LGU Journal of
LIFE SCIENCES

LGU Society of Life Sciences

DOI: https://doi.org/10.54692/lgujls.2023.0704xxx

Paper Submission: 20th April, 2023; Paper Acceptance: 5th Dec 2023; Paper Publication: 22nd Dec 2023

Research Article
Vol 7 Issue 4 October - December 2023

LGU J. Life. Sci
ISSN 2519-9404
eISSN 2521-0130

The Decline of Wild Carnivores and Their Conservation Efforts in Pakistan-A Review

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ABSTRACT: *Pakistan once had a thriving and diverse fauna. However, there has been a significant decline in the wildlife population since the late 1800s. The primary factors contributing to this population decline include human encroachment, conflict with natives and habitat damage. Technological development and climatic change have also contributed to the loss of wildlife. Despite extinction being a natural process, the pace at which it is happening currently is unusual. The ultimate objective of wildlife conservation is to guarantee the survival of these species, which are essential for sustaining the stability of our environment. To fight these extinction pressures, conservation practices and policies have been implemented, including the creation of protected areas for plants and wildlife. In the current study, the main focus has been on the critically endangered mammal species in Pakistan, the factors contributing to their loss, and the necessary conservation measures already being implemented nationally as well as globally.*

Keyword: Conservation, Pakistan, Ecosystem, Wildlife, Threats, Mammals

INTRODUCTION

Pakistan is situated at the intersection of the Middle East and Central Asia in two distinct geographic zones, the Oriental and Palearctic. Pakistan is mostly a semi-arid to arid country, and its forests cover only covers 3.8% of its land. The topography and environmental factors have an impact on the variety of plants and animals (Aslam et al., 2022). In the last 200 years, humans have taken over landscapes, and nearly every ecosystem on Earth has been impacted by human activity. Human activity has altered 40–50% of the Earth's surface, with 10-15% of that area designated for various land uses like urbanization, agriculture, and irrigation, and another 6–8% for pasture conversion (Khattak et al., 2021). Human activity deprives wild animals of the necessities for life by destroying or depleting their environment and creating human pain (Paquet and Darimont, 2010). Due to the agricultural, industrial, and urban development in Pakistan, a number of wildlife species have reached near extinction (Ahmed, 1980).

Having a thorough understanding of the environmental and biological elements that ensure species longevity is necessary to sustain viable populations of any animal species (Comizzoli et al., 2010). As a result of the widespread reduction of numerous wild species, various modules of captivity, including zoos, sanctuaries, and wildlife parks, have been introduced as part of their conservation strategy (Sajjad et al., 2012). The Punjab Wildlife Act of 1974 had designated the plantations and prospective regions in the sub-mountain tract as wildlife sanctuaries (WS) and game reserves (GR) for the conservation of wildlife species (Bibi and Ali, 2013). The establishment of the Khunjerab National Park in northern Hunza on April 29, 1975, was a crucial step towards conservation (Schaller, 1976).

Up to 174 mammal species have been reported in Pakistan. There are at least three endemic species and a number of endemic and non-endemic subspecies (Baig and Al-Subaiee, 2009). Two conservation methods: In-situ conservation and ex-situ conservation are used on a global scale to prevent the extinction of species that are in danger. The in-situ method conserves animals while they are still in their natural habitat. Ex-situ techniques involve taking animals out of their native habitat and keeping them in zoos, safaris, and other facilities for captive breeding (Khan et al., 2014). When the variety of taxa in a particular ecosystem changes due to the extinction or introduction of

taxa, the ecosystem's ability to absorb pollution, preserve the fertility of soils and microclimates, cleanse water, and perform other ecological services also changes (Chardonnet et al., 2002). The mountains will still be beautiful without animals, but a spark of life will also have vanished when some of the most breathtaking animals are nowhere to be seen, turning the summits into silent stones (Schaller, 1976).

