



## VERTEBRATE WILDLIFE OF PAKISTAN: A REVIEW

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### ABSTRACT

Pakistan is one of the few countries in the world with rich diversity of wild animals and ecosystems. Seven healthy populations of Brown bear are found in Karakoram ranges, Hindu Kush and Himalayan mountains. The vertebrate biodiversity includes 198 species of mammals, 700 bird species, 177 reptilian species, 22 amphibian species and 198 species of fresh water fishes. Five species of marine and eight species of freshwater turtles were also recorded. Several globally important endangered species such as Snow leopard, Common leopard, Brown bear, Balochistan black bear, Astor markhor and Indus River dolphin are also part of wildlife of Pakistan. Hingol National Park is a unique national park and comprises of six ecosystems including Arabian Sea, rugged mountains, desert, river, estuary and open plains. Many endemic species including Indus dolphin, Balochistan black bear, Chiltan markhor and Wholly flying squirrels have also been recorded in Pakistan. A lot of research work has been done to observe and record the wildlife of Pakistan. This paper is mainly focused on a review of some selected published data on vertebrate wildlife of Pakistan up to 2022.

**Keywords:** Vertebrate biodiversity, mountain biodiversity, ecosystem, marine turtle, freshwater turtle.

### INTRODUCTION

Pakistan is located in two geographical regions including Oriental and Palearctic (Cox and Moore, 1993) situated at the junction of Middle East and Central Asia. It has great value due to its geographical position. Its total border is 6774 km, on the East attached with India, Afghanistan on its Northwest, Iran in the West and China on Northeast, while Arabian Sea lies in the South. Pakistan has an area of 882,000 km<sup>2</sup>, 61° and 75° east while 24° and 37° north with a coastline of 1,046 km. Pakistan is basically a semi-arid to arid country with small area of forest, only 3.8% (Khan, 2006). The diversity of plants and animals is based on the topographical and environmental conditions (Khan, 1980). There are three ecological zones in Pakistan which includes Indus Plains, foothills and mountain ranges. Various types of habitats including lagoons, mangroves, sandy areas, large coastal belt, valleys and glaciers are found in Pakistan (Khan, 1999b).

Pakistan has four provinces comprising of variety of landscapes and habitats which support wide diversity of wild animals. Beautiful natural sceneries including mountains, forests, valleys and hills in northern areas attract tourism. A diversified ecosystems including fresh water, marine, riverine forests, dry tropical thorn forests, irrigated plantation, tropical deciduous forests, subtropical broad leaf evergreen forests, sub-tropical pine forests, dry

temperate forests, moist temperate forests, sub-alpine forests, alpine pastures, glaciers along with permanent snow fields, plateaus, natural as well as man-made wetlands and Indus delta found in Pakistan.

Roberts (1991) first time provided natural terrestrial ecosystems classification. Table 1 shows the extent of area in each zone together with corresponding CBD thematic area. Eight mangrove species have been reported in Pakistan, among these *Avicennia marina* is dominant, *Ceriops tagal* and *Rhizophora mucronata* occur in localized patches while due to human activities five other species have become locally extinct from delta areas. Mangrove ecosystem of Indus delta extends over an area of about 129,000 hectares on the coastal belt of Sindh, between Karachi and southwestern border of India consisting of 17 major creeks (Khan, 2005).

The publications so far related to the wildlife of Pakistan include Auffenberg and Rehman (1997), Ahmed (1989), Ahmed (2003, 2013), Ahmed *et al.* (2011), Akhter *et al.* (2018), Akram *et al.* (2021), Ali *et al.* (2016), Ali *et al.* (2018), Anwar *et al.* (2005) Asrar (1999), Baig *et al.* (2006), Begum *et al.* (2013, 2014, 2016), Chang *et al.* (2012, 2015), Firdous (1986, 1988, 2000, 2001, 2005), Frost (2008), Ghalib *et al.* (2007, 2013, 2014, 2016, 2018a,b), Ghalib *et al.* (2018 a,b, 2019 a,b), Grimmett *et al.* (2008), Groombridge (1982), Groombridge (1987a,b), Groombridge (1988 a,b, 1989), Groombridge *et al.* (1988),

