The availability of online elephant ivory

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I. Declaration

I declare that this thesis has been composed independently and that it has not been submitted to another degree or qualification apart from MSc Biodiversity Management by research. Unless it has been stated elsewhere in the acknowledgement or references, this thesis has been created and written on my own.

Sunny-Mae Waller

II. Acknowledgements

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IV. ABSTRACT

The ivory trade is an increasingly prominent form of wildlife crime, and due to technological advances in recent years, the internet has made ivory trading more accessible than ever before. This has created a drastic change in how crime operates and has consequently led to difficulties in identifying sales and penalization. Despite the UK Ivory Act banning the trade, and CITES protecting vulnerable elephant populations, the ivory trade still continues to threaten the species. Further research into the online availability of ivory is crucial in understanding the trade and behavioural response of consumers. This study aims to; understand the demand for ivory and the scale of consumerism in more detail, and to investigate the accessibility of the online ivory market. This involved exploring how popular ivory products are in UK marketplaces, and how easy it is to find and purchase ivory as a consumer. These questions are investigated through chapter 2 of this thesis, which involved a 17-week investigation of eBay UK by searching for 'netsuke' items to identify possible ivory products being sold. These were examined for Schreger lines to determine the authenticity of ivory items. Additionally, chapter 3 of this thesis investigates trade data using the search-cost ('shopping list') analysis method, which involves searching for a specific list of wildlife items online. The aim of this is to demonstrate a more time-effective way to gain trade data compared to traditional methods, especially given the scale of online trade. This follows the rationale that when searching for an item, a higher search time would correlate with less availability. The ivory market provides a particularly interesting case study to investigate the effectiveness of the search cost method due to the persistence of active ivory sellers despite the UK Ivory Ban and recent political interest in wildlife crime. For this study, we involved 24 participants who were given a 'shopping list' of both elephant items and non-elephant items and asked them to record how long it took to identify each item online. These

studies identified some key findings, where we can conclude the ivory trade is still prominent, with existing demand and accessibility to consumers. Over the 17-week study period of eBay investigation, we identified a total of 43 unique ivory items with 30% of products being sold to the consumer. 44% of these items were removed from the website, however, approximately a quarter had already been sold. This suggests an existing demand for ivory, in addition to inefficient policies presented by eBay to reduce these sales. This contradicts their 2009 policy that banned such sales on their marketplace, demonstrating the need for new and improved measures in this area. Additionally, easy accessibility of ivory was demonstrated through our search-cost analysis. Despite limited knowledge in this field prior to the study, participants had no reported problems identifying an ivory item, with an average search time of 4.13 minutes. Interestingly, our results also found no time difference between ivory and non-ivory items, contradicting certain results from the original study based on physical markets in China. This was a surprising result, which we have concluded could be due to three key possibilities; current deterrents are ineffective meaning ivory items are just as easy to identify as non-ivory items, the items we chose for the list are not popular on online marketplaces, and participants spent more time searching for items due to the risk of getting it wrong. These have presented certain amendments to the research which could be beneficial in any future replications of the study. From the results of this research, we believe the ivory market is still in demand on online marketplaces, with easy accessibility for consumers. We suggest research on a longer scale to investigate whether trends are increasing or decreasing with time. The search cost was an effective method of gaining trade data, but due to limited studies previously, more research is required. Future study is crucial in building on the results of this study, to understand online consumer response to effectively decrease availability and demand.

Chapter 1 Introduction

1.1 International wildlife trade

Humans rely heavily on biodiversity and its services, with the diversity of our planet being essential for our survival (Bastian et al., 2012). The variety of ecosystems across the globe benefits humans in three broad categories; ecosystem services, biological resources and social benefits (Giri et al., 2015; Kinghorn, 2017). Biodiversity is crucial to the health of the planet as it regulates and nourishes the environment we rely upon through several services such as soil maintenance, pollination and air quality maintenance (Rathore & Jasrai, 2018). However, this extremely fragile balance is threatened as the human population continues to grow at an increasing rate causing a substantial loss of biodiversity (Ceballos, 2015), and unsustainability from anthropogenic practices is known to be driving our sixth mass extinction event (Ceballos, 2015).

As the population continues to grow, we meet the demand for consumption by exploiting resources at an increasing rate (Warchol, 2004). Vulnerable species are exploited for an abundance of different uses and are most commonly used for food sources, traditional medicines and commercial uses (Shinwari et al., 2012). A key driver of species overexploitation is the international wildlife trade (MacFarlane et al., 2022) . The transnational illegal trade alone is worth approximately $7 to $23 billion per annum, making it one of the largest global trades (Nellemann et al., 2016). In addition to causing a decline in biodiversity, the wildlife trade can also have severe socioeconomic impacts on many communities around the world (Warchol, 2004). Wildlife trade is a delicate and complex conservation issue as sustainable trade of wildlife can be sustainable and beneficial when managed effectively, and can be crucial to the economy of many rural communities. The legal trade supports many people across the globe, however, a

significant amount is illegal and detrimental to biodiversity. Additionally, the wide range of species being traded across various borders illegally runs the risk of disease transmission, putting the health of both ecosystems and communities in danger (Karesh et al., 2005). For this reason, careful management is crucial in creating legal, sustainable trade.

The illegal wildlife trade is a major conservation issue that has proven difficult to trace and control, posing a serious threat to an abundance of different species (Izzo, 2010). This trade is thought to be one of the largest illegal businesses in the world due to its high-profit value (Haken, 2011), closely following the drug and human trafficking trades (Giovanni, 2006). Due to the age of the internet and technological advances in recent years, how these crimes operate has changed drastically, making them harder than ever to trace and penalise (Lavorgna, 2014).

Although difficult to trace, many NGOs have contributed greatly to raising awareness around the wildlife trade over recent years through United for Wildlife. Awareness mainly focuses on the more charismatic and well-known species, with elephant ivory, rhino horn and tiger exploitation being the face of many social media campaigns. Although this has created positive change and more funding for combating the illegal wildlife trade, the tendency to focus on a few well-known species overlooks, or even ignores, the seriousness of issues faced by the less iconic species. Many reptiles, birds, amphibians, plants and other species are greatly threatened by the international wildlife trade (Auliya, 2016; Krishna et al., 2019; Marshall et al., 2020; Street et al., 2008) but are not well-researched.

1.1.1 Preventatives to reduce the Illegal Wildlife Trade

A common preventative measure for the illegal wildlife trade is the implementation of trade bans that aim to make international wildlife trade more sustainable, at both national and international levels (Pires & Moreto, 2017). This involves designing policies based on sustainability factors such as the type of wildlife banned, the purpose of wildlife trade, and the level of legalisation. However, it has been argued that trade bans further incentivise ivory sales by increasing the value and price to meet the demand (Harland, 1990). The 1980s demonstrated a surge in the demand for ivory, consequently leading to The Convention on International Trade in Endangered Species of Wild Fauna and Flora updating most elephant populations from Appendix II to Appendix I, although this did not stop the poaching (Stiles, 2004). This was due to sales on the black market increasing, as it presented an opportunity for poachers to sell ivory for a higher price online (Heltberg, 2001). On the other hand, the success can differ greatly between countries when looking at domestic trade bans. For example, Nepal introduced a total ban on ivory whilst enforcing strict legislation to support this, and as a result has had a thriving elephant population for many years (Aryal et al., 2018). Therefore the effectiveness of domestic trade bans can differ greatly depending on the government enforcing the ban, and the actions they are taking to ensure illegal trade imports and exports are reduced.

Concerns around the effectiveness of current preventative tactics include the threat presented by the wildlife trade of certain species being mischaracterized, the data created having been misinterpreted, (especially regarding the *illegal* wildlife trade), and international policies not accurately representing certain species. According to Challender et al. (2022), a common issue during policymaking is misinformation about the realities of the wildlife trade, which may harm conservation efforts for wildlife and people along supply chains. There is a serious need for

improvement in assessment methods to determine what quantity of trade can be sustainable and which potentially under-researched species are most at risk to create better licensing and regulatory laws (Nijman, 2010).

It can be argued that a more impactful approach would be to focus on community incentives in addition to legal action, as reducing the wildlife trade should not restrict the communities that rely heavily on the trade to survive (Roe et al., 2014). For example, in Namibia during the 1990s, local communities were supported by sustainably benefitting from the wildlife that existed within their lands, which changed the community's attitude towards conservation and promoted sustainability (Störmeret al., 2019). Following this in 2004, CITES presented a certain quota (five trophy huntings of adult male black rhinoceros) which consequently caused the rhino population to increase from 1,435 (2007) to 1,750 (2012) (Standley et al., 2013).

1.1.2 The recent rise in interest in Illegal Wildlife Trade

Over the past 10 years, there has been a significant rise in interest surrounding the illegal wildlife trade. The UK government initiated and hosted an international conference in 2014 with attendance from 50 represented countries, stating how crucial it is to reduce unsustainable trade whilst simultaneously supporting communities (Milner-Gulland, 2018). This included specific commitments and pledges from each country against a 'one size fits all' approach with significant funding towards anti-poaching, technological advancements and increased educational resources for children to understand the illegal wildlife trade (Zhongming et al., 2018). The most prominent commitment was to increase local community involvement to promote sustainable financial opportunities, and to increase the effectiveness of monitoring (Roe & Booker, 2019).

The following year in 2015, a conference was held in Kasane, Zambia, involving officials from 31 countries, that aimed to enforce stricter legal action related to money laundering associated with wildlife trafficking, including stronger enforcement of laws and engagement of local communities (Zain & Broad, 2015). The conference reaffirmed the urgency and the 'zero tolerance' message from London in 2014, with government officials committing to encouraging collaboration with businesses to reduce the demand for illegal wildlife items and supporting research efforts to understand the root cause of illegal trading (Martin, 2019). This also supported the attitude that the involvement of local communities and careful monitoring were just as crucial as strengthening law enforcement (DEFRA, 2015). This concluded with the most prominent commitment to strengthening laws and policies, whilst also recruiting local people as key stakeholders to create stability to support communities whilst sustainably using wildlife resources (Roe & Booker, 2019).

The Kasane conference was followed up in 2016 during the Hanoi conference, which involved delegates from 47 countries (Martin, 2019). The discussion was focused on elephant ivory, rhino horn and tiger populations, and investigated the Nhi Khe trafficking hotspot in Vietnam (Covert, 2016). Similarly to the discussions in the 2014 and 2015 conferences, an updated identification of prominent threats was given, with the Hanoi Statement on Illegal Wildlife Trade presenting a list of urgent actions needed to reduce illegal wildlife trading (Martin, 2019; Masse et al., 2020). The Hanoi conference reinforced recognition of reducing human-wildlife conflicts and understanding the importance of supporting local communities in conserving species (Roe & Booker, 2019). It was also agreed between governments that increased monitoring and enforcement of laws was essential in reducing illegal wildlife trading.

The fourth, and most recent, conference on wildlife trade returned to London in 2018 and highlighted ways in which crime networks have evolved and adapted, and how new practices and ways of thinking are essential in reducing the illegal wildlife trade (Masse et al., 2020). This was demonstrated by the fact illegal ivory trading has doubled since 2007 (CITES, 2013). The new proposed practices focused upon the following themes: understanding IWT needs to be tackled as serious organised crime, building coalitions and closing markets (Admin, 2018; Masse et al., 2020). An essential part of this practice included supporting and engaging with rangers who are situated around protected areas. The 2018 London conference was the largest yet and demonstrated the increasing interest and commitment from various governments to reduce illegal wildlife trade and protect vulnerable species.

These various conferences have put pressure on the prominent consumers of illegal wildlife in countries such as China, which has had a vast market for ivory for many decades. Consequently, in 2015 China put ivory import and export bans in place (Gamso, 2019) and banned the domestic ivory trade in December 2016, making it illegal to purchase or sell ivory from 2017 (Xiang & Wei, 2017). Subsequently, the United States also proposed a ‘near total’ ban on ivory in 2016 (Manley, 2015), and in 2018, the UK Ivory Act was introduced, which came into force in June 2022, making it illegal to import or export ivory items (Cox, 2021).

1.2 The decline in elephant populations

Despite recognition from various government officials and preventative measures against the illegal wildlife trade, elephant populations remain in great danger of extinction. There are now three elephant species recognised; the African bush elephant, the African forest elephant, and the Asian elephant (Bialas et al., 2021; Payne, 2013). The African elephant is particularly vulnerable

in Central and East Africa, with only 415,000 individuals estimated to be left on the continent. Similarly, the Asian elephant population has dropped by 50% over the past three generations, with only 40,000 remaining in the wild - making both species endangered (WWF, 2020). Consequently, the African elephant species (*Loxodonta africana*) are listed under CITES Appendix I, excluding populations in Botswana, Namibia, South Africa and Zimbabwe, which are listed under Appendix II (Favre, 1989). Additionally, the Asian elephant (*Elephas maximus*) is listed under Appendix I and has been since the CITES list was created in 1975 (CITES, 2021). The hunting of elephants has drastically reduced populations (Chase et al., 2016), and human-elephant conflict has been an increasing threat. Human population growth and reduced habitat availability for elephants consequently result in conflict over space and resources in both Asia and Africa (Boult et al., 2019). Loss of habitat and fragmentation of land means that elephants come into closer contact with local communities, and conflicts such as crop raiding and damage to property become more prominent, leading to a decline in elephant populations (Newmark, 2008). The close contact between populations can cause serious threats to the livelihoods of local farmers, such as damage to agricultural land and sometimes the killing of people, meaning elephants can be hunted in retaliation (WWF, 2020). In addition to habitat change, unsustainable poaching has become an increasingly serious threat since 2006 (CITES Secretariat, 2014), causing a 50% population loss in African elephants in 10 years (Chase et al., 2016). The biggest drive for poaching is the associated wildlife trade market, as there is a significant worldwide demand for ivory (Gao & Clark, 2014). Illegal trafficking of ivory in 2011 was 3 times as prominent than in 1998, causing significant declines in elephant populations (CITES Secretariat, 2014). Thousands of elephants are killed for their tusks annually, with their

ivory being used for ornaments or jewellery in large consumer markets such as China (WWF, 2020).

