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Illegal avian and reptilian pets: Global perspectives and challenges

Aves y reptiles prohibidos como mascotas: Perspectivas y retos mundiales

Himangshu Dutta*[1]

[1] Independent researcher, City: Dibrugarh, Country: India
Email: himangshu.dibru@gmail.com

*Autor de correspondencia

Himangshu Dutta

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ABSTRACT

Human desire to keep wildlife as pets has created new avenues for exploitation of biodiversity. People satisfy their craving either by obtaining the preferred species from the wild or illicit market. To regulate such activities, laws have been formulated at the national and international levels. Growing demand and scope of commercial gains often require collection of wildlife beyond sustainable levels not permitted by regulations. Under a number of circumstances, the supply and procurement of legally protected species continues in violation of regulations. This has created the enormous possibility of unsustainable harvesting of wild species. The present review focuses on avian and reptilian pets with an aim to provide an overview of illegal pet keeping practices and trade, as well as understand the related driving factors, determinants and consequences. The purpose is to reveal the overall enormity of the illegal pet trade of these two heavily preferred and traded vertebrate classes together, which has never been done. The review is based on peer-reviewed and grey literature retrieved from online sources. The consequences and prevalent situations have been understood by citing appropriate examples. It was revealed that a number of factors intricately interlinked with social, economic, cultural and legal aspects of the society are responsible for this problem. The magnitude of illegal pet trade is also inconspicuous. The most formidable challenge in solving the problem arises from the fact that mechanisms designed to control it are actually utilized for its acceleration. Thus, collaborative initiatives should be taken by conservationists, policymakers, technocrats, law enforcers and social scientists to formulate appropriate solutions.

Keywords: *Companion animal; Conservation; Law; Unsustainable harvest; Species trafficking.*

RESUMEN

El deseo humano de tener animales salvajes como mascotas ha creado nuevas vías de explotación de la biodiversidad, ya que muchas de estas especies son extraídas de su hábitat natural e introducidas en circuitos ilegales de mercado. A pesar de que para regular estas actividades se han formulado leyes a nivel nacional e internacional, la creciente demanda junto al incremento de ganancias económicas ha llevado a la captura de especies salvajes más allá de los niveles sostenibles permitidos por las distintas normativas. Por otro lado, en los últimos tiempos, la captura y el comercio de especies legalmente protegidas ha aumentado de forma alarmante, lo que ha provocado que algunas de estas especies estén en una grave situación de amenaza. De entre las distintas especies salvajes implicadas en el tráfico ilegal, la presente revisión se centrará en aves y reptiles con el objetivo de ofrecer una visión general de las prácticas y el comercio ilegal al que se ven sometidos, buscando al mismo tiempo comprender los factores que impulsan esta actividad, sus condicionantes y las consecuencias relacionadas. El propósito es poner de manifiesto la dimensión global del comercio ilegal de este grupo de mascotas que se encuentran entre las más demandadas y comercializadas. La revisión se basa en publicaciones on-line de revistas con revisión por pares, analizando ejemplos y las consecuencias de este comercio. Los resultados ponen de manifiesto una serie de factores intrínsecamente relacionados con los aspectos sociales, económicos, culturales y jurídicos de la sociedad que son la causa del problema. Las soluciones sugeridas incluyen medidas de concienciación, mayor control del comercio y búsqueda de iniciativas de colaboración. Se concluye que el comercio ilegal de animales de compañía es un creciente desafío para la conservación de la biodiversidad que hace que no podamos descuidar su vigilancia y control.

Palabras clave: *Animales de compañía; Conservación; Legislación; Captura insostenible; Tráfico de especies.*

INTRODUCTION

A large number of animals are kept as human companions worldwide and this practice has several psychological benefits which ultimately translate to human wellbeing (Youg et al., 2020). However, there has been a recent increase in the trend of keeping non-traditional animals as human companions which includes different kinds of wildlife (Grant et al., 2017). In this regard, birds are popularly kept as pets all over the world (Licarião, 2013). Reptiles are also greatly popular as more than one-thirds of all described reptilian species are traded as pets (Marshall et al., 2020). This has given rise to a huge pet market for avian and reptilian fauna.

At the international level, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates and monitors the trade in plant and animal species listed in its three Appendices (https://cites.org/eng). CITES Appendix I is the most protected list and includes species threatened with extinction in case of which trade is strictly restricted, except when permitted only for non-commercial scientific or educational reasons. Trade in captive bred individuals of CITES Appendix I species is allowed, for commercial purposes (Nakamura & Kuemlangan, 2020). A greater level of restrictions imposed upon the Appendix I species provide greater scope and possibility breaking regulations and therefore this list is highly relevant with respect to illegal trade. Several countries also have legal and policy frameworks for the regulation and restriction of wildlife trade at the national level such as the Wildlife (Protection) Act, 1972 of India (https://www.wwfindia.org/about_wwf/enablers/traffic/illegal_wildlife_trade_in_india/). Such frameworks completely prohibit the commercial trade, capture and possession of some wild species or have specified guidelines for authorized permissions to allow such activities. These mechanisms often prevent interested individuals from keeping their preferred wildlife as pets or obstruct the trade and supply of some species for the pet market. Despite of such restrictions, many people openly or secretly trap, keep, sell or supply several wild species banned from the pet market. Sometimes trade in certain species is legally allowed under permits, but the same species are also simultaneously smuggled or laundered by people without permits (Karokaro, 2020). This leads to the parallel existence of both legal and illegal trades of such species.

An understanding of the links with other types of criminal activity has revealed that illegal wildlife trade is a threat to the stability and security of the involved societies (Lawson & Vines, 2014). In view of this, the present review aims to develop critical insights into the illegal aspects associated with the keeping and trading of wild avian and reptilian companion animals. Scientific publications and reports (Licarião, 2013; Stringham et al., 2021) have provided information in this regard separately for birds and reptiles. Moreover, individual manuscripts focus only on their specific aspects of interest without discussing unrelated aspects which might be equally or even more relevant determinants in the context of illegal pets. There is a need of literature that develops a holistic understanding of the problem, which in turn would lead to the formulation of initiatives that could address all the factors and aspects together for a comprehensive solution. It is also necessary to address this need in order to highlight the enormity of the problem which is often less discussed as compared with prominent wildlife conservation issues of present times. The review addresses this gap and presents a comprehensive picture of the illegal trade of these two groups of vertebrates highly popular as pets to inform conservationists, policymakers, and law enforcers. It aims to provide insights into the (a) overall illegal pet keeping practices and trade worldwide, (b) drivers of illegal pet trade and practices, (c) determinants of trafficking for the pet trade and (e) consequences of illegal pet keeping practices and trade. The overall goal is not only to provide scientific perspectives but also to present the realities at the ground level. The manuscript focuses on achieving its aim by describing and discussing appropriate examples from all over the world.

METHODOLOGY

Sources of literature

The review focuses on articles published in the English language from the year 2013 onwards. Three types of literature sources were considered for preparing the manuscript; namely: peer-reviewed publications, web pages of agencies working on illegal wildlife pet trade, and articles published by journalists reporting on wildlife crime. Web pages and articles prepared by journalists cannot be neglected while preparing the manuscript because an initial literature survey revealed that such sources contained relevant information not present in peer-reviewed articles. This is because the topic of the manuscript equally interests researchers, wildlife activists, and journalists, unlike issues that require specialized scientific knowledge to be addressed only in peer-reviewed articles. A biased focus solely on peer-reviewed articles, which concentrate on the scientific foundation, would discard the information present in grey sources, which actually provide insights into the current ground-level realities. This would hamper the manuscript from achieving its aim to create a comprehensive understanding of all the aspects and factors of illegal bird and reptile pet keeping and trading practices. Thus, both peer-reviewed and grey literature sources were considered for the review. Literature from both these sources was also incorporated by Sarkar et al. 2021 in their review article on human-environment systems in the COVID crisis.

Secondary information was obtained by selectively mining web pages and online reports of specialized agencies (such as Defenders of Wildlife, Birdlife International, CITES, WWF, TRAFFIC and so on) working in the fields of conservation, wildlife trade and enforcement. Articles by journalists were retrieved from reputed e-media portals. Relevant qualitative and quantitative information was collected from publications retrieved from scientific databases (Scopus, Science Direct, Web of Science, Medline, DOAJ and JSTOR,) using 'Google scholar' search engine. At first, search strings included general words or phrases like 'illegal pet trade', 'illegal bird pets', 'illegal reptile pets', 'wildlife trade', 'wildlife trafficking' and 'impacts of pet trade'. Later, names of specific species or locations were incorporated in the search strings; for example, 'illegal trade in African Grey Parrots', 'illegal trade in Indian Star Tortoise', 'illegal pet trade in India' and 'illegal pet trade in Thailand'. Articles written by journalists investigating wildlife crime were retrieved using the same search strings.

