QUARTERLY PUBLICATION OF THE EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

ZOOQUARIA

WINTER 2018/19

ISSUE 103

SMALL WONDER

HOW YOU CAN HELP TO SAVE THE ENDANGERED ANOA

Himalayan wonders

INSIDE THE NEW EXHIBIT AT BIOPARC DE DOUE-LA-FONTAINE

A nature manifesto

PUTTING CONSERVATION AT THE HEART OF EU POLICY

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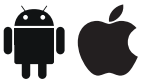

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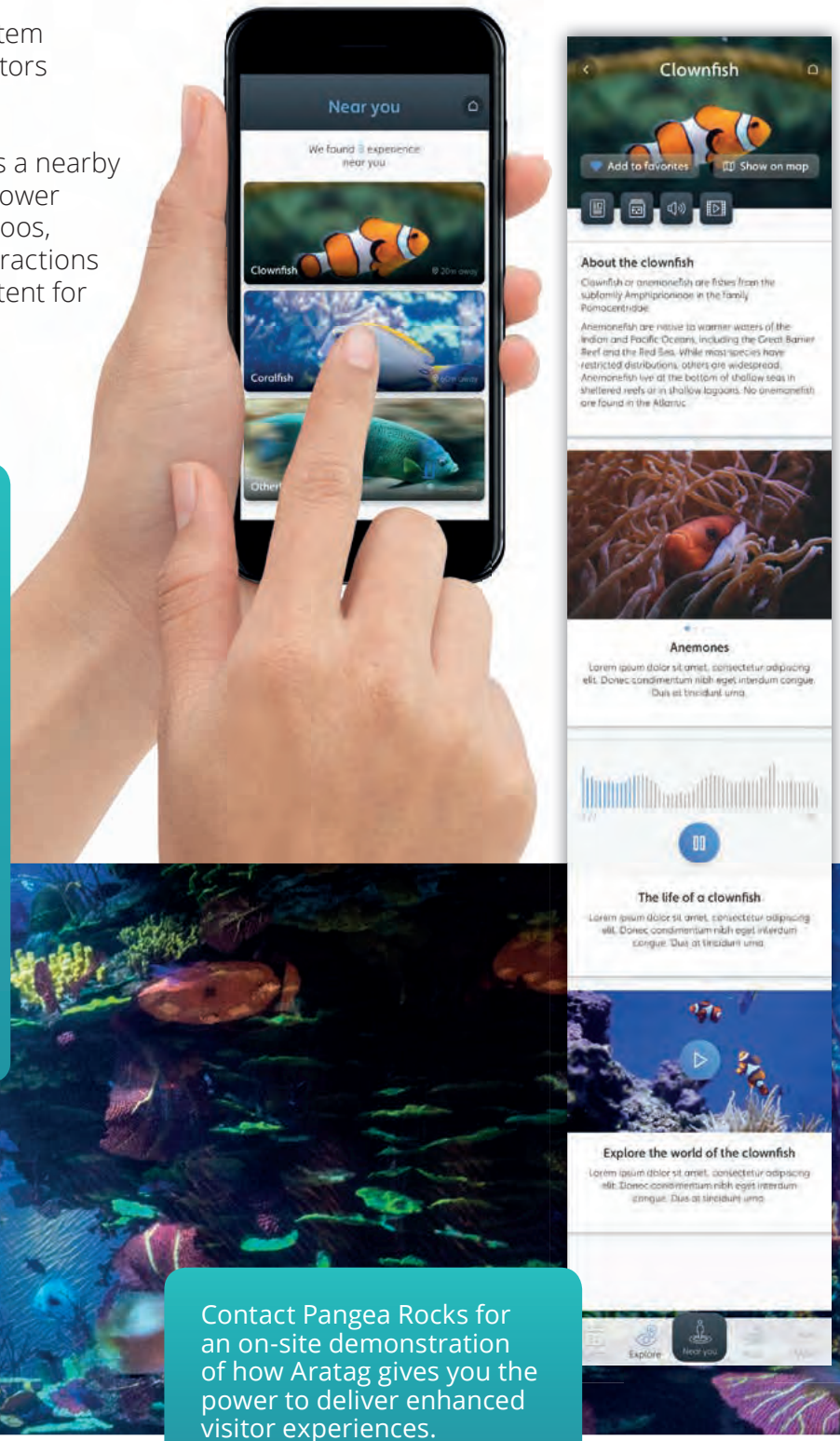

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Zooquaria

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Zooquaria is the quarterly magazine of the European Association of Zoos and Aquaria (EAZA).

EAZA Executive Office, PO Box 20164, 1000 HD Amsterdam, The Netherlands.
Email: info@eaza.net ISSN 2210-3392 . Cover image: © Chester Zoo
. For information on print subscriptions to *Zooquaria* visit:
http://www.eaza.net/about-us/communications
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Plates for printing are free of chemicals. All waste is disposed of in an environmentally friendly manner. Printed by Euro Mail BV.

FROM THE DIRECTOR'S CHAIR

The end of one year and the start of another is a time of reflection for many, and I am no different. Looking back over 2018, it is sometimes hard to believe how much we have achieved. This was a big year for EAZA and our Members as our 2017–2020 Strategy truly came into force and we saw an expansion of activities across all our focal areas.

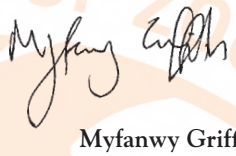
Addressing the focal area that aimed to 'maximise the conservation impact of our Members' we saw an excellent EAZA Conservation Forum attract a maximum capacity of 158 participants. These participants represented five different continents, with many thousands more joining on the livestream. Ample evidence was shared about the diverse conservation work of EAZA Members and *in situ* partners, as well as how to address the continuing threats to biodiversity. It is clear that many EAZA Members are excelling at conservation and building strong partnerships to make a real impact. I won't fall into the trap of singling out individual Members here, but I will encourage you to be inspired by the presentations still available on our EAZA YouTube channel.

One excellent example of conservation impact that I would like to highlight, however, is our Silent Forest Campaign. With its strong focus on the threatened songbirds of Southeast Asia and its multi-faceted approach, I am sure that its positive impacts will continue long after the campaign has officially ended in 2019. If you have not been involved in some way in the Silent Forest campaign so far, I encourage you to take part.

I think it is true to say that the focal area that has seen the most progress is that of 'maintaining healthy populations and individuals with positive animal welfare'. In my piece for *Zooquaria* 101, I wrote about our new population management structure providing a holistic look at what the roles and goals for populations are, and my delight at the approval of our first 'new' Regional Collection Plan (RCP) and EAZA Ex situ Programmes (EEPs). I cannot emphasise enough how much of a step-change these processes are for EAZA. Our Association was built on the collaboration and 'EAZA spirit' required by the original EEPs. It is great to see us respond to current changes and challenges by entering a new era for professionally managed populations. The feedback from everyone involved so far has been overwhelmingly positive, and I look forward to this continuing as we add more 'new style' RCPs and EEPs to the list.

Our third focal area is all about representing the EAZA community with the EU and appropriate stakeholders. This year has seen us develop Position Statements on songbird trafficking as well as European commercial trade in tigers and tiger parts; become heavily involved in revisions to Animal Health Law; and engage with the European Commission about the requirements of the Nagoya Protocol. The long-awaited results of the EU Zoos Directive evaluation were also recently released. EAZA and its Members were heavily involved at all stages of the consultation process and you can find out more what the results mean for us on page 10–11. Looking ahead, 2019 will be an important year for establishing EAZA's credentials with newly elected Members of the European Parliament. Our article on the EAZA manifesto details the commitments that EAZA and its Members will be asking of candidates, and what they can expect from EAZA in return.

Last but by no means least, we have the focal area about communicating our work internally and externally (and hopefully I am doing my part in this article). In 2018 we increased our activities and reach on social media; if you have not yet been featured in our 'Conservation Database' snapshot or the 'Discover EAZAs Members' feature, please get in touch and put yourself forward. Our 'explainer' videos about the work of EAZA provide an excellent resource for use with staff, visitors and administrative or funding bodies. Our monthly eNews to Members seems to get longer and longer each time as we have more and more activities to report on. Overall, there are many positive outcomes on which we can reflect, and I can't wait to see what 2019 will bring!



Myfanwy Griffith
Executive Director, EAZA

NOTICEBOARD

EAZA COUNCIL ELECTIONS

Elections for the EAZA Council 2019–2022 are under way, and National Associations and Members are engaged in nominating candidates. In countries where a National Association is also an EAZA Member, elections will be carried out by those associations; this means that all Members in countries with a National Association Member of EAZA should be aware of the timelines set by their association for nomination of candidates for Council, and for selection of the Council nominees from the list of candidates by vote. For Members in countries where there is no EAZA Member National Association, the process is being led by the EAZA Executive Office. With most nominations in from these countries, voting will begin in the New Year, and all votes must be received by the Executive Office by 4 February 2019.

Results of the elections will be shared with nominees at the beginning of March 2019; however, the nominees will not become Council members until they are confirmed in their posts by the Annual General Meeting, which will take place in Jersey in April.

Also at the beginning of March, the EAZA Executive Office will contact nominees for Council to allow them to put forward their candidacy for the EAZA Chair. Any expressions of interest in running for Chair of the Association must be received by the EAZA Executive Office at the beginning of April.

All contacts with National Associations and with voting institutions in countries without a National Association will be handled by the EAZA Executive Office. If you have any questions about the process, please contact EAZA Director of Communications and Membership David Williams-Mitchell.

EAZA EVENTS – SAVE THE DATE 2019–2020

EAZA will be organising several events during the course of 2019–2020, including:

18–20 January 2019: 10th European Zoo Nutrition Conference, to be hosted by Marwell Wildlife, UK. This is the premier forum for the sharing of nutrition knowledge and best practice in Europe and the Middle East. Register at www.eaza.net/events.

25–28 March 2019: EAZA Education Conference, to be hosted by Skansen Zoo, Sweden. The event, until this year called the European Zoo Educators Conference, will bring together educators to highlight the importance of the discipline in fulfilling the mandate of zoos and aquariums, and will present innovative new strategies and tactics for achieving educational impact with visitors and the wider world. Register at www.eaza.net/events.

23–25 April 2019: EAZA Directors' Days, to be hosted by Jersey Zoo, UK. With a number of key issues to discuss to help continue to shape the direction of zoos and aquariums, this meeting, the most important forum for Director level staff, is a must-attend for decision-makers. The last session of the current Council, the first meeting of the new Council and the Annual General Meeting will also take place during this event. Registration: by invitation only (invitations to be sent to Directors in January – if you are a Director and do not receive an invitation by the end of January, please contact the EAZA Executive Office).

17–21 September 2019: EAZA Annual Conference, to be hosted by Bioparc Valencia, Spain. The flagship event of EAZA, featuring TAG and Committee meetings, plenaries, networking and a full social schedule. Registration will open at a dedicated website in early 2019.

24–27 March 2020: EAZA Animal Welfare Forum, to be hosted by Apenheul Primate Park, the Netherlands. The first iteration of EAZA's Animal Welfare Forum will be held in March 2020 – look out for more information at www.eaza.net early in 2019.

Aqua Medic	www.aqua-medic.de
Aqua-Teknik A/S	www.aqua-teknik.com
Arie Blok Animal Nutrition	www.arieblok.nl
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Zooprofis	www.zooprofessionals.de

EAZA IN IUCN SSC QUARTERLY REPORT

Danny de Man, EAZA's Director of Conservation and Population Management, and Kristin Leus, EAZA Population Biologist and IUCN SSC Conservation Planning Specialist Group member, have published a summary of the new EAZA population management structure in the quarterly newsletter of the IUCN Species Survival Commission. The autumn issue looks closely at the role of *ex situ* conservation, particularly the role of zoos, aquariums and botanical gardens, in supporting IUCN's work in species conservation. To read the issue and the article, go to:

https://www.iucn.org/theme/species/publications/ssc-quarterly-reports

NEW ARRIVALS

BUSH HYRAXES AND GREY PARROTS ADD TO THE MIX AT OPEL-ZOO

IF YOU ASK PEOPLE TO THINK of grey African animals, they will mostly think of elephants or rhinos. But there are other animals that are grey in colour and come from Africa, too – and they can be a great deal smaller and weigh considerably less than an elephant.

