

QUARTERLY PUBLICATION OF THE EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

ZOOQUARIA

SUMMER 2012

ISSUE 78

DEER SPECIAL

The great debate
IS EDUCATION THE PRIMARY
ROLE OF ZOOS?

In the right PLACES
WHY ZOOS SHOULD JOIN
THIS NEW SCHEME

Feed back
AN UPDATE ON EAZA'S
NUTRITION CONFERENCE



Of stags and TAGS

THE NEEDS OF DEER, INSIDE ZOOS AND OUT

Incredible journeys

A NEW EXHIBIT FOCUSING ON MIGRATORY SEA TURTLES



TRIUMPH GATE LTD.



FORENINGEN ZOO
DYREFOND



LOS ANGELES ZOO
RED APES OF THE RAIN FOREST



OKLAHOMA CITY ZOO
CAT FOREST EXHIBIT

Contents

12



- 4 Director's welcome**
- 5 Announcements**
- 6 Births and hatchings**
- 8 Opinion**
Why zoos should consider joining the new PLACES scheme
- 10 Breeding focus**
We need to think more about the types of deer we keep in zoos
- 12 Photo story**
Why many deer species are in critical need of conservation
- 16 Endangered animals**
The many threats facing the deer of Asia
- 22 Aquariums**
Portugal's new sea turtle exhibit
- 24 Debate**
Is education the most important function of a modern zoo?
- 27 Events**
Health and safety in Romania, plus feedback on the latest zoo nutrition conference
- 30 The last word**
The distorted view of zoos as shown by the media must change, says zooboy27

Deer friends

Here is a question for you – what is your favourite animal at the zoo? An elephant? A tiger? Rhino, chimp, parrot, eagle, python? No deer?

How many times have you, as a zoo director, asked your curators to design a new deer exhibit? How many times have you, the curators, lobbied for one? I see some hands raised back there, but not too many. Hey, I'm talking in broad terms here – not only 'real' deer (*Cervidae*), but also chevrotains (mouse-deer; *Tragulidae*) and musk-deer (*Moschidae*). Groups that include species from as small as 2kg to as large as 600-700kg; tropical, temperate or Arctic species; with or without antlers; grey, black, brown or reddish and with or without spots. I still don't see a lot of hands being raised.

Well, I hate to break the news to you, but deer are threatened as well. We are in the first year of EAZA's Southeast Asia Campaign and I am sure that one of the least known facts is that deer are actually one of the most threatened groups (if not the most threatened group) in this region. For example, out of 10 true deer species (tribe *Cervini*) one species is Extinct in the Wild, another one is Critically Endangered, four are Endangered, three are Vulnerable, and one species (sika deer *Cervus nippon*) is Least Concern – but the Southeast Asian sub-species is Extinct in the Wild. And it's not only Southeast Asia – there are 34 threatened deer species around the globe, 13 more with deficient data about their status, and two more that are Near Threatened.

But all is not lost – zoos have been playing a major role in preventing several species from going extinct and are now joining forces with institutions and organisations in the countries of origin. And the EAZA Deer TAG is trying to keep pace with these initiatives, and has published a revised Regional Collection Plan (RCP), is creating new – or upgrading existing – breeding programmes, and is launching an all out campaign to make you all our Deer Friends!

Noam Werner, Chair, EAZA Deer TAG

Zooquaria

EDITORIAL BOARD:

Executive Director Lesley Dickie (lesley.dickie@eaza.net)
Managing Editor Michael Sullivan (michael.sullivan@eaza.net)
Editor Malcolm Tait (malcolm.tait@eaza.net)
Editorial Staff Danny de Man
Designer Louise Tait
Zooquaria is the quarterly magazine of the European Association of Zoos and Aquaria (EAZA).



EAZA Executive Office, PO Box 20164, 1000 HD Amsterdam, The Netherlands.
 Email: info@eaza.net ISSN 2210-3392

Cover image: Reeve's / Chinese Muntjac (*Muntiacus reevesi*) buck © David Kjaer.
 For information on print subscriptions to *Zooquaria* visit: <http://tinyurl.com/zooquaria>.

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

Printed using vegetable inks on paper containing 50% recycled waste and 50% sustainably sourced virgin fibre; bleached using an Elemental Chlorine Free process.

Printed by Offset Print BV. www.offset.nl



From the Director's Chair

In late February I travelled to Abu Dhabi at the invitation of the Chair of the IUCN Species Survival Commission (SSC), Dr Simon Stuart, to take part in the second ever meeting of the SSC Specialist Group Chairs. The Specialist Group chairs were also joined by representatives of the Red List authorities and other IUCN colleagues. This was an exciting opportunity to meet more colleagues across the many and varied specialist groups and to find out about their work. Several other colleagues from the world of zoos were in attendance, indicating our contribution to conservation of biodiversity and that zoos are very much part of the serious conservation community.

There was a particular opportunity to talk about the role of *ex situ* facilities in assisting conservation both *ex situ* and *in situ*. The programme devoted a plenary and workshop session entitled *Building partnerships between the ex situ and in situ communities* in which the whole meeting took part. This session was based upon the discussion document prepared by EAZA and the office of Simon Stuart with a particular focus on bringing together EAZA TAGs and Specialist Groups on areas of mutual interest and possible cooperation (this is available from the EAZA Executive Office). Presentations were given by me on behalf of EAZA, Gerald Dick on behalf of WAZA and Sara Oldfield on behalf of Botanic Gardens Conservation International. After these initial 'setting the scene' presentations the large group then split into smaller groups for more detailed discussion.

Outside the actual sessions I had the opportunity to speak to a number of Specialist Group chairs in more detail about potential collaborations. One such fruitful discussion took place with the Galliformes Specialist Group. They have many actions they wish to undertake but are finding that they would be able to achieve much more with some additional help. There is currently an urgent need to develop a prioritised global list of outline projects requiring status surveys, research on species biology and threat impacts, conservation action and monitoring. In addition a further task lies in promoting projects to members (and others) who are in a position to prepare fuller proposals for the work required, for endorsement by the Galliformes Specialist Group (via a peer-review and capacity-building process). Assistance may then be required with making funding applications, and later with project monitoring, data analysis and reporting, according to the experience of the project leader.

We talked through many options and the group are hoping that there may be EAZA member institutions who would be able to devote some staff time to provide a 'Programme

Officer'. If one EAZA collection could offer a staff member for one day a week to act as a Programme Officer to the Galliformes SG or two EAZA Collections offer half a day per week of staff time to achieve the above identified aims, this would be a huge contribution to the work of the group and galliformes conservation.

Other opportunities being investigated are the possibility of EAZA collections giving assistance to freshwater plant conservation in aquatic exhibits and providing education expertise to varied projects. We will ensure that members are kept up to date.

This edition of *Zooquaria* is devoted to the world of deer. Whilst in Abu Dhabi I had the pleasure of meeting Bill McShea, Chair of the Deer Specialist Group, who enthusiastically committed to contributing an article to this special issue. You will also notice there is no separate Southeast Asia Campaign article. This is because so many of the articles featured in this special issue highlight the need for extensive conservation efforts in Southeast Asia. You will however notice the page devoted to merchandise available to support the campaign. Please make sure that this information is highlighted to your retail staff. The autumn issue of *Zooquaria* will continue the series on the Southeast Asia Campaign projects.

This issue has also been published just after the Directors Days meeting generously hosted by Munich Zoo, where nearly 100 EAZA directors came together to discuss the 2013-16 strategic plan. Our relationships with conservation bodies such as the IUCN formed part of the discussion and we look forward to even stronger relationships in the future.

I wish all EAZA members a productive and successful summer.

Dr Lesley Dickie
Executive Director, EAZA

NOTICEBOARD

AFDPZ FOR SUMATRA

LAST YEAR, MEMBERS OF THE FRENCH zoo association AFdPZ were informed by the Indonesian gibbon protection programme Kalaweit that funding was urgently needed to buy 86 hectares of primary forest in Sumatra that was destined to be sold to a palm oil company, writes *Luc Lorca, AFdPZ*. This forest in the Solok Province is known to be home to gibbons, Malayan tapirs, sun bears and even Sumatran tigers.

The response of French zoos was massive, and more than 70,000 euros were collected by members together with the AFdPZ, making the new Supayang Reserve possible. In total 20 members of the AFdPZ participated in fundraising, among which 15 are also members of EAZA.

This story is highly symbolic and shows how zoos can quickly and effectively respond to an immediate conservation need. Moreover, this sends a strong message to Indonesian landowners:



forested property can be sold for conservation instead of destruction. By helping Kalaweit, AFdPZ zoos have already started participating in the EAZA Southeast Asia Campaign in a most unexpected and effective way. For more information visit: www.kalaweit.org or www.afdpz.org.

PARTICIPATING INSTITUTIONS

EAZA Members: AFdPZ, Amnéville, Asson, CERZA, Clères, Jurques, La Barben, La Boissière, La Bourbansais, La Flèche, La Londe, La Palmyre, Le Pal, Touroparc, Trègomeur, St Martin la Plaine. Non-EAZA Members: Gramat, La Ferme aux crocodiles, Planète Sauvage, Parc du Reynou. Sanary.



ZÜRICH'S AMPHIBIAN LEAP-DAY

ON 29 FEBRUARY ZOO ZÜRICH TOOK PART IN International Leap-Day, writes *Dr Samuel Furrer, Curator, Zoo Zürich, Switzerland*. The aim of this event, initiated by Amphibian Ark, was to promote amphibians, and the conservation success stories achieved so far.

At Zoo Zürich, the programme included guided tours through the amphibian exhibition as well as behind-the-scenes visits. An info desk offered specific information on native amphibian fauna. There were feeding sessions with the keepers in the terrarium and aquarium. And for young visitors, a fairy tale corner was opened and well used. Visitors attending the events were very interested and eager to hear about amphibian biology as well as the news on conservation activities and success.

LEFT: FEEDING SESSION WITH THE KEEPER IN THE TERRARIUM (SF)

RIGHT: FAIRY TALE CORNER FOR THE YOUNG AUDIENCE (SF)

EAZA'S CORPORATE MEMBERS
and where to find them

AB Aqua Medic GmbH	(www.aqua-medic.de)
Base Structures Ltd	(www.basestructures.com)
Billings Productions	(www.billingsproductions.com)
Brogaarden	(www.brogaarden.eu)
CelsiusPro AG	(www.celsiuspro.com)
Doublecheck Oy	(www.doublezoo.com)
Dowman Soft Touch	(www.dowman.com)
EKIPA	(www.ekipa.nl)
Fachjan Project Plants	(www.fachjan.nl)
HMJ Design	(www.hmj-design.dk)
IGUANA Animals Design	(www.animalsdesign.pl)
Instituto Bioclon	(www.bioclon.com.mx)
Jardine Lloyd Thompson Leisure	(www.jltgroup.com)
Kiezebrink International	(www.kiezebrink.eu)
Mazuri Zoo Foods	(www.mazuri.eu)
Pangea Rocks	(www.pangea.dk)
Ralf Nature	(www.ralfnature.com)
Rasbach Architekten	(www.rasbacharchitekten.de)
Ravensden Plc	(www.ravensden.co.uk)
St. Laurent	(www.st-laurent.fr)
Triumph Gate Ltd	(www.triumphgate.org)
TVK ZooDesign	(www.tvkzoodesign.nl)
Zoolife s.l	(www.zoologicaladviser.com)
ZOOPROFIS	(www.zooprofis.de)
ZooTrend	(www.zootrend.com)



JOURNAL OF ZOO AND AQUARIUM RESEARCH

The EAZA Research Committee is proud to announce that the Journal of Zoo and Aquarium Research (JZAR) is now open for submissions. JZAR will provide a forum for rapid publication of novel, peer-reviewed research papers, reviews, technical reports and evidence-based case studies. JZAR will be officially launched in summer 2012 as an open access online journal.

Through their living collections, zoos and aquariums are uniquely placed to contribute to conservation-related research. Research categories covered by JZAR will include studies in pure and applied biological sciences, *in situ* conservation research and research aimed at developing other roles of zoos and aquariums.

If you wish to submit a paper to JZAR, visit the holding page at www.jzar.org and find more information about the aims and scope of JZAR as well as the interim submission guidelines. The full website will be live by September 2012. On the holding page you will also find a list of example papers that are eligible for publication in JZAR. More information will follow soon. If you submit your paper now, it could be published as early as Autumn 2012.

NOTICEBOARD



FROM LEFT TO RIGHT: FIRST EGGS 29 08 2011; HATCHING; FIRST OFFSPRING IN PLOCK ZOO

BREEDING BEADED LIZARDS

IT WAS BACK IN JUNE 2007 that Plock Zoo received 10 young specimens of beaded lizards (*Heloderma horridum exasperatum*) from Zurich, writes Aleksander Niwelinski, Plock Zoo. The animals, born at Zurich in November 2005, were in perfect condition and have been developing very well.

Four years after their arrival, they were first observed mating in June 2011, and on 29 August a female laid ten eggs in a terrarium. The eggs were placed in an incubator at a temperature of 26°C

and 90% humidity, and hatched between 15 and 22 March this year after an incubation period of 206 days. Four eggs decayed during incubation, but in total six young hatched. One young got stuck to the egg shell as the yolk sac dried off during hatching which can last several days. The yolk sac was cut off and the animal was released. The weight of the young ones at birth was consecutively 26g, 25g, 28g, 31g, 30g and 30g. On 26 March all the young ones ate pinkies – one piece for each lizard.



OKAPI SUCCESS

OKAPIS HAVE BEEN HOUSED IN STUTTGART ZOO since 1981, and today there are three breeding females, two breeding bulls and two sub-adults. The latest offspring, a male named Obasi, was born in December 2011. His mother, Ibina, was born in 2001 at Berlin Zoo, and Obasi is her fourth offspring. His father Xano was born in 1996 at Antwerp Zoo.

