Contributed Papers

Building a global taxonomy of wildlife offenses

Maria Pascual¹ | James Wingard¹ | Naila Bhatri² | Alyona Rydannykh³ | Jacob Phelps⁴

¹ Legal Atlas, Missoula, MT, USA
² 1055 High Street Apt 203 Eugene, OR, USA
³ 21 Ilia Chavchavadze Avenue, Tbilisi 0179, Georgia
⁴ Lancaster Environment Centre, Lancaster University, Lancaster LA1 4YQ, UK

Correspondence
Jacob Phelps, Lancaster Environment Centre, Lancaster University LA1 4YQ, UK.
Email: jacob.phelps@gmail.com

Article impact statement: The taxonomy of wildlife offenses facilitates legal analyses, including the comparison of offenses across jurisdictions.

Abstract
Most countries have many pieces of legislation that govern biodiversity, including a range of criminal, administrative, and civil law provisions that state how wildlife must be legally used, managed, and protected. However, related debates in conservation, such as about enforcement, often overlook the details within national legislation that define which specific acts are illegal, the conditions under which laws apply, and how they are sanctioned. Based on a review of 90 wildlife laws in 8 high-biodiversity countries with different legal systems, we developed a taxonomy that describes all types of wildlife offenses in those countries. The 511 offenses are organized into a hierarchical taxonomy that scholars and practitioners can use to help conduct legal analyses. This is significant amidst competing calls to strengthen, deregulate, and reform wildlife legislation, particularly in response to fears over zoonotic threats and large-scale biodiversity loss. It can be used to provide more nuance legal analyses and facilitate like-for-like comparisons across countries, informing processes to redraft conservation laws, review deregulation efforts, close loopholes, and harmonize legislation across jurisdictions. We applied the taxonomy in a comparison of sanctions in 8 countries for hunting a protected species. We found not only huge ranges in fines (US$0 to $200,000) and imprisonment terms (1.5 years to life imprisonment), but also fundamentally different approaches to designing sanctions for wildlife offenses. The taxonomy also illustrates how future legal taxonomies can be developed for other environmental issues (e.g., invasive species, protected areas).

KEYWORDS
enforcement, environmental law, green criminology, illegal wildlife trade, rules, wildlife crime

Creación de una Taxonomía Mundial de Ofensas a la Fauna

Resumen: La mayoría de los países tienen muchos instrumentos de legislación que gobiernan la biodiversidad, incluyendo una gama de disposiciones de leyes criminales, administrativas y civiles que declaran cómo se debe usar, manejar y proteger legalmente a la fauna. Sin embargo, los debates relacionados a la conservación, como el cumplimiento de las leyes, generalmente ignoran los detalles dentro de la legislación nacional que definen cuáles actos específicos son ilegales, las condiciones bajo las cuales aplican las leyes y cómo son sancionadas. Con base en una revisión de 90 leyes relacionadas con la fauna en ocho países con una gran biodiversidad y diferentes sistemas legales, desarrollamos una taxonomía que describe todos los tipos de ofensas a la fauna en aquellos países. Las 511 ofensas están organizadas en una taxonomía jerárquica que los académicos y los practicantes pueden usar para ayudar a realizar análisis legales. Lo anterior es significativo en medio de las peticiones competitivas por fortalecer, desregular y reformar la legislación de la fauna, particularmente como respuesta al miedo por las amenazas zoonóticas y la pérdida a gran escala de la biodiversidad. La taxonomía puede usarse para proporcionar análisis legales más matizados y para facilitar las comparaciones igual-por-igual entre los países, informar...
los procesos para reformular las leyes de conservación, revisar los esfuerzos por desregular, cerrar los vacíos legales y armonizar la legislación entre las jurisdicciones. Aplicamos la taxonomía en una comparación de las sanciones aplicadas en ocho países a la caza de especies protegidas. Encontramos no sólo una gama enorme de multas (de US$0 a $200,000) y términos de encarcelamiento (de 1.5 años a sentencias de por vida), sino también estrategias fundamentalmente diferentes para el diseño de las sanciones para las ofensas a la fauna. La taxonomía también ilustra cómo pueden desarrollarse las siguientes taxonomías legales para otros temas ambientales (p. ej.: especies invasoras, áreas protegidas).