1.3 What is ivory?

Although commonly associated with elephant species, ivory is simply the structure of teeth and tusks of mammals, meaning it technically relates to any mammal species with teeth or tusks of commercial interest. In literature, the teeth of many species such as narwhals or hippopotamuses are often still defined as ‘ivory’ (Locke, 2008). However, the distinction can be found in the idea of ‘real ivory’, which is thought to originate from elephant species or now-extinct ancestors and is defined as the incisors of the individual that grow constantly throughout their lifetime (Heckel, 2018).

As shown in Figure 1, both teeth and tusks have a similar chemical structure (Baker et al., 2020), with teeth being adapted for the efficient consumption of food and tusks having more specialised uses due to their great length which protrude from the mouth. The structure is composed of dentine, pulp cavity, cementum and enamel and is often thought to be 'hierarchical' due to several complex layers that make the material robust (Su & Cui, 1999). Dentine makes up much of the tusk (WWF, 2019) which is the dense connective tissue that is a key component of many ivory objects and consists of minute structures called dentinal tubules which travel up to the cementum border. Outside the dentine is where the cementum is formed which adheres the tusk root to the mandible and maxilla, responsible for holding the lower teeth and upper jaw (Van der Merwe et al., 1995). The enamel tissue wraps the whole tusk and protects it from environmental wear, with the patterns of the enamel prism having taxonomic relevance (Espinoza & Mann, 2000).

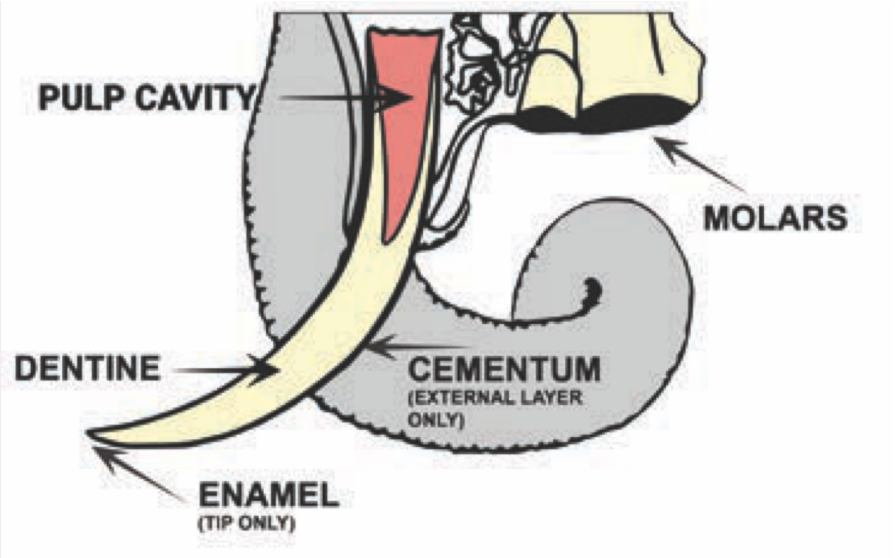

Figure 1. The structure of ivory in elephants (Baker et al., 2020).

This structure means that ivory can easily be carved into an abundance of different objects such as netsukes or jewellery as they are known for their durability in addition to the aesthetic. The material is very dense, can be polished easily and is often carved using woodwork tools (Britannica, 2023). This material is extremely porous meaning it can be dyed to any vibrant colour wanted by the consumer, with its tough structure it can be sliced, cut, curved, heated and able to survive treatments (Chaiklin, 2010). This, along with its natural beauty, means it can be harvested and made into practically any item demanded by consumers, which is why it has been such a prominent trade for centuries.

Elephants are at extremely high risk of being exploited for their ivory, with African elephants being a significant target. Due to much of the ivory being embedded into the skull of the elephant, some hunters will choose to kill the individual to gain the most material. However, in

countries such as Thailand, more sustainable methods may be used by removing the tip of the tusk to gain ivory material but also as part of the management of domestic elephants. However, even if the whole tusk is not taken, the individual is still disadvantaged if unprotected due to the tusk's crucial ability to lift, source food and protect the elephant during conflicts (Shoshani, 1978). Similarly to human hands, elephants are left or right tusked with it being frequently used for tasks and is often worn down more (WWF, 2019).

The tusk of African and Asian elephants continually grows throughout the individual's lifetime, for both males and females, although the Asian species tend to have smaller tusks (especially female individuals). However, this differs slightly for the Indian female elephants as they often have very small tusks that grow at a much slower rate (Heckel, 2018). For this reason, a large portion of commercial trade targets African species. The location of species often impacts the type of ivory produced, with hard ivory typically coming from Western Africa, and soft ivory coming from the Eastern areas. Hard ivory from forest elephants is darker and straighter in shape compared to soft ivory from elephants in Savannah and is often more brittle (Nishihara, 2012).

1.3.1 Ivory identification

One of the most common ways to identify ivory materials is through the examination of Schreger lines as described by Bernhard Schreger in 1800 (Obermayer, 1881), and shown in figure 2 (Singh et al., 2006). These Schreger lines are defined as rows of microscopic tubes that are unique to ivory and present themselves in the cross sections of ivory items (Chervenka, 2021). This is thought to be linked to the dentinal tubules as the waves they formed are intercepted by the cut surface, meaning crossed lines are created at certain angles (Palombo & Villa., 2001), with elephant ivory having an angle greater than 115° (Espinoza & Mann, 1993). There are two types of Schreger lines: the more visible lines around the cementum are known as outer Schreger

lines, and fainter lines close to the pulp cavities are the inner lines. These lines form angles at intersections and form either concave (around the inner area of the tusk) or convex angles (around the outer area of the tusk) (Barry et al., 2020).

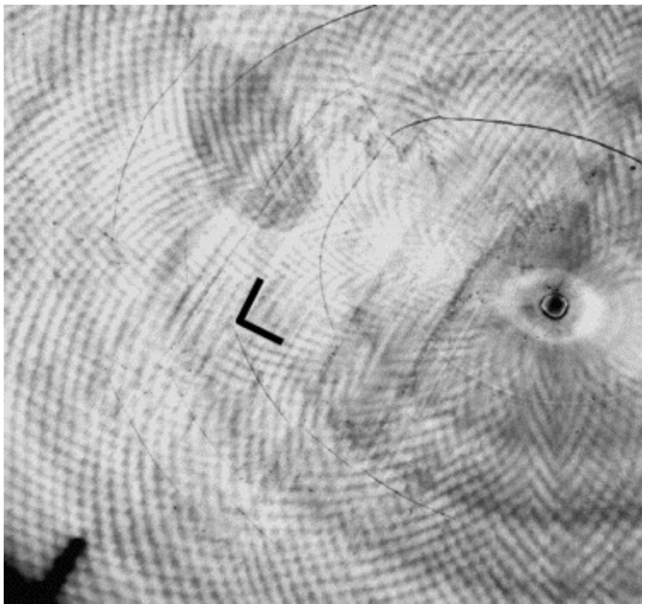

Figure 2. Cross section of elephant ivory demonstrating Schreger lines that result in the distinctive cross-hatched pattern that is indicative of elephant ivory (Singh et al., 2006).

Schreger lines have not been found in ivory alternatives such as resin or plastic, so have appeared to be a reliable way of identifying genuine ivory materials. Typically Schreger lines can be found on the base of ivory items, or where cuts have been made at a right angle to the grain, although they are not always obvious to identify if the item has been heavily polished or carved. The Schreger line method of identification is also commonly used in mammoth ivory studies as the structure is extremely similar to elephant species (Bracco, 2013; Burragato, 1998).

1.3.2 The use of elephant ivory

History has shown that the strong desire for ivory products across the world has been an ongoing struggle for conservationists trying to combat the decline in elephant populations. Famous statues of ancient Greeks, including Athena of Phidias, are made of ivory and gold. Similarly, decorating and carving ivory has been a practice used in India for centuries (Chaiklin, 2010). In China, the ivory trade can be dated back as far as the Ming and Qing dynasties as a form of traditional art, with ivory being carved into various forms (Kao, 1990). This form of art was particularly popular with upper-class communities, with many consumers being from the imperial court and scholars (Gao & Clark, 2014). For many years, ivory was referred to as 'white gold' as it was a symbol of affluence and status. Although popular across the globe, ivory still has a high demand in Chinese culture. Many communities use jewellery and carvings to express their culture and art. Apart from being associated with high social status, ivory is often gifted in many cultures due to its rarity. This can be demonstrated in Hong Kong stores that legally sell ivory, selling expensive jewellery and goods. Ivory can be compared to high art for various communities, often a collector's item seen as an investment as it is rarer than gold.

It is, however, important to note that in addition to these materialistic items made, from the 17th to 19th century, hunters killed elephants for not only ivory but also for food. Every part of elephant meat that could be harvested was dried and eaten by local people (Chaiklin, 2010). There has also been a recent demand for elephant skin, as this is made into beads that are used in jewellery (Kovesi & Johnson, 2020). Additionally, elephant ivory can be seen as spiritually significant with many communities using it to protect themselves from bad luck. Xu Ling from WWF China (Ong, 2018) stated that many people associate the large size of elephants with an increased level of protection, with multiple different communities perceiving ivory as a symbol

of good luck and health. Ivory is also popular in traditional medicines, as certain beliefs have been carried in certain societies for decades. This follows myths that ivory has healing properties such as relieving convulsions, promoting bone growth, and curing epilepsy and boils. This has been popular for decorative ornaments and personal items which are now considered valuable antiques, with vast quantities still being sold (Martin & Stiles, 2005).

The high demand in the UK for ivory dates back to the seventeenth and eighteenth centuries when the selling of ivory in Africa became more prominent due to the growth of European colonialism. The United Kingdom has historically had a large market for ivory, peaking in the 19th century when imports were approximately 500 tonnes per year (Lau et al., 2016). As the British became more interested in Africa and Southeast Asia, the desire for their resources grew. There was a time when local communities offered their ivory to meet the desire in Europe, however, colonialists soon took the ivory for themselves in vast quantities. This led to trophy-hunting becoming increasingly popular to meet the demand for ‘white gold, with both native tribes and elephants being slaughtered for trade and sport. Wealthy Western men saw the killing of elephants as the pinnacle of manhood, with the tusk often used as a trophy (Doty, 2022). This opened the area to further colonial settlement by the British and much of the land, including elephant hunting grounds, was no longer owned privately by hunters and gatherers (Wijngaarden, 1985). As the European population grew, settlers occupied a vast amount of land and wildlife, including elephants, from as early as 1910. Many tribes, such as the Waata, suffered greatly from the decrease in elephant hunting after losing their hunting rights (Kamau & Sluyter, 2018).

The trade of ivory peaked in the 1900s following strong economic development causing an ‘ivory frenzy’ with wealthy individuals globally, and between 1989-1998 African elephant

populations decreased to approximately 357-500,000 (Stiles, 2004). The trade of ivory has made a strong comeback in the 21st century, as significant developments in technology and the internet have consequently led to a revival of the trade worldwide.

In the 1800s, 26 million elephants were estimated to be found on the African continent, however, their populations have now dropped to less than half a million, while Asian elephant populations have dropped to less than 50,000 (Mathiesen, 2021). A National Geographic study revealed the perceptions of likely buyers, finding a disconnect between buying the ivory, and the consequences it has as less than one-third believed elephants are 'very endangered' despite their current threats. The key to decreasing the demand for ivory is by altering individuals' perceptions of ivory so it is no longer glorified and accepted in society, helping people to understand that the purchasing of these items has real-world consequences.

1.4 Ivory substitutes

To reduce the demand for elephant ivory products, one strategy is to encourage the use of substitute materials to create similar items (Martin, 2006). There are currently a variety of different substitutes including other animal parts such as bovine bone (Sims et al., 2011), vegetable ivory (Chu et al., 2015) and man-made products.

1.4.1 Natural alternatives

Typically, vegetable ivory can be obtained through the *Phytelephas macrocarpa,* also known as the Tagua palm tree found in South America. The seed or nut that is harvested from these palm trees (Barfod, 1989) has a white appearance due to the cellulose kernel, giving its familiar appearance to genuine ivory. This occurs due to the endosperm of immature seeds having a milk-like consistency, which over time turns gelatinous and eventually leaves the endosperm as a

hard white substance, comparable to authentic ivory (Chu et al, 2015). This stage of tagua seed has many similarities meaning it can often be manufactured and treated in the same way to create equally beautiful items. Additionally, vegetable substitutes are softer and will dissolve in water if left for a long period, unlike real ivory. Although this may seem like a disadvantage, it does mean the material can be made softer and easier to manipulate during crafting (Chu et al., 2015). When carved, it appears to have a similar line structure to hippopotamus ivory, with fine lines throughout. The difference between vegetable and authentic ivory is a sulfuric acid test, which will turn vegetable ivory pink, whereas real ivory will not change colour (Schabilion, 1983).

Additionally, bone carvings can be used as an alternative for many ivory products, previously known as ‘poor man’s ivory’ due to the lower expense (Abrams, 1987). This can often be the leg bones of cattle, with cow bone being a popular choice for carving (Martin, 2006). This has been a popular alternative due to the similarities in structure and colour, although it is often smoother with fewer lines and imperfections on the surface. Compact bone is a more commonly used alternative as it is more visually similar, with an abundance of canals running through for liquids to pass through which may present themselves as scratch-like imperfections on the surface (Espinoza & Mann, 2000). This is different to ivory which is much denser with fewer imperfections visible on the surface. Bone lacks Schreger lines due to the lack of enamel and pulp cavity (Sims et al., 2011). This means when it has been carved and worked on, products made from bone can look very similar to ivory. There is the argument that the use of bone for materialistic items is still encouraging the desire to use animals for their products, and is often of much lower quality than authentic ivory. However, with 90% of bones used from cows, the items tend to come from non-threatened species and are seen as a good and less expensive alternative by conservationists (Martin, 2006).

In Southeast Asia, several societies prize the skull of the helmeted hornbill (*Rhinoplax vigil*) for its unique material, being referred to as 'golden jade' or 'red ivory', which is carved into various ornaments and jewellery (Kane, 1981) and is becoming increasingly more popular in the west. The casque is made from keratin and shares visual similarities to ivory. However, it is much softer and less dense than elephant ivory, making it easier to work on and carve (Harrisson, 1960). To make these rare items, the casque of the hornbill is cut and carved and is typical of yellow or white colouring. There are various species of this unique bird, however, the helmeted hornbill is the only one with a solid casque that is suitable for carving (Lint K.C, 1972). This ivory alternative is not seen as sustainable due to excessive hunting and a low reproductive rate meaning the helmeted hornbill is extremely vulnerable to population declines (Ingram, 2015).

