

POPULATION STATUS, DISTRIBUTION AND CONSERVATION OF FRESHWATER TURTLES OF PESHAWAR VALLEY, KHYBER PAKHTUNKHWA, PAKISTAN

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ABSTRACT

A total of 2,791 individuals of freshwater turtles were recorded from 18 study sites, located within four districts of Peshawar Valley (Peshawar, Charsadda, Nowshera and Mardan districts) belonging to the family Trionychidae, including the Indian Narrow-headed Softshell Turtle (*Chitra indica*), Indian Softshell Turtle (*Nilssonina gangetica*), Indian Peacock Softshell Turtle (*Nilssonina hurum*) and Indian Flapshell Turtle (*Lissemys punctata andersoni*) and the family Geoemydidae, including Brown Roofed Turtle (*Pangshura smithii*), Crowned River Turtle (*Hardella thurjii*) and Indian Roofed Turtle (*Pangshura tectum*). Based on our present study data, *Lissemys punctata* (28.52%) and *Nilssonina gangetica* (27.41%) were common, whereas, *Nilssonina hurum* (14.76%) and *Pangshura smithii* (11.04%) were less abundant. *Chitra indica* and *Pangshura tectum* were found at levels that may be categorized as scarce (7.31% and 7.49%, respectively). *Hardella thurjii* (3.48%) was rarely recorded. On the other hand, *Lissemys punctata* (28.52%) and *Nilssonina gangetica* (27.41%) were common at all 18 sites sampled, followed by *Pangshura smithii* at 16 of 18 sites. The Spotted Pond Turtle (*Geoclemys hamiltonii*) was unrecorded during the present study, but this species had been reported from different parts of Pakistan by other authors. Habitat destruction, desilting of canals, harmful and unsustainable fishing techniques, such as dynamite explosion, electric-shocks and pesticides, and unprotected status of nesting sites were recorded as major threats to freshwater turtles in Peshawar Valley.

Keywords: Peshawar Valley, freshwater turtles, distribution, population status, conservation.

INTRODUCTION

Peshawar Valley includes the districts of Peshawar, Charsadda, Nowshera, Mardan, Swabi and parts of Malakand, Mohamand and Khyber Agencies. The total length of the Valley is approximately 8,800 km² lying between 71°15' and 72°47'E and 33°40' and 34°31'N (Fig. 1).

The order Testudines comprises of 13 families of tortoises, terrapins and sea turtles. A total of 289 living species of tortoises and terrapins are currently extant, and inhabit a great diversity of habitats (Azam and Saeed, 2011; Safi and Khan, 2014; Akbar *et al.*, 2006; Khan, 2003, 2004; Khan *et al.*, 2012, 2015). Two families of freshwater turtles are found in Pakistan, Geoemydidae which contains Hardshell turtles such as Spotted Pond Turtle (*Geoclemys hamiltonii*), Crowned River Turtle (*Hardella thurjii*), Brown Roofed Turtle (*Pangshura smithii*), and Indian Roofed Turtle (*Pangshura tectum*), while the other family, Trionychidae comprises of softshell turtles such as the Indian Narrow-headed Softshell Turtle (*Chitra indica*),

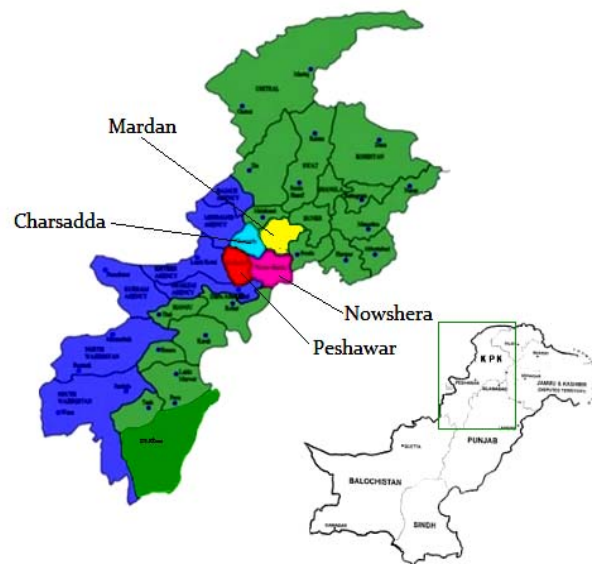


Fig. 1. Maps of Pakistan and Khyber Pakhtunkhwa (KPK) showing Study areas of Peshawar Valley.

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Indian Softshell Turtle (*Nilssonina gangetica*), Indian Peacock Softshell Turtle (*Nilssonina hurum*) and Indian Flapshell Turtle (*Lissemys punctata andersoni*). Soft shell turtles are larger in size as compared to hard-shell turtles. Among freshwater turtles that are human consumed, softshell turtles are considered to be the best due to their low bone to meat ratio and larger proportions of cartilage and gelatinous skin. This demand has made softshell turtles the most important components of the freshwater turtle trade in Asia (Walters, 2000).

Terrapins play important role for maintaining healthy ecosystem of freshwater, as they act as scavengers, herbivores, omnivores and carnivores, provide dispersal mechanism for seeds, scavenging dead organic matter and help to maintain healthy populations of aquatic life (Lovich, 1994; Safi and Khan, 2014). Softshell turtles are source of traditional Chinese medicine, and their shells are supposed to be highly effective for purifying blood and to cure many diseases (Zuberi, 2009; Safi and Khan, 2014). A medicine by the local name Guilinggao has been extracted from plastron and used for treatment of various heart diseases. Plastron is commonly used to extract a product called 'Turtle Jelly'. The use of extracts of turtles in cosmetic industry is also in practice. Some pharmaceutical industries are also developing on the basis of turtle byproducts which has lead to declines in their respective populations.

