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Cover: **Seed dispersal in Milkweeds**
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CONTENTS

FEATURES

ARTISTRY AND MECHANICS IN NATURE

Others

Rivers of neglect

Humans have preferentially settled along freshwater sources from aeons, and as a consequence, freshwater ecosystems and the species they support have suffered from multiple and on-going stresses from use by humans (Revenga *et al.* 2005). South Asia, especially India, has one of the highest known diversity of riverine fauna, including freshwater turtles (Buhlmann *et al.* 2009) and riverine nesting birds (Buckton and Ormerod 2002). However, this is also the region with little information on the specialist fauna of riverine areas (BirdLife International 2001; Rahmani 2012).

In India, most of these rivers have been dammed to divert water for irrigation, drinking or industrial use, and for power generation. When the hydroelectric projects are proposed, they obtain clearances by claiming the benefits of high power generation and the other benefits, but with time, they end up with enormous cost overrun and shortfall benefits due to their consistent underperformance. The construction of dams often impacts the downstream areas, causing some stretches to totally dry up, especially during the dry season or end up as narrow streams.

The construction of dams adversely affects the riverine species, which are adapted to the natural flow of the river with the changing seasons. These impacts are not limited to fish and other aquatic fauna as one would assume, but also riverine island-nesting birds, besides other animals of the riverine ecosystem. The breeding adaptations of riverine nesting bird species reflect seasonal changes in water levels – nesting takes place when low water levels during the dry season expose sand banks or islets, and the young fledge prior to the arrival of the monsoon. However, nowadays, water releases from dams and barrages may flood entire nesting colonies, or conversely, with the retention of water upstream, the downstream areas become too shallow and narrow resulting in the isolated sand islands get connected to the banks making it unsuitable for nesting of riverine birds. Low water levels allow people, cattle, and predators easy access to the nesting sites, making the eggs and chicks vulnerable to trampling and predation.

Most of the development projects in India are required to conduct an Environmental Impact Assessment (EIA). However, in many cases, the EIAs of dam projects are of little merit and are more or less routine exercises for obtaining a green signal for the project, as they do not examine the large cumulative effects of the project. The growth of the construction industry in India has placed an enormous demand for river sand, and a significant proportion of this demand is met through illegal sand mining from rivers. Undisturbed sand deposits are crucial breeding habitats not only for the riverine bird species, but for several other species (including turtles and gharials), but with unchecked sand mining, many of the best nesting sites are being destroyed. The sand loss through extraction, legal or illegal, is worsened by the dams upriver that hold back sand and obstruct the deposition of new sediment. While some of the illegally mined sand is replaced by the annual monsoon floods, their role will be short-lived. Illegal sand mining in Indian rivers has been going on for so long that many locals believe that it's their right to continue exploitation of the same.

Apart from sand mining and dams, many of the rivers in India are dealing with the issue of proposed linking and diversion projects. The belief that floods and drought can be mitigated by simply linking rivers and transferring water across basins may be workable for a few sites or cases but certainly not a universal solution for the problem. Despite a global paradigm shift in water management, we are still eager to go ahead with river linking projects. These interlinking projects result in the loss of biodiversity and habitats through construction of canals, by

PARVEEN SHAIKH

disturbing hydrological cycles, from loss of natural flow, and could also result in displacement of people. Water requirement for various sectors like agriculture, industrialization, and domestic sector is always considered as priority. But is constructing dams, river linking, and distance water transfer for fulfilling these demands is the correct solution? These solutions are having far more impact to the ecosystem than what we predict.

Riverine habitats are among the most threatened of all ecosystems and global freshwater biodiversity is declining at far greater rates than ever for the most affected terrestrial ecosystems. Rivers have enriched our lives since civilization and we cannot afford to neglect them. For how long our rivers will continue to flow freely and for how long we will continue to marvel at the species dependent on them? This will depend on how soon we can break away from our unconscionable dependence on the rivers, on how we can stop hampering the flow of our rivers, and on when we restore them to the pristine state.

Also, one should not forget that the health of our oceans directly depends on the quantum of freshwater and nutrients discharged annually by rivers into seas enriching our marine wealth, including fishery. By linking and damming rivers to provide irrigation for agriculture, are we creating another set of ecological refugee – the fishing community – is a question worth pondering.

Deepak Apte and Parveen Shaikh

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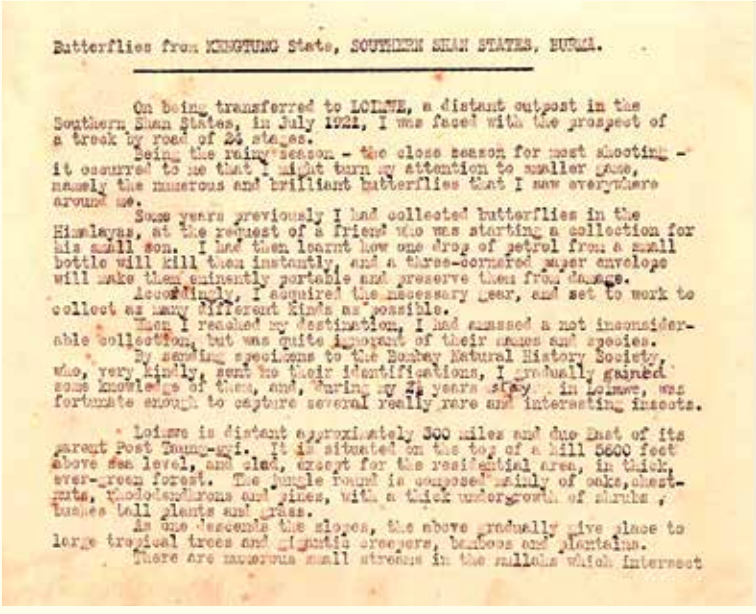
Tracing a tenuous thread

Text and Photographs: **Titus Drummond**

> *"Watching my daughter gently touch a butterfly – a butterfly touched by her great-grandfather nearly a century earlier – changes how I will view everything for the rest of my life."*

Accurate and detailed illustrations of over a hundred butterflies have been painted in this diary



Butterflies from KENGTUNG State, SOUTHERN SHAN STATES, BURMA.

On being transferred to LOILWE, a distant outpost in the Southern Shan States, in July 1921, I was faced with the prospect of a trek by road of 24 stages.

Being the rainy season - the close season for most shooting - it occurred to me that I might turn my attention to smaller game, namely the numerous and brilliant butterflies that I saw everywhere around me.

Some years previously I had collected butterflies in the Himalayas, at the request of a friend who was starting a collection for his small son. I had then learnt how one drop of petrol from a small bottle will kill them instantly, and a three-cornered paper envelope will make them eminently portable and preserve them from damage.

Accordingly, I acquired the necessary gear, and set to work to collect as many different kinds as possible.

When I reached my destination, I had amassed a not inconsiderable collection, but was quite ignorant of their names and species.

By sending specimens to the Bombay Natural History Society, who, very kindly, sent me their identifications, I gradually gained some knowledge of them, and, during my 24 years stay in Loilwe, was fortunate enough to capture several really rare and interesting insects.

Loilwe is distant approximately 300 miles and due East of its nearest Post Town-Lashio. It is situated on the top of a hill 5600 feet above sea level, and clad, except for the residential area, in thick, ever-green forest. The jungle round is composed mainly of oaks, chestnuts, rhododendrons and pines, with a thick undergrowth of shrubs, bamboos tall plants and grass.

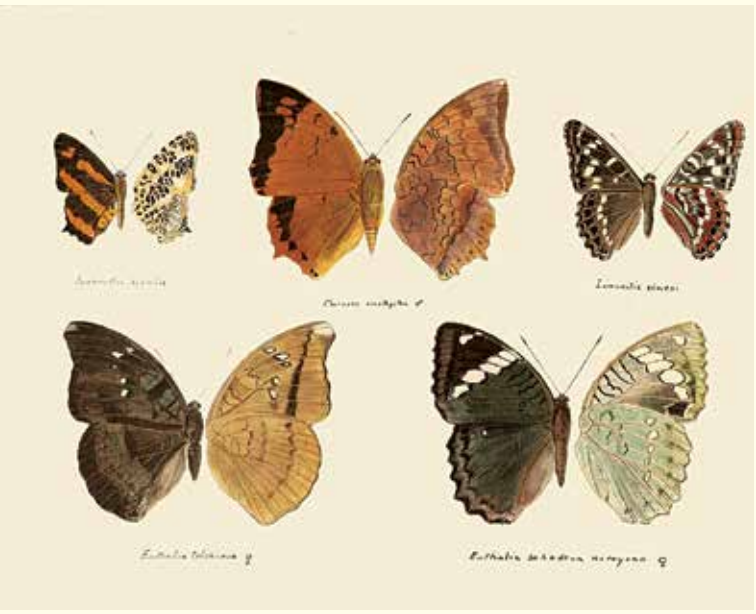
As one descends the slopes, the above gradually give place to large tropical trees and climbing creepers, bamboos and plantains.

There are numerous small streams in the nullahs which intersect

The diary has systematic accounts of the butterflies collected and their habitats

All my adult life I had had the 'Butterfly book'. I'd treasured it, I'd guarded it and I'd wondered about it but, in truth, I'd never really known much about it. I just knew it was important. As a young person, I'd never really known much about my family. My mother had disappeared when I was a baby and my father, while always in the background, had chosen to go and live in Spain. And when he died, a bit over fifty years later, still hadn't come back. I had step-parents who were great but they didn't know much about my family either. Then, when I was thirteen, for a lot of very boring reasons, I was sent to live with my paternal grandmother, and

Watson's Hairstreak is a small butterfly found in the north-east ▶



G.P. Drummond's information on butterflies grew as he entered into communication with experts

a new phase of my life began – to start with, up in the attic I'd found a lot of medals, some moth-eaten animal skins, and the 'Butterfly book'!

As time passed, I learnt that some time in the mid-1920s my grandmother had set sail for India in what was colloquially known as the 'fishing fleet'. This 'fishing fleet' consisted of British women heading for India to find Indian Army officer husbands, and my grandmother did doubly well finding my grandfather because she wasn't even British. She was half Russian, half German!

But, prior to the arrival of the future Mrs Drummond … as well as being a British officer with a Military Cross, and a confidante to Ayub Khan, my grandfather was also an avid butterfly collector who had cut his teeth on the butterflies of the Himalaya. Sadly, from my point of view, he was also a hunter. So when posted to Loimwe, a distant outpost in the Southern Shan State of Burma (now Myanmar), in July 1921, he was most disappointed to learn that it was not only the rainy season but the close season for most shooting. So he turned his attentions back to butterflies.

My grandfather explains "Loimwe is situated on top of a hill, some 5,600 feet above sea level and is clad in thick, evergreen forest. A jungle apparently composed mainly of oaks, chestnuts, rhododendrons and pines, with a thick undergrowth of shrubs, bushes, tall plants, and grass. As one descends the slopes, the above gradually gives place to large tropical trees and gigantic creepers, bamboos and plantains. There are numerous small streams in the nullahs which intersect the hills and then flow into larger streams in the main valleys. These courses are followed by an extra thick tangle of trees and thick vegetation – a favourite haunt of butterflies. Most of the larger streams eventually find their way into either the Salween or the Mekong."

Kengtung – pronounced Chaing Toong – is the capital of a State or Sub-division of the same name. It is a large Shan village, or collection of villages, where the local chief (called Sawbwa) has his palace, and an extensive market is held every fifth day. Kengtung is about 16 miles from Loimwe by pony

track and some 20 by cart road – the only metalled road in the district. It is situated in the middle of a vast, flat valley cleared, for the most part, for the cultivation of paddy, and studded with villages. Around the villages, and in the main town, there are clumps of thick jungle, and groves of bamboo.

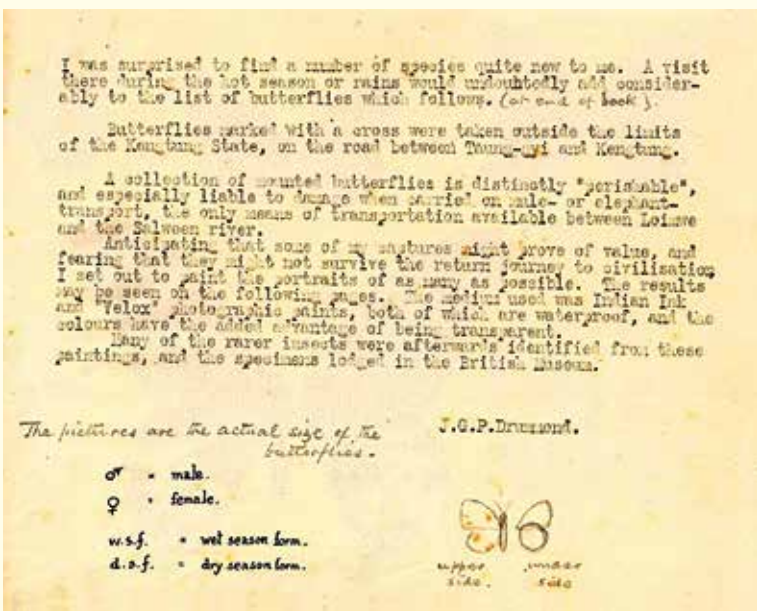
The normal rainfall of Loimwe is about 70 inches annually, and that of Kengtung about 35 inches – and Kengtung is 2,700 feet above sea level. Thus, my grandfather was fortunate in having a 'hunting ground' immediately accessible, which from its varying elevations, contained a very large number of butterfly species.

His knowledge on the subject of Lepidoptera grew as he entered into communication with specialists such as the Bombay Natural History Society and the British Museum, but his next problem was of a more logistical bent and required a bit of lateral thinking. This problem was one of transport – because all that was available to him were mules or elephants – which were quite hard-wearing on the butterflies. In fact, he described his butterflies as "distinctly perishable" under these conditions. So, lateral thinking (and anticipating that some of his captures might be of value), he painted them. Accurate and detailed paintings of over a hundred butterflies; each painting being actual size and with the right-hand wing representing the underside of the insect. The medium he used was Indian ink and 'Velox' photographic paints (both of which are waterproof, and the colours have the added advantage of being transparent).

At some point, then, my grandfather made a book, all bound and with a hard cover, containing an in-depth introduction, over one hundred of his butterfly paintings and an account of his correspondence (including with the BNHS) at the back. Which, at the age of thirteen, as I said, I found in my granny's attic – which I called the 'Butterfly book' and which I have looked after ever since.