The essence of an ecosystem is not the species itself, but the way they interact. While zoos may temporarily preserve a species' genetic resources, they fall well short of preserving the interrelationships and emergent qualities that are the essence of an ecosystem (Nabhan, 1994). Therefore, it is necessary to conserve the endangered wildlife species and prevent the endangerment of the remaining species as they form a vital part of the ecosystem and are necessary for it to thrive. Pakistan accommodates a very diverse and major fauna which requires routine monitoring since the wildlife numbers are decreasing at an alarming rate. Considering the declining wildlife, animal populations have been conserved through a variety of conservation projects around the globe which should be implemented in Pakistan as well. Some of the endangered and critically endangered wild carnivores and the measures adopted for their conservation have been mentioned below.

MATERIALS AND METHODS

To conduct a comprehensive review on the conservation of wild carnivores in Pakistan, 250 papers were systematically reviewed, prioritizing those providing insights into the conservation status and challenges faced by wild carnivores in Pakistan. Information on carnivore species, their conservation status, conservation measures, human-wildlife conflicts, and the economic impact of carnivores on local communities was collected. Papers lacking substantial information, duplicates and articles not available in English were excluded and 186 papers were selected after extensive reading from google scholar data base. Accurate citation of sources for each piece of information, utilizing a standardized citation format was ensured by using Endnote 20.

(1) ASIATIC CARACAL (*Caracal caracal schimitzi*)

The Caracal is very similar to the Serval (*Leptailurus serval*) and the African Golden Cat (*Caracal aurata*) (Avgan et al., 2016). The silvery black-backed ears and long, tufted black hair are its most striking features (Moqanaki et al.,

2016). The caracal's distinct ears are thought to act as "flags" which give an indication of the animal's mood (Burton and Burton, 2002). Caracals are nocturnal and elusive but they may be active during the daytime (Castello et al., 2020). Indian emperors used to train caracals to hunt small animals (Singh et al., 2015). It was the only felid other than the cheetah used by the Mughal emperors for hunting (Sharma et al., 2013). Caracals usually feed on small stock e.g. sheep, goat and rarely resort to mass killings (Avenant and Nel, 2002). Classified as critically endangered in the 2003 (Molur, 2003).

Distribution Around the Globe

The caracal (*caracal caracal*) holds vital significance in West Asia, Middle East Africa, and the Turkish Mediterranean (Unal, 2023). The species is designated as endangered in Jordan, critically endangered in Pakistan, and least concerned in the Arabian Peninsula. Caracal is least concerned in Morocco while the felid has already reached extinction in Kuwait, some parts of Turkmenistan, and is thought to be on the verge of extinction in many regions of North Africa (Fig. 1) (Avgan et al., 2016).

Distribution in Pakistan

In Pakistan, the caracal was native to Baluchistan and Sindh (Sharma et al., 2013). There is currently no comprehensive information on the distribution or abundance of the caracal in Pakistan. The caracal is said to inhabit the hills of Baluchistan, Thal and Cholistan desert in Punjab and The Thar in Sind. According to the minimal information available on the caracal in Pakistan, the felid is reported to be conserved in Hazarganji-Chiltan National Park, Kirthar National Park, Lal Sohanra National Park, and Kutch Wildlife Sanctuary (Fig. 1).

Threats to Conservation

Regarding the dangers to its preservation, there isn't much information in Pakistani literature. Human pressures such as habitat degradation, hunting, and habitat disturbance continue to have an impact on the remaining caracal populations (Eid et al., 2022). Due to the increasing complexity of the difficulties involved in balancing the demands of humans and wildlife species, managing carnivores that have adapted to agricultural landscapes is a significant challenge for wildlife managers and private land owners (Ramesh et al., 2017). The caracal frequently attacked livestock and poultry in close proximity to human areas. This behavior caused friction with

people, endangering its survival in many places in its range (Hassan-Beigi 2015). Local farmers in South Africa's dry Karoo region reported an increase in the incidence of jackal and caracal predation on small livestock in the 2010s. Lethal control of these mesocarnivores was considered as the only possible solution (Drouilly et al., 2021). Lack of information about caracals and the unknowable effects of conflict on their population could have been a contributing factor in pushing the species into an endangered status (Unal, 2023).