In May 2011, another female, Epena, gave birth to a male calf called Kivu. Epena was born in 1998 in Frankfurt Zoo. Kivu's father Vitu was born in Basel Zoo. Kivu is also Epena's fourth calf.

Stuttgart Zoo started breeding this species in 1989. Since then 11 calves have been born, of which nine have survived. In the early years, okapi breeding was anything but successful. The first breeding female, Jindi, came here in 1984, and several stillbirths occurred with only one calf surviving, a female called Stina. The tide turned in 2000 due to a completely new approach, thanks to the enlargement of all inside and outside enclosures, and two new bulls and a new breeding female (Epena from Frankfurt zoo, Stina's daughter). In 2003 the second female, Ibina, from Zoo Berlin joined the group, followed by Kabinda from Rotterdam, who came here in 2004.

Over 50 Okapis are kept in European zoos. Besides the small number of individuals, the population is suffering from a small growth rate and also from a reduced longevity of the animals. So every Okapi is most welcome to this EEP. Hopefully, our third female Kabinda will give birth this summer to a healthy (preferably female!) calf.

SHARK SURPRISE

ON THE MORNING OF 11 FEBRUARY the aquarium keeper at Zoo Emmen saw two baby blacktip reef sharks (*Carcharhinus melanopterus*) swimming in the shark basin, writes Wjibren Landman, Biologist, Zoo Emmen. This was a great surprise, because no matings had been seen, nor did the female show any bite wounds resulting from mating. The keeper quickly put the two young sharks in a separate tank – because the parents seemed to view their offspring as food! Although these sharks are very sensitive to stress, the 30cm baby sharks show no ill effects after being transferred. They are making healthy progress and continue to eat small portions of fish each day.

Within two weeks of the birth, the parents were seen mating. The adults have lived in Emmen Zoo for more than 10 years, but this was the first time this had been seen by the keeper. During mating, the male inserts one of his claspers into the female's cloaca for an internal fertilization. After a gestation period of 8–11 months the young of this viviparous shark are born. Although such a birth in captivity is extremely rare, we are hopeful that the sharks will surprise us again next year.



BABY BOOM BLOSSOMS AT BELFAST

BELFAST ZOO'S RECENT BABY BOOM has continued this spring with the births of Marjorie the Malayan tapir, Blossom the blesbok calf and Eastern bongos Bo and Bert.

Marjorie was born on Saturday 4 March to mother, Gladys and father, Elmer. Gladys came to Belfast Zoo from Toronto Zoo, in 1994 and was soon joined by Elmer, who moved from Mulhouse Zoo in France, in 1995. The French language definitely seems to have proven itself as the 'language of love' with Elmer and Gladys as they are one of the most successful breeding pairs of Malayan tapir in Europe and have welcomed 11 babies since their arrival in Belfast!

Eastern Bongos are Critically Endangered, with the Bongo Surveillance Programme estimating that there could be as few as 75 to 140 individuals left in the wild. Belfast Zoo first became home to Eastern bongo in 1994 and has since established one of the most successful breeding herds in the UK. Since 2005 over 22 calves have been welcomed, including 5 males and 17 females. Bo was born on 24 February, to mother, Fern and Bert was born on 14 March, to mother, Willa. Resident male, Embu, is father to both calves.

Blossom is the first calf of blesbok pair Daphne and Basel. Basel arrived in Belfast in 2009 from Africa 'Alive', Suffolk, and was shortly joined by Daphne. The zoo team are all delighted to be playing an active role in the conservation of this beautiful species which has been brought back from the brink of extinction by conservation efforts. Belfast only became home to blesbok in 2009 and this is the first time that a blesbok has been bred in Ireland.



CLOCKWISE FROM LEFT: MARJORIE THE MALAYAN TAPIR; BO THE EASTERN BONGO; BLOSSOM THE BLESBOK CALF



GIANT OTTER BIRTH AT DUISBURG



ZOO DUISBURG IS RENOWNED AS A ZOOLOGICAL INSTITUTION where several mammal species are kept that visitors rarely see under human care. The first ambassador of the charismatic Giant otter (*Pteronura brasiliensis*) entered the collection in 1975, but there has been no breeding success.

Yet good things come to those who wait... or in this case, try hard. After significant renovation of the existing facility and the arrival of a young pair in 2008 at Zoo Duisburg, the time came for a breakthrough. Obviously, the 1-year-old Hamburg male and the 2.5-year-old female from Dortmund greatly enjoyed the large outdoor pool, additional land area covered with enriching vegetation as well as a naturalistic indoor exhibit with several adjacent stables and nest boxes, as at the end of 2009 the first ever offspring of a giant otter at Zoo Duisburg saw the light of day. Only a few zoos in the world manage to breed the species.

In January 2012, another three cubs were born (two did not survive). To this date, the pair has produced six litters, and of a total of 15 young they successfully reared no fewer than six! During special events such as delivery family members were never separated, and it is interesting to see older siblings highly motivated in taking care of the young.

The contribution to the breeding programme (EEP) has become significant. Currently, 3.3.1 Giant otters live at Zoo Duisburg. Being active during the day, thereby highly agile and playful, visitors regard them as a true highlight in the park. It is under such conditions that visitors can easily be sensitized to the utmost need of nature conservation and wildlife protection.

The world's largest otter species with a total length of up to 2m and a body weight of nearly 30 kg is found only in the rainforests and wetlands of South America, living in large rivers, lakes, and swamps. Habitat loss, over-fishing, river pollution and poaching represent the main threats. The species has declined dramatically in distribution. The total population is down to probably less than 3,000 individuals, making the species highly vulnerable to extinction.

Time to go PLACES

A NEW EUROPEAN INITIATIVE IS ENCOURAGING ORGANISATIONS, SUCH AS ZOOS AND AQUARIUMS, TO BECOME MORE INVOLVED IN DEVELOPING THE CONNECTIONS BETWEEN SCIENCE AND SOCIETY

Antonio Gomes da Costa, PLACES Coordinator of Ecsite, the European network of science centres and museums

A new community is coming together in Europe. It's composed of science communicators, policy-makers and regional actors in research and innovation who want to make the most of the relationship between science and society. This is the Platform for Local Authorities and Communicators Engaged in Science (PLACES).

EAZA is a member of the PLACES Stakeholders Assembly which operates at the European level to provide expert insight and analysis on project outputs. The Assembly is an external and specialised voice in PLACES composed of NGOs, journalists, universities, research centres, and others.

PLACES began with 67 founding City Partnerships who have the same goal – to develop long-term science communication policies. PLACES takes the unconventional approach of being a science communication policies project rather than an activities project. Participating science communication institutions form alliances with local policymakers. Add to this relationship any number of NGOs and businesses and a City Partnership is born.

The City Partnerships are mandated to develop a Local Action Plan (LAP) for science communication policy addressing a science and technology-related issue relevant to their city or region. LAPs must be developed in consultation with citizens and have enough strategic vision to influence science communication policy at the local level for the next five to ten years. Topics for LAPs are already emerging from cities in the project, spanning themes of ecology, innovation, young people and the school system, health, mobility, tourism, water, chemistry, urban planning, and social inclusion.

Now the word is spreading and more cities are climbing aboard the PLACES train to take advantage of fantastic networking opportunities, wide visibility, dissemination instruments, databases, resources and the chance to be part of a forward-thinking community.

Zoos and aquariums are prominent features of a city and are integral to its tourist offerings – they can surely unite citizens, scientists and local policymakers under the banner of wildlife preservation. They can also join forces with like-minded NGOs. As EAZA members will know, zoos and aquariums are bringing countless social awareness initiatives to the table that can fit into the scheme of PLACES. The core mission of EAZA, after all, is to bring European zoos and aquariums together to further education, research and conservation. Why not join forces with the PLACES community and aim for science communication policies on the issues that matter to zoos and aquariums? As is increasingly the case with science centres and museums, zoos and aquariums are enlightening their visitors about social responsibility.

BRINGING PEOPLE TOGETHER

Science communication policies should involve all relevant public and private actors – and citizens in general – in a spirit of co-creation and co-ownership with involvement and investment. Science communication should broaden its horizons from aiming for public understanding of science to a more active public engagement in science and technology.

In times of economic hardship, investment in science might seem a luxury to many. Policy choices must be justified. This opens up a wider discussion of how to measure the benefits of investments in science communication activities whether they are science

centres, science festivals or wider inward investment strategies using science as a competitive advantage for a city or region. EAZA member institutions are invaluable to the identities and economic vitality of their host cities – this puts zoos and aquariums in an excellent position to work at the local policy level.

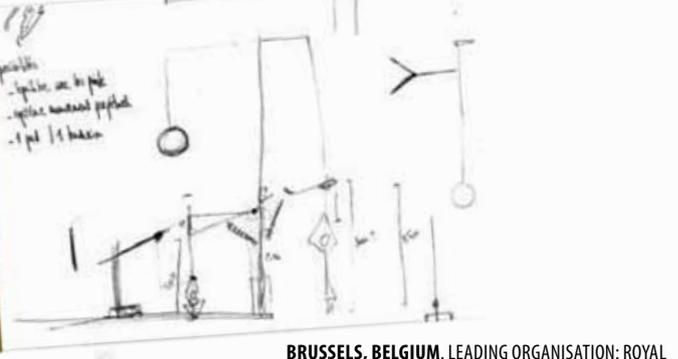
Science communication should combine long-term science perspectives with short-term political priorities. Politicians are driven by short-term goals in democratic systems which are often limited to five-year terms. The political dimension is important, though, because successful science communication policies are often driven by strong local and regional leaders who have a specific interest in science. Once out of power, however, their legacy may be less acceptable to incoming political parties. The bottom line is that strong science communication strategies require both long term legitimacy and consensus across party lines. The institutions that can reinforce this legitimacy are the ones who reach people in a truly memorable and human way – science centres, museums, zoos and aquariums.

Any science communication institution can become a PLACES participant, and as of April 2012, institutions from over 70 European cities have become involved in the project. Cities from outside Europe are also participating. Although each City Partnership focuses on its local city or region, the participating institutions can share ideas and information with each other via the Open PLACES website (www.openplaces.eu).

GETTING INVOLVED How can you get involved in this vibrant project?

Contact me directly at agomesdacosta@ecsitemuseum.eu and outline your interest.

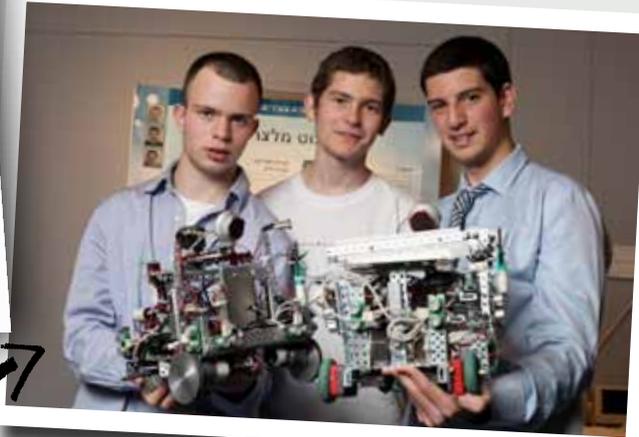
We can discuss possibilities that are relevant to your city and begin outlining possible Local Action Plans. As a project participant, you will have access to many networking opportunities including workshops, annual conferences and the online PLACES OPEN platform. You will also enjoy the invaluable – and free! – dissemination opportunities inherent to a large-scale European project. PLACES is presently reaching out to other EU-level projects and initiatives that can help our project broaden its reach. If you want to create a linkage with PLACES, please get in touch. I also hope to welcome you to Tartu, Estonia, for the second PLACES Conference in October 2012.



BRUSSELS, BELGIUM. LEADING ORGANISATION: ROYAL BELGIAN INSTITUTE OF NATURAL SCIENCES (RBINS). MODELS OF WATER PUMPS CREATED BY BRUSSELS CITIZENS TO RETRIEVE WATER FROM A COVERED RIVER IN THE CITY. THE BRUSSELS CITY PARTNERSHIP IS COMPOSED ASSOCIATIONS OF CITIZENS WORKING WITH THE SUPPORT OF LOCAL AUTHORITIES WHO HAVE THE COMMON GOAL OF IMPROVING WATER MANAGEMENT FOR A BETTER AND MORE SUSTAINABLE CITY. THE RBINS BRINGS ITS EXPERTISE ON BIODIVERSITY TO SUPPORT ACTIONS THROUGH EVENTS AND BY GIVING MORE VISIBILITY TO WATER-RELATED MATTERS. PHOTO COPYRIGHT: ROYAL BELGIAN INSTITUTE OF NATURAL SCIENCES



LISBON, PORTUGAL. WHERE RICH HISTORY AND CULTURE MEET SCIENCE: THE MONASTERY OF JERÓNIMOS IS ONE OF THE MASTERPIECES OF PORTUGUESE ARCHITECTURE FROM THE 16TH CENTURY. ITS WALLS WERE BUILT WITH A RARE STONE CALLED LIOZ LIMESTONE WHOSE TEXTURE REVEALS ABUNDANT FOSSILS FORMED APPROXIMATELY 97 MILLION YEARS AGO. LISBON HAS THE POTENTIAL TO PROMOTE SCIENTIFIC TOURISM UNDER A WIDE VARIETY OF THEMES. THE PAVILION OF KNOWLEDGE – CIÊNCIA VIVA DEVELOPED A COLLECTION OF GUIDES WITH THE AIM OF SHOWING HOW HISTORY AND SCIENCE ARE INTERTWINED IN THE CITY. THE COLLECTION, ENTITLED 'IN LISBON, DISCOVERING SCIENCE AND TECHNOLOGY' COMPRISES FIVE GUIDES, EACH PRESENTING A DISTINCT SCIENTIFIC PERSPECTIVE OF LISBON. DESIGNED AS SELF-GUIDED ROUTES FOR TOURISTS, THEY ARE THE PERFECT TOOL AROUND WHICH TO DEVELOP A LOCAL ACTION PLAN AIMED AT PROMOTING SCIENTIFIC TOURISM IN THE CITY. THE LAP WILL BE A JOINT EFFORT OF AGÊNCIA CIÊNCIA VIVA AND THE MUNICIPALITY OF LISBON. PHOTOGRAPH BY DANIEL ESPÍRITO SANTO.



