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ZOOQUARIA

AUTUMN 2023

ISSUE 119



Small is beautiful

Protecting our most endangered frogs



THE BEAR FACTS

COLLABORATING TO SAVE OUR WILD BEARS

THE OCEAN COALITION

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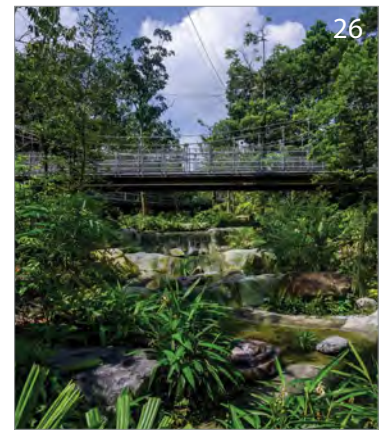
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KEY: a quick guide to frequently used acronyms

CITES: Convention on International Trade in Endangered Species

EEP: EAZA Ex situ Programme

IUCN SSC: International Union for Conservation of Nature Species Survival Commission

LTMP: Long-term Management Plan

RCP: Regional Collection Plan

TAG: Taxon Advisory Group

ZIMS: Zoological Information Management System

Zooquaria

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FROM THE DIRECTOR'S CHAIR

I recently celebrated my 12.5 year work anniversary with EAZA. In addition to realising that the time has flown by, I enjoyed experiencing this Dutch tradition and numerical reasoning of 12.5 being halfway to 25. I am aware that there is a trend for increasingly short turnover periods of staff in organisations; however, I am pleased to share that I am not the first person in the EAZA Executive Office to experience this anniversary, nor indeed the only one this year. This is not to say that some staff turnover is not beneficial – more that achieving a good balance of experienced and new staff is what keeps organisations strong and progressive.

This balance of respecting tradition and embracing change is one that expands to more than work anniversaries. As regular readers of *Zooquaria* will know, EAZA approved a change to our vision in 2021 – from one that focused inwards on developing into a well-organised association to one that was more outwardly focused on what we can achieve as a well-organised association to save species. We also have regular cyclical reviews built into our policies and procedures, from our Accreditation programme to Standards documents to terms for seats on Committees. These reviews don't always have to bring about change; however, they are important for assessing how EAZA is progressing towards the achievement of its vision by meeting internal Member needs and external perceptions and pressures.

There is no doubt that the pace of change is accelerating. It is even more important nowadays to be aware of the drivers of change and the impacts of change on individuals and organisations. I am sure many of you are aware of the Kübler-Ross Change Curve, which tracks productivity and engagement over time from the initiation of a change. The curve predicts various stages such as denial and depression before moving to acceptance and integration. Not everyone is going to be at the same stage in the curve at the same time, and they do need to move through all the different stages if the change is to be effective. What helps change to be embraced and integrated is having good structures in place for inclusive discussion, democratic decision-making, and good communication. These aspects are at the core of how EAZA manages change in order to remain a leading association of progressive zoos and aquariums.

This issue of *Zooquaria* contains many articles that ably demonstrate the balance between respecting tradition and embracing change. From the new EAZA Animal Training Guidelines (built on established training theory and applying this to new species and situations) to outcomes of Regional Collection Planning workshops (agreeing roles and goals for ongoing and new EAZA Ex situ Programmes) and the amazing uptake for the Massive Open Online Course on wildlife reproduction (delivering established and new

knowledge in a changed format) to name but a few. It is clear that professionals throughout EAZA are navigating change towards effective integration and positive outcomes.

I would like to finish with special mention of the conservation database infographics on page 22–23. These infographics are invaluable in our ability to demonstrate the combined activities of EAZA Members towards achieving the 'saving species' part of our vision. I thank all the Members who have been adding their data consistently every year, and those who made a change to add their data this time around. We are able to use the results in our lobby activities and promote the €23.7 million provided in support of conservation in 2022; a welcome increasing trend after the dip caused by COVID-19 restrictions.

Myfanwy Griffith
Executive Director, EAZA

NOTICEBOARD

PROTECTION OF FEED ANIMALS

EAZA Council recently approved a [Position Statement on the protection of feed animals, with a focus on day-old chicks](#). In this document, EAZA supports the ambition of the European Union to be a leader in animal welfare and acknowledges the issue posed by the killing of millions of domestic day-old chicks (*Gallus gallus*) that are considered a byproduct in the laying hen sector. At the same time, however, several million chicks serve as biologically and nutritionally appropriate feed for wild animals in human care, obtained through culling methods recognised and approved by EU law. Therefore, when the killing of day-old chicks is restricted or banned, whether nationally or in EU law, we recommend granting an exemption for the specific purpose of feeding day-old chicks to other animals.

WHAT'S NEW IN ZOO HEALTH?

This year's Zoo and Wildlife Health Conference brought together more than 500 zoo and wildlife veterinarians to the Bioparc Valencia in Spain. The conference began with workshops on topics including elasmobranch medicine, reproductive management of free-ranging wildlife, and great ape cardiovascular disease.

The conference itself was broken into sessions focusing on selected taxa or topics including reptiles, avian disease, public health and elephants. The latest research from some of the European Association of Zoo and Wildlife Veterinarians (EAZWV) members was presented live and was livestreamed online to delegates who couldn't attend in person. Delegates enjoyed catching up at the multiple social events, including the rooftop icebreaker, gala dinner, poster and pasta session and the not-to-be-missed student night out. New EAZWV President Pavel Kvapil (Head Veterinarian at Ljubljana Zoo, Slovenia) provided his closing remarks, which led to a few teary eyes and a well-deserved standing ovation as the delegates said thank you and goodbye to Executive Director, Stephanie Sanderson.

On behalf of the delegates, Veronica

Cowl (EAZA Reproductive Biologist) wishes to thank the EAZWV, the Bioparc Valencia team, and the many students involved for organising such a great event. Many are already looking forward to what next year's conference in Toronto holds!

ANIMAL WELFARE FORUM 2024

The EAZA Animal Welfare Working Group is happy to announce that Parco Natura Viva (Italy) will be hosting the next EAZA Animal Welfare Forum on 19-22 March 2024. The theme of the conference will be 'Knowing me, Knowing you: Understanding individual animal welfare'. Registration will open in October. Save the date!

The organising team is welcoming abstracts for presentations, posters or workshops until 1 October 2023. The abstract should support the forum theme and have a broad application to improving animal welfare in zoos and aquariums.

EAZA is offering five bursaries to help team members from EAZA institutions or organisations, including both Members and Candidates for Membership, to attend the Forum! The bursaries aim to provide zoo and aquarium professionals, whose attendance at the forum is limited due to finances, the opportunity for continuing professional development, which they will use to support application of the EAZA Standards linked to animal training and welfare within the EAZA community. The deadline for applications is 14 November.

Visit the [event page](#) on the EAZA website for information about registration, abstract submission, bursaries and more.



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THANK YOU

Following the call in the June newsletter, 800 articles from 2018 to 2022 have been submitted to the [Zoo Science Library](#)! A massive thank you to all our Members who have entered their data. This growing compilation of your work constitutes a great tool for demonstrating modern zoos' contribution to scientific research. The references will be edited and checked for duplicates in the next few weeks before appearing in the database. If you would like to help with this process or have any questions related to the library, please email zoosciencelibrary@eaza.net.

NEW ARRIVALS



LONG LIVE THE KING COLOBUS

BLACKPOOL ZOO (UK) was happy to announce the birth of a king colobus monkey (*Colobus polykomos*) also known as the Western black-and-white colobus, just in time for Britain's coronation of its own new king. In honour of the new monarch, the zoo gave its latest arrival a very fitting name – Charles.

The king colobus is a West African, forest-dwelling primate, which usually forms multi-male social groups of up to 15 individuals. The word 'colobine' comes from the Greek word *kolobos* meaning mutilated, which refers to their reduced or absent thumbs. This primate is classified as mostly folivorous, with a digestive system specially adapted for foregut fermentation and a large multi-

chambered stomach allowing them to consume vast amounts of foliage as part of their diet.

Blackpool Zoo has successfully bred 37 individuals since their arrival at the zoo in 1995. Charles, who was bright white in colour when born on 3 April 2023 to an experienced female, showed instinctive signs of suckling and was accepted well into the troop. Primate keepers have reported that the offspring is now becoming increasingly independent, spending time interacting with the other individuals, a common behaviour seen in this species, as alloparenting is witnessed in wild populations. Charles has also been seen engaging in play behaviour with the juvenile male and female from last year's breeding success. Not only was

the zoo delighted to welcome one baby this year, but just a month later a second arrival joined the troop, taking the current collection size to 10 individuals (3.5.2). Blackpool Zoo's animal team is working hard to support the future of this species, with a recent transfer of four males to Apenheul (the Netherlands), contributing to the genetic pool in human care.

King colobus are managed across EAZA through an EEP. In May 2023, the EEP Coordinators presented a Long-term Management Plan with requests to increase the current *ex situ* population size and maximise breeding opportunities. Classified as Endangered in the wild, this primate faces a decreasing population trend due to threats such as habitat loss, fragmentation and uncontrolled hunting for bushmeat. The successful breeding of these two recent offspring will contribute to the *ex situ* population and genetic diversity as well as provide opportunities to increase educational awareness of this primate to benefit the *in situ* population. Blackpool Zoo looks forward to continuing the important conservation breeding programme and *ex situ* management of this species for the future.

The EEP is currently looking for new holders to keep this species and anyone interested should contact Carolin Bunert at bunert@zoo-duisburg.de.

COOPERATIVE PROJECT PROVIDES FOSTER PARENTS FOR ROTTERDAM'S VULTURES

ROTTERDAM ZOO (the Netherlands) has been taking care of its current colony of Rüppell's vultures (*Gyps rueppelli*) for 15 years. Successful breeding occurred every now and then, but in very low numbers. During the years, we gained more and more experience in breeding vultures, artificial incubation and foster parent rearing. Since 2020, the decision was made to double-clutch the breeding pairs to increase numbers of this Critically Endangered species. The females of this species lay a replacement egg, approximately four weeks after the first egg is taken to the incubator. If the first egg hatches

in the incubator, the chick is taken care of for up to five days by the keepers before it is brought back to the parents. In this way, the chick gets stronger and the risk of dying in the first days after hatching is greatly reduced. When the chick is returned to the nest, the second egg is taken for artificial incubation.

In 2023 we decided to cooperate with Avifauna Birdpark (the Netherlands) as they also double-clutched their breeding pairs. All eggs were moved to Rotterdam for artificial incubation. Incubation parameters are 36.8°C with 14% relative humidity. Humidity was adapted if necessary to

gain 15–17% weight loss. Egg turning was done automatically, but the eggs were also manually turned over the tip, once a day. Thirteen eggs in total, laid by seven pairs, were incubated. Ten of them hatched successfully. The hatched chicks went to foster parents in both Avifauna Birdpark and Rotterdam Zoo, based on the hatching date and best match and looking at the incubation period of the replacement egg of the (foster) parents. One male pair, which was given a dummy egg and it was accepted. They also reared a chick in Avifauna. After placing eight of the chicks, two were left with no

FIRST OFFSPRING FOR SNOW LEOPARD AT SALZBURG

AS A TYPICAL SNOW LEOPARD (*Uncia uncia*), the young female that came to Salzburg Zoo (Austria) in December 2021 following the EEP Coordinator's recommendation was reserved in her behaviour at first and it took her a while to fully settle in. As she was not sexually mature at the time, the 10-year-old male, who had been living there since 2015, showed no interest in his new partner. Born in April 2019 in Wilhelma Zoo (Germany), the female is a genetically valuable animal. Her grandmother came from the wild after being seized by an anti-poaching unit on the black market.

At the end of 2022, she was in heat and was mated by the male. The team expected her to give birth in the first week of April 2023. Towards the end of the gestation period, it was noticeable that the young cat displayed more sovereignty and also exuded more calmness. Of course, we knew in advance that with a first-time mother, things could go wrong.

