

Current Status of the Striped Hyena in Pakistan

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Keywords: Striped Hyena (*Hyaena hyaena*), Human-Wildlife Conflict, Habitat Loss, Road Mortality, Ecological Role, Scavenger Species, Endangered Species, Wildlife Protection

Received on 09 February 2026

Accepted on 13 March 2026

Published on 20 March 2026

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Abstract

The striped hyena (*Hyaena hyaena*) is a species of great importance and significance for Pakistan as it is an ecological role player in arid and semi-arid ecosystems and is also an endangered species. This species plays a role in maintaining the health of the ecosystem, including scavenging dead animals, helping to spread disease, and cycling nutrients. The striped hyena is however under Critical Endangered category in Pakistan, because of habitat destruction, human-wildlife conflict, illegal killing, and road accidents. Habitat degradation, due to agricultural expansion, urbanization and infrastructure development, has resulted in fragmentation of hyenas and restricted their range. Furthermore, the conflict between the communities and the hyena is also a problem, with many communities in the area killing these animals in response to the annoyance they cause to their livestock. Scavengers as they are, hyenas are still often hunted, being victims of negative cultural

beliefs and ignorance of their ecological values.

This review aims to collate existing information regarding the status, ecology, and conservation concerns of striped hyena in Pakistan. It emphasizes the critical need for holistic conservation efforts that involve restoring habitats, educating communities, managing livestock, and minimizing roadkill. There will also be a need for regional cooperation between Pakistan and neighboring countries such as Afghanistan and Iran for effective conservation. The review ends with recommendations for future strategies

to safeguard the species' survival, including more up-to-date population counts, better enforcement of wildlife regulations and public education and awareness on how to minimize human-hyena interactions.

Introduction

In Pakistan the striped hyena (*Hyaena hyaena*) is a rare and endangered species. The striped hyena is a scavenger and is crucial for the health of the ecosystem particularly within arid and semi-arid regions. The species has been classified as Near Threatened on the International Union for Conservation of Nature (IUCN) Red List (IUCN, 2021). Severe declines in population in some areas, however, mostly as a result of human activities, habitat destruction and direct persecution.

It is highly fragmented with low populations and in Pakistan it is critically endangered (Dawn, 2023). In Pakistan, it is estimated to be less than 500 (Zoo Outreach Organization, 2003), and population is declining due to lack in monitoring and conservation measures.

The species is found in remote, rocky and scrubland habitats, such as Sindh, Balochistan, Punjab, and parts of Khyber Pakhtunkhwa. It is also known to inhabit the Kirthar National Park, Hingol National Park, Cholistan Wildlife Sanctuary and Karunjhar Hills in Sindh (Zoo Outreach Organisation, 2003). Although the striped hyena has been sighted occasionally in these areas, the populations are likely to remain highly fragmented with a focus on to isolated pockets in less accessible areas (Dawn, 2023).

Ecological Role

The striped hyena is a facultative scavenger which plays a very important role in the Pakistan landscapes, in removing carcasses, to reduce the risk of disease and promote nutrient recycling. The scavenging of livestock, wild ungulates and small mammals by striped hyenas, help to clean the environment of decaying organic material, which could otherwise spread diseases (Hussain et al., 2020). Therefore, they play an important role in the health of ecosystems particularly in rural communities where livestock mortality rates are higher.

Striped hyenas are also scavengers and sometimes hunt small animals such as rodents, reptiles and even young ungulates (Hussain et al., 2020). However, they are more commonly associated with secondary consumers (i.e., animals that feed on the remains of others) and carrion. They help natural processes by acting as the natural waste managers and are a critical component in arid environments where carcass presence in the open can affect wildlife and human populations.

In addition, striped hyenas serve as a key indicator species as they are linked to the presence of food sources like carcasses and overall area biodiversity (Hussain et al., 2020). In human-altered areas such as Kirthar and Cholistan they are present or not, it shows the condition of natural resources like denning sites and prey availability (Hussain et al., 2020).

Anthropogenic Effects

The biggest problem with the survival of striped hyena in Pakistan is human activities. The species has been greatly affected by habitat destruction and fragmentation, caused by agriculture, urbanisation, infrastructure projects and land-use changes (Loveridge et al., 2017). The striped hyena is found in many areas where suitable habitats and denning sites have been lost because of human encroachment into previously wild areas.