Palabras Clave: crimen de fauna, criminología verde, cumplimiento, ley ambiental, mercado ilegal de fauna, reglas

INTRODUCTION

Legal details matter to conservation

Most countries have many pieces of legislation that govern biodiversity, including a range of criminal, administrative, and civil law provisions that state how wildlife must be legally used, managed, and protected. However, debates about wildlife conservation often overlook legal mechanics—the details within national legislation that define which acts are legal and illegal, the conditions under which laws apply, and how violations are sanctioned. Yet, legislation can only be operationalized (by government officials, prosecutors, judges), reviewed, and contested (by citizens, parliaments, lawyers) in the context of existing legal details that define specifically what acts are limited or allowed. Legal analyses and comparisons within and across countries are important, especially amidst efforts to strengthen and reform legislation in response to zoonotic disease risks and unprecedented biodiversity loss.

Few tools are available to help scholars and practitioners define, analyze, and systematically compare illegal acts in the environment sector. This is important because terminology, governing approaches, and rules vary widely across cultural contexts, legal traditions, and jurisdictions (Van Hoecke & Warrington, 1998). For example, critical details, such as the definitions of wildlife, descriptions of specific illegal acts, and permitting procedures, are often inconsistent within and across countries; analyses of those differences and ensuring clarity are important. Moreover, wildlife governance involves many areas of law (e.g., related to harvest quotas, permitted technologies, animal welfare standards, import and export rules, quarantine requirements). This can challenge conservation practitioners, who often lack legal training, and even legal professionals whose expertise is often limited to specific sectors and jurisdictions.

We constructed a globally relevant, concept-driven taxonomy for categorizing criminal, civil, and administrative law offenses related to terrestrial wild fauna. The taxonomy serves to parse legislation (e.g., Figure 1) and presents a hierarchically structured framework that can be used to analyze and compare wildlife legislation across countries. For example, we apply the taxonomy to compare how 8 countries sanction the offense of hunting a protected species to demonstrate how this resource can facilitate comparative legal analysis to inform conservation.

FIGURE 1 Example anatomy of a legal provision, which typically includes an offense, facets that qualify that offense, and statement of the penalty for violations

Purpose of taxonomies

Taxonomies—involving classification and naming based on similarities and differences—are a familiar concept in conservation (Thomson et al., 2018). Similarly, across criminology, customs, banking, information systems, and law, taxonomies provide a common lexicon and discrete categories to facilitate communication, collaboration, and harmonization across cultures, languages, and jurisdictions, as well as to understand where there is divergence (e.g., UNODC core areas of criminal law [Bisogno et al. 2015]; World Customs Organization Harmonized Commodity Description and Coding System [WCO 2020]).
In law taxonomies provide the “devices,” “grammar,” and “common dictionary” that improve access, enable translation, and support comparison within and across systems (Bisogno et al., 2015; Mattei, 1997). Legal taxonomies often focus on how countries organize their laws (e.g., Mattei, 1997; Sherwin, 2009), but can also be used to organize legislation around specific topics (e.g., cybercrimes [Land et al., 2013]). They are a cornerstone of legal analysis within a country, which often requires the sorting of rules in ways that allow generalizations (Sherwin, 2009) or facilitate access to all laws that may apply to a certain concept. As such, taxonomies can help identify laws that might be useful in a certain case, that represent loopholes, or that need updating. In comparative law, taxonomies are a “prerequisite to make the knowledge and the problem-solving experience acquired in one system of law understandable and possibly transferable to another” (Mattei, 1997), such as understanding how other jurisdictions are tackling challenging issues. Comparative law can serve to distinguish legal approaches among countries or to identify the types of laws that might be considered as part of a legal revision. Taxonomies can also inform harmonization efforts of legislation across systems (e.g., across the European Union (Law, 2011)); help standardize global reporting (e.g., Bisogno et al., 2015); and facilitate information sharing and law-enforcement cooperation (Land et al., 2013). Importantly, these efforts require an underlying taxonomy that names and categorizes diverse legal concepts.

