

QUARTERLY PUBLICATION OF THE EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

# ZOOQUARIA

SUMMER 2022

ISSUE 114



## SEAL SANCTUARY

FINDING A SAFE HAVEN FOR THE  
ENDANGERED MONK SEAL



### CRISIS IN UKRAINE

NEWS FROM THE FRONTLINE – AND HOW EAZA IS HELPING

### A GREENER FUTURE

IMPROVING SUSTAINABILITY AT DORTMUND ZOO



# Instone AIR

Instone Air Line flew the first racehorse to travel by air in 1919

100  
YEARS IN AVIATION

## Experts in zoo animal transport



## World leaders in animal air transport

Instone Air has been flying animals throughout the world for many years. We have vast experience, working with zoos and wildlife parks, providing both charter and scheduled service flights. Our team will handle all the logistics required to make absolutely sure the animals travel in the best possible way – aircraft – attendants – pens – road transport – documentation.

Licensed, approved members of:



Federal Aviation  
Administration



T +44 (0) 1903 740101

E sales@instoneair.com

W www.instoneair.com



**4 From the Director's chair**

How EAZA is making progress despite the year's turbulent events

**5 Noticeboard**

The latest news from the EAZA community

**6 Births & hatchings**

All the new arrivals at EAZA's zoos and aquariums

**9 Council 2022–2025**

Meet your new EAZA Council members

**10 Crisis in Ukraine**

How the EAZA community has stepped in to help its besieged Ukrainian colleagues

**12 Let the journey begin**

EAZA's new campaign heralds a better future for global conservation

**14 Planning a brighter future**

The first ever online RCP workshop defined the next steps for monotreme and marsupial conservation

**15 Taking the leap**

Why the yellow-footed wallaby could be an ideal addition to many EAZA zoos

**16 The great gorilla challenge**

The many ways in which we can improve the conservation of the Western lowland gorilla

**18 How to hatch a hornbill**

The trials and triumphs of a painstaking programme to improve the great hornbill's breeding success

**20 Avian influenza**

Plan, prepare, prevent – how to deal with avian flu

**22 Back to the wild**

A dedicated programme in a national park in India is addressing the plight of the red panda

**24 The great monk seal rescue**

Why the Mediterranean monk seal has found sanctuary off the coast of Africa

**26 In memoriam**

Zooquaria pays tribute to Françoise Delord and Dr Bernhard Blaszkewitz

**28 JZAR update**

The latest facts and figures from the *Journal of Zoo and Aquarium Research*

**30 Greening the future**

How Dortmund Zoo is improving its sustainability

**KEY: a quick guide to frequently used acronyms**

**EEP:** EAZA Ex situ Programme  
**LTMP:** Long-term Management Plan  
**RCP:** Regional Collection Plan  
**TAG:** Taxon Advisory Group  
**ZIMS:** Zoological Information Management System

Zooquaria

**EDITORIAL BOARD:**

**Executive Director** Myfanwy Griffith (Myfanwy.Griffith@eaza.net)

**Managing Editor** David Williams-Mitchell (David.Williams-Mitchell@eaza.net)

**Editor** Joanna Swinnerton

**Editorial Staff** William van Lint, Lauren Florisson

**Designer** Louise Tait

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



EAZA Executive Office, Plantage Middenlaan 45, 1018 DC Amsterdam, the Netherlands. Email: info@eaza.net ISSN 2210-3392 . Cover pic © M. Haya, CBD Habitat

For information on print subscriptions to Zooquaria visit:

http://www.eaza.net/about-us/communications

The views expressed in this magazine are not necessarily those of EAZA.

The paper used for printing is FSC quality (sustainable). Organic inks are used.

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

There is no doubt that the first half of 2022 has been an eventful time, both in terms of internal EAZA activities and external events. The legacy of Covid-19 continued but was swiftly overtaken in the news by the Russian invasion and military aggression in Ukraine. EAZA has three Candidate for Membership institutions in Ukraine: Kyiv Zoo, Kharkiv Zoo and Mykolayiv Zoo. We responded quickly to the situation and set up communications and an emergency fund for Ukrainian zoos. Many individual EAZA Members also set up their own fund and/or food and medicine supply routes into Ukraine. We have been truly humbled by the amazing support from individual and institutional donors worldwide that will help to provide immediate and long-term assistance to our Ukrainian colleagues. You can find out more about the evolving situation and associated activities in the article on page 10. As the conflict continues, EAZA stands with all zoos in Ukraine, their staff and their families, the animals in their care and the communities they serve.

Uncertainties over Covid restrictions resulted in the need to move our Animal Welfare Forum from March to June. This meant that our first in-person conference after two years was our Directors' Days and AGM, superbly hosted by ZooParc de Beauval, France. I think I speak for all attendees by saying how wonderful it was to be together again in this way (and I know I was not alone in enjoying all the delicious food!). The programme contained a lot of important content, not least the appointment of a new EAZA Chair and next term for Council Members. We briefly introduce the new Council and decisions made during Directors' Days in this issue of *Zooquaria*; more detail will come in the next issue. The ability to have in-person discussions was invaluable to the engagement, understanding and agreement with the decisions that were made. EAZA prides itself on having a large and diverse membership, and while the last two years have proved how much we can achieve online, I feel that it is through our in-person interactions that we truly gain trust, unity and strength to continue being progressive.

Many of you will have seen the successful launch of our EAZA21+ Campaign during the 2021 Annual Conference. The campaign is gaining good momentum as the months progress, with a variety of online and in-person webinars and workshops. If you have not been involved yet, I urge you to join. The campaign will help individual Members, and the EAZA community as a whole, understand European and global conservation and biodiversity frameworks and their emerging priorities. These frameworks will impact many areas of our work; we need to be aware of them and be able to influence them. Key to the campaign is helping Members realise their unique place within these frameworks

and how contributions and connections appropriate to each institution can be combined to fulfil our vision of *progressive zoos and aquariums saving species together*.

Turbulent times have resulted in this edition of *Zooquaria* coming out later than planned. Nevertheless, the important work of EAZA has continued and I hope you enjoy reading about all our varied activities.

**Myfanwy Griffith**  
Executive Director, EAZA





# NOTICEBOARD

## EAZA CORPORATE MEMBERS

### EAZA ANNUAL GENERAL MEETING AND SPRING COUNCIL

The Directors' Days conference took place at ZooParc de Beauval, France in early April. The meeting also included the Annual General Meeting (AGM) of the Association and two Council meetings: the last meeting of the 2019–2022 Council under the Chairmanship of Thomas Kauffels, and the first meeting of the newly elected Council for 2022–2025, under the Chairmanship of Endre Papp.

### COUNCIL DECISIONS

The final meeting of the 2019–2022 Council included the following membership decisions based on the recommendations of the Membership and Ethics Committee:

### TEMPORARY MEMBER TO FULL MEMBER

- Parco Faunistico Valcorba, Italy
- Peak Wildlife Park, UK
- Wingham Wildlife Park, UK

### TEMPORARY MEMBER UNDER CONSTRUCTION TO TEMPORARY MEMBER

- EcoZonia, France

### NEW MEMBER APPLICATIONS

- Natura Park – Zoo de Carratraca, Spain (Temporary Member Under Construction)
- Bears in Mind, Netherlands (Associate Membership, Conservation)
- Goethe University – Zoo Biology, Frankfurt, Germany (Associate Membership, Education)

### TEMPORARY MEMBER UPDATES

- Río Safari Elche, Spain, Zoo delle Maitine, Italy: Temporary membership extension approved

### CORPORATE MEMBERS

New Members: Africa Style, Animals Concept  
Withdrawing Member: Ray Hole Architects

### AGM DECISIONS

Members approved the new Council, the new Chair and Executive Committee. A full list of the

representatives can be found on p9. Additionally, the AGM approved the 2021 Association accounts and their external audit. It also approved the proposed 2023 budget, which moves the payment deadline for fees back to 31 March 2023 and reinstates the 3% annual increase in fees across all membership categories, which was suspended due to the Covid-19 pandemic.

In addition, the AGM approved updates to the following documents:

- Sanctions in the case of a violation of the EAZA Code of Ethics or EEP Procedures
- Standards for the Accommodation and Care of Animals in Zoos and Aquaria
- EAZA Research Standards
- EAZA Membership and Accreditation Manual
- EAZA Population Management Manual

### EAZA EMERGENCY FUND FOR UKRAINIAN ZOOS

As Members will be aware, EAZA has established a fund for emergency relief for zoos in Ukraine. Since the Russian invasion, Ukraine's zoos have been closed to visitors and some have been directly affected by the fighting. Although the military action appears to have moved away from the majority of zoos in the country, there will be a continued need to provide funds and support for Ukrainian colleagues. At the time of publishing, the receipts to the fund stand at over €1.3 million. For further details of the response by EAZA and its Members to the Ukraine war, see pp. 10–11. Funds are still being collected, and we would appreciate further donations from Members to assist with the continued care of animals in Ukrainian zoos as well as to help them rebuild once the war is over. You can find details of the fund at [www.eaza.net](http://www.eaza.net).

### CONFERENCES

EAZA held the Conservation Forum in Zagreb in May and the Animal Welfare Forum at the beginning of June. A full report from these events

- AB Aqua Medic GmbH
- Africa Style
- Animals Concept
- Aqua-Sander
- Arie Blok Animal Nutrition
- Billings Productions Inc
- BioZoo Information
- Brogaarden ApS
- Bureau d'études AKONGO
- Bureau d'études Bioparc
- Carl Stahl Architecture
- China Light Festival
- Convivous
- Crossborder Animal Services B.V.
- Dino Don
- Dinosauriosmexico
- Dorset Identification B.V.
- EKIPA
- Eurogames srl
- Fachjan Project Plants
- Fox Consulting
- GANTNER Ticketing
- Granovit
- HMJ Design
- Imagine Exhibition Inc
- Immotion
- Instoneair
- Jakob Rope Systems
- KaGo & Hammerschmidt GmbH
- Kiezebrink International
- Marine Nutrition
- Mazuri
- Nautilus Attraction Developments Limited
- Nieuwkoop Europe
- Pangea Rocks A/S
- Ralf Nature
- Rasbach Architekten
- Ravensden Plc
- Saint Laurent S.A.
- Sanero Kunstfelsen srl
- SAS Zoopoli France
- Seafoodia
- Siane
- Wisbroek
- Worldwide Zoo Consultants
- Zoological Adviser
- Zoologistics
- Zooprofit

will be published in the next edition of *Zooquaria*.

### EEO MOVE

The EAZA Executive Office moved in February 2022... but only a little way! The office remains within Artis Zoo but at a new location and with a new address:

**Plantage Middenlaan 45, 1018 DC Amsterdam, the Netherlands.**

We look forward to welcoming colleagues for meetings and courses now that Covid-19 restrictions have been lifted.

## NEW ARRIVALS

### SPIDERLINGS HATCHED AT WILHELMA ZOO

THE DESERTA GRANDE WOLF SPIDER (*Hogna ingens*) is one of the rarest spiders in the world, and has a habitat that is restricted to part of the small island Deserta Grande near Madeira, write Isabel Koch and Volker Harport from Wilhelma Zoological and Botanical Garden, Germany. It's the biggest spider in Europe and marked as CR (Critically Endangered) on the IUCN Red List.

Since 2016, an EEP has been coordinated by Bristol Zoo in order to establish an insurance population for this fascinating spider. The first breeding success took place in Bristol Zoo in 2017. The Bristol offspring went to Cologne Zoo, and in March 2020 offspring from Cologne Zoo came to Wilhelma in Stuttgart.

We received 50 little spiderlings from Cologne to be sure to have both sexes when they become sexually mature.



We were very careful at the beginning, but we soon learned that it's a quite tough spider that does not always behave as cited in the relevant literature. Females build a cocoon four months after mating, which they carry with them until the young hatch (up to 500

have been seen in human care). The young will ride on the mother's back for a few days only. The females do not die after the first cocoon: they are able to mate again and produce a second or even a third cocoon.

In July and August 2021 the keepers' work was rewarded: several cocoons hatched, and around 250 young spiders survived the first few weeks. In order not to be flooded with spiders, we allowed cannibalism to occur to a certain extent.

As the spider's offspring have to remain within the EAZA zoo world, the recommendation was to minimise breeding, which is a pity, but there are only a few zoos that want to house this spider.

We hope that maybe in the near future the population in Deserta Grande can be restocked with offspring from other European zoos.

### NEW MANATEE CALF BORN AT ROYAL BURGERS' ZOO



ON 30 DECEMBER LAST YEAR, a 0.1 West Indian manatee (*Trichechus manatus*) was born in the mangrove eco-display at Royal Burgers' Zoo, the Netherlands, writes Arun Idoe, Curator, Bush, Desert and Mangrove. This display, which opened in 2017, houses 1.1 manatees, and this was the second offspring born in this habitat.

The first time this female had a calf was in March 2019, when she was five and a half years old. Sadly, we lost this calf in January 2021 after its health deteriorated

over a long period. This caused the female manatee to lose trust in her keepers and to become uncomfortable in some parts of her habitat.

While she was expecting the second calf, we started a training programme for all the manatees and the keepers, in order to improve the level of care we give to our manatees and to rebuild the trust. During this process we kept in mind the five domains of welfare.

The training sessions were centred on

veterinary aspects and on creating trust between the manatee, its keepers and the veterinarian. We carried out the training sessions between feedings, as we chose not to use diet as a control method. This meant that even if the manatees were not participating in these sessions, we did not reduce their daily food intake.

