The Dissemination of Relevant Information on Wildlife Utilization and Its Connection With Illegal Trade

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Abstract

Taking African elephant (*Loxodonta africana*), tiger (*Panthera tigris*) and totoaba (*Totoaba macdonaldi*), whose populations are more threatened by illegal trade, as examples, this study aims to analyze the generation and dissemination mechanism of relevant information on wildlife utilization, and explore their association with illegal wildlife trade. We compared illegal wildlife trade with related information in order to find potential associations, searched for relevant information on major international websites to summarize similarities of related information production and dissemination, and used “Zhiwei” dissemination analysis platform to analyze the dissemination of information circulated at Microblog. The results show that the most influential information related to the use of wildlife is mainly generated from news media websites and new self-media platforms, mainly 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 participation of relatively influential opinion leaders, the verification ratio of forwarding users, the number of fans, and affective commitment. Misleading information can stimulate and promote poaching and smuggling of wildlife, regardless of the real market demand for them or their products. Therefore, we should carefully examine all links in the course of information dissemination to purify the information environment and reduce the adverse effects of misleading information on wildlife protection.

1. Introduction

Unsustainable wildlife trade is an important reason for the loss of global biodiversity (Harris et al., 2017). The illegal wildlife trade together with illegal logging and illegal, unreported, unregulated (IUU) fishing activities are becoming increasingly rampant due to their high profitability (Lopes et al., 2018), which not only seriously affect the stability of ecosystem and the quality of ecological environment, but also become potential ways of disease transmission, species invasion, and even a threat to transnational security (Gómez & Aguirre, 2008; Wyler, 2008). According to 2017 Global Financial Integrity Report, the illegal wildlife trade has become the largest global illegal trade after transnational organized criminal activities like drug and arms smuggling (IFAW, 2019).

Although a lot of efforts have been made in the international community to combat the illegal wildlife trade (Jiang, 2013), the illegal trade of many species listed in the appendix to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has failed to be prohibited (Challender & MacMillan, 2014). Factors that drive illegal wildlife trade are global population growth and wealth increase, better transportation networks, different levels of legal loopholes and enforcement dilemmas in various countries, lack of ability of government to tackle poaching and smuggling, corruption affected by different socio-political and cultural backgrounds, continuous demand for illegal wildlife products and the public's lack of awareness of the consequences of this demand (Martyr, 2020; Nijman et al., 2018; Sadovy de Mitcheson et al., 2018).
In the research on the driving factors of illegal wildlife trade, the role of information is easily overlooked. In the field of wildlife protection and utilization, research on information mainly focuses on how to use accurate information and its effective dissemination through scientific research to positively influence policy making (Phillis et al., 2013) and reduce consumer demand by using relevant information when public opinion has a particularly obvious impact on protection policies today (Thomas-Walters et al., 2020; Wallen & Daut, 2018). Since social media has become an important platform for online wildlife trade and an important channel for 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’ preference for traded wildlife by monitoring information on online wildlife trade (Siriwat & Nijman, 2018; Sung & Fong, 2018), in order to formulate measures to reduce the demand for protected species (Hinsley et al., 2015). The media and non-governmental organizations (NGOs) are committed to disseminating relevant information to the public through education, advertising and marketing activities, to help them establish the concept of wildlife protection, and persuade consumers to stop using wildlife products, thus reducing demand (Daut et al., 2015; Sun & Xie, 2019; Wang, 2016).

