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Wildlife crime: causes, consequences and countermeasures: A review

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Abstract

Wildlife crime, encompassing illegal activities such as poaching, trafficking and habitat destruction, poses a critical threat to global biodiversity and ecological stability. This comprehensive review paper delves into the multifaceted dimensions of wildlife crime, exploring its causes, consequences and the various strategies employed to combat it. Drawing from an extensive body of literature, this paper examines ecological, economic, social and ethical impacts of wildlife crime. It analyzes the role of organized crime networks, the challenges of law enforcement and prosecution and the effectiveness of international conservation initiatives. Furthermore, this review highlights the critical importance of public awareness and community engagement in addressing wildlife crime. By synthesizing diverse perspectives and research findings, this paper offers a holistic understanding of the issue and underscores the urgency of concerted global efforts to protect our planet's invaluable biodiversity from the menace of wildlife crime.

Keywords: Wildlife crime; Illegal wildlife trade; Poachernomics; Wildlife

1. Introduction

Uncontrolled human activities like natural habitat destruction and covert poaching activities is threatening the ecological balance (Rana & Kumar, 2023). Wildlife crime is defined as an illegitimate exploitation of natural resources (Carter et al., 2017; Gibbs et al., 2010; Rana & Kumar, 2023). It includes and is not limited to: poaching, illegal trade in wildlife, unreported fishing, destruction of wetlands and trade of illegal and unregulated products of the wilderness. Illegal wildlife trade (IWT) are called green or environmental crimes. It is the obtaining, capturing, poaching, smuggling, importing, exporting, processing, possessing, collecting and consumption of wildlife products and its derivatives (South & Wyatt, 2011). Although general definitions of wildlife crime exist, illegal wildlife trade remains undefined and there is no unanimously agreed upon definition, hence any effort to describe it can be considered incomplete (Paoli, n.d.; Paoli & Vander Beken, 2013). It is highly ambiguous in nature, hence its regulations are contested. For example, the use of wildlife products is deeply rooted in Asian cultural heritage, it is culturally appropriate in this context and possibly illegal or criminal in the west (Akella & Allan, 2012; White, 2018). The demand for wildlife products is considerably influences by culture and depends on different consumer groups. It is considered to be a victimless and low-risk activity.

Wildlife trafficking has become more structured and crime against wildlife is considered to be the 4th largest in the list of organized crimes around the globe (Dagras, n.d.). Low risk law enforcement priority, low sentences, affordability of fines and small chance of getting caught or receiving punishment are the attractive trigger points for such statistics (Wyatt et al., 2020). IUCN states that Latin America, Africa and Asia are the regions with highest prevalence of wildlife crime, supporting which a 2017 report revealed spike in wildlife occurrences by 790% (Dagras, n.d.; Singh Rawat Assistant Professor, 2022). Wildlife trafficking in the internet age has changed the environment in which crime operates. It has given way for transit crimes and ensured rapid and secure communication making it a 6-10 billion dollar black

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market per year (Lavorgna, 2014b). UNODC agency with the support from ICCWC have made available seizure database "WORLD WISE" which currently contains 180,000 seizures from 149 different countries as per 2020 (United Nations Office on Drugs and Crime, n.d.). IWT estimates are often subjected to biases that diffuse from highly developed countries with efficient enforcement and better reporting (Underwood et al., 2013). Underreporting is common among species that are easy to conceal or those that are on low priority in the customs or law enforcement agencies (Symes et al., 2018).

The degradation of agriculture due to industrialization has threatened the population of wild animals, making it more valuable in the market. More scare the animal, higher the price or value in the market (Courchamp et al., 2006; Kalof, 2007).

Transnational organizational crime in the illegal wildlife trade has three central characteristics: (i) continuity of operations (ii) practice of corruption (iii) tendency towards violence that is supported by a rational reasoning (Hagan, 1983).

