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THE ZOOLOGIST





Christian Plowman, Law Enforcement Advisor, ZSL

TACKLING ILLEGAL WILDLIFE TRADE

Building capacity in law enforcement

aw enforcement officers trained by ZSL were recently involved in Cameroon's largest ivory seizure to date. The 400kg of ivory – 216 tusks – was captured in southern Cameroon, near the Dja Biosphere reserve where ZSL runs several programmes, and represents a massive coup for the country's Forestry and Wildlife Department.

However, the impacts of the illegal wildlife trade remain at unprecedented levels; the African elephant death rate has far exceeded births for several years running, tiger numbers have decreased by around 97% globally and more than one million pangolins are estimated to have been taken from the wild in the last decade.

"Law enforcement agencies need to get better at tackling the orchestrators of illegal wildlife crime," says Christian Plowman, ZSL's Law Enforcement Advisor. "The poachers themselves come from impoverished backgrounds and are paid poorly – sometimes in whiskey, rather than cash – and yet it's those people who most often pay the price." Christian compares this to drug traffickers the world over employing children to carry their products to minimise risk to themselves.

Christian joined ZSL in 2016 after a stint in Interpol's Environmental Crime Unit and 16 years as an undercover police officer for London's Metropolitan Police. He remains the only law enforcement officer employed full time by a UK wildlife charity and uses his experience infiltrating criminal organisations to set up an intelligence network and train enforcement officers in some of ZSL's key countries – including Cameroon, Kenya and Benin. He is responsible for training almost 200 officers in anti-wildlife trafficking techniques, including the arresting officer in the Cameroon seizure, and remains on-call to all of them should they need advice.

"ZSL is putting pressure on illegal wildlife trade from a strategic level – including as a key proponent of CITES and an advisor to the UK Government on domestic ivory policy – but we are also supporting law enforcement from the ground up," says Christian. "This means training officers in basics that we often take for granted in the UK – for example, property and technology seizure, DNA collection and crime scene photography.

"It also means developing stronger relationships with the political and legal structures in key countries. This will give the officers on ground the support they need to tackle the powerful networks behind wildlife trafficking." This is exactly what's happening in Kenya, where the Kenya Wildlife Service (KWS) and ZSL are working together to provide officers with the right training from the very start. This includes acting as a conduit between local NGOs and KWS to channel intelligence and supporting KWS rangers in the field with patrol monitoring and vehicle support.

Christian is currently working with conservationists from across ZSL to develop strategies for tackling different issues in wildlife crime, from the illegal arachnid trade to the trafficking of poached rhino horn. Besides conserving iconic species, his work has wider relevance for human society: "If someone is involved in wildlife crime – happy to make money by selling or transporting illegal animal products – they are likely to be involved in other criminal activities."





Prof Ken Norris, Director of Science, Institute of Zoology, ZSL

DEAR FELLOWS

n 1974, there were only four known individual Mauritius kestrels (*Falco punctatus*) left in the wild. Today there are a couple of hundred. Captive breeding and release coupled with intensive management in the field bolstered the remnant wild population's recovery, and helped establish a second population in the wild. In contrast, during the first few years of the 21st century the Yangtze River dolphin (*Lipotes vexillifer*) or baiji went extinct. Not only was a unique species lost, but also the sole surviving representative of an entire family of river dolphins. Considerable efforts had been made to conserve the baiji, but ultimately these failed.

Why do some recovery programmes for endangered species succeed while others fail? In 2016, we published a global assessment of 48 recovery programmes involving mammal species. We found that a recovery programme was more likely to be successful if it had identified and removed the threats to the species involved – not too surprising when you think about it! But, we also found that species were dependent on conservation interventions for longer if they lacked sufficient areas of suitable habitat into which their recovering population could expand.

Rewilding involves restoring whole ecosystems, so that habitats can function naturally with minimal interventions from conservationists. The idea is not just to focus on individual species, but rebuild key ecological relationships between plant and animal communities. Making it possible for a threatened species to recover in a system that better supports it.