Not long after starting this training programme, keepers noticed that the vulva had started to bulge a little. We estimated that the birth would take place between mid-December 2021 and mid-January 2022. This gave us around six months to run a training programme by focusing on building up trust between the animals and their keepers, making sure the manatee was comfortable in every part of her habitat, basic veterinary care and gating.

Because we did not use the diet as a control method, we accepted that we would have a lower success rate during these training sessions than if we had used it. Due to the lack of experience of training manatees in zoological institutions, it took us a while to find the right reinforcers.

The calf was born during lockdown,

## SUCCESS FOR THE SUMATRAN LAUGHINGTHRUSH AT THE WILD PLACE PROJECT

LAST YEAR SAW THE FIRST successful breeding of the Sumatran laughingthrush (*Garrulax bicolor*) at the Wild Place Project in the UK since this species arrived in 2013, writes *Natalie Kent, Keeper at Wild Place Project*. The current pair were both hand-reared at their previous institutions and neither had bred before. The female hatched in June 2018 at Chester Zoo and the male in August 2011 at Bristol Zoo Gardens.

They were normally housed in an on-show aviary; however, every time someone unfamiliar to them walked past the aviary, they became too focused on those people and started to alarm call. This behaviour is most likely associated with the birds being hand-reared. The pair were moved off-show into an aviary with denser vegetation, where a wicker basket was tied to a tree approximately 1.5m from ground and lots of nesting materials

which meant that we had minimal disturbance for the manatees, and we continued our normal routine. By this time the female manatee was comfortable with keepers and all parts of her habitat. As soon as the calf was feeding on small bits of solid food, the keepers incorporated her into the training routine.

Thanks to this new routine for taking care of our manatees, we can monitor them better and intervene in a less invasive way than before. This has helped us to improve the overall care for these creatures. Even though we are still in the early stages, the new routine is helping us with their daily husbandry.



provided, such as hay, thin twigs, coconut fibre and old broad-leaf bamboo leaves. The pair took to the basket and built a nest inside. In June they managed to hatch one egg in their first clutch, but this chick disappeared a few days later. The pair then had another clutch in July in the same nest and hatched out two eggs. Both chicks fledged, but one died not long after.

A month after this fledging, two eggs were discovered in a nest that the parents had built in a new location away from the basket at approximately 2.5m from the ground. The nest was built using old broad-leaf bamboo leaves, dried leaves, coconut fibre and thin twigs. The juvenile from the first brood remained with the parents while

they were nesting and it was seen in the nest incubating the eggs while the parents were off foraging for food. Two eggs hatched and the juvenile was seen gathering live food from inside the shed, but it was not clear whether this was then being offered to the chicks. As the chicks fledged, the juvenile was seen feeding both fledglings. Sadly, however, not long after they fledged the two new chicks died from toxoplasmosis. This was obviously devastating; however, we hope for more success from this pair in the future as, despite being hand-reared, they have managed to parent-rear three clutches, and the juvenile demonstrated rarely seen co-operative rearing by family groups.



# CHINA LIGHT: THE MAGICAL COLLABORATION WITH ANTWERP ZOO

The collaboration between ZOO Antwerp and China Light has been going on for almost 10 years – reason enough to look back over the wonderful years of working together, organising events, and creating the most stunning effects. Kathleen Moorthamer, Brand Manager of ZOO Antwerp, talks to us about the past decade.



'The team of China Light has been great. We have been working with them since 2013 and it has been such a pleasure. They are professional, and even under the tough conditions of the pandemic they offered an excellent service. They are very flexible and hands-on. China Light has a proven track record in Europe as well: they offer reliable quality and constantly try to improve.'

## INSPIRED BY IMPROVEMENT

That constant urge to develop and improve is something that really defines China Light. This is also reflected in the installations. Where other, similar, organisations stop at ordinary lantern works, China Light takes it to the next level. For instance, take the interactive installations such as the Moonlight Swing or the interactive portable LED dance floor. Nothing is beyond the imagination of the artists and inventors.

'I think you can safely say that China Light has created the best light festivals in Europe,' says Moorthamer. 'They are able to translate a concept into a great design that is tailored to our parks and produces a fantastic visitor experience.'

## MAGICAL TREES

The question of which installation most impressed Kathleen Moorthamer is a difficult one to answer: 'Hard to choose! Together with the China Light Festival, we have made amazing things, from dinosaurs to fairy-tale princesses. If I must choose, I think the wishing tree that I helped to design is really great. It was a beautiful visitor experience where the viewer could press a button, make a wish and have all the butterflies change colour. Magical!'

## A BRIGHT FUTURE

China Light has already done a huge amount of good for ZOO Antwerp. Moorthamer hopes that will continue: 'The events had a big impact on our revenue, but providing a magical experience also connects our visitors to us in an emotional way. They create new and happy memories with their loved ones in our zoo. What better way to keep your visitors close to your brand? We expect the China Light Festival to keep improving by introducing new techniques and more interactivity. I hope they will continue to reinvent themselves as they have done so far, getting better every year and giving visitors a better experience every year.'

# EAZA Council 2022–2025

A NEW EAZA COUNCIL WAS CONVENED AT DIRECTORS' DAYS IN BEAUVAL IN APRIL. YOUR REPRESENTATIVES FOR THE PERIOD 2022–2025 ARE LISTED BELOW

## EXECUTIVE COMMITTEE



**Chair**  
Endre Papp  
*Sóstó Zoo*

**Vice Chair & EEP Committee**  
Kirsten Pullen  
*Paignton Zoo*

**Treasurer**  
Thomas Kölpin  
*Wilhelma Stuttgart*

**Secretary**  
Barbara Mihelič  
*Ljubljana Zoo*

**Communications Committee**  
Sanna Hellström  
*Helsinki Zoo*

**Technical Assistance Committee**  
André Stadler  
*Alpenzoo Innsbruck*

**Membership & Ethics Committee**  
Brice Lefaux  
*Mulhouse Zoo*

**Aquarium Representative**  
João Falcato  
*Oceanário de Lisboa*

**National Associations Committee**  
Volker Homes  
*VdZ*

## SPECIALIST COMMITTEE CHAIRS (ON COUNCIL)

**Conservation Committee**  
Eric Bairrao Ruivo, *ZooParc de Beauval*

## CO-OPTED COMMITTEE CHAIRS

**Aquarium Representative**  
João Falcato, *Oceanário de Lisboa*  
**National Associations Committee**  
Volker Homes, *VdZ*  
**Research Committee**  
Zjef Pereboom, *ZOO Antwerp*

**Technical Assistance Committee**  
André Stadler, *Alpenzoo Innsbruck*  
**Veterinary Committee**  
Mads Bertelsen, *Copenhagen Zoo*  
**Conservation Education Committee**  
Antonieta Costa, *Lisbon Zoo*  
*(observer status because no more co-opted seats available)*

## MEMBERS

Austria (1)	Zoo Schmiding	Andreas Artmann	Netherlands (2)	Ouwehands Dierenpark	Robin de Lange
Belgium (1)	ZOO Antwerp	Linda Van Elsacker		Artis Zoo	Rembrandt Sutorius
Croatia (1)	Zagreb Zoo	Davorka Malković	Norway (1)	Atlanterhavsparken	Tor Erik Standal
Czech Republic (2)	Liberec Zoo	David Nejedlo	Poland (1)	Gdańsk Zoo	Izabela Krause
	Prague Zoo	Miroslav Bobek	Portugal (1)	Santo Inácio Zoo	Teresa Guedes
Denmark (1)	Odense Zoo	Bjarne Klausen	Russia (1)	Moscow Zoo	Svetlana Akulova
Estonia (1)	Tallinn Zoo	Tiit Maran	Slovakia (1)	Košice Zoo	Erich Kočner
Finland (1)	Helsinki Zoo	Sanna Hellström	Slovenia (1)	Ljubljana Zoo	Barbara Mihelič
France (5)	ZooParc de Beauval	Eric Bãirrao Ruivo	Spain (2)	Barcelona Zoo	Antoni Alarcón
	Mulhouse Zoo	Brice Lefaux		Loro Parque	Javier Almunia
	La Boissière du Doré	Sébastien Laurent	Sweden (2)	Kolmården Wildlife Park	Christine Karmfalk
	Amiens Zoo	Xavier Vaillant		Järvzoo	Jens Larsson
	Zoo de Guyane	Angélique Chaulet	Switzerland (1)	Zoo Zürich	Severin Dressen
Germany (5)	Berlin Zoo/Tierpark	Andreas Knieriem	Turkey	Vacant	
	Zoologischer Garten Köln	Theo Pagel	United Arab Emirates (1)	Arabia's Wildlife Centre	Paul Vercammen
	Zoologischer Garten Halle	Dennis Müller	United Kingdom (5)	Paignton Zoo	Kirsten Pullen
	Leipzig Zoo	Jörg Junhold		RZSS	David Field
	Wilhelma Stuttgart	Thomas Kölpin		ZSL	Malcom Fitzpatrick
Greece (1)	Attica Zoo	Jean-Jacques Lesueur		Flamingo Land	Ross Snip
Hungary (1)	Sóstó Zoo	Endre Papp		Cotswold Wildlife Park	Reggie Heyworth
Ireland (1)	Fota Wildlife Park	Sean McKeown			
Israel (1)	Jerusalem Zoo	Nili Avni-Magen			
Italy (1)	Parco Faunistico La Torbiera	Gloria Svampa			
Latvia (1)	Riga Zoo	Jānis Rudzītis			
Luxembourg (1)	Parc Merveilleux	Guy Willems			

# Crisis in Ukraine

THE RUSSIAN INVASION OF UKRAINE HAS TAKEN A DEVASTATING AND TRAGIC TOLL ON THE COUNTRY'S ZOOS AND THE STAFF WHO WORK THERE, RELIEVED ONLY BY THE CONSIDERABLE EFFORTS OF THE EAZA COMMUNITY TO SEND AID AND SUPPORT TO OUR COLLEAGUES AND FRIENDS

David Williams-Mitchell, EAZA Director of Communications and Membership

As we all know by now, 24 February changed everything for our colleagues in Ukrainian zoos. In the early hours of the morning, a massive Russian invasion force entered the country in the north, east and south, preceded by aerial bombardment. At the time of writing, more than two months later, the planned invasion has ground to an ignominious halt as the Ukrainian armed forces push back against the Russians. The courage and tenacity of the Ukrainians on the battlefield has been bolstered by a swift and resolute response from the nations bordering Ukraine, and support from the wider international community. This holds true for the country's zoos as well.

As the reality of the invasion sank in at the EAZA Executive Office, zoos in Poland, Czech Republic, Slovakia and Germany were already mobilising to collect funds for Ukrainian zoos and put together supplies and transport to help them care for their animals, perhaps a function of long memories of Russian oppression and a well-founded measure of cynicism regarding the intentions of the Russian leadership. Within days, a route had been set up to carry supplies to Rivne in the west of Ukraine, then onward to other zoos further east and closer to the fighting. Berlin also sent a shipment directly to Kyiv – the city's mayor, Vitali Klitschko, has a long relationship with Berlin and is a very well-known figure in Germany.

But what of the zoos themselves? Ukraine has many animal collections, ranging from large state-run institutions, such as Kyiv, Mykolaiv and Kharkiv, to large private zoos near the major cities, such as Feldman Ecopark and XII Months Zoo, and small collections with only a few animals quite unknown outside the country. The worst of the fallout hit XII Months Zoo, located close to the Hostomel airport in Kyiv, which found itself completely surrounded and cut off from the telephone network. Some care staff were left on site, but it was impossible to get supplies to them and the zoo's



TIERPARK BERLIN AND ZOO BERLIN SENDING ANIMAL FOOD TO UKRAINE VIA WARSAW ZOO

social media reflected an increasing sense of desperation as the site came under fire. As it turned out, several animals had been removed from the zoo to other institutions, but the majority of the animals were not so lucky. Feldman Ecopark, to the north of Kharkiv, was also right in the front line of the fighting, and found it very challenging to deliver food to its animals, at a cost that would become apparent only after the Russians had been driven back.

Mykolaiv Zoo came under fire from troops invading from Crimea, and several bombs or shells landed on the site – miraculously not causing any injuries but inspiring several of the keepers to leave their jobs to join up with the army. Troops from Crimea also occupied the whole of Kherson province – including the Askania Nova nature reserve, home to the largest herd of Przewalski's horses in human care and a large population of Turkmenian kulans – and the whole southeastern part of the country, including Berdyansk, home to another major zoo.

Kyiv Zoo and Kharkiv Zoo, in the centre of their respective cities, somehow managed to survive without damage, despite the increasingly random bombardment by frustrated

Russian forces. Kyiv Zoo spent some time clearing up pieces of Russian cruise missiles, surely a first for any zoo in the world. Finally, the zoos further west escaped the worst of the attacks, but evidently zoo visits were the last thing on the mind of local citizens, and so they, along with every other zoo in the country, were left without a reliable source of income.

But for the determination of the Ukrainian people, things could have been very different; and seeing that aid was needed urgently, the EAZA Executive Office set up the Emergency Fund for Ukrainian Zoos on 1 March. With offers of assistance pouring in from Members, partner organisations and individuals across our region and beyond, the fund grew rapidly until, at the time of writing, it has collected €1.3m from more than 130 institutional donors and 11,000 individuals. Looking to the experience of colleagues in Australia, who collected funds to help with the relief effort for animals caught up in the bushfires of 2020, EAZA established a protocol for the fund to help cover the expenses of Ukrainian zoos over three stages of the crisis: to help provide emergency funds to buy food and other supplies for animals and



COLLEAGUES FROM ŁÓDŹ ZOO AND WROCŁAW ZOO PACKING ITEMS DONATED BY THE PUBLIC, VETERINARIAN CLINICS, STAFF AND OTHER EAZA ZOOS IN GERMANY, CZECH REPUBLIC, SLOVAKIA AND POLAND TO SEND TO UKRAINE



KHARKIV CITY

staff in the short term; to help cover the same items over the longer term but also provide funds to help carry out running repairs to critical infrastructure and enclosures over the medium term; and, finally, to help zoos rebuild and rehabilitate their animals once the fighting moves well away from the sites.

