

ISSUE 6  
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Exclusively  
for ZSL Fellows

# THE ZOOLOGIST



**INSIDE:**  
Coral Q&A  
Tiger stepping stones  
Mountain chicken frogs return

The Critically Endangered Greek killifish. Their upturned mouths help them catch bugs that have fallen on the surface.



Brian Zimmerman, Chief Zoological Officer, ZSL

## HOPE FOR WORLD'S RAREST FRESHWATER FISH

**New Aquarium boosts  
pioneering conservation project**

**I**N 2005 ZSL undertook the first ever survey of all known and suspected habitats of the Corfu killifish (*Valencia letourneuxi*), covering 92 streams and wetlands over several weeks. Although known to be decreasing in number, these five-centimetre, light grey fish were thought to be holding on in patches of the waterways criss-crossing Western Greece.

"It was frightening. There were far fewer killifish than we anticipated. We had to act at once and so the Fish Net programme began," says Brian Zimmerman, ZSL's Chief Zoological Officer and Fish Net lead. "It may not seem important to conserve little fish, but they are the canaries in the coal mine. If the killifish are numerous, then we know the whole ecosystem – which supports thousands of other species and local people – is thriving."

Sadly, ZSL's research shows that the plight of the Corfu killifish is not unique. Populations of freshwater animals have fallen by an average of 83% since 1970 and although just 0.3% of surface water on the planet is freshwater, almost half of fish species are. These diverse and unique habitats are among the fastest deteriorating, with pollution, agriculture, overfishing, damming of river systems and competition from introduced species all taking their toll.

In response, this summer ZSL Whipsnade Zoo opened the first aquarium dedicated to conserving the world's rarest freshwater fish. The Aquarium houses 28 species that are essential to Fish Net's work, including five species now thought to be Extinct in the Wild. Fish Net's

strength lies in its ability to link the expertise of ZSL's zookeepers, field conservationists and local and international partners, including Döga Dernegi and the Hellenic Centre for Marine Research. The programme combines conservation breeding programmes with work in the wild and monitors threatened freshwater environments in Greece, Turkey and Madagascar.

The team monitor fish populations, and identify suitable habitats that can be repopulated. In 2013 a ZSL expedition found the last wild Mangarahara cichlids (*Ptychochromis insolitus*) in the pools of a dried-up riverbed in Madagascar. This fish, once thought to be extinct, now numbers in the thousands thanks to zoo breeding and the plan is to reintroduce them to ponds across their homeland. Mangarahara cichlids will then be protected as a utilised food source by the Malagasy people without the risk of introducing new fish species or the diseases they carry.

"What should give people hope is that, when it comes to freshwater fish, you can do a lot with very little. We only need a few tanks to maintain a healthy population, so I calculated that we can save an entire species for as little as £2,000," Brian says. "There are small changes everyone can make which help too: don't waste water; stop polluting water sources and avoid using cleaning products marked 'harmful to aquatic life'.

"Our new Aquarium is an excellent facility which will enable us to expand our conservation breeding programmes, Fish Net project and ultimately save more fish from extinction." **TZ**



Prof Ken Norris, Director of Science, ZSL

## DEAR FELLOWS

**I**MAGINE what it was like to go into the field with Victorian naturalists like Charles Darwin and Alfred Russell Wallace. Gathering data on wild animals was enormously difficult. Not only was it challenging to travel to remote parts of the world, but data could only be gathered by people going out and directly observing animals in the wild themselves. Notebooks, pencils and binoculars were the tools of the trade. Data were hard won!

Roll forward into the 21<sup>st</sup> century and the situation has completely changed. We are now in the age of big data. How did we get here and what does this mean for conservation? Our ability

to collect data on wild animals and their habitats has been transformed by technology. We can now describe the distribution and abundance of wild animals using camera traps and acoustic recorders; understand movement patterns and behaviour in incredible detail using tracking devices attached to individual animals; and monitor the environment at large scales using drones, aeroplanes, submarines and satellites.

This technology generates vast quantities of data. There are millions of camera trap images of wild animals, a few GPS (global positioning system) tags on individual animals can generate thousands of location records in just a few days, and satellites can now view the earth at a resolution of less than  $<1\text{m}^2$  (the surface area of the Earth is over 500 trillion  $\text{m}^2$ ). It would be impossible for people to process all these data, so conservation is now employing techniques from computer science. We use artificial intelligence, machine learning and deep learning. In basic terms, these are all techniques that computers use to recognise patterns in data. The pattern may be an animal in a camera trap image; a behaviour recorded as a series of movements by a tracking device; or a habitat recorded as light reflectance data by a satellite. The growth of this area of research has been rapid over the last decade, and ZSL launched a new journal *Remote Sensing in Ecology and Conservation* a few years ago to support the emerging science.

