Diversity and status of mammalian fauna of Abbaspur, Azad Jammu and Kashmir, Pakistan

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ABSTRACT
Total 4763 mammalian species are reported in the whole world; and 195 species of mammals are documented in Pakistan; while only 71 species of mammals are present Azad Jammu and Kashmir. Present study was conducted at Abbaspur. Linear count survey model was utilized to know the populations of mammals. Data were collected through direct as well as indirect methods. Diversity was calculated through Shannon-Wiener, Evenness and Richness indices. A total of 15 species belonging to 15 genera, 13 families and 6 orders were documented from the study area. Shannon-Wiener diversity Index was calculated as 1.07, richness index was 0.91 and Evenness index was 5.31 in the study area. During present study noted that Indian crested porcupine (Hystrix indica) was reported as the topmost abundant mammalian species of the Abbaspur.

Keywords: Porcupine, Fox, Mammals, Diversity, Richness

INTRODUCTION
Total 4763 mammalian species are reported in the whole world by (IUCN, 2002); in Pakistan, 195 species of mammals are reported (Roberts, 1997b; Roberts, 2005a, b); while only 71 species of mammals are present Azad Jammu and Kashmir (Roberts, 1997b; Roberts, 2005a, b; Altaf, 2017). Out of total in Pakistan, twelve species are Critically Endangered, twelve species are Endangered, twenty species are Vulnerable, thirty two species are Near Threatened, seventy one species are Least Concern, and eight species are Regionally Extinct (IUCN, 2003).

Total 6 biogeographic regions are present in the world; out of total, some parts of 3 (i.e. Ethiopian, Palearctic and Oriental) regions are present in Pakistan. This is the reason country having the wide variety of mammalian fauna in this country (Roberts, 1997b; Roberts, 2005a, b; Altaf, 2017). Pakistan having round about 225 wetlands and gradual changes in elevation provoke changes in mammalian fauna within short distances (Altaz et al., 2014b).
The mammals has direct and indirect benefits for human being (Mols and Visser, 2007). The direct benefits as; food, clothing material, medicines, product, shelter, etc. (Diamond and Filion, 1987; Sibley and Monroe Jr, 1993; Altaf et al., 2017) while, the indirect benefits as; important for ecosystem services as food chain (Assessment, 2005; Altaf, 2016). Many mammalian species are important for seed dispersers, pollinators, recycling of nutrients and maintenance of ecosystems (Heine and Speir, 1989). The mammals are the important environment as other wildlife; good indicators and help to sustain, conserve and maintain the landscape (Myers, 1990; Myers et al., 2000). This study was specifically designed to know the diversity of mammals in Abbaspur.

MATERIALS AND METHODS
The data were collected from May 2009 through April 2010 in selected sites of Abbaspur.

STUDY AREA
Tehsil Abbaspur, district Poonch is located near line of control (Figure 1). Abbaspur is located at 33°49’N 73°59’E, 33°49’N 73°59’E and an elevation of 1,161 m (3,809 ft). Poonch valley is consist of 8500 hectares and elevation is from 1750 meters to 2500 meters. Rainfall recorded 1600mm per year, in monsoon season and in winter. The area is included in the cold temperate forest (Khan et al., 2010).

METHODOLOGY
The linear count survey model was applied, while mammalian diversity was assessed through direct and indirect count methods. The direct count (viz. physical presence and voices) while indirect count (viz. presence of nests, hair mounting, fecal pellets, foot-prints, and meeting with local people). Binoculars was used to see the animals (Roberts, 2005a, b; Mirza and Wasiq, 2007) was utilized to precise classification of the mammalian species.

STATISTICAL ANALYSIS
Shannon-weiner diversity index was utilized to know the diversity of mammalian species of the Abbaspur through the formula (Shannon and Weaver, 1949). Shannon-weiner diversity index is known as H’.

\[ H' = -\sum \pi \log \pi \]

Species richness was documented by Margalef (1958). Species richness is known as R.

\[ R = S-1/\log(N) \]
Evenness Index was documented by Pielou (1966). Evenness is also known as or noted as E.

\[ E = \frac{H'}{\log(S)} \]

Where, “Pi” is “Proportion of the species” and “i” is “relative to the total number of species”

“LogPi” is “natural logarithm of this proportion”

“S” is “total no. of species”

“N” is “total no. of individual”

**RESULTS AND DISCUSSION**

A total of 15 species belonging to 15 genera (Table 1), 13 families (Figure 2) and 6 orders (Figure 3) were documented from the study area. “Shannon-Wiener diversity Index” was noted as 1.07, richness index was 0.91 and Evenness index was 5.31 in the study area (Table 1).

During present study noted that Indian crested porcupine (*Hystrix indica*) was found as the most abundant species of the study area with relative abundance of 0.14 (Table 1). Previously it was also reported from the Balochistan, Indus plain,
Himalayan forest, Lasbela, Kirthar, Shogran, Chitral, Murree hills, Hazara, Swat, head Khanki, head Qadirabad, Chotiari Reservoir, head Marala, Thal desert, Mahban and Malka valley, Azad Jammu and Kashmir and Punjab (Roberts, 1997a; Maan and Chaudhry, 2001; Rais et al., 2011; Altaf et al., 2014a; Khan et al., 2015; Iqbal et al., 2018).