Forty-five years after I first found the 'Butterfly book', I found I was making an arrangement to meet my wife and daughter in Mumbai, July 2016. In fact, I had planned to fly to India in early May, buy a Royal Enfield motorcycle and ride around the country for two months, and then we would all get together in Mumbai. And that is what I did. I bought an olive-green Royal Enfield in Delhi, and I rode north to the old Tibetan border, near a place called Pooh, then south, under Nepal, and then north again to the vintage steam trains of Darjeeling. En route I visited the Taj Mahal and at Varanasi I stood ankle-deep in the great Ganga river. I looked in awe at the astronomical equipment in the observatory of Jaipur and clasped my hands to my heart as I whispered sweet nothings to the *Rajasaurus narmadaensis* skull in the Indian Museum at Kolkata. I paid my respects to Mother Teresa, to those who died in the gas tragedy at Bhopal, and to the hand of the

Indian ink and 'Velox' photographic paints, both of which are waterproof, were used to illustrate all the plates



I was surprised to find a number of species quite new to me. A visit there during the hot season or rains would undoubtedly add considerably to the list of butterflies which follows. (at end of book).

Butterflies marked with a cross were taken outside the limits of the Kengtung State, on the road between Toung-gyi and Kengtung.

A collection of mounted butterflies is distinctly "perishable", and especially liable to damage when carried on mule- or elephant-transport, the only means of transportation available between Loimwe and the Salween river.

Anticipating that some of my captures might prove of value, and fearing that they might not survive the return journey to civilisation, I set out to paint the portraits of as many as possible. The results may be seen on the following pages. The medium used was Indian Ink and 'Velox' photographic paints, both of which are waterproof, and the colours have the added advantage of being transparent.

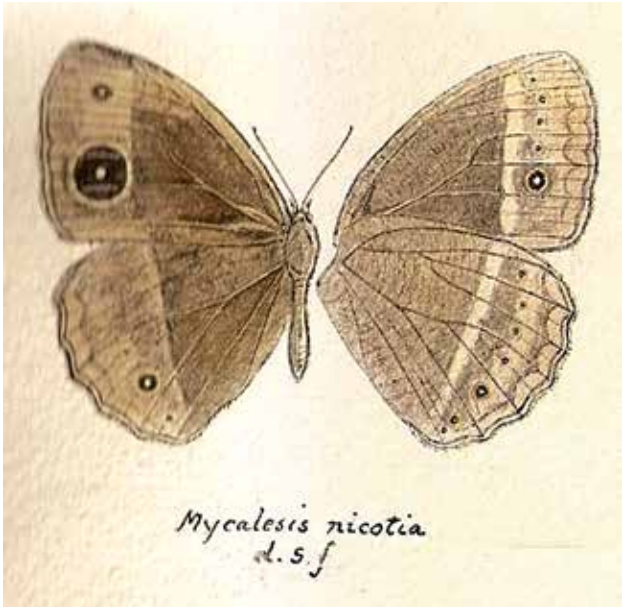
Many of the rarer insects were afterwards identified from these paintings, and the specimens lodged in the British Museum.

The pictures are the actual size of the butterflies. J.G.P.Drummond.

♂ = male.
♀ = female.
w.s.f. = wet season form.
d.s.f. = dry season form.

upper side. under side.

Though aged, the pages from the diary have survived natural degradation



The Bright-eye Bushbrown is mainly confined to the Himalaya and north-east ▶

The 'butterfly book' has been a prized possession for its owner

Mesolithic child at the rock shelters of Bhimbetka. I nearly died of heat exhaustion tramping in full motorcycle garb, under a burning sun, around the fascinating crater at Lonar. I got a tattoo in Daman, which went horrifyingly septic, but I lived, spent three days in the heat of Hampi and four days in the rainy season of Goa. Then I realised I'd missed a remarkable temple dedicated to Om Banna's Royal Enfield motorcycle, somewhere near Jodhpur, so I promptly turned round and roared three days and 1,200 kilometres back to Rajasthan, but at least I got out of the rain! Two months later, my Royal Enfield and I finally rolled into old Bombay where, the very next morning, I made my way to the Bombay Natural History Society and stumbled through their door. Now, you have to remember that I've just spent two months on a motorbike, I've ridden over 12,000 kilometres in heat and a bit of snow and a lot of rain and I've nearly been killed by crazy Indian drivers a thousand times a day. I've been living on weird foreign food, I've hardly washed and my wife is turning up in a few days … *and* this is possibly the most emotional part of my journey. There is a lady behind a desk. I burble and wave my arms at her, "Grandfather … butterflies …" I exclaim and reflected light flashes from the whites of my bloodshot eyes. The lady looks like she's about to come around the front, give me ten rupees and throw me out, when a man appears.

"Can I help you?" he asks.

"Grandfather … butterflies …" I burble but this guy takes it all in his stride and simply directs me to some stairs.

"Up there," he says and so I rush up the stairs. Truth is, I'm terribly excited. I get quite overly emotional at some things and this is clearly going to be one of them. Upstairs is a man behind a desk, he looks quite friendly, and quite calm, so I go into my introductory speech, "Grandfather … butterflies … have you got any?" It's just stress and emotion and I don't know how to introduce myself. The man behind the desk immediately realises that I need some form of guidance and takes control. Remarkably, he also seems to understand what I'm trying to say.

Male of Yellow Coster is faintly marked compared to its female

Orange Awlet is active during dawn and dusk

Bright colours of the Hill Jezebel indicate that it is distasteful

"My name," he says, "is Rahul. Now what is your grandfather's name?"

"Drummond," I say but I am terrified, I am certain this will lead to nothing.

"We have many butterflies from Drummond," this man, Rahul, says. It's like a weight lifting from me.

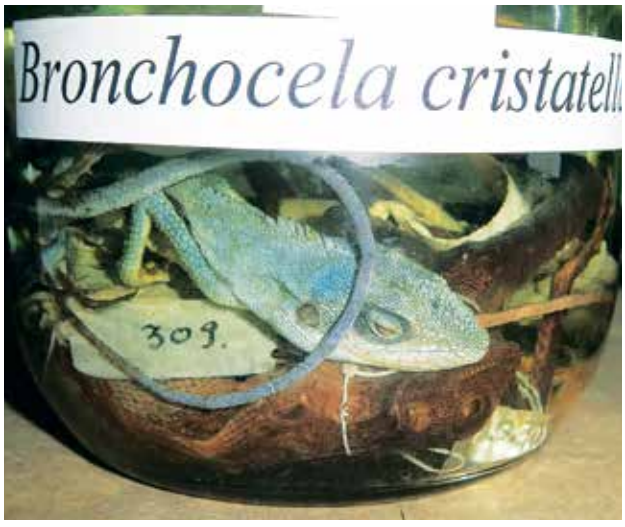
"Wow! Really?"

Ten minutes later I am actually looking at a butterfly, a *Mycalesis*, caught by my grandfather in September 1922, and I think my grandfather has even written the label. And then we look at more of my grandfather's butterflies. They've been with the BNHS over ninety years. It's not 'unbelievable' and it's not 'fantastic'. Museums around the world are filled with exhibits older, younger, larger, and smaller. But my chest swells with pride for my grandfather's achievements; the world needs

Common Red Forester flies up to 2,100 m in forests

Dark Blue Tiger is on the wings throughout the year

The friendly crow that tried to get into the room



BNHS holds a large faunal diversity in its collection

people like him so that people like us can continue the journey of learning. Continue the process of bettering mankind, if you like. My grandfather was called and did not fail.

I make arrangements to return in a few days with my wife and daughter and then, as I am leaving, the lady at the desk stops me and gets me to sign the visitors' book.

A little later on, I pop into the famous Leopold Café and buy a beer. I raise my bottle to the sky, to my grandfather. And a tear may just have rolled down my cheek. What a great day.

The Bombay Natural History Society is a tremendous place and I wonder if India knows what an asset she has? I'm sure she does. The people there clearly love their work; the atmosphere, the walls, effervesce understanding and the place even smells just right. I know my wife and daughter think they are going to be bored but I can feel their hearts lift as the atmosphere of the Society envelops them. Rahul welcomes us in and boxes of butterflies are quickly brought to the fore.

Watching my daughter gently touch a butterfly – a butterfly touched by her great-grandfather nearly a century earlier – changes how I will view everything for the rest of my life.

And there were other highlights to our visit. There was a friendly crow trying to get into the room, through the window, and a nasty chameleonic lizard from the film '*Monsters Inc*' was in a cupboard, pickled in a jar! And I believe we were exceedingly honoured when we were shown the now extinct Pink-headed Duck.

Thanks to Rahul and the others we met at the Bombay Natural History Society from the Drummond family. ■

Titus Drummond is an electronics engineer in the Royal Fleet Auxiliary. He also studies insects and spiders, and during his leaves, rides motorcycles in different countries around the world.

Skull of *Rajasaurus narmadensis* at the Indian Museum, Kolkata

BNHS holds a collection of about 25,000 lepidoptera specimens

It's all about us!

Text and Photographs: **Rushikesh Chavan**

"Tum exactly kya karte ho?" What exactly do you do for living? ... is a question I have been consistently asked at family gatherings in the 15 years of my career as a nature conservationist. In fact, even friends genuinely want to know what I do. I very diligently try to explain to them what conservation of nature entails, till there comes a point in the conversation when I begin to believe that they understand what I am doing. But most often, if not always, out pops the question "Oh, like National Geographic and Animal Planet. Do you also make documentaries?" That's my cue that they have not understood a thing and I start all over again. The conversation ends in "... *oh accha accha*", and most often both parties give up. Initially, I would conveniently tell myself, it's a stupid world, they have lost their connect with nature. Then there was self doubt ... am I unable to explain to people what conservation means? And now I try not to react if I hear "Oh, like Animal Planet …". I have realised that I speak a different language.

Forests are not only magnets to rainfall, they have a very high aesthetic value in our lives and we are hard-wired to enjoy them

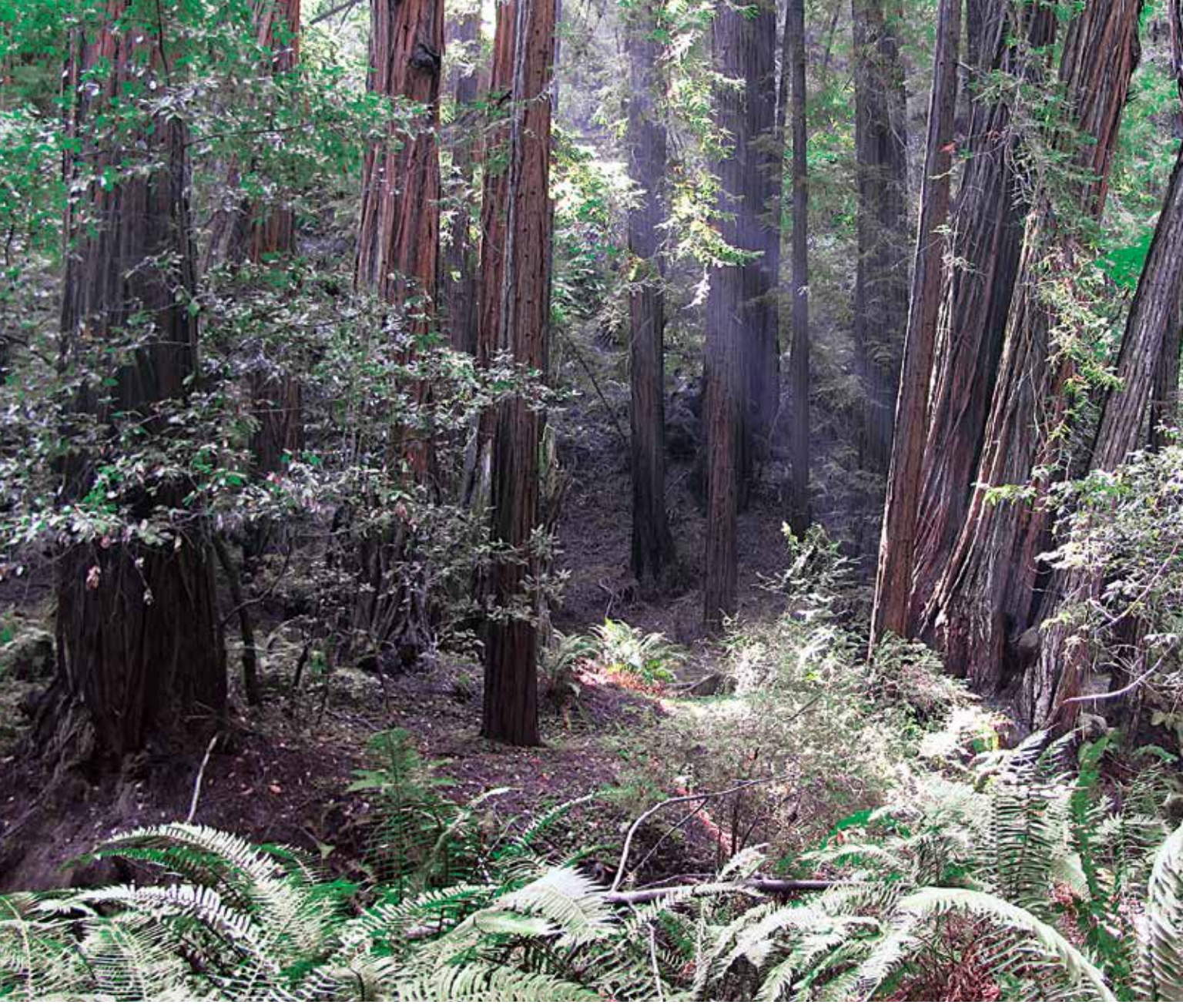
I have understood that people, especially in megacities like Mumbai where I live, are so caught up with the rat race of life that it seems unreasonable to expect them to understand a set of reference points that are not a part of the race, the 7:07 am local would be their priority for the day, helping them reach their destination on time, while protecting termites would be the last on the list, that is if it ever was on the list. The rules are different!

When one looks at conservation from this conventional viewpoint, it becomes evident why conserving nature is a neglected subject. Even those who care, mostly believe that Earth is in trouble and needs saving! However, the truth is that Earth can take care of itself. It does not really matter to Earth if the current environment changes completely and its current inhabitants go extinct. Environment on Earth has always been changing and species have gone extinct and will continue to, species that are surviving today including us humans need the environment as it is today, rather what is supposed to be ideal. Let us not personify Earth, but understand that "It's all about us people!" Our solutions have to be focused on us and not on nature.