The review has been prepared based on the information collected from 81 articles retrieved online from the above three sources. These articles were sampled out of a total of 135 downloaded articles, out of which articles containing repetitive, unclear and limited information had been excluded.

Organization of the manuscript

As mentioned in the introduction, the manuscript focuses on describing and discussing examples. The results section addresses the first aspect and vividly describes examples and case studies without any emphasis on summarization. While conducting the survey, it was found that illegal pet trade includes a number of unique circumstances and elements which can only be understood through exemplification. Hence, the results section has been especially dedicated to this purpose so that the reader can, at first, directly visualize situation- and species-specific information instead of depending upon the summary provided by the author. The second aspect has been addressed in the discussion section, where the findings i.e. examples have been summarized and thereafter discussed so that the reader can have a clear idea of the problem. The results section has been organized as per the objectives of the manuscript into the following subheads as explained below:

i. Overall illegal pet keeping practices and trade worldwide.
   In this subhead, case studies from different locations of the world are presented to exemplify prevalent illegal pet keeping and trading practices. The intention is (a) to make the reader aware of the fact that the illegality

associated with bird and reptile pets is a worldwide problem, as well as (b) to inform the reader about the extent of this problem in terms of types and number of species involved (whenever information is available). The section does not focus specifically on any particular locations but briefly presents studies as representatives of different countries/regions across the globe as a whole. Its purpose is to just create a picture of the existence of illegal pets in brief to present an overall picture based on existing literature. The only exclusion/inclusion criterion is to avoid the repetition of examples from the same locations and include as many regions/countries as possible. This has been done so that the focus of the reader does not remain confined only to a specific part of the world. The pet trade is not uniformly prevalent all over the world and hence, all regions to the globe could not be equally represented in this subhead.

ii. Drivers of illegal pet trade and practices.
In this subhead, drivers i.e. factors that have accelerated the illegal pet trade in the current times have been discussed with an emphasis on consumer perspective and supply chains. In case, if any species is harvested for multiple purposes, then the driver responsible only for the illegal pet trade is mentioned, as per the aim of the manuscript.

iii. Determinants of trafficking for the pet trade
Under this subhead, the factors which determine the extent of the role of drivers of illegal pet trade and practices in facilitating reptilian and avian trafficking have been described.

iv. Consequences of illegal pet keeping practices and trade
This subhead focuses on the consequences of the illegal pet trade on wild avian and reptilian populations.

RESULTS

Overall illegal pet keeping practices and trade worldwide.

Avian pets

The value of illegal wildlife trade is estimated to be USD20 billion out of which a major portion is constituted by endangered and protected species traded as pets (World Animal Protection 2019). The price of exotic birds depends upon their protected status and the legality of the deal in India, where the practice of bird keeping has led to illegal trade (Bhalla, 2015).Indian dealers also smuggle native parrots via Pakistan, Nepal, and Bangladesh to international pet markets worldwide (https://www.wwfindia.org/?6900/TRAFFIC-helps-to-claw-back-illegal-parrot-trade-in-India). As indicated by the Animal Welfare Institute (https://awionline.org/content/bird-trade), the US imports an estimated 800,000 wild-caught birds (excluding the individuals that died in transit) to be sold as pets. It also states that in the US, a large number of birds are smuggled into the black market due to the demand from pet trade, collectors and birds fighting. This happens despite of the presence of the Wild Bird Conservation Act (WBCA), Endangered Species Act, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora, which protect wild birds in the country. The Mediterranean imports 25 million birds annually for food, sports hunting and pet trade, out of which a majority are illegally trapped (BirdLife International http://www.birdlife.org). In Mexico, there is a greater demand for parrots in the domestic illegal pet trade (Tella & Hiraldo, 2014), but 4-14 percent of wild parrots captured in Mexico are smuggled annually to the US (Neme, 2015).

Species belonging to the order Psittaciformes (parrots) are highly preferred as pets because of their beautiful colour, social behaviour, intelligence and vocalization abilities (Pollock, 2013). Parrots are the most internationally traded birds mainly to be used as pets (Chan et al., 2021). The ten

most traded CITES-listed genera of parrots during 1975-2016 are mentioned in Table 1. The demand for parrots as pets is especially high in rural areas of Ecuador even though it is illegal to keep wild birds in the country (Halle et al. 2018, Biddle et al., 2020), and thus, parrots are trapped in Ecuador (Biddle et al., 2021). In 2018, 1,177 individual birds were rescued from illegal trade in Maluku and North Maluku Provinces, out of which 96% were parrots traded for the pet market (Setiyani & Ahmadi, 2020).

Songbirds (Order: Passeriformes) are the most common birds involved in illegal bird-keeping and trade (Sylas et al., 2018). In order to meet the market demand, songbirds are transported to Java from Sumatra and Kalimanthan in Indonesia (Yohanna et al., 2021). The interest in such birds in Java is fuelled by the popular practices of bird keeping and singing contests, which are closely associated with the Javanese culture. This in turn provides scope for illegal trade and consequently smuggled birds destined for Java have been intercepted on a number of occasions in Sumatra (Karokaro, 2020). Some critically endangered endemic songbirds sold in Javanese markets are Bali Myna *Leucopsar rothschildi* Stresemann, 1912; Black-winged Myna *Acridotheres melanopterus* Daudin, 1800; Javan Green Magpie *Cissa thalassina* Temminck, 1826 and Rufous-fronted Laughing thrush (*Garrulax rufifrons* Lesson, 1831 (Nijman et al., 2017). Songbirds are sold in free markets an fairs in the semi-arid regions of Brazil, even though such practices are prohibited by law. In addition, these birds are also sold by arranging meetings at strategic locations and household through marketing networks in secrecy from supervisory bodies in the country (Sylas et al., 2018). Birds are in fact, highly popular companion animals throughout Brazil, which provides immense scope for the illegal trade of at least 295 species of native species (Alves et al., 2013). Alves et al. (2016) found that birds were the most common vertebrates kept as pets in the Santa Luzia municipality in the state of PAraíba in Brazil. They recorded 28 bird species reared as companion animals in this area

Table 1 Ten most traded CITES-listed genera of parrots, mainly to be used as pets during 1975-2016

Sl. No	Name of genus	Name of parrot group	Quantity of trade	Percentage in trade
1	*Agapornis*	Lovebirds	4287540	25.6
2	*Amazona*	Amazon Parrots	1334143	8
3	*Aratinga*	South American Conures	532 453	3.2
4	*Cacatua*	Cockatoos	610 672	3.6
5	*Myiopsitta*	Monk and Cliff Parakeets	1430574	8.5
6	*Platycercus*	Rosellas	504 098	3
7	*Poicephalus*	*Poicephalus* Parrots	985 399	5.9
8	*Psittacara*	South and Middle American Parakeets	688448	4.1
9	*Psittacula*	Afro-Asian Ring-necked Parakeets	1136 843	6.8
19	*Psittacus*	Gray and Timneh Parrots	1790740	10.6

Source: Chan et al., 2021

and observed that the market demand for pets was an important reason for trapping wild native birds in the semiarid northeastern region of the country. A total of 26 species from ten avian families are kept as pets in the city of Campina Grande, Paraíba, where inadequate regulation has led to the illegal capture and breeding of wild birds (Licarião, 2013). On the other hand, 34 wild bird species are kept as pets in the municipality of Lagoa Seca in Paraíba. People capture birds themselves or acquire them through illegal trade (Sylas et al., 2018).

