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Original Research Article

Illegal wildlife trade, seizures and prosecutions: A 7.5-year analysis of trade in pig-nosed turtles *Carettochelys insculpta* in and from Indonesia

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ABSTRACT

The illegal wildlife trade is increasingly recognised as a major threat to biodiversity conservation, and one way of curbing it is to properly enforce existing legislation and where appropriate to prosecute to the full extent of the law. One of the taxa that suffers greatly from unregulated trade are the tortoises and freshwater turtles, with collection for trade currently being the most significant threat for most Asian species. Illegal trade in pig-nosed turtles from Indonesia to supply international demand for pets, and to a lesser degree for meat and use in traditional medicines, continues on a large scale. We examined 26 reported seizures over the period 2013 to 2020, of which 20 took place in Indonesia and the remaining five in other parts of Asia with the turtles being trafficked from Indonesia. In total, this amounted to the seizure of 52,374 pig-nosed turtles. Pig-nosed turtles are totally protected in Indonesia, and nine of the 26 cases we examined were successfully prosecuted though never to the full extent of the law. Trade in and trafficking of pig-nosed turtles is in violation of Indonesia's Fisheries and Customs Acts, yet these legal instruments were not used for prosecutions. In addition to the illegal trade, the Indonesia CITES Management Authority reported the export of 5415 pig-nosed turtles, 95% of which were declared as wild-caught, in direct contravention of Indonesia's own protected species legislation. We strongly recommend a strategy be developed and implemented to more effectively tackle this trade from point of collection through to point of sale, with improved use of all relevant pieces of national legislation to serve as a strong deterrent, and ultimately to protect this species from over-exploitation.

1. Introduction

Wildlife trade is increasingly recognised as a major threat to biodiversity conservation. One of the taxa that suffers greatly from unregulated trade are the tortoises and freshwater turtles, with collection for trade currently being the most significant threat for most Asian species (van Dijk et al., 2000; Cheung and Dudgeon, 2006; Rhodin et al., 2018; Stanford et al., 2020). Many of the traded species are considered globally threatened, are protected at the national level and/or are listed on one of the CITES Appendices. A special resolution on the conservation of, and the trade in, tortoises and freshwater turtles was

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adopted during CITES' 11th Conference of the Parties, which requests the involved countries to faithfully enforce their policies in order to conserve these species. Tortoises and freshwater turtles are collected and traded for a variety of purposes; the animals are kept as pets, used for consumption or used for the production of traditional Asian medicine. The exploited populations are increasingly depleted by illegal collection, causing local declines and extirpations. To continue the supply, regular shifts in collection areas are necessary, eventually leading to the disappearance of these animals throughout Asia (van Dijk et al., 2000). We here focus on the trade in pig-nosed turtle *Carettochelys insculpta.*

The pig-nosed turtle has a disjunct distribution on the island of New Guinea and northernmost Australia, covering three countries (Australia, Indonesia and Papua New Guinea). It appears to be found in all major and some of the smaller south-flowing rivers of Papua New Guinea and the Indonesian province of Papua, although the exact boundaries of its distribution are not clear (Georges et al., 2008). In Australia, it is found in the northern territories, east to the East Alligator River and west to the Victoria River, though, as on the island of New Guinea, the full extent of its Australian distribution is unclear (Georges et al., 2008). Pig-nosed turtle are unique among freshwater turtles as the genus is monotypic with no recognised subspecies (Georges et al., 2008).

The major threats to pig-nosed turtles include the international wildlife trade, collection of eggs and the turtles for local consumption within its native range and destruction of habitat (Georges et al., 2008; Burgess and Lilley, 2014; Eisemberg et al., 2018). Of these, demand for pets in the international market may pose the greatest and most immediate threat (Burgess and Lilley, 2014). While the species is protected throughout its range and all international trade is regulated a substantial illicit trade persists. Indonesia, the epicentre of illegal harvest and trade, is the greatest source of this species entering into illegal trade, both domestically to western Indonesia and internationally to a wide range of countries. Burgess and Lilley (2014) provided a comprehensive overview of the harvest and trade in this species. They examined the harvest of eggs that are hatched for sale, the smuggling of eggs and hatchlings within Indonesia and related aspects of the illegal trade in this species. They also reported that from 2003 to 2012, 32 seizures of pig-nosed turtles, including more than 80,000 individual turtles took place, with three-quarters of these seizures taking place early in the calendar year (between January–March) towards the end of the nesting season for pig-nosed turtles, suggesting that traders are moving shipments as soon as the turtles are hatched (Burgess and Lilley, 2014). Seizures involved large numbers of turtles, with consignments of up to 12,000 individuals per seizure, illustrating the commercial scale of the trade. In the period up to 2012 most seizures occurred at points of export from Indonesia, though some seizures outside of Indonesia were made, viz. in the United States of America (four cases), Hong Kong (two cases) and Thailand (one case) (Burgess and Lilley, 2014).

We here build upon the work of Burgess and Lilley (2014) and we examine seizures made of pig-nosed turtles involving Indonesia from January 2013–June 2020 to determine current trafficking levels; we explore contemporary trade networks and trade hubs, map routes, assess successful prosecutions, and comment on the release of confiscated turtles back into the wild. Finally, based on our finding we make a series of explicit recommendations to catalyze and support future enforcement and/or conservation interventions.