1.4.2 Synthetic alternatives

Synthetic ivory has been of interest since the CITES ivory ban in 1989, with the price being approximately 14% of real ivory in China and made with the same diagnostic standards as authentic ivory (Zhou, 2014). Back in the 1860s, artificial ivory was attempted to be made from Celluloid (Chervenka, 2021). This is a variation of plastic made from cellulose nitrate which is combined with pigments, fillers and alcohol to create a synthetic plastic material (Wiggins, 2019). Previously, this has been known as 'French ivory' due to the white/yellow appearance which has been compared to real elephant ivory and was popular in manufacturing due to the low expense and high durability (Friedel, 1983). However, celluloid has a certain grain pattern that makes it easy to differentiate from authentic ivory and does share a lot of differences despite the similar appearance. Another popular ivory alternative is resin, a solid substance that shares visual similarities with ivory and is thought to be a durable substance when used for ornaments or

jewellery (Baker et al., 2020). Resin looks so similar that genuine ivory products often claim to be made of resin to avoid detection (Christy, 2012).

The issue found with these synthetics is that authentic ivory will have a certain grain pattern and Schreger lines which makes it identifiable, but apart from celluloid, synthetics typically do not have this grain pattern. The expanding gas from impurities in synthetics will lead to round holes on the surface, which is not found in authentic elephant ivory (Chervenka, 2021). However, at first glance, synthetics can look so similar that suppliers name illegal ivory fake and vice versa, causing more complications with the detection and penalisation of illegal traders (Edwards & Farwell, 1995). One study found that out of 57 investigated illegal ivory cases, 27 attempts were covered by labelling products as fake ivory despite only 513 of 1,714 being synthetic (Zhou, 2014).

1.5 Laws and regulations

As interest in the illegal ivory trade grows, conservationists are increasingly involved in the protection of elephant populations, with new regulations and discussions around trade constantly changing and evolving.

1.5.1 How CITES protects biodiversity

The Convention on International Trade in Endangered Species of Wild Fauna and Flora, commonly known as CITES, means that various governments across the globe have agreed to protect vulnerable populations from unsustainable wildlife trafficking (Fuller, 1994). This agreement ensures that the wildlife trade is legal, sustainable, and traceable to protect biodiversity. Species are protected under this agreement through permits and certificates based

on three Appendices that provide a mechanism to ensure trade in these species is sustainable. While some species listed under this agreement are not currently threatened by trade, the permitting mechanism allows for monitoring to ensure they are not unsustainably exploited, therefore protecting them from any future decline. Appendix I includes species that are considered the most endangered (Article II, paragraph 1) and are faced with extinction meaning trade is prohibited with certain exemptions. Appendix II lists the species that are not threatened with complete extinction, but trade must be controlled to prevent future damage, with permits only being provided if specific conditions are agreed upon (Article II, paragraph 2). The last list, Appendix III, includes species requested from a party that regulates trade already and needs collaboration from other countries under the agreement to stop overexploitation (Article II, paragraph 3) (CITES, 2022; Stefes, 2021).

1.5.2 Ivory laws

China is known to be one of the world's biggest traders of ivory (Gao & Clark, 2014), and has taken steps to reduce the demand in recent years. In 2017, China introduced an ivory ban meaning 31st December 2017 was the last day to legally purchase or sell ivory in the country (Xiang & Wei, 2017). Since 2008, the government has cooperated with various conservation experts to create initiatives to reduce illegal wildlife items entering the country, such as the 'Trans-regional Joint Operation' and changes to customs regulations to identify trafficked items (Zhou et al., 2018). This followed a commitment from China and the United States in 2015 which agreed to a 'near complete ban on the ivory trade (Yu et al., 2017). Following China becoming a CITES member in 1980, the country was offered outside assistance with reducing illegal trade at the 1972 Stockholm environmental meeting (Oksenberg & Economy, 1998). This

led to an abundance of rules such as the ‘Order of Strict Protection of Rare and Precious Species 1983’, the ‘Law on Strict Prohibition of Poaching, Illegal Selling, Purchasing, and Smuggling of Wild Animals 1990’ and the ‘Legislation of Hunting Agreement and Documents on Hunting Privileges 1990’ (Oksenberg & Economy, 1998; Permata & Wahyuni, 2020). However, in 2011 and 2012 this had the inadvertent consequence in black market purchases increasing greatly, with the price of ivory growing rapidly (Huang & Weng, 2014). Additionally, ivory carvings from Beijing were listed as an Intangible Cultural Heritage in 2006 and CITES allowed 73 tonnes of ivory to be imported (Bale, 2015).

In addition to China, the United States contributes greatly to the illegal ivory trade. The main laws and legislations covering the ivory trade in the US are the Endangered Species Act of 1973, the Lacey Act of 1981, and the African Elephant Conservation Act of 1988 (Wyler & Sheikh, 2008). These policies are enforced by the United States Fish and Wildlife Service (FWS), and the National Fish and Wildlife Forensics Laboratory, which tests seized ivory items (De la Rocha, 2018). The country has also been a founding member of CITES since 1975 and the U.S. Department of State has numerous initiatives to reduce wildlife trafficking. In September 2015, former US President Barack Obama and China’s President Xi Jinping acknowledged the need for ivory trade bans to rapidly reduce ivory trafficking (Ares & Pratt, 2018; Kramer et al., 2017). This was supported by US regulations in July 2016, which consisted of an abundance of changes to create a ‘near-total’ ban on imports and exports of ivory items (USFWS, 2016). However, in 2018, the Trump Administration changed these ivory bans and allowed elephant trophies from specific African countries to be imported to the US on an individual review basis (De la Rocha,

2018). Although it is still illegal to purchase worked ivory for commercial reasons, with certain exemptions.

The European Union is a member of CITES, meaning member states do have legislation to prevent commercial trade. Within the EU countries often give permits to trade ‘antique’ ivory items domestically and internationally, including China and Hong Kong. This includes pre-1975 musical instruments and items dating from before 1947 if taken by a museum. Although France and the United Kingdom adopted stricter regulations and ivory control, the remaining EU countries are known to be fairly relaxed on their ivory laws. In 2014, 16 states asked for strong allegiance in the fight against illegal ivory trading, with wildlife specialists and NGOs promoting an EU Action Plan (Van Uhm, 2016). This meant that 90 parliament members called for a complete ban on ivory trading, and 90% of respondents supported the ban (IFAW, 2021). For this reason, the EU Agenda on Security 2015-2021 has focused heavily on crossing their borders, including the prioritisation of wildlife trafficking (EU Action Plan against Wildlife Trafficking, 2015). The EU has a set of regulations to control wildlife trade, such as Council Regulation 338/97 which protects CITES species and Directive 2008/99 which requires wildlife trafficking to be against the law but does not establish common sanctions (Fajardo del Castillo, 2016). Policies in the EU are being assessed constantly to make sure regulations are reducing cross-border crime as this can vary between member states (Stiles & Martin, 2005).

1.5.3 Background to the Ivory Act UK

The Ivory Act 2018 is a UK legislation that bans the commercial trade of elephant ivory, meaning it cannot be bought, sold or exported to the UK legally. Before the Ivory Act was implemented, trade regulation was largely through the Control of Trade in Endangered Species 1997 (COTES) which aims to protect CITES species in the European Union (Ong, 1998) from unregulated trade. When the United Kingdom voted in favour of Brexit in January 2016, the country was still a part of CITES regulations during the transition period of leaving the EU, as Council Regulation 338/97 and Commission Regulation 865/2006 to protect CITES species from trade was still in force (Cox, 2021). This avoided any complications regarding permits for imports and exports from the EU, and even after Brexit, original regulations still apply to UK law. However, an issue that was faced within the Ivory Trade was Article 8 of Council Regulation 338/97 as this offered an exemption for certain antique ivory items, causing much debate over what items were worked and unworked. Ultimately this meant that the trade of pre-1947 ivory was legal in the UK, which the Ivory Act aimed to change.

Royal Assent was received for the UK's Ivory Act in December 2018, legislation established by the Environmental Secretary to protect wildlife and the environment from the impacts of the illegal wildlife trade. The British Government's Department for Environment, Food and Rural Affairs (DEFRA) revealed that 87.6% of respondents were in favour of the ivory ban, 4.3% were against the ban, and 8.1% did not have a clear opinion (DEFRA, 2018). This was due to data presented in the House of Commons demonstrating the rapid decline of the elephant communities, and the concerning growth of the ivory market that was contributing greatly to the population decline (Dunn, 2020). This led to over 70,000 responses, and an eventual ivory ban in

May 2018 (DEFRA, 2018). This meant it was now illegal to import or export ivory, including EU trade to and from the UK with some exemptions for certain items. The agreed exemptions from ivory items being banned were musical instruments with a small ivory quantity, items of cultural or historical interest, and ivory sold between museums (De la Rocha, 2018). However, the new ivory bill did not come without its controversies. A group named Friends of Antique Cultural Treasures Limited (FACT) called for a judicial review of the new UK Ivory Act (Cox, 2021; Dunn, 2020). This was because it took away 'fundamental rights to property and the 'right to conduct a business' in the antique trade (Cox, 2021).

1.5.4 The impact of social media

Given the age of technology creating more connectivity and communication across the world than ever before, it is crucial to look at the role of social media in wildlife trafficking (Xu et al., 2020). Individuals who sell illegal products are exploiting the biggest marketplace there is; online platforms. For this reason, the trade is hugely unregulated and extremely difficult to trace back to the seller, meaning that it is easier than ever before to purchase ivory items.

The Coalition to End Wildlife Trafficking Online was formed in 2018, which unites conservation experts with companies from all over the world to prevent marketplaces from selling illegal products (WWF, 2021). This helps conservation organisations such as WWF and TRAFFIC to help popular online platforms reduce illegal trading through trend data, training and knowledge about how to identify illegal items and sellers (Woolloff et al., 2022). This includes influential partners such as Facebook, Google, eBay, and recently the social media platform TikTok, which have committed to diminishing online wildlife trafficking (Davies et al., 2022). This aimed to

spread awareness around the legalities of online wildlife trade and reduce online wildlife trafficking by 80% by 2020 (Hcarswell, 2018). For example, Facebook has changed community guidelines to prevent the exploitation of endangered species on its platform by removing suspicious groups or posts and using pop-up messaging to educate users (Aung, 2020). However, the effectiveness of these social media platforms has been questioned. For example, despite Facebook's involvement, 129 pieces of content were identified quickly after only a quick search, with elephant tusks and various other illegal items being found and only 13% removed by Facebook (Lakhani, 2022).

The benefit of social media is that its powerful influence over a large audience allows the opportunity to spread awareness and knowledge about the reality of illegal wildlife trafficking. This can be demonstrated in the movement #JoinTheHerd created by a collaboration with WildAid and Grey London which demanded change against ivory trading. This reached a huge audience, with celebrities such as Leonardo Dicaprio, Yoko Ono and Alikiba supporting and sharing the campaign with their millions of followers and putting pressure on legislators (WildAid, 2015).

1.6 Research rationale

Although the international wildlife trade has become a topic of increased interest in conservation, elephant populations are still under serious threat. Contributing factors such as habitat fragmentation and elephant-human conflict are decreasing populations dramatically, although the illegal ivory trade is arguably the threat that is most pressing (UNEP et al., 2013). It has been found that in 2011, the illegal ivory trade was 3 times as much compared to 1998 (CITES Secretariat, 2014a), demonstrating how this issue is progressively more prominent. Despite the

numerous regulations put in place, the numbers do not appear to be decreasing as stricter guidelines do not necessarily correlate to compliance (Harris et al., 2019).

One of the reasons for this challenge is the emergence of online trading. Individuals who sell ivory online do not have to declare an exemption certificate number, and it is difficult for buyers to check whether an ivory item is exempt (Bornfree, 2022). Social media is an extremely accessible way to advertise and encourage the illegal wildlife trade, and it has never been easier for individuals to hide behind a fake identity (Kramer et al., 2017). Additionally, elephant ivory could be sold under the disguise of other species due to the exemption of non-elephant ivory items in the UK Ivory Act. This illegal trade does not only impact various elephant populations, but local communities, economies, and the environment (Karesh et al., 2005).

The age of the internet means that the selling of ivory can be difficult to detect, and a lack of legal enforcement means it is continually increasing. This is particularly challenging due to the tendency for consumer trends to be constantly changing, and for sellers to adapt to new obstacles and challenges that may hinder ivory purchases. This demand for elephant ivory demonstrates gaps in knowledge as we have a restricted understanding of consumer attitudes towards the ivory trade (Thomas-Walters et al., 2021).

More research must be undertaken into the availability of these trades to understand how accessible they are to consumers, and how large the demand is. Therefore, this research intends to look more deeply into how available ivory is to individuals wishing to purchase these items online. The aim is to understand how accessible the market is and how many of these items are being sold, as this can indicate the level of demand. The method of this study will involve a search of open online marketplaces such as eBay, a website well-known for the trade of ivory

(Venturini & Roberts, 2020). The keyword 'netsuke' will be important in finding a list of ivory products that are available to buy online, as this can indicate whether items have been removed, sold, or advertised for consumers. The recruitment of participants who will also search for items on an open marketplace will give a wider and more standardised view of accessibility and availability. This research hopes to understand the trends of online trade in more detail, potentially identifying gaps in current knowledge and research.

1.7 Project aims

The overall aim of this project is to understand the ivory trade in more detail, and how online marketplaces contribute towards the consumerism of ivory products. This project will be divided into the following objectives:

1. Understand the demand for ivory products and the scale of consumerism.
- How popular are ivory products in UK marketplaces?
- Are there any trends within the ivory market, is it increasing or decreasing with time?
2. Understanding the accessibility of the online ivory market.
- How available are illegal ivory products online to consumers?
- Is it easy to find and purchase ivory?

The proposed study will be researching the availability of elephant ivory on online markets. This study will involve searching for ivory products found on online platforms such as eBay UK, using search terms to identify and record items found during a weekly search. This will also be supported by a search-cost analysis, where a group of participants will survey how long it takes

to find certain products presented on a ‘shopping list of things to search for. The aim of this is to understand further the availability and accessibility of elephant ivory products online.

