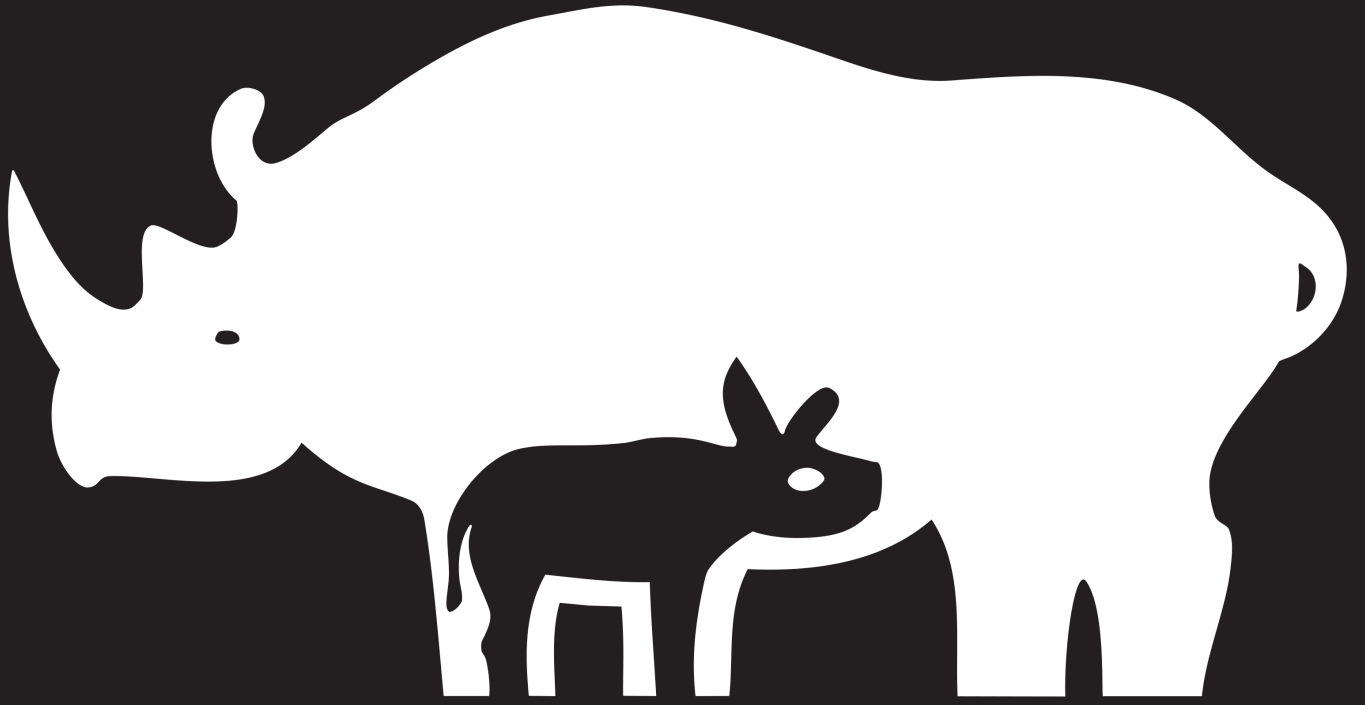


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ZOOQUARIA



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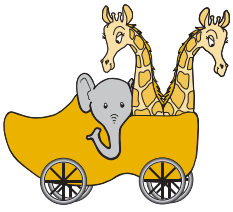
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SPECIAL ISSUE

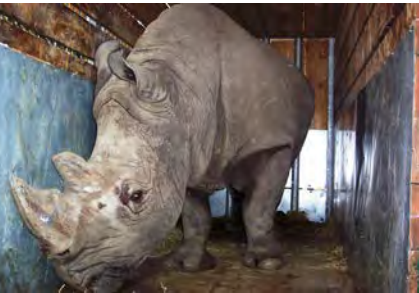
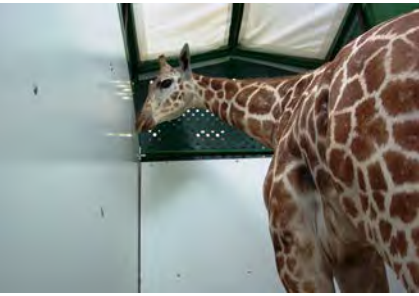


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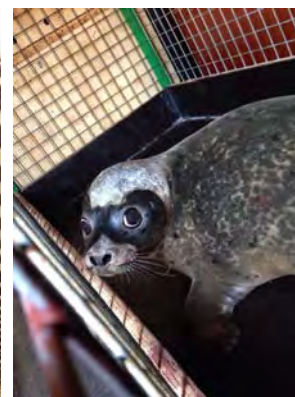
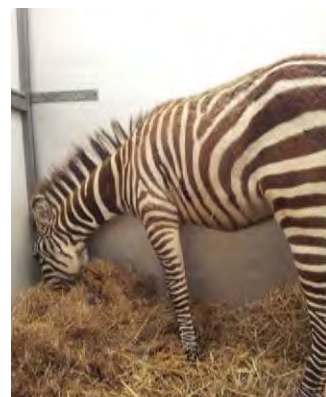
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DANIEL ABED-NAVANDI - HAUS DES MEERES VIENNA

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EAZA dedicates this issue to the memory of Malcolm Tait, longtime editor of this magazine and friend to our community. 25 January 1962 – 27 May 2016.

Zooquaria

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FROM THE DIRECTOR'S CHAIR

I am delighted to share with you this special issue on breeding programmes. With all that we have achieved so far, it is sometimes easy to forget what a relatively young association EAZA is. Throughout this issue you will be reminded of the challenges we have overcome and advances we have made, as well as being inspired by our plans for the future.

Among the many things that have inspired me recently, and reaffirmed my belief in the conservation power of EAZA, are the Global Species Management Plans (GSMPs) that have been agreed for the banteng, anoa and babirusa. These international collaborations between zoo associations in Europe, South-East Asia and North America as well as the IUCN and the Indonesian national government show an excellent joint commitment towards conserving these three species currently threatened with extinction.

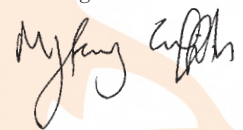
Another great example of how far we have come in terms of breeding programmes and collaborative conservation is the recent highly successful second Joint TAG Chairs meeting, held in March at Omaha's Henry Doorly Zoo and Aquarium in Nebraska, USA. EAZA was very well represented at this meeting and contributed greatly, as various representatives gave presentations, led break-out sessions and actively engaged in the discussions. Further articles summarising EAZA's contribution to this important event will be in the next issue of *Zooquaria*.

In the last issue I said that 2016 was going to be a year of exciting change, and it has certainly lived up to that prediction so far. In this issue you will be introduced in more detail to our new Chairman and Council. I'm sure you will all join me in extending our heartfelt thanks to Simon Tonge for his leadership throughout his terms as Chairman, as well as our appreciation to all the outgoing Council members for their service. It was good to see the high level of interest demonstrated by members in representing their countries on the Council. With such a large and diverse membership, our Council members are key to guiding the Association forward and ensuring that all views are heard and understood. I would encourage everyone to familiarise themselves with their respective members of Council and engage with them as much as possible so that they can best represent you. One of the first tasks of this new Council, along with that of the Committees, will be to agree the EAZA Strategy 2017-2020. We have accomplished a great deal of the ambitious 2013-2016 Strategy and I am excited to have the opportunity to work alongside all our members to develop and implement the next one.

One topic that is frequently discussed within the zoo and aquarium community, as well as the general media – though often with vastly different points of view – is that of the future of zoos. Just one recent example that brought this to the forefront again was the announcement from SeaWorld

that they will stop breeding orca. Whatever your personal opinion, what this means for EAZA is that we need to continue to increase our efforts to promote widely the diverse good work of our members, use our activities to represent EAZA zoos and aquariums both nationally and at the EU level, and support our members' efforts to position themselves in the heart of their local communities as the trusted voice of conservation and best practice in animal management and care. We already have recent achievements in these areas through the inspiring EAZA Conservation Forum (superbly hosted by Bioparc Fuengirola); involvement in an animal welfare indicators workshop jointly supported by EAZA, EAAM, VdZ, Nuremberg Zoo and WAZA and attended by EAZA Members, veterinarians, scientists and politicians; and the new Let It Grow Conservation Campaign. All of these examples not only showcase the significant work we do, but also are indicative of the increasing importance of effective partnership working. I feel that this is one area in which EAZA is especially skilled.

To return to the focus of this special issue, in order to achieve so much with our breeding programmes, and over such a relatively short time, we have had to partner internally and cooperate strongly within our membership. The skills and knowledge that we gain by working together in this way make us ideally suited to take this collaborative approach to external stakeholders. This in turn makes sure that EAZA zoos and aquariums remain progressive and relevant and will play a vital role in exotic species management and conservation well into the future.



Myfanwy Griffith
Executive Director, EAZA

NOTICEBOARD

COUNCIL NEWS

THE EXECUTIVE COMMITTEE proposed by the new EAZA Chair Dr Thomas Kauffels has been approved by the new Council following an electronic vote. For details of the new Executive Committee and a complete list of EAZA representatives, please turn to page 6.

Decisions of Council

At the final session of the 2013-2016 Council, the following membership decisions were approved by Council:

Approval of recommendations for institutions in the EAZA application procedure

a. New Applicants Approved

- i. Temporary 2 years
 1. Terra Natura Murcia, Spain
 2. Exmoor Zoological Park, UK
- ii. Associate member - Conservation
 1. The Foundation for the Preservation of Wildlife and Cultural Assets (FPWC), Armenia

iii. Candidate for Membership

1. Feldman Ecopark, Ukraine

b. Corporate Members

1. Beresford
2. Nieuwkoop Europe B.V.

Approval of EAZA Accreditation Programme screening decisions

c. Maintain Full Membership

1. Zoo de Servion, Switzerland
2. Genova Aquarium, Italy
3. Loro Parque, Spain
4. Safaripark Beekse Bergen, Netherlands

d. Temporary Membership

1. Monde Sauvage, Belgium (2 years)
2. South Lakes Safari Zoo, UK

e. Upgrade to Full Membership

1. Chessington World of Adventures, UK
2. Haifa Zoo, Israel

f. Delay on Decision

1. Zoo de La Palmyre, France
2. Birdland Park, UK

These institutions remain Full Members pending decision in September.

g. Termination

1. Puy du Fou, France

Withdrawing members update

1. Roches des Aigles, France
2. Naples Aquarium, Italy (reconstruction)

Documents Approved by Council

As part of the ongoing process of review and professional updating, the following

new or revised documents have been approved by the EAZA Council:

● EAZA Code of Ethics

Now incorporates references to newly developed EAZA Standards, Guidelines and Statements as well as IUCN Guidelines and the new WAZA strategies. It also integrates some text from the Code of Practice (which will now no longer be in use – see below).

● NEW EAZA Conservation Standards

The Conservation Committee has developed this first set of Conservation Standards containing 12 statements outlining what is expected from EAZA Members in relation to the conservation of species and biodiversity.

● EAZA Conservation Education Standards

The Education Committee carried out an extensive review of the 2008 EAZA Education Standards in light of recent changes in zoo and aquarium education. These Conservation Education Standards reflect that biodiversity conservation must be at the core of a programme of educational activities within an EAZA zoo or aquarium.

● Acquisition and Disposition Chapter of the Population Management Manual

This has been thoroughly reviewed by the EEP Committee and details of the changes have been shared with breeding programme coordinators and TAG Chairs. Some of the most important updates are:

- The decision that EAZA breeding programmes (EEPs and ESBs) must be non-commercial and that consequently selling of ESB specimens is prohibited in the same way that the selling of EEP specimens is prohibited.
- A clearer overview of the responsibilities that EAZA Members have in relation to the ethical sourcing of animals.
- Clarification of the role of TAGs regarding acquisitions of animals from outside the EAZA community and in particular what the status of TAG statements are in favour or against such acquisitions.

● Sanctions in the case of a violation of the Code of Ethics or EEP procedures

This document was updated to reflect changes in the Population Management Manual (see above), and references to the



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Code of Practice were deleted (see below).

EAZA Council also decided that the EAZA Code of Practice should no longer be used, as its content is now represented in these updates and/or other EAZA documents.

All the documents are available to view on the EAZA public website.

Other Approvals

The Council has determined that any sanction or warning imposed on a member by either the Membership and Ethics Committee or the EEP Committee will be publicised to all members via the Association's eNews bulletin.

The Council approved the signing of a new Memorandum of Understanding between the Association and the European Association for Aquatic Mammals (EAAM).

MEET YOUR REPRESENTATIVES

An introduction to EAZA's new Council members for 2016-19

Every three years, EAZA elects a new Council comprising representative members from each of the countries in which there are Full Members. The elections are conducted through our member National Associations or, where these are not present, by the EAZA Executive Office. The Council consists of 46 representatives, with seats allocated by country in proportion to the number of Full Members.

With nominations received and voting completed in March, the Council met for the first time in Kronberg on 15 April 2016. Following a vote by its members, Thomas Kauffels of Opel-Zoo was elected to chair the Council and the Association. Dr Kauffels outlined his nominations for Committee Chairs – and therefore also the Executive Committee – to the full membership, which approved the list on 31 May. The Executive Committee will therefore be as follows:
Chair: Thomas Kauffels (Opel-Zoo)
Vice-Chair: Mark Pilgrim (Chester Zoo)
Secretary: Endre Papp (Sóstó Zoo)
Treasurer: Jesus Fernandez Moran (Madrid Zoo)

Standing Committee Chairs:

Aquarium Representative: João Falcato (Oceanário Lisboa)

EEP Committee: Bengt Holst (Copenhagen Zoo)

Legislation Committee: to be represented by Kirsten Pullen (BIAZA and National Associations Committee Chair)

Membership and Ethics Committee: Frank Rietkerk (Apenheul Primate Park)

In addition, Thomas Kauffels outlined plans (as per article 20.1 of the EAZA Constitution) to co-opt to the Executive Committee Specialist Committee Chairs as follows:

Communications Committee: Columba de La Panouse (Parc Zoologique de Thoiry)

National Associations Committee: Kirsten Pullen (BIAZA)

Technical Assistance Committee: Mark Pilgrim (Chester Zoo) (Interim)

Austria	Alpenzoo Innsbruck	Michael Martys
Belgium	Pairi Daiza	Eric Domb
Croatia	Zagreb Zoo	Davorka Maljković
Czech Republic	Prague Zoo	Miroslav Bobek
Czech Republic	Liberec Zoo	David Nejedlo
Denmark	Copenhagen Zoo	Steffen Stræde
Estonia	Tallinn Zoo	Mati Kaal
Finland	Helsinki Zoo	Sanna Hellström
France	ZooParc de Beauval	Eric Bairrão Ruivo
France	Parc Zoologique d'Amiens Métropole	Christine Morrier
France	Parc Zoologique de Thoiry	Colomba de La Panouse
France	Bioparc de Doué la Fontaine	Pierre Gay
France	Zoo de La Boissière du Doré	Sébastien Laurent
Germany	Berlin Zoo/Tierpark	Andreas Knieriem
Germany	Zoologischer Garten Koln	Theo Pagel
Germany	Opel-Zoo	Thomas Kauffels
Germany	Leipzig Zoo	Jörg Junhold
Germany	Wilhelma Stuttgart	Thomas Kölpin
Greece	Attica Zoo	Jean-Jacques Lesueur
Hungary	Sóstó Zoo	Endre Papp
Ireland	Dublin Zoo	Leo Oosterweghel
Israel	Jerusalem Zoo	Shai Doron
Italy	Representing Parco Faunistico 'La Torbiera'	Gloria Svampa Garibaldi
Latvia	Riga Zoo	Rolands Greizins
Luxembourg	Parc Merveilleux	Guy Willems
Netherlands	Apenheul	Frank Rietkerk
Netherlands	Wildlands Adventure Zoo Emmen	Lisette de Ruigh
Norway	Kristiansand	Rolf-Arne Ølberg
Poland	Wrocław Zoo	Radosław Ratajszczak
Portugal	Lisbon Zoo	Arlete Sogorb
Slovakia	Bratislava Zoo	Miloslava Šavelová
Slovenia	Ljubljana Zoo	Zdenka Ban Fischinger
Spain	Zoo Aquarium Madrid/Parques Reunidos	Jesus Fernandez Moran
Spain	Barcelona Zoo	Carme Lanuza
Sweden	Borås Zoo	Bo Kjellson
Sweden	Nordens Ark	Mats Höggren
Switzerland	Papiliorama Swiss Tropical Gardens	Caspar Bijleveld van Lexmond
Turkey	Izmir Wildlife Park	Şahin Aşşin
Ukraine	Nikolaev Zoo	Vladimir Topchy
UAE	Al Ain Zoo	Mark Craig
UK	Bristol Zoo	Bryan Carroll
UK	Chester Zoo	Mark Pilgrim
UK	South West Environmental Parks	Simon Tonge
UK	Belfast Zoo	Mark Challis
UK	London Zoo	David Field

This Executive Committee composition reflects the breadth of present and future activities of the EAZA.

