Volume 4, June 2025

NATURE MATTERS

A WINTER IN CHANGTHANG

Facilitating a community led vision for people and nature

LIVING SHORELINE

A natural shield for India's shrinking coastlines

Cover: Changthang, Ladakh © Padma Dolmer

Inside cover: Ladakh © Ravneesh Singh Klair

Back cover: Mishmi takin © Arunachal Pradesh Forest Department

SCAN FOR FEEDBACK

CONTENTS

FROM THE EDITOR'S DESK

Dear Readers,

Greetings! This edition of Nature Matters highlights some of the exciting new areas of work that WWF-India is undertaking.

The article "*A Winter in Changthang*" describes the visioning exercises conducted with communities in Changthang, Ladakh. The initiative is built around exploring a vision for Changthang's future, where the Changpa way of life and the region's delicate ecosystems can thrive side by side.

Deep dive into the lives of *Baigas*, residing in and around the forests of Madhya Pradesh, Chhattisgarh, and Maharashtra. WWF-India has been working with them to promote sustainable honey collection practices to enhance their livelihoods while protecting the forest and its biodiversity.

Sundarbans, the world's largest mangrove ecosystem, is a shield against rising sea levels. WWF-India and its partners are working on nature based solutions to protect the coastline. The article "*Living Shoreline*" captures the early successes of this innovative approach.

As part of its mission to rejuvenate the Ramganga River, reducing the impacts of the metalware industry located in Moradabad has been at the forefront of WWF-India's work. The article "*Brass City Shining*" highlights the metalware industry's adoption of a new rinsing mechanism called the Counter Current Mechanism (CCM) to help reduce freshwater consumption.

In 2009, the Uttar Pradesh Forest Department and WWF-India launched the gharial reintroduction programme in the Ganga River. Since then, 973 captive reared gharial juveniles have been released at suitable sites at the State Barasingha Wildlife Sanctuary, Hastinapur. Read more in the article "*Return of the gharial to India's rivers*".

Be inspired by the life of Ashish Gaur, a forest guard at the Rajaji Tiger Reserve in Uttarakhand, who represented India in the 10th IRF World Ranger Congress 2024.

Poaching and illegal wildlife trade are major threats to our wildlife. India's tortoises and freshwater turtles are also victims to this as they are targeted for the pet trade. Their carapace, calipee, and fibrocartilage are also in demand for consumption and traditional medicines. The "*Wild Cry*" section of this edition of Nature Matters highlights the threat to tortoises and freshwater turtles from illegal trade in India.

Hope you find this issue of Nature Matters an informative and interesting read.

Regards

Sejal Worah
Programme Director
WWF-India

Gharial
© WWF-India

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CONSERVATION INSIGHTS

01
GREEN TRANSPORT

Ferry with retrofittable electric propulsion unit
© Sejal Worah

WWF-India has introduced the first retrofittable electric propulsion unit in a commercial ferry to reduce water and air pollution and greenhouse gas emissions in Sundarbans, West Bengal. The pilot project has been launched in the Patherpratima block of the Sundarban Biosphere Reserve as part of the Climate Solutions Partnership between WWF-India and HSBC. So far, three ferries, one fishing boat and two patrol boats have been fitted with the retrofittable electric propulsion unit in collaboration with stakeholder including the West Bengal Forest Directorate. The 600 days of trials has led to 100% reduction in fuel and 76% reduction in operational costs. It is a significant step towards decarbonising water transport in the region, home to over 4.5 million people dependent on water transport for their daily commute. The project focuses on installing a retrofittable electric propulsion unit with an energy-efficient lithium-ion battery pack to a ferry. The e-ferry can then complete a minimum of 50 trips per day. The transition will help eliminate incidences of oil spillage and, thus, water pollution.

Wildlife sniffer dog squads under training
© WWF-India

02
PAWSOME INITIATIVE

Poaching and illegal wildlife trade threaten India's flora and fauna, and to curb this, best enforcement practices need to be deployed, including using wildlife sniffer dogs. WWF-India has been organising training of wildlife sniffer dogs since 2008 and has trained 106 wildlife sniffer dogs so far. Recently, 14 young dogs and their 28 handlers have begun seven months of training at the National Training Centre for Dogs, Basic Training Centre, Indo-Tibetan Border Police Force, Panchkula, Haryana, to become wildlife sniffer dog squads. They will be trained to detect poaching and illicit wildlife trade, including the trade of tiger and leopard parts, bear bile, and other wildlife contrabands. Upon completion, they will be deployed across 14 Protected Areas in Chhattisgarh (4), Telangana (1), Bihar (1), Maharashtra (2), Rajasthan (1), Jharkhand (1), Arunachal Pradesh (1), and Madhya Pradesh (3). This initiative aims to bolster enforcement agencies' efforts against poaching and wildlife trafficking, enhancing India's capacity to combat wildlife crime effectively.

Outreach programme near Keoladeo National Park
© WWF-India

03
WORLD WETLAND DAY CELEBRATION

Wetlands help clean the environment and balance the water retention of the land while providing "ecosystem services". Therefore, on 2nd February, the World Wetland Day, WWF-India highlighted issues related to conserving wetlands through diverse educational and awareness raising events and activities across the country. Over 3000 including students, and community members, were engaged in 23 events organised in seven states- Uttar Pradesh, Uttarakhand, Karnataka, Tamil Nadu, Goa, Punjab, and Rajasthan- at five Ramsar sites such as Asan Conservation Reserve, Ranganathittu Bird Sanctuary, Nanjarayan Bird Sanctuary, Beas Conservation Reserve and Parvati Arga Bird Sanctuary. The celebrations included guided walks, bird watching, nature trails, and educational programmes at key wetlands. Participants also conducted wetland health assessments and learned about the challenges and related issues. Interactive exhibits and community engagement drives, highlighting the importance of wetland conservation and the role of local communities in preserving these vital ecosystems, were also organised.

Turtle being released at Narora, Meerut
© WWF-India

04
TURTLE TALE

In March, 150 turtle hatchlings, including the critically endangered three-striped roofed turtle (*Batagur dhongoka*), the near-threatened brown-roofed turtle (*Pangshura smithii*), and the Indian tent turtle (*Pangshura tentoria*), were released into the Ganga River at Mukhdumpur Ghat, Meerut by Uttar Pradesh Forest Department with support from WWF-India, the Ganga *Mitras*, government officials, and forest staff. This initiative aims to help protect and restore the population of freshwater turtles in India's rivers. WWF-India engages with riparian communities and builds their capacity to support turtle conservation. Since 2022, over 5000 hatchlings have been released in 400 km stretch of Ganga and Ramganga Rivers.

Dr Arun Kumar Saxena, Minister of Environment, Forest & Climate Change, Uttar Pradesh at the pavilion
© WWF-India

05

MAHA KUMBH 2025

At the Maha Kumbh 2025, WWF-India, as part of a consortium of non-profits (*Kalash*) set up a pavilion at Arail Ghat near Sangam, Prayagraj, from 14 January to 26 February 2025. The pavilion exhibited collaterals highlighting Ganga's journey from its origins in the Himalayas in Uttarakhand to its confluence with the Bay of Bengal. It featured life size models of key freshwater species and interactive panels on sustainable water management and organic farming. WWF-India's volunteers engaged visitors, especially children, with educational games focused on water conservation. This initiative highlighted the message of preserving India's holy rivers and ecosystems and appealed for collective action for a future where rivers remain clean, flowing, and full of life.

06

BACK TO THE WILD

One of the rhinos released at Dudhwa Tiger Reserve
© Somreet Bhattacharya

In a historic conservation effort, two greater one-horned rhinos were free-ranged at the Dudhwa Tiger Reserve by the Uttar Pradesh Forest Department with support from WWF-India. The rhino translocation exercise aimed at introducing free-ranging rhinos and increasing their population in India's Terai region was conducted on 27 March 2025. A male and a female rhino aged between 15 to 20 years were selected from a population of around 40 animals in containment for over four decades inside the 27 sq. km fenced rehabilitation area at Dudhwa Tiger Reserve. They have joined two other rhinos that were free-ranged in November last year.

Free ranging rhino at Dudhwa Tiger Reserve
© Vipin Kapoor Saini

COVER

A WINTER IN CHANGTHANG

Facilitating a community led vision for people and nature

By Padma Dolker

Changthang wetland
© Padma Dolker

The biting cold winter of the Changthang plateau in Ladakh tests the limit of the best of adventurers but also mesmerises them with the stunning beauty of the landscape. The high altitude landscape is vast and arid and hosts distinct vegetation, making it a unique ecosystem. Much of the region is covered with wetlands, and pasturelands, providing a rich habitat for diverse fauna, including the snow leopard, Tibetan wolves, and blue sheep. It is also an important breeding ground for many bird species.

The Changthang plateau is home to one of the oldest mountain dwelling communities in the world—the Changpas. Unlike other parts of Ladakh, Changthang's distinct rangelands have shaped the traditional livelihoods of its local communities. The people here have long depended on the region's resources, primarily working as herders and livestock rearers, raising goats, sheep, yaks, and horses, which serve as their primary source of income.

The Changthang region has witnessed significant infrastructure development in recent years. While this has attracted tourists and boosted the local economy, it has also increased human activity. Community members are concerned about the impact of road construction projects, which often bring in labourers from outside Ladakh. Many of these workers are unfamiliar with the region's ecological sensitivity and have been reported to engage in harmful practices, such as killing marmots for consumption. Additionally, the careless disposal of waste by newcomers near areas that have been respected and preserved by the Changpas for generations further contributes to environmental degradation.

The region is also facing a significant threat from climate change. Glacial melt is reducing water availability for wildlife and livestock, while declining precipitation has led to poor pasture growth, affecting grazing resources. Furthermore, increased human activity—including off roading and vehicle movement in wildlife habitats—is disturbing native species and altering their natural behaviour.

A WINTER IN CHANGTHANG

Last winter, I, along with my colleague Rigzin Dawa and three young volunteers from the Changpa community, embarked on an exciting journey to learn and document the traditional knowledge of the Changpas for the conservation of the ecologically fragile rangelands of Changthang.

As we travelled across the frozen, windswept terrain, we weren't just fighting the cold; we were learning from the community, delving deep into their hopes, challenges, and vision. The journey was more than just consultation; it was about connecting with the landscape and its people, listening to their stories, and building a shared vision for the future.

"A vision is a powerful and inspiring image of a possible future, and for the people of Changthang, it is one where their culture, ecology, and economy thrive in balance."

While the winds howled and the landscape lay blanketed in snow, our mission remained clear—to explore the vision of the Changthang people for their rangelands. Despite rapid change and mounting internal and external pressures, the community has remained steadfast while engaging in a collaborative and creative process for a shared future. Their vision and approach focuses on addressing rangeland degradation, biodiversity loss, livelihood, and challenges on reclaiming the role of the Changpas as stewards of their ancestral landscapes.

