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Wildlife Crime in India Today: Key Challenges and Prevention Approaches.

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ABSTRACT
Animal poaching, illegal dealing in wildlife and the products derived from it, and the destruction of habitats are all examples of wildlife crimes that are committed in India today. These crimes pose a substantial risk to the country's biodiversity. Legal enforcement continues to be difficult despite the existence of strict regulations like as the Wildlife Protection Act of 1972. This is because of limited resources, corruption, and the complex structure of networks that are involved in wildlife trafficking. According to the findings of this research, the most significant obstacles and strategies for preventing wildlife crimes remain in India. At the same time as it seeks to investigate the need of improved technical aid for wildlife crimes in India, the study has included an analytical approach of research. The primary and secondary data about wildlife crime have been borrowed from Crime in India Statistics-2021. These data have been analyzed through government reports and various other sources to gain an understanding of the current state of law enforcement in dealing with wildlife crimes per the Wildlife Protection Act of 1972, as well as the necessity of advanced technology to maintain equality with the global call for the reduction of such crimes. The proportion of wildlife crime cases that are still pending and the conviction rate in 2021 are both explained by this. Compared to the number of cases that are still pending trial, which is 93%, the conviction rate is rather low, coming in at 72.63%...
Keywords: *Wildlife crimes, Wildlife Protection Act of 1972, Prevention approaches, Illegal trade.*
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1. INTRODUCTION:

Wildlife criminal sciences refers to the use of several scientific subjects in the enforcement of laws and the resolution of issues that are connected to illegal wildlife activities [1]. The field of wildlife criminal sciences can first seem to be limited to solving cases involving the illegal trade or criminal usage of wild animals, as well as assisting in the reconstruction of crime scenes. On the other hand, the range of applications for this intricate scientific discipline is far more extensive, particularly when one considers the influence it has on the preservation of species and healthcare [2].

The biodiversity of wildlife is now experiencing a significant reduction, and an increasing number of species are becoming highly endangered with the possibility of becoming extinct, while some have already been threatened with extinction. There are a few factors that can be traced back to human activity completely, such as pollution, the destruction of habitat, and other crimes committed against animals [3]. Poaching (which includes the consumption of bushmeat or the practice of coursing), poisoning, illegal trade (which can include ornamental commercial items, pets, or traditional medicine ingredients), the introduction of invasive species, bioterrorism, illegal spills, and animal cruelty are some of the most common or prominent examples of wildlife crimes that threaten wildlife species all over the world (Figure 1).

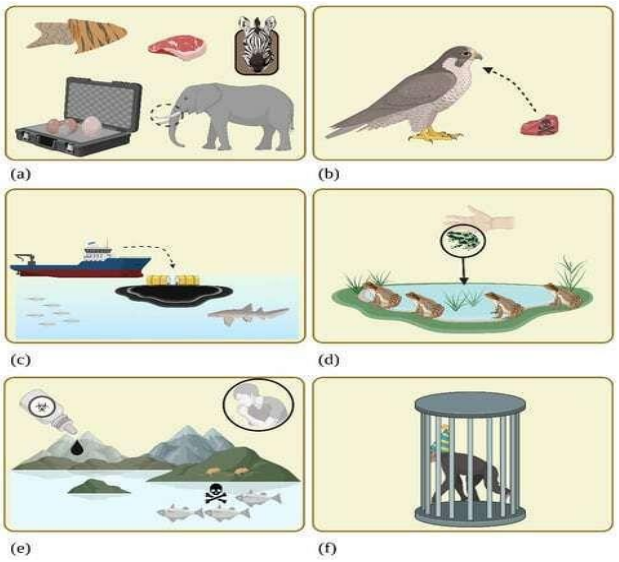


Figure 1: Illustration of some wildlife crimes. (**a**) Poaching and illegal trade (of fur, eggs, ivory, or other body parts); (**b**) poisoning; (**c**) illegal spill; (**d**) intentional introduction of invasive species; (**e**) bioterrorism; and (**f**) animal cruelty [4].

