

# How China's Wildlife Trade Legislation Permits Commercial Trade in Protected Wild Animal Species

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## Abstract

Wildlife trade policies in China and elsewhere have come under increased scrutiny following suggestions that the emergence of the coronavirus SARS-CoV-2 may have been linked to trade in wild animals. The breeding of and trade in most terrestrial wild animal species for consumption as food were prohibited in China in February 2020, but trade for non-food purposes such as ornamental items or traditional medicine continues to be covered by provisions in the Wildlife Protection Law (WPL). While a superficial reading of the WPL could lead to the conclusion that commercial trade in nationally protected species is generally prohibited, in practice key language is interpreted to permit commercial trade in the parts and derivatives of protected wild animal species, including those subject to the most stringent protection within China and internationally, such as leopards and pangolins.

**Keywords:** wildlife trade; wildlife conservation; traditional Chinese medicine; CITES; leopard; pangolin

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Much attention has been paid to China's wildlife trade policies following the emergence of the coronavirus SARS-CoV-2 in Wuhan and initial suggestions that this may have been linked to trade in wild animals.<sup>1</sup> Policy interventions in China have reflected official concern over this reported link, with "Decisions" adopted by the Standing Committee of the National People's Congress (NPCSC) on 24 February 2020 prohibiting the breeding of and trade in most terrestrial wild animal species, including specimens bred in captivity, for consumption as food.<sup>2</sup> Prior to this, regulations had permitted trade in wild animals other than nationally protected species for consumption as food if proof of legal origin could be provided.

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1 Lu et al. 2020.

2 "Quanguo renmin daibiao dahui changwu weiyuanhui guanyu quanmian jinzhi feifa yesheng dongwu jiaoyi, gechu lanshi yesheng dongwu louxi, qieshi baozhang renmin qunzhong shengming jiankang anquan de jue ding" (Decisions of the Standing Committee of the National People's Congress relating to a total prohibition on illegal wildlife trade, eliminating the bad habit of excessive eating of wildlife, and effectively safeguarding the lives and health of the public), 2020, <http://www.npc.gov.cn/npc/c30834/202002/c56b129850aa42acb584cf01ebb68ea4.shtml>. Accessed 19 November 2020.

The new prohibitions were consolidated in a 2020 draft revision of the Wildlife Protection Law (WPL), China's most significant legislation covering the conservation of and trade in wild animals.<sup>3</sup> However, contrary to some media reports, these policy changes do not represent a comprehensive prohibition of trade in wild animals.<sup>4</sup> For example, they do not prohibit the commercial breeding of and trade in aquatic wild animals such as turtles, frogs and salamanders for consumption as food. Nor do they prohibit trade in wild animals for non-food purposes such as traditional medicine, fur, ornamental items or the pet trade. Both the current WPL and the draft revision set out provisions for commercial trade for non-food purposes, even if the species is protected.

### China's Wildlife Protection Law

The WPL was first adopted in 1988, with revisions approved in 2009, 2016 and 2018 – the 2016 revision being the most substantial.<sup>5</sup> After further revision of the WPL was added to the work programme for the NPCSC in February 2020,<sup>6</sup> a revised draft was published in October 2020 and was open to public comments until 19 November.<sup>7</sup>

The WPL stipulates different levels of protection for wild animal species, including first-class and second-class special state protection. First-class special state protection is the highest category of protection under Chinese law and currently covers species including the tiger (*Panthera tigris*), leopard (*Panthera pardus*), saiga antelope (*Saiga tatarica*), musk deer (*Moschus* spp.), Asian elephant (*Elephas maximus*) and three species of pangolin (*Manis* spp.). Species covered by second-class special state protection include the Asiatic black bear (*Ursus thibetanus*) and Chinese giant salamander (*Andrias davidianus*).<sup>8</sup>

Article 27 of the current WPL states that approval may be granted by provincial-level government departments for “the sale, purchase or utilization of wild animals under special state protection or the products thereof [if it] is necessary for scientific research, captive breeding, public exhibition or performances, heritage conservation or other special purposes.” Article 28 then states

3 Zhonghua renmin gongheguo yesheng dongwu baohu fa (xiuding cao'an) (Wildlife Protection Law of the People's Republic of China (revised draft)), [https://eia-international.org/wp-content/uploads/中华人民共和国野生动物保护法\(修订草案\).pdf](https://eia-international.org/wp-content/uploads/中华人民共和国野生动物保护法(修订草案).pdf). Accessed 19 November 2020.

