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editor's note

Cover art **Anarya**

Welcome to the first issue of 2025. I was all set to summarise the contents of this edition, when I realised that there's something much more important to say.

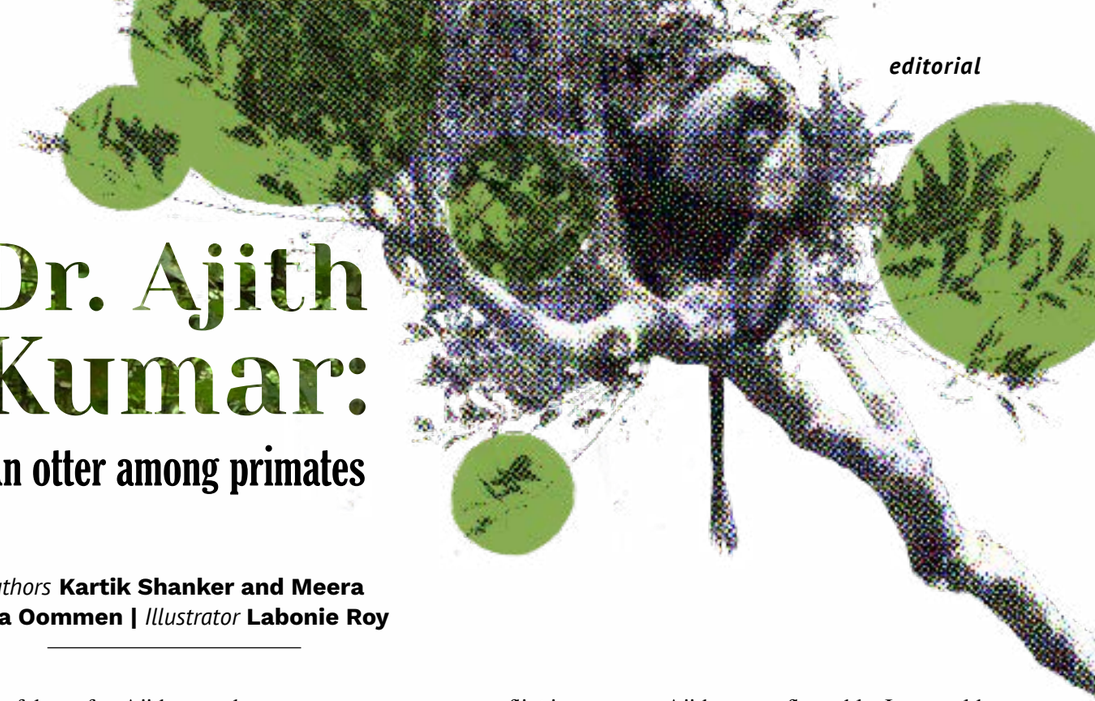
For more than 17 months, we have witnessed the ongoing genocide being committed by Israel in Gaza. With over 15,000 Palestinian children dead, nobody is safe—not doctors, paramedics, international aid workers, journalists or civilians. Since October 2023, over 70,000 tons of bombs—the equivalent of two nuclear bombs—have been dropped on this narrow strip of land between the Jordan River and the Mediterranean Sea.

While perhaps less appalling than the cost of human lives, the 'war' has doubtless had environmental impacts. UNEP's preliminary findings (published in March 2024) reported staggering amounts of air pollution from the relentless aerial bombardment, water pollution with the collapse of solid waste management facilities and contamination of drinking water, "281,000 tonnes of planet-warming gases released in the first 60 days" and widespread disease.

What's happening in Palestine is an intersection of everything we care about—human rights, social justice, climate and environmental justice, disability rights, queer rights, and more. May we never forget. Free Palestine.

P.S. This editorial represents my views alone and does not necessarily reflect those of the contributors.

– *Devathi Parashuram*



Dr. Ajith Kumar:

An otter among primates

Authors **Kartik Shanker and Meera Anna Oommen | *Illustrator* Labonie Roy**

A couple of days after Ajith passed away, a message on the WhatsApp group for his memorial enquired about his cat. But Malli would be fine because she inhabited many homes. Much like his beloved cat, Ajith had many institutional homes, and each one thought he belonged to them. As did each of the hundreds on the WA group and innumerable others. Ajith had a special place in everyone's life.

Many encomiums have and will be written, as they should be. Ajith was an extraordinary person, in the true sense of that word. He was a passionate primatologist and exceptional wildlife biologist, but so are many others. He had an unquenchable thirst for travel to India's wildest places, but he shared that with his brethren. He was a fine scientist, but he was not alone in that. He was a kind mentor and colleague, but some others are too.

Ajith was more than all that. His endless charm, the constant wit, an almost inexplicable calm in the face of all the slings and arrows of life such as it is, endeared him to just about everyone he encountered. To his academic colleagues, government officials, forest officers, students; to his own mentors, his peers, the next generation, the one after that, the list goes on and on. In a community where success is measured by individual brilliance, Ajith was the finest of collaborators. In an ecosystem where conservationists hold vitriolic, polarised opinions, Ajith walked the tightrope with ease, as if it were a stroll in his favourite forest. In a field where conflict is common, Ajith was unflappable. In a world where pettiness abounds, Ajith was generous to a fault with his boundless enthusiasm. With his stories, his ideas, with his affection.

Ajith began his research career in 1974 following a Master's degree in Zoology from the University of Kerala. As a research fellow at the Zoological Survey of India in the late 1970s, his academic journey started with the enigmatic lion-tailed macaque *(Macaca silenus)* in the forests of the Western Ghats. In 1987, he went on to complete a doctoral degree, the first on the species, at the University of Cambridge, under the guidance of Professor David Chivers.

Photo credit: Divya Mudappa and T. R. Shankar Raman

Following his return, Ajith went on to teach and guide research at India's premier wildlife institutions, such as the Wildlife Institute of India (WII), Dehradun and the Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore. During this period, he led several research projects not only related to primatology but also dealing with rainforest ecology and fragmentation, species diversity and small mammal ecology and conservation. He guided several students during this period and many of them have continued his legacy, becoming experts in their own right.

In 2004, with the Wildlife Conservation Society, the Centre for Wildlife Sciences and other like-minded institutions, Ajith established the Master's Programme in Wildlife Biology and Conservation at the National Centre for Biological Sciences, Bangalore. With over 10 batches of students from different parts of India and beyond, this programme is currently one of the most sought after and productive enterprises in the Indian conservation sphere. During these years, Ajith also served as an advisor and mentor to many wildlife and conservation organisations in India. In 2024, fulfilling a long-held dream, Ajith conceptualised and convened the Indian Wildlife Ecology Conference (IWEC) which was attended by researchers from all over the country. Both the Master's course at NCBS as well as the IWEC conference will continue to benefit from his legacy and vision.

