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WELCOME

Bristol Zoological Society is a conservation and education charity that runs two visitor attractions: Bristol Zoo Gardens and the Wild Place Project. The Society’s conservation primacy is strongly embedded in its charitable objects, vision and mission. Our BZS Institute of Conservation Science and Learning (ICSL) runs a number of very impactful field conservation projects here in the UK and in different habitat countries worldwide, achieving great conservation outcomes. Our two zoos are at the heart of our conservation and education mission and complement the work of ICSL through engaging more than 700,000 guests each year with the natural world and promoting positive behaviour change towards more wildlife-friendly actions.

Our Conservation Annual Review for 2016 again highlights some of the excellent work of the four departments that make up Bristol Zoological Society’s Conservation Directorate: Field Conservation & Science; Veterinary Services & Conservation Medicine; Animals & Conservation Breeding; and Conservation Learning. It covers a broad range of activities and achievements, including the successful rearing of six Lord Howe Island stick insects to adulthood and egg deposition, encouraging our guests to make knots in discarded netting for the benefit of wildlife, biomedical evaluation of a wild population of Sahamalaza sportive lemurs in northwest Madagascar, and evaluating enrichment methods for our animals at Bristol Zoo and the Wild Place Project.

The spotlight of this year’s Conservation Annual Review is on our conservation work here in the UK, mainly in Bristol and the South West of England. With all the exotic species of animals and plants in our two collections, and all the exciting work that we are doing in faraway places like Madagascar, Cameroon and the Philippines, our very successful native species programme may sometimes not get the attention that it deserves. I would thus invite you to learn more about our silky wave moth surveys, our breeding and release programme for white-clawed crayfish, our Avon Invasive Weeds Project and our long-standing work in the Avon Gorge and Downs. We have also included a report on our innovative Bristol Community Plant Project, the first ever dispersed National Plant Collection, and the first ever such collection for an annual plant.

My personal conservation highlight of 2016 was the launch of the 5-year IUCN SOS funding programme to implement the IUCN Lemur Conservation Strategy 2013–2016, which was made possible by the generous support from a private Geneva-based foundation. The Madagascar Section of the IUCN SSC Primate Specialist Group, which I chair, will be working jointly with the SOS Fund on this programme, and we are hopeful that it will deliver a step change for the conservation of the most threatened lemur species.

You will find more detail on this, and a lot more, on the following pages. Enjoy!

Dr. Christoph Schwitzer
Director of Conservation
Bristol Zoological Society
Baby gorilla born via rare caesarean section thrives at Bristol Zoo

In February 2016, Bristol Zoo mammal keepers began hand-rearing an infant Western lowland gorilla (*Gorilla gorilla*) after her mother, Kera, fell ill with pre-eclampsia in the late stages of pregnancy and required an emergency caesarean section. Kera suffered complications following surgery and was too ill to care for her infant. When Kera’s condition improved, she showed no signs of maternal interest, by which time the infant, Afia, was 12 weeks old.

In order to reduce human imprinting and increase the chances of Afia gaining sufficient social skills, keepers planned an early reintroduction into her family group before her first birthday. But they needed to find a surrogate mother for little Afia within the group.

At eight months old, Afia was successfully introduced to Romina, an experienced female who readily took on the role. Within two months, the pair had been reintroduced back to the whole group. They are now all living together full-time. Keepers still provide Afia with milk feeds, but in all other ways she receives her care, development and nurturing from her own kind.

Rare okapi births at the Wild Place Project

Wild Place Project had a fantastic 2016 with the birth of 2 female okapi (*Okapia johnstoni*). This is the first time in 37 years that Bristol Zoological Society has had 2 okapi born in a single year, and they are a vital addition to the European Endangered Species Programme (EEP). The calves, Ruby, named after the late Rubani (her father), and Kimosi, which means Monday in Kikongo (the language spoken by local, forest-living people in the Democratic Republic of Congo, the Republic of Congo and Angola), are both doing well, as are their mothers, Kibibi and Lodja. Keepers have been working closely with both calves and have already started hoofcare training with them. It is important for all of our okapi to be comfortable and relaxed in the presence of keepers, so that we can offer the best level of husbandry possible. BZS has a long history with okapi and in 1963, were the first in the UK to breed them.
NEWS

BZS coordinates IUCN workshop on African primate red listing

An African Primates Red Listing Workshop took place at Sapienza University in Rome from April 18th to 23rd. The purpose of the workshop was to update the International Union for Conservation of Nature’s (IUCN) Red List of Threatened Primate Species. It was primarily organised by BZS staff Torsten Wronske and Alison Cotton. Christoph Schwitzer (who is also the IUCN Primate Red List Authority Coordinator), Gráinne McCabe and over 40 other African primate experts gathered to reassess the conservation status of 180 African monkey and prosimian species. The workshop was very productive, with over 55% of all African primate species now classified in one of the ‘Threatened’ categories (Critically Endangered, Endangered or Vulnerable).

Panel discussion: animals and people: is coexistence possible?

On 24 May 2016, BZS lecturer Amanda Webber held a panel session at Bristol Zoo, examining the theme ‘Animals and People: is coexistence possible?’ Over 70 people attended to listen to talks and a discussion by Kate Hill (Oxford Brookes University), Matthew McLennan (Bulindi Chimpanzee and Community Project), Ed van Klink (University of Bristol Vet School), Julia Newth (Wildfowl and Wetlands Trust) and Lydia Tiller (DICE, University of Kent). The speakers talked of their own experiences which included conserving chimpanzees in human-dominated environments in Uganda, working with farmers to reduce lead shot use in UK, and the disease interface between wildlife and people globally. The debates and discussions continued over a drinks reception. The session was part of the University of Bristol’s Institute for Advanced Studies ‘Animals: Non-Human and Human Alike’ season, which ran for two weeks and involved the Departments of History, English, and Music, amongst others.
The arrival of gelada baboons at the Wild Place Project

The gelada (*Theropithecus gelada*) were an exciting addition to the Wild Place collection in 2016. A bachelor group of 6 males arrived from Zurich Zoo in the early hours of 31st July and have been a big hit with both staff and guests. Kito, Kadame, Hector, Hobbit, Hercules and Harshit have settled in well and have taken great pleasure in cropping all of the grass in their enclosure, shuffling around on their bottoms and chatting constantly. They are generally a very harmonious group who initially associated in pairs as is common and now spend time in two groups of three. Keepers have been working hard to provide the gelada with opportunities to display natural behavior, and they have relished using enrichment devices such as “peely-sticks”, fire hose hammocks, and pumpkins filled with treats.

8th Annual BZS Symposium – Technology and Innovation for Conservation

In February 2016, the 8th Annual BZS Symposium focused on how technology and innovative ideas can be harnessed for conservation. Presentations started with a keynote speaker, Peter Barham, who has tested non-invasive technology for individual recognition monitoring on the penguin colony at Bristol Zoo. Richard Sherley gave an update on what information can be gained from tracking juvenile penguins. Novel food sources were described by Mark Steer (University of the West of England), and Chris Chuck (University of Bath) discussed growing foods in the laboratory. Different technologies were explored by Natasha De Vere (Botanic Garden of Wales), Marc Holderied (University of Bristol) and Alex Piel (Liverpool John Moores University), ranging from DNA barcoding to acoustic monitoring. Serge Wich (Liverpool John Moores University) and David Bird (University of the West of England) illustrated the various uses of drones for monitoring animals and plants.

The talks were followed by a poster and drinks reception in the Conservation Education Centre. This was a great way to conclude an interesting and stimulating day with staff, external guests and students!
Bristol Zoological Society continued to deliver to a number of undergraduate and postgraduate degrees in 2016, in partnership with the University of Bristol, the University of the West of England, the University of Gloucestershire, and South Gloucestershire and Stroud College. Over 250 students were taught on site by our field conservation and science, conservation learning and conservation medicine staff.

Undergraduate Degrees

**Foundation Degree in Integrated Wildlife Conservation**

*Partners: University of the West of England*

FdSc Integrated Wildlife Conservation (IWC) has been running since 2010. This programme adopts a biological approach to the study of wildlife conservation issues, developing a scientific understanding of our relationship with, and impact on, wildlife. Appealing to students interested in a career in conservation who may not have considered a university education, the Foundation degree provides a recognised qualification in wildlife conservation after two years, and provides a direct route to Level 3 of BSc (Hons) Integrated Wildlife Conservation at UWE. Students are taught on site at Bristol Zoo Gardens for the two-year programme. Sixteen students enrolled in year one of this course in 2016, with 21 students completing their second year.

**Foundation Degree in Zoological Management**

*Partners: University of Gloucestershire and South Gloucestershire and Stroud College*

FdSc Zoological Management has been designed specifically to develop our student's knowledge of the health, welfare and husbandry needs of species held within animal collections. It equips graduates with the practical skills required for a career in zoological management. The course takes a holistic approach to the study of animal management and is underpinned by a sound understanding of relevant biological principles, and the procedures and legislation related to housing and breeding captive animals. The programme introduces methods of rehabilitating animals, and encourages students to critically assess captive environments and identify areas for improvement, based on behaviour and welfare needs. This two-year Foundation Science Degree is delivered entirely at Bristol Zoo Gardens. This year marked the first time the second year had been run for this degree, after it was started in 2015. The intake for the first year in 2016 was 29 students, up from 14 students in 2015.
BSc (Hons) Wildlife Ecology and Conservation Science

Partner: University of the West of England

Tackling the effects of environmental change and avoiding the mass extinction of species are enormous global challenges. Designed for biologists and ecologists with specific interests in species and habitat conservation, this degree equips students with the scientific knowledge and skills to understand the nature of global biodiversity, the effects of climate change, as well as current and novel scientific approaches to conserving wildlife. Our staff lead three modules – Wildlife and Society (first year), Conservation in Practice (second year) and Primate Ecology and Conservation (third year), along with research project supervision of third year students. First and second year intakes in September 2016 were 64 and 42 students, respectively, and 50 students enrolled for the Primate Ecology and Conservation module.

Postgraduate Degrees

MSc Global Wildlife Health and Conservation

Partner: University of Bristol

This innovative programme aims to give students the knowledge, skills and practical training needed to work with wildlife, with special emphasis on its health and conservation at the global scale. Students take classes both at Bristol Zoo and Langford Veterinary School. Cutting-edge topics include animal capture and handling techniques, the assessment, stabilisation and transport of injured animals, methods for improving the welfare of captive animals, concepts in behavioural ecology, conservation breeding programmes, the reintroduction of captive populations to the wild, post-release monitoring, practical field-based conservation strategies and the management of protected areas. The curriculum also delivers a comprehensive introduction to wildlife disease ecology, surveillance and control. In addition to the two modules run by the BZS veterinary team, we run a variety of workshops and practical sessions on this degree. Thirty students graduated in 2016, with 32 students enrolled for the 2016/17 academic year.

MSc Advanced Wildlife Conservation in Practice

Partner: University of the West of England

New in January 2016, this MSc in Advanced Wildlife Conservation in Practice (AWCiP) course provides students with the opportunity to develop their skills in ecosystem and species conservation, communication and effecting behaviour change, and has a strong emphasis on developing innovation and entrepreneurial skills. BZS staff teach two of the four modules, as well as providing supervision for the research element of the course. The intake for the first run of the programme was 15 students. Projects undertaken ranged from surveying nocturnal primates in Cameroon to understanding human-baboon competition for space in Cape Town, South Africa.
STUDENT RESEARCH

During the 2015/16 academic year, the Field Conservation and Science Department supervised 19 third year BSc projects and 29 postgraduate students, as well as two sandwich placement students. Some of these projects are highlighted below.