Reptilian pets

There is a thriving trade in several reptiles, which have been banned from being traded (https://www.traffic.org/what-we-do/species/reptiles-and-amphibians/). The five most popular reptiles in pet trade identified and ranked by Valdez (2021) based on Google trends are mentioned in Table 2. Between 1999 and 2016, 75 reptile species were smuggled into Australia (Stringham et al., 2021). In Romania, the online pet trade in aquatic turtles is dominated by locally caught European Pond Turtles (*Emys orbicularis* Linnaeus, 1758), even though the collection of this species from the wild is banned in the country (Mărginean et al., 2018). Pragatheesh et al. (2021) recorded a total of 84 species of exotic reptiles from the pet market of India, most of which were likely to have been trafficked in to the country. As per their findings, from 2018 to 2020, 12,505 illegally imported individuals belonging to 22 reptilian species were seized in India, including five species listed in Appendix I of CITES (Pragatheesh et al., 2021). They state that several people who sell exotic reptiles are also involved in the illegal pet trade of native turtles, lizards and pythons protected by The Wildlife (Protection) Act, 1972 in India. Altherr & Lameter (2020) state that the European Union, especially Germany is the trading center of both legally and illegally sourced reptiles. They documented two protected reptiles Pethiyagoda's Crestless Lizard (*Calotes pethiyagodai* Amarasinghae, Karunarathna, Hallermann, 2014) and Kimberley Death Adder (*Acanthophis cryptamydros* Maddock, Ellis, Doughty, Smith & Wuster, 2015) in the European pet market, which indicated illegal trade and capture of these species. Thailand is also a major hub for the illegal trade and procurement of several native and non-native wild reptiles kept as pets (Chng, 2014).

Masroor et al. (2020), during a study in Balochistan, Pakistan from 2013 to 2017, recorded 5,369 live reptiles belonging to 19 species captured by 73 illegal collectors mainly for the local and international pet market. Three species of geckos (Persian wonder gecko *Teratoscincus keyserlingii* Strauch, 1863; Small-scaled Wonder Gecko *Teratoscincus microlepis* Nikolsky, 1900; Persian Spider Gecko *Agamura persica* Dumeril, 1856) highly popular as pets, contributed nearly half of the overall illegal collection. Van den Burg and Weissgold (2020) mention a unique endemic population of Green Iguana (*Iguana iguana* Linnaeus, 1758) which had been described in some scientific publications shared on social media. The population was under taxonomic assessment and despite of the absence of any export permits, they could trace the international online sale of the members of this population as pets. As per their findings, even though there were no records of legal exports in CITES database, the species had been obtained by several private collectors and sold in United States, Germany, Indonesia, Belgium, Malaysia and Japan.

Table 2 Five most popular reptiles in pet trade identified and ranked based on Google trends

Sl. No./ Rank	Reptilian species/group	Family	Scientific name/taxonomic details
1	Bearded dragons	*Agamidae*	*Pogona sp.* Storr, 1982
2	Ball pythons	*Pythonidae*	*Python regius* Shaw, 1802
3	Chameleons	Chamaeleonidae	Species belonging to the genera under the subfamilies Brookesiinae and Chamaeleoninae
4	Leopard geckos	*Eublepharidae*	*Eublepharis macularius* Blyth, 1854
5	Corn snakes	*Colubridae*	*Pantherophis guttatus* Linnaeus, 1766

Source: Valdez 2021

The Indian Star Tortoise (*Geochelone elegans* Schoepff, 1795) is native to Sri Lanka, India and Pakistan (Mombauer, 2019). It is the most illegally traded tortoise species in the international market (D'Cruze et al., 2016), even though its export is legally prohibited in India and Pakistan, but allowed under permits in Sri Lanka (Chng & Bouhuys, 2015). More than 6,040 Indian Star Tortoises were seized globally in 2017 (https://www.traffic.org/what-we-do/species/reptiles-and-amphibians/). Between 2015 and 2017, 3,130 Indian Star Tortoises were seized in Sri Lanka (Malsinghe et al., 2017). It has also been seized on several occasions in India (Mombauer, 2019). D'Cruze et al. (2015) have confirmed the evolution of the commercial trade in Indian Star Tortoises into an international organised crime in several parts of India. According to them there is a domestic demand for Indian Star Tortoises in India, but the individuals of this species are mainly supplied to fulfil the pet market demand of other Asian countries such as Thailand and China. They documented the poaching of 55,000 Indian Star Tortoises from just one 'trade hub' in Andhra Pradesh, India in course of one year. Their analysis of the CITES trade records on import of Indian Star Tortoises from 2004 to 2013 revealed several discrepancies indicative of illegal activity in Thailand. In fact, the Indian Star Tortoise is the most illegally traded tortoise in Thailand and Thai authorities seized 5966 individuals of this species during 15 cases between 2008 and 2013 (Chng, 2014). The species has also been seized in Germany, Indonesia, the Netherlands, the Philippines, Slovakia, Spain, the United Kingdom, and the United States, mostly from air travellers arriving from Asia, and express mail parcels sent from Asia (CITES, 2017). The Indian Star Tortoise has a high demand in the Malaysian pet market because of which it is illegally brought to the country (Chng & Bouhuys 2015). Indian Star Tortoises are openly kept in households in Gujarat, India, despite of prohibition (D'Cruze et al., 2015).

Drivers of illegal pet keeping practices and trade

Demand

Globalization of markets, broad trade routes and increased trading volumes, accelerate the demand for wild-caught birds as pets (Reino et al., 2017). The demand for bird species in the pet market based on popularity or specific identity is determined by media-fuelled trends (Ribeiro et al., 2019). In Indonesia, trade in wild-caught birds is prohibited, but the trade in captive-bred birds is subjected to permit and quota. However, consumers in Java prefer wild-caught to captive-bred songbirds because of the belief that wild individuals are better

singers and thus, are willing to pay enough amount to enable traders to stock wild birds rather than opting for captive breeding (Karokaro, 2020). Bird keeping is a tradition in several Latin American countries (Brazil, Peru, Ecuador and Mexico) and consequent domestic demand fuels illegal live bird trade in these countries (Neme, 2015).

According to Stringham et al. (2021), the demand for illegal pet reptiles in Australia is influenced by species already present in the Western pet trade. As per their findings, the majority of reptiles which were smuggled into the country for the first time had already spent about four years in the US trade. They state that popularity in US pet stores and international online markets, as well as the number of years spent in US import-export records, determined the probability of a particular specie being smuggled to Australia. In addition to the species traded into the US, the Australian desire for illegal exotic pets is inclined towards species that are threatened or protected by trade regulation (IUCN- and CITES-listed) as well as species having a history of successful invasions (Toomes et al., 2020). Many consumers in Asia also seek rare, protected or wild-sourced species to satisfy their craving for companion animals and thus, exotic pet trade has gained popularity all over Asia (TRAFFIC a). The Ploughshare Tortoise (*Astrochelys yniphora* Villant, 1885) is one of the rarest tortoises on earth and thus, very high prices are mentioned in online advertisements for its illegal sale (Morgan and Chng 2018). This tortoise is only found in Baly Bay National Park in Madagascar (Mandimbihasina et al., 2020).

Lack of awareness

There is a lack of awareness about the suffering of animals involved in the pet trade which facilitates consumer interest and subsequent illegal activity (World Animal Protection 2019). According to Mărginean et al. (2018), at times, sellers are not only completely unaware of the identity and conservation status of the species they sell but also the regulations, as in the case of the protected European Pond Turtles (*Emys orbicularis* Linnaeus, 1758). They also add that the same lack of awareness is also observed in case of customers, such as tourists who buy these turtles. On the other hand, due to the dearth of proper environmental education in Coastal Ecuador, the trapping of wild parrots is considered to be an acceptable practice by a majority of people. This is very well reflected with respect to public behavior in terms of number of parrots illegally trapped or kept as pets (Biddle et al., 2021). People who harvest parrots in Maluku and North Maluku Provinces are not aware of wildlife laws as well as the ecological value, population size, and endemism of parrots, which leads to increased illegal pet trade (Setiyani & Ahmadi, 2020).

Economic factors

Illegal pet trade is facilitated by economic well-being because it relies upon the financial ability of consumers to afford exotic animals as luxury (D'Cruze et al., 2015). Several enthusiasts spend huge amounts of money to acquire exotic wildlife which in turn has led to the growth of the economic value of the illegal pet trade worldwide (Louies, 2014). The market for Madagascan reptiles is highly lucrative because interested customers are willing to pay huge amounts to obtain such wildlife, which in turn makes it highly attractive to illegal traders (Runhovde, 2018). Morgan & Chng (2018) found that collectors in Indonesia were willing to spend up to USD 47,000to purchase a single individual of Ploughshare Tortoise, which in turn indicated their affluent economic status. The international demand for Indian Star Tortoise throughout South East Asia (particularly Thailand and China) is driven by increased interest in exotic pets propelled by increasing affluence across this region (Nijman & Shepherd, 2015). Poverty is also an important driver of wildlife pet trade (Animal Welfare Institute) because many poor people worldwide are supported economically by the illegal wildlife trade (Pollock, 2013). The songbird trade provides livelihood opportunities for many people in Indonesia (Yohanna et al., 2021), whereas the illegal trade in Indian Star Tortoises is a source of income generation for the impoverished communities of Andhra Pradesh, India (D'Cruze et al., 2015).