4 See, e.g., “In brief: China bans wildlife trade, consumption.” *The Straits Times*, 25 February 2020, <https://www.straitstimes.com/asia/east-asia/in-brief-china-bans-wildlife-trade-consumption>. Accessed 19 November 2020.

5 Zhonghua renmin gongheguo yesheng dongwu baohu fa (Wildlife Protection Law of the People's Republic of China), <http://www.npc.gov.cn/npc/c238/202001/a0d85c00a9a44b7a80fd88f2bb678253.shtml>. Accessed 19 November 2020.

6 Ministry of Natural Resources 2020.

7 “Yesheng dongwu baohu fa (xiuding cao'an) zhengqiu yijian” (Consultation on Wildlife Protection Law (revision draft)), 2020, <http://www.npc.gov.cn/flcaw/userIndex.html?lid=f1808081752b7d43017543fdc24714c5>. Accessed 18 November 2020.

8 See Ministry of Forestry and Ministry of Agriculture 1989. A much expanded list of species subject to special state protection was published by the National Forestry and Grasslands Administration in February 2021, the first major revision since 1989.

that species under special state protection “for which there exist established knowledge and techniques for captive breeding ... [may be] included on a list ... of captive-bred wildlife under special state protection” (hereafter referred to as the “utilization list”). Captive-bred specimens of these species may be traded commercially, subject to permits and production quotas. The language of both articles remains unchanged in the October 2020 revised draft.

A superficial reading of the WPL may therefore lead to the conclusion that commercial trade in species under special state protection, and products thereof, is prohibited, except for captive-bred specimens of species included on the utilization list. Wang Wenxia and colleagues reach a similar conclusion, stating, “The revised WPL is very specific in outlining wildlife species that are exempted from any use, compiling them in a detailed list of Chinese species under special state protection” and “the consumption or trade of specimens collected in the wild is clearly prohibited.”<sup>9</sup> Neither assertion, however, is correct. Research published by the Environmental Investigation Agency (EIA) into China’s legal, permitted trade in leopard bone and pangolin scales demonstrates how provisions of the current WPL enable commercial trade in the parts and products of species under first-class special state protection, including those sourced from wild populations.<sup>10</sup>

### *Trade in leopard bone*

Leopards (*Panthera pardus*), snow leopards (*Panthera uncia*) and clouded leopards (*Neofelis nebulosa*) are subject to first-class special state protection in China and, since 1975, have been listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which prohibits international commercial trade in the species, including parts and derivatives.

It is known that trade in packaged traditional Chinese medicines (TCM) containing leopard bone has been occurring in China since at least 1994.<sup>11</sup> “Leopard bone,” or *baogu* 豹骨, is also listed as an ingredient within standard formulations in the Chinese State Pharmacopoeia.<sup>12</sup> The term used for leopard bone in TCM is ambiguous, as the generic character for leopard (*bao* 豹) could refer to leopards, snow leopards or clouded leopards, all of which have been officially recognized as species from which the medicinal ingredient leopard bone may be derived.<sup>13</sup> On product labelling, leopard bone is sometimes represented in quasi-Latin as “Os pardi,” a non-scientific term with no precise taxonomic meaning.

9 Wang et al. 2019.

10 EIA 2020a; 2020b

11 Mills 1997.

12 Guojia yaodian weiyuanhui 2020.

13 State Forestry Administration 2004.

In 2007, the Chinese government reported to CITES that “only existing stock of leopard bones could be used” by pharmaceutical manufacturers.<sup>14</sup> In 2019, it further stated that “since January 1, 2006, only the outstanding stockpile of leopard bones held by pharmaceutical factories and verified by the national forestry authorities can be used for medicinal purposes.”<sup>15</sup> The quantities and provenance of these stockpiles have never been made public.