To have your (strong) points of view, and yet accommodate a diversity of others, in fact to embrace them, is a very special skill. Ajith was thus uniquely positioned to be the founding director of his Master's programme, which he led and advised for 20 years. He also brought that particular flavour to the many faculty positions and advisory roles he held in institutions across the country in his professional career.

Above all this, he was the teller of tales, a purveyor of odd ideas, a connoisseur of cheap rum, a fine fryer of fish (!) and an irresistible wave of merriment. He often said that he wanted to be reborn as an otter. Their love of water, their fondness for fish, some things about their social structure perhaps, resonated with him. Words will fail to capture all that was Ajith, his ineffable aura. Ajith Kumar may have passed away, but he will live long in all our memories. What better tribute can we pay than to try to be just that little bit more like him.

Kartik Shanker *is Faculty at the Centre for Ecological Sciences, Indian Institute of Science, Bangalore. He and* **Meera Anna Oommen** *are Founding Trustees of Dakshin Foundation.*

Labonie Roy *is a mixed media illustrator and currently works as the Managing Editor of Art and Design at Current Conservation Magazine.*

Restoration is expensive, but technology can help

Author **Samantha Andres** | *Illustrator* **Deepika Nandan**

Target 2 of the Kunming-Montreal Global Biodiversity Framework calls for approximately 1 billion hectares of degraded land worldwide to be under effective restoration by 2030—just five years from now. While there is considerable optimism and passion supporting this ambitious global target, the financial costs and feasibility of ecological restoration significantly influence whether it can be achieved.

The problem is that restoration is expensive. Extensive research is often required to make informed decisions about where to implement specific actions, and labour-intensive processes such as native species revegetation plantings are typically needed. Restoration also requires long-term commitment and maintenance to ensure the success of ecological recovery efforts, further adding to costs.

To answer the global call for restoration, new technologies that are both cost-effective and scalable are required to help ease the burden on the restoration industry. One such technology—the use of drones—has increased in popularity in recent years and can be used across many aspects of the restoration journey. For instance, there are drones that are capable of dispersing large quantities of seed, enabling revegetation across difficult-to-access and remote terrains.

Although this new method offers the promise of scaling up restoration while alleviating labour costs, how does it compare to more well-established planting approaches?

Practitioners and policymakers planning for restoration urgently require guidance on how to accurately forecast restoration costs to help make decisions about what actions to implement, and where. However, comparisons of restoration costs are often limited and poorly documented. This makes it difficult to predict the potential costs of any given action. Each project is unique, with varying contexts (such as site remoteness, country and currency), requirements (such as maintenance needs, method of implementation) and scales, all of which influence overall costs.

Our research has developed a new, one-of-a-kind framework that allows for flexible yet consistent cost reporting to enable practitioners to equitably compare restoration methods. We demonstrate the application of our framework using a case study where we compare two restoration planting

methods: 1) revegetating with native seedlings grown in a nursery, and 2) using planting drones to conduct seeding. We then compared variation in components of costs between both planting methods, and investigated how total costs varied with context and scale by populating our restoration case study costs across small (1 hectare), medium (10-100 hectares) and large (1,000 hectares) projects.

We showed that both methods exhibit economies of scale where the per-hectare change in cost relative to a 1-hectare planting decreased with each increase in scale. However, the economies of scale were greater for drone seeding. This finding was attributed to the higher costs required to propagate tubestock—young plants that are usually between 5–15 cm tall and ready for planting—in a nursery compared to seeds, resulting in higher consumable costs. Additionally, labour time and associated costs were higher for seedling plantings because the number of staff required to undertake a planting was greater compared to drone-facilitated plantings.

Our framework allows conservation managers to consider costs as well as project feasibility, such as labour time and project team availability, when planning a restoration project and selecting the correct planting methods that are suitable in the context of their project.

While our study focused on the costs of restoration, this is only half the story; different methods of planting may deliver different benefits over time. We also considered the potential benefits of each method using literature and theory. We expect that seedling plantings typically result in restoration benefits earlier in a project—plants mature two to five years earlier—compared to seed-based plantings. Depending on a project's objectives and timeframes for delivering conservation benefits, this can help managers consider cost-effectiveness as a measure of both costs and benefits.

Our research demonstrates that drone-facilitated seeding is an important asset to the restoration community and can be combined with more interventionist methods such as seedling plantings to deliver large-scale revegetation plantings. Moreover, our cost reporting framework provides the context and clarity required by practitioners and funders to make complex financial decisions when planning for the restoration of ecosystems.

Further Reading

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Samantha Andres ***is a conservation scientist and sustainability expert who blends ecological research with policy to advance equitable, data-driven environmental solutions.***

Deepika Nandan ***is an illustrator, animator, and tattoo artist. Using location and context-specific media, she investigates the biosphere and human impacts on it.***

Wild neighbours:
Living among nature

Author **Justin French** | *Illustrator* **Deepti Megh**

As urban landscapes grow and change, wildlife living alongside us face countless issues and increased pressures. Habitat fragmentation, competition for food and resources, smaller home ranges, climate change, and artificial sounds and lights are just a few of the challenges they face. Amazingly, we've seen many species adapt to these circumstances and learn to live in our urban environments. However, they can't do it alone and still need help.

From my own experience working in wildlife rehabilitation—providing animal care and medical treatment—I've seen thousands of distressed animals with issues that wildlife can't adapt well to, many of which are caused by humans. The organisation I work with receives injured wildlife from dog and cat attacks, car strikes, fishing line entanglement, oil contamination from both natural seeps and human-caused spills, and much more.

Yet, despite the impact we might have on our local species, one thing is certain: people care about wildlife. With that in mind, we can all work to live better with our wild neighbours.

Traditional attitudes

Living around wildlife isn't new to many people. As the human population has burgeoned, cities have expanded to meet our demands. Urban sprawl changes natural habitats, leaving massively altered spaces for previous wild tenants. While some animals find this challenging, others stay and adapt to a new life around people. Many animals, such as squirrels, raccoons, opossums, and gulls, have done this. Some animals do this so well that there are now distinct differences between urban wildlife and their more rural counterparts.

Many of these species who make urban spaces their home are often not held in the best light and are considered nuisances. Bunnies eat garden plants, raccoons and opossums rummage through trash, and gulls steal food, making them appear unsavoury in many circumstances. In reality, our wild neighbours are only trying to eat a good meal, find a warm space, and stay safe. Unfortunately, as they are unwanted, people try to eliminate them.

This response isn't helped by the fact that much of the previous work that has gone into wildlife coexistence has been rather broad and disjointed. One popular avenue focuses on human-wildlife conflict to foster coexistence. This has led to work to deter larger, more popular species—animals such as coyotes, bears, and mountain lions.

While it is important to know how to live around these animals, focusing on approaches that emphasise avoidance tends to result in separation between humans and wildlife, rather than full coexistence. Research shows that a one-dimensional approach is often insufficient to support and maintain coexistence, and there are additional archetypes of coexistence that should be utilised as well.

