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Urgent Policy Change Is Needed to Understand the Dimensions of Legal International Wildlife Trade to Enable Targeted Management

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ABSTRACT

Wildlife trade is a key threat to global biodiversity, involving thousands of species and millions of individuals. Global research and policy attention on international wildlife trade has increased in recent years and is represented in key global policy frameworks (e.g., Kunming–Montreal Global Biodiversity Framework). Yet the dominant focus of research and discussion is on illegal wildlife trade and the use of CITES in managing trade for a subset of species, despite the fact that the majority of species in trade are legal and fall outside the remits of CITES. Furthermore, there is no global mechanism to record what species are traded; current systems only capture subsets of species and regions, with no consistent standards. This hampers our understanding of global trade patterns and limits any understanding of the wider sustainability of international wildlife trade. There is an urgent need to develop and implement policies that capture the full scope of international trade, tools that embed comprehensive and reproducible sustainability assessments, and funding that reflects the telecoupled nature of trade and the inherent wealth imbalance between exporting and importing nations. The adoption of these more holistic approaches is critical for a sustainable future for species in trade and the livelihoods reliant on them.

1 | Introduction

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) estimates that ~50,000 wild species are traded (IPBES 2022), and trade is known to represent the major threat to many species' survival. Yet, for the majority of taxa, vanishingly little data are collected on what is traded or whether they originate from wild or captive-reared sources. Consequently, global estimates of the number of species in trade represent only the tip of the iceberg. For instance, IPBES documents 1700 traded terrestrial arthropod species (IPBES 2022), yet separate analyses show at least 1264 species of arachnids (Marshall et al. 2022) and 3767 *Lepidoptera* species alone are in trade (Wang et al. 2023), highlighting major knowledge gaps of even the diversity of traded wildlife. Without accurate knowledge of traded species and volumes, as well as the source of trade, gauging the sustainability of legal trade and guiding effective policy remain impossible for most species.

This disjointed and incomplete picture of the wildlife trade results from a lack of standardized data collection, with no active databases designed to comprehensively document trade internationally across taxa (Figure 1). The only globally consistent data (though not free from errors) of country-specific import and export volumes across time is for species listed in the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices. The database documents the trade of over 1.8 billion plants and 282 million animals from over 40,900 species (of which > 29,000 are orchids) since 1975 (Harfoot et al. 2018; Scheffers et al. 2019), yet this still only represents a minority