The days in Changthang were a mix of excitement and challenge. We travelled across frozen terrain, our feet often numb from the biting cold, wrapped in three or four layers of clothing. Moving around felt cumbersome, and even our phones, crucial for capturing moments and recording conversations, had to be bundled in caps and mufflers to protect their batteries from the freezing temperatures. However, the cold was a minor discomfort compared to the warmth we felt from the community and their openness to share their insights with us.

Our work was community centred, and respecting their time was paramount. Meetings were scheduled at their convenience, with the village head, or *Goba*, facilitating introductions. His support ensured that our interactions with the villagers were meaningful. Despite the harsh winter, the community's warmth and hospitality never faltered. They welcomed us with open arms, offering traditional scarves as symbols of gratitude for coming to their secluded hamlets even during the most challenging time of the year.

Author in conversation with a community member
© WWF-India

During our fieldwork, we observed that while winter traditionally slowed the pace of life for settled agro-pastoralists, the recent employment opportunities from the Border Roads Organisation (BRO) and The Indian army meant that many in the community were engaged in labour work. Therefore, most consultations were held in the evenings in community halls chilled by the winter air. The halls were stark and cold, with frosted windows, but the sense of shared purpose between us and the community slowly warmed the room. *Thukpa*, a warm Ladakhi noodle soup, was served during the meetings.

Visioning exercise being conducted
© WWF-India

A NOSTALGIC VISIT TO KAKZUNG

One morning, we started at 4:30 a.m. to reach Kakzung, a border area of Changthang, for a meeting with herders. Kakzung holds a very special place in the hearts of every herder in Changthang. Decades ago, Changpa herders from across the region would migrate to Kakzung during winter as it served as a vital reserve pasture, offering vast grazing land for their livestock. They would light bonfires and sing *Jabdro*, a famous folk song of Changthang. Traditionally, *Jabdro* is performed by participants standing in a row, stepping in rhythm and holding hands as they sing and dance. This helped keep their feet warm during the freezing months while refreshing their hearts and minds, bringing joy and a sense of community.

Kakzung was more than just a winter pasture; it was a hub for exchanging knowledge, songs, and stories and a place for barter, especially for the heads of families. However, many villagers had changed migration routes and were no longer coming to Kakzung. The abandonment of the Kakzung pasture was due to the long and challenging journey. With lesser snowfall in recent times, many herders had found it easier to access pastures closer to their villages, reducing the need to migrate to distant grazing areas like Kakzung.

Grasslands around Changthang
© Padma Dolker

Changthang lake
© WWF-India

TOUGH CONDITIONS YET A FULFILLING EXPERIENCE

One of the most daunting aspects of the journey was the roads. Heavy snowfall made travel between villages treacherous, and we often felt gripped with fear as our vehicle skidded on icy paths. Our consultations lasted more than an hour, and to ensure our vehicle didn't freeze and stall, we had to keep the engine running the entire time.

We journeyed to every possible hamlet where herders had set up camps, no matter how remote. In winter and spring, Changthang is known for its strong winds, which blow sand across the roads. On one route to Tsaga village, the wind blew so much sand onto the road that our vehicle got stuck. We had no choice but to dig ourselves out with bare hands, sand covering our hair, faces, and clothes.

After spending 15 to 18 days in the field, our bodies slowly adjusted to the harsh conditions. The experience was transformative, as working in such extreme conditions taught us resilience and the power of a positive mindset. Rather than dwelling on the cold, we focused on meaningful conversations with the community. The challenges of sub zero temperatures became secondary to the importance of our mission, making us reflect on our physical and mental strength.

COLLECTIVE VISION FOR A SHARED FUTURE

The Changpas's vision for the future is based on three principles—livelihood, wildlife and environment, culture and values—all deeply intertwined with the landscape and its inhabitants. The community's collective knowledge and experience ensures the long term sustainability and well being of the rangelands for future generations.

The conversations revealed the community's concerns about climate change and the degradation of rangelands. They often related these changes to spiritual beliefs, recounting how their grandparents forbade them from disturbing the mountains, fearing it would anger the spiritual guardians. With increased infrastructure development, they felt these guardians had been disturbed, leading to erratic weather patterns and reduced pasture.

What struck us most was the community's relationship with wildlife as they viewed the wild animals of Changthang as ornaments of the region—adding beauty and meaning to the landscape. Despite occasional predator attacks on their livestock, many herders showed compassion for wild animals. Addressing these conflicts with empathy and open communication was essential to ensuring the long term conservation of both wildlife and rangelands.

Deep respect of the Changapas for the land, their animals, and the natural world left a lasting impression on us as they spoke with reverence about their pastures, water sources, and livestock, expressing immense gratitude for the environment that sustains them.

Additionally, there was a shared recognition of the importance of wildlife conservation and maintaining ecological balance, with herders acknowledging the role of traditional grazing in sustaining the fragile high altitude ecosystems of Changthang.

Yet, amidst this appreciation for nature, there was an undeniable pull towards modernity. The conveniences of city life and well paid jobs were luring many away from traditional herding, and the community wrestled with this anxiety. They felt pride in their way of life but acknowledged the hardships it brought.

The community also emphasised the need for government schemes and institutional support to create sustainable livelihood opportunities—especially for youth—through incentives, regular training, and better market access for pastoral products like pashmina, yak cheese, and wool.

Overall, the community envisions a sustainable and resilient Changthang rangeland that preserves its pastoral heritage and the ornaments of the landscape (wildlife), while integrating modern opportunities for economic growth, education, and community well being. It became clear that continuous support and recognition are crucial if the Changpa way of life is to survive.

In conclusion, our time in Changthang left us deeply reflective. Together, we explored not just a vision for the land but for the future, one where the Changpa way of life and the delicate ecosystems of Changthang can thrive side by side.

WWF-INDIA PROJECT

For a few years, the Changthang plateau has been a core focus of WWF-India's project, "A community led vision for the people and nature of Changthang". For this, WWF-India has partnered with the Changpa community, government authorities and local NGOs to preserve the rangelands of the Changthang plateau using the communities' traditional knowledge and sustainable practices. The project envisions addressing the community's needs while ensuring the sustainable management of these rangelands, which are vital for the well being of the people and the wildlife in the area.

Meeting with the community members
© WWF-India

LIVING SHORELINE

A natural shield for India's shrinking coastlines

By Anamitra Anurag Danda

Terracotta silt traps
© West Bengal Forest Department

Sundarbans, the world's largest habitat for mangroves, is a shield against the eroding coastline of West Bengal in India. It is home to diverse species of mammals, reptiles, birds, and plants and is inhabited by lakhs of people. However, this unique region now faces a serious threat from rising sea levels.

Between 2000-2020, the Sundarban Biosphere Reserve witnessed a significant increase in net land loss, about 550 hectares equivalent to 770 football fields in a year, surpassing the rate observed in the preceding decade. A study by scholars from Jadavpur University, Kolkata found that the short term fluctuation in the rate of coastal land loss closely corresponds with the interannual variability of the rate of sea level rise.

WWF-India, Centre for Climate and Environmental Studies, Indian Institute of Science Education and Research, Kolkata and Calcutta University together with government authorities are working on Nature-based Solutions (NbS) to protect the vulnerable Sundarbans region. One promising initiative has been installing terracotta rings that trap silt and foster natural mangrove growth. This innovative approach offers a sustainable defence for the world's largest mangrove forest and its inhabitants.

A DELTA UNDER THREAT

Sundarbans, a UNESCO World Heritage Site, covers 48 mangrove forest islands and 35 inhabited islands, with over 4.5 million people living in and around. The inhabitants of Sundarbans primarily depend on natural resource based livelihoods, like agriculture, aquaculture, honey collection and fishing. However, the slow onset processes, such as sea level rise and processes of erosion and accretion, and rapid onset events, such as cyclones, can lead to the loss of lives, land, livelihoods, assets and food and water security, threatening the future of Sundarbans.

Sundarban's inhabitants rely on nearly 1,800 km of earthen embankments first erected in the 18th century to protect their land and homes from tidal flooding. The embankments (concrete or earthen structures) have made human settlements possible by keeping saline water at bay. However, during the tidal cycles, the toe of the embankments often erodes, leading to slope instability and vertical collapse of the protective structure.

48 *mangrove forest islands*

35 *inhabited islands*

4.5 *million people*

Mangrove forest
© Debmalya Roy Chowdhury

In January 2019, the Indian Ministry of Earth Sciences (MoES), Government of India, reported that the rate of sea level rise at Diamond Harbour, located at the margin of the Sundarban Biosphere Reserve, was above 5 mm per year during the period 1948 through 2000, making it the highest in the country. All sea facing forest islands of the Sundarbans experienced significant losses in the mangrove forest area. Anthropogenic disturbances, such as curtailing sediment supplies, modifying channels and changing land use, further led to land loss.

Terracotta rings being installed
© WWF-India

New mangrove plants
© Anamitra Anurag Danda

8820 *terracotta silt traps*

3684 *sq. metres*

7 *locations*

A NATURAL SOLUTION TAKES ROOT

To protect the coastline and enhance the embankments' longevity, a Nature-based Solution is being implemented by WWF-India together with its partners. A total of 8,820 terracotta silt traps have been installed foreshore of the embankment, covering a total area of 3684 square metres across seven different locations. These structures work by capturing and holding the sediment and, thus, have the potential to allow vegetation to take root and contribute to stabilising the shoreline. Terracotta was consciously used to ensure that the natural ecosystem remains undisturbed.

The solution has been implemented across seven sites in the Sundarbans between May 2023 and August 2024. The results are encouraging as these rings have successfully trapped sediment, with accumulation ranging from 4 to 42 centimetres across different sites. More importantly, the trapped sediment are fostering natural mangrove growth, particularly in areas dominated by clay and silt deposits. These findings were published in a journal article - *Living Shoreline: Preliminary observations on a Nature-based Solution for toe-line protection of estuarine embankments and mangrove regeneration*.

NATURE'S ENGINEERS AT WORK

Fascinating patterns revealed how these natural defences develop. During the late and post monsoon seasons, all sites except one on the eastern coast of the lower estuarine island exhibited natural mangrove regeneration. Sites in the middle estuary, where clay content was higher, showed better results for mangrove regeneration. Pioneer plant species like *Porteresia coarctata* emerged first, followed by *Sueda maritima* and *Avicennia marina*.

An unexpected bonus came from oysters – primarily *Saccostrea cuculata* and occasionally *Crassostrea cuttackensis* – which were found attached to the terracotta silt traps and began colonising the terracotta rings. These oysters could form natural reefs, providing additional protection against erosion and tidal surges.

