



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*, *Nilssonina gangeticus*, *Nilssonina 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 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-Pakistan subcontinent and not a natural geological 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 (*Nilssonina gangeticus*), Indian peacock soft-shell turtle (*Nilssonina*

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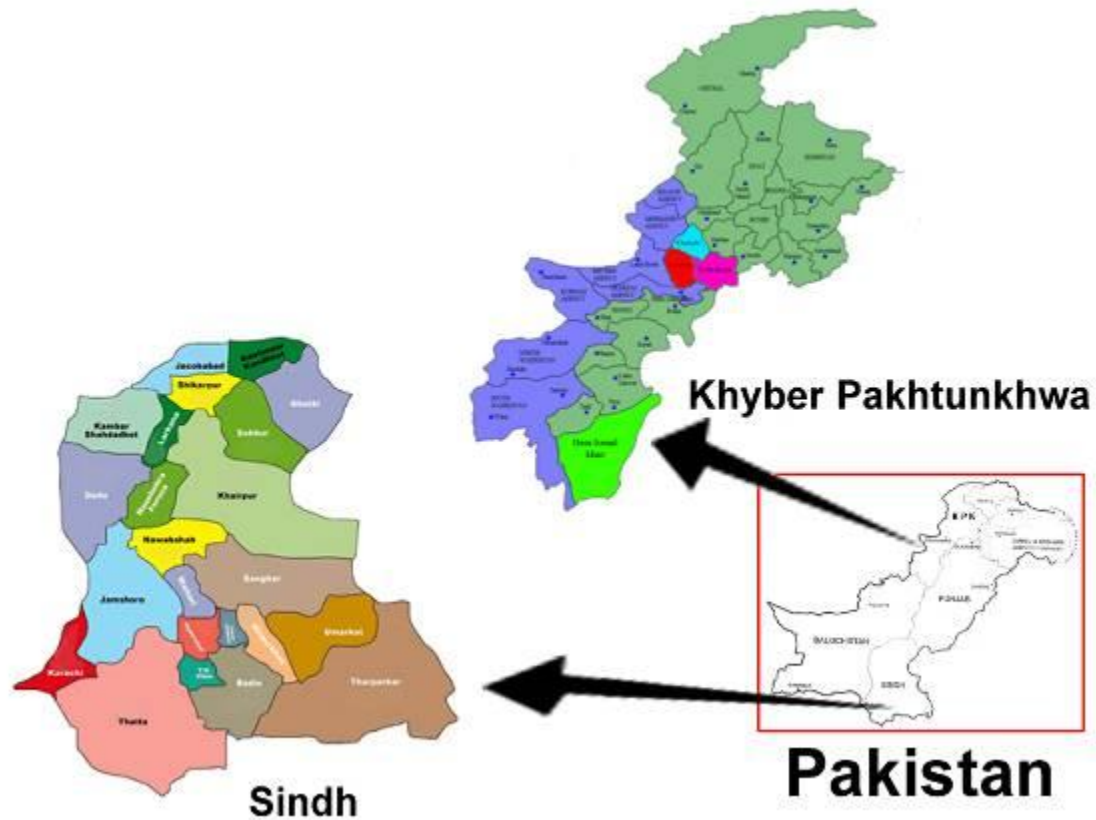


Fig. 1. Map of Pakistan (Showing study areas in Sindh and KPK).

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.

