

**The trade in mammoth ivory: its role in the illegal trade
in elephant ivory.**

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MSc Biodiversity Management

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I. DECLARATION

I declare that this thesis has been composed solely by myself and that it has not been submitted for any other degree or professional qualification except for MSc Biodiversity Management (by-research). Except where stated otherwise by reference or acknowledgement, the work presented is completely my own.

George Nash

II. ACKNOWLEDGEMENTS

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V. ABSTRACT

The mammoth ivory trade is a growing and prominent trade of a wildlife product due to the ever-melting Siberian permafrost and has recently been regularly linked to the elephant ivory trade. The link to the elephant ivory trade has caused conservationists and organisations to pay attention to the trade and led to the proposal of listing the woolly mammoth on CITES Appendix II by Israel at the seventeenth meeting of the Conference of the Parties to CITES. This proposal has led to further discussion of the mammoth ivory trade during future meeting and eventually the proposal was rejected by CITES parties, however, the commission of a study investigating the effect of mammoth ivory on elephant ivory was of great importance. This study aims to; explore the mammoth ivory trade and its links to the trade in elephant ivory; where is the trade occurring? Is the trade increasing, what regulations are in place? Does the mammoth ivory trade overlap with the elephant ivory trade? What is the price of mammoth ivory and does it have a relationship with elephant ivory prices? Is mammoth ivory promoting the illegal trade and laundering of elephant ivory? To what extent can elephant ivory be sold as mammoth ivory? And, Should the woolly mammoth be listed on CITES Appendix II? These questions are investigated in Chapter 2 by carrying out a systematic evidence review on seven different search engines; Google Scholar, Web of Science, Scopus, Microsoft Academic, World Wide Science, Science and JSTOR, using seven search terms; “Mammoth ivory” AND “trade”, “Mammoth” AND “elephant poaching”, “Mammoth” AND “illegal trade”, “Mammoth ivory” AND “elephant ivory”, “Elephant ivory” AND “drivers”, “Mammoth” AND “illegal ivory” and “Mammoth ivory” AND “demand”. To fill gaps in knowledge left by the systematic evidence review questionnaires and semi-structured interviews were conducted in Chapter 3. After sending a total of 1050 emails to 317 individuals, academics, non-governmental organisations, governmental organisation, and law

enforcement officers I received 13 completed questionnaires, 8 partially completed questionnaires and conducted 3 interviews. From both data collection methods there were some key findings. China has become the largest market for mammoth ivory overtaking Hong Kong (SAR) of China, the mammoth ivory trade is rapidly increasing, especially in China where the trade could be considered as big as the elephant ivory trade. There is very little mammoth ivory regulations in the largest market, China, and the regulations that in place for elephant ivory, such as; ID cards for elephant ivory and the domestic closure of the elephant ivory market are increasing the demand for mammoth ivory and facilitating the opportunity of elephant ivory laundering. The price of mammoth ivory is increasing, however, there is little knowledge on the subject and how the price of mammoth ivory is affecting the demand and price of elephant ivory. Finally, the laundering of elephant ivory through the mammoth ivory trade was determined to not be significantly impacting the poaching rates and elephant populations. From the data collected from questionnaires and interviews there was agreement that the woolly mammoth should not be listed on CITES Appendix II. Conservation efforts were recommended to focus mainly on holding discussions with representatives from China and Russia on what legislation can be implemented which will benefit both countries and the trade and stocks of mammoth ivory. This study explores new information on the mammoth ivory trade and has some important findings which help decisions on the regulation of the trade. However, due to the low number of questionnaires completed and interviews conducted, especially from the four largest markets for mammoth ivory should be addressed by CITES by ensuring that a follow up study is conducted. This study should focus on collecting data from the source of the trade and where demand is largest, Russia and China. Moreover, it should investigate the impacts of new legislation in the US, Israel, China, and Hong Kong (SAR) of China on the demand of mammoth and elephant ivory and the relationship between the price of both ivory trades. By doing so, we can gather an even greater understanding of the mammoth

ivory trade and its relationship with the elephant ivory trade before any decisions are made.

1. INTRODUCTION

1.1 The illegal wildlife trade

The illegal wildlife trade is one of the largest illegitimate businesses in the world (Rosen and Smith, 2010). The illegal wildlife trade can be defined as activities which defy the law associated with the trade and commercial exploitation of wildlife products and specimens, both alive and dead (‘t Sas-Rolfes et al., 2019), with wildlife incorporating wild fauna, flora and fungi. Further, trade is defined as the buying and selling of goods and services, including: human harvesting, importation and commercial exchange (‘t Sas-Rolfes et al., 2019), as a result activities such as subsistence hunting and gathering are not considered trade.

It is extremely difficult to determine the scale of the illegal wildlife trade due transactions taking place on the black market, however, the value of the trade has been estimated by many to be around 5-23 billion USD per year, excluding the money made from fisheries and timber (‘t Sas-Rolfes et al., 2019). This would make the illegal wildlife trade one of the top five largest global illegal trades alongside human trafficking, narcotics, counterfeiting and weaponry (Warchol, 2004). However, in comparison, the legal wildlife trade is estimated to be worth 220 billion USD per year, with the trade from 1997 to 2016 generating 2.9-4.4 trillion USD (Andersson et al., 2021). The commodities that generated the most income from 1997 to 2016 were; seafood (3.6 trillion USD), furniture (297 billion USD), fashion (267 billion) and traditional Chinese medicine (97 billion USD) (Andersson et al., 2021). Similarly, to the illegal wildlife trade the two main players in the trade are China and the US.

Although the illegal wildlife trade is estimated to be worth 88% less than the estimated money generated by the legal wildlife trade per year, it is still causing devastating effects to the countries involved. Apart from endangering species, the illegal wildlife trade can threaten the target species as well as other species through by-catch. Criminal involvement due to the ability to make money through the trade causes destabilisation in governments and economies locally and nationally, facilitating corruption and criminality further and has damaged both the security and livelihoods of communities (Esmail et al., 2020). The destabilization and undermining of the government's attempts to manage their natural resources sustainably causes the major economic losses as development and tourism decreases due to the threat of violence and reduced number of charismatic species (Lawson and Vines, 2014). The trade also creates an avenue for invasive species and disease, such as pathogen pollution and human induced infectious agents, having health effects on humans, native species and livestock, this is a visible problem when looking at the conditions in which the specimens are handled and transported (Rosen and Smith, 2010).

In 1975 in order to regulate the wildlife trade and prevent the extinction of habitat and species, the Convention on International Trade in Endangered Species (CITES) came into effect by the United Nations, with currently 183 countries having signed the treaty (cites.org, 2021). CITES works by monitoring and regulating the import, export, re-export of species listed under the convention via a permit system (cites.org, 2021). CITES currently classifies around 38,700 species of fauna and flora through their appendix classification system; Appendix I, Appendix II and Appendix III. Each appendix has a different level of protection that fulfils the requirements of the species dependent on their extinction threat and size of trade. Appendix I includes the species with the highest extinction threat or their populations are being affected by the wildlife trade, this appendix gives the highest level of protection with the trade only being allowed under exceptional

circumstances (cites.org, 2021), there are currently 1,082 species which are protected by Appendix I (Pires and Moreto, 2016). Appendix II includes species which do not have significantly high extinction threat but without the convention's protection could become vulnerable to extinction, there are currently 37,420 species which are listed under Appendix II. Finally, the lowest level of protection provided via the convention, Appendix III, include species that have been identified by one of the CITES parties as requiring the aid of CITES to regulate the trade and avoid overexploitation (Jaimungal, 2018), there are 211 species that are protected by Appendix III (Pires and Moreto, 2016).

1.2 Elephant ivory trade and Elephant populations

Elephants have been extremely affected by the illegal wildlife trade and have been a key focus of CITES when implementing new trade policies. There are three species of extant elephant; African savanna elephant (*Loxodonta africana*), African forest elephant (*L. cyclotis*) and Asian elephant (*Elephas maximus*). African savanna elephants and African forest elephants are currently listed as Endangered (Gobush et al., 2021) and Critically Endangered respectively, and the Asian elephant is listed as Endangered on the IUCN RedList (Williams et al., 2020).

In 1975 when CITES was implemented the Asian elephant was protected by Appendix I and both African species of elephant were protected by Appendix II. In 1979 it was estimated that there was a population of around 1.34 million African elephants (both savanna and forest) by 1987 the population had decline to 700,000 individuals and within 2 years this number had reduced by more than half of what it was in 1979 to around 600,000 due to the demand for ivory (Stiles, 2004). This dramatic decline in the African

elephant's population lead to CITES changing their listing from Appendix II to Appendix I in 1989, therefore, resulting in a ban on commercial trade in their ivory. This decision was resisted by a few southern African countries due to the importance of elephant ivory for the country's economy, power, and their stable elephant populations (Lawson and Vines, 2014).

Since 1989, poaching has continued to increase in both Asia and Africa due to increasing demand for ivory. From 1989 to 1998 the number of African elephants declined to an estimated 357-500,000 individuals (Stiles, 2004). By 2002, the African elephant's population had increased slightly over the last 4 years, however, when looking back at the 1.34 million individuals that made up the African elephant's population in 1979, there was an overall decline by 60-70% (Stiles, 2004). In an attempt to saturate the market and meet demand, legal sales approved by CITES took place in 1999 which saw the import of 49,439kg of raw ivory exported to Japan and in 2002 where 62,333kg of raw ivory was imported into China and 39,434kg into Japan (Kurohata, 2020). Moreover, a legal sale of 102,000kg of ivory was made in 2008, however, by 2010 it was clear that this had not made any impact on poaching levels (Aryal et al., 2018). Between 2010 and 2012 there was an average poaching rate of 6.8% of the total population of African elephants, resulting in the loss of 100,000 elephants (Aryal et al., 2018).

In 2016 the US banned the commercial trade of ivory, and this was followed by China, the world's largest market for ivory, shutting down their legal ivory trade (Aryal, Morley and McLean, 2018). In 2017, the proportion of illegally killed elephants dropped from 10.4% in 2011 to 3.7%, along with a population growth rate at 5%, the poaching rate would be sustainable if kept at this level (Hauenstein et al., 2019). The current population level is estimated to be 400,000 individuals, with African savanna elephants making up around

350,000 and African forest elephants around 50,000 (Gobush et al., 2021). Although Asian elephant populations have been stable over the last 5 years, with an estimated population of around 40-50,000 individuals (Williams et al., 2020), this number has declined by 50% over the last 60 years (Aryal et al., 2018).

Human-elephant conflict is a key factor to consider when looking at elephant populations and their perception in countries that they inhabit. There are three types of conflict which are caused by elephants in both Africa and Asia; crop raiding, human attacks and damage to property. The increasing human population leads to an increased resource requirement which has caused the further fragmentation and displacement of Asian elephants, resulting in these conflicts (Neupane, Johnson and Risch 2017). In 2017, it was found that from 1,182 farmers; 27% of them had experienced property damage and 77% had experienced crop damage from elephants (Neupane, Johnson and Risch 2017). In Sri Lanka alone between 2010 and 2019 there was a total of 14,516 human-elephant conflicts, which resulted in; 807 human deaths, 10,532 property damages and 2,631 elephant deaths (Supun Lahiru Prakash et al., 2020). African elephant conflict with farmers is just as prominent as elephants in Asia. After an increase of 153% in the population and 700% increase of land under crop farming in areas surrounding the Marsabit National Park, Kenya over a 30 year period, human-elephant conflict increased drastically (Ngene and Omondi, 2009). Over a one year period, 414 farms were raided resulting in farmers losing an estimated 208,814 USD (Ngene and Omondi, 2009).

Although human-elephant conflict is a problem in countries where elephants are present, the same countries can be heavily dependent on the animals economically. Elephants, African elephants especially, are the key to tourism growing in countries that they inhabit

as it is reported that the attraction of seeing an elephant in the wild is 30-40%, in some cases up to 88%, of the reason why tourists will visit reserves (Geach, 2002). The direct household benefits of conserving elephants in these countries are; employment for locals and the ability to create businesses linked to safari or elephant tourism, this could be restaurants, gift shops, selling crafts, accommodation (Geach, 2002). The effect of a decreasing elephant population is not only devastating for a country's economy but also has a dramatic effect on the overall environment as the elephants are a keystone species. Both African savanna and forest elephants grazing methods allow smaller surrounding species access to food and materials easier and their most important impact is their role in seed dispersal (Jaimungal, 2018). Tree fall and breakage creates a benefit to local communities through making timber and firewood easily available, this can be used for livestock and the construction of houses and other infrastructure (Gnonlonfoun et al., 2019). Elephants are also an umbrella species as the money used in conserving the habitats in which elephants are found also lead to the conservation of species such as; buffalo, lion and rhinos. Moreover, if elephants disappear from their ecosystem empty forest syndrome will be caused, having effects on not just the animals that make up the ecosystem but humans that rely on the habitats too (Jaimungal, 2018).

1.3 Elephant ivory substitutes and laundering

1.3.1 Elephant ivory use and properties

Historically and currently carving is the main use of elephant ivory, mainly taking place in countries, such as China where there were several workshops in Beijing, Guangzhou and Fujian designated to carving elephant ivory and recently transitioning to mammoth ivory

(Gao and Clark, 2014). These carvings can vary from full tusk carvings, ornaments, figurines, chopsticks, and jewellery (Gao and Clark, 2014).

When trying to identify elephant ivory the key feature is the presence of Schreger lines. Schreger lines are unique patterns that are evident in the cross sections of ivory (Chervenka, 2021). Schreger lines have not been able to be replicated in plastic and other artificially made ivory, therefore, their presence indicates the authenticity of ivory. Schreger angles are formed by Schreger lines crossing paths, these angles can be used to differentiate between ivory from mammoths and that of present-day elephants (Chervenka, 2021), with mammoth ivory having an angle less than 90° , and elephant ivory having an angle greater than 115° (Chervenka, 2021). Tusks of a male African savannah elephant can grow up to more than 3 metres and weigh up to 90kg, whereas the females' tusks are smaller and more slender (Bortolaso, 2008). The tusks of a male Asian elephant are smaller only growing to around 2 metres and the females do not grow tusks (Bortolaso, 2008).

1.3.2 Elephant ivory substitutes

While ivory substitutes have been used for thousands of years (Sims et al., 2011), following the CITES ban on the trade in elephant ivory in 1989, and more recent domestic bans in some of the largest markets such as China and the United States, many manufactures and vendors have begun to look at ivory substitutes more than ever. Animals that have been commercially exploited for their ivory are; elephants, walrus, whales (including narwhal), hippopotamus, warthog and the extinct mammoth (Chervenka, 2021). There are also a number of animals that provide ivory but are rarely

used commercially, such as; wild and domestic pigs, beavers, elk, camels, bears, tigers and jaguars (Chervenka, 2021).

1.3.3 Vegetable Ivory

One substitute which could be considered plausible in terms of the morphological properties is the Jarina seed found in the Brazilian Amazon. The Jarina seed has desirable properties, like a very similar physical appearance and feel to elephant ivory, carvability, conformability and the fact it is biodegradable (Chu et al., 2015). The Jarina seed can also be harvested sustainably and manipulated in order to satisfy the workshops and consumers. Through controlled solidification and freeze casting the seed can be preserved and processed in order to improve its properties, selective breeding will develop larger seeds and processing the hemicelluloses will improve its strength, both very desirable traits that elephant ivory workshops and consumers prioritize (Chu et al., 2015). The tagua nut itself is most commonly used when creating small items such as netsukes, and when compared to elephant ivory under black light the difference can be hard to tell, this could possibly open an avenue for laundering of small carved items (Chervenka, 2021).

1.3.4 Synthetic Ivory

Plastics have an unsuccessful history as a substitute for elephant ivory due to the inability to replicate the same grain structure and Schreger lines (Chervenka, 2021). One of the earliest attempts at creating artificial ivory dates back to 1868 when Celluloid was invented, although, celluloid has a grain, it is easy to detect the difference from elephant ivory due to the repeating pattern (Chervenka, 2021). Nowadays, synthetic ivory is much closer to appearing as genuine elephant ivory and its price in China, the main ivory market,

is around 86% cheaper, this has resulted in attempted instances of laundering elephant ivory (Zhou, 2014).

1.3.5 Animal substitutes

1.3.5.1 Walrus (*Odobenus rosmarus*)

Walrus ivory comes from their tusks, more specifically, upper canines growing up to 1m making them desirable by ivory hunters as their size is desirable for carving or displaying (Chervenka, 2021). The current walrus population is estimated to be 225,000 individuals, even though this number does include the two subspecies of Atlantic and Pacific walrus the current population trend shows a consistent decline (Lowry, 2016). The trade of walrus ivory is protected by CITES through Appendix III, with countries such as Norway, Russia, Canada, and Greenland regulating the harvest of walrus ivory (Lowry, 2016). Although, walrus ivory is one of the only substitutes where the size of the tusk is similar to elephants, it is not that favourable in China, the main ivory consumer as seen through the lack of results generated when searching walrus on Taobao, a Chinese online retailer (Smith, 2018).

1.3.5.2 Sperm whale (*Physeter macrocephalus*)

The sperm whale contains ivory in its lower jaw, with 20-26 pairs of 8-20cm long teeth which can be as heavy as 1 kilogram (Bortolaso, 2008). With the fact that sperm whales are listed under Appendix I by CITES and the collection of their teeth would be extremely difficult in comparison to other substitutes, the trade in sperm whale ivory is very rare.

1.3.5.3 Narwhal (*Monodon monoceros*)

Narwhal's ivory comes from their unique tusk that protrudes 1.5-2.5 m from their head, with a weight of 10 kg (Bortolaso, 2008). Similarly, to walrus ivory the narwhal's ivory is one of the only alternatives that comes close to elephant ivory, in terms of the length of the tusk, making it a plausible substitute, however, its colour and thinness cause it to be less desirable for carving. This is further proven through the lack of results generated when searching for narwhal tusks on Taobao and being listed on Appendix II of CITES (Smith, 2018).

1.3.5.4 Hippopotamus (*Hippopotamus amphibius*)

One of the most commonly used substitutes for elephant ivory comes from the hippopotamus. The canine teeth can reach around 60-70 cm and weigh up to 4kg in males and no more than 1kg in females (Bortolaso, 2008). Even though due to their unfavourable characteristics for carving, such as; hardness and cracking easily hippo teeth were still a staple piece during the 1990-2000s in Fuzhou and Guangzhou workshops, however, it is believed that their importation into Hong Kong (SAR) of China is less common nowadays as sales were poor and better substitutes were identified (Martin, 2006). With a vulnerable population of 115-130,000 individuals, trade in hippo ivory is protected under Appendix II of CITES.

1.3.5.5 Warthog (*Phacocherus aethiopicus*)

This small warthog species grows teeth up to 23cm protruding from their mouth (Bortolaso, 2008). Warthog tusks have been imported into Hong Kong (SAR) of China for

carving, however, have been considered less desirable for carving, the tusks could still be a substitute for elephant ivory as the trade is legal, even though, the species population is declining.

1.3.5.6 Cow, Buffalo and Camel bones

In the 1990s cow bones were the most common alternative used in Chinese workshops for carving and have been turned to for centuries when choosing materials to carve with (Sims et al., 2011). Cow bones made up 90% of the bones used in the workshops due to the quantity of bones available in comparison to camel and buffalo (Martin, 2006). The ease at which the bones could be bought did not make up for the fact that the quality of the carvings were not as high standard as elephant ivory carvings as due to carvings and pieces made from bones valued around 5-7% of what similar elephant ivory carvings and pieces cost, less effort was put in from craftsmen (Martin, 2006).

When comparing bone and elephant ivory, there are some key differences; ivory is a denser material and has no visible texture imperfections. In comparison, when carved, bone has a grainy appearance and other imperfections, such as; dark spots, scratches, streaking and a sponge-like appearance at the ends of the bones (Sims et al., 2011).

Due to the chemical similarities between bones and elephant ivory, it is hard to distinguish between them under UV light which can lead to the laundering of elephant ivory as bone (Sims et al., 2011). However, the main threat of laundering comes from the almost indistinguishable mammoth ivory.

1.4 Mammoths & Mammoth ivory

There are a vast number of different species of mammoth that make up the *Mammuthus* genus; the famous woolly mammoth (*M. primigenius*), *M. hayi*, *M. meridionalis*, *M. columbi*, *M. haroldcooki*, *M. scotti* and *M. sonoriensis* (Lister and Sher, 2015). These seven species could be found across continents now known as North America, Europe, and Asia during the Pleistocene.

One of the earliest appearances of woolly mammoths comes from North-east Siberia around 800,000 years ago, 500,000 years later during the late Middle Pleistocene woolly mammoths can be found throughout the continents of Eurasia and North America (Nogues-Bravo et al., 2008). 42,000 years ago, during the last phase of the Pleistocene epoch, woolly mammoths were still present across Eurasia having adapted to the declining temperatures (Sedwick, 2008).