For 2016-2019, your elected representatives on the EAZA Council will be as shown in the table above.

Following the recent sad death of elected Russian representative Rostislav Shilo, the seat remains

vacant, pending further election by the Russian members.

Contact details for all Council members are available on the EAZA website Member Area; all EAZA Members should feel free to approach their Council members to represent their interests in new and ongoing discussions including any aspect of the Association's areas of cooperation.



Thomas Kauffels, Chair



Mark Pilgrim, Vice-Chair



Endre Papp, Secretary



Jesus Fernandez Moran, Treasurer



Şahin Afşin



Eric Bairrão Ruivo



Caspar Bijleveld van Lexmond



Miroslav Bobek



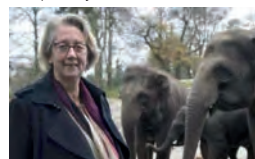
Bryan Carroll



Mark Challis



Mark Craig



Lisette de Ruigh



Eric Domb



Shai Doron



David Field



Zdenka Ban Fischinger



Pierre Gay



Rolands Greizins



Sanna Hellström



Mats Höggren



Jörg Junhold



Mati Kaal



Bo Kjellson



Andreas Knieriem



Thomas Kölpin



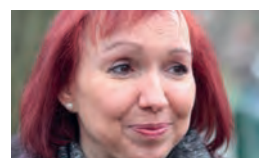
Carme Lanuza



Sébastien Laurent



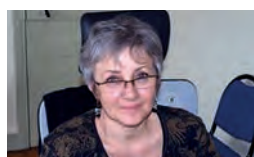
Jean-Jacques Lesueur



Davorka Maljković



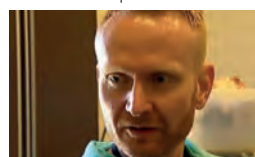
Michael Martyš



Christine Morrier



David Nejedlo



Rolf-Arne Ølberg



Leo Oosterweghel



Theo Pagel



Colomba de La Panouse



Radosław Ratajszczak



Frank Rietkerk



Miloslava Šavelová



Arlete Sogorb



Steffen Stræde



Gloria Svampa Garibaldi



Simon Tonge



Vladimir Topchy



Guy Willems

A renewed focus

AT DIRECTORS' DAYS 2016, THREE DAYS OF DISCUSSION PRODUCED A CLEAR DIRECTION FOR THE REST OF THE DECADE

Directors' Days 2016 took place from 13-15 April 2016 in Königstein im Taunus close to Frankfurt and was hosted by Opel-Zoo in Kronberg. More than 100 EAZA Directors attended the meeting, the first time that attendance at this conference has reached three figures. This attendance rate reflected the importance of the sessions to the future of EAZA; not only did delegates spend a significant part of the meeting discussing the 2017-2020 EAZA Strategy, but also many attended the last session of the 2013-2016 EAZA Council, the inaugural meeting of the 2016-2019 Council, and the Association's Annual General Meeting. Invited speakers also introduced important themes that will inform EAZA's new strategic direction.

STRATEGY

With the end of the 2013-2016 EAZA Strategy imminent, two principal sessions were scheduled to help to determine both the focal areas of its replacement and some objectives to inform the planning of Committee actions over the next few years. Delegates were asked to review the existing focal areas and their suitability for the new strategy. There is no doubt that the context for strategic planning has changed since the drafting of the 2013-2016 document; recent events have highlighted the new public role that the Association has had to adopt, the cultural landscape in which we operate, and advances in zoological and welfare science.

The current focal areas that Directors were asked to review are as follows:

1. Influencing policy and enhancing engagement at the EU
2. Maximising the conservation action of our members
3. Developing conservation learning and engagement for the future
4. Promoting the work of the EAZA community
5. Expanding partnerships to enhance our aims



6. Leading in zoo animal welfare
7. Maximising our available resources
8. A sustainable future

It was agreed to try to reduce the number of focal areas and consolidate our activities under four headings. This was achieved in the first strategy session of the conference, and the following areas were outlined, into which our objectives can sit comfortably:

- Maximising the conservation impact of EAZA and our members
- Leading in zoo and aquarium animal management and care by maintaining healthy populations and individuals with positive animal welfare
- Representing the EAZA community at the EU and with global stakeholders to influence relevant policy and good practice
- Communicating the values and scientific work of progressive zoos and aquariums both internally and externally

Many objectives for specific actions within these areas were also proposed during the second session. These included recommendations to improve funding, communication and measurement of conservation impact; to continuously improve our collective animal welfare science knowledge and implementation and create Best Practice Guidelines for as many species as possible; to engage MEPs and other EU representatives proactively to increase their knowledge of the zoo capacity; and to communicate proactively with audiences everywhere the core values of the Association: Sustainability, Solidarity, Stewardship, Professionalism and Transparency. All of the objectives identified by the Directors, and those proposed by the Committees over the coming months, will feature in the draft strategy 2017-2020. This will be presented to EAZA Council in September at the Belfast Conference for approval.

EAZA COUNCIL

At the last meeting of the 2013-2016 Council, several new documents and recommendations were approved (see page 5 for details). The meeting was the last Council meeting to be chaired by Simon Tonge, who thanked the members for their hard work and productivity over the last three years.

The inaugural meeting of the new Council, whose mandate runs until 2019's Spring Council meeting, included a first for EAZA: the election of a new Chair of the Association. The two candidates for the post, Shai Doron of Jerusalem Zoo and Thomas Kauffels of Opel-Zoo, presented a short summary of their candidacies, following the distribution of their manifestos to the Council in the weeks before the meeting. This was followed by a secret ballot, which resulted in a tie; following a second round of voting in which postal votes were not included, Thomas Kauffels secured a majority and was elected to the post. You can read more of the new Chair's plans for the Association in an interview with him which will appear in *Zooquaria* issue 94.

The meeting also featured presentations from Dr Christiane Schell of the German Federal Agency for Nature Conservation on the role of zoos in nature conservation and awareness, representatives from Nestlé Germany talking on crisis resolution and reputation management through adoption of ethical measures, and a series of talks from Directors on developing trends in our community and good management practice.

EAZA would like to thank all speakers and delegates for their hard work and input, and would especially like to thank Opel-Zoo's team (particularly Jenny Krutshinna) for their exemplary hosting. The next meeting will take place in Chester, UK in April 2017.

Programmed for success

THIRTY YEARS AFTER EEPs WERE FIRST ESTABLISHED, WE LOOK AT THE MANY BENEFITS THAT THEY HAVE BROUGHT TO THE CONSERVATION OF ENDANGERED SPECIES

Bengt Holst, Scientific Director, Copenhagen Zoo and EEP Committee Chair

This issue of *Zooquaria* is dedicated to the subject of EEPs, the breeding programmes that have contributed so much to the conservation of endangered species in recent years. As Theo Pagel explains on page 17, it may be surprising for some to learn that EEPs are barely 30 years old, as their influence over a relatively short time has been so significant. After a 1975 CITES ruling restricting the trade in endangered animals, it became clear to a number of key figures in the zoo community that if animal populations were to prevail in European zoos and aquariums, it was necessary to improve breeding and general husbandry. As a result, in 1985 a group of visionary zoo directors took the first steps into a new era where international cooperation became the main component. The EEPs – Europäischen Erhaltungszuchtprogramme, later translated into European Endangered Species Programmes – were born.

But what is an EEP and what are the benefits of having managed breeding programmes?

COOPERATION WORKS

First, the exchange of animals between zoos has always taken place. But before EEPs, the exchanges were based on the needs of a single zoo rather than of the entire population. Individual animal lines already well represented in Europe could be imported from within Europe or from overseas, but would contribute only to the future of that specific group, not to the European population. EEPs were designed to ensure that the entire population would benefit from each exchange.

Second, cooperation between zoos and aquariums was based more on tradition than on the wish to exchange experience as broadly as possible for the benefit of the entire population. Once more, EEPs have encouraged collaboration across many institutions and an exchange of information from which the entire conservation community can benefit.

Last, but certainly not least, as the joint management of animal populations was implemented, it was quickly followed by the non-commercial exchanges of animals. Until then it was mostly the rule that zoos and aquariums asked for payment for the animals they sent to other zoos. But who can set a price on an endangered species? And is it reasonable that the destination for individual animals of an endangered species should be decided by how much they cost? The only way to ensure that animals are distributed according to biological criteria – that is, to avoid inbreeding and to have the best match – is to disregard their financial value. Sometimes the best place for an EEP species is in a zoo with little money available. As a result, the sale of EEP animals is no longer allowed, and this non-commercial status of EEP animals has been accepted by the entire EAZA community as a result of the Council decision of 25 May 2003.

REACHING ACROSS THE WORLD

Another important benefit of having joint management programmes for our animals is that it makes cooperation with other regions much easier and much more effective. Today there are managed breeding programmes in most other regions of the world. The overall structure of these programmes is more or less the same, and it is easy to work together with our foreign counterparts. Our framework is the same, and breeding programmes have become a blueprint for proper management. Exchanges between regions have thus become easier, and the development of global species management plans (GSMPs) for selected species has become an option. In 2014 the first Joint TAG Chairs meeting was held in Avifauna in the Netherlands, and the success was repeated in 2016 when Henry Doorly's Zoo and Aquarium hosted the second meeting of its kind.

During these meetings steps were taken to increase cooperation between regions, and valuable experience was exchanged between the various TAGs in a structured way with the single purpose of improving the quality and sustainability of animal populations across the globe.

SHARED GOALS

It is easy to see the many benefits of collaborating in structured breeding programmes, but there are also many challenges. In order for our cooperative efforts to be fruitful, we need to work within the same framework and have working procedures that we all follow. Furthermore, we need to accept that while not all recommendations will benefit one's own population in the short run, they are designed for the good of the combined European population. In order to reach the defined population goals we also in some cases need to accept the use of 'non-breeding recommendations'. But in the long run these issues will no doubt be outweighed by the fact that we will have a sound and well-established population with a specific purpose that we would never be able to pursue alone, which is that our animal populations can contribute directly or indirectly to the conservation of endangered species. And after all that is what it's all about: to develop and maintain populations of healthy animals that can contribute to the conservation of their respective species.

In this issue of *Zooquaria* you can read about the history and development of the breeding programmes as well as learn more about the future of the EAZA breeding programme structure. It also celebrates the many successes that members of the EAZA have enjoyed over the last few decades; turn to page 12 to see a selection of historic reports of many exciting and sometimes groundbreaking births and hatchings that EEPs have made possible.

International rescue

FOLLOWING THE ANNIVERSARY OF THE FOUNDING OF THE EEPs, DAVID WILLIAMS-MITCHELL TALKS TO BERT DE BOER, DIETER JAUCH AND MIRANDA STEVENSON ABOUT HOW AND WHY THE PROGRAMMES CAME ABOUT

One thing becomes clear in any conversation with founders of the EEPs: that their creation was epochal for the European zoo community, a unifying influence for our institutions that has continued to the present. Gunther Nogge, one of the founders, outlined a principal motivation for the decision in an article for this publication in 2000:

'The need for a closer cooperation between zoos became obvious after the CITES ruling came into force in 1975. Suddenly zoos saw themselves cut off from the import of wild-caught animals, the trade of which was now strictly regulated. Zoos had to breed animals they wanted to exhibit; to build up self-sustaining populations of animals in order to become independent from the import of wild animals.'

AZA in North America was the first association to implement breeding programmes to address this challenge in 1982, and discussions for a European structure started not long after. Bert de Boer, Curator at Rotterdam Zoo at the time, is clear that the challenges for Europe were considerably more difficult to overcome:

'There was no question at the time that Western European and Eastern European zoos would be able to collaborate on breeding programmes – the politics were just too complicated,' he says. While zoos to the east of the Iron Curtain were members of IUDZG (forerunner to WAZA), cooperation across Europe's political divide and the formation of a European Association would have to wait until after 1991. The great ideological clash was only one of the hurdles, however.

'Official cooperation between zoos was mostly between directors,' says de Boer. 'Contact between curators – who are the backbone of the EEP system – happened on a much more informal basis.'

'There were many experts needed to run the many EEPs and that couldn't be only directors,' adds Dieter Jauch, Aquarium Curator at Stuttgart at the time, and later Chair of the EEP Committee. 'It was the fast growth



DIETER JAUCH



MIRANDA STEVENSON

of the EEPs that made an opening or "democratisation" necessary.'

Disparate breeding programmes already existed, but there were few links between them, and some fears that they could bring about a negative result, as Miranda Stevenson, Curator at Edinburgh Zoo in the mid-80s, explains:

'The Federation of Zoos (now BIAZA) had its own British and Irish Joint Management of Species Programmes (JMSPs) and TAG structure, but these were separate from other programmes on the continent. Some people who were sceptical of the idea expressed the fear that all zoos would become the same, holding the same species; but the data strongly suggested that without management many species would become extinct in zoos, so there was a strong basis for discussing linking up the



BERT DE BOER

programmes into a single structure.'

Bert de Boer points to other obstacles:

'The scientific approaches of, for example, the British and the Germans were quite different, with the British concentrating – perhaps too strongly at times – on mathematical analysis, and the Germans having a more descriptive and philosophical approach. The Netherlands and Belgium were perfectly

placed to bridge that gap, and so a lot of the momentum for the EEPs came from people like Dick van Dam (Rotterdam) and Fred Daman (Antwerp):

Dieter Jauch is not as convinced of differences in the scientific approaches of different countries:

'I never found the approach different with all my partners. The idea of EEPs was from the beginning a very practical one – to save zoo populations of animals as part of an overall population.'

FIRST STEPS

The first meeting to discuss formally unifying European zoo breeding programmes took place at Antwerp in 1985, and involved some of the most progressive zoo personalities of the time, including Christian Schmidt (Zurich), Bent Jørgensen (Copenhagen), Ilkka Koivisto (Helsinki) and Jean-Marc Lerno (Mulhouse). De Boer, however, gives a lot of credit to Dick van Dam for his early approach to the idea of free transfer of animals:

'He was a visionary. He was giving animals to other zoos because he understood that population management could not happen without free exchange. We got to the point when he would come back from travelling and we would ask ourselves: "Which animals has he given away on this trip?!"'