Incredibly, the Ukrainian banking system continued to function throughout, and so regular transfers of funds have been possible. Through its contacts, EAZA has provided funds to its Candidate for Membership zoos (Kyiv, Kharkiv and Mykolaiv) and to many other institutions via the Ukrainian zoo association (based at Mykolaiv) or as a result of direct requests from smaller zoos. As of 15 June, these were: Askania Nova Nature Reserve, Berdyansk Zoo, Feldman Ecopark, Home Zoo Center (Vasylivka), Limpopo Zoo, Mena Zoo, Odesa Biopark, Rivne Zoo, Safari Park on the Arabat Arrow and ZooMir Bilytske.

At the beginning of April, Russian forces began to retreat from the northern border of Ukraine, relieving the pressure on Kyiv and allowing supplies to reach XII Months for the first time since the invasion began. The zoo had been severely damaged, with many animals dead from starvation or bullets and shells. Thankfully, we have had no reports of injury or death to the keepers who stayed on site during the occupation, but the long-term effects on both staff and animals of being

isolated in the middle of a conflict zone will undoubtedly be severe.

The retreat from Kyiv meant that for the east of the country, the situation was only going to get worse. Throughout the early part of the invasion, staff members and volunteers from Feldman Ecopark had travelled to the zoo to ensure that animals received food and care, despite the dangers. Two members of staff failed to return from such a mission in March and, once the site became accessible again, the discovery of their bodies in a basement pointed to their murder by Russian soldiers. Added to that, the death of a keeper from shellfire earlier in the conflict and the recent death of a young volunteer helping to evacuate animals from the site means that Feldman has lost five people in this conflict, a shocking statistic that seems almost unimaginable. Many of Feldman's animals have now been moved to other sites in Ukraine. With a strong counter-offensive underway, we fervently hope that there will be no more deaths at the zoo, and that there will be no further need to relocate animals.

EAZA has also been part of a wider effort to provide solutions for animals in Ukraine, as part of a consortium of organisations working under the umbrella of the European Alliance of Rescue Centres and Sanctuaries (EARS). The group has been evaluating the opportunities to relocate animals away from conflict zones and, so far, 50 or so animals have been

moved. They are very much in the minority – advice from the zoos was, and still is, that the animals should not be moved unless there was no choice. As zoo colleagues will know, transport of animals, especially predators but also large herbivores, is challenging at the best of times; carried out under artillery bombardment and with the challenges of moving trucks along damaged roads while civilians were evacuating, they became practically impossible. The death of the young volunteer at Feldman only reinforced this evaluation; and by the time the routes for relocation became safe, there was no urgent need for it.

As things stand, Ukraine looks to be in for a long ordeal, despite the defeat of Russian advances on every front; this goes for the zoos, too, as visitors are unlikely to return until some sense of resolution is achieved. What we can say though, is that the response has been extraordinary: from the dedication of zoo staff who have continued to care for animals to the large donations provided by partners such as IFAW, the Gorilla Foundation and zoos all over the world, the community has come together as never before. While it is shocking and sad that this has been forced on us by the whims of a dictator, it is heartening to see demonstrated that the zoo and conservation communities are united in their concern for animals, and willing to go to great lengths to uphold the principles of animal welfare and democratic self-determination.

# Let the journey begin

EAZA21+ MARKS THE BEGINNING OF A JOURNEY FOR ALL OF OUR MEMBERS TOWARDS A BRIGHTER FUTURE FOR NATURE CONSERVATION

Tomasz Rusek, EAZA EU Policy Manager; Dr Kirsten Pullen, Chief Science Officer, Wild Planet Trust, UK; and Simon Bruslund, Head of Conservation, Marlow Birdpark, Germany

As explained in the previous issue of *Zooquaria*, our new campaign EAZA21+ should help us determine how we can make the biggest impact in nature conservation, as part of the post-2020 Global Biodiversity Framework (GBF). This framework will be the world's last-minute attempt to stop the decline of nature after the previous attempts, strategies and targets failed. While national governments will have the main responsibility for making it work, everyone must be ready to contribute. That includes progressive EAZA zoos and aquariums.

We can compare this to a journey where we, as a community and as individual institutions, may have a common destination but are all at different stages – some of us are still packing, some are already travelling, and we may be taking different routes. EAZA21+ can guide us along this journey.

## WHAT DO I NEED TO KNOW ABOUT THE GLOBAL BIODIVERSITY FRAMEWORK?

Just as the Paris Agreement was a breakthrough moment for climate action, the GBF, which is being negotiated by nearly 200 governments under the umbrella of the Convention of Biological Diversity (CBD), is expected to bring a breakthrough for nature. It will be more effective than the 20 Aichi Targets, which were the CBD's previous plan to slow the loss of the natural world by 2020.

Governments have not fully met any of the Aichi Targets and in the meantime the state of the natural world has deteriorated even further. The good news is that we have, for the first time, strong data to show this. The Inter-governmental Science-Policy Platform on Biodiversity and Eco-system Services (IPBES) report alerted the global community that as many as one million

species are threatened by extinction. We are also better at illustrating what biodiversity means for the economy. The links between biodiversity loss and climate change have become widely accepted, and the Covid-19 pandemic has shown – painfully – that the health of ecosystems and public health are interlinked, too. All this helps the decision-makers understand that a healthy and biodiverse nature is not merely 'nice to have' but is something we need for our survival.

## NATURE POSITIVE BY 2030

The post-2020 GBF is expected to be adopted later in 2022, at the CBD Conference of the Parties in Montreal (moved from Kunming, China). It will aim to stop the net loss of nature (become 'nature positive') by 2030 and enable it to recover by 2050. This will require support from all other global conventions – Convention on International Trade in Endangered Species (CITES), Convention on Migratory Species (CMS), Ramsar and others – and from all regional efforts such as the EU and its Biodiversity Strategy for 2030, as well as from all sectors of economy and society. National

governments will have the main responsibility: as in the Paris Agreement, each country will determine what it needs to do to work towards the 2050 vision and the 2030 targets.

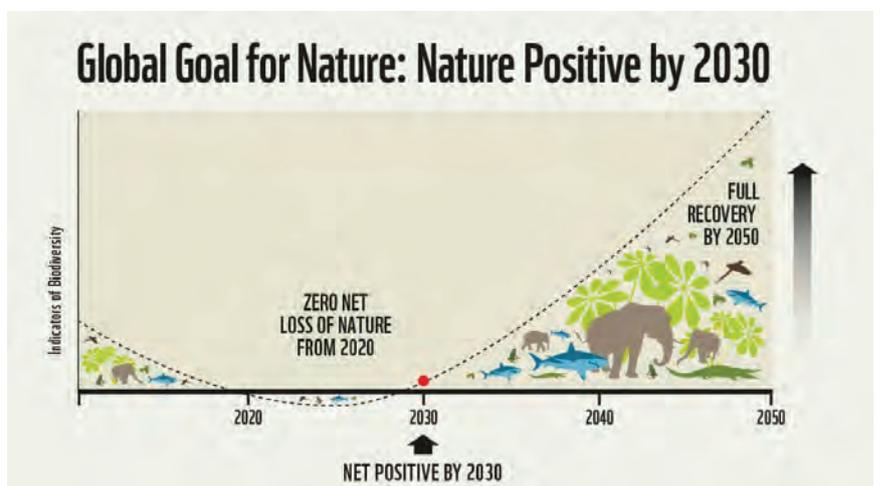
Each professional community needs to find out which targets it can best support. For EAZA and its Member zoos and aquariums, we have identified three main opportunities.

## 1. Active management of species and genetic diversity (Target 4)

By 2030, there will already be a need for various species-specific actions to enable the recovery and conservation of species that are threatened by extinction or extinct in the wild, including through *ex situ* conservation. Protecting the genetic diversity of species will also be part of the focus, which is something EAZA lobbied for when the GBF, and the EU Biodiversity Strategy for 2030, were being established.

Species conservation and management of small populations are, of course, areas where our community can provide vast expertise. We have implemented IUCN's One Plan Approach to connect the *in situ* and *ex situ* needs of a species, which is reflected in EAZA's Regional Collection Planning. Our Members have been involved in many different ways in species- and site-based conservation activities, often supporting official species action plans - for example, for the bearded vulture, forest reindeer or Alpine beetles.

There will be many opportunities to boost these actions and make them more aligned with the goals of the new framework. We will also need to find ways of measuring the results,



EAZA21+ SHOULD ENABLE THE STAFF IN EAZA MEMBERSHIP TO BE MORE EFFECTIVE IN HELPING THE WORLD BECOME NATURE POSITIVE BY 2030 AND RESTORE HARMONY BETWEEN HUMANS AND NATURE BY 2050.

demonstrating how we contribute to the post-2020 GBF, and making sure that our countries include this in their reporting. We will also continue influencing the species conservation policies, which is a shared homework for EAZA as an association but also national zoo associations and individual Members.

## 2. Wildlife trade (Target 5)

Direct exploitation of wild populations of species is the largest direct driver of biodiversity loss in marine ecosystems and the second largest in terrestrial and freshwater ecosystems, according to IPBES. The global target will aim to ensure that by 2030 the harvesting, trade and use of wild species is sustainable, legal and safe for human health.

EAZA and its Members have been actively fighting wildlife trafficking in many ways: by organising awareness campaigns, by cooperating with CITES authorities, and by protecting the animals in our collections from commercial exploitation, as required by EAZA Standards. Our role in this area is broadly recognised – for example, in the EU Action Plan against Wildlife Trafficking.

The new target is an opportunity for us to define how we can make an even bigger contribution, and to discuss how we understand what legal, sustainable, and ethical trade means in the EAZA context. Such a discussion was one of the main wishes coming from the pre-campaign survey that we carried out in late 2021 and which was completed by more than 400 colleagues in the EAZA Membership.

## 3. Helping people appreciate biodiversity

Besides its four main goals for 2050 and 21 specific targets for 2030, the success of the post-2020 GBF will depend on several 'enabling conditions'. One of them is that people should have an increased understanding, awareness and appreciation of the values of biodiversity.

That is a key and unique role of EAZA zoos and aquariums who receive more than 140 million visitors every year. In the words of the EU Commissioner for Environment, Virginijus Sinkevičius (at EAZA Annual Conference in 2020), 'by opening our eyes, you reconnect us with nature'.

However, our actions in conservation education should go beyond

raising awareness. To trigger a true transformative change in how humans treat nature, we need to foster empathy for wildlife, build capacity and motivate pro-environmental behaviours. This is an excellent moment to discuss how we can make these efforts more aligned with the global goals.

## HOW CAN I MAKE THE MOST OUT OF THIS CAMPAIGN?

The deadline for the first actions is in 2030, and already in this period, zoos and aquariums will be crucial pieces of the 'jigsaw puzzle' of biodiversity conservation. We already undertake a range of relevant actions in the three areas mentioned above: in species conservation, in combatting illegal wildlife trade, or in talking to our visitors and nudging them to live in a more sustainable way. But with our limited resources, which were further reduced by the pandemic, we must each – and all, by working together – become as effective as possible.

The system of biodiversity conservation can be confusing to navigate. To contribute to the post-2020 GBF, we first need to understand its targets for 2030 and 2050 and we need the competence to link them to our everyday zoo and aquarium work. We also need the confidence, courage, determination and knowledge to talk

about these topics and engage with the public, politicians or experts on them. This is what EAZA21+ should help us to increase.

How can each of us engage with the campaign? This was the focus of the first workshop of the campaign, which included an inspiring roundtable discussion with representatives of Helsinki Zoo: Sanna Hellström (CEO, Chair of EAZA Communications Committee), Nina Trontti (Director of Animal Care and Conservation), Lotta Kivalo (Marketing Specialist) and Marjo Priha (Environmental Educator, EAZA21+ team member).

The EAZA21+ team looks forward to meeting many more fellow travellers on our shared journey towards a more impactful EAZA in the future! Follow the QR code to join the closed EAZA21+ group on Facebook where you can find all the information and recordings and discuss the campaign topics with colleagues from all over the EAZA region.

*This article is a summary of the first two EAZA21+ workshops, held virtually on 3 February, hosted by Dr Kirsten Pullen, and on 3 March, hosted by Simon Bruslund.*



SCAN CODE TO JOIN FACEBOOK GROUP

### Helsinki Zoo colleagues hope that EAZA21+ will help them achieve the following goals:

- Increased knowledge across different staff groups of the zoo's place in the broader conservation picture.
- A stronger network inside the zoo and with other zoos to share information and experience regarding species conservation and wildlife trade, which help advance the zoo's mission.
- Increased engagement with a range of different audiences (visitors, government, conservation NGOs, etc.), to improve the flow of information and broaden the knowledge of the audiences.
- More focused and impactful conservation work.