Given that trade has long been recognised as a threat to pig-nosed turtles in Indonesia a number of legislative measures are in place to protect the species, to prevent the species from illegal exploitation and to regulate any trade that is allowed. Pig-nosed turtles are totally protected in Indonesia, under the Government Regulation No. 20 of 2018 and prior to that under Government Regulation No 8 of 1999. Guidance on how to implement this regulation and what penalties to impose are given in Regulation 8 of 1999 and Act Number 5 of 1990. Violation of the law carries a maximum five-year prison sentence and a fine of USD7,132 (all prices are presented here in USD using June 2020 conversion rates of 14,000 Indonesian rupiah to the dollar; where appropriate prices are corrected for inflation). Protected species are not allowed to be traded, but an exception is made for a limited number of species for which it is permitted to trade individuals that are captive bred second (F2) and subsequent generations. Pig-nosed turtles are included on this list and typically less than 500 captive-bred individuals are allowed to be exported per year.

According to Indonesia's Fisheries Act No 31 (2004, amended in 2009) 'fish' is defined as all organisms that occur in water for all or a part of their life cycle. 'Fish' thus also includes pig-nosed turtles. Commercial fishing requires a licence, but small-scale fishers are exempt provided they are registered as such. Transporting fish (including pig-nosed turtles) always requires a licence. Operating a fishing business without a licence is punishable by eight years imprisonment and a fine of USD106,975 and illegally transporting fish (again, including pig-nosed turtles) can lead to a prison term of five years and a USD106,975 fine. Transporting animals from one area in Indonesia to another, as for instance from the province of Papua to the province of West Java, or exporting or importing animals, is subject to the rules and regulations as stipulated in Law 16 (1992) concerning the Quarantine of Animals, Fish and Plants. Violation of this can be penalised by three years imprisonment and a USD10,698 fine.

At an international level, pig-nosed turtles have been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 2005. This means that any export has to be approved by the CITES Management Authorities (CITES MA) of the exporting country, normally after a Non-detriment Finding (NDF) has shown that the export does not negatively affect the source population. Indonesia, as the main source of pig-nosed turtles entering the illegal global market has been a Party to CITES since 1979. Australia and Papua New Guinea, as the other range countries of this species, have both been Party to CITES since 1976, and export of this species from these two countries is prohibited by law. CITES itself cannot impose fines to individuals when its rules and intentions are violated as it is up to the countries that are Party to CITES to enact domestic legislation that allows for the enforcement of the Convention. When pig-nosed turtles are exported from Indonesia without declaring them or intentionally declaring them incorrectly this is in violation of the Customs

Law 10 of 1995 (amended in 2006). This is a criminal offence and carries a maximum penalty of imprisonment for up to 10 years and a fine of USD356,583.

2. Methods and materials

2.1. Seizure reports

We collected records of seizures involving pig-nosed turtles in Indonesia for the period January 2013–June 2020 from a variety of sources, including open access media reports, published literature, the CITES Trade Database and the Indonesian Government's Case Search Information System (*Sistem Informasi Penelusuran Perkara*, SIPP), which is an online information database of the courts for each district in Indonesia. Cases involving this species were searched for and downloaded from the SIPP database for every district in Indonesia. In January 2020 we requested data regarding seizures and associated prosecutions related to pig-nosed turtle from the Indonesian CITES MA but as of August 2020 we did not receive a response to our request. To determine trade routes in the illegal trafficking of pig-nosed turtles from Indonesia, we requested seizure data of pig-nosed turtles in neighboring countries (provided that Indonesia was the source) from the CITES MAs of China, Malaysia, Papua New Guinea, the Philippines, Singapore, Thailand and Vietnam. Only the Malaysian CITES MA in Peninsular Malaysia (viz. the Department of Wildlife and National Parks Peninsular Malaysia), responded positively with the seizure data. We carried out an online search for seizures of pig-nosed turtles in English (using search words: pig-nosed turtle, seizures, confiscations) and Bahasa Indonesia (search words: kura kura moncong babi, sita, bksda, bea cukai) for the period January 2013 to June 2020 and made every effort to determine the location of each seizure, the known source and destinations of the shipments and the volumes of pig-nosed turtles in each seizure and known destination. When more than one report was located on the same seizure and conflicting data was presented, we relied on the source with the most detailed information.

2.2. Prosecution of offenders and release of confiscated pig-nosed turtles

For each of the seizure reports we searched for follow-up reports on successful prosecution, including those reported in the SIPP database. Details of focus were the number of individuals in each seizure, other protected species seized, the location of the seizure and the intended destination (allowing us to contrast domestic from intended international trade), the number of people arrested or apprehended, their nationalities, and resulting penalties relating to each seizure.

For each seizure report we tried to find publicly available data on whether or not the confiscated animals in Indonesia were released, and if so, in what numbers, when and where. In addition, reports from seizures made outside Indonesia referred to the (future) release of turtles back into the wild. We compiled this information similar to that of the seizure reports. In addition, for the same time period, we searched for reports in English (search words: pig-nosed turtle, release) and Bahasa Indonesia (search words: kura kura moncong babi, dilepasliarkan, bksda) to add to our database.

2.3. Analysis

We expect a high degree of alignment between the seizures as reported in the media and levels of prosecution, certainly in cases where large quantities of pig-nosed turtles are seized. We expect seizures to occur at all months of the year; we compare the observed seizures (incidents and number of turtles involved) with what would be expected if these were distributed equally over the year with χ^2 tests and Pearson's correlation coefficients. We tested for differences in seizures and the number of turtles in the seizure between the nesting (September–February) and non-nesting (March–August) period (Burgess and Lilly, 2014) using t-tests. Were appropriate data were log-transformed prior to statistical analysis to approach a normal distribution more closely. All tests were two-tailed and we expect significance when $P < 0.05$.