Human–wildlife conflict is one of the major anthropogenic pressures that the striped hyena in Pakistan faces. This is mainly due to the tendency of the species to scavenge in the vicinity of human habitation. Striped hyenas can also be involved in conflicts with farmers and herders by attacking livestock carcasses or garbage (Loveridge et al.,

2017). Also, there are negative perceptions on the species by local communities, which believe that it is dangerous for their livestock or brings bad luck (Akhtar & Shah, 2018). Poaching and illegal trade are other major threats. The striped hyena is hunted for its body parts, bones and fur, some of which are used for traditional medicine or decoration (Akhtar & Shah, 2018). The population of this species has also been depleted by poaching and hunting due to demand in illegal wildlife markets. Though it is listed in CITES Appendix II (Convention on International Trade in Endangered Species), the enforcement of anti-poaching laws is weak, especially in remote and poorly policed areas (Zoological Society of London, 2022).

Further, there is a threat of roadkill which is significant particularly in places with growing network of roads and infrastructure (Shah et al., 2021). Nocturnal and with a wide roaming range, striped hyenas are frequently struck by vehicles as they search for scavenging food along roads, especially in desert areas where roads cross over wildlife corridors.

Conservation of the Striped Hyena in Pakistan

A comprehensive conservation strategy is needed to mitigate threats faced by the striped hyena in Pakistan. Elements of this strategy include:

Protecting and managing habitats

Protected Areas such as Kirthar National Park, Hingol National Park, Cholistan and Karunjhar Hills should be accorded priority for conservation. These areas are important habitats for wildlife, including the striped hyena. Management plans are needed to be effective in these areas to mitigate the impact of illegal poaching, overgrazing of livestock and human settlements.

Community engagement and education

Conservation of the striped hyena should target the human–wildlife conflict, by raising awareness of its ecological value. Education campaigns need to highlight the fact that striped hyenas are primarily scavengers and are not a major threat to livestock, provided that good management practice is followed. Retaliatory killings, which can be reduced by the implementation of livestock enclosures, carcass management systems and compensation schemes (Akhtar & Shah, 2018).

Monitoring and Data Collection will be carried out

A comprehensive conservation strategy needs to have current data on the population status and distribution of striped hyenas and their habitat. To improve understanding of the distribution and behaviour of the species in Pakistan, camera-trap surveys, sign surveys and community reports should be conducted.

Improved Legal Protection & Enforcement

There is a need for greater law enforcement action with regard to wildlife protection laws. Even though the striped hyena is listed under Appendix II of the Convention on International Trade in Endangered Species (CITES) and is protected by the Wildlife Protection Ordinance in Pakistan, enforcement is difficult in remote areas (Zoological Society of London, 2022). Need to increase the legislation, patrolling and penalties against wildlife crimes.

International Cooperation

Cooperation between Pakistan and its neighbouring countries Afghanistan and Iran is essential for the conservation of striped hyena, though its range is found in all three countries. Cooperation should be done on trans-boundary conservation, sharing information and working out a coordinated management plan.

Review of Literature

In Pakistan's dry and semi-arid habitats, the striped hyena plays a crucial role in balancing the ecosystem. But its future in Pakistan is uncertain because of man-made pressures like habitat loss, persecution and poaching. To halt the decline of this unique and critical species, it is essential to implement effective conservation strategies, including habitat protection, community engagement, legal enforcement, and international cooperation. These measures can be integrated into national and local conservation policies and strategies to ensure the long-term survival of the striped hyena for future generations in Pakistan. The striped hyena (*Hyaena hyaena*), one of the last remaining species of hyena in Asia, plays a vital ecological role in arid and semi-arid ecosystems. In Pakistan, the striped hyena is considered Critically Endangered (Dawn, 2023), with population numbers continuing to decline due to habitat loss, human-wildlife conflict, and illegal hunting. As a scavenger, the species plays a crucial role in maintaining ecological balance by removing carcasses, which in turn helps to prevent the spread of diseases (Hussain et al., 2020). This literature review synthesizes the current understanding of the species' ecology, threats, and conservation needs in Pakistan, with a focus on the ecological role of hyenas, anthropogenic pressures, and existing conservation efforts.

Ecological Role of the Striped Hyena

Striped hyenas are primarily facultative scavengers, contributing to ecosystem health by feeding on carrion and organic waste. As large carnivores, they are an integral part of the food web in Pakistan's arid landscapes. By consuming livestock carcasses, roadkill, and remains of wild animals, hyenas help to maintain a clean environment and prevent the accumulation of rotting organic material (Khan et al., 2018). This is particularly important in desert ecosystems where the absence of natural predators for carrion can lead to the spread of pathogens and diseases (Sultan et al., 2019).

