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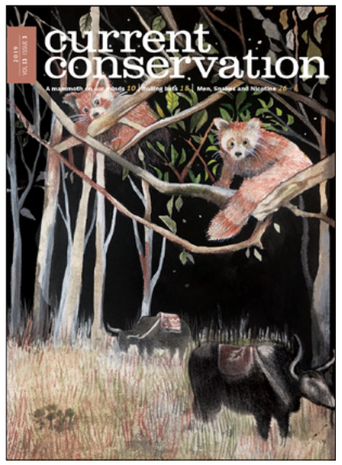


Cover art **Tanuja Ramani**

As the latest to join the amazing team at Current Conservation, I've had great pleasure in helping put 13.4 together. Having spent a good portion of my career studying the feminist gaze, I was struck by Aditi Patil's take on the male gaze that follows her during field trips. Vikram Aditya leads our spotlight story with social medias relationship with the poaching of the pangolin, while Sonia Holmstrom gives us a peek into the life of the elusive red panda. Dina Rasquinha talks crocodiles to us, with some wonderful anecdotes from her time spent with them in Bengal. And while we are on the subject of reptiles, we have the privilege of having the snake man himself - Romulus Whitaker - write for us about a field assistant he cherishes. This story continues our series on field assistants and is the first of a set by Whitaker.

Starting with this issue, we are introducing a section titled 'For Better or Verse' featuring poems that fit the ecological narrative. We're also spotlighting the work an ecologist and two game developers have put together on bird communities. This issue also has a book review by Divya Ramesh where she discusses de-extinction via mammoths – its science and morality. Finally, Nicole Pinto presents her research in translation about human-elephant conflict, and Ari Drummond sheds light on how bats are paying the price for climate change. It has been a privilege to watch our illustrators bring these moving stories to life. I hope you enjoy reading this issue as much as I've enjoyed editing it.

—**Shruti Sunderraman**

Cover art **Saloni Basrur**

In this issue, we're focusing on our friendly neighbourhood spiders. And they really are friendly and neighbourly. Let our dear arachnid-whisperer, Vena Kapoor, tell you all about spiders and walk you through some myths that you may have commonly believed to be true.

—**Shruti Sunderraman**

Your social media likes could be killing pangolins in India

Author **Vikram Aditya** | *Illustrator* **Prajwal Acharya**

Trafficking of body parts and products made from rare and threatened wildlife species are highly lucrative businesses for organized cartels. This business severely exploits poor and vulnerable forest dwelling communities who are usually unaware of the risks and costs involved. In India, a range of species are illegally hunted and traded; some of them, smuggled abroad by trafficking networks. Commonly traded species from India include reptiles like star tortoises, sand boas, and geckos; birds including parakeets and owls; mammals including the Tibetan antelope, musk deer, civets and large cats; large woody trees such as red sanders and teak as well as several rare medicinal and ornamental plants, particularly orchids.

Technology, social media and communication tools play an important role in facilitating wildlife trade through bringing together the nexus of middlemen and buyers based in cities and towns with the hunters who are mostly from villages virtually. Middlemen share videos and pictures of threatened and protected species online to their colleagues and contacts online, attracting buyers and therefore, enabling the trade and trafficking of endangered species.

No single group of animals has been more affected by illegal wildlife trade than pangolins, a group of medium sized, toothless mammals with horny scales covering their body. These scales protect the pangolins from ants and termites, which is their principal diet. Along with the scales, their long tongue and prehensile tail gives them the appearance of a reptile. Of the eight species of pangolins distributed across Africa and Asia, two are found in India, the Chinese pangolin (Manis pentadactyla) and the Indian pangolin (Manis crassicaudata). They are also unique in belonging to their own order (Pholidota) and family (Manidae), highlighting their unique evolutionary history.

All pangolins are under severe threat throughout their range due to the domestic and international demand for their meat, scales and skin. In particular, the four species of Asian pangolins (Indian, Chinese, Sunda and Philippine) are all highly endangered and could face extinction in the next decade. Since the populations of the four Asian pangolin species have plummeted, traders are turning their attention to the relatively more common African pangolins. Consequently, pangolin seizures are increasingly that of African pangolins.

Based on the surveys and community interviews during the course of our project on the Indian pangolin in the Northern Eastern Ghats of India, we found that the most frequently used methods for hunting pangolins were

1) identifying and digging the burrow;
2) tracking the foot and tail prints;
3) waiting at the burrow for the animal to emerge and then hitting them with sticks on the head;
4) use of dogs in tracking them and identifying their dens;
5) setting fire to their burrow entrance to smoke them out, and
6) tracking them at night (since pangolins are nocturnal).

These methods often overlap and are used in combination. It is reported that the pangolins are extremely easy to catch once they are sighted.

A local who hunted several pangolins before recollects, "Dogs track pangolins to their burrows. If we find them outside, they don't even run away, they turn into a ball. We cannot pick them up directly, as their scales will cut our hands. We hit them on their heads with sticks, and they open up. Then we hit

woman we interviewed recalls, "I have seen this, eaten its meat many times. When my husband was alive, he and a few others used to hunt it, they used to dig them out of their burrows with spades."
However, people now realize the commercial value of pangolins in the wildlife trade market, and are trying to keep it alive till they find a buyer and sell it. Pangolins fetch steep prices locally and in the international market, and this is the greatest incentive for its hunting. Some researchers feel that since money is the greatest motivator for hunting pangolins, any strategy which seeks to ask communities to forego that lucrative activity should start with identifying other conservation friendly and economically profitable activity.

Pangolin parts, particularly their highly sought after scales, are composed of keratin, the same material that makes up human fingernails and hair. Keratin is not known to have any medicinal properties. This is the case with most other wildlife parts, which are made of the exact same materials as human body parts. Breaking widely held myths about the purported medicinal properties of wildlife is vital

trade though, remain the grassroots communities, particularly forest dwelling people who coexist with these species. Unless they are made the main partners in conserving pangolins through community initiatives, the situation may continue to worsen rapidly for pangolins and other endangered species. The convergence of various stakeholders, most importantly forest dwelling communities, researchers, government departments and NGOs, in devising strategies to break the web of poaching and wildlife trade is therefore essential to save pangolins and other threatened species from extinction.

Vikram Aditya *currently works as a postdoctoral research associate at the Ashoka Trust for Research in Ecology and the Environment, Bengaluru, on a project focused on developing models for assessing the contribution of biodiversity to agricultural productivity, food and nutritional security and livelihoods*

Prajwal Acharya *is an engineer turned self-taught artist. What started as a small hobby has now become his passion, which made him quit his job and move to the hills. And now he spends his life just creating art.*

Pondering the Red Panda

Author **Sonia Holmstrom** | *Illustrator* **Tanuja Ramani**

Introduction to the Red Panda

In March 2019, I was in eastern Nepal's Bhojpur district for conservation work about red pandas. Suddenly, I found myself in the Bhalukhula Community Forest, an area our guide explained had never had foreign visitors before. I was struck by the vast differences from the Colorado forest I am used to. The Bhalukhula Community Forest never burns, it is old dense growth and the forest floor is covered in moist decaying leaf litter. The trails are only used by locals crossing into other districts and not overrun for recreation. The only forest protection in place is those enforced by local community members.

With the guidance of a local cattle herder and the community forest president, we trekked through the area in search of evidence of red pandas. The forest was so dense with bamboo and trees in some areas that we couldn't fit through and needed to retrace our steps. We climbed rock walls, crossed waters, and slid down steep slopes. The woods were quiet, the lack of human presence ominous. It was hard for even our experienced guides to wade through the terrain, but despite this, everywhere we hiked, there was a local variety of cattle - called chauri. Evidence of the impact of cattle disturbance on the red panda habitat was startling and unexpected. This experience affirmed what I had felt from the very first time that I connected with red pandas – that the world needs to know more about these amazing creatures and what we can do to protect them.

After returning from Nepal, I became increasingly determined to share the plight of this unique animal with the world and raise support for its conservation. Understanding their natural and evolutionary history is essential to protecting them in the wild. The red panda (Ailurus fulgens) from the order Carnivora is an endangered arboreal mammalian species with a curious and debated evolutionary history. It lives in high elevations range of 1500 – 4000 meters, is a size similar to a housecat, and has distinct red-colored fur with a long, ringed tail. The red panda is currently found in temperate forests of China, Nepal, Bhutan, India, and Myanmar. Throughout its range, it is primarily threatened by habitat loss, fragmentation, poaching, and illegal pet trade. Red pandas are an indicator species, with their declining populations foreshadowing larger ecological issues in their forests and the growing problematic effects of climate change.