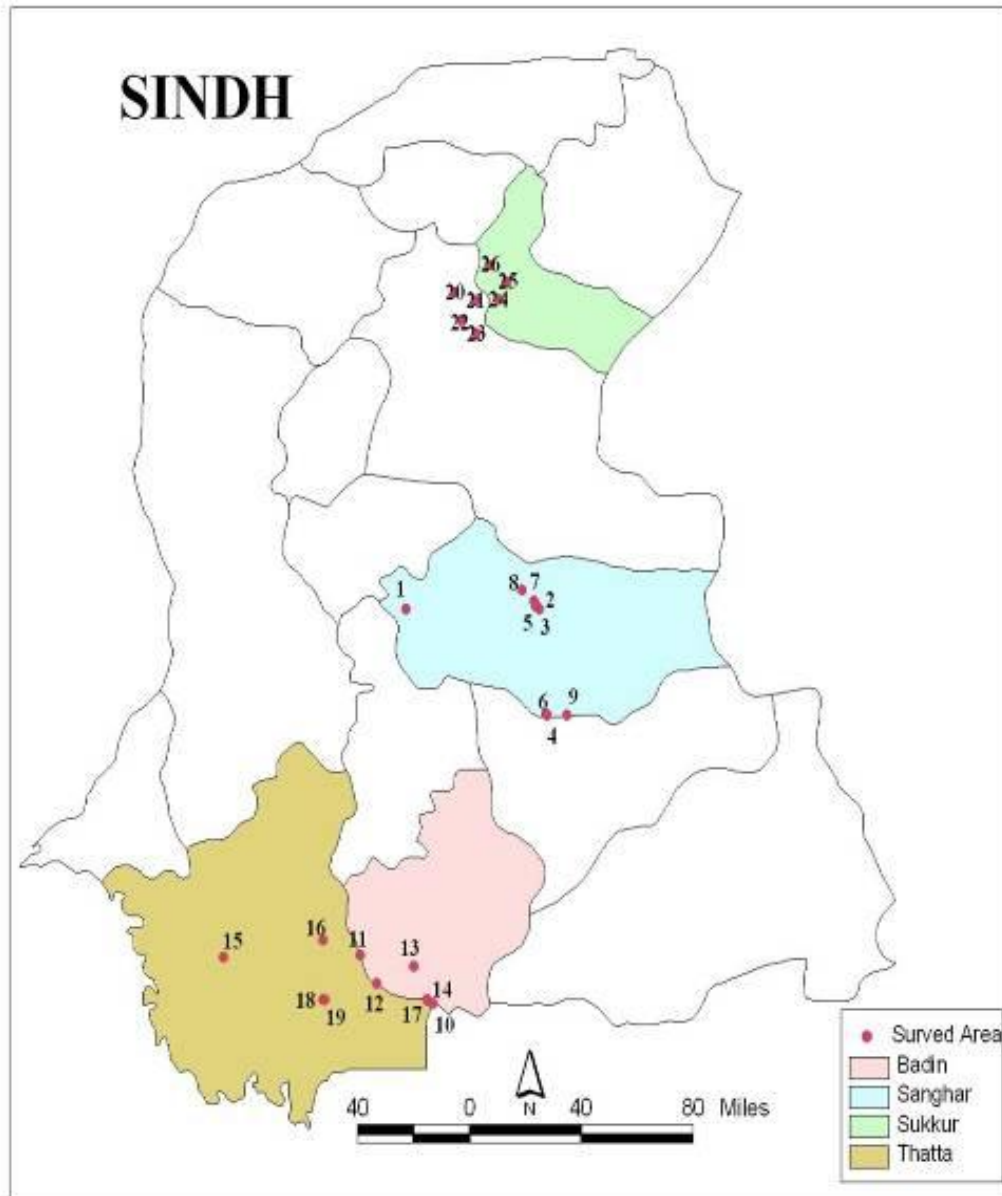


Fig. 2. Study areas in Sindh "Thatta, Badin, Sanghar and Sukkur districts".

1. Khipro Lake, 2. Nara Canal, 3. Bakar, 4. Gujri, 5. Sinjhoru, 6. Ithpar Lake, 7. Soonhari Lake, 8. Sadhori lake, 9. Mehmood Wari, 10. Golarchi, 11. Phoosna Lake, 12. Matchari Dhand, 13. Tando Bago, 14. Shaikh Kheerio Peer, 15. Hadero Lake, 16. Keenjhar Lake, 17. Karo Lake, 18. Mehboob Shah Lake, 19. Kharajo, 20. Nara Canal, 21. Rohri Canal, 22. K.F. Feeder, 23. Mirwa Canal, 24. Khirther Canal, 25. Dadu Canal 26. Rice Canal.