Need for a taxonomy of wildlife offenses

Across contexts and scales, structured legal analyses and comparisons can inform conservation scholarship and practice. Domestically, a legal taxonomy can help identify legal gaps and drafting mistakes. This includes internal conflicts such as when one piece of legislation prohibits a certain action but another provides permissions or when sanctions differ across pieces of legislation. For example, in Thailand reforms in 2019 closed loopholes that previously left non-native threatened species unprotected (USAID, 2019); a legal taxonomy can identify parallel legislation that need revision for alignment.

Structured legal analyses are also important where larger reforms are proposed. For example, a number of high-level policy events have called for strengthened wildlife laws (e.g., Hanoi, 2016; UK, 2019; US, 2019), and the Covid-19 pandemic has prompted proposals to better regulate the sanitary conditions in wildlife markets (Lancet, 2020) and ban all or most wildlife trade (Aguirre et al., 2020). Such reforms require specificity about particular offenses and concurrence across areas of law. For example, reform to ban wildlife trade would require revisions affecting dozens of human actions whose legality is codified across different areas of law (e.g., rules on harvest, market sanitation, international commerce, internet marketing).

A taxonomy is important to revising legislation. For example, concern about the social and ethical impacts of overcriminalization (Duffy et al, 2019; Masse et al. 2020) has prompted calls to allow more legal, sustainable wildlife use (e.g., Challender et al., 2015; PNP, 2020). Related legal reforms would require revisions across legislation to clarify rights, establish processes (e.g., permits) and set standards (e.g., quotas).

A taxonomy can also facilitate international comparisons, revealing different approaches to wildlife governance. For example, some countries’ legislation, such Somalia, Somaliland, Yemen, and Ethiopia, rely on broad prohibitions against wildlife use, whereas others articulate wildlife management, use, and protections according to specific requirements. The Cheetah Conservation Fund and its partners are working to expand and strengthen legislation in the region (CCF, 2019), and international legal comparisons can identify gaps and opportunities by revealing how other countries have legislated similar situations. Similarly, in Indonesia, NGOs are helping update the Natural Resources Conservation Law 5/1990 with reforms to close loopholes for online wildlife trade, strengthen sanctions, and update the protected species list (Gokoon, 2018). The taxonomy can help identify how these issues have been legislated in other countries. Indeed, comparative analysis can inform discussions about international legal harmonization to uphold minimum standards (Pennings, 2004). For example, there are calls to standardize the treatment of illegal wildlife trade as a “serious and organized crime” globally (e.g., UK 2019) and for countries to strengthen domestic legislation to meet international conservation commitments (e.g., CITES & UNEP, 2015).

Concurrently, there are deregulatory efforts to weaken wildlife legislation, including weakening of the U.S. Endangered Species Act (Friedman, 2019), multiple environmental regulations in Brazil (Spring, 2020), and protected area degazettment (Pack et al., 2016). Patterns of weakening wildlife legislation require understanding of what species, contexts, and acts are being revised so that conservationists can respond with legal challenges.

METHODS

We developed the taxonomy based on a structured analysis of the wildlife laws of 8, purposely selected countries from the Global South: Angola, Brazil, Cambodia, Costa Rica, Indonesia, Kenya, Mexico, and Vietnam. These were chosen to reflect a range of high-biodiversity countries with diverse legal systems (Table 1). We avoided United States- and Eurocentric tendencies of many legal taxonomies (Mattei, 1997), recognizing that the legacies of these systems were already strongly reflected in the sampled countries (e.g., British common law informs the legal systems of Costa Rica, Mexico, Kenya, and Brazil) (Table 1).

The research followed steps described in Land et al. (2013). First, we collected all relevant legislation from each country and determined its metacharacteristics by organizing all wildlife offenses from the source material. This involved an empirical-to-conceptual approach, in which offenses were sorted according to language and then grouped into conceptual clusters that described different offenses. This was then used to develop the typology, which is likely to grow and evolve as it is applied to other countries (Land et al., 2013).
### Approach to comparative law

While there are a number of databases that compile wildlife legislation, most are limited to the identification of basic content and keyword searches (e.g., U.S. Library of Congress’ Law Library, VLex Justis, Codices, Fastcase’s Public Library of Law). Instead, we took a concept-driven approach to legal taxonomies and organized “law according to a set of structural rules” in a descriptive way and with an aim of clarification, overview, and coherence (cf. Sherwin, 2009). It focuses on what is empirically observable in pieces of legislation and captures the language in legislation and the concept it conveys. This reflects the approach taken by the Ecolex and Legal Atlas databases, which organize legislation into subject categories (although the Ecolex categories, such as “forestry” and “water” are too coarse to allow nuanced research into different types of wildlife offenses).

