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THE ZOOLOGIST

INSIDE:
Hidden tigers,
Long-term studies,
Eaten to extinction

Black-headed nightingale thrush *(Catharus mexicanus)*

Samuel Jones, PhD student, Institute of Zoology, ZSL

THE RACE TO THE TOP

Predicting the impact of climate change on tropical mountain species

WHAT restricts species to certain places? In the 21st century the answer is often the same – humans. The inexorable expansion of human civilisation has driven animals into increasingly smaller pockets of habitat. But, though it may now be rare, what about areas where humans are yet to encroach?

Animals and plants living on tropical mountains tend to be restricted to specific elevations, existing in narrow ranges with little movement up or down the mountain. The prevailing science has often explained this in terms of climate variables, largely temperature; that animals have evolved to thrive within the microclimates of a specific elevation. If climate change causes temperatures to rise this could see species shift upwards to remain within their optimum climate – putting the limited space of upper mountain habitats under increasing pressure and pushing the eventual losers of the ensuing turf war towards extinction. But that logic is still the subject of debate.

ZSL and several collaborators have embarked on a project in the mountains of Honduras to understand more about the factors behind the elevational distribution of species, using tropical birds like the black-headed nightingale thrush (Catharus mexicanus) as case studies. “The birds we are focussing on are abundant and easy to study,” says Sam Jones, PhD student at ZSL’s Institute of Zoology. “With their elevational range already mapped out we can test various theories about what keeps them there.”

To understand if climate is a primary factor, Sam measures the optimum temperature range of the bird’s physiology – calculated by identifying the points at which the bird’s metabolism starts working to lower or raise its body temperature. The range between these two points is known as the thermo-neutral zone. “Early indications are that these birds may have a much higher tolerance for temperature change than we thought,” says Sam. “The thrush’s range of thermoneutrality is wider than the temperature ranges measured within their habitat – meaning climate might not be the only thing limiting their distribution.” Crucially, this means climate change might not be the death knell for some mountain species, as previously thought.

The project is the first to assess the elevational species distributions of tropical birds holistically, by also looking at how interactions with other species and habitat variation at different elevations could be a factor. The birds might be adaptable to mountain climate change but, if the plants and animals they rely on for food and shelter are not, the result is still the same – the birds may need to follow their habitat upwards.

Interactions with other bird species may also be key. “We’re finding that some birds at lower elevations are more aggressive than related species found at higher up the mountain,” says Sam. “It may be that the dominant species secured the best habitats, and less aggressive species have consequently adapted to life at higher elevations.” The research is ongoing, and the hope is that this work in Honduras will also influence species distribution mapping and, subsequently, predictions of climate change’s impact for other animals in similar habitats.

Read more about how climate change could be affecting birds on page five. TZ

ZSL | LET’S WORK FOR WILDLIFE

Prof Ken Norris, Director of Science, ZSL

DEAR FELLOWS

OVER the last few months, ZSL's Directors have been working hard to develop our new strategy – ZSL 200. One of our ambitions is to transform the science we are able to do by creating a Science for Conservation Campus at Regent's Park.

The Institute of Zoology has a distinctive combination of expertise from veterinary and biological sciences. This has enabled our research to take novel and innovative approaches to wildlife conservation, including exploring transboundary issues between the health of wildlife, domestic animals and people. Understanding wildlife health is key to successful conservation and our science has played a leading role in helping to understand the impacts of infectious disease, environmental pollutants and other environmental stressors on wildlife.

We recognise that wildlife conservation has close links with the health of domestic animals, and the health and well-being of people (often termed 'One Health'). Wildlife is a key, but poorly understood, component of disease pathways affecting animal and human health. Many human infectious diseases originate in wild animals and the rate of disease emergence is accelerating. Meanwhile, connections with wildlife can also have an extremely positive impact on human health. Our ambition is to transform the ability of the national and international research base to address these issues. The new campus will provide the facilities to help us do this.

We plan to create the new campus in collaboration with University College London (UCL) and the Royal Veterinary College (RVC). The research centre will be a world leader in One Health, focussing on wildlife health and conservation science. It will be a unique training environment for students and professionals, enabling us to accelerate the translation of research into use to maximise impact and lead public engagement activities around wildlife health.

