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Essay

Why do we need a wildlife consumption ban in China?

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The COVID-19 pandemic is an alarm call to all on the risks of zoonotic diseases and the delicate relationship between nature and human health. In response, China has taken a proactive step by issuing a legal decision to ban consumption of terrestrial wildlife. However, concerns have been raised and opponents of bans argue that well-regulated trade should be promoted instead. By analyzing China’s legal framework and management system regulating wildlife trade, together with state and provincial-level wildlife-trade licenses and wildlife criminal cases, we argue that current wildlife trade regulations do not function as expected. This is due to outdated protected species lists, insufficient cross-sector collaboration, and weak restrictions and law enforcement on farming and trading of species. The lack of quarantine standards for wildlife and increased wildlife farming in recent years pose great risks for food safety and public health. In addition, wildlife consumption is neither required for subsistence nor an essential part of Chinese diets. All these facts make the ban necessary to provoke improvement in wildlife management, such as updating protected species lists, revising laws and changing consumption behaviors. Nonetheless, the ban is not sufficient to address all the problems. To sustain the efficacy of the change, we propose that a long-term mechanism to reduce the demand and improve effective management is needed.

The connection between COVID-19 and wildlife1-3 has led to global concern about zoonotic diseases4 and reflection on human–nature relationships5. It has been revealed that the spillover of zoonotic pathogens and biodiversity losses share the same causes. A cost-effective measure to prevent the next zoonotic pandemic relies on the protection of natural habitats, such as tropical forests, and a curb on wildlife trade. In order to reduce current and future risks of pandemics, as well as to safeguard ecological security, a legal decision (hereafter ‘the decision’) issued by the Standing Committee of People’s Congress of China in February 2020 called for stopping wildlife consumption and related trade6. The decision aims to reduce the risk to public health and ecological degradation from the excessive consumption of wildlife, including initiating the process of amending relevant laws. It is an emergency measure that provides a legal ground to ban the food consumption and clamp down on illegal wildlife trade with “aggravated punishment” until laws are amended, which is currently in progress. It is not a blanket ban on wildlife trade; rather, it only prohibits the consumption of terrestrial wildlife and farmed populations for food. Neither aquatic wildlife nor non-edible uses such as for medicine or pets are banned. The decision also allows the consumption of certain terrestrial wildlife with mature farming techniques and low health risks. The legal pathway is through the listing in the Catalogue of livestock and poultry genetic resources managed by the Ministry of Agriculture (Supplemental Information).

However, concerns have been expressed7-12. Here we analyze why a ban is necessary in China and how its efficacy can be sustained in the future and contribute to global wildlife conservation and human health.

Why is the ban an appropriate choice for China?

There have always been heated debates about bans on bushmeat or wildlife trade in the conservation community13-17. The opponents of bans argue that well-regulated trade could promote sustainable wildlife use, especially for the benefit of local communities, and at the same time alleviate the pressure on wild populations13,15. Effective management is crucial for the success of this mechanism16. However, the Chinese legal wildlife trade management system does not function as expected because of outdated protected species lists, insufficient cross-sector collaboration and the inability to distinguish legal and illegal wildlife in the market18. Besides, the lack of quarantine standards for wildlife and increasing wildlife farms in recent years raise concerns over food safety and public health. In addition, wildlife consumption is neither needed for subsistence of local communities nor essential for Chinese diets. Thus, in these contexts, the ban, with proper compensations to the wildlife farming industry, could be a cost-effective measure to prevent future outbreaks of zoonotic diseases considering the current dysfunctional management system.

The dysfunctional licensing system for legal wildlife trade

Sustainable use depends on frequent and accurate assessments of population status19. However, scientific knowledge does not feed in a timely way into the Wildlife Protection Law in China, which only protects 60% of Chinese species20. The List of wildlife under special state protection and the List of terrestrial wildlife with beneficial or of important ecological, scientific and social values define the scope of the species to be protected by the law. Unfortunately, neither has been updated since 2003, regardless of significant population changes and new findings in species taxonomy. About one-fourth of the threatened species are not properly protected and need to be up-listed with a higher level of legal protection. Besides, these two lists miss out nearly 200 threatened terrestrial species identified by the IUCN Red List21.