Like the giant panda, bamboo is the main food source of the red panda even though it is classified as a carnivore. In fact, the controversy surrounding the

taxonomic lineage of the red panda has lasted for nearly two centuries. Only recently has molecular research and new fossil evidence revealed that this unique and elusive species is a living fossil, whose close relatives – Simocyon batalleri – are only known from the fossil record.

Who is the red panda?

Historically, the red panda has been grouped with many other families or clades in the order Carnivora, such as Ursidae, Pinnipedia, Mustelidae, and Procyonidae. It was once grouped in a family with only the giant panda, who now is long established to be in the Ursidae, or bear family. The red panda currently lies in its own family, Ailuridae, due to its unique traits, diet, and its relationships to the other carnivore families who remained undetermined and debated for so long. We now know that Ailuridae split off from its ancestors into its own family after Ursidae and Pinnipedia (seals, sea lions and walruses) and has long been in a category of its own.

In recent years, researchers have gained a better understanding about the evolution of the red panda due to fossils that have been found from the Miocene Period. These relatives had primitive carnivore dentition that did not yet show evidence of the herbivore tendencies red pandas have today.

Simocyon batalleri is an example of one of these ancestors and has been studied and categorized as an Ailurid because of the similar adaption of the carpal bone and skeletal features which showed a propensity for climbing over other forms of locomotion. The Simocyon batalleri skeletal adaptations evolved for climbing and an overall arboreal lifestyle because it was important for its survival. It was a small carnivore that needed to adapt to compete and retreat from the larger carnivores of its time. This need to climb also contributed to the adaptation seen in the radial sesamoid. The radial sesamoid evolved as a false thumb for the purposes gripping vegetation which improved climbing. In the red panda we see today, this adaptation functions for both improved climbing as well as for a secondary purpose, gripping its primary food source bamboo.

The modern red panda belongs to the subfamily Ailurinae, which previously had a geographic distribution that was spread throughout Europe, Asia and North America. This indicates that the ancestors of the red panda were once found in the United States. Ailurinae's biogeography was greatly affected by a changing climate and the growth of temperate forests in the Miocene and Pliocene, causing migrations that resulted in widespread populations. The current range of the modern red panda is small, highly fragmented areas in western Asia.

How the red panda adapts and evolves

It wasn't until I visited Nepal that I witnessed just how well the red pandas' red fur helps them camouflage. In the forest there were many trees with the patches of red moss growing on branches, while their dark colored undersides and legs keep them hidden from predators looking below. The guides informed us that even to their trained eye it is difficult to spot these elusive animals.

It is a species with unique adaptations making it well suited for its arboreal lifestyle and specialized diet, traced from those ancestors dating back millions of years. The red panda has additional adaptations that have evolved to help it better survive in its high-altitude home range. Furred paw pads allow for better gripping of logs and trees, aiding its arboreal lifestyle, as well as ensuring the paws stay warm in the cold climate. A long, bushy tail helps with balance, locomotion, and can wrap around its body to keep itself warm. Their striking red color was originally a mystery to me.

The red panda has several muscular and skeletal adaptations that also assist with climbing. One of these adaptations, a flexible joint connection between the tibia and fibula bones, allowing the fibula to rotate on its axis enables their ankles to rotate so that they can climb down trees head first. Red pandas are one of only a few animals in the world that can climb down trees head first and this helps protect them from being vulnerable to predators.

Due partly to its bamboo diet, the red panda evolved an unusual adaptation of the radial sesamoid, which is enlarged to act like an opposable thumb to grab and hold bamboo. This is an adaptation it has in common with the giant panda (Ailuropoda melanoleuca), and is an example of convergent evolution.

Many people are unaware there are potentially two species of red pandas. A geographic boundary and differing physical features distinguishe the two red pandas. The main physical differences are seen in the skull, overall size, and fur color. The western red panda, Ailurus fulgens fulgens, found in Nepal, Bhutan, Myanmar, and India have less pronounced skull features, are generally smaller, and have lighter eye masks. The Styan's red panda, Ailurus fulgens styani, found in China, have more distinct and dark fur features, in particular a darker face mask, and a more pronounced tail stripe pattern.

In the Bhojpur district, many of the local people I spoke with did not know what red pandas were at all, let alone that there are two subspecies. Some locals referred to the red pandas as tiger babies and were frightened of them. In the Bhalukhula Community Forest, the local people believed in the folklore that when red pandas touched any metal object made of brass would glow, adding to the mystical perceptions of the red panda in Eastern Nepal.

Tails for the future

Red pandas face many looming threats. Mainly due to their elusive nature, one of the issues contributing to these threats is a lack of research and data on their biology, populations, and ranges. Red pandas have evolved to fit narrow ecological niches that must be maintained for their survival. These niches require temperate forests with dense bamboo cover, fir trees, and fallen logs, coupled with specific elevations, temperatures, slope, and proximity to water. Currently, their habitat is disappearing and fragmented, and populations occur in small densities mainly because of human development and livestock herding impacts. Although many protected areas have been established in order to support their conservation, it has been estimated that more than 77 percent of red pandas live outside of these protected areas. Red pandas are also being threatened by parasites, and diseases spread from domesticated animals like livestock and dogs, in particular canine distemper, a high incidence of infant death in the wild may be attributed to their susceptibility to these novel parasites and diseases. Poaching using snare traps are also a great threat to their continued survival, particularly in Nepal and India.

In recent years, illegal trade – both for red pandas as pets and for their parts – has become an increasing threat for these adorable animals, but little is known about where the captured red pandas are going. The appeal of the red panda is no secret to anyone who has seen them in zoos or online, but they do not make good pets for numerous reasons. Red pandas have an incredibly shy nature and require a specialized and expensive diet, mainly fresh bamboo constantly throughout the day. Red pandas defecate many times a day due to their diet, and not usually in the same place. They prefer to be up high in trees; how many people can realistically provide this in their homes?

The red panda's conservation needs to be supported by programs that work towards gaining more knowledge of these amazing creatures through coordinated field work in their remaining habitat ranges. It is also important that the countries and communities in proximity to red panda habitats work together towards their conservation, in order to effectively enforce laws protecting wildlife from being trafficked. Restoring habitats is another important effort that needs to be made to repair damage caused by livestock and deforestation.

Educating and working with communities on sustainable livestock management and timber use is another way to bolster red panda conservation. There needs to be collaboration between countries to develop and expand protected areas and corridors. Amazing work is being done and programs have been created, in particular by the Red Panda Network, but more needs to be done if the species is to be saved. They have created community based conservation programs like the Forest Guardians, where local community members are trained to monitor the red panda habitat in their area and provide education on the red panda. They also focus heavily on lessening the impact the local people have on the forest while respecting the needs of the community members' livelihoods. This is done through providing improved cooking stoves, teaching sustainable herding and livestock management, and education on the dangers of free-roaming dogs. Community-based conservation is just one approach that can shift perceptions and create local investment in the conservation of a species.

The red panda is a remarkable and mysterious species whose evolution and historical biogeography still has significant gaps and continues to be debated. Only time and new fossil evidence will uncover the important information needed to better understand the red panda's place in the order Carnivora and its historic geographical distribution. The threats facing the red panda are many but there are conservation efforts being made that need support. Spreading awareness of this incredible animal will help ensure their long-term survival. How can the world afford to lose such an amazing and unique species?

Further Reading:

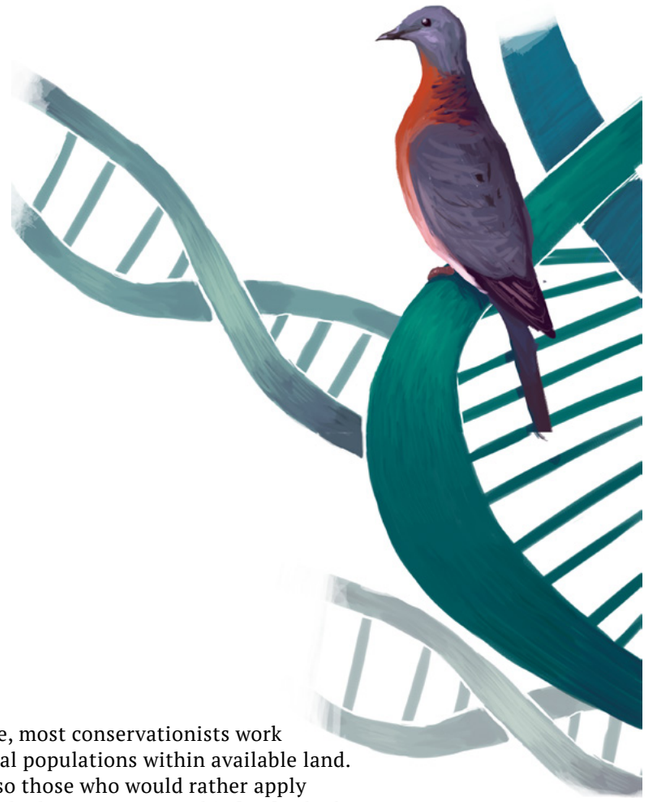
Angela R. Glatston
Red Panda: Biology and Conservation of the First Panda