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Hashmi and Khan (2013), Hamid *et al.* (2021), Iffat (1994), IUCN (2017), Kabraji and Firdous (1984), Karim (1985), Karim and Iftikhar (1988), Khan (2004), Khan and Saima (2005, 2011), Khan and Ghalib (2006), Kanwal and Khan (2018), Khan *et al.* (2018), Kanwal *et al.* (2018), Shah (2011), Safi *et al.* (2021), Shaikh *et al.* (2014), Khan (1976, 1980, 1982, 1983, 1985, 1986, 1991, 1997, 1999 a,b, 2000, 2004, 2006, 2008, 2011, 2012), Khan *et al.* (2005), Khan *et al.* (2012), Khan *et al.* (2010, 2015, 2016, 2018), Maan and Chaudhry (2001), Mahmood *et al.* (2018), Mahmood-ul-Hassan *et al.* (2009), Nawaz (2007), Rais *et al.* (2008, 2009, 2010, 2013, 2021), Rafiq and Khan (2012), Rahman and Iffat (1997), Roberts (1977, 1991, 1997), Ullah *et al.* (2021), Uzma *et al.* (2022) and Zehra *et al.* (2014). This paper is mainly focused on a review of available some selected published literature on vertebrate wildlife of Pakistan upto 2022.

## DISCUSSION

The wildlife of Pakistan includes 700 bird species, 198 mammal species, 177 reptile species, 22 amphibians, 198 fresh water fishes and 5,000 species of invertebrates (Pakistan's Sixth National Report, 2019). Globally critically endangered Snow leopard (*Panthera uncia* or *Uncia uncia*) (Fig. 1) is found in high mountain ranges of Karakoram and Hindukush mainly distributed in Khunjerab and Chitral Gol National Parks, upper Swat valley and slopes of Nanga Parbat.



Fig. 1. Snow leopard (*Panthera uncia* or *Uncia uncia*) (Source: <https://wingsforanimals.org/international-snow-leopard-day/>).

Due to killing and habitat fragmentation Common leopard (*Panthera pardus*) (Fig. 2) has become uncommon in Pakistan. Ayubia National Park is an important protected site for this species.

First time Roberts (1977) reported that Fishing cat (*Prionailurus viverrinus*) is recorded along the lower reaches of the Indus River. It is also found around the swamps of Haleji and Keenjhar lakes in lower Sindh.



Fig. 2. Common leopard (*Panthera pardus*) (Source: <https://en.dailypakistan.com.pk>).

Brown bear (*Ursus arctos*) globally found in Pakistan, India, Nepal and Tibet. In Pakistan seven populations of Brown bear are distributed in ranges of Karakoram, Hindu Kush and Himalaya (Nawaz, 2007) along with fragment distribution in sub alpine zone and meadows of Deosai National Park, Nanga Parbat, Khunjerab National Park and Astore (Virk *et al.*, 2003). Deosai National Park was established in 1993 for the protection and conservation of Brown bear (Fig. 3).



Fig. 3. Brown bears (*Ursus arctos*) family in Deosai National Park (Photo credit: Kamran Saleem/ Shabina Faraz, Dawn, 2019).

Balochistan black bear (*Ursus thibetanus gedrosianus*) (Fig. 4) is a subspecies of Asiatic black bear found in higher hill ranges of Balochistan viz. Takht e Suleiman, Toba Kakkar, Ziarat, Kallat and Khuzdar. Latest survey reported small population, isolated from each other (Aftab, 2019).

Astor markhor (*Capra falconeri falconeri*) is a subspecies of Markhor native in northern areas and Kashmir. Currently about 200 markhors have been recorded in northern areas and Chitral Gol National Park. One of the world's rarest freshwater mammal Indus River dolphin

(*Platanista minor*) also called Indus blind dolphin is a resident of Indus River.