Enrichment and Welfare Research

The zoo provides many of its animals with innovative and challenging enrichment on a regular basis. A key element of this enrichment is the scientific evaluation of how successful it is in improving the welfare of the animals. We undertake a number of different projects designed to evaluate new or existing enrichment and share our results with animal keepers. For example, in 2016, one of our MSc students carried out a project identifying and mitigating stereotypical swimming behaviour in captive fur seals (Arctocephalus australis) using feeding enrichment devices. The use of this enrichment was found to decrease pattern swimming behaviour. We also had a 3rd year dissertation project using camera traps to understand enclosure use by yellow-footed rock wallabies (Petrogale xanthopus). The findings indicated that there was a large amount of individual variation and temporal use of the enclosure, with the male using the enclosure mainly during the day and the joeys being active primarily at night.

Behaviour Research

Behaviour studies increase our understanding of the implications for individual behavioural differences in the management, welfare, and health of animals. In 2016, our MSc students conducted a variety of behavioural studies, including: a study examining the social organisation of drill monkeys (Mandrillus leucophaeus) at Bristol Zoo Gardens, the breeding success of captive western lowland gorillas in European zoos, and an analysis of seal strandings in Cornwall with possible links to intraspecific predation. We also had two sandwich placement year students undertaking behavioural research this year. Anna Egerton (Bangor University) observed and documented the process of introduction of a new gorilla into our social group at BZG, while Lauren Attwood (Nottingham Trent University) studied the impact of guest and environmental noise levels on vigilance behaviour in our meerkats (Suricata suricatta) at both BZG and WPP.

Conservation Science

Many of our students undertake conservation science research. In 2016, one of our 3rd year BSc students examined patterns of litter in the Severn Estuary using long-term data from beach cleans by the Marine Conservation Society. The findings of the study indicate that levels of litter in this region are significantly higher than the average across other coastal regions in the UK. One of the biggest issues was plastic pollution. Another student focused on data from one of our field projects in Tanzania. She analysed camera trap data from the Tropical Ecological Assessment and Monitoring Network (TEAM) in the Udzungwa Mountains National Park to see if occupancy modelling would be a useful tool for monitoring the Endangered Sanje mangabey (Cercocebus sanjei). This species is elusive and difficult to monitor due to the mountainous environment. Results indicate that the animals may be avoiding areas with people and their distribution may be affected by ecological factors such as food availability.
MEET THE FIELD
CONSERVATION & SCIENCE
TEAM

Head of Field Conservation & Science

Dr. Gráinne McCabe

Dr Gráinne McCabe is a biological anthropologist and conservation biologist, specialising in primate behaviour and ecology. Her previous research focused on the reproductive ecology of wild monkeys in both Costa Rica and Tanzania. Gráinne received her Ph.D. from the University of Texas at San Antonio in the United States. In her role as Head of Field Conservation & Science, Gráinne oversees the Society's global conservation projects, with a focus on our work in Cameroon, Tanzania and Costa Rica, and directs our higher education provision, in association with our partner universities.

Lecturers in Field Conservation & Science

Dr. Tim Bray

Tim specialises in the study of genetic variation across populations and species over time. He began using a molecular approach during an MSc in Ecology, following through to a PhD concerned with demographic modelling. In addition to lecturing to students from Foundation level up to Masters degrees, he also supervises PhD students. Tim’s current research interests extend to conservation research of the Critically Endangered lemur leaf frog in Costa Rica, investigating its current range and causes of decline.

Dr. Fay Clark

Fay joined BZS after completing her PhD on the cognition and welfare of chimpanzees and dolphins, with the Royal Veterinary College and Zoological Society of London. Her research thus far has focused on primates and cetaceans, taking insights from human psychology and evolution. Currently, she is extending her PhD research to other taxa, incorporating modern technology into enrichment, and validating novel indicators of welfare. As well as undertaking original research, Fay teaches and supervises students from Foundation to Masters level, in a wide range of topics including captive animal management, welfare, enrichment, project design and statistical techniques.
Dr. Alison Cotton

Alison is both an evolutionary and conservation biologist. Hailing from New Zealand, she began her career in conservation, worked with the Department of Conservation, investigating the efficacy of the Kiwi Aversion Training that is done to deter dogs from killing kiwi. She did her PhD on the evolution of sexually selected traits in stalk-eyed flies at UCL, London. As well as lecturing and supervising BSc and MSc students, she also works for the IUCN primate specialist group, in updating all the primate red list assessments. She is the project lead for the BZS African penguin project and her current research interests surround the conservation, behaviour and ecology of this Endangered species.

Dr. Sam Cotton

Sam uses his background as an evolutionary biologist and behavioural ecologist to investigate problems and issues in conservation biology. He did his PhD and post-doc on sexual selection and evolutionary genetics, a post-doc on theoretical evolutionary and conservation biology, and a NERC Fellowship, on how environmental variation influences sexual selection in natural populations. Sam is currently teaching on the BSc in Wildlife Ecology and Conservation, the BSc in Zoological Management and Conservation and the MSc in Advanced Wildlife Conservation in Practice. His current research includes the investigating the consequences of habitat fragmentation for sexual selection, evaluating the effects on biodiversity of agroecology in Malagasy vanilla plantations, and reforestation efforts. He is the project co-lead for field research in Madagascar.

Osiris Doumbé

Osiris specialises in primatology and he obtained his MSc in Tropical Ecology from l’Université des Antilles et de la Guyane (Guadeloupe, French Indies) and his MRes in Primate Biology, Behaviour and Conservation from Roehampton University (London). For the latter, he studied the nesting behaviour of Nigeria-Cameroon chimpanzees in a fragmented forest of Cameroon. Currently, he is involved in two projects in Cameroon: one on the primates of the Kom forest (North-West region) and another on the conservation of Kordofan giraffes in woodland savannas (northern regions).

Dr. Sue Dow

Sue trained as a Zoologist at the University of Oxford and carried out a PhD at the University of Exeter on foraging and learning in pigeons. She has worked at Bristol Zoological Society since 1992 combining working on building projects and co-ordinating research projects carried out in the zoo. Sue’s main research interests are in animal behaviour, the effects of enclosure design on the behavioural repertoire of captive animals, and environmental enrichment as a husbandry technique. She maintains an interest in optimal foraging and food selection, particularly in birds, in captive and semi-natural situations. In addition, she is carrying out a longitudinal study of gorilla social dynamics at Bristol Zoo Gardens.
Dr. Daphne Kerhoas

Daphne is an Ethologist and Conservation Biologist specialising in wild primates. Following an M.Sc. in Ethology from the University of Paris XIII, her Ph.D. research at the Max Planck Institute for Evolutionary Anthropology, in collaboration with the German Primate Centre, focussed on male-infant relationships in wild Sulawesi crested macaques. In addition to being the Programme Lead on the FdSc in Integrated Wildlife Conservation, Daphne has been analysing trends of the ‘Top 25 Most Endangered Primates’ report, as well as leading the Society’s field project in the Philippines.

Dr. Amanda Webber

Amanda completed an MSc in Primate Conservation and a PhD in Anthropology at Oxford Brookes University. Her thesis focussed on human-wildlife interactions, specifically crop raiding by primates and other large vertebrates in northwest Uganda. Amanda currently teaches on the UWE Wildlife Ecology and Conservation Science course and the UWE MSc programme Advanced Wildlife Conservation in Practice. Amanda also supervises undergraduates and MSc students and her main research interests are human-wildlife interactions, perceptions of ‘pest’ species, and animals more generally, and wildlife conservation. She is currently developing several projects in Madagascar examining wildlife in human-dominated environments.

UK Conservation Manager

Jen Nightingale

Jen Nightingale gained a Masters in Wildlife Management and Conservation from Reading University. She became Curator of the Aquarium at Bristol Zoo Gardens in 1997 and extended this to establish the position of UK Conservation Manager. Within this current role, much of her work is on the conservation of the endangered white-clawed crayfish Austropotamobius pallipes and Jen was pivotal in the establishment of the South West Crayfish Project, the largest white-clawed crayfish initiative in the UK. This work has now expanded into her Ph.D. investigating optimal hatchery techniques for the captive breeding and rearing of A. pallipes for reintroduction.

Avon Invasive Weed Forum Project Officer

Neil Green

Neil has been a Coastal Ranger for the National Trust in North Cornwall, worked on the Source to Sea Invasive species project for Wiltshire Wildlife Trust and worked on the Westonbirt Project. Neil works mainly on the rivers and watercourses within Bristol, South Gloucestershire and Bath and North East Somerset. The AIWF is an independent group of stakeholders such as Bristol City Council and BZS, currently funded by Veolia Trust. The aims are to survey as much of the Avon catchment as possible for Invasive Non-Native Species (INNS), so far over 150 kilometers of riparian habitat have been recorded, to control and reduce INNS found and to raise awareness of INNS in the region.
Conservation Psychologist and Campaigns Manager

Katie Major

Katie’s interest in human psychology first developed during her BSc psychology degree, although she soon completed an MSc in Primate Conservation to pursue a career in conservation. Katie is responsible for developing and managing the Society’s behaviour-change campaigns as well as teaching on the UWE FdSc Integrated Wildlife Conservation course. Katie is currently developing a campaign with other zoos worldwide which promotes the production and consumption of certified sustainable palm oil, and will be actively working with consumers and companies who use palm oil.

Postdoctoral Research Associate

Dr. Richard Sherley

Richard obtained his PhD in 2010 working in the interdisciplinary research group COMBINE at the University of Bristol (UK). The thesis analysed aspects of the population demography, biology and behaviour of two endemic seabird species in the Benguela Upwelling Ecosystem, the African Penguin and the Bank Cormorant. Since January 2011, Richard been working as a postdoctoral research associate at BZS and the Animal Demography Unit (ADU) and the Marine Research Institute. This work focuses on growth, recruitment, survival and movements of fledgling African Penguins in relation to prey availability.

Librarian, Archivist and Administrator

Laetitia Delaleuf

Laetitia received her MSc in Science of Information and Library Science from the Ecole Nationale Superieure des Sciences de l’Information et des Bibliotheques and her History degree from the University of Poitiers. Laetitia is passionate about promoting information literacy skills, as well as fostering an attitude of learning and reading for pleasure. She is convinced that everyone needs to become critical information consumers, and believes that the librarian should be in the heart of this learning, providing both an informal and formal means to achieve it. Laetitia is also the zoo archivist. By working on the archive project at the zoo, she is bringing the zoo’s rich past to life for the public.
IN-SITU CONSERVATION:
EXECUTIVE SUMMARY

This has been an eventful and exciting year for the Society’s field conservation projects. Recognising that effective conservation can only be achieved with the right balance of research and community involvement, in 2016 we brought our conservation science projects and field programmes together under the new Field Conservation and Science Department, and re-evaluated our approach to the projects formerly in both. The result has been more successful than we could have imagined.

Our strategy is to promote evidence-driven conservation that evaluates the effectiveness of our actions and allows us to modify those actions when we are not meeting our targets. By working with local stakeholders in each of our projects, we can ensure that our actions are meeting their expectations, to the extent possible, in addition to conserving our target species and their habitats. For example, this year one of our Masters by Research students, Jack Saunders (University of Bristol), evaluated the reforestation efforts of AEECL in the Sahamalaza region. The results of that study indicated that the reforestation strategy in the protected area had been completely ineffective, with virtually no success in any of the plots. While disappointing, this result has allowed us to take a step back and design an experimental study to determine a more effective method for reforestation in this challenging environment. Once completed, we will work with local communities in the region to share best practice on reforestation and to support future planting efforts. We will apply for funding for this new strategy in early 2017.