Arjun Thapa, Yibo Hu, and Fuwen Wei
The Endangered Red Panda (Ailurus fulgens): Ecology and Conservation Approaches Across the Entire Range

Why Save the Red Panda?
The Red Panda Network

Sonia Holmstrom *who recently received her graduate degree from the University of Miami, Ohio, is an animal keeper in Alaska, and is a Red Panda Conservation Liaison for the Katie Adamson Conservation Fund.*

Tanuja Ramani *is an artist/illustrator exploring themes related to the interplay between our collective human behaviour as cultures and societies, and the natural world. She creates artwork for books, magazines, products, and packaging, as well as a collection of art prints and illustrated products.*



A mammoth on our minds

Author **Divya Ramesh** | *Illustrator* **Hari Kumar**

In a world with limited funding and fast-vanishing space, most conservationists work towards preservation and management of existing animal populations within available land. They work to prevent extinctions. However, there are also those who would rather apply their efforts towards resurrecting extinct animals. This ideology may seem a bit far-fetched and is not particularly popular with the larger community. From minor scepticism of the methods used, to outright dismissal of the entire concept, the idea of recreating extinct animals tends to divide a room. Torill Kornfeldt's book, *The Re-Origin of Species: A Second Chance for Extinct Animals* attempts to bring these disparate opinions to the table and provides plenty of food for thought.

The resurrection of extinct species is definite cause for trepidation. There are too many movies out there with apocalyptic settings and out-of-control dinosaurs. The author shares similar concerns and sets out in search of meaning and reason behind the concept, taking us with her to meetings with scientists across the world. If we are resurrecting species, how do we decide which species to recreate? If a species has been extinct for 10,000 years should we invest time and money in bringing it back? What about a species that went extinct only 100 years ago? Or one that is not yet extinct but stands on its precipice? Will it be a real mammoth if we're only tinkering the DNA of an elephant to produce certain mammoth-like features?

Kornfeldt does not want to give us the answer. Possibly because it is a philosophical question that we need to present to ourselves. The book acts as a guide on this journey, providing an insightful blend of scientific objectivity and dilemmatic humanity. The words encourage the reader to think about where they stand on the spectrum, how they might feel about having mammoth-like creatures roaming the Arctic scapes or cowering under the poop shower of a hundred thousand passing passenger pigeons.

Each chapter is dedicated to ongoing 'de-extinction' projects on species – mammoths, passenger pigeons, bucardo (Iberian ibex), aurochs – and explains key concepts and methods involved in bringing back the dead. Since supernatural spell-casters are highly elusive, we are left with expert scientists and tiny cells in petri dishes that are not nearly as insignificant as they may appear to be. The author does well to articulate with simple and relevant analogies complex methods such as genome sequencing and CRISPR (which is all the latest buzz). The writing maintains a good balance between the ethical and logistical complexities involved in species revival.

Periodically, Kornfeldt brings the mystical back to the courtroom of reality; it is not about the first passenger pigeon or even the first 100 pigeons. This would be a technological advancement indeed. But the aim of species revival, at least with the passenger pigeon, is to restore earlier processes of ecosystem functioning. And to have any intended impact on the ecosystem, we have to not only create many pigeons but we also have to figure out how to get passenger pigeons to form large flocks (hundreds of thousands in one flock), the way they used to in the 19th century. This is a mighty task, given that the cells in the petri dish are still years from taking flight.

Maybe reviving extinct species is not altogether a bad idea. Take the northern white rhinoceros, for example. They are viably extinct today, with only two females and no males remaining. As recent as September 2019, scientists were able to create two embryos using eggs from females and frozen sperm from dead males. The embryos are on their way to a surrogate southern white female rhino. The long-term goal is to recover this species and hopefully safeguard it from the very threats that drove it to the edge of extinction.

Before this book, I didn't think to consider the role of mammoths in keeping carbon dioxide locked into the permafrost in Siberia's vast tracts. As temperatures continue to rise, the ice breaks and carbon dioxide is released into the atmosphere, further increasing temperatures. If mammoths were present, they would compact the snow with their movements to insulate the frozen layers beneath, while also encouraging growth of light-coloured grass (which would reflect the sun's warmth), overall preventing the ice from melting and keeping the

greenhouse gas trapped. Why mammoths? Why not introduce a similar species to fill that niche? The scientist working on this project currently drives around an old Soviet armoured tank to simulate a mammoth knocking down trees, and he hopes it's only temporary.

Even though the book briefly mentions the threats that drive a species towards extinction, it does not spend much on it. The author does acknowledge that these threats need to be addressed, perhaps simultaneously, but prefers placing the context of the book squarely on a post-damage situation, to focus on the philosophical debate around de-extinction rather than the causes of species decline.

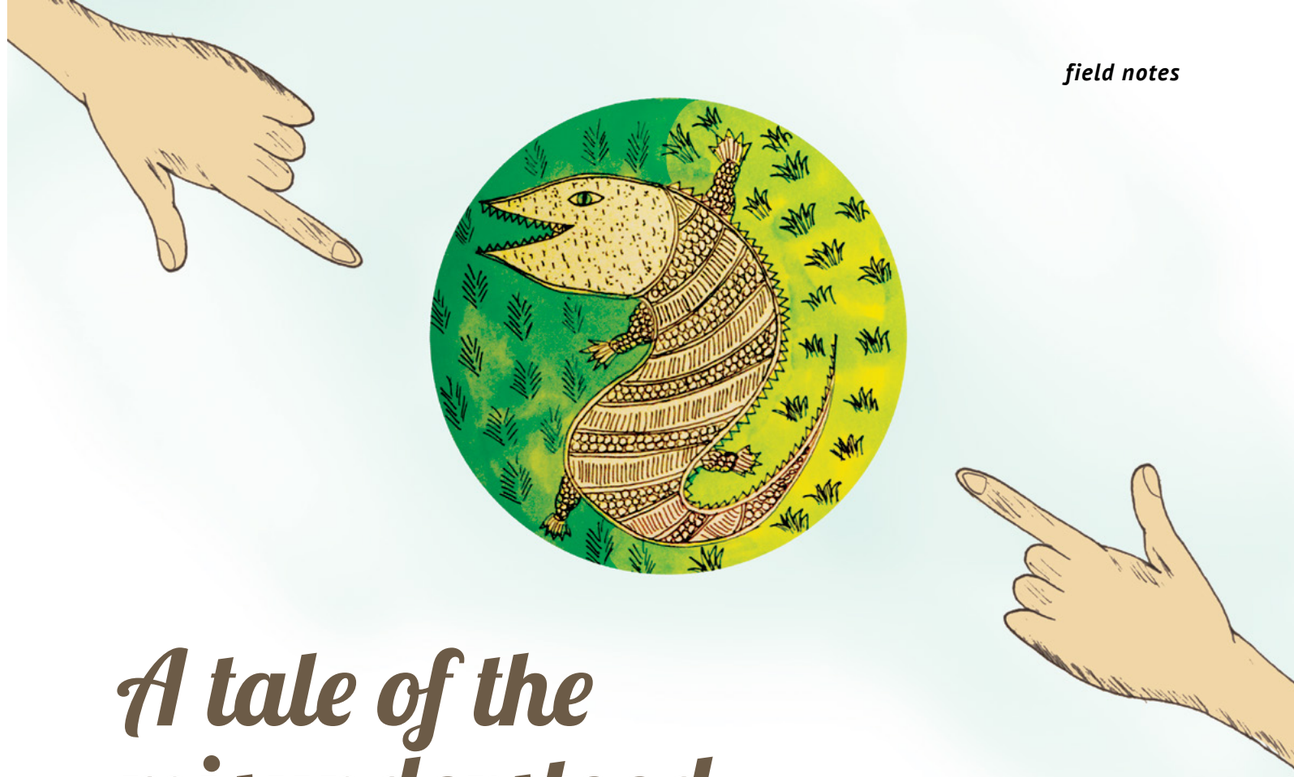
Easily the best feature of this book - it's backbone - is how it constantly initiates discussions on the morality of de-extinction. It asks the big questions of whether we should even bring back extinct species or not, how it may affect the way we interact with nature and our current views on conservation, whether it may inadvertently make us complacent to species on the edge, and what if the worst happens and we suddenly find ourselves in Jurassic Park part 6 without Jeff Goldblum.