Fig. 4. Balochistan black bear (*Ursus thibetanus gedrosianus*). (Photo credit: [https://www.inaturalist.org/taxa/711633-Ursus-thibetanus-gedrosianus/browse\\_photos](https://www.inaturalist.org/taxa/711633-Ursus-thibetanus-gedrosianus/browse_photos).)

Every year over one million migratory water birds belonging to 108 species visited different wetlands in Sindh. Migratory birds visit Pakistan via International Migratory Bird Route Number 4, Indus Flyway during September to February and return to Europe and Central Asia in March. Five species of pheasants including Himalayan monal (*Lophophorus impejanus*), Western tragopan (*Tragopan melanocephalus*), Khalij pheasant (*Lophura leucomalanos*), Koklass pheasant (*Pucrasia macroura*) and Cheer pheasant (*Catreus wallichii*) were reported.

The residential birds include cormorants, moorhens, Indian pond heron (Fig. 5), terns, pochard, shoveler, gadwall, grey leg goose, grebes, jacanas, egrets etc. Some other water birds include flamingoes, herons, grebes, ruddyshell ducks, gadwalls, teals, pintails, spoonbill ducks, storks, curlews, lapwings, swampens, plovers, snipes, coots etc. Certain waders and some water birds visit during winter (CBD First National Report, Pakistan, 1999).

Rehman and Iffat (1997) reported that 200 species of reptilian fauna consisting of lizards, snakes, turtles, tortoises, crocodile and gaviel. Five species of marine turtle includes Green turtles (*Chelonia mydas*), Olive ridley (*Lepidochelys olivacea*), Hawksbill (*Eretmochelys imbricata*), Loggerhead (*Caretta caretta*) and Leatherback turtles (*Dermochelys coriacea*) have been documented from the Sindh and Balochistan Coastal areas.

Two nesting species Green turtle and Olive ridley turtle inhabited at Hawkesbay and Sandspit Karachi coast,

Ormara and Jiwani along with Balochistan coastal areas (Groombridge, 1982, 1987a, 1987b, 1988a, 1989; Kabraji and Firdous, 1984; Firdous, 1986, 1988; 2000, 2001, 2005, Groombridge *et al.*, 1988; Khan *et al.*, 2005; Uzma *et al.*, 2022). Six new nesting sites discovered at Karachi coast (Mubarak village) and Hingol National Park, Gwadar (West Bay), Pushukan and Ganz, Sonmiani in Balochistan coastal areas (Khan *et al.*, 2010).

All turtle species have been declared legally protected under Sindh Wildlife Protection Ordinance 1972, Balochistan Wildlife Protection Act 1974, and Sindh Wildlife Protection Act 1993 (Khan *et al.*, 2010). Eight species of freshwater turtles viz. Smith's turtle, Crowned river turtle, Indian roofed turtle, Spotted pond turtle, Soft shell turtle, Peacock soft shell turtle, Mud turtle and Chitra turtle are also part of wildlife of Pakistan (Kanwal and Khan, 2018). 198 freshwater fish species and over 800 species of marine fish have been recorded in Pakistan's coastal waters (4<sup>th</sup> Pakistan National Report, 2009). Pakistan is significantly gifted with freshwater and marine resources along with more than 500 wetlands. 19 wetlands are declared as Ramsar sites.

All provinces of Pakistan comprising of variety of landscapes and habitats which support wide diversity of wild animals. Balochistan is the largest province which has plains, dry mountains and large coastal area with rich biodiversity. Punjab is basically an agricultural province also known as a land of five rivers supporting wide range of biodiversity. Sindh province has plateaus, deserts, hills, fertile lands, mangroves, marine as well as freshwater habitats, creeks and estuaries. There are 10 wetlands of international importance providing habitat to a large concentration of migratory waterbirds during winter season. Khyber Pakhtun Khawa has rich wildlife as compared to other provinces, some of the most globally important and endangered species of mammals and birds are found in unique geographical zones (Khan *et al.*, 2018).