CITES Appendix-I lists the Indian Softshell Turtle, Peacock Softshell Turtle, Spotted Pond Turtle and the Indian Sawbacked Turtle. Whereas, Crowned River Turtle, Indian Narrow-headed Softshell Turtle and Brown Roofed Turtle are listed in Appendix-II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES (Shah, 1996; Mehmood *et al.*, 2012). The Indian Flapshell Turtle is not listed in CITES Species database of 2014 (Table 1).

Turtles play a vital role in ecological stability of food chains in wetlands and management of environmental regime. They may contribute in reduction of algal bloom. Anthropogenic disturbance to lentic and lotic ecosystems can change ranging behavior, with subsequent change in demographic processes. For example, stress in freshwater turtles suppresses egg laying and reproduction (Thompson, 1993; Safi and Khan, 2014). In Pakistan, the trade of freshwater turtles was highlighted in 1990 (Baig, 2006; Safi and Khan, 2014).

In Khyber Pakhtunkhwa (KPK), commercial exploitation of turtles for their body parts commenced in the year 2006 (Baig, 2006). No prior scientific studies have been reported on population status, distribution and conservation of freshwater turtles of the valley. The main purpose of the present study is the population estimation

and determination of dispersal ranges of turtles in the water bodies of Peshawar valley and record the natural and anthropogenic threats faced by the freshwater turtle species and to suggest action plan for their conservation.

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

Species	Common Name	CITES Status	SSC Red List Status
<i>Chitra indica</i>	Indian Narrow-headed Softshell Turtle	Appendix II	Endangered
<i>Hardella thurjii</i>	Crowned River Turtle	Appendix II	Lower Risk
<i>Pangshura smithii</i>	Brown Roofed Turtle	Appendix II	Lower Risk
<i>Pangshura tectum</i>	Indian Roofed Turtle	Appendix I	Vulnerable
<i>Geoclemys hamiltonii</i>	Spotted Pond Turtle	Appendix I	Vulnerable
<i>Nilssonina gangetica</i>	Indian Softshell Turtle	Appendix I	Vulnerable
<i>Nilssonina hurum</i>	Indian Peacock Softshell Turtle	Appendix I	Vulnerable
<i>Lissemys punctata andersoni</i>	Indian Flapshell Turtle	Non CITES	Lower Risk

MATERIALS AND METHODS

In this study, 18 sites located in four districts (Peshawar, Charsadda, Nowshera and Mardan) of Peshawar valley were selected for survey during Jan 2013 to November 2015. Indus River, distributaries of River Kabul (Sardaryab, Naguman and Shahalam), Tributaries of River Indus (River Budhni, River Bara, River Jindi, River Swat, River Kabul) and some small water bodies (Drains and Canals) like Kashmalo drain, Hisara drain, Fazalabad drain, Dub drain, Jalala drain, Branch No. 6 Canal and Sheikh Canal were surveyed in the valley of Peshawar as shown in Figures 2-11.

The populations of turtles were recorded during each visit to eighteen study sites. Species were identified in the field

on the basis of standard published literature (Khan, 2003, 2004, 2015).

Direct counting of basking turtles has been done by Minolta Binoculars of 10x50mm power. Netting technique was also used for capturing the terrapins for identification. Canals were surveyed, during canal closure season. Animals found above ground in the dry canal were identified and counted. Poultry intestinal baited hooks were used to capture terrapins. Information has been collected from Game watchers, local fishermen, boatmen, and field staff of Department of Irrigation, Government of KPK. Evidences from the impression of finger or foot prints, tails, presence of fecal pellets, egg laying excretion were also collected. Interviews were conducted from the local community to obtain information about population status of terrapins. Special

identification cards were shown during interviews to identify the terrapin species.

However, the present research is based on monitoring and direct sightings of turtles by categorizing them into basking, captured and floating turtles. The given formula has been used for population estimation of turtles following Khan *et al.*, 2015:

$$P = \frac{AZ}{2YX}$$

$$2YX$$

P = Population

A = Total area

Z = Number observed

Y = Average flushing distance

X = Length of strip

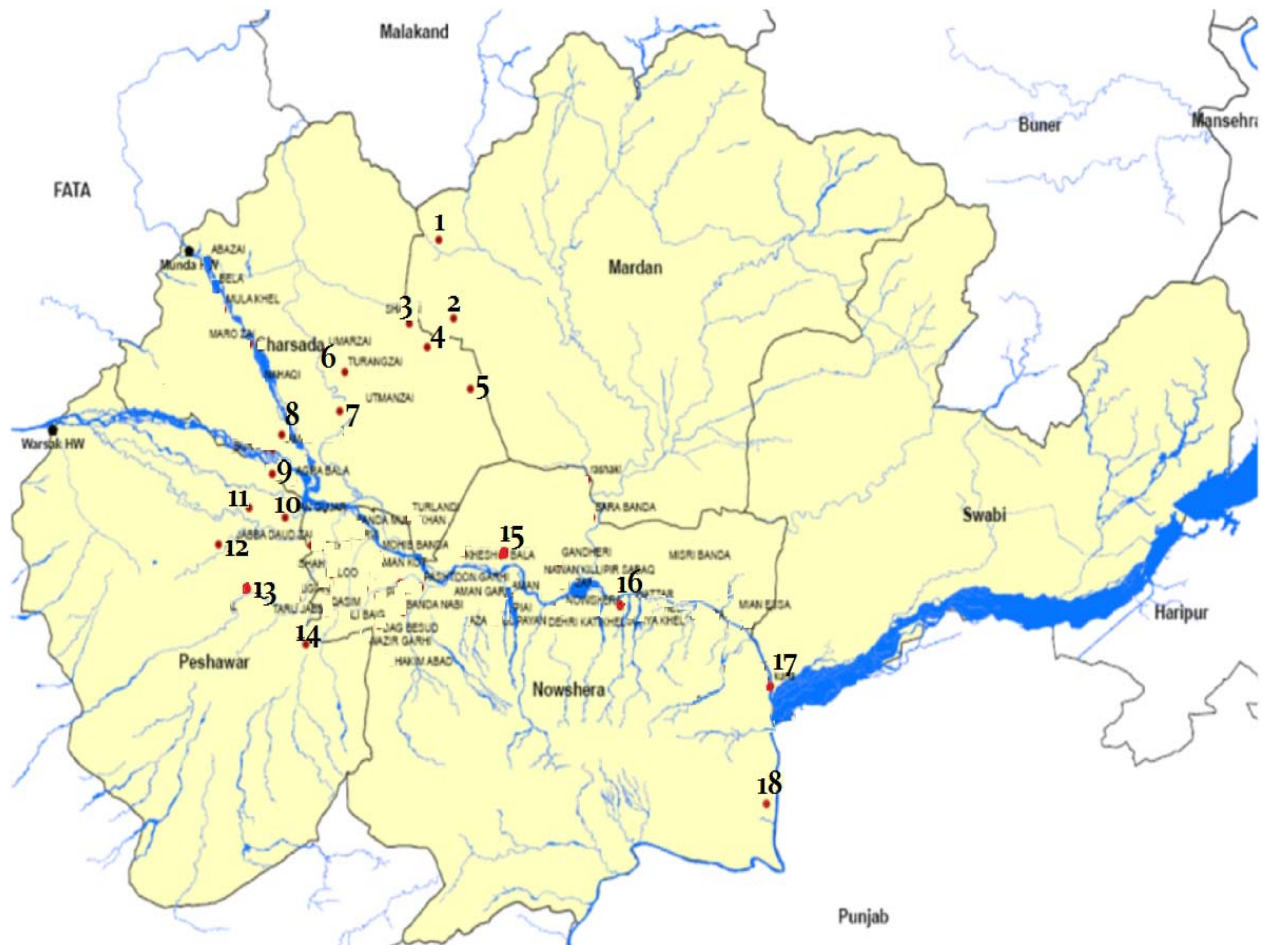


Fig. 2. Map of study sites in Peshawar Valley: 1. Jalala drain, 2. Fazalabad drain, 3. Hisara drain 4. Behlola (Brach No. 6 of lower Swat River), 5. Dub drain, 6. Kashmalo drain (Turangzai), 7. Nimouri (River Jindi), 8. Khyali (River Swat), 9. Sardaryab (River Kabul), 10. Naguman (River Kabul), 11. Shaalam (River Kabul), 12. River Budhni, 13. Sheikh canal, 14. River Bara, 15. Khesghi (River Kabul), 16. Hakimabad (River Kabul), 17. Kund Park (River Kabul + River Indus) and 18. Darwazgai (Indus River).



Fig. 3. River Jindi in Charsadda.



Fig. 4. River Swat (Khyali) in Charsadda.



Fig. 5. River Kabul (Sardaryab) in Charsadda.



Fig. 6. River Budhni in Peshawar.



Fig. 7. River Kabul (Shahaalam) in Peshawar.



Fig. 8. River Kabul (Naguman) in Peshawar.



Fig. 9. Kund Park (River Kabul meets Indus River) in Nowshera.



Fig. 10. River Kabul in Nowshera.



Fig. 11. River Swat in Charsadda.



Fig. 12. Indian Softshell Turtle (*Nilssonina gangetica*).

RESULTS AND DISCUSSION

recorded, which belong to families Trionychidae and Geoemydidae (Table 2 and Figs. 12-18).

In the present study, 2,791 specimens of turtles were

Table 2. Population Distribution of Freshwater Turtles of Peshawar Valley.

