

Rising internet-based trade in the Critically Endangered ploughshare tortoise *Astrochelys yniphora* in Indonesia highlights need for improved enforcement of CITES

JOHN MORGAN and SERENE CHNG

Abstract The Critically Endangered ploughshare tortoise *Astrochelys yniphora*, endemic to Madagascar, is one of the rarest tortoises. Despite its protection under Malagasy national law and featuring in Appendix I of CITES, heightened interest from reptile collectors over recent decades has expedited the scale of poaching to critical levels. Illegal traders are now turning to online retail platforms and social media to sell this species. We present data from a 5-month study conducted by TRAFFIC in 2015 of online trade in ploughshare tortoises in Indonesia during 2010–2015. We identified 88 advertisements selling 126 ploughshare tortoises from 49 sellers. Fifty-six percent of the advertisements were located on forums or online retail sites and 43% on social media. Since 2012 advertisements on social media increased steadily, to > 90% in 2015. Seventy-five percent of the advertisements were from sellers based in Indonesia, 74% of which were from Jakarta. Prices were USD 509–47,000. The internet provides Indonesian traders with a means to sell protected wildlife comparatively safely and easily. The abundance of illegally sourced ploughshare tortoises openly on offer in online trade in Indonesia highlights a disregard for the law among Indonesian importers and their exporting counterparts. A re-evaluation by CITES of Indonesia's existing legislation is necessary. Devoid of a sound legal framework and sufficient enforcement to uphold these laws, there is no deterrent for traders of ploughshare tortoises and other non-native, CITES-listed species.

Keywords *Astrochelys yniphora*, Indonesia, Madagascar, ploughshare tortoise, social media, wildlife trade

Introduction

The keeping and collecting of exotic pets is becoming ever more fashionable, with the rarest species being especially sought after (Slone et al., 1997; Courchamp et al., 2006; Wilson-Wilde, 2010; Lavorgna, 2015). A consumer's

social status may be increased significantly by the acquisition of rare species, which are often associated with attributes such as money, power and skill (Hall et al., 2008). Accordingly, an estimated 20% of the wildlife trade in recent years is purported to be driven by demand for exotic pets (Nijman & Shepherd, 2007; Nijman et al., 2012; Baker et al., 2013).

The angonoka, or ploughshare tortoise *Astrochelys yniphora*, endemic to Madagascar, is one of the rarest tortoises, with an estimated < 1,000 individuals remaining in the wild (Leuteritz & Pedrono, 2008; Kiester et al., 2013). The species is categorized as Critically Endangered on the IUCN Red List (Leuteritz & Pedrono, 2008; Rhodin et al., 2011), and according to a joint statement produced at the 17th Meeting of the Conference of the Parties to CITES, potentially as few as 100 adults remain. Habitat destruction is undoubtedly a prominent factor in the decline of this species but overexploitation is a more severe and immediate threat (Pedrono & Smith, 2013; Raghavan et al., 2015). Despite being protected under Malagasy national law since 1961 and included in Appendix I of CITES (2017) since 1978, the ploughshare tortoise is at continued risk from poaching for the pet trade (Walker, 2012). Its unique beauty, ever-increasing rarity and value have resulted in heightened international interest from reptile collectors and enthusiasts since the 1990s, which has expedited the scale of poaching to critical levels (Pedrono & Smith, 2013; Currylow, 2015).

There appears to be a significant market demand for ploughshare tortoises in South-east Asia, where they have regularly been reported on sale in markets in Indonesia, Malaysia and Thailand (Nijman & Shepherd, 2007; Stengel et al., 2011; Nijman et al., 2012; Walker, 2012; Kiester et al., 2013). In these countries an increasing number of wealthy collectors of exotic wildlife can purchase protected and threatened species with relative ease because of less-than-adequate policing (Nijman & Shepherd, 2007).

The trade in ploughshare tortoises and other protected wildlife is likely to have been exacerbated by the advent of online trade (Alves et al., 2013; Kiester et al., 2013; Lavorgna, 2014; Chng & Bouhuys, 2015). The introduction of new technologies with which anyone can access the internet cheaply and easily, coupled with the anonymous nature of online trade, has created a comparably easy and secure selling environment not only for established wildlife dealers

JOHN MORGAN and SERENE CHNG (Corresponding author) TRAFFIC, Southeast Asia Regional Office, Unit 3-2, 1st Floor, Jalan SS23/11, Taman SEA, 47400 Petaling Jaya, Selangor, Malaysia. E-mail serene.chng@traffic.org

Received 12 August 2016. Revision requested 20 October 2016.