Two days before giving birth she started eating less. Thanks to cameras installed above the whelping box, we know that the two cubs were born on 2 April at about 3am. We also observed that the mother accepted her cubs immediately and they both drank for the first time shortly after birth. Despite this being her first litter, the snow leopardess behaved in an exemplary



way and proved to be very caring. She neither left nor ate her cubs, as sometimes happens with first-time mothers. During the first three weeks, she did not want to let the male see the kittens, despite his previous experience as a father.

The two female kittens also developed splendidly. At the first health check, two weeks after birth, both weighed 1.5 kg. They made their first trips to one of the two outdoor enclosures together with their mother at the age of seven weeks. Meanwhile, the male cat used the other outdoor area. Early on, it was observed that one of the sisters was braver than the other and was first in everything, while the other stayed in the background. Very surprisingly and to our dismay, the

reserved youngster died at the age of nine weeks when mother and daughters were in the outdoor enclosure. A definite cause cannot be determined on the basis of the preliminary pathology report. Although blood was found in the lungs, which led to death by suffocation, the findings, which are not yet complete, do not allow any further conclusions. The toxicological report was negative.

Thankfully the second snow leopard offspring continues to develop well. She has now built up a very close bond with her mother and sometimes puts her patience to the test. But even when the cub plays wildly, she always remains the sovereign and sociable cat we know.

available fosters. Safaripark Beekse Bergen (the Netherlands) was contacted, but its pair of Rüppell's vultures refused the chick. Luckily its pair of griffon vultures (*Gyps fulvus*) accepted it. The pair of griffon vultures in Amersfoort Zoo (the Netherlands) was also used as foster parents. Imprinting on the wrong species might be a problem for these two chicks, but it seems better than hand-rearing. Keeping them with conspecifics in the future will exclude the risk of hybridisation.

Overall the EAZA population welcomed 14 chicks, which is a great success for the EEP.



Training for success

THE EAZA ANIMAL TRAINING WORKING GROUP PRESENTS THE NEW 2023 EAZA ANIMAL TRAINING GUIDELINES

Annette Pedersen, EAZA Animal Training Working Group Chair, Copenhagen Zoo

In the EAZA Standards for the Accommodation and Care of Animals in Zoos and Aquaria 2022 it states that 'EAZA recognises that the use of evidence-based training technology can lead to improved animal welfare for animals in managed care. Because of this, training is considered an essential part of animal care.' This is the foundation for the new EAZA Animal Training Guidelines, developed in 2023 by the EAZA Animal Training Working Group (ATWG), spearheaded by group adviser Barbara Heidenreich. As the field is increasingly evidence-based and has advanced tremendously in recent years, these guidelines are a living document, and are expected to evolve as new data and information emerges.

In these new guidelines, animal training is defined as 'intentionally changing behaviour with an awareness and understanding of the principles of behaviour analysis and applying these principles with individuals or groups of animals in managed care'. The goal is more than just to implement behaviour change. It includes an understanding of why a procedure works, and how to apply it to specific animals under specific conditions. Ideally this is also accomplished while optimising welfare, which is defined as maximising possible benefits and minimising possible harms.

The potential beneficial outcomes of training animals in managed care can include voluntary cooperation in medical care, voluntary participation in day-to-day care, and the ability to address undesired responses. However, it also facilitates advances in scientific knowledge and can support conservation efforts. Training can also inspire visitors to care for wildlife, and it can be economically advantageous.

TAKING THE FIRST STEPS

When considering animal training, it may seem hard to know where to start, so the document describes some important foundation behaviours that

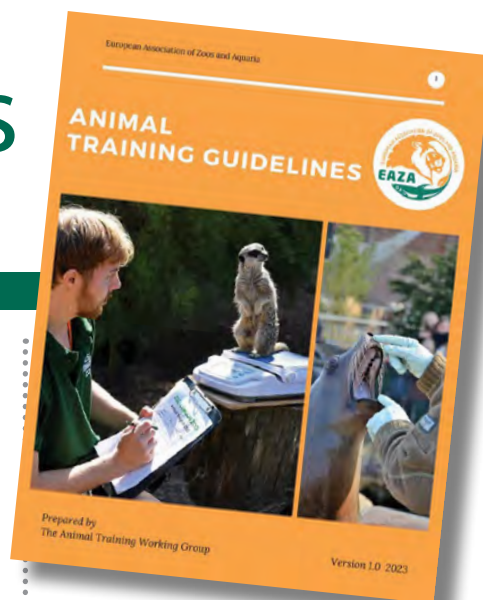
can facilitate day-to-day care for many species. These behaviours are also often used to achieve other behaviour goals such as cooperation in medical care. These foundation behaviours are as follows: 'calm' behaviours, targeting, stationing, shifting, recall, and training for transportation. To help Members visualise these behaviours and other concepts mentioned in the document, there are hyperlinks to a webpage for video examples.

The guidelines also feature a section on generating institutional support for training. Implementing an animal training programme can be difficult without institutional support, and one way of ensuring collection-wide support for a training programme is to involve all stakeholders. Different areas, departments and positions will have a different connection to training and therefore a different way in which they can support it. The guidelines include suggestions on how these departments can be supportive of the training in an institution. These departments can be directors, curators, supervisors, animal caregivers, veterinary staff members, education departments and more.

Animal training draws upon several scientific disciplines defined in the guidelines. For example, *ethology*: the scientific study of animal behaviour, especially as it occurs in a natural environment; *phylogeny*: the natural selection of traits due to genetic inheritance over generations; and *ontogeny*: selection of behaviour by consequences during the lifetime of the individual organism. All three are very important when working with animal behaviour and behaviour change.

UNDERSTANDING ANIMAL BEHAVIOUR

The guidelines also provide a deeper understanding of how animals learn. Many definitions are provided for terms derived from the field of behaviour analysis. Some of these



terms may be more familiar than others, but understanding them provides a foundation upon which all animal training is built. For example, one of the most basic principles to understand is that behaviour is selected by its environment, which leads to the relationship between a behaviour and its consequences. These consequences can either increase or decrease the future probability of a behaviour occurring. Animals may exhibit a behaviour to avoid or escape experiences. They may also exhibit a behaviour to gain access to appetitive experiences such as attention, food, odours and so on. More terms and concepts are covered in the guidelines such as reinforcers (contrived, functional, natural), bridging stimulus, operationalising behaviour, motivating operations, contiguity and others.

Training programmes also need to consider their impact on all stakeholders. The guidelines include a section that alerts Members to the needs of all stakeholders at a facility. Before adding a new behaviour into an animal's repertoire, it is helpful to determine how the existing behaviour affects the welfare, safety and behaviour of different stakeholders, and how the success or failure of the intervention will impact them. This can require trainers to identify all relevant stakeholders. In a zoological setting stakeholders may include direct animal care staff members, veterinary staff members, zoo guests, the focal animal, animals in the same place, neighbouring animals, and so on. The impact on stakeholders is often best determined by conducting a thorough



EASY HEALTH CHECK ON A TRAINED GIANT PANDA (*AILUROPODA MELANOLEUCA*) © COPENHAGEN ZOO

risk/benefit analysis, which can help quantify the decision-making process for those stakeholders.

The section in the guidelines on behaviour change programmes and procedures is a brief introduction to different approaches to address behaviour goals and challenges. This includes an introduction to functional behaviour assessment, non-linear contingency analysis, the constructional approach and so on. An emphasis is placed on individualised function-based training where the specific individual and outcome of the behaviour in question are the focus, as well as the combination of effectiveness (producing intended results), efficiency (minimising use of limited resources) and use of optimal practices (maximising possible benefits and minimising possible harms) is considered when developing a training procedure. This includes avoiding the intentional use of aversive stimuli to inflict pain, fear, anxiety or distress. Understanding that there is no 'one size fits all' or ideal recipe to follow when training animals is very important. This helps emphasise the importance of understanding not only the application, but also the science behind behaviour-change procedures.

FOCUSING ON WELFARE

Ethical considerations encompass all training practices. Training should optimise animal welfare! Therefore, the guidelines support regular risk/benefit analysis of training goals, programmes and procedures. Facilities

should also promote the competency of the practitioners by offering their staff educational opportunities such as courses, workshops and/or online behaviour educational programmes. The guidelines recommend that training should support assent-based programmes (which is a stronger agreement than consent), such as providing the animal the freedom to escape or avoid participation or ensuring the animals have multiple ways in which to access desired reinforcers. The guidelines also promote elevating the collective knowledge of the industry and the ability to improve animal welfare with training by dissemination of information. This includes proper citations and credit for intellectual property.

Another section of the guidelines addresses how to add structure and organisation to an animal training programme. This section covers the roles and potential benefits of oversight of the training programme, from using a training coordinator or behaviour officer, practical application including training and record-keeping by the caregivers themselves, using primary trainers or consultants. Another important part of an animal training programme is data collection, and the guidelines discuss nine different reasons why it is beneficial to collect data and keep records of animal training.

RESOURCES AND TEMPLATES

Finally, the guidelines contain some additional resources which are

hyperlinked. It also includes a training section template for EEPs and TAGs to use when developing other best practice guidelines. This template focuses specifically on animal training, which can be inserted directly into the general best practice guidelines for other species. It provides section headings such as recommended behaviours to train, common behaviour problems observed, recommended props for training, etc. The template ideally will be helpful to those developing the training sections for other best practice guidelines.

The EAZA Animal Training Guidelines are intended to outline some of the elements that most facilities can use and implement right away as well as ideas that may inspire the future development of a training programme. The EAZA ATWG hopes the document will be helpful in understanding and adding structure to your training programme, and when put into practice it can be another step towards optimising the welfare of animals in managed care. The ATWG also provides animal training educational experiences and resources, including workshops and courses under the EAZA Academy, to cover the more practical application of animal training. Your feedback is encouraged. The ATWG hopes that you find the EAZA Animal Training Guidelines useful in achieving your goals.

Download the entire EAZA Animal Training Guidelines from the Best Practice Guidelines section of the EAZA website.



The ocean coalition

THE EU4OCEAN COALITION FOR OCEAN LITERACY AIMS TO IMPROVE OUR KNOWLEDGE OF THE OCEANS AND SPREAD THE WORD THAT WE NEED TO PROTECT THEM AND THE LIFE WITHIN THEM

Laura Myers, EAZA Academy Manager, EAZA Executive Office

How are you connected to the ocean? For some of us the answer is easy – perhaps you live by the coast and the sight and sound of the ocean is a familiar and constant presence; or perhaps your organisation focuses on marine species and you dedicate your time and passion to working with animals from diverse and dynamic ocean ecosystems. Others may have to dig a little deeper to find that connection – perhaps it’s in the food we eat, the imported goods we buy that travel on cargo ships, the shape of the landscape we live in, the ocean-driven patterns of weather and climate that we see are shifting dramatically. However deep you have to look to find the connection, every person in the world is connected to the ocean. It shapes our lives and we, in turn, can change the ocean through our actions.

As vital as the ocean is to our existence, human activity presents an enormous threat to the ocean as we know it – climate change, pollution, and overexploitation of marine resources are three major threats to the ocean, and have negative impacts on our own local seas as well. Managing our oceans responsibly involves a delicate balance between limiting environmental damage and supporting people whose livelihoods depend on the use of the ocean and its resources. We do all have the capacity to create real change by making more sustainable choices; this can be at the level of individual behaviour, but includes creating more ocean-friendly national

and international policies. We are all collectively responsible for maintaining our ocean, and there are many ways we can work to achieve this.

EU4OCEAN COALITION FOR OCEAN LITERACY

One initiative aiming to make positive changes for our interactions with the ocean is the EU4Ocean Coalition for Ocean Literacy. This coalition, funded and supported by the European Commission, was launched in 2020 with the goal of increasing ocean literacy. Specifically, its goals are to increase levels of awareness and engagement among ocean stakeholders, create and develop more ocean advocates and promote ocean literacy as an important item on the EU policy agenda. The coalition started by developing three main components – a platform for organisations and individuals involved in ocean literacy activities, a European Youth Forum for the Ocean and a Network of European Blue Schools.

The second phase of the EU4Ocean coalition development kicked off in January 2023, and for this phase EAZA is involved at an association level. The second phase will involve further expansion of the coalition network, and introduces new concentrations on high-level advocacy and policy work as well as thematic focuses for each year of the campaign. EAZA was invited to participate with the goal of expanding the coalition’s reach and building on the important contributions made

by some of our individual EAZA aquariums in the first phase of the coalition.

