



Vienna Guidelines

„One-Plan-Approach“ - Conservation breeding projects of endangered aquatic animal species

Biological diversity is an internationally recognized and protected asset, and includes both the diversity of ecosystems as well as the variety of species. Habitat loss, climate change and invasive species are the main challenges threatening the existence of rare animal species that live now in only a few limited areas. The situation is serious. Countless aquatic animal species are currently facing extinction in their natural habitats. The biodiversity crisis is so extreme that, to ensure the conservation of some species, essential massive efforts in the wild must be supplemented with an ex situ strategy in the aquarium; it is essential to create reserve populations and generate the basic ecological and behavioral knowledge of endangered species for reintroduction purposes. Some species only exist now in human care, being already extinct in the wild!

The long-term conservation of ex situ populations requires experienced specialists just as much as does the effective protection of species outdoors. The core competence for this lies exclusively with experienced animal keepers from the public and private sector, because they are the only ones with the relevant practical experience. It is important for long-term successful conservation that breeding programs are based on robust science and offer practical guidelines for aquarists, zoos, scientific institutions and other associations conducting species protection projects. Such a cooperative approach leverages the competences and strengths of the respective partners. Institutions, for example, work on a daily basis with authorities, partner organizations, NGOs and the public; which is why private experts benefit when their logistical support, science-based and viable policies, and performance in the public domain. In return, a large number of private enthusiasts contribute their immense practical and theoretical expert knowledge, and their many suitable breeding facilities make an invaluable contribution to ex situ species protection on a scale that public institutions alone could not provide.

With this background, an interdisciplinary group of experts from specialized aquarists, zoos, associations, science and veterinary medicine, having many years of practice and scientific expertise in breeding endangered species and protecting their habitats, held a workshops over three days (7-9th October 2022) at the Haus des Meeres Aqua Terra Zoo on the subject of "species conservation and species protection in aquaristics" and produced the "Vienna Guidelines".

Goals

The aim of the breeding programs is to produce ex situ populations with the greatest possible genetic variability. As reserve populations, they supply animals for reintroduction when needed.

Ex situ conservation breeding projects for endangered or already extinct in the wild species are part of the “One Plan Approach”¹, i.e. they need an in situ perspective that ties in with or initiates conservation initiatives in the habitat and that has the involvement of local people, as equals, for their acceptance and support. They can never be used as a reason to accept the extinction of a species in its natural habitat. Rather, they produce founder populations and species-specific basic knowledge gained from aquarium observations, which is necessary for reintroduction programs. An in situ perspective and heavy responsibility also exists for extinct species whose original habitats have been irretrievably destroyed, but for which new ones could be created elsewhere in the future.

Ex situ conservation breeding projects focus on endangered species including fish, amphibians, crustaceans, snails and other invertebrates. Their aim is to protect natural stocks of animal species that are threatened, or already affected by extinction, by establishing and maintaining viable (maximum genetically variable) aquarium populations that can be used as founder populations for reintroduction projects. Their respective conservation status results from the Red List classification of the International Union for Conservation of Nature (IUCN) or, if the IUCN classification is pending or not up-to-date, from other reliable assessments of their respective threat status by relevant specialists and experts.

Ex situ conservation breeding projects must be long-term and organized in a sustainable manner, because most endangered species cannot be expected to be reintroduced in the near future because of the destruction of their habitats. They must therefore be designed to last for several decades. This can only be achieved by bringing together and collaborating with experts from science, breeding practice, authorities and associations. The long-term perspective necessarily places a moral obligation for all participants to take part in a conservation breeding program for at least four years ideally, but at least two years of commitment (preferably longer) and to distribute the tasks across several shoulders so that the sustainability and continuation of conservation breeding is not jeopardized if individual participants drop out.

