AN EVALUATION OF DISTRIBUTION, STATUS AND ABUNDANCE OF FRESHWATER TURTLES IN THE SELECTED AREAS OF SINDH AND KHYBER PAKHTUNKHWA PROVINCES OF PAKISTAN

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ABSTRACT

In the present work, studies on the distribution and status of freshwater turtles were conducted in Charsadda, Peshawar, Nowshera and Dera Ismail Khan Districts of Khyber Pakhtunkhwa (KPK) province, and Thatta, Badin, Sanghar and Sukkur districts of Sindh province. Eight species - *Lissemys punctata*, *Pangshura smithii*, *Pangshura tectum*, *Chitra indica*, *Nilssonia gangeticus*, *Nilssonia hurum*, *Hardella thurjii*, and *Geoclemys hamiltonii* were recorded. In Sindh, *Geoclemys hamiltonii* was recorded as rare in Badin, Sanghar and Sukkur districts, while other species were abundant, common or uncommon. *Pangshura tectum* was recorded only from Sukkur district while *Chitra indica* was recorded in all the four selected districts of Sindh. *Geoclemys hamiltonii* was recorded as rare only from Sukkur district while *Chitra indica* was recorded in all the four selected districts of Sindh. *Geoclemys hamiltonii* was recorded only in D.I. Khan district of KPK. *Lissemys punctata* was the most abundant and most widely distributed species in Khyber Pakhtunkhwa. Population of freshwater turtles in Sindh is much higher than that in Khyber Pakhtunkhwa. Currently, due to habitat destruction, eutrophication, agricultural farming and other anthropogenic activities, population of *Geoclemys hamiltonii* has also decreased in Sindh.

Keywords: Pakistan, freshwater turtles, distribution, status.

INTRODUCTION

Globally, turtles are among the endangered of the major groups of vertebrates, surpassing birds, mammals, cartilaginous and bony fishes, and amphibians. According to the current IUCN 2013 Red List, 135 turtle species are officially regarded as globally Threatened [(Critically Endangered (CR), Endangered (EN), or Vulnerable (VU)]. Of the 335 total species of turtles and tortoises, 107 (31.9%) are CR or EN, 167 (49.9%) are Threatened (CR, EN, or VU), and 175 (52.2%) are threatened or extinct (van Dijk et al., 2014).

Pakistan is a man’s carved northwestern political division of Indo-Pakistani subcontinent and not a natural geographical entity. Its varied topography and bioclimate are reflected in the diversity of its soil, climates, habitats, flora and fauna (Khan, 1980; Mufti et al., 1997). Around 167 reptile species have been recorded from Pakistan (Auffenberg and Khan, 1991; Ghalib et al., 1976; Rehman and Iffat, 1997). As many as 105 species have been recorded from Sindh (Khan et al., 2012).

The freshwater resources of Pakistan are dominated by the Indus River system, which serves as drainage basin for Himalayas. Most of wetlands support the resident and migratory birds, fish fauna and aquatic vegetation. Due to several anthropogenic activities to cater the needs of growing population, the degradation of freshwater ecosystem by a variety of stressors has increased exponentially. As a result, many ecosystems are in need of some drastic corrective restoration.

Turtles are represented in Pakistan by 05 families, 13 genera and 15 species (Khan, 2006). The freshwater turtle fauna of Pakistan is entirely Oriental at both the generic and species levels (Table 1).

There are 02 families, 06 genera and 08 species of freshwater turtles found in Pakistan, namely Geoemydidae which consists of hardshelled turtles viz Spotted Pond turtle (*Geoclemys hamiltonii*), Crowned river turtle (*Hardella thurjii*), Brown roofed turtle (*Pangshura smithii*), and Indian roofed turtle (*Pangshura tectum*) and the second, Trionychidae which comprises of softshell turtles viz. Indian narrow-headed soft-shell turtle (*Chitra indica*), Indian soft-shell turtle (*Nilssonia gangeticus*), Indian peacock soft-shell turtle (*Nilssonia

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hurum) and Indian flapshell turtle (Lissemys punctata andersonii) (Azam and Saeed, 2011; Noureen, 2007; Noureen et al., 2012; Safi and Khan, 2014).