Science for conservation is about applying knowledge to improve conservation outcomes. Big data is transforming what's possible! **TZ**

## DIARY DATES

**24 October** 9am – 6:30pm

**Symposium** Healthy gardens for people, plants and wildlife

Huxley Lecture Theatre, ZSL London Zoo

**13 November** 5pm

**Annual General Meeting**

Huxley Lecture Theatre, ZSL London Zoo

**12 November** 6pm

**Talk** Madagascar's missing megafauna: Life after lemurs, hippos and elephant birds

Huxley Lecture Theatre, ZSL London Zoo  
(Free to attend)

**14 January** 6pm

**Symposium** Coral reefs: Running the gauntlet of climate change

Huxley Lecture Theatre, ZSL London Zoo  
(Free to attend)

**11 February** 6pm

**Talk** Holistic approaches to conservation  
Huxley Lecture Theatre, ZSL London Zoo  
(Free to attend)

Find out more at [zsl.org/science/whats-on](https://zsl.org/science/whats-on)

## EYE IN THE SKY

### Lifting the lid on shark behaviour

**R**ESearchers from ZSL have been tagging reef sharks in the British Indian Ocean Territory (BIOT) for six years, amassing movement data from almost 200 grey reef (*Carcharhinus amblyrhynchos*) and silvertip sharks (*C. albigmarginatus*) in the region – but what drives that movement? Much of their lives remain a mystery, but satellites could hold the key.

“Sea surface temperature, salinity, chlorophyll density and even wind can all be detected from space,” says Michael Williamson, PhD Researcher at ZSL’s Institute of Zoology. “By matching up shark movements with the environmental factors we can, for the first time, get a deeper insight into the drivers that shape shark behaviour.”

Satellites are already being used to monitor terrestrial animals and habitat change (see *The Zoologist*, Spring 2019) but their use for marine conservation is still in its infancy, says Michael. “The technology has massive implications for sharks. If we can understand what makes an ideal habitat for a shark we can push for more protected areas. Or, in the case of BIOT, we can identify the hotspots sharks are more likely to inhabit and focus the efforts of patrol boats.

“We can even monitor illegal fishing directly. Most fishing activity takes place at night, using lights to attract fish, and we can compare light levels with the number of boats legally permitted to travel through an area – giving us an idea of the scale of the problem.”

The technology could help reduce the cost of conservation action, freeing up funds traditionally tied down to boat hire, staff time and logistics. The satellites use a range of equipment to detect environmental factors, from infrared sensors that read sea temperature to altimeters that can measure the water surface changes and wave height, factors that would otherwise require the installation of equipment.

Michael is now working on a coral health index, using the same data as researcher Catherine Head (see page 8), to see how changes in coral health – the primary habitat for reef sharks – are affecting their behaviour. “Tying shark movements to recent bleaching events gives us a further insight into how habitat quality affects their behaviour,” says Michael. “It could push reef sharks to search for new homes, leaving the safety of protected areas and into the path of fishers.” **TZ**



Silvertip shark (*Carcharhinus albigmarginatus*)



# BACK ON HOME SOIL

## Iconic frog makes first leap in return to island home

**T**WENTY FOUR mountain chicken frogs (*Leptodactylus fallax*) bred at ZSL London Zoo have made the long journey to Montserrat, a landmark return for the species and an important step in the battle against chytridiomycosis.

Mountain chicken frogs are only found on the Caribbean islands of Dominica and Montserrat. They persist in small pockets on the former but haven't been observed on Montserrat since 2015. The disease reached the eastern Caribbean recently and has since decimated wild mountain chicken frog populations, which are highly susceptible to the fungus chytrid causes. The eruption of Montserrat's Soufrière Hills volcano in 1995 and subsequent hurricanes are suspected to have had further impacts on the species, and a number of organisations in the UK have formed the mountain chicken recovery programme to support conservation efforts.