3. Results

From January 2013 to June 2020, 26 reported seizure incidents of pig-nosed turtles involving Indonesia were analysed (Fig. 1). All incidents were of live animals at the time of seizure amounting to 52,374 individuals. Of the 26 incidents, 20 occurred within Indonesia i.e. the island of Bali, Greater Jakarta, and the provinces of Papua and West Java. Most of these incidents occurred in Papua Province (seven incidents) and Greater Jakarta (9 incidents); the latter including eight incidents involving seized shipments at the Soekarno Hatta International Airport. The numbers in Papua amounted to the highest number of pig-nosed turtles seized at 19,700 individuals. This was followed by Java (11 incidents in total) encompassing Greater Jakarta, West Java and Soekarno Hatta International Airport, with 10,034 individuals seized, and Bali (two incidents) with 7684 individuals seized. The remaining six incidents occurred outside of Indonesia i.e. mainland China (one incident), Hong Kong (three incidents) and Malaysia (two incidents) with Indonesia reported as the source country amounting to 10,956 pig-nosed turtles seized.

The number of pig-nosed turtles seized varied considerably between years, with highs of 15,855 in 2014 and lows of 687 in 2013 and 160 in 2017, but no clear temporal pattern is apparent (Fig. 2). Comparing the number of turtles that were seized in the first six months of the year (to make them comparable with 2002 for which we only have data from the first six months) shows no increase or decrease over time (Pearson's $R = 0.184$, $P = 0.663$). The 12-months running mean over this period

Fig. 1. Seizures and release of confiscated of pig-nosed turtles *Carettochelys insculpta* as reported in the Indonesian media.

varies from 12,000 or more individuals being seized in 2014, 2015 and 2019 and less than 2000 individuals in 2016, 2017 and 2020 (Fig. 1). The number of seizures varies from one in 2013 to six in 2018, but no temporal pattern emerges. In years when there are more seizures, not more individual pig-nosed turtles are confiscated (Pearson's $R = 0.5363$, $P = 0.171$). It is unclear if the higher number of seizures in one year is the result of more stringent enforcement and an intensification of inspections or if it just a matter of chance or pure luck.

Seizures occurred during all months of the year but with a clear preponderance for the months of January to March (Fig. 3). Directly comparing the nesting vs the non-nesting period (i.e. September to February vs March to August) shows that there were fewer seizures during the non-nesting period (mean of 1.7 per month vs 2.6 per month) but the difference was not statistically different (*t*-test, $t = 0.819$, $P = 0.432$). The number of pig-nosed turtles included in the seizures was lower in the non-nesting period than in the nesting period (mean of 1649 vs 2118) but again the difference in not significant ($t = 0.782$, $P = 0.442$). The mean number of turtles seized was not homogeneously distributed over the 12 months of the year ($\chi^2 = 15284$, $P < 0.0001$), with only June having the number of turtles seized as expected if they were homogeneously

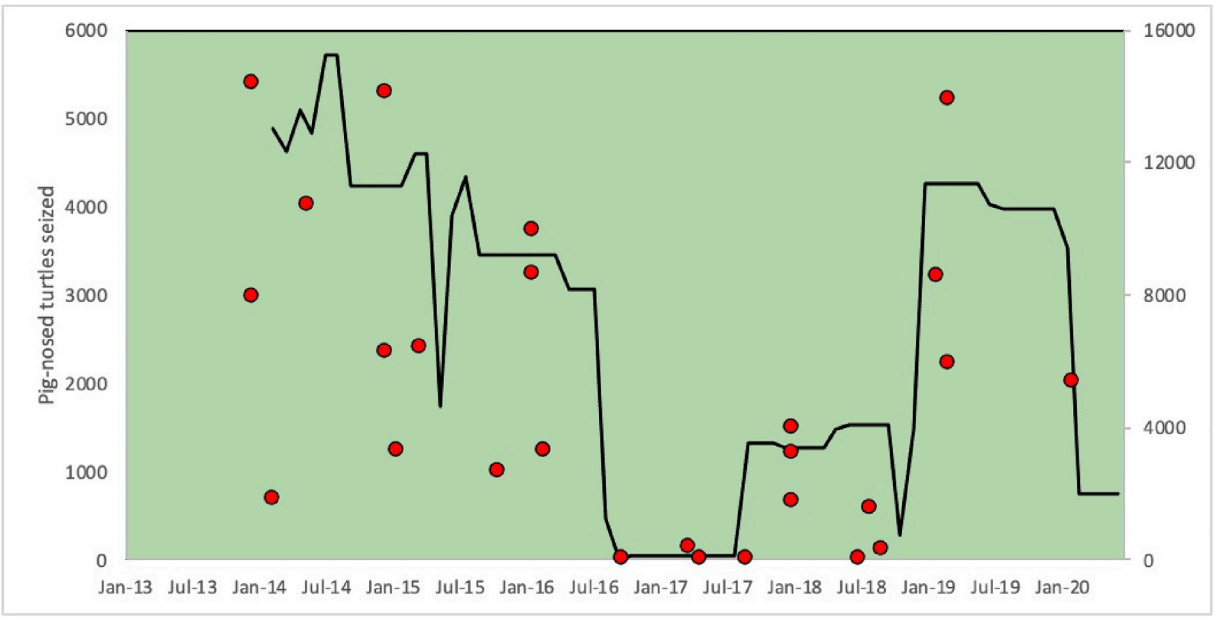

Fig. 2. Seizures of pig-nosed turtles *Carettochelys insculpta* in and from Indonesia over the period January 2013 to June 2020. Red dots represent individual seizures and the black line represent a 12 month running average. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