You can read more about rewilding on page six, but projects that combine threatened species recovery with rewilding already exist. One of these is Round Island off the north coast of Mauritius. Here, plant communities are being restored through planting, giant tortoises are being reintroduced to graze, browse and disperse seeds, and a suite of endangered reptile species are being released into the new habitats. A very remarkable place!

Rewilding can be controversial, but its conservation benefits are potentially huge. **TZ**

DIARY DATES

8 May 6pm – 7:45pm **Science and Conservation Event:** A new era for shark conservation? Huxley Lecture Theatre, ZSL London Zoo

9 May 12pm – 1pm

Julian Huxley Memorial Lecture: The path to rabies elimination, Medical Sciences Building, UCL

16 May 6pm

Safari in the City Gala, ZSL London Zoo

12 June 6:30pm – 9:30pm **Stamford Raffles Lecture:** Collaborators and con-artists, Huxley Lecture Theatre, ZSL London Zoo

2 – 8 July

Royal Society Summer Science Exhibition, ZSL London Zoo

10 July 6pm – 7:45pm Science and Conservation Event: Wildlife and well-being in urban landscapes Huxley Lecture Theatre, ZSL London Zoo

Find out more at zsl.org/science/whats-on

ON THE TRAIL OF THE SUMATRAN TIGER

Using genetic material to monitor population health

The study of genetics offers an opportunity to monitor animals, like the Sumatran tiger (*Panthera tigris sumatrae*), where other monitoring techniques might fail.

Sumatra is the sixth largest island in the world, but it is also home to the Critically Endangered Sumatran tiger – of which there are an estimated 400 in the wild. "The non-invasive collection and analysis of genetic material (faeces) offers an opportunity to monitor these cats that would be impractical with other methods in such a large space and thinly spread population," says Jinliang Wang, Senior Research Fellow in ZSL's Institute of Zoology.

Jinliang, his collaborator Chris Carbone and their PhD Researcher Tola Smith recently journeyed to the island to collect tiger scats, helped by a team of trackers and sniffer dogs. By analysing the genetic material his team can then draw conclusions about the population density and structure of the species. "If genetic material from one population of tigers is found in the DNA of an individual in another area of Sumatra we know that tigers are successfully migrating between the two habitats. Conversely, when a population is isolated we can see that in their DNA. This can tell us where action is needed and informs conservation policy." A similar process was also used by another of Jinliang's PhD students, David Stanton, to study okapi (Okapia *johnstoni*) populations in the Congo basin.

Genetic material is also helping us understand how climate change might affect certain species. "By sampling and studying individuals from the same lineage we can build up a picture of the inheritance of genetic traits that are passed from parent to offspring most readily, thereby understanding their adaptability to change."

Jinliang has gone on to develop the opensource software Colony, which is now being used by scientists in organisations across the world to reconstruct species pedigrees using marker data. In one example, researchers from Oregon Department of Fish and Wildlife recently used the software to understand the effectiveness of conservation measures put in place to help Chinook salmon (*Oncorhynchus tshawytscha*) circumnavigate dams; by taking genetic samples from individuals above and below the dams researchers used Colony to identify if any salmon previously found downstream were successfully travelling and breeding upstream.

Most recently, scientists from ZSL, University of East Anglia and University College London used the software to develop strategies that might help the UK's common bumblebee (*Bombus terrestris, B. lapidarius and B. pascuorum*) populations. "We took samples from several bumblebee species in a defined area to ascertain how many colonies were present," says Jinliang. "We then introduced a range of measures aimed at improving the environment – for example, planting wild flowers – and then took further genetic samples. If the more colonies were present we knew that the changes were having a positive impact."



Genetic material gives a unique insight into Sumatran tiger (*Panthera tigris sumatrae*) behaviour

OPERATING ON A CRITICALLY ENDANGERED PRIMATE

Western lowland gorilla Effie recovering well from recent operation

eterinarians at ZSL London Zoo recently performed life-saving surgery on a 200lb western lowland gorilla (*Gorilla gorilla gorilla*) during a four-hour operation.

Keepers noticed that 24-year-old Effie, resident of ZSL London Zoo's *Gorilla Kingdom* and mother of two-year-old Gernot, was refusing food and separating herself from other members of the normally very sociable family. After a period of observation ZSL's veterinary team were enlisted to help.

