



Position Statement

On the role of botanic gardens, aquariums, and zoos
in species conservation



POSITION STATEMENT ON THE ROLE OF BOTANIC GARDENS, AQUARIUMS, AND ZOOS IN SPECIES CONSERVATION

What do Kihansi spray toad (*Nectophrynoides asperginis*), pink pigeon (*Nesoenas mayeri*), tequila splitfin (*Zoogoneticus tequila*) and café marron (*Ramosmania rodriguesii*) have in common? These species and many others were on the brink of extinction but are now on the road to recovery in the wild through the expertise and conservation efforts of botanic gardens, aquariums and zoos. To achieve these outcomes, many botanic gardens, aquariums and zoos practice high standards of care, conservation, education and research. They are professionally organised and active in national, regional and international professional associations. These institutions work cooperatively with diverse stakeholders contributing their expertise in *ex situ* and *in situ* management, education, research, community engagement and fundraising to prevent the extinction of these and other species and to recover them to a favorable conservation status.

The IUCN Species Survival Commission (SSC) recognises that botanic gardens, aquariums and zoos are not the only types of institutions that manage animals, fungi and plants *ex situ*. However, while botanic gardens, aquariums and zoos can, and do, contribute significantly to species conservation, this role is often under-valued, underrecognised and misunderstood. SSC also recognises that not all botanic gardens, aquariums and zoos around the world are meeting their conservation potential. Therefore, the purpose of this document is 1) to outline SSC's position on the roles played by these institutions in the conservation of species and their genetic diversity, 2) to urge all these institutions to achieve their potential in ensuring that animals, fungi and plants thrive in the wild, and 3) to encourage the global species conservation community to work in a collaborative and integrated fashion towards reversing biodiversity declines. This SSC position statement directly contributes to the implementation of [WCC-2020-Res-079](#) on linking *in situ* and *ex situ* efforts to save threatened species.

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Cover: Przewalski's Horse, *Equus ferus*, EN © Kira Mileham

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SSC's position

The IUCN Species Survival Commission (SSC) recognises the significant contributions that botanic gardens, aquariums and zoos can, and do, bring to conserving wild animals, fungi and plants.

SSC values the key roles that botanic gardens, aquariums and zoos can, and do, play at the intersection between *ex situ* and *in situ* conservation. These roles span applied genetic, behavioural and veterinary science, husbandry, wildlife reintroduction and translocation, research, education and community engagement, policy development, access to nature-based experiences and conservation funding. SSC also believes that there is opportunity and interest to increase participation in these roles.

SSC urges all botanic gardens, aquariums and zoos to meet their conservation potential and to work as valued members of a well-integrated conservation community to ensure the survival and health of wild populations of animals, fungi and plants.

Finally, SSC encourages all its partners including government agencies to collaborate with botanic gardens, aquariums and zoos in the collective work of saving species through the *One Plan Approach*.

Rationale

Many botanic gardens, aquariums, and zoos around the world have increasingly expanded their conservation focus and play leadership roles in the development and implementation of conservation policy, mobilising data for conservation prioritisation, conservation planning and species recovery efforts¹⁻³. Many botanic gardens, aquariums, and zoos include conservation as central to their mission and are increasingly involved in local, national and global conservation efforts through, for example, community engagement, species monitoring, ethical research, education, advocacy, significant funding to diverse conservation efforts, access to nature-based experiences and species management *in situ* as well as *ex situ*⁴⁻⁸.

Scientific-based and conservation-focused botanic gardens, zoos and aquariums are often professionally organised and accredited by national, regional or global associations. Accreditation programs for botanic gardens, aquariums and zoos around the world strive to define and require evolving best practices of their members, and many explicitly include conservation and research as key components of accreditation requirements. Professionally organised and accredited botanic gardens, aquariums and zoos often lead and champion best practices in population management, actively fulfill diverse roles in saving species, act in accordance with IUCN guidelines, are highly valued expert institutions within the global conservation community, and some are IUCN Members and SSC partners. Unfortunately, many botanic gardens, aquariums and zoos throughout the world are not accredited and there remain many around the world which do not currently contribute to conservation. Some of these institutions contribute to negative practices such as inappropriate population management, improper wildlife disease management, unsuitable wild releases, or wild collection of threatened species outside of managed and approved conservation efforts. These low-standard institutions should not be used to judge the community as a whole and are particularly encouraged by SSC to enhance their practices, seek accreditation, and fulfill their conservation potential.