In addition to their scavenging habits, striped hyenas occasionally hunt smaller prey such as rodents, reptiles, and birds, though their diet is largely composed of secondary food sources (Hussain et al., 2020). Their role as ecosystem regulators has been demonstrated in studies where their removal would lead to an increase in carcass waste and a higher risk of disease outbreaks (Khan et al., 2018). By acting as natural garbage collectors, hyenas promote a healthier environment for other species, making them critical for maintaining the biodiversity of dryland ecosystems.

Anthropogenic Effects on the Striped Hyena

Human-induced activities have significantly impacted the striped hyena's populations in Pakistan. Habitat loss and fragmentation are major threats to the species. With the increasing encroachment of agriculture and urbanization in rural and semi-rural areas, hyenas have lost significant portions of their natural habitat, leading to isolated populations (Loveridge et al., 2017). Areas such as Kirthar National Park, Hingol National Park, and Cholistan Desert, where hyenas were once abundant, now face habitat degradation due to expansion of human settlements, roads, and infrastructure (Shah et al., 2021).

Human-wildlife conflict is another significant anthropogenic pressure. As hyenas are often seen scavenging near livestock pens or garbage dumps, they are often perceived as a threat to human livelihoods, leading to retaliatory killings (Akhtar & Shah, 2018). This conflict is exacerbated in regions where hyenas consume livestock carcasses, and farmers view them as competitors for the same food sources. Moreover, local cultural beliefs about the species, often associating hyenas with bad omens or harmful activities, fuel negative perceptions and increase the likelihood of killing (Gillingham & Lee, 2003).

The illegal wildlife trade also threatens striped hyenas, as their fur, bones, and body parts are sold in local markets for use in traditional medicine and rituals (Ahmed & Ali,

2016). Despite being protected under national wildlife laws and listed in CITES Appendix II, enforcement of these laws remains weak, particularly in remote and rural areas (Zoological Society of London, 2022).

Conservation Efforts for the Striped Hyena

Conservation efforts for the striped hyena in Pakistan have been limited, but there are some positive developments. A national survey of the striped hyena's population is essential for assessing its current distribution and understanding its ecological needs. The last estimate of fewer than 500 individuals in Pakistan (Zoo Outreach Organization, 2003) may be outdated, and the lack of recent field surveys means conservation measures are based on incomplete data.

Protected areas like Kirthar National Park and Hingol National Park in Balochistan are critical habitats for the striped hyena and should be prioritized for conservation management (Shah et al., 2021). These areas need effective management plans to curb threats like poaching, habitat encroachment, and disturbance from human activities. Furthermore, initiatives to restore degraded habitats and establish wildlife corridors connecting fragmented populations are vital for ensuring long-term viability (Sultan et al., 2019).

Community-based conservation programs are also essential for reducing human-wildlife conflict. Educating local communities about the ecological benefits of striped hyenas and promoting coexistence strategies can significantly reduce retaliation against the species. For example, livestock enclosures, carcass management, and compensation schemes for livestock losses can help mitigate the impacts of hyenas on farming communities (Akhtar & Shah, 2018).

International Cooperation

Given the transboundary nature of striped hyena populations, international cooperation between Pakistan, Afghanistan, and Iran is essential for the species' conservation. Collaborative efforts in areas such as cross-border conservation, joint patrols, and data sharing can help address the challenges of protecting hyenas across national boundaries (Hunter & Sutherland, 2020).

Future Directions for Conservation

Future conservation strategies should focus on strengthening law enforcement, enhancing public awareness, and updating population assessments through camera trapping, genetic monitoring, and field surveys. Long-term monitoring of hyena populations was providing insights into the effectiveness of conservation measures and help adapt strategies as needed. Additionally, involving local communities in conservation planning is crucial for ensuring the success of any efforts aimed at protecting the striped hyena in Pakistan.

Methodology

Research Design

This study was utilizing a mixed-methods research design, combining qualitative and quantitative data collection methods to provide a comprehensive understanding of the current status, ecological role, anthropogenic effects, and conservation needs of the striped hyena (*Hyaena hyaena*) in Pakistan. A systematic literature review was conducted to synthesize existing knowledge, followed by field data collection to assess the current distribution and conservation status of the species. This approach was allowed for a broad exploration of the species' ecological, social, and legal context, while also providing up-to-date data on its population dynamics.