In 2013, Opel-Zoo Kronberg in Germany opened a new exhibit for African elephants (*Loxodonta africana*) and with financial support from the zoo's friends' association 'Freunde und Förderer des Opel-Zoo e.V.' it also opened a new mixed-species exhibit for bush hyraxes (*Heterohyrax brucei*) and grey parrots (*Psittacus erithacus*). The hyraxes came from other zoos participating in the ESB and have bred every year since 2014. Most parrots came from private households or confiscations and arrived at the zoo without any detailed information such as age, previous husbandry or socialisation. The behaviour of some birds indicated that they had been kept alone for a long time without any contact with fellow birds, and therefore pair bonding in the flock took some time. Every now and then the parrots laid some unfertilised eggs or did not incubate, which was disappointing. But finally in 2018 two pairs reared four chicks, and all of them fledged. In addition the bush hyraxes bred again, so finally, for the first time in five long years, both species have bred successfully within a single year.

RANDERS REGNSKOV

BUSHDOG BABY BOOM IN RANDERS REGNSKOV

IN THE 22 -YEAR HISTORY OF RANDERS REGNSKOV in Denmark, an impressive total of 45 bushdogs have been born. So what is the key to our breeding success?

Bushdog keeper for 12 years, Maria Arentsen, believes that several different factors play a part – one being the structure of the group. We currently keep 12 bushdogs, an alpha pair and their offspring. The minute we see a negative change in behaviour directed towards the alpha male, we separate young males from the group. Also, it is important that the enclosure provides a safe haven for the bushdogs while still allowing the animal keepers to do their job. To accomplish this, we have a backstage area where the bushdogs feel safe and can enter voluntarily so that the keeper can clean the enclosure without having to interact with them. This also allows the keeper to check the nest box without stressing the animals.

When the alpha female has given birth, we try to disturb her as little as possible. We don't change the substrate of the nest box for the first few weeks, and a surveillance camera allows us to follow the pups' development without disturbing them.

The general health of the bushdogs is also crucial of course, and good health is directly linked to feeding. Our bushdogs are fed dog pellets in the morning and a large variety of meat in the afternoon – mostly served 'intact' with bones, internal organs and so on. When feeding the bushdogs we challenge them to use their natural senses, logic and motor skills instead of just serving the food in a bowl. This keeps them both mentally and physically healthy.

If you have any questions about bushdogs, feel free to contact Maria Arentsen on ma@regnskoven.dk.

BREEDING SUCCESS FOR LIVING COASTS

LIVING COASTS HAS ADDED ANOTHER BREEDING SUCCESS to its name. Torquay's coastal zoo has hatched a black-legged kittiwake. This is the first time that Living Coasts has bred this beautiful seabird, which is listed as Vulnerable by the IUCN.

It's thought that Living Coasts is the only collection in the UK to hold and breed this species, and only a few collections in the world have this bird. Living Coasts is working with the shorebird Taxon Advisory Group to learn more about kittiwakes in zoos.

The recent hatching is important because this species used to be common around the world, but this year its status has changed to Vulnerable due to a severe population decline. Climate change has reduced its food supplies, so breeding success and adult survival have dropped.

The UK breeding success has dropped by nearly 44 per cent, and the whole population has dropped by around 60 per cent since the 80s. With the numbers declining so quickly, it's vital that we maintain viable captive populations and try to learn more about their behaviour, to help us protect them in the wild.

The unusual name comes from its call, which is a shrill 'kittee-wa-aaake, kitte-wa-aaake' sound. Living Coasts was previously home to female red-legged kittiwakes; a pair of black legged kittiwakes arrived in 2015. They've established good pair bonds and matured and have now bred, which is great news. Staff are extremely pleased to have bred them and hope to continue to do so.

Tackling tiger crime

ZOOQUARIA TALKS TO DR ALEX SLIWA, EAZA FELID TAG CHAIR AND CURATOR AT COLOGNE ZOO, ON THE LATEST EAZA POSITION STATEMENT ON TIGER CRIME

Allan Muir, EAZA EU Policy Coordinator

AM: Alex, what was the catalyst for such a position statement?
AS: Tigers are under constant threat from human activity, chiefly the destruction of habitats, hunting and illegal trade. A lot is being done to protect them, but at the same time we have seen worrying developments that make this protection very difficult. In the European Union, commercial tiger farms have been discovered that kill captive-bred tigers in Europe for the manufacture of tiger products. Abroad, governments of influential countries are not keeping their commitments on prohibiting the trade in tiger parts. In the Felid TAG and in the wider EAZA community we felt that the EU needed to pay more attention to the protection of tigers in the wild and in EAZA zoos.

AM: What harm does tiger farming pose to tiger populations in the wild and in human care?
AS: We all know that tiger populations are declining in the wild and that EAZA Members carry out vital conservation work, in our zoos and in the field. The commercial tiger trade and tiger farming undermines the *ex situ* management of tigers such as our Sumatran and Amur tiger EEPs. The shocking discovery that such tiger farms exist on our doorstep, within the EU, should be a wake-up call to everybody. This has far-reaching impacts, not only on us as the zoo community, but also on tiger populations in the wild. Tiger farming makes law enforcement very difficult because it's hard to know if a product originated from a farmed or wild tiger. It also fuels the demand for tiger products and the poaching of wild tiger populations.

ARNE LAWRENZ

AM: What action is EAZA calling for in the statement?
AS: We call upon the EU and national authorities across the EU to do three things: combat wildlife trafficking more effectively, provide adequate funding to biodiversity conservation and ensure that tigers in human care in Europe serve the non-commercial roles of education, research and conservation breeding.

AM: What else is EAZA doing to counteract European tiger farming and the commercial trade?
AS: Thanks to our rules and standards, EAZA tigers are protected from commercial exploitation. Our robust record-keeping in ZIMS allows us to monitor all tigers in EAZA zoos closely. We can guarantee that none of the animals found in the Czech tiger farms came from an EAZA Member. We have also signed up to Project TigrisID, a DNA identification project being run by the Czech CITES authorities. When the EAZA Biobank receives a sample from an EAZA tiger, a small sample of the DNA will be shared with TigrisID. This will allow the CITES authorities to build a reference database of known lines of tigers bred in Europe. They are also working on developing forensic techniques to extract tiger DNA from processed products such as broths, wines and boiled bones.

I'd like to invite all readers to take a look at the position statement on the EAZA website. Such calls for action need to happen not only at a central EU level, through the EAZA Brussels office, but also nationally through each and every EU Member State. We should make the collective voice of our community as strong as possible for the benefit of the animals in our care.

The position statement can be found on the EAZA website in the 'Documents' section.

PHILIPPINE CROCODILE © ASAP

STRATEGIC THINKING

THE ASIAN SPECIES ACTION PARTNERSHIP HAS LAUNCHED A FIVE-YEAR STRATEGY TO TACKLE THE PLIGHT OF SPECIES ON THE BRINK

Vickie Guthrie, ASAP Partnership and Communications Coordinator

Southeast Asia is a hotspot for species on the brink of extinction. Across both land and freshwater-dwelling vertebrates, a staggering 195 species are currently listed as Critically Endangered within the region. Sadly, this will surely increase as new Red List assessments are published.

These at-risk species are the focus of the IUCN SSC Asian Species Action Partnership (ASAP), which brings together organisations to mobilise conservation action. EAZA sits on ASAP's governing council, alongside IUCN SSC, zoos and international and regional NGOs.

ASAP is launching a new five-year strategy, which has four key focal areas:

1. **Catalyse conservation** – pinpoint gaps in conservation effort and work with organisations to deliver targeted action.
2. **Increase funding** – increase support available to initiate and scale up conservation action.
3. **Strengthen capacity** – strengthen regional conservation capacity and leadership for ASAP species conservation.
4. **Promote species** – bring awareness of, and drive action for, ASAP species.

AT THE CROSSROADS

'Our priorities over the course of this strategy are to put a spotlight on the species on the brink of extinction,' says Simon Stuart, Chair of the ASAP Governing Council, and former Chair of the IUCN SSC. 'We stand at a crossroads in species conservation. In Southeast Asia, much of this is driven by an explosion in illegal trade and catastrophic habitat loss. However, there is also a cause for hope and we must act now if we are to turn things around.'

Zoos and aquariums play a vital role in halting extinctions. If your institution has an interest in Southeast Asia, we encourage you to become an ASAP Partner by contacting asap@iucn.org. Follow us on Twitter @IUCN_ASAP and visit www.speciesonthebrink.org

A manifesto for nature

AS THE 2019 EUROPEAN ELECTIONS APPROACH, EAZA IS WRITING A MANIFESTO THAT WOULD PUT NATURE AT THE HEART OF EU POLICY

Tomasz Rusek, EAZA EU Policy Manager

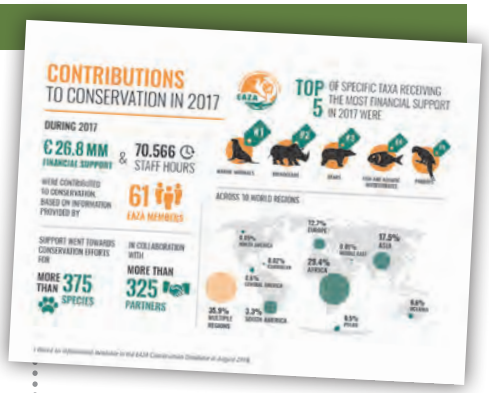
Protecting nature has long been close to the hearts of many Europeans, but it has not always been at the heart of EU policymaking. Inevitably it has faced competition from many other objectives that fight for attention and funding. Yet the mounting pressure on the Earth's environment – including the rapid decline of biodiversity – requires a much more sustainable approach in public policy. Striving for a healthier environment should not be a separate goal: it should be a principle underpinning all policy areas.

On 23–26 May 2019, EU citizens will elect 705 Members of the European Parliament (EP) for a five-year term. This is an important opportunity for our community to raise the environmental objectives and concerns that are central to our mission. Therefore, as we did in 2014, EAZA is publishing a manifesto addressed to the parliamentary candidates and their political parties.

During the 60 years since its establishment, the EP has evolved from a consultative forum to an influential decision-maker. With each update of the EU Treaties, the Member States have granted the EP more powers, making it responsible – together with the national governments – for adopting EU laws.

The EP also co-decides on the EU's budget, scrutinises the work of the European Commission as the EU's executive and ratifies international agreements and the accession (and withdrawal) of EU members. Besides these formal responsibilities, the elected Members (MEPs) have a vast informal influence in a wide range of domains.

All this gives the EP a significant role in the protection of biodiversity, promoting animal health and welfare and creating the right legal framework for modern zoos and aquariums. Our manifesto asks the candidates to commit towards achieving these objectives.



Commitment 1: Make the protection of European and global biodiversity a political priority.

The pressure on biodiversity is increasing and the international community is not on track to meet the targets it has agreed on. We are urging the MEP candidates to:

- Ensure that all areas of EU policy support biodiversity conservation, making the EU a leader in this area.
- Build on earlier efforts of the EP in combating illegal wildlife trade, which endangers populations of animals and plants and entire ecosystems.
- Always consider biodiversity in the broader context, so that European measures (for example on invasive alien species) don't contradict global conservation efforts.

Commitment 2: Make the EU the standard-setter for zoo and aquarium legislation.

The mandate of most of our Members comes from the EU Zoos Directive 1999/22/EC. It recognises zoos as conservation organisations that contribute to saving biodiversity within and outside of Europe. It aims to raise standards through national licensing and inspection schemes. EAZA has endorsed the Directive, urged its proper implementation by all

Note: This work is supported by the European Union LIFE NGO funding programme.
The European Union is not responsible for the views displayed in publications and/or in conjunction with the activities for which the grant is used.

Member States and contributed to its recent fitness evaluation.

Whilst the EP did not co-author this law back in 1999, its current powers give it various possibilities to improve its implementation. We are calling on the candidates to:

- Endorse the importance given by the Directive to modern zoos and aquariums in conservation, research and education.
- Stimulate full implementation and enforcement of the Directive in all Member States, and promote solutions to assist Member States in which implementation is lagging.
- Recognise accreditation by associations such as EAZA as an indicator that the accredited Members comply with the Directive.

Commitment 3: Safeguard the health and welfare of animals in human care and in the wild.

We have been providing feedback to the EU's work on a new Animal Health Law framework to solve the inconsistencies of health legislation across the EU. This also gives us an opportunity to strengthen the already high health standards of our Members and to 'translate' Members' veterinary expertise from the zoo to the wild. We encourage MEP candidates to:

- Support the formation of the new EU Animal Health Law to ensure high health standards for animals, including zoo animals.
- Recognise the relevance of EAZA-based research and policies for enhancing veterinary diagnostics and care.
- Ensure that the animal health legislation does not jeopardise animal transfers that are recommended as part of non-commercial EAZA Ex situ Programmes for population management.

The EU parliamentarians work in Brussels and Strasbourg but also in their home constituencies, whose citizens they represent. We encourage Members and friends of the EAZA community to download the Manifesto from the 'Documents' section on our website and discuss it with candidates and politicians in your regions. A printed version will be available on request from the EAZA Executive Office.