It was regularly belief that by the end of the Pleistocene epoch around 12,000 years ago, woolly mammoths disappeared with it. Although this is true for most of Europe, Northern Asia and Northern America, the species persisted for a further 3,000 years in parts of northern Siberia and Estonia (Stuart et al., 2002) and in some cases it is estimated that they survived until 3,000 years ago, such as on Wrangel island (Nogues-Bravo et al., 2008). However, due to global warming and a change in moisture, from 42,000-6,000 years ago 90% of the mammoth's habitat was lost from Siberia, this equated to a decline from 7.7 million square kilometres to 800,000 square kilometres (Sedwick, 2008). Moreover, there was a decline of 89% in the species geographical range (Nogues-Bravo et al., 2008). Although, mammoths have survived periods of low suitable habitat, such as, 126,000 years ago where it is estimated that there was around 300,000 square kilometres of suitable

habitat left (Sedwick, 2008), from the upper Palaeolithic to mid-Holocene the human population began to inhabit large areas of northern Eurasia, although, there is a lack of evidence of humans hunting mammoths there would have been more of a pressure than before (Nogues-Bravo et al., 2008). The pressure from hunting due to the small number of individuals that would have made up the woolly mammoth population would only have taken 0.0049-0.37 mammoths to be killed per person per year during the mid-Holocene to drive the woolly mammoth to extinction (Nogues-Bravo et al., 2008). Moreover, it is believed that dust storms had a key role in the extinction and preservation of the woolly mammoth. Dust storms during the mid-Holocene were extreme and could have caused mammoths to suffocate and become buried under the dust and become entrapped into the permafrost where they can be found today (Oard, 2000). It is estimated that there are currently 5 million mammoths that are buried under the permafrost in Siberia alone (Oard, 2000). As previously mentioned, the woolly mammoth poses the largest threat to the elephant ivory trade in terms of laundering as the trade in Mammoth ivory is currently legal, apart from countries such as; Israel, India and parts of the United States of America. One of the only ways that mammoth ivory can be differentiated from elephant ivory is the presence of Schreger lines. Mammoth ivory can be identified where the Schreger lines overlap and create an angle of less than 90° and all angles larger than 115° pertaining to elephant ivory (Chervenka, 2021). Recently, with the advancement in technology and microscopic analysis, molecular DNA sequencing has become easier, in turn, giving authorities another method of differentiating between elephant and mammoth ivory. However, DNA analysis may not always be an option due to the necessity for specialized equipment, expertise, time, cost and the destruction of part of the sample (Buddhachat et al., 2017). China and Hong Kong (SAR) are two countries which have shown large interest in mammoth ivory, however, others like Japan consider mammoth ivory less favourable

due to the presence of cracks and dark lines which elephant ivory does not possess and its brittleness during carving (Martin, 2006).

With an estimated 5 million mammoth carcasses frozen in Siberia and being collected for the mammoth ivory trade, what can be done to prevent elephant ivory being laundered through the trade?

1.5 CITES Proposal

During the seventeenth meeting of the Conference of the Parties to CITES in South Africa, Israel submitted a document titled “Identification of elephant and mammoth ivory in trade”. In this document it was recommended that the woolly mammoth species (*Mammuthus primigenius*) should be listed on to CITES Appendix II under a look-alike provision due to the similar attributes that mammoth and elephant ivory share and to prevent the laundering of elephant ivory mislabelled as mammoth ivory through better documentation and regulation. This was a result of a rise in trade in mammoth ivory and the fact that elephant ivory is heavily protected through Appendix I and II and many domestic bans, meaning that the continuation of the legal trade in mammoth ivory provides an easy way of laundering elephant ivory. This inclusion in Appendix II would make woolly mammoths the only species whose trade is illegal when the species itself is extinct. However, the proposal by Israel was rejected by the CITES parties and instead it was decided that the CITES Secretariat would commission a study investigating the effect of mammoth ivory on elephant ivory which would be discussed at the 19th meeting of the Conference of the Parties to CITES in Panama in November.

1.6 Study Aims

The aim of this study is to research the trade in mammoth ivory, and its impact and contribution to the illegal trade in elephant and elephant populations. The research is conducted through 2 key objectives and 8 sub-objectives:

1. Determine the scale of the mammoth ivory trade.

1.1 Where is the trade occurring? What countries are the largest markets? In these countries is the trade legal or illegal and do the countries also have legal markets for other types of ivory?

1.2 Are there any trends? Is the mammoth ivory trade increasing or decreasing?

1.3 How and to what extent is the trade regulated in countries which are of the highest concern? This will give insight into how accessible products containing mammoth ivory are and whether stricter regulations need to be considered.

2. Determine the relevance of the mammoth ivory trade in the context of the illegal ivory trade.

2.1 To what extent do the mammoth and elephant ivory trade overlap? Is the main demand and markets for products containing both mammoth and elephant from similar countries? Is elephant ivory being sold as mammoth ivory?

2.2 What is the difference in pricing of mammoth and elephant ivory? Is one increasing while the other decreases? Does their pricing affect each other in terms of demand?

2.3 Is there evidence to show that mammoth ivory trade is promoting the illegal trade in other elephant ivory types? Through looking at case studies, what evidence is there that mammoth ivory trade is being used as a tool to promote illegal trade in other elephant ivory types?

2.4 To what extent elephant ivory can be sold as mammoth ivory? This can be investigated by looking at samples, determining the physical differences that can be identified. Can law enforcement use this to help regulate the trade?

2.5 What is the scale of the online mammoth ivory trade? Is the term mammoth ivory being used as a way to cover up the sale of other ivory types and if so, to what extent does this occur?

2. EVALUATING LITERATURE ON THE ELEPHANT-MAMMOTH IVORY TRADE

2.1 Introduction

The illegal wildlife trade is one of the main threats to the success of biodiversity management and conservation. In recognition of the need for sustainable trade in wildlife specimens, the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) was adopted in 1973 and it entered into force on 1 July 1975; currently there are 183 party members. International imports and exports of CITES listed species are monitored and controlled through the issuing of trade permits and certificates. The CITES listed species contain around 5,950 animal and 32,800 plant species, which are classified into Appendices I, II, III in accordance with the severity of threat that they are under from international trade. The economic boom during the 1970s and 1980s, particularly in East Asia, led to exponential growth in the demand for ivory from both African and Asian elephants; this resulted in the African elephant population declining from 1.3 million individuals to 600,000 individuals (Barbier et al. 1990; Stiles, 2009). Due to this rapid decline CITES introduced many strategies to mitigate the effects of the illegal wildlife trade such as; placing the Asian elephant (*Elephas maximus*) in Appendix I, prohibiting all trade and the African elephant (*Loxodonta africana*) in Appendix II. In 1989 after a continued decline in elephant populations the African elephant was also placed in Appendix I meaning that there was a complete ban on all elephant ivory trade, however, there were some populations transferred back to Appendix II in 1997 and

2000 under certain conditions (Stiles, 2009). Today, Asian elephants are listed as ‘Endangered’ on the IUCN Red List with a decreasing population currently estimated to be between 40,000 and 50,000 individuals (Williams, et al., 2020). African savanna elephants and African forest elephants are currently listed as Endangered (Gobush et al., 2021) and Critically Endangered respectively.

Recently, a new variable has been introduced to the elephant ivory trade, mammoth ivory. The woolly mammoth (*Mammuthus primigenius*) and steppe mammoth (*M. trogontherii*) were previously pushed to extinction due to global warming as temperate-adapted steppe mammoth populations became scarce and the woolly mammoth was extremely vulnerable to the warming episodes (Lister, et al., 2005). Carcasses of both mammoth species have begun emerging through the permafrost, resulting in the mammoth ivory trade now accounting for 20% of all ivory production (Farah and Boyce, 2015).

In 2019 at the seventeenth meeting of the Conference of the Parties to CITES, Israel proposed the inclusion in Appendix II of the Woolly Mammoth under a look-alike provision. The reasoning behind Israel’s proposal was due to the belief that the rise in mammoth ivory trade is having an indirect threat on elephant populations as the legal trade of mammoth ivory is facilitating the sale of elephant ivory as mammoth ivory (CITES, 2019). This belief has already led to both Israel and India banning the trade of mammoth ivory, with Israel being the most recent country banning the trade on January 1st, 2021 (CITES, 2020). There are only a few characteristics that allow the differentiation of mammoth ivory and elephant ivory and thus requires trained individuals. Grade A mammoth ivory, also known as “Ice”, is practically identical to elephant ivory (Rosencranz and Sehgal, 2017). This look-alike issue is thought to result in the importation, exportation, and trade of elephant ivory in regulated countries disguised as mammoth ivory.

Israel's proposed outcome for the inclusion in Appendix II of Woolly Mammoths as a look-alike species is not primarily to stop the mammoth ivory trade but to facilitate the documentation of the international mammoth ivory trade, allowing a better understanding of the association between the mammoth ivory trade and its impacts on living elephant populations (CITES, 2019). This study aims to review the evidence which is currently available on:

- The impact of the mammoth ivory trade on the elephant ivory trade and elephant populations.
- Where the mammoth ivory trade is occurring, identifying the largest markets and where trade is both legal and illegal.
- Whether the mammoth ivory trade is increasing or decreasing.
- What are the difference and trends between the price of mammoth and elephant ivory?
- What evidence is there for the mammoth ivory being used as a tool to promote the illegal trade of elephant ivory?

2.2 Methodology

2.2.1 Data Collection

To investigate and review the evidence as to whether the mammoth ivory trade is or is not having an impact on the elephant ivory trade and elephant populations, I conducted a systematic evidence review using seven databases; Google Scholar, Web Of Science, Scopus, Microsoft Academic, World Wide Science, Science and JSTOR. The search terms used in the systematic evidence review were developed after thorough discussions between Dr David Roberts and Barend Janse Van Rensburg, where I showed the number and titles of the initial results received through using different search terms on different search engines on a spreadsheet and my opinion on which would work best for this study . The seven search terms that were decided upon were; “Mammoth ivory” AND “trade”, “Mammoth” AND “elephant poaching”, “Mammoth” AND “illegal trade”, “Mammoth ivory” AND “elephant ivory”, “Elephant ivory” AND “drivers”, “Mammoth” AND “illegal ivory” and “Mammoth ivory” AND “demand”. These seven search terms were believed to be the best combination of words to gather the most relevant papers on the chosen search engines. The terms would be able to hit results on; the mammoth ivory trade, elephant ivory trade, drivers of the elephant ivory trade, relationship with mammoth and illegal ivory and elephant poaching and the demand behind mammoth ivory.

The decision to use Boolean search term method of ‘AND’ and quotation marks was a result of searching the phrase ‘Elephant ivory’ on Google Scholar and receiving around 72,000 results with most having no relevance to the study. The Boolean search term method allows the researcher to gather the most relevant results to the

study from the search terms used, making the process of determining relevancy more time efficient.

When conducting the systematic evidence review there were three key stages. The first stage of data collection was to input the seven search terms into the databases, record the amount of results generated and determine which papers were relevant to the study from their titles. On Google Scholar citations and patents were removed and all seven databases were set to 'sort by relevance' instead of 'sort by date', this would provide the most relevant results first which was helpful when thousands of results were generated. In this scenario, the number of results assessed was limited to c.500. 500 was chosen as the results from Google scholar were presented as 10 results per page, therefore, after 50 pages I believed that decision fatigue could affect the results. Moreover, including a limit to the number of results assessed would keep the thesis within the tight deadlines set for each stage.

The next stage of the review was to determine which papers were still relevant to the study after reading their abstracts.

The final stage of the systematic evidence review consisted of reading the full text of the papers which were so far considered relevant and decide whether they provided evidence which supported or opposed the mammoth ivory trade having an impact on the elephant ivory trade and elephant populations.

2.2.2 Data Analysis

To analyse the data generated by the databases and determine which databases should be disregarded or prioritised for future studies, the databases were compared, evaluating the efficiency of each database in finding relevant papers and the overlap of relevant papers between databases. The seven search terms were also analysed by looking at the overlap of relevant papers generated by the databases, this also presents which of the search terms should be prioritised for future studies.

To ensure repeatability of the review process a Kappa analysis using the software SPSS was conducted. Specifically, 6 kappa analyses were conducted. Three of the kappa analyses looked at the measure of agreement on the relevance of titles from the search terms “Mammoth” AND “elephant poaching” on Google Scholar, “Mammoth ivory” AND “elephant ivory” on Google Scholar and “Mammoth ivory” AND “demand” on JSTOR. For this, 610 titles were reviewed over those three search terms. In addition, 3 kappa analyses were carried out to determine the level of agreement on the relevance of papers after reading the abstracts. The search terms used were; “Elephant ivory” AND “drivers” on Google Scholar, “Elephant ivory” AND “drivers” on World Wide Science and “Mammoth ivory” AND “demand” on JSTOR. In total, 96 abstracts were reviewed over those three search terms.

When carrying out the kappa analysis, a Google sheets document was created with one sheet containing all the titles and another with the abstracts generated from the respective search terms. The sheets document along with an explanation of the focus of the study and research questions was then shared with the “participant”, a fellow student of the University of Kent, so that they could make an informed decision to whether they believed that a paper was relevant or not, the participant was asked to

show their decision by putting a 'X' next to a 'relevant' paper. The results were coded into SPSS using 1 as, yes, the papers title is relevant to the study and 0 as, no the papers title is not relevant to the study. Any differences of opinion were discussed through a voice call, where the participant and I would give our reasoning to why the paper was relevant or not or to clear up if there was a possible misunderstanding of the title or abstract. The discussed results were inputted into SPSS to see the change in the level of agreement.

2.3 Results

2.3.1 Search Term Results

In total, the seven search terms generated 4057 results from Google Scholar. The highest number of relevant papers was 43, generated by the search term "Mammoth ivory" AND "elephant ivory", however, the most efficient search term for finding relevant papers was "Mammoth" AND "illegal ivory" with 13.5% of the results initially generated determined as relevant to the study.

Table 1: Systematic evidence review results from Google Scholar.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	1030 (515)* ¹	87 (16.9%)	52 (10.1%)	35 (6.8%)
“Mammoth” AND “elephant poaching”	213	97 (45.5%)	46 (21.6%)	28 (13.2%)
“Mammoth” AND “illegal trade”	769 (576)* ²	107 (18.6%)	47 (8.2%)	29 (5.0%)
“Mammoth ivory” AND “elephant ivory”	353	111 (31.5%)	68 (19.3%)	43 (12.2%)
“Elephant ivory” AND “drivers”	784 (588)* ³	74 (12.6%)	20 (3.4%)	9 (1.5%)
“Mammoth” AND “illegal ivory”	244	117 (48.0%)	62 (25.4%)	33 (13.5%)
“Mammoth ivory” AND “demand”	664 (498)* ⁴	108 (21.7%)	63 (12.7%)	41 (8.2%)
Total	4057 (2987)*⁵	701	358	218
% of results relevant from all search terms		23.5%	12.0%	7.3%

*¹ For the search term “Mammoth ivory” AND “trade” only 515 of the 1030 results generated were analysed.

*² For the search term “Mammoth” AND “illegal trade” only 576 of the 769 results generated were analysed.

*³ For the search term “Elephant ivory” AND “drivers” only 588 of the 784 results generated were analysed.

*⁴ For the search term “Mammoth ivory” AND “demand” only 498 of the 664 results generated were analysed.

*⁵ Of the 4057 results generated by the seven search terms only 2987 were analysed.

The search terms had little success generating results via the Web of Science database and were varied in their efficiency to generate relevant papers. The papers generated by the search terms “Mammoth” AND “illegal ivory” and “Mammoth ivory” AND “demand” were 100% relevant throughout all three stages of the systematic evidence review, however, this only produced 5 relevant papers to the study (table.2). In contrast, “Mammoth” AND “elephant poaching” and “Elephant ivory” AND “drivers” generated 0 relevant papers (table.2).

Table 2: Systematic evidence review results from Web of Science.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	9	6 (66.7%)	6 (66.7%)	6 (66.7%)
“Mammoth” AND “elephant poaching”	0	0	0	0
“Mammoth” AND “illegal trade”	4	2 (50%)	2 (50.0%)	2 (50.0%)
“Mammoth ivory” AND “elephant ivory”	13	5 (38.5%)	5 (38.5%)	5 (38.5%)
“Elephant ivory” AND “drivers”	6	2 (33.3%)	0	0
“Mammoth” AND “illegal ivory”	1	1 (100%)	1 (100%)	1 (100%)
“Mammoth ivory” AND “demand”	4	4 (100%)	4 (100%)	4 (100%)
Total	37	20	18	18
% of results relevant from all search terms		54.1%	48.7%	48.7%

Scopus had a similar level of success in generating relevant papers to Web Of Science. “Mammoth” AND “illegal trade”, “Mammoth” AND “illegal ivory” and “Mammoth ivory” AND “demand” all had 100% efficiency in generating relevant papers, however, this only amounted to 44% of the total relevant papers from Scopus (table.3). “Elephant ivory” AND “drivers” and “Mammoth” AND “elephant poaching” were once again the two search terms which generated 0 relevant papers (table.3).

Table 3: Systematic evidence review results from Scopus.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	10	5 (50.0%)	5 (50.0%)	5 (50.0%)
“Mammoth” AND “elephant poaching”	0	0	0	0
“Mammoth” AND “illegal trade”	2	2 (100%)	2 (100%)	2 (100%)
“Mammoth ivory” AND “elephant ivory”	13	4 (30.8%)	4 (30.8%)	4 (30.8%)
“Elephant ivory” AND “drivers”	5	3 (60.0%)	0	0
“Mammoth” AND “illegal ivory”	1	1 (100%)	1 (100%)	1 (100%)
“Mammoth ivory” AND “demand”	4	4 (100%)	4 (100%)	4 (100%)
Total	35	19	16	16
% of results relevant from all search terms		54.3%	45.7%	45.7%

All seven search terms generated relevant papers on the Microsoft Academic database, however, the percentage of relevant papers at the end of the review was low with the search term “Mammoth ivory” AND “elephant ivory” having the highest percentage at 12.3% (table.4). Both “Mammoth” AND “illegal trade” and “Mammoth ivory” AND “demand” had the lowest efficiency of generating relevant papers with 0.2% and 0.8%, this meant that only 5 relevant papers were generated from 1000 results (table.4).

Table 4: Systematic evidence review results from Microsoft Academic.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	199	42 (21.1%)	23 (11.6%)	9 (4.5%)
“Mammoth” AND “elephant poaching”	237	32 (13.5%)	7 (3.0%)	3 (1.3%)
“Mammoth” AND “illegal trade”	705 (500)* ⁶	33 (6.6%)	12 (2.4%)	1 (0.2%)
“Mammoth ivory” AND “elephant ivory”	57	18 (31.6%)	10 (17.5%)	7 (12.3%)
“Elephant ivory” AND “drivers”	156	46 (29.5%)	22 (14.1%)	4 (2.6%)
“Mammoth” AND “illegal ivory”	72	25 (34.7%)	11 (15.3%)	6 (8.3%)
“Mammoth ivory” AND “demand”	50000 (500)* ⁷	12 (2.4%)	7 (1.4%)	4 (0.8%)
Total	51426 (1721)* ⁸	208	92	34
% of results relevant from all search terms		12.1%	5.4%	2.0%

*⁶ For the search term “Mammoth” AND “illegal trade” only 500 of the 705 results generated were analysed.

*⁷ For the search term “Mammoth ivory” AND “demand” only 500 of the 50000 results generated were analysed.

*⁸ Of the 51426 results generated by the seven search terms only 1721 were analysed.

Similarly to Microsoft Academic, the World Wide Science database generated a low amount of relevant papers from a high number of initial results. The most efficient search term was “Mammoth ivory” AND “trade” with 4 of the 211 papers being relevant to the study (table.5). There were three search terms which had less than 1% of their results that were relevant to the study, however, “Elephant ivory” AND “drivers” was the lowest having only generated 1 relevant paper from the 415 results (table.5).

Table 5: Systematic evidence review results from World Wide Science.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	211	16 (7.6%)	7 (3.3%)	4 (1.9%)
“Mammoth” AND “elephant poaching”	161	13 (8.1%)	4 (2.5%)	2 (1.2%)
“Mammoth” AND “illegal trade”	453	16 (3.5%)	7 (1.6%)	4 (0.9%)
“Mammoth ivory” AND “elephant ivory”	335	30 (9.0%)	10 (3.0%)	3 (0.9%)
“Elephant ivory” AND “drivers”	415	16 (3.9%)	4 (1.0%)	1 (0.2%)
“Mammoth” AND “illegal ivory”	140	15 (10.7%)	5 (3.6%)	2 (1.4%)
“Mammoth ivory” AND “demand”	166	13 (7.8%)	6 (3.6%)	3 (1.8%)
Total	1881	119	43	19
% of results relevant from all search terms		6.3%	2.3%	1.0%

Science was the worst database for producing relevant papers. “Mammoth ivory” AND “trade” was the only search term that generated a relevant paper, which was 0.5% of the initial results from the search (table.6). This meant that only one paper was relevant from the 1406 results generated by the seven search terms (table.6).

Table 6: Systematic evidence review results from Science.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	209	1 (0.5%)	1 (0.5%)	1 (0.5%)
“Mammoth” AND “elephant poaching”	139	5 (3.6%)	1 (0.7%)	0
“Mammoth” AND “illegal trade”	379	5 (1.3%)	1 (0.3%)	0
“Mammoth ivory” AND “elephant ivory”	45	0	0	0
“Elephant ivory” AND “drivers”	330	12 (3.6%)	2 (0.6%)	0
“Mammoth” AND “illegal ivory”	191	5 (2.6%)	1 (0.5%)	0
“Mammoth ivory” AND “demand”	113	0	0	0
Total	1406	28	6	1
% of results relevant from all search terms		2%	0.4%	0.1%

The most successful search terms at finding relevant results on the JSTOR database were “Mammoth ivory” AND “elephant ivory” and “Mammoth ivory” AND “demand” as both search terms generated 3 relevant papers (table.7). The most efficient search term was “Mammoth” AND “illegal ivory” as two of the six papers initially generated were relevant to the study (table.7). “Elephant ivory” AND “demand” once again generated no relevant papers (table.7).

Table 7: Systematic evidence review results from JSTOR.