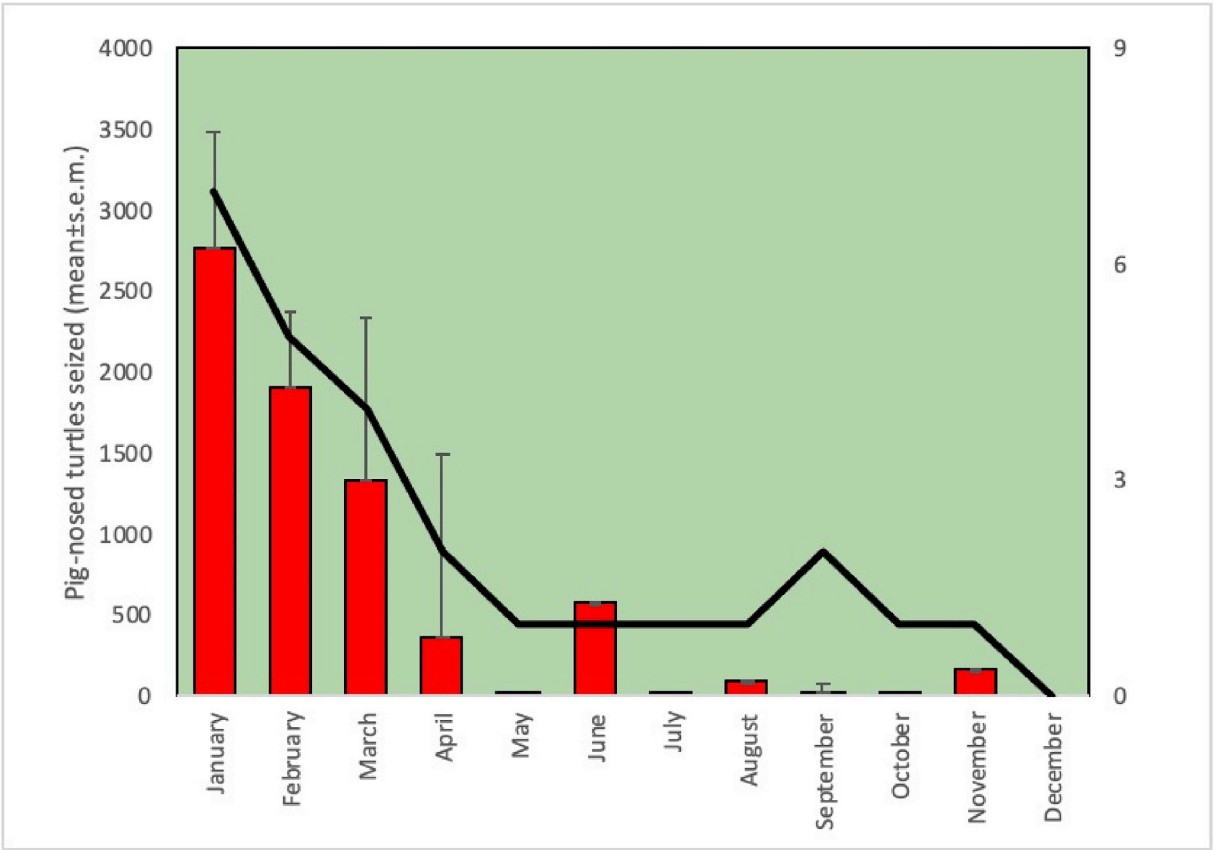

Fig. 3. Seizure incidents (black line) and mean number of individuals seized (red bars) of pig-nosed turtle *Carettochelys insculpta* by month for the period January 2013 to June 2020 showing a preponderance of seizures in the later part of the breeding season which last from September to February. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

distributed. The number of seizures, likewise, was not homogeneously distributed over the 12 months of the year ($\chi^2 = 21.99$, $P < 0.0001$), but here only January and February differed from the other months combined ($\chi^2 = 11.76$, $P = 0.0006$ and $\chi^2 = 4.04$, $P = 0.044$, for January and February respectively).

About three quarters of incidents involved shipments seized at airports and ports/offshore including one incident in Bali, six incidents at the Soekarno Hatta International Airport near Jakarta, four incidents in Papua (i.e. three at airports and one at the port in Ambon), all three incidents in Hong Kong and one in China were at the international airports; and both incidents in Malaysia occurred in coastal waters. Based on the seizure data obtained, at least seven countries were implicated in the trafficking of pig-nosed turtles from Papua (Fig. 4). Mainland China, Hong Kong, Singapore and Malaysia were directly implicated with the seizure (seven incidents) of shipments that originated from Indonesia. In the case of mainland China and Hong Kong, seized shipments came directly from Jakarta's Soekarno Hatta International Airport. For Malaysia, one incident occurred off the waters of Johor, which was reportedly smuggled by boat from Bengkalis Island (part of Riau province, Indonesia) to Peninsular Malaysia; and one incident occurred off the coast of Sabah, part of Malaysian Borneo, near Tawau, which was intercepted by the Malaysian military police. Aside from this, there were another six incidents that occurred at the Soekarno Hatta International Airport which implicated mainland China (two incidents), Japan (one incident), Saudi Arabia (one incident) and Thailand (one incident) as destination countries and one incident in Jakarta that implicated Hong Kong and Taiwan. In four of these incidents, a foreign national from China, Japan, Saudi Arabia and Thailand respectively were arrested.

