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Living with leopards in the digital era *3* | When the land no longer feels like home *16* | Why do birds sing more at dawn? *24* | The challenges of successful bear reintroduction in the Alps *28*



Current Conservation carries the latest in research news from natural and social science facets of conservation, such as conservation biology, environmental history, anthropology, sociology, ecological economics and landscape ecology.

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Cover art **Karunya Baskar**

This year's record-shattering 'super' El Niño began in June, with sea surface temperatures expected to peak between November and December. El Niño is a global weather phenomenon that originates in the Pacific Ocean and occurs every 2–7 years, although it has grown more frequent in recent years. In India, five states have already declared drought following a monsoon deficit, with widespread crop loss, mounting debts, and farmer suicides.

Given this context, the timely cover story of our latest issue—written by Kalkivai Aneesha and beautifully illustrated by Karunya Baskar—tackles the impacts of climate-related disasters and mass displacement, especially the associated psychological distress called solastalgia. The undulating, unstable landmasses and dark tones of the cover perfectly elicit the dread of a looming climate apocalypse. Aneesha makes the case for embedding psychosocial safeguards into national climate policy as a necessary act of climate resilience.

Other thought-provoking articles in this issue include a sharp analysis of the linguistic inequality in global conservation policy, how increased visibility in the digital era is shaping human-leopard coexistence, what happens when conservation success is at odds with social priorities, and a whole lot more.

To pair the visuals with the sombre and academic themes of the issue, we challenged illustrators to limit their expression to greyscale, and bring in a colour of their choice to add dimension. We hope you enjoy this issue!

*– **Devathi Parashuram and Labonie Roy***

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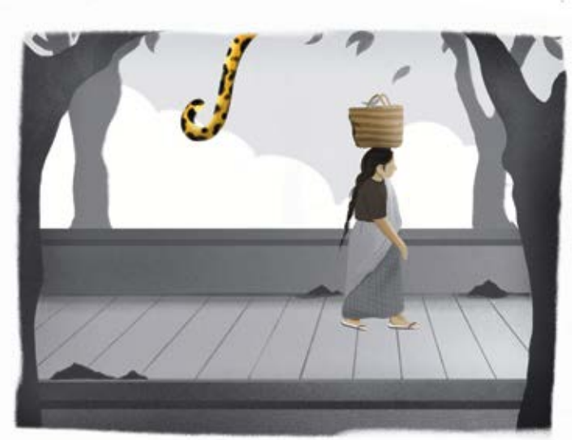
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Living with Leopards in the Digital Era

Authors **Mohmadnavaz Dahya, Aadil Kazi and Rohit Chaudhary** | *Illustrator* **Divya Ribeiro**





Leopards, known for their adaptability among large carnivores, have long coexisted with human communities across Asia and Africa. In India, they are found in almost every state, inhabiting forests, rugged hills, semi-urban areas, and farms. This high adaptability distinguishes them from other big cats such as lions and tigers, which need significant, undisturbed habitats. Leopards have learned to thrive in diverse environments, including sugarcane fields, tea estates, orchards, and city outskirts. For generations, rural people saw leopards as an integral, sometimes feared, part of their environment. Encountering a leopard or its pugmarks was not always a sign of danger; it was simply part of life in landscapes shared by humans and wildlife.

Over the past two decades, technological advancements have significantly altered the way humans and leopards coexist. The widespread use of surveillance devices, such as camera traps, CCTV, and smartphones, along with the extensive reach of social media, has altered the way wildlife encounters are perceived and understood. A leopard seen crossing a road, resting, or drinking water can now be instantly photographed, uploaded, and shared. What might have gone unnoticed once can now go viral, often with sensational headlines and alarmist comments. This evolving perception has transformed the image of the leopard from a silent neighbour to a potential threat, marking a shift from coexistence to conflict in many areas.

Shared landscapes

Leopards have historically shown remarkable resilience and adaptability. Their ability to survive in fragmented habitats and areas heavily altered by humans is largely thanks to their stealth, nocturnal habits, and highly versatile diet. Unlike tigers, which primarily depend on wild ungulates and dense forests, leopards can survive



on smaller prey and quickly adapt to available food sources, such as livestock, feral dogs, and pigs, where wild prey is limited. This opportunistic feeding behaviour allows them to thrive in environments that are unsuitable for many other large carnivores.

Invisibility plays a crucial role in maintaining coexistence. Leopards are often called 'ghosts of the forest' because they can remain unseen even near human settlements. For centuries, rural villagers were aware of their presence through indirect signs, such as tracks, scat, or occasional livestock kills, but seldom saw the animals directly. This invisibility created a psychological buffer, encouraging tolerance. People considered leopards as part of the environment without needing daily reminders of their closeness.

Cultural beliefs have historically fostered coexistence. In many regions of India, leopards feature in folklore, mythology, and local religious stories. Some communities view them as incarnations of local deities or guardians of sacred groves. This cultural acceptance reduced fear, enabling humans and leopards to coexist peacefully without ongoing conflict.

Increasing visibility

Camera traps, introduced in the 1990s, transformed wildlife research by offering ecologists unprecedented insights into elusive species, including their movement, population, and behavioural patterns. Created for scientific purposes, these devices have now spread beyond research, complemented by the rapid growth of CCTV networks in urban and rural areas. Although these technologies have enhanced our understanding and management of wildlife, they have also diminished the invisibility that once allowed for peaceful coexistence.

In the digital age, visibility often signals threat. A leopard spotted on camera is no longer just a sign of biodiversity; it is frequently viewed as a safety risk. Each new sighting or video can potentially cause panic, especially when shared widely on social media. News outlets often sensationalise these events, showing dramatic footage with alarming headlines. This creates a cycle of fear: greater visibility leads to more anxiety, prompting public demands for authorities to capture or eliminate the animals. Over time, this reduces acceptance and increases hostility, even among communities that have coexisted peacefully with leopards for generations.

Examples from across India clearly demonstrate this change. In Mumbai, for example, leopards that live within and near Sanjay Gandhi National Park have coexisted with over two million residents for a long time. Scientific research indicates that these leopards are skilled at avoiding humans and mainly feed on stray dogs. However, with CCTV cameras now present on almost every street and in every compound, leopard movements are recorded and shared online. Even non-threatening sightings can cause public concern, with residents calling for the immediate capture or relocation of leopards, despite evidence suggesting that translocated leopards often return or cause new conflicts elsewhere.

In rural areas of Maharashtra and Gujarat, sugarcane fields have become crucial habitats for leopards. These dense plantations provide shelter for females with cubs and an abundance of prey, including small mammals and dogs. Traditionally, local farmers have accepted this coexistence. However, videos showing leopards emerging from these fields often go viral on social media, where they are seen as threats. Such portrayals stigmatise local communities living near these animals, labelling them as residents of 'danger zones' and leading to unnecessary wildlife interventions.

In the hill regions of Uttarakhand and Himachal Pradesh, leopards have lived alongside mountain communities for hundreds of years. However, modern technology has shifted how these interactions are perceived. Incidents that once seemed isolated or manageable now attract widespread media coverage, fuelling the idea of a growing 'leopard threat'. Every attack or sighting is rapidly turned into a spectacle, often ignoring the ecological and social factors involved in human-leopard relations.

The growth of social media has also significantly changed how wildlife is discussed publicly. Leopard sightings are no longer confined to local news; they go viral and are widely shared, often losing ecological details. This digital spread has three main effects. First, it fosters the view of leopards as dangerous intruders, even if they aren't truly threatening. Second, it increases public pressure on Forest Department officials to respond quickly, often through capturing, relocating, or killing the animals, instead of supporting long-term coexistence. Third, it sustains harmful stereotypes that obscure the vital ecological functions of leopards as top predators and managers of prey populations.

Rethinking coexistence

Despite their controversial reputation, leopards play a vital role in ecosystem stability, even in areas altered by human activities. By hunting feral dogs, pigs, and herbivores, they regulate populations that could otherwise threaten crops, spread diseases, or outcompete native species. In farmland regions, their presence indirectly supports farmers by lowering crop damage from herbivores. Ecologically, leopards serve as barometers of environmental health, as their presence indicates healthy predator-prey dynamics and sufficient prey populations. The disappearance of leopards from these areas would suggest wider ecological decline and diminished ecosystem resilience.

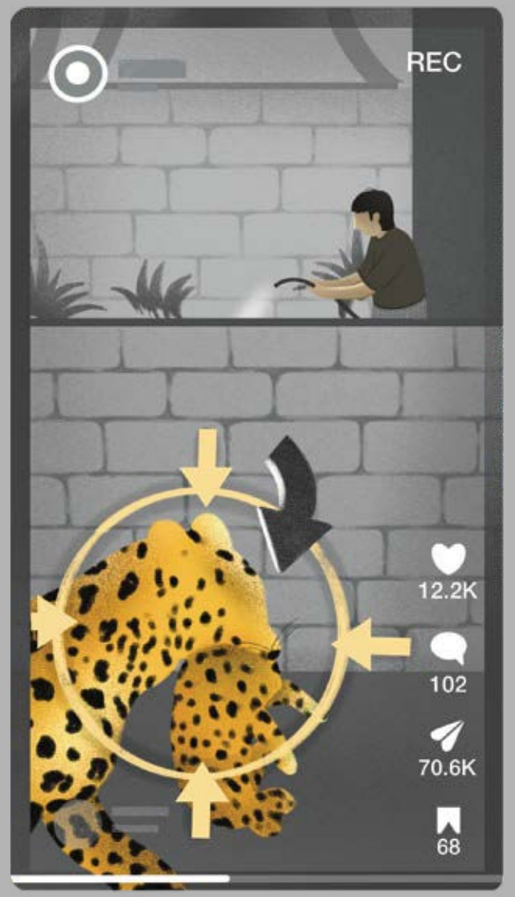
The primary issue today is not removing leopards from human areas, but changing human attitudes toward coexistence. While technology has sometimes increased fear, it can also support



conservation. Essential strategies include media outlets practising ethical reporting with ecological context and avoiding sensationalism. Community awareness programmes can educate residents about leopard behaviour and provide them with proper responses to encounters. Tools such as camera traps and GPS collars should be employed to promote understanding, focusing on scientific facts rather than fearmongering. Additionally, sharing stories of successful coexistence where leopards and people share space peacefully can challenge negative perceptions.

