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# Implementation biases in wildlife trade regulation foster unscientific and inequitable intervention strategies

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International conservation initiatives such as international wildlife trade regulation are important for species conservation efforts, but many current implementation models lend themselves to an environment that promotes biased values and inequitable distribution of benefits and responsibilities. This Perspective article aims to highlight prevailing sentiments observed among the international conservation community that contribute to asymmetrical discourse, policy development, and enforcement. These biases can limit the positive biodiversity impacts of interventions, preventing them from accomplishing species or landscape conservation goals. They can also contribute to mistrust between stakeholders, therefore adversely affecting relationships that are crucial to maintaining biodiversity and ecosystem services. Additionally, interventions and policies can be shaped more by subjective judgments of value than by science. The regulation of foreign bushmeat in the United States and the discourse surrounding it demonstrates the presence of value judgments in conservation policy. It also demonstrates how these value judgments appear to supplant evidence-based policy development and promote a landscape of wildlife resource use where some species and usages are permitted and others are considered unacceptable. The ramifications of these inequities can be seen in protected area and species management strategies globally but are particularly prevalent in African and Asian regions, where militarization and shoot-to-kill policies are in place. We argue that fostering sustainable wildlife resource use is enormously complex and requires a scientific, evidence-based approach to develop and implement initiatives that are both fair and effective. These arguments are supported through the use of select quotations from notable public authorities.

## KEYWORDS

bushmeat, environmental justice, equity, poaching, wildlife crime, zoonoses

## Introduction

Regulating international wildlife trade is crucial to species conservation and maintaining public health security, but without a thoughtful and science-based approach the resulting regulatory frameworks can produce inequitable policies that perpetuate harmful strategies. Biased perspectives contribute to mistrust among stakeholders, inefficient or ineffective programming, and policy strategies with unintended negative overall impacts on human societies and ecosystems (United Nations, 2024). Examples of policy misdirection include purportedly simple solutions to complex conservation issues, such as excluding local communities from accessing resources in protected areas, fortifying private land to discourage unwanted wildlife harvest, and instituting trade bans supported by limited evidence. Furthermore, misperceptions about wildlife trade can stimulate biases and misinformation within institutions, causing them to conflate risks posed by the commercialization of wildlife in ways that may be counterproductive to its protection (Immigration and Customs Enforcement, 2024; Fed Agent, 2023).

Risk mitigation policies crafted to reduce harms are more likely to be successful when they are specifically designed to address the nexus of the most threatening factors (Challender et al., 2015; Sonter et al., 2018). In academic and political discourse on the wildlife trade, the harvest of wildlife is typically highlighted as a primary contributor to species extinction, yet additional factors contribute to species endangerment (t Sas-Rolfes et al., 2019; Devenish et al., 2023). These factors include disease, climate change, and reduced welfare as well as habitat destruction, degradation, and fragmentation resulting from infrastructure development and industrial operations such as logging, mining, or refining. Noise, chemical, and light pollution are also contributing factors.

Failure to acknowledge the nuances of wildlife trade and the diverse ways in which wildlife resources are used and valued can foster policies that undermine human rights, species conservation, public health security, and economic sectors that depend on sustainable relationships with wildlife and wildlife products. This lack of healthy discourse creates a false dichotomy between those who value wildlife as a resource available for consumption and those who believe that wildlife has entirely intrinsic value and should never be treated as a commodity (Table 1). Regardless of moral arguments, this binary value schema exacerbates issues over community and land rights by promoting notions that management frameworks largely originating from institutions based in the Global North are the ones best suited for governing land and wildlife resources globally (Duffy, 2022).

In this Perspective article, we describe how wild meat consumption and poaching elicit prejudices that inhibit equitable access to wildlife and wildlife products. We use a selection of statements quoted from notable, public authorities to highlight the existence of these prejudices across policy, science, and communication strategies. The viewpoint we present herein is relative to our investigation into Advancing the Science of Environmental Justice in the International Wildlife Trade. By

questioning the status quo and looking toward the science underpinning wildlife trade interventions, we aim to catalyze constructive dialogues that often appear absent from this emotionally charged landscape.

## Bushmeat: terminology and regulation

The United States (US) Centers for Disease Control and Prevention (CDC) defines bushmeat as "...raw or minimally processed meat that comes from wild animals in certain regions of the world, including Africa and other areas, and may pose a communicable disease risk" (CDC, 2024). Per this definition, bushmeat could consist of a variety of species including fish, bats, monkeys, and pangolins as well as meat from feral cattle and pigs (Kolby et al., 2023). The importation of bushmeat into the United States is illegal according to CDC regulations and subject to a maximum financial penalty of \$250,000 (CDC, 2024). US Fish and Wildlife Service (USFWS) Law Enforcement Management Information System (LEMIS) import data reveals that significant volumes of raw and minimally processed wild animal meat imported by trophy hunters or by US-based companies are cleared to enter US commerce. These food items include deer meat from New Zealand, guinea pig from Peru, and ostrich and other plains game from southern Africa (Eskeew et al., 2020; USFWS, n.d.; J. Kolby and O. Goodman, pers. obs.). These types of commercial shipments appear to meet the CDC's definition of bushmeat, but regulatory officers and media reporters frequently choose to treat them as if they do not. As a result, some bushmeat traders are punished while others are provided exceptions without clear rationale.