To make all this happen, we will need significant funding and support from all our staff, students, friends, supporters and collaborators. We are all very much looking forward to this journey! TZ

DIARY DATES

2 Oct 6pm

Giving animals choice: How ZSL's zookeepers are using science to positively impact animal welfare

Huxley Lecture Theatre, ZSL London Zoo

13 Nov 5pm

Annual General Meeting followed by **The Living Planet Report 2018:** Modelling future scenarios for biodiversity

Huxley Lecture Theatre, ZSL London Zoo

22 – 23 Nov

Linking behaviour to populations and communities: How can behavioural ecology inform conservation

Huxley Lecture Theatre, ZSL London Zoo

9 Dec 6pm

Rewilding in a changing climate

Huxley Lecture Theatre, ZSL London Zoo

15 Jan 6pm

Marine plastic pollution: The science story

Huxley Lecture Theatre, ZSL London Zoo

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

HIDDEN TIGERS

The role of indigenous customs in tiger conservation

INDIA'S wildest and least accessible state, Arunachal Pradesh, is a sanctuary for the country's anthropological heritage, providing homes for more than 20 indigenous peoples. New research indicates that these communities could also be contributing to the success of a previously unknown population of tigers.

Land ownership in the state follows local customs of community ownership. The forests – which make up roughly three quarters of the state – are owned by local communities. This, and its remote location bordering the Tibetan plateau – a border still unrecognised by China – has meant there has been little conservation attention.

"Conventional wisdom says that, without the security of a properly enforced protected area, tigers shouldn't survive here," says Sahil Nijhawan, Research Fellow at ZSL's Institute of Zoology. "Despite this, tigers are integral to local folklore and their signs were abundant in the traditional homeland of the Idu Mishmi people."

After witnessing these signs first hand in 2012, Sahil embarked on a PhD that would see him live with the Idu Mishmi tribe for two years, learn their language and work closely with members of the community. His aim was twofold: to monitor the tiger population in the mountainous regions of the north and to understand the cultural relationship between the Idu people and tigers.

By meticulously placing camera traps Sahil has been able to build up a detailed picture of the tigers in the area – a revelation itself. However, of equal importance was understanding Idu Mishmi. "Idu culture places tigers at the centre of their creation story, viewing tigers as their brothers," says Sahil. "Tigers are seen as highly intelligent creatures with the ability to make moral decisions, and are afforded the same burial rites as humans."

There are strict taboos around the killing of tigers, or even the hunting of any large mammal. "For example, if an Idu hunter kills a deer, he is unable to sleep in the same bed as his wife, wash his clothes or use the same kitchen utensils as his family for five days," says Sahil. "My analyses show that the taboos intrinsically encourage sustainable behaviour, benefitting wildlife and negating the need for law enforcement."

"The Idu themselves were also hugely supportive. I worked very closely with them, learning from them about their mountains, and jointly studying the tigers." This inclusive methodology had practical benefits too – while many projects lose up to a quarter of all camera traps to theft or vandalism, only two of the 283 camera traps placed by Sahil and his field assistant were lost.

The project has implications for conservation work in other areas of the world too. "Many cultures have inbuilt mechanisms that protect animals, yet they are rarely articulated," says Sahil. "If we can work with these traditions we can have a profound impact on the long-term success of conservation." Sahil argues that social science should form an integral part of any conservationist's training. TZ

Bengal tiger *(Panthera tigris ssp. tigris)*

25-YEAR PLAN ANNOUNCED FOR PHILIPPINE PANGOLIN

ZSL launches new Philippine pangolin project as concerns rise for the species

THE Philippine pangolin *(Manis culionensis)* – a species endemic to the Palawan faunal region in the Philippines – is at the centre of ZSL's latest conservation project. The project plans to help safeguard this Endangered species over the next 25 years.

Numbers of the species are estimated to have halved over the past 30 years due to poaching for the illegal wildlife trade at local, national and international levels. These factors are being further exacerbated by a loss of habitat from deforestation and agricultural development. Due to the threat posed by international trade, the Philippine pangolin, along with all seven other pangolin species, was moved to Appendix 1 of CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) in 2016, thereby prohibiting international trade in wild-caught pangolins.

Thanks to generous support from the Mohamed bin Zayed Species Conservation Fund and an anonymous donor, phase one of the project is almost complete – pulling in expertise and various stakeholders from across the Philippines to develop the world's first conservation strategy for the Philippine pangolin. Local government, NGOs and communities, as well as international pangolin experts, have been involved in developing the strategy so far.

Phase two, led by ZSL, will involve conducting large-scale community based LEK (local ecological knowledge) surveys, to assess the status of pangolins across existing and candidate protected areas in Palawan province. LEK surveys will help to build a clearer picture of current local beliefs and attitudes towards pangolins – vital for their effective conservation management. The team will also collect data on sighting frequencies, local abundance and levels of poaching at each site. This information will then be used to identify top-priority sites for conservation interventions in Palawan province.