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.



Fig. 3. Study areas in KPK (Charsadda, Peshawar, Nowshera and DI Khan).

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,

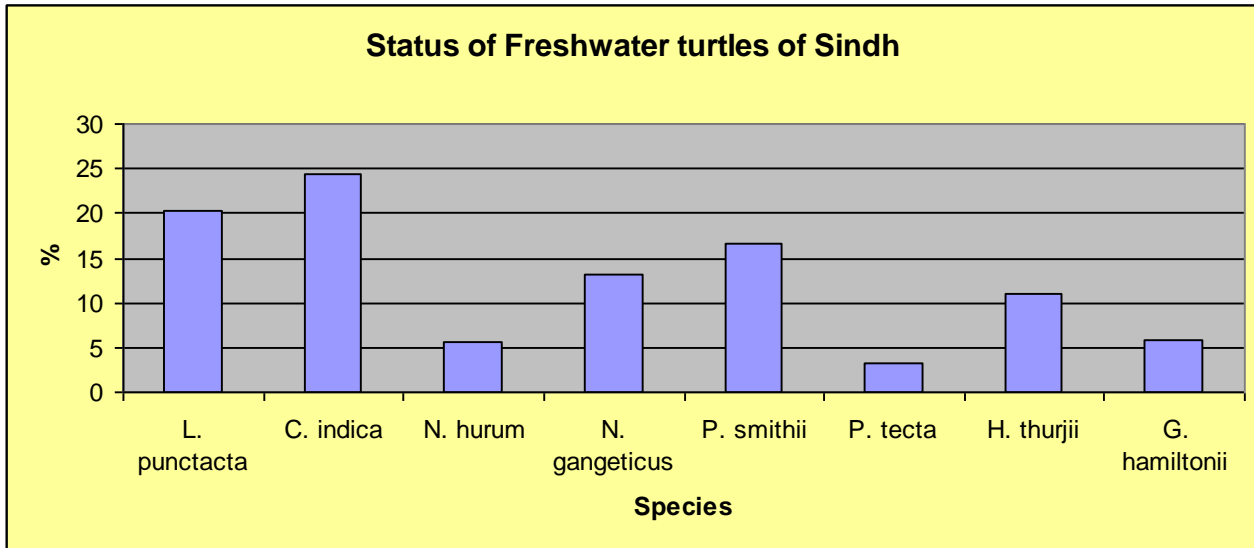


Fig. 4. Status of different species of Freshwater turtles in Sindh province.

