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## **A global taxonomy of wildlife offences**

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### **Abstract**

Environmental laws are ubiquitous, including to the field of conservation where they define how wildlife can be legally used, managed and protected. However, debates about environmental law regularly overlook the details within national legislation that define which specific acts are illegal, where laws apply, and how they are sanctioned. Based on a review of nearly 200 wildlife laws in 8 countries, we developed a taxonomy that describes all types of wildlife offences in those countries. The 511 offences are organized into a hierarchical taxonomy that scholars and practitioners can use to help conduct legal analyses globally, providing more nuance and facilitating like-for-like comparisons of laws across countries. 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. The taxonomy can be used to analyse legal reforms (e.g., new laws, deregulation, closing loopholes, harmonising legislation), or to establish international standards. For example, we apply the taxonomy to compare how 8 countries sanction the offence of “hunting a protected species”, to explore different scales and approaches to imposing fines and imprisonment. The taxonomy also illustrates how future legal taxonomies can be developed in the environment sector.

### **Introduction**

#### **Conservation is backed by law**

Environmental protection and natural resource laws exist globally, and include numerous provisions that govern how wildlife can be used, managed and protected. There are recurrent calls to strengthen and reform many of these laws, particularly amidst growing fears over zoonotic threats and large-scale biodiversity loss. For example, there are recent proposals to restrict wildlife trade and markets (Boyle 2020). There have also been calls to treat wildlife trade as a serious and organised crime (e.g., UK 2019); to strengthen domestic legislation to better meet international conservation commitments (e.g., CITES and UNEP 2015), and to update lists of protected wildlife species (e.g., Chng 2015). There are also calls to further “experiment” with using existing laws in order to more proactively respond to contemporary environmental challenges (e.g., Garmestani et al. 2019). Equally, there are notable contemporary driving deregulation, including of the U.S. Endangered Species Act (Friedman 2019) and of multiple environmental regulations in Brazil (Spring 2020). Both patterns are occurring against a backdrop of growing concern about how regulation affects not only the environment, but also economy and humans. For example, there is broad concern that over-criminalization of wildlife laws can have negative and unethical impacts on local residents, park rangers and biodiversity (Brockington and Duffy 2019; Duffy et al. 2019). This has prompted calls for reforms to allow for legal, sustainable use of some wildlife species (e.g., Challender et al. 2015). These debates reflect a wide body of work on the complex relationships between law, conservation, enforcement, equity and behaviour, with a

diversifying range of contributions (e.g., green and conservation criminology, Kurland et al. 2017; Borrato and Gibbs 2019).

However, across contexts and disciplines, debates about environmental laws and their enforcement often overlook the legal mechanics--the details of national legislation that define which acts are (il)legal, the conditions under which they apply, and how they are sanctioned. Laws can only be operationalized by ministerial officials, prosecutors and judges in the context of these legal details. Moreover, whether trying to better utilize, tighten, relax or reform legislation, there is a need to specifically define exactly which acts will be limited, allowed or reformed. For example, a call to “ban wildlife trade” could require revisions and clarifications affecting dozens of human actions whose legality is codified across many different areas of laws (e.g., international commerce, wildlife harvest, internet marketing, quarantine rules).

Few tools are available to help scholars and practitioners to identify, define, analyse and systematically compare illegal acts in the environment sector. This is important because both technical terminology, legal approaches and wildlife rules vary widely across contexts, legal traditions and jurisdictions (see Van Hoecke and Warrington 1998). Moreover, environmental law involves a broad range of legislation and mandates (e.g., harvests, technologies, welfare, import and export, and quarantine). This can challenge practitioners, who often lack legal training, and even legal professionals whose expertise is often limited to specific sectors and jurisdictions. As discussed below, this restricts efforts to innovate, learn lessons across jurisdictions and ensure legal reforms are thorough and specific.

### **Purposes of taxonomies**

Global 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. Taxonomies are a familiar concept in conservation, where classification and naming based on similarities and differences is often a baseline step in efforts for effective management (Thomson et al. 2018). Similarly, across criminology, customs, banking, information systems and law, taxonomies provide harmonized concepts and definitions that facilitate communication, comparisons and decision-making. For example, the United Nations Organisation on Drugs and Crime’s International Classification of Crime for Statistical Purposes was developed to enable consistent criminal statistics on reporting and analyses for core areas of criminal law (although wildlife law; Bisogno et al. 2015). The World Customs Organisation deploys the Harmonized Commodity Description and Coding System to name and number >5,000 categories that are used to describe millions of products traded globally (WCO 2020).

For the legal field, taxonomies provide the “devices”, “grammar” and “common dictionary” that improve access, enable translation, and support comparison within and across systems (Mattei 1997; Bisogno et al, 2015). Legal taxonomies often focus on how countries organise their laws (e.g., Mattei 1997; Sherwin 2009), but can also be used to organise 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 generalisations (Sherwin 2009) or facilitate access to all laws that may apply to a certain concept. As such, taxonomies can help to 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 (e.g., wildlife cybercrime). 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, see Law 2011); help standardise 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 categories diverse legal concepts.

### First taxonomy of wildlife offences

This study provides a globally-relevant taxonomy of types of legal offences related to terrestrial wild fauna, drawing on a structured review of nearly 200 laws in 8 countries (SI Appendix S1). It serves to parse the laws governing wildlife (e.g., Fig. 1), and presents a hierarchically-structured framework that can be used to analyse and compare wildlife laws and sanctions across countries. For example, we apply the taxonomy to compare how the 8 countries sanction the offence of hunting a protected species, to demonstrate how this resource can facilitate legal analysis and comparative law to inform wildlife conservation.



**Figure 1.** Anatomy of a legal provision, including offence, facets and penalty.

While there are a number of databases that compile wildlife legislation, these are limited to the identification of basic content and keyword searches (e.g., US Library of Congress' Law Library, VLex Justis, Codices, Fastcase's Public Library of Law). Concept-driven legal taxonomies remain rare in environmental law, conservation and wildlife. However, they are an important part of legal analysis, development and reform, as well as debates about how laws affect environmental and social outcomes.

For example, domestically, structured analysis and comparisons of wildlife legislation can help to identify gaps and drafting mistakes. It can also reveal internal conflicts, such as where one law prohibits certain action, but another law provides permissions, or where sanctions across different pieces of legislation fail to match. This type of analysis can also identify sites where law may allow certain types of wildlife management, but where there are no established standards and procedures that would be required in order to operationalise the law. Related gaps can limit implementation and prosecution, and limit a country's ability to cooperate across jurisdictions (e.g. in international wildlife trade, dual criminality). Domestic analysis can also identify "untapped" opportunities within existing laws that are not traditionally used, but could be innovatively applied to address wildlife conservation (cf. Garmestani et al 2019).

International comparisons can reveal fundamentally different approaches to governing wildlife. For example, although some countries have comparatively broad regulations that rely heavily on prohibitions, others enable wildlife management and use according to specific requirements. These differences map onto distinctions between use or non-use of wildlife that are often central to conservation debates, and which are deeply shaped by national and international legislation. International comparison can also identify gaps by revealing how other countries have legislated similar situations. Comparative analysis can further inform discussions about international standards, and whether attempts at legal harmonization are appropriate and viable (cf. CITES and UNEP 2015). Such harmonization of conservation legislation could serve to uphold minimum standards, improve coordination, and close loop-holes (see Pennings 2004), but face many limitations across different political-cultural and economic contexts (cf. climate change legislation, Harring et al. 2019).

For example, in Indonesia a coalition of NGOs are helping to update the Natural Resources Conservation Law) with reforms to address online wildlife trade, strengthen sanctions and update the protected species list (Gokoon 2018). Comparative legal analysis facilitated by a legal taxonomy can help to identify how these types of issues have been legislated in other countries, and help contextualise Indonesian sanctions relative to those of neighbouring countries. The People Not Poaching initiative (<https://www.peoplenotpoaching.org>) is a knowledge-sharing platform to share solutions to wildlife trade based on community empowerment. Legal

analysis can help identify and compare the rights allocated to communities in different countries, as well as provide a legal basis for exploring the social equity implications of legal sanctions for hunting protected species in different countries. In Thailand, TRAFFIC, the wildlife monitoring network is lobbying to close legal loop-holes that have left non-native threatened species unprotected (TRAFFIC 2016); a legal taxonomy can help to identify the aspects of which different laws need to be updated in order to address this gap. In Somalia, Somaliland, Yemen, and Ethiopia, the Cheetah Conservation Fund and its partners are working to expand and strengthen conservation legislation (CCF 2019); a legal taxonomy can help identify the legal approaches and types of laws that might be considered as part of a revision. Across these contexts, structured legal analysis and like-for-like comparisons with other jurisdictions are important to informing scholarship and practice.