Search Term	Number of Results	Relevance by Title	Relevance by Abstract	Relevance by Full Text
“Mammoth ivory” AND “trade”	135	7 (5.2%)	6 (4.4%)	3 (2.2%)
“Mammoth” AND “elephant poaching”	8	2 (25%)	2 (25%)	1 (12.5%)
“Mammoth” AND “illegal trade”	26	4 (15.4%)	4 (15.4%)	2 (7.7%)
“Mammoth ivory” AND “elephant ivory”	27	5 (18.5%)	4 (14.8%)	3 (11.1%)
“Elephant ivory” AND “drivers”	24	4 (16.7%)	0	0
“Mammoth” AND “illegal ivory”	6	4 (66.7%)	4 (66.7%)	2 (33.3%)
“Mammoth ivory” AND “demand”	50	7 (14.0%)	5 (10.0%)	3 (6.0%)
Total	276	33	25	14
% of results relevant from all search terms		12%	9.1%	5.1%

2.3.2 Comparisons between databases efficiency

The most efficient database for finding papers which are relevant to the study is Web of Science as 48.7% of all papers generated were relevant (fig.1). Scopus was also extremely efficient at finding relevant papers with 45.7% of the papers containing relevant information to the study (fig.1). The least efficient database was Science, at each stage of the evidence review it produced the lowest percentage of relevant papers and in total only 0.1% of the papers generated from the initial search were relevant to the study (fig.1).

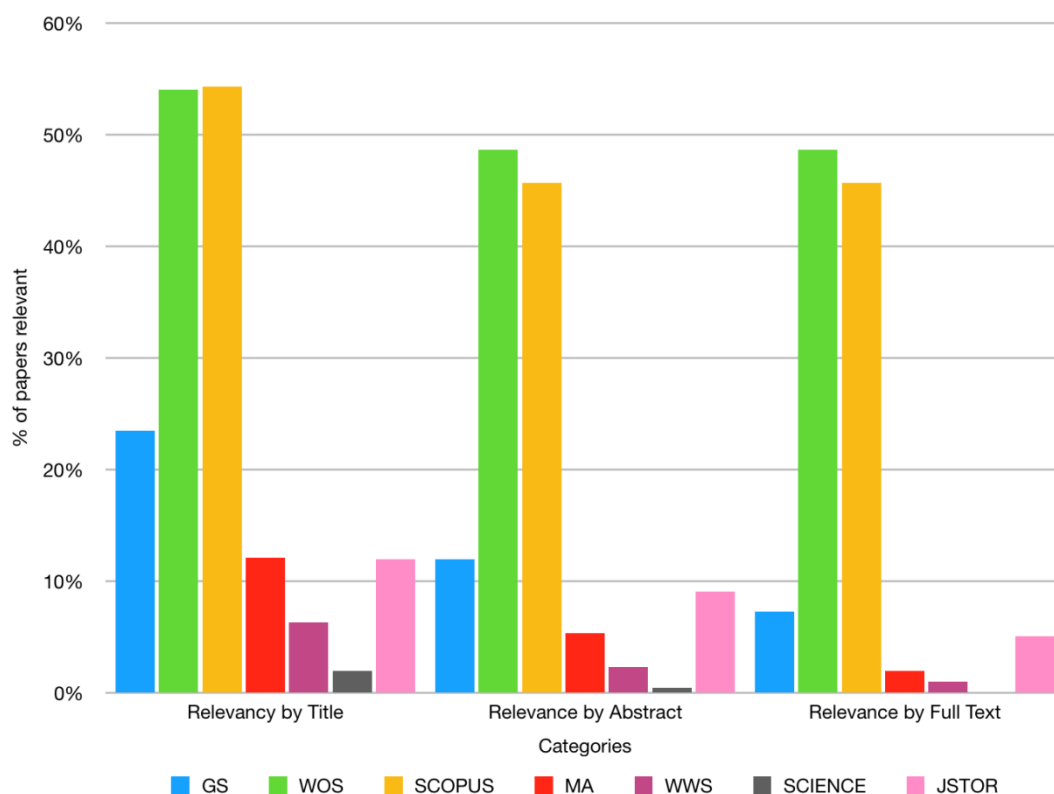


Figure 1: Histogram showing the percentage of papers relevant from each database during the different stages of the systematic evidence review. (GS-Google Scholar, WOS-Web of Science, MA-Microsoft Academic, WWS-World Wide Science, JSTOR-Journal Storage).

Although Google Scholar was not the most efficient database when looking at the percentage of papers relevant to the study, it generated the highest number of papers by far. Initially the database generated 701 papers that were relevant, by the final stage, 218 papers were still relevant to the study (fig.2). Web Of Science, Scopus, World Wide Science and JSTOR all generated a similar number of papers, generating 18, 16, 19 and 14 respectively. Science was once again the worst database, generating 1 relevant paper (fig.2).

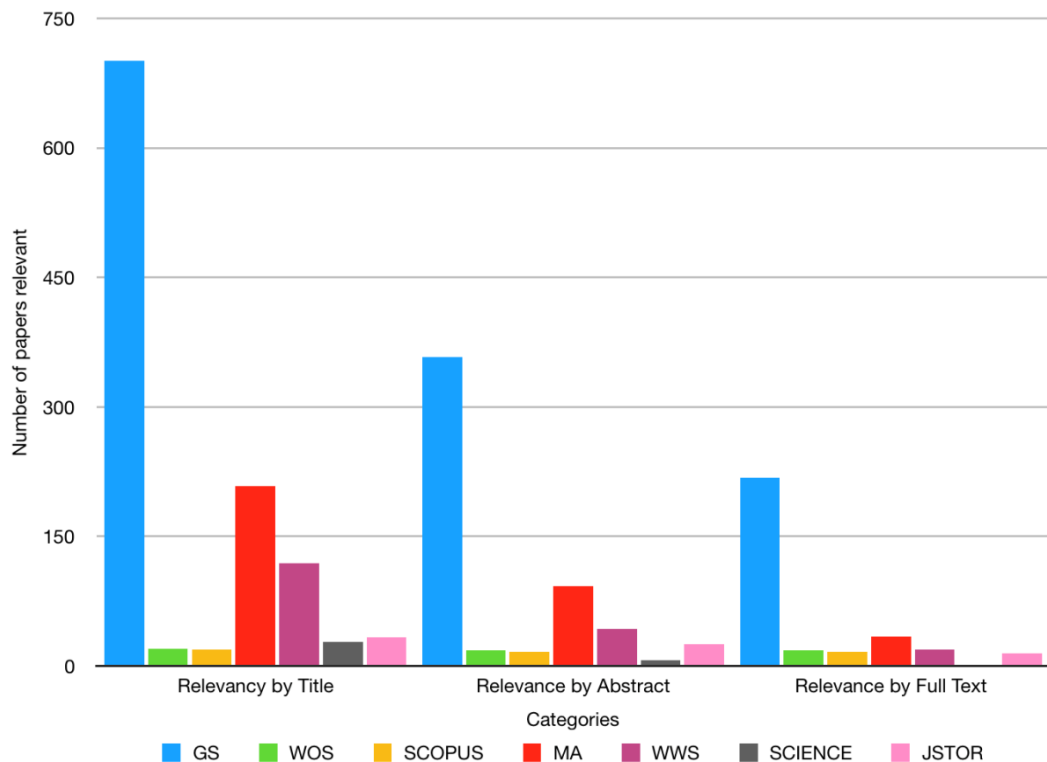


Figure 2: Histogram showing the number of papers relevant from each database during the different stages of the systematic evidence review. (GS-Google Scholar, WOS-Web of Science, MA-Microsoft Academic, WWS-World Wide Science, JSTOR-Journal Storage).

2.3.3 Overlaps in Results

2.3.3.1 Search Engine overlap

After the removal of replicate papers found through the seven search terms, 47 of the 53 relevant papers to the study were found using the Google Scholar database. 4 papers were found across Google Scholar, Web of Science, Scopus and Microsoft Academic and the only databases which generated papers that were unique to their database other than Google Scholar were Microsoft Academic and JSTOR. As

previously mentioned, the Science database only generated 1 relevant paper which was found on every database other than JSTOR.

2.3.3.2 “Mammoth ivory” AND “trade” overlap

41 of the 53 relevant papers were generated when using the search term “Mammoth ivory” AND “trade”. From the 41 papers generated using the search term 35 were found using Google Scholar and Microsoft Academic, JSTOR also generated 6 unique papers.

2.3.3.3 “Mammoth” AND “elephant poaching” overlap

The database ‘Science’ found its only relevant paper using this search term. There was little overlap between papers when using the search term “Mammoth” AND “elephant poaching”, and the only 2 papers which overlapped came when searching on the Google Scholar and World Wide Science databases. Google Scholar, Microsoft Academic and JSTOR all generated unique papers.

2.3.3.4 “Mammoth” AND “illegal trade” overlap

There were four overlaps of papers over the seven databases when using the search term “Mammoth” AND “illegal trade”. Two overlaps were from papers which overlapped on Google Scholar, Web of Science and Scopus and the other two overlaps were from papers overlapping on Google Scholar and World Wide Science. Microsoft Academic and JSTOR only produced one and two papers respectively through this search term, all of which were unique to their respective database.

2.3.3.5 “Mammoth ivory” AND “elephant ivory” overlap

There were a number of paper overlaps from the search term “Mammoth ivory” AND “elephant ivory”. 6 papers overlapped on Google Scholar and Microsoft Academic and there were two papers which overlapped over four databases; one overlapped on Google Scholar, Web Of Science, Scopus and Microsoft Academic and the other was found on Google Scholar, Web Of Science, Scopus and World Wide Science. Moreover, all three of the relevant papers generated by JSTOR were found when using this search term.

2.3.3.6 “Elephant ivory” AND “drivers” overlap

The search term “Elephant ivory” AND “drivers” generated the lowest number of papers. There was only one paper which overlapped, this was between Google Scholar and Microsoft Academic. Web Of Science, Scopus, Science and JSTOR generated no relevant papers using this search term.

2.3.3.7 “Mammoth” AND “illegal ivory” overlap

There were three paper overlaps using the search term “Mammoth” AND “illegal ivory”, these overlaps occurred between; Google Scholar and Microsoft Academic, Google Scholar, Microsoft Academic and World Wide Science and another between Google Scholar, Web Of Science and Scopus.

2.3.3.8 “Mammoth ivory” AND “demand” overlap

Similar to the search term “Mammoth ivory” AND “elephant ivory”, there was a number of overlaps between papers using the search term “Mammoth ivory” AND “demand”. 3 papers overlapped on Google Scholar, Web Of Science, Scopus and Microsoft Academic. Moreover, the use of the search term on Google Scholar produced 39 of the databases 47 relevant papers, it also generated all three of the relevant papers from JSTOR.

2.3.4 Kappa Analysis Results

2.3.4.1 “Mammoth” AND “elephant poaching” on Google Scholar

The results of the Kappa analysis for title relevance from the search term “Mammoth” AND “elephant poaching” on Google Scholar showed various levels of agreement and disagreement in the responses. Although, there was a very good level of agreement with a Kappa value of 0.904, 10 titles were disagreed upon. After discussing the disagreement with the participant 115 titles were agreed upon as not relevant and 95 titles were agreed to be relevant to the study, this very good level of agreement generates a Kappa value of 1.0.

2.3.4.2 “Mammoth ivory” AND “elephant ivory” on Google Scholar

Of the 350 titles that were generated from the search term “Mammoth ivory” AND “elephant ivory” on Google Scholar 229 were agreed upon as not relevant and 110 were

agreed to be relevant to the study, however, there was a difference of opinion on 11 titles, giving a Kappa value of 0.929. After discussing the differences, 117 titles were determined to be relevant and 233 titles not relevant to the study. The complete agreement over the relevance of the titles generated a Kappa value of 1.0.

2.3.4.3 “Mammoth ivory” AND “demand” on JSTOR

The title Kappa analysis for the search term “Mammoth ivory” AND “demand” on the JSTOR database resulted in a high level of agreement with only 2 titles of the 50 being disagreed upon, giving a Kappa value of 0.811. After discussing why there was a difference in opinion on the two titles, it was decided that both the titles were relevant to the study, therefore, increasing the number of relevant titles from 5 to 7 and the Kappa value from 0.811 to 1.0.

2.3.4.4 “Elephant ivory” AND “drivers” on Google Scholar

The results of the Kappa analysis focusing on the agreement between the abstracts generated by the search term “Elephant ivory” AND “drivers” on Google Scholar resulted in 72 of the 74 abstracts being agreed upon. 43 abstracts were determined as not relevant and 29 as relevant, giving a Kappa value of 0.944. After discussing why there was a disagreement on the two abstracts, it was decided that neither abstract was relevant to the study, this gave a Kappa value of 1.0.

2.3.4.5 “Elephant ivory” AND “drivers” on World Wide Science

The search term “Elephant ivory” AND “drivers” on the database World Wide Science was the only Kappa analysis where there was complete agreement without a discussion. Of the 15 abstracts, 11 were agreed to be not relevant and 4 agreed upon as relevant to the study, giving a Kappa value of 1.0.

2.3.4.6 “Mammoth ivory” AND “demand” on JSTOR

The results of the Kappa analysis for abstract relevance show a high level of agreement with only one of the 7 abstracts being disagreed upon. This gave a Kappa value of 0.696 due to the lower sample size. The abstract whose relevancy was disagreed upon was discussed and determined to not be relevant to the study, this resulted in a Kappa value of 1.0.

2.4 Search Term Review

2.4.1 “Mammoth ivory” AND “trade”

The first search term “Mammoth ivory” AND “trade” was one of the most successful search terms at generating results, generating 1,803 results over the 7 databases. Google Scholar generated 57.0% of the results of which only 35 papers were relevant to the study after all three stages of the review (table.1). These 35 papers made up 6.8% of the 515 titles assessed from Google Scholar, with 50.0% of the generated results not included due to 1030 titles being generated (table.1).

On both Web of Science and Scopus the least number of results were received, 9 and 10 respectively (table.1; table.2). 6 and 5 papers were relevant to the study; however, none of the papers were unique to the database as they were all found through Google Scholar.

The search term had its lowest efficiency on Microsoft Academic, World Wide Science, Science and JSTOR with only 4.5%, 1.9%, 0.5% and 2.2% of the papers initially generated being relevant to the study (table.4; table.5, table.6, table.7). Science only generated one relevant paper which was already found through 4 other databases, however, this was the only search term to generate a relevant paper from Science (table.6). Although, the search term had low efficiency on Microsoft Academic and JSTOR, the search term generated 3 papers that were unique to each database.

2.4.2 “Mammoth” AND “elephant poaching”

“Mammoth” AND “elephant poaching” was one of the least successful search terms at generating results, only generating 758 results over the 7 databases. The search term had the most success on Microsoft Academic and Google Scholar, generating 237 and 213 results respectively (table.4; table.1). Of these results, 32 and 97 papers were relevant by their titles, 7 and 46 papers were relevant by their abstracts and 3 and 28 were relevant papers (table.4; table.1). Therefore, the search term had a low efficiency of 1.3% at finding relevant papers on Microsoft Academic (table.4), however, the three papers that were generated were all unique to the database.

The search term, once again, only generated a very low number of relevant papers on WWS and JSTOR. After initially generating 161 and 8 results only 2 and 1 papers were relevant to the study (table.5; table.7) and both papers found through WWS were already generated by Google Scholar.

On Web of Science, Scopus and Science the search term generated no relevant papers (table.2; table.3, table.6).

2.4.3 “Mammoth” AND “illegal trade”

The search term “Mammoth” AND “illegal trade” generated 2,338 results over 7 databases, the most of any search term. 64.0% of these results were generated when searching the term on Google Scholar and Microsoft Academic (table.1; table.4).

Similarly to the previous search term, after the three stages of the evidence review the search term had generated 29 relevant papers on Google Scholar (table.1) and only 1 on Microsoft Academic, this was the second lowest efficiency of any database for this search term (table.4).

When searching “Mammoth” AND “illegal trade” on Web of Science, Scopus, WWS, Science and JSTOR only 11 relevant papers were generated from the 864 results (table.2; table.3, table.5, table.6, table.7). Of these 11 papers only 1 paper from WWS and 2 papers from JSTOR were unique to the respective databases, however, had already been found using previous search terms.

2.4.4 “Mammoth ivory” AND “elephant ivory”

Although, the search term “Mammoth ivory” AND “elephant ivory” generated one of the lowest amount of results when searched over the 7 databases, 843 to be exact, it had one of the highest efficiencies at finding relevant papers alongside the search term “Mammoth ivory” AND “trade”. Of the 53 relevant papers that were found during the systematic evidence review only 5 were not found using this search term. The only database where the search term was extremely unsuccessful was on Science, where no relevant papers were generated (table.6).

2.4.5 “Elephant ivory” AND “drivers”

The search term “Elephant ivory” AND “drivers” was the least efficient search term when used on Google Scholar only generating 9 relevant papers, the second worst generated 28 (table.1). On the databases Web of Science, Scopus, Science and JSTOR no relevant papers were generated using this search term (table.2; table.3, table.6, table.7).

The search terms generated 156 and 415 papers on Microsoft Academic and WWS, however, only 4 and 1 papers were relevant after the three stages of the review (table.4; table.5). This was also the lowest efficiency of any search term on WWS with only 0.2% of results generated being relevant to the study (table.5).

2.4.6 “Mammoth” AND “illegal ivory”

In terms of generating results over the 7 databases, the search term “Mammoth” AND “illegal ivory” was the worst of the 7 search terms, only generating 655 results.

However, the search term had one of the highest efficiencies in finding relevant papers with 6.7% of the 655 results relating to the study. Although this is true, the 45 papers that were generated were not unique to the search term as they had already been generated by previous search terms.

2.4.7 “Mammoth ivory” AND “demand”

The most successful database for finding results using the search term “Mammoth ivory” AND “demand” was Google Scholar, generating 41 relevant papers, the second most from the database (table.1). When searching on both Web of Science and Scopus all 8 results were relevant to the study across all stages of the review (table.2; table.3). Once again, no relevant papers were generated when searched on Science (table.6).

2.5 Discussion of the literature

2.5.1 Where is the mammoth trade occurring?

The mammoth ivory trade is now a booming trade with items being sold in China, the United States, Russia, Macau (SAR) of China, France, Spain, Japan, Thailand, Vietnam, Taiwan and the epicentre of the trade, Hong Kong (SAR) of China. In 2002 the demand for mammoth ivory was already extremely high in Hong Kong (SAR) of China with 12,207 mammoth ivory items on sale over 29 outlets; however, this number was still lower than the 35,884 elephant ivory items for sale from 85 outlets in Hong Kong (SAR) the same year (Martin and Stiles, 2003). One outlet found on Hong Kong Island was selling 3,000 elephant ivory items and 4,000 mammoth ivory items, however, the owner said that in 2001 only 5% of sales were from elephant ivory and 90% of his sales came from mammoth ivory (Martin and Stiles, 2003). By 2011 the trade had increased dramatically with 35,127 mammoth ivory items for sale in Hong Kong (SAR) of China (Martin and Martin, 2011). Most of these items were found in 10 ivory/mammoth ivory speciality shops where the average number of items per outlet was 3,222 (Martin and Martin, 2011). In 2010 there were three main countries from which Hong Kong (SAR) of China was importing mammoth ivory; Russia (83%), USA (8.5%) and Germany (7.5%) (Martin and Martin, 2011).

Mainland China, more known for its mammoth ivory carving factories, still had a mammoth ivory market with 817 mammoth ivory items found in 3 outlets in Guangzhou and 292 mammoth ivory items were found in 3 outlets in Shanghai in 2002 (Martin and Stiles, 2003). By 2004, Guangzhou's mammoth ivory market had

expanded, with 3,064 mammoth items for sale in 17 retail outlets in (Martin, 2006). In January 2011, it was reported that 6,541 mammoth ivory items were being sold in Guangzhou with most being found in the 13 shops that specialised in mammoth ivory and a small mammoth ivory market had emerged in Fuzhou with 100 items for sale (Martin and Vigne, 2011). This increase in availability of mammoth ivory comes after the expansion and increase in wealth in southern China, alongside, national awareness of ivory substitutes on television and other media (Martin and Vigne, 2011). Moreover, the lack of restrictions on the import, export and trade of mammoth ivory meant that most Chinese craftsmen had already been moving their attention to mammoth ivory since the CITES ban in 1976 (Martin, 2019).

There was little knowledge on the availability of mammoth ivory items in the United States, except for 40 mammoth ivory items found on sale in Washington in 2015 (Kramer et al., 2017). However, it is clear that there is a large demand and market for mammoth ivory as two factories in Fuzhou, China exported 10% and 40% of their mammoth ivory to the USA in 2011 (Martin and Vigne, 2011). The laws regulating mammoth ivory in the United States are clear. In August 2014 New York passed a new law prohibiting the sale, trade, purchase and distribution of elephant, mammoth and rhino horn, with exception of ivory manufactured before 1975 (Stiles, 2015). Additional penalties were created for sales involving ivory worth more than \$25,000, these penalties consist of; a fine of \$5,000, a fine of double the amount received from the sale and between one to seven years imprisonment (Stiles, 2015). In the same month a new law similar to the one implemented in New York was also administered in New Jersey, prohibiting the importation, sale, trade, possession with intent to sell and the purchase of elephant, mammoth, rhino horn and other types of ivory (Stiles, 2015). The law imposes fines of \$1,000 or two times the value of the product sold for

first offences and a fine of \$5,000 or two times the value of the product sold for second offenders. There was no mention of imprisonment, instead, the seized ivory would be either destroyed or donated to a university or museum (Stiles, 2015). On the 6th of January 2016 a law in the state of California was passed which prohibits the sale and purchase of elephant, mammoth, rhino horn and other types of ivory (Kramer et al., 2017). This has led to shop owners sending their ivory to their shops found in the state of Nevada to sell there instead where it is legal (Kramer et al., 2017). In 2017, Boston was the next city to ban the sale of both mammoth ivory and rhino horn alongside elephant ivory (Kramer et al., 2017).