Fig. 5. Indian pond heron near a wetland in Sindh.

### WILDLIFE OF SINDH

Ghalib *et al.* (2018a) made a checklist of vertebrate fauna of Sindh excluding fishes in a period of eight years by combining published literature and new survey reports of wild animals of Sindh to update the data.

Reptilian fauna is a blend of Palearctic, Indo-Malayan and Ethiopian forms. Among 103 species of reptiles, 45 snakes, 42 lizards, 14 turtles, one species of tortoise, crocodile (Fig. 6) and gavia have been reported. Among eight species of freshwater turtles, six are threatened while Indian narrow headed soft shell turtle (*Chitra indica*) is an endangered species (Fig. 7) (Table 2).

Khan *et al.* (2015) recorded mammals present in Thar desert. It lies in western region of country. Its boundaries are extended to Indian border. There is severe hot climate during summer. Total 35 species of mammals were noted viz. Indian wild ass, Nilgai, Hayaena, Indian desert jird, Honey badger, Indian desert fox, Bengal fox, Antelope rat, and Indian pangolian. Due to killing, poaching and shortage of food because of overgrazing of domesticated livestock Hayaena, Indian pangolian and Indian wild ass are threatened species. Coal mining project in the area is a major anthropogenic activity causes habitat destruction and decrease of population.

There are 420 avian species including 148 waterbirds, among these 146 perching birds, 52 species of birds of prey and 72 other birds (Ghalib *et al.*, 2018b). Peafowls are commonly found in Thar desert also called beauty of Thar. These are habitual of human interaction and enter in their houses in villages (Fig. 8). Their population is declining due to a disease commonly called 'Rani Kheet'.



Fig. 6. Marsh crocodile (*Crocodylus palustris*) at Haleji Lake Wildlife Sanctuary (Ramsar Site). (Photo courtesy: Khan *et al.*, 2015).



Fig. 7. Indian narrow headed soft shell Turtle (*Chitra indica*), Endangered in Sindh province. (Photo credit: Roohi Kanwal).

Birds of prey play a vital role as biological controller of different pests and limit their population. Vultures are scavengers, they clean the environment by feeding on dead animals. Ghalib *et al.* (2019) assessed the status and distribution of raptors of Sindh. Eight major groups of raptors found in Sindh including Falcons, Harriers, Hawks, Eagles, Ospreys, Vultures, Kites and Buzzards. Their population is severely declining in the whole country due to hunting, killing, poaching, habitat destruction, use of pesticides specially DDT and Diclofenac acid which make egg shell thin and decreasing the survival rate. Total 47 species of raptors found in Pakistan. Of which 38 species are present in Sindh. Among these 15 are threatened while five are near threatened. Measures should be taken against trapping, prohibit the use of pesticides and control in increasing population of Black kites.



Fig. 8. Peacock in the area of Thar, Sindh.

The population of Indian pangolian, White-backed vulture, Hog deer, Houbara bustard, Lesser flamingo, Leopard, Chinkara, Olive ridely and Indian chameleon were decreasing. About 40 species of wildlife are under threat.

Hunting, forest cutting, habitat alteration, anthropogenic activities, drought or climatic change are the major threats. For conservation of wildlife, Sindh province has number of protected areas which includes one National Park, 16 Game Reserves and 33 wildlife sanctuaries (Ghalib *et al.*, 2018a).

