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Zhou, Xuehong and Wang, Qiang and Zhang, Wei and Jin, Yu and Wang, Zhen and Chai, Zheng and Zhou, Zhiqiang and Cui, Xiaofeng and MacMillan, Douglas C. (2018) Elephant poaching and the ivory trade: The impact of demand reduction and enforcement efforts by China from 2005 – 2017. *Global Ecology and Conservation*, 16 . e00486. ISSN 2351-9894.

DOI

<https://doi.org/10.1016/j.gecco.2018.e00486>

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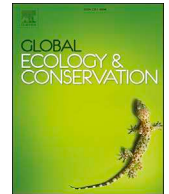
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Short Communication

Elephant poaching and the ivory trade: The impact of demand reduction and enforcement efforts by China from 2005 – 2017

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ARTICLE INFO

Article history:

Received 22 August 2018

Received in revised form 19 November 2018

Accepted 19 November 2018

Keywords:

Elephant poaching

Ivory

Trade ban

Demand reduction

Enforcement

ABSTRACT

African elephants are iconic species threatened by poaching and China was considered as one of the main destinations for illegally sourced ivory. In this article we combine two surveys of ivory carving enterprises with other data sets, including Chinese government seizure statistics, market prices for illegal ivory and substitute goods, to understand the impact of enforcement and demand reduction measures on ivory prices and poaching. Our analysis indicates the strong enforcement measures to combat ivory smuggling temporarily suppressed the tendency of illegal trade while stimulating a steep rise in illegal ivory prices thereafter. Peaking in 2012–2013, prices thereafter fell due to government measures to reduce demand under China's 'Ecological Civilization' programme and the announcement of 'The Eight-point Regulation of the Centre'. Our survey suggests that most Chinese carving enterprises were intending to close or to diversify their business activities away from ivory carving as a result of the total ban on domestic ivory trading by 31st December 2017. And China had banned domestic ivory trade for over half a year and all ivory carving enterprises closed their ivory business activities since this domestic ban. In order to prevent ivory demand in other countries that may undermine Chinese efforts, we argue that other countries now also need to adopt multifaceted actions to curtail their domestic ivory trade.

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1. Introduction

African elephants are iconic species threatened by ivory poaching and populations are declining in various parts of Africa (Wittemyer et al., 2011; 2014). It is now recognized at the highest policy levels (e.g., UN General Assembly Resolution 69/314, 2015; CITES Res. Conf. 10.10 (Rev. CoP17); London Declaration on Illegal Wildlife Trade 2014), that a range of conservation

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actions at national and international levels are necessary to combat this illegal trade, including the engagement of local communities at source sites, effective law enforcement along international trade chains and efforts to understand and address demand in key consumer markets (Cooney et al., 2016; Challender and MacMillan, 2014).

In order to effectively implement these actions, there is an urgent need to improve understanding of the dynamics of the illegal ivory trade, especially from the Chinese perspective, because China was considered as one of the key destinations for raw ivory in the past years (Gao and Clark, 2014). However, the lack of reliable long-term data on actual illegal trade volumes (CITES, 2017a) and prices, and the clandestine nature of this trade, severely curtails analysis in this complex policy arena (Moyle, 2014; CITES, 2017b; Underwood et al., 2013).

China, recognized as one of the main destinations for illegally sourced ivory (Gao and Clark, 2014), has recently undertaken significant measures to curtail supply and reduce demand and ended its domestic ivory trade at the end of 2017. In this article, we combine market information gathered from 2 surveys of Chinese ivory carving factories, with time series data on illegal ivory prices, elephant poaching, Chinese government seizure data, the price of substitute goods of ivory, and China's economic data to investigate and demonstrate how multifaceted policy efforts under China's 'Ecological Civilization' programme and 'The Eight-point Regulation of the Centre' impacted ivory trade dynamics. China's 'Ecological Civilization' programme seeks to alter production and consumption modes and lifestyles to protect and enhance the environment.