Russia is the largest exporter of mammoth ivory in the world, exporting 60,000kg of mammoth tusks annually, with 95% of the tusks destined for China and Hong Kong (SAR) of China (Farah and Boyce, 2015; Martin and Martin, 2010). There is also a large mammoth ivory market found in Moscow, with 1,305 mammoth ivory items found in 27 outlets with one outlet selling 42% of the items in 2009 (Martin and Martin, 2010).

The mammoth ivory trade is legal in Macau (SAR) of China (Martin and Vigne, 2016). There were 590 items of mammoth ivory and three mammoth ivory speciality shops found in Macau (SAR) of China in 2015, this is an increase of 439 items found on display since 2004. However, the number of shops stayed the same; this shows the low demand for mammoth ivory in comparison to mainland China and Hong Kong (SAR) of China (Martin and Vigne, 2016).

There are many European countries which are part of the mammoth ivory trade, one of the main European countries where ivory was found was France. In 2004, six cities

had 71 outlets selling around 1,303 mammoth ivory items, most of these items were found in Paris, with one Chinese-owned shop selling more than 1000 mammoth ivory items (Stiles and Martin, 2005) and in 2011 40% of the mammoth ivory exported from a factory in Fuzhou was destined for France (Martin and Vigne, 2011). In Spain, mammoth ivory was very scarce; however, a stall in Barcelona was found selling mammoth ivory and bone as elephant ivory (Stiles and Martin, 2005). In 2010 Germany was one of the three main countries from which Hong Kong (SAR) of China imported its mammoth ivory, making up 7.5% of the imports (Martin and Martin, 2011).

In 2002 there was a clear preference in ivory throughout Japan as a survey of Tokyo's markets found 5,358 elephant ivory items and only 83 mammoth ivory items for sale. This was also the case in Osaka where 2,207 elephant ivory items and 10 mammoth ivory items were found (Martin and Stiles, 2003). This preference is due to the mammoth tusks being considered brittle, stained and 'rotten' by Japanese carvers and the public preferring the whiter ivory from elephant ivory (Vigne and Martin, 2010). The number of mammoth ivory items for sale in Tokyo decreased by 2009 from 83 to 62, showing that the preference was still apparent seven years later (Vigne and Martin, 2010).

Other countries where there was evidence of the mammoth ivory trade was Thailand where 43,527kg of elephant ivory was illegally imported and 1,991kg of Russian mammoth ivory was legally imported from 1957 to 1997 (Martin and Stiles, 2002). In 2002 mammoth ivory was found in small quantities in Taiwan, however, it was spread out throughout the country. In Taipei 11 mammoth ivory items were found in 4 outlets, in Taichung of the 242 ivory items on sale 12 were made from mammoth

ivory and in the Jade market in Kaohsiung 8 mammoth ivory items were found (Martin and Stiles, 2003). Finally, in 2008 there was evidence of mammoth ivory items being sold in Ho Chi Minh City and mammoth tusks being sold in Ha Noi, Vietnam (Stiles, 2008).

From the literature presented in this chapter, the mammoth ivory trade is a cross-continental trade, with clear connections found between Europe and Asia. The main markets, importers and exporters appear to be Russia, China and Hong Kong (SAR) of China and the smaller mammoth ivory markets found in Thailand, Vietnam, Macau (SAR) of China, France, Germany and the United States.

2.5.2 Is the mammoth ivory trade increasing or decreasing?

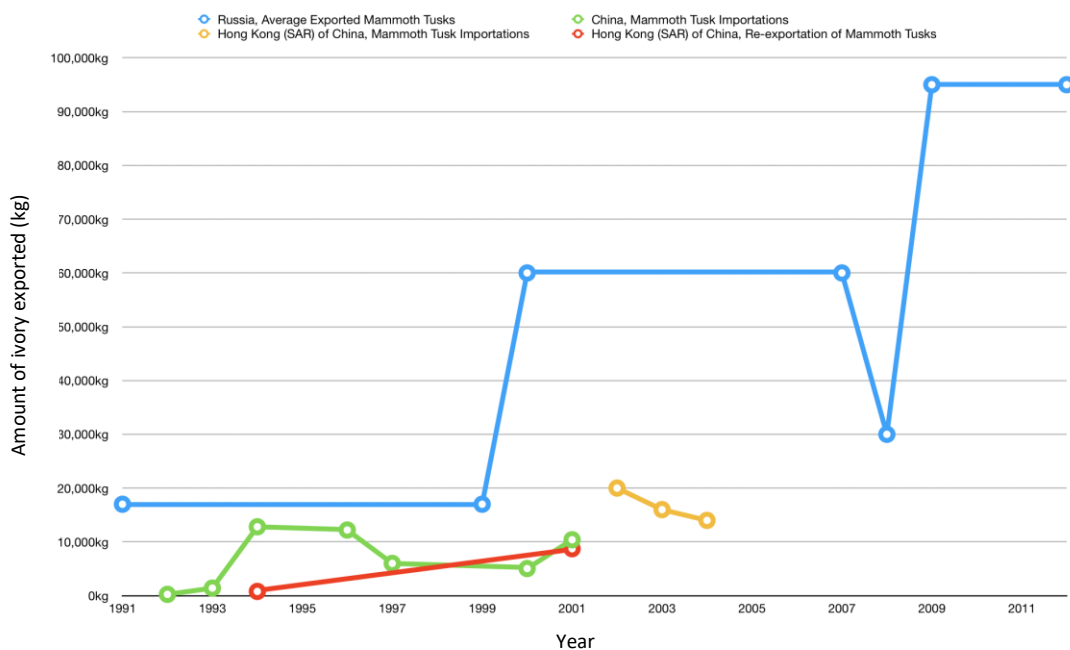


Figure 3: Line graph showing the number of exported and imported mammoth tusks between Russia, China and Hong Kong (SAR) of China from 1991 to 2012.

The number of mammoth tusks exported from Russia averaged at a rate of 17,000kg per year from 1991 to 2000 (fig.3)(Farah and Boyce, 2015). Following the turn of the millennium there was huge growth in the exportation of mammoth tusks averaging 60,000kg per year until 2008 where there was a 50% decline in the mammoth ivory trade due to the great recession (fig,3)(Farah and Boyce, 2015). Between 2007 and 2008 Moscow's largest mammoth ivory company alone was exporting 40,000kg to 50,000kg annually with most of the tusks destined for Hong Kong (SAR) of China (fig.3)(Martin and Martin, 2010). From 2009 to 2012 there was a sharp increase in the amount of mammoth tusks exported to around 95,000kg annually (fig.3). The amount of mammoth ivory being imported into China and Hong Kong (SAR) of China had a clear correlation with the amount of ivory being exported from Russia (Farah and Boyce, 2015).

The aforementioned Hong Kong (SAR) of China's importations of mammoth tusks increased from 244kg in 1992 to 10,395kg in 2001 (Martin and Stiles, 2003). There was, however, fluctuation in the amount imported throughout the 9 years with peaks of 12,809kg, 12,204kg and 10,395kg in 1994, 1996 and 2001 and troughs of 1,408kg, 6,000kg and 5,041kg in 1993, 1997 and 2000 (Martin and Stiles, 2003). From 1994 to 2001 the re-exportation of mammoth tusks from Hong Kong (SAR) of China also increased from 787kg in 1994 to 8,728kg in 2001 (Martin and Stiles, 2003).

The amount of mammoth tusks imported to Hong Kong (SAR) of China declined from 20,002kg in 2002 to 15,997kg in 2003 to 13,995kg by September 2004 (Martin, 2006). This was a result of the increase in the importation costs of mammoth tusks which rose from \$54.73/kg in 2002 to \$77.44/kg in 2003 to 98.61/kg by September 2004 (Martin, 2006).

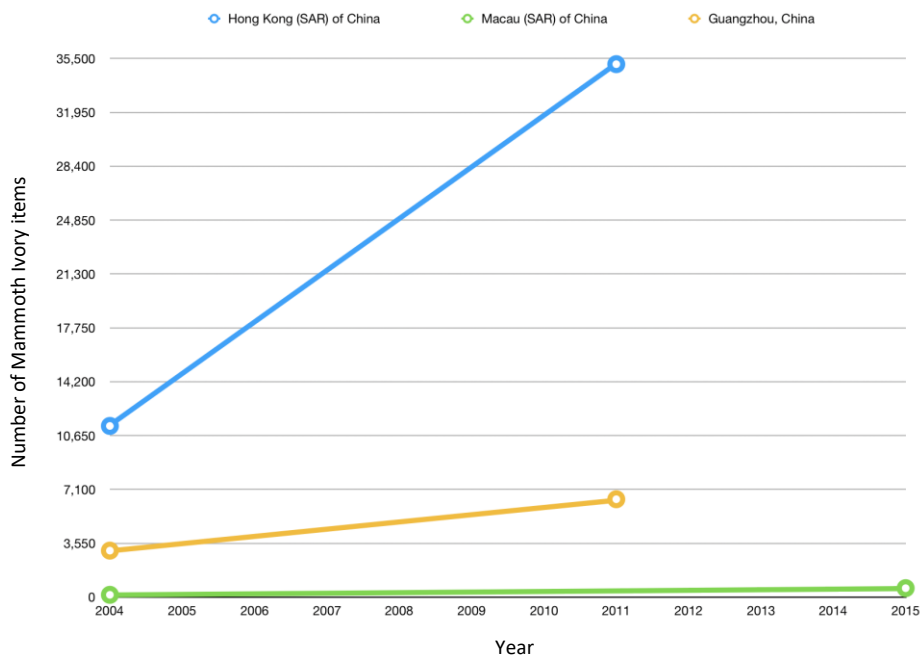


Figure 4: Line graph showing the number of mammoth ivory items found in Hong Kong (SAR) of China, Macau (SAR) of China and Guangzhou, China from 2004 to 2016.

From 2004 to 2011, the biggest influx in mammoth ivory items was also found in Hong Kong (SAR) of China. In 2004 11,282 mammoth ivory items were available, this had increased by 311% in 2011 with 35,127 mammoth ivory items available (fig.4)(Martin and Martin, 2011).

In 2004 the market for mammoth ivory in Macau (SAR) of China had just begun emerging, with 151 items for sale. By 2015, the range of items had increased along with the number of mammoth ivory items rising by 400% to 590 (fig.4)(Martin and Vigne, 2016).

From 2004 to 2011 there was a 100% increase in the number of mammoth ivory items in Guangzhou, China (Martin and Vigne, 2011). The number increased from 3,064 in

2004 to 6,451 in 2011 (fig.4) as a result of the frequent publicity and acceptance of mammoth ivory as a substitute for elephant ivory and the rise in wealth in southern China (Martin and Vigne, 2011).

From the literature presented we can presume that the mammoth ivory trade is increasing. Two of the main examples which prove this conclusion are that from 2004 to 2011 there was a 100% increase in the number of mammoth ivory items for sale and the difference in the number of mammoth tusks exported from Russia averaged yearly from 17,000kg in 2000 to 60,000kg in 2008 to 95,000kg in 2012.

2.5.3 What is the difference in pricing of mammoth and elephant ivory?

In China the price of mammoth ivory changed dramatically from 1985 to 2002. In 1985 mammoth ivory cost \$24per kg, this rose to \$180-560per kg by 1989 (Martin, 1990) and hit \$800per kg in 1990 (Caldwell and Luxmoore, 1990). The importation of 50,000kg of African elephant ivory in 1999 along with the implementation of a grading system for mammoth ivory resulted in a decline in the price of mammoth ivory to \$200-220per kg. This was still more expensive than elephant ivory at the time, however, this may be due to mammoth tusks being larger in size (Martin and Stiles, 2003). Between 2001 and 2003 the price of Asian elephant ivory in Vietnam declined from \$500per kg to \$350per kg as a result of reduced demand, during this time the price of mammoth ivory rose from \$300per kg to \$350per kg between 2002 and 2003 (Stiles, 2004).

In 2004 the wholesale price of elephant tusks weighing 1-3kg was \$200per kg in Hong Kong (SAR) of China, \$250per kg in Macau (SAR) of China and \$316per kg in Fuzhou, moreover, the price of 10kg tusks in Hong Kong (SAR) of China was \$320per kg (Martin, 2006). In comparison, the price of grade A mammoth ivory in Hong Kong (SAR) of China was \$275per kg and \$364per kg in Fuzhou, grade B mammoth ivory in Hong Kong (SAR) of China was \$225per kg and \$243per kg in Fuzhou and Grade C and D in Fuzhou were \$103per kg and \$52per kg respectively (Martin, 2006). By 2010 the prices paid for mammoth tusks by factory owners in Fuzhou had increased through all grades. A grade mammoth tusks cost \$400per kg, B grade cost \$300per kg, C grade cost \$260per kg and D grade cost \$120per kg (Martin and Vigne, 2011). In comparison to the prices paid by factory owners in Fuzhou, the cost of mammoth tusks imported from Russia to Hong Kong (SAR) of China in 2010 was; \$600per kg for A grade, \$400per kg for B grade, \$300per kg for C grade, \$200 per kg for D grade (Martin and Martin, 2011).

From 1995 to 2006 the price of mammoth ivory stayed at a constant price between \$22per kg and \$49per kg even though the quantity of mammoth ivory imported increased from 7500kg to 60,000kg a year (CITES, 2014). In 2007 Hong Kong (SAR) of China and China imported around 98,000kg of mammoth ivory, this coincided with the price of mammoth ivory rising to around \$90per kg. From 2008 to 2011 the amount of mammoth ivory imported was significantly less than 2007, this meant that the price of mammoth ivory took until 2010 to retain a value similar to that of 2007 of \$96per kg. In 2011 and 2012 the quantity of mammoth ivory imported and the price of mammoth ivory both rose to around 85,000kg and 95,000kg and \$112 and \$125per kg respectively (CITES, 2014).

The cost of mammoth ivory tusks was not the only thing that was increasing as the items on sale throughout Asia were also increasing in price, however, what was the difference in price between mammoth and elephant ivory? In 1999 the price of mammoth ivory in Taiwan was much greater than the price of elephant ivory; the price of a white ivory seal ranged from \$60 to \$132 for elephant ivory and \$252 to \$566 for mammoth ivory, white ivory chopsticks were \$63 to \$110 when made from elephant ivory and \$173 when made from mammoth ivory (Wu and Phipps, 2002). The price of a whole tusk carving in Taiwan cost 6317% more when made from mammoth ivory with the most expensive elephant ivory tusk carving costing \$5974 and one made from mammoth ivory costing \$377,359 (Wu and Phipps, 2002).

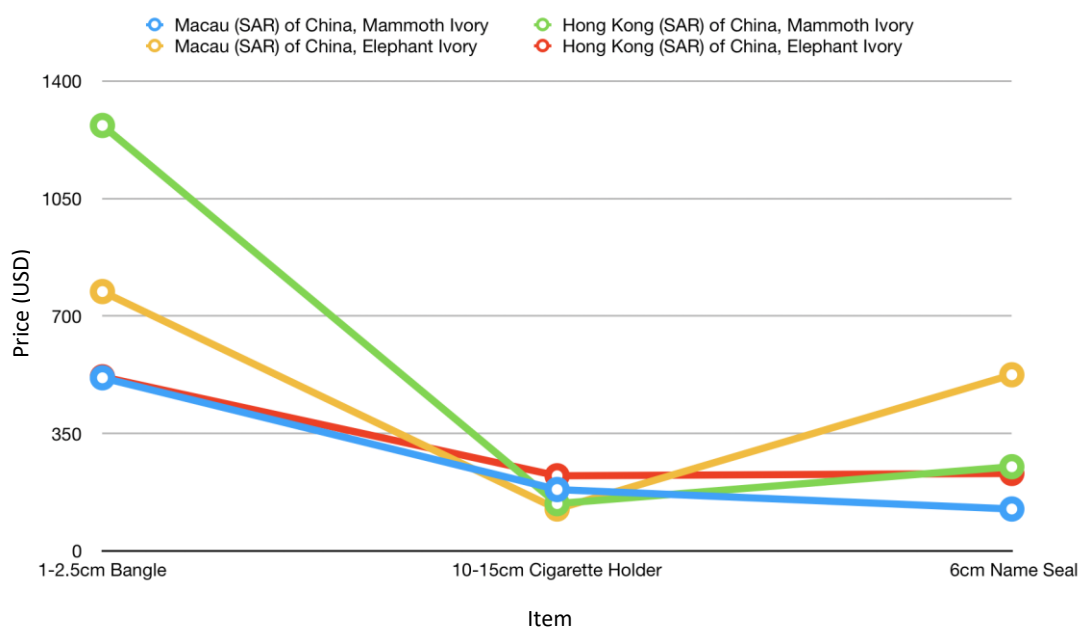


Figure 5: Line graph showing the difference in price of; a 1-2.5cm Bangle, 10-15cm Cigarette Holder and 6cm Name Seal made out of Elephant and Mammoth Ivory in Macau (SAR) of China and Hong Kong (SAR) of China in 2015.

From 2004 to 2015 the price of elephant ivory items increased exponentially in both Macau (SAR) of China and Hong Kong (SAR) of China. A 1-2.5cm bangle increased

from \$55 and \$57 to \$773 and \$519, a 10-15cm cigarette holder increased from \$87 and \$123 to \$125 and \$224 and a 6cm name seal increased from \$99 and \$71 to \$525 and \$231 (Martin and Vigne, 2016). The price of mammoth ivory in 2015 was varied in comparison to elephant ivory in both Macau (SAR) of China and Hong Kong (SAR) of China. A 1-2.5cm bangle was cheaper than elephant ivory in Macau (SAR) of China only costing \$516 (fig.5), however, the cost in Hong Kong (SAR) of China was more than both Macau (SAR) of China and Hong Kong (SAR) of China costing \$1,268 (fig.5). A 10-15cm cigarette holder was more expensive than one made of elephant ivory in Macau (SAR) of China costing \$183, however, was cheaper in Hong Kong (SAR) of China costing \$141 (fig.5). Finally, the price of a 6cm name seal was a lot cheaper than one made from elephant ivory in Macau (SAR) of China as it only cost \$125, however, a 6cm mammoth ivory name seal in Hong Kong (SAR) of China cost \$20 more than one made from elephant ivory (fig.5)(Martin and Vigne, 2016).

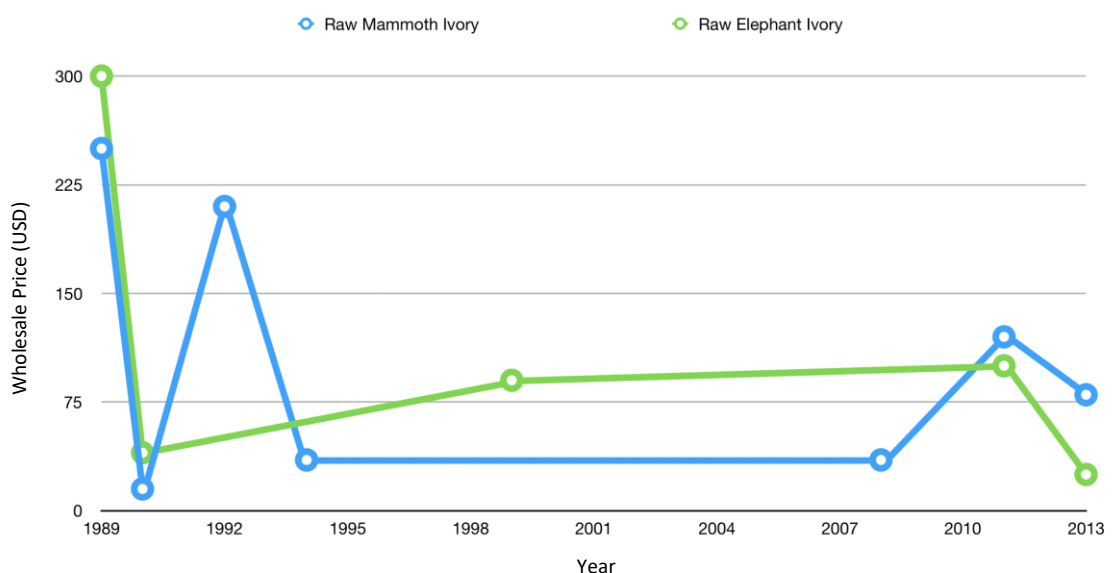


Figure 6: Line graph showing the difference in the wholesale price of Raw Mammoth Ivory and Raw Elephant Ivory from 1989 to 2013.

When looking at the general wholesale price of both elephant ivory and mammoth ivory you can see the effect that the two ivory types have on each other. The raw elephant ivory price before the CITES elephant ivory ban was enforced in 1989 was around \$150-160per kg (Farah and Boyce, 2015). Post ban the price of both raw elephant and mammoth ivory dropped dramatically from \$300 and \$250per kg to \$40 and \$15per kg respectively (fig.6) until 1992 when the price in mammoth ivory experience a boom increasing to \$210per kg (fig.6)(Farah and Boyce, 2015). From 1994 to 2008 the price of raw elephant and mammoth ivory maintained a similar value of \$30-40per kg with peaks in 1999 for elephant ivory increasing to \$80per kg (fig.6), causing a slight decline in the price of mammoth ivory. From 2008 to 2011 both raw mammoth and elephant ivory increased in price, however, from 2011 the price of raw elephant ivory declined from \$100per kg to \$25per kg by 2013 (fig.6), whilst elephant ivory prices decreased mammoth ivory continued to rise for another year and eventually the price of raw mammoth ivory declined from \$120per kg to \$80per kg by 2013 (fig.6)(Farah and Boyce, 2015). Prices for both worked elephant and worked mammoth ivory did not face such fluctuations. After a plateau between 1989 and 2002 the price of worked elephant ivory steadily increased from \$20per kg to \$290per kg in 2013. Worked mammoth ivory stayed at around \$35per kg from 2005 to 2010, after 2010 the price grew exponentially to match the price of worked elephant ivory at around \$290per kg (Farah and Boyce, 2015).