A concept-driven approach has limitations, including its crude classification of the complexities inherent to law (Wadams in Law, 2011); debates about what might be considered moral, superior, or legitimate (see Beyleveld & Brownsword, 1985); and its relative lack of context (Van Hoecke & Warrington, 1998). Laws, as they are written, reflect only a small part of environmental governance and practices. Top-down legal frameworks are regularly interrogated and reshaped, and de jure realities often differ from codified rules (see Cleaver, 2017). Formal, stated law has many limitations including related to their legitimacy on the ground, colonial legacies, and entrenched discrimination (e.g., Ashaba, 2020). Moreover, there is growing recognition of the need to better incorporate diverse values and ontologies into governance (Diaz et al., 2015). In addition, the taxonomy does not explore the implementation or enforcement of legislation, which depends on capacity, resources, priorities, context, and procedural law issues (e.g., whether the provision is a formal part of the criminal code, is a separate legislation but recognized by the criminal code, or whether is an entirely administrative provision). Nevertheless, our approach responds to the ubiquity and hegemony of formal legislation in many countries, where it provides protection to species and helps shape the rights, livelihoods, identities, and norms of many people (see Agrawal & Bauler 2005; Cleaver, 2017; Epstein, 2006). Better understanding of legal mechanics, via a taxonomy that facilitates unpacking the formal rules, is thus valuable across contexts—including for those working within the constraints of formal law (e.g., legal drafting and revision), those who research and critique law (e.g., green criminology, environmental law), and for those challenging that state (e.g., via protest, courts, judicial reviews).

### Compilation of legislation

For each of the 8 sampled countries, we searched for legislation associated with 44 types or subjects of law across criminal, administrative, and civil law that previous experience has demonstrated can refer to wildlife (Supporting information Appendix S1 [e.g., CITES [Convention on International Trade in Endangered Species] national implementing legislation, protected area law, administrative code, criminal code, and laws related to quarantine regulations, anti-money laundering, cybercrime and export]). Not all the countries had legislation in each subject, whereas some had multiple laws on the same subject (e.g., Kenya), depending on each jurisdiction’s degree of legal development. When possible, subordinate implementing regulations were also collected. For example, a country’s act on wildlife and hunting might introduce what actions are offenses, accompanied by a subordinate regulation that sets out the specifics of implementation (e.g., sanctions).

Laws were first sourced from official government websites, but because many countries lack a centralized system for compiling legislation, laws were also compiled from online legal sources (Supporting information Appendix S2). In total, 194 pieces of legislation were compiled and reviewed to check whether they matched our inclusion criteria: whether they related to terrestrial fauna (fisheries and flora were excluded).
due to the scale of the analysis) and whether they included direct reference to illegal acts or penalties. This yielded a list of 90 pieces of legislation (Table 1, Supporting information Appendix S2). Although systematic review protocols are increasingly formalized in conservation, they are not established in the legal field. Our objective was saturation to create a nearly exhaustive list of offenses. Collection and analysis were conducted from June through November 2019.

Data extraction

For each piece of legislation, we followed the “indexing process” of the American National Standards Institute and National Information Standards Organization (2005). This drew on the standard elements in the anatomy of a legal provision (Figure 1). Despite variability, legislation across countries consistently includes a description of the offense (actus reus). We extracted the exact wording used to express each offense, focusing on the verb that described a specific identifiable illegal act. We further followed an internal set of protocols for dealing with common challenges that emerge when comparing laws across countries (Supporting information Appendix S3). Indexing yielded a list of 1548 candidate terms for offenses that described a variety of illegal acts. Most terms (62%) were identified in English; the rest were translated from Spanish and Portuguese with Google Translate and checked by researchers fluent in both languages. We used a thesaurus to identify additional synonyms for describing each offense. We interpreted the legal concept expressed by each term, clustered them, identified synonyms, and removed equivalent terms (semantic analysis) (ANSI & NISO, 2005; Supporting information Appendix S4). For example, the concept of hunting was represented in legislation by 33 terms involving 15 different verbs (e.g., kill, killing, catch, catching), which were treated as synonyms. The terms that appeared most frequently in the data set were selected as the preferred term used in the taxonomy (ANSI & NISO, 2005).