"The frogs have returned to two semi-wild, predator-proof enclosures on the island," says Ben Tapley, ZSL's Curator of Reptiles and Amphibians. "We know that chytrid fungus is still present on the island, and is carried by treefrogs, so to give the mountain chickens a fighting chance we've installed heated pools and removed some of the canopy cover in these enclosures. The fungus is sensitive to temperatures above 32°C, so we hope that the pools and higher ambient temperatures will help the frogs fight off the disease.

"When frogs get sick with chytridiomycosis, they tend to seek out water. We tested the heated pools at our breeding facility in London and found that mountain chickens were happy using them,

so the next step is to try them in the wild."

The technique has already won the programme a gold award from BIAZA (British and Irish Association of Zoos and Aquariums) and, if successful, could have huge implications for many other threatened amphibian species — it's estimated that 200 species of amphibian have already been driven to extinction by chytrid.

So far, the news is promising. ZSL's Veterinary Officer Tai Strike participated in the release and observed the frogs calling and feeding on their very first evening back on Montserrat. Zookeepers and conservationists from the mountain chicken recovery program will continue to monitor their

progress, but the next step is for them to breed.

"The mountain chicken frog is emblematic of the two islands — it features heavily in Creole culture and even on Dominica's coat of arms," says Ben. "Having a breeding population back on Montserrat would be massive for the frogs, the local people and our ability to garner international attention for the project."

There is a long way to go for the mountain chicken frog but, having brought together ZSL's expertise in wildlife health, bringing wildlife back from the brink and building relationships between wildlife and people, there is real hope for their future in the wild. **TZ**

Mountain chicken frog (*Leptodactylus fallax*)



# SAY CHEESE

## Counting Mongolia's most elusive mammal

**H**OW do you study one of the world's rarest large mammals in one of the most remote, inhospitable and expansive landscapes there is? For ZSL's team in Mongolia's Gobi Desert, the answer is camera traps; lots of them.

"There are estimated to be just 1,000 Bactrian camels left, all in Mongolia and China, with the largest sub-population in Mongolia's Great Gobi A Strictly Protected Area," says Samuel Merson, Project Coordinator. "Finding them in an area five times the size of the UK is a challenge, and the difficulty of the terrain makes any census prone to human bias."

The team have deployed 90 camera traps at random throughout Mongolia's Great Gobi A, a 12-day expedition involving four teams and support from National Geographic Society, Gaia Nature Fund and ZSL's EDGE of Existence programme. This massive undertaking, Sam hopes, will provide the most accurate population record of Bactrian camels (*Camelus bactrianus*) in Mongolia to date, and shed light on their use of different habitats.

The project is also investigating the impact of fences that have been erected along the border with China, splitting the Great Gobi A from the

Gashun Gobi in Gansu, China. A further 100 camera traps have been placed at 1km intervals along stretches of the border, with help from Mongolia's Border Defense Agency.

"Bactrian camels are extremely sensitive to human activity — an added consideration when monitoring them — and it's likely the fence, although incomplete in some areas, is having an effect on camel migration," says Samuel. "Long term, separating the populations could lead to inbreeding depression reducing their fitness and making them more vulnerable to threats like habitat loss, poaching and, more broadly, climate change."

Climate change is being felt hardest in countries like Mongolia, where the temperature rise is triple the global average. "We suspect that the increasing desertification is forcing Mongolia's wildlife to collect around the few remaining water sources. In the Bactrian camel's case, that brings them closer to their main predator, wolves, and puts their young at risk." A further 30 camera traps have been placed at some of these key water sources, collecting both video and photos that will shed light on the camels' behaviour around watering holes.

"Camels are part of our popular culture, but few people are aware of the problems they face or that the Bactrian is our only remaining species of wild camel," adds Samuel. "This may be one of the largest ever camera trap studies, but its importance will be bringing the world's attention to this charismatic mammal on the brink of extinction." **TZ**



Bactrian camel (*Camelus bactrianus*)



# BRIDGING THE GAP

## Tiger stepping-stones in Nepal's Terai Arc

**F**OR the first time in a century, tiger numbers are on the rise. Central Asia has seen the biggest increase and, last year, Nepal reported that its tiger population doubled in the last 10 years. Now standing at an estimated 235 individuals, the rise poses a new challenge for Nepal's conservationists – and ZSL is working to find a solution.

“For years we’ve been working alongside the government to boost tiger numbers inside Nepal’s national parks,” says Jake Williams, ZSL’s Transboundary Tiger Project Coordinator. “Now that we’re starting to see the fruits of that labour, tigers are moving out of the parks in search of new territory.”

