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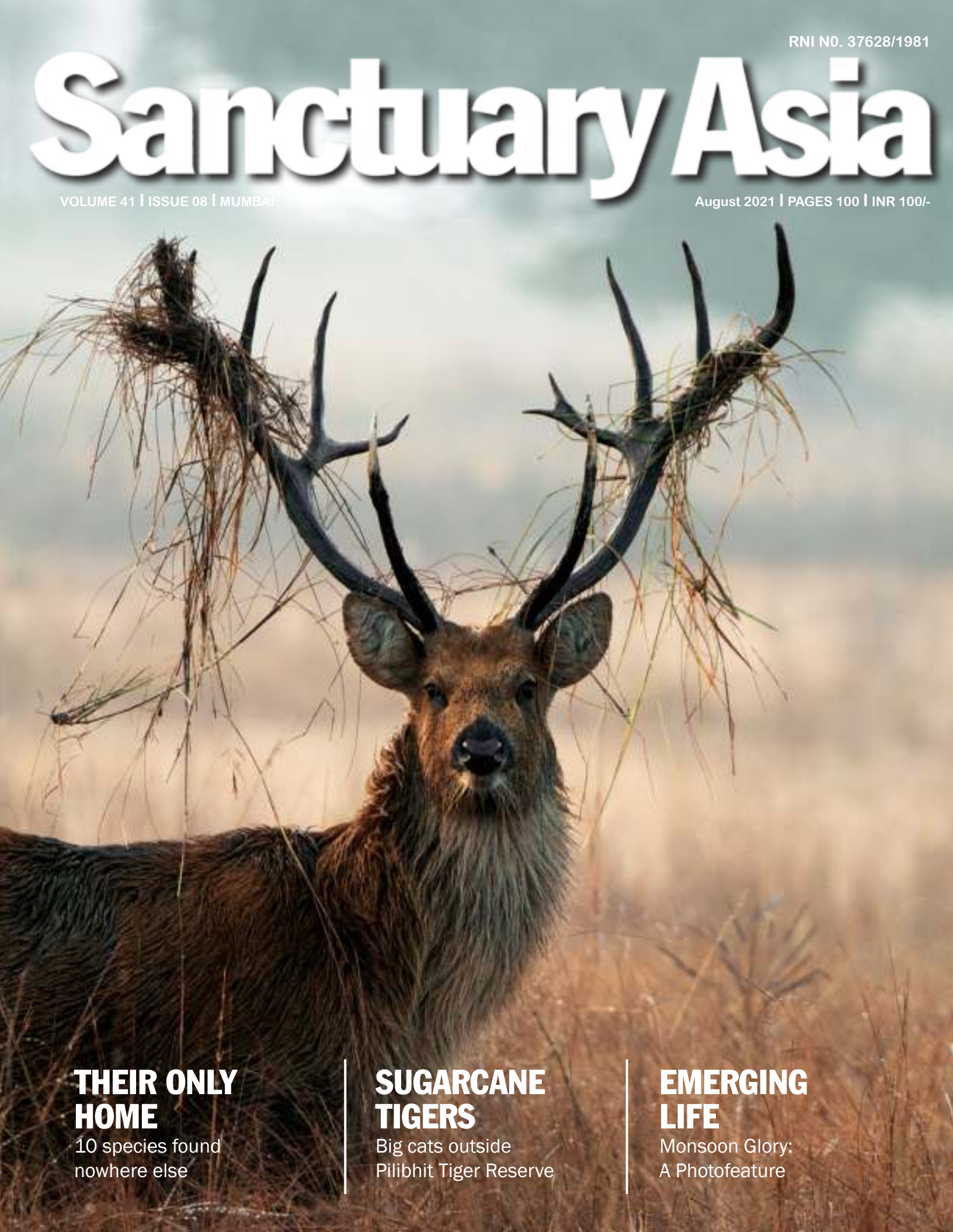

THEIR ONLY HOME
10 species found nowhere else

SUGARCANE TIGERS
Big cats outside Pilibhit Tiger Reserve

EMERGING LIFE
Monsoon Glory: A Photofeature

FOREVER STRIPES

The survival of the tiger and all the creatures that share its habitat, including leopards, wild dogs, elephants, rhinos and uncounted plants, insects, birds and reptiles, depends on whether humans can set aside vast undisturbed wildernesses for nature.

The wildlife conservation movement needs the support of us all. For more information on how you can help, or to pledge your support for those who work round-the-clock to protect our wildlife, write to Dr. Anish Andheria (President, Wildlife Conservation Trust) at anish@wctindia.org or visit www.wildlifeconservationtrust.org

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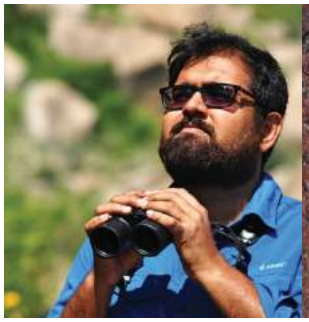

An avid birdwatcher, he studies the evolutionary ecology of amphibians at the Centre for Ecological Sciences, Indian Institute of Science. He has discovered new amphibian behaviour as well as species.

An award-winning conservation photographer, filmmaker and presenter, she has worked with National Geographic WILD, BBC Earth, DD National and Discovery Channel India.

A native of Pilibhit, he is a wildlife writer who has been following conservation issues in Uttar Pradesh. He is committed to highlighting threats and garnering support of locals and authorities to ensure wildlife protection.

An ornithologist, he is presently working with the Zoological Survey of India. His research focus is on long-legged wading birds, especially storks and herons of Northeast India and the reclusive hispid hare.

Sanctuary Asia August 2021

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On the cover

On a chilly winter's dawn in the sal forests of Kanha, where swamp deer graze in large herds, the photographer spotted this lone male barasingha deer, his twelve-tined antlers adorned with grass, possibly to attract a female. Each year males shed and then regrow their antlers larger and more impressive than the last.

Photographer: Mayur Desale

24 Cover Story

Their Only Home

India is an endemic paradise, hosting as many as 683 faunal species whose only homes in the world are restricted to small pockets of wild habitats – from arid deserts to wet grasslands and temperate forests. **Divya Kilikar** and **Abinaya Kalyanasundaram** highlight 10 such spectacular, lesser-known species whose future is threatened by a host of anthropogenic pressures that we must address with effective conservation action.

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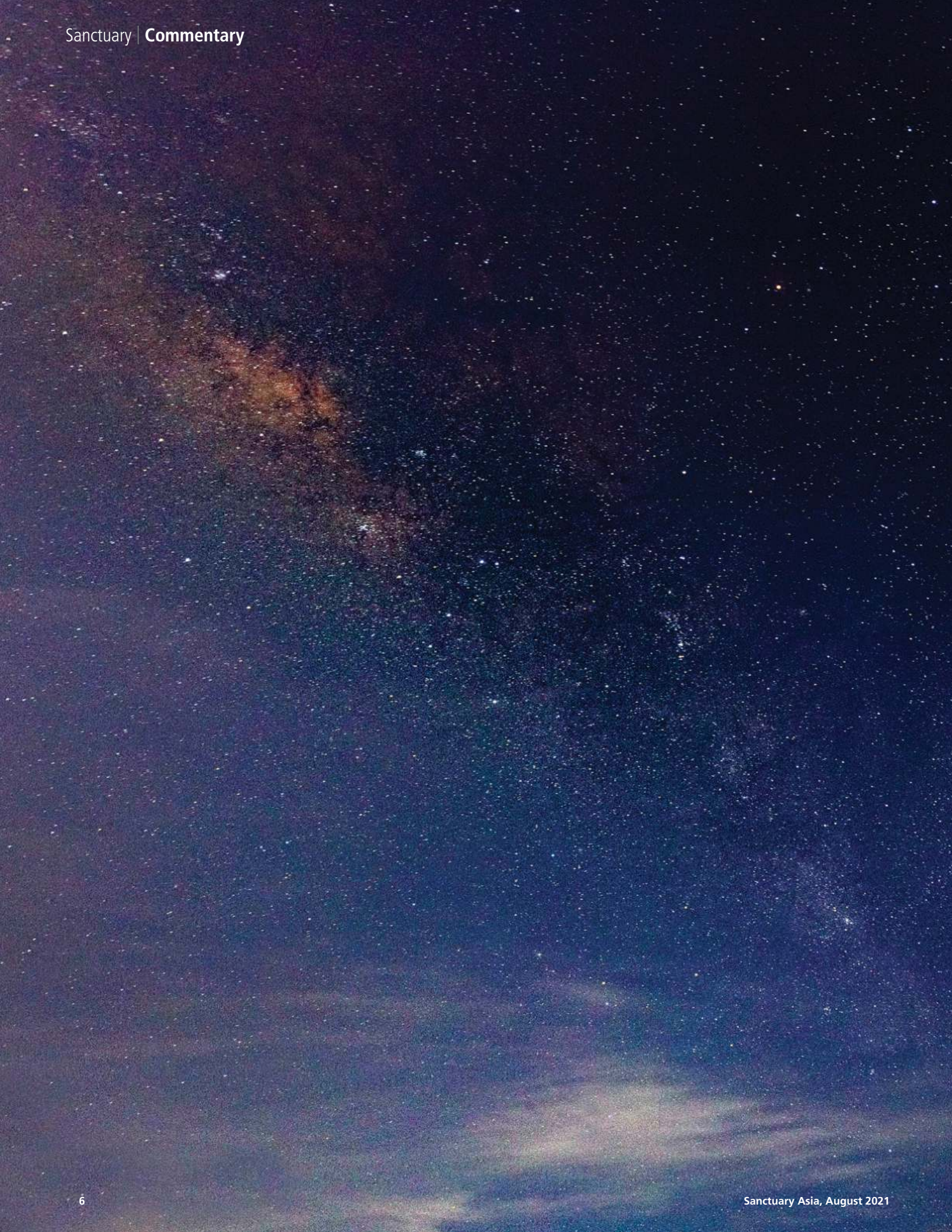


Bittu Sahgal,
Editor, Sanctuary Asia

Another Day, Another Battle

As a child, when city lights were dimmed and much of life was lived outdoors, I was magnetically drawn to stargazing. As a young adult, I would often lie on the open terrace of Ranthambhore's Jogi Mahal, staring up at the night sky on hot summer nights, listening to the alarm calls of herbivores, the moaning of tigers and the sound of nightjars and owlets.

In between, hanging between wakefulness and sleep, that unanswered childhood question would reverberate in my head: "What lies beyond beyond?"

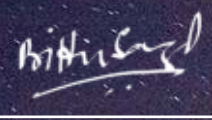
I recall my father, a mathematician by passion, patiently explaining that what I was looking at was the Milky Way, a spiral galaxy of which our sun happened to be but one star. "Beyond the stars we can see, are several billion others we cannot, because their light has not yet reached us."

The sheer vastness of space boggled my mind then, and still does. But where once it scared me, today I am comforted by its sheer scale, which so completely underscores my insignificance.

Post my teens, as life pushed me along its relentless conveyor, I stopped thinking about what lay beyond beyond, in no small part because Galileo, Newton, Cassini, Einstein, Sagan and Hawking provided me with more answers than I could possibly comprehend.

I do now know that the Milky Way, with its one-billion-stars has a diameter of something like 100,000 light years… and that our solar system lies some 25,000 light years from the centre of the Milky Way. The fear I once felt has vanished. It has been replaced by wonder, and the comfort of knowing that as a speck on a speck on a speck, my love, anger, frustration, and worry for our biosphere is little more than a life-choice. It's the way I have chosen to spend my life thus far, and the way I intend to spend my remaining days. Ditto for my brain's defence reflex that drives me to fight for the magical world upon which much of humanity has declared war. I know my striving is little more than a selfish way to give my life meaning and, in the final analysis, it is supreme arrogance to believe the biosphere "needs" me to do this or that.

That is when, hovering between wakefulness and sleep (hypnagogia), the thought ricochets through my brain: "This is a one-way trip buddy… sit back, enjoy the life-show. Let the world turn without you." But then comes the morning when, between sleep and wakefulness (hypnopompia), my much-more-complex-than-the-Milky-Way brain takes over, firing its one hundred billion neurons, to set me on course, puppet-like, to launch me into another day, another battle.



PHOTOGRAPHER: Vijayan Menon
LOCATION: Coonor, Nilgiris
DETAILS: Camera: Canon R5, Lens: Canon EF 16-35 mm., Aperture: f2.8, Shutter speed: 25 sec., ISO 200, Focal length: 24 mm.
DATE: May 31, 2021, 12:02 a.m.

WORLD SCAN

SAIGAS DOUBLE IN KAZAKHSTAN

Saiga populations in Kazakhstan have doubled since 2019, from 334,000 to 842,000. according to an aerial survey conducted across the country's vast steppes. The antelopes were tagged 'Critically Endangered' by the IUCN Red List in 2002. Apprehensions of their potential extinction grew in 2015 when images of saiga carcasses began to circulate. Subsequently, the government ordered a ban on poaching and instituted local conservation efforts that succeeded. One sub-population in Ustyurt, showed a dramatic recovery, from 1,000 in 2015, to 12,000 in 2021. Despite the population boom, conservationists such as Albert Salemgareyev of the Association for the Conservation of Biodiversity of Kazakhstan. believe that numbers may never recover to the original millions estimated in Soviet times, because of habitat destruction by state infrastructure, oil and gas projects.

HEAVY RAINFALL ACROSS EUROPE

Since July 12, 2021, several European countries including the U.K., Austria, Germany, the Netherlands and Belgium have been affected by catastrophic floods. At least 192 people have died, including 159 in Germany, 31 in Belgium, while hundreds more are missing and thousands evacuated. Damage to infrastructure has also been severe. The National Crisis Centre in Belgium said on July 18, that while the imminent danger had receded, search operations were still on and the most pressing concern was the lack of drinking water in the affected areas. Meanwhile in Switzerland, lakes and rivers were swelling and the river through the capital Bern burst its banks while Lake Lucerne flooded the town on its banks. The devastating floods are a result of extremely heavy rainfall, which caused flash flooding. Such extreme rainfall events in Europe are becoming more common. As climate scientists have warned, climate change will impact intensity and frequency of precipitation with warmer oceans increasing evaporation. When moisture-laden air converges into storm systems, it could lead to heavier rain and snow events.

PUBLIC DOMAIN/TRISTAN SHMURR

A heavily flooded street in Clausen, Germany, which was one of the worst hit countries in the 2021 Europe floods.

PUBLIC DOMAIN/MIKE DAVISON

The newly-declared Nkuba Conservation Area (NCA) to be managed by the Walikale *community is key to the future of the 'Critically Endangered' Grauer's gorilla* Gorilla beringei graueri.

A WIN FOR GRAUER'S GORILLAS

The Democratic Republic of Congo has officially recognised community ownership of the Nkuba Conservation Area (NCA), a 1,580 sq. km. area that lies between the Maiko and Kahuzi-Biéga National Parks. Its protection is critical to the future of the 'Critically Endangered' Grauer's gorilla *Gorilla beringei graueri*. The *Walikale* community has entered into a 25-year agreement to manage protection efforts with the support of the Dian Fossey Gorilla Fund. The endemic Grauer's gorilla is threatened by habitat loss, poaching for bushmeat and the impacts of civil unrest. Around 17,000 gorillas thrived in DRC's wilds in the 1990s. By 2016, the number had fallen to 3,800, according to a study in the *American Journal of Primatology*. NCA constitutes 10 per cent of the species' habitat. Vital pollinators and seed dispersers, their protection will help save several other wild species including the African golden cat and giant ground pangolin that share the gorillas' forest home.

WAR ON AMAZONIAN TRIBES

Since mid-May 2021, at least eight separate incidents of violence have been reported in the Yanomami Indigenous Territory in Brazilian Amazon, according to the Hutukara Yanomami Association. The attacks were by *garimpeiros*, or illegal gold miners, against *Yanomami* and *Munduruku* communities in the states of Roraima and Pará, where president Jair Bolsonaro is actively curtailing protection of the lands and the rights of indigenous people. In one incident, two children died when miners opened fire. Community leaders say they are facing the 'most perilous moment' since Brazil's return to democracy in the 1980s.

Gold is also driving the loss of orangutans in Indonesia. In 2020, the future of the endemic Tapanuli orangutan, found only in Batangtoru forests in Northern Sumatra and discovered as recently as 2017, is being compromised. The habitat of the last 800 Tapanuli orangutans found an unwelcome neighbour in the form of a gold mine purchased shortly after their discovery.

INDIA SCAN

ALBINO PALM CIVET AFTER 129 YEARS

A partial-albino common palm civet *Paradoxurus hermaphrodites* was spotted in Odisha's Satkosia Tiger Reserve, for the first time in 129 years! A camera trap placed in March 2020 to monitor tiger movement captured the image, which revealed a creamish-white body below the shoulders, rather than the usual grey. The information was published in *Zoo* journal in June 2021. The last such colour variation was recorded in 1891 in the forests of Kandhamal district, according to Gatikrushna Behera, a Wildlife Institute of India (WII) researcher. The finding is now prompting researchers to look into the taxonomic status and distribution of the species in the region. Common palm civets are solitary animals, except during brief periods in the breeding season. Terrestrial, arboreal and nocturnal, they are active during the darkest hours of the night.

SCAVENGER DROP IN RAIGAD

Populations of Long-billed and White-backed Vultures in Raigad district, Maharashtra, have declined by 28 per cent, according to a recent survey by the Forest Department and Society of Eco-endangered Species Conservation and Protection (SEESCAP). A count in February 2019 recorded 347 individuals, dropping to 249 in March 2021. Both species are listed as 'Critically Endangered' by the IUCN Red List. The survey teams studied the birds' movements in seven locations across the district, along with the impact of natural disasters and anthropogenic pressures on colonies. Premsagar Mestri, founder of SEESCAP, attributed the population drop to cyclones, heavy rainfall, felling of nesting trees and low food availability. SEESCAP works to rescue injured vultures, including chicks, and has witnessed a spike in the number of rescues over recent months.

PUBLIC DOMAIN/ARINDAM ADITYA

Populations of Long -billed Vultures have declined rapidly in Raigad, which is a cause of deep concern for the species. Working closely with the Central and State Government, the Bombay Natural History Society and the Royal Society for the Protection of Birds are partnering to save India's vultures from extinction.

COURTESY: ZAKHUMA DON

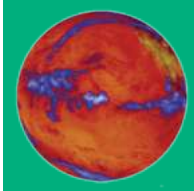
Forest guard Zakhuma Don's camera trap image of the first tiger seen in Dampa in seven years went viral on social media, sparking a 'find the tiger' trend. Can you spot it?

CROUCHING FOREST GUARD, HIDDEN TIGER!

The first photographic record of a tiger in Mizoram's Dampa Tiger Reserve in seven years was captured on camera trap by forest guard Zakhuma Don. The camera was placed in February 2021, and was retrieved in mid-May 2021. A veteran conservationist, Zakhuma has patrolled Dampa's forests for many years and is an alumnus of Sanctuary's Mud on Boots Project. On reviewing the images, he spotted the tiger and sent it forward to the authorities. The WII's Department of Endangered Species Management confirmed that Zakhuma had indeed photographed a tiger. Dampa was referred to as a "tiger reserve without tigers" after the last census in 2018. The reserve has been plagued by administrative issues, including low and delayed wages to ground staff (see page 64 on Pakke's wage issues), who remain dedicated despite these challenges.

BAGHJAN BLOWOUT: THE AFTERMATH

A June 2021 study to investigate the impact of the 2020 oil well blowout in Baghjan and the subsequent fire near the Dibru-Saikhowa National Park and Maguri Motapung *beel*, revealed that the wetland habitat suffered a 55 per cent loss of biodiversity, including over 12 sq. km. of Dibru-Saikhowa. The study conducted by the Assam Forest Department assessed habitat areas in and around the site in Upper Assam's Tinsukia district and estimated losses of around INR 25,050 crores. Titled 'Ecology and Economy: Lessons Learnt from Baghjan Blowout', the report authored by M.K. Yadava, Chief Wildlife Warden, stated that the ecosystem may take a decade to recover after the fire, which took five months to douse. It also confirmed that the oil and gas leak, explosion and fire impacted as many as 40 scheduled species listed in the *Wild Life (Protection) Act*, 1972. A visual count of dead animals listed in the Act was found to be 91, including a Gangetic river dolphin and a Hoolock gibbon mother and baby. The actual count would have been much higher. This vital reserve has been plagued by administrative issues, including low and delayed wages to ground staff, who remain dedicated despite these challenges.



CLIMATE WATCH

DRILLING ARCTIC ICE FOR OIL

Russian state-owned oil company Rosneft has plans to build the Vostok Oil Project in the fragile Arctic tundra ecosystem. The country's largest oil project, with a massive pipeline network (800 km.) and electrical lines (3,500 km.), it will access six billion tonnes of oil reserves to procure 30 million tonnes of oil annually by 2024. The plan includes construction of two airports and 15 towns capable of hosting 400,000 labourers. Much of the site encroaches upon the Taymyr peninsula, home to the indigenous *Dolgan* people and a Vulnerable reindeer species. The Arctic is most at risk to the effects of the climate crisis, and indigenous communities are key to protecting this fast-disappearing ecosystem.

WILDFIRES RISK HEALTH AND ECONOMY

For years *Sanctuary* has been warning that as global temperatures rise, and soil moisture evaporates, increasing incidents of drought will lead to more intense and frequent fire seasons. We now see this reality hitting nations worldwide. In mid-July 2021, 850,000 acres across 12 states in the U.S. were battling fires stretching from Alaska to Minnesota, with the Bootleg Fire in Oregon and Beckwourth Complex in California together affecting 290,000 acres. About 12,000 firefighters were deployed across the country to combat as many as 60 fires. Fires are also threatening livelihoods – in Indonesia, a variety of cayenne pepper that boosted the economy of Hiyung village since its introduction in recent decades, is impacted by wildfires. The Hiyung pepper is an ideal crop for the region's peat swamps and are cultivated during the summer. However, these naturally waterlogged habitats are also highly flammable. Local farmers' groups are currently working to protect crops from fires and educate farmers against burning croplands.

PUBLIC DOMAIN/KIRA SAWA

Western fire seasons are now far longer than they were just a few decades ago.

PUBLIC DOMAIN/GRID

The Dolgan *are high Arctic nomads whose lands are home to massive herds of wild reindeer, which have been traditionally herded, a practice that is seen to be key to the future of the species.*

FIVE MILLION ANNUAL CASUALTIES

A 20-year study involving dozens of global scientists has concluded that five million people die from extreme heat and cold weather conditions each year. It also noted that deaths due to extreme heat were on the rise in recent years, with those due to extreme cold on the decline. Published in the *Lancet Planetary Health* journal, the study analysed data from 2000-2019 in 750 locations in 43 countries, whose average daily temperature increased by 0.26°C annually. Experts have warned that people with pre-existing heart and lung conditions are particularly at risk. During the last week of June 2021 alone, British Columbia in Canada witnessed 486 fatalities due to a record-breaking heat wave. Much of North America is suffering abnormally high temperatures, with California's Death Valley nearly hitting 55°C on July 9, 2021, matching Earth's highest temperature in at least 90 years.

THE ICE THAT NEVER MELTS

The Arctic's 'Last Ice Area', a crucial habitat for polar bears, walruses, seals and other ice-dependent species, is at grave risk because of the climate crisis. A study published in *Nature* suggests that the thick sea ice in the Wandel Sea experienced unnaturally low ice concentration in 2020. Satellite data and sea ice models revealed a multi-year sea-ice thinning trend on account of unpredictable winds blowing the ice out of the area. Where once lay ancient ice, scientists now find open waters. Authors of the study state that their new work suggests that established climate assessment models may need to be re-evaluated since most did *not* predict the 2020 ice melt until several decades later. In 2019, Canada declared part of the Last Ice Area as the Tuvaijuittuq (meaning the place where the ice never melts) as a Marine Protected Area.

PUBLIC DOMAIN/ANDREAS PREUSSER

Polar bears need thick sea ice to hunt, without which they risk starvation, death and ultimately, extinction.

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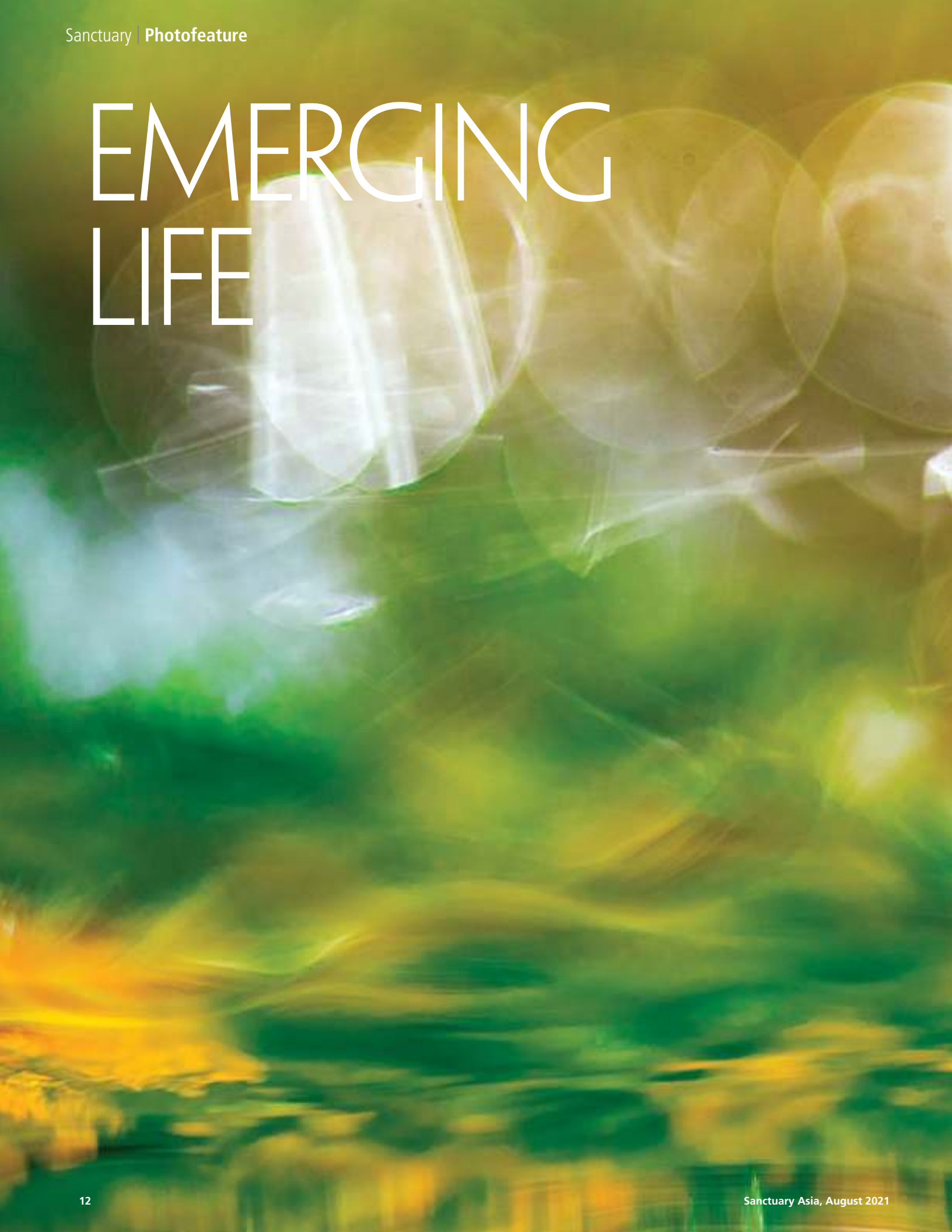

Come June, moisture laden air descends on India's forests. Acute sensitivity to temperature, humidity, and pressure offer plants and animals such as frogs, ants and birds advance notice of the monsoon's arrival. It is as if the entire forest has been waiting in anticipation. Rain first falls as gentle drops, then in torrential sheets, in a rhythmic cycle of life. As wetness seeps into the ground, the soil releases an earthy petrichor. Rivers widen and gush, adding a steady background hum to the melodies of cicadas and calls of amphibians. Leafy greens turn darker, as do tree trunk browns. Lifeforms of all descriptions are energised into boasting their vitality, choosing mates, and then bringing their offspring into a living forest ready to support them.