EAZA believes that this is an important project to be involved in because it has ties to many other international initiatives and frameworks. We are currently in the UN Decade of Ocean Science for Sustainable Development, and the scope of the coalition has clear links to several UN Sustainable Development Goals such as *Responsible production and consumption* (Goal 12) and *Life below water* (Goal 14). It also ties in with the EAZA21+ campaign and the Kunming-Montreal Global Biodiversity Framework, particularly *Sustainable consumption choices are enabled, and food waste reduced by half* (Target 16). It’s also a way for us to build on the good foundations of the Which Fish? campaign which was so badly affected by the COVID-19 pandemic. EAZA’s role within the coalition will centre on communication and awareness-raising, supporting the expansion of the EU4Ocean platform and capacity-building among our membership.

WHAT CAN YOU EXPECT FROM EAZA DURING THIS NEW PHASE OF THE COALITION?

You may have already noticed a more oceanic flavour to some of our communications – EAZA is committed to raising awareness of the EU4Ocean coalition and ocean literacy activities in general across our media platforms. You can expect to see more posts from

us sharing opportunities for funding and engagement with EU4Ocean and highlighting marine issues, and of course we will continue to celebrate the great ocean literacy advocacy going on among the membership.

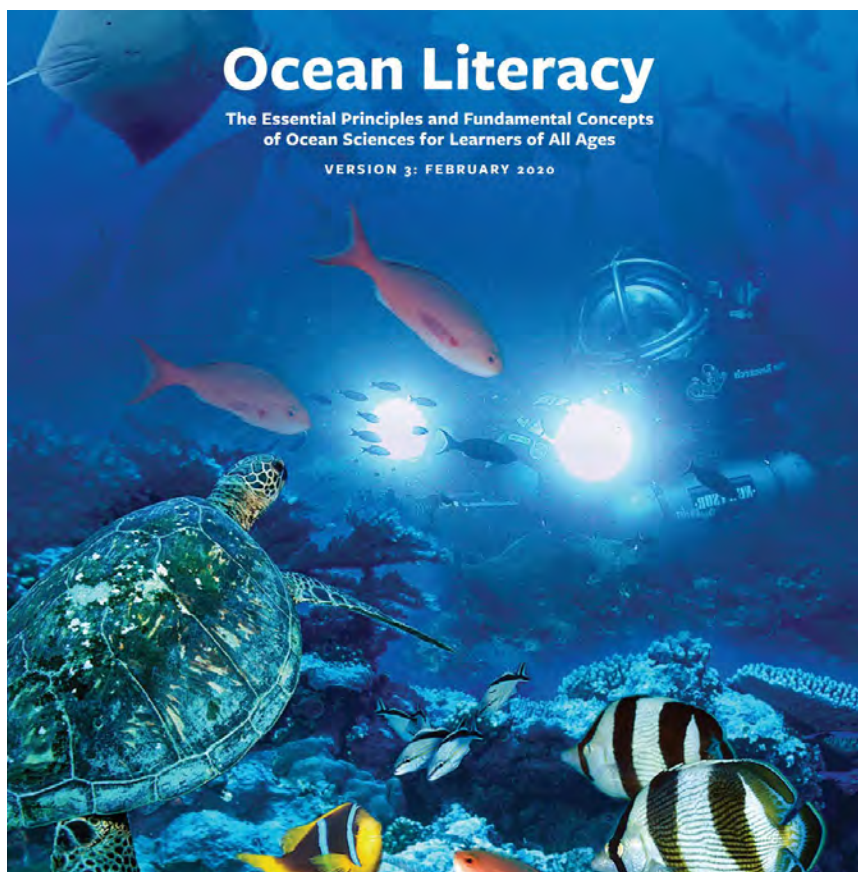
We're also committed to providing space and time to discuss all things blue at EAZA events, so look out for more sessions and themes highlighting the ocean, and presentations and discussions from other coalition members over the next couple of years. Participating in the coalition will also give EAZA access and a voice at other ocean-focused events and open up new possibilities and audiences for the association.

Finally, we want to build capacity among our Members to become ocean advocates and inspire and enable our visitors and learners to become ocean advocates too. In order to do this we will develop and deliver an online course in 2024 focusing on supporting EAZA Members to deliver more ocean literacy content as part of their education offering.

HOW CAN YOU GET MORE INVOLVED?

If you're already doing work focused on ocean literacy, we encourage you to share that through EAZA channels, especially where there are opportunities for other EAZA Members to get involved or learn from your experience. We also encourage to apply for EU4Ocean funding for any relevant projects you are coordinating, as each year the coalition will identify a challenge of the year with associated funding, communication, and platform work centred upon it. Look out for information about funding application deadlines on EAZA social media or in eNews.

We also encourage our Members engaging in ocean literacy work to participate in the EU4Ocean platform (<https://maritime-forum.ec.europa.eu/en/node/4509>). You can sign up to the platform as an organisation or an individual, and in the coming years the platform will develop further as a useful tool for potential collaborators to find each other, and for ocean advocates to network and support each other. For EAZA Members, participating in the platform could be a gateway to future collaborative



WHAT IS OCEAN LITERACY?

In its simplest terms, being ocean literate means that you understand both your impact on the ocean and the ocean's impact on you. It also means being able to communicate this knowledge and being able to apply it to make informed decisions about the impact of your actions on the ocean.

The term was first created in 2004 in the USA and has since expanded globally. Ocean literacy is underpinned by seven Ocean Literacy Principles:

- #1: The Earth has one big ocean with many features.
- #2: The ocean and life in the ocean shape the features of Earth.
- #3: The ocean is a major influence on weather and climate.
- #4: The ocean made the Earth habitable.
- #5: The ocean supports a great diversity of life and ecosystems.
- #6: The ocean and humans are inextricably interconnected.
- #7: The ocean is largely unexplored.

Applying Ocean Literacy Principles started with formal education but has now expanded to cover informal education and community engagement work. The initial focus on knowledge gain has also changed to reflect our current understanding that behaviour change paradigms are more complex than simply increasing an individual's knowledge to drive a change in attitudes and behaviour.

To learn more about the concept of ocean literacy, visit UNESCO's Ocean Literacy Portal (<https://oceanliteracy.unesco.org>).

work with youth organisations or with schools and provide opportunities for powerful long-term engagement initiatives that can have a real and measurable impact.

Finally, we also encourage you all to take some time to consider your own connection to the ocean. If it's not part of your daily life, it can be easy to overlook as we focus on our own needs and other pressing

conservation priorities, but we mustn't lose sight of the importance of the ocean – life as we know it could not exist without it, but our activities can cause tremendous harm to ocean environments. Find that connection and consider what pro-ocean changes you can make, as an individual, at an organisational level, as part of a community, or a nation. Let's all become ocean advocates.

Optimising conservation education

GETTING OUR CONSERVATION MESSAGE ACROSS IS OFTEN A CHALLENGING PART OF OUR WORK, BUT THERE ARE MANY STRATEGIES TO HELP ZOOS AND AQUARIUMS OPTIMISE CONSERVATION EDUCATION

Alice Albertini, EAZA21+ Campaign Coordinator, and Laura Myers, EAZA Academy Manager, EAZA Executive Office

Conservation education takes many forms. It addresses a mixed audience of individuals and communities, and uses different methods to raise awareness, connect people to nature and encourage sustainable behaviours. Although EAZA zoos and aquariums play a major role in receiving and educating more than 140 million visitors per year, building a culture of conservation education and providing evidence of our impact is still challenging. How can we be more effective?

EAZA CONSERVATION EDUCATION STANDARDS

Conservation education is a key pillar of the EAZA21+ Campaign. In a recent webinar*, we highlighted the importance of education and behaviour change for the success of the Kunming-Montreal Global Biodiversity Framework (GBF). Although the GBF has not yet provided SMART (specific, measurable, achievable, relevant and time-bound) indicators for educational activities, it did emphasise the need for transformative, innovative and transdisciplinary education. Zoos and aquariums can rely on valuable resources such as the new EAZA Conservation Education Standards (CES) and the WAZA Conservation Education Strategy. These recognise the diversity of conservation education and the need to cater to various audiences and contexts with different goals, from knowledge gain and nature connectedness to behaviour change. They also underline a holistic and strategic approach, designing learning interventions with clear objectives aligned with your strategic goals, and regular evaluation of success.

MEASURE YOUR IMPACT

Zoos and aquariums are well placed to contribute to behaviour change for nature through their diverse conservation education programmes.

To ensure success, it is crucial to promote evidence-based actions and measure their impact. 'If we want to achieve a behaviour change, such as sustainable consumption choices, and see an effect in our target group, it's important to design a programme around the behaviours that we want to see change,' explains Georgina Spyres (Athena Research Center, Greece, and adviser to the EAZA Conservation Education Committee) during the EAZA21+ webinar.

Zoos Victoria (Australia) has been a global leader in encouraging pro-conservation behaviours. Using their Connect-Understand-Act model, they designed a series of successful community conservation campaigns such as 'Wipe for wildlife' and 'When balloons fly, seabirds die'. Chester Zoo (UK) launched the 'Sustainable Palm Oil' campaign, a multi-stakeholder initiative aiming for meaningful change and quantifiable impact, making Chester the world's first sustainable palm oil city. These examples demonstrate how zoos and aquariums can contribute to GBF Target 16 (*Sustainable consumption choices are enabled, and food waste reduced by half*) and drive changes in sustainable consumption, from individual visitors to business owners to regional governments. Following these processes can make a great impact even at the smallest scale, and collaboration can amplify our efforts.

INSPIRE AND BE INSPIRED

The EAZA CES offer many footholds to start writing and updating your zoo's conservation education strategy. Further inspirations come directly from the work of our colleagues. For instance, Dublin Zoo (Ireland) has just released its Conservation Education Master Plan, which resulted from strategic planning that examined the practices of other zoos and aquariums and national education policies together with WAZA, EAZA and BIAZA standards. During the EAZA21+ webinar, Aileen Tennant (Head of Discovery and Learning at Dublin Zoo) shared many benefits that the zoo has recognised, such as:

- Measuring the zoo's conservation education impact
- Improving opportunities for forward planning and resource planning
- Aligning the team members to a shared vision
- Supporting managers in understanding training needs
- Better engaging with internal and external stakeholders, and gathering support from funders and partners

INSPIRE AND BE INSPIRED

A conservation education strategy can bring you lots of benefits. Which would you like to aim for? Start by listing them, reaching out to colleagues from other zoos, sharing and using resources and templates. And don't forget to celebrate your own journey!

HOW TO START YOUR ZOO CONSERVATION EDUCATION STRATEGY

- Think before you write. Start with answering key questions: 'Where are we now?', 'Where do we want to get to?' and 'How do we get there?' The results of this brainstorming will lay the foundation of your plan.
- Look at your organisation's vision and mission and identify how education fits into those statements.
- A useful exercise is to assess your current education activities and whether they match your strategic goals and the EAZA CES.
- Collaboration is key! Identify your stakeholders early and involve them in your planning process. You don't have to engage with them all at the same time.

*EAZA Members can access EAZA21+ webinar recordings in the EAZA Member Area and on the EAZA21+ Facebook page – scan the QR code for direct access.



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Freshwater challenge

FRESHWATER HABITATS ARE HOME TO 15,000 SPECIES OF FISH, AND YET VERY FEW OF THESE ARE KEPT IN AQUARIUMS, DESPITE MANY BEING ENDANGERED OR EXTINCT IN THE WILD. THREE EEP COORDINATORS EXPLAIN WHY THEY URGENTLY NEED MORE INSTITUTIONS TO FIND ROOM FOR THESE THREATENED SPECIES.

Markéta Rejlková, Poeciliidae EEP Coordinator, Ostrava Zoo; Alex Cliffe, Cyprinodontidae inc. Aphaniidae EEP Coordinator, ZSL Whipsnade Zoo; Charles Fusari, Bedotiidae EEP Coordinator, Bristol Zoo Project

You don't need to spend a lot of money or build a large facility to help save a species. A small exhibition aquarium can please the eye of the visitor and at the same time serve a conservation mission. Are you saying that you don't have a free tank or it doesn't fit into the exhibition concept? You can actually do this on your desk – see that empty corner?