However, we still have a considerable knowledge gap in understanding consumers’ motivation for illegal wildlife trade (Hinsley et al., 2015; Thomas-Walters et al., 2020). Actually, consumers’ needs and motivation will not directly affect wildlife populations, but have impact through the supply behavior at the other end of the trade chain. At present, research on the mechanism of information is mostly seen in the fields of finance, credit markets, and corporate innovation technology (de Janvry et al., 2010; Greenwood et al., 2010), while how the decision making of suppliers of illegal trade is affected by relevant information on the utilization of wildlife remains to be studied. Besides, it is significant in both theory and practice to understand the characteristics of information dissemination in a certain field and factors that affect the depth and breadth of dissemination (Zhao & Zeng, 2014). Therefore, this study, taking African elephant (*Loxodonta africana*) (UNEP, 2013), tiger (*Panthera tigris*) (Aziz et al., 2013) and totoaba (*Totoaba macdonaldi*) (Dunch, 2019) whose populations are seriously threatened by illegal trade as examples, aims to explore the information sources and causes of relevant information on wildlife utilization, the process of information dissemination and the characteristics of participants, as well as its the relationship with the illegal wildlife trade, especially the relationship with suppliers.

### 2. Methods

We compared the trend in the amount of relevant information on the utilization of a certain species 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. Also, we searched for relevant information on major international websites, and summarized similarities in the generation and dissemination of relevant information by comparing information sources and dissemination, and used “Zhiwei” dissemination analysis platform, the visual dissemination analysis tool, to analyze the dissemination of information circulated at Sina Microblog, and explore the dissemination characteristics of relevant information on wildlife utilization on social media. The data set includes the following:
1) 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 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). MIKE is a site-based system designed to monitor the trend of illegal elephant killings, build management capabilities and provide information to help a wide range of countries make appropriate management and law enforcement decisions.

2) The number of cases of smuggling tiger products and the number of information related to trade in ivory and tiger products. We searched for news year by year with keywords such as “tiger products smuggling cases”, “ivory trade in China”, and “illegal tiger products trade in China” in Google (www.google.com.hk), and summarized trends in the number of cases of smuggling tiger products, the amount of information on illegal trade in tiger products from 2005 to 2019, and the amount of information on the ivory trade in China between 2005 and 2018, after data cleansing and removing duplicate and irrelevant information. The collected 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”, and “short supply of illegal ivory dealers in China” etc. Information on 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 so on. Origin 2019 was used for statistical analysis, and SPSS 23.0 was used for Pearson correlation analysis.

3) Market information and illegal trade statistics of swim bladders of totoaba. We searched for the keyword “totoaba” on major international websites to get information about the market of swim bladders of totoaba. With the help of the “Zhiwei” dissemination analysis platform that can accurately describe the spread of a microblog, we analyzed the dissemination characteristics of information circulated at 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, etc.. 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/). The price range of swim bladders of totoaba was obtained by calculating the case value and weight.

3. Results

3.1 Comparative Analysis of the Number of Cases of Smuggling Tiger Products, the Number of Poached African Elephant and the Amount of Related Information

The number of poached African elephant peaked for the first time in 2008, and had the second peak in 2012 before showing an overall downward trend. The trend in the number of information such as “serious illegal ivory trade and its high price in the black market in China” peaked in 2008 and 2012. The trend in the number of tiger product smuggling cases reached a peak in 2010. In 2005, information like “China’s reopening of using tiger bones as medicine”, and “illegal trade stimulated by tiger farming in China” began to appear, the number of which peaked in 2007 and 2010. It was found that both the trend in the
amount of information on the ivory trade in China and the number of poached African elephant had a
small peak in 2008, and then climbed to the top in 2012 before showing a downward trend. The trend in
the number of information on illegal trade in tiger products in China and the trend in the number of cases
of smuggling tiger products both peaked in 2010 (Figure 1).

Based on the Pearson correlation analysis, the trend in the number of poached African elephant from
2005 to 2018 was significantly positively correlated with the trend in the amount of information on the
ivory trade in China (r = 0.694, P = 0.006 < 0.01) (Table 1).

3.2 Analysis of Dissemination of Market Information on Using Swim Bladders of Totoaba

3.2.1 Market Information of Swim Bladders of Totoaba

After sorting out market information of swim bladders of totoaba on the Internet, it was found that
information like “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 China” was widely spread around the
world. Nine typical pieces of information were selected. The source, content, time and dissemination of
these information are shown in Table 2. Environmental protection NGOs and large-scale news media
companies paying attention to wildlife protection played a key role in the dissemination of market
information on swim bladders of totoaba. These social groups mainly publish and forward relevant
information through their official certified 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 1.15 million times in
total.