Rethinking coexistence

To better facilitate coexistence, one such archetype focuses on mutual benefits and coadaptation. This relies on fostering an equal relationship with wildlife by helping them survive and receiving services in return, such as with opossums who help "clean up" carrion and control diseases such as rabies and Lyme disease by eating ticks.

This model of coexistence further highlights that while animals learn to adapt to live in our changing environment, we can adapt to their presence as well. This is important to consider because humans and animals living in a space together will have some influence on how the other behaves. By thinking of humans as equal actors with wildlife in these relationships, we can hopefully change perspectives from animals invading our space, to animals being our neighbours; after all, many animals were already in these places before we were.

Luckily, we can work on this in our own lives. While this may be newer in actual practice, many people are likely open to finding new ways to share our urban spaces. This can be highlighted through the success and support given to many wildlife rehabilitation centres, as people don't want wildlife to die or go away, but may not know how to coexist.

Another concept that can help promote wildlife coexistence is through understanding the behaviour of wildlife around us. This is often an overlooked part when looking for advice on how to act around wildlife. Human activity can greatly influence wild animals and drive them to change their behaviour over time; they may switch to nocturnal sleeping patterns, become bolder around humans, or have more immediate effects like losing a meal or abandoning their young. It is important to remember that for many animals seeing something big and loud like a human can be very threatening and scary. Taking time to learn some basic wildlife behaviours can help inform future human-wildlife encounters.

Solutions

While we might not be able to stop our influence on wildlife altogether, there are things we can be mindful of to coexist with them in an urban space. With a little effort, we can change how we think about many of the wild animals that live around us and create mutually safe environments.

Human activity can greatly stress wildlife. One way to decrease our impact on wildlife is to give them space. While seeing wildlife can be exciting, our presence can be frightening to some animals. For example, shorebirds that live and nest on beaches, such as snowy plovers, will abandon their nest if humans get too close during a beach trip. It's always a good idea to maintain a distance of 100 feet or more if possible.

Another common problem that wildlife encounter is finding a safe green space. We can help by understanding how different aspects of a yard may encourage or discourage the presence of wildlife. Food from bird feeders, sources of water, and dense foliage can all provide good and safe spots for wildlife to visit or live. You can also focus on native plants in your area, which are necessary for a healthy ecosystem. Providing these spots can help provide much-needed natural space for many species in an urban environment and can often be done in a way that keeps animals safe, as well as you and your family.

But it's important to understand that all kinds of wildlife could show up, and not only specific animals you may want to attract. However, you can pair creating suitable habitat for animals with renovating aspects of your home that aren't ideal for an animal to live in (such as a crawl space or a shed) by exclusion fencing or removing clutter. This lets both you and wildlife have a positive place to live together.

Ultimately, the best thing we can do for wildlife is protect natural habitats native to where we live. You can be a good neighbour to local wildlife by volunteering with groups in your area to protect green spaces and create habitats that are wildlife-friendly. These may be conservation groups that restore the environment or help wildlife in a local rehabilitation centre. By taking action yourself and sharing this information with others, we can all help to coexist with our wild neighbours.

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Justin French ***works in wildlife care dedicating their time to protect local species. They earned an M.A. in Biology and use their experience to support conservation in California.***

Deepti Megh ***is a queer visual storyteller, illustrator and animator. She loves choc milk, forests, and is the co-founder of the visual storytelling studio, Paus.***

The other citizen of Kolkata

Author and photographer **Arghya Adhikary**

WINNER OF THE FEBRUARY 2025 PHOTO STORY CONTEST

In the not-too-far-off past, Kolkata was home to a thriving population of Indian jackals (*Canis aureus indicus*, a subspecies of the golden jackal). Despite being confined to the outskirts, these intelligent creatures freely roamed the hidden nooks and corners of the city of joy, especially during the dark of night.

As urbanisation accelerated, their numbers gradually decreased, scattering them into small enclaves within the urban jungle. The encroachment on their territory forced these once-shy creatures to coexist in closer proximity to humans, which has significantly impacted their way of life.

One population of jackals has found comfort in a small part of north Kolkata, where they have displayed an incredible ability to adapt to their changing environment. They soon realised that the nearby dumping yards and bins kept by the city corporation at different locations contained an abundance of food, which was an utmost necessity for their survival. A carcass disposal ground of a state-operated veterinary college and hospital also serves as a treasure trove for these opportunistic feeders. Sometimes at night, they even enter the temporary shelters of nearby construction workers in search of a meal.

Along with a shrinking habitat, jackals face other challenges. Just as they rely on dumping yards for food, so do feral dogs and cats. While cats don't pose as much of a threat, the dogs are relentless in their pursuit of jackals. Yet, jackals are still thriving, showing a remarkable ability to adapt to change.

The transformation of Kolkata's urban landscape has led to the decline and fragmentation of the once-abundant jackal population. But this species' resilience and adaptability has been nothing short of astounding.

Arghya Adhikary is an engineer and passionate nature and wildlife photographer. He is a contributing photographer to WWF-India.

The great Indian bustard is on the precipice

Author **Arun B. Venkataraman** | *Illustrator* **Anarya**

As a conservation professional, I'm rarely emotional about the fate of any species and optimistically believe that someone, somewhere will save it from extinction. The plight of the great Indian bustard, however, is an exception and provokes a deep sense of frustration given that supposed government-mediated conservation could be a façade for insidiously permitting development within its habitat. The species continues to quietly slide away into obscurity. In this perspective, I attempt to demonstrate how prevailing government action has ignored and circumvented good science founded on conservation biology and landscape ecology principles to bring the species back from the brink.

The evidence that the Critically Endangered great Indian bustard is on the precipice is stark. Endemic to India, less than 150 individuals persist within what remains of our arid and semi-arid grasslands. Although previously widespread in India and Pakistan, perhaps more than 90 percent of the global population is now restricted to the Thar Desert. There are only a few other areas in the country where the species still survives. Presently, the Gujarat and Karnataka bustards are the only confirmed evidence of the species outside the Thar Desert and these populations are certainly not viable.

I note with concern recent reports that as compared to 2023 when six individuals were seen in the Siruguppa grasslands in the Ballari district in Karnataka, only two were seen recently. In the Naliya Grassland (an Important Bird and Biodiversity Area) in the Kutch district of Gujarat, which previously supported a healthy population of bustards, there now appear to be only four females and no males.

Turning good conservation planning around

In my opinion, the government's recognition of the imminent threats faced by great Indian bustards indeed began safeguarding the species through robust scientific research and planning. Through funds from the Compensatory Afforestation Management and Planning Authority (CAMPA) in 2020, it financed a study—conducted by the Wildlife Institute of India (WII)—in 4,200 km^2 of bustard habitat in and around the Desert National Park in Rajasthan. The study found that transmission lines killed 84,000 birds of multiple species annually. The great Indian bustard is particularly prone to collision due to its large size, limited frontal vision and heavy weight—and many died through collisions with transmission lines.