This year has also seen the implementation of our newest conservation project, focused on the Kordofan Giraffe in northern Cameroon. Despite being iconic animals of the African landscape, giraffe have been undergoing a ‘silent extinction’ in recent decades, with over 70% population decline in front of our eyes. Kordofan, the subspecies found across Central Africa, is estimated to number less than 2000 individuals, in some of the most politically unstable regions on the continent. BZS is working closely with the Conservators of the national parks in northern Cameroon that hold giraffe to obtain more accurate population estimates, and working with local communities neighbouring protected areas to lessen threats to the giraffe’s habitat through solutions that are beneficial to both people and wildlife.

One of the strengths of our field conservation agenda continues to be our focus on native wildlife and habitats – the Spotlight for our 2016 Annual Conservation Review. As you will see in the pages that follow, the Society has a strong commitment to the conservation of UK species, and our success in this area would not be possible without the dedication and expertise of our Native Species Team. From the captive breeding and reintroduction of Critically Endangered white-clawed crayfish, the control and study of invasive species, to the education of a vast number of people on the importance of the Avon Gorge and Downs ecosystem – we are working to ensure that our own natural heritage is preserved for generations to come.

We have accomplished a lot this year and have many achievements to be proud of, but know there is much more to be done to ensure the future for wildlife both here at home and abroad. With our new strategy of conservation action and evaluation we hope that, together with the help communities here in the UK and at our sites around the globe, we will be able to make an impact that allows us to save wildlife together.

Dr. Gráinne McCabe
Head of Field Conservation and Science
Bristol Zoological Society
IN-SITU CONSERVATION PROJECTS OVERVIEW

Bristol Zoological Society carries out evidence-based field conservation projects on five continents across the world. We aim to identify and implement sustainable solutions to species and ecosystem conservation challenges through research, action and local collaboration.

Many of our field projects are linked to our exhibits, such as the lemurs in the Madagascan village at the Wild Place Project, and African penguins in Seal and Penguin Coasts at Bristol Zoo Gardens.

Central to the approach of all our in-situ conservation projects is the ‘theory of change’ model. The theory of change approach supports planning and evaluation of large-scale community change projects. These initiatives often have ambitious goals and complex sets of interventions. The theory of change model helps us to balance multiple objectives, understand relationships between different objectives and interventions, and deal with the time lags required to observe ecological and social change.

“The theory of change approach is a process of project planning and evaluation which maps the relationship between a long-term goal of a project and the intermediate and early changes that are required to bring it about.”

UK Conservation Manager: Jen Nightingale

We have monitored the silky wave moths (*Idaea dilutaria*) within the Avon Gorge in Bristol for over a decade, in partnership with Butterfly Conservation. This is the only known population of the species in England and we monitor up to 15 moth sites, on both the Bristol and Somerset sides of the Avon Gorge, during their summer flight period. In 2016, we surveyed 12 sites and saw a 23% decline in the peak moth count in comparison to 2015; however, this was comparable with the moth counts in 2014 and the moth was present at all 12 of the sites surveyed, which is encouraging. The results are consistent with low counts for other lepidopteran species during this year.

For the past six years, we have supported the local toad patrols in Bristol, Bath and Somerset. Currently, we help to coordinate 17 toad patrols during the busy breeding season in late winter. We had a good response from the public to assist with helping common toads (*Bufo bufo*) cross the roads to return to their ancestral ponds to breed. Over 4,500 toads in the four active Bristol toad patrols were saved, despite the unpredictable winter weather.

Our invasive species programme continues to develop well, with 12 active community groups working on the River Frome and other tributaries associated with the Bristol Avon. These groups are carrying out invasive weed pulls during the growing season from May through September. These groups also survey for other invasive species and are helping to increase the network of rapid responders (key people trained to react to new species invasions) in the South West. In 2016, over 40 km of river bank was surveyed and 25 km of bank was cleared from invasive plant species, amounting to 2,000 volunteer hours. We are working with Bristol Harbour to introduce a biosecurity protocol for their waterway users and reached over 4,000 individuals with this programme last year. In addition, we now have six permanent zebra mussel colonisation plates in place and have initiated an invasive invertebrate monitoring system. We also trained 25 operatives in invasive plant eradication and set up five study sites with a native species seedling mix, to assess whether they can out-compete regrowth of the invasive species. We assisted the Centre for Agriculture and Biosciences International (CABI) with their biological control work and monitored the effect of releasing psyllids (a small, species-specific plant-feeding insect) on two Japanese knotweed study sites in Bristol. This long-term study will assess the rate at which the psyllid will reduce the growth and spread of this species.

Our rare plant programme at Bristol Zoo continues to flourish! We are working in partnership with South Gloucestershire County Council and Natural England to restore Inglestone Common in Gloucestershire. This was home to the rare adder’s-tongue spearwort (*Ranunculus ophioglossifolius*) and tassel stonework (*Tolypella intricata*). We successfully grew plug plants of these species within our Bristol Zoo glasshouses for planting within the common. In partnership with the Welsh Government and Royal Botanical Gardens of Wales, we have also successfully propagated the rare meadow sage (*Salvia pratensis*), which is being reintroduced into Rectory Meadow, an SSSI in South Wales. Both of these programmes are ensuring that these rare plant species will remain within our British landscape for future years to come.
SPOTLIGHT UK: WHITE-CLAWED CRAYFISH

Project Lead: Jen Nightingale

The white-clawed crayfish, *Austropotamobius pallipes*, is the UK’s only native freshwater crayfish species and is a keystone species of our river habitats. It has become endangered throughout its range, in both the UK and the rest of Europe, as a result of pollution, habitat degradation and competition from invasive crayfish species. One of the primary protagonists for the decline in white-clawed crayfish numbers is the American signal crayfish (*Pacifastacus leniusculus*). Introduced into the UK in the 1970’s for shellfish farming, many signal crayfish escaped and migrated rapidly through our waterways. They not only predate and out-compete our native species but also carry crayfish plague, a fungal disease that is lethal to European crayfish and can eradicate entire white-clawed crayfish populations within a few weeks.

For the past eight years Bristol Zoological Society (BZS) has played a lead role in the South West Crayfish Partnership (SWCP), delivering a landscape-style conservation programme to try and halt the decline of this species in South West England. SWCP comprises BZS, Buglife, Cefas, the Environment Agency, Wildlife Trusts and associated partners.

The SWCP has four main conservation strands to help preserve this species. These include the establishment of ark sites (safe refuges), captive-breeding for reintroduction, an outreach programme and delivering a control programme for the invasive crayfish species. In total, 16 ark sites and river supplementations have been carried out, which include translocations of threatened populations to safe sites and reintroductions of captive-born crayfish.

A captive-breeding hatchery was set up at Bristol Zoo eight years ago and 2016 was the first year we started breeding white-clawed crayfish from Devon. We brought in four wild-caught females with eggs during the spring and successfully hatched and reared over 100 youngsters. We also mated several wild-caught Devon crayfish in the autumn, which we hope will produce young early in 2017. We now work with three different counties, Devon, Hampshire and South Gloucestershire, producing juveniles for wild supplementation.
SPOTLIGHT UK: WHITE-CLAWED CRAYFISH

Both Devon and Hampshire have only two remaining white-clawed populations, so the work that we do producing crayfish to enhance these wild populations is vital to ensure that their native populations do not go extinct. In total, we produced over 1000 hatchlings in 2016, which will be grown on for release or retained as brood-stock within our hatchery.

Following the previous supplementations of captive-born crayfish into the River Itchen in Hampshire, another 249 captive-born individuals were released in 2016. Monitoring results are showing that the crayfish are surviving and thriving. We also set up the first still-water ark site within Hampshire and released 94 captive-born crayfish into this site in late autumn with another release planned for 2017. We added a further 204 captive-born crayfish to our Somerset, still-water research site. This was the first year that we tagged the crayfish, prior to release. We injected passive integrated transponders (PIT) tags (similar to those used for pets) into the crayfish. This will enable us to individually identify released animals in subsequent years when we monitor our sites, providing valuable information on the success of the animals within the sites. This was after a year-long experiment to ensure that PIT-tagging the crayfish would not affect their survival or growth.

During 2016, we promoted the Defra ‘Check, Clean, Dry’ campaign in all of our outreach work. Our key message to the public is that by washing your wellies, nets and fishing gear after you have been in our rivers and lakes you can help stop the spread of disease and invasive species. All you have to do is wash your gear in hot tap water and then dry thoroughly (preferably in sunlight) and you will ensure that our rivers and lakes stay healthy!
Invasive non-native species (INNS) are one of the main drivers of biodiversity loss at the global level. They can change the community structure and species composition of native ecosystems, both directly by out-competing native species for resources, and indirectly through changes in nutrient cycling, ecosystem function and the spread of disease. INNS also have negative social and economic impacts. They cost the UK economy over £1.8 billion per annum and also have wider societal impacts, for example by impacting on human health, increasing flood risk, and reducing access to amenity areas.

The Avon Invasive Weeds Forum (AIWF) project has been running full-time since 2012. It is run by a robust network of informed individuals and groups that comprise the wider Avon Invasive Weeds Forum, fighting the advance of INNS. During 2016, the AIWF carried out over 80 invasive species management days on species such as floating pennywort, Himalayan balsam, Japanese knotweed and giant hogweed. They surveyed over 30 kilometers of river banks, assessing the distribution of aquatic and terrestrial INNS.

We have continued the work alongside CABI (Centre for Agriculture and Biosciences International) to evaluate the bio-controls for Japanese knotweed & Himalayan balsam, two of the most destructive invasive weeds in this country. We hope to continue this relationship during 2017 on this cutting-edge form of INNS management.

One major project for 2016 was to heighten the bio-security measures on local waterways, with positive identification of the Zebra Mussel in the region. Over 50 Check Clean & Dry signs are now situated around Bristol Harbour, Chew Valley Lake, Blagdon Lake and Cheddar Reservoir. Working closely with Bristol Water and Bristol City Council, the importance of Check Clean & Dry to delay the spread of aquatic INNS has never been better understood; however, much more work is required in the coming years. In addition to the work on biosecurity, 20 INNS awareness-raising events have been carried out including: the Festival of Nature, Parish Council meetings, lectures at Bristol Zoo Gardens and presentations to local groups such as the Bristol Nature Network.

Finally, during 2016, the AIWF, BZS, and The Animal and Plant Health Agency have worked hard to develop a National Strategy for Local Action Groups to fully deliver achievable aspects of the Great Britain INNS Strategy. This has manifested in an EU LIFE funding bid that was submitted in September 2016. The outcome will be known in 2017.
SPOTLIGHT UK: AVON GORGE AND DOWNS

Project Lead: Mandy Leivers

The Avon Gorge and Downs Wildlife Project was set up to protect and manage the Avon Gorge, Clifton and Durdham Downs, and to raise awareness and understanding of this unique location.

Bristol Zoological Society has been a key partner in the project from its inception. The Education Officers for the project are based in the Conservation Education Centre and managed by the Head of Learning. The Native Species Officer also co-ordinates the annual surveying and monitoring programme for the rare silky wave moth. The Avon Gorge is the only English site for this species. A total of 12 sites were surveyed in 2016, from the third week of June to the first week of July. The maximum count was 181 moths; the lowest count since the base line surveys began in 2011. These figures, however, were comparable with the cyclical trends we tend to see for silky wave moths in the Gorge.

During the year, 9,586 people participated in the education programme, taking part in one of our walks, talks, courses, educational visits, family or community events. We taught 1,516 school pupils and 257 Higher Education students during the year. Bookings from playscheme groups doubled, with 352 children taught in 2016 compared to 176 in 2015. Many of our groups are from less affluent areas of the city, and for them in particular, the high quality and low cost environmental education we provide is seen as increasingly important. The feedback we have received has been extremely positive, with evaluation scores for session content, presentation, length, and level, all above 95%. All groups have also said they were ‘very likely’ to return in the future.