## Methods

We developed the taxonomy based on an analysis of the wildlife laws of eight, purposely-selected countries: Angola, Brazil, Cambodia, Costa Rica, Indonesia, Kenya, Mexico, and Vietnam. These were chosen to reflect a range of conservation priority countries with differing legal systems (Table 1) to ensure that a diversity of illegal actions associated with wildlife trade were included in the dataset, and to avoid the US- and Euro-centric tendencies of many legal taxonomies (Mattei 1997). The research broadly followed steps described in Land et al. (2013), first collecting all relevant laws from each country, and determining the meta-characteristics of the law by organising all wildlife offences from the source material. We then evaluated these using an “empirical to conceptual” approach, where offences were sorted according to language and common characteristics, and then grouped into conceptual clusters of offences. This was then used to develop the typology, which was tested and expanded, including through trialling pieces of natural law to see how it fits. This generates a working taxonomy that is likely to continue evolving (Land et al. 2013).

**Table 1.** Legal foundations of the 8 sampled countries, and the number of laws and candidate terms

	Angola	Brazil	Cambodia	Costa Rica	Indonesia	Kenya	Mexico	Vietnam
<b>Legal foundations</b>								
Customary	X		X		X	X		X
Napoleonic			X	X			X	X
British/Common		X		X		X	X	
Sharia					X	X		
Roman		X					X	
Portuguese	X	X						
Spanish							X	
Dutch					X			
Soviet								X
<b>Number of laws in analysis (# reviewed)</b>	8 (18)	13(20)	5(14)	9(18)	13(29)	16(45)	12(24)	14(26)
<b>Candidate terms contributed</b>	170	130	139	141	239	258	144	87

\*Table S2 includes a full list of legal sources and the laws collected for each country

## Approach to comparative law

There are different approaches to developing typologies (see Land et al, 2013), and specifically for organising law and legal concepts (Sherwin 2009). This manuscript adopts a formal approach that “organizes 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. This approach has clear limitations, including critiques against crude classification of the complexities inherent to law (Waddams in Law et al. 2013); debates about what might be considered moral, superior or socially legitimate (see Beyleveld and Brownsword 1985), and a recognition that comparative law gains most when it considers context and unique legal styles (Van Hoecke and Warrington 1998). Laws, as they are written,

reflect only a small part of environmental governance and everyday practices; top-down legal frameworks are regularly interrogated and reshaped, and *de jure* realities often differ from codified rules (see Cleaver 2017). Moreover, there is growing recognition of the need to incorporate diverse values and ontologies into governance that are often overlooked in mainstream legislation (Diaz et al. 2015).

Nevertheless, our approach responds to the ubiquity and hegemony of formal wildlife law. However imperfect, it not only provides protection to species and individuals, but also helps shape the rights, livelihoods, opportunities and identities of people globally. Our focus on formal rules seeks to inform not only traditional legal processes and academic scholarship, but provides tools that will facilitate others unpacking the formal rules--including to contest them.

### **Compilation of legislation**

For each of the eight sampled countries, we searched for legislation associated with 44 “types” or subjects of law that previous experience has demonstrated can refer to wildlife (Table S1; e.g., CITES implementing legislation, protected area laws, administrative and criminal codes, anti-money laundering, cybercrime, export laws). Subordinate implementing regulations were also collected (e.g., laws such as a Wildlife and Hunting Act, which might introduce what actions are considered offences, are typically accompanied by a Wildlife and Hunting Regulation that sets out specifics needed to implement the act). Laws were first sourced from official government websites but, as many countries lack a centralized system for compiling legislation, laws were also compiled from online legal sources (Table S2). In total, 194 pieces of legislation were compiled and reviewed to check if they matched our inclusion criteria: whether they related to terrestrial fauna (fisheries, flora, and timber 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, Table S2). Although systematic review protocols are increasingly formalised in conservation (e.g., PRISMA), they are not established in the legal field; our objective here is thoroughness in terms of saturation, to create a nearly-exhaustive list of offences.

Collection and analysis of laws was conducted by researchers at Legal Atlas between November-June 2019. Legal Atlas® ([www.legal-atlas.net](http://www.legal-atlas.net)) is an online legal platform that combines comparative legal analysis and technology to help inform legal scholarship and practise, and policy reform across topics contexts (e.g., access to information, corruption, organized crime, environmental crime, environmental impact assessments, money laundering, and mining).

### **Data extraction**

We extracted the exact wording used to express each wildlife offence, focusing on the verb that described a specific, identifiable illegal act (indexing process, see ANSI/NISO 2005). We followed a set of protocols for dealing with common challenges that emerge when comparing laws across countries (Table S3).

The process drew on the standard elements in the anatomy of a legal provision (Fig. 1). Despite significant variability, legislation consistently includes a description of the illegal act (*actus reus*). They also include facets that further define or qualify the illegal act (e.g., time, place, status of completion, knowledge or intent of the responsible party); serve to identify the victim (e.g., protected species vs. non-protected), and *can determine who may be held liable for an offences* (e.g., persons, government officials, and legal entities) (e.g., Fig. 1; see ANSI/NISO2005). Offence provisions typically also include the sanctions that apply.

That process yielded a list of 1,548 candidate terms that described a variety of illegal acts. Most terms (62%) were identified in English; the rest were translated from Spanish and Portuguese using Google Translate and checked by researchers fluent in both languages. We also used a thesaurus to identify additional synonyms (following ANSI/NISO 2005). We interpreted the legal concept expressed by each term, clustered them, identified synonyms and removed equivalent terms (semantic analysis, cf. ANSI/NISO 2005; Table S3). For example, the concept of “illegal hunting” was represented in legislation by 33 terms involving 15 different verbs, which were treated as synonyms. Terms that appeared most frequently in the dataset were selected as the preferred term (cf. ANSI/NISO Z39.19).

Legal provisions that contained the candidate terms were then also reviewed for “facets” (Fig. 1). Facets enable the taxonomy to focus on the base criminal act, without losing the comparative and analytical understanding held by the facets. Review of the legislation revealed nine common categories of recurring facets (Table 2). We further identified the types of sanctions that applied to each offence we identified, and the aggravating or mitigating circumstances that defined the scope and scale of sanctions that apply for any given offence.

**Table 2.** Key facets of wildlife offences associated with the nature of the offence, offender, victim

<b>Facet</b>	<b>Definition</b>	<b>Dimensions</b>
<b>Offence</b>		
Motivation	Perpetrators’ different potential motives for participating in a particular offence.	Profit or commercial gain Thrill or sport Necessity of obtaining food Tradition & cultural reasons
Location	Geographical delimitations to offences by determining if a particular act has been committed inside or outside a protected area	Inside protected area Outside protected area
Degree of completion	Takes into account whether a particular criminal act has been planned, attempted or completed, and these different degrees of completeness may result in different consequences of the act.	Planned Attempted Completed
<b>Offender</b>		
Nature of the offender	Can accommodate different levels of liability for the same offence based on the fact that the offender may be a physical person, an entity or corporation, or a public employee.	Natural person Legal person Government official
Knowledge and intent	Offender’s offender’s state of mind when committing the offence, given all the circumstances and standards of what is ordinarily considered prudent.	Intentionally Knowingly Recklessness Negligence Gross negligence
Degree of Co-responsibility	Accommodates offences extending to those persons besides the offender who also participate in the offence, such as person inciting to commit the offence, aiding or abetting the offence, or just playing a role as an accomplice.	Incitement Aiding or abetting Accomplice
<b>Victim</b>		
Origin	Accommodates segregation of offences if they apply differently to wildlife harvested within or outside a given jurisdiction (note that this is distinct from whether a species is native and non-native)	Domestic Foreign
Legal status	Whether legal protection is granted to the species, expressed across legislation in various ways (e.g., ‘CITES Appendix I species’, ‘listed species’, ‘rare species’, or ‘species in danger of extinction’.	Protected Not protected
Form	The physical forms in which wildlife can become the object of a given offence (e.g., hunting offences may apply only to live animals or eggs, while taxidermy-related	Live Eggs Dead Meat/Bush meat

offences may apply to trophies, and bushmeat trade may only to meat)	Skins Other parts Products and derivatives Trophies*
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\*Trophies are presented within the facet of “form”, and is also a core part of the taxonomy when it refers to the activities of taxidermy and trophy dealing because these are distinct actions in many countries’ legislation.

