizard-based product was found during the study, which is registered under a local company and manufactured in Malaysia. It seems to be the only company in Malaysia selling this brand to traditional medicine shops and independent distributors in Peninsular Malaysia. Products available were in the forms of capsules, oils, fats³, coffee-mix and as whole dried skins. From the conversations with traders and online sources, three species are reportedly used: Egyptian Spiny-tailed Lizard *Uromastix aegyptia*, Sudan Mastigure *U. dispar* and North African Spiny-tailed Lizard *U. acanthinura*.

³Sellers use the term “*lemak*” for fat taken directly from the animal, and either sold raw or processed into oils.

Prices

Market prices for various spiny-tailed lizard products ranged from between MYR3 (USD0.89) for a packet of coffee-mix claiming to contain spiny-tailed lizard derivatives, to MYR50–90 (USD13.23–23.81) for a bottle of 60 capsules, which was the most commonly available product. A live animal was said to be worth MYR7000 (USD2071) but was not for sale (Table 1).

CITES trade records

According to the UNEP-WCMC CITES trade database, a total of 834 live animals categorized as “live” were imported into Malaysia between 2000 and 2014 (Table 2), with no records available prior to that. Many animals were re-exported from the USA, and mostly originated from Mali (Table 2). The importation of parts or derivatives has never been recorded on the database. Although spiny-tailed lizard-based products were observed for sale in the country in 1994 (S. Broad, pers. comm., 2015), there were no records of spiny-tailed lizards being imported into Malaysia between 1990 and 1999, which suggests that during the 1990s, any animals or derivatives brought into the country were imported without official documentation.

DISCUSSION

Legality issues of trade in Malaysia

As stated above, only one product brand is being offered for retail sale in Malaysia, and appears to be owned by a Malaysian-registered company. It has only been permitted to keep one species—Sudan Mastigure—according to the approval document displayed on the company’s website. However, there are claims by the trader in online sources that these spiny-tailed lizard-based products are made of Egyptian Spiny-tailed Lizard. Nowhere on the packaging

of products observed for sale are any spiny-tailed lizard species mentioned (Fig. 4), despite their being advertised as the main active ingredient. It is possible that by not listing the species on the ingredients list, manufacturers evade screening processes by NPCB and DWNP.

Despite the reported sale of spiny-tailed lizard-based medicinal products in Peninsular Malaysia since the early 1990s (Utusan Melayu, 2014; S. Broad, *in litt.*, February 2016), the CITES trade database has no record of the importation of this genus into Malaysia between 1990 and 1999, and no records of parts and derivatives (UNEP-WCMC, various dates). This does not correspond with the sellers’ claims on their website that dried spiny-tailed lizard (assumed to be parts and derivatives) were obtained from suppliers in Egypt for further processing into products in Malaysia. Furthermore, Egypt has imposed an export ban on some *Uromastix* species including *U. aegyptia* since 1992 (CITES, 1992). This suggests that animals and their parts may have been imported into Malaysia without official documentation (i.e. contravening CITES). An unverified source from 2010 claimed that he had smuggled live spiny-tailed lizards from Jordan into Malaysia in his check-in bag (Kamato, 2010) and it is possible that some products could have been sourced from smuggled animals. These apparent discrepancies should be checked and verified by the authorities.

From 2013–2014, three trade observations about the sale of spiny-tailed lizard-based products involving one night market stall and two premises were reported to the Department of Wildlife and National Parks (DWNP). Two of the raids did not find any spiny-tailed lizard parts and derivatives, while another resulted in confiscation of two suspected spiny-tailed lizard trophies, with investigations ongoing (MYCAT, 2015).

As a traditional medicine, spiny-tailed lizard-based products in the form of capsules sold need to be (and have been) registered by NPCB. However, despite the claims

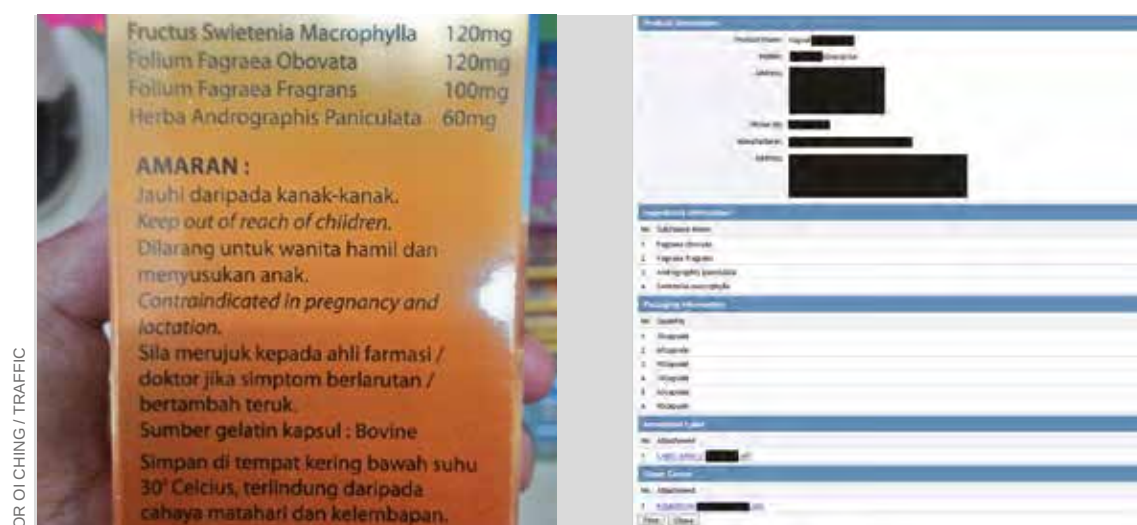


Fig. 4. Spiny-tailed lizard derivatives are not included in the list of ingredients for the Ministry of Health (MOH) registration of this medicinal product (nor on the product packaging, left).