The results highlight the potential of the nature based and cost effective solution to support mangrove regeneration and toe line protection. This proof of concept has also successfully opened new possibilities for sustainable elevation management in the sinking and shrinking mangrove region of the Sundarbans, a significant development in the face of climate change and accelerated sea level rise.

A Bengal tiger in Sundarbans
© Shuvarthi Guha

Moulding of terracotta rings
© WWF-India

COST EFFECTIVE

The *Living Shoreline* approach offers significant cost advantages over traditional protection methods. Installing terracotta rings cost approximately USD 7,700 per square kilometer, compared to USD 33,000 per square kilometre for conventional erosion control measures using *eucalyptus* poles and soil filled gunny bags. Moreover, terracotta installations are maintenance free, unlike traditional methods that require annual maintenance.

LOOKING AHEAD

While the initial results are promising, researchers emphasise that long term observation is needed to assess how the system performs during extreme weather events. However, the success has already inspired action, with the West Bengal Forest Directorate and a local NGO initiating similar experiments.

This approach could be particularly valuable in addressing climate change and accelerating sea level rise. The *Living Shoreline* strategy not only protects existing embankments but also creates new habitats for biodiversity. It's a Nature-based Solution that works with the environment rather than against it.

As coastal regions worldwide grapple with similar challenges, this innovative approach from the Sundarbans could offer valuable lessons in sustainable coastal protection. The success of this experiment suggests that sometimes, the best solutions are those that work in harmony with nature's own processes.

This article is based on research conducted by Paromit Chatterjee, Sugata Hazra, Anamitra Anurag Danda, Punyasloke Bhadury, Punarbasu Chaudhuri, and Sampurna Sarkar, published in the MDPI journal Sustainability and funded by the HSBC Climate Solutions Partnership.

THE SWEET TASTE OF MAIKAL

By Somreet Bhattacharya

A reservoir in Kanha-Achanakmar corridor
© Somreet Bhattacharya

The Kanha-Achanakmar corridor is significant to sustaining the tiger population in Central India as it ensures connectivity between the Kanha Tiger Reserve in Madhya Pradesh and the Achanakmar Tiger Reserve in Chhattisgarh. The corridor hosts a rich floral and faunal diversity and is a critical dispersal and breeding ground for wild mammals.

It is also home to the Baigas—a semi-nomadic community residing in and around the forests of Madhya Pradesh, Chhattisgarh and Maharashtra for centuries. They have traditionally depended on non-timber forest products such as mahua, amla, tendupatta, bahera, harra, bael and wild honey. With time, the community has settled down and started to practise crop rotation, a marked shift from their traditional practices. Their skills, beliefs, norms, values and traditional knowledge have been synergised with ecological services.

A muddy road through the thick forests bordering the forest of the Kanha-Achanakmar corridor in Chhattisgarh connects Aurapani —a quaint village nestled in the lap of the Amarkantak range—to the rest of the world.

On a September morning, as it drizzled incessantly, I rode a bike through the forest road meandering through thick undergrowth. The sambhar, sal, and haldu trees had honeycombs that hung like golden bags. After about an hour's ride through the thick forest that smelled strongly of wildflowers and after crossing a few streams, we reached Aurapani, a tiny Baiga village boasting a village pond and community held agricultural land.

Shivnath Baiga, a 27-year-old who was also once the village's youngest head, led us to his house. Despite the untimely rains, Shivnath and his team of honey collectors had gathered about 50-60 kg of honey in one season.

EARLIER PRACTICES

The wild honey collection has been one of many sought after livelihood sources practised for generations by the Baigas. Traditionally, the honey collectors used fire to subdue the bees, and in some cases, they would hack down the branches of the tree to procure honey from the hives. The whole extraction

Honeycombs on a dried up Arjun tree
© WWF-India

Baiga community praying before honey collection
© WWF-India

Honey collectors at a meeting
© WWF-India

process led to the needless killing of the bees and even caused the collectors to get stung. After going through the tedious and dangerous method of extracting the wild honey, the product would be sold by the collectors in the local *haat* (village marketplace) at INR 90 to 100 per kg or sold to the middleman at the village market.

ADOPTING CHANGE

The Baiga communities residing at the Kanha-Achanakmar Corridor have adopted a sustainable method of honey collection with support from WWF- India to protect the honey bee colonies of *Apis dorsata*, and collect wild honey.

As a first step, the honey collectors have organised themselves into groups of five, each member with a specific task. The group undertakes surveys before the collection season, traversing the thick forest foliage to mark out the trees with a maximum number of hives that are also easy to climb, such as the Arjun and Sal trees.

The trees are numbered based on the areas earmarked for each village, and a log book is maintained to detail the type of tree, the number of hives, and the amount of honey collected from each during a season. As per the Baiga tradition, honey is not collected from all the hives but only from the marked out hives to protect the bee population. While two people climb the tree, the others hold on to the equipment below and protect them from other mishaps.

"The hives with the maximum amount of honey turn golden or brown and are preferred for honey collection" explained Shivnath. "If the weather is inclement, we don't collect honey as it is part of our tradition to collect honey only when the weather is favourable. If the trees have markings of other animals, like sloth bears or tigers, then those trees are also avoided for honey extraction," added Shivnath.

"Only 40 per cent of the hive is cut while the rest are left for the bees and other animals such as the sloth bears who love to feed on them," said Raisingh Baiga, Shivnath's aide who is also an expert in climbing the trees and retrieving the hives.

WWF-India has been supporting communities in adopting sustainable honey extraction methods since 2014. It has provided special suits to honey collectors to discourage them from using fire and protect them from bee stings. This initiative helps ensure that they protect themselves from the bees while protecting the honey bee colonies from destruction.

Collected honey combs
© WWF-India

Members of the community wearing protective suits
© WWF-India

Collected honey handed over for distribution
© WWF-India

After collection, the honey is filtered and stored in metal containers and packed into bottles for the supply. The hive is used to prepare wax, either as household fuel or to make candles shared locally with the other villagers.

MANAGING HONEY COLLECTION AND SALE

Honey collectors have organised themselves in groups, which has led to the formation of a unified *samiti* (honey collector's group)—the Maikal Sahad Sangrahak Kalyan Samiti (MSSKS).

The MSSKS has expanded itself to include 46 members from four villages within the Kanha-Achanakmar Corridor, including Aurapani and Bijrakhachar. It has received organic certification for the collection and storage process from CGCERT (Chhattisgarh Certification Society for Forest and Agriculture Produces).

The collectors under MSSKS have been trained through capacity building workshops and are now collecting honey sustainably. Additionally, WWF-India has trained community members in stock management and bookkeeping and built their account and project maintenance capacities.

To ensure a fair rate for the honey collected, stored and marketed in bulk, the *Samiti* collects INR 500 from each member for a corpus as a matching fund. The *Samiti* also procures the honey from its members and stores it to meet excessive future demands.

A 60-year-old Tihar Singh Baiga, who has been collecting honey for the past 40 years using the traditional method, has joined the *Samiti* to follow this sustainable process. After almost a decade of being associated with the *Samiti*, the community now have a self-reliant village economy that adds sweetness to their lives while protecting the forests.

Kanha-Achanakmar corridor
© Somreet Bhattacharya

Brass ware at display
© Tony Thomas Photography

BRASS CITY SHINING

Moradabad's metalware sector reduced fresh water consumption

By Siddharth Baidya and Abhishek Sah

Known worldwide for its exquisite brass art metalware, Moradabad in Uttar Pradesh has earned its reputation as India's 'brass city'. With approximately 1,200 registered metalware industries and thousands of unregistered household units, the city has evolved beyond brass to incorporate various metal alloys in its renowned handicrafts.

However, this thriving metalware industry is creating significant ecological pressure as it depends entirely on groundwater extraction. Simultaneous agricultural, domestic, and industrial demands compound this stress on the region's water table. Furthermore, the situation has reached a critical threshold because the Ramganga River- a key tributary of India's national River Ganga- which flows through the city of Moradabad, is an aquifer-fed river in the region, and its flow directly depends on the district's groundwater status. The River is also impacted by the pollution from waste water discharge by the city and industries.

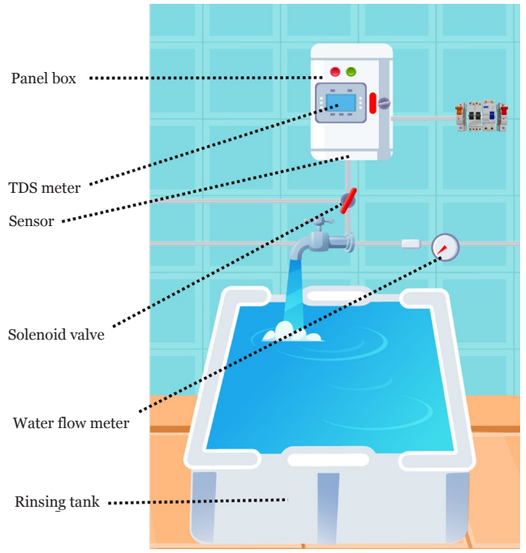
WATER INTENSIVE PRACTICES

The metalware industry has been particularly water intensive, with most units employing inefficient rinsing systems during electroplating. These systems typically involve multiple, continuously running fresh water taps, leading to extraordinarily high water consumption. Studies indicate that the rinsing process alone accounts for approximately 70% of the total freshwater used by the metalware industry. Despite the sector's significant technological progress in other areas, this issue of excessive water consumption during rinsing has persisted, failing to receive collective attention from the cluster, including technologists.

CLEAN TECHNOLOGY FOR NEW SOLUTIONS

In 2013-14, WWF-India along with the District Administration and industry associations began exploring clean technology interventions with various partners to reduce water use by the metalware industry in Moradabad. WWF-India collaborated with the Indian Institute of Technology (IIT), Kanpur, and the District Administration to study technology uptake in the metalware sector and develop a solution to reduce fresh water consumption in the rinsing process. This initiative investigated and field tested technical solutions to minimise freshwater use during rinsing.

The first solution developed under this multistakeholder collaboration was a manual rinsing mechanism called the Counter Current Mechanism (CCM). This method involved the installation of a



The CCM technology designed by IIT-Kanpur with technical support by the Metal Handicrafts Service Centre (MHSC), Government of India
© WWF-India

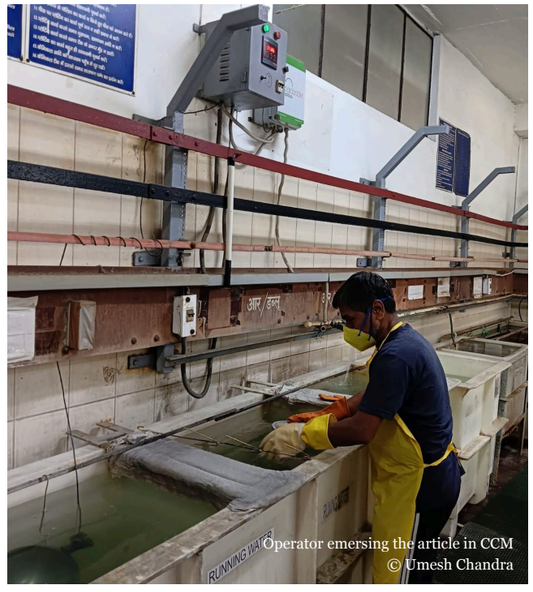
composite iron tank with three partitions and holes drilled in the walls separating each chamber, allowing water to flow between partitions. It also featured the discontinuation of all freshwater taps except one. This method required the factory personnel to control the tap for rinsing the finished products. The worker had to switch the freshwater supply on and off based on the water needed for the rinsing process. This method was efficient in reducing water wastage but was labour dependent.