### The discussions resulted in several practical ideas that Member zoos and aquariums can implement:

- One of the best ways of engaging with EAZA21+ is by establishing reflection groups within each zoo or aquarium that will bring together staff from different departments. They can meet on a regular basis to discuss the campaign's content and identify each institution's strengths and areas for improvement in relation to the EAZA21+ topics.
- Staff who attend the EAZA Annual Conference and other events present a digest to their colleagues when they return.
- Informal sessions are organised for the sharing of recent information from EAZA and from the conservation world across the zoo teams.
- When new employees are hired, they are informed during their introduction about how their new institution works within EAZA and how it engages with the broader conservation picture.

# Planning a brighter future

REPORTING ON THE FIRST ONLINE RCP WORKSHOP FOR THE MONOTREME AND MARSUPIAL TAG

Flemming Nielsen, Monotreme and Marsupial TAG Chair, Copenhagen Zoo, Denmark; Achim Winkler, Monotreme and Marsupial TAG Vice-Chair, Copenhagen Zoo; Matthias Papiés, Monotreme and Marsupial TAG Vice-Chair, Tierpark Berlin, Germany; Kelly Lavooij - van Leeuwen, Animal Programmes and Conservation Coordinator, EAZA, the Netherlands

The EAZA Monotreme and Marsupial TAG covers all 355 existing species. The TAG provides guidance and support to all EAZA holders to maintain a diversity of monotremes and marsupials in EAZA, as well as to convey priorities and conservation needs for particular species. The TAG works closely with the Australasian Zoo and Aquarium Association (ZAA) and Australian authorities to achieve these goals. The RCP document was drafted as a result of this and will act as a guidance document for all current and potential holders.

The Monotreme and Marsupial TAG RCP workshop took place online in November 2020 and was attended by a wide range of participants, including TAG members and representatives from ZAA and the IUCN SSC New World Marsupial Specialist Group. A total of 42 species that fall under the remit of the TAG were discussed, including koalas, wombats, kangaroos, platypus, cuscus and New World marsupials.

At the start of the workshop, the TAG outlined its vital collaboration with ZAA and the Australian authorities, and ZAA emphasised its support for the TAG and summarised the legislative requirements and processes for exporting native animals from Australia to EAZA. The TAG also emphasised its 2019 'position statement on the import of certain monotreme and marsupial species from outside the region to EAZA Members' that can be found on the EAZA Member Area.

Even though all monotremes and marsupials are important, the TAG stressed that those that occur outside Australia should be a priority. Papua New Guinea is a key area in this regard, as it is home to a number of highly threatened species, and contributions to conservation, education and fundraising activities for this region are strongly encouraged. The TAG believes that fundraising for Papua New Guinea can have a considerable effect on the conservation of local populations, as it has fewer resources for supporting conservation than other regions.

The TAG encourages all EAZA monotreme and marsupial holders to contribute to these species' conservation by education and fundraising. Educating the public who live outside the species' natural range about the animals' biology and habitat, the threats to their existence and what the public can do to help is of vital importance. Education activities should, wherever possible, be linked with fundraising for *in situ* projects endorsed by the TAG.

The RCP workshop resulted in the proposal of 19 new-style EEPs (Table 1). For example, the TAG proposed an EEP for the Western long-beaked echidna (*Zaglossus bruijnii*), with roles for education, fundraising, research and insurance. This species is currently not held in EAZA, but as it regularly turns up in the illegal wildlife trade, the TAG hopes to be able to acquire individuals

through confiscations to support its conservation. To maintain diversity and sufficient numbers of monotremes and marsupials in EAZA zoos, the TAG also proposed to manage some Least Concern yet popular marsupials as an EEP (e.g. red and grey kangaroos) with education and fundraising roles. All other species were proposed as either Mon-T, Mon-T Phase Out, Mon-T Replace With, or Mon-T Do Not Obtain. All decisions were made in agreement with ZAA guidance.

The Monotreme and Marsupial TAG would like to thank all participants of the workshop for their input. The final RCP document can be found on the Population Management page of the EAZA Member Area, and the TAG recommends that all current and potential holders should read it. Any questions can be directed to the TAG Chair Flemming Nielsen (fn@zoo.dk).

Table 1: EEPs proposed by the Monotreme and Marsupial TAG

Common name	Scientific name	IUCN Red List Status	EAZA Population (2020)
Tasmanian devil	<i>Sarcophilus harrisii</i>	EN	12.11.0 (23)
Koala	<i>Phascolarctos cinereus</i>	VU	25.34.8 (67)
Brush-tailed bettong	<i>Bettongia penicillata</i>	CR	69.74.7 (150)
Greater bilby	<i>Macrotis lagotis</i>	VU	-
Kowari	<i>Dasyuroides byrnei</i>	VU	23.23.0 (46)
Common wombat	<i>Vombatus ursinus</i>	LC	6.8.0 (14)
Long-nosed potoroo	<i>Potorous tridactylus</i>	NT	29.30.2 (61)
Eastern quoll	<i>Dasyurus viverrinus</i>	EN	7.11.22 (40)
Yellow-footed rock wallaby	<i>Petrogale xanthopus</i>	NT	21.52.1 (74)
Red kangaroo	<i>Macropus rufus</i>	LC	107.172.10 (289)
Eastern grey kangaroo	<i>Macropus giganteus</i>	LC	62.79.11 (152)
Western grey kangaroo	<i>Macropus fuliginosus</i>	LC	17.26.4 (47)
Swamp wallaby	<i>Wallabia bicolor</i>	LC	64.94.7 (163)
Parma wallaby	<i>Macropus parma</i>	NT	69.93.39 (201)
Short-beaked echidna	<i>Tachyglossus aculeatus</i>	LC	15.12.2 (29)
Western long-beaked echidna	<i>Zaglossus bruijnii</i>	CR	-
Goodfellow's tree kangaroo	<i>Dendrolagus goodfellowi</i>	EN	14.15.1 (30)
Common bear cuscus	<i>Ailurops ursinus</i>	VU	3.3.1 (7)
Gray short-tailed opossum*	<i>Monodelphis domestica</i>	LC	9.15.3 (27)
Gray four-eyed opossum*	<i>Philander opossum</i>	LC	1.2.0 (3)
Linnaeus's mouse opossum*	<i>Marmosa murina</i>	LC	0.1.0 (1)
Northern black-eared opossum*	<i>Didelphis marsupialis</i>	LC	1.0.0 (1)

\*Combined EEP for all South American marsupials

# Taking the leap

WHY THE YELLOW-FOOTED ROCK WALLABY COULD BE THE IDEAL ANIMAL TO ADD TO YOUR COLLECTION

Dr Benoît Quintard, Deputy Director, Mulhouse Zoo, France and Yellow-footed rock wallaby EEP Coordinator, and H el ene Birot, Assistant Curator, Mulhouse Zoo and Yellow-footed rock wallaby EEP Studbook keeper

They are one of the most colourful of marsupials with an astonishing capacity for rock-climbing for a macropod: meet the yellow-footed rock wallaby (YFRW, *Petrogale xanthopus*), a unique Australian ambassador species to display in any zoo.

Since the first arrival of individuals in Europe in 2008 from the Species Survival Plan (SSP), this species has thrived and has now reached a total population of 77 individuals held in 10 institutions. Some animals are currently available, so there is now an excellent chance to become involved in the conservation of this attractive and fascinating species.

## WANT TO JUMP IN?

The good news is that things have just been made easier for anyone interested in becoming a new holder; the YFRW Best Practice Guidelines (BPG) have just been released (on [www.eaza.net/conservation/programmes](http://www.eaza.net/conservation/programmes)). Highly illustrated and compiling the work of diverse specialists ranging from species ecology, welfare, housing, nutrition and veterinary medicine, these BPG offer comprehensive knowledge on how to care properly for these animals. They were written with the collaboration of the actual holders – who have kindly shared their experience and knowledge through a questionnaire – and the Australian department of Agriculture, Water and Environment.

Following their own Australian Animal Welfare Standards and Guidelines, the Australian department validates every new enclosure for this Ambassador Agreement Species, making sure it meets the dedicated husbandry and management requirements for the YFRWs. Key points are, for example, the necessity of numerous rock works in the enclosure, elevated shelters inside and outside and a minimum height of 1.8m for the enclosure boundary. Even if they cope very well with free access all year long, the wallabies should be given access to a warm indoor area (18 C) in winter. YFRWs are intermediate grazers and



should have *ad lib* access to fresh grass, browse and hay. Choice of the vegetable and commercial pellets should take into consideration one of the main medical concerns for the species – the calcium-based urolithiasis formation – preferring low Ca/P ingredients.

YFRWs are social marsupials; a group can be composed of an adult male with several females, their number depending on the exhibit size. Juvenile males can stay in the group for two or three years, especially if the exhibit is large enough. The good news is that single-sex groups work: you can help the EEP by adding some male or female YFRWs to one of your macropod exhibits. Indeed, these animals are often successfully displayed with other macropods such as red-necked wallabies (*Notamacropus rufogriseus*), wallaroos (*Osphranter robustus*) and red kangaroos (*Macropus rufus*) or birds such as magpie geese (*Anseranas semipalmata*), gallahs (*Eolophus roseicapilla*) or Australian thick-knee (*Burhinus grallarius*).

One of the specific requirements of caring for this species is the pouch-checking. The opening of the mother's pouch to check the joey will help to define the exact date of birth (by measuring the length of foot and tail), allow holders to determine the sex at an early age and will permit the implantation of the transponder early enough so that it does not affect the link between the mother and the joey. A major step forward in the

management of this species will be to implement training to allow voluntary pouch-checking without having to catch the females, which will improve the animals' welfare.

## SPECIAL STATUS

As well as their educational and ambassador value, YFRWs have an important conservation value. They are indeed one of the only macropods with an IUCN status of concern; they are currently listed as Near Threatened and unfortunately are close to being classified as Vulnerable. The wallaby's range of occurrence is probably not much greater than 20,000 km<sup>2</sup> and is highly fragmented.

EEP institutions are encouraged to support the *in situ* work of Zoos South Australia for the protection of the Aroona sanctuary population. In 1996, 12 YFRWs were reintroduced to this sanctuary, creating a small new population. This was the first macropod reintroduction in Australia. Since then, the dedication of the *in situ* project mainly focuses on population monitoring and pest control measures, chiefly against foxes. Despite these efforts, YFRWs are still listed as Endangered in New South Wales.

Taking those threats into consideration, the Monotreme and Marsupial TAG aims to establish a sustainable *ex situ* insurance population for the YFRW in EAZA, as the species will benefit from having a second insurance population outside ZAA for the future in case of catastrophic events in the species' natural range, which, as recently seen, is not completely unlikely. Bridges already exist with the ZAA, and a future import of new animals (and bloodlines) should soon help to improve the actual gene diversity of 80%.

Interested? Feel free to contact the EEP coordinator ([benoit.quintard@mulhouse-alsace.fr](mailto:benoit.quintard@mulhouse-alsace.fr)) who will give you all the information you need to get started with this species, smooth the link with Australia and help with your enclosure accreditation process.

# The great gorilla challenge

AN IMPORTANT POPULATION ENTERS A NEW MANAGEMENT PHASE

Elmar Fienieg, EAZA Executive Office; Neil Bemment, Apenheul Primate Park, the Netherlands; Maria Teresa Abelló, Parc Zoològic de Barcelona, Spain; and Thomas Bionda, Apenheul Primate Park

The Western lowland gorilla (*Gorilla gorilla gorilla*) EEP is one of the most intensively run EEPs in EAZA, with an EEP Coordinator, two Vice-Coordinators, a Species Committee (as always, democratically elected from among the participants) and several working groups that work on various tasks. This Critically Endangered species is known to be charismatic and easy to empathise with, which is why it has great potential for imparting a strong conservation message to visitors and appealing to their consciences. In addition, in the event of sudden threats to the wild population, this makes the EEP well placed to lobby governments.

There are more ways, however, in which this programme can contribute to conservation. Many of the programme's participants already actively fundraise for EEP-endorsed conservation projects. Also, there seems to be a huge research potential, so it is currently being investigated whether and how research in EAZA zoos can benefit *in situ* conservation actions. Furthermore, the EEP is of course willing to contribute to reintroduction or reinforcement projects, as long as these are in line with IUCN Translocation Guidelines. Right now, there seems to be no need to (genetically) reinforce the wild population, but the EEP population is maintained as an insurance population to allow these options for the future, as history teaches us that conservation needs can change radically in a few decades, the sudden spread of Ebola being just one example.

The EEP also aims to help zoos in other regions of the world to build up a population of Western lowland gorillas, as long as institutions are following the Best Practice Guidelines and other Gorilla EEP-defined prerequisites, which includes keeping the population for

the purpose of conservation, raising awareness and the broader biological education of the public. An additional reason to consider building up such a population is that this would make the global insurance population even more robust against stochastic events.

With 463 individuals (212 males, 250 females) at 69 institutions, the EEP is fortunately demographically very robust. Genetically, the programme is also in a position of luxury, where it really can be considered as a back-up of all functional genetic variation of the wild population. Yet there is no room for the EEP coordinators to be complacent. Take, for example, the male challenge.

## FINDING A NEW BALANCE

The current thinking about the best way of keeping gorillas is to have one silverback with several females and offspring. However, an equal number of males and females are born. In the wild, this 'mathematical' problem is solved by high mortality amongst adolescent males that leave their parental group and fail to survive or die when fighting to take over a harem. For the EEP, different solutions are obviously necessary.

It should be clarified that this challenge has nothing to do with the total population size; whether the population is larger or smaller, there will always be a structural imbalance between males and females. The challenge to place males is becoming more prominent because ageing and good keeping conditions (increased fitness) of the population seem to trigger an evolutionary mechanism that leads to more male births. Simultaneously, there are relatively more female deaths due to natural attrition because there are more older females than older males.