In Pakistan, rather nominal scientific work has been reported on the status and distribution of freshwater turtles mainly concentrated in Sindh and KPK provinces. The main objective of this study was to determine the population distribution, status and abundance of freshwater turtle species in Sindh and Khyber Pakhtunkhwa provinces, particularly in the districts rich in wetlands which potentially provide habitats for turtles.

MATERIALS AND METHODS

After baseline studies, Thatta, Badin, Sanghar and Sukkur districts were selected as study areas in Sindh province, while Charsadda, Peshawar, Nowshera and Dera Ismail Khan districts were selected in Khyber Pakhtunkhwa province (Figs. 1, 2, 3). Several survey techniques were employed for observation and census of turtles. During each visit to the four study areas in each province, the population of each species of turtle was recorded. Identification of the species in the field was carried out with the help of published literature.

COUNTING METHODS

A. DIRECT COUNTING

1. Habitat Searching / Transact Method

At each site several hours search was carried out to detect as many turtles as possible within a circular central zone along the wetlands, such as lakes, ponds, marshes, water reservoirs, canals and rivers, etc. This searching consisted of approximately 20 ha within a 250 meter radius of the observation/sampling points. At first, the suitable place with suitable habitat was chosen. Nearly 1 sq. km. area was selected for the study to observe the surface of habitat. The turtles were active both in the day as well as at night, some of turtles were found sitting on partly submerged logs, larger stones and even on mudflats by the side of water, while some were seen moving or resting just near their shelters and they became alert to see the observers and some of them ran away very fast and dived into the water or lost in the mud underwater. Species were counted and identified in the field. In this way, several km of study areas were surveyed and finally the population of different species of turtle was estimated per square km. Their exact locations and home ranges were recorded by GPS, so that where any observer and biologist or naturalist, comes for study they can easily locate the place where the recorded or reported species are found.

Fig. 1. Map of Pakistan (showing study areas in Sindh and KPK).
Similarly night survey was done with the help of search lights and torches.

2. Capture through Nets
Some species of small turtles were captured by using nets, such as cast net. It was done in small area and in this way, most of the lakes were surveyed.

3. Boat Surveys
Surveys of freshwater turtles in river, large lakes and water reservoirs were made by using fishing boats and making observations while travelling from one end to the other, and the same route was followed on the return trip. In this way, 6 km round trip was covered. As soon as the species was sighted, the time, locations and habitat types were recorded.

4. Incidental Sightings
Incidental sighting is also helpful to determine the presence and population status of the species. In this way number of species, date, time, location and habitat type were recorded.
5. **Basking Behavior**
In winter, the temperature of the water becomes very low. Due to cooler weather and cold water, this cold blooded reptile avoids living in water and so they come outside the lake to enjoy sunshine to keep them warm. Thus, counting of the turtle species becomes very easy at particular area during this season.

**B. INDIRECT COUNTING METHODS**

1. **Information from different sources**
Information was collected from the staff of Wildlife Department, local fishermen, boatmen, field staff of Irrigation Department and other members of local community of different villages.

2. **Presence of Signs like fecal pellets, tracks, den or tunnels (egg laying excretion)**
Evidences from the impressions of fingers or foot prints, or tail, presence of fecal pellets, tracks and existence of tunnels (egg laying excretion) are helpful for finding the existence, range and rough population of the species.

The study was based mainly on direct observation; enumerations depended on basking and floating turtles,
calculated by the following formula (Mehmood et al., 2012).

\[ P = \frac{AZ}{2YX} \]

P-population  A- total area  Z-number observed  Y-average flushing distance  X-length of strip

RESULTS AND DISCUSSION

Sindh Province
In the selected areas of Sindh province, following results of the population of each species of freshwater turtles were documented:

**Thatta District**
In Thatta district, six species of freshwater turtles were observed, *Lissemys punctata* (Webb, 1980a) and *Pangshura smithii* (Gray, 1863), were abundant. *Chitra indica* (Gray, 1831), *Nilssonia gangeticus* (Cuvier, 1825) and *Nilssonia hurum* (Gray, 1831) were common, *Hardella thurjii* (Gray, 1831) was less common (Table 2, Figs. 8 - 11, 13 and 15). These species were recorded in good numbers at Hadero Lake and Ghulamullah Canal. According to the data of one year, *C. indica* was recorded as 21%, *P. smithi* as 22.2%, *L. punctata* as 26.52%, *H. thurjii* as 8.54%, *N. gangeticus* as 8.72% and *N. hurum* as 12.68% (Table 2).
In this area, four species were recorded, *Lissemys punctata* and *Chitra indica* were abundant, *Nilssonia hurum* as less common, while *Geoclemys hamiltonii* as rare (Table 3, Figs. 8-10 and 12). *C. indica* was recorded as 40%, *L. punctata* as 37%, *G. hamiltonii* as 4.31%, and *N. hurum* as 18% (Table 3).

**Badin District**

In this area, four species were recorded, *Lissemys punctata* and *Chitra indica* were abundant, *Nilssonia gangeticus*, *Pangshura smithii* and *Chitra indica* were common. They were highly populated in Chotiari and Bakar reservoir areas.

**Sanghar District**

In Sanghar district, six species were recorded. *Lissemys punctata* was abundant, *Nilssonia gangeticus*, *Pangshura smithii* and *Chitra indica* were common. They were highly populated in Chotiari and Bakar reservoir areas.

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**Table 1. IUCN and CITES Status of Freshwater Turtles of Pakistan.**

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>IUCN Status</th>
<th>CITES Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geoemydidae</td>
<td><em>Geoclemys hamiltonii</em></td>
<td>Vulnerable</td>
<td>Appendix I</td>
</tr>
<tr>
<td>Geoemydidae</td>
<td><em>Hardellathurjii</em></td>
<td>Vulnerable</td>
<td>Appendix II</td>
</tr>
<tr>
<td>Geoemydidae</td>
<td><em>Pangshura smithii</em></td>
<td>Near threatened</td>
<td>Appendix II</td>
</tr>
<tr>
<td>Trionychidae</td>
<td><em>Chitra indica</em></td>
<td>Low risk</td>
<td>Appendix I</td>
</tr>
<tr>
<td>Trionychidae</td>
<td><em>Nilssonia gangeticus</em></td>
<td>Vulnerable</td>
<td>Appendix I</td>
</tr>
<tr>
<td>Trionychidae</td>
<td><em>Nilssonia hurum</em></td>
<td>Vulnerable</td>
<td>Appendix I</td>
</tr>
<tr>
<td>Trionychidae</td>
<td><em>Lissemys punctata</em></td>
<td>Least concern</td>
<td>Non CITES</td>
</tr>
</tbody>
</table>

**Table 2. Population Distribution of Freshwater Turtles of Thatta District.**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Location</th>
<th>Approx surveyed area (km)</th>
<th>Observed Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chitra indica</td>
</tr>
<tr>
<td>1</td>
<td>Hadero Lake</td>
<td>4</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>Haleji Lake</td>
<td>4</td>
<td>62</td>
</tr>
<tr>
<td>3</td>
<td>Keenjhar Lake</td>
<td>4</td>
<td>55</td>
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<tr>
<td>4</td>
<td>Mahboob Shah Lake</td>
<td>4</td>
<td>51</td>
</tr>
<tr>
<td>5</td>
<td>Kharajo Lake</td>
<td>4</td>
<td>66</td>
</tr>
<tr>
<td>6</td>
<td>Karo Lake</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>7</td>
<td>Ghulamullah Canal</td>
<td>4</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>477</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td></td>
<td>21</td>
</tr>
</tbody>
</table>

**Table 3. Population Distribution of Freshwater Turtles of Badin District.**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Location</th>
<th>Approx surveyed area (km)</th>
<th>Observed species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nilssonia hurum</td>
</tr>
<tr>
<td>1</td>
<td>Golarchi (Jaffar ali Lake)</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>Phoosna Lake</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>Charwo and Khanjo Lake</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>Matchary Dhand</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Shaikh Kerrio Peer</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

**Badin District**

In this area, four species were recorded, *Lissemys punctata* and *Chitra indica* were abundant, *Nilssonia hurum* as less common, while *Geoclemys hamiltonii* as rare. *C. indica* was recorded as 19.4%, *P. smithii* as 19.08 %, *L. punctata* as 23.33%, *H.thurjii* as 14.68 %, *N. gangeticus* as 20.2% and *G. hamiltonii* as 3.20% (Table 4).