There is a five-dimensional value for wildlife products. Firstly *functional* value, where the indigenous population use them to protect against harsh weather; for work and warfare and as a source of food, to fulfil everyday purpose (Baumgartner, 2010; Sheth et al., 1991). Secondly *social* value, for entertainment or emotional aspects like in circus or as pets in homes. Thirdly *symbolic* value, it is considered as a symbol of status, power and control (D. P. van Uhm, 2018; D. P. Van Uhm & Moreto, 2018). Live animals or items containing parts of exotic animals become attractive objects of trade or possession especially for royals and elites because of their economic affordability (Pluskowski, 2004). The symbolic value can be understood parallelly with *experiential* value of the wildlife. It serves to fulfil the curiosity and hedonistic pleasure while providing novelty (Holbrook & Hirschman, n.d.). Finally *spiritual* value, where people believe that possession of certain wildlife products in the form of ornaments and accessories could bring luck and fortune in life or business. It is considered sacred (Park & Baker, 2007; Richins, 2016; Skousgaard, 2006).

UNODC classified IWT into five sectors: exotic pets, traditional medicine, jewelry, accessories, wild food and decoration (Mozer & Prost, 2023; Ortega-Baes et al., 2010). Exotic pet is the largest sector of the IWT, majorly involving birds and reptiles, lesser in mammals (Bush et al., 2014). Traditional medicine is often underreported and undocumented. WHO estimates that traditional medicine involving illegally traded wildlife products constitute one-fourth of the total modern medicines (Margulies et al., 2019; Phelps et al., 2016).

Ted Poe's narrative in 2014 about the illusion of complicity between terrorists and wildlife traffickers has been quite controversial. The US government also showed an inclination towards this probe. There are two factors that support this narrative: (i) evidence of links between IWT and transnational organized crime and corruption (Poe, 2014) (ii) growing alarm over involvement of non-state actors (Humphreys & Smith, 2011). Most common groups being associated with IWT, especially ivory trade are Sudanese Janjaweed, Joseph Kony's Lord Resistance Army (LRA) and Al-Shabaab (Maguire & Haenlein, n.d.).

Trade has conventionally been done in physical markets, although still existent there is a paradigm shift to social media and virtual commercial platforms (Davies, 2014; Feddema et al., 2021; Harrison et al., 2016). This rise in the popularity of online trading is due to easy access, limitless, borderless and unregulated nature of the crime (Kulkarni & Di Minin, 2021; Xu et al., 2016). Online trade is difficult to police, but the significant trend is observed where consumers are willing to pay more for rare or specific species in demand (Hall et al., 2008; Sajeva et al., 2013; Slone et al., 1997).

IWT has majority share in contributing to the decline in the biodiversity because the human footprint is rapidly increasing and hence the subsequent increase in the demand for world's natural resources (Maxwell et al., 2016).

2. Methodology

This review paper is primarily based on the data collected from published articles from scientific databases like Science Direct, PubMed Central, ResearchGate, etc using search engines like Google Scholar. Internet articles and reports have been averted to ensure the high quality of the literature. Additional literature on wildlife crimes and environmental regulations has been referred.

3. Discussion

The motivation of the offender comes from primarily two sources: *capability* of the offender and the *opportunity* that the environment offers the offender (Michie et al., 2011; Thomas-Walters et al., 2021). Hunting or poaching is often opportunistic, not necessarily pre-meditated but chance encounters and ends in killing of the wild organism.

3.1. Poachernomics

Poaching is the illegal killing or taking wildlife, for the sake of convenience, consistency. consumption or trade (Carter et al., 2017). It is a low risk high profit business that runs on demand and supply (Zimmerman, 2003). It is a unidirectional flow of goods from source countries through transit country and finally reaches the consumer country (Akella & Allan, 2012). Poachernomics is driven by *wildlife laundering* i.e. augment legal supply chains with illegally obtained wildlife products (D'Cruze et al., 2015; Dickinson, 2022; Lyons & Natusch, 2011; Maxwell et al., 2016).

