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A framework for advancing the science of environmental justice along the international wildlife trade pathway

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The international wildlife trade can be a significant driver of biodiversity loss, as well as a facilitator of zoonotic disease transmission with pandemic potential. Environmental justice has never been more relevant to the wildlife trade as it is today. Yet, environmental justice has not been sufficiently mainstreamed into conservation science, nor practice. Here, we propose a framework for advancing the transdisciplinary science of environmental justice in the international wildlife trade context. The framework is organized via three interrelated domains: a) social justice, b) wildlife species justice, c) ecological justice. Each of these domains is described in terms of transdisciplinary questions that are intended to foster the translation of science of environmental justice for wildlife trade and should be tailored to cultural and historical contexts. It is our hope that the framework stirs open, transparent, mutually respectful discussions about justice between conservation researchers, practitioners, and the vast array of wildlife trade stakeholders.

KEYWORDS

conservation policy, ecological justice, social justice, species justice, research agenda, Wildlife trade

1 Introduction

The trade in live wildlife, wildlife parts, and wildlife products—whether legal or illegal—can be a significant driver of biodiversity loss (Hughes et al., 2023), as well as a facilitator of zoonotic disease transmission with pandemic potential (Pavlin et al., 2009). This has led to increased calls for industry regulation—ranging from comprehensive bans to risk-based strategies that are species, product, and/or geography specific (Borzée et al., 2020). Yet, at the local level, the wildlife trade may support vital sustenance, livelihood, and cultural needs (Rao et al., 2011; Robinson et al., 2018; IPBES, 2019; Future Earth and GEO BON, 2022) and, at the global scale, it comprises a mega billion dollars/year industry (UNODC (United

Nations Office on Drugs and Crime), 2016, 2020, 2024). Those with a strong desire to maximize the socio-economic benefits of the wildlife trade, while simultaneously minimizing adverse impacts, have thus pointed to the need for more balanced oversight and regulation of this globally distributed industry (Borzée et al., 2020). To achieve effective regulatory outcomes that mutually benefit wildlife and people along the trade pathway, there is a need for a discussion of justice (Spapens et al., 2016; Brockett and Woolaston, 2022; Sollund, 2022).

Environmental justice is commonly regarded as the human right to a safe, healthy, productive, and sustainable environment for all peoples, where “environment” is considered holistically to include ecological (biological), physical (natural and built), social, political, aesthetic, and economic contexts (Chowkwanyun, 2023). For the purposes of this paper, we regard environmental justice broadly to include the assignment of these rights as inclusive of a) social justice (all people have equal, protected, rights and opportunities; Montgomery et al., 2024), b) species justice (all non-human wild species are to be protected against discrimination, abuse, or exploitation by humans; Fitz-Henry, 2022), and c) ecological justice (all beings are part of an integrated Earth system and warrant the protection of equal rights and respects, including the ability to access sufficient natural resources for survival; Washington et al., 2018).

Environmental justice has never been more relevant to conservation, or wildlife trade in particular, as it is today. Issues of equity, gender, fairness, legitimacy, and inclusion are widely diffused across the social and ecological systems touched by wildlife trade (Agu and Gore, 2022; Milne et al., 2023; Sovacool et al., 2023). Yet, environmental justice has not been sufficiently mainstreamed into conservation science, nor practice. Specifically, environmental justice is lacking in scientific inquiry, policy, and planning processes relating to the wildlife trade. When environmental justice is not taken into consideration, the sustainability and efficacy of these efforts is likely to fail at best (McGregor et al., 2020); at worst, interventions may reinforce, as well as introduce, new injustices and contribute to biodiversity loss (Sovacool et al., 2023).