Having said that, if conservation of nature is the solution to human survival, then these solutions have to be human-centric, and based on a robust understanding of how nature works. Mere compassion cannot be the solution. People go about planting trees, honestly, one can feel good about it and there are benefits, but it is not going to work. We need functioning ecosystems, gardens won't be much of a help. The solutions have to be based on science and in-depth understanding of natural systems. Do not get me wrong; I do not disregard compassion, but there is no substitute to professional training. E.g. I feel strongly for people suffering

Climate regulation relates to the maintenance of a favourable climate, both on local and global scales, which has important implications for health, crop productivity and other human activities. Forest ecosystems trap moisture and cool the earth's surface, regulate rainfall and temperature, and act as water catchments

Mountains cover *c*. 27% of the world's land surface, and directly support the 22% of the world's population who live within mountain regions. Mountains' are in fact the water towers of the world



The carbon stored in a standing forest has huge economic value, much of which would be lost if the forest is burned or logged. It is unwise to just value trees as forest or carbon stores, yet it is a good starting point

from brain haemorrhage, but does that mean that I perform the surgery myself, or do I take the patient to a qualified doctor? This is what is happening in conservation of nature. Passion alone cannot maintain nature as it suits us. Primarily what we need to do is to re-align human behaviour, as people can no longer relate to nature, let alone prioritise it. This can only be done with robust scientific understanding.

There can never be one solution that sorts out a conservation issue. What worked at one time or at one place need not be the solution in perpetuity. Conservation actions need constant review and a gaze at the horizon. The WildLife (Protection) Act, 1972, (WPA) a monumental milestone in the conservation history of India, is a classic example. Undoubtedly, many species and habitats are secure as long as this law is implemented and not diluted. But what has happened over the past four decades is that we have been mostly left with islands of protected areas. These are good for protecting a number of species, but for protecting ecosystems and their functionality we need to protect large landscapes.

Top: The road to economic prosperity lies in protecting forests

Bottom: Nymphs of species such as dragonflies play an important role in the balance of nature. Nymphs feed on other larvae such as those of mosquitoes

Unfortunately, most large landscapes in our country are a mosaic of multiple-use areas with large human populations. This is where WPA's scope becomes limited. The challenge is to maintain the integrity of the landscape. We have to ensure that ecosystems continue functioning and interactions with other ecosystems are maintained. This is the challenge. We are not like Africa where population densities are lower, we will have to work around the fact that wherever we go in this country we have people who are dependent on ecosystems for their subsistence. Thus, the solution has to focus on ensuring that local communities conserve the ecosystems without jeopardising their sustenance, influence public policies, and, as I mentioned earlier, align human behaviour. Conservation of ecosysytems and landscapes is a global issue and India covers less than 1% of land. So, it is difficult to maintain the world's ecosystem; yet, I believe that this is possible, and this brings us to conservation economics.

Yes, economics – the universal language, a language that every human understands. Economics and

Most landscapes in India are used for multiple purposes and have a high density of population

Deer are critical for the flow of energy as they pass on the energy locked in vegetation to the predators

conservation have never been perceived as partners; in fact many believe that economics has ruined nature. But economics is not the villain; it is the short-term goals, or rather greed fulfilment, for which the fundamentals of economics are exploited. Economics and ecology are actually two branches of the same subject. Ecology and economics originate from Greek words *oikos* (eco) meaning house; *nomos* means management and *ology* means study. So, ecology is the study of a house and economics is the management of a house, the very same house. Conservation, therefore, is all about managing our house! The question remains, how does one do this?

Economics depends a lot on measurement and monitoring. Every buck is counted, measured, and indices are made. Over the years, economists have, with a little help from statisticians, developed models that can be adapted to measure and monitor the effectiveness of conservation initiatives made over the past few decades, i.e. they will assess conservation efforts and tell us what works and how much. This will push conservationists out of their comfort zone and will help to channelise our limited resources. It might burst a few bubbles, so what! That is what we need, robust conservation models. I am optimistic that these models will throw up some very interesting facts about conservation efforts worldwide.

Conservation economists have worked out ways and methods to put a price tag on ecosystem services. This is a little debatable and economists have received a lot of flak for it, yet no one can refute the immense potential it holds. Ecosystem services are divided broadly into provisional services such as food, water, raw materials, and medical resources; regulating services such as climate control, carbon sequestration, moderation of extreme events, waste-water control, erosion control, and pollination; supporting services such as habitats for species and maintenance of genetic diversity; and cultural services such as recreational services, tourism, aesthetic and inspiration for art and culture, and spiritual experience. Let us speak the 'universal language' to the point of speaking the language that people understand. Economists have been looking for ways to estimate the cost of these services, how much you would have to pay for these if they were chargeable. Hopefully, economists will soon be able to price tag these in such a way that the public appreciates their value and the urgency of conservation, and acts upon it.

In a world where development goals are short-term and large "developmental" projects are critical for "growth", it is getting increasingly difficult to protect fragile ecosystems. Unfortunately, some developmental

projects are not just ecological disasters but also economic disasters – the proposed Hooman dam, Maharashtra to name one of many. Several economic cost-benefit assessments (CBA) across the globe, especially in Peru, Bolivia, Ecuador, and many other Latin American and African countries, have proved that many developmental projects don't make any economic sense, and a significant proportion will never live up to the promises they make. CBAs have also helped to understand the negative externalities of these projects, that is the negative impacts they will have on nature, archaeological monuments, and people, and possible ways by which these can be internalised, meaning that negative impacts can be quantified at the planning stage and mitigation measures can be put in place to negate them. Implying, how do you cater for negative impacts of a project and make a project not just economically but ecologically viable as well. A country like India really needs to get these assessments done and find a smarter way to "develop", after all development and growth are two different things. Development by definition is improvement in overall human welfare, and not just increase in the economic bottom-line.

Conservation economics has another fascinating branch which can help avert the "tragedy of commons". This is a term introduced by Garrett Hardin in 1965 to describe a situation where individuals act independently and rationally to fulfill only their self-interest and behave contrary to the best interests of the whole, resulting in depletion of common pool resources. A classic example of one such depletion is over-fishing in our oceans; another is over-grazing which destroys pastures. Elinor Ostrom, through her work in economics, has documented that the tragedy of commons can be averted.

Break away from the rat race, step out, join BNHS on its forest trails

This is done by users of common pool resources (resources that are rival in nature and non-excludable, meaning a resource that is accessible to all, but if one gets it, others won't) working to overcome incentives to destroy, by developing rules-in-use that enable them to utilise these resources more effectively and develop policies to safeguard them.

Conservation economics is a relatively new stream and has its challenges, but surely is one of the most promising fields for conservation of nature. Conservation economics, backed with conventional conservation methods, can give conservation a much needed impetus. It will provide conservation practitioners, like me, a tool to assess our effectiveness and negotiate with communities and policy makers, but most importantly, will help conserve ecosystems for posterity.

I am an eternal optimist and believe that the human race can overcome challenges. True, the road is not going to be easy. Conservation economics is not straightforward and since it is data hungry, garbage in will be garbage out. Also, conservation economics can only be relevant if ecologists strengthen it. Economists will provide tools, but to make it relevant to nature will remain the job of ecologists. So, if ecologists and economists work together, there will, no doubt, be a magical outcome. With this new found armoury in my bag, I should be able to answer the question "*Tum karte kya ho*". Not just that, I should be able to get conservation to dining table discussions. Conservation economics, along with Conservation psychology, what I collectively call Conservation behaviour, will give me a language to talk to you all. As for you guys, find some time to look outside, outside your race, maybe right now. Go out in the wild, read more books, more articles. We are hard-wired to have a good time with nature. My monologues need to be dialogues; for a dialogue to happen you must open the windows and realise that it's all about people … about us ! ■

Rushikesh Chavan is a Conservationist, works with the Wildlife Conservation Trust (WCT) and has started the department of Conservation Behaviour at WCT.

Cranes, Cola and Conservation

Text: **Pranav Trivedi**

The fields stretch out to the horizon. Huge electric pylons dot them, towering in the sky like over-sized sentinels. The landscape is marked by all kinds of use of colours and elements – the lush green of freshly grown paddy, golden-brown of dry wheat tussocks, sooty-black of ash, multiple colours of houses and temples in the background, and the green of tree canopies breaking the background palette of colours. Chimneys of a couple of factories spew out smoke in the distance – intimidating the naturalist in me, while soothing and promising a villager as a promise of 'development' that brings livelihood. I realise that my dreams can be vastly different from theirs; in fact, they are at the opposite ends of the spectrum!

PRANAV TRIVEDI

A view of the Goblaj pond

It is April – spring has bid adieu and summer is at our doorstep. The second harvest is over; wheat has been winnowed, cleaned, and packed in gunny bags, to be sold at the nearby markets. The tussocks are stacked to be used as fodder or to be sent to a paper mill as raw material to satisfy our need to *put things in black-and-white*! The bases of the tussocks left in the field are burnt to convert them into manure to enrich the soil. The tussocks burn at a fiery speed, the raging fire moves like a demon; its flames engulf everything that comes in the way. I watch in awe as the golden fields transform into charred squares and rectangles in moments. There are two men in charge of the operation, their tractor waiting at a distance for its turn to plough the land. And to my surprise, on this seemingly lifeless piece of land there are birds – aware and bold, waiting for the opportunity to catch an unwary insect flushed by the fire. There are rollers, drongos, cattle-egrets and ibises – all known to be opportunists. The land *belongs* to them too, but they are 'neutral' and share this cropland ecosystem with the farmers who claim to own this land!

A closer look reveals more. How did I miss them? Sarus cranes – all adults – tallying to 16! One of them looks up and flaps its wings – standing nearly five-and-a-half feet tall, it is a powerful presence. Probably this is what keeps bringing me back here – to admire this unique species. I am glad that they are still around, but disappointed that there

PRANAV TRIVEDI

PRANAV TRIVEDI

AAKASH TRIVEDI

Top: Spoonbills and Sarus share their space with humans

Centre: A foraging pair of Sarus Crane

Bottom: The farmers are increasingly intolerant of wildlife

are no subadults or juveniles indicating that none bred successfully last year – why?

Welcome to the world of the Sarus Crane – crowned as the world's tallest flying bird. Watching me, the Sarus are alert and some of them raise their beautiful red heads adorning their long, shapely and elegant necks. In this open landscape, most animals can sense the difference between a local and an outsider. It is not long before most of them start moving away, while a few bold and trusting ones continue to forage. There's ample food for them – the leftover wheat grains that still lie scattered in the fields provide an excellent source of short-term food.

I turn back to the land. Much of it is charred. A canal abuts the bund that separates the fields from the road. The bund is covered with trees of all kinds – mostly native. In the distance are green paddy fields. This is summer paddy, made possible by a network of reservoirs linked with rivers and canals that facilitate small-scale irrigation.

The flock of Sarus is moving together and foraging. I inch closer and their stance changes … most of them move further away. I regret my decision and start moving away from them. They are now watchful, but they get back to foraging. For millennia, cranes have existed in this transitional or ecotonal zone of wetland and cropland. The Sarus is no exception. Held in respect

for its fidelity and the local belief of one pining away in grief till death, following its partner's demise, the Sarus has had its way for long. This picture is now changing rapidly as farmers are increasingly intolerant of its 'destructive' ways of nest-building. And there are more problems that are surfacing, as I discover on this exploratory trip into the world of Sarus and the people whom they co-exist with.

As I grapple with my thoughts, the flock abruptly and unexpectedly takes off, to my surprise. I watch their departure with disbelief – the heavy wing-beats and yet graceful flight. Just when I feel I'm about to lose them near the horizon, they start descending behind an earthen bund. "Is there a water body there?" I ask myself rhetorically. My thoughts gain energy as I sense the presence of reeds of *Typha angustata* – a sure indication of the presence of water. An old inhabitant of the village passing by informs me: "It is a big pond of 999 acres and the bottled soft drinks that you folks consume in cities, the water for them goes from here!" I was happy with the information about the pond, but baffled by the last detail.

I now decide to check out on the Goblaj pond, as it is known after the name of the village. The path is a narrow dirt trail that passes many fields, mostly dry and a few green with paddy; lined by trees of khejri (*Prosopis cineraria*), tamarind, neem, pilu (*Salvadora persica*), jamun, and mango. I slip down memory lane to a time not too far in the past, when most fields had such trees on the margins and bunds. Now, many of the small and large fields have fences instead! This is bad for the Sarus as they cannot easily descend or take off. Trickier than the power lines, I guess, as I did see them take off right below one and negotiate it well. However, there have been


PRANAV TRIVEDI

Transmission lines are a cause of worry for large flying birds like the flamingos

reported cases of tragic Sarus deaths due to electrocution.

As I walk further, I think about the good old days of Sarus watching when the roads were empty and we could easily stop and walk at will anywhere in the countryside. Now, the number of vehicles is many times higher, so is the extent and pace of construction with all empty spaces having some element or other of human presence. Is this justified? I soon reach the edge of the water body. To my right are pools of black, slimy stuff, more like tar … remains of an old oil well/pumping site of ONGC. Black gold! I also see a lot of castor growing in the fields – a crop that was absent 20 years ago. There is another crop that I cannot even identify, and some flower and fruit crops that render the landscape unsuitable for Sarus.

A bund separates me from my destination. Ascending slowly, I am eager and excited like a child expecting a surprise. Lo and behold, the pond holds a myriad birds. And the Sarus too – now numbering 30 – there is a sub-adult, and a juvenile with its parents. In the next half an hour or so, I record more than 30 species of birds, numbering about 1,500 individuals! Among these are nearly 250 Black-tailed Godwits, a couple of dozen Garganeys, a flock of Eurasian Spoonbills, and what I assume to be Black-bellied Terns (a globally threatened species). The pond is huge and I only see one third of the water body, the rest is open water with fewer birds. In the distance, a few pumps placed by farmers are drawing water for the crops. "Why not, after all, this is an irrigation pond", I murmur … the human element doesn't disturb me that much now.

Reluctantly, I walk back from Goblaj pond, and on my way back through the brush, I flush two species

The fate of biodiversity rests in the hands of humans

of lark – one a Black-bellied Finch-lark, the other I fail to identify. I walk fast, intending to visit other ponds nearby that could have Sarus congregations. In my hurry and lost in my thoughts, I almost miss a man walking right in front of me, Gopalbhai, the owner of the land where I first saw the Sarus. We smile at each other and stop for a chat. He is less tolerant of the crane than his ancestors, and as his younger brother reveals later, they do not allow the Sarus Crane to nest in their cropfields. So, the Sarus are left largely with the option of wetlands for nesting sites. No wonder I saw only one chick from last year. Feral dogs too must have played a role in eliminating some chicks.