Recognising the need to eliminate any margin for freshwater wastage and reduce the metalware worker's time operating the CCM tap, WWF-India and its technical partners decided to automate this process. Consequently, the next CCM design launched in 2017-18 was fully automatic. It could regulate freshwater supply into the tubs, switching on and off by measuring the water's Total Dissolved Solids (TDS) content.

The automatic CCM required a composite polypropylene (PP) tank, and the metalware industry at large had already transitioned to using PP tanks, which had a significantly higher lifespan than iron tanks. A critical innovation was incorporating a TDS controller– a sensor that records and transmits the TDS value in the most polluted chamber. It was paired with a digital TDS meter configured with a threshold value - to disconnect the flow of fresh water whenever the TDS fell below a pre-defined threshold value.

A valve attached to the water pipeline helped regulate the minimum amount of freshwater required during rinsing. The system stopped the fresh water supply when the TDS in the most polluted chamber was

Training sessions on the use of CCMs
© Umesh Chandra



Operator emersing the article in CCM
© Umesh Chandra

below the threshold (indicating the water is still suitable for rinsing). When the TDS value exceeded the threshold, the solenoid valve activated, supplying fresh water until it fell below the threshold again. The threshold TDS was generally set at three times the TDS of the region's groundwater, though this may have varied based on the size of the articles being processed.

THE IMPACT

WWF-India and other stakeholders' collective action led to the adoption of 192 automatic CCMs by 40 industries. The institutional support of the District Administration and various departments, including the Ground Water Department (GWD), District Industries Centre (DIC), and Industry Associations, has been crucial in promoting CCM adoption.

These 40 industries represent an estimated 50% of the total metalware export market, making adopting the automatic CCM particularly significant.

A credible third party audit agency was engaged to validate the data collection on water savings and methodology for impact assessment of CCMs. Impact studies from the year 2020 onwards comparing water consumption before and after CCM installation revealed:

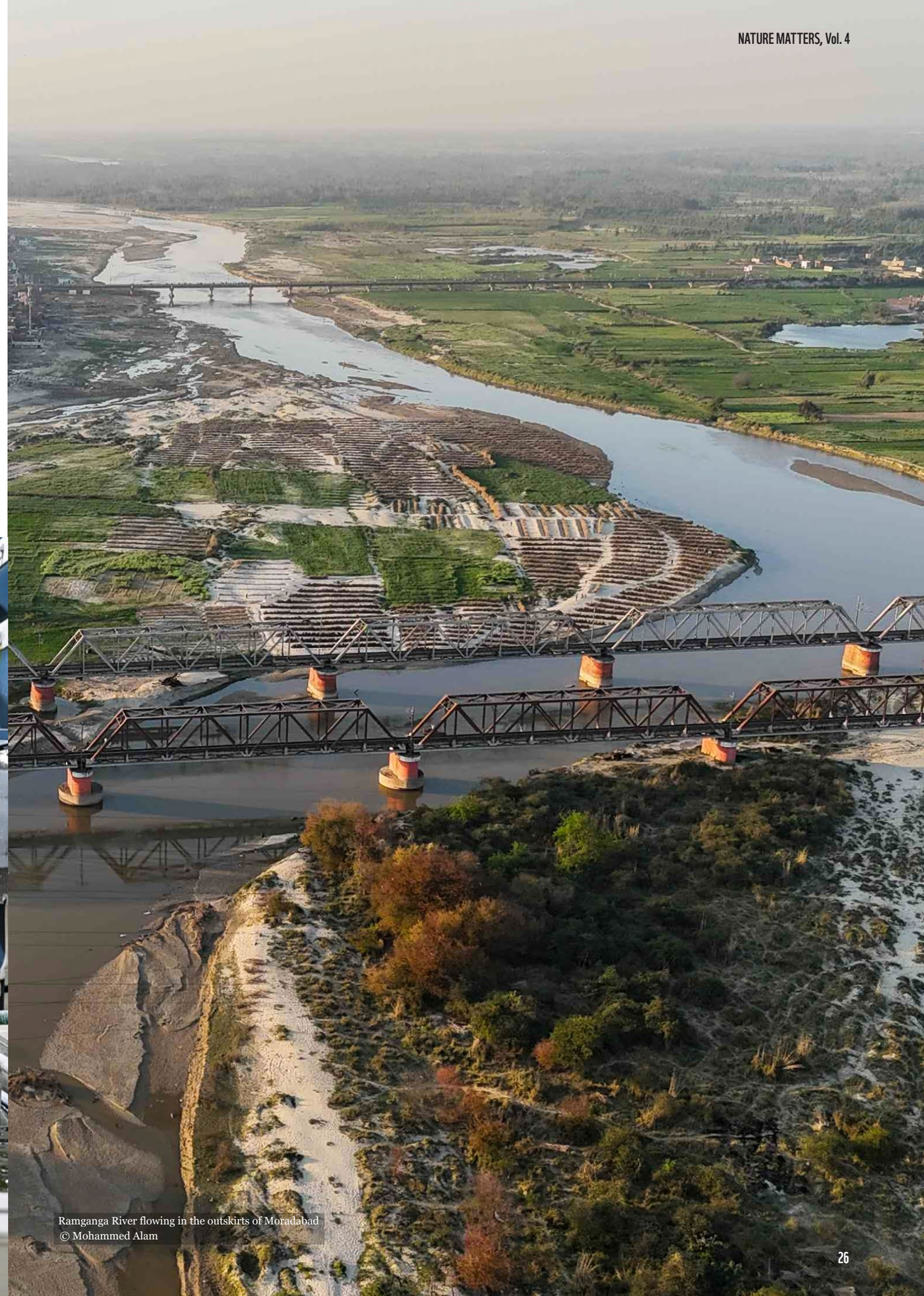
- Average reduction in freshwater consumption ranging from 25% to 47% after installation of automatic CCM

- An estimated total reduction of approximately 18 million litres of water until December 2024

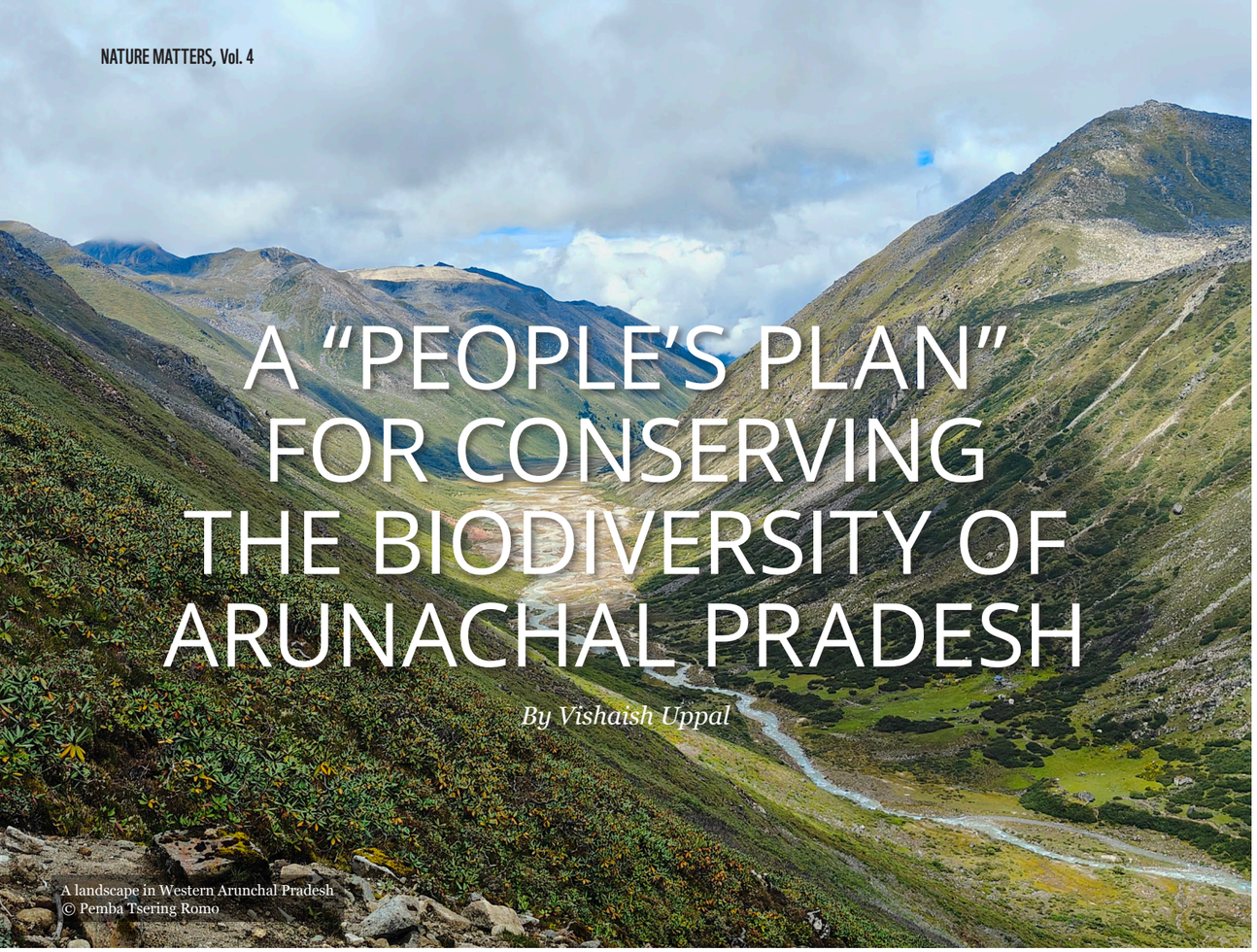
This impact study has assisted the stakeholders in encouraging the wider adoption of automatic CCM throughout the cluster by forming a working group and communicating official information to metalware sector representatives. All stakeholders in the initiative recognise the need for policy support to scale up CCM adoption across the metalware sector as a crucial step towards conserving the Ramganga River.