The wetlands of Ghoda Ghodi, site of ZSL’s new project, nestle in the west of Nepal’s Terai Arc landscape, almost equidistant between Shuklaphanta and Bardia National Parks. Already an important rest area for birds migrating over the Himalayas, but currently unprotected, Ghoda Ghodi could also provide the perfect pitstop for Bengal tigers (*Panthera tigris tigris*) travelling the Terai Arc between the two national parks.

“With funding from the UK’s Darwin Initiative, we’re working with communities and local government to restore the landscape to health,” says Jake. “There are approximately 5,000 households in the area, from 39 villages and numerous ethnic groups, and it’s important that any work we do has the support of the people who live there.”

“Many of these communities rely on fish and aquatic plants for food, so sustainable fishing methods like no-take zones or fishponds are win-wins for everyone. Likewise, improving the grazing methods used by herders, or the breed of cattle themselves, means more produce for farmers and more grass for wild deer – key prey for tigers.”

ZSL’s Nepal team will also be investigating the extent of logging and pesticide use, and helping local government build a plan to deal with the rising numbers of tourists stopping at Ghoda Ghodi on the way between national parks.

Monitoring of the area – already home to the Vulnerable leopard, fishing cat and lesser adjutant stork – will underpin the project but, to ensure long-term success, ZSL are working with the government to establish a local team to manage the project. “Wherever we work, it is important we build in an exit strategy,” says Jake. “Building our projects into the framework of local government allows the communities to take responsibility for their own landscapes.”

Ghoda Ghodi also has wider implications for conservation in Nepal. “If we successfully secure sanctuary status based on the area’s importance for migratory birds,” says Jake, “we hope we’ll have a model for developing other unprotected areas in Nepal.” **TZ**



Bengal tiger (*Panthera tigris tigris*)

# FISHING FRENZY

## Underpinning cross-landscape conservation in Cameroon

**C**REATED in October 2018, Cameroon’s Douala-Edea National Park has afforded new but vital protection to the Gulf of Guinea’s marine inhabitants. Sharks, rays, whales, dolphins, turtles and fish all call this area of West Africa home – one of the most diverse marine environments in the world. The next step for Cameroon’s Government, with help from ZSL and funding from the players of the People’s Postcode Lottery, is to identify the key species living in Cameroon’s waters and build awareness of the area’s new status with local communities.

The first national park in Cameroon to combine marine, estuarine and terrestrial habitats, the area is dominated by mangroves and presents many challenges from a management perspective. But perhaps the greatest problem facing Douala-Edea is enforcing fishing restrictions in a country that sources around 50% of its protein from fish. It is the main source of food and income for Douala-Edea’s marginalised coastal communities and, without immediate action, fish stocks could collapse – risking long-lasting impacts on fishing communities and the area’s ecosystem.

ZSL’s team on the ground have begun their

research with elasmobranchs – sharks, skates and rays – using the group as a way of understanding overall ecosystem diversity. “We conducted a series of market surveys to identify the elasmobranchs regularly being caught and sold,” says Antonio Boveda, ZSL’s Douala-Edea Project Manager. “During visits to the artisanal fisheries and two major fish markets closest to Douala-Edea we identified over 22 species of sharks and rays.

“Many of the elasmobranchs for sale were juvenile and five species observed were even listed as Endangered by the IUCN Red List, proving the area is a hot spot for important marine life and may even function as a nursery for some species.”

Alongside monitoring, Antonio’s team are also working with villages around Douala-Edea and at nearby Lake Ossa to set up community banks and mitigate conflict with primates and elephants. Using the same model as Nepal (see page 6), the approach offers communities the chance to diversify their livelihoods and develop a more positive relationship with wildlife. The data collected will now feed into the Douala-Edea management plan and the combined approach offers hope to Cameroon’s marine life and the mangroves it relies on. **TZ**



# EAGER WEAVER

## Life in the sun sparks an unusual behaviour change

**B**RIGHTLY COLOURED, feisty and territorial, the Mauritius fody (*Foudia rubra*) sat on the brink of extinction 15 years ago. Today, this rare member of the weaver family has doubled in population size and been downgraded from Critically Endangered to Endangered, thanks to the efforts of the Mauritian Wildlife Foundation. But much like humans, life on a sunny isle could also be having an interesting effect on their breeding habits.