The available solutions to ensure that all males can be housed in good conditions, not just for now, but for their entire lives, are clear. First of all, the EEP will strive to maximise the number of harem groups. By keeping smaller harem groups, more such groups can be created and more adult males placed. There is a limit to this, however; two females per silverback is seen as the minimum. Also, bachelor groups continue to be an important part of the solution, but this is mainly a short-term tool to gain time before males become harem-group leaders. Several males may be able to stay long-term in a social situation as leader of a bachelor group if the other group members continue to respect his authority.

Unfortunately, this is not sufficient to completely solve the imbalance of males and females, so additional solutions are needed. Castration is already one of these tools, and has been used for many years now, with positive results so far in terms of its effect on animal welfare and group stability. A possible alternative strategy is that of selective abortion. This could theoretically be done as early as six weeks into the pregnancy through



FIGURE 1: AGE DISTRIBUTION OF THE CURRENT POPULATION, WITH AGE CLASSES OF FIVE YEARS.



injection. It may be the least invasive strategy, but the technical process is not ready yet.

The above strategies should allow the EEP to manage the population in such a way that all individuals can be kept in a good situation. This makes it very unlikely that the EEP's last resort, culling, would ever be needed, unless for veterinary reasons. Nevertheless, if a situation arises where a male cannot be kept long-term in acceptable (social) conditions, and other appropriate solutions are not possible, culling may be best for animal welfare and thus the preferred option.

### CALLS FOR ACTION

While the male challenge is perhaps the most complex topic, there are more challenges and, fortunately, also opportunities. To deal with these, the involvement of all EEP participants is crucial.

- If you are building a new enclosure or make significant modifications to an existing enclosure, you must send the new plans at an early stage to the EEP coordinator for approval. These enclosures should have the necessary indoor and outdoor facilities for animals separated from the main group (single male or old animals)

and maximise the flexibility of these spaces, keeping in mind the needs of the EEP in terms of housing bachelor groups and the temporary housing of single males.

- For any institution holding a harem group, now that the EEP has reached its target population size, the population size will be maintained. The population is demographically very robust and will be monitored closely, so stabilising the population does not pose any significant risk. To slow down breeding accordingly, fewer females will receive a breeding recommendation than in the past. Please follow up on these and other recommendations, including those related to the solutions for males (born and unborn).
- Zoos that transfer an animal to another institution are requested to fill in the Behavioural Information Sheet that can be found on the Great Ape TAG page of the EAZA Member area on the website, and to forward this to the receiving institution. Following the introduction of a new arrival to a group, an Introduction Questionnaire should be completed and returned to the EEP coordinator.
- In case of the death of an individual, please make sure to take a testicle

or ovary sample so that this can be cryopreserved. The EEP is setting up a cryopreservation programme in collaboration with the EAZA Biobank to ensure the long-term maintenance of rare genetic variation. The EEP is developing protocols for this that will be shared with all EEP participants.

- If there are plans to castrate a young male, testes should be stored and sent to the relevant colleagues in Barcelona (see LTMP), who can also share the relevant protocols.
- During anaesthesia, collect blood samples for storage in the EAZA Biobank (even if you already did so, please remember that it is worth taking samples every time you have the option). Protocols will also be made available on taking sperm samples. This should only be done in close collaboration with the relevant colleagues from Allwetterzoo Münster (see LTMP).
- If no samples are available in the EAZA Biobank yet, please take hair samples for any individuals you keep and send them to the EAZA Biobank. Contact the EAZA Biobank Coordinator (biobank@eaza.net) in case of any doubt or the need for support.

# How to hatch a hornbill



A FIRST-HAND ACCOUNT OF ASSISTED BREEDING FOR THE GREAT HORNBILL OFFERS VALUABLE INSIGHTS FOR FUTURE SUCCESS

Václav Štraub and Kamil Čihák, Zlín Zoo, Czech Republic, and Joost Lammers, Vogelpark Avifauna, the Netherlands

As one of the larger and more charismatic Asian hornbills, great hornbills (*Buceros bicornis*) have always been quite popular among EAZA zoos. However, breeding results have been historically poor and the EEP has been struggling to keep up the numbers over the last decades. Since 2000 the population has declined more than 50%, with currently only 28.20 birds left in the EEP, according to ZIMS. The last year in which breeding results were seen in multiple EAZA zoos was 2004. Since then, breeding results in the EEP have been seen in just one single zoo or not at all. With an ageing population, births are needed desperately within the EEP and participating zoos should dedicate

themselves to taking all the necessary steps needed to stimulate breeding.

Breeding of this species began at the Zlín Zoo in 2010, when unrelated birds raised in the Jurong Bird Park in Singapore arrived. At first the birds were kept separate and were not put together until 2011. Everything went smoothly, with no signs of aggression. The young age of the birds seemed to be an additional advantage: the male was six and the female three years old. When they were first put together, it was the female in particular that was active, and she tried to feed the male. Nesting activity became more intense in 2014, and the first clutch appeared.

The first nestings were left completely free of human intervention,

with only one chick hatching in all cases. The female kept the nestling warm, cared for it, offered it food, but did not drop the food into its beak. The first two nestlings both died on the eighth day after hatching; they most likely starved to death in both cases. After these experiences, we opted for artificial rearing. The rearing was done using a mask. After stabilising the young bird, we always placed it in visual contact with the parents. This way we managed to rear two young birds in 2018 and 2020. Both were included in the EEP.

After two cases of hand-rearing, we preferred parent-rearing in a nesting hollow by the female that naturally incubated a single fertilised egg. However, during daily detailed inspections of camera recordings, we found that the phenomenon was repeating; again, the female placed only a fraction of the offered food into the chick's beak. With the diminishing activity of the chick, which was gradually losing its energy, the amount of food delivered by the female was decreasing as well.

After the chick hatched, we partially changed the diet. All the fruit was cut into smaller pieces, and of all the insects, only crickets of no more than 1cm were offered. The daily dose of vitamins and minerals was increased. The breeding pair and the chick were treated with antibiotics immediately after the hatching. Four days after the chick hatched we decided to physically inspect it. To prevent the chick from being injured by the female, which could inadvertently hit it with her beak during the collection, we inserted a roll of carpet under the female and safely removed the chick from the resulting 'tunnel'. During the inspection the chick was weighed, fed and lightly cleansed in the facial area. After less than 10 minutes it was returned under the female in the same way. When comparing the weights obtained during parent-rearing, we found that the chick's weight was already lower than that of the hand-reared birds, so we decided to carry out daily checks and complementary feeding.

A major obstacle came up during the handling of the male, which stayed close to the nesting box and did not like to leave this area. To enter the

quarters, it was always necessary to lock the male in the isolation corridor where he was fed. The process of closing off the male sometimes took more than an hour; however, over time the male got used to it and could be sealed off relatively quickly. Immediately after the inspection we decided to feed the young bird twice a day, always around 9am and 4pm, until it was 14 days old. It took about 15 minutes to handle the chick. From Day 15 it was no longer so easy to feed the chick. Its food intake activity decreased and the feeding took longer, so we started taking it out for feeding for one hour in the morning as well as in the afternoon. Due to the lower weight of the chick compared to the hand-reared ones we decided on Day 18 to take the young out of the box and hand-feed it during the period from nine to three o'clock. The whole handling of the chick was aided by the surprisingly calm nature of the female, which was very gentle with the chick all the time and still tried to feed it. It was at this point that we also managed to get the female used to feeding with tweezers through the walled hole of the box during the handling of the chick. Feeding the female helped considerably to calm the whole situation regarding the collections and returns of the young bird into the nesting hollow.

On Day 25 we tried to feed the young at the same time as the female in the box. This did not work very well though, and the chick fled further down the box to its mother. So we continued taking the chick out for feeding. When the chick was one month old and its weight was 1400 grams, we had to face another problem – we were no longer able to pull it out through the original inspection hole. Therefore, we had to enlarge the hole during the morning feeding with a hand saw. This was not possible during the afternoon feeding when the female was not so hungry.

On Day 38 we recorded the female feeding the chick, which was already actively taking bites from her beak. From that point on we left the rearing up to the parents. We enclosed the male only for the morning feeding, fed the female through the hole and weighed the young bird. The male fed the female dutifully throughout the breeding period. The female left



the hollow 102 days after closing the entrance hole and the male attacked her again, so we separated the couple. The male was confined to an outdoor aviary and the female to the quarters with the nesting box. Within a few days the chick sealed the opening again, leaving only a narrow vertical slit. Before the female calmed down and started feeding the chick regularly again, we fed it with tweezers through the slit. We added the male to the enclosure again after two days of separation. This time all went well, without signs of aggression.

The young hornbill left the box 86 days after hatching. Immediately after leaving it, the male threw it to the ground, then the situation calmed down. To be on the safe side the male was separated from the female with the chick for the night. In the morning all three birds were reunited. The feeding usually took place in such a way that the male fed the female,

and she immediately passed the food on to the young bird. After five days together, the male suddenly attacked the chick and fatally injured it. The reason for this rash reaction is not yet very clear to us. Despite the death of the chick, we found out that systematic work and regular training can be used to handle the hornbills, even at such a sensitive time as the breeding of the young undoubtedly is. Above all, the unsuccessful breeding provided us with a lot of very useful information, which we hope to use in the coming years.

#### BIBLIOGRAPHY:

- Kemp, A. and Woodcock, M. *The Hornbills: Bucerotiformes* (Oxford, OUP, 1995).
- Poonswad, P., Kemp, A. and Strange, M. *Hornbills of the World* (Singapore, Draco Publishing, 2013).
- Poonswad, P. and Kemp, A., *Manual to the Conservation of Asian Hornbills* (Bangkok, Hornbill Project, 1993).
- Birds of the World – The Cornell Lab of Ornithology ([www.birdsoftheworld.org](http://www.birdsoftheworld.org)).

# Avian influenza: plan, prepare and prevent

A NEW INFORMATION SHEET PRODUCED BY THE EAZA VETERINARY COMMITTEE AND THE EUROPEAN ASSOCIATION OF ZOO AND WILDLIFE VETERINARIANS AIMS TO INFORM ZOOS ON THE OPTIONS AVAILABLE TO PREVENT THIS PROBLEMATIC DISEASE

Allan Muir and Kelly Lavooij - van Leeuwen, EAZA Executive Office, the Netherlands, and Alexis Lécu, Paris Zoo, France

Avian influenza (AI) is a disease with which our European zoo community is very familiar; not only from the restrictions and control measures that are placed upon zoological establishments in times of high risk or local outbreaks, but also from its typically seasonal pattern of emergence, associated with the colder winter months and the influx of migratory water birds from the north. However, these patterns appear to be changing, and European zoos are increasingly being subjected to control measures and AI outbreaks themselves. There is a clear need for members of our community to be up to date and prepared with appropriate plans and preventative measures to safeguard the avian species in our care.

## WHAT IS AI?

AI is a transmissible viral disease affecting primarily avian species. It is a disease with significant economic impacts for the farming sector due to its transmissibility, impacts on trade and often high mortality rates. AI can be confusing to understand as many strains and subtypes exist; however these can be broken down into two main groups: low pathogenic avian influenza (LPAI) and high pathogenic avian influenza (HPAI). AI strains are categorised by their physical structure, as well as by how the strain impacts the domestic chicken – if it causes no or few clinical signs, it is LPAI, and if it causes significant clinical signs and potentially mortality, it is classified as HPAI.

As well as infecting bird species, AI has the potential to infect several mammalian species and cause clinical disease. Tigers, rodents, mustelids, canids and equids have the potential to be hosts to AI infection. While detection of such cross-species contamination is often incidental and not linked to threatening signs,



there are very occasional reports of lethal issue as in the case of wild seals. Additionally, it is important to remember the zoonotic potential of this disease and the risk it poses to humans in close contact with infected birds and their faeces. So far, there have been very few reports of bird-to-human transmission with the current clade viruses, but occasional occurrences are still reported (in UK, Russia and China) without associated mortality.

The spread of AI globally is thought to have been facilitated, to a greater or lesser extent, by several factors; globalisation and the international trade in poultry and birds, farming and the sale of live birds and, finally, the migratory patterns of free-living avifauna.

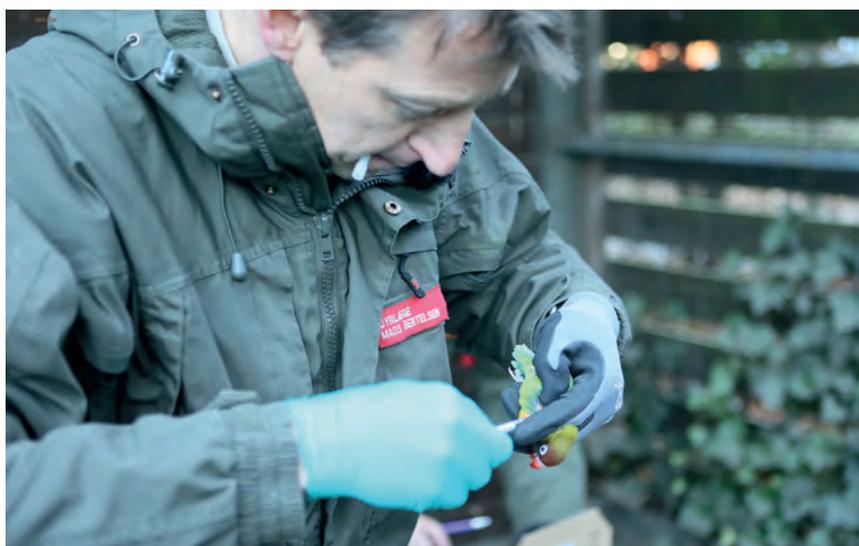
In recent years (since 2020) there has been a change in the typical winter distribution of HPAI outbreaks in Europe. Many more cases are occurring in the summer months, which is normally a season of few or no cases, including an increasing number of summer cases in free-living avifauna

with the viral subtype H5N8. This seasonal change could represent the virus 'over-summering' in free-living avifauna and could be a significant challenge to our community if we do not create and implement effective plans to understand the disease risk to our institutions and mitigate these risks with appropriate biosecurity.