It is estimated that for every 1000kg of mammoth ivory exported from Russia the price of elephant ivory decreased by around \$0.5 to \$1.5per every 1000kg. This means that if mammoth ivory had not been available, using an estimated rate of 84,000kg of elephant ivory exported per year from 1989 to 2013, elephant ivory

prices would be \$40 to \$120 per kilogram higher than they were in 2013 (Farah and Boyce, 2015).

The literature collected on the price of elephant and mammoth ivory shows the varying prices that are found depending on the country where the ivory is being sold. For example, a 1-2.5cm bangle cost \$773 in Macau (SAR) of China and \$519 in Hong Kong (SAR) of China. The price difference of items, such as a 1-2.5cm bangle was dependant on the country as well as the bangle made from mammoth ivory was cheaper in Macau (SAR) of China, \$516, but more expensive in Hong Kong (SAR) of China, \$1,268. The biggest difference of the ivory types came in Taiwan, where the price of a whole tusk carving in Taiwan cost 6317% more when made from mammoth rather than elephant ivory.

2.5.4 What evidence is there that the mammoth ivory trade is being used as a tool to promote the illegal trade of elephant ivory?

There have been three main countries where instances of promoting the illegal trade of elephant ivory using mammoth ivory as a cover has arisen; Thailand, China, and the United States.

In Chatuchak Market, Bangkok during a survey in 2006 and 2007 one vendor admitted to selling a large Chinese-carved elephant tusk to the USA by fabricating a certificate identifying the tusk as mammoth ivory, allowing the exportation to the USA, he said this was an easy and common activity (Stiles, 2009).

One of the main forms of using mammoth ivory as cover for the sale of elephant ivory is the lack and misuse of ID cards in China. In 2011, in large, registered ivory stores in Guangzhou the use of ID cards were not effective, one reason for this is that mammoth ivory and elephant ivory items were mixed and for a buyer if ID cards are not present next to every item they may assume it is all mammoth or all elephant ivory (Martin and Vigne, 2011). The lack of enforcement of ID cards meant that ID cards were reused if the buyer did not take it with them or not used at all, this was the case for 61% of the 6,437 ivory items found in Guangzhou in 2011, one example of this is a vendor who did not use ID cards as she did not know which of her items were mammoth or elephant ivory (Martin and Vigne, 2011). In both Fuzhou and Guangzhou there are 119 outlets selling ivory in 2011 with only 33 permitted to sell ivory and of those 33 outlets 63% of the items being sold are without ID cards. This allows the outlets to be able to register the ivory as old, new, elephant ivory or mammoth ivory (Martin and Vigne, 2011). In the same year it was reported that out of 57 registered stores surveyed in China 34 stores were engaging in illegal ivory activities, by 2014 this number had dropped to 25 out of 73 registered stores (Yu et al., 2017).

In 2014, some of the illegal activities which were occurring in China were; 8 stores in the province of Zhejiang selling ivory items without ID cards and 15 stores in Shanghai selling ivory items which did not match with the ID cards next to them and the number of ID cards did not match the number of items on sale (Yu et al., 2017). Moreover, there were 41 registered shops in China selling mammoth ivory, with at least three shops selling African elephant ivory as mammoth ivory (Yu et al., 2017).

There have been three main instances of elephant ivory being mislabelled as mammoth ivory in the United States. In November 2015 In New York and in March 2017 in Manhattan, undercover police bought an elephant carving labelled as mammoth ivory. The store from which the police in New York had bought their carving was in possession of 126 elephant ivory items valued at \$4.5 million, therefore, it is likely that this was not the first instance of laundering taking place from this store (Kramer et al., 2017). In July 2016 at a flea market in Chantilly Virginia, Washington DC, 67 vendors were surveyed with 40 vendors selling around 438 elephant ivory items. Most vendors stated that the items on sale were made from elephant ivory, however, one vendor labelled all ivory as “mammoth ivory” (Kramer et al., 2017).

Throughout the literature examined there were many instances of mammoth ivory being used to promote the illegal trade of elephant ivory. For example, 61% of 6,437 ivory items in Guangzhou in 2011 either were not sold with ID cards or the buyer did not keep the ID card, this provides an easy method of mixing and selling mammoth and elephant ivory items together. Moreover, in New York a store was found to be in possession of 126 elephant ivory items which the store was selling as mammoth ivory, these items were valued at 4.5 million USD.

2.5.5 Is the mammoth ivory trade having an impact on the elephant ivory trade and elephant populations?

The availability of mammoth ivory as a substitute for elephant ivory has presented its challenges with activities such as the laundering of elephant ivory as mammoth ivory. However, with mammoth ivory now making up 20% of all ivory production (Farah

and Boyce, 2015), the interest of owning and manufacturing elephant ivory is now being replaced with mammoth ivory in some countries due to its legality and the possibility for tourists to buy items and return to their home country with their purchase (Martin and Martin, 2010).

The emergence of the mammoth ivory trade appears to have benefited elephant populations and had a positive impact on the elephant ivory trade. Between 2010 to 2012 it is estimated that the 84,000kg of Russian mammoth ivory exported per year could have reduced the harvesting of elephant ivory by more than 500,000kg per year. Moreover, if mammoth ivory did not exist as an ivory substitute, then around 85,000 elephants per year might have been poached, currently the poaching rate is at 34,000 elephants per year, if the rate was as high as 85,000 per year the populations of 400,000 African elephants and 40,000 to 50,000 Asian elephants would not be able to withstand the demand (Farah and Boyce, 2015). The rate of African elephant mortality, both natural and killing has also decreased as a result of the increase in demand for mammoth ivory in China, decreasing from 10% in 2011, dropping to 4% by 2017 (Vaughan, 2019).

An increase in the amount of mammoth ivory exported from Russia has been found to reduce African elephant ivory seizures at a rate of -370kg to -820kg per 1000kg of Russian mammoth ivory, between 2010-2012 this reduced the seizures by around 59,000kg per year (Farah and Boyce, 2015). So far only 50,000 mammoth carcasses have been excavated from the permafrost in Siberia (Farah and Boyce, 2019) and it is estimated that there are around 10 million mammoth carcasses in Siberia meaning that there should be 18,000,000kg to 90,000,000kg of mammoth ivory available to excavate. At the rate in which mammoth ivory decreases the elephant poaching rate,

this ivory should save between 12 to 63 million African elephants (Farah and Boyce, 2015).

It is important to understand that there are many factors, such as; another economic boom in China, a reduction of permitted elephant ivory sales or a loosening of regulations in Africa that can all lead to the mammoth ivory trade losing its positive impact on reducing the elephant ivory trade (Farah and Boyce, 2015). Therefore, it is important to discuss and investigate all possible aspects of both ivory trades before making critical decisions.

It is difficult to determine whether the mammoth ivory trade is truly having a positive or negative impact on the elephant ivory trade and elephant populations, however, there are examples of the positives that the mammoth ivory trade have previously brought upon the elephant ivory trade and elephant populations. For example, it is theorised that if mammoth ivory was not an available substitute it is estimated that 85,000 elephants could be poached per year and not the current rate of 34,000. Looking into the future, if the rate in which the excavating of mammoth ivory is theorised to be decreasing the elephant poaching rate, the 10 million mammoth carcasses that are estimated to be in Siberia should save 12 to 63 million African elephants.

2.5.6 Limitations

One of the main limitations when conducting the systematic evidence review was the reliance on three papers; Farah and Boyce (2015), Martin and Vigne (2011) and

Martin and Stiles (2003). These three papers provided around 30-40% of all relevant information from the 53 relevant papers generated by the databases.

Although these three papers accompanied with the other relevant literature have provided a good insight into the mammoth ivory trade, there were gaps in knowledge. The main gap of knowledge related to the market for mammoth ivory in terms of growth, price, laundering of elephant ivory and effect on elephant ivory and elephant populations from 2015 to 2020. This means that there is little evidence for the mammoth ivory trade's effect after the bans enforced in New York, New Jersey, California, Boston and Israel in 2014, 2014, 2016, 2017 and 2021 respectively, as well as the effect of the closure of the domestic ivory market in China and similar movement in Hong Kong (SAR) of China. There was also a gap in knowledge in the effects of the mammoth ivory trade prior to the CITES elephant ivory bans in 1976 and 1989. These gaps in knowledge make it hard to give a completely reliable decision on the mammoth ivory's effect on elephant ivory trade and elephant populations.

2.6 Conclusion

The literature review on the effect of the mammoth ivory trade on the elephant ivory trade and elephant populations has provided a wealth of important information. The epicentre for the sale of mammoth ivory was Hong Kong (SAR) of China with 35,127 mammoth ivory items found on sale in 2011, which was more than 28,000 items more than the place with the second most mammoth ivory items for sale, Guangzhou, China. The mammoth ivory being sold in Hong Kong (SAR) of China was found to be mainly imported from Russia with 60,000kg imported annually from 2000 to 2008

and it was found that the tusks would then be exported to factories in Guangzhou and Fuzhou to be carved. Evidence from the literature would suggest that the mammoth ivory trade is increasing with the items on sale in Guangzhou and Hong Kong (SAR) of China increasing between 2004 and 2011 from 3,064 and 11,282 to 6,451 and 35,127 respectively. The increase in the number of items on sale does not come as a surprise due to the amount of mammoth ivory exported from Russia to Hong Kong (SAR) of China increasing between 2009 to 2012 from 42,000kg to 95,000kg.

The literature looking at the price of both elephant and mammoth ivory has given a further understanding of the possible effect that the availability and price of mammoth ivory may have on the price of elephant ivory. From 1994 to 2008 both raw elephant and mammoth ivory maintained a value of \$30-40 per kg. After 2008 the effects began with a peak of raw elephant ivory price in 2008 causing raw mammoth ivory price to decline and as raw elephant ivory prices declined in 2009 and 2011 the price of mammoth ivory continued to increase. In addition, it is estimated that every 1000kg of mammoth ivory exported from Russia decreased the price of elephant ivory by \$0.5 to \$1.5, meaning that in 2013 the price of elephant ivory might have been \$40 to \$120 per kilogram higher.

There was clear evidence of mammoth ivory being used to promote the sale of elephant ivory throughout the literature, with 61% of the 6,437 ivory items in Guangzhou being sold without ID cards and vendors in Bangkok, New York and Washington DC fabricating certificates or labelling elephant ivory on sale as mammoth ivory. In contrast to this, the literature provided evidence of the mammoth ivory trade having a positive impact on the elephant ivory trade and elephant populations such as; between 2010 and 2012 the 84,000 kg of exported Russian

mammoth ivory may have reduced elephant ivory harvesting by 500,000kg per year and if mammoth ivory was not an available substitute it is estimated that 85,000 elephants could be poached per year and not the current rate of 34,000.

This study has further investigated and examined the evidence to whether the mammoth ivory trade is having an impact on the elephant ivory trade and elephant populations helping conservationists and organisations in making future decisions in legislations for and against the mammoth ivory trade. When examining the evidence there was a clear gap of knowledge in what the situation of the mammoth ivory trade was over the last 5 years. There is a need for information looking at the effects of the recent bans on ivory trade in New York, New Jersey, California, Boston and Israel that came into force in 2014, 2014, 2016, 2017 and 2021 respectively, and in particular whether there is an increase in the number of mammoth ivory items for sale or the laundering of elephant ivory through the mammoth ivory trade. There was also a lack of overlaps in the information generated by the papers, meaning that many of the examples used were only found during their respective studies. Due to these two factors, further research is necessary looking at; the mammoth ivory trade and its effects from 2015 to 2020 and comparisons between findings from different papers and authors, before any critical action is taken.

In a future study the results and analysis have shown that only three of the seven databases would be necessary to receive all the relevant papers to this study. These three databases are Google Scholar, Microsoft Academic and JSTOR. Google Scholar had the highest percentage of papers that were relevant from its results, 7.3% (table.1), even though, it had the highest number of results, 2987 (table.1). Although both Microsoft Academic and JSTOR generated lower results and had a lower rate of

efficiency at finding relevant papers, they both generated 3 papers each that were not found through using Google Scholar.

The best three search terms to use in a future study after looking at the results and analysis are; “Mammoth ivory” AND “trade”, “Mammoth” AND “elephant poaching” and “Mammoth ivory” AND “elephant ivory” as these three search terms found all 53 relevant papers to the study. The search term “Mammoth ivory” AND “trade” found all 3 relevant papers generated by JSTOR and 35 papers from Google Scholar which other databases relevant papers overlapped with (fig.4a). “Mammoth ivory” AND “elephant poaching” could solely be used on Microsoft Academic as it generated a paper that could only be found using this search term (fig.4b). Finally, the search term “Mammoth ivory” AND “elephant ivory” generated 43 of the 47 relevant papers from Google Scholar, including the papers which were not generating using the previous two search terms and all 3 relevant papers from JSTOR (fig.5b).

3. UNDERSTANDING KNOWLEDGE GAPS IN THE ELEPHANT-MAMMOTH IVORY TRADE

3.1 Introduction

Elephants have been particularly impacted by the illegal wildlife trade, resulting in the three species listed on the CITES appendices. All three species of elephant; African savanna elephants (*Loxodonta africana*), African forest elephant (*L. cyclotis*) and Asian elephant (*Elephas maximus*) are listed on CITES Appendix I with the exception of the African savanna elephant listed on CITES Appendix II for Botswana, Namibia, South Africa and Zimbabwe (Lawson and Vines, 2014). The 1989 ban on the international commercial trade in elephant ivory (Lawson and Vines, 2014), and more recent bans in 2016 on the domestic trades in elephant ivory in the United States and China, have been implemented in an attempt to reduce the demand for elephant ivory and its availability (Aryal, Morley and McLean, 2018).

Elephant ivory has a long and diverse history of use, historically, its use has been primarily in carving cosmetic items, gifts or furniture for kings and queens or people of importance who could afford the items (Krzyszkowska and Morkor, 2000), however, more recently the number of uses and items created using ivory have increased. These uses have a number of motivations which can be broken down from economic, social, cultural, religious, aesthetic and medical (Stiles, 2021). The economic use of ivory can be as an investment in raw tusks, antiques or carvings which are mainly completed in China (Stiles, 2021). Social and

aesthetic motivations commonly contain the same items, such as; jewellery, chopsticks, curved tusks. Cultural and religious motivations result in the use of ivory in the carving of figures relating to the buyers' culture and elephant ivory has been used to treat bone diseases, maladies and as an anti-convulsant (Stiles, 2021).

These recent bans have caused the consumers to seek legal alternatives to elephant ivory, such as; vegetable ivory, synthetic ivory, walrus ivory, hippopotamus ivory, rhino ivory, cow and camel bones, and the main target. Mammoth ivory is the most similar ivory substitute to elephant ivory physically and chemically, this has resulted in many of the Chinese carving factories converting to carve mammoth ivory, however some consider it inferior as mammoth ivory can be stained due to being in the ground, lack the same texture as elephant ivory and crack easier when carving (Sakamoto, 2004). All Elephantidae have Schreger lines which are overlapping concentric circles that form a checker pattern and two different sets of lines curving clockwise and counterclockwise, the interception of these lines form a number of outer and inner angles called Schreger angles (Palombo and Villa, 2001). Schreger lines are one of the only ways in which you can distinguish the two types of ivory with the angle at which the Schreger lines overlap in mammoth ivory create an angle of less than 90° and all angles larger than 115° pertaining to elephant ivory (Chervenka, 2021).

While the relationship between the trades in elephant and mammoth ivory, and the potential for laundering, has been the subject of research and debate, there are significant gaps in our understanding of the issue which need to be filled. This significant gap in knowledge was demonstrated through the attention it received from CITES when Israel proposed the listing of the woolly mammoth onto CITES Appendix II. This listing was

rejected at the eighteenth meeting of the Conference of the Parties, however, the need for a study to further understand the mammoth ivory trade and its relationship with the elephant ivory trade was made clear by CITES. A recent review of the literature (Chapter 2) aimed to address the gap in knowledge and showed that little had been published in the past 5-6 years, however, during this time there has been significant movement in terms of bans and the response of markets which could provide a more relevant view of the mammoth ivory trade and its effect on the elephant ivory trade.

The main gaps in knowledge identified were:

- What is the effect of the mammoth ivory bans in US states on the trade and possible impacts on the elephant ivory trade?

Since 2015:

- Are China and Hong Kong (SAR) of China still the largest markets?
- How has China's domestic elephant ivory market closure affected their demand for mammoth ivory?
- What new laws have been implemented?
- Is Russia still the largest exporter of mammoth ivory?
- What factors have affected the mammoth ivory trade?
- How has the price of both raw and worked elephant and mammoth ivory changed and have they affected each other? What is the current price? How much is being traded per year?
- How has the demand for elephant and mammoth ivory changed?

- Have new markets emerged?

In this chapter, I aim to explore the interactions between the elephant and mammoth ivory trades and fill the gaps in knowledge (listed above) identified during a systematic evidence review (Chapter 2). To do this I use questionnaires and interviews to collect the opinions of academics and individuals from organisations involved in the regulation of the elephant and mammoth ivory trades. Specifically, I ask (a) whether current legislation for both the elephant and mammoth ivory trades are sufficient? (b) What regulations should be implemented for the mammoth ivory trade? (c) Should mammoths be up listed onto CITES Appendix II? And (d) What is the extent of the mammoth ivory trade and elephant ivory being laundered?

3.2 Methodology

3.2.1 Data Collection

3.2.1.1 Questionnaires:

Questionnaires were chosen as a method of data collection as it is an efficient way of collecting large amounts of both qualitative and quantitative data from a range of participants and countries (Taherdoost, 2016).

Before beginning the questionnaire, it was important to include an introductory page with instructions on how to complete the questionnaire, how long the questionnaire should take, aims of the study and a brief background on the topic that is being questioned in the

survey. Informed consent was essential; this was achieved by attaching a consent form to the questionnaire document and including it as the first page of the survey hosted on Alchemer (SurveyGizmo) which required their signature. The consent form ensured that the participant understood that their participation was voluntary and could withdraw from the project at any time, without reason, they could stop the questionnaire at any time and have the right to decline to answer any question and they consent to their data being used as part of my study and the data collected from the questionnaire will remain anonymous (see supplementary material 5.2).

After the consent form the questionnaire was laid out as follows;

Section 1 – Demographic questions, including age, gender, nationality, and country of residence (see supplementary material 5.4).

Section 2 – More specific demographic questions subject of expertise, current position, organisation affiliated to, country of organisation headquarters, amount of time spent working on ivory and whether they had published literature on the elephant or mammoth ivory trade (see supplementary material 5.4).

Section 3 – Here I tried to gather information on the price of both elephant and mammoth ivory and the amount of ivory being exported out of Russia. This was done through the use of 7 open ended questions where the respondents had a text box to give their response, however, also had the option of a close-ended response of ‘Don’t know’. This section also included 2 Likert scale questions which were used to determine the change in demand over the last 5 years of elephant and mammoth ivory (see supplementary material 5.4).

Section 4 – This section was used to gather information on the elephant and mammoth ivory trade in the respondent’s country of residence and opinions on the regulation of the mammoth ivory trade. The gathering of information on the ivory trades was done by two separate close-ended questions with follow up open-ended questions which asked for the responded to give a reason for their decision. To gather the respondent’s opinion, I used two Likert scales and a follow up question to the second one asking for the reason for their answer (see supplementary material 5.4).

Section 5 – The final section was the longest section with 14 questions. This section was a mixture of the techniques used in sections 3 and 4 with 4 open-ended questions, 4 close-ended questions with open-ended follow up questions and 2 ranking questions where respondents were required to rank 10 countries in order of who had the largest elephant ivory trade and then the largest mammoth ivory trade (see supplementary material 5.4).

When designing the questionnaire there was a number of factors that were considered to ensure it was successful in collecting the data I desired. Using clear, simple, polite, and unambiguous language is key in ensuring that the questionnaire is easy to follow and does not allow for the respondent to become confused (Taherdoost, 2016). The use of open-ended (other, please specify) question responses were important to include at the start of the questionnaire when requesting the respondent’s gender and after a YES, NO question and wanting more information on their answer, without this it restricts the questionnaires producibility. Close-ended (don’t know) question responses were also necessary as it removes the probability of a respondent giving an uneducated answer to a question affecting the analysis of the question and collects the number of people who either could not answer or did not understand the question. Likert scales were also an important

addition to the questionnaire in order to not just collect quantitative data but also to give the respondents a break from the questions requiring qualitative responses.

The presentation of the questionnaire was important to consider as the length of questions, the questionnaire itself, organisation and greeting could all affect the response rate of the survey (Hing et al., 2011). The word document emailed to each individual was 13 pages long including an introductory page, consent form, signature page and an additional comments page with 38 questions making up the questionnaire. Of the 38 questions; 24 were open-response questions and 14 were closed response questions (see supplementary material 5.4).

The questionnaire was hosted on Alchemer (SurveyGizmo), therefore, the presentation of the questionnaire was restricted to their format and page length while the number of questions remained the same. However, the use of an online survey software program allowed for a cleaner and more professional design of the survey and facilitated easier collection and analysis of responses through reports that were automatically generated (Alessi and Martin, 2010).

