

Wang, Wenxia, Yang, Liangliang, Wronski, Torsten, Chen, Shaozhi, Hu, Yanjie and Huang, Songlin

Captive breeding of wildlife resources-China's revised supply-side approach to conservation

<https://researchonline.ljmu.ac.uk/id/eprint/17353/>

Article

Citation (please note it is advisable to refer to the publisher's version if you intend to cite from this work)

Wang, Wenxia, Yang, Liangliang, Wronski, Torsten ORCID logoORCID: <https://orcid.org/0000-0002-0853-6008>, Chen, Shaozhi, Hu, Yanjie and Huang, Songlin (2019) Captive breeding of wildlife resources-China's revised supply-side approach to conservation. Wildlife Society Bulletin. 43

LJMU has developed **LJMU Research Online** for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact researchonline@ljmu.ac.uk

16 March 2019

Wenxia Wang

Research Institute of Forestry Policy and Information, Chinese Academy of Forestry

Beijing 100091, China

+86 (010) 62888856

wang_wen_xia@163.com

RH: Wang et al. • Captive Breeding of Wildlife

Captive Breeding of Wildlife Resources—China's Revised Supply-side Approach to Conservation

WENXIA WANG,¹ *Research Institute of Forestry Policy and Information, Chinese Academy of Forestry, Beijing 100091, China*

LIANGLIANG YANG,¹ *Research Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, Beijing 100091, China*

TORSTEN WRONSKI, *Liverpool John Moores University, School of Natural Sciences and Psychology, Faculty of Science, James Parsons Building, Byrom Street, Liverpool, L3 3AF, UK*

SHAOZHI CHEN,² *Research Institute of Forestry Policy and Information, Chinese Academy of Forestry, Beijing 100091, China*

YANJIIE HU, *Research Institute of Forestry Policy and Information, Chinese Academy of Forestry, Beijing 100091, China*

SONGLIN HUANG, *Research Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, Beijing 100091, China*

ABSTRACT The conservation and utilization of wild animals in China often raises public concerns. Thus, the Chinese government is increasingly exploring sustainable development of wildlife resources, and has implemented a series of measures, such as the modification of

¹

¹ Equal contributors

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

28 the Wildlife Protection Law (WPL), implementation of captive breeding licenses, an animal
29 marking system, forest certification, and other actions to regulate captive breeding and
30 utilization of wildlife. At the same time, the government tries to meet the Chinese traditional
31 demand for wildlife products. We first introduce wildlife utilization as an internationally
32 accepted conservation tool, and describe market-based wildlife farming as a legal substitute
33 for wild-hunted animals. Second, we highlight the importance of wildlife products in Chinese
34 culture and economy and review some successful examples of wildlife utilization in China,
35 showing that the supply-side approach is a viable alternative to classical conservation.
36 Subsequently, we outline benefits of and drawbacks to China’s ‘conservation through
37 utilization’ approach, resulting in the implementation of China’s new, revised WPL. We
38 discuss merits and shortcomings of China’s revised WPL and respond to recent national and
39 international criticism on China’s supply-side approach to conservation. We strongly propose
40 that captive breeding for utilization is a feasible approach to China’s wildlife conservation
41 dilemma, but we are also aware that considerable efforts are still needed to promote this
42 progress, i.e. implementing government legislation the allocation of tasks and duties, and the
43 creation of public awareness.
44
KEY WORDS Chinese Wildlife Protection Law, conservation through utilization, game
farming, mammals, wildlife consumption.

59
60

² Email:chensz99@vip.163.com

1
2
3 47 Wild animals are an important part of our global ecosystems and an indispensable resource
4
5 48 for human life. Since ancient times, wild animals and their products have played an important
6
7 49 role in the evolution of man and the development of human civilizations, eventually leading
8
9 50 to the domestication of today's livestock and pet species (Harding and Teleki 1981,
10
11 51 Diamond 1997, Clutton-Brock 1999). Gazelles (*Gazella* spp.) were kept in ancient Egypt and
12
13 52 the Middle East for meat production and as pets (Legge 1972, Wronski et al. 2017); reindeer
14
15 53 (*Rangifer tarandus*) were—and still are—herded in the arctic for the production of food,
16
17 54 clothes and tools (Sturdy 1975); and, in China, bears (Asian black bear, *Ursus thibetanus*;
18
19 55 brown bear, *U. arctos*; Malayan sun bear, *Helarctos malayanus*) were kept to produce bear
20
21 56 bile for more than 3,000 years (Huang and Li 2006, Bacon 2008).
22
23
24
25
26 57
27

28 58 With continuous growth of the global human population and rapid development of
29
30 59 agricultural and industrial land-use practice, many wildlife species are seriously threatened, if
31
32 60 not extinct (Angelici 2016, Daleszczyk et al. 2016). However, in recent decades, the
33
34 61 ecological and social value of wild animals are increasingly recognized by government
35
36 62 bodies, nongovernmental organizations (NGOs), media and the general public (Sekercioglu
37
38 63 2006, Clucas et al. 2008, Meng 2008). Institutions and societies pay greater attention to the
39
40 64 increasing destruction of habitats and the extinction and decline of species. This led to a more
41
42 65 scientific approach to conservation and sustainable utilization of wildlife resources, such as
43
44 66 ecotourism, trophy hunting or game ranching (Isaacs 2000, Loveridge et al. 2006, Lindsey et
45
46 67 al. 2007, Lindsey et al. 2009). For the survival of threatened species, it became increasingly
47
48 68 important to not only protect them and their environment *in situ*, but to look for alternative
49
50 69 ways such as the intensive breeding for re-introduction or even production (Hudson et al.
51
52 70 1989). This however, demands strict regulations to develop and coordinate the relationship
53
54 71 between conservation and global demand for wildlife products.
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

72

73 In recent decades, the international conservation community increasingly recognized the

74 utilization of wildlife as a tool for the conservation of biodiversity and defined several types

75 of sustainable wildlife utilization (van Hoven and Ebedes 1994). In 1980, the International

76 Union for the Conservation of Nature and Natural Resources (IUCN) developed a new

77 ‘World Conservation Strategy’ that illustrated an alternative idea by putting the sustainable

78 use of wildlife resources in the focus of their activities, resulting in a more formal ‘Policy

79 Statement on Sustainable Use of Wild Living Resources’ (IUCN 1980, 1991, 2000).

80 Moreover, in their ‘Strategic Plan 2008-2013’, the Convention on International Trade in

81 Endangered Species of Wild Flora and Fauna (CITES) recognized that through the

82 sustainable use of wildlife, a significant contribution to the economic concerns of developing

83 countries can be achieved (Abensperg-Traun 2009). The CITES further emphasizes that all

84 contracting nations should carry out sustainable trade of wildlife products, but prevent the

85 excessive exploitation and unsustainable utilization of wildlife resources in their countries

86 (Jiang 2003). Applying this so-called supply-side approach to conservation suggests that

87 species conservation can be most effectively achieved by legalizing and regulating the market

88 of wildlife products (Phelps et al. 2013). According to supply-side economics, consumers

89 will then benefit from a greater supply of wildlife products at lower prices, employment will

90 increase but wild take will decrease. However, applying this approach to conservation

91 remains a dialectical issue with opponents arguing that a legal market would be misused for

92 laundering of illegal products into the commercial trade and leads to a reduction of stigma

93 towards illegal consumers (Eltringham 1984, 1994; Makombe 1994; Kock 1995; Tisdell

94 1994; Croft 2000; Fischer 2004; Tensen 2016).