HOW EAZA MEMBERS HELPED TO ENSURE THAT CRUCIAL EU LEGISLATION REMAINS IN PLACE

Tomasz Rusek, EU Policy Manager, EAZA Executive Office

The European Commission has concluded that the EU Zoos Directive, the legal backbone for zoos and aquariums in the EU, shall remain in place unchanged but that some Member States must improve its implementation. This outcome of the evaluation of the Directive was announced in early November and is fully in line with EAZA's Position Statement and recommendations.

During the two decades since it came into force, the Directive has certainly proven its importance for our sector. It has contributed to the raising of husbandry standards and has, in general, stimulated the performance of zoos and aquariums in conservation, education and research. It has also allowed the EU to fulfil the requirements of the Convention on Biological Diversity regarding *ex situ* conservation. Finally, it has been a valuable reference for EAZA's own Standards and Guidelines – even though they are more rigorous than those of the Directive itself.

The outcome of the evaluation can be summarised as follows:

On progress towards the general objectives, the Commission concluded that the Directive has strengthened the role of zoos in conservation and has increased the public awareness about this role. The national licensing systems, although they are imperfect in some countries, ensure that all licensed zoos and aquariums take part in the conservation of biodiversity, at least to some extent.

On the specific types of conservation measure prescribed in Article 3 of the Directive, the Commission has concluded that *ex situ* breeding and reintroduction, information exchange and public education have been well implemented. In contrast, the Directive has so far not ensured appropriate keeping conditions for all zoo animals across the EU. Other areas to be improved include the prevention of escapes, record-keeping, zoos' involvement in research, and staff training.

In this context, it is worth noting that the Commission recognised that EAZA Members commit themselves to stricter standards than those prescribed by the Directive. The Directive has therefore an important role to play in bridging the gap between our high-standard Member institutions and the rest of the sector that is not regulated by such strict rules.

In the evaluation results, the Commission is calling for the **national licensing and inspection systems to be improved**. On the one hand, there has been progress in establishing such systems in all Member States. On the other hand, these systems vary across the EU; as a result, the requirements of the Directive can be interpreted and applied in different and not necessarily coherent ways. This part of the evaluation, too, recognised the role of zoo associations as a factor that can strengthen the efficiency of national inspections.

This was the first 'fitness check' of the Directive since it came into force in 1999. The EAZA community was closely involved in the evaluation by providing high levels of input to stakeholder and public consultations, contributing to a Best Practices document and sharing expertise in stakeholder meetings (where EAZA Members were the biggest group in the room). This was an excellent demonstration of engagement by EAZA Members under our Strategic Focal Area to represent the EAZA community at the EU to influence relevant policy; we sincerely thank all who were involved.

EAZA has been emphasising for many years that ensuring the highest possible degree of national implementation of the Zoos Directive is in the best interests of the EU, its Member States and the zoo and aquarium community. We will continue to work together with national associations and many other stakeholders across the cultures and languages of the EU to improve the implementation by the Member States, with all the positive outcomes in conservation, education, research and husbandry that this implies.

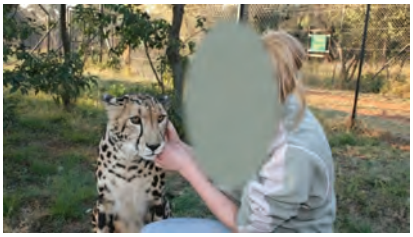
Picture this

IF WE, AS ZOO PROFESSIONALS, PHOTOGRAPH OURSELVES WITH THE ANIMALS IN OUR CARE, DOES IT SEND THE WRONG MESSAGE?

Sally Binding, EAZA Animal Welfare Coordinator

The explosion of social media and the consequential rise of 'the wildlife selfie' – taking a photo of oneself with a wild animal – has become commonplace across social media platforms, with an increase in wildlife selfies of 292 per cent since 2014 (World Animal Protection). You won't have to look far to find a photo of someone sharing a frame with a wild animal. However, the context and therefore conservation and welfare implications of these photos can vary hugely – from the tourist posing with 'photo-prop' animals and selfies with animals in the wild (both respectfully distant or disturbingly close) to the animal management professional capturing a privileged moment of their job role. However, when it comes to the superficial, face-value messaging of these images, can we discriminate between a tourist's wildlife selfie and photos of zoo professionals in close contact with animals in their care? Does the general public recognise the different contexts or does the latter inadvertently condone the former and contradict the work we do to discourage wildlife selfies?

A role within professional animal management often brings with it both the necessity and privilege of working in close contact with wild animals housed within our collections. Whether through training sessions, veterinary procedures, educational demonstrations or simply through the development of positive human-animal interactions, photos with the animals in our care can be an opportunity to showcase the unique keeper-animal relationship that comes with the dedicated work of zoo professionals, as well as capture personal moments of achievement. The opportunity to photograph the rare moment when snow leopard cubs are being handled for health checks or the pride which comes from the voluntary interaction from a dolphin after patient trust-building not only highlights the skill and knowledge of modern zoo animal management staff, but also can arguably raise the profile and appeal of the profession.



ABOVE: AN ANIMAL MANAGEMENT PROFESSIONAL INTERACTING WITH A CHEETAH; BELOW: A MEMBER OF THE PUBLIC HAVING A PAID 'PHOTO EXPERIENCE' WITH A CHEETAH.

However, recent years have seen an alarming increase in the 'wildlife selfie', which has fuelled both the trade in 'photo-prop' animals in many tourist hotspots and the disturbance of wildlife to get that enviable photo. These are not unfamiliar sights on social media, and these photo-prop animals, which range from caimans and anacondas to sloths and bear cubs, are often kept in extremely poor welfare conditions and have been poached from wild populations and/or removed from their mothers. This covert trade is increasingly supported by animal-loving tourists, unaware of the cruel reality surrounding their opportunity for a close encounter with a wild animal.

In recent years the frightening increase in people's determination to snap an enviable wildlife selfie has amplified, resulting in increased risk to both humans and wildlife. In 2016 a beached Franciscana dolphin (*Pontoporia blainvillei*) reportedly died after being used for selfies by beachgoers, and the death of a swan was highly publicised after being pulled from the water by its wing for a selfie. In 2017 the Scottish Government made it an offence to harass seals at a haul-out zone in Aberdeenshire in response to an escalating number of selfie-seekers, and Waterton Canyon Park, Colorado, had to be closed due to naïve tourists encroaching on bears. On 4 December 2017, social media giant Instagram launched their 'wildlife warning' alert, alerting any one of their 700 million users that wildlife experience hashtags, including #koalaselfie and #slothselfie were banned. Dating app 'Tinder' closely followed suit, banning tiger selfies as profile pictures.

Conservation and animal welfare bodies, including zoos, are vigorously campaigning against selfies involving photo-prop animals; however are we ourselves, as zoo-industry professionals, inadvertently validating this current craze and how can we ensure there is a clear divide between the two? Before posting any photos where we share a frame with a wild animal, it is important to ask yourself the following questions:

1. How might the photo be interpreted if it is not provided with any context?
2. If your image was replaced with a non-animal management professional would the scenario still be ethically acceptable?
3. Does the image truly represent your profession with regards to the management and welfare of that animal?
4. Does the image truly represent the species with regards to their natural behaviour and environment?

In short, it is up to us as animal-care professionals to set a good example; so if you have any doubts about a photo that you take – don't post!

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Call of the wild

A NEW EEP AIMS TO IMPROVE THE MANAGEMENT OF EUROPE'S GREY WOLF POPULATION

Marc Enderby, Grey Wolf EEP Coordinator, Highland Wildlife Park, UK

During the EAZA Annual Conference in Athens, the EEP Committee approved the application for a new EAZA Ex situ Programme (EEP) for grey wolf (*Canis lupus*) and with that the approval of me as a new species champion to coordinate and manage this EEP.

The application for the EEP followed on from the new-style RCP workshop that was carried out by the Canid and Hyaenid TAG in 2017. In the workshop a comprehensive group discussion defined the justification and reasons why grey wolves should be kept in EAZA zoos. Although wolves in zoos have been monitored for several years, this will be the first time that the wolf population across European zoos will be actively managed.

LARGE DATASET

Records of grey wolf in European zoos go back more than 100 years, dating back to the late nineteenth century. Although I was aware of the challenges, it was not until I really got to grips with the dataset that I appreciated the task ahead. Using ZIMS for studbooks, I identified more than 70 zoos holding more than 300 individuals of the European grey wolf (*Canis lupus lupus*). Once I added the other wolf subspecies, the number of zoos doubled and the number of individuals tripled. It will take time to compile this data correctly, as it is fraught with inconsistencies, but this is a task I am willing to undertake.

Right now, the data is purely on the European grey wolf. However, in the future, all the subspecies will be held under one dataset, apart from the Iberian wolf (*Canis lupus signatus*), as this is a separate EEP. There is still a population of Scandinavian and Middle Eastern wolves, which will be part of the Grey Wolf EEP, and I will work closely with my colleagues to manage these. The reason for including all *Canis lupus* subspecies (apart from the Iberian wolf) is to allow the phasing out of certain subspecies or hybrids and make room for the European grey wolf or regional wolf subspecies. The roles and goals of this new EEP are as follows:

STATE EDUCATION IN RANGE AND OUTSIDE OF RANGE

Wolves in Europe are slowly growing in numbers. Because of this increase, they are encroaching into their historic ranges once again. This can create, and is creating, issues such as human-wildlife conflict within these historic ranges. European zoos are in an ideal position to help ease this friction by educating their visitors and influencing public perception and opinion of this iconic species. The movement of wolves into Germany, France and the Netherlands, for example, is a transition period, as it is inevitable that wolves will find a foothold within these countries. The success – measured by the resulting perception of wolves after an amount of time – of this transition period is dependent on various stakeholders (farmers, politicians, loggers and public). This is a highly emotive and political issue, which will need a clear, long-term management plan. Zoos will have a pivotal role in the success of the species within these future range states.

HEALTHY *EX SITU* POPULATION

Wolves are not an easy species to manage within zoos, especially the European subspecies. Within the new EEP I will be able to develop a species committee and bring in advisors to provide support for all zoos. We can improve welfare and husbandry for wolves in our care by producing Best Practice Guidelines. Various workshops will be arranged across Europe where wolf keepers can share their experiences and learn from one another. One such workshop was held in the south of England in early 2018 and the proceedings from these activities will help shape the new Best Practice Guidelines. There is experience aplenty across the world with this species and it is vital that we tap into it.

Although the grey wolf is categorised as Least Concern under the IUCN Red List, it still has a place in zoos. Not only can zoos achieve an educational role in reversing the negative perceptions of wolves in the wild, it also gives zoos the opportunity to engage and enthuse the public in the importance of conserving large carnivores and their role in the environment. As apex predators, wolves have a key role in the planet's biodiversity. EAZA zoos, as conservation and education organisations, should treat the wolf as the keystone species it really is.

Endangered enigma

THE ANOA IS A UNIQUE AND CHARISMATIC ANIMAL THAT CAN BE AN INTRIGUING AND REWARDING ASSET FOR ANY ZOO TO TAKE ON

Marcel Alaze, Allwetterzoo Münster, Terry Hornsey, Zoological Society of East Anglia/Africa Alive! and EAZA Cattle and Camelid TAG chair; and Stuart Young, IUCN SSC Asian Wild Cattle Specialist Group

The lowland anoa (*Bubalus depressicornis*) and mountain anoa (*Bubalus quarlesi*) are dwarf buffalo species that are unique in that they are the smallest wild cattle species in the world, reaching a maximum height at the shoulder of just 1m. They are found only on the Indonesian islands of Sulawesi and Buton, and with fewer than 2,500 left in the wild, they are classed as Endangered with a decreasing population. They are in an elite group of 10 species (and one of only two species of Bovidae) to be managed under the auspices of a Global Species Management Plan (GSMP), and at the recent Cattle TAG Regional Collection Plan Workshop the anoa was identified as a high-priority cattle species with which EAZA institutions should become involved.

There are currently 49 lowland anoa being managed within the EEP in 20 institutions. There are some animals currently available, so there is now an excellent chance to become involved with this attractive and endangered dwarf buffalo.

There are five good reasons why collections should consider taking on this species:

1. Listed as Endangered by the IUCN Red List, the species is continuing to decline due to hunting as well as reduced area, extent and quality of habitat. This is primarily because of land conversion to agriculture, as well as gold mining and other activities related to the collection of non-timber forest products. Recent reports indicate that hunting for food is by far the most serious threat.
2. With a height of just 1m at the shoulder, anoa are the smallest wild cattle species in the world, making them unique and attractive animals. Added to this, they are found only on the Indonesian islands of Sulawesi and Buton.
3. Anoa are easy to keep and exhibit. They can also be held in mixed exhibits with other species such as monkeys and birds (crested macaques and maleo are also endemic to the anoa's island home of Sulawesi and mix well with anoa).
4. Anoa are a GSMP species and are a fantastic example of a tropical forest island endemic. Consequently, they offer lots of educational possibilities and are linked very closely with zoological institutions in Indonesia.
5. Keeping anoa can enhance fundraising for any Indonesian conservation project, as well as having a huge research potential (e.g. genetics or behaviour).