FACING PAGE *A dappled afternoon makes for a dreamy frame for this mating pair of dancing frogs* Micrixalus *sp. in Coorg, Karnataka. Male dancing frogs do not depend on sound to attract females, as the fast streams where they live drown their calls. Instead, they flag a leg high and wave in the frog version of a dance.*

ANIKET THOPATE

KARTHIKEYAN SHANMUGASUNDARAM

On a 'not so hot' summer afternoon in Coimbatore, Tamil Nadu, a mother paper wasp Polistes *sp. guards her nest, skillfully constructed using a mix of saliva and wood fibres. Each brood cell hosts a single egg. The mother fans her wings to moderate the temperature of her eggs while also warding off parasitoids and other predators.*

ARNAB DEBNATH

At first glance, this image photographed in Cooch Behar, West Bengal, may seem to be unguarded insect eggs on a leaf. But look closely and you'll see that the brown twigs are stick insects of the order Phasmatodea. They are uncanny in their resemblance to twigs, an effective camouflage against predators. Their eggs have hard shells and resemble seeds.

DATTA PEDNEKAR

A cannibal spider? No, you're looking at a lynx spider shedding its blue-tinged molt (above) in the Tungareshwar Wildlife Sanctuary next to Mumbai's Sanjay Gandhi National Park. Spiders periodically shed their rigid exoskeletons as they grow. The arachnids take in air and use concentrated pressure of their blood to enlarge their bodies, thus cracking and discarding the old exoskeleton.

DIBAKAR ROY

This stunning backlit photograph taken at New Barrackpur, Kolkata, exemplifies the adage that nature is the ultimate artist. The shadows of an army of caterpillars of the Erebidae family swarming over a leaf create a live moving pattern, their urticating hairs adding drama to the frame.

BHAVYA JOSHI

Amidst the leaf-littered Agumbe rainforest floor, a lithe flower mantis nymph (Hymenopodidae), slips ghost-like between mossy rocks. If it survives the next few months, it will grow to adulthood after multiple moultings, feeding all the while on the plentiful tiny forest creatures.

SAURABH SAWANT

Fresh droplets cling to the petals of a wild balsam Impatiens *sp. as a bee approaches seeking nectar, in Wayanad, Kerala. The genus has an interesting etymology – when ripe, a balsam fruit pod tends to curl up inwards so forcefully, that the seeds are ejected at a distance. Hence 'impatient'. The Nilgiris phytogeographical region is home to around 40 species of* Impatiens*, of which almost half are endemic to this small area.*

SAURABH SAWANT

The narrow curled, pinnate leaves of the fern Nephrolepis *sp. were photographed in the green hills of Wayanad. Watching a coiled fiddlehead of a fern unfurl is like watching poetry in real time. Ferns are remnants from the age of the dinosaurs. These non-flowering, non-seed-bearing plants are best found in places with high moisture. Ferns proliferate during the monsoons as they carpet the forest floor. After their spores are formed and the monsoon retreats, ferns leave behind dried filigree-like fronds.*

PAVAN KUMAR T.S.

On a rainy night in the rainforests of Agumbe, a muddy cicada Pomponia *sp. crawls up a twig to find an appropriate spot to moult. Cicadas are known to be the monsoon musicians, their medleys announcing the arrival of the season. Though their wings appear translucent, scientists now suggest that wings of several insects such as cicadas and wasps have unique patterns of swirls, spots and stripes, all exhibiting resplendent colour. When seen against a white surface, the colours go unnoticed but if seen against a coloured background, particularly black, it absorbs all the light to reveal patterns unlike any other.*

MANASKA MUKHOPADHYAY

Photographed in Howrah, West Bengal, these newly-hatched spiderlings seem to be suspended in mid air. It is difficult to imagine invertebrates in parental roles but several spiders, insects and other invertebrates make excellent parents. A spider mother will carry or guard her egg sac until the spiderlings hatch. Once hatched, the young quickly disperse and use silk lines that rely on wind for their dispersal far into the forest.

SAEE BHURKE

Perched on the edge of bracket fungi in Amboli, Maharashtra, this purple tree crab is on high alert, probably having spotted the photographer. Its stunning blueish purple colouration inspired its species name Ghatiana atropurpurea, *which means dark purple in Latin. The crab was described as recently as 2015.*

M. D. BIJULAL

The yellow staghorn jelly fungus Calocera viscosa *grows on decaying wood in Ponmudi, Kerala. This slimy fungus with its typical antler-like branches forked at the tips is easily spotted in the forest, on account of its bright orange-yellow hue. Interestingly, in the dry season, the colour changes to orange-red.*

SAURABH SAWANT

Monsoon is the season for moths in the Western Ghats. Here, a tussock moth of the Lymantriidae family can be seen laying eggs on a coffee leaf in Wayanad, Kerala. They are so named for the tufts of hairs they possess as caterpillars, which help deter predators.

SAURABH SAWANT

Widely found across the Western Ghats, the ground orchid Malaxis versicolour *produces new shoots in the monsoon, fresh after its flowering season in summer. Also found in Assam and parts of Sri Lanka at altitudes of 1,200-2,600 masl., it prefers wet soils, or lateritic rocks.*

SAURABH SAWANT

A tiny green bush frog Raorchestes chromasynchysi *looks out for prey from its perch on a fern. This small frog, about 28-30 mm., is endemic to areas in the vicinity of the Bhadra Tiger Reserve in Karnataka and Wayanad in Kerala. The species is currently listed as Vulnerable in the IUCN Red List.*

ALOK KAR

Just before the monsoon, as skies turn dark, the night ignites with tiny flying lights. Fireflies attract mates using their bioluminescence. Groups move in elaborate circular clusters, swirls and loops – patterns in the night captured in this dreamy slow-shutter image from Cooch Behar, West Bengal.

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Sanctuary
NATURE FOUNDATION

LAISHRAM SHAMUNGOU

THEIR ONLY HOME

10 species found nowhere else

Arid deserts and scrublands, wet and dry grasslands, tropical and temperate forests – the Indian subcontinent is blessed with a unique mix of habitats, diverse geographies, and microclimates. Not surprisingly, hundreds of species are found here, and nowhere else in the world. Yet, much of India's biodiversity lies neglected. Some species remain poorly studied or monitored, some yet undiscovered, and almost all impacted by the relentless destruction of steadily disappearing habitats. The IUCN Red List 2018 tells us that 683 species of fauna and a fourth of all flora in India are endemic. The evolution of some was shaped by reproductive isolation, divergence, or hybridisation (neoendemism). The Narcondam Hornbill is, for instance, an endemic of the Andaman and Nicobar Islands. Though fairly similar in appearance, it is distinct from its mainland relatives, the Blyth's Hornbills of Indonesia and New Guinea. Some, like the purple frog, were forced into isolation when their widespread populations became restricted and eventually confined to a smaller area (paleoendemism). Found only in the Western Ghats, the purple frog has been evolving independent of its closest relatives, the Sooglossidae frogs of the Seychelles.

Climate change and the mismanagement of habitats endanger the survival of all the species listed here. *Sanctuary's* Assistant Editors, **Divya Kilikar** and **Abinaya Kalyanasundaram** picked out a few of India's lesser-known endemics to showcase the stunning diversity of our beautiful country.

Sangai

Rucervus eldii eldii

Range and Distribution: Keibul Lamjao National Park, Manipur
Description: A medium-sized, russet-brown deer with antlers measuring about 100 cm. in length, with a short tail, large ears, and whitish underparts.
Population Numbers: 260
IUCN Status: Endangered

"Over time, as they remain flooded, the delicate grasslands lose their nutrients and struggle to support the weight of the sangai, rendering more areas unsuitable for the species. Aside from flooding, the *phumdis* are also ravaged by wildfires. Mortalities from disease (inbreeding is common within the small, isolated sangai population) also pose a risk to the species' future. The Ministry of Environment, Forest and Climate Change, in association with the Wildlife Institute of India (WII) and Manipur Forest Department is working toward sangai conservation using science-based approaches and advocacy." – Dr. Ruchi Badola, Scientist, WII

Not the largest deer, but the sangai, or brow-antlered deer, is large by human standards. Geographic isolation has resulted in a genetically distinct subspecies. Weighing close to 100 kg., with a body length of 1.5 m., a precariously small population survives in a tiny 10 sq. km. patch of "floating" vegetation in the Keibul Lamjao National Park. Located in Moirang, Manipur, south of the saucer-shaped Loktak lake, the much-loved deer that inhabit this Ramsar site are referred to as "dancing deer" after their prancing gait. The humus-rich *phumdis* are buoyant grasslands that float on water. As the deer walk, these organic rafts bob up and down under their weight making it look as though they are dancing! Mitochondrial DNA sequencing has confirmed that the sangai is a genetically distinct species.

When the monsoon descends, the sangai habitat floods and shrinks further. The *phumdis* that settle down during the lean season, are now perpetually afloat, because of the increased water levels post the construction of the ill-advised Ithai barrage built by the National Hydro-Electric Project Corporation. A study published in the journal *Environmental Monitoring and Assessment* in February 2021 reveals that impacts of the climate crisis is likely to negatively affect the habitat within a few short decades. The endangered sangai must also compete for resources with the hog deer. The isolated population faces the perpetual risk of disease susceptibility and low genetic variability on account of inbreeding and diminished fertility. Experts now suggest that relocation to create a second, wild, satellite population is vital to the survival of the species.

PUBLIC DOMAIN/WIKIMEDIA COMMONSOMMONS

Malabar large-spotted civet

Viverra civettina

Range and Distribution: Western Ghats
Description: Long, grey body mottled with black spots, a long tail and a dog-like head.
Population Numbers: Unknown
IUCN Status: Critically Endangered

"Discrepancies in the early field descriptions suggest that they refer to non-congeneric [of another genus] species, yet most of these descriptions have been repeated almost verbatim until now with no additional information from the wild. We present a novel possibility that the genus *Viverra* does not occur in the wild in southern India and the Malabar civet is not a taxon." – Divya Mudappa, NCF, and Nandini Rajamani, IISER

While most civet species resemble cats, the Malabar civet has a more dog-like look. The existence of this small carnivore has been hotly debated within the conservation community for decades. It was believed to favour near-shallow waterbodies in the evergreen forests of the Western Ghats, possibly its only home, where it largely foraged on the ground. According to the Wildlife Trust of India (WTI), the last recorded sighting was half a century ago in Kerala's Western Ghats forests. The species was officially listed as extinct in 1978. Then, in 1991 a villager discovered fresh skin that was thought to have belonged to *Viverra civettina* and this re-ignited hope of the species' survival.

However, a 2010 study by Divya Mudappa, researcher and co-founder of the Nature Conservation Foundation (NCF), together with Nandini Rajamani of IISER, opined that a wild Malabar civet had never actually been sighted with any degree of certainty and that its documented ecology was based on speculation. On reviewing the specimens collected, together with published and unpublished literature, the authors wrote that a unique genus *Viverra* does not, and probably never did, occur in the wild in southern India. Myth or not, the fact remains that the rich rainforest home of this "missing" civet continues to be threatened by anthropogenic pressures, and efforts to boost conservation action must be amplified.

PUBLIC DOMAIN/P. JEGANATHAN

Madras hedgehog

Paraechinus nudiventris

Range and Distribution: Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telangana, and Puducherry. (In Tamil Nadu: Villupuram, Theni, Salem, Ramanathapuram, Nilgiris, Karur, Viruthunagar, Namakkal, Dindugal, Madurai, Tirunelveli, Tenkasi, Tanjore, Thoothukudi, Erode, Tiruppur, Kanyakumari, and Coimbatore districts)
Description: Small, porcupine-like body, weighing around 300 g., with a long snout.
Population Numbers: Exact numbers unknown, but declining
IUCN Status: Least Concern

This understudied mammal has, in our view, been hastily tagged as being of 'Least Concern' in the IUCN Red List. The Madras hedgehog or bare-bellied hedgehog, looking for all practical purposes like a creature from a Western movie, was once widespread across southeastern India, and is just one of three hedgehog species found on the subcontinent. A nocturnal, insectivorous mammal, it is well-adapted to dry, arid environments. Initially, the Madras hedgehog was listed only from the scrub and arid regions of Kerala and Tamil Nadu, but was later spotted in Andhra Pradesh as well. We have no population estimates of the solitary mammal, and little is known about its behaviour.

"For the last three years, we have noticed a chilling pattern. After every monsoon in Tamil Nadu, there are reports of over 1,500 Madras hedgehog roadkills! This happens because the animals' burrows are flooded and, being creatures of arid climes, they are attracted to the warmth of tarred roads and the abundance of insect food." – Dr. Brawin Kumar, Researcher, IISER-Tirupati

Dr. Brawin Kumar, a researcher from Kanyakumari who works at IISER-Tirupati, has studied the species across 16 districts in Tamil Nadu. He found no mention of the species even in local folklore. Through his surveys and fieldwork, he observed that between 2012 and 2017, a mere 18 live sightings were recorded in low elevation grasslands, hillocks, and in shrubby parts of some urban landscapes. The hedgehogs also frequent pasturelands where cattle graze (attracted by the influx of insects), red sand dunes or *Teris* along the coast, under dried Palmyra tree leaves during the day, and on the edges of agricultural lands and dried waterbodies. Kumar is now working to highlight the threats faced by the species, while raising awareness of its uniqueness and value for the benefit of local communities. Wind farms, road construction and human disturbance all pose a threat to this little-understood hedgehog, which also falls victim to the illegal wildlife trade. Its flesh and skin are mistakenly believed to have "medicinal properties" and tribal families store dried hedgehog skin in their kitchens to treat illnesses. "Dried hedgehog skin, mixed with honey, is given to children. I have observed at least a hundred households stocking up on its skin," says Kumar who rues the fact that hunting for Madras hedgehogs is commonplace.

It is vital to create accurate estimates of hedgehog populations in every district in Tamil Nadu and other range states, says Kumar, who is working with locals to have a Community Conservation Reserve declared in Tirupur. Kumar's research has unearthed the presence of the hedgehog in as many as 162 locations! Ironically, the Madras hedgehog is still not listed on any schedule of the *Wild Life (Protection) Act*, 1972, nor do any school books mention the species. Kumar is working with colleagues to change this by getting young and old community members involved in promoting awareness of the need to protect this captivating mammal.

PUBLIC DOMAIN

SACHIN SAN

JUDE

Anaimalai flying frog

Rhacophorus pseudomalabaricus

Range and Distribution: Anamalai hills, Western Ghats
Description: A vibrant leafy-green frog about five centimetres long, with protruding eyes, and prominent, yellow foot-webbing.
Population Numbers: Unknown
IUCN Status: Critically Endangered

The Western Ghats is an amphibian paradise – at least 117 species of frogs have been recorded here, of which 89 are endemics. The Anaimalai flying frog is one such, thriving in secondary tropical rainforests in the southern Western Ghats. The frog has been recorded in six locations in Kerala and Tamil Nadu, including the Anamalai and Parambikulam Tiger Reserves, as well as habitats outside these Protected Areas. A 2015 paper also confirms the presence of the frogs in tea and cardamom plantations in Munnar and Mankulam, Kerala, where researchers observed nine nests. One of the many endless nights spent in the field threw up a sighting of as many as 42 adults! The frogs are generally known to favour marshy areas at about 1,000 masl., where they nest in overhanging vegetation. "At present, the home range and habitat utilisation of the frog outside of the breeding season are unknown and require further research," the paper authored by Arun Kanagavel suggests. Community members say the frogs consume cardamom, though this behaviour has not been observed. The range of the Anaimalai flying frog was previously thought to be more limited, which underscores the importance of involving communities, including farmers, into conservation plans, as the frogs have been recorded breeding in agricultural fields.

"The species may possibly be considered a bad omen among the *Mannan* tribal community and this might explain the general aversion towards frogs among local communities, particularly women." – Arun Kanagavel, Herpetologist

The species is also referred to as the false Malabar gliding frog, owing to its similarity in appearance to the Malabar counterpart. Juveniles sport striking zebra-like stripes that fade in adulthood. Interestingly, the Anaimalai flying frog is the only amphibian to be featured on an Indian postage stamp! Habitat loss on account of timber extraction threatens the future of this range-restricted, vulnerable amphibian. We urgently need to monitor and protect breeding populations in and around our Protected Areas.


ARPIT PAREKH

Nagarjunasagar skink / Sharma's Mabuya

Eutropis nagarjunensis

Range and Distribution: Current range is 7,000-8,000 sq. km. in the Eastern Ghats of Telangana and Andhra Pradesh. Estimated potential range is 9,537 sq. km.
Description: Dark brown or black with broad vertebral white stripes, undivided and transparent eyelid disc and 21–24 subdigital lamellae under fourth toe.
Population Numbers: Unknown
IUCN Status: Near Threatened

Originally described from Nagarjunakonda, Vijayapuri South, these predominantly rock-dwelling skinks have been documented from just 20 locations (four in Andhra Pradesh, 16 in Telangana), all at elevations ranging between 120 and 520 m. They prefer rocky hills with dry deciduous scrub and secondary forests with a preponderance of xerophytic elements; with trees such as *Borassus flabellifer* and *Ficus benghalensis*, and shrubs including *Jatropha glandulifera* and *Vitex negundo*. Terrestrial reptiles, they burrow their entire bodies into loose soil, snout first, to escape predators. This is a common evasive maneuver of skinks, also used to burrow underground tunnels.

"This habitat is under serious threat from stone quarrying, tourism related infrastructure development, and grazing." – Chethan Kumar Gandla, an independent post-doctoral researcher. In 2018, he visited the Nagarjunasagar dam area when he first spotted the skink. "Astonished, I took photographs of the species, noting details of the location and behaviour."


DAVID RAJU / CHETHAN KUMAR GANDLA

Dugong

Dugong dugon

Range and Distribution: Gulf of Mannar, Gulf of Kutchh, Palk Bay and the Andaman and Nicobar islands
Description: A large, grey-brown marine mammal with a flattened tail, no dorsal fin, paddle-like flippers and a bulbous head.
Population Numbers: Unknown
IUCN Status: Vulnerable

"Populations vary in each of the dugong's habitats in India. In the Andamans, I noticed how vulnerable the seagrass meadows in the Islands are, being subjected to natural and anthropogenic pressures. Seagrass meadows have been affected by the tsunami, possibly due to cyclones, changes in land use patterns (which alters nutrient flow into the water), and sedimentation due to infrastructural development. These factors have led to fragmentation of the extensive meadows found 20-30 years ago. Loss of habitat has severely affected dugong populations, not to mention other threats such as accidental net entanglement and hunting, which are still prevalent in some areas. " – Sohini Dudhat, Marine Biologist

Also called sea cows, dugongs are described as 'farmers of seagrasses' and are vital to the health of some of the most important carbon sinks on the planet. Dugongs trim marine vegetation as they forage, thus aiding regeneration. Seagrass ecosystems absorb carbon 35 times faster than tropical rainforests! They also prevent coastal erosion, vital to dealing with erratic weather extremes. A diversity of fish breed in seagrasses and this supports fisher communities along the coast. A single dugong may consume 40 kg. of seagrass in a day. According to a 2013 report by Dr. K. Sivakumar and Aditi Nair of WII, if the vegetation is not tall enough, dugongs begin to nip at the bottom, consuming rhizomes, stems and leaves, which results in cloudy waters with floating sediment.

Sohini Dudhat, a marine biologist who studied dugongs and seagrass habitats in the Andamans with WII, says that the team is currently attempting a visual census using drones. According to her, the Gulf of Kutchh also hosts a small population. While WII has noted a few signs of feeding trails, very few actual sightings have been reported by fishers here. In Tamil Nadu, a larger population thrives, but is threatened by hunting. The traditional consumption of dugong meat by local communities was once widespread, and continues in smaller pockets, despite being prohibited. Hunting is a concern in North Andaman too, though habitat fragmentation is a larger issue, particularly since the seagrass meadows have been repeatedly ravaged by tsunamis and climate extremes.

Globally, seagrass habitats, which usually occur near-shore, are declining at a rate of roughly seven per cent per annum owing to anthropogenic pressures (Waycott et al. 2009; Green and Short 2003). Their dependence on seagrass beds forces dugongs to remain close to shores, leaving them vulnerable to hunting, propellor strikes, accidental capture in fishing nets and sundry habitat degradation including toxic pollutants and plastic waste.

Mothers incubate babies for a year or so and give birth to a single offspring once between three and seven years. This slow breeding renders them even more vulnerable to anthropogenic pressures. Like almost all other marine creatures, these gentle, once-abundant vegetarians are increasingly falling victim to the human mismanagement of Earth's oceans.

PUBLIC DOMAIN/JULIEN MILLEM

PUBLIC DOMAIN/CHRISTIAN GLOOR

PUBLIC DOMAIN / PAUL ASMAN / JILLIAN LENOBLE

Jerdon's Courser

Rhinoptilus bitorquatus

Range and Distribution: Sri Lankamaleswara Wildlife Sanctuary (SLWLS), Kadapa District, Andhra Pradesh
Description: Large eyes, short yellow bill with black tip and yellow legs. Plumage includes a brown breast with two narrow white bands, broad white lores and supercilium over dark cheek patches.
Population Numbers: Exact numbers unknown, but declining
IUCN Status: Critically Endangered

PUBLIC DOMAIN

The only Rhinoptilus species in India, this nocturnal bird was believed extinct until its rediscovery in 1986 by Bharat Bhushan, an ornithologist at the Bombay Natural History Society (BNHS) in a village in Kadapa District, Andhra Pradesh. This site was later designated as the Sri Lankamaleswara Wildlife Sanctuary (SLWLS), now the only known home of the species. The scrub jungle patches with open areas that are visited by the courser face a diversity of threats including encroachments, agriculture, non-native plantations, livestock grazing, construction of check dams, quarries and canals. On top of this, illegal opportunistic trapping by locals is commonplace.

"The Jerdon's Coursers are not seen very often. [During our surveys,] we could see their tracks or hear their calls. When we looked for them at night (as they are nocturnal), they would crouch down when our torch beams found them and stay still for long periods of time. Once I had to wait nearly 45 minutes for the bird to get up." – P. Jeganathan, Wildlife Biologist

Between 2010 and 2012, the Bombay Natural History Society (BNHS) and the Nature Conservation Foundation (NCF) formulated a joint Species Recovery Plan (SRP), with the Andhra Pradesh Forest Department (APFD), (also translated into the local language, Telugu). Nearly 200 camera traps were set up in SLWLS. "Although several thousand images of nocturnal birds and animals were captured, none were of the Jerdon's Courser. Recently, the APFD restarted this SRP, but field work has been delayed because of the COVID-19 pandemic," says P. Jeganathan, wildlife biologist with NCF, who was part of the project in 2010.

The last authentic record of the bird was in April 2008. Jeganathan says: "We have searched using remote cameras in and near the Sri Lankamaleswara Wildlife Sanctuary where suitable habitats exist, though the entire area has not been covered, and not during all the seasons. The construction of the Telugu Ganga Canal around the sanctuary certainly affected suitable habitats but it is difficult to conclude whether the bird has completely disappeared. There are several areas that need to be explored and if suitable habitats exist without much disturbance, there is a chance that this species occurs there. We need more eyes to find this bird and it is not going to be easy!"

Southern birdwing butterfly

Troides minos

Range and Distribution: Southern and central Western Ghats of Karnataka and Kerala. Rarely seen in southern Maharashtra and northern Goa.
Description: Large butterfly with a 140-190 mm. wingspan. Forewings are deep-black and hindwings golden-yellow with black borders. Female has triangular spots on hindwings.
Population Numbers: Data Deficient
IUCN Status: Least Concern

With its striking black, white and yellow wings, this jewel of a butterfly is endemic to south India and is the second largest butterfly in India. It was declared the state butterfly of Karnataka, its colours matching the state flag. Found at elevations of 2,700 masl. in Western Ghats habitats varying from lowland evergreen coastal forests, to mixed deciduous forests, dry scrub and agricultural fields, recent reports of its presence have been received from Bengaluru near the National Centre for Biological Sciences (NCBS) and the Bengaluru University.

NITIN SHENOY

During and post-monsoons, southern birdwings can be spotted gently circling and sailing among treetops. They are avoided by predators, their bright colours indicating unpalatability, a result of the aristolochic acids ingested as caterpillars. Females lay eggs on creepers and climbers of the family Aristolochiaceae: *Aristolochia indica, A. tagala* and *Thottea siliquosa*. As adults, they feed on nectar from *Lantana, Clerodendrum, Ixora* and *Mussaenda* flowers.

Given its restricted range and endemicity, the IUCN recommends on-going monitoring of the species.

"During field work in Goa, I would often observe the southern birdwing flit high above the forest canopy. It would almost seem like a bird gliding with its beautiful black-yellow wings against the blue sky. I have also searched for its host plants to observe the caterpillars but this is difficult in the forest. Even working as a butterfly researcher, I have only seen the caterpillar once during my entire study." – Ravi Jambhekar, Ecologist and Botanical Illustrator

PUBLIC DOMAIN/INDIANATURE.SG

Mishmi Wren Babbler

Spelaeornis badeigularis

Range and Distribution: Mishmi hills, Arunachal Pradesh
Description: A small, grey-brown bird with a reddish-brown throat, and black-and-white scalloped patterns on the belly.
Population Numbers: 1,500-7,000
IUCN Status: Vulnerable

The Mishmi Wren Babbler (also called the Rusty-throated Wren Babbler) was an enigma for ages. It was first described in 1947 by S. Dillon Ripley from a single specimen collected in Dreyi in the Mishmi hills of eastern Arunachal Pradesh. The bird was not spotted again for several decades. In 2004, two scientists Ben King and Julian H. Donahue set off from Roing towards the Mayodia pass in the Mishmi hills in search of the babbler. They played the calls of a close relative, the Rufous-throated Wren Babbler *Spelaeornis caudatus*, and to their delight, the Mishmi Wren Babbler called back! Within 90 minutes they spotted the furtive and tiny bird, as it flitted amidst the roadside trees. In the course of their expedition, a total of 17 individuals were spotted in low, dense secondary forest vegetation along roadsides, at elevations between 1,700–2,400 masl.

Until 2017, the only known location of the species was near Mayodia pass after which, it was reported from further north on the way to Anini. Conservationist and ornithologist Shashank Dalvi, who co-authored a paper on the species' range extension, says the: "species is highly territorial in summer as well as winter months and found exclusively in the undergrowth in the cloud forests. The Mishmi Wren Babbler is one of the species in Northeast India, which shows allopatric as well as parapatric speciation. Due to allopatric speciation, at mid-elevation it does not share the same range with some of its sister taxa like the Rufous-throated Wren Babbler and Naga Wren Babbler. However, elevationally, it does share the same range with the Bar-winged Wren Babbler. Due to speciation, Spelaeornis Wren Babblers found at mid-elevation have independent geographic distribution. However, it has been observed that the Mishmi Wren Babbler and Rufous-throated Wren Babbler share their distribution with the Bar-winged Wren Babbler in terms of elevation on a mountain range where they have a small overlap."