1.8 References

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Chapter 2:

Understanding the availability of illegal elephant ivory on eBay

Abstract

The illegal wildlife trade has threatened an abundance of vulnerable species, such as elephant populations, which have endured severe declines due to habitat fragmentation, conflict and poaching for their ivory. The rise of the internet has meant that the trade in ivory is more accessible than ever before. As a consequence of increased political interest in the illegal wildlife trade and the decline in elephant populations, various measures have been undertaken including recent bans on the trade in ivory. This study investigates the availability of ivory items online, with the aim of providing an understanding of online trade and how marketplaces respond in the context of the recent UK Ivory Act. This study focuses on the online marketplace, eBay UK, as ivory has been known to be traded on this platform. Over a 17-week period, the search term 'netsuke' was used to search for ivory materials being sold, and all resulting items were examined to determine whether they were made of authentic elephant ivory based on the presence of Schreger lines. This study identified 43 unique ivory items during the 17-week period, with 44% of these listings removed. Linguistic analysis revealed that the word 'ivory' was never used to describe an item. Our results indicate that the ivory trade is still active on eBay UK, regardless of the policies that eBay have put in place and the recent UK Ivory Act largely prohibiting these sales. Increased collaboration from websites such as eBay in combating the illegal ivory trade is essential in educating both consumers and sellers, in addition to increasing detectability as a deterrent for sellers.

2.1. Introduction

2.1.1 Threats to elephant populations

Although elephants have been one of the main focal species in relation to the illegal wildlife trade by governments, law enforcement agencies, non-governmental organisations and other stakeholders, elephant populations still continue to decline at a concerning rate. Between 2010 and 2012, 40,000 African elephants (*Loxodonta africana*) were illegally killed (Wittemyer et al., 2014). However, while much of the focus on the ivory crisis has been driven by the decline in elephant populations in Africa, the Asian elephant (*Elephas maximus*) is also highly threatened with populations having suffered a decline of c.50% over the past three generations (75 years) and 40,000 individuals remain (WWF, 2020; Williams et al., 2020). This follows a historic reduction in elephant populations during the 19th century when there was a significant increase in the demand for ivory. The ivory trade was particularly active in North America and Europe, resulting in a drastic reduction in African elephant populations (Barnes, 1999). By the late 19th century, approximately 700 tonnes of ivory were imported to Europe per annum, resulting in the death of 60,000 African elephants per year (Blanc et al., 2003; Lee & Graham, 2006; Spinage, 1994). This led to what is now known as the 'ivory crisis', between the 1970s and early 1990s, and subsequently the listing of African elephants on Appendix II of CITES in 1989, effectively banning international commercial trade in elephant ivory (CITES, 2022; Lee & Graham, 2006).

Much of these declines in elephant populations are driven by a combination of often interlinked factors, particularly poaching, habitat fragmentation and human-elephant conflict. As human settlements expand, habitats in both Asia and Africa have become degraded with less

connectivity within the landscape, causing a significantly decreased range for elephant populations (Calabrese et al., 2017). Increased habitat fragmentation has led to more contact between elephant populations and local communities, and conflicts such as crop raiding become a more significant issue (Shaffer et al., 2019). For example, the elephants of West Africa are now restricted to c.70 isolated populations (Barnes, 1999).

While ivory can result as a by-product of human-elephant conflicts through retaliatory killings, much of the ivory in the trade comes from intentional poaching. Poaching has continued to increase as ivory, or 'white gold', remains a material in high demand (Rice, 2008). Thousands of both Asian and African elephants are killed yearly for their tusks as consumers purchase the material for ornaments and jewellery (Lemieux & Clarke, 2009). In 2011, ivory sales were 3 times as prominent compared to 1998 (CITES Secretariat, 2014). This is in spite of the fact that African elephant species are listed in Appendix I of CITES, except for the populations of Botswana, Namibia, Zimbabwe and South Africa which are listed under Appendix II (CITES, 2022); the Asian elephant has been listed on CITES Appendix I since 1975 when CITES first entered into force (Sakamoto, 2017)

2.1.2 Initiatives

While the illegal wildlife trade has been the subject of renewed interest for the past 10 years, it still represents a significant challenge. This is in spite of the fact that 181 countries have signed up to CITES, committing them to control illegal wildlife trade and protect at-risk species (Collins et al., 2017). This renewed interest in wildlife trafficking led to the London Conference on the Illegal Wildlife Trade in 2014, the first of a series of government-level conferences on illegal wildlife. This first conference involving 41 countries, resulted in the London Declaration which sets out a range of political commitments, and the actions needed to meet these

commitments (Massé et al., 2020). This led to subsequent meetings in Kasana in 2015 (Zain & Broad, 2015), and Hanoi in 2016 (Martin & Martin, 2019), before returning back to London in 2018. At the same time, United for Wildlife was formed in 2012 by the Royal Foundation of the Duke and Duchess of Cambridge and Prince Harry, with the aim of protecting endangered species from trafficking by using a combination of a financial task force and a transport task force (Martin & Martin, 2019; Van de Water, 2022). This led to a number of initiatives, particularly between NGOs and the private sector such as financial institutes and transport companies. One such initiative was the formation of the Coalition to End Wildlife Trafficking Online in 2018. This is a partnership between 3 NGOs and currently 47 online companies with the aim of increasing collaboration between companies to update both global and regional trend data, in addition to increasing education resources and updating policy guidance (Xu et al., 2020). While the Coalition is a relatively new initiative, NGOs, in particular the International Fund for Animal Welfare, have been putting pressure on online marketplaces for many years. This resulted in eBay banning the elephant ivory trade over their platform in 2008, with a complete ban on all ivory types in 2009 (Coghlan, 2008; Cox & Collins, 2021).

While there are a number of demand-side initiatives such as the Coalition to End Wildlife Trafficking Online, supply-side initiatives are also crucial. These include anti-poaching and strengthening laws, as well as sustainable livelihood-based initiatives such as supporting communities that are reliant on poaching and incentivizing engagement with sustainable practices (Roe et al., 2002). These incentives range from an increased income in other sustainable forms, skill training, more access to medical care and education, and financial compensation for supporting conservation efforts (Aziz et al., 2013). However, these supply-side measures must be used in combination with initiatives that decrease the demand for ivory among

consumers, as supply control alone is not sufficient to reduce the threat of illegal wildlife trading (Challender & MacMillan, 2014).

Although the expansion of the internet in relation to trade is a key factor in the facilitation of the illegal wildlife trade, it can also be used to reach the same consumers with social media campaigns and education initiatives aimed at reducing demand (Xu et al., 2020). In the context of the ivory trade, such targeting of consumers aims to reduce the demand for ivory, thus helping to form new social norms by making the selling and purchasing of ivory socially unacceptable, ultimately with the aim of reducing the incentive to poach (Challender & MacMillan, 2014). It is therefore important for social media and marketplace platforms to engage with these initiatives such as through the Coalition. For example, Facebook has banned the trade in ivory over its platform, changed community guidelines to remove suspected trafficking groups, and educated users through pop-up messaging (Aung, 2020).

While CITES focuses on international trade, due to the demand for elephant ivory, there have been a number of supply-side measures aimed at controlling domestic markets for ivory as well. For example, in 2015, following international pressure, China introduced bans on importing and exporting elephant ivory. This was followed by a total ban on the domestic ivory trade in China in 2016, making it illegal to sell or buy ivory since 2017 (Zhou et al., 2018). In support of China's action to curb its trade in ivory, the United States introduced a 'near total' ban on the import and export of ivory (Manley, 2015). This was in addition to some US states that had already instigated certain bans, such as California which had passed a law in 1976 banning the importation of any elephant parts (Stiles, 2015). While New York, in 2014, signed Bill 10143/Senate Bill 7890, prohibiting the sale, purchase, and distribution of elephant and mammoth ivory, in addition to rhino horn, with certain exemptions, such as for antiques

consisting of less than 20% ivory, and musical instruments made before 1975 (Nash, 2022; Stiles, 2015). More recently, the European Union banned the trade in elephant ivory in 2021, although legislation states that antique ivory that is older than 1947 can be traded (Kufnerová et al., 2021). However, some EU countries, such as France, have introduced stricter legislation and controls on ivory, leading to pressure on the EU to bring in stricter ivory laws (Van Uhm, 2016). The United Kingdom introduced a strict ban on elephant ivory in 2018 following a government consultation which resulted in 87.6% of respondents supporting the proposed ban, 4.3% opposing the idea, and 8.1% not having a definite judgement (DEFRA, 2018). The UK Ivory Act did not come into force immediately due to a legal challenge by the Friends of Antique Cultural Treasures Limited (FACT) resulting in a judicial review (Cox, 2021). FACT argued that the act was a violation of their rights and that the ban on ivory imports and exports would have severe impacts on their businesses (Cox, 2021). Despite this, the UK Ivory Act came into force 4 years later on the 6th of June 2022. More recently, proposals have been put forward to ban other types of ivory in the UK, such as hippopotamus and marine ivory from whales and walruses (Moneron & Drinkwater, 2021).

2.1.3 Online ivory trade

The expansion of the internet has resulted in increased global connectivity between suppliers and consumers thus facilitating the illegal wildlife trade. As a result, cyber-enabled wildlife trafficking is a low-risk and high-profit trade with limited countermeasures within online marketplaces (Challender & MacMillan, 2014). Social media and online marketplaces have made it easier than ever to advertise illegal wildlife and communicate with sellers discreetly from anywhere in the world (Yu & Jia, 2015). The ease with which consumers can access the online trade is illustrated by the low amount of illegal wildlife trade on the dark web in comparison to

the significant amount found on the surface web (Harrison et al., 2016). As a result, the ivory trade thrives on open online marketplaces, as this is far more convenient and less complex than using the dark web (Perdue, 2021).

Although there are a number of online marketplaces that sell elephant ivory products, eBay has been the subject of a number of studies into the illegal wildlife trade including ivory (Hernandez-Castro & Roberts, 2015; Perdue, 2021). For example, in 2007, an investigation carried out by the International Fund for Animal Welfare (IFAW) found 400 elephant ivory products for sale on their website (IFAW, 2007; Venturini & Roberts, 2021). In 2007, ivory sales between countries were banned but had little success, with Richard Ambrose (Head of Safety for eBay UK) stating "*the complex nature of regulations that govern sale globally means it is difficult to distinguish between legitimate and illegal trade*" (Coghlan, 2008). Online trade in elephant ivory, therefore, continues to thrive due to the wide global audience, legal ambiguity, and limited enforcement resulting from difficulties in tracing sales (Lau et al., 2016). These factors paired with the constant evolution of the internet and online trade, mean that methods of detection avoidance are only getting more sophisticated, as sellers constantly adapt to new preventive strategies (Yu & Jia, 2015).

This study aims to provide an understanding of the online trade in elephant ivory in the UK following the introduction of the UK Ivory Act, using the trade-in netsuke carvings on eBay UK as a model. Specifically, we ask the questions (1) What is the availability of elephant ivory, (2) what is eBay's response to this trade through the removal of items, and (3) What language are sellers using to disguise their trade?

2.2 Methodology

This study received ethical approval from the Ethics Committee of the School of Anthropology and Conservation, University of Kent (Ethics ID:20221665996910176).

2.2.1 Online platform

This study focussed on the online marketplace, eBay, as it has a long-term ban on the sale of ivory, is a member of the Coalition to End Wildlife Trafficking Online and that ivory is known to be traded over the platform. Specifically, it focussed on eBay UK, as have a number of other studies (Alfino & Roberts, 2020; Coghlan, 2008; Cox & Collins, 2021), for consistency and as this study relates to the UK Ivory Act.

2.2.2 Search term

The term ivory refers both to the material of mammalian teeth or tusks, but also as a colour, making the search for elephant ivory challenging. However, due to national and corporate bans on the trade in elephant ivory, elephant ivory is rarely advertised as 'ivory', instead 'codewords' are suggested to be used in an attempt to launder authentic ivory as a similar material, such as bone. As a result, these 'codewords' are often imprecise and there are concerns that they could evolve. To counter these issues in searching for elephant ivory, an item that is often made from elephant ivory was chosen, specifically netsuke.

Netsuke are small carved figures of Japanese origin, varying in size from 2 to 8 cm. These were used to attach a container to the cord of the kimono, as the kimono lacked pockets. Specifically, the container called an Inro, was attached to the silk cord of the kimono, while a netsuke was attached to the end to stop the cord from slipping (Banerjee, 2008). Netsuke is often made from

boxwood or animal bone, but the aesthetic of elephant ivory means it has been a very popular material to carve (St Aubyn, 1987). Elephant ivory was a costly material in nineteenth-century Japan and was often brought over from India and Africa to make other items such as the samisen (a Japanese string instrument), with netsuke being made from the leftover ivory (Banerjee, 2008). Other materials such as mammoth ivory, resin, porcelain or tagua nut are also commonly used (Banerjee, 2008; Milhaupt, 2009). Due to their aesthetic appeal, netsuke is popular with antique collectors in Europe, the United Kingdom and the United States (Milhaupt, 2009).

2.2.3 Systematic online search

Systematic online searches were undertaken on the online marketplace eBay UK. Searches focussed solely on the category ‘Antiques’, with the item location set to ‘UK Only’. Searches took place at approximately 10 am, every Friday over a 17-week period, from the 11th November 2022 to the 17th March 2023, representing approximately a third of a year. All resulting items were examined to determine if it was made of elephant ivory as described in section 2.2.4 below. The item URL, item number, listing title and seller username were recorded. Each item was subsequently monitored to determine whether it had been removed or sold, and if sold the final price it achieved.

When looking for items, we were aware of the differences between advertisements, listings and items. For the purpose of this study, an advertisement is defined as an individual post persisting online for an indefinite amount of time. This advert may be sold or relisted again, therefore representing the same item but a new advertisement. However, an item is a unique object that is offered for the same, and that same item may be offered across multiple adverts or listings (e.g. relisted).