CARE AND HUSBANDRY CONSIDERATIONS

Each anoa must have its own enclosure with a minimum area of 100m² for each animal. The enclosure should have a good structure with places to hide, and a warm indoor facility is important, with an ambient temperature of at least 10°C in winter time. However, they do adapt to colder climates and can also be given access to their outdoor enclosure at colder temperatures. The boundary around the enclosure should be a minimum height of 1.6m.

Anoa are intermediate feeders, feeding on more than 150 different plant species in the wild. In captivity they are very easy to feed; their diet is mainly high-protein grass or hay and branches with leaves. Some vegetables and dry feed can also be used to enrich the diet.

They are mostly solitary, and in captivity are normally kept separate. However, this can vary depending on an individual's temperament and in some cases, they can be kept in pairs, but in general, they only come together for mating. Same-sex animals cannot normally be held together, and this is especially true of males. When being introduced for mating, the pair should only be put together under supervision, and once pregnant, the female should again be separated from the male. After parturition, the female should be allowed to rear her calf on her own.

Daily maintenance of the enclosure is simple, although the animals should be removed from the area while cleaning is being carried out, as a precaution. However, most individuals are friendly and provide a good base for animal training and enrichment in protected contact.

ACTION INDONESIA GSMP

Action Indonesia is an international partnership coordinating the GSMP for anoa (as well as banteng, babirusa and Sumatran tiger). Over 50 partner institutions are involved, combining the skills, resources and expertise of both the zoo community and *in situ* conservationists to achieve stable wild and *ex situ* global anoa populations.

A major output of these GSMPs is the production of breeding and transfer recommendations, and in August 2018 these resulted in the successful transfer of one anoa between two Indonesian zoos – a major step towards cooperative breeding in Indonesia. The anoa GSMP also supports *in situ* conservation work in Sulawesi, including providing training to forestry staff to manage rescued and confiscated animals.

One of the goals of the GSMP is to 'reach a demographically and genetically healthy global *ex situ* population' of anoa, with a target of 300 animals. The cooperation of all regions is needed to achieve this target, and you can help by becoming an EAZA holder of this charismatic dwarf buffalo.

You can also get involved and link your collection to this dynamic conservation partnership through financial, technical, logistical or scientific support. Please get in touch with James Burton, IUCN SSC Asian Wild Cattle Specialist Group Chair (jamesaburton@yahoo.co.uk) for more information.

Please contact the EEP Coordinator and International Studbook Keeper Gerd Nötzold (gnoetzold@zoo-leipzig.de) if you are interested in knowing more.

Breaking the virus stigma

WHY ACTIVE PARTICIPATION IN VIRUS MANAGEMENT IS ESSENTIAL FOR THE HEALTH OF THE GLOBAL PARROT POPULATION

Simon Bruslund, Curator, Heidelberg Zoo, resp. EAZA Parrot TAG chair, EAZA Parrot vice chair and Veterinary advisor of the Parrot TAG, Sandra Molloy, Research and Conservation Coordinator, Dublin Zoo, Helena Vaidlova, Mada Avian Veterinary Clinic

There are more than 16,000 parrots in EAZA zoos. The Regional Collection Plan (RCP) currently recommends programmes for 79 species, and at least 18 of our programmes for parrots are flagged as having direct conservation relevance.

Parrots can be carriers of different viruses, and contrary to our information for most groups of wild birds, we have a comparatively high knowledge about these, thanks to the pet industry and commercial interests. Various parrot diseases were well known long before we knew which type of virus actually caused them, such as psittacine beak and feather disease (PBFD) caused by a circovirus and proventricular dilatation disease (PDD) now known to be caused by a bornavirus.

We still have much to learn about how these viral infections affect the organism, how the different viruses interact with each other in certain combinations and why the different viruses affect different species in different ways. Obviously, certain viruses have coevolved with certain parrot species, perhaps in a specific continent; in such a case, when exposed to a foreign host from a different region the effects of the infection become worse.

Conservative estimates suggest that 30 per cent of parrots in captivity are infected with one or more viruses that are considered relevant for population health. Several studies even put the estimate as high as 50 per cent. Unfortunately, it is impossible to determine trends in the levels of infection in zoo populations of parrots because our ability to perform good diagnostics are constantly improving; therefore current results are not directly comparable with those performed just five years ago.

Other experiences have confirmed that with careful and consistent management the infection rate can be controlled and massively reduced. The 'street light method' aims to separate positive from negative birds within a population. The symptomatic or confirmed positive individuals are categorised as 'Red'. Unconfirmed, untested or questionable results are categorised as 'Yellow', and confirmed, tested clinically healthy birds are categorised as 'Green'. Essentially green is paired with green, yellow is paired with yellow – or exceptionally with green, in which case both individuals will be considered yellow. Yellow should always be investigated further in order to achieve green status and pairings may be delayed pending the results. Red is only paired with red with the exception of extreme welfare cases. This is done on a programme-by-programme basis, with the consideration of housing with other individuals with a different status on a virus-by-virus case. It is important that welfare and conservation considerations are also taken into account when implementing this method.

When we know there is a problem, and we know we can potentially act against it, is it then not clearly our duty to at least try to do so? In addition, we are obliged to take all measures possible to ensure that these viruses are not transferred to the wild through introductions, as we anticipate more active EEP involvement in parrot introductions in the future.

SO WHAT ARE THE CHALLENGES?

- **Testing is expensive**. Multiple testing may be required in certain conservation-relevant EEP populations, and zoos should plan such expenses if these programmes are to achieve their conservation targets, which is in all of our interests.
- **The risk of false positives and false negatives.** Variability in the types of sample taken (e.g. buccal swab, cloacal swab, blood etc.), transport of swabs and the competence of laboratories carrying out the tests can result in false positives and false negatives. It is essential to use accredited laboratories, and the Parrot TAG veterinary advisors can assist in identifying competent laboratories around Europe.
- **Collecting samples is invasive and demands special skills.** Capture, restraint and procedures to collect oral swabs or blood samples in parrots can be challenging if it is not a part of a regular routine. It is advised to use the EEPs or the TAG to share experiences or even to invite an experienced colleague to help improve the routine.
- **The stigma of 'positives' in your collection.** It is understandable that zoos can be reluctant to share examination results. However, a 'Red' categorisation for parrots in a collection is not an indicator of good or poor management, it might be entirely a question of luck. The main thing is not to ignore the problems.
- **We do not have all the answers yet.** There are still a lot of unanswered questions about how these viruses affect parrots. However, we need to take steps now to limit their spread and the potential negative impacts.
- **Proper virus management is only feasible if the whole population is tested.** We expect 30 per cent of our parrot populations to be positive. Many of our EEPs are managed in very small populations, and subdivision of these small populations through a virus management strategy will surely be problematic. The best strategy decisions can obviously only be taken when the most information is available. If a large portion of institutions do not perform the testing, the management strategies will remain ineffective.
- **Animal welfare considerations.** Some institutions are only willing to take certain types of sample or sample a restricted part of the collection as they feel this process

has a negative impact on the welfare of the parrots, especially if previous testing has not yielded positive results. This can make population management decisions more difficult as the infection risk from other parts of the collection cannot be assessed. Some institutions would prefer to see a risk assessment approach where the history and management of the parrot is taken into account along with the veterinary history of the parrot collection.

HOW DO WE WANT TO SOLVE THIS?

The subject of virus screening in our parrot collections was first approached during the Parrot TAG meeting in Emmen in September 2017. Under the supervision of the Parrot TAG vet advisors, we introduced the problems with presentations by Julia Stagegaard from ReePark and Helena Vaidlova from Prague Zoo. In September 2018 in Athens, we initiated the first discussion round in the form of a workshop, and as we anticipated, there are many open questions, which are not easy to answer conclusively. The 90-minute workshop with both veterinarians and population managers in the room did provide us with a clear direction and confirmed that the membership wants to pursue a pragmatic and realistic management strategy for viral infections in our parrot collections.

Our goals are to develop an open dialogue and to produce a guidance document for standards of management. We also encourage each EEP to adopt a policy on virus management in their population, promoting successful virus management across EAZA institutions.

Above all, we must break the stigma about positive results; ignoring the problem will surely not make it disappear. A positive population in a zoo is not automatically a disaster. Zoos willing to hold or even breed with positive, clinically healthy birds and then test the offspring will make a huge contribution to the overall management strategy.

If you have had experiences, good or bad, regarding virus infections in your zoo, the Parrot TAG is keen to hear about them.

Our next discussion forum will be during the BirdTAG's mid-year meeting in Berlin, between 15 and 19 May 2019. Here we hope to present case studies and to discuss different scenarios in order to develop better strategies and to test feasibilities. Please join us in Berlin and take the opportunity to share your views and experiences.

You can also monitor the Parrot TAG workspace for more information, presentations and reference papers, which will be continuously uploaded when available.

COMMON QUESTIONS AND SOME ANSWERS:

- **Are parrots carrying more diseases than other bird species?** Very unlikely, we just happen to know more about the diseases in parrots.
- **If a bird is positive, should it be euthanised?** Positive birds can still participate actively in breeding programmes. Borna virus is not very virulent and there have been cases of positive parents rearing their own young, which turned out negative after several tests. Decisions to euthanise EEP species should include consultation with the coordinator responsible.
- **Are there risks from feral free-flying ring-necked parakeets and monk parakeets?** Very little seems to be known about this. The Parrot TAG would welcome studies of pathogens in feral parrots around zoos.
- **Should post-mortems of parrots include checking for viruses even if the cause of death is very obvious (e.g. trauma)?** Yes, as the parrot might have been impacted by an underlying illness, which led to the cause of death. Every viral test helps us understand more about the infections. Ideally, all dead parrots, embryos and non-developed eggs should be tested.
- **Will reducing the encounter rates with viral diseases reduce the effectiveness of the immune systems of parrots in our collections?** Certainly not. Recommended screening is focused on only a few viruses (and chlamydia), which are dangerous for parrot populations. There are many other less virulent pathogens to keep the immune system of parrots effective.

The future starts now

ZOOQUARIA TALKS TO ACHIM JOHANN, TAG CHAIR AND DIRECTOR OF RHEINE ZOO, ABOUT THE PROSIMIAN TAG AND ITS RECENTLY COMPLETED NEW REGIONAL COLLECTION PLAN

Katharina Hermann, EAZA Animal Programmes and Conservation Coordinator and David Williams-Mitchell EAZA Director of Communications and Membership

KH: Achim, the Prosimian TAG finished its Regional Collection Plan (RCP) earlier this year. Can you tell us how you found the process?

AJ: The Prosimian TAG – representing the EAZA zoos, of course - has potentially more than 100 species to choose from. We pre-selected 51 species to plan for, which was quite challenging enough! We realised and were satisfied that we had not lost any taxa from EAZA collections in the last 20 years, even though we recognise that we don't have the space to maintain sustainable populations for all of them. However, it supported our philosophy that we shouldn't give up on preserving populations of the largest possible range of prosimians, and I think that this approach was proven to be correct when we reviewed it during the RCP process. That said, with all of the pressures on prosimian species and the often bleak perspectives for their conservation, the RCP process was, in a way, also a valuable opportunity to do a thorough appraisal of our work with prosimians in the past and work out a clear direction for the future. All told, it was a very rewarding process, and one I can recommend to all EAZA TAGs.

DWM: What would you say were the main factors in getting through this massive task in a reasonable time frame?

AJ: The contribution of Elmar Fienieg and Katharina Herrmann from the EAZA Executive Office was especially important in keeping us moving through the process. As I mentioned, we learned that our approach was correct – that we were right not to give up on any of the managed species in our care, despite moves elsewhere in the global zoo community to limit the number of taxa for *ex situ* management because of theoretical calculations on feasibility. The Prosimian TAG mission helped us to stay focused when discussing the various species' needs. So, in essence, we were able to look at the global picture through the lens of the mission statement, with the help of some great facilitators.

Prosimian TAG mission statement
Based on expertise in professional husbandry and science-based population management, the EAZA Prosimian TAG safeguards a diversity of prosimian species in zoos (ex situ facilities) – primarily in EAZA but also in the animals' native countries – with the goals of enhancing the in situ conservation of prosimians directly and indirectly through research and educating and inspiring people.

DWM: So what are the main changes that the RCP identified and recommended for the TAG?

