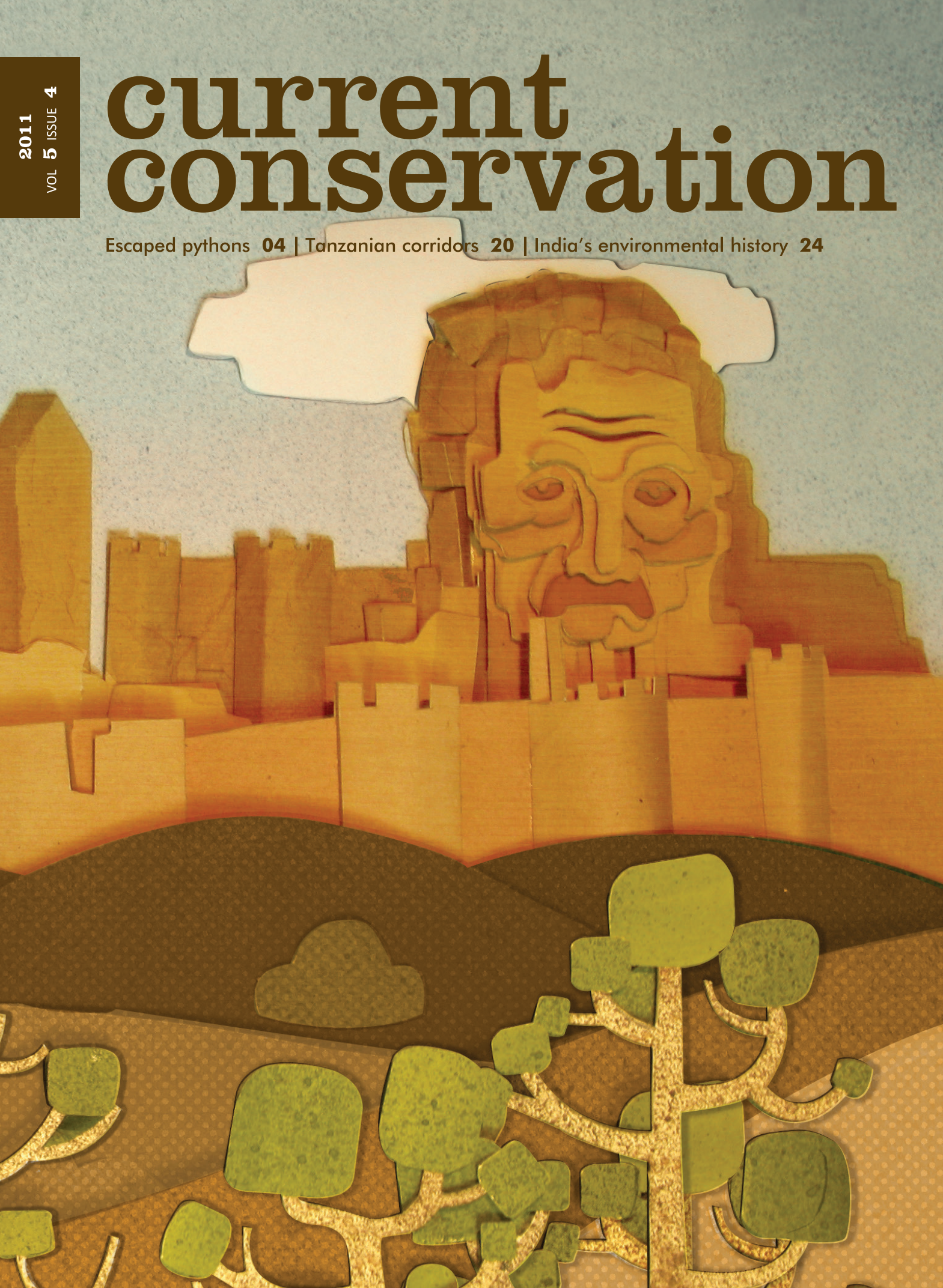
2011
VOL 5 ISSUE 4

current conservation



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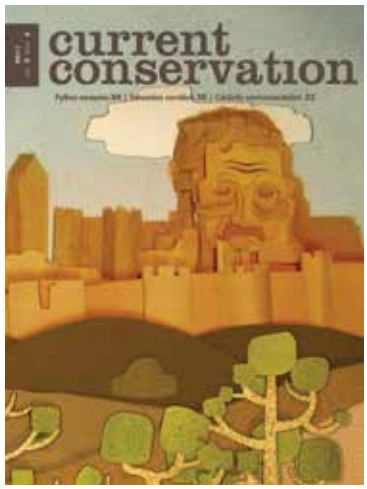
Kalyani Ganapathy

editor's note |



Cover art by Pencil Sauce

'What is current about Current Conservation?', some of you have asked. In these pages we typically present current research or stories that might lead our readers to a better understanding of conservation issues, whether directly or indirectly. This issue carries a number of summaries of scientific papers that highlight the myriad facets of science with implications for conservation. Species that are introduced or that escape into habitats foreign to them can do much damage - like depressing the numbers of prey species (pythons in the Everglades) or affecting other predators (green crabs and dunlins). What determines whether such species succeed or dies out? Scientists suggest that it has to do with how many times the species is introduced, but additionally, it depends on specific life-history traits as well.

Other research discusses how climate change and warming waters can affect swiming behaviours. Can protecting habitats ensure the success of species—in this issue we explore two marine species—Hector's dolphins and manta rays. Finally, our columnist explores what causes the spread of conservation ideologies in society today. Dan Brockington convincingly argues that the environmental movement requires media darlings, and that articulate, confident people take the cause further.

Succeeding in a foreign world

**Jessica Stephens*

CAN WE PREDICT SUCCESS OF NON-NATIVE SPECIES IN INTRODUCED HABITATS?

Exotic plant and animal species are transported daily; however, not every introduced species will survive and proliferate to become an established invasive. Given that billions of dollars are spent each year on eradicating invasive species, researchers Van Wilgen and Richardson examined the predictors of establishment success of introduced species, specifically reptiles and amphibians.

Their study, published in the journal Conservation Biology, suggests that establishment success of non-native reptiles and amphibians is most closely associated with number of introductions into non-native habitat. This supports previous findings of the establishment of invasive species.

The authors also suggest that sexual maturity at a young age plays an important role in establishment success. For example, frogs and lizards are known to reproduce very early in life, while turtles and snakes reach maturity much later. This characteristic helps explain the documented high establishment pattern of non-native frogs and lizards worldwide. Other strong predictors of establishment success are similarity in climate among the native and non-native habitats and being more distantly related from native species.

Studies, such as this, that aim to predict the probability of arrival and establishment of non-native species are crucial in preventing future invasions. Results from these studies can inform

Rich Hoyer

David Herrero Gonzalez

current regulations of the exotic pet trade. Like, for example—imposing more stringent laws on the transport of species that have a higher probability of establishment success based on the above factors.

Van Wilgen, NJ and DM Richardson. 2012. The roles of climate, phylogenetic relatedness, introduction effort, and reproductive traits in the establishment of non-native reptiles and amphibians. Conservation Biology. doi: 10.1111/j.1523-1739.2011.01804.x

Pythons decrease biodiversity

**Jessica Stephens*

DECLINES IN MAMMAL SIGHTINGS LINKED TO INVASIVE BURMESE PYTHON ESTABLISHMENT

Invasive species pose a significant threat to biodiversity worldwide. Monitoring their ecosystem impact is often difficult given that the time between introduction and establishment of invasives can take decades. Fortuitously, Michael Dorcas and colleagues have been monitoring various mammal taxa in Everglades National Park, USA for the last 20 years, spanning across the introduction and establishment of the invasive Burmese python in the Park.

Their study, published in the Proceedings of the National Academy of Science, found a strong correlation between the decline in number of mammal sightings and the establishment of invasive Burmese pythons.

The authors monitored nine mammal species via road surveys across the Everglades National Park. They found a severe decrease in mammal sightings between surveys prior to Burmese python establishment (1993-1999) and surveys after establishment (2003-2011). Of particular interest was a very steep decline in raccoon and opossum sightings (>98% decrease).

There was also a difference in sightings on a spatial scale. Specifically, areas in which the pythons have been established longer had a more drastic decrease in mammals, while areas that have been recently invaded showed a less precipitous decline.

It is often hard to monitor exact population numbers for each mammal, but this study provided numerous links between the decrease in mammal sightings and python establishment. The cascading ecosystem effects due to the reduction of mammals are currently unknown, but there is speculation that they will have considerable impacts on ecosystem function and biodiversity.

Dorcas, ME et al. 2012. Severe mammal

declines coincide with proliferation of invasive Burmese pythons in Everglades National Park. Proceedings of the National Academy of Science 109:2418–2422 DOI/10.1073/pnas.1115226109.

**Jessica Stephens is a PhD student at The University of Georgia, Athens, GA, USA. jstephens@plantbio.uga.edu*

Can marine protected areas safeguard marine mammals?