Internet access

The internet has increased the craving for exotic pets (World Animal Protection, 2019) as evident from the fact that it has globalized the demand for protected Madagascan reptiles (Runhovde, 2018). Rapid sharing of information, especially through so¬cial media, has increased the level of public interest in traded species, which has intensified the demand for pets (Clarke et al., 2019; Kitson & Nekaris, 2017). An increase in the number of trading websites and people accessing the internet has accelerated the illegal trade of European Pond Turtles (Mărginean et al., 2018). It also acts as a convenient means to buy and sell birds (https://awionline.org/content/bird-trade).

The internet has contributed to the growth of illegal pet trade by facilitating clandestine sales (Louies, 2014). In this context, social media has emerged as the new hub of illegal wildlife trade in exotic pets (https://www.traffic.org/what-we-do/species/reptiles-and-amphibians/).Through social media platforms, sellers can take the advantage of remaining anonymous and closed networking groups controlled by administrators (Pragatheesh et al., 2021). Middlemen and sellers can easily coordinate through private groups in social media to contact customers, with very little risk of being caught as well as switch between platforms to evade detection by law enforcement agencies. Thus, the illegal pet reptile trade involves extensive utilization of social media platforms (UNODC, 2020). Online platforms, especially social media are commonly used by illegal traders of Madagascan reptiles to reach out to customers worldwide (Runhovde, 2018). Facebook is widely used for the trade of a large number of CITES-listed live reptiles in the Philippines by people mostly involved in illegal trading (https://www.traffic.org/what-we-do/species/reptiles-and-amphibians/). The sale of Indian Star Tortoise has decreased in physical markets due to law enforcement and public awareness, but increased in the online market in Malaysia, supported by the social media (Chng & Bouhuys, 2015).The factors that hamper monitoring and legislation of online trade are language barriers, restricted access to closed social-media groups, rapid change in terms and codes used in online discussions and dearth of proper search tools which are able recognize species from photographs (Runhovde, 2018). Numerous videos available on different social media and video-sharing platforms on ways to capture wild species encourage people to range areas to collect reptiles for secondary income (UNODC, 2020).

Global air connectivity

Air connectivity has enhanced wildlife trade by increasing the availability of pets (World Animal Protection, 2019). A study by FLIGHT revealed that up to 40,000 birds are trafficked out of Kualanamu Airport, North Sumatra in a month (Karokaro, 2020). African Grey Parrots caught from the wild are trafficked on flights from the DRC, Nigeria and Mali to the Middle East, as well as, western and southern Asia (World Animal Protection 2019). Indian Star Tortoises captured in India are trafficked to different parts of the country via road or rail and via cargo boats to certain Asian countries (Malaysia, Singapore and Thailand), from where the animals are further supplied to more countries in Asia by air (D'Cruze et al., 2015). Radiated Turtles destined for Asian pet markets are smuggled out of Madagascar via its international airport (Runhovde, 2018).

Poor regulation

Poor regulation is an important driver of wildlife pet trade (Animal Welfare Institute).Several wild birds, including protected species are illegally trapped and sold openly in many countries (Chng & Eaton, 2016). Illegally sourced and protected birds are openly displayed for sale in Javanese markets in Indonesia (Nijman et al., 2017).In fact, due to the drawbacks in legislation, Indonesian traders also openly sell threatened and protected reptilian pet species, such as the Ploughshare Tortoise, without any fear of prosecution and regard for the law (Morgan & Chng, 2018).This is also observed in India, where trapping of birds from the wild and their sale at very low prices continue without any regulation because such activities often escape the attention of the authorities (Sinha, 2014). Lower law enforcement in local markets provides ample scope for the illegal trade of the protected

European Pond Turtles in Romania, where the risk of being caught and consequent punishment is almost inexistent because of the passive nature of authorities (Mărginean et al., 2018). Some aspects related to poor regulation of illegal pet reptile trade in Brazil are: (a). For environmental crimes such as illegal pet trade, only fines are imposed, which are negligible as compared with profits obtained; (b). Fine waivers are available in case of domestic possession of non-threatened wildlife; (c). Corruption and lack of resources hamper law enforcement; (d). Illegal and domestic breeders and traffickers are punished in the same way and previously convicted traffickers are not denied entry into the country; (e). Lack of specificity in laws and ambiguity their enforcement (Fonseca et al., 2021).

A number of importing countries also overlook the marketing of illegally sourced species, whereas some countries with stringent laws are unaware of the extent of illegal international trading of their indigenous species (Altherr & Lameter, 2020). In India, the Wildlife Protection Act prohibits trade and private ownership of the Indian Star Tortoise, but a lack of proper regulation in other Asian countries facilities the illegal trade of this species (Nijman & Shepherd, 2015). For instance, in Thailand legislation prohibits only the private ownership of indigenous tortoises, even though the country acts a centre for illegal trade of the non-indigenous Indian Star Tortoises by acting as a consumer as well as a point of transit. Thai law enforcement can act only when illegal activity is supported by evidence in case of this species (D'Cruze et al., 2015). Loop holes in the legal system are exploited for the sale of illegally sourced animals in Thailand (Nijman & Shepherd, 2015). In Brazil, possession of wild animals is prohibited, unless bred in captivity, but this law could not be enforced properly because it is virtually impossible to confirm whether a particular animal was captured from the wild (Neme, 2015).

Regulated mechanisms also facilitate the illegal trade in wild animals (D'Cruze et al., 2015), as evident from the fact that fraudulent CITES permits are used to ship Grey Parrots on commercial flights (Martin et al., 2019). Some legal businesses take advantage of their legitimate status to traffic live reptiles through forged documents and/or smuggle for the pet market (Wyatt et al., 2018). Due to conflicting and deficient legislation the efficiency of inspection and regulation is reduced and this facilitates illegal supply of exotic pets through licensed breeding facilities (UNODC, 2020).

Captive breeding

In general, traders are bound to bear economic losses due to the death of captive bred birds because captive breeding requires considerable monetary investments, but such financial risks are not involved in case of birds trapped from the wild (Bhalla, 2015). Criminals have used licensed breeding facilities for the illegal supply of exotic pets (UNODC, 2020). There is the scope for licensed breeders to deal in birds caught from the wild as well as traders without permits to smuggle birds through licensed breeders for commission, as evident in Indonesia (Karokaro, 2020). It is not possible to distinguish trapped birds from captive bred birds and thus, illegally smuggled individuals from India are traded as aviary bred. This enables the smugglers to escape the restrictions imposed by the Wildlife Protection Act of the country (Bhalla, 2015). The sale of Indian Star Tortoise is also prohibited in India and so Star Tortoises are smuggled from India to countries where this species is not protected by law to be sold as captive bred (Louies, 2014). Identification of wild-caught birds as captive-bred, along with forged permits from CITES, and secret supply chains have catalyzed the illegal trade of African Grey Parrots. According to a proposal submitted at the 17th CITES Conference, exports of captive-bred African Grey parrots have been reported from several range countries without any breeding facilities (Dasgupta, 2016).

Miscellaneous

According to Wyatt et al. (2018), there is an inconsistency in monitoring and adhering to guidelines during all the stages of live reptile trading, which facilitates their illegal trade. They further mention that the smuggling of live animals for pet

trade is also facilitated by corrupt practices such as bribing inspection authorities. At times tourists act as unaware smugglers when they unknowingly buy protected wildlife during their trips, but later sell the animals because of their dissatisfaction with the animals as pets or personal reasons (Mărginean et al., 2018). On the other hand, social acceptability plays a key role in allowing poaching, as mentioned by Steinmetz et al. (2014), and this in turn can affect the supply chain of the illegal pet trade.

Determinants of trafficking for pet trade

Geographical location is an important determinant of the level of illegal activity. This is evident in case of Maluku and North Maluku Provinces in Indonesia, which provide ample scope for the trafficking of live parrots due to their conveniently accessible sea transport links and proximity with other countries such as Philippines and Australia (Setiyani & Ahmadi, 2020). Contacts and logistics to sell birds are important determinants of illegal trade and these factors determine whether poachers trap birds for their own collection or sale (Biddle et al., 2021).