The WII study also included systematic field surveys of bustard presence and satellite telemetry of several individuals across the Thar Desert. From these surveys, three areas were earmarked for safeguarding the species based on intensity of habitat utilisation: priority (13,000 km^2), potential (78,500 km^2) and additional important areas (around 6600 km^2).

In April 2021, the Supreme Court—recognising the threat that transmission lines and wind turbines posed to the great Indian bustard—ordered that overhead transmission lines in priority and potential bustard habitats in Rajasthan and Gujarat be underground. The Central government, however, maintained that it's impossible to follow this order due to costs and other factors. The Supreme Court then decided to rescind the 2021 order, resulting in a fresh judgement in April 2024 that overturned years of good research and planning.

An insightful opinion piece by Debadityo Sinha for NDTV on April 11, 2024 indicates how facetious this ruling was, especially the Central government's arguments that other threats are more significant than the impact of transmission lines, that prevailing technical transmission issues exist with undergrounding transmission lines and, rather sweepingly, that climate change will impact all biodiversity in the Thar Desert. Sinha's key point is that "while this judgement is rooted in complying with climate change agreements, it contradicts our commitment to conventions such as the Conventions on Biological Diversity and Migratory Species (India was instrumental in categorising the great Indian bustard as a migratory species)".

I further question the scientific and moral wisdom behind the Ministry of Environment, Forests and Climate Change sanctioning INR 56 crores (US$ 67 million) in July 2024 from CAMPA funds to restore populations of the great Indian bustard through captive breeding, reintroduction to the wild, and habitat restoration. While these seem bold steps to save the species from extinction, they sidestep the real issues behind the likely path to extinction for the species, and appear to be a controversial "offset", fraught with uncertainty in terms of success and falling short of holistically safeguarding the Thar Desert habitat of the species.

The need for landscape-scale planning

In my opinion, there is justification for demarcating a large potential area. Both the WII surveys and those carried out by the Bombay Natural History Society (BNHS) in 2020–21, found great Indian bustard aggregations in the Desert National Park and the Pokharan Firing Range in the priority area. But bustards also dispersed southwest of the Pokharan Firing Range outside the priority area. Furthermore, less than 20 years ago, individuals were recorded north and east of the firing range.

These data indicate that while the bustards are largely confined to two aggregations, excursions from the priority area occur. Additionally, I'm certain that climate change influencing water and food resources and future land use could cause dispersals to areas where the species has not been seen before.

Bustard home ranges typically average around 100 km^2. But long-term telemetry data collected by WII indicate that the population today is far more fragmented than when the species was distributed across western Rajasthan. There could be several reasons for this.

For instance, intrusions such as transmission lines or wind turbines could restrict dispersal. During my visits to the bustard priority area, I was astounded by the high density of transmission lines criss-crossing a landscape with spectacular biodiversity. These structures serve as a grim reminder that for several soaring birds, aerial space is also habitat and needs to be considered in landscape planning. Moreover, the 2020 WII study indicated that where transmission line densities increased, the great Indian bustard went locally extinct.

Art by Anarya
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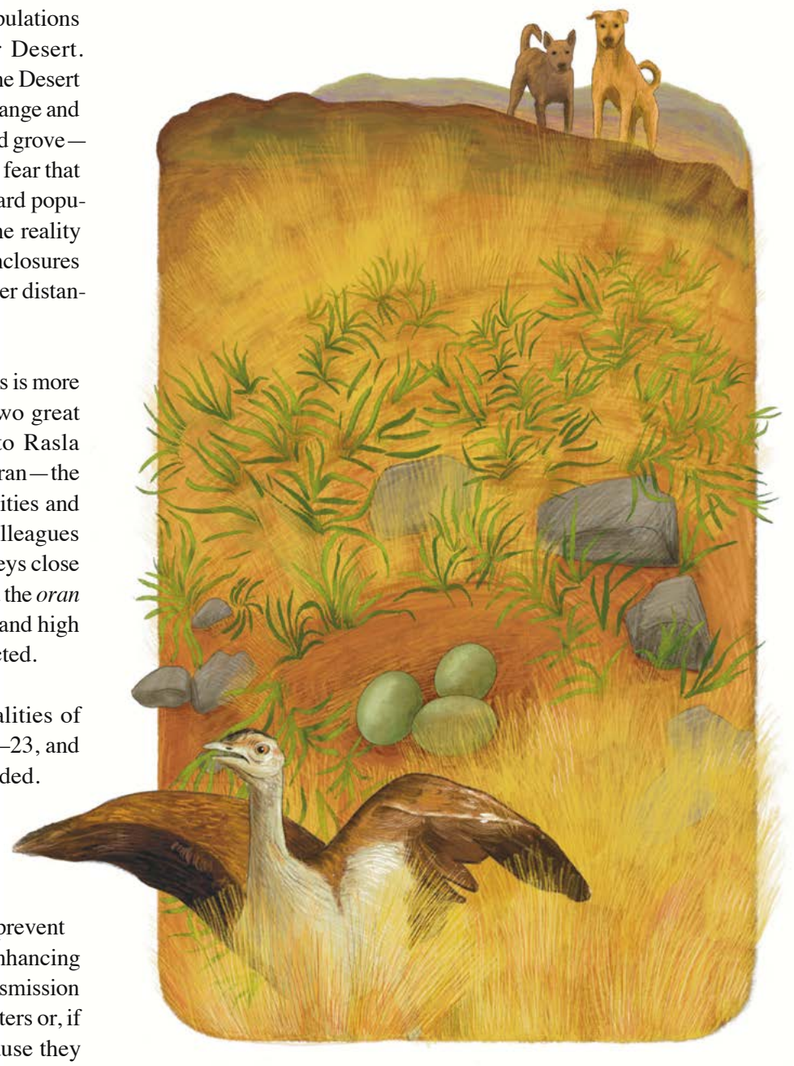
The government conservation strategy for the great Indian bustard currently includes:

1. Demarcation of grassland enclosures—thought to be breeding and foraging areas for the bustard—by keeping them predator-free. The 2020 WII study reports that the feral dog populations in the Thar Desert landscape increased sixfold between 2015–17. Feral dogs predate on bustard nests and are believed to be a significant catalyst for their extinction.
2. Removing invasive tree and shrub species, particularly *Prosopis juliflora* as this does not allow natural grass growth, which is preferred habitat for the species.
3. Preventing incompatible land use, such as agriculture.
4. Banning the use of malathion, a pesticide which was used intensively to control a locust infestation in 2019, and which was linked to bustard declines in the WII report. The pesticide is potentially harmful to birds and could affect bustards through contamination of water resources and foraging areas.