2. The policy context and our approach

Understanding the linkages between elephant conservation and trafficking in ivory is handicapped by inadequate long-term data on prices, substitute commodities and enforcement action (Burn et al., 2011). Although we recognize a number of drivers are connected to poaching levels such as price, poor governance (Bennett, 2015) and the impact of policy interventions (Hsiang and Sekar, 2016), the full complexity is difficult to examine in quantitative terms as large, long-term datasets are required to explore the complex systems and dynamic interacting processes that operate in illegal trade. These are currently lacking. Previous studies that have relied purely on statistical inferences from existing data have been severely criticized (Hsiang and Sekar, 2016) for failing to incorporate all known major drivers of poaching including demand, enforcement effort (Underwood and Burn, 2016), and which is partially confounded by unobservable changes in markets and law enforcement effort (Gao and Clark, 2014).

Hence, in this study we attempt to present a more holistic analysis of data trends salient to dynamics of poaching and its links to elephant poaching by combing new and original data with official government data on illegally traded ivory seized by Chinese Customs from 2001 to 2017, and corresponding time series data on the price of illegal ivory in China and its close substitute, jade, and China's economic data. To enrich our understanding of price movements and market drivers we also interviewed managers of legal ivory carving factories in China, which combined, represent over 50% of the nation's total gross production of carved ivory. As no official or reliable records are kept for price data we researched secondary data for illegal ivory prices for the period 2006 to 2017 from various websites and established average price trends over this time period.

The datasets we drew on comprise the following:

1) The proportion of illegally killed elephants

The proportion of illegally killed elephants (PIKE) data is derived by a cause of death examination at the site and can be scaled up to the sub-regional and continental levels to estimate numbers of elephants killed and absolute poaching rates (CITES, 2017a; 2017b). The proportion of illegally killed elephants is depicted in Fig. 1a and has been increasing since 2005 (Fig. 1a).

2) Seizure data

Fig. 1b describes ivory seizure data from Chinese Customs. The data includes original seizure data of illegal ivory and carvings recorded by Chinese Customs from 2001 to 2017. The officers responsible for seizures entered the data when the seizures occurred.

3) Price data

A major limitation to understanding illegal wildlife trade is the failure of CITES to require Parties to the Convention (i.e. nation states) to collect market price data, despite its importance to understanding illegal trade dynamics (Challender et al., 2015; MacMillan and Han, 2011). Hence, we established the trend in average illegal ivory prices from 2006 to 2017 from various online sources. Price data on raw ivory or ivory carvings traded illegally is difficult to obtain so we collected the price data of illegal ivory in general.

Prices of Hetian jade, a close substitute for carved ivory were obtained from market information provided by Xinjiang Province, which is the centre for Hetian jade carving in China. Fig. 1c shows that the price of illegal ivory was increasing until 2013, but fell dramatically thereafter. A similar trend can be observed with Hetian jade of all qualities and sizes (Fig. 1d and e).