Consequences of illegal pet keeping practices and trade

The demand for pet market has led to the removal of several species from the wild and resulted in heavy mortality and morbidity (Ashley et al., 2014; Warwick et al., 2014). In this context, Jolly et al. (2021) mention that the endangered Broad-headed Snakes (*Hoplocephalus bungaroides* Schlegel, 1837), which are illegally captured for pet trade in Sydney, Australia have slow life histories and reproduce infrequently. According to them, these snakes are vulnerable to illegal collection for pet trade because the removal of a few adult females can suppress their population growth. They observed negative population growth of this species at unprotected sites, where it is collected for the pet market. On the other hand, a large number of Star Tortoises smuggled from India die en route due to inappropriate transporting methods used by the smugglers who overlook the welfare of the live animals (Louies, 2014).

The increasing illegal domestic online trade in European Pond Turtles is a threat to the conservation of this species and must be urgently addressed (Mărginean et al., 2018). Extensive seizures of Radiated and Ploughshare Turtles of Madagascar indicate the massive pressure exerted by the illegal trade on wild populations (Runhovde, 2018). The Ploughshare Tortoise included in Appendix I of CITES and protected under Malagasy national law is increasingly poached for the pet market (Morgan & Chng, 2018). Illegal collection severely threatens the existence of the last remaining population of this Critically Endangered tortoise found only within one National Park in Madagascar (Jenkins et al., 2014). According to Mandimbihasina et al. (2020) the Ploughshare Tortoise is likely to become extinct in the wild, unless its illegal poaching is completely stopped. They further mention that the population of this species would never be able to recover without intensive management, even in the absence of poaching. The simultaneous occurrence of the illegal pet trade and habitat loss further enhances wild population decline as exemplified by the Bog Turtles (*Glyptemys muhlenbergii* Schoepff, 1801) of North America (US Department of the Interior, 2020) and African Grey Parrots of Africa (Annorbah et al., 2016).

Pet trade has led to the extinction and reduction of population of several bird species (Peng & Broom, 2021). The international pet trade is the main reason because of which Spix's Macaws became extinct in the wild in 2018 (US Department of the Interior, 2020). Three species of Indian parrots Nicobar (*Psittacula caniceps* Blyth, 1876), Long-tailed (*Psittacula longicauda* Boddaert, 1783) and Derby's (*Psittacula derbiana* Fraser, 1852) Parakeets are nearing extinction because of the illegal pet trade (WWF India b).About 75–90% of birds caught from the wild die before being sold as pets (Peng & Broom, 2021). Three-fourths of parrots captured in Mexico for the pet market die before reaching a buyer (World animal protection a). Hill mynahs,

parakeets and munias are extensively caught from the wild to be sold as pets and thus, such species are no longer common in several places in India (Sinha, 2014). The practice of bird keeping is one of the major drivers of species loss in Indonesia. This is evident in Java, where native population of birds has considerably declined due to habitat loss and excessive illegal trapping and thus, in order to meet the demand, birds are obtained from other parts of Indonesia (Yohanna et al., 2021). The rate of trapping of Amazon parrots and macaws is extremely high considering their availability in the wild in Costa Rica, which can have severe consequences on the native population (Romero-Vidal et al., 2020).

The two intelligent and gregarious birds African Grey Parrot *Psittacus erithacus* Linnaeus, 1758 and Timneh Parrot *Psittacus timneh* Fraser, 1844 are highly popular as pets worldwide. This has led to their excessive exploitation for illegal trade because of which these species have become endangered (BirdLife International, 2018). The African Grey Parrot is one of the most preferred species kept as pets in Europe, the USA and the Middle East because of its aesthetic physical features, long life span, and ability to mimic human speech (World Animal Protection 2019). In order to capture these birds from the wild, an injured individual of this species is tied to a branch painted with sticky glue and used for luring. The provoked screeching of the tied bird attracts individuals which get stuck in the glue upon descend. The trapped birds are sold to traders in small crates and containers in which a majority of individuals suffocate or starve to death (World Animal Protection 2019). Nearly 66% of illegally captured birds die even before reaching transport planes (World animal protection a). According to CITES, between 1994 and 2003, 21% of the overall wild population of African Grey Parrots was trapped and traded every year for the pet market (Defenders of Wildlife 2016). Following widespread population decline arising from illegal trading, the species was identified as Vulnerable in the IUCN Red List in 2012 (Dasgupta, 2016). However, excessive trade further affected the population of African Grey Parrot, because of which it was declared as an endangered species by International Union for Conservation of Nature (IUCN) in 2016 (Atoussi, 2020).I n Benin, Burundi, Ghana, Guinea, Guinea-Bissau, Kenya, Rwanda, Tanzania and Togo, populations of the species have declined by 90% to 99% (Defenders of wildlife, 2016).

DISCUSSION

The illegal pet trade is a formidable conservation problem because it affects many species at risk and even has the potential to threaten the existence of commonly found wildlife. Its impacts can be exemplified by the heavy trafficking and domestic trade of parrots (order: Psittaciformes) as discussed earlier. Among the species belonging to Psittaciformes, 24% and 28% are threatened and near threatened respectively (BirdLife International http://www.birdlife.org). A socio-ecological initiative is required to abolish the tradition of keeping pets in order to prevent the decimation of parrots in Neotropical countries (Tella & Hiraldo, 2014). The most important aspects of illegal pet trade, which makes it a severe threat to wildlife are unsustainable harvesting and large-scale animal deaths. The severity of threat can be understood from the fact that the African Grey Parrot became an endangered species because of the illegal pet trade.

Animal cruelty is closely associated with all the stages of the pet trade right from the collection of target species from the wild. Some trapping methods not only disturb, but also kill non-target species (Peng & Broom, 2021). In India, hunters usually puncture the eyes of two already captured parrots and leave them on a sheet so that their painful cries can attract other parrots from the wild. In order to capture, sheets are thrown over the descending birds. At times, adhesives are also used to capture the arriving birds (Bhalla, 2015). Some Indian trappers also collect parrot chicks from the wild for smuggling (https://www.wwfindia.org/?6900/TRAFFIC-helps-to-claw-back-illegal-parrot-trade-in-India). The captured birds are at

high risk of injury in this process and are subjected to deplorable conditions during transportation, thereafter. However, trapping and trading of wild birds are not prohibited in many countries (Animal Welfare Institute https://awionline.org/content/bird-trade). Live birds are smuggled to India in bottles, suitcase piping, PVC pipes and underwear. They are also stuffed in socks and shoes (Bhalla, 2015). Thus, the welfare of captured individuals is completely neglected during transit because the main priority is escaping detection by authorities. Such practices lead to widespread painful deaths under highly inhospitable circumstances and can never be supported from the viewpoint of ethical treatment of animals. Some other prominent ethical and welfare issues related to the pet trade are cruel captive breeding practices, insufficient nutrition received as pets and unhealthy human contact (World Animal Protection b https://www.worldanimalprotection.org/our-work/animals-wild/exotic-pets). Issues related to the welfare of birds arise when their requirements are overlooked in large scale breeding facilities, due to limited knowledge of breeders or their interest in deriving more profits (Animal Welfare Institute https://awionline.org/content/bird-trade). Commercial avian breeding in India is terrible in terms of bird welfare. Birds under such breeding conditions are given injections to lay more eggs and this leads to health effects, which also arise due to negligence (Bhalla, 2015). Thus, wildlife pet trade can never be justified on grounds of animal welfare and wildlife conservation, which are even more severely neglected when the trade is carried out illegally. However, the issues of illegal reptile collection and trade have always been neglected in Pakistan (Masroor et al., 2020).

I consider markets and other public venues to be crucial parts of the supply chain, but the social acceptability of selling certain wild species also impacts their appearance in markets (or other aspects of the supply chain). Social acceptability plays an important role in deciding whether it is suitable to buy and sell animals as well as which animals are sold (and for what purpose). It is necessary to undertake campaigns across various media sources to raise awareness among pet enthusiasts (Atoussi, 2020). This is because there is a lack of public awareness about the negative effects of pet trade and thus, many birds are kept in households as companions (Peng & Broom, 2021). The same is also true for other wild species kept as pets. As a result, the popularity of exotic animals continues to remain intact and even gets propelled because of the internet. In the present times, social media and video platforms have numerous web pages and channels especially dedicated to exotic pets which definitely play an important role in promoting interest. Such platforms have the capacity to trigger vicious cycles in which people who own illegal pets inspire others to own such pets. Because pet ownership is linked with human desire, emotions and personal urge can also eclipse individual judgement of legality and sustainability. Nekariset al. (2013) mention about a viral video on social media about ticking a Slow Loris, which might have triggered consumer interest in this mammal as a pet and its subsequent illegal trade. Additionally, the internet acts as suitable medium of business. Tremendous consumer demand is the main foundation that keeps the pet market afloat leading to illegal trade. This interest must be curbed to disintegrate the illegal market for wild pets, which can be only done through proper awareness. Social media and online platforms can also act as powerful tools for raising awareness. In fact, videos highlighting the negative impacts of the illegal pet trade are present on Youtube channels such as World Animal Protection, Vice and so on. However, excessive fascination with the aesthetic features of wild pets might contradict the effect of awareness initiatives. Situations are even more complicated when pet keeping is interlinked with cultural and social aspects.