The wilderness i.e. the land habited by wild animals (Fletcher et al., 2021) is geographic-specific Some of the commonly exploited wildlife species along with their source countries are mentioned in the table below:

Table 1 Endemic wildlife exploitation (Pires et al., 2016; Sollund & Goyes, 2021; D. P. van Uhm & Wong, 2021; D. van Uhm & Siegel, 2016; Viollaz et al., 2021; Warchol & Harrington, 2016)

Specie	Country
Parrot	Bolivia, Peru
Abalone	South Africa
Caviar	Russia
Wolf	Norway
Totoabamaw	Mexico
Leopard	South Africa

Poaching emerges within a context of already entrenched poverty and limited economic opportunities. Environmental stressors like drought is an outright driver of poaching because farmers are poor and cattle are dying, it exacerbates the already profound economic inequality (Lunstrum & Givá, 2020). It is motivated by the desire to attain a sense of freedom, economic and otherwise elusive to previous generations (A. M. Hübschle, 2017).

Protected high value species are expensive in underdeveloped countries. The supply factors and purchasing motivations determine even in the best funded African countries, the number of rangers and the budget required to counteract poaching is inadequate (Akella & Allan, 2012; 't Sas-Rolfes, 2016). Price elasticity of wildlife products and commodities may vary within markets or niches (Michael, 2012).

Local people have very few incentives to protect or conserve wildlife like albatross (Petrossian et al., 2022; Petrossian & van Uhm, 2023) elephant, rhino or tigers because in most supply countries they are considered to be a symbol of colonial authority (Akella & Allan, 2012; A. Hübschle & Shearing, 2018; Treves et al., 2009). The increased human - wild animal interaction aggravate conflict between different groups of people (Carter et al., 2017). Also the revenue generated from wildlife tourism is comparatively lower than the harvest based extractive activities like trophy hunting (Akella & Allan, 2012).

Most poachers are funded with organized crime groups. Wildlife crime data is mostly anonymous. It provides no information about the identity of the adversary that committed the crime (Ford et al., 2014). There are three levels in the hierarchy of an organized illegal wildlife trade group: (i) Local farmers that sell species illegally to supplement their incomes (ii) Mafia style groups that purchase species from impoverished peasants and sell them at an exponential profit, and (iii) Major international smuggling rings that involved cross trade between countries or groups (Zimmerman, 2003). Harvesting networks are poaching networks of varying degrees of sophistication; syndicates that misuse or corrupt the legal avenue available for obtaining wildlife products. They are generally vertically integrated organizations. They demonstrate resilience in the face of opposition and have the capacity to adapt when necessary. There are seven types of networks, from single actor substinence-use network to complex networks involving multiple individuals. It is

important to consider this structural arrangement to understand how they operate and how resilient they are to different interventions introduced (Ayling, 2012; Phelps et al., 2016).

It is an event of dynamism and co-evolution (Ayling, 2012). Below is a table depicting the stages of poachernomics:

Table 2 Stages of poachernomics in executing a wildlife crime (Cornish, n.d.; Hancock & Laycock, 2010; Lavorgna, 2014b, 2014a)

Stage	Description
Stage 0	Preparatory activities antecedent to the commission of wildlife trafficking
Stage 1	Poaching, harvesting or breeding of the animal/ plant
Stage 2	Intermediate passage through local intermediaries or domestic markets
Stage 3	Passage through regional intermediaries or international traders
Stage 4	Distribution of the product
Stage 5	Activities that are directly consequential or subsequent to the trafficking activity

Payoffs in the poachernomics are high and understanding the nature of the offender's decision making and their rational choice perspective is torn between impulsivity and opportunism. It is often a confusion between if it's a patterned planning i.e. premeditated commission of the crime or a template game, where the offenders have a reference point (Brantingham & Brantingham, n.d.; Cornish, n.d.; Feeney, 1986).