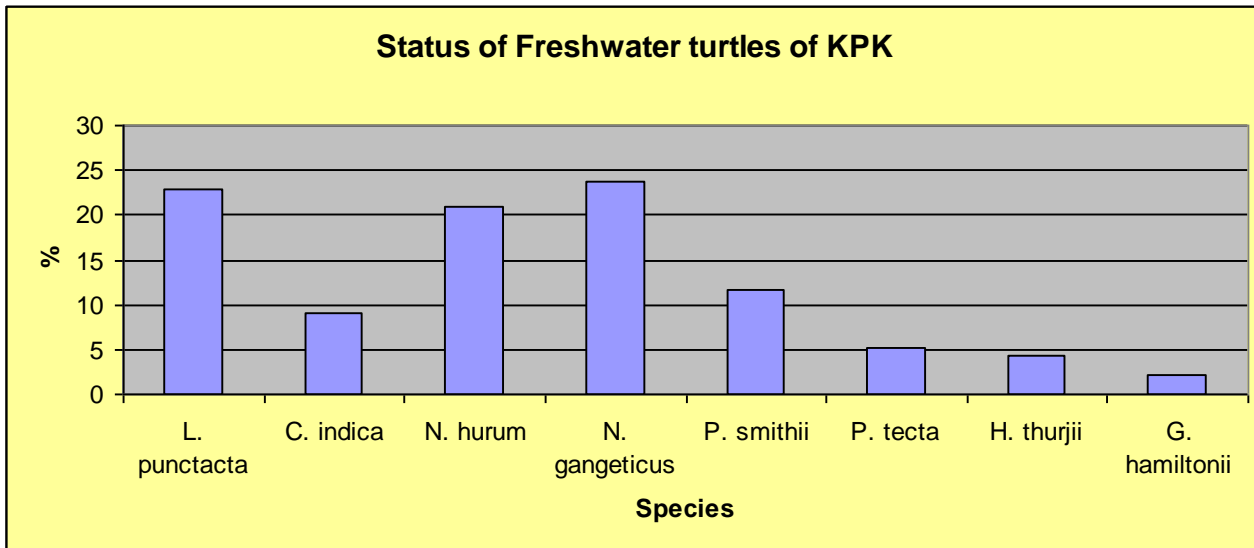


Fig. 5. Status of different species of Freshwater turtles in KPK province.

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), *Nilssonina gangeticus* (Cuvier, 1825) and *Nilssonina 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. smithii* 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).

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

Family	Species	IUCN Status	CITES Status
Geoemydidae	<i>Geoclemys hamiltonii</i>	Vulnerable	Appendix I
Geoemydidae	<i>Hardella thurjii</i>	Vulnerable	Appendix II
Geoemydidae	<i>Pangshura smithii</i>	Near threatened	Appendix II
Geoemydidae	<i>Pangshura tectum</i>	Low risk	Appendix I
Trionychidae	<i>Chitra indica</i>	Endangered	Appendix II
Trionychidae	<i>Nilssonina gangeticus</i>	Vulnerable	Appendix I
Trionychidae	<i>Nilssonina hurum</i>	Vulnerable	Appendix I
Trionychidae	<i>Lissemys punctata</i>	Least concern	Non CITES

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

S. No	Location	Approx surveyed area (km)	Observed Species							Total	%
			<i>Chitra indica</i>	<i>Pangshura smithii</i>	<i>Lessemys punctata</i>	<i>Hardella thurjii</i>	<i>Nilssonina gangeticus</i>	<i>Nilssonina hurum</i>			
1	Hadero Lake	4	70	80	92	30	32	52	356	15.8	
2	Haleji Lake	4	62	74	83	21	25	60	325	14.4	
3	Keenjhar Lake	4	55	64	89	30	20	40	298	13.2	
4	Mahboob Shah Lake	4	51	70	77	20	20	33	271	12	
5	Kharajo Lake	4	66	69	71	22	22	31	281	12.5	
6	Karo Lake	4	48	57	69	29	33	38	274	12	
7	Ghulam ullah Canal	4	125	87	115	40	44	31	442	19.6	
Total			477	501	596	192	196	285	2247		
%			21	22.2	26.52	8.54	8.72	12.68			

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

S. No.	Location	Approx surveyed area (km)	Observed species				Total	%
			<i>Nilssonina hurum</i>	<i>Chitra indica</i>	<i>Lissemys punctata</i>	<i>Geoclemys hamiltonii</i>		
1	Golarchi (Jaffar ali Lake)	5	28	71	75	07	181	26
2	Phoosna Lake	5	39	62	60	06	167	23.9
3	Charwo and Khanjo Lake	5	26	56	53	05	140	20.1
4	Matchary Dhand	5	20	48	37	08	103	16.2
5	Shaikh Kerrio Peer	5	14	44	33	04	95	13.46
Total			127	281	258	30	696	
%			18	40	37	4.31		

Badin District

In this area, four species were recorded, *Lissemys punctata* and *Chitra indica* were abundant, *Nilssonina 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).

Sanghar District

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

Hardella thurjii was less common, while *Geoclemys hamiltonii* was rare (Table 4, Figs. 8, 10 – 13 and 15). *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 *Nilssonina gangeticus* were common and *Hardella thurjii* was less common, while *Geoclemys hamiltonii* was

Table 4. Population Distribution of Freshwater Turtles of Sanghar District.