3.2.1.2 Participants:

The request for participation in both questionnaires and interviews was sent via email. The emails included the word document version of the questionnaire and consent form, a link to Alchemer (SurveyGizmo), background information on who I am, where I am studying, my course, the reason for conducting the study and the reason for why I am contacting the individual (see supplementary material 5.1).

In total 371 individuals were approached, including; academics, consultants, consultancies, non-governmental organisations, governmental organisations, law enforcement and civil societies. These individuals were chosen through a strategic sampling approach as it was decided between Dr. David Roberts and I that the thesis would attempt to include a response from an individual from each country that could have a decision in the listing of mammoth ivory and the separate opinions of individuals in different areas of expertise. The initial emails were sent out over a number of days; 11th May, 23rd May, 24th May, 1st June 2021. If no response was received a follow up email was sent on the 10th June and then a final follow up email was sent on the 30th June 2021. This resulted in a total of 1050 emails sent.

3.2.1.3 Interviews:

Interviews are an important way of collecting qualitative data and providing a deeper insight into a topic, people's opinions, experiences, predictions, and attitudes in comparison to questionnaires (Rowley, 2012). Before conducting the interviews, it was essential that informed consent was given by the participant. I achieved this by sending a consent form via email before the interview was conducted which required their signature. The consent form ensured that the interviewee understood that; their participation was voluntary and could withdraw from the project at any time, without reason, they could leave the interview at any time and have the right to decline to answer any question, they consent to their data being used as part of my study and the data collected from the questionnaire will remain anonymous and they consent to being recorded via an audio capture device and the recording will be deleted once the project is finished (see supplementary material 5.3).

There are many different ways in which interviews can be conducted; individual interviews, focus groups, unstructured interviews, semi-structured interviews and structured interviews (Rowley, 2012). Both structured and unstructured interviews have their benefits in a research study, such as; allowing the participant to complete the interview at their own leisure or discussing a theme and adapting the questions to their response. However, as I wanted to ask specific questions in order fill gaps in knowledge and had already sent out questionnaires these methods were not favourable for my study. For my study I decided to conduct semi-structured interviews with 13 questions adapted to gather a deeper understanding of data already collected from the questionnaire (see supplementary material 5.5). A semi-structured interview allows for a question to include sub-questions where, if necessary, I could explore the main question sufficiently (Rowley, 2012). Moreover, similarly to unstructured interviews, semi-structured interviews allow the respondent to answer the question without restrictions and the questions can be used to guide the conversation to different topics whilst allowing other relevant themes to emerge throughout the conversation (Evans, 2018).

The interviews which lasted between 30 minutes and 1 hour were conducted using zoom and recordings of the interviews were made by the screen recording software OBS with consent from the participant.

After contacting 370 individuals I was only able to conduct interviews with 3 individuals, 2 of which are consultants and 1 an employee of a CITES authority.

3.2.2 Data Analysis

3.2.2.1 Questionnaires:

The data recorded from questionnaires completed on both Alchemer (SurveyGizmo) and word documents were inputted into a Microsoft Excel document. Excel was used to present data by the creation of tables and to analyse the data by estimating range, mean, median, mode, standard deviation, and standard error. SPSS was used to conduct an Independent T-test looking at the relationship between Likert scales.

3.2.2.2 Interviews:

The interviews were transcribed and analysed using the computer software Nvivo. Thematic analysis was the chosen method of data analysis as it enables the researcher to identify patterns in the data and connect the patterns together into themes that are relevant to the subject being investigated (Braun and Clarke, 2006). Themes are considered to be a word or phrase that captures an important view or fact that relates to the research topic.

Thematic analysis is conducted through a six-phase process. The first phase of analysis is familiarising yourself with the data then generating initial codes, I used nodes in Nvivo, after this search for themes within the nodes, review the themes, define, and name the themes and finally produce the report (Braun and Clarke, 2006).

3.3 Ethics

I received ethical approval from the Research and Ethics Committee of the School of Anthropology and Conservation, University of Kent.

All data collected from the questionnaires and interviews were kept on an encrypted memory stick which was password protected and will be deleted after 7 years.

Respondents were also required to confirm that their age was 18 or above and all risks to the participants were considered in the design of both questionnaires and interview questions.

3.4 Results

3.4.1 Response rate to questionnaire

Of the initial 371 emails that were sent out 5% (n=18) responded from the first email, after sending a follow up email 2% (n=9) of individuals responded and 3% (n=10) of individuals responded to the third and final follow up email, this results in a 10% (n=37) response rate with 90% (n=334) of individuals not responding to any email (see table 1). The highest number of responses came from governmental organisations (n=23) and the number of responses from academics, law enforcement and non-governmental organisations were 7, 5 and 2 responses respectively (see table 1). However, the highest level of non-respondents came from governmental organisations 83% (n=277), followed by NGOs 14% (n=45), Academics 2% (n=7) and Law enforcement 1% (n=5) (see table 1).

In relation to the number of emails I sent to each “Current Position” criteria, all response rates were low. Both NGOs and governmental organisations had particularly high non-response rates at 90% (n=45/50) and 92% (n=277/300) respectively. Out of the 7 law enforcements that I contacted 71% didn’t respond (n=5/7) and the highest response rate of 50% came from academics (n=7/14) (see table 1).

Of the 37 individuals that responded to the emails, 35% (n=13) started a questionnaire, 22% (n=8) (see table 4) completed a questionnaire and 8% (n=3) agreed to completing an interview (the same respondents also completed a questionnaire) (see table 1). Of the 371 individuals initially contacted the completion rate of questionnaires was 6% (n=21, 13 complete) and the agreement rate to completing an interview was 1% (n=3) (see table 1). The positions that had the highest rate of completion for questionnaires was governmental organisations with 71% (n=15, 8 complete), the second most was from academics with 19% (n=4, 3 complete) and the least from NGOs 10% (n=2, 2 complete). 67% (n=2) of interviews were completed by academics and 33% (n=1) by a member of a governmental organisation (see table 1).

Table 1 : Email Response Data

Current Position	How Many Contacted	How Many Responded From First Email	How Many Responded From Second Email	How Many Responded From Third Email	How Many Didn't Respond	How Many Completed a Questionnaire	How Many Partially Completed a Questionnaire	How Many Agreed to an Interview
Academic	14	7	0	0	7	3	1	2
Law Enforcement	7	1	1	0	5	0	0	0
Governmental Organisation	300	9	6	8	277	8	7	1
NGO	50	1	2	2	45	2	0	0
Total	371	18	9	10	334	13	8	3

3.4.2 Questionnaire Results

Demographics section

Almost half of the respondents were aged 35-44, (48%; n=10), followed by 45-54 (28%; n=6) and 55-64 (19%; n=4). The two least common age ranges of respondents were 65+ with only 1 and 20-34 with 0. Of the 20 respondents 62% were Male and 38% Female.

There was a total of 18 different nationalities that completed or partially completed the questionnaire, with British, American, and Australian being the most common nationalities making up 10% (n=2) of all respondents each. In comparison, there were 19 different countries of residence with the UK and Kenya being the two most common countries of residence, with 2 respondents each residing there respectively.

The most common current position of the respondent was in a governmental organisation with 48% (n=10) of respondents. 19% (n=4) of respondent's current position were as academics and 10% (n=2) of respondent's current position was in law enforcement or a different position that was not listed. In terms of the organisation that respondents are currently affiliated to CITES was the most common with 52% (n=11) of respondents. 10% (n=2) of respondents are affiliated with either a university or WCS, while 5% (n=1) of respondents were either affiliated with DICE, IUCN or were independent from an organisation. When asked how long respondents had work on the ivory trade for, the most common response was 15 or more years, 33% (n=7), while 19% (n=4) of respondents had worked on ivory for either 1-3 years or 11-14 years and 10% (n=2) of respondents had worked on ivory for 4-6 years.

Geographical location of respondents

In terms of nationality of respondents there were 2 respondents each who declared their nationality as British, American, and Australian, while there was one each for Indonesian, Danish, Andorran, Belgian, Georgian, Zimbabwean, Latvian, Antigua & Barbuda, Thai, Dutch, Comoros, New Zealand, Guatemalan, Beninese, Guyanese.

When asked about the respondent's country of residence there were 2 respondents each who stated their country of residence as UK and Kenya, while there were a number of different countries only stated by one respondent each, including; Indonesia, Australia, Denmark, Principality of Andorra, Belgium, Georgia, Zimbabwe, Latvia, Antigua & Barbuda, Thailand, Canada, Comoros, New Zealand, Equatorial Guinea, Benin, Guyana and Myanmar.

Ivory pricing

Only two respondents stated how much elephant ivory was being sold per year; it was estimated that shops registered with the government in Thailand during 2015-2020, the lowest amount sold was 50kg in 2017 and 150kg in 2020, a 300% increase in 3 years. 5 respondents gave information on what the current price of elephant ivory is being traded at in a range of different countries. The prices ranged drastically depending on the country and point of purchase, all currencies were converted using [xe.com](https://www.xe.com), using the prices from Wednesday 29th September 2021. One respondent stated the general price of elephant ivory at 700-1000 USD/kg. The poacher price of raw elephant ivory in African countries varied country to country; in Kenya the price is 50-60 USD/kg and 100-200 USD/kg in

Cameroon and Gabon. Exportation prices also depended on the location as the price of elephant ivory was estimated to be 250 USD/kg from Eastern and Southern Africa and 400 USD/kg from Central and West Africa. One respondent also stated that the price of elephant ivory was around 170-250 USD/kg in Zimbabwe. The same respondent gave an estimation on the price of raw elephant ivory from the importers; in Vietnam the price was 680 USD/kg and 1,250 USD/kg in China. Raw elephant ivory was estimated to be around 1,200-1,400 USD/kg in Indonesia and 598-1,794 USD/kg in Thailand depending on the weight of the item or tusk.

Demand for Ivory

An independent-samples t-test was conducted to compare the change in demand for elephant ivory and mammoth ivory over the last 5 years (see table 2). There was little difference between the scores for change in elephant ivory ($M=2.54$, $SD=0.776$) and change in mammoth ivory ($M=3.09$, $SD=0.944$) demand; $t(22) = -1.57$, $p=0.13$. These results suggest that there is no significant difference in the response regarding the recent change in demand for elephant and mammoth ivory.

Table 2: Likert scale results and analysis as to what extent the demand for elephant and mammoth ivory have changed over the last 5 years.

Decision	Number of respondents on Elephant ivory demand change	Percentage of total respondents	Number of respondents on Mammoth ivory demand change	Percentage of total respondents
Decreased a lot	1	8%	0	0%
Decreased a little	5	39%	3	27%
Has not changed	6	46%	5	46%
Increased a little	1	8%	2	18%
Increased a lot	0	0%	1	9%

Ivory Legislation

Questionnaire respondents were asked if there is any specific legislation around the trade in elephant ivory in their country of residence, 87% (n=13) of respondents said yes to their and 13% (n=2) said no.

Respondents whose country of resident was the UK stated that the legislation was “*bans on trade except antique ivory*” and “*generally no commercial trade in ivory allowed*”.

Respondents from Kenya stated that the current legislation for elephant ivory was “*all wildlife trade banned since 1978*”, “*current punishment for poaching is a life sentence or*

fine of USD 200,000” and “a near total ban on trade including antiques up to five years in jail and an unlimited fine”.

In Indonesia the legislation was stated to be *“since 1990, Sumatran elephant (including ivory and other elephant parts) is protected. The punishment for violating the law is 5 years in prison and fine for IDR 7,500”.*

Respondents who stated EU regulations as legislation for the elephant ivory were from Denmark, Belgium and Latvia and respondents who stated CITES regulations as legislation were from Belgium and Georgia.

Respondents were also asked if their country of residence has any specific legislation around the trade in mammoth ivory. 87% (n=13) of respondents said that there was no specific legislation in their country of residence for the mammoth ivory trade, 13% (n=2) of respondents did not know if there was legislation and 0 respondents stated that their country of residence has legislation for the mammoth ivory trade.

Although, there was no respondent who stated that their country of residence had legislation towards the mammoth ivory trade one respondent from the UK stated that “My understanding that currently it is legal but there are consultations in process to see if this needs to be changed”.

To compare the opinion of respondents on how important it is to regulate the mammoth ivory market and include mammoth on Appendix II an independent-samples t-test was conducted (see table 3). There was no significant difference between the scores for regulating the mammoth ivory trade (M=3.53, SD=1.125) and up-list mammoths on

Appendix II ($M=2.93$, $SD=1.163$); $t(28) = 1.436$, $p=0.162$. These results suggest that there is a belief that the mammoth ivory market should be regulated but that listing on Appendix II does not appear to be the appropriate mechanism.

Table 3: Likert scale results and analysis as to how important it is to regulate the mammoth ivory market and to what extent listing mammoths on CITES Appendix II would benefit the elephant ivory trade and elephant populations.

Decision	Regulate the Mammoth Ivory Market	Percentage of total respondents	Up-list Mammoth ivory on CITES App. II	Percentage of total respondents
Not at all important	1	7%	2	13%
Somewhat unimportant	2	13%	3	20%
Undecided/Unsure	2	13%	5	33%
Somewhat important	8	53%	4	27%
Extremely important	2	13%	1	7%

To further investigate the respondent's personal knowledge and experience with the elephant and mammoth ivory trades they were asked if they were aware of any actual or specific known incidents where elephant ivory was laundered as mammoth ivory. 14% ($n=2$) of respondents said that they were aware of an incident of elephant ivory laundered as mammoth ivory and 86% ($n=12$) stated that they were not.

Two respondents stated that in China they knew of laundering instances of “*worked elephant ivory in retail shops*” and also “*cases where mammoth was passed off as elephant, but before the Chinese ban on elephant ivory, quantities were fairly small as far as I know*”.

In Indonesia there are known cases of laundering such as “*in Eastern Indonesia, raw ivory (both mammoth or elephant ivory) is used for wedding gift. Since getting mammoth ivory become more difficult, the suppliers then replace mammoth ivory to elephant ivory from Sumatran elephant in Sumatra and Borneo elephant*”.

To understand the respondent’s opinion on the current legislation and regulations imposed on the elephant and mammoth ivory trades, they were asked whether it was sufficient where markets are largest. In terms of believing that legislation and regulation concerning elephant ivory trade is sufficient in the largest markets, 31% (n=4) of respondents said Yes, 31% (n=4) said No and 38% (n=5) said they did not know.

There was a range of legislation suggested from the 4 respondents that said that the legislation was not sufficient enough for elephant ivory. One respondent said that there may be enough legislation, however, enforcement and management are more important. Asset forfeiture and stricture regulation of internal trade in countries which use ivory were also suggested.

One respondent had the view that “*the trade should be legal and regulated after consultation with the main stakeholders, suppliers, craftsmen, traders, retailers and consumers to obtain agreement to buy only legal ivory*”.

When questioned whether the respondents believe that there is enough legislation towards the mammoth ivory trade in countries where the markets are largest, only 8% (n=1) said Yes, 23% (n=3) said No and 69% (n=9) said that they did not know.

Of the three respondents that answered No to question 40 only one respondent stated what legislation should be implemented to regulate the mammoth ivory trade. The respondent stated that there needs to be legislation in mainland China for material coming in directly from Siberia, however, regulation across the border is difficult to enforce.

Ivory Markets

According to respondents, China was considered to be the largest market for elephant ivory (see table 4). The second largest elephant ivory markets were considered to be Vietnam, although, Japan and Hong Kong (SAR) were very close with some respondents stating that they were second or Vietnam was the third largest elephant ivory market (see table 4). Thailand was ranked the 5th largest market for elephant ivory and Macau (SAR) of China and the United States were joint and the most common countries ranked in the 7th position (see table 4). Similarly, Singapore and Russia were both ranked in 8th position, whilst the clearly smallest market for elephant ivory was Germany (see table 4).

The joint largest market for mammoth ivory out of the 10 countries were China and Russia (see table 5). Hong Kong (SAR) of China and Vietnam were also considered to be the joint 3rd largest markets of the ten (see table 5). Japan had a similar level of market for both elephant and mammoth ivory, ranked as the 4th largest (see table 5). Macau (SAR) of China and Thailand were ranked as the 5th and 6th largest markets for mammoth ivory (see table 5). Similarly, to the rankings for elephant ivory Singapore, United States and

Germany were considered 3 of the smallest mammoth ivory markets out of the 10, for mammoth ivory the rankings were 7, 8 and 10 (see table 5).

When asked if any new elephant or mammoth ivory markets had emerged since 2015, 23% (n=3) of respondents stated that since 2015 new elephant or mammoth ivory markets had emerged, 39% (n=5) stated that there were no new markets and 38% (n=5) did not know of new markets. No new markets for mammoth ivory were listed by the respondents, however, for elephant ivory, the new markets listed were; Myanmar, Laos, Cambodia, United Arab Emirates and Algeria.

3.4.3 Interview Results

Following completion of the questionnaire, there were still gaps in specific knowledge on the mammoth ivory trade and the relationship between the elephant and mammoth ivory trades. Semi-structured interviews were used to try and fill these knowledge gaps.

All respondents agreed that China is still the largest market for elephant ivory. However, in terms of the largest market for mammoth ivory, there was a lack of knowledge on the subject, this was showed through a statement made by Respondent 3:

“We actually have no idea where the largest market for mammoth is...” – Respondent 3

Interestingly none of the respondents knew what effect the closure of the domestic elephant ivory market in China and Hong Kong (SAR) of China had on the demand for mammoth ivory, however, one respondent stated:

“...logically, you would think it would have increased the demand” – Respondent 1

However, the respondent was hesitant to say that it was fact, without further evidence.

Similarly, there was no information gathered on any new laws over the last 5 years that have been implemented to regulate the mammoth ivory trade, however one respondent commented in relation to the situation in China:

“For what reason? For them it’s a win-win, they have no reason to have any control” –

Respondent 2

In this quote the respondent is referencing the idea of China implementing laws on mammoth ivory and why would they implement laws if it is not affecting their country, the respondent then went on to say that:

“Russia is the one that’s likely increased their legislation” – Respondent 2

There was no clear understanding of how the laws implemented in the United States have impacted the mammoth ivory trade, however two respondents gave interesting insights into how the laws could be working:

“I imagine its depressed it considerably because law enforcement is quite effective in the States” – Respondent 1

“I just know there’s been so much publicity against ivory in America” – Respondent 2

In terms of any interaction between the elephant and mammoth ivory trade in the United States, one respondent comment that:

“I do know that some carvers in the US have started using mammoth ivory in place of elephant. I know that this gives more opportunity for laundering because if they have got leftover elephant ivory stocks they can carve that and say this is mammoth ivory” –

Respondent 1

This shows that elephant and mammoth ivory is still present in the United States and there is the demand for it, however, there is a lack of knowledge on the market.

All respondents were in agreement that Russia is still the largest exporter of mammoth ivory.

“Yeah. Well, how can it change. Siberia is where they are” – Respondent 1

“Yes, it’s still the only one that we know about for mammoth ivory” – Respondent 3

The reasoning for why Russia is still the largest exporter of mammoth ivory in comparison to Alaska and Canada, where mammoth ivory can also be found was given by Respondent 1.

“From what I’ve heard from users is that the Siberian mammoth ivory is superior quality to Alaskan and Canadian. I’m not quite sure why, the only thing I can think of is that there are larger areas of permafrost in Siberia where mammoth ivory’s found” – Respondent 1

The impacts of COVID-19 on the illegal wildlife trade was a common theme mentioned when discussing the new factors that have impacted the mammoth ivory trade over the last 5 years. One impact of COVID-19 comes from the supplier themselves.

“Banning flights that type of thing, which has happened quite a bit in a lot of places. It’s had a huge impact” – Respondent 1

“it’s also slowed the trade down...because there’s less trafficking travel, allowed less shipping containers” – Respondent 2

Moreover, the impact of COVID-19 on the consumer was also discussed.

“Because of the economic problem, people have less ability to buy. They can’t afford the ivory like they could in the past, before the COVID pandemic” – Respondent 3

There was no pattern found in the respondents response when discussing the changes in price of both raw and worked elephant and mammoth ivory over the last 5 years, however, there was a link between the two ivory prices.

“Elephant ivory prices have dropped and it’s mammoth ivory that’s gone up. This would indicate just by economic principles that mammoth ivory has taken over the supply, so it’s in higher demand” – Respondent 1

The idea that elephant prices had dropped was then contradicted by another respondent.

“For raw elephant ivory we’ve not seen that much change...but for worked elephant ivory the price has naturally increased as the price of craftsmen and production is increasing” – Respondent 3

This shows the clear lack of knowledge and agreement on the price of both trades.

There was a difference in opinion on the effect of mammoth ivory trade on elephant ivory trade with two respondents agreeing that the mammoth ivory trade has had an impact.

“The increase in mammoth ivory going into China has been massive so that must have had an impact on elephant ivory in that sense because if there wasn’t so much mammoth ivory there would be more demand for elephant ivory” – Respondent 2

The respondent, however, recognised that although mammoth ivory is the best substitute for elephant ivory and reduced the demand slightly, there has not been that much of a difference.

“I think mammoth ivory is the best substitute there is to elephant ivory and its filled a gap. But it hasn’t stopped the illegal trade of elephant ivory because there are still shipments of ivory coming out and China is such a huge country. It’s such an inexhaustible demand for ivory” – Respondent 2

After the answer from Respondent 1 on the changes in price of elephant and mammoth ivory, I asked whether they believe that the fact that mammoth ivory’s price is increasing and elephant ivory’s price is decreasing that their prices are affecting each other.

“Now that I think about it because we have seen the price of elephant ivory drop, I was considering it more or less to have happened on its own and I hadn’t really taken into consideration mammoth ivory” – Respondent 1

The final respondent did not share the beliefs of either respondent.