Taxonomy, pathology, molecular biology, biochemistry, genetics, and toxicology are some of the disciplines that are often included in it. However, that list might vary based on the circumstances and the objectives [5-7]. It can be involved in a variety of activities, including the identification of species, the prosecution of wildlife crimes, the monitoring of environmental changes, and the

research of disease epidemiology, which exemplifies the fact that it is a transdisciplinary field.

Elephants *(African: Loxodonta africana, Asian: Elephas maximas)*, rhinos (*Indian: Rhioceros unicornis, Javan: Rhinoceros sondaicus)*, tigers *(Panthera tigris)*, and pangolins are among the most endangered animal species in the world at present. A number of these species are also among the most threatened animal species in the world [8,9]. The increasing demand for elephant ivory, rhino horns, tiger goods, and pangolin scales on the global market is causing poaching of these creatures, primarily in Asia and Africa. Poaching is a problem because these animals are being used for their economic value.

According to the records of the United Nations Office on Drugs and Crime (UNODC), and with an annual trade that ranges from seven to twenty-three billion dollars, it is regarded to be the fourth most criminal trade after people trafficking, drug trafficking, and weapons trafficking [10,11]. Among the more than 31,500 species of terrestrial birds, mammals, amphibians, and squamate reptiles, around 24% (N = 7638) are traded on a worldwide scale, putting them in danger of extinction. This business is worth multiple billions of dollars [12]. On the other hand, the yearly legal trade in wildlife is twenty to fifty times bigger than the illegal trade in commercial fishing, which is estimated to be $80 billion, timber, which is estimated to be $227 billion, and fashion, which is estimated to be $2.5 billion [13].

As a consequence, the purpose of this research is to present the current state of wildlife crime in India, including the main challenges and potential solutions. The following are the goals of the study:

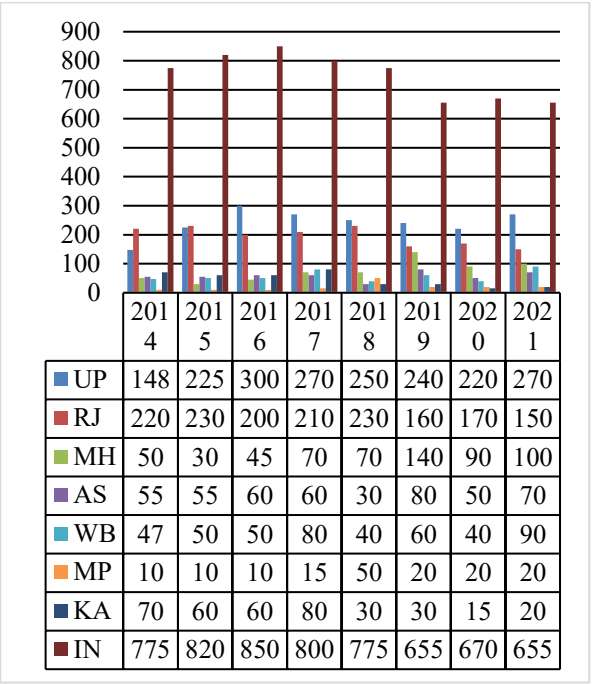
To explore the socioeconomic implications of wildlife crime, considering its impact on local communities' livelihoods, the economy, and cultural heritage tied to wildlife.

To assess the effectiveness of India's legal framework, specifically the Wildlife Protection Act of 1972 and relevant amendments, in addressing wildlife crime and deterring offenders.

To investigate the challenges faced by law enforcement agencies in combating wildlife crime, including issues related to enforcement capacity, corruption, and coordination among agencies.

Current trend of wildlife crime in India

In India, wildlife crime has been on the rise, which poses a significant threat to the country's biodiversity and the conservation efforts that are being made [14]. As a consequence of the strong demand for animal parts such as ivory, skin, and bones in illicit markets, the present trend suggests an alarming rise in the poaching and trafficking of endangered species such as tigers, elephants, and rhinos. This increases the risk of extinction for these species [15,16]. Data on wildlife crime from the National Crime Records Bureau report (NCRB 2014–2021) reveals that the seven Indian states with the highest number of wildlife crime cases reported are Uttar Pradesh, Rajasthan, Maharashtra, Assam, West Bengal, Madhya Pradesh, and Karnataka (Figure 2). This information was gathered over the last eight years.