Fresh water covers less than 1% of the Earth's surface, but it is home to 15,000 species of fish. This is an enormous diversity, and yet we find surprisingly few freshwater fish species in zoos and aquariums. These are often fish that are pretty or easy to keep. We show visitors fancy breeding forms that they can buy themselves at any time in the pet store. When did we forget the power of story? Why have we abandoned our mission of conservation and education? Freshwater fish are among the most endangered groups of animal and there is no reason why every zoo or aquarium should not be involved in their breeding and contribute significantly to species conservation.

Endangered fish are available in many sizes, geographic origins and demands. The choice is large (unfortunately). With few exceptions, freshwater fish are not large, attractive animals. But their story is powerful, and including them in the collection means allowing visitors a glimpse into the underwater world and direct contact with creatures that would otherwise remain just a scientific name on the list of species that are Extinct in the Wild or approaching that fate.

The fight for water affects everyone on the planet, but fish mostly remain nameless and voiceless victims. However we can easily present their story to the public. Fish are a symbol of our care for rivers, lakes and wetlands. When they are able to face threats and thrive, or return to their original habitat, it is confirmation that

this critically important piece of our environment is functioning properly again. Our institutions can directly participate in this, not only by raising awareness, but also by participating in conservation breeding of endangered species.

Here we present a small selection of species whose story might appeal to your visitors. They represent different types of environment and at the same time typical threats that freshwater habitats face today.



LINKEI'S LIQUORICE GOURAMI
© MARKÉTA REJLKOVÁ, OSTRAVA ZOO

LINKEI'S LIQUORICE GOURAMI (*Parosphromenus linkei*)

- Origin: Kalimantan Tengah, Indonesia
- Minimum tank size: 20 litres
- Special requirements: ideally blackwater conditions or at least soft water, live food

Liquorice gourami are small and very graceful fish, but they tend to be shy. They are like a hidden gem in disappearing forests. They inhabit blackwaters, especially small wetlands, which are drained and destroyed during deforestation and conversion of land to agricultural use. The genus *Parosphromenus*, with more than 20 described species, represents one of the most endangered groups of fish in Southeast Asia.

Liquorice gourami are generally not easy to keep. The blackwater environment is specific and it is necessary to imitate it in the aquarium. But if you are considering including these gems in a forest exhibit or keeping them behind

the scenes and contribute to maintaining an insurance population, *Parosphromenus linkei* (classified as Endangered) is a great choice to start with. It is less demanding to strictly observe the conditions, and keeping and breeding is possible even at a higher pH.



MÚZQUIZ PLATY (*Xiphophorus meyeri*)

- Origin: Coahuila, Mexico
- Minimum tank size: 40 litres
- Special requirements: temperature 22–25°C with cooler period (16–22°C)

This little grey fish with conspicuous black spots lived in a single spring on the outskirts of the city Múzquiz. At the time of its discovery in the 1980s, the environment was already heavily affected by humans – the typical location is a swimming pool in the municipal park! The species was last seen in 1997, after which the site temporarily dried up due to excessive water usage. This species exists only in aquariums; as of 2019, it is officially classified as Extinct in the Wild. The pools in Múzquiz are now inhabited by other species of native fish and conditions appear to be favourable, unless the drought returns, as has been the case regularly in recent years. It is not yet time for reintroduction, so continuing conservation breeding is essential.

Omnivorous and viviparous, it can be kept in large groups and attractively planted aquariums. It requires oxygenated and clean water and the care of an experienced keeper,

but long-term successful breeding is manageable in simple conditions.



ACIGÖL KILLIFISH © ALEX CLIFFE, ZSL WHIPSDADE ZOO

ACIGÖL KILLIFISH

(*Anatolichthys transgrediens*)

- Origin: Lake Acigöl, Turkey
- Minimum tank size: 50 litres
- Special requirements: temperature range (16°C winter and 24°C summer)

This killifish is endemic to Lake Acigöl, Turkey and is classified as Critically Endangered due to invasive species and habitat loss. It is now only found in one viable tributary, which, if compromised, could force this small fish to the brink of extinction. The name *transgrediens* means 'transgressing across a gradient' as they are often found swimming between varying salinities in the lake.

It has been formally recognised as a priority species within the EAZA Freshwater Teleost TAG, and the EEP Coordinator is actively working with in-country partners to try and save this species. It is important to increase the representation of this species within zoos and aquariums to ensure that insurance populations are robust.

It is a seasonal egg-layer, and the males have vertical stripes, whereas the females are speckled. Feeding on small invertebrates, they are an active species and prefer oxygenated and clear water in planted aquariums to thrive.



JOBA MENA © BRIAN ZIMMERMAN, ZSL LONDON ZOO

JOBA MENA

(*Ptychochromis insolitus*)

- Origin: Marotandrano, Madagascar
- Minimum tank size: 300 litres

- Special requirements: enough features (rocks, wood, etc) for territories and breeding

This 'gorgeously ugly' fish lives in the Amboaboa river, in the north-east of Madagascar. The species was classified as Critically Endangered in 2004 and was known to occupy the Mangarahara river basin. In 2013, only three males remained in aquariums globally following the death of the last female. By then, habitat information suggested that the species was potentially Extinct in the Wild. The ZSL London Zoo Aquarium (UK), which held two of the last males, launched an urgent press campaign to find a female and save the species from extinction.

Sixty-three million people saw the campaign and a clue led the London team to Madagascar, where they discovered an isolated population near the Amboaboa river, downstream from the village of Marotandrano. Nineteen individuals of this species were captured and placed in a pond in Madagascar to be bred as a rescue population. The fish reproduced successfully, and some individuals were then sent to zoological institutions in North America and Europe. Today, thousands of joba mena swim in zoos and public aquariums, and this fish is no longer on the brink of extinction.

GOLDEN MAHSEER

(*Tor putitora*)

- Origin: montane and submontane rivers in South Himalayan region
- Minimum tank size: 8,000 litres
- Special requirements: fast-flowing, oxygenated water

Habitat degradation affects this species in a similar way to the aforementioned fish. But there is also another element – it is a popular food fish and trophy for anglers. Overfishing takes a toll, and both the mahseer population and individual size have decreased significantly over recent decades. The golden mahseer is categorised as Endangered by the IUCN. There are various activities in place to boost its population, including the controversial release outside the native range.

As conservation programmes, including artificial breeding, operate in the countries of occurrence, it might seem that there is no role for this species in the tanks of European zoos and aquariums. But why stock large display tanks with big fish that have no conservation value and do not carry a message about the threats against the freshwater world and how difficult it is to repair the damage done to nature? The golden mahseer will help us show this to visitors. And most importantly, breeding is possible and has been repeatedly achieved even in an exhibition aquarium.

THE CONSERVATION MISSION

As we revise our institutions' animal collections, there is always an opportunity to lean more towards the mission of species conservation. Aquariums are not a marginal sector for our efforts – on the contrary. The EAZA Freshwater Teleost TAG and individual EEP Coordinators are happy to assist curators in their meaningful selection of fish that have a story to tell and/or need our help.



GOLDEN MAHSEER
© MARKĚTA REJLKOVÁ, OSTRAVA ZOO

The vital role of the registrar

HOW THE WORK OF AN AQUARIUM REGISTRAR IS AN INVALUABLE PART OF THE CONSERVATION OF ENDANGERED SPECIES

Ana Ferreira, Science and Conservation Officer, Oceanário de Lisboa; Beatriz Dominguez, Assistant Director, Oceanogràfic Valencia



Effective data management is vital for successful species management in various contexts, including aquariums, zoos and conservation programmes.

Accurate and comprehensive data enables managers to make informed decisions, understand species dynamics, track population trends and implement targeted conservation strategies.

Terrestrial species have been studied and kept in human care for many decades, leading to a wealth of data mostly on individual organisms. However, when it comes to aquatic species, especially those housed in aquariums, data management becomes even more challenging. Aquatic species biology is not so extensively known and there are still many husbandry goals to be achieved, particularly when dealing with group records instead of individuals. In aquariums, group records provide less specific information compared to individuals, making data retrieval and analysis more difficult.

Group-based management can also be more complex for species with intricate life histories, such as fish, invertebrates and plants. Unlike larger-bodied species such as birds and mammals, individual identification is not always feasible for group-managed species. Additionally, resource constraints may limit the extent of data collection efforts. The trade-off between time and detail in data collection is crucial. Managers must prioritise data collection efforts based on the species' characteristics and management goals. Striking a balance between gathering detailed data and practical data collection is essential.

THE POWER OF DATA

Major advances in data collection have been accomplished over the last decades and aquariums are currently an important source of valuable information on endangered species such as corals, sharks and rays. As several endangered species are quite complex to study *in situ*, aquariums and similar institutions are uniquely placed to study and collect data from animals that they have held, in several cases, for many decades. It is possible to follow the same individuals over time, learning about their behaviour, biometrics, reproduction and so much more, thus contributing to increasing species knowledge that can then be applied in effective conservation actions.

Species management grew from merely inventory status reports to growth, nutrition, breeding and welfare analysis. Recently there was a significant global investment made by aquariums to promote research and develop species reproduction, aligned with new technologies like cryopreservation or genetic biobank initiatives.

A comprehensive understanding of species biology is necessary to plan data collection for management purposes. Species-specific factors, such as reproductive strategies, behavioural dynamics and environmental effects, influence the type of data required.

Data standards are essential for animal management in aquariums, to ensure consistency and comparability of information between individuals or groups and within groups over time. Modern software programmes have evolved to accommodate individual and group records, providing better flexibility and support for data entry and retrieval.

Global databases are being built and shared between institutions. This information is also integrating many research studies, and is being published and communicated to the scientific community as well as the general public.

Data conventions, including established data standards and validation methods, are critical for accurate data recording and quality. Validation methods help to identify and rectify errors, ensuring data integrity and reliability.

Before data collection, defining the managed species' strategy is essential. This involves considering all possible events and data related to the individual or group to effectively track and manage their dynamics. Core transaction data for aquatic animals' management includes species identification, census data, birth and death records, transfers and milestone life events. Properly documenting these core data points provides valuable information for ongoing analysis and decision-making. Many aquariums have therefore allocated specific resources to deal with this challenging work, integrating the registrar role within their teams.

THE ROLE OF AN ANIMAL REGISTRAR

The life of an animal registrar at an aquarium is a unique and fulfilling experience that involves a diverse set of responsibilities, tasks and rewards. The registrar plays a key role in maintaining comprehensive records, ensuring compliance with regulations, coordinating animal transfers and contributing to conservation efforts. In this role, they work closely with various departments, such as animal care, veterinary services and education, to support the aquarium's mission of



L-R: ZEBRA SHARK (*STEGOSTOMA TIGRINUM*) TRAINING; ARRIVAL OF A LARGETOOTH SAWFISH (*PRISTIS PRISTIS*) © EMILIO BADILLO, OCEANOGRÀFIC VALENCIA; MARINE AQUARIUM AT OCEANOGRÀFIC VALENCIA © ANDREA SPINELLI

conservation, education and animal welfare. The responsibilities of an animal registrar at an aquarium, while sharing some similarities with their counterparts in zoos, present distinct differences that make this role particularly engaging.

The daily routine of an animal registrar at an aquarium typically begins with meticulously updating and maintaining animal records. They keep track of essential information about each individual or group, such as their identification, health history, feeding habits, and behavioural observations. This level of attention to detail is crucial to ensure the wellbeing and proper management of the aquarium's diverse animal collection. Accurate record-keeping serves as a valuable resource for researchers, veterinarians, and animal keepers, enabling them to make informed decisions about animal care and health.

While in a zoo the focus may be on land-dwelling animals, the aquatic nature of an aquarium adds complexity to the role. Aquatic species require specialised care and ensuring the water quality and proper environmental conditions that are crucial for their health and longevity.

Animal transfers and acquisitions are significant aspects of the animal registrar's responsibilities at an aquarium, as they work closely with other institutions to support breeding programmes and conservation efforts. The logistics involved in moving aquatic species require careful planning and coordination. Unlike terrestrial animals, transporting marine creatures can be more challenging due to the need for appropriate transport containers, water quality considerations and

health assessments before and after the transfer. The registrar's ability to manage these transfers efficiently contributes to the broader goals of species preservation and genetic diversity among populations in human care.