Operator taking out the article after rinsing
© Umesh Chandra

A CCM operator in action
© Tony Thomas Photography



Ramganga River flowing in the outskirts of Moradabad
© Mohammed Alam



A landscape in Western Arunchal Pradesh
© Pemba Tsering Romo

A "PEOPLE'S PLAN" FOR CONSERVING THE BIODIVERSITY OF ARUNACHAL PRADESH

By Vishaish Uppal

Arunachal Pradesh is one of the most mega biodiverse regions in India and the world. The diverse ecosystems in the state, from the lush Himalayan forests to the biodiverse plains and valleys, contribute immensely to the overall health and resilience of Arunachal Pradesh and its people.

Arunachal Pradesh developed its first State Biodiversity Strategy and Action Plan (SBSAP) in 2002 when India's Biodiversity Act was enacted, and it was one of the first states in India to do so. The state was always cognizant that its people live in harmony with nature and that biodiversity is an integral part of the way of living in the state.

Like many regions in the country, Arunachal Pradesh has faced numerous challenges vis a vis biodiversity conservation over the years. Forest fragmentation, habitat loss, climate change, rapid urbanisation, and unsustainable resource extraction have been some growing threats eroding the state's natural heritage.

In the last 20 years, there have also been considerable changes at the state, national and international levels. The state has made remarkable achievements in different dimensions of development. The state improved its infrastructure and has focused on enhancing its horticulture and agriculture sector. In 2023-24, 'the state's GSDP (at constant prices) grew at 9.5%, compared to 7% in 2022-23. India has also become the 3rd largest economy based on gross term, and there were changes in the legal, institutional and policy arrangements. At the international level, the most significant and recent outcome was the adoption of the Kunming-Montreal Global Biodiversity Framework (KM- GBF) under the Convention on Biological Diversity.

India updated its National Biodiversity Strategy and Action Plan (NBSAP) in 2024 and revised Nationally Determined Contributions (NDCs), which is providing clear directions for conserving biodiversity and mainstreaming it across sectors.

There was a strong need to develop a new Biodiversity Strategy and Action Plan for Arunachal Pradesh to address the challenges of conserving nature and reflect the current national and international context, including ensuring that the needs of the people were integrated along with biodiversity conservation related customs and practices carried out by tribal communities, especially women and youth.

District level consultation at Ziro, Arunachal Pradesh
© WWF-India

PROCESS

The Arunachal Pradesh Biodiversity Board (APBB), in collaboration with WWF-India, embarked on an endeavour to develop the State Biodiversity Strategy and Action Plan for Arunachal Pradesh in 2023.

The earlier plan provided a good foothold to learn from and build upon. Based on the evaluation of the earlier plan, secondary and primary data, and extensive stakeholder engagement and discussions with various departments and experts, a new SBSAP was formulated to conserve the state's rich diversity and heritage and minimise the potential risks for economic biodiversity trade offs.

The preparation of the APSBSAP involved a desk review of national and international changes and extensive outreach and consultations involving government departments, NGOs, CSOs, subject experts, business groups, BMCs, and local communities.

The most crucial aspect of plan development was to conduct the district level consultations to reach out to the local community, traditional village authorities, and institutions and agencies. Most of these meetings were held under the chairpersonship of the Deputy Commissioner of the relevant districts. A diverse group of stakeholders participated in these consultations, including the forest department, district administration, agriculture department, horticulture department, *Gaon Burah/Burihs*, Gram Panchayat, NGOs, community based organisation, youth groups, women groups, etc. Where possible, political representatives like Zilla Panchayat Chairpersons and Members, as well as Members of the Legislative Assembly, were also invited to participate in the meeting and provide key inputs.

In addition, input from local communities through district level consultations, suggestions and guidance from technical and steering committees enabled the development of goals, targets and actions.

A total number of 30 district level consultations were organised in 26 districts. Over 1000 people attended these consultations, including 102 *Gaon Burah/ Burihs*, seven Zila Parishad Chairpersons, 36 Zila Parishad members, 54 Gram Panchayat Chairman, and 14 members of Gram Panchayat.

After extensive collaboration and hard work, *Arunachal Pradesh's State Biodiversity Strategy and Action Plan: People's Plan* was finally developed. It was released by the Chief Minister of Arunachal Pradesh, Shri Pema Khandu, on 13 March 2025 at Itanagar. Several dignitaries from the Government of Arunachal Pradesh including Shri Wangki Lowang, Honourable Minister, Environment and Forests;

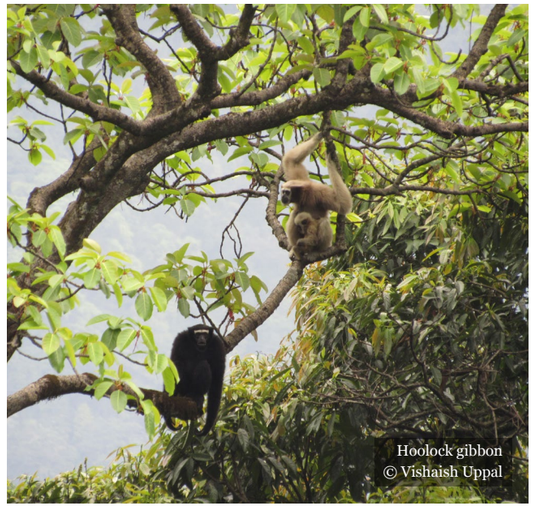
A district level consultation at Daporoji, Arunchal Pradesh
© WWF-India

White rhododendron
© Jyotsana Nirula

Shri Wanglin Lowangdong, Advisor to Minister, Environment and Forests; Shri Manish Kumar Gupta, Chief Secretary; Shri P. Subramanyam, PCCF & HoFF, Environment, Forests and Climate Change; and Ms Koj Rinya, Member Secretary, Arunachal Pradesh Biodiversity Board were present at the launch.

GOALS AND TARGETS

The Arunachal Pradesh State Biodiversity Strategy and Action Plan (APSBSAP) aims to guide the state to sustainably utilise its rich biodiversity while ensuring a harmonious balance between development and nature conservation. This robust and holistic plan provides guidance and a pathway for sectoral integration, convergence, and mainstreaming biodiversity for a sustained flow of ecosystem services and maintenance of ecological integrity.



Hoolock gibbon
© Vishaish Uppal

GOAL 1 PROTECT AND CONSERVE TERRESTRIAL AND INLAND WATER ECOSYSTEMS AND SPECIES	**GOAL 2** SUPPORT AND ENABLE SUSTAINABLE USE OF BIODIVERSITY	**GOAL 3** ENHANCE AND STRENGTHEN IMPLEMENTATION
TARGETS 1. Promote conservation and restoration of ecologically rich areas through effective management and spatial planning to enhance biodiversity, ecological integrity and connectivity by 2030 2. Strengthen protection and management of species to halt human induced extinction, promote coexistence, one health approach, and minimise human-wildlife conflict 3. Maintain and enhance genetic diversity and resources through in-situ and ex-situ conservation practices 4. Adopt strategies for the management of invasive alien species, prevent its introduction and promote its eradication to reduce its impact on biodiversity and ecosystem services 5. Adopt measures to reduce the impact of pollution from all sources on biodiversity, including pollution from plastics and solid waste as well as highly hazardous chemicals	**TARGETS** 1. Scale up positive incentives for local communities for the conservation and sustainable use of biodiversity 2. Enhance nature's contribution to people by adopting ecosystem based approaches for sustainable management of areas under agriculture, horticulture, fisheries and forestry for the overall health and wellbeing of people and the state 3. Minimise impacts of climate change on ecosystems and biodiversity through the adoption of ecosystem based mitigation and adaptation measures 4. Adopt biosafety protocols to prevent genetic erosion and reduce benefits for people and nature 5. Support local community institutions to effectively use access and benefit sharing mechanism	**TARGETS** 1. Integrate biodiversity and its multiple values into state policies, planning and development processes and poverty eradication strategies, to reduce the overall footprint and negative impacts on biodiversity and ecosystem services 2. Encourage and enable businesses to monitor, assess and reduce their impacts and dependencies on biodiversity from the state and also report on compliance with access and benefit-sharing measures 3. Strengthen capacity, undertake research and strengthen knowledge management, including traditional knowledge 4. Raise awareness on biodiversity and its values as well as customs and practices of local communities which support conservation 5. Promote, inclusive, participatory and gender responsive approach for decision making, with full and equitable representation of tribal and local communities as well as women and youth, with the view of recognising and respecting their rights over land and natural resources

Download the People's Plan at https://wwfin.awsassets.panda.org/downloads/apsbsap_1-4-2025_final.pdf

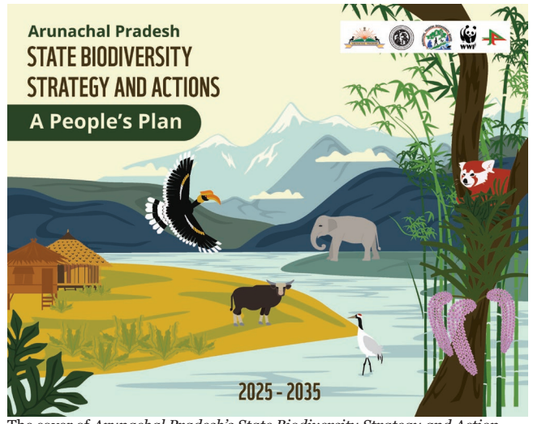
District level actions have been included to enable effective implementation, encourage local stewardship and provide benefits to rural people, farmers and tribal communities through biodiversity conservation and implementation of the Access & Benefit sharing mechanism.

The APSBSAP clearly defines the state's vision along with three goals and 15 targets in alignment with the National Biodiversity Targets. Each goal has five targets with specific action points for each target. A total of 140 actions have been identified, of which 64 are to be taken up immediately, 27 are medium term, and 49 are such that they have to be undertaken for the entire 10-year period. Different departments and agencies will implement these action points using a holistic government and society approach.

PEOPLE'S PLAN

The APSBSAP is a springboard for future conservation actions. It gives direction through the vision, shared goals, and action points for managing nature in all states, from cities and towns to our grasslands, alpine meadows, lush forests, agricultural lands, and water bodies. It is a People's Plan and recognises that everyone has to play a crucial role, as nature is the foundation of the existence of the state and its people.

The strategy and action plan will enable the government, non-government and communities to



The cover of *Arunachal Pradesh's State Biodiversity Strategy and Action Plan: People's Plan*

care for nature across diverse ecosystems and biomes as it draws on the current status of nature and its challenges and recognises the existing efforts being made.

The plan will guide the development of new and innovative approaches to support healthy and functioning ecosystems by strengthening the connection between people and nature, revitalising traditional systems, enhancing efforts to care for nature, and generating data and sharing knowledge. It is a 'people's roadmap to understand better, be responsible, protect and reverse nature loss, and sustainably manage nature by 2050.