** Ema Fatima*

DOLPHIN MONITORING FOR OVER TWO DECADES REVEALS BENEFITS OF PROTECTED AREAS

Robert Bell

Marine reserves have recently become a major focus in marine ecology, fisheries management, and conservation biology. Traditional management methods are inadequate to address the multiple types of anthropogenic impacts, and marine protected areas (MPAs) have been proposed as an efficient and inexpensive way of managing fisheries. They also simultaneously preserve biodiversity and meet other conservation objectives as well as human needs, though the decisions concerning the design and location of most existing reserves have largely been the result of political and social processes.

There has been little evidence that MPAs have been effective in improving demographic parameters of marine mammals, as many years of data are often required to detect any meaningful biological change. The first evidence that MPAs can work for marine mammals is from a 21-year study undertaken in Banks Peninsula Marine Mammal Sanctuary. The sanctuary was established in 1988 to reduce gillnet mortalities of Hector's dolphin, an endangered dolphin species endemic to New Zealand.

The authors individually identified 462 dolphins by photographs of their dorsal fin patterns and tracked this population from 1986 (before the sanctuary was set up) to 2006. Using statistical models, the authors analysed survival of dolphins before and after establishment of the sanctuary, and found that the probability of survival of dolphins from one year to the next increased by 6% after the establishment of the sanctuary. This study shows that area-based protection of marine mammals is possible, but that long-term studies are required for effective monitoring of areas and species.

Irrespective of the size and species in concern for which the marine reserve is being established, it is paramount that goals are explicitly stated beforehand. These would help in designing the reserve, and are also critical for assessing the success of the MPAs.

Gormley AM, Slooten E, Dawson S, Barker RJ, Rayment W, duFresne S & S Bräger. 2012. First evidence that marine protected areas can work for marine mammals. Journal of Applied Ecology 49: 474–480.

** Ema Fatima is a research scholar at the Centre for Ecological Sciences, Indian Institute of Science, India. fatimaema@gmail.com*

Is swimming in warmer waters more costly?

**Sartaj Ghuman*

FISH USE MORE ENERGY TO SWIM IN WARMER WATERS, AFFECTING OTHER ROUTINE BEHAVIOURS

Global climate change has resulted in an increase in water temperatures in marine and freshwater habitats and the trend is likely to continue in the future. A model developed by Andrew Hein and Katrina Keirsted, of the University of Florida, attempts to predict the effect of this temperature change on the metabolic cost of transport (COT) in fishes, which is a measure of the energy required to swim a given distance. The model builds on work addressing the relationship between temperature, body size and maintenance metabolism, and on the work relating temperature and body size to swimming energetics. It was validated using data from swimming experiments on 22 diverse fish species.

The model predicts that rising water temperature may increase the energetic cost of routine swimming behaviours such as foraging and migration. Further, a given increase in temperature will prompt a larger absolute change in the energetic cost in warm water than in cold water. Interestingly, the effect of temperature on COT is mainly mediated through energy expenditure

Changua Coast Conservation Action

Calidris alpina *(also known as dunlin) are one of the migratory birds found wintering in the Pacific and Atlantic coasts of North America as well as coasts in Asia (Japan and China). The study area in the Californian coast showed gradual decline of dunlin populations due to the predation of the invasive Green crabs on clams, which is the dunlin's primary source of diet.*

devoted to maintenance and not directly through swimming energetics.
To understand the potential for climate change to affect fishes and the communities they inhabit, however, these results must be integrated with work on thermal physiology of fishes at different life-stages.

Hein AM, and KJ Keirsted. 2012. The rising cost of warming waters: effects of temperature on the cost of swimming in fishes. Biology Letters 8(2) 266-269.

Green crabs affect both clams and dunlins

**Sartaj Ghuman*

HOW DOES THE NATIVE SPECIES COPE WHEN AN INVASIVE EATS ITS FOOD?

The global populations of many shorebirds, for whom coastal ecosystems are critical wintering habitats and foraging areas, are on the decline. The quality of food available in the coastal habitats in the non-breeding season affects shorebird survival, migration and breeding success.

Exploring the largely neglected effect that non-native invasive marine invertebrates can have on wintering shorebirds, Veronica Estelle and Edwin Grosholz conducted controlled experiments at Bodega Harbour, central California.

They sequentially placed European green crabs and dunlin (a shorebird) in field enclosures to see what effect the crabs had on the diet of the bird. On measuring the gut content of both the crabs and the birds, and studying the feeding behaviour of the birds, they found that green crabs were associated with a reduction of predation by dunlin on polychaetes and an increase in their predation on clams.

The abundance of clams in Bodega Harbour has declined by 90% since green crabs were introduced in 1994, resulting in an increase in the proportion of juveniles. These increasingly smaller and less energy-rich clams present an unknown energetic-cost for dunlin. Green crabs not only selectively consume larger clams, they may render the smaller ones more accessible to dunlin through physically turning and loosening the near-surface sediments.

These changes in prey availability affect fitness of individuals and consequently population dynamics. Authors therefore suggest that effects of introduced marine species be considered when planning shorebird conservation measures.

Estelle V. and E D Grosholz. 2012. experimental test of the effects of a non-native invasive species on a wintering shorebird. Conservation Biology, 26: 472–481. doi: 10.1111/j.1523-1739.2011.01820.x

**Sartaj Ghuman is a PhD student at the National Institute of Advanced Studies, India. batalaland@gmail.com*

Steven Trainoff

Tracking the devil fish

**Divya Ramesh*

SATELLITE TRACKING OF THE MANTA RAY RAISES CONSERVATION CHALLENGES

We know little about manta rays. Thanks to the forward-pointing fins on their head that give them their nickname, people probably kept away from the 'devil fish'. They glide underwater, perform double flips in the air and travel great distances. To see how far these mega marine animals move, Graham and colleagues resorted to an increasingly popular method. They attached satellite-tracking tags on the mantas that collected locations, temperature, etc.

The study was conducted in the southern Gulf of Mexico where a few marine protected areas exist. The scientists found that mantas remained for longer periods in shallow waters, largely eating plankton and fish eggs. They were capable of switching their diet and this flexibility is another fascinating insight into their mysterious lives. Additionally, manta ray congregations swam below some of the busiest shipping routes of the region, impacts of which are still unknown.

While the tagged animals were sometimes found within the existing marine protected areas, on most occasions they roamed very far, overlapping little with these. The authors recommend that this crucial finding be considered before making new reserves. They also highlight the importance of knowing a species' whereabouts in space and time before declaring protected areas.

Satellite tracking has once again proven to be a great tool, this time to help understand these mysterious fish and frame better conservation strategies.

Graham RT, Witt MJ, Castellanos DW, Remolina F, Maxwell S, Godley BJ, & LA Hawkes. 2012. Satellite tracking of manta rays highlights challenges to their conservation. PloS one: 7(5) e36834.

Does seaweed provide enough food?

**Divya Ramesh*

CHANGING LIVELIHOODS

A global decline in fishes is already underway, with each passing year adding to the pressure. While large trawlers leave almost nothing behind for local fishing, there are also more protected areas for species like the whale that are out of bounds for people. Fisherfolk everywhere are caught in a net, much like the fish they try to catch. Therefore, governments often encourage them to switch to options like seaweed farming. But whether these 'alternatives' are good enough or even accepted easily is not well known.

Hill and colleagues studied the effects of seaweed farming as an alternative to fishing, in villages in central Philippines. They asked villagers about their perception to changes in number of fisher folk over the years and whether they liked seaweed farming. Results, however, varied across villages; while

SEAFDEC/AQD

some felt fishing increased because human populations had grown, others felt the opposite. Additionally, some said fishing was not reliable anymore, while others still strongly believed fishing to be the breadwinner.

Many other studies have suggested that fishing is difficult to replace, not just for its economic stability but also for intangible benefits like enjoyment. In this study too, most villagers felt that seaweed farming did not provide as much, in all aspects, as fishing. But their mixed opinions call for the scrutiny of the feasibility of such alternatives and if they will ever be good enough. After all, in today's unstable economy, being able to do different jobs when needed is a handy tool to survive.

Hill NAO, Rowcliffe JM, Koldewey HJ and EJ Milner-Gulland.. 2012. The interaction between seaweed farming as an alternative occupation and fisher numbers in the central Philippines. Conservation Biology, 26: 324–334. doi: 10.1111/j.1523-1739.2011.01796.x

Singing for a living

**Divya Ramesh*

FLYCATCHERS SING LONGER SONGS IN NOISIER SURROUNDS

Many species of birds are famous for their repertoire of songs, which primarily helps them find mates and guard territories. Some of them unfortunately live in urban areas, where there is simply too much noise. Scientists have studied the effects of varying noise levels on one group of songbirds, including nightingales, and found that birds sang higher pitched songs in noisier areas. There is another group of songbirds whose singing skills are not as well developed and therefore have been largely neglected. Some preliminary studies have shown that they might be singing a different tune, quite literally.

