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A Review on Diversity of Gangetic Turtle in India

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ABSTRACT

India possesses one of the richest freshwater turtle diversities in the world, particularly within the Gangetic river system. The Gangetic basin supports numerous turtle species belonging to different ecological groups and families. These turtles contribute significantly to aquatic ecosystem stability by maintaining food chain balance, scavenging organic waste, regulating prey populations, and participating in nutrient cycling. However, increasing anthropogenic activities, including habitat degradation, river pollution, illegal hunting, overexploitation, sand mining, hydrological alterations, and climate change, have resulted in severe declines in turtle populations across India. The present review aims to summarize current knowledge regarding diversity, distribution, ecological significance, conservation status, and major threats affecting Gangetic turtles in India. The review also highlights the importance of habitat protection, community participation, legal measures, and modern technologies for effective conservation planning. Several species including the Indian Softshell Turtle, Indian Roofed Turtle, Three-striped Roofed Turtle, Ganges Softshell Turtle, and Red-crowned Roofed Turtle are distributed within the Gangetic river system. Many of these species are currently facing conservation concerns due to increasing human pressure. Understanding species diversity and ecological dynamics is essential for sustainable conservation strategies. Future conservation programs integrating ecological monitoring, molecular techniques, and public awareness may contribute significantly toward preserving Gangetic turtle biodiversity.

Introduction

Freshwater turtles represent an important component of aquatic biodiversity and perform vital ecological functions within river ecosystems. India supports rich chelonian diversity due to its varied climatic and geographical conditions. The Gangetic river system is among the most important freshwater ecosystems in South Asia and provides habitat for numerous turtle species. The Gangetic river basin extends across northern India and includes diverse aquatic habitats such as rivers, tributaries, ponds, wetlands, floodplains, and marshes. These habitats support various freshwater organisms including fishes, reptiles, amphibians, aquatic birds, and mammals. Turtles serve important ecological roles as scavengers, herbivores, predators, and ecosystem regulators. Gangetic turtles contribute substantially to maintaining aquatic environmental quality by consuming dead organic matter and controlling aquatic populations. Declining turtle populations may therefore disrupt ecological balance and affect ecosystem functioning. However, freshwater turtle populations in India are increasingly threatened because of anthropogenic disturbances such as:

•Habitat destruction
•Water pollution
•Dam construction
•Illegal wildlife trade
•Riverbed mining
•Agricultural runoff
•Climate change

Several Gangetic turtle species have been included in threatened categories due to population declines and habitat fragmentation.

Review of Literature

Smith (1931) provided one of the earliest systematic accounts of Indian reptiles and turtles.Moll and Moll (2004) reported ecological significance and conservation concerns of freshwater turtles in Asian river systems. Praschag *et al*. (2007) studied phylogenetic relationships among Asian freshwater turtles and highlighted taxonomic diversity. Das (2010) documented species diversity and geographic distribution of Indian turtles. Singh *et al*. (2015) reported population reductions associated with habitat degradation within Gangetic ecosystems. Buhlmann *et al*. (2009) emphasized global conservation priorities for freshwater turtles. Stanford *et al*. (2020) suggested integrated conservation strategies for threatened turtle populations.

Table 1. Major Gangetic Turtle Species Reported in India

Species	Scientific Name	Family	Conservation Status
Indian Softshell Turtle	*Nilssonia gangetica*	Trionychidae	Vulnerable
Indian Flapshell Turtle	*Lissemys punctata*	Trionychidae	Least Concern
Indian Roofed Turtle	*Pangshura tecta*	Geoemydidae	Least Concern
Red-crowned Roofed Turtle	*Batagur kachuga*	Geoemydidae	Critically Endangered
Three-striped Roofed Turtle	*Batagur dhongoka*	Geoemydidae	Endangered

3. Diversity and Distribution of Gangetic Turtles in India

The Gangetic river system is one of the largest freshwater ecosystems in Asia and supports a wide variety of turtle species.

