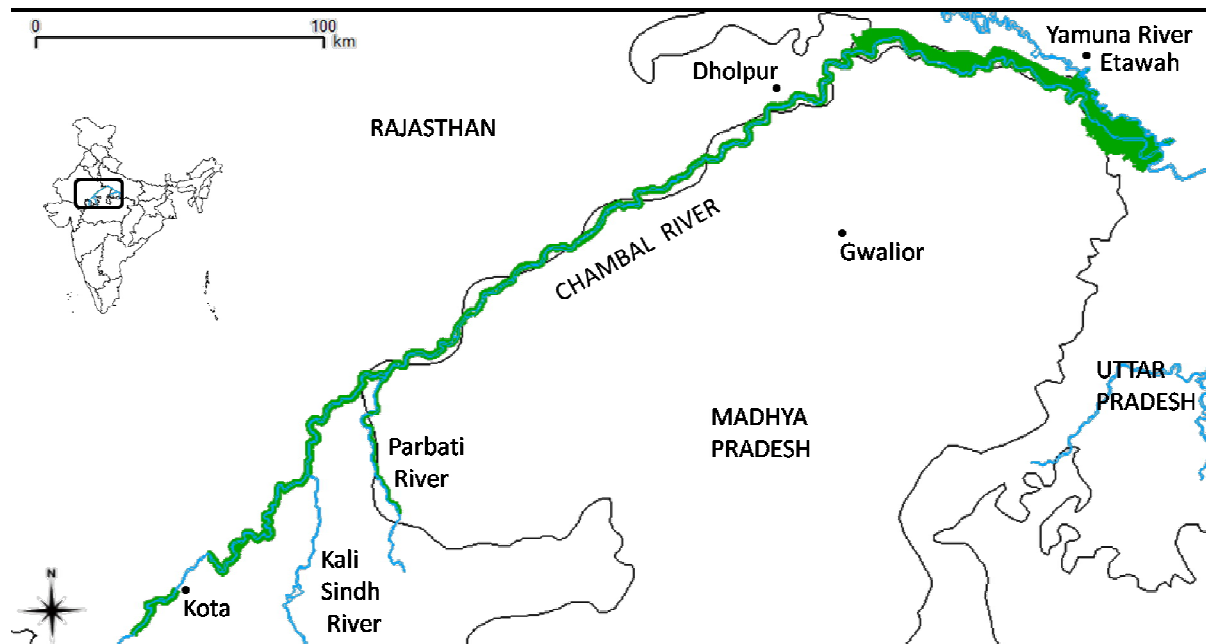


Vertebrate fauna of the Chambal River Basin, particularly in the National Chambal Sanctuary¹

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Biodiversity inventories or checklists serve as repositories of baseline information on species occurrences, biogeography and their conservation status. They are essential tools for developing our knowledge and understanding of biodiversity, and often the first step to undertake effective conservation action. This information is also fundamental to assess changes in species composition and distribution in the face of perturbations that may be anthropogenic (dams, mining, etc.) or natural (earthquakes, volcanoes, etc.).



Location of the study area (Inset) across the states of Rajasthan, Madhya Pradesh and Uttar Pradesh; and map of the National Chambal Sanctuary, covering an area of approx. 1800 km². The sanctuary area is marked in dark area along the river, as per relevant gazette notification.



Gharial resting on a sand bank with Indian Cormorants and lesser whistling ducks in the NCS

Lying between 24°55' to 26°50'N and 75°34' to 79°18'E (see Figure), the National Chambal Sanctuary (hereafter, NCS), was established between 1978 and 1983 by the states of Rajasthan, Madhya Pradesh and Uttar Pradesh to conserve the gharial and the unique Chambal ecosystem. It covers nearly 1800 km², to form the first and only tri-state protected area in India. The NCS is also an Important Bird Area (BirdLife International).

Despite being one of the last remnant rivers in the greater Gangetic Drainage Basin to have retained significant conservation values, the Chambal River faces severe extractive and intrusive pressures for resources. Yet, a comprehensive database of species occurring in this landscape does not exist. Currently, this information is scattered throughout literature (Dubey & Mehra 1959; Sale 1982; Sharma et al. 1995; Chandra & Gajbe 2005; Saksena 2007; Sharma & Choudhary 2007; Srivastava

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2007; Tigerwatch 2008, 2009; Vyas, Tomar & Singhal *in prep.*²), difficult to procure and inaccessible to the general public or administration.