Conservation Status and Measures in Pakistan

The caracal is endangered in Pakistan (Avgan et al., 2016). Pakistan, Egypt, Algeria, Israel, Jordan, Turkey, Uzbekistan, Syria, Morocco, Tajikistan, Afghanistan, Iran are some of the countries which have banned hunting caracals as a conservation measure (Avgan et al., 2016). The intactness and stability of carnivore populations after reintroductions may potentially increase intraspecific competition levels. In addition to prey abundance, multiple other variables must be considered in future carnivore density estimates to optimize park management (Ramesh et al., 2017).

(2) STRIPED HYAENA (*Hyaena hyaena*)

The striped hyena is an average-sized predator with pointed ears that are pale brown in color (Neupane et al., 2021). Hyenas have excellent survival skills. Their fore limbs are longer than their hind limbs, resulting in a slanted back posture. They have more curved bones than felids making them similar to canids. Their sturdy forelimbs allow them to seek prey that is larger than them (Akash et al., 2021). The striped hyena was more omnivorous than the spotted hyena (Crocuta crocuta), scavenging a wider range of food items (Alam & Khan, 2015). Male and female hyenas are almost indistinguishable. The authors of the most recent paper on spotted hyenas discovered that males and females appeared "so similar that sex could only be determined with certainty by palpation of the scrotum" (Gould, 1981). Males are slightly larger than females (Neupane et al., 2021). They were classified as critically endangered (Molur, 2003).

Distribution Around the Globe

The striped hyena has an extensive distribution that stretches from East and North-East Africa through the Middle East, the Indian subcontinent and Central Asian regions (Wagner, 2006).

Hyenas are among the most prevalent big carnivore in Africa, with populations found in a number of nations, including Ethiopia (Fig. 1) (Abay et al., 2011)

Distribution in Pakistan

The striped Hyena is found in Kirthar Mountain range, hills surrounding Quetta in Balochistan, at the border with India near Lahore, DG Khan, DI Khan Attock, Mardan in KPK (Roberts & Bernhard, 1977). Its recently known localities include Kall, Bhal, Palugram, Daphar plantation, Jalspark, Qaderabad, Sukh Beas near Chunian, Changa Manga and Kirthar National Park according to a document published by the University of Sargodha. (Figure 1)

Threats to Conservation

Conflict between people and wildlife are commonly acknowledged as one of the most problematic concerns for wildlife conservation worldwide (Tona and Tarcha, 2020). The hyena may have been subjected to environmental stress and range fragmentation in both Europe and Africa, however the implications of these hypothetical range contractions may have differed in each continent (Varela et al., 2010). Many animals make use of seasonal resources, such as ones for hiding, foraging, and reproducing. As a result, some species are vulnerable to climate change, because temperature change disturbs their life cycle (Bhandari et al., 2022).

Conservation Status and Measures in Pakistan

The IUCN has classified them as a threatened species due to their impaired population size, which has reduced drastically within their distribution region in Pakistan (Alam & Khan, 2015). According to a study conducted in Azad Kashmir, Pakistan, disease is the primary factor responsible for livestock loss, which is not usually reported in the scientific literature on human-wildlife conflict, and it disproves the concept that predators are always the primary culprits in livestock loss (Dar et al., 2009). The IUCN's conservation strategy plan devotes an entire chapter to 'Cultural and Public Attitudes: Improving the Relationship between Humans and Hyenas'(Gould, 1981).

(3) LEOPARD (*Panthera pardus*)

The leopard (*Panthera pardus*) is a solitary and reclusive big cat. Its female's territory overlaps the larger territory of similarly solitary male (Hayward et al., 2006; Jacobson et al., 2016). It is the most common member of the big felids. Leopards are highly variable morphologically weighing between 20 and 90 kg in adulthood. In order to maintain body mass, they

require between 2 and 5 kilogram of meat per day (Hayward et al., 2006). The common leopard inhabits a broad range of environments and feeds opportunistically on a number of prey species (Borah et al., 2014). Classified as critically endangered (Molur, 2003).

