

Committing to Conservation - The World Zoo and Aquarium Conservation Strategy

Science and Research

Vision: Every zoo and aquarium contributes to conservation-relevant research to further its conservation mission, and maximises opportunities to engage in conservation-relevant research.

Editors' Note

Zoos and Aquarium have tremendous potential to engage the general public in wildlife conservation. These facilities also contribute for conservation research which is fundamental for conservation of threatened species. Since the extinction rate has been accelerated many folds due to anthropogenic activities, modern zoos are contributing for species conservation in the wild as well. This document by WAZA - Committing to Conservation: The World Zoo and Aquarium Conservation Strategy, outlines the key role zoos and aquariums can play in supporting conservation in the wild. We have permission from WAZA to serialize this publication. This is much needed and timely milepost. Happy reading!

Zoos and aquariums provide a unique opportunity to increase understanding of wildlife species, their environmental needs and their ability to adapt. This can fill an important gap in knowledge that cannot be gained from wild populations because of cryptic animal behaviour, inaccessible environments, limited access to the animals, prohibitive costs of studying enough individuals and the likelihood of the study itself impacting on the animals being observed. Zoo and aquarium-based populations provide access to individuals on a long-term basis, providing context and life-history parameters to understand the significance of samples taken at a single point in time. The hands-on work of zoo and aquarium professionals also provides a singular training ground to develop expertise in animal handling, containment, specialized veterinary medicine, breeding and husbandry of wildlife populations. Zoos and aquariums provide an important venue for scientists and the public to meet and communicate, providing a platform for interpreting the outcome of research and explaining the implications for conservation action. Through the animals and the expertise of staff, zoos and aquariums have a tremendous potential to conduct and participate in research that leads to better management of the animals in their care and wild populations, and thus contribute to the viability of species in a world that faces an enormous conservation crisis.

SCOPE OF CONSERVATION RELEVANT RESEARCH

Ultimately, conservation-relevant research benefits the conservation of natural populations and ecosystems. The research itself furthers a facility's conservation mission, and may range from research on populations and their natural habitats led and/or supported by zoological facilities to studies on the animals at or visitors to zoos and aquariums. As conservation efforts are increasingly likely to pursue a One Plan Approach,

conservation-relevant research must also be coordinated between zoological settings and range habitat.

CARRYING OUT CONSERVATION RELEVANT RESEARCH

Academic researchers, government-agency scientists, and zoo and aquarium staff conduct conservation-relevant research, and there are aspects of significant overlap among the agendas of each community.

Contributions of academic science to the conservation mission of zoos and aquariums. Many aspects of zoo and aquarium operations pose relevant research questions that are interesting to academic researchers. Collaborations with academic experts can expand access to the latest specialised equipment and generate novel ideas for assessment, diagnosis and treatment of health, reproductive, genetic, nutritional, welfare and behavioural issues of animals cared for by zoological facilities. Examples include the assessment and treatment of an individual's health by experts in their field, the development and improvement of contraception and assisted-reproductive techniques (including cell preservation), and the development of appropriate nutrition and environmental-enrichment programmes.



MARIANAS AVIFAUNA CONSERVATION (MAC),
PACIFIC BIRD CONSERVATION
Translocating the golden white-eye between the
Northern Mariana Islands.

Zoo and aquarium animals can be a valuable resource to academic-community researchers. To the academic community, research areas include understanding the basic biology, life history, cognition and behavior of threatened species, the calibration of non-invasive methods to assess physiological states relevant to the health and reproductive status of individuals, testing tolerance and preference of nutritional and environmental conditions, and genetic and taxonomic work to support population management and to unravel the systematic relationship of little-known taxa. Using zoo and aquarium animals for academic research is only acceptable as long as researchers understand that their studies must not compromise the well-being of animals, the benefit in terms of gained knowledge will outweigh any potential temporary reductions in welfare, and such research benefits the conservation mission of zoos and aquariums. To this end, all zoological

institutions should formulate or have access to a research committee that reviews potential research applications.

Application to conservation management. Scientists dedicated to animal management and species recovery may benefit from zoo and aquarium staff and resources. In those instances where recovery plans require conservation breeding and reintroduction, zoos and aquariums have the husbandry expertise, the researchers to improve breeding success and the facilities to manage such tasks. They are also primed to support the management of small populations, be it from population declines or fragmentation. In the field, zoos and aquariums can offer unique benefits, ranging from financial support for cash-strapped management plans to veterinarian expertise for the safe capture and handling of animals. Zoos and aquariums also serve as platforms for scientists to report their goals, findings and progress to the public.