Mitigating these threats could make these enclosures important source sub-populations for bustard recovery in the Thar Desert. Several enclosures already exist in the Desert National Park, the Pokharan Firing Range and adjacent to the Degrai Oran—a sacred grove—outside the priority area. However, I fear that akin to the decline of the small bustard populations in Karnataka and Gujarat, the reality is that they cannot survive in these enclosures alone and need to disperse over longer distances for foraging and breeding.



The isolation of these sub-populations is more pronounced than perceived. The two great Indian bustard enclosures close to Rasla village are adjacent to the Degrai Oran—the grove revered by the local communities and utilised frequently by bustards. Colleagues who have carried out extensive surveys close to these enclosures have reported that the *oran* is surrounded by transmission lines and high mortality of bustards could be expected.

There have been three known fatalities of great Indian bustards between 2020–23, and perhaps others that were not recorded. Central Electrical Authority guidelines require power lines in bustard habitats be equipped with bird flight diverters—devices installed on transmission lines that prevent birds from colliding with them by enhancing the visibility of the lines. Several transmission lines in this region do not have diverters or, if present, have limited efficacy because they are old and faded and do not contrast with the background. The absolute disregard for any norms to save the species is shockingly evident here and this disregard persists elsewhere despite regulations.

Human-induced mortality of great Indian bustards in these small, isolated sub-populations is catastrophic. A paper published by Suthirta Dutta and colleagues from WII in 2010 predicts that populations of less than 25 individuals have a 67–100 percent probability of going extinct in 100 years, if human-induced mortality is not completely controlled.

These results are ominous today. First, fragmented sub-populations are smaller than in the past, and even without human-induced mortality, are prone to extinction. Second, mortality from collision with transmission lines and wind turbine blades may occur more frequently than observed. The 2020 WII study reported an estimated 18 bustards could die each year from collisions with transmission lines.

Scientific solutions exist but delays are perilous

Why are we delaying pertinent actions to save the species? Several organisations, including WII, BNHS, Corbett Foundation and incredibly diligent grassroots conservation organisations, have provided adequate data and well-founded solutions for the conservation of the great Indian bustard.

As to where the power transmission lines should go underground the answer is obvious—those surrounding enclosures are priorities. The 2020 report demarcated certain areas as "critical migration areas", allowing for dispersal and genetic exchange between isolated sub-populations. Undergrounding power lines in these areas could significantly reduce mortality. Debadityo Sinha, in his opinion piece, argued that costs for undergrounding are only 3–5 percent of the earnings from power generation. Given the environmental costs, typically never considered in a cost-benefit analysis, these costs are not prohibitive!

In other great Indian bustard areas with records of bustard presence in the last five years, diverters should be mandatory. The efficacy of diverters in reducing collision risk is not yet scientifically established. However, there is some guidance available from a related species—the Great Bustard *(Otis tarda)*, found in parts of Europe and northern Asia. While the species has also been heavily impacted through collisions with transmission lines, there is a natural tendency to avoid transmission lines which could be enhanced through diverters.

A call for immediate action

We cannot let the great Indian bustard go extinct on our watch. That would be a travesty of environmental as well as climate justice. Excellent studies indicate that 10 percent of carbon sequestration in California occurs because of the Mojave Desert, also threatened by renewable energy expansion. Opening the Thar Desert to rampant renewable energy development would destroy unique habitats for numerous threatened and migratory species, the ecosystem services it provides, and ultimately our faith in the government commitment to safeguarding our unique biodiversity. The Bishnoi community has protected the desert tirelessly and cannot be let down!

In December 2024, the Supreme Court directed the Rajasthan state government to identify and notify its sacred groves (such as *orans*). An earlier Centrally Empowered Commission recommendation asking the state government to identify sacred groves and to declare sacred groves as "deemed forests", barring highly fragmented ones, was delayed due to the state's own interpretation of a "deemed forest". This resulted in an affidavit objecting to the delay leading to the 2024 judgment further clarifying that the "deemed forest" classification should not depend on the size or extent of the groves, but instead focus solely on their purpose and cultural and ecological significance to the local community.

This judgement, despite the long delay potentially undermining conservation of threatened species like the great Indian bustard, could secure vital habitat in *orans*, especially when implemented with local communities. Safeguarding *orans* through legal action could also influence the location of transmission lines and wind turbines and prevent catastrophic fragmentation of the sacred groves, enhancing dispersal of bustards.

The balance between honouring India's climate change commitments and preventing the great Indian bustard from going extinct is entirely feasible and requires:

1. Scrupulously protecting the source sub-populations from the threats described above
2. Ensuring that all existing and future transmission

lines are undergrounded in and around enclosures. The zone of undergrounding around the enclosures can be guided by the bustard habitat utilisation data from WII telemetry studies.

3. That existing and future transmission lines in the critical migration area are undergrounded
4. That bird flight diverters are made mandatory at other locations in the priority and potential areas where bustard presence has been reliably recorded in the last five years
5. That the Supreme Court empowers the committee to monitor the above actions and penalise defaulters

These actions should be ably guided by scores of scientists, conservationists, communities and government agencies. Let's hope that the Supreme Court acts urgently and wisely to secure a national heritage.

Note: This article was inspired by the author's deep concern for the fate of the great Indian bustard, especially given that pragmatic but unheeded solutions exist to prevent the species' extinction. He has worked extensively across the bustard landscapes in Rajasthan and Gujarat. The opinions expressed in the article are his personal views and do not represent those of any organisations he works with.

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Arun Venkataraman ***is a conservation and sustainability professional with 35 years of experience in India, Southeast Asia and Africa. He presently advises international financial institutions and corporates on best practices to manage risks to biodiversity.***

Anarya ***is a freelance illustrator and art educator based in Delhi. She works as Programmes Manager for Artreach India***

Wings of change:

Conserving the glory of India

Authors **Sarika Baidya and Ritam Dey**

Illustrator **Reshu Singh**

Butterflies play a crucial role in the ecosystem—as pollinators, but also as prey for a wide range of predators, in addition to being bioindicators that signal the health of the environment. Their conservation in turn will lead to the bottom-up preservation of the entire habitat.

However, a lack of data on the life history and ecology of several butterflies poses a serious challenge to designing proper conservation interventions for the concerned species. One striking example of this is Ludlow's Bhutan glory, a species that is rare in the wild and classified as Endangered on the IUCN Red List.

Ludlow's Bhutan glory *(Bhutanitis ludlowi)* was first discovered by British naturalists Frank Ludlow and George Sheriff in 1933–34 in upper Trashiyangtse Valley, Bhutan. Alfred Gabriel formally described the species in 1942. In 2009, after a significant gap of 67 years, it was rediscovered in the same region. The butterfly was then considered endemic to Bhutan, following which the government took steps to study the species.