In 2018, the EIA identified 36 products listed on TCM manufacturer websites which included leopard bone in the ingredients list, plus an additional 26 products for which leopard bone was listed as an ingredient on images of product packaging and/or package inserts hosted on a third-party website.<sup>16</sup>

Since 2003, Chinese Government agencies have implemented a labelling mechanism for products which contain the body parts of certain wild animal species as a means of tracing and legitimizing trade.<sup>17</sup> The EIA found images of these China National Wildlife Mark (CNWM) labels on the packaging of six products which noted that they contained leopard bone (“Os pardi” or *baogu*) (Figure 1). Five of these products carried the code “W,” which indicates that the bone was sourced from the wild, while the sixth was marked with an “N,” which indicates that the origin is unknown. A search of the alphanumeric code on these labels on the CNWM website produced details of permits issued to the manufacturer by the State Forestry Administration (SFA, renamed the National Forestry and Grassland Administration (NFGA) in 2018) between 2011 and 2016.<sup>18</sup> Further details of these permits (such as quantities of leopard bone covered) do not appear to be publicly available. However, the full text of one permit issued by the SFA in 2018, Forestry Protection Permit No. 01237, was made available online by investigative journalists in China.<sup>19</sup>

Permit No. 01237 allowed one company to purchase 1.23 tonnes of leopard bone. According to a Chinese media article, the bone was verified by SFA experts in 2010.<sup>20</sup> When inspectors asked about its provenance, the individual named on the permit stated that his father had purchased the bone from many different places over the past few decades; a representative of the local forestry bureau claimed that he would not reveal its origin. These details indicate that the registering of leopard bone with the authorities and the procurement of new stock by pharmaceutical companies were both allowed after 2006, despite the 2006 regulation, and that a permit for the sale of leopard bone may have been issued without proof of its legal origins.

14 CITES Management Authority of China 2007.

15 CITES Management Authority of China 2019.

16 EIA 2020a.

17 State Forestry Administration and State Administration for Industry and Commerce 2003.

18 The CNWM website may be found at <http://chaxun.cnwm.org.cn/web/index.jsp>.

19 EIA 2018.

20 “Qidi baogu wang: shuxue jiaoshi xiang yaojiu qihe xiao baogu 1.23 dun, lai yuan chengmi” (Uncovering the leopard bone king: maths professor sells 1.23 tonnes of leopard bone to medicinal wine company, source is a riddle). *Thepaper.cn*, 27 June 2018, [https://www.thepaper.cn/newsDetail\\_forward\\_2221417](https://www.thepaper.cn/newsDetail_forward_2221417). Accessed 19 November 2020.

Figure 1: CNWM Label Affixed to Hongmao Yaojiu Packaging, 2019



Source:

Characters for “leopard bone product” (*baogu zhipin* 豹骨制品) are visible.

The continued permitted domestic trade in leopard bone products in China is a serious concern given the lack of any obvious replenishable legal source and the high level of illegal trade in the species. While publicly reported seizures are insufficient to establish the true scale of the illegal trade, a minimum of 5,430 Asian leopards have been reportedly seized since 2000.<sup>21</sup> In 2015, leopards were assessed as “vulnerable” by the International Union for Conservation of Nature (IUCN) on its Red List of Threatened Species – a rapid decline in status from “least concern” in 2002.<sup>22</sup> Loss of range has been particularly severe for leopards in Asia.<sup>23</sup> In 2015, it was estimated that there were fewer than 450 leopards remaining in the wild in China.<sup>24</sup> The IUCN assessment recognized that trade in leopard parts for medicinal use may represent a substantial threat to leopard populations.<sup>25</sup> In 2019, a CITES review highlighted China as one of the countries of particular concern regarding illegal trade in leopards, and noted an apparent growing demand for leopard bones in China and Vietnam.<sup>26</sup>

By allowing the domestic trade in leopard bone to continue, the Chinese government is failing to implement key elements of CITES Resolution 12.5 on conservation and trade of Asian big cats. For example, paragraph 5a) recommends: “that the consumer States ... work with traditional medicine communities and industries to develop and implement strategies for gradually reducing and eventually eliminating the use of Asian big cat parts and derivatives.” Paragraph 1c) urges: “all Parties in whose jurisdiction there is a legal domestic market for specimens of tiger and other Asian big cat species that is contributing to poaching or illegal trade, take all necessary legislative, regulatory and enforcement measures

21 Data collated by the EIA and the Wildlife Protection Society of India.

22 Stein et al. 2020.

23 Jacobson et al. 2016.

24 Laguardia et al. 2015.

25 Stein et al. 2020.

26 CITES Secretariat 2019a.

to close their domestic markets for commercial trade in tiger and other Asian big cat specimens.”<sup>27</sup>

### *Trade in other species subject to first-class special state protection*

In contradiction to the claims made by Wang and colleagues outlined above, these findings clearly point to the fact that China still permits commercial trade in species under first-class special state protection and from wild sources.<sup>28</sup> They also demonstrate that upgrading a species from second-class to first-class special state protection does not automatically prohibit commercial domestic trade in that species.

