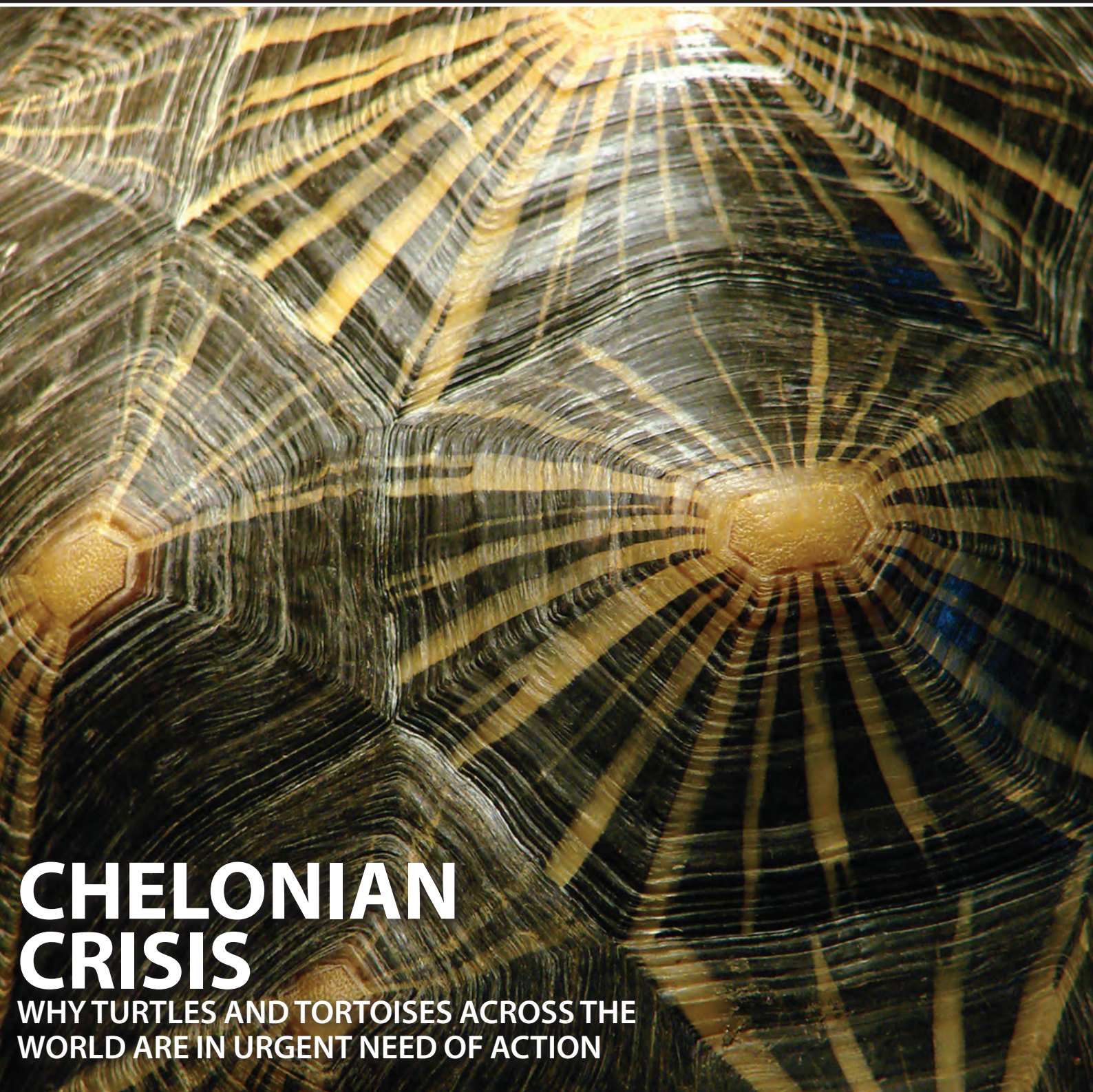


QUARTERLY PUBLICATION OF THE EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

ZOOQUARIA

WINTER 2019/20

ISSUE 107



CHELONIAN CRISIS

WHY TURTLES AND TORTOISES ACROSS THE
WORLD ARE IN URGENT NEED OF ACTION



PLANNING FOR THE FUTURE

HOW A NEW RCP WILL TRANSFORM CHELONIANS' PROSPECTS

NOT FOR SALE

WHY ILLEGAL TRADE REMAINS A CRITICAL THREAT





Primates



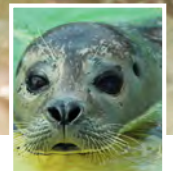
Herbivores



Carnivores



Birds



Fish-Eaters

Scientific concepts for

We feel responsible for those we are familiar with. Therefore Granovit Zoofeed partners with zoos to implement scientific nutrition concepts that keep animals strong and healthy.

Participate in science based feeding technology and share our passion for responsible zoo animal nutrition.

www.granovit.ch

Contact our distribution partners:

France: SERLAB www.serlab.fr | Scandinavia: BROGAARDEN® www.brogaarden.eu

For other markets: Granovit Zoofeed www.granovit.ch | T. +41 61 816 16 16 | info@granovit.ch



- 4 **From the Director's chair**
Our Director introduces this special chelonian issue, and announces the launch of EAZA's new campaign
- 5 **Noticeboard**
The latest news from the EAZA community
- 6 **Births & hatchings**
Success stories from the turtle and tortoise world
- 8 **Together for nature**
Reports from three recent conferences demonstrate the vital importance of global co-operation
- 10 **Asking the right questions**
EAZA's new Which Fish? campaign shines the spotlight on marine conservation
- 12 **Turtles in trouble**
Zooquaria talks to IUCN SG Executive Vice-Chair Anders Rhodin about the role he plays in chelonian conservation
- 14 **Meet the chelonians**
As a new RCP is finalised for chelonians, we look at what it aims to achieve in the years to come
- 16 **Origin unknown**
How confiscated animals can create studbook issues
- 17 **The return to Rote Island**
Why the highly endangered snake-necked turtle is a worthy subject for an EAZA EEP
- 18 **A turtle solution**
Supporting the European pond turtle
- 19 **Plans for a radiant future**
The perilous position of the radiated tortoise
- 20 **Chelonia conservation**
A visual guide to the facts and figures of tortoise and turtle conservation
- 21 **A recipe for success**
An imaginative kitchen-themed exhibit is raising awareness of the plight of an endangered turtle
- 22 **The great turtle rescue**
Lessons learned from the Hong Kong confiscation
- 24 **Chelonians in Cambodia**
Why the ACCB is a hotspot for turtle conservation
- 26 **Save our sulcata**
Is SOS Sulcata the last chance for this species?
- 27 **Home comforts**
Making a home for the enigmatic leaf turtle
- 28 **Making light work**
How Jersey Zoo perfected its light and heat provision for its resident turtles
- 30 **Trade wars**
Tackling illegal trading in tortoises and turtles

Zooquaria

EDITORIAL BOARD:

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

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

Editor Joanna Swinnerton

Editorial Staff Katharina Herrmann, William van Lint

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: Radiated tortoise shell © Vassil CC

For information on print subscriptions to *Zooquaria* visit:

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

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

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

Plates for printing are free of chemicals. All waste is disposed of in an environmentally friendly manner. Printed by Euro Mail BV.



FROM THE DIRECTOR'S CHAIR

I am pleased to share with you this special issue on chelonians, in which we look at the terrible situation that confronts chelonians and at the conservationists working to make a difference. I must admit that my personal knowledge of chelonians is somewhat limited, so I was fascinated by the insights that this issue provides; for example, I never knew that many tortoise and turtle species were such avid climbers! Anders Rhodin, Chair of the IUCN SSC Tortoise and Freshwater Turtle Specialist Group (see his interview with David Williams-Mitchell on pp. 12–13), introduces us to the current conservation situation whereby more than 50 per cent of species are currently threatened with extinction. In their articles, both Anders Rhodin and Chris Shepherd, former head of TRAFFIC and now Monitor at the Conservation Research Society (p. 30), identify that many of the pressures on chelonian populations are primarily human in origin, and primarily based around habitat loss and trade (both legal and illegal). It is therefore heartening to read also of the great efforts of many EAZA Members in combating these threats through a range of *ex situ* and *in situ* activities. Many of you will be aware of my love of data, and my regular reminders to add data to our Conservation Database, and so I am also happy to see a summary infographic on chelonian conservation statistics on page 20.

A great example of how the EAZA community was able to mobilise collective conservation action is summarised in the article about the Hong Kong turtle confiscation, whereby 10,000 turtles were seized in a customs operation (pp. 22–23). Due to our coordinated efforts, many of these turtles were given homes by EAZA Members and they have helped guide EAZA's efforts in husbandry and conservation to this day. A common theme, and subsequent obstacle, for confiscations is that of identifying origins of confiscated animals. Given that confiscations are regular, and zoos are often asked to receive such individuals, this can lead to issues of management and housing. Mark de Boer at Rotterdam Zoo outlines the issue as it pertains to Egyptian tortoises, a widely trafficked species (p. 16). The issue of varying subspecies of tortoises and turtles and subsequent conservation classification and action also means that focusing on genetic analysis will greatly aid effective decision-making in both confiscations and our other work.

As our knowledge increased, we were able to write a Regional Collection Plan (RCP) for chelonian species in 2019, which assessed 51 species over two days and recommended 29 as new-style EEPs, including 10 for new species. The roles are primarily as insurance populations, but there's a lot of research and *in situ* support built in, too. TAG Chair Matt Goetz shares the details on pp. 14–15. The RCP also identifies that many chelonians are ideal candidates for the One Plan approach. We look at reintroductions and the

plans being made to reintroduce Rote Island snake-necked turtles (p. 17), and efforts to safeguard a population of European pond turtles (p. 18). *In situ* support is typified by the ACCB project of AllwetterZoo Münster in Cambodia (pp. 24–25) and Amiens Zoo's project in Senegal (p. 26).

Finally we look at welfare within exhibits, and UV lighting especially (pp. 28–9), and the exhibits themselves – one for leaf turtles at Prague Zoo (p. 27), and one for Vietnamese pond turtles at ZSL London (p. 21) – exhibits that meet the needs of the species while telling a powerful story about these highly threatened species.

Last but not least, I have to deviate from chelonians to highlight the launch of our Which Fish? Conservation Campaign 2020–2021 (p. 20). I know many of you have already joined and encourage those who haven't to visit www.whichfish.eu and sign up today. Whether it be fish, chelonians or any other taxa, what is clear is that EAZA Members are at the forefront of conservation activities and I wish everyone much continuing success in this work in 2020 and beyond.

Myfanwy Griffith
Executive Director, EAZA

NOTICEBOARD

EAZA SIGNS THE ABU DHABI DECLARATION

The year 2020 marks the end of the Decade of Biodiversity, along with the Aichi Targets and the whole United Nations Convention on Biological Diversity (CBD) framework. This means that the CBD will spend this year taking evidence from stakeholders and designing a new framework for the decades to come.

We cannot pretend that the CBD strategy has thus far been effective in stopping biodiversity loss, although public understanding of the concepts and the scale of the problem is much further advanced than at the beginning of the 2010s. Time, however, is not on the planet's side, and as a result, the International Union for the Conservation of Nature (IUCN) has issued the Abu Dhabi Declaration, a manifesto for action that the Union and the declaration's signatories intend as a call to arms for the international community.

The Abu Dhabi Declaration calls for an end to species decline by 2030, and for the groundwork to be done to allow for species recovery by 2050. The declaration is undoubtedly ambitious; however, IUCN calculates that without such ambition, we are likely to lose thousands of species, including some of the world's best-known animals and plants, unless there is a concerted effort by governments, international agencies, the business community, conservationists and the public to prevent their extinction. With a view to demonstrating our commitment to the protection and recovery of animal species, EAZA has signed the declaration, along with many of our Members. Any organisation can sign the declaration and append their logo to the document by writing to species@iucn.org, and we urge every EAZA Member to take the time to read the Declaration and sign up. You do not have to be an IUCN member to sign the Declaration.

The Convention on Biological Diversity's Conference of the Parties will take place in Kunming, China in October next year, and will set out the framework for at least the next 10 years.

IUCN WORLD CONSERVATION CONGRESS

In 2020, IUCN will hold its four-yearly World Conservation Congress, the largest global forum for conservation and an important driver of species and habitat protection. The 2020 iteration of the Congress will take place in Marseille, France in June. EAZA will be present and will take an active part in the proceedings; we have sponsored two motions (on law enforcement in the commercial trade in tigers and tiger parts, and the trafficking of songbirds, in line with the Silent Forest campaign's priorities), co-sponsored another five motions, and support the 37 motions sponsored or co-sponsored by EAZA/IUCN Members. In addition, EAZA made a 'Speaker Pitch' for the Forum of the WCC (this is the part of the Congress that does not include votes on motions) which has been accepted, meaning that we will present on the topic of 'How does visiting a zoo or aquarium help conservation?' To ensure that we have a strong and unified presence, IUCN members who are also EAZA Members are asked to contact Sandrine Camus (Sandrine.Camus@eaza.net), who will be coordinating EAZA work for the WCC; please keep us up to date with your plans.

EPZQF IN TRANSLATION

The European Professional Zookeeper Qualification Framework (EPZQF), an Erasmus+ project that has been coordinated by EAZA with input from EAZA Members and educational institutions specialising in the training of keepers, is now available in translation.

