

Short communication

Rhino horn trade in China: An analysis of the art and antiques market

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ABSTRACT

Poaching is an imminent threat to African rhinos. International media and conservationists often attribute poaching to demand for rhino horns because of use in traditional Chinese medicine. Consequently, conservation efforts are allocated to addressing this issue. Our study gives novel information on a critical, yet presently underestimated driver of rhino horn consumption in China—the art and antiques market. A media content analysis of Chinese ($n = 332$) and western newspapers ($n = 166$) from 2000 to 2014 revealed significant differences between perceptions of rhino horn consumption. In Chinese media, rhino horn product acquisition was most frequently reported for investment and collectible value (75%), artistic value (40%), and medical value (29%). In contrast, western media alleged consumption of rhino horn in China was mostly for their medical value (84%). Additionally, Chinese rhino horn auction records ($n = 7,042$, 2000–2011) showed a significant positive correlation between the volume of rhino horn auctioned in China and the number of rhinos poached in South Africa. Carved containers procured the highest price per gram (USD 490). A fitted general model identified the weight of the item and its historical era of origin as two significant factors in determining inflation-adjusted price, while the year of sale was not a significant predictor. The auction market has stalled since 2012, but interest in the collection and investment of rhino horn antiques and crafts remains. We offer recommendations to improve rhino conservation.

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1. Introduction

Relentless poaching is jeopardizing the international community's goal of securing "future viable populations of wild African rhinoceroses" (Emslie and Brooks, 1999). The estimated total population of 4880 black (*Diceros bicornis*) and 20,165 white (*Ceratotherium simum*) rhinos is currently distributed across 12 range states in Africa (Emslie et al., 2013). From 2006 to 2013 at least 3387 rhinos were illegally killed in an alarming trend that is ongoing (Emslie and Knight, 2014). International organizations, media, and researchers often attribute the poaching problem to the demand for rhino horns in Southeast Asia (e.g., Emslie et al., 2013; Milliken and Shaw, 2012). Whereas Vietnam is considered the primary end-use market (Milliken and Shaw, 2012), China is seen as an important consumer too (Emslie et al., 2013). Rhinoceroses roamed the Chinese landscape in historical times (Rookmaaker, 2006), and rhino horns were used as an ingredient in traditional medicines to treat fevers, heart disease, and other ailments (Emslie and Brooks, 1999; Leader-Williams, 1992). This practice was

prohibited in 1993 when the Chinese government officially banned trade in rhino horns (China State Council, 1993). However, the widespread belief that rhino horns have medical value remains, and illegal trade in horns has continued in black markets (Emslie and Brooks, 1999). Consequently, current efforts to reduce demand focus on debunking the traditional and emerging medicinal beliefs about the value of rhino horns (e.g., as a cure for cancer). Rhino horn is also highly sought after as a fine art carving material in China (Chapman, 1999), used to make cups, bowls, hairpins, thumb rings, as well as other functional or ornamental items. These items are typically sold in the art and antiques market by live auction houses where sales are well documented.

We first compare how Chinese rhino horn consumption is portrayed in newspaper articles in China and internationally. As demonstrated by a large body of research in the field of mass communication (e.g., McCombs and Shaw, 1972), mass media both record and influence public knowledge and perception. Therefore we describe media constructs around Chinese demand for rhino horns. Second, we explore and quantify a previously neglected rhino horn market in China—the auction of rhino horn antiques and crafts. We analyse the nationwide trend in rhino horn auctions in relation to rhino poaching activities in South Africa. We also examine detailed sale records from one of the most active

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auction houses during the peak year for rhino horn auctions (2011) to describe volume sold, prices, and other market dynamics. Lastly, we discuss the socio-economic factors for the rhino horn art and antiques market and offer recommendations to improve rhino conservation.