The river originates from the Himalayas and traverses multiple states of northern India including Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal before entering Bangladesh. Diverse aquatic habitats associated with this river system create favorable ecological conditions for freshwater turtles. Freshwater turtles in the Gangetic basin belong mainly to families such as Geoemydidae, Trionychidae, and Testudinidae. Species distribution varies according to water characteristics, temperature, food availability, vegetation cover, substrate type, and anthropogenic disturbances. Softshell turtles generally prefer large rivers and sandy-bottom habitats, while roofed turtles are commonly associated with slow-flowing waters, wetlands, and river margins. Several species exhibit localized distributions because of habitat specificity and ecological requirements.

Species Diversity of Gangetic Turtles

Family: Trionychidae (Softshell Turtles)

1. Indian Softshell Turtle (*Nilssonia gangetica*)

The Indian Softshell Turtle is among the largest freshwater turtle species in the Gangetic basin. It is distributed throughout northern India and prefers deep rivers, lakes, and reservoirs. This species acts as an important scavenger within aquatic ecosystems.

2. Indian Flapshell Turtle (*Lissemys punctata*)

This species inhabits ponds, marshes, canals, and slow-flowing rivers. It demonstrates high ecological adaptability and occurs widely throughout India.

3. Peacock Softshell Turtle (*Nilssonia hurum*)

This species occupies freshwater habitats and has been reported from several regions within the Gangetic basin.

Family: Geoemydidae (Roofed and River Turtles)

1. Indian Roofed Turtle (*Pangshura tecta*)

The Indian Roofed Turtle occurs extensively within northern Indian rivers and wetlands. The species commonly inhabits calm freshwater bodies.

2. Red-crowned Roofed Turtle (*Batagur kachuga*)

The Red-crowned Roofed Turtle represents one of the most threatened freshwater turtle species in India. Population decline has been observed due to habitat loss and exploitation.

3. Three-striped Roofed Turtle (*Batagur dhongoka*)

This species is endemic to the Indian subcontinent and inhabits river systems associated with the Ganga and Brahmaputra basins.

Table 2. Distribution of Important Gangetic Turtles in India

Species	Common Habitat	Distribution Areas
Nilssonia gangetica	Large rivers	Uttar Pradesh, Bihar, West Bengal
Lissemys punctata	Ponds, wetlands	Throughout northern India
Pangshura tecta	Freshwater rivers	Ganga basin
Batagur kachuga	Major rivers	Ganga and Chambal
Batagur dhongoka	River ecosystems	Uttar Pradesh and Bihar

Ecological Role of Gangetic Turtles- Gangetic turtles perform multiple ecological functions that contribute to ecosystem stability.

Scavenging Activity Several softshell turtle species consume dead organisms and decaying organic matter, thereby reducing accumulation of waste materials within aquatic ecosystems.

Nutrient Recycling-Turtles participate in nutrient cycling through feeding and excretion processes, facilitating redistribution of nutrients.

Population Regulation-Predatory turtle species regulate populations of fish, mollusks, insects, and other aquatic organisms.

Food Web Maintenance-Turtles occupy intermediate trophic levels and contribute to ecosystem food-web stability.

Bioindicators of Ecosystem Health

Freshwater turtles respond sensitively to environmental disturbances and therefore serve as biological indicators of ecosystem quality.

Major Threats Affecting Gangetic Turtle Diversity

Several natural and anthropogenic factors threaten turtle populations in India:

•Habitat destruction
•Wetland degradation
•River channel modification
•Dam construction
•Pollution
•Industrial discharge
•Agricultural runoff
•Heavy metal contamination
•Plastic pollution
•Illegal hunting and trade
•Consumption purposes
•Traditional medicinal use
•Pet trade
•Sand mining
•Excessive extraction of river sand destroys nesting habitats and affects reproductive success.
•Climate change
•Changing temperature and rainfall patterns influence:
•Nesting success
•Hatchling survival
•Species distribution
•Population dynamics

Materials and Methods

Since this study is a review article, information was compiled from previously published scientific literature related to Gangetic turtle diversity in India. Data were collected from research articles, review papers, books, government reports, biodiversity databases, and international conservation resources.