An expedition was soon arranged in the Trashiyangtse region, which reported more observations of the species from the Trashiyangtse Valley and small pockets of Bumdeling Wildlife Sanctuary. Along with his team, Tshering Dendup—Chief Forestry Officer of Pemagatshel Divisional Forest Office, Department of Forests and Park Services—documented the life history of Ludlow's Bhutan glory. The species was then designated as the National Butterfly by the government of Bhutan.

Across the border

In 2011, three years after the rediscovery of Ludlow's Bhutan glory in Bhutan, the species was first recorded in the neighbouring northeastern Indian state of Arunachal Pradesh. Later expeditions recorded more observations from Eaglenest Wildlife Sanctuary. While these findings significantly expanded the species' range outside Bhutan—where it was previously considered endemic to the country—it is still only known to occur in a few localities across this range.

Despite being a protected species under Schedule I of the Wildlife Protection Act (1972), there are no projects or policies in place to conserve the globally threatened Ludlow's Bhutan glory across its limited range in India. Moreover, there is a complete lack of information on the population status and life history of the species in the country.

The first photographic record of an early stage in the life cycle of Ludlow's Bhutan glory was obtained in 2018 from Eaglenest Wildlife Sanctuary. In 2023, we—colleagues from Nature Mates-Nature Club, a Kolkata-based NGO dedicated to butterfly conservation across the country—initiated the first project in India focused on this species.

Through this project, we are studying the life cycle of Ludlow's Bhutan glory as well as conducting awareness campaigns to involve the local community and state Forest Department staff in our conservation efforts. We are also working closely with the staff to estimate the population of the species. Despite the difficult mountainous terrain and unfavourable weather conditions, our team found a good number of adults inside the sanctuary.

Grave danger

Its highly restricted range and distribution make Ludlow's Bhutan glory extremely vulnerable to extinction, even with slight changes in its environment. Unfortunately, the Indian population of the species is threatened by habitat loss and disturbance as well as illegal trade.

Like all other butterflies, Ludlow's Bhutan glory is heavily reliant on its larval host plant *Aristolochia griffithii* and specific plants for nectar. The forests of Eaglenest Wildlife Sanctuary have seen a recent surge in unplanned developmental activities, which are often accompanied by indiscriminate logging, leading to the destruction of important resource plants for the species. Ludlow's Bhutan glory is also internationally traded on account of its beauty as well as rarity in the wild. It is therefore listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which includes species that are not traded in large numbers but could be vulnerable if trade increases.

The way forward

Conservation efforts at Eaglenest Wildlife Sanctuary are mostly focused on birds and big mammals, while insects such as butterflies go unnoticed. Hence, we are working to incorporate butterflies into the existing ecotourism model followed by the local community. To this end, we conducted butterfly walks to spread awareness, which in turn will boost our efforts to conserve Ludlow's Bhutan glory through the active participation of local people.

We are also collaborating with the Forest Department and members from the local Community Reserve Forest to increase vigilance and prevent illegal collection of Ludlow's Bhutan glory—an initiative supported by the Conservation Leadership Programme.

The long-term conservation of this magnificent butterfly requires a holistic approach and relies on strong cooperation between local stakeholders, community members and administration.

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Sarika Baidya *is a new-age lepidopterist bridging the gap between community and conservation in India. Her work focuses on research and conservation of butterflies and their habitat.*

Ritam Dey *is a butterfly conservationist from Nature Mates-Nature Club, India. He works to spread awareness for insect conservation through his camera lens.*

Reshu Singh *is a visual artist and illustrator. She was one of three Indians amongst 100 women comic creators across the world whose work was curated and exhibited by Paul Gravett and Olivia Ahmed at House of Illustration, London in 2016.*

Are international conservation agreements for migratory shorebirds effective?

Authors **Eduardo Gallo-Cajiao, Tiffany H. Morrison and Richard A. Fuller**
Illustrator **Divya Ribeiro**

Migratory shorebirds are the ultimate globetrotters. Each year, they repeat a cycle of breeding primarily at high latitudes in the northern hemisphere and migrating south when winter hits. These bird populations are generally declining, with some species listed as threatened and at least one as extinct. It is clear that international cooperation for their conservation is needed given their vast movements and multiple threats. However, while multiple international agreements have been negotiated for their conservation, evaluation of such conservation tools has generally lagged. Without such assessments, we do not know whether these agreements are effective at all on achieving their conservation goals, and how they can be potentially strengthened.

International agreements are a well-known fixture of migratory shorebird conservation in the Asia-Pacific, a region also known as the East Asian-Australasian Flyway (EAAF). So, a look at these agreements in the EAAF may provide clues to inform ways to advance the conservation of these birds. There are now 28 such international agreements across the flyway. Against this backdrop, a key question relevant to conservation is whether this set of agreements covers the full life cycle of migratory shorebirds within the flyway relative to their threats. With two pressing and imminent threats to migratory shorebirds in the EAAF, namely habitat loss and hunting, we studied what such agreements cover, how they enable coordination, and how well they protect the flyway by country and shorebirds' migratory cycle. Our research adopted a network analysis approach drawing on membership to international agreements, as well as on where shorebird species occur and how they move from country to country.

Encouragingly, we discovered that the sets of agreements for addressing habitat loss and hunting cover the entire flyway, though with some variations. First, there are more agreements for habitat conservation than for hunting management. Second, agreements for the former include a variety of members, such as national governments, intergovernmental organisations and non-governmental organisations, whereas members were restricted to national governments in hunting management agreements.

Third, the agreements around habitat conservation were built into a more resilient and robust network given by redundancy and reinforcement of connections among members, while those for hunting management resulted in a weaker network given by fewer connections. The East Asian-Australasian Flyway Partnership emerged as the most central habitat conservation agreement in this flyway. Notably, there is no agreement in place for flyway-wide coordination of hunting management. Lastly, agreements for habitat conservation covered more thoroughly the migratory cycle of shorebirds than those focused on hunting management.

Many of these agreements have emerged as a response to conservation pressures, such as coastal reclamation. However, it is important to acknowledge that each new agreement draws personal energy, political attention and financial resources for negotiation. So, shorebird conservationists should ask themselves if any additional agreements are worthwhile, considering there are already 19 agreements for habitat conservation and 16 for hunting management within this flyway.

Taking into account the limited resources available for conservation, such as capacity, funding and political bandwidth, we recommend that the habitat conservation issue requires no further agreements, but does need a much stronger focus on implementation. Conversely, while implementation of existing agreements for hunting management is important, a central coordinating agreement is still lacking. Hunting management needs to account for flyway-wide mortality and quota allocations per country, which are currently non-existent so a new agreement is needed.

Ultimately, international agreements for conserving migratory species need to be evaluated for the degree to which they fit the threats at hand. With such evaluations, conservationists need to make hard decisions on whether the focus should be on implementation or on addressing gaps by negotiating new agreements.

