



The dissemination of relevant information on wildlife utilization and its connection with the illegal trade in wildlife

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Abstract We analyzed the generation and dissemination of relevant information on wildlife utilization based on the African bush elephant (*Loxodonta africana* Blumenbach.), the tiger (*Panthera tigris* L.) and the totoaba, a species of marine fish, (*Totoaba macdonaldi* Gilbert) as examples, whose populations are more threatened by the illegal wildlife trade. We compared the illegal trade in wildlife with related information in order to find possible associations, searched for relevant information on major international websites to summarize similarities in information production and dissemination, and used a “Zhiwei” dissemination analysis platform to analyze the dissemination of information

circulated at Microblog. The results show that the most influential information related to the trade in wildlife is mainly generated from news media websites and new self-media platforms, usually from non-governmental organizations concerned with wildlife protection. The main factors that affect the depth and breadth of disseminating relevant information on wildlife utilization include the participation of relatively influential opinion leaders, the verification ratio of forwarding users, the number of followers, and affective identification. Misleading information can stimulate and promote poaching and smuggling, regardless of their real market demand or their products. Therefore, all links in the course of information dissemination should be carefully examined in order to purify the information environment and reduce adverse effects of misleading information on wildlife protection.

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Keywords Wildlife · Illegal trade · Misleading information · Dissemination

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Introduction

The unsustainable trade in wildlife is an important reason for much of the loss of global biodiversity (Harris et al. 2017). The illegal wildlife trade, together with illegal logging and the illegal, unreported, and unregulated (IUU) fishing activities, are increasingly serious due to high profitability, which affects the stability of ecosystems and the quality of ecological environments, and has other negative consequences including disease transmission, species invasion, and even a threat to transnational security (Gómez and Aguirre 2008; Wyler 2008; Lopes et al. 2018). According to the 2017 Global Financial Integrity Report, the illegal trade in wildlife has become the largest global illegal trade after

transnational organized criminal activities such as drug and arms smuggling (IFAW 2019).

Although numerous efforts have been made by the international community to combat the illegal wildlife trade, it continues for many protected species (Jiang 2013; Challer and MacMillan 2014). Factors that drive this trade are global population growth and increased wealth, better transportation networks, differing levels of legal loopholes and enforcement dilemmas in various countries, limited government capacity to tackle poaching and smuggling, varying degrees of corruption, a growing demand for illegal wildlife products, and the public's lack of awareness of the consequences of this demand (Nijman et al. 2018; Sadovy de Mitcheson et al. 2018; Martyr 2020).

Understanding the factors that affect consumer demand is crucial to addressing the illegal wildlife trade (Veríssimo et al. 2020). Most of the research on the drivers of the illegal wildlife trade has focused on consumer demand and neglected the extensive role of information. In the field of wildlife protection and utilization, research on information has mainly focused on: (1) how to use accurate information and its effective dissemination through scientific research to positively influence policy making; and, (2) how to reduce consumer demand by using relevant information when public opinion has a particularly obvious impact on protection policies (Phillis et al. 2013; Wallen and Daut 2018; Thomas-Walters et al. 2020). Social media has become an important platform for online wildlife trade and an important channel for the dissemination of market information (Hinsley et al. 2016; Vaglica et al. 2017). Previous studies have evaluated the trend of illegal activities and factors that affect consumers' preferences by monitoring information on online wildlife trade in order to formulate measures to reduce the demand for protected species (Hinsley et al. 2015; Siriwat and Nijman 2018; Sung and Fong 2018). The stated aims of media and non-governmental organizations (NGOs) are to disseminating relevant information to the public through education, advertising and marketing activities to help them establish the concept of wildlife protection and to persuade consumers to stop using wildlife products, thus reducing demand (Daut et al. 2015; Wang 2016b; Sun and Xie 2019).