S. No.	Location	Approx surveyed area (km)	Observed Species							Total	%
			<i>Chitra indica</i>	<i>Nilssonia gangeticus</i>	<i>Pangshura smithii</i>	<i>Hardella thurjii</i>	<i>Geoclemys hamiltonii</i>	<i>Lissemys punctata</i>			
1	Khipro Lake	5	71	74	63	45	10	80	343	12.7	
2	Nara Canal	5	64	76	69	50	27	83	369	13.7	
3	Sanghriaro Lake (Chotiari)	5	80	85	88	61	31	89	434	16.17	
4	Bakar Lake	5	57	60	52	40	07	60	276	10.2	
5	Soonhari Lake	5	41	52	44	47	09	67	260	9.69	
6	Gujri	5	60	51	47	33	01	71	263	9.80	
7	Ithpar	5	45	58	38	32	01	60	234	8.72	
8	Sadhori Lake	5	53	39	50	46	00	56	244	9	
9	Mehmood-wari Dhand	5	52	47	61	40	00	60	260	10.67	
	Total		523	542	512	394	86	626	2683		
	%		19.4	20.20	19.08	14.68	3.20	23.33			

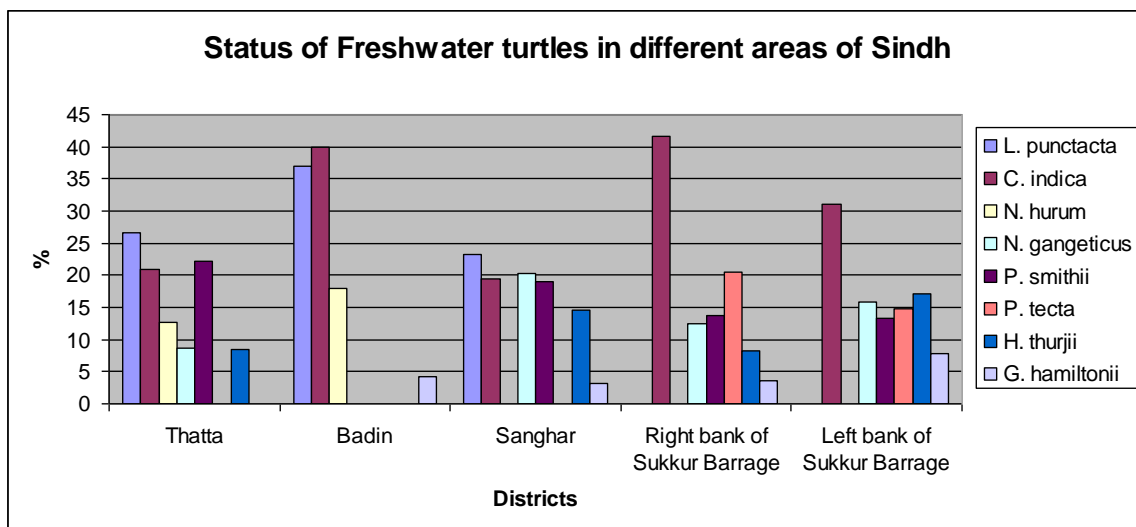


Fig. 6. Distribution and status of Freshwater turtles in different districts of Sindh.

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:

Charsadda District

In Charsadda 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

Table 5. Population Distribution of Freshwater Turtles in the Right Bank in Indus, Sukkur District.

S. No.	Location	Approx surveyed area (km)	Observed Species						Total	%
			<i>Chitra indica</i>	<i>Nilssonina gangeticus</i>	<i>Pangshura smithii</i>	<i>Pangshura tecta</i>	<i>Hardella thurjii</i>	<i>Geoclemys hamiltonii</i>		
1	Khirthar Canal	6	52	17	19	20	10	08	126	31.81
2	Dadu Canal	6	60	13	18	28	11	04	134	33.83
3	Rice Canal	6	53	19	17	33	12	02	136	34.34
Total			165	49	54	81	33	14	396	
%			41.66	12.37	13.63	20.45	8.33	3.53		

Table 6. Population Distribution of Freshwater Turtles in the Left Bank of Indus, Sukkur District.