"There is no more important example of the kind of animal vets are here to treat," says Amanda Guthrie, Senior Veterinary Officer. "A female – from a Critically Endangered species – in the prime reproductive period of her life."

"Alongside an internal medicine specialist from Royal Veterinary College, we performed an ultrasound examination. We identified a blockage and decided that the best option would be to operate that same day." After anaesthetising her, Amanda and her team successfully removed eight inches of infected bowel, most likely caused by some food trapped in her digestive system. "Effie has since returned to her family and is recovering well," adds Amanda.

Veterinarians at ZSL are 'general practitioners' in every sense of the phrase – caring for all taxonomic groups and animals ranging from less than one gram to over 3,500kg. "The role requires a 360 degree understanding of healthcare – from preventative medicine, radiology and surgery to dentistry, oncology and parasitology."

Dealing with such a variety of species means that learning is key – as is creativity. "Most veterinary equipment is made for domestic species, like cattle, so we often have to develop new techniques or technology in-house." This, in turn, benefits wildlife in the field. For example, veterinarians at ZSL developed a new, safer way of intubating big cats which is now being used in areas like India's Gir Forest, home to the Endangered Asiatic lion (*Panthera leo persica*). "Ex-situ observation has been incredibly valuable to veterinary science," says Amanda. "We are in a unique position to learn about the physiology of a range of otherwise inaccessible species, and we regularly publish findings or collaborate with in-situ conservationists to improve techniques in the field."

"Zoological medicine is a relatively new specialty, but advances in technology – radiographs, ultrasonography, endoscopy, MRIs, anesthesia and assisted reproduction techniques – mean that we can now provide the same level of care as a human doctor."



A life-saving operation for Effie the western lowland gorilla (Gorilla gorilla gorilla)

SHARK STRANDINGS

ZSL's Cetacean Strandings Investigation Programme expands to include sharks

The team of scientists responsible for investigating whale strandings around the UK's coastline has now expanded its research into the strandings of large-bodied shark species.

Coordinated by scientists from ZSL and funded by Defra and the Devolved Governments of Scotland and Wales, the UK Cetacean Strandings Investigation Programme (CSIP) currently studies stranded whales, dolphins, porpoises, basking sharks and marine turtles. The extended research will now cover species like the Vulnerable porbeagle (*Lamna nasus*) and the Critically Endangered angelshark (*Squatina squatina*).

The CSIP provides a vital source of data for monitoring the various health threats facing these iconic species – from accidental entanglement in fishing gear (by-catch) to the insidious effects of persistent organic pollutants like polychlorinated biphenyls (PCBs). "Research into sharks found stranded around the UK coast has been limited up until now, so we're really excited to be expanding our remit," says Rob Deaville, CSIP Project Manager. "It's crucial that we develop an understanding about the threats facing these iconic marine animals."

"Strandings undergo post-mortem examination, which provides us with valuable information on causes of death, disease, contaminants, reproductive patterns, diet and the general health of the populations living in the seas around our coasts. This gives us useful baseline data to help detect outbreaks of disease or unusual increases in mortality."

The public can report strandings to the CSIP by calling the UK strandings hotline on 0800 6520333.



CSIP will now monitor species like the Critically Endangered angelshark (Squatina squatina) © Michael J Sealey

VITAL FUNDING FOR CAMERA TRAP SYSTEM

Support from players of People's Postcode Lottery funds Instant Detect 2.0

nstant Detect, ZSL's pioneering monitoring tool, will soon be getting an upgrade thanks to new funding from the players of People's Postcode Lottery.

Designed to monitor wildlife in the world's most demanding environments, Instant Detect was first developed in 2013 through the Google Impact Award and employs low power sensors and camera traps. It has been tested in a range of locations, including Kenya, Antarctica and the Chagos Archipelago, and is also used to help tackle poaching by providing an early warning system of illegal human activity to rangers.