The voice of the author at times trembles with uncertainty, fills with hope, shivers a little while pondering the whys and hows of de-extinction. As a reader, you may find her words mirroring yours - trying to choose which side of the fence to land on.

I'm left wondering if the appeal of species revival, like other concepts in conservation, depends on context. I would have liked for the author to arrive at a decision, albeit for herself, in any one species revival project, and share her reason with the readers, as an example of how to navigate this "philosophical quibble in my (own) mind." If we are indeed re-creating species, I find myself more accepting of the rhino project than the mammoth project for instance, and even then only after completely eliminating poaching and other threats to rhinos. Can we truly predict and prevent any possible mishap in the re-origin of species? Where would you draw the line?

Divya Ramesh *is a behavioural ecologist looking for patterns in nature through observations, math, words, and pictures.*

Hari Kumar *is a freelance Graphic designer currently based out of Chennai.He has an interest in working on books for children's education and working with technologies like augmented and virtual reality solution.*



A tale of the misunderstood crocodile

Author **Dina Rasquinha** | *Illustrator* **Maanasa Ganesh**

"We don't go alone into the forest because there are crocodiles."

A woman states this while stirring fragrant, crispy mudi, or puffed rice, on a wood-fired chullah. My field assistant and I crouched down to catch a glimpse of how each rice kernel pops into a plateful of deliciousness.

Another day in Odisha, an acquaintance recounts his encounter with a fascinating beast.

He says, "While I was fishing by the river, a crocodile attacked me out of nowhere. I somehow managed to escape unhurt."

"Did you know the Forest Department breeds crocodiles here?" asks a concerned old man. He goes on to explain how the number of crocodiles in the vicinity are increasing because of the in-situ conservation efforts of the Forest Department in the region. He is aghast. He doesn't understand why the Department invests resources in increasing the number of crocodiles. Crocodiles that eat their fish! Crocodiles that sometimes even harm them!

How crocodiles help us

But what they fail to understand is how these fantastic creatures that bask along riverbanks, soaking up the warm sun's rays, play a crucial role in the river food chain as the apex predator, much like the tiger. They help increase the general population of fish in the river by preying on predator fish that eat smaller fish and destroy fishnets.

Similarly, the scavenging role in the ecosystem is almost never discussed. What keeps the river clean? The crocodile! They ensure carcasses decompose properly, keeping the rivers clean and healthy. In this region, the crocodiles also play a very significant role in keeping mangrove forests healthy.

Part of the government's efforts in reviving the species from the brink of extinction have made sure that *Phoenix paludosa*, a mangrove palm is part of the re-afforestation efforts in the park. The bushy and scrubby growth of the palm provides the perfect nesting habitat for the reptile. The reptile also creates a sense of fear and caution, keeping villagers away from deep forested areas. They only enter demarcated forest trails, always in groups to harvest firewood. Villagers also do not trouble the reptiles by destroying their habitat.

Reptilian mythology

Crocodiles and humans share a bittersweet relationship. It's interesting how mythology sometimes plays such an intricate role in influencing how people interact with wildlife. The Indian mugger, for example, is often seen as the vehicle of the river goddess Gangadevi. The depiction portrays a calm and benign presence of the creature rather than the usual fearsome and deadly representation of the reptile.

A popular story narrates how the Hindu God, Vishnu, had to descend to Earth to rescue the elephant king Gajendra from the clutches of this aquatic beast. The elephant struggled for over a thousand years to free itself from the crocodile's powerful hold, finally resorting to divine assistance. During my time with the villagers, many used this tale to explain why they keep away from the infamous reptile. It was also interesting to know how some felt keeping away was better than simply troubling the creature.

Ironically, religious significance often overrides ecological significance in India. Occasionally, both coincide beautifully and make for enriching stories. At other times, they don't. For example, villagers value the mangrove forest, locally referred to as Hental-ban or Sundari-ban, for its ecological significance. The forest's ability to keep the shoreline intact, attenuate large waves, and provide a protective net against frequent storms is well known. In contrast, the ecological significance of the crocodiles is less clear. They are usually feared, at times revered too, but not for their important role in the river ecosystem.

Coexistence or no existence?

However, the large population density of crocodiles and humans in the region has made it difficult for both to keep their distance and live peacefully. A recent study reports that in the last 15 years, about 57 people were attacked by crocodiles in Bhitarkanika. Among those who were attacked, 27 lost their lives. The remaining suffered injuries, some major.

But from my interaction with villagers, it appeared they were more upset at not being adequately compensated for living in such close proximity to these stealthy creatures, oblivious of human-forest-water boundaries. Most felt the process to acquire compensation was tedious and non-transparent. Some strongly felt that if extracting firewood was a crime, they should at least be provided enough compensation when they suffer losses from animal raids.

They just wanna chill

Bhitarkanika harbours the saltwater crocodile (*Crocodylus porosus*), the largest species of the crocodilian family in the world. Although presently this species is at a much lower risk of extinction, the '70s was a grim decade for all three crocodile species found in the country (the freshwater species *Gavialis gangeticus* or the gharial, and *Crocodylus palustris*, also known as the Indian mugger). Commercial killing and habitat loss were two major things that pushed these creatures to the verge of extinction.

As you walk along the muddy roads in Bhitarkanika, you will notice ample green. Yellow-ish light green shade of the rice fields on one side, a dark dense green hue of the mangrove forest on the other. If you ask a villager where you can spot a crocodile, he'll point to both directions.

Every year, the crocodile park is shut to visitors during the annual crocodile census scheduled in the first week of January. It is a good earning time for some villagers, especially those who possess boats. According to news outlets, this year, officials reported about 1742 individual crocodiles. This is a marginal increase from the 1713 individuals reported in 2018.

"But the tourists don't understand," a Forest Guard explained. "There are signboards everywhere, but they still throw stones at them because they want to see them move." He emphasises, "These lazy creatures just like to stay put in one place and soak up the sun. Is that too much to ask?"

Dina Rasquinha *is a social ecologist and a communicator, currently pursuing her Ph.D. at the University of Georgia. She enjoys a good cup of tea and a story.*

Maanasa Ganesh *is a designer and illustrator currently living in Tokyo. She loves traveling, studying new cultures, visiting museums, and looking for inspiration in nature.*

Almost all my returns are timed with the sky

Author **Shreyasi Sharma** | *Illustrator* **Malvika Tewari**

A clear-dandruff like collection of clouds
should mean I am coming to the ruffle of leaves.
A cue to the coral should mean it is 7
and I am to miss tea.
A well-stationed azure should mean
the bus will have left.
A wind is still learning to settle
what it is going to leave behind.
On the roads where people spill along
with brown leaves, there is a reflection
of a chai spilled, a biscuit broken —
a tip to summer and an earthworm.
When I arrive early, I take a longer route.

When I arrive late, I already see
the sky at home
(from some other place).
Glad that the one thing that won't move with me
will be this.
I am occupied, looking around,
because
I do not need to carry the sky
or pack it or remember it forever.
I can't really do any of those things.
Even knowing that my travels speak to me
more about home, should have
made me feel adjusted. Most days,
I feel well-travelled.

Shreyasi Sharma *is a postgraduate in Literary Art Creative Writing from Ambedkar University Delhi.*

Malvika Tewari *is an illustrator and designer based out of Bangalore with a love for stories, food, and the environment. She hopes to cross paths with a Slender Loris someday!*

Boiling bats– the carnage of climate change

Author **Ari Drummond** | *Illustrator* **Deepti Sharma**

Monday, 26 November 2018 was catastrophe and carnage. When temperatures spiked from 36C to over 43C, Spectacled Flying-Foxes (Pteropus conspicillatus) plummeted from canopy heights to forest floors, carpeting leaf litter with carcasses. We arrived before the nightly fly-out unsure of what we would find. Though history had yet to record the effects of climate change on this Far North Queensland species, knowledge of heat stress events in their southern cousins–the Grey-Headed Flying-Fox (Pteropus poliocephalus)–stifled hope for moderate loss. As the sun set we watched as around thirty flying-foxes departed their roost to seek hydration from nectar and fruits. The black specks vanished into a dusky horizon that should have been peppered with bats.

Night descended and malodorous fumes settled in a forest thick with the screams of babies calling for mothers that would never again groom and suckle young. Trailing lianas and a thick, thorny forest understory flouted the beams of our torches as we attempted to trace the echoing cries of the new orphans. We found as many as darkness would allow, some gasping their last breaths. As we searched, tripping over bodies, we found young adults weakly hanging against trunks of their towering roost trees, glazed eyes unblinking as we attempted to unhook their claws from thorny vines.

