

# Perceptions of Local Communities on Gharial Conservation in the National Chambal Sanctuary, India

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## ABSTRACT

The Indian Government has sanctioned a conservation initiative for the critically endangered gharial crocodile species, which includes the establishment of designated sanctuaries to safeguard key gharial habitats. The National Chambal Sanctuary (NCS) has been established along the Chambal River, a significant tributary of the Ganges River system in northern India. Three State Government (Madhya Pradesh, Rajasthan and Uttar Pradesh) Forest Departments jointly manage the NCS. Rehabilitation efforts targeting the critically endangered gharial have been ongoing since 1983. The Chambal River serves as a vital resource for local communities, supporting activities such as drinking water provision, washing, sand and stone mining, irrigation, transportation, Agriculture and livestock husbandry. This research aims to understand the human-gharial interactions within the NCS. Observations indicate that gharials exhibit harmonious behaviour and habitat utilisation alongside minimal human conflict in the Sanctuary. Current research on the long-term survival of gharials underscores the successful cohabitation of humans and gharials within the sanctuary.

**Keywords:** Gharial, Chambal, Riverfront Communities

## Introduction

A significant portion of the global biodiversity is found in regions where dense human populations have grown in last several years [1]. Protected areas are crucial for safeguarding species in their natural habitats and are integral to global environmental preservation efforts. Anthropogenic activities are fostering a deeper connection between humans and the natural world, both within and outside protected areas [2]. Amphibians and reptiles, among all vertebrates, are particularly vulnerable to human-induced alterations [3,4].

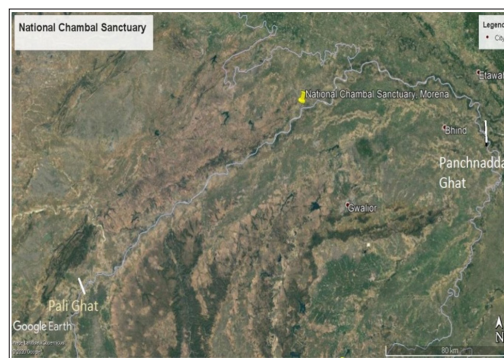
Public opinions play a vital role in assessing the effectiveness of conservation initiatives, aiding in the development of sustainable biodiversity protection plans that also consider the welfare of local communities. Analysing nuanced differences in conservation efforts can help identify successful strategies and areas needing improvement [5].

Today, wildlife conservation requires not only scientific knowledge about species and habitats but also an understanding of local community perspective towards management strategies [6]. Among the most endangered freshwater reptiles in the world, the gharial (*Gavialis gangeticus*) is a unique, long-snouted, fish-eating crocodilian endemic to the Indian subcontinent. Once widespread across the major rivers of northern India, Nepal, Bhutan, and Bangladesh, its population has now declined to a few fragmented stretches due to habitat loss, river pollution, sand mining, entanglement in fishing nets, and disruption of nesting sites [6-8]. The species is currently listed as Critically Endangered on the IUCN Red List [9]. In India, the National Chambal Sanctuary (NCS) represents one of its most important strongholds, with smaller populations of Gharial are surviving in rivers such as the Parvati, Son, Gandak (Katarniaghat), and Girwa (Bihar) [8,10,11]. The gharial's highly specialized ecology—strictly piscivorous diet, dependence on clean water, and preference for undisturbed sandy banks—makes it a sensitive indicator of riverine ecosystem health [12]. As a

keystone species, its presence reflects the ecological integrity of the river. While captive breeding and reintroduction programs have aided recovery in certain stretches, long-term conservation success depends on habitat protection, effective enforcement, and the active participation of local communities [6, 8, 13]. This paper is grounded in the recognition of gharial conservation efforts within the National Chambal Sanctuary in India.