A high altitude mountain region in northern Arunachal Pradesh
© WWF-India

IN FOCUS

RETURN OF THE GHARIAL TO INDIA'S RIVERS

By Abhishek Sah

Gharials at the banks of Chambal River
© Areeb Hashmi

The gharial (Gavialis gangeticus) population in India had drastically declined in the wild, placing the species on the verge of extinction. In response, the Government of India had launched Project Crocodile in 1975–76 through the Ministry of Environment and Forests (now the Ministry of Environment, Forest and Climate Change). On 04 March 2025, the Hon'ble Prime Minister of India, Shri Narendra Modi announced a new project for the conservation of gharials during the 7th meeting of National Board for Wildlife , signaling a renewed national commitment to securing a future for this critically endangered species. On World Crocodile Day on 17th June 2025, India also celebrated 50 years of crocodile conservation efforts.

The basin of India's storied river- Ganga- is home to over 600 million people and a wide range of rare and threatened species, such as the iconic Ganges river dolphin, otters, freshwater turtles, over 140 fish species, and the Critically Endangered gharial.

An estimated population of 650 adult wild gharials now occurs in four tributaries of the Ganga: the Chambal, Ramganga, Gandak, and Girwa Rivers in India and the Rapti-Naryani River in Nepal. Infact, India is home to the largest population of gharials, hosting almost 80% of the global population, of which Chambal alone hosts about 77% of the global adult population.

ECOLOGICALLY IMPORTANT

Gharials are crucial for healthy river ecosystems. Gharials, as specialised piscivores, help sustain healthy fish populations by preying on weak or diseased individuals. Their sensitivity to environmental disturbances makes them key indicators of the Ganga's ecological health, as a thriving gharial population reflects clean water, stable banks, a flourishing fish population, and a balanced riparian ecosystem.

NATURE MATTERS, Vol. 4

SPECIES AT RISK

A non-aggressive, fish-eating member of the crocodilian family, the gharial faces grave threats. Dam, barrages, and water abstraction adversely affect gharial by turning suitable river habitats into marginal or unsuitable habitats and altering the water availability to downstream river sections. Indiscriminate fishing, entanglement in fishing nets, and nest and hatching predation by stray dogs are also significant threats to the species.

With its long, toothy rostrum, the gharial is particularly vulnerable to entanglement in fishing nets, where it is frequently trapped underwater and drowns. Entangled gharials may also be at risk of injury or harm by fishers, possibly due to perceived damage to fishing nets. River bed cultivation impacts gharial survival by alienating them from the terrestrial component of their habitat, leading to desertion and migration. Removal of sand from riverbanks disrupts gharial behaviour and may even force local populations to desert the area. Sustained mining activity may destroy vital basking and nesting sites, resulting in direct egg mortality during the nesting season.

GHARIAL REINTRODUCTION

The mass mortality of gharials in the Chambal River in 2008 underscored the species' extreme vulnerability to extinction, prompting the urgent search for viable alternative habitats. The ultimate aim was to establish a breeding population of gharials, restoring the species to its historical range – areas where it historically lived - and ensuring its long-term survival in the wild.

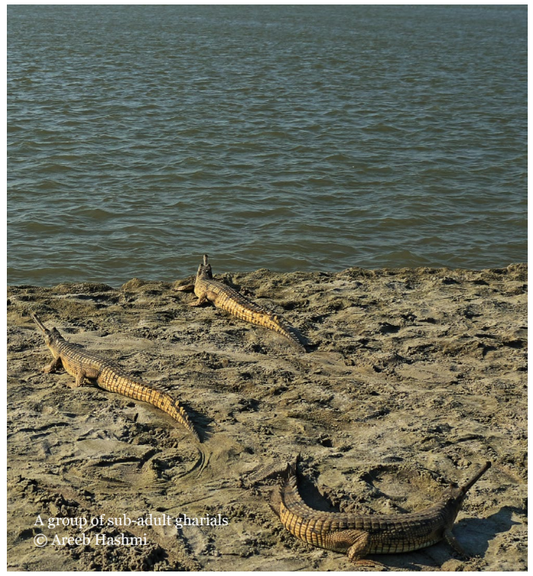
In 2008-09, WWF-India led a consortium of conservation organisations to assess the gharial's status in the wild and outline actions for its long-term survival. The Uttar Pradesh Forest Department and teams from WWF-India identified the need to reintroduce gharials in their historic habitats for species recovery. Recovering the gharial population was vital for preserving the health of river ecosystems and ensuring the survival of a key species that has coexisted with the habitat for millions of years.

The Uttar Pradesh Forest Department and WWF-India accelerated gharial conservation work and targeted efforts to secure suitable protected habitats, raise awareness among local communities, release captive reared juvenile gharials, and monitor gharial numbers, spatial distribution, and behaviour.

In 2009, the Uttar Pradesh Forest Department in partnership with WWF-India, released 131 gharials for the first time in the Ganga River at the State Animal Barasingha Sanctuary (formerly the Hastinapur Wildlife Sanctuary). This Sanctuary was chosen for its suitable habitat features, including deep pools, undisturbed sandbars, and multi-stream braided channels conducive to gharial survival and breeding.

The released gharials were bred at the Kukrail Gharial Rehabilitation Centre in Lucknow that is managed by the Uttar Pradesh Forest Department. For this, gharial eggs were hatched artificially within the Centre and this delicate process required precise mimicking of natural nesting conditions. After being

A set of release boxes for gharials
© Areeb Hashmi



A group of sub-adult gharials
© Areeb Hashmi

reared for two to four years, the juvenile gharials were released into the wild. The releases followed IUCN protocols, which recommend a release ratio of one male to three females. They were performed with support and guidance from the regional co-chair of the IUCN crocodile specialist group. Before release, each gharial's health was assessed, its biometric data was recorded, and its tail scutes were marked for later identification. This information helped monitoring the growth of the released animals in the wild during subsequent recaptures for biometric exercises.

Intensive post-release monitoring showed that the gharials had successfully adapted to their new habitat, moving upstream and downstream from the release site. Between 2009-2024, 973 captive-reared gharial juveniles have been released into the Ganga River at suitable sites selected at the State Barasingha Wildlife Sanctuary, Hastinapur.

MONITORING THE RELEASED GHARIALS

WWF-India, in collaboration with the Uttar Pradesh Forest Department, consistently monitors the released gharials for dispersal, habitat use, and potential threats. Regular growth assessments of these gharials through biometric exercises have confirmed that the animals are in good health, indicating successful adaptation to their new environment. It also suggests that the released gharials have acclimatised well to the wild, thriving in the River Ganga, which provides a conducive environment for their survival and reproduction. Notably, the animals released in 2009 and 2010 have reached sizes comparable to that of adults, further validating the success of the reintroduction effort.

Occasionally, some of the released gharials accidentally ventured into the canals and became stranded when the water levels receded. In these instances, WWF-India, in collaboration with the Uttar Pradesh Forest Department, has facilitated rescue operations to safely translocate the individuals back to the main channel of the Ganga River in the State Barasingha Wildlife Sanctuary.

Local riparian communities, including riverbed farmers and fishers, have actively participated in the gharial reintroduction programme. With support from the Uttar Pradesh Forest Department and WWF-India, these communities have become Ganga *Mitras*—friends of Ganga and the gharials. Science-based training on sustainable agriculture and fishing practices has fostered a positive shift in attitudes toward aquatic biodiversity. This shift in attitude among riverbed farmers played a key role in securing the basking and potential nesting habitats for gharials in the State Barasingha Wildlife Sanctuary.

WWF-India and the Uttar Pradesh Forest Department has also developed the Ganga Interpretation Centre at Hastinapur Forest Training Center to raise awareness about aquatic biodiversity, which was inaugurated in February 2019. The Centre serves as a hub for dialogue among stakeholders. It features life-size replicas of the Ganges river dolphin, gharial, and three species of freshwater turtles, helping visitors understand these iconic species' morphology and size.

EXPANDING THE RANGE

With technical support from WWF-India, the model of establishing a breeding population of the gharials in Uttar Pradesh, is now being engaged by other states for similar conservation initiatives.

Punjab

In Punjab, the gharials, locally known as "*Sansar*", were once extensively distributed in its rivers. The past reference from the Gurdaspur District Gazetteer of 1914 mentions gharial as a "pest in rivers" because it caused economic loss to fisheries and, therefore, hunted. The gharial reintroduction project in Punjab aims to reestablish a breeding population of the gharial in the Beas River and ensure their long-term survival. The project was initiated in the newly declared "Beas Conservation Reserve" by the Department of Forest and Wildlife Preservation, Punjab, following 'IUCN's reintroduction protocol and with technical support from WWF - India. Ninety-four juvenile gharials brought from the Gharial Breeding Centre in Deori, Morena, Madhya Pradesh, were reintroduced into Beas in five batches between December 2017 and December 2021. To study the acclimatisation, distribution and habitat preference of reintroduced gharials, every year, post-monsoon gharial monitoring is conducted by a joint team comprising the Department of Forests and Wildlife Preservation, Punjab and WWF-India.

West Bengal

In February 2024, the West Bengal Forest Directorate (WBFD), with support from WWF-India, initiated the gharial reintroduction programme in West Bengal. The aim is to restock the gharial population in River Ganga in Murshidabad district. The first batch of 37 juvenile gharials was released in February 2024 following a detailed site suitability assessment conducted jointly by the WBFD and WWF-India. The release of a second batch is under planning, and therefore, a site suitability assessment was conducted across approximately 656 km of river stretches in North Bengal. Based on the ecological and social suitability factors the stretches of Jaldhaka River (in Jalpaiguri and Coochbehar districts) and the Fulahar River (a distributary of the Mahananda in Malda) have been identified as potential locations for releasing the second batch of gharials. Community awareness and engagement programmes are being organised along the potential release sites.

Assam

In Assam, there have been sporadic sightings of gharials in the Brahmaputra River and its tributaries, including the Manas, Dikhow, Beki, Jinjiran, and Subansini rivers. In response, the Assam Forest Department, in collaboration with WWF-India and other partners, has initiated the assessment of the gharial's conservation status in the region and is developing a roadmap for the species' recovery in the state.

MOVING FORWARD

The efforts to bring gharials back to their historic home range are underway, and there has been a notable improvement in the wild adult gharial population, increasing from around 200 individuals in 2006 to approximately 650 in 2019, largely due to sustained conservation and reintroduction efforts over the past decade.

The progress made by these reintroduction efforts underscores the importance of collaborative conservation initiatives. Government bodies, conservation organisations, and local communities have made significant strides in securing a future for the gharial by working together. Continued monitoring, habitat protection, and community engagement will be crucial in ensuring the long-term survival of this iconic species. As we look ahead, the lessons learned from these efforts can serve as a model for similar conservation projects nationwide, highlighting the power of collective action in preserving our rich biodiversity.