The goal of the EPZQF project was to identify the key skills, knowledge and competences that zookeepers need to be able to carry out their duties successfully. As a result of this project, there is now a clear set of expectations that can be applied across the European Union and the wider EAZA region. EAZA commissioned professional translations of the framework into other languages to support more EAZA Members in applying the EPZQF

EAZA CORPORATE MEMBERS

AB Aqua Medic GmbH
Aqua-Teknik A/S
Arie Blok Animal Nutrition
Beresford SAS
Billings Productions, Inc
BioZoo Information
Brogaarden ApS
Bureau d'Etudes AKONGO
Bureau d'Etudes Bioparc
Carl Stahl Architecture
China Light Festival BV
Close to Bone
Crossborder Animal Services BV
Dorset Identification BV
EKIPA
Fachjan
Fox Consulting
Gantner Ticketing
Granovit
HMJ Design
IFA SKYFAST
Immotion
KaGo & Hammerschmidt GmbH
Kiezebrink International
Lionhouse Architects
Marine Nutrition
Mazuri
Nautilus
Nieuwkoop
Pangea Rocks
Ralf Nature
Rasbach Architekten
Ravensden Plc
Ray Hole Architects
Saint Laurent S.A.
Sanero Kunstfelsen
Seafoodia
TVK Zoodesign
Zoological Adviser
Zoologistics
Zoopoli
Zooprofis

to their own training, professional development and recruitment. This complements existing community translations and will open up the framework to more people. So far in 2019, the EPZQF team has added translations in Czech, Portuguese and Croatian, and Spanish, German and Italian translations will be available early in 2020. You can find the translations, together with the original framework in English, online modules and other resources on the EPZQF website:
<https://www.zookeepers.eu/>

NEW ARRIVALS

TURTLE SUCCESS Philipp Wagner, Curator of Research and Conservation, Allwetterzoo Münster, Germany, reports on three projects that are being supported by the International Centre of Turtle Conservation

THE RAREST ZOO HATCHLINGS IN THE WORLD

ZHOU'S BOX TURTLE (*Cuora zhoui*) is one of the rarest tortoises in the world. Thought to be endemic to China, all known 'wild' specimens have been traced back to Chinese food markets and the species has never been found in nature. Fewer than 200 adult individuals were available from the trade between 1990 and 2009, and no new specimen has been seen since then. Therefore we think that the species is already extinct in the wild. The 200 wild-caught founders decreased in human care relatively rapidly to fewer than 30 adult individuals, and only a handful of breeders are able to reproduce the species. The most successful are Ingrid and Elmar Meier from the International Centre of Turtle Conservation (IZS), a conservation project located at the Allwetterzoo Münster, Germany, and operated by the zoo and the Zoological Society for the Conservation of Species and Populations (ZGAP).

The world *ex situ* population totals about 170 individuals, and those include more than 80 hatchlings from the IZS. However, even with the great success of the survival of this species, the habitats and distribution of the species is still unknown and there is a strong likelihood that the species has already disappeared in the wild. So our next conservation actions should include



more *ex situ* breeding populations and an intensive search for the species in their possible countries of origin. *Cuora zhoui* is heavily reliant on us, the zoo community. There are private breeders and turtle conservation societies who already manage populations of this super-rare species, but for a sustainable *ex situ* breeding population we need zoos with off-show breeding facilities for the species' survival.

HIDDEN BEAUTIES WITH AN UNCERTAIN FUTURE

THE MOST BEAUTIFUL *Cuora* species are closely related and highly terrestrial. *Cuora bourreti*, *Cuora galbinifrons* and

Cuora picturata are all Critically Endangered according to the IUCN and predominantly occur in Vietnam. All three species face the same threats: Chinese food and medicine markets, poaching, habitat destruction and local markets. All of them are relatively delicate in human care, easily stressed and not easy to breed.

The estimated number of individuals in nature of *Cuora galbinifrons* is between 10,000 and 40,000, with about 1,500 specimens in human care. The situation of *Cuora bourreti* is somewhat worse, with an estimated population of 10,000-20,000 individuals in nature, but fewer than 1,000 in human care.

Twelve years after the scientific description *Cuora picturata* was found in 2010 for the first time in the wild, the situation of the species is not encouraging. The remaining habitat is small and the wild population is estimated to comprise fewer than a maximum of 10,000 individuals with only 500 specimens in human care. Successful population management, and especially regular success, is still rare. The small clutch size of one to three eggs makes the reproduction process slow, and adult specimens are easily stressed, which often results in a non-productive breeding season. The IZS is the only EAZA institution that regularly produces offspring for all three

INDOCHINESE BOX TURTLE (*CUORA BOURRETI*) © PHILIPP WAGNER



species. Despite the fact that these are very colourful and attractive tortoises, they are not the best animals for zoo exhibitions. Single individuals could work, but I want to encourage zoos to have off-show rearing space for a breeding population and to use modern media to show the individuals to visitors.

ONE OUT OF 115

THE SULAWESI FOREST TURTLE, (*Leucocephalon yuwonoi*) is endemic to the Minahasa Peninsula of northern Sulawesi, and is Critically Endangered. Detailed field studies are still absent, but although it seems that the species is more common than previously thought, population management programmes are still needed.

The species is threatened by habitat destruction, especially logging and clearing for palm plantations, and to a lesser extent by its capture for food markets. Besides the need for population surveys to monitor the wild populations, conservation priorities must include *ex situ* population management programmes, which will be a considerable challenge. Females lay only a single egg, and occasionally two eggs, but several clutches in a year are possible. This results in a low reproductive rate, but increasing the species' numbers is difficult and the success is very limited. The known number of the global F1 captive population is 115. This mainly includes offspring from a private keeper (27 ind.), the IZS, operated by Allwetterzoo Münster, Germany (23 ind.) and Denver Zoo (22 ind.). The remaining 43 F1 individuals are mainly bred by US zoos and organisations, as Allwetterzoo is the only EAZA institution that holds the species and the only global institution that regularly breeds this species (the Denver Zoo series is more or less from one year). Moreover, the global founder population is about 150 individuals because the mortality of newly imported specimens is between 25 and 100 per cent. The difficulties experienced in successfully increasing the numbers of this species in human care could be caused by their being prone to stress and having less than optimal conditions.

ALDABRA GIANT TORTOISES BORN AT TAIPEI ZOO



TAIPEI ZOO

IN 2018, TAIPEI ZOO had the first successful zoo-born hatchlings of the Aldabra giant tortoises (*Aldabrachelys gigantea*), thanks to improvements made to the animals' environment and feeding methods as part of a five-year programme, write Gekko Tai, Curator of Amphibian and Reptile House, Taipei Zoo, and Eric Tsao, PhD, CEO, Conservation and Research Centre, Taipei Zoo, Taiwan. Segregating males and females can stimulate adult estrous, and allow for mating behaviours over several months. In the past we had observed the adult tortoises displaying mating behaviour every year, but no eggs were found, so we observed their behaviour to try to establish the cause.

First, we found that most of our tortoises were not stable when walking. Obviously a lack of leg muscle endurance is a major issue, because they can't properly mate if they can't lift their bodies off the ground. Once we had understood the problem, we began to think how we could improve the situation.

The first step was to check whether the nutritional composition and food intake met the needs of each individual. At this point, we received a useful gift from a former colleague: several photos of wild Aldabra giant tortoises, taken on Moyenne Island in the Seychelles, where the reintroduced Aldabra giant tortoises live. The photos showed that the terrain of these islands is variable and undulating, and the tortoises were active in this environment every day. By contrast, we had provided an environment that was too simple and flat, because of the fear of the tortoises overturning, but as a result they were not getting enough exercise.

Since 2013, Taipei Zoo has carried out several measures to improve the

environment for its Aldabra giant tortoises. We selected the hillside area inside the zoo as a new environment, where not only was the space larger, but also the hills were closer to the 30-degree angle that the tortoises needed to explore and exercise. In addition, we increased the food intake and the proportion of leaves to meet the true nutritional needs of the tortoises. Another key improvement in feeding was to change the feeding method. In the past we placed food on the ground for feeding. Now we feed tortoises by hanging food. In this feeding mode, the tortoises must straighten their necks and even lift their forefeet to reach their diet, which is closer to the tortoise's feeding habits in the wild.

Since the improvements were made, the tortoises have become more stable and the growth of individuals has accelerated. Then in November 2017, one of the female tortoises appeared to be looking for a place to lay eggs, and duly spawned in an area prepared by the keeper. The keeper removed the eggs and artificially incubated them. During the incubation process, we used a light source to examine the embryo and confirm that the egg had been inseminated. In March the following year, these eggs hatched successfully.

The zoo provided the newborns with a complex and varied environment, as it was observed that young tortoises also like to climb high. The young tortoises are healthy and growing well, and the success of this species at Taipei Zoo has been a breakthrough. But for the zoo the value lies in the process: we have improved animal welfare, so that the tortoises have better care and live more closely to their natural life in the wild, and this is the goal that we always pursue.

Together for nature

THE 74TH WAZA ANNUAL CONFERENCE ADDRESSED A RANGE OF CRUCIAL TOPICS AS IT BROUGHT TOGETHER ZOO PROFESSIONALS FROM ACROSS THE GLOBE

Gavrielle Kirk-Cohen, WAZA Director of Communications

The World Association of Zoos and Aquariums (WAZA) held the 74th WAZA Annual Conference in Buenos Aires, Argentina from 3–7 November. The conference drew participants from 34 countries and regions around the world under the theme ‘Together for Nature’.

The themes of the discussions included the conservation impact of human population growth and the role that zoos and aquariums can play to address this issue; how to work with the next generation of professionals; crisis communications; animal welfare policies set by the tourism industry; and species conservation and sustainability.

A panel on the WAZA/IUCN Global Species Plan delved into how zoos and aquariums can work more closely with the IUCN and the role they can play as IUCN Red List Assessment centres, using as an example The Deep aquarium in the UK.

Another main topic of discussion was the WAZA 2023 Animal Welfare Goal, which states that by the end of 2023, WAZA associations must have an animal welfare evaluation process in place with specific elements approved by WAZA. By 2023, all WAZA institutional members must be compliant with this process.

During the conference, WAZA presented three awards. Zoo Zürich was awarded the WAZA Conservation

Award for its outstanding 25-year commitment to the protection of the Masoala National Park in Madagascar. Taronga Zoo was awarded the WAZA Environmental Sustainability Award for its resolute commitment to sustainable practices. Finally, Kris Vehrs, Executive Director of the Association of Zoos and Aquariums (AZA) was honoured with the Heini Hediger award – WAZA’s highest award for professional excellence, in recognition of her four decades of respected leadership in the global zoo and aquarium community.

Theo Pagel (Cologne Zoo) was ratified as WAZA President for the 2019–2021 period. The three Council representatives for region II (Europe and Middle East) were also ratified (Thomas Kauffels, Opel-Zoo; Radosław Ratajszczak, Wrocław Zoo; James Cretney, Marwell Wildlife). Simon Tonge (Wild Planet Trust) will continue as chair of the WAZA Committee for Population Management (CPM). EAZA was elected to take a seat at the WAZA Council and will be represented by its Executive Director Myfanwy Griffith, who was also appointed chair of the WAZA Associations Committee.

The 75th WAZA Annual Conference, held in conjunction with the International Zoo Educators Association (IZE) and hosted by San Diego Zoo, will take place from 11–15 October 2020.

How to start a revolution

AT THE 2019 ANNUAL MEETING OF THE IUCN SSC CPSG, THE FOCUS WAS ON ENGAGING GOVERNMENTS TO REVOLUTIONISE SPECIES CONSERVATION PLANNING

Jamie Copsey, Director of Training, and Fran Webber, Communications Officer, IUCN SSC CPSG

We know we must transform species conservation planning so that we can scale up our work to save species. To do this while continuing to support zoos, aquariums and botanic gardens in their conservation missions, we must engage governments in species conservation planning. That is why we made this the central theme of the 2019 Annual Meeting of the Conservation Planning Specialist Group (CPSG).

Around 70 conservationists from 25 countries gathered in Buenos Aires, Argentina in October, forming working groups to tackle the challenges we face. Focusing on problem areas such as aligning CSPG-led and government conservation plans and overcoming political and governmental obstacles faced by zoo-based programmes, the attendees committed to tangible actions that will bring us closer to achieving our goal of covering every species that needs one with an effective, implemented plan, so that we can change the future for threatened wildlife.

As CPSG focuses on engaging governments, we know we must also transform the way we do things within our own organisation. In developing our strategic plan for 2020 and beyond, we identified three strategic pillars that will allow us to catalyse a species conservation planning revolution:

- **Shared Responsibility:** unite leaders behind our shared responsibility to save species.
- **Access to Knowledge:** transform information into more effective species conservation action.
- **Inclusive Voices:** support new voices to effectively drive change.

CONSERVATION REVOLUTION

Although our strategic plan is still in development, the revolution has

KRIS VEHR'S OF AZA RECEIVED THE 2019 HEINI HEDIGER PRIZE FOR HER FOUR DECADES OF LEADERSHIP



already begun. At the 2019 Annual Meeting, mentees in the CPSG Planner Development Path – launched to increase conservation planning capacity and scale up our planning efforts – shared the impact of their training and mentoring on themselves, their work and their ability to facilitate and plan for the recovery of threatened species. In 2019, CPSG nearly doubled the number of planning meetings, demonstrating the impact of our efforts to increase planning capacity. And staff from the newly formed, CPSG-supported IUCN SSC Species Survival Centre in Brazil, hosted by Parque das Aves, energised attendees with their story of changing their approach from a reactive to a proactive, strategic one, embracing all aspects of the Assess-Plan-Act cycle.

As well as working-group reports identifying the actions that CPSG and its partners will take over the next year to further species conservation planning, the meeting resulted in a plan outlining CPSG's contribution to IUCN's Abu Dhabi Call for Global Species Conservation Action. Supported by over 160 organisations, including EAZA, this is an urgent call to massively scale up species conservation action in response to the escalating biodiversity crisis. In addition, we helped to draft a resolution, approved days later by WAZA members at their Annual Conference, recognising the importance of zoos and aquariums in species conservation and calling on them to commit to scale up their efforts to:

- apply and promote the One Plan;
- continue to lead, and partner on, species conservation projects in zoos and aquariums and in the wild;
- continue to provide and increase resources for saving species in the wild;
- educate, engage, inspire and mobilise the general public, particularly their 700 million annual visitors, to raise awareness on species, and encourage them to take direct action to support species conservation; and
- raise awareness of species and their conservation challenges through their exhibits and their communications and education programmes.

Thanks to all those who contributed to making this year's meeting such a success! Continued and growing support from organisations such as EAZA and its Members is essential to catalysing

the species conservation planning revolution that will ensure every species that needs one is covered by an effective plan. Together, through scaled-up conservation planning, we can change the future for wildlife. To find out more about CPSG, how we can support your work and how you can support us, contact office@cpsg.org.

