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ZOOQUARIA

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ISSUE 105

VETS TO THE RESCUE

WHY VET ADVISORS ARE CRUCIAL
TO THE SUCCESS OF EAZA'S TAGS



POPULATION MATTERS

LESSONS TO BE LEARNED FROM THE INDOCHINESE SIKA DEER EEP

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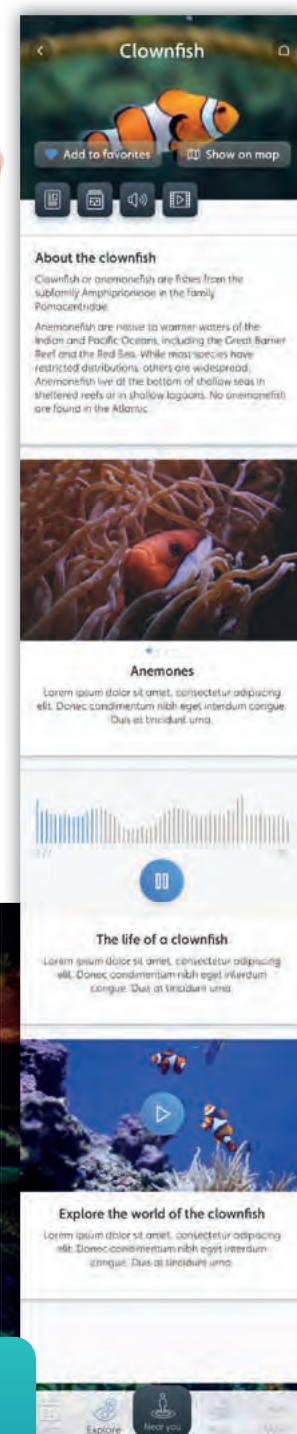
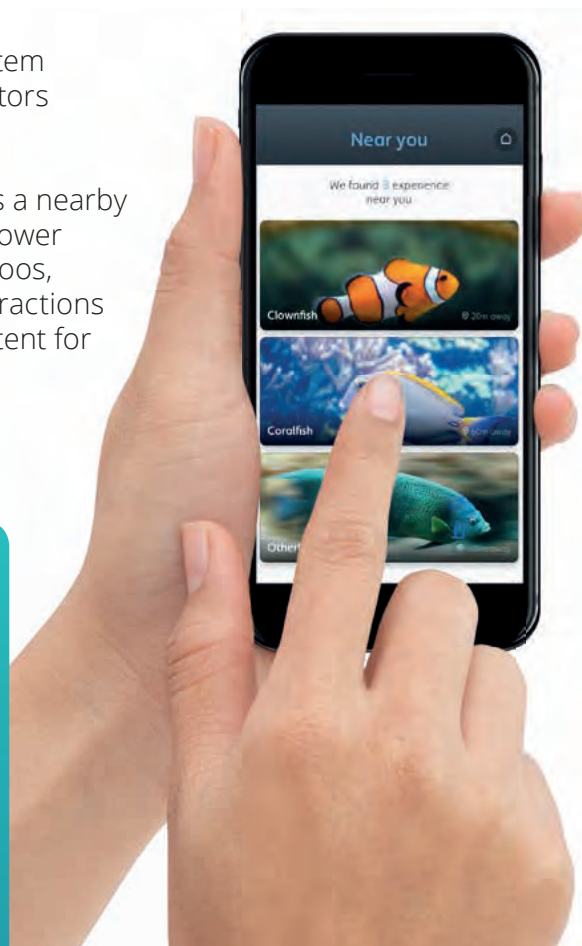
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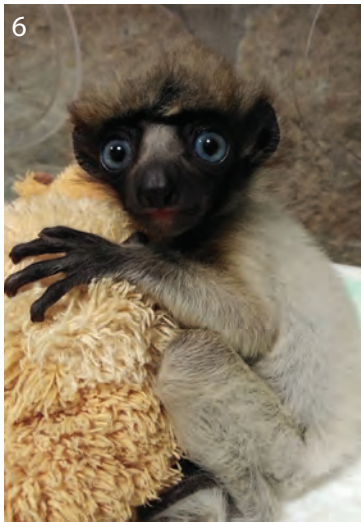


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Zooquaria

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FROM THE DIRECTOR'S CHAIR

This has been a busy year so far for conferences, and this issue of *Zooquaria* will quickly prove to our readers the important knowledge-sharing potential that these events have for Members and other partners. In January, we had the European Zoo Nutrition Conference (see p. 22), which brought together some of the world's best animal nutrition experts at Marwell in the UK. March saw record-breaking attendance at the EAZA Education Conference (p. 23) in Skansen, Sweden. And externally, EAZA and our partners UIZA (the Italian Association of Zoos and Aquariums) took the lead in organising a symposium on the role of science engagement centres – including zoos and aquariums – held at the Pontifical Academy of Sciences (PAS) in Vatican City.

EAZA Chair Thomas Kauffels, Vice Chair Mark Pilgrim, Cologne Zoo CEO and President Elect of WAZA Theo Pagel and UIZA Director Gloria Svampa all presented at the conference. Their task was to show to the Academy how zoos and aquariums educate the public and protect species, two roles that are at the heart of our mission. The following final statements from the Academy demonstrate approval and support for good zoos in their work:

'The worldwide communities of natural history museums, zoological and botanic gardens are catalytic and significant allies in the global drive toward species protection and nature preservation.'

'The unique ability of zoos and aquaria to save small populations of animals from extinction needs to be more strongly addressed and societies and decision-makers need to be asked to ensure the adequate support to enable them to sustainably perform their vital functions.'

So with strong specialist work happening in our own conferences, and support for our mission from outside EAZA, we felt it was time to start looking at the Association's vision and mission statements and see if we needed to update them. This is part of our preparation for the new EAZA Strategy which will roll out in 2021, and it ensures that our planning for the next strategy is based on an up-to-date image of how zoos and aquariums operate in the 21st century. It also became the main theme for our Directors' Days meeting, the annual gathering of director-level staff at EAZA Members, which took place in Jersey in April (see p. 8).

It was great to have more than 100 zoo and aquarium directors at the Directors' Days meeting, and their input was an important starting-point for a consultative process that will continue all year, including at our Annual Conference in Valencia in September. If you haven't registered for Valencia yet, I hope that you will do so and come to make your view of EAZA's future known. As an association, we are strongest when we have the widest possible cross-section of views represented, so every voice will be important. It is exactly for this reason that I would have liked to see more Directors at the event.

We also saw the IUCN Regional Conservation Forum for our region being held in Rotterdam in June. While it was great to see some colleagues there, if we want to be right at the heart of the IUCN's plans for species conservation, we all need to be present at these opportunities. In this spirit, I would like to draw your attention to some upcoming events where we need to give and get input in order to help shape the future of conservation. The IUCN World Conservation Congress, in June next year, will be held in our region, in Marseille, France, and I'd like to see EAZA Members represented strongly in the motions being proposed and backed, and in the activities around this huge event. If you or your colleagues are planning to attend, please let us know.

Also next year, we'll be continuing our development of the next strategy – with, we hope, a strong vision and mission in place – at the Directors' Day Conference, which will be hosted by Bergen Aquarium in Norway. I would encourage all Directors to attend, so that the widest possible range of views, including from them and their staff, can be represented.

Thomas Kauffels, who was re-elected Chair of our Association at the Directors' Days meeting in Jersey, has committed to making the Association more democratic in its decisions; but to make this happen, it's important that everyone takes the opportunity to engage with Council (see p. 30), our Committees and the Annual General Meeting. The start of a new strategy means that this is an exciting time to be Director of EAZA – and the more confidence I have that all of your viewpoints are represented, the more exciting it will be. So please make me happy and use your voice!

I look forward to seeing many of you in Valencia.

Myfanwy Griffith
Executive Director, EAZA

NOTICEBOARD



MEMBERSHIP DECISIONS OF COUNCIL

The EAZA Council met in Jersey on 24 April and made the following decisions:

NEW MEMBERS

Full Membership was awarded to La Garenne (Switzerland), and Serengeti Park Hodenhagen (Germany).

Temporary Membership was awarded to Zoo delle Maitine (Italy), and Wingham Wildlife Park (UK).

Temporary Membership (Under Construction) was awarded to EcoZonia (France) and Crécy Tropical Park (France).

Corporate Membership was awarded to Dorset Identification (UK), Sanero Kunstfelsen (Germany) and China Light Festival (the Netherlands).

EAZA ACCREDITATION PROGRAMME

Full Membership will be retained by Tierpark Nordhorn (Germany), Banham Zoo (UK), Africa Alive! (UK), Wilhelma Zoo Stuttgart (Germany), Zooparc de Beauval (France), Prague Zoo (Czech Republic), Zoo Liberec (Czech Republic), Riga Zoo, (Latvia) and Nausicaá Centre National de la Mer (France).

Temporary Membership was accorded to Tallinn Zoo (Estonia).

Withdrawing Members include Dolfinarium (the Netherlands) and Wassenaar Wildlife Breeding Centre, (the Netherlands).

OTHER DECISIONS OF COUNCIL

EAZA Standards for the Accommodation and Care of Animals in Zoos and Aquaria were updated by majority approval. The revised Standards include the requirements for animals in demonstrations, previously a non-mandatory guideline.

Council approved the adoption of the EAZA Statement on Intentional Breeding for the Expression of Rare Recessive Alleles into the EAZA Standards for the Accommodation and Care of Animals in Zoos and Aquaria. This will go to the Annual General Meeting in 2020 for approval.

Various Committee Terms of Reference were approved, finalising this review process for all Committees. EAZA Biobank documents relating to transfer and ownership of samples were approved and the IUCN Guidelines for the management of confiscated, live organisms were endorsed.

The Technical Assistance Committee had four new members approved by Council: Franck Haelewyn (Parc Zoo du Reynou, France), Gary Batters (Zoological Society of East Anglia, UK), David Field (ZSEA) and Sarah Forsyth (Colchester Zoo, UK).

Council approved six new members of the Conservation Committee: Simon Bruslund (Marlow, Germany), Gerardo Garcia (Chester, UK), Brice Lefaux (Mulhouse, France), Christoph Schwitzer (Bristol, UK), Carl Traeholt (Copenhagen, Denmark) and Lesley Dickie (Jersey, UK).

Council also approved the appointment of Arlete Sogorb (Lisbon Zoo, Portugal) as the new Chair of the Education Committee.

EXECUTIVE COMMITTEE AND NEW CHAIRS OF COMMITTEES

The new Council approved the new Executive Committee as follows:

Chair: Thomas Kauffels (Opel-Zoo, Germany)

Vice Chair and Chair of the EEP Committee: Mark Pilgrim (Chester Zoo, UK)

Treasurer: Sean McKeown (Fota Wildlife Park, Ireland)

Secretary: Brice Lefaux (Zoo Mulhouse, France)

Communications: Sanna Hellström (Helsinki Zoo, Finland)

Technical Assistance: André Stadler (Alpenzoo Innsbruck, Austria)

Membership & Ethics: Endre Papp (Sostó Zoo, Hungary)

National Associations: Volker Homes (VdZ, Germany)

Aquariums: Joaõ Falcato (Oceanario Lisboa, Portugal)

DECISIONS FROM THE AGM

The EAZA Annual General Meeting (AGM) approved the 2018 financial report and the proposed 2020 budget. There was unanimous approval for

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TVK ZooDesign	www.tvkzoodesign.nl
Zoological Adviser	www.zoologicaladviser.com
Zoologistics	www.zoologistics.nl
Zoopoli (ex Lamartine Construction SAS)	www.lamartine-construction.com
Zooprofs	www.zooprofs.com

changing the timing of the membership fees. There will be a double invoice in 2020 to align the years, and the following timeline will be implemented from December 2020 for the invoices for the 2021 fees: invoices sent out in December of the year before with 1 January as the invoice date. The deadline for payment will be 31 March.

