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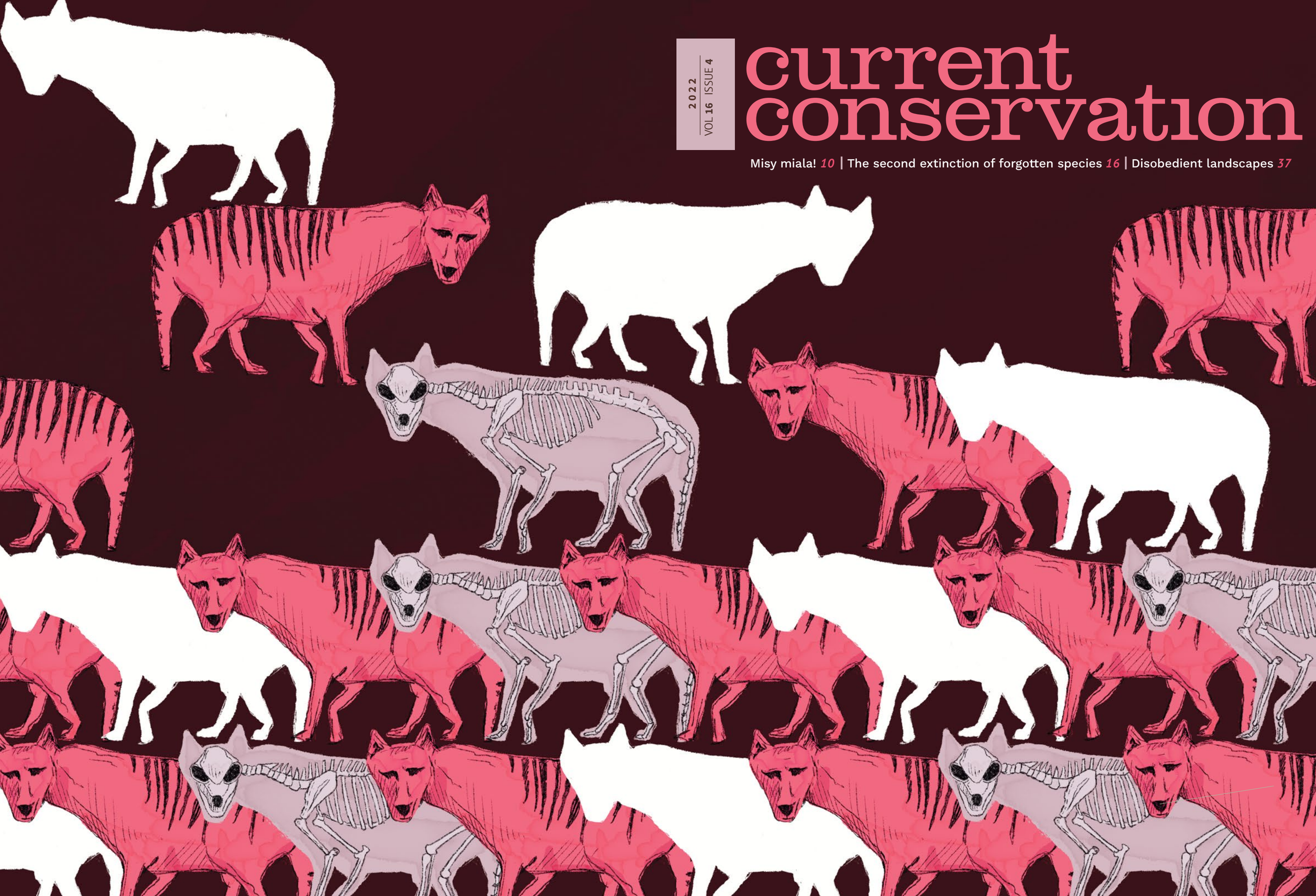

Current Conservation carries the latest in research news from natural and social science facets of conservation, such as conservation biology, environmental history, anthropology, sociology, ecological economics and landscape ecology.

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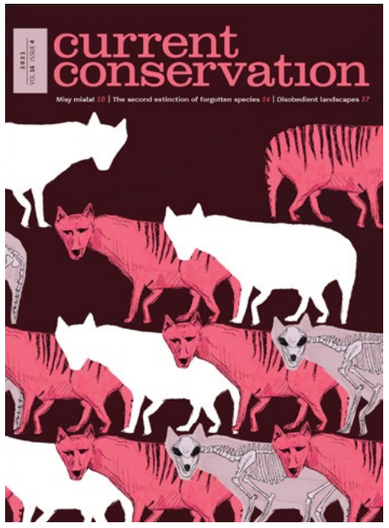


Cover art **Athulya Pillai**

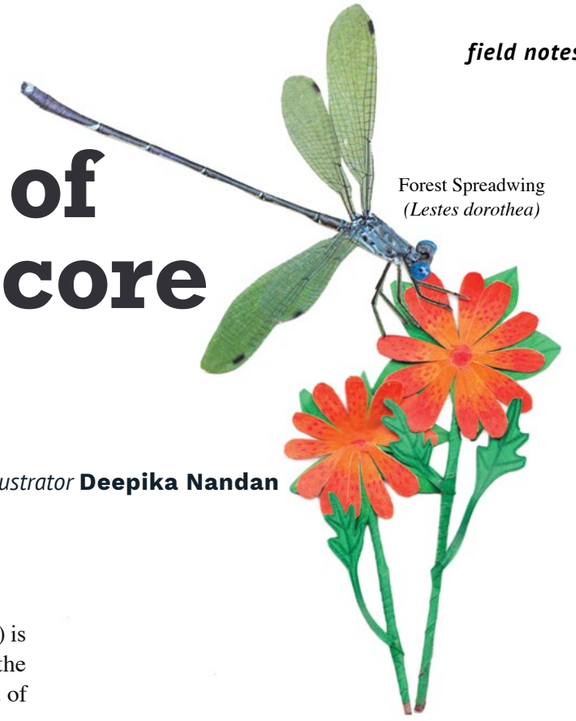
In this issue of Current Conservation, we have an eclectic collection of articles from around the world. Vivek Chandran chases after the elusive Tranvancore reedtail in India's Western Ghats, while Aina Brias-Guinart draws parallels between her research in Madagascar's capital, Antananarivo, and learning to use *taxi be*—large minibuses that travel across the city. Through a campaign to reduce threats to the giant ibis and other birds in northern Cambodia, Emiel de Lange demonstrates the importance of understanding how information and behaviours spread through social groups, before designing conservation interventions.

We have three articles on the topic of extinction. Diogo Veríssimo and Ivan Jarić write about a phenomenon that they call 'societal extinction'—the disappearance of species from our collective memory—and why this matters for conservation management and cultural identity. In the Research in Translation section, we learn about the cascading effects that result from the loss of plants and animals and their associated ecological functions from an ecosystem, as well as how to apply decision science to complex scenarios, such as preventing the extinction of species and ecosystems, while also considering the needs of people.

At the turn of the millennium, Mac Chapin openly critiqued the functioning of three big conservation NGOs. 18 years later, Hari Sridhar talks to him about his motivations for writing the article (which remains relevant today), the storm it created, and the current relationship between these organisations and indigenous peoples. Finally, our regular columnist Kartel Shockington (who may or may not exist) sends strongly-worded letters to the Siberian tundra and the global economy, amongst others, urging them to change themselves to conform to our prescribed models of reality.

– Devathi Parashuram

In pursuit of the travancore reedtail



Forest Spreadwing
(Lestes dorothea)

Author & Photographer **Vivek Chandran A** | *Illustrator* **Deepika Nandan**

The Travancore reedtail (*Protosticta ponmudiensis*) is a damselfly. It was first described in 2015 from the Ponmudi hills in the Thiruvananthapuram district of Kerala, India, and soon forgotten by all. This is not an unusual fate for an odonate—the collective term for dragonflies and damselflies—in the prevailing conservation milieu. Although they were one of the first animals to conquer the skies, some 300 million years ago, many odonate species in India, including the Travancore reedtail, remain 'Data Deficient' in the IUCN Red List. Despite their important role in the food web as prime predators of invertebrates in most ecosystems, dragonflies and damselflies do not receive the conservation attention they deserve. I started studying odonates because they reflect the health of the environment. Their short life cycles coupled with sensitivity to anthropogenic disturbances, such as pollution and deforestation, make them excellent bioindicators. Officially, I study the diversity and ecology of odonates in the Kole wetlands, a Ramsar site in central Kerala. Unofficially, I chase after odonates wherever I can find them, including forests.

My passion has led me to a few amateurs who love observing and documenting odonates. I first met Reji Chandran—a professional event photographer—when I was trying to make field identification keys for odonates found in Kerala. He was a passionate 'odonutter', who lived in Aryanad village, adjacent to Peppara Wildlife Sanctuary. Reji's backyard was wonderfully rich in odonate species thanks to its proximity to the Agasthyamala hills in the Western Ghats, a biodiversity hotspot. He had recorded close to a

hundred species from his surroundings. After months of fieldwork and discussions over the phone, we were able to make field keys for the identification of over 20 confusing odonate species.

