2017
VOL 11 ISSUE 4

current conservation

This magazine is produced with support from:

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FES
FOUNDATION FOR ECOLOGICAL SECURITY

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ISSN 0974-0953

contents

features

perspective

column

cc kids

a day in the life

fun facts

poem

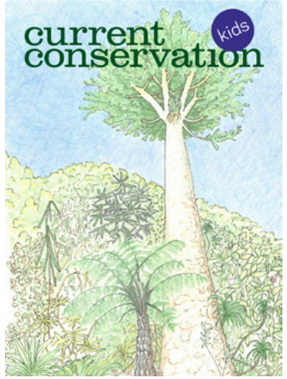
Cover by Smitha Shivaswamy

Do coral reef ecosystems mimic cityscapes? A captivating article by Madhusudhan Katti urges us to reimagine cities as terrestrial reefs that co-exist with other species, just as corals do. Human minds can imagine a different and symbiotic future where there is no competing and killing for space.

This issue of Current Conservation is all about what we can learn from each other through imitation, adaptation and experimentation. Katie Shanks tells us about a fascinating research project that explores how biomimicry can be used to improve technology—whether the wing structure of a butterfly can be replicated to make more efficient solar panels.

Mimicry is also often defined as an imitation that is trying to ridicule or mock. Aparajita Datta's piece on large dams in Arunachal Pradesh brings out the deep crevasses in the regulatory and legal systems that make a mockery of legal procedures and safeguards. She brings attention to the critical issue of creating paper forests by destroying native forest, aided by the compensatory afforestation mechanism. Ritwick Dutta's review of the National Wild Life Action Plan (NWAP) 2017-2031 talks about how the plan is in direct violation of the Supreme Court judgment when it does not mention the Asiatic Lion. No tweaks, says Dutta, but an overhaul will address the lacunae.

We do hope you find Current Conservation 11.4 an engaging issue and we welcome feedback and suggestions. We request you also engage with Dan Brockington "colonisation score-card" initiative to derive answers to whether countries need to be colonised and by what sort of power.



Cover by Georgianne Griffiths

Have you ever woken up with the first light, just as the world is starting to stir, and the birds are beginning to chatter and chirp? Matthew Creasey takes us into the Australian outback, as a family of babblers heads out early in the morning for a breakfast of creepers, crawlers, and hoppers.

And speaking of creepers and crawlers…Did you know there is a whole invisible world of creatures out there? Springtails that jump, beetles that sniff out their prey, and microscopic mites that trap their food in strands of silk! Join Georgianne Griffiths on the forest floor, where hundreds of tiny creatures are at work, hidden from view, breaking down leaf litter and recycling nutrients for other plants to use.

Think of them, the next time you visit a forest—remember to take a magnifying lens with you! And let us know what you find. Happy reading!

Butterflies heat up the world of solar energy

"Biomimicry" is the word we use to describe when we steal or are inspired by nature's incredible designs and apply them to our own creations. We've done it many times over—with Velcro, aeroplane and turbine fins, and the nose of the Shinkansen Bullet Train, for instance. When you see the original models out in the wild—sticky burrs, the flippers of marine animals, or the streamlined bill of a kingfisher, in the case of the examples above—it is clear that nature has much to teach us. However, we can't learn from nature unless we conserve it. The good news is that biomimicry itself may facilitate more and better conservation.

You might think that butterflies are more likely to inspire artists than scientists, but these insects are the basis of cutting-edge biomimicry research into how to improve solar panels. Some species of butterfly—the small cabbage white (*Pieris rapae*), the green veined white (*Pieris napi*), and the large cabbage white (*Pieris brassicae*)—have figured out that they can heat their flight muscles faster in the morning sun if they position their very white wings in a particular V-shape above their bodies. By energising themselves in this more efficient way, these whites (referred to hereafter as 'Pierids') can go foraging for all the best fruit whilst the other butterflies are still enjoying their metaphorical solar coffee. After observing this behaviour, a group of interdisciplinary researchers (of which I am a member) asked whether a closer analysis of the butterfly's technique might help them optimise solar panels—which are somewhat expensive and, relative to many sun-basking species out in nature, fairly inefficient (especially in places like the cloudy UK, where the butterfly research is being conducted).

The secret of the butterflies' success is their "optical concentrator". In the human world, examples of optical concentrators include magnifying glasses, telescopes, lighthouses, spectacles, and cameras; each of these devices manipulate light to increase or decrease the size of an image. Solar panels incorporate optical concentrators in the form of specialised "photovoltaic (PV) concentrators", which combine optics with photovoltaic material that converts the sunlight into electricity. The optics are designed to focus the image of the sun onto the small areas of photovoltaic material in the same way analog cameras compress large scenes onto much smaller photo film. This allows solar panels to receive more energy and, therefore, produce more power—sometimes at even greater efficiencies due to how the materials they're made of work.

In the world of thermodynamics, the moreconcentrated the energy is on a converting element (such as PV), the more efficient the conversion process can become. This is one of the reasons scientists are so keen on developing solar concentrator technology. Single-junction solar cells—the first generation of solar panels—had efficiencies of only around 15%. Due to the constraints of thermodynamic laws, their theoretical limit was 33%, though this could be increased to 45% with concentration. For multi-junction solar cells, the increase facilitated by concentrators is even more, improving the efficiency limit from 66% to 93%—as long as the cells

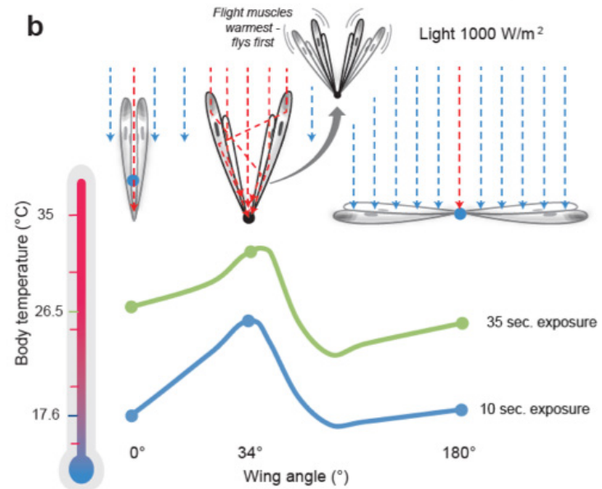


Figure 1: When butterfly wings are held at just the right angle (34°), body temperature increases by approximately 17°C.

Manini Bansal

are functioning in a difficult-to-create perfect system. Currently, the record solar cell efficiency in a real-world functioning system (a 4-junction solar cell under concentrated sunlight, to be specific) is 46%.

In other words, we still have a long way to go but the efficiencies and efficiency potentials of solar cells are still higher than those of wind or wave turbines (currently at around 35% with an efficiency limit of 59%). The efficiency of solar cells can go higher and they can be installed in almost any location—in almost any size and shape. However, to optimise the solar concentrating process, researchers and designers have to make adjustments and compromises on a wide array of solar panel traits—including size, weight, angles, materials, stability, and ease of manufacturing—to produce final products that function optimally across a range of temperatures and under different weather conditions. As if that wasn't already enough to think about, priorities for each of these change depending on the exact application— so designers must start from scratch for each new project!

Current solar panels are bulky and heavy, limiting our ability to install them directly onto building structures and vehicles. Solar concentrators can be used to design differently shaped solar panels which integrate into buildings as tiles or windows, but these features can add weight and make the solar panels thicker and more cumbersome. What we need are lightweight, reliable, and weather-resistant optics—which is exactly what the wings of the cabbage white butterfly seem to be.

These species have been concentrating light for much longer than we have; if they had been watching when we first developed the telescope, they would have most likely laughed at how clever we thought we were. In order to concentrate light, the butterflies use their wings like a funnel to catch a wide area of sunlight and narrow its focus onto their much smaller thoraxes. If we were to adopt a similar method with our technology, we could reduce the area of photovoltaic material (PVM) required in solar panels—a huge step forward in our search for sustainable clean energy, as PVM is the expensive part of solar panels. Protective glass, wires, and metal framework merely play a supporting role while the PVM does the hard work of converting sunlight into electricity.

So why did we think these butterflies were concentrating light in the first place? Simple observation—the first, and often most overlooked, step in the scientific process. Biologists noticed that these species always basked with their wings in a very particular 'V' shape characterised by a consistent opening angle. This seemed too repeated a behaviour to merely result from chance—especially since it was not observed in other species. Enter the physicist studying solar energy technology. By chatting with colleagues in this other discipline, the biologists found out about V-trough concentrator photovoltaics, a type of technology in which the specific shape and opening angle is used to optimally reflect light onto solar panels at the centre of the base. The scientists predicted that the butterflies' wings probably had good reflectance (most of the light hitting the butterfly wing is reflected in some direction) allowing them to use the 'V' posture to increase the amount of energy being directed toward their bodies. The researchers teamed up to explore this multidisciplinary research question to find out how to steal clever ideas from nature to help us improve our designs…yet again.

Our team has measured the wings of all three species of Pierid mentioned above. We not only found the reflectance of these wings to be very high (more than 80% for the large cabbage white), but also to reflect the range of light useable by solar cells. It is remarkable—and highly promising for the field of solar energy—that a natural substance could achieve this while being very lightweight and weather resistant.

Further investigations involved attaching actual butterfly wings to a small (1 × 1 cm) photovoltaic cell and recording the power output at different wing opening angles. We found that the wings successfully

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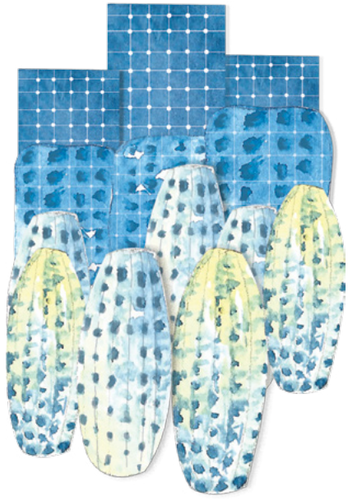


Manini Bansal

increased the power output from the small solar cell at a power to weight ratio 17× higher than that of standard solar concentrator technology. This improvement resulted from the fact that butterfly wings weigh significantly less than the standard mirror or lens materials used in manmade solar panels. Attachment of the wings increased the amount of light hitting the solar cell (a result of the concentrator effect) and increased the power output—with minimum added weight. By mimicking the structure of butterfly wings when manufacturing solar panels in the future, we can reduce the amount of rare, toxic, and costly-to-mine PV material. This can reduce the overall weight of the solar panels, which has the added benefit of diminishing the cost and energy required to make and transport the devices.