Despite these differences, the fundamental role of a registrar remains consistent in both settings; whether it's an aquarium or a zoo, animal registrars play a crucial role in supporting animal care, conservation, education and research efforts, making their work deeply rewarding and impactful.

THE CONSERVATION ROLE

One of the most rewarding aspects of working as an animal registrar at an aquarium is the opportunity to contribute actively to conservation initiatives. Many aquariums are actively involved in breeding programmes for endangered species, aiming to replenish populations in the wild and raise awareness about conservation challenges. The animal registrar's role in managing populations and maintaining genetic records is crucial to the success of such programmes. Being part of efforts to preserve endangered species and witnessing the growth of successful breeding programmes can be deeply fulfilling for a registrar, knowing that their work directly contributes to the protection and survival of these species for future generations.

Another significant advantage of working as an animal registrar at an aquarium is the ability to engage with visitors and educate them about marine life and conservation. Aquariums often have educational programmes and interactive exhibits designed to raise awareness about marine ecosystems and the

importance of conservation. Animal registrars may participate in these programmes, offering insights into the individual animals and their conservation status, further connecting the public to the animals and fostering a sense of responsibility for their well-being.

The diverse and dynamic environment of an aquarium, with constantly evolving challenges and opportunities, adds excitement to the life of an animal registrar. The variety of aquatic species and the ever-changing landscape of marine conservation make each day unique and inspiring. Additionally, the role offers ample opportunities for professional growth and development, allowing animal registrars to stay updated on the latest advancements in animal care, data management, and conservation practices.

In conclusion, data management is a vital aspect of species management for aquariums and conservation programmes. In the hands of an animal registrar this work is performed as a fulfilling and impactful journey. The distinction of working at an aquarium lies mostly in the aquatic nature of these complex environments, the focus on interconnecting various departments, and the specialised care required for marine species. The role's best part is the opportunity to actively contribute to conservation initiatives, engage with visitors, and witness the positive impact of this work on animal welfare and species preservation. The life of an animal registrar at an aquarium is an extraordinary and rewarding experience that connects the registrar to the awe-inspiring world of marine life and the vital mission of conservation and education.

Vanishing jewels

A RECENT RCP WORKSHOP IDENTIFIED A NUMBER OF FROG SPECIES IN URGENT NEED OF PROTECTION, THANKS TO THE COMBINED EFFECTS OF ILLEGAL TRADING, DISEASE AND HABITAT DESTRUCTION

Gerardo Garcia, EAZA Amphibian TAG Chair, Chester Zoo; Olivier Marquis, EAZA Amphibian TAG Vice Chair, Paris Zoo; and Benjamin Tapley, EAZA Amphibian TAG Vice Chair, ZSL London Zoo and ZSL Whipsnade Zoo

Most frogs are small, brown and nocturnal and therefore extremely difficult to exhibit. Conversely, many frogs of the subfamily Dendrobatinae are brightly coloured and diurnal, making this group the ideal candidates to engage zoo visitors with amphibians and amphibian conservation. This group of amphibians also includes the infamous poison dart frogs; the golden poison frog (*Phyllobates terribilis*) is reported to be the most toxic amphibian on the planet (Daly et al., 2005). Dart frogs also exhibit a vast array of fascinating behaviours. Many are excellent parents; some carry tadpoles to water and go to great lengths to select optimal larval development sites while others feed tadpoles infertile eggs (see Wells, 2007 for an overview).

These charismatic frogs are highly prized by collectors and hobbyists (e.g., Lötters et al., 2007; Auliya et al., 2016). The illegal trade in Dendrobatinae continues to threaten the wild populations of many species. All frogs of the family Dendrobatinae are included in Appendix II of CITES as the international trade is recognised as a threat. Despite the regulation

of the international trade, many Dendrobatinae species continue to be negatively affected by illegal trafficking. In addition, habitat loss and infectious diseases are driving the decline of many species.

The neotropics are not just home to poison dart frogs. A diverse array of other highly charismatic amphibians hail from the region including the unusually named mountain chicken frog (*Leptodactylus fallax*), a species that underwent the fastest ever documented decline of a vertebrate due to the emergence of chytridiomycosis (Hudson et al., 2016); the Titicaca water frog (*Telmatobius culeus*) which is the largest aquatic frog in the world and in some parts of its range is blended live and drunk as an aphrodisiac (Quispe et al., 2023); and the vivid green, arboreal frogs of the genus *Agalychnis* from Central America.

The EAZA Amphibian TAG prioritised these amphibians for the second Regional Collection Programme following the new process. To guide the process, the TAG used the IUCN Red List, noted if species were considered a global conservation priority given their

evolutionary distinctiveness and global endangerment (EDGE species), clustered species by EAZA/*ex situ* holdings and looked at the outputs of the Amphibian Ark Conservation Needs Assessment process (Johnson et al., 2020) to identify the role of each species. As well as the 61 species of the Family Dendrobatinae, the Amphibian TAG included four other neotropical amphibians in the RCP: the mountain chicken frog, the Titicaca water frog, the lemur leaf frog (*Agalychnis lemur*) and Morelet's treefrog (*Agalychnis moreletii*) as they are species either already managed as an EEP or of particular interest to the EAZA community.

These 65 species were evaluated during a two-day workshop that was hosted by the EAZA Executive Office in 2022. The outputs of the RCP process include the creation of four new EEPs, the assignment of 21 species to the Mon-T category (Monitored by TAG) and 36 species assigned to Mon-T DNO (Do Not Obtain). New EEPs have been recommended for the Marañón poison frog (*Excidobates mysteriosus*); *Oophaga anchicayensis*; Vicente's poison frog (*O. vicentei*) and a

Scientific name	Common name	IUCN Status	Direct conservation roles	Indirect conservation roles	Non-conservation roles	Programme decision
<i>Excidobates mysteriosus</i>	Marañón poison frog	EN	Insurance, Research (conservation & vet)/ Model	-	Exhibit	EEP
<i>Oophaga anchicayensis</i>	<i>Oophaga anchicayensis</i>	EN	Research (<i>in situ</i>), Research (genetic), Insurance	Research (husbandry)	Exhibit	EEP
<i>Oophaga vicentei</i>	Vicente's poison frog	EN	Insurance, Research (<i>in situ</i>)	Research (husbandry)	Exhibit	EEP
<i>Phyllobates bicolor</i>	Black-legged poison frog	EN	Insurance	Research (genetic), Research (husbandry)	Exhibit	EEP*
<i>Phyllobates terribilis</i>	Golden poison frog	EN	Insurance	Research (genetic), Education (out of range), Research (vet), Research (husbandry)	Exhibit	EEP*
<i>Agalychnis lemur</i>	Lemur leaf frog	CR	Source, Research (<i>in situ</i>), Insurance	-	-	EEP
<i>Agalychnis moreletii</i>	Morelet's treefrog	LC	Insurance, Capacity building (in range)	-	-	EEP
<i>Leptodactylus fallax</i>	Mountain chicken	CR	Rescue, Population restoration (reintroduction), Population restoration (reinforcement), Insurance Education (in range)	Education (out of range), Capacity building, Fundraising, Ambassador	Exhibit	EEP

* *PHYLLOBATES TERRIBILIS* AND *PHYLLOBATES BICOLOR* FALL UNDER THE SAME EEP

combined EEP for the golden poison frog and black-legged poison frog (*Phyllobates bicolor*). The mountain chicken frog, lemur leaf frog and Morelet's treefrog will continue to be managed as EEPs (see table above).

What may be surprising to some readers is the number of species that were assessed as Mon-T DNO. According to the IUCN, biological resource use is a threat that affects 37 of the Dendrobatinae included in this RCP. As many of the taxa that have been assessed during this RCP process are not currently held in EAZA institutions, the EAZA Amphibian TAG adopted the stance that Members should not obtain species that are not currently held in zoos and aquariums, because we do not want our community to drive the demand for the trade in these frogs and because we cannot always be sure of the provenance of animals acquired from the private sector. Some species present in the pet trade have never been legally exported from range states (Auliya et al., 2016). We acknowledge that in certain instances, animals seized from the illegal wildlife trade could be offered to zoos by national agencies. In such instances, we encourage potential holders to discuss the acquisition with

EAZA and to enquire whether relevant agencies from the range state of the seized animal have been alerted to the seizure.

The EAZA Amphibian TAG is actively looking for people to fill the positions of EEP Coordinators for the species in green. Please contact the authors if you are interested in taking on the role for any of these species.

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Reproduction matters

A NEW ONLINE LEARNING RESOURCE AIMS TO IMPROVE OUR UNDERSTANDING OF ZOO AND WILDLIFE REPRODUCTION AND THE ROLE IT PLAYS IN POPULATION MANAGEMENT AND SUSTAINABILITY

Isabel Callealta, Adviser to the EAZA Reproductive Management Group, ECOLifes, Reproduction and Ultrasound Veterinary Services; and Veronica Cowl, Reproductive Biologist, EAZA Executive Office

The *ex situ* maintenance of healthy and breeding genetic reservoirs is becoming increasingly important as an estimated one in seven threatened species is housed in zoos and aquariums (Fa et al., 2011). However, many *ex situ* populations are currently unsustainable; a review of more than 110,000 breeding recommendations found that as few as 20% of recommended pairs successfully bred before a new recommendation was issued (Faust et al., 2019). While the failure to produce offspring may arise for various reasons, increasing our understanding of animal reproduction is vital for improving population sustainability (Holt et al., 2014 and Powell et al., 2019).

Simultaneously, and despite current rates of extinction, some *in situ* populations are reaching undesirably high numbers, exacerbating the carrying capacity of their ecosystem and leading to human-wildlife conflict or ecological damage (Fagerstone, 2002 and Massei and Cowan, 2015). Understanding reproductive biology *in situ*, as well as the financial, legal, safety and welfare complexities of using reproductive control methods, can be more challenging than when working with a population in human care. Nonetheless, *in situ* wildlife fertility control becomes increasingly important as human populations continue to encroach on natural habitats.

In order to achieve *ex situ* and *in situ* sustainable populations without impacting the reproductive potential and the welfare of the animals, it is fundamental to have a comprehensive approach to reproductive management, and therefore to have a good understanding of the options available.

THE ROLE OF REPRODUCTION MANAGEMENT

The role of reproduction management

in zoos and wildlife settings is to achieve the final goal of maintaining healthy, sustainable, breeding populations. In a nutshell, this can be accomplished by either enhancing or limiting breeding according to short-term and/or long-term population needs.

The two complementary aspects of reproductive management are:

- **Enhancing reproduction:** using husbandry information and Studbook data, together with full reproductive health assessments, to help identify and understand what factors contribute to the fertility or subfertility of a single individual, a breeding pair, or the whole population in a breeding programme, to ultimately improve natural breeding. Assisted reproductive techniques, such as artificial insemination or embryo transfer, could help to link incompatible individuals and unconnected populations by exchanging genetic material without the risks and challenges associated with introduction or translocation. These reproductive techniques could also help to transfer genetic information between *in situ* and *ex situ* populations, without the risks associated with the relocation of an individual animal raised under unnatural conditions (Lueders and Allen, 2020).
- **Limiting reproduction:** there are several methods with which one can manage population size including social, chemical and/or surgical contraception as well as management euthanasia. These methods may help population sustainability in terms of genetic management (overrepresentation, inbreeding) and animal welfare (for example by mitigating against excessive testosterone-related aggression, reproductive pathology treatment and/or prevention), but each comes with its own set of

considerations for the health and welfare of the individual, as well as the impact on the population.

In addition, lifetime reproductive planning and genome resource biobanking (i.e. methodical collection, storage and distribution of genes from threatened species) ultimately become safeguards in this race against the clock for population unsustainability and extinction.