### **WILDLIFE OF BALOCHISTAN**

Based on land area Balochistan is the largest province extended over an area of 347,190km<sup>2</sup> lies between 24° 32'N and 60° 70'E while coast line is about 770 km long (Khan and Saima, 2011). According to a field study there were 90 mammalian species (Ali *et al.*, 2007) and 410 bird species (Avibase, 2018). Begum *et al.* (2016) studied the distribution, current population trend and status of the population of Balochistan's coastal birds. The coastal belt is extended between Lasbella and Gwadar. Different habitats viz. mangrove forests, rocky hills, mountains, lagoons, plains, plateaus etc. support a large biodiversity. Hingol National Park, Jiwani and Miani Hor are the coastal sites of province supporting a big population of water birds. According to collected data there were 133 species of coastal birds, of them 83 were migratory. Five groups of birds were observed during the study which includes passerines, birds of prey, water and game birds and others from study site (Begum *et al.*, 2016). Table 3 shows the seasonal status of coastal areas; 50 species were recorded as resident, while 83 found to be migrant. The dominant and common, widespread water birds on the coast are waders or shorebirds including gulls and terns. Dalmatian Pelican, Egyptian vulture, Rufous vented prinia and Marbled teal were recorded as threatened species. Population of water birds is declining due to habitat loss, hunting, trapping and other human related activities. For the protection and conservation of marine biodiversity the government of Balochistan has established Marine Protected area "Astola Island" on 2017. Kanwal *et al.* (2018) conducted a study on Astola Island and recorded 41 species of birds (Table 4) and eight species of reptiles. The island is also an important nesting and conserving site for Green turtle and Hawksbill turtle.

### **WILDLIFE OF KHYBER PAKHTUNKHWA (KPK)**

The province of Khyber Pakhtunkhwa – KPK, before 2010 called North West Frontier Province NWFP is the 3<sup>rd</sup> largest province. It has following nine main ecological zones (Roberts, 1991, 1997; Shah, 2011):

1. Alpine meadows
2. Sub-alpine scrub
3. Permanent snow fields/ Cold deserts
4. Dry temperate conifers forest
5. Moist temperate forest
6. Sub-tropical pine forests

7. Sub-Tropical Sub Humid Forests
8. Foot Hill Plains and
9. Wetlands Eco-system

The KPK has rich wildlife compared to other provinces of the country. Some of the most globally important and endangered species of mammals and birds are found in the unique geographical zones of this province (Ali *et al.*, 2018; Khan *et al.*, 2018). Recently, Ali *et al.* (2018) conducted a study in KPK and reported that 87 species of mammals found in different prime habitats of the province. Khyber Pakhtunkhwa have 13 unique key mammals species include Snow leopard, Common leopard, Balochistan black bear, Brown bear, Langur, Flying squirrel, Markhor, Musk deer, Himalyan ibex, Urial, Indian wolf, Blanford's fox, and Grey goral. There are 12 species threatened, four species are endangered, three are vulnerable and five species are near threatened (Table 5).

Khan *et al.* (2018) conducted a study on population of *Capra falconeri cashmiriensis* (Kashmir markhor) in Chitral Gol National and reported that the total of 2,057 Markhor distributed in 39 small ridges, clusters and narrow gorges were enlisted from eight vantage points. The park is known to support the world highest population of Kashmir markhor. A recent study, Hamid *et al.* (2021) reported that Sheikh Buddin National Park has 23 herpetofauna species including two species of amphibians and 21 of reptiles (eight species of snakes and 13 lizards).

Another study Khan *et al.* (2016) assessed the population status, conservation and distribution of freshwater turtles in Peshawar valley and seven species of freshwater turtles including Indian narrow-headed softshell turtle (*Chitra indica*), Indian softshell turtle (*Nilssonina gangetica*), Indian peacock softshell turtle (*Nilssonina hurum*), Indian flapshell turtle (*Lissemys punctata andersoni*), Brown roofed turtle (*Pangshura smithii*), Crowned river turtle (*Hardella thurjii*) and Indian roofed turtle (*Pangshura tectum*) were recorded. While, Spotted pond turtle (*Geoclemys hamiltonii*) was not recorded during the study, but this species had been documented from different parts of Pakistan. Illegal trade of freshwater turtles for consumption, traditional Chinese medicines and pet trade are in practice in different parts of KPK due to lack of knowledge on the importance of turtles and other wildlife.

