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CASE STUDY

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GHARIALS ON THE GANGA

How WWF-India is working with partners to reintroduce gharials within the Hastinapur Wildlife Sanctuary

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Map of the Ganga river basin

Introduction

The gharial (*Gavialis gangeticus*) is a crocodylian presently found in India and Nepal, though it used to be widespread between the Indus River in Pakistan and the Irrawaddy River in Myanmar. The gharial is ‘critically endangered’ according to the IUCN Red List; it is estimated that there are fewer than 200 breeding adults remaining in the wild, representing a decline of 96-98% since 1946, with a decline of 58% from 1997 to 2006.¹

Gharials are characterised by their long, thin jaws which are adapted to their fish-based diet. The species is named after the ‘ghara’, an earthenware pot whose shape resembles the protuberance that male gharials develop at the end of their snout upon sexual maturity. Gharials are one of the largest crocodylians, reaching lengths of up to 6 metres. Gharials lay their eggs during the dry season (March-May) in nests located within steep and sandy riverbanks or river islands.²

The ultimate aim of WWF-India's gharial programme is to establish a breeding population of gharials in the Ganga River. To do this, WWF is working in collaboration with the Uttar Pradesh Forest Department to secure suitable protected areas as gharial habits, to raise awareness among local communities, to release captive-reared juvenile gharials and to monitor gharial numbers, spatial distribution and behaviour.



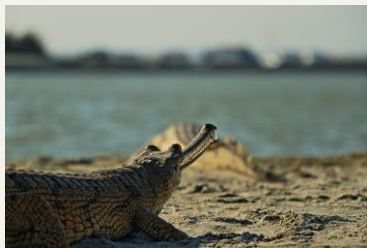
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What problem are we trying to address?

The gharial is listed under Schedule 1 of India's Wildlife (Protection) Act 1972, affording it the highest degree of protection. However, poor enforcement of wildlife protection laws remains a major challenge for gharial conservation.³

The main threats to gharials in India are: infrastructure development and resulting changes in river flows and habitat connectivity; reduction in gharials' prey base; entanglement in fishing gear; destruction of nesting and basking sites due to sand mining, riverbank agriculture and other human disturbance.^{3 4} Pollution is also a problem; for instance, a mass mortality event occurred on the Chambal River during the winter of 2007-2008, when over 100 gharials died from gout – the exact cause has not been identified, but studies point to exposure to toxic chemicals within the river or the gharials' prey.^{3 5} Finally, it is possible that climate change may impact gharials not only via changes in river flows but also via temperature changes, given that temperature-dependent sex determination occurs in crocodylians.⁶

Aspects of gharial behaviour influence the extent to which various threats impact them. For example, eggs hatch around mid-June, coinciding with the monsoon and causing many juvenile gharials to be washed downstream by floodwaters; sudden water discharges from dams and barrages can have the same impact. Gharials are unable to walk well on land which presents challenges during low flow conditions, while basking on sandbanks exposes gharials to predation and hunting.¹

Although there have been several studies of gharial behavioural and spatial ecology, for example on the Chambal River which is home to between 48% and 85% of the total gharial population,^{1 3 7 1} not much research has been done on the Ganga River. WWF-India is seeking to address this gap by undertaking population surveys, gathering biometric data and running a radio-telemetry study, as detailed in this case study. The documentation of present and potential future distribution of gharials, as well as their habitat preferences, is vital for understanding population dynamics and planning species-oriented conservation programmes.

What did we do?

Within the scope of the Rivers for Life programme, primarily funded via the HSBC Water Programme (2012-2017), WWF-India has primarily focused on: sustainable water

¹ <https://www.youtube.com/watch?v=k-AKVEheu4g>

Gharial releases at Mukhdumpur



Gharials in tubes for transport © Simon de Trey-White/WWF-UK



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WWF-India's Asghar Nawab releases a juvenile gharial © Simon de Trey-White/WWF-UK



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management; biodiversity and habitat conservation; water stewardship; and climate change adaption. Several areas of work indirectly contribute to gharial conservation (in terms of habitat availability, prey base, water quality, etc.) via things like pollution reduction and environmental flows releases. In addition, WWF-India has implemented several activities directly aimed at gharial conservation, such as scientific research and the creation of management plans for protected areas.