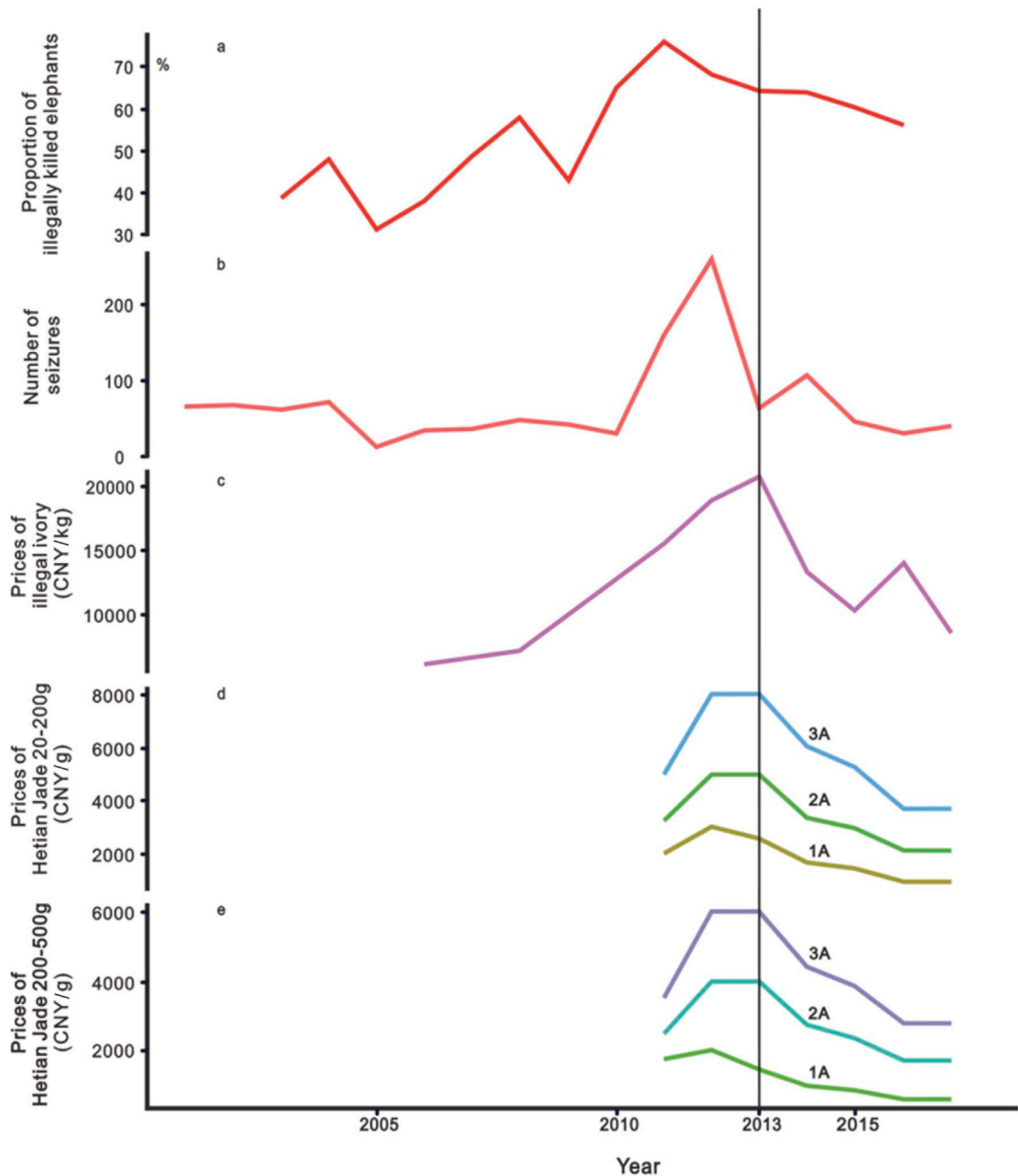


Fig. 1. **a** Proportion of illegally killed elephants from 2003 to 2016 based on MIKE data. https://www.cites.org/eng/prog/mike/data_and_reports. **b** Trend of ivory (including ivory carvings) seizures 2001 to 2017 from China's General Administration of Customs. **c** Trend of prices of illegal ivory from 2006 to 2017. **d,e** Trend of Hetian jade prices from 2011 to 2017 (3A, 2A, 1A represents different levels of jade, 3A is the highest level see <http://www.cnhetianyu.com/upload/xinxilianmeng/zhidaojia.html>).

4) China's economic data

China's economic data, including China's GDP, PCDI (Per Capita Disposable Income), growth rate of GDP, growth rate of PCDI and Gini coefficient from 2008 to 2017, were obtained from the website of National Bureau of Statistics of China (Fig. 2).