Instant Detect 2.0 will see key improvements to the physical capabilities of the hardware, including improved battery life, increased coverage – meaning one communications hub can manage a wider network of sensors – and the addition of acoustic sensors and an intuitive data management tool. ZSL's Conservation Technology Unit are also sourcing more cost effective parts and hoping to reduce the cost by 50%. The product is currently being developed and robust testing is planned in the Parsa and Chitwan National Parks in Nepal, key habitats for the Endangered Bengal tigers (*Panthera tigris tigris*) and Vulnerable greater one-horned rhino (*Rhinoceros unicornis*).

The funding from the players of People's Postcode Lottery, totalling £250,000, will also go towards escalating community-based projects in Cameroon's west coast Douala-Edea Wildlife Reserve and surrounding area. ZSL's Net-Works programme - designed to create sustainable and scalable solutions to reduce marine plastic whilst improving communities' lives – will be expanded from its base at Lake Ossa into neighbouring Lake Tissongo, a crucial habitat for the Vulnerable African manatee (Trichechus senegalensis). Village Savings and Loans Associations, already successful in Cameroon and the Philippines, are being implemented to facilitate net collection and marine conservation while giving families access to vital financial services.



Greater one-horned rhino (Rhinoceros unicornis) found in Nepal.

ZSL JOURNAL CELEBRATES 20TH ANNIVERSARY

hen Animal Conservation was launched by ZSL in 1998 there were 14 journals with 'conservation' in their title, now there are 43 – and *Animal Conservation* is ranked within the top four.

The journal began with the intention to address issues facing specific species and their habitats, and this was reflected in the dominance of papers focussed on individual species in the inaugural issue. However, over the past 20 years, the journal has moved towards broader lessons that can be learnt and applied more holistically. This is both a reflection of our increased ability to apply learnings from one species to others and our shift away from a 'nature for itself' mentality to 'people and nature', emphasising cultural, organisational and governance structures that support positive outcomes for humanity and nature.

The field of conservation has also seen a shift in ownership; in recognition, firstly, that structural issues in academia have limited the recruitment and progression of female researchers and, secondly, that the development of capacity in low- and middle-income countries is paramount for the long-term future of animal conservation in these regions. *Animal Conservation* has reflected this with an increasingly diverse authorship and a commitment to gender and geographic balance.

Looking towards the future, the rate of development of genetic, electronic, computer and data technology is staggering. Animal conservation has entered the age of big data and is increasingly driven by new technology in real-time monitoring and threat intervention. As a result of the significant decreases in animal population size and range, emphasis will likely be placed on restoration and rewilding – novel means of restoring genetic diversity within species, resurrecting extinct species and re-engineering ecosystem processes and ecosystem service delivery.

The current issue of *Animal Conservation* was published in February 2018 and includes papers on invasive mammal eradications on islands and its effect on seabird populations; the causes of colony mortality in bumblebees; and the role of animal learning in developing species restoration plans. ZSL Fellows receive a 60% discount on Animal Conservation, as well as access to other journals and exclusive borrowing rights from the ZSL Library and Archive.

WHERE THE WILD THINGS ARE

S cientists from ZSL will be taking to The Mall in London this summer as part of The Royal Society's prestigious week-long Summer Science Exhibition. Cutting-edge technology is now making it possible to observe, interpret and even predict the behaviour of wildlife in the most remote and challenging environments on earth – and ZSL will be bringing it to life for schoolchildren, families and adult audiences. Visitors can learn about the camera traps that are enabling ZSL's conservationists to study a variety of species in the hard to access forests of South America and South East Asia, how acoustic biotelemetry tracking methods are used to monitor the movement of sharks in the remote waters of the Indian Ocean, why scientists are photographing and mapping areas of previously unexplored sea around Greenland, and how miniature tracking devices attached to migratory sea birds are transforming our understanding of where animals go and why. Robin Freeman, Head of ZSL's Indicators and Assessment Unit, will be at the exhibition and explains how monitoring feeds into global policy on page 8.

The exhibition is free to the public and open from Monday 2 July until Sunday 8 July. Take this opportunity to visit and meet ZSL's experts in person and get hands-on with some of the monitoring equipment that they use. Visit **royalsociety.org** for more details and opening times.

DEVELOPING MONITORING TECHNOLOGY

Conservationists test turtle tags in Principe

U nderstanding how species behave in their natural habitat is the first step to conserving them, and ZSL's team of developers are creating the technology to help us do just that.