Distribution Around the Globe

The leopard (*Panthera pardus*), one of the top predators in its habitat, has the broadest distribution range of any felid species (Akrim et al., 2018). It is found in Africa, as well as from Russia to Java (Akrim et al., 2018). The habitat of leopards varies widely. Tropical woods, grassland plains, deserts, and alpine environments are all suitable for this species (Fig. 1)(Jacobson et al., 2016).

Distribution in Pakistan

Despite being very adaptable and widespread in Africa and Asia, the leopard is endangered in Pakistan. It is present in the Pakistani provinces of Punjab, Khyber-Pakhtoonkhwa, and Azad Jammu & Kashmir, Sindh and Balochistan (Akrim et al., 2018). The forested parts of the Himalayas: the Galliat in Khyber Pakhtunkhwa province and the Neelam Valley in Azad Jammu and Kashmir, were the leopard's main habitat in Pakistan (Shehzad et al., 2015). (Figure 1)

Threats to Conservation

Since the year 2000, there have been rising reports of conflict between the leopards and humans in the Himalayan forests, with both sides suffering from casualties (Shehzad et al., 2015). Many ecological, biological, and anthropogenic factors contribute to the global loss of this carnivore species (Kabir et al., 2014). The cascading effects of climate change are expected to have a severe impact on ecosystems, affecting a wide range of trophic levels and species interactions (Baral et al., 2023). Large carnivores, in particular, are vulnerable to such conflicts due to their vast home ranges and food requirements, which increasingly overlap with the needs of humans (Kabir et al., 2014).

onservation Status and Measures in Pakistan

The leopard is classified as Vulnerable by the IUCN (Jacobson et al., 2016). One of the most difficult conservation concerns is protecting large carnivores with the expanding human populations, agricultural expansion, and over-use of natural resources (Shehzad et al., 2015). Any efforts to reduce human-leopard conflict and conserve the species in conflict should be built on a clear understanding of the conflict patterns (Kabir et al., 2014). The Khyber Pakhtunkhwa Wildlife Department has

organized a series of consultative workshops to assist in developing an effective plan for the common leopard's conservation in Pakistan (Shehzad et al., 2015). Research on the effects of climate change on the common leopards and their suitable habitat in the Himalayan region under climate change scenarios is critical for future conservation (Baral et al., 2023).