95

96 The most intensive form of wildlife utilization is the husbandry of wild animals (wildlife or

game farming), involving intensive care and management with the final goal of supplying animal products to the markets (Yerex 1982, Van Hoven and Ebedes 1994). Market-based wildlife farming was proposed as a legal substitute for wild-hunted animals because theory suggests that saturating the market with legal, high quality and affordable products should reduce the illegal collection of wild specimens and thus prevent extinctions (Layton 2001, Bulte and Damania 2005; Mitra 2005). Moreover, supply-side, market-based interventions can be more attractive and efficient (e.g. aquarium-fish sector; Wabnitz et al., 2003 or songbird keeping; Jepson and Ladle 2005) than traditional policy instruments such as hunting bans or the simple delineation of protected areas without sufficient law enforcement. Other examples include the captive breeding of fur animals such as artic fox (*Alopex lagopus*, IUCN Red List: LC), mink (*Neovison vison*; IUCN Red List: LC) and raccoon dog (*Nyctereutis procyonoides*, IUCN Red List: LC; Reid et al. 2016), which has been practiced for decades and is able to meet the consumer demand without jeopardizing the species' survival in the wild (Ashbrook, 1937, Ginsberg 1994). The shift from wild-caught to farmed animals was key to the recovery of these fur animals in the wild and farming has almost completely replaced wild resources (Ginsberg 1994). Given the control of relevant laws and regulations, the controlled and rational use of wild animals is not only beneficial to the protection of wildlife populations and their habitats, but also promotes the economic development of human societies (Rasker and Freese 1995, Sun and Wang 2007, Van Kooten and Bulte 2000). Social benefits of this approach are significant, playing an important role in promoting local people's employment, improving social stability and facilitating economic development (Bulte and Damania 2005). However, supply-side interventions may lack effectiveness due to consumer preferences for wild-collected products or low financial incentives for wildlife farming.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Ten years after the implementation of China’s first Wildlife Protection Law (WPL) in March 1989, the Chinese government decided to develop China's wildlife industry and hosted the Wildlife Management Conference in 1999 (Pan et al. 2001, Zhang et al. 2001, Li et al. 2005). The conference advocated establishing large-scale breeding of wildlife, integrated processing and utilization of wildlife products. Other objectives included the advancement of the ecotourism industry, and coordinating development of conservation, captive breeding and sustainable utilization (Pan et al. 2001, Zhou et al. 2007, Meng 2008, Wang 2011). This initiative did not only conform to the essentials of China's tradition and socio-economic development, but also intended to increase support and awareness for the conservation of wildlife and associated habitats. Because of considerable efforts in wildlife conservation and declaration of several protected areas during the past 2 decades, great progress in preserving wildlife has been made in China (Harris 2008, Li et al. 2016). Although illegal hunting was greatly reduced, game farming and intensive game husbandry are still in a premature state with nontransparent and inchoate governmental legislation and vague guidelines for animal health and welfare (Li 2007, Harris 2008, Pickett and Harris 2015). To overcome these aberrations, China’s government implemented a revised WPL in January 2017, the new primary document of legislation relating to the conservation of wildlife in China.

We want to join the discussion on China’s supply-side approach to conservation and view it in the light of the newly introduced wildlife policies and legislations. We first highlight the importance of wildlife products in Chinese culture and economy, followed by an outline of the general benefits and drawbacks of China’s supply-side approach to conservation. China’s first WPL was an attempt to cease the ever-increasing take of wildlife from their natural habitats by legalizing the captive breeding of wildlife resources. However, a number of loopholes and shortcomings required that law to be revised. Subsequently, we compare

1
2
3 147 China's revised WPL to the previous version and discuss the relative merits and weaknesses
4
5 148 of China's reviewed wildlife legislation.
6
7
8

9 149 **Importance of Wildlife Products in Chinese Culture and Economy**

10
11
12 150 Since time immemorial (>3,000 years,), captive breeding of wild animals and use of their
13
14 151 products for food, clothing, or medicinal purposes have played an important role in Chinese
15
16 152 culture (Still 2003, Chen 2006). Because if declining wild populations and poaching proved
17
18 153 unprofitable, wildlife farming became increasingly popular and lucrative. Captive breeding
19
20 154 populations were successfully established for >230 wildlife species (Cao 2014; for some
21
22 155 commercially bred mammalian examples see Table 1). By the end of 2006, 19,018 wildlife
23
24 156 breeding and farming ventures existed in China, including 3,166 commercial companies
25
26 157 engaged in the processing and utilization of wildlife products (Meng 2008). Captive wildlife
27
28 158 and alternative livestock industries in China have experienced unprecedented growth in
29
30 159 recent decades (Lin 2004, Nijman 2010). For example, the Chinese fur industry is reported to
31
32 160 grow by roughly 28% every year (2008-2010), with >70 million farmed foxes, minks, and
33
34 161 raccoon dogs in 2010, compared to 55 million animals in 2009 (Petry and Liting 2010).
35
36 162 These figures make China the largest fox and raccoon dog producer and the second largest
37
38 163 mink pelts producer worldwide (Petry and Liting 2010). None of these species is currently
39
40 164 listed as threatened by the IUCN red list (IUCN Red List 2015). Another example for China's
41
42 165 growing wildlife industry is the sika deer (*Cervus nippon*; IUCN Red List 2015 status: LC), a
43
44 166 species that was hunted in China for centuries to use their antler velvet in traditional
45
46 167 medicine. Due to dwindling wild populations (<1,000 animals left in China; Harris 2015),
47
48 168 sika deer farming has become a large scale industry with about 300,000 sika deer kept in
49
50 169 captivity by the end of the 20th century (Ohtaishi and Sheng 1990). In 2004, 9,465 sika deer
51
52 170 farms were reported, with 452,355 farmed sika deer, and an annual production of 73,000 kg
53
54
55
56
57
58
59
60

of deer antler velvet (Meng and Yin 2008). Due to the increased provision of antler velvet from captive stock, wild sika deer numbers are slowly recovering in China (Harris 2015). The most precious wildlife species farmed in captivity are musk deer (*Moschus* spp.; Sheng and Liu 2007). Similar to the fur and antler velvet industries, the Chinese musk production is increasing (Wang et al. 2015). Since the 1950s, musk deer are kept in captivity to harvest their musk, an oily substance secreted by a specific gland located between the genital and the naval of adult males (Parry-Jones and Wu 2001, Wang et al. 2015). For >5,000 years, musk was used for the production of traditional medicine but also as a scent fixative in cosmetics and perfumes (Holmes 1999). The annual average musk extraction per individual is only 12.26 g, while the Chinese demand is estimated to be around 2,000 kg per annum (Parry-Jones and Wu 2001, Cheng et al. 2002). Thus, musk is currently traded at around US\$45,000 per kg making it more precious than gold (presently dealt at about US\$38,000 per kg; Wang et al. 2015). These examples show how important wildlife products are in Chinese culture and highlight their significant economic value. The ever-increasing demand for wildlife products in conjunction with dwindling wild populations eventually prompted the Chinese government to implement and follow the supply-side approach to conservation by adopting the first WPL.

Benefits and Drawbacks to China’s Supply-Side Approach

Although it might be viewed as a method of last resort, captive breeding of endangered wildlife species is considered to be an additional way to facilitate their conservation in China (Mitra 2005, Jiang et al. 2007). Beside other measures, such as the declaration of protected areas and serious law enforcement, wildlife farming can be an effective method to expand the number of wildlife populations that would otherwise face further population declines and possibly extinction (Zhou 1997, Wang 2002, Mitra 2005, Wang et al. 2010, Tensen 2016).

Market-based conservation strategies are not effective on their own, but seem to be best utilized as supplements to regulation and education (Zhong 2005, Sun and Wang 2007, Phelps et al. 2013). Above examples show that under certain circumstances the supply-side approach to conservation can be successful. These circumstances include that 1) farmed wildlife products should be considered equal in quality, taste, and status; 2) the demand for wildlife products can be satisfied by legalized products; 3) farming should be more cost-efficient than illegal hunt; 4) wildlife farmers should not depend on wild populations for restocking; and 5) laundering of illegal wildlife products into the commercial trade must be prevented (Tensen 2016).

In addition to reducing consumption of wild specimens and thus releasing pressure from natural populations (Mitra 2005, Jiang et al. 2007, Wang 2011, Tensen 2016), advantages of wildlife farming include: 1) protecting and managing wildlife species as a (genetic) reserve resource in captivity (Meng and Wang 1999, Che 2000, Sheng and Liu 2007); 2) providing legal and sustainable resources for utilization (Brown and Layton 2001, Bulte and Damania 2005); 3) providing resources and scientific data for medical and health research, teaching and science propagation (Pan et al. 2001, Sun and Wang 2007); and 4) promoting development of related industries such as the fur processing industry, the pharmaceutical industry, or tourism, and thus being an integral part of China's national economy (Fu 1993, Pan et al. 2001, Sun and Wang 2007, Cao 2014). However, there are also a number of drawbacks to the supply-side approach: by generating supplies from captive breeding stocks, wildlife commodity prices will fall, thereby lowering the incentive to hunt illegally. This will create an increased demand and raised incentives for poachers, simply because more people can afford the products, eventually leading to increased rather than decreased wild take (Fischer 2004). Moreover, supply-side approaches often ignore the institutional framework in which the wildlife trade takes place and potential strategic responses of traders and agents

(Damania and Bulte 2007). For example, the illegal trade of wildlife commodities is controlled by a small number of organized, criminal groups (Damania and Bulte 2007). These agents operate between poachers and consumers (or retailers), setting prices for poachers and determining the quantities to be released to the markets. Critical analysis including these aspects found that the effects of supply-side policies may contribute to further devastation of wild stocks instead of saving them (Damania and Bulte 2007, Tensen 2016). To counteract and avoid these drawbacks in the future, the Chinese government was prompted to review the previous WPL and implement a revised version.