Working with the Arribada Initiative, with funding from the Shuttleworth Foundation, ZSL is developing open-source GPS tags for pelagic marine animals. "The GPS tags currently available are very expensive, making it difficult for researchers to fund more than a handful of equipment," says Rachael Kemp, from ZSL's Conservation Technology Unit. "By making both hardware and software open source, and choosing cost effective off-the-shelf components, we have reduced the cost of marine tags 10 fold." This will allow researchers the world over to scale up their research with a greater number of tags and capture more robust data.

Prototype testing of the tags has recently been carried out with the Endangered green sea turtles (*Chelonia mydas*) on Principe, an island approximately 150 miles off the west coast of Africa, with the help of the Principe Trust. On arrival, a base plate is fitted to the chosen turtle using non-toxic epoxy, with the tag and its enclosure fixed to the plate. This means that, after the initial fitting, researchers can replace tags with freshly charged ones without the need for reapplying the epoxy – dubbed the 'pit stop tag'. This minimises the disturbance to the animal at this important point in their life cycle whilst enabling us to collect vital data that will help towards their conservation. "The implications of this technology are massive," says Rachael. "Increasing the scale of data and the speed at which it can be collected will allow researchers to pin-point more accurately the key feeding, breeding and migratory spots of these animals – which in turn will allow NGOs to pressure governments into creating more, and better defined, marine protected areas."

A variant of the GPS tags also has an in-built video camera that captures footage at regular intervals. "We can follow the turtles' journey underwater and study how they interact with their environment and other species, and identify any pollution threats," says Rachael. Green sea turtles are often killed by eating plastic bags, which resemble jellyfish – a staple of their diet. "Crucially, the footage also helps us get the public excited about marine conservation."

The team are now working on developing technology that will cut the 'time to first fix' to less than a second, by using a finely tuned combination of sensors and cutting edge GPS chipsets. GPS satellites are reliant on the animal surfacing to collect location and telemetry data, a rare occurrence for pelagic species, making it vital that the tags communicate with the satellites as quickly as possible before the animal descends.

There will be further testing in Guinea-Bissau, where the team aim to contribute to the Government's decision to create a marine protected area. Once testing is completed, the hope is that the technology can be adapted for other pelagic species. To view the footage from the video tags, visit: zsl.org/blogs/conservation/green-turtles

Researchers fit a green sea turtle (Chelonia mydas) with a 'pit stop tag'





A NEW HOME FOR A CRITICALLY ENDANGERED REPTILE

The gharial (Gavialis gangeticus) is the world's rarest crocodilian

A male gharial (*Gavialis gangeticus*) was recently translocated from Babai River in Bardia National Park, Nepal, to Chitwan National Park as part of a programme to boost populations of the Critically Endangered reptile.

Once numerous across the northern Indian subcontinent, gharials are now confined to the Bardia and Chitwan National Parks in Nepal and Girwa and Chambal rivers in India. Highly specialised fish-hunters and the only surviving member of the *Gavialis* genus, gharial numbers declined dramatically during the 20th century and current estimates put the population at around 300 individuals. Readers of autumn 2017's *The Zoologist* will know that ZSL recently undertook a programme, supported by the Darwin Initiative and UKAid, to halt this decline through the renovation of the gharial conservation breeding centre and development of sustainable fishing programmes in local communities.

"Male gharials normally maintain a community of several females but, on finding that only two males remained in Chitwan National Park to breed with over 166 females, the move was vital for maintaining a healthy breeding population in Chitwan," says Hem Baral, ZSL's Country Manager for Nepal. "Gharial gender is dependent on incubation temperature and it is speculated that falling water levels on river banks where gharials breed, due to anthropogenic disturbances, and the subsequent loss of colder, moist sand could be unbalancing the sex ratio."

Maintaining a breeding population is only half the battle – identifying and removing the threats to the species is crucial to securing the gharial's future. The primary reason for their decline is habitat loss and deterioration due to human expansion. Dammed rivers and household chemicals have caused fish stocks to decline, leading to a shortage of prey, and both the leather industry and local superstition have also led to the gharial being hunted. ZSL is working to mobilise local people as guardians of the gharials and river ecosystem in community-run anti-poaching operations, as well as establish sustainable fishing practices that will allow fish stocks to recover.