S. No.	Location	Geographical Coordinates	Approx Surveyed area (km)	Observed Species								
				<i>C. indica</i>	<i>N. gangetica</i>	<i>N. hurum</i>	<i>L. punctata</i>	<i>H. thurjii</i>	<i>P. smithii</i>	<i>P. tectum</i>	Total	%
1	Kashmalo drain	34.220361 N 71.748956 E	4	-	29	09	42	09	17	07	113	4.05
2	Dub drain	34.160653 N 71.790753 E	4	21	51	14	67	-	13	-	166	5.95
3	Hisara drain	34.281803 N 71.82955 E	4	18	79	27	48	-	16	08	196	7.02
4	Branch No.6 (L. Swat River)	34.245989 N 71.849339 E	4	-	16	-	09	-	16	21	62	2.22
5	Khyali (River Swat)	34.216183 N 71.668581 E	4	36	57	11	78	09	34	23	248	8.89
6	Nimouri (River Jindi)	34.205394 N 71.7266 E	4	19	129	58	98	11	15	03	333	11.93
7	Sardaryab (River Kabul)	34.129483 N 71.688142 E	4	45	52	38	64	14	26	31	270	9.67
8	Naguman (River Kabul)	34.135110 N 71.572151 E	4	25	39	22	40	03	31	12	172	6.16
9	Shalam (River Kabul)	34.099296 N 71.579704 E	4	18	28	22	56	-	09	-	133	4.77
10	Budhni River	34.069724 N 71.513442 E	4	03	39	17	38	06	-	-	103	3.69
11	Sheikh Canal	34.022608 N 71.539149 E	4	-	11	-	18	02	-	-	31	1.11
12	Bara river	33.998141 N 71.691370 E	4	-	06	15	27	-	24	-	72	2.58
13	Kheshgi (River Kabul)	34.042646 N 71.900196 E	4	08	45	51	19	18	27	23	191	6.84
14	Hakimabad (River Kabul)	34.016727 N 72.035766 E	4	05	48	47	52	13	26	27	218	7.18
15	Kund Park (River Kabul +Indus river)	33.917708 N 72.229829 E	4	04	39	48	33	04	16	24	168	6.02
16	Darwazgai (River Indus)	33.824637 N 72.235751 E	4	02	28	33	16	08	19	22	128	4.59
17	Jalala drain	34.331657 N 71.900840 E	4	-	32	-	50	-	12	05	99	3.55
18	Fazalabad drain	34.281163 N 71.874189 E	4	-	37	-	41	-	07	03	88	3.15
			Total	204	765	412	796	97	308	209	2791	
			%	7.31	27.41	14.76	28.52	3.48	11.04	7.49		



Fig. 13. Indian Peacock Softshell Turtle (*Nilssonia hurum*).



Fig. 14. Indian Narrow-headed Softshell Turtle (*Chitra indica*).



Fig. 15. Indian Flapshell Turtle (*Lissemys punctata andersoni*).



Fig. 16. Indian Roofed Turtle (*Pangshura tectum*).



Fig. 17. Brown Roofed Turtle (*Pangshura smithii*).



Fig. 18. Crowned River Turtle (*Hardella thurjii*).

Based on our results, the occurrence of *Lissemys punctata* and *Nilssonina gangetica* was recorded to be common with 28.52% and 27.41% whereas, *Nilssonina hurum* and *Pangshura smithii* were recorded as less common with 14.76% and 11.04%, respectively. *Chitra indica* (7.31%) and *Pangshura tectum* (7.49%) were recorded as scarce. *Hardella thurjii* was recorded as rare with 3.48%. *Lissemys punctata* (28.52%) and *Nilssonina gangetica* (27.41%) were common in all the eighteen sites sampled, followed by *Pangshura smithii* found in sixteen sites out of eighteen. The largest numbers and species diversity were recorded at River Jindi (11.93% of all captures) having seven different species, followed by Sardaryab (A distributor of River Kabul) (9.67%) and Khyali (River Swat) (8.89%) having all seven species. The reason was that these water bodies have greater water capacity (Figs. 19-21).

Lissemys punctata is the most abundant species, probably because it likes shallow streams, stagnant waters of rivers, marshes, ponds, lakes, and often extends into sewage systems of metropolitan cities, as previously reported by Minton (1966). Taking together, our data indicate collectively that *Lissemys punctata* has a healthy population and is found in nearly all sites in Peshawar Valley that surveyed. The second-most abundant species is *Nilssonina gangetica* which has large populations at the surveyed sites. Mehmood *et al.* (2012) conducted the study in the Korang River of Islamabad and reported that *Lissemys punctata* was the most abundant species, contributing up to 56% of the total turtles by numbers. *Lissemys punctata* were 30%, while *Pangshura smithii* was recorded as least abundant (08%) during their study. The present study shows the same results and confirms earlier studies.

In a recent study, Khan *et al.* (2015) reported the distribution of all the eight species from the district of Dera Ismail Khan of Khyber Pakhtunkhwa province, another study, Noreen (2007) also observed all species in Dera Ismail Khan of KPK.

During the present study, seven species were recorded in the valley of Peshawar, while *Geoclemys hamiltonii* was not recorded in the valley (Safi and

Khan, 2014; Khan *et al.*, 2015). Another study, Akber *et al.* (2006) reported all the eight species from Punjab province. According to them, *Pangshura smithii* and *Pangshura tectum* were abundant, where as *Hardella thurjii* and *Chitra india* were rare at different localities of Punjab province of Pakistan.

Khan *et al.* (2015) conducted a study in four districts of Sindh province and recorded all the eight species. They reported four species from Badin district and six species from each of Sukkur, Thatta and Sanghar districts of Sindh.

In the present study, seven species of freshwater turtles were recorded in Peshawar division viz. Peshawar, Charsadda and Nowshera districts, while in Mardan district (Mardan Division) only four species, namely *Lissemys punctata* and *N. gangetica*, *Pangshura smithii* and *Pangshura tectum* were found, as we have studied only two sites in Mardan because Peshawar Division (Peshawar, Charsadda and Nowshera districts) are rich in aquatic resources as main rivers and streams are passing in this division of the Khyber Pakhtunkhwa. Charsadda and Nowshera districts of Peshawar division have more water resources and that is the reason that these two districts have been adversely affected from flood in the past.