Accepted 22 February 2017. First published online 19 June 2017.

but also for individual private sellers (IFAW, 2005, 2014), and a substantial proportion of wildlife trafficking now appears to be dependent upon the internet (IFAW, 2005, 2014; Wu, 2007; INTERPOL, 2013). Ploughshare tortoises have been observed for sale on internet forums in China, Indonesia, the Philippines and Thailand since at least 2008 (Walker, 2012; Kiester et al., 2013). The speed at which commercial internet activity has developed since the mid 2000s has left many of the international laws relating to online trade outdated and insufficient (Wu, 2007; IFAW, 2014).

Since the internet first came into mainstream use in the mid 1990s Indonesia has seen an exponential rise in the number of users (Hill & Sen, 1997). Of a population of nearly 250 million people there were 78 million internet users in Indonesia at the end of 2015. Indonesians are amongst the most prolific users of social media, particularly Facebook, outside the USA (Scheepers et al., 2014). With illegal traders worldwide now turning to online retail platforms and social media to sell their products (Lavorgna, 2014; Krishnasamy & Stoner, 2016), it is likely that Indonesia has followed suit, given its history of illegal wildlife trade, and high levels of social media usage (Shepherd et al., 2004; Nijman, 2010).

Indonesia's national laws relating to the regulation of exploitation of wildlife and wildlife products are comprehensive. Licences are required from the Ministry of Forestry and Environment (Kementerian Lingkungan Hidup dan Kehutanan) for any harvesting, transportation or distribution of wildlife. Since 1978 Indonesia has also been a party to CITES in an effort to regulate international wildlife trade (Soehartono & Mardiasuti, 2002). Despite having a well-developed legal framework for the protection of Indonesian species, a loophole is evident when dealing with non-native species.

Previous reports revealed that ploughshare tortoises have been sold online in Indonesia (Walker, 2012; Kiester et al., 2013); however, the scale and magnitude of this online trade is not yet known. This 5-month study, conducted during August–December 2015, was the first systematic attempt to uncover and document the online trade in ploughshare tortoises in Indonesia during 2010–2015. We aimed to assess the scale and severity of the problem, and the potential threat it could pose to the survival of the species, and highlight the challenges for management and regulation of the trade.

Methods

We conducted an online study of the trade in ploughshare tortoises in Indonesia during August–December 2015. Google Adwords were used to identify the most popular search terms in Indonesian relating to the sale of ploughshare tortoises: *jual* and *dijual* (to sell), and *yniphora*, *ynip*

and *angonoka* (ploughshare tortoise). These were input into the Google Indonesia (Google, 2017) search engine to locate all advertisements and posts during 2010–2015. Separate searches were conducted on Facebook and Instagram, as these did not appear in the original Google searches. In Facebook we searched using the same terms, and selected the first 40 groups and profile pages that were identified to be selling tortoises and freshwater turtles. In Instagram we used hashtags (*#dijual*, *#yniphora* and *#angonoka*) to narrow down searches. We conducted only manual searches of these selected groups and individual pages. No automated web scrapers were used.

We carried out 6 hours per week of web searching; time spent collecting background information on the advertisements was in addition to this. We recorded information only where there was a definite intent of sale in the advertisements. We investigated all advertisements where these terms appeared, and collected information on the location, language, price, and the number and size of individuals advertised. No personal data about the sellers were collected and no interaction with sellers took place. When sizes were not given in the advertisement's description we estimated the size from the photographs provided. Based on the information obtained in the advertisements, we grouped the sellers into categories: private sellers, breeders and commercial sellers. Private sellers were traders with no links to commercial trade. Commercial sellers were traders who were associated with either a physical shop or online store (or both). Breeders were differentiated from commercial traders as they either mentioned they were breeding tortoises or they discussed wholesale trade involving multiple species. We also recorded whether there was any mention of legal documents provided with the sale of the tortoise.

To ensure that we evaluated a reliable sample of individuals derived from the advertisements, we followed the methodology of Krishnasamy & Stoner (2016). We attempted to identify individual tortoises either from photographs accompanying the advertisements or from details of size and price provided by the seller. Traders often posted the same advertisement on multiple forums or Facebook groups to increase the chance of sale. In these cases, only the earliest advertisement was counted.

Results

During 2010–2015, 88 unique advertisements selling ploughshare tortoises were recorded. All advertisements were for live pets. Forty-nine unique sellers were identified. The majority of sellers posted only on a single occasion, with only 15 sellers (31%) posting more than one advertisement. Fifty-seven percent of the advertisements were deemed to be from private sellers (31 individuals). Twelve sellers were associated with one of 10 online or offline stores and

accounted for 18% of all advertisements. Posts considered to be from breeders comprised 25% of the advertisements and featured nine sellers.