And gharial conservation benefits all. "Gharials are an apex predator in Nepal's river systems – the equivalent of tigers in lowland forest or snow leopards in the mountains," adds Hem. "If the gharial is faring well it indicates the rivers' other flora and fauna are also healthy, which benefits local human populations."

RE-THINKING CONSERVATION

Shifting the focus from species to ecosystems

R ewilding poses an exciting opportunity for conservation but must be rooted in better scientific understanding, according to new research from Nathalie Pettorelli, Senior Research Fellow at ZSL's Institute of Zoology.

Rewilding shot to public attention in 2013 with the publication of George Monbiot's *Feral* and appears to offer a promising strategy to enhance biodiversity and ecosystem strength alongside human development. However, the term rewilding has been used by conservationists for decades to describe a variety of projects, from the reintroduction of wolves to Yellowstone National Park in the 1990s to the more recent reintroductions of beavers to the UK.

"The concept has remained largely undefined," says Nathalie, "which means that our first task was to develop an inclusive definition that set rewilding apart from other management actions." The new definition proposed by Nathalie and co-authors points out two peculiarities of rewilding approaches: firstly, rewilding is about the reorganisation of biota and ecosystem processes to set a social-ecological system on a preferred trajectory and, secondly, rewilding is associated with minimal ongoing management of self-sustaining ecosystem processes.

The research then points out that identifying a preferred trajectory and measuring those ecosystem processes needs more research before rewilding can be considered a realistic addition to the conservationist's arsenal. It notes five key areas for further work: trajectory prediction and target setting; risk assessment and the development of a decision framework; cost and benefit assessments; identification of social impacts; and monitoring and evaluation.

Despite the long road ahead, Nathalie believes rewilding could be crucial to the future of conservation. "The extent of global environmental change is now driving some ecosystems beyond their limits, meaning that restoration is no longer an option for these systems. Rewilding offers a fresh perspective on the way forward for conservation of these areas.

"The delivery of rewilding projects is underpinned by the use of existing management actions – ZSL is among many global charities that have undertaken species reintroductions and habitat restoration projects for decades – yet it represents a paradigm shift from focussing on the preservation of individual species to the enhancement of ecosystem health and processes like decomposition, heterotrophic respiration and evapotranspiration."

However, rewilding poses some interesting adaptation challenges to the global and national environmental regulations. "Current legislation is characterised by the preservation of historic conditions and species," says Nathalie. "With environmental change sometimes making these benchmarks unattainable, policy-makers will need to broaden their perceptions of conservation work to include the emergence of novel ecosystems and the introduction of species beyond their original distribution range."



Eurasian beaver (Castor fiber), building a new home in the UK



Some midwife toads (*Alytes obstetricans*) prove resistant to chytrid

LIFE-SAVING BACTERIA

Microbial communities could be key to fighting chytrid

N ew evidence published in *Nature Communications* suggests that susceptibility to the chytrid fungus *Batrachochytrium dendrobatidis (Bd)*, responsible for decimating amphibian populations worldwide, could be influenced by skin bacteria.

"Our study found that the populations of toads proving most resistant to the chytrid pathogen all possessed a skin microbial community distinct to those suffering severe *Bd*-driven declines," says lead author Kieran Bates, PhD student at ZSL's Institute of Zoology and Imperial College London (ICL). "Our next goal is to determine exactly how these skin microbiomes may be protecting the toads, which could open up exciting new possibilities for protecting this and other species from disease," added Kieran.

Conducted in partnership with the Spanish National Research Council and ICL, the study used more than a decade of data collected from midwife toads (*Alytes obstetricans*) in the French and Spanish Pyrenees to investigate why certain populations of this species demonstrated a degree of resistance to *Bd*. The fungus causes chytridiomycosis, which affects the host's skin cells' ability to take in nutrients – of deadly importance to amphibians, who take in water, minerals and, in some species, oxygen through their skin.