Van Dam and the other founders understood that competition between zoos was primarily about scientific prestige rather than business, and that the birth of a zoo animal – especially endangered species – was a victory for all zoos. Miranda Stevenson stresses that 'the concept of animals not having a monetary value was a big advance.'

This didn't mean the end of ownership of animals, however; for Dieter Jauch, free exchange of animals within the EEP framework was aimed more at ensuring compliance with recommendations than in removing cash from the equation.

'There still are some zoos who insist on ownership because they think that owners show more responsibility for "their" animals,' he says. 'What led to the free exchange of animals was the need to make sure that zoos did not decide to go over the heads of the coordinators and move animals without first having a recommendation.'

Of course, exchange of animals

was only one pillar holding up the EEP structure. Stevenson identifies the foundation of the Taxon Advisory Groups (TAG) in 1992 as another landmark for breeding programmes:

'The TAG structure and the preparation of Regional Collection Plans give an important overview of the species and management priorities, thanks to enthusiastic and dedicated people who carry out the work, much of it in their own time.'

She and Bert de Boer agree that training was also key; courses have been run regularly since the foundation of the EEPs to help participants and coordinators manage programmes to their best effect. There is little doubt that the EAZA Academy, founded on the principle of professional development and still including breeding programme management as a key part of its curriculum, has its roots in the early days of the EEPs and the scramble to learn how to manage small populations of zoo-bred animals.

VALUABLE DATA

Record-keeping played a central role in the success of the EEPs from the earliest days. With the foundation of ISIS (International Species Information System) in 1974 – partly under the influence of Ulie Seal, the first Chair of CBSG – a computerised catalogue of animals in zoos was initiated. In the early days, ISIS software had some limitations for European zoos, particularly a lack of functions for curators and studbook keepers; this led to the development of European software for studbook management (ZRBOOK) by Frank Princée.

'ISIS provided the car,' says de Boer, 'Frank's work gave us the tyres so that it would run better.'

With the advent of ZIMS (Zoological Information Management System) and the deep involvement of EAZA in the development of new modules for the software, record-keeping is now a highly sophisticated part of the EEP and allows programme managers a very high level of access to information they need for their populations. There remain, however, some significant challenges that need to be overcome, as Miranda Stevenson explains:

'Getting sufficient people from zoos involved in the process and training them is one of the major challenges.'

As the structure evolves and there are more sophisticated Regional Collection Plans and ICAPs, more expertise, training and trainers will be required.'

Bert de Boer believes that Collection Planning needs to continue to develop to help the EEPs succeed better:

'Collection Planning is the vehicle for maintaining sustainable populations. EEPs will become more difficult to maintain and some will fail unless we have realistic RCPs that effectively link up the efforts of different zoos under solid scientific direction.'

Both agree that connections with *in situ* conservation will be vital to the future of breeding programmes, and indeed this is reflected in the support that the EEPs give field conservationists through the developing One Plan Approach. 'Programmes can establish a vital bridge between zoo animals and their wild counterparts,' says Bert de Boer, although he is clear that maintaining sustainable populations in zoos is not a panacea.

'The short-term crisis we face in the coming decades is biomass, not necessarily biodiversity,' he says. 'With the amount of animals and plants decreasing hugely, reintroduction of small sustainable populations to refuges is very challenging and won't save the world.'

Instead, he views the EEPs as having a value to zoos in their educational and engagement roles.

'We shouldn't be ashamed to say that the EEPs are for the conservation of zoo populations. Say the gorilla becomes extinct in the wild. Gorillas in zoos would still be valuable even if it were impossible to reintroduce them into some form of wild habitat. They would be important for history, so that people can learn about the riches of the natural world and learn to respect it more. You will never get that from TV.'

Indeed a sense of history runs through all of the commentaries on the foundation of the EEPs; there is no doubt that establishing sustainable populations through breeding programmes changed European zoos for ever. Whatever our future, and whatever the future for zoo breeding, we can look at 1985 as the beginning of a new era of international cooperation for our institutions, and give thanks for the vision and dedication of everyone who brought the EEPs into being.

NEW ARRIVALS

IN CELEBRATION OF EAZA'S SUCCESSFUL BREEDING PROGRAMMES, WE LOOK BACK AT SOME HISTORIC ARRIVALS, WHICH WERE FIRST REPORTED IN EAZA NEWS



ANTELOPES AND APES AT FRANKFURT

After an interruption of six years, another bongo (*Tragelaphus eurycerus*) was born at Frankfurt on 10 May 1997. Frankfurt Zoo was the first to breed this EEP species in Europe in 1973 after importing a trio in 1970. Before this time bongos were rarely seen in European zoos.

Frankfurt also saw the birth of female Western lowland gorilla (*Gorilla g. gorilla*) on 9 June 1997. The father is the 39-year-old 'Matze', while mother 'Zsa-Zsa' was born at Munich's Tierpark Hellabrunn in 1986. At first, Zsa-Zsa showed no interest in her first baby, but some hours after the birth and with the help of the keepers, she accepted her young. This is the 15th Western lowland gorilla born at Frankfurt Zoo but only the fourth to be mother-reared.

MALE MANATEE BORN AT AMSTERDAM ZOO

On 26 April 1997 a male Caribbean manatee (*Trichechus m. manatus*) was born at Amsterdam's Artis Zoo. He measured 1.15m at birth and is being reared by the mother. This is the sixth offspring of the parents, which were wild-caught in Suriname and arrived in Artis in 1966 and 1972 respectively. Five of these young (3.2) survived and were mother-reared; one was still-born in 1987. Amsterdam Zoo has a long tradition of keeping manatees and achieved the first breeding success in Europe in 1977.

PARIS WELCOMES FEMALE AYE-AYE

A female aye-aye (*Daubentonia madagascariensis*) was born at Paris Zoo

(Vincennes) on 12 June 1996, after being conceived at Jersey Wildlife Preservation Trust (UK). The mother is the first aye-aye ever born in a zoo (August 1992, Jersey).

AMUR LEOPARD SUCCESS FOR PRAGUE ZOO

Prague reported the birth of 1.1 Amur leopards (*Panthera pardus orientalis*) on 6 May 1997. The birth is of great importance for the EEP population of this species as both parents were wild-born. The mother was very nervous after delivery, so the Lion House was closed for six weeks in order not to disturb her and her offspring. The father is on breeding loan from Moscow Zoo (Russia).

THREE YOUNG HORNEROS FOR WUPPERTAL

At the end of 1996 the pale-legged horneros *Furnarius leucopus* in Wuppertal's walk-through aviary for neotropical birds built their impressive oven-shaped nest high up on a dead tree. On 1 February 1997, three young horneros fledged. They looked almost like the adults, but their beaks were somewhat shorter. Two

days before the young fledged, both parents started to build a new nest on top of another dead tree, which they completed in 13 days.

MULTIPLE PARROTS HATCHED AT CHESTER ZOO

Some 80 species of bird were hatched at Chester Zoo during the first eight months of 1987, including a large number of parrots. The list included two red-tailed amazons (*Amazona brasiliensis*), red-fronted macaws (*Ara rubrogenys*), two blue-winged macaws (*Ara maracana*), a thick-billed parrot (*Rhynchopsitta pachyrhyncha*), three



green-cheeked amazons (*Amazona viridigenalis*), three Greater Vasa parrots (*Coracopsis vasa*) and four blue-throated conures (*Pyrrhura cruentata*).

FOUR ASIAN ELEPHANTS BORN IN EMMEN

No fewer than four Asian elephants (*Elephas maximus*) were born in Emmen Zoo between November 1997 and March 1998. The calves, three males and one female, are being mother-reared. The four births took place without any human interference in the group of seven adult females. The animals roam free in their 35 x 15m night quarter. The adult elephants are being chained daily for half an hour when feeding. The four 'Burmese' mothers were unrestrained at delivery. These births bring the total number of Asian elephants born in Emmen to eight.

BLYTH'S TRAGOPANS HATCHED AT CLÈRES

On 30 June and 3 July 1998, two Blyth's tragopans (*Tragopan blythi*) hatched at the Zoological Park of Clères after artificial insemination. The female that produced these chicks hatched in 1994 in England and has been housed in the Zoological Park of Clères since 1995. She was first paired with a male, which unfortunately has badly crooked toes, at the end of 1996. Three clutches of two eggs laid in 1997 were infertile despite the male displaying well. This male was exchanged for a younger one born in 1996 in a German private aviary prior to the 1998 breeding season. The female laid three clutches of two eggs during the 1998 breeding season. The laying interval between two eggs was three days and each clutch was separated by about three weeks (18 and 24 days). The first egg was laid on 13 April and the last one on 2 June. After the first clutch of two eggs proved to be infertile, an examination of the male reproductive



organs revealed his immaturity and it was decided to try to inseminate the female with semen collected from the older, isolated male, with the agreement of Han Assink,

International Studbook keeper for this species. This resulted in two fertile eggs, from which two viable chicks were hatched, on 30 May (70.6g) and on 2 June (70.3g).

SHARKS ARE A WORLD FIRST FOR ROTTERDAM ZOO

The world's first zoo-bred leopard sharks (*Triakis semifasciata*) were born on 8 June 1998 at Rotterdam Zoo. All four young survived and are doing well, whereas the seven young of 1997 were all stillborn. The wild-caught parents have lived since 1985 at Rotterdam and are approximately 15 years old.

FINGERS CROSSED FOR EEP OKAPI CALVES

No fewer than five okapi calves (*Okapia*

johnstoni) were born in the EEP region in the past six months, bringing the total number of okapis in Europe to 43 individuals. In June 1996, okapi Onja from Basle Zoo (Switzerland) successfully delivered her first calf; a female named Tunda. September was a happy month for Rotterdam Zoo (the Netherlands) when okapi Moera delivered her first female calf, Dumba, after having given birth to seven sons in a row. A few days later Basle Zoo was pleased to receive a playmate for Tunda when female Henny gave birth to a male calf, Tumai. Okapi Kasindi in Antwerp (Belgium) became mother and grandmother in the space of one month; in October daughter Sofie delivered granddaughter Xantia and one month later Kasindi herself gave birth to her fourth calf, a male named Xano. A significant increase in growth rate in the EEP okapi population is urgently needed in order to terminate the rate of loss of genetic variation in this small population. The five calves recently born bring hope that this increase in population growth may indeed be achieved.

Anatomy of the EEPs

IN THIS SHORT HISTORY OF THE EUROPEAN ENDANGERED SPECIES PROGRAMME, WE EXAMINE ITS CONCEPTION, PROGRESS AND ACHIEVEMENTS OVER THE LAST THIRTY YEARS

William van Lint, Assistant Manager, Collection Coordination and Conservation (CCC) and Danny de Man, Manager, CCC, EAZA Executive Office

It all began with a meeting in June 1985 in Antwerp, where the possibilities of coordinated breeding programmes were discussed by a handful of forward-thinking zoos, namely Amsterdam, Antwerp, Cologne, Copenhagen, Helsinki, Mulhouse, Rotterdam and Zurich. This meeting is now regarded as the 'birth hour' of the EEP.

Following this historic meeting, a second meeting was held in Cologne in November of the same year. Twenty-six institutions from nine countries were represented and the first 19 EEPs were established: bearded vulture (*Gypaetus barbatus*), Congo peafowl (*Afropavo congensis*), drill (*Mandrillus leucophaeus*), bonobo (*Pan paniscus*), black gibbon (*Nomascus concolor*), giant anteater (*Myrmecophaga tridactyla*), red panda (*Ailurus fulgens*), Persian leopard (*Panthera pardus ciscaucasica*), tiger (*Panthera tigris*), Przewalski's horse (*Equus ferus przewalskii*), babirusa (*Babyrousa babyrussa*), vicuña (*Vicugna vicugna*), Lesser Malayan mousedeer (*Tragulus kanchil*), Chilean pudu (*Pudu pudu*), okapi (*Okapi johnstoni*), gaur (*Bos gaurus*), anoa (*Bubalus depressicornis*) and muskox (*Ovibos moschatus*).

In the first five years the EEP programme structure was overseen by the EEP Committee. Later on, the Committee was supported by the EEP Executive Office (1990). Parallel to the collection planning developments, there was a political need for zoos in Europe to cooperate more closely, which led to the establishment of ECAZA (European Community Association of Zoos and Aquaria) in 1988; after the fall of the Iron Curtain, this became EAZA (European Association of Zoos and Aquaria) in 1992. That was also the moment when the EEP Committee came under the umbrella of EAZA and from that point the EEP Executive Office would continue

functioning as EAZA Executive Office.

STEADY GROWTH

From those modest beginnings, we now have 370 members (excluding 16 Candidates for Membership) in 44 countries. These joint forces make it possible to keep not only more robust populations, but also a better variation of species in EAZA collections in the long term. In 1990 the largest EEP for mammals counted 253 living individuals (Orang utan/*Pongo pygmaeus* EEP), and the largest EEP for birds counted 150 living individuals (Hyacinth macaw/*Anodorhynchus hyacinthinus* EEP). Today we have mammal programmes such as the Giraffe (*Giraffa camelopardalis*) EEP with more than 900 living individuals and bird programmes comprising up to 1800 living individuals, as in the African penguin (*Spheniscus demersus*) EEP.

Along with the membership, the number of breeding programmes has also increased from 19 EEPs to 201. In addition to the EEPs the concept of a European Studbook (ESB) was approved in 1994, and since then the number of ESBs has also gradually increased to 200.

The first EEPs were selected in a more ad hoc manner; later the initiation of EEPs (and ESBs) was based on the outcome of a comprehensive regional collection planning exercise done by a Taxon Advisory Group (TAG). The first TAGs were established in 1990, although it took a number of years before all taxa were covered. In the last 15 years we have established around 40 TAGs, with some variation due to TAGs that have split and/or merged.

It is also interesting to see the division across the taxa. In 1985 the first 19 EEPs were heavily dominated by mammals. In 1990, 66 species were represented by EEPs of which 54 were

mammal species (82 per cent), 10 bird species (16 per cent) and two reptile species (2 per cent). At the end of 2015, programmes for mammals were still most numerous, but relative to other taxa this has decreased to just under 60 per cent (234 programmes). The bird programmes follow with 30 per cent (120 programmes). The remaining 10 per cent is divided over the lower vertebrates and invertebrates (see chart on page 15). Of particular note is the recent increase in the number of fish programmes; by 2015 there were seven EEPs for sharks and rays (see page 28).

WIDER INVOLVEMENT

The growth in membership and programmes led also to an increase in the number of institutions running a programme. Currently 138 EAZA Members run at least one programme. This shows an increase in the number of institutions actively contributing to the management of EAZA programmes, and the EAZA Executive Office always welcomes expressions of interest from more who want to get involved.

Improvements in technology have certainly contributed to faster communication between colleagues in different countries. The first mention of the internet was in EAZA News 16 (Winter 1996), and in the following issue the 'worldwide web' was introduced to the zoo world. In the early days of EEPs, all communication was via post, fax or phone. Now there are mobile phones, listservs, Facebook pages and so on, which guarantee that you can easily reach the relevant colleague or whole zoo community when necessary.

There are several aspects of the EEP structure that are vital to its success; for example, there is a coordinator who, together with his/her Species Committee, is responsible for the overall management of the population.