The revised list of proposed Council Members 2019–2022 presented in the meeting was approved.

The AGM also unanimously agreed the EAZA Council recommendations to approve the updates to the following documents: Population Management Manual, EAZA Standards for Accommodation and Care of Animal in Zoos and Aquaria, Sanctions in the case of a violation of the EAZA Code of Ethics or EEP procedures.

NEW ARRIVALS



NEW HOPE FOR THE POLAR BEAR

TIERPARK BERLIN

IN THE LAST COUPLE OF YEARS, more and more participants within the Polar bear EEP have been able to share the wonderful news that they have managed to breed polar bears.

This was not the case 11 years ago when the polar bear studbook was upgraded to an EEP, which was necessary because the European zoo population was showing a clear and considerable decline at the time. The polar bear population reached its peak in the 1980s, when around 300 specimens were kept in the European zoo community. After this point the numbers began to decline until 2006 when the population had decreased to fewer than 100 specimens. It was at that point that the EEP was founded.

Since then, a number of significant improvements have been made. Zoos have started to invest in their polar bear facilities across EAZA, creating larger and softer enclosures. More attention was given to improving the design and location of cubbing dens, and the increased use of remote video and sound monitoring within the cubbing areas gave us better insight into what was required by the female bears. There was an increased level of data-sharing between polar bear holders, which was facilitated by more frequent meetings

and an enhanced level of communication with and support for the activities of the IUCN/SSC Polar Bear Specialist Group. A short but crucial document was created and widely distributed, entitled, 'Critical Criteria for Breeding and Rearing Polar Bears in Captivity'.

Probably the most important measure of improvement within the programme was the increase in the number of breeders and potential breeders. Twelve years ago we had four to five institutions that had fairly consistent success in increasing the population. Today more than 20 of the 43 participant institutions breed and rear polar bears or have a high potential to do so. A lot of work still needs to be done to reduce the mortality rates during the first week of life. We produce more polar bears in more zoos than before, but we still need to reduce the neonatal mortality rate, which is around 50 per cent.

During 2018, the following institutions produced cubs:

- Berlin Tierpark – 2 born, 0.1 surviving.
- Zoo Copenhagen – 2 born, 0.1 surviving.
- Dierenrijk Europa, Mirlo – 2 born, 0.2 surviving.
- Zoo am Meer, Bremerhaven – 2 born, unfortunately neither survived.

The EEP is now demographically and

genetically stable, and is beginning to show measurable growth, as one or two new participants join the programme each year. Even with new holders coming on board, the marked improvement in breeding success has caused us to consider lengthening the inter-birth interval by increasing the time the cubs stay with their mother from two to three years to give us sufficient time to place offspring appropriately. In the event of the mother becoming intolerant of the older cubs and to give increased management flexibility, it is recommended that each holder, especially those in a breeding situation, needs to have not two but three separate enclosures.

Unlike most other programmes, the use of any kind of chemical birth control to limit population growth is contraindicated for polar bears. Although there is a huge interest in the species internationally, the options for moving surplus to other regions is very limited due to a range of factors; for example, a long-standing import ban by the USA, inappropriate climate or a lack of large, modern facilities. If we are to avoid the programme going into decline again, we will need to be creative in how we manage the population and be prepared to explore a range of possibilities.

RARE SIFAKA BORN AT THE MUSEUM OF BESANÇON

ON 11 DECEMBER 2018, a female crowned sifaka (*Propithecus coronatus*) was born at the Museum of Besançon – a promising event for this particularly endangered species of lemurs endemic to Madagascar.

At birth, the sifaka, named Soa, weighed 73g. After two days, the team caring for her noticed that she was growing weak and did not seem to be suckling her mother. It was therefore decided to set up a hand-rearing protocol, a recommendation made by the coordinator of the EAZA Ex situ Programme (EEP).

Hand-rearing is extremely rare because it can lead to the imprinting of animals and to behavioural disorders. However, this recent birth was vital for the survival of the population in human care, as crowned sifaka are very rare, currently numbering a population of 21 individuals – including only six females – in seven zoos across the world.

The teams took turns day and night to give 10 feeds every 24 hours. Clinging to a soft toy, which plays the role of her surrogate mother, and kept warm in an infant incubator, Soa ingests every day 18 to 20 per cent of her body mass in a specific mixture of milks, which allows her to increase her weight by more than 2 per cent each day. We can only hope that she will continue to make progress and offer hope for the survival of her species. For more information on the Crowned sifaka EEP, please read the Prosimian TAG Regional Collection Plan available on the EAZA Member area.



MARGAUX PIZZO, MUSEUM OF BESANÇON

NEW CHICKS FOR EDWARDS'S PHEASANT

EDWARDS'S PHEASANTS (*Lophura edwardsi*) are endemic to central Vietnam and are currently listed as Critically Endangered on the IUCN Red List of Threatened Species. The species has severely declined through lowland forest deterioration and high hunting pressure. There have been no confirmed records since 2000 (when a male pheasant was confiscated by a hunter and then kept in captivity in the Hai Lang District Forest Protection Department, Quang Tri). While currently listed as Critically Endangered, it could, in the worst case scenario, already be extinct in the wild.

Tayto Park has been involved with the World Pheasant Association and has been keeping Edwards's pheasants since 2015. Since becoming members of EAZA, we have joined the Edwards's pheasant EEP. Last year we successfully reared two

male chicks, which were transferred based on studbook recommendations.

This year we are delighted to announce that we have eight chicks. As the weather was quite changeable during the spring, and Edwards's can be very sensitive to fluctuations in temperature, we decided to pull the eggs and incubate our chicks in a controlled and stable environment. This proved to be successful, and our pheasant chicks are now 10 weeks old. Our chicks are nearly ready to leave our chick rearing unit and go to their new aviary. But before introducing them to their new aviary, each chick will be sexed. Knowing the sex of the animal is a vital piece of information as it means the studbook holder can then go on to make the most genetically valuable pairings.



TAYTO PARK

Channelling the future

THE RECENT DIRECTORS' DAYS MEETING AT JERSEY ZOO FOCUSED ON LEADERSHIP AS WELL AS THE VITAL ROLE THAT ZOOS AND AQUARIUMS PLAY IN GLOBAL CONSERVATION

David Williams-Mitchell, EAZA Director of Communications and Membership

The names 'Durrell' and 'Jersey' are central to the development story of European zoos, and with the end of the EAZA 2017-2020 Strategy just around the corner, Jersey also played a central role in discussions held to define the direction of the next EAZA Strategy, as Directors of EAZA Member institutions gathered in St Helier for the annual Directors' Days meeting. Hosted by Jersey Zoo, the event opened on 23 April with the meetings of the Executive Committee and the Membership and Ethics Committee as well as the icebreaker event, which was held at the Jersey Maritime Museum. Day two started with a welcome from Jon le Fondre, Jersey's First Minister, and an introduction from Durrell Wildlife Conservation Trust CEO Lesley Dickie, who pointed out that a new EAZA Strategy should also aim to build diversity and opportunity for diversity within our community.

The theme of the conference was 'Leadership in Conservation and Operations', and keynote speaker Susan J. West, a well-known leadership coach in Brussels, gave a presentation outlining strategies for leadership success, from appointing a personal board of directors to help challenge and hone decision-making to examining motives behind strategy. In the same session, EAZA Director Myfanwy Griffith provided an overview of the recent work of EAZA, and Chair Thomas Kauffels asked delegates to maintain a flexible mindset when working on possible revisions to the EAZA Vision and Mission statements, a key aim of the conference.

In session two, ZSL Director of Conservation, Andrew Terry, presented the findings of research into barriers that prevent EAZA Members from doing more conservation work; the principal outcome was that whatever the financial or political constraints, zoos and aquariums can do fine conservation work if they maintain the will to do so. The Director of the European Alliance



COLOMBA DE LA PANOUSE, LEE DURRELL AND TIIT MARAN AT DIRECTORS' DAY

for Rescue centres and Sanctuaries (EARS), Dave Eastham, made a powerful case for zoos to continue to play an important role in housing confiscated and rescued animals, and Copenhagen Zoo's Bengt Holst, who stood down as EEP Committee Chair at the meeting, outlined the different parts of the patchwork that make up the context for zoo conservation activity. Finally, Jerry Harrison of the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) introduced the processes established for the creation of a post-2020 Convention on Biological Diversity framework, and how EAZA can input into that framework.

This was mirrored by an important talk from Anne Burrill of the European Commission, showing how the EU Biodiversity Strategy from 2020 onwards would take cues from the CBD framework, and that zoos and aquariums can continue to play an important part in both its planning and implementation. Danny de Man, EAZA Deputy Director, gave a presentation on EAZA's engagement with CITES, outlining the strategic necessity of being present at the COP and relevant Committee meetings for our efforts in both *in situ* and *ex situ* conservation. Pascal Damois, Director of the Parc

Animalier d'Auvergne showed how visitors can become a central part of a zoo's conservation strategy, while newly appointed Chair of the Conservation Committee and Director of Science and Conservation at Beauval Zoo, Eric Bairrao Ruivo, outlined his vision of EAZA's collaborative conservation work.

Presentations from the following day included Mike Barclay, Director of Singapore Zoo, talking about the UN Sustainable Development Goals and how they are integrated into the zoo's strategy; Kirsten Pullen, in her last EAZA meeting as BIAZA Director, showing how coordinating communications between EAZA Members can vastly improve media outcomes; David Williams-Mitchell, EAZA Director of Communications and Membership speaking on the external effects of a robust vision and mission; and Thomas Koelpin, Chair of the Elephant TAG, giving an update on the discussions of the TAG over the last 12 months. All of the presentations were aimed at setting up a discussion of the vision and mission of EAZA, and whether it has changed since the last statements were created more than 10 years ago. This process will continue at Annual Conference in September.

The final session of the 2016-2019 Council, and the inaugural session of the 2019-2022 Council also took place, along with the Annual General Meeting of the Association. To see the decisions taken by these bodies, see Noticeboard (p. 5).

The meeting wrapped up with a gala dinner at the Grand Jersey hotel, and was followed on 26 April with a visit to the legendary Jersey Zoo, with additional options to visit some of the zoo's local conservation projects. EAZA thanks the zoo and its staff for their professionalism and hospitality, which helped make this edition a highly successful one – and further cemented Jersey's place in EAZA's future.

A plan for the lemur



THE FUTURE OF THE RING-TAILED LEMUR DEPENDS ON CAREFUL FORWARD PLANNING

Elmar Fienieg, EAZA Population Biologist; Caterina Spiezio, Head of Research and Conservation, Parco Natura Viva; Achim Johann, CEO Rheine Zoo; Delphine Roulet, Cotswold Wildlife Park; Nora Hausen, EAZA Assistant Population Biologist; and Katharina Herrmann EAZA Coordinator Animal Programmes and Conservation

Do you keep ring-tailed lemurs (*Lemur catta*) at your institution? For the average reader of *Zooquaria*, the answer is probably yes. With 200 EAZA institutions holding a combined population of around 2,000 individuals, this species is one of the most common kept by EAZA Members. However, this gives the false impression that this species is relatively safe from extinction when the opposite is true. Due to habitat destruction, most of Madagascar's wildlife is threatened with extinction and the ring-tailed lemur is no exception; it is listed as Endangered on the IUCN Red List (Andriaholinirina *et al.*, 2014).

It is therefore important that we ensure professional management of this insurance population, as defined in the recent Prosimian TAG's Regional Collection Plan. This is why this recently established EEP was prioritised for a Long-term Management Planning (LTMP) workshop.