Introduced to the tiny island of Île aux Aigrettes off the south-east coast of Mauritius, site of a concerted effort to improve the habitat through the removal of invasive species and introduction of non-native giant tortoises, the fody is now thriving. It is thought that lower altitude and different habitat on the island, compared to the Mauritian mainland, has helped the population grow to around 300 individuals – the estimated carrying capacity of the island. The environment could also be having an unintended consequence on fody breeding though, with ZSL's scientists observing polygyny for the first time.

"Males on Île aux Aigrettes are mating with more than one female, something we've never observed in fodies," says Theresa Robinson, PhD researcher at ZSL's Institute of Zoology. "It's very unusual for a bird to change its breeding behaviour so fundamentally and it shows that, at least in this location, habitat change might not be a limiting factor for the fody. Rainfall patterns

on Mauritius are changing, and the fody's ability to adapt their breeding to suit a new habitat is encouraging."

Despite this exciting finding, scientists remain cautious. "The fody is a very territorial bird," says Theresa, "and limited space might be driving the behaviour change." Reintroductions of the Seychelles magpie-robin to small islands in the Seychelles archipelago showed that the strongest birds spent more time defending the territory they had earned than breeding. This reduced the overall population productivity – to the potential detriment of the species – but also informed and improved the species management effort.

"Fodies on Île aux Aigrettes are breeding around 10 times a year, year-round, as opposed to just five months of the year on the Mauritian mainland," adds Theresa. "The males expend large amounts of energy on this mating effort and moulting their bright feathers, and without a large enough gap between breeding seasons it could be driving some males to exhaustion. We also don't know if the females are as productive as they would be if they were in monogamous pairings."

ZSL and the Mauritian Wildlife Foundation will continue to monitor the species, and it is hoped the fody can be introduced to other suitable locations in the future. So far, their adaptability has proved a strength, but more research is needed to understand the long-term consequences. **TZ**

A male Mauritius fody (*Foudia rubra*)



# SAVING WORLD'S RAREST APE

## Social science offers new insights for conservation

**C**HINA is one of the most ancient and densely populated countries in the world – with human numbers currently soaring towards 1.4 billion. Such high population density brings major conservation challenges where people continually interact with – and exploit – natural resources. One species suffering at the hands of overpopulation in China is the Hainan gibbon (*Nomascus hainanus*) – now the world's rarest ape.

Classified as Critically Endangered on the IUCN Red List, the 27 remaining individuals live on Hainan Island, a large island off the south coast of China. Although the island is around 33,920 km<sup>2</sup> (about the size of Belgium), gibbons are now only found in a 15 km<sup>2</sup> fragment of Bawangling National Nature Reserve.

"We need to see both humans and wildlife as part of a single system," explains Heidi Ma, ZSL's Hainan Gibbon Project Coordinator. "They are part of the same shared local history, and so trying to understand how to conserve the Hainan gibbon cannot be done without looking at local peoples' value systems and connection to the species."

"Conservation science doesn't always have to mean technological approaches such as camera trapping. We can establish a rich source of information about the wider conservation issue, and also identify possible solutions, from having conversations with the people who live in the same landscape as threatened species."

Communities living close to nature often rely on reserves for firewood, sources of protein, and other products. Although hunting of the Hainan gibbon is no longer an issue, hunting for small animals and other activities carried out inside the reserve by local people still causes major disturbance.

"To understand the impact that local people are having on a species, we need to first have a baseline of local knowledge, to establish whether they have high or low awareness of the species. Can they easily recognise one? And whose responsibility do they think it is to conserve species?"

"Our interviews show that there is a high level of awareness about the Hainan gibbon, and that local people can easily identify one and know it is a protected species – it is actually more well-known locally than the giant panda."

"It's also important to recognise," explains Heidi, "that not all villages are the same. Variation in attitudes and belief systems across different communities is also something we hope to feed into conservation plans for the species, as part of a wider programme that also includes local reforestation."

Heidi hopes to build a social science research model that will work for other projects around the world, meaning bottom-up approaches could be better evaluated and generate greater overall impact.