Afterwards, I was unable to visit Reji's village due to the prevailing COVID-19 travel restrictions. But there was finally a window of opportunity in September 2021, when I booked a train ticket to Trivandrum Central without thinking twice. Reji had planned an expedition to the Ponmudi hills in search of the Travancore reedtail. His previous (and frequent) visits had been unsuccessful, but he believed that with our combined effort, we would be able to find the skittish damselfly.

On the first day, I requested to see Reji's 'backyard', which consisted of rubber plantations owned by his neighbours. The plantations had luxuriant wild undergrowth and a few streams flowing through them, and were separated from Peppara Wildlife Sanctuary by the Karamana River. Thus, we were hiking through an 'ecotone'—the edge between two kinds of habitats. Ecotones host rich biodiversity because they attract species from both habitat types. Further, they support species which prefer such edges. No wonder Reji found more odonate species here than recorded anywhere else in Kerala—it was the ecological phenomenon called 'edge effect' in action!

I was amazed by Reji's knack for locating odonates. He would brush aside some understorey vegetation, point to a dry twig on a tall tree and there it would be—a Goan shadow dancer (*Idionyx gomantakensis*). At the point where a stream met the Karamana River, he made me sit on my haunches and showed me a damselfly that gave me goosebumps—the red-striped bambootail (*Elattoneura souteri*). Both species are rare and endemic to the Western Ghats. Odonates show high microhabitat specificity and Reji knew exactly where each species could be found.

At the edge of the river in a Myristica swamp—tree-covered wetlands in the Western Ghats that are dominated by trees belonging to the family Myristicaceae—we spotted a brilliant blue pair of Myristica sapphire (*Calocypha laidlawi*) males engaged in an aerial fight for territory. The successful male would mate with a female, who would then lay eggs in plant debris floating in the slow-flowing water. In a few days, tiny aquatic predators would hatch out from the eggs.

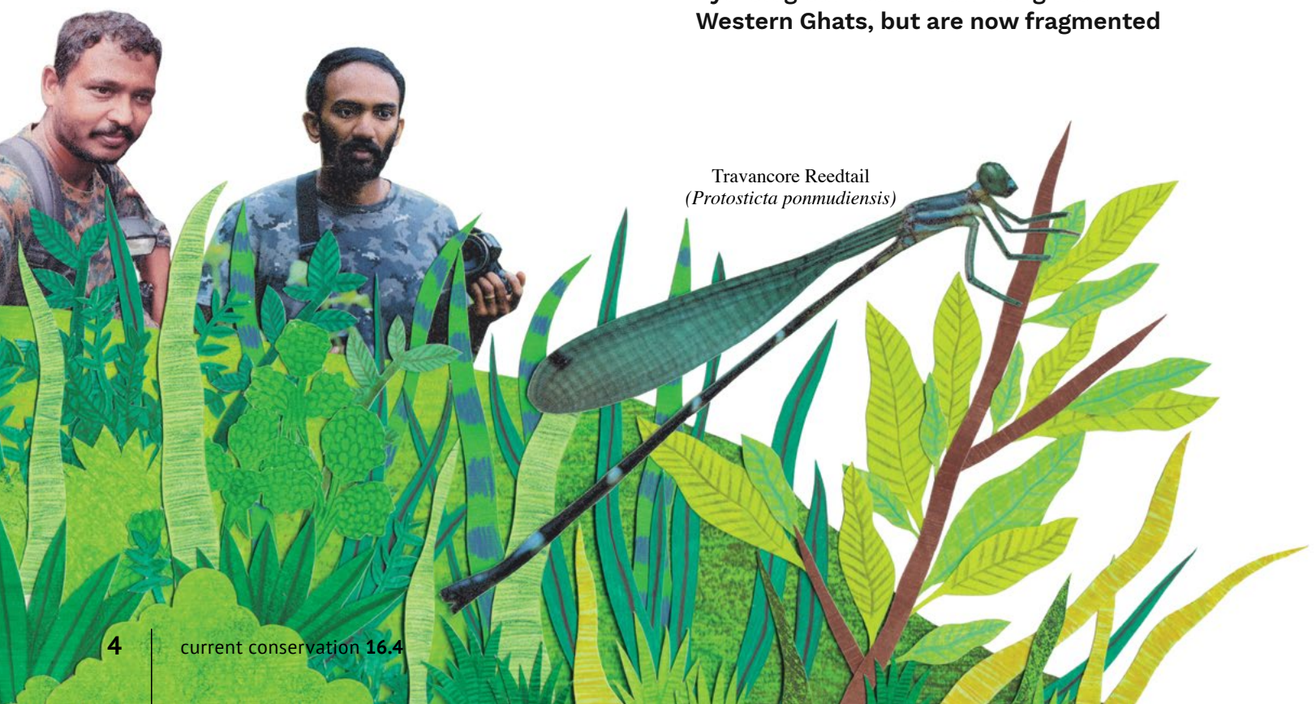
Myristica swamps once formed a large hydrological network all along the Western Ghats, but are now fragmented and exist as small, isolated pockets. These threatened habitats host species like the Myristica sapphire, found nowhere else in the world.

Hours passed by as we gawked at one odonate after another and it was twilight by the time we started heading back to the village.

Early next morning I woke up to Reji's palpable excitement. Ponmudi was an hour away by motorbike. In a rocky stream halfway up the hill, we chanced upon a Saffron reedtail (*Indosticta deccanensis*)—a brightly coloured shade-loving damselfly, endemic to the Western Ghats. It was a close relative of the Travancore reedtail and with its saffron body and azure blue face, more attractive to the eyes. I was seeing it for the first time. Perhaps we would find the Travancore reedtail after all! The Saffron reedtail sighting awoke an intense sense of expectation in me. We followed the road uphill and arrived at a spot where the stream banks had a thick cover of shrubs and saplings. The flow of the stream was slower and the shade offered by the plants was denser. Here, we began a thorough search for our quarry.

Reji stepped with great precision, eyes scanning the undergrowth for any sign of the reedtail. My feet sore from the previous day's leech bites, I limped after him. We had taken some twenty steps when Reji paused suddenly, turned around and gave me an "I told you so" look. It was the Travancore reedtail—a female, delicate and green-eyed beauty with a thread-thin body! The body was mostly black with bluish-white bands. We only managed to take a few photographs in the dim light before she was chased by a male. We gaped open-mouthed as they flitted away, across the stream and deep into the forest. We had just encountered one of the rarest odonates of the region. Since all its sightings have been from the Ponmudi hills, it could well be a spot endemic—found only at a single location on the globe.

Our mission accomplished, we thought of paying a quick visit to the famed hilltop of Ponmudi before returning. Though the ride through the mist and the panoramic view from above were mesmerising, we were appalled by the callousness of the large crowd of tourists. They were shouting, entering restricted areas, and dumping plastic waste in patches of once-pristine shola forest. None of them seemed to realize the ecological value of the Ponmudi hills. When we descended the hill, it was with mixed feelings. We were elated to have found the Travancore reedtail, but worried about its future.



Travancore Reedtail
(Protosticta ponmudiensis)

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Vivek Chandran A *is a passionate birdwatcher. He has immense love for all things living and pursues research on odonates because he believes they are the barometers of our environment.*

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

Saffron Reedtail
(Indosticta deccanensis)

Travancore Torrent Dart
(Euphaea cardinalis)

Lesser Blue-Wing
(Rhyothemis triangularis)

Changing behaviour for conservation means thinking about social relations

Author **Emiel de Lange** | *Illustrator* **Radha Pennathur**

Social relations have a strong influence on our behaviour. We often learn new things and change our views and behaviours through discussion with or observation of others—our neighbours, friends, family, and colleagues.

Sometimes the opposite happens, and we resist change because we worry about what others will think. Consider how wearing face masks has become the norm in many public places during the COVID-19 pandemic:

many people wear them because they want to protect others or avoid disapproval.

Social scientists have made a lot of progress understanding how information, opinions, and behaviours spread (or don't) through social groups. This insight is being used by marketers, public health officials, and many others to design more effective campaigns and communications. Yet, although conservationists increasingly draw on behavioural science, little research has been done about the role of social relations in shaping conservation behaviours.

I wanted to explore this in northern Cambodia, where birds like the giant ibis (*Thaumatibis gigantea*) are being threatened by pesticides contaminating the water ponds on which they rely throughout the dry season. My colleagues and I worked with partners in government, with community leaders, and with the Wildlife Conservation Society, to understand this issue and then designed a campaign to reduce pesticide pollution.

Our prior research showed us that many residents were unhappy with the pollution, which was caused by a minority of careless locals, but that they felt powerless to act and were worried about creating conflict. Our campaign thus focused on promoting a hotline that can be used to report pollution. We organised a community event with uplifting videos and speeches from respected villagers, and distributed materials with the phone number printed.