AJ: The RCP undoubtedly has led to the conversion of some of our ESBs to EEPs, with no major change of goals across most of the species for the time being – primarily because what is needed from these programmes continues to be the support of conservation in range and the preservation of insurance populations. For the ring-tailed lemur (*Lemur catta*) the goal has changed. This species, which is very well known in zoos and in the media, has been regarded so far as *the* flagship species for all the lemurs. But ring-tailed lemurs are now listed as Endangered in Madagascar because the conservation situation *in situ* continues to deteriorate. So, preserving an insurance population in EAZA is now regarded as a priority and the species will be the subject of a Long-term Management Plan (LTMP) in 2019. The main issue for us is time – now that we've completed the RCP, we have heads bursting with ideas for future actions, but we need to find the time to get them done.

The RCP has recommended that EEPs be maintained for 20 species, almost all of which have as a primary direct conservation role the maintenance of a viable insurance population; for example, the Red-bellied lemur EEP (*Eulemur rubriventer*) and Red-ruffed lemur EEP (*Varecia rubra*). Other roles included *ex situ* and *in situ* training and research (e.g. the Greater bamboo lemur EEP, *Prolemur simus*), conservation education in range (e.g. the Aye aye EEP, *Daubentonia madagascariensis*) and population restoration (e.g. the Crowned sifaka EEP, *Propithecus coronatus*). The conservation education angle in range is particularly important, as many local populations are unaware that lemurs occur only on Madagascar and have no real understanding of potential extinction.

KH: How do you aim to deal with the issues identified in the RCP?

AJ: Luckily, the TAG is blessed to have some great volunteers to work on projects; for example, Margaux Pizzo (Besancon) is one of the active TAG advisors and will be responsible for coordinating the Mon-P species. We all will be working together to ensure that all the EEP coordinators will be able to work towards the RCP goals over the long term. This is especially important as we complete more LTMPs in the coming years.

One of the other major issues is space – it's very difficult to set priorities for such a large number of species when we know we don't have enough space in EAZA to keep sustainable insurance populations of all of them. That said, we realise that *ex situ* conservation of prosimians needs to be a global enterprise, and that we need to cooperate closely with other regions such as AZA, and more urgently with *ex situ* facilities in Madagascar, too. For example, in the case of greater bamboo lemurs (*Prolemur simus*), we are exchanging animals with Ivoloina in Madagascar, and the EEP is a key element in the *in situ* conservation of the species. We are also exchanging blue-eyed black lemur (*Eulemur flavifrons*) between AZA, EAZA and Madagascar, for this reason. The newly established Coquerel's sifaka (*Propithecus coquereli*) EEP will be managed in close

collaboration with the SSP, benefiting the global population and increasing our contacts so that we can further improve our husbandry and fundraising potential.

We're also pressing ahead with a kind of informal global cooperation on the aye-aye. In all of this, the main thing we need to concentrate on is good communications between the SSPs, EEPs and other partners, to ensure that we are providing sustainable cover across the widest possible spectrum of species.

DWM: Can you tell us more about the TAG's collaboration with the *ex situ* facilities in Madagascar?

AJ: The continuing collaboration with Madagascar is essential to the TAG and to the RCP, but there are some major issues to contend with.

The aim is to continue with the transfer of animals and knowledge with the *ex situ* facilities in Madagascar. This currently happens on a limited scale – which is partly due to bureaucratic hurdles on that side. While the recent criticism of CITES regarding the export of rosewood has not been a factor so far in stalling these transfers, there is a danger that the country might fall out of the CITES system because of illegal or questionable animal and plant exports at some point in the future, and this would be disastrous for the TAG's work. We also need to ensure continuity on our side; that is to say, that we maintain relationships with the government and NGOs in Madagascar over the long-term. The TAG Vice-Chair, Delphine Roullet, supported by Cotswold Wildlife Park and by other zoos, is a key person in this role and is very involved in networking with the important stakeholders. Doing this ensures that we are acting as efficiently as possible, and that knowledge on both sides is being retained within the prosimian conservation community and the wider stakeholder network.

It's also been essential for the future to have the Ministry of the Environment's Director General of Forests, Eric Robsomanitrandrasana, as a partner, attending meetings of the stakeholder group, but obviously, this and the wider retention of long-term partnerships with *ex situ* facilities in Madagascar requires funding – this amounts to roughly €15,000 per year, which we need to raise from zoos and private donors. The TAG will be working to set up a fundraising body to gain support from zoos over the next few years to ensure the continuation of the current collaboration with Madagascar.

KH: This seems like a very innovative approach. Do you see this as a model for other EEPs in the future?

AJ: Definitely, where it is appropriate; we believe that the need to establish and fund *ex situ* facilities in range states will become apparent across a number of species and habitats. This, along with the exchange of animals between facilities, seems to be a real reflection of the capabilities of zoos to support the One Plan approach, and we look forward to seeing how this goes with prosimians so that we can report back to the EAZA Conservation and EEP Committees on its effectiveness and how to overcome some of the hurdles.

DWM: You mentioned some of the challenges of providing information to Malagasy communities about prosimians. Could you just recap some of the other pressures on wild populations, and give us your assessment about the future of prosimians in the country?

AJ: The poverty of the people reflected in slash-and-burn agricultural practices and also more recently in bushmeat hunting, creates enormous pressures. More than 90 per cent of the natural environment in Madagascar has been destroyed and species are surviving in fragments of habitats. The political instability in the country means that we shouldn't expect these pressures to ease any time soon.

Nonetheless, the TAG is very optimistic about the prospects for conservation of prosimians, and believes that the RCP will be integral to the success of the EEPs and the wider collaboration with Madagascar. Despite a large number of species, and a very difficult conservation status, there is a clear vision of how to develop and ensure sustainable populations over the next years. The TAG will prepare a presentation to promote the RCP among current and potential holders, and looks forward to encouraging EAZA Members who haven't yet held these highly charismatic species to choose species to help with the fulfilment of the plan and to bring more attention to the issues, more funding to the conservation projects and more expertise and knowledge to the TAG. It's an exciting time for us all, and we look forward to welcoming new colleagues into the world of prosimians and their conservation.

The great coral challenge

THE DESTRUCTION OF CORAL REEFS AROUND THE WORLD COULD BE DEVASTATING FOR THE FUTURE OF THE PLANET – AND URGENT ACTION IS NEEDED

Paul Pearce-Kelly, Senior Curator of Invertebrates, Lower Vertebrates and Research, ZSL London Zoo

The severity of threat that climate change presents to biodiversity and humanity's wellbeing is clearly demonstrated by the global-scale impacts on warm water corals and their biodiverse reef ecosystems. Unprecedented back-to-back mass bleaching events over the last few years have affected reefs around the world and shown that even the best-managed reefs have little defence against such heat stress. There's little doubt that without concerted action, reefs will be the first great ecosystem to be lost to the world; but the positive news is that there may yet be time to take the necessary actions to ensure the survival of these invaluable habitats.

TREASURE TROVES OF BIODIVERSITY

Today's reef-forming stony (Scleractinian) corals have been around for over 200 million years, and although warm-water reefs occupy less than 1 per cent of the marine environment, they are the most biodiverse of all our planet's ecosystems. Home to a quarter of all known marine species, the number of species still to be discovered in these complex habitats is thought to considerably exceed the known species. Reefs also support further biodiversity through their integral connection with wider ecosystems, especially mangrove and seagrass habitats.

In addition to their recreational and tourist revenue-generating value, reefs provide a wide range of free ecosystem services, including food for up to a billion people, habitat for economically valuable fish species, sand for beaches, and protection of thousands of kilometres of shoreline from wave erosion. They are also a rich source of new pharmaceuticals.

HIGHLY INTERACTING THREATS

Despite their importance, around 40 per cent of coral reefs have been lost over the last 40 years due to a wide range of interacting human pressures including unsustainable coastal development, destructive fishing practices, sedimentation, fertiliser and sewage pollution and resultant eutrophication. Some excellent conservation initiatives, especially the designation and proper management of large-scale protected marine areas, show how well coral reefs and their reliant biodiversity can respond, to the great benefit of local communities.

However, the latest mass bleaching events show that even the best-managed reefs have suffered some of the worst bleaching. This clearly demonstrates that current global warming of just 1°C is already too much for corals to contend with, which is especially alarming when we consider that the ocean will take several decades to fully respond to current atmospheric carbon dioxide (CO^2) levels, and that additional warming and ocean chemistry changes are already locked into the system.

The extra CO^2 being absorbed by the ocean is increasingly changing ocean pH levels, which in turn is reducing the ability of corals to maintain the calcification levels necessary for countering the constant erosional pressures of their environment. Ocean acidification poses as great a threat to coral reef viability, and projected impacts include reduced growth, weaker skeletons, increased bioerosion and, potentially, dissolution of carbonate substrates and coral skeletons. There is also evidence that coralline algae (the effective glue that binds reefs together) is especially susceptible.

Increasing storm severity is a further interacting impact problem for the healthiest of reefs, but when combined with the debilitating effects of ocean acidification, a reef can be severely compromised. As if that weren't enough, reefs are facing many additional stressors, including sea level rise, changing ocean currents and the spread of deoxygenation zones.

Because coral reefs need 10–20 years to sufficiently recover from mass mortality events, the back-to-back bleaching events have been especially worrying. Even if corals do recover, they may suffer impaired reproduction, increased susceptibility to disease and compromised calcification ability. Their habitats are also more susceptible to phase shifts from coral to a macroalgal-dominated system.

Although the Paris Agreement's 1.5°C target is the current policy focus, it's clear that even if the world's governments were to realise the necessary actions to achieve this target, it would not be sufficient to prevent the functional extinction of coral reefs. A global scientific assessment of climate change on World Heritage coral reefs states that under emission pathways compatible with the Paris Agreement, CO^2 concentrations would not return below 350ppm until the middle of the 22nd century, if at all. The inadequacy of the 1.5°C target is also highlighted by Steffen *et al.* (2018) who explain how human-induced warming is rapidly approaching levels that may trigger positive climate feedbacks, which could greatly accelerate global warming and its impacts.

CAN WE SAVE THEM?

Concerted efforts to reduce local stresses to reefs through best conservation management is essential to ensure these ecosystems can be as resilient as possible to climate change. However, it's clear that for coral reefs to remain viable ecosystems, it's essential to return CO^2 concentrations to below 350ppm while it's still possible to do so (Veron *et al.* 2009). This requires a rapid phase-out of fossil fuels, especially coal, along with capturing CO^2 from the atmosphere. Although this is a considerable challenge, there are some scientifically compelling CO^2 capture proposals such as enhanced weathering through biogeochemical improvement of soils by adding crushed, fast-reacting silicate rocks to croplands (Beerling *et al.*

COMBINED BEFORE AND AFTER MASS BLEACHING AMERICAN SAOMOA; BELOW: NOT JUST CORAL. CLOWNFISH ON BLEACHED ANEMONE GREAT BARRIER REEF FEBRUARY 2017

2018) which, if carried out at sufficient scale, has the potential to both reduce atmospheric CO^2 levels and counter the effects of ocean acidification while greatly improving agricultural systems. Such actions may sound far removed from our usual conservation focus, but these are the kind of mitigation policy considerations we need to be aware of and potentially advocating for if there is to be any chance of meeting the coral reef conservation challenge.

With our hundreds of millions of visitors, our international aquarium and zoo community has a vital role to play in raising awareness of these threat realities and response imperatives. We need to alert our visitors to the fact that current climate change mitigation commitments fall far short of what's necessary for reefs and to channel their policy-influencing power to demand essential mitigation policy action.

Beyond our public engagement and policy-influencing role, we are ideally placed to advance coral conservation efforts through *ex situ* coral reproduction initiatives, such as the *Project Coral* programme by the Horniman Museum in the UK and international collaborators. We also need to ensure that as many of our coral species as possible are cryopreserved in facilities such as the EAZA Biobank. Both of these actions will be assisted by the clearing up of current taxonomic knowledge gaps in collection inventories.

Because they are so sensitive to climate change, if we can ensure a future for coral reefs, we'll also give ourselves the best chance of saving most major ecosystems, along with our coastal cities and socioeconomic wellbeing. Conversely, if the reefs are allowed to become functionally extinct, we'll have committed ourselves to truly unmanageable climate change impacts to biodiversity and humanity alike. There's every incentive therefore to do our collective best to ensure the necessary action is taken while there's still time.

REFERENCES

- Beerling *et al*. (2018). Farming with crops and rocks to address global climate, food and soil security. *Nature Plants* 4:138–147.
- Franks *et al*. (2018). Mobilizing domestic resources for the Agenda 2030 via carbon pricing. *Nature Sustainability* 1:350–357.
- Heron *et al*. (2017). Impacts of Climate Change on World Heritage Coral Reefs: A First Global Scientific Assessment. Paris UNESCO World Heritage Centre.