Aquariums in a changing world

THE 2019 EUROPEAN UNION OF AQUARIUM CURATORS (EUAC) CONFERENCE FOCUSED ON THE VITAL NEED FOR MAINTAINING A HEALTHY MARINE ECOSYSTEM

David Aparici Plaza, EAZA Animal Programmes Coordinator, EAZA Executive Office

In October 2019 the EUAC conference took place in Boulogne-sur-Mer, France. Hosted by Nausicaá, an EAZA Member, it attracted more than 240 participants from all over the world. Featuring many presentations on diverse issues, it focused on three main topics: societal change, climate change and change affecting biodiversity.

Day 1: Societal change

The first topic tackled the changes in the relationship between modern society and wildlife and how the awakening of public awareness of the fragility of nature and the increase of anthropogenic pressure on the environment has to some extent led to an increase in social movements against keeping animals in human care, which tend to be focused on animal suffering and/or environmental damage. In addition, citizens all over the world want to be heard and to have a say in the decision-making process. All these facts make it imperative that aquariums and zoos effectively communicate their role as centres of education, awareness and preservers of species.

The first keynote speaker, Dr Delphine Paulet (Dean, the NEXT MBA), expressed the growing necessity for society to want to be connected to nature, and how aquariums can play a role by helping to spread knowledge

about marine life and how to protect our oceans. Dr Marco Weydert (European Commission) continued this theme by declaring the urgent need for aquariums to raise awareness of the planet's need for healthy marine ecosystems.

In keeping with the day's theme, Dr Paul Boyle (American Humane Society) explained how good zoos and aquariums play an essential role in saving species from extinction, and how American Humane, the largest certifier of animal welfare, can help to fulfil the growing demand for the humane treatment of animals in human care by verifying and ensuring animal welfare.

Gilles Doignon (European Commission) shared the success of the 'World aquariums against marine litter' campaign, which the EU has decided to make permanent; and Jean-Luc Bourgain and Dr Géraldine Lacave (both of Nausicaá), gave a presentation on a joint veterinary approach on osteopathy in a California sea lion (*Zalophus californianus*) with paralysis.

Day 2: Climate change

As the keynote speaker for the second day, Dr Guigone Camus, social anthropologist and scientific advisor at Ocean & Climate Platform, focused on climate change as the main factor of global environmental change. She emphasised several impacts that climate change has on the oceans that are major threats to human civilisation and are included by the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate.

Day 3: Changes affecting biodiversity

On the last day, Professor David Johnson (Southampton Solent University) described how, despite new discoveries of species in aquatic ecosystems, there is a high rate of biodiversity loss. He encouraged aquariums to be transparent, to restrict impacts on the most threatened hotspots of marine biodiversity and to raise awareness of genetic diversity. Finally, Dr Nadia Ounaïs (Oceanographic Institute of Monaco) proposed to build a 'Noah's Ark' for corals with help from the network of World Public Aquariums. This project would focus on conservation, restoration and research of corals as well as providing education about corals to the general public.

Asking the right questions

EAZA'S NEW CAMPAIGN AIMS TO PROTECT OUR MARINE ECOSYSTEMS BY FOCUSING ON THE CONSUMPTION OF MARINE PRODUCTS, NOT JUST BY HUMANS, BUT ALSO BY THE ANIMALS IN OUR CARE

Claudia Gili, Stazione Zoologica Anton Dohrn, and Laura Myers, EAZA Executive Office

The official launch of the new EAZA conservation campaign *Which Fish?* took place at the EAZA Annual Conference in Valencia. The two-year campaign will run from 2020–2021, and will focus on issues linked to the sustainable acquisition and consumption of marine products, with a main goal of raising awareness and facilitating behaviour change.

The initial suggestion for a marine-focused campaign came from the EAZA Education Committee. This suggestion was picked up by Acquario di Genova, with Nausicaá – Centre National de la Mer and Oceanário de Lisboa also leading on developing the campaign. This makes the *Which Fish?* campaign the first to be led by EAZA aquariums. The campaign team is also partnering for the first time with the European Union of Aquarium Curators (EUAC) and the European Association for Aquatic Mammals (EAAM) to bring this campaign to an even wider audience.

WHY A CAMPAIGN FOCUSED ON AQUATIC SPECIES?

Oceans cover more than 70 per cent of the Earth's surface, and healthy oceans are essential for our planet. Fish and aquatic invertebrates play a vital role in keeping marine ecosystems stable, and are also important for many human communities as they provide a significant source of nutrition as well as livelihoods for millions of people. Human harvesting of marine resources puts a great deal of pressure on aquatic biodiversity, which has knock-on effects for many other species.

Human consumption of fish is rising. According to the latest fishery statistics from the Food and Agriculture Organisation of the United Nations (FAO), the average person consumes 20.3 kg of fish per year, a figure that is continuing to rise year on year. For Europeans, this figure is even higher, with an average annual consumption of 22.5 kg per person. With this increasing demand for fish, many

species are experiencing pressure. FAO estimates that around one third of marine stocks are currently overfished, and just under 60 per cent are classed as maximally sustainably fished. Only seven per cent of stocks are classed as underfished, leaving consumers with some challenging choices to make to keep our oceans healthy.

Concerns about overfishing touch directly on the EAZA region, as the FAO area with the highest proportion of unsustainably fished stocks is the Mediterranean and the Black Sea. There are also concerns over specific species and sub areas in the North Atlantic FAO area. When it comes to trade, the European Union is the biggest single market for fish products, accounting for 38 per cent of global imports in data from the most recent FAO yearbook.

KEY CAMPAIGN AREAS

The *Which Fish?* campaign challenges participants to look at their acquisition and utilisation policies of marine products in three key areas and to improve their sustainable practices:

- sustainable consumption by humans,
- sustainable consumption by animals, and
- sustainable collection planning in zoos and aquariums.

The majority of fish produced (around 88 per cent according to the latest FAO data) enters the human food chain, so a major part of the campaign will be to encourage people to make sustainable choices. To support participants, the campaign team has created a 'green' list of sustainable fish species that are generally considered sustainable according to their provenance, together with guidance on how best to use the list. The materials also include a list of links to reputable sustainability lists that could be more targeted towards specific countries or regions.

Making sustainable choices is challenging, and consumers need sufficient information to be able

to make them. For this reason, the campaign materials include information about the other factors that need to be considered to make a good choice, such as the identification of stocks by sorting the locations where a fish is caught, the fishing method used, the size of the fish, the season, and information about the life and reproductive cycles of different species.

The campaign encourages all participants to take a positive approach by promoting fish that represent a better sustainable choice, rather than focusing on what should be avoided. The communications and education representatives in the campaign team are putting together a communications strategy and compiling education resources that will support participants in taking this positive approach. The team is also challenging participants to commit to serving sustainably sourced fish to visitors and staff.

Since we are all involved with high standards of animal care, the second strand of the campaign focuses on sustainably sourced food for our fish-eating animals. Many of the same issues apply to animal diets as to human ones, and we must tackle the additional challenge of still providing nutritionally balanced diets for the species under our care. The campaign is challenging participants to commit to sustainably sourcing fish and other marine products included in animal diets, and even to exploring nutritionally balanced alternatives to fish-based food.

The final strand of the campaign links to fish and aquatic invertebrates that are kept in our zoos and aquariums. Due to the wide variety of species and their reproductive physiology, it's more common to find wild-caught fish and invertebrates on exhibit than wild-caught terrestrial species. Unsustainable harvesting for the aquarium trade (which also includes many hobby and private collectors, not just public aquariums) is the primary threat for some species.



A. ROSENFELD, NAUSICAA

Aquariums have been working to address this issue for some time now, and this campaign encourages all participants to refer to the Guidelines for Acquisition developed by EUAC and implement them in their own institutional protocols.

BEHAVIOUR CHANGE FOR INSTITUTIONS AND INDIVIDUALS

Several of the campaign goals are concerned with behavioural change, which is always a challenging target to measure. The campaign team is focused on creating behaviour change not just at an individual level among visitors, but also at an institutional level. At institutional level, the goal is to see some measurable and positive changes in food acquisition policies and consumption patterns by the end of the campaign. Participants will be asked to fill in surveys before, during and after their campaign participation so that the team can collect data that will allow them to assess rates of change.

FLEXIBLE CAMPAIGN COMMITMENTS TO SUIT DIFFERENT NEEDS

The campaign is led by EAZA aquariums, but all EAZA Members

can support it – even those who don't hold any fish or aquatic invertebrates in the collection, most likely host animals that are fed on fish, or offer fish to staff or visitors in the restaurants and canteens. The campaign is focused mainly on marine species, as the majority of global capture fishery production comes from marine waters; however, the campaign team is open to participants focusing on freshwater species if they live in regions where consumption of freshwater species is more common.

The campaign team has come up with a list of different commitments, linked to the three main strands of the campaign, that participants can sign up for. This will allow them to be flexible with their campaign participation and tailor their commitments to their own situations. We encourage participants to sign up for a minimum of three to four commitments, and to take part in a way that best suits their own needs and goals.

Pressure from unsustainable consumption is just one of many complex factors threatening the biodiversity of our oceans. The Which Fish? campaign is firmly focused on sustainable consumption, but can easily

complement activities focused on other marine threats, such as climate change, marine pollution and littering, and invasive alien species, and many of these threats are interconnected.

A QUESTIONING CAMPAIGN

The campaign title is framed as a question – Which Fish? – because we all need to be able to ask the right questions and get all the information that we need to make a more sustainable choice. As with so many issues linked to biodiversity conservation, there are no simple answers, only better choices that may be different for different people, locations and institutions involved in the campaign. The campaign team firmly believes that encouraging people to ask more questions, whether they are questions we ask ourselves as institutions, or questions we encourage our visitors to ask about their own consumption preferences, is a far more effective way of creating real change. Instead of saying This Fish or That Fish, by the end of the campaign we should all be asking 'Which Fish?'

Sign up for the campaign today or find more information at <https://whichfish.eu>.

Turtles in trouble

DAVID WILLIAMS-MITCHELL, EAZA DIRECTOR OF COMMUNICATIONS AND MEMBERSHIP, TALKS TO ANDERS G. J. RHODIN, CHAIR EMERITUS AND EXECUTIVE VICE-CHAIR OF THE IUCN SSC TORTOISE AND FRESHWATER TURTLE SPECIALIST GROUP (TFTSG)

DWM: Could you give an introduction to the conservation status of chelonians as a whole? What are the main threats and where are they most acute?

AR: Turtles are in terrible trouble. Of the more than 360 species that have graced our world over the last 500 years, more than 50 per cent are threatened with extinction, and nearly 60 per cent are either threatened or have already gone extinct. Turtles and tortoises are more threatened than any of the larger groups of vertebrates, surpassed only by the primates. They are threatened primarily by massive over-exploitation for food, traditional medicine and the pet trade, as well as extensive habitat loss from deforestation and agricultural conversion. These threats are most prevalent in Asia, the nexus of what was called the Asian Turtle Crisis, but which is now spreading to the rest of the world.

DWM: You mention the pet trade and the scale of the problem, which includes rampant demand and unscrupulous attempts to service that demand, such as turtle farms in China. Do you have an insight into why these animals are so sought after for the pet trade?

AR: People have had a fascination for turtles for a long time, and keeping them as pets has always been popular, but what used to be a relatively innocent and innocuous diversion has morphed into an obsession and vocation for many, driven by high values for certain species and the attendant prestige of ownership; pets have become more of an investment than a source of appreciation. Chinese turtle farms and the international illegal animal trade both cater to this demand, and continued poaching and smuggling of endangered turtles and tortoises from the wild and from protected areas is the worst problem. If we cannot bring this illegal trade under control we will lose most currently endangered species

of turtles and tortoises, and many of those will go extinct in a few decades. Already, critically endangered species like the ploughshare tortoise or angonoka (*Astrochelys yniphora*) from Madagascar, the Rote Island snake-necked turtle (*Chelodina mccordi mccordi*) from Indonesia, and several species of Asian box turtles (*Cuora* spp.) from China, have been rendered functionally extinct in the wild by illegal over-collection for the pet trade.

DWM: We see from the Specialist Group's 'Turtles in Trouble' document and our own RCP analysis that many species are listed as CR or with populations in precipitous decline. Is this the future for these taxa, or are you optimistic that we can turn the situation around? And what is a realistic outcome for conservation efforts over the long term?

AR: Realistically, the conservation status of most currently threatened turtle and tortoise species will probably continue to worsen with time. As I look down the road 100 to 200 years from now, I worry that we will be left with only small scattered parcels of protected areas with isolated and devastated populations of turtles barely surviving and needing concerted efforts from conservationists and reserve managers to prevent their extinction. A few generalist species will probably survive almost no matter what we do – for example, red-eared sliders (*Trachemys scripta elegans*), snapping turtles (*Chelydra serpentina*) and Mediterranean pond turtles (*Mauremys leprosa*).

In the long run, I am, unfortunately, pessimistic about whether we can successfully prevent the extinction of many currently endangered species, but the optimist in me knows that our efforts to date have already made a difference, and even if we can only slow their rate of decline, we must follow our ethical and moral imperatives to continue to fight for and aid their survival. We can never give up hope.

DWM: 'Turtles in Trouble' has a strong focus on Asian species – but how is the situation for other regions?

AR: Asia remains the epicentre of the turtle extinction crisis caused by trade, but there is trouble elsewhere in the world as well. North American and African species have become increasingly targeted, as have South American ones to a lesser extent. There is nowhere that's safe. Even in Australia, where poaching for the trade is not yet a major problem, turtle populations are affected by environmental variables associated with global climate change, such as drought, fires and disease.

DWM: Chelonians are a very ancient group that does not appear to have needed to evolve physiologically to any great extent over the millennia. Do you think that the previous success of 'the design' makes them more vulnerable to quick changes such as climate change? Is there any way for us to help make them more resilient to these pressures?

AR: Turtles have evolved a suite of morphological and physiological characteristics that have allowed them to remain largely unchanged for about 250 million years, and they would easily withstand and adapt to our current climate change if their habitats had remained intact and anthropogenic threats had not curtailed their populations and adaptability. Turtles have already survived many glacial and inter-glacial warming periods and could easily do so again except for the human-induced restrictions they now face. What we can do to help at this time is to consider assisted migration of species from their current habitats that are under climate threat to other areas more amenable to their survival. Measures such as these are already being developed and considered for critically endangered species such as the Western swamp turtle (*Pseudemysdura*

umbrina) in Australia, the Bolson tortoise (*Gopherus flavomarginatus*) in Mexico and the USA, and the geometric tortoise (*Psammobates geometricus*) in South Africa.