At the policy level, wildlife authorities should transition from reactive approaches, such as indiscriminate capture, to proactive coexistence strategies that emphasise education, monitoring, and conflict prevention. This involves enhancing livestock protection, restoring wild prey populations, and encouraging livelihood incentives that foster tolerance. By combining technology, educational efforts, and traditional ecological knowledge, it is possible to maintain landscapes that benefit both human communities and leopard populations.

Leopards have coexisted with humans for centuries, adapting to various environmental challenges. Recently, the change isn't in leopard behaviour but in how they are perceived, shaped by technology, media, and fear. In an era of omnipresent surveillance, leopards are no longer invisible, leading to reduced tolerance and coexistence. Recognising their ecological role and improving public understanding are crucial for restoring harmony. By leveraging technology as a tool for connection rather than division, communities can help ensure leopards remain vital parts of shared habitats, embodying resilience and coexistence rather than conflict.



Further Reading

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What things impress?

Author **Metolo Foyet** | *Illustrator* **Roeqin**



In the wide, arid scenery of South West Africa, the ancient stones, paintings, and petrified wood hold millennia-old stories. Yet, they are not just relics of the past—they serve as tangible metaphors for the complexities of modern conservation debates. My PhD fieldwork helped bring together not just the physical world but also the digital world of wildlife conservation discourse.

Standing timeless in Namibia's desert landscape, the first 'thing' to explore from my fieldwork was the Twyfelfontein engravings and the Bushmen paintings located nearby, both etched into the rocks of Damaraland. Though ancient and seemingly silent, they capture moments of human interaction with the environment that are still relevant today. They tell stories of a time long before—yet ironically so similar to—today's conservation debates; stories of survival, respect for wildlife, and the balance between humans and nature—a balance that has been disrupted by modern, Western-based conservation models.

These markings, mute as they may seem, speak volumes about the human connection to the land and its creatures. They are not just art forms but expressions of relationships between humans and non-humans. The rocks themselves seem to participate in this relationship, though they are often treated as mute. The stone, despite being non-living, has a kind of agency. It draws humans to it, commands reverence, and tells a story that isn't verbal but visual and felt. The Western-based conservation model, however, often reduces this relationship to scientific categorisations, sidelining the Indigenous knowledge systems that recognise the stone's deeper meanings.

The other 'thing' was the petrified wood. Particularly unique to the Damaraland region, it embodies both endurance and silence. Yet, it too is a repository of knowledge, waiting for us to decipher its story. On the surface, this stone-like material is scientifically classified as fossilised remnants of ancient forests. Standing silent and unchanged in the desert, it is another symbol of disruption. It speaks of time and transformation, having once been living, breathing trees, now turned to stone by the slow, almost invisible hand of time.

Yet, this description seems to fall short. The petrified wood isn't just an inert object; it holds layers of meaning, history, and relationships with the land and the people. It embodies a kind of muteness, a silence that mirrors the erasure of Indigenous voices and histories within conservation narratives; a muteness often imposed on rural communities in Namibia, whose livelihoods are deeply tied to the land and the wildlife. Just as the petrified wood is reduced to an object of scientific curiosity, the voices of these communities are often sidelined in policy debates.

In many ways, this petrified wood exists as a 'thing' but also as something beyond that—it holds an abstract veil of connection to the past. The Western conservation model, while focused on wildlife preservation, sometimes overlooks the intricate relationships that Indigenous people have with the environment—relationships that are as enduring and complex as the fossilised forest itself.

When the stone speaks

In my fieldwork, I not only engaged with these physical elements but also with the digital realm, where conversations about wildlife conservation unfold. Social media platforms serve as the modern-day 'rocks' upon which stakeholders carve out their positions, often in ways that abstract and distance the reality on the ground. Like the rock engravings, these digital debates capture a moment in time, yet they too can feel silent—devoid of the deeper, lived experiences of the communities impacted by conservation policies.

The challenge lies in interpreting both these ancient and digital inscriptions, understanding what is being said, and what remains unsaid. Both the stones of Damaraland and the social media conversations hold power, not in their noise, but in their silence. They remind us that conservation is not just about protecting wildlife, but also about recognising the stories that are etched into the land and the voices, both human and non-human, that remain unheard.

Social media, as part of my fieldwork, echoed this tension between the living and non-living, the voiced and the silenced. In online spaces, conversations between wildlife stakeholders often treat the landscape and the wildlife as 'things' to be managed, commodified, and controlled. Policy debates on platforms like Twitter (now X) or Facebook tend to decontextualise these natural elements, transforming them into abstract numbers or conservation targets. This reflects a simulacrum—an imitation of reality—where what is discussed online may not align with the complex, lived experiences of the rural communities affected by these policies. The Western framework creates an intimacy with the idea of conservation but ignores the intimate relationships between rural people and their environment.

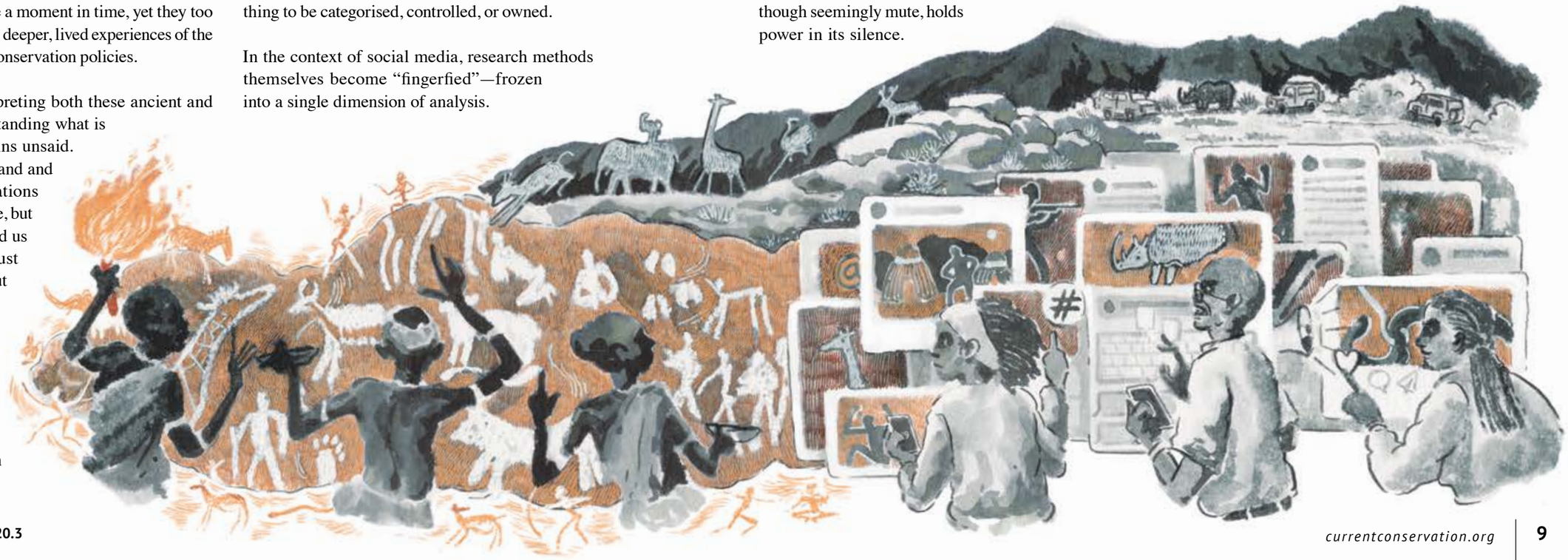
The violence done to these things—whether it's through Western conservation efforts or the forced belonging imposed on local communities through policy—begins with naming. In naming the petrified wood, the rocks, and the wildlife, we risk objectifying them, freezing their identity in the lens of Western science. This mirrors the violence done to people when names, identities, and histories are imposed on them. The lines between what is a 'thing' and what is living are thin, and the violence begins when we start treating living relationships as something to be categorised, controlled, or owned.

In the context of social media, research methods themselves become "fingerfied"—frozen into a single dimension of analysis. Capturing and interpreting online conversations can feel like reducing a living, fluid interaction into something static—a thing. Yet, the conversations around wildlife conservation are not neutral. They are shaped by cultural realities, power dynamics, and the legacies of colonialism, much like the petrified wood that remains as a silent witness to time.

Reclaiming African history—especially in the context of wildlife and land conservation—requires us to listen to the stones, to the silence of the more-than-human world, and to understand the relationships they hold with the people. The petrified wood, in its stillness, has agency. It shapes the way humans perceive and interact with the land, just as social media shapes the real-world consequences of policy. The violence of simplification—whether of a stone or a social relationship—reveals the tension between the objectified and the living, the thing and the human, both in Namibia's desert and in the digital field of social media.

Ultimately, things matter because of the feelings they evoke and the relationships they shape, whether they are ancient fossils or modern digital avatars. Understanding the force of things helps us recognise their agency, and in turn, question our own biases in how we relate to them—both in writing and in the world. The petrified wood, though seemingly mute, holds power in its silence. It speaks to the history of the land, the violence of colonialism, and the need to return to Indigenous ways of knowing that understand the world as a complex web of relationships between humans and the more-than-human and metaphysical world.