"Even though the Mishmi Wren Babbler is highly localised (distribution wise), I have seen this species on every visit, in the undergrowth along the main Mishmi hills road, but always between 1,500-2,200 masl." – Shashank Dalvi, Conservationist and Ornithologist

Dam construction and road widening threaten the future of this small bird. "Climate change will also be a major threat for this species in the future. Several species in the eastern Himalaya are already migrating upwards," Shashank adds.

JON IRVINE

PUBLIC DOMAIN/MIKE PRINCE

A Tale of Two Species

Speciation is the process by which new species of plants or animals evolve.

Allopatric speciation occurs when a species is separated into two groups by a physical barrier, such as a mountain range or a waterbody. The two groups eventually evolve into separate species, depending on the varying characteristics that develop as a result of minute dissimilarities in their unique habitat, leading to reproductive isolation and genetic variations.

Parapatric speciation occurs when a species is spread out over a large geographical area. Over time, individuals only interact and mate within the same group. As observed in other examples of speciation, different habitats trigger the development of species variations. The species diversify, owing to differences in the same geography, and not necessarily because of physical barriers.

Myristica species

Range and Distribution: Uttara Kannada district, Karnataka; southern Kerala; Goa; and northern Western Ghats, Maharashtra
Description: Swamp ecosystems with many endangered species of flora and specialised fauna.

A rare and ancient ecosystem, *Myristica* swamps were once thriving across the low-lying valleys of the Western Ghats. These groves were traditionally considered sacred by local communities across the Western Ghats. However, much of the cultural knowledge has been lost over time.

These tropical freshwater swamp forests are home to several species of the *Myristicaceae* family, believed to be the most primitive flowering plants in the world, dating back to the Early Eocene. These evergreen trees have evolved to survive the water-inundated swamps by possessing two types of strange-looking roots – knee roots that stand out of the ground and exchange gases; and stilt roots, which emerge from the trunk and keep the tree erect in the soft wet alluvial soil. They form a dense, closed-canopy top, creating a unique ecosystem, which harbours several endemic species.

The predominant species – *Gymnacranthera canarica* and *Myristica fatua magnifica* – are listed as Vulnerable and Endangered, according to the IUCN Red List.

The Myristica sapphire *Calocypha laidlawi* is an endemic damselfly species that breeds in forest streams and rivers flowing through the *Myristica* swamps. Dark bodied with azure streaks, and dark violet-metallic gossamer wings, it is often seen perched in the shade, either on submerged logs or twigs. The *Myristica* bambootail *Phylloneura westermanni* (bottom) is another endemic damselfly species that lives in small colonies on overhanging plants.

Myristica swamps now survive in fragmented patches, most having been converted to paddy fields, monoculture tree plantations, or submerged under dam reservoirs. These swamps' ability to act as sponges (storing water during monsoon and slowly releasing them into streams through the year) make them vital infrastructures for water storage and carbon sequestration, apart from the fact that they support a diversity of floral and faunal biodiversity.

PUBLIC DOMAIN/SIDDARTH MACHADO

JIGNASU DOLIA

Sanctuary's Mud on Boots' Project Leader Malhar Indulkar has been persistently working to protect a rare *Myristica* swamp known as Kanhalachi Rai in the midst of paddy fields in Hevale-Bambarde village in Sindhudurg, Maharashtra. In February 2021, this 18,464 sq. m. *Myristica* swamp was declared a Biological Heritage Site. Malhar along with local conservationists Gayathri Sreedharan and Narayan Desai, and several other researchers documented this landscape and collaborated with a local farmer, Ramesh Thakur, to set up a small nursery of *Myristica* saplings. Watch more here.

COURTESY: AVI MITTAL

The *Sanctuary* Interview

Meet Rushikesh Chavan

With extensive experience working on ecosystem and species conservation across 19 states, Rushikesh Chavan heads The Habitats Trust, which collaborates with organisations and individuals to protect India's biodiversity and threatened wild habitats. In the process, he believes, the quality of life and security of marginalised communities will be greatly enhanced. ***Lakshmy Raman,*** *Executive Editor,* Sanctuary Asia, *speaks with him about his inspirations, the need to focus on lesser-known species and The Habitats Trust's long-lasting stewardship plans for the planet.*

You have been enmeshed in conservation for over two decades. How did you get interested? As a student in the late 90s and a vagabond eager to skip classes, I would wander about Mumbai. One day I ended up under a tall tree – a Mitragyna atop a hillock overlooking the Arabian sea. Something about that moment made me introspect about why I was born, and some inner resolve compelled me to dedicate my life to nature conservation. And as I became more involved in conservation, it engulfed me completely.

Who were your major influences? Several people. I travelled to forests with my friend Nitin Chitroda. I met and worked with multiple wildlife and conservation experts – Deepak Apte of the Bombay Natural History Society who let me volunteer with the organisation, Bittu Sahgal who infused his zeal into me, the late J.C. Daniel, Gretchen Daily, Janine Benyus and so many more whose wisdom guides me to this day. I have also been influenced by economists such as Neeraj Hatekar and conservation psychologist Vivek Belhekar who helped broaden my perspectives. Colleagues and peers, some of them in their 20s, inspire me daily.

Your work at the BNHS and then the Wildlife Conservation Trust is well known. What prompted your move to The Habitats Trust (THT)? The expanded conservation opportunity across the globe. My work with the Wildlife Conservation Trust was very satisfying, but when I received a call from THT and heard Roshni Nadar Malhotra's vision, it instantly struck a chord. The opportunity to help turn her vision into reality was irresistible, as it aims to scale long-term conservation initiatives, through collaborations with organisations and individuals… in a Fibonacci sequence manner. The technological strength of HCL can help fill gaps and create deep understanding of our conservation challenges, with curated rather than rubber stamp solutions. I believe we can and will knit the fraternity closer to the advantage of our biosphere.

THT refers to itself as a "coalition of passionate individuals coming together to secure natural habitats and their indigenous species." Yes, Roshni and Shikhar Malhotra, our trustees, are at the centre of it all. Running a company as large as HCL, they bring incredible strengths to our conservation and humanitarian endeavours. Our vision extends way beyond THT and from day one, we have worked on expanding our coalition of organisations and individuals, through Grants, our On the Brink series, and various on-ground projects. In a collaborative way we believe that, working with nature, a series of positive actions and interactions are going to make a discernible impact, nationally and internationally.

It's interesting that THT's focus is on lesser-known species conservation. Yes! bite-sized actionable tasks help us work for the larger picture, without losing sight of the foundation upon which our biosphere rests. Nature is complex and umbilically interconnected. The focus on flagship and umbrella species over the past several decades has secured some of India's most critical ecosystems and species. But the time has come to dive deeper into the ecological web to understand and protect the little things in life, without which a natural equilibrium cannot be maintained. Our aim is to create the impetus for climate resilience, ecological and water security.


VISHAL BANSOD


COURTESY: RUSHIKESH CHAVAN

ABOVE *In 2015, Chavan attended a conservation economics course conducted by the Conservation Strategy Fund at Stanford University.*

TOP *The Habitats Trust is working to build a knowledge base of technologies and infrastructures to aid in nature conservation.*

FACING PAGE *Chavan and his team monitor critical wildlife corridors in the Western Ghats. The Habitats Trust seeks to improve wildlife connectivity in the Western Ghats.*

THT was launched in 2018. Are you satisfied that the direction in which you are moving is on track? I believe so, but we take nothing for granted and have a strict monitoring and evaluation protocol in place to measure impact and reflect on outcomes. We do not plan to create a gigantic organisation that competes with other organisations. We intend to mimic nature's mutualism processes, through collaboration and concerted efforts that help fill gaps, build bridges brick by brick. All with a degree of urgency that conservation movements of yesterday may not have had to deal with because we are in a race against time.

COURTESY: IDREES BABU

ABOVE *Free diving in the atolls of Lakshadweep, Chavan sets up (string) line transects to measure the distribution of organisms, while studying giant clam habitats.*

How would you condense your focus and strategy? THT is building all its projects on four pillars of strength – strategic partnership, conservation technology, on-ground projects, and awareness generation. Our grants support both conservation organisations and heroes, and we go beyond financial assistance. Don't be fooled by our 'youth', we are growing fast (see box, for examples).

THT's future plans? In the coming three years; we intend to collaborate with people/organisations to build consortiums across large landscapes in different states. We will soon be announcing the launch of several new programmes, and will showcase a short video series on lesser-known species. We look forward to exciting times ahead.

The COVID-19 pandemic? Will it teach us any lessons? And is THT working to drive a much-needed transformative change? COVID–19 is a grim reminder that GDP as a measure for development is flawed and inadequate. The lessons it is teaching have come at a terrible cost. We don't look upon sustainability as a 'project' or report, it's a survival strategy for every segment of society

Transformative change is the DNA of the organisation as it is in HCL, which scored India's highest Environment and Social Governance (ESG) rating. And we are adding multiple dimensions to what is our evidence-based approach to conservation.

Is the government doing enough? All governments, across the globe, need to do more, and India is no exception. But the current 'Development Vs. Environment' narrative will not cut it. We hope to work with conservationists to help navigate the tricky nuances of political economy and tackle the drivers of government decision-making. In our view, apart from consulting and educating, the worst affected victims' voices need to be heard. This is probably the best way to get governments to take the right, decisive, actions.

The Dasgupta Review points out that economic expansion has come at a "devastating cost to nature"

LEFT *Roshni Nadar Malhotra, co-founder and trustee of THT, distributes field equipment kits to frontline forest officers of the Dudhwa Tiger Reserve in Uttar Pradesh.*

RIGHT *Malhotra addresses the winners of The Habitats Trust Grants in 2018.*

and calls for a new global commission on the economy and nature to help catalyse a global nature-positive economy. Do you see this happening? It is not a matter of choice – we *have* to do all in our power to make it happen. This has actually been my personal focus over the past six years.

Through successful on-ground models we need to encourage and facilitate practical governance; to demonstrate that the Dasgupta recommendations fit the CPR framework. It's not going to be easy, but we can and must create incentive structures in the devolution of funds, design contracts, and minimise trade-offs. At THT, we are determined to help Sustainable Development Goals (SDGs), among other things, possible at scale for all levels of economic activity.

How can the average citizen push for such change? To begin with by realising that they are not 'average' or 'helpless'. Each of us can create a 'butterfly effect' (see how art is making a difference – Where Art Meets Conservation) for a desired outcome. Cities and citizens can reduce consumption. Even seemingly insignificant things like avoiding water waste at home can produce positive impacts. Reduce consumption, don't buy products that contain palm oil, avoid plastic packaging… every step makes a difference.

You are right. Any message for the young? If you want to protect wildlife don't imagine you have to become a biologist. Conservation is a vast, multidisciplinary field and you have a rainbow of options. Do things you enjoy and are good at. The journey towards understanding the biosphere is an adventure that can enrich your life. Conservation can be integrated into every aspect of living. Nature has all the solutions you need. Just build your knowledge of the fundamentals of ecology and earth systems and with time, like magic, your world and your life will be enriched and you and yours will be safe.

Over two decades, Chavan has collaborated with several conservation leaders, organisations and academicians engaged with the most pressing challenges India's wild habitats have faced.

The Habitats Trust (THT) supports M. Suraj's decade-long efforts to protect Chhattisgarh's lush forests and wildlife. THT aims to address the poaching of prey species with technological tools and data driven methods. We hope to bring an evidence-based approach to his work, greater efficacy and long-lasting impact.

We are also active in the Dudhwa landscape, one of the last refuges for the hispid hare. Our on-ground work here has grown from supporting Forest Department field staff to a more integrated conservation approach of this lesser-known species.

We are also working on a repository of visual documentation for education and awareness. Our commissioned series on threatened species 'On the Brink', recorded 18 species over two seasons, and won the best film documentary at the International Nature Film Award Gödöll 2021.

HIDING IN PLAIN SIGHT

Discovering a new frog in the Western Ghats

Text and photographs by Dr. Seshadri K.S.

It was a late June evening in 2015 and the monsoon was in full strength. With just thin rain wear as protection, we drove a scooter towards the laterite rock plateau on Manipal's outskirts, near Udupi. Ramit Singal and I sheltered under a tree and soon began to hear our quarry – frogs – calling. Suddenly, Ramit went silent and signalled for me to follow. Pointing to the ground he whispered: "This is the call!" But the weird sound I heard was nothing like a frog! Kneeling beside Ramit, very gently, we began lifting one fallen leaf after another and suddenly… there it was! A tiny frog, half the size of my thumb. It was indeed the frog calling, but

FACING PAGE ABOVE *An adult male* Nyctibatrachus kumbara *covering eggs with mud, likely to camouflage them from potential predators.*

TOP RIGHT *An adult male* Microhyla laterite, *described in 2016. Males vocalise from small depressions in the laterite rocks.*

it sounded like nothing I had ever heard before.

Earlier that month I had arrived in India for fieldwork on Western Ghats' frogs. My collaborator, Dr. Gururaja K.V. had received two sound recordings from Ramit seeking identification help. After listening, I concluded it was most probably an insect. Ramit, however, was insistent that it was a frog and we were there to verify which creature was sending out those calls.

That night, we continued our search and recorded several frog calls. By now, based on its size and narrow mouth, we had already concluded that the frog making the insect-like sound belonged to the genus *Microhyla*. This group of frogs remains highly understudied in South and Southeast Asia. We suspected that the "*Zeeeeee, Zeeeeee…*" calls could well belong to an undescribed species so we took detailed photographs, collected a few individuals as voucher specimens (see box on page 39). We also took a small piece of thigh muscle tissue and stored it in vials of absolute ethanol for DNA analysis. Specimen collection is strictly regulated with permissions required from the Forest Department as well as the animal ethics committee where one is based.

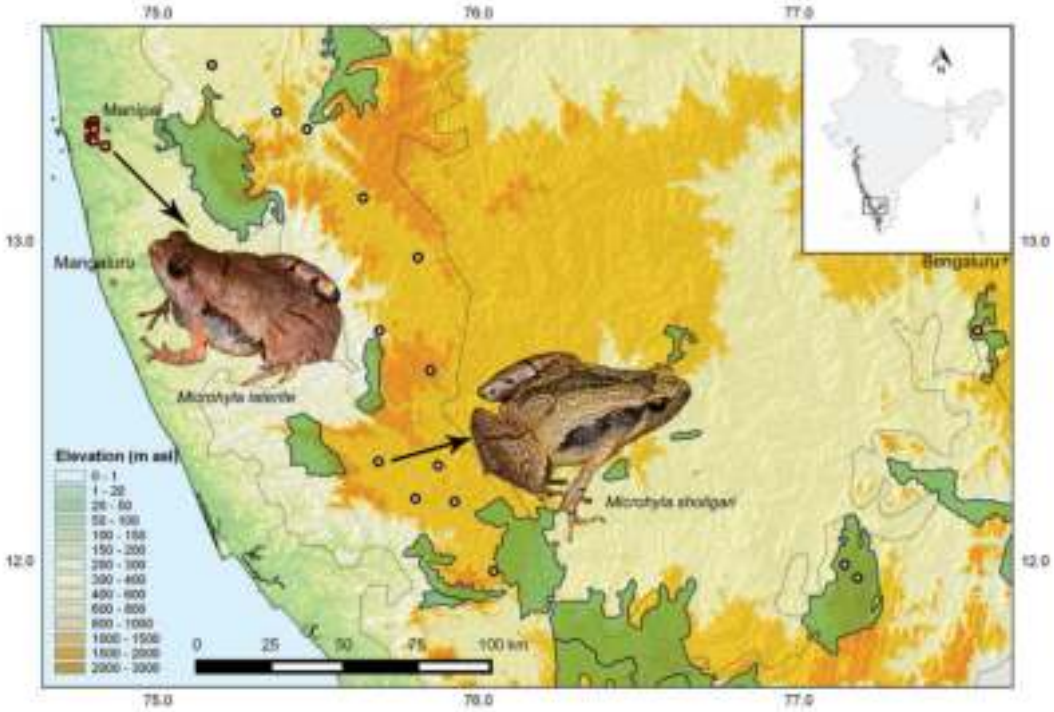
THE PLOT THICKENS Back in our Bengaluru laboratory, Gururaja and I measured the specimens and analysed the calls as our colleague, Dr. Priti Hebbar, began comparing two gene fragments, 12S and 16S rRNA, with other frogs of genus *Microhyla* in India. The new Microhylid matched no known species from India, but was closely related to another species *Microhyla sholigari*, described in 2000 and named after the *Sholiga* tribe in the Biligiri Rangaswamy Hill Temple (BRT) Tiger Reserve, Karnataka. Priti had obtained that species' genetic data on another expedition.

We were delighted to have stumbled upon an undescribed species and could assign a name to it, as determined by the rules outlined in the International Code on Zoological Nomenclature (ICZN) (see box on page 38).

We finally homed in on *Microhyla laterite*, after the laterite rock formations predominant in the area. We wanted to draw attention to this habitat which, regrettably, is listed as a wasteland in the (outdated) Wasteland Atlas of India, prepared by the Government of India. We registered the species on ZooBank, the official registry of zoological names by ICZN. Subsequently, the specimens were deposited at the museum of the Bombay Natural History Society (BNHS), an institution that has contributed immensely to our understanding of the natural world by housing the type specimens of several thousand large and small species.

Later, when Dr. Gururaja and I were in the field in Bisle, Karnataka, to our immense surprise we heard a call similar to the one we had heard in Manipal. It was yet another microhylid frog! Comparing the genetic data, it turned out we had

In India, new species are being discovered nearly every month. More than 50 per cent of the ~ 472 species of amphibians found in India are endemic. This biological heritage is in peril.



LEFT *Geographic distributions of* Microhyla laterite *(left) and,* Microhyla sholigari *(right). Green areas outlined by black are Protected Areas. The two species are similar in size but have several morphological, acoustic and genetic differences.*

FACING PAGE TOP *Naming a species after the location where it was first found can be useful. For instance, the Kalakad gliding frog* Rhacophorus calcadensis *was described in 1927 by Ahl and the name refers to the Kalakad region of what is now part of the Kalakad Mundanthurai Tiger Reserve, indicating the distribution of this rare frog.*

FACING PAGE MIDDLE *A taxonomist often spends hours in museums studying specimens, some of which can be over a century old. Shown here are specimens of the genus* Raorchestes, *collected in the 1800s by Albert Gunther and Col. Richard Henry Beddome. Each specimen gets a unique tag and number using which one can trace the location and identification of the specimen. Here, the specimens are housed in the Natural History Museum of London, formerly known as the British Museum of Natural History.*

FACING PAGE BOTTOM *An adult male* Microhyla sholigari *from Bisle, Hassan District, Karnataka. A sword-shaped mark on the back is characteristic of this species. The males vocalise near waterbodies, often gathering in groups of over 50 individuals.*

discovered a new population of *Microhyla sholigari*, which was thought to be restricted to the BRT Tiger Reserve. Now that we knew its call, we realised that the frog has a much wider distribution across Karnataka, including Bengaluru. Over the next few months, we wrote two papers, one describing *M. laterite* and the other, re-describing *M. sholigari* because the original description from 2000 lacked details of the adult frogs, and included neither colour photographs nor genetic data.

THE NAMELESS EXTINCTION

Amphibians have lived on earth for over 350 million years, yet they are now the most threatened of all vertebrates. Varied threats ranging from habitat loss to climate change is impacting them… magnifying their trials of life. Several species have already succumbed to the deadly Chytrid fungus *Batrachochytrium dendrobatidis* infection. In India however, new species are being discovered nearly every month. More than 50 per cent of the ~ 472 species of amphibians found in India are endemic. This biological heritage is in peril. We are probably losing species even without knowing they exist. That's like burning a library without even cataloguing the books!

What's in a Name?

The ICZN code controls how a species is named and published. For example, a species cannot be named after oneself but can be named after others. There must be a physical specimen of the species in a museum accessible to the public and the species description must be published in a journal having either ISSNs or ISBNs, which are accessible either in print or online. The specimen used to describe a species is called the 'Holotype' and a few other alternate specimens are designated 'Paratypes'. The collection of animals for specimens is a contentious issue and is under the oversight of both the legislations of the land and animal ethics committee of the authors' institute of affiliation.

Authors describing a new species, have the freedom to name the species. Initially, the ICZN code mandated Latinised species names but in recent years, this mandatory provision has been changed. Consequently, in recent years, authors have chosen Indian vernacular names such as *Nyctibatrachus kumbara* – derived from the Kannada word for 'potter', because male frogs cover eggs with mud; or named a species after a person such as *Beddomixalus bijui*, derived from the two eminent taxonomists, Col. Richard Henry Beddome and Dr. S.D. Biju.

Our amphibian knowledge has grown and important disciplines such as biogeography, ecology, culture, and even medicine are now better known. The habitat where *M. laterite* is found is dominated by laterite rocks, an ancient geological rock formation. These habitats are fast disappearing, mined for bricks, converted to dumping grounds, or succumbing to rapid urbanisation. We expect this species to be listed as Endangered in the assessments made by the IUCN Red List. We also expect that *M. sholigari*, currently listed as Endangered, will be downgraded to Least Concern because it is now more widespread than thought. To frame effective conservation strategies, we must understand species distribution. Accidental discoveries like that of *M. laterite* highlight the importance of attention to detail. One does not have to mount expeditions to remote jungles to find new species, some thrive right behind our houses. If Ramit had not paid attention to that call and insisted that it was a frog, would *M. laterite* have been lost to science despite living so close to human habitation?

Identifying a New Species!

In the past, taxonomic descriptions were short and lacked detailed information but most included detailed lithographs. Taxonomy being a comparative science, access to specimens or even descriptions would have been difficult, and the same species would have been described several times by several authors under different names. Today, the process is much more streamlined. Museums, voucher specimens, and genetic data are integral to this process.

When we encounter a frog species that looks distinct, we use at least three independent lines of evidence:

1. Morphology – the most obvious visible aspect of a species. Detailed measurements of specific body parts such as the femur length or the snout-to-vent length allow us to statistically compare groups of species that look different. Colour, unfortunately, is not a good characteristic as it tends to fade in alcohol preserved specimens and amphibians can have variable colour. So instead, we look for a pattern e.g., does a frog have an X mark on its back as opposed to a Y mark, and so on. A detailed description allows you to compare the new specimen. The taxonomist must also visit museums to access old specimens or rely on detailed descriptions from journal publications. It is now increasingly common to use computer tomography (CT) scans to identify distinct bone or tissue characteristics.

2. Acoustics – most frogs and toads communicate using acoustic signals. The male typically calls to signal to a female. The female assesses the vocalising male and decides to mate with it. Although how these assessments are made is not yet known, we know that each species has a unique call. With quality call recordings, one can determine the number of notes, call duration, peak frequency of the call and other characteristics to compare with other frogs' calls.

3. Genetic data – this insightful tool has helped identify species, especially cryptic ones. We typically use a fragment of the ribosomal RNA, a common gene product found in all cells. All species have it but over time, small changes may get accumulated at different rates between species and therefore, it becomes easy to compare them. The gene sequences are available on repositories such as Genbank® and can be downloaded and analysed.

THE PANJE WETLANDS

Text and Photographs by Aishwarya Sridhar

ABOVE *The documentary 'Panje - The Last Wetland' by Aishwarya Sridhar showcases the changes Uran has witnessed over the years. It asks for the protection of this last remaining wilderness around Navi Mumbai, which plays host to thousands of migratory and resident birds. The film also highlights how Panje's disappearance could spell trouble for the Navi Mumbai Airport, which will probably experience greater bird-hit incidents since its location lies on the migration path of large flocks of godwits and pintails. Since the wetland is located 17 km. away from the airport (as the crow flies), it could serve as a suitable 'magnet' for birds, which might otherwise opt for sites closer to the flight path of planes landing and taking off from the airport.*

My earliest memories involved watching flamingos in the Uran wetlands. Just 30 km. from Panvel, where we lived, my father would take me there on weekends, when the air reverberated with birdsong. Through my binoculars I recall spending hours watching birds feeding and roosting. As the years rolled by, Uran's birding habitats declined, save for one – Panje. This degradation was a result of mass land acquisition for the Navi-Mumbai Special Economic Zone (NMSEZ) sanctioned by CIDCO at the Uran-Dronagiri node. Within a decade, nearly 2,000 ha. of mangroves and wetlands were destroyed across Uran. The coastal town was transformed from a functioning ecosystem and a thriving birder's paradise into a degraded parcel of land crisscrossed by giant concrete bridges.

FOLLOWING ELUSIVE MIGRANTS Panje, now spreads across 289 ha., but is barely holding on to existence. I have recorded over 250 species of birds here (see checklist of Panje's fauna). In winter, this once-extensive habitat offered refuge to a massive number of

A flock of migratory Northern Pintail, Eurasian Widgeon and Common Teal take to the skies. Such sights add to the brand equity and climate security of Mumbai and Navi Mumbai, which will experience more severe climate impacts if wetlands such as Panje are thoughtlessly urbanised for their short-term real estate value.

avians, but despite its mistreatment, it still hosts migrants all the way from the Arctic, Russia, China and parts of Europe.

In 2018, for the first time in 15 years, a Red-necked Phalarope was spotted. When I got the call from an excited Parag, my talented, local bird guide, I wasted no time to grab my camera and field glasses and set out to see the special visitor. By the time I reached, word had got out and I saw that a few equally enthusiastic birders had already arrived.

A small, delicate wader, the bird is well-adapted to life on water. I spotted two and returned faithfully over the next three days to photograph them. The arrival of the phalaropes had birders from across India visiting the Panje wetlands to witness their arrival.

Apart from such rare winter migrants, Panje hosts an estimated 1.4 lakh birds every winter. The Northern Pintail, Ruddy Shelduck, Bar and Black-tailed Godwits, Ruddy Turnstone, Glossy Ibis, Curlew Sandpiper, Kentish Plover, Slender-billed Gull and Pacific Golden Plover are some of the star attractions. Additionally, the wetland offers refuge to thousands of flamingos and many Painted Storks that roost and feed here. The ecosystem supports an abundance of aquatic life on which both birds and fisherfolk depend. A flood-control infrastructure and a huge economic asset of inestimable ecological worth, this wetland is neither understood nor valued by Navi Mumbai's business world and most of its urban denizens.

A SLOW DEATH In 2018, the NMSEZ actually blocked the inflow of tidal waters, causing the wetland to dry up. At a meeting at CIDCO's headquarters, an unnamed senior official insinuated that the migratory path of birds could be changed, the way we redirect traffic!

I was aghast! But he seemed serious! Can we afford to leave the fate of our planet and future generations in the hands of such ill-informed decision-makers?

At a meeting at CIDCO's headquarters, an unnamed senior official insinuated that the migratory path of birds could be changed, the way we redirect traffic!

A History of Destruction

Panje is a vast expanse of a low-lying inter-tidal area in Uran taluka of Raigad district in Maharashtra. It is bordered by the fishing villages of Panje, Phunde, Bokadvira and Dongri. The entire site is adjoining a creek and was used extensively for salt manufacturing. Part of the land was also used to cultivate paddy in the monsoon, a common feature in many coastal areas. Artisanal fishermen make a living at this site.