Lift Irrigation Project in the NCS

This article provides an updated checklist of vertebrate fauna of the Chambal River Basin in north-central India with an emphasis on the National Chambal Sanctuary. The checklist consolidates information from field surveys and a review of literature pertaining to this region. This represents the first such extensive checklist for this region and provides an initial baseline of species for future research.

The aim of this research is to compile information from several sources including peer-reviewed publications, reports and our field observations, in order to highlight the vertebrate faunal diversity (fishes, reptiles, birds and mammals), and provide a baseline, reference checklist for the region. We also discuss threats to the regions biodiversity, particularly in the NCS.

About the Chambal Basin The Chambal Basin (22° 27' N, 73° 20' E - 27° 20' N, 79° 15' E) is a rain-fed catchment and drains a total area of 143 219 km² and is characterised by an undulating floodplain, gullies, forests, ravines, and a mosaic of land-use types. It is bounded on the south, east and west by the Vindhyan mountain range and on the north-west by the Aravallis. The 960 km long Chambal River originates in the northern slopes of the Vindhyan escarpment and joins the Yamuna River near Bareilly in Uttar Pradesh. The tributaries of the Chambal include Shipra, Choti Kalisindh, Sivanna, Retam, Ansar, Kali Sindh, Banas, Parbati, Seep, Kuwari, Kuno, Alnia, Mej, Chakan, Parwati, Chamla, Gambhir, Lakhunder, Khan, Bangeri, Kedel and Teelar. The NCS consists of a ~ 600 km long arc of the Chambal River. Over this arc, two stretches of the Chambal are protected as the National Chambal Sanctuary - the upper sector, extending from Jawahar Sagar Dam to Kota Barrage, and the lower sector, extending from Keshoraipatan in Rajasthan to the Chambal-Yamuna confluence in Uttar Pradesh.



Painted Storks in the NCS, all photos in this article from a SANDRP supporter

The NCS lies within the semi-arid zone of north-western India at the border of Madhya Pradesh, Rajasthan and Uttar Pradesh States with a mean annual precipitation of 590 mm. From the source down to its confluence with the Yamuna, the Chambal has a fall of about 732 m. The Chambal averages 400 m in width while depth ranges from 1 to 26 m. The vegetation is classified as ravine and thorn forest.

Evergreen riparian vegetation is completely absent, with only sparse ground-cover along the severely eroded river banks and adjacent ravine lands. The region was also subject to intentional aerial

² The list of references is not included here, but anyone who wants the list can contact SANDRP or the authors.

seeding of *Prosopis juliflora* in the 1980s, as a ravine reclamation measure (Prasad 1988), and as a consequence *P. juliflora* is widespread in the region.

Much of the basin has been influenced by a long history of human occupation. Anthropogenic influences are chiefly in the form of dams, sand-mining; bank-side cultivation; fishing and other domestic activities. The Chambal River also suffers severe hydrological modifications from water impoundment and extraction.



Sand mining in the NCS

Faunal diversity Through secondary and primary research we recorded 147 fish species comprising 32 families, 56 reptile species comprising 19 families, 308 bird species comprising 64 families and 60 mammal species comprising 27 families from this region, based on available literature and our field observations. This includes 6 Critically Endangered, 12 Endangered and 18 Vulnerable species, as categorised by the IUCN Red List of Threatened Species (IUCN 2011).