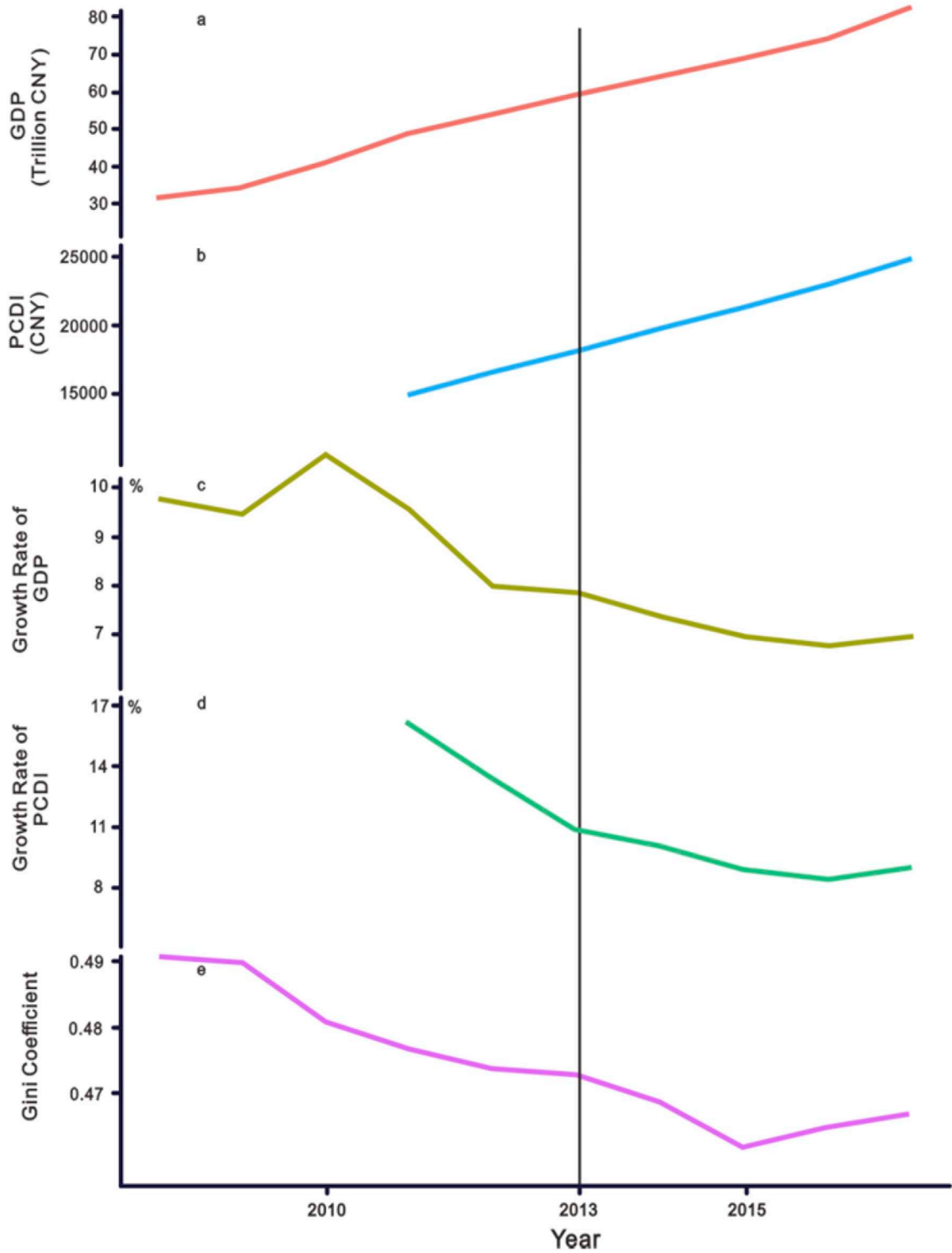


Fig. 2. GDP from 2008 to 2017 based on NBSPRC (National Bureau of Statistics of China) <http://data.stats.gov.cn/ks.htm?cn%C01&zb%A0501>. b PCDI from 2011 to 2017 based on NBSPRC (National Bureau of Statistics of China) <http://data.stats.gov.cn/easyquery.htm?cn%C01&zb%A0A01&sj%2016>. c Growth rate of GDP from 2008 to 2017 based on NBSPRC (National Bureau of Statistics of China) <http://data.stats.gov.cn/ks.htm?cn%C01&zb%A0501>. d Growth rate of PCDI from 2011 to 2017 based on NBSPRC (National Bureau of Statistics of China) <http://data.stats.gov.cn/easyquery.htm?cn%C01&zb%A0A01&sj%2016>. e Gini Coefficient from 2008 to 2017 based on NBSPRC (National Bureau of Statistics of China) <http://www.stats.gov.cn/>.

5) Two surveys of Chinese ivory carving enterprises.

Interviews of the first survey were carried out by E-mail during March 2016 based on a semi-structured questionnaire. In total 26 out of all 34 officially recognized legal ivory carving enterprises took part, representing over 50% of total output of carved ivory in China. Interviews of the second survey were carried out by telephone during September 2017 based on a structured questionnaire, 25 of all 34 officially recognized legal ivory carving factories took part.

3. Ivory trafficking, market dynamics and China's response

To further enforcement ivory management, since 2008, the Chinese government, in collaboration with international organizations, began a series of initiatives to eliminate wildlife products entering China illegally (for example, China participated in the 'Trans-regional Joint Operation' against great apes and other endangered species organized by WCO (World Customs Organizations) in Jan–Feb. 2011) and Chinese Customs Agencies took steps to intercept illegal trafficked ivory. Consequently, ivory seizures dramatically rose in 2011 and 2012 (Fig. 1b). These enforcement measures had an immediate effect on suppressing the tendency of illegal trade (CITES, 2013; Xia, 2015), but the prices of illegal ivory rose quickly (Fig. 1c) probably due to restricted supply and as a result of investor speculation in raw ivory (Harvey et al., 2017). The increasing price may be one of the main reasons for the increasing poaching rate of elephants (Fig. 1a).