However, we still have a considerable knowledge gap in understanding consumers' motivation for their involvement in the illegal trade in wildlife (Hinsley et al. 2015; Thomas-Walters et al. 2020). In reality, the needs and motivations of consumers will not directly affect wildlife populations, but will have impact through the supply behavior at the other end of the trade chain. The illegal supply in the wildlife trade consists mainly of poaching and illegal trafficking which directly affect wild populations. At present, research on mechanisms of information dissemination is mostly seen in the fields of finance, credit markets, and corporate innovation technologies, while we are unaware of research on the

use of wildlife-related information to influence the decisions of illegal trade suppliers (de Janvry et al. 2010; Greenwood et al. 2010). However, it is of vital importance in both theory and practice to understand the characteristics of information dissemination in a particular field and the factors that affect the depth and breadth of that dissemination (Zhao and Zeng 2014). Therefore, this study, using as examples the African bush elephant (*Loxodonta africana* Blumenbach.), tiger (*Panthera tigris* L.) and totoaba, a species of marine fish (*Totoaba macdonaldi* Gilbert) (Aziz et al. 2013; UNEP 2013; Dunch 2019), whose populations are seriously threatened by illegal trade, aims to examine the sources of relevant information on wildlife utilization, the processes of information dissemination and the characteristics of participants, as well as its impact with the illegal wildlife trade, especially how it relates to suppliers.

Method

The trend in the amount of relevant information on the utilization of a particular species was compared with the trend in smuggling and poaching of this species in the same time period in order to find the potential association of the two. We also searched for information on major international websites, and summarized similarities in the generation and dissemination of information by comparing the sources of this information sources. The “Zhiwei” dissemination analysis platform (a microblog communication analysis tool based on visualization technology) was used as the visual dissemination analysis tool to analyze the dispersal of information circulated at Sina Microblog (the largest social microblog site in China, social networking platforms that share short, real-time information), and to explore the distribution characteristics of information on wildlife utilization on social media. The data set includes the following sections:

- *African elephant poaching statistics* The number of illegally hunted elephants in Africa from 2005 to 2018 was collected through Monitoring the Illegal Killing of Elephants (MIKE) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). MIKE is a site-based system designed to monitor the trend in illegal elephant killings, build management capabilities and provide information to help a wide range of countries make appropriate management and law enforcement decisions (Schlossberg et al. 2020).
- *The number of cases of smuggling tiger products and the amount of information related to trade in ivory and tiger products* We searched for data with keywords such as “tiger products smuggling cases”, “ivory trade in China”, and “illegal tiger products trade in China” through search engines. However, the search results could not

be used directly because, for example, the same cases were reported repeatedly in different years, and "Ivory Coast" trade information or other irrelevant news were also found. The data was then cleaned up to remove any irrelevant and duplicate information, and trends in the number of cases of smuggling tiger products, the amount of information on the illegal trade in tiger products from 2005 to 2019, and the amount of information on the ivory trade in China between 2005 and 2018 were extracted. The information on the ivory trade in China mainly included "serious illegal ivory trade in China", "expensive price of ivory on the Chinese black market", "large demand from the ivory market in China", "short supply of illegal ivory dealers in China" and so forth. Information on the illegal trade in tiger products in China were mostly "China's reopening of using tiger bones as medicine", "illegal trade stimulated by tiger farming in China" and similar information. Origin 2019 was used for statistical analysis, and SPSS 23.0 for Pearson correlation analysis.

- **Market information and illegal trade statistics of swim bladders of totoaba** We searched for the keyword "totoaba" on major international websites for information on the marketing of swim bladders of totoaba used in traditional Chinese medicine. With the help of the "Zhiwei" dissemination analysis platform that accurately describes the spread of a microblog, we analyzed the dissemination characteristics of information circulated on social media before July 2020, taking Sina Microblog as an example, from the perspectives of key accounts, information exposure, characteristics and emotional values of participating users and other aspects. The information on the weight and value of key cases of swim bladders of totoaba seized between 2017 and 2018 came from the General Administration of Customs of China (<http://www.customs.gov.cn/>). We divided the value by weight of each case to get the price range for the swim bladders.

Results

Comparative analysis of numbers of smuggling tiger product cases, numbers of African elephants poached and the amount of information

For the time frame of this study, the number of poached African bush elephants peaked in 2008, and has been on the decline since reaching a new high in 2012. The trend in the amount of information such as "serious illegal ivory trade and its high price in the black market in China" peaked in 2008 and 2012. Both the trend in the amount of information on the ivory trade in China and the number of poached African bush elephants had a small rise in 2008, and then

increased in 2012 before decreasing (Fig. 1a). Therefore, there was a correlation between poaching itself and the amount of information on poaching. Based on Pearson correlation analysis, the trend in the number of poached African elephants from 2005 to 2018 was significantly positively correlated with the amount of information on the ivory trade in China ($r=0.694$, $P=0.006 < 0.01$) (Table 1).