Scientific advances have resulted in new research techniques and technologies that are not routinely available to zoos and aquariums. Unless individual zoological institutions are willing to invest in the development of their own research facilities, access to these scientific skills and tools requires a commitment to building long-term partnerships with academic, public and private laboratories. There are now numerous successful partnerships between the academic community and zoos and aquariums,



What is 'conservation-relevant' scientific research?

Conservation-relevant research by zoos and aquariums is essentially a form of applied research to serve an institution's conservation mission and may cover a wide range of collaborating disciplines, from biological and veterinary science to social sciences, conservation psychology, and educational and communication sciences. There are at least two types of research that zoos and aquariums undertake when conducting conservation-relevant research.

TYPE 1

Aims to support field conservation directly; that is, the conservation of species and their habitats in the wild, including their viability or sustainability. This will usually be field research but is not necessarily limited to this if such research generates knowledge that directly contributes to the conservation of wild populations. For instance, nutrition studies conducted on species that are part of a reintroduction programme may provide critical information for ensuring reproduction of multiple, healthy generations, in which some animals from each generation are reintroduced into the wild.

TYPE 2

Has the purpose of gathering new knowledge to serve the institution's conservation mission. This covers research that may assess visitor attitudes and preferences, and how their interest in and attitudes towards conservation and sustainability may be improved, and benefit efficient approaches to communicating conservation goals and environmental education.

Conservation-relevant research may also involve other species, not necessarily solely those that are threatened, which may serve as a 'model' to test and improve conservation-relevant actions and procedures applicable to threatened species. The One Plan Approach may help to decide, on a case-by-case basis, whether a particular project should be regarded as conservation-relevant research and how essential its contribution is likely to be. Where there are no formal integrated conservation-management plans of the One Plan kind for a particular species, One Plan thinking may still be helpful to assess the necessity and priority of proposed conservation-related research.

which will assure improved conservation breeding and animal welfare, increase our understanding of species resilience, encourage high-quality scientific research, and strengthen the scientific credibility of zoos and aquariums. Scientific research is essential for establishing self-sustaining wildlife populations.

DATABASES AND BIOBANKS

Databases and biomaterial banks are essential tools for an evidence-based approach to conservation research and action, and should be considered a priority for all zoos and aquariums. A well-organised animal database and living collection, and appropriate storage and documentation of samples of dead or live animals (biobank) from zoological institutions or the wild, are feasible for most facilities at modest costs. Databases and biobanks will not only increase the efficiency of management operations but also provide a supply of reference material and genetic diversity.

Furthermore, improvements in genome resource banks and reproductive technologies have the potential to overcome space issues and problems with maintaining genetic diversity (i.e. sustainable populations) over time.

Globally, zoos and aquariums are collecting and storing in regional biobanks the genetic resources of species in their facilities, including collaborative projects such as the Frozen Ark. Such tools are made more valuable by widespread participation and access, and by being compatible with each other where possible. The Zoological Information Management System (ZIMS), provided by the International Species Information System (ISIS), is an excellent, class-leading database for recording information and facilitating data sharing. With nearly 900 institutions participating in ISIS, the population-level information



LEIBNIZ INSTITUTE FOR ZOO AND WILDLIFE RESEARCH (IZW), GERMANY

Faeces of an African wild dog, collected as part of a project in the Ruaha ecosystem, Tanzania, supported by various conservation organisations, including Minnesota Zoo, MN, USA. Faeces reveal many things about an animal in addition to what it eats; for example, species identity, sex, individual identity, physiological stress level, reproductive stage, parasite load and contamination with environmental pollutants.



LEIBNIZ INSTITUTE FOR ZOO AND WILDLIFE RESEARCH (IZW), GERMANY

Blood-sucking insects are a highly successful minimally invasive tool to obtain blood samples from endangered species in a stress-free manner. This process was demonstrated during the conservation breeding and reintroduction programme of the Iberian lynx carried out by Spanish and Portuguese zoological institutions.

essential for population management and the large sample sizes needed to establish veterinary norms are readily available.

SCIENCE AND RESEARCH STAFF

Some zoos and aquariums have research departments or staff employed to make sure that research targets are met. Others provide long-term support to researchers unaffiliated with zoological facilities. In both of these instances, zoos and aquariums are able to guarantee that conservation-related research is part of their overall research portfolio. Facilities that respond to ad-hoc, often externally driven research requests may find that their own research portfolio is of limited conservation relevance.



IZW, GERMANY, AND SFD & SWD, MALAYSIA

Camera trap image of an otter civet in Deramakot Forest Reserve, Sabah, Malaysian Borneo, taken during a project largely funded by zoological institutions



PROYECTO TITI, COLOMBIA

The Proyecto Titi field team prepares cotton-top tamarin faecal samples for analysis. Proyecto Titi seeks to ensure the survival of the cotton-top tamarin in Colombia and is partially supported by zoological institutions.