The song of the vermilion flycatcher is sung mostly before sunrise and is composed of certain elements in a particular order. Expecting higher pitched and longer songs, Alejandro and his colleagues recorded the songs of male flycatchers in parks and urban areas in Mexico City. They also recorded noise levels at different times of the day. But what they found was quite different from earlier studies.

The birds did not increase the pitch of their songs to match the noise level. Instead, they sang longer songs with more elements. The authors do not generalize that all flycatchers will respond this way, and a study on the ash-throated flycatchers has found confounding patterns contrary to both this study and previous ones. One thing is for sure: birds can adapt and adjust their songs to be heard over and above the loud racket we create. Whether they all successfully reproduce and survive remains to be seen.

Ríos-Chelén AA, Quirós-Guerrero E, Gil D, & Macías Garcia C. 2012. Dealing with urban noise: vermilion flycatchers sing longer songs in noisier territories. Behavioral Ecology and Sociobiology, DOI 10.1007/s00265-012-1434-0

Restoring rocky wastelands

Centuries of degradation, grazing and neglect, followed by a misguided attempt to green the landscape with Prosopis juliflora, *an invasive Mexican species had sent the native flora into retreat.*

WORKING WITH THE MEHRANGARH MUSEUM TRUST, JODHPUR, PRADIP KRISHEN RESTORED A 70 HECTARE ROCKY WASTELAND AROUND THE MEHRANGARH FORT TO ITS FORMER ECOLOGICAL STATE. IN THIS INTERVIEW, THE AUTHOR OF 'TREES OF DELHI' NARRATES SOME OF THE CHALLENGES HE FACED WHILE SHARING THE EXCITING MOMENTS IN HIS PIONEERING WORK OF THE LAST SIX YEARS, CREATING THE RAO JODHA DESERT ROCK PARK.

Prabha Mallya

All images by Janaki Lenin.

When did you start planting?
1 April 2006 was our start. We started the nursery a month or so earlier with a very contracted range of mostly trees and shrubs. We found a forest nursery with only about five species we could use. So we had April, May, June before the rains came. And we managed to grow some 14, 15 species. We chose a linear patch of about a hectare, where the thickest mesquite was, above the lake in Jaswant Thada [the royal mausoleum], and we chose another three-quarters of a hectare near Ranisar. We said let's just do all our learning and make all our mistakes in these two plots. That's all we had time to clear, anyway. The Khandwalias [local stone miners] removed the mesquite and we were shocked at how much soil we needed to fill the pits. We had donkeys going back and forth with panniers of soil. We were varying the soil mixtures so we could understand how soil affected things. We planted with these limited numbers of species but in fairly high numbers that first year.

How many species have been planted?
Probably just over a 100, by now. When we were numbering pits for the first three years, we crossed 7000 or 8000 large pits. I wouldn't be able to say how many thousands now. If you count the little things, it goes into many, many thousands. Now we are getting more and more into the little things with a huge emphasis on grasses because all the big things, like trees and large shrubs, are already in place.

Did you try to protect trees and plants from hares and porcupines?
We've accepted hares, porcupines and pigs. The damage hasn't been great. It's not big enough for us to worry about. Wild boars were sometimes a problem. Feral dogs are sometimes a nuisance. If you have a pit with sandy or soft soil in the pit, this is an ideal place for them to litter and then the plant is quickly destroyed. We solved the problem by mulching with stone. If you raise the size of the aggregate, then dogs don't want to nest there anymore.

Would you call mesquite a pioneer or an usurper in this landscape?
It's both, it doesn't have to be an either/or. Its seeds were scattered here from an airplane in the 1930s. Not just here but over an extensive part of the old kingdom of Jodhpur. You can assume that it was fairly evenly scattered, and that it found purchase only in those spots where it could find the cracks. So it starts as a pioneer and it doesn't just out-compete other things, it secretes alkaloids in its root zone that discourage anything else from growing there. It practices allelopathy which is one of its strategies. So once it gets in, it creates a pure crop. It's as invasive as you can get.

It's a pioneer for your planting. It told you where to plant.
I always try to acknowledge that. In an ecosystem like this, if you were to give me a habitat shorn of mesquite and said, "Plant it up," I'd be hard put to think of where to plant new things. Do you plant wherever you think there might be a little pocket of soil? Do you plant wherever you see a little bit of a crack? How do you identify the precise planting places? It's not easy. But mesquite had done that work. It's possible to make the assumption that mesquite had done all the basic work of finding out where it was possible to grow. In the places it was absent, it was too difficult to find purchase. We took the decision to follow mesquite's lead casually but it turned out to be a very useful way of proceeding: only plant where mesquite has shown you it's possible to grow.

Did you face any unforeseen challenges besides the ones you anticipated before taking on this job?
Well, you know what happens, you tend to start with a lot of bravado and then a moment of doubt creeps in. That first year we started, we had only a short lead time into the monsoon. When the Khandwalias cleared about 2 hectares of mesquite, suddenly this area which was thick with thorny mesquite was now reduced to empty pits. I thought, "Great! We've removed the mesquite but what if nothing else grows here? What if we don't know how to do it? What if we don't choose the right plants? We could end up with 70 hectares of pits and nothing to really take the place of mesquite."That's a scary thought! After all, you are not doing something that has a track record, you can't consult people who've already done it. There are no books to learn from. We could fail! That was the big fear. Collecting plants, seeds, and germinating them had its problems but we overcame them. The biggest challenge is ahead of us, which is to grab the attention of people and excite them, engage them, with all that is enjoyable about this park. I think that is going to be a much more intractable problem. But it's one I look forward to.

This place was badly degraded from grazing and over-use. Is it possible that there was a top soil that was eroded?
This part of Jodhpur is an outcrop of volcanic rock called rhyolite. Originally, many millions of years ago, the rhyolite would have been capped by sandstone. When did this all change? Who knows. What we do know is that wherever you see rhyolite in the desert today, it tends to have little or no top soil. Things that grow on rhyolite exploit the cracks and fissures in it. It is in those little linear cracks that you can get things growing. You've seen these huge euphorbias, which for us are one of the emblematic rock plants. We autopsied one to see what its root structure was like. It has a very thin fibrous root and it exploits the cracks by forming a fan-like structure. Thousands of extremely thin, fibrous roots that don't penetrate

very deep but add up to a huge surface area. So it is brilliantly adapted to living in the cracks of rhyolite. My initial assumption was that if a plant is not a tiny herbaceous thing, it would have to have deep roots. Thhor—*Euphorbia caducifolia*—showed me that it was possible to have lots of thin, fibrous roots that could be just as effective as long, penetrative roots.

The cracks are actually very good at conserving moisture. The thinner the crack, the better it is able to protect the little soil in it from drying out. No desiccating air can reach it. In the month of May, we have taken rocks apart and about three, three and half feet below, inside a hairline crack, lies moist sand. It's astonishing.

So you did an analysis of the plant's root system and the rock to understand how the system works before you actually did planting.
I won't say 'analysis', I don't think we had the scientific training or the tools. We just did our best to understand something that we had no previous understanding of. You are dealing with an ecosystem where plants have amazing resilience, they must have amazing adaptations. And you need to understand what those adaptations are. Obviously it varies. Succulence is the best known way of dealing with drought. But a lot of trees like *Acacia senegal,* which is the charismatic tree of rocky desert areas, doesn't have any succulence at all. But it has the ability for its roots to penetrate the cracks. In unprotected rock, unless there are cracks, almost nothing can grow there. Some of our rocky hillocks in the Park are completely bare, there is nothing at all growing on them. Once we understood how cracks

and soil work, we would take some of the heavier clayey soil and dust the hillocks, hoping that the soil would penetrate every little possible crack. So we were accelerating something that happens naturally. When the wind blows this is what is happening, anyway. A lot of little things, not just grasses, are very happy growing in cracks. There's a plant called *Seddera* which grows in some of the most inhospitable places, it just anchors itself in the thin cracks and luxuriates. It's a very beautiful little bushy plant. And often you'll see it growing in these linear cracks along a line because that's how the crack spreads. So it just follows that line beautifully.