Source: MOH Pharmaceutical Services Division

Year	Taxon	Exporter	Origin	Importer reported quantity	Source ¹
1990–1999		No records of trade			
2000	<i>Uromastix dispar</i>	Ghana	Mali	10	W
2005	<i>Uromastix geyri</i>	USA	Niger	20	W
2005	<i>Uromastix ocellata</i>	Sudan		50	W
2006	<i>Uromastix aegyptia</i>	Jordan		20	C
2006	<i>Uromastix ornata</i>	Jordan		30	C
2007	<i>Uromastix dispar</i>	USA	Mali	10	W
2007	<i>Uromastix geyri</i>	USA	Mali	10	W
2008	<i>Uromastix dispar</i>	Mali		4	W
2008	<i>Uromastix geyri</i>	USA	Niger	25	W
2009	<i>Uromastix dispar</i>	USA	Mali	6	W
2009	<i>Uromastix geyri</i>	USA	Mali	16	W
2010	<i>Uromastix acanthinura</i>	Sudan		200	W
2010	<i>Uromastix geyri</i>	USA	Ghana	10	W
2010	<i>Uromastix ocellata</i>	Sudan		200	W
2010	<i>Uromastix ornata</i>	Sudan		200	W
2011	<i>Uromastix</i> spp.	USA	Mali	9	W
2011	<i>Uromastix</i> spp.	USA	Chad	2	W
2011	<i>Uromastix geyri</i>	USA	Mali	8	W
2012	<i>Uromastix geyri</i>	USA	Mali	4	W
2013–2014		No records of trade			
Total				834	

Table 2. Live Spiny-tailed lizard species reported to have been imported for commercial purposes by Malaysia between 1990 and 2014.

¹the reported source of the transaction relates to the original source of the species being traded: W=specimen taken from the wild; C=animals bred in captivity. Source: CITES Trade database

that the main active ingredient in the capsules is spiny-tailed lizard derivative, products observed in trade during this survey did not list it as an ingredient; only plant-based ingredients were listed (Fig. 4). This appears to be a violation of the *Medicines (Sales and Advertisement) Act 1956*. Both authorities have been contacted to alert them to this, and to clarify the registration status of the company and product.

Trade dynamics of spiny-tailed lizard-based products in Malaysia

Products of this company have been promoted as the only medicinal products containing spiny-tailed lizards available in Malaysia and have been marketed openly for over a decade, evolving into a business that could be gaining in popularity, as suggested by the company's frequent participation in trade fairs and the introduction of a new product. The availability of spiny-tailed lizard-based products for sale for more than two decades suggests there is a steady supply and demand. Furthermore, these products are actively promoted at various national trade events such as MAHA and the Malaysian International Halal Showcase, a trade show promoting Halal products and services to international markets.

Online sources promoting the products appear to target a Muslim audience as products are promoted as *halal*, a binding Islamic certification concerning the consumption of certain products/foods according to religious rules.

Dhabsinai capsule products are certified *halal* by the governmental Department of Islamic Development Malaysia (JAKIM). Product brochures also promote spiny-tailed lizards as herbivores and consumption is therefore not prohibited in Islamic scripture; however, it is worth noting that Castilla *et al.* (2011) have presented evidence of scavenging behaviours in Egyptian Spiny-tailed Lizards. It is unclear if this new finding will affect the *halal* status of spiny-tailed lizards; this will require further investigation.

Conservation concern

Overhunting of spiny-tailed lizard species has been reported as a threat to their survival in range countries, including Egypt, India and Pakistan (Wilms *et al.*, 2012; Rasheed, 2013; Conservation India, 2014); locals in Saudi Arabia have reported dwindling numbers of spiny-tailed lizards as a result of overhunting (Reuters, 2013), and in some regions the species can no longer be found (Habib, 2014). Often, this animal is sold in local markets in large numbers (Abdulaziz *et al.*, 2001). One of the species claimed to be used in medicines in Peninsular Malaysia—the Egyptian Spiny-tailed Lizard—is already listed as Vulnerable by IUCN, with a decreasing population trend and trade cited as a conservation threat (IUCN, 2015). More consistent monitoring is required to understand the prevalence of trade in Malaysia or other countries, and the impact on wild populations.

CONCLUSIONS

Traditional medicine products reportedly containing spiny-tailed lizard parts and derivatives are being traded in Malaysia. Due to apparent discrepancies uncovered during this study, there are concerns that some of this trade may be taking place without proper import documentation. Furthermore, registered products observed do not include spiny-tailed lizards and derivatives on the ingredients list despite their being advertised as the main active ingredient. This omission contravenes Malaysian legislation governing the sale and advertising of medicines.

TRAFFIC is working with DWNP and NPCB to verify the trade of spiny-tailed lizard products, and to recommend follow-up regulatory actions where required. Further monitoring and comprehensive investigation into the trade of this genus in Malaysia is recommended. As this emerging trade could potentially be a threat to wild spiny-tailed lizard populations, it is also recommended that range countries from which the animals are exported monitor wild populations and regulate hunting and export.

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Acknowledgements. These should include acknowledgement of funders of research and production, as well as of reviewers and contributors.

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