2.2.4 Ivory identification

Determining whether an item is made of ivory, and the species from which it came, is challenging due to a range of physical and chemical factors that create the material. As a result, microstructure analysis is usually used to identify ivory materials (Jha et al., 2017), making identification from online images particularly challenging. Items were therefore only identified based on the presence of Schreger lines (Palombo & Villa, 2001). This is a standard method of identifying elephant ivory in the online trade (Locke, 2008; Palombo & Villa, 2001; Vollrath et al., 2018). As previously mentioned, the presence of Schreger lines was proposed as a means of identifying elephant ivory by Bernhard Schreger in 1800 (Obermayer, 1881), as they are absent from other ivories and similar materials, such as bone and resin. Schreger lines form a crosshatch pattern with a >115 angle in the cross-section and can be usually seen on the base of an ivory item (Espinoza & Mann, 1993) or on smooth curved surfaces.

2.2.5 Statistical Testing

To understand the relationship between the number of netsuke items identified and the number that were made of elephant ivory, a Pearson's correlation was used. This correlation tests for the measurement of association and whether there is a positive or negative relationship between two variables (Sedgwick, 2012). The variables are thought to be related if the changes in one variable impact the other (Obilor & Amadi, 2018). Further statistical testing used Fisher's exact test to investigate the number of ivory items removed by eBay, by comparing items removed in the first 5 weeks and items removed in the last 5 weeks. The Fisher Exact test was proposed by Fisher in 1934 (Fisher RA, 1934) and is a test for independence and association using a 2x2 contingency

table (Sprent, 2011). This was used in replacement of a Chi-squared test due to a small sample size (Warner, 2013).

2.3 Results

Over a 17-week period between the 11th November 2022 and 17th February 2023, a search of eBay UK was conducted on each Friday using the search term ‘netsuke’, which generated between 677 and 957 individual items (mean = 828). Of these between 0 and 10 (mean = 3.4) were found to be made of elephant ivory; i.e. between 0.0% and 1.1% (mean = 0.39%) of items were found to be made of elephant ivory. In total 63 advertisements were identified on eBay UK selling elephant ivory, although a third (32%, N = 20) of these advertisements were items relisted by a seller. As a result, there were 43 unique netsukes, made of elephant ivory, advertised during the 17-week period. Using a Pearson’s correlation test no significant correlation was found between the number of netsuke items advertised and the number that were made of elephant ivory (r^2 = 0.078, p = 0.27, Figure 1).

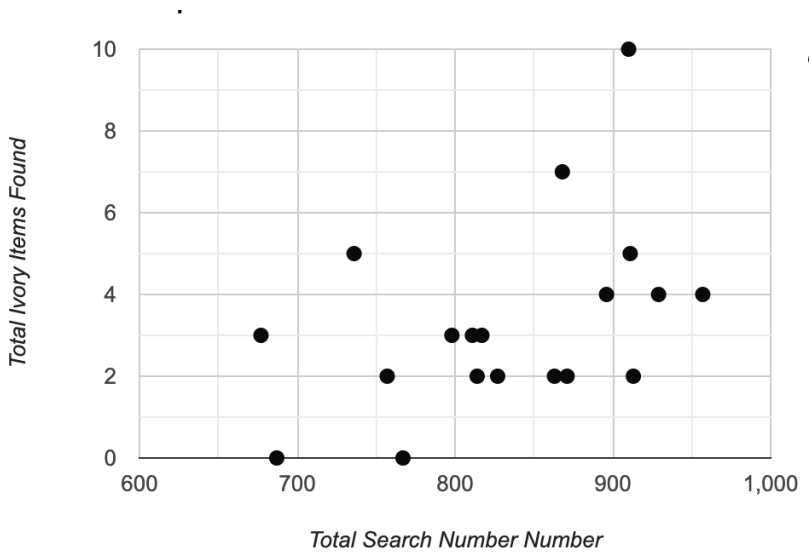

Figure 1. A scatterplot of the total number of items searched each week, compared to the total number of elephant ivory items identified.

After the relisted items had been removed from the dataset, 30% (N = 13) resulted in a sale, with the rest continuing to be offered for sale unless the bidding process had ended or the post was removed. The individual with the most unique advertisements had three listings. The price of items sold ranged from £9.99 to £75.00 (N = 13), with a median price of £26.00. Items were regularly offered for sale each week with an average of 4 items per week, ranging from 0 to 10 items. The 43 unique items were offered for sale by 36 sellers, with 83% (N = 30) of sellers offering for sale a single item during the period, and 17% offering multiple listings (N = 6) (Figure 2). Using the complete dataset including relistings, 67% of sellers posted a singular advertisement (N = 24) and 33% posted more than one listing (N = 12). Most sellers with multiple listings had relisted the same item several times. After relistings were removed, 83% of sellers posted a singular advertisement (N = 30) and 17% posted more than one listing (N = 6).

Excluding relisted items, 44% (N=19) of ivory listings had been removed from the website by the end of the 17-week study period, as indicated by a ‘page missing’ notice. Of these 19 items 26% (N = 5) had been sold. In comparison, with relistings, 70% of ivory listings had been removed from the site (N=25), of which 28% (N = 7) had sold. A Fisher exact test showed that significantly more items were removed in the first 5 weeks (N = 21) compared with the last 5 weeks (N = 0) of the study ($df = 1$, $P \leq 0.001$).

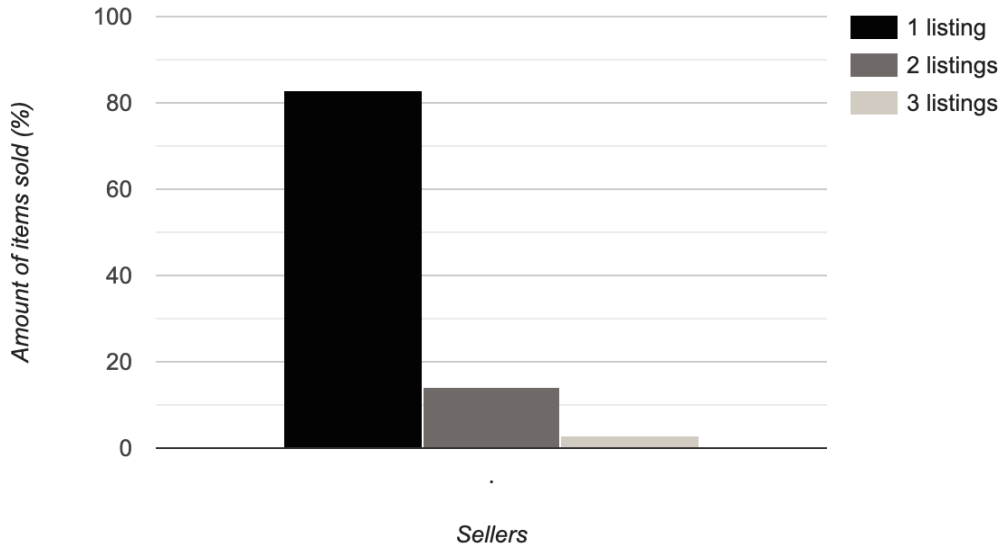

Figure 2. Identified elephant ivory items for sale per observed seller during the 17-week period.

Figure 3. The total number of items removed from eBay in the first 5 weeks, compared to the final 5 weeks

When advertising items, the most commonly used word in the title (not including relisted items), as one would expect, was 'Netsuke' (79%, N = 34), as this was the search term used, followed by 'Japanese' (70%, N =30). In addition, both the words 'signed' and 'carved' were used in the title

of items 26% (N = 11) of the time, and ‘carving’ on 4 occasions (9%). In relation to age, ‘Antique’ was used in 35% of listings (N = 15), while ‘Vintage’ was used on 5 occasions (12%). Other age-related words were used, such as references to the 19th (7%, N = 3) and 18th (5%, N = 2) centuries. The overall percentage for the age-related items was 31% (N = 26). ‘Rare’ was used in the title on 4 occasions (9%) to describe the advertised item. The word ‘ivory’ was never used to describe the materials.

2.4 Discussion

The results of this study reveal that elephant ivory items in the form of netsuke continue to be sold on eBay UK, with 63 ivory advertisements being identified during a 17-week study between the 11th of November 2022 and the 17th of February 2023. This is in spite of the UK Ivory Act 2018 which came into force on the 6th of June 2022, that prohibits the sale of elephant ivory items unless registered exempt (Cox, 2021). This is also in contradiction to eBay’s Animal and Wildlife Products Policy which clearly prohibits the sale of ivory items and has done so since 2009 (Coghlan, 2008; Cox & Collins, 2021), as well as eBay being a signature to the Coalition to End Wildlife Trafficking Online (eBay, 2018). This result confirms the findings of Alfino and Roberts (2020) who identified 183 ivory items across 4 different eBay marketplaces over a 21-day period, which was a clear violation of eBays policy (eBay, 2018).

According to these results, 44% of ivory items were eventually removed (excluding relistings). It is important to note that around a quarter of those removed had already been sold. It is therefore unclear the extent to which eBay is being proactive and removing items or removing items based on NGO-based cyber spotter schemes, or whether the item was removed by the seller due to a private sale. Venturini and Roberts (2020) found that eBay only removed between 1.3% and

6.9% of elephant ivory items identified, despite some items even having the material listed under the ‘primary materials’ section of the advertisement. Our data indicates it was common for items to be removed the first time they appeared, however, 20% of removed items were simply relisted again and never taken down by eBay, suggesting inconsistencies in detection techniques. It is unlikely to be a deterrent if a seller knows they can just re-upload the same item again. Similarly, it was common for items to have been relisted due to an ending bid, none of which were removed. This could be due to a shorter residence time, as suggested by Yeo et al. (2017), who found the ‘Buy It Now’ items have a longer residence time compared to auction listings and therefore are more likely to be detected.

The study data also showed that, excluding relistings, the majority of sellers (N=30, 83%) posted one advertisement, with 43 unique items being identified. Sellers with multiple advertisements often relist the same item several times. Sellers with singular advertisements are unlikely to be significant dealers and thus are not making a significant commercial gain from selling elephant ivory. Further, as the study covered 17 weeks it does not appear that there is a significant strategy of ‘drip feeding’ of ivory onto the market by individuals that have several items they wish to sell. However, while the majority of items were sold by those selling a single item there is always the potential that an individual seller could be selling items across multiple accounts as a way of avoiding detection (Yeo et al., 2017). This supports other studies that have found intermittent and single-sale items by a seller that could indicate naivety and not understanding trade restrictions and requirements (Harrison et al., 2016; Yeo et al., 2017). The policies presented by eBay are an indication of their corporate awareness of the trade and not a lack of knowledge of the trade, therefore more effective measures to combat the trade are essential in increasing the detectability of ivory as a deterrent for sellers.

When carrying out linguistic analysis of search results, language relating to the age of ivory such as ‘antique’ and ‘19th century’ was common amongst sellers (31%), potentially due to eBay’s policy allowing the trade in ivory items that predate 1900 (eBay, 2018). As mentioned by Collins et al. (2017), there have been very limited successful prosecutions against members of the antique trade found selling illegal ivory. The majority of listings did not include the word ‘ivory’ in the title or description, and any indication that the material of netsuke was ivory was rare (21%, N=9). It was common for alternative descriptions such as ‘iv0ry’ or ‘not fake’ to be used as indicators, presumably to avoid the consequences of violating eBay’s policy on wildlife products. These are equivalent to other studies demonstrating the continued market for ivory on eBay despite restrictions against sales, with codewords being a prominent issue (Collins et al., 2017; Venturini & Roberts, 2020; Yeo et al., 2017).

The amount of active sellers on the site and the inconsistent rate of items being removed suggests that eBay currently does not have sufficiently effective methods to identify and remove illegal ivory items consistently. This is ultimately a matter of corporate responsibility, especially due to the policies they put forward to prevent the sale of illegal wildlife items, in addition to being a signature of the Coalition to End Wildlife Trafficking Online (eBay, 2018). Furthermore, due to the UK Ivory Ban, this is not only a matter of moral and environmental responsibility, but legal responsibility, meaning that by not putting the appropriate measures in place the site may not be operating in line with UK laws. Due diligence would be expected on the part of eBay, by effectively monitoring risk and reviewing sales of illegal ivory regularly to keep track of active sellers and trend data. However, with 63 ivory advertisements and 43 unique items identified, it is clear that eBay’s policies are not actively preventing the sales, and are instead offering a platform for wildlife traffickers. This is further supported by the lack of any mention of CITES

permits in the descriptions of ivory items, which was also found by Harris et al. (2019) and Venturini and Roberts (2020), however, this could be a result of the items being preconvention. To respond effectively to the illegal wildlife trade, more collaboration with online marketplaces is key in monitoring sales and creating deterrents for sellers.

The trade of illegal wildlife products goes beyond the active sellers on eBay, with an abundance of online marketplaces providing a platform for illegal trading. In 2014, IFAW released a report stating that over a six-week period, 33,006 wildlife and wildlife products were identified across 280 online marketplaces globally, including protected species from both CITES Appendix I and II (IFAW, 2014). This demonstrates that whilst this study focuses on one specific marketplace, it goes far beyond eBay. To decrease these numbers, more effective deterrents must be enforced, although it is important to acknowledge that trade is permitted in many CITES lists and that domestic trade in many instances does not require a CITES permit. It is crucial that platforms effectively enforce bans on the trade in illegal wildlife products, and make policies explicit to both sellers and consumers trying to search for wildlife items. This could include active communication of policies against trading, such as a warning message informing the individual about the repercussions of engaging in the trade such as account suspension. Additionally, effective detection tools for both sellers and buyers, meaning those who wish to engage are clear about the risks involved. When investigating the illegal wildlife trade, many researchers have focused on the sellers and the consequences of their advertisements. eBay currently claims to remove advertisements of illegal products and suspend the account of suspected sellers, but states that it is up to the seller to check whether selling and shipping requires certification. It is therefore equally as valuable to educate and enforce penalties on buyers, and marketplaces should have impactful deterrents for both sellers and buyers of illegal wildlife items.