DWM: Conservation genetics now gives us an opportunity to know more about the taxonomy of chelonian species and subspecies, yet the conservation challenges are enormous. Do you think we can afford to treat similar subspecies or populations separately, or should we perhaps group some of these in conservation terms so as not to lose the totality? I am thinking, for example, of Egyptian and Libyan populations of *Testudo kleinmanni* in which the differences between the populations in genetic terms may be very small but ecologically significant.

AR: As we discover more and more turtle diversity through improved genetic analysis and define more and more species, subspecies and evolutionarily distinct populations, we are faced with the dilemma of how best to prioritise our limited conservation resources. Clearly, we need to prioritise our efforts and conservation targets in a rational manner, but we should never engage in medical-style battlefield triage of withholding aid to any species deemed by some to be 'beyond help'. Even when only a very few animals of a taxon survive, we know we can save it from extinction, as we did with the Espanola giant tortoise (*Chelonoidis hoodensis*) from the Galapagos, down to 15 animals before conservation efforts were initiated and then rebounding to over 1500. Similarly, the Yunnan box turtle (*Cuora yunnanensis*) from China was declared Extinct by the IUCN, but then three animals were rediscovered and it since has recovered to over 70 at the latest count. There are several other examples of species on the brink of extinction that have recovered after heroic efforts have been made. We should never give up on any species facing extinction.

DWM: How do you think that zoos could contribute more effectively to chelonian conservation?

AR: Zoos provide not only the opportunity for the public to view



and admire the diversity and beauty of the animal world, but also the crucial opportunity to educate the public about that diversity and the threats that it faces. Zoos need to be more than just entertainment and revenue centres, they need to be ardent advocates for diversity and conservation and help lead and support such efforts to the greatest extent possible. For many people, zoos are a window to the natural world; we need to make the most of that and help convince them that the natural world needs saving. In the field of turtle conservation, zoos are already helping to lead the way in establishing assurance colonies for breeding endangered species, assisting with repatriation projects, and supporting fieldwork by researchers and conservationists. Many zoos in EAZA are fully engaged in these critically important activities, and the Shellshock Campaign carried out by EAZA nearly 20 years ago has provided much-needed support for global turtle conservation efforts funded through the Turtle Conservation Fund. By working together we can help save turtles and aim for zero turtle extinctions in the future.

DWM: Anecdotally, we see that people are interested in chelonians at zoos, but tend to move on very quickly without much engagement. Obviously we saw a lot of interest in the Mary River turtle story that went viral last year, but not all chelonians can grow pondweed punk hairstyles! What narrative do you think would help to retain people's attention and get them interested in contributing to conservation, the eradication of the illegal trade, and so on?

AR: I think the most important thing we can do is to show others our passion

and enthusiasm for turtles and to openly impart our sense of concern for their survival. We need to engage with the public and share our view that turtles are really cool, but that they're really in trouble, and they desperately need and deserve our protection and preservation. Most people, especially children, like turtles and tortoises (unlike other reptiles), so we need to appeal to the sense of loss they would have if turtles were to disappear from the Earth, as the dinosaurs did. We need to make it personal for people to contemplate the loss of turtles from the world and from their lives — how will they feel if all the turtles are gone?

DWM: Can you tell us how and why you became interested in chelonians and what is your favourite of all the species?

AR: Growing up first in Sweden and then outside New York City, I had no exposure to turtles or tortoises as a child. It wasn't until my last year of university studies that I developed an interest in turtles, and when I graduated in 1971 I went on a long trip to the jungles of Central and South America with my good friend Russ Mittermeier. While staying with natives in a hut in the Brazilian Amazon, I obtained a juvenile yellow-footed tortoise (*Chelonoidis denticulatus*) as a pet. I named it Jaboti (the local name for the species) and took it home with me back to the USA and then to Sweden, where I started medical school. That pet tortoise inspired and catalysed my interest in chelonians, and as a result I began to read and study and sought out ways to learn more.

With help from Russ I got a part-time job with Ernest Williams at the Museum of Comparative Zoology at Harvard, where I initially catalogued and identified turtles that had recently been collected by Fred Parker in New Guinea. As a result, Russ and I discovered a new and undescribed turtle species among the collection, and with Ernest's urging we described it in 1976 as Parker's snake-necked turtle (*Chelodina parkeri*). That was the start of my parallel career in herpetology in addition to my main career in medicine and orthopaedic surgery. To this day, that turtle species remains my favourite – although in reality I love all turtles and tortoises, and find them totally fascinating.

RADIATED TORTOISE (*ASTROCHELYS RADIATA*)



PARKEN ZOO

Meet the chelonians

A NEW EAZA REGIONAL COLLECTION PLAN FOR TURTLES AND TORTOISES AIMS TO MAKE SIGNIFICANT CONSERVATION PROGRESS – BUT IT NEEDS URGENT MEMBER ASSISTANCE

Matt Goetz, Head of Herpetology, Durrell Wildlife Conservation Trust, Jersey, and EAZA Reptile TAG (Chelonia) Vice-Chair

By the time this feature is published, the chelonia subgroup of the EAZA Reptile TAG will have published its new Regional Collection Plan, the first RCP in the new style that the Reptile TAG has taken on. This was quite deliberate, as we wanted to take the opportunity to develop a new chelonian RCP under the One Plan approach as soon as possible, so that we could take the work that EAZA does with this extremely threatened taxon and move it forward in a more structured, conservation-focused way.

Chelonians are ideal candidates for

the One Plan approach, as the majority of species can benefit enormously from population management and insurance population initiatives, head-starting programmes or, due to their often extended longevity and generation length, long-term genetic management. This is especially true for the most critically endangered group of this species, the Asian turtles, where the most significant population declines are mainly caused by over-exploitation for food and the illegal wildlife trade, while habitat is often still available for potential reintroductions.

Management in human care for many species is occurring both in EAZA institutions and programmes in many field locations. Developing best husbandry and breeding techniques and disseminating these through various channels is vital, as many of our species are still not easy to breed continuously.

Genetic management is equally vital: our studbooks are dealing with many species which exhibit long generation lengths and low reproductive output while we care for significant parts of their worldwide population; long-term management through our EEPs must

ensure that these populations can still flourish and maintain their genetic potential under the care of the next generations of zoo and conservation professionals.

When looking at release initiatives, whether through collaborative work with, for example, rescue or population management centres in the regions or indeed using zoo-bred animals as outlined in the new EAZA translocation guidelines, our responsible engagement must employ standardised, continuously updated veterinary disease screening to reflect current knowledge and best practice decision-making. Over the past two decades, many newly emerging reptile and amphibian diseases have been identified with often devastating impacts when introduced into the wrong places or onto naive taxa.

With this background we set out to prioritise all species down to the ~50 we could deal with in a two-day RCP workshop and relegated the remaining taxa to a second workshop in the near future. Using the conservation status of species held in EAZA institutions, we prioritised the Asian turtles and also Testudines (tortoises) listed as CR or EN.

The workshop was held at, and wonderfully hosted by, Nordens Ark; we'd like to thank Mats Hoeggren and his team again for their great hospitality. We must also thank the facilitation and preparation team at the EAZA EEO, who did all the heavy lifting for us!

The workshop's output shows that our new programmes can and will heavily focus on conservation aspects embracing the One Plan approach.

We assessed 51 species and ended up with 29 species receiving EEP recommendations. Of the 51 species assessed, 33 (or 28 of the 29 prospective new EEPs) will have a direct Ark/Insurance population role; 24 of the 51 (or 20 of 29) include a direct research and *in situ* support role, and 10 new EEPs will additionally develop strong links with partners to fulfil an *in situ* capacity-building and training role.

We are of course relying on EAZA Members' willingness to support both the roles of the EEPs and the EEP coordinators in their new, more demanding roles, not only coordinating transactions between zoos, but also integrating *in situ* conservation initiatives in various ways.

A first step for Members could be to help to mitigate a main constraint for our EEPs: holding space for EEP turtle species in the long-term. Many species (not just chelonians) rely heavily on small, permanent enclosures either on- or off-show, which can be run cost-effectively and with minimal impact. Offering such low-cost but relatively high-impact housing space for any small EEP species, be it turtles or amphibians, invertebrates or lizards, should nowadays be high on the list for all and any EAZA Members.

And it would only be timely after the very recent IUCN SSC's Abu Dhabi Call for Global Species Conservation Action called on zoos, botanical gardens and aquariums to scale up their commitment to species conservation.

We believe that this new EAZA Chelonia RCP and its meaningful and urgently needed conservation roles for the new EEP species is a positive move, and not only towards more integrated zoo conservation work; if all EAZA institutions actively consider their engagement, it can only further strengthen EAZA's standing as a conservation-oriented member organisation.

SPIDER TORTOISE (PYXIS ARACHNOIDES ARACHNOIDES)



Origin unknown

HOW CONFISCATED ANIMALS OF UNKNOWN ORIGIN CAUSE DILEMMAS WITHIN A STUDBOOK

Mark de Boer, Curator Oceanium, Rotterdam Zoo, The Netherlands, and EAZA EEP Coordinator *Testudo kleinmanni*

At the time of writing, the EAZA EEP of *Testudo kleinmanni* consists of 260 animals. Seventy animals have been captured in the wild and have mostly been integrated into the EEP after being confiscated. A large number have possibly been smuggled from Libya, sold on the Egyptian market and have spread further from there. From 51 animals (the Libya group) we know that they were seized in October 2005 at an airport in Italy during a smuggling attempt from Libya and put into custody at the Bioparco in Roma.

For 23 animals, their origin is impossible to trace. Of the 167 animals born in human care, their genealogy is mostly unknown. So although the recommendation from the IUCN Red List (Perälä, 2003) – ‘The use of (captive or confiscated) Egyptian tortoises of unknown origins or parentage in conservation programs should be discouraged at all times for several reasons’ – is a logical guideline that one would like to follow in regards to breeding programmes, it can be very challenging in everyday practice.

Because the origin of most of the animals in the studbook is unknown, the studbook does not mention subpopulations. Only the ‘Libya group’ of 2005 is managed separately from the other animals in the studbook.

The estimated total world population in 2002 was 7,470 individuals. When compared to earlier estimated numbers, the global population of *T. kleinmanni* would seem to have declined by more than 85 per cent in less than three generations, which is why they are listed as Critically Endangered. Discussions about illegal trade in the 1990s imply that it involved more than 10,000 animals. There are no more recent figures available. Limited data on the situation in the wild suggest that geographically isolated subpopulations can be found in the known territory of the Egyptian tortoise. The tortoises live in arid coastal deserts along the Mediterranean Sea, from the coasts of Libya, north-western Egypt (north coast and North Sinai) and the (north-



western) Negev Desert in Israel. A small population at the Zaranik Protected Area (Egypt) was the only known population in the last few decades. However, three new populations of Egyptian tortoises have been found outside this area in the past four years. The situation in Libya is unclear due to the revolution and the civil wars that followed. The species was found in two distinct and geographically disjunct regions in Libya, Tripolitania and Cyrenaica (Perälä, 2001).

Extensive genetic research would be necessary in order to clarify any differences between the (sub)populations. We already know from earlier research that there is a difference between populations to the west and to the east of the Nile. In 2001, Perälä suggested renaming the eastern population from the Negev Desert as *Testudo weneri*. However, in a re-evaluation of this study, analysis and the results of the new study suggested that there were minor morphometric differences between the eastern and western populations of the Egyptian tortoise. The very low level of genetic variability between the two populations, together with the morphological evidence, strongly indicates that eastern and western populations of the Egyptian tortoise should be considered as a single species. In fact, the level of genetic variability between the western and the eastern subpopulations is even lower than the within-species level of genetic

variability in other *Testudo* species (Attum *et al.*, 2007).

As we do not have valid data on all (sub)populations in Libya, Egypt and Israel, proper management of the subpopulations in human care and reintroducing them to the wild is very difficult. The first step towards gathering such valid data would be to map out the genetic make-up of populations in the wild. Although that would not be a problem in Israel and Egypt, the war in Libya makes research on the ground impossible. Another way might be to make a map of the genetic make-up of animals in human care to create a healthy breeding programme. It is thus necessary to investigate whether the ‘Libya group’ is a homogenetic group consisting of animals from one region. So from this point on it is advisable to treat the ‘Libya group’ as a separate population, at least until it is possible to make a valid connection between the *in situ* population and the population in human care.

REFERENCES

- Perälä, J. (2001). A New Species of *Testudo* (*Testudines: Testudinidae*) from the Middle East, with Implications for Conservation. *Journal of Herpetology* 35 (4): 567-582.
- Perälä, J. (2003). *Testudo kleinmanni*. The IUCN Red List of Threatened Species 2003: e.T21652A9306908.
- Attum, O., Baha El Din, S., Carranza, S., Earley, R., Arnold, E. N. & Kingsbury, B. (2007). An evaluation of the taxonomic validity of *Testudo weneri*. *Amphibia-Reptilia*, 28 (3), 393-401.

The return to Rote Island

THE EEP IS THE KEY TO SUCCESSFUL CONSERVATION FOR ONE OF THE WORLD'S MOST ENDANGERED CHELONIANS, THE ROTE ISLAND SNAKE-NECKED TURTLE

Jimmy Helgesson, EEP Coordinator, Nordens Ark, Sweden, and Borja Reh, Assistant Director, Zoology Dept, Wildlife Reserves Singapore



HATCHLING AT NORDENS ARK © JIMMY HELGESSON

The Rote Island snake-necked turtle (*Chelodina mccordi* sp.) is one of the most endangered chelonians in the world. In 2018, the IUCN Tortoise and Freshwater Turtle Specialist Group (TFTSG) listed it as one of the top 25 most threatened turtles on the planet. When the species was first described in 1994 as *Chelodina mccordi*, it instantly became a very attractive item in the illegal wildlife trade. It was at that time thought to be endemic to Rote Island (Roti) in the east of Indonesia, but was later re-classified as the same species, though a different subspecies (*Chelodina mccordi timorensis*), that is found on east Timor.