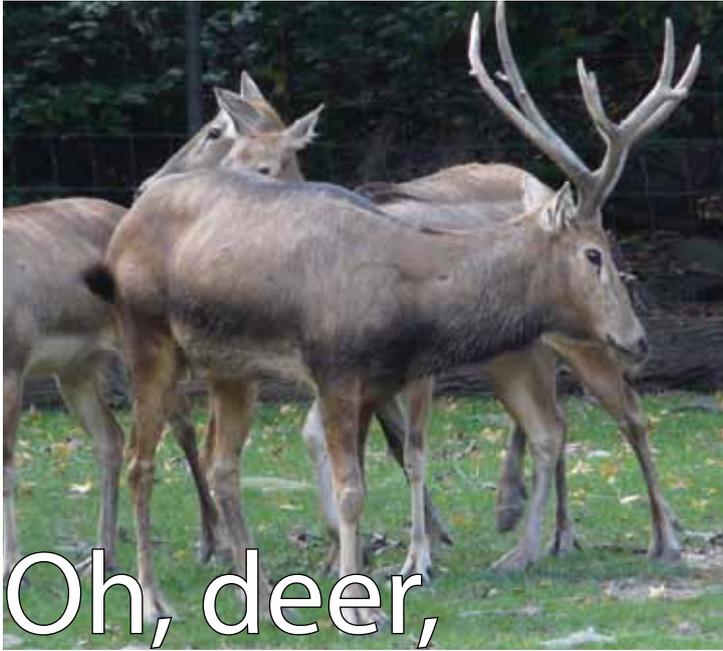
JERUSALEM, ISRAEL. LEADING ORGANISATION: BLOOMFIELD SCIENCE MUSEUM JERUSALEM. COMPETITORS IN THE ISRAEL YOUNG SCIENTISTS COMPETITION. THE JERUSALEM CITY PARTNERSHIP IS GAINING MOMENTUM. FOR EXAMPLE, MARCH 2012 HAS BEEN DECLARED THE FIRST 'SCIENCE MONTH' IN THE CITY. AN INITIATIVE OF THE BLOOMFIELD SCIENCE MUSEUM JERUSALEM, THE SPECIAL MONTH WILL BENEFIT FROM THE COLLABORATION OF THE JERUSALEM MUNICIPALITY IN PARTNERSHIP WITH THE HEBREW UNIVERSITY OF JERUSALEM, THE JERUSALEM FOUNDATION, THE JERUSALEM DEVELOPMENT AUTHORITY, AND CULTURAL INSTITUTIONS. PHOTO CREDIT: BLOOMFIELD SCIENCE MUSEUM JERUSALEM, JERUSALEM, ISRAEL.

TERUEL, SPAIN. LEADING ORGANISATION: DINÓPOLIS TERUEL. SCIENCE ON THE STREET IN TORICO SQUARE, TERUEL. THIS WAS THE MEETING POINT TO CELEBRATE DINÓPOLIS' DISCOVERIES: PICTURED HERE IS THE CAST OF THE FORELIMB OF A GIANT DINOSAUR WHICH WAS DISPLAYED ALONGSIDE A HUGE VIDEO PROJECTION DEALING WITH FOSSILS, WHILE GIANT DINOSAUR FOOTPRINT-SHAPED COOKIES WERE DOLED OUT TO THE PEOPLE. DINÓPOLIS TERUEL ALREADY HAS AN IMPORTANT PRESENCE IN THE CITY OF TERUEL, ILLUSTRATED BY THE FACT THAT THE MUSEUM'S 'FUNDAMENTOS PALEONTOLÓGICOS' (PALEONTOLOGICAL FUNDAMENTALS) SERIES HAS APPEARED IN DIARIO DE TERUEL NEWSPAPER SINCE JULY 2003. IN THIS SERIES, PALAEOLOGISTS FROM DINÓPOLIS SHARE INSIGHT ON GEOLOGY AND PALAEOLOGY, INCLUDING SPECIFIC SCIENTIFIC DATA AND EVEN PALAEOLOGICAL ANECDOTES. THIS IS HOW THE ACHIEVEMENTS OF DISTINGUISHED RESEARCHERS AND THE RICHNESS OF TERUEL'S PALAEOLOGICAL HERITAGE HAVE BEEN BROUGHT TO THE LOCAL COMMUNITY. THIS IS THE SOLID FOUNDATION ON WHICH TERUEL CITY PARTNERSHIP IS BUILDING ITS LOCAL ACTION PLAN FOCUSED ON GEOTOURISM. PHOTO COPYRIGHT DINÓPOLIS TERUEL



NAPLES, ITALY. LEADING ORGANISATION: FONDAZIONE IDIS – CITTÀ DELLA SCIENZA. CHILDREN ON A GUIDED TOUR AT CITTÀ DELLA SCIENZA. THE NAPLES CITY PARTNERSHIP IS GATHERING KEY SCIENTIFIC ACTORS AS WELL AS ENGAGING THE MUNICIPALITY OF NAPLES AND THE UNIVERSITY OF NAPLES FEDERICO II – ITALY'S OLDEST UNIVERSITY. THIS DIVERSE COLLABORATION WILL ADDRESS THE RELEVANCE OF SCIENCE AND TECHNOLOGY IN THE DAILY LIVES OF CITIZENS. PHOTO COPYRIGHT: FONDAZIONE IDIS – CITTÀ DELLA SCIENZA





Oh, deer,

what can the matter be?

THERE'S NO SHORTAGE OF DEER IN EUROPEAN ZOOS. BUT THE TROUBLE IS, THEY'RE NOT THE RIGHT ONES

Noam Werner, EAZA Deer TAG Chair,
The Tisch Family Zoological Gardens (the Jerusalem Zoo)

Deer are in crisis – a very severe crisis. So what? Many species are in crisis. What can we do? There is only limited space in our zoos, and most EEPs are vying for new holders. All the TAGs are fighting for the space available. All, except the Deer TAG. The Deer TAG is actually quite content with the space that is allocated for deer. Many, if not most, zoos keep deer, possibly even more than one species. So what is the problem? Well, it is the types of deer that are being kept in the first place.

A quick browse of ISIS finds 3,875 deer recorded in European zoos. These are chiefly species that are not threatened and are not managed, such as the European fallow deer or axis deer. Meanwhile, red deer, reindeer, Chinese muntjacs and sika deer (all of unknown subspecies) comprise the rest. I am sure that some of you keep these species because they fit your collection plans, but I have a feeling that some keep these species because there was an empty yard to fill and these deer were the easiest animals to obtain. However, if we assume that there is a higher cause to our work than to fill empty yards, then I would like to ask for those yards to be emptied again.

What can you put there instead?

The polygynous mating system of many deer species creates a surplus of males

Plenty! The remit of the EAZA Deer TAG covers 53 species of deer (family *Cervidae*), and an additional two other ruminant families (which are not necessarily the most closely related to deer, but just happened to have the word 'deer' in their common names) – the musk deer (family *Moschidae*; 7 species) and the mouse-deer or chevrotain (family *Tragulidae*; 10 species) – hereafter all will be called deer. To help you choose the new species of deer that you will put in your now vacant deer exhibit, you can turn to the Deer TAG Regional Collection Plan (RCP). While the RCP mainly suggests the management level recommended for each species or subspecies, we have also added a table that includes biological data on each taxon so you can more easily find a species that is not only recommended for keeping, but also fits your yard parameters and exhibit themes. We did

this because among the recommended species you can find small or large ones, tropical or temperate or cold weather ones, forest or open habitat ones, species with or without antlers, with or without spots, and pair-living or gregarious species.

We understand that the change is not going to happen at once and we understand that not everybody is going to stop holding fallow deer (which is good). There are encouraging signs for action in the regional organisation level, but I hope that the change is going to pick up even more steam sooner rather than later because, and apologies for getting back to this, deer are in trouble!

Out of the 70 species or so (taxonomists still argue) that fall under the remit of the Deer TAG, 47 species are either threatened or cannot be assessed due to deficient data, while several subspecies of non-threatened species are also threatened or even



LEFT TO RIGHT: THE ODD-LOOKING BUT IMPRESSIVE PÈRE DAVID'S DEER IS EXTINCT IN THE WILD IN ITS NATIVE CHINA. HOWEVER, DUE TO EUROPEAN ZOOS A POPULATION REMAINS IN CAPTIVITY AND IS BEING REINTRODUCED INTO ITS FORMER RANGE. (ALEX KANTOROVICH); THE CHILEAN (SOUTHERN) PUDU IS THE SMALLEST DEER (CERVID) IN THE WORLD AND IS THREATENED IN ITS NATIVE RANGE. DESPITE BEING AN EEP SPECIES IT SUFFERED A DECLINING POPULATION IN EUROPEAN ZOOS, A TREND THAT STOPPED ONLY A YEAR AGO (ALEX KANTOROVICH); A YOUNG, RE-INTRODUCED MESOPOTAMIAN FALLOW-DEER (*DAMA MESOPOTAMICA*) MALE IN THE WILD IN THE JERUSALEM HILLS (NOAM WERNER); WITH SMALL ANTLERS AND LARGE CANINE TEETH, THE TUFTED DEER (*ELAPHODUS CAPHALOFUS*) DOES NOT LOOK MUCH LIKE A DEER, BUT THIS NEAR-THREATENED ASIAN SPECIES IS A DEER NONETHELESS! (ALEX KANTOROVICH)

extinct in the wild. Yet what is worse is the bleak situation of many of these species in captivity. The relative ease of breeding most deer species in captivity allows zoos the opportunity to keep large enough populations of threatened species to ensure their survival, and several deer species are still with us thanks to the contribution of zoos, such as Père David's deer (*Elaphurus davidianus*) and the Vietnamese sika deer (*Cervus nippon pseudaxis*). On the other hand, many species are showing decreasing numbers (from low numbers to begin with) in recent years, for no apparent reason. For example, in Europe the numbers of individually recorded sambars (*Rusa unicorn*), a large, impressive deer from south and south-east Asia, which is classified as Endangered, dwindled from 44 individuals 12 years ago to about 30 today with the number of females falling from over 30 to fewer than 20. Other noticeable examples are the hog deer (*Axis porcinus*), another south/southeast Asian Endangered species that was once common in zoos but has been disappearing from collections. From over 100 individuals some 20 years ago it is now down by more than half to about 50 with the more significant decline, again, in the numbers of females. Meanwhile, the Siberian musk deer (*Moschus moschiferus*), an east-Asian cold-weather, Vulnerable species, declined from 20 animals in European

zoos to 11, with, once more, female numbers dropping from 12 to 4. You get the point.

This trend is due to us. It is not climate change, illegal hunting or habitat destruction. Luckily, unlike some of the former, we can change the trend fast. Remember those empty yards from the beginning of the article? Now you can start re-filling them – with the 'correct', recommended species. And may I also suggest that you consider an all-male group? The polygynous mating system of many deer species creates a surplus of males, which, in many cases, need to be housed away from their natal group. This is either because culling is illegal and transferring these males may be the only solution for them, or, because, especially in small-population species, these males may have value for the genetic diversity of the captive population and may be used later in time for breeding. I also will not go into the debate of what is more impressive – little fawns or several stags with antlers. I am just saying: consider.

One more thing to consider about deer is records. For one reason or another, when it comes to deer, some zoos are not as meticulous in writing down what is happening with their animals. 'Unknown sire' and 'unknown dam' are quite common when it comes to deer. I have even seen such entries by zoos who keep just one pair of deer!

I take the blame for this. Despite the large number of threatened deer species, the TAG is currently managing only a handful of breeding programmes, 4 EEPs and 3 ESBs, and when animals do not belong to a breeding programme we may not be as meticulous as we ought to be. But this will change. The TAG has already started several monitoring programmes to check the need for managing certain species and some of these will surely be upgraded to more intensely managed programmes, and of the existing programmes some will also be upgraded. This, I hope, will add an incentive to manage our deer better.

It is doable – the Jerusalem Zoo keeps almost 70 Mesopotamian fallow deer (*Dama mesopotamica*), with some 20 breeding females, and all the deer are individually marked and have known dams. Several of the individuals that were born at the Jerusalem Zoo now roam the Galilee and Jerusalem Hills. This is what we work for – from cleaning the exhibits to collection planning, through record keeping to managing a breeding programme or writing an article – seeing the animals run free again in the wild or knowing that they are safe from extinction in our zoos. This is it – it is worth the effort.

And, deer friends, it is in our hands. *The Deer RCP* is available to download on the Deer TAG workspace in the member area of the EAZA website.



CLOCKWISE FROM ABOVE: ELD'S DEER (*CERVUS ELDI*) FEMALE WITH YOUNG, KEIBUL LAMJAO SANCTUARY, MANIPUR, INDIA. KNOWN LOCALLY AS SANGAI OR BROW-ANTLERED DEER. ENDEMIC THREATENED SPECIES © ANUP SHAH; CHILEAN HUEMUL OR SOUTH ANDEAN DEER (*HIPPOCAMELUS BISULCUS*), TORRES DEL PAINE NATIONAL PARK, PATAGONIA, CHILE. ENDANGERED SPECIES © ORIOL ALAMANY; ELK (*CERVUS ELAPHUS*) BULL BUGLING IN RUT, YELLOWSTONE NP, WYOMING, USA © ROLF NUSSBAUMER; WHITETAIL DEER, FLORIDA, USA (*ODOCOILEUS VIRGINIANUS*) © BERNARD CASTELEIN; **OPPOSITE PAGE:** YOUNG MALE MOOSE (*ALCES ALCES*) STANDING IN WATER, TUPPER LAKE, ADIRONDACK MOUNTAINS, NEW YORK, US © JOHN CANCALOSI



Deer abundance: it's not what it seems

AS A FAMILY, DEER POPULATE THE WORLD IN STRONG NUMBERS. MANY SPECIES WITHIN THAT FAMILY, HOWEVER, ARE IN CRITICAL NEED OF CONSERVATION

Co-Chairs of the IUCN/SSC Deer Specialist Group William J. McShea, Conservation Ecology Center, Smithsonian Conservation Biology Institute, & Susana González, Genética de la Conservación, Uruguay

We often speak at meetings of hunting clubs or civic organizations, and find that most people in the audience feel they are deer experts. This is partly because deer are the commonest large mammals in Europe and North America. Many people interact with deer on a regular basis and have strong opinions on their ecology and conservation. In Europe, most people recognise several species, such as reindeer, elk, red deer, and roe deer, and they all seem to be doing well in today's world. Deer seem to adapt well to humans and their modifications to the landscape. In fact, a recent volume on deer management in Europe found at least one deer species to be abundant in most countries, and often numbers in forested areas are reaching levels of resource damage.