Figure 2: Orders of mammalian species recorded in study area.

Figure 3: Families of mammalian species recorded in study area.
Asiatic Jackal (*Canis aureus*) was observed (relative abundance, 0.12) from study area during present study, it was also reported from the Hazara, Murree hills, Quetta, Islamabad, head Khanki, head Qadirabad, Balochistan, Chottiari Reservoir, Thal desert, Lasbela and Azad Jammu and Kashmir (Roberts, 1997a; Ghalib *et al.*, 2007; Rais *et al.*, 2011; Altaf *et al.*, 2014a; Khan *et al.*, 2015; Faiz and Fakhar-i-Abass, 2016; Iqbal *et al.*, 2018; Younus *et al.*, 2018).

Present census revealed that Himalayan Palm civet (*Paguma larvata*) was reported from the study area with relative abundance was 0.01. Previously it was reported from Rawapindi, Sergoda, Multan, Dera, Ghazikhan, Hazara, Mansera and Margalla hills (Roberts, 1997a; Awan *et al.*, 2004).

Himalayan Wood Mouse (*Apodemus rusiges*) and Indian Barking Deer (*Muntiacus muntjak*) were documented as the lowest abundant species of the study area and relative abundance of both species were 0.001 in study area.

House Mouse (*Mus musculus*) was sighted in study area (relative abundance, 0.11) during present study, researchers (Roberts, 1997a; Rais *et al.*, 2011; Altaf *et al.*, 2012; Altaf *et al.*, 2014a; Faiz *et al.*, 2015; Faiz and Fakhar-i-Abass, 2016; Iqbal *et al.*, 2018; Manzoor *et al.*, 2018) also documented from the areas of Balochistan province, Hazara, Faisalabad Gujranwala, head Khanki, head Qadirabad, head Marala, Chottiari reservoir, Thal desert, Pothwar and Azad Jammu and Kashmir.

House Rat (*Rattus rattus*) was observed from study area (relative abundance, 0.13) during present study, and previously documented from Balochistan, Sindh, Bahawalpur, KPK, Murree, Dera Ghazi Khan, Gujranwala, Head Khanki, Head Qadirabad, Pothwar and Azad Jammu and Kashmir. (Roberts, 1997a; Altaf *et al.*, 2012; Altaf *et al.*, 2014a; Faiz *et al.*, 2015; Faiz and Fakhar-i-Abass, 2016; Iqbal *et al.*, 2018).

House Shrew (*Suncus murinus*) and Indian Wild Boar (*Sus scrofa*) were documented from study area with relative abundance of 0.08 in study area. Previously House Shrew was also recorded from Karachi area, Punjab, Mardan, Swat, Dir, Hazarat, Abbottabad, Balakot, Kaghan valley, Multan, Chottiari Reservoir and Thal desert (Roberts, 1997a; Awan *et al.*, 2004; Rais *et al.*, 2011; Altaf *et al.*, 2014a; Khan *et al.*, 2015). Researchers (Roberts, 1997a; Rais *et al.*, 2011; Altaf *et al.*, 2014a) reported Indian Wild Boar from the Margalla hills, Murree foothills, Peshawar, Mardan, Dera Ismail Khan, Balochistan, Chitral valley, Punjab, Mahban and Malka valley.

Red Fox (*Vulpes vulpes*) was seen in study area (relative abundance, 0.05) during present study. Previously this was also recorded from Khunjrab, Mahaban, Malka Valley and Bagh (Qureshi *et al.*, 2011; Azad *et al.*, 2018; Iqbal *et al.*, 2018).

Rhesus Macaque (*Macaca mulatta*) was seen in study area (relative abundance, 0.06) during present study, this was also observed from the
Himalayan temperate forest, Chitral, Swat, Kohistan and Hazara district (Roberts, 1997a).

Cape hare (*Lepus capensis*) and grey langur (*Semnopithecus entellus*) were reported from the study area and relative abundance of both species were as 0.07 (Table 1).

Small Indian Mongoose (*Herpestes javanicus*) species was seen in study area (relative abundance, 0.03) during present study, and also documented from Indus River, Central and Northern Sindh, Tharparkar, Cholistan, South western part of Punjab, Murree foothills, Balochistan, Chotiari Reservoir, Thal desert, Mahban and Malka valley (Roberts, 1997a; Ghalib et al., 2007; Rais et al., 2011; Khan et al., 2015; Iqbal et al., 2018).

Small Kashmir Flying Squirrel (*Hylopetes fimbriatus*) species was seen in study area (relative abundance, 0.04) during present study. Previously it was also documented from Hazara, Swat, Nathiagali, Kaghan Valley, Murree Hills, Azad Jammu and Kashmir, Kohistan and some areas of Gilgit (Molur, 2003).