Listen to Heidi talk about her work on ZSL's Wild Science podcast: [zsl.org/zsl-wild-science-podcast](https://zsl.org/zsl-wild-science-podcast) **TZ**



# ASSESSING ANGOLA'S WILDLIFE

## Finding the road to recovery

**I**N 2011, the newly formed National Institute for Biodiversity and Conservation Areas (INBAC) in Angola began an enormous task. Less than a decade after the end of a 27-year civil war, the Government set out to do the seemingly impossible: to understand, record and conserve Angola's remaining biodiversity.

At the Government's invitation, ZSL came aboard in 2016 and started to implement programs to assess and restore Angola's wildlife. With 14 conservation areas, including nine designated national parks, the country is home to a broad range of extraordinary animals from African wild dogs, desert-adapted cheetahs and forest elephants to the giant sable antelope – found nowhere else in the world.

"Our key challenge was a lack of data," says Rosemary Groom, Conservation Biologist in ZSL's Range Wide Conservation Program for Cheetah and African Wild Dogs, "Nobody had surveyed Angola's wildlife in almost 50 years but we suspected that – alongside the unimaginable humanitarian suffering – the war had had a huge impact on the nation's environment."

What the team found was unsurprising: the displacement of large numbers of people into

formerly pristine wildlife habitats; extensive hunting driven by the disruption of normal food supplies; and the widespread laying of landmines, had been catastrophic. But all was most certainly not lost.

"Despite the obvious challenges," says Sara Elizalde, who manages ZSL's fieldwork in Angola, "we have seen an astonishing focus by the Angolan Government on conservation. They have been hugely supportive of our work in the region, suggesting potential wildlife hotspots for us to survey. Based on data from our camera traps the government are now working towards creating new national parks.

"Some of our surveys have been a source of real hope," continues Sara "We found African wild dogs in areas where we feared they had vanished and viable cheetah populations too. On one survey we even uncovered the first evidence of a cusimanse – a small mongoose – recorded in more than 100 years."

And ZSL's work in Angola is now informing changes to international law too. A coalition of 24 scientists led by the team at ZSL are among the first to offer support for the UN's proposed 5<sup>th</sup> Geneva Convention, which aims to



Angola supports several big predators, including the leopard (*Panthera pardus*)

recognise deliberate damage to wildlife and the environment alongside other war crimes.

"The brutal toll of war on the natural world is well-documented," adds Rosemary, "it destroys the livelihoods of vulnerable communities and drives many species, already under intense pressure, towards extinction. But we have shown that, with evidence-based targeted conservation, it can recover. In Angola there is still much work to do, but if the optimism and ambition of the Government continues, the future of its wildlife looks to be much brighter than any could have predicted." **TZ**



Gharial (*Gavialis gangeticus*)

## TIPPING THE SCALE

### Easing pressure on Nepal's most endangered reptile

**B**RISTLING with teeth, the yellow-eyed and slender-snouted gharial (*Gavialis gangeticus*) exemplifies prehistory. Basking in the sun along the banks of Nepal's Rapti River, jaws resting patiently open at the water's edge, it would be easy to imagine that the gharial is as much a mainstay of Nepal's scenery as the trees and vines of their home in Chitwan National Park. In fact, the gharial diverged from the crocodilian family around 40 million years ago – but this is only half the story.

Once ranging throughout the Indian subcontinent, the gharial is limited to just 650 wild adults in Chitwan and four other locations in India and Nepal. It sits 17<sup>th</sup> on ZSL's EDGE of Existence list, ranking the most evolutionarily distinct and globally endangered animals, and is a priority for conservation.

"The gharial faces a host of problems," says Bed Bahadur Khadka, Assistant Conservation Officer for Chitwan National Park. "Overfishing and pollution have depleted their source of fish, while dams at the border between India and Nepal have meant they can no longer move between habitats."

Bed oversees the gharial breeding centre at Chitwan, supported by ZSL and a number of other global organisations. The centre is home to around 600 gharials and aims to boost population numbers with regular reintroductions. "We've released 100 gharials into the national park this year," says Bed, "but the pressures on our rivers continue to come

from outside the park's borders." Each release is marked with a ceremony and he hopes that, through these ceremonies and the tourists who visit the centre, the gharial can win the support of Nepal's politicians.

To tackle the overfishing, ZSL has also been working with eight villages in the buffer zones of Chitwan National Park. Local Tharu and Bhote tribes have been fishing for centuries and fish play an important part of their culture, even being used in birth, marriage and funeral ceremonies. "By setting up community banks and providing seed funds, the villages have been able to build and stock fishponds," says Bhogendra Rayamajhi, ZSL's Senior Programme Officer. "No longer reliant on fish from the rivers, where the catch has been dwindling every year, the communities now have a reliable source of income. We hope that other communities will follow suit when they see the impact it has.