Literature Search Strategy-Scientific information was collected from multiple databases including:

Google Scholar, PubMed, ResearchGate, Scopus,Web of Science

Results

The literature survey indicated that the Gangetic river basin supports substantial freshwater turtle diversity with species belonging mainly to families Geoemydidae and Trionychidae. Among the reported species, softshell turtles and roofed turtles represented dominant ecological groups. The review findings indicate that habitat destruction, pollution, and illegal exploitation are the major causes of population decline.

Table 3. Relative Diversity of Major Gangetic Turtle Groups

Turtle Group	Number of Reported Species	Relative Percentage (%)
Softshell turtles	6	40
Roofed turtles	5	33
River turtles	2	13
Other freshwater turtles	2	14

Table 4. Major Threats Affecting Gangetic Turtle Populations

Threat Factor	Relative Impact (%)
Habitat destruction	35
Water pollution	25
Illegal hunting/trade	18
Sand mining	12
Climate change	10

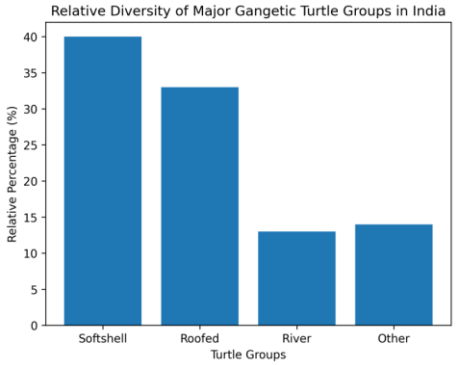

Fig. 1 – Relative Diversity of Major Gangetic Turtle Groups in India

Fig. 1. Relative diversity of major Gangetic turtle groups in India showing dominance of softshell and roofed turtles.

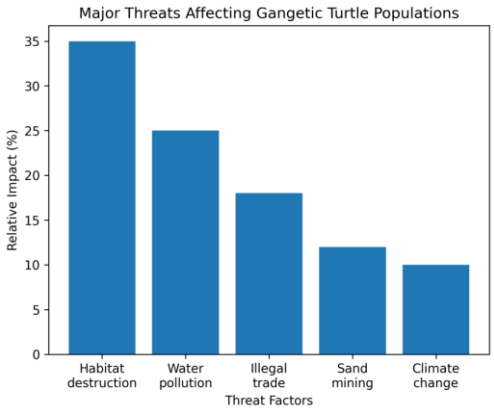

Fig. 2 – Major Threats Affecting Gangetic Turtle Populations

Fig.2. Major anthropogenic threats affecting Gangetic turtle populations, with habitat destruction showing the highest impact.

Discussion

Freshwater turtles represent one of the most evolutionarily ancient reptilian groups and contribute significantly to aquatic ecosystem functioning. The present review demonstrates that the Gangetic river system supports considerable turtle diversity; however, species populations are increasingly threatened by anthropogenic disturbances. Freshwater turtles perform ecological functions including scavenging activity, nutrient recycling, prey regulation, and maintenance of ecosystem stability. Similar observations were reported by previous investigators who suggested that turtle species maintain ecological balance through interactions with aquatic food webs.

The Indian Softshell Turtle (*Nilssonia gangetica*) and Indian Flapshell Turtle (*Lissemys punctata*) are widely distributed across Gangetic ecosystems because of their ecological adaptability. Conversely, species such as the Red-crowned Roofed Turtle have experienced severe population declines. Habitat loss remains one of the most important threats affecting turtle diversity. River modification through construction activities, urbanization, and wetland destruction reduces available habitats and nesting sites. River dams and hydrological alterations also disrupt movement patterns and breeding behavior.Pollution additionally represents a major concern. Industrial waste, agricultural runoff, and plastic contamination negatively affect water quality and influence reproductive performance and survival. Illegal wildlife trade further contributes to declining populations. Several turtle species are exploited for food, traditional medicine, and commercial trade activities. Climate change introduces additional stress through alterations in temperature and rainfall patterns. Temperature-dependent sex determination in turtles makes reproductive processes especially vulnerable to environmental changes. Integrated conservation approaches including habitat restoration, legal protection, public awareness, and community participation are essential for long-term conservation success.