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IUCN. 2002. Red Lists of IUCN.


Table 1: Diversity of mammals in study area.

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Common name, Scientific name (Species authority), Order, Family</th>
<th>Status (IUCN)</th>
<th>R.A.</th>
<th>LogPi</th>
<th>PiLogPi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asiatic Jackal, Canis aureus (Linnaeus, 1758), Carnivora, Canidae</td>
<td>LC</td>
<td>0.12</td>
<td>-0.93</td>
<td>-0.11</td>
</tr>
<tr>
<td>2</td>
<td>Cape hare, Lepus capensis (Linnaeus, 1758), Lagomorpha, Leporidae</td>
<td>LC</td>
<td>0.07</td>
<td>-1.16</td>
<td>-0.08</td>
</tr>
<tr>
<td>3</td>
<td>Grey langur, Semnopithecus entellus (Dufresne, 1797), Primates, Cercopithecidae</td>
<td>LC</td>
<td>0.07</td>
<td>-1.16</td>
<td>-0.08</td>
</tr>
<tr>
<td>4</td>
<td>Himalayan Palm civet, Paguma larvata (Smith, 1827), Carnivora, Viverridae</td>
<td>LC</td>
<td>0.01</td>
<td>-2.16</td>
<td>-0.02</td>
</tr>
<tr>
<td>5</td>
<td>Himalayan Wood Mouse, Apodemus rusiges (Miller, 1913), Rodentia, Muridae</td>
<td>LC</td>
<td>0.001</td>
<td>-2.33</td>
<td>-0.01</td>
</tr>
<tr>
<td>6</td>
<td>House Mouse, Mus musculus (Linnaeus, 1758), Rodentia, Muridae</td>
<td>LC</td>
<td>0.11</td>
<td>-0.96</td>
<td>-0.10</td>
</tr>
<tr>
<td>7</td>
<td>House Rat, Rattus rattus (Linnaeus, 1758), Rodentia, Muridae</td>
<td>LC</td>
<td>0.13</td>
<td>-0.88</td>
<td>-0.12</td>
</tr>
<tr>
<td>8</td>
<td>House Shrew, Suncus murinus (Linnaeus, 1766), Eulipotyphla, Soricidae</td>
<td>LC</td>
<td>0.08</td>
<td>-1.10</td>
<td>-0.09</td>
</tr>
<tr>
<td>9</td>
<td>Indian Barking Deer, Muntiacus muntjak (Zimmermann, 1780), Cetartiodactyla, Cervidae</td>
<td>LC</td>
<td>0.001</td>
<td>-2.33</td>
<td>-0.01</td>
</tr>
<tr>
<td>10</td>
<td>Indian Crested Porcupine, Hystrix indica (Kerr, 1792), Rodentia, Hystricidae</td>
<td>LC</td>
<td>0.14</td>
<td>-0.86</td>
<td>-0.12</td>
</tr>
<tr>
<td></td>
<td>Species</td>
<td>Order</td>
<td>Family</td>
<td>Relative Abundance</td>
<td>Evenness Index</td>
</tr>
<tr>
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</tr>
<tr>
<td>11</td>
<td>Indian Wild Boar, <em>Sus scrofa</em> (Linnaeus, 1758), Cetartiodactyla, Suidae</td>
<td></td>
<td></td>
<td>LC</td>
<td>0.08</td>
</tr>
<tr>
<td>12</td>
<td>Red Fox, <em>Vulpes vulpes</em> (Linnaeus, 1758), Carnivora, Canidae</td>
<td></td>
<td></td>
<td>LC</td>
<td>0.05</td>
</tr>
<tr>
<td>13</td>
<td>Rhesus Macaque, <em>Macaca mulatta</em> (Zimmermann, 1780), Primates, Cercopithecidae</td>
<td></td>
<td></td>
<td>LC</td>
<td>0.06</td>
</tr>
<tr>
<td>14</td>
<td>Small Indian Mongoose, <em>Herpestes javanicus</em> (É. Geoffroy Saint-Hilaire, 1818), Carnivora, Herpestidae</td>
<td></td>
<td></td>
<td>LC</td>
<td>0.03</td>
</tr>
<tr>
<td>15</td>
<td>Small Kashmir Flying Squirrel, <em>Hylopetes fimbriatus</em> (Gray, 1837), Rodentia, Sciuridae</td>
<td></td>
<td></td>
<td>LC</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Shannon-wiener index**

<table>
<thead>
<tr>
<th>Evenness index</th>
<th>Richness index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.07</td>
<td>0.91</td>
</tr>
<tr>
<td>5.31</td>
<td></td>
</tr>
</tbody>
</table>

Notes: RA (relative abundance), LC (least concerned)

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**Availability of data:** Authors have included all data in the manuscript that were collected during the field survey.

**Authors’ contributions:** Rasheed has designed project and collected data, Bashir has written this article and Jaddon critically analysis this article and approved as final.