The opportunity exists for scientists working for society to conceptualize an environmental justice framework that better informs regulation of the international wildlife trade to help minimize biodiversity loss, harmful practices and infectious disease risks while also affording sustainable justice outcomes. Here, we propose a framework for advancing the transdisciplinary science of environmental justice in the international wildlife trade context. The framework arises as a synthesis of biological and social sciences, insights from conservation and social justice practitioners, and lessons drawn from case studies. It is organized via three interrelated domains: a) social justice, b) wildlife species justice, c) ecological justice. Each of these domains is described in terms of transdisciplinary questions that are intended to foster translation of the science of environmental justice to society, specifically for wildlife trade. The framework does not offer rigid authority for considering major types of justice with touchpoints to wildlife trade (e.g., distributive, corrective, commutative; Kuehn, 2000). Rather, our goal is to help

better facilitate transdisciplinary scientific analysis and inclusion of environmental justice into legal and illegal wildlife trade policies and practices.

Every aspect of international wildlife trade and every proposed risk reduction measure has implications for environmental justice (Sollund, 2019, 2022). Amongst a range of factors driving global biodiversity loss (e.g., Hald-Mortensen, 2023), wildlife trade stands apart in its diversity of influencing factors and functions, socio-cultural roles and impacts, levels of legality, and enforcement (Fukushima et al., 2021). The need to improve understanding of the environmental justice issues tied to wildlife trade is readily apparent. This is particularly true for consumer demand versus supply provision along the trade pathways, as well as how the supply chain is influenced by, and impacts, economic, cultural, and geographic biases. Deeper understanding of environmental justice patterns and trends can enable the design and evaluation of more effective regulatory and control frameworks that help manage risks and harms in actuality—rather than merely in concept. For example, improved insight about environmental justice can facilitate efforts to determine where and how to support legal and sustainable wildlife trade, versus where the trade should be more tightly regulated. A better understanding of environmental justice can also elucidate the societal implications of restrictive regulation and point to opportunities for proactively mitigating potential adverse impacts on affected stakeholders. For example, it would be useful to assess the potential of trade bans to drive historically legal wildlife trade into black markets. Likewise, in instances in which wildlife trade bans could undermine the security of local peoples and whole cultures, it would be wise to support these communities in developing alternative livelihoods consistent with their socio-cultural norms, use and conservation goals. Some scholars also recognize opportunities for environmental justice studies in the wildlife trade context to help advance green criminological concepts of ecological citizenship and institutionalized harm (e.g., Sollund, 2021) as well as rights-based approaches, which are scant in wildlife trade activities (Osorio and Bernaz, 2024).