The total number of ploughshare tortoises on sale in all advertisements (discounting reposts by the same individuals) was 126 individuals, 66 of which were in Indonesia. According to the descriptions given in the advertisements or the accompanying photographs, 58% of the advertisements were selling only one tortoise, 26% were advertising two individuals and 6% were selling three or more.

Of all the advertisements, 56% ($n = 49$) were located on forums or online retail sites (Kaskus, Ceriwis and Carousell), 43% ($n = 38$) were on social media sites (Instagram and Facebook) and one was found on a blog (HumbaLeehum ReptiLia; Fig. 1). From 2010 until the end of 2015 the Indonesian online retail site Kaskus had advertisements for ploughshare tortoises posted every year ($n = 21$), Ceriwis had 27 advertisements exclusively in 2013, and Carousell contained one advertisement in 2015.

Hashtag searches on Instagram uncovered 1,201 hits for the various keywords individually, and yielded 139 hits for the keyword combination of 'ploughshare tortoise' and 'for sale'. On further inspection, 36 of the posts were found to be advertising the sale of ploughshare tortoises and not just tagging random photographs. After discounting the number of reposts, there were nine unique posts remaining, all of which occurred in 2015.

Of 40 Indonesia-based Facebook groups and communities identified to be selling exotic wildlife, including tortoises, 11 contained at least one advertisement selling ploughshare tortoises. These included eight groups (two of which were closed) and three profile pages. The groups that displayed advertisements for ploughshare tortoises had 643–12,141 members, with a median group size of 4,008. Advertisements on Facebook, and social media in general, increased steadily after 2012, apart from a brief absence in 2013 (Fig. 1).

The majority of the advertisements were in Indonesian (66%), followed by English (33%) and Thai (1%). Seventy-five percent of the advertisements were from sellers based in Indonesia. Fifteen percent were from Cameroon (four unique sellers) and only a single advertisement was identified from each of Malaysia, France and Thailand. Of the Indonesian-based advertisements 97% were from Java and 74% were from the capital, Jakarta (Fig. 2).

Only a few advertisements provided prices for the tortoises on sale; the majority of sellers asked potential buyers to send their personal details so that the seller could contact them privately. However, from the prices that were available ($n = 11$), ploughshare tortoises were sold for IDR 7–650 million (USD 509–47,000), with a median price of IDR 19 million (USD 1,374). The tortoises on sale were 5.5–40 cm long, with a median size of 12 cm ($n = 87$). There was a strong positive correlation between the size of the tortoise and the price ($r^2 = 0.679$, $P = 0.03$).

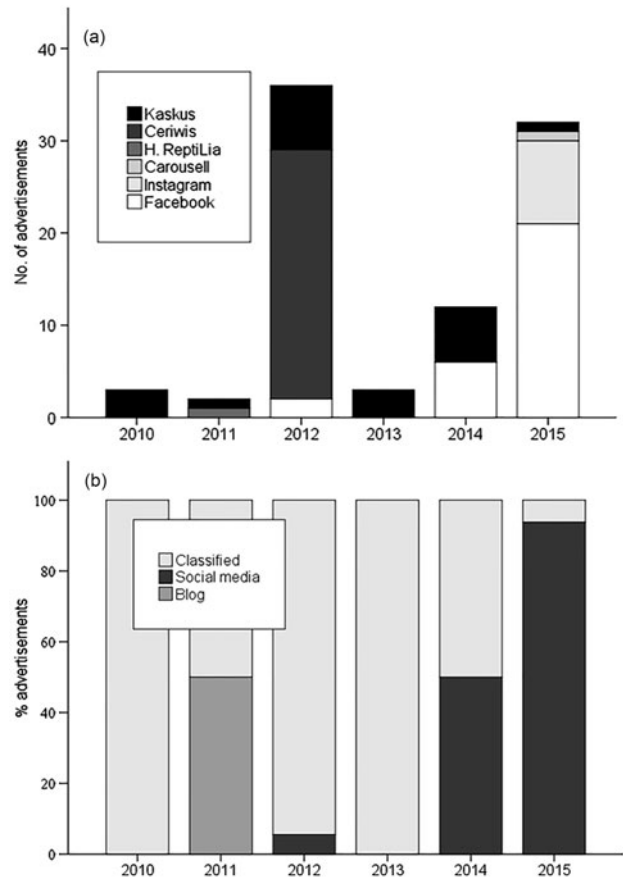


FIG. 1 (a) Number of advertisements for ploughshare tortoises *Astrochelys yniphora* posted online during 2010–2015 in forums, online retail sites, social media and blogs in Indonesia. (b) Percentages of online advertisements for ploughshare tortoises in Indonesia by year and by platform, showing a shift from forums to social media platforms in 2014 and 2015.