The talk turns to Goblaj pond, and then he says something that stuns me: "The water from the pond is being channelled to the nearby soft drink factory!" I am shocked beyond belief… blurting out "What, which company? Does the village get anything in compensation for this?" He isn't sure of what I mean. The existence of the factory is a reality that the villagers seem to have taken in their stride, but it is not easy for me to accept, and many thoughts run through my mind. Is this soft drink factory essential as part of development? Are we promoting it at the cost of our rich wildlife? Would it be possible for the factory to generate its own water supply through rainwater harvesting instead of drawing it from the tank? Is it possible to make the company pay a biodiversity tax to compensate for the exploitation of a common resource that supports rich biodiversity? Could we pause and give a thought before we open the next bottle of aerated drink – that it could shut the door to the future of a benign species? Or, is it indeed justified, considering the way humanity consumes soft drinks, to share the water with the company? I leave with many unanswered questions … and troubled thoughts.

As I drive away, I spot a pair of Sarus in a small patch of paddy. They are engaged in a courtship display, oblivious of the perils that increasingly confront them. I wonder what the new generation of farmers thinks about it, if at all. Again, I see the landscape of conservation embedded deeply in the mindscapes and heartscapes of our species. We need to think about reconnecting with life at a higher level, so that we listen to the rhythm of life within and around us. ■

Pranav Trivedi, an alumnus of the Wildlife Institute of India, is a wildlife biologist and environmental educator. He is a Senior Scientist with Nature Conservation Foundation.

Pelicans gulping down birds!

We rarely observe birds (or for that matter, other animals) feeding on food other than what they are commonly known to eat, yet at times we notice changes in their staple diet.

I recently came across a Rosy Pelican catching and eating a Common Pochard at Lakhota lake, Jamnagar, Gujarat, though there were plenty of fish in the lake with species like catfish, including the suckermouth catfish of South America.

The pochard did try to free itself from the pelican's grip, but was unsuccessful. What surprised me further was that other pelicans tried to snatch this prey. It took the pelican nearly an hour to gulp down the struggling Common Pochard! ■

Amish H. Patel
Jamnagar, Gujarat

Pelicans feeding on other birds: an expert's response...

There are eight species of pelicans in the world, of which three are found in India, namely Dalmatian, Spot-billed, and Great White Pelican. Pelicans are some of the heaviest flying birds and have wingspans up to 3 m. They have a distinctive pouch under the beak, which functions as a drag net for scooping up fish while swimming.

Pelicans, in general, mainly feed on fish, but are not restricted to a fish diet, and they are known to be opportunistic foragers. The Great White Pelican (earlier known as Rosy Pelican) is known to catch and eat feral pigeons *Columba livia,* as was recorded on a few occasions in St James's Park, London. Another such observation was of Great White Pelican *Pelecanus onocrotalus* feeding on the chicks of Cape Gannet *Morus capensis* breeding in colonies on the island of Malgas, South Africa. Similarly in Walvis Bay, Namibia, they feed on the eggs and chicks of Cape Cormorant *Phalacrocorax capensis* – it was observed that the pelicans were so dependent on the cormorants that when the population of the cormorants declined, the pelican population also declined with it. There have been a few observations from India of the Great White Pelican feeding on Little Cormorant *Microcarbo niger* (Wellington Dam, Gujarat), Little Grebe *Tachybaptus ruficollis* (Little Rann of Kutch, Gujarat) and Common Pochard *Aythya ferina* (as above). ■

Asif N. Khan
Mumbai, Maharashtra

Missing Migrants

I reside in a building named Rewa Apartments at Haji Ali which is right opposite the Arabian Sea, and has an unobstructed view of the seascape. I first came to live in the building in *c.* 1976 and ever since then have noticed that just as the October heat ends, the first flocks of migratory seagulls arrive along the shore, and with uncanny precision I can predict that winter too has arrived, as in fact it has.

Not a single year passed without the migratory seagulls heralding the commencement of winter, but for the first time in the last 40 years, this year (2016), even though winter is almost half-way through, not a single migratory seagull has arrived. It worries me that this portends some environment disaster to follow.

It would be nice if with the experience of your members an inquiry could be made to find an explanation as to why this has happened this year. I am inclined to believe that many other members may also have observed this 'nature's failing'. ■

Dinsoo Zaiwalla
Mumbai, Maharashtra

Editors' Note: Seagulls (mainly Black-headed, and some Brown-headed) were in fact seen at Marine Drive (near NCPA) and other parts of Mumbai this year in the usual numbers, so this may be an issue specifically related to the area described.

Unusual diet of Indian palm squirrel

I often volunteer for the Collection Department of BNHS, and near the desk that I occupy is a small window which overlooks the lush trees in the neighbouring Museum compound. One afternoon, as I was entering bird related data into the computer, I heard an unfamiliar call which Vithoba Hegde Sir told me was that of a squirrel. To my left, about three metres away, I saw a Three-striped Palm Squirrel feeding on the grub of a wood borer. I immediately picked up my camera to photograph this feeding observation. I had never seen a squirrel feed on grubs

– the species is known to mainly feed on nuts and fruits.

What prompted the squirrel to change its diet? ■

Priyanka Gala
Mumbai, Maharashtra

Editors' Note: Yes, the usual food of all squirrels is fruits, nuts, young shoots, buds, and tree bark. But squirrels are occasionally known to feed on insects and also on eggs of birds. In fact, according to S.H. Prater (author of THE BOOK OF INDIAN ANIMALS), they are persistent egg robbers.

ABOUT THE POSTER

The Himalayan Monal, also known as the Impeyan Monal, is a birdwatcher's favourite and a visual delight. It is a relatively large pheasant and sexually dimorphic, as is common among pheasants. The female is dull brown and the male has bright and colourful feathers of blue, green, purple, and red. Both male and female of the species have blue circles of skin around their eyes.

The Monal inhabits the high oak, rhododendron, and deodar forests, interspersed with open glades and sheep pastures of the Himalaya from north Pakistan to Arunachal Pradesh between *c.* 2,600–5,000 m. It is the national bird of Nepal, where it is known as the Danphe (or Danfe), and is the state bird of both Uttarakhand and Himachal Pradesh in India.

The Himalayan Monal is poached heavily for its colourful feathers and is also losing out its habitats rapidly to urbanization and hydel power projects. It has been listed as Least Concern by IUCN, despite the fact that the population is decreasing. This is because the species has a very large range, and hence does not approach the thresholds for Vulnerable under the range size criterion. Fortunately, the decline is believed to be not sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion. ■

Himalayan Monal *Lophophorus impejanus*

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Himalayan Monal *Lophophorus impejanus*

ADITYA CHAVAN

The Journey before the beginning

Text and illustrations: **Pooja Gupta and Tasneem Khan**

"I am the daughter of the elements
With whom Winter conceived;
To whom Spring gave birth;
I was reared in the lap of Summer
and I slept in the bed of Autumn.
At dawn I unite with the breeze
To announce the coming of light;
At eventide I join the birds
In bidding the light farewell."

– Kahlil Gibran

Any significant variation in environment – moisture, temperature, amount of sunlight available, soil composition – may create conditions under which seeds of certain plants cannot germinate. Plants, therefore, must disperse their seeds in such a manner and quantity that some may survive, so that the species may continue.

How then has this enormously diverse group of life forms – that we classify as plants – devised mechanisms to colonize and establish themselves in every conceivable nook and cranny on this planet? Seeds are engineering marvels and are the natural vehicle for gene movement and storage. The shape, size, pattern, weight, and function are all finer aspects that determine their individual dispersal method. Over millions of years, plant species have evolved remarkable ways to disperse their seeds. And so, long before a tree exists as we know it, roots intertwined with the earth and leaves in conversation with the sky, the seed has already travelled great distances – blowing in the wind, drifting in the ocean, hitchhiking on animals, passing through digestive tracts and bursting out of pods. The dispersal of seeds is important to ensure that a plant does not compete for the same resources as its offspring.

With the slightest effort, even an untrained eye can observe the elegance of physics and biology in action. Welcome to the world of refined structures, where intricately designed wings, floats, sails, parachutes, and mechanical explosives work in conjunction with the elements like wind, water, fire, and gravity.

A closer look at common seeds teaches us volumes about the relationship between form and function, and about evolution. Every seed tells a story about the tree it came from, its mode of dispersal, the environment it was surrounded by and where it might reach.

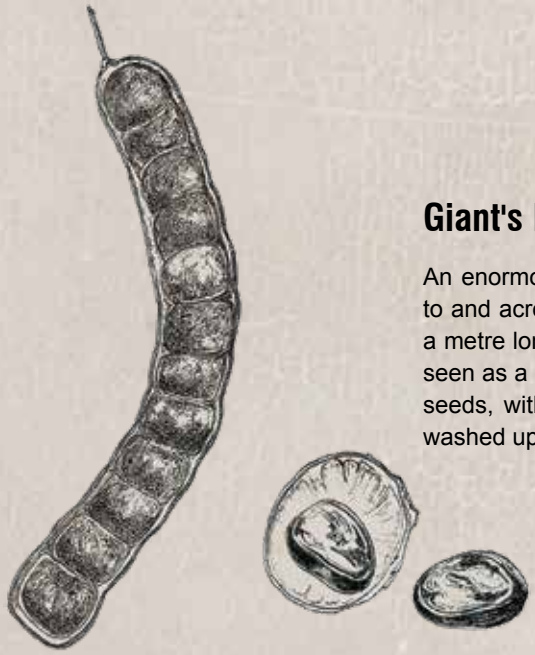
A seed is fundamentally an embryo embedded in nutritious tissue called endosperm. It contains an immature plant and everything it needs to sprout, establish itself, and eventually grow into an adult plant. Yet "the seed" has an arduous journey and much adventure long before it truly begins its life as a plant. As a seed, it lives as long as its external environment and internal environment maintain an ideal balance.

Red Mangrove *Rhizophora* spp.

This long smooth radicle (propagule) is an extension to the actual seed. It is both a float and an anchor for the plant that germinates while still attached to its parent. These trees live in the space between land and sea, forming belts of vegetation along the coast that is regularly inundated by tides. These perfectly balanced and buoyant structures maximize the chance of survival of each seedling and enable its journey to distant shores.

Sundari *Heritiera littoralis*

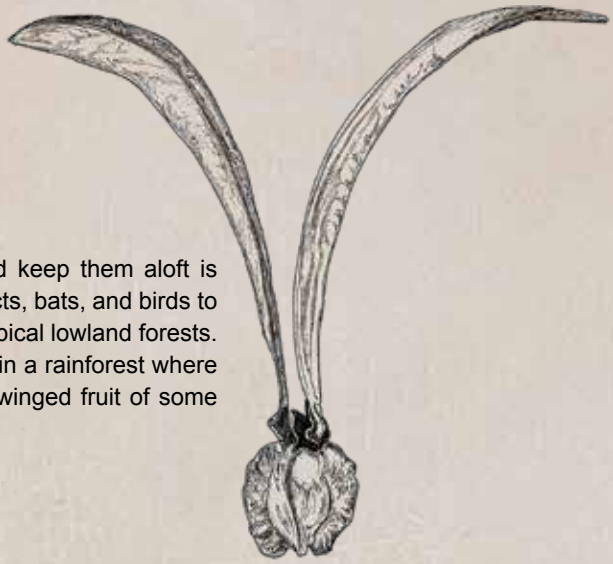
Sundari or the Looking Glass plant is also common along seashores and has devised a hard, thick-walled floating seed. The seed is a 5 to 7 cm ovoid with a prominent keeled edge. This fin-like structure has a slight curve to it and functions like a sail, catching even a gentle gust of wind along the water's surface.



Giant's Rattle *Entada rheedii*

An enormous climber with twisted and angled stems that makes its way up to and across the rainforest canopy. Its massive woody seedpods grow over a metre long and about 10 cm wide! When the pod splits open, each seed is seen as a glossy chocolate red disc with a 3–5 cm diameter. These attractive seeds, with their hard waterproof seed coat, float well and are often found washed up on beaches and river banks.

BLOWING IN THE WIND

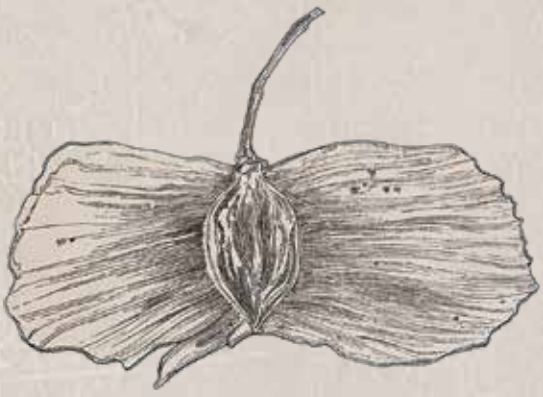


Gurjan *Dipterocarpus* spp.

The mechanism that causes “helicopter seeds” to spin and keep them aloft is almost identical to the aerodynamics that allows certain insects, bats, and birds to hover. Dipterocarp trees are the emergent giants of Asian tropical lowland forests. Only trees of this height can afford to rely on wind dispersal in a rainforest where there isn’t much air current below the canopy. The mature winged fruit of some species of Gurjan can be as large as 30 cm.

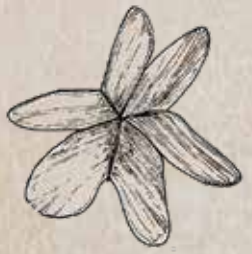
Milkweed Subfamily: Asclepiadaceae

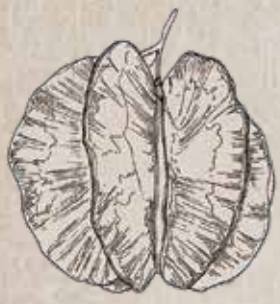
In comparison to the number of flowers, the pods on this plant seem few. However, each pod is full of more than 200 seeds! So, from a colony of a hundred odd shoots, thousands of seeds can spread into the environment. Milkweed seeds are light and fluffy, and can float on the wind. The seeds have a crown of silky hair that is carried on wind currents like a miniature parachute. Seeds with a tuft of hair are called comose seeds.