What do these naturally reflective wings look like? There are large variations in structures and properties observed across species but the basic arrangement is a series of scales tiled over the wing and partially overlapping in a way similar to roof tiles. Each individual scale is made up of vertical lines of chitin (the material comprising insect exoskeletons), linked by shorter ribs. The cabbage white butterflies contain a unique added layer of ellipsoidal pterin beads; pterin is a molecule made up of two joined rings that give Pieridae wings their white colour and high natural reflectance. The pterin compounds are shaped into three-dimensional ovals that squeeze between the short and long ribs of the wing scales. Scientists are still trying to understand how the butterflies grow such small shapes (~500 nm–about 200 times thinner than an eyelash) that seem joined to the central band of the beads. It is unusual to find this elongated bead shape in nature because it is not something that is straightforward to produce. Further, the beads are joined so delicately that physical abrasion causes them to fall off like pollen grains shaken from an anther. Why have butterfly wings evolved to have such a complex structure which can be thrown away so easily? Is it so the beads can more easily be renewed and the bright, reflective wings can remain pristine? Is it for signalling as well as concentration purposes? Further research is required to fully understand, and therefore utilise in a solar energy capacity, the properties of the unique butterfly wing structure and its optical and physical characteristics.

Currently, we are trying to replicate the complex butterfly wing structure synthetically to produce a similar lightweight and reflective solar concentrator for solar panels. This multidisciplinary research project also aims to explore other ways in which biomimicry can improve technology. For example, we are examining other interesting butterfly wing properties such as water-resistance, durability and transparency (how much light hitting a material passes straight through without being reflected, absorbed, or scattered). These characteristics could help us address problems associated with the glass that is used in all solar technology, either as a concentrating lens (magnifier), or as a protective outer layer. If we could steal a few tricks from butterflies, we could potentially improve outputs from, and longevity of, the next generation solar panels.

As exciting as the butterfly biomimicry research is, perhaps even more amazing is the fact that it is just the tip of the iceberg; nature contains a vast range of advanced and complex designs that could eventually be studied, replicated,

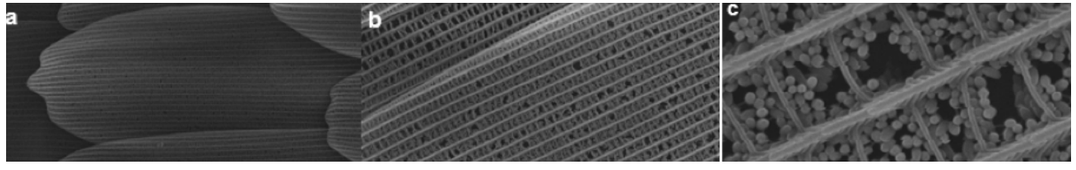
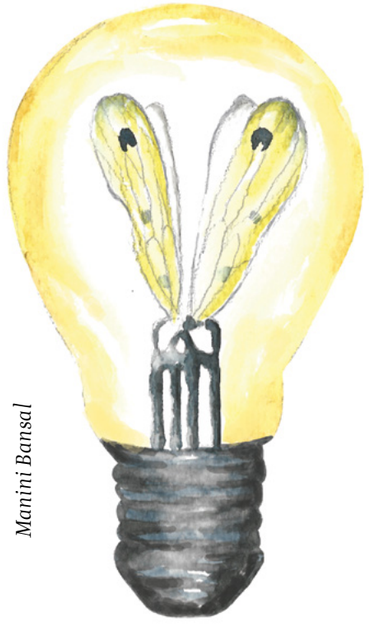


Figure 2: Magnified images of the wing structures of large white Pieridae wing .

By copying nature's best inventions, we can reach a more sustainable way of living, and by using biomimicry to promote conservation, we can help protect the very species from which we can draw further inspiration.

and adapted for our own use. These structures emerged over billions of years as a result of evolution optimising their functioning. This design process far exceeds any 'trial and error' optimisation routine that could ever be carried out by us—not only in terms of timescale, but also success and sheer creativity. Structures within nature often fulfil multiple functions, and so the resulting features are a compromise reflecting a series of trade-offs associated with the many jobs they must complete and the many physical constraints faced by their owners. In the case of cabbage white butterflies, for example, wings need to facilitate flight, capture heat, provide camouflage (white flowers) to avoid predators, be flashy to catch the eye of potential mates, and be both strong and large enough to get the butterflies' bodies airborne but just enough so as not to weigh the animal down.



Manini Bansal

These complicated structures may appear random and chaotic to the casual observer when, in fact, they represent a delicate balance of many influences—environmental, genetic, physical, energetic, social, and developmental—that we are yet to understand. Improving our knowledge of how these forces cumulatively drive the evolution of traits (and of the resulting physical characteristics themselves) could be fruitful, as these 'chaotic' designs have already proven to be useful in certain applications. For example, Blu-ray disks are patterned with partly-random holes to better manage the lasers hitting them whilst they are being read, and nuclear fusion is made more stable by including obscure twisting designs in the magnetic chambers where the superheated fuel is contained.

The big question is, is it actually possible to actively design this sort of randomness? Luckily, we don't have to—thanks to biomimicry. By copying nature's best inventions, we can reach a more sustainable way of living; by using biomimicry to promote conservation, we can help protect the very species from which we can draw further inspiration. As the story of the cabbage white shows, incredible technological breakthroughs can result from paying attention to the world around us, asking the right questions, forging collaborations across disciplinary boundaries, and designing smart experiments to find useful patterns in the chaos.

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Katie Shanks studies the combination of optics and solar power to develop more efficient technology made from novel materials. This has led her into areas of biomimicry and building applicable designs for maximum impact. She has always been interested in the self-sustainability of renewable energy and enjoys the mixture of creative design and problem-solving that comes with this cutting-edge technology.

When dams loom large: missing the big picture

Smitha Shivaswamy

A looming threat

In the north-east region of India, especially in Arunachal Pradesh, a threat to forests is looming large and is expected to lead to a loss of large areas of forests in the next decade—mega dams and mining.

From 2004 to 2013, at an all-India level, 6000 km^2 of forests were given clearance for various kinds of development projects including 2500 km^2 for mining—an area equivalent to three tiger reserves. Of this, ~1600 km^2 was given clearance for projects in Northeast India, with 90% of these projects in Arunachal alone. The projects cleared include open-cast coal mining, limestone, thermal power, uranium, cement and fertilizer plants, oil exploration and drilling (at least 14 in three states).

In addition, a multitude of dams are proposed and ongoing in several states of Northeast India. In 2009, there were 130 proposed dams in Arunachal (38,613 MW), which by March 2013 had increased to 153 (43,118 MW). The forest areas to be submerged are large including 5000 ha in Dibang, 1400 ha in Lower Demwe, 4000 ha in Lower Siang, and 4000 ha in Lower Subansiri adding up to 15,000 ha (150 km^2) of forest in Arunachal Pradesh. There are numerous upstream, downstream, cumulative ecological and social impacts of these dams.

Rivers be dammed

Often, these dams are proposed as being more benign and less ecologically damaging as they are termed 'run-of-the-river' schemes. This is misleading. Run-of-the-river schemes are defined as:

A power station utilizing the run of the river flows for generation of power with sufficient pondage for supplying water for meeting diurnal (daily) or weekly fluctuations of demand. In such stations, the normal course of the river is not materially altered.

A storage dam is defined as:

This dam impounds water in periods of surplus supply for use in periods of deficient supply. These periods may be seasonal, annual or longer.

However, even though many of these dams may not require large submergence areas, they drastically reduce or change the natural water flow regimes of the rivers. In addition, given that multiple projects are proposed on the same rivers, large stretches of a single river can be affected.
The November 2012 minutes of the Expert Appraisal Committee on River Valley and Hydroelectric Projects states:

On the main Siang river, the reservoir of Lower Siang HEP spreads for about 77.5 km, followed by reservoirs of Siang Upper Stage-II and Stage-I for 57 km and 74 km respectively i.e. total river length in reservoirs will be 208.5 km without any free flowing river stretch in between. On Siyom river, there are six planned projects in cascade affecting 90 km of river stretch (63.5 km in reservoirs and 26.5 km in tunnels) without significant free flowing river stretch in adjacent projects. Similarly, 7 projects are planned on Yargyap Chhu in cascade.

Dam safety and other risks are critical to consider in a geologically fragile and seismically active region. Scientists have suggested that the proposed dams in Arunachal will have severe effects on wildlife in important Protected Areas like Dibru-Saikhowa and Kaziranga, with negative impacts on species such as floricans, wild water buffaloes, and river dolphins.

The negative impacts of such dams can be severe, including loss of fisheries, changes in wetland ecology in the floodplains, disruption to agriculture in the chaporis (islets) and impede on other livelihoods due to blockage of rivers by dams. Moreover, there is increased vulnerability to floods due to boulder extraction for dam construction and sudden massive water releases from reservoirs during monsoons. Dam safety and other risks are critical to consider in a geologically fragile and seismically active region. Scientists have suggested that the proposed dams in Arunachal will have severe effect on wildlife in important Protected Areas like Dibru-Saikhowa and Kaziranga, with negative impacts on species such as floricans, wild water buffaloes, and river dolphins. An argument that is often made in favour of dams in low human population density areas such as in Arunachal is the 'small displacement' of people involved, suggesting that there is little social impact. For example, the proposed 3000 MW Dibang Valley hydropower project, which will submerge around 5000 ha, is in the thinly populated Dibang Valley district in Arunachal Pradesh that has a population density of 1 person per km^2. However, the entire global population of a tribe—the Miju Mishmi, numbering 9500—resides here. There are 17 dams are proposed in this valley and yet the social impact is deemed as low with an entire tribe either directly or indirectly affected.[1]

The bewildering numbers of dams in every single river basin appear to have been proposed with no foresight in terms of the logistical feasibility and existing infrastructure to access these areas and the capacity to build such large dams.

A double whammy: replacing native forests with paper forests

Compensatory afforestation is also offered as a way of minimising ecological damage by proposing double the area to be 'reforested', but there are few documented examples of scientifically planned afforestation with native species. Despite huge sums of money being allocated and spent, afforestation efforts often fail. In many cases, natural scrub forests or grasslands, looked upon as 'wasteland', end up being the target of afforestation efforts. Hence, not only are certain forest areas permanently lost, 'compensatory afforestation' involving monocultures of non-native species with limited biodiversity value result in damage or loss of natural habitat in another area.