The Bristol Festival of Nature is the UK’s largest celebration of the natural world. In June 2016, we teamed up with the Zoo’s and Wild Place Project’s education teams and the Conservation Campaign Manager, to present the ‘Be fantastic, save wildlife from plastic’ tent. The aim was to raise awareness about the different kinds of plastic litter and its harmful effects on wildlife. We also showcased some imaginative ways to reduce, re-use and recycle used plastic items.
The Friday schools’ day was a great success; we taught 160 Key Stage 2 children from a variety of different schools. Over the festival weekend, we ran two activities. The first involved working with visitors to up-cycle plastic bottles into bird feeders. For the second, we worked with a local artist to create a hedgehog sculpture from plastic milk cartons and grocery nets (after the festival, the sculpture was moved to the ‘Knot your net’ campaign space in the Zoo). In total, 5,461 people came through the tent over the weekend.

We also ran activities at other public and community events, including: the first anniversary of the opening of Avon Wildlife Trust’s Bennett’s Patch and White’s Paddock nature reserve; the Peaceful Portway Sunday events (the Portway was closed to traffic for two afternoons so that visitors could enjoy the Gorge in tranquility); and ‘Bird Week’ at Bristol Zoo (held to raise awareness of our native UK birds and the Philippines Negros bleeding heart dove project).

In partnership with Friends of the Downs and Avon Gorge, and Walking for Health, we continued to develop the Your Downs initiative (a series of events to widen the range of people visiting and enjoying the site).

We continued to work with the Bristol City Council Inner City Health Improvement Team running guided walks for their clients. In May, the Easton Family Centre joined us for a lovely half-term walk. We also ran guided walks for the Heartful Dodgers (a group of people recovering from heart attacks and strokes from Southmead Hospital) and Headway (a charity that works with people recovering from brain injury).
SPOTLIGHT UK: BRISTOL COMMUNITY PLANT COLLECTION

Project Leads: Emma Moore and Eddie Mole

Bristol Community Plant Collection was set up as a pilot project in 2012 to explore the possibility of establishing a collection of an annual plant, *Calendula*, grown in many locations across Bristol by community groups.

Due to the initial success of the pilot year, Bristol Zoo Gardens have achieved many ‘firsts’ in the field of plant conservation. Plant Heritage, who oversees National Plant Collections, have rewritten their guidelines to accommodate this new type of ‘dispersed’ collection. It is also the first National Plant Collection that looks after an annual plant (*Calendula*) and also have community groups and schools as their growers.

The project now grows ten of the 15-20 species in the genus including the Critically Endangered *Calendula incana maritima*. It has also had unexpected outcomes for many of the older participants, such as community cohesion, increased feelings of self-worth in individuals, and an increased desire to improve their own environment.

In 2016, 3 community groups and 4 schools took part in the project and participated in ‘Hand pollination and Herbarium’ workshops at the lab facilities at the Conservation Education Centre at Bristol Zoo Gardens. The groups and schools were shown how to hand pollinate plants and keep the flowers isolated to avoid cross-pollination and how to take scientific herbarium specimens for the plant collection records.

In September, the project coordinator, Emma Moore, was invited to speak at the European Association of Zoos and Aquaria Annual Conference in Belfast as part of the plenary ‘Working Outside the Zoo: A community role for Zoos and their employees beyond the gates’.
SPOTLIGHT UK: BEHAVIOUR CHANGE

Project Lead: Katie Major

Conservation Campaign 2016: Knot Your Net

Every year, Bristol Zoological Society carries out a conservation campaign which encourages guests to perform a pro-environmental behaviour that will benefit biodiversity. This year we wanted to support the EAZA campaign ‘Let it Grow’ which focused on helping native species. Therefore, we launched ‘Knot Your Net’, a litter-related campaign that encouraged guests to tie knots in discarded netting before binning it and to maintain regularly used netting, with hedgehogs as the mascot species. Knot Your Net was delivered by staff and volunteers at Bristol Zoo Gardens and Wild Place Project, and was made up of several elements, including:

- **Hedgehog Hub**: an open space where guests could learn about Knot Your Net through various interactive activities and displays.
- **Willow hedgehog**: a 3D willow hedgehog which introduced the campaign.
- **Hedgehog Hustle**: a six-part activity encouraging children to act like hedgehogs.
- **The maze**: a litter themed maze that contained information on actions that guests could perform to help wildlife at the end of each dead-end.
- **Public animal talks, Animal Encounters and Butterfly Forest**: staff and volunteers discussed Knot Your Net to guests who attended these talks and exhibits.
- **Activity Centre**: guests could take part in a range of Knot Your Net activities, including the board game ‘Spikes and Netting’, colouring in campaign sheets, and making a campaign badge.
- **Bristol Festival of Nature**: the theme for Bristol Zoological Society’s tent was an extension of Knot Your Net that focused on single use plastics.

Knot Your Net inspired guests to be environmentally friendly, with 64.4% of guests intending to knot their nets after seeing the campaign, compared to only 17.6% of guests who were actively knotting nets before the campaign launched. We also examined the best method for engaging guests with the campaign, and found that guests engaged most with the interactive parts of the campaign (e.g., talking to staff at Animal Encounters and taking part in the maze) and novel exhibits (e.g., viewing the 3D hedgehog created from recycled netting and plastic in the Hedgehog Hub), and interacted less with passive elements (e.g., signs in the Hedgehog Hub). These findings highlight the best approach to delivering key conservation messages to our audience and will help us design future campaigns.
PHILIPPINES

Project Leads: Daphne Kerhoas and Nigel Simpson

Project overview

The Republic of the Philippines is recognised as being one of the most biodiverse countries in the world; a ‘Biodiversity Hotspot’. It also has a rapidly expanding human population, many of whom live in poverty and are dependent on subsistence agriculture for food. The consequences are obvious; as the demand for more farmland increases, so does the amount of forest loss – chopped down to make new fields or provide timber for houses, or firewood for cooking. On the island of Negros, in the West Visayas region, less than 5% of the original forest remains due to land change over the last 200 years. This is not only having a detrimental impact on the rural poor who are dependent on the forest for livelihood, but also the exceptional and endemic biodiversity found there.

Our flagship species is the Negros bleeding heart dove (Gallicolumba keayii), but the forests contain other high profile species that are also facing extinction unless we can protect them and their habitat; e.g., the Visayan warty pig (Sus cebifrons), the wreathed-billed hornbill (Aceros waldeni), the tarictic hornbill (Penelopides panini), and the Philippine spotted deer (Rusa alfredi). In the Barangay (village) of Mantiquil, in the Cuernos de Negros, BZS and our partners have identified that the current rate of forest loss is one hectare per month. If we do not address this, then total deforestation could occur in this area within 20 years. The forest is home to populations of an unknown size of all five species listed above, and there may be 30 or more bleeding heart doves left there – a relative stronghold.

Introduction of ‘Rainforestation’ programme to the area

In 2016, we have been promoting habitat restoration through ‘rainforestation’, a programme that involves planting 50 native tree species, which are propagated from tree saplings gathered in the local forest and grown in a dedicated nursery, to help reverse the fragmentation of habitats in the area. Ideally, the existing National Greening Programme, which gives income to villagers by planting any tree species, including exotics, would be replaced by this strategy that takes into account the need to protect endemism by stipulating that all newly-planted trees be indigenous, endemic (where possible), and based on Non-Timber-Forest Products rather than felling. ‘Rainforestation’ meets both of these criteria, and has been promoted as a way to give direct benefits to people's organisations that are operating community resource management plans.
PHILIPPINES

Preliminary Avian Survey and Camera Trapping

In order to ensure that our actions within the community are having a measurable effect on conserving the wildlife in the region, it is necessary to monitor the species’ populations over the long-term. In 2016, we undertook the first preliminary survey of the avifauna in the Mantiquil Forest. A total of 74 species of birds were recorded in the area, of which 39 are found only in the Philippines, and three are known to only occur in the Negros-Panay islands region. These include the Negros striped babbler, the Negros scops owl and our flagship species, the Negros bleeding heart dove.

This initial survey was limited in time and scope; thus, only nine observations of the bleeding heart dove were recorded. However, in 2017, we hope to send Bristol Zoological Society masters students to the region to undertake more thorough studies of the fauna in the region and the habitat availability for such species.

![Map of the survey region and location of transect](image)

We have achieved much in 2016 for the protection of the Mantiquil forest and its inhabitants, but we know that working with communities requires long-term, sustained commitment to support change. We expect it will be several years until we find that sustainable development is firmly established. BZS is committed to such long-term planning and implementation, and we are thankful that operating Bristol Zoo Gardens and the Wild Place Project enables us to think in these time scales – we are here for the long haul, and we thank our donors for their continued support.
CAMEROON

Project Leads: Osiris Doumbé, Gráinne McCabe and Will Walker

This year, we initiated our Giraffe Conservation Project in northern Cameroon. This project will tie in to our new giraffe enclosure at Wild Place Project (opening in May 2017). Despite being iconic symbols of the African wilderness, giraffes have undergone a dramatic population decrease, with a loss of more than 40% of their numbers in the wild in less than 20 years. Given this silent extinction, the IUCN Red List recently changed the status of *Giraffa camelopardalis* from Least Concern to Vulnerable, in recognition that the species is facing a high risk of extinction in the wild.

The Kordofan giraffe (*Giraffa camelopardalis antiquorum*) is one of the most threatened subspecies due to habitat destruction, illegal hunting, and capture of infants for illegal private zoos. It is restricted to the savannahs of Central Africa, a region which has faced civil unrest for decades. Kordofan giraffes still occur in two regions in northern Cameroon: the North, and the Far North region. In the North region, the Bénoué complex is a set of protected areas comprised of many hunting zones surrounding three national parks: Bénoué, Bouba Ndjidja, and Faro. The latter two parks are located close to the borders of Central African Republic and Nigeria, respectively. Bénoué National Park (BNP) is situated in the centre of the region and thus plays an important role for large mammals. For example, recent studies have shown that elephants migrate between the East and the West of Cameroon via BNP.

In April 2016, BZS travelled to BNP to meet with Jean-Paul Kevin Mbamba Mbamba, the Conservator of the protected area. The team took note of the challenges of the national park and were able to observe some giraffe while visiting the site. As a result of this first visit, we concluded that it was necessary to conduct a survey of the giraffes of BNP, in order to map their distribution and estimate their population size. Due to the habitat (i.e., most of the park is covered by dense woodland vegetation of *Isobellinia doka*, *Afzelia africana*, *Acacia sp.*, etc.), we chose to use a quadcopter drone to ease visibility. The device was generously donated to the Society by MAPLIN®.

In August 2016, we returned to BNP. As it was the rainy season, the grass was very high (up to 2 meters) restricting the visibility of wildlife. However, the team were able to use this trip to initiate training of the eco-guards of BNP in the use of the drone and GPS units for wildlife surveying. The remainder of 2016 was spent planning our first full field season in BNP which will be used to conduct a park-wide census of large mammals and hold a workshop for the conservation service of the four national parks in northern Cameroon on the use of new technology in field conservation. This trip will be in February-March 2017.

In addition to the giraffe project, we also continue our support of the primate sanctuary, Ape Action Africa, based in Mefou National Park, Cameroon. The sanctuary is home to over 300 monkeys and apes that have been rescued from the bushmeat and pet trade in Central Africa. We provide support for the operational costs, as well as the salary of the deputy director. In November 2016, BZS Head of Field Conservation & Science, Dr Gráinne McCabe, joined the AAA Board of Trustees.
MADAGASCAR

Project Leads: Amanda Webber, Sam Cotton and Alan Toyne

Lemurs are only found in the wild in Madagascar, and over ninety percent of the 107 species are threatened with extinction. This makes lemurs the most imperilled group of mammals in the world.