**Study Area**

The Chambal River, a major tributary of the Yamuna River and ultimately the Ganga River system, originates in the Vindhyan Range of Madhya Pradesh at an elevation of 854 meters above mean sea level (22°27'N, 75°37'E) [6]. Flowing northeast for approximately 965 kilometers, it merges with the Yamuna River in Uttar Pradesh (Figure 1). The National Chambal Sanctuary (NCS), established in 1979, spans approximately 600 km stretch of the river from the Jawahar Sagar Dam in Rajasthan to the confluence at Panchhnada in Uttar Pradesh. It is jointly managed by the forest departments of Madhya Pradesh, Rajasthan, and Uttar Pradesh and is recognized as India’s longest riverine protected area [10,14]. The state governments of Madhya Pradesh, Rajasthan, and Uttar Pradesh jointly manage this sanctuary. The NCS was created primarily to conserve the endangered gharial (*Gavialis gangeticus*), along with the mugger (*Crocodylus palustris*), smooth-coated otter (*Lutrogale perspicillata*), the Gangetic dolphin (*Platanista gangetica*), birds, freshwater turtles, fishes etc. [6,7].



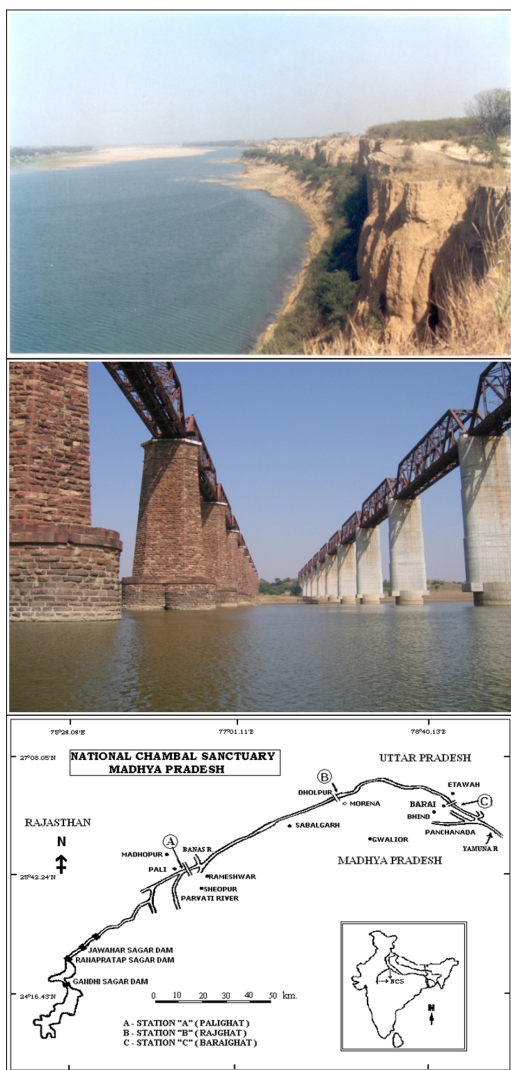
**Figure 1:** The Chambal River declared as National Chambal Sanctuary, India

**Data Collection**

The NCS, overseen by three states, encompasses a significant area, including 226 village settlements within a 2-kilometer radius of the sanctuary zone in Madhya Pradesh. In this study, conducted from January to December 2020, a total of 2,240 respondents (58% male and 42% female) from 125 riverbank villages across three districts Sheopur, Morena, and Bhind of Madhya Pradesh were selected to explore community perceptions and attitudes towards gharial conservation. Through group discussions and in-depth interviews, data were collected on various aspects, including local communities’ perceptions of the benefits and challenges associated with the NCS, the coexistence of wildlife and residential areas, and community involvement in sanctuary management. Semi-structured surveys were conducted with family heads to gather information. Insights into management initiatives and priorities were provided by sanctuary administration and field employees, with careful consideration given to factors such as knowledge, community participation, and integration into sanctuary protection when selecting the field crew.