Personal values appear to comele with policy implementation, separating species that are "acceptable" to consume as food from those that are not. For instance, a US law enacted in 2018 prohibits the trade in and slaughter of dogs and cats for human consumption (7 USC 2160, 2018), while it remains legal in many states for those same animals to be euthanized at animal shelters.

## Public health risk perceptions associated with bushmeat trade

A core criticism of modern bushmeat trade and consumption is that it introduces heightened risks of exposure to zoonotic pathogens that spread from animals to people (Karesh et al., 2007; Milbank and Vira, 2022). This perception also arguably justifies the CDC's steep financial penalty for importing bushmeat from Africa, Asia, and Latin America. Bushmeat intercepted at the US border is typically seized and destroyed without routine pathogen testing by the CDC or another US agency (USCBP, 2024). Seemingly, no coordinated effort exists to build a rigorous scientific foundation which could help justify the total import prohibition. It should be noted that thousands of pounds of prohibited bushmeat are still illegally imported into the United States annually (Walz et al., 2017). Yet, CDC staff are "...unaware of

any documented cases of such disease being spread through consumer bushmeat” (Dr. Galland, as quoted in [Donnelly, 2007](#)), a disclaimer also stated on the CDC website ([Table 1](#); [CDC, 2024](#)). Meanwhile, hunters returning to the United States from Canada transporting coolers of raw black bear (*Ursus americanus*) meat are allowed to import their hunted meat with relatively few administrative barriers despite several confirmed outbreaks of freeze-resistant human trichinellosis directly attributed to the consumption of hunted bear meat ([Cash-Goldwasser et al., 2024](#)).

The term “bushmeat” legitimizes a system of inequity and prejudice-enabling attitudes, presumptions, and policies governing wildlife trade regulation to develop independently of scientific approaches to risk analyses and pathogen surveillance ([Challender et al., 2022](#); [Hughes A. et al., 2023](#)). While the detection of genetic sequences of zoonotic pathogens in bushmeat imported from parts of Africa is certainly concerning, pathogens must also be viable and infectious to pose a zoonotic threat ([Smith et al., 2012](#); [Chaix et al., 2022](#)). It is plausible that the risk of infection posed by imported bushmeat is greater than what has been scientifically demonstrated through genetic sequencing. However, the absence of investigations of viability has resulted in trade policies that are decoupled from rigorous scientific evidence.

Any human-animal interface presents risks of zoonotic exposure, and it is imperative that policymakers and researchers avoid misattributing elevated risks to wildlife when surveillance data suggests that human-livestock interfaces may be much more frequent sources of zoonotic transmission ([Kock and Caceres-Escobar, 2022](#)). Research demonstrates that pigs, cows, and poultry, as well as common pets such as dogs and cats, present an abundance of opportunities for zoonoses emergence in humans ([Klous et al., 2016](#); [Desvars-Larrive et al., 2024](#)). In the post-COVID-19 environment, states and international development initiatives incentivize interventions that target wildlife harvest and “wet markets” over domesticated animal production systems. However, policies and interventions that are designed to pander to donor trends and political interests are not serving the public if they eschew standards of scientific rigor. Considering the negative impacts of industrial livestock operations on the environment and human health, a well-regulated trade in meat from wild animals could contribute to an alternative, or complementary system of food production. Such a system might prove beneficial to affected communities, cause less habitat degradation, incentivize less land-use change, and facilitate the emergence of fewer zoonoses, such as the highly pathogenic avian flu ([Nasi et al., 2011](#)).

**TABLE 1** Quotations extracted from a variety of sources which express or describe sentiments that portray unequitable perspectives of wildlife consumption.