EEP Committee Chairs

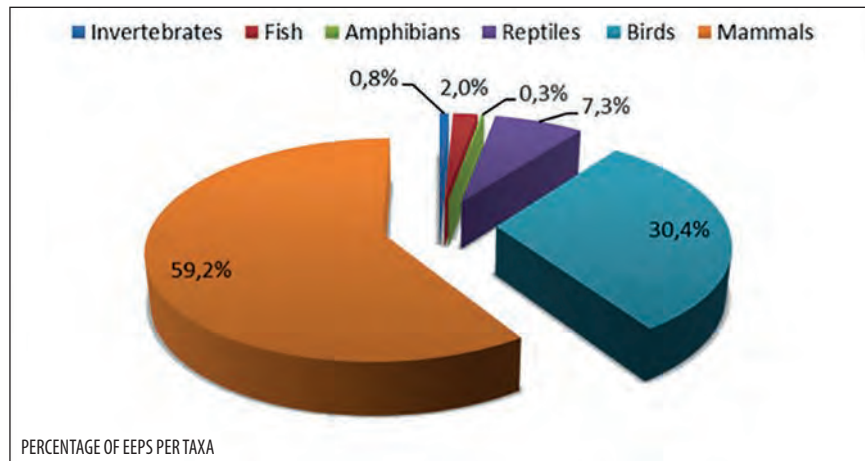
Wilber Neugebauer (Stuttgart): 1985–1988
Gunther Nogge (Cologne): 1998–1994
Dieter Jauch (Stuttgart): 1994–2000
Bert de Boer (Apeldoorn): 2000–2003
Bengt Holst (Copenhagen): 2003–today

EAZA institutions keeping an EEP species are obliged to participate and follow up on the breeding and/or transfer recommendations, and the recommendations are made by making use of the relevant data collection and analytical tools for population management, as ZRbook/SPARKS/ZIMS and PMx. The aim of the EEP is to achieve a demographically and genetically healthy population in the long term, and for that reason institutions were expected to think beyond their own needs for the overall good of a population. Another important part of the EEP concept was that EEP animals no longer had a commercial value, so the sale of EEP animals was not permitted.

As EEPs are programmes run under the umbrella of EAZA, and the costs of running the programmes are shared by the EAZA community, EEPs are first and foremost for EAZA Members. However, sometimes non-EAZA holders can offer important contributions to an EEP. Hence a process for non-EAZA members to participate in EEPs was designed in the early 2000s, and some 210 non-EAZA participants are now approved in 84 EEPs.

THE IMPORTANCE OF TRAINING

An important part of the breeding programme structure is to make sure that all coordinators and studbook keepers are properly trained in how to run an EEP/ESB. To this end, all newly approved coordinators/studbook keepers must attend the Basic Breeding Programme management course. To date, 392 colleagues have attended this three-and-a-half day course at the EAZA Executive Office in Amsterdam. In 2006 an advanced course was introduced, tailored to more complex analyses of the population to help planning and issuing breeding and transfer recommendations. These courses have been hosted by different EAZA Member institutions and so far 125 colleagues have attended. Today



almost 95 per cent of our programme leaders have completed the basic course and 40 per cent have taken both courses.

SHARING INFORMATION

In our efforts to collectively manage our populations, the use of ISIS/ZIMS by all our members has been crucial. Today, 95 per cent of our (Full and Temporary) membership are members of ISIS, and keep their records in ZIMS. This is replacing the rather time-consuming process of producing space surveys for the different taxa, which the EAZA Executive Office used to produce frequently until 2004.

Our collection planning efforts and programme updates have previously been published in the EEP Yearbook, later renamed as EAZA Yearbooks. The first EEP Yearbook was published in 1991 and the last hard copy in 2006; an electronic version was published for 2007/08. However, as the number of programmes grew, it became too impractical to produce, so in 2011 it was decided to discontinue this document. Instead, all coordinators and studbook keepers are encouraged to produce their own report and upload it to the relevant TAG page on the Member Area of the EAZA website. At the request of the TAG chairs, all TAGs were granted their own TAG page on the Member Area of the EAZA website in 2009, which has enabled them to upload and manage relevant information and documents (e.g. husbandry guidelines, studbooks, annual reports and presentations or publications), and make them permanently available for the whole membership.

With more than 400 EAZA breeding programmes in place,

involving more than 300 participants from 44 countries, it is important that there are clear guidelines and procedures in place for everyone to follow. For that reason working procedures were produced for EEPs and ESBs in 1994 (and updated in 1999) and for TAGs in 2009. More recently all these working procedures and all other population management-related guidance documents, statements and so on produced over the years were compiled, revised and included in the new Population Management Manual (PMM), approved by Council in 2012. The PMM is often referred to as the EAZA breeding programme 'bible' and is available on the EAZA website.

Right from the beginning it was recognised that appropriate husbandry standards and experience are important for the care and management of animals and for successful reproduction to take place. EEPs were and are encouraged to produce husbandry guidelines for holders to strive to comply with. In recent years the development process of the guidelines has been fine-tuned and the name changed to EAZA Best Practice Guidelines. EAZA is proud of these important documents, and guidelines following the new template are available on EAZA's public website.

The 30-year milestone seemed the right time to review the collection planning structure and to produce a revised structure for the future. The EEP Committee is, together with the TAG chairs, EEP Coordinators and ESB Keepers, currently working on this (see page 26). We have high hopes that this will produce an even more effective structure for the future of the EEP.

Committed to success

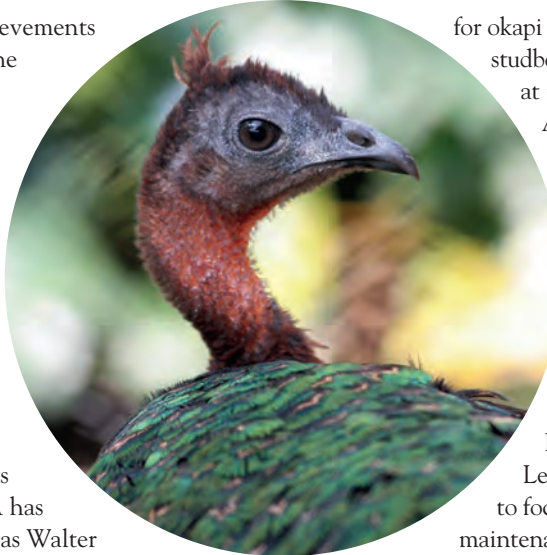
STRONG INSTITUTIONAL SUPPORT IS AT THE CORE OF ANTWERP ZOO'S UNWAVERING COMMITMENT TO EAZA AND ITS BREEDING PROGRAMMES

Zjef Pereboom, Manager CRC, Antwerp and Planckendael Zoos

One of the key elements in the achievements of the EEP breeding programme is the commitment of individual EAZA Members. The Royal Zoological Society of Antwerp (Antwerp and Planckendael Zoos, hereafter KMDA) has been one of the early proponents of the importance of collaboration in captive breeding and has dedicated staff time and resources to taking an active role in making joint breeding programme management a success.

At the core of why KMDA staff are truly committed to EAZA and its breeding programmes is that KMDA has always had visionary directors, such as Walter Van den Bergh (1946-1978) and Fred Daman (1983-2001). They had a central role in setting up the first international collaborations between zoos, initially in the International Union of Directors of Zoological Gardens (IUDZG, now WAZA), and later the European Community Association of Zoos and Aquaria (which became EAZA with the formal incorporation of the EEPs). Because of the prominent role of its directors, curators and other staff at KMDA were continuously encouraged to take up responsible roles in EAZA committees and working groups, and to actively contribute to studbook management and breeding programme coordination. The illustrious curator troika Bruno Van Puijnenbroek, Roland Van Bockstaele and Pol Van den Sande, who were carefully selected by KMDA's directors in the early Sixties, paved the way for the active involvement in EAZA's breeding programmes of the current generation of KMDA curators and biologists.

Of course the strong involvement in the coordination of EEPs is also partly related to some of the high-profile species managed by KMDA since very early on. Keeping detailed studbook data was of crucial importance, and has been a standard operating procedure for the rare, and at that time highly elusive (and difficult to breed), species such as okapi, bonobo and Congo peafowl that used to come in to the European zoos through the Port of Antwerp because of its close links to Zaire. As such, Agatha Gijzen (initially employed by Rotterdam Zoo, and later by KMDA from 1947 till 1974) was in many ways a pioneer in the international zoo world. She maintained comprehensive studbooks for several species long before the existence of EEPs and introduced the practice of adopting scientific principles in zoo animal management that are now customary for all captive breeding programmes. This included keeping detailed animal records, performing routine necropsies and carrying out regular exchanges of individual animals between zoos based on studbook analyses. For example, she established the first international studbook



for okapi in the 1960s, and published detailed studbook analyses in the early 1970s aimed at improving the breeding programme.

Agatha Gijzen was also instrumental in promoting the necessity for collective efforts in captive breeding.

With this historical legacy, and with the start of the EEP programme structure in the mid 1980s, KMDA's commitment to the new EEPs was further emphasised by appointing full-time population biologists like Helga De Bois (1988-1996) and Kristin Leus (1996-2007). Their priority was to focus all their attention on studbook maintenance and analysis and to support the

curators in the management of KMDA's breeding

programmes by applying scientific principles from both population demography and genetics. Even today KMDA still has several devoted scientists at work in its Centre for Research and Conservation, who support the EEP programmes coordinated by curators and research staff alike and who use scientific research to further improve these EEPs and captive breeding programmes in general.

The early and continuous commitment of its curators and biologists has resulted in high-quality studbooks and well-led EEP programmes, which was independently confirmed by a quality assessment exercise of International Studbooks by WAZA's Committee for Population management in 2013. The results revealed that two out of the four international studbooks with the fewest data quality issues were managed by KMDA since the 1950s and 60s: those for the Congo peafowl and okapi. Two other KMDA studbooks (bonobo and golden-headed lion tamarin) were amongst the top 10 studbooks.

Yet dedication and motivation does not necessarily mean these are also the EEPs within EAZA that are without problems. Despite the long-term efforts, the continuation of the Congo peafowl EEP, for example, is a serious concern, and the breeding programme is in dire need of a substantial boost or there will be no more birds to breed in the near future. This can only be achieved if members of staff get the time and resources to do this as part of their job, and are acknowledged for their efforts by their own directors and line managers.

We are very fortunate at KMDA to be in such a situation, and I suppose the 'secret formula' of KMDA is not only its history of visionary directors, dedicated and capable staff, and in-house appreciation; it is also the international recognition for the work that studbook managers and programme coordinators do that inspires and motivates them to make the extra effort.

From humble beginnings

IN 1985, COLOGNE ZOO HOSTED A MEETING AT WHICH THE FIRST EEPs WERE ESTABLISHED. MORE THAN THREE DECADES LATER, THE ZOO IS STILL ENJOYING THE BENEFITS OF ITS LONGSTANDING COMMITMENT TO THESE MANAGED PROGRAMMES

Theo Pagel, Cologne Zoo, Germany

A lot of our young colleagues will probably not know that EAZA was once called ECAZA (European Community Association of Zoos and Aquaria) and that EEPs and our collective efforts around breeding programme management and collection planning are only about 30 years old.

When the Convention on International Trade in Endangered Species (CITES) came into force in 1975, the effect was to cut zoos off from the import of wild-caught animals, as the trade was so strictly regulated. As a result, zoos realised that they would have to breed animals they wanted to exhibit. As Professor Gunther Nogge, who was then the director of Cologne Zoo, explained: 'To this end they had to join their forces, as exemplified by the Species Survival Plan (SSP) developed by the Association of Zoos and Aquariums (AZA) in 1983. As at this time there was no European zoo association in existence, it took Europe a while to follow the American example.'

Nogge went on to describe how Dick van Dam of Rotterdam Zoo, Bart Lensink of Artis Zoo Amsterdam and Fred Daman of Antwerp Zoo took the initiative, inviting European colleagues to a meeting at Antwerp Zoo in June 1985 to discuss the possibilities of coordinated breeding programmes in Europe. Disappointingly, only five people took up the invitation: Bent Jørgensen of Copenhagen Zoo, Ilkka Koivisto of Helsinki Zoo, Jean-Marc Lernoould of Mulhouse Zoo, Christian Schmidt at Zürich Zoo, and Professor Nogge himself. However, as Nogge said: 'This meeting has to be regarded as the birth-hour of the European Endangered Species Programme (EEP).' A second meeting was held in November the same year, at Cologne; this time 26 zoos from nine different countries were represented and the first 19 EEPs were established.

In a way, EEPs were born at Cologne Zoo; we were convinced by the idea from the start and we still feel the 'spirit' of EAZA. The One Plan Approach, as defined by the Conservation Breeding Specialist Group (CBSG), was soon added, which was that we all need to cooperate to save biodiversity. That is why Cologne Zoo was and still is very progressive and active in its conservation work. Our efforts are even greater today, as we have formed relationships with *in situ* projects around the globe via our breeding programmes. We also use our education and marketing department to teach our visitors, to get them enthusiastic about nature so that they become active themselves.

Professor Nogge, formerly Chairman of EAZA and Director of Cologne Zoo, maintains a strong presence in the running of breeding programmes, species monitoring and taxon advisory groups even after his retirement. 'We collaborate in species advisory groups and I am also active in the EEP Committee and in the EAZA Council,' he explains. 'Our staff spend a great deal of time on EAZA involvement, but it is necessary and indispensable. At the moment we are



BALI STARLING

restructuring our breeding programmes and evaluating our tools. On a long-term basis we need healthy populations of animals. We need to provide a future for some of the world's most vulnerable species.'

Over 25 years ago, before I worked in the zoo world, I established a breeding programme for the Bali Starling (*Leucopsar rothschildi*), together with Zoo Wuppertal and Cologne Zoo. Since 1992 this has been an official EEP, which I ran until 2007. Today we can say that we have a stable population of this beautiful bird in human care, a success that makes me very happy. However, it is still endangered in the wild. On my last trip to Bali at the end of 2015 I was able to see what is being done in the country of origin, which again showed me how important our work is.

But what do we get in return? We get to collaborate and exchange information with interesting scientists, colleagues, NGOs and government bodies. We have created a reputation that is very useful, especially at a time when animal rights people are campaigning against us. We have been able to find and describe new species in the wild. We have seen the young EAZA grow and mature to become an active, intelligent and successful organisation. EAZA is us; and EAZA is biodiversity and we all should work together to further develop our efforts. It is important to remember that the more of us who take part in this far-sighted project, the more effective we will be – so I would urge anyone who is considering it to take the opportunity and go for an EAZA position, for you will become an active member of the most dynamic, innovative and effective zoo and aquarium membership organisation in Europe.

From the zoo to the wild

SUCCESSFUL COOPERATION BETWEEN BREEDING PROGRAMMES IN ZOOS AND IN THE WILD HAS TRANSFORMED THE FORTUNES OF THE BEARDED VULTURE



Hans Frey, Scientific Director, Richard Faust Centre, Austria and Alex Llopis, VCF bearded vulture captive breeding manager, Centre de Fauna Vallcalent, Spain

In 1978 the bearded vulture reintroduction project started in the Alps (FZG 832/78; WWF 1567/78) based on a captive breeding programme. This bearded vulture captive network has been included in the European Endangered Species programme since the EEP began. Between 1978 and 2015, 461 juveniles were reared successfully as part of the programme, which made it possible to broaden the initial goals and start other reintroduction projects. The reared offspring have been used for reintroduction projects in Europe: in the Alps (204), Andalucía (37), Grands Causses (9), Sardinia (3), and for the captive breeding network (208). The first reproduction of bearded vultures in the wild occurred in 1997 (France) and by 2015 148 fledglings had fledged in the Alpine mountains. In 2015 the Andalusia bearded vulture reintroduction project celebrated a great achievement: after nine years of releases the first chick hatched in the wild from a female that was only five years old.