Regarding the legality of the sales, only 14 advertisements from four sellers offered paperwork of some description along with the purchase; however, the kind of paperwork was never specified. The four sellers that offered paperwork were all from the group deemed to be breeders. Only breeders offered international shipping. The only other mention of delivery was from a private seller in Jakarta, who stated he would deliver the tortoise personally (presumably within the Jakarta area).

Discussion

We identified 88 advertisements selling 126 ploughshare tortoises on Indonesian internet sites. However, we suspect that some of the advertisements (offering 36 tortoises in total) may have been posted by fraudulent sellers, who receive money from buyers but then disappear without supplying the goods (Walker, 2012; Kiester et al., 2013; Lavorgna, 2014). Fake advertisements were likely to be from the small number of sellers we categorized as breeders ($n = 9$),

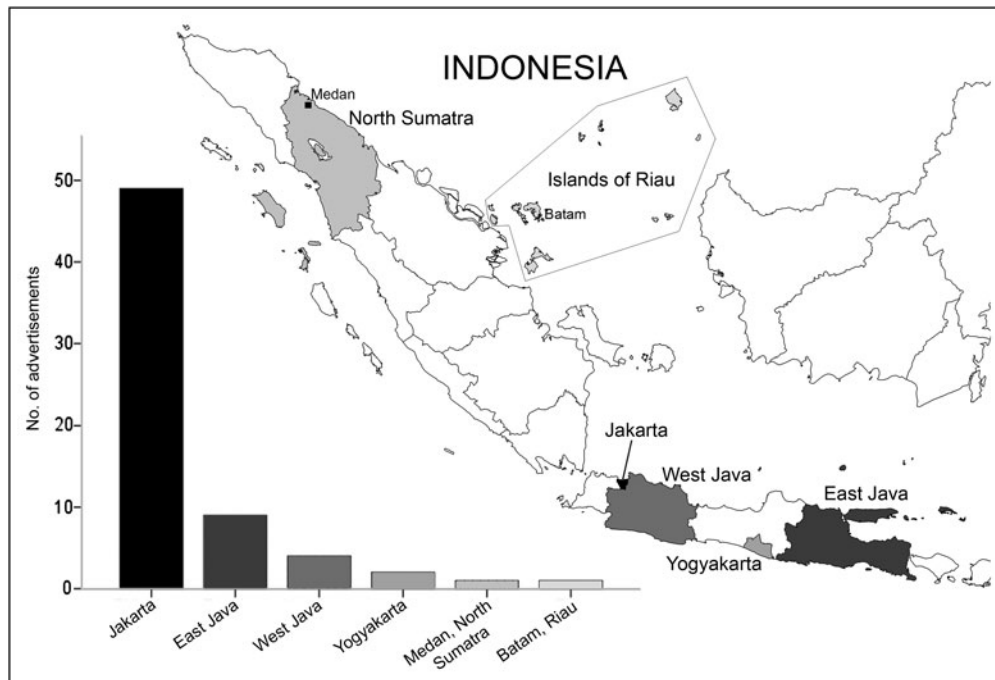


FIG. 2 Frequency and distribution of online advertisements selling ploughshare tortoises across the provinces of Indonesia.

who were operating from outside Indonesia (Cameroon, France, Thailand and Malaysia), and therefore personal delivery would be impossible or impractical and would require a money transfer. Background searches were conducted on these breeders' websites, phone numbers and email addresses, but no additional information was found. Even if these breeders were genuine, there is currently no legitimate commercial captive breeding of ploughshare tortoises, and the tortoises would probably have been wild-sourced (Raghavan et al., 2015). If we accept that these advertisements were fake, their removal leaves a total of 90 ploughshare tortoises for sale.

The rest of the advertisements identified were presumed to be genuine. Traders operating within Indonesia (the majority of which were in Jakarta) often asked potential buyers to send their personal details so that they could discuss the sale via phone and then meet personally to present the tortoise and make the exchange. In these cases traders would find it difficult to convince potential buyers if they did not have the tortoise to sell.