Of the 26 seizure records obtained, we found successful prosecution records for nine cases (41%) (Table 1). The highest sentence was given to a Japanese national and two Indonesians that were arrested in one case for trying to smuggle several turtles, one of which was a live pig-nosed turtle, to Japan in 2017 (Table 1). The Japanese national was sentenced to 2.5 years while the Indonesian nationals were sentenced to two years. The lowest penalty (four months jail and a fine of USD314 or additional two months jail) was given to an individual arrested for trying to smuggle 1195 pig-nosed turtles out of Papua Province. For six of the nine successful prosecutions it was clear what the specifics were of the charge - in four cases it was of violation of protected species legislation (Law 5 of 1990 and Regulation 20 of 2018; maximum fine five years in prison and a fine of USD7,132); in one case it was of violation of quarantine legislation (Quarantine Law 16 of 1992; maximum sentence three years in prison and USD10,698); and in one case it was both. As far as we can assess no one was charged for customs violations and failing to declare their export (Customs Law 10 of 1995; maximum sentence 10 years in prison and USD356,583

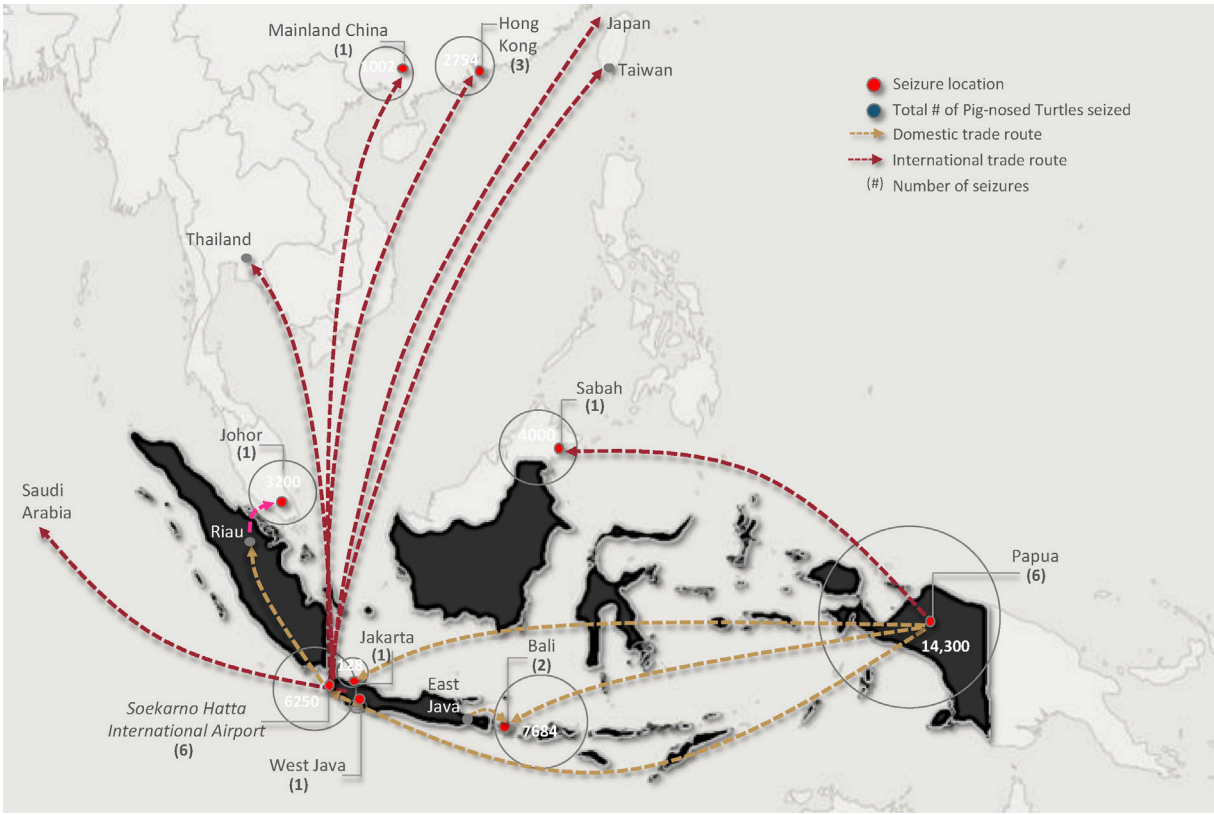

Fig. 4. The locations of pig-nosed turtle *Carettochelys insculpta* seizures that occurred in Indonesia, and several that occurred outside the country but reported Indonesia as the source; and quantities of individuals seized at each location. This is based on 26 seizure incidents obtained for the period January 2013 to June 2020.

Table 1
The number of seizures that resulted in arrests and convictions for the trafficking of pig-nosed turtles *Carettochelys insculpta* involving Indonesia from January 2013 to June 2020.

Date	Seizure Location	No. suspects	Evidence (all live)	Sentence
17-Jan-15	Soekarno Hatta International Airport	1 Indonesian	2350 pig-nosed turtles	6 months jail and USD627 fine (or additional 1 month jail)
16-May-17	Soekarno Hatta International Airport	1 Japan national, 2 Indonesians	1 pig-nosed turtle	Japan national: 2 years and 5 months jail and USD3,137 fine (or additional 2 months jail) for smuggling and 6 months jail and USD 627 fine (or additional 1 month jail) for not providing legal health/quarantine documents; Indonesian nationals: 2 years jail and USD6275 fine (or additional 3 months jail)
26-Jan-17	West Java	1 Indonesian	1 pig-nosed turtle	5 months jail and USD31 (or additional 1 month jail)
09-Jan-18	Mopah Merauke Airport	2 Indonesians	1195 pig-nosed turtles	1 person sentenced: 4 months jail and USD314 fine (or additional 2 months jail)
25-Aug-18	Hong Kong Airport	unknown	596 pig-nosed turtles	USD2,322 fine
26-Sep-18	Jakarta	9 Indonesians	128 pig-nosed turtles	1 person sentenced: 6 months jail and USD1255 fine (or additional 1 month jail)
26-Jul-18	Soekarno Hatta International Airport	1 Indonesian	3 pig-nosed turtles	1 year and 6 months jail and USD6,275 (or additional 2 months jail)
14-Mar-19	Papua Province	1 Indonesian	2227 pig-nosed turtles	1 year and 2 months jail and USD627 fine (or additional 2 months jail)
26-Mar-19	Papua Province	2 Indonesians	5202 live pig-nosed turtles (327 dead when seized)	1 year and 4 months jail and USD3,137 fine (or additional 3 months jail)

fine) or illegally transporting 'fish' (Fisheries Act 31; maximum prison term of five years and an USD106,975 fine). While three out of four seizures where foreign nationals were involved led to a successful prosecution and only six out of 11 cases where Indonesian nationals were involved led to a successful prosecution, the difference is not statistically different (Fisher's exact probability test, $P = 0.604$). When sentenced the mean jail time given to foreigners was 19.7 months and that to Indonesians 11.5 months, the difference not being statistically significant ($t = 0.946$, $P = 0.375$).