Appearances, however, can be deceptive; there are more than 50 species of deer in the world, but most are declining in numbers and most are not adjusting well to a world dominated by humans (Table 1). The story of deer is the story of conservation in the modern world, trying to galvanize action about an impending crisis that is not obvious to the casual observer.

Why are some deer species doing so well, while others so poorly? Let us first look at the well-off species. The deer species in North America are actually a conservation success story. White-tailed deer and to a lesser extent moose, mule deer and elk, declined precipitously in the late 1800s due to widespread conversion of land to agriculture and the unregulated sale of wild meat to commercial dealers. It was only with the creation of hunting regulations, and public agencies devoted to game restoration and habitat restoration, that deer numbers started to increase. Within 40-60 years following these activities deer numbers had increased to such an extent that landowners started to protest about wildlife damage, while deer/vehicle collisions became a serious issue. It is worth noting that, throughout most of deer range, large predators were not part of the restoration activities. While hunters were relied on to replace the native predators, an important demographic trend recently is the declining number, and ageing population, of deer hunters. The result of these intentional and unintentional activities was the restoration of deer in many protected areas to the extent that they have serious impacts on ecosystem functions, especially

in forests. These impacts cut across trophic levels, with changes in vegetation due to deer browse impacting nesting songbirds and small mammals, whose numbers affect both insect and predator populations. Today, deer are a keystone species in most forests of North America and Europe and their management is of primary concern for conservationists. This association of deer with overabundance, severe crop and forestry damage, as well as deer/vehicles collisions, makes it extremely difficult to rally the public around conserving the less known species, whose circumstances do not match those of the deer we know.

Unfortunately there are no examples in the emerging world of deer species being considered overabundant. Table 1 is a summary of the IUCN Red List for deer and shows that few deer outside of Europe and North America are not threatened or endangered. For a quarter of the species we do not know enough to determine their status (referred to as Data Deficient). For more than half of the species we are concerned about their future. There are consistent reasons across the world why deer species are declining; loss of habitat and unregulated hunting. We are even unsure of how many species of deer exist, as small cryptic species of deer in the forests of South America (*Mazama* sp.) and Asia (*Muntiacus* sp.) seem to be discovered with each new exploration of river drainages or mountain tops. We do know that large deer species outside of North America and Europe are in dire conditions, due to the ease of hunting with modern weapons and their use as meat or in traditional medicine. For the smaller species, their low numbers are often linked to lack of control over snares set for bushmeat that is used locally or transported to the larger cities as a delicacy. For some species, such as huemul in the mountains of Argentina and Chile, their decline seems to be linked to an inability to coexist with domestic dogs and livestock. Unless reserves established at lower elevations can exclude these animals the species outlook is of concern. In both Asia and South America, dam construction for hydroelectric power and reservoirs is removing wetland habitats that were home for both large and small deer species.

The good news is that we know everything we need in order to conserve the rarer deer species. Habitat needs are known, or can be estimated, and we can control poaching on public

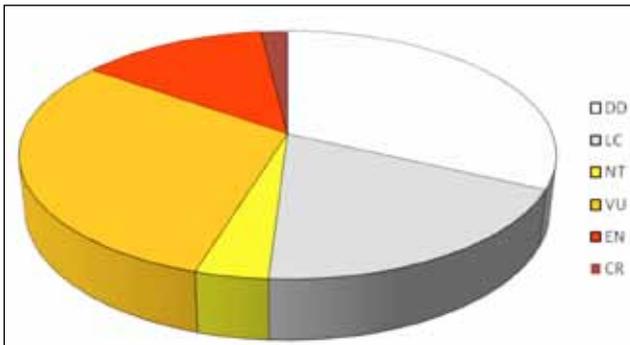


Figure 1. The relative number of deer in each category of endangerment according to the IUCN Red List. DD are Data Deficient species for whom we do not know enough to rank their level of endangerment. The remaining categories are in increasing level of concern (Least Concern (LC); Near Threatened (NT); Vulnerable (VU); Engangered (EN); and Critically Endangered (CR). We do not include 2 species where one has gone extinct in the last 50 year (*Rucervus schomburgki*) and one is present only in semi captive populations (*Elaphurus davidianus*).

lands if supported by the public will and sufficient funds are allocated. In addition, deer are easily bred in captivity, easily translocated and provisioned at new sites, and usually their habitat can be easily manipulated to increase forage. Restoring deer populations through restocking or better management does not garner the same extreme of human/wildlife conflicts involved with bringing back large predator, although farmers will suffer increased crop losses that will need remediation.

Restoring deer usually has the added benefit of restoring cultural and economic activities that can be sustainable, if managed properly. There is no reason why emerging countries cannot derive income from deer species; what is lacking is effective regulation. There is great potential to leverage funds

for deer conservation. Tiger conservation is presently an Asia-wide effort that has garnered the backing of the World Bank and multinational corporations. Tigers, as well as other large predators, will only persist in the wild if their prey base persists, and the diet of tigers across most of their range is deer. The zoo community can rally to the cause by displaying the diversity of international deer species and generating interest and funding for conservation within range countries. Zoos have done this in the past, for example conserving the Chinese Pere David's until the Chinese government was ready to resume stewardship. The hunting community has played a strong role in recovering deer species within North America and Europe through their support of licensing fees, taxes allocated to game lands, personal efforts on private lands, and support for national legislation.

It is hopeful that this support can be expanded to the developing world, especially for large species that are considered trophy animals.

One of us (WJM) once spent a long dry season looking for the endangered Elds deer in Laos. I would show local villagers photos of the deer, and one villager got very angry and started pointing into the forest and toward his crop fields. After a quick translation he reported that he hated that deer, as they nightly came out from the forest to eat his crops. He hoped I had come to remove all the deer. That was the only population of deer we located in the country and the species still retains its endangered status on the IUCN Red List. The villagers in that region were not convinced that their locally abundant deer was anything special and they assumed everyone had the same large deer eating their crops.

Everyone is an expert on their local deer, but we have to realize that not all deer enjoy the population status of deer in Europe and North America. Most deer need conservation assistance quickly, and only by thinking and acting beyond our local situation will we save much of the diversity we so admire in deer.

Data Deficient	Least Concern	Near Threatened	Vulnerable	Threatened	Critically Threatened
<i>Mazama americana</i>	<i>Alces alces</i>	<i>Elaphodus cephalophus</i>	<i>Blastocercus dichotomus</i>	<i>Axis calamianensis</i>	<i>Axis kuhlii</i>
<i>Mazama nana</i>	<i>Alces americanus</i>	<i>Ozotoceros bezoarticus</i>	<i>Hippocamelus antisensis</i>	<i>Axis porcinus</i>	
<i>Mazama temama</i>	<i>Axis axis</i>		<i>Hydropotes inermis</i>	<i>Dama mesopotamica</i>	
<i>Muntiacus feae</i>	<i>Capreolus capreolus</i>		<i>Mazama bororo</i>	<i>Hippocamelus bisulcus</i>	
<i>Muntiacus gongshanensis</i>	<i>Capreolus pygargus</i>		<i>Mazama bricenii</i>	<i>Muntiacus vuquangensis</i>	
<i>Muntiacus montanus</i>	<i>Cervus elaphus</i>		<i>Mazama chunyi</i>	<i>Rucervus eldii</i>	
<i>Muntiacus puhoatensis</i>	<i>Cervus nippon</i>		<i>Mazama pandora</i>	<i>Rusa alfredi</i>	
<i>Muntiacus putaoensis</i>	<i>Dama dama</i>		<i>Mazama rufina</i>	<i>Axis calamianensis</i>	
<i>Muntiacus rooseveltorum</i>	<i>Mazama gouazoubira</i>		<i>Muntiacus crinifrons</i>		
	<i>Mazama nemorivaga</i>		<i>Przewalskium albirostris</i>		
	<i>Muntiacus atherodes</i>		<i>Pudu mephistophiles</i>		
	<i>Muntiacus muntjak</i>		<i>Pudu puda</i>		
	<i>Muntiacus reevesi</i>		<i>Rucervus duvaucelii</i>		
	<i>Muntiacus vaginalis</i>		<i>Rusa marianna</i>		
	<i>Odocoileus hemionus</i>		<i>Rusa timorensis</i>		
	<i>Odocoileus virginianus</i>		<i>Rusa unicorn</i>		
	<i>Rangifer tarandus</i>				

Table 1. Endangerment status of each deer species according to IUCN Red List. We do not include two species where one has gone extinct in the last 50 years (*Rucervus schomburgki*) and one is present only in semi-captive populations (*Elaphurus davidianus*).



MAIN PIC: ELD'S DEER (*CERVUS ELDI*) MALE PORTRAIT, KEIBUL LAMJAO SANCTUARY, MANIPUR, INDIA. KNOWN LOCALLY AS SANGAI OR BROW-ANTLERED DEER. ENDEMIC THREATENED SPECIES. © ANUP SHAH; **BELOW, CLOCKWISE:** CHINESE WATER DEER (*HYDROPOTES INERMIS*) MALE, CAPTIVE, FROM CHINA AND KOREA, VULNERABLE SPECIES © ROD WILLIAMS; CHINESE WATER DEER (*HYDROPOTES INERMIS*) BUCK IN WOODLAND SHOWING TUSKS, CAPTIVE, KENT, UK © DAVE BEVAN; KUHLS' / BAWEAN HOG DEER (*AXIS KUHLII*) NATIVE TO BAWEAN ISLAND, INDONESIA. CAPTIVE, EDINBURGH ZOO, CRITICALLY ENDANGERED © MARK BOWLER; BARASINGHA / SWAMP DEER (*CERVUS DUVAUCELI*) STAG, KAZIRANGA NATIONAL PARK, ASSAM, INDIA © MATTHEW MARAN



IMAGES COURTESY OF NATURE PICTURE LIBRARY Nature Picture Library (NPL) is one of the world's leading wildlife and nature image libraries, representing more than 300 of the finest specialist photographers in this field, with worldwide and in-depth coverage, including many rare and endangered species. Our website www.naturepl.com provides access to more than 275,000 images available to download at high resolution. The collection illustrates nature in the broadest sense, from animal portraits and behaviour, plants and landscapes, to marine life, conservation and the environment. NPL is exclusive agency for the Wild Wonders of Europe, 2020VISION, Meet Your Neighbours and Coral Triangle. Our research staff hold zoology degrees and are experienced in supplying images to zoos and aquaria for use in displays, promotional literature and online. We support conservation projects by donating a percentage of our sales to a different charity each quarter.



A family at risk

MANY OF THE DEER SPECIES OF SOUTHEAST ASIA REALLY ARE IN DANGER OF EXTINCTION IN THE WILD

Will Duckworth, IUCN/SSC

Southeast Asia, here defined as the area covered by the Association of Southeast Asian Nations (ASEAN), supports about 20 species of deer; 'about' because the taxonomy of some groups remains unclear. Here, 'deer' are defined as the biological family of *Cervidae*. Animals in other biological families that may have the word 'deer' in their English names, such as chevrotains (*Tragulidae*, also called 'mousedeer') and musk-deer (*Moschidae*) are not considered here.

Deer are a major conservation priority in Southeast Asia, although this fact is not yet as widely recognised as is needed. There are two main types of deer in Southeast Asia: the muntjacs (the genus *Muntiacus* and the allied tufted deer *Elaphodus cephalophus*) and the 'typical' deer ('typical' only in that this group contains familiar species such as the red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) of Europe – the muntjacs are in no way 'atypical' or 'aberrant'). The muntjacs' conservation concern is mostly because their taxonomy is in a mess, and therefore species of high conservation need may exist but remain unrecognised. So far, only one muntjac species, the large-antlered muntjac, is known to need urgent conservation intervention. By contrast, *all* the typical deer in Southeast Asia are at elevated risk of extinction, excepting Schomburgk's deer... because it is already extinct.

The muntjacs are smaller than the typical deer, with smaller antlers, simpler social structure, and elongated canines in males (and, in one group of species, in females too). The tufted deer is a species with no close relatives but is generally grouped with the muntjacs. The typical deer are highly specialized. They have a complex social structure (eg the seasonal rutting and/or the large herds of some species), which explains arguably the most recognisable feature of deer – their large often complex antlers (borne



LARGE-ANTLERED MUNTJAC (*MUNTIACUS VUQUANGENSIS*)
- NAM THEUN 2 POWER COMPANY LTD

Deer have been hunted out, or nearly so, from many of the large tracts of prime habitat persisting in various parts of Southeast Asia



in Southeast Asian species by the males only). They also lack elongated canines.