**Sukkur District**

Studies were conducted at Sukkur barrage on the right and left bank of Indus River on the right bank area of Sukkur Barrage, six species were recorded. *Chitra indica* was to be abundant, *Pangshura tectum*, *Pangshura smithii* and *Nilssonia gangeticus* were common and *Hardella thurjii* was less common, while *Geoclemys hamiltonii* was
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found to be rare (Table 5, Figs. 8 and 11 - 15). *C. indica* was recorded 41.66%, *P. smithii* as 13.63%, *H.thurjii* as 8.33%, *N. gangeticus* as 12.37%, *P. tectum* as 20.45%, and *G. hamiltonii* as 3.53% (Table 5).

On the Left bank of Sukkur barrage, six species were recorded, *Chitra indica* was abundant, while *Nilssonia gangeticus*, *Pangshura tectum*, *Pangshura smithii* and *Hardella thurjii* were common. *Geoclemys hamiltonii* was rare (Table 6, Figs. 8 and 11 - 15). *C. indica* was recorded 30.99%, *P. smithii* as 13.30%, *H. thurjii* as 17.04%, *N. gangeticus* as 15.95%, *P. tectum* as 14.85%, and *G. hamiltonii* as 7.83% (Table 6). *P. tectum* was recorded only from the Indus in Sindh in this study area.

### Khyber Pakhtunkhwa Province

In the selected areas of Khyber Pakhtunkhwa province, the population of each species of freshwater turtles was recorded:

#### Charssadda District

In Charssadda District, seven species of freshwater turtles were observed, *Lissemys punctata* (Webb, 1980a), *Nilssonia gangeticus* (Cuvier, 1825) and *Nilssonia hurum* (Gray, 1831) were abundant. *Pangshura smithii* (Gray, 1863) and *Chitra indica* (Gray, 1831), were common, *Hardella thurjii* (Gray, 1831) and *Pangshura tectum* (Gray, 1873) were less common (Table 7, Figs. 8 – 11 and 13 - 15). These species were recorded in good numbers in
River Jindi, River Swat (Khyali) and River Kabul (Sardaryab). According to the data of one year, *C. indica* was recorded as 12.99%, *P. smithii* as 10.69%, *P. tectum* as 5.28%, *L. punctata* as 29.50%, *H. thurjii* as 3.79%, *N. gangeticus* as 18.54%, *N. hurum* as 19.22% (Table 7).

**Peshawar District**

In this area, five species were recorded, *Lissemys punctata* was abundant, *N. hurum, N. gangeticus and P. smithii* were common, while *C. indica* was less common (Table 8, Figs. 8 – 11 and 15). *C. indica* was recorded as 9.82%, *L. punctata* as 34.05%, *P. smithii* as 15.64%, *N. gangeticus* as 22.09%, and *A. hurum* as 18.40% (Table 8).

**Nowshera District**

Six species were recorded in the Nowshera District. *Lissemys punctata* was abundant, *N. gangeticus, N. hurum, P. smithii and P. tectum* were common, while *H. thurjii* was less common (Table 9, Figs. 9-11 and 13-15). *P. tectum* was recorded as 13.59%, *P. smithii* as 14.15%, *L. punctata* as 17.88%, *N. hurum* as 30.35%, *A. gangeticus* as 17.88% and *H. thurjii* as 6.15% (Table 9).
Dera Ismail Khan District
In this district, seven species were recorded, *N. gangeticus* was found to be most abundant, *L. punctata*, *N. hurum* and *C. indica* were common, while *G. hamiltonii*, *P. smithii* and *H. thurjii* were less common, *Geoclemys hamiltonii* was observed only in this area of KPK (Table 10, Figs. 8 – 13 and 15). *C. indica* was recorded 12.52%, *P. smithii* as 7.92%, *H. thurjii* as 6.08%, *N. gangeticus* as 37.94%, *N. hurum* as 15.84%, *L. punctata* as 11.23% and *G. hamiltonii* as 8.47% (Table 10).