The trend in the number of tiger product smuggling cases reached a peak in 2010. In 2005, information such as "China's reopening of using tiger bones as medicine", and "illegal trade stimulated by tiger farming in China" began to appear and the number of mentions peaked in 2007 and in 2010. The trend in the amount of information on the illegal trade in tiger products in China and the trend in the number of cases of smuggling tiger products both peaked in 2010 (Fig. 1b).

Analysis of dissemination of market information on totoaba swim bladders

Market information on swim bladders of totoaba

Information such as "huge demand and extremely high price of swim bladders of totoaba in China" and "unit price of swim bladders of totoaba reaching 250,000 US dollars in

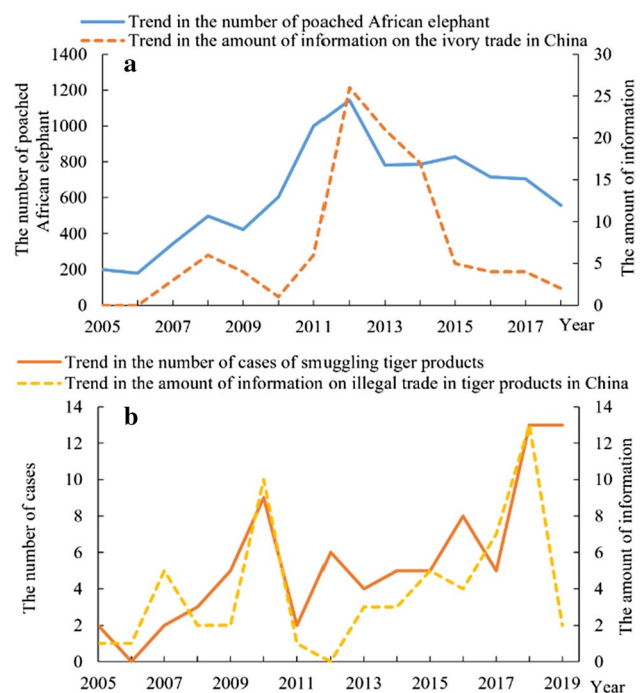


Fig. 1 Trends in the number of elephants poached in Africa versus trends in the amount of specific information (a); and trends in the number of tiger product smuggling cases versus trends in the amount of specific information (b)

Table 1 Correlations between numbers of poached African bush elephants and the amount of information on the ivory trade in China (2005 to 2018)

	Number of poached African elephants		Amount of information on the ivory trade in China	
	Correlations	Significance	Correlations	Significance
Number of poached African elephants	1		0.694**	0.006
Amount of information on the ivory trade in China	0.694**	0.006	1	

**Significant correlation ($P < 0.01$)

China” was widely spread around the world via the Internet. Nine typical statements were selected. The source, content, time and dissemination of these statements are shown in Table 2. Environmental protection NGOs and large-scale news media concerned with wildlife protection played a key role in the dissemination of market information. These social groups mainly publish and forward relevant information through their official certified and personal accounts on social media such as Facebook and Twitter. For example, BBC Earth stated in a video posted on its official Facebook account that “the swim bladder of totoaba is an extremely expensive delicacy in China”. This video has been played a total of 1.15 million times.

Dissemination of market information on totoaba swim bladders on social media

The analysis of the dissemination of market information was made using Sina Microblog as an example. In Sina

Microblog, two representative microblogs with a wide range of dissemination were selected, one from the international non-profit organization “Sea Shepherd Conservation Society” (hereinafter referred to as “Microblog a”), and the other from a globally influential medium “The Economist Group” (hereinafter referred to as “Microblog b”). The “Zhiwei” dissemination analysis platform was used to analyze the two microblogs. See Table 3 for the main content, exposure and exposure scores, total user score and emotional values of the two microblogs. Exposure refers to the number of displays on Microblog user pages. The total user score is the weighted average of the indicators, such as the activity of all forwarding users, the proportion of verification, and the number of followers. The emotional value, ranging from –100 to 100, reflects the intensity of the user’s emotions. The greater the negative value, the stronger the negative emotion, and the greater the positive value, the stronger the positive emotion. The system average was the average calculated based on the microblogs analyzed in the database. The