China’s Revised Wildlife Protection Law – Merits and Shortcomings

In March 1989, the People's Republic of China implemented the first WPL. After nearly 30 years of practice, setback, and experience, Chinese lawmakers made some progress in the field of wildlife legislation (Jiang 2003, Zhou and Zhang 2003, Chen 2006, Hua 2012). This progress is reflected by the new, revised WPL, which passed China’s National People’s Congress in July 2016 and took effect on 1st January 2017 (Zhang 2016). We will illustrate the improvements of the revised WPL and join the public discussion on China’s wildlife protection by debating the relative merits and shortcomings of the revised WPL (Table 2). In recent decades, wildlife farming and use of wild animal products has become a sensitive and controversial issue, arousing public attention and arguments among the international conservation community (Parker and Graham 1971, Geist 1985, Milner-Gulland and Leader-Williams 1992, Kock 1995, Brown and Layton 2001, Wan 2004, Bulte and Damania 2005, Mitra 2005, Challander et al. 2015, Tensen 2016). In China, this became particularly true just before the newly enacted WPL took effect. National, but also international media coverage, and the public response were fairly critical of the revised law, although some comments highlighted the advantages of the new legislation (EIA 2016; Wang et al. 2016a, b; Zhang

2016; Diao 2017; Liu 2017; Gong et al. 2017).

The main concern regarding the revised WPL and its implementing regulations is a putative emphasis on wildlife utilization; that is, encouraging captive breeding and expanding opportunities to utilize wildlife, rather than protecting it (Xie 2016, Xu 2016, Yu 2016, Mang 2016, Ji 2016, Lei 2016, Li 2016). The law stimulates the demand for wildlife products rather than creating incentives to reduce it and consumers feel encouraged to use wildlife products although synthetic alternatives are often available (Diao 2016, Jiang 2016, Guo and Wei 2016, Ji 2016, Ma 2016). However, no matter whether the demand is met by the captive breeding or not, wild take will be reduced. Any proportion of the overall demand that can be covered by captive breeding reduces take from the wild of a similar proportion (Jori et al. 1995, Parry-Jones 2001, Lapointe et al. 2007, Biggs et al. 2013). For example, average annual bear bile production in China has reached 12,590 kg per annum, a supply that can almost meet the current market demand and thus reduce the wild take (Cao 2014). Similarly, the fur industry or the sika deer farming industry are able to meet consumer demands (Chen 2006, Meng and Yin 2008). According to the revised WPL, China's new approach to conservation follows 2 lines—protection and utilization—and is thus in line with policy documents published by the international conservation community (UNEP 1992, IUCN 2000, Abensperg-Traun 2009). The revised WPL highlights the priority of conservation over utilization (Article 4; Li 2016, Liu 2017) and is fairly balanced in weighing the 2 approaches against each other (Wang et al. 2016a, b). The law clarifies that utilization must be rational and sustainable, and announces strict measures of law enforcement (Articles 4, 29-35; Wang et al. 2016a, b). Apart from breeding programs for scientific research or conservation purposes, the phrasing avoids any terms that encourage or promote the domestication or the captive breeding of wildlife (Article 25). The Chinese government will also no longer award outstanding achievements in the domestication and breeding of wildlife as promoted by the

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

269 old WPL (Article 9 revised WPL vs Article 4 previous WPL). Furthermore, it was clarified
270 that Chinese consumers can only use wildlife products that originate from captive populations
271 and consumption or trade of specimens collected in the wild is clearly prohibited (Articles 29,
272 30; Wang et al. 2016a, b). The revised WPL is very specific in outlining wildlife species that
273 are exempted from any use, compiling them in a detailed list of Chinese species under special
274 state protection.

275
276 It was further claimed that the revised WPL opens the door for the laundering of poached
277 wildlife by registered breeding institutions and may bring illegal goods to legal markets when
278 trade is liberalized (Fischer 2004). Other critics raise concerns that the control of distribution
279 links is not guaranteed, a marking permit system is not in place, and competency and
280 jurisdiction are ill defined (Ma 2016, Xu 2016, Xie 2016). This will lead to competition
281 between law enforcement authorities and more live-capture of wild specimens to satisfy the
282 increasing demand of wildlife farms. To counter laundering, the Chinese government
283 implemented a wildlife marking permit system (Articles 27, 28, 33), which is fundamental to
284 China's wildlife protection and management legislation (Huang 2016). It ensures that the
285 sources of wild specimens and products are legal (i.e., from licensed, registered captive
286 breeding institutions) and thus sustainable and traceable. Granting of marks and labels is
287 stringent: companies and breeding institutions must provide confirmatory materials
288 (certificates of origin, purchase documents, breeding records, etc.), and rigorous reviews in
289 conjunction with *in situ* evaluations determine whether marks will be awarded (Wang 2006,
290 Huang 2016). Without a ‘place-of-origin’ label, wildlife and products thereof cannot be
291 traded. Government authorities at various levels and their relevant departments will conduct
292 the supervision and inspection of sale, purchase, utilization, transport, and mailing of wildlife
293 and products thereof (Article 34). While the revised WPL clearly defines competency and

jurisdiction (Articles 42-56), the criminal law of the Peoples Republic of China provides the disciplinary measures. Marking and labeling of wild animals and their products is an internationally recognized and effective measure to control the use and trade of captive bred wildlife and its products (e.g., EU Council Regulation No. 338/97). Marking is highly valued by governments and nongovernmental organizations, and shown to be a useful tool for internal or cross-border trade control (Lin et al. 1999, Wang 2006, Huang 2016; but see also Zhang et al. 2008). Marking schemes were developed to prevent fraud, curtail illegal trade of specimens and products within the scope of the revised WPL, and ensure that traded specimens are in fact those referred to in the enclosed documents.

It was further argued that law-abiding consumers may operate in another market, separate from illegal consumers, and legal trade reduces the stigma of doing something unlawful. This will increase the overall demand, eventually augmenting the wildlife farmers' need to restock with wild specimens (Stiles 2004, Fischer 2004, Bulte and Damania 2005, Drury 2009, Abbott and van Kooten 2011). Because this phenomenon is based on consumer behavior and preferences, the WPL has only limited opportunities to influence it directly. Creating more conservation awareness through improved education, public outreach, and comprehensive media coverage is the only way to induce a change in consumer behavior (Article 8). Awareness creation must first tackle the overall demand for wildlife products and secondly—if demand persists—stigmatize consumption of illegally obtained specimens and encourage the consumption of legal products (Zhang and Yin 2014, Duan 2015). Only when captive-bred products dominate the market and demand does not increase, can wildlife farming be beneficial for conservation (Bulte and Damania 2005).

Another issue is the current situation of animal health and welfare conditions in Chinese

1
2
3 319 wildlife farms (Petry and Liting 2010, Pickett and Harris 2015, EIA 2016). Opponents assert
4
5 320 that health and welfare stipulations are not included in the revised WPL and it completely
6
7 321 ignores the increased risk of epidemics related to wildlife farming (Yu 2016, Diao 2016).
8
9 322 Since the pandemic disease outbreaks of avian influence and SARS coronavirus in the early
10
11 323 2000s, the Chinese government focused great attention to the management of wildlife health
12
13 324 and welfare in captive breeding institutions (Smith 2006, Arima et al. 2013). The revised law
14
15 325 added a new article (Article 16) to prevent, identify and mitigate the risk of epidemics at the
16
17 326 interface of wildlife, domestic livestock, and humans. The legislation also regulates how farm
18
19 327 animals are raised, kept and transported in accordance with their natural habitats and
20
21 328 behavioural properties (Article 26). Captive breeding of wildlife in China should be based on
22
23 329 the ecological and behavioral requirements of each wildlife species to conform best to animal
24
25 330 health and welfare standards (Wang et al. 2016a, b). This includes sufficient space,
26
27 331 opportunities to retreat (from conspecifics and humans), enrichment structures, and suitable
28
29 332 facilities to constrain animals for health treatment and breeding management (Hosey et al.
30
31 333 2013). At present, there are only 7 wildlife breeding institutions in China that were awarded
32
33 334 the official certificate of the China Forest Certification Council (CFCC), indicating that their
34
35 335 breeding and management conditions have achieved a satisfactory level of animal health and
36
37 336 welfare standards (Zhong pers. comm.). One reason for the low level of legal registration and
38
39 337 law abidance is the lack of governmental resources to efficiently control compliance (Zhao
40
41 338 2012). Currently, it seems impossible to strengthen the legal control of wildlife farming only
42
43 339 by relying on government institutions and their financial and administrative resources. Article
44
45 340 5 of the revised WPL encourages private, nongovernmental institutions to support
46
47 341 government bodies, enforcing the revised WPL, and supervise and control health and welfare
48
49 342 conditions (Zhang 2016). It is thus suggested that wildlife management control and captive
50
51 343 breeding licensing should be gradually replaced by third party certification and monitoring.
52
53
54
55
56
57
58
59
60