At a time when environmental laws such as the Coastal Regulation Zone (CRZ) notifications were yet to evolve, CIDCO acquired massive land parcels of thousands of hectares in Raigad and Navi Mumbai. A development plan made in 1980 demarcated various areas as Development Nodes, such as the Dronagiri node of 2,740 ha. This area, which lies three metres within the High Tideline, witnessed massive reclamation activity. The CRZ notification that came into effect in 1991 prohibited the reclamation of mangroves, intertidal areas and waterbodies, but this did not stop CIDCO from continuing with its construction plans without CRZ clearances. Almost without let or hinderance, land use changes were implemented periodically. Fishing zones were turned to industrial use at great cost to the community. Walls were built without permission and plots demarcated near Panje, in Dronagiri. A huge dam requiring 72 sluice gates was erected at the creek mouth. For eons, tidal waters and mangroves played their respective roles in maintaining the ecologically productive habitat, but now this control was left in the hands of hydraulic engineers, who took their instruction from politicians. Blockage of tide water without express permission is an offence, normally issued for flood control. Dronagiri's flood waters normally collect at Panje, where water is retained until the tide recedes. But the sluice gates prevented tidal waters from entering during the monsoon. What was once an open, living estuarine area had completely dried up. Subsequently, low-lying areas in the vicinity of these villages were reclaimed by CIDCO, and consequently tidal waters now inundate the afflicted villages even away from the monsoon season. That's not all. CIDCO went one step further and sold parts of Panje to a private developer,

This sluice gate (above) blocked the natural flow of water from the sea to Panje's shallow waterbodies, rendering what was once a living estuarine area into a dry wasteland (facing page). But Panje is not beyond repair, if quick action is taken to prevent builders from damaging it.

Wetlands are a critical part of the Central Asian Flyway. Unfortunately, Panje today is far from thriving. Photography has been banned and security guards have been deployed by NMSEZ to patrol the area, not to protect birds, but to keep birders at bay. When I visited in early June 2021, I was subjected to verbal abuse from the security guard who threatened to have me arrested. Despite an approval from the State Wildlife Board to declare Panje as a flamingo sanctuary, the land is yet to be notified according to the provisions under the *Wild Life (Protection) Act*, 1972. Bizarrely, despite orders from the Honourable Chief Minister of Maharashtra, and the National Green Tribunal, CIDCO has not yet removed the thrombosis, very purposefully placed to prevent tidal inflows into the wetlands. In the days to come, this humungous error is going to cost Navi Mumbai, both ecologically and financially. We will HAVE to repair the damage if the city is to remain viable.

For now, however, Panje is literally gasping for life (as is our city) and if nothing is done soon, it may breathe its last!

ostensibly to create an SEZ that has not seen the light of day even 15 years later.

Eventually in 2013, the Maharashtra State government agreed to change the land use from SEZ to residential! This meant that residential towers could come up after reclamation. A stop work notice given by the Maharashtra Coastal Zone Management Authority (Environment Department) was ignored and work continues apace. Such illegalities are going to make it difficult for Navi Mumbai to cope with the worst impacts of climate change in days to come.

The Panje wetland is home to thousands of birds when tide water inundates the land. Reclamation for the Navi Mumbai International Airport has added to the potential risk of future floods because thousands of hectares have been damaged, displacing huge populations of avifauna… the original maintenance engineers of this critical habitat.

As a mitigation measure, it was suggested that a mangrove park would be set up. Any such thought was rejected by the project proponent, which predictably wanted to dissuade avians to prevent bird hits to planes. Effectively, the clearance to the project was granted, knowing full well that airport and birds sanctuaries make poor bedfellows. The mangrove park, a specific environment clearance condition, appears to have been a smokescreen. Nearby waterbodies and low-lying areas were identified as possible alternative sites to help the displaced avifauna cope with the loss of habitat. Panje is one such site recommended by the BNHS (the agency appointed) to be preserved and protected as a sanctuary.

Data logged by the BNHS includes 31 migratory, six of which are 'Near Threatened', one 'Vulnerable' and 45 nominated as 'protected species'. Such data is evidence enough that the site was biologically rich and a vital, thriving wetland. What is more, the habitat was known to be vital to the prevention of floods for Dronagiri and its nearby villages. And, the area was declared a No Development Zone. This is no way to look after the interests of Navi Mumbai's current and future citizens. Protecting ecosystems is not an act of charity, it is a survival imperative.

By Stalin D., Vanashakti

PUBLIC DOMAIN

SOHAM KACKER

A Fraudulent Flower

By Soham Kacker

If you find yourself in the dry, rocky hills of Tamil Nadu, you may come across a flower that you will likely smell before you see. The putrid smell of decaying flesh wafts in the warm spring air, but do not be mistaken – this is no carcass. You have caught the scent of a centuries-old evolutionary treachery – the flowers of *Caralluma umbellata*. Deep red patterned petals and hundreds of fine downy hairs complete its disguise: this flower evolved to mimic a rotten carcass.

Of the 10 or so species of *Caralluma* native to India, *C. umbellata* is the most striking, yet all of them carry the family trait of malodourous flowers. Collectively called carrion flowers (though this name applies to several other plants as well), they are an example of what biologists call Pouyannian mimicry – where flowers mimic other organisms, or in this case their remains. To understand why this strange appearance has evolved, one must take an evolutionary step back – to the time when some fly and beetle families evolved to depend on carrion. These necrophagous (carrion-eating) insects gradually developed strong in-built sensory mechanisms to seek decaying carcasses to lay their eggs. This ensured that their young would have a plentiful food-source on hatching. The strategy proved so successful for the insects that they became completely dependent on carrion.

Enter, the carrion flowers. The evolution of flesh-eating flies provided them a distinct reproductive advantage in the form of an effective and faithful potential pollinator. Over millennia, through a process of small changes, carrion flowers evolved a complex cocktail of volatile organic compounds (VOCs), which allowed them to mimic the smell of a dead animal. To their pollinators, the downy hairs on their petals resemble mould, or remains of fur. In donning this elaborate disguise, carrion flowers broke the classical plant-pollinator bargain. Most flowers offer pollinators a food source (nectar or pollen) in exchange for pollen transfer. But the deception of carrion flowers was so convincing that they stopped producing nectar altogether – completely duping their insect benefactors.

But why go through so much (evolutionary) trouble? The most diverse families of carrion flowers worldwide have evolved in similar environments. Most are stem succulents, inhabiting hot and water-scarce regions. Here, pollinators are few and producing nectar-laden, showy flowers is an expensive strain on limited resources. Deception is far more economical. Further, having a small group of specific pollinators increases the chances that the pollen will be transferred to a flower of the same species – in other words, it maximises reproductive success.

Despite having so many aces up their sleeves, many species of carrion flowers in India are threatened. A cousin of the *Caralluma* – *Boucerosia frerei* – from the Western Ghats is listed as 'Endangered' by the IUCN, and has recovered from the brink of extinction thanks to ex-situ conservation efforts. Often the rocky, arid landscapes, which host these unique plants are viewed as wastelands, cleared and constructed on. But in fact, it is these conditions which allow evolution to get creative, and produce plants that have been deceiving insects and fascinating humans for eons.

Further Reading: Jurgens and Shuttleworth, 'Carrion and dung mimicry in plants', from Carrion Ecology, Evolution and their Applications*, CRC Press, 2015. Also read Carrion and Dung Mimicry in Plants.*

Carrion flowers are an example of Pouyannian mimicry – where flowers mimic other organisms, or in this case their remains.

FACING PAGE TOP & BOTTOM
Caralluma *flowers evolved their 'rotting flesh' stench and carrion-like appearance to attract pollinators such as necrophagous flies and beetles, which lay eggs within the leafless flowers.*

Soham Kacker is passionate about plants and has apprenticed at the Auroville Botanical Gardens and the Aravalli Biodiversity Park. Based in New Delhi, he is currently pursuing a bachelor's degree in the biological sciences from Ashoka University.

PUBLIC DOMAIN/LOVIJAY KUTTY

The Sugarcane Tigers of PILIBHIT

By Keshav Agarwal

The first time he heard the rustle in the sugarcane fields, he was not alarmed. But after the second time, Sachin Gangwar knew it was not the movement of a small animal. The next moment, he froze – a tiger, just 100 m. away.

CATS IN THE FIELD In the past three months, tigers have been spotted in the villages of the Lalaurikhera block in the Pilibhit district, Uttar Pradesh, seven times, confirmed by pugmarks in each instance. The latest sighting was in the last week of March 2021. And while it's an unusual sight for the villagers at Lalaurikhera, it is not so strange in the Amaria block, some 25 km. away.

Over the past nine years, Amaria has been home to "sugarcane tigers" – big cats that were born or grew up on sugarcane farms, where they are more comfortable than in forests. Last year, 10 adult tigers were confirmed from Amaria, plus three cubs.

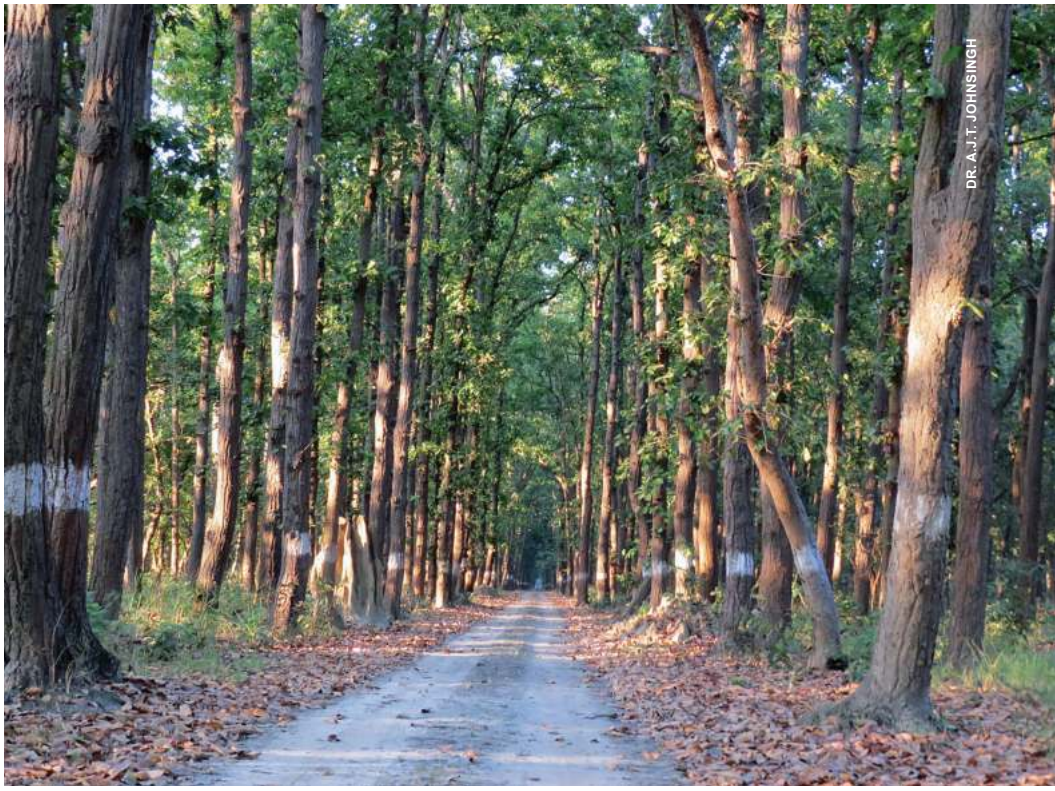
Now, they have begun moving further, to Lalaurikhera, over 30 km. from the nearest core forest of the Pilibhit Tiger Reserve. "We had heard of Amaria's tigers, but never had a sighting here," Sachin, a sugarcane farmer from Handa village who was the first to spot one, said. "We want

the authorities to do something before they make the cropped fields at Lalaurikhera block their permanent home and this leads to conflict."

The tiger he saw was a two-and-a-half-year-old male. "When tigers grow up, they leave their mothers to make their own territory normally when they are around two and a half years old," says Divisional Forest Officer of the forest and wildlife division Sanjeev Kumar. "Tigers generally migrate along river courses and since the Apsara river flows directly from Amaria to Lalaurikhera, they may have followed the river to reach here." WWF-India has installed many camera traps in agricultural areas at Lalaurikhera to monitor the movement of tigers but we still do not know exactly how many tigers may have migrated so far.

On March 13, 2021, a young tigress from Amaria became entangled in a net set up by local farmers around a sugarcane farm to trap wild pigs in Lalaurikhera's Harchuiya village. The DFO told us the tigress was about two-and-a-half years old, 142 cm. in length, weighing 140 kg. "She had been here from the previous morning when she was spotted entering a sugarcane field. Unable to spot her for a day and night, forest teams began searching for her using high-power binoculars and drone cameras. She was finally located, entangled in a net, rescued and released back into the Pilibhit Tiger Reserve," he added.

MOVING TIGERS The sugarcane tigers are believed to be the offspring of a tigress that had first migrated to Deuni dam area under Amaria block in November 2012 along with her



TOP RIGHT *The Pilibhit Tiger Reserve, Uttar Pradesh, is part of the Terai Arc Landscape where WWF-India has been working for over two decades to ensure habitat integrity and connectivity. Located in the upper Gangetic Plain, its characteristic sal forests, tall grasslands and swamps host a great variety of species, including an estimated 65 tigers.*

BOTTOM RIGHT *A tiger quenches its thirst in a water pit in a wheat field in Amaria village. In 2020, 10 adult tigers and three cubs were reported from the village's fields.*

FACING PAGE *The vast sugarcane farms in villages around the Pilibhit Tiger Reserve are home to about 13 tigers, many of which were born and raised in these fields.*

Over the past nine years, Amaria has been home to "sugarcane tigers" – big cats that were born or have grown up on sugarcane farms and are more comfortable there than in forests.

ABOVE *A tranquilised 'sugarcane tigress' being shifted to a cage on March 13, 2021. The tigress had walked from Amaria to Harchuiya village in the Lalaurikhera block. She got entangled in a net meant for wild pigs, and was released by wildlife officials in the core area of the Pilibhit Tiger Reserve the very next morning.*

three cubs. Forest officials believe that this migration could have been influenced by the behaviour of mother cats of shifting their cubs to safer places for their protection from male tigers that are often known to kill cubs from earlier litters, with intent to mate with the female.

The agricultural belt of Amaria is vast, saturated with water streams from two rivers, plus a feeder canal. Not surprisingly, herbivores and antelopes including deer, wild pigs, nilgai, stray cows, bulls and calves, are abundant and with food, water and secure hide outs, tigers would understandably turn the human-dominated areas into their territory. Temporarily at least, such features allow 'sugarcane tigers' to avoid conflicts with humans. But for villagers, though the tigers may not have posed a threat thus far, they live under constant fear of attack. "Their growing population in our agricultural fields will inevitably result in fatal human-tiger conflict in the future. We want them to be shifted to the wild," said Paramveer Singh Perry, a farmer of Surajpur village in the Amaria block. Some local farmers warn that they will take matters into their own hands and shoot the tigers, even if that means facing imprisonment, because they fear for the lives of their families.

Faced with this brewing conflict, Pawan Kumar Sharma, Chief Wildlife Warden of Uttar Pradesh says: "The translocation of sugarcane tigers to

"The translocation of sugarcane tigers to non-tiger zones of the country is under consideration. But because they have become habituated to living in human-dominated areas, we will first need to house them in rewilding enclosures until they are adapted to an exclusively wild environment." – Pawan Kumar Sharma, Chief Wildlife Warden, Uttar Pradesh

DR. A.J.T. JOHNSINGH

The grasslands and scrublands of the Terai form an ideal home for the nilgai, a major prey base for tigers in the region.

non-tiger zones of the country is under consideration. But because they have become habituated to living in human-dominated areas, we will first need to house them in rewilding enclosures until they are adapted to an exclusively wild environment." If there is adequate prey and suitable habitat, there is no reason why this would not work. However, delays are being faced in the allocation of money from the Compensatory Afforestation Fund Management and Planning Authority (CAMPA). These funds are vital to set up the rewilding enclosure in the Pilibhit Tiger Reserve. This has held up the translocation and every day's delay renders the rehabilitation process more difficult.

The first ever official estimation of sugarcane tigers in Pilibhit was initiated in 2020 by the Uttar Pradesh Forest Department authorities in coordination with WWF-India, but the final report is awaited. Meanwhile, a plan has been mooted to bring in five elephants from Karnataka to monitor the sugarcane tigers.

Experienced wildlife conservationists stress the urgent need for the prompt translocation of these sugarcane tigers to wild habitats, as much to protect the tigers from poachers as to protect farmers from living in constant fear of death.

In the words of Kaushalendra Singh, former member of the Uttarakhand State Wildlife Board: "Unlike protected forests, agricultural belts lack appropriate safety and security measures. This vulnerability may attract poachers and wildlife criminals to target the sugarcane tigers."

I agree with him, prevention is inevitably better than cure.

PINAKI PRASAD SINGH

One of Amaria's 'sugarcane tigers' with its prey. Local villagers are demanding that the tigers be shifted out quickly, but neither is the Forest Department being funded and equipped to create suitably large rewilding enclosures, nor are efforts being made to wean farmers away from sugarcane, an inappropriate crop that forces large carnivores into conflict with humans.

The Pilibhit Tiger Reserve

Covering parts of Pilibhit and Shahjahanpur districts in northern Uttar Pradesh, the Pilibhit Tiger Reserve was notified as recently as 2014, and remains one of the narrowest protected tiger habitats in the country. The sal forests, Terai grasslands and swamps of this landscape flourish well into the low-lying hills of Nepal, while the reserve embraces the border between the nations on the upper Gangetic plain. This wondrous blend of ecosystems forms the Terai Arc Landscape (TAL), a confluence of 14 trans-bordered Protected Areas. The Terai's three major charismatic species: tigers (see *Sanctuary Asia*, Vol. 24, No. 6, June 2004, The Forgotten Tigers of Pilibhit), rhinos and elephants can be seen in Pilibhit and the adjacent Dudhwa Tiger Reserve. Rhinos and elephants are more transitory, particularly in the LaggaBagga area of Pilibhit.

Despite being nestled in a heavily populated region, the Pilibhit Tiger Reserve has seen a steady rise in tiger numbers over the years since its notification, as much as doubling over the decade. In 2020, the reserve won the inaugural TX2 Award, presented by IUCN, UNDP, Global Tiger Forum and several other organisations. The success of its commendable efforts is bittersweet given the challenges – the vast swathes of agricultural lands that extend close to natural habitat in the district now potentially host more cats, and other wild species than can be sustained. Human-wildlife encounters look like they will rise, placing both wildlife and people at unpredictable risk.

Pilibhit's unfolding story is a stark reminder that wildlife conservation has no clear-cut solutions and processes, but must adapt and transform by evolving along with the changing relationship between people and the wild.

"Unlike protected forests, agricultural belts lack appropriate safety and security measures. This vulnerability may attract poachers and wildlife criminals to target the sugarcane tigers."– Kaushalendra Singh, former member of the Uttarakhand State Wildlife Board

KALYAN VARMA

G. GOKULAKRISHNAN

THE NARCONDAM SHREW DISCOVERED!

By Dr. Manokaran Kamalakannan

In April 2020, researcher G. Gokulakrishnan of the Andaman and Nicobar Regional Centre of the Zoological Survey of India (ZSI), travelled to the uninhabited Narcondam island to study the endemic Narcondam Hornbill *Rhyticeros narcondami*. Little did he imagine that in the process he would end up discovering the first insectivorous mammal in India, after a period of four decades. On one of his forest explorations, he saw a strange, mouse-like mammal in the leaf-litter. Intrigued, he waited and watched and discovered it feeding primarily on insects.

It was a shrew!

He and his colleagues collected it, and later compared it to others in the records. They then came to the conclusion, based on its distinct external morphology, craniodental characters and molecular assessment, that it was an entirely new species of shrew. It also had substantial genetic variances to other *Crocidura* species on the Indian mainland, and the Andaman and Nicobar archipelago, Myanmar and Sumatra. The shrew was named *Crocidura narcondamica*, after the type locality.

The first discovery of a shrew from this island, it brings the total number of recorded *Crocidura* species in India to 12. Earlier, scientists from the ZSI had discovered the Andaman shrew *Crocidura jenkinsi* on the South Andaman Island in 1978.

CROCIDURA shrews are terrestrial, insectivorous mammals, commonly referred to as white-toothed shrews. Over 198 species have been recorded from Africa, Europe, and Asia, making them the most species-rich group of mammals. The shrews are characterised by small to medium-sized bodies with short, dense, grey fur, a large first-unicuspid tooth that protrudes forward, and is hooked with a small cusp present behind the main cusp. The teeth are unpigmented and have no zygomatic arches.

The unparalleled biogeography of oceanic islands clearly provides the right habitat, because several *Crocidura* species have recently been discovered. The distribution of *Crocidura narcondamica* is likely to be restricted to the tiny Narcondam island, one of only two volcanic islands in India, located in the Andaman Sea.

With almost 80 per cent forest cover, the island has been recognised by UNESCO as a World Heritage site. The extremely restricted insular habitat and the associated limited population size automatically enhances the vulnerability of the species. Additional field studies on its taxonomy, ecology, and distribution will help understand its present status and promote location-specific conservation plans.

The latest finding has been published in Scientific Reports*, an online, multidisciplinary, open-access journal from the publishers of* Nature*. The author is a researcher with the Zoological Survey of India, Kolkata.*

CITATION: *Kamalakannan, M., Sivaperuman, C., Kundu, S. Gokulakrishnan, G., Venkatraman, C. & Chandra, K. Discovery of a new mammal species (Soricidae: Eulipotyphla) from Narcondam volcanic island, India.* Scientific Reports *11 (9416): 1-11.*

Ghosts at the Top of the World

Text and photographs by Shreekant Somany

Enroute to Komic, our driver Tsering Lara, drove off-road for a short distance to a vantage point, from where we scrambled down a slope near a *nullah* (stream) where a snow leopard had made a donkey kill. We could see a flock of Griffon Vultures awaiting their pound of flesh – a sure sign that the leopard was still there! I was yet to acclimatise to the thin air and stopped a while to catch my breath. Then almost like magic, there before me was our quarry, an elusive snow leopard. Silently as I could, so as not to disturb the cat, I took my trusty Canon 100-400 mm. (crop factor 1.6) in hand and managed to shoot off a few frames, before the magnificent cat melted, ghost-like, away into the gorge.

For me a long-cherished dream had just come true. As I sat, digesting the experience, I gazed around me at the vast wilderness, and could see why these, the world's most elusive large cats, preferred to live solitary lives, hunting and patrolling their territories solo, across ranges that could extend to 1,000 sq. km.

I had been to Ladakh earlier, drawn by the grey ghost in the mid-winter of 2015 when I visited the Hemis National Park with Rahul Ogra, snow leopard conservationist and founder of Mystic Himalayan Trails. That year we spent four magical nights at Ulley village, but the snow line was higher and the cat did not descend lower in pursuit of prey. We were disappointed but learned later that even a British Broadcasting Corporation (BBC) team camped in the park for three weeks that year had to return without a sighting.

FROM KULLU TO KAZA Still in search of the snow leopard, five years later, toward the end of 2020, I chose to visit Himachal Pradesh's Spiti Valley, home to around 30 snow leopards. The hill panchayat had sensibly limited the number of travellers to follow COVID-19 precautions. Possibly it was the reduced disturbance that gave the good fortune of actually spotting the grey ghost that I described at the start of this article. Clearly, I had made the right choice by honing in on Kaza as my base, rather than Langza. Almost everything had begun falling in place, even before I arrived. The weather forecast, for starters, had predicted clear skies I could see above me! Shrikant Baldi, former Chief Secretary, Himachal Pradesh, had arranged the circuit guesthouse for our stay. I took off for Kullu on January 25, 2021.

ABOVE *Blue sheep or bharal are fleet-footed and agile mountain climbers. Adult males have an impressive set of horns, which are used to challenge other males competing for mating or territorial rights.*

FACING PAGE *A snow leopard mother and cub bask in the afternoon sun in Hikkim village, Spiti. A rare sighting in the wild, mother and cubs normally stay together for two years, during which she imparts the survival skills the young ones will need to survive the trials of high-altitude life.*

After a day's rest in Manali, I boarded the Bell 407 chopper at 8.30 a.m. and looking out of the window I could see majestic snow-clad Himalayan massifs. A short 30-minute flight saw us across the Rohtang Pass and Kunzum La, and then we were at Kaza where we were greeted by the Aide-De-Camp (ADC) Kaza Gian Sagar Negi, my guide Tsering Lara, and the local doctor. The circuit house where we camped was a mere stone's throw away.

Kaza, the sub divisional headquarters of the Spiti Valley, lies at 3,700 masl.

Despite the exquisite blue skies above us, the temperature was a bone-chilling -16 °C outside, but our room was warm and snug, and I slept a dreamless sleep that night.

ABOVE *Snow leopard cubs are born during the summer months of June and July, after breeding season in winter. For two to three months, they stay relatively hidden in caves or other safe places, then follow their mother around for two years before separating to lead solitary lives.*

With a largely Buddhist population of around 12,000, far from the hustle, bustle and stress of urban life, the local economy here is supported by farming and low-impact tourism (homestays and transport services). In this well-balanced society, we found neither extremely wealthy nor impoverished residents.

Despite the exquisite blue skies above us, the temperature was a bone-chilling -16 °C outside, but our room was warm and snug, and I slept a dreamless sleep that night. I woke to a breakfast of *aloo parathas, aachar* and black coffee, after which I took some well-advised rest, and took off post-lunch in Lara's Toyota Innova to Komic, the world's highest (4,587 masl.) motorable road. Lara's advance team of six trackers, equipped with walkie talkies, had positioned themselves at selected locations to report any sightings. Driving along roads that wound their way through barren, snow-clad mountainscapes, far below us we could see the exquisite Spiti river, the lifeline of the valley, glinting like a jeweled necklace in the bright sunlight.

Panthera uncia is the ultimate symbol of transboundary conservation. The cat occupies a vast territory in the Himalaya extending from India, Nepal and Bhutan to the central Asian mountains of Kyrgyzstan, Afghanistan and parts of Russia and Mongolia. It prefers the most inaccessible habitats, above the tree line, up to 5,500 masl. Here it roams freely across 13,000 sq. km., relatively safe from poachers, thanks to the inaccessible terrain and effective conservation actions involving locals.

Enroute to Komic, we had spotted groups of blue sheep, or *bharal*, vital prey for the snow leopard. I would, of course, never have been able to spot the snow leopard if not for the locals who shared its high-altitude home and knew its ways. Living solitary lives, snow leopards generally hunt and travel solo, with a cat's range extending as far as 1,000 sq. km.

That year we spent four magical nights at Ulley village, but the snow line was higher and the cat did not descend lower in pursuit of prey. We were disappointed but learned later that even a British Broadcasting Corporation (BBC) team camped in the park for three weeks that year had to return without a sighting.

THE SUNLIT TRIO It was late afternoon when we headed back for Kaza. The midday sun bathed the landscape in a vibrant glow, and on the horizon, the moon was in ascent. What a good day it had been!

We set off at 9 a.m. the next morning. It was a bright, sunny day and my first stop was the thousand-year-old Key Monastery, the largest training centre for Lamas. Founded by Dromton, a disciple of Atisha, a Buddhist leader of the 11th century, the monastery was pillaged by Mongol invaders and ended up being

rebuilt several times down the years. In 1840, it was ravaged by a large fire and more recently, in 1975, it was rocked severely by an earthquake. In 2000, the Kalchakra ceremony was performed in the Key Monastery, in the presence of His Holiness The Dalai Lama.

I was still replaying the snow leopard sighting as we headed back from the monastery towards Kibber. We received news that trackers had spotted the movement of a leopard, but it had drifted away by the time we reached. We nevertheless walked about for three kilometres through thick snow, in the hope of catching a glimpse of the cat. No such luck! We did see a herd of Himalayan ibex scouring the ridge for food some 500 m. from the road. By now it was close to midday and we chose to move on towards Kibber and Komic. A few kindly monks offered us some hot *dal* and *roti*, which we gratefully accepted, happily abandoning the cold packed lunch we had carried with us.