| Affiliation   | Quote   | Citation  |
|---|---|---|
| National Institute of Allergy and Infections Diseases | “I think we should shut down those things [wildlife markets] right away ... It boggles my mind how when we have so many diseases that emanate out of that unusual human-animal interface, that we don't just shut it down.”   | <a href="#">Samuel, 2020</a>                          |
| Center for Biological Diversity                       | “Immediately ban the import and export of all live wildlife, permanently close all domestic live-wildlife markets, and urge all nations to take similar actions.”   | <a href="#">Center for Biological Diversity, 2020</a> |
| MCRS  | “When people say hunting is a livelihood issue but it's illegal - like ‘Oh the hunter is really poor and he has five children’ - I can't get on board ... If you're going to make an exception for hunting then why not let them sell two of their kids, as well? Or deal in cocaine?”  | <a href="#">Nuwer, 2018</a>                           |
| African Parks   | “We receive EU funding to put poor poachers in jail, while in Europe a hunter who kills a wolf will only get a small fine.”   | <a href="#">Pilling, 2024</a>                         |
| United Nations  | “It would be good to ban the live animal markets ... The message we are getting is if we don't take care of nature, it will take care of us.”   | <a href="#">Samuel, 2020</a>                          |
| CDC   | “Dr. Glenda Gale Galland, a veterinarian and animal-disease expert with the CDC, testified there was concern about the potential for the spread, from primates to humans, of diseases to include Ebola, measles, tuberculosis, monkeypox, and retroviruses similar to HIV. However, she also admitted she was not aware of any documented cases of such diseases being spread through consumer bushmeat.” | <a href="#">Donnelly, 2007</a>                        |
| WildAid   | “Some people call this a souvenir. I call this criminal.”   | <a href="#">WildAid, 2008a</a>                        |
| WildAid   | “Connect the dots and you discover a thin line separates a buyer from a killer.”  | <a href="#">WildAid, 2008</a>                         |
| Northumbria University                                | “During the Voices From the Frontlines: Communities and Rangers session, the panelist from Tajikistan ironically asked their fellow panelists and audience why the same actors promoting militarized approaches are not using guns and their own military to protect critically endangered European species such as bats and butterflies.”  | <a href="#">Massé et al., 2020</a>                    |
| John Jay College                                      | “If species are beautiful enough to carry as a handbag, they should be beautiful enough to let live sustainably and fulfill their ecological roles in the wild.”  | <a href="#">Sosnowski and Petrossian, 2020</a>        |
| Australian Minister for the Environment and Water     | “I think anybody who's involved in animal trafficking is a despicable human being.”   | <a href="#">Hartley, 2024</a>                         |
| Wildlife Conservation Society                         | “Governmental authorities should stop the sale of wildlife for human consumption, especially birds and mammals, either presented as live animals or fresh meat, in cities, towns, and peri-urban settings, and their supply and trade, whether from wildlife farms or directly from the wild.”  | <a href="#">Wildlife Conservation Society, 2021</a>   |

## Geographical biases

Common reasons people hunt wild animals are to access affordable protein or diversify their protein intake (Cawthorn and Hoffman, 2015). In many parts of the world, hunted meat is cheaper and more accessible than meat from livestock (Ingram et al., 2021; Gaubert et al., 2024). This demand for wild meat provides a foundation for an informal economy built around bushmeat, whereby hunters can sell their animals further down the supply chain, thus increasing marginal profits (Davies, 2002; Lescuyer and Nasi, 2016). Studies in West Africa suggest that bushmeat vendors enjoy long, relatively stable careers (Gaubert et al., 2024). Studies also suggest that these bushmeat markets show evidence of “post-depletion sustainability,” whereby deforestation and other land-use changes unrelated to bushmeat hunting activities have transformed local ecosystems to favor small and mid-size mammals, such as antelope and rodents (Cowlshaw et al., 2005). Similar species are targeted for hunting in the United States, namely whitetail deer (*Odocoileus virginianus*), and gray squirrel (*Sciurus carolinensis*) (Sowers, 2020). While these species generally cannot be lawfully sold commercially in the United States, meat from similar wild animals is commercialized in the United Kingdom and across Europe as game (Marescotti et al., 2019; USDA, 2024).

Regulations and dialogues surrounding the consumption of bushmeat are also frequently characterized by concerns over species offtake and commercialization (Stansell, 2002; Hinsley et al., 2023). Bushmeat is consumed globally, but in the United States, the United Kingdom, and Europe it is commonly referred to as “game” (Goguen and Riley, 2020; Booth et al., 2021). In these regions, trade and consumption of “game” meat tends to be supported while trade and consumption of “bushmeat” is vilified – even though either term could describe the same or similar species (Hoffman and Wiklund, 2006). Conversations about bushmeat that take place in the international policy environment rarely acknowledge the widescale consumption of wild cervids, fowl, and rodents that occurs across North America and Europe despite their zoonotic potential (Han et al., 2016). These conversations broadly categorize bushmeat from areas in the Global South as inherently illegal and threatening species with extinction. Risks should be measured against scientific evidence of harm and decoupled from biased attitudes in the Global North that presume that the consumption of game and even domestic animals is safer and more ecologically friendly than that of wild animals (Cawthorn and Hoffman, 2015).

Poaching is one of the most common wildlife issues leveraged to support conservation interventions by non-governmental organizations (NGOs) and government agencies (Massé and Lunstrum, 2016; Massé, 2019). Poaching, a term used to describe the illegal killing or collection of plants and animals from the wild, is an emotionally charged topic that regularly appears to elicit public disapproval of all forms of wildlife commodification, conflating legal and illegal trade (Montgomery, 2020; Maxson, 2024). This activity is often discussed in the context of illegally harvested elephant tusks and rhinoceros horns in African parks, perpetuating a narrative that critically endangered species are primarily affected and that the people performing such acts are solely interested in amassing wealth (de Jong, 2019). Across the entire spectrum of poaching,

from orchids to eels, the legal status of an event that leads to the death or removal of wildlife from nature does not inherently denote the extent to which populations and ecosystems are impacted by poaching activity. This presents notable challenges when using seizure data, such as those maintained by TRAFFIC, to evaluate legal or illegal wildlife trade and its impacts (TRAFFIC International, 2024). Legality and sustainability are not always positively associated. For many species affected by trade, the absence of population-level scientific information necessary to define “sustainable use” and quantify the actual impact of trade pressures, whether legal or illegal, poses a significant barrier to objective discussions about when and why trade becomes harmful (Hughes A. et al., 2023; Hughes L. J. et al., 2023). Despite a consistent lack of scientific data to accurately describe species population estimates and trends for most species traded globally, anti-poaching efforts across Africa and many parts of Asia are often referred to as “conservation wars” or part of the “war against poaching” conducted to save species from extinction (Simlai, 2015). Although trade-driven pressure is a proximate cause of decline for certain species, the ultimate cause is often multifaceted. The absence or minimization of such acknowledgement in conservation narratives and interventions tends to result in a diminished perception of the negative environmental impacts fueled by resource extraction and infrastructural development. This lack of nuance can be weaponized to justify the acquisition and use of military-grade hardware against suspected trespassers or would-be poachers by portraying a paucity of alternative strategies for preventing extinction (Duffy, 2022).