ZSL also plans to pilot a model of site-based protection in at least one of the key sites, working with local stakeholders on the ground from government to local communities to designate a Local Pangolin Conservation Area (LPCA).

The project will also be gathering data regarding trafficking practices and routes, which will be disseminated to anti-trafficking organisation TRAFFIC, CITES and international enforcement agencies. This will help to inform the prioritisation of areas in which to undertake proactive, targeted law enforcement action.

It is hoped that by 2043, populations of the Philippine pangolin will be thriving in suitable habitats as part of fully-functioning ecosystems that benefit biodiversity and local communities. As a flagship species, its biology and ecology will be understood, its threats mitigated, and its conservation prioritised through good governance and empowered stakeholders.

Read more on page seven about a new technique being used to combat the illegal trade of pangolin body parts. TZ

Philippine pangolin *(Manis culionensis)*

Chequered skipper *(Carterocephalus palaemon)*

RESTORING ENGLAND'S NATIVE WILDLIFE

ZSL's vets ensure disease-free reintroduction

WILDLIFE veterinarian Jenny Jaffe – part of ZSL's Disease Risk Analysis and Health Surveillance (DRAHS) team – recently took part in the reintroduction of chequered skipper butterflies *(Carterocephalus palaemon)* to Northamptonshire, England.

Forty-two butterflies were taken from a successful population in Belgium and released into Rockingham Forest, with Jenny on hand to provide disease risk management for the project. The species has been extinct in England since the 1970s due to a reduction of suitable habitat.

"Ensuring the health of both the reintroduced species and those already existing in the area is vital to any successful reintroduction," says Jenny. "The first step of our disease risk analysis, done beforehand, was to identify butterfly diseases found in both areas. Some species of butterflies already move between the two countries. Simply put, this decreases the risk of chequered skippers being exposed to or bringing new diseases in the UK. Our research showed that the overall risk of disease to the success of the translocations was low. However, with so many unknowns, post-release health surveillance is part of any well executed reintroduction."

The Back from the Brink project, a partnership between Natural England, Butterfly Conservation and other charities, has been working to manage the woods in Rockingham Forest in a way that will encourage the growth of the flowers and grasses favoured by the chequered skipper as well as create the sunny areas butterflies like.

Although more of a logistical challenge, the Belgian butterflies were chosen over a dwindling population of chequered skipper in Scotland, because removing several butterflies would be less likely to harm the donor population and the Scottish butterflies feed on a different type of grass to that found in England and Belgium.

On the day of capture Jenny checked each butterfly for visible signs of disease before, stored in cool boxes, the butterflies were driven the 300 miles to the release site. "With a lifespan of only 10 to 14 days as butterflies, it was crucial to get them to Northamptonshire as fresh as possible, and before the females laid eggs."

Volunteers kept an eye on the butterflies – 32 females and 10 males – and they appear to be thriving in their new home, with several surviving for almost two weeks after translocation. If all went well, the females will have laid lots of eggs. ZSL will be regularly monitoring the area and any caterpillars for disease, as well as assisting with more releases over the next two years to build a sustainable population. TZ

TERRA INCOGNITA

Missing maps hamper habitat protection

COMPANIES are failing to accurately disclose where they operate, according to new research into the tropical forestry sector by ZSL's SPOTT (Sustainability Policy Transparency Toolkit) team.

The report, which assessed 50 of the world's largest tropical timber and pulp producers, found that most are failing to publish accurate maps of their operations – suggesting transparency is still a low priority for the majority of companies.

"Last year [2017] was the second worst year on record for tropical tree cover loss," said Chris Eves, ZSL Forestry Officer. "Besides functioning as a home for biodiversity and human communities, tropical forests have been shown to curb climate change by capturing and storing carbon. Their loss only speeds up processes leading to dangerous climate change."

ZSL's SPOTT assessments cover timber and pulp producers in the tropics with combined land holdings of over 350,000km^2, an area the size of Germany. In the latest annual assessments, only eight companies were found to publish comprehensive maps of their forestry operations, while 27 companies disclosed incomplete information. A further 15 companies do not provide any suitable maps of their operations, meaning the location of over 45,000km^2 of forestry operations remains unclear.

"We are encouraging the tropical forestry sector to freely publish digitised maps that allow exact locations of their work to be identified," said Chris. "Certification schemes including the FSC [Forest Stewardship Council] and PEFC [Programme for the Endorsement of Forest Certification] have a vital role to play in ensuring forest products are sustainably sourced, but to date they aren't doing enough to encourage the publication of spatial data that would allow third party monitoring of forest areas."