The main challenge for the EEP is to adapt the birth rate to fit the space capacity in EAZA. Currently, there is a risk to animal welfare if more animals are born than we have appropriate housing for. Furthermore, with a further expansion of a limited number of prolific ring-tailed lemur families, genetic diversity decreases and the value of our population as an insurance population decreases with it.

To stabilise the situation, the birth rate will need to be reduced by half. In order to do this while maintaining a behaviourally and genetically healthy population, the best solution seems to be for each institution to adhere to the following five-year cycle for population management, as follows:

- Year 1: A new breeding male is transferred into the group.
- Year 2: The new male is allowed to breed with the females.
- Year 3-4: Assuming successful reproduction in year two,

the group receives a non-breeding recommendation. Reproduction can be avoided by vasectomy of the male, so the group can function behaviourally without producing offspring.

Year 5: The male is transferred to a bachelor group together with his male offspring.

Year 6: A new male is transferred into the group.

This represents a considerable change in management, but is very much needed.

For more information, please see the LTMP on the Prosimian TAG page of the EAZA Member area. More information and the year in which each group is allowed to reproduce will be communicated to holders by the EEP coordinator.

REFERENCES

- Andriaholinirina, N., *et al.* 2014. *Lemur catta*. The IUCN Red List of Threatened Species.

Taking the reins

ANDRE STADLER, DIRECTOR OF ALPENZOO INNSBRUCK, AND NOW THE NEWLY APPOINTED CHAIR OF THE TECHNICAL ASSISTANCE COMMITTEE, TALKS TO DAVID WILLIAMS-MITCHELL, EAZA DIRECTOR OF COMMUNICATIONS AND MEMBERSHIP

DWM: André, you have just been made Chair of the Technical Assistance (TA) Committee. The remit of the Committee has changed quite considerably just recently. Could you tell us what is different?

AS: First of all, I must say that I feel very honoured to become the Chair of this Committee! Many thanks to EAZA for showing such trust in me. Regarding the changes: of course there are always new tasks coming up for the TA Committee, but one of the most striking recently was that Candidates for Membership (CfMs) are not exclusively zoos from Eastern Europe who want to become Members, but are also zoos who experienced a change in membership status during the screening process. This leads to a different situation and creates new tasks.

DWM: You've also been a mentor with the TA Committee for a while now. In your experience, what is it that CfMs lack – and how does mentoring help with this?

AS: Mentoring is a hard and time-consuming task for both sides but can really help to improve the zoo staff and the welfare of zoo animals. One of the greatest challenges is that the understanding of what it means to run a modern zoo can be quite different in the beginning. Most of the CfMs are used to the old ways of running a zoo, which means they are not necessarily used to such things as collaborating in population management programmes, being transparent, supporting conservation, improving the welfare of animals, coordinating research programmes and so on. Also some zoos need to modernise their infrastructure and enclosures to fit today's requirements of animals, keepers and visitors, and this comes down to finances and funds, which are a problem for some zoos. So, in a nutshell, for a CfM, mentoring can have a big impact on the structure and the functioning of the zoo.

DWM: We had the results of the evaluation of the Zoos Directive recently from the European Commission. One of the findings was that implementation of the Directive on a national level needs to be improved. Do you think that the TA Committee can contribute to this, either as a model of good practice or as a direct contributor?

AS: I personally believe that the TA Committee can strongly contribute to this. With the regular visits and the constant availability of the mentor and the Committee itself, it can act as a kind of expert for the politicians in the respective countries to help to implement the Directive.

DWM: Obviously, as Chair of the TA Committee, you have seen zoos and aquariums of all standards. Do you think that every institution has the potential to reach EAZA Standards, or are there institutions you'd prefer to see shut down?

AS: Of course I have seen some sub-standard zoos, but personally I do not believe that any zoo should be shut down. We definitely need zoos in our world, and there is an old saying that if we did not have any zoos already, we would need to invent them. And this is true, but what is most important with the sub-standard zoos is that there must be a will to improve the situation! As long as there is a will to change and improve and there are enough funds to do it, every zoo can meet EAZA Standards. But, as always, this depends on people making the right decisions.

DWM: Are you intending to make any changes to the Committee, in terms of membership and working procedures?

AS: I am in the lucky situation of having taken over the Committee from my predecessor (Mark Pilgrim, Chester Zoo) in a very good state with no need for

big changes. I just want to continue Mark's great work and to further improve the work of the members of this Committee itself. My main goal is to be able to say that if we do not make improvements in the CfMs as fast as we want to, it should not be because the mentor is at fault. To meet this goal, I plan to establish a kind of screening of our own mentor work, so that we as mentors can also improve.

DWM: The work of the Committee is something that the general public and other external stakeholders probably don't know much about. Do you think there's an opportunity to show people what you do, and do you think that would affect people's perception of zoos and aquariums?

AS: If the zoos that we are mentoring really improve in terms of the welfare of zoo animals, education, research and conservation, the visitors will recognise it and start telling the story. Also the zoo will tell its story to the media and politicians, so I hope there will be an effect on people's perception of zoos and aquariums, because good, modern zoos definitely have this impact on people in my view. But as you've asked me that question, I will take this on as a task and, together with my colleagues at the Committee, we will start to look at where we can advertise more widely what we are doing and what successes we have already had.

DWM: There is a bit of crossover in terms of mandates of committees – I am thinking specifically of the National Associations and EEP Committees. Do you have plans to strengthen the collaboration between the committees or, alternatively, create a clearer delineation of the work of different committees?

AS: I don't believe we need a clearer delineation of our work. We should act as a team to manage our tasks, and I



am really looking forward to working together with the other Chairs on all our upcoming tasks.

DWM: You are the mentor of Kaliningrad Zoo in Russia. Would you say that they are a typical CfM; and if not, what do you think a typical CfM is like, and how could they learn from the experience of Kaliningrad, or other CfMs that have overcome big challenges?

AS: Every CfM is different, with its own challenges and tasks. I was lucky that my counterparts at Kaliningrad are highly motivated and really want to do the right things at the right time. I am proud to see that they have developed a deeper and more up-to-date understanding of zoo management. To see all those changes, not only in animal welfare, but also in the infrastructure, the management, enrichment, education, conservation and so on is great, and gives me a good

feeling that the TA Committee is the right tool to assist our colleagues who want to meet EAZA Standards. I am looking forward to see Kaliningrad Zoo as a full Member in the near future.

DWM: I understand you have just received your PhD; could you tell us more about your thesis, and whether your work might be applicable to the wider zoo community?

AS: Blood-sucking bugs of the genus Reduviidae can represent a method for obtaining blood samples of vertebrates, especially of species where a sample collection without anaesthesia is not possible. Reduviid bugs can suck blood quantities of 40 to 3800µl without disturbing the vector. In my doctoral thesis the application possibilities of *Dipetalogaster maxima* were tested in common zoo days, and the result was that Triatomines can be used as an alternative means for obtaining blood samples from vertebrates instead of the conventional method via syringe and needle. Exclusively, the triatomine *Dipetalogaster maxima* was used in the present study because of the considerable blood volume that can be obtained. If the method with blood-sucking bugs was modified to the different host species like reptiles, birds or mammals, the 'living syringes' were successfully used in 12 European countries and 47 institutions and 72 different species. The present study verified the reduction of glucose in the stomach of the blood-sucking bugs for the first time, and the hypothesis that blood-sucking bugs can be used for the blood sample collection was confirmed. Also, the screening for epizootic diseases like brucellosis, tuberculosis, malaria and blue-tongue disease were successful. All results were identical in both collection methods, with no false-positive or false-negative results. In addition, stress hormone analysis proved again the advantage of the minimal invasive method via blood-sucking bugs.

DWM: Assuming you have any spare time, how do you like to spend it?

AS: My greatest hobby is birdwatching and visiting zoos, but I also enjoy watching football and spending time with my dog and my wife, preferably combined with travelling.

Out in the field

COLLECTING DATA FROM A REMOTE MOUNTAIN SITE INVOLVES DIFFICULT TERRAIN AND CHALLENGING WEATHER – BUT THE RESULTS CAN BE INVALUABLE

Christian Devenish and Stuart Marsden, Manchester Metropolitan University

Conservation in the field is often viewed as a romantic occupation; however, as rewarding as fieldwork sometimes is, it is also very hard work. These notes from the Silent Forest Campaign Preselected Project 'Searching the Birds' clearly show that, here, both things are true. From Regional Collection Planning to setting priorities about which sites to protect or which species to include in conservation relevant legislation, decisions depend on data from the field. Without passion and some extra dedication, we would probably not be able to access those viable pieces for the puzzle on which our conservation planning decisions depend. In this case, information is urgently needed and the mountains in Java are the last home for several near-extinct songbirds in rapid decline; it is, therefore, vital and urgent that we understand the situation on the ground.

Simon Bruslund, Silent Forest Campaign

NOTES FROM MOUNT SLAMET

We often talk about the lack of basic ecological data required for conservation decisions; for example, prioritising species for conservation action, or areas for protection, or managing a species' recovery. These basic data often take the form of species distributions, abundances and survival rates, at least initially, before they can be transformed to other quantities, such as trends over time and probabilities of extinction. What are the reasons behind this lack of data? Should we be surprised that we often don't know how many individuals of a particular species (even common ones) exist, or how much uncertainty we have about some of these basic measurements? One fundamental reason for this lack of data is the difficulty in obtaining it. When working with species of high conservation interest, we are often in

regions of high biodiversity, which tend to be in the tropics and in countries towards the bottom of the global table in earnings per person. Add to this some political uncertainty and a lack of local capacity to do science, and these factors can inflate the difficulty of doing fieldwork.

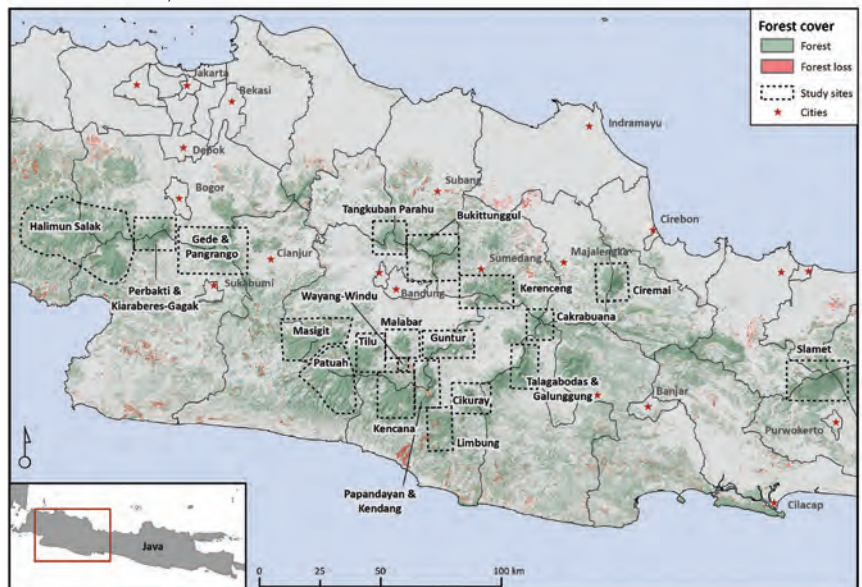
The EAZA Silent Forest campaign aims to improve the situation of Asian songbirds in their natural habitat and to develop an increased knowledge and understanding of the threats to these birds. Improving the situation of birds at risk – for example, by identifying sites for protection, or prioritising reintroduction sites – requires knowledge of the presence of key species within their natural habitats. This information is currently being sought as part of a project to establish two new protected areas in Java. The project is led by the Bird Conservation NGO, Burung Indonesia, with Manchester Metropolitan University leading the biodiversity component, including fieldwork and data analysis. The main project, funded by Rainforest Trust and the EAZA Silent Forest campaign, aims to survey some 20 mountains, many of which are volcanos, across the west of Java over the next two years. Funding for surveys on Mt Slamet also came

from Chester Zoo.