David Pilling (2024) of The Financial Times described the “real business” of African Parks Network (APN) as, “defending wildlife, often with guns, on the frontline of the conservation wars.” Millecamps and Toulemonde (2022) similarly stated in the Africa Report that, “One of the main features of the APN is the use of rangers, armed eco-guards equipped with the latest equipment.” The protection of conservation areas is inarguably dangerous business, but there is a stark contrast between the type of violence deemed permissible against the poor in the Global South and that allowed against malefactors in the Global North. For example, in 2016 a group of US extremists seized the Malheur Wildlife Refuge in Harney County, Oregon for over a month (Robbins, 2016; United States Attorney’s Office, 2018). While they eventually capitulated, only seven out of twenty-seven militants received time in prison and all surviving members of the group were granted a fair trial, despite seizing control of federal property. Further evidence of this dichotomy can be seen in the work of such organizations as the Environmental Investigation Agency and the Wildlife Justice Commission, two NGOs that employ the expertise of former law enforcement and intelligence officers to carry out extrajudicial field investigations in the Global South (Environmental Investigation Agency, 2024; Wildlife Justice Commission, 2024a). These organizations use their findings to develop detailed and compelling intelligence reports for use by the public and state authorities. However, it remains unknown whether their donors, which include the National Geographic Society, US Agency for International Development, Deutsche Gesellschaft für Internationale Zusammenarbeit, and the United Kingdom’s Department for Environment Food and Rural Affairs, among others, would be



equally supportive of the same kinds of extrajudicial investigations if they were instead performed within the US, Germany, or the United Kingdom (Environmental Investigation Agency, 2024a; Wildlife Justice Commission, 2024b).

## Differential enforcement

State-sanctioned militarized strategies visible across Africa, India, and elsewhere in the Global South are notably absent from the Global North (Duffy, 2022). Poachers and wildlife traffickers in North America face financial penalties, asset forfeiture, deportation, and potential jailtime, meanwhile authorities in protected areas across Kenya, Tanzania, Botswana, and India have been known to enforce shoot-on-sight policies (Messer, 2010; Maxson, 2024). This dichotomy is so prevalent it incited sardonic commentary at the 2018 London Illegal Wildlife Trade Conference questioning why European militaries were not being deployed to protect wildlife and ecosystems in their own jurisdiction (Table 1). Notably, this comment followed days after speakers praised the British military's deployment to support APN rangers in Liwonde National Park, Malawi (Massé et al., 2020).

In their evaluation of the 2018 London Illegal Wildlife Trade (IWT) Conference, Massé et al. (2020) concluded that, "Notwithstanding that many engage in illicit hunting and extraction of flora and fauna and other aspects of IWT as a way out of poverty and as a calculated livelihood strategy, this discourse overshadows much-needed discussion about investment in sustainable livelihoods as a long-term preventative approach to address IWT." Nearly six years later, the same conclusion can be drawn from institutional responses to the joint zoonotic and conservation risks posed by both legal and illegal harvest and commercialization of wildlife resources wherein total or near-total trade bans have been loudly advocated without equivalent calls for the development of infrastructure and education needed to make existing trade safer.

When prominent policymakers deny the possibility of finding common ground with wildlife resource stakeholders, it creates an environment of hostility and conflict that constrains the emergence of solutions to facilitate legal and sustainable trade (Harrison and Loring, 2020). Policymakers have frequently denounced wildlife use, sometimes expressing their own biased views or broadcasting what they believe to resonate best with their audiences and constituents (Table 1). Like the inequities caused by the vague and inconsistent application of the term "bushmeat," the broad operational definition of "wildlife trafficking" is likewise troublesome for painting all perpetrators as criminals. For instance, wildlife trafficking includes relatively innocuous events such as the hypothetical import of a shipment of captive-bred turtles into the United States that would have been legal, except that it was accidentally cleared by US Customs prior to clearance by the USFWS. Picking a single blue jay (*Cyanocitta cristata*) feather up off the ground and carrying it from the United States across an international border, for instance as a bookmark or on a keychain, also constitutes wildlife trafficking (Migratory Bird Treaty Act of 1918, 1918).