	2014	2015	2016	2017	2018	2019	2020	2021
UP	148	225	300	270	250	240	220	270
RJ	220	230	200	210	230	160	170	150
MH	50	30	45	70	70	140	90	100
AS	55	55	60	60	30	80	50	70
WB	47	50	50	80	40	60	40	90
MP	10	10	10	15	50	20	20	20
KA	70	60	60	80	30	30	15	20
IN	775	820	850	800	775	655	670	655

Figure 2: The previous eight years (2014–2021) saw several animal incidents in India.

The advanced strategies used by organized criminal networks allow them to take advantage of law enforcement's weaknesses. Enforcement is difficult because of corruption and a lack of resources, even if legislation such as the Wildlife Protection Act of 1972 is rather strict. It is becoming more difficult to monitor and prevent illegal wildlife trading, according to recent statistics. More effective monitoring and protection measures are being pushed for by environmentalists who are calling for more coordination between national and regional organizations and local communities. In addition, drones and AI are being used more and more to keep an eye on wildlife areas and foresee when poaching could happen. To alter mindsets and decrease demand for illegal wildlife items, public awareness initiatives are equally essential.

North-East India

India's North-East area is home to a diverse array of plant and animal life. As both a supplier and a consumer of wildlife, this area is considered to be a component of the core of Southeast Asia for the international wildlife trade. The North-East region of India is well-known for the magnificent natural resources and fauna that it has [17]. One-horned rhinos and wildcats are two endangered species that could be found in these states; however, not many people are aware of the unusual reptile species that can be found there. Several unique and endangered reptiles could have been discovered in the hills and forests of Northeast India. As a consequence of human trafficking and the widespread murder that occurs among them, several of these are in danger of becoming extinct. A Tokay Gecko Lizard is one of these species [18,19].

According to the Wildlife (Protection) Act of 1972, it is against the law to trade in these lizards, and it is also against the law to kill them. For this reason, however, tougher rules need to be enacted and implemented to put

an end to the widespread slaughter and selling of these lizards [20].

Eastern India

It provides a list of the most recent animal crimes that have occurred in West Bengal. A residence in Swarupnagar, North 24 Parganas, was discovered to be dead with 500 Indian Soft-Shell Turtles, according to the report. Two dealers were captured and detained by forest and wildlife crime prevention officers. The group has discovered both living and dead turtles—a total of 88. The flesh from certain turtles was harvested while their shells were still attached [21]. The turtles were thereafter reportedly moved to other marketplaces in Bongaon and Madhyamgram after being manufactured under Schedule I of the Wildlife Protection Act. Forty exotic animals, including nineteen primates, were confiscated from two administrations in Delhi as they were being transported from Mizoram to Siliguri in Northern West Bengal. In addition to the three large tortoises, there are thirteen little turtles, two baby wallabies, and three exotic birds. One of the tiniest whale species, the Indo-Pacific Finless Porpoise prefers to spend its time in shallow coastal waters. In the East Midnapore area of Bengal, several finless porpoises that seemed to have had their fins severed had been discovered throughout the previous two years.

Literature Review

In this section authors provide a review of literature based in the wildlife crime in India.

Yeo et al., (2024) [22] utilized rapid DNA extraction and MinION sequencing in our scalable DNA barcoding method to genotype a significant fraction of the pangolin scales subsampled from two record shipments intercepted in Singapore in 2019 (37.5 t). Among white-bellied *(Phataginus tricuspis)*, black-bellied *(Phataginus tetradactyla)*, and gigantic *(Smutsia gigantea)* pangolins, a total of 2346 *cytochrome b (cytb)* barcodes were found in 1091 scales, 227 scales, and 1028 scales, respectively. In comparison to *P. tetradactyla* (22 haplotypes, 15 novel) and *S. gigantea* (25 haplotypes, 21 novel), the haplotype diversity of *P. tricuspis* scales was higher at 126. Our findings demonstrate the value of thoroughly subsampling big seizures and provide a molecular strategy for quick genetic screening that the majority of forensic labs and law enforcement organizations should be able to implement.