In similar findings last year a ZSL-led study indicated that greater bacterial diversity in common frogs (*Rana temporarial*) could lead to higher resistance to the lethal pathogen ranavirus, and research into microbial communities is receiving more attention than ever. "Understanding the links between the microbiome and animal health can help us to tackle a broad range of conservation challenges," says Xavier Harrison, Research Fellow at the Institute.

"There is growing interest in the idea that variation in the gut microbiome could also affect how animals acquire energy and nutrients from food, thereby influencing body condition," says Xavier. ZSL is currently leading a research programme into the links between gut microbiomes and nutritional health in lightbellied brent geese (*Branta bernicla hrota*). "One of the aims is to understand how administering probiotics might improve the health and success of translocated animals."



Mosquito net fishing often targets small-bodied and juvenile fish

NET BENEFITS Is the fight against malaria harming wildlife?

merican sociologist Robert K. Merton is reputed to have first popularised the idea of the law of unintended consequences, following earlier musings by the likes of Adam Smith. In contemporary conservation terms, however, it's hard to imagine a better example of this concept than the routine use of mosquito nets, intended to protect tropical populations from the scourge of malaria, for subsistence fishing in ecologicallysensitive regions. It's also hard to imagine a more politically delicate conservation issue, straddling as it does the ethical confluence of healthcare, wildlife protection and international development.

Recent decades have witnessed an upsurge in the numbers of mosquito nets being distributed across the world's malarial belt by governments, aid agencies and healthcare organisations to great effect; between 2000-2015 incidences of malaria globally dropped by 37%. Anecdotal evidence has long existed about many of these nets being used for fishing instead of their intended purpose, by local populations for whom food and financial survival are often seen as more immediate priorities than avoiding disease, but it's only now that an understanding of the full scale of this practice is emerging.

This has been helped by a study overseen by Rebecca Short, PhD student at ZSL's Institute of Zoology, alongside co-authors from Oxford University and Imperial College London, recently published by the journal *PLOS ONE*. "The aim with this research was to produce a rapid assessment of the extent and characteristics of mosquito net fishing (MNF) across the globe," says Rebecca. "Collecting reliable data on such an unregulated activity was always going to be a challenge, so our approach involved distributing a questionnaire and interviewing a series of expert witnesses living and working in malarial zones around the world."

"The process revealed a number of findings, most significantly that MNF is currently happening at a range of scales across most of the world's tropical latitudes, particularly Sub-Saharan Africa, and is impacting a broad range of marine and freshwater habitats and species in the process.

"The fine gauge of the netting required to keep malaria-carrying mosquitos out is also ideal for keeping tiny juvenile fish and even eggs in – meaning that MNF is undermining the current bases for fisheries management and is thought to pose a threat to the long-term sustainability of these marine and freshwater ecosystems, with obvious potential consequences for food security."

As well as exploring the scale of MNF, the paper also made policy recommendations for how this problem could potentially be mitigated in future, including more effective planning of how nets are both distributed and disposed of.

"The widespread distribution of free mosquito nets is vital to helping humanity fight a disease that threatens around half the planet's population," adds Rebecca. "However, we would like to encourage closer collaboration between the healthcare, development and conservation communities, to find outcomes that benefit marine and freshwater wildlife as much as they do human health."

DEARTH OF DATA SPAWNS UNCERTAINTY OVER AMPHIBIAN EXTINCTION RISK

Two thirds of amphibian species have missing or out-of-date assessments

A team of conservationists, led by ZSL's Curator of Herpetology Benjamin Tapley, is calling for increased efforts to assess the extinction risk of the world's amphibians. A study, recently published in *Biological Conservation*, revealed that IUCN Red List assessments for 61.3% of amphibians are either missing or out of date, potentially hindering conservation efforts targeting those species most in need.

"The last time that we had a near-complete overview of extinction risk in amphibians was over 10 years ago, in 2004, when the IUCN's ground breaking Global Amphibian Assessment was published," says Benjamin. "Since then, more than 1,700 amphibian species have been discovered – but extinction risk assessments haven't kept up."

The authors, including colleagues from the Australian Museum and the Amphibian Specialist Group, call for adequate funding to be dedicated to IUCN Red List assessments for amphibians, greater incentives to exist for people to contribute to the assessment process and for authors describing new species to ensure they include information relevant to extinction risk assessments in published species descriptions.