FILLING THE KNOWLEDGE GAPS

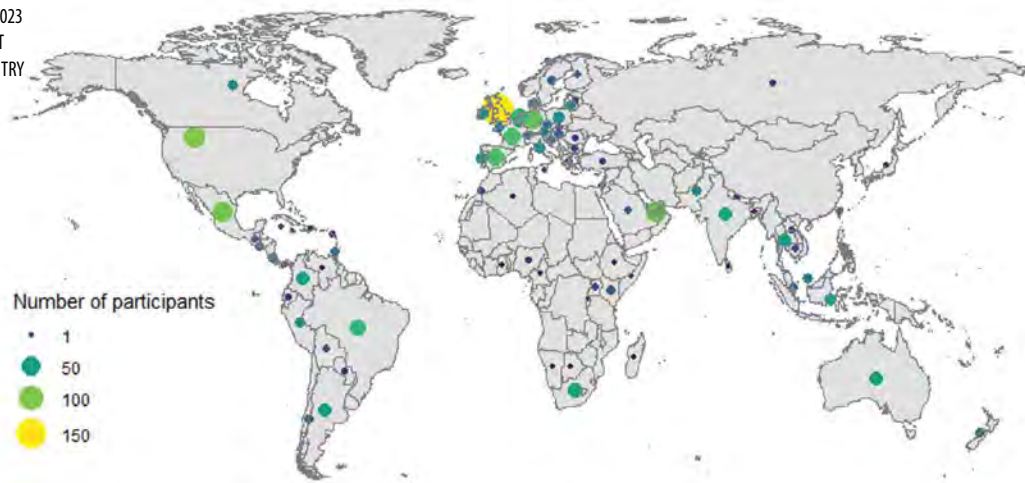
To carry out the appropriate reproductive management, it is essential to have a good knowledge and understanding of the reproductive biology and physiology of the species as well as the different techniques and options available.

In May 2023, the EAZA Reproductive Management Group (RMG) launched a Massive Open Online Course (MOOC) on Reproductive Management of Zoo and Free-Ranging Species. With five modules, more than 20 hours of pre-recorded lectures and 150 pages of written e-learning material, the course provides an overview of how reproduction may be brought into management and veterinary decisions to improve the sustainability of *in* and *ex situ* animal populations. The course brought together 26 global experts in reproductive management in mammals, birds, reptiles, amphibians and aquatic species.

Each module encompasses a key aspect of reproductive management. The first module, 'An Introduction to Reproductive Biology and Physiology', provides a basic overview of reproductive management and its role in zoo and wildlife populations, as well as the basics of reproductive biology, physiology and endocrinology in a range of species.

The second module, 'Sustainable Reproductive Management', discusses different methods of population control and their impacts on population sustainability,

FIGURE 1. OVERVIEW OF THE 2023 REPRODUCTIVE MANAGEMENT MOOC PARTICIPANTS BY COUNTRY



reproductive health and maintaining reproductive potential. This module summarises the challenges and benefits of contraception in order to identify the most suitable option for each individual case. In addition, this module contains an overview and examples of reproductive viability analyses and lifetime reproductive planning.

The third module, 'Reproductive Monitoring', illustrates the broad range of methods used to understand reproduction, ranging from non-invasive behavioural and endocrine monitoring through to complete, minimally invasive reproductive assessments. We were delighted to share case studies with participants to illustrate 'real world' examples of diagnostic techniques and treatments.

The fourth module, 'Assisted Reproductive Techniques and Cryopreservation', describes different basic and advanced assisted reproductive techniques (ARTs), demonstrating the steps needed to start utilising ARTs in your populations as well as how to carry them out. This module also provides a theoretical overview of how banked materials can be reintegrated into living populations.

The last module, 'Reproductive Management of Free-Ranging Species', brings the information learned in the first four modules *in situ*, and discusses the complexities involved in *in situ* fertility control, including product development and welfare, ethical, ecological and cost considerations, as well as how to apply the One Plan Approach to wildlife conservation breeding.

The first edition of this course brought together more than 1,000

attendees from 88 different countries (see Figure 1), including veterinarians, animal care staff, scientists, students, animal collection managers, curators and many other professionals from all over the world. All participants had a basic knowledge of animal reproduction and, according to feedback surveys, became more confident in each and every topic after the five-week online training on reproductive management (there was about a 43% improvement in understanding of the covered topics). As a special benefit, the attendees of this first edition had the opportunity to participate in weekly live Q&A sessions (one session per module), where they could discuss and pose all their questions directly to the respective tutors and lecturers.

If you missed it but are interested to learn more about zoo and wildlife reproduction, registration is still possible. The registration form is available on the [EAZA Academy](#) and [EAZA RMG website](#). All information (including pre-recorded lectures, e-learning materials, contacts and recordings of the Q&A sessions) will remain available indefinitely at the EAZA Academy as an open online reproductive resource. Subtitles for lectures are available in Spanish, German, Italian, French, Czech, Polish and Portuguese. This is a living resource, and we will continue to add lectures and updated information in due time. It is hoped that this course will provide a better understanding of how to practically apply reproductive management to the individuals and populations of both *ex situ* and *in situ* breeding programmes.

The EAZA RMG thanks the Morris

Animal Foundation (USA), the Botstiber Institute for Wildlife Fertility Control (USA), Chester Zoo (UK), and The Science and Conservation Center, Zoo Montana (USA), for their sponsorship, which supported development of the MOOC. Likewise, we thank all the lecturers who kindly participated in this course by giving their knowledge, time and patience, without which none of this would have been possible.

Please, contact contraception@chesterzoo.org for more information.

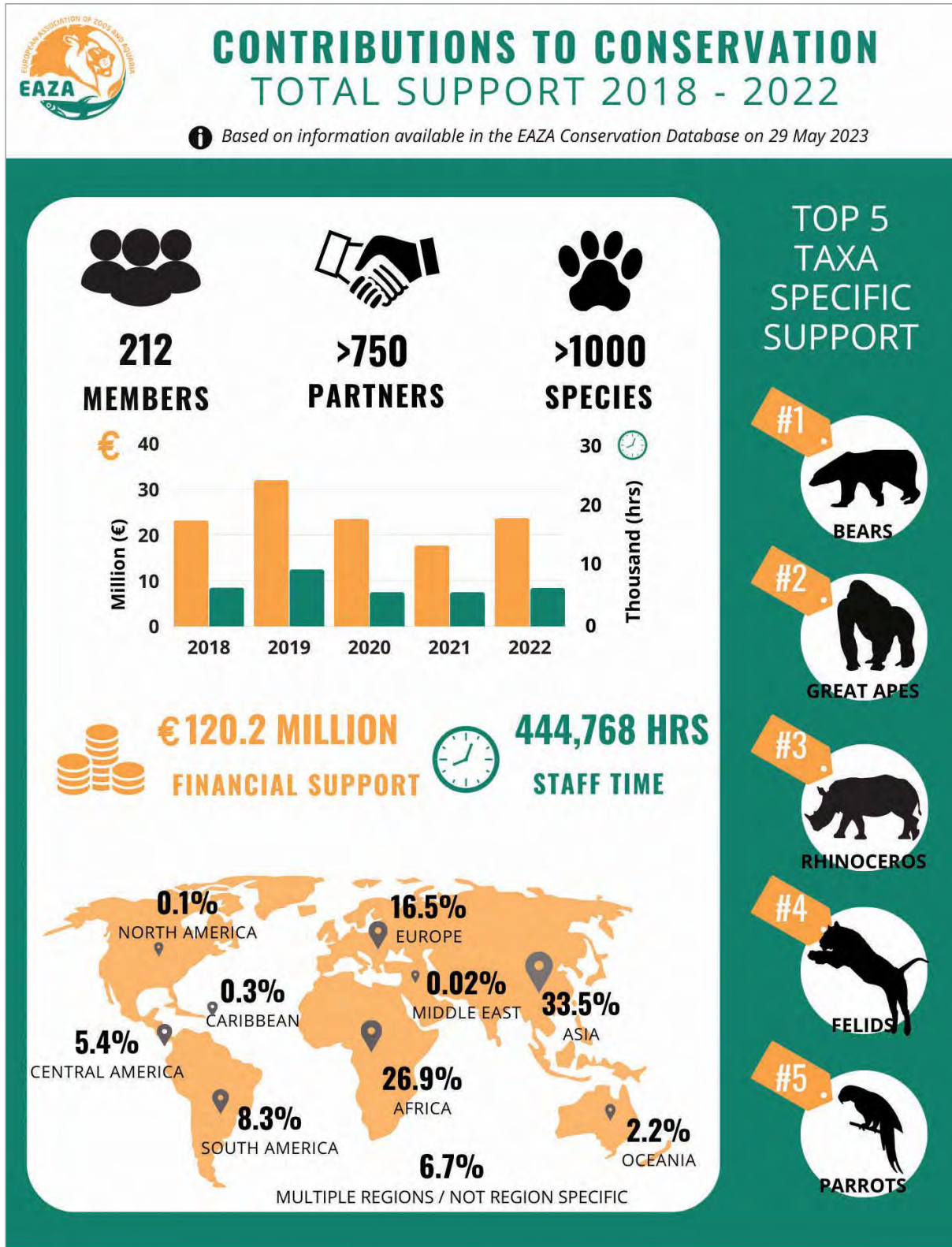
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Your amazing conservation efforts in numbers

Merel Zimmermann, Animal Programmes and Conservation Coordinator, EAZA Executive Office

The EAZA Conservation Database is the online tool for our community to help quantify, gather and showcase all efforts of EAZA Members for conservation. Contact info@eazaconservation.org for access and support. Record your annual support towards field conservation as part of fulfilling the EAZA Field Conservation Standards and don't forget to check out the EAZA website and Conservation Map on www.eaza.net/conservation to see how your amazing efforts are represented to the public.



Progressive Zoos and Aquariums Saving Species Together With You



CONTRIBUTIONS TO CONSERVATION

TOTAL SUPPORT 2022

i Based on information available in the EAZA Conservation Database on 29 May 2023



84,326 HRS
STAFF TIME



MILLION €23.7



164
MEMBERS



>500
PARTNERS



>600
SPECIES

AREAS OF FINANCIAL SUPPORT

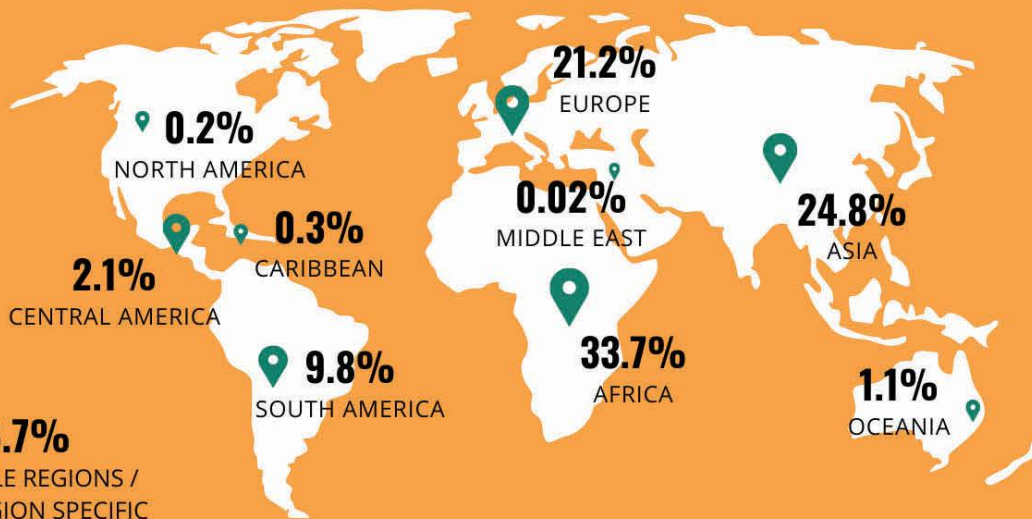


OTHER* 5%
INVERTEBRATES 3%



REPTILES 2%
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**includes plant, habitat conservation, conservation tool development*

Progressive Zoos and Aquariums Saving Species Together With You

The seal project

HOW CONSERVATIONISTS ARE WORKING TOGETHER TO SAVE THE SAIMAA RINGED SEAL IN A CHANGING ENVIRONMENT

Sanna Sainmaa, Specialist in Veterinary Medicine and Infectious Animal Diseases, Helsinki Zoo; Miina Auttila, Nature Conservation Senior Specialist, Metsähallitus Parks and Wildlife Finland; and Marja Niemi, Project Researcher, University of Eastern Finland

The Saimaa ringed seal (*Pusa hispida saimensis*) is one of the world's rarest and most endangered seals with a wild population of 430. It is endemic to Lake Saimaa (Finland) and strictly protected. The species gives birth in a snow lair and its breeding success and general fitness depend on adequate ice and snow coverage. Thus, climate change is an acute problem, especially for this subspecies, which lives in the southern edge of the ringed seals' distribution area.

