

# Ex-situ conservation for Danube River Sturgeons – concept, facts and outlook

**Ralf Reinartz:** Consultant for Fisheries & Aquatic Ecology, Münster, Germany, e-mail: ralfreinartz@online.de

**András Péteri:** National Agricultural Research and Innovation Centre, Research Institute for Fisheries and Aquaculture, Szarvas, Hungary, e-mail: shubunkin@invitel.hu

**Thomas Friedrich:** Institute for Hydrobiology & Aquatic Ecosystem Management, BOKU, Vienna, Austria, e-mail: thomas.friedrich@boku.ac.at

**Cristina Sandu:** Institute of Biology, Romanian Academy, Bucharest, Romania, e-mail: sanducricri@yahoo.com

## Introduction

The Danube River is the last refuge for populations of five sturgeon species in Europe (*Acipenser gueldenstaedtii*, *A. ruthenus*, *A. nudiiventris*, *A. stellatus* and *Huso huso*). All of these populations are seriously endangered or threatened by extinction due to a whole complex of factors. This includes the historic burden of centuries of overexploitation, resulting in small population sizes, e.g. by the Allee effect and genetic bottlenecks, and, in combination with blocked migration routes, in the loss of subpopulations living and/or spawning in the Upper and Middle Danube River and their tributaries (Reinartz 2002; Schmall & Friedrich 2014). Populations are also still impacted by illegal, unreported and unregulated (IUU) fishing and under an increasing pressure by infrastructural development in the Danube region, resulting in a potential loss of sturgeon habitat.

## The ex-situ concept

One conservation approach to counteract the extinction of wild animal populations is the implementation of ex-situ (“off-site”) measures aka conservation breeding, as already

envisioned by the Sturgeon Action Plan under the Bern Convention (Bloesch et al. 2005) and included in the Program “STURGEON 2020” (Sandu et al. 2013). Ex-situ measures serve two main purposes (Reinartz 2015):

- the conservation of endangered sturgeon populations or populations on the brink of extinction by establishing captive life-cycle units and ensuring the survival of adult spawners of each population entity aka conservation unit (CU)
- the stabilization of CUs by compensating for deficits in natural reproduction through the release of juveniles adapted to wild conditions (fit-for-survival) and thus ensuring viable year-classes of future wild spawners.

It is of paramount importance to maintain and protect the genetic identity and diversity, as well as the morphological and behavioural characteristics of the respective CUs in both captivity and the wild. Measures have to be in line with the existing life-cycle of CUs, synchronized with all in-situ (“on-site”) activities and conducted long-term until stocks have recovered. Ex-situ operations have to be clearly distinguished from commercial aquaculture operations (Figure 1), as the desired traits in produced offspring differ significantly (see also the article by Friedrich et al. in this volume).

## Feasibility

Respective guidelines and studies (Chebanov et al. 2011; Reinartz 2015) deliver the following important resources for the feasibility of ex-situ measures (in alphabetical order):

1. Broodstock: Adult spawners that genetically represent the wild CUs
2. Ex-situ expertise: Necessary for establishing and running ex-situ facilities and operations
3. Funding: Short- to mid-term funding for establishing facilities and broodstock and long-term funding to cover maintenance costs
4. Knowledge and research: In-depth knowledge and research of in-situ conditions and ex-situ processes
5. Live gene bank facilities: Sites for keeping broodstock and running ex-situ operations