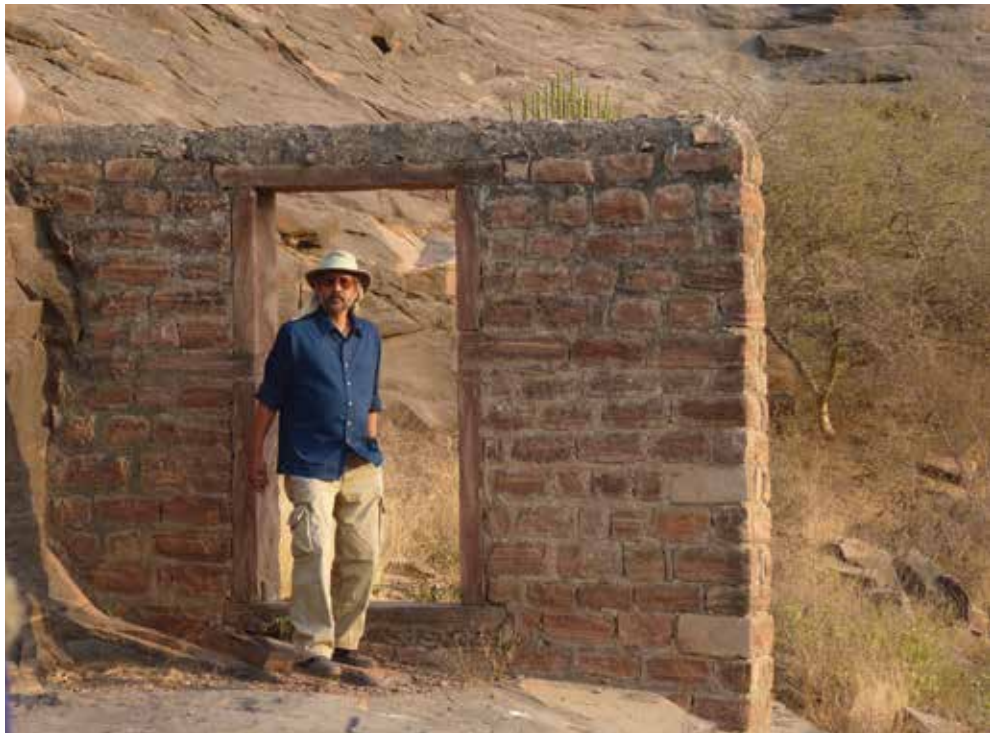
How did Professor M.M. Bhandari help you? What expertise did he bring?
Bhandari sahib wrote 'The Flora of the Indian Desert' nearly 35 years ago. He is the taxonomic expert for plants in this part of the world. It was very important for us to rely on his expertise, especially in the beginning. For example, there are three kinds of *Aerva*, which are very important in the desert. Two of them tend to grow in sandy or gravelly habitats and only one will exploit rock, that too not as happily as it does in sand. They are quite hard to tell apart. It was terrific for us to be able to take it to him and ask "Doct saab, tell us how to distinguish between *Aerva tomentosa* and *persica*." Or whatever!

On two occasions, we took him along on field trips out into the desert. He'd say, "I can't walk at all, my knees are bad. I'll have to stay in the car and direct you." We wondered how this was going to work but his recall for physiographic features was amazing. He'd say, "Go around this hill, you'll find a big rock and maybe it's still splashed with vulture scat. Go down there and you'll find some plants like this." And invariably he was right! He'd done an enormous amount of exploring in his younger days, he was an excellent field botanist. To be able to count on his experience and knowledge of plants was a terrific advantage for us. His knowledge of the desert, the different kinds of microhabitats it has, and what you can expect to find in these areas was invaluable. He died last year. We are very sad we lost him because very often we come across something and we want to go to him. And now of course, we can't.

In the course of exploration, were there any tragedies? Like he had seen some plant twenty years ago and you go there and find the plant had disappeared.
Not specifically. For example, there's a plant called phog (*Calligonum polygonoides*). It is one of those wonderful desert plants that is now in retreat. Doct saab told us about attempts he had made in the past to tell the administration about conserving it and trying to make sure it doesn't disappear. It is an important endemic plant in the desert. Becoming rare, but not endangered yet.

There's a plant called *Monsonia senegalensis.* In our first year of collecting, we found 20 or 30 plants. We picked up three and they survived, they flowered and they even set fruit in the Jaswant Thada area. But it didn't come up again the next year and we've never seen the plant again. It doesn't mean the plant doesn't exist. But we wouldn't even know where to look for it now. We've kept our eyes peeled but haven't seen it again. So we are going to have to discover it for ourselves afresh.

One of the great things about traveling with Doct saab was, for example, there's a genus of small, weedy herbs called *Tephrosia.* Quite common. You can see it in Delhi on the Ridge. We passed through one sandy valley and we saw, from the distance, a grey-green



bush about seven or eight feet high. It turned out to be *Tephrosia falciformis* with beautiful large, bright pink flowers, only growing in that one little sandy valley. It seemed as if it was endemic to that one specific place. We managed to collect some seeds and propagate it. It is now growing in the visitor's centre. This was one of the great joys of going out with with Bhandari saab. We could have learned all this by ourselves over thirty years, but of course he knew all this already. So it was wonderful. There's only one other plant, other than *Monsonia,* that we haven't been able to lay our hands on but we'll get there. It's a succulent called *Caralluma edulis.*

What threatens some of these plants, like phog?
Phog lives in salty sand so it's a halophyte, not a crack-dweller. The threat to phog is two-fold: one is that the flowers make the most delectable raita. They are collected especially by the women folk in all the outlying villages in the desert and they make this raita, which is just the most amazing thing. It flowers in February. But the wood has got high calorific value and is lopped for fuel wood. That's the big threat to phog actually. It's not that phog is intrinsically rare, it's just in retreat and you can see whole areas have been stripped of it.

Any charismatic plant that you haven't been able to find?
We were very keen to get *Ephedra*, the only gymnosperm in the desert. We found it and propagated it successfully from cuttings. Some of these plants are doing very well. But they haven't flowered and fruited yet. So we are not doing something quite right. Maybe it takes some years to flower. But no, there is no charismatic desert plant that is not already here.

When you did your inventory, how many species did you come up with?

We just did our best to understand something that we had no previous understanding of. You are dealing with an ecosystem where plants have amazing resilience, they must have amazing adaptations. And you need to understand what those adaptations are.

It's a difficult question to answer. If you count all the grasses, all the little species, we've got between 170 and 190 species now. At 220, we should be bumping our heads against the ceiling. There are some grasses we still need to collect. The challenge now is not so much looking for new species as much as learning how to work with species we know, especially grasses.

Why is that?
For aesthetic reasons. I want to be able to try and work with grasses like you paint with colours in a palette. They have beautiful textures, especially when seen *en masse.* Because grasses grow in groups, and not individually, you can actually do swathes, and you can have them mingle in particular ways and you can literally–well, maybe not quite literally- paint with them. People in other parts of the world practice prairie-style planting in large meadows. We don't have meadows here, but along the trails I want to work with grasses in special ways so the trails themselves become places of great beauty. The thing with grasses is, once you know exactly how to handle them, they respond so quickly. We need to learn lots more about them. We need to know not just how they grow and prosper, but also how they die. What becomes of them when they turn golden and brown. That's an important part of the visual palette. I think grasses are the most exciting prospect for the future.

When you were trying to figure out how to plant this area, you said you explored other rocky terraces. Give me an example of places you visited.
One of the best known rocky areas is around Barmer town, about 200 km. away from here. A lot of the outcrops are unnamed places along the road. We'd literally set off and see a rocky area and drive towards it. At the right time of year, we'd pick up things we din't know, press and take them back to Jodhpur. We'd take them to Dr. Bhandari or look them up in his book. The rocky outcrops tend to be places where nobody is likely to farm and they tend not to be inhabited. The places that are sometimes inhabited are the slightly more gravelly piedmonts at the base of hills. Many of them don't have names. Rocky parts are, in some ways, the poor cousins, parts of deserts that are not intrinsically valued for any reason. Not for water, not for soil, not for farming, not for anything.

Why did you have to go 200 km.? What's special about Barmer?
Two or three different kinds of rocks for a start and very extensive rock.Very steep and relatively unspoilt hills. A convenient place to stay close by, in Barmer town.

What discovery of plant during your exploration was the most exciting?
The plant that gave me the most pleasure was a clonal forest. There's a plant called *Anogeissus sericea* variety *nummularia.* We were driving to Nagaur, and in the distance we saw what looked like roughly 150-200 old, gnarled trees covering about three hectares. When we went close by, it was riven by seasonal nallahs with a small lake in the middle which was more or less dry. The soil was filled with lime granules. All these trees were very old and quite badly lopped for fodder. Very beautiful leaf structure. We didn't know what it was and had to look it up. There was not a single young plant as you'd expect in a forest of that kind. I suspected it was a clonal forest. I can't say for sure because I haven't done a DNA test. But the chances are very high as the forest was propagated by suckers. It is one giant organism. It's when the idea hits you that you realise, "Oh my God! You've got a huge, huge organism here." We know that other species of *Anoigeissus* also form clonal forests, like pendula. So it is very likely this is doing the same thing. That was very exciting for me. We managed to use some of the suckers to make vegetative cuttings and reproduce them. So we have got some of these growing in the park.