## DISEASE SURVEILLANCE PLANNING

The disease surveillance plan is created and updated annually by the zoo veterinarian as part of the approval process under the EU Animal Health Law. This plan is an important step towards determining the disease risk posed to the confined establishment by notifiable or 'listed' diseases, including AI. The plan should be seen as a living document and should be kept updated according to the numbers and species kept within the institution.

The plan can look broadly at the mitigation steps involved in reducing disease risk, and how these steps change over time to reflect this risk.



Results of disease testing, either from serological sampling of zoo birds or from post-mortem examinations, can be used to quantify the plan and qualify the mitigation measures in place. Additionally, any free-living birds found dead within zoo grounds should have a post-mortem examination alongside any relevant testing, to help assess any risk posed from free-living avifauna.

Given the significance of AI, institutions may also wish to create an avian influenza risk assessment, separate but linked to the confined establishment's disease surveillance plan. This assessment could go into more detail on specifying AI disease risk by each epidemiological unit within the zoo, describing staff risks and procedures during low and high-risk periods, disease risks associated with specific taxa and enclosure level measures to reduce outbreak likelihood. For instance, this risk analysis list should contain a focus about water areas (natural/artificial ponds) and feral avifauna description.

#### **ZOO BIRD VACCINATIONS\***

One measure that is uniquely afforded to zoos in the EU is the ability to apply to their Member State competent authority for permission to vaccinate zoo birds against HPAI during times of high risk. This is laid down in Commission Decision 2007/598. Competent authorities then put forward their applications for HPAI vaccination to the European Commission, with two vaccines currently in use across a number of Member States; a H5N2 inactivated vaccine produced by MSD Animal Health and a H5N9 vaccine by Merial.

This ability to vaccinate zoo birds

has been available to zoos in the EU since 2007; however, over time the number of Member States applying for permission has reduced significantly. Only Denmark, Hungary and France have vaccinated in recent years, and sometimes only under specific circumstances e.g., following an outbreak.

The EAZA/ European Association of Zoo and Wildlife Veterinarians (EAZWV) legislation subgroup has put together a table of current access to HPAI vaccination for zoo birds, which can be found attached to the information document discussed below. It is hoped that this document and table will help EAZA and EAZWV Members when talking to their authorities about access to HPAI vaccination for zoo birds.

Vaccination should be considered as only one tool among a larger panel of preventative measures. To date, several scientific publications made by EAZWV members are demonstrating that immune response is variable between avian taxa, in strength and duration. Added to the recent scientific literature on poultry vaccination, there's a strong suspicion that the protection against clinical disease could be good, although the impact on transmission and shedding may be limited.

#### **CONTINGENCY PLANNING**

Another plan worthy of mention in the context of avian influenza is the contingency plan. This document details the steps and actions of what should happen should an outbreak of a notifiable disease occur within or near to the confined establishment. It again is site-specific and unique

to the zoo and its animal collection. Close cooperation with the competent veterinary authority, as well as strict epidemiological unit management and biosecurity, are key components of this contingency plan.

Epidemiological units within a zoo can be defined as enclosures or groups of enclosures, which are isolated from one another from a disease perspective. Outlines of where bird species are kept in the confined establishment and how they are separated, from one another and from free-living avifauna, can be drawn on aerial view maps of the site. Moreover, staff (keepers) management compartmentalisation is a key point for such units' valid definition.

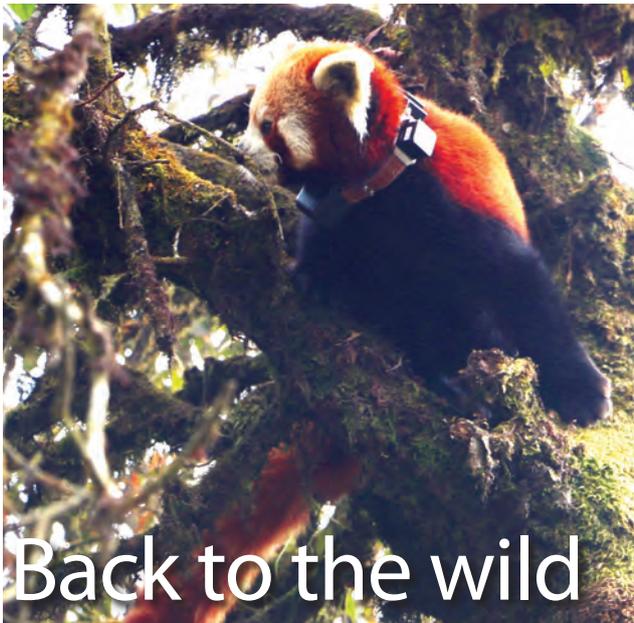
In addition to the veterinary and disease management steps, the contingency plan may describe appropriate business continuity plans, in the case of full or part zoo closure from a disease outbreak. This may extend to planned communications with local media, stakeholders and the general public on the status outbreak, and the measures put in place to protect animal health, welfare and conservation. Such plans should be viewed as a collaborative project and include input from other departments within the zoo, and not be the sole responsibility of the zoo veterinarian.

#### **EAZA/EAZWV AVIAN INFLUENZA INFORMATION SHEET**

The EAZA Veterinary Committee, together with colleagues at EAZWV, have put together an information sheet for members on the recent trends of avian influenza in Europe, together with sections on relevant EU legislation and zoo bird vaccination.

Members will have been sent a copy through EAZA eNews, while veterinarians working in EAZA Members and EEP Coordinators/TAG Chairs will have been sent a copy through the relevant email listservs. Please do get in touch if you have not yet received a copy and would like one!

*\*Since the time of writing, Commission Decision 2007/598 has been removed from force. EAZA is currently clarifying with the European Commission future access to HPAI vaccination for captive birds kept within confined establishments. EAZA and EAZWV Members will be kept updated on any developments.*



## Back to the wild

A DEDICATED PROGRAMME IN INDIA'S SINGALILA NATIONAL PARK IS FOCUSING ON THE CONSERVATION OF THE RED PANDA

Dr Basavaraj Holeyachi, Director, Padmaja Naidu Himalayan Zoological Park, India, and Janno Weerman, EEP Coordinator and GSMP Convenor for the red panda, Rotterdam Zoo, the Netherlands

The range of the red panda extends from Nepal in the west through to western China. The *fulgens* subspecies' range extends from Nepal in the west into parts of western China while the *styani* subspecies is found only in China and possibly in Myanmar. Although the status of the *fulgens* and *styani* pandas combined was upgraded to Endangered on the IUCN Red List in 2015, the status of the two forms individually has yet to be assessed. They are also Schedule I animals as per the Indian Wildlife Protection Act 1972, and thus have the highest protection priority under law. In India, the red panda is found in the state of Sikkim, the Darjeeling hills of North Bengal and the north-eastern state of Arunachal Pradesh.

Their actual numbers are far from clear, although it has been suggested that a maximum of 10,000 individuals, both subspecies combined, may still survive. This estimate is probably optimistic. In addition, these individuals survive as highly fragmented subpopulations, making their future far from secure. Despite protection, red pandas are still subjected to habitat loss and further fragmentation, disturbance and illegal capture and/or killing. These threats are not likely to disappear in the near future, particularly as the local human populations continue to move deeper into the mountain areas. The survival of the red panda in the wild may eventually depend on human intervention, including demographic or genetic supplementations or possibly the restocking of habitat with animals born in human care.

### A VITAL ROLE FOR ZOOS

Red pandas are doing well in zoos; there are regional breeding programmes in Australasia, Europe, India, Japan, North America and South Africa. India is the only range state country in which the species is actively managed under the umbrella of the Red Panda Global Species Management Programme (GSMP). The red panda population has been

unofficially managed on a global basis since the early 1990s. The first global breeding masterplan, dealing only with the Himalayan red panda, was produced in 1994, and a second, dealing with both red pandas, was produced in 2004. The strategy of both red panda masterplans was based on the loose cooperation of autonomous regional breeding programmes, which exchange a few individual animals during each masterplan period and otherwise run their programmes independently, with the common goal of sustainable world populations.

The first step in the GSMP process, a special red panda workshop, was convened in Rotterdam Zoo (home of the Red Panda International Studbook) in April 2012. This was attended by all the regional coordinators. Under the leadership of Kristin Leus (CPSG Europe), a working plan for the GSMP, a population management masterplan for the next six years (one red panda generation) and the formal application for GSMP status were all drafted. The latter was submitted to the World Association of Zoos and Aquariums Committee for Population Management (WAZA CPM) and approved at the meeting in October 2012 – and so the Red Panda GSMP was born. The first official GSMP masterplanning session was held in India and was hosted by Padmaja Naidu Himalayan Zoological Park (PNHZ) in Darjeeling. During the session PNHZ and the Indian Central Zoo Authority presented the proposal of an augmentation programme in Singalila National Park.

### PREPARING THE GROUND

The West Bengal Zoo Authority under the Department of Forests in the government of West Bengal has taken up the programme for conservation breeding of the red panda as well as restocking the declining population in Singalila National Park and Neora Valley National Park. The objective of this programme is to strengthen the wild population through the release of genetically, biologically and behaviourally viable zoo-bred red pandas. This will be carried out in a scientific and planned manner which will help the long-term conservation of the species. Genetic analysis of scat samples from the two proposed augmentation locations revealed that Singalila National Park (78.6 km<sup>2</sup>) has a population of around 38 individuals and Neora Valley National Park (88 km<sup>2</sup>) around 32 individuals. Based on the size and habitat quality of the two national parks, recent knowledge of the average red panda home range size of 1.4m<sup>2</sup> (Bista *et al.*, 2021) and the fact that red panda numbers are low, augmentation can be valuable for the long-term survival of this species in the two national parks mentioned. The physical augmentation is important for species survival, and the knowledge and experience gained from it would help in preparing the necessary protocols and policies that can be used for future augmentation/introduction. In 2003 the PNHZ released two female zoo-bred red pandas in the Singalila National Park under the banner 'Back to the Wild'. One of the released animals mated with a wild male and gave birth to one cub. A step further towards conservation breeding was the establishment of a Conservation Breeding Centre on five hectares of land at Topkeydara in 2011. This facility focuses on the conservation breeding of red panda and snow leopards; both species have bred successfully.

As mentioned above, in 2019 a five-year project 'Red Panda Augmentation in Singalila National Park and Neora

Valley National Park, West Bengal' was initiated by PNHZ Park (PNHZZP), the coordinator of the Central Zoo Authority (CZA) red panda conservation breeding programme. CZA has a stable and genetically healthy population of 31 red pandas in three facilities. The majority (27) of the pandas are housed in PNHZZP. It aims to release eight red pandas (four male and four female) in the two national parks over a period of four years. Extensive measures for the improvement and protection of the natural habitat are being taken up during the project period, and the release of more animals will be considered at a later stage.

### SELECTION OF RED PANDAS FOR RELEASE

A genetic analysis of red pandas was carried out by LaCones, Centre for Cellular and Molecular Biology, Hyderabad and the Indian Institute of Science Education and Research, Kolkata, India. Based on the results of the genetic analysis, 2.2 red pandas were selected for release at Singalila National Park in the first phase (see Table 1). The GSMP provided the pedigree information of the red pandas based on studbook analysis in PMx. Animals with the highest heterozygosity for the 12 microsatellite marker loci analysed and distant pedigree were selected. A matrix of maximum likelihood relatedness based on 12 loci revealed that the two males were genetically unrelated to the two females (see Table 2). The selected individuals earmarked for release were kept in open-air enclosures in the Conservation Breeding Centre in Topkeydara and underwent a complete health check before release.

### SELECTION OF COLLARS

In November 2018, *ex situ* research took place in Rotterdam Zoo to assess the potential effects of GPS collars on the behaviour of red panda (Bunte *et al.*, 2021). The possible physical discomfort was also measured. Based on these results it was plausible to conclude that used GPS collars were safe to use in an *in situ* setting. By the end of 2019, 10 red pandas were collared in Eastern Nepal (*in situ*) as part of a study of red panda ecology in human-dominated landscapes. No negative impact of wearing a GPS collar was observed during the *in situ* study. For the augmentation project, the tested collars are used, which are custom-made Litetrack Iridium 130 TRD-L (around 250g). The collar can transfer GPS data via the Iridium Satellite system. In the field, collars can be tracked via VHF radio communication. The collars also have a mortality function and a TRD-L (Timed Release Device) drop-off function; they are also geo-fenced, so that they give a signal if the animal crosses pre-set GPS boundaries.

### BEHAVIOURAL COMPETENCE INTERVENTION

From August 2020, behavioural observations were carried out on the selected animals in the Conservation Breeding Centre using the focal sampling method. An association with feed provided at the zoo was broken at the centre by the gradual reduction of the zoo diet, bringing it down to 25% while keeping natural bamboo *ad libitum*. In the soft release facility, the zoo diet was further gradually reduced to zero over a period of 21 days. At present the pandas are on a natural diet. Daily observations have revealed that they are healthy and have not lost their vigour, which implies that they have adapted to the wild food.