Gharial basking in Lower Ganga in Murshidabad, West Bengal
© Mridul Kanti Kar

WILD CRY

TROUBLED BY ILLEGAL WILDLIFE TRADE

Tortoise and freshwater turtles of India

By Astha Gautam and Dipankar Ghose

Indian roofed turtle
© Dr Saket Badola

Tortoises and freshwater turtles are integral to our ecosystems. They act as predators, prey and scavengers in their habitat and help disperse seeds as pollinators.

India has 29 tortoises and freshwater turtle species distributed across terrestrial, freshwater, and estuarine habitats. Three of these, the Travancore tortoise (*Indotestudo travancorica*), Leith's softshell turtle (*Nilssonia leithii*) and Cochin forest cane turtle (*Vijayachelys sylvatica*) are endemic to India.

As per the IUCN Red List of Threatened Species, nine species in India have been classified as Critically Endangered, 11 as Endangered, five as Vulnerable, two as Near Threatened, and the remaining two as Least Concern (Table 1). These species are threatened by habitat loss, degradation, and climate change, in addition to poaching and illegal trade (Datta, 2012; Stanford *et al*., 2020).

Poaching and illegal wildlife trade have significantly impacted the species in India (Kundu *et al*., 2018). Tortoises and freshwater turtles are targeted for pet trade, superstitious beliefs, and their meat, carapace, calipee, and fibrocartilage to supply the demands for consumption and traditional medicines (Badola *et al*., 2019). They are also hunted for local consumption and use in traditional medicines. The hunting and poaching of tortoises and freshwater turtles have been reported in north (Mendiratta *et al*., 2017; TRAFFIC, 2021; Sengottuvel *et al*., 2023), northeast (Baruah *et al*., 2010; Kundu *et al*., 2018), east (Roy & Kumar, 2023) and Southern India (Krishnakumar *et al*., 2009).

PROTECTION STATUS

National laws and international conventions protect India's tortoises and freshwater turtles from poaching and illegal trade. Under India's Wild Life (Protection) Act, 1972, poaching and illegal wildlife trade of indigenous turtles are punishable offences. The latest amendment to the Act in 2022 lists 28 species found in India [except for the impressed tortoise *(Manouria impressa)*] in two Schedules (I and II). Twenty five have been listed in Schedule I, granting them the highest level of protection under the law, and three have been listed in Schedule II (Table 1).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement that enlists species in three Appendices that subject their international trade to specific regulations. These regulations are implemented to ensure that the trade in wildlife does not threaten the species' survival. All 29 species found in India have been listed in CITES, 19 in Appendix II and 10 in Appendix I (Table 1).

In the past, CITES has played a significant role in safeguarding turtles and tortoises from the detrimental impacts of unregulated international trade. The heavily trafficked species like the Indian star tortoise (*Geochelone elegans*) was listed in Appendix I during CITES CoP18, and red-crowned roofed turtle (*Batagur kachuga*) in Appendix I, during the CoP19 Prop. 25 (Rev. 1), for eliminating their commercial trade (trade is permitted only in exceptional circumstances) and to safeguard the species' survival by reducing commercial exploitation.

The amended Wild Life (Protection) Act, 1972 of India, has included the CITES-listed species in the Schedule IV category (Chapter VB), including all tortoises and freshwater turtle species listed by the CITES. Currently, 238 species of the order testudines are listed under the three Appendices of CITES. With the amendment to the Wild Life (Protection) Act, 1972, members of the family Carettochelyidae (pig-nosed turtles), Chelidae (Austro-American sideneck turtles), Chelydridae (snapping turtles), Dermatemydidae (Central American river turtles), Emydidae (box turtles, freshwater turtles), Geoemydidae (box turtles, freshwater turtles), Platysternidae (big-headed turtles), Podocnemididae (Afro-American sideneck turtles), Testudinidae (tortoises), and Trionychidae (softshell turtles) have been included in Schedule IV of the Act.

Including CITES listed species in national law aims to regulate the possession, transfer, and breeding of living Scheduled animal species and discourage the illegal trade of exotic wildlife in India.

The amendment also authorised enforcement agencies, including the Directorate of Revenue Intelligence (DRI) and Central Board of Indirect Taxes & Customs, to seize any offending contraband (illegally traded wildlife and articles) under Section 50 (1)(c) of the Act. Before this, Customs officers could only seize wildlife and articles under the Customs Act, 1962, for violation of import and export rules. The positive effects of this have been reflected in the thousands of species rescued from illegal trade by both agencies. For example, in June 2023, Customs seized 6850 red-eared slider turtles (*Trachemys scripta elegans*) at Tiruchirappalli International Airport, Tamil Nadu, which were being smuggled from

Aldabra tortoise
© Trisha Shears/Wikimedia Commons

Indian star tortoise
© BC Choudhury

Malaysia. (The Hindu Bureau, 2023). In February 2024, DRI seized 679 live turtles, which included the Indian tent turtle (*Pangshura tentoria*), Indian roofed turtle (*Pangshura tecta*) and brown roofed turtle (*Pangshura smithii*) from Lucknow, Uttar Pradesh (The Times of India, 2024b). Recently, in February 2025, DRI seized 1448 Indian flapshell turtles (*Lissemys punctata*) in Khurda in Odisha (Express News Service, 2025). According to the news report, the freshwater turtles were transported from Andhra Pradesh to West Bengal in a van.

TRACKING ILLEGAL TRADE OF TORTOISES AND FRESHWATER TURTLES IN INDIA

In the past decade, hundreds of seizures involving thousands of tortoises and freshwater turtles have been reported in India (Badola *et al*., 2019; Badola & Gautam, 2022; Sengottuvel, *et al*., 2023), presenting a concerning scale and complex network of species exploitation.

An analysis of five years of seizures of tortoises and freshwater turtles (2011-2015) by Mendiratta *et al*. (2017) found at least half (15) of the 29 species found in India in illegal trade, with thousands of individuals seized in the assessed period. A 2019 analysis by TRAFFIC reported more than 11,000 tortoises and freshwater turtles belonging to 14 species in the illegal wildlife trade every year from September 2009–September 2019 in India (Badola *et al*., 2019). The analysis found the Indian star tortoise, Indian softshell turtle (*Nilssonia gangetica*), Indian flapshell turtle and spotted pond turtle (*Geoclemys hamiltonii*) to be the most seized species, with Uttar Pradesh and West Bengal identified as major hotspots.

In 2021, TRAFFIC issued an alert to the enforcement agencies to warn about the rise in poaching and illegal trade of tortoises and freshwater turtles in and around the Terai Arc Landscape, mainly in the select areas of Uttarakhand, Uttar Pradesh and Bihar, and their nearby regions of northern India (TRAFFIC, 2021). It was based on a study undertaken by TRAFFIC from November 2020 to January 2021, where over 6500 freshwater turtles were reported in illegal trade involving calipee and dead and alive Indian flapshell turtles, Indian softshell turtles and Indian peacock turtles (*Nilssonia hurum*). The analysis by TRAFFIC indicated poaching of freshwater turtles in the Indo Gangetic plains to supply markets within India and across the border in Bangladesh. It highlighted certain areas on the Uttar Pradesh and Uttarakhand border as poaching areas and holding sites, Bihar as a transit point and West Bengal as a demand point.

According to the newsletter by the Wildlife Crime Control Bureau (Wildlife Crime Control Bureau, 2022), the turtles used to source calipees are caught downstream of the Ganga plains. The calipees, once processed, are commonly trafficked through Etawah,

Brown roof turtle
© Dr Saket Badola

Etah, Mainpuri, Auraiya, Sultanpur, Amethi and Farrukhabad districts of Uttar Pradesh to Bangaon IN North 24 Paraganas and other border areas in West Bengal, according to TRAFFIC. The calipee then gets trafficked to Bangladesh, further destined for Southeast Asian countries, where they are in significant demand. The calipees are trafficked, mainly through trains and often disguised as tree barks.

From 2018 to 2021, the Wildlife Crime Control Bureau (WCCB) seized 565 kg of turtle calipee were seized (Wildlife Crime Control Bureau, 2022). Most seizures were from Uttar Pradesh and West Bengal, inside trains or at railway stations. One significant seizure involving around 270 kg of turtle calipee was seized in Malda, West Bengal, in November 2022 (Hindustan Times, 2022). According to news reports, the calipees were supposedly destined for Bangladesh.

In another seizure in January 2024, 36 kg of dried turtle calipees were seized at Etawah Railway Station in Uttar Pradesh (The Times of India, 2024). According to news reports, the calipees were sourced from Uttar Pradesh and Madhya Pradesh and were destined for West Bengal. According to their website, WCCB has conducted several seizures to curb the illicit trade of tortoises and freshwater turtles in 2024 (Wildlife Crime Control Bureau, n.d.). In Uttar Pradesh, 745 turtles (species not mentioned) were seized in January; 54 Indian roofed turtles and 31 spotted pond turtles were seized in April; and 191 Indian roofed turtles in May. In West Bengal, two tortoises (species not mentioned) were seized in April and Indian softshell turtles (quantity not mentioned) were seized in February. In March, five Indian star tortoises were seized from Gujarat. In Madhya Pradesh in March, six Indian flapshell turtles were seized in two different seizures, and two of the turtles were seized alongside pangolin scales.

An analysis by Sengottuvel *et al*. (2023) of the illegal trade of tortoises and freshwater turtles reported the seizure of more than 21,000 tortoises and hardshell turtles and 53,000 softshell turtles in at least 118 and 103 incidents, respectively, from 2013 to 2019. The analysis identified the difference in the trafficking network for tortoise, hardshell and softshell turtles depending on the demand for the species. The trafficking of tortoises and hardshell turtles was found to have a more organised network with more international connections and spread over a larger geographical scale than the softshell turtle trafficking network.

Other studies supported the prevalence of Gangetic plains (Mendiratta *et al*., 2017; Sengottuvel *et*

Tricarinate hill turtle
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al., 2023), and the states of Uttar Pradesh and West Bengal (Leupen, 2018; Badola *et al*., 2019; Sengottuvel *et al*., 2023) in the trafficking route of tortoises and freshwater turtles. Chennai (Leupen, 2018; Badola & Gautam, 2022; Sengottuvel *et al*., 2023) has also been identified as a prevalent part of the trafficking network. The prevalence of these regions in the trafficking network can be credited to the significant population of freshwater turtles and proximity to international borders.

GROWING TRADE IN EXOTIC SPECIES

A concerning issue in wildlife trafficking is the increasing demand for exotic tortoises and freshwater turtles in India, as reflected by the seizure incidents in the past (Badola & Gautam, 2022; Gautam & Fernandes, 2023). From the giant Aldabra tortoise (*Aldabrachelys gigantea*), one of the world's largest tortoises (Hasnat, 2020) to the red-eared slider turtle (*Trachemys scripta elegans*), among the most invasive species in the world, all have been seized in India in the past few years.