Every year, millions of freshwater turtles are consumed through Asian food markets. Presently, several species of turtle are in decline. Indian Peacock Softshell Turtle (*Nilssonina hurum*) is traded in East Asian markets at volumes of 60 to 80 tons per week (IUCN, 2015).

In Peshawar valley, we noticed that there is lack of knowledge on conservation of wildlife, including terrapins, within local communities. According to them, terrapins were harvested a few years ago to the point that they have been nearly exterminated.

Nonetheless, a population persists here, which indicate that terrapins have recovered from harvest within a short period of time.

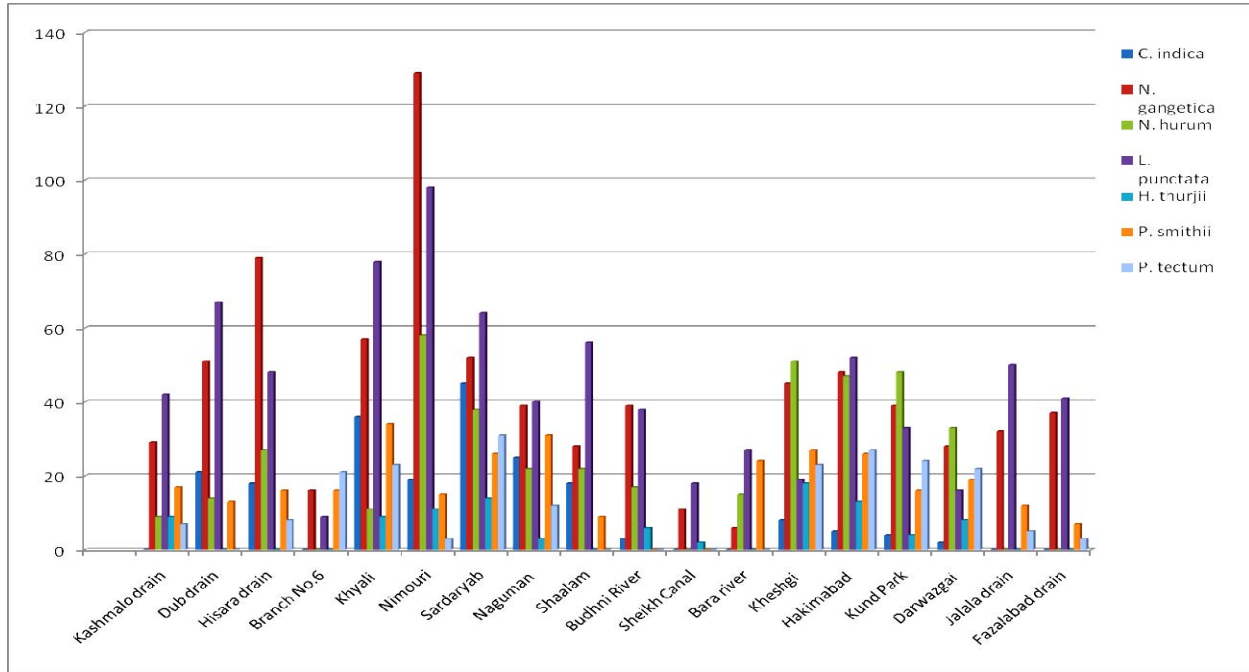
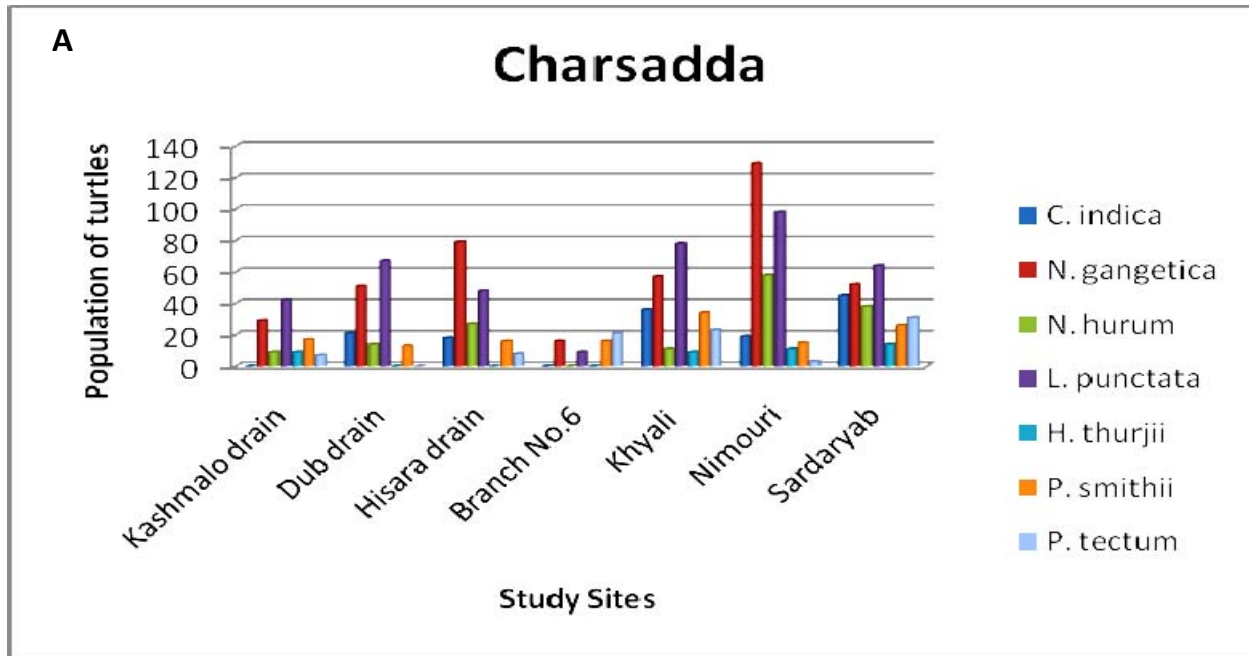
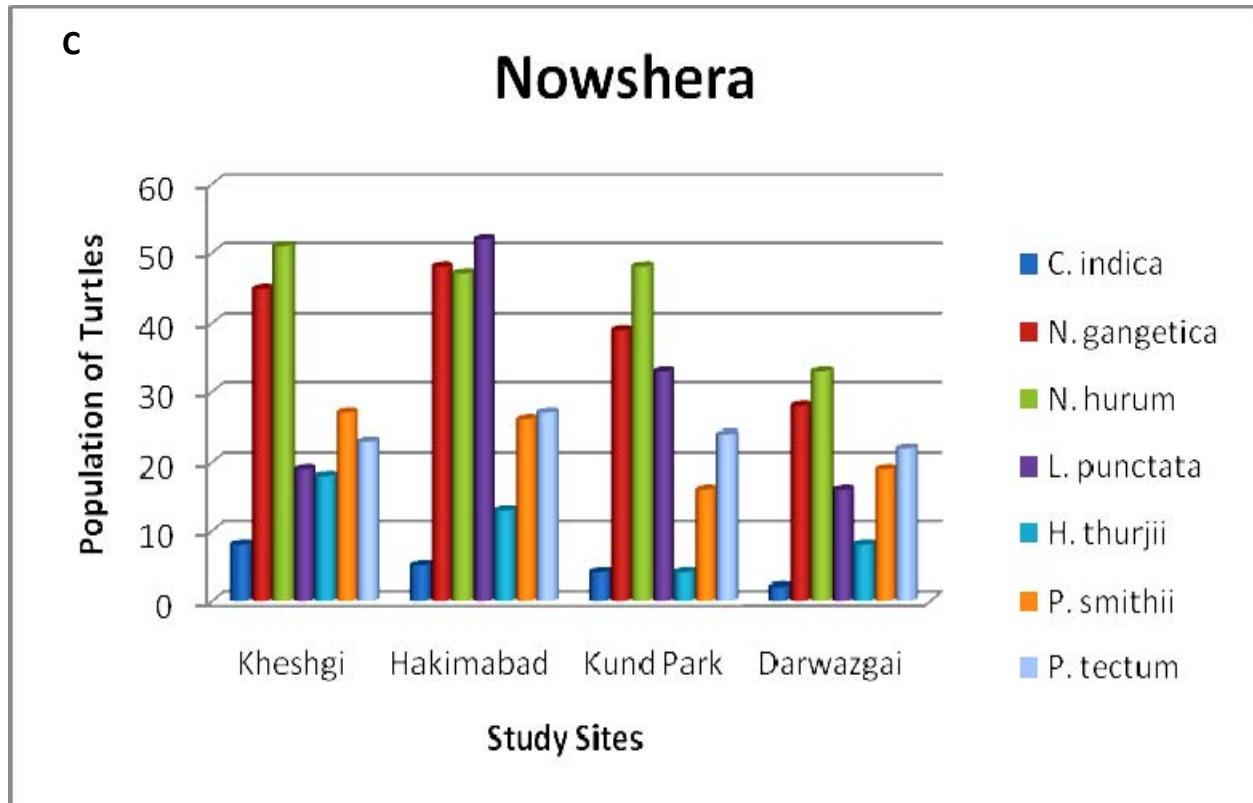
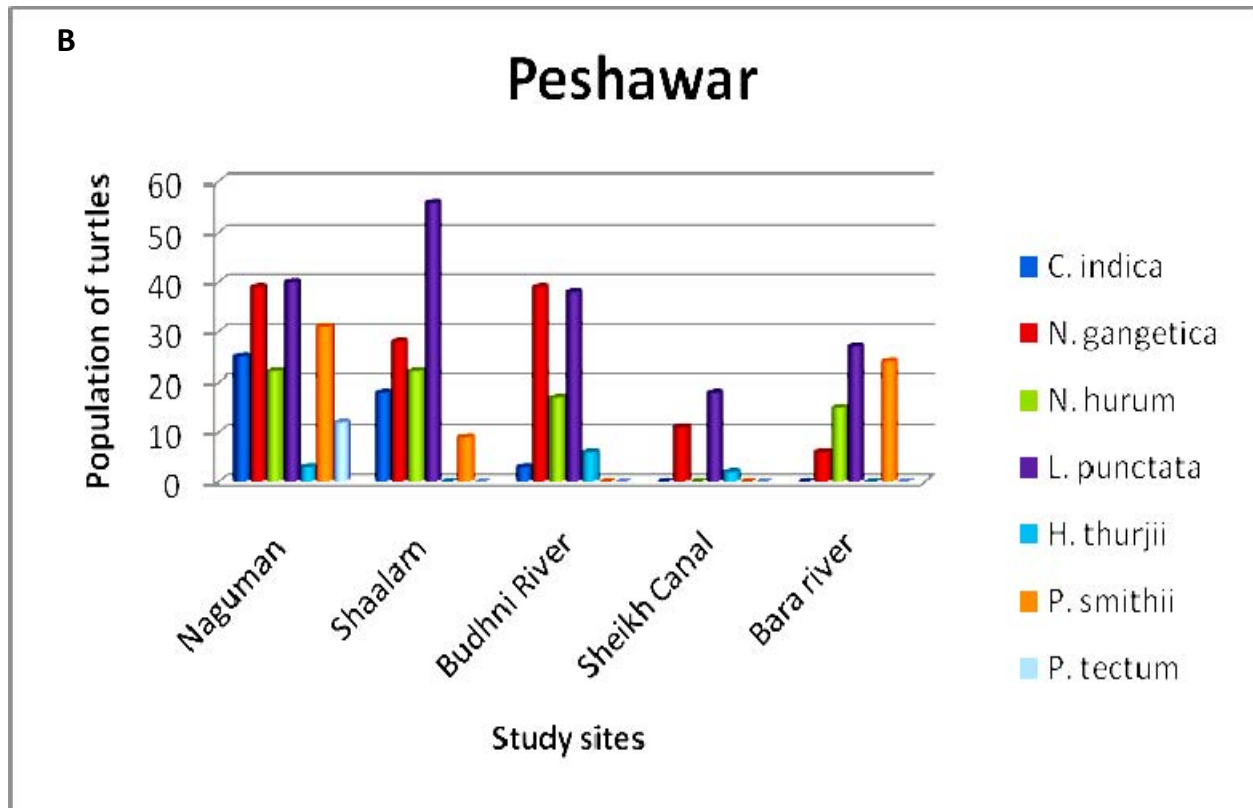