2 Characterization of the international wildlife trade pathway

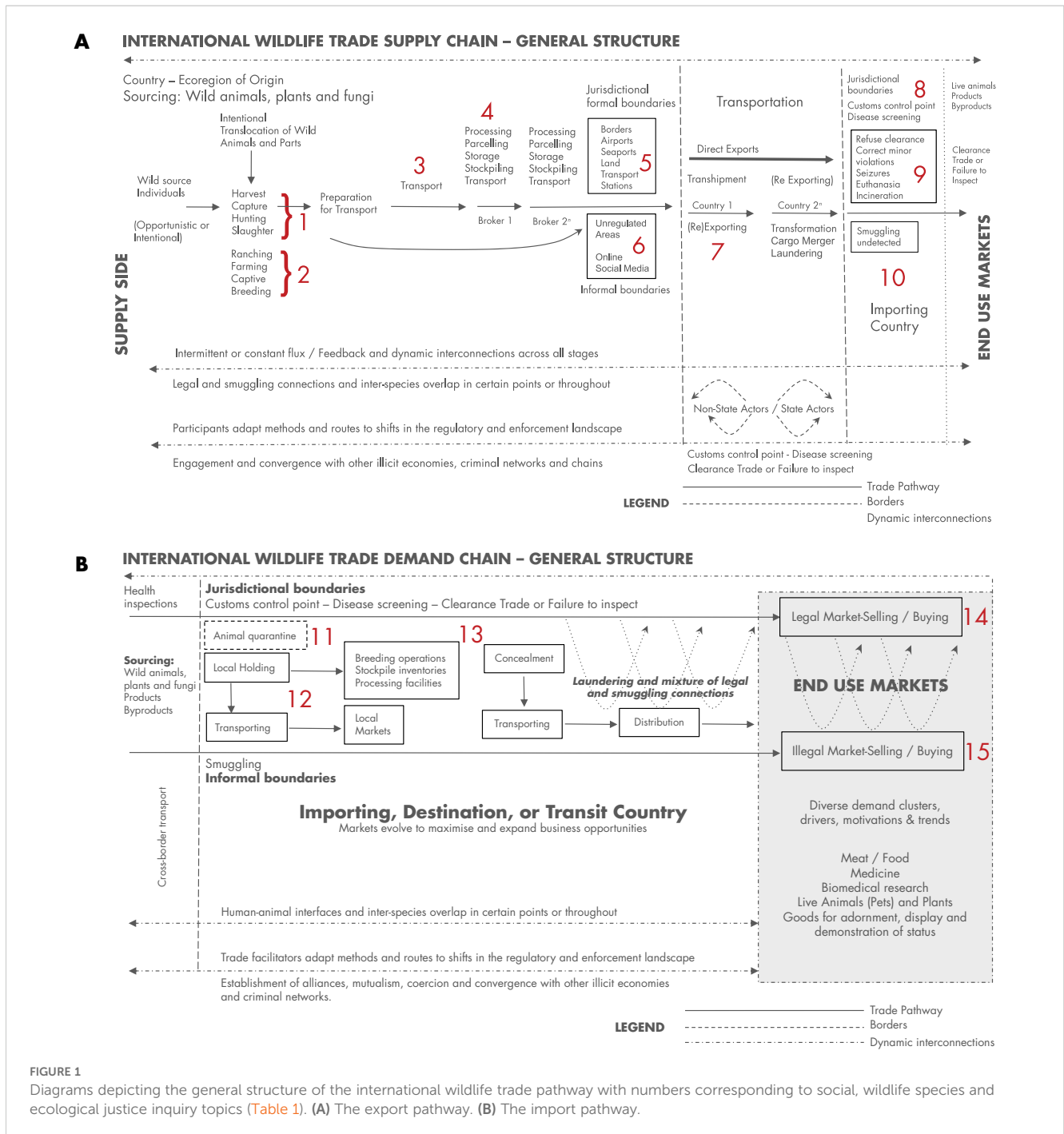
For the purposes of this paper, the international wildlife trade is defined as the intentional translocation of wild animals (wildlife), wildlife parts, or wildlife products across national borders in exchange for currency or other goods. The term “international wildlife trade” covers legal (regulated and unregulated) and illegal activities that, at a minimum, includes wildlife provisioning (harvesting, ranching, or farming), containment, preparation to meet consumer needs, transportation, and exchange (trade) to fulfill a wide range of consumer end uses (e.g., pets, food, décor, research). We recognize that, when appropriately managed, the trade in wild animals, parts, and products can provide livelihood benefits to local and rural communities, as well as contribute to species conservation

(Cooney et al., 2015; IPBES, 2019). It is also clear that the opposite can be true; poorly managed trade, including illegal trade, can put people, cultures and wildlife at risk of harm as a direct and indirect consequence (Baker et al., 2013; Maher and Sollund, 2016; Van Uhm, 2016). Environmental justice is of particular concern in poorly managed trade contexts but warrants consideration under even the most well managed wildlife trade circumstances.

Trade is often discussed in terms of the “supply side” versus “demand side” of a commerce pathway equation, given the impression that trade is a simple binary. In actuality, the

international wildlife trade is interconnected, spatio-temporally complex, constantly transforming and in flux. For this reason, the framework proposed herein should be regarded as a generalized model. The structure and details of an environmental justice framework will need to be specified (fit-to-context) on a case-by-case basis.