Over the next 5 days our small team of volunteer flying-fox carers and rescue workers would collect almost 12,000 corpses and 351 live bats. We worked in heat reaching up to 45C, perhaps even hotter inside the 6-acre stretch forest. Death clung to every branch. In the forest centre we found the trunks of the tallest trees encircled by layer upon layer of dead bats, sometimes nearly 30cm deep. Even after 3 days of desiccation and rot we still found live young half-buried in the decomposing piles. As we scoured the forest for the live, we packed the dead into bag after bag. When we ran out of bags, we counted the scattered bodies into piles. With no options for disposal we left the bodies to stew and rot in the viscous heat. By Day 6 the forest was silent except for the constant hum of thousands of flies, still but for the wriggling of hundreds of thousands of maggots.

Spectacled Flying-Foxes are a keystone species in Queensland's tropical ecosystems. These bats are pollinators of a variety of native flowering trees and shrubs and have a long evolutionary history as primary seed dispersers of the fruiting trees that comprise Australia's northern rain forests. This region encompasses the Wet Tropics World Heritage Site, a major biodiversity hotspot. Without the flying-foxes the rain forest will lose a key player responsible for forest regeneration and growth.

Heat events such as this occur yearly in Australia and seem to be occurring with increasing frequency and severity. Due to mass die-offs, the effects are more evident in species like flying-foxes; however they threaten more than just bats. During the same event that withered the forests of Queensland, birds dropped from their perches and small mammals expired beside dried riverbeds.

This is climate change in action. Skeptics point to geological history and the uneven distribution of climate change effects to argue that the changes we see are part of a natural cycle of the Earth's physical environment. While such changes do occur, the scope and severity of what we currently face are unprecedented, outside of mass catastrophes such as extinction-generating meteorites and volcanic eruptions.

Usually we talk about climate change in terms of prevention. However events such as Far North Queensland's first extreme heat event reveal that the time for prevention has already passed us by. In order to protect species and delicate ecosystems we must shift our attention from preventing temperature increases to addressing the immediate challenges climate change has already laid at our feet. This includes finding novel ways to protect and preserve Earth's biodiversity given that climate change is already altering the habitats and behaviours of organisms across the globe.

In a few hot days we lost at least one third of the Spectacled Flying-Fox population. That week, as roosts vanished, we watched as local governments struggled to respond and trained animal rescue workers tried to cope with the scope of the crisis.

None of us at Edmonton was prepared to for the true face of global climate change: carnage. We witnessed the decimation of a colony estimated to have contained around 13-14,000 flying-foxes before the event. Of that number we were able to save 351 or less than 3%. In order to conserve the remainder of the species we will have to find ways of actively protecting the animals from future heat event effects. If these 12,000+ deaths can teach us anything, it is that we need to stop focusing on prevention and start examining how we can proactively support ecosystems and wildlife that are going to face extreme climate events with increasing frequency and severity.

Ari Drummond *is a conservationist, Wildlife Rescue Technician and an applicant for a PhD in Ecology.*

Deepti Sharma *is an animator, illustrator and chocolate milk connoisseur, currently based in Goa. She deeply cares about sustainability and conservation, and love drawing plants, animals and imaginary creatures.*

An ecologist and a game developer walk into a forest

Author **Bharti Dharapuram** | *Illustrator* **Soundarya Raman**

There are animated parties in the forest with a motley bunch of attendees. Their colours and calls are hidden among the trees and one may not notice them immediately. Pay a little more attention though, and one can see birds of various hues and sizes making their way through the forest in a palpable buzz of activity. There are birds that carefully pick out insects from the bark and leaves of trees and others swoop down on flying insects in acrobatic dives. Some birds have more of their own kind for company, while others are loners that tag along with the group.

Mixed species bird flocks have been reported all around the world, and form the basis of a new card game called 'Flocks!' developed by an unlikely duo. An ecologist and a game designer put their heads together to create a game where players build their own mixed species bird flocks using rules derived from ecological principles. It has the potential of finding its way among a growing list of games that are anchored in science without compromising on the fun.

The founders of Flocks! are Priti Bangal, a PhD student at the Centre for Ecological Sciences, Indian Institute of Science, and Prasad Sandbhor, a National Institute of Design alumnus and freelance game designer – both based in Bangalore. They always wanted to work on a game or material which would connect natural phenomena with play, and wanted to bring Priti's PhD work to more people, make it interesting for them to understand. This motivated Prasad to visit Priti in Anshi, when she was carrying out fieldwork.

The current version of the game consists of a set of cards, each of which has an illustration of a bird species, its name, group size, a cartoon depicting its feeding strategy – gleaning or sallying, its position in the forest canopy and the number of points assigned to it. There are symbols identifying special cards with predator species, and drongos that alarm call on detecting predators in nature. The cards represent 12 species including gregarious, non-gregarious and predatory birds. The game is played by two-five players and starts with dealing each player two gregarious and three non-gregarious cards, and shuffling the rest

with predator cards to form a deck. A mixed species flock starts with a gregarious species card, and players take turns to build their respective flocks by adding one species at a time, gaining points based on the species and its number. As players replenish their cards from the deck in each turn, drawing a predator card threatens the flock by eliminating species, which can be rescued by the presence of a drongo in the flock. Players can declare a flock complete when it has at least two different species, and a player with the highest number of points in the end wins the game. Players strategize based on the number of flocks they build at a time and their composition.

The bird species and their traits that could be included in the game were immediately clear, but they also included aspects of their biology such as feeding, energy depletion and habitat choice in their earliest versions. Eventually, they threw away these details in pursuit of a simpler game structure and tested it immediately. Players were randomly dealt cards, with a species listed on each, and took turns to build a flock by adding species using ecological rules. One such rule derived from species biology states that a species added once, as a single or in a group, cannot be added to a mixed species flock again. As the player picks a new card from the deck in each turn, drawing a predator card dispersed their flock.

At the end of the game, flocks were assigned points based on its attributes. Through several game testing sessions, they introduced rules that allowed better strategizing and gave players more control of play. In the final version, they assigned points to each species, allowing players to earn rewards as they added species to flocks in progress. This made the game more engaging to players, and more liberating in terms of the kinds of flocks one

could form, moving closer to natural observations of mixed species bird flocks. Friends and family provided crucial help with illustrations, card design, and as unsuspecting game testers during this period.

“A game has mechanics, dynamics and aesthetics. It is a very serious business,” says Prasad. Mechanics has to do with game rules, the control given to players and the ultimate goal of the game. Dynamics refers to player choices, interaction between players, and the changes in game state that it brings about. Aesthetics refers to the entire multi-sensory experience of playing a game, he explains.

One unwritten rule while deciding on game rules was to not move away from scientific observations. They did not bring in anything alien for the sake of a story or engagement. They also point out that their goal was not to just educate people but to create a fun game where ecological rules surrounding mixed species flocks translate into game mechanics. In October 2018, they took their game to CHI PLAY – an international game research conference in Melbourne, Australia. They pitched their game by relating the ecology of mixed species bird flocks to the Mechanics-Dynamics-Aesthetics framework of game design. They were an unusual team, given that most participants came from game research labs involved in developing specific games and gaming algorithms. It was a validation of their efforts for over a year, and they could look ahead with possibilities.

The journey so far has inspired them to keep working on creating games and other playful formats like stories and comic books among others. They want to work on material that connects players to nature, making them curious enough to look around and observe natural phenomena.

Bharti Dharapuram *is a researcher studying marine biogeography at the Indian Institute of Science, Bangalore.*

Soundarya Raman *is a freelance illustrator & graphic designer based in Coimbatore. Her style leans towards minimalism with vibrant colors and contextual details.*

Charming snakes with a charming Natesan in the Western Ghats

Author **Romulus Whitaker** | *Illustrator* **Upasana Agarwal**

As a snake freak growing up in India, I was peerless. I mean, I had no buddies, no peer group who shared my obsession. I met the usual snake charmers who didn't know very much about the natural history or behaviour of snakes and I felt no sense of camaraderie with them. Sometime in 1968, I read an article about snakes written by Harry Miller, a Welsh journalist based in Madras (the old name for Chennai, Tamil Nadu). He said he gained his knowledge of snakes from interacting with a local tribal community called the Irula and his description of their abilities to find snakes sounded more magical than true. Nonetheless, I jumped on a train and was in Madras two days later to meet this fabled group. I was immediately impressed with their magical ability to read almost invisible tracks on hard ground. For whenever I'm with the Irula, it is I who am their field assistant. They were more tuned to the seasons, ways of animals, and reading tracks than I or anyone else actually.

In 1969, I set up the Madras Snake Park, the very first one of its kind in the country. Naturally, I hired Irulas to help me with this venture. Three Irulas in particular were constant companions over the next thirty years: Natesan, Rajamani and Chockalingam. Besides helping me get the Snake Park going (constructing enclosures, and feeding and caring for the reptiles), Natesan was my liaison with other Irulas who were shy to talk to me. Natesan understood my version of Tamil and quickly picked up phrases in English, enough so that his nickname among the Irula was 'Sure man'.