### Categories in the taxonomy

Iterative sorting and reduction resulted in a taxonomy with a 4-level hierarchical structure (see ANSI/NISO Z39.19; following Bisogno et al. 2015). Level 1 of the taxonomy was the broadest category, listing illegal actions associated with the harvest, transport, use of wildlife, forgery and obstruction of justice (corruption and organised crime were not included here). Each category was then further divided into mutually-exclusive, sub-categories. In the Level 2 of the taxonomy, acts were sorted (where possible and appropriate) following a common pattern: (1) acts that are prohibited; (2) acts conducted without legal authorization (e.g., permitting, registration); (3) acts conducted in violation of authorized standard or procedures (e.g., quotas, size limits, transportation requirements, humanitarian standards) and (4) acts conducted with wildlife of an illegal origin. In addition, (5) a final catch-all category capturing “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 offences in those sections of the law. Levels 3 and 4 of the taxonomy reflect further specificity of the acts, often informed by facets that define the conditions under which an act is illegal (see Fig. 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 offences

We developed a taxonomy that identifies and organizes all types of wildlife offences present in 8 high-biodiversity countries. It consists of 511 offence types, organized into a 4-level hierarchy, (e.g., Table 1; full taxonomy available as an Excels Sheet in Supplementary Information). Level 1 presents 16 broad categories of wildlife offence, and each subsequent level identifies a more specific offence (Table 1, e.g., Level 2 has 82 categories, Level 3 has 296 categories). Each offence is identified with a numeric code that consists of four numbers that refer to its position in the hierarchy (cf. ISO 2005). For example, in the code 02-03-003-005, the 02 refers to the second item in Level 1 of the taxonomy.

**Table 3.** Extract of the 4-level taxonomy, focused on offences related to the transportation of wildlife (Full taxonomy available as an Excels Sheet in Supplementary Information)

Level 1	Level 2	Level 3	Level 4	Final Code
Offences related to the transportation of wildlife				04-00-000-000
	Transporting wildlife			04-01-000-000
	Transporting wildlife without due authorization			04-02-000-000
		Transporting wildlife without the mandatory business registration		04-02-001-000
		Transporting wildlife without mandatory documentation		04-02-002-000
		Transporting wildlife without shipping		04-02-002-001
		Transporting wildlife without transit documents		04-02-002-002
		Transporting wildlife without a health certificate		04-02-002-003
		Transporting imported wildlife without a CITES permit		04-02-002-004
	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

We found that the 511 types of offences were subject to diverse sanctions; we identified 17 categories of sanctions for wildlife offences, ranging from fines and incarceration to warning letters, license suspension and community serve (Table 4).

**Table 4.** Types of sanction imposed for wildlife offences.

<b>Category</b>	<b>Type of sanction</b>
Economic sanctions	Fines
	Reimbursement of investigation or prosecution costs
Related to the wildlife specimen(s)	Confiscation or seizure of affected wildlife
	Cost of the repatriation of a non-native specimens
	Destruction of the specimens
Limit on rights	Revocation of, and/or ban on future rights, permits and licenses
	Suspension or ban of right to hold a public position
	Suspension or ban of corporate activities
	Loss of corporate custom benefits and incentives
	Loss of corporate right to conduct customs activities
Loss of personal freedom	Criminal imprisonment
	Administrative arrest
	Community service
	Deportation of foreign offenders
Orders to remedy environmental harm	Environmental restoration (e.g., costs of reintroduction)
	Financial compensation/indemnification for harm
Information	Warning letter
	Inscription in the public register of environmental offenders

We also identified 5 categories of common aggravating and mitigating circumstances that informed the scale of those sanctions (Table 5). For example, an illegal act that caused specific types of harm might receive greater sanctions, or an offender's circumstance (e.g., young age) might result in reduced sanctions.



**Table 5.** Types of aggravating and mitigating circumstances that define the scope and scale of sanctions that apply for any given offence.

<b>Category of circumstance</b>	<b>Aggravating and mitigating circumstances</b> (i.e. whether the offence caused or depended on the following)
Type of harm caused by the offence	<ul style="list-style-type: none"> <li>Caused harm to public security</li> <li>Caused harm to public health</li> <li>Caused harm to the broader ecosystem/environmental</li> <li>Caused harm to private property</li> <li>Caused harm to fauna that was irreversible</li> <li>Caused harm to multiple individuals (number of specimens)</li> <li>Caused harm to species that were protected</li> </ul>
Technical characteristics of the offence (e.g., methods, time, place)	<ul style="list-style-type: none"> <li>Used methods of mass destruction</li> <li>Used cruel methods</li> <li>Used illegal methods</li> <li>Used aerial, terrestrial or river transportation</li> <li>Used weapons</li> <li>Used violence</li> <li>Used coercion</li> <li>Used false documents</li> <li>Occurred inside protected areas or other areas where it is prohibited to hunt</li> <li>Occurred inside areas under legal protection</li> <li>Occurred inside wilderness areas</li> <li>Occurred inside an urban area</li> <li>Occurred at night</li> <li>Occurred in times of drought or flood</li> <li>Occurred during closed hunting seasons</li> <li>Occurred on Sundays or public holidays</li> <li>Occurred using fraud or involving breach of trust</li> <li>Took improper advantage of authority</li> <li>Involved corrupt officers</li> <li>Took advantage of national disasters, wars, states of emergency</li> <li>Occurred in breach of the terms of a license</li> <li>If continued crime</li> <li>Was of international nature</li> <li>Involved minors</li> </ul>
Economic characteristics of the offence	<ul style="list-style-type: none"> <li>Depending on the monetary value of the affected wildlife</li> <li>Depending on the scale of the gain, benefit or estimated proceeds from the crime</li> </ul>
Offender's circumstances	<ul style="list-style-type: none"> <li>Involved recidivism (repeat offending)</li> <li>Depending on offender's age</li> <li>Depending on offender's criminal past record</li> <li>Depending on offender's educational level</li> <li>Depending on offender's economic condition</li> <li>Depending on offender's social condition</li> <li>Depending on offender's psychological and psychiatric condition</li> <li>Involved a professional hunter</li> <li>Involved a legal entity</li> <li>Involved a public officer</li> <li>Involved a legal guardian of the wildlife resource</li> <li>Involved an organized group</li> <li>Involved an indigenous person with traditional uses for wildlife</li> </ul>
Offender's degree of intent	<ul style="list-style-type: none"> <li>Demonstrated negligence</li> <li>Demonstrated intent</li> <li>Made the offender profit or was motivated by commercial profit</li> </ul>

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Was done in the interest of a legal entity that was a beneficiary of public funds or tax incentives  
Depending on the offender's behaviour following the crime

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## Discussion

### Applying the taxonomy

The taxonomy can be deployed in two different ways: In a “law-to-taxonomy” approach, a piece of legislation is mapped onto the taxonomy, focusing initially on the illegal act(s) (e.g., Table 5). This can form part of a stock-taking exercise for identifying gaps or inconsistencies within a single country, or to enable international comparisons. Alternatively, in “taxonomy-to-law” approach an offence listed in the taxonomy is selected, and then identified across multiple 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 facets that shape the scope of the offences, and the sanctions associated with different acts and facets.

