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A tribute to Ajeimai Yun 3 | One Last Dance 15 | Wildlife Protection Act being broken 26



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Contents

field assistant
3 A tribute to Ajeimai Yun
Ambika Aiyadurai

feature
9 Cougar range expansion and the benefits of coexistence
Jennifer Robertson

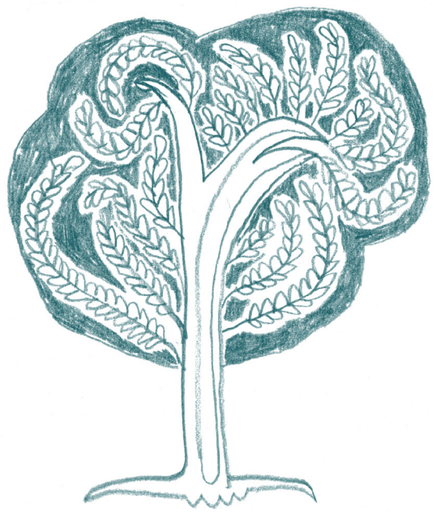
spotlight
15 One Last Dance: The Fate of Manipur's Dancing Deer

feature
18 Sailing into an uncertain future

spotlight
23 How much carbon is in your cup of coffee?

feature
26 Is the Wildlife Protection Act being broken in moving potentially 'dangerous' animals?

column
30 Compassionate Halfism



CC Kids

a day in the life
34 of a Butterfly Researcher

fun facts
40 by a Butterfly Researcher

volume
13.3

editors' notes



Cover art **Rahael Mathews**

This issue begins with another article in our series on field assistants and their contribution to research in India. Ambika Ayyadurai pays tribute to Ajeimai Yun, who was her friend, companion and guide during her research on hunting practices in Arunachal Pradesh. Many carnivores around the world had their ranges greatly reduced by a combination of habitat loss and hunting over the last century, but due to habitat protection and laws preventing hunting, many of their ranges have started to expand into human dominated landscapes. Jennifer Robertson maps the recent expansion of cougar ranges in the USA and what it has meant for conflict and coexistence with humans. Later in this issue, Neha Sinha addresses a similar issue with 'problem animals' like crocodiles and leopards in India. She argues that the government's standard approach to dealing with them, namely translocation, may be neither legal nor effective.

Priya Ranganathan enquires into the fate of Manipur's dancing deer, and the effects of habitat loss in its only haven, the Keibul Lamjao National Park. Matt Creasey and Shawn Dsouza then explore the effects of trawling on marine fauna and ecosystems, with personal snippets of their experiences as on-board observers on a trawling boat. Emmalina Glinskis explores the value of shade grown coffee in combatting climate change. And finally, our columnists explore what would happen if you took two extreme conservation ideas, Compassionate Conservation and Half Earth, and hybridized them.

—**Kartik Shanker**



Cover art **Hitesh Sonar**

In India, during the hot and sweaty days of summer, water becomes scarce and wildlife gathers around shrinking water-holes. Not only elephants, gaur and deer, but also butterflies, bringing fluttering colour to the hazy air. In this issue of CC Kids', Ravi Jambhekar searches for pattern and meaning in the butterflies' flit-flapping flights.

—**Matthew Creasey**

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A tribute to Ajeimai Yun

Author **Ambika Aiyadurai** | *Illustrator* **Sana Bansal**

I had just reached Yatong, a small remote settlement 12 km from Hayuliang in Anjaw district of Arunachal Pradesh. I was there for fieldwork for my Masters dissertation in Anthropology, Environment and Development from University College London.

The first thing I did was to look for a field assistant who would be my companion and guide through fieldwork. Basila Kri, a village council member, suggested that Ajeimai Yun would be the right person, "someone who is knowledgeable and nice." Ajeimai lived in Gab, a village uphill and a two hour walk along the UI river, a tributary of the Lohit river. The very next day, I set out for Gab with a young boy who was going towards the village. Trailing off the main road, within minutes we reached a very long hanging bridge across the river. Two women carrying bamboo baskets on their backs were on the bridge and we waited for them to cross first. Crossing these foot suspension bridges is sometimes the only way to reach villages. Some bridges are very old and in need of repair and can make you very nervous while crossing. Travellers to Arunachal Pradesh are both fascinated and petrified by these long hanging bridges. Fürer-von Haimendorf, a well-known anthropologist who worked in Arunachal Pradesh, said one has to be an "acrobat'' to cross these bridges. Another visitor provided a useful top for the not-so-adventurous: "Never look down!"

Once we entered Gab, two girls with large bamboo baskets on their backs who were collecting some plants greeted us. I asked, "Do you know where Ajeimai lives?" One of them laughed and said, "that's me!", with a bright smile. I was surprised, as I had first assumed that Akeimei was a boy. Field assistants are known to be mostly men. I was glad to meet her. Ajeimai belongs to the Kman Mishmi, which is one of the 26 indigenous tribes in the Arunachal. There are an estimated 15,000 Mishmi people spread across 340 villages in Lohit and Anjaw districts.

Ajeimai looked short for her age of 25, probably due to a hunchback. She later told me that she had fallen ill when she was a child, and had since been hunched. Consequently, she could not do much farm work and remained restricted to household chores such as cooking, washing, taking care of chickens and tending kitchen gardens. Like many other young girls in Gab, Ajeimei wore a trouser and a blouse. Women both young and old wear the traditional daal-phlai (wrap around sarong), hand woven by the women themselves.

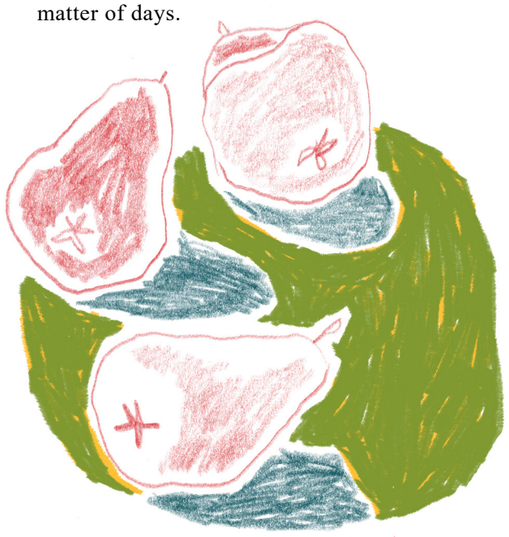
As we walked towards Ajeimai's house, I noticed that Gab was a very small village, inhabited by the Yun clan of Kman Mishmi, with just 100 people and about 30 houses. All the houses were made of bamboo, including the floor and walls. These bamboo houses stood high on stilts to prevent wild animals and snakes from entering the house and also to keep the indoors dry during the monsoon. The space below the house was used to keep cattle, pigs and chickens. A thick log carved with steps served as a ladder. "Be careful while climbing, aaram se", said Ajeimai.

It was dark inside her house, and little light entered even during the day. Ajeimai pushed two sliding doors, through which soft rays of light filtered through bamboo slits. A kerosene lamp was lit to brighten the room. "Gab mein light nahi hai" ("There is no electricity in Gab"), said Ajeimai. A man in his 40s who was cleaning his gun, greeted me with a smile. He was Ajeimai's father, Sopreng Yun. I asked, "Going to the forest?" He replied, "No, just cleaning the gun." After he was done, he got up with

his fishing nets and his cane backpack. I asked him if I could join him for fishing, he smiled and replied, “You take rest, it will be hazardous for you.” After an hour, he came back with fresh fish. While I unpacked, Ajeimai collected some fresh beans and dug out some garlic from her kitchen garden. We had rice, boiled beans and delicious fish and began to chat.

Ajeimai was not sure if she was the right person to help me in my research. She had not done anything like this before. My research was to gather information about wildlife and wildlife hunting practices in the Kman Mishmi (or Miju Mishmi) society. I was keen to know about the animals hunted and the methods used, as well as what women did when men were out hunting. After I explained that, in general, I want to know about Mishmi people too, she looked intrigued and asked “Is that your research”? Is that what you do?’ a question that became a frequently used one-liner to pull my leg.

Looking puzzled, she placed a kettle over the fire to prepare tea. She added few bay leaves, tea leaves into the kettle with lots of sugar. Laalchai was refreshing! Shaking her head with disbelief and smiling, she said that my research was easy and declared that we should begin doing research immediately. As I looked up, I noticed two bamboo trays, one above the other, hanging over the fireplace. She explained that the trays were used to smoke meat, dry grains and firewood. During the monsoons, it is difficult to get firewood, and these would come in handy. Ajeimai’s strategy was to share information about each and every thing around the house, village and forest. She became my eyes and ears, and a trusted guide in a matter of days.



One of six siblings, Ajeimai never went to school as she had to take care of her younger brother, who was only two years old when Ajaimai’s mother passed away. She took on the responsibility of household work to help her father. She could not weave because of her hunchback but she enjoyed knitting and embroidery and was good in all domestic chores.

Ajeimai knew everyone in the village, who was related to whom, who hunted what, and when. Based on my initial discussions, we prepared a detailed research plan. I told Ajeimai, “We have a lot of work and I need to interview hunters, document traps, photograph animal skulls.” Raising her eyebrows with a broad smile in playful tone, she asked ‘Is this your research? That’s all!’

We started our work the following day. Ajeimai took me around her village. It was difficult to climb up the steep slopes. Boys with catapults around their necks, with small pebbles inside their sling bags wandered along the trails. Steadily looking up at the canopy for birds and squirrels, they had their eyes fixed on the trees.