When wild populations become increasingly small, fragmented, and in need of active intervention and intensive management, the distinction between *in situ* and *ex situ* management and conservation tools can blur. For many species, these approaches are better viewed as a continuum of management practices and expertise that can be applied to meet species conservation challenges⁹. Species conservation plans and actions often do not account for a wide and inclusive approach, whether at a landscape level, individual species action plan or species collection and management plan for

ex situ populations. As a result, species conservation efforts can suffer from siloed approaches across *in situ* and *ex situ* management. When species collection and management plans for *ex situ* populations are developed in isolation, they may miss opportunities to address priority conservation needs of the species *in situ*¹⁰. Conversely, when *in situ* conservation plans are developed without adequate consideration of the roles that *ex situ* management could play, they may miss opportunities for suitable priority *ex situ* actions and can risk leaving *ex situ* interventions too late for the survival of the species¹¹⁻¹². Achieving integration and alignment of the strengths, knowledge, experience, data, resources and efforts from across a diverse and inclusive set of stakeholders holds enormous potential for protecting species, restoring habitats and engaging communities.

IUCN urges an integrated approach to species conservation that involves the active participation of diverse stakeholders and considers all potential conservation options in the development and implementation of species conservation and recovery plans. This *One Plan Approach*, developed by the SSC Conservation Planning Specialist Group, recognises the conservation benefits of involving all available expertise in species conservation prioritisation, planning and practice for *in situ* or *ex situ* populations, resulting in more holistic and unified strategies for saving species¹⁰. Where this practice is followed, the likelihood of reversing species' extinction risk has been shown to improve¹³⁻¹⁴. Integrated conservation strategies should also include conservation social science and participation of local and indigenous communities to define conservation solutions that suitably involve human dimensions.

To help guide integration with botanic gardens, aquariums and zoos, within a *One Plan Approach*, the *Guidelines on the Use of Ex situ Management for Species Conservation*¹⁵ provide a five-step decision-making process to assess whether or not *ex situ* options are a beneficial and appropriate component of a species conservation strategy. This process can be applied to all taxa, regardless of their current *ex situ* status. It should be jointly conducted by stakeholders representing both *in situ* and *ex situ* expertise and can be incorporated into overall species conservation planning for wild populations. These *guidelines* identify that *ex situ* management can help address threats (e.g., through ethical research and targeted human behavior change), offset the impact of threats and restore wild populations (e.g., through population reinforcement and reintroduction), buy time and provide additional future conservation options (e.g., through population rescue and insurance populations). The *guidelines* define the resources and expertise needed to meet the objectives of *ex situ* management, providing a comprehensive list of considerations including evaluation of the facilities, proper staffing, and sufficient funding necessary to produce the desired results.

SSC encourages all its partners, including government agencies, to make optimal use of the tools, expertise and capacity available in accredited botanic gardens, aquariums and zoos and to build or strengthen links within and across these institutions in the work of saving species. The 2020 World Conservation Congress in Marseille (September 2021) adopted [Resolution 079](#) urging the IUCN Secretariat and IUCN Members to promote integration of *in situ* and *ex situ* conservation interventions by applying the *One Plan Approach* to ensure the effective use of all available conservation tools, and recommending closer collaboration among SSC and botanic gardens, aquariums, zoos, and biobanks through integrated membership, aligned goals and shared species conservation prioritisation, planning and practice. During the same World Conservation Congress, [Resolution 119](#) was also adopted, calling on the conservation community to urgently develop collaborative and ambitious strategies for the re-establishment of Extinct in the Wild species back *in situ* and for botanical gardens, aquariums and zoos especially to ensure the long term survival of Extinct in the Wild species.

In 2022, the Convention on Biological Diversity (CBD) included within Target 4 of the Global Biodiversity Framework a specific prompt to include *in situ* and *ex situ* management practices to halt extinctions, drive species recovery and restore genetic diversity. The Global Strategy for Plant Conservation (GSPC) adopted by the parties to CBD in 2001 highlights the importance of *ex situ* conservation for plants. Likewise, in 2004 the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) adopted [Resolution Conf. 13.9.](#), *Encouraging Cooperation between Parties with Ex situ Breeding Operations and those with In situ Conservation Programmes*.

Botanic gardens, aquariums and zoos can, and often do, play a central role in their local communities – socially, culturally, politically and financially. In an increasingly urbanised existence botanic gardens, aquariums, and zoos often provide people with their first, or most accessible, experiences of animals, fungi and plants from around the world. These connections with nature, along with formal and informal environmental education opportunities, can increase their visitors' understanding and appreciation of the intrinsic value of animals, fungi and plants, with the potential to educate, inspire and empower them to adopt conservation positive practices and behaviors¹⁶⁻¹⁹. Botanic gardens, aquariums and zoos have access to large, diverse audiences and the ability to influence local businesses, governments and policy makers in conservation-related decisions. Moreover, many of these institutions make use of diverse funding sources and collectively contribute significant financial support to many aspects of species conservation.