An insight into wildlife trafficking through India's airport from 2011-2020 found a large quantity of exotic species of turtles being trafficked (Badola & Gautam, 2022). Red-eared slider turtles represented the highest quantity of live exotic species reported during the observed period, followed by the Chinese pond turtle (*Mauremys reevesii*). Red-eared slider turtles continue to be seized in huge quantities in India, with 6850 live turtles seized at Tiruchirappalli International Airport, Tamil Nadu in June 2023 (The Hindu Bureau, 2023). At the Chennai International Airport, Tamil Nadu, over 5000 turtles were seized in April 2024 (The Times of India, 2024), over 4900 turtles in September 2024 (The Hindu Bureau, 2024) and 5193 turtles in December 2024 (Express News Service, 2024).

The exotic species trade threatens native species and their habitat when these exotic species are deliberately abandoned or released. These species often turn invasive, competing with native species for space and resources and negatively impacting habitats. Many exotic species also carry the risk of zoonotic diseases for humans and wildlife alike, especially in habitats where they are introduced since they are often trafficked in unhygienic and stressful conditions. On the other hand, exotic species are also often taken from their habitats in the wild; thus, their native population and habitat may be severely impacted by their loss.

CONCLUSION

Tortoises and freshwater turtles of India are persistently targeted by traffickers to supply to national and international markets. Along with threats to their habitat, the illegal trade significantly impacts the species population, especially the ones already threatened with extinction.

Strong national and international legislation and their implementation, cross border cooperation, research, capacity building of enforcement agencies, awareness about the importance of tortoises and freshwater turtles and highlighting the effects of illegal trafficking are critical for safeguarding them. Studies of the tortoise and freshwater turtle species found in India are also needed to understand their physiology, population, habitat, distribution, and threats. Findings from these studies will be instrumental in forming effective policies for conserving the species and their habitat.

Coordination among enforcement agencies is also crucial in curbing the illegal trade of tortoises and freshwater turtles across states and international borders. Effective coordination would allow for the sharing of intelligence and provide support for successful seizures, investigation and prosecution of wildlife offenders and dismantling organised crime networks. Effective prosecution with appropriate punishments and fines is critical to discourage traffickers from repeating offences.

There is also a need to incorporate modern techniques such as using Artificial Intelligence to predict poaching hotspots, monitor the internet for illegal trade, recognise wildlife contrabands in the scanned images of luggage and cargo, and identify altered or forgotten certificates and permits to curb the illicit trade.

Further enhancement of the capacity of enforcement agencies requires access to resources like identification tools (*Identification Cards - Tortoises and Freshwater Turtles, 2019*) and technological interventions such as DNA analysis, improved scanning equipment, and digital investigation tools. Engaging wildlife sniffer dogs for patrolling trafficking routes, including railway stations and airports, can also help detect the trafficking of illegally traded species more effectively.

The important role of creating awareness among the buyers can not be undermined. People need to be made aware of the prohibitions on owning native species, the regulations for exotic species and the punishment for offences against the law.

Red-eared slider turtle
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TABLE 1: LEGAL AND CONSERVATION STATUS OF TORTOISES AND FRESHWATER WATER TURTLES IN INDIA

COMMON NAME AS PER WILD LIFE (PROTECTION) ACT, 1972	SCIENTIFIC NAME	IUCN STATUS	LISTING UNDER CITES APPENDICES	LISTING UNDER THE WILD LIFE (PROTECTION) ACT, 1972, SCHEDULES
Asian giant softshell turtle	*Pelochelys cantorii*	Critically Endangered	II	I
Asian giant tortoise	*Manouria emys*	Critically Endangered	II	I
Asiatic softshell turtle	*Amyda cartilaginea*	Vulnerable	II	I
Assam leaf turtle *Asian leaf turtle	*Cyclemys gemeli*	Near Threatened	II	II
Assam roofed turtle	*Pangshura sylhetensis*	Critically Endangered	II	I
Black softshell turtle	*Nilssonia nigricans*	Critically Endangered	I	I
Brown roofed turtle	*Pangshura smithii*	Near Threatened	II	II
Cochin forest cane turtle	*Vijayachelys silvatica*	Endangered	II	I
Crowned river turtle	*Hardella thurjii*	Endangered	II	I
Elongated tortoise *Sal forest tortoise	*lndotestudo elongata*	Critically Endangered	II	I
Impressed tortoise	*Manouria impressa*	Endangered	II	-
Indian black turtle	*Melanochelys trijuga*	Least Concern	II	II
Indian eyed turtle	*Morenia petersi*	Endangered	II	I
Indian flapshell turtle	*Lissemys punctata*	Vulnerable	II	I
Indian narrow-headed softshell turtle	*Chitra indica*	Endangered	II	I
Indian roofed turtle	*Pangshura tecta*	Vulnerable	I	I
Indian softshell turtle	*Nilssonia gangetica*	Endangered	I	I
Indian star tortoise	*Geochelone elegans*	Vulnerable	I	I
Indian tent turtle	*Pangshura tentoria*	Least Concern	II	I
Keeled box turtle	*Cuora mouhotii*	Endangered	II	I
Leith's softshell turtle	*Nilssonia leithii*	Critically Endangered	I	I
Northern river terrapin	*Batagur baska*	Critically Endangered	I	I
Peacock softshell turtle	*Nilssonia hurum*	Endangered	I	I
Red-crowned roofed turtle	*Batagur kachuga*	Critically Endangered	I	I
Southeast Asian box turtle *Amboina box turtle	*Cuora amboinensis*	Endangered	II	I
Spotted pond turtle	*Geoclemys hamiltonii*	Endangered	I	I
Three-striped roofed turtle	*Batagur dhongoka*	Critically Endangered	II	I
Travancore tortoise	*Indotestudo travancorica*	Vulnerable	II	I
Tricarinate hill turtle	*Melanochelys tricarinata*	Endangered	I	I

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INTERVIEW

MANAGING THE WILD

By Somreet Bhattacharya

Ashish Gaur at the Rajaji Tiger Reserve, Uttarakhand
© WWF-India

It was a proud moment for India, as Ashish Gaur, a forest guard deployed with the Rajaji Tiger Reserve, Uttarakhand, for over twenty years, represented the country in the 10th IRF World Ranger Congress 2024. He shared his experience of managing human-wildlife conflict in a highly fragmented landscape like the Rajaji Tiger Reserve and adapting new age technology into on ground enforcement work. Gaur, who had left his private job to take up the role of a forester, was motivated by the passion that was passed onto him by his father and grandfather.

The 10th IRF World Ranger Congress 2024 was held at Hyeres, France, between 7-11 October 2024. The Congress brings together rangers from all over the world, giving them an opportunity to learn new skills, share knowledge and create partnerships.

What inspired you to become a forest ranger, and what has kept you in this profession?

I am a third generation forester. My grandfather, father, and uncles were all forest guards, and their lives inspired me to join a similar profession and become a forest ranger.

I pursued my Bachelor of Sciences and passed out in 2001, only to join a private company. The job provided me with a good salary, but the lure of the forest was always in my veins. I quit my job in 2010 and applied for the position of forest guard in the Uttarakhand Forest Department and began my journey as a forester.

"The lure of the forest was always in my veins"

Would you share a memorable encounter with wildlife, and what did you learn?

In 2021, on a sunny afternoon during the monsoons, my assistant and I patrolled the forest near the Ganga River, where we found drag marks. We presumed it was a leopard that had dragged a kill inside the forests since Rajaji has a good population of leopards. As we started to follow the drag marks, we heard a roar, and a tiger leapt out of the bush on us. As its paw swished past me, it missed my ear by a few inches. The tiger landed in a bush across the trail and prepared to pounce again. I fired in the air with my service shotgun to scare the tiger, but it did not budge.

The tiger and I looked at each other for two odd minutes, which seemed an eternity. I was sweating, and I tried to load another round into my gun, but it jammed. To our luck, the tiger slowly stepped out of its crouch and walked past us to the kill. This unnerving experience taught me a valuable lesson of never to trail a carnivore's kill.

Gaur helping install a camera trap at Rajaji Tiger Reserve, Uttarakhand
© WWF-India

Ashish Gaur
© WWF-India

How has technology recently changed how you monitor and protect wildlife?

Technology is a boon, given the nature of our work, that requires us to understand our surroundings deeply. Using drones, GPS devices, or even smart sticks (sticks with a low powered tazer to ward off aggressive animals) have helped us in our day to day wildlife monitoring efforts. It also allows us to sensitise and alert the communities about the presence of wildlife and, in turn, helps to reduce negative human-wildlife interactions.

What are some unique challenges of protecting wildlife in Rajaji specifically, compared to other reserves you may have worked in?

I have devoted my service to Rajaji Tiger Reserve and have not worked with others. Though I have visited other reserves, I can confidently say that Rajaji is unique in its ways.

With human habitations surrounding Rajaji, managing and protecting wildlife is challenging. Local communities around the forests also have rights over the forest and often use forest resources. Due to shrinking forests and encroachments, wild animals stray into the villages, leading to human-wildlife conflict. Managing this conflict is Rajaji's biggest challenge, and we, as the forest department, try to balance both sides.

Gaur with his colleague on patrol
© WWF-India

From your experience, what role does the local community play in supporting conservation efforts?

The local communities and wildlife have coexisted and shared forests for ages. Nobody understands the forests like the local communities. Therefore, they can play a huge role in wildlife conservation, protection, and forest management. They help identify threats such as illegal wildlife trade and human-wildlife conflict and can also support mitigating these.

Would you encourage your children to take up this profession?

Yes. I strongly recommend that my children join the Indian Forest Services. I feel there is a bright future for people with a career in this. The forest across our country needs attention; together, we can work towards a better future.

"Seeing the forest thrive due to our efforts is my biggest motivation. The forest is my family."

Gaur at Rajaji Tiger Reserve, Uttarakhand
© WWF-India

"We have been progressively incorporating new technology for forest management, yielding promising results."

How do you and your team handle medical emergencies involving injured wildlife?

We have a standard operating procedure for every wild animal. A drone tracks the injured animal, and once its position is established, a team moves it in to capture it and conduct the appropriate medical procedures. We have been progressively incorporating new technology for forest management, yielding promising results.

What is the most rewarding part of your work? What keeps you motivated during challenging times?

The most rewarding part of my work is that it keeps me in the forests. My wife and children live nearby, and I visit them occasionally. Seeing the forest thrive due to our efforts is my biggest motivation. The forest is my first family.

Tiger at Rajaji Tiger Reserve, Uttarakhand
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