In June 2020, the protection status of the Chinese pangolin (*Manis pentadactyla*) – a critically endangered species threatened by poaching and much prized in traditional medicine for its scales<sup>29</sup> – was upgraded.<sup>30</sup> Yet, in July 2020, the EIA found 56 pharmaceutical companies advertising 64 products that claimed to contain pangolin.<sup>31</sup> Of the 12 legible CNWM labels found in images online, five stated that the pangolin scales were wild-sourced; the other labels list the scales as being of “unknown” source (Figure 2). While the Chinese pangolin was removed from a section of the 2020 State Pharmacopoeia, which lists key medicinal ingredients, it remained listed as an ingredient in eight standardized formulations in the pharmacopoeia.<sup>32</sup> Similarly, while semi-processed pangolin scales are reportedly no longer covered by national medical insurance as of January 2020, processed medicines containing pangolin continue to be covered.<sup>33</sup> As with leopards, the pangolin scales circulating in the legal domestic trade purportedly derive from registered stockpiles, but data on the quantities and origins of such stocks have never been made publicly available and there are concerns that the management system is highly susceptible to abuse and is used to launder illegally sourced stock.<sup>34</sup> Indeed, in May 2021, Chinese news media reported that a pharmaceutical company in Beijing had been fined, and staff imprisoned, for illegal trade in pangolin scales and saiga horn; the case involved fraudulent use of labels to launder illegally sourced protected wildlife products.<sup>35</sup>

Trade in other species under first-class special state protection has also been documented through the CNWM label mechanism. Products include traditional

27 CITES Secretariat 2019b.

28 Wang et al. 2019.

29 Challender et al. 2019b.

30 NFGA 2020.

31 EIA 2020b.

32 Ibid.

33 Ibid.

34 Ibid.

35 “Beijing shou lie zhenggui yaoqi feifa shougou, chushou yesheng dongwu zhipin an xuanpan” (Beijing’s first case of a formal pharmaceutical company sentenced for illegal purchase and sale of wild animal products). *Legal Daily*, 18 May 2021, [http://www.legaldaily.com.cn/index/content/2021-05/18/content\\_8508546.htm](http://www.legaldaily.com.cn/index/content/2021-05/18/content_8508546.htm). Accessed 19 May 2021; *Thepaper.cn*, 27 June 2018.

Figure 2: Medicinal Product Advertised on a TCM Company Website, July 2020



## Notes:

This CNWM label indicates the product contains pangolin scales (*Squama manitis*) of wild origin.

medicine containing saiga horn,<sup>36</sup> and rugs made from the skins of captive-bred tigers.<sup>37, 38</sup>

Ambiguity persists around the legality of trade in farmed tiger bone and rhino horn. A 1993 State Council notification prohibited trade in and medicinal use of tiger bone and rhino horn, and both were removed from the State Pharmacopoeia.<sup>39</sup> Yet a 2005 government notification (which appears not to be publicly available in full) apparently permitted the medicinal use of captive-bred tiger bone.<sup>40</sup> In 2018, a new State Council notification repealed the 1993 notification and stated that farmed tiger bone and rhino horn could be used in certain circumstances.<sup>41</sup> Shortly thereafter, a government spokesperson indicated that implementation of the 2018 notification was being delayed and that in the interim, the former prohibitions remain in place.<sup>42</sup> While a government submission to CITES in 2019 referred to the continued validity of the 1993 ban,<sup>43</sup> the 2018 notification is still listed on the State Council website as valid policy without qualification.