The genus *Chelodina* consists of around 15 different species living in central and northern parts of Australasia. Years before the Rote Island snake-necked turtle was even described, the first animals to be imported to Europe were falsely identified as New Guinea snake-necked turtles (*Chelodina novaeguineae*). Some of these were later recognised as Rote Island snake-necked turtles, and the first European studbook was established for the species, created by the European Studbook Foundation (ESF). For a number of years this studbook helped to build up an *ex situ*

population of the species in Europe and has been the basis of the EEP that we have today.

Sadly, since its discovery, most of the turtles on Rote Island have been collected to feed the increasing demand for these strange-looking chelonians. This, together with other threats such as habitat destruction and invasive predatory fish (*Channa* sp.), has now led to its disappearance on the island. Despite intense surveys, the sub-species (*Chelodina mccordi mccordi*) have not been seen on Rote Island for close to 10 years and are now thought to be regionally extinct. To change the fate of this species' survival, a conservation project has been developed, and now there is new hope for this exceptional turtle.

Since 2016, the Indonesian Forest Department, Wildlife Conservation Society (WCS) and Wildlife Reserves Singapore (WRS) have made extensive efforts to conserve this species, including genetic studies, habitat restoration, community engagement, *ex situ* population management and study of methodology for future reintroductions. The most significant outcomes of these efforts include the addition of Rote Island snake-necked turtle to the list of national protected

species under P.106/2018 of MoEF Regulation (2018); the construction of the breeding centre in Kupang (East Nusa Tenggara); and the designation of the reintroduction area as Essential Ecosystem Areas. This provides the area with a protection status for the habitat of important species that occur outside the protected area network.

The Kupang Turtle Breeding Facility has the capacity to keep 80 animals in several breeding pools, tubs for rearing, and a large habituation pond for pre-release turtles bred in the facility. This facility will be managed by the MoEF/BBKSDA NTT (the Natural Resources Conservation Agency of East Nusa Tenggara) and WCS with expert support by WRS and other EAZA Member institutions. It is hoped that zoos participating in the population management programmes in both EAZA and AZA will be able to send animals to the centre in Indonesia to act as breeding animals. Singapore Zoo will be a transit hub for the turtles sent from both programmes, and the animals will be held in the zoo until they reach the desired size before going to the centre.

The EEP could now become a very important tool for the conservation of this species. However, before any animals can be sent, a genetic screening will be conducted to verify which subspecies is kept in the EEP population. Based on the results, a breeding plan and exit strategy will be developed to determine which animals from the EEP could be sent to the repatriation project without jeopardising the remaining *ex situ* population.

Today, the EEP population consists of 248 animals (47.58.143) held by 56 institutions. The EEP now eagerly welcomes more institutions to start keeping Rote Island snake-necked turtles. By being a part of the EEP, zoos would directly contribute to the conservation of the species. And, hopefully, one day these joint forces will help the Rote Island snake-necked turtle to swim safely on the island where it belongs once again.

A turtle solution

PLANS ARE AFOOT TO SUPPORT THE EUROPEAN POND TURTLE AMIDST WIDESPREAD HABITAT DESTRUCTION AND THE SPREAD OF COMPETITIVE INVASIVE SPECIES

Jan Vermeer, Zoological Director, Parc Animalier de Sainte Croix, France, and European pond turtle ESB studbook keeper

The European pond turtle (*Emys orbicularis*) is a small, colourful species of freshwater turtle that was once widespread in Europe and Asia Minor. However, anthropogenic activities have resulted in its extinction in several regions of Western Europe and Asia. EAZA zoos play an important role in conservation programmes aimed at reinstating healthy populations in regions where this species has gone extinct.

European pond turtles live in different types of water habitat, feeding on animal prey (arthropods, fish, etc.) and plant materials. Hibernating during the winters in the silt on the bottom of water bodies, the turtles reappear at the surface when temperatures begin to rise. Shortly after mating in spring, the female leaves the water in search of a nesting place. In some cases suitable nesting grounds may be a few kilometres from the water, and a female has to travel for several days to reach it. Females are loyal to a certain nesting spot, and there is evidence that they may visit the same nesting spots for more than 80 years (astonishingly, these small turtles can live for up to 120 years).

The main threat for the species was and is habitat destruction. Throughout its vast distribution range, ponds are being drained, streams are being altered and water is polluted. While in some regions water sources were protected, often the nesting sites were destroyed by agricultural activities or became inaccessible through the construction of roads and train tracks. Over recent decades, invasive North American slider turtles released from captivity as unwanted pets have become a problem,



EUROPEAN POND TURTLE POPULATIONS NEED SUPPORT FROM ZOOS

mainly because of competition and the transmission of new diseases. It is therefore important that zoos give shelter or are otherwise able to deal with unwanted pet turtles, preventing them from being discarded into the wild.

Recent morphologic and genetic studies have shown the great diversity of the European pond turtle. Thirteen subspecies have been described, and genetic analysis has revealed that there are at least 70 different haplotypes, divided into seven main evolutionary lines. However, for hundreds of years the European pond turtle has been the subject of a lively trade. The species was considered to be a delicacy, and, interestingly, Catholics were allowed to eat turtles during Lent. Historical reports tell of wagon-loads of thousands of captured animals being transported throughout Western Europe. While turtles are no longer on the menu in most countries, many animals have been and are still being captured for the pet trade. As a result of turtles being moved across Europe, in addition to the intentional or unintentional release of captive animals in natural water bodies, many regions are now inhabited by the 'wrong' i.e. non-native haplotypes and/or the resulting hybrids. As with the problem of the invasive sliders, zoos can educate their visitors about the negative effects of releasing unwanted pets.

At country level, *E. orbicularis* is often listed on the IUCN Red List as Endangered or Extinct. Conservation measures are necessary to conserve the overall genetic variability of the species and to reinstate viable populations in areas where the turtle has gone extinct.

These range from habitat protection and restoration to pollution avoidance and the release of animals hatched and head-started in zoos and aquariums.

Together with government organisations, NGOs, museums and universities in most range countries, European zoos play an active and important role in the conservation of European pond turtles. Besides carrying out research and supporting the protection and restoration of habitats, several zoos have built successful population management centres where large numbers of turtles are hatched and head-started through official reintroduction projects into the wild.

To improve the collaboration between zoos and other conservation partners in the various projects, and to be able to supply more animals with known provenance and haplotypes to reintroduction programmes, the EAZA Reptile TAG decided in 2017 to initiate an ESB for this species. This ESB now features in the new 2019 Chelonian RCP to be continued as an EEP. The recently migrated ZIMS studbook is now being updated, and Best Practice Guidelines will be published in 2020. Large numbers of European pond turtles are kept in EAZA zoos, and many came into these collections as ex-pets; therefore, genetic analysis will be a priority to find out if they can be integrated into the population management programmes. With the help of zoos, viable populations of European pond turtles can be reinstated throughout their former range, improving the biodiversity of Europe's most important ecosystems.

Plans for a radiant future

THE CURRENT STATE OF THE RADIATED TORTOISE IS PERILOUS, AND URGENT ACTION IS NEEDED TO IMPROVE ITS CHANCES OF SURVIVAL

Linn Lagerström, General Curator, Parken Zoo i Eskilstuna, Sweden, and Radiated tortoise ESB studbook keeper



The radiated tortoise (*Astrochelys radiata*) is an iconic species native to Madagascar, and it needs conservation. Today it is managed as a European studbook (ESB) with almost 60 EAZA institutions involved, keeping around 450 animals. During 2019 we had a Regional Collection Planning (RCP) workshop that worked on parts of the chelonian species according to the new-style RCP with the One Plan approach. The workgroup agreed to recommend managing the radiated tortoise as an EAZA *ex situ* programme (EEP) in the future, with the aim of managing the population genetically and demographically, carrying out husbandry research and supporting the *in situ* work that is done in Madagascar with regular contributions. This species also displays very well and has a good educational role with links to *in situ* work in Madagascar and how the illegal trade can affect a species.

The illegal wildlife trade and harvesting of animals for local food consumption is one of the major threats to this species, together with the continuous loss of habitat. At the 2005 Population and Habitat Viability Assessment (PHVA) workshop, it was

estimated that between 22,000 and 24,000 animals are collected annually. At this rate it will not be long before there are no radiated tortoises left in the wild. During 2018 the Malagasy government carried out two very large confiscations of radiated tortoises, the first in April, which rescued more than 10,000 animals, and produced shocking pictures of how the tortoises had been kept in a house without water or food. The rescued tortoises were in need of intensive care and there was a huge effort made by many different stakeholders. Organisations such as the Turtle Survival Alliance (TSA), Turtle Conservancy, SOPTOM Villages des Tortues and the Durrell Wildlife Conservation Trust, which already operated in Madagascar, made a collective effort to supply the necessary intensive care for those turtles that needed it. The project required money as well as willing hands, and there was a response from the zoo community all over the world, various NGOs, Chelonia groups and private individuals. The second very large confiscation took place in late October, during which almost 7,000 animals were rescued.

TSA has taken a governing role in the work that is needed to return these tortoises to the wild. Facilities were constructed to hold these animals during their recovery and a 'Confiscation to Reintroduction' strategy was created. During 2018 a total of 20,558 tortoises were confiscated in Madagascar, of which 16,499 went to two TSA rescue centres. Today TSA has 47 employees working in Madagascar. TSA has a Confiscation to Reintroduction strategy and is collaborating with the Ministry regarding law enforcement efforts. The enforcement of the law is very important, because if the extensive harvesting of animals doesn't stop, there will not be a viable population in the future. Some of the key aspects of the reintroduction programme include community engagement, habitat suitability, poacher accessibility and examining the existing tortoise population. To do this correctly will take some time and will need continuous support. On top of this, there was a fire in the TSA Tortoise Conservation Centre at the end of September 2019, which completely destroyed the office and living quarters, and with it the solar power grid and distribution system, computers, security system, tortoise records and staff living space and personal items. The projected cost to restore this is \$45,000.

We can help save the radiated tortoise with regular financial support, as well as assistance from students and professionals that want to help *in situ* with work and research. The cost for husbandry for one radiated tortoise in one year in one of the rescue centres in Madagascar is estimated to be as little as three euros, although that does not include the running cost, infrastructure improvement and maintenance.

Remember to enter the work that you do to support *in situ* work in the EAZA Conservation Database. This is a helpful tool for sharing what we do and what we can achieve together. Let's all help to give the radiated tortoise a future before it is too late.



Chelonia Conservation 2014 - 2018

i Based on information available in the EAZA Conservation Database on 28 October 2019

29	4.5 MILLION	12,487 HRS	>50	>34
MEMBERS	FINANCIAL SUPPORT*	STAFF TIME	PARTNERS	SPECIES

*22 % towards Chelonia specific conservation activities | 88% towards non-species specific conservation activities benefitting Chelonia

TOP 5 SPECIES SPECIFIC SUPPORT



Loggerhead sea turtle
(*Caretta caretta*)



European pond turtle
(*Emys orbicularis*)



Painted terrapin
(*Batagur borneoensis*)



Galapagos giant tortoise
(*Chelonoidis nigra* ssp.)



Palawan forest turtle
(*Siebenrockiella leytensis*)

FOCUS OF FINANCIAL SUPPORT

8% EUROPE	28% ASIA
3.7% AFRICA	
60% MULTIPLE REGIONS / NOT REGION SPECIFIC	

BEST SUPPORTED CHELONIA PROJECTS

- Ankhor Centre for Conservation of Biodiversity (ACCB) / International Centre for Turtle Conservation (IZS)
- Katala Foundation (Palawan forest turtle)
- EULIFE+ LIFEEMYS (European pond turtle)
- Kura Kura - Sea Turtles in Danger
- Mission Caretta caretta
- Sea turtle conservation in Sao Tomé and Príncipe Islands



This work is supported by the European Union LIFE NGO funding programme.

The European Union is not responsible for the views displayed in publications and/or in conjunction with the activities for which the grant is used.

A recipe for success

TO RAISE AWARENESS OF THE PLIGHT OF A CRITICALLY ENDANGERED TURTLE, THE TEAM AT ZSL HAS CREATED AN IMAGINATIVE EXHIBIT THAT BENEFITS TURTLES AND VISITORS ALIKE

Benjamin Tapley, Curator of Reptiles and Amphibians, ZSL London, UK



In the late 1990s, the Asian Turtle Crisis, driven by unsustainable harvesting of freshwater turtles for Chinese markets, was recognised by the IUCN as a significant threat to turtle species survival. Today, turtle harvesting remains at unsustainable levels, and turtles in Asia face a conservation crisis.

The tropical Asian region supports the greatest diversity of tortoises and freshwater turtles in the world; it also has the highest number of threatened tortoise and freshwater turtle species. These threats can seem far removed from our zoo visitors and it can be a challenge to convey the issue when exhibiting turtles in a zoo setting.

Our team at ZSL wanted to develop an impactful, culturally sensitive exhibit that highlighted the ongoing crisis for turtles in Asia without compromising optimal animal husbandry and welfare. We also wanted to showcase our ongoing collaboration with the Asian Turtle Program (<http://www.asianturtleprogram.org/>) of Indo-Myanmar Conservation (<https://www.indomyanmar.org/>). Finally, we wanted to inform our visitors of the threats posed to freshwater turtles and show what they could do to benefit this imperilled group of animals.

The Asian Turtle Program prioritises the Critically Endangered Vietnamese pond turtle (*Mauremys annamensis*) for conservation attention, one of the 25 most endangered chelonians (Stanford *et al.*, 2018) and highlighted in the recent EAZA Regional Collection Plan process. This turtle has been held at ZSL since 2004 and seemed like the ideal species to champion. With a tight budget of €1,500, we converted our naturalistic exhibit to something we hoped would have more impact.

Having worked in Asia on various herpetology initiatives, the ZSL team members drew inspiration from turtles they had encountered in wet markets and kitchens and came up with innovative ways to create a kitchen theme while ensuring that the turtles could still exhibit natural behaviours and enjoy the five freedoms in line with UK zoo legislation. For example, a partially submerged washboard acts as a basking site and ramp in and out of the water body, and ambient humidity was increased by adding a fogging device disguised inside a pot, providing the effect of a bubbling pot of turtle soup. One of the key components was the provision of an appropriate nesting site, so a secluded area with deep substrate

was created, hidden by a large wok. We wanted to be explicit about the threats posed to turtles, so menus featuring photographs of cooked Asian turtles became part of the design. We felt it was important not to target a particular nationality in the design, and so we used Chinese cooking instruments as well as a Vietnamese menu.