FURTHER READING

- Hoegh-Guldberg (2017). Coral Reef Ecosystems under Climate Change and Ocean Acidification. *Frontiers in Marine Science* 4:158.
- Steffen *et al*. (2018). Trajectories of the Earth System in the Anthropocene. Proceedings of the National Academy of Science, 14 August 2018, 115:33.
- Veron *et al.* (2009). The coral reef crisis: The critical importance of <350 ppm CO2. *Marine Pollution Bulletin* 58:10.
- See also WAZA's climate change Position Statement and Emergency Resolution at www.waza.org.

THE OCEAN AGENCY XL CATLIN SEAVIEW SURVEY CORAL REEF IMAGE BANK

New directions

ZOOQUARIA TALKS TO ERIC BAIRRÃO RUIVO, DIRECTOR OF SCIENCE, COLLECTION AND CONSERVATION AT BEAUVAL ZOO, AND THE NEW CHAIR OF THE EAZA CONSERVATION COMMITTEE

David Williams-Mitchell, EAZA Director of Communications and Membership

DWM: Eric, you were appointed the new Chair of the Conservation Committee at the Conservation Forum in Tallinn earlier this year. Could you tell us more about the background to your appointment?

EBR: I have been a member of the Conservation Committee for a long time – 17 years or so, by my reckoning! The Committee has always been made up of some great people, but I am not convinced we have always been as effective as we could be. This is the result of several different factors: partly due to unrealistic expectations from Members, and partly just because there was a lot of work that needed to be done just to get started. I think perhaps we spent too much time talking and not enough time doing, and I am as guilty as anyone.

DWM: There have been some important developments though: the Conservation Database and the Guidelines on the Definition of a Direct Contribution to Conservation, for example.

EBR: Sure, but I think we need to look objectively at the Database – it took a long time to come to fruition after we had decided that we needed one, and even now, it's really not being used by Members as much as we need; we can't improve our conservation impact if Members are not adding their data. We also spent a great deal of time discussing the Guidelines, but it's still unclear how Members will use it to measure their conservation work. So while I am not sure that I am the most qualified person to be leading the Conservation Committee, I know I am good at getting things done, and I think that this is what the Committee was looking for.

DWM: So what are your priorities for the Committee over the next few years?

EBR: Let's start with what I see as being one of the most difficult: I believe strongly that the Conservation Committee needs to be a Standing Committee of the Association. Conservation is a key part of our mission; indeed, it is one of the four focal areas of the 2017-2020 EAZA Strategy. More than this, if we believe ourselves to be a conservation organisation (which I do), then we need to demonstrate to both our Members and the outside world just how seriously we take this part of our work. It seems logical that the Chair of the Conservation Committee should be part of the Executive Committee alongside the other Members, such as the Chair of the EEP Committee. If we believe that the goal of population management and the care of animals at zoos and aquariums is partly to support conservation, then I would think that a conservation voice on the

Executive Committee would be an important addition; not only that, but I think also that an increased emphasis on conservation within the Association and its structures would encourage Members to strive to have more impact on conservation both individually and together.

DWM: How do you think you might be able to achieve this?

EBR: Well, I think there are several steps to take. The first is to work on the Committee itself. I believe that you need to inspire change by making changes. In terms of the Committee, this means adding new Members alongside some familiar faces, the idea being to build a strong team that is skilled in conservation but also very active.

We'll also need to look at the Terms of Reference for the Committee, with the aim of setting up a structure that will allow us to find ways to get practical action from Members. To do this, we'll be holding a Committee workshop in March 2019, which will look at some actions and how to finance them.

DWM: So what sort of changes will the Terms of Reference suggest?

EBR: I think we should look, for example, at the Working Groups that the Committee oversees. Currently, we have a Palm Oil Working Group and a Reintroduction and Translocation Working Group. I personally find that the remit of the Palm Oil Working Group is a little reductive. Palm oil is only one problem in a portfolio of human agricultural issues harming nature, which also includes soy and beef production. So first off, I would like to see the Palm Oil Working Group become a Sustainable Agriculture Working Group, which would look at these issues and help EAZA to formulate a workable response that supports our conservation work.

For the Reintroduction and Translocation Working Group, I believe that all reintroductions should be approved by this working group before they go ahead – this way we can evaluate exactly what it is that EAZA can bring to a project, ensure that EEP animals that are reintroduced are the most suitable animals and so on. It's just a question of tightening up the oversight we have with these projects, and making sure that we act in concert and with maximum impact.

On top of these changes to the existing Working Groups, I would like to see two additional Working Groups established. The first would look at many of the other human issues affecting conservation, which I would group under the heading of a Sustainable Industry Working Group. This group would look at how EAZA should respond to issues such as sustainable fishing, plastics production and so on, and would inform how we present these issues in an educational context in zoos and aquariums.

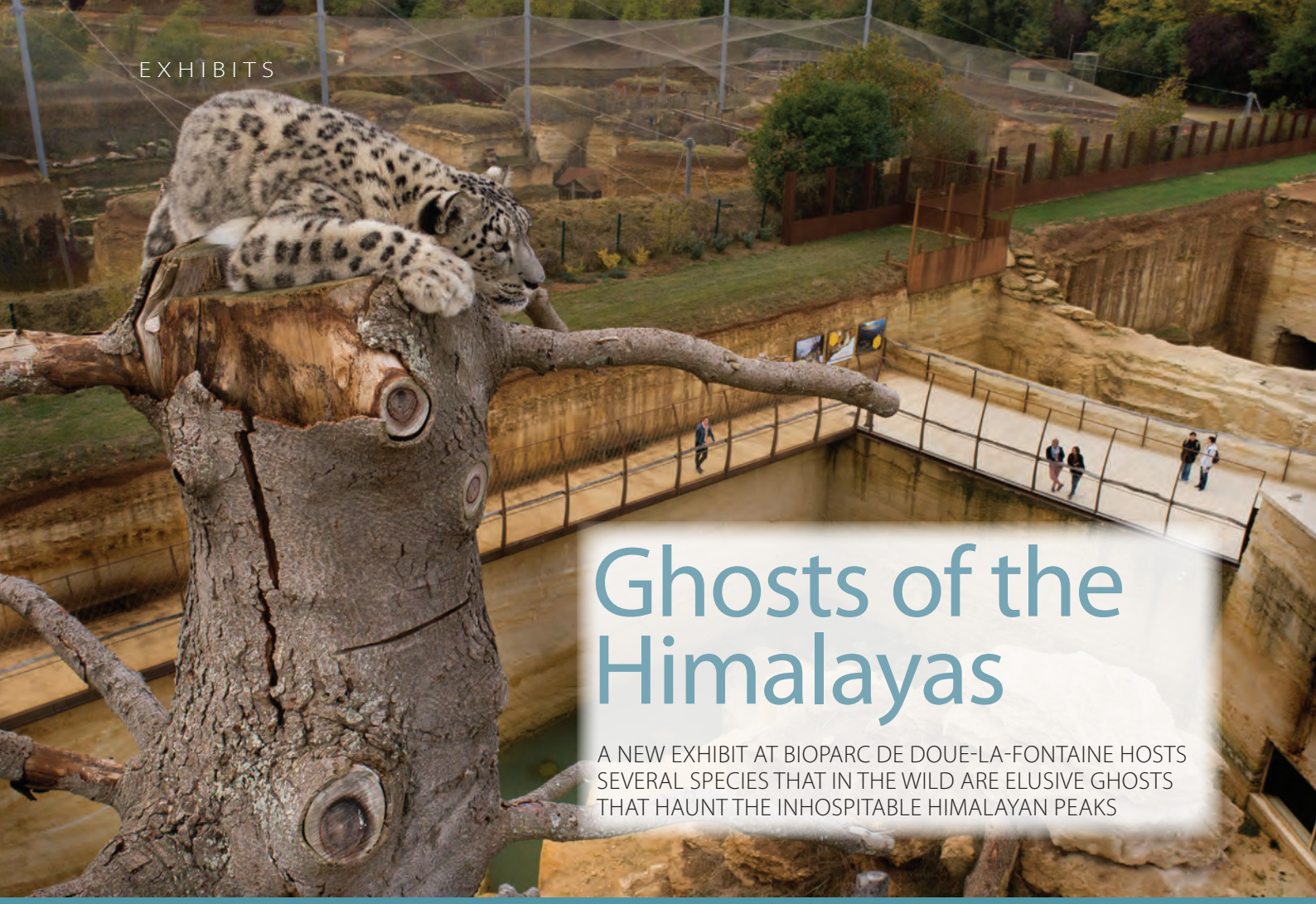
The other working group I would like to see established is a Wildlife Trade Working Group. The trade of animals and animal parts places a huge pressure on the natural world, as we have seen from the Silent Forest campaign, the Bushmeat campaign and so on. I think we can do a lot of good by being active in this area and sharing our findings and positions with the public and other stakeholders.

I dream of being able to do a worldwide campaign on the issue of the wildlife trade, involving institutions and organisations of all kinds to finally get a handle on this unnecessary and horribly destructive activity.

DWM: It strikes me that you believe that conservation needs to be led by action on human influences on the natural world. Would you say that's an accurate reflection of your philosophy?

EBR: Absolutely correct. You simply can't solve issues of species conservation without seeking solutions to the pressures that are leading those species towards extinction. I believe that the zoo and aquarium community can have an impact on people's behaviour, and on the political process – this is the level at which we can make a real difference. I am not saying that individual species conservation is not important – it very much is. I just believe that there are already a lot of conservation heroes who are working in this sphere, and while we should support their work as much as we can, we can most effectively help them by working to reduce the impact of humans on those ecosystems through good educational engagement. Let me say that I think education is a vital part of our work and one that deserves attention; I would like to see more engagement in the Committee, for example, with education and communications professionals among our Members, who I think can do a great deal of good with their skill sets.

Also key to this will be continued partnerships, such as with IUCN, who have a huge political influence, and with the EU; after all, we are both committed to future generations. I think what we are realising at the moment is that EVERYTHING we do is related to conservation – and we will see more and more people coming to the Committee for advice on issues ranging from the killing of migratory birds in the Mediterranean to sustainable industry. We will need to look at where we can make the biggest difference, but I hope that we can build an even stronger voice for the zoo and aquarium community in the world of conservation – there's a lot of potential for us to make a real difference.



Ghosts of the Himalayas

A NEW EXHIBIT AT BIOPARC DE DOUE-LA-FONTAINE HOSTS SEVERAL SPECIES THAT IN THE WILD ARE ELUSIVE GHOSTS THAT HAUNT THE INHOSPITABLE HIMALAYAN PEAKS

Peggy Lavergne, Education and Conservation Manager, BioParc Doué la Fontaine

In 2017, the Bioparc de Doué-la-Fontaine in France opened a new 11,000 m² space based on a Eurasian theme. Gathering connected species through their food chain and original habitat, the 'Ghosts of the Himalayas' exhibit is now home to snow leopards (*Panthera uncia*), markhors (*Capra falconeri heptneri*), marmots (*Marmota Himalayana*) and a group of griffon vultures (*Gyps fulvus*), black vultures (*Coragyps atratus*) and Egyptian vultures (*Neophron percnopterus*).

This new space is made up of several quarries and chiselled cliffs, dug out of our limestone rock. Each animal enclosure is surrounded by fences made from metal sheeting and stone boxes. The snow leopards benefit from an enclosure of 2,000 m², as do the markhors. At the heart of this craggy landscape is a 4,000 m² amphitheatre hewn out of the rock, giving a new dimension to vulture feeding time and providing ideal conditions for building nests and producing chicks to be reintroduced in the wild.

This extension is designed to be discovered on two different levels by our visitors. The first discovery leads visitors through 200 metres of tunnel to the low level of the vultures' amphitheatre. The underground passage offers 'cosy' views of the snow leopards' and markhors' parks, but revealing only a small part of them. Later, at the higher level of the Bioparc, the visitors can see these animals' entire enclosures and have an excellent overview and understanding of this new creation. Marked by several informative panels, this path serves the ecological purpose, illustrating the strong link between herbivores, carnivores and scavengers in mountain territory.

With this new creation, the Bioparc is once more confirming its commitment to the safeguarding of endangered species. As the first zoo to have reintroduced vultures in 1983 and to have welcomed snow leopards in France in 1985, we wanted to give these species and the *in situ* conservation programmes we support in the wild their full scope, providing more space for our individuals and highlighting our involvement in their protection.