The lack of assessments was found to be particularly problematic in regions with the richest amphibian diversity – specifically, the tropics. The rapid expansion of human populations in many of these areas is putting extra pressure on newly-discovered species' habitats and putting them particularly at risk. Additionally, newly discovered species – and indeed those yet to be discovered – are most likely to be more at risk than the average, as they tend to have small ranges, meaning they are more vulnerable to localised threats.

This has been highlighted in Benjamin's recent amphibian discoveries in Vietnam. More than 70 new species of amphibian have been described from Vietnam in the past 12 years alone and there are many more awaiting description. Working in the highly biodiverse Hoang Lien National Park, Tapley has been part of a team that has discovered several new species in recent years.

"The most recently described of these species is the red-thighed horned frog, *Megophrys rubrimera*," says Benjamin. "Though new to science, the species is probably highly threatened, as the only forest patches it is known from are extremely degraded and encroached upon by agriculture. It is only through building a better knowledge base around species like this that we can ensure their future survival, otherwise we may discover them only to lose them again."

Visit **zsl.org/blogs** to read Benjamin's account of the discovery.



Monitoring indicates that African hunting dog (Lycaon pictus) breeding might be affected by rising temperatures.



SCIENTISTS' CORNER Q&A with Robin Freeman

We would love to get your feedback. Go to zsl.org/thezoologist to send us your suggestions.

ZSL LET'S WORK FOR WILDLIFE

Robin Freeman is Head of the Indicators and Assessments Unit at ZSL's Institute of Zoology and responsible for the Living Planet Index (LPI), a collaborative database maintained by ZSL and WWF. Training as a computer scientist at Aberdeen before completing a PhD in Zoology, Robin specialises in the development of new technology – both software and hardware – designed to monitor animals in the wild.

TZ: Why is monitoring such an important part of ZSL's work?

RF: Monitoring has two chief purposes. Firstly, it allows us to develop a complex understanding of the ecological needs of individual species – such as the amount of space, habitat features or prey density they require – and plan our conservation efforts in the field more effectively. Secondly, monitoring is vital to government and public engagement. It's hard to engage people with the slow atrophy of nature, especially in the UK where our daily lives are often so far removed from issues of species and habitat decline, and the data provided by monitoring allows conservationists to build a more compelling picture of global trends.

TZ: How do you ensure that the picture you build is accurate?

RF: My team, in collaboration with WWF, maintain the LPI database. It contains the population data of over 4,000 vertebrate species from terrestrial, freshwater and marine habitats and represents the largest database of its kind in the world. This is very time-consuming and involves feeding in data from thousands of journals, online databases and government reports, but we're working on a machine learning tool that will automate the process to some extent. TZ: How does this feed into policy on global issues?

RF: From the database we calculate the LPI, published biennially in the *Living Planet Report*, which functions as a measure of the state of the world's biological diversity based on wildlife population trends. It plays a pivotal role in measuring progress towards the 2020 targets set at the 2010 Convention on Biological Diversity in Aichi. The targets, agreed by 193 nations, include actions that 'take effective and urgent action to halt the loss of biodiversity,' and the LPI offers an insight into how successful these actions have been.

TZ: How do you see the field of wildlife monitoring developing?

AC: Advances in consumer technology have made conservation monitoring more affordable, meaning we're no longer limited to asking 'where is the animal'. A practical example might be my colleague Rosie Woodroffe's recent work with African wild dogs (Lycaon pictus). Using hightech collars, the study found that wild dog packs spend less time hunting on hot days and that pups also have a higher mortality rate in hot weather – an indication of the impact climate change might have. However, I would like to see data being more freely shared. Despite technological advancements there are still holes in the data – particularly in areas of political strife. A lot of useful data is currently held in silos, but ZSL is working to develop stronger bonds with international governments and agencies.

Robin and his team will be exhibiting at this year's Royal Society Summer Exhibition (see page 4) and the Living Planet Report 2018 is due to be published in October.

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Animals and their habitats face increasing threats across the world. Donate to ZSL to help build a future where animals are valued and their conservation assured. ZSL is a registered charity in England and Wales no: 208728





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