All of these achievements have been possible thanks to the constant breeding success achieved at the Alpenzoo Innsbruck, which was inspired to start a reintroduction project based on a captive breeding programme. The essential guidelines along with its *modus operandi* were established during the international meeting held in 1978 in Morges,

Switzerland. One of these guidelines was to restrict the programme to the use of bearded vultures that were already in zoological parks and wild birds that had been injured and were not suitable for release. With this in mind, a breeding centre was created on the outskirts of Vienna at the Richard Faust Zentrum (RFZ), which is also the coordinating centre for the programme.

Initially, the Frankfurt Zoological Association and WWF Austria provided the financial support for this project, and since 1992 the Vulture Conservation Foundation (formerly the Foundation for the Conservation of the Bearded Vulture) has led the project. A general meeting is held once a year, at which all results, both *ex situ* (from zoos) and *in situ* (from birds in the wild), are presented. Over the last few years this annual meeting has become a gathering for experts on bearded vultures, where anyone monitoring other wild and reintroduced populations can present their results and problems and discuss solutions together.

CREATING A CAPTIVE BREEDING NETWORK

The bearded vulture is a territorial and non-colonial species; thus it is not recommended to hold a group together because as soon as a pair bonding arises they defend their territory (aviary)

against their con-specifics. That is why the most appropriate release method for this species is the 'hacking' technique, where nestlings are introduced in an artificial adapted nest site. One of the pillars of success of this method is the learning and adaptation capacities that result from the age and species. In birds, learning and adaptation capacities peak during the nestling and especially fledgling phase. Furthermore, they recognise the release site as their hatching place, increasing the high return percentage and occupying territories in the surroundings of the release area. This philopatric inborn behaviour makes it possible to build up a local subpopulation.

In 1978 it was clear that only offspring from zoos could be used, because the autochthonous populations were threatened or unexplored. Nearly 40 bearded vultures were still distributed throughout European zoos, including only one successful brooding. With the help of Hans Psenner and Richard Faust (director of FZG) it was possible to transfer most of these birds to the Richard Faust Centre for pair bonding, to study behaviourally problematic birds and develop the housing guidelines for this species. Paired birds and juveniles went back to the zoo, and so from 1978-1985 the European breeding network emerged and was a precursor of the later established EEP.

From the beginning the objectives were clearly defined and are still being followed unchanged: the preservation of genetic diversity as an *ex situ* genetic reserve, natural and optimal rearing conditions (by parents or foster parents), reintroduction of the species in former distribution areas and building human-independent, free-living populations (*in situ*). The ultimate aim of the programme is to create a European meta-population of bearded vultures, creating gene flow between the existing isolated autochthonous populations in Europe (in the Pyrenees, Corsica and Crete) and with populations in North Africa and Asia.

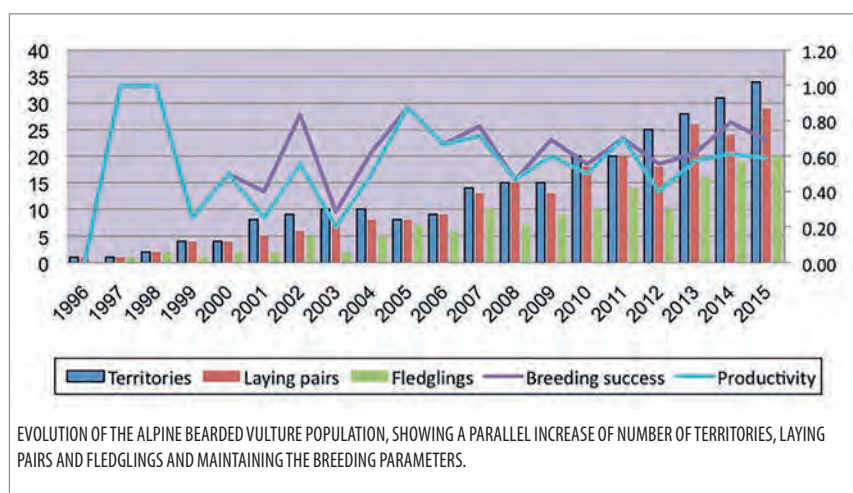
This can be achieved only if chicks are natural-reared, encouraging the development of their natural behaviour. That is why hand-rearing is completely avoided. As the logo of the Bearded vulture EEP clearly states: 'Quality before Quantity'.

The reintroduction project of bearded vultures in the Alps was one of the first examples of a fruitful cooperation between *ex situ* and *in situ* projects, which sends an important message to zoos regarding their conservation species function.

THE STRUCTURE OF THE BEARDED VULTURE EEP

The Bearded vulture EEP network is composed of a huge number of different types of institution: private and municipal zoos, private collections, NGO institutions and governmental recovery centres, several of which are not EAZA Members. That is why an international foundation structure, the Vulture Conservation Foundation (VCF), was created to ensure that all our partners accept, respect and follow the guidelines of the EEP. There are currently 38 (mainly European) zoos, three large and two smaller specialised captive breeding centres and two private keepers holding a total of 161 birds, and 80 per cent of these birds are owned by the VCF.

Pair formation in bearded vultures can be complicated and dangerous. That's why Specialised Breeding Centres were created where highly experienced employees are responsible for new pair bonding, including new founders (injured wild birds) into



the breeding network; analysing problematic birds from zoos; adopting hatchlings; and maintaining genetic diversity. The main role of the other partners is to breed the established couples.

The average breeding success in the Specialised Breeding Centres is 0.89 juvenile/pair, with the first successful breeding at an average of 9.2 years. The life expectancy is 27.1 years. In the other institutions, the comparative figures are 0.39 juvenile/pair, 12.4 and 16.6 years respectively. This quite considerable difference shows the importance of Specialised Breeding Centres, as it is due to the continuous presence of highly experienced staff.

Nevertheless, zoos and other institutions play a crucial role in the EEP and in the conservation of bearded vultures. Although their success rate is lower, they still contribute substantially to the annual number of raised animals. Furthermore, by maintaining stock distributed across several separate centres, we reduce the risk of losses caused by epidemic diseases. Most importantly zoos contribute by showcasing the species and its conservation plight to hundreds of thousands of people, helping to build the core support for vulture conservation that would otherwise be impossible to achieve.

RELEASES IN THE ALPS

In 1986 the first releases were carried out in Krumltal (National Park Hohe Tauern, Austria). Immediately breeding results increased, making it possible to carry out further releases: in 1987 in Haute-Savoie, France, in 1991 in National Park of Switzerland and in 1993 in P.N. Mercantour,

France & P.N. Alpi Marittime, Italy. Although the distance between each release point was around 250-300km, bird exchange and pairing occurred between them. It was necessary to wait 10 years before the first breeding success occurred in the wild, almost 100 years since the last bearded vulture was shot in the Alps.

Since then, the Alpine population has increased from zero to 33 territories in less than 20 years and the number of fledglings per year has increased to 20 individuals in 2015. Furthermore, the breeding parameters are constantly showing a healthy increase of this reintroduced population (see graph above) thanks to the high survival rates of all age classes (Schaub *et al.* 2009). However, many of the birds released in the framework of the reintroduction programme are closely related. That is why the effective population size was estimated at a value of only 28 in 2010 (Loercher *et al.* 2013). Therefore, a focus for the conservation of this population is the enhancement of the genetic diversity by furthering releases of young birds from rare founder lines, and the establishment of a corridor between the Alpine and the Pyrenean populations.

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Saving the Amur tiger

ONE OF THE FIRST EEPs TO BE ESTABLISHED IS STILL PRODUCING EXCELLENT RESULTS THIRTY YEARS LATER

Jo Cook, Amur tiger EEP Coordinator, Zoological Society of London

Tigers have always been one of the most popular exhibits in zoos, inspiring people with their beauty and power, and there is no indication of that changing. They undoubtedly bring visitors in and have a big commercial impact, but they also offer the chance to highlight conservation issues relevant to these top predators. Given the number of Amur tigers that are kept in zoos and their importance within collections, it was perhaps obvious that this particular population should become one of the first to be managed as an EEP.

Efforts to develop a coordinated breeding programme for the Amur tiger in Europe followed discussions held by the European members of the International Union of Directors of Zoological Gardens (IUDZG) and the IUCN SSC Captive Breeding Specialist Group (CBSG), and key to its establishment was the International Studbook for Tigers (ISB). In 1986 the ISB was managed by Dr Seifert (Leipzig Zoo) who wrote to all European and USSR zoos holding registered tigers, asking if they would participate in an Amur tiger breeding programme. Positive responses were received from 68 zoos and these formed the basis of the EEP with a population of 206 from 60 founders.

The first breeding and transfer recommendations were issued in 1987 by Georgina Mace, then a Research Fellow in ZSL's Institute of Zoology and a pioneer of population biology. SPARKS, PMx and similar software now used daily by many of us was not widely available, making this a greater undertaking than we can imagine today, not to mention that communication was via letter, fax and phone.

Sarah Christie (ZSL) took over in 1995 and, using a grant from the Save the Tiger Fund, organised a meeting at Moscow Zoo involving zoo directors from that region to discuss the programme and general Amur tiger conservation. The meeting was followed by a tour of Russian zoos, and these

events were pivotal in building the strong relationships between Sarah and her co-coordinator, Tanya Arzhanova, as well as with the zoos, which continue to provide such a strong framework for this EEP.

BUILDING SUPPORT NETWORKS

As well as population management of the EEP, there has always been a strong emphasis on maximising conservation support. The significant number of participant zoos in the range state led to the large founder base due to wild-caught tigers held by zoos that had been received from dealers or circuses. In 1995, as a result of the implementation of the State Strategy of Amur Tiger Conservation and following a request by the Ministry of Natural Resources and Environment of the Russian Federation, the Amur tiger EEP issued a statement confirming it would not request wild-caught tigers, but would house wild-caught tigers in EEP zoos if they were unfit for release into the wild.

This agreement stands today and the EEP occasionally receives new founders resulting from ongoing poaching pressures on the wild population. It is not uncommon for cubs to be found in a desperate state after their mother has been killed and every effort is made to rehabilitate these tigers.

This work is usually carried out at the Primorskii Regional Non-Commercial Organisation Tiger Center, and in the past three years six tigers have been rehabilitated, five of which are now living successfully in the wild. The sixth released tiger displayed unwanted behaviour, making a conflict situation highly likely; he was therefore recaptured and is currently in an EARAZA zoo as part of the EEP.

Raising awareness and funds for *in situ* projects has also been a priority for the programme, and zoos holding Amur tigers have donated through channels such as the Amur Leopard and Tiger Alliance (ALTA) for projects including anti-poaching, conflict mitigation

and wildlife health monitoring. My roles as ALTA coordinator and EEP Coordinator put me in the privileged position of seeing how *in situ* and *ex situ* work can really complement each other as we work towards the common goal of protecting the Amur tiger's future and, we hope, increasing the impact that *ex situ* measures can have.

MAINTAINING GENETIC DIVERSITY

The programme has not been without its difficulties and has endured two separate, but connected, hybrid situations. In the mid-1990s the subspecific purity of Amur tigers ISB #3260 and #3261 was queried and DNA tests were run in the US. The results indicated that #3261 was not a pure Amur tiger but carried Sumatran tiger alleles. In this situation the most responsible action can be to remove the animal and any of its descendants from the breeding population. This was done with minimal impact on the EEP, and as the results suggested that #3260 was not a hybrid, his exclusion was not needed. However, in 2007 the samples were reanalysed and it was concluded that #3260 did carry Sumatran tiger alleles. At that time 42 Amur tigers related to #3260 were in 22 zoos, all of which needed to be excluded from breeding. This big decision had several practical implications, some of which we are still dealing with nine years later. Thankfully, despite removing these tigers, the EEP retained 96.84 per cent genetic diversity, and the current gene diversity for the whole EEP (EAZA and EARAZA) stands at 97.8 per cent with an average inbreeding of 0.027.

Initially the EEP was managed as one population across the European and Russian regions, with one set of breeding and transfer recommendations issued. This was crucial, as the population in the Russian region alone was unsustainable, and this method continued until 2005 when an EARAZA programme for Amur tigers was created, under the umbrella of the



EEP. Since then recommendations for each region have been made separately by the relevant coordinators (Alla Glukhova at Moscow Zoo now manages the EARAZA population), but there remains a very close working relationship with fairly regular transfers between the regions. The EEP is also one of the regional programmes in the Amur tiger GSMP that was formed in 2012, along with the JSMP (Japan) and the SSP (North America).

POPULATION CONCERNS

The population target for the EAZA region of the EEP is 250 and that has been maintained for the past few years with little fluctuation. However, as tigers are living longer, the number of breeding recommendations given is decreasing and this year just 14 have been issued. In a programme with 91 participating institutions, this leaves a lot of zoos without the opportunity to showcase their work and attract visitors with tiger cubs. There have been non-recommended litters in the past and the EEP has always made it clear that such litters are not the EEP's responsibility to place, and they will not be guaranteed a home within the EEP. Some zoos breed and cull at dispersal age and this is arguably the best way of managing

this particular species, although it raises ethical issues and is illegal in several countries. Others retain non-recommended cubs for exhibit while others may place them outside the EEP as surplus animals, something we would like to avoid as it can impact on the future management of the programme.

One such example was the transfer of a surplus tiger from the US to Japan (pre-GSMP) before it was known that it carried the allele responsible for white coat colour. Once the GSMP was formed and all tiger pedigrees examined, tigers from this hybrid lineage were excluded from breeding as part of regional and GSMP populations, limiting the number of tigers held in Japan that are considered part of the GSMP. It also affects the majority of tigers held in Korean zoos and would impact on their involvement in the GSMP should they join in the future.

Tiger cubs are hugely important for zoos as not only do they often improve income, but also they ensure keepers gain experience of managing a breeding pair and offspring. This experience is being lost in many cases because zoos have been holding genetically unimportant, non-breeding stock. Breeding and rearing young is also important for the behavioural and

physical health of the tigers themselves and not having that opportunity can impact on their welfare. We are therefore investigating different options enabling us to increase the number of breeding recommendations given and are asking zoos if they will cull at dispersal age or partially cull litters, if they will euthanise older animals and how long they can hold offspring. With that information, we hope to tailor recommendations to individual zoos thus increasing the number given. We also need to encourage all zoos to act in the best interests of the programme.

The Amur tiger EEP unquestionably is a success because it has ensured that we have a demographically and genetically robust population that could be used for supplementation or reintroduction in the future if necessary. It has also directly contributed to the conservation of wild Amur tigers by providing research opportunities and data that have informed conservation activities as well as funds for *in situ* work. The importance of involving the range state country from the very beginning cannot be underestimated and Alla and I are very grateful for Sarah and Tanya's hard work and for their continued advice as we take the programme forward.

Programme snapshots

FROM AFRICAN PENGUINS TO ZEBRA SHARKS, WE REPORT ON SOME RECENT ACHIEVEMENTS AND CHALLENGES OF BREEDING PROGRAMMES WITHIN EAZA

As a complement to the two in-depth articles on EEPs for the bearded vulture (page 18) and Amur tiger (page 20), here we offer a snapshot of the status, achievements and challenges of some further EEPs and ESBs. These programmes were established at different times over the last 30 years, some in the early days and some more recently.