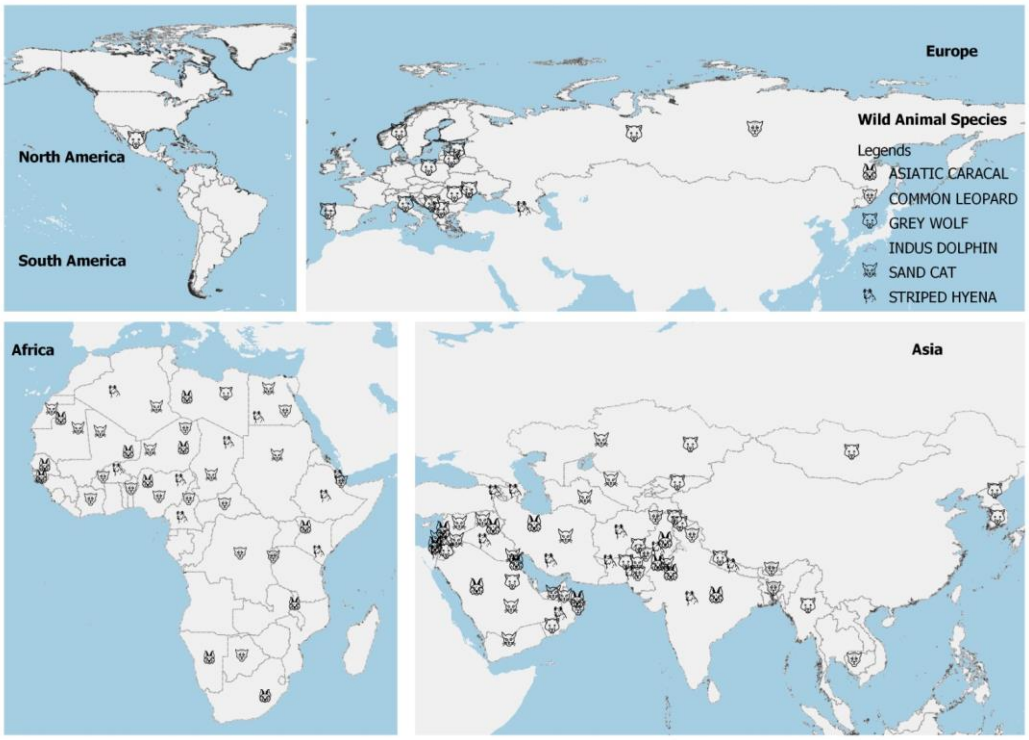

Fig. 1: Distribution map of wild carnivores around the world and in Pakistan

(4) SAND CAT (*Felis margarita*)

The sand cat (*Felis margarita*), a felid species, is closely associated with desert environments. There are four subspecies known from the deserts of Asia and Africa (Huang et al., 2002). The sand cats are adapted to highly arid settings, including shifting sand dunes, hence one of their early names, "Sand dune cats" (Sausman, 1997). In Pakistan, the sand cats change their hunting behavior to match that of their prey by becoming nocturnal in the summer and crepuscular in the winter (Cunningham, 2002). Most sand cats have sand to straw grey shade, with the abdomen being slightly darker than the back. Each cheek has a reddish line that extends from the corner of the eye. The tail has two to three rings, a black tip, and is around 30 cm long (Sausman, 1997). The 39 sand cats that were collected in a study in the winter

ranged in weight from 1.32 to 2.95 kg and had tail lengths that varied from 21 to 28.5 cm and 43 to 53 cm, respectively (Breton et al., 2022). They have a broad face with well-developed cheek whiskers and huge ears that are positioned very low on the head (Sausman, 1997). Classified as Critically endangered (Molur, 2003).

Distribution Around the Globe

The desert regions of Arabia, Pakistan, the Sahara, and Soviet Central Asia are home to the nocturnal Sand cat, Felis margarita (Sausman, 1997). The natural distribution area of the Sand Cat covers a large portion of North Africa, the Sinai Peninsula, Israel/Palestine, Jordan, Iran, Pakistan, Afghanistan, the Central Asian Republics, and Arabia (Cunningham, 2002). The arid regions of North Africa, the Arabian Peninsula, Pakistan, and Soviet Central Asia—particularly those with sand dunes—are home to four subspecies (Sausman, 1997). (Figure 1)

Distribution in Pakistan

The sand cat is one of the seven of these species which are critically endangered in Baluchistan (Ghalib et al., 2007). The sand cat is primarily found in Baluchistan and Nushki quoting a recent document published by the University of Sargodha. (Fig. 1) Detailed research on its distribution in the different areas of Pakistan is still to be formulated and carried out.

Threats to Conservation

Felis margarita is listed as LR (Lower risk) / LC (Least concern) on the IUCN Red List of Threatened Species (2000), but its actual status is unknown throughout much of its range. Because it does not meet the criteria for Critically Endangered, Endangered, Vulnerable, and of least concern, it is classified as a Lower Risk taxon (Cunningham, 2002). Commercial dealers began exporting a population from Pakistan in 1967, mostly to Europe and the United States, and by 1972, the species had become endangered here (Sausman, 1997). Stress during travels, illnesses, injuries, and incompatibilities with show companions can all result in the loss of significant individuals which must be prevented (Witzenberger and Hochkirch, 2013). According to a particular account, a shepherd killed kittens and destroyed a Sand Cat den in revenge for a lamb that had been killed by a Sand Cat (Brighten and Burnside, 2019).