The EU-funded Our Saimaa Seal LIFE project will enhance the implementation of the Saimaa ringed seal conservation strategy and action plan, with the aim of achieving a 5% annual population growth to reach a population of more than 500 individuals at the end of the project in 2025.

The project's main objectives are to:

- Prepare for the threats caused by climate change by creating man-made snowdrifts and developing artificial nest structures, and by improving health monitoring and non-invasive population monitoring tools
- Enhance the role of the existing volunteer network in the conservation of the species
- Enhance the surveillance of the restrictions set to protect the species by developing and increasing the use of seal-friendly fishing gear, by providing information to water owners, and by building a patrolling network among authorities
- Improve the genetic variability through translocations of individuals
- Develop seal-friendly eco-tourism

Due to climate change the quality of the seal's breeding habitat is decreasing, causing a higher pre-weaning pup mortality and decreased weaning conditions. The lack of snow lairs may also have a negative effect on adult seals' body condition. All the individuals of the population are significant for the survival of

the subspecies. However so far, no appropriate facilities, guidelines or networks for short-term treatments of Saimaa ringed seals have been available.

In 2019, a pup in need of veterinary care was transported to the wildlife rehabilitation centre in Helsinki Zoo. However, due to the risk of contamination and transmission of pathogens new to the landlocked seal population, that individual could not be released back to Lake Saimaa. Therefore, there is a need to create a handbook on best practices for temporary veterinary care, and a seal welfare and treatment network that could give the necessary care for Saimaa ringed seals locally, minimising the risks of direct or indirect contamination and ensuring the possibility of eventual release of the treated seal back to its natural habitat.

The project aims to create a network of local vets who can offer short-term treatments for individuals in poor condition, increasing their chance of survival in the wild. A handbook including ethical and practical guidelines for seal catching, moving, handling, keeping and releasing and general treatment procedures is being prepared. Two training sessions were held for local vets, focusing on the treatment of wild animals, especially Saimaa ringed seals.

TRANSLOCATIONS

The population of Saimaa ringed seals is small and fragmented. Several genetic studies showed that this small population has divided into genetically semi-isolated subpopulations and that its genetic diversity is very low, making the population vulnerable to inbreeding depression. Within-lake translocations were planned to maintain the current genetic diversity and hopefully improve the survival chances of this endangered population. After careful selection of animals and of suitable capture and

release sites, the first translocations were conducted under the LIFE project in spring 2023. The capture sites were monitored with camera traps. Hauled out seals were identified, and the suitable seals selected. One at a time, a female and a male were captured from central Lake Saimaa, Lake Pihlajavesi basin and transported to north, Kolovesi basin and South Saimaa respectively. The seals were captured in water near their haul-out site using supervised, modified tangle nets. They were transported by boat in a box under the supervision of a wildlife veterinarian. Only the cooling of the box was necessary during transportation. The seals remained very calm. Before releasing them to the target area, body measurements and DNA samples were taken. The pelage patterns were also photographed for future photo identification purposes. A satellite tag (SMRU, University of St Andrews, UK) was glued to the dorsal pelage of the seals to monitor daily movements and behaviours in the short-term. Both translocated seals moved less than 10 km from their releasing sites during the first 24 hours and found a core area on their new basins. So far, both have made some exploring trips during the summer but returned to the new core areas. Satellite tag monitoring will continue as long as possible (nine months at most, the tags will fall with the moult). Long-term monitoring will be conducted via photo-ID, lair censuses and DNA sampling. Based on the knowledge gained in 2023*, the translocation of one to three seals is planned for 2024.

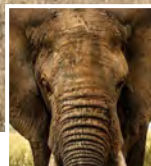
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Primates



Herbivores



Carnivores



Birds



Fish-Eaters

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Paradise found

THE NEW BIRD PARADISE AT MANDAI WILDLIFE RESERVE IS A SUPERB NEW HOME FOR THOUSANDS OF BIRDS AND A PLACE WHERE CONSERVATION, RESEARCH AND EDUCATION CAN ALL BE PRIORITISED

Luis Carlos Neves, Vice President, Mandai Wildlife Reserve

After more than 10 years since the idea was first discussed, the new Bird Paradise finally hatched on 8 May 2023, as part of the brand new Mandai Wildlife Reserve precinct in Singapore's Mandai area. The new park joins the already existing Singapore Zoo, River Wonders and Night Safari in this area, designed to be Singapore's go-to hub for connecting with nature and learning about wildlife conservation and sustainable living. All four zoological parks are managed by the Mandai Wildlife Group.

Taxonomically themed parks are becoming increasingly rare, as they tend to be more of a niche market and usually fail to deliver a strong message; the new Bird Paradise defies this trend. The Mandai Wildlife Group already had an existing ornithological park, the world-famous Jurong Bird Park. However, Jurong was ageing fast and its location was not ideal, so the strategic decision was made to move the birds to the same area as the other parks and to reconsider what shape a bird park could take to continue to be relevant in terms of its mission and messaging. The design intent was to provide the birds with optimal living conditions and improve overall welfare while continuing to be engaging to guests, and to focus efforts and resources in making the park aligned with the vision and mission of a zoo-based conservation organisation such as Mandai Wildlife Group.

This had direct implications for park design and population planning. While the new park is smaller than

Jurong, at 14 hectares compared to 20 hectares, it has almost four times the area dedicated to animal habitats, with more than six hectares of walkthrough aviaries alone. These are laid as a series of eight inter-connected walk-through habitats, geographically themed and connected by educational hubs that celebrate bird-related topics such as feathers, courtship, migration, colour, and so on. The walk-through aviaries are:

- **The Nyungwe Forest Heart of Africa** - inspired by African tropical forest and woodlands, home to many species of African starlings, pigeons, nine species of turacos and six species of African hornbills
- **The Kuok Group Wings of Asia** - inspired by the rice terrace fields in Southeast Asia and meant to show that, when given the chance and respected, birds can also thrive in close proximity to humans; home to four species of Asian hornbills, milky storks (*Mycteria cinerea*), lesser adjutant storks (*Leptoptilos javanicus*) and black-necked storks (*Ephippiorhynchus asiaticus*), black-faced spoonbills (*Platalea minor*) and many other species
- **The Hong Leong Foundation Crimson Wetlands** - inspired by the South American flooded savannahs, housing more than 80 psittacines including hyacinth (*Anodorhynchus hyacinthinus*), blue-throated (*Ara glaucogularis*), red-fronted (*Ara rubrogenys*), great green (*Ara ambiguus*) and red-bellied (*Orthopsittaca manilatus*) macaws, as well as scarlet ibises (*Eudocimus*

ruber), roseate spoonbills (*Platalea ajaja*) and American flamingos (*Phoenicopterus ruber*)

- **Amazonian Jewels** - neotropical forests, housing mid-sized neotropical psittacines, toucans, oropendolas, cotingas and many other species
- **Songs of the Forest** - Asian forests with emphasis on Asian songbirds
- **The Lori Loft** - Irian Jaya forests, focusing on Loriinae and *Cacatua* species, including the largest flock of blue-eyed cockatoos (*Cacatua ophthalmica*) in any zoological institution
- **Mysterious Papua** - the forests of Papua New Guinea, Solomon Islands and Sulawesi, focusing on Loriinae, palm cockatoos (*Probosciger aterrimus*) and imperial pigeons
- **Australian Outback** - the dry forests of Australia, featuring black cockatoos and other Australian endemics

There is also the **Ocean Express Penguin Cove**: a fully indoor, saltwater habitat for king (*Aptenodytes patagonicus*), gentoo (*Pygoscelis papua*), rockhopper (*Eudyptes chrysocome*) and Humboldt (*Spheniscus humboldti*) penguins, as well as Inca terns (*Larosterna inca*), replicating the environment in the sub-Antarctic region of the Falklands, including a matching light cycle; and the **Winged Sanctuary**, the only area with conventional aviaries, where conservation projects are highlighted, as well as housing species that cannot be kept in the walk-through aviaries because they are either too





FROM LEFT TO RIGHT: OCEAN EXPRESS PENGUIN COVE; KUOK GROUP WINGS OF ASIA; THE HONG LEONG FOUNDATION CRIMSON WETLANDS, ALL © MANDAI WILDLIFE RESERVE

delicate (for example, small songbirds, small psittacines or rare species) or predatory (such as large hornbills and Philippine eagles, *Pithecophaga jefferyi*).

These areas are supported by a fully off-show Breeding and Research Centre with 142 aviaries specifically to breed birds off-show, as well as a gallery accessible via a backstage pass experience, a fully autonomous Avian Hospital equipped with full diagnostic capability, including a CT scanner as well as a nutrition centre and commissary. There is also a 2,000-seat amphitheatre for free-flight demonstrations and a 100-seat classroom.

A FOCUS ON CONSERVATION

The population plan was carefully developed to prioritise species that can fulfil specific roles, in particular conservation ones, as well as function as outreach enablers. With most of our conservation projects focused on the Southeast Asian region, we decided to concentrate our efforts, resources and spaces to a few groups that we identified as those that could play a more meaningful role in conservation, research and education – hornbills, Asian songbirds, Indo-Pacific psittacines, Indo-Pacific columbiformes and tropical pheasants. One consequence is that some groups were either removed or significantly reduced, to make spaces for these focal groups. This included pelicans, flamingos, cranes and other waders, as well as most raptors. The result was an ambitious population plan, phased

in two stages – opening and phase II (first three years of operations) – that saw close to 3,500 birds of 420 species make the move between Jurong and the new Mandai precinct, over a period of four months. As the population continues to mature and the plan is implemented, new species will be added, and some will be transferred to other parks or phased out. The opening population includes approximately 24% of threatened species and highlights close to 75 EEPs, ESBs and other *ex situ* managed breeding programmes. The park currently holds the Coordinator position for seven of the EEPs, namely for the Santa Cruz ground dove (*Alopecoenas sanctaerucis*), Victoria crowned pigeon (*Goura victoria*), black hornbill (*Anthracoceros malayanus*), knobbed hornbill (*Rhyticeros cassidix*), salmon-crested cockatoo (*Cacatua moluccensis*), straw-headed bulbul (*Pycnonotus zeylanicus*) and black-winged myna (*Acridotheres melanopterus*).

With much improved facilities compared to Jurong, the new Bird Paradise allows for great opportunities to focus on the core values of conservation, research and education, while inspiring guests to respect, protect and become advocates for wildlife.

Conservation projects are supported through Mandai Nature throughout the Southeast Asian region, and within the park conservation breeding programmes they take centre stage, such as those for the Negros bleeding-heart pigeon (*Gallucolumba keayi*), Philippine eagle,

Vietnam pheasant (*Lophura edwardsi*), Santa Cruz ground dove and straw-headed bulbul, to name just a few.

Research in developing best practices, understanding breeding biology and other particularly critical areas are developed for groups such as hornbills, birds-of-paradise and Asian songbirds.

EDUCATION FOR ALL

Education is part of any modern zoo's DNA, and Mandai Wildlife Group focuses on reaching out to schools, educating the future generations of conservationists. Throughout the park, conservation-communication is present in every corner. Promoting respect and advocacy through meaningful experiences is essential to amplify our outreach programmes; we want everyone that comes through our gates to go back home knowing more and understanding nature and wildlife better. Connecting people and wildlife, creating emotional connections and sharing stories is the best way to achieve this.

For this we have various levels of programming, from keeper talks, feeding opportunities and backstage pass exclusive packages (Breeding and Research Centre, Avian Hospital, Avian Nutrition Centre, and Ocean Express Penguin Cove) to free-flight demonstrations.

The new Bird Paradise is a place to celebrate birds and bird life, and fall in love with these amazing animals, understand their challenges and threats, and learn how everyone can help to save them and make this planet we all share a better place.