For the protection and conservation of wild animals and ecosystems in the KPK there are six National Parks, three Wildlife Sanctuaries, 38 Game Reserves, two Wildlife Refuges, 16 Private Game Reserves, eight Wildlife Parks and three Ramsar Sites (Ali *et al.*, 2018).

Table 1. The extent of Ecozones/Habitat types in Pakistan (Source: GIS Lab. WWF Pakistan, 2018).

S. No.	Ecozone/ Habitat type	CBD Thematic area	Area (ha)	% of total area
1	Mangrove and littoral	Marine and Coastal	550,186	<1%
2	Tropical thorn forest	Dry lands, Agriculture	38,146,635	43.5%
3	Arid sub-tropical forest	Dry land, Agriculture	30,035,234	34.2%
4	Steppe forest and alpine dry steppe	Mountain	9,305,417	10.6%
5	Dry sclerophyllous and tropical deciduous forest	Dry Sub humid Lands	471,561	<1%
6	Sub-tropical pine forest	Mountain	2,163,320	<1%
7	Dry temperate coniferous	Mountain	1,831,506	<1%
8	Himalayan moist temperate forest	Mountain	1,070,736	<1%
9	Permanent snow, alpine meadows & sub-alpine scrub	Mountain	4,220,152	<1%
	Total		87,794,747	100%

Table 2. Status of Freshwater Turtles in Sindh (Khan *et al.*, 2016).

S. No.	Family	Scientific name	Common name	IUCN status	CITES Appendix	
					I	II
1	Geoemydidae	<i>Geoclemys hamiltoni</i>	Spotted pond turtle	Vulnerable	+	
2		<i>Pangshura smithii</i>	Brown roofed turtle	Near Threatened		+
3		<i>Pangshura tectum</i>	Indian roofed turtle	Vulnerable	+	
4		<i>Hardel lathurjii</i>	Crowned river turtle	Vulnerable		
5	Trionychidae	<i>Nilssonina gangeticus</i>	Indian soft shell turtle	Vulnerable	+	
6		<i>Nilssonina hurum</i>	Peacock soft shell turtle	Vulnerable	+	
7		<i>Lissemys punctata</i>	Indian flapshell Turtle	Least Concern		+
8		<i>Chitra indica</i>	Indian narrow headed soft shell turtle	Endangered		+

Table 3. Seasonal Status of the Coastal Birds of Balochistan province.

S. No.	Seasonal status	No. of species
01	Resident (R)	50
02	Winter Visitor (WV)	72
03	Passage Migrant (PM)	01
04	Migrant (M) / Year Round Visitor	04
05	Summer Breeding Visitor (SBV)	02
06	Summer Visitor (SV)	04
	Total Species	133

Table 4. Species of Birds recorded from Astola Island (Kanwal *et al.*, 2018).

S. No.	Scientific name	Common name	Population status
1.	<i>Pelcancus onocrotalus</i>	White or Rosy pelican	C
2	<i>Pelecanus crispus</i>	Delmatian pelican	A
3	<i>Phalacrocorax carbo</i>	Large cormorant	A
4	<i>Egretta intermedia</i>	Intermediate egret	C
5	<i>Casmerodius albus</i>	Great egret	C
6	<i>Ardea cinerea</i>	Grey heron	LC
7	<i>Egretta gularis</i>	Reef heron	LC
8	<i>Accipiter badius</i>	Shikra	SC
9	<i>Falco tinnunculus</i>	Common kestrel	SC
10	<i>Pandion haliaeetus</i>	Osprey	SC
11	<i>Haematopus ostralegus</i>	Oystercatcher	C
12	<i>Vanellus indicus</i>	Redwattled lapwing	C
13	<i>Tringa hypoleucos</i>	Common sandpiper	LC