**Table 5.** “Law-to-taxonomy” analysis of two articles of the Kenya Wildlife Conservation and Management Act

Act Article & Paragraph	Taxonomy item	Taxonomy facet	Example observations
<p>93. <i>Offences relating to invasive species</i></p> <p><i>Any person who—</i> <i>(a) knowingly introduces an invasive species into a wildlife conservation area an invasive species; or</i></p>	<p>Introducing wildlife invasive species into wildlife habitats and ecosystems (01-02-008-000)</p>	<p>Knowledge and Intent: The facet of “knowingly” is a requirement for the act to be a legal offence.</p> <p>Offence Location: Specifically into a wildlife conservation area</p>	<p>Negligence is not a covered</p> <p>Introducing invasive species into sites that are not formally protected is not covered.</p>
<p><i>(b) fails to comply with the measures prescribed by the Cabinet Secretary set out under this Act,</i></p> <p><i>commits an offence</i></p>	<p>Other acts in violation of the law related to wildlife and wildlife habitats conservation (01-99-000-000)</p>	<p>NA</p>	<p>Very broad legal drafting</p>
<p>95. <i>Offences relating to trophies and trophy dealing</i></p> <p><i>Any person who, without a permit or exemption granted under this Act in relation to a species not specified under section 92 -</i></p> <p><i>(a) kills or injures, tortures or molests, or attempts to kill or injure, any wildlife species;</i></p>	<p>Hunting without authorization (02-02-000-000)</p>	<p>Victims’ Legal Status: Offences relate to species that are not protected (protected species are covered by Art. 92)</p>	<p>Drafting language suggests that there is a permitting process that might enable torturing, molesting and injuring wildlife, which is presumably a mistake in the Act.</p>
<p><i>(b) deals in a wildlife trophy;</i></p>	<p>Operating as a wildlife trophy dealer without</p>	<p>NA</p>	

	authorization (06-02-001-000)		
<i>(c) deals in a live wildlife species;</i>	Trading wildlife without authorization (07-02-000-000)	Form: Only applies to live specimens	Unclear how the law deals with dead specimen that are not considered trophies
<i>(e) is in possession of a wildlife trophy</i>  <i>or live wildlife species; or</i>	Possessing wildlife trophies without authorization (09-02-002-000)  Possessing wildlife without authorization 09-02-000-000	NA  Form: Only applies to live specimen	
<i>(e) manufactures an item from a wildlife trophy,</i>  <i>commits an offence and shall be liable on conviction to a fine of not less than one million shillings or a term of imprisonment of not less than twelve months or to both such fine and imprisonment.</i>	Processing items from wildlife trophies without authorization (06-02-003-000)	NA	Employs financial and imprisonment sanctions  Sets minimum sanctions

#### **Example: How do sanctions for hunting protected species differ across 8 countries?**

There are laws regulating the hunting of protected species globally. However, approaches to sanctioning vary widely (Table 4). Understanding this requires not only parsing out laws of a single country (e.g., Table 5), but international comparison (e.g., Table 6). Amidst calls for strengthened legal responses to wildlife crime, a taxonomy-to-law approach revealed differences that could inform debates about what is necessary and appropriate across contexts.

We identified legislation related to the hunting of protected wildlife across 8 countries (Table 6). Each jurisdiction has 2-4 relevant laws that placed a range of sanctions. Most sanctions were fines and imprisonment, although there was significant variation. For example, minimum fines range from \$0 to nearly \$200,000, and maximum imprisonment terms range from 1.5 years to life imprisonment. Comparative analysis also revealed different approaches to sanctions (Table 6). For example, Costa Rica exclusively used imprisonment sanctions, and employed no monetary fines for the hunting protected species (fines only apply to hunting non-protected species). This likely reveals a comparatively strict, highly criminalised 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.

**Table 6.** Sanctions across 8 countries for hunting protected wildlife (offence 02-01-000-000 and facet of “protected species”)

Sanction type		Angola	Brazil	Cambodia	Costa Rica	Indonesia	Kenya	Mexico	Vietnam
Admin. fine <sup>±</sup> (\$ <sup>†</sup> )	Min	900		2,450			49,157	221	22
	Max	1,800		36,750		6,988	196,628	308,722	21,500
Crim. fine <sup>±</sup> (\$ <sup>†</sup> )	Min	22	1,295 per specimen					1,608	2,163
	Max	133	2,591 per specimen					16,080	64,917
Prison (Yrs)	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 Offences, 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

<sup>†</sup> US dollar equivalent June 2019

<sup>±</sup>Admin. fines refers to administrative fines that involve non-criminal law, enforced and implemented by the executive power (e.g., Ministry of Environment) and does not require trial (e.g., fine for expired hunting permit); Crim. fines refers to criminal fines are included in the criminal code, implemented by a judicial power and require a trial and a court sentence.

Comparison further revealed that sanctions were defined by a range of aggravating and mitigating circumstances that vary across countries (Table 7). For example, fines in Mexico were conditional on the offender’s salary, which could potentially increase the equity dimensions and deterrence of sanctions. Equally, they could be manipulated to enable lower sanctions for responsible parties who benefit significantly from environmental crime, or whose salary bears no relation to their actual wealth derived from illicit income. In Brazil, maximum sanctions only applied if the offender’s motivation was for profit, providing need-greed distinctions (cf. Roe 2015) that may also speak to social equity concerns, but also potentially open up opportunities for manipulation. Economic sanctions were also allocated depending on the number of specimen, rather than per illegal act, potentially helping to ensure that the scale of sanctions better reflects the scale of harm and increasing deterrence (see Milner-Gulland and Leader-Williams 1992). In Cambodia, maximum sentencing applied only to cases within a protected area. This is likely problematic because protected biodiversity often exists outside of protected areas (Boakes et al. 2019), and that many seizures of wildlife occur along trade chains outside of protected areas. Cambodia also allowed for payment of fines to replace prison terms, which preferences wealthier perpetrators. Angola set fines based on the market values of wildlife, which conflates market values as a proxy for social, ecological and intrinsic values

of wildlife. Through comparisons with other countries, the strengths, limitations and questions become especially evident.

**Table 7.** Notes on the sanctions that apply for “hunting protected wildlife” (taxonomy offence 02-01-000-000 + “protected” facet), with reference to different aggravating and mitigating circumstances (see Table 9).

Country	Notes on sanctions (conditions underlined)
Angola	<ul style="list-style-type: none"> <li>● Fine equal to the <u>market value</u> of the animal</li> <li>● Minimum and maximum values set for <u>CITES-listed species</u></li> </ul>
Costa Rica	<ul style="list-style-type: none"> <li>● No fines</li> <li>● Imprisonment is only set for hunting protected species. (Fines are only set for illegal hunting of <u>non protected species</u>, which is a different offence in the taxonomy)</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>● No minimum fines or imprisonment are set</li> <li>● Maximum fines and imprisonment only apply <u>if the act was intentional</u></li> </ul>
Mexico	<ul style="list-style-type: none"> <li>● Fines are based on offender’s salary</li> <li>● Scale of fines <u>depends on whether animal is alive or dead</u></li> </ul>
Cambodia	<ul style="list-style-type: none"> <li>● Financial sanctions can be in addition to, or a substitute for imprisonment</li> <li>● Minimum sanctions only apply if the act involves <u>a protected species</u>, and maximum only apply if the act involved <u>a protected species within a protected area</u></li> </ul>
Brazil	<ul style="list-style-type: none"> <li>● Fines are set per specimen</li> <li>● The maximum sanctions only apply if the act was <u>motivated by profit</u>.</li> </ul>
Vietnam	<ul style="list-style-type: none"> <li>● Between minimum and maximum fine limits, there is a detailed design of fine that depends on a permutation that considers <u>species protected status (Group I-B, II-B)</u>, species value, and number of specimens.</li> </ul>
Kenya	<ul style="list-style-type: none"> <li>● Administrative fines and prison time for protected species are set depending on species type. Lower penalty (minimum in the table) is set only for <u>“Category B” species and the higher penalty (maximum in the table) is set only for “Category A” species</u>. This includes mandatory life imprisonment for hunting a “Category A”.</li> </ul>

\* Here we are focused on facets that define the offence, but there are also other factors that define the level of penalty (e.g., value, number of specimen, offender salary).