White Chuglam *Terminalia bialata*

The characteristic butterfly-shaped fruit of the White Chuglam is about 11 cm across, and has broad, stiff veined wings. It is often easier to identify tree diversity from what we find on the forest floor as opposed to gazing up into the canopy.





Pencil Yam *Dioscorea* sp.

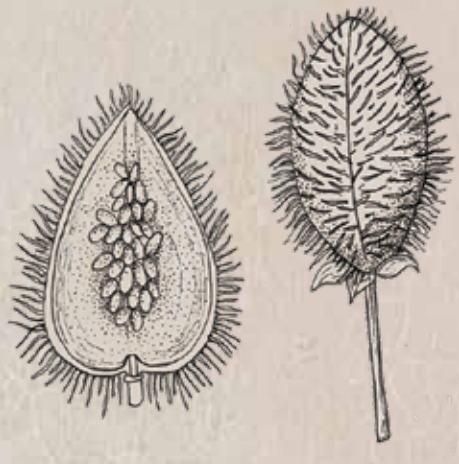
These pendulous clusters of seedpods develop rapidly after pollination, and at first blend in perfectly with the plant. The three-winged pods then turn pink before drying to straw brown, with a light papery texture. The rounded wings are about 14–16 mm and each pod contains about six seeds.

Cat's claw *Martynia annua*

This little flowering shrub has an ovoid drupe with an inner woody capsule. The woody part splits open at one end into two curved claws, and each capsule eventually releases about 40 seeds. The spiny structure of the capsules allows them to catch on and travel on animal fur.

Achiote *Bixa orellana*

This tropical shrub can grow to a height of 10 m and is cultivated primarily for its bright red seeds, the best-known source of the natural pigment annatto. The fruits are in clusters of red-brown seed pods covered in soft spines. These spines can stick to the body of foraging animals and help the seeds to get transported across the landscape.



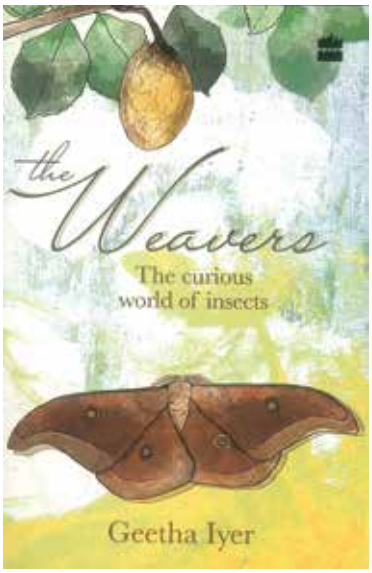
Wild millet *Echinochloa crus-galli*

This wild grass, originating from tropical Asia, is commonly known as cockspur grass or barnyard grass. Often used as cattle fodder (the grain of some varieties is eaten by humans), it also disperses easily and is considered a weed in some areas.The coarse stalk of grass has spikelets densely arranged on branches tufted with long awns. The tiny, bristly seeds are dispersed by insects, birds, and on the feet of larger animals.

Pooja Gupta is a visual artist and uses video, illustration, and graphics to translate her thoughts into stories. She is passionate about nature.

Tasneem Khan is a biologist, educator, photographer, and sailor with a fascination for the natural world.

Reviewed by: **Kumaran Sathasivam**



The Weavers: The Curious World of Insects
by Geetha Iyer
Published by: HarperCollins Publishers India, 2016
Size: 13 x 20 cm
Pages: xvi + 198
Price: Rs. 399/-
Paperback

Considering how numerous, diverse and omnipresent insects are, they hardly get the attention they deserve from naturalists. Insects could do with some doting. "Here is a book that contributes to setting the balance right", thinks one on reading the title. The author, Geetha Iyer, is described as 'an ardent wildlife watcher, naturalist, author, teacher, and consultant in the twin fields of education and environment'. I suppose you could call her a votary of entomology too. Her first book, *Satpada*, is an introduction to Indian insects. As a matter of fact I have sought her help a number of times in identifying insects from photographs. So it was with keen interest but with no idea of what genre this, the author's second book, belonged to that I started reading it.

"Why insects, you may ask", says the author in the introduction. "Why not birds, frogs, flowers, or tigers? It is not that I consciously chose to observe or study them – they were just always around, and more practically, were easily accessible to my Nature Club students. If you are on an eco-tour that most wildlife sanctuaries promote these days, insects could well be the most easily observable animals on your way; even easier to spot than birds, for you don't need binoculars or fancy expensive field equipment to locate and study them". I am not sure the birdwatchers among the readers of this review will agree!

What about the 'weavers' of the title? According to Geetha Iyer, there is a lot of truth in the words of the professor of chemistry who said that life was a chemical soup. "The chemical soup of insects is remarkable, especially the variety of proteins," she says. "In this book, my focus will be on silk … There is more to silk protein than the popular fibre we obtain from silkworm cocoons. For many insects, silk is the thread that binds their lives ... rarely are they depicted as skilled weavers."

The first chapter presents a number of legends and facts about the discovery and use of silk. The term 'silk' here refers specifically to the substance obtained from the moth *Bombyx mori*. But as the author points out, silk is merely a functional term used to describe a variety of materials of similar composition. She devotes the last chapter to the chemical nature and structure of silk, the word being used in the wider sense here.

Held in this silken sandwich, figuratively speaking, are the weavers: Chapters 2–7 are devoted to the different insect groups that have members that produce silk. You would not have thought that there were so many insects that make silk. Apart from moths, the weavers include members of some less known orders: Trichoptera (caddisflies), Embioptera (webspinners), Ephemeroptera (mayflies), Neuroptera (lacewings and their kin) and Psocoptera (booklice). It may come as something of a surprise that there are even ants, bees, wasps, crickets, and praying mantids that produce silk.

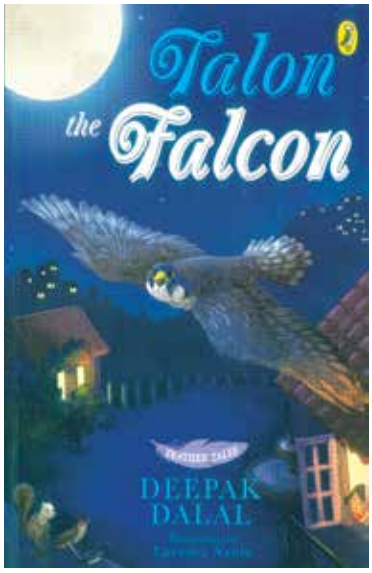
What is all this silk-making about? What do the weavers use the silk for? These insects use it to construct nests; to aid dispersal; to protect themselves from heat, cold, humidity and enemies; to wrap nuptial gifts; to capture prey; and to line tunnels and burrows.

It turns out that there are at least four types of silk-secreting glands among insects, producing 23 categories of silk, with distinct properties. Apparently these resulted from independent evolution. When secreted by the glands, the silk filaments, made of a protein called fibroin, are in the form of a gel. The glands also secrete another protein – sericin – that glues filaments of silk together.

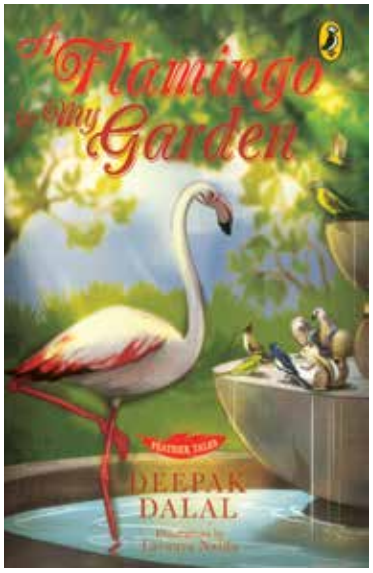
The Weavers is informative to a fault. I learnt that the silk spun by the caterpillars of the moth *Samia cynthia* is called eri. Eri silk cocoons are collected only after the adult has left the cocoon. Since the insect is not killed, eri silk is known as ahimsa (non-violent) silk. I learnt that the caddisfly larva produces silk from labial glands that occupy a large part of the body cavity. I read that webspinners, particularly the females, exhibit something called neoteny, wherein they retain a number of juvenile features as they grow. And

did you know that ant-lions remain in the larval stage for one to three years or that during this entire period the digestive remains of their food are retained within their bodies?

Talking of ant-lions, you will enjoy Geetha Iyer's description of how the children at Rishi Valley School derived entertainment from observing them and their prey. There are other anecdotes as well. The author describes how she tried to collect what she thought was an abandoned hornets' nest. She was right about it being a hornets' nest; she was wrong about it being abandoned! On the whole, though, this is a book that enlightens you about silk and the insects that make it. If you are looking for information on these topics, this is the book for you. ■



Talon the Falcon
by Deepak Dalal
Published by: Penguin Random House India Pvt. Ltd., 2016
Size: 14 x 20 cm
Pages: 58
Price: Rs. 199/-
Paperback



A Flamingo in my Garden
by Deepak Dalal
Published by: Penguin Random House India Pvt. Ltd., 2016
Size: 14 x 20 cm
Pages: 96
Price: Rs. 250/-
Paperback

Reviewed by: **Asif N. Khan**

"A children's story that can only be enjoyed by children is not a good children's story in the slightest." – C.S Lewis.

Both TALON THE FALCON and A FLAMINGO IN MY GARDEN by Deepak Dalal surely fall in the other category. And though written for 8–12 year olds, the books will also interest adults. These books from the series *Feather Tales* by the author are amazing reads that personify common birds and mammals to tell interesting stories about their lives.

The first TALON THE FALCON speaks of the friendship between Shikar, a white-headed squirrel, with birds. Shikar can speak 'bird language', a reason for his unpopularity amongst the other denizens of Rose Garden. The book teaches children to be more accepting, to shed society's xenophobic nature, and look beyond a person's appearance or his/her choice of company. The book is also about freedom, and through the story, portrays the ethics of caging birds, especially those caught from the wild. The mournful song sung by all caged birds (as explained by the Magpie) "No wingbeat, no heartbeat" could be an anecdote on caged songbirds, like bulbuls kept in cages for their beautiful songs. Combine all this with a hint of adventure and interesting characters, and you have a complete package.

The second A FLAMINGO IN MY GARDEN tells the story of Sunglow the flamingo who was 'bird-napped' by seagulls and crows, and rescued by Longtail – the wagtail. The book gives a bird's perspective of the human world, making it fun to read. This book teaches children to not be stereotypical, and not make rapid assumptions about people. Deepak has managed to keep the writing simple and enjoyable for children. The book has characters portraying Indian wildlife, with illustrations which can instantly be related to common birds around you. It is a good resource to educate children about different bird species and their behaviour.

The illustrations are splendid and vivid, the background colour of each page gives a subtle feel of the scenario at play, e.g. the backgrounds are brightly coloured or even white to depict day, and darker to indicate night. The only niggle I have with both these books is the choice of names for the characters; though in many cases rhyming and witty, they somehow stand out and break the flow of the story. ■

Peter Jackson (1926–2016)

In the early fifties, Peter Jackson came to India as a correspondent for Reuters. He was in charge of the Reuters bureau in India as Chief Correspondent twice – once between 1954 and 1960, and again from 1962 to 1970. His affinity for nature made him well-known among nature enthusiasts, and soon he was elected Secretary of the Delhi Bird Watching Society. This birding group was established in 1950 under the chairmanship of Horace Alexander, with Mrs. Indira Gandhi as one of the founder-members.

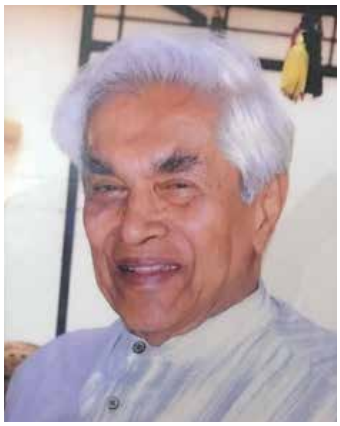
He enjoyed a good rapport with Mrs. Gandhi, and that was how he could lobby for the Sultanpur jheel to give it protected status. The sanctuary was notified on April 2, 1971 and the formal inauguration took place on February 6, 1972.

Peter Jackson left India in mid-1970 to join as Director of Information at the World Wildlife Fund in Switzerland. A decade later, in Porbandar, he spotted a small lake with more than 4,000 Lesser Flamingos. That was when he was told that the lake was going to be reclaimed to construct a park. Alarmed by the thought of the flamingos losing this wonderful lake, he once again approached Mrs. Indira Gandhi. The Prime Minister immediately spoke to the Chief Minister of Gujarat, who scrapped the plan to reclaim the lake. The lake was thus saved and a new bird sanctuary was soon notified in November 1988.

He led a truly eventful life as a journalist, naturalist, conservationist, and a cat specialist. Very much concerned, but not over-sentimental, about the tiger, Jackson worked consistently for its protection. Cats being his favourite, Jackson was closely associated with WWF's Operation Tiger, which was launched to support India's own Project Tiger. His wife Adrienne Farrell Jackson equally shared his concern for India's wildlife.

He was a recipient of the second 'International Sálim Ali Award for Conservation' from the Bombay Natural History Society (BNHS) and the 'Peter Scott Award' for Conservation Merit from the IUCN Species Survival Commission.

He was 90 when he passed away in London. ■



Duleep Matthai (1924–2017)

Duleep Matthai, who passed away on March 5, 2017 at the age of 92, was one of the most charismatic Indian conservationists of his era. Born into an eminent Kerala family, Duleep was the second of the three children of Dr. John Matthai, who served successively as Railways and Finance Minister in Independent India's first cabinet, and Ms Achamma Matthai who, as Chairperson of the Central Social Welfare Board of the Govt of India, played an important role in the resettlement of refugees from West Punjab in India after Partition. Matthai's first job was in 1944 as a management trainee in the tea industry in Assam with Jardine Henderson. In 1960, he moved to Bombay, initially as Mr. JRD Tata's Executive Assistant before taking on senior roles in other Tata companies. Despite his busy corporate life, Matthai found time with Dr. Sálim Ali, to extend the conservation work of the BNHS. The two became lifelong friends with their shared passionate interest and deep knowledge of India's birdlife. In his mid-50s, he resigned from his corporate career to focus on nature conservation and environmental protection, and in doing so, developed friendships with similar minded people across India's social strata. Securing the country's water-catchment areas – the forests – was thus a key campaign for Matthai.