Compensatory afforestation in states like Arunachal Pradesh is usually undertaken in existing Unclassed State Forest (USF) areas (which are used by the community) and under *de facto* ownership of local people. As a result of the afforestation activities, these community-use forest areas can be taken over by the Forest Department.

Another bizarre consequence of dam clearances is that the area under 'Recorded Forest' 'increases' after submergence. The area of forest, which is lost and under water, is declared as a Reserved Forest with fishing rights. Consequently, on paper, government records will show an increase in the Reserved Forest area after submergence.

Smitha Shivaswamy

I met a chief engineer for one of the hydropower project companies in Arunachal Pradesh who had been associated with the only concrete gravity diversion dam (405 MW) that has been built and completed in Arunachal Pradesh on the Ranganadi river. He said that the Ranganadi is now a dead river and that the dam project was a 'Himalayan blunder'. Coming from a dam builder, this was a rare admission and telling. Since the project has been commissioned, it has generated far less power than its originally planned capacity, while the river and its aquatic fauna have been negatively affected. The dam has also caused hardships and changes for the Nyishi community residing in the area.

The problem with Environmental Impact Assessments (EIAs)

If all these dams and others in the other Himalayan states come up, India would have the highest dam density in the world (0.33 /1000 km^2), which is 62 times greater than the global average— one for every 32 km of river channel. Of these dams, 88% are in species-rich ecosystems with a projected loss (extinction) of many plant and animal taxa[2] .

While the construction of mega dams in Arunachal Pradesh and their negative consequences have been highlighted in the print media by a few environmental activists/ journalists, there are surprisingly few reviews/critiques in peer-reviewed mainstream conservation science discourse and literature. Apart from a few networks/ organisations like the South Asia Network on Dams, Rivers and

[1]Vagholikar, N. 2011. Dams and environmental governance in India. In: Water: Policy and performance for sustainable development. India Infrastructure Report 2011. Section V, Pp. 360-369.

[2]Pandit, M.K. and R.E. Grumbine. 2012. Potential effects of ongoing and proposed hydropower development on terrestrial biological diversity in the Indian Himalaya. Conservation Biology 26 (6): 1061-1071.

People (SANDRP) (http://sandrp.in), the River Research Centre, and Kalpavriksh, mainstream wildlife biologists have failed to acknowledge the seriousness of this issue.

Conservation scientists complain that EIA studies are undertaken by dubious agencies with no scientific credibility, but few are willing to participate in making the EIA process better or critically evaluating an EIA report. The non-availability of scientific literature on impacts of dams, the lack of published expert opinion/critiques of projects and their EIA studies can be a major hindrance for dam opponents who have mounted legal challenges to these projects.

It is well known that EIA studies are seldom conducted by 'independent bodies' as they are usually paid for by the project proponents resulting in an obvious conflict of interest. Worse, few EIA studies conduct or provide ecological analyses on the potential impact on wildlife in the area.

In the Tawang Stage II EIA study, the report only listed five of the common mammal species that occur in the area, with vague statements that the area is visited by 'many bird species'. Earlier scientific research has recorded at least 34 species of mammals in the Tawang area, almost all of which occur close to the dam site. While it is true that some species are restricted to higher altitudes and would not be directly affected, the EIA failed to mention that the one of the main populations of the newly discovered Arunachal macaque (*Macaca munzala*) is also found at the site. The area is also visited by the black-necked crane, a highly threatened bird species and other key species such as the takin (*Budorcas taxicolor*) and the Chinese goral (*Nemorhaedus caudatus*).

Missing the woods for the trees

I would like to make two points here. First, more scientific studies on the actual and potential effects of dams and how they can affect our river systems/terrestrial habitats and flora and fauna are much needed. We also need better critiques of existing EIA studies and attempts to improve the way EIA studies are conducted to ensure that minimum standards are followed.

Second, some development projects are obviously needed for the people of Arunachal Pradesh to create genuine economic opportunities and jobs, and improve living standards. However, conservationists, scientists, bureaucrats and government policy makers should not gloss over the impact of these projects on transforming natural landscapes irreversibly, especially in comparison to the relatively lower-impact subsistence land-uses by forest-dependent people.

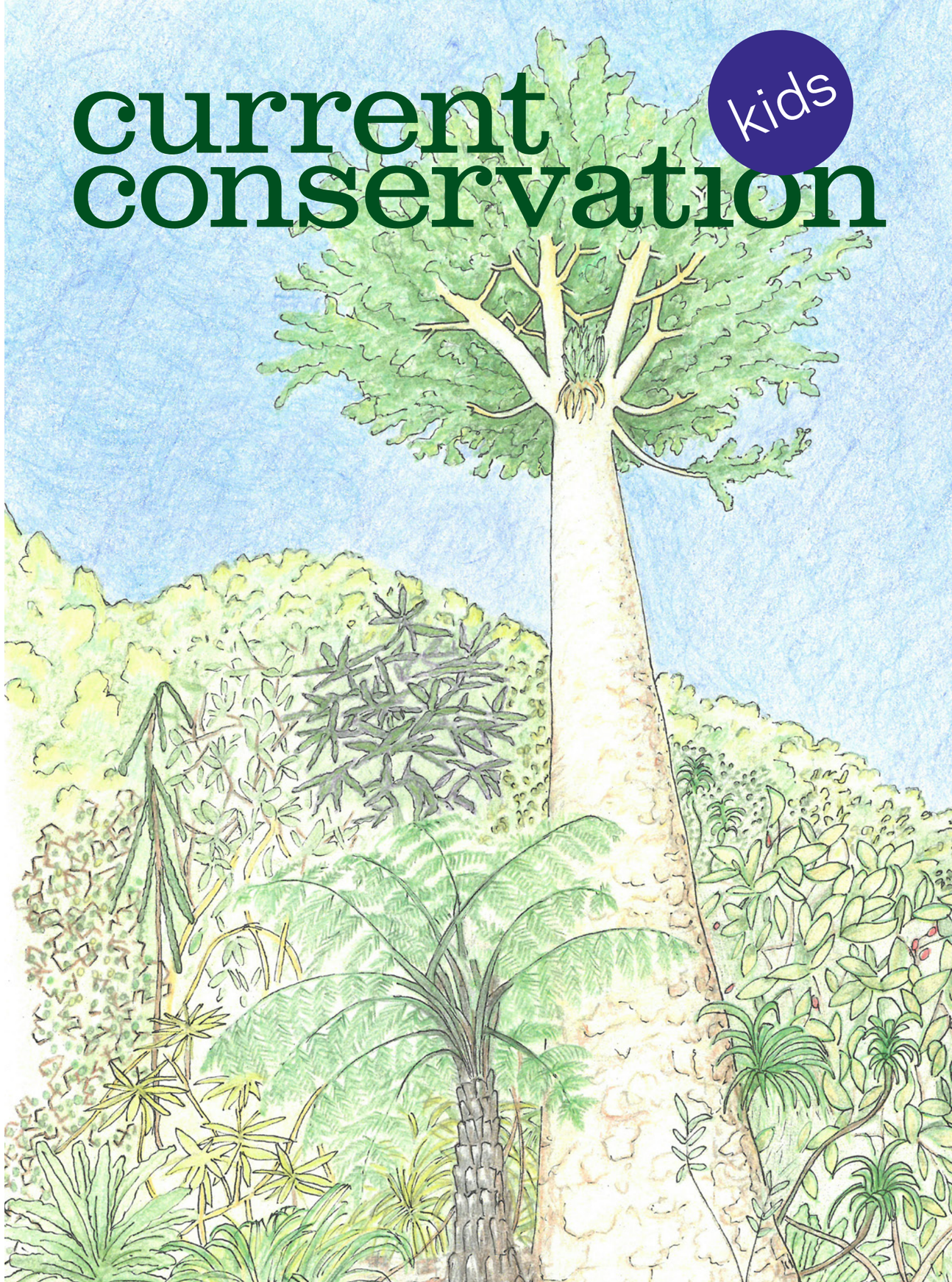
Despite the more obvious large-scale threats from mining, dams and other projects, the subsistence needs of communities' resident around reserves have more often been portrayed in mainstream scientific literature as the overriding threat to conservation. There has been an undue emphasis on documenting the ecological impacts on biodiversity due to hunting, logging and shifting cultivation in Northeast India. While this is important, as field biologists, we have neglected to assess the loss of biodiversity and forests due to government policies, industrial growth and development. The emphasis seems skewed and disproportionate to the degree of threat.

To take just one example, the impact on wildlife and forests of a series of seven dams on the Lohit river due to a 7500 MW dam, the loss of 1400 ha of forest and the influx of around 7000-10,000 migrant labourers that are resident for close to 7-8 years is likely to affect the ecology of that area much more than the subsistence shifting-cultivation and hunting practices of 3500 Idu Mishmi people. And this is just one river basin; the same applies to all the river systems in Arunachal.

In fact, communities can be allies in conservation as borne out by the case of the proposed 780 MW Nyamjangchu Hydro-electric project in Tawang, Arunachal Pradesh. Here, the petitioners against the dam were the Save the Mon Region Federation, a local community organisation of Buddhist lamas and monks from Tawang. Environmental lawyer

As field biologists, we have neglected to assess the loss of biodiversity and forests due to government policies, industrial growth and development. The emphasis seems skewed and disproportionate to the degree of threat.