Bristol Zoological Society works with 30 European Zoos as part of AEECL (Association Européenne pour l’Étude et la Conservation des Lémuriens) to research and conserve lemurs and their natural habitat. Our primary site is in the Sahamalaza-Iles Radama National Park (SIRNP), in the northwest of the country.

A number of students conducted research in this area in 2016. PhD candidate Caitlin Eschmann (University of Bristol) continued her study on the potential hybridization between blue-eyed black (*Eulemur flavifrons*) and black (*Eulemur macaco*) lemurs in northwest Madagascar and Daniel Hending (University of Bristol) successfully completed his MSc on the behavioural ecology and bioacoustics of the Sambirano mouse lemur (*Microcebus sambiranensis*). From tracking radio-collared individuals, Dan was able to establish home range sizes, nightly travel distance and preferred habitat, in addition to determining and classifying five vocal call types for this understudied species. MSc student, Jack Saunders (University of Bristol), conducted his fieldwork examining the efficacy of reforestation efforts in northwest Madagascar. Preliminary results suggest that the current approach is not working and BZS are working to develop interventions to improve the success of the reforestation programme.

In addition to field research, we continue to support community-based development programmes and conservation education looking at reforestation, fire control and protection and providing wells for clean drinking water. Furthermore, we support local schools; funding the salaries of over 60 teachers in the Sahamalaza area. BZS are committed to developing a sustainable future for both wildlife and people in this region.

In 2016, we were particularly excited to announce a significant donation to the IUCN’s ‘Save our Species’ (SOS) Fund from a private Geneva-based foundation. The generous financial support has been secured with the help of our director of conservation, Dr Christoph Schwitzer, and will enable the implementation of projects identified by the IUCN’s Lemur Conservation Strategy. The strategy includes some 30 individual lemur action plans to help communities across Madagascar protect their own natural resources, including those at the SIRNP.

In January 2017, a six-year plan will be launched, working with a broad range of Malagasy and international civil society organisations, to advance current lemur conservation projects in Madagascar and implement new ones. Without the funding, this would not have been possible.
Not all our Madagascar projects work with lemurs. In 2016, we secured funding for a population survey of the Madagascar sacred ibis (Threskiornis bernieri), a colonial waterbird found only on the west coast of Madagascar and the Seychelles (Stiftung Artenschutz and Zoo Berlin, with support from Landau Zoo, Allwetterzoo Muenster, ZGAP and private donors).

This Endangered waterbird was only classified as a species in 2003 and its ecology and behaviour is still poorly understood. Sahamalaza-Iles Radama National Park (SIRNP) is believed to be a stronghold for this species but the few surveys that have taken place in this area suggest a declining population and a change in distribution, with birds now absent from previously inhabited areas. It has been suggested that these changes are due to human disturbance but this needs to be investigated thoroughly. Local people are, however, reliant on the mangroves for food and materials, so any future interventions need to take into account the needs of both people and wildlife.

We are pleased to be working with a local Malagasy NGO, Mikajy Natiora Association (MNA) to develop a long-term conservation strategy for the ibis. This will begin with the population survey in 2017 that will determine the number and distribution of birds in SIRNP and the nearby unprotected Loza Bay.

IUCN SSC Primate Specialist Group Madagascar Programme Officer

Dr. Sylviane Volampeno

Sylviane is a Madagascar primatologist whose PhD research focused on the Critically Endangered blue-eyed black lemur. Since then she has worked in conservation, protecting the biodiversity of Madagascar. She is the founder and currently the president of the Madagascar-based conservation association "Mikajy Natiora”. She is also a part-time lecturer at the Department of Animal Biology, Faculty of Sciences, at the University of Antananarivo. She is involved in the implementation of conservation projects relating to endemic biodiversity, especially threatened lemur species. Her areas of interest include primate conservation, biological research, local community development and education. Since 2016, Sylviane has been the IUCN SSC Primate Specialist Group Madagascar Programme Officer, which is a role hosted by Bristol Zoological Society and sits within the Department of Field Conservation & Science.
African penguin overview

The African penguin (*Spheniscus demersus*), is the only penguin species found in Africa. Living in large colonies along the rocky coastlines and islands of the Cape region, they are one of the most northerly penguin species. They can survive in more temperate climates by benefitting from oceanic upwellings which bring cold, nutrient-rich ocean water to the surface, supporting an abundant food chain. Between 2001 and 2013 alone, the global population of African penguins by fell a devastating 70%, leaving less than 18,000 breeding pairs in the wild. As such, this species is now classified as Endangered and faces a significant risk of becoming extinct if no action is taken to reverse their decline.

The main causes of this decline are overfishing off the coast of South Africa and Namibia, and oil spills. Worldwide, 30% of fisheries landings by weight are forage fish (e.g., sardines and mackerel); however, these species also support many predators, including penguins. In South Africa, environmental change and fishing pressure have caused these species to spawn further east than two decades ago, out of reach of penguins in the Western Cape much of the time. However, because fishing vessels mainly operate from west coast ports and, like birds, are limited in how far they can go to find fish, the result has been heavy fishing pressure where the fish have already become scarce. As fishing can amplify forage fish collapses, competition around the penguins’ breeding colonies may now be too high, contributing to declines in this endangered species.

What do we do to help?

**Monitor penguin populations on Robben Island**

Robben Island is a key penguin colony that has seen a 90% decline in penguin numbers in the last 100 years. In collaboration with both national and international partners such as Earthwatch and the University of Cape Town, intensive monitoring is conducted throughout the breeding season, which runs from March to August. It is critical to collect detailed data on breeding success, fledging success, recruitment, foraging and survival in order to understand the drivers of the decline. In addition to this data, there are a number of ongoing projects on Robben Island that benefit the population, from setting up artificial nest boxes, to supporting BZS and SANCCOB in the rescue of abandoned chicks.
SOUTH AFRICA

Support the Chick Bolstering Project

BZS are a key partner of SANCCOB (Southern African Foundation for the Conservation of Coastal Birds), who are a South African non-profit conservation organization that rescue and rehabilitate oiled African penguins, prior to release. Oil spills are a major penguin problem. When penguins come into contact with oil, they lose the water-proofing quality of their feathers and swallow the oil as they try to clean themselves, leading to high levels of mortality. Two individual oil spills (in 1994 and 2000) in range of their habitats have killed around 30,000 individuals. In 2016, SANCCOB admitted 92 adults that were oiled, following a spill in Algoa Bay in August. Although the source of the spill is not known, these birds had as much as 90% of their bodies covered in oil. The centre also rescued 61 chicks which were the offspring of the oiled birds. These chicks were close to starvation as the parents were unable to forage for them. Almost all of these adults and chicks have now been released back into the wild.

BZS and SANCCOB, along with several other professional partners, have worked together to set up the Chick Bolstering Project (CBP). One aim of this project is to investigate the effectiveness of bolstering declining African penguin colonies by reintroducing hand-reared chicks. When fish stocks are low, the breeding season can begin later as adult penguins need more time to reach peak physical condition for reproduction. When egg laying and hatching is delayed, chicks are not yet old enough to fledge and feed themselves before their parents start the moult process (where they lose their waterproof feathers). Without the ability to swim to find food to feed their chicks, the chicks can starve. In 2016, the Chick Bolstering Project rescued 980 chicks. Even more alarming, it was observed that the chicks were being abandoned even earlier than normal – some as young as 5 days old. After extensive rehabilitation, to date the project has successfully released 83% of the chicks back into established colonies. The project is also working to develop the infrastructure and knowledge required to relocate birds to establish new colonies along the Eastern Cape of South Africa – locations more conducive to successful survival of the species, as they are closer to the current centres of gravity of their fish prey.

Research on temporary fishing closures

In response to the species’ worsening conservation status, South Africa’s fisheries department agreed to investigate the potential benefits to penguins of spatial fishing restrictions. Temporary fishing closures were implemented around four key colonies, with the aim of taking pressure off the penguins during the breeding season. Restrictions have made it easier for penguins to find food at the four main colonies in South Africa. BZS and University of Bristol MSc student, Jennifer Grigg, monitored adult penguin foraging behaviour using GPS loggers, and recorded growth and body condition of penguin chicks when the closures were in place, as well as when the sites were open to fishing. This information was used to determine if fishing closures are helping African penguins. In 2016, the results of this study showed that there were some localized effects, with chick condition at Robben Island being significantly higher during the closures, although this was not the case on all the islands. There was no effect of the closures on foraging duration; thus, penguins were still spending the same amount of time out looking for food. These results demonstrate that although it may be a useful technique, especially if it was trialled for longer and with a larger area, there is unlikely to be a ‘quick fix’ solution to the problem of the African penguin decline.
COMORO ISLANDS

Project Lead: Gráinne McCabe

Located 300 km north of Madagascar, the archipelago of the Comoros is comprised of four volcanic islands, each with distinct fauna and flora. BZS’s focus in the Comoros is Livingstone’s fruit bat (*Pteropus livingstonii*), one of the largest fruit bats in the world and a flagship conservation species for the country, found only on two Comorian islands and nowhere else in the world.

The support provided in the Comoros is channelled through the local NGO Dahari, created in early 2013 as an outcome of a BZS-led project between 2008 and 2012 funded by the Darwin Initiative and French Development Agency. Dahari has 58 employees working to shape sustainable and productive landscapes with Comorian communities. The NGO has adopted a landscape approach to conserving the bats, working on rural development, agroforestry, watershed reforestation and management, and biodiversity conservation. Complementary programmes include ecotourism and a marine management programme.

This support in 2016 resulted in two important outcomes for the species. In partnership with researchers from Durrell Wildlife Conservation Trust and Dahari, we published a paper in *Oryx* reporting on the results of five years of population monitoring and assessment of risks to roost sites. The bats need large, tall trees, ideally on a south-east facing slope, so that they are protected from the heat of the midday sun while they roost and where they can easily drop off into the valleys below to look for food. Only 21 roost sites remain, located in mid-level natural forest areas under increasing pressure from agriculture and timber extraction for construction. The study also reported a population of 1260 individuals; likely making Livingstone’s fruit bat the most threatened fruit bat species in the world. Worryingly, only one of 16 roost sites lacked signs of habitat degradation or increased anthropogenic pressure. As a result of the study, the species has been upgraded to Critically Endangered on the IUCN’s Red List.

Dahari has thus prioritized protection of the remaining roost sites as part of its conservation strategy. While agricultural and agroforestry development reduces pressure on remaining forest being lost at one of the highest rates in the world, additional measures are needed to incentivize local farmers to protect the remaining roost sites. In 2016, Dahari signed the first of two conservation agreements to protect roost sites in perpetuity. The philosophy is that farmers need to benefit from conservation measures if conservation is to be successful in the long-term. The agreements allow farmers to benefit from support for agricultural development in their other fields. Within the area surrounding roosts, farmers are either supported to develop agroforestry regimes, or get financial support from ecotourism to regenerate natural forest. Once enough large trees have developed in the area, this financial incentive will be supplied through sustainable timber offtake.
TANZANIA

Project Lead: Gráinne McCabe

There are seven recognised species of Cercocebus mangabey monkeys. All are threatened with a high risk of extinction according to their IUCN Red List status, and all are relatively understudied. They are found across Africa, from the sooty mangabey in the west (Ivory Coast) to the Tana River mangabey in the east (Kenya). Also known as ‘white-eyelid’ mangabeys for their distinctive white-eyelids which they flash in threat displays; they are highly terrestrial, spending a large amount of time on the forest floor rather than up in the trees like the majority of primates. Part of the reason they are so little-known is that they are usually found deep in the forest, in regions that are difficult to access and not often visited by tourists or researchers.