The chosen examples clearly show that our programmes have been very successful over the years, and offer an insight into some of the reasons for this success. Common reasons include continuing research, social housing and a better understanding of nutritional need or veterinary care; but sometimes all that is needed is good cooperation among the holders and a coordinated effort to work on a species.



Species/scientific name: Zebra shark *Stegostoma fasciatum*

Programme level: ESB

Coordinator/studbook keeper: Silvia Lavorano (GENOVA)

Year of establishment: 2007

IUCN status (IUCN 2015): Vulnerable

Population (1 Sep 2015, studbook): 38.44.00 (m.f.u)

Population trend, 2010-2015: Increasing

Biggest achievement: An increase in the number of participants and animals and an improvement in husbandry knowledge. The improvement of husbandry techniques resulted in a decreased death rate within the population, resulting in more animals reaching maturity, which in turn led to the first successes in reproduction. Males are often very aggressive with females during mating, and separating animals other than for mating or holding the animals in colder temperatures helped to prevent injuries to the females. Furthermore, changes to the dietary requirements improved the survival and rearing of offspring.

Biggest challenge: In the studbook there are still many animals without breeding potential: for example, an uneven sex ratio in this population leads to many sharks not being able to breed. The challenge is to further increase breeding success across holders within Europe, in order to build up a sustainable population that is no longer dependent on the importation of animals caught in the wild.

We hope for a positive reproduction trend over the next few years. The transfer of animals between aquaria to create more reproductive couples would be especially helpful, but unfortunately this is a difficult and expensive process.

Species/scientific name: Mountain chicken frog *Leptodactylus fallax*

Programme level: EEP

Coordinator/studbook keeper: Gerardo Garcia (CHESTER)

Year of establishment: 2004 (as ESB, upgraded since March 2016)

IUCN status (IUCN 2015): Critically Endangered

Population (31 Dec 2015): 69.102.63 (m.f.u)

Population trend, 2010-2015: Stable

Biggest achievement: The programme supplied enough animals to run trial releases in Montserrat Island. In preparation for the releases, two different techniques for individually marking the frogs were validated (microchipping and photo identification), which helped to monitor the wild populations in Montserrat and Dominica.

A biosecure safety net population of frogs suitable for future reintroductions in their historical natural range of distribution was developed. We tracked down every single individual and parental linkage of the studbook since the first rescue programme in 1998.

We developed two breeding programmes in EAZA and recently in AZA to support the Species Action Plan (one biosecure and one non biosecured) to support all the *ex situ* actions.

Biggest challenge: To maintain a large number of frogs in a long-term sustainable *ex situ* population until we have secured areas for reintroduction; and to mitigate the infertility problem that has an effect in all institutions.



Species/scientific name: African penguin *Spheniscus demersus*

Programme level: EEP

Coordinator/studbook keeper: Corinne Bos (AMSTERDAM)

Year of establishment: 1996

IUCN status (IUCN 2015): Endangered

Population (11 Nov 2015): 825.770.266 (m.f.u)

Population trend, 2010-2015: Increasing

Biggest achievement: The programme started with 800 penguins in 32 institutions. At that time 60 per cent (500 birds) were unsexed and a large number of birds were not individually marked. So this programme not only dealt with a big population increase over the last 20 years both in numbers and institutions involved, but also managed to encourage institutions to individually mark their penguins and sex their birds. Only 14 per cent of the birds, mostly juveniles, are now unsexed.

More recently, the preparation and publication of the 2016 Long Term Management Plan for the African penguin EEP was a big achievement.

Biggest challenge: There remains great difficulty in establishing a known pedigree for this EEP population; this is made significantly more complicated by evidence of some historic hybridisation with Humboldt penguins.



Species/scientific name: Marabou stork *Leptoptilos crumeniferus*
Programme level: ESB
Coordinator/studbook keeper: Cathy King (WALSRODE)
Year of establishment: 2002
IUCN status (IUCN 2015): Least Concern
Population (31 Dec 2015): 149.122.11 (m.f.u)
Population trend, 2010-2015: Stable

Biggest achievement: Marabous often serve just as decoration for hoofstock exhibits; they are increasingly held in covered enclosures in group compositions that allow them to display a fuller range of their natural behaviours: for example, two pairs of marabous nested together in a live tree in an aviary at Rotterdam Zoo in 2015. More such exhibits are planned. Marabou holders are generally very cooperative in placement of available marabous, and it has been possible to consider enclosure suitability as well as demography in selecting marabou recipients and setting up groups. Several zoos are now consistently parent-rearing marabous each year, and more are expected to start soon.

Biggest challenge: Intraspecific killings, particularly of females, remains the greatest problem. Most recent killings in EAZA zoos have been due to human error. Ensuring that staff working with marabous are aware of which circumstances create a dangerous situation and avoiding putting marabous in these situations remains a huge challenge, as does convincing zoos to undertake husbandry training that could further reduce likelihood of aggression. A better understanding of how and why aggression occurs is needed, and investigations such as the planned EAZA and AZA joint marabou endocrine and behavioural study should be undertaken.

Species/scientific name: White-naped crane *Grus vipio*
Programme level: EEP
Coordinator/studbook keeper: Ruben Holland (LEIPZIG)
Year of establishment: 1989
IUCN status (IUCN 2015): Vulnerable
Population (31 Dec 2015): 96.111.20 (m.f.u)
Population trend, 2010-2015: Slowly increasing

Biggest achievement: We have established a good breeding population with a good founder representation. As the programme reached carrying capacity within EAZA, breeding was slowed down.

Biggest challenge: As white-naped cranes are traditionally kept in open enclosures, the upcoming ban on pinioning in more and more countries might be the biggest challenge. This means we have to move gradually in the direction of a healthy population of fully winged birds. Finding new holders with

suitable facilities will become more difficult.

With only 44 per cent known pedigree, the other challenge is how to manage the population so that it is (genetically) sustainable.

Species/scientific name: Bali starling *Leucopsar rothschildi*
Programme level: EEP
Coordinator/studbook keeper: Bernd Marcordes (KOLN)
Year of establishment: 1992
IUCN status (IUCN 2015): Critically Endangered
Population (31 Dec 2015): 158.143.17
Population trend, 2010-2015: Slight decrease

Biggest achievement: In the early days of the establishment almost half of the European/EEP population was kept by private breeders. Nowadays a healthy core population is present within EAZA institutions and only a few really dedicated private breeders are still involved. Over the years, birds have been provided for releases in Indonesia, but the results so far have not been very satisfying. Sadly the Bali starling is still in great demand for the bird trade.

Biggest challenge: Given that the Bali starling is Critically Endangered, the *ex situ* population has an important role to play. More recently there have been collaborative efforts between the other zoo associations and the Indonesian government. The biggest challenge will be to work together with the aim of saving the species on Bali in the long term.



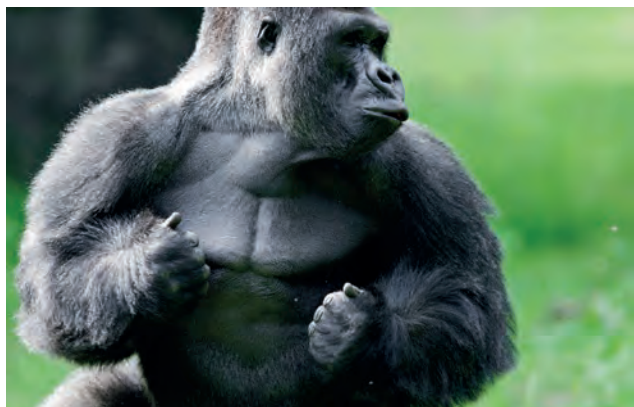
Species/scientific name: Black and white ruffed lemur *Varecia variegata* (excl. *Varecia variegata subcincta*)
Programme level: EEP
Coordinator/studbook keeper: Lisbeth Hoegh (BANDHOLM)
Year of establishment: 1990
IUCN status (IUCN 2015): Critically Endangered
Population (31 Dec 2015): 193.151.5 (m.f.u)
Population trend, 2010-2015: Decreasing

Biggest achievement: The programme started as a Ruffed lemur EEP (including red ruffed and variegated lemur); however, based on further taxonomic research, the programme was split in 2008. In the early days, after some of the initial husbandry issues were solved, this popular species was doing very well. However, after several years, breeding was stopped, due to the above mentioned need for more taxonomic research, and it took a lot of effort to get the EEP back on track again.

There have been a lot of recommended transfers to bring (important) individuals into a good breeding situation, in order to get breeding started again. This is now slowly improving the

population, as unfortunately a lot of husbandry knowledge necessary for successful breeding is no longer present in a lot of zoos due to the long pause in breeding, housing of only single sex groups and other factors.

Biggest challenge: The biggest challenge now is how to manage the population to reach the target of around 400 animals. Restricted breeding is needed to improve the demographics and the genetics. Varecia need more space and a more complex and flexible facility than most zoos give them, so that surplus animals can be kept in the group. This will be one of the big challenges for the coming period.



Species/scientific name: **Western lowland gorilla**
Gorilla gorilla gorilla

Programme level: EEP
Coordinator/studbook keeper: Frank Rietkerk (APELDOORN)
Year of establishment: 1991
IUCN status (IUCN 2015): Critically Endangered
Population (31 Dec 2015): 224.254.0 (m.f.u)
Population trend, 2010-2015: Stable

Biggest achievement: We have just about solved the problems with hand-rearing and the integration of hand-reared individuals in social or bachelor groups. We have set high standards for gorilla husbandry (published in the 2006 Gorilla EEP Husbandry Guidelines, which have been reviewed and will be published this year as the 2016 Gorilla EEP Best Practice Guidelines) and achieved a significant improvement in gorilla management and accommodations over the past decade. We have organised the EEP so that the work is divided over the members of the species committee, which enables the EEP to deal with the intensive coordination that this high-profile species requires. We have made it possible for zoos outside the EAZA region to become active participants in the programme and so enable gorillas to tell their story beyond EAZA's borders.

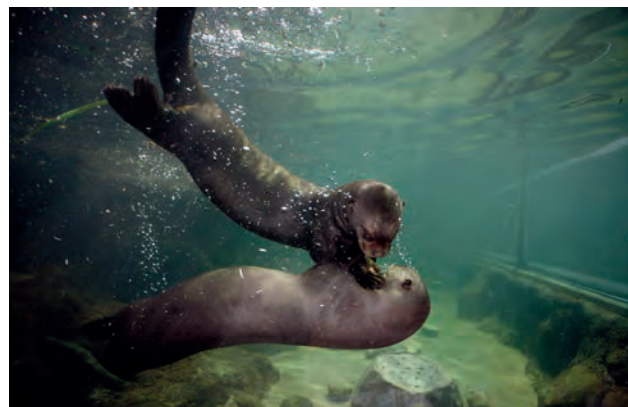
Biggest challenge: Our biggest challenges have been: staying in control of the growing number of males by being creative in finding and trying different ways in different institutions and with different techniques; being more pro-active in gorilla conservation; and finally, very importantly, managing to keep this as a cohesive EEP when other institutions that do not have their own programme join this programme.

Species/scientific name: **Spotted hyena** *Crocuta crocuta*
Programme level: ESB
Coordinator/studbook keeper: Raymond van der Meer (AMERSFOORT)
Year of establishment: 1999

IUCN status (IUCN 2015): Least Concern
Population (31 Dec 2015): 45.47.11 (m.f.u)
Population trend, 2010-2015: Increasing

Biggest achievement: Managing to find more holders and getting zoos interested in spotted hyena. Many new pairs were set up and we now have more zoos with small social groups, reflecting the situation in the wild.

Biggest challenge: To manage these larger groups and keep aggression to an acceptable level. A husbandry workshop organised in 2015 has been used as a tool to work on this and many other husbandry challenges.



Species, scientific name: **Giant otter** *Pteronura brasiliensis*

Programme level: EEP
Coordinator/studbook keeper: Tim Schikora (SCHWERIN)
Year of establishment: 2003
IUCN status (IUCN 2015): Endangered
Population (31 Dec 2015): 32.28.6 (m.f.u)
Population trend, 2010-2015: Increasing, now Stable

Biggest achievement: Establishing suitable husbandry and housing standards that ultimately resulted in breeding and rearing success. Over decades there was a problem with parents either killing their cubs or the cubs dying within a short time for unclear reasons. After changing the enclosure structures to offer more land area and providing strict privacy for the first three months after they were born, the first cubs were reared successfully in the 1990s. Between 2005 and the present day, we have reached a status where we can say that cubs are reared on a regular basis with a resulting exponential growth of the population. More recently a recommended slowdown in breeding has been implemented, as not enough holding space is available.

Biggest challenge: More holders are needed to maintain the population and improve the genetic status. Surplus animals are available and any interested institution that fulfils the husbandry guidelines could have giant otters within a short time.

Species/scientific name: **Giant anteater**
Myrmecophaga tridactyla

Programme level: EEP
Coordinator/studbook keeper: Ilona Schappert (DORTMUND)
Year of establishment: 1985
IUCN status (IUCN 2015): Vulnerable
Population (31 Dec 2015): 69.80.2 (m.f.u)
Population trend, 2010-2015: Increasing

Biggest achievement: Due to good cooperation within the programme, good breeding successes have been achieved over

the last couple of years. The population has increased from 37 animals in 14 zoos back in 2000 to 151 animals in 61 zoos in 2015.

Biggest challenge: Currently the biggest challenge is finding new holders. Despite a long waiting list with interested holders, many institutions have not yet finished their enclosures.

JON-PAUL ORSI / RZSS



Species/scientific name: Pallas's cat *Otocolobus manul*
Programme level: EEP
Coordinator/studbook keeper: David Barclay (EDINBURGH)
Year of establishment: 1997
IUCN status (IUCN 2015): Near Threatened
Population (31 Dec 2015): 49.40.5
Population trend, 2010-2015: Increasing

Biggest achievement: Generating greater interest in the species from European collections from a point where Pallas's cats had a reputation of being a poor exhibit animal. Greater consistency with husbandry and veterinary care has also shown some recent improvements in infant survival through the recommended use of clindamycin through the breeding season. Over the last three years the programme has also been successful in connecting with *in situ* conservation projects and raising the profile of the species across the world.

Biggest challenge: Despite improved husbandry and veterinary guidelines, and recent cases of high infant survival in some collections, the programme is still challenged by the sensitivity of the species through the breeding season and more specifically towards toxoplasmosis.

Species/scientific name: Asian elephant *Elephas maximus*
Programme level: EEP
Coordinator/studbook keeper: Harald Schmidt (ROTTERDAM)
Year of establishment: 1993
IUCN status (IUCN 2015): Endangered
Population (31 Dec 2015): 80.214.0 (m.f.u)
Population trend, 2010-2015: Increasing

Biggest achievement: We are now housing Asian elephants in matriarch groups, as is found in the wild, rather than splitting them up; as a result, the reproductive rate has increased significantly.

Biggest challenge: An increasing number of young Asian elephants are dying from EEHV (herpes virus); research is difficult, long-lasting and expensive and keeper time to regularly check elephants for this should be increased.

Species/scientific name: White rhino *Ceratotherium simum*
Programme level: EEP
Coordinator/studbook keeper: Lars Versteeg (HILVARENBEEK)
Year of establishment: 1992
IUCN status (IUCN 2015): Near Threatened
Population (1 June 2015): 113.167.0 (m.f.u)
Population trend, 2010-2015: Slightly increasing

Biggest achievement: Getting a better cooperation between the holders of this species with an increased number of animals exchanged, increasing the number of births. It was also decided to transfer daughters out of the herd when they reached three years of age, as breeding seemed to be suppressed by the mother.