MARKHORS – AMAZING CLIMBERS

Belonging to the Turkmenistan sub-species *Capra falconeri heptneri*, markhors are new in the Bioparc. We welcomed a male group in a steep area composed of two symmetrical and connected slopes. Designed to welcome up to 10 animals, this enclosure allows them to satisfy their incredible climbing skills. With only 2,000 animals remaining in the wild, these ibexes, as for the other sub-species, are prey for snow leopards.

BIOPARC FACTS AND FIGURES

The 'Ghosts of the Himalayas' required nine months of earthworks; 65,000 tons of rock and soil were extracted. It was designed by François Gay, and was inspired by the hexagon shape omnipresent in nature. Involving local companies, the creation was directed by the Bioparc team. The project development and realisation was filmed in its entirety for the French channel RMC Découverte, in an eight-episode serial.

SNOW LEOPARDS – THE ELUSIVE MOUNTAIN CAT

Our pair of snow leopards has moved to a new area five times larger than their previous home. This multi-layered mineral territory of 2,000 m² provides 10 metres of high gradient, satisfying the climbing capacity of these mountain predators and providing a huge explorative territory. In addition, a 10-metre tree trunk enhances the elevation, allowing the animals to have an aerial view over the Bioparc. A waterfall and a creek cross the enclosure to encourage the growth of a vegetal flow. Visitors can observe the leopards from different points, from the lower underground level and from a steel footbridge suspended above the cliff, which guarantees a spectacular if dizzying experience. For their welfare, the leopards have free access to their outside enclosure 24 hours a day.

VULTURES – THE SKY GLIDERS

Built to welcome up to 60 vultures, the immersive amphitheatre offers the birds a huge exploratory territory and provides a large choice of shelters and nests dug out of limestone prisms. Shrubs and trees were planted to provide nesting platforms for black vultures in the near future.

Despite the birds' wounded wings, gliding flights took place and are now often observed by our enthusiastic public and team. The daily feeding time, often presented in front of more than 1,000 people, is an incredible natural spectacle. Metal sculptures of markhors illustrate the link between herbivores and scavengers in mountains: two of them represent dead animals and are used as containers for meat. Griffon vultures, black vultures and Egyptian vultures are cohabiting with a breeding pair of Alpine marmots, which have taken up residence in galleries that they dug in the friable rock.

INCREASING OUR LINKS WITH NATURE

Acting as a reception centre and in collaboration with local associations, the Bioparc takes in only birds of prey that have been injured in the wild and that cannot be released because of their handicap. It is also a breeding centre, and was the first zoo park in France to reintroduce its birds into the wild for 35 years. This large space allows us to increase our capacity for taking in new birds. More young birds born at the Bioparc will be offered to associations responsible for releasing them in Europe, including the Ligue pour la Protection des Oiseaux, the Vulture Conservation Foundation and the Fund for Wild Flora and Fauna NGO in Bulgaria. Since 1983, around 50 vultures from the Bioparc have already been released in the mountains of Europe, including the first black vulture to be tracked by GPS in the French Alps (female Lucie, 2017) and the first griffon vulture born in the amphitheatre this autumn.

We also support additional *in situ* actions, awareness, feeding areas and local support. In Bulgaria, the Fund for Wild Flora and Fauna NGO does remarkable work: it aims to secure food for vultures by helping farmers to create traditional breed herds, by replacing for free any livestock killed by a wild predator and by providing herding dogs. After it disappeared from the Balkan Mountains for 50 years, the griffon vulture was reintroduced for the first time in 2007 by FWFF. Six years later the first chick was born. One of its parents was none other than a vulture born at the Bioparc!

SNOW LEOPARDS AT THE BIOPARC DE DOUE-LA-FONTAINE

In 1986, Pierre Gay travelled in the Kashmir region with Helen Freeman, the creator of the famous American Snow Leopard Trust. This meeting was highly significant and inspired his philosophy and conservation involvement.

Since 2001, the Bioparc has supported the Trust at different levels. We invited Brad Rutherford, previous director, to present the Trust at two of the *in situ* conservation forums that Pierre Gay organised in France (Angers, 2012, 2014) with EAZA. We have participated in the extension of the Trust zoo partnership programme in Europe. Our annual donation of €5000 helps 50 livestock herder families in the Gobi Desert in Mongolia. Trained and equipped with spinning wheels, women can create felt objects with the wool of the herd, which is sold at a lower price in its raw state. The Trust buys and sells these handicrafts (anywhere from Mongolia to zoos, the Bioparc included) so that the participating families can substantially improve their daily life. In return, the entire community pledges to protect the snow leopards. The recent news proves the merit of this collaborative work: the first National Reserve created for leopard conservation in the Tost Mountains of Mongolia is effective and the leader, Surenkhuu Luvsanwin, won the 'Conservation Champion 2018' award from the David Shepherd Wildlife Foundation.

A meeting of minds

A RECENT WILDLIFE HEALTH CONFERENCE BROUGHT TOGETHER ZOO VETERINARIANS FROM ACROSS THE GLOBE TO SHARE THEIR SKILLS AND KNOWLEDGE

Veronica Cowl, Chester Zoo, UK and EAZA Reproductive Biology Coordinator and Katharina Herrmann, EAZA Animal Programmes and Conservation Coordinator

C. BARRIENTOS

More than 600 delegates from over 50 countries were welcomed to the city of Prague, Czech Republic in October this year, for the Second Joint Zoo and Wildlife Health Conference, which was hosted by the European Association of Zoo and Wildlife Veterinarians (EAZWV), the American Association of Zoo Veterinarians (AAZV), the Leibniz Institute for Zoo and Wildlife Research (IZW) and Prague Zoo.

The pre-conference day was packed full of specialised veterinary workshops, covering topics such as advanced anaesthesia, cardiac disease in great apes, avian handling and wildlife pathology. A particular highlight among these sessions was the joint AZA and EAZA vet advisor meeting, which presented an opportunity for vet advisors on both sides of the pond to meet each other and share their experiences of supporting their relevant population management programmes. The joint vet advisor session began with an introduction to the similarities and differences between the structure of AZA and EAZA population management programmes, and was followed by presentations on the various support tools available to vet advisors such as ZIMS for medical, the EAZA Biobank, and a joint presentation from the AZA Reproductive Management Center and the EAZA Group on Zoo Animal Contraception. The joint session concluded with a discussion on the challenges facing vet advisors, and potential solutions or action points to aid them in their work. The workshops were followed by an enjoyable ice-breaker evening in the National House of Vinohrady, which allowed colleagues from all around the world to re-engage with one another following the months since the last conference.

The conference was officially under way on the next day, following a welcome plenary by Prague Zoo's director, Miroslav Bobek, who introduced the audience to the zoo's rich history and its various conservation successes, not least with the breeding and reintroduction of Przewalksi's horse (*Equus ferus przewalskii*) to Mongolia, and Chinese giant salamander (*Andrias davidianus*) husbandry and research.

Conference session topics included anaesthesia, reproduction, wildlife and conservation, ethics and welfare, as well as various sessions dedicated to specific taxa. A particularly striking and unique plenary on natural disaster management included a talk by Prague Zoo's vet, Roman Vodička, who discussed the evacuation plans and aftermath of the devastating floods that the zoo faced in 2002 and again in 2013. Throughout the conference there was significant focus on the work of the veterinary advisors, with four sessions dedicated to the excellent work of the AZA and EAZA vet advisors, illustrating the incredible joint efforts across breeding programmes. A particular highlight was a joint talk by EAZA's Baptiste Mulot, Beauval, and AZA's Cora Singleton, San Diego Zoo, about mortality in Queensland koalas in Europe and North America, which illustrated the similarities and differences between the two managed populations.

The conference provided delegates also with the opportunity to get involved with round-table talks looking at sharing veterinary experiences with the devastating elephant endotheliotropic herpes virus (EEHV), use of ZIMS Medical for vets, conservation work by zoo vets, and on balancing animal welfare with the demands of population sustainability. The conference also presented an opportunity for the EAZA Veterinary Committee to hold a meeting and to present updates from the EAZA conference to the larger European zoo vet community. During the meeting, important discussions were held to identify how the European zoo vet community can have a stronger and more succinct voice within their regions, in Brussels, and ultimately within EU legislation.

Obvious highlights of the week were, of course, the several social events, which included an opportunity for delegates to delve deeper into the 91 posters that were presented during the Poster and Pasta Party, the very well-attended student's night out, where delegates were able to let their hair down, the zoo visit and dinner, a festive evening full of live music and dancing, and the farewell conference banquet.

Overall, a huge 'well done' must be given to the organising committee, which comprised members of the IZW, EAZWV, AAZWV and Prague Zoo, as well as the scientific programme committee for putting together a fantastic series of talks and posters, and not least to the various reviewers and session chairs. For now, we look forward to the next AAZWV conference in St Louis, USA, the next EAZWV conference, and the first joint ECZM/EAZWV/IZW conference in Kolmarden, Sweden in 2019. For more information, please keep an eye on the websites for EAZWV (eazwv.site-ym.com) and IZW (www.izw-berlin.de/conferences.html).

Managing populations

WHAT IS REPRODUCTIVE MANAGEMENT AND HOW DOES IT COMPLEMENT POPULATION MANAGEMENT?

Veronica Cowl, Chester Zoo, UK and EAZA Reproductive Biology Coordinator, Sue Walker, EGZAC co-chair, and Yedra Feltrer Rambaud, EGZAC vice-chair

One of the ways in which zoos assist the conservation of endangered species is through our population management programmes, designed to foster healthy, sustainable *ex situ* breeding populations. Ideally, these are genetically diverse with low levels of inbreeding and minimal adaptations to being kept in human care. However, not all populations are sustainable. They can grow too rapidly, exceeding the resources available, or may not grow quickly enough and therefore not reach the minimum number required for a sustainable population management programme. For this reason, reproductive management is required.

The primary target of *ex situ* population management programmes is not to have as many 'hooves on the ground' as possible. Instead, the idea of reproductive management has been adapted within zoos to include both limiting and enhancing reproduction so that we can meet the demographic and genetic targets of each programme.

While the need to limit reproduction may sound contradictory to the aims of *ex situ* breeding, there are many reasons to prevent certain animals from breeding. It may be necessary to prevent breeding between non-recommended individuals, reduce the number of surplus animals, or maintain family groups. Also, as conditions in zoos may allow animals to reproduce earlier and more frequently than their wild counterparts, temporarily limiting reproduction may decrease the physical burden of continuous pregnancies. In zoos, limiting the reproductive potential of animals primarily involves the use of reversible contraception or separation of the sexes, although in some cases alternative methods such as breeding and culling are chosen. In any scenario, however, the impacts of the chosen techniques need to be carefully considered, and the effects need to be evaluated holistically.

While sadly there are no published assessments of reproductive success in EAZA population management programmes, a 2011 study of over 16,000 AZA breeding recommendations found that only 23 per cent were successful (Faust *et al.*, 2011). Thus in just over a fifth of breeding recommendations, the pair successfully produced offspring within the recommended timeframe. There are many contributing factors to the low rate of success; for example, the pair may not have been in the same institution, they may have been socially incompatible, or one of the individuals may have died. However, what cannot be ignored is that subfertility is also a contributing factor.

A general assumption in population management programmes is that animals that receive breeding recommendations are fertile. However, in many species fertility must first be established by a breeding event upon reaching sexual maturity, and then must be maintained by continuous pregnancies throughout the individual's lifetime. For some species, pregnancies also carry a protective function for uterine health, preventing the incidence of various reproductive pathologies. Termed 'use it or lose it', this phenomenon has been identified in various species (Penfold *et al.*, 2014). However, all species held in zoos will not respond uniformly to these breeding decisions, and understanding species physiology and reproductive biology is key to ensure that husbandry practices are not hindering reproduction.

Ensuring that animals in population programmes are fit for purpose is key. While breeding recommendations primarily focus on maintaining genetic diversity, given the low rate of success between some recommended pairs, a more holistic approach is essential. There needs to be a thorough evaluation of factors contributing to reproductive success, including the overall health of the animal and its group, its reproductive history and health, its age and reproductive state, and the behavioural, social and welfare impacts of the breeding recommendation. Also, the effects on fertility of non-breeding and repeated breeding need to be carefully balanced with the population requirements for sustainability.

For this, basic information on species' reproductive and breeding biology is essential, especially given that species physiology and responses to breeding and non-breeding are almost as unique as the species themselves. Given the extensive knowledge that exists within the EAZA community, this presents an exceptional opportunity for collaboration across institutions, committees, working groups and regions. To ensure the welfare of our animals and to remain at the forefront of best husbandry practices, a holistic and proactive approach evaluating the behavioural, social, physiological and pathological effects of breeding decisions is integral. The use of tools such as ZIMS and the Contraception Database facilitate the systematic collection of vast amounts of data across zoological collections, enabling the analysis of trends across populations and the continued advancement of best practice.