## Conclusion

Legal taxonomies can serve not only as organisational tools and decision-making tools (Law 2011), but also as instruments for identifying and articulating the approaches and elements that need reform (or revolution). This taxonomy provides a working draft for understanding and comparing wildlife offences globally that, as it is tested across contexts and for diverse uses, will likely require modification (cf. Land et al. 2013)

A number of recent, high-level policy events have called for strengthened conservation laws and enforcement in order to protect imperiled wildlife (e.g., Hanoi 2016; UK 2018; US 2019). These have clashed with concerns over how stricter rules affect livelihoods and rights (e.g., Masse et al. 2020). Our application of this taxonomy illustrates how these debates can gain from engaging the mechanics and nuances of domestic environmental law.

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## References

1. ANSI/NISO Z39.19. 2005. Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies. Baltimore: National Information Standards Organization. URL: <https://www.niso.org/publications/ansiniso-z3919-2005-2010>.
2. Beyleveld, D., Brownsword, R. 1985. The practical difference between natural-law theory and legal positivism. *Oxford Journal of Legal Studies* 5:1–32.
3. Boakes, E.H., Fuller, R.A., McGowan, P.J., 2019. The extirpation of species outside protected areas. *Conservation Letters* 12:e12608.
4. Boratto, R., Gibbs, C. 2019. Advancing interdisciplinary research on illegal wildlife trade using a conservation criminology framework. *European Journal of Criminology*, p.1477370819887512.
5. Boyle, L. 2020, 10 April. The Independent calls for tighter restrictions on wildlife trade and markets. *The Independent*. URL: <https://www.independent.co.uk/environment/wildlife-trade-market-ban-restrictions-china-wuhan-a9459796.html>.
6. Brockington, D., Duffy, R. 2019. The ethics of violent conservation. Blog for the BioSec Project, University of Sheffield. URL: <https://biosecproject.org/2019/11/25/comment-the-ethics-of-violent-conservation/>.
7. Challender, D. W., Harrop, S. R., & MacMillan, D. C. (2015). Towards informed and multi-faceted wildlife trade interventions. *Global Ecology and Conservation*, 3, 129-148.
8. (CCF) Cheetah Conservation Fund. 2019. Cheetah Conservation Fund Wins Grant From UK'S Illegal Wildlife Trade To Address Cheetah Trafficking in Horn of Africa/Gulf of Aden Region. URL: <https://cheetah.org/press-releases/cheetah-conservation-fund-wins-grant-from-uks-illegal-wildlife-trade-to-address-cheetah-trafficking-in-horn-of-africa-gulf-of-aden-region/>.
9. (CITES and UNEP) 2015, 05 May. CITES and UNEP support strengthening of wildlife laws. Convention on International trade of Endangered species of Fauna and Flora, United Nations Environmental Programme. URL: [https://www.cites.org/eng/CITES\\_UNEP\\_support\\_strengthening\\_of\\_wildlife\\_laws](https://www.cites.org/eng/CITES_UNEP_support_strengthening_of_wildlife_laws).
10. Cleaver, F. 2017. Development through bricolage: rethinking institutions for natural resource management. Routledge, U.K.
11. Chng, S.C., 2015. In the market for extinction: an inventory of Jakarta's bird markets. Traffic. URL: [https://www.traffic.org/site/assets/files/2466/market\\_for\\_extinction\\_jakarta.pdf](https://www.traffic.org/site/assets/files/2466/market_for_extinction_jakarta.pdf)
12. Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S., Báldi, A., Bartuska, A., 2015. The IPBES Conceptual Framework—connecting nature and people. *Current Opinion in Environmental Sustainability* 14:1-16.
13. Duffy, R., Massé, F., Smidt, E., Marijnen, E., Büscher, B., Verweijen, J., Ramutsindela, M., Simlai, T., Joanny, L. and Lunstrum, E. 2019. Why we must question the militarisation of conservation. *Biological conservation* 232:66-73.
14. Friedman, L. 2019, 12 Aug. U.S. Significantly Weakens Endangered Species Act. The New York Times. URL: <https://www.nytimes.com/2019/08/12/climate/endangered-species-act-changes.html>.
15. Garmestani, A., Ruhl, J.B., Chaffin, B.C., Craig, R.K., van Rijswick, H.F., Angeler, D.G., Folke, C., Gunderson, L., Twidwell, D. and Allen, C.R., 2019. Untapped capacity for resilience in environmental law. *Proceedings of the National Academy of Sciences*, 116(40), pp.19899-19904.
16. Gokkon, B. 2018, 06 April. Indonesian conservation bill is weak on wildlife crime, critics say. Mongabay. URL: <https://indonesia.wcs.org/Initiatives/Wildlife-Policy.aspx>
17. Harring, N., Jagers, S.C., Matti, S., 2019. The significance of political culture, economic context and instrument type for climate policy support: a cross-national study. *Climate Policy* 19:636-650.
18. ISO 25964-1:2011. Information and documentation - Thesauri and interoperability with other vocabulary. Part 1: Thesauri for information retrieval. 2017 Version. URL: <https://www.iso.org/standard/53657.html>.
19. (IUCN) International Union for Conservation of Nature. 2020. Global Species Programme. URL: <https://www.iucn.org/theme/species/about/iucn-global-species-programme>

20. Keane, A., Jones, J.P., Edwards-Jones, G. and Milner-Gulland, E.J., 2008. The sleeping policeman: understanding issues of enforcement and compliance in conservation. *Animal Conservation* 11:75-82.
21. Kurland, J., Pires, S.F., McFann, S.C., Moreto, W.D. 2017. Wildlife crime: A conceptual integration, literature review, and methodological critique. *Crime Science* 6:4.
22. Land, L., Smith, S. Pang, V., 2013. June. Building a Taxonomy for Cybercrimes. Proceedings of the Asia Pacific Conference on Information Systems (p. 109). URL: <http://aisel.aisnet.org/pacis2013/109>.
23. Law, S., 2011. Epistemological considerations in private law: Exploring taxonomical structures in the Common Law, Civil Law and beyond. *Maastricht Journal of European and Comparative Law* 18:454-478.
24. Massé, F., Dickinson, H., Margulies, J., Joanny, L., Lappe-Osthege, T., Duffy, R., 2020. Conservation and crime convergence? Situating the 2018 London Illegal Wildlife Trade Conference. *Journal of Political Ecology* 27:23-42.
25. Mattei, U., 1997. Three patterns of law: taxonomy and change in the world's legal systems. *The American Journal of Comparative Law* 45:5-44.
26. Milner-Gulland, E. J., Leader-Williams, N. 1992. A model of incentives for the illegal exploitation of black rhinos and elephants: Poaching pays in Luangwa Valley, Zambia. *Journal of Applied Ecology* 29:388–401.
27. Ostrom, E. 1990. Governing the commons: the evolution of institutions for collective action. Cambridge: Cambridge University Press.
28. Pennings, G., 2004. Legal harmonization and reproductive tourism in Europe. *Human Reproduction* 19:2689-2694.
29. Phelps, J., Shepherd, C. R., Reeve, R., Niissalo, M.A. Webb, E.L. 2014. No easy alternatives to conservation enforcement: Response to Challender and Macmillan. *Conservation Letters* 7:495–496.
30. Roe, D., 2015. Conservation, crime and communities: case studies of efforts to engage local. URL: [https://www.researchgate.net/publication/276267349\\_Conservation\\_Crime\\_Communities\\_Case\\_studies\\_of\\_efforts\\_to\\_engage\\_local\\_communities\\_in\\_tackling\\_illegal\\_wildlife\\_trade](https://www.researchgate.net/publication/276267349_Conservation_Crime_Communities_Case_studies_of_efforts_to_engage_local_communities_in_tackling_illegal_wildlife_trade).
31. Sherwin, E., 2009. Legal taxonomy. *Legal Theory* 15:25-54.
32. Spring, J. 2020, 22 May. Brazil minister calls for environmental deregulation while public distracted by COVID. URL: <https://uk.reuters.com/article/us-brazil-politics-environment/brazilminister-calls-for-environmental-deregulation-while-public-distracted-by-covid-idUKKBN22Y30Y>
33. Thomson S.A., Pyle R.L., Ahyong S.T., Alonso-Zarazaga M., Ammirati J., Araya J.F., et al. 2018 Taxonomy based on science is necessary for global conservation. *PLoS Biology* 16(3): e2005075
34. TRAFFIC, the wildlife monitoring network. 2016. Legal loopholes leave non-native wildlife unprotected in Thailand. URL: <https://www.traffic.org/news/legal-loopholes-leave-non-native-wildlife-unprotected-in-thailand/>
35. WCO (World Customs Organization). 2020. What is the Harmonized System (HS)? URL:<http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx>
36. (US) United States Department of State. 2019. END Wildlife Trafficking Report 2019. Bureau of Oceans and International Environmental and Scientific Affairs. URL: <https://www.state.gov/2019-end-wildlife-trafficking-report/>
37. Hanoi statement on illegal wildlife trade 17-18 Nov. 2016, Hanoi, Vietnam. URL: <http://iwthanoi.vn/wp-content/uploads/2019/09/hanoi-statement-on-illegal-wildlife-trade.pdf>
38. (UK) UK Government. 2019. Illegal Wildlife Trade Conference: London. 11-12 Oct., 2018, London. URL: <https://www.gov.uk/government/topical-events/london-conference-on-the-illegal-wildlife-trade-2018>
39. Van Hoecke, M., Warrington, M., 1998. Legal cultures, legal paradigms and legal doctrine: towards a new model for comparative law. *International & Comparative Law Quarterly* 47:495-536.