2. Material and methods

The first part of our research is a media content analysis following standard procedures (Macnamara, 2005). We selected six English newspapers with international circulation and influence: The Guardian, The Times and The Sun in the UK, and The New York Times, Daily News and Washington Post in the U.S. Searching for terms “rhino horn” and “China/Chinese” in the LexisNexis database, we retrieved 199 articles published between 2000 and 2014. As for Chinese articles, we searched for “xijiao/xiniujiao” (rhino horn) from all newspapers available in Wisearch, one of the most comprehensive Chinese news archives. This yielded 513 references from 2000 to 2014. After removing irrelevant (e.g., a village called “rhino horn”) and duplicate articles, we obtained 166 English articles and 332 Chinese articles for analysis. The first author went through all articles and developed a comprehensive list of rhino horn values, including medical, investment, artistic, religious, and social elements, which are manifested in the typical words or phrases used to describe rhino horn as well as the way rhino horn consumption is framed (Table 1). Two coders were then trained to conduct quantitative coding independently. Cohen's kappa was used to determine the degree of inter-coder reliability. The coded results had kappa values of 0.75 or above for all variables, representing a strong level of agreement among coders (Lombard et al., 2002).

An allied part of our research quantified China's rhino horn art and antiques market. We obtained data on rhino horn auctions from two sources. First, we collected the total number of rhino horn items sold in auctions annually between 2000 and 2014 from an online auction database developed by Artron (auction.artron.net). Artron is a leading Chinese art data company that collects auction outcome records from auction houses across the country. We also referenced an accounting of rhino poaching events in South Africa between 2000 and 2014,

published by the South African Department of Environmental Affairs (2014). Using these data, we tested for a correlation between the size of the Chinese rhino horn auction market and the rate of rhino poaching in South Africa. We elected to assess the poaching trend in South Africa because that is where the largest rhino population is found and where the most intense poaching has occurred (Emslie and Knight, 2014).

Second, we collected detailed rhino horn auction records from 1995 to 2011 directly from China Guardian, one of the largest Chinese auction houses. We recorded each item's name, the year it was put to auction, its reported age (categorized by historical era of origin), the type of item, its weight, and the price realized if the sale was successful. Not all information was available for every item, and the number of records used in the analysis is detailed in the results below. We adjusted all sale prices to the 2011 value using the Urban Consumer Price Index gathered from the Chinese National Bureau of Statistics and converting to U.S. dollars at a rate of 1 USD = 6.45 RMB. We selected a subset of the data to characterize the sales of the most common type of rhino horn items (carved drinking cups). Using 156 complete records of carved cup sales, we tested whether the rhino horn value per gram changed by year. To do this we fitted a general linear model of the natural logarithm of inflation-adjusted price (transformed to stabilize the variance). We included year and weight (in grams) as continuous covariates and historical era of origin (reported age) as a third categorical factor. We also included the interaction factors of the three variables. Stepwise selection with a threshold of $p < 0.15$ was adopted to find the best model.

3. Results

Data revealed important trends in media coverage, rhino horn trade, and other aspects of the market and conservation efforts.

3.1. Media coverage of Chinese rhino horn consumption

Trends in both Chinese and international media coverage of rhino horn consumption in China are shown in Fig. 1. The number of Chinese news articles on rhino horns started to grow in 2006 with a slight decline around 2009, surging in 2010, and peaking in 2011 before plummeting thereafter. International media coverage shows a similar pattern with a time lag of 2 to 3 years. The number of English newspaper articles increased around 2009, levelling off in 2012, and peaking in 2013 before a 2014 decline.

Among all collected articles, rhino horn values were mentioned in 323 Chinese articles and 99 international (English) ones. More than one value was sometimes mentioned in a particular article. Fig. 2 presents the quantitative coding result. Among the Chinese articles, over 75% highlighted the economic value of rhino horn carvings as collectible and investable assets, 40% mentioned the artistic value of rhino horn carvings, and 29% stated the medical value. The social value of rhino horns as status symbol was mentioned by only 5% of Chinese articles, as was the religious value. In comparison, an overwhelming 84% of international news articles highlighted the medical value when they mentioned rhino horn consumption in China, while only 6% of articles mentioned the investment element, 4% the social value, and 2% the artistic value of rhino horn products.