The field sites are generally over 1000m in altitude amid the rainforest; their inaccessibility to loggers and farmers also means they are difficult for us to reach, and our fieldwork usually starts with a significant trek uphill just to get the personnel and equipment to the project site. We are using camera traps and audio recorders to record wildlife, and although there is the advantage of capturing data over 24-hour periods and analysing images or recordings in the comfort of an office, the recorders still have to be put in place and taken down. The 10-person team consists of professional Indonesian ecologists, local guides and ecology students from local universities gaining valuable experience. The ecologists, helped by the students, set up the equipment and carry out bird, amphibian and vegetation surveys at the sites, supported by occasional visits from the UK-based scientists. All of these people need to be fed and watered, which also means carrying food up the mountains and including cooks amongst the guides. A one-week field trip can easily eat its way through a sack of rice and an amazing amount of chillies.

Achmad Ridha, leading the field team from Burung Indonesia, has ample

BIODIVERSITY HOTSPOTS, SPECIES RICHNESS AND GLOBAL EARNINGS



SETTING UP MONITORING EQUIPMENT SUCH AS THESE SOUND RECORDING DEVICES IS OFTEN DONE IN TORRENTIAL RAIN OR NEAR DARKNESS.



fieldwork experience, but even for him, surveying these mountains represented a challenge. ‘The hardest part to avoid while working in a tropical country is the extreme weather,’ he says. ‘Strong winds and sudden hard rain can make the trails very slippery.’ Then with characteristic calm he adds, ‘The worst parts are the falling trees and landslides.’ Indeed, a tree crashed down in the night on Patuha mountain not far from the camp. Luckily it was far enough away from the camp to just shock the team without causing any damage.

A typical day involves getting up well before 6am, having a quick breakfast of coffee and noodles or energising oat-based drink and then hitting the trails. Tasks include setting up camera traps or audio recorders and performing vegetation surveys at each of these locations. Measuring the diameter of a huge tree is often a job for two people. Once the equipment is set up – typically taking at least a day – transect surveys for birds are carried out during the following mornings and afternoons, and then amphibian searches go on into the night. After three days of surveys, another day is needed to collect up the equipment again. Rains can come frequently and hard, usually in the afternoon, but also at any time of the day, making every job more difficult or even impossible. However, there are moments that can’t be beaten by any office work. Ridha reflects on his favourite part of the job: ‘Birdwatching is the most enjoyable part of doing fieldwork, it’s like meditation where you can find yourself connected with the nature.’

The team will walk tens of kilometres and ascend and descend hundreds of metres over the week. The forest slopes are generally steep and rugged, with many small streams cutting

their way down the mountain sides. This means that the trails descend to cross streams multiple times on the way up a mountain, making the total ascent much more than the final elevation reached. Trails are rocky, muddy, traversed by large tree roots, or intersected by branches. Trails are used both by hikers, ecologists and

the mammals that they search for. On Slamet, Javan leopards (*Panthera pardus melas*) were photographed just hours after the field team had passed the cameras. Although the data analysis stage is still largely to come, early results already have shown presence of important birds and mammals on most of the sites visited.

Once the fieldwork has finished, the data analysis will start to look at where the most suitable sites are for extending or creating new protected areas, and also, at a later stage, where possible reintroductions of species such as green magpie (*Cissa thalassina*), might take place. However, this will require other contextual factors to change, such as those that drive the trade in wild birds. As Ridha remarked, ‘In terms of doing the conservation effort, changing perspectives from a profit mindset into a sustainable mindset is the key.’

SIGN UP TO OUR CONSERVATION CAMPAIGN

It only takes three minutes to pledge your support, so join the cause today by signing up. Financial support is not mandatory, and our Silent Forest campaign needs you! *Simon Bruslund, Marlow Bird Park*

The current number of sign-ups to the Silent Forest Campaign on the website www.silentforest.eu already exceeds our target of 175 EAZA Member participants. Therefore we should be content, but for some reason it doesn’t sit right.

The reason for our concern is not the total amount, but rather the distribution; a surprising number of those zoos who we would have expected to sign up did not. Even some bird parks have, surprisingly, simply chosen to ignore the campaign.

We did, of course, analyse the sign-ups to understand and document the impact of the campaign. Our initial thoughts were that perhaps we were not communicating effectively with regions where the use of English is not strong; however, the poor responses throughout Scandinavia demonstrate that this cannot be the main cause. The main hosting countries for this campaign, Czech Republic and Germany, have by far the highest rate of sign-ups, which suggests some impact from personal relations – but also perhaps national pride.

The pledges for financial support and the amazing amounts that the campaign have already helped to fundraise for conservation activities on the ground in Asia are carried by a little less than a third of the signed-up EAZA Members. This represents less than 20 per cent of all EAZA Members. It is frustrating to know that we could achieve so much more if more zoos would chip in, even if only a little bit.

The accounts of the Silent Forest Campaign are open for your contributions and projects are ongoing, so if you have dedicated funds for songbird conservation, don’t hesitate to transfer money to the campaign. It is sorely needed and extremely helpful, even if it is only the first part of bigger pledge.

EAZA MEMBER SIGN-UPS TO THE SILENT FOREST CAMPAIGN



INDOCHINESE SIKA DEER,
© JAN PLUHÁČEK



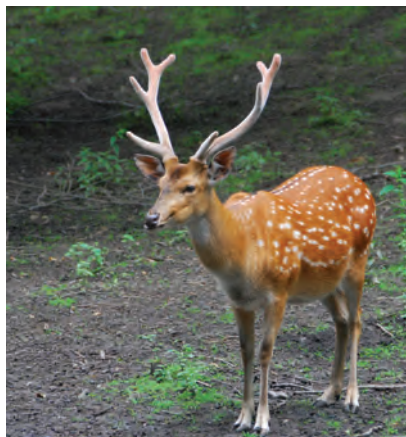
Matters of life and death

THE COORDINATOR OF THE INDOCHINESE SIKA EEP SHARES THE DIFFICULT LESSONS HE HAS LEARNED

Jan Pluháček, EEP coordinator and researcher, Ostrava Zoo

In this article, I would like to show, using data from one of the EEPs I am coordinating, that in some species even a temporary restriction in reproduction might lead to the death of the population. In addition, I would like to illustrate the importance of proper management (EEP) for the long-term sustainability of the population of a prolific species that seemingly does not need it.

Indochinese sika deer (*Cervus nippon pseudaxis*) is a very rare taxa listed as Extinct in the Wild (EW) by the IUCN Red List. This species is very adaptive to a European climate and can be kept and bred fairly easily. Therefore, the European (EAZA) population is quite a good size (it currently stands at 383 individuals in 30 zoos) and has been managed as an EEP since 1990. Ostrava Zoo began hosting this EEP in 2012, and since 2015 we have been compiling and publishing the International Studbook as well. During this short time I realised that whereas the European population is flourishing, the unmanaged population in AZA (North America) is rapidly declining (34 individuals in three zoos). The question is – why? And the other question is: might any threats causing the decline of the AZA population affect our



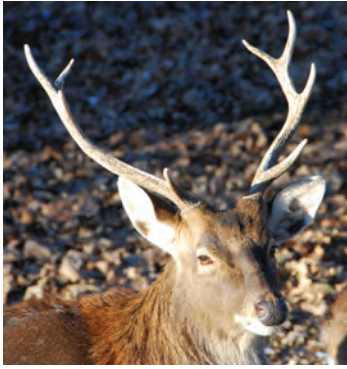
population as well? The answer to the latter is yes, they can. To answer the first question, it is necessary to provide a little background information.

In the wild, the sika deer represents a prey for many carnivores. Therefore, the females adopt the so-called r-strategy, that is to breed as much as possible in almost every reproductive season. Their reproduction in the wild as well as in human care is strictly seasonal. Thus, in the rutting season males compete over females either by establishing social hierarchy (Endo *et al.*, 1997; Endo and Doi, 2002) or territoriality (Miura, 1984). Since male mating success correlates with antler size (Miura, 1984), the reproductive success of each male is limited to a few seasons only. In

addition, several males can successfully contribute to reproduction in one season (Endo and Doi, 2002). Thus various males sire offspring in various seasons. Based on this, females of sika deer are evolutionarily adapted to breed every year, but not with the same male for the whole of their life.

LESSON 1: BREEDING HERDS THAT FORGET TO BREED

Thanks to its adaptability and prolific reproduction strategy, the Indochinese sika deer EEP has an obvious problem: the limited capacity in EAZA zoos. As many zoos cannot or choose not to adopt a breed-and-cull strategy, some of them had prevented reproduction by either removing the male or using permanent castration. When I took over the EEP, I realised that in several zoos, breeding had stopped completely for several consecutive seasons. To avoid losing the genetic representation of some founders, I recommended introducing a new male to three of these groups. The result was surprisingly clear. Only one group out of three in which reproduction was stopped resumed breeding. In addition, even in that one successful group, only half (six out of eleven) adult females reproduced.



When two more institutions decided to add the species to their collections, both of them established new groups consisting of a mix of older females from groups that had not bred for several years, young females and a new male. In both institutions all the younger females reproduced every season, but none of the older females reproduced.

Based on these experiences, it is clear that after an absence of breeding for several consecutive seasons, the female loses reproductive potential. However, since this effect was not seen in 100 per cent of cases, we cannot label as 'sterile' in PMx the females that did not breed for several seasons. As several holders in our EEP refuse to allow breeding because culling is not allowed in their facilities or countries, it is possible that almost a quarter of all females in the Indochinese sika deer EEP population might no longer be reproductively active.

The conclusion is that although we seem to have a nicely sized EEP population, a significant part of it is actually genetically dead. In other words, to keep the Indochinese sika deer population healthy, females need to be allowed to breed almost permanently.

LESSON 2: NON-BREEDING HERDS ARE NECESSARY FOR BREEDING

In this EEP there is a preference among the holders to only keep females. This preference leads to a population with a skewed sex ratio where only a few males reproduce, which causes genetic erosion of the population. Thus, to keep the population genetically healthy and to more closely reflect the situation in the wild, the best solution would be to replace the male after several breeding seasons by culling him and introducing another. However, where should we find new adult males when almost no holder is willing to keep

more than one for breeding? The answer seems easy: in all-male groups. However, no zoo has been willing to keep such a group. Due to this, most new males introduced for breeding are recruited from a group of young, socially inexperienced individuals, which has caused problems in some institutions. Although seemingly non-reproductive, the all-male groups are serving as a genetic pool to support the reproduction of the population. They are essential for the long-term survival of the species, and the institutions that keep them are supporting the EEP as much as those that keep breeding herds. On the other hand, so-called 'breeding groups', where breeding did not occur for three or more seasons, actually support the rapid decline and end of the population.

To address this problem the EEP (species committee) adopted the rule that any new holders of the species can hold an all-male herd only. Unfortunately, we have since lost several potential holders, as they decided to switch to other deer species because of this rule. However, some more progressive institutions willing to keep all-male groups have appeared, so we expect the establishment of the first permanent male group in our EEP during this year.

In summary, our EEP faced two problems: first, many holders resorted to non-breeding to avoid culling surplus offspring, resulting in a high rate of sterility among the females; and secondly, there was a lack of adult socially experienced and genetically valuable males. The holders themselves might be divided into two groups: (a) those who accept and practise a breed-and-cull policy and (b) those who do not choose this, or for whom this policy cannot be applied. By implementing the very elegant solution explained above, both types of holder will contribute to the long-term

survival of the population; institutions where a breed-and-cull policy might be applied should keep breeding herds, leaving them to reproduce every season; institutions where this policy is not preferred or cannot be applied should keep all-male herds. The EEP population needs both types of holder.