## Supplementary Information

**Table S1.** Types of legislation typically found in national jurisdictions as related to wildlife management and enforcement.

Categories	Types of legislation
Domestic trade related legislation	Constitutions
	Overarching environmental protection
	Endangered species
	Forestry
	CITES implementation legislation
	Dedicated wildlife trade legislation
	Wildlife management legislation
	Hunting/fishing legislation
	Wetlands legislation (e.g., Ramsar Convention implementation)
	World Heritage legislation (specifically the natural heritage elements)
	Indigenous rights legislation
Manufacturing legislation (e.g., taxidermy, furs, pelt tanning)	
Media and e-commerce legislation	
Foreign traderelated legislation	Free trade and/or transportation agreements
	Bilateral agreements on mutual administrative assistance in customs matters
	Import/export legislation
	Quarantine legislation
	Port authority legislation
	Customs legislation
	Maritime ports/airports legislation
Transportation authorities legislation	
Enforcement, judiciary and prosecution related legislation	Bi/multilateral agreements on judicial assistance or enforcement cooperation
	Criminal law
	Criminal procedure codes
	Administrative law
	Environmental liability legislation
	Customs legislation
	Police/customs/wildlife or CITES Management Authorities legislation
	Environmental prosecutors and courts mandates
	Organized crime legislation
	Anti-Money laundering legislation
	Anti-terrorism financing legislation
	Anti-corruption legislation
	Civil defense and military legislation
Firearms legislation	
Transportation legislation (e.g., railway transport, inspection rules)	
Wildlife uses related legislation	Zoos/sanctuaries legislation
	Captive breeding/farming for commercial purposes legislation
	Personal or household effects/tourist souvenirs legislation
	Traditional medicine legislation
	Art and culture legislation
	Pharmaceutical legislation
Commercial law	



**Table S2.** List of sources and laws by country

<b>Country</b>	<b>Sources</b>	<b>Laws included in analysis</b>
<b>Angola</b>	Coordination Cabinet for the Urban Development of the Cities of Kilamba, Camama and Cacuarco (GCKCC) - <a href="http://www.gckcc.ao">http://www.gckcc.ao</a> LegisPalop - <a href="https://www.legis-palop.org">https://www.legis-palop.org</a> LEXLINK - <a href="https://www.lexlink.eu/legislacao/angola">https://www.lexlink.eu/legislacao/angola</a> Private National Portal - <a href="https://www.info-angola.com">https://www.info-angola.com</a> South African Legal Information Institute - <a href="http://www.saflii.org/content/angola-index">http://www.saflii.org/content/angola-index</a>	CITES Regulation, 2013 Criminal Code (Bill), 2006 Customs Code, 2006 Environmental Law, 1988 Forest and Wild Fauna Basic Law, 2017 Law Criminalizing Infractions Related to Money Laundering, 2014 Prohibition of Trade, Transportation, Possession and Exhibition of Protected Species, 2016 Protected Species Hunting Ban, 2015
<b>Brazil</b>	Legal Portal of Presidential Office - <a href="https://legislacao.planalto.gov.br">https://legislacao.planalto.gov.br</a>	Anti-Money Laundering Law, 1988-2017 Criminal Code, 1940-2018 Decree on Administrative Infractions and Sanctions to Environmental Offences, 2008-2017 Fauna Protection Law, 1967-2000 Law on Criminal and Administrative Sanctions on Activities Harming the Environment, 1988-2014 Law on the National System for Conservation Units, 2000 Law on the Use of Animals for Scientific Research, 2008 National Environmental Policy, 1981-2015 Organized Criminal Law, 2013-2016 Protected Areas Law, 1981-1989 Protected Areas Regulation 1990-2009 Regulation on Banned Activities within Protected Areas, 1989 Regulation on the Inspection of Controlled Items, 2018
<b>Cambodia</b>	Council for Development of Cambodia - <a href="http://www.cambodiainvestment.gov.kh/why-invest-in-cambodia/laws-regulation.html">http://www.cambodiainvestment.gov.kh/why-invest-in-cambodia/laws-regulation.html</a> Central Department of Customs and Excise of Cambodia - <a href="http://www.customs.gov.kh/laws-and-regulations/">http://www.customs.gov.kh/laws-and-regulations/</a> Cambodian Business Corner <a href="https://cambodianbusinesscorner.wordpress.com/2013/01/05/civil-code-2007/">https://cambodianbusinesscorner.wordpress.com/2013/01/05/civil-code-2007/</a>	Anti-Corruption Law, 2010 Criminal Code, 2009 Forestry Law, 2002 Protected Areas Law, 2008 Wildlife Protection Declaration, 1996

	<p>Open Development Cambodia -  <a href="https://opendevelopmentcambodia.net/database/laws-policies-and-agreements/">https://opendevelopmentcambodia.net/database/laws-policies-and-agreements/</a>  SK&amp;P Cambodia Law Group -  <a href="http://www.skpcambodia.com/laws-and-regulations-of-kingdom-of-cambodia.html">http://www.skpcambodia.com/laws-and-regulations-of-kingdom-of-cambodia.html</a>  WIPO Lex -  <a href="https://www.wipo.int/wipolex/en/">https://www.wipo.int/wipolex/en/</a></p>	
<b>Costa Rica</b>	<p>National Legal Information System - <a href="http://www.pgrweb.go.cr">www.pgrweb.go.cr</a></p>	<p>Animal Welfare Law, 1994-2017  Anti-Corruption Law, 2004-2016  Criminal Code, 1970-2018  Customs Law, 1995-2015  Firearms and Explosives Law, 1995-2011  National Park Law, 1977  Organized Crime Law, 2009  Wildlife Conservation Law, 1992-2017  Wildlife Conservation Regulation, 2017</p>
<b>Indonesia</b>	<p>Information System of the Directorate General of Laws and Regulations -  <a href="http://ditjenpp.kemerkumham.go.id/">http://ditjenpp.kemerkumham.go.id/</a>  International Labour Organization -  <a href="https://www.ilo.org/dyn/natlex/">https://www.ilo.org/dyn/natlex/</a></p>	<p>Animal, Fish, and Plant Quarantine Law, 1992  Anti-Corruption Law, 1999  Anti-Money Laundering Law, 2010  Conservation of Living Resources and their Ecosystems Act, 1990  Criminal Code, 1999  Customs Code (2006 Amendment)  Customs Code, 1995  Electronic Information and Transaction Law, 2008  Forestry Affairs Act, 1999  Game Hunting Affairs Government Regulation, 1994  Management of the Living Environment Act, 1982  Trade Law, 2014  Utilization of Plants and Wildlife Regulation, 1999</p>
<b>Kenya</b>	<p>National Council for Law Reporting -  <a href="http://kenyalaw.org/lex//index.xql">http://kenyalaw.org/lex//index.xql</a></p>	<p>Animal Diseases Act, 1965-2012  Anti-Corruption and Economic Crimes Act, 2003-2016  Bribery Act, 2016  Computer Misuse and Cybercrimes Act, 2018  Customs and Excise Act, 1978-2013  Firearms Act, 1953-2015  Penal Code, 1930-2014  Prevention of Cruelty to Animals (Transport of Animals) Regulations, 1984  Prevention of Cruelty to Animals Act, 1962-2012  Prevention of Organized Crimes Act, 2010  Proceeds of Crime and Anti-Money Laundering Act, 2009-2017</p>