I loved seeing *Tephrosia falsiformis* in that sandy valley because they are very beautiful. Because we don't have sand in our park, we created one small sandy plot in one small part. We dug down and created a bowl, and trucked in salty sand to create a sandy exhibit.
The other plant I really enjoyed discovering was *Moringa conkanensis.* I saw it for the first time growing on the crest of a sand dune. From a distance I wondered what it was. I asked a local and he named another desert tree which it didn't resemble at all. We stopped the jeep, walked to the top of the hill. It turned out to be *Moringa.* At that stage it was almost completely bare, with very corky bark but its roots had been completely exposed because the sand dune had shifted. Clearly it had roots that ran many metres long. Some of the roots were sticking out like elbows. Subsequently, we've seen it in flower. Very beautiful. They are pure white with a beautiful tinge of pink. In our field guide, there is a photograph of them and I've said they are like birds in flight.

So propagating plants wasn't a challenge?
Propagating has not been a challenge. There are a few species, may be just about four or five species that Vinod [our nursery man] says, "I've managed to germinate them but I don't know how to keep them alive." Something is not right about how we're doing it. We are trying to understand why this happens. We know that die-back is very important in the desert. Usually what happens is that a plant invests so much energy in its root zone that it can often look dead above ground. That's when a gardener will typically say, "Oops! This one's gone," and chuck it away. So you have to be careful not to chuck away plants that look dead but aren't really dead.

Tree planters talk of scouring seed coats with acid, or eroding it on a hard surface before planting. Are there strategies like that you use?
Yeah. Herbaceous plants have one very successful strategy which doesn't involve any kind of physiological adaptations to the ecosystem. Instead, they live very short lives in that little window of opportunity when there is moisture in the soil. And the strategy involves rushing through their life cycle, producing hard-coated seeds, dropping them just as conditions become adverse and those seeds then remain in the ground until the next rains come. With these seeds, you basically need to soften the seed coat. We've never needed to use acid, but sometimes you just need to rub them on sand paper. Very often it's enough to leave them in water overnight. At worst, pour boiling water on them and that will soften the seed-coat enough. People know how to handle the bigger leguminous things, like acacias, for example. There are no secrets there, really.

Does anything have to pass through the gut of an animal?
We haven't found a recalcitrant seed yet that's that difficult.

You mentioned that *Farsetia* was so endangered that it was found in only one place in India. Is there any plan to rehabilitate it like taking it out into the wild and repopulating the landscape?
There should be. We got just a few plants of *Farsetia* and in theory we could be thinking of rehabilitation. One of the problems is that if you plant anything in an unprotected area, it's very hard to have any kind of reasonable confidence that it will survive on its own. So it's a tricky thing. Often you'll need to look after a plant for a few months at least. That's hard to do. You are talking of sites 200-300 km away. You'd have to look after it for three months, four months. That's hard to do long distance.

You were saying that Barmer was fairly remote. What would affect a plant in such a remote area that it's in retreat?
You'd have to know what the dangers were, what if anything was foraging on it. In our experience if you put the plant in the ground, if it is being introduced and it is not just coming up from seeds then there is certain amount of looking after that you have to do. If you don't do, you are really minimizing the chances of its survival.

Have you tried seeding a place?
We've never been able to get *Farsetia* seeds in that quantity. At best, we get about 10 seeds a year. Some don't germinate. Quantities are too small.

Grasses?
Absolutely.

Now that the park is open, what about the local people? How are you going to bring them into the picture?
Don't really have specific plans yet. It's clearly very, very important for us to try and get this right. What we've already started doing, over nearly two years ago, is to engage with people from a residential area called Brahmpuri who walk through the park. They have a gate that leads directly into the Park. We want them to feel they can do this, that they are not being excluded. So whenever I've had an opportunity of meeting somebody, I've often tried to engage them in conversation, tell them what we are doing, make them understand the whole point of it. Many of them feel a tie with the land that goes back generations. They say, "My father used to come here, my grandfather used to come here. We used to sit here." We want to encourage that, we want it to be an important part of what we're doing.

One of the things I'm very keen on doing but don't know how to do yet is to institute a system of voluntary guides or 'docents'. Some people think the docent system may not work here. When you have a good docent system, you are tapping into reservoirs of enthusiasm that can be very infectious. If we can do that, it would be one of our best strategies to protect ourselves from the damage that people who are hostile to the park can possibly do. We have a temple next to us. The moment they are hostile to us and hostile to the park, we need to disarm that. We need to make them feel part of it. It's not going to be easy. It's not something I think I'm very good at. So we may need to bring other people to come in and do this for us. Other than the interpretation centre, we want to have a really good guiding system in place.

Is there a way of taking the park out of the park? It's also a conservation area. You don't want a lot of people trudging up and down. So is there a way of taking it out of the confines of the park itself?
I don't know. Of course what we want to do is confine people to trails which are clearly marked. I think the big challenge is how do you make something that people will respect, won't treat as something that is not worthy of respect. When you are growing native plants, the problem often is that people will go through the landscape and will say, "What is this? Just jungly things?" With local people that's often the problem. I don't know how this is going to work really. I think guiding is really one of the keys. Vinod, for example. He himself is so enthusiastic, he's telling people about the butterflies, the medicinal properties of the plants, their local uses and it's very infectious. I'd love to institutionalise it, somehow.

**Janaki Lenin is a freelance writer with a special interest in wildlife and conservation issues. janaki@gmail.com.*

Celebrity, charisma and the environmental movement

WHAT ROLE DOES CELEBRITY AND CHARISMA HAVE IN THE ENVIRONMENTAL MOVEMENT? ENVIRONMENTALISTS ARE OFTEN EGALITARIAN BUT CHARISMA AND POWERFUL PERSONALITIES MAY BE MORE SIGNIFICANT THAT WE REALISE

Who is your favourite conservationist, or environmental activist? Do you have a hero who inspired you onto your current life path? If not, allow me to suggest a few. How about Arnold Shwarzenegger, the former governor of California, actor and Terminator? Arnie was named by the The Observer's 'Eco-Power' list, as one of a number of 'activists, film-makers, writers, politicians and celebrities who will be setting the environmental agenda' after he had, among other things 'effectively outlawed his own hummer' while in power. If you object that he flew to work in a private plane a bit too often to qualify then how about Brad Pitt, an actor (for building green homes in New Orleans). Or how do you feel about Walmart, the US retailer, which was listed by The Observer, because it has 'promised to apply eco labels to thousands of product lines.'

There was a quick repost to the publication of the 'eco-power' list from the UK environmentalist, activist and writer George Monbiot. George, responding in The Guardian, was not amused. In part he objected to the lifestyles and roles of some of the people listed. Some of the people on that list owned a few too many cars, like, Alan Mulally, who is the CEO of Ford, and responsible for making quite a few of them. 'Much of the list,' Monbiot complained, 'was a catalogue of rich and powerful people who have now added green—or some nebulous semblance of green—to their portfolios.'

But Monbiot had some more fundamental objections. First, 'eco and power occupy different spheres.' His environmentalism is about challenging systems which concentrate resources onto a few. It cannot celebrate the lives and achievements of people who have done so well out of those systems. Second, the environmental movement is about collective effort and solidarity. The media may like to promote the work of a few individuals which it thinks is rich and special. But we must reject, Monbiot argues, the superman myth that individuals can save the world. 'In reality, only big social movements, emphasizing solidarity and collective effort are likely to be effective.' Furthermore, he insisted, 'Environmentalism is one of the last hold-outs against celebrity culture' and this 'eco-power' list portends an invasion of celebrity interest which had to be resisted.

Monbiot's argument has much to commend it. For a start, if people who are not particularly beautiful, rich, articulate or charismatic began to get more attention, then I would be bound to benefit. Lets face it, most of us would. But, more seriously, there are difficulties in moving from the idealism of this call into real life environmental and conservation movements. Examine almost any environmental movement and you will find some dominant figures, and sometimes towering personalities, at work.

Can you imagine, for example, accounts and histories of conservation and environmentalism in the US which did not mention John Muir, Rachel Carson or David Brower? In Australia without David Flannery or Penelope Figgis? In India without Valmik Thapar, Billy Arjan Singh or Vandana Shiva? In the UK without mention of Tony Juniper or David Bellamy? I am not arguing that these people are celebrities, many may well eschew, or have eschewed, fame. The point is simply that environmental movements, like any other social movement, cannot evade the power of personal charisma. Solidarity and collective effort are essential to environmentalism but it is difficult to imagine their being mobilised without charismatic power. Monbiot's complaint gave no space for the workings of charismatic power or the demands of audiences and participants for it.

The prominent individuals in environmental and conservationists movements are not just media darlings, they are produced by forces within the social movements themselves. Often these people are good communicators, they make good speakers and are powerful motivating forces. Indeed, there is a distinct tendency among left wing activist and environmental movements in the UK to demand the same people address their conferences. Naomi Klein is a favourite, and another is George Monbiot.