The new exhibit has raised awareness of the consumption of Asian turtles; it was evaluated by comparing it with a naturalistic exhibit for Critically Endangered Rote Island snake-necked turtles (*Chelodina mccordi*). Many visitors liked the strong conservation message embedded in the exhibit, highlighting the plight of these turtles in the wild. They also liked the unique design, which made it stand out against the surrounding more 'naturalistic' exhibits. It was also more effective at conveying the extinction risk of the species; 79 per cent of visitors (N=99) identified that the Vietnamese pond turtle is Critically Endangered compared to 57 per cent for the Rote Island snake-necked turtles. Visitors also demonstrated a better understanding of the threats posed to the Vietnamese pond turtle; 72 per cent of the visitors were able to identify that the main threat to the species in the wild was human consumption.

We are extremely grateful to Indo-Myanmar's Asian Turtle Program, Timothy McCormack, Nguyen Thu Thuy and Hoang Van Ha for assistance in the development of the exhibit.

REFERENCES

Stanford, C.B., Rhodin, A.G.J., van Dijk, P.P., Horne, B.D., Blanck, T., Goode, E.V., Hudson, R., Mittermeier, R.A., Currylow, A., Eisemberg, C., Frankel, M., Georges, A., Gibbons, P.M., Juvik, J.O., Kuchling, G., Luiselli, L., Shi, H., Singh, S., and Walde, A. (Eds.) (2018). *Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles* (2018). IUCN SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservancy, Turtle Survival Alliance, Turtle Conservation Fund, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and Global Wildlife Conservation, 80 pp.

MALE *HEOSEMYS GRANDIS* © PETR HAMERNÍK

The great turtle rescue

EIGHTEEN YEARS AFTER THE HONG KONG TURTLE CONFISCATION, WE LOOK AT THE LESSONS LEARNED FROM THE RESCUE AND THE LONG-TERM CARE OF THESE DAMAGED BUT VALUABLE ANIMALS

Ivan Rehák, Prague Zoo, EAZA Reptile TAG Chair, and Petr Velenský, Curator of Reptiles, Amphibians & Fish, Prague Zoo, Czech Republic

It is 17 January 2002. Cold weather is affecting most of Europe, and frozen roads are extremely unfriendly for drivers. Nevertheless, several well-heated cars bearing the emblems of British, Czech, Danish, Dutch and Polish zoos are approaching Amsterdam. Approaching the same destination is a KLM aeroplane with nearly 1,000 turtles on board, who have survived a hellish ordeal. While our colleagues in Hong Kong are finally breathing out, the staff of about 30 EAZA zoos are alert and ready. Four weeks of feverish effort, intensive emailing, telephoning, consulting, travelling and hectic paperwork have not been in vain. Around 6pm, 185 boxes full of turtles will arrive at Schiphol Airport. By the evening, every turtle will be on its way to its new home. This will be an unforgettable day for everyone who took part.

HONG KONG CONFISCATION

On 11 December 2001, during a joint operation of the Customs Ship Search and Cargo Command and the Agriculture Fisheries and Conservation Department, about 10,000 live South East Asiatic turtles were seized in

Hong Kong. The shipment, originally destined for the Chinese food market, had an estimated market value of \$3.2 million. The conservation and scientific value of the confiscated animals, as well as the ethical aspects of the situation, were enormous, and incalculable in monetary terms. Turtles were placed at Kadoorie Farm and Botanic Garden in Hong Kong. It was an incredible job to take care of such a quantity of mostly damaged, wounded and ill turtles. The wider international cooperation proved to be essential in reducing at least in part the suffering of the turtles.

On 17 December 2001, Henk Zwartepoorte (Rotterdam Zoo, The Netherlands), Turtle Survival Alliance (TSA) Steering Committee member for EAZA, informed the EAZA Amphibian and Reptile TAG (ARTAG) of the confiscation and consequent rescue activities of the TSA in USA. Several hours later, Rick Hudson (Fort Worth Zoo, USA), TSA co-chair, pointed out the need to mobilise the European zoo community on a large scale to deal with this crisis, as Kadoorie was not prepared to house all the turtles long term.

The so-called 'Hong Kong turtle crisis' gave the EAZA a serious

and difficult task that Christmas. But EAZA's swift reaction and the international rescue that followed were exemplary. The superb cooperation between the Kadoorie Farm and Botanic Garden, TSA and EAZA – namely the EAZA Executive Office, ARTAG, Rotterdam Zoo and 26 other zoos in 11 countries – resulted in the successful import of 988 turtles (285 *Cuora amboinensis*, 126 *Orlitia borneensis*, 283 *Heosemys spinosa*, 90 *Heosemys grandis*, 204 *Siebenrockiells crassicollis*) and their consequent housing in individual zoos. During the rescue operation, which attracted a huge amount of publicity and media coverage, EAZA demonstrated its ability to carry out a complicated international operation with speed and efficiency, and we can be rightly proud of that.

In his original message to the ARTAG chairs, Henk Zwartepoorte posed two questions: first, what role can European zoos play in this matter? Secondly, are zoos prepared not only to save a lot of individual turtles, but also to invest in the establishment of *ex situ* populations of endangered Asian species? The answers at the time were

positive. Now, 18 years later, we can evaluate whether the reality has lived up to our expectations.

HOW THE CONFISCATED TURTLES FARED IN EAZA ZOOS

The media attention soon died away, but the real work had only just begun. The first stage was difficult, a struggle to save the lives of stressed and badly damaged turtles. The losses were reduced significantly thanks to the superb efforts and professional skill of vets, curators, keepers and specialists. The ARTAG, in close cooperation with the EAZA Executive Office, evaluated the best way to manage the genetically very valuable arrivals, which consisted of five species, each represented by a promising number of specimens. The intention was to turn the tragedy of the confiscated turtles into a positive event: namely, the formation of prospective *ex situ* EAZA populations. The ESB was considered to be the optimal category to begin the management of the confiscated turtles. Several research studies were conducted to improve and streamline this management and improve husbandry (two MSc theses were completed and relevant scientific papers published).

In the years that followed, it could be seen that progress towards this goal differed significantly between individual species, as illustrated by the examples of the giant Asian pond turtle (*Heosemys grandis*) and the Malaysian giant turtle (*Orlitia borneensis*). *Heosemys grandis* is a semi-aquatic turtle from continental Southeast Asia with a carapace length of over 40cm. The biggest representative of its genus, it was found infrequently in European zoos prior to the Hong Kong import. Breeding *ex situ* occurred only occasionally (e.g. at London Zoo and Rotterdam Zoo). The rescue event fundamentally enriched our collections. Post-import losses (25 per cent) mostly occurred soon after the import. The remaining animals stabilised very well and gave us an excellent opportunity to form strong *ex situ* populations with numerous potential founders and good prospects. The ESB currently registers 104 (24.22.47) living specimens, allocated to 26 European zoos in 12 countries. The species bred very well in EAZA

zoos from the start (e.g. in Prague Zoo alone, 129 offspring have been born). Thus it is only the available space that limits the size of the *ex situ* European population of this attractive turtle at present.

Orlitia borneensis, an impressive, highly aquatic species associated with large bodies of fresh water in Borneo, Sumatra and Malaysia, is one of the biggest river turtles (sometimes measuring over 100cm). Prior to the Hong Kong import it was rarely kept in European zoos and no breeding was reported at any European zoo. The Hong Kong rescue action created a European *ex situ* population (126 specimens were imported), but the condition of the imported animals was desperate. Thanks to effective post-transport veterinary treatment and care in Rotterdam Zoo and Burgers' Zoo, as well as the efforts of the staff at the 16 EAZA zoos in five countries to which these giants were later allocated, the post-import mortality (12 per cent) was not as terrible as we had first expected.

At present we have in our care a healthy population with good prospects. The ESB registers currently 60 (14.30.16) specimens in 21 European zoos in 10 countries. In contrast to previous species, the reproduction rate in our zoos is an exception; only a few hatchlings have been born and survived. The species is of great conservation and scientific value, but increasing its numbers in human care is not easy. Thanks to its size and extreme intraspecific aggression, these turtles have considerable space requirements, and as a result the number of institutions interested in keeping this turtle and the number of turtles in European zoos is decreasing.

WHAT HAVE WE LEARNED?

We have gained considerable experience in how to take care of badly damaged specimens that originated from a confiscation, and how to establish from such a base a prospective *ex situ* colony for the managed species, as well as for ecologically similar and eventually more endangered species. However, we have also learned that this is not always enough! With species such as *Heosemys grandis* we quickly and successfully developed adequate husbandry, and thus created a major task for the future: to manage a population with enormous breeding potential. But with species such as *Orlitia borneensis*, almost two decades of effort was still not enough to develop satisfactory husbandry techniques, nor to find an easy way to keep and breed the species in *ex situ* conditions. It is important to improve this situation to establish an *ex situ* population for the future and its insurance value for eventual conservation breeding.

Despite all the interspecies differences, the solution to ensuring a future for *ex situ* populations based on confiscated turtles has a common denominator: sophisticated population management, which is unthinkable without the cooperation of a large number of interested zoos and aquariums. Now we know that we can give a positive answer to those questions posed almost two decades ago, but we must be aware that while a mutual, short-term exemplary action, as in the case of Hong Kong turtle crisis, can bring to our institutions animals with a huge future potential, only our widespread, patient, professional and long-term cooperation is able to make the best use of it.



EVEN GIANTS ARE BORN TINY: ORLITIA BORNEENSIS HATCHLING ON THE HEAD OF ITS DADDY © PETR VELENSKY

Chelonians in Cambodia

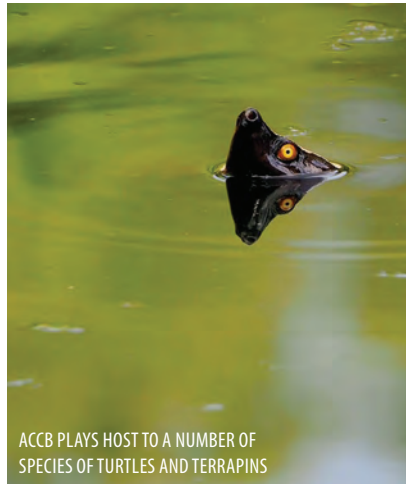
THE ACCB IN CAMBODIA IS A HOTSPOT OF TURTLE CONSERVATION, TACKLING ILLEGAL TRADING AND HABITAT DESTRUCTION ALIKE TO SAVE SPECIES

Philipp Wagner, Curator of Research and Conservation, Allwetterzoo Münster, Germany

The Angkor Centre for Conservation of Biodiversity (ACCB) in Cambodia is one of the conservation programmes run by the Allwetterzoo Münster in Germany. Situated within the Phnom Kulen National Park, next to Kbal Spean (50km north of Siem Reap), it is operated by 30 staff and takes care of around 750 individuals out of 45 species. In total, 92 per cent of the species kept are in a Threatened IUCN category, and many are listed as Critically Endangered.

The ACCB was established in 2003 by Allwetterzoo Münster in collaboration with Dr Stephan Goetz as a private donor and the Zoological Society for the Conservation of Species and Populations (ZGAP). Today it cooperates with many partners, including zoos, NGOs and the VdZ-Conservation Foundation (Stiftung Artenschutz). It is also a WAZA conservation project and partner of the Asian Species Action Partnership (ASAP) programme.

The conservation objectives of the ACCB are, alongside other programmes, focused on wetland and freshwater species. These include water birds, storks and ibises as well as turtles and terrapins. Besides the common slider (*Trachemys scripta*), obtained from local traders, the ACCB keeps only eight species of native Cambodian turtles, tortoises and terrapins: *Indotestudo elongata*, the elongated tortoise (333 ind.); *Batagur affinis edwardmollii*, the southern river terrapin (26 ind.); *Cuora amboinensis kamaroma*, the Southeast Asian box turtle (201 ind.); *Cyclemys oldhamii*, Oldham's leaf turtle (one ind.); *Heosemys annandalii*, the yellow-headed temple turtle (10 ind.); *Heosemys grandis*, the giant Asian pond turtle (seven ind.); *Malayemys subtrijuga*, the Malayan snail-eating turtle (seven ind.); and *Siebenrockiella crassicolis*, the black marsh turtle (three ind.). All specimens were confiscated from illegal trade or are our own hatchlings, making ACCB one of



ACCB PLAYS HOST TO A NUMBER OF SPECIES OF TURTLES AND TERRAPINS

the most important turtle conservation hotspots in Southeast Asia.

In comparison to other Indochinese countries, the turtle populations in Cambodia are still in 'good' condition, which means that they are not as endangered as in other countries, but they are nevertheless under considerable pressure. The threat level is just behind that of countries such as China and Vietnam and it is only a matter of time before we lose Cambodian turtle populations and/or species.

A relevant example of this is the river terrapin (*Batagur a. edwardmollii*), which was thought to be extinct in Cambodia until 2001, when a small population was rediscovered in the river systems of Sre Ambel and Kaong. By 2007, 23 nests had been found and some eggs were taken to develop two *ex situ* populations in Cambodia, with support from Singapore Zoo. The ACCB specimens are mainly males and too young to breed at the moment. However, a population management programme for the species at ACCB is under development and the *Batagur* pond offers the possibility of natural breeding within the enclosure.

TRADED AND ENDANGERED

The main threats are legal and illegal trade and habitat destruction. All Cambodian species can be found at local markets or are collected for

the international wildlife trade. In Cambodia the most traded species, maybe together with softshell turtles, was *Indotestudo elongata*, but the numbers in the markets are decreasing. This was globally recognised by the IUCN, as the new assessment of the species recategorised the species from Endangered to Critically Endangered. As the populations in Cambodia are rapidly decreasing, ACCB started a population management programme for this species with 30 founders, which has resulted in more than 300 offspring individuals at the time of writing. To stabilise the native populations, ACCB is beginning the preparations for a reintroduction programme. However, it is difficult to find habitats that are sufficiently high in quality and well protected (there is a high risk that the individuals will be poached and sold at markets) for the population's survival. ACCB has found a potentially well-protected habitat, but there will be a test phase before the reintroduction programme to evaluate the chances of the latter.