Conservation Status and Measures in Pakistan

A reliable Pakistani source with in-depth information about its

endangerment could not be located. According to the limited information which exists about its status, the sand cat is critically endangered in Pakistan. Procedures like artificial insemination, embryo transfer, and cryopreservation of sperm and embryos, has been promoted as a method to preserve threatened wildlife populations (Swanson, 2006). Sand cats should be kept in a dry area with minimal temperature and humidity fluctuations because they are particularly susceptible to respiratory illnesses (Cunningham, 2002). Growing human populations and economic development are fundamentally altering natural landscapes, along with ongoing range shifts for many species in response to recent global warming. Consequently, managing appropriate habitats and biological corridors beyond the current protected areas network based on the needs of surrogate species can be a cost-effective conversation strategy (Khosravi et al., 2019).

(5) WOLF (*Canis lupus*)

The largest member of the Canidae family is the grey wolf (Canis lupus), which has a head and body length of 100–150 cm, a shoulder height of 66–81 cm, and a weight range of 16–60 kg (Saad et al., 2015). The critically endangered Indian wolf, Canis lupus pallipes, prefers to live in agro-pastoral settings influenced by humans and stays away from forested areas (Jethva and Jhala, 2004). Indian grey wolves (Canis lupus pallipes) and Tibetan wolves (Canis lupus chanco) are two of the wolf subspecies that live in Pakistan. They form packs, which are often family units made up of an "alpha pair" of dominant males. Their offspring can range in size from 8 to 30, but typically they are smaller (8 to 12 individuals) (Saad et al., 2015). Due to its involvement in the predation of cattle, the Indian grey wolf is endangered throughout much of its territory (Sharma et al., 2019). It was classified as endangered in the 2003 (Molur, 2003).

Distribution Around the Globe

The grey wolf (Canis lupus), which was once one of the most extensively dispersed mammals, now only inhabits largely wild and isolated places. Despite several Asian countries having wolf populations that are among the most threatened and lacking in data, the wolves of Asia are less studied than those of North America and Europe. In Pakistan, where many of its great carnivore species are extinct, this is especially important (Hamid et al., 2019). The Indian Grey Wolf was formerly the mammal with a range that included the Indian subcontinent and the

Holarctic (Gaubert et al., 2012). In the states of Rajasthan, Orissa, Bihar, West Bengal, Uttar Pradesh, and Haryana, there are reportedly isolated regions where Indian grey wolves can be found (Fig. 1) (Singh and Kumara, 2006).

Distribution in Pakistan

The Indian grey wolf (Canis lupus pallipes) and Tibetan wolf (Canis lupus chanco) are the two subspecies of wolves that are currently known to exist in Pakistan; however, more genetic information is needed to determine their exact location within the Canis lupus clade (Hamid et al., 2019). Several protected regions, including Kirthar National Park, Chumbi-Surla Wildlife Sanctuary, Hazarganji-Chiltan National Park, Hingol National Park, Cholistan, and Lal Sohanra National Park, are home to Indian grey wolves (Saad et al., 2015). A recent study in the Salt Range of Punjab discovered the population to be present in small patches of scrub woods, with an estimated six individuals spread out over an area of 88 km2 within Lehri Nature Park (Hamid et al., 2019). (Figure 1)

Threats to Conservation

In Pakistan, wolves are hunted down and killed by shooting, poisoning, and smoldering their dens as revenge for predation on sheep and goats. High human population, expanded agricultural practices, urbanization, grazing pressure, removal of forests, and a lack of readily available wild prey all contribute to habitat loss (Saad et al., 2015). Conflict between humans and wolves is posing a severe threat to their long-term survival (Sharma et al., 2019). Compared to nomadic shepherds, local shepherds are more hostile to wolves. The grey wolf was hunted, had their dens smoked in, and had their pups dug out and killed (Saad et al., 2015). The large carnivores need a lot of space and a wide range of different prey animals. However, given the current circumstances, maintaining such situations has become a difficult task for forest managers (Sharma et al., 2019).