The NCS is among the most important and significant habitats where several globally threatened fauna still survive. Apart from being a strong candidate for World Heritage and Ramsar Convention listings, the NCS is also subject to international treaties like the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), which lists both flagship species of the NCS - the Gharial (*Gavialis gangeticus*) and Gangetic River Dolphins (*Platanista gangetica*). It contains the most viable breeding populations of the critically endangered gharial and red-crowned roofed turtle (*Batagur kachuga*). It is also among the most important strongholds of the Deccan Mahaseer (*Tor khudree*), Putitor Mahaseer (*Tor putitora*), Narrow-headed Softshell Turtle (*Chitra indica*), Three-striped Roofed Turtle (*Batagur dhongoka*), Indian Skimmer (*Rynchops albicollis*), Black-bellied Tern (*Sterna acuticauda*), Sarus Crane (*Grus antigone*), and Gangetic River Dolphin. The NCS functions as a vital source and nursery for fish fry and fingerlings, contributing significantly to downstream fisheries in the Gangetic river system (Sivakumar & Choudhury 2008). It is an Important Bird Area particularly for the Oriental White-backed Vulture (*Gyps bengalensis*), Long-billed Vulture (*Gyps indicus*), Pallas's Fish-Eagle (*Haliaeetus leucoryphus*) and Greater Spotted Eagle (*Aquila clanga*) among others (Islam & Rahmani 2004). The NCS also serves as among the best over-wintering sites for migratory birds. In addition, this river sanctuary also forms a vital corridor and link for the movement and dispersal of tigers (*Panthera tigris*) from the source population of the Ranthambore Tiger Reserve to the Protected Areas of Kuno-Palpur, Madhav National Park and Darrah-Mukundra.

Threats The Chambal faces severe extractive and intrusive pressures in the form of dams, water impoundment and abstraction, sand- and stone-mining, infrastructural development, water pollution, over-fishing, poaching and riparian chemical agriculture related activities.

7 major, 12 medium and 134 minor irrigation projects operating in the Chambal River basin, have greatly reduced river flow (Hussain & Badola 2001). Misleading environment impact assessments have permitted recently commissioned water abstraction projects to operate in the NCS by suppressing information on species' occurrences and falsely stating "As there is no significant flora and fauna in or around Chambal River, there should also not be any ecological impacts from the increase in abstraction" (RUSDIP 2008, page 44). Up- and downstream effects of dams are well-known,

The National Chambal Sanctuary is among the most important and significant habitats where several globally threatened fauna still survive. Apart from being a strong candidate for World Heritage and Ramsar Convention listings, the NCS is also subject to international treaties like the Convention on the Conservation of Migratory Species of Wild Animals. However it is at severe risk.

stemming from inundation, flow manipulation, and fragmentation. Dams obstruct the dispersal and migration of organisms, and these and other effects have been directly linked to loss of populations and entire species of freshwater fish (Nilsson et al. 2005). Low-flows in the Chambal River result in discontinuity between deep pools in the river, due to which species become more vulnerable to netting and dynamiting (Dubey & Mehra 1959; Katdare et al. 2011). Additionally, reduction in the number of inaccessible islands results in increased destruction of nests of gharials, turtles and ground-nesting birds like skimmers and black-bellied terns (Sundar 2004, Nair 2010). Altered flow regimes, and insufficient flooding disrupts siltation rates and sand deposition in the river channel. As Moll (1997) notes, upriver dams exacerbate the problem by preventing replacement sand from coming downriver while increasing erosion by periodic and unseasonable elevation of water levels.

Sand-mining destroys crucial breeding areas and is one of the most serious threats to the survival of species that lay their eggs on sand deposits. Other activities like poaching, illegal fishing, riparian agriculture and associated constant human disturbance pose a threat to the ecological balance and biodiversity of the NCS.

In the future, river flows would be further impacted by the 52 irrigation projects that are under construction and 376 projects that have been planned in the basin (Department of Water Resources, Rajasthan). Additionally, there are proposals to divert the two most important tributaries of the Chambal - the Parbati and Kalisindh rivers. In spite of water being the most critical resource in the NCS, the environmental impact assessment for these projects do not account for changes in the hydrological regime due to the diversion of water. There have also been calls to de-notify the sanctuary itself in order to facilitate sand-mining.

Misleading environment impact assessments have permitted recently commissioned water abstraction projects to operate in the NCS by suppressing information on species' occurrences and falsely stating that there is no significant flora and fauna in or around Chambal River. 52 irrigation projects are under construction and 376 have been planned.

Conclusion Our effort is intended at providing a peer-reviewed and open-access compilation of vertebrate fauna of the Chambal River basin, which highlights the regions ecological significance. We believe that this checklist will serve as a baseline for assessing changes in species status, distributions and occurrences in the face of threats; inform protected area managers, conservationists and environment impact assessors; and serve as a platform to initiate participatory biodiversity monitoring initiatives.

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