3.2.2 Dissemination of Market Information on Swim Bladders of Totoaba on Social Media

The analysis on the dissemination of market information on swim bladders of totoaba on social media
was made by taking 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 media “The Economist Group” (hereinafter referred to as “Microblog b”). We used “Zhiwei”
dissemination analysis platform to analyze the two selected microblogs. See Table 3 for the main
content, exposure and exposure scores, user total score and emotional values of the two microblogs. The
exposure referred to the number of displays on Microblog users’ pages. The user total score was the
weighted average of the indicators such as the activity of all forwarding users, the proportion of
verification, and the number of fans. The emotional value, ranging from -100 to 100, reflected the
intensity of the user’s emotions. The larger the negative value, the stronger the user’s negative emotions,
vice versa. The system average was the average calculated based on the microblogs analyzed in the
database. The results showed that the exposure scores, total user scores, and emotional values of the
two microblogs were significantly higher than the system average. In addition, considering the depth and
breadth of the dissemination of the microblog and various indicators of participating users, the
comprehensive influence index of the two microblogs was concluded, 71 and 73 (total value 100), indicating that the depth and breadth of the influence of the two microblogs were both relatively large.

The key users of Microblog can be seen from the dissemination paths diagram. Key users who disseminated Microblog a were “Jiaoshixiaodaolong”, a well-known popular science writer who had contract with a We Media and was verified by Microblog with more than 7.2 million fans, and “Chinese Felid Conservation Alliance”, a public welfare environmental protection organization for the purpose of scientifically protecting wild cats in China which was verified by Microblog and had more than 1.2 million fans (Figure 2). In addition to the Economist Group and its official Chinese website on Microblog, the key user who disseminated Microblog b included “Heilinjiguanshe”, a well-known scientific popular science blogger with more than 2.3 million followers (Figure 3).

3.3 Situation on the Seizure of Swim Bladders of Totoaba

In 2017, the weight of swim bladders of totoaba seized was about 375kg, and this number increased significantly to about 6000kg in 2018 (Figure 4). Based on the value of many cases and the weight of the seizure, the price of swim bladders of totoaba could be roughly calculated, ranging from ¥20,000/kg to ¥70,000/kg.

4. Discussion

4.1 Generation of Relevant Information on Wildlife Utilization

It can be seen from the source and dissemination of relevant market information on swim bladders of totoaba that the most influential information mainly comes from large news media companies and environmental protection NGOs concerned with wildlife protection. In recent years, social organizations that care about wildlife protection have played an increasingly significant role in the national effort of protecting wildlife and biodiversity. Through timely follow-up of relevant news, these organizations can make up for the lack of wildlife news materials collected by traditional media, make comments from the public’s perspective to win their support, and influence public opinion through media, thus affecting management decisions on wildlife protection and utilization by the government (Lee et al., 2012; Raja-Yusof et al., 2016; Liao et al., 2015). However, these social organizations differ greatly in professionalism, focus, resources, and effectiveness (Lawrence, 2014). Some NGOs employ qualified experts, while others only have non-professionals as members. For example, misleading information on the threats faced by sharks and the corresponding protection scheme mainly comes from non-professional representatives of NGOs rather than scientists (Shiffman & Hammerschlag, 2016).

Based on the source of relevant market information on swim bladders of totoaba, it is found that information related to wildlife utilization is mainly generated from news media websites and new We Media. In the context of media integration, the pattern of media has undergone profound adjustments (Zhang, 2015). In the traditional media environment, subjects of public opinion transmits 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, and Tieba can become sources of information (Fu & Tian, 2013). These new platforms are featured by low threshold, strong autonomy, convenient information exchange, and short dissemination time (Hou et al., 2018), providing the public with sufficient opportunities for expression and interaction (Lv, 2014). However, as these new media are characterized by disintermediation, they are prone to produce a lot of misleading information (Al et al., 2018).