1
2
3 344 This will help government bodies to improve supervision efficiency and reduce public
4
5 345 spending. It is further hoped that legally certified breeding institutions play a positive role
6
7 346 within the industry and function as a role model for other wildlife farms in China and East
8
9 347 Asia. Guidance for this supervision process could be the forest certification manual published
10
11 348 by the Chinese State Forestry Administration (2014). This manual is an essential part of
12
13 349 China's forest certification system, and defines the basic requirements for captive breeding of
14
15 350 wildlife, including human resources (animal keepers, veterinarians), infrastructure (water,
16
17 351 heating, etc.), dietary requirements and nutrition, reproduction, animal health and welfare,
18
19 352 sanitation, animal euthanasia, and product acquisition. The licensing system, depicted by the
20
21 353 forest certification manual, provides the requirements to verify whether wildlife-breeding
22
23 354 units comply with relevant laws and principles of sustainability. The manual further aims to
24
25 355 create awareness among wildlife farmers, guide them towards establishing sustainable
26
27 356 management conditions, and follow animal health and welfare regulations. The legal award
28
29 357 of captive breeding licenses and their strict control and enforcement are the only way for
30
31 358 China to continue recognition by the international conservation community and realize the
32
33 359 vision of a supply-side approach to conservation (Zhong et al. 2013).
34
35
36
37
38
39
40
41

42 361 Ultimately, the revised WPL was criticized for its narrow definition of wildlife: it should
43
44 362 include all wildlife species, not only endangered species under special state protection such as
45
46 363 tiger (*Panthera tigris*) and rhinoceros species (*Ceratotherium*, *Dicerorhinus*, *Diceros*,
47
48 364 *Rhinoceros*), but also all other wildlife species that are not (yet) endangered or that have
49
50 365 already recovered (Li 2016, Xu 2016, Xie 2016). Critics further suggest that the marking
51
52 366 permit system for protected species should be also applied to nonprotected species (including
53
54 367 invertebrates) that are kept in captivity. Wildlife species mentioned by the revised WPL are
55
56 368 divided into 2 categories with different protection status: wildlife under first-class (special)
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

369 state protection and wildlife under second-class state protection (Article 10). In Article 2, it
370 was further clarified that the law does not only apply to endangered species, but also to any
371 other terrestrial species that has an important ecological, scientific, or social value (Wang et
372 al. 2016a, b). However, the list appears incomplete, missing some Chinese species (e.g., the
373 tufted deer [*Elaphodus cephalophus*]) and disregarding all non-native species (EIA 2016).
374 The revised WPL makes a clear-cut differentiation between endangered species that are not
375 permitted to be traded (i.e., all specimens from the wild) and those that are allowed to be
376 traded as long as they are legally bred in licensed wildlife farms. Animals from the latter
377 group must be recorded in the list of terrestrial wildlife for which artificial breeding
378 technology was proven to be fully developed. Additionally, it should be mentioned that
379 Article 12 clarifies to protect, restore, and improve the environments in which wildlife lives
380 (i.e., the designation of protected areas and the preservation of natural habitats).

381
382 Of particular concern is also the regulation on disposal of seized items, which potentially
383 allows for the auction of seized items derived from protected wildlife (EIA 2016). The
384 revised WPL (Articles 6, 7, 9) and regulations for the management and disposal of seized
385 terrestrial wildlife and wildlife products provide unambiguous guidelines on how to handle
386 seized items. Moreover, 2 new articles (Articles 56, 57) were added to the revised WPL
387 clarifying the management, storage, or disposal of seized items. As a professional standard
388 method, all seized items must be evaluated and quarantined before handed over to local
389 wildlife departments for destruction or the exhibition in educational institutions such as
390 schools and museums. Seized wildlife or wildlife products from foreign countries must be
391 returned to the exporting country, stored at secured and authorized locations, or destroyed.
392 Generally, any seized item is prohibited from being auctioned.

393

Given the above arguments, it is essential to guide the international (and Chinese) public to openly discuss both—negative and positive—aspects of the revised WPL and establish the right balance between wildlife conservation and utilization. Facing current levels of public concern and the international attitude towards wildlife utilization in China, we must establish a proportionate and fair discussion, and strengthen our professional guidance by building our decisions on sound scientific evidence when implementing the concept of wildlife conservation through utilization. Some nongovernmental organizations propagated only one-sided coverage and developed network media platforms where lopsided opinions are reiterated. However, such media-coverage inspires the enthusiasm of the public to preserve wildlife (and its habitats), promote the implementation of ‘absolute protection’ and propagate the relinquishment of consuming wildlife products (Lu and Zhang 2012).

Conclusions and Recommendations

Despite CITES, other international regulations and worldwide anti-poaching efforts, the illegal trade in many endangered species has increased in recent years (Rosen and Smith 2010, Drury 2011, Challender and MacMillan 2014). It seems that current interventions and regulations, including actual law enforcement actions, are not sufficient to prevent poaching (Abbott and van Kooten 2010, Rosen and Smith 2010, Wellsmith 2011, Tensen 2016). To avert further extinctions due to illegal hunting, alternative approaches must be considered. The concept of ‘conservation through utilization’ is such an alternative approach, but is at the same time a disputed one in wildlife conservation (Mitra 2005, Jiang et al. 2007; Tense 2016). Criticism on rational wildlife utilization has continuously increased during the last 26 years (coinciding with the period the previous WPL was in place), leading to a reduction of wild animal consumption and a gradual shift towards legal substitutes. No doubt, the excessive, unsustainable use of wildlife resources from the wild should be strictly prohibited,

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

but species for which captive breeding technology as well as health and welfare standards are established should be used by humans (Kock 1995).

We strongly propose captive breeding as being the only feasible approach to China’s wildlife conservation/utilization dilemma. Moreover, we want to counteract the negative international attitude towards China’s attempts to rationalize the utilization of wildlife, following successful examples from Africa and other parts of the world (see review by Hudson et al. 2010). The revision of the old WPL represents an important effort in strengthening wildlife conservation, regulating wildlife utilization and promoting harmonious development of humans and nature in China. Despite these advances, the revised WPL still needs to address animal welfare aspects, effective law enforcement, and border controls (Li 2007, Nijman 2010, Pickett and Harris 2015). Furthermore, it would be desirable if the new WPL would advocate for more conservation awareness through improved education, public outreach, and comprehensive media coverage (Duan 2015). A constructive and progressive discussion to improve China's national standards for captive wildlife breeding (wildlife farming) is needed to further develop conservation legislation. Advancing this appeal, we forward the following suggestions:

(1) The duties, functions, and authority of the permit-issuing and law-enforcing administrations must be clarified. Currently, the management and administration of some species, especially of non-national key or alien species remains indistinct.

(2) It is imperative to strengthen the law enforcement, emphasize the illegality of harvesting wild animals in their natural habitat, and further match phrasing with international legislations.

(3) The government of China ought to increase funding for the conservation of wild animals (i.e., improve and increase *in-situ* conservation), promote scientific research on game farming species, establish a rational, independent monitoring system, and increase public awareness.

(4) China's wildlife legislation should promote third-party certification and monitoring by nongovernmental organizations. The law should include the opportunity for regulations that supplement government legislation (e.g., nongovernmental organizations and industry develop own health and welfare standards and monitor themselves through third-party guided self-control).

(5) The revised law should pay more attention to health and welfare standards for wildlife in captivity, including prevention of epidemics, vaccination schemes, transport, enclosure enrichment, sedation, confinement, handling, and capture.

(6) China's wildlife legislation needs to ensure the correct disposal of seized items (i.e., the relentless destruction of seized items derived from protected wildlife species, except for scientific or educational purpose).

ACKNOWLEDGMENTS

The authors would like to thank two reviewers and the editorial team of the Wildlife Society Bulletin for their considerable input to advance the publication of this article. Furthermore, we are greatly indebted to Jennifer Gervais (Associate Editor) for improving and commenting on previous versions of our manuscript. The research was funded by Science and Technology Development Center of the National Forestry and Grassland Administration (The special researches on certification of precious and endangered wildlife for production and management, RZ 2017-3, RZ 2019).

LITERATURE CITED

Abbott, B., and G. C. Van Kooten. 2011. Can Domestication Of Wildlife Lead To Conservation? The Economics Of Tiger Farming In China. *Ecological Economics* 70(4): 721-728.