Fig. 19. Population status and distribution of Freshwater turtles in Peshawar Valley.





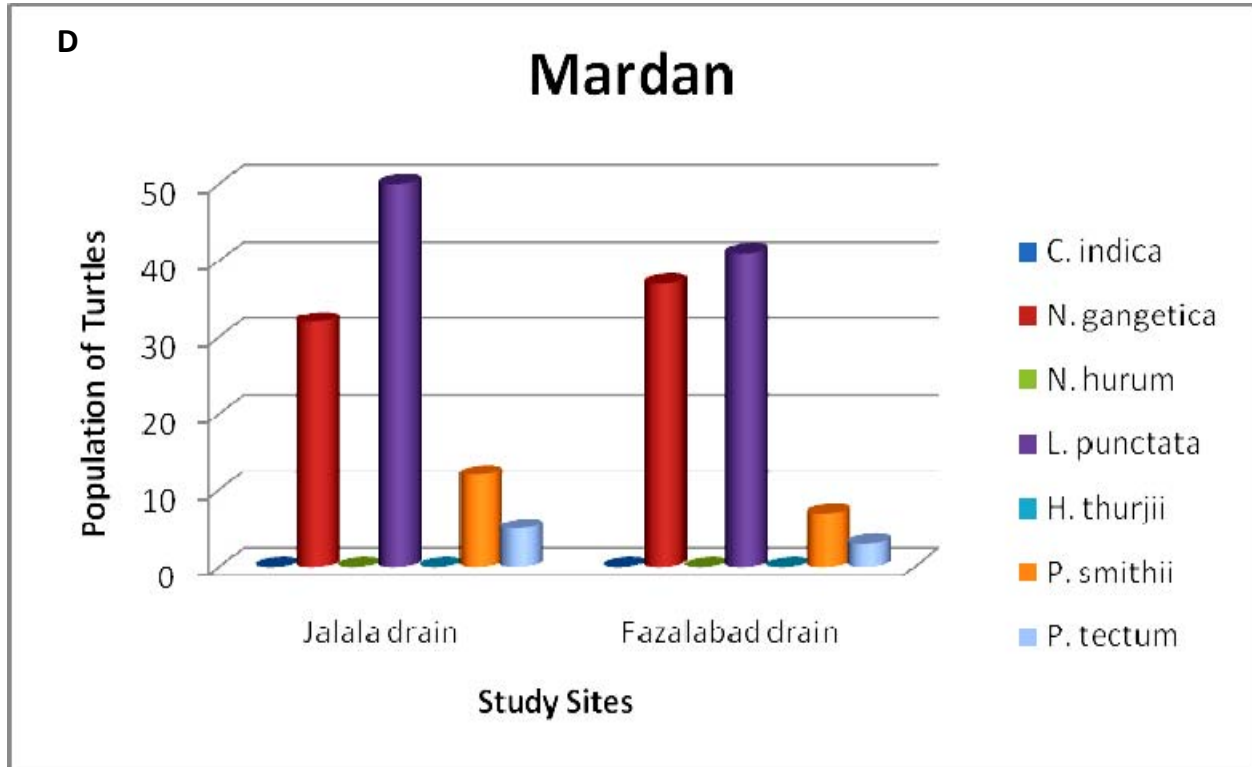


Fig. 20. A - D, Distribution and population status of Freshwater turtles in four districts of Peshawar Valley.