As we walked round, curious villagers approached us with endless queries. Ajeimai was always bombarded with questions, and the villagers were not convinced that the topic of my study was ‘wild animals and hunting’. One man said, “Who will come this far to study wildlife hunting?” As hunting is not seen an unusual activity here, people suspected that I used hunting as an excuse to hide the primary purpose of my work. Many people asked asked Ajeimai, “Is she from the medical department to vaccinate children?”, “To sell clothes?”, “An official from the government department?”. Once she burst out laughing when a man claimed that I was a spy (jasoos) from China!

People finally believed me when I could identify some birds and animal skulls, thanks to Ajeimai. She would carry my animal books, bird guides and binoculars with pride to convince fellow villagers that I was indeed a ‘real’ researcher studying the hunting practices of the Mishmi. ‘Didi, show them the musk deer photo’, she would request. Musk deer (kasturi in Hindi, təla in Kman) was a star animal, and many were curious to to know what the animal looked like. As days passed by, we became friends. We shared jokes, worked together all day doing both research and household chores. Sometimes we mutually admired admired our skills in embroidery and cooking. She defended me and did not tolerate anyone making fun of me.



One morning, Ajeimei said she would introduce me to Kitusa who was a good hunter. I asked her, ‘What makes him a good hunter?’ “Oh… he is always out and never at home”, was her answer. Kitusa (name changed), around 35 years old, was busy scrubbing a leather shoulder belt for holding the machete (dao in Hindi, sut in Kman) when I went to meet him. Ajeimai spread out a brown coloured mat for us to sit on, which looked like an animal skin. She looked at me, expecting me to ask the obvious question. ‘What skin is this?’, I asked. Kitusa said, ‘Paahi’. Ajemai repeated ‘P-a-a-h-i’ and pointed to the skull on the trophy board. It was a barking deer. I confirmed it with the picture in the guidebook. Ajeimai used this book frequently, and there was a look of childish excitement on her face whenever she shared the book with others. This time she showed it to Kitusa, and both agreed that ‘Paahi’ was barking deer. The pictorial guide of animals raised curiosity and excitement among other members of Kitusa’s family, and they joined us too. They showed me the animals found in the region. Ajeimai helped me with the local names of other animals and birds, and a checklist was prepared. Local names made conversations more comfortable and exciting. She told me ‘Now that you know the local names of the animals and birds, people will trust and accept you quickly!’. I saw that she tried very hard to make me comfortable and made sure I was welcomed and hosted well during my research. As Kitusa narrated his stories of trekking up in the mountains and hunting, we got engrossed in his stories. He told us something which intrigued me. ‘Do you know who owns the mountains and the forests?’. I replied quickly and confidently, ‘Forest department’?. Kitusa laughed and said, ‘No. No. The owner of the forest is a Mountain spirit called ‘Shyutoh’. He continued:

“We hunters fear and respect the mountain spirits, and draw a circle around the camp for protection. After starting the fire, we make an offering to the spirits for safety, success and good health. Shyutoh is our mountain God and hunters pay respects to Shyutoh when they reach the hunting grounds. Shyutho owns the forests and provides us with animals to hunt.”

‘Which animals are found there up in the mountains?’ I asked. Ajeimai quickly replied, ‘Khyəm (Takin), Təla (Musk Deer), Rə’ai (Serow) and pheasants’. Kitusa said that one has to really go far to the snow covered areas to hunt musk deer. He said the trick they used to track musk deer was to smell the rocks. Musk deer leave a strong smell on the rocks where they rest. ‘The smell is powerful and remains for a long time. We look for footprints to track the animal.” Ajeimai confessed that even she never knew these stories and acknowledged my role: ‘Didi, because of



Ajeimai asked her aunt, ‘When men go to hunt, what do women do?’. ‘What do we do? We sit at home and work!” she replied. We probed her, ‘Why don’t women join them in hunting?” Two more women joined, and we chatted for long hours through the night. A fire was lit and our faces glowed in the dim glimmering light.

Shamimai said ‘Women do not hunt, but there are women who trap small animals on the farm occasionally’. When asked why women don’t hunt, the reply was simple, ‘That’s the rule’. When I asked the men, they said, ‘It is very tough for women’.

you, I am learning about my community’.
These stories enriched my research. Kitusa added that the distance travelled for musk deer is more than for any other animal and that the rituals followed are very strict. People consulted Mishmi shaman priests (Kətuwat) before hunting trips for musk deer and takin. If a shaman indicated that the trip would be successful, villagers set out for hunting; if not, it would be postponed. Rituals were performed near the rocks, using some leaves and red ochre (glaa), an essential item. Ochre was collected near hot springs in the high mountains and had a spiritual significance. Glaa was sprinkled on the leaves by offering prayers and uncooked rice and millet were offered to the owner of the mountains.

Over time I met other villagers and gathered more information about hunting. Ajeimai found my work very interesting. We would go through the bird book together and identify birds spotted on the bushes or the small birds that the boys catapulted. She understood my work well and would update me with interesting events in the village. Having Ajeimai as my field assistant also came in handy when I wanted to interview women. ‘That is easy’ she said ‘I will take you to my aunt, Shamimai’.

Ajeimai’s aunt was busy weaving a multi coloured fabric flowing from the wall tied to her waist. The loom (tho’) had pink, black, green and blue coloured threads, and the design was intricate. We sat next to her and watched her excellent skill of giving life to bare threads. Among the Mishmis, each house has a loom and women weave daal-phlai (sarongs), tüpəi (bags) and gul khana (jackets for men). These jackets have a unique design and are usually pink and black. Later that day, we sat in the haanda (balcony), an extension of the longhouse that has a bamboo platform and a roof.

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One man said that women were scared of hunting. Ajeimai took over the interview; she was so absorbed in the discussion that it appeared that she was the researcher. Many of the things we heard were new to Ajeimai and her curiosity to learn more was endless. I realized that this research was no more mine alone, but belonged to her too. It became a collaborative project. Ajeimai turned to me and said, ‘Didi, did you know that when husbands go out hunting, their wives do not tell anyone that the husband is away hunting?’ I began to write everything she narrated. Stories filled up my field dairy. That day both of us felt a sense of achievement.

Till the end of my work, not a single day was spent without walking around the village, collecting wild berries and wandering in the forests around. She showed me the ‘danggri baba ka ped’, a tall tree where it was believed that spirits resided and felling

was prohibited. She pointed to rodent traps (tawan) around the granaries. Over time, I developed an eye for things that I had never noticed before. Ajeimai became my teacher and my mentor. 'Don't enter this house, its kəmüt' she would warn me. Three days after a ritual, the house is closed for guests, a period called kəmüt. She would point to the bunch of green bamboo grass at the door that indicates kəmüt. The information about taboos and the role of women in the society was possible only because of Ajeimai. Her constant desire to learn and willingness to share was boundless.

It was time for me to wind up my fieldwork and say goodbye to Gab. Ajeimai walked with me until Yatong. She pulled out a packet that had a colourful daal-phlai (sarong), 'yeh, aapkeliye Didi'. A gift from Ajeimai that I still have and cherish. It reminds me of not only her, but my connection with the Kman Mishmi society. Not knowing what to give her, I presented her my wristwatch. As I thanked and hugged Ajeimai, our eyes were moist and I felt a slight heaviness in my heart. 'Achche se jaeeye, Didi', she said as I sat on the vehicle to leave for Tezu.

I knew I would miss Ajemai but did not know that I would never see her again. A month after I completed my fieldwork, I received the sad news that Ajeimai was no more. She suffered from jaundice and malaria and died on the way to the hospital. This came as a shock to me while I was writing my dissertation. I lost a friend forever. I am forever indebted to her for the valuable contribution she made to my research.

Field assistants play an important role in our work and there is a deep association between the researcher and the community. Without Ajeimai, my fieldwork would not have been possible. When I submitted my masters' dissertation at the Department of Anthropology in University College London, I dedicated it to her.



To
Ajeimai Yun

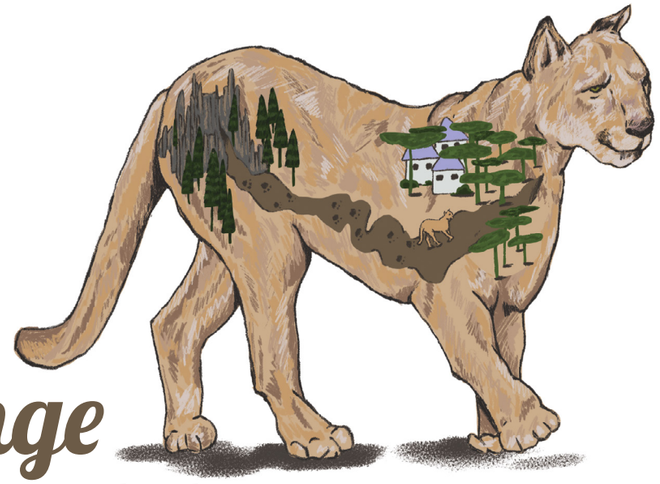
My field assistant and a good friend in Gab village who passed away after a month of this research work.

I dedicate this dissertation to her.