These diagrams (Figures 1A, B) draw partial ontological components from green criminology, geography, law, economics, logistics, and conservation science. They are intended to be flexible in application across geographical, political, and cultural contexts,



as well as the market(s) and taxonomic groups involved. They should be adapted and fit-to-context on a case-by-case basis corresponding with issues to be analyzed. The diagram details will differ, for example, among inquiries taken from ecological justice, animal welfare, and species at risk perspectives. These diagrams are linked to [Table 1](#). The numbers correspond to the proposed environmental justice framework, emphasizing the significance of environmental justice inquiry at these stages.

The major difference between illegal and legal wildlife trade pathways is that illegal wildlife shipments are not, by definition, subject to regulatory scrutiny unless intercepted by enforcement officers. Live animals are thus more vulnerable to animal welfare injustices such as poor-quality transport conditions (e.g., overcrowding, inhumane containment). It is also likely that illegal wildlife shipments bypass all pre-export pathogen testing and vaccinations, thereby facilitating the risk of disease transmission

TABLE 1 Science-based environmental justice questions to investigate along the international wildlife trade (IWT) pathway.

Pathway Stage	Social Justice	Wildlife Species Justice	Ecological Justice
1	How, when and/or why are indigenous people and local communities engaged by outsiders to hunt local species for IWT? How can authorities ensure that access and benefits sharing policies are in place to support local peoples?	How do we determine and enforce sustainable removal rates for particular species in specific contexts? How can we guarantee animal welfare conditions during capture/hunting?	How do we assess and address the systemic and structural impact of wildlife removal in biodiversity and ecosystems? (loss of biodiversity at the level of genes, species, alteration of food webs, etc.) How can we ensure rights of nature are recognized and enforced from local to global scales?
2	How can occupational conditions and safeguards for managing large and/or risk wildlife species (e.g., venomous species) be gender sensitive?	How can we prevent the laundering of species from the wild and their introduction into captive breeding schemes? How can we guarantee animal welfare conditions in captivity? How can we work with users to inform, support and increase their awareness and capacity for species-specific animal care?	How do we ensure facility biosecurity to prevent wildlife escape and/or disease transmission from the facility to wild populations?
3	How is the physical, psychological, and economic safety of environmental defenders, local guardians, law enforcement officers and their families ensured?	How do we ensure handling and transportation standards meet species-specific welfare needs and are enforced? This should include regulations that limit multi-species co-housing to prevent pathogen/parasite spread.	How do we ensure transport biosecurity to prevent wildlife escape and/or disease transmission to wild populations and vice versa?
4	How do we support a fair distribution of income and other benefits along value chains? e.g. in the stages of transportation, storage, inventory and pre-processing.	How do we ensure handling and holding facilities meet species-specific welfare needs and are enforced? This should include regulations that limit multi-species co-housing to prevent pathogen/parasite spread. Especially those shipments that are abandoned, animals suffer from a lack of basic resources and hygiene.	What is the ecological footprint of wildlife trade processing and packaging? How can the practices become more sustainable? How do we ensure waste products and packaging do not become environmental contaminants and/or a source of disease for wild populations?
5	How comprehensive are security and sanitary conditions guaranteed for workers handling wild specimens (plants and animals) and by-products? How can they be improved? How are compliance obligations monitored and are educational entry points identified and used in noncompliant situations? How can they be improved?	What capacity do inspectors have to verify species identity? How can this capacity be improved to aid enforcement activity and accuracy of trade data? This is especially important for those shipments that take a long time to leave the fiscal precincts due to administrative problems or that are abandoned by customs agents. While these procedures are resolved, animals may suffer from a lack of basic resources and hygiene.	How do we ensure points of entry biosecurity to prevent wildlife escape and/or disease transmission to wild populations? How can wildlife inspectors be incentivized by and rewarded for their roles in ecological stewardship?
6	Internet wildlife sales, legal and illegal, may be associated with dark web activities. How can surveillance of wildlife sales improve detection of other crimes, such as drug and sex trafficking?	How can regulations and platform terms of use be established that require accurate and transparent statements of species identification for marketed items? What tools and technologies can be employed to assess the species identity of wildlife and wildlife-derived products online to aid enforcement activity? How can we infiltrate certain illegal distribution chains to work with users mainly to inform, support and increase their awareness and capacity for species-specific animal care?	How can internet consumers be effectively educated about the adverse ecological consequences of purchasing wildlife and wildlife-derived products? What approaches and incentives are needed to inspire the behavior changes (e.g., purchasing decisions) necessary to protect ecological systems from IWT impacts?
7	How do we guarantee a fair distribution of income and other benefits along value chains where not	How do we ensure handling and transportation standards meet species-specific welfare needs and are enforced? This should include regulations that limit multi-species co-housing to prevent	What are the various impacts of the wildlife transport pathway(s) on ecological systems?