Coping with the tendency to throw up leaders and follow them is challenging and requires considerable effort from both leaders and listeners alike. When I heard Naomi Klein speak at a book launch (and I listened as irreverently as

Pencil Sauce

I could) I was impressed by the way she directed her audience to local activist groups so that they could get involved and not just listen. Monbiot has done the same (at least I think he did, I was trying hard to ignore the people on the stage). Flat social movements have to be fought for.

So given that this is a fight, and I'm rather scared of fights, I think we actually do need Arnie. Who better to take on an entire social movement and squash it flat whether it wants to be or not? Please come back Arnie; you promised you would.

** Daniel Brockington is a Reader at the School of Environment and Development, University of Manchester, United Kingdom. Dan.Brockington@manchester.ac.uk*

Conflicted lands in east Africa

A STUDY DOCUMENTS FAUNA AND PRESSURES IN A WILDLIFE CORRIDOR UNDER SEVERE THREAT IN THE KILOMBERO VALLEY, TANZANIA

Kalyani Gamapathy

The Kilombero valley is the largest seasonal wetland in east Africa. Situated between the Selous Game Reserve and the Udzungwa mountains, the area supports a diverse fauna and flora. It once had the largest density of wildlife in Tanzania outside protected areas. Most of the Kilombero valley consists of alluvial floodplains, fringed by Miombo woodlands, evergreen forest fragments and grasslands.

The valley is home to over 350 species of plants and a wide variety of animals, many of them endemic or threatened with extinction. It also contains an important bird community, including three endemic species—a weaver bird and two species of warblers. During the rainy season, the valley becomes an important spawning area for several fish species in the Rufiji river. In addition, it has a high diversity of amphibians and reptiles, including one endemic species of crocodile.

The Kilombero valley also contains a number of large mammal species such as African elephants, buffalo, baboon, bushpig, bushbuck, hartebeest, reedbuck, sable and waterbuck. In wooded grassland areas, a number of African ungulates are present such as the zebra, eland, and puku. The puku formerly occurred widely in grasslands near permanent water, within the savannah woodlands and floodplains of south-central Africa, but has now been reduced to fragmented and isolated populations and are listed as Near Threatened on the IUCN Red List. Puku are the only large mammal not represented in the National Parks and Game Reserve network of Tanzania. The long–term survival of the species is therefore dependent upon the conservation of the remaining isolated populations, the largest of which is found in the Kilombero valley. This population accounts for half the global population, making it critical for the survival of the species, however, its habitat is increasingly threatened. Despite not having a protected status, except for the marginal protection it receives as a Game Controlled Area and as Forest Reserves, the valley is of utmost importance for the migration of large mammals like elephants. Historically, elephants and other large mammals have crossed the valley to migrate between the Udzungwa mountains and the Selous, moving down into the floodplain during the dry season and going back to the Miombo woodland during the rainy season. However, in recent years the increase of farming encroachment in the valley has put increasing pressure on the only two remaining wildlife corridors: the Nyanganje corridor and Ruipa corridor.

The valley constitutes one of the most fertile areas in Tanzania, and in the past decade the availability of unprotected land has attracted a large number of migrants into the floodplain and the Miombo woodland. As a result, large areas of the Miombo have been cleared for farming and cattle grazing. Although the majority of the villagers are subsistence farmers, mainly cultivating rice and maize, the extent of human encroachment is so significant that it threatens the survival of many species and the viability of the whole ecosystem. The degradation of the Miombo woodlands and the floodplain is of great concern as their importance as a wildlife refuge is likely to increase as the remaining corridors are getting less and less practicable.

Socio-economic surveys have shown that over 25% of the families currently living in the area have immigrated less than five years ago, predominantly from within the Morogoro region, and often from neighbouring villages within the same district. This migration has mainly been driven by the availability of fertile land and lower population densities in the Kilombero valley. However, population pressures on agricultural lands lead to increasing unsustainable land use practice, and expansion onto marginal lands. As a result, human–wildlife conflict increases due to the threats that wildlife pose to crops and livestock. In addition, social tensions are aggravated between traditional inhabitants and the recent agro-pastoralist migrants. To complement socio-economic surveys, long–term monitoring of

Kalyan Varma

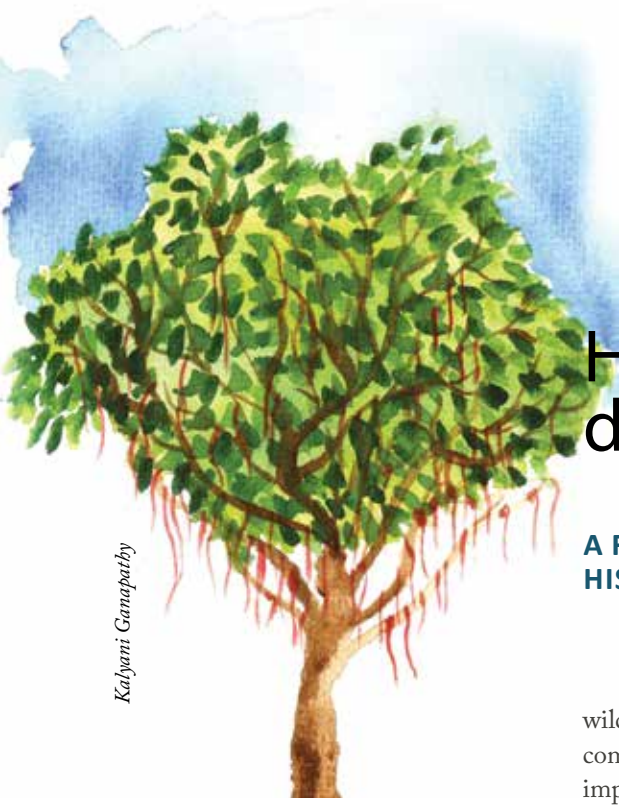
large mammals is essential to assess the impact of human encroachment on wildlife. Surveys have been carried out in the Kilombero valley since 1998 and have shown a significant decline in the number of large wild mammals observed in recent years, especially elephants, puku and buffalo.

Recent surveys of the Northern part of the Ruipa corridor have shown a total collapse in wildlife numbers, with duiker the only wild large mammal recorded in the Namwai forest in 2010, compared to 25 species just three years ago. Furthermore, studies of the spatial distribution of elephants in the southern Ruipa corridor, between the Selous and the Kilombero river, suggest that this section of the corridor is also closed. Elephants seem to be unable to cross the Ifakara-Mahenge road and reach the floodplain from the Selous. The potential isolation of a large population of elephants within the Udzungwa Mountain National Park is worrisome because it is likely to lead to important disturbances within the park and threaten other local endemic species.

Without adequate management of non-protected areas, the land surrounding National Parks and other protected areas becomes increasingly degraded. However, with a substantial amount of time and financial commitment, as well as political will, limiting human-wildlife conflict and restoring the Ruipa corridor is possible. To this end, management recommendations are now being drawn for each village along the Ifakara-Mahenge road.

There is often a conflict between the conservation of wildlife and human needs. However, in some cases protection measures can be mutually beneficial. For instance, there is evidence that agriculture at low densities could actually increase species diversity and abundance of large mammals. In order to reopen such a migration route, large mixed-use areas are therefore likely to be more efficient than the single–use land management plans currently in place. In addition, protecting Namwai forest, which is currently over-exploited, would be an important step in preserving the migration route and would also directly benefit the local communities. The village councils are being made officially responsible for the conservation of the floodplain. However, they currently lack the capacity and resources to control immigration and effectively manage their lands, the boundaries and tenures of which are also under dispute. In order for them to effectively enforce the new management plans, it will be essential to invest in capacity building. In particular, this should involve improving education on good farming and grazing practices, as well as infrastructures. It is by directly engaging the local farmers that the sustainable use of natural resources will be achieved, and hence the long term survival of large mammals in the Kilombero valley.