Field Data Collection

Following the literature review, fieldwork was conducted to gather new data on the current distribution of the striped hyena in key habitats in Pakistan. This was including the following steps:

Study Areas and Sampling Sites

The study focused on several critical habitats where striped hyenas have historically been found, including:

Kirthar National Park (Sindh)

Hingol National Park (Balochistan)

Cholisthan Desert (Punjab)

Karunjhar Hills (Sindh)

Sampling sites were chosen based on historical sighting records and local conservation reports. These areas represent the core and marginal habitats of the striped hyena, allowing for a comprehensive understanding of its ecological needs and threats.

Camera Trap Surveys

To assess the presence, density, and distribution of the striped hyena, camera trap surveys will be conducted at each study site. Camera traps were set up at strategic locations such as water sources, paths, and near carcasses (to attract hyenas). These surveys were help provide indirect evidence of hyena presence and activity patterns. The camera traps were placed for a minimum of two months to allow for enough data to be collected.

Data to be collected: Number of independent hyena sightings, frequency of sightings, time of activity (diurnal/nocturnal), and group size.

Analysis method: The data from the camera traps will be analyzed using capture-recapture models to estimate population size and density (Kery & Schaub, 2012).

Field Observations and Interviews

Direct field observations were used to record signs of hyena activity (e.g., scats, tracks, and dens). In addition to field observations, semi-structured interviews were conducted with local herders, farmers, park rangers, and wildlife conservationists to gather information on human-wildlife interactions, including the perception of hyenas, the extent of human-wildlife conflict, and livestock depredation incidents. These interviews helped to provide a socio-cultural context to the conservation challenges and offer insights into local attitudes toward hyenas.

Data to be collected: Reports of conflict, livestock kills, sightings, and traditional beliefs regarding hyenas.

Analysis method: Thematic analysis was used to identify common themes and issues related to human-wildlife conflict and conservation attitudes (Braun & Clarke, 2006).

Road Mortality Monitoring

Given that roadkill is a significant threat to the species (Shah et al., 2021), road mortality monitoring was conducted along key roads in the study areas. Observations will focus on the number of hyenas found dead on roads and the correlation between road density and mortality rates. This data helps assess the extent of road kill as a threat to hyenas and identify **high-risk zones** that require mitigation.

Data to be collected: Number of hyenas killed on roads, species identification, time of occurrence.

Analysis method: A spatial analysis was conducted to identify high-risk zones using Geographic Information Systems (GIS) (Hassan et al., 2019).

Data Analysis

Population Estimation

The camera trap data was analyzed using capture-recapture models to estimate the population size of the striped hyena in each study area. The Mark-Recapture method will be applied using Program MARK (White & Burnham, 1999), which was provide estimates of hyena density and detectability.

Human-Wildlife Conflict Analysis

The qualitative data from interviews and field observations was coded using NVivo software to identify key factors contributing to human-wildlife conflict. Statistical analysis was performed to assess the relationship between hyena activity and livestock loss, and the effectiveness of conflict mitigation strategies like livestock enclosures and carcass disposal.

GIS Mapping

Spatial data from road kill monitoring and camera trap surveys were analyzed using ArcGIS software to create habitat suitability models and map the distribution of hyenas across the study sites. This helps to identify potential corridors for future conservation efforts.

Ethical Considerations

All fieldwork was followed ethical guidelines to ensure the welfare of the animals and the safety of local communities. The study will involve minimal disturbance to wildlife, and all camera traps will be placed in accordance with ethical standards for non-invasive data collection. Informed consent will be obtained from all interviewees, and their privacy was be respected.

Discussion

The striped hyena (*Hyaena hyaena*) in Pakistan faces multiple challenges that threaten its survival, despite its significant ecological role as a scavenger in arid and semi-arid ecosystems. As outlined in the literature, the striped hyena plays a crucial role in maintaining ecosystem health by removing carcasses, promoting nutrient cycling, and preventing disease outbreaks in rural and remote landscapes (Hussain et al., 2020). The species' ecological contribution is especially vital in the dryland ecosystems of Sindh, Balochistan, and Punjab, where the scavenger role becomes more pronounced due to limited natural predators for carcasses.