1
2
3 467 Abensperg-Traun, M. 2009. CITES, sustainable use of wild species and incentive-driven
4
5 468 conservation in developing countries, with an emphasis on southern Africa. *Biological*
6
7 469 *Conservation* 142: 948-963.
8
9
10 470 Angelici, F. M. 2016. Problematic wildlife at the beginning of the twenty-first century. Pages
11
12 471 3-20 in *Problematic Wildlife: A Cross-Disciplinary Approach*, Angelici, F.M. (Ed.),
13
14 472 Springer, New York.
15
16
17 473 Arima, Y., R. Zu, M. Murhekar, S. Vong, and T. Shimada. 2013. Human infections with
18
19 474 avian influenza A(H7N9) virus in China: preliminary assessments of the age and sex
20
21 475 distribution. *Western Pacific Surveillance and Response Journal*, WHO 4(2): 1-3.
22
23
24 476 Ashbrook, F. G. 1937. The breeding of fur animals. US Dept. of agriculture Yearbook
25
26 477 separate, No. 1603.
27
28 478 Bacon, H. 2008. Implications of bear bile farming. *Veterinary Times*.
29
30 479 <https://www.vettimes.co.uk/article/implications-of-bear-bile-farming>. 2008(5).
31
32
33 480 Biggs, D., F. Courchamp, R. Martin, and H. P. Possingham. 2013. Legal trade of Africa's
34
35 481 rhino horns. *Science* 339:1038-1039.
36
37
38 482 Brown, G., and D. F. Layton. 2001. A market solution for preserving biodiversity: the black
39
40 483 rhino. In: Shogren J & Tschirhart T (Eds.), *Protecting Endangered Species in the United*
41
42 484 *States: Biological Needs, Political Realities, Economic Choices*. Cambridge University
43
44 485 Press, Cambridge.
45
46
47 486 Bulte, E. H., and R. Damania. 2005. An economic assessment of wildlife farming and
48
49 487 conservation. *Conservation Biology* 19(4): 1222-1233.
50
51
52 488 Cao, S. 2014. A research of relationship between black bear breeding industry and wildlife
53
54 489 conservation. Thesis, Northeast Forestry University, Harbin, China.
55
56 490 Challander, D. W. S., S. R. Harrop, and D. C. MacMillan. 2015. Towards informed and
57
58 491 multi-faceted wildlife trade interventions. *Global Ecology and Conservation* 3: 129-148.
59
60

- Challender, D. W. S, and D. C. MacMillan. 2014. Poaching is more than an enforcement problem. *Conservation Letters* 7 (5): 484-494.
- Che, J. 2000. Elk wild stocking in Yancheng Dafeng Nature Reserve was successful. *Chinese Wildlife*. 3: 47.
- Chen, C. 2006. The research on wildlife taming and breeding legal system in China. Thesis, Central South University of Forestry and Technology, Changsha, China.
- Cheng, J., Y. Luo, M. Qiao, Y. Cai, and D. Wang. 2002. The factors affecting musk secretion quantity in *Moschus berezovskii*. *Special Wild Economic Animal Plant Research* 3:15-18.
- Chinese State Forestry Administration. 2014. Forest Certification in China: Precious and Endangered Wildlife for Production—Feeding and Management. Chinese State Forestry Administration, Beijing, China.
- Clucas, B., K. McHugh, and T. Caro. 2008. Flagship species on covers of US conservation and nature magazines. *Biodiversity and Conservation* 17: 1517-1528.
- Clutton-Brock, J. 1999. A natural history of domesticated mammals, 2nd ed. Cambridge University Press, Cambridge.
- Croft, D. B. 2000. Sustainable use of wildlife in western New South Wales: possibilities and problems. *Rangeland Journal* 22(1): 88-104.
- Daleszczyk, K., A. E. Eycott, and J. E. Tillmann. 2016. Mammal species extinction and decline: Some current and past case studies of the detrimental influence of man. Pages 21-44 in *Problematic Wildlife: A Cross-Disciplinary Approach*, Angelici, FM (Ed.), Springer, New York.
- Damania, R., and E. H. Bulte. 2007. The economics of wildlife farming and endangered species conservation. *Ecological Economics* 62: 461-472.
- Diamond, J. 1997. *Guns, Germs, and Steel: The Fates of Human Societies*.

1
2
3 517 Population and Development Review 23(4):889.
4
5
6 518 Diao, F. 2016. With four mentions of ‘utilisation’ at the start, the revised draft of the Wildlife
7
8 519 Protection Law has attracted controversy. [https://eia-international.org/wp-](https://eia-international.org/wp-content/uploads/Diao-Fanchao-With-four-mentions-of-utilisation-at-the-start1.pdf)
9
10 520 [content/uploads/Diao-Fanchao-With-four-mentions-of-utilisation-at-the-start1.pdf](https://eia-international.org/wp-content/uploads/Diao-Fanchao-With-four-mentions-of-utilisation-at-the-start1.pdf). 14
11
12 521 January 2016.
13
14
15 522 Diao, F. 2017. State Forestry Administration: with the up-listing of pangolins onto CITES
16
17 523 Appendix I in effect, eating could mean a criminal sentence. [https://eia-](https://eia-international.org/wp-content/uploads/State-Forestry-Administration-with-the-up-listing-of-pangolins-onto-CITES-Appendix-I-in-effect-eating-could-mean-a-criminal-sentence.pdf)
18
19 524 [international.org/wp-content/uploads/State-Forestry-Administration-with-the-up-listing-](https://eia-international.org/wp-content/uploads/State-Forestry-Administration-with-the-up-listing-of-pangolins-onto-CITES-Appendix-I-in-effect-eating-could-mean-a-criminal-sentence.pdf)
20
21 525 [of-pangolins-onto-CITES-Appendix-I-in-effect-eating-could-mean-a-criminal-](https://eia-international.org/wp-content/uploads/State-Forestry-Administration-with-the-up-listing-of-pangolins-onto-CITES-Appendix-I-in-effect-eating-could-mean-a-criminal-sentence.pdf)
22
23 526 [sentence.pdf](https://eia-international.org/wp-content/uploads/State-Forestry-Administration-with-the-up-listing-of-pangolins-onto-CITES-Appendix-I-in-effect-eating-could-mean-a-criminal-sentence.pdf). 24 February 2017 .
24
25
26 527 Drury, R. 2011. Hungry for success: Urban consumer demand for wild animal products in
27
28 528 Vietnam. Conservation and Society 9 (3): 247-257.
29
30
31 529 Drury, R. 2009. Reducing urban demand for wild animals in Vietnam: Examining the
32
33 530 potential of wildlife farming as a conservation tool. Conservation Letters 2: 263-270.
34
35
36 531 Duan, J. 2015. Special legislation to protection endangered wildlife research in China—
37
38 532 Yunnan—the example of snub-nosed monkey. Thesis, Yunnan University, Kunming,
39
40 533 China.
41
42 534 Duffy, R. 2000. Killing for Conservation: Wildlife Policy in Zimbabwe. The International
43
44 535 African Institute. James Currey, Oxford.
45
46
47 536 Eltringham, S. K. 1984. Wildlife resources and economic development. Wiley, Cichester and
48
49 537 New York.
50
51 538 Eltringham, S. K. 1994. Can wildlife pay its way? Oryx 28: 163-168.
52
53
54 539 Environmental Investigation Agency; EIA. 2016. Comments on draft implementation
55
56 540 regulations for the revised law of the People’s Republic of China on the protection of
57
58 541 wildlife. <https://eia-international.org/wp-content/uploads/EIA-comments-on-WPL-draft->
59
60

- 542 implementation-regulations-bilingual.pdf.
- 543 Fischer, C. 2004. The complex interactions of markets for endangered species products.
544 Journal of Environmental Economics and Management 48: 926-953.
- 545 Fu, C. 1993. The protection and utilization of wild animal resources. Ecological Economy 6:
546 39-43.
- 547 Geist, V. 1985. Game ranching: threat to wildlife conservation in North America. Wildlife
548 Society Bulletin 13: 594-598.
- 549 Ginsberg, J. R. 1994. Captive breeding, reintroduction and the conservation of canids. Pages
550 365-383 in Creative conservation: Interactive management of wild and captive animals
551 (eds. Olney PJS, Mace GM, Feistner ATC). Chapman & Hall, London, UK.
- 552 Gong, M., J. Wang, L. Zhang, and G. Liu. 2017. Thinking about the supervision of animal
553 release. Sichuan Journal of Zoology 36(2): 227-231.
- 554 Graham-Rowe, D. 2011. Biodiversity: Endangered and in demand. Nature 480: S101–S103.
- 555 Guo, P., and Y. Wei. 2016. Revision of the Wildlife Protection Law: it's time to say goodbye
556 to commercial utilization of wildlife. [https://eia-international.org/wp-](https://eia-international.org/wp-content/uploads/Guo-Peng-Wei-Yubao-Revision-of-the-Wildlife-Protection-Law1.pdf)
557 [content/uploads/Guo-Peng-Wei-Yubao-Revision-of-the-Wildlife-Protection-Law1.pdf](https://eia-international.org/wp-content/uploads/Guo-Peng-Wei-Yubao-Revision-of-the-Wildlife-Protection-Law1.pdf). 8
558 January 2016.
- 559 Harding, R. S. O., and G. Teleki. 1981. Omnivorous primates: Gathering and hunting in
560 human evolution. Columbia University Press, New York.
- 561 Harris, R. B. 2008. Wildlife conservation in China—preserving the habitat of China's wild
562 West. M.E. Sharpe, Armonk, New York.
- 563 Harris, R. B. 2015. *Cervus nippon*. The IUCN Red List of Threatened Species:
564 e.T41788A22155877.
- 565 Homes, V. 1999. On the scent: conserving musk deer - the uses of musk and Europe's role in
566 its trade. TRAFFIC Europe, Brussels.