One thus wonders, did they silence us? Or did we silence ourselves?



Further Reading

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Metolo Foyet ***is a UNESCO World Heritage Expert. Currently affiliated with the University of Toronto, she studies how natural, biological, cultural and knowledge resources from the Congo Basin travel, generate global value, and shape futures.***

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Speaking *the* LANGUAGE of *life*



Authors **Diogo Veríssimo, Carolina Hazin, Maria Dias and Ricardo Rocha** | *Illustrator* **Hitesh Sonar**

It is coffee break time at a meeting of the Convention on Biological Diversity. Around the conference hall, small groups of delegates gather with steaming cups, their conversations flowing in a patchwork of languages.

A negotiator from Brazil shares with a colleague from Mozambique updates on new forest restoration targets. Across the room, scientists from Malaysia and Indonesia compare notes on coral reef monitoring in the Coral Triangle. Near the counter, representatives from France and Morocco discuss how to strengthen the next global review of collective progress towards the Kunming-Montreal Global Biodiversity Framework (GBF).

They are all here to serve a shared purpose—protecting life on Earth—yet their exchanges are shaped, and sometimes limited, by the languages they speak. Some turn to interpretation headsets, others to hesitant English, others still to gestures and patience. What connects these people is not only their commitment to biodiversity but the fragile thread of language that allows their cooperation to exist at all.

Linguistic barrier

In an international conservation meeting, the air hums with translation headsets, documents in multiple versions, and delegates waiting for their turn to speak. Yet beneath this choreography of diplomacy lies a quieter imbalance, one not of ideas but of languages.

Conservation is a global effort, but it is carried out through a remarkably narrow linguistic lens. The world's major environmental treaties such as the Convention on Biological Diversity (CBD) or the Convention on Migratory Species (CMS) largely operate in just three to six languages: English, French, Spanish, and, less consistently, Arabic, Chinese, and Russian. These languages were chosen for historical and political reasons, not ecological ones. As a result, the nations that hold the most biodiversity often find themselves outside the linguistic boundaries of global conservation.

This mismatch matters. The GBF, adopted in 2022, calls on all nations to live "in harmony with nature" by 2050. Research has long shown that language is more than a communication tool; it is a gatekeeper of participation and power. In global biodiversity meetings, English often becomes the default, especially in smaller circles such as Friends of the Chair or contact groups. Friends of the Chair is a very small group of chair-selected countries that have divergent views on specific clauses of one decision and come together with the aim of reaching a compromise. Contact groups are groups of countries that will actually negotiate language, line by line, of the decision in question. These are the groups where key compromises are actually achieved. Delegates who are not fluent may struggle to intervene, and their perspectives may be diluted or delayed by interpretation limits.

In our article titled 'Languages of life: A global perspective on linguistic priorities for biodiversity conservation' published in *Conservation Letters,* we explored whether the languages currently used by major international biodiversity agreements reflect where biodiversity is actually found. We noted that even when interpretation services exist, they are typically restricted to English, French, or Spanish, excluding many of the most spoken languages worldwide.

This linguistic inequality trickles down the policy chain. National agencies receive technical documents in unfamiliar languages. Field practitioners and local conservationists, those mostly responsible for turning global commitments into action, often work from secondhand summaries or partial translations. Over time, this creates a gap not just in understanding but in representation: whose science informs policy, whose priorities shape conservation goals, whose voices are heard at the table.

Beyond practicality, language barriers expose deeper questions of justice. For example, in conservation, this means the communities most intertwined with nature often have the least say in global decisions about it. We argue that linguistic accessibility is central, not peripheral, to the success of multilateral environmental governance. The loss of biodiversity, then, is not only ecological. It is also linguistic, a quiet erosion of understanding that undermines cooperation at every scale, from United Nations negotiations to a ranger's notebook in the field.

Mapping the languages of life

To understand how language shapes global conservation, we articulated a surprisingly simple question: which languages does the world's biodiversity 'live' in? We searched for data to identify where the highest levels of biodiversity, by taxonomic group, were located and which languages are spoken in those locations.

We began with one of the most comprehensive databases in conservation science, the IUCN Red List. We compiled the maps of the distribution of more than 33,000 species of mammals, birds, reptiles, amphibians, and corals. These groups

were chosen because they are comprehensively assessed in the IUCN Red List—which means that we have global maps of the distribution for virtually all species. Then, we overlaid a map of species richness of each of the groups with a map of languages spoken in different countries based on the work of Negret et al., 2022. For every country, we noted both the official language used for governance and the most spoken language used by its people.

By combining these two layers of information, we could see how species distributions overlap with linguistic boundaries. In other words, for each species, we asked: in what language is this species most likely to be "spoken about" by the people and policies that govern its range?

The results were revealing. When official languages were considered, Spanish and English emerged as the two dominant languages of biodiversity, each covering about a quarter of all species distributions. They were followed by Portuguese, French, and Malay, which together accounted for another quarter. But when the researchers looked instead at the most spoken languages, the picture changed considerably. English and French lost ground, while Malay gained prominence, especially in the marine-rich regions of Southeast Asia.

This shift highlights a simple truth: some of the languages where the highest levels of biodiversity for some taxa occur are not represented in many cases in the international policy arena. For example, coral species are concentrated in the Coral Triangle, spanning Malaysia, Indonesia, the Philippines, Timor-Leste, and Papua New Guinea. Yet few global conservation documents are ever translated into Malay or Bahasa Indonesia, the very languages spoken by the communities who manage these reefs.

Even Portuguese, which ranked above French in the study, is invisible in multilateral biodiversity fora. It is the official language of nine countries across South America, Africa, Europe, and Asia, including Brazil, Mozambique, and Timor-Leste, regions that together hold vast portions of the planet's biodiversity.

The pattern is clear. The biodiversity of the world is represented by a multilingual community of countries, but the international policies meant to protect it are most often not. The study's figures show that two non-UN official languages, Portuguese and Malay, are among the most relevant for global biodiversity, yet they remain largely ignored by Multilateral Environmental Agreements (MEAs).

This mismatch does more than complicate communication. It limits whose knowledge, science, and priorities inform conservation policy. As we put it, the languages of biodiversity conservation have evolved for political convenience, not ecological necessity. And that, we believe, needs to change.

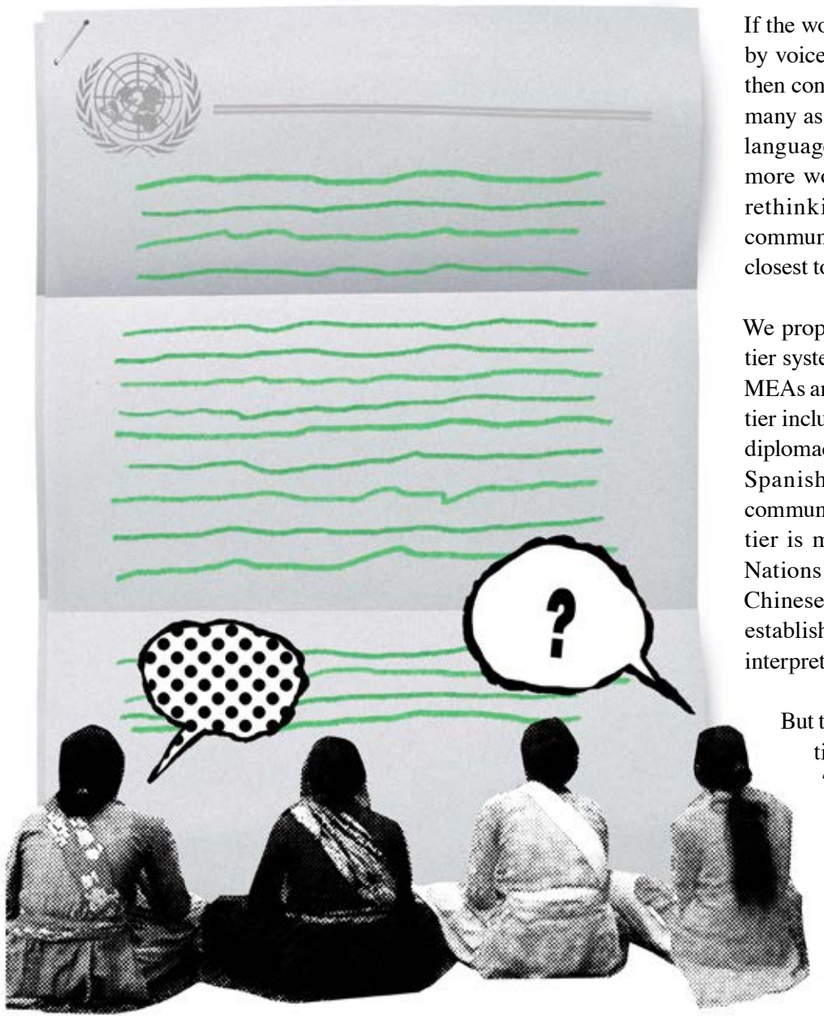
Words shape the world

If biodiversity conservation depends on cooperation, then language is the first bridge that must be built. Our findings make clear that language barriers are not a side note in conservation; they are a structural fault line running through it. The choice of official languages in multilateral agreements, such as English, French, and Spanish, reflects post-World War II diplomacy and the workings of the United Nations. But biodiversity does not follow the same map as politics. Some of the richest ecosystems on Earth are governed in languages that rarely appear in international conservation dialogues.