The implementation of this solution would be impossible without the EEP framework and especially without a very constructive and supportive species committee. I believe that the result of our work is clear: whereas the European population has a chance to remain genetically healthy and flourishing, the unmanaged North American population, where all institutions wanted to breed, is slowly vanishing.

I think that the Indochinese sika deer is not the only species that suffers from these problems. Therefore, I hope that the lessons we learned in this EEP may be useful for other ungulate programmes as well as for their holders.

My thanks are due to my assistant Andrea Garguláková for her help in compiling the studbook. I am also grateful to all members of the Indochinese sika deer EEP species committee, namely Noam Werner (Tisch Zoological Gardens), Jörg Beckmann (Opel Zoo), Christian Kern (Berlin Tierpark), Jitka Vokurková (Zoo Olomouc), Ferenc Boda (Sóstó Zoo), Sabine Haderthauer (Vienna Zoo), and Klaus Rudloff for their suggestions and support.

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Positive vetting

EXAMINING THE POTENTIAL VALUE AND ROLE OF VETERINARY ADVISORS FOR AVIAN TAXON ADVISORY GROUPS

Dominik Fischer, EAZA TAG vet advisor to the Falconiformes and Strigiformes TAG, the Raptor Center & Wildlife Zoo Hellenthal and the Clinic for Birds, Reptiles, Amphibians and Fish at Justus-Liebig University, and Kirsi Pyönnönen-Oudman, Chair EAZA Falconiformes and Strigiformes TAG, Helsinki Zoo

Ten years ago the situation of veterinary advisors in bird Taxon Advisory Groups (TAGs) was quite different from how it is now: only a few TAGs had specific advisors and certainly not many had a nominated veterinary expert to assist with the TAG work. At present, 26 of the 39 TAGs have at least one veterinary advisor (TAG vet advisor). In addition, 98 of the 400 programmes (EEP and ESB) have veterinary advisors.

What is the potential value and the role of TAG vet advisors for the different bird orders? TAG vet advisors have an important role in overseeing problems and diseases, addressing husbandry and dietary requirements and helping to coordinate diagnostic, prophylactic and therapeutic measures. In these areas, the independent point of view of the TAG vet advisor can be helpful to the local veterinary colleagues in solving specific problems in zoological institutions. TAG vet advisors need to cultivate a good cooperative relationship with skilled local veterinarians, who may be employees of the zoos, or may be consultants with a private practice.

Furthermore, a continuous exchange of information about avian medicine with universities, research institutions and specific veterinary associations, such as the European Association for Avian Medicine (EAAM), the European Association for Zoo and Wildlife Veterinarians (EAZWV) or the European College for Zoological Medicine (ECZM), are valuable for TAG vet advisors, as it ensures that they are regularly updated. Therefore, continuous research in infectious diseases, animal welfare and species conservation (e.g. development and improvement of assisted reproduction in birds) is essential. The TAG vet advisor needs to communicate the results of such research projects

to zoos to enable evaluation and implementation in the zoological management of avian species.

Another task that falls to TAG vet advisors is the veterinary supervision of species conservation projects considering the release into the wild of individuals bred in human care. In particular, prior to release, the health situation of *ex situ* and wild populations needs to be assessed using a thorough risk-assessment procedure with a specific focus on potential disease transmission from captive to wild populations (Jakob-Hoff *et al.*, 2014).

To give an example, the vet advisors for the Falconiformes and Strigiformes TAG supported the TAG in the creation and editing of the EAZA Falconiformes and Strigiformes Taxon Advisory Group Husbandry and Management Guidelines For Demonstration Birds (Habben *et al.*, 2016). Moreover, they consulted with colleagues at participating EAZA institutions and took part in a discussion about different diseases of raptors in the TAG. As a result, diagnostic measures and treatment options of avian malaria caused by *Plasmodium* spp. and other haemoparasites were reviewed in northern owls. The key information was shared by the chairpersons of the TAG at the TAG meeting in Belfast and an overview-sheet about treatment options was issued.

Recently, the increasing number of infections by the arthropod-borne flaviviruses West Nile virus (WNV) and Usutu virus (USUV) in goshawks (*Accipiter gentilis*) and owls required action. The fact sheets of the 5th EAZWV Transmissible Disease Handbook about WNV (No. 65) and USUV (No. 136) were updated and information was distributed by the TAG chairs to EAZA institutions. As Usutu virus infections seem to pose a risk especially in great grey owls (*Strix*

nebulosa) in Central and Southern Europe, preventative health care and improvement of owl husbandry are currently being prioritised. Vector management and prevention are discussed alongside vaccination. Moreover, the current situation and spread of Usutu virus and West Nile virus were discussed during the Falconiformes and Strigiformes TAG meeting at the mid-year TAG meeting in Berlin to clarify recommendations for the raptor holders. In preparation for this meeting, the TAG vet advisor consulted leading national and private research institutions to provide the latest updates on these emerging viral pathogens.

In conclusion, good cooperation





between TAG vet advisors and local veterinarians, veterinary associations, research institutions, zoos, private practitioners and involved stakeholders is essential to ensure the most up-to-date medical management of birds and avian collections. The veterinary advisor should act as a liaison between all parties to share knowledge across the different stakeholders, to maintain healthy captive populations and to improve training and husbandry conditions.

From our point of view, voluntary commitment for the EAZA TAG is sometimes challenging, but we appreciate being involved in a continuous process of improvement and development that is beneficial for

the animals in our care, the zoological institutions, the participating staff and the visitors. Therefore, we encourage all veterinarians to support the TAGs and to get involved in TAG work according to your personal interest, skills and experience, specific training and education. In case of further questions, please get in touch with the authors.

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Sandrine Camus, EAZA Communications Officer



A workshop for welfare

SANDRINE CAMUS TALKS TO YITZHAK YADID, GENERAL CURATOR AT FONDAZIONE BIOPARCO DI ROMA, ABOUT THE ANIMAL WELFARE WORKSHOP THAT IT HOSTED RECENTLY FOR THE SECOND TIME

SC: Can you tell me what you liked most about the Animal Welfare Workshop that you have now hosted twice in Rome?

YY: I really liked the involvement of the keepers, as well as the interest and creativity they showed during the workshop. The last day is dedicated to building enrichment items and the participants were divided into groups according to animal species. Many ideas came up about how to implement what had been discussed over the three previous days. The items were then constructed with a lot of enthusiasm. That was the highlight of the course!

SC: Would you say the team is now more connected, and works better together?

YY: I feel the workshop was very important for the mental attitude of the team. It allowed everybody to use the

same language and talk about the same things when discussing welfare. What exactly are we talking about? How can we assess it? How can we implement solutions that will enhance animal welfare? That was the priority: now we have the language and ability to assess and intervene. Being aware of the fact that your own initiatives and actions can really impact and enhance the welfare of the animals you care for is a great motivation.

SC: What has changed in the keepers' daily routine since the workshop?

YY: It is a work in progress. We haven't managed to change all the routines in all the departments yet. In many of them, enrichment procedures had already been done. I can say we definitely increased them, but differently, depending on the sections. The keepers are now more aware of the importance

of these procedures and they are more motivated. They come up with enrichment ideas, they construct them and then put them into use and see how animals interact with them.

In addition, we started using an enrichment forum where everyone can suggest ideas and describe them. When an idea is approved by me as the curator, they can build it. This is a great indicator of how many people are interested, enthusiastic about the topic and actively participating. From my point of view, the course made a big difference in that regard.

SC: How did the course influence your approach to welfare?

YY: It motivated us to conduct some research to find out more about our animals. We installed cameras in enclosures to know what animals are doing at night time or to tackle some issues. For instance, one of our chimpanzees sometimes refuses to go out. We now approach the problem



by collecting data daily and try to understand what is connected with that behaviour. Is there some health problem, is it something that happened in the environment? Does placing an enrichment item outside encourage the female to go out? I guess we now try to think more from the animal's point of view than from the keeper's.

SC: Zookeepers are often already very busy. Would you say integrating welfare procedures in their routine is a big additional workload?

YY: To be honest, it is difficult to integrate these into the daily routine. We are currently trying to redo the workload of each section to incorporate time for welfare activities (assessment and enrichment). It is not easy. On the one hand, it depends on how much the keepers are willing to change their routine. But on the other hand, money is, of course, a huge limiting factor. If you want to allocate time for welfare actions in your keepers' schedule, you have to hire more keepers. The workshop was a big push in that direction. We are working on adapting budgets, including welfare modules. Even if it is difficult, I see it as a mission, because we cannot do without it.

SC: I saw you had an additional meeting on top of the workshop to come up with strategic actions.

YY: Yes, that was an important and

necessary meeting. Sally Binding (EAZA Animal Welfare Coordinator) helped a lot with this. We listed different steps that allow us to embed welfare actions in the daily routine, from scheduling the enrichment and monitoring stocks to having regular meetings presenting what was completed in each department. It is still a work in progress. This table could be useful to every institution; it is a good guideline for how to implement, follow up and motivate people.

SC: What about the other participants of the workshop, were there any collaboration opportunities with other institutions?

YY: We were really happy to have participants from other zoos in Italy and in other countries. It is great to see people coming from Dublin, from the Netherlands and so on. It means the need is there. There were collaborations during the workshop; participants had to work in groups and come up with enrichment ideas. Of course, there was a language problem which sometimes limited the discussion for some keepers who only spoke Italian. Some people exchanged emails and phone numbers, but I don't know if that led to any professional collaborations.

SC: Do you have any advice for other institutions who might consider

hosting this workshop? What would make it easier for them to organise the welfare training?

YY: First of all, I would tell them 'Do it! It's a very interesting and positive experience.' I saw how much the keepers enjoyed themselves and were enthusiastic during the workshop. Their eyes were shining (laughs). They could talk about their problems, get some solutions and understand different concepts from training to enrichment. Actually, we liked it so much we are considering hosting a third session in Rome! As long as there are requests, I believe it is essential to repeat it. Regarding the organisation needed to host the workshop, it is important to have someone dedicated to the task. We are very grateful for Claudia (my assistant) who helped organise things before the training and make sure the material was there, and she translated from English to Italian for four days. She did a wonderful job!

SC: Any improvements you could suggest regarding the workshop?

YY: Nothing comes to mind right now. Each day was interesting, stimulating and worthwhile. In the first workshop we had a second instructor, Jake Veasey. It was fascinating to discover his knowledge and his methodology. But even when Sally was on her own the second time, it was very interesting and we learned a lot.



Emergency rescue

HOW AN INTENSIVE PLANNING SESSION PRODUCED A COMPREHENSIVE STRATEGY TO SAVE THE RAPIDLY DECLINING OWSTON'S CIVET

Veronica Cowl, Reproductive Biology Coordinator, Chester Zoo, and EAZA Executive Office

Despite being little-known and elusive, the Owston's civet (*Chrotogale owstoni*) may be 'a candidate for the most threatened species of carnivore in the world' (Duckworth, 2018). The species, historically found throughout Vietnam, Laos PDR and southern China, doesn't inhabit any functional protected areas *in situ*, and falls victim to the indiscriminate snaring of the illegal wildlife trade in the region. As such, the Owston's civet is now probably extinct in China, and the *in situ* population has faced declines of close to 50 per cent within the last 15 years (Willcox *et al.*, 2014). *Ex situ*, its plight isn't much better; populations are small and have suffered from disease and low rates of reproductive success.