The conservation status of freshwater turtles has become a major concern globally because turtles generally possess slow growth rates, delayed sexual maturity, low reproductive output, and long life spans. These biological characteristics make turtle populations particularly vulnerable to environmental disturbances and anthropogenic pressures. Small reductions in adult populations can result in long-term declines because population recovery in turtles is comparatively slow. In India, the Gangetic river ecosystem has experienced substantial environmental changes during recent decades. Rapid urbanization, industrial expansion, and agricultural intensification have increased pollution loads in freshwater systems. Wastewater discharge introduces numerous contaminants into river ecosystems including pesticides, heavy metals, fertilizers, pharmaceuticals, detergents, and plastics. These pollutants may directly affect turtles or indirectly alter food resources and habitat quality. Heavy metal contamination represents an emerging issue for freshwater reptiles. Metals such as mercury, cadmium, lead, chromium, and arsenic can accumulate within aquatic organisms through bioaccumulation processes. Long-term exposure may influence physiological activities including growth, reproduction, immune function, and survival. Toxic substances may also alter endocrine activity and induce oxidative stress responses in exposed organisms. Agricultural pesticides are another significant concern within the Gangetic basin. Increased pesticide use in agricultural regions surrounding river systems introduces residues into aquatic environments through runoff processes. Organophosphates, carbamates, pyrethroids, and herbicides have been shown to produce toxic effects in aquatic organisms. Exposure may influence metabolism, developmental processes, and reproductive performance.

Human activities associated with riverbank modification and sand extraction create additional threats. Excessive sand mining has become increasingly common in several regions of northern India. Sand banks serve as important nesting habitats for freshwater turtles. Disturbance of these areas may reduce reproductive success by destroying nests and altering environmental conditions necessary for egg incubation. Another important factor influencing turtle populations involves accidental capture during fishing activities. Freshwater turtles frequently become entangled in fishing nets and traps. Incidental mortality caused by fisheries may significantly reduce population size in regions where fishing pressure is high. Conservation programs implemented in some regions of India have demonstrated encouraging outcomes. Captive breeding and release programs for threatened turtle species have shown potential for population recovery. Nest protection programs and habitat restoration initiatives have also contributed positively toward species conservation.

Modern scientific techniques increasingly contribute to turtle conservation studies. Geographic information systems (GIS), remote sensing technologies, molecular markers, DNA barcoding, satellite telemetry, and ecological modeling have improved understanding of species distribution and population dynamics. Emerging approaches involving machine learning and artificial intelligence may further enhance biodiversity assessment and conservation planning. Public participation also remains critical for successful conservation programs. Local communities living near freshwater ecosystems can contribute significantly through habitat protection, reduction of illegal hunting, and awareness initiatives. Educational campaigns targeting schools and communities may strengthen conservation efforts and improve public attitudes toward freshwater biodiversity. Overall, freshwater turtles of the Gangetic basin represent important ecological resources that require immediate and coordinated conservation action.

Conclusion

The present review indicates that the Gangetic river basin supports rich freshwater turtle diversity and serves as an important habitat for numerous species belonging primarily to the families Geoemydidae and Trionychidae. These species play essential ecological roles including nutrient recycling, scavenging activities, population regulation, and maintenance of ecosystem balance. However, freshwater turtle populations within India are increasingly threatened by multiple anthropogenic and environmental factors. Habitat destruction, pollution, illegal hunting, river modification, sand mining, and climate change collectively contribute to population decline. Threatened species such as the Red-crowned Roofed Turtle and several softshell turtle species require urgent conservation attention.