When major policy documents and technical manuals remain untranslated, the result is exclusion in slow motion. National agencies that receive these documents may lack the capacity to translate or interpret them accurately. Local conservation officers and field teams, who are responsible for turning broad policy goals into on-the-ground action, are often left with secondhand summaries or unofficial translations. This weakens implementation, but it also shapes whose knowledge counts as legitimate.

In practice, this means that international decisions about coral reefs in Indonesia or forest restoration in Mozambique are often informed by materials written in languages foreign to those who manage them. Even the most dedicated practitioners cannot apply what they cannot fully understand. As our study points out, countries with representatives who are not fully proficient in English are excluded from effectively participating in the decision-making process, and the same pattern repeats at national and local scales.

The issue goes deeper than efficiency. It is about justice and power. The dominance of certain languages in conservation determines which scientific studies are cited, which communities are consulted, and which forms of knowledge are seen as credible. A growing body of research has shown that much of the world's biodiversity science is written in non-English languages, yet remains overlooked in global assessments. When translation lags behind, local insights and Indigenous knowledge risk being silenced.



Language thus becomes both a mirror and a barrier. It reflects old hierarchies while quietly shaping new ones. Policies written for everyone but comprehended by few cannot foster true collaboration. The study reminds us that inclusivity in conservation is not achieved only through funding or representation, but also through the words we choose and the languages we use to speak for nature.

The future must be multilingual

If the world's biodiversity is represented by voices speaking in many languages, then conservation must learn to listen in many as well. We argue that solving the language gap is not just about adding more words to a document, but about rethinking how global conservation communicates with the people who live closest to nature.

We propose a practical solution: a four-tier system for prioritising translation in MEAs and global policy forums. The first tier includes the lingua francas of global diplomacy, such as English, French and Spanish, which allow countries to communicate across borders. The second tier is made up of the official United Nations languages, including Arabic, Chinese, Russian, which already have established systems for translation and interpretation.

But the real shift happens in the third tier. Here we suggest what we call 'biodiversity-priority languages'—those spoken in countries that hold a large share of the planet's species and ecosystems. Portuguese and Malay, for example, are used across

vast regions rich in tropical forests, coral reefs, and endemic wildlife. Yet these languages are almost absent from major biodiversity conventions. Translating technical guidance, reports, and training materials into these languages could make a direct difference for conservation officers and researchers who depend on them every day.

The fourth tier focuses on local and Indigenous languages, which play an irreplaceable role in the implementation of conservation policies. These are the languages in which people discuss fishing practices, forest use, and sacred landscapes. They carry generations of ecological knowledge that often remain invisible to formal policy frameworks. Including them, even through small steps such as community-led translation or local naming in educational materials, strengthens both equity and effectiveness.

We also recognise that language inclusion must be feasible. We do not call for every document to be translated into every language, but for a smarter, more strategic approach. We suggest partnerships, where various actors call for coordination in the translation and review of policy documents. This would correspond to the 'whole of society approach', as the Global Biodiversity Framework of the Convention on Biological Diversity calls for. Voluntary funding or regional networks could support this process, ensuring that the languages most relevant to biodiversity get the attention they deserve.

Technology could help too. Machine translation tools are becoming more accessible, but they cannot fully replace human understanding, especially for complex technical, scientific, or legal concepts. The study recommends hybrid systems that combine artificial intelligence with expert review to maintain accuracy while reducing costs. Another idea is to expand crowd-sourced translation, where local professionals and conservation students contribute to translating materials relevant to their regions, either by raising awareness about the relevance of translation and/or finding some sort of incentives for wider engagement. This not only improves context and quality but also builds local capacity and ownership.



Behind these technical suggestions lies a powerful message: conservation cannot be truly global if it speaks only a handful of languages. The biodiversity crisis demands cooperation from every level of society, from international diplomats to local field teams. And cooperation depends on comprehension. As we write in our paper: "An international conservation arena that truly embraces inclusivity must make greater efforts to acknowledge the rich linguistic diversity of humanity."

Language inclusion, then, is not an administrative exercise. It is an act of respect, a recognition that the protection of life on Earth begins with the ability to understand one another.

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When the land no longer feels like *home*

Author **Kalkivai Aneesha** | *Illustrator* **Karunya Baskar**

As climate change alters our landscapes, it's becoming increasingly difficult to ignore the emotional toll on our communities. Across India, average temperatures have risen by 0.7°C between 1901 and 2018, the frequency of extreme rainfall events has increased by 75 percent since the 1950s, and groundwater is being rapidly depleted. The Internal Displacement Monitoring Centre estimates that in 2024, floods, storms, and other climate-related disasters forced 5.4 million people to relocate within India. The impact of such loss goes beyond material or ecological damage, giving rise to a sense of psychological disorientation called solastalgia.

During my field visits to migrant communities on the fringes of Bangalore, I witnessed the human face of this invisible trauma. One encounter stayed with me. A young girl, her voice soft but steady, said: "Back home, the farmlands I ran in began to die from the heat. That made me sad. But I don't like this place either—it's not home."

She and her family hailed from northern Karnataka, where heatwaves and water scarcity have destroyed farmlands. Here in the city, they live in makeshift huts, surrounded by concrete and dust, disconnected from the soil that once sustained them. Their story, like many others, reflects not only the struggle against climate change but also the grief over a fading way of life.

The term solastalgia was coined by the Australian philosopher Glenn Albrecht in 2003 to describe a sense of distress people feel when their home environment is altered beyond recognition. Unlike nostalgia—which is the longing to return to a place that no longer exists—solastalgia is the longing for a home that is still there but has been rendered unrecognisable. It is about a particular type of loss that comes not from moving away but from watching the slow decline of one's world. Although it's being increasingly discussed within academic circles, it's not receiving its due in Indian policy and public discourse.

Solastalgia in the Indian context

A 2021 study by researchers from the Central University of South Bihar and the University of Allahabad interviewed 34 villagers in Gaya and Jehanabad, in the southern part of the state. They reported frequent heatwaves, erratic rainfall, delayed monsoons, dried-up water sources, and the disappearance of birds and trees, disrupting agricultural calendars—the seasonal patterns that guide planting and harvesting, as well as community practices. Participants described deep "worries and uncertainties" as they were forced to abandon traditional cropping, eroding their sense of self-worth and belonging.

In Hingalganj—a vulnerable deltaic area of the Indian Sundarbans, part of the world's largest contiguous mangrove forest—a 2022 study by Action Aid Association and the Professional Institute for Development and Socio-Environmental Management found that frequent cyclones, rising salinity, and repeated displacement have caused visible psychological distress among residents. The report revealed growing anxiety over food insecurity, erosion, embankment failures, and the loss of agricultural livelihoods. These stressors have contributed to mounting psychological pressure, particularly among women, who now bear the triple burden of earning an income, caring for children and elders, and managing disrupted households.





Art by Karunya Baskar
Current Conservation Issue 20.3
currentconservation.org

Alarmingly, the report also reveals cases of emotional trauma that have escalated into self-harm. Residents spoke of recurring emotional pain linked to the sudden deaths of loved ones, crop failures, and economic instability. For many, the trauma following Cyclone Aila in 2009 marked a breaking point, pushing them into cycles of hopelessness, indebtedness, and in some cases, suicidal ideation. While medical infrastructure in the area is limited, anecdotal evidence gathered during field interviews suggests a rise in untreated anxiety, insomnia, and psychosomatic conditions. The study called for urgent mental health interventions, integrated with climate resilience programmes, to support affected communities.

In the Nilgiris region of the Western Ghats—including Sathyamangalam, Masinagudi, and Wayanad—elephant corridors are being developed to mitigate the rising human-elephant conflict, which has been exacerbated by climate change, as forests dry and animals stray into villages. These corridors threaten to displace over 12,000 people, including hundreds of tribal families from communities including the Irula, Kurumba, and Mullu Kurumba. During my field visit to the Sathyamangalam Tiger Reserve, a Forest Officer explained that "no amount of monetary support could ever truly compensate for the loss of their land". For many, this loss is not merely physical but also psychological, severing ties to home, heritage, and identity.

Meanwhile, a looming crisis is unfolding in the Nicobar Islands, where plans to build an airport, port, and townships on Great Nicobar threaten to uproot the isolated Indigenous Shompen and Nicobarese tribes, who have had little outside contact. Though yet to occur, experts and human rights advocates warn of catastrophic consequences: destruction of mangroves, disruption of turtle nesting beaches, and the potential for solastalgia.

Across the world

Studies from the Pacific show that when isolated communities are uprooted or their environments eroded, solastalgia can appear long before relocation can take place, as fear, distress, and anticipatory grief. Research from the James Cook University of Queensland on Erub Island in the Torres Strait found that residents already expressed sadness, worry, and a loss of belonging as coastlines disappeared. A more recent collaborative study led by the UNSW Sydney (School of Psychology) in Australia and New Zealand described this as 'anticipatory solastalgia'—the psychological distress people feel in the present while anticipating environmental decline. Breaking such intimate bonds with land is often tantamount to destroying identity.

International research increasingly recognises the significant psychological impacts associated with solastalgia. In Australia—where the term was first coined—several studies, particularly involving farmers and Indigenous communities, have shown a strong correlation between environmental change and mental distress.

A national scoping review of 18 such studies confirmed widespread experiences of anxiety, depression, and a deep sense of loss tied to environmental degradation. Australia is also among the few countries where solastalgia has entered public health and climate adaptation conversations, though its inclusion in formal mental health services remains limited and uneven across regions. Communities with strong cultural ties to land are especially vulnerable to such distress, but they also demonstrate greater resilience when given culturally grounded mental health support.