¹ The „One Plan Approach“ was formulated by the IUCN SSC Conservation Planning Specialist Group (CPSG) as an integrated planning of conservation initiatives that, from project inception includes all populations of a threatened species within and outside of their natural range, all established tools (*ex situ* and *in situ*), involve all resources and all conservation stakeholders. It is intended to establish new partnerships, improve understanding and trust between all those interested in species conservation, and accelerate the optimization of species conservation management so that all factors contribute to species conservation as specifically as possible (summarized from: Byers O., Lees C., Wilcken J. & Schwitzer C. (2013) *The One Plan Approach: The Philosophy and Implementation of CBSG's Approach to Integrated Species Conservation Planning*. WAZA magazine Volume 14, pages 2-5).

Approaches

Conception and coordination of species-specific *ex situ* individual projects

For each endangered species there is a different starting point for a species protection project depending on the taxonomy, threat situation and geographical origin; species-specific coordination is therefore required. This will be ensured separately for each *ex situ* species conservation project by a technically competent **species coordinator** and - in the interests of sustainability - by deputies. The species coordinators ensure that success control and quality assurance are carried out for each individual project in the interests of sustainability. This means that you can learn from your own mistakes and improvements can be implemented promptly.

In particular, species coordinators ensure that

the **general and species-specific husbandry guidelines**, as well as the basic **principles of husbandry hygiene**, are specified and assured by the participants, i.e. husbandry in species tanks, availability of quarantine units and ensuring a generally good state of health

the **breeding initiative is part of a One Plan Approach**. In order to ensure this, the species coordinators must not only network with other breeders, scientists, institutions and conservationists in their own region but also in the countries of origin.

- animals are only **passed on to knowledgeable participants** who have voluntarily committed to participate in a species protection project for at least two to four years. Competent participants must have relevant experience and be guided by established "best practice". Under no circumstances should they fall below the minimum legal requirements applicable at the time.
- **all participants in a species protection project must document stocks** by surveying those every six months or annually, documenting them digitally and storing the results securely to prevent data loss. The documentation to be used is standardized. Where such a tool is not yet available, the documentation is to be provided by the species coordinators.
- **they keep a standardized studbook** that ensures the establishment, maintenance and long-term management of several breeding lines, and that **the communication and exchange of animals are controlled** in such a way that all participants contribute with their stocks to the greatest possible genetic diversity of the maintained aquarium populations over the long term
- **Husbandry guidelines are developed dynamically using a digital "living document" and are constantly being further developed**, so that basic aquaristic, behavioral and ecological knowledge for *ex situ* and *in situ* species protection is available in accordance with the one-plan approach.

- **the use of excess animals for distribution and for selling them only takes place with their consent.** Passing on, possibly also selling them, to outside the group of participants is only permitted if it is ensured that genetically valuable animals are not lost to the conservation breeding project. The transfer must be transparently documented both internally for the project and anonymously for the public.

Cooperation with partners in the countries of origin

In terms of the one-plan approach to species protection, *ex situ* species conservation projects alone are not effective. In order to give the *ex situ* initiative an *in situ* perspective, it needs the acceptance and support of people in the countries of origin of the endangered species. Local cooperation partners support the same species conservation goal, allow practical solutions to be found for the protection of the species on site and give *ex situ* projects legitimacy. Individual projects should therefore be linked to local institutions, e.g. universities and NGOs. This can be achieved above all by involving committed people, e.g. scientists and private species conservationists from the countries of origin in the work.