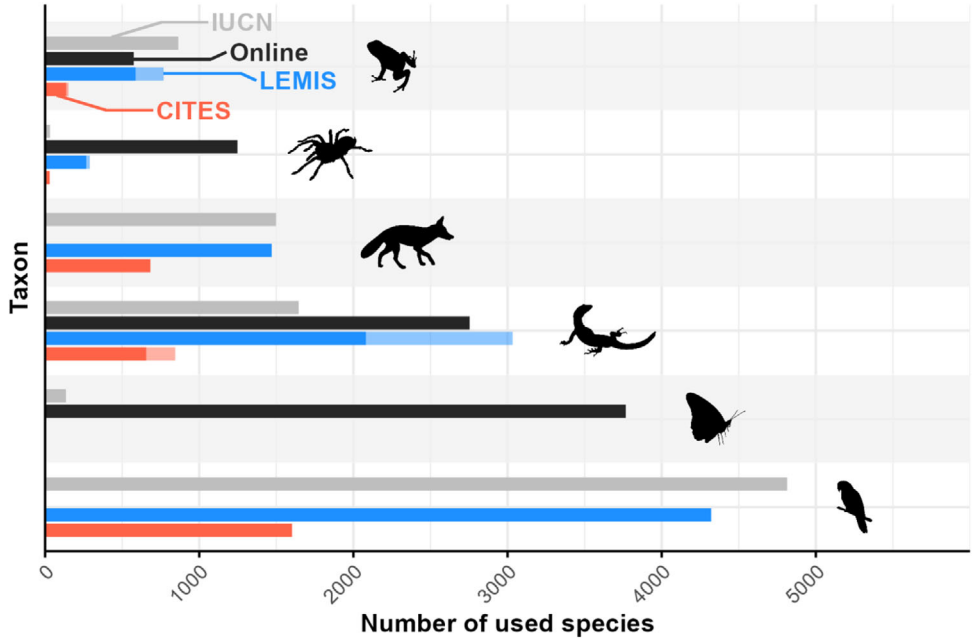

FIGURE 1 | Different data for different purposes, with no data source effectively capturing all global trade. Number of species recorded by the IUCN "use and trade" (grey), published online surveys (black), and published summaries of the LEMIS (blue) and CITES (red) databases. Shown for amphibians, arachnids, mammals, reptiles, *Lepidoptera*, and birds. While the LEMIS and CITES data explicitly capture international trade, we contrast this with the number of species marked with "use and trade" by the IUCN and with studies of online trade, which both reflect national and international trade. Lighter colors for CITES and LEMIS records of reptiles and amphibians occurred when differing sources produced different estimates. See Supporting Information for a comprehensive list of sources.

of species in trade (Figure 1). Without consistently collecting export or import data encompassing the tens of thousands of species legally traded outside of CITES (Figure 1), we can neither provide an accurate measure of what species are traded nor confidently assess the sustainability of this trade (Marshall et al. 2020). Given that species will only be listed in the CITES Appendices where there is sufficient evidence that trade poses a risk to species survival, the lack of data for unlisted species means that demonstrating there is risk can be difficult or impossible. In turn, this hampers the effectiveness of CITES and the listing of at-risk species in the CITES Appendices since, without sufficient data, it is difficult to demonstrate that trade could threaten their survival (e.g., the listing of glass frogs at the 2022 Panama CITES-CoP [CITES 2022]). In the case of glass frogs, the EU claimed there was insufficient evidence that trade posed a risk to species survival, and only additional independent data that documented the online trade to generate a more complete list of species in trade (highlighting the lack of data on trade into Europe) was sufficient to list these species to CITES (CITES 2022; A. C. Hughes et al. 2021).

Unlike CITES, regional databases, such as the LEMIS database, provide a more holistic assessment of all taxa in trade but only focus on international trade to and from the United States. The LEMIS database provides recordkeeping for the USFWS Office of Law Enforcement, and despite its limitations, it remains the most comprehensive record of international wildlife trade (Eshew et al., 2020). Europe is also being pushed to consider similar measures to facilitate wildlife trade management (Cardoso et al. 2024; Tlusty et al. 2024) to counteract the data gaps highlighted for groups such as the glass frogs.

Accurate monitoring and databasing is critical to understanding and sustainably managing trade, as understanding what is in trade, in what volumes, and where it is from is critical to assessments on the impacts of trade on any given species. Recent studies have highlighted that traded populations suffer an average decline in abundance of 62% relative to untraded populations (Morton et al. 2021), and an estimated 16% of used species are exploited at unsustainable levels, though gauging this is hard given the lack of data for the majority of traded species—particularly for highly traded groups such as orchids, timber species, and invertebrates (Marsh et al. 2022). While illegal trade is rightly vilified, often, it is legal trade that pushes species invisibly towards extinction. For instance, populations of purple-naped lory (*Lorius domicella*)—a parrot species restricted to the Indonesian island of Seram—rapidly declined due to domestic trade, facilitated by high legal harvest quotas (BirdLife International 2023). Yet well-managed, legal, and sustainable trade offers a potential path to incentivize conservation and support local livelihoods but requires data that is generally lacking. Collating data on international trade is not only easier to quantify (due to limited export and import points) but may also represent newer forms of demand or rapid changes in volumes, highlighting trade that may require intervention to ensure it does not threaten the survival of the species.

As global markets become increasingly connected and the demand for exotic pets, traditional medicines, and wildlife foods continues to grow, we urgently need a step change in how we monitor and manage legal international wildlife trade (A. Hughes et al. 2023). Several targets of the Kunming–Montreal Global Biodiversity Framework (KM-GBF) (Target 5—sustainable, safe,

and legal harvesting and trade of wild species; Target 9—manage wild species sustainably to benefit people) focus on this, yet no appropriate data indicator accurately captures wildlife trade, with sustainable fish stocks listed as the only current indicator for Target 5. CBD-COP16 offers the final opportunity to allow for the consideration of any additional measures, and thus advancing the dialogue and highlighting the need for a more appropriate indicator at this juncture is essential. Focusing or basing policy efforts on species that are currently known to be traded and/or threatened by trade (e.g., CITES-listed species) provides little scope for adaptive and holistic policy able to identify and protect species from emerging threats. Furthermore, the lack of data from across species means that interventions and knowledge are limited to this unrepresentative subset of species (such as those included within CITES, which are often those with high commercial value), especially given that in many instances, we do not know what species are in trade due to a lack of monitoring. We outline four fundamental changes to the legal international trade in wildlife that must be adopted at a global scale to help halt and reverse the trade-driven biodiversity extinction crisis:

2 | Priority 1: Ensuring Representative Monitoring of Species in Trade

Monitoring methods must be extended to cover *all* traded wildlife by combining the robust global importer- and exporter-databasing of CITES with the complete taxonomic coverage based on the US Fish and Wildlife Service's Law Enforcement Management Information System (LEMIS). Such monitoring of wildlife imports and exports globally likely does not represent an insurmountable challenge since many countries routinely monitor wildlife trade in some form. However, at present, the lack of standards (and therefore interoperability) and lack of public accessibility mean that such data cannot contribute to enhancing our understanding of trade more broadly. Creating standards to enhance interoperability would ensure this data is vastly more useful in enhancing our understanding of trade. Developing the mechanisms for implementation could be met by leveraging signatories of the KM-GBF to develop protocols to share, collate, and database aspects of customs applications. This could extend the United Nations Comtrade (customs codes) system to more easily record species-level data and add additional parameters consistent with those already used within LEMIS and CITES to facilitate interoperability (Watters et al. 2022), similar to what is already being called for in the EU (Cardoso et al. 2024). Where particularly threatened species (Figure 2), species at high zoonotic or invasion risk, or reported volumes appear unsustainable, this will provide data to support effective regulatory responses (e.g., listing in the CITES Appendices, Priority 2). For countries lacking the capacity for data systems or species identification, funding could be drawn from the signatory's commitments to the Global Biodiversity Framework Fund (GBFF) or from country-specific funds allied to analogous purposes (e.g., China's Kunming Biodiversity Fund).

3 | Priority 2: Effective Sustainability Assessments for Traded Wildlife

For species where high levels of trade (noted through the above steps on monitoring trade) may pose a threat to their survival, detailed sustainability assessments must be conducted. Yet, for the majority of species, there is insufficient data on vital parameters (mortality and reproductive rates, movement, etc.) and offtake rates to calculate a maximum sustainable yield and thus accurately assess the volume of trade that is not detrimental to species survival. Tracking trade is key to ensuring provenance, identifying the potential of laundering, and establishing the degree of offtake (and, therefore, if it is above the maximum sustainable yield). Current advice for data-poor species from CITES non-detriment findings (NDF) workshops advocates a pragmatic "simple" NDF, utilizing trade volumes, coarse life-history grouping, known range size/number of populations, and presence in domestic or illegal trade (CITES 2023), though such approaches are applied inconsistently between groups (A. Hughes et al. 2023). An open, standardized, and reproducible methodology is needed and would provide an ideal indicator for target five of the global biodiversity framework. Standardizing the data needed, the methodological approaches, and the frequency of updating these assessments would provide a critically needed transparent standard for sustainable trade. Combining trade or harvest information for some species with phylogenetic, trait, and environmental (range, human pressures) modeling approaches may facilitate assessments of maximum numbers that could be harvested sustainably. This would also identify legally traded species that are too poorly understood (e.g., geographically isolated, newly described; Figure 2) to evaluate the severity of the threat posed by trade and need targeted monitoring or consideration for CITES listing.

FIGURE 2 | The endangered Bawangling leopard gecko (*Goniurosaurus bawanglingensis*), described in 2002 and listed in CITES Appendix II in 2019. The species is endemic and restricted to a small mountain range area in Hainan, China, and yet is observed frequently in online sales adverts with no distinction made between captive-bred and wild-sourced individuals. The severely limited range places the species at a high risk of overexploitation, the same is true for many *Goniurosaurus* geckos, which still show high rates of species description. *Source*: https://species.wikimedia.org/wiki/Goniurosaurus_bawanglingensis.