Habitat destruction associated with human population increase and several human activities may very well be a factor in Pakistan. The status of freshwater turtle species has decreased, due to hunting, habitat destruction, fragmentation, agricultural and several anthropogenic actions. In Sindh, due to habitat destruction, eutrophication, use of chemical fertilizers, over grazing of aquatic vegetation and paucity of water, the population of *Geoclemys hamiltonii* (Spotted Pond Turtle) has decreased as during the present study, this species was recorded as rare in Badin, Sanghar and Sukkur districts,
while in Khyber Pakhtunkhwa, this species was recorded only in Dera Ismail Khan district (Fig. 6 and 7).

During a field survey on distribution and status of freshwater turtles conducted in 2003, the Indus River at Sukkur Barrage, Guddu Barrage, Jamaldin Wali and pond areas adjacent to Kandhkot, six species Aspideretes gangeticus, Pangshura smithii, P. tectum, Hardella thurjii, Chitra indica and Lissemys punctata were recorded. While, Pangshura smithii and Chitra indica were observed as abundant in various parts of the study area (Azam et al., 2005). Another study Akber et al. (2006) reported the distribution of fresh water turtles in Punjab, Pakistan. A total of 3528 specimens of freshwater turtles belonging to the species Pangshura smithii, P. tectum, Geoclemys hamiltonii, Hardella thurjii, Nilssonia
gangeticus, Nilssonia hurum, Chitra indica, and Lissemys punctata were identified. Pangshura smithii (43.62%) and P. tectum (42.06%) had abundant population status whereas, Hardella thurjii (0.88%) and Chitra indica (0.54%) were rare.
Freshwater turtles have served as an important food resource in tropical and subtropical of many Asian countries. However, several countries of our region have made few attempts for conservation and management of the resource. In Asian countries, the freshwater turtles are little exploited for jewellery, tourist souvenirs and leather. They are mostly utilized to some extent as medicine and food. During our present study, it was also observed that soft-shell turtles are targeted by local communities because parts of these turtles are in demand in the Chinese international markets and used in traditional Chinese medicines. Some freshwater turtle traders contact the local communities and offer them good amounts of money to start the business and adopt it as their work.
Local techniques and instruments are used for turtle capturing (Figs. 16-17). Some causes of population declines were also recorded which include large scale illegal capturing of turtles for export from Chashma Barrage, Tausna Barrage, Head Qadirabad, Head Rasool, Head Trimmu, Head Balloki and Chiniot area (Azam et al., 2005). In Sindh, the freshwater turtle trade is destined to Karachi, from where turtles and their body parts are exported to other countries such as Hong Kong, China, South Korea and Vietnam (Noureen, 2009; Noureen et al., 2012).

The fishermen also capture turtles during fishing with nets and angling, some turtles are accidentally killed with nets,
whereas, some fishermen consider them the enemies of fish, therefore, they kill the captured turtles to save their fish. In our study, 08 dead Pangshura smithi, 17 Nilssonia gangeticus, 11 Chitra indica and 05 N. hurum were recorded at Charsadda, Peshawar, Thatta, Sukkur and Sanghar districts. During the present study, illegal capturing mostly from Thatta District (Hadero Lake, Haleji Lake, Karo Lake and Mahboob Shah Lake), from Sanghar district (Chotiari Wetland complex), and Badin District (Phoosna Lake and Shaikh Keerio Peer) was noted.

In Thailand, Kitimasak et al. (2005) surveyed the distribution and population status of the Narrow Headed Softshell Turtle (Chitra indica) and reported that due to destruction of habitat *Chitra indica* species has become rare everywhere and population seems to be declining. Habitat destruction is the major threat, as the activities, such as road and building construction require a large amount of sand to be removed. It represents another problem of population decline, by eliminating or degrading the quality of sand at beach nesting habitats. *Chitra indica* is primarily found in large rivers with sandy or muddy bottom (Das, 1995; Ernst and Barbour, 1989; Tikader and Sharma, 1985). At present, this species is abundant in Sindh but may soon be wiped out or will become rare if habitat destruction continues.