"We want to work closely with businesses in commodities sectors that pose a high risk to biodiversity and develop relationships that support the delivery of best practices on the ground. Successful engagement with business is important to the success of ZSL's field programmes in areas like Cameroon and Indonesia."

As the only forestry sector assessment of its kind, SPOTT scores companies against over 100 environmental, social and governance (ESG) indicators that measure company transparency. With investors increasingly aware of ESG issues, the SPOTT team hope that their work will support investment in more sustainable commodity production. "Investing in companies engaged in unsustainable activities leaves investors open to financial and reputational risks," says Chris. "By using the information generated by SPOTT, investors can better screen the companies in their portfolios for risks and support more sustainable practices."

Issues covered by the assessments include biodiversity conservation, greenhouse gas emissions, land conflicts and labour rights. The 2018 results emphasise the pressing need for improved transparency across the board: on average, forestry companies scored just 31%, while over a third of companies assessed lack a full commitment to conserve biodiversity. TZ

Chacma baboon *(Papio ursinus)* troop relaxing

BENEFITS OF LONG-TERM FIELD STUDIES

Lessons learnt from following baboons

LONG-TERM datasets are the gold standard for scientists, particularly as those returning from a season in the field reflect on robust datasets, replicated studies and whether their sample size was large enough. So, other than being statistically viable, why are long-term field studies important? In one such study, researchers at ZSL have been studying wild Chacma baboons *(Papio ursinus)* for over 18 years. Guy Cowlishaw, Senior Research Fellow at ZSL's Tsaobis Baboon Project, explains all.

"Studying animals in the wild over long periods allows us to look at how their natural environment changes over time, and how this impacts their behavioural, social or genetic patterns," says Guy. "And, although baboons are not Endangered, they are the perfect model species for how more threatened primates may respond to environmental change or human-wildlife conflict, and for improving our understanding of the social dynamics of other long-lived species."

"When I first started work as a PhD student at our Tsaobis field site on the edge of the Namib Desert in Namibia, back in 1990, there were luxuriant woodlands growing along the banks of the ephemeral Swakop River. They were important for a variety of life in the desert – including the baboons. Over the years, the Swakop's seasonal flows dried up, causing many trees to die and impacting the wildlife that relied upon them. Through our long-term research, we have been able to monitor and study why events like this occur, the consequences of them and the effects of environmental change not only on baboons, but the whole ecosystem.

"One year, during a particularly tough drought, all of our adult males died. We expected that the young would be the most vulnerable to a situation like this but, on this occasion, it was our big males. Why? We think it was a simple case of their larger body mass requiring greater amounts of food, leading to death from malnutrition. One unexpected outcome was that one young male began to climb the non-existent ranks and take control of the females in the group, including his own relatives.

"This was an obscure finding – that major social disruption in primate troops after a massive loss of males could lead to problems with inbreeding – and only possible through long-term observation. We have since found that such inbreeding further increases susceptibility to gut parasites, with potential impacts on reproduction and survival. Such information is invaluable to conservationists, as droughts become more frequent due to global climate change.

"Primates are naturally long-lived animals, so it's quite common to find that they are threatened species; reproducing more slowly and being rarer makes them more vulnerable. To understand the biology and ecology of primates, long-term field studies are the only way. Studying them for two or three years just isn't enough."

Behavioural ecology and evolutionary biology are essential parts of ZSL's Institute of Zoology's work, producing ground-breaking research that supports its applied conservation. To find out more about the Tsaobis Baboon Project or to become a field volunteer visit: **zsl.org/baboons** TZ

EATEN TO EXTINCTION

Disease threatens iconic amphibian's survival

DRIVEN to the edge of extinction by over-exploitation for food, Chinese giant salamanders are now threatened by epidemic disease caused by poorly-regulated commercial farming.

Long considered a delicacy in southern China, populations of the Critically Endangered Chinese giant salamander *(Andrias davidianus)* have declined by 80% due to over-exploitation and habitat loss. Recent research by ZSL indicates the species has all but disappeared from it's traditional freshwater habitat. With wild populations no longer able to sustain demand and local governments keen to diversify the rural economy, the species is now largely restricted to commercial farms. However, inadequate farm management and husbandry has seen outbreaks of disease that could cross over into their wild counterparts.

In a survey of 43 such farms conducted by ZSL in Shaanxi Province – a hub of Chinese giant salamander farming – 39 reported signs of ranavirosis, a lethal disease that can cause up to 100% mortality of amphibian populations.