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Chapter 3:

Analysing the online ivory trade using the search cost (‘shopping list’) method

Abstract

The illegal wildlife trade is currently one of the most prominent forms of transnational trafficking, with vast numbers of species exploited each year to meet the increasing demand for illegal wildlife products. Innovations in online trade have led to wildlife products becoming more accessible than ever before. Amongst vulnerable species threatened by illegal wildlife trade are elephants, whose populations have seen severe declines over recent years. As technologies become more sophisticated, the online ivory trade is now a significant threat to elephants. Surveying the availability of online wildlife products can be a time-consuming and challenging process. This study investigates the accessibility of online ivory items to consumers, with the aim of understanding online trade in greater detail. A recently developed method, search-cost analysis, is used to search for specific products online to gain insight into the accessibility of ivory products. Search Cost follows the rationale that when searching for an item, a higher search time would correlate with lower availability. For this study, 24 participants were provided with a 'shopping list' of both ivory and non-ivory jewellery items and recorded how long it took for them to find each item online. The results revealed that the mean time to find an elephant ivory bangle was only 4.13 minutes. However, there was no significant difference ((F(4,115 = 2.09, p = 0.86)) found between the times to find each item. Elephant items had a mean time of 3.26 minutes compared to non-elephant items at 3.09 minutes. The shopping list method offers an economical way to gather trade data, which is especially useful given the volume of online wildlife trade. Due to the limited number of studies using this method, future research into the

application of search cost analysis is required to provide an understanding of the online trade in wildlife.

3.1 Introduction

3.1.1 Wildlife trade

The demand for wildlife products by an ever-growing human population continues to rise (Warchol, 2004). Species are overexploited for various purposes including traditional medicines, food consumption, exotic pets, cosmetics, decorative objects, exotic leather, and the horticultural trade (Shinwari et al., 2012). This has led to the trade of billions of species annually, making wildlife trafficking one of the most prominent forms of transnational trafficking, estimated to be worth $7 to $23 billion per year (Nurse & Wyatt, 2020). Areas that are rich in biodiversity are typically less economically developed countries that depend on access to their natural resources (Robinson, 2016). In addition to the increased loss of biodiversity, unregulated trade contributes to environmental degradation, the destruction of habitats and issues surrounding the livelihoods and health of local communities (Wyatt, 2013). However, if managed effectively, a legal wildlife trade has the opportunity to be a sustainable practice that supports the economy of local communities and benefits livelihoods (Hughes et al., 2023). A significant amount of wildlife trade is unregulated and continues to have a detrimental impact on many species across the globe (Tella & Hiraldo, 2014; Wyatt et al., 2022). Within the legal market, the illegal trade is often well hidden, meaning sales are easily disguised (Van Uhm, 2018; Vinke & Vinke, 2012)

The illegal wildlife trade significantly impacts elephant populations, as poaching increases to meet the demand for ivory materials. The severity of the decline is rooted in this illegal trade, in addition to habitat fragmentation and human-elephant conflict as populations are driven closer to

human settlements due to less habitat availability and resources. This is often connected to ivory collection potentially being a by-product of human-elephant conflicts and retaliatory killings of elephant individuals (Shaffer et al., 2019). As a result, they have been the focus of interventions by many non-governmental organisations and law enforcement agencies. In the 1970s and 1980s, the ivory trade expanded rapidly as the demand for ivory products grew, consequently leading to catastrophic impacts on both Asian elephant (*Elephas maximus*) and African elephant (*Loxodonta africana*) populations (Stiles D, 2009). During the late 19th century, approximately 700 tonnes of ivory were imported to Europe annually, leading to what is known as the 'ivory crisis', resulting in African elephants being listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II in 1989 (Lee & Graham, 2006). The high value of ivory means that the demand for ornaments and jewellery is a significant threat to elephants, with tens of thousands being killed annually for their tusks (Rice, 2008). Between 2010 and 2012, 40,000 African elephants were killed illegally to meet the demand for ivory products (Wittemyer et al., 2014). As a result, both Asian and African (not inclusive of populations found in Botswana, Namibia, South Africa and Zimbabwe) elephant populations are listed under CITES Appendix I, effectively banning the international commercial trade of ivory materials (CITES, 2019).

The examination of Schreger lines is one of the most common methods of ivory identification, as proposed by Bernhard Schreger in 1800 (Obermayer, 1881). These appear as sets of lines running through the ivory at an angle greater than 115° (Espinoza & Mann, 1993), formed by several lines of microscopic tubes that are unique to ivory material (Chervenka, 2021). This is commonly used as a test for genuine elephant ivory as the Schreger lines are not present in other ivories, bone or synthetic ivories, and are therefore seen as a reliable identification method. With

the ivory trade becoming prominent on online markets in recent years, this method can now be adapted to examine Schreger lines through photos of ivory items uploaded by the seller

CITES banned the international trade of ivory in 1973 and 1989 (Stiles, 2004). The criteria state that a permit to sell Appendix I species is only issued in exceptional circumstances, due to the high threat and risk of extinction (Stiles, 2004). In response to the elephant poaching crisis, the 2018 UK Ivory Act was introduced (Cox, 2021). This legislation bans the commercial trade of elephant ivory so it cannot be bought, sold or exported in the UK legally. The wildlife trade has often taken place in physical markets and stores (Zhang et al., 2008). However, in recent years technological advances have led to changes in how criminal enterprises operate and have led to the increase of illegal wildlife products being traded online (Sung & Fong, 2018). The expansion of the internet has resulted in increased global connectivity between suppliers and consumers which facilitates the illegal wildlife trade (Zagorchev et al., 2011). The emergence of social media platforms has made it easier for consumers to access illegal items, while heightened levels of anonymity make detection and prosecution challenging (McCrea-Steele T, 2017). Consequently, online trade offers a new low-risk, high-profit market that has encouraged wildlife trafficking and made it easier than ever before for sellers to go undetected (Challender & MacMillan, 2014). As a result, the threat to elephant populations has grown since ivory sales have shifted online, as it is even more challenging to monitor and enforce regulations. In 2011, a 2-week investigation by IFAW identified 669 ivory advertisements for sale across 5 European countries (IFAW, 2011).

The anonymity offered by online sales has made it easier than ever for criminal enterprises to operate undetected (Milliken & Shaw, 2012; Vigne, 2020). Illegal wildlife trade is notoriously difficult to monitor and control due to a lack of capacity and resources within governments meaning it is difficult to undertake investigations and monitor trade effectively (IFAW, 2008; Lavorgna, 2014). The lack of punishment also associated with the illegal trade has made it a low-risk and high-reward market. The recent emergence of online markets has exacerbated these challenges as illegal activity is disguised with ease, and there is the potential for illegal wildlife items to be easily traded. The constant evolution of how the trade operates online means that the market can constantly adapt to sell illegal items with a small risk of detection. This means that current law enforcement may not be able to control trade productively, and requires improvements to manage trade. This means that research into online trade is limited. Although non-governmental organisations (NGOs) such as the International Fund for Animal Welfare have released numerous reports analyzing online trade, they are often limited due to the amount of time and resources needed to collect necessary data (Hernandez-Castro & Roberts, 2015). This leads to a lack of trade data, especially given the scale of online marketplaces, which can cause significant gaps in knowledge surrounding the illegal wildlife trade.

Surveying the availability of online ivory has an added challenge due to sellers' use of code words to avoid detection. Finding authentic ivory online may mean that keywords need to be used (Alfino & Roberts, 2020). There are other associated challenges with the word ivory itself, as this is often not specific to elephant ivory, and can be used as a general term for teeth or as a colour (Hernandez-Castro & Roberts, 2015). This means that current trade is usually monitored by expert enforcement officers and NGOs and can be extremely time-consuming. Although these

manual searches are informative and relevant to today's research, they may not be the most effective way to understand the availability of online ivory.

Searching physical markets is a traditional method of surveying the availability of wildlife items, as researchers would identify selected species, prices and quantities to assess what species were most regularly traded (Barber-Meyer, 2010). However, this assumes that all the items were sold in an open marketplace with no private sales and that the physical markets were the only method of selling wildlife items. If sellers are aware the item they are offering is illegal, they may likely be cautious of legal consequences, especially as restrictions have increased over time. When assessing the impact of trade on wildlife populations, it is common to survey markets as this is considered far less time-consuming and economical considering the scale of wildlife trade (Allebone-Webb et al., 2011; Pheasey et al., 2021). However, with online trade steadily increasing, this is a time-consuming and challenging method to identify available items.

The search-cost analysis method was first presented by Stigler (1961) and first applied to conservation in 2014 when Moyle and Conrad presented a method to investigate the illegal ivory trade in physical markets found in China. The aim of this method was to offer an effective and less time-consuming approach to identifying illegal sales of wildlife items. The method follows the rationale that when attempting to identify wildlife items, a higher search time would correlate with lower availability. When searching for a product the consumer experiences both the cost of the purchased product and the time spent searching for the item at an agreed price. This is known as the Search Effort (Pheasey et al., 2021; Stigler, 1961).

The search-cost method differs from traditional market surveys as it compares the availability of each item from a list by recording the time it took to find an item, as opposed to recording the number of items available for sale. In the context of the online wildlife trade, this would mean

that illegal products will have a higher search effort as they are more difficult to find, compared to legal products which are sold openly with less discretion (Pheasey et al., 2021). This is also due to illegal items often being hidden within the legal market, making detection challenging. As far as we are aware, this method has not yet been applied to the online wildlife trade but has been used on physical marketplaces for items such as ivory (Moyle & Conrad, 2014) and marine food products in Costa Rica (Pheasey et al., 2021).

3.1.2 Project Aims

The overall aim of this research is to use search-cost analysis to understand how online marketplaces contribute towards the consumerism of ivory products. To understand the availability, we will apply search cost analysis to an online market to estimate the availability of ivory online.

3.2 Methodology

This study received ethical approval from the Research and Ethics Committee of the School of Anthropology and Conservation, University of Kent (Ethics ID:20221665996910176).

For this study, search-cost analysis was used. This involved recruiting participants who were given a ‘shopping list’ of items to search for online, for items made from elephant products and similar items that used faux ivory or other “non-elephant” items. Participants were asked to record to time how long, in minutes, it took them to identify each object. Prior to the study, participants were informed about the purpose of the study, what the data would be used for, and that their answers would remain anonymous. They were asked to complete a demographic questionnaire before starting the shopping list exercise. The aim of this was to gather background

information about who was involved in the research including participant's gender, age, employment status, whether they were wage earners and their average annual income. Participants were not compensated for their time, however, to encourage participation, two £25 gift cards were offered up as raffle prizes.

3.2.1 Survey Recruitment

Participants were recruited primarily through the use of email, using an advertisement sent to postgraduate and undergraduate students (Appendix 1). We targeted primarily Wildlife Conservation University students, as they are most likely to have some background knowledge and motivation to participate in a conservation-based study. Before the beginning of the study, and to ensure that all participants had the same background information, participants were given training in identifying ivory from photos and Schreger lines.

3.2.2 Questionnaire

We piloted the questionnaire to ensure participants understood the questions and to remove any ambiguity. The aim of the questionnaire was to gain an understanding of participant’s demographics and shopping habits which may later inform the outcome of the study (Appendix 2). The questionnaire was divided into two sections; online shopping questions and demographic questions.

The online shopping section included seven closed questions about the participant’s shopping preferences regarding online purchasing of products. We specifically stated we were only

interested in their shopping habits regarding online marketplaces (not from other online shopping outlets such as grocery shopping from supermarket websites for example). The questions covered which products participants usually look for online, and the usual websites they visit. The aim of this was to indicate the likelihood of the participant coming across ivory before the study, for example, people shopping for jewellery and ornaments may be more likely to have seen ivory products than people searching for music or furniture. Also included in this section was a question based on how participants would identify an elephant ivory product such as through Schreger lines or a CITES permit. This helped us understand whether the participants had prior knowledge of the topic and their capability of finding ivory products during the study

3.2.4 Shopping list

In 1980, 20% of all ivory was used for jewellery (Martin, 1985). In recent years, the demand for jewellery has decreased, and new pieces are often made from the offcuts of leftover netsukes (Martin & Stiles, 2003). An alternative to authentic ivory is the use of items made from bone. Although similar in appearance, bone and ivory are different structurally. Bone is often used as an alternative to genuine ivory products due to the similarities in weight and texture; however, it does not contain Schreger lines (Espinoza & Mann, 1993). Jewellery made from the tagua nut, also known as vegetable ivory, is another common alternative (Banerjee et al., 2008). This is grown from the tagua palm tree which is white in colour and can be carved to have the appearance of ivory (Archuleta, 2019). Elephant hair is also a popular product, which is often boiled to soften and then moulded into jewellery items, commonly bracelets. These are sold to tourists throughout Southeast Asia and Africa (Espinoza et al., 2010) as it is believed elephant hair bracelets bring protection to the individual wearing them (Goyal, 2016).

Participants were given a list of five items to search for online, and they were required to record the time it took them to find each item to the nearest second. From online research of the market, the following five items were chosen:

- Elephant ivory bangle

The first item on the list is key in seeing whether genuine ivory jewellery is easily available for consumers. This was identified through Schreger lines.

- Elephant hair bracelet (not wire, leather or plastic)

CITES currently have regulations against the selling of elephant hair, unless it is purchased from a licensed trader in possession of a wildlife trader's licence.

- Elephant hair bracelet made of wire

For comparison, participants were also asked to find an elephant hair bracelet made of wire, as this is a common alternative to authentic elephant hair jewellery. This would not include any genuine elephant hair.

- Bone bracelet
- Tagua bangle, bracelet or necklace with brown outer surface

3.2.5 Statistical Analysis

The objective of this analysis was to establish if there was a difference in the search effort between items. We used R-Studio to run a one-way ANOVA after log-transforming the dataset to achieve normality. To compare legal products (Elephant hair bracelets made of wire, bone bracelets and tagua bangle) to illegal products (Elephant ivory bangle and authentic elephant hair bracelet) a Mann-Whitney U test was used to identify any possible differences in search times between groups of items. This test was used after transforming the data, as normality was not achieved (McKnight & Najab, 2010). The questionnaire was run through Google Forms and emailed to each participant as this offered the necessary statistics and summary data once all participants had completed the questionnaire.

3.3 Results

In total, 24 participants were included in the study, 19 of which were individuals from a conservation background. Additionally, 16 were from the University of Kent, 2 from the University of Sussex and 1 from Bristol University. The remaining 4 participants were not students and claimed they had limited previous knowledge about the illegal wildlife trade. Participants had varying degrees of background knowledge surrounding the ivory trade. The demographic questionnaire identified that 21 of the participants had previously purchased items online. Additionally, 2 participants had come across an ivory product online prior to the study, 13

stated that they had never seen an online ivory item, but 9 participants were unsure. There were no reported concerns or uncertainty around identifying the items on the shopping list.