The Sanje mangabey (Cercocebus sanjei) is endemic to the Udzungwa Mountains of south-central Tanzania. It is listed as Endangered due to declining population size, habitat loss and forest fragmentation. The species is divided between two isolated forest block populations; the well-protected Udzungwa Mountains National Park and the relatively unprotected Udzungwa Scarp Nature Reserve. The first and only population survey of the species was completed in 2000 and estimated the population size to be between 1300-3500 individuals remaining. Seventeen years on, with the human population in the Udzungwa region growing at a rapid rate, and forest loss a significant threat in the Scarp, it is time for a reassessment.

In 2016, we were awarded a NERC Industrial Case Studentship in partnership with Cardiff University to take on PhD student, Christina Paddock, for this reassessment. The study aims to improve our understanding of the remaining Sanje mangabey population and to investigate the underlying genetic structure and management status of the two forest blocks. To do this, a population survey will be conducted in 2017 to estimate the total population size, using acoustic survey methods, designed to be more suitable for the Sanje mangabey than methods used in previous surveys. We will also analyse DNA from faecal samples to establish the genomic diversity of the population and to identify any differences in genetic structure between the two sub-populations. The results will be used to model population and habitat viability and to develop potential conservation strategies in association with the local stakeholders. A management plan will be created in collaboration with local and national Tanzanian authorities in a series of workshops. Ultimately, our aim is to increase the protection of the Sanje mangabey and its remaining habitat in the Udzungwa Mountains.
The Desertas wolf spider (*Hogna ingens*) is the largest known species of wolf spider and is a strict endemic, being found in a single valley on Desertas Grande, an island on the east coast of Madeira. They are classed as Critically Endangered by the IUCN Red List, due to habitat loss caused by a floral imbalance in grasses. This incursion of grass has caused massive shrinkage of their habitat, reducing their extent of occurrence by over 70% in less than a decade.

In 2016, Mark Bushell (Curator of Invertebrates) and Richard Saunders (BZS Veterinarian) attended a three-day workshop in Funchal, Madeira alongside experts from the IUCN Species Survival Commission, Madeira University and the Institute of Forest and Conservation of Nature. The strategy that was proposed during this meeting follows a holistic view of the conservation programme, including a significant *ex-situ* element, focused on rearing spiders in captivity for future release, with an EAZA Endangered Species Programme being created and coordinated by Bristol Zoo Gardens. BZS will also play a significant role in habitat restoration on Madeira, with plans in 2018 for habitat work to start with volunteers working alongside park rangers on Desertas Grande.

As part of the strategy, 25 individual spiders were collected from the island to form the founder population for the wolf spiders at Bristol Zoo Gardens. Since then we have successfully reared nine individuals to adulthood and have started breeding trials with positive outcomes so far. During this process, we have documented, for the first time, the mating ritual of this species, along with other key information that may prove crucial for the conservation programme overall and for the creation of future invertebrate conservation projects.
FRENCH POLYNESIA

Project Lead: Mark Bushell

Polynesian tree snails are the subject of one of the longest running international conservation programmes, with Bristol Zoo Gardens having been involved since 1995. The introduction of a carnivorous snail to islands in French Polynesia in an effort to control another invasive, the giant African land snail, resulted in disaster, with only 19 species of Polynesian tree snails remaining, from a previously diverse taxon of over 100 species. At present, Bristol Zoo Gardens hold four species, all of which are classed as Extinct in the Wild by the IUCN Red List; *Partula dentifera, P. hebe bella, P. tohiveana* and *P. tristis*.

In 2016, alongside the captive breeding work we participate in, Bristol Zoo contributed snails from all four of the species we hold, for a release back into the wild on the islands of Tahiti and Raiatea. In total, 48 snails were contributed to the overall release population of 1700 snails. These were released into tree plantations where the predatory snails are absent or otherwise in very low numbers. Snails were also released into a reserve constructed on Tahiti that BZS financially supported.

We hope to follow this release up with a concerted effort led by Bristol Zoo Gardens, focusing on the island of Raiatea.

Research into the spread of the predatory snail has revealed that it is in decline in some areas previously thought to be strongholds, although unfortunately a new predator has started to appear – the predatory New Guinea flatworm *Platydemus manokwari*. Whether this new threat is an accidental or deliberate introduction is not clear, but it presents a new danger to the survival of snails in French Polynesia.

*Partula tohiveana* marked ready for release
Biomedical evaluation of free-ranging Sahamalaza sportive lemurs, *Lepilemur sahamalazensis*

In 2016, Charlotte Day continued the biomedical evaluation of the Critically Endangered Sahamalaza Sportive Lemur, *Lepilemur sahamalazensis* in Madagascar. This is part funded by the American Association of Zoo Veterinarians’ Wild Animal Health Fund and the Association Européenne pour l’Etude et la Conservation des Lémuriens (AEECL).

Returning to research camp with sportive lemur for biomedical assessment and radio collar placement

Biomedical assessments have previously been used as tools for monitoring the population health of several other free-ranging lemurs. They are particularly useful for threatened species, where small population size means that anthropogenic (human) disturbance or disease epidemics could have potentially catastrophic effects.

The study aimed to maximise data collection from this species during a concurrent study into its social system and vocal communication, which required individuals to be anaesthetised for radio-collars to be fitted. Fourteen lemurs were caught during August 2016 by darting them with an anaesthetic drug in the forest and they were then transported a short distance to camp for examination, sampling and fitting or removal of radio-collars. Measurements were taken and blood and faecal samples collected from each individual before they were allowed to recover from the anaesthetic and released back where they were found during the night. Some samples were analysed in the field and others brought back to laboratories in the UK. Blood samples have been analysed for biochemical and haematological parameters as well as tested for specific diseases such as toxoplasmosis. Faecal samples have been examined for parasites and cultured to determine normal faecal flora.
CONSERVATION MEDICINE

The biomedical data we have collected will enable development of the first reference ranges for biomedical parameters in this species and will be useful for future management of both free-ranging *L. sahamalazensis* and for a potential future captive population, as proposed in the 2013 Action Plan for Lemur Conservation in Sahamalaza.

Disease survey of wild cranes in South Africa

The wattled crane, *Bugeranus carunculatus* is Critically Endangered in South Africa. In 2000, population and habitat viability analysis identified the need for a captive breeding and release programme. The Wattled Crane Recovery Programme (WCRP) was established to address the decline of this charismatic bird. Its objectives are: to maintain a captive breeding flock to serve as a genetic reservoir in the case of catastrophic extinction of birds in the wild and to increase the wild population through the release of captive reared fledglings into existing wild flocks. Before release of any captive reared animals, it is good practice to carry out a disease risk assessment and consequently a disease survey of wild cranes has been running since 2014, overseen by Michelle Barrows, the veterinary advisor to the WCRP. This project is part funded by a Conservation Action Now grant from Oklahoma Zoological Society and involves sampling wild fledglings when they are caught up for routine ringing, which takes place annually. In 2016, 11 cranes were sampled giving a total of 29 cranes so far. It is hoped that this project will be completed at the end of 2017.
MEET THE CONSERVATION MEDICINE TEAM

**Head of Conservation Medicine**

**Dr. Michelle Barrows**

Michelle studied zoology at UCL and veterinary medicine at Glasgow University and has a RCVS diploma in zoological medicine and a Post-Graduate Certificate in Conservation Medicine. She is also a European Veterinary Specialist in Zoological Medicine (Zoo Health Management). She has been Head of Veterinary Services & Conservation Medicine at BZG since 2010, is a clinical teacher at the University of Bristol Veterinary School, and a unit director for the MSc in Global Wildlife Health and Conservation. She is interested in disease risk assessment and preventative medicine, and is conducting *in situ* biomedical evaluations of Critically Endangered lemurs and disease surveys of wild cranes in South Africa.

**Veterinarians**

**Dr. Rowena Killick**

Rowena qualified as a vet from the University of Edinburgh in 1997 and spent several years in veterinary practice before completing the MSc in Wild Animal Health at RVC/ZSL in 2005. She completed a three-year residency at Bristol Zoo Gardens/University of Bristol, during which she achieved her RCVS Diploma in Zoo Medicine (Mammalian), and is a clinical teacher for Bristol vet school. Her research interests include vitamin D and calcium metabolism in primates, and zoo animal training for husbandry and veterinary procedures. She is also currently conducting a biomedical evaluation of free-ranging Sahamalaza sportive lemur in Madagascar.

**Dr. Richard Saunders**

Richard is a RCVS Registered Specialist in Zoo and Wild Animal Medicine (Mammals). He gained his BSc and BVSc from Liverpool University and has worked in a charity wildlife clinic plus private veterinary practice. For the past 8 years he has worked in Bristol Zoo Veterinary Department and within private practice for exotic animals. He has supervised student projects on gorilla reproduction, infectious diseases in rabbits and gastrointestinal bacteria flora in birds. His research interests include rabbits, rodents, birds of prey, marine mammals and invertebrates.

**Veterinary Intern**

**Dr. Charlotte Day**

Charlotte graduated from the University of Bristol with degrees in Veterinary Science and Zoology (2008). She then worked in mixed veterinary practice and a private exotic pet clinic (reptiles, birds, small/exotic mammals and wildlife) in addition to volunteering as a part-time small carnivore keeper at Port Lympne Wild Animal Park, and assisting in the veterinary care of gorillas, chimps and other primates at Ape Action Africa (Cameroon). Charlotte started a veterinary internship at Bristol Zoo in 2014. She is also the Veterinary Advisor for the BIAZA Small Mammal focus group.
The Conservation Learning Department has many facets, and dovetails closely with the Field Conservation and Science Department, particularly in the management and delivery of higher education, guest action campaigns, the Avon Gorge and Downs Wildlife Project and the Society’s library service.

The department carries out many functions that support and deliver the conservation and education charitable objects of the Society, and provides an informative and engaging visit for our guests. For example, the Graphics team produces most of the communications pieces for the Society, including materials for getting conservation messages across to our guests – interpretation on what the Society does, as well as materials to deliver the guest action campaign.

The Volunteer team manages upwards of 300 volunteers across the Society, supporting most departments, and delivering Animal Encounters – 1,078 of which were delivered to audiences totalling 15,771 people through 2016 (many with a conservation message). The section’s income (£58,326 in 2016) helps support the Society’s conservation work. They also helped deliver the ‘Knot Your Net’ campaign with 2,216 conversations in the Encounters, and 2,999 in the walkthrough exhibits which they help to cover.

The Education team taught nearly 40,000 pupils and students in our themed classrooms during 2016.

The Ranger team delivered 2,952 talks to 98,948 guests throughout 2016. They play a crucial role in giving guests a great day out as well as informing them and enthusing them about wildlife and the work of the Society. When appropriate, the talks inform and encourage guests to engage in wildlife-friendly behaviours: looking for the Marine Stewardship Council (MSC) or Forest Stewardship Council (FSC) logos when shopping, for example. This forms part of the Society’s developing work in attempting to support positive wildlife conservation outcomes through our guest interactions. In addition to talks, ‘roaming’ Rangers (out and about with props) had personal conversations with 15,727 guests.
CONSERVATION LEARNING

The Education section taught 37,768 pupils and students in 1,503 sessions, both in the Zoo and on outreach. This output consists of over 50 different session titles, tailored for the needs of visiting groups. But it’s not just about the numbers; sessions such as classification, art and design, pets and animal care, and primate communication are all delivered as part of the educational mission of engaging people with the natural world. In 2016, the team delivered a new Conservation Academy course for 8-12 year olds, running 4 two-day courses for a total of 39 children. In addition, adult evening classes were started; an eight-week course on Wildlife Conservation was run 3 times in 2016 and was delivered to 52 participants.