Early on, we realized that to make the Snake Park a success we needed to go out and catch or otherwise acquire reptiles from other parts of the country. So we started making regular trips to the Western Ghats and brought back pit vipers, trinket snakes, monitor lizards and other interesting species. This was all new terrain for Natesan; he was a man of the open, dry scrub jungle, but he soon adapted and used his superb powers of observation to find creatures in the rainforest.

I remember one trip to Nilambur Valley in Kerala. We parked the jeep on an old forest road and walked down till we hit the nearest large stream. After a ritual smoke, Natesan invoked his goddess Kaniamma and we set off downstream, walking slowly along the opposite banks of the stream. We both exclaimed to each other when we saw an interesting frog (all new to

us), giant black snail, knobby backed millipede or a plant of note. Natesan called me over to see the vine that the Irula call 'Veli-kodi kerengu', a yam that was once a staple of the Irula diet. He dug around the base of the stem and soon unearthed a huge tuber, the size of his arm. He sliced the bottom three quarters of the tuber and carefully re-planted the top quarter with the stem and vine attached. Natesan was most impressed with the size of the tuber and said that we never find such large ones back home.

We continued walking along the stream edge and I saw the first Malabar pit viper of the day. Here I could be the teacher and showed Natesan just where the pit vipers prefer to sit, motionless and splotched like lichen, along a root or low tree branches very near the flowing water where it is cool. Once he knew where they were, Natesan was spotting pit vipers every few hundred meters and it wasn't long before we had found 24 of them! Along the way Natesan dug out a couple of the big, glossy blue-black forest scorpions which I wanted to photograph.

I showed him the large silvery web-lined nest holes of tarantulas which preferred the higher embankments above the water line. My previous trips to the Western Ghats gave me a slight advantage but very soon Natesan was showing me things that I might have otherwise missed including bird nests, rat and squirrel nests and the long strings of toad eggs in a still pool.

On one trip to the Nilgiris, we dropped in to see a colony of 'hill Irula' at Mukkali, whom I had heard about and was interested to see how they differed from our 'plains Irula'. Natesan was in good form that day and for hours shared his knowledge of herbal remedies with the elders of that tribe. It turned out that these were very different people and obviously a completely different tribe with the same name being a mere coincidence. The plains Irula call themselves 'Villiyan' ('people of the bow') and Irula may have been a name bestowed on them by outsiders. The 'hill Irula' had no special knowledge of reptiles and rodents and were fascinated with Natesan's herbal remedies for snakebite. Natesan was fascinated with the comely hill Irula women and later confided to me that he'd already talked to them about bringing a hill Irula woman home as his bride.

One spectacular trip Natesan and I took was to an area now called the Kalakkad-Mundanthurai Tiger Reserve. When Natesan and I arrived in these hills we put out the word out amongst the tea estate labourers that we were interested in any snakes they see. There were many reports of king cobras and that was one snake I was sure we needed for the Madras Snake Park. Eventually we did get a pair which was causing considerable consternation in the tea fields.

There was no one stationed at the Forest Department Bungalow in Sengaltheri where we next went to. So we forced the door open and made ourselves at home, starting a small fire in the kitchen for a much needed tea fix. We hunted the grasslands, edges of a stream and the small forest patches in the valleys and came up with several snakes neither of us had seen before including a Forsten's Cat Snake, Montane Trinket Snake, Brown Vine Snake and a Flying Snake.

Natesan was learning new things too, used as he was to the dry scrub jungles of Kanchipuram district and the ecology of rice and peanut fields. Here in the rainforest we had to look for snakes under logs, in tree hollows and in leaf litter, while back home it was a question of mainly going from one rat hole to the next until a fresh snake track was spotted. Then the snake, if home, was dug out.

Natesan was as amazed as I was when we turned over a big log and found an array of creatures, all the way from a pygmy shrew and a shieldtail snake to a number of kinds of beetles and their larva, millipedes, centipedes, a couple of frogs and a toad or two and some spectacular, large jungle cockroaches. But what impressed Natesan the most were the leeches. He was familiar with the 'buffalo leeches', big ones, sometimes eight inches long, found in waterways on plains and not so interested in human blood it seems. But the forest leeches were a different story, coming aboard your feet and legs literally by the hundreds in some areas.

After sitting on a rock "deleeching" ourselves, Natesan taught me the art of stopping the blood flow. Leeches have a heparin-like anticoagulant which they use to keep the blood flowing into their gullets. After they've dropped off, satiated, the wound will keep bleeding for hours making a big mess. Natesan tore a small piece of paper off from his packet of beedis and applied a bit of it to each leech bite after wiping the blood off. The beedi wrapper was the perfect stopper unlike newspaper or toilet paper which are just a bit too absorbent to work. Natesan truly was a man of many resources.

Romulus Whitaker *is an Indian of American origin who has a lifelong obsession with reptiles.*

Upasana Agarwal *is an illustrator based out of Kolkata. When they're not drawing they organise a LGBTQ art space in the city. Their work is largely influenced by the nostalgia and history of urban landscapes and the fabric of life that ties them together. They are obsessed with tea, cats and plants.*

Why male elephants stick together in human-occupied areas

Author **Nicole Pinto** | *Illustrator* **Samyuktha S**

When young, male elephants live in herds as adolescents, they wander looking for new areas to occupy, and as adults, they settle down and lead largely solitary lives. However, for a young male to find a suitable area for himself, he will sometimes have to travel vast distances, often through human-occupied areas like agricultural fields.

A study conducted on male African elephants shows that the high nutritional content of cultivated crops corresponds with an increase in body size. This explains why elephants venture into agricultural fields, even though they sometimes have to cross highways, railway-lines and other human-occupied areas to do so.

Sociality in Asian male elephants

A new research paper found that adolescent bulls were not all solitary or in mixed-sex groups. They had formed stable relations with other males in a similar age class. According to researchers, risky environments showed an increase in group size.

The paper also showed that the availability of resources and the level of risk arising from humans inhabiting certain areas play a more important role in the formation of all-male groups.

Moreover, the elephants that fed on crops were in a significantly better body condition than those that foraged in forests. Better body conditions mean that elephants have more body mass, and can stay in musth, a period where they experience a rise in reproductive hormones for longer.

All this indicates that the formation of the all-male groups could be an adaptive strategy in Asian elephant populations in a human-dominated landscape.

Recalibrating conservation strategies

Older, more knowledgeable males play a pivotal role in all-male groups, as younger males mimic their behaviour in uncertain situations. Without the older bulls, these adolescent males would probably be more anxious in unfamiliar surroundings and prone to reacting more instinctively, and perhaps more aggressively. When devising management and conservation strategies for elephants, it is important to pay special attention to adolescent males, while keeping the protection of older bulls in mind.

Further Reading:

Nishant Srinivasaiah, Vinod Kumar, Srinivas Vaidyanathan, Raman Sukumar & Anindya Sinha
All-Male Groups in Asian Elephants: A Novel, Adaptive Social Strategy in Increasingly Anthropogenic Landscapes of Southern India

Patrick I. Chiyo, Phyllis C. Lee, Cynthia J. Moss, Elizabeth A. Archie, Julie A. Hollister-Smith, Susan C. Alberts
No Risk, No gain: Effects of Crop Raiding and Genetic Diversity on Body Size in Male Elephants

S. S. Pokharel, B. Singh, P. B. Seshagiri, R. Sukuma
Lower Levels of Glucocorticoids in Crop-Raiders: Diet Quality as a Potential 'Pacifier' Against Stress in Free-ranging Asian Elephants in a Human-Production Habitat

Nicole Pinto *works with FERAL, particularly on the Frontier Elephant Programme to communicate stories about the changing behaviour of elephants in human-dominated areas, as well as with farmers to find proactive approaches to mitigate conflict.*

Samyuktha S *is a Chennai-based product designer who finds joy in drawing, studying and interacting with the natural world. She particularly specialises in black pen illustrations but is currently exploring the wonderful world of colour.*

Men, Snakes and Nicotine

Author **Aditi Patil** | *Illustrator* **Ankit Kapoor**

As I stepped out of the car onto the fertile soil of Chikhodra village in Anand district of Gujarat, I was explaining to my team how field work is all about improvisation. My co-researcher in this project was a 25-year old woman named Manya Singh, a trained ecologist terrified of reptiles. We had come together to understand the implementation of the National Agroforestry Policy 2014 in Gujarat. Our third team member, Praful, was a recent graduate of Agriculture Science, and was proficient in the local language. We were going to interview farmers to understand what trees they planted on their farms and their experience with the practice. Manya suggested that we sneak in a quick smoke first. "Aditi, could you be a doll and get me a Marlboro from that store over there? I'll get the survey sheets in order till then," requested Manya.