Joint efforts

CAN RESEARCH IN ZOOS CONTRIBUTE TO THE CONSERVATION OF WILD BEARS? A COLLABORATION BETWEEN *EX SITU* AND *IN SITU* COMMUNITIES IS YIELDING PROMISING RESULTS.

Lydia Kolter, EAZA Bear TAG Research Adviser, Cologne Zoo; Marion Schneider, EAZA Bear TAG Research Adviser, Free the Bears; Brian Crudge, Regional Director, Free the Bears; José Kok, EAZA Bear TAG Chair, Ouwehands Zoo; all members of the IUCN SSC Bear Specialist Group

Field biologists sometimes have questions that cannot easily be answered by research in the wild. Tackling these questions together with *ex situ* professionals can yield promising results. The Sun Bear and the Polar Bear Research Prospectus are examples of this.

The Sun Bear Research Prospectus is an outcome of the Sun Bear Conservation Action Plan 2019–2028 (Crudge et al., 2019). One of its goals refers to contributions to the conservation of the sun bear (*Helarctos malayanus*) by zoos and rehabilitation centres. A working group, consisting of Bear TAG members from EAZA and its American counterpart AZA and representatives of rescue facilities in Southeast Asia, set up objectives and actions during the action plan workshop in Kuala Lumpur, which followed the 1st International Symposium on Sun Bear Conservation and Management in 2017.

One recommendation for maximising the contribution of the global *ex situ* population is to improve the quality and quantity of conservation-directed research in facilities that are holding bears (Crudge et al., 2019). A survey in 2019 revealed that in the past primarily husbandry-related projects had been conducted, often based on small sample sizes. To gain insight into the research needs of field researchers and conservationists, the members of the IUCN SSC Bear Specialist Group overseeing the global *ex situ* sun bear population asked field biologists and sun bear holders for proposals on conservation-related research topics, which could be addressed by *ex situ* studies. Subsequently, sun bear experts from the field and the *ex situ* community used more than 20 criteria to assess the quality and suitability of 60 submitted projects during a consultation workshop, hosted by the Royal Burgers' Zoo and financially supported by Ouwehands Zoo Foundation (both in the Netherlands), in June 2019. Twenty-three projects were selected according to their feasibility and conservation impact. They were assigned to eight research fields (Box 1). The precise research question and a synopsis, including objective and potential methods, the conservation impact, potential study locations and expected study duration are given in the prospectus as well as information on further reading.

Evaluating the long-term impact of conservation interventions on the status of wild sun bear populations requires effective monitoring. It is not surprising, therefore, that half of the selected topics focus on testing and elaborating field techniques necessary for studies on occupancy, population development and abundance of an elusive species inhabiting dense tropical forests (Box 1).

ONGOING RESEARCH

The prospectus was circulated to TAG Chairs and population managers of sun bears in zoo and aquarium associations in Europe, USA, Southeast Asia and Australasia (EAZA, AZA,

BOX 1: CONSERVATION RELEVANT TOPICS FOR SUN BEAR RESEARCH

FIELD TECHNIQUES

- Test eDNA methods to detect wild bears
- Olfactory and auditory attractants/deterrents
- Stimulation of rubbing
- Standardising a hair capture protocol for genetic monitoring of sun bears
- Hair morphology as a tool for species identification
- Auditory detection
- Identifying signs of different species and their decay rates
- Test tracking units/validation of radio signals for collars
- Identification of species sharing the habitat by their scats
- Test iDNA methods to detect wild sun bears
- Test fresh bear claw marks for detectable DNA
- Validation of usefulness of stable isotopes in faeces to determine the feeding niche of sympatric species

BEHAVIOUR

- Identification of distinct sensitive periods for certain learning experiences during behavioural ontogeny, which are relevant for the development of survival skills
- Under which conditions do sun bears climb?

NUTRITION

- Digestive efficiency and effects of an oil palm fruit-dominated diet
- Digestive efficiency of an insect-dominated diet

HEALTH & DISEASE

- Sun bear infectious disease susceptibility
- Identification of factors relevant for breeding success

PHYSIOLOGY & METABOLISM

- Thermoregulation in sun bears
- Determination of glucocorticoid metabolites levels and hair cortisol levels indicating stress

FORENSICS/GENETICS

- Validation of techniques to analyse Traditional Chinese Medicine
- Components of sun bear bile in comparison to bile of other ursids
- Population genetics

SEAZA and ZAA) as well as to managers of rescue facilities. Due to the pandemic, planned projects were delayed or even completely cancelled. Meanwhile, some pilot studies were started in EAZA and AZA zoos in the fields of behaviour, reproduction, field techniques and genetics, such as Lenz et al. (2020), which addressed the olfactory stimulation of rubbing. Several EAZA zoos contributed to a project to validate genetic methods to identify individuals quickly. Projects on behavioural ontogeny of sun bear cubs at the Royal Burgers' Zoo are the base for further long-term studies. In collaboration with Free the Bears (Australia) and Chester Zoo (UK), a study to identify factors relevant for



BOX 2: CONSERVATION RELEVANT TOPICS FOR POLAR BEAR RESEARCH

BEHAVIOUR AND PHYSIOLOGY

- Assessing polar bear capacity for problem solving and tool use
- How individual and environmental variation affect polar bear denning
- Kin recognition
- Numerical ability
- Predicting reproductive success
- Sensory modalities
- Reference ranges of serum-based indicators of stress
- Susceptibility of denning bears to disturbance
- Supporting and utilising data from animal collection management software

BIOBANKING AND RESEARCH DATA MANAGEMENT

- Biobanks: supporting their existence and applying their resources to conservation research
- Supporting and utilising data from animal collection management software

DISEASE AND PATHOLOGY

- Dose response studies
- Establishing disease incidence rate and reference ranges
- Effects of ambient temperature on physiological processes

ENERGETICS, DIET, AND NUTRITION

- Quantifying metabolic cost of thermoregulation in water
- Nutritional value of alternate food sources
- Turnover rate of dietary tracers

FIELD TECHNIQUES

- Deterrents and attractants
- Transport best practices
- Validating collar-mounted accelerometers in a denning context
- Validating collar-mounted acoustic tag to indicate cub birth
- Validating the time period represented by minimally invasive biomarker matrices
- Validating Unmanned Aerial Vehicle (UAV) imagery on body mass

breeding success started this year. Here the involvement of all EEP participants will be crucial. A paper of a pilot study in Ouwehands Zoo on the question 'Under which conditions do sun bears climb?' is in preparation.

Zoos and scientists interested in adopting one of the topics should download the Sun Bear Research Prospectus (<https://bit.ly/ExSituSunBearResearchProspectus>). Marion Schneider, Ex Situ Management Focal Point of the Sun Bear Action Plan, should be informed of research plans or of suggestions for new topics.

POLAR BEAR PROJECTS

The recently launched Polar Bear Research Prospectus was developed using a similar process. In March 2023, Berlin Tierpark (Germany) hosted a meeting to assess and evaluate 39 projects, which were submitted by field researchers. Members of the EAZA Bear TAG, representatives of Polar Bears International and the field researcher community selected 23 projects on *Ursus maritimus* and assigned them to research fields (Box 2). Here most topics deal with 'Behaviour and physiology' followed by 'Field techniques'. Biobanking and data mining are new areas of research.

The conclusion to draw is that we can make the difference – so take the chance to take part!

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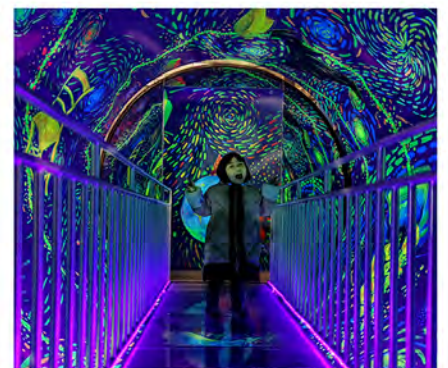
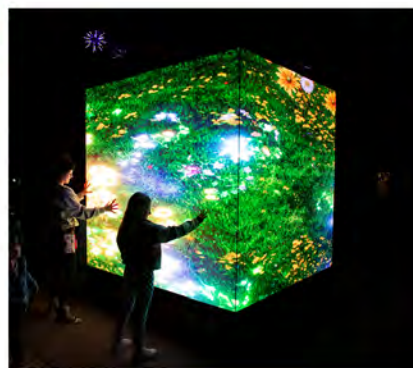
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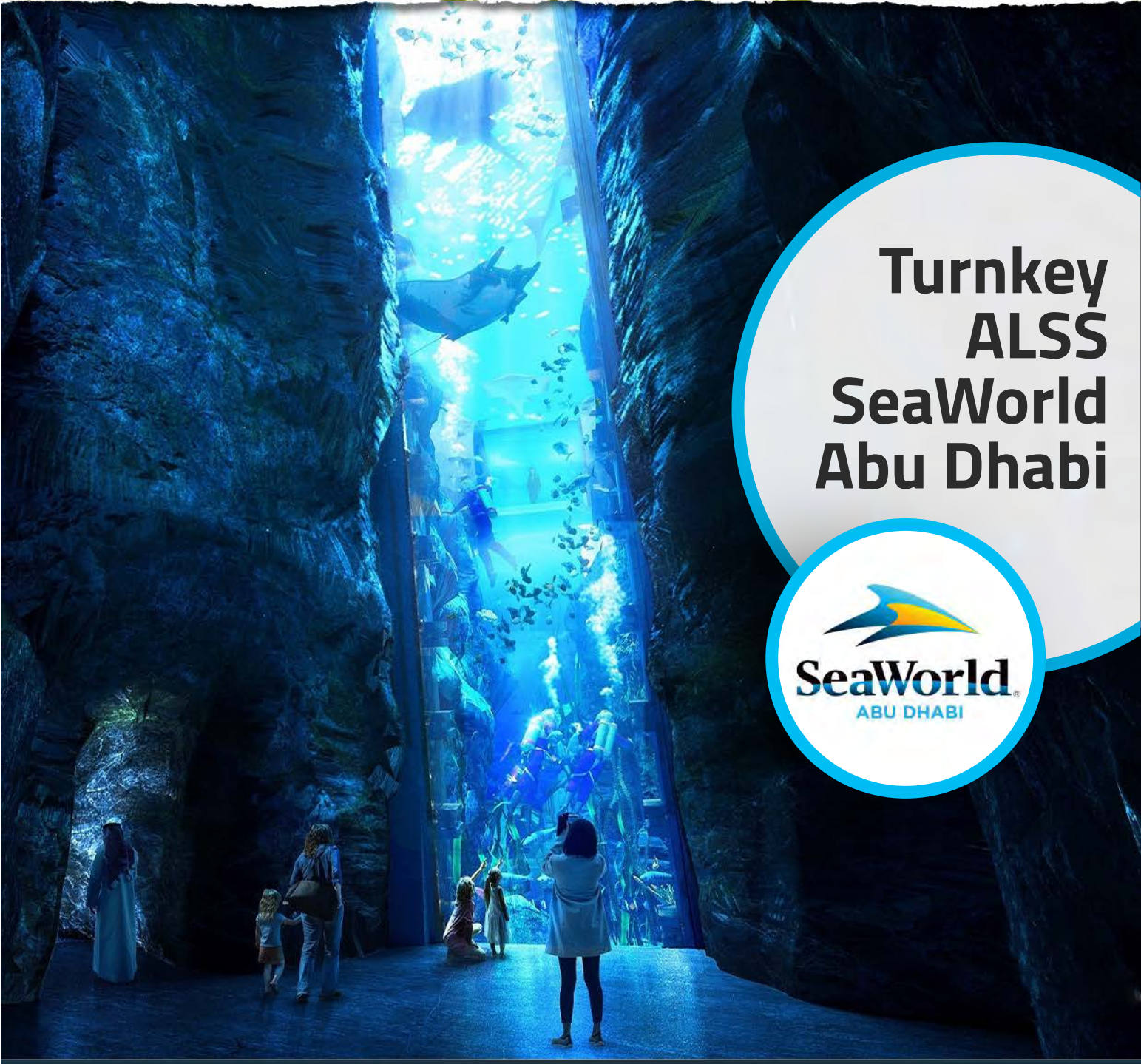




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