Population Decline and Human-Wildlife Conflict

One of the primary reasons for the decline in striped hyena populations in Pakistan is habitat loss and fragmentation. As agricultural expansion, urban development, and infrastructure projects continue to encroach upon hyena habitats, the species finds itself confined to smaller, isolated areas (Loveridge et al., 2017). The increase in human-wildlife conflict, specifically through livestock depredation and retaliatory killings, further exacerbates the threat to the species. As local communities often perceive hyenas as threats to livestock, they are killed or driven away (Akhtar & Shah, 2018). Despite hyenas' primary role as scavengers, their presence near human settlements or livestock pens frequently leads to conflict, as farmers see them as competitors for carcasses.

In addition to human-wildlife conflict, illegal hunting and the wildlife trade further contribute to the decline in striped hyena numbers in Pakistan. Hyenas are hunted for their fur, bones, and body parts, which are often used in traditional medicine or rituals

(Ahmed & Ali, 2016). These pressures, combined with insufficient law enforcement in remote areas, make it difficult for conservation efforts to succeed.

Road Mortality and Conservation Challenges

Another key threat is road mortality. As highlighted in the field monitoring data, hyenas are frequently killed on roads, particularly in regions with expanding road networks such as Kirthar National Park and Cholistan Desert (Shah et al., 2021). Roadkill often occurs when hyenas, which are primarily nocturnal and roam widely for food, cross busy roads in search of carrion. Road mortality is especially critical in fragmented habitats, where the isolated nature of populations increases the risk of inbreeding and genetic bottlenecks, potentially affecting long-term species survival (Hassan et al., 2019).

Human Perception and Cultural Factors

The negative cultural perceptions surrounding the striped hyena also play a significant role in its decline. As hyenas are often linked to bad omens or seen as pests, local communities tend to view them with hostility. This view is compounded by traditional beliefs, where hyenas are sometimes considered dangerous or malevolent creatures. Changing these perceptions is key to reducing conflict and fostering a more conservation-friendly attitude (Gillingham & Lee, 2003). Educating local communities about the ecological importance of hyenas and their role in maintaining the balance of ecosystems is essential for improving the conservation status of the species.

Conclusion

The striped hyena is an ecologically important species in Pakistan, playing a crucial part in the health of the ecosystem as a scavenger and nutrient recyclers. There are however a number of issues that have caused a dramatic drop in the population of the species, such as habitat loss, human-wildlife conflict, poaching and road kills. All these have put the striped hyena in a Critically Endangered condition in Pakistan where not more than 500 individuals are left in fragmented populations. In addition, there is a lack of updated information on the species' population size and distribution, which further hinders conservation efforts, and effective protection measures are needed.

Conservation strategies need to be able to help solve the issues of human-wildlife conflict, as well as the habitat fragmentation issues. From the literature and field observations, it is obvious that the striped hyena is a misunderstood species by the local people and this plays an important role in their persecution. Thus, community involvement and community education should be part of any conservation plan. Additionally, measures to combat roadkill and strengthen anti-poaching legislation are crucial for the species' survival.

Recommendations

National Population Survey and Habitat Assessment

A comprehensive national survey of striped hyena populations is essential for accurate data collection. Camera trap surveys, field observations, and genetic monitoring should be implemented across known habitats, including Kirthar, Hingol, and Cholistan. These efforts should also include a habitat assessment to identify core areas and critical corridors that require protection and restoration. Such data will be crucial for determining the conservation priorities and developing effective management strategies.

Conservation of Critical Habitats

Priority should be given to the protection of key habitats such as Kirthar National Park, Cholistan Desert, and Hingol National Park. These regions are critical refuges for striped hyenas, and their protection should be central to any conservation plan. In addition, the creation of wildlife corridors linking isolated populations should be prioritized to facilitate genetic exchange and reduce the risks of inbreeding.

Community Engagement and Education

Efforts to reduce human-wildlife conflict should be a cornerstone of striped hyena conservation in Pakistan. Community-based initiatives aimed at educating local communities about the ecological importance of hyenas and mitigating conflict through the promotion of livestock management techniques, such as night enclosures and carcass disposal systems, should be expanded. Compensation schemes for verified livestock losses to hyenas can also help improve relations between local communities and hyenas.

Roadkill Mitigation

Given the high mortality rate of striped hyenas due to roadkill, a roadkill mitigation plan should be developed for regions with high road density, such as Kirthar National Park and Cholistan Desert. This plan should include the establishment of wildlife crossing structures and fencing to reduce hyena mortality, as well as awareness campaigns targeted at drivers in high-risk areas.