(Continued)

TABLE 1 Continued

Pathway Stage	Social Justice	Wildlife Species Justice	Ecological Justice
	only the large companies or extreme end users are the beneficiaries of the added value of what is marketed? How can we ensure gender is considered as an aspect of fair distribution?	pathogen/parasite spread. This is especially important for those shipments that take a long time to leave the fiscal precincts due to administrative problems or that are abandoned by customs agents. While these procedures are resolved, animals may suffer from a lack of basic resources and hygiene.	How can we minimize the impact from local to global scales and vice versa?
8	How are security and sanitary conditions guaranteed for workers while screening for diseases in animal specimens (and by products)?	What pathogens and parasites warrant routine screening for particular wildlife species? What regulatory frameworks, tools, and technologies need to be put in place to enable rapid disease screening, data collection, and risk mitigation at ports of entry for legal and illegal wildlife imports?	How can we ensure biosecurity at points of entry to prevent the escape of imported wildlife into local environments? How can we prevent native wildlife from frequenting points of entry where they might come into contact with pathogens or parasites contaminating shipping conveyances/containers?
9	How can we improve the working conditions of the personnel in charge of receiving, protecting and guarding wildlife shipments? A lack of adequate resources (financial, human, infrastructure and training) is common, leading to morale issues and high rates of staff turnover. The capacity and attitude of these workers impacts animal welfare and the wildlife in transit is dependent upon their decisions and actions.	How can we ensure that these actions are consistent with species-specific welfare standards (e.g., humane euthanasia varies among species) and that those standards are enforced? These issues are particularly concerning for shipments that take a long time to leave the fiscal precincts due to administrative problems or that are abandoned by customs agents. While these procedures are resolved, animals may suffer from a lack of basic resources, and hygiene. How can any seized wildlife or wildlife-derived products serve conservation goals for the species?	How can financial penalties for illegal wildlife importation be directed to biodiversity conservation programs in the country of origin? How can we improve waste practices so that there is little or no impact on the environment? Ideally, a zero waste scheme would be a requisite business practice. Biological waste is linked to euthanasia and cremation practices while transport containers and associated materials may be incinerated or landfilled.
10	How can we prevent public health risks for workers and their families, e.g., exposure to infections, zoonotic diseases, while handling specimens for sale.	What approaches can be used to end the illegal (black) market demand for particular species? What tools and technologies can be used to detect specimens, products and by-products in black market circulation? How can we infiltrate certain illegal distribution chains to inform, support and increase their awareness and capacity for species-specific animal care?	How can we infiltrate illegal distribution chains to inform, support, and increase their biosecurity capacities, preventing wildlife escapes, as well as zoonotic disease outbreaks?
11	How are security and sanitary conditions guaranteed for workers handling live specimens and by products? Do gender biases need to be addressed? If so, how?	What species warrant quarantine holding? Why and for how long? How can quarantine standards be established and enforced to meet species-specific needs? This is especially important for countries with very limited resources and hygiene conditions. How can disease testing results obtained during quarantine be collected and publicly reported in a standardized manner to aid wildlife health and conservation measures?	How can we ensure quarantine facility biosecurity? Imported wildlife needs to be contained and prevention measures need to be in place to keep local wildlife from coming into direct or indirect contact with imported wildlife (e.g., via waste disposal).
12	How can we guarantee a fair distribution of income along value chains so that large companies are not the only (or primary) beneficiaries of the added value of what is marketed? How can we ensure gender is considered as an aspect of fair distribution?	How can we ensure housing and transportation standards meet species-specific welfare needs and are enforced? This should include regulations that limit multi-species co-housing to prevent pathogen/parasite spread. How can we infiltrate certain illegal distribution chains to inform, support and increase people's awareness and capacity for species-specific animal care?	How can we ensure biosecurity to protect against facility escapes? How can early detection and rapid response measures be put in place to respond to wildlife escapes? How can we eradicate and/or control imported wildlife species that become invasive, especially if they are highly charismatic species? Who is held accountable for ecological impacts and how?
13	How can security and sanitary conditions be guaranteed for workers handling animal specimens? Do gender biases need to be addressed? If so, how? How can we ensure public health and safety if animals escape or are released	How can we ensure animal welfare that meets species-specific needs?	See 12