Cultural factors are also important in this regard, as evident from the bird keeping practice in Java, which has led to extensive illegal trapping and smuggling. The popularity of bird keeping associated with the Javanese culture propagated to different parts of Indonesia when residents of Java were relocated to other parts of the country under the transmigration program of the government

for depopulation (Karokaro, 2020). According to Yohanna et al. (2021), the scale of songbird competitions has also increased in Indonesia, which in turn has accelerated the demand for such birds. They suggest that in order to conserve songbirds in Indonesia, it is at first necessary to estimate their population size in the wild so that the necessary adaptive management can be undertaken. Biddle et al. (2021) have recommended environmental education and increased protection of wild birds through guarding to prevent illegal trapping and sale of parrots. It is also necessary to understand trade networks and consumer markets by monitoring social media to curb the illegal trade of African Grey Parrots (Martin et al., 2018). Tech companies should detect and restrict fraudulent advertisements to reduce illegal wildlife trade in their online platforms (Atoussi, 2020). Steps must be taken for the employment of poor sections of the society which depend upon the illegal pet trade for their livelihoods. Captive breeding might appear to be a solution to protect the wild population, but at times it can actually lead to the depletion of wild population by facilitating illegal trade. It is in fact, the lucrative nature of the illegal bird and reptile trade which drives traders to face all the legal risks involved and make all efforts to overcome such risks.

The USA and European Union are large markets for reptile trade. The USA imports about two million reptiles, and exports 2–4 million juvenile turtles annually to be reared as pets (Warwick, 2014). Smugglers transport live reptiles by using fake packaging descriptions via courier service, and bringing live reptiles by air, attached to their bodies or packed in luggage (Wyatt et al., 2018). North African reptiles are smuggled into the pet market of the EU through coastal routes (European Parliament, 2016). However, nearly 75% of snakes, lizards, tortoises and turtles are unable to survive even a year after becoming companion animals (https://www.worldanimalprotection.org/our-work/animals-wild/exotic-pets).

As long as interest and supply chains exist, the illegal pet trade would continue. Adequate law enforcement is crucial to break the supply chains, which fulfil existing demands. Rather than the status of wild populations, the extent of trade should be considered while selecting eligible species for protection. The problem of illegal pet trade is especially difficult to address due to its hidden nature, inconsistent regulation and limited specialised law enforcement (UNODC, 2020). The trade is also difficult to monitor because of which its magnitude cannot be assessed. However, a number of countries have enacted laws to curb the illegal pet trade. For example, in Singapore, Endangered Species (Import and Export) Act 2006; Animals and Birds (Amendment) Act 2014 and Wild Animals and Birds Act 2000 regulate trade and rearing of wild fauna. Violation of these laws entails fines and imprisonment (https://www.traffic.org/site/assets/files/3753/asian-songbird-trade-singapore-factsheet.pdf). Organized criminal groups have demonstrated their ability to exploit weaknesses in complex supply chains. There are several opportunities to launder illegally sourced wildlife through the legal supply chain, which are utilized by criminals (UNODC, 2020). In some cases, lacunae are present in domestic regulation of supply chains, whereas in other cases, loopholes arise from the mismatch of legislations among different countries. Trans-boundary efforts are required to enforce regulations and prosecute illegal traders (https://www.traffic.org/what-we-do/species/reptiles-and-amphibians/). Laws should be formulated as per requirement, but equal emphasis should also be placed in their implementation at the ground level. The lack of implementation is evident from the fact that Indian Star Tortoises are openly kept in public places such as temples which directly obtain the species from the wild even though it is prohibited to do so (D'Cruze et al., 2015). In general, providing a holistic view of wildlife trade, Scheffers et al. (2019) state that policies should be proactive rather than reactive, whereas Morton et al. (2021) has emphasized upon the prioritization of improved management to tackle with unsustainable demand and improvised trade reporting.

In general, economic, legal, personal, societal, technological and geographical factors play an important role in determining the extent of illegal pet trade, as evident from the driving forces (Table 3). However, the effects of divers can differ among species, and regions depending upon the harvester's perspective or consumer's perspective. For instance, poverty has accelerated the illegal pet trade of some species, but its relevance and role might vary from case to case because of the presence of influencing factors such as social acceptability, law enforcement and so on. Recent studies such as Lunstrum et al. (2020) have indicated that the relation between poverty and illegal wildlife harvesting is much more complicated. It is evident that drivers are also interlinked among one another. Thus addressing the problem with respect to any location or species, the first step should be to specifically identify the drivers and all the factors that affect the drivers.

Illegal pet trade symbolizes the overexploitation of biodiversity for its aesthetic value. However, unlike other prominent conservation threats of the current times such as human-wildlife conflicts and habitat loss, the magnitude of illegal pet trade is inconspicuous. The most formidable challenge in solving the problem arises from the fact that mechanisms designed to control it are actually utilized for its acceleration. Its linkage with economic and cultural aspects of the society makes it even more complicated. There is also an emotional side to the problem because it stems from human desire. In fact, all the driving factors are also interlinked among themselves. Thus, collaborative initiatives should be taken by conservationists, policymakers, technocrats, law enforcers and social scientists to formulate appropriate solutions. It is suggested that steps must be taken to reduce the human craving for wild pets, followed by strengthening of the regulatory system. This is the only way to protect biodiversity and ensure sustainable utilization of its aesthetic value.

Table 3 Summary of details of different aspects that determine the existence of illegal pet trade

Aspects	Details
Economic	Ability to spend money, need to support livelihood financially
Legal	Poor domestic regulation and mismatch between international regulations, loopholes in regulation, scope for laundering through captive breeding and fake permits
Personal	Lack of awareness, influence from media and market trends, individual preferences
Societal	Cultural, social and traditional practices; acceptability of wildlife pet trade as a means of income
Geographical	Appropriate geographical location where easy transportation facility complements the availability of tradable species
Technological	Global transport connectivity, internet access
Logistical	Existence of proper network and logistics to facilitate the entry of illegal wildlife to enter the illegal trade

REFERENCES

Altherr, S. & Lameter, K. (2020). The Rush for the Rare: Reptiles and Amphibians in the European Pet Trade. Animals, 10:2085. https://doi.org/10.3390/ani10112085

Alves, M.M., Lopes, S.F. & Alves, R.R.N. (2016). Wild vertebrates kept as pets in the semiarid region of Brazil. Tropical Conservation Science, 9(1):354-368. https://doi.org/10.1177/194008291600900119

Alves, R.R.N., Lima, J.R.F. & Araújo, H.F. (2013). The live bird trade in Brazil and its conservation implications: an overview. Bird Conservation International, 23:53-65. https://doi.org/10.1017/S095927091200010X

Animal Welfare Institute. Bird Trade. https://awionline.org/content/bird-trade[Accessed 15 February 2022].