China’s Wildlife Protection Law, issued in 1987 and revised in 2016, adopts a supply-side approach through legalizing and regulating wildlife trade22 with a complex license system (Figure 1). With a license, all species could be farmed and then utilized or traded. There were no science-based restrictions and standards on which species can be farmed that considered the impact on wild populations and health risks. The only exception is the food consumption of Species under special state protection, unless they are included in the List of farmed species under special state protection. There were many loopholes in the licensing system: “for species under special state protection, only farmed individuals that were captive-bred for at least two generations could be traded. For other species,
wildlife utilization should concentrate on farmed individuals and should benefit wild populations. These statements in wildlife law and the licensing system established an ambiguous situation. As long as one claims or tags the animals as farmed, trade becomes legal because there are very limited ways to differentiate between wild-sourced and farmed individuals. The farming license has no expiration date or limitations on the quantity of farmed individuals. This means that with a license, illegally caught wildlife could be easily sold in the market. Due to the judicial difficulties to distinguish legally and illegally sourced wildlife, punishment for laundering activities is normally just an administrative penalty, not the withdrawal of licenses or criminal punishment. The license system fails as farmed and trade licenses usually act as the disguise for frequent wildlife laundering activities, which harms lawful farmers as well.

The insufficient cross-sector collaboration has weakened market supervision, judicial forensics and law enforcement. The current management and license systems related to wildlife management, quarantine, food safety and market supervision are distributed across different departments (Figure 1). Deprived of expertise, inspectors from the Market Supervision Department cannot differentiate wildlife species, leading to a lack of oversight of wildlife trade. Department of Agriculture has insufficient wildlife veterinarians to carry out quarantines, leaving the door open for uninspected animals to be traded. Furthermore, the lack of understanding of the linkage between wildlife and human health once impeded these departments to actively engage with wildlife trade management, which hugely reduces the effectiveness and coverage of these regulations.

Wildlife farming was expected to assist in reaching the goal of poverty alleviation. Current laws encourage wildlife utilization. The government supports the development of wildlife farming industries, which was reflected by petty loan policies and widely broadcasted China Central TV programs on successful wildlife farmers and training courses to attract rural people joining the industry. It has stimulated a boom in wildlife farming with or without licenses. Although more new farming and trade licenses are issued each year, we observe an increase in poaching and illegal wildlife trade cases, suggesting a potential failure of “wildlife utilization should concentrate on farmed individuals and should benefit wild populations” stated in the law (Figure 2A).

Lack of quarantine protocols
From the 13121 trade licenses released by state (n = 6463, 2001–2020) and provincial level Forestry Bureaus (n = 6658, 2007–2020), there are 254 species traded for different commercial purposes. By comparing the species list with the World Organization for Animal Health (OIE) World Animal Health Information System (WAHIS)-Wild interface database (2008–2019), 69 species have been identified as possible hosts or vectors for at least one zoonotic disease (Supplemental Information).

Quarantine safeguards food safety and public health. However, huge gaps exist in the wildlife trade system. All wildlife is required to be quarantined before entering markets, yet there is no quarantine protocol specifically designed for wildlife in China due to insufficient research on wildlife pathogens and diseases. Wildlife in similar groups as domestic species could refer to the existing 13 production place quarantine protocols for livestock and poultry, which applies to wild canids, felids, ruminants, equids, fowls and wild boars. But the rest, such as bamboo rats, palm civets, or porcupines, lack standards for farming. No slaughter quarantine protocols are in place for any wildlife species. The lack of quarantine protocols poses uncontrollable public health risks. In response to COVID-19, the decision clarifies the requirement to meet quarantine standards for any uses of wildlife and draws a clearer line between legal and illegal uses.

Wildlife is not an indispensable part of the Chinese diet
A key concern is whether the ban will impact rural populations who depend on wildlife for subsistence protein intake and thus food security. Subsistence hunting for bushmeat is no longer taking place in China. Wildlife is consumed more as a delicacy to show status and hospitality, as well as to pursue health benefits, which are not always scientifically proven. The demand for luxury food and supplements drives the price much higher than that of livestock. The price of muntjacs, palm civets and bamboo rats is about twice to five times the price of pork, and a much higher price applies for more threatened and rarer species. The shift of wildlife consumers from the poor to the upper-middle class is a serious concern. The strong demand from populations with increasing wealth and power indicates a market that may not be easily terminated, especially when large profit
The attention span of the government and the public can be short. In May 2003, when Himalayan palm civets in Guangdong were found to carry SCoV-like viruses after the SARS outbreak, the State Administration of Industry and Commerce and the State Forestry Bureau announced a temporary ban on wildlife hunting and trading. However, the List of 54 terrestrial species to be commercially traded, used and farmed, including palm civets, was released after repeated appeals from wildlife farmers and provincial Forestry Bureaus, to which WHO showed concerns. Although the list was abolished in 2012, it actually lifted the restriction on farming and trading of species without special state protection. The lesson from SARS indicates that the promotion of policy change especially related to wildlife management is time-sensitive. Thus, the decision with an extended effective period beyond the pandemic signals a permanent change, which is unprecedented and encouraging.