The store, however, was thronged by men who were already staring at us, leaving me feeling terribly uncomfortable. You'd think as a woman living in India I'd be used to these stares. But no one ever gets comfortable with objectification, no matter what they tell you. So I reached out to Praful, "Praful, could you be a doll and get Manya a Marlboro from that store over there?"

Praful had other concerns. "Of course, I can go. But the bigger question is, why would Manya smoke a Marlboro when there are tobacco farms all around us?"

"You're right, we are in Anand! It has a dedicated Bidi Tobacco Research Centre built way back in 1947!"

"Of course, that's the first thing you do after your country gets independence!"

While the non-smokers of the team intensely discussed tobacco history, Manya had gotten the survey sheets in order, gone to the store to get her cigarettes, smoked one, spoken with a couple of men there, figured out the village demography with leads to which farmers we should talk to. I admired her gumption, patriarchy be damned.

As we crossed paddy fields and plantation farms, I couldn't help observing that a steady supply of water from Gujarat's Narmada canal-system made all plantations possible in Chikhodra for now. Anand district had an efficient canal system, making irrigation possible for successful tree farming, unlike many of other places in Gujarat, which did not even have drinking water.

The three of us were walking along one of these canals in a single file as it was a thin walking space between the canal's wall and the adjoining palm plantation. I was walking in front explaining how water intensive palm plantations might not be a good idea with the climate crisis staring us in the face, how this is in direct conflict with the objective of the National Agroforestry Policy.

Suddenly Manya let out a short high-pitched squeal. Scores of rose-ringed parakeets perched on a nearby palm tree instantly flew off, scared by this human siren. I turned around to see her face turn several shades of green resembling the paddy fields we had just crossed. After three whole minutes of trying to find her voice and two more in making sense of it, she finally blurted, "There's a snake in the water."

Brilliant, I thought, and turned on my mobile camera, rushing to the spot. Manya seemed horrified by this and began exclaiming, "Aditi, are you crazy? Did you not hear me? There's a snake in the canal and it was huge and it was moving like Kraken! "

"Wow, who was that?"

"In Pirates of the Caribbean!"

"What?"

"Kraken, the sea-monster who arises at the world's end in the Johnny Depp movie!"
I wanted to feed her to whosoever this Kraken person was right then, but I had signed ethical social research regulations. So, with all my patience, I politely asked, "Manya, the snake! Who was the snake? Was it a banded water snake? With bands or it? Or was it plain grey like the plain-bellied water snake?"

"It was like Kraken, huge and wiggly! I'm out of here."

“You do realise there can be a family of snakes here right? All the best wandering off alone!”

The look on her face as she imagined a family of “Krakens” was the best moment of my day. Thanks to Manya’s loud drama, we found ourselves surrounded by several men from nearby farms. We quickly explained to them our purpose in their village. One particular man introduced himself as the son of the Sarpanch [an elected leader of a taluka/village] and offered his suggestion, “You can finish all of your surveys right here with us, we will help you.”

I thanked him and explained that we wanted to speak to women farmers as well. They laughed among themselves while we looked at them with a straight face not getting the joke. The Sarpanch’s son tried again, “Madam, I’ll help you get all the data, there is no need for you to waste your time walking all over the village. My house is nearby, we can all sit there and talk. My wife makes excellent tea!”

A simple study on trees was going to be a lot more than just trees. We could have sat there and discussed the Sarpanch’s son’s understanding of gender roles and how the work that India’s women do on farms often goes unnoticed.

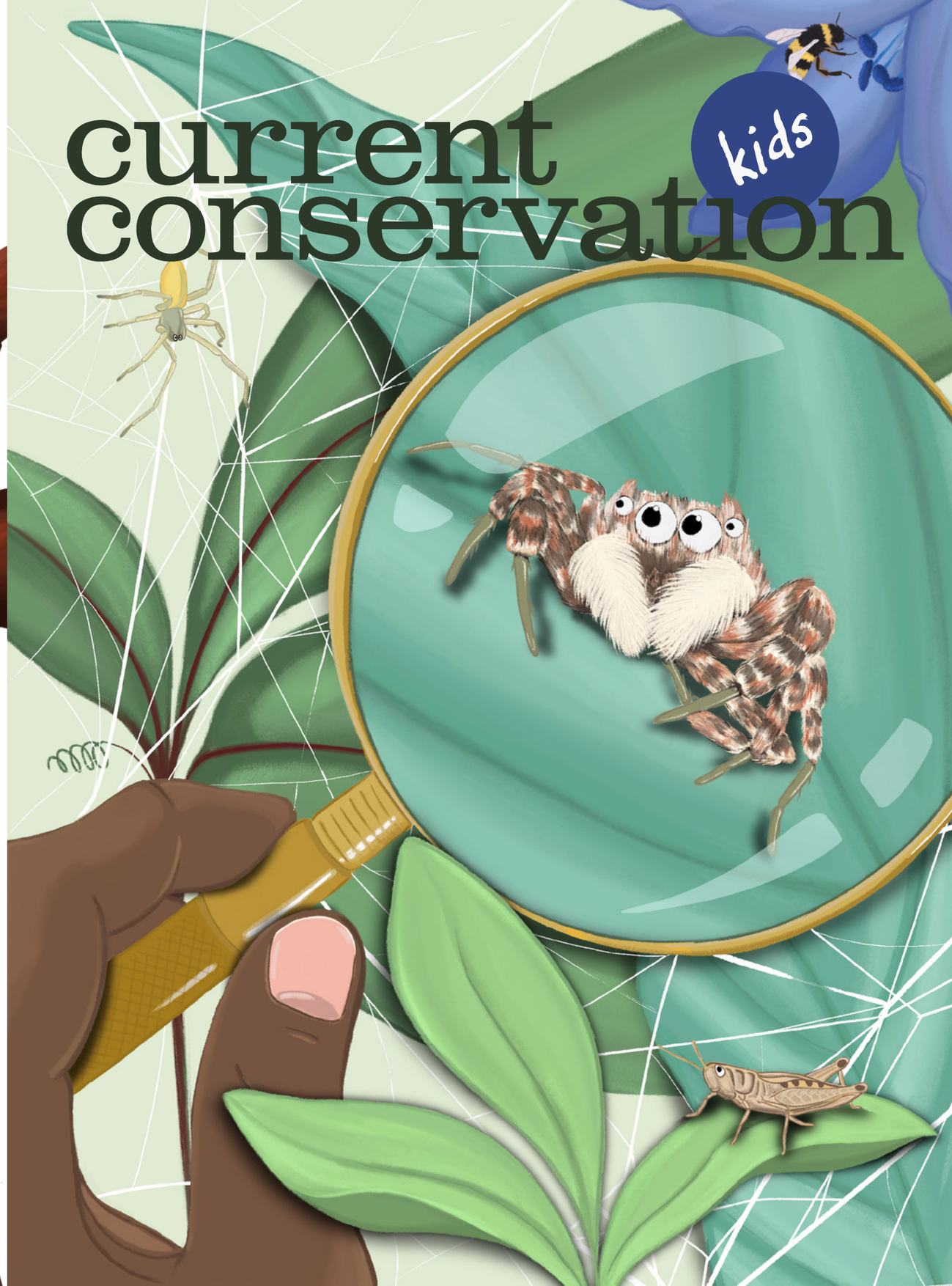
But Manya slyly said, “Thank you so much Sir! We would love to go to your house. Thank you for making our work easy, we would’ve been lost without you!”

And then she quickly winked and whispered into my ear, “Let’s go to his house, there’s bound to be women there, we’ll talk to the lady of the house and the women who work for her. We’ll get all perspectives under one roof!”

Field work was all about improvisation.

Aditi Patil *is a Political Economy Analyst-Illegal Wildlife Trade at Wildlife Conservation Society. She often wonders if she was born into the wrong species.*

Ankit Kapoor *is an Illustrator and Animator who graduated from Srishti School of Art, Design and Technology and currently freelances out of Delhi/ Chandigarh.*



Tingling our spidey senses

Words **Vena Kapoor** *and Pictures* **Saloni Basrur**

I never knew spiders were so fascinating, bizarre and cool until about 20 years ago when I started doing research and documentation on them! And so whenever I get the opportunity I make sure I tell everyone the wonderful natural history stories of the spiders that are around us, with the hope that this will get more people interested and awed by them. I hope you will discover your own cool spiders and spider stories and you will pass this information to others as well!

