Chapter 15

The Diversity, Ecology and Conservation Management of Freshwater turtles in Ganges River System

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Introduction

Freshwater turtles in India inhabit different water bodies ranging from shallow ponds to deep lakes and rivers. The Ganga River is a major river in India, which is a home for different species of aquatic animals including freshwater turtles. In addition major tributaries of the Ganga River including Chambal, Yamuna, Ken, Son, Ghagra, Girwa and Ramganga also hold different species of turtles. Few studies conducted on Indian freshwater turtles have mainly dealt with taxonomy and their broad distribution ranges (Smith 1933; Pritchard 1979; Daniel 1983; Das 1985; Tikader and Sharma 1985). Data on demographic and life histories of Indian turtles are limited (Rao 1982; Moll 1984). Rao (1990 and 1995) and Pandit (1997) contributed significant knowledge on the ecological relationships among few turtles in the Chambal River and in the Ganga River. The lack of scientific information on life history, bio-ecology and populations of turtles has been considered as one of the pressing problems to devise management strategies for turtles in the field. In India large numbers of turtles were slaughtered in different states for consumptive utilization. Due to lack of restrictions on the capture of turtles and little or no enforcement of existing legislation, populations of turtles in different water bodies are decreasing (Moll, 1984). The steady decline in populations of different species of freshwater turtles in different river systems in India has prompted research and conservation programmes on freshwater turtles in different parts of India (Moll, 1984; Rao, 1990; Choudhury and Bhupathy, 1993). The National as well as International scientific and conservation community has therefore declared a number of turtles as endangered in the Schedules of Indian Wildlife (Protection) Act, 1972 and in the Red Data List (IUCN 2010; Rao, 1989).

Looking into the success of the crocodile conservation project in India, where populations of all three species of crocodiles are highly protected, turtles living in similar aquatic habitats could also be conserved effectively. This paper deals with species diversity and major conservation issues for turtles in Ganges River system India.

Surveys were conducted in the Ganga River and Chambal River, a major tributary in the Ganges River system to collect information on turtle species diversity, habitat characteristics, species utilization, conservation status *etc.* Identification of the specimens was done by following the keys given by Smith (1933), Pritchard (1979), Daniel (1983) and Das (1985).

Ganga River

The Ganga River rises at 7010 meters in Gangotri, Utttarkashi District, Uttarakhand, India on the southern slopes of the Himalayan Range. It flows through four different States – Uttarakhand, Uttar Pradesh, Bihar and West Bengal covering a distance of 2525 km where large number of tributaries joins the Ganga River before the river joins the Bay of Bengal. The Ganges river system in India is considered as most productive and important river system. The information presented in the paper was collected from the upper stretch of the river in the Uttarakhand and in the Uttar Pradesh after the river starts flowing in the plains at Rishikesh to Kanpur. The total length of the river in this stretch is 645 km. The entire river stretch under study is shallow with only intermittent small stretches of deep water pools and reservoirs upstream barrages. There are four barrages constructed on the river. They are at Rishikesh, Haridwar, Bijnor and Narora. Large amount of water is being diverted from the river for varied purposes, mainly for irrigation. The river is considered as a holy river, so during different festivals large numbers of people take bath and perform rituals in the river. The Ganga river, including the study area, has been under constant threat of pollution due to various human activities like sewage and industrial wastes disposal, dead bodies disposal, deforestation, excessive use of fertilizers and pesticides, bathing, pilgrimage and water development programmes.

Chambal River

The Chambal River, one of the best remaining habitats for the gharial in its range, originates in the Vindhyan range near Mhow in Madhya Pradesh. It flows in a northeastern direction, passing through Rajasthan up to Pali and thereafter it flows in eastern direction, forming the boundary of M.P. and Rajasthan and M.P. and Uttar Pradesh. It joins the Yamuna River near Barecha of Etawah District of U.P. The Yamuna, in turn, flows in a southeast direction, till it meets the Ganga River at Allahabad. Kali Sindh, Parbati, Banas and Kuno are the important tributaries of the Chambal River. A series of multipurpose dams at Gandhi Sagar (M.P.), Rana Pratap Sagar (Rajasthan), Jawahar Sagar (Rajastahn) and Kota barrage (Raj.) have been erected in the upper reaches of the Chambal River.