The more conservative figure of 90 individuals may still be a significant underestimation of the actual internet-based trade. We examined only a selection of 40 Facebook groups and profiles. There are potentially thousands more unidentified Facebook profiles and groups that could also be selling ploughshare tortoises. The manual monitoring of Facebook is time consuming, especially considering not all posts were accompanied by identifying keywords, such as the name of the species (e.g. in some cases only photographs of the tortoise were posted under the text 'want to sell'). Therefore, the identification of all advertisements, in the absence of

an automated search tool that could also recognize the species from photographs, was beyond the scope of this study. For this reason, it is likely that many advertisements were missed. Additionally, some advertisements may have been deleted and some groups may have closed and could no longer be viewed. Even during the study period we noticed that a couple of posts were removed, presumably after the sale had taken place. The extent of advertisement removal is difficult to gauge but was potentially more of an issue on social media. The online retail website Kaskus, for example, has an archive version (Kaskus, 2016), which we utilized to retrieve advertisements that had been removed from the main site. As the use of social media to sell ploughshare tortoises is a more recent phenomenon, the data collected prior to this should be reasonably complete.

With an estimated population of < 1,000 ploughshare tortoises even the conservative figure of 90 individuals on sale is equivalent to 9% of the total remaining wild population, and is therefore cause for concern. Furthermore, 77 of the tortoises offered for sale appeared to be based in Indonesia. According to a survey conducted during 2008–2011 (including both online and physical market data) there were estimated to be six illegally held ploughshare tortoises in Indonesia (Kiester et al., 2013). This now appears to be a significant underestimate, especially considering our study did not include physical market data (Morgan, *in press*). Searching sites in Indonesian increased the likelihood of encountering advertisements that searches in English alone would have missed. The Indonesian retail sites (all in Indonesian), in particular Kaskus, featured ploughshare tortoises for sale across the timespan of the

survey. Regarding the longevity of postings, it appears the majority remained online indefinitely, as advertisements were identified as far back as 2010. Manual searches on social media (Facebook and Instagram) also ensured that a more complete set of advertisements were identified.

Since 2012 (but excluding 2013) the number of advertisements on Facebook has increased gradually. A surge in Instagram posts was also noted in 2015, with none being found prior to that year. A study of online trade in all species of freshwater turtles and tortoises also reported that sales on social media had risen sharply in both Indonesia and Malaysia since 2011 (Bouhuys & Van Scherpenzeel, 2015). In Indonesia the rise in the use of social media to sell ploughshare tortoises (and other protected species) over the last couple of years may be a result of increased pressure from Indonesian conservation NGOs on retail websites and platforms such as Kaskus and Tokobagus to ban or block the sale of protected species. This lobbying resulted in Tokobagus agreeing to block the sale of protected species on their website in 2013 (Tejo, 2013). Although Kaskus is still displaying advertisements for protected species (authors, pers. obs., April 2016), the open nature of the website means traders can be easily identified and monitored. Sales on the Ceriwis forum were found only in 2013. The site was founded in 2009, so why there were so many posts ($n = 27$) in that 1 year is unclear. The reason the advertisements stopped afterwards is that the site transformed from a retail site to a news portal and forum.

Facebook is more difficult to monitor and regulate as there is no easy and comprehensive way to run an automated search for keywords or photographs within groups (Hinsley et al., 2016). Online traders can remain relatively anonymous by setting up profiles specifically for trading, and may also use code names to conceal the goods they are selling (Lavorgna, 2014; Yu & Jia, 2015). Furthermore, although most of the groups searched were open access, two were closed groups that required permission to enter. Closed groups provide cover for illegal traders, who can use them to sell protected species easily and freely (Yu & Jia, 2015; Krishnasamy & Stoner, 2016).

Our findings provide more evidence that the internet and, more recently, social media are being used as a platform for selling ploughshare tortoises and other wildlife in Indonesia. Although the majority of the online advertisements (56%) were from established traders and breeders, with links to online and offline stores, the significant proportion of advertisements (44%) from individual/private sellers is of concern. Undoubtedly, the internet has a direct impact on the trade in ploughshare tortoises by providing an avenue for sellers that makes it easy to circumvent international and national wildlife laws, but it may also affect the trade indirectly by increasing demand. Online advertisements and photographs of ploughshare tortoises, particularly in Facebook groups and on Instagram, were regularly

'liked' and commented on by people who expressed envy of the seller/owner of the tortoise. Comments included *mantap* (Indonesian slang for perfection), *super mewah* (very luxurious), *kecil kuranya, harganya super gede* (small tortoise with a very high price), *sangat langka* (extremely rare) and *astaga, ternyata ada di Indonesia juga, beli di mana bro?* (wow, in fact they are here in Indonesia too, where did you buy it?). Such comments could increase the desirability of ploughshare tortoises among tortoise collectors. Furthermore, the potential influence of these comments is significant, given that some of the groups have tens of thousands of members. These social networks provide the opportunity and platform for young enthusiasts or collectors to become traders (Lavorgna, 2014).

