



RESEARCH PAPER

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Vertebrate fauna diversity and bio-ecological threats finding in Maslakh State Forest Mountain Range, District Quetta, Pakistan

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Abstract

The present study was conducted from August 2020 to December 2021 to count the vertebrate population and to examine the negative impact cause their scarcity. The Maslakh range forest (30°03' to 30°21' N and 66°31' to 66°49' E) extends over an area of 115,040 hectares with an altitude of 1406 meter to 4228 meter. Standard methods such as track counts, point surveys, line transects, road side counts, pellet counts, trapping, fresh holes, tracks counting, baited spotlight trick and normal spotlight were used to record the number of mammal species. For aves fauna survey strip census trick was used, and for reptiles, amphibian species direct counting (night observations, one-hour plot searching, stones, rocks and rotten trees turning) were processed, while indirect counting (informations) were obtained from field staff, game inspectors, game watchers, and local villagers. In total 153 vertebrate species including 28 mammals (18.30%), 100 birds (65.36%), 22 reptiles (13.92%) and 3 amphibians (2.06%) were recorded. Threatened species recorded were Striped hyaena (*Hyaena hyaena* Linnaeus, 1758), Indian wolf (*Canis lupus* Linnaeus, 1758), Balochistan urial (*Ovis vignei blanfordi* Blanford, 1894), Chinkara (*Gazella bennettii* Sykes, 1831), and the imperial eagles (*Aquila heliaca* Blanford, 1894) found to be critically endangered. It was observed that hunting and capturing of animals of the study area and native live-stock grazing were known to be the main reasons of fauna and flora decline. Another important factor was noted to be droughts intensity due to climatic change of the area. It is concluded that prompt management plan of the Forestry Department Balochistan (Balochistan wildlife Protection, Preservation, Conservation and Management) Act 1974 may be implemented in its full spirit at the earliest to save the vertebrate fauna, vegetation and natural fresh water reservoirs of Maslakh range forest, Pakistan.

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Introduction

In Balochistan province (Pakistan), the marked decline in biodiversity happened due to anthropogenic activities like deforestation, species migration, and habitat fragmentation (Groombridge, 1998; Qasim *et al.*, 2017). Other factors that violate biodiversity include increased human and live-stock population, habitat destruction, global warming, and also putting the lives in danger of some useful and unique species (Rawat & Agarwal, 2015; Tareen, 2017; Baboo *et al.*, 2017; Javed, 2019).

Major threats to vertebrate fauna diversity and habitat loss are forest degradation, wood logging, hunting, and disturbance by humans of the area (Khan *et al.*, 2018). Maslakh wildlife protected area was established in 1968. The area was declared as a wildlife sanctuary for chinkara and urial (IUCN, 1997; Groombridge, 1998; WWF-Pakistan, 1998; Government of Balochistan and IUCN Pakistan, 2000; Ghalib *et al.*, 2007) according to Balochistan wildlife (Protection, Preservation, Conservation, and Management) Act 1974.

The Chinkara population in Maslakh range forest was almost wiped out by large hunting (Virk, 1991). The hill ranges are drained by main rainy Pishin river (Said & Hussain, 1959). The middle belt of about 8-9 km has no surface or groundwater (Said & Hussain, 1959).

Maslakh range (state) forest lies in the Olive-Pistacia vegetation zone. Due to extreme lopping and overgrazing in the past, tree growth in Maslakh is represented only by *Pistacia khinjuk* and infrequent copies of *Fraxinus xanthoxyloides* (Rafi, 1965). The predominant tree species are *Olea ferruginea*, *Pistacia khinjuk*, *Prunus eburnea*, *Stocksia braubica* and *Berberis vulgaris*. *Artemisia maritima* and *Cousinia minuta* constitute the main ground cover above 5,500' while *Hammada griffithii* replaces *Artemisia* in lower parts. The major grasses are *Sipa pennata*, *Chrysopogon aucheri*, *Cymbopogon schoenanthus*, *Aeluropus littoralis*, *Poa sinaica* and *P. bulbosa* (Rafi, 1965; Marwat *et al.*, 1989).

As previously, no literatures are available on vertebrate fauna diversity of Maslakh range forest Quetta. Therefore, to accomplish this gap of scientific knowledge, the vertebrate population count was estimated and the bio-ecological problems of the study area were determined. The management strategy required for conservation and organization of wildlife in the range forest was proposed.

Materials and methods

Area of Study

The current study was carried out in Maslakh State Forest Mountain Range (Fig. 2). It lies at about 32.2 Km in the west of Quetta Metropolitan city district Quetta (Fig. 1). The area is a high land of Balochistan with an elevation ranges from 4613' (1406m) to 13871' (4228m) which comprise on 46555.25 hectares (Said & Hussain, 1959).

The highest peak in the area is 7967 feet above sea level, and the lowest point is 4613 feet (Rafi, 1965). Based on preliminary surveys, some important localities in the Maslakh range forest were selected for this study (Table 1 and Fig. 3).

Table 1. Selected study locations at Maslakh State Forest Mountain Range.

Study areas	Sub-areas	Co-ordinates
Shella	Shella hill slopes	30° 17' 49.7292" N 66° 46' 50.2752" E
Sultan,	Sultan band Nullah	30° 17' 44.5668" N 66° 47' 7.332" E
Badwan,	Badwan Top	30° 17' 56.3028" N 66° 47' 22.6248" E
Daru	Daru hill slopes	30° 18' 31.3848" N 66° 40' 1.542" E
Kodali,	Nund Kodali	30° 15' 51.7644" N 66° 45' 21.5676" E
Basha,	Wach maand	30° 16' 27.7104" N 66° 36' 15.6816" E
Kaftari	Zharhai talab	30° 11' 45.888" N 66° 43' 35.6268" E
Sebat,	Kozh ghar (Sebat nullah)	30° 12' 12.9852" N 66° 35' 58.7508" E
Sheikh Ki	Karez nullah	30° 11' 20.6412" N 66° 43' 10.1028" E
Kurram	Marjaan wooba,	30° 6' 15.2352" N 66° 32' 9.1716" E
Saidal	Sewi nullah	30° 18' 7.7364" N 66° 46' 31.116" E
Kach,		

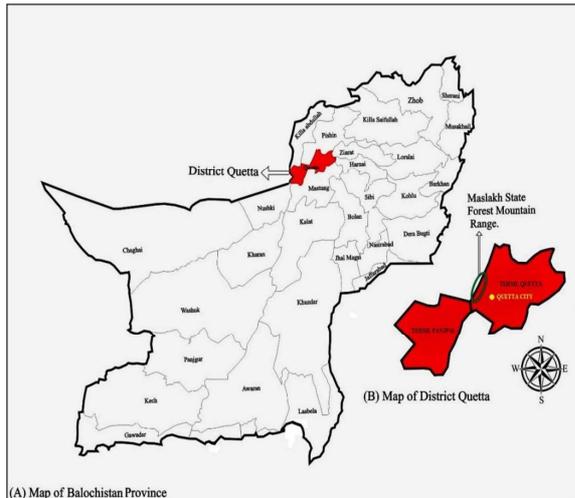


Fig. 1.(A). Balochistan province map, red show district Quetta. (B) District Quetta map, arrow show Maslakh range forest.

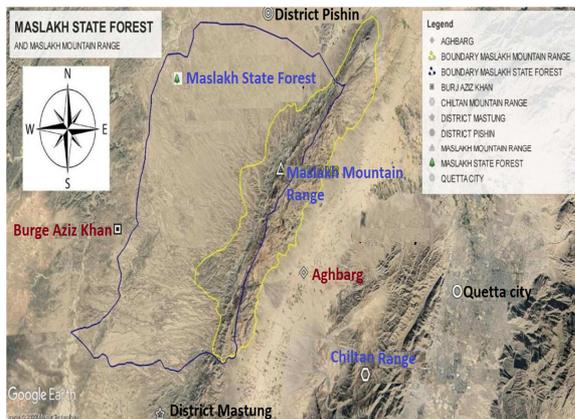


Fig. 2. Maslakh state forest mountain range.

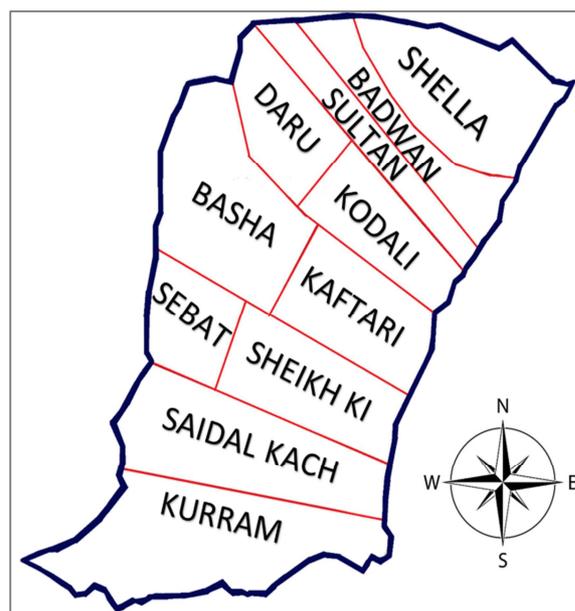


Fig. 3. Maslakh state forests show different localities.

Survey of Mammals

For observation, census, and documentation of key mammalian species following methods were employed:

Track Counts

This method was used to confirm nocturnal and most secretive habitats for animals, especially after rain, where the old tracks were eradicated, and the fresh tracks of animals coming toward the inside or leaving the study areas were followed as a measure of their population.

Point Surveys

Hidden points for observation were made at higher and suitable sites near roads, ponds, or marshlands for viewing the habitat of mammals. This method was applied during dawn and dusk time daily at each observation point for a period of 1 to 5 hours. An index of the richness of each species was expressed as the number of mammals seen in each hour of sightings (Brower *et al.*, 1990).

Line Transects

This method observed animal species' present status and population estimation along prearranged transect lines. This technique was employed for those difficult to see and count animals. Distances were recorded at which the mammals were sighted. The number of animals for the whole area was considered as the population divided by the strip area and multiplied by the total area (Schemnitz, 1980).

Pellet Counts

For tracing large mammals and examining their population, pellets (fecal material) were counted in a particular area. Such counting was effective in the dried habitats where pellet groups remained preserved between sampling periods. All pellet groups were removed from plots and then from subsequent observations. The number of groups per hectare was estimated to compare animal use of areas between sampling periods.

Roadside Counts

Normally it was difficult to locate large mammals by walking in their habitat because they were sensible to detect human presence from a long distance. Hence,

this method was applied to detect and estimate the population of different mammalian species. Furthermore, on mountain range slopes vehicle (4 x 4) was used during the early morning to observe animals

Trapping (Sharman Traps)

Sharman traps were used to capture and observe live small size mammals. Traps were fixed at a distance of 10 m on a line of 500 m in length. Traps were put in the dusk time and checked at dawn time. Different colored bands marked each trap to locate the traps easily. The data of the trapped animals, such as trap fixing date, collection date, location, altitude, territory, habitat, environmental conditions, and their effects, were noted on the data register at the spot; after getting data, the animals were released without any harm. To attract the animals," rice and wheat were used as bait.

Counting of Fresh holes and Tracks

This method counted new holes and tracks in one square kilometer to observe small mammals' status and population range (Brower *et al.*, 1990).

Baited Spotlight Method

In this method, fresh meat and skin of freshly slaughtered sheep were hinged behind the vehicle. Firstly, the vehicle just crossed the track, but on returning over the route, some animals were found following the smell trail spread in the area.

Normal Spotlight Method

This method was applied for tracing large and small nocturnal mammals (fox, jackal, wolf, porcupine, hare, hedgehog, and some rodents). These nocturnal animals move at night in search of food.

Survey method of Birds

Bird fauna (resident as well as migratory species) was recorded with the help of a zooming camera (Nikon company), a guidebook (Birds of Pakistan, etc.), and sound identification (Buckland *et al.*, 2001; Sutherland, 2006; Khan and Khan, 2015). Then, the strip census method was used record the birds presence in the study area used. The strip for 200m on each side, thus a total

covering 400m, was observed using spotting scopes/binoculars (Khan *et al.*, 2010c). The following methods were used in bird surveying.

Line and Point Transects

In the line transect method, a prearranged track was visited, and the birds on both sides were recorded. In the point transect, and birds were allowed time to settle. Then all the birds seen or heard were recorded in a predefined time, ranging from 5 to 20 minutes.

Capture Techniques

Some birds living in dense vegetation or the forest stratum were rarely seen or heard. In such situations, soft nets were used to capture and record them. The safety and protection from injury of the birds were always on a priority basis.

Counting Water Birds

Different water bird species were observed and counted. DSLR zooming camera and binoculars were used to collect information on the site usage by those birds. The basic data was obtained for formulating management plans for the avifauna.

iv. Block Method

The block method was used either for a distant flock in flight or densely packed flocks on the ground. Depending on the flock size, a "block" of 10, 100, or 1000 birds within the flock was counted or estimated. Then this "block" was used as a measuring model to measure the rest of the flock.

Survey method of Amphibians and Reptiles

Amphibians were very active just after dusk during their mating and breeding season. Skinks and some lizards were diurnal in activity and seemed most active during mid-morning. To study the reptilian fauna, field visits were carried out between 7:00 am to 6:00 pm. Many snakes and geckos were active only at night. The following techniques (Direct and indirect counting) were applied to observe amphibians and reptiles.

Direct Counting

One-hour Plot Searching

One-hour exploration was done over 30 ha to detect the

maximum number of reptiles and amphibian species. The searching area consisted of a circular central zone of a 300-meter radius of sampling points.

Night Observations

Spotlight transects were used to detect nocturnal lizards and snakes with portable spotlights. One night, one transect of 4 km distance was observed on both passing through and returning on the same route. So a total of 8km distance was covered.

Turning of Stones, Rocks, and Rotten Trees Process

Some reptiles and amphibians were found during the day taking shelter or requesting by hiding beneath stones, rocks, or rotten fallen trees, especially in the hilly area where scattered stones were in abundance (Auffenberg and Rahman, 1991). The stone turning technique helps a lot for location and population estimation of various species. This technique also detected prey of reptiles such as larvae, termites, beetles, spiders, and scorpions.

Indirect Counting

This method obtained facts and Figs from field staff, forest rangers, game inspectors, game watchers, shepherds, and other local villagers. Furthermore, Evidence from the impression of footprints, tracks, and the existence of holes or track the presence of fecal pellets helped in finding the existence range and estimating the reptile population.

Results and discussion

This is the first-ever study on vertebrate fauna and threats to the bioecological features of the Maslakh state forest mountain range as there is no prior

published data available on the cited subject matter. Results revealed 153 vertebrate species recorded from the study area in the following composition: 28 mammals, including seven large mammals species (Table 2), 100 birds (Table 3), 22 reptiles (Table 4), and three species of amphibians (Table 5). The large mammal species are from the three families, the Canidae, which include *Canis lupus* (Indian wolf) (Fig. 4), *Canis aureus* (Asiatic Jackal, also known as the golden, oriental, or common jackal) (Fig. 5), *Hyaena hyaena* (Striped hyaena) (Fig. 6), and *Vulpus vulpus* (Common red fox) (Fig. 7), the family Hystricidae include *Hystrix indica* (Indian crested porcupine) (Fig. 8).

At the same time, *Ovis aries aries* (Karakul sheep) (Fig. 9) and *Capra aegagrus hircus* (Angora goat) (Fig. 10) belongs to the family Bovidae. Twenty-one small mammal species of the orders Chiroptera, Insectivora, Lagomorpha, and Rodentia belong to Erinaceidae, Dipodidae, Ochotonidae, Rhinolophidae, and Soricidae were recorded (Table 2).

The most common of these include Cape hare (*Lepus capensis*) (Fig. 11), Wild Rabbit (*Oryctolagus cuniculus*) (Fig. 12) killed by a hunter, Afghan hedgehog (*Hemiechinus auritus megalotis*) (Fig. 13), Afghan peka (*Ochotona rufescens*) (Fig. 14), Balochi mouse-like a hamster (*Calomyscus baluchi*) (Fig.15), Afghan vole (*Microtus afghanus*) (Fig.16), Balochistan short tail shrew (*Blarina hylophaga*) (Fig. 17) Sundevall's Jird (*Meriones crassus*) (Fig. 18), Lybian Jird (*Meriones libycus*) (Fig. 19), Five-toed Jerboa (*Allactaga elater*) (Fig. 20).

Table 2. Mammals of Maslakh State Forest Mountain Range.

SN	Species Name	Common name	Order	Family	Distribution
1	<i>Gazella bennetti</i>	Chinkara or Ravine Deer	Artiodactyla	Bovidae	Kodali
02	<i>Fovis vianei blanfordi</i>	Balochistan Urial	Artiodactyla	Bovidae	Kodali, Basha
03	<i>Ovis aries</i>	Karakul sheeps	Artiodactyla	Bovidae	Karakul sheep farm Shella, Kodali
04	<i>Capra aegagrus hircus</i>	Angora goats	Artiodactyla	Bovidae	Karakul sheep farm shella, Kodali
05	<i>Ochotona rufescence</i>	Afghan Pika	Lagomorpha	Ochotonidae	Dooshan, Zharhai talaab.
06	<i>Lepus capensis</i>	Cape Hare	Lagomorpha	Leporidae	Maayar cheena,
07	<i>Ellobius fuscocapillus</i>	Afghan Mole Vole	Rodentia	Muridae	Aghbarg, Basha, Daru
08	<i>Mus musculus</i>	House Mouse	Rodentia	Muridae	Aghbarg, Sultan, Basha
09	<i>Mus saxicola</i>	Grey Spiny Mouse	Rodentia	Muridae	Sheikh ki, Saidal kach
10	<i>Rattus rattus</i>	Roof or House Rat	Rodentia	Muridae	Basha, Sultan

SN	Species Name	Common name	Order	Family	Distribution
11	<i>Nesokia indica</i>	Short-Tailed Mole Rat	Rodentia	Muridae	Kurram
12	<i>Millardia gleadowi</i>	Sand Colored Rat	Rodentia	Muridae	Kurram, Saidal kach
13	<i>Meriones libycus</i>	Libian Jird	Rodentia	Muridae	Regi Nasaran, Shella
14	<i>Meriones persicus</i>	Persian Jird	Rodentia	Muridae	Kurram, Sebat
15	<i>Meriones crassus</i>	Sundevall's Jird	Rodentia	Muridae	Aghbarg, Basha
16	<i>Calomyscus bailwardi</i>	Mouse-like Hamster	Rodentia	Muridae	Shella, Kurram
17	<i>Cricetulus migratorius</i>	Migratory Hamster	Rodentia	Muridae	Saidal kach, kurram
18	<i>Allactaga elater</i>	Small Five Toad Jerboa	Rodentia	Dipodidae	Maslakh lamboor, Laal bhai nullah
19	<i>Crocidura gmelini</i>	Balochistan Short Tailed Shrew	Insectivora	Soricidae	Sultan, Daru, Shella
20	<i>Crocidura zarudnyi</i>	Zarudny's Shrew	Insectivora	Soricidae	Sheikh ki, Saidal kach
21	<i>Hemiechinus auritus</i>	Afghan Hedgehog	Insectivora	Erinaceidae	Throughout Maslakh state Forest.
22	<i>Paraechinus hypomelas</i>	Brandt's Hedgehog	Insectivora	Erinaceidae	Dooshan nullah
23	<i>Hystrix indica</i>	Indian Crested Porcupine	Rodentia Bovidae	Hystriidae	Aghbarg and Sultan.
24	<i>Rhinolophus ferrummequinu</i>	Greater Horse Shoe Bat	Chiroptera	Rhinolophidae	Maslakh lamboor.
25	<i>Vulpes vulpes</i>	Common Red Fox	Carnivora	Canidae	Throughout Maslakh state forest range.
26	<i>Canis aureus</i>	Asiatic Jackal	Carnivora	Canidae	Kodali, Sultan
27	<i>Canis lupus</i>	Indian Wolf	Carnivora	Canidae	Kodali, Kaftari
28	<i>Hyaena hyaena</i>	Striped Hyaena	Carnivora	Canidae	Rarely once seen in shella

Table 3. Birds of Maslakh State Forest Mountain Range.

SN	Family	Common Name	Scientific Name	Distribution	Status
01	Falconidae	Eurasian Kestrel	<i>Falco tinnunculus</i>	Kodali, Kaftari	R/WV
02	Falconidae	Merlin	<i>Falco columbarius</i>	Kurai nullah, Zhurg nullah	SBV/WV
03	Falconidae	Saker Falcon	<i>Falco cherrug</i>	Kodali, Shella	WV
04	Accipitridae	Short Toed Eagle	<i>Circaetus gallicus</i>	Bahadur tsha, Tabai nullah	R
05	Accipitridae	Bonelli's Eagle	<i>Hieraaetus fasciatus</i>	Bash, Daru	R
06	Accipitridae	Tawny Eagle	<i>Aquila rapax</i>	Aghogharha, Kurram	R
07	Accipitridae	Golden Eagle	<i>Aquila chrysaetos</i>	Kodali, Sultan	R/WV
08	Accipitridae	Eurasian Sparrow Hawk	<i>Accipiter nisus</i>	Maayar, Maslakh Lamboor, Shella	SBV
09	Accipitridae	Black Kite	<i>Milvus migrans</i>	Shella, Aghgharha	SBV
10	Accipitridae	Shikra	<i>Accipiter badius</i>	Kurram, Saidal kach	WV/SBV
11	Accipitridae	Long Legged Buzzard	<i>Buteo rufinus</i>	Shella, Kodali	WV
12	Accipitridae	Common buzzard	<i>Buteo buteo</i>	Sultan, Daru	WV
13	Corvidae	Mag Pie	<i>Pica pica</i>	Shella, Agho gharha	R
14	Corvidae	Raven	<i>Corvus corax</i>	Aghbarg, Basha	R
15	Corvidae	Alpine Chough	<i>Pyrrhocorax graculus</i>	Zharhai talaab, Kodali	R
16	Corvidae	Chough	<i>Pyrrhocorax pyrrhocorax</i>	Kodali, Badwan	PM
17	Corvidae	Jackdaw	<i>Corvus monedula</i>	Badwan, Daru	WV
18	Coraciidae	European roller	<i>Coracias garrulus</i>	Aghbarg, Kurram	PM/YRV
19	Sturnidae	Rosy Pastor	<i>Sturnus roseus</i>	Aghbarg, Shella	PM /YRV
20	Strigidae	Eurassian Eagle Owl	<i>Bubo bubo</i>	Aghogharha,	R
21	Strigidae	Little owl	<i>Athene noctua</i>	Kaftari, Maayar	R
22	Strigidae	Pallid Scops Owl	<i>Otus brucei</i>	Sheikh Ki, Kodali	SBV
23	Otididae	Houbara Bustard	<i>Chlamydotis undulata</i>	Kurram	WV/PM
24	Phasianidae	Chakor	<i>Alectoris chukar</i>	Zharhai talaab, Kodali	R
25	Phasianidae	See-see Partridge	<i>Ammoperdix griseogularis</i>	Throughout Maslakh state forest mountain range.	R
26	Phasinidae	Common quail	<i>Coturnix coturnix</i>	Plains of sultan, Kurram, Basha.	PM/YRV
27	Columbidae	Blue Rock Pigeon	<i>Columba livia</i>	Old wells of Maslakh lamboor	R
28	Columbidae	Little Brown Dove	<i>Streptopelia senegalensis</i>	Dooshan cheena	R/SBV
29	Columbidae	Eurasian Ring Dove	<i>Streptopelia decaocto</i>	Aghogharha	R/SBV
30	Charadriidae	White Tailed Lapwing	<i>Chettusia leucura</i>	Sultan, Sebat	PM/SBV
31	Caprimulgidae	Eurasian Nightjar	<i>Caprimulgus europaeus</i>	Kaftari	SBV/V

SN	Family	Common Name	Scientific Name	Distribution	Status
32	Meropidae	European Bee-Eater	<i>Merops apiaster</i>	Nearer vegetated areas Aghbarg, Kurram	SBV
33	Meropidae	Blue- cheeked Bee-eater	<i>Merops persicus</i>	Aghbarg, Kurram	PM
34	Upupidae	Hoopoe	<i>Upupa epops</i>	Shella	SBV
35	Alaudidae	Small Skylark	<i>Alauda gulgula</i>	Aghbarg	R
36	Alaudidae	Crested Lark	<i>Galerida cristata</i>	Throughout Maslakh state forest mountain range.	R
37	Alaudidae	Hume's Short Toed Lark	<i>Calandrella acutirostris</i>	Sultan, Aghbarg	SBV
38	Alaudidae	Greatet Short Toad Lark	<i>Calandrella brachydactyla</i>	Saidal kach, Basha	WV
39	Alaudidae	Eurasian SkyLark	<i>Alauda arvensis</i>	Kurram, Saidal kach	WV
40	Alaudidae	Eastern Calandra Lark	<i>Melanocorypha bimaculata</i>	Sultan, Daru	WV
41	Timaliidae	Common Babbler	<i>Turdoides caudatus</i>	Kaftari, Zharhai talaab	R
42	Timaliidae	Streaked Laughing Thrush	<i>Garrulax lineatus</i>	Shella, Badwan	R
43	Motacillidae	Long Billed Pipit/ Brown Rock Pipit	<i>Anthus similis</i>	Regi Nasaran, Sultan, Saidal kach	R
44	Motacillidae	Water Pipit	<i>Anthus spinoletta</i>	Kurram, Shella	WV
45	Motacillidae	pied wagtail	<i>Motacilla alba</i>	Aghbarg, Sultan	R/WV
46	Motacillidae	Grey Wagtail	<i>Motacilla cinerea</i>	Kurram, Aghogharha	SBV
47	Motacillidae	Yellow Wagtail	<i>Motacilla flava</i>	Kurai nullah, Zhurg nullah	WV
48	Motacillidae	Yellow Headed /Citrine Wagtail	<i>Motacilla citreola</i>	Shella, Aghbarg side	SBV
49	Pycnonotidae	White Cheeked Bulbul	<i>Pycnonotus leucogenys</i>	Bahadur nullah, Tabai nullah	R
50	Pycnonotidae	Red Vented Bulbul	<i>Pycnonotus cafer</i>	Bahadur nullah	PM
51	Paridae	Black Crested Tit	<i>Parus rufonuchalis</i>	Shella, Shinshobe	R
52	Passeridae	Tree Sparrow	<i>Passer montanus</i>	Shella, Aghogharha	R
53	Passeridae	House Sparrow	<i>Passer domesticus</i>	Aghbarg, Basha	R/SBV
54	Passeridae	Spanish Sparrow	<i>Passer hispaniolensis</i>	Zhalga, Zharhai talaab	PM
55	Emberizidae	Rock Bunting	<i>Emberiza cia</i>	Maslakh lamboor	SBV
56	Emberizidae	White Capped Bunting	<i>Emberiza stewarti</i>	Shell, Kaftari, Daru	SBV
57	Emberizidae	Pine Bunting	<i>Emberiza leucocephalos</i>	Shella, Shinshobe	WV
58	Emberizidae	Red Headed Bunting	<i>Emberiza bruniceps</i>	Zharhai talaab	PM
59	Emberizidae	Black Headed Bunting	<i>Emberiza melanocephala</i>	Mandoki, Kurram	PM
60	Fringillidae	Eurasian Goldfinch	<i>Carduelis carduelis</i>	Tabai nullah, Kodali	R
61	Fringillidae	Billed Desert Finch	<i>Rhodopechys obsoleta</i>	Kurram, Saidal kach	R
62	Fringillidae	Red Fronted Serin	<i>Serinus pusillus</i>	Tabai nullah	R
63	Fringillidae	Common Rosefinch	<i>Carpodacus erythrinus</i>	Aghogharha, Kurram	SBV
64	Fringillidae	Eastern Linnet	<i>Carduelis cannabina</i>	Daru, Sultan	WV
65	Fringillidae	Mongolian Finch	<i>Bucanetes mongolicus</i>	Sheikh ki, Maayar	WV
66	Laniidae	Bay-Backed Shrike	<i>Lanius vittatus</i>	Laalbai nullah, Kurram	R
67	Laniidae	Rufous- Backed Shrike	<i>Lanius schach</i>	Aghogharha, Mandoki	R
68	Laniidae	Great Grey Shrike	<i>Lanius excubitor</i>	Mandoki nullah	R/SBV
69	Laniidae	Lesser Gray Shrike	<i>Lanius minor</i>	Sultan, Kurram, zhurg nullah	PM
70	Laniidae	Brown Shrike	<i>Lanius cristatus</i>	Aghogharha, Dooshan nullah	SBV/R
71	Laniidae	Red Backed Shrike	<i>Lanius collurio</i>	Kurai nullah, Zhurg nullah	PM
72	Hirundinidae	Barn or Common Swallow	<i>Hirundo rustica</i>	Basha, Sultan, Kurram, Aghbarg	SBV/WV
73	Hirundinidae	Red Rumped Swallow	<i>Hirundo daurica</i>	Kurram	SBV
74	Hirundinidae	Collared Sand Martin	<i>Riparia riparia</i>	Dooshan nullah	PM
75	Hirundinidae	Crag Martin	<i>Ptyonoprogne rupestris</i>	Kurram	SBV
76	Apodidae	Alpine Swift	<i>Tachymarptis melba</i>	Shella, Shinshobe	SBV
77	Apodidae	Common Swift	<i>Apus apus</i>	Kodali, Sultan	SBV
78	Apodidae	House Swift	<i>Apus affinis</i>	Dooshan nullah	SBV
79	Sittidae	Common European Nuthatch	<i>Sitta europaea</i>	Maslakh lamboor, Tabai nullah	R
80	Sittidae	Eastern Great Nuthatch	<i>Sitta tephronota</i>	Aghogharha, Dooshan	R
81	Sylviidae	Plain leaf Warbler	<i>Phylloscopus neglectus</i>	Sultan, Basha	SBV
82	Sylviidae	Booted Warbler	<i>Hippolais caligata</i>	Zharhai talaab	WV/SBV
83	Sylviidae	Green Warbler	<i>Phylloscopus nitidus</i>	Maayar, Aghogharha, Sultan	PM

SN	Family	Common Name	Scientific Name	Distribution	Status
84	Sylviidae	Upcher's Warbler	<i>Hippolais languid</i>	Aghbarg	SBV
85	Sylviidae	Orphean Warbler	<i>Sylvia hortensis</i>	Shella, Badwan	PM/SBV
86	Sylviidae	Great Reed Warbler	<i>Acrocephalus scirpaceus</i>	Sultan, Sebat	PM
87	Sylviidae	Cetti's Warbler	<i>Cettia cetti</i>	Shella, Kurram	WV
88	Sylviidae	Streaked scrub warbler	<i>Scotocerca inquieta</i>	Maslakh lamboor	R/SBV
89	Sylviidae	Sulphur –Bellied Warbler	<i>Phylloscopus griseolus</i>	Shella, Shinshobe	SBV
90	Sylviidae	Lesser White Throat	<i>Sylvia curruca</i>	Shell, Daru	WV/SBV
91	Muscicapidae	Spotted Flycatcher	<i>Muscicapa striata</i>	Maslakh lamboor	WV
92	Muscicapidae	Red Throated Flycatcher	<i>Ficedula parva</i>	Sheikh ki.	WV
93	Muscicapidae	Bluethroat	<i>Luscinia svecica</i>	Laal bhai nullah	PM
94	Turdidae	Common stonechat	<i>Saxicola torquata</i>	Maayar, Shella	SBV
95	Turdidae	Pied Bush Chat	<i>Saxicola caprata</i>	Aghogharha nullah	SBV
96	Turdidae	Blue Rock Thrush	<i>Monticola solitarius</i>	Dooshan nullah, Maslakh lamboor	R/SBV
97	Turdidae	Hume's Wheatear	<i>Oenanthe alboniger</i>	Sultan, Saidal kach	WV
98	Turdidae	Pied Wheatear	<i>Oenanthe picata</i>	Laalbai nullah, Badwan, Basha	SBV
99	Turdidae	Desert Wheatear	<i>Oenanthe deserti</i>	Kurai nullah	WV
100	Turdidae	Black Redstart	<i>Phoenicurus ochruros</i>	Tabai nullah	PM

R= Resident, SBV = Summer Breeding Visitor, WV = Winter Visitor, PM = Passage Migrant, YRV= Year-round visitor.

Table 4. Reptiles of Maslakh State Forest Mountain Range.

SN	Order	Family	Common Name	Scientific Name	Distribution
01		Varanidae	Caspian Varanus	<i>Varanus griseus</i>	Shella, Aghbarg
02		Scincidae	Broad-headed Skink	<i>Plestiodon laticeps</i>	Maaya, Laal bhai nullah
03		Geckonidae	Fat Tailed Gecko	<i>Eublepharis macularius</i>	Maslakh lamboor,
04		Geckonidae	Persian Sand Lacerta	<i>Eremias persica</i>	Aghbarg, Sultan, Shella
05		Geckonidae	Snake Eyed Lacerta	<i>Ophisops jerdoni</i>	Kurai nullah, Zhurg nullah
06		Geckonidae	Long Tailed Desert Lacerta	<i>Mesalina watsonana</i>	Saidal kach, Daru
07		Gekkonidae	Persian House Gecko	<i>Hemidactylus persicus</i>	Aghbarg, Basha
08		Gekkonidae	Persian Spider Gecko	<i>Agamura persica</i>	Tabai nullah, Bahadur tsha
09		Gekkonidae	Kachh Spotted Ground Gecko	<i>Cryptopodian kachhense</i>	Sultan, Basha, Daru
10	Squamata	Geckonidae	Mountain Dwarf Gecko	<i>Tropicolotes depressus</i>	Shella, Shinshobe
11		Agamidae	Common Field Agama	<i>Trapelus agilis</i>	Kurram, Sultan
12		Agamidae	Rock Agama	<i>Laudakia nupta</i>	Dooshan nullah, Maslakh lamboor,
13		Agamidae	Ocellate Ground Agama	<i>Trapelus megalonyx</i>	Aghogharha
14		Viperidae	Levantine Viper	<i>Macrovipera lebetina</i>	Kodali, Zharhai talaab
15		Viperidae	Saw Scaled Viper	<i>Echis carinatus</i>	Dooshan lamboor
16		Colubridae	Common rate snake	<i>Ptyas mucosus</i>	Maayar, Kaftari
17		Colubridae	Cliff Racer	<i>Platyceps rhodorachis</i>	Maslakh lamboor,
18		Colubridae	Golden Wolf Snake	<i>Lycodon striatus</i>	Shella, Kodai
19		Colubridae	Saharo-Sindhian Ribbon Snake	<i>Psammodphis schokari</i>	Shella, Narhanda nullah
20		Colubridae	Dark-headed Dwarf Racer	<i>Eirenis persicus</i>	Shella, Narhanda nullah
21		Colubridae	yellow-spotted wolf snake	<i>Lycodon flavomaculatus</i>	Maayar, Maslakh lamboor
22	Testudines	Testudinidae	Afghan Tortoise	<i>Agrionemys horsfieldii</i>	Shella, Maslakh lamboor

Table 5. Amphibians of Maslakh State Forest Mountain Range.

SN	Order	Family	Common Name	Scientific Name	Distribution
01		Bufo	Indus Valley Toad	<i>Bufo stomatsicus</i>	Shell, Maslakh lamboor, Zharhai talaab, Kurram
02	Anura	Bufo	Zugmayer's Toad/ baloch Green Toad	<i>Bufo viridus</i>	Shella, Maslakh Lamboor, Zharhai taalaab.Aghbarg
03		Ranidae	Common Skittering Frog	<i>Euphlyctis cyanophlyctis</i>	Maslakh lamboor, Sultan, Basha



Fig. 4. Indian wolves captured by.



Fig. 7. Common red fox.



Fig. 5. Asiatic or golden Jackal local hunter.



Fig. 8. Indian crested porcupine.



Fig. 6. Striped hyena.



Fig. 9. Karakul sheep.



Fig. 10. Angora sheep.



Fig. 13. Afghan hedgehog



Fig. 11. Cape hare.



Fig. 14. Afghan peka.



Fig. 12. Wild rabbit killed by hunter.



Fig. 15. Balochi mouse like hamster.



Fig. 16. Afghan vole shrew.



Fig. 19. Lybian Jird.



Fig. 17. Balochistan short tail.



Fig. 20. Five-toed Jerboa.



Fig. 18. Sundevall's Jird.

Due to the illegal capturing of adult and juvenile Indian wolves, its population was scarce in the study area. A local villager was seen capturing two Indian wolves (whose snout and legs were tied with rope) for selling (Fig. 4). Some nomads were found selling the hide (skin) of Indian wolf and striped hyaena (*Hyaena hyaena*). Very few striped hyaena were hardly observed near Badwan as they were scarce. These results are in line with those of AbiSaid and Dloniak (2015) where they mentioned that striped hyaena may come close to meeting a continuing decline of 10% over the next three generation. The IUCN (2003) has also listed it as near-threatened. It appears to be scarce in Baluchistan and rare in Sindh.

It is common around the hill ranges surrounding Quetta city in Baluchistan (Roberts, 1977). In the present study the Indian porcupines (*Hystrix indica*) were found less common because of their killing as a farm pest by local farmers. Red foxes (*Vulpus vulpus*) were still common throughout the Maslakh state forest mountain range. Asiatic Jackal (*Canis aureus*) was found to be less common.

In the present study the recorded bird's species number was 100 belonging to twenty-five families (Sturnidae, Strigidae, Otididae, Phasianidae, Columbidae, Charadriidae, Caprimulgidae, Meropidae, Upupidae, Alaudidae, Timaliidae, Motacillidae, Pycnonotidae, Paridae, Passeridae, Emberizidae, Fringillidae, Fringillidae, Laniidae, Hirundinidae, Apodidae, Sittidae, Sylviidae, Muscipidae, Turdidae) as shown in table 3.

The status of the birds recorded was identified as 34 residents (34%), 19 passage migrants (19%), 35 summer breeding visitors (35%), 27 winter visitors (27%), and three year-round visitors (3%), respectively. Among these, the most common game birds comprised Chukar partridge (*Alectoris chukar*) (Fig. 21), see-see partridge (*Ammoperdix griseogularis*) (Fig. 22), houbara bustard (*Chlamydotis undulata*) (Fig. 23) and common quail (*Coturnix coturnix*) (Fig. 24). Blue rock pigeon (*Columba livia*) (Fig. 25) were found living in old wells (Karez system) near the studied areas. Two types of dove have been recorded a little brown dove (*Streptopelia senegalensis*) (Fig. 26), Eurasian ring dove (*Streptopelia decaocto*) (Fig. 27).

Rosy paster (*Sturnus roseus*) (Fig. 28), and Desert wheat-eater (Fig. 29) were round the year visitors during the grape and mulberry season. Predatory birds like Sparrow hawk (*Accipiter nisus*) (Fig. 30), black kite (*Milvus migrans*) (Fig. 31), golden eagle (*Aquila chrysaetos*) (Fig. 32), long-legged buzzard (*Buteo rufinus*) (Fig. 33), Eurasian kestrel (*Falco tinnunculus*) (Fig. 34), little owl (*Athene brama*) (Fig. 35) and common house sparrow (*Passer domesticus*) (Fig. 36), Hoopoe (*Upupu epops*) (Fig. 37).



Fig. 21. Chukar partridge.



Fig. 22. See see partridge.



Fig. 23. Houbara bustard.



Fig. 24. Common Quail.



Fig. 25. Blue rock pigeon.



Fig. 26. Little brown dove.



Fig. 27. Eurasian ring dove.



Fig. 28. Rosy paster.



Fig. 29. Desert wheat-eater.



Fig. 30. Sparrow hawk.



Fig. 31. Black kite.



Fig. 32. Golden eagle.



Fig. 33. Lon legged buzzard.



Fig. 34. Eurasian kestrel.



Fig. 35. Little owl.



Fig. 36. House sparrow.



Fig. 37. Hoopoe.

A total of 22 species of reptiles belonging to seven families (Varanidae, Scincidae, Geckonidae, Agamidae, Viperidae, Colubridae, and Testudinidae) was recorded during the present study. Table 4 represented 13 lizards and eight snake species, including two species of poisonous snakes. Levantine viper (*Macrovipera lebetina*) (Fig. 38), Saw scaled viper (*Echis carinatus*) (Fig. 39). Only one testudine was recorded, namely Afghan Tortoise (*Agrionemys horsfieldii*) (Fig. 40). The important species were Ribbon snake (*Psammodphis schokari*) (Fig. 41), golden wolf snake (*Lycodon striatus*) (Fig. 42), fat-

tailed gecko (*Eublepharis macularius*) (Fig. 43), Caspian Varanus (*Varanus griseus*) (Fig. 44), Quetta rock gecko (*Hemidactylus maculatus*) (Fig. 45), Rock agama (*Laudakia nupta*) (Fig. 46). Fat-tailed gecko, *E. macularius* was found very famous because of its beautiful skin, some local villagers were found capturing and selling it illegally for money making purposes. Road vehicles killed a few Caspian Varanus and *V. griseus* during the summer months of June and July 2022. Many non-poisonous snakes were found dead by shepherds or local villagers due to the masses' unawareness of conserving the area's wildlife. Two amphibian (toads) species *Bufo stomaticus* (Fig. 47) and *Bufo viridus* (Fig. 48), and one species of frog, *Euphlyctis cyanophlyctis* (Fig. 49), were recorded.



Fig. 38. Laventine viper.



Fig. 39. Saw-scale viper.



Fig. 40. Afghan tortoise.



Fig. 41. Ribbon snake.



Fig. 42. Golden wolf snake.



Fig. 43. Fat tailed gecko.



Fig. 44. Caspian varanus.



Fig. 45. Quetta rock gecko.



Fig. 46. Rock agama.



Fig. 47. Toad (*Bufo stomaticus*).



Fig. 48. Toad (*B. viridus*).



Fig. 49. Frog (*Euphlyctis cyanophlyctis*).

The aims of the Maslakh state forest establishment during 1981-1982 were to conserve and protect the

chinkara (*Gazella bennettii*) and Balochistan urial (*Ovis vignei blanfordi*) (Khosa *et al.*, 2013; Hamdullah *et al.*, 2014). While Maslakh range land at Shella (Fig. 60), Lower Daru (Fig.61), Shinshobe and Kodali (Fig. 64) were selected as a natural habitat for Karakul sheep (*Ovis aries aries* Linnaeus, 1758).

According to Virk (1991) and Shafique (Personal communication, 2010) the population of chinkara recorded in the Maslakh area was almost wiped out due to indiscriminate hunting. Karakul sheep are famous for their ability to forage and grow under extremely harsh living conditions.

They can survive severe drought conditions because of their special quality, storing fat in their tails. They are currently listed as endangered (Kevin, 2009; Ibrahim *et al.*, 2011). The taxonomic status of urials are disputed. Roberts (1967a, 1977, 1985) refers to them as Baluchistan urial (*Ovis vignei cycloceros blanfordi*), Schaller (1977) as Afghan urial (*Ovis vignei cycloceros*), and Valdez (1988) differentiates between the Afghan urial (*Ovis vignei cycloceros*) distributed in the north of Quetta, and the Baluchistan urial (*O. o. blanfordi*) distributed in the south of Quetta and Sindh west of Indus.

In total 661 animal species had identified in Balochistan province (Roberts, 1997; Syed, 2007) compare to 153 recorded in the present study.

The identified plant species in Balochistan are 1,750 (Ghafoor, 2002; Shareeque and Arshad, 2005). Key plant species observed in the study area include *Pistacia khinjuk* (Jangli pasta) (Fig. 50), *Ficus carica* (Wild fig) (Fig. 51), *Ephedra* sp. (Joint-pine) (Fig. 52), *Aegopordon beradiodis* (Fig. 53), *Asragallus strocksii* (Fig. 54), *Artemisia annua* (Fig. 55), *Convovulvus siposus* (Fig. 56), *Hertia intermedia* (Fig. 57), *Peganum hemala* (Fig. 58), *Sophora mollis* (Fig. 59), etc. Similar plant species were also reported by Rafi (1965), Said and Hussain (1959). Marwat *et al.* (1989) had reported 83 species of Maslakh range vegetation.



Fig. 50. *Pistacia khinjuk*



Fig. 51. *Ficus carica*



Fig. 52. *Ephedra* sp.



Fig. 53. *Aegopordon beradiodis*



Fig. 54. *Asragallus strocksii*



Fig. 55. *Artemisia annua*



Fig. 56. *Convovulus siposus*.



Fig. 57. *Hertia intermedia*.



Fig. 58. *Peganum hemala*.



Fig. 59. *Sophora mollis*.

During the present study, local people were found cutting various plant species like *Ephedra intermedia* and *Artemisia annua* in large quantities for burning. Local ruminant (goats) grazing was found in Badwan (Fig. 62) and Saidal Kach (Fig. 63), hence increased the threat to the state forest. A few trees of *Pistacia khinjuk* (Fig. 50) were observed, indicating the area's potential for tree plantation. It is suggested that seeds of the *Pistacia khinjuk* and *Artemisia annua* (Fig. 55) may be cultivated, bringing better results. *Pinus* and *Juniperus* may also be planted. The area after such type of management may cater to habitats for wildlife. However, the current image of vegetation studied in the present investigation may not provide suitable habitats for world life. There is a need to improve realization to at least keep the animal and plant origin in its original status and diversity among them. The study area also faced long droughts (2003-2021). Winter rains occur in less precipitation, and plants were seen facing less growth in spring in the Kodali area (Fig. 60). Small dams and reservoirs may be constructed to conserve underground and surface waters at Daru hill slop (Fig. 64), where snow in large quantity was observed during winter 2022. Encroachment in the protected area, construction of roads, housing schemes, residential colonies, and human population pressure found around the Maslakh range forest are growing greatly. This situation effectively upset the wildlife habitats of the area. Illegal capturing of wolves due to the skin value or pet keeping and hunting game birds (Chakur, See-see partridge, Houbara bustard, and Quail) had severely affected their population growth.



Fig. 60. Kodali area vegetation at Maslakh range forest in spring season.



Fig. 61. Shella area of Maslakh range forest in summer season.



Fig. 62. Grazing in summer at Badwan area of Maslakh range forest.



Fig. 63. Grazing at Saidal Kach area of Maslakh range forest in autumn season.



Fig 64. Upper Daru hill slope snow fall in winter at Maslakh range forest.

Conclusion

Maslakh range forest is endorsed by a variety of biological diversity as it is home to some threatened

species. It was declared a wildlife sanctuary in 1968. The area's habitat is under serious threat due to anthropogenic pressure and the visible ignorance of the responsible authorities. Due to the lack of natural gas facilities in the area, local inhabitants cut the valuable plant species like *Ephedra*, *Artemisia*, and other trees and shrubs for burning. Another factor of habitat loss noted was the continuous grazing of goats and sheep there (Fig. 62, 63). Moreover, climate change, especially after 2018, with increased drought intensity, has adversely affected the wildlife habitat. Hence, quick management needs to be done to further improve the situation. It is suggested that Forestry and Wildlife Department stop the plant cutting as plants are a primary food source and shelter for numerous animal species in the study area. Every organism on earth has an equal right to exist, whether it is valuable to humans or not. Further, the barbed wire around the range forest boundary was cut off at several points, so it needs to be repaired to prevent people entry, grazing and destroying. Similarly, illegal capturing of Indian wolves and hunting of Chakor and See-see partridge are continued, which need to be discouraged. Some small ponds were found eroded by rain and require reparation to restore water for vertebrate fauna of the state forest.

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