Table 2 Summary of information on swim bladders of totoaba

Source of information	Information content	Time	Dissemination
Sea Shepherd Conservation Society (Facebook)	(Video) The swim bladders of totoaba can fetch more than \$10,000 kg ⁻¹ on the Chinese black market	Apr. 2017	It has been played 24,000 times and garnered 389 thumb-ups and 12 comments
Environmental Investigation Agency (Facebook)	Illegal gill nets are killing Vaquita for totoaba whose dried swim bladders are very popular in China	Sep. 2017	A total of 37 thumb-ups and 40 shares
Greenpeace (Facebook)	(Video) Mexican fishermen have designed a net catch of totoaba to meet huge demand in China	Sep. 2017	It has been played about 200,000 times
BBC Earth (Facebook)	(Video) The swim bladder of totoaba is an extremely expensive delicacy in China	Dec. 2017	It has been played about 1.15 million times
CNN money (Google news)	(Video) The bladders belonged to a highly protected species of fish in Mexico, the totoaba, which are valued at up to \$250,000 each on the black market	Dec. 2017	CNN Business Shared this video three times on its Facebook account in December 2017, with a cumulative total of 56,000 views
Mogaznews (Google news)	A whole bladder can sell for up to \$250,000 once it reaches China	Dec. 2017	
Homeland Security (Google news)	Mexican cartels are now making up to \$250,000/kg of something else—fish bladders in China	Jul. 2018	
Viva Vaquita (Twitter)	On the black market, a single swim bladder of totoaba can be worth as much as \$250,000	Jul. 2018	Got 22 thumb-ups and 19 shares
Brooke Bessen (Google books)	<i>Vaquita: Science, Politics, and Crime in the Sea of Cortez</i> : A totoaba fisherman can earn up to \$250,000 for a single bladder in China	Sep. 2018	Nonprofit Tiergarten freunde Nürnberg Shared the book on Facebook account

Table 3 Microblog content, the comparison of various indicators and the system average

Microblog	Main content	Exposure (score)	User total score	Emotional value
Microblog a	The totoaba's swim bladders are known as "aquatic cocaine", and can be sold for as much as \$100,000 kg ⁻¹ on the Chinese market	14.22 million (71)	67	71
Microblog b	Dried totoaba's swim bladders are made into top-quality fish maw, which can fetch up to \$20,000 kg ⁻¹ on the black market in Hong Kong	8.9 million (69)	68	54
System average		(32.5)	45	30

results show that the exposure scores, total user scores, and emotional values of the two microblogs were significantly higher than the system average. In addition, the comprehensive impact index of the two microblogs is 71 and 73 (the maximum score is 100), which indicates that the two microblogs have a great influence on both depth and breadth of information distributed.

The key users of Microblog seen from the dissemination paths diagram were "Jiangshixiaodaolong", a well-known popular science writer who had a contract with We Media ("We Media" refers to the way in which the general public releases information to the outside world through the Internet and other channels), and was verified by Microblog with more than 7.2 million followers, and "Chinese Field Conservation Alliance", a public welfare environmental protection organization for the purpose of scientifically protecting wild cats in China, and verified by Microblog with more than 1.2 million followers (Fig. 2). In addition to the Economist Group and its official Chinese website on Microblog have expanded their influence by reposting their own microblog, the key user who disseminated Microblog b included "Heil-injiguanshe", a well-known scientific popular science blogger with more than 2.3 million followers (Fig. 3).