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Eduardo Gallo-Cajiao *is an assistant professor of environmental governance with research interests in biodiversity conservation drawing on political science and ecology.*

Tiffany H. Morrison *is a professor of political geography, her work combines human geography and political science to address the institutional and relational dimensions of complex environmental change.*

Richard A. Fuller *is a professor in conservation and biodiversity, his work spans multiple disciplines, from the ecology and conservation of mobile species to understanding what explains variation in conservation concern among the human population.*

Divya Ribeiro *is a graphic and information designer from Goa, India. She currently works as a designer at Revisual Labs.*

Breaking the silence:
Menstruation and fieldwork

Author **Chaithra Girish** | *Illustrator* **Reshu Singh**

Fieldwork is a crucial part of my education and career as a wildlife biologist. However, a significant challenge that people who menstruate (including women, such as myself) face during these trips is their monthly cycle. The reality of managing periods in the field can be daunting, yet this issue is rarely discussed or addressed. Changing a sanitary napkin or tampon requires privacy, water and a hygienic way to dispose of used products. These basic necessities are often unavailable in remote locations, with access to clean, private restrooms being a rare luxury.

Hidden impacts

While carrying out fieldwork in India's Western Ghats, I have had to endure hours of discomfort because there was no appropriate place to change my sanitary napkin. The constant worry about leakage and the unease of not being able to clean myself properly made it difficult to concentrate on my work. The anxiety and distress that come with such situations are overwhelming, and they definitely affected my focus and productivity.

My sister, who is currently pursuing a Master's in Geological Sciences, faced even more challenging conditions during her fieldwork in the Himalayas in Uttarakhand, India. She recalls one particular day when she was menstruating and had severe cramps. They were mapping a remote area, and there were no restrooms for miles. After several hours, she couldn't bear the discomfort any longer and had to leave the group to find a place to change her sanitary napkin. Recognising her distress, her professor arranged a car for her to travel to the nearest toilet. This trip to the closest village took a significant amount of time, during which she missed important parts of the fieldwork.

While this solution provided temporary relief, it highlighted the extreme measures that menstruators often have to take to manage their menstrual hygiene in such challenging conditions. While my sister was lucky to have empathetic colleagues on this day, this is not the most common experience for most people who menstruate in the field.

Women often feel compelled to push through discomfort and health risks to avoid falling behind in their work. This can lead to burnout, health issues, and a sense of isolation. There's also the fear of being perceived as less capable or dedicated. This prevents many women from voicing their needs or seeking help. In a field where your physical endurance and resilience are often equated with professional competence, that is particularly concerning.

Let's do something about it

The stigma surrounding menstruation during fieldwork perpetuates a lack of understanding and support. Educating all team members, regardless of gender, about menstrual health is crucial. By fostering awareness and empathy, we can create a more supportive environment where menstruating individuals feel understood and accommodated.

Field sites often lack basic sanitary facilities, posing challenges for managing menstrual hygiene. It's essential to equip field locations with clean and accessible options. Portable solutions such as sanitary tents or designated areas for changing menstrual products should be provided where permanent facilities aren't feasible. Ensuring these facilities are available can significantly alleviate the stress and discomfort menstruators face during fieldwork.

Menstruation can bring physical pain and varying energy levels. Allowing for flexible scheduling and planning acknowledges these needs. By accommodating menstruating team members, we can help them manage their discomfort effectively while maintaining productivity and focus in the field.

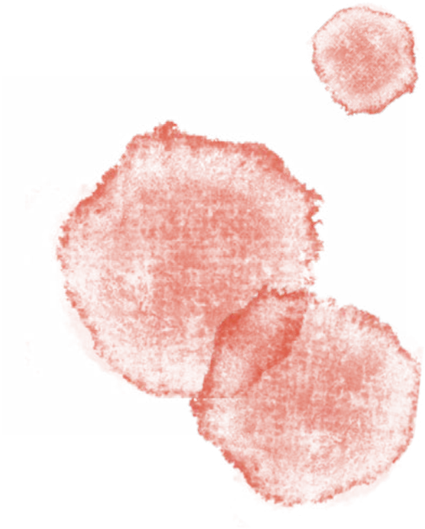
Creating a supportive network where menstruators can openly discuss their menstrual needs is crucial. This can include establishing mentorship programmes or designating team leaders who understand these challenges firsthand. Such support systems not only provide practical guidance, but also foster a culture where menstruation is recognised and respected as a normal aspect of health in fieldwork settings.

Institutional policies play a significant role in addressing menstrual health during fieldwork. Advocating for policies that recognise and accommodate menstrual needs is essential. This could involve provisions for menstrual leave, inclusion of menstrual hygiene products in field kits, or guidelines for creating inclusive fieldwork environments that prioritise menstrual health.

Addressing the challenges of menstruation during fieldwork isn't just a matter of convenience, but of equity and inclusion. By acknowledging and accommodating these needs, we can create a safer and more supportive environment for all researchers and professionals. It's time to break the silence and make menstrual health a priority in the field.

Chaithra Girish *completed her MSs in Wildlife Studies from the Kerala Veterinary and Animal Sciences University. She is passionate about nature conservation and education. She educates through popular science articles, webinars and seminars for students and the public. She is also a published author, and writes fiction in the form of stories, poems and essays.*

Reshu Singh *is a visual artist and illustrator. She was one of three Indians amongst 100 women comic creators across the world whose work was curated and exhibited by Paul Gravett and Olivia Ahmed at House of Illustration, London in 2016.*



A settlement in Ngorongoro Conservation Area, Tanzania
Photo credit: Arash Ghoddousi

How can researchers best support local conservation?

Authors **Helen Newing and Arash Ghoddousi**

Indigenous peoples manage about a quarter of the world's lands, and many of them are working passionately to protect the species and habitats that these lands contain. However, rather than supporting them, external conservation projects often exclude them. This can have devastating impacts on their rights and well-being, and it can worsen conservation outcomes.

Conservation organisations and governments have made repeated commitments over several decades to shift to more inclusive practices, but so far, this shift has failed to happen. However, in 2022, 196 governments signed a new Global Biodiversity Framework at the 15th Convention on Biological Diversity that reiterates their commitment to shift to inclusive, rights-based conservation, and this has created a window of opportunity to transform the way that conservation is done.

In a recent paper in *Biological Conservation*, we set out 14 good practice principles on what researchers need to do to contribute to this change. A fundamental step is for researchers themselves to develop more inclusive ways of working with Indigenous peoples and local communities. This means opening up spaces for their participation at all stages of the research process. They will obviously vary in how and how much they wish to be involved, but the ideal is for research to be planned jointly and to address shared conservation concerns.

One example is the Indigenous-led Transformative Pathways project, in which biologists at the University of Oxford are supporting the Indigenous Ogiek in Kenya to monitor biodiversity on their lands. This will enable them to document and improve their biodiversity stewardship, which will also support their land claims.

Similarly in the Arctic, researchers and Indigenous Inuit peoples have co-designed research to monitor the local impacts of climate change, which are threatening their way of life.