The results found no significant difference between the time taken to find each item ($F(4,115 = 2.09, p > 0.05$). We found no significant difference in search times for both elephant bracelets and tagua jewellery (2.39 minutes, 2.28 minutes and 2.48 minutes respectively) ($F(2,69 = 1.817, p = 0.170$) (Fig. 1). The ivory bangle and bone bracelet had the highest mean time to find ($M= 4.13, SD = 0.003$), ($M = 4.17, SD = 0.003$), but there was no significant difference found between the time taken to find these items ($F(1,46 = 0.34, p=0.855$). The results reflect that of the elephant items, the ivory bangle had the highest search effort ($M = 4.13, SD = 0.003$). Of note, 58% ($n = 14$) of elephant ivory bangles were found in 2 minutes or less. Similarly, 83% ($N = 20$) of elephant hair bracelets were found in 2 minutes or under ($M = 2.39, SD = 0.003$).

We found no significant difference in the search effort between elephant items and non-elephant items ($F(4,115) = 2.021, p > 0.05$). The elephant products had a slightly higher mean search time but this was not significant ($M = 3.26, SD = 0.003$) compared to non-elephant items ($M = 3.09, SD = 0.002$). As the search effort was not found to be significantly different between any items, or groups of items, further analysis regarding the demographics or shopping habitats of the participants was not necessary.

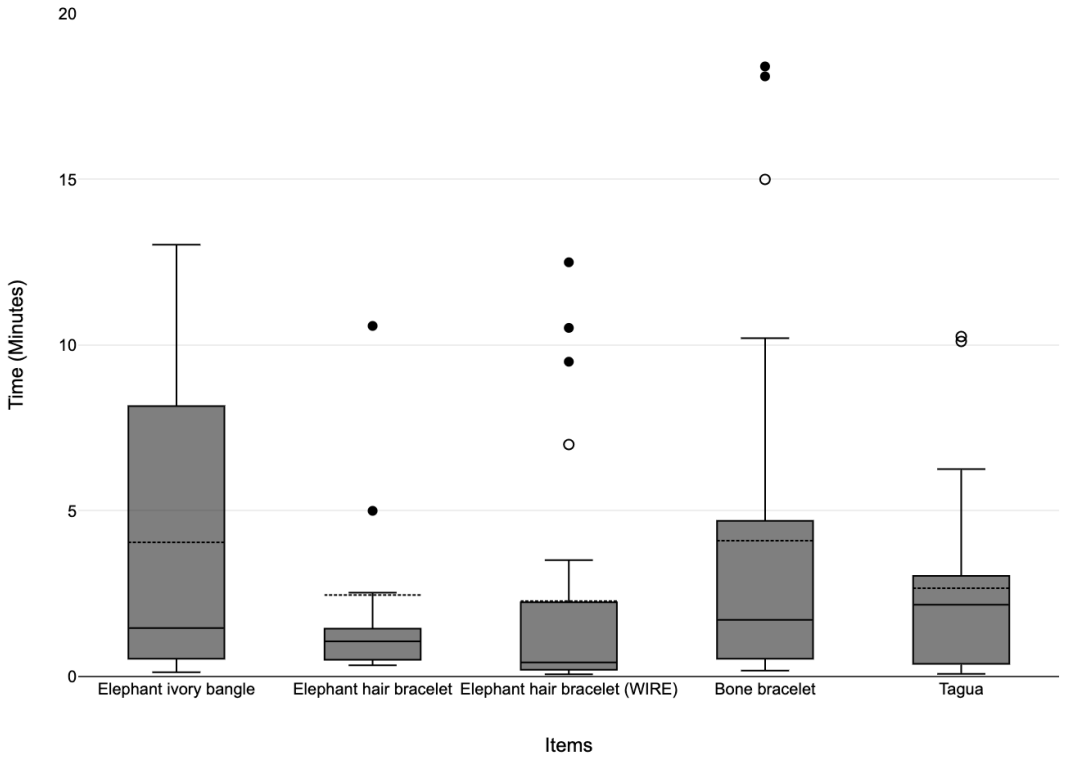

Figure 1. Search effort to find items. The top line of the box demonstrates the upper quartile, and the bottom shows the lower quartile. The 'whiskers' represent the minimum quartile to the maximum quartile. The dashed line within the box represents the mean, and the solid line beneath shows the median. The points outside the box represent outliers in search times, the closed circles are included data, and the open circles are reflective of anomalies not included in the data.

3.4 Discussion

The results of this study reveal that elephant ivory is easily available online for consumers, with the ivory bangle having a mean search time of 4.13 minutes. Despite 3 participants having not shopped online previously, they were still able to find ivory in under 5 minutes. We found no significant difference in search times between the non-ivory products we included in the study. All 24 participants successfully found the ivory item with no one reporting problems identifying ivory from online photographs. We recognise that this study uses a small sample size, and that a

potential bias of this study was that the participants were not presented in a random order to each participant.

Despite minimal differences between elephant and non-elephant items, it is clear that participants found it straightforward to identify elephant products (ivory bangle and elephant hair bracelet). Elephant products had a mean search effort of 3.26 minutes, suggesting these items were readily available for consumers to find online. 2 participants gave some feedback stating how they were surprised at how little time it took to find the items. This is in spite of the UK Ivory Act 2018, which came into force on the 6th June 2022, which prohibits the sale of elephant ivory items unless registered exempt (Cox, 2021).

The ease at which ivory items are found mirrors the pre-Ivory Act. Yeo et al. (2017) found 42-67 items per week on eBay UK alone over a six-week period. When the UK Ivory Act was enforced in 2018, it was seemingly strict legislation that aimed to be *one of the toughest bans on the planet* as stated by the British government (Cox, 2021). Harris et al. (2019) found that traders often did not check that their sales were compliant with ivory trade regulations and did not perceive current legislation as punishment to deter them from trading. This reflects a lack of enforcement by large online marketplaces which has been identified by several studies (Coghlan, 2008; Masters et al., 2022; Perdue, 2020; Sung & Fong, 2018; Venturini & Roberts, 2020) that found that the wildlife trade is active through online marketplaces and that illegal items are openly sold. This is reflected by studies that have searched for illegal wildlife on the dark web. Harrison et al. (2016) found limited illegal wildlife activity on the dark web, demonstrating that low levels of enforcement mean that the trade can remain surface level and does not need to be driven to the dark web. This suggests a lack of effective enforcement of ivory regulations on the surface web, and that the ivory trade is prominent online due to compliance with the UK Ivory

Act not being effectively monitored by online marketplaces. Low risk of detection and lack of effective penalties are likely to be the main drivers of the online market, with current ivory regulations not an effective deterrent for sellers or consumers.

Aside from inadequate enforcement of ivory regulations, there are other possibilities for no difference in search effort between elephant products (ivory bangles and elephant hair bracelets) and non-elephant products (bone, tagua and fake elephant hair bracelets made of wire). This method was originally used to investigate ivory availability in China by Moyle and Conrad (2014). The results of their study supported their hypothesis that high-quality pieces would be harder to find in the illegal market, and they concluded that it was easier to find legal bracelets and necklaces compared to illegal pieces identified. It is important to note that Moyle and Conrad (2014) originally carried out this study in a physical market, and revealed that illegal sellers made an effort to conceal their products, indicating that Chinese enforcement was an effective deterrent to sellers. The original study identified bangles and trinkets far easier to find compared to larger items. Since we did not ask participants to search for larger items, this could explain the search effort differences between studies.

Moyle and Conrad (2014) demonstrated how trade dynamics can be distorted through risk-spreading (Reuter & Kleiman, 1986). This is the idea that if a seller distributes many smaller items to a greater number of sellers, the risk of detection is much lower, compared to a single high-value sale. It is also financially safer, as the trader will not lose all their profit from one ivory item being seized, as they have made financial gain from the other small items sold. There is also lower competition within the market for smaller pieces, in comparison to high-end items that are much larger. This has been found in the wider context of the wildlife trade, with smaller and easily disguised products more likely to be trafficked due to the convenience of

transportation and a much lower chance of being detected (Uddin et al., 2022). It is especially common among elephant ivory, which is cut into smaller pieces to make cross-border trade a lower risk. It has been found that ivory can be made into cubes to facilitate smugglers disguising ivory onboard flights or mixing it in with other materials so authorities cannot identify the ivory. This can later be made into items such as jewellery and ornamental carvings (Warchol, 2004). This demonstrates the poor enforcement of ivory regulations, as simple methods of disguising ivory mean sellers can easily go undetected. This highlights the need for stricter and more thorough enforcement of laws.

The key finding of this study is that we have identified the speed and ease at which a consumer can find a piece of ivory jewellery online (4.13 minutes). This high level of accessibility will only continue to encourage the online ivory trade and keep meeting the high consumer demand for such products. Understanding whether the ivory market is driven by supply or demand is complex, as it is often integrated. However, the consequences of the ivory ban suggest that this market is primarily driven by high demand. The ban was originally introduced by CITES in 1989 to reduce the supply of ivory and protect elephant populations, as existing items were seized from the market, and the production of ivory was prohibited (Heltberg, 2001; Stiles, 2004). However, the consequence of this was that ivory sales increased, with higher black market prices and profit for poachers, as the demand from the consumer increased (Sosnowski, 2020). Trade bans are likely to be more effective in the reduction of ivory poaching if there is a simultaneous reduction in demand (Heltberg, 2001).

The implications of having ivory readily available can be detrimental to vulnerable elephant populations, as the demand for ivory materials and the rate of elephant poaching has a direct correlation (Hauenstein et al., 2019). African elephant populations are declining by 8% annually

(Chase et al., 2016), mainly due to ivory poaching. The decline in populations has consequently led to the African elephant species being listed as endangered and critically endangered on the IUCN Red List (IUCN, 2020). This has wider impacts on ecosystems due to the species being crucial environmental engineers, impacting the landscape through processes such as seed dispersal, migration pathways, and water preservation (Fritz, 2017; Guldemond & Van Aarde, 2008; Stommel et al., 2016; Talukdar et al., 2020). Therefore, elephant populations are important in supporting biodiversity, food webs, and landscapes (Fritz, 2002) which can directly impact local communities and the preservation of their environment (Omeja et al., 2014). Our finding that ivory is so available to the online audience demonstrates how these declines in elephant populations will continue, and that ultimately the demand will continue to drive the ivory market. The concern with having ivory so accessible is the idea that people may accidentally discover an ivory product online, and purchase it at speeds and with anonymity that has never been possible before. This is the increased threat that is emerging from the growth of online marketplaces. We are likely to see the continued detrimental impacts that online ivory sales are having on elephant populations and the local communities that depend on the species for environmental preservation. More research must be done into the online market to understand trends and consumer behaviour to reduce the demand for ivory products.

The shopping list method provides useful insight into the illegal wildlife trade, as it does not require experts or skilled surveyors to search for items, and is likely to represent consumers accurately (Pheasey et al., 2021). Therefore, this survey technique has proved an economical way to gain an understanding of the trade quickly, which is especially useful given the scale of online trade. Market surveys are helpful in understanding the demand, and the shopping list method makes the process much simpler. It allows for reliable data on specific items rather than

searching for every item online. Whilst this method has been shown to be effective for surveying physical markets, we demonstrate that it is also applicable for use in online markets. The challenges presented whilst using this method are largely due to a limited amount of previous studies, meaning future research will be beneficial in improving trade data and understanding online trade effectively.

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Chapter 4 - Discussion

4.1 The Illegal Ivory Trade

This thesis investigates the availability of online elephant ivory, intending to understand how accessible the trade is to consumers. Despite the UK Ivory ban of 2018 (Cox, 2021) and CITES protection (Mak & Song, 2018), trade is still known to be active and thriving through online marketplaces. After numerous conferences in London, Kasane and Hanoi, it has been agreed upon by governments that the trade is detrimental to elephant populations and that it is crucial to decrease levels of unsustainable trade (Masse et al., 2018; Zain & Broad, 2015). Despite increased political interest over recent years, elephant populations are still threatened by the illegal wildlife trade and the impacts of elephant-human conflicts and habitat fragmentation (Breuer et al., 2016). In addition to the effects on biodiversity, local communities are likely to suffer the repercussions of the wildlife trade through corrupt governments and disease outbreaks (Duffy & Humphreys, 2016; Karesh et al., 2005; Wittig, 2016). Reducing unsustainable trade, however, has been challenging as whilst protecting vulnerable species impacted by the trade is essential, trade in wildlife is crucial as part of a livelihood strategy for local communities (MacFarlane et al., 2022). The illegal trade of ivory has become more attractive as the market shifts from physical to online marketplaces.

4.2 Challenges of online trade

The internet has facilitated an increased connection between sellers and consumers, and advertised illegal items can now reach a wide online audience (Bennett, 2011; Siriwat & Nijman, 2020). The illegal wildlife trade is largely accessible through open public marketplaces, meaning items are mostly presented on surface websites (Harrison et al., 2016) which are ultimately accessible to any individual with access to the internet. Utilising the internet to sell illegal items has made it easier than ever for sellers to disguise products and sell them to consumers with high levels of anonymity (Grabosky, 2013). To minimise illegal trade online, large media platforms such as eBay and Facebook have banned ivory products from being sold on their sites (Cox & Collins, 2021; Davies et al., 2022). However, current deterrents are not currently effective enough to reduce trade (Venturini & Roberts, 2020). Due to the emergence of online trading, it was found that in 2011, the illegal ivory trade has tripled compared to 1998 (CITES Secretariat, 2014).

The main challenge presented by online illegal trade is the detection and regulation of sales (Yeo et al., 2017). The trade has proven difficult to monitor effectively and is therefore largely unregulated (Fukushima et al., 2021). Furthermore, the use of social media platforms and private messaging has made discrete communication simple and largely undetected. As the large global cyberspace of online trading covers multiple countries and territories, designated law enforcement can be difficult to impose (Lavorgna et al., 2020). The low chance of detection has meant that the risk of trading online is minimal in comparison to other methods through which illegal ivory products are traded (Yeo et al., 2017). As a result, the illegal wildlife trade is a low-risk, high-reward market for criminal activity.