Annorbah, N.N.D, Collar, N.J. & Marsden, S.J. (2016). Trade and habitat change virtually eliminate the Grey Parrot Psittacus erithacus from Ghana. Ibis, 158 (1):82-91. https://doi.org/10.1111/ibi.12332

Ashley, S., Brown, S., Ledford, J., Martin, J., Nash, A. E., Terry, A., Tristan, T. & Warwick, C. (2014). Morbidity and mortality of invertebrates, amphibians, reptiles, and mammals at a major exotic companion animal wholesaler. Journal of Applied Animal Welfare Science, 17:308-321. https://doi.org/10.1080/10888705.2014.918511

Atoussi, S., Bergin, D., Razkallah, I., Nijman, V., Bara, M., Bouslam, Z. & Houhamdi, M. (2020). The trade in the endangered African Grey Parrot Psittacus erithacus and the Timneh Parrot Psittacus timneh in Algeria. Ostrich. https://doi.org/10.2989/00306525.2020.1763492

Bhalla, R. (2015). Inside Delhi's illegal bird trade. India Today. Retrieved February 15, 2022, from https://www.indiatoday.in/mail-today/story/an-investigation-into-the-delhis-illegal-bird-trade-274999-2015-11-30

Biddle, R., Ponce, I.S., Cun, P., Tollington, S., Jones, M., Marsden, S., Devenish, C., Horstman, E., Berg, K. & Pilgrim, M. (2020). Conservation status of the recently described Ecuadorian Amazon parrot Amazona lilacina. Bird Conservation International, 30:586-598.
https://doi.org/10.1017/S0959270920000222

Biddle, R., Solis-Ponce, I., Jones, M., Pilgrim, M. &Marsden, S. (2021). Parrot Ownership and Capture in Coastal Ecuador: Developing a Trapping Pressure Index. Diversity, 13:15. https://doi.org/10.3390/d13010015

BirdLife International. (2018). State of the world's birds: taking the pulse of the planet. Cambridge, UK: BirdLife International.

BirdLife International. http://www.birdlife.org [Accessed 15 February 2022].

Chan, D.T.C., Poon, E.S.K., Wong, A.T.C. & Sin, S.Y.W. (2021). Global trade in parrots - influential factors of trade and implications for conservation. Global Ecology and Conservation, 30:e01784. https://doi.org/10.1016/j.gecco.2021.e01784

Chng, S.C.L. & Bouhuys, J. (2015). Indian Star Tortoises: Shop sales fall as internet trade increases. TRAFFIC Bulletin, 27(2):73-78.

Chng, S.C.L. & Eaton, J. A. (2016). In the market for extinction: Sukahaji, Bandung, Java, Indonesia. Birding ASIA, 26:22-28.

Chng, S.C.L. (2014). Seizures of tortoises and freshwater turtles in Thailand 2008 - 2013. TRAFFIC, Petaling Jaya, Selangor, Malaysia

CITES. (2017). Secretary-General's Certificate of Commendation. CITES Notification to the Parties No. 2017/076.

Clarke, T. A., Reuter, K. E., LaFleur, M.,&Schaefer, M. S. (2019). A viral video and pet lemurs on Twitter. PloS one, 14:e0208577. https://doi.org/10.1371/journal.pone.0208577

D'Cruze, N., Singh, B., Morrison, T., Schmidt-Burbach, J., Macdonald, D.W. & Mookerjee, A. (2015).A star attraction: The illegal trade in Indian Star Tortoises. Nature Conservation, 13:1-19. https://doi.org/10.3897/natureconservation.13.5625

D'Cruze, N., Choudhury, B. C., & Mookerjee, A. (2016). Geochelone elegans. The IUCN Red List of Threatened Species 2016, e.T39430A2926441. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T39430A2926441.en

Dasgupta, S. (2016). International trade in African grey parrots banned. Mongambay. https://news.mongabay.com/2016/10/international-trade-in-african-grey-parrots-banned/ [Accessed 15 February 2022].

Defenders of Wildlife. (2016). Last chance to save African Grey Parrot. https://defenders.org/blog/2016/09/last-chance-save-african-gray-parrot [Accessed 15 February 2022].

European Parliament. (2016). EU trade policy and the wildlife trade. Office of Directorate-General for External Affairs, Policy Department, European Parliament.

Fonseca, E., Zank, C., Cechin, C. Z. & Both, C. (2021). Reptile pet trade in Brazil: A regulatory approach to Sustainable biodiversity conservation. Conservation Science and Practice:e504. https://doi.org/10.1111/csp2.504

Grant, R.A., Montrose, T.V. & Wills, A.P. (2017). ExNOTic: Should We Be Keeping Exotic Pets? Animals 7:47. https://doi.org/10.3390/ani7060047

Jenkins, R.K.B., Tognelli, M.F., Bowles, P., Cox, N., Brown, J.L., Chan, L., Andreone, F., Andriamazava, A., Andriantsimanarilafy, R.R., Anjeriniaina, M., et al. (2014). Extinction risks and the conservation of Madagascar's reptiles. PLoS ONE, 9(8), e100173. https://doi.org/10.1371/journal.pone.0100173

Jolly, C.J., Takach, B.V. & Webb, J. K. (2021). Slow life history leaves endangered snake vulnerable to illegal collecting. Scientific Reports, 11:5380. https://doi.org/10.1038/s41598-021-84745-1

Karokaro, A. S. (2020). Trafficking of thousands of songbirds highlights rampant trade in Indonesia. Mongabay. https://news.mongabay.com/2020/07/trafficking-of-thousands-of-songbirds-highlights-rampant-trade-in-indonesia/ [Accessed 15 February 2022].

Kitson, H.&Nekaris, K. (2017). Instagram-fuelled illegal slow loris trade uncovered in Marmaris, Turkey. Oryx, 51: 394-394. https://doi.org/10.1017/S0030605317000680

Lawson, K. & Vines, A. (2014). Global Impact of the Illegal Wildlife Trade - The Costs of Crime, Insecurity and Institutional Erosion. Chatham House, London, 62 p.

Licarião, M.R., Bezerra, D.M.M.&Alves, R.R.N. (2013). Wild birds as pets in Campina Grande, Paraíba State, Brazil: An Ethnozoological Approach. Annals Brazilian Academy of Sciences, 85(1):333. https://doi.org/10.1590/S0001-37652013000100011

Louies, J. (2014). An overview of pet trade in India. In: Chhabra, D. B. & Beteille, R. (ed), PANDA Special Issue on Illegal Wildlife Trade in India, WWF, India, p. 3-6.

Lunstrum, E. & Givá, N. (2020). What drives commercial poaching? From poverty to economic inequality. Biological Conservation, 245:108505. https://doi.org/10.1016/j.biocon.2020.108505

Malsinghe, D., Anslem de silva,Priyadarshani, H.A.A., Dassanayake, D., Rodrigo, K., Kithsiri, D.M.D., Kulathuga, D.G.B.D., Kumaratunga, V. & Jinadasa, T.N. (2017). Seizure of the biggest illegal shipment of star tortoises (Geochelone elegans) by the Sri Lanka navy. WILDLANKA, 5(2):78 - 83.

Mandimbihasina, A.R., Woolaver, L.G., Concannon, L.E., Milner-Gulland, E.J., Lewis, R.E., Terry, A. M. R., Filazaha, N., Rabetafika, L.L. & Young, R.P. (2020). The illegal pet trade is driving Madagascar's ploughshare tortoise to extinction. Oryx, 54(2):188-196. https://doi.org/10.1017/S0030605317001880

Mărginean, G., Gherman, E., & Sos, T. (2018). The illegal internet based trade in European pond turtle Emys orbicularis (Linnaeus, 1758) in Romania: a threat factor for conservation. North-Western Journal of Zoology, 14(1):64-70.

Martin, R. O., Senni, C., D'Cruze, N., & Bruschi, N. (2019). Tricks of the trade-legal trade used to conceal Endangered African Grey Parrots on commercial flights. Oryx, 53:213. http://dx.doi.org/10.2989/00306525.2020.1763492

Martin, R.O., Senni, C., & D'Cruze, N.C. (2018). Trade in wild-sourced African grey parrots: Insights via social media. Global Ecology and Conservation, 15:e00429. https://doi.org/10.1016/j.gecco.2018.e00429

Masroor, R., Khisroon, M. & Jablonski, D. (2020). A case study on illegal reptile poaching from Balochistan, Pakistan. Herpetozoa, 33:67-75. https://doi.org/10.3897/herpetozoa.33.e51690

Mombauer, D. (2019). Bid for greater protection of star tortoise, a trafficking mainstay. Mongabay. https://news.mongabay.com/2019/08/bid-for-greater-protection-of-star-tortoise-a-trafficking-mainstay/ [Accessed 15 February 2022].