3.2. Indian context

60-70% of world's biodiversity is concentrated in India and 17 other megadiverse countries. It also contains 2.9% of IUCN threatened species list. India has no reflection about international in the Wildlife Protection Act (WLPA), 1972 and is aimed at indigenous species (Karmakar, 1962).

In the Indian context, wildlife crime situation is often contentious because the national government focuses on real extent of protection or implement new protected areas without regard to equity and rights of indigenous communities. Their reaction towards new policy is affected by their vulnerability and replaceability (Carroll & Noss, 2022; Noss & Cooperrider, 1994). The problems of the law enforcement have been listed below:

- Overall lack of deterrent effect: The Indian judiciary focuses on certainty of punishment rather than the severity in achieving deterrence.
- Under resourcing and marginalization of the crime.
- Wildlife crime is not taken seriously: It is due to fewer prosecutions brought to the court and comparatively less awareness among the public.
- Corruption in enforcement agencies and governments.
- A large dark figure in the statistics: Only 10% of wildlife related crimes end up in court and in large proportion they never come to the attention of the authorities (Wellsmith, 2011).
- Human coexistence and conflict with wildlife: 65% of Indian population live in rural region that share space with protected areas of the forests (Carroll & Noss, 2022; Rana & Kumar, 2023). Rural population still struggle with food poverty, so they engage in natural resource exploitation (Cao Ngoc & Wyatt, 2013). Substantial underground community and culture that is labelled with using wildlife products are associated with aesthetics and ritualistic practices (Michael, 2012).
- Traditional human response is to clear wildlife habitat or retaliate against wild animals for perceived or real threat. Such kind of responses undermine conservation goals (Marker et al., 2003).
- Shortage of wildlife laboratories, workforce and funding.
- Dynamism of wildlife crime and international politics: usually associated with international trade of alien species that escape the current legislative and scientific tools of nations (Hulme, 2021; Rana & Kumar, 2023).
- Unlicensed trade, disguised marketing and prosperity charm: wild and rare animals such as tortoises, turtles, snakes, bears, deers etc. are used for prosperity or good luck and are associated with religious sentiments (Rana & Kumar, 2023; Sharma & Kumar, n.d.).

- Concept of victimization is unclear: it is difficult to narrow down to time, place, person and impact of victimization in a wildlife crime because it generally involves animals (Sharma & Kumar, n.d.).
- Information is unregulated and is difficult to monitor due the borderless nature of the crime (Fukushima et al., 2021). Detecting physical movements of the trade is not possible because corrupt officials, legal authorities or financial professionals may never physically handle evidence but can facilitate the IWT (D. P. Van Uhm & Moreto, 2018; Wyatt et al., 2018).
- The WLPA covers practices like venom extraction from snakes, for scientific purposes. Institutions exploit this opportunity and extract venom multiple times, until the organism dies, hence depleting their population (by Robert & Prescott-Allen, n.d.).
- Self-defense is another provision that leads to easy abuse of the wildlife. Burden of proof does not lie on the person to prove if he was hunting or not (Buncombe, 2007; Sharma & Kumar, n.d.).

3.3. Impact of Wildlife Crime

Wildlife crime has its impact beyond those posed by regular criminality. It is a threat to endangered species leading to loss of revenue and natural resources. It breeds organized crime involving transnational networks and undermines sustainable development goals (Venugopal et al., n.d.). Impact is not only on the threatened animals but also on impoverished communities that lose their natural habitat, for which there is no alternative (Duffy, 2000; D. P. van Uhm, 2018). Unsustainable harvesting and hunting is a potential source of zoonotic diseases (Di Minin et al., 2022). No hygiene standards are generally maintained and diseases or pathogens can spread quickly, eg: COVID-19 outbreak (Sutmoller, 1997; Yin et al., 2020). 60% of infectious diseases in humans are caused by zoonoses and IWT account 71.8% of it (Jones et al., 2008; Taylor et al., 2001). Poaching do not necessarily alter counter populations and attracts compensatory predation by avian or mammalian foreign species and is dependent on factors like weather, disease etc. (by Robert & Prescott-Allen, n.d.). IWT bears the risk of introducing invasive species into new environments. The increasing trend in IWT suggests that 1-16% of all species can become invasive, irrespective of whether it was released as a deliberate act or part of IWT (Diagne et al., 2021).