Legal provisions also include so-called facets that further define or qualify the offense (e.g., time, place, status of completion, knowledge, and intent of the responsible party); identify the victim (e.g., protected species vs. unprotected), and can determine who may be held liable for an offense (e.g., persons, government officials, and legal entities) (Figure 1). We separated out facets so as to focus on the base criminal act without losing the comparative and analytical understanding held by the facets. We collected the facets from each piece of legislation and identified 9 common categories of recurring facets (Supporting information Appendix S5). We further identified the recurring types of sanctions that applied to each offense (Supporting information Appendix S6) and developed a list of common aggravating or mitigating circumstances that defined the scope and scale of sanctions that apply for any given offense (Appendix S7).

Categories in the taxonomy

We used iterative sorting and reduction to create a taxonomy with a 4-level hierarchical structure (ANSI & NISO, 2005) following Bisogno et al. (2015) (Supporting information Appendix S8). Level 1 of the taxonomy was the broadest category and contained offenses associated with the harvest, transport, use of wildlife, forgery, and obstruction of justice (corruption and organized crime were not included here due to scope). Each category was then further divided into mutually exclusive subcategories.

In level 2 of the taxonomy, acts were sorted following a common pattern: acts that were prohibited; acts conducted without legal authorization (e.g., permitting, registration); acts conducted in violation of authorized standard or procedures (e.g., quotas, size limits, transportation requirements, welfare standards), and acts conducted with wildlife of an illegal origin. In addition, a final catch-all category captured “other acts in violation of the law related to…”. This reflects a common legal drafting practice that involves a generic declaration intended to criminalize acts, even when they are not explicitly listed as offenses in those sections of the law. Levels 3 and 4 of the taxonomy reflected further specificity of the acts, often informed by facets that defined the conditions under which an act is illegal (Figure 1). Where we deduced that acts were missing from the taxonomy, we added these (7 acts), and where acts involved generic terms (e.g., importing goods) we made these specific to a wildlife context (e.g., importing wildlife).

RESULTS

Taxonomy of wildlife offenses

We developed a taxonomy that identifies and organizes all types of wildlife offenses present in 8 sampled countries. It consists of 511 offense types organized into a 4-level hierarchy (e.g., Table 2). The full taxonomy is provided in Supporting information Appendix S8. Level 1 presents 16 broad categories of wildlife offense, and each subsequent level identifies a more specific offense (e.g., level 2 has 82 categories, level 3 has 296 categories). Each offense is identified with a numeric code of 4 numbers that refer to its position in the hierarchy (ISO, 2017). For example, in the code 02-03-003-005, the 02 refers to the second item in level 1 of the taxonomy.

The 511 types of offenses were subject to diverse sanctions. We documented 17 categories of sanctions for wildlife offenses, ranging from fines and incarceration to warning letters, license suspension, and community service (Supporting information Appendix S6). We also identified 5 categories of common aggravating and mitigating circumstances that informed the scale of those sanctions (Supporting information Appendix S7).

DISCUSSION

Applying the taxonomy

The taxonomy can be deployed in 2 different ways. In a law-to-taxonomy approach, a piece of legislation is mapped onto the taxonomy, focusing initially on the illegal act (e.g., Table 3).
TABLE 2: Extract from the 4-level hierarchical taxonomy of wildlife offenses, focused on offenses related to the transportation of wildlife