Around 2013/14 the situation changes dramatically, with the illegal price of ivory falling. Evidence from our survey of ivory carving establishments clearly points to two crucial factors at play here. There are launch of China's drive towards 'Ecological Civilization' (EC) and the announcement of 'The Eight-point Regulation of the Centre'. The EC initiative was proposed in the 18th National Congress of the Communist Party of China (CPC) in November 2012. The 18th National Congress of CPC report raised public awareness of the need to conserve resources, protect the environment and promote ecological progress, and foster a social atmosphere of practicing moderate consumption and cherishing the ecological environment (Hu, 2012). It signaled an integration of ecological considerations into all aspects of Chinese policies for economy and society and recognized the importance of adjusting human production and consumption modes and lifestyles to protect and enhance the environment (Yu, 2013; Li et al., 2014). Soon after 'The Eight-point Regulation of the Centre' was announced in December 2012 to reduce bureaucracy, extravagance and undesirable work habits (Political Bureau of the CPC Central Committee, 2012; PTI, 2015). Also the CCDI (Central Commission for Discipline Inspection) established a monthly reporting system since August 2013 to monitor the implementation of 'The Eight-point Regulation of the Centre' nationwide (PTI, 2015). Associated measures relevant to ivory include restrictions on advertising luxury products from February 2013 by China's State Administration of Radio, Film and Television (The State Administration of Press, Publication, Radio, Film and Television of the People's Republic of China, 2013) and a crackdown on the gray market for ivory, together with other initiatives had a significant impact on consumer spending on luxuries and expensive gifts. These unprecedented policies and their powerful implementation also reduced demand from speculation. During this period there was also a marked slowdown of the annual average growth of luxury spending in China falling from +30% in 2011, to -1% in 2014 (Gao, 2013; Tang, 2015) with overall spending by Chinese consumers of high net worth on gifts down by 25% (Hurun Report, 2014). For example, the consumption share of pre-paid shopping card expenditures in top quality department stores decreased from 30% in 2012 to 15% 2013, and to just 10% by 2014 (Tang, 2015). As can be seen in Fig. 1d and e, the prices of another important luxury good, Hetian jade, also fell in a similar way to ivory.

