



Assessing consumer trends and illegal activity by monitoring the online wildlife trade



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ABSTRACT

Wildlife ranks the fourth among illegally traded items. The insatiable market demand for wildlife products directly threatens plants, animals and their natural habitats. Identifying illegal trade and understanding consumer trends is important for the conservation of overexploited species. The internet and social media have emerged as popular platforms for wildlife trade, and surveying these marketplaces is an important tool for conservation. Due to their high demand and high value, we choose turtles as a case study to demonstrate the usefulness of monitoring the online trade. We collected data (species, number and price) on the sale of live turtles from a Hong Kong-based internet forum for 36 months (September 2013–August 2016) to assess the scale of the trade, identify potential illegal trade and investigate factors that influence prices. We recorded 14,360 individuals of 136 species, including 67 threatened species. Of the 77 species sold that are listed in CITES appendices, 36% were likely illegally traded as they had neither possession licenses under Hong Kong law nor CITES import records. Turtles with the highest prices tended to be critically endangered species, wild-caught or those with special morphological forms. Sale of hybrid turtles of 38 “species/varieties” occurred in 4% of all sale posts. Our survey of the online trade in Hong Kong discovered important trends of sale price and consumer preference, collected baseline data for enforcing trade regulations and highlighted likely illegal trade of turtles. We encourage similar studies for other highly traded wildlife to be incorporated into integrative approaches for conservation management.

1. Introduction

Illegal wildlife trade, worth up to USD 7–23 billion a year, is one of the most lucrative crimes following trafficking of humans, arms and drugs (Nellemann et al., 2016). The major driver of the illegal wildlife trade market is the demand for food, pets, commodity goods and medicine (Broad et al., 2003; Rosser and Mainka, 2002). This unsustainable overexploitation for human use has been identified as the biggest driver of biodiversity decline (Maxwell et al., 2016), which can synergize to more serious problems of ecosystem malfunction (Nijman, 2010).

Wildlife trade is regulated at both international and national levels. The Convention on the International Trade in Endangered Species (CITES) is the international agreement that regulates international trade of approximately 35,800 species of animals and plants, which are listed in one of the three Appendices (I, II and III) (CITES, 2017).

Different appendices offer different levels of restriction: Appendix I covers globally threatened species affected by trade (e.g. elephants, tigers) and no commercial trade of these species across borders is allowed; Appendix II covers species that are not necessarily threatened by imminent extinction but whose trade is subjected to strict regulation and cross border commercial trade requires non-detriment finding and export permit; and Appendix III requires export permits from the listing countries or certificates of origin from the non-listing countries to export. Through national laws, signatory national authorities implement CITES through a system of permits during import and export. National laws controlling the domestic trade of species may strengthen regulation of CITES-listed species after import into a country. Laws and regulations may differ between countries and territories. For example, the practice of “one country, two systems” in mainland China and Hong Kong results in differences in implementation of CITES. In China, endangered species are designated (first class, second class) and protected

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under Article 9 of the Wildlife Protection Law of the People's Republic of China. The list of first class and second class species overlaps, but is not identical to CITES appendices. Use of protected species in mainland China is limited to scientific research, domestication, exhibition and special purposes, with the regulating body differing between first class (State Council) and second class species (provincial government). In Hong Kong, a license issued by the government is required to possess wild-caught individuals of species listed on CITES Appendix I and II. Although laws are in place, ineffective implementation of international and national laws (e.g. insufficient border controls, corruption and insufficient domestic trade control) hampers the effectiveness of CITES (Challender et al., 2015). What results is illegal cross-border and domestic trade of CITES-listed species (Nijman, 2010; Nijman and Shepherd, 2007).

The internet has emerged as an important platform for wildlife trade (Lavorgna, 2014). Previously, studies on wildlife trade were done by visiting physical markets (Cheung and Dudgeon, 2006; Nijman and Shepherd, 2007; Regueira and Bernard, 2012), but recent studies showed that the internet is increasingly being used for illegal trade of various wildlife, including birds (Alves et al., 2012), mammals (Harrison et al., 2016), and orchids (Hinsley et al., 2015). Given the obscurity of traders online, regulation of wildlife trade on internet platforms is fraught with difficulties (Bennett, 2011). Formulation of measures to halt online wildlife trade is in dire need (Shirey and Lamberti, 2011), which necessitates a comprehensive understanding on the scale of the market (Sajeva et al., 2013), especially for heavily traded and harvested groups of wildlife (Yeo et al., 2017).

The demand and price of wildlife may increase with rarity associated with morphology (Lyons and Natusch, 2013), life-history traits (Hinsley et al., 2015), origin (Dutton et al., 2011), and conservation and trade regulation status (Courchamp et al., 2006). Consumers may prefer rare species and pay disproportionately high prices for them, leading to increased hunting efforts (Courchamp et al., 2006). What results is a positive feedback loop—consumers pay disproportionately high prices for rare species, making it worthwhile for a hunter to dedicate more time and effort to find the organism, in turn making the species rarer and more expensive (Courchamp et al., 2006). Understanding the factors influencing consumers' preference in wildlife trade can help to identify measures to reduce demand for and regulate the trade of species of conservation concern (Hinsley et al., 2015).