		<p>Proceeds of Crime and Anti-Money Laundering Regulation, 2013</p> <p>Protected Areas Act, 1949-1964</p> <p>Tourism Act, 2011-2014</p> <p>Trade Description Act, 1977-2003</p> <p>Wildlife Conservation and Management Act, 2013</p>
<b>Mexico</b>	<p>Congress of the Union - <a href="http://www.diputados.gob.mx/LeyesBiblio/index.htm">www.diputados.gob.mx/LeyesBiblio/index.htm</a></p>	<p>Administrative Responsibilities Law, 2016</p> <p>Animal Health Law, 2007-2018</p> <p>Animal Slaughtering Norm, 2014</p> <p>Criminal Code, 1931-2018</p> <p>Customs Law, 1995-2018</p> <p>Environmental Law, 1988-2018</p> <p>Forestry Regulation, 2005-2014</p> <p>Humanitarian Transportation Norm, 1995</p> <p>Organized Crime Law, 1996-2017</p> <p>Protected Areas Regulation, 2000-2014</p> <p>Weapons and Explosive Law, 1972-2015</p> <p>Wildlife Law, 2000-2018</p>
<b>Vietnam</b>	<p>Ministry of Justice Legal Database - <a href="http://vbpl.vn/TW/Pages/vbpqen.aspx">http://vbpl.vn/TW/Pages/vbpqen.aspx</a></p> <p>Laws of Law Library - <a href="https://thuvienphapluat.vn/en/">https://thuvienphapluat.vn/en/</a></p>	<p>Anti-Corruption Law, 2015</p> <p>Anti-Money Laundering Law, 2012</p> <p>Biodiversity Law, 2008</p> <p>Circular on Common Wildlife Management, 2012</p> <p>Circular on Criminal Code Guidelines (Forest Violations), 2007</p> <p>CITES Implementing Decree, 2006</p> <p>Criminal Code, 2015-2017</p> <p>Environmental Administrative Violations Decree, 2013</p> <p>Decree on Goods Banned From Business, 2006</p> <p>Endangered Species Decree, 2013</p> <p>Environmental Protection Law, 2014</p> <p>Exploitation of Endangered Species Decree, 2006</p> <p>Forest Administrative Penalties Decree, 2013-2017</p> <p>Forestry Law 2017</p>
<b>Additional resources</b>	<p>Boratto, R., Gibbs, C. 2017. Wildlife Crime. <i>Oxford Research Encyclopedia of Criminology and Criminal Justice</i></p> <p>Crow, M.S., Shelley, T.O., Stretesky, P.B. 2013. Camouflage-Collar Crime: An Examination of Wildlife Crime and Characteristics of Offenders in Florida. <i>Deviant Behavior</i> 34:8, 635-652</p> <p>Gottschalk, P. 2010. Categories of Financial Crime. <i>Journal of Financial Crime</i>. 17:14, 441-458</p> <p>Nurse, A. 2011. Policing wildlife: perspectives on criminality in wildlife crime. <i>Papers from the British Criminology Conference</i>. 11 . pp. 38-53. ISSN 1759-0043</p> <p>UNODC (United Nations Office on Drugs and Crime). 2012. Wildlife and Forest Crime Analytic Toolkit. URL: <a href="https://www.unodc.org/documents/Wildlife/Toolkit_e.pdf">https://www.unodc.org/documents/Wildlife/Toolkit_e.pdf</a></p> <p>UNODC (United Nations Office on Drugs and Crime). 2015. International Classification of Crime for Statistical Purposes.</p>	

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URL: [https://www.unodc.org/documents/data-and-analysis/statistics/crime/ICCS/ICCS\\_English\\_2016\\_web.pdf](https://www.unodc.org/documents/data-and-analysis/statistics/crime/ICCS/ICCS_English_2016_web.pdf)

UNODC (United Nations Office on Drugs and Crime). 2018. Guide on Drafting Legislation to Combat Wildlife Crime

URL: [https://sherloc.unodc.org/res/cld/guide-on-drafting-legislation-to-combat-wildlife-crime\\_html/Wildlife\\_Crime\\_ebook.pdf](https://sherloc.unodc.org/res/cld/guide-on-drafting-legislation-to-combat-wildlife-crime_html/Wildlife_Crime_ebook.pdf)

Viollaz, J., Graham, J., Lantsman, L. 2018. Using script analysis to understand the financial crimes involved in wildlife trafficking. *Crime, Law and Social Change*.

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**Table S3.** Protocols for addressing common challenges when identifying candidate terms in legislation

Protocol		Example	
Step	Explanation	Offence as articulated in legislation	Candidate term(s) extracted for the dataset
<b>Focusing on the unlawful act.</b>	<p>Sentence-like structures in law were converted to candidate terms, starting with the gerund form of the verb to ensure that the focus remained on a singularly identifiable act</p>	<i>Those who enter a protected area carrying a hunting gun</i>	Carrying a gun inside a protected area
<b>Additional offence elements.</b>	<p>Candidate terms did not include legal elements defining exceptions, and aggravating or mitigating circumstances for an offence.</p> <p>These elements provide relevant limitations to an offence, however, ventured beyond the scope of this core wildlife offence taxonomy..</p>	<p>Indonesia’s ‘Conservation of Living Resources and the Ecosystems Act, No. 5 of 1990’:</p> <p><i>Article 21(2)(a): Any and all persons are prohibited to catch, injure, kill, keep, possess, care for, transport, and trade in a protected animal in live condition.</i></p> <p><i>Exception:</i></p> <p><i>Article 22(1): Any exception from the prohibition pertaining to Article 21 can only be permitted for purposes of research, science, and/or safeguarding those plants or animals.</i></p> <p><i>Mitigating:</i></p> <p><i>Article 22(3): An exception to the prohibition to catch, to injure, or to kill a protected animal can only be permitted in case the animal endangers human life.</i></p>	<p>Offence Exemption: if is for scientific or research purposes or if to safeguard animals</p> <p>Offence Mitigating circumstance: in the case the animal endangers human life,</p>
<b>Repetition of offences.</b>	When offences were repeated within legislation, they were recorded in the dataset only once per piece of legislation, in order to inform the selection of preferred (versus non-preferred/synonym) terms.		
<b>Aggregation of illegal acts.</b>	When a piece of legislation listed several acts into one provision, these were each treated as a separate candidate term	<p>Indonesia’s ‘Conservation of Living Resources and the Ecosystems Act, No. 5 of 1990’:</p> <p><i>Article 21(2)(a): Any and all persons are prohibited to catch, injure, kill, keep, possess, care for, transport, and trade in a protected animal in live condition.</i></p>	<p>Catching a live protected animal</p> <p>Injuring a live protected animal</p> <p>Killing a live protected animal</p> <p>Keeping a live protected animal</p> <p>Possessing a live protected animal</p>