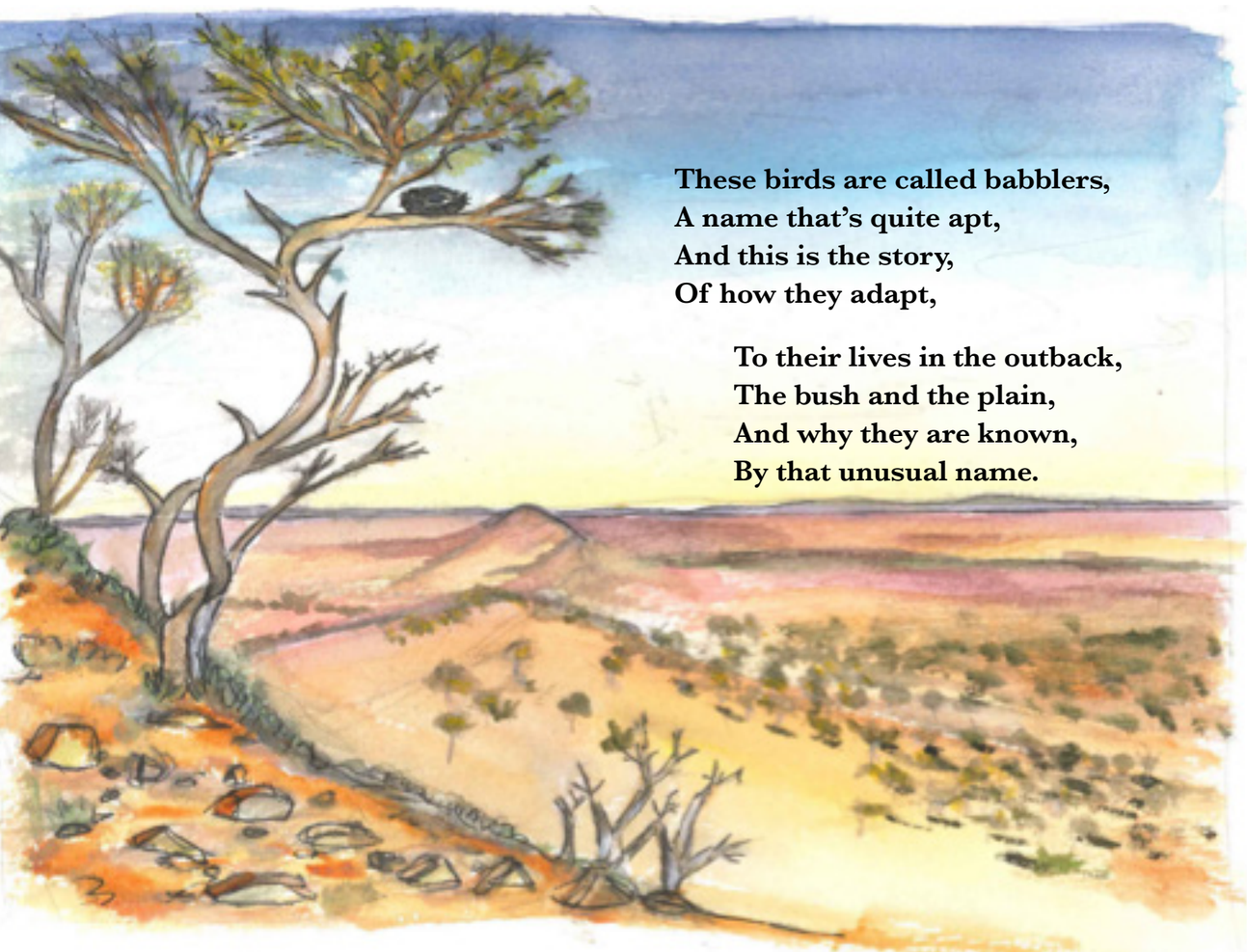
[3]Datta, A. 2012. A critique of the Nyamjang Chhu hydo-electric project Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). Mysore: Nature Conservation Foundation Working Paper 2.



Sophie and the Babbler Birds of the Desert

Five o'clock in the morning,
The desert at night,
The wind holds its breath,
Awaiting the light.

Then from deep in the creek,
A noise can be heard,
The chatter, the natter,
The waking of birds.

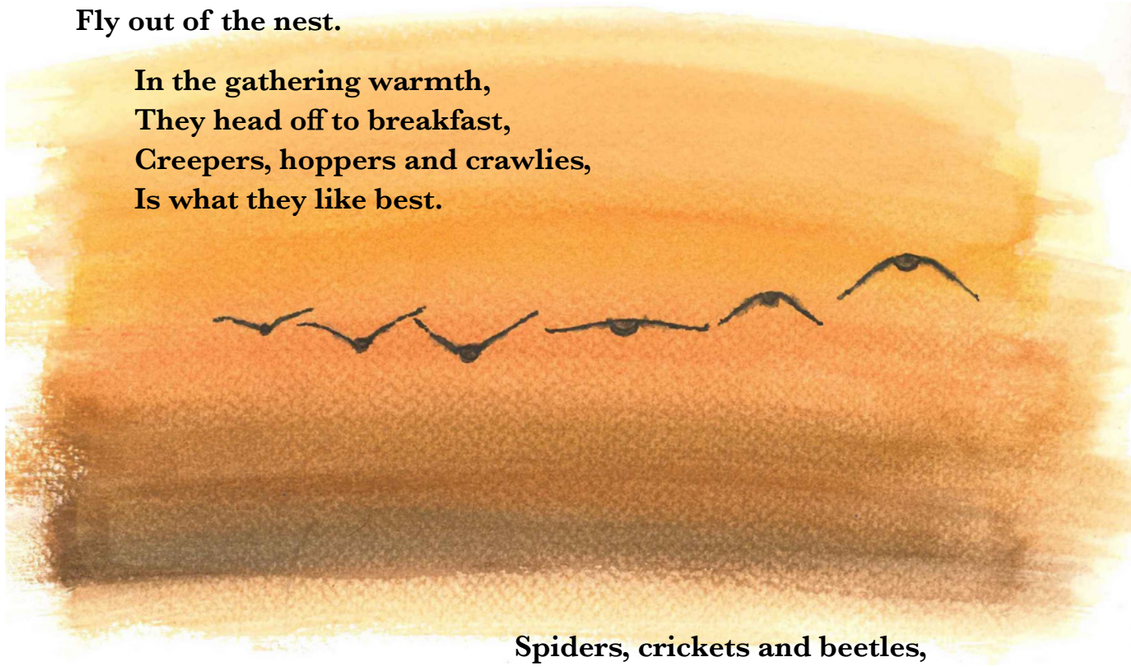


These birds are called babblers,
A name that's quite apt,
And this is the story,
Of how they adapt,

To their lives in the outback,
The bush and the plain,
And why they are known,
By that unusual name.

Now father and mother,
And uncle and brother,
And sister and cousin,
Fly out of the nest.

In the gathering warmth,
They head off to breakfast,
Creepers, hoppers and crawlies,
Is what they like best.



Spiders, crickets and beetles,
Small lizards and weevils,
All these can be found,
When you know how to look.

By pecking and flipping,
Turning and tipping
And poking your beak
Into cranny and nook.

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These are just the first two pages of a longer story, which can be found at the following link **https://issuu.com/universityofexeter/docs/babbler_birds_of_the_desert__1_** or ordered in hard-copy by contacting the author.

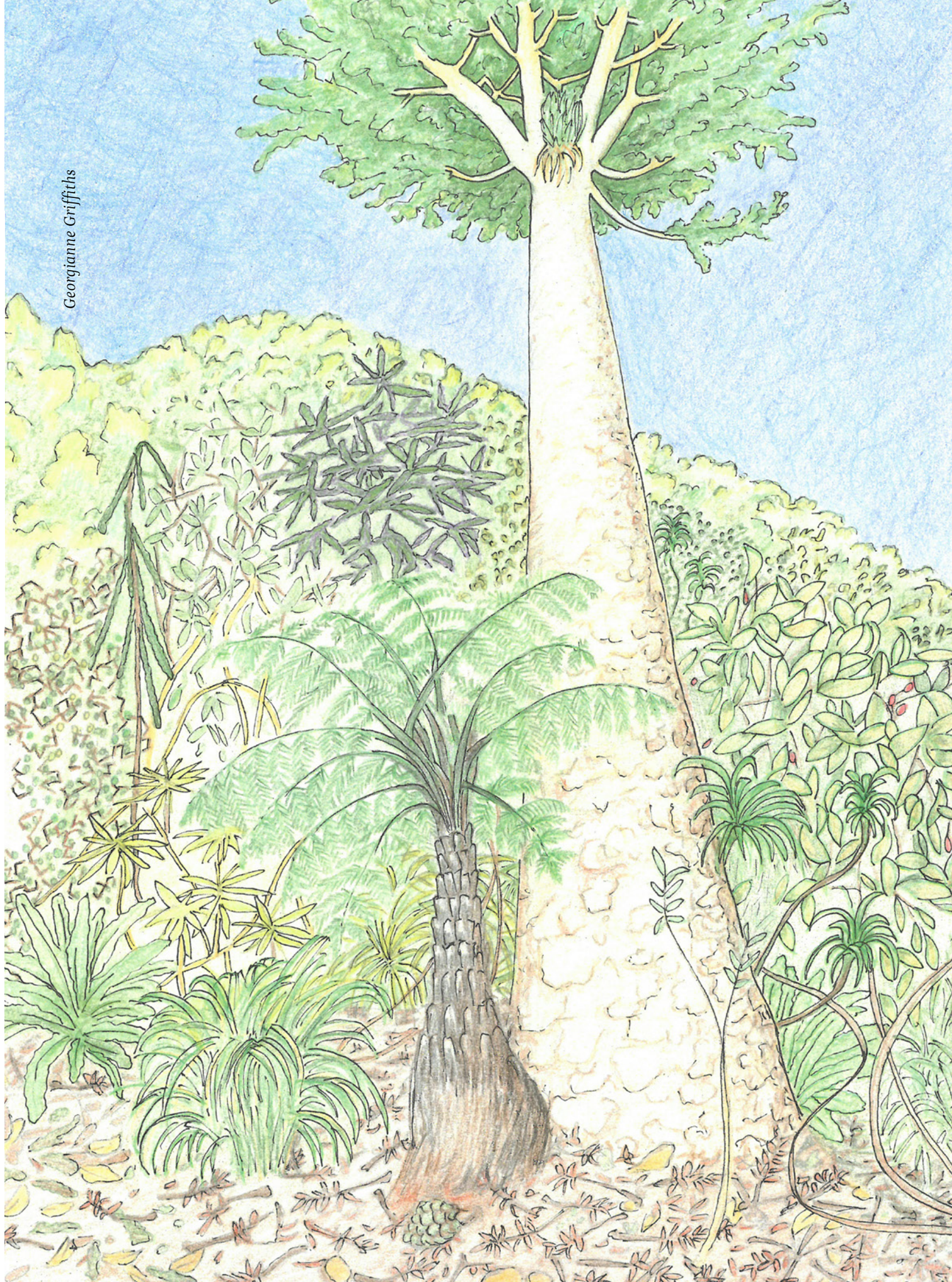
Meeting a community ecologist

Invertebrates amaze me. Animals without a backbone make up the majority of species on earth. Mostly us humans will admire the pretty ones, try to get rid of the annoying or dangerous ones, and hardly notice the rest. But once you start looking at them, especially under a microscope, the beauty and diversity is delightful. That's when you start looking for them.