3.2. Auction of rhino horn antiques and crafts in China

The trends in Chinese rhino horn auctions and South African rhino poaching from 2000 to 2014 are depicted in Fig. 3. Prior to 2005, the number of rhino horn items traded in China's live auction market was fairly low. Around 2005 the market started to surge, mushrooming after 2009 and peaked in 2011. The number of rhino horn items auctioned in 2011 ($n = 2694$) was more than an order of magnitude greater than in 2005 ($n = 202$), four times the number in 2009 ($n = 669$), and 2.1 times the number in 2010 ($n = 1302$). After 2011, the market suddenly plummeted to 107 items sold in 2012, 16 items in 2013, and

Table 1

The different values of rhino horn. Chinese society attaches a host of values to rhino horn which are manifested in the typical words or phrases used in public discourses on rhino horn.

Value of rhino horn	Key words in statements	Example quotations
Medical	Clear away heat, nerve soothing, blood cooling, detoxifying, body strengthening, combat hangover, fever, convulsions, nightmares and delirium, rheumatism and gout, aphrodisiac	“It is part of Chinese culture to use rhino horn in traditional medicine to treat all sorts of maladies.”
Investment/collectible	Rare, precious, soaring price, auction, collect, invest	“Genuine rhino horn cups are extremely rare and highly priced in the auction market.”
Artistic	Exquisite, workmanship, intricate, artistic	“The workmanship and artistic creativity of the master craftsman is unreservedly expressed in this flawless rhino horn statue.”
Religious	One of eight immortal power tools of Taoism, ward off evil and misfortune, protection, blessings and luck	“Since Shang Dynasty, rhino horns have been considered as a bringer of good fortune.”
Social	Symbol for status, luxury items, extravagant gifts	“Rhino horn items have become a status symbol among the country's rapidly growing middle class.”

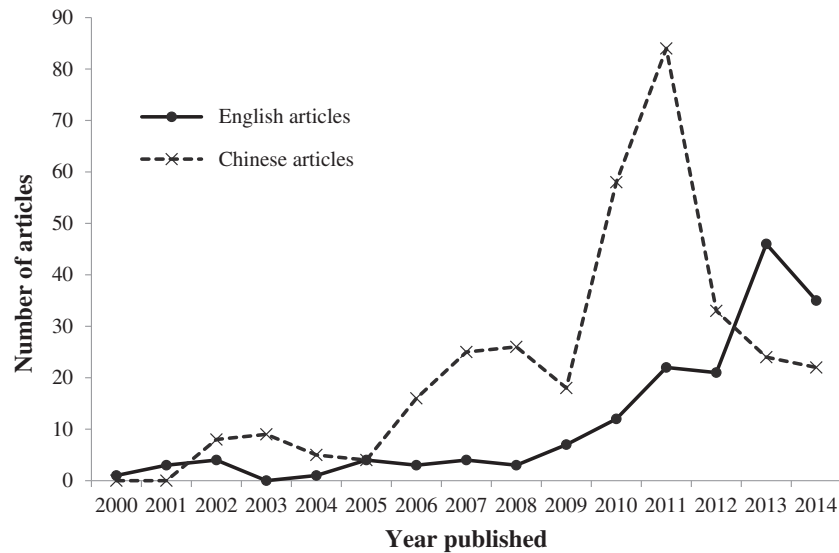


Fig. 1. Trends in the Chinese and English media coverage of rhino horn consumption in China.