Rebollada et al., (2024) [23] examined 10 red foxes that had died after being turned in by authorities in the Madrid metropolitan region between 2014 and 2022 on suspicion of maltreatment. The four unnatural causes of death in the ten cases were blunt-force trauma (n=2), hypoxia due to hanging (n=1), and firearm injury (n=1). Natural causes accounted for the majority of the other cases (n=4), which were characterized by extreme malnourishment and an abundance of parasites, most often *Sarcoptes scabiei*. As more and more wild animals, especially red foxes, make their homes in cities, forensic veterinarians may need to look into cases of apparent mistreatment to determine the cause of death.

Hopkins et al., (2023) [24] developed predictive models to pinpoint the origins of wood turtles *(Glyptemys insculpta)* from Maine and captive wood turtles from the eastern United States. They examined various combinations of four stable isotope ratios and fifteen trace elements collected from the claw tips of these two populations. Because of environmental and dietary differences, we discovered that 14 out of the 19 markers (two stable isotope ratios and twelve trace elements) had distinct chemical signatures in captive and wildwood turtles. The stable isotope ratio model had almost ideal predictive accuracy in classifying wood turtles as wild or captive, while our trace element and combined models were 100% accurate.

Brandis et al., (2023) [25] created a new way to identify the geographical origin of animals or animal parts using a portable X-ray fluorescence instrument. They used three highly trafficked species from the Philippines—the Philippine cockatoo, the Philippine pangolin, and the Palawan Forest turtle. By offering a quick, non-destructive, and cost-effective way to determine the origin of sold animals, this technology can greatly aid in the fight against illegal wildlife trafficking. Law enforcement, border patrol, animal rescue centers, and environmentalists are some of the final consumers of this product

Zenke et al., (2022) [26] investigated forensic sex and species identification of three cervid species that live in Europe as hunting sports. The hunting group can suggest a forensic genetics study if they think the animal's sex was lied about. Unlike other criminal events, this one does not feature any dead bodies. Fast and cost-effective detection of a certain species or group of species can be substantial before subsequent analysis when testing several biological remains left at the crime scene is necessary. Accordingly, sex and species detection might reveal possible poaching conflicts and lend early credibility to the resolution of illicit actions with trophy animals.

De Bruin et al., (2021) [27] investigated the application of forensic geomorphology in the case of a poached rhino to aid in the conviction of alleged poachers in the lack of DNA evidence. Two experimental study sites matched the characteristics of the rhinoceros' natural habitat. The findings show that the first experimental study site demonstrated a clear link between the suspects and the poaching site, but the second experimental study site hinted that a link could be established. This study only used inorganic materials, such as sand grains, to link suspects to scenes.

Sarma et al., (2021) [28] investigated the hair of a selection of wild and semi-wild mammal species, such as the Bengal tiger (Panthera tigris), Indian one-horn rhinoceros (Rhinoceros unicornis), Asian elephant (Elephas maximus), Mithun (Bos frontalis), Barking deer (Cervulus muntjac), and Yak (Bos grunniens), to determine the animal-specific hair based on indices such as hair color, length, average hair shaft diameter, cortico-medullary index, and cuticular scale pattern. According to the results of this study, tiger cuticular scale patterns differ from rhinoceros, elephant, Mithun, barking deer, and yak patterns, which are coronal simple, imbricate crenate, imbricate flattened, and imbricate crenate, respectively. Based on the measurements taken, the average shaft

diameter for tiger, rhinoceros, elephant, Mithun, barking deer, and yak was 140 ± 0.417, 160 ± 1.199, 200 ± 1.958, and 150 ± 2.665 µm, 135±1.864, and 150±3.670 respectively.

Viollaz et al., (2021) [29] used expert-based elicitation with thirteen workshop participants in Vinh, Vietnam, to examine criminal scripts for three distinct poacher types across nine phases of the poaching process. The investigation shed light on the specifics of the crime and the steps involved in poaching, from getting ready to hunt to selling one's haul. To implement preventative strategies, which are tailored to certain kinds of snare poaching or poachers, the stages involve identifying various access sites. While the primary emphasis of this study was on protected areas, the multidisciplinary methodology can be easily applied to many conservation settings.