** Andrew Bamford is Principle Investigator and Daniella Ferrol-Schulte is Research Officer for the Frontier Tanzania research programme. Elise Belle is Research and Development Manager at the Society for Environmental Exploration /Frontier, UK.*



Kalyani Ganapathy

Human-nature dynamics through time

A FASCINATING ACCOUNT OF 20TH CENTURY ENVIRONMENTAL HISTORY AND THE HUMAN FOOTPRINT ON THE PLANET

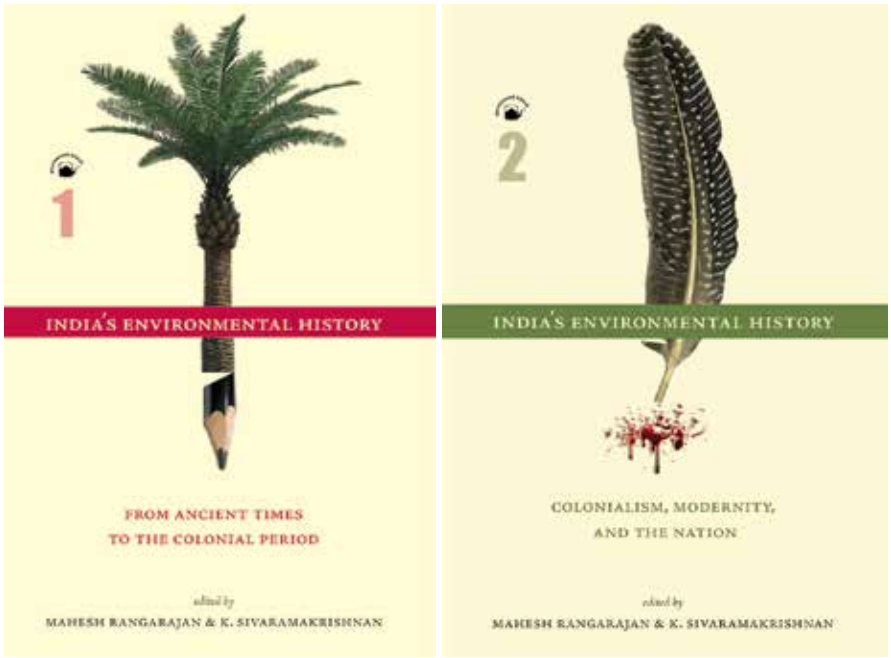
Picture this: a thriving forest is set afire and all its wildlife exterminated, simply to construct a new headquarters for a new government. If you were asked to date this, you could be forgiven for thinking it yet another irresponsible excess committed by a freshly-elected party in contemporary India. While the exact answer is a matter of some debate, the description goes back to mythology: this is how Indraprastha, the Pandava capital, was created.

If there were only one lesson that a student or practitioner of conservation science could take from the recently published two-volume anthology India's Environmental History (IEH), it would be that old truth: history repeats itself. To anyone with an interest in conservation in India today, it might seem that the powers-that-be function with a with a near-imperialistic drive, whether in the pursuit of economic heights through the thoughtless extraction of natural resources or with the desire to protect what wilderness remains. In either case, local communities and cultures, ecological impacts and conservation concerns be damned. But none of this is new—the whimsy of those in power might ban cow slaughter today, in exactly the same way that a newly-converted emperor Asoka banned hunting and fishing over two millennia ago, punishing disobedience with expulsion.

As one moves from chapter to chapter, the realisation that many of these tussles with nature are far older than we imagine comes as a sort of mixed comfort. Larger contests like power struggles over the commons, state powers marginalising forest communities as well as particular frictions such as the altering of river courses, the detrimental effects of canal irrigation and the centuries-old conflicts with wildlife in agricultural landscapes: these have all existed through the ages, although the backdrops against which they are played out constantly change.

But a word of caution for those looking into the book hoping to stumble upon solutions to these disputes comes in Sumit Guha's essay on local communities' use of the commons. He reminds us that through time communities have "previously encountered many of the problems we face today and were frequently unable to provide optimal solutions to them." Yet, as one reads on, what one does find are not answers but certainly a far more nuanced understanding of several sticking points in contemporary environment and conservation debates.

While essays underpinned by key issues in environmental history form the meat of the book, the anthology also contains a very welcome sprinkling of pieces that provide fascinating tidbits from the past: Trautmann writes about war elephants and their central contribution to the might of Mauryan armies, Divyabhanusinh tells us of the Mughals and their relationship with nature and wildlife as evidenced by their paintings, biographies, autobiographies and incredibly meticulous record-keeping and Grove reveals that that East India company network was key to early studies on climate patterns, including the discovery of the link between the Indian monsoon and the El Nino weather phenomenon.



INDIA'S ENVIRONMENTAL HISTORY, Vols. 1 and 2
Edited By Mahesh Rangarajan and K. Sivaramakrishnan
Permanent Black, New Delhi, Delhi, IN, 2012.pp.464 & pp.614, 1850.00

While the essays span an admirable breadth across time, space, methodologies, theories and issues, understanding history only as a series of such individual accounts of events is to limit its function as well as our own understanding: a classic failure that nearly all school textbooks of history suffer from. History, as we encounter it in the education system, is often no more than a documentation of what went before, a simple compendium of occurrences, offering little besides the appeal of a story. But history as process as rather than episode, as a continuous narrative of many and varied threads weaving together to create the present, carries far more: it surprises, reveals and teaches.

This approach that IEH takes: examining not a series of events, but the gamut of processes that shaped (and continue to influence) the environment of the subcontinent through the centuries. Such an approach makes it possible, even for the uninitiated reader, to follow threads that whet their interest and explore further. More importantly, it provides a variety of frameworks through which to examine and understand environmental conundrums of the present, not as *sui generis*, as they often seem, but as near-inevitable inheritances from the past.

But how is the new reader, say a student of science rather than the arts, to identify these threads and frameworks? Editors Rangarajan and Sivaramakrishnan make that process both easy and greatly interesting in their superb introductions to both volumes. Although the proper office of an Introduction is to put the book into context for readers of all backgrounds and persuasions, rarely do they carry out this duty. Often, they further gate the book and cause trepidatious beginners to flee. The two introductions in IEH, however, triumph in this tricky task. They provide a fantastic overview of materials from which history can be reconstructed—the use of oral, literary, archeological and more recently, ecological evidence—while directing the reader to be aware of the voices of each of these privileges. They guide the reader through the evolutions of debates and arguments that have accompanied tellings of the past and flag problems with the tools of these presentations. In sum, the introductions in IEH are what make the parts whole and illumine how and why we find ourselves at these coordinates at this time.

** Pavithra Sankaran works with Education & Public Engagement team at Nature Conservation Foundation. pavithra@conservation.in*

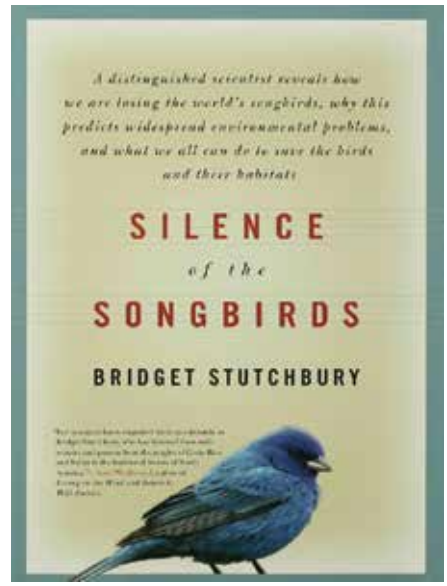
Myriad threats to songbirds

THIS BOOK ON CONSERVATION ISSUES CONCERNING MIGRANT BIRDS IN THE AMERICAS IS ONE FOR THE COLLECTION.

With this book, Bridget Stutchbury, ornithologist and currently professor at York University, Toronto, has made an important contribution to the popular science literature on birds of the New World. The focus is on the many bird species that are suffering long-term declines in their populations, especially neotropical migrant songbirds that breed in North America and spend the 'winter' (or more accurately, the non-breeding season) in Central and South America.

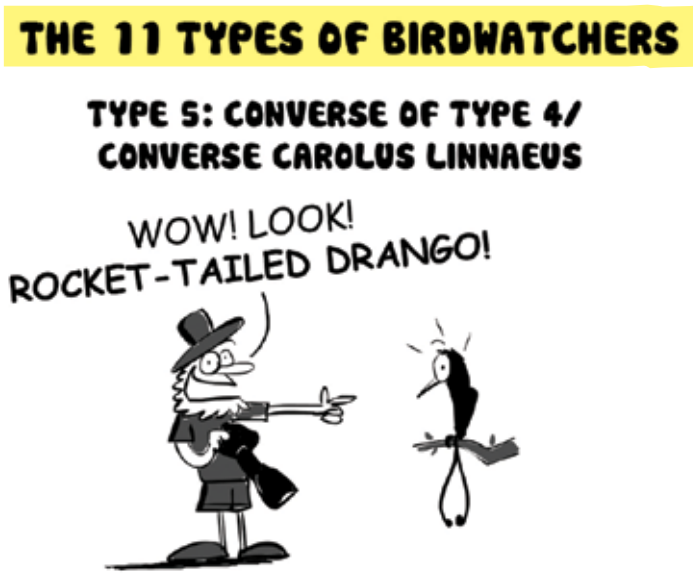
In nine chapters, Stutchbury leads the reader through key conservation issues affecting these birds in the breeding and non-breeding range. Some are very familiar to readers of the neotropical migrant bird literature: habitat loss and fragmentation at both ends of the range, brood parasitism by cowbirds and predation by feral cats in the breeding grounds, problems for migrants en route in stopover sites, and the conservation value of countryside and secondary habitats for birds, including shade coffee plantations in the south and the forests regenerating on abandoned agricultural land in the north. All of these have spawned a great deal of scientific literature and attention, particularly since the early 1990s. Two notable earlier books that brought to the fore the emerging concerns, including the alarming problems faced by neotropical migrant birds, were John Terborgh's 1989 book 'Where Have All the Birds Gone?: Essays on the Biology and Conservation of Birds That Migrate to the American Tropics' and Scott Weidensaul's 1999 popular overview of the ecology of migrant birds 'Living on the Wind: Across the Hemisphere with Migratory Birds.'