Muntjacs inhabit shaded areas from old-growth forest to scrub and secondary vegetation, whereas the typical deer are rare or absent in unbroken closed evergreen forests of Southeast Asia. This is because the typical deer are grazers or browsers, and in unbroken closed evergreen forest most of the fresh leaves are in the canopy out of reach of even the tallest deer. Thus, perhaps paradoxically, partly logged and otherwise disturbed forests have more deer food than do primary evergreen forests. Highest densities of tropical Asian deer occur

in grasslands: nearly all leaves are low enough for deer to eat. Many muntjacs live in forests, because they eat more of foods such as fruit; no species is credibly suggested to need little-degraded forest. Thus, habitat loss is not the major threat to most Southeast Asian deer. Instead, deer have been hunted out, or nearly so from many of the large tracts of prime habitat persisting in various parts of Southeast Asia. Although nearly all countries of ASEAN have wildlife protection legislation sufficient to keep deer widespread and common, enforcement is uneven. Well-protected parts of nature reserves and national parks in Southeast Asia show what is possible when wildlife protection laws are followed. Deer species of level habitats, such as grasslands and open parkland-type woodland, have declined particularly heavily because the animals are easily found and killed, and can be removed by vehicle. This explains the paradox that the biggest deer of Southeast Asia, the sambar, is the least threatened typical deer there: it is much more a species of edge forest

Deer (Cervidae) of Southeast Asia

Species	Range	Red List	Global zoo status (n° of m.f.unk)
Tufted deer <i>Elaphodus cephalophus</i>	Marginal in region: far north-east Myanmar. Also S and C China	Least Concern	<i>E. c. cephalophus</i> 34.26.3
Bornean yellow muntjac <i>Muntiacus atherodes</i>	Endemic: Borneo	Least Concern	0.0.0
Fea's muntjac <i>Muntiacus feae</i>	Endemic: Myanmar–Thailand border mountains and hills	Data Deficient	10.11.10
Gongshan muntjac <i>Muntiacus gongshanensis</i>	Non-endemic: northern Myanmar. Also S China and north-east India	Data Deficient	0.0.0
Red muntjac <i>Muntiacus muntjak</i>	Non-endemic: widespread SE Asia. Also South Asia and south China	Least Concern	76.88.222
Sumatran mountain muntjac <i>Muntiacus montanus</i>	Endemic: Sumatran mountains	Data Deficient	0.0.0
Large-antlered muntjac <i>Muntiacus vuquangensis</i>	Endemic: Lao–Vietnam border mountains and hills and small part of adjacent Cambodia	ENDANGERED	0.0.0
Roosevelts' muntjac <i>Muntiacus rooseveltorum</i>	Probably non-endemic: north Lao PDR, probably also elsewhere in Lao PDR and Vietnam. Also (probably) southern China	Data Deficient	0.0.0
Annamite muntjac <i>Muntiacus truongsoneensis</i>	Endemicity unclear: named from Vietnam–Lao border mountains. Perhaps also China.	Data Deficient	0.0.0
Puhoat muntjac <i>Muntiacus puhoatensis</i>	Endemicity unclear: named from northern Vietnam	Data Deficient	0.0.0
Leaf muntjac <i>Muntiacus putaoensis</i>	Probably non-endemic: named from northern Myanmar. Probably also north-east India and adjacent China.	Data Deficient	0.0.0
Calamian deer <i>Axis</i> (= <i>Cervus</i> ; = <i>Hyelaphus</i>) <i>calamianensis</i>	Endemic: Philippines, in the Calamian Islands (Busuanga, Calauit, Culion and some smaller islands).	ENDANGERED	19.30.2
Bawean deer <i>Axis</i> (= <i>Cervus</i> ; = <i>Hyelaphus</i>) <i>kuhlii</i>	Endemic: Indonesia, Bawean Island	CRITICALLY ENDANGERED	8.5.6
Hog deer <i>Axis</i> (= <i>Cervus</i> ; = <i>Hyelaphus</i>) <i>porcinus</i>	Non-endemic: two sites in Cambodia and some in Myanmar (formerly widespread in non-Sundaic SE Asia). Also northern South Asia, southern China (probably extirpated) and Sri Lanka (evidently introduced). Large introduced populations outside Asia.	ENDANGERED	<i>A. porcinus</i> ssp. 34.62.168 <i>A. p. porcinus</i> 8.30.34 <i>A. p. annamiticus</i> zero
Sika <i>Cervus nippon</i>	Non-endemic: extinct in region (formerly northern Vietnam). Also China, Japan and Russia. Widely introduced.	Least Concern	<i>C. n. pseudoaxis</i> 77.195.32
Eld's deer <i>Rucervus</i> (= <i>Cervus</i> ; = <i>Panolia</i>) <i>eldii</i>	Near-endemic: Cambodia, Myanmar and two sites in Lao PDR (formerly widespread in non-Sundaic SE Asia). Also Hainan (China) and one site in north-east India	ENDANGERED	182.282.262
Schomburgk's deer <i>Rucervus</i> (= <i>Cervus</i>) <i>schomburgki</i>	Endemic (extinct 1930s): central Thailand	Extinct	
Visayan spotted deer <i>Rusa</i> (= <i>Cervus</i>) <i>alfredi</i>	Endemic: Philippines (Panay and Negros Islands; formerly also Guimaras and possibly Siquijor)	ENDANGERED	46.51.1
Philippine deer <i>Rusa</i> (= <i>Cervus</i>) <i>marianna</i>	Endemic: Philippines (Basilan, Catanduanes, Leyte, Luzon, Polillo, and Samar Islands, and possibly Bohol and other small islands); introduced some west Pacific islands	Vulnerable	3.1.0
Javan rusa <i>Rusa</i> (= <i>Cervus</i>) <i>timorensis</i>	Endemic: Indonesia (Java and Bali); widely introduced, including elsewhere in Indonesia	Vulnerable	21.20.95
Sambar <i>Rusa</i> (= <i>Cervus</i>) <i>unicolor</i>	Non-endemic: widespread SE Asia. Also South Asia, southern China and Taiwan	Vulnerable	133.170.475

Explanatory notes:

Range: endemic = restricted to Southeast Asia; near-endemic = nearly restricted to Southeast Asia; non-endemic = significant parts of global range both inside and outside Southeast Asia; marginal = Southeast Asian range only a small part of global range. Introduced range not

comprehensively covered. **Global zoo status,** based on the ISIS website (International Species Information System www.isis.org); many zoos, farms and breeding or conservation facilities, particularly outside Europe and North America, are not members of ISIS and their animals are not listed.

(eg stream-sides) than of grassland, so can use the rugged hill forests. Large areas of these still remain in Southeast Asia, largely impenetrable to vehicles and within which tracking and sighting animals is hard work. However, the death-knell for deer in even these habitats is being sounded by the rapid spread of industrial-scale snaring.

Schomburgk's deer, which became extinct in the 1930s, was tied to lowland plains and grasslands of central Thailand – the hinterland of Bangkok. The hog deer has similar habitat choices and in Southeast Asia is on the verge of extinction. Only the populations in some well-protected areas of India, such as Kaziranga National Park, prevent it being a candidate for the rarest surviving mammal in the world.

These species of wet grassland declined heavily and early because rice is a wetland grass, so massive areas of habitat were converted for agriculture. Most of the forest species survived relatively well into the mid-20th century, but in later decades the strong economic development of some countries, notably China, has allowed many more people to indulge in the longstanding cultural predisposition to eat wild meat for its perceived health-strengthening properties. Southeast Asia contains and is close to these huge markets, so bears a heavy demand for wild meat and items (such as antlers in velvet), sought for use in 'traditional' medicine.

Without decisive action, all the typical deer of Southeast Asia face regional extirpation in the next few decades: and for the five species (about 60%) that occur nowhere else, this means global extinction. Some muntjacs will survive longer: in heavily hunted areas of Southeast Asia, red muntjac is one of the few animals significantly larger than a domestic dog that remains widespread, albeit much reduced. However, trade-driven hunting may well switch to muntjacs through the well-known phenomenon of 'hunting down' – when favoured species are commercially extinct, attention shifts to those formerly eschewed.

Without sustained reductions in hunting levels, Schomburgk's deer will merely have been the first in a long line to be lost forever

Among the other groups of Southeast Asian mammals with many species, only the wild cattle and apes show similar levels of extinction risks, as measured by *The IUCN Red List of Threatened Species*. Thus the typical deer, while not uniquely highly threatened in the region, are firmly in the highest-risk group of mammals from a Southeast Asian perspective.

EFFECTS ON PEOPLE

This extinction crisis playing out in Southeast Asia has a tragic direct human side: because disturbed forests form prime habitats for some of the typical deer, if hunting was brought in line with the laws already in place, vast areas of Southeast Asia covered by forest degraded and fragmented by logging, shifting cultivation and other human uses, would hold huge numbers of deer. This would reflect the present status of western roe deer (*Capreolus capreolus*) in parts of western Europe, and of white-tailed deer (*Odocoileus virginianus*) in parts of North America. These could provide continually replenishing wild protein sources for most of the region's most marginalised people. Instead, hilly northern Southeast Asia provides increasing evidence of worsening nutritional status of rural people, particularly children, through their recent enforced near-veganism, because trade-driven hunting has removed almost all their former protein sources.

Several good precedents show that where resources (not just money, but also technical know-how and, perhaps most critically, public support at all levels from ministerial to village) are sufficient, some deer populations can rebound quickly and persist in relatively small and degraded landscapes. Thus,

these species are not the most difficult animals to conserve. This is not so for all species – for example, in two areas of Thailand where hunting is now under control, populations of most wild ungulates are rebounding but sambar remains at low densities. This may have something to do with the complex social systems and be an example of the Allee effect, whereby some species find it difficult to survive at low densities even after removal of the factor which reduced numbers.

FURTHER EXTINCTIONS?

Time is running out for Southeast Asia's typical deer: without sustained reductions in hunting levels, Schomburgk's deer will merely have been the first in a long line to be lost forever. The changes needed in Southeast Asian deer conservation are generational (people enjoy hunting, protein deficiency is pervasive in hill areas, and beliefs in the efficacy of wild animal consumption in strengthening the body are deeply held) and in the decades it will take to bring lasting change, some of the Southeast Asian species probably will not survive outside zoos. This is already the situation for the Southeast Asian subspecies of sika, now extinct in the wild. Some of the other species or subspecies on 'death row' do not have populations in internationally accredited zoos, such as the eastern subspecies of hog deer.

Zoos have already demonstrated their unique contribution to deer conservation, for example Père David's deer (*Elaphurus davidianus*) of China would now be extinct but for zoos, and the opportunities for serious zoo involvement in Southeast Asian deer conservation have never been greater.

SUPPORT THE SOUTHEAST ASIA CAMPAIGN ORDER CAMPAIGN MERCHANDISE!



ASHWOOD

SUMATRAN RHINO T-SHIRT

100% PROFITS GO TO THE CAUSE

- 100% Organic Cotton certified FairTrade & GOTS
- Unisex cut
- Adult: XXL,XL,L,M,S & Kids: 2,4,6,8,10 Yrs Old
- A minimum total order of 500 pieces is required to make this project viable, so order your T-shirts today!



CHROMIUM KEYRINGS

- Every keyring supplied with a smart and functional 'EAZA' branded header card.
 - Made from high quality, chromium coated metal with proven retail sales potential.
 - Range includes saola, Mekong giant catfish, Sumatran rhino, proboscis monkey, clouded leopard, Siamese crocodile and rufous-headed hornbill
- Can be assorted – minimum of 125 pieces per design



Empreinte & Territoires

TIGER: LORD OF THE JUNGLE

This book presents what we know about the tiger today; its history, its astonishing ability to adapt, from the snowy Siberian taiga to the Malaysian rainforest by way of the Indian jungle, and its tumultuous relationship with its human neighbours. In this book, text and photographs bring the tiger to life and hope to play a part in ensuring its survival. That is why Empreinte & Territoires is happy to donate 10% of the book royalties to EAZA to support its Southeast Asia Campaign.



SOUTHEAST ASIA CAMPAIGN southeastasiacampaign.org



SOUTHEAST ASIA CAMPAIGN southeastasiacampaign.org

SOUTHEAST ASIA CAMPAIGN southeastasiacampaign.org

PLUSH SAOLA

- This beautiful saola soft toy was designed by craftsmen and handmade with the highest quality materials exclusively for Dowman Imports Ltd and the Dowman Soft Touch brand.
- minimum order requirement is one pack (consisting of 48 saola toys)
- conforms to all European safety standards EN71. All products are fairly traded with the people and countries of manufacture.



SOUTHEAST ASIA CAMPAIGN SILICONE WRISTBANDS

Silicone wristbands are as popular and fashionable as ever and still one of the most widely-used fundraising tools. You can stimulate awareness about the Southeast Asia Campaign in a very easy, accessible and effective way by selling campaign wristbands. By selling wristbands in your zoo shop you are actively promoting the Campaign and helping in meeting our fundraising target.

**FOR INFO ON ORDERING, PRICES AND QUANTITIES GO TO:
WWW.SOUTHEASTASIACAMPAIGN.ORG/RESOURCES/MERCHANDISE
OR CONTACT INFO@SOUTHEASTASIACAMPAIGN.ORG**

The making of the milu

THE EUROPEAN TALE OF THE MILU, OR PERE DAVID'S DEER, IS WELL-KNOWN: BUT THE REESTABLISHMENT OF THIS ANIMAL IN CHINA HAS BEEN JUST AS EXCEPTIONAL

Nick Lindsay, Senior Curator, ZSL

The story of the discovery of the milu in a monastery in China in 1864 and its renaming to Pere David's deer is widely told in zoos as a great example of conservation breeding. However, the reintroduction and establishment of new populations in China is not widely known or reported. This is a remarkable story in the challenges conservationists faced in China on the back of a tremendous programme to build up the numbers of this unusual animal in Europe. There are now good populations totalling over 2,000 milu in four parks in China plus a number of animals in zoos and farms.

The recovery of a few deer from the monastery is well documented but it is estimated that out of the herd that was taken to Woburn Abbey at that time only 11 deer actually bred but there were a number of other deer in parks in France and Germany. This is yet another example of a species that has recovered from the brink of extinction with very small founder populations.