The decreasing of ivory and jade prices can't be simply attributed to the slow growth of China's economy because China's GDP and PCDI (Fig. 2) have been increasing while the proportion of illegally killed elephants has fluctuated (Fig. 1) since 2008. Furthermore, the temporary slow growth of GDP and PCDI 2013 to 2016 might be related to the construction of 'Ecological Civilization' and the implementation of 'The Eight-point Regulation of the Centre', which constrained the power of officials (Wang, 2014) and the consumption of 'the three public expenses' (buy and use cars, travel overseas and host meetings) and reduced the consumption of high-end restaurants and luxury goods (Li and Cheng, 2013; Yang and Chang, 2014) and regulated the order of income distribution (Wang, 2014). Since 2013, Gini coefficient had a significant decrease (Fig. 2), indicating the decreasing inequality in China, which is the direct results of EC and 'The Eight-point Regulation of the Centre' (Wang, 2014).

Information provided by the managers of Chinese ivory carving factories also support the 'demand reduction' narrative with the majority indicating that the peak year for expensive ivory carving sales was 2013 (Fig. 3). Since then there has been a significant slump in demand for carvings, especially for larger carved ivory pieces typically used as luxury gifts, with consumer demand now concentrated on smaller, less valuable ivory carvings. Some managers mentioned that EC related campaigns have led many young people in China to believe that consuming ivory carvings is 'shamed' and have adopted negative attitudes toward ivory carving purchase. Taken together, this evidence suggests that recent falls in ivory prices have clearly been driven by demand management measures in China.

We also questioned ivory carving enterprises (in China, most of ivory carvings enterprises not only operate ivory but also other products business) about the impact of the domestic ban on ivory carving and found that around half would downsize their business to survive while around one quarter reported they could cease trading (Fig. 4a). The remainder would diversify their other business activities after ivory trade ban. And now all ivory carvings factories in China had banned their ivory business. However, none of the enterprises believed that the domestic ban would end poaching, with most of the view that

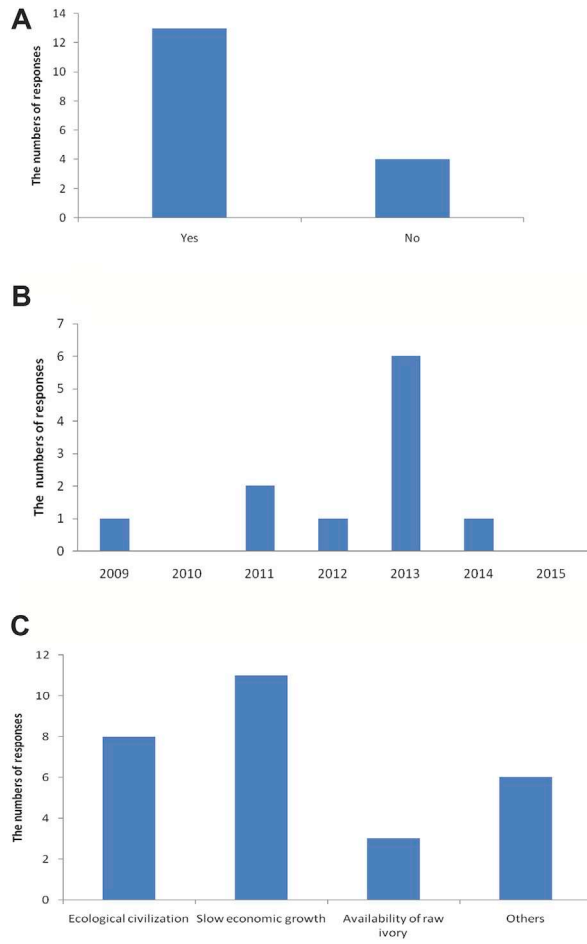


Fig. 3. a: Has there been a big change of ivory carvings sales in recent years? **3b**: In terms of sales in the last 7 years what has been the peak year? **3c**: What were the drivers of slower sales since the peak year?