National Chambal Sanctuary

During 1978 the Chambal River was declared as a Crocodile Sanctuary under Crocodile Project with an aim to provide fully protected habitat for conservation and propagation of gharial crocodilian and other wild animals. The National Chambal Sanctuary extends over the Chambal River from Jawahar Sagar Dam to Kota barrage and after a gap of 18 km free zone, from Keshoraipatan (Raj.) through Pali to Pachanada (U.P.) where Kunwari, Pahuj and Sindh rivers form a confluence with the Yamuna River. The total length of the river inside the sanctuary is about 600 km. The width of the river that is included inside the sanctuary is 1000 m from either bank in Rajasthan and Madhya Pradesh. Uttar Pradesh has a greater width totaling to an area of 635km^2. Geographically, the sanctuary lies between the latitude 25^0 35' N and 26^{0}52' N and longitude 76^0 28' E and 79^0 01' E.

Species Diversity

India is bestowed with a great variety of Chelonian fauna. There are 24 species of freshwater turtles, 4 species of tortoises and 5 species of marine turtles. The distribution of freshwater turtles in India was not known clearly until a country wide survey was conducted during late 1980's (Moll, 1984). With the increase in the interest on Chelonian studies, now large number of locality records of different species is available. The occurrence of different species of freshwater turtles in various Biogeographic zones identified by Rodgers and Panwar (1988) and in different states is shown in **Tables-1 and 2**. Each State in the country holds at least one species of turtle with maximum number of 17 turtle species in the State of West Bengal (77.3%).

The freshwater turtle diversity in different rivers of the Ganges river system is almost similar with minor changes. There are more than 12 species of freshwater turtles in habit in these rivers. In the Upper Ganga River, a total of 12 species of freshwater turtle species have been identified. The list of turtle species is given in **Table-3**. The *Pangshura* sp. are dominated with 3 species (*Pangshura smithii, P. tecta, P. tentoria,* followed by two species each of *Nilssonia (N. gangetica and N. hurum)* and *Batagur* (*B. dhongoka* and *B. kachuga*) one species each of *Chitra indica, Lissemys punctata, Hardella thurjii, Geoclemys hamiltoni* and *Melanochelys trijuga*.

Table-1: Data showing occurrence of turtle species in different Biogeographic Zones

S.No.	Biogeographic Zone	No. of Species	Percentage
1.	Trans Himalayas	0	0
2.	The Himalayas	17	77.2
3.	The Indian Deserts	2	9.1
4.	Semi Arid Zone	10	45.5
5.	Western Ghats	5	22.7
6.	Deccan Peninsula	10	45.5
7.	The Gangetic Plains	14	63.6
8.	The North Eastern Zone	15	68.2
9.	Andaman and Nicobar Islands	2	9.1
10.	The coastal region	10	45.5

Table-2: Data showing occurrence of different turtle species in various States and Biogeographic Zones in India.