Finally we found one case of a penalty given to an Indonesian fined for the illegal trafficking of 596 pig-nosed turtles from Indonesia to Hong Kong. The Hong Kong authorities handed down a fine of USD2,322, and there were no details on suspects apprehended.

Indonesia reported exporting 5442 pig-nosed turtles for commercial purposes during this period (2013–2019) in the CITES Trade Database (Table 2). According to Indonesian law, pig-nosed turtles may only be exported for commercial purposes if captive bred to the second generation and beyond. Nine exports were reported, involving 5442 individual pig-nosed turtles. Of these, two exports totalling 50 turtles were declared as captive-bred (F2), three exports were declared as captive-born (F1) totalling 127 turtles, and three were declared as wild-caught totalling 5240 individual turtles. The vast majority of the turtles were destined for mainland China ($n = 3025$) and Hong Kong ($n = 2160$), with the remainder being exported to Japan ($n = 103$), the US ($n = 80$), the United Kingdom ($n = 48$) and the Philippines ($n = 26$).

We were able to find precise data on seized pig-nosed turtle release for five seizure incidents. Of the 8860 pig-nosed turtles seized in two seizures in Jakarta and Denpasar in January 2015, 6350 were released on 8 February 2015 in the Baki swamps, Asmat regency, Papua province. On 26 February 2016 it was announced that the 3250 pig-nosed turtles seized at Timika airport earlier that month were to be released in the Maurepan Mile 21 area of Freeport. On 20 August 2018,599 pig-nosed turtles that were part of two seizures in Hong Kong totalling 2158 individuals were released in the Kao River, Boven Digur regency. Finally, on 13 September 2018 1195 pig-nosed turtles were released in the Vreenskap River, Asmat regency; they were confiscated on 9 January 2018 at Merauke Airport.

In addition, we found several reports of pig-nosed turtles that were released in Papua over the period January 2013 to June 2020, but it was less clear when and where the individuals were seized. In 2013, 26,000 pig-nosed turtles were released in various parts of Papua and in early 2014, 2534 pig-nosed turtles were released in Otakwa River system, East Mimika district and 5553 pig-nosed turtles were released in the Baki swamps, Asmat regency (Anonymous, 2015). In 2015, according the Ministry of Forestry, a total of 8860 pig-nosed turtles were released in various parts of Papua (Anonymous, 2016), but this probably refers to the 6350 out of 8860 referred to above. On 6 April 2019, 2140 out of 2227 confiscated pig-nosed turtles were

released in the Bover Digul regency. All in all then, over the last seven and a half years almost 50,000 pig-nosed turtles were released in different parts of Papua, typically around 3000 individuals at a time.

4. Discussion

The international wildlife trade is a direct cause for the declines and extinctions of an increasingly long list of species due to continuing demand for wildlife as food, traditional medicines, luxury goods and pets. The trade in live animals involves more species than other drivers of the trade, with much of it being illegal and unsustainable (Stengel et al., 2011; Eaton et al., 2015). Among the groups of species most threatened by this trade are the tortoises and freshwater turtles, yet the trade in many of these species is poorly known and receives little attention (Samedi and Iskandar, 2000; van Dijk et al., 2000; Schoppe, 2009; Stengel et al., 2011). Globally, more than half of currently recognised tortoise and freshwater turtle species are threatened with extinction and over 35% are listed as Endangered or Critically Endangered on the IUCN Red List of Threatened Species (Stanford et al., 2020). In 2017, the pig-nosed turtle was reassessed as Endangered on the IUCN Red List of Threatened Species from a previous assessment of Vulnerable in 2000 (Eisemberg et al., 2018). Populations of this species are described as being in decline due to unsustainable exploitation for the international demand for pets, and for food, which if not urgently curtailed, could drive the species to a Critically Endangered status (Eisemberg et al., 2011, 2018). The interest in pig-nosed turtle has intensified over the years due to its taxonomic distinctiveness (only surviving species of a once widespread family of turtles) and increasing rarity (Burgess and Lilley, 2014), and this combined with new hunting methods and technologies, is leading to increasing and likely unsustainable harvest of the species (Eisemberg et al., 2018). Our study's findings are therefore concerning as, like Burgess and Lilley (2014), it shows that the international trade in pig-nosed turtles originating in Indonesia continues on an enormous scale regardless of legislation in place to prevent this.

4.1. Contemporary pig-nosed turtle trade

The seizure data presented here shows the persistent pressure on pig-nosed turtles with seizures occurring all year round though more prominently during the nesting season. When comparing our study period with previous years, there's been an increase in seizures of pig-nosed turtles between 2013 and 2019 (average of 3.5 incidents/year) in comparison Burgess and Lilley (2014) which covered the period between 2003 and 2012 (average of 2.3 incidents/year). This suggests that there may have been improved enforcement effort, monitoring and/or reporting of crimes related to pig-nosed turtles in Indonesia. That said, the average quantities of the turtles being seized in each incident (~2014 turtles/seizure; 6983 turtles/year) appears to have decreased slightly in comparison to Burgess and Lilley (2014) (~3139 turtles/seizure; 7178 turtles/year) with the exception of Bali (Fig. 5). The reduced quantities being seized could be due to several factors including the possibility that improved enforcement has made traders more discreet and are reducing size of shipments being smuggled; or, more concerningly, perhaps it is indicative of the impact that unsustainable exploitation and illegal trade is having on pig-nosed turtle populations in Indonesia.