Conservation Status and Measures in Pakistan

The grey wolf is critically endangered in Pakistan (Jethva and Jhala, 2004). Respondents were questioned regarding their preferences for controlling grey wolves, which included lethal control and habitat enhancement (such as preserving and protecting the grey wolf's natural prey) (Hamid et al.,

2019). Understanding the range and population status of long-ranging species like wolves is essential for their conservation and management (Sharma et al., 2019). The best chances for the wolf's long-term survival are found in environments with a stable population and little conflict (Jethva and Jhala, 2004). Activities like planting new trees or changing the way the landscape is laid out to increase habitat could be ineffective or cause increased stress upon the species (Sharma et al., 2019).

(6) INDUS DOLPHIN (*Platanista minor*)

The Indus River dolphin is a freshwater cetacean that can only be found in the Indus River system in Pakistan and India. It is an endangered species (Braulik et al., 2015). It traces a flipper along the river's bottom as it swims on its side. It swims to the surface after 40 seconds or more, rotates upright to breathe, then swims back to the bottom while rotating 90 degrees. Other than the Ganges River Dolphin, no other dolphin consistently exhibits this peculiar side swimming behavior (Waqas et al., 2012). Due to their unique evolutionary history and precarious state, Indus dolphins, often known as "blind dolphins" because of their small eyes and poor vision, are creatures of high conservation priority (Braulik et al., 2015). The dolphins in the two distinct rivers have nasal crests that are different from one another (Kasuya and Nishiwaki, 1975). The characteristics of the Indus River Dolphin include a long snout, rounded belly, stocky body, little dorsal fin, and huge flippers (Waqas et al., 2012). Blind dolphins may be charismatic predatory species, but little is known about their fundamental biology (Braulik et al., 2015). Classified as endangered (Molur, 2003).

Distribution Around the Globe

Barrages have divided the range of Indus dolphins into 17 river segments. Surveys of dolphin sightings and interviews revealed that dolphins are no longer found in ten river sections, are still present in six, and are unknown in the stretch of the Sutlej River that is along the India-Pakistan border. On the Indus mainstem, there are currently five subpopulations of Indus dolphins, which are separated by the Jinnah, Chashma, Taunsa, Panjnad, Guddu, Sukkur, and Kotri Barrages (Fig. 1) (Braulik et al., 2015).

Distribution in Pakistan

The Indus, Jhelum, Ravi, Chenab, and Sutlej Rivers, which flow from the foothills of the Himalayas to the estuary and have a linear length of around 3500 km, are where Indus dolphins were first

discovered in the mid-1870s. It appears that they never joined the ocean. They were described as being prevalent in Kalabagh all the time and upstream as far as Attock in April. In northern Sindh, between the Guddu and Sukkur barrages, is where the largest and most significant subpopulation is found (Fig. 1) (Braulik et al., 2015).

Threats to Conservation

It is crucial to point out that, in addition to Pakistan, many other nations share responsibility for what happens to the Indus Dolphins and the numerous other animals that are impacted by large-scale water development projects. By assisting in the planning and financing of water megaprojects, foreign governments are attempting to support Pakistan's economic growth and alleviate poverty on the subcontinent. We sincerely hope that they are not doing so at the expense of the consumer country's, and subsequently the world's, ecological heritage (Reeves et al., 1991). Dolphins frequently accidentally get caught in fishing nets. These animals were once hunted and harpooned by neighborhood fishermen for use as bait, medicine, food, and oil (Waqas et al., 2012). In Sindh at the beginning of the 1970s, dolphin hunting was common, and numerous boats were outfitted to capture them (Braulik et al., 2015).

Conservation Status and Measures in Pakistan

The Indus River Dolphin is the second most endangered freshwater dolphin population (Waqas et al., 2012). The most suitable approach for conserving them remains unclear because it is uncertain what elements affect their survival and what causes a decline in their number (Braulik et al., 2015). Two possible ways were concluded to be adopted as preventive measures. One is to put a halt to this dolphin poaching. To do this, educational propaganda will be required to refute the false belief in the therapeutic value of dolphin oil. The other is to maintain a given section's water level above a predetermined level during the winter. This appears to be only conceivable by successfully utilizing the water resources economically (Kasuya and Nishiwaki, 1975). When the Wildlife Acts of Sindh, Punjab, and Khyber Phakhtunkhwa (KP) Provinces were approved and a reserve for the Indus dolphin was established between Guddu and Sukkur barrages, the dolphin became a protected species. After a few years and a few legal actions, dolphin hunting in Sindh came to an end (Braulik et al., 2015). In order to conserve the species, WWF - Pakistan has been working with the wildlife departments in Sindh, KP,

and Punjab. To help preserve the threatened species across its entire range, WWF-Pakistan has worked particularly on the Pakistan Wetlands Program and the Indus River Dolphin Conservation Project (Waqas et al., 2012).