S. No.	Location	Approx surveyed area (km)	Observed Species						Total	%
			<i>Chitra indica</i>	<i>Nilssonina gangeticus</i>	<i>Pangshura smithii</i>	<i>Pangshura tecta</i>	<i>Hardella thurjii</i>	<i>Geoclemys hamiltonii</i>		
1	Nara Canal	6	80	53	35	31	41	25	265	24.1
2	Rohri Canal	6	90	52	41	42	50	21	296	26.9
3	K. F. Feeder	6	86	30	40	50	52	23	281	25.6
4	Mirwah Canal	6	84	40	30	40	44	17	255	23.2
Total			340	175	146	163	187	86	1097	
%			30.99	15.95	13.30	14.85	17.04	7.83		

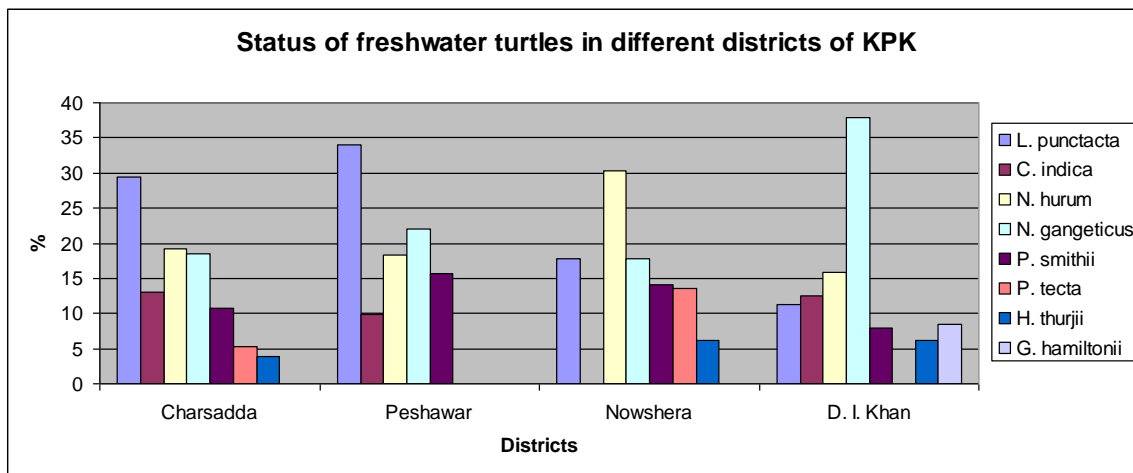


Fig. 7. Distribution and status of Freshwater turtles in different districts of KPK.

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 *Chitra 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).



Fig. 8. Indian narrow-headed soft-shell turtle (*Chitra indica*).



Fig. 9. Indian peacock soft-shell turtle (*Nilssonina hurum*).

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,



Fig. 10. Indian flap shell turtle (*Lissemys punctata andersonii*).



Fig. 11. Indian soft-shell turtle (*Nilssonina gangeticus*).

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*, *Nilssonina*



Fig. 12. Spotted pond turtle (*Geoclemys hamiltonii*).



Fig. 13. Crowned river turtle (*Hardella thurjii*).

gangeticus, *Nilssonina 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.



Fig. 14. Indian roofed turtle (*Pangshura tecta*).



Fig. 15. Brown roofed turtle (*Pangshura smithii*).

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.



Fig. 16. Local community activity for trading.



Fig. 17. Trading of some body parts of Freshwater Turtles.

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, Taunsa 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,

Table 7. Population Distribution of Freshwater Turtles in Charsadda District (KPK).