"With the country's wildlife populations climbing, human wildlife conflict is an increasingly important issue," adds Bhogendra. "Helping the people on the edges of protected areas to see the benefits that wildlife and tourism bring is a massive part of our work."

The UK government is supporting ZSL's work with communities living in the buffer zones of national parks in Nepal and Kenya. Give by 31 December and the government will double all donations, up to £2m. Find out more at [zsl.org/ForPeopleForWildlife](https://zsl.org/ForPeopleForWildlife) **TZ**



# TWEETING BOOSTS DATASETS

## Once overlooked social media now used by scientists

**S**Ocial media could be the new 'Web of Science' or 'Google Scholar', with ZSL scientists heralding it as a previously overlooked but useful source of data, using posts from popular platforms like Twitter.

Dr Nathalie Pettorelli, Senior Research Fellow in ZSL's Institute of Zoology recently published a paper outlining how 55 species had arrived at new locations in the UK due to climate change. Within this study, at least ten of the species were discovered through Google searches and social media.

The Jersey tiger moth (*Euplagia quadripunctaria*) has been spotted in London



From naturalists posting images on websites or tweets of wildlife sightings in unusual places, ZSL scientists were able to locate, verify and add the data to the analyses. However, it's not just climate change research that social media can boost datasets for: research into ecosystem services mapping, conservation marketing and education, conservation communications and the tracking of global wildlife trade are all fields which have already benefited.

These benefits include accessing large, free, cheap sets of data, with some (in the case of species on the move) including useful geolocated photographs in real time. Such data can also give an indication of behaviour, public opinion or social trends without having to conduct rigorous surveys.

On the flip side, verification can be long and difficult where sources seem unreliable. The consensus seems to be that these data are of benefit, but not if used in isolation – they must be substantiated with other evidence.

"It's essentially a form of citizen science, with participants probably not even realising the enormous contribution they are making to the cause

at the touch of a screen," explains Dr Pettorelli.

"Our project focuses on species on the move with climate change. That is, species that are establishing populations in new locations without assistance from humans. The arrival of the small skipper butterfly in Lanarkshire, Scotland, for example was detected thanks to Twitter.

"Currently, there is no national platform for monitoring species movements due to climate change, with information on species' displacements being sparse; social media provides a really cheap and simple method for us to track these changes and associated impacts. This information is vital for us to become better at predicting what may arrive next where, and what impacts these new arrivals may have."

ZSL scientists are calling for people to submit their rare wildlife sightings on Twitter to @SOTM\_UK with the hashtag #SOTM\_UK (species on the move), in order to assist further research on assessing the ecological and societal impacts of wildlife's movements under a changing climate across the UK.

Submit your sightings now:

[twitter.com/SOTM\\_UK](https://twitter.com/SOTM_UK) **TZ**

# BENEATH THE CANOPY

## Counting wildlife that lives under the trees

**T**HE first step towards conserving any species is knowing how many of them there are, and the second step is understanding whether their numbers are changing, and why.

In order to do this on a large scale and understand the status of species globally, ZSL uses the Living Planet Index (LPI). The LPI provides a measure of global biological diversity based on population trends of vertebrate species from around the world, in much the same way that a stock market index tracks the value of a set of shares. The Living Planet Database (LPD), from which the LPI is calculated, currently holds information on over 23,000 populations of more than 4,200 mammal, bird, fish, reptile and amphibian species surveyed from around the world, which are gathered from a variety of sources such as journals and government reports.

"A single survey might not necessarily be typical of an entire ecosystem or set of species, but by aggregating survey data from so many different sources, collected in so many different ways, we can build a robust overview," says Louise McRae, Conservation Scientist at ZSL's Institute of Zoology. "The LPI is an extraordinary tool, and a tried-and-tested way for us to measure biodiversity. But what we wanted to do was focus this analysis on a habitat we know relatively little about – forests. Although lots of studies highlight the reduction in forest area, we had to look beneath the canopy to get clear insight into forest health."

Using the newly developed Forest Specialist Index, Louise and her colleagues in ZSL's Indicators and Assessments Unit undertook the first-ever global assessment of forest wildlife. The picture is not pretty: surveyed forest wildlife populations

have declined on average by 53% globally since 1970, mostly due to human activity.