**Results**

The Chambal River is an ideal habitat for aquatic species like crocodiles, turtles, dolphins, Otter and birds. Large stretches of sand and muddy banks, ideal for basking and nesting of crocodiles, turtles and some birds, deep water pools for dolphins and rocky stretches for otters, perennial water for fishes, migratory birds and aquatic vegetation are the major habitats in the Chambal River. The Chambal River is an ideal habitat for the Gharial and mugger due to availability of suitable habitats including sand banks for nesting and basking and different species of fish for food (Figure. 2).





**Figure 2:** Gharial and mugger basking in the Chambal River on mid-islands

The recovery of the gharial population has undeniably progressed following assurance efforts. The Government has given total protection to the wildlife and their habitats in the Chambal River from any illegal activities. By following the National Wildlife Protection Act, 1972 strict punishments are imposed on any illegal activities including commercial fishing in the Chambal River. Captive raising programmes for gharials were initiated in 1983 A 'grow and release programme for Gharial' has been adopted by collecting the wild-laid eggs, hatching them in artificial hatcheries, rearing them for three to four years and subsequently releasing them in the Sanctuary (Figure 3 and 4). Long-term research studies have been taken up in the National Chambal Sanctuary since 1983 to monitor gharial and other wildlife population build-up.



**Figure 3:** Gharial egg collection and hatching of eggs



**Figure 4:** Captive rearing of gharial at Deori Gharial Rearing Station, Morena, MP, India

The rehabilitation initiative has seen significant success in the Chambal River, attributed to various factors including favourable environmental conditions, abundant prey availability, minimal disturbances from distant and restricted areas, and administrative interventions such as fishing bans and sanctuary

staff reconnaissance. Most releases of captive reared gharial were occurred upstream to maintain a safe distance from potential gharial movement beyond the sanctuary boundaries. The extensive length of river access for released gharials and diligent care of the animals and their habitats appear to be the primary factors contributing to the higher success rate of the restoration programme in the Chambal River. Although the gharial conservation management by the Government helped the population recovery of the gharial, there is a constant disturbance to the habitat in the Chambal River due to human activities from the river side villages along the Chambal River Sanctuary.

### Human activities in the NCS

The Chambal River serves as the primary water source for the ecosystem and human consumption in the region marked for widespread poverty and illiteracy. The residents from the river side villages meet out the requirement of water, land for cultivation, sand and fish from the Chambal River. Continued human activity along the riverbank prevents gharials from utilising these areas. Sand and stone mining activities significantly degrade habitat quality along the Chambal River's banks, disrupting gharial basking and nesting sites. The Chambal River suffers from hydrological modifications due to dams, the diversion of river water for irrigation. Farmers illegally utilise motor pumps along the river to extract water. Despite fishing being prohibited within the sanctuary, fishermen from nearby areas inadvertently catch fish and accidentally turtles and gharials in their nets, leading to asphyxiation and mortality of these wild animals.

### People's Perception Towards Crocodile Conservation

The inhabitants of riverbank communities are greatly impoverished, with riverside agriculture farming, water extraction for irrigation, collection of drinking water, bathing of people and their livestock, fishing, and sand gathering as their primary livelihoods (Figure 5). However, following the designation of the Chambal River as a Crocodile Sanctuary, and the enactment of the Wildlife Protection Act, 1992, all human activities along the waterway were prohibited. Consequently, the local populace, reliant on these activities, faced legal restrictions on utilising resources from the NCS, leading to conflict with sanctuary management tasked with preserving its natural ecosystem. Due to the establishment of the sanctuary and the crocodile conservation programme locals face many advantages and disadvantages.