The generation of information related to illegal ivory trade is often related to changes in the protection and utilization policies. According to the requirements of the relevant CITES resolutions, China has stepped up its crackdown on illegal ivory trade, and the number of seized ivory smuggling cases has increased (Wen, 2016), so that since 2006, information such as “serious illegal trade in China’s ivory market” began to increase. 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 ivories (SFA, 2008). Since then, the amount of information like “large demand, serious illegal trade and rapidly increasing price on China’s black ivory market” 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 unfavorable in combating illegal ivory trade were required to submit rectification plans within two months, and the amount of relevant information decreased afterwards. 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 then, the amount of relevant information has 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 that of countries that have more ivory smuggling cases seized (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).

Relevant information on tiger products is mainly generated based on the demand for tiger products in the Chinese market and discussions on the role of legal trade protection. After 2005, there were voices in China calling for using artificially-bred tiger bones as medicine (Southern, 2005). Some organizations claimed that China would or might have reopened the use of tiger bones as medicine and tiger breeding in China 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 opinions quickly faded after the Global Tiger Protection Summit. 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 tiger 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. In 2010, China expressed its firm support for the plan to restore global wild tigers at the Global Tiger Conservation Summit.
4.2 The Dissemination of Relevant Information on Wildlife Utilization

According to the diagram of the dissemination path of microblog, it is found that the key users who disseminate relevant information on the use of wildlife on social media are mainly environmental protection NGOs and popular science bloggers with greater influence and a large number of fans. Opinion leaders who often provide information to others on social media and have the influence to affect behavior and attitudes of others play an important intermediary role in the formation of achieving mass communication and are important promoters of forming many public opinions (Cai et al., 2014; Hu, 2012). As the main opinion leaders in the field of wildlife protection, animal protection organizations become the guide of public opinion 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 seeking help from influential third parties such as celebrities, well-known entrepreneurs and senior media professionals to make their views widely disseminated (Huang & Zhun, 2014). The repost of popular science workers, wildlife protection enthusiasts and other opinion leaders has enabled the dissemination of original information to increase in the form of geometrical growth in the network, which helps the dissemination and fermentation of public opinion on wildlife utilization reach a climax.

It can be seen from the characteristics of users who disseminate relevant market information on swim bladders of totoaba that non-key users who participate in the dissemination of information on wildlife utilization are relatively active with a higher proportion of verification and a larger number of fans. When ordinary users receive an 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 (Zhang et al., 2014), such as the provider's verification, membership and the number of fans (Zhang et al., 2014). Therefore, the more verified users with a larger number of fans participate, the longer the dissemination chain and the greater the amount of forwarding by ordinary users will be in the process of dissemination, resulting in greater exposure of the relevant information. As We Media continues to develop and becomes more influential, the general public has sufficient opportunities to express themselves and interact with each other. The grassroots are no longer the "silent majority"; rather, they hope to influence the dissemination of public opinion information through their own forwarding behavior (Yuan et al., 2015), thus having a slight impact on the current situation of wildlife protection and management.