Regardless of these challenges, there remains significant potential to conserve the species and, with this in

mind, more than 60 delegates from Vietnam, China, Laos PDR, Singapore, Australia, USA and the UK convened in Hanoi, Vietnam at the beginning of April to determine what a successful conservation strategy for Owston's civet would look like. The meeting was organised by Save Vietnam's Wildlife (SVW), with close involvement from the International Union for the Conservation of Nature (IUCN) Small Carnivore Specialist Group. It brought together representatives from Vietnamese organisations, government partners, conservationists and external stakeholders to identify the most pressing issues facing the species and to develop a clear framework for the conservation of the species, both within the region and further abroad. To begin to develop a plan however, delegates needed to clearly understand the current status of the species.

WHAT DO WE KNOW?

Unfortunately, historic conservation attempts of Owston's civet are complicated, as little is known about the life history or biology of this mysterious species. This civet is the only species belonging to its genus (Veron and Heard, 2000), and a study based on 26 civets, both wild-born and in human care, has suggested that there may be two geographical clades in existence (Veron *et al.*, 2004). The civets are nocturnal (Gray *et al.*, 2014), and are generally considered to be solitary outside the breeding season (Robertson *et al.*, 2002). They have been found in various evergreen forest types, in altitudes ranging from 100 to 2,600 metres, indicating that the species can inhabit a range of environmental climes, but has functionally been restricted due to habitat degradation. In Vietnam in



particular, snaring is a primary threat to the species (Timmins *et al.*, 2016), even though it isn't a direct target for the illegal wildlife trade. Moreover, the Owston's civet satisfies a general demand for pelts and wild meat, and although it is listed under CITES Appendix 2, it seems that it may also be a target for the pet and private zoo trade.

The first *ex situ* population was established in 1995 in Cuc Phuong National Park, Vietnam, by the Carnivore and Pangolin Conservation Programme (now SVW). In Europe, Owston's civets have been present since the early 1990s, although three pairs were sent to the UK in 2005 to form the basis of the studbook. These also provide the majority of knowledge on the biology of Owston's civets. Data collected from animals in human care suggest that the species has a relatively well-defined breeding season, ranging from late November to February, and that females produce one to two offspring (although some captive females have produced triplets) following a gestation of 75–90 days.

Interestingly, while the Owston's civet studbook is coordinated by Owen Taylor, Paignton Zoo, UK, the EEP consists of two populations: one half resides in Europe, while the other is in Vietnam, held at SVW. Currently, however, both populations are too small to be sustainable; the European subset is faced with an ageing population of few founders and low reproductive success, while

the Vietnamese *ex situ* population has recently halved due to disease. In total, there are 11 animals born in human care in the European EEP population (4.7), representing 10 founders, while the Vietnamese EEP population currently stands at seven animals (0.7). The first birth since 2014 in the EEP took place earlier in 2019 at Newquay Zoo, UK.

WHAT NEXT?

Under the expert facilitation of the IUCN Conservation Planning Specialist Group, delegates of the workshop separated into three groups: the first focused on developing a strategy for *in situ*, site-based conservation, the second on tackling issues concerning the illegal wildlife trade, and the last concentrated on producing a robust *ex situ* conservation plan. Within these groups, our aims were to identify what exactly it is that we want to achieve, given the most pressing issues for the civets *in* and *ex situ*. For the site-based conservation group, this involved identifying areas in which the civets could successfully be conserved, with considerations for any other ongoing conservation projects that may be in the region, while priorities for tackling the illegal wildlife trade lay in highlighting issues facing the civets, in particular snaring, on a global platform. As for the *ex situ* conservation group, our tasks lie with identifying factors that contribute to successful reproduction

in both Vietnam and Europe, with a focus on environmental, social and husbandry factors. Work has already begun among the holders of the European EEP animals with a meeting to share husbandry practices and experiences of breeding and rearing. Moreover, the EEP has recently established a routine and non-invasive endocrine monitoring programme in partnership with the EAZA Reproductive Management Group (RMG), designed to shed light on the reproductive biology of the species and the reproductive status of the animals in the programme. Future plans aim to extend this work to individuals at SVW, as well as additional *ex situ* animals in Asia.

Throughout the workshop the need for strong *in situ* and *ex situ* partnerships among all stakeholders was continually echoed. As a result, the conservation action plan for Owston's civets truly embodies a One Plan Approach to conservation. For more information on the plan, watch out for its publication later this year.

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Food for thought

A RECENT NUTRITION CONFERENCE TACKLED OLD AND NEW QUESTIONS ALIKE IN THIS VITAL TOPIC

Anouk Fens, nutritionist, Apeneul Primate Park, and Vice-Chair EAZA Nutrition Group

Every two years, the European Nutrition Conference brings together keepers, zoo nutritionists, veterinarians, researchers and feed companies from across the globe to share their expertise. This year, the 10th European Zoo Nutrition Conference, organised by the EAZA Nutrition Group (ENG), was hosted by Marwell Zoo, UK. This was particularly appropriate, as the second nutrition conference should have been held there in 2001, but was cancelled due to foot and mouth disease. Although it has taken 18 years to reschedule, the effort was worth it, as it was the largest to date; it drew 161 delegates from over 30 countries, including attendees from other regions, such as Japan, Australia and the USA.

With its aim 'to promote and support nutrition in zoological institutions as an essential component of their conservation mission', the ENG is made up of zoo animal nutrition specialists from across Europe, working in zoological collections and in academia. Nutrition is probably the most important factor for establishing healthy and viable populations in human care, and although much progress has been made over the past 20 years in the development of scientifically based knowledge on zoo nutrition, there are still many unanswered questions, and specialists in this field remain scarce. This conference is therefore invaluable for the continued development of zoo animal nutrition.

Prior to the conference, delegates could attend an EAZA Academy Recognised Course on the topic of 'Meat and fish quality, nutrition and feed presentation', facilitated by Richard Chivers (Food Safety Southwest), Dr Len Lipman (Utrecht University), Professor Dr Annette Liesegang (University of Zurich) and Professor Dr Marcus Clauss (University of Zurich). The workshop combined theoretical information and practical elements regarding fish and meat quality and nutrition. It was followed by an

enjoyable icebreaker evening in the Marwell Hotel, which allowed the far-flung delegates to meet and re-engage.

The conference began with a welcome speech by Dr Will Justice, Head of Plants and Animal Management at Marwell Zoo, followed by an update from EAZA, delivered by David Williams-Mitchell, EAZA's Director of Communications and Membership. Then the first day kicked off with two keynote talks on the role of vitamin D in nutrition. Professor Susan Lanham-New (Surrey University) explained the challenges of vitamin D supplementation in human nutrition, and Frances Baines (UV Guide UK) translated theory into practice by talking about the use of UVB lights and full-spectrum lighting solutions.

Previous conferences have often been dominated by topics such as obesity, lack of dietary fibre, fruit-free diets and body condition score. This year a new topic emerged, namely browse quality and storage. The provision of browse is becoming more important in the diets of browsing herbivores. However, many zoos find it hard to store and collect sufficient quantities of browse, which is often only seasonally available. In one session, the effects of frozen storage on the chemical composition and fermentability of browse were discussed, along with inconsistencies within vitamin A and E content in forages. Speaker Sven Seiffert from ZSL, UK, explained the lessons learned during 10 years of browse provision.

The second day began with a zoo visit, which featured not just guided tours but also several workshop stations spread throughout the zoo, where information was presented on specific zoo animal nutrition items, such as body condition scoring, faecal consistency scoring, forage sampling, feeding anatomy and dentition and conducting a diet change.

A particular highlight were the talks given by nutrition colleagues from the USA: Dr Andrea Fidgett from San Diego Zoo and Shannon Livingston from Disney's Animal Kingdom. Their

presentations offered us a look inside the 'kitchen' of US zoos, including the history, current challenges and future plans for animal nutrition.

Conference sessions were dedicated to different taxa, including mammal, reptile and bird nutrition. Within mammal nutrition, various topics were discussed, including obesity management in equid species, fruit-free diets for primates, body condition scores in elephants and nutrition for geriatric zoo animals. In reptile and bird nutrition, the talks included challenges in raptor nutrition, digestive traits of old world vultures, feeding regimes in lesser flamingos and body condition scores of tortoises. The conference also allowed students to share the results of their research by means of posters and pitches. All delegates were able to vote for the best poster, and 'Browse preference in bonobos' by Sarah Depauw and others won with a convincing majority.

A huge thank you is owed to the organising committee, consisting of members of the ENG, EAZA Executive Office and Marwell Zoo, for putting together a superb conference. Thank you also to sponsors Arie Blok, Granovit, Kiezebrink International, Lucerne for Browsers – Itchen Valley, Mazuri Zoofoods, Saint Laurent SAS, Versele-Laga NV and Zooprofis, for their support.

As a result of the conference, we are delighted to announce that there will soon be another issue of EAZA Nutrition Group news. Based on papers and posters presented at the conference, it will present issues of importance to zoo animal nutrition management in an easily digestible form. In addition to this, the ENG section on the EAZA website has recently been updated and much useful material has been uploaded. Furthermore, the ENG is now also active on Facebook (www.facebook.com/EAZAnutrition/), providing regular posts regarding zoo animal nutrition. For more information, please go to our website: <https://www.eaza.net/about-us/areas-of-activity/eaza-nutrition-group>.

An excellent education

EAZA'S BIENNIAL CONFERENCE FOR EDUCATORS PROMOTES GOOD PRACTICE IN LEARNING AND EVALUATION

Mirko Marseille, EAZA Events Coordinator

Every two years since 2009, EAZA has been involved in the organisation of an Education Conference, which grows ever larger in both delegate numbers and programme content; this year we welcomed almost 200 delegates from 34 countries. The conference brings together educators from across the world for three days of activities focused on sharing good practice and highlighting future trends in zoo and aquarium education. It also provides invaluable opportunities for educators to meet and share their experiences. And these educators are not just EAZA Members; 45 educators came from other regions, including universities, NGOs and zoos.

The event began with the usual pre-conference EAZA Academy course, focusing on how to effectively evaluate and measure the effects of our conservation education programmes, and to provide educators with new ideas and skills to help them meet the EAZA Conservation Education Standards (CES). The course was fully booked with 60 delegates and five tutors: Dr Sarah Thomas (conservation consultant), Cassandra Murray (ZSL), Dr Andy Moss and Greg Counsell (Chester Zoo) and João Neves (Zoomarine Portugal). After a hard day's work, the delegates met for refreshments at the brand new Baltic Sea Science Center at Skansen, and in this impressive setting the conference was officially opened.

The next day began in the beautiful old Högloftet building in Skansen Zoo. The theme this year was 'Conservation education – acting for a sustainable future'. This reflects the important role conservation education plays in EAZA zoos and aquariums in meeting the UN Sustainable Development Goals. How do we and should we encourage, support and empower our audiences to take positive personal, community and wider social actions towards the animals and the natural world? The aim of this conference was to highlight the best conservation education taking place

in EAZA zoos and aquariums, while considering a future focus to help shape our education programmes to meet current and future challenges.

The first day included many different presentations from educators all across Europe, as well as a poster session and an introduction and workshop session focusing on the next EAZA Conservation Campaign. The first keynote speaker, Diogo Verissimo from Oxford University, gave a presentation entitled 'Behaviour Change: the next Frontier for Zoos'. This included elements of his current research into designing and evaluating behaviour change interventions, with the focus on better management of illegally traded wildlife resources. The second speaker, Emma Nohrén, from the Swedish Green party Miljöpartiet de Gröna, spoke about issues affecting the Baltic Sea such as plastic pollution and overfishing and what politicians and we can do to protect marine areas more effectively.

On the second day the programme included an open space session, an unstructured discussion time that allows delegates to raise issues or questions relating to their own educational practice. After lunch a group photo was taken, and then delegates were free to explore Skansen Zoo. The day ended with a discussion panel about the challenges and successes of implementing the EAZA CES.