| Level 1                                      | Level 2                                      | Level 3                                      | Level 4                                      | Final code       |
|----------------------------------------------|----------------------------------------------|----------------------------------------------|----------------------------------------------|------------------|
| Offenses related to the transportation of wildlife | Transporting wildlife                        |                                              |                                              | 04-00-000-000    |
|                                              | Transporting wildlife without due authorization |                                              |                                              | 04-01-000-000    |
|                                              | Transporting wildlife without the mandatory business registration |                                              |                                              | 04-02-000-000    |
|                                              | Transporting wildlife without mandatory documentation |                                              |                                              | 04-02-001-000    |
|                                              | Transporting wildlife without shipping documents |                                              |                                              | 04-02-002-000    |
|                                              | Transporting wildlife without transit documents |                                              |                                              | 04-02-002-001    |
|                                              | Transporting wildlife without a health certificate |                                              |                                              | 04-02-002-002    |
|                                              | Transporting imported wildlife without a cites permit |                                              |                                              | 04-02-002-003    |
|                                              | Transporting wildlife of illegal origin        |                                              |                                              | 04-03-000-000    |
|                                              | Transporting wildlife illegally hunted in the country |                                              |                                              | 04-03-001-000    |
|                                              | Transporting wildlife illegally hunted in a foreign country |                                              |                                              | 04-03-002-000    |
|                                              | Transporting wildlife illegally imported        |                                              |                                              | 04-03-003-000    |
|                                              | Transporting appendix i wildlife imported without cites certificate |                                              |                                              | 04-03-004-000    |
|                                              | Transporting wildlife sourced from unauthorized breeding site |                                              |                                              | 04-03-005-000    |
|                                              | Transporting wildlife illegally sold            |                                              |                                              | 04-03-006-000    |
|                                              | Transporting wildlife illegally purchased        |                                              |                                              | 04-03-007-000    |
|                                              | Transporting stolen wildlife                    |                                              |                                              | 04-03-008-000    |
|                                              | Transporting wildlife in breach of legal requirements and procedures |                                              |                                              | 04-04-000-000    |
|                                              | Transporting wildlife in improper receptacles   |                                              |                                              | 04-04-001-000    |
|                                              | Transporting wildlife in overcrowded conditions |                                              |                                              | 04-04-002-000    |
|                                              | Transporting wildlife in amounts that exceed what is necessary for customary use |                                              |                                              | 04-04-003-000    |
|                                              | Transporting wildlife that is unfit to be transported |                                              |                                              | 04-04-004-000    |
|                                              | Transporting wildlife injured or sick           |                                              |                                              | 04-04-004-001    |
|                                              | Transporting wildlife that is likely to give birth during conveyance |                                              |                                              | 04-04-004-002    |
|                                              | Other acts in violation of the law related to the breach of legal provisions on wildlife transportation |                                              |                                              | 04-99-000-000    |

*Full taxonomy of 511 items available in Appendix S8.

This can form part of a stock-taking exercise for identifying gaps or inconsistencies in a single country or be a first step in international comparisons. Alternatively, in a taxonomy-to-law approach an offense listed in the taxonomy is selected and then identified in the laws of different countries. This facilitates like-for-like comparisons and can be used to consider differences in which acts are legal or illegal across jurisdictions, the types of conditions (facets) that shape offenses, and the associated sanctions.

Example of how sanctions for hunting a protected species differ across 8 countries

We illustrate one use of the taxonomy by comparing sanctions for illegally hunting a protected species in different countries. All the countries in the sample had a list of nationally protected species, although the criteria for inclusion in this list varied widely (e.g., based on national science-based evaluations, using International Union for Conservation of Nature data, listing iconic species, using CITES-listed species). In all of the countries, legislation stated that hunting these protected species is illegal (as a criminal offense). We identified relevant legislation in each country (2-4 relevant pieces in each) and used the taxonomy and facets to compare how the same illegal act was sanctioned in different countries (Table 4).

Minimum fines ranged from $0 to nearly $200,000, and maximum imprisonment terms ranged from 1.5 years to life imprisonment (Table 4). Importantly, comparative analysis revealed different approaches to setting sanctions for hunting protected species (Table 5, Supporting information Appendix S6). For example, Costa Rica exclusively used imprisonment sanctions and employed no monetary fines for hunting protected species (fines apply only to hunting unprotected species). This likely reveals a comparatively strict, highly criminalized conservation approach, although the maximum imprisonment term was notably lower than other countries. Similarly, Kenya had both fixed fines and imprisonment for hunting protected species.