We were not really looking for another snow leopard sighting, but we still waited for a couple of hours to get an update from the trackers scouring the surrounds. At 3.30 p.m., we heard the crackle-buzz of the walkie talkie. "Come to Hikkim! A mother and two cubs have been spotted." Hearts pounding, we rushed to Hikkim village, which proudly operated the highest post office in the world. Just beyond the village boundary, we stopped and walked down slope to the edge of the ridge. And there they were, as though waiting for us! A mother and her two cubs were lounging about in the snow without a care in the world, across from where I had set up my tripod. Females bring up and protect their cubs without any help from males, until they are around 18 months old.

I watched in disbelief at the three cats bathed in the golden rays of the setting sun. Transfixed, I mechanically set up my camera, capturing every movement of the trio over the next hour, until their mother led them away.

On January 29, at 8.30 a.m., the chopper transported me back to Kullu. Looking out of the window, I wistfully stole a last look at the majestic Himalaya where creatures roamed the Earth long before humans became the humans we now are.

My trip left me wondering, as I do time and again, how anyone could hunt such a stunning animal for its fur and bones. I recalled the powerful, piercing gaze of the famous Afghan girl captured by Steve McCurry in the refugee camp in Afganistan during the war in 1985, her eyes questioning the atrocities on her people. The gaze in the eyes of the snow leopard mother was no different to me – *"why do you hunt us?"* she seemed to inquire.

An industrialist and presently the Chairman and Managing Director of Somany Ceramics Limited, which manufactures ceramic tiles, sanitary ware and CP fittings, **Shreekant Somany** is an explorer of the unexplored. Capturing the frames of new heights and new perspectives every day, Somany beautifully brings life to his expeditions with an edge towards technology, a sharp aesthetic sense, and an ever-lasting yearning for nature.

The Spiti valley is the heart of India's snow leopard cold desert home. The cultural roots of local communities are key to the survival of the cats and towards this end the stunning landscapes and incredible wildlife attract tourists from across the world. Organisations such as the Snow Leopard Conservancy, Snow Leopard Trust and NCF are working to harmonise the relationship between people and the wild species whose home they share.

The Cold Desert Valley

Spiti valley is a remote, cold desert mountain valley in north-eastern Himachal Pradesh, its terrain peppered with hardy grasses and shrubs. The region is home to a variety of fauna, including Himalayan ibex, blue sheep, snow leopards, Tibetan antelope, argali, kiang, Himalayan brown bear and musk deer. Poaching of wildlife is a persistent issue that plagues the landscape – Tibetan antelope are hunted for the production of *shahtoosh* shawls, snow leopards for their fur and musk deer for their fragrant pods (see *Sanctuary Asia*, Vol. 41, No. 2, February 2021). A recent study by the Himachal Pradesh Forest Department and Nature Conservation Foundation (NCF), however, guesstimates that the state may be home to over 70 snow leopards, excluding cubs, a significant rise from the past census. NCF has been working closely with the local community for over two decades to plan and employ an effective conservation strategy in the region and promote a peaceful coexistence between wildlife and people.

Hearts pounding, we rushed to Hikkim village, which proudly operates the highest post office in the world. Just beyond the village boundary, we stopped and walked down the slope to the edge of the ridge. And there they were, as though waiting for us! A mother and her two cubs.

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SAURABH SAWANT

WALONG'S WHITE BELLIES

SURVIVING AT GROUND ZERO

By Gopinathan Maheswaran

The land of dawn-lit mountains, Arunachal Pradesh has continued to draw me ever since my first visit in 2005. And I found myself in this avian El Dorado once more, when the second COVID-19 wave struck.

In the first week of April 2021, I received news that a White-bellied Heron *Ardea insignis*, a species I had studied earlier, had been sighted at Walong in the Anjaw district. I ignored the news as I had recently read that except for the Namdapha Tiger Reserve, the herons had never been sighted in Arunachal Pradesh. A week later, the buzz on sightings grew and reports began to emerge from sources I trusted. If true, I figured, this would be a new distributional record for the White-bellied Heron from India, because earlier reports came only from Manas in Assam and Namdapha. What's more, the information I received was that a pair was nesting! This was enough to prompt the Arunachal Forest Department to constitute a fact-finding committee to confirm the sightings and a joint research team from the Zoological Survey of India (ZSI) and the Wildlife Institute of India (WII) was formed.

I was understandably delighted when a letter to be part of the team from the PCCF arrived on April 23, 2021. The pandemic, of course, made travel a challenge. I chose to travel by road from Kolkata with my colleague Amitava Majumder, a birder and excellent wildlife photographer. We set out on May 10 and drove 1,800 km., virtually non-stop, to reach Tezu on May 12. After meeting the Divisional Forest Officer Santosh Kumar Reddy there, we proceeded to Walong, which involved another eight-hour, 220 km. journey.

THE WHITE-BELLIED HERONS The next morning, Ashesh, a Forest Department staffer, was deputed to accompany us to the site where the White-bellied Herons had indeed constructed their nest, on a 40 m. tall chir pine *Pinus roxburghii* tree, some 10 m. from the east bank of the Lohit river. Unwilling to disturb the birds, we peered through our scopes from a distance of 180 m. The nest had been constructed

on the extreme end of a long branch, just above the halfway mark of the tree trunk.

For the four days we were there, the area experienced moderate to heavy rainfall and we were able to spot one of the adult birds incubating its egg(s). The nesting site, at an altitude of 1,120 masl. was considerably higher than the one at Namdapha, where the herons were observed away from the hills and the Noa-Dihing river at an altitude of just 390 masl. Unlike Walong, the heron's habitat there was dominated by secondary forests, and no nearby pine trees (See Noa-Dihing's White-bellied Herons, *Sanctuary Asia* Vol. 34, No. 8, August 2014). The nesting of the herons in Walong was particularly significant, as few breeding pairs have been located globally and the one we were at was far (85 km. aerially) from the Namdapha nest, and separated by tall mountain ranges. I believe the pair may have made their way from the neighbouring Tibet Autonomous Region (TAR) of China, from where the Lohit river originates. Google Earth images suggest that there are suitable habitats in southwestern China, bordering India, and given the region's remoteness, these probably escaped the attention of birders.

Strong trans-boundary cooperation between India, Myanmar and China could reveal more herons, but in low numbers since we have no evidence of major adult populations capable of producing young that would disperse to new territories. But the sighting was beyond significant and there was a distinct possibility of more birds in nearby areas. Hopefully, extensive surveys will now be launched to establish population, status and distribution of these rare and elusive avians from this remote, obscure Eastern Himalayan landscape.

We urged the Arunachal Forest Department to protect the nesting and foraging site with help from other agencies, to prevent the hunting of birds. Groups of young men with airguns and catapults are a common sight in Walong.

OTHER AVIFAUNA The mountains of Walong and the surrounding areas are part of the Dichu Reserve Forest, a designated Important Bird Area (IBA) (see box on page 61). Over 250 bird species have been reported from here, including the Spot-breasted Parrotbill, Derbyan Parakeet, Godliewski's Bunting, Chestnut-eared Bunting and a sub-species of the Koklas Pheasant *Pucrasia macrolopha meyeri* – testimony to the diversity of this region and the flora upon which the birds and their food chain are umbilically linked.

Birding along the gushing white waters of the meandering Lohit river is a treat! Taking some time out from heron watching, we decided to go out in search of forest birds. Setting out from Walong at 8 a.m. on May 16, we reached the army post at Helmet Top around 11:30 a.m., stopping frequently to scan the area for

GOPINATHAN MAHESWARAN

GOPINATHAN MAHESWARAN

ABOVE *A pair of herons nesting on a pine tree* Pinus roxburghii *in Walong. This is a record observation, as herons (in Namdapha) were previously only observed nesting on* Terminalia myriocarpa *trees. The image was captured from a safe distance, to avoid disturbing the birds.*

TOP *An adult heron lands deftly at its nest, allowing its mate that was incubating the eggs to leave for foraging. Parents share the responsibility of guarding the nest, and caring for offspring.*

FACING PAGE *Over 250 species of birds have been recorded in the subtropical montane forests of Walong, which lies on the west bank of the Lohit river in Arunachal Pradesh. These include the Himalayan Monal, Rufous-necked Hornbill and Wood Snipe.*

I chose to travel by road from Kolkata with my colleague Amitava Majumder, a birder and excellent wildlife photographer. We set out on May 10 and drove 1,800 km., to reach Tezu on May 12.

SAURABH SAWANT

LEFT *A pair of Spot-breasted Parrotbills* Paradoxornis guttaticollis *perch on an isolated grass blade patch, their strangely twisted bills resembling a smile. The species generally prefer dense shrubbery and bamboo stands.*

PUBLIC DOMAIN/SHANTANU

The Battle of Walong

Walong, not well-known to most, played a significant role in the 1962 Indo-China war. According to literature available, the 'Battle of Walong' was one of the fiercest between the world's two most populous countries. For over a month, night after night, the sky was lit up by mortars and shells exchanged between the two powerful armies. Even today War memorials can be seen scattered across the region, even as the rejuvenated mountains and rivers attempt to conceal long gone battle scars.

The next day, we set off toward the Kibuthu village on the Indian side, on the last motorable road before the Line of Actual Control (LAC), separating India from the Tibetan Autonomous Region.

birds. Interestingly, the area was christened Helmet Top (2,090 masl.) when post the 1962 war with China, locals discovered helmets and boots strewn around, without a trace of any uniformed men. Walong supports very high biodiversity, and the Ditchu RF sits at the tri-junction of India, Myanmar and China.

The 17 km. steep stretch from Walong to Helmet Top has zero human habitation, possibly because of the steep incline of 1,000 masl. Along the way we found the Derbyan Parakeet only at one stretch during our entire survey. But it is a difficult species to photograph, given its preference for roosting on the uppermost pine branches. The region may also have Black Partridges. On May 17, standing outside the Walong Inspection Bungalow, at around 5.15 a.m., I heard the partridges calling from the higher reaches of the mountain slope west of the Inspection Bungalow where we had camped. I knew the call from my work in the Terai grasslands of Dudwa and Jaldapara, where the species is common. But a positive identification is needed since Black Partridges are known to generally prefer lower-elevation grasslands.

The next day, we set off toward the Kibuthu village on the Indian side, on the last motorable road before the Line of Actual Control (LAC), separating India from the Tibetan Autonomous Region. The 30 km. stretch from Walong was no different to the adjoining areas, except that it rose gently and was moderately open and dotted with villages and farms. Though dominated by military camps and army personnel, silence ruled – the only sound we heard was the gush of the fast-flowing Lohit river. Stopping awhile, we observed short to medium-sized patches of grassland that supported a variety of birds, including Spot-breasted Parrotbills, especially at Yakung. In India, this is the only place where the bird is possible to spot, apart from a few isolated places in Manipur. This could also partly be because of the skulking nature of the species.

The Indian Bird Conservation Network (IBCN)

The IBCN is a network of birdwatchers and NGOs working for avian conservation. The IBCN is housed at the Bombay Natural History Society, Mumbai. IBCN members comprise organisations and individuals. Organisations are usually nature groups that work at specific Important Bird Areas (IBAs) or a network of several IBAs. The IBA Programme of BirdLife International aims to identify, monitor and protect a global network of IBAs. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a Protected Area network.

The IUCN WCPA (World Commission on Protected Areas) Transboundary Conservation Specialist Group

This Group works towards cooperative and effective conservation of ecosystems across international borders. Comprising over 250 members from diverse fields and specialities, the focus is to not allow different management and political governances to impact conservation goals. Four types of Transboundary Conservation Areas are recognised by the WCPA – a **Transboundary Protected Area**, a defined geographical region across two countries; **a Transboundary Conservation Landscape and/or Seascape,** which has both Protected Areas and multiple resource use areas; **Transboundary Migration Conservation Areas**, habitats needed for migratory species; and a special designation called **A Park for Peace**, applicable to any of the above three types for special peaceful cooperation between countries.

Several such transboundary conservation initiatives are in the works across the world – some informal agreements, some MoUs between governments. The transboundary region between the Tibet Autonomous Region of China and the adjacent mountain habitat of India and Nepal, for instance, is a culturally and ecologically diverse and fragile region. This mountain habitat is home to several specialist species such as chiru, Tibetan wolves, and snow leopards, which move across national boundaries. A consolidated conservation, management and monitoring framework between countries is thus a necessity.

BOON OR BANE? Walong remained largely out of bounds for outsiders for most of its history with limited 'developmental' activities. The Brahmaputra and Lohit rivers served as natural barriers. Anyone wishing to reach Walong had to cross these two rivers near Tinsukia in Assam and Roing in Arunachal Pradesh. Until recently one had to use a ferry from Sadiya Ghat in Assam to cross over. Now, multiple bridges over these rivers have made the journey easier. However, other than the odd birder or two, few visit the region and virtually no one visits in winter. Nevertheless, a few homestays have been set up by locals at Walong and Dong. The only mobile network operated by BSNL for the entire region is located within an army camp at Walong, where locals can often be seen nearby trying to access a signal.

During the monsoon (May to mid-September), multiple landslides cut the region off from its surroundings. We ourselves were stuck for over 24 hours between Yasung and Tezu!

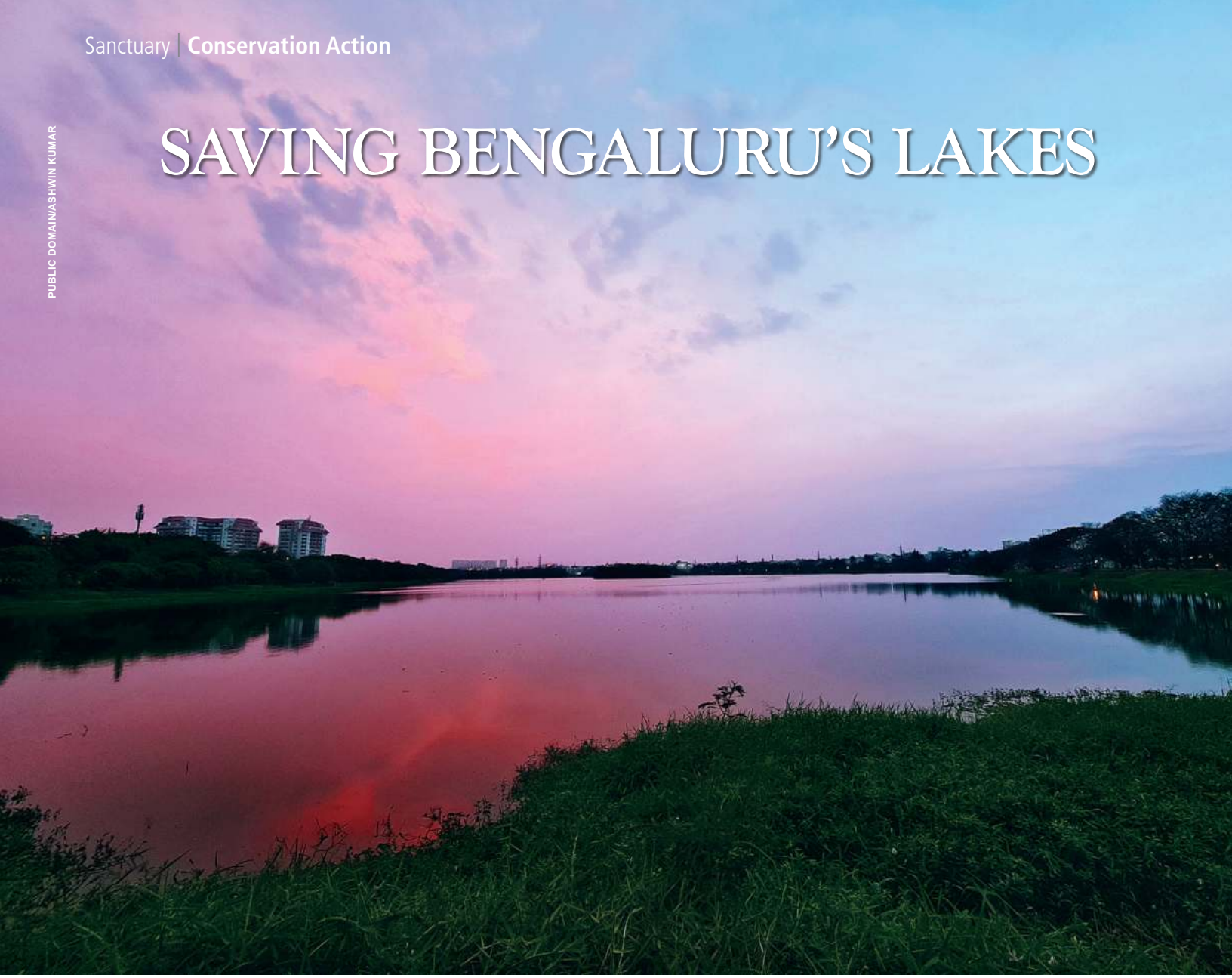
That said, the lack of logistics is a blessing for the biodiversity of the area. Where humans congregate, birds tend to vanish! But Arunachal Pradesh has never failed me – it's concealed avian diversity has always blessed me with sightings and this time, I was particularly grateful that despite the pandemic, I was able to spend time with the avians of Walong.

SAURABH SAWANT

ABOVE *The glistening rivers that feed the rich landscape of Walong make for a wistful frame. The connected forests are recognised as an 'Important Bird Area' by the Bombay Natural History Society and BirdLife International. Protection of this area strengthens support for threatened endemics such as the Mishmi takin* Budorcas taxicolor.

Strong trans-boundary cooperation between India, Myanmar and China could reveal more herons, but in low numbers since we have no evidence of major adult populations capable of producing young that would disperse to new territories.

SAVING BENGALURU'S LAKES



PUBLIC DOMAIN/ASHWIN KUMAR

By Dr. P.U. Antony

The 2012 order did not include lakes and waterbodies in rural Karnataka. The amendment of June 15, 2021, includes the revival and rejuvenation of lakes in both rural and urban Karnataka.

"Once upon a time, Bengaluru was peppered with several hundred glimmering lakes. In the last few decades, many of the city's life-giving waterbodies have been degraded, dredged, or dried out as urbanisation has steadily ruined them, one by one," wrote Divya Kilikar describing the battle to save the Puttenahalli lake in the city (*Sanctuary Asia*, Vol. 41, No. 4, In the Life of a City Lake). Citizen-driven campaigns like this are our last hope for the beleaguered waterbodies of this beautiful city.

Historically, communities across South India have depended largely on wetlands for their water security. However, over the years, rapid urbanisation and mismanagement led to a loss of these vital ecosystems. At present, Karnataka has an estimated 40,000 lakes but has already lost at least 10,000 lakes in recent decades.

The Bengaluru metropolitan area had 262 lakes in 1961. Official statistics today mention 117 lakes, but only 33 are still more or less visible on satellite imagery. Previous lakes have been transformed into residential and commercial areas, universities, bus stands, stadium or golf courses. Some are now used to dump domestic and industrial wastes or open sewage. This has had a

dangerous consequence on groundwater levels, climate stabilisation function, biodiversity and recreational value.

Pained by the merciless onslaught on these commons, individuals and NGOs have come forward to fight for their protection from time to time. In 1995, Padmashree Zafar Futehally was the first person to file a Public Interest Litigation (PIL) in the High Court (HC) of Karnataka to save the tanks in and around Bengaluru. In 2006, a PIL was filed in the HC by B.K. Bhat against the state government of Karnataka to ensure that no sewage enters the lakes and tanks of the state. In 2007, the NGO Vishwa Adhyatma Vikasa Prathisthana filed a PIL questioning the action of the state and its agencies, and its failure to maintain the 81 tanks in Bengaluru metropolitan area.

In 2008, the Environment Support Group (ESG) and Leo Saldanha tried to stop the privatisation of a lake by filing a PIL in the HC. The final judgement was passed in 2012, which directed the state government to ensure management and rehabilitation of lakes by forming a committee of officials at the centralised level. But this committee failed to implement the guidelines and neglected public grievances associated with the revival and rejuvenation of lakes. In 2014, Citizens' Action Group, a volunteer organisation, filed a PIL to draw the court's attention to the committee's incompetence.

Later in 2019, Saldanha and ESG filed a PIL seeking involvement of citizens in the rejuvenation of lakes by submitting a proposal. This proposal requested three committees to be formed at the state level, Bruhat Bangalore Mahanagara Palike (BBMP) and district level. The Karnataka Lake Protection and Rehabilitation Authority was the apex committee that had to oversee the functions of the three committees.

In response to this, recently the HC of Karnataka passed an order on June 15, 2021, which directed the government to set up district-level committees, headed by Deputy Commissioners of the districts across the state, for monitoring maintenance and development of lakes/tanks. This would allow citizens to engage in all aspects of governance and the decision-making process. The 2012 order did not include lakes and waterbodies in rural Karnataka. The amendment of June 15, 2021, includes the revival and rejuvenation of lakes in both rural and urban Karnataka.

Water occupies a significant position in Indian culture, and the shores of most lakes were dotted with temples and idols of deities. This helped reinforce restrictions on overuse during specific seasons, through cultural and religious taboos. Lakes are common pool resources that serve multiple functions – ecological, social, and economic. The restoration of these waterbodies must be planned in a way that fosters inclusivity and a deeper socio-ecological connection. Lakes were initially maintained by local communities who shouldered responsibilities for various activities, such as channelling and monitoring water distribution, dredging and desilting the lake, and maintenance of the tank embankments.

Centralised lake management typically involves fencing and restrictions on lake entry enforced by security guards. Such a vision of the lake governance favours recreational use, while banning consumptive use by fodder collectors, fishers, migrant labourers and washer communities *(dhobis)*. This has distanced many low-income communities from lakes they once actively engaged with and managed for centuries. Changes in peoples' attitudes toward environmental issues is possible only after they realise the benefits.

Water occupies a significant position in Indian culture, and the shores of most lakes were peppered with temples and idols of deities. This helped reinforce restrictions on overuse during specific seasons, through cultural and religious taboos.

PUBLIC DOMAIN/RAJEEV RAJAGOPALAN

ABOVE *Once managed by the local village community, the Kaikondrahalli lake in Bengaluru was polluted and nearly dried out until a network of residents, researchers and local government officials worked to restore it.*

FACING PAGE *A four-year campaign, spearheaded by a citizen-led movement under the Agara Lake Protection and Management Society (ALPMS) helped rejuvenate the Agara lake in Bengaluru.*

Buffer zones can be improved by public participation to plant saplings of native species. It will attract butterflies, birds and small mammals. Lake festivals *(kere habbas)* involving residents can help them develop a connection with the lake. As practiced in the Joint Forest Management (JFM) model, the basic rationale of the approach is the cooperation of local communities and the state government in the protection of lakes from illegal fishing, encroachments and waste discharge by industries. In exchange for this they receive the right to sustainable legal use of the lake's resources.

The Kaikondrahalli lake on Sarjapura Road and the Byrasandra Lake at Jayanagar in South Bengulu are examples of two lakes restored through peoples' participation. Being part of this collaborative restoration, I strongly feel that making locals custodians of the lake is key to the success of any new system of lake management. They should be educated about the working of an ecosystem by experts and how they are part of it.

Long-time educator **P.U. Antony** was awarded the Sanctuary Green Teacher Award in 2020. Read more about his work here or watch this video.

PRANAV CAPILA

Pakke's 'Irregulars'

Unheralded heroes on the frontlines of conservation

In June 2021, 'casual' or 'temporary' frontline staff working in the Pakke Tiger Reserve, Arunachal Pradesh, went on a day-long strike to protest the non-payment of their wages since December 2020. This included members of the Special Tiger Protection Force (STPF), who constitute the backbone of wildlife protection in Pakke. **Pranav Capila** had visited the tiger reserve in January 2020, staying with and walking on patrol with STPF personnel. This is a story about those invisible, unsung frontline heroes.

PART I: BOOTLESS IN KHARI

Three damp field boots huddle in a patch of sunlight next to the frontline staff quarters at Khari Camp, Pakke Tiger Reserve. They shiver in the stiff morning breeze, eyelets laced with fear, tongues hanging out from the previous day's exertions. The fourth of their company is missing, having perhaps legged it under cover of night.

Tinku Kino emerges from the room nearest to them – the room with the monobloc and the cane chair on the porch, the clothes flopped onto the washline, the sky blue door with *'Dil Mange More'* (The Heart Asks More) and *'tinku'* calligraphed on the outside. He wears a cap, a brown jacket over his camo uniform, and bright orange flip-flops. A *dao* (a short sword that takes various forms across the tribal Northeast) is slung around his shoulders. A waterproof pouch hangs from his neck.

A sigh of relief rises like a mist around the boots as Tinku walks past them without a glance. His patrol today will take him along the riverbed, the wet conditions making boots a liability. Field boots are lucky if they last three months in these parts. At least they've been spared this morning's grind.

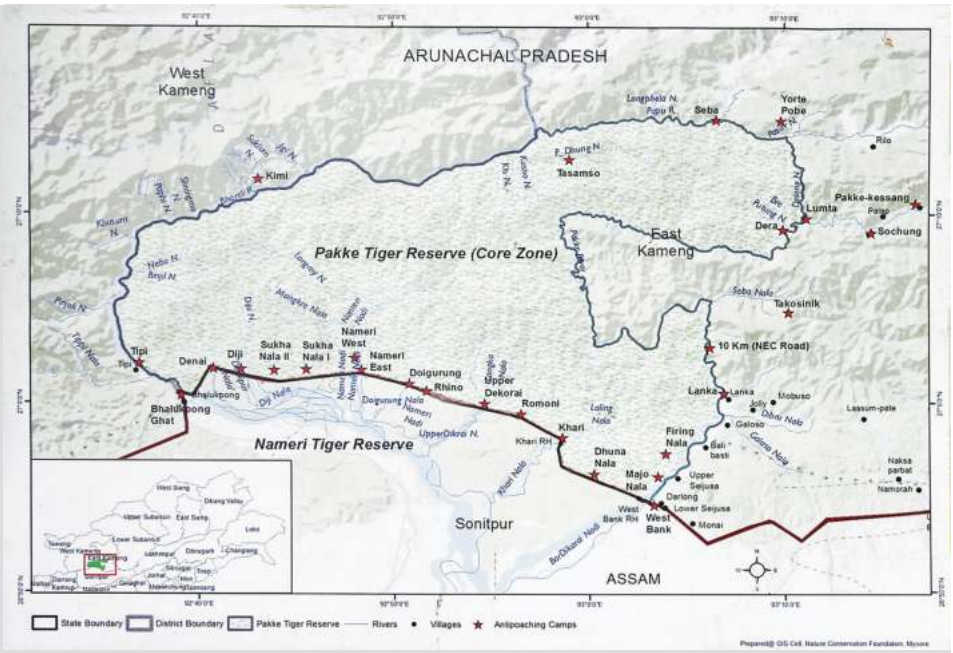
Velcro sandals would have suited Tinku's purpose more than flip-flops but his last pair broke some weeks ago. Since he buys them out of pocket, he is making do. He walks downhill to the

ABOVE *Tinku Kino, seen here at the staff quarters, Khari Camp, Pakke, has been an STPF guard since 2013, with a salary of Rs.14,000 a month. As the STPF has not been regularised in Arunachal Pradesh, such foot soldiers are deemed 'temporary' or 'casual' workers. They often fall into debt traps as they are forced to borrow money to sustain their families, since their wage disbursements are routinely delayed by the state government.*

Regularising the STPF

Despite the MoU signed between the National Tiger Conservation Authority (NTCA) and the State of Arunachal Pradesh (among other states) for 'Raising, arming and deploying the Special Tiger Protection Force (STPF)' in 2009, and although the *Arunachal Pradesh Forest and Special Tiger Protection Force Act* was passed in 2012 (coming into effect vide Gazette Notification on 14/03/2013), the STPF has yet to be regularised in the state.