We used this event to conduct an experiment. First, we interviewed all 400 residents of one village and asked them about their social relations—who they spend time talking with. We then asked them questions about their intentions to report pollution, measuring willingness on a 10-point scale. We invited 40 people to attend our event. Two weeks later, we followed up with another village-wide survey to see who had learned about the campaign and if intentions to report pollution had changed, which we repeated again after six months.

We found that information about the campaign spread far and wide. After six months, at least 141 people knew details of the campaign and hotline. When we looked at their social relations, statistical models showed that people were twice as likely to know about the campaign if they lived with someone who also knew about it. Word of mouth was clearly important for spreading information.

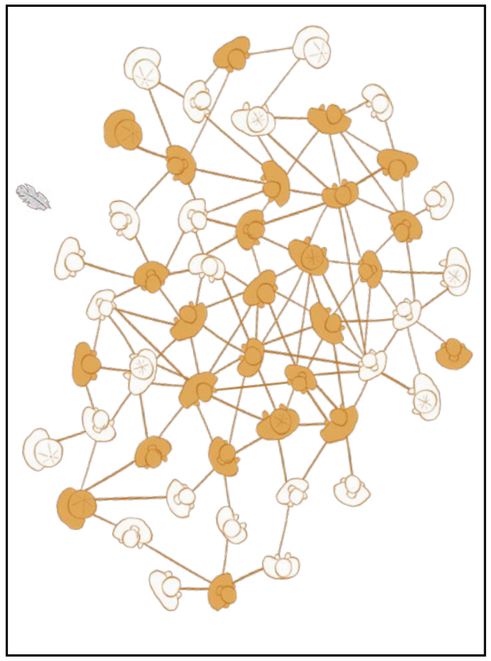
Those who attended the event had also become more willing to report pollution, suggesting that the campaign was persuasive. Perhaps surprisingly, after two weeks, many people who did not attend had also become more willing to report pollution. Statistical models showed us that knowledge about the campaign did not influence people's willingness. Instead, social influences were important, as people became more willing if their social

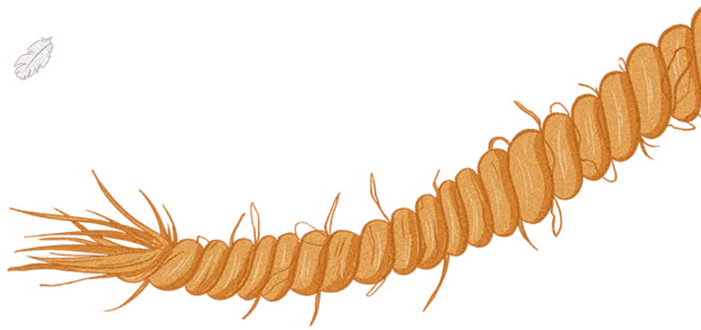
relations were also more willing. But, after six months, the same influences had pushed average levels of willingness back to pre-campaign levels.

These results paint a complex picture, but they suggest that social influences are critical for changing conservation behaviour and are more important than spreading information. Just as with wearing a face mask, an individual's willingness to report pollution depended strongly on what their social relations said and did. Eventually, villagers may have felt that reporting pollution was too socially risky if many of their friends and relatives weren't also supportive of this action.

Conservationists can take this into consideration, drawing on proven strategies from other disciplines, such as using information about social relations to target key influencers in a community. We simulated such a strategy using our data and found that this is likely to be effective in Cambodia too. But this data can often be challenging and expensive to collect in conservation settings. For larger programmes that operate across many communities, conducting research on social relations in a small number of villages could help generate insights that apply across the programme. Cheaper and rougher methods, such as consulting local experts or discussions with community members, could still help to define important social relations, identify influential individuals, or understand relevant social groupings.

Keeping these questions in mind could help conservation campaigns overcome resistance, to instead be embraced by communities, and to generate new social norms. Campaigns can work with influential members of the community or encourage conservation-minded community members to share and discuss their motivations with others. As attitudes and behaviours shift in some parts of a community, campaigns will need to adapt to support and enable these groups as they influence other more resistant groups. Taking a social relations perspective means recognising that people are the greatest resource for conservation.





Map above: A diagram showing the interactions that make up the village's social network. Using questionnaires, individuals in the village shared information about who they speak with regularly, and these connections are represented by lines in the diagram.

Emiel de Lange *is a conservation social scientist conducting interdisciplinary and applied research with practitioners to conserve biodiversity and improve human wellbeing*

Radha Pennathur *is a designer who specialises in visual storytelling and illustration. She works as the Lead Designer at WCS-India*

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Misy miala! a road map to malagasy public transport

Author **Aina Brias-Guinart**
Illustrator **Bhavya Arora**

*I was sitting in a **taxi be** squashed in between Malagasy people, carrying my huge sketchbook full of hand-drawn diagrams, when I felt I had gained a little personal victory on my PhD journey.*

September 2019: It was my second time travelling to Madagascar—a world biodiversity hotspot and dream destiny for many—for my PhD research. I was excited by the possibilities ahead. My research consisted of interviewing practitioners from nature conservation organisations to hear their views on conservation education programmes. Despite the widespread belief that conservation education is a panacea for a sustainable future, the practitioners themselves often wonder whether their programmes have long-term impacts. In turn, I was trying to understand *how* these education

programmes, which often target children living close to protected areas, influence the conservation of biodiversity.

The challenge

I decided to rent a room in the country's capital Antananarivo, or just Tana as people call it, because most of the big conservation organisations were headquartered there. Doing research in Madagascar as a foreigner born in Barcelona and studying in Finland, required being respectful and striving to understand the cultural context as much as possible. Thus, I embraced the Malagasy lifestyle. And that included using public transport: *taxi be*. *Taxi be* are large minibuses that travel all around the city and, according to the Lonely Planet guide, *"they are of limited use to travellers because of the difficulty to work out the route and where bus stops are"*. But I was not put off by the challenge. Who said that the PhD journey would be an easy one anyway?

Increasing knowledge

It was one of my first afternoons in Tana, and I was having lunch with my colleague Rio in the city centre. I explained to him my determination to use *taxi be*, and that I had been searching for printed maps and online apps to increase my knowledge before getting on the first *taxi be*. Of course, these didn't exist. Fortunately, Rio decided to take me under his wing. We walked together to one of the main bus stops where, during rush hour, you had to run to be the lucky person to squeeze into the already packed *taxi be*. After we managed to hop on one, Rio patiently explained: *"There are always two people working in the taxi be: the driver and the collector. The collector collects the standard fare of 500 Ariary (around €0.11) and he is the one shouting the final destination of the bus, so people know if it is convenient for them to get on."* Soon, we were approaching my home, so when the collector asked "*Misy miala?*" (Is there someone getting off?), Rio replied loudly: *"Misy miala!"* (Someone is getting off!).

Collaboration with others

For a while, I was only brave enough to attempt the same route I had done with Rio: from the city centre to home and vice-versa. I was scared of not knowing where to get on and off the bus, or which line to take. But as I started to schedule dates for my first interviews, I realized that I would never master the art of using *taxi be* unless I conquered my fear. I also realized that I couldn't do it alone. Hence, every time an interview was scheduled, I would also ask for directions to get there by public transport.

Despite my careful planning, things often didn't go as planned (this is exactly why problem solving is a skill you learn as a researcher). Tana is sprawled across two main hillsides and is full of steep and narrow streets, which translates into huge traffic jams. I am not a punctual person in my private life, but I wanted to arrive on time for my interviews. I would often leave home well before my meetings, only to end up sitting in a *taxi be* for two hours, stuck in a traffic jam. Sometimes, tired of sitting, I would get off and walk for a while, hoping that the traffic jam would disappear and that I could get an alternative *taxi be*. This meant, however, that I needed to ask for directions in my poor Malagasy. Yet, slowly, I started to understand how to get around the city.

Changing perspectives and cultural practices

In my interviews, I wanted to understand practitioners' assumptions about the role of education in conservation. This turned out to be a difficult task because for many of the interviewees, it was their first time reflecting on the linkages between activities, outcomes, and impacts. Due to this, I decided to use a participatory research method: instead of me asking questions and writing notes, we would draw. Well, maybe not exactly draw, but we would create diagrams to identify

the pathways that connect their education programmes with conservation goals. That is how I ended up buying a huge sketchbook that I carried along to the interviews.

Despite being born in the Mediterranean culture, my perception of personal space had been strongly transformed after years of living in Finland. Personal space is essential for Finns. Often, on Finnish buses, people would rather leave a seat unoccupied than sit next to a stranger, to allow for personal space. That was absolutely not the case in Madagascar. *Taxi be* were often packed with people, and even the aisle would be transformed into a seat by placing a wooden plank across the seats on either side. The first few times, I felt uncomfortable and ashamed when entering with my huge sketchbook, silently apologising to others for taking up so much space. But, soon my perspective changed as I understood that the Malagasy idea of personal space was completely different. After this, I embraced—and somehow enjoyed—the trips being squashed between others.