"The industrial-scale farming, high stocking densities, and trade in animals across China in the absence of biosecurity measures has led to the spread of infectious disease," says Andrew Cunningham, ZSL's Deputy Director of Science. Since its emergence in 2009 ranavirus infections of Chinese giant salamanders have occurred most years on farms in Shaanxi Province and most likely elsewhere in China, too.

In addition to causing devastating mortality of farmed salamanders, the disease could cross over into their wild counterparts. "Water is pumped between enclosures – even farms – before being discharged, untreated, directly into rivers or streams," says Andrew. "Large amounts of ranavirus are released into the environment, including directly into typical Chinese giant salamander habitat."

To complicate matters further, ZSL scientists working with the Kunming Institute of Zoology and others have shown that the Chinese giant salamander, previously thought to represent a single species, actually consists of at least five distinct genetic lineages – some of which are now exceedingly rare and possibly already extinct in the wild. These lineages, which have likely evolved in separate watersheds over millions of years, are indistinguishable to the naked eye and are mixed on farms and traded across China, leading to hybridisation and loss of genetic integrity.

The Chinese government sponsors the release of farm-bred salamanders into the wild as a conservation measure. In light of the results of our research, ZSL is calling for this practice to be reviewed as it could actually increase risks to any existing wild animals. "When salamanders are released from farms there is no pre-release assessment of their health or origin," says Andrew. "The risk of spreading disease is high, as is the potential for genetic pollution of the distinct Chinese giant salamander populations."

Even before our research on the Chinese giant salamander began, ZSL's EDGE of Existence programme ranked the species as the second most evolutionarily distinct and globally endangered amphibian in the world, and the one in most need of conservation attention. Protecting what is now known to be these iconic species while navigating cultural sensitivities is not without its challenges; it requires engagement with stakeholders at government, business and community levels. TZ

Chinese giant salamander *(Andrias davidianus)*

Pink-footed geese *(Anser brachyrhynchus)*

HOW FAST IS TOO FAST?

Population declines of mammals and birds linked to rapid warming of climate

NEW research has revealed that the rate at which our planet is warming is a critical factor in explaining the decline of bird and mammal species across the globe.

In a study led by ZSL's Institute of Zoology, scientists analysed populations of 481 species of birds and mammals from across the globe to investigate how the rate of climate change is linked to population decline. The study indicated that the rate at which our climate is warming is the best explanation for the observed rate of population declines.

"If the rate at which the climate warms exceeds the ability of a species' to adapt we will start to see local extinctions on a large scale," says Fiona Spooner, lead author and PhD student. "There have been other studies looking at populations of animals in North America and Europe, where data is most easily available, but this is the first global study on the effects of climate change on bird and mammal populations."

Birds were the worst affected by rapid climate warming, with effects being twice as strong in birds over mammals, as well as populations located outside of protected areas being more severely impacted. Species particularly affected include the black-tailed godwit *(Limosa limosa)* in Germany and Senegal, pink-footed geese *(Anser brachyrhynchus)* and burrowing owls *(Athene cunicularia)* in Canada and corncrakes *(Crex crex)* in Central Europe.

"We think birds might be worse off because their breeding seasons are particularly sensitive to temperature changes," said Fiona. "This could be leading to a desynchronisation of their reproduction cycle and the negative impacts we're seeing. Mammal breeding seasons are a lot more flexible, and this is reflected in the data."

The report stresses the urgency of understanding the vulnerability of animals to temperature increases and how rapid warming translates into population declines. "Higher temperatures could mean that food availability is peaking earlier than usual, something that would normally coincide with the breeding season, says Fiona. "Or it might mean that warmer temperatures are causing species to shift their ranges to areas where food or appropriate habitat are less available."

Importantly, the report also highlights the need for the UK Government to meet the UN's Sustainable Development Goals and provides a snapshot of what may come to pass if climate change doesn't slow. "If we continue business-as-usual the current rate of warming will be devastating for wildlife," says Fiona. TZ

A PERFECT STORM

Threats beset the European eel from all sides

THE European eel *(Anguilla anguilla)* is still under threat, despite an international trade ban – a ban that may be pushing other eel species towards the same fate – according to research led by ZSL's Aquatic Species and Policy Programme Manager Matt Gollock.

Anguillid eels – particularly the Japanese eel – are prized in east Asian cuisine and, due to a range of threats, many species have seen a decline in abundance over the past 30-40 years. The European eel is arguably the anguillid at greatest risk and is presently listed as Critically Endangered on the IUCN Red List. Unsustainable fisheries pose one of the most manageable threats so, in 2007, the European eel was listed in Appendix 2 of CITES (Convention on International Trade in Endangered Species). This meant all international trade has to be proven to be sustainable.