From
Ambika Aiyadurai

Ambika Aiyadurai *is an anthropologist of wildlife conservation with a special interest in human-animal relations and community-based conservation projects in Arunachal Pradesh, India. Ambika is an Assistant Professor (Anthropology) in Indian Institute of Technology – Gandhinagar.*

Sana Bansal *is a Bangalore-based illustrator, drawing odd humans, odd animals and everything in between. Her work is often influenced by folktales and magic realism. She loves working with print and occasionally brings out self-published zines and comics.*



Cougar range expansion and the benefits of coexistence

Author **Jennifer Robertson** | *Illustrator* **Rahael Mathews**

On the night of June une 11th, 2011, a young cougar (Puma concolor) was struck and killed by an SUV on the Wilbur Cross Parkway near the coastal town of Milford, Connecticut. At the time of death, the necropsy report indicated that this lean, two- to four-year old, sub-adult male had an empty stomach and porcupine quills embedded into his subcutaneous tissue. Without any evidence of a captive lifestyle (not neutered or microchipped), genetic analysis confirmed that this cougar's DNA matched that of the expanding wild cougar population in the Black Hills region of South Dakota. Camera trap videos, paw print comparisons, and also a genetic trail of fur, scat, and leftover carcasses revealed that this cougar traveled throughout Minnesota, Wisconsin, Michigan, into Canada through southern Ontario, and then down into New York (approximately 30 miles from Manhattan) before his abrupt demise in southern Connecticut. On the search for a mate and his own home territory, this big cat's two-year journey covered a distance of nearly 2,000 miles. This more than doubled the previous, longest-known distance of 640 miles that was ever recorded by a dispersing cougar.

Male cougars disperse much further away from their natal ranges as compared to females but rarely do they ever travel more than a few hundred miles.

This cougar's incredible cross-country trek is also the longest known migration of any land mammal ever documented in the United States. What made it even more remarkable was the fact that it was the first confirmed cougar sighting in the state of Connecticut in more than 100 years. Cougars have historically occupied the entire expanse of the United States, back in a time when Native Americans both revered and peacefully coexisted with them. However, that harmony shifted when early European immigrants began to perceive these big cats as major threats to human life and property. By the turn of the twentieth century, these apex predators were hunted to extinction in virtually all areas east of the Rocky Mountains . Records confirm that the last remaining eastern cougar was killed in 1938 near the Maine-Quebec border. The only viable cougar population left in the eastern United States is now found in South Florida. This small Floridian population was saved



from the brink of extinction in 1995 through a highly controversial reintroduction of wild cougars from the state of Texas. However, this population of only 80-100 breeding-aged adults continue to struggle and survive in less than 5% of their historic home range.

As cougars and other large carnivores help stabilize populations of potentially disruptive prey, the 80-year cougar absence in the eastern United States has had an adverse rippling effect throughout the entire region. The East is now above the carrying capacity with the cougar's preferred prey, the white-tailed deer (Odocoileus virginianus). This unbalanced predator-prey relationship has brought about severe ecological disruptions and huge socioeconomic consequences to many parts of the East.

Ecological Disruption

Deer have become the most prevalent and influential large herbivore in the eastern United States and are increasingly exceeding the environmental limits to many forested ecosystems. The chronic browsing pressure by deer results in tremendous biodiversity loss and produces a negative cascading effect on the health and function of entire forests. Overfeeding by excess deer prevents forests from naturally regenerating, since individual plants, shrubs, and herbaceous layers are damaged and cannot recover. Additionally, the openness to the forest floor alters the habitat composition of the forest and causes a shift in the colonization of non-native plant species. These dramatic ecosystem changes interfere with normal food web interactions and greatly impact the livelihood and survival rates of many animal species found in the forest. The animals most affected are the ground-nesting bird species such as the wood thrush (Hylocichla mustelina), the Eastern towhee (Pipilo erythrophthalmus), and the hooded warbler (Wilsonia citrina). Other affected animals include small mammals like the Allegheny woodrat (Neotoma magister) and the Tuckahoe masked shrew (Sorex cinereus nigriculus). Additionally, numerous reptiles, amphibians, and invertebrates are also greatly impacted. Some examples include the bog turtle (Glyptemys muhlenbergii), the blue-spotted salamander (Ambystoma laterale), and the Appalachian tiger beetle (Cicindela ancocisconensis).

Socioeconomic Costs

Human health and safety are also greatly impacted by the overabundance of deer in the East. Deer are statistically the most dangerous wild animal to people in the United States. Deer serve as hosts to vectors of several zoonotic diseases such as Lyme disease and other tick-related illnesses. If left untreated or undiagnosed, Lyme disease can have severe symptoms that include recurrent arthritis, memory loss, and neurological issues. Documented occurrences of these tick-related diseases have reached an all-time high in every eastern state. Additionally, the number of deer-vehicle collisions have skyrocketed to an unprecedented rate of 1.2 million a year. These collisions in the East have resulted in more than 200 human fatalities, 29,000 injuries, and $2.3 billion dollars in damage costs. Lastly, deer cause the most damage to agricultural operations and private property residences than any other animal in the eastern United States. Extensive crop damage results when deer feed, travel, or rest in agricultural fields. Crop damage costs eastern farmers a combined annual revenue loss of more than $3.5 billion dollars. The crops that experience the most damage are grains, soybeans, corn, lettuce, and tomatoes.

Cougar Range Expansion

Despite the cougar's intentional extermination in the midwestern and eastern regions of the United States, the cougar numbers in the western United States have rebounded as a result of hunting regulations imposed by most western states throughout the mid-1960's. However, cougars still only exist in a fraction of their historic home range as they are heavily impacted by human-caused activities such as habitat loss, habitat fragmentation, trophy hunting, poisoning, and predator control. Current data indicates that some western cougars are now dispersing eastward as these anthropogenic stressors continue to increase throughout their western ranges. This movement is crucial for maintaining genetic diversity within



populations and is essential for their long-term survival. This long-distance natural dispersal has already facilitated new breeding populations in the Great Plain states of North Dakota, South Dakota, and Nebraska.

Coexistence Benefits

Based on cougar predation rates from western source populations in the United States, the average cougar appears to kill between 30-40 deer a year. Based on this information, it was estimated that cougar restoration in the East would reduce the deer density by as much as 22% over a 30-year period. This could lead to 700,000 fewer deer-vehicle collisions and result in 155 fewer deaths, 21,400 fewer injuries, and a savings of more than $1.6 billion dollars. Another study found that if the deer density were to stabilize in the eastern United States, the most damaged eastern forests could regenerate within two to three decades. Just the predation threat alone affects herbivore behavior by reducing their overall feeding time, altering their forage movements, and limiting successful reproduction by increasing their stress hormone levels. Cougars and other large carnivores

TABLE 1

•Make yourself look big. Stay calm, face the cougar and raise your arms to look as large as possible.

•Give it a chance to leave. Most big cats try to avoid confrontation. Back up slowly but do not take your eyes off the cougar. Always leave the animal an escape route.

•DO NOT RUN. This may trigger an attack. Scoop up young children so they don't panic and run.

•If approached, get aggressive. DO NOT PLAY DEAD. Try to look threatening – wave your arms, yell, and be assertive. Cougars can often be intimidated.

•Throw rocks and sticks. If bluster does not scare off the approaching cat, demonstrate that you are in charge. The idea is to convince the cougar that you are not prey but a potential danger.

•Fight back. If the cougar attacks, fight back with anything you can get your hand on, such as rocks, sticks, shovels, even your bare hands. Try to stay on your feet. If you are aggressive enough, a cougar will most likely flee realizing that it has made a mistake.

•Report the attack. Report the incident to local authorities immediately.



also promote healthier herbivore herds by eliminating weak, disease-susceptible individuals. This ensures optimal genetic herd health by restoring the social order of dominance and allowing only the most fit males to breed.

High Risk Perception

Although science has proven that living alongside cougars would actually save far more people from death and injury, cougars (and all large carnivores) are continuously stigmatized as "bloodthirsty" animals with malicious intentions. A huge injustice occurs when these misunderstood animals, such as big cats, wolves, sharks, and others, are villainized in media outlets such as in Hollywood movies or in news reports. A substantial overestimation of risk is often associated with these animals and it causes most people to have an irrational fear of them. Cougars, however, have much more to fear from us than we do from them because humans are by far the largest causes of cougar mortality.

Cougars have repeatedly proven that they are not a substantial public threat as there were only 29 human fatalities and 171 nonfatal attacks that occurred in the United States and Canada between 1890-2017. Although these incidents during the past 127 years are extremely serious, they come nowhere close to the 4.5 – 4.7 million Americans that are attacked by domestic dogs (Canis lupus familiaris) each year in the United States. Statistics indicate that approximately 20-30 people die every year from domestic dog attacks, making people ten times more likely to be killed by a domestic dog than by a cougar.

Although the odds of encountering a cougar in the wild are very small and attacks are extremely rare, more cougar attacks have been reported in the western United States over the past 20 years than in the previous 100. These attacks are directly related to the increasing human population and its encroachment into cougar habitat. There is, however, safety in numbers. Solitary hikers are three times more likely to be attacked by a cougar rather than people in a group. See Table 1 for information on how to act when encountering a cougar

Coexistence Strategies

Since 2005, there have been a total of 466 cougar confirmations in the midwestern United States and five confirmations in the Northeast. Most of these confirmations have gone unnoticed since cougars typically try to avoid contact with people. This was demonstrated by the Connecticut cougar who remained virtually unseen and undetected for two years until that fateful summer night. However, as these big cats are steadily advancing past the Rocky

Table 2

Actions to Reduce Cougar Encounters:

- Do not feed wildlife (deer, raccoons)
- Remove plants, or protect gardens, that attract wildlife
- Use garbage cans with tight-fitting lids to not attract wildlife
- Bring pet food inside to not attract wildlife
- Keep pets inside from dusk until dawn
- Close off open spaces under structures (areas beneath porches and decks) that can provide shelter for wildlife
- Keep outdoor areas well lit
- Prune dense vegetation near your house
- Provide sturdy and secure pens to protect livestock

Mountains, they are increasingly sharing more of the same space with humans in areas where they have long been absent. These dispersing cougars will need the full support and acceptance of the public if they are to have any chance of recolonization back into their former home territories.