Thus, STPF personnel in Arunachal are still 'temporary' or 'casual' workers. They earn meagre amounts and are not issued the ration allowances that permanent staff like forest guards receive. They are also subject to the vagaries of wage disbursement that plague casual workers across the country. When I visited Pakke in January 2020, STPF personnel had not received wages in several months because the state government had not released the requisite funds. (A lump sum amount covering six months' pay was credited to their accounts between January 18 and 20.) Sadly, this pattern continues and staff had not received wages for six months when they went on strike in June 2021.



Map of the Pakke Tiger Reserve and neighbouring areas.

COURTESY: ARUNACHAL PRADESH FOREST DEPARTMENT

"Despite the central government having sanctioned these posts, the state government has not regularised them for a decade," said advocate Nabum Rama, representing the STPF 'irregulars', when I spoke to him in March 2020. "The buck (for initiating recruitments) is being passed from the Forest Department to the police and vice versa. But we can expect a favourable verdict soon. Final arguments will be presented before the High Court by the end of the month."

But by the end of March, the COVID-19 pandemic held sway. Hearings were scheduled in January and February 2021, but postponed. Final arguments have still not been heard and as of July 2021, the matter of 'Shri Radhe Nabam & 42 Ors. versus State of AP & Ors.' remains in limbo.

Khari river and turns upstream towards a minor tributary, the Lalling *nullah*. He stops a moment here, retrieves his cellphone from the waterproof pouch and launches the M-STrIPES app – 'Monitoring System for Tigers: Intensive Protection and Ecological Status', deployed across tiger reserves by the National Tiger Conservation Authority (NTCA) in 2010. He takes a selfie and enters his name into the app. His position appears on an offline map of the tiger reserve; the route and distance of his morning patrol will now be part of the official record.

It is 6.30 a.m. and the dawn sun feathers a rosy blush across all of Pakke. The *nullah* sings and gurgles, meandering its many-fingered way through the tangle of subtropical jungle. Tinku maintains a brisk pace along a jeep track, stopping occasionally to photograph animal signs and sightings. Jungle cat scat, leopard pugmarks (still wet), bear pawprints, elephant footprints, the spot where a wild pig poked his tusks out of a thicket and beat a panicked retreat a minute ago, fresh elephant dung, more elephant footprints – everything is logged in the app.

Tinku wades across a knee-deep rivulet and reaches under a bush, retrieving a dull brown rectangular box: a camera trap. He adjusts

Pakke is one of the last magical places on Earth. When I first came here five years ago, I was enchanted by its ancient, near-impenetrable rainforest. I listened to the night songs of elephants, and heard Great Hornbills barking at dawn.

PRANAV CAPILA

LEFT *Sanjay Tisso has worked in Pakke since 2007, initially with the anti-poaching squad and subsequently with the STPF. An artist in his free time, he is seen here in full uniform armed with a .315 rifle at the Khari Camp. Pakke's frontline staff have been faced with a shortage of firearms for several years, because the state government has not issued the requisite permissions for their purchase.*

the preset capture interval, replaces the batteries and conceals the camera once again. With the *nullah* sickle-curving around a bend, he decides to take a trail that cuts through the jungle.

On the other side, just as he emerges from the undergrowth, he stops dead. His right arm shoots out to the side, rigid, like the boom barrier at Pakke's West Bank entrance.

With that outflung arm he probably saves my life.

A TUSKLESS DILEMMA Tinku is a member of the Arunachal Pradesh Special Tiger Protection Force (STPF). He has been with the STPF since August 2013, posted first at Upper Dekorai and subsequently at Khari. His association with Pakke, however, began several years prior. When he was a lad just out of school, he began working at the Nameri West Camp as a beat guard, a 'daily wage' or 'casual' worker, earning Rs. 1,430 a month. "*Uss time main bhaag gaya thha...*" he says; "I ran away... I was terrified of living in the jungle."

On April 19, 2007, Forest Guard P.D. Majhi was shot and killed in an encounter with poachers in Pakke. Young Tinku was among the frontline staff called to the scene. "I will never forget what I saw that day," he says. "There was blood everywhere. Majhi sir's body was all stiff, hunched over. One of the poachers had been captured. Jaimala [a matronly camp elephant] was called for and they took Majhi sir to the Range Office on her back. Four men marched the poacher back on foot."

It was all too much for the boy. He left soon after, began a Bachelor's degree in Political Science in 2010, got married in 2011. That he found himself back with the Forest Department in 2013 was, he feels, inevitable. "I needed a job and you don't get many other opportunities out here."

He has been in the STPF for over six years now but remains a casual worker [see box on page 65]. He earns just Rs. 14,000 a month, plus (inadequate) rice rations. His wages, often delayed by several months, are effectively paid by the kilometre, since STPF personnel must walk a minimum of 200 M-STrIPES-logged km. on patrol per month.

We walk 8.5 km. together on that late January morning. He tells me about his wife and five-year-old son and how fortunate he feels that they live just a kilometre from the West Bank gate. Some of the STPF guards, he says, have families far away and get to go home just twice or thrice a year. He asserts that he is no longer the frightened boy in the jungle, describing several encounters with Pakke's famously aggressive *makhnas* (tuskless male elephants) and the time he saw a leopard at close quarters ("just a glimpse and it was gone"). He has learned that comradeship is at the heart of life in the jungle: "It's not as if we never feel tired when we are out on patrol, or afraid when we encounter an animal or a poacher. But we keep each other's spirits up. We look out for each other; we have each other's back."

As if to underscore that point, he stops me in my tracks as we emerge from that shortcut through the trees, just before we reach the water where, less than 10 m. away, a *makhna* stands mid-stream: massive, grey and glad to see us.

Although that last bit is probably not true – the erect elephantine member swinging between the *makhna's* hindquarters has more to do with the pre-*musth* state he is in. A good reason to keep absolutely still.

"We've made him uneasy, he may charge," Tinku whispers. But the *makhna* surveys us for a minute or 10, then lumbers into the tall grass and melts into the trees beyond. Giving him a wide berth, we carry on up the jungle.

"We've made him uneasy, he may charge," Tinku whispers. But the makhna *surveys us for a minute or 10, then lumbers into the tall grass and melts into the trees beyond. Giving him a wide berth, we carry on up the jungle.*

PART II: ALONG THE BACKBONE

Pakke is one of the last magical places on Earth. When I first came here five years ago, I was enchanted by its ancient, near-impenetrable rainforest. I listened to the night songs of elephants, and heard Great Hornbills barking at dawn, and spent my days witnessing the rewilding of a rescued bear cub. I also encountered Schrodinger's elephant – a *makhna* who both did and didn't chase me for a breathless kilometre down a jungle path (I never looked back to check).

No irate elephant ushers me through the jungle near the West Bank Range Office this morning. My only companion is Sanjay Tisso, who has worked in Pakke since 2007, first with the anti-poaching squad and subsequently with the STPF. (Sanjay is also something of an artist; his murals adorn the tourist centre at West Bank.) Waiting to accompany a VIP safari arriving from the Pakke Paga Hornbill Festival in nearby Seijosa, he is in full uniform, scrubbed and shining from cap to boots, and armed with a .315 rifle.

The Forest Department provides each STPF guard with a raincoat, a pair of jungle boots and enough cloth to get a shirt and a pair of trousers stitched. The uniform and boots, to be worn in field conditions day after day, are required to last a year. (Field staff hadn't received replacements in two years when I visited). "Earlier we also used to get a torch, an umbrella and a mosquito net if there was a tiger or elephant census," Sanjay says. "But not in recent years." The headlamp he wears on night patrol, the dark green jacket with which he keeps out the winter chill – he bought them himself, from a local market.

Even firearms, it seems, aren't always deemed essential: there has been a crippling shortage of weapons for Pakke's frontline staff for several years now. And for once funds aren't the issue; the state government hasn't got around to clearing the purchase of weapons, despite repeated entreaties.

Like the other STPF guards Sanjay received six months of overdue wages just a day ago. STPF personnel get their wages through Project Tiger, a Centrally Sponsored Scheme. The issue seems to be that the state government, which has to contribute just 10 percent of the funds, holds up the entire disbursement until it can release its share. "It's an impossible situation to be in," Sanjay says. "Only we know how we run our households without a salary. Our children's education suffers. We can't even buy them a toy during the festive season."

The men are in good spirits, having received their overdue wages. There is a palpable sense of relief, even though they know it will be short-lived. "We live on borrowings; we have debts to pay off with interest. The money will soon be gone," Lokhiram says.

THE EMPTY HOUSE From West Bank to Khari to Upper Dekorai I go, past Tarzen and Rhino Camps and beyond Nameri West where an artificial salt lick attracts wild buffalo, sambar and elephants every afternoon. Through the singing Nameri river to the Nameri East Camp, located in a clearing at the tri-junction of jungle roads.

With its occupants out on patrol, Nameri East seems desolate; a study in concrete grey and rusted tin, solitary in its solar-fenced cocoon. There is a rudimentary kitchen amidst the 16 pillars on which the camp is perched. Four wooden benches, low enough to

BELOW *The Pakke Tiger Reserve lies in the foothills of the Eastern Himalaya. Its thick rainforest trails and undulating elevation make patrolling a challenge. STPF personnel must patrol a minimum of 200 M-STrIPES-logged km. per month in this rough terrain.*

PARO NATUNG

PARO NATUNG

squat on, gather around a stonehenge stove top. It is here that the men will sit when they return in the early evening, here that they will cook and eat, and share their stories and songs.

The living quarters are up the stairs, beyond a heavy trapdoor. There is a storeroom for grain and other supplies, a tiny toilet, and two rooms with rough-hewn beds sidled into the corners. There are quilts and sleeping bags here, and clothes hanging off nails on the unpainted walls. There are toothbrushes and razor blades, a porcupine quill, a needle and thread, a bottle of Nivea face wash.

A ginger moggie pokes a paw out from under one of the doors, thinking its humans are home. Nothing else stirs.

Forgotten or not, they walk. From daybreak till twilight, day after day, they walk out on patrol. And under the moonlight, they walk out on patrol. And through the pandemic and its lockdowns.

PART III: TIPI TIPI TAPPED

Range Forest Officer Kime Rambia is worried about his 'boys.' This is not unusual, since Rambia is the kind of officer who is always worried about his boys, as he calls the field staff working in his Range. It is, indeed, the measure of the man – every conversation veers towards his boys and the hardships that they face in the field.

As we drive out from Nameri East past Sukha Nala I and II, Diji Camp and Denai Camp, Rambia tells me how delayed wages force the men into a cycle of debt and repayment. He tells me of the men who, disheartened and desperate, left Pakke never to return. We reach Bhalukpong Ghat and cross the Tipi River by country boat, and he tells me of the men who died on duty – six in the six years that he has been in Pakke. Just yesterday, Ramesh Orang, a beat guard training to be an elephant helper, was killed by a captive elephant at Doigurung Camp in the Seijosa Range.

Rambia drops me off at the Tipi River Camp. When we speak again six months later, I ask him how he fared during the nationwide lockdown. "The lockdown was announced without warning and we had problems arranging rations for staff in the anti-poaching camps initially. We also had to step up night patrolling and there were a couple of

FACING PAGE *STPF frontline workers are seen rafting across the Kameng river near the Tipi range on a route fraught with danger. Pakke is flanked by the Kameng river to the west and north, and the Pakke river to the east.*

encounters with poachers. The boys have had a tough time of it. Some of them haven't seen their families in months," he says worriedly.

It is, indeed, the measure of the man.

BY THE JADE RIVER The Tipi River Camp stands on a rise next to the river. It is an austere structure, just three bare rooms and a toilet raised up on stilts. Field staff don't reside here – this is a transit camp used to patrol some of the more inaccessible parts of the Tipi Range – so it lacks the lived-in feel (and furniture) of other camps.

Last night, the four STPF guards I'm with – Nabam Rakesh, Tangru Sangchoju, Lokhiram Ronghang and Chandan Patro – slept on the concrete floor in their sleeping bags. Now, at 6 a.m., they are reheating our dinner (potato curry, rice and a local *saag-patta* I can't remember the name of) so we can have a bite before the day's patrol.

Rakesh, who is 23 years old, has been with the STPF for six years. He shows me a camera-trap image he has on his phone: the leopard that nearly killed him three years ago. "He came up behind me when I went down to the river to collect water", he recalls. "He had me in his jaws. I remember the blood and the pain. I don't know how I got away."

Never one to play second fiddle, Tangru (49 years old and a former hunter) also has a photo to show me. Not of the wild elephant that once trampled him, but of a high-rise in Delhi, which he recently visited for the premiere of an Animal Planet documentary he had a starring role in.

The men are in good spirits, having received their overdue wages. There is a palpable sense of relief, even though they know it will be short-lived. "We live on borrowings; we have debts to pay off with interest. The money will soon be gone," Lokhiram says.

But they shrug off their troubles and fears as they have a thousand times before and get to work. A rubber raft is unpacked, inflated and carried down to the river. We row across the jade water to a beach on the other side. The team's details are entered into the M-STrIPES app and the day's patrol begins.

This is the toughest jungle terrain I have ever walked: tripping, snarling creepers, squelching 60-degree ascents, and the kind of undergrowth your legs vanish into only to be found a kilometre later. We stop to examine camera traps at three *pukris* (ponds); the images show elephants a-chillin', sambar deer a-wallowing and a family of civets feasting on frog eggs. I learn from Rakesh that placing dried elephant dung on a camera trap will keep animals from messing with it. I learn from Lokhiram that a leaf skilfully folded can become a cup to drink from a stream. I learn from Chandan that the creeper he calls '*pani lota*' can be a source of fresh water in a pinch. And Tangru, like a proud parent showing off his rainforest's repertoire, brings me an assemblage of plant items: junglee adrak *Cheilocostus speciosus*, the sweet and earthy bark of gonsorai *Cinnamomum cecidodaphne* and the stretchy resin from a giant '*labber*' (rubber) tree *Ficus* sp.

We return to the camp in the afternoon along a treacherous rocky path I have labelled 'Bouldersmort' in my notes. An eight-kilometre patrol according to M-STrIPES, but I am totally leached, and leeched. At twilight, just as the hornbills start settling into the trees opposite the camp, I leave Pakke.

I leave, and gradually I forget. On my desk the *labber* loses its elasticity, the *gonsorai* bark loses its scent. I forget about Tinku and Sanjay, Tangru and Rakesh, Lokhiram and Chandan.

But forgotten or not, they walk. From daybreak till twilight, day after day, they walk out on patrol. And under the moonlight, they walk out on patrol. And through the pandemic and its lockdowns.

Across riverbeds where pugmarks glisten in the soft blush of dawn. Through jungles so dense that every step is a negotiation. They walk, and returning to their camps, they cook and eat a modest meal, and sleep a weary sleep on creaking beds, or huddled together on a concrete floor.

The next day they walk again. Sometimes never to return, for death is a companion that accompanies them on patrol every day.

They die by tooth and claw, in encounters with elephants, and by the poacher's bullet. They die, too, by the slow strangle of our indifference. Under-equipped and poorly paid, sometimes unpaid for months on end.

And yet, they walk.

Ignored, unappreciated, invisible, they patrol this slice of paradise.

Pranav Capila is an editor and writer who tells stories about wildlife, wild spaces, and unsung heroes on the frontlines of conservation.

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PRESENT

THE SANCTUARY WILDLIFE AWARDS

Co-sponsor

Greenko

The Sanctuary Wildlife Awards were instituted in the year 2001 to recognise and draw national attention to the contribution of individuals working for the protection of wildlife and natural habitats in India. We invite nominations and entries from Sanctuary readers, which should be sent to reach us no later than ***August 31, 2021*** *Send entries to: Sanctuary Wildlife Awards 2021, 145/146, Pragati Industrial Estate, N.M. Joshi Marg, Lower Parel., Mumbai 400 011 or email: admin@sanctuaryasia.com*

Lifetime Service Award

Criteria: An individual whose life has been devoted to the protection of wildlife species or their habitats on the Indian subcontinent.

We are in search of a true hero; someone whose life's purpose and respect for nature can be held out as an inspiration to the youth of India.

Nomination Form

Lifetime Service Award

Name of candidate: _____

Sex: M/F Age: ____ Occupation: _____

Place of work: _____

Address: _____

_____

City: _____ State: _____ Pin: _____

Tel.: _____ Email: _____

Proposed by: _____

Occupation: _____

Address: _____

_____

City: _____ State: _____ Pin: _____

Tel.: _____ Email: _____

Signature: _____ Date: _____

Seconded by: _____

Occupation: _____

Address: _____

_____

City: _____ State: _____ Pin: _____

Tel.: _____ Email: _____

Signature: _____ Date: _____

What qualifies your candidate for the Award? (attach sheet)

Wildlife Service Award

Criteria: Individuals currently working in the field who have displayed extraordinary courage, dedication and determination in the arena of wildlife conservation.

We are in search of inspired wildlifers, forest employees, researchers, villagers or anyone currently involved in nature conservation in the field who have set personal standards for others to follow.

Nomination Form

Wildlife Service Award

Name of candidate: _____

Sex: M/F Age: ____ Occupation: _____

Place of work: _____

Address: _____

_____

City: _____ State: _____ Pin: _____

Tel.: _____ Email: _____

Proposed by: _____

Occupation: _____

Address: _____

_____

City: _____ State: _____ Pin: _____

Tel.: _____ Email: _____

Signature: _____ Date: _____

Seconded by: _____

Occupation: _____

Address: _____

_____

City: _____ State: _____ Pin: _____

Tel.: _____ Email: _____

Signature: _____ Date: _____

What qualifies your candidate for the Award? (attach sheet)

Guidelines: Nominations must be kept confi dential from the candidate. ● Nominations must be proposed and seconded by individuals/organisations who know the candidate well. ● A brief note (around 500 words) on the achievements that qualify the candidate for the award should be attached along with a biographical note (around 250 words) and photographs of the candidate at work. ● Details of specific instances/examples demonstrating the candidate's committment together with details of the issue he or she is tackling. ● Press clippings/published material, if any, by or about the candidate or the candidate's work may be included. ● Any other supporting material for the benefit of the judges may be included.

Green Teacher Award

Criteria: An individual currently working to communicate wildlife and conservation values to students in Indian schools or colleges.

We are in search of an individual with a missionary zeal who is setting an example for other teachers to follow. Creativity, leadership qualities and a proven track record of working with young persons in a rural or urban setting is imperative.

Green Teacher Award Nomination Form

Name of candidate: _____

Sex: M/F Age: _____ Occupation: _____ Place of work: _____

Address: _____

_____ Tel.: _____ Email: _____

Proposed by: _____ Occupation: _____

Address: _____

_____ Tel.: _____ Email: _____

Signature: _____ Date: _____ Seconded by: _____

Address: _____

_____ Tel.: _____ Email: _____

What qualifies your candidate for the Award? (attach sheet)

Guidelines for Green Teacher Award: Nominations must be proposed and seconded by individuals/organisations who know the candidate well. ● A brief note (around 500 words) on the achievements that qualify the candidate for the award should be attached along with a biographical note (around 250 words) and photographs of the candidate at work. ● Any other supporting material for the benefit of the judges.

Young Naturalist Award

Criteria: An individual between the age of 16 and 25 on August 31, 2021, who shows extraordinary caring and respect for nature.

We are in search of a young naturalist or conservationist, for whom the study and defence of nature is the purpose of life, whose actions speak louder than words and who inspires hope for the future.

Young Naturalist Award

Name: _____ Sex: M/F Age: _____

Occupation: _____ Address: _____

_____

_____ Tel.: _____ Email: _____

Proposed by: _____ Address: _____

_____ Tel.: _____ Email: _____

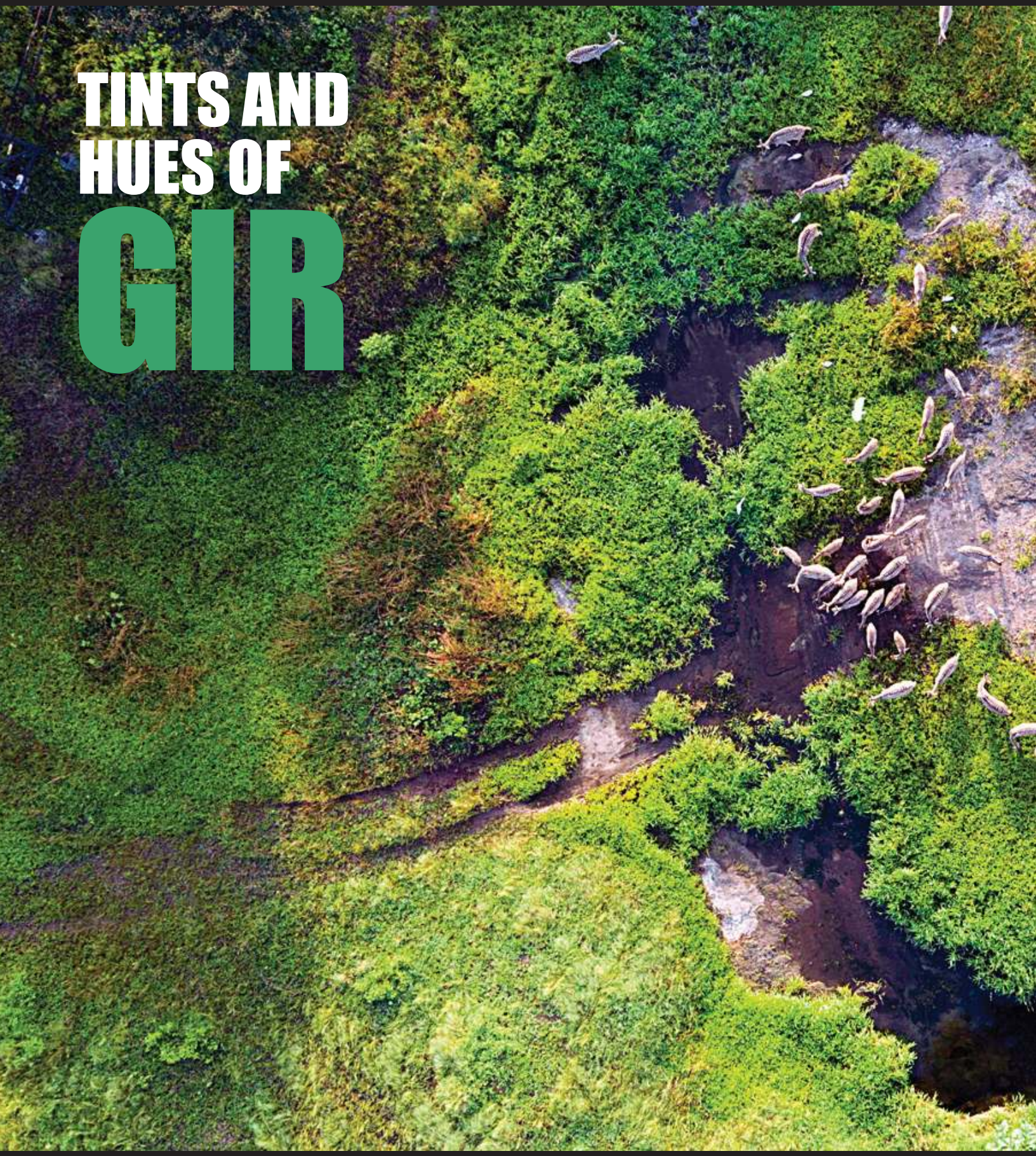
What qualifies your candidate for the Award? (attach sheet)

All awards are subject to the following conditions

The contest is open to everyone except Sanctuary Nature Foundation, DSP Investment Managers Pvt. Ltd., IndusInd Bank and Greenko employees or those directly associated with the organisation of the contest. The winners will be chosen by a panel of judges, appointed by the Sanctuary Nature Foundation, whose decision will be final. In the event that entries do not meet the judges' standards, the organisers reserve the right to refrain from making an award.

Sanctuary
NATURE FOUNDATION

TINTS AND HUES OF GIR



Text and photographs by
Dr. Moham Ram IFS

The passage of seasons is marked by a flourish of colours that sweep across the deciduous forests of Gir, Gujarat. Summers between March and June, turn the forest bronze, with grasses turning gold and trees brown. The heat now weighs heavy on the land as the canopy cover falls away. By May, the forest floor is clothed by a leaf litter carpet. Occasional winds cause dry leaves to rustle, producing a melody that defines forest summers. Water now virtually disappears, and the Forest Department creates artificial water sources where wildlife congregate. This is when the 'ghost tree' *Sterculia urns* sheds its leaves, but, unlike most other trees, its bare branches continue to sport dense orange-red flowers that droop downwards from the ends of its branches.

The monsoon arrives in mid-June and waters the land all the way to October. An earthy fragrance now wafts through the forest. The first showers awaken the soil, from which fresh vegetation springs, and turns the forest green. This is when all manner of life forms are able to sustain their new families. The air now reverberates to the sound of birds and insects, and at night, fireflies put up their spectacular displays. Streams and rivers eventually spring to life, and their gurgling draws lions, leopards, jackals, langur, and birds to the life-giving waters.

A chital herd feeds on fresh monsoon grasses that emerge when the rains arrive, turning the scorching, dry heat of summer into a verdant wonderland.

When the monsoon recedes, Gir's green gables are slowly transformed, with mere patches of green remaining. The moist air is replaced by dry cold winds as they await the next season of plenty. Within larger seasonal cycles, smaller cycles create microhabitats to which plants have learned to adapt. Trees prepare for the dry season ahead, having shed their green hues to display vibrant reds, oranges and yellows.

Soon, the sky clears, the days grow short and a slow chill begins to set in. Mango trees flower, filling the surroundings with their fragrance. As temperatures drop, cold-blooded mugger crocodiles emerge from the burrows and can often be seen basking in the sunlight. Between November and February, winter migrants including Himalayan Griffons, Eurasian Griffons, Egyptian Vultures, Cinereous Vultures, together with a diversity of eagles, buzzards, rollers, shrikes, flycatchers, waterfowls, and ducks turn Gir into a birders' paradise.

Walking the many trails at Gir forest, termite mounds, locally called *raafdo*, stand cathedral-like, all naturally engineered using moist soil and saliva. These structures turn into thermoregulators for termites to maintain humidity, temperature and soil health. Interestingly, termite activity together with mound construction helps create nutrient-rich patches. It is known that termite mounds influence floral diversity. In this, the last bastion of *Panthera leo persica*, lion numbers have risen steadily and are now estimated to be not less than 674 individuals as per the last official estimation. The Asiatic lion evolved from its African counterpart, possibly migrating from Africa to the Arabian peninsula into southern Europe… and then India.

TOP *A male Asiatic lion* Panthera leo persica *paces the parched Gir forest that retreats under the relentless summer sun.*

LEFT *While most trees shed their canopies in summer, the flame of the forest trees* Butea monosperma *colour the landscape orange and crimson with their extravagant blooms that sustain a myriad pollinating lifeforms ranging from bees and butterflies to squirrels and monkeys.*

Though Gir is not a savanna, it has proven to be a perfect habitat for the lion, with entire prides capable of disappearing into their sand-coloured landscape as if by magic.

Gir throws up unique ecological canvases as one season melds into another, making a visit to this natural haven a journey to remember.

Dr. Mohan Ram is an Indian Forest Service Officer (IFS) and is currently the DFO, Wildlife Division, Sasan-Gir, Gir National Park and Sanctuary. He has a keen passion for forest and wildlife conservation and is an alumnus of the Indian Agricultural Research Institute, New Delhi.