Morgan, J. & Chng, S. (2018). Rising internet-based trade in the Critically Endangered ploughshare tortoise Astrochelys yniphora in Indonesia highlights need for improved enforcement of CITES. Oryx, 52(4):744-750. https://doi.org/10.1017/S003060531700031X

Morton, O., Scheffers, B.R., Haugaasen, T. & Edwards, D.P. (2021). Impacts of wildlife trade on terrestrial biodiversity. Nature Ecology and Evolution, 5:540-548. https://doi.org/10.1038/s41559-021-01399-y

Marshall, B.M., Strine, C., & Hughes, A.C. (2020). Thousands of reptile species threatened by under-regulated global trade. Nature Communications, 11:1-12. https://doi.org/10.1038/s41467-020-18523-4

Nakamura, J. N., &Kuemlangan, B. (2020). Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) through national fisheries legal frameworks: a study and a guide. Legal Guide No. 4. FAO, Rome. https://doi.org/10.4060/cb1906en

Nekaris, K., Campbell, A. I. N., Coggins, T. G., Rode, J., &Nijman, V. (2013). Tickled to death: analysing public perceptions of 'cute' videos of threatened species (slow lorises - Nycticebusspp.) on Web 2.0 sites. Plos One, 8(7):e69215. https://doi.org/10.1371/journal.pone.0069215

Neme, L. (2015). Latin American illegal wildlife trade exploding in scope and scale. Mongabay. https://news.mongabay.com/2015/11/latin-american-illegal-wildlife-trade-exploding-in-scope-and-scale/ [Accessed 15 February 2022].

Nijman, V. & Shepherd, C.R. (2015). Analysis of a decade of trade of tortoises and freshwater turtles in Bangkok, Thailand. Biological Conservation 24:309-318. https://doi.org/10.1007/s10531-014-0809-0

Nijman, V., Sari, S.L., Siriwat, P., Sigaud, M. & Nekaris, K.A. (2017). Records of four Critically Endangered songbirds in the markets of Java suggest domestic trade is a major impediment to their conservation. Birding ASIA, 27:20-25.

Peng, S., & Broom, D.M. (2021). The Sustainability of Keeping Birds as Pets: Should Any Be Kept? Animals, 11:582. https://doi.org/10.3390/ani11020582

Pollock, C. (2013). Understanding the illegal parrot trade. Lafeber Vet website. https://lafeber.com/vet/understanding-the-illegal-parrot-trade/ [Accessed 15 February 2022].

Pragatheesh, A., Deepak, V., Girisha, H.V. & Tomar, M.S. (2021). A looming exotic reptile pet trade in India: patterns and knowledge gaps. Journal of Threatened Taxa, 13(6):18518-18531. https://doi.org/10.11609/jott.6998.13.6.18518-18531

Reino, L., Figueira, R., Beja, P., et al. (2017). Networks of global bird invasion altered by regional trade ban. Science Advances, 3:e1700783. https://doi.org/10.1126/sciad v.17007 83
https://doi.org/10.1126/sciadv.1700783

Ribeiro, J., Reino, L., Schindler, S., Strubbe, D., Vall-llosera, M., Araújo, M. B., Capinha, C., Carrete, M., Mazzoni, S. & Monteiro, M. (2019). Trends in legal and illegal trade of wild birds: a global assessment based on expert knowledge. Biodiversity and Conservation, 28:3343-3369. https://doi.org/10.1007/s10531-019-01825-5

Romero-Vidal, P., Hiraldo, F., Rosseto, F., Blanco, G., Carrete, M. & Tella, J.L. (2020). Opportunistic or Non-Random Wildlife Crime? Attractiveness rather than Abundance in the Wild Leads to Selective Parrot Poaching. Diversity, 12:314. http://dx.doi.org/10.3390/d12080314

Runhovde, S. R. (2018). Illegal online trade in reptiles from Madagascar. The Global Initiative Against Transnational Organized Crime, Switzerland

Sarkar P., Debnath, N., & Reang, D. (2021). Coupled human-environment system amid COVID-19 crisis: A conceptual model to understand the nexus. Science of the Total Environment, 753: 141757. https://doi.org/10.1016/j.scitotenv.2020.141757

Scheffers, B.R., Oliveira, B.F., Lamb, I. & Edwards, D.P. (2019). Global wildlife trade across the tree of life. Science, 366:71-76. https://doi.org/10.1126/science.aav5327

Setiyani, A.D., & Ahmadi, M.A. (2020). An overview of illegal parrot trade in Maluku and North Maluku Provinces. Forests and Society, 4(1):48-60. https://doi.org/10.24259/fs.v4i1.7316

Sinha, N. (2014). The caged bird: illegal trade rendering birds flightless. In: Chhabra, D. B.&Beteille R. (eds). PANDA Special Issue on Illegal Wildlife Trade in India WWF, India, p. 7-10.

Stringham, O.C., García-Díaz, P., Toomes, A., Mitchell, L., Ross, J.V. & Cassey, P. (2021). Reptile smuggling is predicted by trends in the legal exotic pet trade. Conservation Letters:e12833. https://doi.org/10.1111/conl.12833

Sylas, W., de Oliveira, L., Lopes, S.F. & Alves, R.R.N. (2018).Understanding the motivations for keeping wild birds in the semi-arid region of Brazil. Journal of Ethnobiologyand Ethnomedicine, 14:41. https://ethnobiomed.biomedcentral.com/articles/10.1186/s13002-018-0243-6

Tella, J.L. & Hiraldo, F. (2014). Illegal and Legal Parrot Trade Shows a Long-Term, Cross-Cultural Preference for the Most Attractive Species Increasing Their Risk of Extinction. PLoS ONE, 9(9):e107546. https://doi.org/10.1371/journal.pone.0107546

Toomes, A., Stringham, O. C., Mitchell, L., Ross, J.V. & Cassey, P. (2020). Australia's wish list of exotic pets: biosecurity and conservation implications of desired alien and illegal pet species. NeoBiota, 60:43-59. https://doi.org/10.3897/neobiota.60.51431

TRAFFIC a. Reptiles and amphibians: seeking sustainability within. https://www.traffic.org/what-we-do/species/reptiles-and-amphibians/[Accessed 01 February 2022].

TRAFFIC b. https://www.traffic.org/site/assets/files/3753/asian-songbird-trade-singapore-factsheet.pdf [Accessed 01 February 2022].

UNODC (United Nations Office on Drugs and Crime). (2020). World Wildlife Crime Report 2020: Trafficking in Protected Species. United Nations, New York.

US Department of the Interior. (2020). 10 things poachers don't want you to know about wildlife trafficking. https://www.doi.gov/blog/10-things-poachers-dont-want-you-know-about-wildlife-trafficking [Accessed 15 February 2022].

Valdez, J.W. (2021) Using Google Trends to determine current, past, and future trends in the reptile pet trade. Animals, 11:676. https://doi.org/10.3390/ani11030676

Van den Burg, M.P. & Weissgold, B.J. (2020). Illegal trade of morphologically distinct populations prior to taxonomic assessment and elevation, with recommendations for future prevention. Journal for Nature Conservation. https://doi.org/10.1016/j.jnc.2020.125887

Warwick, C. (2014). The morality of the reptile "pet" trade. Journal of Animal Ethics, 4:74-94. https://doi.org/10.5406/janimalethics.4.1.0074

World Animal Protection. (2019). Wild at heart: The cruelty of the exotic pet trade. World Animal Protection, London UK.

World Animal Protection a. Poached African grey parrots smuggled on Turkish Airlines flights. https://www.worldanimalprotection.org/news/poached-african-grey-parrots-smuggled-turkish-airlines-flights [Accessed 15 February 2022].

World animal protection b. https://www.worldanimalprotection.org/our-work/animals-wild/exotic-pets [Accessed 15 February 2022].

WWF a. Illegal wildlife trade in India. https://www.wwfindia.org/about_wwf/enablers/traffic/illegal_wildlife_trade_in_india/ [Accessed 01 February 2022].

WWF b. https://www.wwfindia.org/?6900/TRAFFIC-helps-to-claw-back-illegal-parrot-trade-in-India[Accessed 01 February 2022].

Wyatt, T., Johnson, K., Hunter, L., George, R. & Gunter, R. (2018). Corruption and wildlife trafficking: three case studies involving Asia. Asian Criminology, 13, 35-55. https://doi.org/10.1007/s11417-017-9255-8 https://doi.org/10.1007/s11417-017-9255-8

Yohanna, Irham, M. & Kurniawan, P.T. (2021). Monitoring of songbird trades in Jambi, Indonesia. IOP Conference Series: Earth and Environmental Science, 690:012035. https://doi.org/10.1088/1755-1315/690/1/012035 https://doi.org/10.1088/1755-1315/690/1/012035

Young, J., Pritchard, R., Nottle, C. & Banwell, H. (2020). Pets, touch, and COVID-19: health benefits from non-human touch through times of stress. Journal of Behavioral Economy for Policy, 4 (COVID-19 Special Issue 2), 25-33.