The other much-traded chelonian is *Cuora amboinensis*. Even though the global IUCN conservation status is 'only' Vulnerable (assessed in 2000), it is considered as Endangered in Cambodia and most probably merits Critically Endangered status. However, the detailed population status in Cambodia is unknown, but the species is now rare in the local markets, which is undoubtedly a sign of a drastic decrease of a species. Between 1998 and 1999, *Cuora amboinensis* was amongst the 10 most traded chelonians, and the international trade to China is still a particular problem. Therefore, similar to *I. elongata*, ACCB has already started a breeding programme, producing 170 hatchlings so far. But, finding a good habitat in a well-protected reserve will be more of a struggle than with the other species mentioned here. Natural wetland areas are becoming rare in Cambodia, and

BATAGUR POND AT ACCB, A POTENTIAL BREEDING GROUND FOR THE SOUTHERN RIVER TERRAPIN



in agricultural land those turtles would simply be collected up and sold.

CREATING A NATURAL HABITAT

ACCB breeds both species under natural conditions. Adult individuals are kept in huge enclosures with hiding places and water basins. Egg-laying and incubation also takes place under natural conditions within the enclosures. Right after hatching, the juveniles are relocated into rearing facilities, which are solidly built and enclosed with fences and nets to protect the juveniles against predators such as birds or monitor lizards. The juveniles are regularly measured and weighed and kept in groups like the adults.

However, as the situation for chelonians in Cambodia is getting worse, these breeding programmes will help but not solve the problem. Therefore more breeding programmes will have to be developed in the near future, especially for the large temple and pond turtles. Together with other NGOs active in Cambodia, ACCB wants to develop a national action plan for chelonians which combines

ex situ and *in situ* programmes. Because of the high commercial value of the specimens, finding suitable and highly protected reserves and habitats is crucial. The status of National Park or National Reserve is not sufficient protection against poachers, who often use dogs to find the turtles.

Another threat for native chelonians, which is relatively new, is international trade. As the demand for turtles remains high while the native populations rapidly decrease, more and more individuals of species or populations not native to Cambodia can be found on the local markets. This includes, for example, *Trachemys scripta*, which shows that even Cambodia is now part of the international trade routes. Despite the suitability of the Cambodian habitat for common sliders, it is not regarded as a seriously invasive species, and other alien species present more of a threat. The Mekong snail-eating turtle, *Malayemys subtrijuga*, is one of the most traded turtles in Cambodia at the moment. As the demand is higher than for the local populations, there is a high risk that turtles from

Thailand, Laos and maybe Vietnam will be traded into Cambodia. As these turtles are often used for Buddhist merit release, they could get into natural habitats and interbreed with Cambodian populations. That could not only cause problems for the Cambodian populations, but also result in natural hybrids of distinct species, especially as the systematics of *Malayemys* are not fully resolved so far.

Buddhist merit release is a problem for species conservation in Cambodia and heavily affects bird and turtle populations. The procedure is always the same: animal traders sell the individuals next to the pagodas, religious people or tourists buy them and release them for merit or social media photos, and the animals are caught again by the traders behind the pagoda. This lasts until the animal dies or escapes. As non-native species are used also for merit release, this religious act and tourist attraction causes problems for conservation on several levels. Therefore, ACCB is also working in environmental education and trying to raise awareness, especially in the monk community.

Save our sulcata

IS THE SOS SULCATA PROGRAMME THE LAST CHANCE FOR *CENTROCHELYS SULCATA* IN SENEGAL?

Laure Garrigues, Head of Science, Amiens Zoo, and Christine Morrier, Director, Amiens Zoo, France

The African spurred tortoise (*Centrochelys sulcata*) is a well-known large tortoise, and should be of interest to anyone managing tortoises in human care, as it is quite easy to breed.

It is also the biggest mainland tortoise; a typical male can weigh more than 100kg. The African spurred tortoise comes from Sahel, but its range includes Senegal, Mauritania, Mali, Niger, Tchad, Soudan and Erythrea.

The biology of the wild African spurred tortoise is not well known, but it is a highly specialised reptile that can survive in an arid area. Both its body and behaviour are adapted for Sahel life. As well as being famous for its size, it is famous also for digging burrows to protect itself from the heat. It can spend several months in estivation in such a burrow during the dry season (which can last for six to eight months, in temperatures of up to 48°C).

Thanks to its size, the adult of this species has no predators. However, its reproduction rate is slow. Like most tortoises, growth is slow and the young offspring have a lot of predators, including jackals and small carnivores, hornbills and other birds and reptiles. As with so many species across the world, human activities are now the biggest threat to the African spurred tortoise, including over-grazing, deforestation of the Sahel, farming development and traffic.

Through the ages, tortoises have always been 'friendly' pets. Many legends and stories place them as a totem animal, bringing longevity, strength and power or healing of illness and troubles (in Africa, the African spurred tortoise is mainly believed to cure asthma). Because of such beliefs, it is very common to find the African spurred tortoise kept in domestic homes in West Africa, and today it is more common in captivity than in the wild.

This species is listed in CITES Appendix II and as Vulnerable on the IUCN Red List, but now it is the most endangered reptile in Senegal.

This is why the SOS Sulcata



programme was created in 1993. Led by the French association SOPTOM (Station d'Observation et de Protection des Tortues et de leurs Milieux), the first step was to build a scientific centre in Noflaye near Dakar, which is called 'Le Village des Tortues'. Its goals are:

- 1) to receive captive tortoises from authorities, zoos or the Senegalese people;
- 2) to breed African spurred tortoise in order to release some into the wild (in the Ferlo area) to reinforce the wild population; and
- 3) to educate the local population and tourists.

In the 2000s, SOS Sulcata led research projects and studies into the last-known Senegalese area where *Centrochelys sulcata* lived. Wild population inventories were made in the Faunal Reserves of north and south Ferlo, which have now been unified as the Biosphere Reserve of Ferlo, under the direction of the National Park, the Minister of the Environment of Senegal and the participation of IUCN.

Results showed that remaining populations are fragmented and isolated, (about 50 individuals found in several thousand km²) and are therefore ineffective in conservation terms.

The Senegalese government is keen to protect its biodiversity, so in 2006, the second step of the SOS Sulcata programme was to work with the government to reinforce these small and very patchy populations. Twenty-four African spurred tortoises were released into the Biosphere Reserve of Ferlo, at the station called Katané. Then, in 2011, 12 other tortoises were released to reinforce the first group.

This station is a 1200ha area surrounded by a fence to protect it from human activities and has been the location for several reintroduction programmes (*Centrochelys sulcata*, *Gazella dama*, *Oryx dammah* and *Gazella dorcas*). In 2019, 13 years after the first release, the population at the site has grown, and baby tortoises and sub-adults have been seen each year.

SOS Sulcata is based in Ranérou, a small town but the biggest of the Ferlo zone. The programme works in parallel with local populations, and various approaches were taken to involve the local population in the preservation of local biodiversity.

1) SOS Sulcata works with schools on a pilot education programme of environmental awareness. A number of educational activities are organised for pupils and out-of-school children (the Ferlo area is mainly occupied by the Peuhl, nomadic shepherds): drawing, theatre, journalism, outside activities and visits to the protected area. Children discover the biodiversity and develop new skills at the same time.

2) SOS Sulcata works with local communities to prevent poverty. The population lives in harsh conditions, suffering poverty and malnutrition, and needs income-generating sustainable activities. Since 2012, SOS Sulcata has led groups of men and women in self-supporting activities; the women work in market gardens thanks to micro-credit, and the men, since 2018, in modern beekeeping.

Amiens Zoo supports several programmes in the world, including a global approach to biodiversity protection. It was decided to help SOS Sulcata because the African spurred tortoise contributes to the fragile balance of the Sahel. The paradox between *ex situ* and wild populations is so great that we very much want to help and support this programme. Furthermore, the project chooses to fully involve local communities in the process, which is essential for ensuring a successful and sustainable development.

Home comforts

PRAGUE ZOO HAS CREATED A NATURAL JUNGLE HABITAT FOR THE ENIGMATIC LEAF TURTLE

Petr Velenský, Curator of Reptiles, Amphibians & Fish, Prague Zoo, and Ivan Reháč, EAZA Reptile TAG Chair, Prague Zoo, Czech Republic

In Prague Zoo, turtles from the two large Hong Kong confiscations (in 2001 and 2004) inhabit seven different mixed-species exhibits in the Indonesian Jungle House. The most remarkable of them is the forest stream on the second floor of the large greenhouse. This part of the pavilion is home to a group of enigmatic leaf turtles (*Cyclemys enigmatica*).

The core of the exhibit is a densely vegetated rapid-stream bed measuring 9.1m². This area has no barrier around its borders, so turtles can move around the whole floor of the house, including 96m² of visitors' paths, 150m² of the forested ground and 138m² of the water basin, separating the orangutan enclosure and the visitors' area. The basin itself is one of the mixed species exhibits for Southeast Asiatic turtles, but the enigmatic leaf turtle is the only species capable of climbing over the steep banks and running around the whole house. When we assessed the shallow, crooked, rapid stream (up to 20cm deep) as the optimal habitat for the group of these turtles, the keepers made enormous efforts to convince the turtles to accept it. They finally succeeded with a mixture of the positive reinforcement training method and permanent improvements to the stream conditions, which were adapted to what we thought the turtles wanted.

In 2007, three years after receiving a group of these turtles (which were confiscated in Hong Kong in 2004) as a loan from the Turtle Survival Alliance, the first juvenile hatched naturally in the exhibit, and has since been followed by 21 further offspring. We have placed

signage for the visitors near the turtles' favourite place, on the bridge over the stream, and visitors have a good chance of seeing them just as if they were in the wild, peeping out from behind the water vegetation. And, of course, visitors can see them during the feeding session, when turtles emerge from the stream as well as from the forest undergrowth and run towards the keeper. The stream itself is part of five different water bodies in the house. Basins in the first and the second floors seem to be connected with the stream and the waterfall, but in fact these are two separate filtration systems. Each filtration system is created with a drum filtration unit, a sand filtration unit, UVC lamps and a heat exchanger. The water temperature is 27°C, and the ambient temperature of the house is 25°C during the winter and 27°C during the summer.

The enigmatic leaf turtle was described in 2008, four years after these turtles came to Prague Zoo and one year after their first breeding. When we received the group of confiscated *Cyclemys* spp. turtles, we identified the different types within the group and we decided to treat them separately, rather than allow them to hybridise. The most homogeneous group was placed on the second floor of the newly opened Indonesian Jungle House. In 2008, following the key given by Fritz *et al.* (2008) in their paper describing the new species, we identified these turtles as *Cyclemys enigmatica*. This was later confirmed by a DNA analysis carried out by a team headed by Professor Lukáš Kratochvíl, from Charles University in Prague.

The species inhabits the southern Malay Peninsula and the Great Sunda islands. They can be distinguished from the other species of the *Cyclemys* genus by the uniformly dark plastron of the adults, the uniformly copper colour of the top of the head and the limbs, and the distinctly creamy light colour of the internal skin.

Very little was known about the lifestyle of these turtles. According to our experience, the turtles love the shallow forest streams. Powerful limbs armoured with sharp claws help them to fix themselves firmly to the bed of the rapid stream. They swim very well but they don't remain in deep water. On the other hand, they are extremely good climbers, capable of climbing the vertical rocks almost like geckos. To search for food, they leave the water and prowl around the forest floor. They eat a broad variety of foodstuffs, including any source of protein and different fruits.

In Prague Zoo, we had probably the first opportunity to closely observe juveniles of this species. In fact, they resemble those of other *Cyclemys* species, having a rounded and slightly serrated shell. Their basic coloration is lightly brown with dark mottling on both sides of the body. This impressive species seems to be thriving at Prague Zoo, and we are confident that it will continue to do so.

REFERENCES

Fritz, U., Guicking, D., Auer, M., Sommer, R. S., Wink, M., Hundsdoerfer, A. K. (2008). Diversity of the Southeast Asian leaf turtle genus *Cyclemys*: how many leaves on its tree of life? *Zoologica Scripta*, 37, 4: 367–390.

Making light work

A DECADE OF CAREFUL OBSERVATION AND TRIALS AT A NUMBER OF EAZA AND BIAZA INSTITUTIONS HAS PRODUCED A BEST-PRACTICE APPROACH FOR LIGHT AND HEAT PROVISION FOR CHELONIANS AND OTHER REPTILES

Matt Goetz, Head of Herpetology, Durrell Wildlife Conservation Trust, Jersey, and EAZA Reptile TAG (Chelonia) Vice-Chair

Virtually all reptile species kept in indoor accommodation rely on artificial light and often heat provision to be able to thrive. The past decade has provided a steep development curve both in our understanding of our species' requirements and in the technical possibilities for fulfilling those requirements to an ever-improving standard.

Major shifts included the better understanding of light perception in reptiles, which can be quite distinct to our own; the development of what has now established itself as the standard provision of ultraviolet A and B radiation in species-appropriate gradient levels; and the importance of distinguishing the different properties of heat radiation spectra.

Having said that, we have probably still only scratched the surface of knowing which light is needed at what levels for respective species and how to best provide this artificially. However, we have come to a best-practice approach, which continues to be refined by research in the wild and ongoing trials of animals in human care. This approach entails mixing and matching different lighting products for brightness, heat and UV radiation, and combining these depending on the requirements of the species and the design and size of an enclosure. The general principle is to establish a gradient of light intensity and ultraviolet radiation throughout an enclosure, just as we always do for temperature and humidity, so that animals can choose and self-regulate.