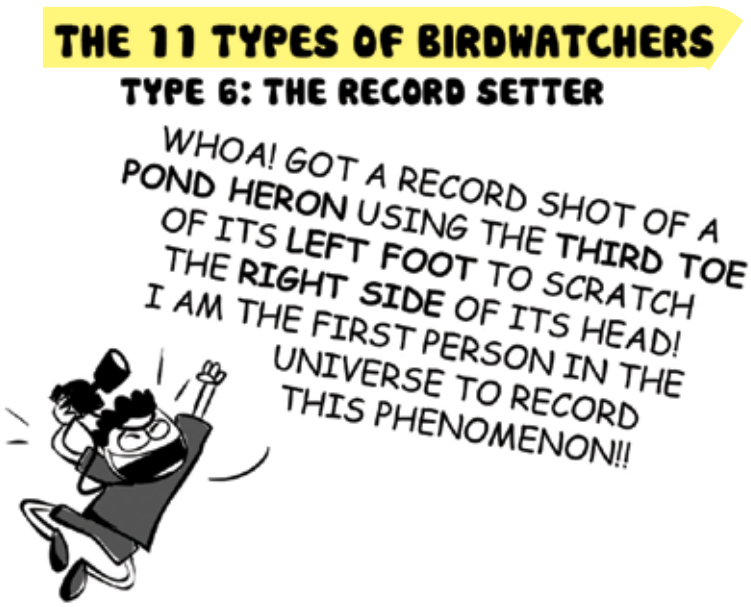
Stutchbury's book is a valuable addition to this literature in two ways. First, her book, published in 2007, brings the knowledge up-to-date, introducing some recent studies that have improved or changed our understanding, for instance, studies on stopover ecology and edge effects. In addition, she describes some issues at greater depth, paying more attention than the earlier books on the subject. For instance, Chapter 6 on the ongoing scourge of pesticides is timely, evoking the awareness that even 50 years after Rachel Carson's ground-breaking book 'Silent Spring', the environmental problems created by pesticides remain as serious, if not more, today. Even as some of the persistent organic pollutants, such as the organochlorines (OC) including DDT have been banned or reduced in several countries, new and more potent chemicals such as organophosphates and carbamates have taken hold. While some of these may not accumulate like the more persistent chemicals, they are more toxic at smaller doses to organisms in the environment (e.g., deadly organophosphates such as monocrotophos and carbamates such as carbofuran). They also affect human and animal health by disrupting hormonal or nervous systems, causing cancers, or having other detrimental effects.



SILENCE OF THE SONGBIRDS
How We Are Losing the World's Songbirds and What We Can Do to Save Them
Bridget Stutchbury. 2007. Walker & Co, 2009. ISBN: 9780802716910

Her final chapter is also interesting as it builds on the work of her students and herself, among others, on the importance of the presence of other individuals of the same species (conspecifics) for birds to establish themselves and breed successfully in habitats. Recent work on behavioural ecology, particularly related to breeding behaviour and breeding success, is described by Stutchbury, highlighting that "of paramount importance is





whether or not [the birds] will lead a productive social life...". This has its own implications for conservation. As she concludes: "In terms of managing forests and landscapes to increase bird biodiversity, we have to do more than add trees and nest sites to forests. Birds need other birds; as the numbers of migrants continue to fall, this will only disrupt the mating system even more, and in turn the population decline will accelerate."

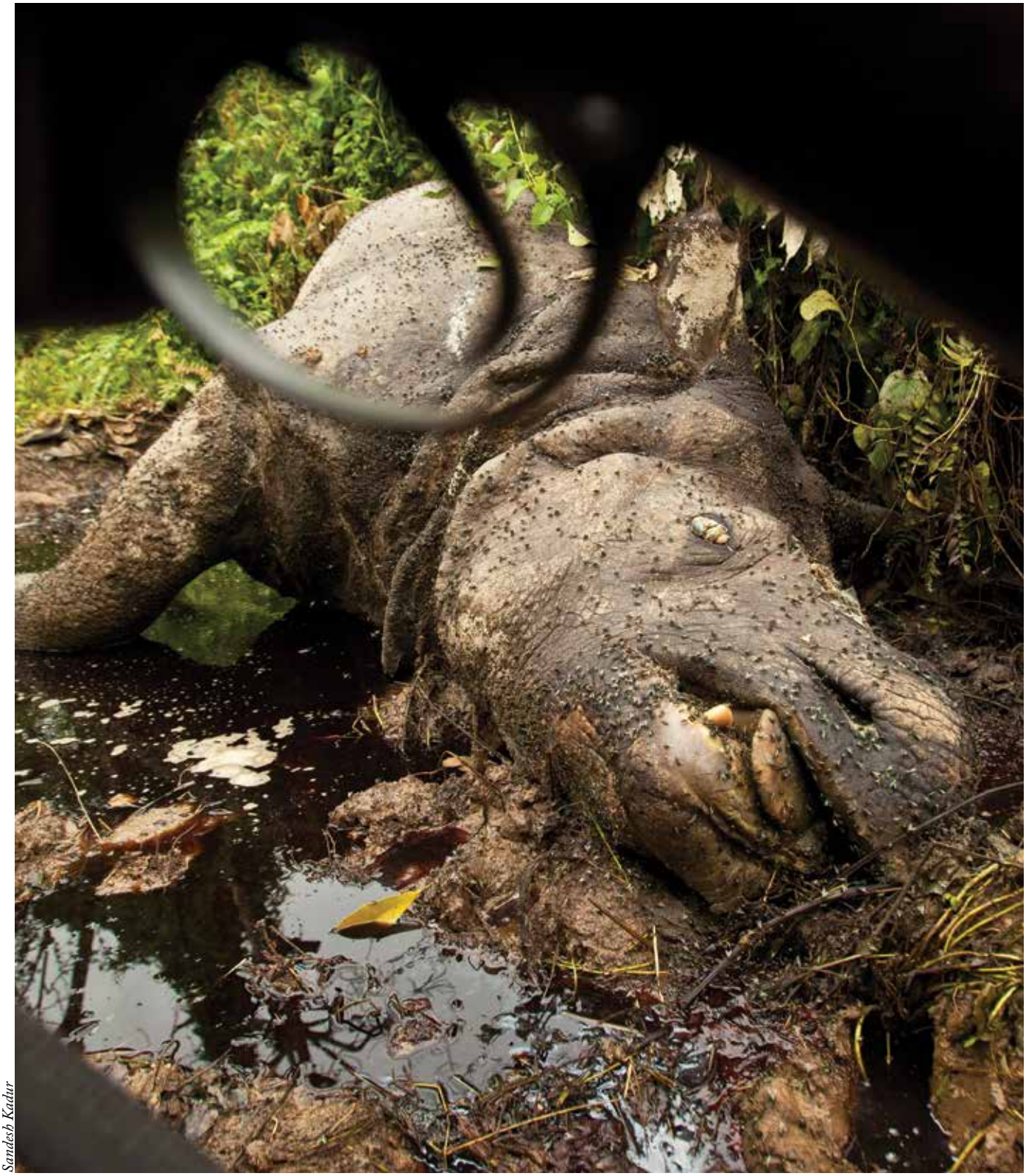
The only aspect where the book falls a little short is in the missed opportunity to describe parallel research and findings from the Old World. The author makes passing mention of similar bird declines noticed in the UK and in the Europe–Africa migrations, but does not expand on it. Are the patterns similar, or different, and in what ways? Similarly, there is an entire chapter devoted to shade-coffee plantations and birds, which retains an exclusive New World focus. There is a significant body of work from the Old World on the conservation values of shaded plantations, home gardens and the like, with significant similarities and some key differences, which finds no mention. As in science, so in scientific communication, it seems, that each region progresses sometimes as if the other hardly exists.

Written in an easy and simple style, this is overall a good book for the shelf of anyone interested in birds and conservation. The author highlights what individuals, as conscientious consumers, can do to minimise their environmental footprint, such as by buying shade-grown coffee and organic produce, keeping bird-eating cats indoors, or turning down lights in cities during the migration season. In a few places the writing sparkles and it feels like we are accompanying her and her students on a morning walk, through the forests of Pennsylvania or Panama, watching birds and learning about their ecology and behaviour from someone who really knows them well.

**TR Shankar Raman is a scientist at the Nature Conservation Foundation, Mysore. trsr@ncf-india.org*

REFUGIA

Every year, rising floodwaters of the Brahmaputra River in Northeast India force rhinos to leave the protected plains and seek shelter in neighboring hills. This is where poachers lie in wait for an opportunity to strike.



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