Once a request has been generated, staff (curators, keepers, researchers, veterinarians) must determine whether a study is of value to the management, understanding or conservation of a species. Institutional investment is essential to the success of any study as it makes certain that research is carried out with sufficient support and consistency. Withdrawing support from a project not yet finished prevents an evidence-based conclusion from being reached. This wastes resources already committed and reduces the perceived value of science to provide clear answers. The following elements of a project should be considered when weighing the benefits and costs.

- What is the problem that generated the question?
- What is the specific research question?
- Is the answer going to be important to informing zoo or aquarium operations?
- How will the research be carried out?
- Does the research need and have ethics approval?
- What will the project cost and how will those funds be secured?
- Who will assist with the project and what experience do they have?
- How will the results be published or presented?
- What are the overall benefits to the zoo or aquarium (e.g. staff development)?

If zoos and aquariums have dedicated science and research staff, they can support the development of a research policy, proposing research priorities and evaluating prospective research projects on their suitability in line with the institution's conservation mission. Staff should have a solid academic-research background and the capability to build collaborations with external research facilities. Such collaborations will help the institution realise its full potential in conservation-relevant research.

ESTABLISHING CONSERVATION-RESEARCH PRIORITIES

The establishment of priorities for conservation-relevant research will be informed by the capacity, resources and conservation mission of a given zoo or aquarium. All areas of operations, as well as conservation-outreach programmes, will benefit from such research; therefore, all staff should be informed about and directly involved in research, when appropriate and feasible.

Collaboration among institutions is essential. When effectively harnessed, the global network of accredited zoological facilities offers an impressive conservation-research resource. Carefully designed and executed research projects that operate across zoos and aquariums, incorporating both large and small institutions, will generate augmented sample sizes as well as opportunities to assess the influence of a wider range of variables

than would otherwise be possible. This will improve the quality and value of research results. Collaboration among zoos and aquariums on conservation-research programmes in the field will assure greater efficiency and more sustainable resources, and provide opportunities for meaningful engagement by smaller institutions that may otherwise be unable to establish and fund their own field-based conservation research.

Zoological facilities should become integrated components of national and global efforts for conservation research, by improving and formalising relationships with organisations charged with evaluating and determining conservation priorities and research issues. These include government wildlife and development- planning agencies, IUCN SSC specialist groups, and well-established, conservation-focused non-governmental organisations and academic societies. Implementing the relevant Aichi Biodiversity Targets through conservation research is also a priority. Local, regional and global frameworks for zoo- and aquarium-based conservation-relevant research can be set up or strengthened by establishing partnerships with these organisations, and finding agreement within the research and zoological communities as to how to translate the recommendations of these organisations into research plans based at zoos and aquariums. These research plans could operate at global, regional and institutional levels, and their conservation impact should be evaluated regularly.

THE IMPORTANCE OF PUBLISHING

Even small-scale studies that provide a better understanding of wildlife biology and management strategies should be published. This helps to avoid duplication of effort, provides evidence-based information to guide global management decisions, increases understanding in the wider community as to the complexities of wildlife management, and provides evidence of the value of research to managers and peers. Results of studies that do not provide positive outcomes will often not be submitted for publication but, assuming the science was conducted well, the work should still be published to prevent repetition and guide future studies.

CONCLUSION

All zoological facilities should assess their potential for and improve their contributions to conservation-relevant research, and build their own conservation-research strategy with realistic and achievable goals. Zoos and aquariums can facilitate conservation-relevant research at every stage of development, although the research capacity of individual zoological facilities will vary and lead to different levels of research output. Institutional conservation-research plans should be developed to align with and contribute to the conservation mission of an institution.

RECOMMENDATIONS

- Assess and invest in the research capacity of the zoo or aquarium, and the potential to develop a conservation-research strategy, which would serve the field-conservation mission and address the research needs of populations of species in the wild and those in the institution. Research capacity could be improved by developing partnerships and links to organisations that have research as a core business.
- Set up or utilise well-structured data-collection and management systems (e.g. ZIMS), and well-organised specimen-sample collection and long-term storage (biobanks).
- Develop a research policy and conservation-research strategy fitting the field-conservation mission of the institution.
- Consider developing partnerships with academic institutions and/or other zoos and aquariums with research resources, and take a leadership role in developing the next generation of conservation biologists, including creating opportunities for children to aim for careers in science, technology, engineering and mathematics.
- Ensure priority is given to research that can achieve impactful results and has clear implications for improving conservation efforts for species in the wild.



Yangtze alligator

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