Research Problem Statement

It is the evaluation of the effectiveness of current prevention strategies in mitigating wildlife crimes. Despite stringent laws, India continues to face significant challenges in combating illegal poaching, trafficking of endangered species, and habitat destruction. The research could focus on identifying gaps in the implementation of existing legal frameworks, analyzing the role of technology and community participation in wildlife conservation, and proposing innovative approaches to enhance enforcement. Additionally, assessing the socio-economic factors driving individuals towards wildlife crime and developing targeted awareness and education programs could form a crucial part of the study. This research aims to provide a comprehensive understanding of the current landscape of wildlife crime in India and offer actionable recommendations for improving prevention and enforcement mechanisms.

Methodology Adopted for The Study

To have a better understanding of the need for improved technical support for wildlife crimes in India, the study has used an analytical research approach. Primary and secondary data have been studied via government publications and a variety of other sources, to gain an understanding of the current state of law enforcement regarding wildlife crimes and the need to use cutting-edge technology to maintain them on par with the worldwide demand for the reduction of such crimes.

Wildlife Crime Statistics in India: An Interpretation

The Environmental (Protection) Act of 1986 and the Wildlife (Protection) Act of 1972 are two examples of the particular pieces of legislation that have been enacted in India to ensure that these crimes against wildlife are dealt with rigorously. For this research, the data about wildlife crime was taken from Crime in India Statistics-2021. The study also examines the reactions of law enforcement to crimes committed against wildlife by the Wildlife Protection Act of 1972.

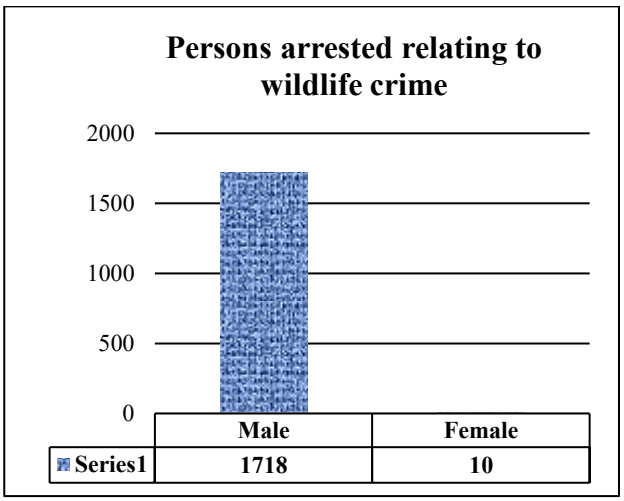


Figure 3: Persons arrested relating to wildlife crimes

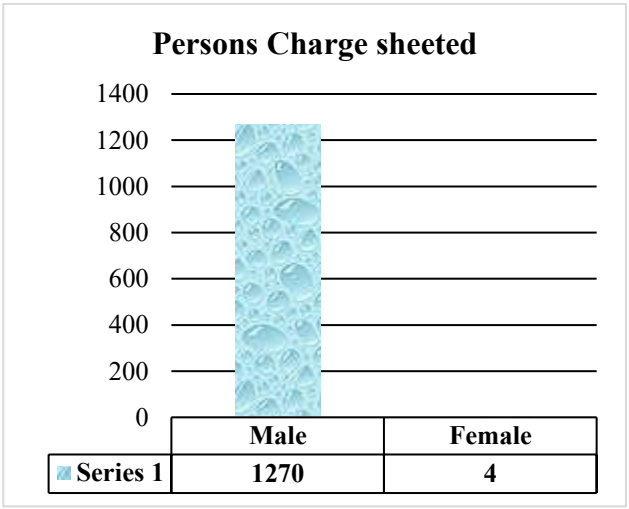


Figure 4: Person Charge sheeted

According to the Wildlife Protection Act of 1972, the number of people who were arrested in 2021 is analyzed in Figure 3 which is located above. In all, 1728 people have been arrested, and 1718 of them are male, while just 10 of them are female. Each of the individuals against whom the chargesheet was drafted is shown in the following Figure 4. There are a total of 1274 people here, 1270 of them are male and 4 of whom are female.