The inspiring presentations continued throughout the third day, and after each thematic session the speakers came on stage to answer questions from the audience. This last day included seven parallel workshop sessions relating to the identified

conference themes, which offered delegates the option to develop practical skills in certain areas or to participate in in-depth discussion and strategic thinking about future directions for conservation education.

At the end of the day the EAZA Education Committee and delegates thanked Sarah Thomas, Chair of the Education Committee, for her dedicated work for the EAZA community over the past six years and presented her with her leaving gifts. This was followed by the gala dinner and farewell party at the Solliden restaurant in Skansen, where delegates could relax or network – or both. The following day Kolmården Zoo organised a zoo visit, which brought this excellent conference to a very enjoyable close.

The evaluation survey was extremely positive in all areas; Skansen Zoo did a wonderful job, offering conference facilities and catering beyond all expectations. The survey also showed that the main idea most conference delegates will use at work is that evaluation of education practices is very important and should be given more time and consideration.

The next EAZA Education Conference will be in March 2021, hosted by Wrocław Zoo in Poland. For updates, please keep an eye on the Events page on the EAZA website. As one delegate said in the survey: 'As a new educator this conference proved to be an extremely useful experience. I can see that the educators from the European Zoo and Aquaria community are like one huge family, always willing to help each other. For me, this experience has been very motivating.'

CONFERENCE LIVE-STREAM

For those unable to attend in person, we live-streamed this conference on the closed EAZA Education Conservation Group Facebook page. With the approval of all speakers, most presentations have been made available on the EAZA YouTube channel. Look for the 'EAZA Education conference 2019' playlist on the EAZA video channel and enjoy.

Opening session: <https://www.youtube.com/watch?v=y2438bHPeMU>

Keynote Emma Nohren: <https://www.youtube.com/watch?v=jHUTK3-930s>

ZOO ANIMALS BEING REINTRODUCED INTO THE WILD NEED FEEDING REGIMES THAT WILL HELP THEM MAKE THE TRANSITION TO WILD FORAGING OR HUNTING

Diet secrets

GOOD ZOO NUTRITION CAN BE VITAL FOR THE SUCCESS OF CONSERVATION PROJECTS IN THE ZOO AND IN THE FIELD

Lauren Samet, zoo nutritionist associated with Marwell Wildlife

Zoo nutrition plays a vital role in conservation within our zoos and aquariums, and not just because it helps us to offer an optimal diet in a similar format to that found in the wild. The start of 2019 marked the 10th European Zoo Nutrition Conference, which was held at Marwell Zoo in the UK (see p. 22), and once again research highlighted how nutrition is one of the key areas within animal care that can fundamentally impact the health, immunity, body condition, physiology, metabolism, cognition, brain function, gut microbiome, behaviour, reproductive ability, longevity, welfare, quality of life and emotional state of a captive animal (Dierenfeld, 1997; Fraser, 2008). Poor nutrition can result in deficiency, disease, poor welfare, poor condition (which includes obesity alongside weight loss) and even depression (Fraser, 2008). Additionally, the further away a captive animal's diet is from that of its wild counterparts, the greater the potential there is for each of these parameters to evolve away from how they have been adapted for success in the wild.

CONSERVING HABITATS AND WILD TYPE DIETS

The link between diet, niche and species specificity is perhaps most famously demonstrated by the Giant Panda (*Ailuropoda melanoleuca*), which when kept in human care requires around 17kg of bamboo stems or 40kg of bamboo shoots per day and can eat relatively little else. The panda is one example of how habitat loss and a lack of dietary options resulted in a critically endangered species; however, it is one that has improved its status to 'Vulnerable' through population management programmes and the protection of wild habitat, including the reforestation of bamboo forests and corridors.

In presenting diets that are too far from an animal's natural diet, we run the risk of unconsciously selecting for or against less obvious traits such as digestive efficiency (Ley *et al.*, 2008; David *et al.*, 2014) or digestive tract, tooth, skull or beak morphology (Van Valkenburgh, 2007; Pérez-Barbería & Gordon, 1999). This in turn can influence food transit time through the gut, body size and potentially the suitability to survive on a wild diet

(Smith *et al.*, 2010; Clauss *et al.*, 2007; Demment, 1997).

NUTRITION FOR SUCCESSFUL POPULATION GROWTH

Many studies now focus on analysing wild diets in order to provide more suitable diets for species whose only chance of avoiding extinction is often to be part of an *ex situ* breeding programme. Adaptations and evolution to a niche diet are often responsible for the success or failure of a captive species' breeding programme and the health status of rare populations in human care (Morrow *et al.*, 2018; Jayson *et al.*, 2018).

Living in a zoological institution does not mean an animal can try any less hard to attract a mate. In the wild it is often the brightest, most colourful bird or tomato frog that enjoys the most success with the opposite sex. Where we cannot provide an exact copy of the wild diet in captivity, supplementation of carotenoids and other pigment precursors is often necessary to ensure full colouration is possible and that a creature can catch the eye of the opposite sex to encourage breeding to take place.

For successful reproduction in human care, an animal's diet must meet the necessary energy requirements to ensure that each specimen can reach sexual maturity, maintain gestation and support lactation where necessary. The quality of the egg and/or sperm production is also critical for viable conception in the first instance, and then for the prevention of infant mortality. Birds and reptiles that lay eggs must have adequate nutrition to support the protective shell of the developing embryo, while nutrients such as zinc, selenium and vitamin E can support healthy sperm motility, concentration and ejaculate volume to increase the chances of successful fertilisation when a breeding event takes place.

Indeed, nutrition is key at every life stage. A large project currently being carried out by the Smithsonian National Zoo's Conservation Biology Institute in the US, is the Exotic Animal Milk Depository in which scientists are collecting milk samples from various exotic species to analyse nutritional composition in order to better replicate it when hand-rearing neonatal mammals that do not have access to parental milk.

FEEDING FOR SUCCESSFUL REINTRODUCTION PROGRAMMES

But of course, zoo nutrition is much more than just providing the correct dietary components; ask any keeper how long they spend on daily food preparation and feeding enrichment and it is likely that the hours soon add up. Providing meals in the same way in which the animals would receive them in the wild (think carcass-feeding for carnivores) or using some of the same attributes that are used when hunting, scavenging and foraging can make a zoo animal better prepared for life in the wild.

Conservation scientists involved in a North African ostrich (*Struthio camelus*) reintroduction programme realised the need for weaning ostriches into wild foraging behaviours when the human-bred ostriches they released from acclimatisation pens *in situ* did not widely disperse to forage independently, but instead returned to the team around meal times in expectation of food. The scientists took note, creating a strategy to try and reduce this behaviour in future (Petretto, 2017).

Calculus and periodontal disease are often more common in captive carnivores due to diet and presentation of food far removed from their natural menu (Kapoor *et al.*, 2016). The speed of tooth wear can also be increased in animals in human care if an inappropriate diet is provided, which may lay weaker foundations for an animal's long-term success back in the wild (Taylor *et al.*, 2016).

SUSTAINABLE ZOO NUTRITION

No mention of zoo nutrition and conservation would be complete without the mention of sustainability in food production, security and waste. Many zoos have already made the step to remove palm oil from their animal diets, as well as from their café and gift shop offerings. Marwell Wildlife hosted a two-day seminar on Sustainability in Zoo Nutrition in January 2018. Themes included palm oil and soya sustainability; the increase in invertebrate use in both human and animal food; the purchase of sustainably sourced fish approved by the Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC); the identification of onsite browse as a food source; and how to prevent food waste and overfeeding by monitoring and reducing dietary drift in zoo-based animal care.

THE FUTURE OF ZOO AND AQUARIUM NUTRITION

The future trends set to be big news in zoo animal nutrition include the ever-fascinating role of the gut microbiome and its underlying influence on seemingly everything in an animal's biology; the continuing search for sustainable ways of providing species with their natural diets all year round; reducing obesity and increasing activity in zoo animals; and, of course, increasing interest in zoo animal nutrition, communication of research, and demonstrating the value of nutrition training and specialists within zoos and aquariums. Sustainability in zoo animal nutrition is just as big an issue as it is in human nutrition, and continued research in this area, alongside that which supports captive animal care and health, is key in supporting *ex situ* population management, re-release and conservation programmes in zoos and aquariums.

The 11th European Zoo Nutrition Conference organised by the EAZA Nutrition Working Group will be held in 2021.

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Welcome to Plan Bee

TO PROMOTE THE VITAL IMPORTANCE OF BEES TO OUR ECOSYSTEMS, RIGA ZOO HAS CREATED AN ENGAGING AND INTRIGUING EXHIBIT THAT OFFERS A CLOSE-UP VIEW OF HOW BEES LIVE AND WORK

Ilona Roma, Section Head of Insectarium, and Alexander Napolov, Entomologist, Riga Zoo

The decline that pollinating insect populations have been suffering in recent years is an increasingly pressing global problem. As we know, pollination is a fundamental process within natural and anthropic ecosystems, which are largely guaranteed by pollinating insects. At Riga Zoo we wanted to focus our visitors' attention on the complicated and fascinating world of Hymenoptera living around us, demonstrating the connection of these insects with the plants and highlighting the importance of a global strategy for their conservation.

Taking this as our premise, the project 'Hymenoptera Around Us' was launched at Riga Zoo in 2010. It includes an exhibit of bumblebees (*Bombus terrestris*), flower beds with nectar plants, a bee hotel for solitary bees and the Days of Bumblebees, an educational activity for zoo visitors.

BEE EXHIBIT

The first step was the creation of the bumblebee exhibit. The exhibit is located at the zoo's Latvian Amphibian and Reptile Exhibit hall, near the north-facing window. It has a simple but functional and attractive design. A 20-litre cylindrical hollow is carved vertically out of a large pine stump, and this houses a bumblebee nest, covered by a thick piece of glass. Through this window visitors can observe life inside the nest. The careful queen, busy bumblebee workers, larvae, silk cocoons with pupae and honey pots are all clearly visible in the nest.

For this exhibit, we use artificially grown bumblebee nests that are sold for the pollination of plants in greenhouses. They come in plastic boxes with a transparent top. The nests

are connected to a tank full of syrup, the starting feed for the nest. The bumblebees leave the nest through a metre-long tunnel and search for nectar and pollen on the zoo grounds. To assist them, a garden of nectariferous plants was created on the lawn in front of the exit point of the bumblebee tunnel. Oregano, lavender, catnip, makleya and liatriss are the most favoured by bumblebees. The white background under the bees' exit tunnel makes it easy for visitors to see the bumblebees departing and returning with full pollen baskets.

One nest functions for about 40–50 days, then the colony disintegrates (the old queen and workers die, and new queens and males fly away), and then the nest has to be replaced. During the short Latvian summer season (May–September) we use two or three nests in the exhibit.

Educational information panels have been installed along the path to the exhibit, offering information on the biology of the bumblebees and interaction between insects and plants. The display includes interactive information panels in the form of flowers for children, with contents and language adapted to an accessible level, with information on bumblebee reproduction and development stages.

BUILDING THE BEE HOTEL

In the spring of 2013, the next stage of the project was implemented, which was the creation of a bee hotel.

The design of the structure was inspired by ancient Latvian symbolism.



The decoration in the central part of the roof represents Jumis, a Latvian pagan deity related to the harvest. The symbol of the sun that is related to fertility was used for the main structure. The 'rays' of the sun are filled with pieces of wood with drilled holes, as well as stems of hollow-stemmed plants such as *Phragmites sp.*, *Polygonum sachalinense*, *Artemisia sp.*, *Sambucus sp.* among others. The whole structure consists of about 2,500 single 'rooms', each large enough for a bee.