The fear of human-cougar conflict plays a major role in anti-predator sentiments towards these large carnivores. Overcoming the societal challenges and the "not in my backyard" mentality will ultimately determine if people have the ability and the desire to coexist with them. Solutions to help foster positive public attitudes are essential, and significant investments into age-appropriate educational and public awareness programs should be a top priority. Children should be a primary focus for the purpose of creating future generations of conservation-minded individuals.

Knowledge of the cougar's long-term valuable impact can also help diminish the negativity and fear that are associated with these apex predators. Information about permanent human influences on the landscape, such as roads and urban developments, should be assessed to gain an understanding of how successful cougars are in avoiding these human disturbances. Research into potential dispersal corridors should also be encouraged to help cougars safely facilitate their eastward expansion. Lastly, actions to reduce cougar encounters should be recommended by each eastern state's wildlife agency with the interests of all stakeholders in mind. See table 2 for actions. With more tolerance, insight, and some changes to

our lifestyle, perhaps one day our long-lost eastern cougars will once again recover and unobtrusively roam the lands in which they formerly lived.

Conclusion

The cougar's important predatory influences were not yet recognized when they were successfully eradicated from the eastern United States over a century ago. Without any natural enemies, the ecological and socio-economic evidence is quite compelling that the deer population has become overabundant in the East. Methods such as sport and recreational deer hunting have not proven effective in the management of white-tailed deer and demonstrate that the cougar's predation pressure in controlling such populations is unmatched. Now that science has proven the value and worth of these big cats, the restoration of a natural predator-prey relationship in the East could be the much-needed solution for deer control. However, this will be for the public to decide. Whether or not cougars will be "allowed" back into the eastern United States, they are incredibly important animals that deserve protection. Not only for their valuable services to both the environment and to society, but also for the intrinsic value that they have in their own right.



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Jennifer Robertson *works as a big cat keeper at the Philadelphia Zoo. She completed this project as part of her graduate work in the Global Field Program at Miami University in Oxford, Ohio. (Contact info: rober162@miamioh.edu; Robertson.Jennifer@phillyzoo.org).*

Rahael Mathews *is an undergraduate student of art and design based on Bangalore with a keen interest in sustainable practices. She enjoys making conceptual art rooted in abstraction and can usually be found with her head stuck in the world of books.*

One Last Dance: The Fate of Manipur's Dancing Deer

Author **Priya Ranganathan** | *Illustrator* **Labonie Roy**

Manipur's dancing deer, the sangai, has one last stronghold – Keibul Lamjao National Park (KLNP), the world's only floating protected area. But even this floating paradise is at risk. Lauded as the state animal of Manipur, the sangai (Cervus eldi eldi) occupies a mere 15-20 sq. km. of floating marshland known as "phumdi" on the southern edge of Loktak Lake, a naturally occurring wetland and RAMSAR site in this north-eastern state. Phumdi is the most important characteristic of its habitat. This floating vegetation is created by the amassing of organic debris and biomass with soil, varying from a few centimeters to a few meters in thickness. While most of it is under the water's surface, it floats delicately, creating a unique floating island ecosystem on Loktak Lake.

The sangai goes by many names; the dancing deer and the brow-antlered deer are two of the most commonly used appellations. The former is derived from its dainty gait that has inspired the movements of the equally graceful Manipuri classical dance style. The latter name is derived from the deer's unique antlers, with the front protruding beam appearing to come out of the deer's brow or forehead. Primarily associated with a wetland habitat, this deer feeds twice a day on aquatic plant species, grasses, herbs, and shoots.

Culturally, the sangai is venerated in Manipur. Popular folk legends associate the sangai with the bridge between the human soul and nature. To kill a sangai is to symbolically destroy the delicate binding between humans and nature; thus, this dancing deer is the way that Manipuri tribes express their love for nature. The sangai is also one of the rarest animals in the world and a great source of pride for the people of this state – its name can be found on signages, in restaurant names, in tourism appeals, and in newspapers.

The dancing deer was thought to be hunted to extinction during the British Raj, but in 1951, it was rediscovered by British tea planter and famous naturalist Edward Pritchard Gee. His report on the deer, which described in detail its unique antlers and specific habitat, was published in the journal of the Bombay Natural History Society (BNHS) in December 1960. After the Wildlife Protection Act (1972) was passed, M.K. Ranjitsinh, who contributed to the creation of the Act, carried out an aerial survey for the sangai in 1975. His survey found 14 deer in the area now notified as KLNP.



Despite legal protection, KLNP faces many challenges. Phumdis cover 70 percent of Loktak Lake, but only 23 sq. km. of this floating vegetation, found within the national park, is thick enough (at least 1 m thick) to bear the weight of sangai. Additionally, the lake itself faces shallowing waters. Nearly 30 rivers feed into Loktak Lake, and the sediment inflow is high year-round. The only outflow from the lake is at the Ithai Barrage, which releases water but not sediment, contributing to various ecological crises in this wetland ecosystem. The barrage was constructed with the aim of running hydropower projects in the southern end of Loktak Lake. After its construction, the water level was maintained at a consistent 769.12 m above sea level, creating stress in the lake due to conditions of permanent flooding.

Moreover, the barrage prevents fish species from swimming upstream during the spawning season. Another major impact is the prevention of the natural removal of old phumdis, which once flowed out of the lake into the Manipur River but are now stopped by the barrage. Water pollution also contributes to the degradation of the lake ecosystem. The influx of detergents, agricultural fertilizers, and wastes from the inflowing rivers has created various algal blooms that deplete the oxygen levels in the water and reduce the biodiversity of the lake. Human activities including fish farming, fishing, agriculture, and poaching have added to the stresses upon the lake. The presence of the invasive plant species water hyacinth (Eichhornia crassipes) has increased the biomass on the lake surface, contributing to localized eutrophication. Without careful environmental management and community support, Loktak Lake is expected to become a dead zone.



If the sangai's habitat faces such diverse onslaughts, what protection can Manipur offer its state animal? The sangai is wholly dependent upon the preservation of KLNP. As the quality of Loktak Lake and the national park continue to decline, the survival of the sangai in this isolated pocket of the world becomes more doubtful. Add to that the loss of genetic variety, inbreeding depression, and disease outbreaks, and the sangai's last dance seems to be rapidly approaching.

While the deer's population has increased slightly over the past decade due to increased protection, its survival is still tenuous. The fate of an entire species rests on the responsible management of their wetland ecosystem. A recent proposal by various stakeholders has suggested Pumlen Pat and the adjoining Thongam Mondum Reserve Forest as possible sites for the reintroduction of the sangai due to similarities with KLNP. Reintroduction in other sites could buffer the species to some degree.

Is the sangai doomed to its last dance or can we ensure its persistence in the ever-changing human-nature interface of India's Northeast?

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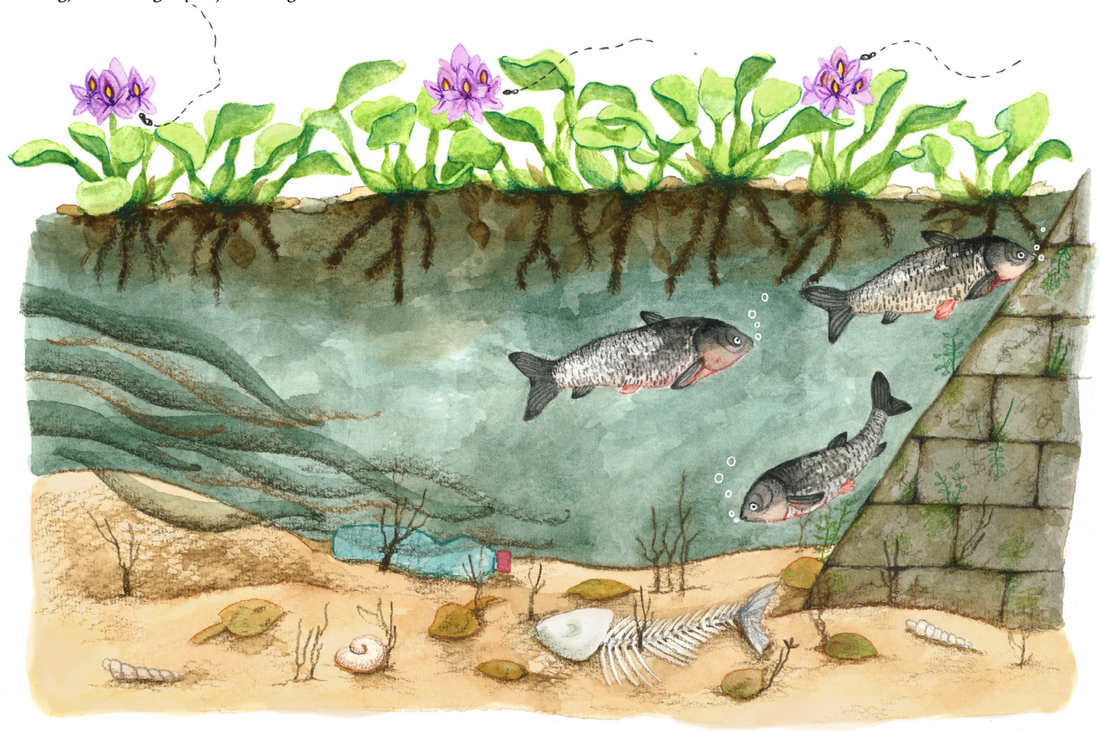
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Priya Ranganathan *is a Research Associate at the Ashoka Trust for Research in Ecology and the Environment, Bangalore, where she works on wetland ecohydrology and conservation. She has a M.Sc. in Ecosystem Science and Conservation from Duke University and when not at the office, can be found dancing, writing, or drinking cups of steaming hot chai.*

Labonie Roy *is a self taught illustrator and nature lover, who collaborates with environment and conservation based organisations. In her spare time, she loves to cook, repurpose her old clothes and experiment with zero-waste DIYs.*



Sailing into an Uncertain Future

Author **Matthew Creasey & Shawn Dsouza** | *Illustrator* **Adwait Pawar**

This is a story about trawl-fishing, about the lives of the people who depend on this dying industry and the reasons for its inevitable demise. Ultimately, it seems likely that the industry is destined for collapse, doomed by its own brutal efficiency. But what does this mean for individual fishers? How are we preparing for a time when trawl-fishing is no longer able to provide jobs to the millions that have depended upon it for decades and what is the future for those people?