Matthai was a founding trustee of WWF-India and was instrumental in getting land allotted for its office in New Delhi. His concerns about environmental degradation found resonance with Prime Minister Indira Gandhi, who invited him to become a member of important advisory bodies, such as the National Committee of Environment Planning and Coordination and the Indian Board of Wildlife. In the 1980s, he was appointed to the governing bodies of the newly established Indian Institute of Forest Management at Bhopal and the Wildlife Institute of India at Dehradun. He became a member of the Steering Committee of Project Tiger. Matthai was a member of India's CITES delegation, in 1981, that pushed through some ground-breaking conservation achievements, such as the listing of all parrot species (bar three very common ones) on the CITES Appendices – thus putting the brakes on a vast global trade that threatened to wipe out many species. They also turned the global spotlight on the trade in ivory and rhino horn that

ultimately led to the CITES ban on international trade in ivory in 1989.

In 2001, Matthai became a founding trustee of the Foundation for Ecological Security, an NGO that is involved in the critical task of ecological restoration in the country, "wastelands" in particular, and in 2007, he set up on his own initiative and became a founding trustee of the Duleep Matthai Nature Conservation Trust, to which he donated the major part of his personal assets. A room in the David Attenborough building in Cambridge, UK, has been named in the memory of Duleep Matthai.

Personable, driven, and determined, he helped in many ways to bring wildlife conservation to centre-stage at a time when most Indians were competing among themselves to outdo the British in the destruction of natural India. He used to say then what many young minds now understand: "Nature does not need us. We need Nature." ■

Dr. Ashok M. Bhagwat (1945–2017)

Dr. Ashok M. Bhagwat, Honorary Seccretary, BNHS, became associated with the Society as a life member in 1978. He became an Executive Committee member in 1988–1989 and was a member of several subcommittees, and Chairman of the Research and Collection Subcommittee. He held the position of Honorary Secretary from 1994–1996, and again from 2014 till his demise. He was also a member of the University Studies Subcommittee of Mumbai University.

One of his many remarkable contributions to the BNHS was his active participation in leading and shaping the Society's flagship programme, Vulture Conservation Breeding Centre, especially in facilitating the setting up of the laboratory for vulture breeding at Pinjore during 1999–2000. It was his efforts that helped the Vulture programme earn national and international recognition. He also played a vital role in building Conservation Research Strategy at the BNHS.

Dr. Bhagwat completed his doctorate during 1972–1974 in Chemistry, bringing together three seemingly diverse areas: Organic Chemistry, Zoology, and Botany. The work titled 'Enzymatic Oxidation and Reduction: Studies in Dehydrogenase Activity' proved to be a true confluence of these subjects. His strong interdisciplinary approach, led to several outstanding pieces of research. The range of his expertise was enormous: from wildlife conservation to pharmacology and pharmacognosy, which is amply reflected in the theses, scientific reports, and research articles that he, along with his students, produced over several decades. In a career spanning many decades, Dr. Bhagwat was instrumental in shaping minds as a unique teacher and guide to his many students. A teacher by vocation, he could adapt his teaching methods across generations and was able to bridge the generation gap with ease.

In the academic sector, Dr. Bhagwat first joined Ramnarain Ruia College as a Demonstrator. Later, he was invited to be a Lecturer in Zoology in Ramniranjan Jhunjhunwala College, where he also held the position of Vice-Principal. Himself a meritorious student, he was selected as a Fulbright Scholar.

Dr. Bhagwat became a recognized research guide in 1980 and successfully guided 10 students to obtain their research degrees. He was the Director, Clinical Research, of C.B. Patel Research Centre for Chemistry and Biological Sciences, Vile Parle, Mumbai, from 1995 to 2013. He made significant contributions to the fields of Drug Analysis, Drug Discovery and Development, Pre-Clinical Trials, Clinical Trials, Pharmacokinetics and Pharmacognosy, Biokinetics, Analytical Chemistry, and Microbiology while at the Centre. After completing his overwhelmingly successful stint at this Centre, he was invited to join the Department of Biotechnology, University of Mumbai, and served there as Adjunct Professor till his last days.

Dr. Bhagwat was also known for his work on the treatment and prognosis of Thalassaemia, and as a social responsibility, he would conduct Thalassaemia detection camps and counselling sessions. He was the founder of the NMIMS School of Science, which was among the first schools in Mumbai to offer an MSc-PhD dual degree programme. In addition, he conceptualized and founded the Clinical Research Programme in collaboration with the Clinical Research Academy of America (CRAA), New Jersey, USA.

At BNHS, Dr. Bhagwat was always looked up to for his in-depth knowledge on several matters and for motivation. He kept himself updated on the Society's multifarious activities, in the field and otherwise. Thus, he helped BNHS continue its journey towards its goal of conservation. He was an academician par excellence. In his demise, BNHS has lost a versatile personality with multidisciplinary facets, who will always be remembered. ■

Lakshadweep

It was a BNHS treat,
To the enchanted Isles of Lakshadweep,
And to sail in the Tipu Sultan ship
Away from the port of Cochin's heat.
We sailed along till the moon so bright
Appeared on the horizon and we did sight
The Isle of Kavarati thickly forested with palms,
So green and so cool and so full of charms.
Small boats arrived by the ship's side,
Into which we jumped and raced with the tide,
Snapping the seagulls and terns on the buoys
Sitting so still and looking like toys.
On the clean white sand of the shore
We were welcomed by islanders galore.
And given a coconut each
To sit and enjoy on the beach.
Then to an aquarium our guide took us with zest
To see strange creatures which, of all the rest,
Dr. Chhapgar, our leader, thought the best.
And from there to a museum of corals and shells
The delight of Manoj Muni, our connoisseur of shells.
Back to the grove to enjoy a good meal
And then to relax and the white sand to feel,
Or swim in the lagoon, so shallow and clear,
And view all the creatures without any fear,
Or go in a kayak and row away
To some island nearby, and there to stay.
By evening we're back on the ship in the deep
For dinner and a wash, but not to sleep.
For on deck there is Ros with his mouth organ small
Playing music so inviting to young/one and all.
Then out bursts loud singing, dancing, and clapping,
And joining of hands in the merry making.
Till sleep stole o'er us and our movements did slow
And our voices became so soft and low.
Then on chairs or on deck or in cabin secure
Dreams overtook us, of what, we're not sure.
Before dawn the light house of Kalpeni did beam
Its light to early risers did seem
To show, but vaguely, its coast in outline,
Which, as we come nearer, looked so very fine.
After a drink and eat of a coconut each
We went up the steps of the lighthouse so steep
Till we reached the top and saw the view
Of small isles and the sea so enchantingly blue.
We waded through lagoons spotting crabs and sea urchins
And through glass-bottomed boats saw sea cucumbers and sea anemones.
Then under the shade of some palm trees we sat
And ate a good meal and also did chat.
The men of the island regaled us with dancing
While we watched in silence their nimble prancing.
The third morning saw us at Minicoy
With its silver beaches and children so coy,
Their books in their hands on their way to school
To learn the three Rs and Arabic too.
For the people of Lakshadweep, who Muslim religion do keep,
Are originally from Kerala, and Malayalam they speak.
Except in Minicoy, where Mahl is spoken,
And from right to left in the Divehi script is written.
The women dress in salwar, khameez and dupatta,
But in Kavarati they dress in lungi and straight kurta.
The dupatta all have, but no burkha to hide
Their beauty and charm as they gracefully glide
Through avenues of palms, carrying children in their arms.
We climbed up the lighthouse, higher than at Kalpeni
And saw islands dotted around in the azure "pani."
Rare plants and trees on the island are found
That absorbed Dr. Almeida while looking around.*
Too soon the sun set over Minicoy
And with hearts so heavy we said Goodbye
To the beautiful Isles of Lakshadweep
So heavenly peaceful, so calm as if asleep.

Pareen Lalkaka
On her return from Lakshadweep, January 1991

Poovar – a new birding destination

Text and Photographs: **Rajendra Borkar**

On January 15, 2013, we decided to embark on a 'family and friends' tour to some of the nature sites that "God's Own Country" is known to be blessed with. The highlight of the tour was a visit to a little known site – a visit that will stay with me for the rest of my life.

It was with full enthusiasm and eagerness that we boarded the Duronto Express from Kurla (Mumbai) for the onward jouney. As we travelled through Goa and Karwar, the passing scenery that we saw from the train completely mesmerized us. The backwaters of Karwar, dotted with small fishing boats, along with the clear blue sky above and the long green stretches of coconut trees took our breath

away. Small narrow paths bordered with green grass and dainty wild flowers, and lush fields with farmers working in their traditional attire, all of these were a treat for our eyes. These scenic experiences were made available to us by the Indian Railways, or to be more specific, Konkan Railways, at no extra cost!

When we arrived in Kerala, I could not wait to see the country's renowned lush greenery dotted with groves of coconut trees, the hill stations, tea plantations, wildlife and bird sanctuaries. Among the major sanctuaries we visited were Eravikulam National Park, Thattekad Bird Sanctuary, and Periyar Wildlife Sanctuary. Unfortunately, we missed the boat ride in Periyar reservoir, as we failed to get a booking, and had to be content with strolling in the lush green forest. There, we had a sighting of a pair of giant

Lesser Pied Kingfisher has a spectacular fishing technique

flying squirrel, resting and feeding in the canopy of tall, large trees. I had to wait patiently for some time to obtain snaps of these spectacular creatures with the 500 mm lens of my camera. They occasionally offered opportunities for this while moving about in the dense foliage of the trees.

After the visit to the sanctuaries, while returning by road from Kanyakumari to Kovalam, we came across a village, Poovar, in Trivandrum district. It was not on our itinerary, but what caught my attention were the posters and banners put up there, with images of birds. On seeing these, I requested our driver to translate the information on the banners for us, and learnt that this area has a rich diversity of bird species. On hearing this, I had no second thoughts about opting for a birding cruise in the backwaters of Poovar.

Kerala is known for its chain of brackish lagoons (and lakes) along its borders with the Arabian sea, that are

Pied Bushchat is commonly seen near cultivation and villages

interconnected by a network of canals and rivers. These lagoons were formed by the action of waves creating low barrier islands across the mouth of many of its rivers which flow down from the Western Ghats. In this picturesque landscape, there are a number of villages and towns, situated either at the start or end points of the backwaters. The backwaters mostly support brackish water inhabiting plants and animals.

Poovar is a small, scenic coastal fishing village, an island rather, with lush greenery, coconut groves, banana plantations, and emerald backwaters. Here you get the opportunity to see, at one place, the sights of Neyyar river, Poovar lake, the Arabian sea and the golden sandy beach. The Poovar backwater cruise was a unique boating experience. The route went through canals lined with

Malabar Giant Squirrel is a large, arboreal, diurnal squirrel

Brahminy Kite can be seen throughout the Indian Union up to *c.* 2000 m in the Himalaya

coconut groves, trees, shrubs, climbers, and mangroves. Sitting in the boat, one gets the feeling of passing through a dark evergreen tunnel, made more pleasant by the cool breeze flowing through. It was the most refreshing feeling I ever had in my life. In fact, I went into a sort of trance, absolutely captivated by the melodious calls of birds, the calm and musical sound of the lake's lapping waters, and the cool breeze blowing through the leaves of water plants on the surface of the bluish-green water.

The boatman, who also served as our guide, quietly stopped the boat at times on seeing bird species and provided information on them and on other birds occurring in the area. The sightings included the Oriental Darter, a most beautiful bird with colourful lines running down its back. The darters sat perched on the fronds of coconut trees or on rocks, drying their wings. It was remarkable to watch them swim underwater with their neck gliding above the water. Indian Shags perched in twos on the branches of trees, looking like twins. The Grey Heron stood hunched in water, waiting for prey; the black dotted line running on its neck was striking. And similarly, the Purple Heron stood patiently in watch over the waters to pick up an unsuspecting fish or two. Indian Pond-Herons stood with neck high, 'staring' at us on our approach. We had the privilege to sight three species of kingfishers at the same time: Common Kingfisher, Lesser Pied Kingfisher and Blue-eared Kingfisher. Snowy-white Little Egrets walked causally along the edges of the canal. We spotted a Greater Coucal looking at us from a green leafy branch. What a marvellous bird it is, with its black neck, brown wings, and long black tail. What was most amazing was to watch Brahminy Kites sitting on coconut trees, some flying over the water and making their nasal, screaming calls. I could not let this moment pass without capturing it in my camera.

Greater Coucal is one of the non-parasitic cuckoos

Common Kingfisher eggs are white, glossy, roundish ovals

We cruised for two hours in this heaven on earth – it was a delightful day for me. The mesmerizing 'arena' made me forget everything of the world of the concrete jungle I came from. As if it had never existed, as if this was only how it was supposed to be. Alas, it isn't, and we have to face the truth, and proceed for the return trip to Mumbai. ■

Rajendra Borkar was Deputy Secretary, Govt of Maharashtra. He loves to travel, photograph and watch birds.

Are They Our Eggs ?

Text and Photographs: **P.M. Lad**

Skimmers are known to nest on sand islands

The eggs were found close to the eroding edge of the sand island

The eggs were shifted away from the edge

Will the skimmers accept their eggs? This was our main worry when we shifted the nest of the Indian Skimmer pair a little away from the eroding edge of the sand island. Skimmers generally nest on large, exposed newly formed sand islands in large rivers like the Yamuna or Chambal, which at times get eroded by the flowing water (see *Hornbill* October–December 2016, pp. 12–15).

On April 12, 2012, we went to watch the breeding of skimmers in Chambal, which we have been observing for the last 25–30 years. On that day, the eroding edge of the sand island was creating a problem, as one nest was too close to the sandy edge and was likely to be washed away. Dr. Rishikesh Sharma and the staff of Chambal Sanctuary were naturally worried.

Should we shift the nest? Many birds abandon the nest if touched or disturbed by man. We had no knowledge of the reaction of skimmers in such cases. But there was no alternative in this case for that nest, and we decided to shift it a few feet away from the edge.