The desirability and rarity of ploughshare tortoises is reflected in the prices advertised. The fact that collectors were apparently willing to spend up to USD 47,000 (depending on the size) for a single individual is an indicator not only of their economic means. They regard the ploughshare tortoise, like other rare species, as a commodity that can be used as a status symbol amongst fellow wildlife collectors (Baker et al., 2013).

As ploughshare tortoises continue to be observed for sale in pet shops, markets and reptile expos (Morgan, [in press](#)), it remains uncertain whether online trade is replacing the physical market trade in the species, as was the case with the Indian star tortoise *Geochelone elegans* in Malaysia (Chng & Bouhuys, 2015). What is apparent is that the internet is being utilized increasingly and regularly by illegal traders as a means to sell the tortoises. The high demand and trade in Indonesia, as indicated by our results, is undeniably contributing to the poaching, smuggling and trading of this species, and if not abated will lead to its extinction in the wild.

Only the potentially fraudulent breeders group offered any form of documentation in the advertisements and only twice did people enquire in the comments about the legality of the sale; both comments were in English and both were ignored. It is unlikely, and within Indonesia impossible, that commercial sellers of ploughshare tortoises have the correct documentation. Globally, there are 71 ploughshare tortoises known to be present at 12 institutions across five regions outside Madagascar (Raghavan et al., 2015). All of these individuals were confiscated, and the majority have not yet reached sexual maturity and therefore no breeding has been reported. Nevertheless, even if breeding did occur, these individuals would be used for conservation purposes and not for commercial sales. In 1996 a captive-breeding programme in Madagascar implemented by the Durrell Wildlife Conservation Trust was compromised by the theft of 75 individuals, only half of which were recovered (Kiester et al., 2013).

The fact that large numbers of illegally sourced ploughshare tortoises are still appearing openly in online trade in

Indonesia highlights a disregard for the law by Indonesian importers and their counterparts in exporting countries. Improved cooperation and coordination amongst relevant agencies, the ministry and NGOs at both national and international levels is required to help stop this international trade. Indonesia is currently rated as Category 1 by CITES, which means that the national legislation was deemed to be sufficient for effective CITES implementation. Indonesia's upgrade to Category 1 was based on the establishment of Ministerial Decree (Surat Keputusan) No. 447 of 2003 (Administration Directive for the Harvest or Capture and Distribution of Specimens of Wild Plants and Animals). This decree stipulates the regulation of the harvest, domestic transport, domestic possession, domestic trade and international transport of wildlife included in the CITES Appendices (Samedi & Hardjanti, 2005). In practice, however, Ministerial Decrees in Indonesia hold little weight in the complex hierarchical legal system and are often overlooked or even ignored (Dirhamsyah, 2006). Cases of wildlife crime in Indonesia predominantly refer to Act No. 5 of 1990 on the Conservation of Living Natural Resources and their Ecosystem, which deals with native species on the national protected list. Essentially, if a species is not on this list, law enforcement agents are not obliged to act (Stengel et al., 2011; USAID, 2015).

During surveys of freshwater turtles and tortoises carried out in Jakarta by TRAFFIC in 2015, discussion with a trader openly selling ploughshare tortoises revealed that he was fully aware that the tortoises had been smuggled illegally into the country. Another trader mentioned that he was more fearful of selling protected Indonesian species than non-native CITES-listed species (Morgan, *in press*).

The shortcomings of the current legislation, which supposedly supports CITES implementation in Indonesia, allow traders to sell threatened and protected species, such as the ploughshare tortoise, openly, with minimal fear of prosecution. Until Ministerial Decree No. 447 of 2003 is recognized by law enforcement agents as a valid legal document, or until it is upgraded to an official Act or Law, the open trade in non-native, CITES-listed species at a domestic level is likely to continue. A re-evaluation by CITES of Indonesia's existing legislation is necessary. Devoid of a sound legal framework and sufficient enforcement to uphold these laws, there is no deterrent for traders of ploughshare tortoises and other non-native, CITES-listed species to refrain from their illegal activities.