GHARIAL RELEASES AND AWARENESS RAISING

The Uttar Pradesh Forest Department (UPFD) has operated the Kukrail Gharial Breeding Centre in Lucknow since the late 1970s. The UPFD collects gharial eggs from the banks of the Girwa and other rivers, and these are hatched artificially within the Centre; furthermore, there is one breeding pair at the Centre. This is a delicate process requiring precise mimicking of natural nesting conditions. After being reared for two to four years, the juvenile gharials are then released back into the wild. The idea is to give the juvenile gharials a head start; indeed, a study on the Chambal River found a hatching success rate of 67.9%, but a 92.3% hatchling mortality rate within the first year.⁷ The current reintroduction programme seeks to improve upon a model that has been in place since the mid-1970s in India, as part of which around 5,000 gharials have been released back into the wild, but whose effectiveness at establishing viable populations in most sites has been questioned.^{1 2 3 7} As detailed in the case study, the current programme has made improvements by: involving local communities; releasing gharials in protected areas; and robustly and consistently monitoring reintroduced populations.

The current releases follow IUCN protocols, which for example recommend a release ratio of one male to three females, and are being performed with support and guidance from the regional co-chair of the IUCN crocodile specialist group. Prior to release, each gharial's health is assessed, its biometric data recorded and its tail scutes marked for later identification. This information helps to monitor the progress of reintroduced animals during subsequent recapture exercises.

In 2009, WWF, local communities and the UPFD initiated a gharial reintroduction partnership, involving the release of gharials in a stretch of the Ganga identified (following a viability study) as having good potential to establish a breeding population, near the village of Mukhdumpur within the Hastinapur Wildlife Sanctuary.⁸ WWF-India participates in the releases, including the biometric data recording, scute marking and month-long post-release monitoring. Since 2009, a total of

2016 gharial rescue



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In October 2016, a local riparian community member notified WWF that a gharial was trapped in an irrigation canal, which had been drained and shut for dredging.

The Uttar Pradesh Forest Department asked WWF-India to lead the rescue operation, which involved a two hour process to remove the gharial from the mud and then overnight transport in a specially-constructed padded wooden box.

The gharial was released within the Hastinapur Wildlife Sanctuary where it had originally been reintroduced to the wild back in 2009.



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At 3.2m long and 86kg, this female gharial was nearing adulthood and in good health despite her ordeal.

Rescuing this animal from certain death and releasing it within a protected area was important given WWF's aim of establishing a breeding population of ghariais in the Ganga.

606 juvenile ghariais have been released into the Ganga as part of this initiative, including 112 animals during the lifetime of the HSBC Water Programme (2012-2017).

Awareness raising forms an important element of the gharial reintroduction initiative; lack of community involvement has been identified as one of the key failures of previous government-backed programmes.³ WWF-India and the UPFD have been working with local communities in and around Mukhdumpur village to raise awareness of the gharial and of the impact of activities such as riverbed farming and fishing on the species.⁸ WWF-India is also raising awareness further afield than the reintroduction site. Mitras, friends of the river, are a group of around 4,000 people of various backgrounds who volunteer their time to improve the health of the Ganga and Ramganga rivers. Most are farmers, urban residents and schoolchildren. WWF has enabled the participation of Mitras in gharial release events in order to raise their awareness about the species but also to draw a direct connection between the activities the Mitras are doing and the rivers' biodiversity. WWF-India also works to ensure there is widespread print and social media coverage of gharial releases. Finally, WWF-India regularly runs awareness-raising events: for example, information about ghariais was included in a campaign during the 2013 Kumbh Mela, a religious pilgrimage attended by millions of people.

GHARIAL RESCUES

On occasion, WWF-India is called upon to assist in the relocation of ghariais found in precarious situations outside of protected areas (see box in the margin). In 2013, a male gharial that had been dispersed 110km downstream by flood waters was captured, transported and released back within the Hastinapur Wildlife Sanctuary, where he had first been reintroduced to the river in 2010. Biometric data comparison showed the sub-adult animal was acclimatising well to the wild.