Reptiles have served as a food resource. Exploitation for food is heaviest in the tropical and sub tropical regions,
but also occurs in temperate areas. Of all reptiles, turtles are the most heavily exploited for human consumption (Figs. 16-20). High, unsustainable levels of exploitation for food are directly responsible for the precarious conservation status of many turtles (Klemens and Thobjarnarson, 1995). Trade volumes for freshwater turtles and tortoises in Asia are also huge, to the level that it has threatened the survival of several species. In 2006 and 2007, during two surveys at Chatuchak market in Bangkok, Thailand, they recorded a significant trade in non-native CITES listed freshwater turtles and tortoises to be used as pets. They documented 688 individuals of 19 species from different regions of the world, many of which are globally threatened with extinction. Five species were listed on CITES Appendix I, precluding all international trade, and an additional six species in Appendix II (Nijman and Shepherd, 2007).

According to the CITES List, Spotted pond turtle, Indian peacock soft shell turtle, Indian saw back turtle (CITES Appendix-I), while Narrow headed soft shell turtle, Brown roofed turtle and Crowned river turtle, Indian soft shell turtle listed in Appendix are in (CITES Appendix-II), while Indian flap Shell turtle is not listed in CITES (see Table 1).

Diversion of water for irrigation and the drainage of wetlands are the key causes of the degradation of many wetlands of Pakistan. Small wetlands created by the seepage from the irrigation systems are targeted for drainage to be used as agriculture lands, other threatened by the discharge of saline water into the wetlands, as well as by decreasing ground water levels due to draining programs. The drainage programs have also caused loss of natural water bodies. At present, only 25% of the water from the Indus River actually reaches the Indus Delta. Most of the lakes in Thatta and Badin districts are facing this problem.

Cultivation on river banks is a common practice among several areas of Pakistan that can destroy or alter turtle nesting sites. Continued clearing of aquatic vegetation...
along watersheds leads to siltation, turbidity, decreased productivity and increased flooding. In the present study, according to many field observations siltation is the most common problem faced by every wetland in Sindh. Due to the denudation of catchments area, the inflow of water brings with it a certain amount of silt. This inflow increases during the rainy season and causes siltation of wetland, and presently Haleji Lake faces this problem.

Increasing salinity in freshwater rivers and wetlands tends to decrease the species richness of aquatic communities of the wetland as a whole, resulting in loss of wetland biodiversity (Brock et al., 2005). Many agriculture lands, especially in Sindh, face acute salinity and water logging.

Dogs were observed wandering during canal closure in search of food; these dogs eat dead fishes, trapped fishes and turtles in shallow waters. Dead bodies of spotted pond turtles and Indian soft-shell turtles were observed being eaten by dogs (Akber et al., 2006). In our study, it was also observed that the turtles were eaten by dogs in Thatta and Badin districts. Drought is also one of the important
factors for mortality and habitat destruction of freshwater turtles.

Undoubtedly over-exploitation, habitat destruction and habitat alteration were recorded as common threats to all species during one year study. Before the present study, very less scientific data have been reported on the population, distribution, status and abundance of freshwater turtles in these districts of Sindh and KPK. Hopefully, this study will serve as a springboard for further research, conservation, education and future management plan. The present study revealed that Sindh province has a richer chelonian fauna as compared to Khyber Pakhtunkhwa (Tables 2-10). On the basis of our study, three species Pangshura tectum, Geoclemys hamiltonii and Hardella thurjii were recorded as rare in KPK, and Pangshura tectum, Geoclemys hamiltonii and Nilssonia hurum in Sindh, while other species are abundant, common or less common in both the provinces. The population status of Lissemys punctata is better than that of other freshwater turtles of Pakistan (Figs. 4-7).
CONCLUSION

It is concluded that due to habitat destruction, eutrophication and other anthropogenic activities, the population of freshwater turtles is on the decrease. The freshwater turtles are important part of our ecosystems and need attention for their conservation and management including control over trading activities. Further studies are needed to collect more data for preparing the conservation and management plan for freshwater turtles in Pakistan. There is a need to increase public awareness to enhance public participation in conservation activities particularly directed towards freshwater turtles and their habitats.

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