“I think mammoth ivory trade is not effecting the elephant ivory trade” – Respondent 3

There was a clear agreement against the use of regulations for the mammoth ivory trade from Respondents 1 and 2.

“It’s going to affect the elephant ivory trade, no matter what you do...if you don’t regulate it that might be the best thing you can do is let mammoth ivory replace the elephant ivory, let the Chinese have it. If you start pulling out mammoth ivory they’re going to say, well, to the hell with it we’ll go back to elephant ivory” – Respondent 1

“Once you start putting in bans, it’s a disaster, once you start putting in too many regulations it’s a disaster because everybody goes onto the black market and does everything under the table” – Respondent 2

With this in mind both respondents were in favour of management instead of regulation and proposed many methods of doing so.

“Manage quantities, pricing. What would be optimal in the supply and price point for illegal elephant ivory” – Respondent 1

“I have got a friend...He believes that he could train his dogs to distinguish the difference between elephant and mammoth ivory. This would be able to help as it will be cheap and dogs aren’t corrupt and don’t lie, therefore, if a shop is mixing the two or there is elephant ivory in the back or on the counter, the dogs would certainly put fear into people as the dogs would know” – Respondent 2

Incentives were a common theme in how to replace the demand of elephant ivory with mammoth ivory.

“You want to create an incentive for consumers to prefer mammoth ivory over elephant ivory” – Respondent 1

“I’m not a fan of regulations, if people want the stuff they want the stuff, you’ve got to give incentives to do it” – Respondent 2

Respondent 2 was clear with the fact that management and incentives need to come from Russia and China not western governments or NGOs.

“It’s really up to the job of Russia, the Russians and the Chinese to get together and try and form a route as sort of a tradeable route that doesn’t put the dealers off” –

Respondent 2

There was clear agreement from all three respondents that mammoths should not be included in CITES Appendix II.

“Absolutely not... CITES does not stop illegal trade” – Respondent 1

“I think it would be a very exhausting process for every CITES country to monitor every piece of mammoth ivory” – Respondent 2

“We don’t think it helps prevent mammoth ivory from affecting the trade of elephant ivory” – Respondent 3

There was a number of reasons mentioned by the respondents for the clear agreement against listing of mammoths on to CITES Appendix II.

“Only legal trade can be regulated. Okay, with national laws, or quotas. seller and buyer agree to certain guidelines to keep the product coming. In a wildlife trade, it's renewable resource. So, you want to keep the source alive. And the way you do that is by regulating

the trade. Everybody agrees. Everybody knows what's going on. Everyone has 100% information of the market. It's an open market, like the stock market. As soon as it's banned. It's a black market. It's underground. No one knows what's going on, overall, except for what they know, in their little network of illegal trade. And there might be a dozen or two dozen illegal trade networks, neither of which knowing what's going on with the other, because they're very secretive. And they don't want to get busted. So, there's no regulation of the supply. And they're all in competition with one another. So, they all go after the supply independently, and it gets wiped out. Because there's no regulation” –

Respondent 1

“If it went on to Appendix II, it would be nothing would have just caused a headache for everybody. When all we really need is the data to find out what's happening” –

Respondent 2

Two of the respondents also proposed that CITES could be involved in managing the mammoth ivory trade without listing it on Appendix II.

*“The trade is only affecting two countries, so let’s get CITES to find a way to just deal with Russia and China” – **Respondent 2***

“I think we should have more studies on mammoth ivory to support the consideration of mammoth ivory being listed on Appendix II because we barely have any knowledge about it; how much ivory we have, where are the trade routes, what is the use by the consumer, who has ivory...Once we have more information we can make a better decision” –

Respondent 3

3.5 Discussion

Throughout this chapter I have further explored the relationship between the elephant and mammoth ivory trade, attempting to fill gaps in knowledge left after conducting a systematic evidence review (Chapter 2).

3.5.1 How has the price of both raw and worked elephant and mammoth ivory changed and have they affected each other? What is the current price?

In terms of filling the gaps in knowledge on the prices of mammoth and elephant ivory and whether they affect each other, I found that the current estimated price of elephant ivory in China is around 1,250 USD per kg, this shows little change in price of elephant ivory in China since 2017, reported at around 1,237 USD per kg (8,000 CNY) by Zhou et al. (2018). This price is a vast decrease from the reported price of 3,100 USD per kg (20,000 CNY) in 2013, however, it has increased from the wholesale price of 750 USD per kg in 2017 (Stiles, 2021).

In other Southeast Asian countries the price of elephant ivory varies. In Indonesia the price is estimated to be 1,200 – 1,400 USD per kg, Vietnam 680 USD per kg and Thailand 616 – 1,850 USD per kg. The price of elephant ivory in Vietnam is almost double the price reported in 2003 of 350 USD per kg (Stiles, 2004), while in Thailand the price is similar to that reported in 2001/2 by Martin and Stiles (2002) where the price varied on whether it

was raw or worked ivory and the size of the object, such as; 5kg tusk costing 159 USD per kg, chopsticks costing 57-80 USD, a 4kg tusk costing 2000 USD.

In the source continent of Africa, the price of ivory varied depending on the source of the ivory; in Kenya the poacher price of ivory is estimated to be from 50-60 USD per kg and the poacher price in both Cameroon and Gabon is estimated to be around 100-200 USD per kg, a general price of elephant ivory in Zimbabwe was also given at 170-250 USD per kg. The exportation prices are slightly more expensive with the price of ivory that is exported from Eastern and Southern Africa estimated at 250 USD per kg and the exportation prices from Central to Western Africa around 400 USD per kg. The price of poacher ivory has increased drastically over the last 20 years. The price of elephant ivory from poachers in Cameroon depended on the size of the tusks, however, it ranged from 30 USD per kg to 50 USD per kg, this is 50-150 USD less than today (Martin and Stiles, 2000). There was a similar increase in price from poachers' ivory in Gabon, increasing from 30-47 USD per kg. The price of poached ivory in Zimbabwe has increased exponentially from the reported 4 USD per kg to 170-250 USD per kg (Martin and Stiles, 2000).

No information was available on the price of mammoth ivory through questionnaires as most respondents stated that they had "No idea", this shows the continued lack of knowledge surrounding the mammoth ivory trade. Other studies have found the price in the largest market of China, to range from 120-400 USD per kg depending on the grade of the ivory (Martin and Vigne, 2011).

3.5.2 Is Russia still the largest exporter of mammoth ivory?

When trying to fill the gaps in knowledge on whether Russia is still the largest exporter of mammoth ivory, the results of the questionnaires and interviews indicated that this was still the case (Chapter 2). The 95,000kg of mammoth tusks exported during 2009 to 2012 is thought to have declined back to the 60,000kg of mammoth tusks exported per year, previously reported from 2000 to 2008 (Farah and Boyce, 2015). One respondent of the semi-structured interviews stated the reason for Russia remaining the main exporter of mammoth ivory, compared with Alaska and Canada, is due to its superior quality.

3.5.3 Are China and Hong Kong (SAR) of China still the largest markets? Have new markets emerged?

From the systematic evidence review the largest market for mammoth ivory was Hong Kong (SAR) of China with China rising in its demand for mammoth ivory (Chapter 2), as a result of trade through its carving factories. However, the data collected from the questionnaires and semi-structured interviews now suggests that China is by far the largest market for mammoth ivory with only Russia playing a similar kind of role in the trade. Hong Kong (SAR) of China was considered to be the third largest market for both elephant and mammoth ivory from the questionnaire respondents. There was limited information on the extent of Vietnam's mammoth ivory market when conducting the evidence review, however, it was considered to be the third largest mammoth ivory market joint with Hong Kong (SAR) of China.

Japan, Macau (SAR) of China, Thailand and Singapore were ranked 4th to 7th largest mammoth ivory markets respectively. This mirrors previous findings, in that mammoth

ivory items were on sale in Japan in 2002 (Martin and Stiles, 2003), although elephant ivory was still the preferred ivory. While in 2015, the number of mammoth ivory shops were increasing in Macau (SAR) of China (Martin and Vigne, 2016).

Surprisingly the United States and Germany were considered to be the smallest mammoth ivory markets from the respondents. This suggests a clear change in demand from these two countries as over the last 10 years as in 2011 two factories in Fuzhou, China exported 10% and 40% of their mammoth ivory to the United States (Martin and Vigne, 2011) and in 2010 Germany was only one of three countries that Hong Kong (SAR) of China imported its mammoth ivory from, making up 7.5% of all imports (Martin and Martin, 2011). Interestingly, three respondents from the questionnaire also identified new elephant ivory markets that have emerged since 2015 (Myanmar, Laos, Cambodia, United Arab Emirates and Algeria), however, no new mammoth ivory markets were identified.

3.5.4 How has the demand for elephant and mammoth ivory changed?

The general consensus among respondents was that the demand for elephant ivory has decreased a little or has not changed (85%), whereas there was a broader opinion on the change of mammoth ivory demand since 2015 with 27% of respondents saying that it had decreased a little, 46% stating it had not changed and 18% saying it had increased a little. However, the suggestion that the demand for elephant ivory had decreased a little was contradicted by the 300% increase in elephant ivory traded from 2017 to 2020 as stated by one respondent, while one interviewee stated that the increase in shops selling ivory (both elephant and mammoth) in Guangzhou was massive from 2011 to 2018. While Stiles, in a recent paper, stated that the second largest ivory seizure was recorded in China in 2019,

weighing 7.48 tonnes (Stiles, 2021). This suggests that China continues to be a major demand country for elephant ivory. However, it is important to note that an interviewee stated that *“the increase in mammoth ivory to China has been massive, therefore, it must have reduced the demand for elephant ivory as without the mammoth ivory all the demand would be solely towards elephant ivory”*. Further, in 2015, mammoth ivory made up 20% of all ivory production (Farah and Boyce, 2015). Farah and Boyce (2015) suggested that without mammoth ivory as a substitute, 50,000 additional elephants would have been poached.

3.5.5 How has China’s domestic elephant ivory market closure affected their demand for mammoth ivory? What factors have affected the mammoth ivory trade?

The closure of the domestic elephant ivory market in China and Hong Kong (SAR) of China could have had an impact on the demand for both elephant and mammoth ivory. However, due to the lack of knowledge on the mammoth ivory trade from the interviewees, this could not be confirmed. That said, the recent GlobeScan-WWF ivory consumer survey in China found that only 12% of respondents had purchased ivory in 2020, this was a drastic decline from 31% in 2017 (Meijer et al., 2021).

One factor which was agreed between all interviewees to have had an impact on the mammoth ivory trade is COVID-19. COVID-19’s impact has come in the form of reducing flights and shipping, and therefore trafficking. In addition, Stiles (2021) suggested that the pandemic has result in a further shift from buying in person to online and is proving to be more common. However, COVID-19 has had a drastic impact on the financial situation of

many individuals which would leave many unable to afford ivory when previously they may have been able to.

3.5.6 What new laws have been implemented?

No new legislation was found to have been implemented for the mammoth ivory trade over the last 5 years, although a respondent suggested that in the UK there is currently an assessment as to the need for regulation. The reason for the lack of legislation was explained by an interviewee, stating that *“for what reason would there be any legislation implemented in any other countries except for China and Russia as that’s where the supply and demand is coming from, moreover, why would China implement legislation when they are benefitting economically from the lack of legislation? However, Russia would have been one country that’s likely increased their legislation”*. While for elephant ivory trade, 87% of respondents stated that their country’s had legislation, although for some this was only as EU or CITES regulations.

3.5.7 What are the effects of the mammoth ivory bans in US states on the trade and possible impacts on the elephant ivory trade?

The legislation in the US for both elephant and mammoth ivory is already understood as seen in Chapter 2, however, the impact of the laws is not. From the interviews it was hypothesized by two respondents that the laws would have *“depressed it considerably”* due to law enforcement being *“quite effective”* in the US, however, no statistical evidence was provided to back up these claims. The lack of knowledge on legislation in the US may be

linked to the respondents ranking of the US as the 8th largest mammoth ivory market, making their impact on the mammoth ivory trade not worth monitoring.

While the majority of questionnaire respondents suggested that regulation of the mammoth trade was needed, the majority did not think it was appropriate to list mammoths on CITES. One method proposed was to implement legislation in mainland China for ivory coming in directly from Siberia. In contrast, two of the three interviewees were against any type of regulation as due to impacts on the elephant ivory trade and the potential to push the trade onto the black markets. This is reinforced by Stiles (2021) showed that the recent domestic elephant ivory market bans in China and Vietnam had push the trade further underground. In addition, it was suggested that the mammoth ivory should be completely unregulated, thus replacing the demand for elephant ivory, and that if too many regulations are implemented the main market, China, could return to the utilisation of elephant ivory. However, the interviewee was not against the management of mammoth ivory. The implementation of incentives in China and Russia to cooperate with management of quantities, pricing and finding the optimal supply and price point for mammoth ivory were suggested mechanism for managing the trade.

It is important to note that all three interviewees state that there was a clear need for more information on the subject of mammoth and elephant ivory markets. This is borne out by the CITES decision 18.120 expressing a need for further knowledge on the interaction between the two markets. The response rate for the questionnaire and invitations for interviews was low, 6% and 1% respectively. Given the importance of this issue it is concerning that stakeholders did not engage more enthusiastically with the study, especially from countries, such as; China and Russia, where the elephant and mammoth ivory trades are prominent.

3.6 Conclusion

This study has helped to fill a number of the knowledge gaps identified during the systematic evidence review (Chapter 2). Further, this study has also explored the mammoth ivory trade and its relationship with the elephant ivory trade in support of CITES decision 18.120 and any further debates surrounding the mammoth ivory trade.

When looking at the number of responses from the questionnaires and interviews used in this study it is important to note that only English versions of the questionnaire were sent to the participants and the interviews were only available to be conducted in English. This may have played a role in the number of responses, especially from countries where English is not their first language; Russia, China, Vietnam. There were many responses in the questionnaire from participants where English is not their first language which did not address the question or showed a clear misunderstanding of the question. These factors could have created a bias in the response rate as the reason for a response from countries may have been due to their ability to provide a representative that had a high enough level of English to understand the questions and jargon used. Subsequently this may have caused a bias in the responses of participants as the responses received were partially from countries where the elephant and mammoth ivory trades were not as prominent as countries such as, Russia and China.

Given the low response rate and number of questionnaires and interviews completed it has been hard to fill the gaps left in chapter 2, however, from the information gathered it is appearing that China is the largest market for both elephant and mammoth ivory, with Hong Kong (SAR) of China and Vietnam having significant markets for both ivory types

and Russia playing a key role as the largest exporter of mammoth ivory. A number of new elephant ivory markets were identified (Myanmar, Laos, Cambodia, United Arab Emirates and Algeria), however, no new mammoth ivory markets were identified.

There appears to be a lack of knowledge on the price of mammoth ivory other than a suggestion that the price had increased. In addition, there were varied levels of agreement on the price of elephant ivory, however, the knowledge was clear with respondents giving exportation, poacher, and regional prices. Unfortunately, there was insufficient data to determine whether there was a relationship between the price of mammoth and elephant ivory. Further, there was insufficient knowledge to determine whether there was a relationship between the demand of mammoth ivory and elephant ivory, or whether there had been a change in demand for the two ivories. Finally, while there was general agreement that the trade in mammoth ivory needed to be regulated, no new legislation was identified, and that regulation should not be in the form of listing on CITES.

As seen through the low response rate from the questionnaires and interviews, in future studies it is essential that stakeholders engage more in evidence gathering, especially in China and Russia as without information from the two main players in the mammoth ivory trade we will not completely understand the extent of the trade. CITES decision 18.120 should request for a study to be completed with a researcher examining the extent of the mammoth ivory trade by gathering first hand evidence through interviews from suppliers in Russia, the main importers in Hong Kong (SAR) of China and China and the consumer and vendors in China, this will give us an overview of the trade where markets are largest and allow CITES to make more informed decisions on the regulation of the mammoth ivory trade.

4. CONTRIBUTION TO THE FIELD AND CONCLUSIONS

4.1 Introduction

This thesis explores the impact and role of the mammoth ivory trade on the elephant ivory trade and elephant populations. With the seventeenth meeting of the Conference of the Parties to CITES in South Africa, the proposal that the woolly mammoth species (*Mammuthus primigenius*) should be listed on to CITES Appendix II under a look-alike provision was introduced (CITES, 2016). This proposal has led to further discussion of the mammoth ivory trade during future meeting and eventually the proposal was rejected by CITES parties, however, the commission of a study investigating the effect of mammoth ivory on elephant ivory was of great importance. This thesis, therefore, takes a first step in carrying out this study addressing the gaps in knowledge on the mammoth ivory trade to determine how CITES parties should proceed. The data presented in Chapter 2 shows the current information available on the mammoth ivory trade and its impacts on the elephant ivory trade and elephant populations, whilst highlighting what gaps are present on the subject through a systematic evidence review. Chapter 3 filled gaps left by Chapter 2 through conducting questionnaires and semi-structured interviews.

The listing of elephant ivory on CITES Appendix I in 1989 and the recent closure of domestic elephant ivory markets in 2016 have shown the importance and commitment of countries to conserve elephant populations. However, with the mammoth ivory trade growing, potentially becoming ever more connected to the elephant ivory trade, the overall lack of legislation, except for bans in Israel, India, and the US (specifically New York,

New Jersey, California and Boston), the trade still has the ability to impact the elephant ivory trade. In this final chapter, I discuss the main themes of the thesis; filling the gaps in knowledge on the mammoth ivory trade, exploring the relationship between the mammoth ivory trade and elephant ivory trade, deciding whether mammoths be listed onto CITES Appendix II and the extent of the mammoth ivory trade and the laundering of elephant ivory. This chapter also suggests how CITES should approach mammoth ivory regulations and how future research can help CITES in making decisions surrounding the trade.

4.2 Contribution to the field

4.2.1 Gaps in knowledge on the mammoth ivory trade

Since 2015, as identified in Chapter 2, there has been a lack of research and accessible information on the largest mammoth ivory markets, price of mammoth ivory, demand for mammoth ivory and mammoth ivory legislation, with Chapter 3 attempted to address these gaps. The largest market for both mammoth and elephant ivory was found to be China by far, with Russia, Hong Kong (SAR) of China, and Vietnam being considered other important parties in the ivory trades, with Russia's impact being primarily as the source of mammoth ivory. The US and Germany are two countries whose impact on the mammoth and elephant ivory trade has increased over the last 10 years, more specifically on the importation and exportation of mammoth ivory.

No data was collected on the price of mammoth ivory from the questionnaires and interviews in Chapter 3, however, the difference in elephant ivory price from poacher to vendor was discussed. The price in the largest market countries, such as; China and Vietnam was estimated to be 1,250 USD per kg and 680 USD per kg. In comparison, the

variation in poached ivory price from Kenya to Cameroon, Gabon and Zimbabwe was around 50-200 USD per kg. Exportation costs were in the middle of poacher prices and vendor prices as the price of exported ivory from Eastern and Southern Africa was estimated at 250 USD per kg and the exportation prices from Central to Western Africa around 400 USD per kg.

The gaps on the extent of the demand for mammoth ivory was not fully concluded through this study as through the respondent's data, 27% of respondents saying that it had decreased a little, 46% stating it had not changed and 18% saying it had increased a little since 2015. However, there were interviewees which stated that there had been an increase in items on sale in China since 2011. No new mammoth ivory legislation was found to have been implemented over the last 5 years in Chapter 3; however, Russia and China were advised to look at implementing legislation. Moreover, no information on the impact of legislation in the US was collected; therefore, the impact is still not understood.

4.2.2 The relationship between the mammoth ivory trade and elephant ivory trade

Understanding the relationship between the mammoth ivory trade and the elephant ivory trade is a key factor when addressing the CITES decision 18.120, therefore, in order to try and establish the extent of this relationship I asked the respondents of the questionnaire and interviews what their opinion and view was (Chapter 3). It was assumed that the presence of the mammoth ivory trade alone creates a relationship with the elephant ivory trade as it is shifting demand from elephant ivory to mammoth ivory. There was no evidence supporting an impact from the domestic elephant ivory market in China and Hong Kong (SAR) of China, however, a recent GlobeScan-WWF ivory consumer survey

in China found that only 12% of respondents had purchased ivory in 2020, this was a drastic decline from 31% in 2017 (Meijer et al., 2021). Chapter 2 found through previous studies that between 2010 to 2012 it is estimated that the 84,000kg of Russian mammoth ivory exported per year could have reduced the harvesting of elephant ivory by more than 500,000kg per year and the presence of mammoth ivory as a substitute has reduced the poaching numbers per year by around 51,000 elephant (Farah and Boyce, 2015) and the rate of African elephant mortality had reduced by 6% in 6 years by 2017 (Vaughan, 2019). Further research on this subject is essential as without understanding the impact of the trade on each other and the possible knock-on effects of legislation when implemented on either trade, decisions cannot be taken.

4.2.3 Should Mammoths be listed onto CITES Appendix II

Listing Mammoths onto CITES Appendix II under a “look-alike provision” was rejected by the CITES parties at the eighteenth meeting of the Conference of the Parties in 2019 (CITES, 2019). The information gathered in Chapter 3 shows an overwhelming agreement with this decision taken by the CITES parties. All three interviewees were clear in the agreement with the CITES parties, stating “*Absolutely not... CITES does not stop illegal trade*”, “*I think it would be a very exhausting process for every CITES country to monitor every piece of mammoth ivory*” and “*We don’t think it helps prevent mammoth ivory from affecting the trade of elephant ivory*”. Moreover, the lack of understanding on the mammoth ivory trade and its relationship with elephants as a whole stays looming over decision-making, which was made clear in Chapter 3 with respondents stating; “*all we really need is the data to find out what's happening*” and “*I think we should have more studies on mammoth ivory to support the consideration of mammoth ivory being listed on Appendix II....*”.