S.No.	Species	No. of States	Percentage	No. of Biogeographic Zones
1.	*Cuora mouhotii*	7	28	1
2.	*Cyclemys gemeli*	3	12	2
3.	*Cuora amboinensis*	3	12	3
4.	*Vijayachelys silvatica*	3	12	1
5.	*Melanochelys tricarinata*	6	24	3
6.	*Melanochelys trijuga*	11	44	6
7.	*Geoclemys hamiltonii*	9	36	6
8.	*Morenia petersi*	4	16	3
9.	*Hardella thurjii*	10	40	6
10.	*Pangshura smithii*	8	32	4
11.	*Pangshura tecta*	14	56	6
12.	*Pangshura tentoria*	12	48	7
13.	*Pangshura sylhetensis*	4	16	2
14.	*Batagur dhongoka*	5	20	3
15.	*Batagur kachuga*	9	36	3
16.	*Batagur baska*	2	8	1
17.	*Lissemys punctata*	20	80	9
18.	*Pelochelys cantorii*	3	12	1
19.	*Chitra indica*	11	44	5
20.	*Nilssonia gangetica*	11	44	5
21.	*Nilssonia leithii*	7	28	3
22.	*Nilssonia hurum*	10	40	6
23.	*Nilssonia nigricans*	2	8	1
24.	*Amyda cartilaginea*	2	8	1

Table-3: List of freshwater turtle species in the Ganges river system and their conservation status.

S.No.	Species	Rivers	Conservation Status		
			WLPA	CITES	IUCN
1	*Melanochelys trijuga*	G	NL	NL	LR
2	*Geoclemys hamiltonii*	G	SI	AI	VU
3	*Hardella thurjii*	G,C	NL	NL	VU
4	*Pangshura smithii*	G	NL	AII	NT
5	*Pangshura tecta*	G	SI	AI	LR
6	*Pangshura tentoria*	G,C	NL	AI	LR
7	*Batagur dhongoka*	G,C	NL	AII	EN
8	*Batagur kachuga*	G,C	SI	AII	CE
9	*Lissemys punctata*	G,C	SI	AII	LR
10	*Nilssonia gangetica*	G,C	SI	AI	VU
11	*Nilssonia hurum*	G	SI	AI	V
12	*Chitra indica*	G,C	SII	AII	E

G: Ganga River, C: Chambal River
WLPA: Indian Wildlife Protection Act, 1972; CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora; IUCN: International Union for Conservation of Nature and Natural Resources (World conservation Union)
NL: Not Listed, S: Schedule, A: Appendix, VU: Vulnerable, LR: Low Risk, NT: Near Threatened
EN: Endangered, CE: Critically Endangered

Threats

In India turtle populations have declined drastically during the last few decades as a result of direct and indirect human interventions. Illegal and over exploitation have caused an alarming state for turtles. To meet the demand, freshwater turtles from different rivers of the northern states of India are illegally caught and exported to various markets in the north-eastern states. Soft-shell turtles particularly, *Nilssonia gangetica, N. hurum, Chitra indica, Lissemys punctata* are most commonly sold due to their tender flesh and more meat yield per animal. *Batagur kachuga, G. hamiltoni,* and other large hard-shell turtles are also sold in the markets.

Loss of turtle eggs due to predation by man, domestic and wild animals, and other abiotic factors are the main factors for population decline of turtles. The water development projects in India are serious threats to the freshwater turtle population. The dams and barrages on the rivers mainly affect the natural riverine habitats of the turtles. Natural discharge of rivers is altered by the construction of dams. Additional important factors are conversion of river banks into agricultural fields and collection of sand from nesting sites (Rao 1990, 1995).

Species depletion

In the Ganga River depletion of populations of turtle species was mainly due to habitat loss and over-exploitation.

a. Habitat loss:

The riverine habitat of freshwater turtles in the Ganga River is under constant threat due to many human activities like construction of barrages, agriculture practices on the river banks, discharge of pollutants *etc.* The notable among them are water development projects which alter the natural flow of the river. Barrages constructed on the Ganga river made the flowing water habitat stagnant upstream of the barrages. In the downstream less water flows. Intensive agriculture practices on the river banks have resulted in the decline of suitable nesting sites for turtles. Due to the rapid urbanization and industrialization on the river banks large amount of domestic, industrial and agriculture pollutants are reaching the river. The pollution in the river is a major threat to the aquatic animals including turtles as the food chain is affected.

b. Exploitation

Freshwater turtles in the Ganga river are used for food and medicinal purpose. Locals in the bank-side villages, fishermen and other turtle poachers frequently catch large number of turtles. The large turtles particularly, the soft-shell turtles, *Geoclemys, B. kachuga* and *B. dhongoka* are highly used by the locals for food. During fishing operations small turtle species, mostly *Pangshura* spp. die in fishing nets. The fishermen intensively fish in the river, using various types of nets. Small turtles get entangled in the nets and die due to drowning.