Diversifying options

I was starting to feel confident about commuting by *taxi be* when I decided to venture outside the capital. Some of my interviewees were from smaller organisations that worked only in certain regions of Madagascar. For one of those visits, I travelled overnight by *taxi brouse* (minibuses that travel around the country) to the coastal city of Tamatave. On arriving, I received a call from Tsiry, the practitioner I wanted to interview. He asked if we could meet at their education centre, located 30 minutes outside the city. I thought to myself: If I can use public transport in Tana, why not in Tamatave? I left with my backpack and my big sketchbook without hesitation. After being directed to different bus stations, I managed to get the right bus, arriving at my destination exactly at lunchtime. Tsiry and their colleagues invited me to share lunch with them.

We conducted the interview after the meal. Then, Tsiry offered to give me a lift back to Tamatave on his motorbike. I happily accepted because I was exhausted, but I also thought it would be great to have another new experience under my belt. However, the motorbike suddenly stopped as we were riding. *"How strange. This has never happened before,"* Tsiry said, as he tried to fix it. No luck. Someone passing by stopped and gave it a shot too. Still no luck. Suddenly, a *cyclo-pousse* (a rickshaw pulled by a cyclist) came to a halt and offered to take us. Tsiry and I looked at each other—could a cyclist carry a motorbike? It was the moment to find out. We put the motorbike on top of the cyclo-pousse and clambered into the rickshaw ourselves. To our surprise, we slowly managed to reach the city. Tsiry repeated once again, laughing: *"This has never happened before."*

Leaders of change

It was one of my last days in Tana. For two months, I had met and been inspired by passionate conservation practitioners working across the country. I was sitting in a *taxi be*, squashed in between Malagasy people, feeling proud of my own learning process with public transport. A whole range of strategies had helped me achieve my goal: from increasing my knowledge thanks to Rio, to asking others for directions, to changing my perspective of personal space and diversifying my transportation options.

In a similar way, the results of my research also showed that there isn't a single way to achieve

positive change through education, but rather that practitioners had different views on how the change was brought about. Five pathways of change emerged on the role of education in conservation across the 15 organisations I interviewed. For some, it was about increasing knowledge. Others stressed the importance of building an emotional connection to nature and changing certain traditional cultural practices. Others believed that change should happen at the community and societal level, highlighting the role of collaboration amongst stakeholders. And a few others emphasized that education approaches need to be accompanied by other structural solutions, such as access to alternative livelihoods and policy changes. Finally, many highlighted the importance of fostering future leaders: youth who would have agency over their natural resources.

It was time for farewells, and I was feeling a mix of emotions. I felt privileged to have met all those practitioners who were leaders of change themselves. People like my friend Lova, who worked persistently to implement conservation education programmes with boundless energy, despite the lack of time and resources. At the same time, I was doubtful about the practical implications of my research. It had not answered the question about whether education has an impact on conservation. But complex problems never have a straightforward solution. Yet, reflecting on the pathways of change was probably a first step towards a more comprehensive evaluation, and to be able to design transformative interventions. For years to come, education will probably remain a cornerstone of conservation initiatives. But, what if the end goal went beyond biodiversity conservation? What if education could also support and celebrate the richness of cultural diversity? What would those education programmes look like? Unfortunately, my time in Madagascar was up, so those would remain questions to explore in the future.

Aina Brias-Guinart *is a doctoral researcher at the University of Helsinki on the field of biodiversity conservation. Her current focus is on environmental education in Madagascar.*

Bhavya Arora *is an illustrator and graphic designer. She creates detailed illustrations with 3 Sided Coin and not-so-secretly wants to illustrate 111 kids books.*

Further Reading

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The second extinction of forgotten species

Authors **Diogo Veríssimo & Ivan Jarić** | *Illustrator* **Athulya Pillai**

"Much that once was is lost, for none now live who remember it."

– Galadriel in *The Lord of the Rings: The Fellowship of the Ring*.

We often think of extinction as happening out there, in far away wild places, but it also takes place right inside our minds, in our everyday conversations and on social media. Beyond biological extinction, which takes place when the last animal or plant of its kind dies, species can live on in our collective memory, traditionally transmitted locally through word of mouth, art and literature, and more recently through movies, television, and the internet. These memories can, almost paradoxically, keep an extinct species like the passenger pigeon, present in our everyday lives long after they are gone. But, tragically, the contrary also occurs.

When a species disappears from, or has never been in, our minds despite still existing across the Earth, this lack of collective knowledge and memories of the species can accelerate its physical disappearance.

Introducing societal extinction

As more and more species become threatened or extinct, they also become increasingly isolated from people. A growing number of people live in cities, and spend increasing amounts of time indoors, becoming isolated from experiencing the natural world. This leads to the extinction of experience—the progressive loss of our daily interactions with nature, a situation that has been further aggravated with the arrival of the COVID-19 pandemic and the measures to contain it, such as lockdowns and remote work.

This process of disappearing from collective memory is what we refer to as 'societal extinction' in a recent paper—in contrast to biological extinction—and it often occurs gradually. Take, for example, the Japanese or Honshū wolf, which used to live on several islands of the Japanese archipelago, but went extinct by the early 20th century due to rabies and persecution by humans. Although it was once ubiquitous in the local culture, with many villages bearing its name, dedicated shrines, and representation in art and various traditions, its societal footprint is increasingly eroding because the only remaining source of new experiences are a few museum specimens.

Societal extinction can also progressively impact local ecological knowledge. Studies among communities in southwestern China and with Indigenous people in Bolivia have shown the loss of local knowledge and memory of extinct bird species. Such memory loss eventually led to people forgetting the names of these species and also what they looked and sounded like. Yet, species that have been forgotten in wider society can sometimes maintain their cultural presence in rural or Indigenous communities through traditional ecological knowledge. But when cultural losses of a disappearing species occur for Indigenous communities, it is likely to be much more acute if they have strong cultural ties to the species. Indigenous people are, therefore, key allies in the efforts to maintain societal presence and memory of such species.

The scale

Societal extinction can also occur locally. The Tasmanian tiger and the Tasmanian devil used to inhabit both Tasmania and mainland Australia. With their extinction on the mainland, they were lost from Indigenous Australians' memories here. However, their memories continued to persist in Tasmania, where they remained an important part of the local Indigenous culture.

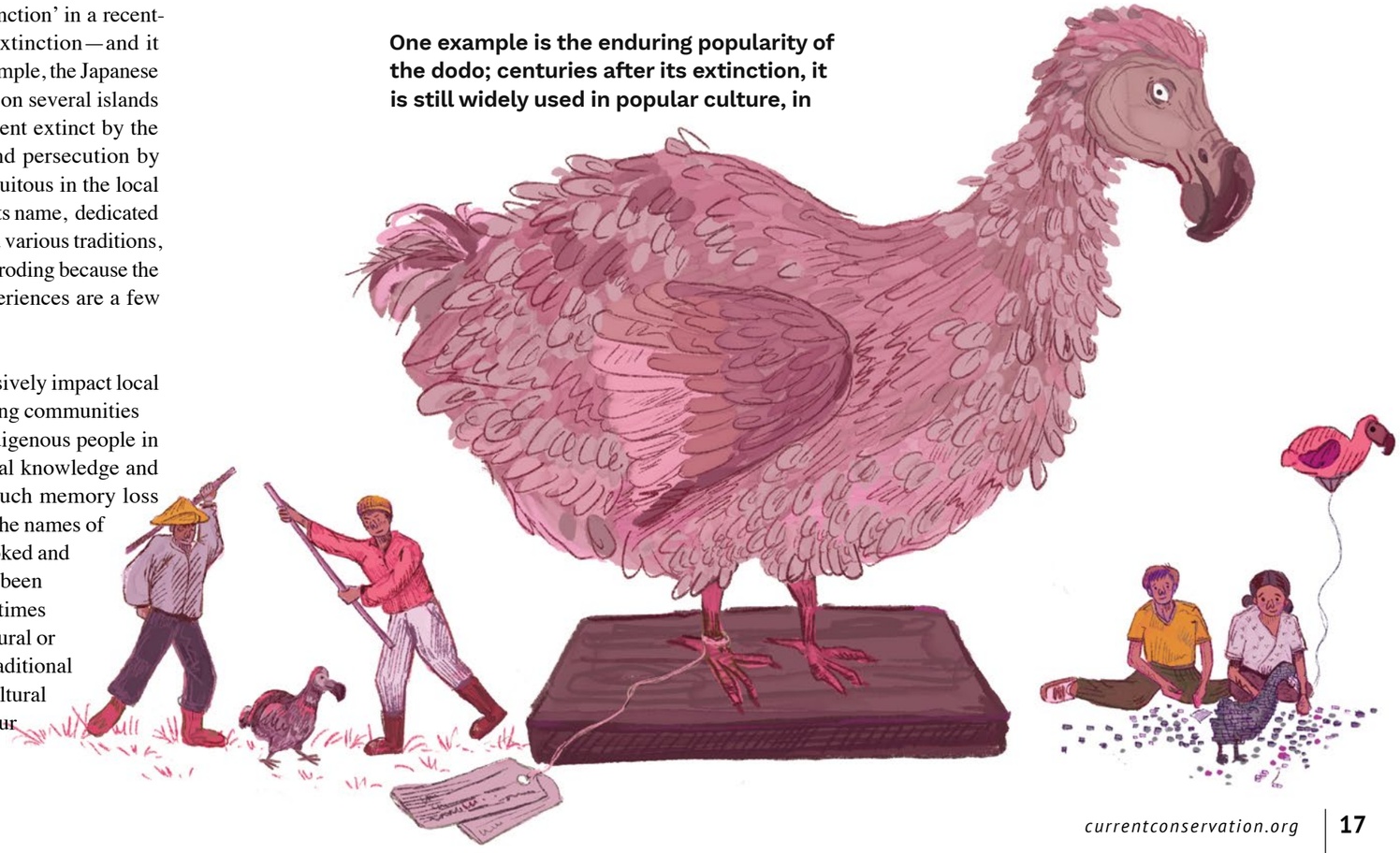
Yet, extinct species can also remain highly present societally, or even increase in their prominence long after their extinction. Some are even used as conservation flagships to appeal to a targeted audience to attract their support for the conservation efforts of extant species.