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 perceptual on the issue of wildlife protection and utilization. A large number of studies have shown that the degree of affective commitment of information influences the persuasive effect and willingness to spread information (Kim et al., 2020; Pezzo & Beckstead, 2006). Headlines and content that can arouse strong emotion and stimulate motivation are more likely to attract the attention of the audience than objective and neutral news (Shi & Ye, 2019). As people from all walks of life become more aware of wildlife protection and show sympathy for animals, issues related to wildlife can easily trigger affective commitment of the public who have a strong willingness to disseminate the information. According to the emotional infection theory of psychology,
users can easily affect each other emotionally, thus leading to widespread concern and discussion among the public (Wang, 2016). Nowadays, shallow reading is prevalent, and the public isaccustomed to using fragmented time to obtain simple and concise information. It is difficult to calm down and conduct in-depth analysis and mining of some events (Wang, 2017). Therefore, the public is susceptible to the influence of public opinion propaganda slogans and thus perceive and spread the relevant information on wildlife emotionally. The personal factors of the audience aggravate the formation of homogenous communities, that is, the whispering wall effect. 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 the research, wildlife protection NGOs play an important role in the generation and dissemination of relevant information. Therefore, NGOs should strive to improve their professional level, seek to collect data scientifically and completely, and make full use of We Media platforms to increase their influence, so as to convey objective and rational concepts of wildlife protection and utilization to the public. Opinion leaders such as well-known science bloggers who have their voice heard in the field of wildlife should fully follow the self-discipline principle of network communication in the process of information dissemination on the Internet, and at the same time cherish their right to speak, in an effort to consciously assume the responsibility of guiding the public opinion. Experts and scholars in the field of wildlife should give full play to the guiding role of public opinion. In the early stage of a potential wildlife hotspot incident, experts and scholars should fully collect and integrate first-hand information on the public incident, and publish scientific and accurate information through journals, news media or establishing personal We Media accounts before the mass media has paid any attention to or reported it, to actively carry out popular science education in order to help the public rationally view the issue of wildlife protection and utilization. The public should cultivate their own critical thinking, hold a dialectical view in judging the relevant information on wildlife utilization so as to avoid and weaken the influence and the sustained effects of misleading information (Yang, 2016).

4.3 Association between Misleading Information and Illegal Wildlife Trade

Due to differences in factors such as the individual characteristics of the information audience and the environment in which the information is received, information such as a large demand or high price of a type of wildlife or its products in a certain market can be misleading. For example, information like “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” will mislead the judgment of suppliers of illegal wildlife trade.

The results of the study show that the number of poached African elephant is obviously 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 African elephant. Hunters are affected by misleading information such as “serious illegal ivory trade in China”, and subjectively believe that the demand for ivory in the Chinese market is huge, so that they would like to take risks in the hope of seeking benefits through active supply, which lead to an increase in the number of illegal hunting. There is a popular 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 has risen to a level that matches the amount of smuggled ivory. In fact, China strictly abides by and implements the CITES Convention, and adopts the most stringent measures in supervising the processing and sales of ivory and its products. Also, the law enforcement and penalties for illegal transactions of ivory and its products are also extremely severe, and there is no shortage of supply in the legal market.

The dissemination of misleading information is one of the influencing factors of illegal trade in tiger products. According to the research, the number of cases of smuggling tiger products has shown an overall upward trend 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”, while the number of cases of smuggling tiger products decrease rapidly as public opinion fades. Since 2000, there have been several cases of foreigners being seized for carrying the tiger products out of the country as they failed to find buyers when they smuggled in. The behavior of foreigners bringing tiger products into the country for sale and peddling tiger products to Chinese tourists by some countries are an active suppliers who raise goods first, driven by relevant information, and then promote goods based on the subjective judgment. In fact, China has continued its previous policies. Not only has it not reopened tiger bones for use as medicine, but it also has continuously improved wildlife protection laws and regulations, protection management systems and law enforcement capabilities, taken strong measures against tiger-related crimes and significantly stepped up efforts to crack down on illegal trade in tiger products, and carried out extensive public education so as to promote the Chinese people's awareness of protecting tigers.