Acknowledgements

We thank the Darwin Initiative (through partners Durrell Wildlife Conservation Trust) and the Turtle Conservancy for generously supporting this work. We are also grateful to Chris Shepherd, Stephanie Pendry, Richard Thomas

and two anonymous reviewers who kindly provided suggestions for the improvement of this article.

Author contributions

JM carried out the data collection and subsequent analysis, and was the main author of the paper. SC assisted in the study design and development of the methodology, provided guidance on the report outline and contributed to the writing.

References

- ALVES, R.R.N., LIMA, J.R.F. & ARAUJO, H.F.P. (2013) The live bird trade in Brazil and its conservation implications: an overview. *Bird Conservation International*, 23, 53–65.
- BAKER, S.E., CAIN, R., VAN KESTEREN, F., ZOMMERS, Z.A., D'CRUZE, N. & MACDONALD, D.W. (2013) Rough trade: animal welfare in the global wildlife trade. *BioScience*, 63, 928–938.
- BOUHUYS, J. & VAN SCHERPENZEEL, M. (2015) *Online Trade in Freshwater Turtles and Tortoises in Indonesia and Malaysia: Legality Index of Online Trade and Legislation Awareness Index Among Traders*. Van Hall Larenstein, University of Applied Sciences, The Netherlands.
- CHNG, S. & BOUHUYS, J. (2015) Indian star tortoises: shop sales fall as internet trade increases. *TRAFFIC Bulletin*, 27, 73–78.
- CITES (2017) *The CITES Appendices*. <http://www.cites.org/eng/app/index.shtml> [accessed 1 March 2017].
- COURCHAMP, F., ANGULO, E., RIVALAN, P., HALL, R.J., SIGNORET, L., BULL, L. & MEINARD, Y. (2006) Rarity value and species extinction: the anthropogenic allee effect. *PLoS Biology*, 4(12), e415.
- CURRYLOW, A. (2015) Ploughshare tortoise (*Astrochelys yniphora*) natural entrapment: rarest tortoise nearly becomes slightly rarer. *Herpetology Notes*, 8, 485–487.
- DIRHAMSYAH, D. (2006) Indonesian legislative framework for coastal resources management: a critical review and recommendation. *Ocean & Coastal Management*, 49, 68–92.
- GOOGLE (2017) Google Indonesia. <http://www.google.co.id> [accessed 1 July 2015].
- HALL, R.J., MILNER-GULLAND, E.J. & COURCHAMP, F. (2008) Endangering the endangered: the effects of perceived rarity on species exploitation. *Conservation Letters*, 1, 75–81.
- HILL, D.T. & SEN, K. (1997) Wiring the warung to global gateways: the internet in Indonesia. *Indonesia*, 63, 67–89.
- HINSLEY, A., LEE, T.E., HARRISON, J.R. & ROBERTS, D.L. (2016) Estimating the extent and structure of trade in horticultural orchids via social media. *Conservation Biology*, 30, 1038–1047.
- IFAW (INTERNATIONAL FUND FOR ANIMAL WELFARE) (2005) *Caught in the Web: Wildlife Trade on the Internet*. International Fund for Animal Welfare, London, UK.
- IFAW (INTERNATIONAL FUND FOR ANIMAL WELFARE) (2014) *Wanted—Dead or Alive: Exposing Online Wildlife Trade*. International Fund for Animal Welfare, London, UK.
- INTERPOL (2013) *Project Web: An Investigation Into the Ivory Trade Over the Internet Within the European Union*. <http://www.interpol.int/en> [accessed 12 February 2016].
- KASKUS (2016) <http://archive.kaskus.co.id> [accessed 20 October 2015].
- KIESTER, A.R., MANDIMBIHASINA, A.R., LEWIS, R.E., GOODE, E.V., JUVIK, J.O., YOUNG, R. & BLANCK, T. (2013) Conservation of the angonoka (ploughshare tortoise), *Astrochelys yniphora*. *Chelonian Research Monographs*, 6, 162–170.