The first invertebrates I encountered as a child were the dead cockroaches I would collect off the kitchen floor after my parents had put poison down, the ants I would tease by directing where they could walk and the snails I would make houses for in the garden. Then came my big revelation. A trip to the woods with the "Museum Club" showed me that invertebrates, and all of nature, could be studied.

I became a community ecologist so I could understand why species occur where they do and how they interact with each other.Invertebrates are the perfect study animals for this. I can examine interactions between predators and prey, between animals that help each other or those that compete against each other, all in a handful of leaf litter. I have been doing just that in my current research project to understand what speeds up the decomposition (or break-down) of leaf litter and the release of nutrients for plant growth.

A few years ago I set up a litter bag experiment at two forest sites in New Zealand: Hauturu-o-Toi, an offshore island, and the Waitakere Ranges on the mainland. Litterbags are the method I use to understand how invertebrates influence leaf litter decomposition. I simply put a net bag containing a certain amount of leaf litter out in the forest. Several months later I collect the bag. Back at the lab I measure how much the leaves have decomposed and count the invertebrates which have found their way into the bags. These are the invertebrates which have influenced

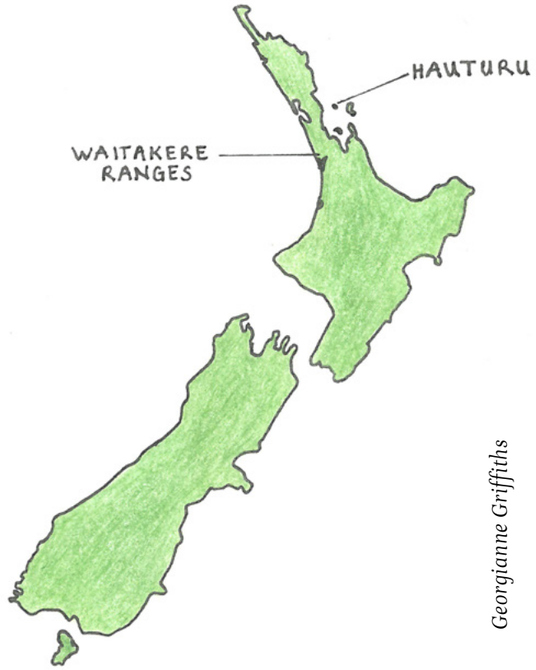


decomposition, directly or indirectly.

Days in the field are wonderful. My litter bags are located randomly through the bush, and are usually reached by 'bush-bashing' or off-track navigation using a GPS.

I love picking my way through the dense tangle of trees, shrubs, climbers and grasses, scrambling up and down steep slopes, wading across streams and emerging into an occasional clearing or high point to feel the breeze and hear the not-so-distant sea. On Hauturu, birds and their song are an enchanting distraction. Near one of my plots there is a tall Kauri tree that emerges above the forest canopy and my collections and measurements there are often accompanied by the haunting "Ko-ka-ko" call of the Kokako bird. Not so in the Waitakere Ranges though, where the unnerving silence of the bush is a reminder of the damage done to New Zealand's native birds by invasive rats.

Time back in the lab can be just as exciting. The quality and diversity of the leaf litter itself impacts how fast leaves decompose and the community of invertebrates that live in it. Identifying the hundreds of species of invertebrates from the litter bags has shown that a diverse community of invertebrates is more important for decomposition than any one species or group (even though some groups, such as amphipods, can really eat through the litter). I'm now using lab techniques to look at the feeding and genetic relationships between invertebrate species in the litterbags. I hope this can tell me how it is that diverse communities decompose litter faster, and what keeps those communities diverse.

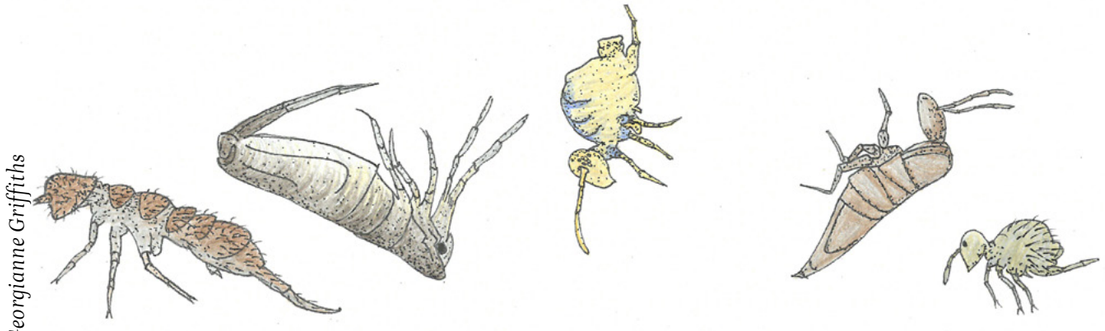


Georgianne Griffiths

Georgianne Griffiths
is a community ecologist who studies invertebrates in all their wonderful diversity. She is interested in finding out about the things insects do that help us humans, from eating the pests that attack our crops, to recycling nutrients for plant growth. She currently works in New Zealand and the UK.

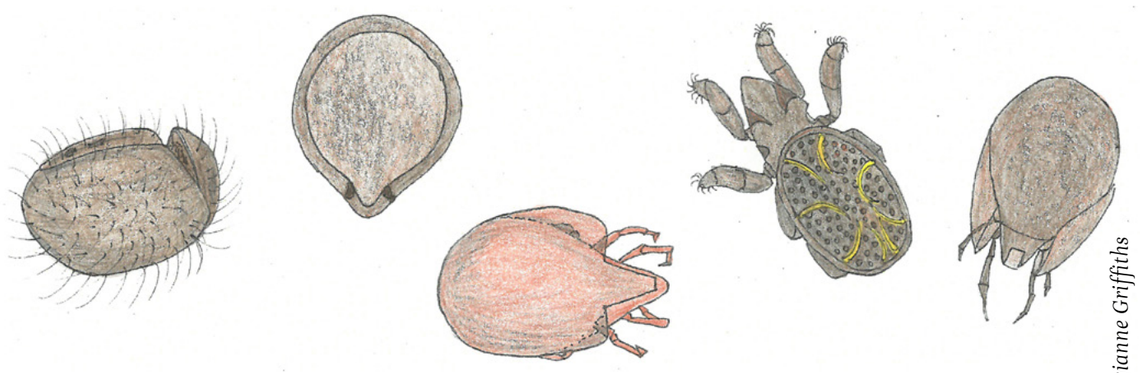
Fun Facts

A handful of leaf litter may look like just a collection of dead leaves with the occasional millipede, centipede, woodlouse or earthworm visible, but hidden from view at a micro-level is an astonishing diversity of tiny invertebrates. Here are some fun facts about just a few of them. All of the species shown here are under 2 mm.



Georgianne Griffiths

Springtails (Collembola) are so called because they possess a spring or forked structure on the underside of their bodies used for jumping when the animal senses danger. It is usually held against the body, but if a predator is detected nearby, the spring is released sending the springtail flying out of harm's way. These animals are very abundant in the leaf litter and soil. They eat dead leaves and the bacteria and fungi that live in the leaf litter. Their poo provides food for micro-organisms that do most of the decomposition and springtails are also an important prey item for lots of litter invertebrates.



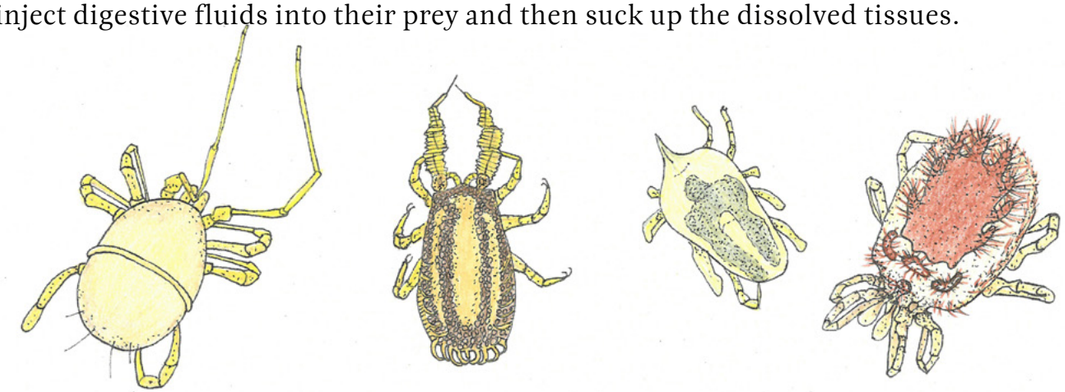
Georgianne Griffiths

Mites (Acari)

Mites are the most numerous invertebrates living in the leaf litter and among the smallest. There are many groups that perform different roles in the food web. Here are just three of them:

The Oribatid mites are distinctive because most adults are very smooth, with a hard exoskeleton or outer body surface, making them difficult for predators to catch and eat. This is just as well since they are also slow-moving creatures, with slow development. They can take up to seven years to grow from eggs and larvae to nymphs and adults. Oribatid mites mostly feed on decaying leaves and fungi and are important decomposers.

In contrast, the Mesostigmatid mites are active predators, searching through the leaves and soil pores to find small invertebrates including Collembolans, softer-bodied mites and mite nymphs. Rather than eating their prey whole, they inject digestive fluids into their prey and then suck up the dissolved tissues.



Georgianne Griffiths

Prostigmatid mites are more likely to be ambush, or sit-and-wait predators. Some have developed ingenious ways to catch their prey. For example, the Bellidae or Snout mites produce strands of sticky silk from glands in their mouth to entangle their prey and stop them escaping.

Beetles (Coleoptera)

Hidden in the leaf litter are a diverse subfamily of tiny beetles called the Pselaphinae, pronounced sel-a-feen-eh. These specialised predators eat mostly collembolans and mites. Living in the leaf litter, they are not visual hunters but use the hundreds of hairs on the tip of their antennae to detect prey using smell and touch. Their touch can be so delicate they do not trigger the escape response in Collembola. Many species will grab hold of their prey using sticky structures on their maxillary palps (one of several mouthparts) and a sticky substance they produce.