Conservation

Out of the 12 species of turtles identified from the study area 6 species are considered as endangered and categorized in Schedule I of the Indian Wildlife (Protection) Act, 1972. Although the turtles were protected through legislation, the laws are not effective in the field. Exploitation of turtles is still continued. Due to human population increase need for exploitation of natural resources is also very much increasing. The continued exploitation of turtles and degradation of habitat is alarming.

a. Religious protection

The turtle occupies an honored place in many mythologies. The turtles and tortoises are considered as religious symbols. According to Hindu mythology, the Universe is supported by four elephants standing on a turtle's back. People show special reverence to the turtle as they consider the turtle as a one of the ten main incarnations of 'Vishnu', the supreme God. River Yamuna, mythologically called as 'Mother Yamuna' used the turtle as her 'vahan' (vehicle) (Rao, 1987). All these superstitions gave good protection to the turtles. In addition, the river stretches at major pilgrimage centers are protected by local people where they perform rituals. These river stretches are good habitats for large number of turtles. Such river stretches can be referred as 'Religious Sanctuaries ' for the protection of turtles.

b. Legislation

In India, laws are legislated under Wildlife (Protection) Act, 1972 to save the endangered species from illegal poaching and give protection to their habitat. To control any illegal International trade many of the endangered species are included in Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Indian chelonians are also given protection through National as well as International

legislation (Rao, 1987; Choudhury and Bhupathy, 1993). The total number of species included in Indian Wildlife (Protection) Act (IWPA) and CITES are given in **Table-3**.

c. Incidental protection

Freshwater turtles in India receive incidental protection in different sanctuaries specially created for crocodile conservation started since 1975. Populations of crocodiles have been protected in 34 protected areas in which 13 areas have been specially created as crocodile sanctuaries. Stopping of fishing activity, maintaining full protection from poaching, extending protection to habitat and rehabilitation of captive reared crocodiles are the management strategies adopted in different crocodile sanctuaries (Rao, 1992). Protection staff posted in the sanctuaries and in other protected areas keeps regular vigil to stop illegal capturing of crocodiles and also other animals like turtles. In this way turtles receive incidental protection in different crocodile areas.

The aquatic fauna in the Chambal River is protected as the river is under the management of National Chambal Sanctuary. Aquatic life in some stretches in the Ganga River is protected as these stretches receive protection from the religious people on the river ghats. The National Chambal Sanctuary, specially declared as Gharial sanctuary in the year 1978, has contributed much for the Biodiversity conservation. Regular monitoring revealed that populations of different turtles species in the Chambal River are in good number in comparing with the populations in the Ganga River. If the National Chambal Sanctuary is taken as an example of protecting aquatic animals in the Chambal River, then at least one or two sanctuaries should be created in the upper stretch of the Ganga River for turtle conservation.

Conclusion

In recent years there has been growing awareness of the need for positive conservation action for chelonians. Unfortunately, there are still major gaps in our knowledge of the ecology, distribution and status of many of the rarer and endangered species. This makes conservation planning more difficult. Some Indian turtle species are endangered for clearly defined reasons, while others are feared to be in trouble because of their restricted ranges or habitat specialization. Efforts have to be made to formulate suitable action plan for conservation of turtles in India. The goal to get the right kind of support for turtle conservation is being achieved by creating awareness of the importance of turtle fishery among the public. If the people realize that turtle resources are managed primarily for a common benefit then only would they co-operate in conservation and rationally utilize the turtle resources.

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