During the 2019–20 Australian bushfires, surveys of over 2,000 residents found solastalgia strongly mediated the link between fire impact and mental health outcomes such as anxiety and depression, and even people geographically distant from the fires reported distress. Australian policymakers now advocate pre-emptive, land-based therapy, community mental health hubs, and cultural engagement to address solastalgia. After the fires, the National Centre for Epidemiology and Population Health called for a broad rollout of mental health resources in rural areas to counteract solastalgia.

In Canada and the United States, post-wildfire mental health research has increasingly identified solastalgia as a key factor contributing to rising cases of post-traumatic stress disorder (PTSD), depression, and anxiety. Communities affected by severe wildfires often report a negative psychological experience, not just from the immediate trauma of evacuation and loss, but from the long-term grief of seeing familiar landscapes permanently altered or destroyed. In response, mitigation strategies have included a combination of family-based therapy, government-provided financial aid, and community-centred recovery initiatives that help restore a sense of stability and agency.

In Canada's northern territory of Nunavut, where Indigenous Inuit communities face the compounded effects of climate change, these frameworks go further. Here, mental health programmes are being adapted to address "country food insecurity"—the decline in access to traditional hunting and fishing resources due to melting ice and disrupted ecosystems. Counselling services are paired with cultural revitalisation efforts, such as land-based healing, community feasts, and intergenerational storytelling, helping individuals not only process their grief but also reconnect with identity and tradition.

How India can learn—and lead

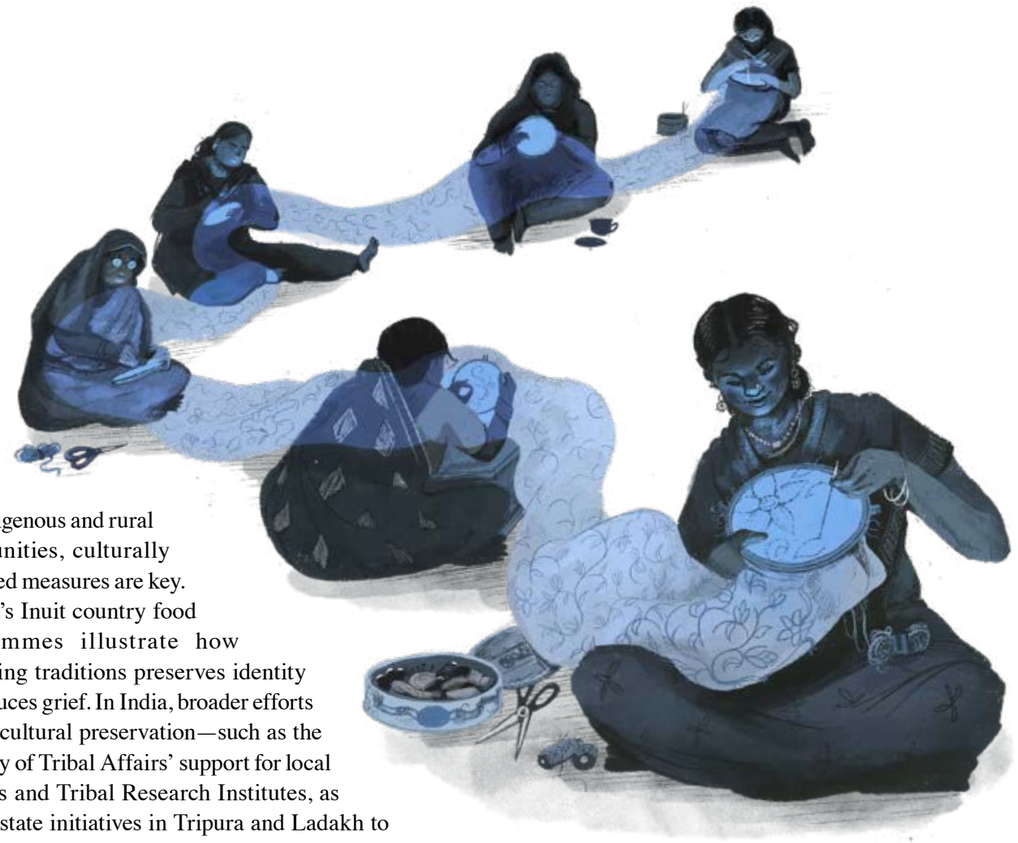
India has only a handful of studies on climate change and mental health, and most are not widely known. A 2025 scoping review by psychiatrists in Kerala, published in *The Primary Care Companion for CNS Disorders*, analysed 12 Indian studies and concluded that research on climate anxiety and solastalgia remains sparse. Globally, a 2024 review in *BMJ Mental Health* confirmed that solastalgia is linked with higher rates of depression, anxiety, and PTSD —but also highlighted that most existing studies are observational and too few to establish causality. These gaps show why India urgently needs systematic, long-term monitoring in regions like drought-prone Karnataka, the flood-affected Sunderbans, and the fragile Nicobar Islands.

Policy gaps are equally stark. Environmental Clearances (ECs) evaluate ecological impacts, while Social Impact Assessments (SIAs) under the RFCTLARR Act (2013) examine livelihoods and resettlements. In principle, both could incorporate psychosocial assessments, but documented cases in India are extremely limited, whether due to a lack of transparency in reports or simply because mental health has never been prioritised in these processes. This silence leaves a critical gap: while homes, land, and compensation are measured, the psychological distress of displacement is not.

One way forward is Health Impact Assessments (HIAs), which the World Health Organisation recommends for evaluating health, including the mental health consequences of projects. Integrating HIAs within ECs and SIAs could help identify psychosocial risks such as solastalgia. As emphasised by Acharya and Dua (2014), very few Indian projects, such as Sardar Sarovar and Bargi Dam developments, have used HIAs, and most were not embedded within formal EC or SIA processes. The study highlights that making HIA integration mandatory and coordinating it through intersectoral policy support, legislative backing, and public health capacity building could be an effective approach.

Building on this gap, India's existing health policies and programmes could provide an institutional foundation for integrating mental health safeguards into climate responses. According to the *Indian Journal of Psychiatry* in 2024, the District Mental Health Programme covers 767 districts, making it a cornerstone for counselling and outreach in rural and disaster-affected areas. The National Tele-Mental Health Programme (Tele-MANAS), launched by the Ministry of Health and Family Welfare in 2022, expands this reach through 24×7 toll-free services and state-linked call centres, ensuring access for remote populations.

Moreover, India's health and disaster management frameworks also have potential entry points for addressing solastalgia. For instance, the National Disaster Management Authority's 2023 *Guidelines on Mental Health and Psychosocial Support* in Disasters could be expanded to include slow-onset crises, such as droughts and coastal erosion, beyond sudden events. Likewise, health sector programmes such as Ayushman Bharat Health and Wellness Centres embed mental health screening and referrals into primary care, offering an institutional base for long-term psychological support in vulnerable regions.



For Indigenous and rural communities, culturally grounded measures are key. Canada's Inuit country food programmes illustrate how protecting traditions preserves identity and reduces grief. In India, broader efforts toward cultural preservation—such as the Ministry of Tribal Affairs' support for local festivals and Tribal Research Institutes, as well as state initiatives in Tripura and Ladakh to promote cultural hubs and festivals—could be meaningfully expanded to help communities stay connected to their environment. Drawing on traditional knowledge and shared rituals, such programmes could offer grounding against the distress caused by solastalgia.

If India's climate policy is to be truly just, it cannot limit itself to counting trees or compensating land; it must also protect minds and identities. Anticipating solastalgia and embedding psychosocial safeguards into environmental, health, and resettlement frameworks is not symbolic; it is a necessary act of climate resilience and responsible governance.

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Research in Translation (RiT) articles aim to make conservation science more accessible by summarising recently published scientific papers in jargon-free language. This was also one of the foundational goals of *Current Conservation,* and RiTs remain central to the magazine's purpose. Written either by the scientists who conducted the study, or by someone who found it particularly important, these short summaries clearly communicate the study's purpose, methods, findings, and relevance to our readers in an engaging way.

– Daniel Read, Chief RiT Editor

Art on page by Amo, Pari Satarkar and Priyanka K

WHY DO BIRDS SING MORE AT DAWN?