Georgianne Griffiths

Ritwick Dutta fought the case in the National Green Tribunal (NGT). After a long-drawn out court case which began in 2012, the NGT finally suspended the Environmental Clearance (EC) for the project in April 2016 while asking for a fresh study including public consultation. While many other socio-cultural concerns were expressed, the proximity of the dam site to the wintering grounds of the black-necked crane was a key factor. It was a rare judgment where wildlife played a significant role in the suspension of clearance. Among other documents, a critique of the EIA study was used in the court case[3]. This highlights the positive outcome due to the cooperation between community groups, research organisations, scientists, lawyers and activists which unfortunately does not happen as often as it should.

The success of the Save the Mon Region Federation should enthuse other community groups in Arunachal to challenge farcical public hearings, faulty EIAs and other issues with the clearance process. But as with most such dam projects, this is just a temporary victory.

A call to conservationists

On the one hand, we insist on relocation as a policy for safeguarding tiger populations and creating inviolate spaces based on the premise that human residence in a reserve is inimical for tiger conservation. We also want buffer zones where people and tigers are expected to 'co-exist', and where land use is to be made compatible with tiger conservation. Yet, when vast swathes of those same lands are being given away for dams and coal mines or converted to monoculture cash-crop plantations, we do not seem to protest as loudly. Maybe it is just easier to study the impacts of local communities rather than engaging with damaging policy decisions or critiquing government-supported development projects.

Smitha Shivaswamy

Fortunately, there has been a subtle shift in the last few years with greater acknowledgement among many biologists and conservationists of the threats from developmental projects. Following the elections of 2014 and the changes to environmental governance being brought in to favour industry and economic growth, several scientists, conservationists and members of civil society are acknowledging the far-reaching destructive impacts of 'development' projects. But we need more voices and inputs from scientists on the impacts of such development projects on both species and habitats as well as on local communities.

Further reading

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Aparajita Datta leads NCF's Eastern Himalaya programme, under which research and community-based conservation with hornbills as a flagship has been carried out for 20 years. She has been a member of the National Tiger Conservation Authority (NTCA) and a member of the State Wildlife Advisory Board of Arunachal Pradesh. She has evaluated and critiqued proposed dam projects in Arunachal. Her interests include plant–animal interactions, understanding human impacts on wildlife, and engaging with tribal communities for conservation.

India's new National Wild Life Action Plan: lacking action and plan

India's wildlife is in a crisis. The crisis stems not just from traditional threats to wildlife such as deforestation, poaching, and habitat destruction, but also from a complete policy paralysis and governance failure with respect to the conservation of wildlife. The Ministry of Environment, Forest and Climate Change (MoEFCC) today functions with two part time ministers; the National Board for Wildlife has not met since the present government came to power and the success of the MoEFCC is judged by the number of Environmental and Forest clearances it has granted, therefore facilitating the 'ease of doing business'. It is with the above background in mind that one has to look at the new National Wildlife Action Plan (NWAP) for 2017–31. The question to ask is whether the new action plan will be able to achieve the goal of wildlife conservation in the currentera of 'business above all'.

The NWAP (2017–31) is the outcome of a task assigned to a committee headed by the former Director General of Forests, Government of India that comprised of 12 members. It is noteworthy that the Union Minister of Environment, Forest and Climate Change released the NWAP (2017–31) at the World Bank promoted Global Wildlife Programme (GWP) conference on October 2, 2017. Normally, the NWAP is released by the National Board for Wildlife, which is headed by the Prime Minister, since the mandate of the Board is framing policies and advising the Government on ways and means of promoting wildlife conservation

Is the action plan legally binding?

An action plan is not a legally enforceable document. However, while dealing with the issue of conservation and protection of the wild buffalo the Supreme Court in 2012 highlighted that the NWAP, despite being a policy document, is central to the concept of ecocentrism. The Court observed:

> Environmental justice could be achieved only if we drift away from the principle of anthropocentric to ecocentric.... Ecocentrism is nature-centred where humans are part of nature and non-humans have intrinsic value.... The National Wildlife Action Plan 2002–2012 and the Centrally Sponsored Integrated Development of Wildlife Habitats Scheme, 2009 are centred on the principle of ecocentrism.

The Supreme Court gave legal backing to NWAP (2002-16), by directing in 2005 that activities in National Parks and Sanctuaries may be permitted so long as it is consistent with the NWAP. Later, in *Centre for Environmental Law versus Union of India*, the Supreme Court directed the Central Government to implement the Action Plan:

> The Government of India and the MoEF are directed to identify, as already highlighted by NWAP, all endangered species of flora and fauna, study their needs and survey their environs and habitats to establish the current level of security and the nature of threats. They should also conduct periodic reviews of flora and fauna species status, and correlate the same with the IUCN Red Data List every three years.

Thus, the NWAP is not just an academic piece of work but also a guiding document for the conservation and protection of wildlife.

A faulty premise

The NWAP (2017–31) is based on faulty premises. It states that about 20% of the total geographical area is under 'effective wildlife management' and claims that India has achieved Convention on Biological Diversity's Aichi target. This target stipulates that, by 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, should be conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas (PAs) and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

However, the statistics with respect to effective wildlife management are highly questionable. The 20% figure is based on the assumption that wildlife is conserved in all 'State managed forests'. There are, in fact, various categories of state managed forest such as reserve forest, protected forest, un-demarcated protected forest, etc. These forests are generally managed under Working Plans prepared by the State Forest Department and Forest Development Corporations. There are many which exist only in paper and serve no ecological role. A classic example is the Forest Research Institute in Dehradun, which is a notified reserve forest. Clearly, no 'wildlife management' is taking place on this campus, which houses at least five institutions including the regional office of MoEFCC. Even more alarming are the many reserved forests declared by the State without any consideration of ecological factors. If these are the areas the Action Plan has counted as being under 'effective wildlife management', it raises serious doubts on both the claims and the premise.

The same applies to protected areas including National Parks and Sanctuaries. Most protected areas are yet to be finally notified under the Wildlife (Protection) Act, 1972. In some protected areas, the area under effective protection may be only a fraction of the total area.

Short shrift to its mandate

The predominant thrust of the NWAP is to defend and justify the existing policy as well as the approach of the Government and the various institutions engaged with wildlife conservation. For example, the NWAP states that the National Tiger Conservation Authority (NTCA) has been fulfilling its mandate by issuing advisories. However, the NTCA has been a mute spectator to many serious assaults on India's Tiger Reserves. It remained silent when the critical Kanha–Pench Tiger Corridor was destroyed due to the expansion of National Highway-7. One of the rare instances when the NTCA did issue 'directions' was with respect to prohibiting a BBC journalist from entering Tiger Reserves after they 'wrongly' projected India's conservation efforts to the global community. The section on Environment Impact Assessment (EIA) is extremely limited despite the fact that there is going to be huge pressure on wildlife habitat due to increased investments in highways, waterways, ports, dams, mines, etc. All that is mentioned is the need to assess human-animal conflict in EIA assessments. The Plan does discuss the establishment of the National Environmental Appraisal and Management Authority (NEAMA), which is an attempt to reform the review process and improve transparency in environmental impact assessments of development projects in the country. However, this recommendation merely repeats the MoEFCC's plan to set up such an authority and does not in any way engage with or substantiate how this body would help focus attention on issues relating to wildlife.

One of the interesting targets of NWAP (2002–16) was to undertake, by 2007, a long term project to assess the water contribution of PAs and connected forests to lean season flows, ground water recharge as well as flood and drought mitigation.

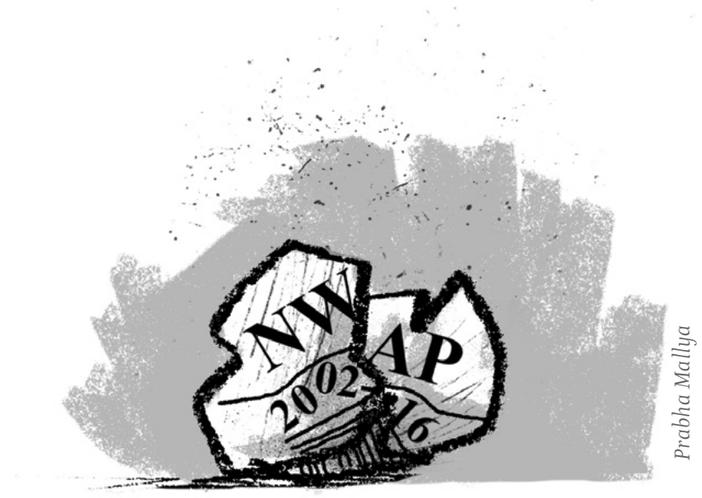
Prabha Mallya

One of the interesting targets of NWAP (2002–16) was to undertake, by 2007, a long term project to assess the water contribution of PAs and connected forests to lean season flows, ground water recharge as well as flood and drought mitigation. The responsibility for conducting the study was entrusted to Wildlife Institute of India, Dehradun. Given the large number of ecologically destructive projects that are approved in PAs, such a study could have helped assess the implications of these projects. Unfortunately, this study is yet to be initiated. There is no reference to this particular assessment in the new NWAP (2017–31).

Whither forest rights?

One of most important changes in the forest governance landscape since the NWAP (2002– 2016), is the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 popularly known as the 'Forest Rights Act' (FRA). This led to forest dwellers being treated as right holders as opposed to privilege holders and encroachers. The Forest Rights Act has also led to conflict between the Forests Departments on the one hand and forest dwellers on the other.

The NWAP states that, "it aims at building, enhancing and sustaining people's support and participation in wildlife conservation." Although it recognises that the potential conflicts between forest dwelling communities and the state forest department can only be avoided by making them partners in wildlife conservation, the plan does not go far enough in outlining actions. The NWAP focuses on strengthening and expanding institutions like Joint Forest Management Committees (JFMC), Forest



Prabha Mallya

Development Agencies (FDA), Van Panchayats, advisory committees and management committees for protected areas. However, there is no mention of the pivotal role the Gram Sabhas and Forest Rights Committees play under the Forest Rights Act, which are far more important than FDA and JFMC in a legal context.

Whither lions?

Among the most serious concerns with respect to the NWAP (2017–31) is the complete absence of the Asiatic lion from the list of priority species for conservation or species recovery and no mention of the Expert Committee constituted by the Supreme Court to complete the task of translocation of the Asiatic lion from Gujarat to Madhya Pradesh. Surprisingly, there is a specific mention of the 'Asiatic cheetah' though the Supreme Court had said that the plan to bring African cheetahs to India was not in consonance with NWAP (2002–2016) as it is an exotic animal.