			<p>Caring for a live protected animal</p> <p>Transporting a live protected animals</p> <p>Trading a live protected animal</p>
<p><b>Elimination of extraneous elements.</b></p>	<p>Specific references to a country's name or title were replaced with a generic phrase.</p>	<p>Canada's 'Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act, 1992':</p> <p><i>Article 6(1): No person shall import into Canada any animal or plant that was taken, or any animal or plant, or any part or derivative of an animal or plant, that was possessed, distributed or transported in contravention of any law of any foreign state.</i></p>	<p>Importing any animal possessed, distributed or transported in contravention of any foreign state</p>
		<p>... in violation of the Hunting Law provisions</p>	<p>... in violation of the law</p>
<p><b>Handling cross-references.</b></p>	<p>Cross-references are instances where a provision in legislation does not state the full basis for the offence, but instead references some other specific provision in the legislation. In these instances, candidate terms recorded the referenced article.</p>	<p>Indonesia's 'Forestry Affairs Act, No. 41 of 1999':</p> <p><i>Article 78(7): Whoever deliberately violates the provision as meant in Article 50 sub section (3) letter h will be threatened with the punishment of a maximum imprisonment of 5 (five) years and a maximum fine of Rp 10,000,000,000.00 (ten billion rupiah).</i></p> <p><i>Articles 50(3)(h): Everyone is prohibited to transport, control or own forest products not covered by a certificate on the legality of the forest products</i></p>	<p>Transporting forest products not covered by a certificate on the legality of the forest products</p> <p>Controlling forest products not covered by a certificate on the legality of the forest products</p> <p>Owning forest products not covered by a certificate on the legality of the forest products</p>
<p><b>Handling linked references.</b></p>	<p>When provisions in a piece of legislation are linked and, in combination, constitute an offence, the candidate term was generated by combining the linked provisions.</p>	<p>Mexico's 'Federal Animal Health Law, 2007':</p> <p><i>Article 167 (XX): Violations of the provisions of this Law and other provisions arising therefrom will be sanctioned administratively by the Secretariat, without prejudice to the corresponding penalties when they constitute crimes. These are administrative infractions:</i></p>	<p>Transportation of live animals or animal products involving zoo sanitary or sanitary risk not following legal requirements</p>

	<p><i>Failure to comply with the provisions relating to article 70 of this Law</i></p> <p><i>Article 70: The Secretariat shall determine, through animal health provisions, the characteristics, requirements or specifications that must be met by vehicles and the transportation of live animals, goods of animal origin and products for animal use or consumption, when they involve a animal health risk or, where appropriate, a risk of contamination of goods of animal origin.</i></p>	
<p><b>Recording catch-all offences.</b></p> <p>In situations where the offence section of a piece of legislation contained a general offence penalizing any violation of provisions in that law, the candidate term(s) were determined as either:</p> <ul style="list-style-type: none"> <li>- If the law contained a list of specifically prohibited acts, these were converted to candidate terms per the rest of the applied protocol steps.</li> <li>- If no such specific list existed, the candidate term used the phrase “breach/violation of the rules of...”</li> </ul>	<p>Mexico’s ‘Norm NOM-051-ZOO-1995 on the Humanitarian Treatment of Wildlife Transportation’:</p> <p><i>Article 8: Failure to comply with the provisions contained in this Norm will be sanctioned in accordance with the provisions of the Federal Animal Health Law and the Federal Law on Metrology and Standardization.</i></p>	<p>Violation of the rules of humanitarian treatment during transportation of wildlife.</p>

**Table S4.** List of candidate terms and the frequency with which they appeared in the dataset. Bold indicates selected term used in the taxonomy, followed by synonyms (not in bold). “-“ indicates that term was from the Thesaurus.

<b>Term</b>	<b>Frequency</b>	<b>Term</b>	<b>Frequency</b>
<b>Ammunition</b>	27	<b>Wildlife</b>	236
Cartridges	4	Species	174
Gunpower	3	Wildlife Species	83
Munition	-	Fauna	82
Bullets	-	Animals	76
<b>Breeding</b>	60	Wild Animals	69
Nurture/Nurturing	2	Forest Animals	29
Grown/Growing	1	Game	7
Farm/Farming	1	Wild Species	7
Rear/Rearing	1	Fauna Species	5
Fosterage/Fostering	-	Common Species	5
Multiplication/Multiplying	-	Biota Species	1
Procreation/Procreating	-	Game Species	1
Propagation/Propagating	-	Wildlife Animals	1
Upbring/Upbringing	-	<b>Wildlife Management Site</b>	12
<b>Conceal/Concealing</b>	24	Wildlife Refuge	3
Hide/Hiding/Hidden	6	Wildlife Reserve	2
Mask/Masking	-	Game Reserve	2
<b>Protected</b>	136	<b>Use/Using</b>	27
Endangered	86	Consumption/Consuming	5
Rare	70	Enjoyment/Enjoying	-
Threatened	37	Spend/Spending	-
Precious	19	<b>Weapon</b>	45
Listed	14	Firearm	39
Prohibited	12	Arm	2
CITES Listed	6	Gun	1
Controlled	1	<b>Transportation/Transporting</b>	83
Flagship	1	Carriage/Carrying	27
<b>Exotic (Wildlife)</b>	14	Transfer/Transferring	11
Alien	4	Transit/Transiting	3
Non-native	1	Shipment/Shipping	3
Foreign	-	Deliver/Delivering	2
<b>Export/Exporting</b>	73	Mobilization/Mobilizing	2
Removal/Removing	5	Convey/Conveying	-



Selling abroad	-	Freightage	-
Market abroad	-	Movement/Moving	-
Market overseas	-	<b>Storage/Storing</b>	11
Send abroad	-	Deposit/Depositing	5
Shipping out	-	Stock/Stocking	5
<b>Foreign Commerce</b>	14	Have in custody	-
Foreign Trade	5	Slack	-
International Commercial Transaction	4	Pile	-
International Trade	3	Collect	-
<b>Harass/Harassing</b>	21	<b>Trade/Trading</b>	79
Exhaust/Exhausting	2	Commercial Exploitation	17
Tease/Teasing	-	Traffic/Trafficking	12
Torment/Tormenting	-	Deal/Dealing	7
Interfere/Interfering	-	Country Commerce	5
Disturb/Disturbing	-	Exchange/Exchanging	4
Fatigue/Fatiguing	-	Commercialization	3
Annoy/Annoying	-	Commercial Transaction	3
<b>Hunt/Hunting</b>	152	Commercial Trade	1
Take/Taking	46	<b>Sale/Selling</b>	26
Collect/Collecting	26	Offer/Offering for Sale	3
Kill/Killing	25	Transfer/Transferring	3
Capture/Capturing	22	Market/Marketing	3
Trap/Trapping	13	Peddle/Peddling	-
Catch/Catching	12	Put on Sale	-
Slaughter/Slaughtering	6	<b>Purchase/Purchasing</b>	14
Gather/Gathering	3	Acquisition/Acquiring	13
Remove/Removing	3	Receival/Receiving	6
Eliminate/Eliminating	2	Procurement/Procuring	3
Shoot/Shooting	1	Obtain/Obtaining	3
Wound/Wounding	1	Buy/Buying	1
Nets/Netting	-	Attainment/Attain	-
Bait/Baiting	-	Bargain for	-
Poison/Poisoning	-	Barter for	-
Lure/Luring	-	Contract for	-
<b>Import/Importing</b>	103	Pay for	-
Introduction/Introducing to country	37	Shop for	-

Bring into country	1	<b>Protected Area</b>	36
Bringing in	-	Conservation Area	20
Shipping in	-	National Park	17
Sourcing from abroad	-	National Reserve	6
Bringing from abroad	-	Protected Zone	2
Buying from abroad	-	Protected Ecosystem	2
<b>Native (Wildlife)</b>	25	Biological Reserve	1
Endemic	6	Nature Reserve	1
Indigenous	-	<b>Process/Processing</b>	12
<b>Performance/Performing</b>	12	Transformation/Transforming	5
Exhibition/Exhibiting	4	Manufacture/Manufacturing	3
Demonstration/Demonstrating	2	Fabricate/Fabricating	-
Show/Showing	2	Prepare/Preparing	-
Display/Displaying	1	Produce/Producing	-
Showcase/Showcasing	-	Make/Making	-
<b>Possession/Possessing</b>	83		
Cage/Caging	2		
Hold/Holding	2		
Impark/Imparking	1		
Have/Having	-		
Keep/Keeping	-		
Maintain/Maintaining	-		
Own/Owning	-		
Retain/Retaining			