With the current methods of detection, it is unlikely that illegal trading will be identified through an online advertisement, and new alternative methods must be utilised to identify online trading of wildlife products. It is also to be considered that trade can occur via different forms of media, such as surface websites, the dark web, or private communication and that detection methods required may vary. It is important to understand consumer behaviour patterns, including whether individuals are mostly searching for illegal products with intent, or are uncertain of trade requirements. The challenges presented by online trade need to be met with a multidisciplinary approach to increase knowledge surrounding the illegal trade of wildlife products online (Bennett et al., 2017).

4.3 Impacts on biodiversity

Although protected by CITES Appendix I and II, elephants have seen detrimental impacts as a result of the illegal ivory trade (CITES Secretariat, 2012; Underwood et al., 2013). The rate of population decline has increased over recent years, with 75% of a selected 306 populations experiencing declines, thought to be associated with the increase in black market prices (Wittemyer et al., 2014). This differs from legal trade, which aims to be controlled effectively and is often associated with the natural death of elephants as opposed to unregulated ivory poaching (Smith et al., 2015). The illegal ivory trade has strong correlations with governmental corruption and is linked with the unlawful killing of elephant populations to meet the consumer demand for ivory (Gross, 2007; Smith et al., 2015).

On a wider scale, the unsustainable trade of wildlife threatens an abundance of species worldwide, further contributing to the drastic rate of biodiversity loss and the conservation crisis we are currently experiencing (Esmail et al., 2020; Rice, 2008). If managed at sustainable levels, the wildlife trade can provide economic stability to local communities and contribute towards

important conservation initiatives (Cooney et al., 2015; ‘t Sas-Rolfes et al., 2019). For this reason, it is crucial that the CITES regulatory framework is followed closely, and that parties put in place the required steps to regulate the wildlife trade.

4.4 Research focus

This thesis aims to provide insight into the online ivory market, specifically the availability of ivory advertisements and what this means for the effectiveness of current regulations. This acknowledges the importance of future research into the emerging online marketplace to regulate the wildlife trade.

Two methods were applied to the illegal ivory trade to understand accessibility and consumer demand. The first was a 17-week systematic analysis of eBay UK (Chapter 2) by searching for the term ‘netsuke’ to identify potential ivory listings. The aim of this research is to gain insight into the availability of ivory, eBay’s response to the trade, and whether sellers were using specific language to disguise their trade. Secondly, search-cost analysis (Chapter 3) aimed for a selected 24 participants to search for specific products online to understand the accessibility of ivory based on the search time of each item. This method followed the rationale that when searching for an item, a higher search time would correlate with lower availability.

4.5 Contributions to research

4.5.1 Understanding the demand for ivory products and the scale of consumerism

In the context of the illegal wildlife trade, a decreased demand relates to reducing the desire from consumers to search for and purchase illegal wildlife items. A key challenge when evaluating the

international wildlife trade is measuring demand, with price data and consumer interviews being difficult to interpret (‘t Sas-Rolfes et al., 2019). There is a need for updated consumer research to understand the extent to which ivory items are still in demand.

Our results have shown that there is still a demand for ivory products in UK marketplaces. Ivory products are still actively being sold to consumers, suggesting demand for such items persists. Over the 17-week survey period of eBay, availability of ivory remained fairly consistent throughout the weeks meaning no trends of increase or decrease were identified. Of the 43 unique ivory items identified, 30% were sold to consumers demonstrating that there is still an existing demand for these items. Additionally, despite 44% of ivory items being removed from eBay, approximately a quarter of those items had already been sold. This directly contradicts the eBay ban on ivory in 2009 (Coghlan, 2008) and demonstrates that measures to reduce trade on the website are currently not effective enough. Similarly, Yeo et al. (2017) found between 42-67 elephant ivory products per week across an 8-week period. They additionally found that a smaller quantity of users were selling multiple items, with the majority posting one singular post. This may not represent intentional participation in wildlife crime, but rather a lack of knowledge about the illegal market of ivory. Our results supported this as only 17% of sellers offered multiple listings which could be indicative of a smaller demand on eBay, however, there is also the potential that an individual user could be selling ivory across multiple accounts to avoid detection (Stiles et al., 2015; Yeo et al., 2017). Interestingly, when searching for netsuke, we did not identify any usage of codewords in the title advertisements indicating that the item was potentially made of ivory (e.g. ‘ox bone’ or ‘faux ivory’).

To decrease unsustainable trade, it is crucial to reduce the demand for ivory products. Currently, many of the campaigns used to increase awareness and decrease demand are targeted towards consumers, but it is equally as essential to deter sellers. Even if there were less consumer demand, there would still be continued elephant poaching at a significantly high level which could increase stockpile quantity (Stiles et al., 2015). Only a small proportion of funds targeted towards the international wildlife trade have been assigned to demand reduction (World Bank, 2016). Whilst some advocate for limiting supply whilst others focus on limiting demand, it can be argued that an integrated approach that accounts for multiple factors is the most effective way to reduce demand (Thomas-Walters et al., 2020).

4.5.2 Understanding the accessibility of the online ivory market

Our results indicate that illegal ivory products are still widely available to consumers. We can first see this from the 17-week study period of eBay searches, as we found an average of 4 items per week and a total of 43 unique ivory items. Similar results have been found by multiple studies such as Alfino and Roberts (2020) who identified 183 ivory items across multiple eBay marketplaces throughout a 21-day period. This conflicts with the current policies created by eBay to prevent the sale of illegal wildlife items (Cox 2021; eBay, 2018), in addition to their support of the Coalition to End Wildlife Trafficking Online. Since eBay presented these policies, it is clear that there is corporate awareness around the illegal wildlife trade and there is no lack of knowledge about the sales, therefore, more effective measures must be taken to decrease the accessibility. Due to the UK Ivory Ban, there is both a moral and legal responsibility for eBay to present the appropriate deterrents to operate in line with current UK law. It is crucial they make

illegal wildlife items less available to consumers, but with a total of 63 ivory advertisements identified, we can conclude that the policies are not effective in preventing sales.

The availability of online illegal trade in wildlife unfortunately goes beyond eBay. In 2014, IFAW identified 33,006 illegal wildlife and wildlife products over a 6-week period across 280 different online global marketplaces; specifically CITES Appendix I and II species (IFAW, 2014). Our results supported this as we found ivory was easy to find and purchase as a consumer. The 24 participants involved in the search-cost analysis successfully identified both ivory and non-ivory items. The average search time for an ivory bangle was 4 minutes, and 13 seconds demonstrating that it did not take the participant an extended amount of time to identify the ivory item displayed on the 'shopping list'. This is supported by the original search-cost ivory study by Moyle and Conrad (2014) as participants successfully identified illegal ivory found within a physical market located in China. However, our results also differ as our study found no time difference between ivory and non-ivory items. In contrast, the original study found that high-quality illegal ivory was much harder to find. It was a surprising result that minimal differences were found between the two groups. This could be due to the original study being carried out in a physical market where the Chinese government provided effective enforcement to deter illegal sales. Considering this study was used on open online marketplaces, this could be a key justification for the difference in search times. Importantly, this also highlights how deterrents and enforcement for online trade are far less effective, especially compared to certain physical markets.

4.6 Future research recommendations

To reduce the illegal trade of ivory, it is crucial to understand the availability and demand, in addition to identifying any current trends. At the beginning of this thesis, it was hypothesised that the advertisements for illegal ivory would be prominent online and that items would be easily accessible to the consumer. Our results largely supported this, with 43 unique ivory items being found on eBay UK, and an average search time of 4 minutes, and 13 seconds for participants to identify a specific ivory product. The findings of this study aim to contribute to existing knowledge surrounding the ivory trade and offer an enhanced understanding of the emerging online market.

The search-cost analysis has proved to be a quick and effective method of collecting data. There have been limited studies using this method previously, and to the best of our knowledge, this is the first study that has used search cost to investigate the availability of wildlife items over the internet. We encourage any replications of this study to create a shopping list that reflects items that are popular with the online audience. This may involve additional research to understand what consumers are currently searching for, as this is likely to be the most representative method of gaining trade data and understanding consumer behaviour response. As suggested by Pheasey et al. (2021) when investigating physical markets, this method does not require experts in the field or particularly skilled surveyors, meaning that it is likely to accurately represent real-life consumers. For this reason, this methodology could be used for wider conservation applications in the future and can offer an important understanding of trade data and demand. Given the difficulty of estimating the size of online trade (Hughes, 2021), it is convenient that the shopping list method can be applied to both physical and online markets of varying sizes. This method has proven to be an effective and economical way to gain the much-needed trade data used to

understand the demand and availability of online wildlife items. Future research using shopping-list analysis will be beneficial in improving the method in the future, and crucial in creating trade data to understand online trading in more detail.

A valuable future study would be to understand the extent to which the time taken to find items correlates with the availability of the items. This may include participants searching for items whilst the researcher simultaneously undertakes their own research, creating data on the number of items available. To identify trend data, it may be useful to undertake research at a longer scale throughout the year to investigate whether the ivory market is increasing or decreasing with time. Additionally, it may be beneficial to have participants share a similar knowledge of the ivory trade, such as conservation or environmental science students. This means they may have a prior understanding of the authenticity of ivory and whether items were illegal, such as background knowledge of CITES permits. This was attempted for this study, however, we, unfortunately, did not gain enough participants to use solely conservation students. Overall, replicating the Moyle and Conrad (2014) study has proved to be a valuable way to understand the availability and demand for illegal wildlife products and would be very effective for future studies.

Alongside other studies, we found that the vast majority of ivory sales identified on eBay were one-time sellers who were offering one singular item, rather than multiple listings (Yeo et al., 2017). From these findings, it is likely that ivory listings are primarily due to a lack of understanding surrounding permits and regulations for selling these items, rather than organised crime. Future research could explore how marketplaces could effectively educate consumers on wildlife trade regulations. Although the use of codewords was not identified in this study, further research into the use of codewords to disguise illegal items could be beneficial in understanding the availability of ivory. Due to the abundance of one-time sellers found in the study, it would be

valuable to understand the likelihood of commercial sellers using multiple accounts to avoid detection, or whether code words are more prominent than our results reflected. For example, Harrison et al. (2016) identified ox-bone as a common code word used to disguise ivory products on open marketplaces. Additionally, this study could be expanded to other online marketplaces, as data could be compared to the availability of ivory found on eBay UK.

Arguably one of the most challenging components of investigating online trade is testing the authenticity of ivory items identified. As suggested by Hernandez-Castro and Roberts (2015), it is rare for the word 'ivory' to be used by sellers due to the fear of detection, which is reflective of our findings in this study. Therefore, we are reliant on the use of Schreger lines to test whether items are genuine. As we are examining these items online, picture quality can make identification challenging. Although much care was taken over examining the items, it is almost impossible to eliminate the risk of this potentially impacting results. This is why it is valuable to understand in more detail the use of codewords (Xu et al., 2019), improve image surveying techniques, and investigate potentially overlooked metadata such as postage price and feedback scores (Hernandez-Castro & Roberts, 2015).

As the trade of wildlife products moves to online marketplaces, it is crucial that we understand trade characteristics to create impactful interventions in the future. This includes knowledge surrounding similarities and differences to physical marketplaces, especially the behaviour patterns of both consumers and sellers and how this is different to in-person sales. There are benefits and costs to the global space of online marketplaces, but they can be harnessed for good if the correct measures are enforced, as it is easier than ever to contact a wide online audience. It is crucial that websites put more effort into actively identifying and removing illegal wildlife items. We suggest that eBay, in addition to other platforms, focus more on this issue as current

policies are not effective enough to deter sellers. Such large companies should theoretically have the resources to put improved systems in place to report potential illegal items, so they can be effectively identified and removed (Venturini & Roberts, 2020).

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Appendices

Appendix 1: Participant advertisement for recruitment

Appendix 2: Participant Questionnaire

Shopping Experience Questionnaire

This questionnaire is part of a study looking into the availability of elephant ivory for sale online. This questionnaire is about your online shopping preferences and the demographic information will help us understand you as a participant, meaning there are no right or wrong answers. All data collected is intended for research purposes only and will be kept in strict confidence.

A. Online Shopping Questions

This survey will look at your use of online marketplaces rather than targeted online purchases, such as supermarkets or store websites. The following questions only relate to online marketplaces.

1. Have you ever bought an item from an online marketplace?
   Yes (please go to question 2)
   No (please go to question 8)

2. On average, how often do you purchase items from an online marketplace?

   Daily
   3-5 times a week
   Once a week
   2-3 times a month
   Once a month
   Every few months
   1-2 times a year

3. Please list the last 3 online marketplaces you have purchased items from.

1._____

2._____

3._____

4. Please list three online market-places you use **most frequently**, placing them in order with 1. Being the most often, and 3. The least often

1._____

2._____

3._____

5. Thinking about your most recent online marketplace shopping experience, which type of products did you purchased on that day (please tick all that apply)

   Cosmetics

   Jewellery
   Clothing
   Household cleaning
   Furniture
   Ornaments
   Gifts
   Music
   Audiobooks
   Books
   Technology
   Other (please state)

6. Which of the following items would you typically look for on an online marketplace before searching directly on a store website (please tick all that apply)

   Cosmetics
   Jewellery
   Clothing
   Household cleaning
   Furniture
   Ornaments
   Gifts
   Music
   Audiobooks
   Books
   Technology

Other (please state)

7. When shopping online, have you ever found items being sold as ivory?

   Yes
   No
   Unsure

B. Demographic Questions

8. On a scale of 1-10, what is your knowledge of the trade of ivory?

_____

9. On a scale of 1-10, what is your ability to identify elephant ivory?

_____

10. Which of the following statements best describes you? (Please only tick one box)

    I would never knowingly buy ivory
    I would buy ivory if it was from a sustainable source
    I would buy antique ivory
    I would buy ivory if it was affordable
    I would buy ivory if it was to support elephant conservation

11. What gender do you identify as?

    Male
    Female
    Other (please state)
    Prefer not to say

12. What is your age?

    18-25 years old
    26-35 years old
    36-45 years old
    50+ years old
    Prefer not to say

13. What is your employment status?

    Employed full-time
    Employed part-time
    Self-employed
    Student with an **additional income**
    Student with **no additional income**
    Retired
    Not employed
    Prefer not to say

14. What is your average annual income?

    Up to £5,000
    Up to £10,000
    Up to £20,000
    Up to £30,000
    Up to £40,000
    Up to £50,000
    Above £50,000
    Prefer not to say

Thank you for taking the time to complete this questionnaire. Please now read the instructions to complete the online ivory survey.