## Recommendations

We believe that transparent scientific research should underpin the development and implementation of wildlife resource use policies. For instance, we recommend that policies designed to reduce the risk of disease emergence from bushmeat trade should be crafted from scientifically driven risk analyses. Data produced through these analyses should then be used to help inform whether all wild animal meat carries equivalent public health risks. If the trade in certain species and/or commodities is found to introduce negligible risk, then it may become more effective, efficient and equitable to target trade restrictions only where the greatest known risks have been identified. One such approach to achieve this output would be to implement a system of surveillance whereby imported wild animal meat is methodically tested for zoonotic pathogens prior to confiscation and destruction of bushmeat or clearance of game meat to enter the United States. The data generated could be applied to determine whether current perceptions of threat to public health are scientifically substantiated and if not, to adjust policies accordingly.

## Conclusion

Biases and prejudices are part of human nature, but they can perpetuate injustice and violence when inserted into the legal frameworks of wildlife trade and resource regulation. Policies that are sometimes established through a precautionary approach in the absence of optimal scientific evidence should be communicated as such to mitigate perceptions of bias and should be continually scrutinized, reevaluated, and adapted to mitigate negative and inequitable impacts. Implanting greater equity into the highly emotive landscape of wildlife commodification will require policymakers to embrace the scientific method as standard practice and acknowledge prejudices that exacerbate systemic violence toward those who engage in the wildlife trade. It will also require practitioners to evaluate the design and intention behind the tools and interventions used to gather information for intervention and policy development.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

## Author contributions

JK: Conceptualization, Writing – original draft, Writing – review & editing. OG: Conceptualization, Writing – original draft, Writing – review & editing.

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## References

- 7 USC 2160. (2018). Prohibition on slaughter of dogs and cats for human consumption. From Title 7 – Agriculture, Chapter 54 – Transportation, Sale, and Handling of Certain Animals. Available online at: <https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title7-section2160&num=0&edition=prelim> (Accessed February 18, 2025).
- Booth, H., Clark, M., Milner-Gulland, E. J., Amponsah-Mensah, K., Antunes, A. P., Brittain, S., et al. (2021). Investigating the risks of removing wild meat from global food systems. *Curr. Biol.* 31, 1788–1797.e3. doi: 10.1016/j.cub.2021.01.079
- Cash-Goldwasser, S., Ortbahn, D., Narayan, M., Fitzgerald, C., Maldonado, K., Currie, J., et al. (2024). Outbreak of human trichinellosis — Arizona, Minnesota, and South Dakota 2022. *CCDR* 50, 153–157. doi: 10.14745/ccdr.v50i05a05
- Cawthorn, D.-M., and Hoffman, L. C. (2015). The bushmeat and food security nexus: A global account of the contributions, conundrums and ethical collisions. *Food Res. Int.* 76, 906–925. doi: 10.1016/j.foodres.2015.03.025
- Center for Biological Diversity (2020). *End Wildlife Trade: an action plan to prevent future pandemics*.
- Center for Disease Control (2024). *Bushmeat*. Available online at: <https://www.cdc.gov/ebola/media/pdfs/2024/05/Bushmeat-FactSheet-h.pdf> (Accessed June 28, 2024).
- Chaix, E., Boni, M., Guillier, L., Bertagnoli, S., Mailles, A., Collignon, C., et al. (2022). Risk of Monkeypox virus (MPXV) transmission through the handling and consumption of food. *Microbial. Risk Anal.* 22, 100237. doi: 10.1016/j.mran.2022.100237
- Challender, D. W. S., Brockington, D., Hinsley, A., Hoffmann, M., Kolby, J. E., Massé, F., et al. (2022). Mischaracterizing wildlife trade and its impacts may mislead policy processes. *Conserv. Lett.* 15, e12832. doi: 10.1111/conl.12832
- Challender, D. W. S., Harrop, S. R., and MacMillan, D. C. (2015). Understanding trade-threatened species in CITES. *Biol. Conserv.* doi: 10.1016/j.biocon.2015.04.015
- Cowlshaw, G., Mendelson, S., and Rowcliffe, J. M. (2005). Evidence for post-depletion sustainability in a mature bushmeat market. *J. Appl. Ecol.* 42, 460–468. doi: 10.1111/j.1365-2664.2005.01046.x
- Davies, G. (2002). Bushmeat and international development. *Conserv. Biol.* 16, 587–589. doi: 10.1046/j.1523-1739.2002.01636.x
- de Jong, M. (2019). *Constructing the poacher: narratives of blame in ivory poaching* (Master's thesis, University of Michigan). Deep Blue Documents. Available at: [https://deepblue.lib.umich.edu/bitstream/handle/2027.42/148673/deJong\\_Marlotte\\_Thesis.pdf?sequence=1&isAllowed=y](https://deepblue.lib.umich.edu/bitstream/handle/2027.42/148673/deJong_Marlotte_Thesis.pdf?sequence=1&isAllowed=y).
- Desvars-Larrive, A., Vogl, A. E., Puspitarani, G. A., Yang, L., Joachim, A., and Käsbohrer, A. (2024). A One Health framework for exploring zoonotic interactions demonstrated through a case study. *Nat. Commun.* 15, 5650. doi: 10.1038/s41467-024-49967-7