(Continued)

TABLE 1 Continued

Pathway Stage	Social Justice	Wildlife Species Justice	Ecological Justice
	from the facilities? Rural communities may be particularly at risk. What is the decision process for determining facility locations and analyzing risk? How can environmental justice be improved?		
14	How can we counteract the legacy (culture) of violence, abuse, and mistreatment to animals displayed in legal markets? Intervention is needed for both animal welfare and establishing healthy societal norms for youth values and behavior.	How can we inform, support and increase user's awareness and capacity for species-specific animal care? How can we foster species-specific rescues for imported wildlife that is no longer wanted by the consumer?	See 12 How can we track what happens when wildlife is not sold and address ecological consequences? While there is speculation that links exist between trade distribution chains and illegal landfills in natural or semi-disturbed environments, the issue is poorly assessed.
15	How does the end use for illegal wildlife correspond to other illegal markets? Will successful IWT interventions result in increased wildlife populations which then increases human-wildlife conflict which can create burdens for local people? How can we counteract the legacy (culture) of violence, abuse, and mistreatment to animals displayed in illegal markets? Intervention is needed for both animal welfare and establishing healthy societal norms for youth values and behavior.	How can we infiltrate illegal distribution and selling chains to work with users, mainly in urban areas, to improve species-specific animal welfare? See 14 How can we foster amnesty programs that enable people to turn in illegal wildlife without penalty?	See 12, 14

to other animals and people. This presents social, species (domestic animals and wildlife), and ecological injustices. We offer the following points to emphasize and clarify environmental justice concerns across the pathway. These points underpin the inquiries offered in [Table 1](#).

A. **Illegal trade.** What constitutes illegal trade can range from a wildlife shipment with an unintended error in accompanying documents (which is correctable) to intentional wildlife smuggling. Which acts constitute crimes depends on the applicable national legislation, which vary within countries, among countries, and over time. Illegal trade undermines the rule of law, leads to losses in revenue, and increases health risks to wildlife and people. Illegal wildlife trade may be intermingled with other criminal activity, such as drug and human trafficking. However, the evidence base for specific points of vulnerability to corruption in the wildlife trafficking chain, how those points vary over time and by context, and on the effectiveness of risk mitigation responses remains weak.

B. **Pathogens (including parasites)** can be present anywhere along the chain; they may enter and exit via secondary interactions. There are relatively few requirements for wildlife, or their parts, to be quarantined, tested, and/or vaccinated for pathogens at any point along the pathway. Pathogen transmission among animals in transit should be of the greatest concern when a) multiple species are held in close quarters and/or b) shipping conveyances or containers are reused without sterilization. Transmission risk to people is a function of human exposure to wildlife and/or the bodily materials (e.g., blood, excrement).