12 items in 2014. The rate of rhino poaching in South Africa experienced a similar exponential increase, though the trend lags a few years behind the auction trend. Poaching remained quite low until 2008, at which point the rate jumped substantially and increased steadily in subsequent years (Fig. 3), even though the auction volume began to decline in 2012. In 2014 the number of rhinos poached ($n = 1116$) was already more than tenfold the number poached in 2008 ($n = 83$). A correlation analysis confirms that between 2000 and 2011, the volume of rhino horn auctioned in China was significantly correlated with the rate of annual rhino poaching in South Africa ($r = 0.941$, $p < 0.001$).

In 2011, 91 Chinese auction houses were involved in the sale of rhino horn products. Of these, eight houses traded 58.8% of the total number of items: Poly International ($n = 506$ items sold), China Guardian ($n = 298$), Zhongjia International ($n = 204$), Shanghai Bohai ($n = 143$), Printed Qianshan ($n = 119$), Qingdao Rongde ($n = 117$), Beijing Hanhai ($n = 104$), and Zhongdu International ($n = 94$). All of these except Shanghai Bohai are based in Beijing.

China Guardian was the second most active auction house for rhino horn trade in 2011. Trends in rhino horn auctions held by China Guardian (Table A1) mirror those of national trends described above. Table 2

summarizes the different types of rhino horn items auctioned by China Guardian in 2011, as well as their respective prices. Rhino horn containers, such as cups, were the most common (48% of auctions), followed by sculptures, including figurines (16%), carved and intact horns (13%), and jewelry (8%). The rest (15%) were miscellaneous, consisting primarily of walking sticks. Among the auctioned items, carved containers had the largest price range per item (USD 178–427,907), as well as the highest average price per gram (USD 490). In contrast, uncarved horns had a much lower price per gram (USD 72). Of all the items China Guardian auctioned in 2011, 55.8% ($n = 163$) were attributed to the Qing dynasty (1644–1912), followed by 3.8% ($n = 11$) each from the Ming dynasty (1368–1644) and China's Republican period (1912–1949). The rest of the items (36.6%, $n = 107$) did not specify historical origin.

In a fitted general linear model (adjusted $R^2 = 34.82\%$, residual plots shown in Fig. A1) of a rhino horn cup's price (natural logarithm of inflation-adjusted), weight ($F = 34.57$, $p < 0.001$, coefficient = 0.001) and historical era of origin ($F = 16.89$, $p < 0.001$) were significant predictors. Year of sale was not a significant predictor for price, nor were interaction factors of the three variables. Fig. A2 shows the average price per

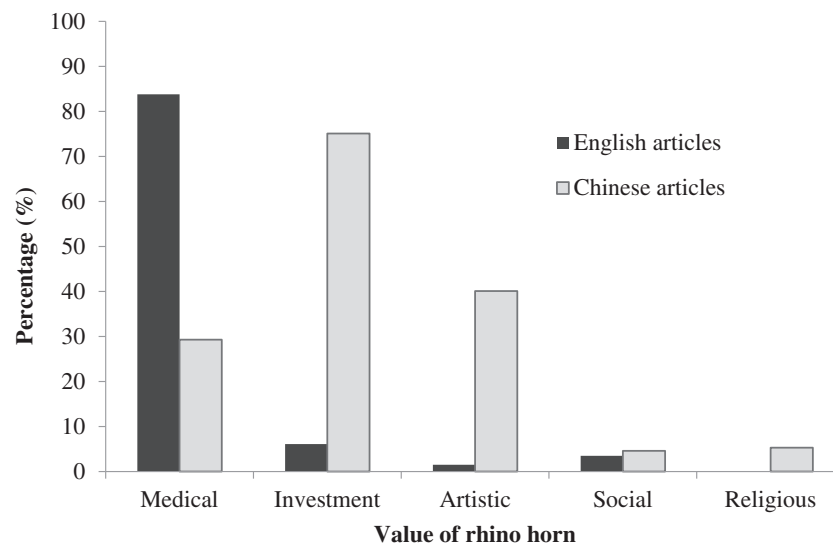


Fig. 2. Values of rhino horn mentioned in English and Chinese newspaper articles, shown by percentage.