"The EU stated it wasn't able to prove trade was sustainable and implemented a ban on trade in European eels from member states," says Matt Gollock, ZSL's chair of the IUCN's Anguillid Eel Specialist Group. "However, as a result, we've seen an increase in European eel fisheries in places like North Africa, where management is not as well developed."

Despite the international ban, it remains legal to catch and sell eels at a national level, and EU countries are free to trade with each other. "There has been little co-ordination of fisheries management to meet the demand in the EU, and some countries are still catching as many as they did before the ban," adds Matt. "It's estimated that as much as 40% of eel catches remain untraceable, and they may well find their way into the illegal trade which is believed to supply East Asian demand."

The ban is also having a knock-on effect on other species, such as the American and short-fin eels, the latter found in South East Asia. "Fishers in rural communities are suddenly able to make thousands of pounds for just a kilogram of glass eels – several times their annual salary." Glass eels – the anguillid eels' juvenile form – are then shipped in their millions to farms in East Asia where they can be grown and sold into the food trade. The eels' complex breeding cycle make it near-impossible to breed them in captivity, meaning the trade is reliant on wild-caught animals.

Matt and his team are working with fishing communities in the Philippines to implement sustainable practices, and he regularly visits Japan to establish diplomatic ties with Japanese stakeholders in industry, government and science. Sadly, fishing is just the tip of the iceberg.

The eel's life cycle takes it on one of the largest migrations in the world, exposing it to many different threats. Born in open ocean, the larvae grow to become tiny glass eels that migrate into coastal waters and up-river to grow. "Dams can block their access on the way up, and the turbines in the hydropower stations can often kill or damage them on the way back to the sea as

European eel *(Anguilla anguilla)*

adults," says Matt. "Changing water currents and plankton levels in oceans, all of which the eel relies on for its migration, and rising pollution in both marine and freshwater systems are making the journey harder every year."

One of the hardiest marine animals on the planet – able to move on land between water sources, dive to depths of 1,000 meters, live in almost oxygen-devoid water and migrate between fresh and saltwater – the anguillid eel is exposed to a huge range of threats. In 2018 Matt and the rest of the IUCN Specialist Group will be carrying out a Red List assessment of all 16 species of anguillid eel to better understand the scale of the problem and prioritise conservation action. TZ

Mediterranean monk seal *(Monachus monachus)*

SAVING THE WORLD'S MOST THREATENED SEAL

Giving Mediterranean monk seals a fighting chance

THE Endangered Mediterranean monk seal *(Monachus monachus)* is often regarded as one of the world's most endangered marine mammals, and ZSL is working on the ground to ensure its survival.

Revered by ancient Greeks as good omens and even featured on coins from 500BC, the Mediterranean monk seal also has the unlucky claim of being the first European mammal to make our EDGE of Existence list as both evolutionarily distinct and globally endangered. Historically abundant across the Mediterranean, the species has been reduced to around 700 individuals because overfishing, hunting and coastal developments have taken vital habitat. EDGE Fellow Ezgi Saydam is working in Turkey, a stronghold for around 100 seals, to secure their future.

"To save the Mediterranean monk seal is to save the Mediterranean itself," says Ezgi. "As apex predators they are vital for maintaining a healthy ecosystem." Ezgi was first captured by the seal's intelligent and curious nature when she volunteered with a local Turkish charity for orphaned monk seal pups, and has worked on their behalf ever since. In 2016 ZSL chose to support her work through the EDGE Fellowship programme.

Ezgi observed that the seals, who previously used pebble beaches to breed and rest, have retreated to pupping in a series of coastal caves, where juveniles remain – reliant on their mothers – for up to four months. "We have set up camera traps in four caves across the seal's range. We want to better understand how the seals are using these caves and, long term, establish core protection zones with the help of the Turkish Government."

The Gokova Species Environmental Protection Area, a 1,098km^2 area encompassing the seal's range along Turkey's coast, contains six no take zones where fishing is entirely banned. However, illegal fishing is still rife. "The fishers are the hardest group to get on side," says Ezgi, "but the reality is that no take zones benefit everyone. The fish are given the opportunity to develop and breed, in turn ensuring more food for the seals and larger catches for fishers." Fishers in the area have seen their monthly income increase since 2013 as a result.

Ezgi is also working with local communities to raise awareness for the Mediterranean monk seal's plight. Earlier this year she organised a monk seal festival in Marmaris, with a photography exhibition, music, workshops and a play. Over 300 children attended, accompanied by their parents. "If we can inspire the next generation to care about the monk seal, perhaps we can ensure their survival." TZ

Asian elephants *(Elephas maximus)*

LIVING IN HARMONY

Coexistence with Thailand's giants proves challenging

REDUCING human-wildlife conflict and improving the relationships between Thai communities and neighbouring elephant herds requires drastic improvement of forest connectivity in Thailand's forests.