As with other sectors involved in nature conservation, many botanic gardens, aquariums and zoos are working hard to prevent and reverse negative trends in species survival, while others could do more to meaningfully achieve their potential in supporting the conservation and recovery of plants, animals and fungi around the world. With the increased rate of species loss, SSC urges all conservation partners to use all the tools, capacity and expertise available by working together to save species.

Examples of roles botanic gardens, aquariums, and zoos can, and do, fulfill in the conservation of wild species

The list below is a non-exhaustive list of examples where botanic gardens, aquariums, and zoos currently contribute or can be further called upon to fulfill their conservation roles and aid in the critical work of ensuring the long-term survival of species in the wild.

1) Care, knowledge, and management of *ex situ* and *in situ* populations of animals, fungi and plants and their environments

- Knowledge of, and expertise in managing species *ex situ* that can be applied *in situ* (e.g., *ex situ* propagation, identification, handling, care, ecological and socio-biological needs and behavior); not limited to threatened species but also for related species that may serve as models for threatened counterparts *in situ*.
 - Hold, rear, propagate, breed a wide range of species *ex situ* as part of highly diverse roles of *ex situ* management for species conservation – including providing samples for and/or managing and coordinating biobanks or germplasm banks.
 - Care for and expand populations of the only surviving individuals of particular species (which are by definition Extinct in the Wild) either locally or globally, thereby preserving and striving towards future conservation interventions for *in situ* recovery.
 - Ability to demographically manipulate populations to increase productivity or reduce mortality at particular stages to influence population growth of threatened populations *in situ*.
 - Lead and/or assist in rescue, recovery and rehabilitation of species.
 - Assist in combating wildlife crime by working with law enforcement on animal, fungi and plant cases (e.g., species identification, care, placement and possible repatriation of confiscated live specimens, pathology and biosecurity expertise and capacity, and marking and tracing to identify illegal trafficking of species).
- Support in managing and preventing the risk of emerging pests and pathogens and invasive species including biological approaches, awareness raising, outreach and planning.
 - Contribute to landscape and ecosystem restoration and protection through direct efforts and indirect community mobilisation.
 - Manage sustainable *ex situ* populations which decreases the need for sourcing from *in situ*, striving for genetic and demographically healthy populations where possible.
 - Expertise in non-invasive management and manipulation of individuals that can for example, help monitor wild populations or guide operant conditioning to help shape and modify behaviour in the management of human-animal conflict and coexistence scenarios.

2) Health and pathology

- Ability to use *ex situ* species expertise, medical data and capacity to monitor, prevent and treat diseases and pests and conserve species *in situ*.
- Opportunities for applied research and treatment development with *ex situ* populations and biobanks for emerging and zoonotic diseases and other aspects of wildlife and plant health.
- Possibility to monitor and research diseases in *ex situ* individuals that are not observable in *in situ* populations.
- Expertise in the One Health Approach – assistance in understanding the connection between health of people, animals, fungi and plants and the environment and for advocating on related approaches and policies with communities and policy makers.
- Expand knowledge about comparative pathology, pathogen discovery and pathogen ecology, including in relation to zoonotic diseases and the related risks to humans and other animals, fungi and plants.
- Potential to evaluate pathogen presence and impact in *in situ* populations through evaluation of individuals of wild origin (e.g., rescues, confiscations).
- Knowledge and protocol development around best practice biosecurity measures to manage and mitigate disease risk.
- Development of veterinary field and health screening protocols which can be applied during health assessments, biopsy collection, translocations and necropsies, etc.
- Development of baseline ecological and biological data such as physiological response to capture, health and reproduction parameters, application of pharmaceuticals, capacity for genetic analysis and cryopreservation, etc.

3) Conservation translocations

- Source of individuals for conservation translocations in line with the [IUCN SSC Guidelines](#).
- Evaluation of pedigree or molecular genetic information for the purposes of conservation translocations.
- Expertise and resources important to conservation translocations (e.g., access to and testing of equipment and techniques, logistical expertise, holding and transport advice, permit experience, expertise in handling, training and species-appropriate care, management approaches for competing species *in situ*).
- Development of pre-translocation techniques and protocols such as pre-translocation behavioural training and post-translocation monitoring and support.
- Fostering support for translocation efforts with range-country stakeholders including governments, scientists, indigenous groups and communities.