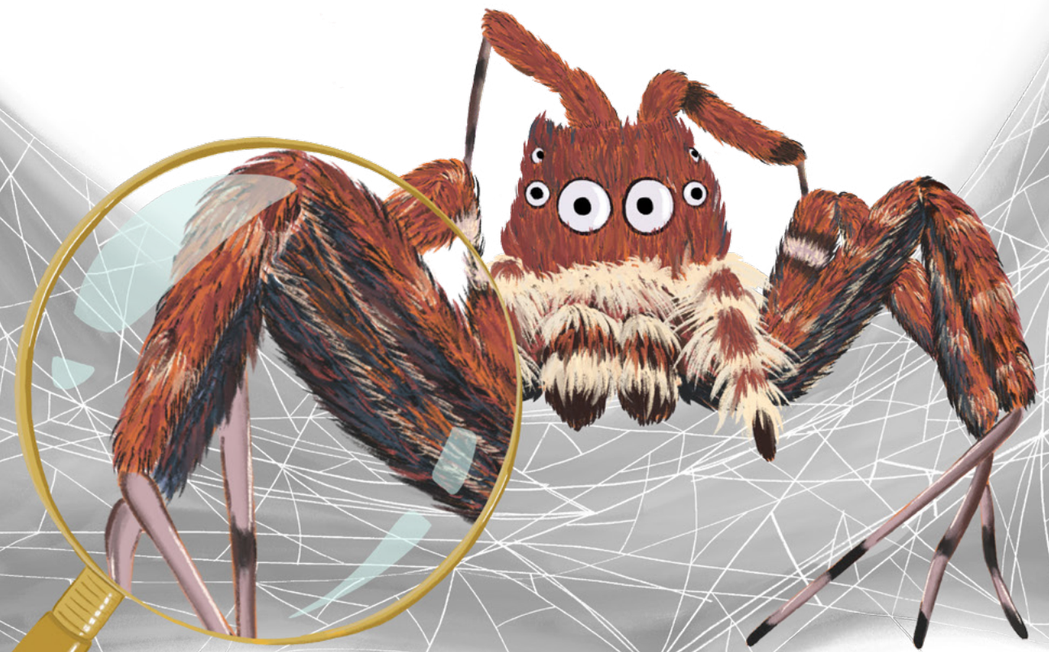
Here are some of my favourite spiders. Do keep a close look out for them, you may find many of them in your own backyard.

Our lady Portia

She looks very much like a piece of moving debris. Meet Portia, a spider of the family Salticidae or jumping spiders. Lab and field experiments by scientists have shown that the Portia spider is very intelligent and has amazing vision. A spooky fact about her is that she loves to eat other spiders - the animal kingdom is indeed strange, eerie and wonderful.

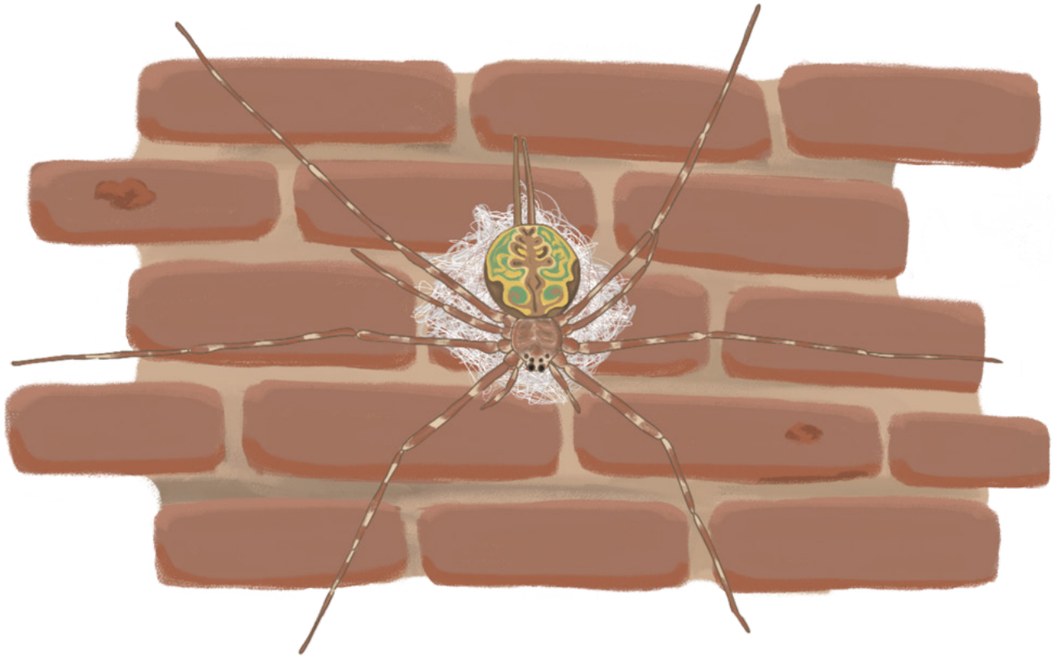
Portia spiders hunt their prey by trickery, stalking and stealth. They trick other spiders by pretending to be a mate of the spider she is hunting. She also sometimes pretends to be a struggling insect caught in a web just to lure her prey. When the unsuspecting spider comes to investigate, our Portia pounces, catches, and injects it with venom.

Scientists who study Portia spiders say that she uses different hunting techniques depending on the type of spider she hunts and modifies her hunting behaviour accordingly. Smart and cunning? Definitely!



Two-tailed scurriers

Flat against a tree trunk or on walls, are the skittish and quick-footed two-tailed spiders of the family Hersiliidae. Two-tailed spiders blend in so beautifully against the surface that they reside on that you need to peer and follow the silken trail lines they leave behind to spot them. Their common names come from the very prominent and long silk spinning organs (known as spinnerets) that look like “long tails”. Look out for them on the trunks of trees and on walls - at first you will find it hard to find them, but when you get the hang of spotting them you will start seeing them everywhere! They are a great example to showcase camouflage in the natural world! And you thought only chameleons can camouflage well?



Spider? Or ant? Look for clues!

When you look at this spider, you will never be able to tell that it is, indeed, a spider. As many people will attest it is terribly confusing to decide what one is looking at! This group of spiders that mimic ants, not only look very much like them, but also exhibit the behaviours of the ants they mimic!

Ants use chemical pheremones to communicate with each other and find their own family groups. Some ant-mimic spiders are known to mimic these ant chemical phremones.

By mimicking these ant pheromones, some species get access to the nests of ants and to feed on the ant eggs. But they are not doing this just to find food, but also to avoid their own predators. Many insects, birds and other spiders avoid feeding on ants because ants are usually aggressive, and can be quite untasty!

Oh crab!

With the first two pairs of longer enlarged legs and posture, the crab spider indeed has an apt name. Belonging to the large diverse family group Thomisidae, if you peer closely at flower heads you will sometimes find them cheekily camouflaged and nestled there. Here, they wait for unsuspecting insects like bees. Bees fly to flowers for the sugary sweet flower nectar that they get in return for their pollination services.

If you move a white crab spider to a yellow flower, given the right conditions after a few days the spider will change its colour to match the colour of the flower it has been placed on! Crab spiders are classic ambushers and it's always a treat to spot them catch an unsuspecting insect with speed and agility.

Scientists are still trying to find out what the exact role of camouflaging themselves plays because experiments have shown that to their prey the spider is actually not very camouflaged at all! Are they getting any other benefits by blending in with their surroundings? Only more research and experiments will uncover this.

Spider cowgirls and cowboys

Have you heard of a ‘bola’? It’s a type of throwing weapon where heavy ball-like objects are tied to the end of ropes and thrown by people towards a running object that they want to stop. You must have seen some cowboy movies where they throw something in true fisherman style?

Bolas spiders use silk and a sticky gum ball attached to the end of this silken line to act like their own bolas! They swing it like a weapon to whack and catch their prey!

But before that, the spider mimics the pheromones that a particular group of female moths emit. Female moths emit this to attract male moths. When the male moth flies towards the direction to investigate the pheromone scent, the bolas spider is ready. Like a lasso, this sticky line is swung around to whack and then catch and capture the moth! Can you think of a cooler hunting strategy? I recently had the privilege of seeing a female bolas spider close to her freshly laid egg sacs, but because she is active at night I did not get to see her lasso-like hunting moves. I do hope that day comes soon!

Vena Kapoor *works on nature education and outreach at the Nature Conservation Foundation, Bangalore. She also documents, conducts walks, talks and writes about the spiders and insects that she comes across.*

Saloni Basrur *is an all-round artist who uses multiple media to express herself - from digital illustration to embroidery. She has brought animals to life through her creativity and storytelling, and hopes to continue doing so for conservation communication.*