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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- Devenish, K., Goodenough, K., Jones, J. P. G., Ratsimba, H. R., and Willcock, S. (2023). Mapping to explore the challenges and opportunities for reconciling artisanal gem mining and biodiversity conservation. *Extract. Industries Soc.* 15, 101311. doi: 10.1016/j.exis.2023.101311
- Donnelly, F. (2007). *Culture clash over monkey meat ends up in court*. Available online at: [https://www.silive.com/news/2007/09/culture\\_clash\\_over\\_monkey\\_meat.html](https://www.silive.com/news/2007/09/culture_clash_over_monkey_meat.html) (Accessed August 22, 2024).
- Duffy, R. (2022). *Security and Conservation: The Politics of the Illegal Wildlife Trade* (New Haven: Yale University Press).
- Environmental Investigation Agency UK (2024a). *What we do. Eia-international.org*. Available online at: <https://www.justice.gov/usao-or/pr/final-defendant-sentenced-armed-takeover-malheur-national-wildlife-refuge> (Accessed August 01, 2024).
- Environmental Investigation Agency UK (2024b). *Final report: study on live pangolin trade in Malawi, Zambia, Mozambique, and Tanzania*. Available online at: [https://eia-international.org/wp-content/uploads/GIZ-Live-Pangolin-Study-Report\\_EIA-publication.pdf](https://eia-international.org/wp-content/uploads/GIZ-Live-Pangolin-Study-Report_EIA-publication.pdf) (Accessed August 03, 2024).
- Eskew, E. A., White, A. M., Ross, N., Smith, K. M., Smith, K. F., Rodriguez, J. P., et al. (2020). United States wildlife and wildlife product imports from 2000–2014. *Sci. Data* 7, 22. doi: 10.1038/s41597-020-0354-5
- Fed Agent (2023). *New HSI Unit Takes Aim at Wildlife Trafficking*. Available online at: <https://www.fedagent.com/news/new-hsi-unit-takes-aim-at-wildlife-trafficking> (Accessed June 10, 2024).
- Gaubert, P., Djagoun, C. A. M. S., Missou, A. D., Ales, N., Amougou, C. V., Dipita, A. D., et al. (2024). Vendors' perceptions on the bushmeat trade dynamics across West and central Africa during the COVID-19 pandemic: Lessons learned on sanitary measures and awareness campaigns. *Environ. Sci. Policy* 152, 103649. doi: 10.1016/j.envsci.2023.103649
- Goguen, A. D., and Riley, S. J. (2020). Consumption of wild-harvested meat in society. *Wildl. Soc. Bull.* 44, 553–563. doi: 10.1002/wsb.1108
- Han, B. A., Kramer, A. M., and Drake, J. M. (2016). Global patterns of zoonotic disease in mammals. *Trends Parasitol.* 32, 565–577. doi: 10.1016/j.pt.2016.04.007
- Harrison, H. L., and Loring, P. A. (2020). Seeing beneath disputes: A transdisciplinary framework for diagnosing complex conservation conflicts. *Biol. Conserv.* 248, 108670. doi: 10.1016/j.biocon.2020.108670
- Hartley, T. (2024). *Cutting-edge technology is being deployed to stop the illegal trafficking of Australian wildlife*. Available online at: <https://www.abc.net.au/news/2024-07-08/cutting-edge-technology-to-stop-wildlife-trafficking/104030746> (Accessed July 21, 2024).
- Hinsley, A., Willis, J., Dent, A. R., Oyanedel, R., Kubo, T., and Challender, D. W. S. (2023). Trading species to extinction: evidence of extinction linked to the wildlife trade. *Camb. prisms Extinct.* 1, e10. doi: 10.1017/ext.2023.7