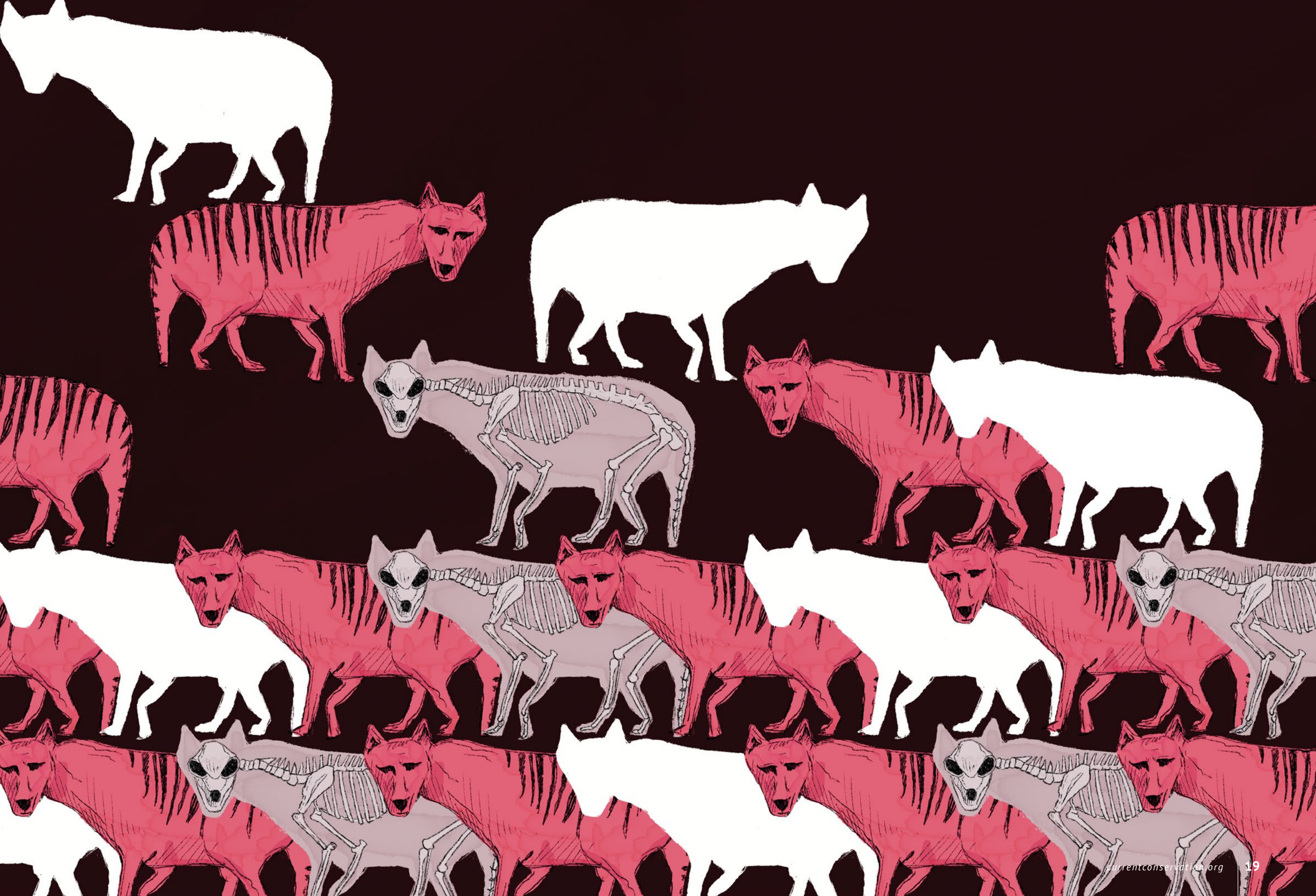
One example is the enduring popularity of the dodo; centuries after its extinction, it is still widely used in popular culture, in works of art, as a mascot, and even as one of the main targets of the movement for de-extinction—a process of recreation of once-extinct species, mainly through genetic resurrection. Ironically, the dodo is more globally salient today than it was when it went extinct.

The drivers

Whether a species will become societally extinct depends on many factors, including its charisma, societal importance in terms of symbolic or cultural values, whether and how long ago it went extinct, and how distant and isolated its geographic range is from human settlements and activities.

Societal extinction can also occur in extant species, often due to different social or cultural





changes, such as the urbanization and modernization of society that can radically change our relationship with nature and lead to the collective loss of memory.

For example, in Europe, the replacement of traditional herbal medicine with modern medicine, which is much more reliant on synthetic products, is believed to have degraded general knowledge of many medicinal plants.

It is important to note that a majority of species cannot actually become societally extinct, simply because they never had a societal presence to begin with. This is common in uncharismatic, small, cryptic or inaccessible species, and especially among invertebrates, plants, fungi and microorganisms—many of which have not yet been formally described by scientists or noticed by humankind. They suffer declines and extinctions in silence, unseen by people and societies.

Why it matters

The understudied phenomenon of societal extinction can considerably challenge efforts aimed at the conservation of biodiversity, as it can affect our perception of the environment and expectations of its natural state, such as what is normal or healthy. Societal extinction can distort perceptions of the severity of threats to biodiversity and true extinction rates, and thus diminish the public support for conservation and restoration efforts. It can also reduce our will to pursue ambitious conservation goals. For example, it could reduce public support for rewilding efforts, especially if the targeted species are no longer present in our memory as a natural component of the ecosystem. Bearing in mind the ongoing extinction crisis, as well as our growing disconnection from nature, it is highly likely that countless cases of societal extinction still lie ahead, and that this process is going to intensify in the coming years.

If we are to mitigate the process of societal extinction and its consequences for conservation, it will be necessary to address the problem through targeted, long-term marketing campaigns, and conservation education, as well as support for indigenous culture and storytelling, to revive, improve, and maintain memory of societally extinct species.

How do we tackle it?

The rise of global internet connectivity has created the opportunity for large-scale conservation engagement efforts, but conservationists have yet to fully explore its potential. Wildlife already features in numerous aspects of our everyday digital lives, from Animal Crossing and King Kong to Tiger King to Guggimon. Wildlife is a major part of our culture, but that omnipresence is rarely purposefully used to positively influence how we feel about it and our actions as voters and consumers. This needs to change.

This is especially important in cases where there are very few or no living eyewitnesses of a species.

For example, each year on September 7, Australia celebrates the National Threatened Species Day. This day represents in fact the anniversary of the death of the last captive thylacine, or Tasmanian tiger, in the Hobart zoo, and helps maintain and strengthen the memory of the species. The collective memory of a species should also be rekindled in reintroduction programmes, as a way to tackle extinction beyond its biological component.

Such a process could follow the same path used to strengthen cultural identity by resurrecting lost languages, such as Cornish, to highlight the historic links between society and the reintroduced species, and thus help increase public support for conservation efforts.

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A challenge to conservationists: an interview with Mac Chapin

Author **Hari Sridhar** | *Illustrators* **Tara Anand (Portrait) & Maanvi Kapur**

In an article published in World Watch magazine in 2004, Mac Chapin critiqued the work and style of functioning of three big conservation NGOs—World Wildlife Fund (WWF), Conservation International (CI), and The Nature Conservancy (TNC)—especially in relation to their neglect of indigenous peoples living within their areas of work. Based on a variety of sources including published literature, conversations with NGO staff, and his own personal experiences, Chapin argued that the relationships of these NGOs with indigenous groups stems from conflicts of interest linked to their government and corporate funding. The article, as you will see below, created a storm, before and after it was published, and attracted both criticism and praise. 18 years after its publication, we asked Mac Chapin about his reasons for writing this article, the controversies surrounding its publication, and how he views the relationship between conservation NGOs and indigenous peoples today.

Hari Sridhar: What got you interested in the relationship between conservation and indigenous peoples, and motivated you to write this article?