Author **Pavithra Sundar**

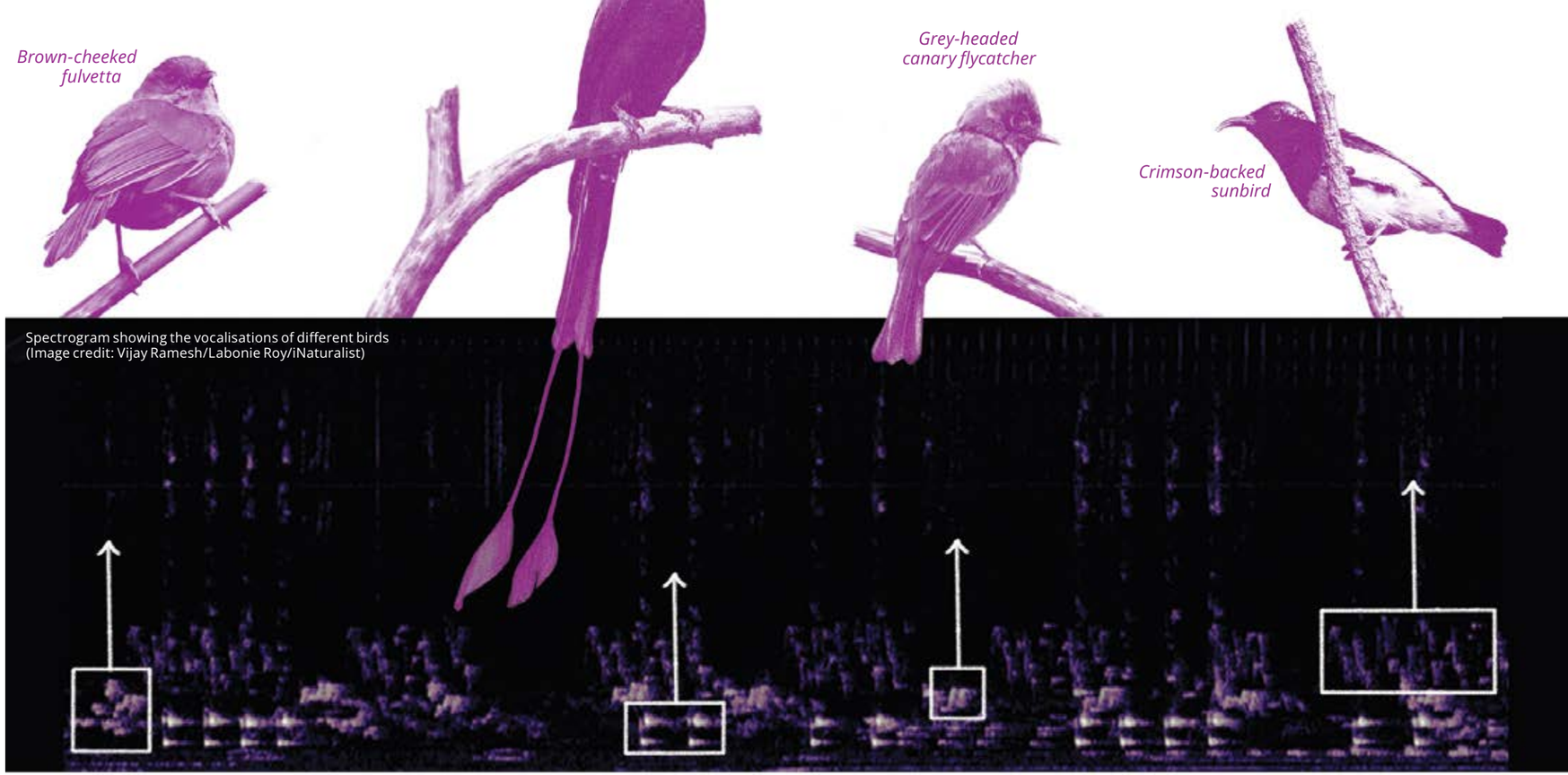
Hearing a forest awaken with chirps of its feathered inhabitants makes each morning feel like a blessing (less so if you prefer to sleep in!). This melodious orchestra of bird vocalisations as the horizon lightens is referred to as the 'dawn chorus'. This peak in vocal activity is followed by a lull later in the day, and again, a subtler affair, the 'dusk chorus' in the evening. You must have observed the difference in bird vocalisations throughout the day, but have you wondered why that's the case?

Some researchers attribute high vocal activity earlier in the day to better transmission conditions, while others propose that the early morning flurry of vocalisations serves to deter intruders. There is also a hypothesis that suggests that low light levels at pre-dawn and post-dusk hours make it difficult for birds to forage for food, so they vocalise instead. However, other researchers suggest that searching for food and informing their mates about it may be how birds prefer to start the day. People have been searching for answers to this question for over a century, but the jury is still out.

We, at Project Dhvani, a research collaboration that uses sounds to study biodiversity, were puzzled by this question as well. So, we set out to the Valparai plateau—located in the Anamalai Hills in India's Western Ghats—to listen to what the birds had to say on this matter. We left audio recorders in the field to capture the sounds of the rainforest. This technique of using remote devices to record sounds without direct observation is called passive acoustic technology. Then, using spectrograms—visual representations of the loudness of sounds at different frequencies across time—we visualised and marked bird vocalisations. And we used these vocalisations to test the different hypotheses for the dawn chorus.

We could decipher so much of the forest drama from sounds alone! As soon as the sun rose, the environment filled with notes of the choral explosion. A pair of grey-headed canary-flycatchers let out squeaky whistles, while a Malabar whistling-thrush chipped in with its melody. Meanwhile, Indian white-eyes and brown-cheeked fulvettas engaged in a flurry of vocal activity. Come evening, the dusk chorus kicked in with the calls of Malabar grey hornbills. Dark-fronted babblers rattled while scrambling through the understory, and an Indian pitta uttered two-note whistles.

Our results showed that most birds vocalised more at dawn than at dusk. Species that fiercely maintain and defend territories, such as the white-bellied treepie, and those that are omnivorous, such as yellow-browed bulbuls, tended to vocalise more at dawn than dusk.



Spectrogram showing the vocalisations of different birds
(Image credit: Vijay Ramesh/Labonie Roy/iNaturalist)

In the Western Ghats, omnivores and insectivores have been observed to form mixed-species flocks, where species flock together and hunt in groups to stay protected from predators and become more efficient foragers. These flocks may vocalise to alert others about predators, and they tend to be more active at dawn than dusk. Overall, our results suggest that vocalising at dawn plays a role in advertising and defending territories, and it is also driven by the availability of food, such as insects.

Our research shows how passive acoustic technology could help us answer one of the most fundamental scientific queries—why do birds sing so much in the morning? The audio recorders also helped us study birds at multiple sites simultaneously over long periods. Going ahead, we look forward to integrating field observations with acoustic technology to provide deeper insights into behavioural patterns.

So maybe next time, remember the idiom as 'The early bird gets the worm, and its territories stand firm'.

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Pavithra Sundar ***is an aspiring ecological researcher passionate about birds, acoustics, biodiversity, and conservation. She loves hiking, reading, cooking, and working out.***



Bees, hoverflies and moths of the UK (Image credit: Laboni Roy/iNaturalist)

MORE BUILDINGS, FEWER TREES: THE DECLINE OF URBAN POLLINATORS

Author **Mariella Bodemeier Loayza Careaga**

Insects are key players in the reproductive lives of plants. By carrying pollen from one plant to another—a process known as pollination—insects contribute towards the reproduction of 35 percent of crops and 60 to 90 percent of flowering plants. But despite their central role in pollination, the number and diversity of major pollinating insect groups worldwide has dropped over the years, raising concerns about their vulnerability—especially in human-modified landscapes such as cities.

Urbanisation, which is associated with habitat fragmentation, disturbance, and loss, is a well-known driver of insect population declines. While cities do pose many challenges to insects, each city is unique. They can vary greatly in the proportion of impermeable surfaces—such as buildings, roads, and parking lots—and green areas, thus offering different levels of ecological habitat quality to pollinators.

In a recent study (Ellis et al., 2025), researchers examined how pollinators that are active during the day (diurnal) and at night (nocturnal) respond to increasing levels of urbanisation. The team focused on members of three orders of flying insects: hoverflies (Diptera), bees (Hymenoptera), and nocturnal moths (Lepidoptera). These pollinators play complementary roles in the pollination of urban plants. However, little is known about the effects of urbanisation on lesser studied insects such as flies and nocturnal moths.

The researchers—from the University of Sheffield and the University of Helsinki—sampled the pollinators in urban horticultural sites (allotments) across three UK cities that differed in size and level of urbanisation. Some of the allotments were located closer to the city centre (more urbanised areas), while others were closer to the city borders (less urbanised areas). The team collected the pollinators using a combination of different trapping methods and measured how urbanisation affected their species richness (total number of insect species) and abundance (total number of insects).

Urban landscapes were associated with a reduction of up to 43 percent in species richness. A closer analysis revealed that for every 10 percent increase in human-made impervious surfaces, there was a reduction of up to 7.5 percent in species diversity for all three insect groups. These findings, the authors of the study say, reveal how an increase in impervious surfaces—and consequently a reduction in semi-natural habitats and tree coverage—contributes to the decline of insect diversity in urban areas. The findings also reinforce the importance of preserving or even expanding natural elements within urban areas to protect pollinators.

Urbanisation did not affect the abundance of all insect groups equally. Hoverflies and moths were more susceptible to urbanisation than bees, suggesting that these often overlooked pollinators may be more sensitive to human-modified landscapes.

Though these results paint a gloomy picture for urban pollinators, not all hope is lost. The researchers found that certain green space features support these pollinating insects. For instance, an increase in tree cover was linked to a greater abundance and diversity of moths. In contrast, semi-natural habitats—such as scrubs and grasslands—benefited all pollinators by likely offering essential resources, including food, nesting, and pupation sites. Unexpectedly, domestic gardens, which are commonly found in cities, did not bolster the abundance or diversity of pollinators; the authors speculate that this may be due to variations in how these private, green spaces are maintained.

By examining the general and group-specific threats posed by urbanisation to pollinators, the study reinforces the need for conservation approaches that consider these nuances to better protect urban insects and the ecological services they provide.

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THE CHALLENGES OF SUCCESSFUL BEAR REINTRODUCTION IN THE ALPS

Author **Marco Salvatori**
Illustrator **Amo**



Can large carnivore reintroductions succeed in the long term even within human-dominated landscapes? A recent study, published in *Biological Conservation*, on the reintroduced brown bear population of the Central Alps gives us a complex answer.

Centuries ago, brown bears were widespread in the forests of the Alps, but began declining in the 18th century due to deforestation, agriculture, and direct human persecution. When the reintroduction programme was launched in the late 1990s, the species was deemed functionally extinct in the Alps, with only a couple of bears estimated. Through the EU-funded LIFE Ursus project between 1999 and 2002, 10 bears from Slovenia—a genetically similar population—were translocated to the Adamello Brenta Nature Park in the Italian Dolomites, where bear presence was still documented.

Since then, bears have been carefully monitored through the collection of hair and faeces, in order to obtain the genetic identity of as many individuals as possible. Armed with more than 20 years of data, our research team, comprising ecologists, geneticists, and wildlife managers, could estimate trends in this bear population. Using statistical models, we focused on population density, spatial expansion, and responses to artificial barriers, such as highways, roads, and urban areas.