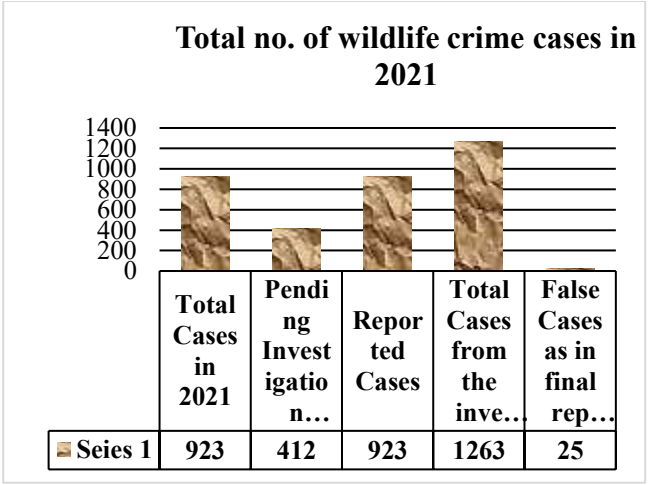


Figure 5: Total number of wildlife crimes for investigation

Within the year 2021, the total number of wildlife crime cases that the police were required to investigate is shown in Figure 5 which can be seen above. According to the data, there were a total of 923 cases that were recorded in the year 2021, while there were 412 cases that were still awaiting inquiry from what happened in 2020. Consequently, the total number of cases that would be examined in the year 2021 would amount to 1263. The final report submission has a total of 25 incidents that have been reported as being fraudulent.

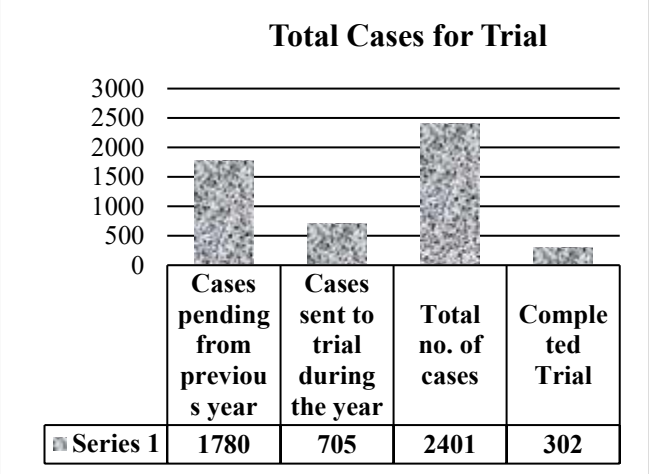


Figure 6: Total number of Cases for trial in 2021

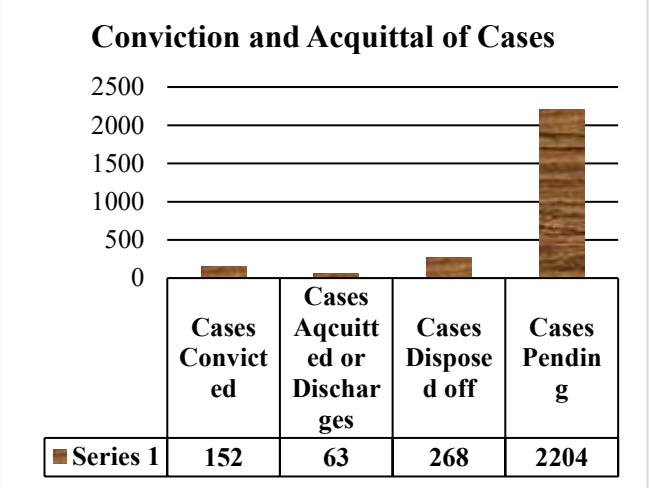


Figure 7: Cases Disposed and Pending

The data that were shown in Figure 6 explain the total number of instances of wildlife crimes that were brought to trial, which amounted to 2401 and included the 1780 cases that were remaining from the year 2020. Twenty-two cases were successfully tried in 2021, while seven hundred and five cases were sent to trial. While 63 cases were either acquitted or released, 152 cases were given convictions to fulfill their responsibilities. According to the data (Figure 7), there are a staggering amount of 2204 cases that are now awaiting trial.