Mac Chapin: I lived with the Guna Indians in Panama for three years in the late 1960s, with the Peace Corps. I became aware of the Guna's close relationship with their natural ecosystems, and how they were threatened by colonisation from non-Indians and "modernisation" in general. That inspired me to study anthropology, and in the mid-1980s, I started working throughout Central America with Cultural Survival, an indigenous rights NGO. From the start, we focused on indigenous rights and conservation; and in 1992 we collaborated with The National Geographic Society on a bilingual Spanish-English map of Central America showing the forests and indigenous regions of occupation and use. There was a clear correspondence, and we began working on programmes that emphasised the two areas.

Some of the large conservation organisations (WWF and CI) expressed interest (TNC was not very interested) and we tried to work with them, but, unfortunately, collaboration was difficult, often impossible. They developed their programmes without consulting with us or, more importantly, with the indigenous peoples living in the areas they wanted to conserve. They felt they knew more about conservation than the Indians, who were excluded from their programmes; and beyond this, there was often hostility toward the peoples living in the areas they had singled out for their work.

This situation was coming to a head in the late 1990s and early 2000s. Indigenous peoples were getting organised in Central America and they began complaining—to us and to some of the private foundations that were funding the conservationists. Several of the foundations were meeting and discussing this at a gathering in California, and the Ford Foundation decided to hire an anthropologist who has worked in Mexico and an economist from India to do a study. I knew the anthropologist and we spoke, and he started feeding me material; he also got me in touch with the economist, and I started expanding my research. I had no thoughts of publishing what I was writing; I just wanted to clear things up in my head, and see how widespread the problem was (it was very widespread).

I was very close to Ed Ayres, the editor of *World Watch* Magazine. Ed is very principled and stands firm for things he believes in. He phoned up one morning when I was almost finished and asked what I was up to. I mentioned my research and sent a draft to him. He phoned the next morning and asked where I was going to publish it. I said I had no thoughts about it, and he said, "Then we'll take it." It was obviously an issue that was on many people's minds at the time, yet nobody was writing about it.

HS: Stepping back a bit, can you trace the origins of your interest in indigenous communities' rights? What led to you spending three years living with the Guna Indians, as part of the Peace Corps?

MC: When I was young, I read many books about travel to exotic (for me) parts of the globe: Africa, Latin America, the Near East; both fiction and non-fiction. This interest grew out

of my very early reading of comic books: Tarzan, Scrooge McDuck (who was always heading off to distant lands with Donald and Huey, Dewey, and Louie), Tintin, and so forth. I graduated to tales of Richard F. Burton and the search for the origin of the Nile, the adventures of hunters and animal collectors in Africa and the Amazon Basin, the British Empire, and on and on. This was my search for adventure, pure and simple. After my undergraduate studies (History of Medieval and early modern Europe), I began traveling myself, to Europe and Turkey and Israel. And in 1965, I joined the Peace Corps in the Dominican Republic, where I spent two years working with small-holder coffee farmers. In 1967, I rejoined the Peace Corps, this time with the Guna Indians in Panama, and stayed there for three years as director of an agricultural school. On the strength of all this practical experience, with Caribbean Blacks and Central American Indians, I decided to study anthropology. With my degree in hand, I set out to apply my knowledge helping the indigenous peoples of Central and South America to hold onto their lands, natural resources, and cultures.

You will see that I began vicariously with literature that can only be described as "colonialist" and ended up somewhere on the opposite end of the spectrum. The heroes of virtually everything I had been reading and thinking about were white males of European descent (except perhaps the Disney Ducks—but they sure acted like White males); and the "natives" in the colonised regions of the world were depicted as submissive and not terribly bright—often like children needing a helping hand from the civilised and powerful. But of course, in this world things don't work that way. The literature had a strong effect on me, and it took years to shed it, and only partially. At the same time, I strongly believe that the contrast between the two groups—rich and poor, First World versus Third World—allowed me to understand the ramifications, the scarring impact of the power differential. This didn't happen all at once, like a flash of lightning. It was gradual, and after many years in the field and thinking and writing about rural development, and seeing the power differential up close, I believe I understand, to some extent, what is going on. At the same time, I have to catch myself from time to time from practicing what I don't preach. No matter what, I am a member of the class that runs the world, and I often feel like Lady Macbeth, who, try as she might, cannot clean her blood-stained hands. But I try.

In this context, the actions of the large conservationist organisations are a prime example of the ugly face of this imbalance.

HS: What happened after Ed Ayres offered to publish the article in World Watch?

MC: In summary, a draft escaped, all of the conservationist NGOs got hold of it, and they contacted World Watch, trying to have it squashed. The editor told me: "This is the first time the shit has hit the fan before an article has been published!"

He weathered the storm nicely, but there was a fair amount of commotion surrounding the issue of the magazine. A woman who had a small foundation had offered to give World Watch $30,000 to cover the cost of destroying the 30,000 copies of the magazine that had already been printed and republish it with an altered (sanitised) version of my article. This was done without informing the editor or me. It was a crazy, half-baked scheme and was abandoned soon after, but it had already become public. The editor stood up for me and in the end the magazine was distributed with the article untouched. The woman in the small foundation was trapped: she had been pretending to be on my side, but this exposed her, and she resigned shortly after. The following issue of the magazine contained 16 pages of letters about the article, most of them positive.

I think the article had a powerful impact. It opened up a needed debate; it ignited a broad movement among many indigenous organisations worldwide; and the recent environmental congress in Glasgow, Scotland, apparently pledged to support indigenous peoples on conservation issues. On the other side, the big conservation organisations—WWF, TNC, CI—have been trying to co-opt the issues raised in the article for their own benefit, with what they say are initiatives to help indigenous peoples. But at least it is out in the open, and indigenous and tribal peoples are taking up the cudgel and fighting for their rights—something they were not involved with to any extent before.

HS: In the 18 years since this article was published, have you seen any examples of conservation programmes that you think are "responsive to the needs of both biological and human diversity"?

MC: Just a couple of days ago [as on 22 March 2022], I was speaking with someone who continues working in this field and he said that in the recent gathering in Glasgow, people were talking about the need to work with indigenous peoples on conservation initiatives, and they were talking about tens of millions of dollars. This sounds like a move in the right direction. But how in Hades would this work? Who would handle it? Which indigenous groups would get the money, and for what? If those with the money and in charge of organising the distribution [of funds] don't do it "correctly" it will hurt indigenous peoples. It needs to be done carefully, sensitively, and responsibly—but I doubt that will happen. On the surface, it sounds like it will do more harm than good.

Please excuse my cynicism, but I have seen this sort of thing before, many times.

HS: Why do you think it might "do more harm than good"? What might the "right" approach look like?

MC: I'm afraid, based on experience, that the donors (who are varied; largely private foundations in the United States, and a mixture of government and private donors in Europe) will want to throw lots of money at the problem. If they give oodles of money directly to indigenous organisations, things could go awry fast. Few of them in Latin America, a region I know best, presently have the administrative capacity to manage money responsibly; they are learning, but they need help on this. The large conservationist NGOs see their role as working on *conservation*, not *administration*—or any of the other needs of indigenous organisations, such as land tenure and employment ("too political," they often say). Also, we are in a transition phase, in which indigenous groups want to take more control of their own programmes, and many are increasingly seeing non-indigenous NGOs that work with indigenous peoples as unnecessary, and their role is being questioned by both indigenous peoples and donor agencies. Into this mix, we find the largest donors wanting to do something big and fast (after all, the problems facing all of us are quite large) and this will never happen if they are forced to fund small, less sophisticated indigenous organisations. So, they stick with the large conservation NGOs. There are very few donor agencies that have experience with indigenous peoples, and too much money too fast can cause havoc. It can easily destroy the organisations they are attempting to help.

Much of this is predetermined. In the environmental programmes of the large foundations, the staff have invariably come directly from the large conservation NGOs, and they funnel their money directly back to their colleagues. This has always been the case with the largest private foundations—MacArthur, Moore, Packard, Hewlett, and Ford Foundations—and the same pattern is found throughout the donor community. The number of foundations with programmes to work with indigenous peoples is miniscule. If donors want to really help indigenous peoples, they should provide support for institution strengthening, land rights, and employment generation—things indigenous organisations desperately need. These are the priorities of indigenous peoples. But they are not the priorities of the conservationists, and trying to jam conservation down the throats of indigenous and tribal peoples will go nowhere. Donors tend not to see this, and they are invar-

iably unhappy with what indigenous peoples do with their money. This is repeated over and over and over.

HS: How has the increasing dependency of conservation organisations on corporate funding affected their relations with indigenous peoples?

MC: This has become a huge problem. It not only causes the conservation NGOs to ignore indigenous peoples; but has also served to disfigure their mission and turn a blind eye to the unsustainable, destructive activities of the corporations; and, I might add, their relations with abusive governments, such as Brazil, where the Amazon rainforest is vanishing with astounding speed. Conservation NGOs can be thrown out of a number of countries for working with indigenous peoples on environmental issues (or any other issues, for that matter). Granted, the conservationist NGOs are caught in an impossible situation, but they are the ones to blame.