1
2
3 567 Hosey, G., V. Melfi, and S. Pankhurst. 2013. Zoo Animals: behaviour, management and
4
5 568 welfare, 2nd edition. Oxford University Press, Oxford, UK.
6
7
8 569 Hua, Z. 2012. Talk about the perfection of legal system on our country wildlife protection.
9
10 570 Thesis, Northeast Forestry University, Harbin, China.
11
12 571 Huang, S. 2016. Study on the identification and traceability system of wild animals and their
13
14 572 products in China. ,Dissertation, Beijing Forestry University, Beijing, China.
15
16
17 573 Huang, H., and Z. Li. 2006. Bear farming and bear conservation in China. In: Proceedings of
18
19 574 the Fourth International Symposium on the trade in bear parts (ed. Williamson DF).
20
21 575 TRAFFIC East Asia, Tokyo.
22
23
24 576 Hudson, R. J., K. R. Drew, and L. M. Baskin. 2010. Wildlife Production Systems. Cambridge
25
26 577 University Press, Cambridge, UK.
27
28 578 International Union for the Conservation of Nature and Natural Resources (IUCN), United
29
30 579 Nations Environment Programme (UNEP) and World Wide Fund for Nature (WWF).
31
32 580 1980. World Conservation Strategy. IUCN, Gland, Switzerland.
33
34
35 581 International Union for the Conservation of Nature and Natural Resources (IUCN), United
36
37 582 Nations Environment Programme (UNEP) and World Wide Fund for Nature (WWF).
38
39 583 1991. Caring for the earth. A strategy for sustainable living. IUCN, Gland, Switzerland.
40
41
42 584 International Union for the Conservation of Nature and Natural Resources (IUCN). 2000. The
43
44 585 IUCN Policy Statement on Sustainable Use of Wild Living Resources.
45
46 586 <http://www.iucn.org/themes/policy/polstateng.html>
47
48
49 587 International Union for the Conservation of Nature and Natural Resources (IUCN). 2013.
50
51 588 Guidelines for Reintroductions and Other Conservation Translocations, vs 1.0. Gland,
52
53 589 Switzerland: IUCN Species Survival Commission.
54
55
56 590 Isaacs, J. C. 2000. The limited potential of ecotourism to contribute to wildlife conservation.
57
58 591 Wildlife Society Bulletin 28(1): 61-69.
59
60

- Jepson, P., and R. J. Ladle. 2005. Bird-keeping in Indonesia: conservation impacts and the potential for substitution-based conservation responses. *Oryx* 39:442-448.
- Ji, S. 2016. Protection or utilization? Experts call for the draft Wildlife Protection Law topriorities protection of wildlife. Nanfang Metropolitan News, <https://eia-international.org/wp-content/uploads/Li-Shi-Protection-or-utilisation.pdf>. 21 January 2016.
- Jiang, J. 2016. Draft animal protection law worries activists. Global Times,<https://eia-international.org/wp-content/uploads/4.-Draft-animal-protection-law-worries-activists-Global-Times.pdf>. 26 April 2016.
- Jiang, Z. 2003. Value, utilization and legal management of wildlife resource. *Journal of Chinese Academy Science* 18(6) 416-419.
- Jiang, Z., C. Li, H. Fang, Z. Meng, and Y. Zeng. 2007. Captive-bred tigers and the fate of wild tigers. *Bioscience* 57(9): 725-725.
- Jori, F., G. A. Mensah, and E. Adjanohoun. 1995. Grasscutter production: an example of rational exploitation of wildlife. *Biodiversity and Conservation* 4:257-265.
- Kock, R. A. 1995. Wildlife utilization: use it or lose it—a Kenyan perspective. *Biodiversity and Conservation* 4(3): 241-256.
- Lapointe, E., K. Conrad, B. Mitra, and H. Jenkins. 2007. Tiger conservation: it's time to think outside the box. IWMC World Conservation Trust. Lausanne, Switzerland.
- Legge, A. J. 1972. Prehistoric exploitation of the gazelle in Palestine. Pages 119-124 in Higgs E.S. (Ed.). *Papers in economic prehistory*. Cambridge University Press, Cambridge, UK.
- Lei, C. 2016. Can the bones of dead tigers be utilized? NPC Standing Committee Members Debate. *The People's Daily*. https://eia-international.org/wp-content/uploads/5.-Can-the-bones-of-dead-tigers-be-utilised_-.pdf. 27 April 2016.
- Li, Z., Y. Qin, Y. Zhao, and C. Yue. 2005. Current Situation and Countermeasures for Wild

1
2
3 617 Animals Development in Zhejiang Province. Journal of Zhejiang Forestry Science
4
5 618 Technology 2:46-50.
6
7
8 619 Li, P. J. 2007. Enforcing Wildlife Protection in China—the legislative and political solutions.
9
10 620 Sage Publications 21(1): 71-107.
11
12 621 Li, X., S. Wu, and D. Qi. 2016. The analysis on quantity of nature reserves in China. Practical
13
14 622 Forestry Technology 11:35-38.
15
16
17 623 Li, Y. 2016. Protection or utilisation? Revision of the Wildlife Protection Law called into
18
19 624 question. China Science News. [https://eia-international.org/wp-content/uploads/Li-Yu-](https://eia-international.org/wp-content/uploads/Li-Yu-Protection-or-utilisation.pdf)
20
21 625 [Protection-or-utilisation.pdf](https://eia-international.org/wp-content/uploads/Li-Yu-Protection-or-utilisation.pdf). 14 January 2016.
22
23
24 626 Lin, B. 2004. China's domestic animal breeding industry began to take shape. China Forestry
25
26 627 11:27-28.
27
28 628 Lin, Y., S. Jing, S. Bai, and E. Liu. 1999. The mark of wild animals and their products.
29
30 629 Chinese Journal of Wildlife 5:40-41.
31
32
33 630 Lindsey, P. A, S. S. Romañach, and H. T. Davies-Mostert. 2009. The importance of
34
35 631 conservancies for enhancing the value of game ranch land for large mammal
36
37 632 conservation in southern Africa. Journal of Zoology 277(2): 99-105.
38
39
40 633 Lindsey, P. A., P. A. Roulet, and S. S. Romañach. 2007. Economic and conservation
41
42 634 significance of the trophy hunting industry in sub-Saharan Africa. Biological
43
44 635 Conservation 134(4): 455-469.
45
46
47 636 Liu, X. 2017. The revision of Wildlife Protection Law: the degree of Protection and
48
49 637 Utilization to become the focus. The people’s congress of China 2: 20-20.
50
51 638 Liu, Y. 2005. Study of the wildlife industry management: a comparison between China and
52
53 639 Australia. Thesis, Northeast Forestry University, Harbin, China.
54
55
56 640 Loveridge, A. J., J. C. Reynolds, and E. J. Milner-Gulland. 2006. Does sport hunting benefit
57
58 641 conservation? Pages 224-240 in Macdonald, D. and Service, K. (Eds.), Key Topics in
59
60

- Conservation Biology. Wiley-Blackwell, Oxford, UK.
- Lu, F., and W. Zhang. 2012. Investigation and Analysis of public Attitudes towards Wildlife utilization. *Journal of Northeast Forestry University* 40(11):155-158.
- Ma, W. 2016. Dubbed the 'Wildlife Exploitation and Utilisation Law': the pain of overhauling the Wildlife Protection Law China Times. <https://eia-international.org/wp-content/uploads/Ma-Weihui-Dubbed-the-Wildlife-Exploitation-and-Utilisation-Law2.pdf>. 12 January 2016.
- Makombe, K. 1994. Sharing the land: Wildlife, people and development in Africa. IUCN/ROSA Environmental Issues Series No.1, IUCN/ROSA, Harare, Zimbabwe and IUCN/SUWP, Washington, USA.
- Mang, P. 2016. Revision of the Wildlife Protection Law: we should not see wildlife as a resource The Paper. <https://eia-international.org/wp-content/uploads/Mang-Ping-Revision-of-the-Wildlife-Protection-Law1.pdf>. 7 January 2016.
- Marks, S. A. 1984. The imperial lion. Human dimension of wildlife management in Central Africa. Westview Press, Boulder, Colorado.
- Meng, M. 2008. Research on Chinese public awareness of wildlife utilization and conservation. Thesis, Beijing Forestry University, Beijing, China.
- Meng, X., and W. Wang. 1999. The use and conservation of saiga antelope in China. *Chinese Journal of Wildlife* 20(5): 2-4.
- Meng, M., and F. Yin. 2008. Survey of breeding status of sika deer (*Cervus nippon*) in deer farms in China. *Chinese Journal of Wildlife* 29(1): 47-49.
- Milner-Gulland, E., and N. Leader-Williams. 1992. Model of incentives for the illegal exploitation of black rhinos and elephants: poaching pays in Luangwa Valley, Zambia. *Journal of Applied Ecology* 29: 388-401.
- Mitra, B. 2005. How the market can save the tiger. *Far Eastern Econ Review* 168: 44-47.