Additionally, the conviction rate and the proportion of cases that are still pending in wildlife crime cases in the year 2021 are explained in Figure 8. Comparatively, the proportion of cases that are still pending trial is 93%, which is much higher than the conviction rate, which stands at 72.63%.

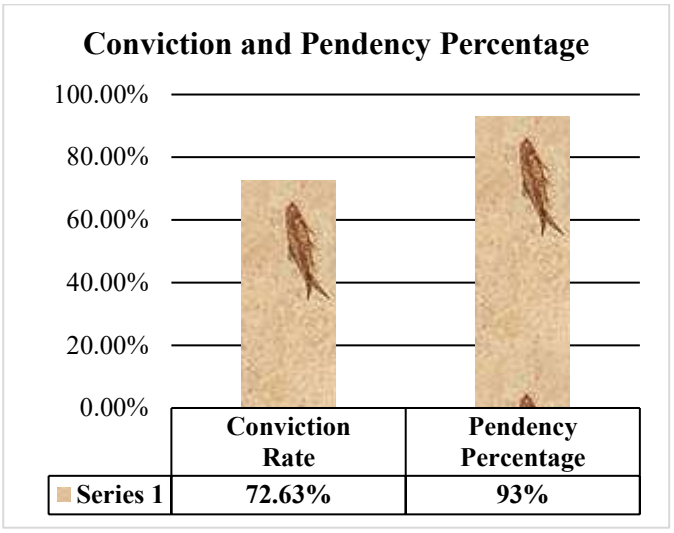


Figure 8: Conviction Rate and Pendency Percentage

The data, however, convey a very pessimistic impression of the cases that are remaining compared to the situations that have been resolved. There is a remarkable number of arrests being made, but there is a very large number of cases that are still pending investigation and trial.

Prevention Approaches to Combat Wildlife Crime

The current state of wildlife crime in India is characterized by the very coordinated and sophisticated methods used by poachers. Several scientific, administrative, and technical strategies are outlined below to combat these well-mannered poachers (Figure 9):

Figure 9: Prevention approaches to combat wildlife crime

Monitoring wildlife through artificial intelligence

The use of artificial intelligence (AI) has had a significant effect on every aspect of human life and has shown to be quite helpful in the monitoring of wildlife and the prevention of violence against animals [22]. India is one

of the world's leading countries in the field of information technology (IT), and it has the potential to assist in the establishment of AI-based monitoring of wildlife. This monitoring system has the potential to be useful in tracking the movement of wildlife in real time and effectively solving crimes in a manner that is analogous to the way that cellular phones are being used in the process of tracking down and solving personal crime cases. The use of various AI techniques can help reduce wildlife crime. These include GPS, micro-chipping, drone-based surveillance, infrared cameras (which can see animals at night), sensors, acoustics (animal noises, gunfire, chainsaw), cyber trackers, and the Spatial Monitoring and Reporting Tool (SMART) [23].

Strengthening and modernization of wildlife laboratories

In every state, there is a pressing need to establish contemporary wildlife laboratories near sensitive areas. Additionally, it is necessary to strengthen the existing state forensic science laboratories to investigate wildlife crimes. These laboratories should be equipped with at least fundamental testing facilities, such as morphometry, microtomy, hair examination, and blood/tissue tests [24]. Further efforts must be made to ensure that every state laboratory is equipped with sophisticated test capabilities for genetic identification. These facilities should include multiplex PCR and mitochondrial DNA analysis sequencing [25-27]. The environmental DNA (e-DNA) that is released by wild animals in the water, soil, vegetation, or even air in forest regions should be frequently evaluated via metagenomics analysis or metabarcoding studies. This is particularly important for monitoring wild animals that are difficult to access [28,29].

Amendment of existing wildlife laws

There is an urgent need to amend the Wildlife (Protection) Act, of 1972, to include alien and exotic species in its six existing schedules (I-VI) and to include sections dealing with penalties and punishments for wildlife defaulters engaged in the exotic wild/pet species trade, because the act currently only covers native species. The Wildlife (Protection) Act, 1972, which should be revised or reclassified under the Prevention of Cruelty to Animals Act, 1960, does not apply to any transaction involving peacock (Pavo cristatus) tail feathers. A new schedule of exotic species (Schedule IV) that is classified under CITES was included in the Wildlife (Protection) Amendment Bill, 2022, which was eventually approved by both chambers of parliament in December 2022. This bill also imposes increased penalties for wildlife defaulters [30].