- KRISHNASAMY, K. & STONER, S. (2016) *Trading Faces: A Rapid Assessment on the Use of Facebook to Trade Wildlife in Peninsular Malaysia*. TRAFFIC, Petaling Jaya, Malaysia.
- LAVORGNA, A. (2014) Wildlife trafficking in the Internet age. *Crime Science*, 3, 5–17.
- LAVORGNA, A. (2015) The social organization of pet trafficking in cyberspace. *European Journal on Criminal Policy and Research*, 21, 353–370.
- LEUTERITZ, T. & PEDRONO, M. (2008) *Astrochelys yniphora*. The IUCN Red List of Threatened Species 2008: e.T9016A12950950. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T9016A12950950.en> [accessed 26 November 2015].
- MORGAN, J. (In press) An Assessment of Jakarta's Tortoise and Freshwater Turtle Trade. TRAFFIC Southeast Asia, Selangor, Malaysia.
- NIJMAN, V. (2010) An overview of international wildlife trade from Southeast Asia. *Biodiversity and Conservation*, 19, 1101–1114.
- NIJMAN, V. & SHEPHERD, C.R. (2007) Trade in non-native, CITES-listed, wildlife in Asia, as exemplified by the trade in freshwater turtles and tortoises (Cheloniidae) in Thailand. *Contributions to Zoology*, 76, 207–211.
- NIJMAN, V., SHEPHERD, C.R., MUMPUNI & SANDERS, K.L. (2012) Over-exploitation and illegal trade of reptiles in Indonesia. *Herpetological Journal*, 22, 83–89.
- PEDRONO, M. & SMITH, L.L. (2013) Overview of the natural history of Madagascar's endemic tortoises and freshwater turtles: essential components for effective conservation. *Chelonian Research Monographs*, 6, 59–66.
- RAGHAVAN, R., LUZ, S., SHEPHERD, C.R., LEWIS, R., GIBBONS, P. & GOODE, E. (2015) A case study of the ploughshare tortoise *Astrochelys yniphora* and the role zoos can play in conservation. *TRAFFIC Bulletin*, 27, 79–84.
- RHODIN, A.G.J., WALDE, A.D., HORNE, B.D., VAN DIJK, P.P., BLANCK, T. & HUDSON, R. (eds) (2011) *Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2011*. IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservation Fund, Turtle Survival Alliance, Turtle Conservancy, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and San Diego Zoo Global, Lunenburg, USA.
- SAMEDI & HARDJANTI, F. (2005) CITES legislation: experiences from Australia, Canada, China and the Hong Kong special administrative region, the Czech Republic, Indonesia, New Zealand, Paraguay, Switzerland, the European Union, the United States of America and Viet Nam. *CITES World*, 15, 2–19.
- SCHEEPERS, H., SCHEEPERS, R., STOCKDALE, R. & NURDIN, N. (2014) The dependent variable in social media use. *Journal of Computer Information Systems*, 54, 25–34.
- SHEPHERD, C.R., SUKUMARAN, J. & WICH, S.A. (2004) *Open Season: An Analysis of the Pet Trade in Medan, North Sumatra, 1997–2001*. TRAFFIC Southeast Asia, Petaling Jaya, Malaysia.
- SLONE, T.H., ORSAK, L.J. & MALVER, O. (1997) A comparison of price, rarity and cost of butterfly specimens: implications for the insect trade and for habitat conservation. *Ecological Economics*, 21, 77–85.
- SOEHARTONO, T. & MARDIASTUTI, A. (2002) *CITES Implementation in Indonesia*. Nagao Natural Environment Foundation, Tokyo, Japan.
- STENGEL, C.J., SHEPHERD, C.R. & CAILLABET, O.S. (2011) *The Trade in Tortoises and Freshwater Turtles in Jakarta Revisited*. TRAFFIC Southeast Asia, Petaling Jaya, Malaysia.
- TEJO, A. (2013) Animals traded illicitly online: ProFauna. *JakartaGlobe*, <http://jakartaglobe.id/news/animals-traded-illicitly-online-profauna/> [accessed 1 March 2017].
- USAID (United States Agency for International Development) (2015) *Changes for Justice Project Wildlife Trade, Wildlife Crimes and Species Protection in Indonesia: Policy and Legal Context*. USAID, Washington, DC, USA.
- WALKER, R.C.J. (2012) The internet based trade in Madagascar's Critically Endangered tortoise species: a preliminary study identifying the conservation threats. *Testudo*, 7, 3–13.
- WILSON-WILDE, L. (2010) Wildlife crime: a global problem. *Forensic Science, Medicine, and Pathology*, 6, 221–222.
- WU, J. (2007) World without borders: wildlife trade on the Chinese-language internet. *TRAFFIC Bulletin*, 21, 75–84.
- YU, X. & JIA, W. (2015) *Moving Targets: Tracking Online Sales of Illegal Wildlife Products in China*. TRAFFIC, Cambridge, UK.

Biographical sketches

JOHN MORGAN is interested in Chelonians, particularly Testudines, and their conservation. His main focus is on mitigating the illegal trade in wildlife. SERENE CHNG is documenting and tackling the illegal wildlife trade in South-east Asia, particularly focusing on live reptiles and birds.