Despite government efforts to protect crocodiles, many locals remained unaware of the importance of crocodile conservation. However, interview results showed that 55.44% of locals expressed support for gharial restoration initiatives in the sanctuary as they feel that the reintroduction programs will fetch job opportunities to the local villagers and 23.88% of villagers, mostly women, have no knowledge on gharial reintroduction programme in the Chambal River. Concerns were raised regarding illegal fishing practices by fishermen from nearby areas, with 22.46% of the local population strongly opposing fishing within the sanctuary. They informed that fishermen from neighbouring areas engaged in illegal fishing by using set nets at night and bringing in their catch early in the morning to be sold in the nearby fish markets. 31.70% of respondents stated that they favoured the gharial reintroduction efforts within the sanctuary and reported that the muggers attacked their livestock.



**Figure 5:** Large segregations of locals along the Chambal River for religious purposes

Despite challenges, the creation of the sanctuary and crocodile conservation programme brought various benefits to the local community (Figure 6). Many locals now find employment opportunities with the Forest Department, serving as watchmen and boatmen within the sanctuary, participating in eco-tourism activities, and assisting in research projects conducted within the sanctuary. If cases of crocodile attacks are reported within the sanctuary or outside of the protected area, the government compensates locals for their losses.



**Figure 6:** Co-existence of crocodiles with human in the Chambal Sanctuary.

## Discussion

Although gharials are available in different northern tributaries of Ganga River, the Chambal River is the best river in India for the long-term survival of the Gharial. The sanctuary encompasses a mosaic of sandy banks, deep river pools, ravines, and islands — all critical habitats for breeding and basking crocodylians [8]. On both sides of the Chambal River there are large numbers of villages present and the villagers are mostly dependent on the river for extracting water for drinking and agriculture, washing the cloths, drinking and washing of domestic animals, fishing, sand extraction etc. [15,16].

Since 1978, over 5,000 gharials reared in captivity have been released into the Chambal River and other rivers in the Madhya Pradesh under coordinated recovery programmes [6, 9]. This river stretch currently holds one of the largest remaining wild populations of gharials [8]. The populations of gharials and muggers along the Chambal River have thrived due to habitat protection measures [10]. The annual Gharial population surveys indicate the increase of gharial population in the Chambal River [19,20]. The socio-ecological setting of this region, with 226 villages located within 2 km of the sanctuary boundaries in Madhya Pradesh alone, makes it an important landscape to study human–gharial interactions [10]. Although muggers pose a threat to humans and animals in the Chambal River, there have been no reported incidents of gharials harming people or livestock. Rajesh [18] conducted a study during 2016-17 in 27 villages along the Chambal River and reported few cases of injuries and mortality of human (12), Goats (34), Buffalos (37) and Dogs (6) by the mugger crocodiles, however there were no reports of gharial harming humans or domestic animals along the Chambal River.

Residents believe that they have a unique role in wildlife security and preservation. Participatory initiatives enable locals to understand the importance of wildlife species, fostering a deeper connection with animal conservation efforts. To reduce reliance on river resources, sanctuary management should create additional job opportunities for residents. Increasing awareness of the benefits of wildlife preservation programmes among villagers is crucial to mitigate conflicts between wildlife and residents.

The NCS exhibits both positive and negative perceptions among its inhabitants. This study aimed to assess residents' perceptions regarding wildlife management within the sanctuary. Human activities such as fishing, sand mining, agriculture, water extraction, bathing, and washing, pose significant threats to wildlife existence within the sanctuary [11]. Locals in the NCS acknowledge limited opportunities for progress within the area due to restrictions on resource use imposed by the government for crocodile preservation, which they view as the primary barrier to poverty alleviation [18]. While residents express concern about mugger attacks on humans and pets, they generally support gharial preservation as they perceive gharials as non-threatening [19].

Future research on sanctuary economic management should focus on developing strategies to mitigate human-induced risks and conflicts between sanctuary administration and

local communities. Ensuring active community participation in sanctuary management is essential, along with providing alternative employment opportunities for residents restricted from utilising local resources, particularly for fishing. Sanctuary management should inspire confidence in long-term conservation plans and foster a sense of community ownership in crocodile preservation efforts.

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