The first shipment of Pere David's deer to China took place in 1985 with 38 deer from Woburn going to the Nanyang Royal Hunting Garden, near Beijing, creating the Beijing Milu Park. A year later there was a second shipment made up of 39 deer from Whipsnade Zoo, Marwell, Glasgow, Chester, Knowsley and Longleat which went to the Da Feng Forest Farm. WWF and the Marquis of Tavistock were the driving force for the initial programme with the Zoological Society of London (ZSL), IUCN and the Ministry of Forestry of the People's Republic of China undertaking the second shipment.

In Da Feng the deer were monitored during their time in quarantine and then during and after the releases. Three females were fitted with radio collars to assist in the tracking of the herds when they were released into a 1.2km reserve area. In April 1987 after spending the first winter in quarantine 7 fawns were born. Even in the early days the deer proved to be highly adaptable and used all the available

land including woodland areas, grassland, the wetlands and the farmed lands in the reserve. They ate a wide variety of plants including many of the trees and water plants. Such was the interest in the milu that the reserve had over 20,000 visitors in the first year.

Both populations developed well enabling deer to be relocated to establish new herds in two further reserve areas. In 1993 30 milu were transferred to the Tianezhou Milu Nature Reserve with an additional 34 joining them in 1994 and a further 30 in 2002. All were from the Beijing Park. Also in 2002, 30 deer from Beijing and 20 from Dafeng were used to establish a new population in the Yuanyang Forestry Farm in Henan.

Currently there are 53 herds of milu in the 4 reserves. Nine of these have fewer than 25 animals and about 75% have fewer than 10 individuals. Herds can be maternal groups or single sexed groups. None of the reserves can be

considered to be truly wild areas as they all are fenced to prevent the deer going to adjacent farm areas and raiding the crops. All populations are managed to some degree but it is recognised that there is a need to move animals between the populations to introduce new blood lines. The Chinese are also very keen to establish a fully free-ranging population of milu.

It is interesting to note that all four reserves with milu are different in their climate and topography but it is concluded that the deer prefer living in low lying grassland areas such as seasonal flooded areas or coastal marshes. They swim well and spend long periods in water, enjoying eating the water plants.

There is still some work to do with this fascinating species but much of the groundwork to secure the future of the species in China has been done and I am sure the programme will continue to develop in the future.



Spotting a recovery

HOW *EX SITU* AND *IN SITU* CONSERVATION OF THE PHILIPPINE SPOTTED DEER IS HELPING TO SAVE THE SPECIES

Jens-Ove Heckel and Christina Schubert, Studbook keepers, c/o Zoo Landau in der Pfalz; Roland Wirth, Chair, Zoological Society for the Conservation of Species and Populations (ZGAP); and William L R Oliver, Director, Philippines Biodiversity Conservation Programme

The Philippine spotted deer, (*Rusa alfredi*) is among the most threatened deer species today. Originally occurring on all five of the larger Central Visayan Islands in the Philippines, it now only survives on two of them – Panay and Negros – and even there, its forest habitat has declined by more than 95% and the little remaining habitat is heavily fragmented. Furthermore, the last few existing subpopulations of the species are still subject to poaching. Not surprisingly, IUCN lists the species in its highest threat category: Critically Endangered.

In order to save this deer from extinction, Zoo Mulhouse, France, in cooperation with the German conservation organisation Zoological Society for the Conservation of Species and Populations, ZGAP (Munich, Germany) and William L R Oliver initiated a conservation programme. One component of the project is a captive breeding programme in the Philippines and in Europe.

A first group of Philippine spotted deer of Negros origin arrived in Europe in 1990. The animals settled in well and soon started to breed. In 2001, a second group of animals was imported via Poland. By the end of 2010, 20 zoos in France, Germany, Italy, UK, Netherlands, Poland, Czech Republic, Luxembourg, Spain and Portugal had become partners in the programme. The captive population in Europe (still the only captive population outside the Philippines) has increased to about 120 individuals to date. Zoo Landau in der Pfalz, Germany, runs the International Studbook for the captive population of Philippine spotted deer originating from the island of Negros.

An integral component of the programme is financial and scientific support to local rescue and breeding centres in the Philippines. Colonies of the deer were founded from specimens that were rescued, confiscated and donated. Under the leadership of W Oliver and with continuing support



received from zoos participating in the breeding programme, from various conservation organisations and from other sources, these local 'rescue centres' have evolved into leading local conservation centres, which continue to function as rescue, breeding and conservation education centres for endangered Philippine wildlife species. The captive deer population in the Philippines was reported at about 30 animals by 2011.

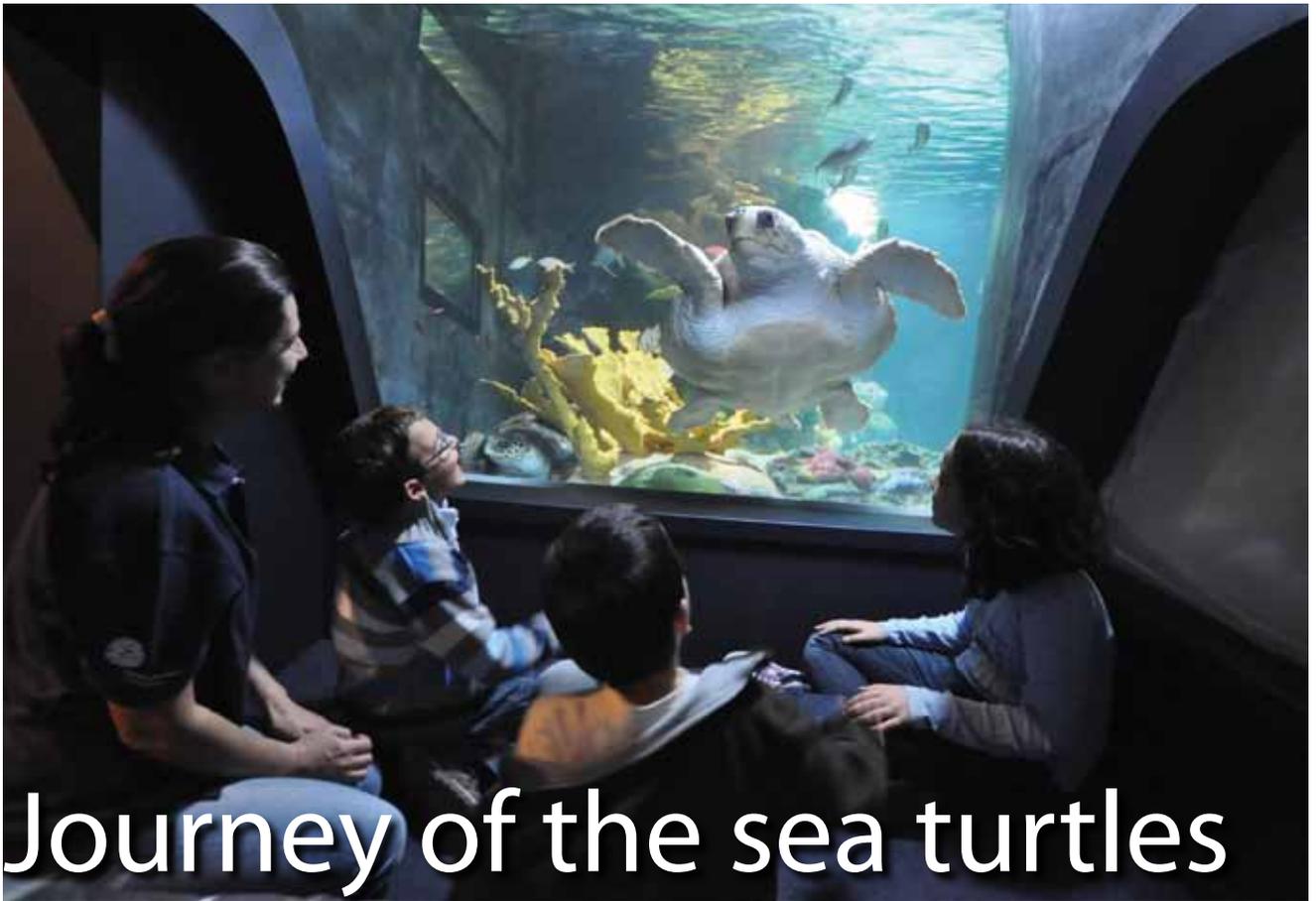
What started off as a recovery programme for the deer has expanded to other highly endangered endemic Philippine species. Other organisations have joined in over the years and have become long-term funding partners in this multi-species conservation and recovery programme, named Philippines Biodiversity Conservation Programme (PBCP), in one of the globally most endangered 'biodiversity hotspots' – the Central Philippine islands.

Philippine Spotted Deer provide few management and husbandry problems in zoos. Unlike many other deer, however, they need heated winter quarters in Northern and Central Europe and, again, unlike many other deer, females can be aggressive to each other. Breeding herds of up to five or six females are possible, but usually only by building up numbers from

a founder female and her daughters and granddaughters. Such female groups may be stable for years, but sudden aggression directed against one particular female, requiring its separation, or the re-structuring of herds, is always possible. On the positive side, enclosure size can be smaller than for many other deer species, and as this species is not a very good jumper, fences can be lower than for most other similar sized deer.

Partner zoos to the programme are expected to make a one-off or preferably annual financial contribution to the continuation and expansion of the conservation activities in the Philippines. Participation of each new zoo in the Philippine Spotted Deer Conservation Programme will have to be endorsed by the Wildlife Authorities of the Philippines, the Department of Environment and Natural Resources, DENR, with its Protected Areas & Wildlife Bureau, PAWB, as all deer and their progeny are within the ownership of the Government of the Philippines. Since 2006 the programme has been branded as a WAZA conservation project.

The authors would like to acknowledge the continuous support over all the years provided by the Philippine project partners as well as DENR, PAWB.



Journey of the sea turtles

A NEW TEMPORARY EXHIBITION AT PORTUGAL'S OCEANÁRIO DE LISBOA AIMS TO DRAW VISITOR ATTENTION TO THE PLIGHT OF THESE ENIGMATIC REPTILES

Teresa Pina, Education Department, Oceanário de Lisboa

One of the most fascinating aspects of sea turtle behaviour is their instinctive ability to travel long distances. By returning to the beaches where they were born in order to nest, females present one of the great mysteries of the oceans. The concept of this exhibition examines the astonishing journey that sea turtles undertake by highlighting some aspects of the lives of these magnificent creatures, their relationship with marine ecosystems, and the dangers and challenges that they encounter over this long trip.

With the aim of strengthening the Oceanário de Lisboa's direct commitment to the conservation of the oceans in general and these species in particular, the exhibition 'Sea turtles. The journey.' examines these animals' natural history and behaviour. Visitors can learn about the threats facing sea turtles and the relevance and necessity of current efforts to conserve them. With conservation always at the top of our minds, following this journey inspires us to reflect on the impact of our activity on these extraordinary



SEA TURTLES: THE THREATS

For centuries sea turtles have been sought for their eggs, meat, oil, skin, and carapaces, leading to the decline of many populations. Currently, with the rapid growth in the human population, new threats have emerged that put their survival at risk. Pollution, bycatch, coastal development, climate change and illegal trade make sea turtles among the most threatened of species. Around the world, almost 100 institutions are dedicated to sea turtle conservation projects. The Oceanário de Lisboa is also playing an active role supporting the project 'Protection and integrated management of sea turtles in Cabo Verde' and the programme SADA, on the island of Príncipe, both led by the Universidade do Algarve.

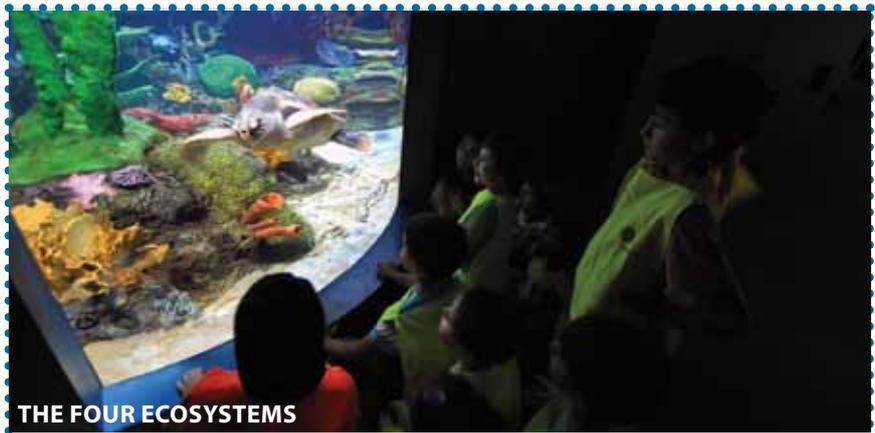
animals and is the first step towards becoming actively involved in their conservation.

Sea turtles are among the oldest living reptiles and can be easily identified by their unmistakable carapaces. Over 100 million years of evolution have prepared them to survive the most adverse conditions that the oceans can offer. Of the more than 300 species of turtles on the planet, only seven are sea turtles. The threatened status of six of them is a major concern, as they may be at risk of disappearing from the oceans forever. Due to the charm that they have acquired over many centuries of living alongside man, sea turtles are a thrilling sight for anyone to see.

TELLING THE TALE

The exhibition 'Sea turtles. The journey' opened in April 2011, and has received more than 512,000 visitors in just one year. Before the opening, and for 13 months, a dedicated team of engineers, architects and biologists were involved in building an aquarium with unique characteristics. The result recreates the holistic nature of the marine system of the North Atlantic Ocean, taking visitors on a remarkable journey. The exhibition presents a broad loop circuit and is inspired by the constant motion of the sea turtles. It maximises the space available for these animals to swim, allowing visitors to understand immediately sea turtles' true adventurous nature. The main aquarium is an oval ring with a surface area of 132m², a perimeter measuring almost 70m, an average width of 1.8m, a maximum depth of 2m and a volume of 250m³. Throughout the visit, four small aquariums encourage visitors to discover the ecosystems upon which sea turtles depend for their survival: coral reefs, seagrass beds, Sargasso Sea and oceanic waters. Despite being physically separated from the main aquarium by acrylic panels, these aquariums are visually linked, allowing the various themes to be connected.