Challenges for Wildlife crime

Wildlife crime in India presents a complex array of challenges that hinder conservation efforts and threaten biodiversity. Some of the key challenges include:

1. Poaching and Illegal Trade

High Demand: There is a significant demand for wildlife products like tiger skins, rhino horns, elephant tusks, and various animal parts used in traditional medicine.

Sophisticated Networks: Poachers and traffickers often operate through well-organized and sophisticated networks, making it difficult to track and dismantle these operations.

Corruption: Corruption at various levels of enforcement agencies can facilitate illegal trade, allowing poachers to evade capture and prosecution.

2. Habitat Destruction

Deforestation: Rapid deforestation for agriculture, urbanization, and industrial projects leads to habitat loss for many species, making them more vulnerable to poaching.

Infrastructure Development: Roads, railways, and other infrastructure projects often cut through critical habitats, leading to fragmentation and increased human-wildlife conflict.

3. Weak Law Enforcement

Inadequate Resources: Wildlife protection agencies often lack sufficient resources, including funding, manpower, and technology, to effectively combat wildlife crime.

Judicial Challenges: Prosecution of wildlife crimes can be slow and inefficient due to lengthy legal processes and lack of specialized knowledge among judiciary members.

4. Human-Wildlife Conflict

Encroachment: Human encroachment into wildlife habitats leads to conflicts, as animals can attack livestock or crops, resulting in retaliatory killings by local communities.

Compensation Issues: Delays and inadequacies in compensation for losses caused by wildlife can exacerbate local hostility towards conservation efforts.

5. Lack of Awareness and Education

Public Awareness: There is a general lack of awareness among the public about the importance of wildlife conservation and the laws protecting wildlife.

Community Engagement: Effective community engagement is often missing, which is crucial for garnering local support for conservation initiatives.

Conclusion

Wildlife crimes are fueled by the enormous demand for animal parts in the markets for traditional medicine, fashion, and exotic pets, which are present both domestically and globally. Insufficient execution of conservation regulations, corruption, and a lack of understanding among local populations are all factors that contribute to the growth in wildlife crime. The complexity and scope of wildlife crime continue to be a barrier to conservation efforts, even though governmental and non-governmental groups have made attempts to reduce these activities via the implementation of strict regulations, more community participation, and international collaboration. The findings of this research highlighted the primary obstacles and strategies for preventing wildlife crimes in India. As part of its efforts to investigate

the need for improved technical support for wildlife crimes in India, the study has included an analytical research approach in its methodology. The primary and secondary data about wildlife crime have been borrowed from Crime in India Statistics-2021. These data have been analyzed through government reports and various other sources to gain an understanding of the current state of law enforcement in dealing with wildlife crimes under the Wildlife Protection Act of 1972, as well as the necessity of advanced technology to maintain them at par with the global call for the reduction of such crimes. It explains the proportion of wildlife crime cases that are still pending as well as the conviction rate in the year 2021. Comparatively, the proportion of cases that are still pending trial is 93%, which is much higher than the conviction rate, which stands at 72.63%.

The primary challenges include poaching, illegal trade, and habitat destruction, driven by high demand for animal parts like tiger bones, rhino horns, and elephant ivory. Weak enforcement of wildlife protection laws, corruption, and lack of resources exacerbate the situation. Additionally, local communities often depend on wildlife for their livelihoods, leading to conflicts between conservation efforts and economic needs. Preventive measures must address these multifaceted issues through a holistic approach. Strengthening law enforcement with better training and resources is crucial. Anti-poaching technologies, such as drones and camera traps, can enhance monitoring and protection efforts. Community engagement is vital, promoting alternative livelihoods to reduce dependency on wildlife exploitation. International collaboration is also essential, targeting transnational wildlife trafficking networks. Education and awareness campaigns can foster a conservation ethic among the public, ensuring long-term success in preserving India's rich wildlife heritage...

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