Turtles provide a good case study for understanding the interplay between consumer preferences and the illegal online wildlife trade. There are four main reasons. First, turtles have low species richness (356 species) (Rhodin et al., 2017), making species identification easier compared to other groups [e.g., > 25,000 species of orchids (Chase et al., 2003) and > 3500 species of snakes (Uetz et al., 2017)] and allowing for a better characterization of the trade. Second, turtles are among the most imperiled groups of organisms—over 60% of all species meet the criteria for critically endangered, endangered or vulnerable of the IUCN Red List (Rhodin et al., 2017). Unsustainable harvest of turtles for traditional medicine, food and pets is the primary threat responsible for plummeting turtle populations (Buhlmann et al., 2009; Cheung and Dudgeon, 2006; van Dijk, 2000). Third, the volume and diversity of turtles traded are high (Cheung and Dudgeon, 2006; Nijman and Shepherd, 2014), due to the high value and ease of transport. For example, a juvenile golden coin turtle (*Cuora trifasciata*) that is approximately 500 g is hearty enough to survive long-distance travel, can be easily smuggled and fetch over USD 5000. Lastly, the turtle trade exemplifies an important issue that needs to be understood about wildlife trade—sale of hybrids. For turtles, hybrids are intentionally produced and sold in the trade, leading to complications of species identification for trade regulations and formulating conservation efforts (Dalton, 2003; Parham et al., 2001; Stuart and Parham, 2006).

To demonstrate the usefulness of monitoring the online wildlife trade for conservation management, we study the online trade of turtles in Hong Kong, a major hub for international wildlife trade (Cheung and

Dudgeon, 2006; Luiselli et al., 2016; Nijman, 2010). By monitoring a popular Hong Kong-based internet platform for 36 months (September 2013–August 2016), we are able to (1) characterize the online turtle trade (e.g. number of individuals and species, and conservation status of traded species), (2) identify probable illegal trade, (3) identify the factors influencing the sale price and (4) investigate the phenomenon of producing and selling hybrids. We discuss each of these topics in detail, as well as provide recommendations on how to incorporate and improve online surveys for regulating wildlife trade.

2. Materials & methods

2.1. Study platform

Due to the possibility of cross-posting on different platforms and manpower constraints, we monitored a single wildlife trading platform in Hong Kong. To identify the most active platform, we compared the number of posts selling turtles as pets on three internet platforms for three months. Two of these platforms were forums (one selling all animals and the other specializing on turtles) and one platform was a group on social media (specializing on turtles). The forum specializing on turtles had the highest number of posts, so we focused on this forum. On the forum, members connect and discuss a variety of topics about turtles, including husbandry and trade. The forum is accessible to the public, but only members can post. Due to ethical considerations, we do not disclose the specifics of the forum (name, site address) following the practices of similar studies (Hinsley et al., 2016; Sajeva et al., 2013).

2.2. Sampling

We collected data (date of post, species identity, number of individuals sold and price) from all posts that live turtles were sold between September 2013 and August 2016. Species identity was based on the scientific or common name listed in the post. For hybrids, the identity of the parental species was also based on scientific or common name. Photos could not be used for validation of species identity because not all posts included pictures. It is possible that posts (mistakenly or purposefully) misidentified species, but a preliminary cross-check of a subset of posts did not find any misidentifications. It is possible for members to use multiple user names, but we were unable to account for this in our data collection. Data from September 2013 to December 2015 were collected at a single time as an archive of past posts, while data from January 2016 to August 2016 were collected bi-weekly. We standardized species names by following the taxonomy in Rhodin et al. (2017). To ensure consistency and minimize over-estimates, we enacted two rules when collecting data. First, we assumed one turtle for sale if the number of individuals was not listed. Second, to avoid repeatedly recording the sale of the same individual or batch of turtles, we excluded posts by a member selling the same species in the same month.

We identified potential illegal trade in two ways. First, we compared forum data to official import records into Hong Kong between 2007 and 2016 in the CITES trade database (CITES, 2017), following the CITES listings as of August 2016 (CoP16). These import records were retrieved in March 2018 to avoid missing records because of delay in data submission to CITES. Although our online surveys began in 2013, we included older import records to be conservative in identifying illegal trade, as turtles are long-lived animals that can be sold several years after import. Species being sold in Hong Kong but absent from CITES import records were regarded as likely being imported to Hong Kong illegally. Second, under a law in Hong Kong, Protection of Endangered Species of Animals and Plants Ordinance (CAP.586), a possession license is required for the possession and sale of all live turtles included in CITES Appendix I, and wild-caught individuals in Appendix II. We obtained a species list for which possession licenses had been issued by the enforcement authority (Agriculture, Fisheries and Conservation

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