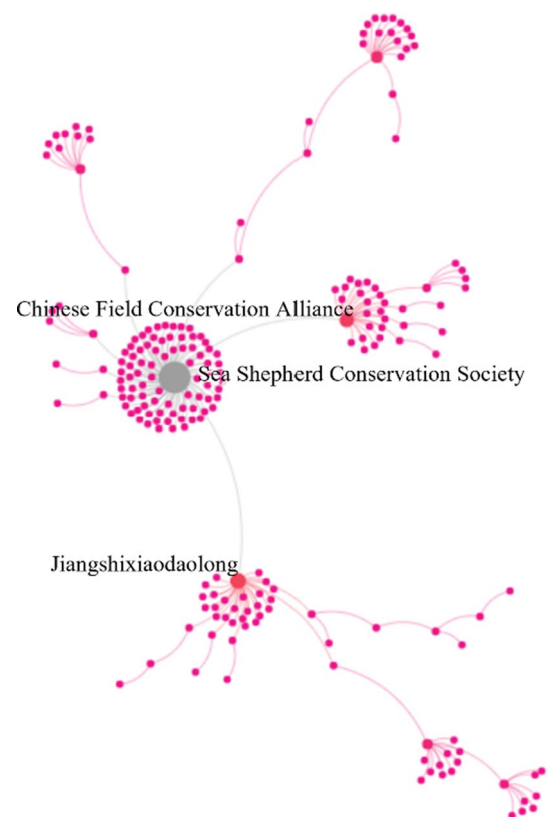
Seizure of totoaba swim bladders

In 2017, the weight of totoaba swim bladders seized was about 375 kg and this increased significantly to about 6000 kg in 2018 (Fig. 4). With the value of many seizure and the weight of the seizure, the price could be roughly calculated from \$ 3000 to \$ 12,000 kg⁻¹.

Discussion

Generation of relevant information on wildlife utilization

From the source and dissemination of market information on totoaba swim bladders, the most influential information

**Fig. 2** Diagram of the dissemination path of microblog a

mainly comes from large news media companies and environmental protection NGOs concerned with wildlife protection. In recent years, social organizations involved in wildlife protection have played an increasingly significant role in national efforts of protecting wildlife and biodiversity. Through timely follow-up of relevant news, these organizations can supplement or augment wildlife news materials collected by traditional media, publish comments from the public's perspective to win their support, and influence public opinion, thus affecting management decisions on wildlife protection and utilization by governments (Lee et al. 2012; Liao et al. 2015; Raja-Yusof et al. 2016). However, these

Fig. 3 Diagram of the dissemination path of microblog **b**

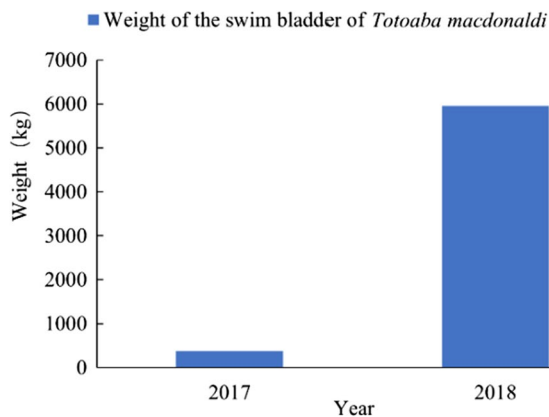
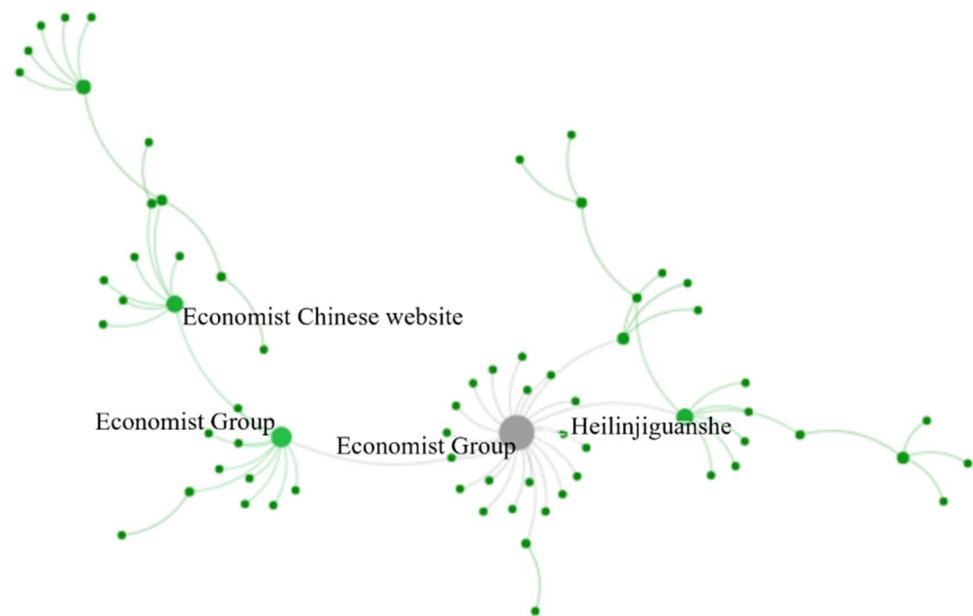


Fig. 4 The weight of swim bladders of totoaba seized in 2017 and 2018

social organizations differ greatly in professional focus, resources, and effectiveness (Lawrence 2014). Most NGOs have qualified experts or volunteers with sufficient professional knowledge but some staff of NGOs are activists with more interests than knowledge. The threats faced by shark populations and by misleading information about protection programs are mainly from non-professional representatives of NGOs (Shiffman and Hammerschlag 2016).