This year marks the 10th anniversary of EAZA Group on Zoo Animal Contraception (EGZAC) and the expansion of our remit to take a comprehensive approach to reproductive management. Given the wealth of experience within the EGZAC working group on reproductive medicine, health, and fertility, EGZAC is increasing its support to include breeding enhancement, fertility assessments, reproductive pathology and basic breeding research, among others. The Contraception Database that we curate with the AZA Reproductive Management Center will remain an active part of our work, which we use to provide contraceptive guidelines to the wider EAZA community as well as to identify gaps in current knowledge.

For more details, visit egzac.org or email us at contraception@chesterzoo.org.

REFERENCES

Faust *et al.* (2011). PMC Track, www.pmctrack.org.

Penfold *et al.* (2014). 'Use it or lose it': Characterisation, implications, and mitigation of female infertility in captive wildlife. *Zoo Biology* 33 (1): 20–28.

Note: This work is supported by the European Union LIFE NGO funding programme. The European Union is not responsible for the views displayed in publications and/or in conjunction with the activities for which the grant is used.

Top of the class

THE 2018 IZE CONFERENCE PROVED TO BE AN OASIS FOR CONSERVATION EDUCATORS

Laura Myers, EAZA Academy Manager

In October 2018, Al Ain Zoo, UAE, played host to educators from across the globe for the biennial International Zoo Educators (IZE) conference. This was the conference's first visit to the EAZA region since 2012, and the first time that the conference had been held in the Middle East. EAZA Members took full advantage of having a 'local' conference, and around 50 delegates attended from across our region.

The theme for the conference was Culture and Conservation – Bringing a Deeper Human Dimension to Zoo Education. This theme was showcased from the very start of the conference, when the seven delegates sponsored to attend by the IZE modelled their national costumes (and shared some dance moves) during the icebreaker at Al Ain Zoo.

Welcome speeches from His Excellency, Dr Thani Bin Ahmed Al Zeyoudi (UAE Minister of Climate Change and the Environment), His Excellency, Ghanim Al Hajeri (Director General of Al Ain Zoo) and IZE President Isabel Li (Ocean Park Hong Kong) kicked off a busy first day of presentations. The keynote speech by Jamie Copsey (Conservation Planning Specialist Group) set the tone for the conference, challenging delegates to think about the cultural aspects of conservation, and framing zoo educators as the new conservation project managers.

The delegate presentation session on the first day focused firstly on zoo education and then on education in the field. Europe was well represented in both sessions; Anastasia Kadetova (Moscow Zoo) presented some innovative and creative teaching methods to make zoo-based learning more attractive, Katarzyna Walowska (Wroclaw Zoo) shared the outcomes of their WAZA Nature Connect funded projects to give young people the chance to connect to nature both inside and outside the zoo, Antonieta Costa (Lisbon Zoo) shared preliminary results from a new school-based learning partnership, and Constanze Mager (Royal Burgers' Zoo) shared their experience of connecting a new mangrove exhibit in the zoo with a long-running conservation project in Belize.

'It's an experience that changes a person after attending such a conference. It is impossible to come back to your zoo with the same thinking and attitude you left with.' – LINA, BURSARY RECIPIENT

Day two started with presentations from the IZE-sponsored delegates, whose work spanned both the globe and the full spectrum of education, from teacher training in Guatemala to kindergarten sessions in Vietnam. Several of the sponsored delegates work primarily with *in situ* conservation, and this session and the conference as a whole offered great opportunities for exchanges of ideas and support between educators working in the field and those based in zoos.

The second part of the day was all about interpretation, with presentations on work done to incorporate indigenous cultures into conservation education in Hawaii and New Zealand, how to provide opportunities for all groups of zoo visitors to connect with animals, and a lot of discussion about the challenges of working in very multicultural environments. In a presentation that picked up on some of the ideas from the keynote, Simon Garrett (Bristol Zoo) challenged educators to think less about wildlife and more about people, and to think more carefully about how to define the role of zoo education. Shamsa Alshamsi (Al Ain Zoo) gave all the delegates a taste of Emirati culture and storytelling traditions with her presentation on the philosophy behind education programming in Al Ain, setting the scene for an evening visit to a desert camp and the third day of the conference.

Day three allowed delegates to fully immerse themselves in local culture, starting with a visit to Al Ain Zoo. The zoo visit blended traditional experiences such as the Emirati welcome of *gahwa* (spiced coffee) and dates with

EAZA EDUCATION COMMITTEE BURSARIES

This year, after a very successful conference of their own in 2017, which received some generous sponsorship, for the first time the EAZA Education Committee was able to offer financial support to educators from EAZA Members to help them attend the conference. The committee agreed to offer bursaries of €1000 for first-time conference delegates to be used to offset the costs of attending the conference. The committee decided to do this both to support the event being hosted by one of our members, and also to support EAZA Members in fulfilling Conservation Education Standard 15: *Zoos should support staff involved in conservation education in zoos to be actively involved in local, national, regional and international conservation education networks and meetings*.

In total we were able to support four delegates to attend the conferences. Two bursaries were offered to any educators working at an EAZA Member or Candidate for Membership, and the recipients were selected by the EAZA Education Committee and the EAZA Executive Office, with oversight from the IZE regional representative. An additional two bursaries were offered to French educators, and the recipients were selected by the joint organising committee from the Association Française des Parcs Zoologiques, the Commission Française de la Pédagogie Zoologique, and the Parc Zoologique de Paris.

There were some tough decisions for the reviewers, as all the applicants were of a very high quality, but finally the following four recipients were selected: Nóirín Burke (Galway Atlantaquaria), Lina Gediminė (Lietuvos Zoologijos Sodas), Anaïs Frapsauce (Parc Zoologique du Muséum de Besançon) and Laetitia Lebeyrie (Parc Animalier et Botanique de Branféré).

Three of the bursary recipients had posters accepted for exhibition at the conference, and we were encouraged to see so many of them making an active contribution to the programme. Anaïs presented a poster on her work to build closer collaborations with teachers, Lina presented a poster about the conservation education elements of the European Professional Zookeeper Qualification Framework, and Nóirín presented a poster on ocean literacy training for student teachers.

All of our bursary recipients participated enthusiastically in every aspect of the conference, and all gave feedback stating that one of the most valuable aspects of attending the conference was simply being able to meet so many other educators with such a diverse range of experience, and the opportunity to exchange ideas and to network was one of the biggest attractions of attending the conference. Nóirín told us: 'The bursary provided me with the opportunity to attend an international conference, where I got to meet professionals from all over the world. This was the first time in 10 years of working in zoo/aquarium education that I had this opportunity. It was a privilege to attend, and a hugely positive learning experience for me both professionally and personally.'

Even in the short time since the conference, our bursary recipients are already taking action based on their conference experiences. Lina tells us: 'Renovation is starting at our zoo and a large Education Centre will be built. Our department must create a clear plan as to how this educational facility should be equipped with interactive educational tools and other resources in the near future. Al Ain Zoo, especially Sheikh Zayed Desert Learning Centre, has very modern and interactive areas for conservation education, which inspired new ideas for our future Education Centre.'

Nóirín has been busy too: 'Since the conference I have been in touch with three other collections about collaborating on an Atlantic Ocean Project, Marine Litter Project. I have also been working with Debra Erickson (San Diego Zoo) to try to bring San Diego Kids [a free TV channel with clips filmed at San Diego Zoo and other zoos] to children's hospitals in Ireland.' We can't wait to hear from them again at the EAZA Education Conference in March 2019 to see what else they have achieved.

innovative experiences such as a safari tour, which recreated aspects of the African savannah against a unique Emirati backdrop. Delegates were also able to fully explore the Sheikh Zayed Desert Learning Centre, a state-of-the-art building designed to immerse visitors in geological, ecological and cultural aspects of life in the desert. Delegates were inspired with fresh ideas (and perhaps a touch of jealousy) by the sympathetic design and interactive features. The day concluded with a visit to the Al Ain Oasis, a UNESCO World Heritage site.

The final day of the conference featured interactive workshops on developing effective live interpretation skills (given by Ann Marie Lisi from the Maritime Aquarium) and the challenge of delivering important but culturally sensitive conservation messages (given by Tomoaki Nishihara from the Wildlife Conservation Society). The last presentation session was focused on future goals for conservation education, including presentations on creating effective behaviour change campaigns in Zoos Victoria and Bristol Zoo; an inspiring example from Chester Zoo of conservation educators engaging with the One Plan approach as part of the Action Indonesia GSMPs; and a presentation from EAZA Education Committee Chair Sarah Thomas on how the 2016 EAZA Conservation Education Standards are shaping strategic thinking about conservation education in EAZA Members. The conference concluded with a gala dinner at the Al Muwaji Palace.

Perhaps unsurprisingly for a conference steeped in desert culture, the IZE conference provided a virtual oasis for conservation educators. The combination of generous Arabic hospitality, thought- provoking programming and motivated and enthusiastic colleagues allowed delegates time and space to reflect on their journeys so far, and to refresh themselves with new connections, inspiration and support to continue driving conservation education forwards.

Feeling inspired? Registrations are now open for the biennial EAZA Education Conference, which will take place at Skansen in March 2019. Visit eaza.net/events for full details.

A better LIFE

HOW ACQUARIO DI GENOVA'S FISH SCALE PROJECT TACKLED THE CONSERVATION PROBLEMS CREATED BY COMMERCIAL FISHING

Dalila Frasson, EAZA Funding Coordinator; Claudia Gili and Bruna Valettini, Costa Edutainment S.p.A c/o Acquario di Genova

The LIFE EU financial programme has been running since 1992 and has co-financed more than 4,500 projects across the EU and developing countries. It has contributed over €4 billion to the protection of the environment and climate, mobilising over €9 billion in total. At any given moment some 1,100 projects are ongoing. While all LIFE projects strive to benefit Europe's flora and fauna, some beneficiaries and projects merit special attention.

One example of how LIFE funding has been used is that of Acquario di Genova in Italy, an educational, scientific and cultural body, whose aim is to raise awareness about the sustainable use of aquatic resources; thanks to the LIFE funding, it took part in five cutting-edge projects aimed at the conservation of aquatic species, including common spadefoot (*Pelobates fuscus*), Mediterranean limpet (*Patella caerulea*) and Ligurian pond terrapin (*Emys orbicularis*). Acquario di Genova is an excellent example of the positive impact of funding that supports the implementation of EU nature and biodiversity policy.

The LIFE projects are in fact great examples of the cost-effective contribution to nature conservation, and demonstrate exemplary ways of using LIFE funding to restore habitats, conserve species and support biodiversity, in line with the goals of EU nature and biodiversity policy. This article highlights the FISH SCALE project, which stands for 'Food Information and Safeguard of Habitat a Sustainable Consumption Approach in Local Environment'.

FISH SCALE, carried out from 2010 to 2013, set out to tackle the problem that the commercial fish market is heavily concentrated on certain fish species, and only a small percentage of edible fish species are currently commercialised. Non-commercial species are hence classified as 'by-catch' and are usually discarded by industrial fisheries. This practice results in a huge waste of marine resources, alteration of marine biodiversity and reduction of adult reproductive fish. The reform of the Common Fisheries Policy (CFP) of 2013 aimed at gradually eliminating the wasteful practice of discarding through the introduction of the landing obligation. FISH SCALE focused on:

- changing the attitudes of consumers by increasing their awareness of the importance of 'by-catch' species;
- helping to relieve pressure on populations of more exploited species, establishing a more sustainable use of marine resources by reducing the quantity of edible fish discards, and providing economic benefits for consumers because 'sustainable' fish are generally cheaper.

The FISH SCALE project has confirmed the role of modern zoos and aquariums as important shareholders for biological and ecological knowledge and for the development of social knowledge and awareness involving everyone, from producer to final consumer.

The main objectives of the project were based on the sustainability and replicability of the project, objectives that coincide with the basic philosophy of the LIFE programme. As Joanna Drake, Deputy Director-General of the European Commission's DG Environment, said: 'To show to the world what Europe has been doing…it's not enough just to do it, we have to let others know that it has been done.'

Marine biodiversity loss is a complex issue. People rely on marine biodiversity for many things, including nutrition, economic livelihood and supplying the aquarium trade. Sadly, marine biodiversity is threatened by many things, including marine pollution, invasive species, climate change and overfishing, to name just a few.

By placing unsustainable consumption in a broader context, this topic is relevant for everyone. Not all EAZA Members hold marine species in their institutions, but everybody uses aquatic species for either feeding animals or their visitors. We all need healthy oceans!

Note: This work is supported by the European Union LIFE NGO funding programme. The European Union is not responsible for the views displayed in publications and/or in conjunction with the activities for which the grant is used.

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