Over-exploitation of natural resources in the form of IWT is expected to surpass climate change in its destruction ability and detrimental effects on earth and its biodiversity (Maxwell et al., 2016). In situations where only parts or derivatives of animals are traded; traps, snares, steel jaw traps are used as weapons in poaching, which can lead to slow death and severe animal suffering, eg: rhino for rhino horn, farming bear for bile extraction (Wyatt, 2014).

65% of wildlife incidents and accidents are homicides. Poachers are responsible for this leading cause of death of rangers and wildlife or forest officers (Prakash et al., 2021).

Wildlife acts as a renewable source of economic income and trade that is legitimate and sustainable can support the pursuit of internationally endorsed UN sustainable development goals (D. W. Challender et al., 2019).

3.4. Strategies to tackle Wildlife Crime

Conservation community always looked at increasing risk of crime, removing excuses for non-compliance of rules and reducing provocations that contribute to retaliatory killing (Kurland et al., 2017). But there was no proper implementation because there was no understanding of what might work in a particular context or setting (Baylis et al., 2016). It is difficult to implement a generalized preventive strategy because harvesting and trade is illegal in most source countries but remains legal in consumer countries (eg: elephant ivory in Japan and pangolin scales in China) (Hinsley & Roberts, 2018). This dilemma determined that legality and social legitimacy are two different aspects that are often contradictory to one and other in this scenario (Elliott, 2012). Reducing IWT should be intervened by inputs from other behavioral science fields like sociology, psychology, marketing and consumer study (Verissimo et al., 2012). The behavior to commit IWT could be superficially same in majority cases, but the differing motivations subsequently means that they do not respond to the same intervention strategy (Shairp et al., 2016).

- Direct interventions decrease the severity or frequency of human-wildlife conflicts and destruction of property. Indirect interventions raise human tolerance for wildlife or its encounters (Treves et al., 2009).
- Security and Certifications – Regular compliance review and monitoring to reduce over harvesting and attest legality to on-going activities (Ebeling & Yasué, 2009).
- Bans – Ban on trade of particular species can help in preventing species endangerment or disease outbreaks (Bonwitt et al., 2018; Underwood et al., 2013; Xiao et al., 2021).
- Quotas – Establishing written quotas can prevent over exploitation, but it should be accompanied with robust execution and responsible mindset among public (Janssen & Chng, 2018; Natusch & Lyons, 2012).

- Technology – Intervention using technology can make the job easy and also align with the evolving internet age.
    - WILDLIFE ALERT is used for identification of illegal wildlife products (Kretser et al., 2014).
    - iNaturalist is an automated specie identification through photography (Hanoi et al., n.d.; *INaturalist*, 2021).
    - PAWS is a software that successfully models the wildlife crime domain and optimizes wildlife crime patrols while remaining flexible enough to operate generally and in a specific deployed area (Ford et al., 2014).
    - Object detection models like Faster R CNN ResNet 101 and Faster R-CNN Inception v2 have displayed average mean precision to detect pangolins in different image settings with pre-trained datasets (Cardoso et al., 2023).