Based on the source of market information on the value of swim bladders of totoaba, it was found that this information is mainly generated from news media websites and new We Media. In the context of media integration, the media have undergone profound adjustments (Zhang 2015). In the traditional media environment, subjects of public opinion transmit information to the public through the intervention of media agenda setting, while in the new media environment,

We Media platforms such as Twitter, Facebook, blog, Microblog can become sources of information themselves (Fu and Tian 2013). These We Media platforms are characterized by low thresholds for publishing content, strong autonomy, convenient information exchange and fast dissemination times which provide the public with sufficient opportunities for expression and interaction (Lv 2014; Hou et al. 2018). However, due to the disintermediation characteristics of these new media, almost all ordinary We Media users can release unverified information according to their will which may contain much misleading information (Al et al. 2018).

Information about the illegal trade in ivory is often associated with changes in conservation and utilization policies. According to the requirements of the relevant CITES resolutions, China has stepped up its crackdown on the illegal ivory trade and the number of seized ivory smuggling cases has increased (Wen 2016). Some people believe that the large number of seizures due to the serious illegal trade has led to an increase in information such as "the serious illegal trade in China's ivory market" since 2006. According to government sources, China has implemented a series of measures to strengthen the standardized management of ivory processing and sales and law enforcement supervision, which has effectively curbed the criminal cases of smuggling and illegal processing and sales of ivory and its products, prompting the 57th CITES Standing Committee in July 2008 to approve China's import of a batch of raw ivory (SFA 2008). Since then, the amount of information such as "large demand, serious illegal trade and rapidly increasing price on China's black ivory market" has increased again, which reached the peak of public opinion in 2012. In the 16th CITES Conference of Contracting Parties held in March 2013, countries that were considered to be in need of

improvement in their measures to combat the illegal ivory trade were required to submit rectification plans within two months, and the amount of relevant information decreased afterwards (CITES 2013). The State Forestry Administration of China and the General Administration of Customs publicly destroyed 6.1 tons of ivory confiscated by law enforcement in Dongguan City, Guangdong Province on January 6, 2014. Since that event, the amount of information dropped sharply. Studies have shown that the number of ivory smuggling cases seized in China ranks only seventh in the world, but the number of reports by foreign media is significantly higher than for countries that have more ivory smuggling cases (Wen et al. 2016). This phenomenon may be caused by factors such as differences in culture and political ideology of various countries (Underwood et al. 2013).

Information on tiger products is mainly generated on the demand in the Chinese market and in discussions on the role of legal trade protection. After 2005, there were calls for using artificially-bred tiger bones in medicine (Southern Weekend 2005). Some organizations claimed that China would or might reopened the use of tiger bones for medicine and that tiger breeding had promoted market demand for tiger products and stimulated illegal trade (Zhang 2005). This unconfirmed information spread through various channels and reached the peak of public opinion before the 14th CITES Conference of Contracting Parties in 2007 and the 2010 Global Tiger Protection Summit. Related public opinion quickly faded after the Global Tiger Protection Summit 2010. In the 14th CITES Conference of Contracting Parties, the contracting parties that had farmed tigers on a commercial scale were requested to take measures to keep the size of breeding populations at a level that only supported the protection of wild tigers, while farming for the purpose of using tiger parts or derivatives should be prohibited (CITES 2007). In 2010, China expressed its firm support for the plan to restore global wild tigers at the Global Tiger Conservation Summit.