A publicly accessible database lists all the permits issued by the NFGA to “buy, sell and/or utilize terrestrial wildlife under first-class state protection or the products thereof.” While the species, products, quantities and purposes covered by these permits are not specified on the database, a 2017 notification lists

36 CITES Management Authority of China 2015.

37 CITES Management Authority of China 2019a.

38 EIA 2013.

39 State Council 1993.

40 EIA 2013.

41 State Council 2018.

42 “Full transcript: State Council executive deputy secretary-general Ding Xuedong answers media questions.” *Xinhua*, 12 November 2018, [http://www.china.org.cn/china/Off\\_the\\_Wire/2018-11/12/content\\_71941870.htm?from=groupmessage&isappinstalled=0](http://www.china.org.cn/china/Off_the_Wire/2018-11/12/content_71941870.htm?from=groupmessage&isappinstalled=0). Accessed 19 November 2020.

43 CITES 2019a.

ten taxa for which trade permits, under Article 27 of the WPL, must be approved by the central forestry department (i.e. NFGA) rather than provincial authorities.<sup>44</sup> It is likely therefore that these permits relate to these ten taxa.<sup>45</sup> There were 45 such permits issued to pharmaceutical companies between January 2018 and August 2020, indicating that the scale of permitted trade in these species alone for medicinal purposes could be considerable.<sup>46</sup> Six of the companies issued with these permits have previously been implicated in the trading of tiger parts and derivatives, and six have been documented advertising products claiming to contain leopard bone.<sup>47</sup>

## Discussion

If the permitted trade outlined above is in accordance with the WPL, the exemptions in Article 27 allowing trade for “special purposes” are evidently being interpreted to allow for commercial trade in traditional medicine products. This may be owing to the provision made for “heritage conservation.” In 2014, the production methods for Hongmao Medicinal Wine, a product which lists leopard bone as an ingredient (see Figure 3), were added to the “representative intangible cultural heritage” list and thus were deemed worthy of protection.<sup>48</sup>

The trade in captive-bred specimens of species included on utilization lists published to date, such as the Chinese giant salamander, may be occurring in accordance with Article 28 of the WPL.<sup>49</sup> This includes trade in these species for the consumption as food. CNWM labels, however, also indicate the permitted use of captive-sourced bear bile in traditional medicine products,<sup>50</sup> and lion bone (*Panthera leo*) in tonic wines offered for sale at tiger farms and associated retail premises (although marketed as containing tiger).<sup>51</sup> Neither of these species is included on the published utilization list for terrestrial species.<sup>52</sup> This could suggest additional species have been added to utilization lists without public notification, or that provisions in Article 27 are being interpreted to permit such trade outside the mechanism specifically designed to regulate trade in captive-bred specimens of protected species.

44 State Forestry Administration 2017.

45 The ten taxa are leopards, tigers, elephants, rhinoceroses, giant panda, crested ibis, golden snub-nosed monkey, gibbons, apes and bustards

46 EIA 2020c.

47 Ibid.

48 Ministry of Culture and Tourism 2018.

49 Ministry of Agriculture and Rural Affairs 2017.

50 For example, Shanghai Kai Bao Pharmaceutical Co. Ltd. 2020. “Tanreqing zhusheyue” (Tanreqing injection fluid), <http://www.xykb.com/productinfo/710828.html>. Accessed 19 November 2020.

51 Lions are not a native species and are not on the official list of protected species, but they are managed as such by virtue of their listing on CITES Appendix II. Interview with anonymous source, London, 2019; EIA 2013.

52 “Guojia linye ju fabu shou pi rengong fanyu guojia zhongdian baohu lusheng yesheng dongwu minglu” (State Forestry Administration announces first list of species on the “List of terrestrial wildlife under special state protection for captive breeding”). *Xinhua*, 28 June 2017. [http://www.xinhuanet.com/politics/2017-06/28/c\\_129642939.htm](http://www.xinhuanet.com/politics/2017-06/28/c_129642939.htm). Accessed 3 June 2020.



Figure 3: **Hongmao Yaojiu, A Medicinal Wine for Sale in a Pharmacy in China, 2019**



Notes:

Characters for “leopard bone” (*baogu* 豹骨) are visible on the packaging.

Captive breeding of threatened wild animal species, including those used in TCM such as tigers and bears, has long been endorsed by the Chinese government and some other commentators as a means to meet market demand while alleviating pressure on wild populations.<sup>53</sup> Conversely, many have argued that the farming of wildlife frequently increases extinction risk.<sup>54</sup> Several species which have been bred commercially in China have declined in the wild since commercial breeding began, including the Chinese giant salamander,<sup>55</sup> tiger and Asiatic black bear.<sup>56</sup>

53 See, e.g., Jiang et al. 2007; CITES Management Authority of China 2007; “Commercial raising saves bears.” *Beijing Review*, March 1994, cited in Li 2004.