A hard lesson learned

When the decision was announced by the People’s Congress, the wildlife farming and trading industry raised strong opposition. The livelihood of some rural populations engaged in wildlife farming is heavily impacted by the decision, although many of them did not have licenses. To minimize such an impact, both central and provincial governments offered financial aid to compensate farmers’ economic losses. For example, Guangxi and Jiangxi, two of the largest wildlife farming provinces, have paid 1.1 billion and 720 million CNY to compensate 20,000 and 2,344 farms, respectively (Supplemental Information). Farmers are encouraged to shift their livelihoods, but it is not so easy even with the compensation. A hard lesson learned from this turmoil is that, as farming wildlife was subsidized and encouraged for many years with insufficient management measures (i.e. quarantine), future guidance related to livelihoods and rural development should be more science-based and strictly abide by the laws and policies to avoid economic risks.

A long-term mechanism to sustain the efficacy of the ban

The purpose of the decision and ongoing law amendments is to curtail wildlife trade, especially to permanently ban food consumption of wildlife in China. However, to sustain the efficacy of the change, a long-term mechanism and efforts to reduce demand and improve management are needed.

A new paradigm for effective management

Sustainable use of wildlife is promoted through different international agendas including CITES and CBD (Convention on biological diversity). However, with the hard-hitting lesson of COVID-19, health risks should be considered throughout this process. Although food consumption has drawn most attention, emphasis should be shifted to the whole wildlife trade sector. In China, food consumption only accounts for about 24% of the output value of the wildlife farming industry. The rest consists of fur, medicine, exhibition, pets and experiments, which are not banned. The health risks from direct contact with wildlife could arise at any stage of the supply chain of such trades. Effective trade regulation requires collaboration and management input from various institutions, which include departments overseeing food safety, animal health and public health, apart from the current wildlife management and conservation departments. It requires a holistic approach to manage wildlife trade, such as the One Health framework, which was officially adopted as a wildlife management framework by CBD in 2014.
to promote biodiversity conservation and human health\textsuperscript{11}. The decision has provoked rapid changes in the current system. The revised List of wildlife under special state protection was released for public comments in August 2020, for the first time after its release 30 years ago. The Catalogue of livestock and poultry genetic resources has been finalized in May 2020, which only allows 33 species to be farmed. The revision of the Animal Epidemic Prevention Law was released in September 2020 and the new Biosafety Law was issued in October 2020. The draft revision of Wildlife Protection Law was released for public suggestions in October 2020, which officially incorporated the decision into law and further restricted hunting, transportation and trade of other unprotected terrestrial species with an emphasis on public health.

The improvement of the legal system could facilitate changes in institutional management and collaborations. Ministry of Ecology and Environment has announced that they will include illegal wildlife activities into their central environmental inspection program\textsuperscript{11}, which is particularly effective in supervising environmental problems (e.g. pollution) as each reported problem will be included into the performance evaluation of responsible officials. This will strengthen the governance and law enforcement on wildlife protection as a whole.

Law amendments and future policies should internalize the externality of public health risks into the wildlife management. Strict quarantine standards for both wildlife and traditional domestic animals should be in place for any type of utilization. The traceable supply chain of wildlife should be required to differentiate legally sourced wildlife and their products from illegal ones. These requirements, together with reduction or cancelation of subsidies, can raise the bar of entering wildlife trade and phase out less competitive players.

**Education campaigns to reduce demand**

Wildlife conservation should be prioritized to serve as the safety buffer against spillovers of possible zoonosis diseases from wildlife to humans. The ultimate way to reduce the potential risk to human health is to reduce the demand for wildlife consumption\textsuperscript{12}. Social norms and a more sustainable culture have been proven to be more effective than legal tools in many conservation interventions. As a recent survey showed, over 90% of the public are not interested in consuming wildlife and support a ban on consumption or all wildlife trade in China. It is especially noticeable that over 90% of wildlife consumers indicated a willingness to stop eating wildlife\textsuperscript{28}. Although the survey was done via the internet and biased towards an urban and more educated population, it indicates a possible demand-side change with continuous education campaigns. For example, many restaurants, wet markets, shopping malls and other public venues have set up signs to warn of the health risks of wildlife consumption, raising the awareness of both consumers and suppliers. Though the effectiveness of this action needs to be monitored, it is the first time most Chinese receive continuous signals that eating wildlife can be illegal and threaten public health.