14	<i>Tringa totanus</i>	Redshank	LC
15	<i>Calidris minutus</i>	Little stint	A
16	<i>Phalaropus lobatus</i>	Rednecked Phalarope	C
17	<i>Stercorariuspar asiticus</i>	Arctic skua	C
18	<i>Larushem iprichi</i>	Sooty gull	A
19	<i>Larus ridibundus</i>	Black-headed gull	A
20	<i>Larus cachinnans</i>	Caspian gull	A
21	<i>Larus heuglini</i>	Heuglin's gull	A
22	<i>Gelochelidon nilotica</i>	Gullbilled tern	C
23	<i>Hydroprogne caspia</i>	Caspian tern	C
24	<i>Streptopelia sengalensis</i>	Little brown dove	C
25	<i>Asio flammeus</i>	Short-eared owl	SC
26	<i>Apus pallidus</i>	Pallid swift	LC
27	<i>Riparia paludicola</i>	Plain martin	C
28	<i>Galerida cristata</i>	Crested lark	C
29	<i>Ammonanes deserti</i>	Desert lark	C
30	<i>Alaemon alaudipes</i>	Greater hoopoe lark	LC
31	<i>Alauda arvensis</i>	Common skylark	SC
32	<i>Lanius meridionalis</i>	Southern grey shrike	LC
33	<i>Oenanthe picata</i>	Variable wheatear	LC
34	<i>Hippolais caligata</i>	Booted warbler	SC
35	<i>Sylvia nana</i>	Desert warbler	SC
36	<i>Oenanthe isabellina</i>	Isabelline weatear	LC
37	<i>Passer domesticus</i>	House sparrow	A
38	<i>Motacilla flava</i>	Yellow wagtail	C
39	<i>Matocilla alba</i>	White or pied wagtail	C
40	<i>Emberiza striata</i>	House or striped bunting	C
41	<i>Oenanthe deserti</i>	Desert wheatear	C

Legend: A = Abundant, C = Common, LC = Less Common, SC = Scarce.

Table 5. Threatened Mammals of Khyber Pakhtunkhwa.

S. No.	Scientific name	Common name	Status
1	<i>Eupetaurus cinereus</i>	Woolly flying squirrel	EN
2	<i>Platanista minor</i>	Indus river dolphin	EN
3	<i>Uncia uncial</i>	Snow leopard	EN
4	<i>Manis crassicaudata</i>	Indian pangolin	EN
5	<i>Panthera pardus</i>	Leopard	VU
6	<i>Moschus chrysogaster</i>	Musk deer	VU
7	<i>Ursus thibetanus</i>	Black bear	VU
8	<i>Capra falconeri</i>	Markhor	NT
9	<i>Naemorhedus goral</i>	Himalayan goral	NT
10	<i>Semnopithecus entellus</i>	Grey langur	NT
11	<i>Hyaena hyaena</i>	Striped hyaena	NT
12	<i>Lutra lutra</i>	Common otter	NT

Legend: EN= Endangered, VU= Vulnerable, NT= Near Threatened

During last three years KPK province has developed several programs for protection and conservation of biodiversity. Recently, Ali (2022) reported that KPK declared thousands of hectors of land in Malakand, Hazara, Peshawar and Kohat divisions as Protected Areas under the Khyber Pakhtunkhwa Wildlife and Biodiversity (Protection, Preservation, Conservation and Management)

Act, 2015. Nizampur area 5,236 hectares of Nowshera district also established as National Park.

Another National Park declared in Mansehra district with 19971.76 acres of Reserve Forests in Malkandi area. While, an area of 5455.82 acres in Kamal Ban area of Mansehra district has been notified as National Park. Now,

the Khyber Pakhtunkhwa government has documented nine National Parks, 87 Community Game Reserves, 38 Public Game Reserves, five Conservancies, three Wildlife Sanctuaries, two Wildlife Refuges, four Sites of Special Scientific Interest with an accumulative area of more than 1,564,000 hectares which make 15.38 percent of the total area of the province (The Nation, 2022).