HS: Could you tell us about the response the article received at the time it was published, both formally and otherwise?

MC: The editor got a strong response, especially from indigenous people and representatives of NGOs that work with indigenous peoples. Most of the reaction was positive. The three large conservationist NGOs sent in measured responses, admitting that they needed to do more to work with indigenous peoples in the field. Ford gave a defensive, not-terribly-honest response that missed the mark altogether. But the reaction on the whole was positive and constructive.

Most important, however, is that the article opened up discussion on the issue and it has continued to this day. Much of it now resides with indigenous people, who have become more openly active in the defence of their lands and conservation of their natural resources.

HS: Are there ways in which science (and scientists) can contribute to repairing this fraught relationship?

MC: It is my experience that the conservation NGOs use science to exclude indigenous people. They advertise themselves as doing "science-based conservation," which sets them apart from indigenous people, who are not, in their eyes, "scientists." (Here there is a disagreement regarding the meaning of the term "science".) With the conclusion that they need to be guided by the "real scientists" (themselves). Does this sound familiar?

My feeling is that biological science has much to contribute, and indigenous people could learn a good deal from it. But it has to be a two-way street, for the conservationists can learn a good deal from the indigenous people. Unfortunately, it all boils down to power and money, two things the indigenous people do not have.

HS: Do you have any suggestions on what biologists can do differently (e.g. in what they choose to study, the approaches they take, the interpretation of their data) to help repair this relationship between conservation and indigenous groups?

MC: What the biologists/conservationists need to do is stop imposing their agendas on indigenous peoples. They have to listen to indigenous agendas and take them seriously. They could do this by spending time with indigenous people and experiencing *their* lives, what *their* problems are and how they deal with them. What their thoughts are on a variety of issues such as natural resources, food, sustainability, economics, and land tenure. I know this would take time, but something along these lines needs to be done. Without it, there will be no meeting of the minds and no basis for negotiating terms, and collaboration. There will be no respect or trust on either side of the divide. The biggest obstacle at present is the imbalance of money and power, both of which are on the side of the conservationists. It allows them to push their own agendas, using the excuse that they know what is right for the planet. I don't think we can change this. In other words, I am not optimistic.

HS: Looking back, what is the place of this article (2004, World Watch) and the study on which it was based in the long arc of your career?

MC: I see the article as a small blip in my career path.

I value much more the work of bringing indigenous peoples together in Central America and Mexico by helping—with various indigenous groups—to organise regional conferences and workshops dealing with natural resources, land tenure, and cultural identity; and also the mapping projects we set up with groups in Latin America, Africa, and New Guinea, and the mapping of Central America we did with

National Geographic (1992 and 2002) and the International Union for the Conservation of Nature (2015). These maps were collaborations with the indigenous peoples and showed natural ecosystems, indigenous territories of occupation and use, and protected areas. All of this mapping, in which indigenous people and local villagers mapped their lands according to their wishes, have been extremely influential and have had a powerful impact at all levels.

The mapping we did with a number of indigenous peoples in Latin America, along with the work in Africa (Cameroon) and New Guinea (West Papua and Papua New Guinea) was a first step in which people in all of these areas have begun to learn about the practical value of mapping and learn to do the mapping themselves. They have begun to learn the technology of cartography; they have been working with professional cartographers in their own countries—and the cartographers have learned new skills to *work with indigenous people in the field, with field data, for the first time* (before this, they had only worked with aerial photographs, never field data). The mapping has been a real collaboration of people and technology, and the maps have been recognised as valid—"official"—by governments everywhere we have worked.

When I consider all that has been done with the organising and especially the mapping, the World Watch article was a minor diversion.

HS: What might you say to a young conservationist who is about to read the 2004 article?

MC: Just be aware of the issues it raises. I can't force anyone to behave as I would like. But they should know what the dynamic between conservation and indigenous rights is, and perhaps learn something that can lead to a more constructive partnership in the field.

This article has been modified from: Sridhar, H. 2022. Revisiting Chapin 2004. Reflections on Papers Past. https://reflectionsonpaperspast.wordpress.com/2022/04/24/revisiting-chapin-2004/. Accessed on 5th May 2022.

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The ecological extinction of land animals

Author **Maya Munstermann** | *Illustrator* **P I Megha Vinod**

As a lemur swings through the forest, consuming fruit, it inadvertently contributes to the persistence of the forest flora. Forest regeneration and ecosystem functioning are not at the forefront of the lemur's to-do list. Rather, when the lemur enjoys its meals, seeds are consumed and, via faeces, distributed throughout the forest. However, the logging of huge tracts of forests at an alarming rate creates a dire survival situation for arboreal, foraging primates, and a negative feedback loop ensues. As the trees in the forest are felled, available habitat declines and many species are unable to remain in the forest consuming fruits. In turn, the seeds they would normally digest and defecate are no longer

dispersed throughout the forest. Other organisms with tree-dwelling and foraging ecological traits will have similar effects on ecosystem functioning. Many plants rely on larger consumers, such as lemurs, to disperse their seeds, and without these obligate dispersal partners, the plants cannot effectively maintain their populations. Thus, there is a domino effect with extinction.

Plants and animals possess ecological traits that directly mediate ecosystem services. In the primate-logging example, not only are the lemurs at risk of extinction, but the important ecosystem functions (seed dispersal) they provide are also at risk. However, if we can assess extinction risk in terms of ecological traits, we can obtain a clearer image of the cascading effects that may result from their loss. Yet, the consequences of the biodiversity crisis are typically measured in terms of population loss or individual species extinctions. Due to the differences in ecological and taxonomic diversity, our research team was particularly interested in another equally important aspect of the biodiversity crisis: the ecological functions that are at risk of being lost and the associated consequences.

Ecological traits at risk of extinction

We assigned terrestrial vertebrate (amphibians, reptiles, mammals, birds) species to three core ecological niche axes (habitat association, mode of locomotion, and feeding mode) and tested for associations with their extinction risk status. We found that cave-dwelling amphibians, primates that live in trees and use all four limbs for locomotion, aerial and scavenging birds, and scaled reptiles that use walking locomotion are all disproportionately threatened with extinction (high-risk ecological categories). The loss of ecological functions associated with these traits has the potential to disrupt ecosystem processes and services on global scales.

Risk factors of extinction

We identified the threat types contributing to endangerment across all terrestrial vertebrates. Agriculture is a dominant human influence on our planet and we discovered that it is the single most common threat type to terrestrial vertebrate species globally. Further, we examined the connection between the high-risk ecological categories and their primary extinction threat types. For example, primates that live in trees and use all four limbs for locomotion are most threatened by agriculture, hunting, and logging.

The *'death by a thousand cuts'* hypothesis

We examined the total number of extinction drivers threatening terrestrial vertebrates as a whole and within each taxonomic class and found that species at greater risk of extinction are on average affected by a greater number of extinction threat types. Thus, following a death by a thousand cuts scenario, where a species may tolerate one or two extinction drivers, but as the number of threats increase, the species' vulnerability to extinction also increases.

Our study demonstrates that certain ecological traits make a species more vulnerable to extinction. The preferential loss of ecological traits in conjunction with increasing human disruption, has the potential to have global consequences. By identifying the threat types most strongly associated with endangerment of ecological traits, we take a critical first step towards ameliorating these global functional disruptions.

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Making better decisions to save species and ecosystems

Authors **Victoria Hemming & Abbey Camaclang** | *Illustrator* **Komal Pahwa**

Halting species extinction and ecosystem degradation require proactive decisions. We make decisions every day, often without thinking, but the decisions encountered in conservation are often perplexing. They include decisions like, how to save a species threatened with extinction? How to protect species and ecosystems while also considering the needs of people? When to stop monitoring and implement an uncertain solution? They take place against a backdrop of cumulative anthropogenic pressures, chronic underfunding, and a broader social, cultural and economic landscape. They also involve differing values, complex alternatives, scarce resources, urgency, and uncertainty.

When faced with such challenging decisions, the rapid, intuitive way we make decisions is often not our friend. It can lead us to delay decisions, pick the first alternative that comes along, or flip a coin and hope for the best. But using these strategies to manage species and ecosystems can lead to bad outcomes. For example, species may go extinct while waiting for the action to be taken, or scarce funds may be wasted on ineffective measures.

So, what can be done? In a recent paper in the journal Conservation Biology, we suggest that theories, frameworks, and tools from decision science can help. Decision science structures thinking so that decisions are informed, transparent, and defensible, and the alternatives identified improve the chance of achieving desired outcomes. Decision science is not new to conservation, but there are barriers to uptake. These include a lack of training; confusing terminology; a perception that applying decision science is complex, time-consuming and costly; and not knowing where to start.

Our paper seeks to overcome these barriers to help conservation practitioners navigate the disparate decision science literature better and improve the rigour and feasibility of applying decision science in conservation contexts.