Dissemination of information on wildlife utilization

According to the diagram of the dissemination path of the microblog, it was found that the key users who disseminate information on social media on the use of wildlife are mainly environmental protection NGOs and popular science bloggers with considerable influence and a large number of followers. Opinion leaders, who often provide information on social media and effect the behavior and attitudes of others, play an important intermediary role in achieving mass communication and are important promoters of public opinions (Hu 2012; Cai et al. 2014). As the main opinion leaders in the field of wildlife protection, animal protection organizations become the guide for public sentiment on social media by increasingly mobilizing media through a variety of new

media communication channels using values to gather public opinion and mobilize social resources, and enlisting influential third parties such as celebrities, well-known entrepreneurs and senior media professionals to make their views widely known (Huang and Zhun 2014). The reposted comments of popular science workers, wildlife protection enthusiasts and other opinion leaders have enabled the dissemination of original information to increase geometrically throughout their many networks, which enables and foments desired reactions, including moral indignation and a frenzy to take action.

From the characteristics of users who disseminate market information on totoaba swim bladders, non-key users who subsequently participate in the dissemination of information on wildlife utilization are relatively active with a higher proportion of verification and a larger number of followers. When ordinary users receive information about something that they have not experienced, their judgment on the credibility of the information usually comes from the characteristics of the information provider, such as the provider's verification, membership and the number of followers (Zhang et al. 2014a, b). Therefore, the more verified users with a large number of followers participating, the longer the dissemination chain and the greater the amount of forwarding by ordinary users in the process of spread, resulting in greater exposure of information. As We Media continues to develop and becomes more influential, the public has increasing opportunities to express themselves and interact with each other. The grassroots are no longer the "silent majority"; rather, they hope to influence public opinion information through their own forwarding behavior, thus having a significant impact on the current situation of wildlife protection and management (Huang et al. 2015).

The results of the study also show that users who repost microblogs related to totoaba have strong positive emotions, indicating that the public is more perceptive on the issue of wildlife protection and utilization. A number of studies have shown that the degree of effective commitment of information influences the degree of persuasion and willingness to spread information (Pezzo and Beckstead 2006; Kim et al. 2020). Headlines and content that can arouse strong emotions and stimulate motivations are more likely to attract attention than objective and neutral news (Shi and Ye 2019). Due to the increasing awareness of wildlife protection from all walks of life and the public's sympathy for animals, problems related to wildlife can easily arouse emotional identify and make the public have a strong willingness to spread. According to the emotional infection theory of psychology, users can easily affect each other emotionally leading to widespread concerns and discussion among the public (Wang 2016a). Nowadays, shallow reading is prevalent, and the public is accustomed to using fragmented time to obtain simple and concise information. It is difficult for readers to

conduct in-depth analysis of some events as they react emotionally to headlines or short phrases which are designed to draw attention (Wang 2017). Therefore, the public is susceptible to the influence of opinion which has been deliberately designed to elicit an emotional reaction. The personal and emotional attributes of the audience support the formation of homogenous communities, that is, the “echo wall effect” (Wen and Zhang 2018). A strong group polarization emerges when people share and discuss the same opinions, isolated from different or opposite opinions (Pierri et al. 2020).

According to research, wildlife protection NGOs play an important role in the generation and dissemination of information. Therefore, it is incumbent on NGOs and other groups who transmit information to collect data for communications strategies as scientifically and objectively as possible when they conduct research, particularly given that their information will be broadly shared. This especially applies to We Media platforms, as their use has proliferated, and to opinion leaders such as well-known science bloggers or celebrities. It is expected that experts and scholars in the field of wildlife conservation understand their influence in shaping public debate. Experts and scholars can use We Media platforms in a timely manner to carry out science popularization education such as setting up personal We Media accounts to release scientific and accurate viewpoints so as to help the public view the rationality of wildlife protection and utilization (Yang 2016).

Association between misleading information and the illegal wildlife trade

Due to differences such as the individual characteristics of the audience and the environment in which the information is received, information such as a high demand or high price of a species of wildlife or its products in a certain market can be misleading. For example, “serious illegal ivory trade in China”, “a large demand from ivory market in China”, and “reopen the use of tiger bones as medicine in China” can mislead the judgment of suppliers of the illegal wildlife trade.