Another important consideration in moving towards more inclusive conservation research is the choice of methods. Ideally, this choice should be made jointly, to best address the agreed research aims. Some methods, such as questionnaires, are good at generating quantitative data that can be analysed statistically and provide robust scientific evidence. Others, including many qualitative and transdisciplinary methods, are more suitable for developing an in-depth understanding of an issue, including by building on Indigenous and local knowledge and perspectives.

For example, participatory video has been used effectively in Guyana by Indigenous peoples, with support from researchers in the UK, to document their views and experiences of state-run protected areas and help mediate conflicts with the government authorities. A common option is to use a mix of quantitative, qualitative and transdisciplinary methods, and thus benefit from their complementary strengths.

Finally, conservation research with Indigenous peoples and local communities raises several ethical issues related to collective rights and impacts. These kinds of issues are not currently addressed in most research ethics protocols. Under international law, Indigenous peoples and some other groups have the right to participate in any decisions that may affect them, and to give or withhold their collective free, prior and informed consent for any activities on their customary lands. Therefore, researchers may need to obtain collective as well as individual consent for the research and the research should not go ahead unless consent is granted.

Consent must be fully informed, which means that the risks and potential impacts on communities need to be assessed jointly. This includes risks connected to how the research findings may be used. For example, conservation research is often designed to inform decisions by governments and others about spatial planning, development options, or about restrictions on natural resource use. These decisions may benefit local people, or they may have devastating impacts on them, including through forced evictions and dispossession.

While we are not suggesting that all research in conservation needs to be collaborative, more widespread adoption of collaborative approaches is a rational next step as we struggle to meet the immense challenges posed by the global environmental crisis. For this next step to be accomplished, conservation training curricula and research ethics protocols will need to be revised to incorporate the above considerations. Also, research funding and institutional requirements will need to become more flexible, enabling researchers to adapt to accommodate Indigenous timescales, knowledge systems and ways of working.

Mixed farm-forest landscape in Sabah, Malaysia
Photo credit: Helen Newing

Local people in Annapurna Conservation Area, Nepal
Photo credit: Arash Ghoddousi

Further Reading

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Helen Newing *is a research fellow at the University of Oxford. She works to strengthen social science perspectives and recognition of human rights in conservation.*

Arash Ghoddousi *is an assistant professor at Wageningen University. His research focuses on human-wildlife interactions, area-based conservation measures and monitoring methods.*

GO WILD! *Stories, Essays and Comics that Celebrate our Earth*

Edited by Bijal Vachharajani

Book review by **Mamata Pandya**

Several years ago I co-edited a book called *Walking the Wild Path*. We invited wildlife researchers and conservationists to share their early 'encounters' with wildlife, and the experiences that launched them onto a lifelong journey of exploration of the natural world. From Romulus Whitaker to R Sukumar, Isaac Kehimkar to Ravi Chellam and Shekar Dattatri, the stories shared the common element of how early exposure to nature led to a lifelong passion and engagement with nature and nature conservation.

Go Wild! a new book ably edited by Bijal Vachharajani, compiles inspirations from equally passionate nature lovers, across generations. From Bittu Sahgal, Zai Whitaker and Ranjit Lal, conservation stalwarts who inspired me when I embarked on my own journey as an environmental educator and writer, to brilliant young naturalists and illustrators who are continuing to carry the baton for a greener future, this book brings together diverse celebrations, and shared concerns.

Bittu Sahgal in 'My Nature Diary' celebrates the natural wonderland that is India, reminiscing about visits to unspoiled forests and pristine islands, even as he finds glimpses of wildlife in the heart of the concrete jungle that is Mumbai. Prerna Singh Bindra looks through the eyes of a baby elephant who admires his mama—the matriarch of a herd in forests which are increasingly being encroached and threatened, while Ranjit Lal peeps into the politics and machinations in an ant colony.

Kartik Shanker takes us on a rainy walk in the Western Ghats, exploring its history, discovering hidden treasures, and celebrating a carnival of dancing frogs; but also sharing the grave consequences of the fact that these oases of biodiversity are being engulfed by numerous threats.

From real forests to concrete jungles, many contributors to this compilation share vignettes of close encounters of the wild kind, even amidst the hurly-burly of urban life. Lavanya Karthik's balcony garden hosts a family of pigeons. A single palash tree in Chennai gives Yuvan Aves hours of wonderful observation as it changes through the seasons, and attracts a fascinating murmuration of starlings and other feathered friends. Meanwhile, Shabnam Minwalla weaves a moving story of three friends who try to save a beloved tree from greedy builders in 'The Banyan Tree of BD Kelkar Road'.

For the majority of children who live and grow in these urban jungles, these are reminders that nature and wildlife do not always have to mean tiger spotting in a dense jungle. That looking around us with fresh eyes can reveal a myriad of creatures big and small, some that have adapted to new environs; while some like Buddhiram Ulluji, the wise old owl in Ravikant Kisana's touching story mourns the changes wrought to the landscape by the passage of time.

To appreciate the present one must know the past. Have we ever wondered, as we pick products off the shop shelves in their packaged form, where they came from and how they got to us? Meghaa Gupta goes back in history to trace the origin of plants that we consume and use every day. The only time water bodies are in the news is when they are badly polluted or blamed for flooding in cities. Seema Mundoli and Harini Nagendra share the history of water bodies in three cities, and a reminder of the critical services that these used to provide, whereas today, disfigured or filled in and built over, these are a sad remnant of their old selves.

The authors paint powerful word pictures in their pieces. But the wonderful part of the compilation is that so many of the authors are also talented artists who express themselves in words as well as visuals. The book is a visual treat with a variety of artwork. Priya Kuriyan's colourful graphics tell a story of positive human-bird interaction. Salil Chaturvedi takes us on a photo tour with his wheelchair. We discover a teeming world in a tide pool through Rohan Chakravarty's quirky illustrations and supporting text. Nidhin Donald's single-colour, single-page sketch has enough details for one to discover something new every time. And Rajiv Eipe's beautifully executed mantis drawings are indeed chuckle-worthy! Prabha Mallya's cover and supporting illustrations pull it all together to make for an attractive browse-through before choosing which piece to dip into according to one's mood.

All the stories share similar concerns about the rapidly increasing threats to the natural environment from the ever-increasing encroachment by humans. And yet these are not gloom and doom scenarios. They reflect hope, and a sense that all is not lost. *Go Wild!* is the message that will inspire the next generation as they too start their journeys of exploration and discovery, which will lead to positive action.

As Zai Whitaker reminds us:

Just worrying about the planet —
That can't really help much, cannet?
We should match the worry
With some useful scurry,
And do our own little bit.

Mamata Pandya *has been an environmental educator for over three decades. She is also an instructional design consultant, writer, storyteller, and blogger based in Ahmedabad.*

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