TABLE 1: Wild carnivores, their distribution, conservation status and efforts for conservation in Pakistan

	DISTRIBUTION WORLDWIDE	DISTRIBUTION IN PAKISTAN	IUCN STATUS	IUCN STATUS IN PAKISTAN	CONSERVATION PROJECTS
ASIATIC CARACAL *(CARACAL CARACAL SCHIMTZI)*	Africa, The Middle East, Central and South Asia	Hills of Baluchistan and the deserts of Sind and Punjab, the Thal desert and the Cholistan desert	Least Concern	Critically endangered	1. Systema Naturae's Conservation of Asiatic Caracal, 2. Ranthambhore's Conservation Project, 3. Ensemble Modeling Approach for Asiatic Caracal, 4. Wildlife of Pakistan - Conservation Projects
STRIPED HYENA (*HYENA HYENA)*	North and East Africa, the Middle East, the Caucasus, Central Asia, and the Indian subcontinent	Baluchistan and Sind Kohistan, including the hill ranges surrounding Quetta city in Baluchistan and the Kirthar mountain range in Sindh	Near-threatened	Critically endangered	1. MBZ Species Conservation Fund, 2. WWF-P Conservation projects
LEOPARD (*PANTHERA PARDUS)*	Africa, South West and Central Asia, India and South East Asia	Galyat, Murree, Sawat and Kashmir	Vulnerable	Critically Endangered	1. WWF-Pakistan Leopard Conservation Project, 2. Leopard Conservation Case Study
SAND CAT (*FELIS MARGARITA)*	The desert ranges of the Sahara in Africa, the Arabian	The Chagai desert in southwest Baluchistan,	Least Concern	Not well-documented	1.Establishment of the protected area

	Peninsula, and southwest Asia, including countries such as Iran, Pakistan, and Afghanistan	Pakistan			
WOLF *(CANIS LUPUS)*	The dry Arabian desert, the xeric Mediterranean shrublands, and the coniferous forests of Siberia	The southern mountains of Balochistan to the northern regions of Gilgit-Baltistan	Critically Endangered populations in Germany and western Poland, Endangered populations in Western-Central Alps and Scandinavia, and Near Threatened populations in Iberia, Finland, and Russia.	Endangered	
INDUS DOLPHIN (*PLATANISTA MINOR*)	The lower reaches of the Indus River in Pakistan	The Indus, including the Chenab, Jhelum, and Sutlej rivers	Endangered	Vulnerable	1. Protecting Indus River Dolphin program, 2. Dolphin rescue program

CONCLUSION

This paper highlights the alarming decline of some of the major wild carnivore species in Pakistan, indicating the urgency of addressing the issue. Since, the wild carnivores cause a decrease in livestock numbers in their native regions which is a major cause of animal-human conflict leading to the illegal hunting of these wild species and in turn a major decline in their numbers. The conservation measures being adopted worldwide and in Pakistan are especially emphasized so the necessary preventive measures can be formulated for the viability of the ecosystem in the future.

RECOMMENDATIONS

Implement and strengthen conservation planning initiatives, emphasizing

sustainable practices to safeguard wildlife habitats and ecosystems. Collaborate with international organizations to share knowledge and resources for effective wildlife conservation plans. Raising public awareness and engaging local communities in conservation efforts is crucial to foster a sense of responsibility and participation. Continuous modifications of the implemented conservation plans conforming to the international standards should be ensured to achieve effective conservation efforts.

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