Biggest challenge: To further increase the number of births by addressing all individual animals which are not yet breeding, and to ensure that all holders of this species build appropriate facilities with separation facilities to house surplus animals.



Species/scientific name: Giraffe *Giraffa camelopardalis*
Programme level: EEP
Coordinator/studbook keeper: Joerg Jebram (GELSENKIRCHEN)
Year of establishment: 1990
IUCN status (IUCN 2015): Least Concern (*G. c. rothschildi* and *G. c. peralta*: Endangered)
Population (31 Dec 2014): 376.527.0 (m.f.u)
 39.54 Kordofan Giraffe (*G. c. antiquorum*)
 8.13 Angolan Giraffe (*G. c. angolensis*)
 0.1 (*G. c. tippelskirchi*)
 69.93 (*G. c. reticulata*)
 180.254 (*G. c. rothschildi*)
 46.61 (Hybrids)
 18.23 (unknown subspecies)
 16.28 (*G. c. giraffa*) – unrecommended subspecies
Population trend, 2010-2015: Increasing

Biggest achievement: The EEP managed to separate all the subspecies (and hybrids/unks) and manage them each towards their own goal. Breeding successes have increased and contributed to a growing population. In 2013 a Long Term Management Plan was established for the species.

Recently a good cooperation with the Okapi and Giraffe Specialist Group was established, as was a good cooperation with the Giraffe Conservation Foundation in Namibia to connect *in situ* and *ex situ* giraffe conservation (for example, establishing a World Giraffe Day inside the zoo community).

Biggest challenge: To solve the gaps in pedigrees of *G. c. rothschildi*, to reduce the population of hybrids and unknowns. To improve management of the surplus situation and, related to that, the housing of young males.

Creating a flexible future

A RECENT EVALUATION OF EEPS CONCLUDED THAT ONE SIZE DOES NOT ALWAYS FIT ALL, AND THAT GREATER FLEXIBILITY COULD BE OUR BEST STRATEGY IN THE FUTURE

Danny de Man, EAZA, Manager Collection Coordination and Conservation; Kristin Leus, Copenhagen Zoo, EAZA Population Biologist and Chair of the EAZA Population Management Advisory Group (EPMAG); and Bengt Holst, Copenhagen Zoo, Chair of the EAZA EEP Committee

In this issue of *Zooquaria* we are celebrating the 30th birthday of the European Endangered Species Programmes (EEPs). Since the EEPs were implemented as our format for the collective management of animal populations across zoological institutions in the EAZA region, there have been countless successes. As highlighted in other articles in this issue, EEPs have contributed to the development of sound husbandry and management practices for animals in our care and contributed to the reproductive success of many species. Having colleagues from zoos across Europe working towards a common goal of maintaining demographically and genetically sustainable populations contributed to building the zoo community in Europe, which facilitated the birth of EAZA itself.

In 2016 we reached yet another milestone: we now have 400 EAZA breeding programmes (EEPs and ESBs) that are overseen by 39 EAZA Taxon Advisory Groups. Out of those 400 programmes, 74 per cent of the EEP species and 44 per cent of the ESB species are threatened with extinction according to the IUCN (2016).

PLANNING FOR THE FUTURE

‘Where have I come from?’, ‘Who am I today?’ and ‘Where do I go next?’ are the kinds of things that people ask themselves as they turn 30. In a similar spirit, the EAZA Council asked the EEP Committee for a holistic evaluation of EAZA’s breeding programme structure in the EAZA Strategic Action Plan 2013-16 and to develop a proposal for its future. The EEP Committee approached this exercise by asking itself the following question: Knowing what we know today, how would we design the EAZA breeding programme structure if it did not yet exist?

The EEP Committee and the Collection Coordination and Conservation team at the EAZA Executive Office worked together with the TAGs, EEPs, ESBs and other relevant stakeholders on this task for just over two years, and the work is now nearing completion. The proposed new breeding programme structure will be tabled for approval by the EEP Committee in September 2016 and EAZA Council in April 2017. In this article we present a sneak preview of some of its key elements.

HEALTHY POPULATIONS OF HEALTHY ANIMALS

The first step in the process was developing a vision for animal populations held across the EAZA membership. Where do we want our animal populations to go and what do we want to achieve with them? The answer was: *EAZA animal populations will contribute to global biodiversity conservation and reconnect people with nature, inspiring them to care for the natural world.*

Without animal populations EAZA Members cannot

achieve either of these goals. Regardless of whether the conservation contribution takes place *in situ* and/or *ex situ* and is direct or indirect, sound management is required to keep genetically, demographically and behaviourally healthy EAZA animal populations that can achieve the targets that are set for them. *Healthy populations of healthy animals* is what EAZA aims for, and to succeed in this it is important that *EAZA animal populations are managed scientifically, cooperatively and professionally* as well as *realistic to their set roles and goals.*

MOVING AWAY FROM ‘ONE SIZE FITS ALL’

With the vision for animal populations and the purpose of EAZA breeding programmes established, the next step was to look at the breeding programme structure.

Traditionally, zoo breeding programmes have largely followed a ‘one size fits all’ approach. They have tended to be given the standard role of long-term self-sustainable back-up populations, with the goal of maintaining 90 per cent of gene diversity for 100 years. The tool widely employed to reach this goal was individual-based pedigree management. When a couple of years ago we evaluated how our EAZA programmes were performing against this goal, we had to conclude that only a few were able to reach it. It made us realise that applying a standard role and goal to each programme and trying to use a single population management tool is not the right approach.

It was concluded that it would be best to give more attention to defining the precise aims of each programme and then set it up with a tailor-made structure and manage it with the most appropriate tools to maximise the chances of the role being fulfilled. After all, building a long-term self-sustainable breeding population composed of a large number of individuals kept on exhibit in many zoos within one region is merely one of many options for *ex situ* populations, and each of those characteristics should be a conscious choice rather than an *a priori* decision. A programme may need to keep higher amounts of gene diversity, or be part of a meta-population, or not involve breeding at all (e.g. head starting), or be short term until reintroduction has seized, or keep a small population until a particular research or education goal has been reached; otherwise managers may be willing – or be forced – to risk the consequences of higher amounts of inbreeding and lower gene diversity.

Our individual, pedigree-based analytical tools have limitations for group living species, and molecular genetic techniques, assisted reproductive technologies and biobanks are expected to play an increasingly important role in population management. Currently each EAZA breeding programme has to be squeezed into one of two management categories (EEP or ESB), whereby differences between

them are somewhat arbitrary, applied differently across TAGs and countries, and the characteristics of either may be inappropriate to the programme one would ideally like to build. Last but not least, present EAZA breeding programmes do not appropriately reflect the breadth of population management activities and needs of EAZA Members. For example, the management of corals and of many freshwater fish species are not included. Nor is the management of European hamsters, hazel dormouse, corncrakes, Hungarian meadow vipers, Swedish green toads and many other species to which the *ex situ* population management is a direct conservation contribution. Why wouldn't these classify as EAZA population management programmes?

Instead of having a fixed 'one size fits all' approach with limited management categories and standard goals and pedigree-based analyses, it was agreed that EAZA's *population management structure must be flexible* to serve the defined role and meet the defined goal set/priorities for that population. The structure must also be flexible in order to be *applicable for all animal taxa*.

THE ONE PLAN APPROACH

In an increasingly global world, where a decline of habitat and species is the rule rather than the exception, management of populations is no longer tied to a fixed location. Intensive management of animal populations is not limited to the EAZA region, nor the global zoo and aquarium community. It also happens in sanctuaries, private collections and in protected and non-protected areas in the wild. In the future these efforts should and will be integrated into a joint conservation approach to make the biggest impact on species conservation. This is the One Plan Approach (OPA) as coined by the Conservation Breeding Specialist Group.

Under the OPA for species conservation, *in situ* and *ex situ* specialists need jointly to decide the most appropriate conservation actions to save a species. Ideally they should use the IUCN Species Survival Commission Guidelines on the Use of *Ex situ* Management for Species Conservation (2014) as part of this process to evaluate if this should include *ex situ* management activities. Our EAZA community can thus not operate in isolation. On the contrary, as part of the OPA it is important to work together with a range of conservation partners, stakeholders and colleague zoo and aquarium associations to contribute to the development of single species conservation strategies, to apply the OPA to our collection planning processes so as to prioritise species and develop roles and goals for our *ex situ* populations, and to cooperatively manage (where relevant) meta-populations of animals present in different *ex situ* and *in situ* locations.

The EAZA population management structure will need to define, both in general and per recommended species, who the partners are that we want to work with, and under what forms and conditions.

EAZA EX SITU PROGRAMME

Following on from the above, the future EAZA breeding programmes can be defined as '*population management activities that are endorsed by EAZA for species that are held in EAZA collections aiming towards (maintaining) healthy populations of healthy animals within EAZA or beyond*'. The proposed new single term for all programmes would be: EAZA *Ex situ*

FIVE-STEP DECISION MAKING PROCESS FOR EEPS*

1. Population **status review** and assessment of opportunities, threats and issues for the species (*in situ and ex situ*).
2. Define the (potential) **role** that the population of that species in EAZA can have in terms of conservation and/or other zoo operations (if any).
3. Determine the **goal(s)**, characteristics and dimensions for the EAZA *ex situ* programme to achieve this role.
4. Define **resources and expertise** needed for, and the **feasibility and risk** associated with, the EAZA *ex situ* programme.
5. Decide **to endorse** an EAZA *ex situ* programme (yes/no) and determine its **management strategy**.

These five steps are then followed by an evaluation.

*Based on the 'IUCN Species Survival Commission Guidelines on the Use of *Ex situ* Management for Species Conservation' (2014).

Programme (EEP).

The 'IUCN SSC Guidelines on the Use of *Ex situ* Management for Species Conservation' include a five-step decision-making process to decide when *ex situ* management is an appropriate conservation tool. The same process can also be used to decide on the role and goals of populations without a (direct) conservation role (see box, above) and will form the basis for regional collection planning in the proposed new EAZA breeding programme structure.

Rather than having one general goal of (self) sustainability for each EAZA *ex situ* programme, we will move towards a situation where each EEP has its own role(s) and associated population management goals, that will depend on the current status and threats *in situ* and *ex situ* (what do we have and what are current challenges), what the purpose of that *ex situ* population is in terms of direct or indirect conservation or other zoo roles (what do we want), what the most suitable population management strategy might be to fulfil the role (what do I need to get there) and whether that is feasible (feasibility and risk of different scenarios). The needs of the programme will define the programme characteristics.

SUCCESS DEPENDS ON YOU

The success of the new breeding programme structure will depend on people. The new process cannot be successful without increasing support from population biologists to assist the TAGs and EEPs in the five-step assessment process, contribute to progressing science and tools, assist with meeting facilitation, help liaise with partners and provide training to programme leaders.

Also, the EAZA breeding programme structure cannot exist without the commitment, dedication, knowledge and expertise of the EAZA membership. Providing time and resources to EEP coordinators and TAG chairs to manage their programmes, attend meetings and get population management training is something all EAZA Members have a responsibility for. Prioritising what is in the best interests of the overall population over short-term institutional needs (the 'EEP spirit') is equally important and calls on the leadership of CEOs of EAZA Member institutions. There are many EAZA Members showing the way already, and we look forward to working with them and those not yet involved to make the new breeding programme structure a success for the EAZA community and wider species conservation.

Inside the aquarium

MULTI-INSTITUTIONAL FISH-BREEDING PROGRAMMES HAVE BEEN SLOW TO START, BUT PROGRESS IS BEING MADE. HERE WE EXAMINE THE MANY CHALLENGES FACED BY THE AQUARIUM COMMUNITY

Brian Zimmerman, Aquarium Curator, Zoological Society of London, Chair Fish and Aquatic Invertebrate TAG

Managing fish through multi-institutional collaborative breeding programmes is a relatively new concept that is only just beginning to take hold. The first fish ESB, for zebra sharks, was established as recently as 2007.

There are a number of reasons for fish-breeding programmes getting off to a slow start and there are still a great many challenges to overcome, but good progress is being made. Some species are inherently challenging to spawn in aquariums, with reproductive triggers unknown and perhaps impossible to replicate in human care. Even for species that are easier to breed, there are some additional hurdles to cross, including high fecundity, larval rearing difficulties, sometimes short lifespans and difficulty in distinguishing individuals.

Just as it was for early zoos with other taxa, it has traditionally been easier and cheaper for aquariums to obtain their animals from the wild or bred through dealers. This has meant that aquariums have been reluctant to invest their resources in developing managed breeding programmes. However, times are changing and there is growing interest in breeding fish at our institutions. There are many reasons for this change of heart; reduced availability, tighter regulations, greater costs and public pressure have all played a role in making sustainably managed breeding programmes more attractive to public aquariums. For each species the reason for developing a programme may be different and the goals are often varied as well. Here, the three current sub-TAGs under Fish and Aquatic invertebrate TAG (FAITAG) outline their plans and different objectives.

AQUATICS ARE GETTING ORGANISED – AND SHARKS AND RAYS ARE LEADING THE WAY

Elasmobranch FAITAG: Max Janse, Curator, Royal Burgers' Zoo, Arnhem, the Netherlands

The Elasmobranchii (sharks, rays, skates and sawfish) and Holocephali (chimaera) form the class of cartilaginous fishes or Chondrichthyes, an animal group which is very attractive and therefore often found on display in zoos and public aquariums. Some of these charismatic species were bred in aquariums at different individual institutions. However, there was little collaboration on a European level. Realising that managed programmes would ensure a healthy genetic population for the future, in 2007 the first studbooks were started on elasmobranchs, beginning with the zebra shark (*Stegostoma fasciatum*) and blue spotted stingray (*Taeniura lymma*). The current number of studbooks is nine.

In 2011 a European-wide elasmobranch census was done over the period of 2006–2010. The goal of the census was to get more insight into the aquarium population of elasmobranchs and to understand the breeding activities. A total of 41 species of shark, 50 species of ray and one chimaera species were found in 65 participating public aquariums, with a total number of 3,100 animals. The number

of public aquariums is much larger, but responding aquariums represented a good spread over Europe, making it a reasonable overview of species diversity. At the time of writing a second census is taking place for the period 2010–2015.

In 2013 a FAITAG workshop was held at ZSL London Zoo to discuss the results of the census and to realise the first Regional Collection Plan (RCP). Every species was evaluated for its potential conservation, research and educational role and combined with both IUCN and CITES listing. The overall conclusion of the workshop was that a large number of species needed some sort of management. Besides ESBs, another level was introduced within the aquarium community: Monitoring programme (Mon-P). This lower level of management tracks the number of individuals in the aquarium population via a species coordinator who will also be the central person for husbandry issues. From the workshop 32 species were defined as potential monitoring species. Now, three years later, 31 programmes have been set up, each with a coordinator, and most have published their first Mon-P report. Some monitoring programmes even follow the animals on an individual level.

It is a big change within the aquarium community to have so many different managed programmes within the elasmobranch group, and it is encouraging to see the enormous interest being shown in participating in these programmes and the changes to the population. Animals are transferred to form potential breeding couples and husbandry information is compiled, which will result in improved husbandry. Many more steps will have to be taken in the future, but a basic population management on elasmobranchs has already been realised.

THE URGENT REQUIREMENT FOR STRONG PROGRAMMES FOR FRESHWATER FISHES

Freshwater teleost TAG: Anton Weissenbacher, Zoological Curator, Schönbrunner Tiergarten GmbH, Zoo Vienna, Austria
Current records of worldwide and global freshwater fish biodiversity suggest that there are between 30,000 and 35,000 species. Due to this high number it is particularly difficult and time-consuming for all participating parties to obtain an overview on species diversity and categorise them according to Regional Collection Plan (RCP) criteria. Hence nine representative families including species that can be fairly easy *ex situ* bred and kept, and which raise conservation concerns, were selected at the Freshwater Fish (FAITAG) Regional Collection Planning Workshop, held in 2014 in Vienna.