S. No.	Name of locality (water Body)	Approx surveyed area (Km)	<i>L. punctata</i>	<i>C. indica</i>	<i>N. hurum</i>	<i>N. gangetica</i>	<i>P. tecta</i>	<i>P. smithii</i>	<i>H. thurjii</i>	Total	%
1.	Kashmalo Drain (TurangZai)	3	20	-	06	13	-	09	07	55	7.44
2.	Dub Drain (Mardan road)	3	48	17	21	27	-	04	-	117	15.83
3.	Hisara Drain (Near Kashmir Kalay)	3	36	13	24	37	-	07	-	117	15.83
4.	Branch No. 6 from Main canal of Lower Swat (Behlola)	3	06	-	-	05	07	16	-	34	4.60
5.	River Swat (Khyali) Near Tarnab	3	39	27	09	17	13	17	05	127	17.19
6.	River Jindi (Nimouri)	3	28	16	53	19	-	08	09	133	18.00
7.	River Kabul (Sardaryab)	3	41	23	29	19	19	18	07	156	21.11
Total			218	96	142	137	39	79	28	739	
		%	29.50	12.99	19.22	18.54	5.28	10.69	3.79		

Table 8. Population Distribution of Freshwater Turtles in Peshawar District (KPK).

S. No.	Name of locality (water Body)	Approx surveyed area (Km)	<i>L. punctata</i>	<i>C. indica</i>	<i>N. hurum</i>	<i>N. gangetica</i>	<i>P. smithii</i>	Total	%
1.	Naguman (River Kabul)	2	24	16	18	25	26	109	33.44
2.	Shaalam (River Kabul)	2	36	16	21	18	06	97	29.75
3.	River Budhni	2	23	-	09	21	-	53	16.26
4.	River Bara	2	22	-	12	-	19	53	16.26
5.	Sheikh canal (Kabul River Canal)	2	06	-	-	08	-	14	4.29
Total			111	32	60	72	51	326	
		%	34.05	9.82	18.40	22.09	15.64		

whereas, some fisherman consider them the enemies of fish, therefore, they kill the captured turtles to save their fish. In our study, 08 dead *Pangshura smithii*, 17 *Nilssoniana 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,

Table 9. Population Distribution of Freshwater Turtles in Nowshera District (KPK).

S. No.	Location	Approx surveyed area (Km)	Observed Species							Total	%
			<i>N. hurum</i>	<i>N. gangeticus</i>	<i>L. punctata</i>	<i>P. tecta</i>	<i>P. smithi</i>	<i>H. thurjii</i>			
1	Kheshgi (River Kabul)	4	40	28	17	16	20	15	136	25.33	
2	Hakimabad (River Kabul)	4	46	25	41	22	20	11	165	30.73	
3	Kund Park (Kabul + Indus rivers)	4	46	24	30	15	22	-	137	25.51	
4	Darwazgai (Indus River)	4	31	19	08	20	14	07	99	18.44	
Total			163	96	96	73	76	33	537		
%			30.35	17.88	17.88	13.59	14.15	6.15			

Table 10. Population Distribution of Freshwater Turtles in Dera Ismail Khan District (KPK).

S. No.	Name of locality (water Body)	Approx Surveyed area (Km)	<i>L. punctata</i>	<i>C. indica</i>	<i>N. hurum</i>	<i>N. gangetica</i>	<i>P. smithii</i>	<i>G. hamiltonii</i>	<i>H. thurjii</i>	Total	%
1.	Purani kirri (Chashma Right Bank Canal Plus Indus River)	4	12	22	19	45	12	19	12	141	25.97
2.	Mela wali	4	20	05	06	11	-	03	-	45	8.29
3.	Mianwali Road (Dhap Shumali)	4	12	13	19	39	05	09	08	105	19.34
4.	Indus View Road	4	04	11	21	73	09	-	-	118	21.73
5.	Bhakar Road (Kiri Juma Khan)	4	13	17	21	38	17	15	13	134	24.68
Total			61	68	86	206	43	46	33	543	
%			11.23	12.52	15.84	37.94	7.92	8.47	6.08		

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



Fig. 18. Another trading activity of local community for Freshwater Turtles.

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



Fig. 19. Another trading activity of local community.



Fig. 20. Burning of seized body parts of Turtles by Wildlife Department in Peshawar (Courtesy by: Dawn news).

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 *Nilssonina 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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