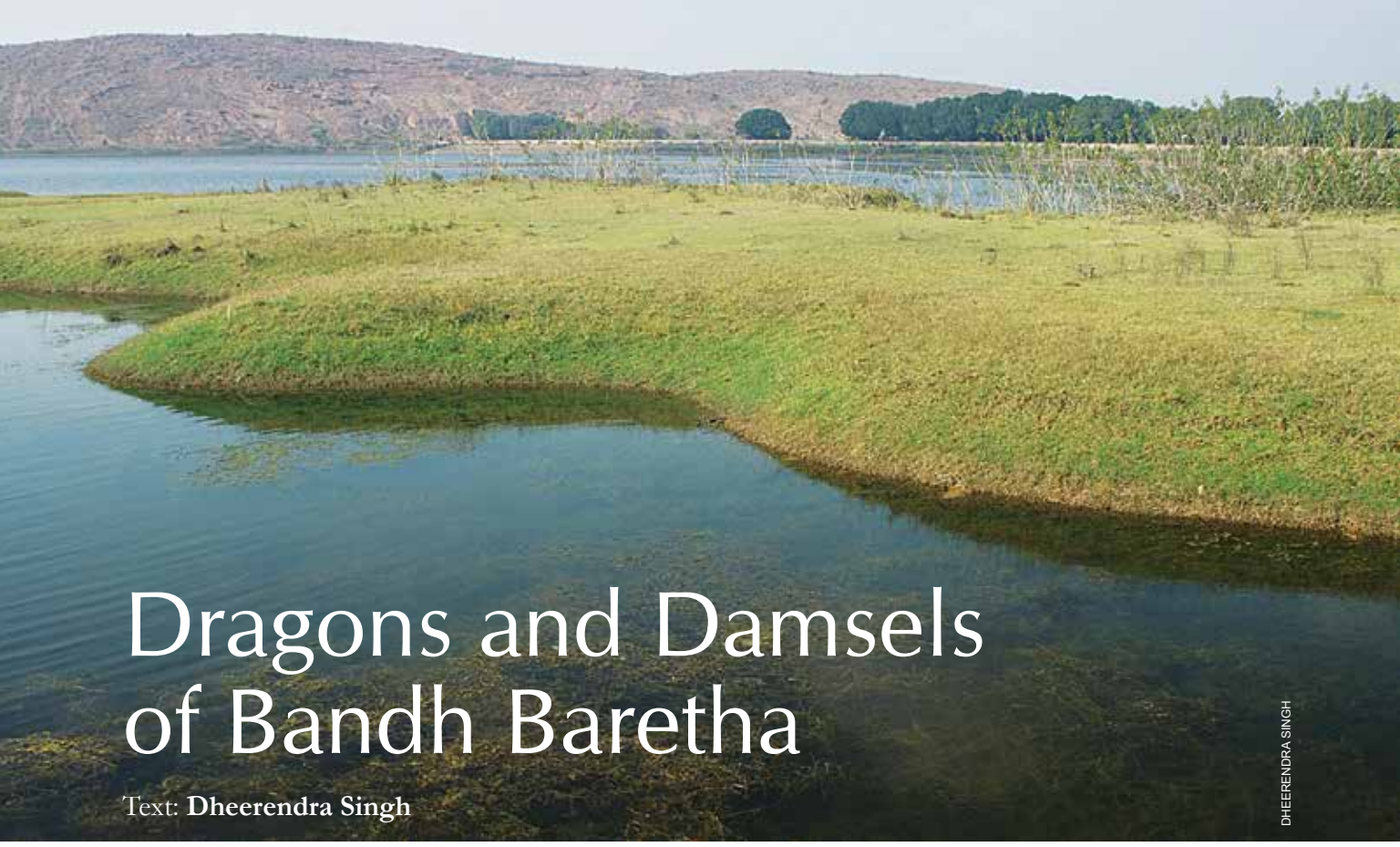
It took a few minutes to shift the nest, and then we hurriedly moved away. After a few minutes, the birds returned and cautiously approached the nest. We were all worried. The birds were carefully inspecting the new nest.

The Skimmer inspected the shifted nest

... once satisfied, it accepted the nest

Probably after satisfying themselves that the eggs were their own, one of the birds sat on the eggs to incubate them. We were overjoyed to see this. I congratulated the staff for this unique effort and their dedication for the welfare of the birds. ■

P.M. Lad – a retired Forest Officer – was instrumental in setting up a number of bird sanctuaries in Madhya Pradesh. He enjoys photographing birds.



Dragons and Damsels of Bandh Baretha

Text: **Dheerendra Singh**

DHEERENDRA SINGH

Bandh Baretha is an old wildlife reserve 65 km from Bharatpur, an internationally well-known site for birders. Bandh Baretha reserve has something to offer throughout the year. It is home to about 200 bird species, and one can sight a leopard or striped hyena if one is lucky. The reservoir in Bandh Baretha is my favourite destination for watching dragonflies and damselflies, and not birds as most would expect! The reservoir is one of the main water sources for Bharatpur and its bird sanctuary. Spread over 179 sq. km, the construction of the dam, built across the Kakand river, was initiated by Maharaja Jaswant Singh of Bharatpur and completed between 1888 and 1897.

Both 'dragons' and 'damsels' look very similar but it is not difficult to tell the difference between them. Dragonflies are robust in appearance and strong flyers and they usually keep their wings spread or at an angle while resting. Damselflies on the other hand have delicate bodies and are weak flyers, and they usually fold their wings over their abdomen when at rest.

Before reaching the reservoir, I usually visit two other aquatic habitats nearby. The first, which I call the washing place, is conducive for watching dragonflies as there is a small bridge from which one can easily observe these amazing insects. The water from the dam flows through a canal into this waterbody. Women often gather to wash their laundry here.

Along the flowing water, there is dense vegetation of babul trees and reeds. The surface of the water is largely covered with Water Hyacinth. It was here, in early 2014, that I discovered two males of the Greater Crimson Glider *Urothemis signata*, a beautiful, large red dragonfly with amber coloured wing bases. Later, I also saw a female, which is more rusty-yellow rather than blood red. The males, I observed, mostly sat on a perch (preferring dead stalks of reeds) projecting 50 to 100 cm above the water surface and defended their territories against other males. I also got an opportunity to observe the breeding behaviour of the numerous Ruddy Marsh Skimmer *Crocothemis servilia*. They perch low on the vegetation, mainly on the leaves of the Water Hyacinth, from which they make frequent territorial sallies at other males, or to court females. I observed two mating wheels (mating pairs clutch each other to form a mating circle or wheel), which lasted only a few seconds. After mating, the females chose open water to lay the eggs. They laid them by dipping the tail end of their abdomen into the water. Both the females that I saw laying eggs were guarded by males. Ruddy Marsh Skimmer males are also coloured blood-red, but are smaller than the Greater Crimson Glider and lack the

Crimson-tailed Marsh Hawk *Orthetrum pruinosum*: Mating pairs clutch each other to form a mating circle or wheel

Small Skimmer *Orthetrum taeniolatum*: Dragonflies always spread their wings at an angle while resting

Unlike most dragonfly species, the Blue Darner *Anax immaculifrons* female lays eggs by inserting them into plant tissues

characteristic amber coloured wing-spots. This site also has populations of Little Blue Marsh Hawk *Brachydiplax sobrina*, Variable Glider *Rhyothemis variegata*, Orange-tailed Marsh Dart *Ceriagrion cerinorubellum*, Coromandel Marsh Dart *Ceriagrion coromandelianum* and Black Marsh Dart *Onychargia atrocyanea*.

The Orange-tailed Marsh Dart, Coromandel Marsh Dart, and Black Marsh Dart lay eggs in a tandem formation. I observed that these species carefully select the sites to lay their eggs, mostly using the leaves of Water Hyacinth. At times I saw the Coromandel Marsh Dart also using decaying plant tissue. Unlike most of the Dragonfly species, Damselflies usually insert their eggs into the plant tissue, which is normal for this group.

A part of the pond dominated by Water Hyacinth has near stagnant water while on the other side, the water flows down on to stones. Here, I observed two or three males of the Crimson-tailed Marsh Hawk *Orthetrum pruinosum* trying to establish territories. They were highly territorial and aggressive towards each other, perching at the water's edge usually on some large stones. The mating wheel in this species was done sitting on the ground or on low vegetation, and contrary to the Ruddy Marsh Skimmer lasted for several minutes. I observed three females oviposit; they flicked droplets of water (probably containing eggs) towards or onto the bank.

My second stop before going to the dam is a small nursery of the Forest Department. In a grove of mango trees here is a large colony of Flying Foxes. There is no aquatic habitat, except for a cemented water tank. Many dragonflies rest under the shade here, especially during the hottest part of the day. In 2016, I discovered the roosting sites of two very crepuscular dragonflies: the Coral-tailed Cloud Wing *Tholymis tillarga* and the Brown Dusk Hawk *Zyxomma petiolatum*. The latter is brown with a very thin abdomen and brown-tipped wings. Because of this cryptic coloration, these dragonflies are easily overlooked when they rest among the branches of low shrubs. Here, they

Coromandel Marsh Dart *Ceriagrion coromandelianum* feeding on another damselfly

Pixie Dartlet *Ischnura nursei* (male): Most damselflies fold the wings over the abdomen when at rest

rest perching vertically. In such a densely shaded area as this nursery, I observed active males patrolling incessantly over water, not stopping to perch. Two males chased one another repeatedly over the water in the tank until eventually one left.

Finally I reach Bandh Baretha reservoir. Near a bridge over the dam is a stony area where small streams run with the onset of the monsoon. As the monsoon progresses, a range of dragonflies appear: Pied Paddy Skimmer *Neurothemis tullia*, Common Clubtail *Ictinogomphus rapax*, Black Stream Glider *Trithemis festiva*, Scarlet Rock Glider *Trithemis kirbyi*, and Crimson Marsh Glider *Trithemis aurora*.

The Crimson Marsh Glider, which I observed a number of times, is an amazingly beautiful dragonfly. Mature males have a uniformly magenta or purplish red thorax and abdomen, with reddish veins in the wings. The males tend to perch on very low vegetation, or sometimes on rocks. During their active period (between 11:00–14:00 hrs), I saw males frequently chasing each other and returning to the same perch. I witnessed once a mating wheel, which lasted around 20 seconds in the air. After that, I observed the female hovering, while the male flew down to the water surface, where he in turn hovered as though to indicate the best place to drop the eggs. The female then started to oviposit flying low and rapidly along the water surface, dipping her abdomen quickly in the water. The male followed close behind, guarding her from other males.

So the Bandh Baretha area gives an opportunity for a leisurely stroll and a fairly certain chance of seeing many interesting dragonflies and damselflies and studying their fascinating behaviour. Visit the place while you can, perhaps you may also find me there! ■

Dheerendra Singh is a naturalist, particularly interested in dragonflies. At present, he is compiling a field guide on Indian dragonflies.

Saffron-faced Blue Dart *Pseudagrion rubriceps*: Damselflies usually insert their eggs in plant tissues

Bird Migration Studies in India – Insights

Text: **P. Sathiyaselvam and Tuhina Katti**

Migration is one of the most fascinating aspects of bird behaviour. The annual to and fro mass movement of billions of birds, typically along a north-south axis from their breeding grounds in the far northern or far southern climes to their wintering grounds in fair-weather temperate, subtropic, and tropic regions, is an extraordinary manifestation of nature and one of the most enthralling aspects of the avian world. Each year, an estimated 50,000 million birds undertake such migrations.

Systematic bird migration studies started in 1749 when Johannes Leche began recording the arrival dates of Finnish birds, and this marked an important step towards understanding migration, following which a published statement appeared in Thomas Berwick's A HISTORY OF BRITISH BIRDS in 1798 on the migration of the swallow. In the early 1900s, people started recording data on collection dates, flights of birds, arrival and departure dates, light house kills, and field observations, which was imperative in obtaining information on the movements of birds. In 1890, the Danish teacher Hans

Great Knots banded with colour flags at Sakhalin Island, Russia, wintered in Coringa Wildlife Sanctuary, Andhra Pradesh

P. PRASHANTHI

P. SATHIYASELVAM

Experts from United States Geological Survey (USGS) imparted training to the BNHS scientists on satellite tracking

P. SATHIYASELVAM

A Common Teal fitted with satellite transmitter in Odisha spent the summer in Madhya Pradesh and Chhattisgarh

Christian Cornelius Mortensen started to systematically tag the legs of Starlings *Sturnus vulgaris* and other birds with metal rings, and began to receive reports on ringed migrants shot or otherwise found further afield. Later, in 1903, ringing experiments became the established practice to study bird migration.

Till now, BNHS is the only organization involved in long-term bird ringing and migration studies in India. The first study on bird migration by the BNHS was undertaken as early as 1927 through a small-scale bird banding/ringing programme, aided by the Maharaja of the former Dhar State, to ring migrant ducks to establish their origins. A few recoveries were obtained from these exercises, which furnished the first positive evidence that the ducks which bred in Siberia and the central and north-east Asian provinces wintered in the Indian region. At the same time, a White Stork *Ciconia ciconia* ringed in western Germany and a Rosy Starling *Sturnus roseus* ringed in Hungary were recovered in India.

The year 1959 was significant for Indian ornithology and the study of bird migration, when the first ever organized scheme for bird banding and migration study in the Subcontinent was taken up by BNHS. During this ringing programme from 1959 to 1973, and later, from 1980 to 1992, by the BNHS with funding by the World Health Organization (WHO), US Research and Development Group, Smithsonian Institution, US Fish & Wildlife Service, and the Ministry of Environment and Forests, Government of India, over 500,000 birds were ringed in India. More than 3,000 recoveries were obtained from 29 countries spanning five continents (Asia, Europe, Africa, Australia, and Antarctica). Based on these recoveries, the breeding zones, migratory routes, and stopover sites of more than 40 species were well-documented. The information obtained through these intensive studies was pivotal in delineating the boundaries of East Asian-Australasian, Central Asian, and African-Eurasian flyways.

Though the recoveries obtained through the ringing programmes provided a profile of the migrations in and out of the Subcontinent for some species, especially for ducks and some waders, we are still unable to pinpoint the migratory routes and pattern of many waders, terns, cranes, and passerines. A limitation to bird ringing is that the ringed birds need to be recaptured in order to obtain data on their movements. This becomes a tremendous strain on finances, and is difficult to implement due to the need to have long-term bird banding field stations and trained personnel to handle birds.

Bird ringing is being carried out on a large scale in Europe with over four million birds ringed each year. In several countries, bird ringing has been in constant use for over 100 years and data from national ringing schemes covers large geographic areas. It is undertaken not only to track bird movements but also to monitor the population size and dynamics, for evolutionary and behavioural studies, dispersal and population persistence, bird-transmitted diseases, and site-specific action plans, and to address climate change issues. But in India, it has been restricted to a few locations, on a small scale at most of these sites.