The four loggerhead turtles (*Caretta caretta*) featured in the exhibition were taken from rescue centres (Centro de Reabilitação de Animais Marinhos de Quaios, Estação Litoral da Aguda, Portugal and El Oceanográfico de la Ciudad de las Artes y las Ciencias de Valencia, Spain), where they were recovering. They will stay in this



CORAL REEFS It is in the exuberant coral reefs that six of the seven species of sea turtle rest and search for food. Coral reefs house thousands of plants and animals. Although coral reefs occupy less than 1% of the total area of the oceans, 25% of all fish species are concentrated in these magnificent places. The abundance of life and the large number of species found in coral reefs are made possible by their unique ability to provide their inhabitants with shelter and food.

SEAGRASS BEDS In this garden of sea plants, turtles find the ideal place to feed. Green turtles are one of the few animals to eat seagrass. With their unique characteristics, seagrass beds are among the most productive marine ecosystems in the North Atlantic. They are the only plants which have adapted to survive submerged in salt water, covering extensive areas of the beds of estuaries, lagoons and coastal regions. They play an extremely important role, functioning as a place of shelter and nourishment and providing the coast with a protective barrier.

SARGASSO SEA The Sargasso Sea is the first destination of many sea turtles as soon as they are born. It is situated in the North Atlantic, west of the Azores, in the famous and mysterious Bermuda Triangle. The unusual deep blue colour of these warm and crystalline waters, and its quite high salinity levels, distinguish this area from the rest of the ocean. For a long time, scientists did not know what happened to newborn turtles until they reappeared as young adults. In those 'lost years', the turtles take refuge and feed in the Sargasso Sea, preparing for their long journey of a lifetime.

OCEANIC WATERS Turtles undertake long, solitary migrations spanning hundreds or thousands of miles. In the open ocean, they cross strong currents to return to the beaches where they were born. Dispersed across the immensity of the seas, they remain submerged for long periods in search of food. This ecosystem plays an essential role in maintaining the equilibrium of the planet.

aquarium during a clinical, nutritional and behavioural rehabilitation period. The Oceanário team will be involved in the process of reintroducing them to their natural habitat.

These sea turtles were subjected to a period of quarantine so that they could adapt to their new diet and environment. In order to maintain their health and to satisfy their energy needs, it is essential that their diet is balanced. The quantity and quality of the food consumed by the sea turtles is rigorously controlled. Their meals, which are offered daily to each animal, mainly consist of squid, small fish and

some vegetables.

The voyage of the sea turtles is an incredible experience and a unique opportunity to explore, learn about, and become closely acquainted with the planet on which we live. The Oceanário de Lisboa's commitment to conserving these animals and their habitats involves visitors in activities which increase their knowledge about these magnificent animals and their threats. Our educational activities and the guided tours to the exhibition constitute unique visiting experiences within the scope of the Oceanário's education programme.

Is education the most important function of zoos?

ERIK VAN VLIET, HEAD OF STORYTELLING, DIERENPARK AMERSFOORT, AND LARS VERSTEEGE, SAFARIPARK BEEKSE BERGEN, DEBATE ZOO PRIORITIES. WE BEGIN WITH ERIK'S OPENING LETTER TO LARS. PICTURES BY HARRY SCHRAM

DEAR LARS

My earliest childhood memories were shaped during my first visit to Amsterdam Zoo in the early 1960s. Encountering the single black rhinoceros, his mouth with its little fingerlike upper lip moving towards the offered carrot, as well as the young gorillas with their dark serious-minded faces and the incredibly large giant tortoises, were moments of sheer fascination which I can still recall. And I am no exception. Zoo animals form a large component of every child's reality. All children recognise elephants, giraffes and tigers as easily as daily features like cats, trees and bikes. A waste of intellectual capacity one might argue. You'd be better off stimulating your toddler to engage in computer games developing keyboard skills and preparing for life in the real world.

But the call from nature's top actors is irresistible. How many school-day memories compared to zoo memories does an average European have? Zoo animals do generate a tremendous impact when compared to the long and many days in the classroom. A day at the zoo is worth a year at school. And amazement is the secret.

'Wow, how can such a creature exist?' Feeling the wonder is in the foundation of our genetic makeup. Understanding nature was the key to survival in times less complicated than today. And encountering the iconic zoo species still has an impact beyond anything else. The moment after the first amazement is one of gradually translating wonder into question. Why would an anteater's body suddenly stop without finishing in a proper head? Who would design the colour combinations of a clown triggerfish? Amazement equals asking the question 'why?'. And that's

education. Not only the beginning of education but the very essence. Being brought to a position that leads to asking the question is more important than being provided with the answer.

Zoos offer more, of course. Habitat-like environments stimulate further interest as do volunteers, keeper talks, quests and all sorts of electronic bleep-bleep machines. Today's conservation education ranges from circulating random trivia to storytelling that sticks and contextualises. And educational theories increasingly underpin the amount and nature of the various approaches. But the real animal is what it's all about. Its impact is much more than all forms of secondary education combined with all sources of in-house wildlife experience. Animal Planet and Discovery Channel do bring us our daily amounts of rhinoceroses and wildebeests stampeding into our living rooms. But that's only complementary. There is

nothing like being connected to the real thing.

In the late 1970s, the era of big changes in the zoo community, we desperately needed legitimising. Zoos were under fire. We then found the breeding of endangered species as our mission. Exactly for whom and why we embarked upon those ambitious efforts remained a very relevant but unanswered question for a while. With a sigh of relief we, at least, recovered education as the reason for our increasingly successful breeding efforts. We needed all those animals for ourselves. For effective zoo education. And luckily they are still there, alive, breathing and referring to something deep down in everybody. And that is the essence of our profession. The breeding practicalities, the secondary education theories, it's all instrumental to being able to offer that one magic moment, meeting a live hippopotamus, hyacinth macaw or hammerhead shark.

The best tools nature possesses for marketing its value, in a world with so many competing thrills, are the iconic zoo animals. They help to retrieve part of what once was nature's unchallenged status as the most important dimension of life. And zoo animals keep doing that in the language of all ages and cultures in all parts of the world. For many, they are the only access to nature. Maybe we should no longer use the moth-eaten, pedantic and argumentative term 'education'. Let's try 'inspiration' or 'storytelling'. But however you want to name it, for sure education is the single most important function of zoos. I dare even go further and say, zoos are the most effective and accessible educational tools anyhow to address the world about today's most important message: the value and beauty of nature.

DEAR ERIK

We all know the obligations of modern zoos: conservation, education, recreation and research. I dare to say that without conservation, the other three obligations will not be successful. Without the ability to breed our species we will not make a contribution to the declining world populations of so many species. We will always struggle with getting our education message across.



People's minds need to be 'emptied', they need to return to their roots and forget about modern life

We will always 'cheat' our visitors by not showing them the full potential of our collections and our research is partly failing because we cannot even get our own species to breed. Conservation is the key that can make or break our missions.

The modern zoo, adventure, ecosystem, bioparc, or whatever we like to market our zoological collections as today – where would they be without the ability to manage our collections and conserve the species? There is no better marketing tool than proving your 'worth' as a zoo by breeding the species, putting effort into population conservation and being involved with the conservation of the species in the wild. It is expected of modern zoos to 'fight' for their species, and zoos being active in any kind of conservation and being able to 'sell' this to the public will be more successful. Unfortunately a trend that is seen within our zoo community is that more and more institutions have turned into commercial profit organisations and the focus has shifted towards making money. Luckily for the species it all began with,

this also means that their value has increased enormously because of their 'commercial' value. With this change, education in zoos has also changed. So much focus lies upon new creative ways of getting visitors' attention within a world which is overfilled with stimuli that sometimes the message seems to become less important. For sure we live in a difficult time with people becoming more and more blind and deaf to anything not part of their daily life, partly due to the continuing media attention from which there is almost no escape.

People's minds need to be 'emptied', they need to return to their roots and forget about modern life. And this is where our zoological institutions should step in more. What could be greater than to sit in the sunshine watching a young chimp or a rhino play around in a tree or in the mud? How much fun is it to see a cheeky colobus monkey steal food from a massive silverback gorilla? Those moments should be cherished and visitors should be left alone to spend those few minutes in this fantasy world. Only when you have the power

to distract visitors from their daily life can you think about expanding this new 'fantasy' world with other kinds of mysterious adventures.

Without the ability to conserve species, education departments can only preach to the converted and will have minimal influence on the average zoo visitor. This for sure is a huge obligation of zoos, because we need to make sure that our exhibits are natural, appealing, large and so on, because we need to create the fantasy world for the average visitor. And most importantly we need to conserve our species and breed them as naturally as possible. Only when we succeed in letting visitors be part of our passion will we be able to 'reach' them in order to teach them something.

There is a long path before us – a large majority of our well marketed breeding programmes are not even sustainable. In too many programmes the zoos are only 'users' of the species and are not contributing to conservation. Many zoos are too focused on creating their own niche to attract more visitors than their direct competitors, while they should actually pay more attention to the basics. Make sure that you breed the species that you need to breed.

'Zoos are the most effective and accessible educational tools to address the world about today's most important message; the value and beauty of nature?' Only if they focus on their most important task which is making sure they breed with their endangered species and take part in sustainable conservation!

DEAR LARS

Commerce is not a bad thing. On the contrary, zoos need commercial minds to guarantee the funding of their work. I share your fear however of a zoo world where means and aims change position and profit-making becomes the name of the game. But we cannot close our eyes to the paradoxical reality that commercial collection decisions tend to be the most educational.

The playing chimpanzee in your example never fails to touch those otherwise not connected to the animal world. And there is a good reason why you mention a chimpanzee and not a Partula snail or some of those extremely endangered amphibian species that never win the visibility prize. You do not



even take the Meller's duck, the gaur or the Visayan warthog as a convincing example. It requires a lot of effort in the fields of adventure, ecosystem suggestion and other tricks slightly looked down upon by you to make those species tell the story.

But yes, if we succeed in presenting not necessarily the most charismatic endangered species in an appealing way, we can really bring the message of their plights across. It should however not necessarily be our only message. In the long and challenging process of winning hearts and minds for conservation, we must distinguish phases. Offering a first connection to live animals to the masses is what we do best. And that can simply be done more effectively by some animal species than others. The first and foremost aim of breeding programmes is to make our own collections sustainable. Therefore we should not necessarily choose endangered species during those devil's dilemmas as to which species we want to go ahead with. Conservation education is not about showing endangered species. It is about finding the most effective tools to tell about an endangered world.

DEAR ERIK

As a collection manager I find it the task of zoos to work in the best possible way with any species, but in terms of sustainability we cannot justify the collections of many of our key species and this is precisely where our mission lies and where the education department also plays its role. Why do we need to make sure that we have as many sustainable collections as possible for as many species as possible? Why

should we frown upon spending millions on importing species which can never be sustainable in our region anyway?

In my view by working on these programmes we are making our collections more sustainable which will give the education department the tools it needs to work with. Nevertheless, this is not the only role that our breeding programmes have. A breeding programme provides structure and gives additional attention to a certain species. For sure, it needs a very creative mind to 'sell' conservation value for a Meller's duck to zoo visitors, and I agree that sometimes the status 'being endangered' is exploited. I do not wish to start a discussion here about importing endangered species which are so rare in the EAZA region that a sustainable population can simply never be built, in the view of conservation. There is for sure a huge commercial value to 'endangered species' and my fear is that more and more examples of unsustainable collection management decisions will be taken for commercial reasons.

There are also enough examples of very small species like ants or termites which make a fantastic display with so many educational possibilities. Perhaps we need more imagination within our education departments to work with 'less attractive' species as well?

I agree with you that we need to find the best ways to educate our visitors about the endangered world, but in my opinion education departments often overlook the potential to make the visitors part of the magic world of our collections. Our collections are the key to successfully reaching the minds of our visitors.



HAVE YOUR SAY

Would you like to respond to the debaters on this issue? Please write to Mike Sullivan with your comments at michael.sullivan@eaza.net.

Improving security in Romanian zoos

HOW TO CONDUCT A WORKSHOP, DESPITE ESCAPED TIGERS AND VLAD THE IMPALER

Douglas Richardson, Animal Collection Manager, RZSS Highland Wildlife Park



It was my pleasure this January to conduct a workshop in Targoviste, Romania, on behalf of BIAZA, who have been tasked with mentoring the Romanian Zoo Federation on behalf of EAZA. The workshop topic was zoo security from the animal, visitor and staff perspectives. There were 15 participants – directors, curators, vets and zoo biologists – from 10 different Romanian zoos. The workshop was supposed to have been scheduled for slightly later in the year, but an incident with a tiger caused the timing to be moved forward.

The first day started with my asking the participants what their priorities were for this workshop, and the vast majority wanted to know more about animal escapes, both how to deal with them and how to avoid them. We discussed the recent tiger escape at length and used this as an example and built the later discussions around it.

What became apparent quite quickly was that although all the zoos are municipally owned and funded, the local and central government have a limited comprehension of their needs. This is not an accusation, but it illustrates the need for a greater understanding of what support is required to improve the standards and functions of the country's zoos. They have to deal with the ironic

situation of it being illegal for the zoos to hold firearms or for a firearm to be discharged within city limits. It is to the zoos' credit that they have come up with a rather novel way around the legislation by each collection having a couple of friendly, local, licensed hunters on tap for incidents that sadly may require the use of lethal force to protect the lives of visitors and/or staff. Unfortunately, as the tiger had to be dispatched to avoid a more serious incident, the legal system is now considering how they need to deal with the individuals who used a rifle within the town's borders.

We went on to discuss protocols for escapes, what everyone's role is during an incident, the need for animal staff to develop a controlled version of obsessive compulsive behaviour when it came to doors and locks, and the obvious need for some legislative changes and how this may be achieved. Other discussions centred round simple alterations to facilities, eg making sure that doors open into enclosures, the nature and size of visitor barriers in front of dangerous animal enclosures, warning signage, and how to survive life-threatening situations.