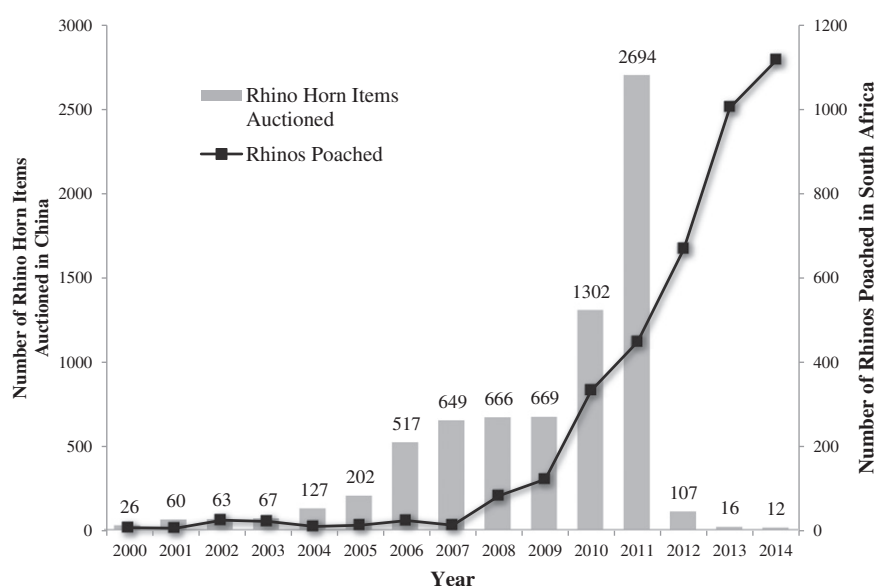


Fig. 3. The number of rhino horn items auctioned in China and rhinos poached in South Africa, from 2000 to 2014.

gram of rhino horn cups auctioned by China Guardian from 2003 to 2011, sorted by year of sale and historical era, respectively.

4. Discussion

Despite recent programs and policies for ameliorating the threat of illicit trade on rhinoceroses, there is still a major concern for rhino poaching, suggesting that present conservation efforts are not adequate. Attempts to model market dynamics (e.g., Crookes and Blignaut, 2015; Di Minin et al., 2015), debate over legalizing versus banning the rhino horn trade (e.g., Biggs et al., 2013; Collins et al., 2013), and the effectiveness of public education campaigns are all undermined by a lack of information about the demand and end-use market.

4.1. An alternative trade in rhino horn

Our data reveal a previously neglected type of rhino horn trade that arose relatively recently in the socio-economic environment in China (Gao and Clark, 2014). In the past decade, the art and antiquities market has emerged as an appealing alternative for investors looking “to store value, to hedge inflation and to diversify portfolio allocation” (J. P.

Morgan, 2013). According to a survey report by Forbes China (2013), 56.1% of the mass affluent class (a group of individuals with an annual household income of USD 18,150–825,000 [RMB 110,000 to 5,000,000; about 10 million people in 2012]) were interested in collectibles such as antique calligraphy and paintings, luxury products, and contemporary arts. Rhino horn pieces are portrayed in the Chinese media as an excellent investment opportunity whose value is tied more to the rarity of the raw materials rather than the artistic nature of the item. The aggressive media attention has played a significant role in the growth of the art market. Outlier items (Fig. A2), those that fetch astronomically high prices at auction, quickly attract media attention. Coverage of these sales drives the perception that collecting rhino horn is highly profitable and influences black market prices.

The striking drop in the auction of rhino horn items in 2012 was because of an official intervention. On December 15, 2011, China's State Forestry Administration issued a special notice reiterating the policy that “whenever the products were made, the purchasing, transporting, and selling (including auction) of wildlife products shall comply with the relevant wildlife laws and regulation” (China Association of Auctioneers, 2011). As the China Association of Auctioneers reported, “banning the trading of artworks made of rhinoceros horns and ivory has contributed to a sharp decrease of turnover in China's booming art auction market” (Xinhua, 2013). Nevertheless, the threat that the art market poses to rhino conservation is not yet fully curbed. We have been informed by various sources that the rhino horn market is “*You Jia Wu Shi*,” which literally means “the price remains high but there is no turnover.” Collectors, investors, and speculators are holding onto their collections, refusing to sell at a low price and waiting for the policy to change.