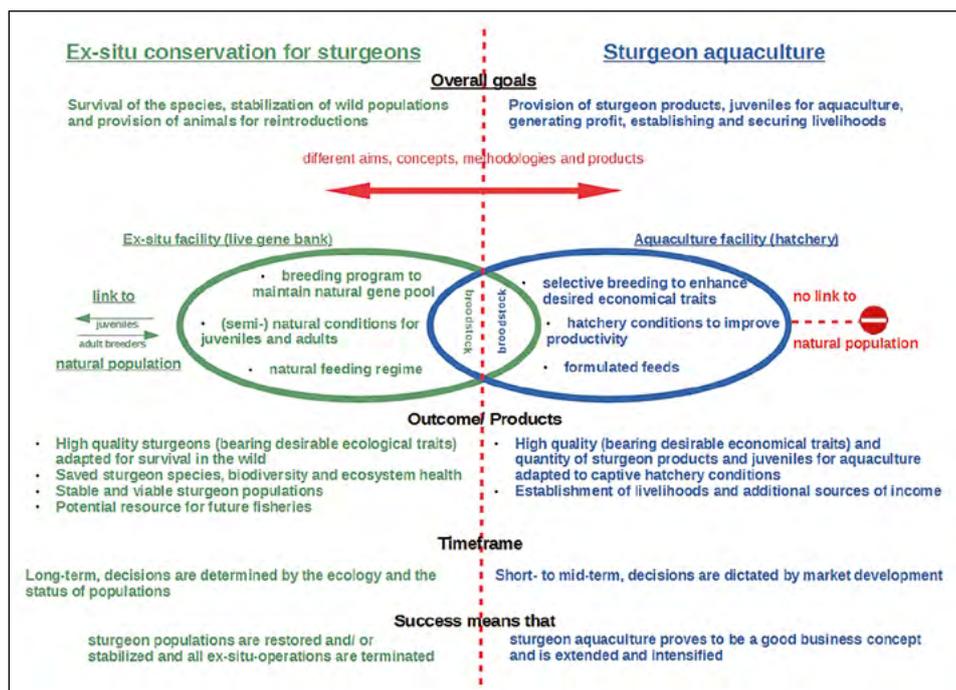


Figure 1. Main differences between ex-situ measures for sturgeons and sturgeon aquaculture (from Reinartz 2015)

6. Management: Transnational management at all levels for the goal-oriented implementation of basin-wide ex-situ measures under public coordination and control
7. Political will: Is vital for the support and long-term funding of ex-situ measures.

### Ex-situ survey to preserve sturgeon genetic diversity in the Middle and Lower Danube aka STURGENE

Up to now, releases of migratory sturgeon juveniles from controlled propagation into the Danube system have been sporadic and their stocking always depended on the availability of funding and caught wild spawners (Reinartz 2002). Funded by the EUSDR START program, the project "Ex-situ survey to preserve sturgeon genetic diversity in the Middle and Lower Danube" (STURGENE) constitutes the first step towards transnational concerted ex-situ measures on a regular basis, in line with "STURGEON 2020". This project was carried out in Bulgaria, Romania, Serbia and the Ukraine, and comprised a survey of existing aquaculture facilities and captive broodstock (Figure 2), as well as raising awareness with local stakeholders and high-level policy makers.

Most of the surveyed facilities are not suitable for running integrated ex-situ operations except one, provided that minor adaptations would be implemented. However, a limited number of potential broodfish of the three anadromous species exist in facilities from Bulgaria, Romania and Ukraine and could provide future spawners, if their Danube origin and genetic suitability will be confirmed (Friedrich et al. 2015). Also, the terms and conditions for the use of these resources are not clear, as both facility and broodstock are in private hands. The stakeholder workshops and the high-level political event documented a good hands-on expertise in controlled propagation, as well as a general stakeholder and political support for ex-situ measures.

### Ex-situ theory vs. reality

STURGENE results have shown that there will be no easy solutions for the implementation of basin-wide ex-situ measures, as major necessary resources still need to be established. Thus, pragmatic yet responsible solutions should be favoured to achieve the overall goal of ex-situ, which is the conservation, stabilization and restoration of original Danube sturgeon populations, as described above.

### Outlook

The following activities are seen as most urgent for a further successful implementation of ex-situ measures for sturgeons in the Danube-Black Sea system (DSTF 2016):



Figure 2. Sturgeon juveniles in facility at Horia, Romania during STURGENE survey (photo András Péteri)

- Establishment of an international consortium, with governmental representatives and scientists, to lead the ex-situ conservation program
- Feasibility study for in-situ conservation, as a basis for the ex-situ conservation program
- Genetic inventory of captive sturgeons to select suitable candidates for future restocking programs
- Establish a pilot facility for migratory species and secure most valuable sturgeons
- Launch a rescue program for the Russian sturgeon (*A. gueldenstaedtii*), which is on the brink of extinction.

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