During breaks, the attendees were offered the opportunity to discuss any new enclosure plans, the advantages

of EAZA membership, and their potential role within the global zoo community. On day two we all went around Targoviste Zoo and looked at real situations and discussed the pros and cons of their facilities and what changes should be implemented in light of the topics we explored the day before. The zoo has a number of areas that require alteration, but the statue of former local boy, Vlad the Impaler, near their main entrance certainly caught my attention; this is matched only by the plaque commemorating the life and music of Jimi Hendrix in the Seattle Zoo.

On the 21st I flew out of Bucharest, just as the biggest snow storm in a number of years hit Romania. The Romanians were superb and generous hosts and I was impressed by their tangible desire to improve in spite of some of the legal and financial constraints they have to operate within.

I would like to thank Miranda Stevenson for inviting me to conduct the workshop, Dana Canari of the Romanian Zoo Federation for organising the whole thing, Codrut Visoiu who hosted my tour of and accommodation in the Bucharest Zoo, and Vlad Vancia of the Turda Zoo who provided a superb translation service; he definitely had to work harder than anyone else, including me.



EAZA ANNUAL CONFERENCE

September 26 to 29, with Icebreaker on Tuesday 25

EAZA's Annual Conference in 2012 will be hosted by Alpenzoo, which is located in Innsbruck, the capital city of the federal state of Tyrol in western Austria.

The conference itself will be held in Congress & Messe Innsbruck, a modern congress centre at the heart of the city.

Registrations are now open and accommodation can be booked in a range of hotels located around the city centre.

Full Conference Fee	€ 630-
Early bird rate* <i>(register before midnight June 30th)</i>	€ 530-
Single Day Fee	€ 200-
Early bird rate* <i>(register before midnight June 30th)</i>	€ 185-
Accompanying Partner (icebreaker, zoo visit, farewell dinner)	€ 150-

2012
INNS' BRUCK



For more information, visit www.eaza.net

Feed back

A SPECIAL REPORT ON THE 7TH EUROPEAN ZOO NUTRITION CONFERENCE REVEALS THAT MORE ANSWERS ARE BEING FOUND TO THE BURNING QUESTIONS

Andrea Fidgett, Nutritionist, North of England Zoological Society, Chester Zoo

The nutrition of zoo animals is fascinating for its many challenges, in terms of logistics, hygiene, health issues and communication involved, the evolutionary history revealed by adaptations of digestive physiology, and the enormous variety of items considered 'food' by this planet's inhabitants. So this January, animal experts from across the globe were once more provided with plenty to chew on at the 7th European Zoo Nutrition Conference, organised by the University of Zurich, Zurich Zoo and the EAZA Nutrition Group.

More than 125 participants and speakers from 20 countries attended and two different aims underpinned the conference. With respect to content, attendees of the previous conference had requested basic information, such as how a digestibility trial is performed, how body condition is evaluated, or how roughages should be chosen. So this year, we offered several activities (workshop, zoo demonstrations) that covered many of these questions, and we actively encouraged presentations based on practical experiences. Additionally, several keynote talks addressed issues considered of general interest by last conference's attendees. In terms of costs, previous attendees emphasized that low conference costs are very important, so we did our best to keep expense to an absolute minimum while maintaining an atmosphere in which colleagues can meet. Nevertheless, the present financial status of many zoos meant that some people who were interested in joining us could not attend.

Some topics were familiar – management of obese and overweight animals remains a husbandry challenge for zoos, and diets need fewer sugars and



WITH THANKS Significant financial support via sponsorship was contributed by Arie Blok Diervoeding (Kaspar Faunafood), Brogaarden ApS, Kiezebrink Putten BV, Mazuri Zoo Foods Europe, Mazuri Exotic Animal Feeding Resource US / Nutrazoo, Provet AG, Provimi Kliba AG, St. Laurent, and Versela-Laga. Additional sponsorship was provided by DogVision, Taylor & Francis Academic, Zurich Zoo, and the Canton of Zurich and the City of Zurich. Participants also contributed items and bought tickets for a raffle held on the last evening which raised over 500 Euros for the EAZA IUCN/SSC Southeast Asia Campaign. A huge thank you, too, to Marcus Clauss, his colleagues at the University of Zurich and fantastic team of helpers for organising another wonderful conference.

more fibre, explained by the fact that wild fruit composition is quite different to the more readily available domestic cultivars in common use. However, progress was also evident. Weight loss programmes are working, precisely because commercially available fruits and other low-fibre items are being reduced in diets. And the fibrous 'stuff' is being increased! Also, more talks were delivered by, or highlighted the positive involvement of keepers, providing early evidence that efforts to deliver targeted nutrition training for zoo keepers is working. Research questions are also shifting from identifying the problem 'this food or diet is wrong' to making recommendations of 'this is what it should be'. Micronutrients and in particular, vitamin A, were covered in detail and

more work here is needed. Taking on these recommendations, contributions and discussions also considered diet change or 'how to make proper diets' encompassing feeding behaviour, logistics and costs of feeds, the necessity for patience, further education for animal care staff and, in some instances, perhaps even our visitors.

The final part of the puzzle is monitoring, or 'are we doing ok?', and examples of non- or low-invasive tests, measuring body condition, obesity, diabetes and nutrient status were presented. Without these checks in place, welfare may be compromised. New diet management software under development promises to be of significant technical assistance to solving the question 'how can we feed our animals well?'

Outputs from the conference will include another special nutrition issue of *Zooquaria*. Copies of presentation abstracts can be downloaded from the nutrition area of www.eaza.net. Planning for the next conference, which is held approximately every two years, is already under way with a target date of January 2014.



The EAZA Nutrition Group and EAZA Academy worked together to organise a very successful one-day course prior to the start of the conference. 56 participants from 49 different institutions across 16 different countries took part in this interactive workshop relating to best practices when feeding herbivores. Participants commented that there was a good mix of theory and practical advice that was directly useful in everyday zookeeping. Graduate details can be found on the EAZA Academy pages of the EAZA website.



ZOOBOY27 IS ON A MISSION TO BROADEN THE THINKING AND INFLUENCE OF THE EUROPEAN ZOO WORLD, AND PULL NO PUNCHES IN DOING SO. HE REMAINS AT LARGE.

When the camera lies

ZOOS WORK VERY HARD TO CREATE NATURALISTIC ENCLOSURES. SO WHY DO SO MANY STILL MAKE IT EASY FOR THE MEDIA TO GIVE A DISTORTED VIEW?

During the past decades zoo managers and staff at all levels have ceaselessly worked towards the creation of as naturalistic as possible enclosures and behaviour of zoo animals. Millions, and sometimes tens of millions are spent on exhibit design and construction to mimic natural environments. Species specific group structures are aimed for, and much time, effort and money are invested in behavioural enrichment, not only in order to raise animal wellbeing, but also to present as natural picture as possible of wild animals to the visitors.

Contrastingly, what the viewer sees in the average television programme or series on zoo activities is something totally different. Vets in the zoo are almost continuously operating on animals, castrating them, pulling teeth or tusks, and shooting with blowpipes or anaesthesia guns. Keepers are catching animals all the time, separating them from their group members in their inside stables full of fences and steel bars, moving them from one enclosure to the other, forcing them into heavy crates, and loading them onto trucks or planes to transport them to other zoos. Zoo animals must be handled, managed and manipulated; they must be ill, sick or limping, must fight each other and get seriously wounded. Otherwise they are not interesting. At least, that is what TV-makers want us to believe. That is what they want to come to the zoo for with their camera crews. Not for natural animal behaviour, not for beautiful naturalistic enclosures, harmonic groups or educational and conservation highlights.

In their eagerness to appear on the screen, zoo managers give the TV-makers what they want: footage with as much artificial intervention in normal animal life as possible, resulting in an overall public image of zoos in which exceptions become the standard. Exactly the opposite of what we altogether have been so effortlessly striving at during the past decades. Even worse: it seems that many a zoo pays considerable sums of money to TV-producers to sponsor its own 'anti-propaganda'!

A culmination of such self-betrayal, such selling of ideals in exchange for commercialism, was the tragic case of Knut. TV-makers (and other media) made a hero of this poor motherless animal, and its home zoo eagerly fed them with images,

stories and interviews. The (short-term!) spin-off in terms of PR, visitor numbers and income was enormous. So profitable that this example was soon followed by another (non-EAZA) zoo in Denmark. Back to the past, when chimps and gorillas in diapers attracted tenfold media attention compared to harmoniously mother/group-reared ape babies. [Please note that this was less than 15 years ago and even now it is tempting to hand-raise zoo-born animals because of the assured interest of the media.]

TV-makers claim that they know what the general public wants to see or hear. That is why they want 'action' in the zoo, emotion about 'pitiful' animals, and ultimate dedication of keepers to the 'helpless' creatures under their care. But is this really true? Is this really what the TV-viewers want to see? I do not believe it! Consider the immensely popular David Attenborough Planet Earth and Frozen Planet television series. All purely natural, nothing artificial, and yet adored by the viewers. Quite recently there was even considerable protest when it was discovered that polar bear cubs with their mother in a winter snow-den were filmed in a zoo, and not in the wild. TV-viewers want reality, the truth, natural animal behaviour, pure nature, not fake, not artificial. TV-makers of lesser quality (than those of the BBC) still do not seem to understand that.

The ultimate question: can we change this? I think so, if we want. Until the 1980s, in my country it was common for zoos almost weekly to bring animals into TV studios; snakes, baby orangs, armadillos and the rest. Great amusement for the viewers. We, zoo people, however, increasingly found this totally unnatural presentation of wild animals embarrassing. After lengthy discussions our national federation decided not to honour further requests to bring animals into the studio. Conclusion: if we really want to profit from our tremendous investments in natural enclosures, animal behaviour and wellbeing, we must act collectively and change simple-minded views of media people. We cannot accomplish that as individual institutions, but collectively we can, if we want! Zoos need to be commercial in order to survive, but spending tons to waste millions has nothing to do with truly effective long-term commercialism.

Can we change this, or are we eternally bound to the dictates of simple-minded media-people?

OUR DINOSAURS ARE STAMPING INTO EUROPE

BILLINGS PRODUCTIONS' LIFE-LIKE ANIMATRONIC DINOSAURS ARE A HIT IN MANY LEADING ZOOS, MUSEUMS AND THEME PARKS ACROSS THE UNITED STATES. EXPERIENCE THEM IN EUROPE THIS SPRING/SUMMER AT BRISTOL ZOO GARDENS, CHESTER ZOO, MADRID ZOO AQUARIUM AND MARINELAND ANTIQUES.

REASONS WHY MORE ZOOS PARTNER WITH US:

CLOSE TO 300
DINOSAURS
SPANNING MORE
THAN 55 SPECIES

EXCEPTIONAL
QUALITY FOR BOTH
INDOOR AND
OUTDOOR DISPLAY

EXPERIENCED
EXHIBIT
CONSULTANTS AND
TECHNICAL CREW

BILLINGS PRODUCTIONS, INC
WHERE THE PREHISTORIC PAST COMES TO LIFE!
www.billingsproductions.com



For more information, visit our website or contact our International Representative today:
CHRISTOPHER CHEW | email: chrischew@billingsproductions.com | cell: +1 972 6588833 / +65 97980881
Billings Productions, Inc | 1277 Republic Parkway, Allen TX 75002, U.S.A. | Tel. +1 972 5627265 | Fax: +1 972 562 7266



MazuriTM Zoo Foods

Meeting the nutritional requirements of each species is a continual challenge faced by the leading nutritional experts in wildlife research. Formulating and producing a product that is palatable, completely drug free and that is capable of approximating a natural diet is what sets Mazuri Zoo Foods apart from the competition.

We have a number of agents throughout Europe – phone or email for more details.

Tel +44 (0) 1376 511260
Fax: +44 (0) 1376 511247
Email: info@mazurifoods.com
www.mazuri.eu



BIRDS

- Crane
- Flamingo Breeder
- Flamingo Maintenance
- Lori Nectar
- Ostrich Breeder
- Ostrich Grower/Maintenance
- Ostrich Starter
- Parrot (Zoo A)
- Pheasant Breeder
- Pheasant Maintenance
- Pheasant Starter
- Poultry Breeder
- Poultry Grower
- Poultry Starter
- Sea Duck
- Sunbird Nectar
- Waterfowl Breeder
- Waterfowl Maintenance
- Waterfowl Starter

RODENTS

- Guinea Pig
- Rabbit Breeder
- Rabbit Maintenance
- Rodent Breeder
- Rodent Maintenance

PRIMATES

- Leaf Eater Primate
- Marmoset Gum
- Marmoset Jelly
- Marmoset (Mini Marex)
- Mazuri Primate
- NW Primate Gluten Free
- Old World Monkey
- OWM Chunks (Banana)
- Tamarin Cake
- Trio Munch Range

CARNIVORES

- Canine (D3)
- Carnivore Meat
- Carnivore Feline
- Carnivore Supplement
- Feline
- Feline High Vit A Supplement
- Feline Supplement
- Omnivore Supplement
- Polar Bear Supplement
- Zoo Diet A

GRAZERS AND BROWSERS

- Browser Breeder
- Browser Maintenance
- Camel
- EL-E-VITE
- Exotic Grazer
- Grazer
- Herbivore Concentrate
- Macropod
- Moose
- Pig
- Reindeer
- Sheep (Locush)
- Vitamin E Cubes
- White Rhino Concentrate
- Zebra

AQUATICS

- Aquatic Diets 3 and 4
- Fish Eater Tablets
- Aquatic Gels (Herbivore and Omnivore)

MILK REPLACERS

- Flamingo Crop Milk Replacer
- Milk Replacers
- Rhino Milk Replacer

SPECIAL DIETS

- 4% Vitamin E Supplement
- Exotic Leaf Eater
- High Fibre Red Panda
- Kinkajou Cake
- LowFe
- Zooplement GP and ZM

Leading the way