- Hoffman, L. C., and Wiklund, E. (2006). Game and venison – meat for the modern consumer. *Meat Sci.* 74, 197–208. doi: 10.1016/j.meatsci.2006.04.005
- Hughes, A., Auliya, M., Altherr, S., Scheffers, B., Janssen, J., Nijman, V., et al. (2023). Determining the sustainability of legal wildlife trade. *J. Environ. Manage.* 341, 117987. doi: 10.1016/j.jenvman.2023.117987
- Hughes, L. J., Morton, O., Scheffers, B. R., and Edwards, D. P. (2023). The ecological drivers and consequences of wildlife trade. *Biol. Rev.* 98, 775–791. doi: 10.1111/brv.12929
- Immigration and Customs Enforcement (2024). Help make wildlife traffickers an endangered species. Available online at: <https://www.ice.gov/features/wildlife> (Accessed June 10, 2024).
- Ingram, D. J., Coad, L., Milner-Gulland, E. J., Parry, L., Wilkie, D., Bakarr, M. I., et al. (2021). Wild meat is still on the menu: progress in wild meat research, policy, and practice from 2002 to 2020. *Annu. Rev. Environ. Resour.* 46, 221–254. doi: 10.1146/annurev-environ-041020-063132
- Karesh, W. B., Cook, R. A., Gilbert, M., and Newcomb, J. (2007). Implications of wildlife trade on the movement of avian influenza and other infectious diseases. *JWD* 43, S55–S59.
- Klous, G., Huss, A., Heederik, D. J. J., and Coutinho, R. A. (2016). Human–livestock contacts and their relationship to transmission of zoonotic pathogens, a systematic review of literature. *One Health* 2, 65–76. doi: 10.1016/j.onehlt.2016.03.001
- Kock, R., and Caceres-Escobar, H. (2022). *Situation analysis on the roles and risks of wildlife in the emergence of human infectious diseases* (Gland, Switzerland: IUCN, International Union for Conservation of Nature). doi: 10.2305/IUCN.CH.2022.01.en
- Kolby, J. E., Pitt, W. C., and Reaser, J. K. (2023). Domestication matters: risk analyses necessary to prevent zoonotic pathogen spillover from international wildlife trade are constrained by terminology. *IJRAM* 26, 95–117. doi: 10.1504/IJRAM.2023.139016
- Lescuyer, G., and Nasi, R. (2016). Financial and economic values of bushmeat in rural and urban livelihoods in Cameroon: Inputs to the development of public policy. *Int. forest. Rev.* 18, 93–107. doi: 10.1505/146554816819683726
- Marescotti, M. E., Caputo, V., Demartini, E., and Gaviglio, A. (2019). Discovering market segments for hunted wild game meat. *Meat Sci.* 149, 163–176. doi: 10.1016/j.meatsci.2018.11.019
- Massé, F. (2019). Anti-poaching's politics of (in)visibility: Representing nature and conservation amidst a poaching crisis. *Geoforum* 98, 1–14. doi: 10.1016/j.geoforum.2018.09.011
- Massé, F., Dickinson, H., Margulies, J., Joanny, L., Duffy, R., and Lappe-Osthege, T. (2020). Conservation and crime convergence? Situating the 2018 London Illegal Wildlife Trade Conference. *J. Polit. Ecol.* 27. doi: 10.2458/v27i1.23543
- Massé, F., and Lundstrum, E. (2016). Accumulation by securitization: Commercial poaching, neoliberal conservation, and the creation of new wildlife frontiers. *Geoforum* 69, 227–237. doi: 10.1016/j.geoforum.2015.03.005
- Maxson, P. (2024). "The poaching issue" how oversimplification undermines global conservation. Available online at: <http://www.saisperspectives.com/23-24issue/2024/2/19/the-poaching-issue-how-oversimplification-undermines-global-conservation> (Accessed August 01, 2024).
- Messer, K. D. (2010). Protecting endangered species: When are shoot-on-sight policies the only viable option to stop poaching? *Ecol. Econ.* 69, 2334–2340. doi: 10.1016/j.ecolecon.2010.06.017
- Migratory Bird Treaty Act of 1918 (1918). 16 U.S.C. 7 § 703-712.
- Milbank, C., and Vira, B. (2022). Wildmeat consumption and zoonotic spillover: contextualising disease emergence and policy responses. *Lancet Planet. Health* 6, e439–e448. doi: 10.1016/S2542-5196(22)00064-X
- Millecamps, M., and Toulemonde, M. (2022). *African parks: "in Benin, we don't define the military strategy against jihadists"*. Available online at: <https://www.theafricareport.com/217705/african-parks-in-benin-we-dont-define-the-military-strategy-against-jihadists/> (Accessed July 16, 2024).
- Montgomery, R. A. (2020). Poaching is not one big thing. *Trends Ecol. Evol.* 35, 472–475. doi: 10.1016/j.tree.2020.02.013
- Nasi, R., Taber, A., and Van Vliet, N. (2011). Empty forests, empty stomachs? Bushmeat and livelihoods in the Congo and Amazon Basins. *Int. forest. Rev.* 13, 355–368. doi: 10.1505/146554811798293872
- Nuwer, R. (2018). *Poached: inside the dark world of wildlife trafficking* (Boston: Da Capo Press).
- Pilling, D. (2024). *The battle to control Africa's national parks*. Available online at: <https://www.ft.com/content/851f96d4-1c3d-45b8-9502-a0f8fed5f719> (Accessed July 15, 2024).
- Robbins, W. G. (2016). The Malheur occupation and the problem with history. *Oregon Historic. Quarter.* 117, 575–603. doi: 10.1353/ohq.2016.0010