The seizure data also implicates several countries/territories in the international trafficking of pig-nosed turtles from Indonesia – mainland China, Hong Kong, Japan, Malaysia, Saudi Arabia, Singapore, Taiwan and Thailand (Fig. 4). This is unsurprising considering similar findings were reported by Burgess and Lilley (2014). They note major domestic destinations and likely transit locations of pig-nosed turtles out of Papua as Jakarta, Surabaya, Probolinggo, Makassar and Bali from which the turtles are smuggled to mainland China, Hong Kong, Malaysia, Singapore and Thailand. In our study, about three quarters of incidents took place at airports and ports as well as coastal waters indicating that a large part of the trade in pig-nosed turtles are destined for international markets. Pig-nosed turtles have been found available for sale online in countries such as Malaysia (Krishnasamy and Stoner, 2016) and Thailand (Phassaraudomsak and Krishnasamy, 2018), though according to these studies, volumes are very low. Some of these countries are also likely to be transit points for trade and trafficking bound for further destinations. Malaysia at least is clearly a transit point for the trade of pig-nosed turtles coming from Indonesia and as recent as February 2020, a shipment of 4000 pig-nosed turtles was seized in Malaysian waters, coming from Indonesia.

There does not appear to be a significant trade in this species for pets within Indonesia, despite Indonesia being a major trade hub for other species of tortoises and freshwater turtles to meet local demand. Pig-nosed turtles have been recorded in shops where pet tortoises and freshwater turtles are sold in Jakarta (Shepherd and Nijman, 2007; Stengel et al., 2011), but in small numbers compared to the volumes seized destined for international markets, further indicating that domestic demand for pet pig-nosed turtles in Indonesia is not the greatest driver of the illegal trade in this species.

4.2. Reported origins of pig-nosed turtles in trade

Our examination of CITES Trade Data reveals a shortcoming in the CITES permitting system as applied by the Indonesian authorities and as accepted by importing countries. The pig-nosed turtle is protected in Indonesia and can only be traded if bred in captivity to at least F2 generation. Yet, Indonesia reported nine exports of pig-nosed turtles to the CITES Secretariat in 2017 and 2018, involving over 5000 individual turtles, of which only 50 were declared as being captive bred. Information provided to the authors suggests that one registered reptile exporter in Indonesia has been granted permission to export and unknown number of farmed/captive-born (F1) pig-nosed turtles. If this is correct this would account for the 127 individual pig-nosed turtles in the CITES trade database that were declared by Indonesia as farmed. Given the time and resources it

Table 2
CITES trade records involving the export of pig-nosed turtles *Carettochelys insculpta* from Indonesia from 2013 to 2019, extracted from the CITES Trade Database (June 2020); all trade concerned live turtles and was labelled as commercial. Values in italics and underlined are those reported by Indonesia; and values in normal font are those reported by the importing country. Captive-born (F1) refers to first generation offspring born in a captive setting out of wild-caught parents; captive-bred (F2) refers to second generation offspring born in a captive setting out of parents that themselves were born in captivity; ranched refers to eggs taken from nest then reared in a secure facility with a proportion of the hatched turtles being released back into the wild.

Year	Importing country/territory	Quantity	Source
2013 to 2016, and 2019: none reported			
2017	Japan	*101*	Captive-born
	Philippines	*24*	Captive-born
2018	Japan	2	Captive-born
	Philippines	*2*	Captive-bred
	China	25	Ranched
	China	*3000*	Wild-caught
	Hong Kong	*2160*	Wild-caught
	US	*80*	Wild-caught
	UK	*48*	Captive-bred

would require in breeding pig-nosed turtles in captivity to the second generation, it is extremely unlikely any exported specimens truly are captive bred to F2 (or even to F1). It is more likely these individuals are all wild caught or ranched, and falsely declared as being captive bred to circumvent restrictions and enable export to countries where the checking of the source of the imported animals is lax. According to Burgess and Lilley (2014), none of the ex-situ hatcheries they came across in Papua were legitimate captive-breeding facilities as they relied on illegally harvested wild pig-nosed turtle eggs. Laundering wild-caught reptiles under the guise of being captive bred in Indonesia is well known and well documented (e.g. Lyons and Natusch, 2011; Nijman and Shepherd, 2015) and in the case of pig-nosed turtles, should be investigated further by authorities in Indonesia and in importing countries. Of greater concern is the 5240 turtles that were exported as wild-caught which is in violation of Indonesia's own legislation. Considering pig-nosed turtles are fully protected species in Indonesia, it is unclear how exports of wild caught specimens were allowed, and this issue should be investigated by the. Further, of the 5240 wild caught turtles, 80 were imported into the US, which is clearly in violation of the US Lacey Act. As far as we can ascertain, no action on this has been taken by the US government, but we urged the US authorities to be cautious to ensure that no wild-caught pig-nosed turtles are imported into the US. The profile of this illegal trade should be raised amongst importing countries. Perhaps elevating this species from CITES Appendix II to Appendix I should be considered to assist all three range states in obtaining stronger cooperation from all other CITES Parties. Indonesia clearly remains a major source of