Out of the taught sessions, 39% had a significant conservation-focused component. Analysis of feedback from these sessions shows that, as a result of their session:

In collaboration with the Field Conservation and Science Department, the education team taught on most of the currently-running HE programmes, including the launch of the new MSc Advanced Wildlife Conservation in Practice where Simon Garrett co-led a module on Communication for Conservation.

At the Wild Place Project, the team have greatly expanded the conservation education work done in 2016, with 5472 students being taught in 300 workshops. The process began to fulfil the Society’s ambition of ‘Ranger Stations’ around the site, by installing Ranger Station boxes in key locations. These contain various items such as biofacts, model skulls, binoculars and conservation games, which volunteers and staff use to engage guests with the animals and our conservation projects. In order to engage people with our native species, the team created a tree ID trail and Spring wildflowers ID around the site as well as installing a bird ID board in the bird hide.
MEET THE CONSERVATION LEARNING TEAM

Head of Conservation Learning

Simon Garrett

Simon studied biology at the University of Bristol. After leading a post-grad expedition to the forests of Venezuela, he started as an Education Officer at the Zoo, and now, 25 years later, leads a sizable Learning Department, encompassing all aspects of formal and informal learning, and working closely with the Conservation Science department in the delivery of Higher Education programmes. He was a member of the BIAZA Education and Training Committee, and is a member of the International Zoo Educators’ Association. He also sits on the steering group of the Bristol Natural History Consortium, and is part of their committee that oversees the annual ‘Communicate’ conference. His main interest is developing the role of zoos into the field of encouraging wildlife-friendly actions in zoo visitors.

Education Manager

Dave Naish

Dave completed a degree in Zoology at Nottingham University and then headed to the Amazon to work as a naturalist guide, and as a mammologist doing large mammal surveys for Conservation International. He joined the Zoo in 2001 and now manages the Education section and its formal learning output to the 42,000 school and college students that visit. He is also currently Chair of the Learning and Volunteering Committee for the British and Irish Association of Zoos and Aquariums (BIAZA), promoting best learning practice amongst the 112 BIAZA members.

Avon Gorge and Downs Biodiversity Education Officer

Mandy Leivers

Mandy Leivers studied biological sciences at Birmingham University. During this time she discovered her passion for British wildlife and practical conservation. After graduating she spent nine years working for the British Trust for Conservation Volunteers before running a project to protect hedges and dry stone walls in Bath and North East Somerset and South Gloucestershire. In 2000 she studied for a Post Graduate Certificate in Education at Bath University. Since 2011, Mandy has been the Avon Gorge & Downs Wildlife Biodiversity Education Officer. In this role, she delivers a popular programme of education, interpretation and promotional work to encourage greater public involvement, understanding and enjoyment of the wildlife interest of the Avon Gorge and Downs.
Wild Place Project Learning Officer

Tania Dorrity

Tania is originally from Zimbabwe and read zoology & botany at the University of Cape Town, South Africa. After her degree, she worked for the BBC Natural History Unit. She spent the next 24 years making wildlife documentaries such as The Really Wild Show, Big Cat Diary, Wildlife On One and Deadly 60. In 2010, she left the BBC to fulfil another lifelong ambition - to teach. After two and a half years’ teaching science & biology in secondary schools, she joined Wild Place Project in 2014 to set up the learning programme and implement theming and interpretation.

Senior Ranger

Sam Western

Sam holds an undergraduate degree in Psychology, with a focus on animal behaviour, and a Diploma in the Management of Zoo and Aquarium Animals. She began at the zoo in 2008 as a Seasonal Ranger. She then worked briefly at Paignton Zoo before returning to Bristol Zoo to work on the Presentations section with the Amazing Animals and seals. Sam manages a team of Rangers who deliver the informal learning schedule in the zoo, including enclosure talks, walkthrough animal enclosures, and busking around the zoo. The team also provide extra value experiences such as behind the scenes tours for guests staying in The Lodge.

Manager of Volunteer Services

Ann Lovell

After 15 years in the Financial Services Industry, Ann joined BZS in 2000, and she now manages the volunteer services. Since starting at BZS Ann has helped to increase volunteer numbers at Bristol Zoo Gardens from around 60 in 2000 to over 250 currently. Ann has also been integral in developing and maintaining the volunteer scheme at Wild Place Project, which now boasts over 100 volunteers.

Graphics Manager

Phil Jearey

Phil was born in Zambia and came to the UK in 1985 to study. In 1989, he moved to Bristol to undertake a degree in Graphic Design at the University of the West of England. Phil began working for the BZS in 1993. He has had his current role manager of the Graphics Section since 1996, where he oversees the society's wildlife illustrator and graphic designers.

 Theming and Interpretation Coordinator

Daniel Days

Daniel studied sculpture and photography before obtaining a degree in music at Bretton Hall. He subsequently worked in stage and set design, eventually retraining as a joiner, and engaging more and more in construction management. Daniel also worked as a safari guide, running overland trucks throughout central and eastern Africa, and has been accredited by Namibian based conservation organisation Cyber-Tracker, as a level 3 specialist tracker. Daniel’s main responsibilities within BZS are to coordinate the interpretation and theming projects both at the Zoo and Wild Place Project.
CONSERVATION BREEDING

This year was another hugely successful year for conservation breeding achievements at BZS, across both the Bristol Zoo and Wild Place sites.

Conservation breeding is a major part of the Bristol Zoo invertebrate department and this year has seen three pairs of Critically Endangered Lord Howe Island stick insects, *Dryococelus australis*, reared to maturity, with many eggs being produced so far. Eggs are due to hatch from late February 2017 onwards.

In addition, the department have started a captive population of another Critically Endangered species, the Desertas wolf spider, *Hogna ingens*, at Bristol Zoo as part of the conservation strategy for the species.

In 2016, we also provided animals for a release of several *Partula* species (Polynesian tree snails) onto Tahiti and Raiatea (islands in the Society Islands group) as part of the conservation programme run by a consortium of zoos across the globe. All four species we provided are classed as Extinct in the Wild by the IUCN Red List.

In the Aquarium, Bristol Zoo have successfully bred and reared a number of Endangered Banggai cardinal fish, *Pterapogon kauderni*, which are an Endangered tropical marine species of mouth brooder from Indonesia.

Our curator of reptiles and amphibians, Tim Skelton, facilitated the re-homing and creation of a new EAZA studbook for around 100 Critically Endangered Tanzanian blue geckos, *Lygodactylus williamsi*, that had been confiscated at Heathrow Airport. The species is threatened by severe habitat loss and over collection for the pet trade. It has since been placed on CITES Appendix 1 in order to control this trade.

Tanzanian blue geckos (*Lygodactylus williamsi*)
CONSERVATION BREEDING

Bristol Zoo also had the most successful year to date breeding Bourret's box turtle, *Cuora bourreti*, with four hatchlings successfully reared, bringing our total to eight.

There have been a number of new mammal arrivals in 2016 across both sites at BZS, many threatened with extinction in the wild. These included two new Livingstone’s fruit bats, which are Critically Endangered (Bristol Zoo).

There were a number of threatened primate species born at Bristol Zoo in 2016, including two sets of Endangered golden-headed lion tamarin twins, *Leontopithecus chrysomelas*, twin ring-tailed lemurs, *Lemur catta*, and a baby Goeldi’s monkey, *Callimico goeldii*, which is currently classified as Vulnerable. Wild Place also had five ring-tailed lemurs being born, as well as two female okapi.

Excitingly, three Endangered Visayan Tarictic hornbills were also born and were raised in an artificial tree cavity in the Forest of Birds enclosure. Our female hornbill sealed herself in the nest with mud around the opening. There she stayed for several months while incubating the eggs and brooding the chicks. Throughout this process, the male provided the female and the chicks with all their food through the small crack in the opening.

Wild Place have had a fantastic year for conservation breeding of birds, with a number of threatened species being born. These included five Critically Endangered Bali starling chicks, *Leucopsar rothschildi*, and one Socorro dove, *Zenaida graysoni*, which is Extinct in the Wild. In addition, five Endangered pink pigeon eggs, *Nesoenas mayeri*, that were laid at Wild Place, were reared by foster doves at Bristol Zoo. This was the second most pink pigeons hatched at any collection worldwide in 2016. We hope that this important breeding programme will directly contribute to boosting the genetic diversity of the wild population, which is on the road to recovery thanks to intensive conservation management.
MEET THE CONSERVATION BREEDING TEAM

Head of Conservation Breeding

John Partridge

John Partridge, the senior curator of animals at Bristol Zoo Gardens, began working at the zoo in 1975 when he was 20 years old. His first job was with the apes – families of gorillas, orangutans, chimpanzees and gibbons. He has worked with a host of animals in the 41 years since, including some the Zoo’s most well-known inhabitants such as Wendy the elephant and gorillas Samson and Delilah who produced Daniel, the first baby gorilla to be successfully reared in the UK. Although predominantly specialising in the husbandry and care of mammals, John has also worked with the reptiles and amphibians at the Zoo, to broaden his knowledge and experience. Today his work is less hands-on and more in a supervisory capacity – planning and managing the Zoo’s animal collection and ensuring it is developed with a strong focus on global species conservation, in line with the Society’s mission statement and strategic plan. John also supervises a large team of keepers, volunteers and students within the animal department.

Curators

Mark Bushell – Curator of Invertebrates

Mark has been at BZS since 2010, having previously studied invertebrates as a private individual. He is Chair of the BIAZA Terrestrial Invertebrate Working group and Chair of EAZA’s Terrestrial Invertebrate Taxon Advisory Group. He also oversees the Invertebrate Regional Collection Plan for EAZA, and works closely with the IUCN Species Survival Commission on the Spider & Scorpion and Grasshopper Specialist Groups, the latter of which he is Co-Chair of. Mark works on many key invertebrate conservation projects, including the Crau Steppe grasshopper and the spiky yellow woodlouse, plus holds the European studbooks for Desertas wolf spiders and the Lord Howe Island stick insect.

Tim Skelton – Curator of Reptiles and Amphibians

After initially training as a cook and then a veterinary nurse, Tim studied applied zoology at Bangor University before completing a Masters in “Applied Animal Behaviour and Animal Welfare” at the University of Edinburgh. After graduating in 1994, he began as a trainee reptile keeper at Edinburgh Zoo where he studied for my zoo-keeping qualification. Tim has worked for BZS since January 1999 as head of the reptile section. He is now curator of reptiles and amphibians, and head of the ectotherm section. Tim created studbooks for the African pancake tortoise, yellow headed day gecko and more recently lemur leaf frogs. His current interests include DNA research within these studbook species to try and manage them more effectively and the captive breeding of the many species currently housed within the section.
Jonny Rudd – Aquarium Curator

Jonny has been working for BZS since 1999. After studying for a BSc in aeronautical engineering he changed career paths to pursue his interest in animal care. Initially he worked with a large range of species from nocturnal mammals, reptiles, fish and aquatic invertebrates, but Jonny soon found his interest focusing on aquatic animal care. After completing a foundation degree in Zoo resource management in 2008 he took on the role of aquarium curator. Managing a large facility consisting of 23 public displays and over 100 off-show research and breeding tanks, Jonny is responsible for the care of over 3000 individual fish, corals and aquatic invertebrates. His interests include the breeding and rearing of seahorses, conservation of endangered fresh water fish, and captive care and propagation of stony corals. In 2016, he also took over as chair of the BIAZA Aquarium working group.

Richard Switzer – Curator of Birds

Rich has recently joined Bristol Zoo Gardens as Curator of Birds. He has a special interest in techniques and strategies at the interface between captive breeding and the restoration of species in the wild. His bird conservation career started with the Mauritius Wildlife Foundation, developing programmes for threatened native Mauritius songbirds. Following that, he spent a decade in Hawaii working for the San Diego Zoo’s Institute for Conservation Research, managing captive breeding and reintroduction programmes for some of Hawaii’s most threatened native birds. For two years he worked in Qatar as Bird Curator at the Al Wabra Wildlife Preservation and he has also carried out fieldwork with threatened birds in French Polynesia and Galapagos. With a background in teaching, Rich is a long-standing member of the faculty at the Durrell Conservation Academy in Jersey.