In response to a Public Interest Litigation, the Supreme Court had directed the Central Government to initiate and complete the process of translocation of the Asiatic lion from Gujarat to its proposed second home in Kuno–Palpur Sanctuary in Madhya Pradesh. The Court stated that the protection of the Asiatic lion and providing a second home for the animal was 'top priority'.

Once the Supreme Court held that the decision for reintroduction of Asiatic lion to Kuno was of utmost importance and that the introduction of cheetahs in India was illegal, the NWAP's silence on the issue of reintroduction of lions while emphasising the need for reintroduction of cheetahs amounts to an extraordinary case of an Action Plan overruling a judgment of the Supreme Court. This can be regarded as nothing short of contempt of the orders of the apex Court.

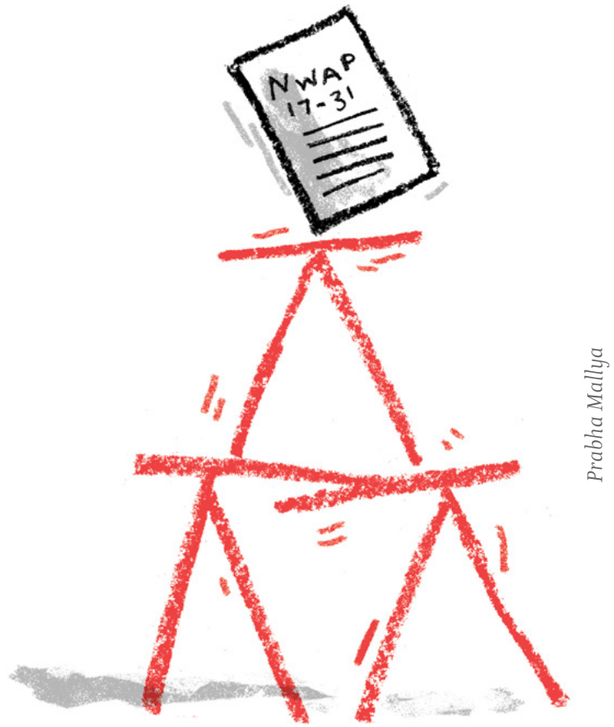
The reasons for this omission and silence are not very difficult to discern. The Government of Gujarat has consistently opposed the shifting of lions from Gujarat to Madhya Pradesh. The Central Government's silence and inaction even after the Supreme Court's verdict reflects its passive support for Gujarat. The silence of well-known conservationists in the Committee is, however, a cause for grave concern.

Too important to ignore

Georges Clemenceau, French Prime Minister during the First World War said, 'War is too important to be left to the generals'. A perusal of NWAP (2017–31) leads one to conclude that wildlife conservation is too important to be left to conservationists and forest officials. The NWAP (2017-31), despite identifying some key areas for action, falls short in many respects. It lacks vision and is aimed at maintaining status quo.

The fact that the Action Plan is in direct violation of judgements of the Supreme Court with regard to certain subjects is a cause for serious concern. Not only may this amount to contempt of court, it suggests that the members of the committee may either have aligned with the government's priorities or simply have been unaware of the implications of ignoring the court's directions. It would indeed be a tragedy if the cost of silence on these grave issues were paid by India's vanishing wildlife.

There is an urgent need to review and revise the NWAP (2017–31). The problems are too serious to be fixed by tweaks, and there is a need for a complete overhaul. To begin with, the task of framing the Action Plan ought to be entrusted to a group of individuals with diverse knowledge and experience in a wide range of disciplines that include not just wildlife and ecology, but also environmental and social sciences, hydrology, climate change, governance and related fields. The Committee should have wide-ranging consultations with people across sectors and importantly, with those having opposing viewpoints. After all, wildlife conservation has less to do directly with wild animals and more with managing pressure on wildlife from the human, industrial and developmental goals of the country. Given the increasing threat to wildlife habitat, we urgently need an action plan that is focused, robust and implementable.



Prabha Mallya

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The committee included Bibhab Talukdar of Aranyak, Vivek Menon Wildlife Trust of India, and R. Sukumar of the Indian Institute of Science among others

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Coral Reefs of the land

Reimagining and reinventing cities as terrestrial reefs, as rich and diverse as we can learn to coexist with, and instead of becoming their killers and competitors, we become their nurturers, gardeners and symbionts.

It is a hard nonliving complex three-dimensional structure built by living beings, often covering extensive areas of habitat, and unlike anything else naturally found in the vicinity. It is a product of the labor of an organism which has evolved to transform the materials in its surroundings into a protective home for its progeny and itself. It is built in layers, growing upon itself as its occupants continue to build it over generations. It does the job of protecting its inhabitants well enough to outlast them, standing firm over scores of generations and thousands of years. It helps concentrate the flow of energy and materials from its surroundings to make life more efficient for its denizens, sometimes thriving even in places that otherwise seem deserted. It not only provides shelter and resources and a supply of energy to the species that built it, but also supports a wider range of other species that may come seeking its riches and adapt to new ways of making a living in this strange new construction. Its appearance, color and occupants vary from one part of the world to another. It is large enough in some places to be visible from space. It is resilient to a surprisingly wide range of environmental variation, yet vulnerable to catastrophic collapse under conditions such as rising sea levels and warming ocean temperatures. And even when it collapses and is no longer able to support its creators and main occupants, it continues to loom in its place, casting shadows deep into history, until the patient forces of water and wind and temperature wear it down and its remains wash up on some shoreline in the sands of time.

It is a Coral Reef, built by ingenious, soft-bodied, tough little creatures that can scarcely survive on their own in the vast ocean outside its protections. It is a City, also built by ingenious creatures with bodies softened by civilization, too clever by half, but creative and tough as hell and who may also struggle to survive outside the city walls.

Coral reefs are ecosystems rich in biodiversity, often concentrating biological productivity and wealth amid relatively poor waters. Coral reefs are described as rainforests of the ocean harboring as much, if not more, biodiversity underwater as tropical rainforests do on land. They stick out in the underwater landscape as distinctly as forests full of tall trees do in terrestrial landscapes, marvelously unlike anything around them, but teeming with a richness of diverse marine organisms that have evolved to be uniquely adapted to life in the coral reef, lured by its richness to tie their evolutionary fate to that of the reef itself.

It may seem odd, but coral reefs are also often likened to cities. The City, that quintessential "artificial" construction by human beings alienated from nature, symbolic of how we pave over natural ecosystems, is often used as a metaphor to understand and explain the complexity of coral reefs. There are children's picture books full of wonderful artwork that explain how coral reefs function much like cities. Tall structures rise up from the ocean floor like skyscrapers. Schools of fish and molluscs and crustaceans scuttle about busily, commuting among productive nooks and crannies where they can feed, nest, and raise babies securely. Diverse species evolve to specialise in different tasks, much like how medieval guilds of craftsmen and workers divided up human labor to make it more efficient, enabling us to produce wonders of art, craft, and technology—diverse, creative, and sometimes horrific.

It may seem odd, but coral reefs are also often likened to cities. The City, that quintessential "artificial" construction by human beings alienated from nature, symbolic of how we pave over natural ecosystems, is often used as a metaphor to understand and explain the complexity of coral reefs.

We have never debated whether coral reefs are complex ecosystems in their own right, worthy of protection. We should also be long past debating whether cities are ecosystems. Of course they are, unique ones described in much of the recent literature as complex social-ecological systems, because we like to pull the human social elements apart from the "natural" in our Cartesian ways of thinking. A much more interesting exercise is to ask what kind of ecosystems cities can be rather than worrying about how unnatural a blight they are on more "natural" landscapes.

As they stand, unlike coral reefs, cities are not founts of biological diversity amid less diverse landscapes. In the relatively short timespan of human history, cities have become known more for destroying biodiversity rather than enhancing it. More recent work in urban ecology has found a surprisingly high diversity of species in many of our cities. Do cities destroy other habitats and ecosystems? Of course. Do cities cause local extinctions of many species? Undoubtedly. We never built them as habitats for any species other than ourselves. Indeed it would seem that we build cities as places where we seek refuge from "nature" in all its vagaries and its "red in tooth and claw" horrors. Yet, we also bring a lot of that nature, and many other species, with us into the city—planting some in our gardens, growing others on our walls and balconies, feeding and watering many with intent or benign neglect, and willingly or unwittingly sharing the bounty of resources we concentrate for ourselves in cities. We know now that we depend on many of these other species for food, water and air, for our bodies and our minds, and for our culture and artistic inspiration—even though we never built cities for anyone but our own selves. Just like the mindless tiny organisms that build coral reefs.

But unlike the coral organisms, we have minds capable of reflecting on

our own actions, and of imagining different futures. Imagine building cities more intentionally like coral reefs on land. The oldest cities are just a few thousand years old—an order of magnitude younger than the oldest coral reefs. That deeper span of time has allowed coral reefs to evolve into the diverse ecosystems we now celebrate and whose decline through our actions we dread and lament. Yet, to borrow that tortured phrase from urban land developers, the coral organisms simply built their little shelters, and they came: all the diverse algae and plankton and fish and mollusks and crustaceans in the ocean to evolve together into a diverse ecosystem thriving under the ocean. A growing body of research on urban wildlife is now showing us that many species on land come into our cities once we build them, so long as we leave enough of our surplus of resources for them. Recognising the value of nature and wildlife, the biological and cultural ecosystem services they provide us in the current jargon, we are also actively bringing other species into our cities. Why not go all the way and reimagine our cities as bustling diverse coral reefs on land?

Surely, if we build cities with intention, with niches full of unique resources, many other species will come on their own, and over time will adapt and evolve into unique urban creatures, tying their fates to ours just like the house sparrow or the chimney swift have already done. Even underwater, our artefacts, like sunken ships, can act as surrogates for species fleeing damaged coral reefs, and are being used intentionally to restore reef ecosystems threatened by warming oceans and rising seas. It is not hard to imagine some of our major coastal cities also turning into such surrogate reefs as they submerge under the rising oceans. So let us reimagine and reinvent our cities as terrestrial reefs, as rich and full of other species as we can learn to coexist with, becoming not just their competitors and killers, but also their gardeners and nurturers and symbionts. Let us think as deep into the future as the coral reefs teach us about the past, and turn the metaphor of the coral reef as a city into the real city as a coral reef, diverse and resilient and full of evolutionary ferment to match the tides of our changing world.