"Wildlife is vital to keeping ecosystems healthy and productive. In forests, many species pollinate and disperse seeds, for example, and so drive the natural cycle of forest replenishment which is so essential for carbon capture," adds Louise. "If these forest species continue to decline in number, this vital process is also affected and may impede forest regeneration as well as exacerbating climate change. We also found that, although reversing deforestation is essential to restore biodiversity, it isn't enough on its own."

Instead, to reverse the decline in wildlife and to restore the health of forests, it is crucial to

address the multiple threats to the species that call them home. These include the illegal wildlife trade, unsustainable hunting, invasive species, climate change and disease.

"Using this new indicator, we can continue to track forest numbers and measure progress towards international agreements and biodiversity targets," says Louise. "While the findings of the Forest Specialist Index aren't good news, our data do show that targeted conservation can be very effective for wildlife recovery. By sharing our results with governments around the world we provide the evidence they need to act effectively. Knowledge of these trends is the first step in reversing them." **TZ**

The black howler monkey (*Alouatta caraya*) is a key seed disperser in the Amazon Rainforest







Species like this table coral could be the most vulnerable to climate change



Dr Catherine Head, Post Doctoral Researcher at ZSL's Institute of Zoology

## SCIENTISTS' CORNER

### Q&A with Catherine Head

We would love to get your feedback.

Go to [zsl.org/thezoologist](https://zsl.org/thezoologist) to send us your suggestions.

**D**R Catherine Head is a Post Doctoral Researcher specialising in coral reef biodiversity. Having launched ZSL's EDGE of Existence coral programme in 2011, she now leads research into coral reef biodiversity and connectivity in the British Indian Ocean Territory (BIOT).

**TZ:** Your recent paper on coral reefs painted a scary picture. Is there any hope for coral reefs?

**CH:** Let's be clear: based on the current rate of CO<sup>2</sup> emissions and the continuing upward trend, coral reefs are predicted to be functionally extinct by 2050. The 70% coral die off we recorded in BIOT was the result of back-to-back heatwaves in 2015 and 2016, an unprecedented occurrence both in terms of their frequency and the length of time that temperatures remained high.

That's the bad news, and it's a whopper. But there is hope — for example, even though the temperatures reached far higher in 2016, and for longer, the coral loss in BIOT was far worse the previous year. We believe that the most vulnerable corals were killed in 2015, leaving species that are more resilient to temperature rise. It indicates that reefs could persist, although at a reduced level of complexity — which would have a knock-on effect on the thousands of species reefs support.

**TZ:** The problem facing coral reefs is a global one. Do we have the tools to meet it?

**CH:** The 2016 Paris Climate Change Agreement, to limit temperature change to no more than two degrees above pre-industrial levels, is our biggest tool in the fight for corals. Much of this is implemented through policy changes and we must keep up the pressure on policymakers to make this happen. So many people are now starting to realise that their

everyday actions have an impact, and that gives me hope.

But there are the local problems of pollution and overfishing which hamper the chances of reef recovery; this is where my research comes in. My team are collecting environmental DNA and coral tissue samples from coral reefs and combining these with hydrodynamics and other environmental factors collected by Stanford University to build a picture of reef biodiversity and connectivity across BIOT. Through analysis of the genomes we can infer coral parentage, identify the source reefs where the majority of coral larvae originate from and increase protection around these hotspots.

**TZ:** Will your research have any wider implications for the world's coral reefs?

**CH:** The next stage will be to investigate the connectivity of the Indian Ocean as a whole, taking samples from Indonesia to east Africa to identify the reefs of most importance, in terms of their larvae supply, to the whole region. My role is both ambassador and scientist, and I hope my research will help inform communities and governments how to safeguard their underwater resources.

The last global mass bleaching event of modern history, in 1998, taught us that some corals have the resilience to bounce back, given time. But we must create and enforce safe havens — free of local human pressures — if corals are to stand a chance.

Catherine will be chairing a symposium at ZSL on coral reefs on 14 January 2020, hosting the brightest minds in coral conservation to talk about saving the world's reefs. To find out more visit [zsl.org/whats-on-TZ](https://zsl.org/whats-on-TZ)



**The 2016 Paris Climate Change Agreement is our biggest tool in the fight for corals. Many people are now starting to realise that their everyday actions have an impact, and that gives me hope.**