Solitary bees are particularly active from late April to June. During this period, on sunny days our visitors can enjoy the frenetic activity of a multitude of bees.

These bee species have a sting but are not aggressive and thus present no danger for the zoo visitors.

So far there has been no study of the species of bees that occupy the hotel. Judging by the size and type of the material used for closing the holes, there are at least five groups of single bees here. Parasitic wasps and flies have sometimes been observed as well.

BUMBLEBEE DAYS

In 2013, we launched a new part of our project, called Bumblebee Days. On the second week of June each year we hold educational workshops dedicated to Hymenoptera and the importance of pollinators. During these Bumblebee Days, the space between the bumblebee exhibit and the bee hotel welcomes children and adults interested in the fascinating world of bumblebees.

The activities include lectures and presentations for an adult public as well as a 'workshop for a researcher of bumblebees and other buzzing creatures' for the youngest visitors, where they can learn about social bees, bumblebees and wasps. Through crossword puzzles, painting workshops and insect observation under a microscope, children and adults can get closer to the delicate world of industrious insects that surrounds us, and can better understand how the bee plays a vital role in the ecosystems of the world.



Kamenes un ziedi

Kamenes mutes divdabija

Kamenes mute pielāgota gan nektāra, gan ziedputekņu vākšanai.



Augšzobītis – divas biezas plātnītes ar zāģzobainu malu – kalpo cietu ziedputekņu vākšanai un smalcināšanai.

Putekļus vāc grozīpus uz pakalējām kājām. Putekļi ir olbaltumvielu avots, savukārt nektārs tiek pārstrādāts medū, kas satur ogļhidrātus.



Apakšzobītis ir stingri izstiepts. Garš, lokāns un elastīgās mēlītes galu kāj smalki matiņi, kas palīdz uzsūkt nektāru.



Kamenes ir spēcīgas, aukstumizturīgas un čaklas augu apputeksnētājas

Savvājā un augu kultūras kameneņi ir liela nozīme tauriņsiedu, lūpstiežu, skarblapju dzimtu augu apputeksnēšanā. Kamenes spēj lektot un aizsniegt nektāru dziļi ziedos ar saaugulām vainaglapām.

Kamenes ir aktīvas no agrā pavasara līdz pat vēlam rudenim. Ari darba diena ir garāka nekā citām bitēm. Izlido agri pirms saullēkta un atgriežas pēc saulrieta. Apmeklē ziedus arī sliktos laika apstākļos, kad apmācies, vējains vai drēgns. Kamenes spēj sevi sildīt, darbinot krūšu muskulus.

Barības meklējumos dienā lido līdz 18 stundām, apciemojot līdz 1000 ziedu.

Nektāra laupīšana

Kamenes piekopi arī „nektāra laupīšanu”. Ja nektārs ziedā atrodas ļoti dziļi, kamene pārdūr ziedu pie pamatnes un izlaiza nektāru.



Kameņu mēlītes garums

Kamenes mēlīte ir garāka nekā citām bitēm, tāpēc tās spēj aizsniegt nektāru ziedos ar dziļiem vainagiem.

Dažādām kameņu sugām ir dažāda garuma mēlītes. Tas nosaka izvēli, no kuriem ziediem levākt nektāru.



While you were sleeping...

UNDERSTANDING THE SLEEPING HABITS OF THE ANIMALS IN OUR CARE IS ESSENTIAL IF WE ARE TO MEET THEIR WELFARE NEEDS AND ENSURE THAT THEY LIVE HEALTHY AND STRESS-FREE LIVES

Brendan Walsh, Dublin Zoo; Sally Binding, EAZA Animal Welfare Coordinator; and Dr Lisa Holmes, Chester Zoo

'I feel so much better after a good night's sleep!' We've all been there, enjoying the benefits of undisturbed sleep. The question is, are we providing good-quality sleep opportunities for the animals in our care? Zoos have an obligation to provide animals with the highest possible level of welfare, satisfying both their physical and psychological needs. Modern zoos should provide zoo animals with opportunities to have control over their environment and be able to make choices that improve their own welfare – and this should include accommodating appropriate sleep patterns and the provision of an appropriate sleep environment. However, the importance of sleep is not always a primary consideration as we try to optimise the welfare of animals in our care. As zoo professionals, how many of us have full knowledge of the sleep patterns of the animals in our care and their sleep needs, including bout length, frequency, total amount and distribution of sleep across the 24-hour period? And are we providing the opportunity for the animals to meet their sleep needs for positive welfare?

Between species there can be marked differences in sleep duration and quality, due to evolutionary adaptations to environmental conditions (Samson & Shumaker, 2015). In general, mammal sleep duration is linked to their feeding habits. The daily need for sleep is highest in carnivores, lower in omnivores, with herbivores sleeping the least (Siegel, 2005). Sleep is an important aspect of life, and a lack of it can pose both acute and chronic health limitations to animals and humans alike (Bryant *et al.*, 2004; Hillman *et al.*, 2018). Life events can negatively impact on sleep, particularly when it involves infants (as many parents will testify!), but it's not just the parents that can be affected. Most newborn mammals and chicks need to achieve a high proportion of REM sleep for development of the brain,

particularly noted for altricial species such as rats and cats (Siegel, 2005). Sleep deprivation in humans can lead to confusion, disorientation and exhaustion, and if sleep deprivation becomes chronic, immunosuppression (Dinges *et al.*, 1997). For example, during early-stage infection, sleep deprivation can result in prolonged illness and increased mortality rates, in comparison to individuals with appropriate sleep levels (Cheeta *et al.*, 1997; Siegel, 2005; Toth, 1995). In non-human animals, chronic poor quality sleep, and an inappropriate quantity, has long been shown to impact negatively on welfare. For example, as far back as the 1970s, the negative impact of poor sleep on animals' wellbeing was being studied, including reduced ability to thermoregulate (Schmeidek *et al.*, 1972) and a decrease in normal social behaviours during maturation (Watson and Henry, 1977). Conversely, animals' sleep patterns could be used as a non-invasive measure of welfare. It has long been identified that hypothalamic-pituitary-adrenal (HPA) axis hyperactivity (associated with chronic stress) reduces sleep quality and quantity (Bradbury *et al.*, 1998). In a study of rats' sleep, Abou-Ismael *et al.* (2007), found that low frequencies of sleep and low sleep duration correlated with some indicators of elevated physiological and physical stress, such as adrenal weight and bodyweight gain; and chronic psychological stress (for example, subordination) has been found to reduce the quantity of sleep in humans (Hurst *et al.*, 1999).

Arguably, nocturnal animals suffer the greatest sleep disturbance within zoos. Where reversed light cycles are used to increase opportunities for visitors to see the animals, there should be appropriate areas for the animals to sleep during the light phase, but also deterrents in place to prevent visitors from disrupting the animals with bright lights from cameras or mobile

phones. If reversed lighting is not used, then it is important to ensure the animals can get the rest they need with minimal disruption from the visiting public. Similarly, provision should be made for species that go into torpor or hibernation when environmental conditions change.

Creating an appropriate sleeping environment has a number of aspects, and amongst the most important are:

- a suitable sleeping surface, for example, deep sand for elephants (Williams *et al.*, 2015);
- suitable noise levels for the species, taking into account hearing ranges outside human limits, such as infrasound (Orban *et al.*, 2017);
- light provision of both natural and artificial sources – for example, the importance of natural light to maintain health circadian rhythms and avoidance of artificial light overnight (Raap *et al.*, 2015; Samson *et al.*, 2017).

Therefore, whilst we cannot make the assumption that animals' sleep patterns in the wild are the same as their requirement in captivity (due to unknown impact of lack of predators, readily available food etc.), providing a similar environment and opportunity for good-quality sleep for animals in human care, which mimics that of their wild behaviours, is a reasonable approach to take in promoting positive welfare.

Welfare is a wavering state; it is impossible to keep welfare at a constant 'high' or 'positive' level. The lows in life such as death, conflict and some other variables are unavoidable. As zoo professionals, we can only aim to maximise the 'highs'. Our attitude and actions can and do make a difference. By considering animals' full life rhythms across a 24-hour period, seasonally and during changing life stages, and designing habitats and husbandry with this in mind, we can greatly improve animal welfare in our zoos and aquariums.

STUDYING SLEEP: ELEPHANTS, DUBLIN ZOO

It is thought that elephants sleep for four hours on average over a 24-hour period, most of which occurs at night (Ganswindt and Munscher, 2007) and in social groups, but we know little about wild sleeping conditions such as body positioning, nocturnal social interactions and sleep time periods. These unanswered questions led me to start a long-term study regarding the sleep behaviour of the elephants at Dublin Zoo. Our starting question was: How long do the elephants sleep each night?

The Dublin Zoo herd comprises one adult bull, two bull calves, three adult cows, one sub-adult cow and one cow calf. The two elephant houses (one for the adult bull and one for all others) have sand substrate at a depth of 1.8m which provides a comfortable sleeping surface for their large frames, and allows urine and water to drain away, creating a drier and fresher home. The elephants also have access to the outdoor paddock area both day and night. As it is believed that elephants can only experience deep sleep if they are lying down, sand mounds of 2m are created daily to enable individuals to easily lie down and return to a standing position after sleep, particularly for pregnant cows.

Over 700 nights of CCTV footage was reviewed, and the average sleep duration for the herd was found to be 4 hours and 16 minutes, similar to that recorded in the wild. The five adults generally slept (mean 3hr 37min) for less time than the three calves (mean 5hr 8min). There was a significant negative relationship between age and mean sleep duration ($R^{-2} = 0.89$, $p < 0.05$). Juvenile mammals typically sleep for longer with prolonged REM sleep periods to aid brain development (Siegel 2005; Ferber 1985).

The birth of a calf was also found to influence sleep. A bull calf and cow calf did not lie down on the first night immediately after their births and slept very little on the second night. This may have been a natural instinct to reduce risk of predation. On the third night they were surrounded by the entire herd as they lay down to sleep, as if forming a protective circle; it would appear that their protective instinct remains



very strong in a zoo environment. The sleep of all adult cows also reduced in the days after a calf was born. This co-operative herd behaviour is typical of wild elephants as allo-mothering behaviour is a driving and central component of elephant society (Schulte, 2000). Suckling is also a likely factor in the low quantities of sleep, as it took all calves and mothers time to establish successful feeding regimes. Even as the calves got older, at least one elephant stood over the calves as they slept for approximately 90 per cent of the observed sleep periods, particularly the matriarch and her daughter.

It is also important to note that the herd consistently opted to sleep on the sand substrate, rather than concrete; supporting previous studies (Williams *et al.*, 2015) and application of evidence-based zoo animal welfare.

To truly promote positive welfare, we should strive to cater for our animals' sleep needs. I thought I knew our herd's behaviour prior to our study, but some interactions were only observed at night, such as guarding behaviour or interactions between specific individuals. This study delivered new information and gave me a great appreciation for the 24-hour needs of our animals, not just when visitors and staff are present.

Adapted from Walsh, B. (2017). Sleep in Asian elephants (*Elephas maximus*): long-term quantitative research at Dublin Zoo. *Journal of Zoo and Aquarium Research* 5(2), 82-85.

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EAZA Council 2019-2022

A NEW EAZA COUNCIL WAS CONVENED AT DIRECTORS' DAYS IN JERSEY IN APRIL. YOUR REPRESENTATIVES FOR THE PERIOD 2019-2022 ARE LISTED BELOW

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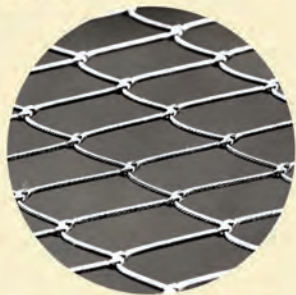
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