Comparison further revealed that sanctions were defined by a range of country-specific facets that can yield insights about novel sanctioning strategies, potential loopholes, and neighboring country standards (Table 5). For example, fines in Mexico
| Act article & paragraph | Taxonomy item | Taxonomy facet | Example observations |
|-------------------------|--------------|---------------|---------------------|
| 93. Offenses relating to invasive species | Introducing wildlife invasive species into wildlife habitats and ecosystems (01-02-008-000) | Knowledge and intent: the facet of “knowingly” is a requirement for the act to be a legal offense. Offense location: specifically into a wildlife conservation area | Negligence is not a covered Introducing invasive species into sites that are not formally protected is not covered |
| Any person who— | | | |
| (a) knowingly introduces an invasive species into a wildlife conservation area; or | | | |
| (b) fails to comply with the measures prescribed by the Cabinet Secretary set out under this Act, commits an offense | Other acts in violation of the law related to wildlife and wildlife habitats conservation (01-99-000-000) | NA | Very broad legal drafting |
| 95. Offenses relating to trophies and trophy dealing | Hunting without authorization (02-02-000-000) | Victims’ legal status: offenses relate to species that are not protected (protected species covered by Art. 92) | Drafting language suggests there is a permitting process that might enable torturing, molesting, and injuring wildlife, which is presumably a mistake in the act. |
| Any person who, without a permit or exemption granted under this Act in relation to a species not specified under section 92 (a) kills or injures, tortures or molests, or attempts to kill or injure, any wildlife species; | Operating as a wildlife trophy dealer without authorization (06-02-001-000) | NA | |
| (b) deals in a wildlife trophy; | | | |
| (c) deals in a live wildlife species; | Trading wildlife without authorization (07-02-000-000) | Form: applies only to live specimens | Unclear how the law deals with dead specimen that are not considered trophies |
| (d) is in possession of a wildlife trophy or live wildlife species; or | Possessing wildlife trophies without authorization (09-02-002-000) | NA Form: applies only to live specimen | |
| (e) manufactures an item from a wildlife trophy, | Processing items from wildlife trophies without authorization (06-02-003-000) | NA | Employs financial and imprisonment sanctions |
| commits an offense and shall be liable on conviction to a fine of not <1 million shillings or a term of imprisonment of not less than 12 months or to both such fine and imprisonment. | | | Sets minimum sanctions |

*Kenya Wildlife Conservation and Management Act No. 47 of 2013, Amended by Statute Law (Miscellaneous Amendments Act, 2018). http://www.parliament.go.ke/sites/default/files/2019-04/TheStatuteLaw_MiscellaneousAmendment_Bill_2019.pdf Accessed 17 June 2021.*
TABLE 4 Sanctions across 8 countries for hunting protected wildlife (taxonomy offense 02-01-000-000 and facet of protected species)*

| Sanction type | Angola | Brazil | Cambodia | Costa Rica | Indonesia | Kenya | Mexico | Vietnam |
|---------------|--------|--------|----------|------------|-----------|-------|--------|---------|
| Admin. fine$^b$ | min 900 | 2450 | | 49,157 | | 221 | | 22 |
| | max 1800 | 36,750 | 6988 | 196,628 | 308,722 | 21,500 |
| Crim. fine$^b$ | min 22 | 1,295 per specimen | | | | 1608 | 2163 |
| | max 133 | 2,591 | | | | 16,080 | 64,917 |
| Prison (years) | min 0.5 | 0.8 | 1 | 1 | 0 | 5 | 1 | 0.5 |
| | max 3 | 1.5 | 10 | 3 | 5 | life | 9 | 5 |

*Legal sources: Angola: Forest and Wild Fauna Law 2017, Decree on Hunting Ban 2015, Decree on Hunting Fees and compensation to the State 2016, Criminal Code 2019. Brazil: Protected Areas Regulation, 1990–2009, Fauna Protection Law, 1967–2000, Law on Criminal and Administrative Sanctions on Activities Harming the Environment, 1988, Decree implementing Administrative Infractions and Sanctions to Environmental Offenses, 2008. Cambodia: Forest and Wild Fauna Law, 2017, Decree on Hunting Ban, 2015, Decree on Hunting Fees and compensation to the State, 2016, Criminal Code, 2019. Costa Rica: Criminal Code, 1970–2018, Wildlife Law, 1992–2017; Indonesia: Conservation of Living Sources and the Ecosystems Act, 1990, Environmental Protection and Management Law, 2003, Kenya: Wildlife Conservation and Management Act No. 47 of 2013, Environmental Management and Coordination Act, 1999, Criminal Code, 1930; Mexico: Environmental Law, 1988–2018, Criminal Code, 1931–2018, Wildlife Law, 2000; Vietnam: Exploitation of Endangered Species Decree, 2006, Forest Administrative Penalties Decree as amended in 2017, Criminal Code as amended in 2017.