Threat perception against the presence of predators and

House name	Sex	DoB	Age on 01.01.2022	Heterozygosity %
Shifu	M	27.06.13	8 yrs 6 mths	62.8
Noel	M	14.07.15	6 yrs 5 mths	86
Smile	F	19.06.12	9 yrs 6 mths	100
Yeshe	F	08.07.17	4 yrs 5 mths	90

TABLE 1: DESCRIPTION OF RED PANDAS SELECTED FOR RELEASE AT SINGALILA NATIONAL PARK

	Shifu (M)	Noel (M)
Smile (F)	0.02	0.0
Yeshe (F)	0.0	0.0

TABLE 2: MAXIMUM LIKELIHOOD RELATEDNESS AMONG MALE AND FEMALE ANIMALS

human beings was induced by masking trees and the pandas' trails with leopard scat and urine. The pandas were also exposed to the charging and barking of dogs, which are one of their main predators. Human-associated threats were induced by way of false entries (entry without feed), charging and scaring the animals. In all these situations, the pandas displayed an increased vigilance, thus meeting the objective.

### SOFT RELEASE FACILITY

The soft release facility is located at Gairibans in Singalila National Park at an altitude of 2626m. The area was selected because the panda population in this specific part of Singalila NP declined when compared with previous studies. The forest has a dense vegetation of Maling bamboo (*Arundinaria maling*) which constitutes the bulk of the red panda's diet. The forest also has *Castanopsis hystrix*, *Quercus lamellate*, *Machilus odoritissima*, *Michelia sp.*, *Rhododendrons*, *Euria sp.* and *Rubus sps.* in abundance. These species are key for a suitable red panda habitat (Roka, Jha and Chhetri, 2021). The four selected red pandas were released in the soft release facility on 15 January 2022. Two researchers and two field assistants are observing the animals daily through direct sighting, VHF antenna and camera traps. Scats of the animals are collected on a weekly basis to study gut microbe biome, feed composition and parasitic load, which will be compared with that of both wild animals and those in human care. The animals will be released into the National Park after they completely acclimatise to the wild.

### POST-RELEASE MONITORING

The animals will be tracked and monitored for 70 weeks using GPS data and VHF. Observations regarding their home range, behaviour, feeding habits, health, reproductive behaviour and birth of offspring will be made and scientifically analysed. Perhaps we will be able to share the results in a future issue of *Zooquaria*.

### REFERENCES

- Bista, D., Baxter, G.S., Hudson, N.J., Lama, S.T., Weerman, J. and Murray, P.J. (2021). Movement and dispersal of a habitat specialist in human-dominated landscapes: a case study of the red panda. *Movement Ecology* 9(62).
- van de Bunte, W., Weerman, J. and Hof, A. R. (2021). Potential effects of GPS collars on the behaviour of two red pandas (*Ailurus fulgens*) in Rotterdam Zoo. *PLoS ONE* 16(6).
- Roka, B., Jha, A. K., Chhetri, D. R. (2021). A study on plant preferences of red panda (*Ailurus fulgens*) in the wild habitat: foundation for the conservation of the species. *Acta Biologica Sibirica* 7: 425–439. <https://doi.org/10.3897/abs.7.e71816>

# The great monk seal rescue



A PENINSULA OFF THE COAST OF AFRICA HAS BECOME A HAVEN FOR AN ENDANGERED SEAL THANKS TO A DEDICATED CONSERVATION PROGRAMME

Pablo Fernández de Larrinoa, Director of CBD-Habitat's Monk Seal Conservation Programme

The Mediterranean monk seal is one of the most endangered species of marine mammals in the world. The main objective of the Monk Seal Conservation Programme, developed at the Cabo Blanco peninsula, is to improve the conservation status of this precious but threatened species. Indeed, half of this seal's worldwide population is currently protected and monitored by this conservation programme.

The largest Mediterranean monk seal population that still survives in the world, and the only one that still keeps the structure of the ancient large colonies, is found at the Cabo Blanco peninsula on the north-west coast of Africa. It is located in an area with extraordinary oceanographic conditions, inside the Canary Current System, one of the world's major eastern boundary upwelling ecosystems, in a very productive region which experiences year-round upwelling, with a large continental shelf and high luminosity. These are ideal conditions for marine life and primary production – but also for artisan and industrial fishing.

The Cabo Blanco monk seal population is concentrated in only three caves on the cliff-lined coast of the peninsula, in just 1km of coastline and just 7km away from Nouadhibou (140,000 inhabitants), the second most important city of Mauritania. The seals are surrounded by the huge pressure of the inhabitants of the city and associated activities, mostly fisheries.

Despite the richness of marine waters, social development in the region is low, as the artisan fishermen's living and working conditions are very fragile.

In 1997, a mass mortality event caused by a red tide killed more than two-thirds of the Cabo Blanco peninsula monk seal population in a single month. The situation was so worrying and the risk of extinction of this population so high that the four countries of the Atlantic distribution range of the species joined forces and in

2000 began to develop an Action Plan for the Recovery of Mediterranean Monk Seal in the Eastern Atlantic under the frame of the Convention of Migratory Species/ United Nations Environment Programme (CMS/UNEP). The Memorandum of Understanding for the Action Plan was signed in 2007 by the authorities of Spain, Portugal, Morocco and Mauritania.

The Foundation for the Conservation of Biodiversity and its Habitat (CBD-Habitat) Monk Seal Conservation Programme was created in 2000 as a global programme that

## **MOM – the Hellenic Society for the Study and Protection of the Monk Seal**

The Hellenic Society for the Study and Protection of the Monk Seal (MOM), is a Greek non-governmental environmental organisation. MOM is active in the protection and promotion of the coastal and marine environment of Greece, as well as of the Mediterranean monk seal, which is the only seal species in the Mediterranean Sea and the most endangered seal on earth.

One of MOM's most important activities is the rescue and rehabilitation of sick, wounded and orphan monk seal pups, and their reintroduction to the wild. A key element in the success of this activity is the MOM's First Aid Station in Athens, which was created and fully equipped by Attica Zoological Park within its premises. The total operating budget of the rescue centre is covered by Attica Zoological Park. Dedicated personnel within the zoo provide the necessary veterinary and rehabilitation care at the First Aid Station. Between 2015 and 2021, seven pups were released back to the wild.

For more information regarding MOM please visit <https://www.mom.gr/home>



creates strategies to protect the species and its habitat, and to solve conflicts with human activities related to them. Since its creation, CBD-Habitat's Monk Seal Conservation Programme has helped the relevant countries with the technical development of the Action Plan.

Since its inception, CBD-Habitat has also been working non-stop in the *in situ* conservation of the Cabo Blanco monk seal population, as it is responsible for carrying out the actions identified in the Action Plan. The main action axes are:

- a) effective protection of the breeding caves,
- b) constant monitoring of the population to evaluate the protection and conservation measures, and
- c) delivering social support actions to artisan fishermen and information and awareness to them and the school community.

### 'COAST OF THE SEALS' RESERVE

Due to the lack of protective measures in the area and in the breeding caves, in 2001, CBD-Habitat, with the collaboration of the artisan fishermen and regional authorities, created the coastal and marine 'Coast of the Seals' reserve. This reserve has been continuously surveyed since then, preventing the setting of nets in the caves area and therefore reducing the risk of the seals becoming entangled in gillnets and drowning. In addition, all kinds of human disturbances in and around the breeding caves (goose barnacle collectors, fishing activity from the top of the cliffs, people entering the caves, tourist and visitor activity) have been curtailed.

In parallel, many social support and environmental awareness actions have been developed to improve the working and living conditions of the artisan fishermen, and information has been provided to fishermen and school students about the monk seals, marine environment

conservation and responsible and sustainable fishing. These actions included building a fish market so the fishermen could sell their products in good sanitary conditions. We also donated security materials and provided training about responsible and sustainable fishing.

Since the Monk Seal Conservation Programme at Cabo Blanco began in 2000, the Cabo Blanco monk seal population has experienced an incredible recovery, increasing from the 100 individuals that are estimated to have survived the mass mortality event in 1997 to more than 350 animals today; and the reproduction rate has risen from 26 annual births to almost 80 pups being born per year.

However, despite these positive demographic indicators, the long-term survival of the monk seal colony at Cabo Blanco remains uncertain. Another mass mortality event or the collapse of one or more of the remaining caves would be catastrophic for this colony. Increasing industrial and artisanal fishing pressure in the waters around Cabo Blanco, episodic illegal fishing intrusions into the no-fishing area adjacent to the colony, and the potential that sea level rise may reduce beach habitat inside the sea caves could all degrade the conservation status.

Therefore, the Monk Seal Conservation Programme, within the framework of the Action Plan, is working towards the creation of a network of new Monk Seal populations in open beaches throughout the Atlantic range that would improve the long-term survival probabilities for the species.



### EAZA SUPPORT FOR THE MEDITERRANEAN MONK SEAL

The Mediterranean monk seal is one of the most endangered species of marine mammal in the world, and a symbol of marine environment conservation, writes Anna Kazazou, Attica Zoological Park/Pelargos. The EAZA Marine Mammal TAG encourages EAZA Members with experience in handling this species (and similar species) to make their expertise available in the event of rescue situations and to provide financial support for initiatives such as the Hellenic Society for the Study and Protection of the Monk Seal (MOM) and the CBD-Habitat's Monk Seal Conservation Programme.

According to the EAZA Conservation Database, the following EAZA Members are currently supporting Mediterranean monk seal conservation efforts: Madrid Zoo and Aquarium, Faunia, Selwo Marina, ZooParc de Beauval, Marineland Antibes, Attica Zoological Park and Blair Drummond Safari and Adventure Park.



## FRANÇOISE DELORD

Conservationist and founder of ZooParc de Beauval, St Aignan, France

Françoise Delord, who passed away on 3 December 2021, leaves behind a superb legacy, the ZooParc de Beauval, which she founded in 1980. Deeply passionate about animals, Françoise Delord was a visionary who followed her instincts to establish an organisation dedicated to the protection of biodiversity. We reflect on a life filled with passion.

### Early influences

Delord's first love was the theatre. At a young age, she dreamt of performing at the Comédie Française, and she later worked in a famous Parisian music hall, Bobino. But fate decided otherwise.

In the early 1970s, Delord acquired two African silverbills, which proved to be the inspiration for her second passion: birds and then animals in general. At one point, she had 300 birds in her Parisian flat. And so, the time came to consider moving... She and her family left Paris to settle in the Loir-et-Cher region and she opened what would become her lifelong project: a bird park in Saint-Aignan-sur-Cher in 1980.

### A family affair

Big cats, great apes, tigers, birds, fish, reptiles, mammals... over the years, the zoo has expanded and welcomed an ever-increasing number of species. Guided solely by her temerity and passion, Delord wanted to offer her 'protectees' large and beautiful spaces. In the 1990s, she took her two children, Rodolphe and Delphine, on a world tour of zoos to find inspiration. Having beauty in her surroundings was non-negotiable. It is no coincidence that ZooParc de Beauval has been ranked as the fourth most beautiful zoo in the world since 2018.

Delord was a woman of taste, and always worked with the same aim: to ensure the wellbeing of animals in a beautiful setting. Today, each species lives in its own specific territory, in a reconstituted natural biotope. This same aim is one of the top priorities of Rodolphe and Delphine, who took over the management of the zoo a few years ago. Both have inherited their mother's passion for her cause and her enthusiasm for carrying out ambitious, and occasionally extravagant, projects. Rodolphe is responsible for major works, improvements to the park and long-term work to welcome new species. Delphine is responsible for education, teaching and Beauval's influence throughout the world. Driven by their amazing, infectious energy, these siblings accomplish their tasks with great success, helped and supported by the zoo's many employees.

### An iron will

Awareness of the fragility of biodiversity and the need to conserve endangered species are also key priorities for the Delord family. From very early on, Delord became aware of these issues during her travels around the world. To fascinate and amaze in order to better protect became Beauval's *raison d'être*. With this in mind, the Beauval Nature association was created in 2009 to support conservation on a global scale. Each year, Beauval Nature helps and supports more than 50 conservation programmes and 15 or so research programmes.

Behind each project and every battle was Françoise Delord with her unparalleled tenacity and fierce determination. Those who met her in France as she sought to develop Beauval, or abroad during conservation missions, remember her as an exceptional woman, convinced of the validity of her cause. She played a major role in various international organisations: as adviser to EAZA (from 1995 to 2016), as Beauval's representative at WAZA for many years, and as president of the French Association of Zoological Parks (1995 to 2011). She also encouraged the development and coordination of numerous population management programmes (EEP and ESB) at Beauval, such as the Philippine cockatoo EEP (*Cacatua haematuropygia*), Emperor tamarin EEP (*Saguinus imperator*), Lowland tapir EEP (*Tapirus terrestris*) and Palm cockatoo EEP (*Probosciger aterrimus*).

### Expansion and evolution

Over the past 40 years, some major events have marked the life of the zoo: the opening of the first tropical greenhouse for chimpanzees and orangutans in 1992, the construction of the tropical bird greenhouse in 1994, the creation of the African Savannah in 1999, the inauguration of the Australian greenhouse in 2002, the arrival of a group of elephants in 2003, okapis in 2005 and sloths in 2013. The year 2008 marked the opening of the first hotel located next to Beauval, *Les Jardins de Beauval*. Beauval then became a tourist destination in its own right; since then, three further hotels have opened on the site.