> *Left anchorage at 6 a.m., the crew still brushing their teeth. A full moon casts a yellow light over calm waters. The sun will not rise for another hour. The Indian fishing town of Malvan recedes into the darkness.*

Around the globe, mechanised trawler-boats have become one of the mainstays of commercial fishing. Although they vary massively in scale, the principle is the same – a net is cast from the back of a motorised vessel and towed for a number of hours. Sometimes the net is dragged along the sea-floor, sometimes it hangs midway in the water column. In either case, whatever marine life is in the net's path, it is caught up and mechanical winches then haul it aboard the boat.

> *Once in deeper waters, winches begin whirring, ropes begin to play out and the net is cast for the first time of the day…*

Trawling is a hugely effective way of extracting marine resources with a high market value. However, the problem lies in its indiscriminate nature. A whole suite of organisms that are not targeted or commercially valuable end up in trawl nets. These range from juvenile fish to sea turtles to sea snakes.

These two factors—the large number of boats operating throughout the tropics and the broad range of species which are caught—have set in motion a chain of events which are having severe consequences, both for marine ecosystems and fisher communities.

First, due to the effectiveness of the technique, trawling has been one of the factors which has caused dramatic declines in stocks of highly prized commercial species such as anchoveta (Engraulis ringens) in Peru and other South American countries, and prawn stocks in Southeast Asia and Australia. Some fisheries experts say that because stocks of target species are in such a depleted state, there are now none which can be 'sustainably' harvested. There are just those for which harvesting is slightly less unsustainable than others.



The next link in the chain is the commercialisation of by-catch. By-catch is all the sea-life which was not being targeted, but which was caught incidentally due to the non-selectivity of the trawl nets. By-catch is estimated to account for around 40% of the global marine catch and has traditionally had little market value. In the past, therefore, much of it was thrown back into the sea. Now however, as stocks of target species decline, fishers are forced to commercialise more of this by-catch to maintain income-levels.

> *…and in the two hours in which the net will be pulled through the water, there is time to speak with the crew. Deepak is young – he can be no more than 22. His arms are strong and on one arm is a heart tattoo, with the initials of a past girlfriend. When asked about it, he smiles bashfully. Anil meanwhile has been working on fishing boats since he was 14 or 15. Now 46, he is one of the most experienced members of the crew. Direct and straightforward, Anil answers questions in the same way that he and his crew-mates complete all tasks aboard the boat - briskly. Here in Malvan he earns about Rs100 a day (less than 1 ½ USD). With this money he supports his family at home in Karwar, Karnataka: his wife, son and two daughters, the eldest of whom is in her second year at university. The crew takes shore-leave on rotation and having just returned, Anil will now not see his family for four to five months. By working on a trawler, Anil is able to provide his family with comparative financial security. It is true that were he to get injured, there is no health insurance on these boats and the owner would provide no financial assistance with medical costs. He previously worked on a small-scale gill-net vessel, a way of life which neither required such long spells at sea, nor so much time away from his family, but which compelled a more-or-less hand-to-mouth existence. Now on the trawler he has a reliable income and earns enough to make life more comfortable for his family. He does not have a passion for the ocean, or for this way of life – it is simply a job. But it is one that he and his family depend on for their health and livelihood.*
>
> *At 8.30 a.m. the net is winched in. By 8.50 a.m. the catch has been landed onto the boat and an hour and a half later it has been sorted, the target and trash-fish boxed, the discards thrown overboard. Sorting is done by hand with dust-pans and plastic scrapers. Venomous sea snakes are buried amidst the squirming, salty pile. Bites are not uncommon.*
>
> *10.30 a.m. – breakfast. Fish curry and rice, cooked below deck at the prow, by the ship-cook Shivram.*
>
> *The net was re-cast for a second trawl almost as soon as the first was hauled up – there will be four today. Despite the aid of mechanised winches, the physical exertion required by the crew is immense. As is the potential danger. Men run along the gunwales as the small boat pitches, wheels spin, cranks pull and taut metal lines thrum and strain. Although regularly maintained, the machinery is decades old and rutted with rust. Not one of the fishers is without scars.*

As a testament to the ingenuity of the fishing economy, a number of markets have been established for by-catch which previously had no commercial value. Some is sold for food, with re-branding or euphemistic names used to entice customers, such as crab cake, or the better-known fish oils and other dietary supplements. Most, however, is dried, ground down into powder and made into fishmeal. This is then used in animal feeds (ironically this includes food for fish farms, which have been proposed as one solution to overfishing) and fertilisers.

> *12.30 p.m. – lunch. Fried fish and rice. After the meal everyone does their own washing up, including the Captain, Yeshwant. He chews a mouthful of saunf (fennel seeds) and the cabin is filled with the sweet smell.*



At 8.30 a.m. the net is winched in. By 8.50 a.m. the catch has been landed onto the boat and an hour and a half later it has been sorted, the target and trash-fish boxed, the discards thrown overboard. Sorting is done by hand with dust-pans and plastic scrapers. Venomous sea snakes are buried amidst the squirming, salty pile. Bites are not uncommon.

But as with stocks of commercial species, it seems inevitable that the fishing industry's strategy of diversification, known as "fishing down the food web" , cannot be sustained in the long-term. More data is needed to be certain, but since overexploitation has dramatically reduced stocks of commercially important fish such as tuna and anchoveta, it seems highly likely that the new reliance on alternative species will, in turn, denude stocks of these forms of sea-life.

> *The last haul of the day is negligible – disappointed and late we turn for shore, heading almost due North on an easterly bearing 73° 27. 015'E. Drop anchor at 5.30 p.m. The impact of the relentlessly throbbing engine on our eardrums only becomes clear when it stops at last. A hollow space is left behind. The crew load a small row-boat and ferry the catch to the market on the beach.*
>
> *A working day of over 12 hours. The crew does not get weekends.*

And where this chain ends, it seems, must be the collapse of the trawl-fishing industry. Marine-life simply does not have the capacity to reproduce at a rate which will keep pace with the rate of extraction, and so the biodiversity of our oceans will reach such a depleted state that no large-scale fishing will be economically viable. It is true that there are global efforts to reduce the ecological impacts of fishing. However, there is an enormous gulf between allowing marine ecosystems to slowly recover, and bringing them back to a point where they can once again be harvested on a commercial scale.

And so, it seems that the sad but inevitable truth is that in many ways, trawler fishing can already be seen to be dead in the water – it is only a matter of time before it sinks completely. Stocks of target-species are already barely commercially viable. The fishmeal industry is no more sustainable in the long term. On the one hand it is difficult to have sympathy for an industry which has literally destroyed its own foundations by overexploiting the resource on which it depends. On the other however, to view the issue from this broad scale misses the finer detail. It misses the impacts on the lives of individual fishers like Anil, Deepak and their crew-mates – Yeshwant the captain and Shrivam the cook, Pintya, Lankesh, Subodh and Keshav; the impacts on the thousand such 'thalashis' at Malvan, and the millions more around India's coastline.

The challenge now is finding a brighter future, for both the myriad life-forms that live in our seas, and also the approximately 40 million people that depend on those seas for their livelihoods. With the demise of the industry these people will find themselves with no means to support themselves and their families. And so it is vital that although the industry will die out—be it over the next 10, 20 or even 50 years—we do not allow its fishers to sail into the abyss with it.

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Matthew Creasey *is a biologist and science writer. He currently works for the wildlife conservation charity WildTeam.*

Shawn Dsouza *is a researcher at Dakshin Foundation with interest ranging from marine ecology to marine resource management.*

Adwait Pawar *is an illustrator based in Bangalore who lives with his three cats and aspires to their sense of detachment. He has been experimenting with different styles of illustration recently and is quite enjoying himself.*





How much carbon is in your cup of coffee?

Author **Emmalina Glinskis** | *Illustrator* **Shriya Datye**



Most of us don't think about the ways we can connect the imagery of climate change—factories pumping thick smokestacks, inundated coastlines and destroyed homes, polar bears sinking on melting icebergs—to the thing we need most every morning: a cup of coffee. But its agriculture, production, and consumption all play an intimate and unstudied role in tackling the largest environmental crisis of our era.