The results of this study show that the number of poached African bush elephants is positively correlated with the amount of misleading information such as “serious illegal ivory trade in China”. The dissemination of misleading information may be one of the reasons for the increase in the number of poached elephants. Hunters are influenced by misleading information and subsequently believe that the demand for ivory in the Chinese market is considerable, so that they seek to satisfy what they have been led to believe is the demand, which then leads to an increase in the number of illegal hunts. There was common opinion in the West that the sale of ivory to China by South Africa, Namibia, Botswana and Zimbabwe in 2008 triggered a surge in Chinese

consumers’ demand for ivory sculptures (Gabriel et al. 2012). However, there is a lack of evidence that the volume of market transactions had risen to a level that matched the amount of smuggled ivory, and the price of ivory has not risen as sharply as claimed (Moyle 2013).

The dissemination of misleading information is also one of the influencing factors of the illegal trade in tiger products. According to our research, the number of cases of smuggling tiger products is positively correlated with the spread of information such as “China’s reopening of using tiger bones as medicine and illegal trade stimulated by tiger farming in China”, and the number of cases of smuggling tiger products decreases as public opinion fades. Since 2000, there have been several cases of foreigners being charged for attempting to carry tiger products out of the country, as they failed to find buyers when they smuggled the products in (Wang 2007). Some foreigners who bring tiger products for sale in China are active suppliers, acquiring the products first based on information that there is a high demand, and then “pushing” them to market. Misleading information creates a supply-driven market for illegal goods, and that there is speculation that the market will reopen, stimulating prospective stockpiling. In fact, China has not allowed tiger bones to be used in traditional medicine, continuing a previous policy (Xu 2018). Increased poaching is, therefore, likely to be based on speculation, driven by misleading information.

The illegal fishing and trade of totoaba has also been affected by misleading information. From the end of 2017 to the end of 2018, widely disseminated information such as “the price of swim bladders of totoaba reaching as high as \$250,000/piece in China”, and “a huge demand and extremely high price of totoaba in China” may lead fishermen and others to believe that the catch of a single totoaba can bring huge profits, thereby stimulating a sharp increase in poaching, which likely to be one reason why Chinese customs seized 16 times more totoaba swim bladders in 2018 than in 2017 (Fig. 4). From several cases of totoaba smuggling uncovered by the Chinese Customs Anti-smuggling Department in 2018, it was found that prices of smuggled totoaba were different due to differences in quality and size but were all far lower than the \$250,000 rumored to be in North America (Cui 2020). Although information on wildlife utilization released by environmental protection organizations and news media exposed the cruel realities of illegal hunting and trade, it also likely stimulated part of the public’s profit-seeking psychology, which in turn leads to the intensification of illegal hunting and trade and thus poses a great threat to the survival of wildlife.

In order to achieve the goal of protecting wildlife, the international community must work together, not only to strengthen the supervision of the wildlife market and crack down on illegal markets, but also to remove from the information environment all links to the information

dissemination chain combined with the knowledge of journalism and psychology, based on Laswell's "5 W" model of the dissemination process, i.e., Who → Says what → In which channel → To whom → With what effects (Guo 2014). News and publicity departments at all levels should attach importance to the function of guiding public opinion, give full play to the important role of mainstream media in this guidance and create a positive social environment for fostering public opinion. The We Media platforms should establish information filtering and verification mechanisms or real-name systems, and create a dedicated accounts for refuting rumors to suppress misleading information in the early stage of occurrence and dissemination. The information released by the news media or businesses should be scientific and objective, to prevent excessive exaggerating and play up information on the wildlife market from misleading the public.

Conclusion

This study takes three wildlife species whose populations are severely affected by illegal trade as examples to analyze the source and dissemination characteristics of relevant information on wildlife utilization and its association with the illegal wildlife trade. The main conclusions are as follows:

- (1) Information on wildlife utilization is mainly from large news media companies and environmental protection NGOs concerned with wildlife protection and is initiated by news media websites and new We Media platforms; the main reasons for this are changes in protection and utilization policies, market demand and discussions on the role of legal trade protection;
- (2) The key users who disseminate information on wildlife utilization on social media are primarily environmental protection NGOs and well-known science bloggers; non-key dissemination users are highly active with a high verification ratio and a large number of followers, which leads to a wide range of information dissemination; users who participate in the dissemination of information related to wildlife have strong emotional expressions;
- (3) Misleading information on wildlife utilization is likely to stimulate the public's profit-seeking psychology and thus aggravate illegal hunting and trade;
- (4) All links in the information dissemination chain should be purified to reduce the influence of misleading information on illegal trade suppliers and the adverse impact on wildlife protection and management.

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