C. **Gender** shapes the engagement in and roles of people involved in all stages of the international wildlife trade supply chain. Across the trade chain from source to end market gender undoubtedly influences trade patterns and processes, including criminality and efforts to mitigate harm. For example, on the supply side, gender likely influences roles in wildlife extraction. Gender is known to influence wildlife poaching prevention efforts (e.g., ranger employment). On the consumer side, gender likely influences what wildlife species and products are in

demand. However, the gender dimensions of wildlife trade have been poorly studied and thus warrant environmental justice research (Agu and Gore, 2020, 2022; Seager, 2021).

3 Proposed environmental justice framework

Advancing the science of environmental justice is an act of expanded, deepened, and better integrated inquiry. Table 1 is a transdisciplinary framework for advancing environmental justice research along the international wildlife trade pathway. The framework is intended to facilitate the ability of environmental justice researchers to identify broad questions that can then be refined for application to specific international wildlife trade contexts (wildlife species, geographies, players, purposes, victims, etc.). We also hope the framework will help funding agencies identify granting targets, needs, and priorities. The framework is not exhaustive; the questions are exemplary, and the invitation exists for researchers to identify other relevant inquiries fit-to-context.

Rather than function as an authoritative structure for the application of major types of justice (e.g., distributive, corrective, commutative, restorative), the framework is intended to facilitate transdisciplinary scientific inquiry into environmental justice in the wildlife trade context—from both legal and illegal perspectives—with the hope of better informing decision making across the whole trade pathway. For example, it is intended to promulgate the science that will enable decision makers who have a desire to regulate the importation of potential harmful species to consider the various ramifications of proposed regulatory actions on the suite of affected parties and systems involved in trade export activity (Martin et al., 2013).

Questions in Table 1 are largely framed from a “how can we...” perspective. The “we” refers to all those who self-identify as interested in improving environmental justice along the international wildlife trade pathway, with a particular emphasis on the conservation research community. The “how to” frame is intended to place the focus on capacity building rather than simply the identification of environmental justice challenges. The framework is, thus, a scholarly tool for addressing environmental injustices. Although actionability of the framework elements is critical, we have intentionally provided broad questions in multiple instances to catalyze innovation, a wide range of possible response narratives, and stakeholder inclusivity. We recognize that these justice issues are inter-related and may overlap. In some situations, it may be challenging to distinguish between Wildlife Species Justice (focused on species conservation, ethical treatment, and welfare) and Ecological Justice (focused on all biota and the processes among them). However, the inquiries can be framed differently according to the scale of impact (species vs. ecosystem).

4 Discussion

The international wildlife trade is a multi-billion dollar, cross-border, globally-distributed, socio-environmental phenomenon that is ecosystem, species, and socially agnostic (Gore and Bennett, 2022; Gore et al., 2023a, b). The complexities of trade pathways, particularly supply–demand dynamics, help highlight the need for context-specific solutions to risk mitigation. The international wildlife trade is not decreasing in scope or scale (UNODC (United Nations Office on Drugs and Crime), 2016, 2020, 2024); it is reasonable to assume that the legacy of [social and ecological] injustice(s) will continue alongside a range of escalating and emergent burdens (see Levy and Hernández, 2022). It is our hope that the framework herein offers a rendezvous point of sorts for conservation scholars and practitioners to accommodate the interconnectedness of human rights, animal welfare, and ecological health when seeking fair and sustainable outcomes responsive to international wildlife trade related risks. These interconnections may produce cumulative exposures and differential vulnerabilities; they may be generated via community engagement, empowerment, capacity building (Levy and Hernández, 2022), as well as creating awareness and involving all sectors of society.