BALANCING WHITE AND COLOUR

Generally speaking, if natural light does not reach the enclosure in sufficient levels, metal halide discharge lamps currently seem still to be the best for providing light intensity including UV-A radiation at a relatively well-balanced visible spectrum. LED lamp technology is rapidly advancing but

still has a less balanced spectrum and no UV-A radiation. Reliable, long-lasting and easily adjusted UV-A and UV-B radiation can be best provided by combining the above with one or multiple fluorescent tubes; the largest multi-tube units can now project UV-B radiation over distances of up to around two metres. Unfortunately, fluorescent tube spectra are not continuous or well-balanced but usually consist of rather distinct spikes for blue, green and often yellow. Our human brain 'tells' us that we should see white light as it combines these colour spikes, but reptile eyes work differently and many species have four cone/colour receptors, which can perceive the ultraviolet and infra-red spectrum. We simply do not know whether their brain also converts such distinct colour spikes into a 'white light' perception or whether illumination through fluorescent tubes alone is more akin to making our animals wear coloured glasses all day. Hence, we should aim to balance out the never-perfect spectra of a respective lamp by combining it with other lamp types.

CREATING A BASKING AREA

Another area of developing thought is the provision of heat, i.e. infra-red radiation for basking. To be able to thermoregulate effectively and to reach their preferred body temperature, most reptiles will need a distinct basking area with significantly elevated temperatures. A great variety of lamp and heater types are used to achieve local basking areas, usually much dependent on enclosure size, from incandescent/halogen spot lamps over metal halide spots to infra-red heaters and ceramic bulbs or panels.

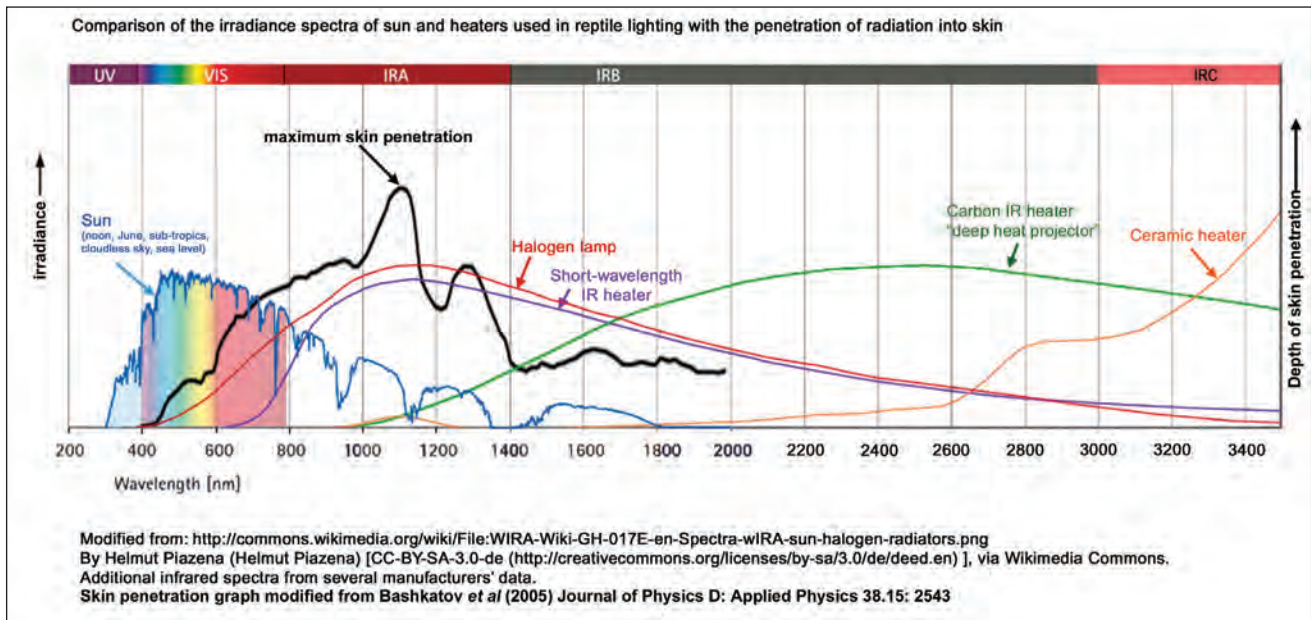
Two factors have more recently come into focus, which allow us to refine our best practice in this area. First, as thermal imaging cameras have become much more affordable, we can observe the basking behaviour of our animals and the effect various lamp set-ups have on thermoregulation in

real time. Using these, it becomes immediately apparent that basking areas have to be larger than the size of the largest animal in the enclosure, i.e. the devices we use to create this area need to be large or numerous enough to create a uniform temperature across an area larger than the animal basking there. Only then will the animal heat up quickly and uniformly as would be natural. This avoids overly long basking times, animals not able to get to their preferred body temperature, or even skin damage while the animal tries to heat up. Basking lamps with too narrow a beam focusing on only a part of the animal's body, especially in larger species, seem inadequate for effective thermoregulation.

Second, just as 'light' is a collection of different wavelengths with quite different properties, heat is equally not just 'heat', which we need to somehow provide; instead, there is a whole spectrum of infra-red radiation wavelengths to consider. Just as we define different wavelength bands of ultraviolet radiation (UV-A, UV-B and UV-C), infra-red radiation also has different properties and different wavelength bands, which can be distinguished as IR-A, IR-B and IR-C. At one end of the infra-red spectrum, IR-A or near infra-red (i.e. near to our human visual spectrum) is the still faintly yellow/red glowing radiation we see from things such as infra-red heaters or fire embers. At the other end, IR-C and most of IR-B is very long-wave heat (also termed far infra-red) which the sunlight reaching earth does not contain but which is heat radiation we get from black, non-luminescent bodies such as pre-heated rocks, electrical radiators or ceramic bulbs. The problem with IR-C and much of IR-B is that this type of heat is naturally transmitted not by convection but through conduction. When emitted by a heater through air, this type of heat does not penetrate deeply but only heats the immediate

LEFT: TWO QUARTZ-HALOGEN HEATERS AND TWO UNITS OF SIX UV-B FLUORESCENT TUBES PROVIDE A LARGE BASKING AREA FOR TORTOISES IN A NATURALLY-LIT ENCLOSURE. RIGHT: MONITORING THERMOREGULATING TORTOISES IN REAL-TIME USING A THERMAL-IMAGING CAMERA

JERSEY ZOO



surface it reaches. It is of course very useful for elevating the background air temperature or increasing surface heat. However, if we provide IR-C and IR-B as the means of radiating heat to a basking tortoise or monitor lizard, for example, it will heat up its skin but will not penetrate deeper into the body than the top epidermis layer (~5mm). In this case, we usually see abnormally extended basking times and sometimes even skin problems because of too-high thermal loads on the skin surface of larger reptiles. This can be especially problematic in chelonians where the highest point of the animal is very close to the radiation source, with the added complication of a thick bony layer underneath the scutes. Basking under IR-C and IR-B sources prevents or at least drastically extends the time needed for the thorough heating of the tortoise's

body, and can overheat and dry out the shell's scutes.

CHOOSING THE RIGHT EQUIPMENT

Applying this knowledge, many zoos have moved to create basking areas by using equipment such as quartz-halogen heaters (short-wavelength infra-red heaters), especially for larger reptiles where incandescent spot lamps or halogen flood lamps, otherwise perfectly adequate for smaller animals, are too small. Quartz-halogen heaters provide good IR-A radiation, which, similarly to sunlight, penetrates deeper into the body where blood vessels distribute the heat further. These heaters come in different sizes and can create homogeneous basking areas of any size needed. Of course, they remain faintly orange in their glow, so the important brightness in a basking area has to be supplemented

in the absence of plenty of natural light. However, a significant positive change in basking behaviour can usually be noticed in animals given this more natural choice; in chelonians it seems to help in effective thermoregulatory heating of the body and less overheating of the carapace. To summarise, we should practically embrace our theoretical knowledge that UV radiation, 'heat' and visible 'light' are not separate things but simply components of a continuous radiation spectrum provided by sunlight. Throughout the day, animals choose different levels and parts of this whole spectrum depending on its varying properties and the animals' needs at that time. We should aim to replicate this whole spectrum in appropriate gradients in our enclosures, bearing in mind the specific properties, benefits and risks of each of the spectral parts.

Trade wars

MORE EFFORT IS NEEDED TO TACKLE THE ILLEGAL TRADE IN TORTOISES AND FRESHWATER TURTLES

Chris R Shepherd, Monitor at the Conservation Research Society

Tortoises and freshwater turtles are among the most threatened taxa in the world today. Of the 353 species of tortoises and freshwater turtles, a total of 251 have been assessed by the IUCN Red List of Threatened Species, and of these, 154 are considered Threatened. Eight species are now Extinct.

Illegal and unsustainable wildlife trade is the greatest threat to a growing number of these species, as their meat is traded for consumption, their parts for use in traditional medicines and live specimens for the booming global pet trade. More species are involved in the international pet trade than the meat and traditional medicines trades combined, and is far more global in nature.

While much of the international trade in tortoises and freshwater turtles for pets is legal, much of it is not. Rare and attractive species are poached and illegally marketed internationally, especially in East and Southeast Asia, North America and the European Union, with organised crime syndicates often in control.

It is essential that illegal wildlife trade is prioritised because of the criminal and structurally harmful elements. Tortoises and freshwater turtles are among the most commonly found animals in seizures made by law enforcement officers, and yet prosecution rates remain low.

Better use of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is essential. While all tortoise species globally are listed in Appendix I or II of the Convention, not all freshwater turtle species are. During the recent 18th meeting of the Conference of the Parties to CITES, held in August 2019, five proposals to transfer species of



PREVENTION OF ILLEGAL TRADE IS ESSENTIAL: RANGERS IN MADAGASCAR PROTECTING PLOUGHSHARE TORTOISES

tortoise and freshwater turtle from Appendix II to Appendix I were put forward and accepted, thus greatly restricting international trade. These species were the Bourret's box turtle (*Cuora bourreti*), Vietnamese box turtle (*Cuora picturata*), Annam leaf turtle (*Mauremys annamensis*), Indian star tortoise (*Geochelone elegans*) and pancake tortoise (*Malacochersus tornieri*). Unfortunately, a number of freshwater turtle species are not listed in the Appendices of CITES. Appendix II should be considered for species that may be impacted by international trade. Listing a species in Appendix II of CITES does not equate with a trade ban. Instead, it allows trade through a permitting system which enables regulation, and opportunities to track and analyse trends, thus providing an early warning system should wild populations begin to decline. This is extremely important, as illegal trade in non-listed species is difficult, if not nearly impossible, to track. Some countries and political unions such as the European Union do not have legislation that allows for the prevention of trade in illegally sourced non-CITES species. With the CITES permitting system, such a mechanism is in place: if there is no permit from the exporting country, the shipment should be deemed 'not legal' and should not be allowed to continue.

Flaws in national legislation in some major tortoise and freshwater turtle trade hubs, such as Thailand and Indonesia, also need to be addressed. CITES-implementing legislation in these two countries continue to enable trade in illegally sourced tortoises and freshwater turtles smuggled into the country and sold openly in markets, as national legislation protects only native species, creating a convenient loophole that facilitates the ongoing illegal trade in non-native species.

Unfortunately, one of the greatest obstacles to ensuring adequate protection for tortoise and freshwater turtle species is a lack of published evidence needed to justify legal measures and to catalyse conservation action. While trade and other parallel threats are driving many species towards extinction, too little investigative research is being carried out to fully understand the threats and to support essential interventions. As such, the declines in wild populations continue. Many species threatened by international trade could be better protected by being listed in the appendices of CITES. Loopholes in legislation in multiple countries involved in the trade have long gone unaddressed, thus enabling a booming illegal trade. Research into these issues and efforts to bring the findings to the forefront are absolutely essential.

CHINA LIGHT BRIGHTENS YOUR BUSINESS !

Increase your visitor numbers
of the zoo in low seasons.



Create a visual attractive and informative festival in any theme
you desire.



Successful editions of China light
have been experienced by our
business partners in Cologne,
Antwerp, Halle , Rotterdam,
Budapest and Paris etc.

Whole package of services is
handled by our professional team.

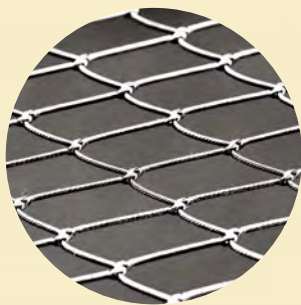


Interested? Please visit our website www.chinalight.eu and we're looking forward to your call or email.
(Tel: 0031641377584; E-mail: yunzhu@tianyuculture.com)



STAINLESS STEEL NET

HAVING TRIED AND TESTED THESE PRODUCTS IN OUR OWN ZOOS, WE CAN NOW OFFER THEM AT ATTRACTIVE PRICES



Our stainless steel handwoven net is the ideal solution for presenting all species of birds, primates and carnivores. This long-lasting solution combines optimum safety and aesthetics.

We work directly with the manufacturer and monitor the quality of the product and delivery times to offer you the best price for this unique netting.



VINE ROPES

IDEAL FOR AVIARIES, VIVARIUM, PRIMATE ISLANDS AND INDOOR OR OUTDOOR EXHIBITS



Made of a polypropylene rope covered with silicon acrylic latex, natural fibres and dyes.

Two models available : diameter 30mm (20 meters long) and diameter 50mm (15 meters long).

A stainless steel buckle at each end of the vine rope makes it easy to attach.

WIRE THICKNESS	MESH
1,2 mm	20 x 20 mm / 25 x 25 mm / 30 x 30 mm 38 x 38 mm / 51 x 51 mm
1,6 mm	25 x 25 mm / 30 x 30 mm / 38 x 38 mm 51 x 51 mm / 76 x 76 mm
2 mm	38 x 38 mm / 51 x 51 mm / 60 x 60 mm 76 x 76 mm / 90 x 90 mm
2,4 mm	51 x 51 mm / 60 x 60 mm / 76 x 76 mm 90 x 90 mm / 102 x 102 mm / ...
3,2 mm	51 x 51 mm / 76 x 76 mm / 90 x 90 mm 102 x 102 mm / 120 x 120 mm / ...

A SPECIALIST TEAM

WORKING WITH ZOO PARKS
FRANCE AND INTERNATIONAL

PRICE – CONTACT US
JOHANNA & FRANÇOIS GAY
INGENIEURS PAYSAGISTES

- johanna@bioparc-zoo.fr
- +33 (0)6 79 43 99 52

BUREAU
D'ÉTUDES
BiOPARC

BIOPARC'S DESIGN OFFICE

103 RUE DE CHOLET • DOUÉ LA FONTAINE
49700 DOUÉ-EN-ANJOU • FRANCE