In general, the development and implementation of RCPs depend on direct partners, the EAZA zoos. Sadly, freshwater fish projects and active participation in RCPs have generated little interest so far. This is one of the reasons why a disproportionately high number of collaborations are conducted with members from universities, research institutes, NGOs and private keepers. These cooperations are a fundamental gain for efficient conservation projects and cover

a wide range of aspects and activities to maintain populations of several species. Members of the FAITAG are currently working to engage more EAZA Member institutions as long-term collaborators in *ex situ* and *in situ* projects.

A further challenge is posed by the establishment of studbooks for freshwater fish species. It is almost impossible to individually mark and identify fish to be able to track the pedigree and demographic history of each individual in a population. Some species can be bred only when more than one male and/or female is in the breeding aquariums. Therefore, juveniles cannot be easily assigned to certain parents. However, the EAZA Population Biologist Kristine Schad is currently working on a possibility to manage species on a population level instead of an individual level. Initial successful achievements with salamanders, which face similar problems, offer hope for a reasonable and long-term studbook management of endangered freshwater fish.

The primary aim of RCPs is to identify endangered species and to establish conservation criteria. Several freshwater species are potentially endangered simply due to their small distribution area. This applies also to *Garra barreimiae*, a cyprinid freshwater fish endemic to the south-eastern Arabian Peninsula. In northern Oman the species exhibits two forms: a blind, unpigmented cave form and a pigmented surface population with developed eyes. The Department of Molecular Systematics of the Vienna Natural History Museum together with the University of Ferrara and the Vienna Zoo investigated the systematic status of the two populations. The collaboration produced a highly professional method of breeding fish species using hormonal stimulation. This approach, which increases the probability of breeding success at a certain time period, could greatly assist the effective and efficient application of resources when continuous breeding of several species is necessary. We will announce the results of the study as soon as they are available.

EUROPE'S PUBLIC AQUARIUM COMMUNITY IS GEARING UP TO BETTER MAINTENANCE OF MARINE BONY FISHES

Marine teleost TAG: Daniel Abed-Navandi, PhD.MSc. Marine Curator and Associate Director, Haus des Meeres, Vienna, Austria

Our fish inventory is constantly changing and, we believe, in most cases growing. This is mainly due to technical improvements, tempting new offers from wholesalers, discovery of new collection grounds, improved transportation routes and new trends – garden eels, for example, are becoming more popular these days. Now a new initiative has started among the EAZA/EUAC FAITAG to ensure that more fish species will be bred and that their keeping will be put on a more sustainable basis.

As a first but important step, data will be collected in a pan-European aquarium census to help us learn precisely which marine bony fish species are out there, which among them constantly give us a headache and which are easy to breed or are even already sustainably bred. One example of the latter is the Long snout Seahorse *Hippocampus reidi*. During the last two decades, seahorses received special attention from the public aquarium community, which led to successful long-term breeding ventures for various seahorse species. The basis for this success was data generation and collection, liberal sharing of this information among professionals and



amateurs and regular contact at dedicated meetings. Even so, the two European seahorses presented a complicated management scenario and were last year downgraded from ESBs to Monitoring programmes. Along the way a great deal was learned and this test case will help us to avoid pitfalls with other species.

Across the vast group of marine bony fish, the keepers' demands with regard to breeding are very diverse, especially in a public aquarium setting. Our large volume, mixed-species exhibits require the daily practice of many special techniques, such as administering a special breeding diet to brood-stock, manipulation of breeding cues like temperature, salinity and day length, the timely identification of a courting or even spawning pair of fish and, finally, the proper handling and raising of the fish fry. These are all examples of the challenges that we are facing – and which we are planning to solve in the long run within this new initiative.

Behind the scenes

OFF-EXHIBIT ENCLOSURES AT NORDENS ARK HAVE A VITAL PART TO PLAY IN THE PROTECTION OF ENDANGERED SPECIES

Ewa Wikberg, Zoological Director, Nordens Ark and Mats Niklasson, Scientific Leader, Nordens Ark, Phd and Associate Professor at SLU

Nordens Ark is a non-profit foundation whose main goal is to rescue, breed and re-introduce endangered species. Animals displayed in the public parts of the park consist almost exclusively of threatened species, the majority of which are jointly managed (SAZA, ESB and EEP). In addition, a number of species representing strict re-introduction projects are kept and bred in off-exhibit facilities on the foundation's premises. Off-exhibit resources are an important part of the breeding of these projects but can also be used for other purposes such as quarantine, isolation and temporary separation of animals.

Economy and funding is a constant issue when it comes to off-exhibit enclosures. As a private foundation, Nordens Ark receives funding from a great variety of sources, which are unpredictable. Therefore designing and building enclosures is often a compromise between economy, practical constraints and animal need. Laws and regulations of course constitute a bottom line from an animal welfare perspective. However, during development of pure breeding facilities, this is seldom an issue, since much of the work in breeding is focused on maximising the number of offspring, which is closely related to creating an enriched, comfortable and safe situation for the animals. This is not always equal to having large enclosures, but rather to ensure appropriate conditions during critical periods of reproductive events.

OFF-EXHIBIT ENCLOSURES WITHIN THE PARK

Some of the species in the zoological park have off-exhibits out of sight from the public; for example, the Amur tigers (*Panthera tigris altaica*) have both private areas and recovery rooms. Maned wolves (*Chrysocyon brachyurus*), wolverines (*Gulo g. gulo*), otters (*Lutra l. lutra*) and Przewalski's wild horses (*Equus caballus przewalskii*) have similar facilities.



THIS COMPLEX HAS BOTH INDOOR FACILITIES AND OUTDOOR ENCLOSURES. THE EMPTY SPACE HAS OFTEN PROVED TO BE THE MOST VALUABLE ONE – THEREFORE THESE ENCLOSURES ARE ONLY USED TEMPORARILY. THEY ARE BUILT TO BE VERY FLEXIBLE FOR HOSTING DIFFERENT SPECIES AND CAN EASILY BE REMODELLED TO SUIT DIFFERENT REQUIREMENTS.

For species in breeding programmes (ESB, EEP), the aim is to have areas where we can keep several breeding couples, groups and juveniles separated from each other, depending on the needs of the programme. In Sweden, off-exhibit space requirements are not different from display standards. Here are some examples: for pudu (*Pudu pudu*) the minimum standard for off-exhibit is 1000 m², for Pallas's cat (*Felis manul*) 300 m², and for Przewalski's horse (*Equus caballus przewalskii*), markhor (*Capra falconeri heptneri*) and reindeer (*Rangifer tarandus fennicus*) the minimum standard is 3000 m². This is difficult to accomplish within the zoological park. To be able to meet these requirements and be flexible, a larger off-exhibit area has been designed to host several different species with a minimum standard of 1000 m² next to the zookeeper area and veterinary clinic (see photo, above). Species requiring

larger enclosures have either their off-exhibit enclosure next to their main enclosure or in Lunden, our closed breeding and quarantine area.

OFF-EXHIBIT ENCLOSURES OUTSIDE THE PARK: THE LUNDEN AREA

From the very beginning, Lunden was planned and constructed to provide space and facilities for breeding endangered animals as well as for keeping animals off-exhibit. The area is enclosed by a fence and has its own water and sewage system. Over the years the importance of the area and the work done there has grown; in fact, Lunden has been deliberately grown until it is almost as large as the public areas. The zoological area – including the wild park and the farm that is open for visitors – is around 40 hectares, whereas the Lunden area covers almost 30 hectares. The rest of the site is forest and cultural landscape that's currently being restored in the Ecopark project.

MAIN BUILDING



BREEDING ENCLOSURE FOR THE LONG-HORNED BEETLE *PLAGIONOTUS DETRITUS*



THERE ARE SEPARATE FACILITIES FOR KEEPING WHITE-BACKED WOODPECKERS AND ALLOWING THEM TO BREED. SIX SINGLE AVIARIES USED ONLY FOR BREEDING ARE LOCATED IN LUNDEN ALONG WITH A BUILDING WITH ENCLOSURES FOR JUVENILES AND NON-BREEDING BIRDS. THE AVIARIES ARE PLACED A MINIMUM OF 100M APART SO THAT THE BREEDING PAIRS DO NOT DISTURB EACH OTHER.

A GREENHOUSE FOR BREEDING *PARNASSIUS MNEMOSYNE* BUTTERFLIES MEANT FOR RE-INTRODUCTION IN SWEDEN IS OUR LATEST PROJECT UNDER CONSTRUCTION. IN THE BACKGROUND IS THE INDOOR QUARANTINE FOR BIRDS ON ONE SIDE AND CARNIVORE SECTION ON THE OTHER WITH ADJACENT OUTDOOR ENCLOSURES FOR THE CARNIVORES. IF WE KEEP BIRDS IN QUARANTINE TO TEST FOR NEW CASTLE OR AI – BOTH AIRBORNE DISEASES – ONLY THE BIRD SECTION IS USED AS IT IS EQUIPPED WITH SPECIAL AIR VENTILATION.

In addition to the breeding facilities and the animal enclosures in Lunden, there are also quarantine areas for birds, larger and smaller carnivores, amphibians and reptiles and isolation enclosures for hoofed animals. Lunden gives us the tools we need to manage our animals within the zoological collection. For example, here we can hold bachelor groups of wild goats and sheep, keep carnivores for upcoming placement within the respective ESB and/or EEP and separate individuals before breeding if necessary.

There is a great need for flexibility, as the number of individuals fluctuates considerably over the year. Births and the arrival of sensitive species at short notice can put the facilities under pressure, and there is a great need for buffering capacity. This has been made possible by Lunden.

Individually designed buildings and rooms have been constructed for the long-term breeding projects of lesser white-fronted goose (*Anser erythropus*), white-backed woodpecker (*Dendrocopos leucotos*), peregrine falcon (*Falco peregrinus*), green toad (*Bufo viridis*), mountain chicken frog (*Leptodactylus fallax*), lemur leaf frog (*Agalychnis lemur*), great capricorn beetle (*Cerambyx cerdo*) and the long-horned beetle (*Plagionotus detritus*).

At the centre of Lunden there is a main building (see picture above, top left) with rooms for breeding of fodder insects, hatching rooms and rooms for hand-feeding falcon chicks. There are also four further rooms, for amphibians and reptiles, a food preparation area, an office and a staff room.

When building enclosures in public areas, aesthetics need to be taken

into account, but this is not so for off-exhibit buildings. In the closed areas, functionality and purpose are the most important aspects. To be able to focus intensely on several breeding projects at the same time, a variety of resources with great flexibility are essential to meet the requirements of different species. The complexity of the enclosures varies widely from tree trunks for the insects (see picture above, top right) to much more complex constructions. As an example, a full life cycle for the green toad includes: hibernation chambers (a simple construction); indoor tanks for tadpoles and semiaquatic aquariums for later stages in a biosecure building, (a complex building in a separate house); and simple outdoor enclosures for juveniles meant for release. The Lunden area makes all of this possible.



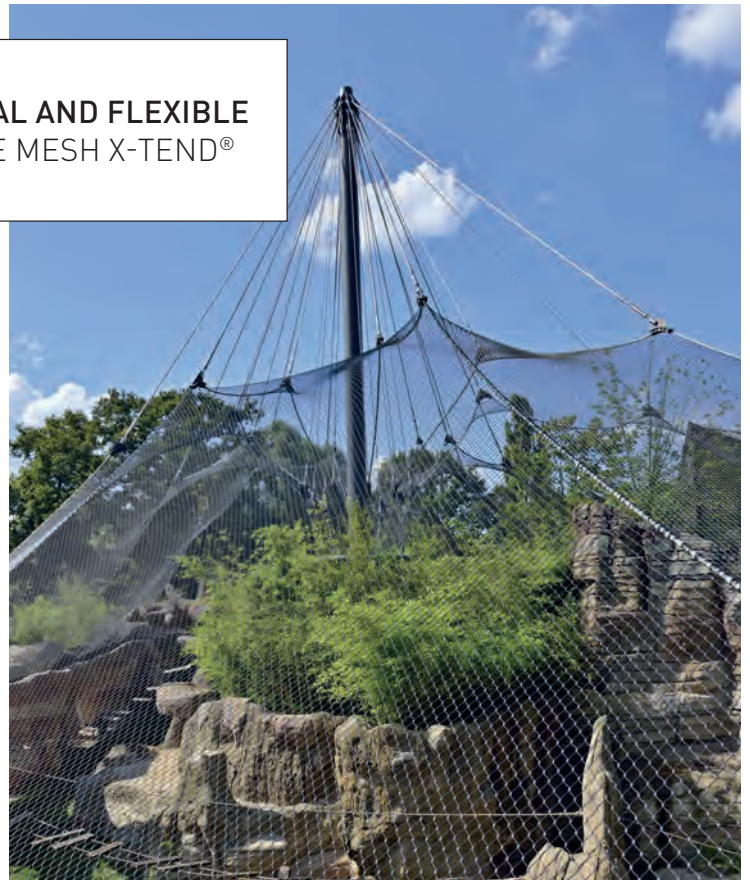
ZOOLUTIONS - INDIVIDUAL AND FLEXIBLE STAINLESS STEEL CABLE MESH X-TEND®

Together with zoos and zoo architects worldwide, Carl Stahl Architecture has developed a compendium of requirements for successfully keeping animals in species-appropriate surroundings. These requirements are put into practice in unique, individually designed enclosures in zoos all over the world. They are the result of careful technical planning, precise static calculations and professional on-site assembly based on long years of experience in lightweight construction architecture.

The prerequisite for the creation of a species-appropriate enclosure is the analysis of the requirements of the particular species as well as of the existing constructional conditions, taking into consideration the wishes and visions of the owner, zoo keepers and visitors to the zoo. The outdoor enclosure for chimpanzees in Hanover Zoo (completed in 2013) was completely redesigned professionally to adhere to these requirements. The perfect material: X-TEND® by Carl Stahl Architecture. Its three-dimensional moldability and lightness make it ideal for creating species-appropriate habitats.



Stainless steel mesh constructions are especially suited to the architecture of the open-air enclosure. They unite safety and beauty, are hard-wearing and durable, and offer virtually barrier-free insights and perspectives thanks to their transparent structure. The delicate area-covering structural element makes it possible to span large expanses of material and thus helps create spacious enclosures that give the animals plenty of room to move about. In their minimalist form, the lightweight constructions have their own design language which is always oriented toward the requirements of the species, topography, usability and appeal to visitors.



A genuine challenge is making sure enclosures really are appropriate to the particular species, taking into consideration their natural living conditions, current scientific findings and zoological experience. In the wild, chimpanzees live in small roaming fission-and-fusion groups consisting of several adult females and/or males. Chimpanzees use both tree regions of primary and secondary forests as well as open forest savanna and grassland. They live both on the ground and in trees, climb and select elevated positions as points of orientation. Due to their natural behavior, chimpanzees must be given the opportunity to use a space in all three dimensions. This necessitates numerous structures suitable for climbing on combined with elevated spaces where the chimpanzees can sit. Furthermore, to satisfy the high cognitive capabilities of the animals they must also be given a stimulating habitat, including a wide range of manipulable objects and materials as well as varying forms of feeding.

Further projects by Carl Stahl Architecture:

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