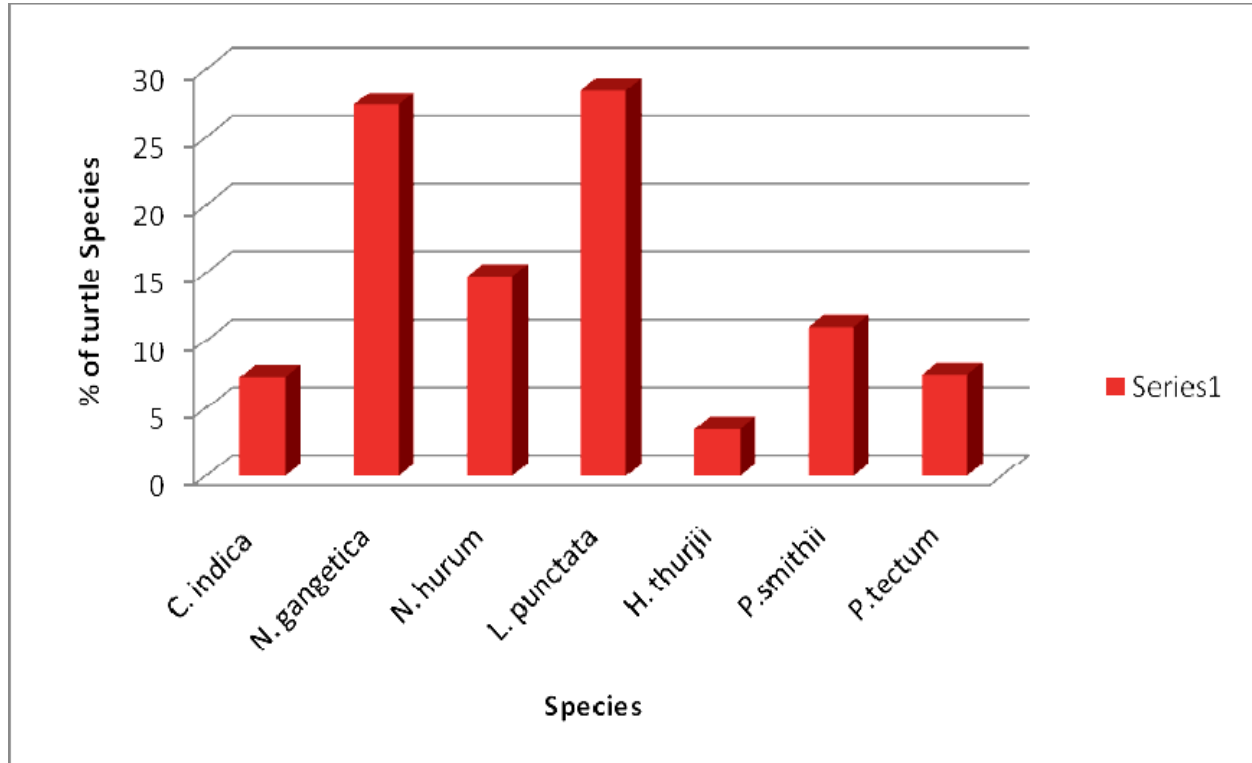


Fig. 21. Population status of Freshwater turtle species in Peshawar Valley.



Fig. 22. Some of the Equipments used for turtle poaching.



Fig. 23. Turtles captured through net.

During the study, we observed the following anthropogenic threats to turtle population (Figs. 22 and 23):

1. The foremost threat to freshwater turtles especially is uncontrolled poaching and poor implementation of the

North-West Frontier Province Wildlife (Protection, Preservation, Conservation and Management) Act, 1975.

Due to this factor, poaching and capturing of turtles in a huge number is common.

2. Illegal trade for consumption, traditional Chinese medicine and pet trade is in practice.
3. Habitat destruction such as damming and channeling of rivers, logging, slash and burn agriculture has been taking place.
4. Natural habitat loss is one of the prime threats to freshwater turtles as during the Monsoon season (July to September), rivers overflow, and carry turtles far into the valley, when the water recedes, most of them cannot find their way back. Often, wandering turtles fall in to the hands of vandals who may pelt them with stones for fun.
5. Urbanization and development of road networks along the water resources has also badly affected the overall distribution of turtles.
6. Many turtles have been captured by fishermen during regular fishing practices. Accidental killings of turtles are also common via capture in nets, and sometimes, they have been killed by fishermen for protection of their fishes, as turtles are considered a predator of fish.
7. Some locals, especially nomadic tribes, eat turtles and their eggs.
8. Stray dogs, cats, crows and kites were observed wandering extensively during canal closure in search of food. These animals eat the eggs of terrapins, hatchlings and turtles.
9. De siltation of canals is a major cause of killing of turtles during hibernation because hibernated turtles have been carried from their natural habitat along with the silt which leads to high mortality.
10. During the closures of canals, turtles are affected due to shortage of water as well as scarcity of food resources.
11. Nesting sites of freshwater turtles are unprotected.
12. Fishermen use various harmful and unsustainable techniques, such as dynamites, electro fishing and pesticides for fishing.
13. There is lack of awareness about the role of turtles in ecosystem maintenance.

Priority Actions

1. Habitat destruction, harmful and unsustainable fishing techniques may be avoided.
2. The legislation banning the trade in turtles needs to be implemented.

3. Department of Wildlife KPK and Department of Fisheries should control poaching of turtles and their mortality in fishing nets.
4. Turtle farming practices should be initiated to reduce the hunting pressure.
5. Awareness should be created among the local masses about the conservation and importance of biodiversity including turtles.

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