Stronger Enforcement of Anti-Poaching Laws

Improved law enforcement and stronger penalties for poaching are essential to protect striped hyenas from illegal hunting and trade. Collaborative efforts between local authorities, conservation organizations, and community groups should be strengthened to curb illegal activities. Additionally, monitoring the illegal wildlife trade through surveillance and sting operations could help dismantle trafficking networks.

Regional Cooperation

As the striped hyena's range extends beyond Pakistan, regional cooperation between Pakistan, Afghanistan, and Iran is vital for addressing transboundary threats and promoting conservation efforts. A regional conservation framework should be developed, focusing on shared habitats, wildlife corridors, and data sharing to ensure coordinated conservation measures.

International Collaboration and Funding

Pakistan should seek international collaboration with organizations such as the IUCN, CITES, and the Convention on Migratory Species (CMS) to secure funding and technical assistance for striped hyena conservation. Partnerships with international NGOs could provide much-needed resources for monitoring, habitat restoration, and community outreach programs.

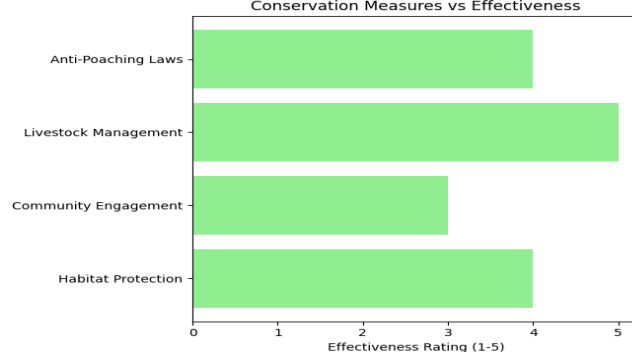
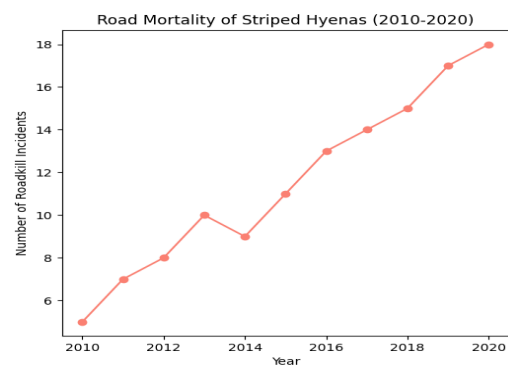
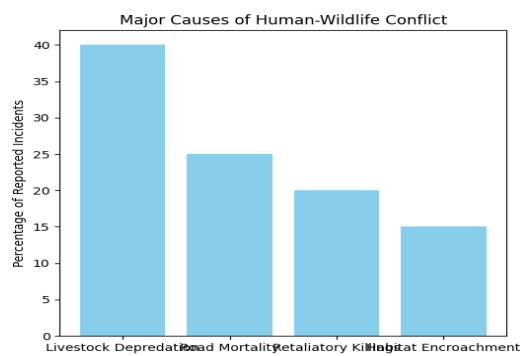
Table: 1. Population Distribution

A table summarizing the distribution of the striped hyena across different regions of Pakistan would be helpful. This can include known populations, sighting frequencies, and any available data on population size or density.

Region/Area	Known Population (Est.)	Number of Sightings (Last 5 years)	Threats Identified
Kirthar National Park (Sindh)	~150	20	Habitat loss, Poaching
Hingol National Park (Balochistan)	~80	10	Road mortality, Conflict
Cholistan Desert (Punjab)	~100	15	Human-wildlife conflict, Poaching
Karunjhar Hills (Sindh)	~50	5	Habitat fragmentation

Table: 2. This table could summarize various conservation efforts, such as habitat protection, community engagement, or livestock management, and evaluate their effectiveness based on available data or case studies.

Conservation Measure	Description	Effectiveness Rating (1-5)	Comments
Habitat Protection (National Parks)	Establishing and enforcing protected areas	4	Effective in limiting habitat degradation
Community Education and Engagement	Educating locals on hyena ecology and conflict mitigation	3	Needs more widespread implementation
Livestock Management (Night Enclosures)	Introducing better livestock pens to prevent hyena access	5	Reduces conflict significantly
Anti-Poaching Laws & Law Enforcement	Increasing patrols and legal actions against poaching	4	Successful but under-enforced in remote areas



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