Madhusudan Katti is Associate Professor for Leadership in Public Science in the Department of Forestry & Environmental Resources at North Carolina State University, Raleigh, North Carolina, USA. He studies how an evolutionary understanding of cities as social-ecological systems can help us reconcile nature and biodiversity conservation with human development.

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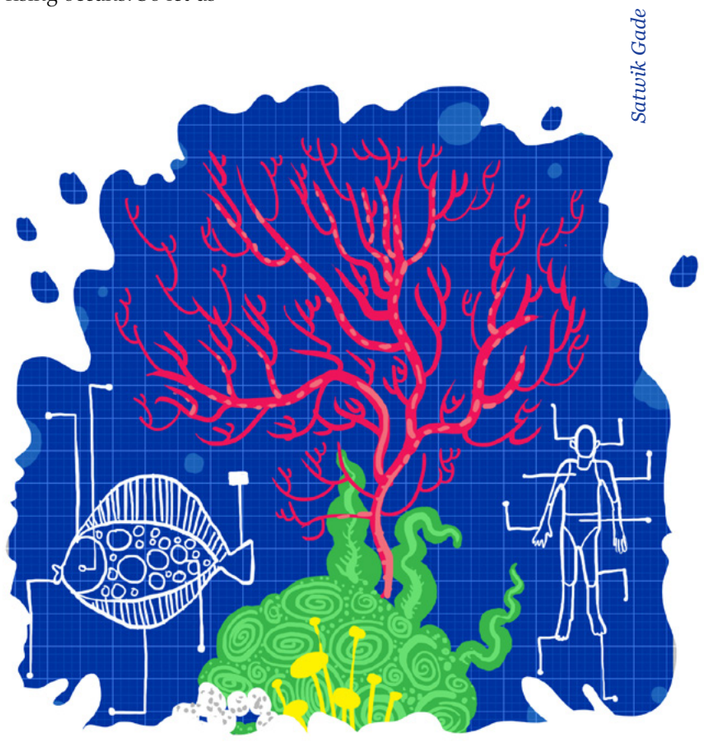

Satwik Gade

It's time to take 'the case for colonialism' as seriously as it deserves

One of the more intriguing debates conservationists have to deal with is whether they represent some sort of colonising influence. Critics of conservation will contend that some of the main ideas in conservation were imposed by colonising powers, or extended through neo-imperial influence. Defenders insist that much conservation is home grown; it's foolish to treat it as an invasive exotic given that it is so thoroughly blended with local institutions and independent governmen

Recently, however, the whole colonialism debate took a surprising twist when an article unashamedly advocating colonialism as a good thing was published. What is worse is that it was published in the Third World Quarterly (TWQ), a journal that has long been home to left-leaning scholars. And, worse still, the 'scholarship' behind this piece was appalling.

There has been a vigorous response to this paper. You could almost hear the spluttering of cappuccino hitting the computer screens of indignant readers. Most of the editorial board of the journal has resigned. At one point the author himself asked the article be retracted. There have been a host of intelligent, reasoned responses to this paper: try here on clickbait, here for an intelligent commentary on TWQ itself, and here for a summary of the whole sorry affair. There may be some positive outcomes, in that the board's resignation may see new, more just publishing initiatives emerge. There has also been some disgraceful hounding of scholars who spoke out against the article by alt-right trolls.

I don't think further discussion on TWQ's pages, despite the invitation to do so, provides a suitable vent for the issues this article raises. The basic problem is that the scholarship that underpins the article is so poor that it does not deserve that sort of critical engagement. We need to see how ridiculous it is. To that end, I think we should approach this problem slightly differently and ask: If 'colonisation' is the answer, what is the question? To kick things off I have developed one answer to that question, and am proud to launch the new Need for Colonisation (N4C) Index. This takes the form of a new miniature survey and scorecard that I believe can produce rapidly available, policy relevant findings.

The N4C Index is based on a curious but fundamental truth that is buried deep within the argument of Gilley's article: just because a state is a state, why should that mean that it gets to govern itself? Is self-determination an inalienable right, or a privilege that is earned? We know that states are recent inventions in the course of human history. If they are communities at all, then they have to be imagined as such, conjured up by media, representation and re-written histories. Their borders are arbitrary, participation in the election of their rulers often derisory, and their governments subject to corporate whim and multi-lateral restructuring policies. No decent left-leaning intellectual in her heart of hearts deserves her cardigan if she is also a blind-to-all-faults nationalist. We may have to recognise that in some cases things are so bad that colonialism could be the answer to the problems that face our different countries.

The N4C Index is based on a curious but fundamental truth that is buried deep within the argument of Gilley's article: just because a state is a state, why should that mean that it gets to govern itself? Is self-determination an inalienable right, or a privilege that is earned?

But we need also to recognise that in today's academic circles this cannot be a mere theoretical argument. We need applicable findings that can make a difference and change the world. Based, therefore, on an extensive review of colonial invasions, wars and imperial conquest, I have derived a colonisation scorecard whereby you can determine how desperately your country needs to be colonised and by what sort of power. It works very simply—you answer the question, score your answer and add up the total. The sum will reveal how much colonisation you need.

Scores will be submitted to a major international conference— to be held in Berlin— that will demarcate the new global political geography and who will wield power over whom. I invite any legitimate government and potential colonising forces (as well as governments deserving colonisation) to participate. I also suggest that trends towards scores of zero (indicating perfect legitimate self-government) be monitored as part of counting progress towards the Sustainable Development Goals.

The questions are:

1. Has your country's leadership been overtaken by a narcissistic buffoon with a penchant for media gaffes and a silly hairstyle?

Yes–60 points;
Nearly–50 points;
No–10 points;
There is no way that you can call that hairstyle silly–1000 points

2. Does the leadership have a penchant for military spending and nuclear weapons?

Yes–100 points
No–5 points
No, because they do not spend nearly enough money on nuclear weapons, who could?–500 points

3. Does your country have a great history of colonial rule and military conquest?

Yes–2000 points
No–10 points
No, we have never sought an Empire–100 points

4. Are your country's international borders fenced?

No–5 points
Not any more because someone dug a tunnel underneath the one secure border we had and anyway anyone can get in from Scotland–1000 points
Not yet and I am personally overseeing the construction of the one nearest me to the south–1000 points (if you are from the US) or 5 points (if you are from Scotland or Canada)

5. Do you already have the ideal leader?

No, there is no such thing–5 points
Yes – 50 points
I think to be ideal then we would be looking for some sort of cross between Rodrigo Duterte, Kim Jong-un, Robert Mugabe, Saparmurat Niyazov, Donald Trump and Jacob Zuma–50,000 points

6. Are you still answering these questions?

No–0 points
Yes–500 points

Scores:

Over 10-good, only minor colonisation required.
You could probably still do with a short visit from a small expeditionary force given that you were concerned enough to answer these questions in the first place.

Between 100-1000–serious; urgent colonisation required.
Please invite your nearest neighbour to come and sign some quick treaties ceding territory and trading rights to them. Make sure they are signed by unrepresentative leaders, preferably in languages you don't understand.

Over 1000-Even more serious.
Your country may or may not be alright but you are a basket case. Are you from Nambia ?

Further reading

http://www.web.pdx.edu/~gilleyb/2_The%20case%20for%20colonialism_at2Oct2017.pdf

https://timesofindia.indiatimes.com/world/uk/journals-editorial-board-resigns-over-colonialism-essay/article-show/60754617.cmsu

https://www.insidehighered.com/news/2017/09/26/author-third-world-quarterly-article-colonialism-wants-it-stricken-record-it-might

http://blogs.lse.ac.uk/impactofsocialsciences/2017/09/19/clickbait-and-impact-how-academia-has-been-hacked/

https://blackopinion.co.za/2017/09/25/colonialism-destroyed-third-world-quarterly/

https://www.thecollegefix.com/post/36998/

http://edition.cnn.com/2017/09/21/africa/trump-nambia-un-africa-trnd/index.html

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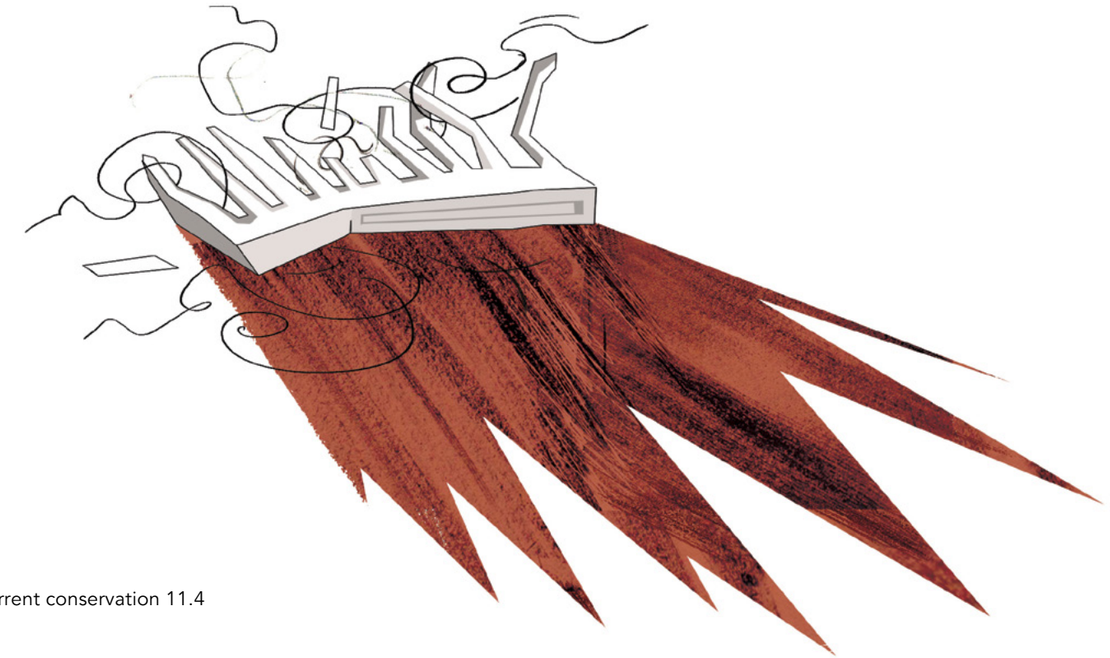

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