The environmental justice framework herein is also intended to enhance extant, mainstream solutions that are broadly discussed in the conservation literature, such as prevention measures, trade bans (Challender et al., 2024), biosecurity measures (Pienaar et al., 2022), species-specific welfare standards (Pienaar et al., 2022; Wyatt et al., 2022) and global health governance (Willetts et al., 2024). In particular, the framework can be applied to community-engaged research and/or efforts to integrate environmental justice principles into wildlife management, regulation and controls, simultaneously mitigating biodiversity loss; reducing abuse; and, supporting socio-economic benefits with a particular focus on those local communities reliant on trade for their livelihoods (Schroeder, 2008). When adapting the framework across geographical, political, and cultural contexts, we encourage practitioners to consider how to shape inquiries relative to such factors as legal frameworks (e.g. strict vs. weak enforcement, socio-cultural traditions (e.g., focal species, harvest purpose, harvest demand patterns), user groups (e.g., local consumption vs commercial exportation), and ecological condition (e.g., human dominated, highly impacted system vs. relatively intact system with low anthropogenic pressures).

We offer three broad observations, reflections, and implications that emerge from the framework.

- A. Justice issues along the international wildlife trade pathway are driven by internal and external attributes and factors, which in turn, have internal and external impacts. The pathway is not an isolated distribution and commerce chain. To advance the science of socio environmental justice, the pathway must be

regarded as a complex system full of dynamic human-to-human and human-to-wildlife interactions.

- B. There is broad opportunity for multi-dimensional policy innovations at individual, neighborhood, and community levels that foster justice and sustainability (Esmail et al., 2020). By more deliberately integrating social, species, and ecological justice into wildlife trade policies, policy makers may address ecological harms and mistreatment of wildlife while supporting the socio-economic needs of communities. Beyond the technological innovations to confront the international wildlife trade (Kretser et al., 2017), neighborhood, community, and regional policy innovations can equally help ensure that international wildlife trade interventions are effective, just and less harmful.
- C. If risk prevention and mitigation strategies stemming from biosecurity, health and animal welfare are enhanced, a focus on the entire wildlife trade pathway—rather than specific points—may enable justice in a more holistic way (Adeeso, 2024). There are clear opportunities to mitigate risky public health issues and uphold ethical practices in wildlife management at discrete points along the wildlife trade pathway. However, because justice issues have so many intricate trade pathway touch points, narrowly focused strategies may simply displace injustices to other locations along the pathway. Justice in IWT spaces may not always emerge from *adding* innovations or strategies; de-adoption, de-implementation or discontinuance of practices that are known to be harmful or unjust (Ashcraft et al., 2024) are also possible paths to follow.

Some environmental justice scholars acknowledge that frameworks are ideally centered on the communities they seek to serve (Van Horne et al., 2023). We acknowledge our lived experiences and expertise as academics/scientists and recognize our framework is investigator led. We also point out that the framework is intended to serve the investigator community, particularly those practicing in the field of conservation from biological and/or social science perspectives. We encourage these investigators to collaborate with trade pathway stakeholders on data collection and ownership, communication and results dissemination, and project leadership—in the spirit of justice and equity both social and ecological.

5 Conclusion

The international wildlife trade impacts social, species, and ecological justice through the buying and selling of wild animals and plants and wildlife-derived products. We have provided a general socio environmental justice inquiry framework to support scholars and practitioners, but especially conservation scientists, in their efforts to understand and mitigate injustices along this type of trade pathways worldwide. The framework is to be regarded as a catalyst for the identification of additional real world research questions and

challenges, as well as the tailoring of investigations by cultural and historical contexts. It is our hope that the framework stirs open, transparent, mutually respectful discussions about justice between researchers, practitioners, and the vast array of wildlife trade stakeholders. We trust that the findings generated by the application of this framework will point the way to greater justice in international wildlife trade policies and practices. Yet, we underscore the need to recognize that achieving justice is not a one-off, single step task. Achieving environmental justice throughout all the various international wildlife trade pathways that are constantly evolving requires the substantial and sustained will of every nation and of all those who inform national decision making, but also the responsibility and the commitment of users themselves.

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

IA-Q: Visualization, Writing – original draft, Writing – review & editing. MG: Visualization, Writing – original draft, Writing – review & editing. JR: Conceptualization, Funding acquisition, Project administration, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

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

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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