Recently, an academic study published in Bioscience found that while coffee cultivation in Asia is on the rise, shade-grown coffee systems have decreased by 20 percent globally since the 1990s. As climate change increasingly threatens future outputs of one of the most important beverages to modern society (after water, of course), this matters for a whole slew of reasons. Open-sun cultivation, often pictured as rows and rows of manicured coffee bushes devoid of any other crop varieties or native vegetation, remains the dominant mode of cultivation today. But trees contribute more than just shade to the coffee, adding to its unique texture and flavor profiles across hilly landscapes throughout the Western Ghats. The diverse canopies of native trees contribute incredible species diversity, offering additional habitats to the fauna that call it home. They offer strength in numbers, providing resilience against natural shocks to the ecosystem like flooding, droughts, and wildfires. They filter and clean the water, maintain soil quality from erosion, and most importantly in the era of global warming: they store carbon.

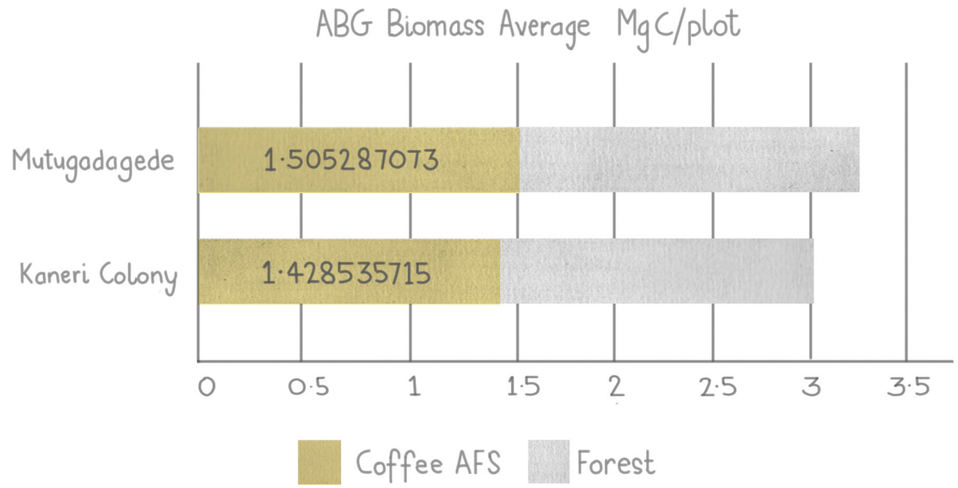
India remains unique in the world as most coffee grown here is often in diverse multi-cropping homesteads under the canopy of forest trees, which play a huge role in mitigating the amount of CO_2 being pumped out by our factories, cars, and power-plants. The process works a little like this: through photosynthesis, the trees take in CO_2 and exchange it for the oxygen we need to breathe. But this also does something else, something we can't see with our own eyes. The carbon gets fixed by the trees, sucked up through the dense network of leaves, woody stems, and thick trunks back down into earth where it is stored as soil carbon. This ancient process becomes one of the most important "sinks" in the carbon cycle, making trees the real unsung heroes of climate change. As natural agents in mitigating the spiraling levels of greenhouse gases around the world, we need them to get the job done.

That's why promoting shade-grown coffee is such a big deal. This lies at the heart of some of the research I have been conducting with Black Blaza as a Fulbright researcher alongside the Bangalore-based institute Ashoka Trust for Research in Ecology and Environment (ATREE). Black Baza prides itself on being an activist company with a unique mission: to reconstruct the existing marketplaces for coffee and re-embed it in place, people, and ecology. This means eliminating the use of pesticides or fertilizers, and relying only on organic, natural farming. They envision a market system which values producers and nature equally by conserving native forest cover and local biodiversity (like the small raptor that inspired the company's name) while enhancing the participation, voices, and ideas of farmers in the overall production cycle.

The focus of their efforts lies in the hazy green mountains of the BR Hills tiger reserve, the mighty ecological corridor between the Western and Eastern Ghats that's home to hundreds of different species of wildlife. It's also the home of the Soliga community, the Adivasi stewards of the land who have been intimately linked with these forests for hundreds of years. Originally the community lived off the forest, harvesting non-timber products like lichen, gooseberry, and honey while sometimes practicing shifting cultivation. But once the region was recognized as a Wildlife Sanctuary in 1974, the Soliga community was directed to settle in hamlets outside of the forest interior and practice settled agriculture. Families started growing traditional crops—millet, ragi—which quickly attracted hungry wildlife like elephants, boars, and deer, disrupting the delicate balance between conservation and livelihoods. In the 1990s, the government promoted coffee as an alternative cash crop that didn't cause human-wildlife conflict and was easy to maintain, and family by family, households converted to its cultivation. Since they live in highly protected forests, the farmers often kept native trees standing, planting coffee by the bush on the forest floor. So while the Soligas never actively made the decision to grow coffee in this landscape themselves, year after year it becomes a bigger part of the community's new ecological identity.

But even now, there are many unanswered questions in this new forest-agriculture landscape. In a rich biodiversity hotspot like BR Hills, how was the presence of coffee farms affecting the connectivity of key forest species like pollinators, or the diversity profile of standing trees? Black Baza knew they couldn't effectively reach their radical mission without the right metrics. Circling back to the mighty power of carbon storage, the untapped potential of shade trees as an ecosystem service had also remained unstudied and unnoticed.





That's where we came in. My team arrived at the tiger reserve at the tail end of the monsoon season with a deceivingly difficult mission: we wanted to know just how much carbon was being sequestered, or stored, in the farms that Black Baza partners with in BR Hills, compared to the neighboring forests. Farm after farm, we set up plots, delicately wrapping tape measures around trunks, counting the centimeters across the branches of coffee bushes, and identifying the diverse native trees by their local name. We machete'd our way through forests choked by the Lantana vine, an invasive plant introduced by the British during their colonial occupation. While the Brits left, the Lantana unfortunately stayed, and still today no natural source of control exists for this weed. We passed by mounds of fresh elephant dung, a reminder of their ever-close proximity. The Soliga rule of thumb: if you see a wild elephant, run.

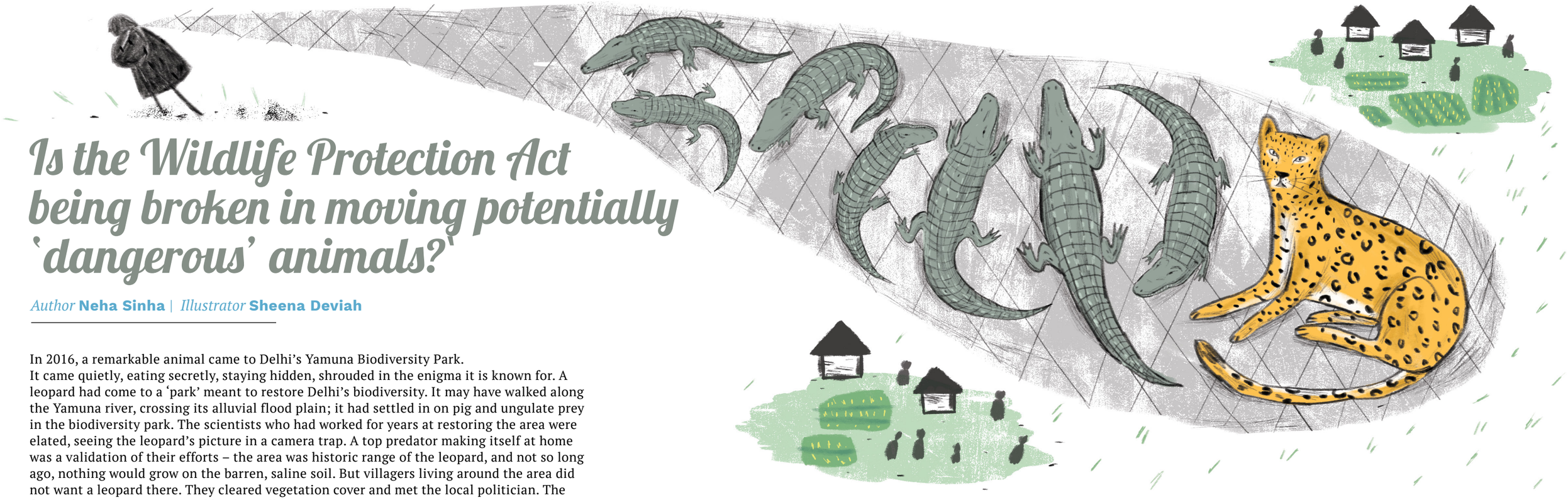
After months of field work, we had the measurements we needed to understand the power of shade coffee as a fighting force for climate change. And what we found was pretty wild—the carbon stored above ground in shade coffee systems was near-equal to forests plots of the same size, meaning the two systems were comparable in storing carbon within the vegetation's woody tissue. But this is not to say that shade coffee systems are the same as native forests. Just because they may provide similar carbon storage benefits doesn't mean we should replace every protected forest with coffee farms. But for coffee production itself, this really exhibits the mighty ecological power trees actively offer us when we grow coffee under their leafy canopies. And for Black Baza, this helps them get one step closer to reimagining the role coffee can play in conservation and agricultural livelihoods. So the next time you pour a cup of organic shade-grown brew, know that you're not just enjoying the delicate tastes of the elevations at which it grows, or its chemical-free inputs—you're giving a nod to the original actors keeping our planet cooler, healthier, and greenhouse gas-free.