The year 2012 marked a turning point in the park's history with the arrival of a pair of giant pandas, Yuan Zi and Huan Huan, which have drawn visitors to the zoo ever since. Beauval is now counted amongst the giant panda breeding centres whose professionalism is recognised worldwide. In 2017, the birth of Yuan Meng (the first baby panda to be born in France) was celebrated worldwide, as was that of the panda twins in August 2021.

Françoise Delord has left her mark on generations of enthusiasts and helped to change the way we look at zoos. Just watching her in her 'Eden', always in awe of nature, you would notice that she could barely go for a stroll without being warmly thanked and complimented on her work – work that her children continue every day. From behind her dark glasses, Françoise Delord opened the eyes of millions of visitors to the beauty of the world.

## DR BERNHARD BLASZKIEWITZ

Biologist and director of Tierpark Berlin and Zoo Berlin

We were saddened to hear of the passing of Dr Bernhard Blaszkiewitz in December 2021. A qualified biologist, Dr Blaszkiewitz served as director of Tierpark Berlin from 1991 to 2014 and of Zoo Berlin from 2007 to 2014 – making him the first joint director of the Zoo, Tierpark and Aquarium.

### Life and work

Bernhard Blaszkiewitz was born in Berlin on 17 February 1954 and regularly visited Zoo Berlin as a child. While studying biology at Freie Universität Berlin from 1974 to 1978, he took up an internship as an animal keeper at the zoo. Following stints at other German zoos in Frankfurt and Gelsenkirchen, he returned to Zoo Berlin in 1984 as a curator. In 1987 he completed his doctorate at the University of Kassel before succeeding Tierpark founder Professor Heinrich Dathe as the director of Tierpark Berlin in 1991.

In 2007, Dr Blaszkiewitz also became the director of Zoo Berlin, taking over from Dr Jürgen Lange. He was closely involved with the zoo and Tierpark throughout his life and he campaigned tirelessly for Tierpark Berlin to maintain the form and size it still has today, particularly during the uncertain times that followed the fall of the Wall. In the 1990s, the Tierpark in the eastern part of the city was emerging from financial difficulties and was in dire need of modernisation. By the year 2000, Dr Blaszkiewitz had overseen the replacement of many animal stalls and facilities – some of which had only ever been provisional – with new, modern buildings. This included the construction of extensive habitats for European domestic animals, mountain animals and African ungulates. The Primate House, the Giraffe House, popular walk-through habitats like the Lemur Forest, the petting zoo and the kangaroo area were also built during his time as director, over a period of more than 20 years. In 2013, he opened the World of Birds at Zoo Berlin.

Dr Blaszkiewitz was passionate about animals in all their diversity and had extensive knowledge of many species; his personal favourites included manatees and rhinos. His wide-ranging interest in animals and the history of zoos found expression in more than 600 scientific and popular science articles, which he wrote during his 40-year career. His travels took him not only to zoological institutions around the world, but also to the animals' habitats in the wild. He particularly enjoyed his visits to Africa. Dr Blaszkiewitz was a well-known figure in the international zoo community and an active member of numerous zoological associations.

### An eventful career

During his time as director, Dr Blaszkiewitz strove to



ensure greater species diversity at Zoo and Tierpark Berlin. Highlights included the successful conservation breeding of African and Asian elephants and Indian rhinoceroses. The first two koalas on German soil were loaned to Tierpark Berlin from San Diego Zoo in 1994 – the same year the first manatees arrived. However, Dr Blaszkiewitz also had to make some difficult decisions during his time as director. For example, all the great apes had to be removed from the Tierpark by the mid-90s as it was no longer possible to keep them in a welfare-focused, species-appropriate manner in the existing conditions at the time.

Other highlights of his time as director included:

- 1991: First successful breeding of white-lipped deer (*Przewalskium albirostris*) in Europe
- 1992: First successful breeding of Australian pelican (*Pelicanus conspicillatus*) anywhere in the world
- 2003: First successful breeding of martial eagle (*Polemaetus bellicosus*) anywhere in the world
- 2013: First successful breeding of Chacoan peccary (*Catagonus wagneri*) in Europe

### Dedicated service to Berlin's zoos

'He was a passionate zoologist who had a decisive influence, particularly on the Tierpark, over the past decades,' says Zoo and Tierpark Director Dr Andreas Knieriem of his predecessor. 'It is largely thanks to his efforts that the German capital is home to two outstanding zoological institutions whose species diversity is unparalleled around the globe.' Frank Bruckmann, Chairman of the Supervisory Board of Zoologischer Garten Berlin AG, adds: 'We will forever honour the memory of Dr Bernhard Blaszkiewitz. He unwaveringly forged his own path, guided by a firm set of values, and put his life at the service of Berlin's zoos. On behalf of the Supervisory Board, I would like to express our sincere condolences to his family.'



# JZAR PUBLICATIONS

**OPEN ACCESS**

SINCE ITS LAUNCH IN 2013  
10 VOLUMES  
34 issues published



563 submissions received

247 publications accepted

PER YEAR *on average*  
64 submissions received  
28 articles published



**ACCEPTANCE RATE 57%\***

**Desk reject rate 10%**

**After review reject rate 33%**

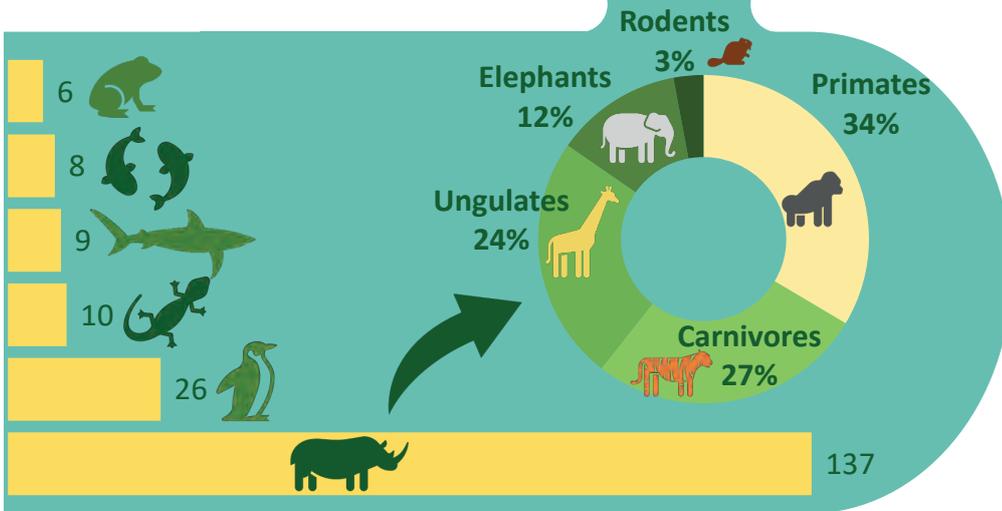
\* ALL years. Current ('20 -'21) acceptance rate is 44%



# PUBLICATIONS FROM  
EUROPE 164 (67%)  
NORTH AMERICA 60 (25%)  
ASIA 32 (13%)  
OCEANIA 15 (6%)  
SOUTH AMERICA 4 (2%)  
AFRICA 2 (1%)

@EAZA

EAZA ZOOS CONTRIBUTED TO **47.4%** OF JZAR PUBLICATIONS



**JOIN OUR TEAM:** reviewers, board members, section editors, copy editors, typesetters, social media experts etc.



[www.jzar.org](http://www.jzar.org)  
[editor@jzar.org](mailto:editor@jzar.org)

# Greening the future

DORTMUND ZOO HAS IMPLEMENTED A RANGE OF MEASURES TO IMPROVE ITS SUSTAINABILITY AND CONTINUES TO LOOK FOR WAYS TO BE A GREENER ZOO

Stephanie Zech and Carolin Boehlke, Dortmund Zoo, Germany

Dortmund Zoo was founded in 1953 and celebrates its 69th anniversary in 2022. Like any other zoo, it has faced and will continue to face many changes over the decades. These changes involve not only animal husbandry and veterinary care, but also infrastructure and energy supply. A couple of years ago the city of Dortmund initiated several climate change programmes and projects, and as a key member of the city's life and landscape, Dortmund Zoo is playing its part in creating a more sustainable future.

## WHAT HAS BEEN DONE SO FAR?

Starting with the zoo's office life, all office consumables are eco-labelled and paper is recycled and/or FSC certified. Entry tickets and zoo maps are printed on recycled and/or FSC certified paper.

A waste separation system has been established in the office and will be expanded over the entire zoo area. In addition, a water dispenser has recently been installed that allows zoo staff to use filtered tap water with their own reusable bottles, minimising plastic bottle waste.

Our employees' work clothes have been obtained from a resource-saving supplier for several years.

In most offices and keepers' working areas, old light bulbs or fluorescent lamps have been replaced by energy-saving LEDs. We have also begun to replace the street lamps in the park with LEDs, as well as in some of the enclosures. Zoo staff (i.e. keepers and veterinarians) use electric cars and cargo bikes to deliver food or other materials.

Installing green roofs on several buildings, including the veterinary building and the rock wallaby enclosure, provides insulation in summer and winter, contributes to air cleaning, and provides a habitat for insects. A huge meadow for butterflies, bees and other insects was established a couple of years ago, and many smaller areas around the zoo are also used for this purpose.

In 2019 the city of Dortmund granted funding to the zoo of about €30 million,



which was mainly to improve enclosures and working areas. Among other projects, we used the grant to rebuild the former carnivore house (now the lion house), creating a new roof and insulation.

In 2021 we built a new garage for the motor pool. The huge roof provided a perfect surface for rainwater collection, so an underground water reservoir was built and the collected rain is now being used to water plants.

## PLANNING FOR THE FUTURE

Our objective over the next few years is to reduce the zoo's plastic consumption to a minimum and to remove any plastic consumable items from food service (takeaway sales) and the zoo shop.

Alternative products (i.e. FSC-certified wood from regional sources, organic toys, sustainable tableware and cutlery) will gradually replace consumables or toys made of plastic. Furthermore, annual passes for visitors made from biodegradable plastic will help to reduce plastic waste. For refilling ponds, flushing toilets and watering plants, rainwater will be used to reduce fresh water consumption.

All measures will be guided by the 'ZooDo-GreenTeam', five to six employees from all zoo departments who take the lead in finding long-term measures for a sustainable zoo.

The biggest challenge, though, is the implementation of sustainable energy

and heating resources. Dortmund Zoo relies on fossil fuels for heating – mostly gas, but also electricity. Some buildings date back to the early 1990s and 1980s or even earlier, when using electricity for heating was cheap, and no one really thought about the consequences.

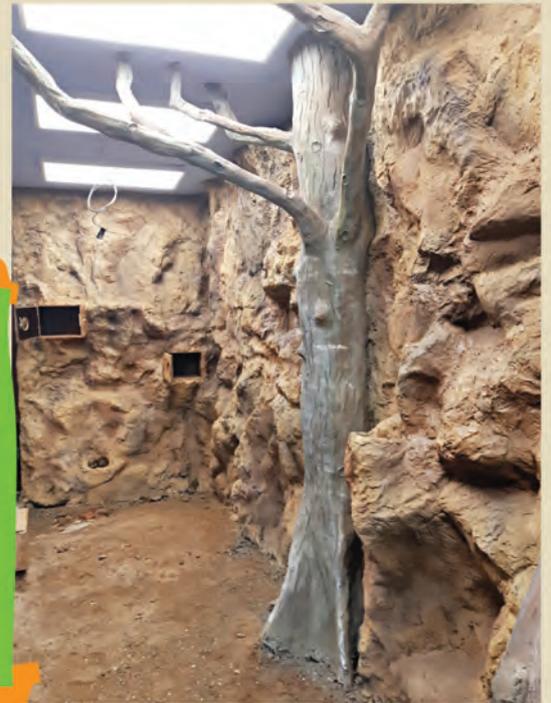
At the moment a feasibility study is being conducted for the use of geothermal energy in cooperation with Eco-Center North Rhine-Westphalia and DEW21 – Dortmunder Energie- und Wasserversorgung GmbH, the city's local energy and water supply company. They prepared a concept called cold heat network, which uses low initial temperatures to lower the heat losses in a network. Even in the surrounding areas of the zoo, sustainable energy resources might be accessible. By doing this, a neighbouring school as well as the tropical houses of the neighbouring Botanical Garden Rombergpark might profit from this system. Preliminary tests showed that geothermal drill holes in combination with solar collectors could provide sufficient thermal energy. Decentralised heat pumps will meet the different temperature needs in each building.

Dortmund Zoo challenged itself to make the heating for its buildings climate-neutral by 2030, so we hope that in a few years' time, using electricity or fossil fuels for our heating will be history.



**Sanero**  
ROCKS & DECORATIONS  
**REALLY ROCK'S MAKERS**

Top rated  
**ROCK ART COMPANY**  
with a team of real experts  
in building exclusive  
modern projects



Hauptstrasse 44, 74219 Möckmühl, Deutschland  
+49.160.99.538.901 \* info@kunstfelsbau.de

[www.kunstfelsbau.de](http://www.kunstfelsbau.de)



# St Laurent

Food and equipment for wild and domestic animals



Tél. : +33 (0)5 49 72 09 20  
Email : [commercial@st-laurent.fr](mailto:commercial@st-laurent.fr)

ZA du BOUILLON - 3, rue du Bouillon  
79430 LA CHAPELLE SAINT LAURENT (FRANCE)

[www.st-laurent.fr](http://www.st-laurent.fr)