LEFT *Also referred to as* navrang *for the nine colours of its vibrant plumage, Indian Pittas* Pitta brachyuram *sift through the forest floor for insects and other delectables that emerge during the monsoon.*

BELOW *Winter has ended, another seasonal cycle laid to rest. Within larger seasonal cycles, smaller cycles create microhabitats to which plants have learned to adapt. This tree seems to be preparing for the dry season ahead, having shed its green hues to display vibrant reds, oranges and yellows.*

FIRE OF THE SUN

An inhabitant of high-altitude oak and coniferous forests, the plumage of the Fire-tailed Sunbird *Aethopyga ignicauda* sports what seems like all the hues of a setting sun. Both male and female counterparts appear similar, except in the breeding season.

Between May and June, over the past five years, photographer Kallol Mukherjee faithfully visited the subtropical forests of eastern Sikkim in search of the Fire-tailed Sunbird and the Himalayan Monal. He visited Nathang valley, where he often encountered Fire-tailed Myzornis, Golden Bush Robins, and a variety of fulvettas.

Much to his delight, one morning, while walking at about 3,000 masl., amidst a thick understory of rhododendron trees across a one-kilometre stretch, he stumbled upon no less than 20 sunbird nests. Unlike females and juveniles, the tails of breeding males are significantly longer, which helps identify them. Mukherjee watched in silent amazement as males jousted in pairs for a better perch, frequently taking to the air as their duels intensified.

Fire-tailed Sunbirds are the highest dwelling of most sunbird species, found up to 5,000 masl. across their range, which is largely limited to the Eastern Himalaya. Though listed as 'Least Concern' by the IUCN Red List, an accurate population size of this species has not yet been recorded. Meanwhile, their fragile mountain habitat continues to be sliced by linear intrusions, large swathes of old-growth trees are felled relentlessly, and waterways choked by hydrothermal projects.

We in India are surely better than this!

PHOTOGRAPHER: Kallol Mukherjee
LOCATION: Zuluk, East Sikkim
DETAILS: Camera: Nikon D850 Lens: Nikon 300 mm. with 1.4 TC II, Aperture: f/5.6, Shutter speed:1/1600, ISO: 1600, Focal length: 420 mm.
DATE: May 21, 2019, 8:40 a.m.

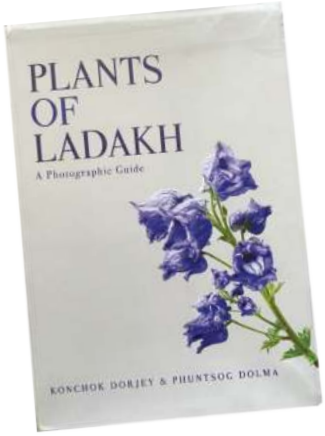
THE MUD ON BOOTS PROJECT

August 2021

Maps and Books in Ladakh

In Rong valley, Ladakh, Project Leader Phuntsog Dolma continues to identify and map pasturelands. Covering Teri and Kyungyam villages between March and April, she went on to map pastures in Tarchit and Himya villages. This involved weekly surveys with breeders, local farmers and site visits. In total she identified and mapped 13 pastures over the past two months. Phuntsog also created a checklist of plant species found during her surveys, and was able to document 12 native species in the mapped areas.

Meanwhile, an exquisite new field guide 'Plants of Ladakh - A Photographic Guide' published by the Nature Conservation Foundation – India spotlights the rugged flora of Ladakh. Researched and written by Phuntsog and Dr. Konchok Dorjey, the book is a valuable addition to India's natural history documentation.



Flowering plants of the Aconitum *genus that thrive in Ladakh's desert landscape are traditionally valued for their pharmaceutical properties.*

Growing up on stories about local biodiversity told by her grandparents, Phuntsog developed a keen interest in studying the plant diversity of her homeland. As an adult, her work with the Sheep Husbandry Department has allowed Phuntsog to explore and observe the faunal diversity of the region. Her co-author Dr. Konchok Dorjey is an Assistant Professor of Botany at EJM College, Leh, and is a recipient of the prestigious Dr. A.P.J. Abdul Kalam Scientific Excellence Award 2020 for his contribution in the field of ethnobotany and mycology.

Over the past four years, Dr. Dorjey and Phuntsog have trekked across the region to collect, identify, and document plant species. The book includes nomenclature, botanical features, indigenous uses and excellent photographs of 193 species of plants found in this high-altitude, arid landscape.

Forest Restoration Near Chapramari

In West Bengal's Panijhora forest village, local residents joined the Forest Department in a month-long forest restoration effort in the periphery of the Chapramari Wildlife Sanctuary! The sanctuary borders the village, and its edges have been degraded by anthropogenic pressures over the years.

Project Leader Amir Chhetri along with 35 volunteers joined Forest Department staff to clear invasive species and plant native species, including those that are palatable

The Chapramari forests, where elephants, rhinos, gaur and leopards roam, are contiguous with the Gorumara National Park.

to wild elephants! In the 20 days preceding the paddy planting season, the local team planted over 2,000 saplings of species such as *Dillenia indica, Lagerstroemia speciosa, Mallotus philippensis, Magnolia champaca,* and *Phyllanthus emblica* on the outskirts of the sanctuary.

"The plant species consumed by elephants change according to the forest type from place to place. Hence it is not advisable to plant the same fodder plant species everywhere. It has to be appropriate to the landscape. Moreover, if plantation is done within the forest land, care should be taken to plant native species so that the ecology of the forest type is not disrupted," says Priyanka Das who has previously studied forage selection by Asian elephants across land use and land cover types in North Bengal. Priyanka now works closely with Amir and the Forest Department on issues and studies related to human-elephant conflict through The Coexistence Project.

Rewilding in the Himalaya!

Project Leader Vishal Ahuja is dedicatedly working with community members and the Forest Department to rewild abandoned terraces around the Khajjiar-Kalatop Wildlife Sanctuary in Himachal Pradesh. For this, Vishal is guiding government nurseries in the selection and nurturing of native food plant species, getting enthusiastic consent from farm owners for the project, involving youth in plantation activities, and collecting wild plant seeds.

Over the past few weeks, with support from Khajjiar Seva Samiti and the help of 12 young volunteers from the Khajjiar Mandir Committee, Vishal planted 300 native tree saplings, including Indian horse-chestnut, wild Himalayan pear, and wild Himalayan cherry, in degraded areas around the sanctuary. In addition, 80 saplings of eight wild fruit species were planted at a local farm whose owner has agreed to utilise her land for restoration work.

Vishal's work is guided by Dr. Sanjay Molur, Executive Director, Zoo Outreach Organisation. Dr. Molur says: "Vishal's new found enthusiasm that combines conservation science with social sciences, has led to several outreach and networking efforts to bring about an attitudinal change among farmers. Based on his findings on wild mammal natural resource utilisation, he has been successfully reforesting areas around the Khajjiar-Kalatop Wildlife Sanctuary with the help of farmers and the Forest Department. This will reduce negative interactions between humans and wildlife and also pave the way for a bigger rewilding effort."

Musician, family man, amateur botanist, conservationist – Vishal Ahuja is quietly working to restore a slice of paradise in the Western Himalaya. A true mud-on-boots inspiration!

Vishal Ahuja is spearheading rewildling projects around the Khajjiar-Kalatop Wildlife Sanctuary.

Feral Dogs in the Desert

In May, residents from Khetolai village in Pokhran reported five chinkaras being attacked by free-ranging dogs. Three of these were rescued, provided first aid by a local veterinarian and released back into the wild by Project Leader Radheshyam Bishnoi. Radheshyam regularly reports incidents of dog attacks on wildlife in this critical Great Indian Bustard landscape of Jaisalmer. The region is no exception to the nationwide concern about the number of feral and free ranging dogs (see page 92) and their impact on wild populations.

Studies suggest that India is home to an estimated 60 million dogs, the fourth highest in the world. Impacts such as direct predation and competition with wild predators for prey, disturbance to ecosystems, transmission of diseases, and interbreeding with closely related species have been studied and reported by various researchers, experts, photographers and organisations, throughout the country. Mud on Boots Project Coordinator Maitreyee Mujumdar recently wrote an appeal for urgent and humane intervention to address the impact of feral dog population on wildlife in India to the Ministry of Environment, Forest and Climate Change.

As an earnest conservationist and trusted member of the community, Radheshyam regularly patrols the landscape, recording threats to wildlife and cautioning the local Forest Department of any unnatural disturbances. In the past two months, Radheshyam reported seven incidents of poaching in the region, and assisted the Forest Department in apprehending the accused. Seven poachers were arrested during three different incidents, which were also reported in the local newspaper.

A free-ranging dog approaching a Critically Endangered Great Indian Bustard in Pokhran, Jaisalmer.

ADITYA JOSHI/WCT

FORENSICS VS. WILDLIFE CRIME: A BATTLE THAT MUST BE WON

Wildlife crime has ballooned into a multi-billion-dollar industry that has not only caused species extinctions on a mass scale, but has also devastated economies, lives, and livelihoods. In 2016, the annual value of the illegal wildlife trade was estimated at up to US$23 billion by the United Nations. A large percentage of this blood-stained money is estimated to be funding global terror groups and militias.

Unfortunately, wildlife investigations continue to fall short because of poor understanding and faulty handling of evidence, lack of infrastructure, training, support and funding. In India, low conviction rates and poor quantum of judicial punishment makes wildlife crime a low-risk-for-high-reward transaction. Enforcement agencies are caught in a perpetual arms race of sorts with the ever-evolving modus operandi of wildlife crime perpetrators. If they do not adapt, they will continually be a step or two behind wildlife trade operatives.

Fortunately, in recent years, forensic science (see also Keshav Kumar) is fast becoming our strongest ally to stop and stem the illegal wildlife trade, the world's fourth largest and most profitable organised crime industry, ranked only below drug, human, and arms trafficking. "Every contact leaves a trace," states the 'Locard's Exchange Principle', a simple, powerful premise on which forensic science rests. Any crime scene is replete with evidence that can be scientifically interpreted by a trained eye. Forensic analysis can help investigating agencies build a water-tight case that can withstand scrutiny in the court of law and bring perpetrators to justice.

Wildlife Forensics Head at the Wildlife Conservation Trust (WCT), **C. Samyukta**, speaks with Conservation and Science Writer **Purva Variyar**, on the power of forensics.

TELL US WHAT FORENSIC SCIENCE REALLY IS…

It is an amalgamation of sciences used to establish links between the criminal, the crime scene, and the crime. Forensic scientists are trained to put evidence through a battery of tests to derive information to advance an investigation.

As with any other science, reliable results require time and patience. Unlike the glamourised version of forensics that TV shows have popularised (commonly referred to as the CSI effect), it is not a magic wand that will provide all the answers needed in the time frame of a single episode! Forensic science is powerful but has its limitations on the kind of information it can glean from evidence, and the process can take weeks or even months.

WHY IS THE BUSINESS OF WILDLIFE CRIME SO LUCRATIVE? WHAT IS DRIVING IT?

There are systemic issues behind this. Wildlife crime is largely ignored by policy makers. Stringent policies and suitable budgets to combat crime are lacking. Enforcement agencies are inadequately trained and/or set up for wildlife crime investigations, making it a secondary or tertiary priority for them. Wildlife crime cases that do reach the court are often so weakly constructed that they are dismissed prematurely or result in weak sentences. Collectively, these actions create a vicious cycle that allows wildlife criminals to believe that even if apprehended, they will get away with an easy sentence or warning. Wildlife crime is therefore at an all-time high and with each passing day, more species are falling victim.

WHAT IS THE POWER OF IMMACULATE EVIDENCE IN THE COURT OF LAW AND HOW DOES FORENSICS HELP TO CONSOLIDATE IT?

Just as a doctor would prescribe medicine based on the nature and severity of symptoms presented by a patient, the Criminal Justice System is designed to prescribe sentences based on the evidence quality and factual strength established by the investigating officers. Evidence is paramount to the delivery of justice.

A suspect is deemed innocent until proven guilty. No matter how compelling the testimony of investigating officers may be, the judge cannot take it into consideration unless it is corroborated by sound evidence. Here is where forensics makes a difference. Forensic reports prove evidence to be reliable and establish facts beyond reasonable doubt. However, if the evidence itself is thought to be compromised (a tactic employed frequently by defence lawyers), then its value could be nullified.

DAN BENNETT/PUBLIC DOMAIN

THE CONVICTION RATE IN WILDLIFE CASES IS DISMALLY LOW IN INDIA, LESS THAN FIVE PER CENT. WHERE IS THE LAW ENFORCEMENT AND JUDICIARY FALLING SHORT?

The hands of both are tied. Enforcement officers must be more aggressive in their investigations and ensure strict implementation of wildlife law. Judges need to be sensitised and given the tools they need to pronounce strict rulings. We can make a significant impact only when wildlife crime is tackled with the gravity it truly deserves. Policymakers will then have little choice but to create better measures and allocate sufficient budgets to combat wildlife crime. Surely, conviction rates are then bound to drastically increase, and the law will be a deterrent for traders and poachers.

WHICH ARE SOME OF THE FORENSIC LABORATORIES EQUIPPED TO ASSIST IN WILDLIFE INVESTIGATION IN INDIA?

There are a handful of laboratories in India that focus on wildlife forensics.

ABOVE *In Myanmar, body parts of tigers and other rare and endangered wildlife species are in huge demand. This is true of several Asian countries, largely for use in traditional Chinese medicine.*

FACING PAGE *An Indian pangolin, photographed in Central India. Pangolins are among the most imperiled species in the world. Poaching for pangolin scales and meat by the brutal wildlife trade is rampant.*

WCT

ABOVE *C. Samyukta (far right) interacting with forest staff as part of a Wildlife Crime Investigation and Forensics training programme organised by the Wildlife Conservation Trust.*

The Wildlife Institute of India (WII), Dehradun; Centre for Cellular and Molecular Biology (CCMB), Hyderabad; Advanced Institute for Wildlife Conservation (AIWC), Chennai; as well as laboratories set up by the Zoological Survey of India (ZSI) and the Botanical Survey of India (BSI) are among them.

Since wildlife crime investigations are pivoted on the accurate identification of the species targeted by the criminal, these labs are focused on DNA or morphological evidence. Sometimes, such identification may not be possible due to the paucity of 'standards' that enable forensic scientists to compare their results. Also, human evidence from wildlife crime scenes (such as clothing, firearms, vehicles, etc.) are required to reconstruct the crime scene and link the criminal(s) to it. However, forensic labs that work on human crimes are over-loaded with case work and often cannot deliver timely reports.

Of late, government agencies have taken serious cognisance of the need for both wildlife and human forensics facilities. The Centre and some states have begun building multi-disciplinary wildlife forensic labs; but their current development pace leaves much to be desired.

TELL US ABOUT WCT'S CRIME INVESTIGATION AND FORENSICS TRAINING PROGRAMME FOR FOREST STAFF ACROSS THE COUNTRY.

WCT has been working from the ground up to improve the capacity of forest staff to investigate and combat wildlife crime. Since forest staff, particularly forest guards, are the first responders at wildlife crime scenes, their actions there determine the case outcome. Lack of appropriate training has led forest staff to repeat the same errors at crime scenes that their predecessors made. To correct this, we have developed training programmes on evidence handling, and how to utilise evidence and forensic reports. All trainees are given kits to avoid crime scene tampering and to collect evidence scientifically. We now find

ILLUSTRATION: WCT

C. SAMYUKTA/WCT

that because of such training, guards are no longer intimidated by evidence.

We have held these programmes in several tiger reserves across the Central Indian Landscape and in other key tiger habitats. We expect that with increased implementation, both within and outside Protected Areas, forest officers will maximise the quality of evidence gathered to build strong cases with their improved investigative skills.

YOU HAVE ALWAYS STRESSED THE NEED FOR HEIGHTENED UNDERSTANDING OF WILDLIFE LAW AND CRIME AMONG LAWYERS AND JUDGES. WHAT IS WCT DOING ON THIS FRONT?

Along with policy makers and enforcement officers, lawyers and judges are key to curbing wildlife crime. In collaboration with state-level judicial academies, WCT conducts regular sensitisation workshops for judges, especially at sessions courts. We provide bursaries to ensure that good lawyers are available to Forest Departments. We have also created a moot court competition for law students to increase awareness about wildlife conservation and its challenges and to draw them to wildlife law practice. We hope that as a result of this, wildlife law is taught as a mainstream subject in Indian law schools and that sound legal talent is routinely available to enforcement agencies. Ultimately, this will result in the kinds of judgements needed to curb the trade.

THERE IS MORE TO FORENSICS THAN DNA PROFILING AND FINGERPRINT ANALYSIS. CAN YOU BRIEFLY TOUCH UPON THE DIVERSE APPLICATIONS OF THIS FIELD?

Forensics is an umbrella science. Sometimes a single case could encompass several sciences and even non-sciences, such as art, accounting, and architecture. For crimes such as murder and theft, investigators rely greatly on physical evidences from the crime scene, such as cigarette butts, poisons, firearms, and even the victim's body. Along with forensic DNA analysis, this could involve the use of disciplines such as forensic botany, dentistry, toxicology, medicine and ballistics. Recently developed forensic applications include cyber forensics and forensic accounting.

In wildlife crime investigations, there is great scope for application of varied forensics – both old school and new age. Depending on the crime, forest officers may need a forensic lab to analyse animal carcasses and parts, ammunition, vehicles, cell phones, weapons, identification documents, and more. Depending on the strength of the resultant information drawn, officers can create a strong case against the suspects. When possible, they could possibly go a step further and use new-age forensic techniques to investigate information and/or money exchange between the suspects and possible traders or buyers. Thus, forensic tools can be applied to all stages of the wildlife crime supply chain.

ABOVE RIGHT *Forest staff investigating a mock crime scene during a forensics training programme conducted by WCT.*

ABOVE LEFT *An illustrative depiction of wildlife crime scene management.*

COURTESY: W.FITCH/PUBLIC DOMAIN

The green birdflower *Crotalaria cunninghamii* is native to Australia's semi-arid deserts and coastlands. It blooms for a short period between January and April. Locally, it's known as the 'hummingbird' flower – for its large flowers and long petal keels that resemble the bird. It's been long debated if this uncanny resemblance is due to natural selection – a tactic to ward off predators, or perhaps attract certain pollinators (the flower is pollinated by insectivorous birds, bugs and bees), a concept known as Batesian mimicry. The same debate prevails for the monkey orchid *Dracula simia* and the moth orchid *Phalaenopsis*.

The Sanctuary Papers

By Abinaya Kalyanasundaram

MATTERS OF THE HEART

Giraffes are known to have the longest neck proportions in the animal kingdom today. As effective as it is to reach the top leaves of their favourite acacia trees, there are some disadvantages to this length. Adult giraffes can grow up to six metres tall, and so their hearts need to work really hard to pump blood to the head. So much so that to achieve the optimum blood pressure of 110/70 (for mammals) at the head, the blood pressure at the heart is a whopping 220-280/180! Such high pressure would, in humans, thicken the heart muscles and cause fibrosis in the left ventricle (which is the side that pumps blood to the head), and over time lead to heart failure. But giraffes, scientists noticed, have evolved innovative damage control mechanisms. While they do exhibit thickening of muscles, they do not develop fibrosis, thanks to the gift of mutations in five genes related to fibrosis. To avoid heart failure, they also have a larger ventricle and an extended ventricular-filling phase, which allows more blood to be pumped per stroke. And that's not all! To avoid knee swelling, a common side effect of hypertension, they possess a tight wrapping of dense connective tissue in the region, which act like support stockings that BP patients use. Evolution truly is amazing!

PUBLIC DOMAIN

THE HUMAN SYNDROME

PUBLIC DOMAIN

For millions of years, New Zealand's forest, shrubland, and subalpine ecosystems were home to large flightless birds called moas. Endemic to the island, nine moa species thrived, the largest *Dinornis robustus* and *Dinornis novaezelandiae* reaching about 3.6 m. (as tall as a bus!). They grazed on vegetation and laid eggs. Their only natural predators were the massive Haast's Eagle, the largest eagle believed to have existed. However, the moas began to decline once humans arrived on the island, as New Zealand's 80 million year isolation meant its ecosystems were quite vulnerable to new species. In the 13th century, the first *Mori* (indigenous Polynesians) arrived and found the hapless flightless moas easy food. In addition to grabbing moa eggs, they also cleared vegetation, impacting the herbivorous birds. Moas went extinct, in less than a hundred years, according to recent carbon dating evidence. The Haast's Eagle too vanished soon after, its main prey species gone.

Did You Know?

When ambushed by sudden floods, fire ants form rafts by linking their bodies together so they can float to a safer, dryer region. These can be really large, with 100,000 individuals in a raft, with the workers on the side and the queen protected in the middle.


PUBLIC DOMAIN/ANSELMUS BOËTIUS DE BOODT


PUBLIC DOMAIN/ANSELMUS BOËTIUS DE BOODT

OF SPINES AND QUILLS

Defense mechanisms are vital for survival in the wild, and all creatures have evolved their own unique traits. Some use poison, some camouflage, while some like the hedgehog and porcupine have turned hair into weapons. While hedgehogs have short spines on their back, porcupines have longer quills that they use to defend themselves from predators. A study into the morphology and mechanics of a hedgehog spine and porcupine quill revealed some interesting differences. It appeared that the former's spines, which are hollow hair made of keratin, are as short as possible and can bear loads because of internal stringers and septums, which prevent buckling. The porcupine's quill on the other hand is proportioned to be as long as can be and bend easily if loaded. This led them to conclude that the porcupine prefers to use its quills to keep predators as far away as possible, while hedgehog's spines' main function is to absorb shock if it falls, which scientists say is quite common as they are quite clumsy and climb trees in search of insects.

> The octopus *Callistoctopus furvus* was first described in 1852 but was forgotten to science until 2018, when local Brazilian fishermen alerted scientists to their existence.

LOST AND FOUND IN THE MEDITERRANEAN


PUBLIC DOMAIN


PUBLIC DOMAIN

About 170 years ago, researchers on the United States South Seas Exploring Expedition that roamed the Pacific Ocean collected, among others, specimens of strange octopuses from a seafood market in Rio de Janeiro. Red with white spots and a small head, the species was declared new to science by American naturalist Augustus Addison Gould. It was named *Callistoctopus furvus* in 1852. However, no specimens of this cephalopod were subsequently recorded and some scientists were convinced that it had most probably been that of *C. macropus*, a similar species found in the Mediterranean. That is until about 2013, when local Brazilian fishermen informed a graduate student researching octopus species in Brazil, Manuella Dultra, about 'a strange octopus that only appeared in shallow waters when the wind changed and blew from the east' and would 'bury itself in sand when approached'. After years of study and working with local farmers, the species was found to be the *C. furvus* Gould described all those years ago!

Did You Know?

The pudu deer is the smallest deer in the world at 30-40 cm. height and lower than 15 kg. in weight! There are two species of pudu – southern and northern – that live in the temperate rainforests of South America and are solitary herbivores.

SQUEAK OF "DEATH"

The death's head hawk moth *Acherontia atropos* has a sinister reputation. Perhaps it's the skull-and-crossbones pattern on its head. Known to be a death omen in many cultures, this reputation was further sealed when it was featured in the classic horror 'The Silence of the Lambs', where it was stuffed down victims' throats by the film's murderous villain. In real life, though, this large moth species (80 to 120 mm.) is just an everyday moth found throughout Africa and southern Europe. It is gorgeous with dark upper wings, that are a stark contrast with the bright yellow of its lower wings. It has one more unusual trait – a sharp funny squeak. Turns out, the species has a two-part, accordion-like system and its rapid movement produces sound. First, it sucks in air, causing the epipharynx, a flap between the mouth and throat, to rapidly vibrate. The air is then expelled with the flap open, creating a second sound. This happens at a fifth of a second! The moth's behaviour of feeding on honey would have allowed it to develop strong muscle movements and the epipharynx, which make the sound production possible. The death's head hawk moth squeaks to deter predators such as birds and bats.

PUBLIC DOMAIN

{ Venus flytraps shut their clamps in about 1/10th of a second once they detect stimuli, but the digestion process for an average insect takes up to 10 days. }

VENUS FLY TRAP

Described by Charles Darwin as "one of the most wonderful [plants] in the world", the venus flytrap *Dionaea muscipula* is a fascinating marvel. Growing in the subtropical wetlands of North and South Carolina, USA, it is one of the smartest carnivorous plants out there. The small plant has a rosette of seven or eight leaves, each of which are armed with a 'trap' hinged at the midrib. The two lobes of the trap secrete nectar to attract insects, and hang open like a clam. When an unsuspecting insect bumps into the lobes' inner sensory hairs, electric signals spread across the leaf and it clamps shut! But it's not that simple. See, it could have been a stray raindrop or wind that triggered the sensory hair. So how does the plant know it's an actual prey? It calculates time… only if the hairs are triggered twice or thrice in a 30 second period, they clamp shut!

Scientists at the National Institute of Basic Biology in Okazaki, Japan, found that changes in calcium concentrations inside leaf cells helped the plant keep time. They genetically modified Venus flytraps to emit green fluorescence when calcium ions were present. When sensory hairs were stimulated, they observed a green glow indicating increasing calcium ion concentrations. The glow gradually dropped until a second stimuli raised the concentration again. When a certain threshold was reached, within 30 seconds, the trap clamped shut.

PUBLIC DOMAIN/ALICE LOUNSBERRY

Did You Know?

Sea otter moms lick their babies' fur for hours in order to make their hair fluffier with tiny air bubbles caught in between. This helps them float and stay buoyant and also keeps them warm!

COURTESY SAHJEEVAN

THE BANNI

Indigenous Breed Conservationists in an Arid Grassland

By Divya Kilikar

In north western Gujarat's Kutchh district, just south of the marshy salts of the Rann of Kutchh, is a vast arid grassland. Stretching over 2,000 sq. km., the Banni grasslands are home to tiny hamlets where tribal communities rear livestock breeds unique to the region. Camels that can swim through swamps, donkey milk that sells for thousands of rupees per litre – Banni's indigenous breeds thrive and ensure high productivity in a dry landscape with less than 300 mm. of rainfall. The perennial grasses of this ecosystem are so rare that some may not even have local names. Village elders tell stories of how their massive grassland home came into existence – Banni, which comes from *'banai'* or 'made', they say, was created by an earthquake in 1819. Before that the mighty Indus river is believed to have gushed through this region, allowing farmers to harvest a diversity of crops. Though this unique ecosystem was declared a Reserve Forest in 1955, its management lies with the Revenue Department.

For the past three decades, Sahjeevan, an NGO, has worked with the pastoralist tribes of Banni to revive their age-old ecological knowledge, employ scientific technologies to conserve traditional water systems, influence local governance to improve tribal lives and promote indigenous breeding practices. In 1991, the organisation began considering ways to promote sustainable rain-fed agriculture, protect seed diversity, map groundwater and provide drinking water to hamlets. A decade of dedicated efforts later, the team realised that to improve water and food security in a region where animal husbandry was traditionally practiced (as seen among indigenous communities in most arid regions worldwide), a focus on pastoralism was crucial. Communities such as the *Rabari* and *Fakirani Jat* manage a diversity of endemic breeds including Banni buffalos, Kahmi goats, Halari donkeys and Kharai camels.

In India, pastoralist breeds recognised by law are usually inducted into the dairy industry and the communities that rear them receive government support for breeding programmes. However, breeds

that do not enjoy such official status are considered 'nondescript' and receive little support. Banni buffalos and Kharai camels were some of the first to receive official recognition. The latter can survive in the arid, scrubby terrain as well as swim in mangrove swamps. Though primarily bred for milk and transportation, Sahjeevan recognised their potential to boost the local economy. In 2013, the NGO launched a project focused on marketing camel hair and wool. Kharai camels produce high quality wool that is water-resistant and durable, and the hair can be used to make carpets and ropes. In 2014-2016, Sahjeevan proposed a rapid survey of Kharai camels to the Department of Animal Husbandry of Gujarat, and a grant of Rs. 60 lakhs was sanctioned towards the study and conservation of 20 handpicked populations. In the years that followed, through meticulous documentation and consistent advocacy, Sahjeevan successfully facilitated the recognition of the Panchali sheep, Kachchhi-Sindhi horse, Kahmi goat, Halari donkey and recently in 2020, the Nari cow, reared in Pali and Sirohi districts of Rajasthan and Mehsana district of Gujarat.