The idea of implementing bans separate from Appendix II on the mammoth ivory trade was largely agreed against as there were concerns that this could lead to the trade going to the black market and becoming untraceable. Chapter 3 explores what should be done instead of listing the woolly mammoth on Appendix II and finds some interesting proposals which could be discussed and trialled in the future. Currently the mammoth trade is in the hands of China and Russia, this means that establishing trust between the two parties and all other parties is a key priority. Once trust is established CITES should hopefully gain information on the current trade routes and be able to provide a plan for monitoring import and export, managing quantities and possibly managing supply and price points, which also benefits China and Russia. CITES should also discuss the possibility of promoting and creating incentives for consumers to purchase mammoth ivory over elephant ivory in China.

It is of great importance that the mammoth ivory trade stays legal as it will be easier to monitor. As previously mentioned, when implementing bans on a trade, there is the risk that the trade becomes untraceable. By keeping the mammoth ivory trade legal it allows an open market where the price, quantities, supply, demand are all public. With this information it will also be easier to discuss the previously mentioned regulations with China and Russia as data will show where changes may need to be made.

4.2.4 Laundering of elephant ivory through the mammoth ivory trade

One of the main concerns which led Israel to propose that the woolly mammoth should be listing on CITES Appendix II was that the mammoth ivory trade is allowing the laundering of elephant ivory, which could lead to further poaching and therefore a decline in elephant populations. Looking at the trend of elephant populations pre COVID-19, as the transport

of mammoth ivory has been affected by the pandemic, we are able to see the extent of which the presence of the mammoth ivory trade has affected elephant populations. Chase et al. (2016) estimated there to be a total of 334,464-370,078 African elephants in 2015, with the population experiencing high rates of 8% per year between 2005 and 2014 (Chase et al., 2016). In MIKE sites in 2011 the poaching peaked at 10.4%, however, this number has decreased to 3.7% by 2017, which is near to a sustainable level of poaching for the current African elephant population (Hauenstein et al., 2019). Although, poaching has had a clear impact on the African elephant's population over the last 25 years especially, it is important to understand that there are other factors impacting the populations, such as habitat loss and fragmentation, civil unrest and climate change (CITES, 2017). Further research is essential to truly understand and explore the relationship between the laundering of elephant ivory through the mammoth ivory trade and its current and potential future impact on elephant populations, however, from current estimations, I believe it is not a significant enough issue for the woolly mammoth to be listed on CITES Appendix II.

4.3 Future research & Recommendations for policy and practice

4.3.1 Engaging the CITES parties

As seen in Chapter 3, the response rate of my questionnaires and interviews was extremely low with only 1% of the 371 individuals contacted agreeing to an interview and 6% completing a questionnaire. Of these 371 individuals, around 200 were CITES management, scientific or law authorities, with all 183 parties contacted for their participation. More specifically only 19 countries of the 183 responded to my email or participated in the study (Chapter 3). Of the 10 largest markets for both elephant and

mammoth ivory only one of the parties participated in my study, therefore, limiting the effectiveness and potential of my study to gather evidence from where the trade is occurring.

The proposal by Israel to CITES at the Eighteenth meeting of the Conference of the Parties in 2019, states that ‘We consulted with all CITES Parties via Notification No. 2018/088 which the Secretariat issued in all three languages on 8 November 2018’ (CITES, 2019). This consultation only received four responses from the US, EU, Canada, and Japan. This response rate is 4% less than my study, with a rate of 2%, in addition, the four largest markets for both elephant and mammoth ivory did not participate. The lack of response from these four markets needs to be addressed by CITES, as without their cooperation and transparency it will be challenging to understand the extent of the mammoth ivory trade and its impact in their countries, especially on the elephant ivory trade.

4.3.2 Conduct further research

In this thesis, I have identified many gaps where further research is essential and can provide a broader and important understanding of the mammoth ivory trade and its impact on the elephant ivory trade and elephant populations, giving a better conclusion for the CITES Decision 18.120.

4.3.2.1 Study in China and Russia

As previously mentioned, the absence of cooperation from CITES management authorities in China and Russia has resulted in this study lacking the necessary evidence to make effective conclusions on the extent of the mammoth ivory trade. With this in mind it is

essential that CITES decision 18.120 requests for a substantial study to be completed with a researcher examining the extent of the mammoth ivory trade by gathering first hand evidence through interviews from CITES representatives from the four largest mammoth ivory markets giving their reasoning for deciding against the listing of mammoth ivory on Appendix II, suppliers and excavators of mammoth ivory in Russia, the main importers of mammoth ivory in Hong Kong (SAR) of China and China and the consumers and vendors of mammoth ivory in China. Some of the information gathered during such a study will hopefully fill the gap in knowledge on the impact of the closure of the domestic ivory market in China and Hong Kong (SAR) of China on the mammoth ivory trade. Overall, this study will provide us with an overview of the trade and allow CITES to make more informed decisions on the regulation of the mammoth ivory trade.

4.3.2.2 Study looking at the impact of New Legislation and Price relationship

Chapter 3 was unsuccessful in providing evidence to fill the gaps in knowledge left by Chapter 2 on recent legislation implemented on the mammoth ivory trade. More specifically, bans enforced in New York, New Jersey, California, Boston, and Israel in 2014, 2014, 2016, 2017 and 2021 respectively. By investigating the effect of these bans on the mammoth and elephant ivory trade we will gain a greater understanding of how bans can be advantageous or disadvantageous when implementing future regulations.

It would also be beneficial for the study to look at the relationship between the price of mammoth ivory and elephant ivory. There is a lack of studies which have investigated this relationship and how the emergence of mammoth ivory as a favourable ivory substitute has affected the price of elephant ivory and in turn demand. It is also important to gather up-to-date data on the supply, importer, and vendor prices of all different types of mammoth

ivory tusks (whole and the different parts), worked (from vendors and carving workshops), Grade A, B, C, D, E and the prices of raw mammoth ivory from Canada and Alaska.

4.4 Conclusions

This thesis has further explored the focus of Israel's proposal for the listing of the Woolly mammoth on Appendix II at the Eighteenth meeting of the Conference of the Parties in 2019 (CITES, 2019). I conducted a systematic evidence review to provide a background on the existing information on the mammoth ivory trade and its impact on the elephant ivory trade and elephant populations. After identifying gaps in the current knowledge, I attempted to fill these gaps, understand why Israel's proposal was rejected and gather information on the current situation of the mammoth ivory trade through questionnaires and semi-structured interviews completed by academics, governmental organisations and non-governmental organisations. The findings of my thesis provide a base for a complementary study to be carried out whilst also highlighting how the largest market for mammoth ivory has shifted from Hong Kong (SAR) of China to China and the regulation of the mammoth ivory trade should be handled extremely delicately as there is great concern of the trade being pushed on to the black market.

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6. SUPPLEMENTARY MATERIALS

6.1 Email to Respondents



2 attachments (159 KB) Download all

Save all to OneDrive - University of Kent

To whom it may concern,

My name is George Nash and I am currently studying Biodiversity Management as a Master's degree at the Durrell Institute of Conservation and Ecology, University of Kent.

My Master's research project aims to gain a greater understanding of the impact the trade in mammoth ivory is having on the illegal trade in elephant ivory and how this is impacting elephant populations. This research is relevant to Decision 18.120 on *Trade in mammoth ivory* agreed by the Conference of the Parties to CITES at its 18th meeting in 2019.

I have carried out a systematic evidence review, and it has become evident that there is a lack of knowledge and limited information on the subject of the mammoth ivory trade since 2015.

To bridge the gap in knowledge I am looking for suitable participants willing to complete a short questionnaire and take part in a semi-structured interview.

The interview should last 45 minutes to 1 hour and the questionnaire will only take 14-16 minutes to complete.

The information obtained from the interviews and questionnaire will be vital to making my research project relevant and allow me to determine if there is a link between the two ivory trades.

Would it be possible for you to pass the documents attached to this email along with my email (gen20@kent.ac.uk) on to the appropriate people who would be willing to participate? If the participants would rather complete the email online the link is (<https://survey.alchemer.eu/s3/90335658/Mammoth-Ivory-Trade-Impact-on-Elephant-Populations>).

I am hoping to conclude all interviews and have received the completed questionnaires by the **6th June**.

If you have any questions, or require further information please feel free to contact me at the email address above.

If you would like to contact my supervisor for any questions, his email is d.i.roberts@kent.ac.uk

Thank you in advance for your support with this request.

Kindest regards,

George Nash

6.2 Questionnaire Consent Form

CONSENT FORM FOR PARTICIPATION IN QUESTIONNAIRE RESEARCH

I volunteer to participate in a research project conducted by Mr. George Nash as part of his MSc Biodiversity Management degree from the University of Kent, supervised by Dr. David Roberts.

I understand that the questionnaire aims to gather information on the subject of elephant and mammoth ivory trade throughout the world to determine its nature and scale, and in particular if the trade in mammoth ivory impact on and contribute to the illegal trade in elephant ivory and the poaching of elephants.

1. My participation in this project is voluntary. I will not be paid for my involvement in the project. I can withdraw from the project at any time, without reason.
2. I understand that I can leave at any time before or during the questionnaire and I have the right to decline to answer any question in the questionnaire.
3. I consent to any data or information provided being used as part of the researcher's masters degree. I understand that the researcher will not identify me by name throughout any of the reports when using the information obtained from this questionnaire, therefore my organisation and I will remain anonymous. I understand that this data will be kept, securely, stored on university of Kent premises for a period of 5 years after the questionnaire, in accordance with the Data Protection Act 1998.
4. I understand that the information generated from this questionnaire could be published through the researcher's final project.
5. I understand that this research has been approved by the University of Kent ethics committee.
6. I agree to give my consent over email on this word document provided to me by Mr. George Nash.
7. I have read and understood the explanation of the research project provided to me. I have had the opportunity to ask any questions and they have been answered to my satisfaction, I voluntarily agree to participate in this study.

8. I have been given a copy of this consent form.

Thank you for participating in this questionnaire!

My name is George Nash and I am currently studying Biodiversity Management as a Masters degree at the University of Kent.

My Masters' research project aims to contribute to the ongoing conversation and is relevant to Decision 18.120 on *Trade in mammoth ivory* agreed by the Conference of the Parties to CITES at its 18th meeting in 2019. This research is therefore aimed to provide a better understanding of the potential role of the trade in mammoth ivory on illegal trade in elephant ivory and how it is impacting elephant populations.

The 12 main objectives of my research is to:

- Determine the scale of the mammoth ivory trade.
- Where the mammoth ivory trade is occurring?
- What countries are the largest markets of mammoth ivory?
- Where the mammoth ivory trade is legal or illegal?
- Is the mammoth ivory trade increasing or decreasing?

- Determine the relevance of the mammoth ivory trade in the context of the illegal ivory trade.
- To what extent do the mammoth and elephant ivory trade overlap?
- Is elephant ivory being sold as mammoth ivory?
- What is the difference in pricing of mammoth and elephant ivory?
- Does the price of mammoth ivory effect the price of elephant ivory?
- Is there evidence to show that mammoth ivory trade is promoting the illegal trade in other elephant ivory types?
- What is the scale of the online mammoth ivory trade?

After carrying out a systematic evidence review it was clear that there was a gap in knowledge of the topics mentioned through my objectives since 2015. Therefore, your contributions through this questionnaire are extremely important and appreciated.

This questionnaire is fully anonymous and no names will be needed throughout. I hope you find this questionnaire insightful, and if you have any questions regarding the questionnaire or my Masters project, my email is gen20@kent.ac.uk.

If you would like to contact my supervisor for any additional questions, his email is d.l.roberts@kent.ac.uk.

THIS QUESTIONNAIRE SHOULD TAKE 12-15 MINUTES.

My Signature

Date

A handwritten signature in black ink, appearing to be 'D.L. Roberts', written over a horizontal line.

My Printed Name

Signature of the Researcher

6.3 Interview Consent Form

CONSENT FORM FOR PARTICIPATION IN INTERVIEW RESEARCH

I volunteer to participate in a research project conducted by Mr. George Nash as part of his MSc Biodiversity Management degree from the University of Kent, supervised by Dr. David Roberts.

I understand that the interview aims to gather information on the subject of elephant and mammoth ivory trade throughout the world to determine its nature and scale, and in particular if the trade in mammoth ivory impact on and contribute to the illegal trade in elephant ivory and the poaching of elephants.

1. My participation in this project is voluntary. I will not be paid for my involvement in the project. I can withdraw from the project at any time, without reason.
2. I understand that I can leave at any time before or during the interview and I have the right to decline to answer any question in the interview.
3. I consent to the interview being recorded via an audio capture device. I understand that the recording will be used for transcription of results and once the project is finished the recording will be deleted.
4. I consent to any data or information provided being used as part of the researcher's master's degree. I understand that the researcher will not identify me by name throughout any of the reports when using the information obtained from this interview, therefore my organisation and I will remain anonymous. I understand that this data will be kept, securely, stored on university of Kent premises for a period of 5 years after the interview, in accordance with the Data Protection Act 1998.
5. I understand that the information generated from this interview could be published through the researcher's final project.
6. I understand that this research has been approved by the University of Kent ethics committee.
7. I agree to give my consent over email on this word document provided to me by Mr. George Nash.

8. I have read and understood the explanation of the research project provided to me. I have had the opportunity to ask any questions and they have been answered to my satisfaction, I voluntarily agree to participate in this study.

9. I have been given a copy of this consent form.

Thank you for participating in this interview!

My name is George Nash and I am currently studying Biodiversity Management as a Master's degree at the University of Kent.

My Master's research project aims to gain a greater understanding of the impact the trade in mammoth ivory is having on the illegal trade in elephant ivory and how this is impacting elephant populations. This research is relevant to Decision 18.120 on *Trade in mammoth ivory* agreed by the Conference of the Parties to CITES at its 18th meeting in 2019.

The 12 main objectives of my research is to:

- Determine the scale of the mammoth ivory trade.
- Where the mammoth ivory trade is occurring?
- What countries are the largest markets of mammoth ivory?
- Where the mammoth ivory trade is legal or illegal?
- Is the mammoth ivory trade increasing or decreasing?

- Determine the relevance of the mammoth ivory trade in the context of the illegal ivory trade.
- To what extent do the mammoth and elephant ivory trade overlap?
- Is elephant ivory being sold as mammoth ivory?
- What is the difference in pricing of mammoth and elephant ivory?
- Does the price of mammoth ivory effect the price of elephant ivory?
- Is there evidence to show that mammoth ivory trade is promoting the illegal trade in other elephant ivory types?
- What is the scale of the online mammoth ivory trade?

After carrying out a systematic evidence review it was clear that there was a gap in knowledge of the topics mentioned through my objectives since 2015. Therefore, your contributions through this interview are extremely important and appreciated.

I hope you find this interview insightful, and if you have any questions regarding the interview or my Master's project, my email is gen20@kent.ac.uk.

If you would like to contact my supervisor for any additional questions, his email is d.l.roberts@kent.ac.uk.

THIS INTERVIEW SHOULD TAKE 45 MINUTES TO 1 HOUR.

My Signature

Date



My Printed Name

Signature of the Researcher

For further information, please contact:

Mr. George Nash

Email - genzo@kent.ac.uk

6.4 Questionnaire

Section 1:

1. Age

- 20 - 34 years old
- 35 - 44 years old
- 45 - 54 years old
- 55 - 64 years old
- 65 + years old

2. Gender

- Male
- Female
- Transgender Male
- Transgender Female
- Non-binary
- Not listed

3. Nationality

4. Country of Residence

Section 2:

5. Subject of Expertise

6. Current Position:

- Academic
- Law enforcement
- Governmental organisation
- Non-governmental organisation
- Civil society
- Student
- Other:

7. Organisation Currently Affiliated To

8. Country of Organisation Headquarters

9. How long have you been working on ivory?

- 1 - 3 years
- 4 - 6 years
- 7 - 10 years
- 11 - 14 years
- 15 + years

10. Have you published any peer-reviewed/grey literature on the ELEPHANT ivory/MAMMOTH ivory trade?

YES

NO

11. If YES, could you please list the titles of the reports/papers below:*

Section 3:

12. How many kilograms of ELEPHANT ivory are currently being sold/traded per year?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

13. What is the current total value in US dollars of ELEPHANT ivory being sold/traded per year?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

14. What is the current price per kg of ELEPHANT ivory being sold/traded per year?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

15. How many kilograms of MAMMOTH ivory is currently being sold/traded per year?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

16. What is the current total value in US dollars of MAMMOTH ivory being sold/traded per year?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

17. What is the current price per kg of MAMMOTH ivory being sold/traded per year?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

18. How much MAMMOTH ivory in kilograms is currently being exported annually from Russia alone?

Please give your best estimate, along with your highest and lowest figure estimates below:

Don't Know

19. In your opinion, over the past 5 YEARS, to what extent has the demand for ELEPHANT IVORY changed?

Decreased A Lot	Decreased A Little	Has Not Changed	Increased A Little	Increased A Lot
1	2	3	4	5

Don't Know

20. In your opinion, over the past 5 YEARS, to what extent has the demand for MAMMOTH IVORY changed?

Decreased A Lot	Decreased A Little	Has Not Changed	Increased A Little	Increased A Lot
1	2	3	4	5

Don't Know

Section 4:

21. In your country of residence is there any specific legislation around the trade in ELEPHANT ivory?

YES Don't Know
 NO

22. If YES, explain what type of legislation there is:

23. In your country of residence is there any specific legislation around the trade in MAMMOTH ivory?

YES Don't Know
 NO

24. If YES, explain what type of legislation there is:

25. How important do you think it is to regulate the MAMMOTH ivory market?

Not at all important	Somewhat important	Undecided/Unsure	Somewhat important	Extremely Important
1	2	3	4	5

26. In your opinion, to what extent do you think listing mammoths on CITES Appendix II as a look-alike species could contribute to protecting elephant populations and addressing illegal elephant ivory trade?

Not at all important	Somewhat important	Undecided/Unsure	Somewhat important	Extremely Important
1	2	3	4	5

27. Please explain the reason for your answer to question 26

Section 5:

28. To what extent do you believe that mammoth ivory trade is contributing to illegal elephant ivory trade and therefore negatively affecting elephant populations?"

Please give your answer below: (Maximum of 250 words)

Don't Know

29. What are the main physical differences between ELEPHANT and MAMMOTH ivory?

Please give your answer below:

Don't Know

30. Since 2015, has there been any new ELEPHANT or MAMMOTH ivory markets which have emerged?

YES

NO

31. If Yes, please list the countries below and whether their market mainly consists of ELEPHANT or MAMMOTH ivory:

32. Please rank these countries in order of who has the largest ELEPHANT ivory market.

There are additional blank sections for you to include any additional markets from question 29 that are not listed

China	
Vietnam	
Japan	
Russia	
The United States	
Hong Kong (SAR) of China	
Thailand	
Macau	
Germany	
Singapore	

33. Please rank these countries in order of who has the largest MAMMOTH ivory market

There are additional blank sections for you to include any additional markets from question 29 that are not listed

China	
Vietnam	
Japan	
Russia	
The United States	
Hong Kong (SAR) of China	
Thailand	
Macau	
Germany	
Singapore	

34. Do you believe that legislation and regulation concerning ELEPHANT ivory trade is sufficient where markets are largest?

YES

NO

Don't Know

35. If NO, what legislation do you believe should be implemented to regulate the ELEPHANT ivory trade:

36. Do you believe that there is enough legislation towards the MAMMOTH ivory trade in countries where the markets are largest?

YES

NO

Don't Know

37. If NO, what legislation do you believe should be implemented to regulate the ELEPHANT ivory trade:

38. If you have any further comments, please comment in the box below:

Thank you for completing the questionnaire!

***If there are any reports, papers or additional information you would like to send to me, my contact details can be found below, it would be extremely appreciated.**

Mr. George Nash
Email - gen20@kent.ac.uk

6.5 Interview Questions

1. What countries would you say are the largest markets for elephant ivory? - Is this trade legal or illegal?
- How is the trade regulated in these countries?
2. What countries would you say are the largest markets for mammoth ivory? - Is this trade legal or illegal?
- How is the trade regulated in these countries?
3. In 2011, the largest markets of both elephant and mammoth ivory were mainland China and Hong Kong Special Administrative Region (SAR) of China, to what extent has this changed over the last 10 years?
4. To what extent has the closure of the domestic elephant ivory market in mainland China and a similar process currently going on in Hong Kong (SAR) of China affected the demand for mammoth ivory?
5. Over the past 5 years, what new laws have been implemented to regulate the mammoth ivory trade?
- Do you believe that these laws are working? Especially, in the countries that are the main markets.
6. Specifically in the US there has been laws implemented in New Jersey, New York, Boston and California focusing on tackling the mammoth ivory trade. How has that impacted the mammoth ivory trade in those cities and states?
7. Has there been any clear interaction between elephant and mammoth ivory trade in the United States?
8. To what extent is Russia still the main exporter of mammoth ivory, moreover?

9. Over the last 5 years has there been new factors that have impacted the mammoth ivory trade such as;
 - as the emergence of an online mammoth ivory market?
 - COVID-19

10. How has the price of both raw and worked elephant and mammoth ivory changed over the last 5 years?
 - Has the price of elephant or mammoth ivory affected the other?

11. In your opinion, what is the effect of mammoth ivory trade on the elephant ivory market and elephant populations?

12. In your opinion, how could the mammoth ivory trade be regulated in a way that does not affect elephant ivory trade?

13. Do you believe that listing mammoth ivory in CITES Appendix II as a look-alike species would help combat the laundering of elephant ivory through the mammoth ivory trade and its effect on elephant populations?