This should be achieved effectively through personal contact, by approaching each other respectfully as equals, and by means of one or more of the following initiatives:

- **Research relevant to species protection**, which concentrates on aspects relevant to protection, e.g. the recording and research of still extant habitats; research into environmental parameters important for survival, behavior and ecology in the aquarium and in the field; as well as the identification of threat factors.
- **Habitat protection, restoration measures and, if necessary, reintroduction projects**, the financing of which should be made possible by, for example, project applications and crowdfunding initiatives being submitted and carried out in close cooperation with local authorities, NGOs or private individuals. However, already established financing of *in situ* projects is not a prerequisite for the start of *ex situ* conservation breeding projects.
- ***Ex situ* breeding projects also in the countries of origin.**

Preservation of the greatest possible genetic diversity through coordinated documentation of breeding work

Genetic diversity is one of the most important factors for the survival of species in nature. Only in this way can species dynamically adapt to changing environmental conditions. In conservation breeding projects, which ideally turn into reintroduction projects, not only the species-specific phenotypic characteristics, but also the genetic diversity present in the breeding lines must be preserved as much as possible over many generations. This includes a science-based and coordinated approach within the framework of a studbook kept by the species coordinator, which is used in particular for documentation. The background to this approach is that even with the best breeding management, genetic diversity is lost over the breeding generations, so that good breeding management only gains time, but can never completely stop the loss of genetic diversity. The studbook must be easy to understand and adapted to the specific species, and its content and objectives are based on the established breeding management of zoological institutions.

In order to maintain the genetic diversity of the wild type to be preserved in aquaristic practice over many generations, the following principles should be followed as much as possible in conservation breeding projects:

- A **management unit is originally geographically separated locality populations of a specific species** that are always managed separately from others of the same species.
- A project is started with **as large a number of founder animals** as possible.
- **Founder animals are divided as early as possible into as many separate breeding lines** as possible and from then on are bred separately in genetically dissimilar groups.
- In order to minimize the risk of failure, an attempt should be made to combine **only a maximum of 25% of the genetic diversity of a unit in one holding**, i.e. wherever possible at least four holdings per unit should be established.
- In every genetically dissimilar groups one should work with the **parent generation for as long as possible**, so that the original genetic variability is maintained for as long as possible.
- **Generations of a line are kept separately** and listed separately in the studbook, so that unwanted backcrossing and inbreeding effects within the individual aquarium stocks do not occur.
- **Direct selection based on external characteristics must be avoided** in order not to indirectly select for lower genetic variability. However, individuals obviously deviating from the wild type are not bred further.

- Non-natural selection is also avoided by raising **only a random number of individuals required selected as early as possible to maintain the breeding goals under comparatively extensive conditions**. This avoids indirect selection for relatively unnatural rearing conditions and direct selection through the targeted selection of fewer offspring from a large number of offspring.
- **Size, composition and husbandry conditions of the breeding groups and the specific formulation of the breeding goals are based on species-specific characteristics**, e.g. in relation to social behavior, expected number of offspring and generation times, in order to be able to plan realistically.

Studbook

The keeping of a studbook by the respective species coordinators serves to obtain a systematic and long-term overview of the respective stocks: their (genetic) quality, diversity, their degree of relationship, if necessary the proof of pedigree for breeding animals as well as data on the breeding history. The specific elaboration of the studbook specifications is critical, and is indispensable as a means of documentation. In the case of aquatic species with generally high numbers of offspring, the studbook in aquaristic practice does not differentiate according to the production of individual animals, but rather according to the production of viable generations of a breeding line. The most important goal of continuing a self-reproducing breeding line in a single holding is therefore primarily to secure long-term aquarium populations and only secondarily to bring the highest possible number of offspring into the next generation.

In order to be up-to-date and reliable, **studbook management** should enable active breeders to file their entries in a uniform format directly into a common, non-public workspace. This workspace is managed by the species coordinators and registration is done through the species coordinators. It **records, documents, characterizes and coordinates**:

- Participants
- Lines, stocks and generations of a management unit (species, subspecies, geographic population)
- Housing conditions of the respective participants
- Origin and number of founder animals per stock of the respective participants
- Passing data and distribution of parts of a stock to others

Optional, but absolutely desirable for the scientific validation of the lineages and the success in maintaining the genetic and phenotypic diversity, are regular laboratory analyzes of the genetic identity and diversity of the stocks in the holdings, as well as a photographic documentation of the phenotype of all founder animals and representative individual animals of the following generations (usually aquarium photos in side view and possibly top view). However, genetic sampling requires a sufficient financial basis, the participation of relevant scientific institutions, and the involvement of specialist staff who have the relevant qualifications for sampling. As an interim solution, the archiving of genetic samples from the initial generation should be practiced.