TABLE 5 Notes on the sanctions that apply for hunting protected wildlife in 8 countries*

| Country | Notes on sanctions |
|---------|-------------------|
| Angola | minimum and maximum fines set only for protected species that are CITES-Appendix 1 listed; fines then equal to the market value of the animal |
| Costa Rica | no fines; imprisonment only set for hunting species on its protected species list; fines only set for illegal hunting of unprotected species, which is a different offense in the taxonomy |
| Indonesia | no minimum fines or imprisonment set; maximum fines and imprisonment apply only if act was intentional |
| Mexico | fines based on offender’s salary; scale of fines depends on whether animal is alive or dead |
| Cambodia | financial sanctions can be in addition to or a substitute for imprisonment; minimum sanctions apply only if act involves a protected species, and maximum applies only if act involved a protected species in a protected area |
| Brazil | fines set per specimen; maximum sanctions apply only if act was motivated by profit |
| Vietnam | Between minimum and maximum fine limits, there is a detailed design of fines that depends on a permutation that considers species protected status (group I-B, II-B), species value, and number of specimens. |
| Kenya | administrative fines and prison time for protected species set depending on species type: lower penalty (minimum in the table) set only for Category B species and higher penalty (maximum in the table) set only for Category A species; includes mandatory life imprisonment for hunting a Category A species. |

*Facets that further define or qualify the offense, identify the victim or determine who may be held liable are underlined. In the taxonomy, this offense is identified as #02-01-000-000, and the facet is protected species. The notes identify different aggravating and mitigating circumstances that inform the scope and nature of the sanction that applies to this offense in each country.
These legal details are relevant to practitioners. For example, recent calls to ban all or most wildlife trade would require a range of legal reforms including significant expansions of protected species lists that currently define the offence. These are now typically reserved for a subset of species, and the taxonomy highlights how these facets often shape sanction regimes (Table 5), which would have to be revised to consider all or most wildlife. New bans would also need to review the sanction regimes associated with increased criminalization. The taxonomy highlights many, fundamentally different approaches to sanctioning (e.g., Tables 4 & 5), which are central to mounting debates about which sanctions are most effective and equitable (Wilson & Boratto, 2020). Structured legal comparisons could facilitate learning among neighbors and further debate about the options, their strengths, and limitations.

Understanding law admittedly requires more than comparisons of illegal acts and sanctions. Laws are best understood within their different political-cultural and economic contexts (see Harring et al., 2019). For example, this legal analysis highlights that Indonesia's lack of minimum imprisonment sentencing sets it in contrast with many other countries (Table 5), but this overlooks the fact that Indonesia also does not set minimum sentencing for murder of humans. Similarly, differences in human dependence on wildlife resources and cultural associations with wildlife vary significantly across the identified countries, and so too should their legal approaches. Nevertheless, legal reform and critique still require appreciation for the stated law itself, which is at the heart of this taxonomy.

The taxonomy provides a working draft for understanding and comparing wildlife offenses cross jurisdictions that will likely develop as it is tested across contexts and for diverse purposes (Land et al., 2013). It can serve as an organizational and decision-making tool (Law, 2011) including to help identify and articulate the approaches and legal elements that need reform (or revolution). Legislation also offers tangible manifestations of humanity’s diverse relationships to nature and can yield insights into countries’ approaches to wildlife governance (Margules et al. 2019). Our example application of the taxonomy, to reveal different approaches to sanctions for hunting protected species, points to a range of academic and practical conservation debates that could provide insight through engagement with the mechanics of domestic legislation via structured analyses.

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ORCID
James Wingard https://orcid.org/0000-0001-8965-1165
Jacob Phelps https://orcid.org/0000-0001-6489-1103

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**SUPPORTING INFORMATION**

Additional supporting information may be found online in the Supporting Information section at the end of the article.