### **WILDLIFE OF PUNJAB**

The Punjab province is predominantly on plain level, however, there are several hilly areas in the North-West and extreme South-West. The River Indus, Jhelum, Chanab, Ravi and Sutlaj flow via this province.

One of the oldest man made forest in the world Changa Manga is found in the province of Punjab. *Acacia nilotica* (Kikar), *Eucalyptus microtheca* (Sufeda), *Dalbergia sissoo* (Shisham), *Morus alba* (White mulberry) and *Saccharum bengalenses* (Kana) are most common species planted in the forest areas (Ahmed, 2016). Last 10 to 15 years due to effects of climate change and anthropogenic activities the level of degradation has increased. In Changa Manga plantation areas 14 species of mammals, 50 species of birds, six species of reptiles, two species of amphibians and 27 species of insects were recorded. While, Nilgai (*Boselaphus tragocamelus*), Hog deer (*Axis porcinus*) and Spotted deer (*A. Axis*) were recorded as endangered species (Maan and Chaudhry, 2001; Ahmad, 2016). Hog deer, Black buck, Chital, Blue bull, Wild boar, Jackal, Rhesus monkeys, Black and Grey partridges, Quails, Peafowl and Brahminy myna are found in the different parts of the province. Eight species of freshwater turtles found in province, among these Brown and Indian roofed turtles were abundant while Crowned river and Indian narrow headed softshell turtles were rare in several areas of Punjab (Altaf *et al.*, 2018). Total 519 species of birds have been recorded in the province out of which 27 are globally threatened (Avibase, 2019). Black buck (*Antelope cervicapra*) was re-introduced in Lal Suhanra National Park which was declared as first Biosphere Reserve in 1977 (Khan, 2012). Currently park has 17 species of mammals, 74 bird species, five species of amphibians and 27 species of reptiles (Khan *et al.*, 2018).

Another study, Altaf *et al.* (2018) conducted a study on anthropogenic impact on the distribution of the birds in the tropical thorn forest, Punjab and during the one year field surveys 150 species of birds recorded from Chenab River habitats. Statistical data show that diversity which was highest at habitat of forest 4.261 followed by habitat of rural forest 3.746, habitat of agriculture 3.623, habitat of agri-rural 3.746, habitat of urban vegetative 3.215, WLH 2.723 and habitat of urban non-vegetative 2.247. This study concluded that the landscape gradients are the important factors affecting the birds population, diversity and distribution. A recent study, Rais *et al.* (2021) discussed Amphibian fauna of Pakistan with notes on future

prospects of research and conservation and recommended that systematic and coordinated surveys are conducted Punjab and throughout the country to established scientific database of Amphibian fauna of the country including species occurrences, distributions, national and international population status.

### **CONCLUSION**

Although, Pakistan has globally important wild animal species but facing several threats due to high pressure of human population, increasing poverty, overgrazing, degradation of natural habitat, illegal hunting, development projects, poor law and order situation and wildlife officers having lack of scientific updated knowledge. Species are declining due to loss of habitat, unsustainable level of hunting, fishing and harvesting. Houbara bustard (*Chlamydotis undulata*) hunting is prohibited for local people but continues for friends from Gulf countries. Climate change and loss of wildlife are the biggest environmental threats; currently Pakistan is likely to be seriously affected by climate change and included in climate change affected countries. Today there is growing realization to adapt and develop strong policy and measure to mitigate climate change impact. Recently, a community-based project of regeneration of alpine forests and new forest plantations in riverine plains to enhance mangroves along coastline has been successfully completed by Khyber Pakhtunkhwa under the 'Billion Tree Tsunami' in between 2014 and 2018. Pakistan has 19 Ramsar sites, the diversion of water for irrigation and drainage of wetlands are important causes of wetland habitat degradation. Unfortunately, there has been no regular and systematic assessment of protected areas to determine the status of key species population and effectiveness of the management. The review observed that management of the protected areas need to be updated and upgraded according to the principles of wildlife conservation.

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