Financing of species protection initiatives

The main financial burden of ex situ species protection initiatives on a private basis is taken on by private keepers on a voluntary basis. Donations and grants (money, material) can be accepted as long as it is ensured that no conditions are attached to them and that third parties are not granted co-determination rights. This is the only way to ensure that species protection initiatives are not publicly discredited or thwarted, e.g. through "greenwashing".

The marketing of animals that are not required for the maintenance of breeding goals can also support species protection initiatives financially by cushioning ex situ maintenance costs. Species coordinators and breeders decide on the disposition together on the basis of the "Vienna Guidelines". The species coordinators must ensure that their documentation and communication is transparent throughout. It may only take place as long as the animals are not required for the breeding goals of the species conservation project.

Contributors to the Vienna Guidelines

Name	Institution
Dr. Jens Bohn	Zoo Rostock
Jens Crueger	Verband Deutscher Vereine für Aquarien- und Terrarienkunde (VDA) e.V.
Björn Encke	Citizen Conservation (CC)
Florian Glaser	
Kathrin Glaw	
Johannes Graf	Internationale Gesellschaft für Regenbogenfische (IRG)
Robert Guggenbühl	Schweizerischer Dachverband der Aquarien- und Terrarienvereine (SDAT) Deutsche Cichliden Gesellschaft (DCG)
Marco Hasselmann	Zoologischer Garten Berlin AG
Dr. Fabian Herder	Leibniz-Institut zur Analyse des Biodiversitätswandels (LIB)
Dr. Stefan Hetz	VDA-Arbeitskreis Zwergcichliden (AKZ)
Harro Hieronimus	Deutsche Gesellschaft für Lebendgebärende Zahnkarpfen (DGLZ)
Stefan Inselmann	Deutsche Cichlidengesellschaft (DCG)
Ariel Jacken	Zoologischer Garten Leipzig
Dave-Suryanto Kasih	Berliner Gesellschaft für Großaquarien - 1000arten
Daniel Konn-Vetterlein	Internationale Gemeinschaft Barben Salmier Schmerlen Welse e.V. (IGBSSW)
Ulrike Korte	VDA-Arbeitskreis Lebendgebärende Aquarienfische (AK-LAF)
Torsten Kortum	
Michael Köck	Goodeid Working Group (GWG)
Dr. Thomas Litz	Deutsche Killifisch Gemeinschaft e.V. (DKG)
Gunnar Loibl	Internationale Gemeinschaft für Regenbogenfische e.V. (IRG)
Marco Meyer	
Dominik Niemeier	
Markéta Rejlková	Ostrava Zoo
Dr. Ulrich Schliewen	SNSB-Zoologische Staatssammlung München
Fabian Schmidt	Zoo Basel
Tobias Schmiedecker	Österreichischer Verband für Vivaristik und Ökologie (ÖVVÖ)
Jeff Schreiner	Haus des Meeres: Aqua Terra Zoo
Dr. Arne Schulze	Zoologischen Gesellschaft für Arten und Populationsschutz e.V. (ZGAP)
Dr. Martin Singheiser	Bundesverband für fachgerechten Natur-, Tier- und Artenschutz e.V. (BNA)
Kay Urban	Arbeitskreis Lebendgebärende Aquarienfische des VDA (VDA AK LAF)
Andreas Wagnitz	
Dr. Helmut Wedekind	Institute for Fisheries, Bavarian State Research Center
Anton Weissenbacher	Tiergarten Schönbrunn
Benjamin Wilden	<i>Parosphromenus</i> Project

An initiative of:

