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Saqib Younas
Department of Zoology,
GPGC Karak, Pakistan

Hameed Ur Rehman
Department of Chemistry,
Kohat University of Science and
Technology, KUST, Kohat,
Pakistan

Shafiullah Gul
Department of Zoology,
GPGC Karak, Pakistan

Rukhsana Gul
Department of Chemistry,
Kohat University of Science and
Technology, KUST, Kohat,
Pakistan

Baharullah Khattak
Department of Microbiology,
Kohat University of Science and
Technology, KUST, Kohat,
Pakistan

Correspondence
Hameed Ur Rehman
Department of Chemistry,
Kohat University of Science and
Technology, KUST, Kohat,
Pakistan

Animal diversity of district Karak, KP, Pakistan

Saqib Younas, Hameed Ur Rehman, Shafiullah Gul, Rukhsana Gul and Baharullah Khattak

Abstract

The present study was conducted to explore the vertebrate and invertebrate fauna of district Karak, Khyber Pakhtunkhwa province of Pakistan during the period from May 2016 to May 2017. Karak includes all the vertebrates, including fishes, amphibians, reptiles, birds and mammals. During the present survey, 184 different species of the both vertebrates and invertebrates fauna of the district Karak were observed. Out of which, 28 species of mammals, 6 species of amphibians, 12 species of reptiles, 54 species of birds, 28 species of fishes, and 56 species of invertebrates. So from the present study, it may be concluded that the families *Cyprinidae*, *Ranidae*, *Agamidae*, *Phasianidae*, *Equidae*, *Bovidae*, *Libellulidae*, *Formicidae* were very dominant in the district Karak.

Keywords: Fish, amphibian, reptiles, *Cyprinidae*, Karak

Introduction

Biodiversity refers to the extent, diversity and distribution across biological scales ranging through genetics and life forms of populations, species, communities and ecosystems^[1]. Fish is one of the major groups of vertebrates. Among all the aquatic fauna, fishes are one of the most important fundamentals and also play a key role in the wealth of many nations as they have been a found as a constant item in the diet of many nations^[2]. It influences human life in a number of ways. It is a rich source of food and playing a predominant role in overcoming the nutritional difficulties including Proteins, fat and vitamins and also provides several by products like fish meal, fish glue and fish oil etc.^[3]. According to Jayaram^[4] (1999) out of the total 40,000 species of vertebrates, 21, 723 are fishes. From Pakistan round about 173 fresh water species and 786 marine species have been described^[5]. As vast research work has been done on the diversity of fish fauna of Khyber Pakhtunkhwa province, Pakistan by several workers including Butt^[6] observed ninety four species of fishes from the whole province of Khyber Pakhtunkhwa. Saqib *et al* worked on Khurum dam and described six species of fishes^[7]. Asmat *et al* in 2014 studied the diversity of fish fauna in the Baran dam of district Bannu, Khyber Pakhtunkhwa province (KPK), and reported 15 species^[8]. Hameed *et al* in 2016, study the fish fauna of dandy dam North Waziristan agency of FATA, KPK, Pakistan and documented 5 species^[9]. Hameed *et al* 2016, conducted studies on Dargai dam and describe the 5 different species of fishes^[10].

Amphibians, the ancestors of modern reptiles and mammals, first evolved in Devonian era and flourished throughout Carboniferous period. This unique group of kingdom animalia provides an evolutionary link between aquatic and terrestrial mode of life^[11]. Among vertebrates, amphibians are of particular concern, as they are still poorly known and are highly threatened^[12] and a decline in their population is a major concern^[13, 14]. There are 7,044 species of amphibians in three orders exist today in the world^[15]. Amphibian fauna is scarce in Pakistan as not a single species of two vital amphibian orders, Caudata and Gymnophiona, exists here. These species fall in twelve genera of four major families viz., Bufonidae, Megophryidae, Microhylidae and Dicroglossidae^[16]. The pioneer work on the systematic of true frogs in Pakistan's some specific areas is previously done^[17]. In Pakistan Ranidae is the richest family of Order Anura under Class Amphibia, they having 750 true frog species which contained 61 Genera^[18]. Reptiles are cold-blooded animals found in almost all the parts of the world, except the very cold regions. Reptiles were considered as the first truly land vertebrates. The lungs and heart of reptiles were changed for making reptiles more advanced. Reptiles are called an amniotes because they contain four embryonic membranes. Reptile diversity is particularly high in arid regions of the world, for instance in North American deserts^[19],

southern Europe etc. [20].

In Pakistan, reptile is represented by four categories which are (Testudines, Sauria, Serpentes, Crocodilia). According to IUCN, there are now 1,677 reptile species have been included on the IUCN Red List, with 293 added in 2009. In total, 469 are threatened with extinction and 22 are already Extinct or Extinct in the wild. Pakistan has 179 species of reptilian fauna consisting of turtles, tortoises, crocodile, gavia, lizards and snakes [21]. Birds and their diversity constitute a main part of the natural environment and play a functional role as agents of flower pollination, seed dispersal, source of food chain and agents in breaking seed dormancy [22]. Birds are among the most easily defined and readily recognized categories of animals, due to the presence of feather, which is unique to them. In addition to feathers, the development of forelimbs as wings, mostly for flight; feathered tail that serves for balancing, steering and lifting; toothless horny beak and skeleton exhibiting unique adaptations, mainly for flight and bipedal locomotion are characteristics of birds [23-24]. Although they occupy most of the earth's surface, most species are found only in particular regions and habitats, whereas others are cosmopolitan [25]. Class Aves contains two suborders: Archaeornithes and Neornith, three Super orders and 29 Orders [26, 27] described avifauna distribution in the whole country of Pakistan [28] described the avifauna of Salt Range, of Pakistan. Ali & Ripley [29] and Roberts [27, 30] also described avifauna distribution in whole country [31-32]. Recorded the avifauna of Ravi siphon and Head Qadir abad respectively. Irfan [33] noted the biodiversity of Changa Manga. Donald [34] worked on birds of prey of the Punjab.

Mammals (class Mammalia) are an extraordinary group, its showing an amazing diversity of species, ecologies, physiologies, in their life histories as well as in their behaviors. Like birds, mammals also perform a key role in the ecosystem by transferring pollen grains from one flower to another and also controlling various diseases [35-36]. According to IUCN [37], out of 4763 mammalian species of the world, 1137 are threatened. Mammalian fauna of Pakistan is represented by 195 species belonging to 10 orders [38, 39]. Roberts [40] explored mammalian fauna of Pakistan, Chaudhry *et al.* [41] documented diversity of Salt Range and Cholistan desert while Singh and Banyal [42] recorded mammalian diversity from river Ravi near India-Pakistan border. The invertebrates are one of the most important biotic components that influence all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter [43, 44]. Invertebrates are a very diverse and influential group that comprises more than 90% of the estimated 10 million-plus animal species of the invertebrates, in which mainly arthropods [45]. Most invertebrates provide food for human beings. These beneficial invertebrates are shrimps, termites, grasshoppers and honey bees. They are widely used in research, aquaculture, farming, and as displays in aquarium [46]. The objective of the research work was to find out the animal diversity of district Karak, KP, Pakistan.

Materials and Methods

Sampling, Identification and Preservation

Fishes were collected from different standing water bodies of district Karak like Changhoz dam, Sharki dam, Zebe dam, Dand Eidal Khel Lake, and Teri toi, Khurum dam from May

2016 to May 2017. etc. with the help of local fisherman using different types of castnets and hooks with the regular intervals. Immediately after capturing the fishes were directly preserved in 70% alcohol and 10% formalin solution, larger fishes were given injection of formalin in their abdomen and other parts of the body to avoid bacterial contamination. After collection the fishes were brought to the lab for identification. The meristic and morphometric characters were studied and the fishes were identified up to species level with the help of using different types of following books and fish keys of Mirza and Sandhu [47], and Nelson [48]. Surveys of amphibians were conducted during day and night using different survey methods. The method involves rapid surveys and careful visual estimation of amphibians in all the possible habitats, such as agricultural fields, wet lands, rocky areas and open lands [49]. The species were identified by using [50, 51]. Nomenclature for Amphibians was followed from [15].

Reptiles were observed by eye, and using binoculars. Each zone was then actively surveyed for suitable microhabitats for reptiles (stones, pond embankment, crevices, leaf litter/debris, rotten logs) and potential reptile breeding sites (marsh, small water pools, and water channels). Night surveys within the study sites were conducted using boots, hand lamps and powerful torches to avoid dangerous snakes. For the collection of reptile use bare hands, with long forceps or snake clutches were the usual means for collection, Snakes, especially venomous species, were caught with snake clutches or sticks. "Scoop nets" were used in shallow water and "cast nets" in larger bodies of water for the collection of aquatic reptiles and [52]. Voucher specimens were injected and preserved in 10% formalin solution or 50-70% alcohol and for their identification using specific keys [53, 54]. The survey for birds were conducted daily basis at different locations of the Karak like agriculture fields, wetlands and tanks, river banks, road side tree, sericulture research campus, mango orchards, Municipal dumping area. At each sighting bird were counted using a binocular (8x to 32x) and identified. In case of doubtful identification, photographs were taken and the species is identified later by consulting experts. Identification of birds was done using field guides [55, 56] and only those species with confirmed identity are reported in this paper. The checklist was prepared using standardized common and scientific names of the birds following Manakadan and Pittie [57].

The diversity of the mammalian species was studied by direct physically observations. The indirect clues (calls and voices, nests, burrows, fecal pellets, marks and foot-prints for the presence or absence of species) were also considered [58]. Binoculars (32x50) were used to observe the animals and field guides were consulted to correctly identify the species [59]. All species were arranged according to taxonomic classification and their IUCN conservation status determined [60-61]. Samples of invertebrates were collected from different sampling sites of the Karak with the help of plankton net of mesh size 60-75 μ . The collected specimens were then transferred into a tube filled with 5% formalin for their preservation. These were brought into to laboratory and then sorted into different groups. The invertebrates were identified up to species level with the stereo zoom microscope by using identification keys [62, 63].



Fig 1: Map of district Karak, KP, Pakistan

Results

The recorded amphibian species during the survey of district Karak belongs to two different orders, four families and five genera. The order Anura was dominant in Karak region. The order Anura consist three families (*Dicroglossidae*, *Ranidea*, *Bufo*) and five species (*Rana tigrina*, *Euphlyctis cyanophlyctis*, *Duttaphrynus melanostictus*, *Rana femporaria*, *Buffo surdus*) and the order (*caudata*) having one family (*salamandridea*) and one species (*Pleurodeles waltii*).In

daistic Karak twelve species of amphibians are analyzed(*Chamaeleo zeylanicus*, *Saara hardwickii*, *Xantusia vigilis*, *Lampropeltis getula*, *Agamura persica*, *Naja haji*, *Sitana ponticeriana*, *Natrix tessellate*, *Varanus bengalensis*, *Uromastix aegyptian*, *Anguis fragilis*, *Ablepharus pannonicus*) which belong to seven family (*Chamaeleonidae*, *Agamidae*, *Xantusiidae*, *Colubridae*, *Gekkonidae*, *Serpentes*, *Varanidae*) and one dominant order (*Squamata*).

Table 1: Taxonomic classification of Fishes collected from district Karak, KP, Pakistan

S.No.	class	Order	Family	Genus	Species
1	Actinopterygii	Cypriniformes	Cyprinidae	Cyprinus	C. carpio
2	Actinopterygii	Cypriniformes	Cyprinidae	Labeo	L. rohita
3	Actinopterygii	Cypriniformes	Cyprinidae	Labeo	L. calbaso
4	Actinopterygii	Cypriniformes	Cyprinidae	Carassius	C. auratus
5	Actinopterygii	Cypriniformes	Cyprinidae	Catla	C. catla
6	Actinopterygii	Cypriniformes	Cyprinidae	Cirrhinus	C. mrigala
7	Actinopterygii	Cypriniformes	Cyprinidae	Ctenopharyngodon	C. idella
8	Actinopterygii	Cypriniformes	Cyprinidae	Puntius	P. ticto
9	Actinopterygii	Cypriniformes	Cyprinidae	Puntius	Sophore
10	Actinopterygii	Cypriniformes	Cyprinidae	Hypophthalmichthys	H. molitrix
11	Actinopterygii	Cypriniformes	Cyprinidae	Barilius	B. vagra
12	Actinopterygii	Cypriniformes	Cyprinidae	Barilius	B.pakistanicus
13	Actinopterygii	Cypriniformes	Cyprinidae	Crossocheilus	C. latius
14	Actinopterygii	Cypriniformes	Cyprinidae	Crossocheilus	C.diplocheilus
15	Actinopterygii	Cypriniformes	Cyprinidae	Cyprinion	C. watsoni
16	Actinopterygii	Cypriniformes	Cyprinidae	Aspidoparia	A. morar
17	Actinopterygii	Cypriniformes	Cyprinidae	Salmophasia	S. bacaila
18	Actinopterygii	Cypriniformes	Cyprinidae	Cirrhinus	C. cirrhosus
19	Actinopterygii	Cypriniformes	Cyprinidae	Tor	Tor
20	Actinopterygii	Cypriniformes	Cyprinidae	Oreochromis	niloticus
21	Actinopterygii	Cypriniformes	Cyprinidae	Ctenopharyngodon	Ctenopharyngodon
22	Actinopterygii	Cypriniformes	Cyprinidae	Barilius	B.bendelisis
23	Actinopterygii	Channiformes	Channidae	Channa	C.punctatus
24	Actinopterygii	Channiformes	Channidae	Channa	C. straitus
25	Actinopterygii	Channiformes	Channidae	Channa	C. gachua
26	Actinopterygii	Siluriformes	Siluridae	Ompok	O. pabda
27	Actinopterygii	Mastacembeliformes	Mastacembelidae	Mastacembelus	M. armatus
28	Actinopterygii	Anguilliformes	Anguillidae	Anguilla	A. anguilla

Table 2: Taxonomic classification of Amphibians collected from district Karak, KP, Pakistan.

S. No.	class	order	family	genus	species
1	Amphibia	Anura	Dicroglossidae	Rana	Rana tigrina
2	Amphibia	Anura	Ranidea	Euphlyctis	Euphlyctis cyanophlyctis
3	Amphibia	Anura	Bufoidea	Duttaphrynus	Duttaphrynus melanostictus
4	Amphibia	Anura	Ranidea	Rana	Rana femporaria
5	Amphibia	caudata	salamandridea	pleurodeles	Pleurodeles walti
6	Amphibia	Anura	Bufoidea	Buffo	Buffo surdus

Table 3: Taxonomic classification of Reptiles collected from district Karak, KP, Pakistan

S. N	class	order	family	genus	species
1	Reptilia	Squamata	Chamaeleonidae	Chameleo	Chamaeleo zeylanicus
2	Reptilia	Squamata	Agamidae	Saara	Saara hardwickii
3	Reptilia	Squamata	Xantusiidae	Xantusia	Xantusia vigilis
4	Reptilia	Squamata	Colubridae	Lampropeltis	Lampropeltis getula
5	Reptilia	Squamata	Gekkonidae	Agamura	Agamura persica
6	Reptilia	Squamata	Serpentes	Naja	Naja haji
7	Reptilia	Squamata	Agamidae	Sitana	Sitana ponticeriana
8	Reptilia	Squamata	Colubridae	Natrix	Natrix tessellate
9	Reptilia	Squamata	Varanidae	Varanus	Varanus bengalensis
10	Reptilia	Squamata	Agamidae	Uromastix	Uromastix aegyptian
11	Reptilia	Squamata	Anguillidae	Anguis	Anguis fragilis
12	Reptilia	Squamata	Scincidae	Ablepharus	Ablepharus pannonicus

Table 4: Taxonomic classification of Birds collected from district Karak, KP, Pakistan

S. No.	class	order	family	genus	species
1	Aves	Columbiformes	Columbidae	Zenaida	Z. macroura
2	Aves	Passeriformes	Paridae	Poecile	P.atricapillus
3	Aves	Passeriformes	Passeridae	Passer	P.domesticus
4	Aves	Passeriformes	icteridae	agelaius	A. phoeniceus
5	Aves	Passeriformes	Hirundinidae	Hirundo	H. rustica
6	Aves	Piciformes	Picidae	Picoides	P. villosus
7	Aves	Passeriformes	Emberizidae	Junco	J.hyemalis
8	Aves	Passeriformes	Motacillidae	Motacilla	M. flava
9	Aves	Passeriformes	Motacillidae	Motacilla	M. alba
10	Aves	Passeriformes	Motacillidae	Anthus	A.similis
11	Aves	Galerida	Alaudidae	Galerida	G.cristata
12	Aves	Passeriformes	Turdidae	Turdus	T.merula
13	Aves	Passeriformes	Alaudidae	Melanocorypha	M. calandra
14	Aves	Passeriformes	Sylviidae	Sylvia	S. communis
15	Aves	Passeriformes	Alaudidae	Alauda	A. arvensis
16	Aves	Strigiformes	Strigidae	Athene	A. noctua
17	Aves	Bucerotiformes	Upupidae	Upupa	U. epops
18	Aves	Columbiformes	Columbidae	Columba	C. trocaz
19	Aves	Galliformes	Phasianidae	Gallus	G. domesticus
20	Aves	Galliformes	Phasianidae	Alectoris	A. chukar
21	Aves	Passeriformes	Rhipiduridae	Rhipidura	R. leucophrys
22	Aves	Galliformes	Phasianidae	Coturnix	C. coturnix
23	Aves	Galliformes	Phasianidae	Francolinu	F. pondicerianu
24	Aves	Passeriformes	Pycnonotidae	Pycnonotus	P. leucotis
25	Aves	Passeriformes	Leiothrichidae	Turdoides	T. caudata
26	Aves	Passeriformes	Laniidae	Lanius	L. collurio
27	Aves	Coraciiformes	Halcyonidae	Halcyon	H. smyrnensis
28	Aves	Passeriformes	Pycnonotidae	Pycnonotus	P. cafer
29	Aves	Pelecaniformes	Ardeidae	Bubulcus	B. ibis
30	Aves	Accipitriformes	Accipitridae	Milvus	M. migrans
31	Aves	Passeriformes	Sturnidae	Acridotheres	A. tristis
32	Aves	Coraciiformes	Coraciidae	Coracias	C. benghalensis
33	Aves	cucliformes	Cuculidae	Hierococyx	H.sparverioides
34	Aves	cucliformes	Cuculidae	Clamtor	C.jacobinus
35	Aves	Piciformes	Picidae	Picus	P.canus
36	Aves	Piciformes	Megalaimidae	Psilopogon	P.virens
37	Aves	Psittaciformes	Psittaculidae	Psittacula	P.krameri
38	Aves	Coraciiformes	Meropidae	Merops	M.opister
39	Aves	Columbiformes	Columbidae	Columba	C.livia
40	Aves	Galliformes	Phasianidae	Coturnix	C.coturnix
41	Aves	Galliformes	Phasianidae	Alectoris	A.chukar
42	Aves	Charadriiformes	Turnicidae	Turnix	T.sylavaticus

43	Aves	Passeriformes	Sturnidae	Acridotheres	A.ginginanus
44	Aves	Passeriformes	Corvidae	Corvus	C.splendens
45	Aves	Galliformes	Phasianidae	Gallus	G.gallus
46	Aves	Anseriformes	Anatidae	Anas	A. crecca
47	Aves	Galliformes	Phasianidae	Perdix	P. perdix
48	Aves	Galliformes	Phasianidae	Pavo	P. cristatus
49	Aves	Galliformes	Numididae	Numida	N. meleagris
50	Aves	Galliformes	Gruidae	Grus	G. grus
51	Aves	Passeriformes	Pycnonotidae	Pycnonotus	P. barbatus
52	Aves	Accipitriformes	Accipitridae	Buteo	B. jamaicensis
53	Aves	Anseriformes	Anatidae	Cairina	C. moschata
54	Aves	Passeriformes	Dicruridae	Dicrurus	D.adsimilis

Table 5: Taxonomic classification of Mammals collected from district Karak, KP, Pakistan

S. No.	class	Order	family	Genus	Species
1	Mammalia	Carnivora	Hyaenidae	Crocula	C. Crocula
2	Mammalia	Carnivora	Canidae	Canus	C. aureus
3	Mammalia	Carnivora	Canidae	Canus	C. familiaris
4	Mammalia	Carnivora	Felidae	Felis	F. catus
5	Mammalia	Carnivora	Mustellidae	Lutra	L. lutra
6	Mammalia	Carnivora	Herpestidae	Herpestes	H. edwardaii
7	Mammalia	Carnivora	Felidae	Felis	F. silvestris
8	Mammalia	Artiodactyla	Bovidae	Capra	Capra hircus
9	Mammalia	Artiodactyla	Bovidae	Ovis	Ovis aries
10	Mammalia	Artiodactyla	Bovidae	Bos	Bos Taurus
11	Mammalia	Artiodactyla	Camelidae	Camelus	C.dromedarius
12	Mammalia	Artiodactyla	Suidae	Porcula	P. salvania
13	Mammalia	Artiodactyla	Bovidae	Bubalus	B. bubalis
14	Mammalia	Perissodactyla	Equidae	Equus	Equus asinus
15	Mammalia	Perissodactyla	Equidae	Equus	E. ferus
16	Mammalia	Perissodactyla	Equidae	Equus	E.mulus
17	Mammalia	Eulipotyphla	Erinacidae	Hemiechinus	H. auritus
18	Mammalia	Eulipotyphla	Soricidae	Suncus	S. murinus
19	Mammalia	Eulipotyphla	Talpidae	Euroscaptor	E. grandis
20	Mammalia	Pholidota	Manidae	Manis	M. javanica
21	Mammalia	Chiroptera	Vespertilionidae	Nyctalus	N.noctula
22	Mammalia	Rodenta	Hystricidae	Hystrix	H. hindica
23	Mammalia	Rodenta	Muridae	Rattus	R. tanezumi
24	Mammalia	Rodenta	Muridae	Mus	M. musculus
25	Mammalia	Eulipotyphla	Soricidae	Crocidura	C.attenuata
26	Mammalia	Rodentia	Muridae	Rattus	R.norvegicus
27	Mammalia	Rodentia	Sciuridae	Xerus	X. rutilus
28	Mammalia	Chiroptera	Pteropodidae	Cynopterus	C.brachyotis

Table 6: Taxonomic position of Invertebrates collected from district Karak, KP, Pakistan

S. No.	Class	Order	Family	Genus	Species
1	Insecta	Hymenoptera	Apidae	Amegilla	A. cingulata
2	Insecta	Hymenoptera	Apidae	Apis	A. Mellifera
3	Insecta	Hymenoptera	Formicidae	Tapinoma	T. sessile
4	Insecta	Hymenoptera	Formicidae	C	C. camponotus
5	Insecta	Hymenoptera	Formicidae	Tetramorium	T. caespitum
6	Insecta	Hymenoptera	Formicidae	Solenopsis	S. invicta
7	Insecta	Hymenoptera	Formicidae	Formica	F. rufa
8	Insecta	Hymenoptera	Formicidae	Vespula	V. germanica
9	Insecta	Hymenoptera	Thenthredinidae	Tenthredo	T. mesomela
10	Insecta	Hymenoptera	Sphecidea	Sceliphron	S. caementarium
11	Insecta	Hymenoptera	Vespidea	Vespa	V.velutina
12	Insecta	Coleoptera	Sarabaeidae	xylotrupes	X.ulysses
13	Insecta	Coleoptera	Sarabaeidae	Chondropyga	C. dorsails
14	Insecta	Coleoptera	Coccinellidae	Coccinella	C. magnifica
15	Insecta	Lepidoptera	Hedlidae	Macrosoma	M. bahiata
16	Insecta	Lepidoptera	Nymphalidae	Venessa	V. cardui
17	Insecta	Lepidoptera	Pieridae	Colias	C. erate
18	Insecta	Diptera	Culicidae	Culex	C. frittaeniorhynchus
19	Insecta	Diptera	Culicidae	Anopheles	A. subpictus
20	Insecta	Diptera	Muscidae	Musca	M. domestica
21	Insecta	Diptera	Muscidae	Tachina	T. praeceps
22	Insecta	Orthoptera	Grylledae	Acheta	A. domestica

23	Insecta	Orthoptera	Tetrigidae	<i>Titrix</i>	<i>T. titrix</i>
24	Insecta	Orthoptera	Acrididae	<i>Omocestus</i>	<i>O. vividulus</i>
25	Insecta	Orthoptera	Acrididae	<i>Omocestus</i>	<i>O. rufipes</i>
26	Insecta	Orthoptera	Acrididae	<i>Hieroglyphus</i>	<i>H. daganensis</i>
27	Insecta	Orthoptera	Acrididae	<i>Achurum</i>	<i>A. carinatum</i>
28	Insecta	Orthoptera	Mntidae	<i>Loboptera</i>	<i>L. decipiens</i>
29	Insecta	Odonata	Libellulidae	<i>Orthetrum</i>	<i>triangulare</i>
30	Insecta	Odonata	Libellulidae	<i>Orthetrum</i>	<i>Sabina</i>
31	Insecta	Odonata	Libellulidae	<i>Palpopleura</i>	<i>Sexmaculata</i>
32	Insecta	Odonata	Libellulidae	<i>Pantala</i>	<i>Flavescens</i>
33	Insecta	Odonata	Libellulidae	<i>Orthetrum</i>	<i>Pruinosum neglectum</i>
34	Insecta	Odonata	Libellulidae	<i>Trithemis</i>	<i>Festiva</i>
35	Insecta	Odonata	Libellulidae	<i>Trithemis</i>	<i>Aurora</i>
36	Insecta	Odonata	Aeshnidae	<i>Anax</i>	<i>Immaculifrons</i>
37	Insecta	Odonata	Gomphidae	<i>Onychogomphus</i>	<i>Bistrigatus</i>
38	Insecta	Odonata	Lestidae	<i>Austrolestes</i>	<i>A. cingulatus</i>
39	Insecta	Hemiptera	Cimicidae	<i>Cimex</i>	<i>C. lectularius</i>
40	Insecta	Hemiptera	Cicadidae	<i>Neotibice</i>	<i>N. linnei</i>
41	Insecta	Hemiptera	Cicadidae	<i>Neotibicen</i>	<i>N. linnei</i>
42	Insecta	Hemiptera	Aphididae	<i>Aphis</i>	<i>A. spp</i>
43	Insecta	Hemiptera	Gerridae	<i>Barisus</i>	<i>B. cercius</i>
44	Insecta	Hemiptera	Gerridae	<i>Aquarius</i>	<i>A. remigis</i>
45	Insecta	Blatiodes	Termitidae	<i>Coptotermes</i>	<i>C. formosanus</i>
46	Insecta	Mecoptera	Boreidae	<i>Boreus</i>	<i>B. hiemalis</i>
47	Insecta	Mantodoptera	Mantodae	<i>Tenodera</i>	<i>T. sinensis</i>
48	Insecta	Phthiraptera	Pediculidae	<i>Linognathus</i>	<i>L. setosus</i>
49	Chilopoda	Lithobiomorpha	Lithobiidae	<i>Lithobius</i>	<i>L. forficatus</i>
50	Cliellata	Arynchobdellida	Hirudidae	<i>Hirudo</i>	<i>H. medicinalis</i>
51	Cliellata	Haplotaxida	Lumbricidae	<i>Lumbricus</i>	<i>L. terrestris</i>
52	Arachnida	Araneae	Arancidae	<i>Araneus</i>	<i>A. diadematus</i>
53	Arachnida	Araneae	Theraphosidae	<i>Brachypelma</i>	<i>B. smithi</i>
54	Arachnida	Scorpiones	Buthidae	<i>Hettenotta</i>	<i>H. tumulus</i>
55	Chromadorea	Rhabditidae	Rhabditidae	<i>Ceanorthabditis</i>	<i>C. elegans</i>
56	Gastropoda	Heterobranchia	Helicidae	<i>Cornu</i>	<i>C. aspersum</i>

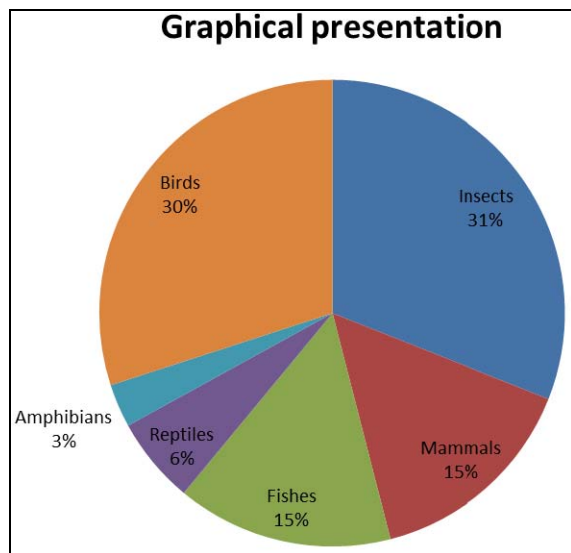


Fig 2: Graphical classification of district Karak animals.

Discussion

During the present survey, 184 different species of the both vertebrates and invertebrates fauna of the district Karak were observed. Out of which, 28 species of mammals, 6 species of amphibians, 12 species of reptiles, 54 species of birds, 28 species of fishes, and 56 species of invertebrates. Faisal *et al* conducted a survey Muhabbatkhel dam (Lake Kana) located at district Karak Khyber Pakhtunkhwa, Pakistan. During his survey 4 different species were identified naming *Labeo rohita*, *Hypophthalmichthys molitrix*, *Cyprinus carpio*, *Cirrhinus cirrhosus* belonging to order Cypriniformes and

species Cyprinidae [64]. Similarly Faisal *et al* worked on the fishes of Khaisari (Ghundi Shahbaz Khan) dam Karak and recorded 4 species [65]. Khan [66] reported one species of toad, three frogs and nine species of lizards and snakes each from the District of Mianwali which is located 164 km from Chakwal District, North-western Punjab. The highest numbers birds of the order Passeriformes were recorded. Ali & Akhtar [67] recorded 126 avifauna species from Chashma, 115 from Nammal, 110 from Rang-pur and 103 species from Uchchali lakes. Awan *et al.* [68] during the survey of Muzaffar-abad, Azad Kashmir, Pakistan, a total of 59 species were noted, out of which 24 were resident, 14 were winter visitor, 11 were summer visitor. On the basis of the studies undertaken so far in different regions of the Karak 28 species of mammals have been recorded which belonging to 23 genera, 17 families and 8 orders and 28 different species which were recorded. In Karak the order Carnivora are very dominants. Roberts [40] recorded 23 mammalian species (15 small and 8 large mammalian species) from river Chenab belonging to 20 genera, 11 families, and 6 orders. Saqib *et al.* [69] conducted study on Khurum dam and Muhabbat Khel dam of district Karak, Khyber Pakhtunkhwa province of Pakistan during the period from April 2016 to December 2016 in order to determined the zoological fauna of the both dams. Fishes of both dams include *Cyprinus carpio*, *Crossocheilus diplocheilus*, *Ctenopharyngodon idella*, *Salmostoma bacaila*, *Aspidoparia morar Ompok pabda*, *Labeo rohita*, *Cirrhinus cirrhosus*, and *Hypophthalmichthys molitrix*. The Amphibians of both dams include *Rana tigrina*, *Euphlyctis cyanophlyctis*, *Duttaphrynus melanostictus* and *Rana tigrina*. The Reptiles are *Chamaeleo zeylanicus*, *Saara hardwickii*, *Xantusia vigilis*, and *Lampropeltis getula*. In Khurum dam nine species of