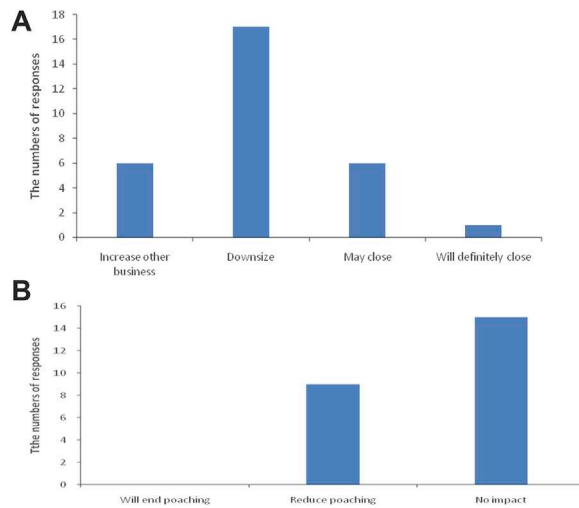


Fig. 4. a: What will be the impact of the ivory ban on future activities of the enterprise? **4b**: What do you think will be the impact of the ivory ban on future elephant poaching activities?

poaching would continue as before as elephants are killed for many reasons (Fig. 4b) such as property right and poor governance.

4. Towards global governance on illegal ivory trade

Although we have shown how China has made significant interventions to curtail elephant poaching, the proportion of illegally killed elephants remained above the long-term average, thus it may be too early to contemplate an end to poaching. This is because the diverse drivers (including property rights, criminal profiteers, speculative investors, and demand from end consumers) at play combined with factors that facilitate the proliferation of poaching and trafficking in other countries (including poor governance, inadequate enforcement). In our view, unless there are stronger and more coherent global efforts to implement effective law enforcement by closing all ivory markets against the speculative demand from other countries and other poaching drivers, we can expect the threat to the African elephant to remain.

In recent years there have been other notable steps by individual state and collectively in international agreement taken to regulate the ivory trade, for example by the U.S and similar measures within CITES that have been mandated of Parties in various Resolutions (Res. Conf. 10.10 (Rev. CoP17); Res. Conf. 17.4) as part of the National Ivory Action Plan (NIAP) process. While the closure of domestic ivory markets in China represents a step toward achieving an effective global trade ban, such action should be supported and encouraged by the global community (Witemyer, 2016) and other countries also need to act to curtail their domestic markets in ivory products (Knights, 2018). A global consensus is growing for a complete ban on trade in ivory to combat elephant poaching (Sekar et al., 2018). Similar coordinated actions have worked before; For example, the EU ban on the importation of wild birds into Europe in 2007 following the outbreak of H5N1 avian influenza. However the dynamics and politics of illegal trafficking of ivory from Africa, including the persistence of incentives for individuals to poach in Africa (Nkoke et al., 2017), suggests that we are now entering uncharted territory for global governance of this high profile and valuable trade because of some important factors such as speculation from other countries and criminal networks.

Acknowledgements

We thank China's General Administration of Customs for the seizure data of ivory. We thank the program of 'Research on Wild Animal Smuggling Situation and Integrated Management System for Case Information' by China CITES Management Authority. We also thank Kirsten Conrad, Wei Ji and Daniel Stiles for critical discussions and reading of the manuscript.

Author Contributions X. Z. conceived the project; X. Z. and D. C. M. oversaw all analysis, and led the drafting of this paper. All authors contributed to the analysis and interpretation, and commented on the draft paper, focusing as follows: Q.W. and X. C., data collection and analysis and charts. Y. J., Z. Z., Z. W. and Z. C., data collection. W. Z. and Z. Z. material flows.

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