Emmalina Glinskis *is an environmental researcher and journalist from Brooklyn, New York City. She is interested in the nexus of ecology, agriculture, and urbanization through geospatial analysis and sustainable planning practices. She completed a Fulbright research grant with Ashoka Trust for Research in Ecology & Environment in the Western Ghats, Karnataka.*

Shriya Datye *is a design student, interested in documenting and reflecting on the natural and human world around her, through illustration. She especially enjoys mixing analog materials with digital editing- working primarily with ink and pencil and digitally colouring and manipulating these artworks and images.*

Is the Wildlife Protection Act being broken in moving potentially 'dangerous' animals?

Author **Neha Sinha** | *Illustrator* **Sheena Deviah**



In 2016, a remarkable animal came to Delhi's Yamuna Biodiversity Park.
It came quietly, eating secretly, staying hidden, shrouded in the enigma it is known for. A leopard had come to a 'park' meant to restore Delhi's biodiversity. It may have walked along the Yamuna river, crossing its alluvial flood plain; it had settled in on pig and ungulate prey in the biodiversity park. The scientists who had worked for years at restoring the area were elated, seeing the leopard's picture in a camera trap. A top predator making itself at home was a validation of their efforts – the area was historic range of the leopard, and not so long ago, nothing would grow on the barren, saline soil. But villagers living around the area did not want a leopard there. They cleared vegetation cover and met the local politician. The forest department, instructed by the Delhi government, moved quickly: a trap was set for the leopard, it was caught and sent to an undisclosed location. Unofficially, this location was revealed to be forests in Saharanpur.[1]

Neither Yamuna Biodiversity Park nor Saharanpur are protected as wildlife sanctuaries, and it is doubtful what future a leopard would have in Saharanpur, where it was sent to 'stay', like a pet dog asked to sit in the corner. Would it be caught again if Uttar Pradesh local administration deemed it dangerous?

But at least for Delhi, the Big Cat was out of sight, and so out of mind.
In January 2019, the Gujarat forest department quietly captured 15 mugger crocodiles. This was in order to safeguard tourists who would visit the state's new mega tourist offering – a gigantic statue of Vallabhbhai Patel, the Statue of Unity. Crocodiles living in the pond where an aircraft ferrying tourists was set to land had to be moved. After the first 15 crocodiles were moved, the forest department said they were not sure how many more they would translocate, or how many crocodiles were in the ponds. Some reports suggested close to 500 crocodiles would be moved away[2] – a rough estimate not based on systematic estimations. Outrage at the unsustainability—and the unfairness—of the plan has halted further translocations.

The Wildlife (Protection) Act, 1972, says a Schedule 1 Animal—like the mugger crocodile and the leopard—can only be captured if it is proven to be a danger to human life. Neither Delhi's leopard nor Gujarat's muggers had yet proved to be a danger to human lives. They were trapped because of their potential for danger; like junking a car because it may possibly cause an accident.

Many more efforts to catch leopards have continued. In May 2019, a trap was laid for a leopard that was frequenting a village in Sirumugai forest range in Tamil Nadu.[3] It is interesting to note that last year, another leopard was trapped in a village in Sirumugai and then transported away to an undisclosed location.

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[2]Indian Express 2019, 15 out, 485 to go: crocodiles removed from Seaplane to Unity Statue retrieved online
[3]Times of India 2019, Forest officials set to trap leopard frequenting Sirumugai village, retrieved online

So what does a tourist site, a village in forest land and a biodiversity park have in common? Nothing at all, save the fact that human society decrees wild animals should not live there. The idea of which animals to remove is tempered by perceptions of danger. Both the crocodile and the leopard are top predators. Not only do they have disproportionate impacts on their ecosystems, they also occupy psychological spaces of unease.

But the problem needs further interrogation. If animals are going to be trapped in biodiversity parks and forest land, where exactly are they supposed to be?

Not near me

The issue of spatiality of the animal sits through the lens of human perception on where wildlife belongs. A pond that newly 'belongs' to tourism, no longer belongs to a predator. Such a predator is best relegated to a separate, 'out of sight, out of mind' place. These kind of knee-jerk translocations go against any understanding of the subject and its preference for a home range.

The forced relocation of animals also demonstrates a particular view of Nature. An area meant for reclaiming Delhi's habitat is meant just for gentle nature; the proverbial stroll in the park with butterflies and birds; not for anything as wild or untameable as a leopard. This connects to the first point: Nature is acceptable as long as it is not dangerous to us.

"Relocation of crocodiles to a suitable location is fraught with potential problems and must be done under advice and supervision from competent experts or there is a great risk of killing them," says noted crocodile conservationist Romulus Whitaker. "This will not solve the problem."

It is clear that relocation of crocodiles is not a simple matter, and relocation may lead to a new conflict situation.

Does the law and its schedules matter?

Here is what the Wildlife (Protection) Act, 1972, says on catching protected wild animals. The Act is divided into Schedules that afford protection—Schedule I being the highest level. A Schedule I animal can be trapped only if it has become a danger to human life, and through an order given by the Chief Wildlife Warden. There are further safeguards in section 11 of the Act. The first is the fact that it is not mandatory for the CWW to issue an order for hunting (this includes trapping) the moment an animal has become a danger to human life. The exercise of the power is discretionary. Secondly, the order has to be a detailed speaking order which discloses why there is no other option but to hunt the animal. In the case of the Delhi leopard, Section 11 was invoked, but this was pre-emptive. The leopard had not yet proved to be a danger, nor had it attacked anyone.

For other Schedules, the animal can be trapped or hunted it if has become a danger to human life or property or standing crops, again through a written order by the Chief Wildlife Warden (CWW). Wild animals can be trapped for management, scientific research and translocation with prior approval of state government, and in the case of Schedule I species permission needs to come from the Central Government.

Whitaker for example, noted that it is highly unlikely that the Central government granted necessary permissions to the Gujarat Forest Department to capture and relocate the Schedule I protected crocodiles.

The Wildlife Protection Act is constantly being contravened. Consider this: Crocodiles are given even more protection through the Act. Birds and reptiles are accorded a higher level of protection in the Act than in comparison to mammals. This is because under Section 2 (16) of the Act, hunting has been broadly defined to include "capturing, coursing, snaring, trapping and every attempt to do so." However, in respect to birds and reptiles, the definition of hunting includes ncludes, "disturbing the eggs or nests of such birds and reptiles." Thus, even the act of 'disturbing' the nest or eggs of crocodiles is covered under the definition of hunting and there is no requirement for the actual killing or capturing of the Crocodile for it to be considered hunting.



The question of where the animals are taken is also an important one.

"Under section 12 bb (i) of the Act, the Chief Wildlife Warden can give a permit in writing for the purpose of translocating any wild animal to an alternative, suitable habitat. The use of the expression 'alternative suitable habitat' by the legislature is significant since it mandates that the CWLW must be satisfied that the area where the animal is being relocated is an 'alternative' habitat which is 'suitable' for the animal," says environmental lawyer Ritwick Dutta.

The area must also satisfy the definition of 'habitat' which is provided in the WPA viz an area "which is a natural home of any wild animal" [Section 2 (15) of the Act]. Thus shifting an animal to an area which is not a 'natural home' of the wild animal would be contrary to the provisions of the WPA. Thus, he stresses the law is being violated on several counts—not only are wild animals being moved without reason, they are being moved without any credible assessment of suitable habitat.

Are we solving the problem?

Management actions for wildlife need a basic yardstick to work. First, we need to understand what the problem is, and then understand what the solution must be. Secondly, we need to understand the behavioural ecology of the subject.

The view of 'problem' animals, confined to a view of Nature as desirable as long as it is not dangerous, paints all so-called unwanted animals in the same way. The answer is reached before the question is posed: the answer is that the animal must be removed. In this sense, there is no difference in the way the leopard or the crocodile is treated, though both pose different kinds of risks when relocated forcibly. The 'answer' is also not sustainable and reached without the use of any modern technologies. Leopards are often moved, shot or trapped without exercises done to identify individuals. In this case it is hard to tell if the same individual recolonizes the area it was relocated from, as leopards are known to do. The final question to ask is: what are the other lenses to look at the issue, apart from legalities. Surely, best practices need to come from an understanding of the subject. Local perspectives of living with wildlife assume significance here, and should be learned from. For instance, people in Charotar in Gujarat, and Kotmi Sonar in Chattisgarh know how to live with mugger crocodiles. Instead of setting in place catch-them-by-the-tail, all-guns-blazing relocation, we could learn from them.

We need assessments to understand if we have a problem on our hands in the first place, or whether management solutions can involve not actually moving animals. Finally—and it seems counter-intuitive to state this—any move to take care of a problem has to include a genuine attempt to solve it.

Neha Sinha *is with the Bombay Natural History Society. Views expressed are personal. She has a chapter in the newly published, 'Nature Conservation in the New Economy', ed Ghazala Shahabuddin and K Sivaramakrishnan.*

Sheena Deviah *by day, works as an art director at a children's book publisher and by night she enjoys working with her hands while surrounded by her three rowdy cats. She loves the company of messy art supplies and is constantly fascinated by nature, both inside and outside.*



millions of endangered Kemps ridley turtle eggs from Mexico to the US and incubated them in Styrofoam boxes, releasing only males for many years (because they didn't know yet that temperature determined sex of hatchlings).

The thing about those ideas is that they are, fortunately, isolates. But, every now and then two wacky fads come along at once. As we have previously written , the Half Earth project is one of the more bonkers, and potentially callous, ideas out there. But now there is a new one – Compassionate Conservation .