birds are present, which is following *Passer domesticus*, *Acridotheris tristis*, *Anas crecca*, *Perdix Perdix*, *P. cristatus*, *Numida meleagris*, *Grus grus*, *Pycnonotus barbatus*, and *Upupa epops*. While in Muhabbat khel dam *Passer domesticus*, *Acridotheris tristis*, *Anas crecca*, *Buteo jamaicensis*, *Cairina moschata*, *Dicrurus adsimilis*. Nine species of mammals are discovered. The family Bovidae of mammals is more abundant in both dams. The invertebrates found in Khurum dam are *Sympetrum flaveolum*, *Pandinus imperator*, *Pterostichus melanarius*, *Anax junius*, *Solenopsis invicta*, *Hirudo medicinalis* and *Sceliphron caementarium* *Vespa velutina*, *Hirudo medicinalis*, *Pandinus imperator* are present in Muhabbat Khel dam. Among invertebrate faunal diversity, insects are extremely important to ecosystems as they perform essential natural processes that sustain biological system. Indeed, our present ecosystem would not function without insects [70]. Zaryab *et al* conducted study vertebrate and the invertebrate fauna in Tanga dam of district Karak, Khyber Pakhtunkhwa province of Pakistan during the period from August to October 2016 includes all the vertebrates, including fishes, amphibians, reptiles, birds and mammals. Fishes include *Catla catla*. Amphibians include *Rana tigrina*. Reptiles include *Xanthus vigilis* and *Lampropeltis getula*. Birds include *Passer domesticus*, *Acridotheres tritis* and *Anas crecca*. Mammals include *Capra hircus*, *Ovis aries*, *Canis adustus*, *Bos taures*, *Equus asinus*, *Canis lupus* and *Felis catus*. Among invertebrates *Pandinus imperator*, *pterostichus melanarius*, *Solenopsis invicta* and *Hirudo medicinalis* were abundant in Tanga dam. So from the present study, it may be concluded that Tanga dam is suitable for the survival of both vertebrates and an invertebrates [71]. Hameed *et al* conducted study from June 2014 to July 2015 on the Birds Biodiversity of District Karak Khyber Pakhtunkhwa Pakistan. During the survey total of 32 bird species belonging to 26 families and 11 orders were recorded from different areas of district karak. In the present study highest numbers of the order Passeriformes were recorded. From the obtained studies it may be concluded that district karak have rich fauna of birds belonging to order Passeriformes [72]. Shehzad *et al* conducted study in Kotal wildlife park there are so many bird species like *Black partridge species (Taroo)*, *Grey partridge (Seenzara)*, *Chukar partridge (Zark)*, *See-see partridge (Zark)*, *Common crane (Karkara)*, *Demoiselle crane (Karkara)*, *Greyheron (Kharrabagla)*, *Intermediate egret (speenabagla)*, *Little egret (Warookaspeenabagla)*, *Green peafowl (Moor)*, *Mrs. Hume's pheasant (Sra marghai)*, *Turkey (Peru)* [73]. Data was collected from officials of Wildlife Park and by a short safari of that park. About 11 different species of 8 different orders of animals were observed in Kotal wildlife park of Kohat (graph-1) that includes *O. orientalis (Mouflon)*, *H. porcinus (Indian hog deer)*, *G. gazelle (Indian Ghazele)*, *H. edwardsii (Indian gray mongoose)*, *F. chaus (Jungle cat)*, *P. micropus (Indian hedgehog)*, *H. indica (Indian crested porcupine)*, *L. nigricollis (Scorpion)*, *V. bengalensis (Bengal monitor)* and *N. naja (Cobra)*. All of them were kept in natural habitat. Only 2 out of 11 species were found Endangered by their conservation status while the rest of them were least concerned. Kotal Wildlife Park is completely fenced and isolated area where no natural predator animal can get entered to harm animals inside the park. Human activities are also restricted up to some extent to prevent disturbance in wildlife area. About 11 different species of 8 different orders are placed here. Mammals were leading among all animals in the park out of them order Artiodactyla was found abundant [74].

Conclusion

From the current study, it can be concluded that district Karak provides suitable environmental conditions to support the diversity of both vertebrates and invertebrates.

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