We contend that better outcomes start with learning to think through decisions by decomposing decisions into manageable components. This process is called decision analysis (or structured decision-making) and lies at the heart of decision science. The steps can be loosely summarised as follows:

- Define the decision to be made
- Specify what we want to achieve (i.e., values of importance)
- Identify the alternatives we can take to achieve values of importance
- Estimate how alternatives perfor on values of importance
- Assess trade-offs
- Pick the best option

Iterating through these steps helps ensure we're working on the right decision and that all values of importance are identified. This process can also help to design alternatives that better achieve these values. Rapidly iterating through these steps with the information at hand may reveal a suitable alternative, at which point the decision can be made. If this doesn't occur, the initial iteration can provide insights for subsequent iterations (such as a value that needs to be considered).

At each step, a number of decision-support tools can be drawn on. They include qualitative tools, such as brainstorming, conceptual mapping, and strategy tables; quantitative tools, such as data, models, structured expert elicitation; and tools for dealing with trade-offs. In addition,

there are decision support frameworks such as Priority Threat Management framework and Systematic Conservation Planning which can help to navigate through multiple steps of a decision analysis for a range of conservation decisions. Our paper simplifies the choices between the vast array of tools and frameworks by outlining to which steps and to what problems each may be helpful.

For those facing difficult conservation decisions, our paper provides a much-needed contextual framework of key terms and prescriptive guidance for getting started with decision science. This will help to illuminate a pathway for turning these difficult problems into timely, effective, and beneficial outcomes. As a bonus, many of the steps outlined are universal and will help improve decision-making for any difficult decision encountered.

Positionality statement: The paper reflects the views and experiences of 24 authors who primarily work in Australia, Canada, the United Kingdom and the USA, and who have been primarily trained in western (ecological) sciences. The authors have diverse demographic identities within these bounds, and diverse experience with decision science. Our hopes in preparing this paper were to: 1) Provide a simple entry point to decision science, so that difficult conservation decisions are more tractable; 2) Diversify who can access and apply decision science; 3) Provide a foundation for critical appraisal of the field; and 4) Stimulate discussion and contrast of the field and other ways of making decisions for biodiversity conservation.

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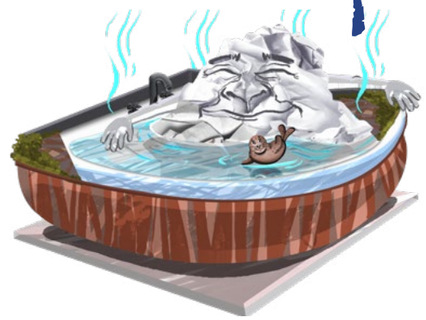
DisOBedient LandScapes



Author **Kartel Shockington** | *Illustrator* **Amit Kaikini**

At the turn of the last century, James Carrier and Daniel Miller introduced the idea of a 'virtualism'. A virtualism is a model of reality that is so powerful that when people imbibe the model, they expect it to be true. A bit like marriage if you think about it. If reality proves to be different from the model then reality, not the model, has to change.

In the main, these authors had in mind economists' models, which have tremendous prescriptive power. For example, these models expect people to be rational profit maximisers, and when the modellers discover that people are not, well then, they ought to learn to be. You must change yourself to conform to the model. But virtualisms are also prominent in conservation. Conservation is full of models and visions of what the Earth should look like. It is the science of the future.

Carrier and Miller's arguments are important, but they are flawed in one obvious respect. They fail to say how right virtualisms are. It seems obvious to us that if you have a good working model that allows you to understand things, then it is only reasonable to change the world so that it fits the model. Otherwise you fall prey to a myriad local tyrannies and pretensions of nuance that simply ignore the fact that THE MODEL IS RIGHT. Models are always right. In fact, they are more than that. They are beautiful—which is why models are called 'models'. On the catwalk of life, they shine most gloriously. The history of life on this planet could, and should, be written as an unnecessarily painful process of learning to be a model of itself [1].

Now, it is our unfortunate duty to report that, despite there being a number of reasonable and utterly exquisite models of landscapes, biodiversity and society, there are a number of places and things which continue to exist in blatant disregard of their proper place or form. We must do something about this. And it is with more sadness than anger that we write to seven of the most egregious offenders these letters in the following page.

[1] DNA, for example, did not have a clue what it actually was until Crick and Watson made their famous model of it.

1) Dear Indian biodiversity,

According to the Global Roadmap for Conservation, you ought not to exist. Given the massive number of roads that run through your domain and the bazillions of people that live off you, you should have disappeared and become a low priority for conservation planning. We ask that you rid yourself of all those endemic fish and frogs, butterflies and birds and beetles. Keep a tiger for old times' sake!

Don't drive us crazy,
The Road Kartel

2) Dear Siberian Tundra,

By virtue of the same Global Roadmap, you have been pronounced an important area for biodiversity conservation. So, stop mucking around with the handful of shrubs and herbs, and the occasional anaemic tiger, and give us the goods. We demand a cacophony of crickets, a glut of geckos, a decadence of damselflies. How about a forest? That would be good for carbon too. These cold austere landscapes will not do.

Freezing you out,
Cold Shockington

3) Dear Wilderness of North America

You most definitely exist. You were created by imagining people-less wilds to be the pinnacle of landscape evolution and then purging the peoples who had the temerity to people you, thus restoring your unsullied virginity. But you need to get bigger, better, more original. The histories of the lands you need to conquer are no object. After all, they never have been before. You are much too small and modest right now. And make your mountains grander while you are at it, please.

Yours pristinely,
Awe Shockington

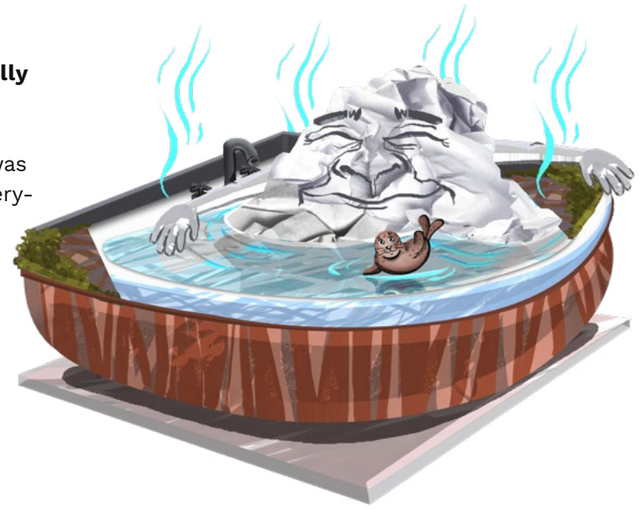
4) Dear Mt. Hanang,

We regret to inform you that you exist in the wrong place. You are a 3500m mountain found in central Tanzania, covered with afromontane forest and montane ericaceous vegetation. Yet, in the vitally important new eco-regions map of all the world's ecological zones, you are plainly, and rather neatly, classified as halophytic floodable savannah. You are appear to think that you are an extinct volcano, but you are meant to be a salt lake. You must stop this selfish occupation of endangered halophytic territory immediately. You are therefore instructed to move to one of the places where extinct volcanoes are normally found within three days of the post-marked date of this letter. Please resist any temptation to explode upon receipt of this directive.

We lava you,
Heat Shockington

5) Dear Unpronounceable volcano originally somewhere in Iceland,

If ever there is a feature of the landscape that was found in the wrong place, it is you. You got everywhere! Keep yourself to yourself and well away from any flight paths for evermore.



We lava you too,
Still Smokington

6) Dear Beaches of the World,

Stop shifting your sands. All this constant erosion and accretion is driving us nuts. You are making it very hard for coastal developers, cartographers, town planners, and beach bums. Various molluscs, crustaceans, and worms of all kinds are greatly inconvenienced by your behaviour. We have also received a petition from the sea turtles of the world, asking that you stay exactly where you are. Do not move, do not cross go, do not collect $200!!

Yours sedimently,
Oyster Shuckington

7) Dear Global Economy,

You have never done what was expected of you. The Crash of 2008? The shock therapy treatment of Russia? Are you trying to make economists look stupid? Your behaviour is decidedly weird because you helped give rise to the phenomenon of virtualism in the first place. At the very least you could have stuck to the script. Now people are pointing out that growth does not bring happiness, prosperity (broadly defined) or a general positive outlook on life. And that is definitely not what the model prescribed.

Yours shilingly,
Debt Piling-upton

The problems do not end here. Make up your minds, mangroves—are you aquatic or terrestrial? Rivers, how dare you change course? And in the larger and longer scheme of things, continents, for heaven's sake[2], stop drifting and settle down.

If only the world and its peoples (and other life) realised that it is the scientists' job to decide what things look like and how to behave, and everyone else's job to do what they are told, then the world would be a much better place. Just ask a lab rat.

Kartel Shockington *is a failed comic book creation with special powers of rapid hair loss. He sometimes appears as Kartik Shanker, and at other times as Dan Brockington.*

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Amit Kaikini *is a freelance illustrator, with a decade of experience in digital advertising. He loves to explore Sci-Fi & Horror genres, with an inclination towards nature & a desire for surreal storytelling, he is working towards selfpublishing his own comics in the near future.*

[2] Ed – surely 'Earth' in this context?