It's a bit difficult to summarise Compassionate Conservation. It is not the idea that, as feral cats chomp through your endemic avifauna, you should feel sorry for the cats. It is more complicated than that - but not very much. It's not exactly that, as crocodiles crunch on fishermen, we should sympathise with the crocodile because the meal wasn't sufficiently salty. But it's heading in that direction. Nor is it the idea that nothing should kill anything ever - at least we don't think it is.

It is important to tackle this thinking. But in this article, rather than engage too deeply with this approach, we propose instead to adopt it, adapt it and turn it to good use. In fact, we'd like to do that with both of these new fads in as constructive, dynamic, novel, unique and revolutionary manner as possible. So, bringing together the 'Very Best of Half Earth and Compassionate Conservation', we would like to offer to the world a new and improved trend which we are proud to launch here. It is: 'Compassionate Halfism'®©.

Compassionate Halfism is the idea that there are lots of things that we have far too much of and that this world would be a much more wonderful place if these things were precisely cut in half. Obviously the two fads we have just mentioned are themselves prime candidates for such halving. But there are clearly plenty of others. And so we'd like to start a more general 'Half It' movement that seeks to cut a swathe through the excess of our lives.



The current list for this populist movement is given below. Additions are welcome.

- Global carbon emissions;
- Gas from political campaigns;
- The distance people travel to work:
- The distance batsmen have to run between wickets in cricket;
- The desire to measure progress in terms of GDP;
- All dependence on economists to measure progress;
- Donald Trump's remaining term in office;
- Or failing that, just the office;
- All the characters of anything written in Comic Sans;
- The text and number of academic articles – in whatever font;
- Airlines and certainly airline food;
- The US defence budget;
- Paris Hilton's budget;
- Meat consumed by Americans, rice by Indians, soy by vegans;
- Any food called 'British' excepting cakes;
- The rate of our personal hair loss;
- Justin Bieber fans, but not, of course, Justin Bieber.

Further Reading

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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.*

Kartik Shanker *is at Indian Institute of Science & Dakshin Foundation, Bangalore, India. Email: kshanker@gmail.com*

Daniel Brockington *is at University of Sheffield, UK. Email: d.brockington@sheffield.ac.uk.*

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 self-publishing his own comics in the near future.*





A mudpuddling puzzle: how butterflies avoid predators

Words **Ravi Jambhekar** *and Pictures* **Hitesh Sonar**

My name is Ravi and I study butterflies in the lush green forests of the Western Ghats region of India. A person who studies butterflies is known as a lepidopterist. I want to tell you a story about something I witnessed almost 10 years ago, when I was working in the Biligiri Rangan Betta Tiger Reserve, Karnataka.

During the dry season water becomes scarce in the reserve, and the wildlife depends on the fast shrinking water-holes for something to drink. This means that elephants, gaur, deer and other big mammals often gather in these places, and can be spotted quite easily.

I also used these waterholes to rest until I was picked up by my jeep, as they had a thick canopy and nice shade to rest under . One particular day, my field assistant Kete Gowda and I were returning home from the forest in the scorching May heat. The trees were all leafless and the waterbodies fast drying up. There was a strong smell of elephant and gaur, and we knew to be careful, as these animals can attack humans if they get too close. As we were sitting near a big pond, waiting for our ride, I

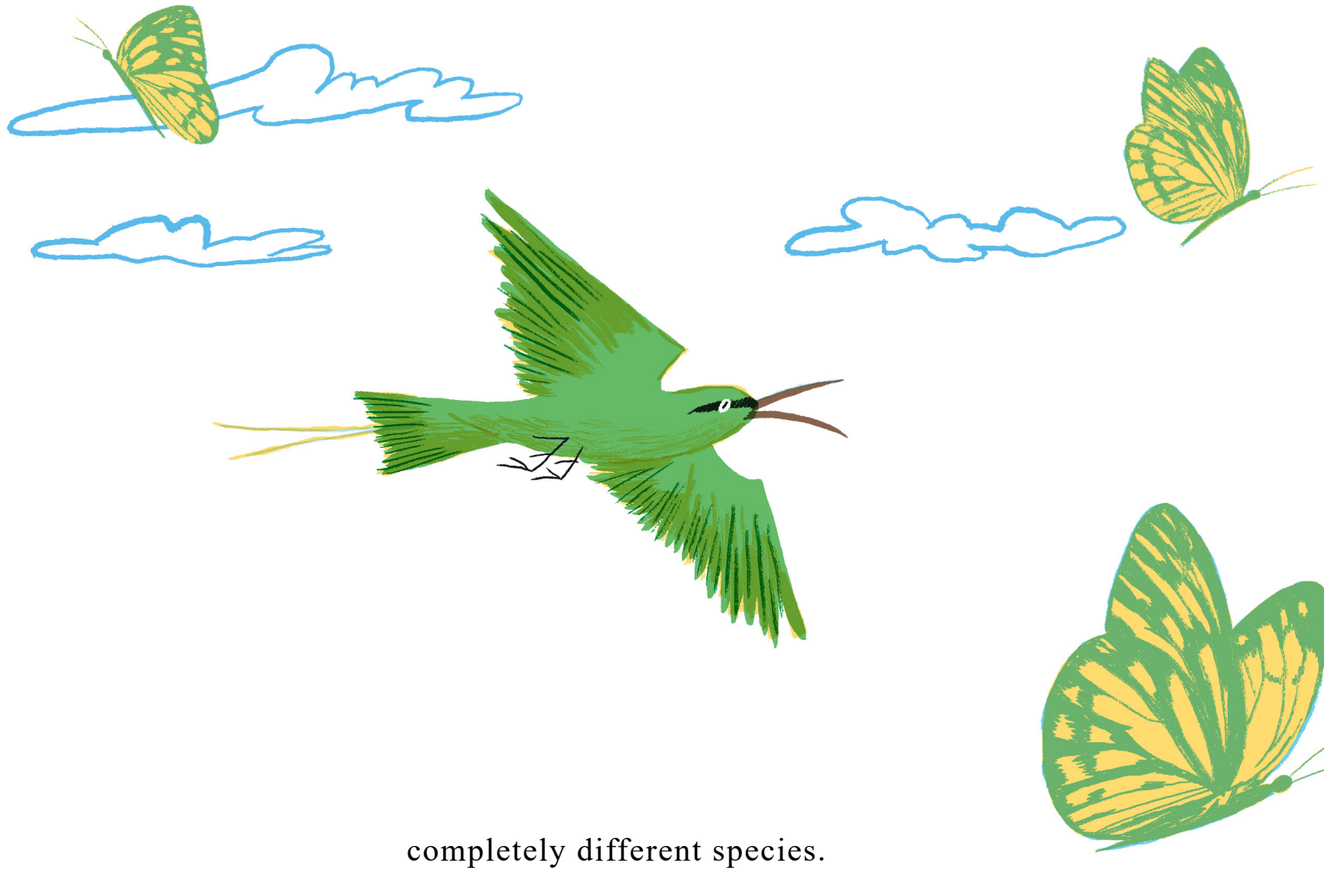


noticed butterflies gathering beside the water. This activity where butterflies come to damp patches to drink water and absorb salts from the mud is called ‘mudpuddling’. As we watched we were amazed to see hundreds and thousands of these beautiful and delicate butterflies: red, blue, green, orange, black, white and all the colours one can imagine, coming together on the damp banks.

I returned to my field camp, my head full of questions. In particular, why don’t all these butterflies get eaten by predators? They seemed so exposed! Next day we went back to the water-hole to watch the butterflies again. That was the



first of many such visits, watching, taking notes and pondering on what we were seeing. Eventually, something extraordinary became clear: the butterflies were not positioning themselves randomly along the water's edge. Instead, we found that butterflies of a similar colour and size grouped together. That means for example that all butterflies that are yellow or all butterflies that are red, orange, crimson, etc. will come together, even if they belong to





completely different species.

The reason for this, we think, is that grouping together in this way gives the butterflies protection from predators. By gathering with others of a similar size or colour, it makes it harder for predators to pick out a single individual and target them. Such behaviours have been observed in birds before, but this is the first time it has been seen in butterflies.

This was just one of my butterfly-adventures before starting out on 5 years of study for a degree in Ecology at the Indian Institute of Science.



Fun Facts about butterflies

- The butterflies go through three stages of development before they become adults. The first stage is the egg, the second is the caterpillar stage, where the caterpillar feeds on plants and grows, before it goes into the third stage, the pupal stage. During this stage the pupa cannot move and is attached to a twig or a leaf, protected in a hard chrysalis. Finally, the last stage is the adult stage, when the bright and beautiful adult butterfly emerges from the chrysalis and flies away.

- Many butterfly species have a single type of plant on which they lay their eggs. So if a caterpillar that feeds on mango leaf is given a leaf of banana plant, it won't feed on it.

- Only male butterflies mudpuddle, and the salts which they absorb while mudpuddling are transferred to females while mating. This helps the females produce more eggs.

- Butterflies form the base of the food chain and are also one of the most important pollinators for plants. The caterpillars are herbivores, meaning the feed only on plants, whereas the adults are nectarivores, meaning that their diet consists almost completely of the sugar-rich nectar produced by flowering plants.



Ravi Jambhekar *is a post-doctorate researcher studying urban ecology at Azim Premji Uiversity, Bangalore. When he isn't chasing butterflies in the forests, he dabbles as an artist, traveller, photographer and Ultimate Frisbee player. He posts as @ravijambhekar on Instagram.*

Hitesh Maruti Sonar *is an illustrator and graphic artist. He has worked on various projects from book illustrations and magazines, to newspaper illustrations and animation backgrounds. He finds the natural world (birds in particular) and people travelling by Mumbai's local train, most inspiring.*

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