4) Ethical research, science and data

- Expand, manage and share demographic, genetic, taxonomic, physiological, ethological, environmental, genomic and other aggregated data on thousands of species to support conservation initiatives, inform policy, support species status assessments, etc.
- Experience in implementing responsible exchanges and collections *in situ* by following the provisions expressed by international policies, such as the Convention on Biological diversity (CBD) policies, with particular regards to Access and Benefit Sharing (ABS) and Nagoya Protocol.
- Understanding and expertise to translate knowledge learned from *in situ* populations through field assessments towards *ex situ* population management.
- Taxonomic and genomic expertise to support new species discovery, species identification, monitoring, and management.
- Gathering and recording of developmental, life history, phenological, morphometric, and demographic data where conditions do not allow this knowledge to be gained *in situ*.
- Source of individuals for ethical, non-invasive research benefiting the conservation of many species *in situ*.
- Expertise in scientific research about the ecology, biology, evolution, physiology and behavior of many animals, fungi and plants.
- Availability and access to research materials, samples and biobanks as a resource for a wide variety of conservation-relevant research fields.
- Understanding of genetic diversity information to inform high standard population management *ex situ* and *in situ* and to inform genetic diversity targets and strategies.
- Availability of samples and molecular genetic expertise to aid with identifying and clarifying taxonomic identity, and with monitoring and managing gene diversity of *in situ* and *ex situ* populations/individuals and wider ecosystem health.

- Development of methods and tools for genetic and demographic management of small populations, relevant to the conservation management of both *ex situ* and *in situ* populations and of genetic conservation units.
- Ability to identify potential genetic issues that might impact species (e.g., diseases, inbreeding depression, genetic drift).
- Open sharing and publication of conservation science data, analysis and papers to maximise the accessibility and impact beyond each individual project.
- Biotechnology development, for example, assisted reproduction and propagation capacity.
- Development and testing of new technology and monitoring techniques (eg., e-DNA protocols, testing and samples).
- Undertake, lead or support key conservation assessment and planning processes (e.g., Red List assessments, Key Biodiversity Identification, species conservation planning, etc).

5) Working with communities

- Broad relationships with and engagement of local communities, indigenous groups, governments, universities, and civil society at large, with nature and conservation initiatives.
- Serve as a neutral convener of diverse stakeholder groups relevant to species conservation.
- Relationships at the global, regional, national, and local levels.
- Advocate for and implement conservation policy changes, laws, regulations and standards, and treaties to conserve animals, fungi and plants (e.g., CITES, CBD, and Convention on Migratory Species).
- Ability to raise the profile, engagement with, and support for lesser-known species often overlooked in conservation efforts - such as fungi, invertebrates, amphibians, rodents, etc.
- Develop and promote human-wildlife coexistence strategies.
- Expertise in connecting visitors to nature, fostering empathy for the natural world, and educating visitors about the importance of biodiversity and the intrinsic value of animals, plants and fungi.
- Provide broad access to educational opportunities and up-to-date education philosophies, models and techniques.
- Expertise in offering informal educational opportunities (e.g., signage, webinars, family nature days) and formal educational opportunities (e.g., classes, summer camps, school programs and field trips, undergraduate and postgraduate programming, lectures, intern programs, virtual programs) including in underserved communities.
- Expertise in messaging complex conservation topics to diverse audience groups in-person and virtually.

- Delivering visitor experiences to support conservation goals and encourage pro-conservation behaviours.
- Access to large venues for events and to diverse audiences (e.g. visitors, the wider public at large, governing boards, donors, elected officials, local businesses and docents/volunteers) and ability and capacity to collaborate with partners.
- Social science expertise in design, delivery, evaluation and impact monitoring of education, outreach, citizen science and behaviour change programmes both *in situ* and *ex situ* to effectively empower communities as agents of change.

6) Capacity building and resources

- Employ, train and motivate staff and volunteers to work in the conservation of animals, fungi and plants.
- Delivery of training and capacity building, including in-country, across diverse skill sets and participants.
- Funding, often long-term, for *in situ* and *ex situ* conservation work including through engagement with wider conservation donors (e.g., individuals, foundations, government agencies, local business partners, docents/volunteers).
- Working as catalysts for strategic species assessments, conservation planning or mobilising action, including in partnership with the volunteer expert SSC network such as through hosting an SSC Center for Species Survival or an SSC Specialist Group.
- Providing capacity and training in key conservation assessment and planning processes (e.g., Red List assessments, Key Biodiversity Identification, species conservation planning, etc).
- Training and capacity building programmes that equip, train and mentor conservation professionals in all stages of their career, including from low-capacity regions.
- Capacity building for first responders, including veterinarians during disaster and emergency response and rescue.

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