POPULATION MONITORING

WWF-India undertakes an annual biodiversity survey which allows the team to monitor dolphin and gharial population trends. The boat-based survey provides the total population count in the surveyed stretch. In addition, WWF-India and the UPFD undertake monthly surveys and also recapture reintroduced ghariais on an annual basis to obtain biometric data and monitor the effectiveness of the reintroduction programme. This monitoring is part of an effort to improve understanding of the effectiveness of reintroduction programmes; the failure to monitor reintroduced gharial populations has been pointed to as a major drawback of

Biometric data collection



Weighing © C. Cockett/WWF-UK



© C. Cockett/WWF-UK



Comparing scute markings © C. Cockett/WWF-UK



© C. Cockett/WWF-UK

previous similar efforts in India.³ The surveys so far point to a 40% survival rate for the reintroduced gharials.⁸ Measurements have so far shown that the length and weight of the female gharials seems to be progressing better than that of the males. Since this is the first such biometric data collection programme for gharials, it is not known whether this difference in the male and female rates of maturing is natural; moreover, the sample size is too small to draw conclusions yet. Overall though, the recaptured animals appear to be in good health, indicating successful adaptation to their new environment.

In addition to the annual population survey and the recapture to obtain biometric data, WWF-India is also running a radio-telemetry study, in order to obtain data about the dispersal patterns and habitat preferences of reintroduced gharials. The study started in 2015, with 9 gharials (4 females and 5 males, all from the batch released in 2010) having been tagged so far, as part of a knowledge partnership with Professor Lang, a gharial expert from the University of North Dakota who has also undertaken gharial research on the Chambal River. Although gharials have previously been tagged and monitored, for instance in the Chambal River, such a study is unprecedented on the Ganga River's main stem. The gharials are tagged with a very high-frequency transmitter; manual signal reception (within a range of 3 to 4km) using hand-held receivers with portable Yagi antennas is required for tracking. To date, tracking has taken place in the field during the post-monsoon season of 2015 and the pre-monsoon season of 2016. Unfortunately, the tracking teams have to date not been able to locate tagged individuals.

It is hoped the data will provide information about the gharials' seasonal and general movement patterns, territoriality and dispersal. Indeed, a similar tagging study on the Chambal River revealed that sub-adult gharials move around 10 to 20 km while adult females move around 80 to 100 km, which has major implications for reintroduction programmes, given the likelihood of gharials moving beyond the protected areas where they are initially released.⁹

PROTECTED AREAS

WWF-India is developing management plans to conserve aquatic biodiversity and habitats in two stretches of the Ganga River jointly with the Uttar Pradesh Forest Department and in consultation with local stakeholders and district administrations. One stretch is within the Hastinapur Wildlife Sanctuary and the other is within the Narora Ramsar site. The management plans focus on terrestrial management but also include provisions for species recovery, with a particular focus

on aquatic species. This forms a departure from existing norms, where management has tended to focus solely on terrestrial habitats and biota. The management plans will benefit gharials through their consideration of terrestrial management and threats to habitats generally.

Within the Hastinapur Wildlife Sanctuary, the focus is on addressing threats to gharials in terms of habitat loss, disturbance from human activities (e.g. farming, sand mining) and mortality related to fishing practices. Habitat preservation and threat mitigation is considered to be an essential complement to reintroduction programmes.⁷

Where will we go from here?

The gharial reintroduction programme is too recent to have reached the objective of establishing a breeding population. Indeed, female gharials reach sexual maturity when they've reached a length of around 3 metres² (at approximately 7 to 10 years old); the female gharials released at the start of the WWF/UPFD Ganga gharial reintroduction programme are therefore nearing maturity. Males take longer to reach sexual maturity: 13 to 15 years.⁶

The HSBC Water Programme funding has been extended for a further three years (2017-2020). Within this period, several Rivers for Life programme strategies will directly address gharial conservation:

- The threat of overfishing (which impacts the gharials' prey base) will be addressed in a 255km stretch of the Ganga River, including the Hastinapur Wildlife Sanctuary.
- The programme will also seek to reduce habitat destruction (namely the sand banks that gharials depend on for basking and nesting) by controlling riverbank farming within the Hastinapur Wildlife Sanctuary.
- WWF-India and the UPFD will commission a study to determine the gharial carrying capacity of the Hastinapur Wildlife Sanctuary, and will use the findings to review the gharial conservation strategy.
- WWF-India will also commission a study to determine the response of target species (including gharial) to flow and water quality changes.

FOR MORE INFORMATION

Contact the WWF-India team

Resources

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