Lynsey Bugg – Curator of Mammals

Lynsey studied for an Ecology degree at the University of Plymouth before moving to Bristol where she began her zoo keeping career as a volunteer one day a week on the Primate Section, as it was then. In 2000, she secured a part-time position, and then a full-time position one year later. Her first full-time role was a keeper in Twilight World, working with a variety of nocturnal species. Her interest for primates in particular remained, and as her career progressed she moved back to primates but also trained on large mammals. During the 16 years she has been at BZS, Lynsey has worked her way up to Mammal Curator and is now responsible for running the Mammal Section with over 40 species, plus a team of 19 keepers, as well as volunteers and students.

Will Walker – Wild Place Animal Manager

Will has been working at Wild Place since it opened in 2013 and has been working in zoos for over 15 years both in the UK and overseas. His passion, experience and knowledge is with large mammals, with a particular focus on African species. He has travelled extensively over much of Eastern and Southern Africa in pursuit of wildlife. Will is the EAZA EEP coordinator for red river hog (Potamochoerus porcus), and is a member of the tapir and suiform TAG. The red river hog breeding program currently has over 200 animals within it across 70 zoos and wildlife parks. Will is enjoying the challenges that this program brings. Giraffe are a favourite for Will, having worked with them for 6 years in a previous zoo, and he is keen to add them to the ever-growing collection at Wild Place in 2017.
SELECTION OF GRANTS AND AWARDS

American Society of Primatologists Travel Grant, USA: $500 USD (£406) for University of Bristol PhD student Caitlin Eschmann on hybridization of the blue-eyed black and black lemur

Global Wildlife Conservation, USA (including Connie Roosevelt and Andy Sabin): $20,000 (£15,400) – IUCN African primate red listing workshop in Rome

Houston Zoo, USA: $14,093 (£10,860) – IUCN African primate red listing workshop in Rome

Mohamed bin Zayed Species Conservation Fund, Abu Dhabi: $12,000 (£9,745) – Population assessment of the Sanje mangabey, *Cercocebus saniei*, in the Udzungwa Mountains, Tanzania

Mohamed bin Zayed Species Conservation Fund, Abu Dhabi: $10,000 (£8,121) – Population viability of Kordofan Giraffe in Northern Cameroon

Mohamed bin Zayed Species Conservation Fund, Abu Dhabi: $10,000 (£8,121) - Conserving the white-clawed crayfish: optimising aquaculture techniques and assessing long-term ark site survival

Mohamed bin Zayed Species Conservation Fund, Abu Dhabi: $20,000 (£15,400) – IUCN African primate red listing workshop in Rome

Rufford Foundation, UK: £5,000 for University of Bristol PhD student Caitlin Eschmann on hybridization of the blue-eyed black and black lemur

Stiftung Artenschutz, Germany: €6,194 (£5,310) – Population survey of Madagascar sacred ibis in northwestern Madagascar

Synchronicity Earth, UK: £10,000 (£8,121) - IUCN African primate red listing workshop in Rome

The Explorers Club, USA: $3,000 USD (£2,436) for University of Bristol PhD student Caitlin Eschmann on hybridization of the blue-eyed black and black lemur

Verde Ventures (Conservation International, USA): £19,831 (£16,105) – Understanding the use of cacao plantations by primate species in north-western Madagascar

Verde Ventures (Conservation International, USA): £19,918 (£16,176) - Landscape and biodiversity assessment of vanilla plantations and surrounding areas in the Sava region of Madagascar
Conference and workshop presentations:


BZS Conservation Lecture Series, Bristol Zoo Gardens. 4 May 2016. “What to conserve? Population genetics in an evolving world” (T. Bray)


- “Competence and agency: evaluation of two novel indicators of welfare in zoo-housed chimpanzees (Pan troglodytes)” (F. Clark)
- “Social behaviors of blue-eyed black lemurs (Eulemur flavifrons) during the mating season in northwest Madagascar” (C. Eschmann, G. McCabe)
- “Monitoring the Sanje mangabey (Cercocebus sanjei) population in Tanzania while engaging the local community.” (G McCabe)
- “Enhancing the profile of threatened primates: impact of the ‘top 25 most endangered primates’ list on the scientific community and the general public” (D. Kerhoas, G. McCabe, C. Schwitzer, A. Webber)
- “Aiding conservation through research: edge effects in the Critically Endangered Sahamalaza sportive lemur, Lepilemur sahamalazensis, in north-west Madagascar” (I. Mandl, C. Schwitzer)
- “Trade-offs between reproduction and parasitism in wild female Sanje mangabeys (Cercocebus sanjei)” (G. McCabe)
- “Lemur conservation network: increased conservation success through collaboration” (C. Schwitzer)
- “Reproductive output and longevity in wild-caught and captive-born Javan gibbons (Hylobates moloch)” (J. Wise, C. Schwitzer)

The 9th International Penguin Congress, Cape Town, South Africa. 5 – 9 September 2016. “Investigating the effects of spatial management of South African fisheries on African penguins Spheniscus demersus in the Western Cape” (J. Grigg, G. McCabe, R. Sherley)

Monkey Mondays, Oxford Brookes University. 31 October 2016. “Challenges and Hopes in Conservation: Case Study on the rarest chimpanzee” (O. Doumbé)

Department seminar, Psychology Department, Biology Faculty, Portsmouth University. 2 November 2016. “The socioecology of infant created macaques” (D. Kerhoas)

Festschrift in Honor of Dr Linda Fedigan, University of Calgary, Banff, Canada. December 2016. “Infant mortality and seasonality in wild Sanje mangabeys, Cercocebus sanjei” (G. McCabe)
SCIENCE COMMUNICATION

Conferences and workshops attended:


Animals and People: is co-existence possible? Part of the University of Bristol’s Institute for Advanced Studies’ ANIMALS: Non-Human and Human Alike season, Bristol Zoo Gardens. 16-27 May 2016. (A. Webber)

Annual Learning and Teaching Conference, University of the West of England. 22 June 2016. (A. Webber)


International Zoo Educators Conference, Buenos Aires, Argentina. 18-22 October 2016. (K. Major)

Advanced Bid Writing Workshop, CML Consultants Bristol. 10 October 2016. (T. Bray, S. Cotton, D. Kerhoas, K. Major)

Festschrift in Honor of Dr Linda Fedigan, University of Calgary, Banff, Canada. 30 Nov – 3 Dec 2016. (G. McCabe)

Reviewing & editing roles:

* BZS staff hold a variety of editing roles and committee membership.*

Editors

- Animal Behavior and Cognition (Editorial Board)
- Animal Welfare (Section Editor for Zoo Animals)
- Frontiers in Veterinary Medicine: Animal Welfare and Behaviour (Review Editor)
- Journal of Zoo and Aquarium Research (Member of Editorial Board),
- Lemur News (Editor-in-Chief; Editorial Board)
- Primate Conservation Special Issue on Crowned Sifakas (Guest Editor)
SCIENCE COMMUNICATION

Journal review

- American Journal of Primatology
- Animal Behavior and Cognition
- Animal Welfare
- Applied Animal Behaviour Science
- Companion Animal
- International Journal of Primatology
- Journal of Heredity
- Journal Small Animal Practice
- Journal Zoo & Wildlife Medicine
- Mammalia
- Oryx
- PLoS One
- Primates
- Zoo Biology
- Zoology in the Middle East
- Behavioural Ecology

Committee & specialist group participation

- African pancake tortoise EEP
- American Society of Primatologists Conservation Committee
- Association Européenne pour l’Etude et la Conservation des Lémuriens (AEECL) (Vice-President)
- BIAZA Aquarium working group (Chair)
- BNHC Steering Group and Communicate Committees.
- BIAZA Field Programmes Committee member
- BIAZA Learning and Volunteer Committee chair
- BIAZA Native Species Working Group Steering Group
- BIAZA Primate Focus Group
- BIAZA Research Committee
- BIAZA Terrestrial Invertebrate Working Group Steering Committee
- BIAZA Veterinary Focus group with responsibility for the following: primates (R. Killick), small mammals (C. Day), birds (M. Barrows), native species (R. Saunders).
- BIAZA Volunteer Coordinators’ Forum
- Desertas wolf spiders EEP
- Dexter Cattle Society Genetics Team
- EAZA Nutrition Group Steering Committee
- EAZA Population Management Advisory Group
- EAZA Pigeon and Dove TAG and Pink Pigeon EEP (Veterinary advisor)
- EAZA Research Committee
- EAZA Tapir and Suiform TAG
SCIENCE COMMUNICATION

- EAZA Terrestrial Invertebrate Taxon Advisory Group (Chair)
- Howler monkey EEP (Veterinary advisor)
- Hubei Shishou Milu National Nature Reserve, Hubei, China, Expert Advisory Committee member
- International Primatological Society Captive Care Committee
- International Primatological Society (Vice President)
- IUCN SSC Conservation Breeding Specialist Group
- IUCN SSC Grasshopper Specialist Group (Co-Chair)
- IUCN SSC Spider & Scorpion Specialist Group
- IUCN SSC Giraffe and Okapi Specialist Group
- IUCN SSC Primate Specialist Group (Deputy Chair and Red List Authority Coordinator)
- IUCN SSC Stork, Ibis and Spoonbill Specialist Group
- Lemur leaf frog EEP
- Lord Howe Island stick insect EEP
- Red river hog EEP
- Scientific Advisory Committee of Ambatovy Minerals S.A., Madagascar
- World Pheasant Association Scientific Advisory Committee
- Wattled Crane Recovery Programme – Veterinary advisor
- Yellow headed day gecko EEP

Organization or society membership

- American Association of Physical Anthropology
- American Association of Zoo Veterinarians
- American Society of Primatologists
- British Tarantula Society
- Association of Avian Veterinarians
- Association of reptile and amphibian veterinarians
- BBSRC Animal Welfare Research Network
- British Bee Veterinary Association
- British Veterinary Zoological Society
- Chartered Institute of Ecology and Environmental Managers
- EAZA Callitrichidae Taxon Advisory Group
- European Association of Zoo and Wildlife Veterinarians
- French Society for the Study of Animal Behaviour
- International Association of Astacology
- International Primatological Society
- Phasmid Study Group
- Primate Society of Great Britain
- Society of Conservation Biology
In August, the Director of Conservation, Head of Field Conservation and Science, and two Lecturers attended the 26th Congress of the International Primatological Society (IPS) in Chicago. The week-long congress was hosted by Lincoln Park Zoo's Lester Fisher Center for the Study and Conservation of Apes, and was the first meeting of its kind to be hosted by a Zoological Park.

The conference opening reception actually took place in the zoo with talks in different enclosure highlighting the research and field conservation undertaken. Dr Jane Goodall received the IPS Lifetime Achievement Award, and other distinguished talks were given by world-renowned primatologists.

Christoph Schwitzer contributed to a symposium on the use and care of captive primates. Fay Clark took part in a symposium on the advancement of great ape welfare, giving a talk on novel indicators of welfare in a zoo setting. Daphne Kerhoas chaired the session on conservation and gave a talk on the evaluation of a specific conservation campaign, investigating the impact of the “top
SELECTION OF SCIENTIFIC PUBLICATIONS


Bray T and Bocak L. 2016. Slowly dispersing neotenic beetles can speciate on a penny coin and generate space-limited diversity in the tropical mountains. *Scientific Reports*, 6: 33579. DOI: 10.1038/srep33579.