A RELENTLESS STRUGGLE

Anthropogenic pressures continue to ravage the vulnerable ecosystem. Salt and cement factories are a common sight across Kutchh, thermal power plants spew pollution into its coastal waters, and a 41,500 MW hybrid renewable energy mega-park is under construction, steadily claiming 60,000 ha. of land. Such massive projects have unfortunately led to the marginalisation of communities, and adversely impacted traditional livelihoods. Mangroves, on which the Kharai camels, listed as 'Endangered' by the IUCN Red List, are heavily dependent for over eight months of the year, have given way to power plants. According to Mongabay, residents of Tunda Vandh village (of the *Rabari* community) in Mundra recall wistfully a time when nearly every household owned Kharai camels. During high tide, the sea water would often lap up to their homes, until two power plants encroached their lands and cut off waterflow by constructing a canal and a conveyor belt.

However, these challenges have only spurred the team into action and a focus was placed on governance to revive age-old livelihood systems. Partnering with organisations that aligned with their vision, Sahjeevan identified four thematic areas with specialised teams working on each – pastoralism, water security, biodiversity and urban landscapes. Sahjeevan, today, is synonymous with community upliftment across Gujarat, and is a member of the International Union for Conservation of Nature (IUCN). Ramesh Bhatti, a community member of the Banni, says that the recognition of grazing rights remains a challenge. "Pastoralists are essentially breed conservationists. We live in an environment that is extremely water-stressed that may seem to offer low ecological resources, but our way of life helps us adapt, and countless important indigenous breeds thrive, despite all the odds," he says.

Given that a majority of India's well-known cattle breeds were developed by pastoralists, Sahjeevan stresses on the importance of recognition for the "keepers of genes". Indigenous breeds are particularly important in an era where no landscape is exempt from climate disasters. India is home to anywhere between 20 to 30 million pastoralists from over 50 communities that live in pockets across the Himalaya, semi-arid and arid regions in western India and the Deccan Plateau. Alongside them, thrive indigenous breeds of goats, sheep, cattle, buffalo, pigs, horses, camels, donkeys, yak and even ducks. Sahjeevan reminds us that we must not neglect the communities that maintain such breeds. Their Centre for Pastoralism employs scientific research to create a "shared space" that can enhance our understanding of such ecosystems, develop collaborations to promote livelihood security, and undertake outreach. This virtual network includes 35 organisations spread across the country, and a partnership with the University of Leeds in U.K. Together, they have made the exchange of knowledge and financial support possible, and have united the efforts of those protecting the future of indigenous breeds.

ABOVE *In 2019, Sahjeevan succeeded in obtaining official recognition for the Kachchhi-Sindhi indigenous horse breed, following which the state government offered a grant of Rs. 12 lakhs toward its conservation and breeding.*

FACING PAGE *Anthropogenic pressures ravage the vulnerable mangrove ecosystem of indigenous breeds such as the Kharai camels. Massive projects such as thermal power plants and cement factories have led to the marginalisation of communities, and adversely impacted traditional livelihoods.*

BOOK REVIEWS

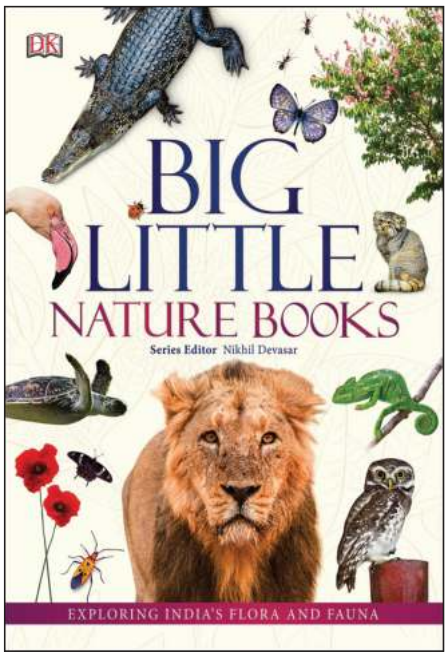
With improved technology and a much greater appetite among the young for books to remind them of the wonderful biosphere in which they live, it is heartening to see how many new, high-quality publications are emerging from within India. Here are a few books that *Sanctuary* believes should be in every public library and in the homes of all those whose hearts beat to nature's drum.

BIG LITTLE NATURE BOOKS

Edited by Nikhil Devasar
Published by Dorling Kindersley (DK)
Soft cover, set of five (see below)
Rs. 1,250/-

India's ecological wealth is magnificent. An unquantified abundance of endemic flora and fauna is hidden within each of our biodiversity hotspots. However, our attempts to put the science down on paper and make it easily accessible are dismal in comparison. This five-part series attempts to do that and has already grown popular with wildlife explorers. Each *Big Little Nature Book* is convenient, pocket-friendly size, and delightfully jam-packed with imagery.

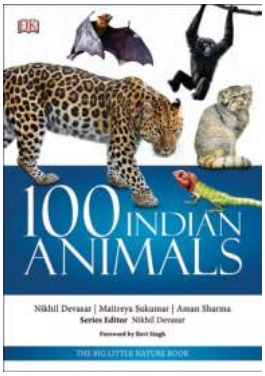
"I was quite surprised when I was unable to find even a single book on common Indian garden flowers or trees." Dissatisfied with the low availability of books, editor Nikhil Devasar set out to familiarise Indian readers with a hundred hand-picked trees, bugs, birds, flowers and animals one is sure to come across in the country. Species are described by experts from the field. Each comes with a breezy profile one can memorise at a glance, succinct notes on ecology and stunning visuals. With forewords by Bittu Sahgal, Dia Mirza, Ravi Singh, Sanjay Sondhi and Pradip Krishen, the guides are equally handy when taking a closer look at your garden or out in the wild.

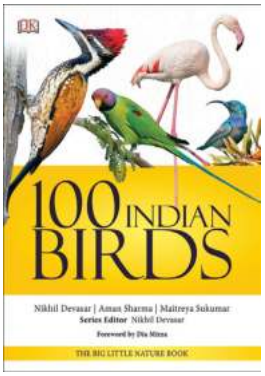


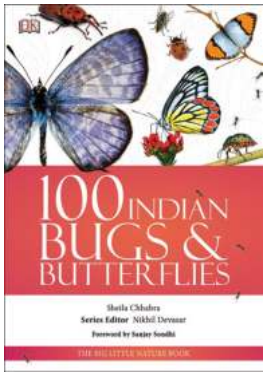
High quality, reliable documentation such as *Big Little Nature Books* serve a cause that falls in line with *Sanctuary* – to make well-researched content accessible, awaken curiosity, grow communities and spur (conservation) action.

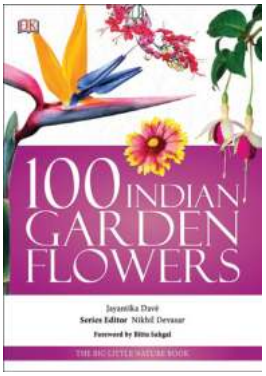
The series includes: 100 Indian Animals by Nikhil Devasar, Aman Sharma and Maitreya Sukumar; 100 Indian Birds by Nikhil Devasar, Aman Sharma and Maitreya Sukumar; 100 Indian Bugs and Butterflies by Sheila Chhabra; 100 Indian Garden Flowers by Jayantika Dave and 100 Indian Trees by Sanjay Tiwari.

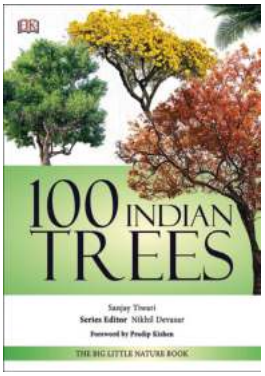
Reviewed by Divya Kilikar

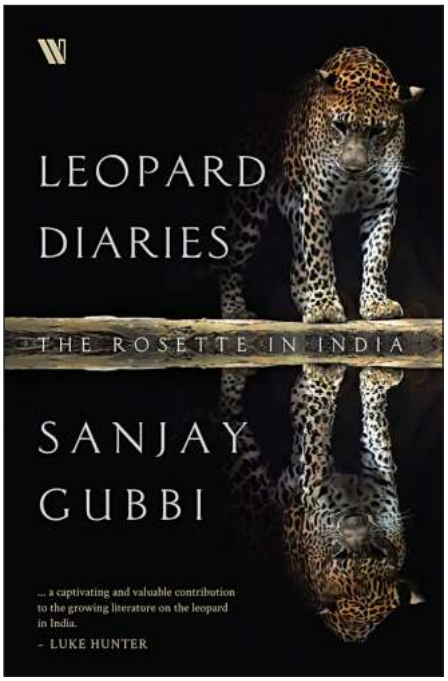












LEOPARD DIARIES
THE ROSETTE IN INDIA

By Sanjay Gubbi
Published by Westland Publications
Paperback, 239 pages
Rs. 599/-

"Leopards are a mixture of several natural aspects – social but solitary, inconspicuous but significant in numbers, large but ubiquitous; they don't fit into any of the standard pigeonholes of large-cat conservation."

Scientist, conservationist and writer, Sanjay Gubbi's latest book *Leopard Diaries,* is a nuanced compilation of his decade's worth of experiences in Karnataka's wilds. With notes on natural history, animal biology, conservation politics and more, he weaves a rich tapestry worthy of the big cat's legacy in India.

The leopard, he writes, is a poster boy against extinction. Indeed, this large felid has survived against all odds not only in wild forests but on the fringes of urban pockets too. It can co-exist with predators much larger than itself, and navigate the narrow boundaries with human communities with equal agility. Growing up in Tumkur district, with low lying hills and forest patches, Gubbi is no stranger to the delicacy of this wildlife-human balance. A childhood curiosity burgeoned into a lifelong pursuit to understand it. *"This book is as much about my transformation as it is about the leopards."*

ABOVE *The author and his team placing a radio collar on a leopard, to study its movement and behaviour post release.*

We join Gubbi as he embarks on a delightful natural history retelling of the leopards' history in the world. We follow him and his team on their arduous journey that began in 2011 as they walked over 2,800 sq. km. across 24 areas in Karnataka's wilds, in search of leopard marks, scat and scrapes to assess leopard populations and occupancy. We are privy to their extensive camera trapping expedition – many successful in capturing behaviour that has been little observed, such as polygamy in leopards, new records of honey badgers in the Cauvery Wildlife Sanctuary, and not-so-surprisingly, human behaviour too.

"The picture from the opposite camera, which was tied to the bole of an acacia-like oil cake tree, gave a bit more details. The man with the gun looked surprised and had turned his head towards the camera trap, giving the picture an angelical glow. The picture from the opposite camera also revealed he had two companions. All of them seemed a bit startled by the camera."

Few days later, the gunman, a notorious poacher known as Ganesha, was finally apprehended.

Thrilling field adventures pace up the narrative. Tense moments prevail in 'Following the Cats', when signals from Gubbi's team's first collared and released leopard, Benki, are elusive (they became active after 48 hours, much to their relief). There's also an entire chapter on Gubbi's viral leopard encounter that resulted in grievous injury. And all the while, the narrative is peppered with warm everyday tales – eating hot *masala dosa* in local eateries – that combined with the simple prose make this a leisurely read.

Leopard Diaries is as much an ode to the rosetted cat, as it is to the foot soldiers Gubbi has worked with over the years. Indeed, people and communities are a vital part in the leopard's fate. *"The leopard's future probably depends upon how much people are willing to tolerate this large felid."*

Reviewed by Abinaya Kalyanasundaram

INDIA'S GREAT BIG DOG PROBLEM

From the semi-arid habitats of Pokhran, Rajasthan, to the cold high-altitude mountains of Ladakh, one common threat prevails – the problem of wildlife-hunting free-ranging and feral dogs.

There are an estimated 60 million dogs in India, the fourth highest in the world, of which 35 million are free-ranging. The rising feral dog population across the country poses a major threat for wildlife, particularly around Protected Areas. These dogs have been detected in camera traps in almost all of the 50 tiger reserves according to the *Status of Tigers Co-predators and Prey in India 2018* report. A pan-India online survey published in 2017, reports dog attacks on 80 species of Indian wildlife, of which 31 are listed under a threatened category on the IUCN Red List. These include the Great Indian Bustard, Bengal Florican, Chinese pangolin, Himalayan goral, Asiatic wild ass, red panda and golden langur. Nearly 48 per cent of the incidents included in this survey were reported in and around Protected Areas.

Several wild species already suffer population declines on account of various anthropogenic pressures. These dogs seriously hinder any population recovery efforts. Direct predation and competition with wild predators for prey, disturbance of ecosystems, transmission of diseases such as rabies, parovirus and distemper, and interbreeding with closely related species have been reported by various researchers, experts, and photographers.

The explosion in stray dog populations in India is related to human activities, waste mismanagement being a prime cause. Untreated garbage provides a ready feeding ground for stray animal populations. Dogs eat human-derived food and hunt to supplement that.

RUPAK GHOSH DASTIDAR

MOUSAM RAY

A free-ranging dog attacks a Himalayan Griffon Vulture in Jalpaiguri, West Bengal (above), while another clutches a turtledove in its jaws in the Pangolekha Wildlife Sanctuary in Dzuluk, Sikkim (below). Increasing reports of dog attacks on wildlife in and around Protected Areas highlight the need for stonger management interventions.

Mitigating the impact of these dogs requires a multi-pronged approach and demands methodical studies to further strategise non-lethal and humane measures. Particularly, areas of critical wildlife concern require immediate attention and strict implementation of the Standard Operating Procedure (SOP) released by the National Tiger Conservation Authority (NTCA) in December 2020. While the SOP outlines steps such as the formation of a committee, birth control and immunisation measures, there is much more to be done to overcome this deadly threat. Experts suggest that the SOP is inadequate and needs to address wildlife disease surveillance and disease risk assessment linked to free-ranging dogs. An objective threat assessment is vital before a response plan is prepared. It is also vital to understand that the SOP only covers tiger reserves while the problem of free-ranging dogs exists everywhere in the country.

WHAT YOU CAN DO:

Ask for:

1. Investment in more research on feral dog populations, to assess disease risk to wildlife, control measures, vaccination protocols and strategies.
2. Trained veterinary doctors in tiger reserves and other Protected Areas.
3. Implementation of waste management systems and aggressive animal birth control measures.
4. Responsible dog ownership, with owned dogs being sterilised and collared, and encouraging local communities in mitigation through outreach and awareness activities.
5. Collaboration between animal welfare organisations to address this problem in the interest of animal welfare, wildlife conservation, and human safety.

WRITE TO:

Sanjay Kumar
Director General of Forests and Special Secretary, Ministry of Environment, Forest and Climate Change
dgfindia@nic.in

Animal Welfare Board of India
animalwelfareboard@gmail.com

National Tiger Conservation Authority (NTCA)
ms-ntca@nic.in

MAYUR DESALE

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NETWORKING

Join *Sanctuary's* online network

The Sanctuary Nature Foundation's print, on-ground and online network has grown to over a million caring individuals in India and across the globe. We would be delighted if you were to invite your family and friends to join this purposeful group to celebrate and protect our planet and its utterly miraculous biosphere.

@sanctuaryasiapage
@sanctuaryasiagroup

@SanctuaryAsia
@SanctuaryAsia

Feedback on Pooja Gupta interview

Priyasha Sharma

The children really enjoyed seeing your artwork, and the content of *Sanctuary Asia*. Some are now aspiring artists and conservationists and your work will surely inspire them!

@doeltrivedy

Getting creative with @poojaslaboratory; it was an authentic and heartfelt interview about art and conservation.

Rare tricarinate hill turtles hatched in UP by the Turtle Survival Alliance India (TSA)!

@shantanujo

Would love to see a study of how many actually survive in the wild. Captive breeding is ongoing for more than a decade. When do they plan to release any of them and actively monitor them? Haven't seen any such work from TSA.

Conservation breeding programmes are highly debated worldwide considering the time and resources spent on them. Challenges, however, are disregarded and successes underappreciated. Over the years, the TSA India Programme has strived to develop efficient breeding protocols for several species and shared their learnings. Decades long perseverance is helping to revive the critically endangered Batagur kachuga *population in the Chambal river. About 70 per cent head-started individuals have shown survival in the wild with methodical monitoring programmes in place. Currently, the tricarinate hill turtle captive breeding project is in its fourth successful year; the release and monitoring programme will be gradually expanded, once they attain optimum size. - TSA India*

@rashmisrivastava.shiats

Impressive piece of work. I witnessed much hardship and excitement behind this. I am fortunate to be a part of this team.

First Tiger in Dampa Tiger Reserve in seven years! *(see page 9)*

@wildlahaulspiti

Wow... it took me 40-50 sec. to spot. Great effort. @zakhumadon

@ashadeepbaruah

The picture seemed to come alive after I spotted the mighty cat.

@consciouslivingwali

Interesting how difficult it can be to find proof of existence of tigers in the wild!

Interview with Aaliya Mir

@implicitself

Thank you for this beautiful story... I cannot even begin to imagine the hardships this must entail for Aaliya Mir. Working with people to change their mindsets is the most difficult thing to do, harder than developing any sophisticated technology... with the added dimension of a conflict zone. To say this is inspiring is an understatement. It is uplifting. She is my hero.

On a post about ritualistic hunting in West Bengal

Vinod Rishi, Dehradun

Our approach to date has not worked. Ground realities are different. Religion, tradition, social anthropology and human ecology have not been taken into account. The power of public faith and passion is obviously greater than that of administrators, scientists and experts. We must find a way to adapt to this reality and redress our shortcomings in explaining our rationale for wildlife conservation as development. If we fail, the game will go on until Nature steps in.

@razakazmi

Abba and I were interviewed (a first for me!) for the April issue of @SanctuaryAsia. What made this especially interesting and fun was that our answers were not disclosed to each other beforehand. So we read each other's replies only post-publication.

READERS' FORUM

PUBLIC DOMAIN

A must-watch film

I enjoyed watching 'Sherni', starring Vidya Balan as a forest officer in a male-dominated service. Her character's efforts to save a wild tigress with cubs, and the political obstacles in her way, were realistically portrayed. I was happy that the tiger was not painted as a bloodthirsty killer, but as a mother trying to bring up her cubs against all odds. I found myself sympathetic towards the plight of the villagers, and with sincere wildlife defenders that wanted to do well by both communities and wildlife. I was left saddened by the way that the tigress fell prey to human politics and greed.

Rayna Arya, Mumbai

Greening our campus

I took over as the Principal of Tagore Government Arts and Science College in February 2017. Appalled by the vast treeless campus, I set to change this. Today, the college has eight acres of green cover with native trees such as banyan, neem and peepal, fruit trees and flowering plants. A section is also devoted to seasonal vegetables. We have recorded several avian visitors. We have also invested in rainwater harvesting that recharged 1.2 million litres of water last year. Recently we drew honey from honey-combs installed as part of an apiculture initiative. We have come a long way from 100 trees four years ago to a mini forest (3,000 trees) today!

Dr. Sasi Kanta Dash, Principal, Tagore Govt. Arts & Science College, Puducherry

Feedback on *Sanctuary Asia* June 2021

Thank you and your team for featuring our conservation work [The Magnificent Markhor] in *Sanctuary Asia*. It will strengthen the conservation action in our project areas and boost our efforts.

Sameer Khazir, Markhor Recovery Project, Wildlife Trust of India, Kashmir

SAMYAK KANINDE

IN OUR NEXT ISSUE...

Mountain Transitions: Challenge, Change, Recognition and Restoration in the Western GHats

The Western Ghats and Sri Lanka biodiversity hotspot is recognised as an exceptionally rich, yet threatened landscape. While this wasn't always the case, in the last 40 years the area has been the focus of important conservation struggles, vital studies, conservation efforts and restoration initiatives. It is distinguished by its approaches to addressing anthropogenic impacts. **Ian Lockwood** looks back at developments, challenges and opportunities in the last several decades.

SUHAIB FIRDOUS YATOO

Not only are the photographs amazing but the article [The Secret World of Slime Moulds] is extremely articulate. I will share this article with my students who are just being introduced to biological classification.

Dr. Shyammala Shah, Mumbai

Conservation Dogs was interesting. Besides being able to sniff and help in conservation, these dogs provide companionship to the much-stressed foot soldiers.

Anand Madabhushi, Sanctuary Kids for Tigers Associate, Hyderabad

Dogs are definite assets for conservation law enforcement. Aaranyak, a society for biodiversity conservation in Northeast India, introduced 'Jorba' about seven or eight years ago in Kaziranga who did splendid work to help park authorities. He is retired now.

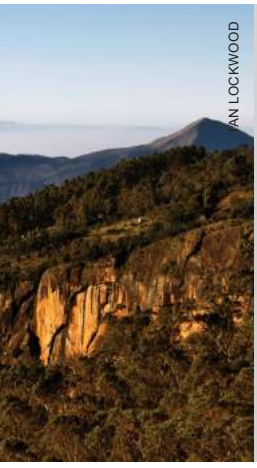
Firoz Ahmed, Guwahati, Assam

Sanctuary Asia June 2021 took me back to Ladakh. I particularly recall two interesting plants that I saw. The Sia plant (Siachen is named after it) is the local name for wild roses that grow here and Siachen means abundance of roses. The other one is the Leh berry or sea buckthorn, a hardy deciduous shrub, valuable in terms of nutrition as it is rich in antioxidants and phytochemicals. After reading this edition, I want to explore this paradise again.

Bhamini Pande, New Delhi

Over the last decade the quality of the photography in your magazine has gone up to another level in scope, brilliance and extraordinariness! Superb – and I love it as much for this today as for the content. Happy 40th, team!

Julian Matthews, TOFT, U.K.



IAN LOCKWOOD

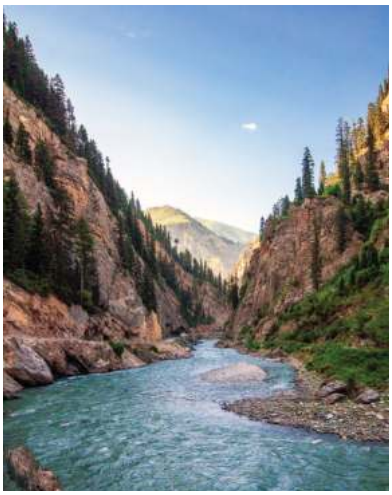
Call of the Wild: 40 Years of Sanctuary

Entering its 40th year in publication, *Sanctuary* looks back at our decades of legacy. Our next issue invites a multitude of stalwarts and veterans who have supported and enhanced our journalism and on-ground action, to write notes on Sanctuary's watchword 'Call of the Wild', the very connection that motivates those from the conservation community towards the mission of shaping a world with abundant biodiversity, a sustainable climate and an equitable future for all.

Notes from our writers: June 2021

I wrote this article as a tribute to Late Shri Ambika Sir. I feel blessed to have been able to pay my tribute to the noble soul through your magazine.

R. Sreenivasa Murthy, IFS Retd., Bhopal



SATVIK SHAHPUR

This is my first image (left) in your magazine. I have always followed your stories and articles and this is a proud moment for me.

Satvik Shahpur, Bengaluru

I am grateful that my image has been chosen to be published in a magazine of South Asia with fair conservation practice, which is an award enough for me. My gratitude to *Sanctuary Asia* for taking on such an onerous task.

Pranay Chandra, Bengaluru

The June 2021 issue looks great! I like the frequent message that comes through about the importance of involving local communities in nature conservation. I was particularly happy to see a reference to my article [Monitoring Trans-Himalayan Migrants in Ladakh] in the piece by Pankaj Chandan 'Highways in the Sky'.

Simon Delany, The Netherlands

Congratulations on an attractive and very valuable edition focussing on J&K and Ladakh. I was delighted to see no less than six of my images published in this issue. I always wish to see *Sanctuary* progress, grow and continue to educate and campaign for a safe and healthy environment.

Tahir Shawl, Kashmir

I am writing this mail on behalf of *Abba* who struggles a bit with typing emails on the laptop. *Abba* wrote [In Memory of P.K. Sen *Saheb*] as his little homage to his mentor and boss. "I wonder, do men like Sen *saheb* truly die? Perhaps not. Perhaps they live on through their work, and in the hearts of all those lucky enough to have known them."

Raza Kazmi, Jharkhand

The issue brought the hidden parts of Jammu and Kashmir to limelight, whether that be in terms of its biodiversity or different landscapes. I received many positive comments for my article [The Secret World of Slime Moulds] too.

Suhaib Firdous Yatoo, Kashmir

I am grateful to share that five years of combined research work of my PhD guide Dr. Anil Kumar and mine on eastern Ladakh Trans-Himalaya have made it to the pages of *Sanctuary Asia*, 'From the Rooftop of India'.

Iqbal Ali Khan, Ladakh

COW KILLS TIGER?

The headline got you right?

By Bittu Sahgal

We do not use pugmarks to count tigers any longer. But there was a time when experts not merely counted tigers, but claimed they could actually *identify* individual tigers from their pugmarks... almost like humans can be identified by their fingerprints!

Predictably, fanciful census numbers began being bandied about each year. For two decades, tiger numbers kept magically rising, even as organisations such as the Wildlife Protection Society of India (WPSI) and the Environmental Investigation Agency (EIA) confirmed beyond doubt that poachers were running rampant... killing tigers to feed bottomless illegal markets in China and the Far East.

Tiger parts, you see, were in very high demand and India was the main supply source.

Sanctuary estimated that one tiger was being killed every single day (*Sanctuary Asia*, Vol. 16, No. 5, September/October 1996, 1,000 Days To Save The Tiger).

Mercifully, camera traps and scientific estimation began to give us a better idea of tiger populations in the mid-1990s. But, even then, poachers were never the tiger's only problem. As the image above graphically demonstrates for those who understand nuances, cattle are often leaving no space for wild herbivores, upon which carnivores like tigers, leopards and wild dogs depend.

India has an estimated 300 million cattle, many living in and around wildlife habitats. That works out to roughly one for every four humans.

All this is very well... but how do cattle "kill" tigers?

1. By overgrazing forests, and out-competing shy herbivores without which tigers die.
2. By spreading deadly diseases like anthrax that can take a huge toll on wild herbivores, without which tigers die.
3. By falling prey to tigers and leopards that look upon cattle as any other (less fleet-footed) food source.

But... hang on a minute... falling prey to tigers? Tigers kill cattle... but how does a cow kill a tiger?

Good question! It's a result of what has come to be called "revenge killing". And this is what happens:

A cow gets killed by a tiger. The owner is justifiably distressed and very angry. He therefore lathers the deceased cow with an easily accessible pesticide. Then, when a tiger turns up for a second helping... it consumes the poisoned cow... and dies. If it's a tigress with cubs, three or four tigers die. That's not all. Mongooses die. Jungle crows and treepies die. Jackals and hyaenas die.

So... yes... even in death... cows can kill tigers!

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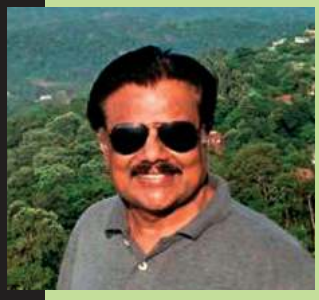

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