- 667 Nijman, V. 2010. An overview of international wildlife trade from Southeast Asia.
668 Biodiversity Conservation 19:1101-1114.
- 669 Ohtaishi, N., and H. I. Sheng. 1990. Deer of China: biology and management. Proceedings of
670 the international symposium on deer of China. Elsevier, Oxford, UK.
- 671 Pan, Z., W. Zhang, and X. Zhou. 2001. The Necessity for Developing the Wildlife Industry.
672 Journal of Northeast For University 29(5): 58-59.
- 673 Parker, I. S. C., and A. D. Graham. 1971. The ecological and economic basis for game
674 ranching in Africa. Pages 393-404 in The scientific management of plant and animal
675 communities for conservation, Duffley, E. and Watt, A. S. (Eds.). Blackwell, Oxford,
676 UK.
- 677 Parry-Jones, R. 2001. Captive breeding and traditional medicine. Commercial Captive
678 Propagation and Wild Species. IUCN/SSC Wildlife Trade Programme, Florida, USA.
- 679 Parry-Jones, R., and J. Y. Wu. 2001. Musk deer farming as a conservation tool in China.
680 TRAFFIC East Asia, Taipei.
- 681 Petry, M., and B. Liting. 2010. China-Peoples Republic of Fur Animals and Products. GAIN
682 (Global Agricultural Information Network) Report, CH10031, USDA Foreign
683 Agricultural Service.
- 684 Phelps, J., L. R. Carrasco, and E. L. Webb. 2013. A framework for assessing supply-side
685 wildlife conservation. Conservation Biology 28(1):244-257.
- 686 Piao, H. 2003. Development of special animal farming industry in China. Journal of
687 Economic Animal 7(1):1-4.
- 688 Pickett, H., and S. Harris. 2015. The Case Against Fur Factory Farming A Scientific Review
689 of Animal Welfare Standards and 'WelFur'. [http://www.furfreealliance.com/wp-](http://www.furfreealliance.com/wp-content/uploads/2015/11/Case-against-fur-farming.pdf)
690 [content/uploads/2015/11/Case-against-fur-farming.pdf](http://www.furfreealliance.com/wp-content/uploads/2015/11/Case-against-fur-farming.pdf) [last accessed 03.06.2017].
- 691 Prins, H. H. T., J. G. Grootenhuys, and T. T. Dolan. 2000. Wildlife Conservation by

- 692 Sustainable Use. Springer, Amsterdam, Netherlands.
- 693 Rasker, R., and C. H. Freese. 1995. Wildlife in the marketplace: opportunities and problems.
694 Pages 177–204 in *On Fundamental Policies in Wildlife Conservation*. (eds. Geist V &
695 McTaggart-Cowan I), Detselig Publishers, Calgary, Canada.
- 696 Reid, F., M. Schiaffini, and J. Schipper. 2016. *Neovison vison*. The IUCN Red List of
697 Threatened Species 2016: e.T41661A45214988. doi.org/10.2305/IUCN.UK.2016-
698 1.RLTS.T41661A45214988.en. [Last accessed on 15 July 2018]
- 699 Rosen, G. E., and K. F. Smith. 2010. Summarizing the evidence on the international trade in
700 illegal wildlife. *Ecohealth* 7: 24-32.
- 701 Sekercioglu, C. H. 2006. Increasing awareness of avian ecological function. *Trends Ecology*
702 *and Evolution* 21(8):464-471.
- 703 Sheng, H. L., and Z. X. Liu. 2007. The musk Deer in China. The Shanghai Scientific and
704 Technical Publishers, Shanghai.
- 705 Smith, R. D. 2006. Responding to global infectious disease outbreaks: Lessons from SARS
706 on the role of risk perception, communication and management. *Social Science &*
707 *Medicine* 63(12):3113-3123.
- 708 Stiles, D. 2004. The ivory trade and elephant conservation. *Environmental Conservation*
709 31(4):309-321.
- 710 Still, J. 2003. Use of animal products in traditional Chinese medicine: environmental impact
711 and health hazards. *Complementary Therapies in Medicine* 11:118-122.
- 712 Sturdy, D. A. 1975. Some reindeer economies in prehistoric Europe. Pages 55-95 in
713 *Palaeoeconomy* (ed, Higgs, ES) Cambridge University Press, Cambridge.
- 714 Sun, C., and Q. Wang. 2007. Thinking on Correlation of Wildlife Conservation and Use.
715 *Chinese Journal of Wildlife* 28(6):45-47.
- 716 Tensen, L. 2016. Under what circumstances can wildlife farming benefit species

1
2
3 717 conservation? *Global Ecology and Conservation* 6:286-298.
4
5 718 Tisdell, C. 1994. Does the economic use of wildlife favour conservation and sustainability.
6
7 719 Biodiversity conservation: Studies in its economics and management, mainly in Yunnan,
8
9 720 China. Working Paper No. 2, The University of Queensland, Brisbane, Australia.
10
11 721 United Nations Environment Programme (UNEP). 1992. Convention on Biological Diversity
12
13 722 (CBD). Nairobi, Kenya.
14
15 723 Van Hoven, W., and H. Ebedes. 1994. Wildlife Ranching: A celebration of diversity.
16
17 724 Proceedings of the 3rd International Wildlife Ranching Symposium. Center for Wildlife
18
19 725 Management, University of Pretoria, Pretoria.
20
21 726 Van Kooten, G. C., and E. H. Bulte. 2000. The Economics of Nature: Managing Biological
22
23 727 Assets. Blackwell, Malden, MA.
24
25 728 Wan, Z. 2004. Wildlife trade management and enforcement. China Forestry Publishing
26
27 729 House, Beijing.
28
29 730 Wang, H., Y. Zhai, and H. Wang. 2016a. The interpretation of wildlife protection law of the
30
31 731 People's Republic of China. China Legal Publishing House, Beijing, China.
32
33 732 Wang, H., X. Zhang, and Z. Yue. 2016b. Interpretation of the Law of the People's Republic
34
35 733 of China on the Protection of Wild Animals. China Democracy and Law Press, Beijing.
36
37 734 Wang, L., H. Wang, H. P. Liu, J. D. Liu, H. Ning, Q. Y. Wang, Z. Q. Cheng, and Y. J.
38
39 735 Wang. 2015. Breeding and development of musk deer in Sichuan. *Pharmacy Clinics of*
40
41 736 *Chinese Materia Medica* 6(4):6
42
43 737 Wang, M. 2002. The Research on Wild Animal Taming and Breeding Legal system. Thesis,
44
45 738 Northeast Forestry University, Harbin, China.
46
47 739 Wang, W. 2011. Study on the effect of wild animal breeding on the protection of wild
48
49 740 population. PhD thesis, Northeast Forestry University, Harbin, China.
50
51 741 Wang, X., H. Yang, and Q. Wang. 2010. Current Situation and Thinking of Special
52
53
54
55
56
57
58
59
60

- 742 Economic Animal Breeding. Special Economic Animal and Plant 13(6): 5-7.
- 743 Wang, Z. 2006. Study on the problems and countermeasures of the current marking
744 management of wildlife and its products in China. Thesis, Northeast Forestry University,
745 Harbin, China.
- 746 Wellsmith, M. 2011. Wildlife crime: the problems of enforcement. *European Journal on*
747 *Criminal Policy and Research* 17:125-148.
- 748 Wronski, T., H. Lerp, E. V. Bärmann, T. M. Butynski, and M. Plath. 2017. Dark-furred
749 gazelles on the Arabian Peninsula: threatened species or domestic pet? *Hystrix* 28(1):
750 78-85.
- 751 Xie, Y. 2016. Wildlife conservation is crucial for national ecological security. Utilisation of
752 wildlife cannot be expanded at will. *China Environment News*. [https://eia-](https://eia-international.org/wp-content/uploads/Xie-Yan-Wildlife-conservation-is-crucial-for-national-ecological-security2.pdf)
753 [international.org/wp-content/uploads/Xie-Yan-Wildlife-conservation-is-crucial-for-](https://eia-international.org/wp-content/uploads/Xie-Yan-Wildlife-conservation-is-crucial-for-national-ecological-security2.pdf)
754 [national-ecological-security2.pdf](https://eia-international.org/wp-content/uploads/Xie-Yan-Wildlife-conservation-is-crucial-for-national-ecological-security2.pdf). 19 January 2016.
- 755 Xu, W. 2016. Shenyang experts and volunteers come together to discuss wildlife. Shenyang
756 Evening News. [https://eia-international.org/wp-content/uploads/Xu-Weiwei-Shenyang-](https://eia-international.org/wp-content/uploads/Xu-Weiwei-Shenyang-experts-and-volunteers-come-together-to-discuss-wildlife2.pdf)
757 [experts-and-volunteers-come-together-to-discuss-wildlife2.pdf](https://eia-international.org/wp-content/uploads/Xu-Weiwei-Shenyang-experts-and-volunteers-come-together-to-discuss-wildlife2.pdf). 19 January 2016.
- 758 Yang, F. 2012. Chinese deer industry development strategy research. Thesis, Jilin University,
759 Changchu, China.
- 760 Yerex, D. 1982. The farming of deer. World trends and modern techniques. Agricultural
761 Promotion Associates: Wellington, New Zealand.
- 762 Yu, F. 2016. What conservationists expect from a Wildlife Protection Law. [https://eia-](https://eia-international.org/wp-content/uploads/Yu-Fengqin-What-conservationists-expect-from-a-Wildlife-Protection-Law2.pdf)
763 [international.org/wp-content/uploads/Yu-Fengqin-What-conservationists-expect-from-a-](https://eia-international.org/wp-content/uploads/Yu-Fengqin-What-conservationists-expect-from-a-Wildlife-Protection-Law2.pdf)
764 [Wildlife-Protection-Law2.pdf](https://eia-international.org/wp-content/uploads/Yu-Fengqin-What-conservationists-expect-from-a-Wildlife-Protection-Law2.pdf). 12 January 2016.
- 765 Zhang, W., Z. Pan, Y. Jin, and Y. Xu. 2001. The Problems Necessarily Requiring
766 Appropriate Solution in the Wildlife Industrializing Process. *Journal of Northeast*