We found that brown bears increased in number and density, reaching 90–120 individuals in 2023, with higher densities in steeper areas and closer to the reintroduction site. While males were found to be more prone to dispersal, females tended to remain close to their natal area. The higher propensity of males to disperse, even over very long distances, resulted also in a lower survival probability compared to females. Dispersal is indeed a dangerous phase in a bear's life, compounded by the higher risk of being poached or falling victim to vehicular collisions. Despite their low propensity to move away from their natal area, females' ranges steadily increased, nearly quadrupling over the past two decades.

Human-bear coexistence

These findings confirm the success of the reintroduction programme in bringing bears back to the heart of Europe, yet they also highlight human-related threats to its future persistence. The population remains small and vulnerable to inbreeding and is completely isolated from its closest population in the Dinaric Alps. A major, heavily urbanised valley lacks effective wildlife corridors and constitutes an almost insurmountable artificial barrier for bears. No female has ever crossed this barrier to settle in the east, nor has any bear been documented to move from Slovenia to the Central Alps. More than half of the bears found dead during the study period died due to human-related causes, such as vehicle collisions, poaching, accidents during captures, and legal removal.

In addition, new threats are emerging as human-bear conflicts intensify. In 2023, a fatal attack on a mountain runner by a female bear with yearlings sparked a heated debate over bear management, the meaning of coexistence, and the compromises that come with the reintroduction of large carnivores in a human-dominated area. Periodic surveys conducted among local communities clearly highlight a shift in social perceptions over time, with decreasing tolerance towards bears. Fear for personal safety and overestimated perceptions of bear numbers were recorded even where bears are absent or only sporadically present.

Therefore, human-bear conflicts, both real and perceived, currently pose a major challenge for the bear population in the Central Alps, putting conservation and social priorities at odds. Addressing conservation challenges and, at the same time, ensuring safety for the local communities living within bear ranges will be crucial to foster long-term coexistence. Hopefully, this study will help recentre the public debate around scientific knowledge, favouring evidence-based management and improved connectivity measures.

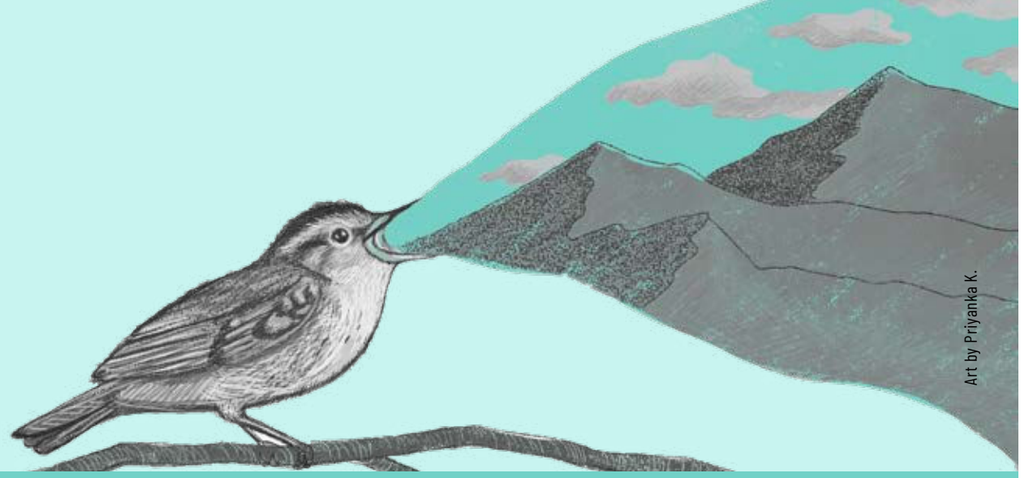
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Amo *is a student of visual communication, and an aspiring illustrator and designer. Their practice draws inspiration from the intersections of the natural world, fantasy, and queer-trans lives.*

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Art by Priyanka K.

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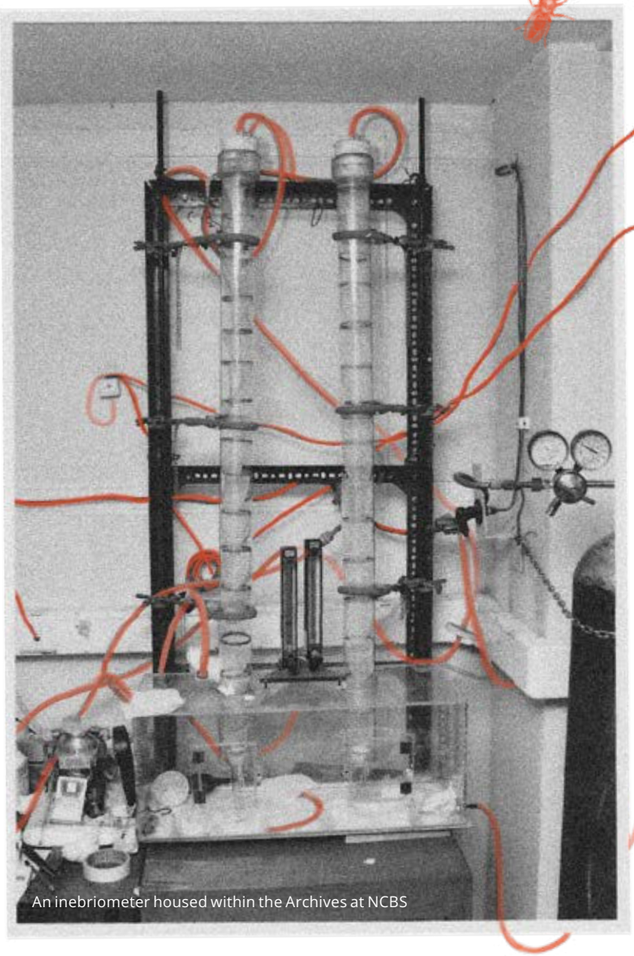
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Flies, flytraps and fittings

Author **Madhuri Ramesh**
Illustrator **Labonie Roy**

In the Archives at the National Centre for Biological Sciences, in Bengaluru, India, I recently came across an apparatus made up of a pair of graduated glass columns, with coloured pipes running here and there—it had an ad hoc aesthetic and on enquiring, I was told that it was an 'inebriometer'. I felt compelled to look up what this strange fitting was doing in an otherwise sober archive of science. In the process, I discovered how tiny fruit flies have contributed to our understanding of a series of interconnected questions about the different levels of brain functioning. For example, what happens when an organism is intoxicated, anaesthetised or sleeping versus irrevocably dead?



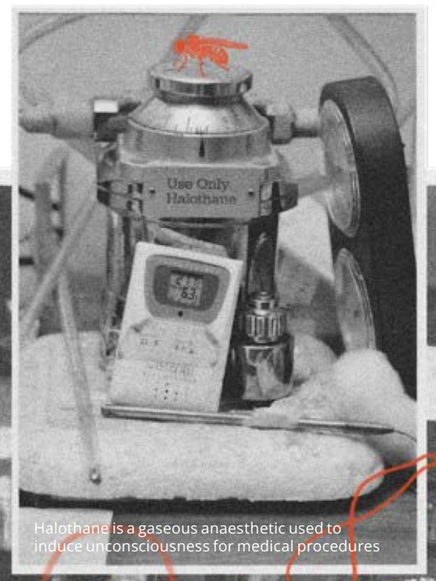
An inebriometer housed within the Archives at NCBS

But first, a bottled history of science and the fruit fly. If geneticists had to choose a totem animal, the tiny *Drosophila melanogaster* would probably top their list. *D. melanogaster* is one of the 12 species of fruit flies in the world. All of them are widespread human commensals that mostly feed on overripe or decaying fruits and vegetables. Despite these uncharismatic traits, scientists have spent not just hours but centuries studying *D. melanogaster,* beginning with T. H. Morgan in 1909. In fact, an entire journal, *Drosophila Information Service,* was created in 1934 to promote the exchange of research-related information on this singular insect and it continues to remain in print.

There are several reasons for this scientific fascination with *Drosophila*. Fruit flies are tiny insects that can be sustained on overripe bananas or tomatoes. This makes them easy to maintain in large colonies that can be housed in typical laboratory glassware, and they are also easily anaesthetised. The entire cycle from egg to sexual maturity takes around 10 days and adult females can lay hundreds of eggs. Hence, several generations of fruit flies can be studied within the span of a few months. This is especially useful for studies tracing heritable versus non-heritable characteristics. And finally, in an odd twist of convergent evolution, the *Drosophila* genome, although it contains just four pairs of chromosomes, bears genes that closely resemble several human genes. The molecular makeup of its central nervous system too is remarkably similar (or even identical in some cases) to that of humans.

Hence, experimental studies on fruit flies have played a major role in shaping our understanding of how human sensory systems (touch, vision, smell, etc.) function, as well as human health problems such as cardiac and mental illnesses, obesity and ageing. In fact, studies of *Drosophila* have made such significant contributions to the domains of physiology and medicine that they have garnered the Nobel Prize six times so far: in 1933 (genetic regulation), 1946 (mutagenesis), 1995 (embryonic development), 2004 (olfactory mechanisms), 2011 (innate immunity), and 2017 (circadian rhythms).

To return to the inebriometer, it was put together in 1988 by a graduate student named Kurt Weber, who aimed to study the effect of alcohol on fruit flies. However, the apparatus that caught my eye was a version that had been redesigned by the molecular biologist K. S. Krishnan to study how fruit flies responded to a gaseous anaesthetic, halothane. Although halothane had been in use since 1956, the genetic and molecular pathways through which it triggered a 'reversible loss of consciousness' were largely a mystery.