- Samuel, S. (2020). *The coronavirus likely came from China's wet markets*. Available online at: <https://www.vox.com/future-perfect/2020/4/15/21219222/coronavirus-china-ban-wet-markets-reopening> (Accessed July 20, 2024). They're reopening anyway.
- Simlai, T. (2015). Conservation 'wars': global rise of green militarisation. *Econ. Polit. Week.* 50, 39–44.
- Smith, K. M., Anthony, S. J., Switzer, W. M., Epstein, J. H., Seimon, T., Jia, H., et al. (2012). Zoonotic viruses associated with illegally imported wildlife products. *PLoS One* 7, e29505. doi: 10.1371/journal.pone.0029505
- Sonter, L. J., Ali, S. H., and Watson, J. E. M. (2018). Mining and biodiversity: key issues and research needs in conservation science. *Proc. R. Soc. B.* 285, 20181926. doi: 10.1098/rspb.2018.1926
- Sosnowski, M. C., and Petrossian, G. A. (2020). Luxury fashion wildlife contraband in the USA. *EcoHealth* 17, 94–110. doi: 10.1007/s10393-020-01467-y
- Sowers, M. (2020). *Most common game animals in the U.S. and information on intakes, habitation, hunt frequency, and human consumption: a research report supporting the 2016 EPA document on biota modeling for Superfund risk assessment* (Environmental Protection Agency). Available online at: <https://clu-in.org/conf/tio/commongame/Most-Common-Game-Animals-in-the-U.S.-and-Information-on-Intakes,-Habitation,-Hunt-Frequency,-and-Human-Consumption.pdf> (Accessed June 5, 2024).
- Stansell, K. (2002). *Testimony on Illegal bushmeat consumption in Africa before the House Committee on Natural Resources, Subcommittee of Fisheries, Wildlife and Oceans. Illegal bushmeat consumption in Africa* (Assistant Director for International Affairs, U.S. Fish and Wildlife Service, Department of the Interior). Available online at: <https://www.fws.gov/testimony/illegal-bushmeat-consumption-africa> (Accessed July 20, 2024).
- 't Sas-Rolfes, M., Challender, D. W. S., Hinsley, A., Verissimo, D., and Milner-Gulland, E. J. (2019). Illegal wildlife trade: scale, processes, and governance. *Annu. Rev. Environ. Resour.* 44, 201–228. doi: 10.1146/annurev-environ-101718-033253
- TRAFFIC International (2024) *Wildlife trade portal*. Available at: [www.wildlifetradeportal.org](http://www.wildlifetradeportal.org).
- United States Attorney's Office (2018). *Final defendant sentenced for armed takeover of Malheur national wildlife refuge*. Available online at: <https://www.justice.gov/usao-or/pr/final-defendant-sentenced-armed-takeover-malheur-national-wildlife-refuge> (Accessed July 20, 2024).
- UNODC (2024). *World Wildlife Crime Report 2024: Trafficking in Protected Species*. (Vienna: United Nations publications, 2024).
- USCBP (2024). *Bringing Agricultural Products Into the United States*. Available online at: <https://www.cbp.gov/travel/clearing-cbp/bringing-agricultural-products-united-states> (Accessed July 20, 2024).
- USDA (2024). *Have a Question?* (AskUSDA). Available online at: <https://ask.usda.gov/s/article/Can-game-animals-or-birds-be-legally-sold> (Accessed August 10, 2024).
- USFWS (n.d.). *Office of Law Enforcement: Import/Export Data*. Available online at: <https://www.fws.gov/library/collections/office-law-enforcement-importexport-data> (Accessed August 01, 2024).
- Walz, E., Wilson, D., Stauffer, J. C., Wanduragala, D., Stauffer, W. M., Travis, D. A., et al. (2017). Incentives for bushmeat consumption and importation among West African immigrants, Minnesota, USA. *Emerg. Infect. Dis.* 23, 2095–2097. doi: 10.3201/eid2312.170563
- WildAid (2008). *WildAid PSA- Harrison Ford: Situation*. Available online at: <https://www.youtube.com/watch?v=N1dz-MOaBrU> (Accessed July 10, 2024).
- WildAid (2008a). *WildAid PSA- Harrison Ford: Souvenir*. Available online at: <https://www.youtube.com/watch?v=xroizr8U00s> (Accessed July 10, 2024).
- Wildlife Conservation Society (2021). *Preventing epidemics and pandemics of zoonotic origin: the role of wild meat markets and wildlife trade. WCS Policy*. Available online at: [https://cdn.wcs.org/2021/06/09/5cq7svg1f4\\_Summary\\_of\\_WCS\\_policy\\_on\\_wild\\_meat\\_markets\\_wildlife\\_trade\\_and\\_zoonotic\\_2021\\_05\\_21\\_Final.pdf?\\_ga=2.105811523.1986428670.1720618587-1927756587.1720618587&\\_gl=1%2A1r0hrju%2A\\_gcl\\_a%2AMTM50Tk1OTAzMi4xNzIwNjE4NTg3%2A\\_ga%2AMTKyNzc1NjU4NzIwNjE4NTg3%2A\\_ga\\_BTX9HXYMXS%2AMTCyMDYxODU4Ny4xLjEuMTcyMDYxOTAwMCA4MCA4wLjA](https://cdn.wcs.org/2021/06/09/5cq7svg1f4_Summary_of_WCS_policy_on_wild_meat_markets_wildlife_trade_and_zoonotic_2021_05_21_Final.pdf?_ga=2.105811523.1986428670.1720618587-1927756587.1720618587&_gl=1%2A1r0hrju%2A_gcl_a%2AMTM50Tk1OTAzMi4xNzIwNjE4NTg3%2A_ga%2AMTKyNzc1NjU4NzIwNjE4NTg3%2A_ga_BTX9HXYMXS%2AMTCyMDYxODU4Ny4xLjEuMTcyMDYxOTAwMCA4MCA4wLjA) (Accessed July 14, 2024).
- Wildlife Justice Commission (2024a). *Our work*. *Wildlifejustice.org*. Available online at: <https://wildlifejustice.org/our-work/> (Accessed August 01, 2024).
- Wildlife Justice Commission (2024b). *Our partners*. *Wildlifejustice.org*. Available online at: <https://wildlifejustice.org/partners/> (Accessed August 01, 2024).