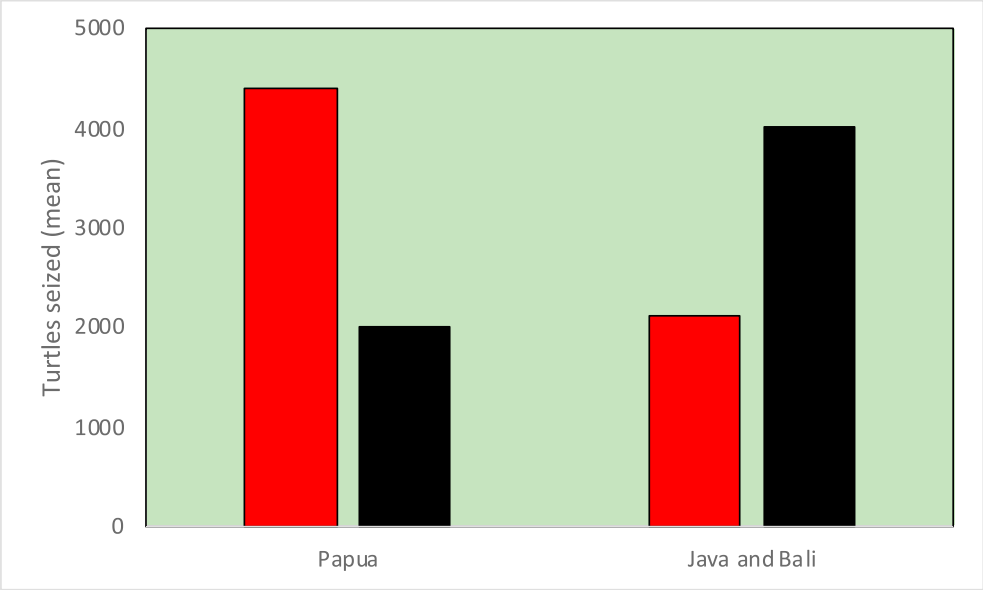

Fig. 5. A comparison of average quantities of pig-nosed turtle seized per incident between our study covering the period 2013–2020 (black bars) and Burgess and Lilley covering the period 2002–2012 (red) reported by the main islands of Indonesia (i.e. Bali and Java and Papua Province). It should be noted that the quantities seized in each incident varied greatly e.g. from as low a one turtle to as high as 5000 turtles. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

the illegal international trade in this species, despite it being totally protected by law. Further research should also be carried out in consumer countries to better understand the drivers behind the trade, the policies in place that could be used to prevent illegal trade trafficking in this species and to guide efforts to reduce demand.

4.3. Release of pig-nosed turtles back into the wild

The challenges of what to do with the large number of pig-nosed turtles that were seized in Indonesia was first raised by Arida and Ibarrondo (2007). We report on the release of around 50,000 pig-nosed turtles back into several river systems in Papua, following their seizure in either Papua, Java, Bali or indeed elsewhere. Individual seizures are typically in the order of 3000 pig-nosed turtles at a time. These numbers are very similar to those reported by Burgess and Lilly (2014), who document the release of around 49,000 pig-nosed turtles over a five year period.

Burgess and Lilley (2014) made a series of specific recommendations with regards to the release of pig-nosed turtles back into the wild, including (a) a proper health, condition and population origin examination should be conducted by the relevant authorities prior to release in order to minimise risks of disease transfer, disruption of population genetic integrity and negative effects on local fauna and flora; (b) release programmes should be organised in consultation with a range of experts and stakeholders, including government personnel, management agencies, non-government organisations, universities, veterinary institutions, zoos and funding bodies; and (c) individual pig-nosed turtles, or a proportion of them, should be tagged prior to release allowing them to be followed and studied to increase our understanding of the biology of the species. It appears from the reports were have located that few, if any, of these recommendations have been properly followed.

4.4. Enforcement and prosecutions

Indonesia is well known as a hub of illegal trade in tortoises and freshwater turtles (Samedi and Iskandar, 2000; Shepherd, 2000; Schoppe, 2009; Stengel et al., 2011; Nijman et al., 2012; Morgan, 2016). Illegal trade in Indonesia has been identified as being due in part to an inadequate understanding of the species being traded and is facilitated by inadequate resources, monitoring and enforcement, especially at key trade hubs (Natusch and Lyons, 2012).

While enforcement efforts that have been taken against the trafficking of pig-nosed turtles are commended, analysed records indicate that seizures continue to be made without offenders being prosecuted, thus failing to provide effective deterrents. Under the Act of the Republic of Indonesia No.5 of 1990 concerning conservation of living resources and their ecosystem, trafficking in pig-nosed turtles may result in a five-year prison sentence and a fine of USD7,132 and when pig-nosed turtles are trafficked or transported lawbreakers can be prosecuted under the Fisheries Act or the Customs Acts that carry the possibilities for significantly higher fines and jail time. Our research show, however, that offenders rarely receive penalties close to the maximum – the highest prison sentence given was approximately half the potential maximum. Furthermore, the reported estimated value of a seized shipment of 4000 pig-nose turtles in February 2020 was over USD200,000 yet given fines rarely reflect the value of trafficked wildlife to be a sufficient deterrent. Given the frequency and scale of the seizures, stronger deterrents, alongside proper announcements of the sentencing to the general public, would prove useful.

As the pig-nosed turtle is a seasonal breeder that nests in predictable and often well-known locations, enforcement efforts should be increased during this period and in strategic locations to disrupt the harvest of eggs and subsequent trafficking of hatchlings. Traffickers use airlines to move illicit shipments of pig-nosed turtles within Indonesia and internationally – as such relevant enforcement agencies in airports, such as Customs, health and quarantine and other authorities should be alerted to the large-scale smuggling of this species and encouraged to be more vigilant. In-situ conservation to protect these breeding grounds from poaching is crucial and further research should be carried out to develop a strategy that would involve local communities in conservation efforts for this species.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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