4 | Priority 3: Ensuring the Sustainability of Captive-Breeding Operations

Captive breeding has a major role in the future of wildlife trade—for sustainability and biosecurity (e.g., the EU bird directive restricting wild bird imports) (Meeks et al. 2024).

Captive breeding can minimize pressure on wild populations but must be coupled with stocking and demographic data to identify species and volumes that can be legitimately supplied to identify where laundering may be occurring (Meeks et al. 2024). Emerging technologies, such as DNA barcoding of parentage as commonly used in zoo breeding programs, can also be adopted to identify the presence of wild-caught individuals (see Priority 4 for funding pathways). This will require certification combined with improved databasing and registries of breeders and stock. This will likely be a particularly pertinent issue for rapidly growing captive-breeding enterprises, especially in lower-income countries with a history of imperfect compliance. For example, the annual export of 17.2 million Tokay geckos (*Gekko gecko*) from Indonesia derives from an 8.2 million harvest quota and contentious claims of captive breeding (Kurniati et al. 2023). Thus, methods for oversight and monitoring are needed. In the livestock trade, tagging or chipping of animals has become standard, as well as comprehensive tracking and databasing such as the Tracking Animal Certification for Export (TRACE) system utilized by the Australian Government. Many governments utilize similar national control methods (e.g., the UK Animal and Plant Agency (APHA) requires various Export Health Certificates), and international collaboration could reconcile these into globally coherent databases (Priority 1). Similar approaches could be used for recording individuals in higher-value species and those at risk of laundering, or even the use of image recognition or computer vision technologies to record and identify individuals in trade based on unique markings.

5 | Priority 4: Importer Pays

The majority of species legally traded internationally are harvested in tropical nations with limited resources and institutional capacity but imported by wealthy developed nations. Importers must take greater responsibility for ensuring sustainable trade is consistently monitored, supported by rigorous offtake assessment, and of verified origin. This includes importers shouldering the financial burden of implementing key measures, including the costs of validating species identification, developing technical capacity to enable exporters to generate suitable offtake assessments, and the development of appropriate processes (such as certification standards and verification of species identity in collaboration with national focal agencies). Furthermore, the use of tools, such as DNA barcodes, which can now be provided rapidly and affordably, to validate species identity could serve a dual purpose of reducing laundering and generating data on wild species. Funding for this could be leveraged as a percentage tax on wildlife imports, an application fee for certification and export–import, or fixed-scaled contributions similar to the UN Scales of Assessment process (as the CITES Trust Fund is currently funded). Securing such funding pathways would reflect the telecoupled historical drivers of exploitation, wider resolve to decrease end-user disconnect with potential impacts, and need for financial viability that does not place an impossible burden on developing economies.

6 | Conclusion

Globally, there is no overarching system to collect international wildlife trade data across taxa, meaning most species in trade have vanishingly little data, precluding assessments of the sustainability of the wider legal wildlife trade. The continuation of this status quo will inevitably lead to the extinction of species, particularly those with small populations for which high demand exists (Figure 2), as well as preventing the tracking of potential zoonoses and future invasion risks. Without data on what is in trade, we cannot hope to set effective policy, and we cannot track progress towards targets. Furthermore, it may be suggested that substantive change is improbable, yet such statements were also made before the implementation of the EU zero-deforestation supply-chain regulations (EUDR) (Venturini 2024) and the EU Birds Directive (Cooney and Jepson 2006). However, such legislation has not only been implemented but has also successfully reduced global bird trade by an estimated 90% (Reino et al. 2017), highlighting that not only is change possible but that it can mark a step change in our ability to regulate the risks of wildlife trade and effectively conserve species.

Databasing of many commodities has become standardized globally. Yet wildlife trade has been largely neglected, overlooking the globalization of travel and internet connectivity and the increased demand for a much wider suite of species than were traditionally vulnerable. The failure to collate global wildlife trade data undermines our ability to reach global targets on conservation, with sustainable use forming a key tenet of both the Convention of Biodiversity and the Convention of Trade on Endangered Species, and yet sustainable trade without data on what is globally in trade is not possible. Modernizing wildlife trade management in line with the trade of other commodities must become a priority. Proactive rather than reactive safeguards are needed. Urgent action is required to enact consistent recording and reporting standards that enable comprehensive monitoring of the legal international trade in wildlife, providing the basis for sustainably managing trade.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.