1
2
3 767 Forestry University 29(5): 60-63.
4
5 768 Zhang, L., and F. Yin. 2014. Wildlife consumption and conservation awareness in China: a
6
7 long way to go. Biodiversity Conservation 23(9): 2371-2381.
8 769
9
10 770 Zhang, L. 2016. China: New Wildlife Protection Law. Library of Congress-Global Legal
11
12 771 Monitor. [http://www.loc.gov/law/foreign-news/article/china-new-wildlife-protection-](http://www.loc.gov/law/foreign-news/article/china-new-wildlife-protection-law/)
13
14 772 [law/](http://www.loc.gov/law/foreign-news/article/china-new-wildlife-protection-law/). 5 August 2016.
15
16
17 773 Zhang, L., N. Hua, and S. Sun. 2008. Wildlife trade, consumption and conservation
18
19 774 awareness in southwest China. Biodiversity Conservation 17(6):1493-1516.
20
21 775 Zhao, J., X. Lan, C. Jiang, and J. Niu. 2012. Conservation and utilization of tropical wildlife
22
23 776 resources in China. Chinese Journal of Tropical Agriculture 32(12):106-109.
24
25
26 777 Zhong, L. 2005. The rule of development and utilization of wild fauna and flora. Forestry of
27
28 778 China 19(10A):12-13.
29
30
31 779 Zhong, L., Y. Yang, H. Sun, S. Wang, L. Zhu, J. Yang, and D. Ju. 2013. Wildlife feeding
32
33 780 management system and certification. Journal of Economic Animal 17(4):187-191.
34
35 781 Zhou, F. 1997. Captive breeding of economic wildlife. Guangxi Science and Technology
36
37 782 Press, Nanning, China.
38
39
40 783 Zhou, X., J. Ma, and W. Zhang. 2007. Discussions on sustainable development of Chinese
41
42 784 medicinal industry from wildlife resources. Sichuan Journal of Zoology 26(4):859-861.
43
44 785 Zhou, X., and W. Zhang. 2003. The necessity of modifying the wildlife protection law in
45
46 786 terms of wildlife industry. Journal of Northeast For University 31(6):57-58.
47
48
49 787 Zhou, Q. 2016. New Wildlife Protection Law is passed—discussion of use of tiger bone in
50
51 788 medicine. Caixin. <http://m.china.caixin.com/m/2016-07-03/100961514.html>. 3 July 2016
52
53 789 Zou, X., A. Wang, L. Zou, and C. Huang. 1998. Countermeasure to develop the breeding of
54
55 790 economic wildlife in China. Journal of Economic Animal 2:1-5.
56
57
58
59
60

Table 1

Most common, commercially bred mammalian species in China, the estimated total number in captivity, and the breeding purposes. (*) endangered species under special state protection, (#) commercial use prohibited.

Common name	Scientific name	Estimate number	Reference	Breeding purpose
Musk deer	<i>Moschus berezovskii</i> , <i>Moschus moschiferus</i> , <i>Moschus sifanicus</i>	8,400	Li (2012)	musk (base note in perfumery)
Sika deer	<i>Cervus nippon</i>	1,200,000	Yang (2012)	antler velvet (cartilage and tendon injuries), venison
Wapiti deer	<i>Cervus canadensis</i>	80,000	Yang (2012)	antler velvet and venison
Saiga*	<i>Saiga tatarica</i>	51	Li, Zhao & Bennett (2007)	horn (reducing body heat, detoxification, releasing infant fevers & epilepsy)
Rhinoceroses*,#	<i>Rhinoceros</i> , <i>Ceratotherium</i> , <i>Diceros</i>	several 100	Graham-Rowe (2011)	horn (fever, rheumatism, gout)
Macaque	<i>Macaca mulatta</i>	8,000	Kong (2008)	laboratory experiments
Asian black bear	<i>Ursus thibetanus</i>	9,905	Cao (2014)	bear bile (treatment of inflammation, bacterial infections, gallstones, pain)
Brown bear	<i>Ursus arctos</i>			
Sun bear	<i>Helarctos malayanus</i>			
Tiger*,#	<i>Panthera tigris</i>	4-5,000 6-10,000	Abbott & van Kooten (2011) Graham-Rowe (2011)	bone (hemiplegia joint sprains), urine (rheumatism)
Mink	<i>Neovison vison</i>	70,000,000	Petry & Liting (2010)	fur, clothing
Artic fox	<i>Vulpes (Alopex) lagopus</i>			
Raccoon dog	<i>Nyctereutes procyonoides</i>			

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 2

Legal and administrative improvements by China’s revised WPL.

	Previous WPL	Revised WPL
1	‘Priority of conservation’, ‘rational and sustainable utilization’ and ‘strict law enforcement’ were not explicitly highlighted.	The principles of ‘priority of conservation’, ‘rational and sustainable utilization’ and ‘strict law enforcement’ were manifested.
2	The scope of wildlife conservation was limited.	The new law does not only apply to endangered species, but also to any other terrestrial species that has an important ecological, scientific or social value
3	No specific provisions about the origin of commercial wildlife product.	Chinese consumers can only use wildlife products that originate from captive populations and the consumption or trade of specimens collected in the wild is clearly prohibited
4	No provisions for a marking scheme were included.	Marking schemes were developed to prevent fraud, to curtail illegal trade of specimens and products, and to ensure that traded specimens are in fact the ones referred to in the enclosed documents.
5	Legal prosecution and penalization were lacking vigour. No legal liability for violating nature reserve regulations or destroying wildlife habitat.	The intensity of legal prosecution and penalization was increased, e.g., by the provision to confiscate illegal wildlife products, hunting implements and all unlawful income, by suspending special hunting licenses, and by fining perpetrators one to five times the value of the commodity. The new WPL also includes legal liability for violating nature reserve regulations or destroying wildlife habitat. Moreover, wildlife conservation authorities and their relevant departments will be held responsible for any dereliction of duty.
6	Ignored the importance of habitat protection.	The provision for wildlife habitat protection was included.
7	Legal procedures for hunting, artificial breeding, utilization, and trade were either very vague or were not included.	Legal procedures for hunting, artificial breeding, utilization, and trade were refined and specified.
8	Protection and management measures for captive and wild populations were either missing or vaguely formulated.	In addition to the provisions of the previous WPL, newly tailored protection and management measures for captive and wild populations were implemented. In recent years, wildlife breeding techniques have experienced major breakthroughs, forming larger, healthier and more stable captive populations, to a degree that artificial breeding populations can meet the

		market demand. These experiences were included into the revised WBL.
9	Compensation for wildlife damage and insurance by the central government were not stipulated.	Existing provisions for wildlife damage compensation and insurance by the central government were supplemented by requesting local governments of provinces, autonomous regions and municipalities to formulate and implement directives for the compensation of injury, death, crop raiding or other losses of property. Local government bodies were urged to provide own subsidies for compensation, and to encourage insurance companies to develop and set-up insurance programs to compensate for damage caused by wildlife.
10	Guidelines for wildlife reintroduction and release procedures were not enclosed.	Guidelines for wildlife reintroduction and release procedures were added, largely following IUCN reintroduction and translocation guidelines (IUCN 2013).
11	Although a licensing system for wildlife farms and the trade with captive bred wildlife species was in place, regulations regarding breeding conditions and animal welfare were insufficient, and without specific standards and regulatory measures.	A certification scheme for wildlife breeding and trade was implemented and regulations regarding breeding conditions and animal welfare with specific standards and regulatory measures were established.
12	The disposal of seized items was vague and not specific.	The new law added specific regulation about the disposal and management of seized items.