54 Drury 2009; Kirkpatrick and Emerton 2010.

55 Turvey et al. 2018.

56 Garshelis and Steinmetz 2020.

Laura Tensen argues that the commercial breeding of wild animals can only benefit conservation of a species if five conditions are met: farmed products must be more cost-efficient than illegally sourced products; demand should not be stimulated by the legal market in farmed products; a lack of consumer preference for wild-sourced products over farmed products; the absence of the laundering of illegal products through the legal market; and no re-stocking of farms from the wild.<sup>57</sup> Tensen concludes that for most species being traded, including tiger, bears and pangolins, these conditions are unlikely to be met. For instance, in the case of tigers and bears, studies find that consumers prefer wild-sourced products over farmed when the products are used in traditional medicine.<sup>58</sup> The captive breeding of pangolins to meet consumer demand has been deemed to be commercially unviable.<sup>59</sup> The laundering of illegally sourced tiger products through China's legal markets has been documented,<sup>60</sup> and research has indicated the widespread trapping of wild Chinese giant salamanders to stock farms.<sup>61</sup>

## Conclusion

As it is currently implemented, the WPL permits commercial domestic trade in wild animal species subject to the highest levels of protection, including specimens sourced from the wild. The lack of transparency around the awarding of permits and the paucity of information on the quantities and origins of wildlife products in government and private stockpiles renders the accurate estimation of the scale of the trade and the true provenance of products sourced from protected species practically impossible through open-source research. A policy environment characterized by a lack of transparency, mixed messages and, in some cases, the overt legitimization of the commercial use of threatened wildlife is of particular concern for species such as leopards, tigers, bears and pangolins, given the threat that demand in China and trade in their body parts pose to these species.

Revision of the WPL, which is ongoing at the time of writing, represents an opportunity to resolve the ambiguities within it and address such concerns, particularly if Articles 25, 27 and 28 in the existing law are amended to specifically prohibit the commercial breeding of and trade in wild animal species that are threatened by trade, including for traditional medicine and ornamental purposes.

The revised draft of the WPL published in October 2020 contains significant changes, including increased penalties and new coordination mechanisms for

57 Tensen 2016.

58 On consumer preference for wild over farmed tiger products, see Gratwicke et al. 2008; on consumer preference for wild bear bile products, see Dutton, Hepburn and Macdonald 2011; Crudge, Nguyen and Cao 2018.

59 Challender et al. 2019a.

60 EIA 2013.

61 Cunningham et al. 2016.

law enforcement. However, key language in the aforementioned articles remains unchanged. Academics and NGOs both in China and abroad have raised concerns that the revised draft will continue to permit the commercial trading of protected species and have recommended further changes.<sup>62</sup> Whether these recommendations will be reflected in subsequent drafts remains to be seen.

## Acknowledgements

I would like to thank the Environmental Investigation Agency and its donors who have enabled this research and the writing of this paper, particularly Save the Rhino International and Network for Social Change.

## Conflicts of interest

The author is employed by the Environmental Investigation Agency.

## Biographical note

Aron WHITE is a wildlife campaigner and China specialist at the Environmental Investigation Agency in London, where his work focuses on wildlife trade and policy in China, South Asia and South-East Asia, and the use of wild animals in traditional medicine.

**摘要:** 在新型冠状病毒 SARS-CoV-2 疫情的影响下, 中国与其他地区的野生动物贸易政策受到了越来越多的关注。2020 年 2 月, 中国禁止了对大多数陆生野生动物物种以食用为目的的人工繁育和贸易, 但以中医药、装饰品等非食用为目的的贸易仍然适用《野生动物保护法》的规定进行。浅读《野生动物保护法》可令人以为所有国家保护野生动物的商业性贸易都是违法, 但在运作上, 法律中的关键词被解释为允许对国家重点保护野生动物包括豹 (*Panthera pardus*) 和穿山甲 (*Manidae*) 等那些在中外受到最严格保护的物种的个体部分和制品进行商业性贸易。

**关键词:** 野生动物贸易; 野生动物保护; 中医药; 《濒危野生动植物种国际贸易公约》; 豹; 穿山甲

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62 Pieterse 2020; EndPandemics 2020; EIA 2020d.

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