**International collaboration and law enforcement to reduce spillover of demand**

As spillover of demand to other countries has happened for timber, pangolins, ivory and others, we caution about similar consequences from this “ban”, especially for countries with weak regulations. As many of the consumed wildlife species are not listed in CITES, such as palm civets, or protected in other countries, such species might be increasingly traded to meet the domestic demand. The high demand may also drive more illegal wildlife trade domestically and internationally through online and physical markets. Before the demand drops to a reasonable level, international collaboration should be on the agenda to tackle associated risks. As China is holding the next COP meeting of CBD, we believe China will and should take the step forward to initiate stronger international enforcement to reduce spillover of possible demand-side change with continuous signals that eating wildlife can be illegal and threaten public health.

**Supplemental information**

Supplemental Information containing species lists can be found with this article online at https://doi.org/10.1016/j.cub.2020.12.036.
Quick guide

Gloss

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What is gloss? Gloss is the optical property that causes a material to appear shiny or mirror-like and is ubiquitous in nature. It is different to other visual effects, such as iridescence, because it is independent of hue. Specifically, gloss refers to how well the material reflects light in the specular or mirror angle — the same magnitude but opposite direction from the angle of incident light. The glossiness of an object increases when more light is reflected specularly, changing from a matte appearance to white gloss highlights or a mirror-like effect.

Multiple visual effects can be produced by this principle, depending on the spread of reflected light around the specular angle. To capture these effects, six types of gloss have been defined: specular gloss, sheer, bloom/haze, distinctness of image, contrast gloss and surface texture/orange peel (Figure 1). These distinctions are routinely used in materials science but rarely in studies of biological coloration. However, they may be useful to adequately describe the diversity of visual effects. For example, glossy feathers and mirror-like scarabs will both have high specular gloss, but glossy feathers will have low distinctness of image, whereas mirror-like scarabs will have high distinctness of image.

What is the biological significance of gloss? In many cases, gloss is a by-product of a non-visual function of the material, such as hydrophobicity, but it can also influence visual behaviours. Studies in monkeys and humans show that variation in glossiness can play a role in object identification and shape recognition. Animals may use variation in gloss, rather than colour differences, to identify surface characteristics, such as wet and dry surfaces, or to identify objects; for instance, pollinators may use gloss to identify suitable flowers. Thus, gloss could help animals assess food quality, find safe travel routes, or form a search image to find food, refuges or mates.

Gloss may also play a role in many forms of camouflage by reducing a predator’s ability to detect and identify prey. In marine environments, many fish use mirror-like scales to reflect the surrounding environment and blend in with the background. These scales may also be used to produce silver flashes to confuse predators during pursuit. In terrestrial environments, jewel beetle elytra are harder to detect on leaves with greater specular gloss. This may be because gloss creates a visually complex background making prey items harder to detect or contrast is reduced between glossy elytra and glossy leaves. Beyond background matching, highly glossy objects or unusual patterns of gloss may also disrupt the body outline, making it more difficult for predators to develop a search image.

In visual communication systems, gloss may convey signaler quality, highlight visual signals or attract the attention of the receiver. Signaller quality may be linked to glossiness via the structural mechanism causing gloss. In birds, gloss correlates with feather morphology and contrast gloss or specular gloss may be a signal of quality. Gloss may also enhance visual signals by creating light intensity flashes that contrast with the background. Flies (Lucilia sericata) use the frequency of specular gloss flashes from moving wings for sex identification. Alternatively, gloss may impede a receiver’s assessment of colour or shape. For example, the microscopic texture of some flower petals reduces gloss, which may enable more accurate colour assessment by pollinators.

How do animals perceive gloss? Animal perception of gloss is poorly studied, but is likely to depend on multiple factors. Evidence from humans indicates that perceived glossiness is a complex interaction of illumination (e.g. direction), object characteristics (e.g. shape, texture, colour and motion) and observation (e.g. viewing distance, binocular disparity and visual processing). Similar factors may be important in animal perception of gloss but to what extent will depend on...