Bird banding studies through satellite telemetry offer an option to address this problem. Unlike bird ringing, satellite telemetry can track birds (or other animals) from mountain tops to ocean beds. In 1999, a study with

The Bar-headed Goose fitted with satellite transmitter in Chilika Lake (Odisha) was sighted in a small islet of the river Ganga in Panchanandapur, Malda district, West Bengal

satellite transmitters was carried out by Aligarh Muslim University, Wildlife Institute of India, US Geological Survey, and BNHS on two Bar-headed Geese *Anser indicus* in Bharatpur, which were tracked up to Tibet.

When the avian influenza virus H5N1 spread from Southeast Asia to Europe and India in 2005, it kindled wide public interest in the movements of wild birds as never before. This interest was driven by the assumption that wild birds, especially waterfowl, are the main carriers of avian influenza and thus form the primary risk for the introduction of the disease into countries and into poultry holdings.

As part of the avian influenza studies in India, BNHS and United States Geological Survey (USGS) with funding from United Nations Food and Agriculture Organization (FAO) started large-scale satellite tracking studies in India during 2008. A total of 108 individuals of high-risk migratory ducks and geese of eight species, namely Bar-headed Goose, Brahminy Shelduck *Tadorna ferruginea*, Gadwall *Mareca strepera*, Eurasian Wigeon *Mareca penelope*, Northern Shoveller *Spatula clypeata*, Garganey *Spatula querquedula*, Northern Pintail *Anas acuta*, and Common Teal *Anas crecca* were fitted with satellite transmitters in four states (Odisha, Tamil Nadu, Assam, and West Bengal) and their movements were monitored. Later, tracking studies were extended to three more species, and altogether 160 individuals of 12 species were fitted with satellite transmitters and their migratory routes were tracked. Satellite tracking of migratory species provided comprehensive information on the stopover sites, duration of stay in stopover sites, the pathways for northward and southward passage migration, and most importantly, the connectivity between the networks of wetlands used in the migratory pathway for each species. Such data is important while planning a landscape level conservation action plan for threatened species, mapping the spread of avian influenza, and in determining the home-range of the species in the wintering ground. However, judging from the present scenario, satellite tracking may never replace bird ringing, as transmitters are relatively expensive, a large amount of technical equipment is required, and the technique is mostly limited to larger species.

In addition to the traditional methods of marking birds with metal rings, BNHS has adopted the more recent methods of tagging birds

P. GANGAIAMARAN

A Bar-headed Goose fixed with neck collars in Mongolia was sighted at Koonthankulam in Tamil Nadu

P. SATHIYASELVAM

A Gadwall tagged in Odisha moved southwards and utilized saltpans and backwaters near Ichachapuram in Andhra

with colour-flags and neck-collars. An individual each of Bar-headed Goose and Greylag Goose neck-collared in Pong Dam, Himachal Pradesh by the BNHS were sighted in Vadhavana wetland, Gujarat, in subsequent years. As more people are becoming aware of the significance of reporting information on colour-tagged birds, interesting information is being reported from all over their migration routes in the past two years. Three colour-tagged Curlew Sandpiper, one from Point Calimere and two from Chilika, were sighted in Bohai Bay of Shanghai, China, during return migration. In the case of birds tagged outside the Indian region, Great Knots tagged with leg flag in Sakhalin Island, Russia and Chongming Island, China were sighted in Kakinada, Andhra Pradesh. Another from Chongming Island was sighted near Palghar, Maharashtra. Bar-headed Geese fitted with neck collars in China and Mongolia were sighted in wetlands of the Peninsula and south up to Koonthankulam in southern Tamil Nadu. These sighting records reported by ornithologists and photographers have yielded interesting results on waterbird movement and have established links between migratory birds wintering in India and the East Asian-Australasian Flyway (EAAF) population.

Throughout the Central Asian Flyway, changing agricultural practices and land use continue to have major impacts on bird populations. Besides this, global climate change is already affecting the distribution and migration of many bird species, and is set to have much greater effects over the coming decades. The conservation of many migratory bird populations also requires the protection of site networks and other suitable habitats along flyways under international treaties such as the Ramsar Convention, Bonn Convention, African Eurasian Waterbird Agreement (AEWA), and Arctic Migratory Bird Initiative (AMBI). To address these large-scale conservation issues we need to have knowledge of population dynamics and bird migration patterns, and monitoring bird movements is an imperative tool to address many of the conservation issues related to bird migration.

Owing to the need for multi-disciplinary conservation efforts and policy endorsement in India, BNHS has proposed to conduct a pan-India Bird Ringing Programme integrating migration studies, social-dependence and the hydrology of wetlands. The programme aims to safeguard wetlands along the migration routes of long-distance migratory birds in conjunction with the food security and livelihoods of the local communities through conservation of wetlands. The objective is to incorporate the scientific knowledge obtained through the study into a policy framework for wetland conservation at a regional scale. Many state governments have already given permission for this programme, and large-scale ringing activities are proposed to be carried out in the following years. ■

To be continued.

P. Sathiyaselvam, Scientist "C" of the BNHS, is trained in satellite tracking, and has been involved in Bird Migration studies since 2002.

Tuhina Katti is currently associated with the Wetlands Programme of the BNHS. She has been involved in Bird Migration studies since 2013.

Sustainable agricultural practices for conservation of landscape species

BNHS PHOTO LIBRARY

The farmers discussed the effects of pesticides on wildlife and human health

The Pune Wildlife Division, BNHS, Gramin Suvidha Kendra (CSR unit of Multi Commodity Exchange of India), WOTR Organisation – Pune, and Krushi Certification Pvt. Ltd, supported by National Thermal Power Corporation (Solapur Unit), launched the 'Sustainable Agriculture Training Programme' designed in three phases, spread over twelve months, for farmers inhabiting the marginal villages of Great Indian Bustard Sanctuary in Solapur. The first two phases were successfully completed with the introduction of farmers to sustainable agricultural practices, followed up with support to cultivate demonstration plots in their fields. The third phase would involve branding and marketing of the agricultural produce. A two-day workshop was organized to familiarize farmers with sustainable agriculture and the benefits of long-term commitment to it. Effects of pesticides on wildlife and non-target species, as well as on human health, were discussed, followed by a talk on the need for organic farming for sustainable development. Presentations on organic farming, water management, soil testing, and preparation of organic formulations were delivered. ■

Identifying EIMCBA using EBSA

Maharashtra's 720 km long coastal area boasts of a rich marine biota, however, it is vulnerable to unplanned random developmental activities. Intertidal habitats such as rocky-sandy shores and mudflats are neglected in the face of competition with industrial and infrastructure projects for human development.

BNHS has made an effort to identify these ecologically significant habitats and the conservation issues plaguing the region, using the norms laid down by the Convention on Biological Diversity (CBD). The CBD-defined 'EBSA tool' (Ecologically or Biologically Significant Marine Areas) was deployed considering its scientific approach, ease of understanding, and uniformity across the world.

BNHS projects have begun focusing on systematic enumeration of the areas that call for conservation. But the process cannot be complete without creating awareness among the locals who live adjacent to these marine habitats and exploit their resources for livelihood. BNHS, therefore, chalked out a workshop for college students who can contribute to conservation efforts.

Masters/graduate students from the coastal districts/villages who were studying zoology or environmental sciences were particularly selected for this workshop. The main agenda was to introduce students to the EBSA tool and its usage, besides throwing light on the current regional and world-wide issues related to marine biodiversity.

BNHS PHOTO LIBRARY

The workshop focused on spreading awareness among college students

Workshops were held at Kudal and Ratnagiri for students from Sindhudurg and Ratnagiri districts, respectively. About 140 students and 20 professors participated in these workshops. Presentations on marine biodiversity of Maharashtra, EIMCBA (Ecologically Important Marine and Coastal Biodiversity Areas) studies by BNHS, and introduction to EBSA tool were delivered by experts and guest speakers. A guest speaker from UNDP presented a case study from Malvan, highlighting the benefits of community involvement in conservation efforts. The Assistant Conservator of Forests, Sawantwadi, enlightened the students about the government's role in marine biodiversity conservation. ■

Identify birds at a click with 'Internet of Birds'

'Internet of Birds' (IoB) is a citizen science platform by Accenture Labs in collaboration with BNHS. A first-of-its-kind, the software helps to identify images of bird species found in India. IoB is an image recognition platform which uses artificial intelligence technology to identify birds based on the photograph uploaded by the user. IoB makes bird identification easy, interesting, and accessible through its website www.internetofbirds.com.

At present, this platform recognizes approximately 330 species and will eventually include all the species found in India. BNHS and Accenture Labs invite all members and birdwatchers to contribute their photographs for IoB. Please send photographs with the bird's name and photographer's name to bnhsenv@gmail.com.

For further queries, contact us at bnhsenv@gmail.com or 022-22821811.

Do not miss this video on IoB https://youtu.be/vLH0pqEtzRI. ■

Chasing the Golden Jackal @ CEC-Delhi

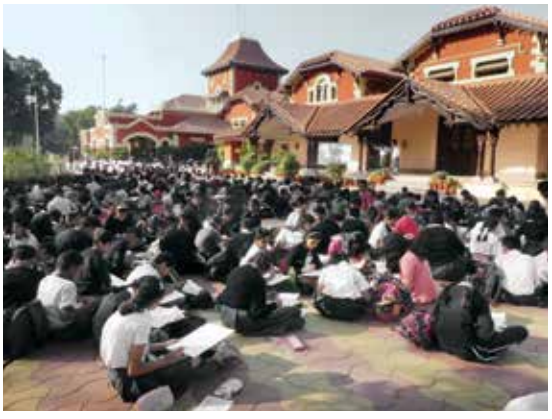
BNHS PHOTO LIBRARY

Participants observed nine Golden Jackal during the trail

On January 8, CEC-Delhi initiated a first of its kind programme at the Asola Bhatti Wildlife Sanctuary – the Golden Jackal Safari. A group of 30 people gathered for a glimpse of the beautiful Indian Golden Jackal. The day began with a brief introduction to the Sanctuary and guidelines to be observed while in the premises. Participants were explained the behaviour and ecology of jackals, their diet, the primary reasons for the increase in their population in Asola Bhatti and their significance. Field markings like scat and pugmarks were also shown and their importance in study of mammals explained.

The half-day programme entailed a 16 km ride along the forest road up to the pristine lake in the midst of the Sanctuary. Along the way, the group spotted Bluebull, Spotted Deer and Black-naped Hare before it got an opportunity to see jackals. The group spotted nine jackals during their trail and a pair of juvenile White-backed Vulture, which are globally threatened birds. The programme was repeated four times during February; the visitors were delighted by the sightings in the Aravalli forest. As the programme has received an overwhelming response, CEC Delhi will conduct this safari during the coming summer.

To join the programme, write to us at cecbnhsdelhi@bnhs.org ■



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Increasing numbers of students participate in the competition

Drawing competition @CEC-Nagpur

CEC-Nagpur, along with Raj Bhavan Nagpur, has been organizing drawing competitions for school students for the past three years, which happily show a consistent increase in participation. These competitions are conducted in the Raj Bhavan premises to spread awareness about the surrounding forests and biodiversity. The day ends with a tour of the Raj Bhavan Biodiversity Park. This year saw 800 students from 20 schools participating in the drawing competition for topics like 'Birds Around Us', 'Tiger Tourism', 'Clean Drive in Our City', 'My Green City', 'Eco-friendly Festival', and 'Stop Poaching and Save Wildlife'. ■

CEC-Mumbai announces online courses

BNHS PHOTO LIBRARY

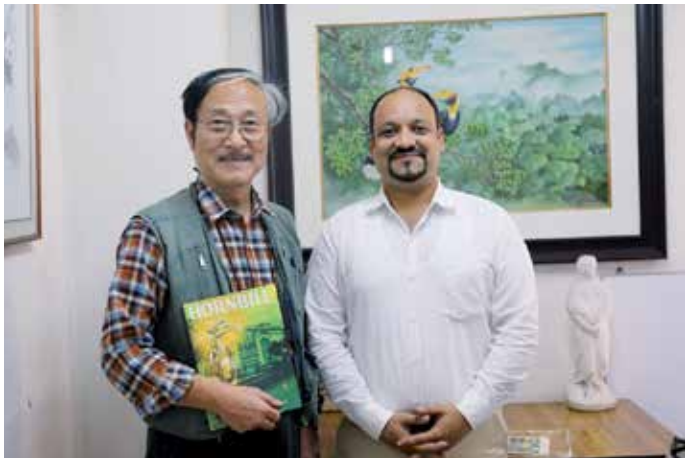
Field trips are an essential element of the BNHS online courses

Here is a chance for all nature enthusiasts caught in the hubbub of daily lives to reconnect with the realm of plants, animals, birds, and butterflies along with their habitats, by enrolling for BNHS Conservation Education Centre's online courses. After the successful completion of the Basic Course in Ornithology and Leadership Course in Biodiversity Conservation, registration for forthcoming batches for these courses has begun. CEC is also reviving its course in Herpetology, and announcing a new 'Certificate Course in Butterfly Studies'. A combination of online and field components interwoven to provide a holistic understanding of the subjects, these courses are open to anyone interested in studying biodiversity.

To enroll for online courses of BNHS, contact: cecbnhs@gmail.com ■

Building Bridges

Mr. Hobun Ikeya, President, Ecosystem Conservation Society-Japan (ECS), visited BNHS on February 06, 2017, along with his colleague Mr. Hiroaki Katoh, as part of their study trip. They interacted with their counterparts at BNHS, discussing conservation efforts by both organizations in their respective countries. They also visited the Natural History Collection Department at BNHS and praised the efforts made by BNHS to conserve the biodiversity of India. BNHS' work on conservation of vultures especially intrigued and impressed them. ECS and BNHS have agreed to work in collaboration and exchange information for conserving the biodiversity of both countries. ■



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Mr. Hobun Ikeya at the BNHS collections with Dr. Rahul Khot, Curator, BNHS

A Citizen Science Initiative

The Common Bird Monitoring Programme (CBMP) is a citizen science initiative commenced by the BNHS to encourage and involve citizens in birdwatching and monitoring common birds. A series of workshops have been conducted under CBMP across Maharashtra since last year. The workshops are followed by a bird survey for field experience and better understanding of scientific techniques needed to monitor common birds. In the past two months, a total of 446 individuals participated through seven workshops.

For details contact:
Nandakishor Dudhe on n.dudhe@bnhs.org ■

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