Habitat destruction and fragmentation are known to have an array of devastating consequences for wild populations of animals in Thailand. One of them is the increased occurrence of wild animals encountering human settlements, as the area of suitable habitat they occupy becomes increasingly smaller and restrictive. These occasions of wildlife contact with humankind can result in crop raiding, property damage, injury and even death, fuelling strong negative associations between communities of people and the wild animals that live close by. Conflict between wildlife and Thai people has now entered the national agenda and become a top priority for both government and conservation organisations alike.

ZSL works closely with one species that is particularly impacted by human-wildlife conflict, the Asian elephant *(Elephas maximus)*. Focusing on the southeastern area of the Western Forest Conservation Complex (WEFCOM), situated close to the Myanmar border, WEFCOM contains approximately 30% of all Thailand's elephants, and is regarded as a crucial habitat stronghold for the species. Historically, the approach to preventing elephant-human conflict has been to erect large fences, which are often unsuccessful and costly to maintain. ZSL hopes to revolutionise the way in which Thai settlements mitigate human-wildlife conflict by going to the source of the problem.

Increasing forest connectivity between areas of high and low human density through man-made forest corridors is one avenue ZSL is currently pursuing. "The southern habitat of WEFCOM is experiencing higher levels of human-wildlife conflict than the northern areas," said Kritsana Kaewplang, ZSL's Country Manager for Thailand. "By facilitating elephant dispersal, we hope to reduce this conflict significantly. A dam built in the area 50 years ago has constricted the available habitat suitable for elephants. By making the northern habitats such as Srisawat and Chaloem more favourable through improved land management and water availability, we can encourage elephant groups towards these areas and away from people's homes."

The crops harvested by farmers in these local settlements are mainly sugar cane, cassava, animal corn and fruits, which Asian elephants will eat as an alternative food source when displaced from their own habitat. "We are training local communities to measure crop damage and working with them to explore alternative crop types that are less suitable for elephant consumption," says Kritsana.

Currently, elephants are driven off usually through shouting and chasing. "This is stressful and dangerous for both the animal and the community, so we've developed early-warning, motion-triggered camera systems," says Kritsana. "These alert settlements of encroaching elephants earlier so safer deterrence methods can be implemented with minimal stress." ZSL is also working with communities on recognising the individuals in the herd, and how they behave, to make sure the right method of deterrence is carried out. Community outreach initiatives aim to inform, empower and educate local people on conflict mitigation techniques and ultimately develop a human-wildlife conflict resolution model that can be replicated in other landscapes and for other species. TZ

OFF THE SCALE

Fingerprinting techniques used to battle pangolin poaching

FORENSIC fingerprinting techniques will now be used in the battle against illegal wildlife trade as new methods of lifting fingermarks from trafficked animals are developed.

In a collaboration between ZSL and Portsmouth University, with support from the UK Border Force, the technology is poised to help protect one particular animal – the pangolin.

Also known as scaly anteaters because of their appearance, pangolins are found throughout Asia and Africa, but their numbers are dwindling as a result of poaching for international trade.

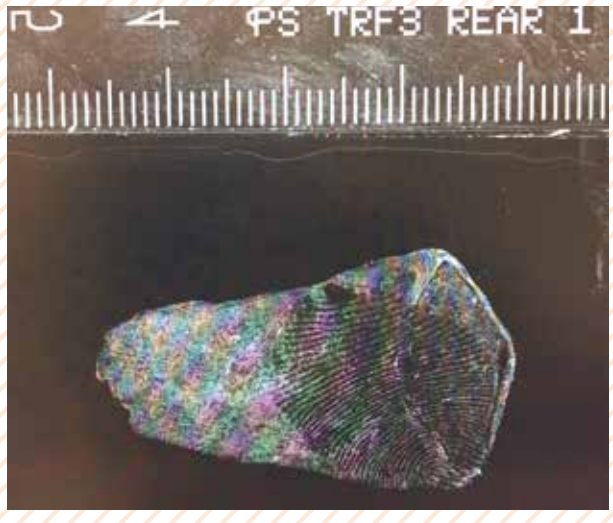
Around 300 pangolins are poached every day, making these unusual animals the most illegally trafficked mammals in the world. Their meat is considered a delicacy in China and Vietnam, while their scales are used in traditional Asian medicine. They are also used in traditional African bush medicine. All trade in pangolin meat and scales is currently outlawed under the international CITES (Convention on International Trade in Endangered Species) agreement.