The illegal fishing and trade of totoaba has also been affected by misleading information. From the end of 2017 to 2018, the widely disseminated information such as “The price of swim bladders of totoaba reaching to as high as $250,000/piece in China”, and “a huge demand and extremely high price of totoaba in China“ may make fishermen and other individuals believe that the catch of a single totoaba can bring huge profits, thereby stimulating a sharp increase in catches. According to the smuggling cases of totoaba seized by China Customs between 2017 and 2018, such information was very likely to be one of the factors influencing the intensified illegal fishing and smuggling of totoaba. Based on several cases of smuggling of totoaba uncovered by the customs anti-smuggling department in 2018, it is found that the prices of smuggled totoaba were different due to their differences in quality and size, but were all far lower than the sky-high price of $250,000 rumored in North America. Although the relevant information on wildlife utilization released by environmental protection organizations and news media were to expose the cruel reality of illegal hunting and trade, it is also likely to stimulate the 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 should work together not only to strengthen the supervision of the wildlife market and cracking down on the illegal market, but also to purify the information environment from all links in the information dissemination chain combined
with the knowledge of journalism and psychology, based on Laswell’s “5W” model of the dissemination process, that is, 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 good social environment for fostering public opinion. The We Media platform should establish an information filtering and verification mechanism or a real-name system, and create a dedicated account for refuting rumors, so as to suppress misleading information in the early stage of occurrence and dissemination. News media or businesses should publish information or advertisements at appropriate angles to ensure that they are scientific and objective to prevent excessively exaggerating and playing up information on the wildlife market from misleading the public.

5. Conclusion

This study takes several wildlife species whose populations are more severely affected by illegal trade as examples to analyze the source and dissemination characteristics of relevant information on wildlife utilization and their association with illegal trade. The main conclusions are as follows: The relevant information on wildlife utilization is mainly from large news media companies and environmental protection NGOs concerned with wildlife protection and generated by news media websites and new We Media platforms; the main reasons for the generation are changes in protection and utilization policies, market demand and discussions on the role of legal trade protection. The key users who disseminate relevant information on wildlife utilization in 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 fans, which leads to a wide range of information dissemination; users who participate in the dissemination of information related to wildlife have strong emotional expressions. Misleading information on wildlife utilization is likely to stimulate the public’s profit-seeking psychology and thus aggravate illegal hunting and trade. We should start from all links in the information dissemination chain, purify the information environment, and reduce the influence of misleading information on illegal trade suppliers and the adverse impact on wildlife protection and management.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and material
All data generated or analysed during this study are included in this published article [and its supplementary information files].

**Competing interests**

The authors declare that they have no competing interests

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**Authors' contributions**

Wei Zhang conceived the project and proposed the research method; Xuehong Zhou supervised all analyses and led the drafting of papers; Zhifan Song wrote and revised the paper; Qiang Wang collects and analyzes data; Zhen Miao made and optimized charts.

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### Tables

**Table 1** The correlations between the number of poached African elephant and the amount of information on the ivory trade in China from 2005 to 2018

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

**:** Significant correlation ($P<0.01$)

**Table 2** Summary of information about 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 on the Chinese black market. | April 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. | September 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. | September 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. | December 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. | December 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 | December 2017 |
| Homeland security Google news | Mexican cartels are now making up to $250,000/kg of something else—fish bladders in China. | July 2018 |
| Viva Vaquita Twitter | On the black market, a single swim bladder of totoaba can be worth as much as $250,000. | July 2018 | Got 22 thumb-ups and 19 shares |
| Brooke Bessesen Google books | Vaquita: Science, Politics, and Crime in the Sea of Cortez: A totoaba fisherman can earn up to $250,000 for a single bladder in China. | September 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 a. The totoaba's swim bladders are known as "aquatic cocaine", and hunters can sell them for as much as $100,000/kg on the Chinese market.

Microblog b. Dried totoaba's swim bladders are made into top-quality fish maw, which can fetch up to $20,000/kg on the black market in Hong Kong.

System average

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

Figures

Figure 1

Trends in the number of tiger product smuggling and elephant poaching in Africa versus trends in the amount of specific information.
Figure 2

Diagram of the dissemination path of Microblog a
Figure 3

Diagram of the dissemination path of Microblog b
Figure 4

The weight of swim bladder of totoaba seized in 2017 and 2018

Supplementary Files

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