Halothane is a gaseous anaesthetic used to induce unconsciousness for medical procedures

Molecular biologist K. S. Krishnan modified the inebriometer to study the effect of halothane on fruit flies (Photo credit: Zita)

In fact, similar to *Drosophila,* scientific interest in anaesthetic compounds spans several centuries because their ability to 'knock out' an organism raises fascinating questions about states of consciousness, the functions of the brain, the connection between the brain and sense organs etc. For instance, far back in the 1860s, Charles Darwin used different anaesthetic compounds on plants to explore how plants sense and respond to their environment, even though they don't have a brain or nervous system the way animals do. Many of his studies involved administering chloroform to a Venus flytrap (*Dionaea muscipula*) to study how its sensitivity to touch was affected. The flytrap is an insectivorous plant with hairy leaves. As soon as an insect lands on these hairy leaves, the plant immobilises and consumes the insect by immediately snapping its leaves shut and releasing digestive enzymes. Darwin was interested in how these leaf movements changed when he used different chemicals and varied the dosage—usually rendering the flytrap's sensitive triggers and leaves temporarily unresponsive, with recovery depending on the dose and duration of exposure. He eventually published a book in 1875 titled *Insectivorous Plants,* which became a bestseller for the time because it sold 1700 copies in the first edition.



In the case of animals too, anaesthetic compounds are able to create a state in which the organism is no longer awake, aware or responsive. However, this state is different from sleep because it is a disruption in how the brain normally functions. For example, certain reflexes are suppressed and the brain becomes static (it does not even show the typical cyclical activities associated with sleep). Most importantly, anaesthetics temporarily block the ability to feel pain and hence are widely used during surgical procedures. However, if the dosage of the anaesthetic is not gauged correctly, the animal can die.

Krishnan's work then, seems to have brought these two hoary traditions together—the study of *Drosophila* and the study of anaesthetics. He was interested in uncovering the molecular and genetic pathways that determined how fruit flies responded to a commonly used anaesthetic, halothane. For this, he collaborated with geneticist Howard Nash from 1988 onwards. Using the modified inebriometer, they were able to identify the exact mutations that caused resistance to anaesthesia and prove that it was a heritable trait. It is through such painstaking work of numerous scientists that our knowledge of how to use anaesthesia to minimise pain during surgery has been built up. So the next time you hear of someone undergoing a root canal treatment or cardiac surgery, remember to give thanks the *Drosophila, Dionaea,* and other uncharismatic creatures that nevertheless improve the quality of human life.

Further Reading

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Images courtesy K. S. Krishnan/Archives at NCBS. https://archives.ncbs.res.in/

Learning to love spiders

Author **Kayla Manuel**
Illustrator **Taarini Ravjit**



"There's no way I'm touching that!"
"Why does it look like that?"
"Ewwww!"

These are things that I commonly hear at Butterfly Pavilion, the zoo where I am employed. We showcase a variety of invertebrates—animals with no bones—but our spider collection is one of our highlights. The spiders on exhibit range from tiny jumpers to giant tarantulas. Public reactions to them are as varied as the animals themselves, but it's not unusual to encounter someone who finds our exhibits terrifying.

Arachnophobia (the fear of spiders) is one of the most common phobias. The Cleveland Clinic reports that approximately 3–15 percent of the population is arachnophobic. Yet only 0.5 percent of spider species found globally are harmful to humans. With at least 50,000 species of spiders found on the planet, that leaves only 250 with medically significant venom. Whether you think they are cute or creepy, the majority of spiders aren't dangerous.

Yet the number of people who tell me they hate spiders or kill them on sight continues to grow. As a recovering arachnophobe myself, I can empathise with those who find them scary. But regardless of how a person feels about them, spiders are an essential part of our ecosystems, and rampant fear can have devastating effects on their conservation. Invertebrates as a whole are woefully underrepresented when it comes to conservation, and spiders are frequently overshadowed by pollinating insects when it comes to conservation action.

After several years of research and teaching about spiders, I've compiled a few strategies to use when I talk to people about them, to help these fascinating creatures seem more relatable and less scary. By studying what traits make specific animals likable, we can use that information to help people learn to love spiders.

What is charisma?

'Charismatic' animals are those that inspire interest, affection, or attraction. While animal preferences can be highly subjective, there are certain traits that charismatic animals tend to share. Large, forward-facing eyes, interesting colours or patterns, and beauty or "cuteness" are all considered important when evaluating charisma. Large size is also fairly important, but only when combined with other desirable traits. Big cats are generally considered charismatic, but big spiders are not.

Relatability is also crucial. We can more easily empathise with animals that live in family groups, engage in play, and use tools because their behaviour mirrors our own. It's much harder for us to relate to an animal when its behaviour doesn't make sense to us.

Non-charismatic animals are those considered ugly, gross, or scary. Spiders frequently top the list, along with insects and snakes. Spiders are at a distinct disadvantage when it comes to charisma—their bodies are very different from ours, and their behaviour can be difficult to understand and relate to. They aren't the sort of animals that people want to pet or cuddle.

But we can use what we know of animal charisma and apply it to spiders. It might not be immediately apparent, but spiders can meet the definitions of charisma—you just have to look at them through a different lens.

Emphasise our similarities

Spiders may live very different lives from humans, but ultimately they want to survive, just like us. They build homes, find partners, look for food, and care for their offspring. While the majority of spider species are solitary, several social species have been discovered. Indian social spiders *(Stegodyphus sarasinorum)* and African social spiders *(Stegodyphus dumicola)* build communal webs and hunt together. Socotra Island blue baboon tarantulas *(Monocentropus balfouri)* can even be kept in communal enclosures under human care.

Spiders aren't known for their strong maternal instincts, but some species do care for their offspring. Wolf spiders *(Hogna sp.)* carry their spiderlings on their backs for up to two weeks after hatching. Nursery web spiders *(Pisaura mirabilis)* spin a silk chamber for their young to have a safe place to complete their early molts. In 2018, for the first time, an ant-mimicking jumping spider (*Toxeus magnus*, a species native to Southeast Asia) was observed 'nursing' its offspring with a nutritious milk-like substance secreted from the egg-laying organ.

Finally, there is evidence suggesting that jumping spiders may be capable of dreaming. A 2022 study found that they experience a REM-like sleep state, which in humans is associated with dreaming. It's possible that other spider species also experience REM-like sleep, though jumpers are particularly easy to study because of their large eyes. While we may never know for certain, the possibility remains.

You may have to look closely, but spiders are more similar to us than expected!

Focus on how they help us

A world without spiders would be very different. For one, there would be a lot more pests! Spiders prey on flies, cockroaches, grasshoppers, and other undesirable insects. Multiple studies have shown that the presence of spiders in orchards can reduce pests and increase fruit yield.

While spiders alone are not enough to eradicate agricultural pests, they are an important part of keeping the ecosystem balanced. They are also an important food source for many animals, including birds, reptiles, amphibians, and mammals.

Get excited!

Finally, I have found that my own enthusiasm for spiders can be infectious. I try to head off any declarations of disgust by gleefully sharing how cute I find tarantulas or huntsman spiders. This typically stops people in their tracks and forces them to re-evaluate the animal they are looking at.

I still get skeptical looks, but more often than not, I receive a positive response. The animals I work with may not be attractive in the traditional sense, but a little enthusiasm can go a long way!

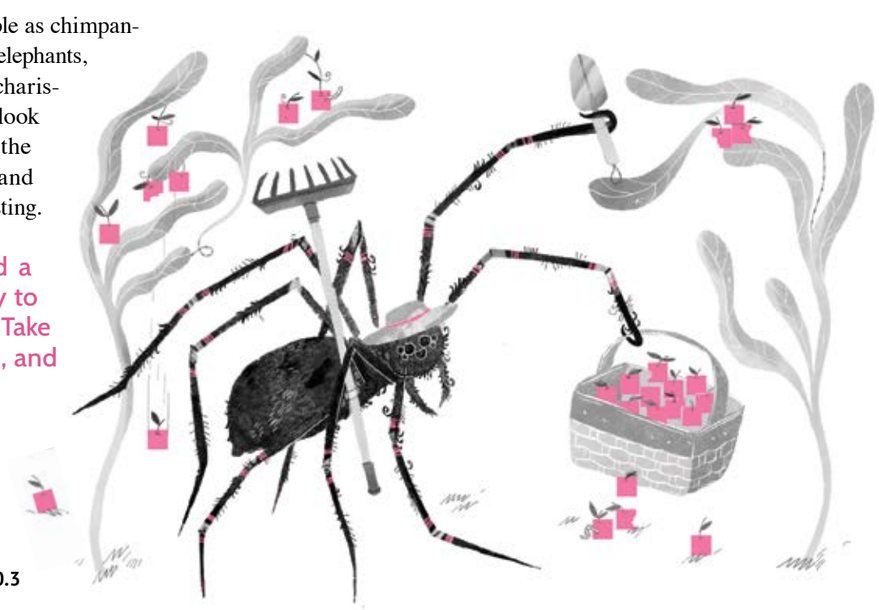
Surprise yourself

Spiders are incredible animals. I, for one, am glad that I took the time to conquer my own arachnophobia and learned to love them. Now I'm able to utilise my own passion for spiders to help people fall in love with them too.

Spiders may not be as relatable as chimpanzees or as majestic as African elephants, but they can be considered charismatic—if we are willing to look closely. They contribute to the health of our ecosystems and enrich our lives simply by existing.

The next time you find a spider in your home, try to push past any initial fear. Take a moment to observe it, and feel compassion for it.

You may be surprised by what you discover.



Further Reading

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