The new method uses gelatine lifters with a low-adhesive gelatine layer on one side, which are used universally by forensic practitioners for lifting footwear marks, fingermarks and trace materials off various objects in criminal investigations.

In a preliminary trial, the researchers tested the usability of gelatine lifters for visualising finger marks on pangolin scales. Using 10 pangolin scales from several species, supplied by Grant Miller and Tim Luffman of UK Border Force, each scale was gripped by five participants. A gelatine lifter was applied to the scale, removed and scanned using a BVDA GLScanner system which provided 100 fingermarks (one from the front and one from the back of the scales).

The fingermarks were then graded for the presence of ridge detail on the University's BVDA gel imaging scanner and 89 per cent of the visualised gelatine lifts examined produced clear ridge detail. This means that law enforcement agencies will, potentially, be able to use the mark to identify persons of interest who have come into contact with the scale.

For more information on ZSL's work with pangolins please visit **zsl.org/saving-pangolins** TZ



Fingerprint on a pangolin scale
© Jac Reed, Portsmouth University

Cheetahs *(Acinonyx jubatus)* need larger areas to roam than other large predators

Sarah Durant, Senior Research Fellow, Institute of Zoology, ZSL

SCIENTISTS' CORNER

Q&A with Sarah Durant

DR Sarah Durant is a Senior Research Fellow at ZSL's Institute of Zoology. She leads the Serengeti Cheetah Project (SCP), the world's longest study of wild cheetah, and the Range Wide Conservation Programme for Cheetah and African Wild Dogs.

TZ: Why is the SCP so important?

SD: It has taught us much of what we know about wild cheetahs today. By following the lives of individual cheetahs in the Serengeti National Park, home to the world's largest remaining cheetah population, we've demonstrated that cheetah live at very low densities compared to other predators. They are known as 'fugitive' predators – constantly on the move, living on the margins between communities of larger predators – and often lose cubs or kills to lions and hyena. We have shown that competing predators are as much a factor in determining cheetah behaviour as their prey.

TZ: Large predator numbers are declining on a global scale – why are cheetahs particularly at risk?

SD: Today, there are only 7,000 cheetahs left in the wild, grouped into 33 populations across just 9% of their historic range. Cheetahs may cover more than 1,000km^2 a year to avoid competitors and find sufficient prey, which means that the protected areas that go some way to conserving other species are often not enough for cheetahs. In fact, two-thirds of cheetah live outside protected areas, where they sadly suffer even more due to the impacts of people. With bushmeat trade rampant and habitats being lost to agriculture, the land available to cheetah is dwindling. With the human population set to double by 2050 in Africa, home to most of the remaining cheetah population, the challenges for cheetahs are only going to intensify.

TZ: If protected areas alone cannot save cheetah, how can we adapt our approach?

SD: Cheetahs aren't going to change their behaviour, so we're looking at ways of bridging the gaps between existing protected areas by fostering coexistence between humans and cheetahs. Historically, conservation has tended to separate humans and wildlife but, if we can help diversify livelihoods and develop opportunities for more wildlife-based enterprises – including in areas that can't rely on wildlife tourism – it will give communities a reason to conserve their local wildlife. Secondly, engaging the private sector is key. Charismatic wildlife appear in 20% of the advertisements we see, which demonstrates their global appeal, but belies the dire circumstances facing the species seen on our televisions every day. In response to this the UN recently set up The Lion's Share, an initiative encouraging advertisers to pledge 0.5% of the media spend to conservation projects. I would love to see more novel initiatives like this.

TZ: What does the future hold for the cheetah?

SD: In 2007 ZSL, together with WCS, helped set up the Range Wide Conservation Programme for Cheetah and African Wild Dogs (another wide-roaming hunter). We're now actively working with 18 African countries – home to 97% of cheetah's African distributional range – to safeguard the remaining populations. We are currently focused on the protection of four large, transboundary landscapes spanning 11 of those countries. This includes implementing wildlife corridors to increase connectivity between isolated cheetah populations. The work requires establishing and maintaining good relationships with government wildlife authorities and working closely, together with partners, with local communities to develop more sustainable livelihoods. Cheetahs are extremely resilient – they survive in the Sahara – one of the most extreme environments on earth – at a density of just one per 4,000km^2 – so, if we can find ways for communities and cheetahs to prosper together, they will survive. TZ

We would love to get your feedback.

Go to zsl.org/thezoologist to send us your suggestions.

> **"With the human population set to double by 2050 in Africa, home to most of the remaining cheetah population, the challenges for cheetahs are only going to intensify."**