- The gaps in knowledge have to be filled w.r.t species, ecology, animal behavior and taxonomy (Bennett et al., 2017).
- Local communities and consumers can be engaged in reducing wildlife trade activities by increasing wildlife stewardship incentives (Biggs et al., 2017; Cooney et al., 2017).
- Supply side approach – holding cheaper substitutes for illegal wildlife products can drive down prices and reduce illegal harvesting (BULTE & DAMANIA, 2005). It can be used as a disguised deterrence strategy. Ending demand will remove money out of supply chain as it eliminates the incentive to hunt regardless of their economic reality (D. W. S. Challender & MacMillan, 2014). Sustainable farmed alternatives can be flooded into markets to reduce the trade of threatened or endangered species (BULTE & DAMANIA, 2005; Williams et al., 2018).
- Citizens should help in surveillance, identification and collecting intelligence to reduce human-wildlife conflicts (Frigerio et al., 2018).
- Education and awareness to be brought through social media and marketing campaigns can be enforced in the demand end (Hinsley et al., 2015; Li & Hu, 2021).
- Challenging use of wildlife as medicines can be key to prevent wildlife trade because every specie has an intrinsic value that is not to be crosses. Species right to live has to outweigh the human's benefit from the said activity (Cao Ngoc & Wyatt, 2013).
- There has to be a radical change in the punishment perspective, from lenient or liberal law to punitive sentencing policies. The legislation should state wildlife trade to be a serious crime and the subsequent penalties awarded should reflect the gravity of the crime (Martin, 1979; Zimmerman, 2003).
- Militarized anti-poaching approaches.
- Forensic intervention – DNA barcoding and DNA profiling can help to assess if the species was protected or not and prevent wildlife laundering (Smart et al., 2021). Radiocarbon dating (Quarta et al., 2019) and Wildlife and Forest Crime Analytic Toolkit are other scientific methods that help in establishing source of origin of an acquired sample (Nations & Nations Office Drugs, 2012, 2021).
- On examining incentives of poachers, criminologists and environmentalists realized that they are more sensitive to detection and interception than decrease in the demand or prices of wildlife and their products (Lopes, 2015; 't Sas-Rolfes, 2016).
- Job training maybe effective for individuals with poor work prospects who rely on poaching as a source of income (Knapp, 2012; Wilson & Boratto, 2020).
- Intelligence-led policing and hotspot policing is an integral part situational crime prevention (Jachmann, 2008).

3.5. Contradictory perspective on banning IWT

In Africa, trophy hunting is considered to be an important conservation tool, provided it can be done in a controlled and regulated manner (Di Minin et al., 2016). Blanket ban on hunting in Africa, can lead to worse conservation outcomes because financial resources for conservation is limited in developing countries (Naidoo et al., 2016). Revenue generated from trophy hunting can be used for anti-poaching rangers or enforcement. If not, natural habitats shall be transformed into other infrastructure, commercially rich with high monetary returns that lead to destruction of biodiversity (Di Minin, Fraser, et al., 2013). Among all these, the most glorified eco-tourism is also depraved because eco-tourists generally prefer accessible and safe areas and this notion is valid, but it does not improve the condition of the communities that coexist with the biodiversity in deep remote areas (Di Minin, Macmillan, et al., 2013; Lindsey et al., 2006). On the brighter side, the African indigenous communities articulate that management for hunting requires maintenance of large wildlife populations, whereas ecotourism only supports particular species that are important for tourist attraction (Di Minin, Fraser, et al., 2013). In support to this belief, conservationists, environmentalists and scientists have researched and stated that trophy hunting has a smaller footprint than ecotourism, taking into

consideration the carbon emissions and infrastructure development that degrade the quality of life (Lindsey et al., 2007).

Abbreviations

- IWT – Illegal Wildlife Trade
- IUCN – The International Union for Conservation of Nature
- UNODC – United Nations Office on Drugs and Crime
- ICCWC – International Consortium on Combating Wildlife Crime
- WLPA – Wildlife Protection Act

4. Conclusion

Unifying strategies that can be implemented long term is the need of the hour. Critical analysis of the effectiveness of the preventive strategies is necessary for implementation of functional solutions. Factors including economic, cultural and ecological drivers has underscored the complexity of wildlife crime. Theories of the environmentalists or sociologists have to be backed by empirical evidence to bring in effective tackling of procedures of IWT. These strategies serve as beacons, guiding the research towards an imperative outcome.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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