The strong correlation between rhino poaching in South Africa and the horn auction market in China should be treated with caution. Correlation is not causation. There may be a third factor (such as Chinese income per capita) that causes both of the trends. Our current data are limited and we are unable to build a reliable causal relationship. Although some anecdotal evidence has shown that new rhino horns are made to look old and sold as antiques, serious investigation is required to demonstrate conclusively that recent poached rhino horns have been sold in China's auction houses. It is also important to note that while China's rhino horn auction has stalled, rhino poaching seems to continue unchecked. This likely stems from multiple factors. First, illegal rhino horn trade continues in other forms of trade (e.g., online black markets) and in other countries. Second, as is common with trade chains, some lag time should be expected after the decline in demand before the supply tapers off. Finally, although

Table 2
Types and prices of rhino horn items auctioned by China Guardian Auction House in 2011.

Type		Price per item (USD)			Price per gram (USD)		
		N	Min.	Max.	N	Mean	SE
Container	Bowl	23	2674	57,054	21	155	25
	Cup	71	178	427,907	70	381	62
	Other	13	5349	356,589	13	490	232
Horn	Carved	8	8915	320,930	8	64	18
	Uncarved	22	3209	160,465	19	72	19
Jewelry	Bracelet	11	535	14,620	5	30	14
	Pendant	4	7488	12,481	3	195	21
	Other	2	1070	8558	2	115	71
Sculpture	Human figurine	18	3566	258,527	17	114	13
	Others	18	2674	140,853	17	157	43
Misc.	Knife handle	1	28,527	28,527	1	85	–
	Pen holder	1	6240	6240	1	33	–
	Scepter	1	1248	1248	1	208	–
	Seal	7	2674	32,093	6	158	52
	Walking stick	20	3566	258,527	9	102	15
	Others	3	3922	28,527	2	124	92

public auctions of rhino horn items have ceased, the price for these items remains high and interest in rhino horn as an investment opportunity has not declined.

4.2. Conservation implications

Unlike the consumption of rhino horns in the traditional Chinese medicine industry, the additional trade of rhino horns in the art and antiques market involves a different group of stakeholders, including antique dealers, art collectors, investors, speculators, auction houses, investment companies, and museums, to name a few. While we acknowledge that the different values of rhino horn that we have categorized are not mutually exclusive, we urge the conservation community to consider the art and antiques market as a separate threat to rhinos which should also be addressed with targeted campaigns to build awareness and change behaviour. Although rhino horn is mostly reported in the Chinese media for its investment value, in our analysis the year of sale is not a significant predictor of the inflation-adjusted price of rhino horn items, indicating that rhino horn has not appreciated in value in real terms and is therefore not a good investment. This finding is potentially instrumental in changing consumer behaviour.

Until now, the rhino horn trade in the art and antiques market is seldom acknowledged by western conservationists. The gap in recognizing that rhino horn has asset value in addition to its medicinal value may be an indication that the Chinese media are reporting on a change in consumption behaviour ahead of the Western media. The asynchronous understanding hinders timely, concerted programs to reduce demand that are grounded in a contextual and factual understanding of consumers and their motivations. The shortfall partly results from a lack of Chinese participation in addressing the China-bound illegal wildlife trade. We believe that greater cooperation between Chinese and international conservation communities can help to mitigate the gap, and we suggest that new arenas be created to foster more cross-cultural understanding and collaboration. It is our hope that our study will lead to new, inclusive, and productive efforts to end the ongoing rhino poaching crisis.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.biocon.2016.08.001>.

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