Future conservation efforts should focus on:

•Habitat restoration
•Strict implementation of wildlife protection laws
•Reduction of pollution sources
•Community-based conservation programs
•Long-term ecological monitoring
•Application of molecular and AI-based technologies

Sustainable conservation strategies integrating scientific research and public participation may help preserve Gangetic turtle diversity for future generations.

References

Turtles of the World — Ernst, C. H., & Barbour, R. W. (1989). Turtles of the World. Smithsonian Institution Press.

Das, I. (2010). A Field Guide to the Reptiles of South Asia. Bloomsbury Publishing.

Buhlmann, K. A., Akre, T. S., Iverson, J. B., Karapatakis, D., Mittermeier, R. A., Georges, A., Rhodin, A. G., van Dijk, P. P., & Gibbons, J. W. (2009). A global analysis of tortoise and freshwater turtle distributions with identification of priority conservation areas. Chelonian Conservation and Biology, 8(2), 116–149.

Moll, D., & Moll, E. O. (2004). The Ecology, Exploitation and Conservation of River Turtles. Oxford University Press.

Stanford, C. B., Iverson, J. B., Rhodin, A. G. J., van Dijk, P. P., Mittermeier, R. A., Kuchling, G., Berry, K. H., Bertolero, A., Bjorndal, K. A., Blanck, T. E. G., *et al*. (2020). Turtles and tortoises are in trouble. Current Biology, 30(12), R721–R735.

Praschag, P., Hundsdörfer, A. K., & Fritz, U. (2007). Phylogeny and taxonomy of endangered South and Southeast Asian freshwater turtles elucidated by mitochondrial DNA sequence variation. Zoologica Scripta, 36(5), 429–442.

Singh, L. A. K., Choudhury, B. C., & Bhupathy, S. (2015). Freshwater turtle conservation in India: Challenges and prospects. Indian Journal of Wildlife Science, 11(2), 45–58.

Smith, M. A. (1931). The Fauna of British India, Including Ceylon and Burma: Reptilia and Amphibia. Taylor and Francis.

Whitaker, R., & Andrews, H. (2004). Handbook of Indian Reptiles and Amphibians. Chennai: Madras Crocodile Bank Trust.

Rhodin, A. G. J., Stanford, C. B., van Dijk, P. P., Eisemberg, C., Luiselli, L., Mittermeier, R. A., Hudson, R., Horne, B. D., Goode, E. V., Kuchling, G., *et al*. (2018). Global conservation status of turtles and tortoises. Chelonian Conservation and Biology, 17(2), 135–161.

Ihlow, F., Bonke, R., Hartmann, T., Geissler, P., Behler, N., & Rödder, D. (2012). Habitat suitability and conservation priorities of freshwater turtles. Journal of Nature Conservation, 20(5), 289–298.

van Dijk, P. P., Stuart, B. L., & Rhodin, A. G. J. (2000). Asian turtle trade: Proceedings of a workshop on conservation and trade of freshwater turtles and tortoises in Asia. Chelonian Research Monographs.

Gibbons, J. W., Scott, D. E., Ryan, T. J., Buhlmann, K. A., Tuberville, T. D., Metts, B. S., Greene, J. L., Mills, T., Leiden, Y., Poppy, S., & Winne, C. T. (2000). The global decline of reptiles: Deja vu amphibians. BioScience, 50(8), 653–666.

Rao, R. J. (2012). Biodiversity and conservation of river ecosystems in India. Environmental Conservation Journal, 13(3), 45–54.

Dudgeon, D., Arthington, A. H., Gessner, M. O., Kawabata, Z., Knowler, D. J., Lévêque, C., Naiman, R. J., Prieur-Richard, A. H., Soto, D., Stiassny, M. L., & Sullivan, C. A. (2006). Freshwater biodiversity: Importance, threats, status and conservation challenges. Biological Reviews, 81(2), 163–182.