



Global Re-introduction Perspectives: 2010

Additional case-studies from around the globe
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IUCN/SSC Re-introduction Specialist Group (RSG)





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Re-introduction of Atlantic salmon to the River Rhine System: case study of the River Sieg, Germany

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Introduction

Atlantic salmon (*Salmo salar*) is an anadromous salmonid spawning in freshwater, in the headwaters of rivers. Juveniles in the range of 12 to 25 cm migrate in the springtime to the sea. After 1 to 4 years, the adults leave the sea and enter freshwater again. They grow up from 50 cm to more than 100 cm reaching a total weight of up to 30 kg. The species is widely distributed in Europe from Spain (South) to Norway and Russia (North) and formerly colonized all big German rivers draining the North Sea. The fishery of Atlantic salmon was very important in Europe and in 1885 more than 250,000 individuals were captured in the Rhine. In the beginning of the 20th century Atlantic salmon catches were strongly declining in the Rhine despite first international efforts to maintain the species. By the end of the 1950s Atlantic salmon was extinct from the Rhine System and other large German rivers (Ems, Weser and Elbe). As a consequence Atlantic salmon is listed as priority species in Annex II and V of the Habitat Directive. In the German Red List the species is listed as extreme rare (RL 1: es) and in the IUCN Red List as vulnerable (VU). The geographical area of the re-introduction project is the River Rhine System in North Rhine-Westphalia, Western Germany.

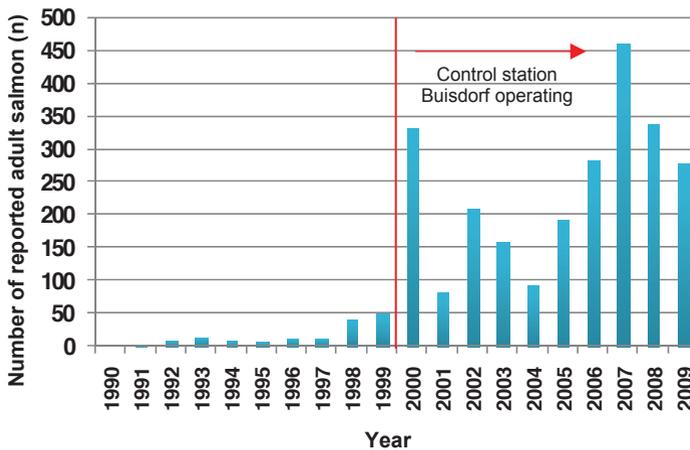
Goals

- Goal 1: Rehabilitation of rivers and their habitat in order to fulfill the ecological demand of sensitive migratory fish species.
- Goal 2: Re-establishment of a genetically adapted population of Atlantic salmon by using returning adult fish in a breeding program.



Largest salmon captured in the River Sieg since 1990 (male/113 cm) © G. Feldhaus, LANUV

Fig. 1: Number of adult salmon recorded in the River Sieg since 1990



- **Goal 3:** Re-introduction of the formerly extinct Atlantic salmon in best suited tributaries of the River Rhine.

Success Indicators

- **Indicator 1:** Increase of available juvenile habitat that can be reached again by adult spawning fish.
- **Indicator 2:** Increase of downstream migration of juveniles

(smolts) leaving the river of their release (measured by e.g. marking experiments, rotary screw trap in the River Sieg).

- **Indicator 3:** Increase of the return rate of adults entering the river of their release (measured by counting adult salmon at control stations in the River Sieg and its tributaries, e.g. Buisdorf and Troisdorf).
- **Indicator 4:** Increase of natural reproduction of adults in several tributaries of the River Sieg (e.g. Agger, Bröl, Naafbach); counting of natural fry by electro-fishing campaigns.

Project Summary

Feasibility: The project started as early as 1988 along the River Rhine coordinated by the International Commission for the Protection of the River Rhine (ICPR). The so called Rhine Action Program (called “Salmon 2000”) was initiated by the riverine countries as a reaction to a dramatic fire incident in Switzerland (Sandoz accident) where in 1986 contaminated water killed fish along a 200 km stretch of the River Rhine in Switzerland, France and Germany. The overall goal of the Rhine Action program is the ecological rehabilitation of the River System which is now integrated into the activities with regard to the Water Framework directive of the EU aiming at the good ecological status of watersheds. In the beginning of the project, the habitat surface suitable for Atlantic salmon (juvenile and spawning habitat) was investigated in the River Sieg and its tributaries, North Rhine-Westphalia. More than 100 ha of habitats were mapped and GIS referenced. The potential salmon stocks in other European countries showing comparable environmental conditions as the former Rhine salmon were screened for the delivery of eggs and other life stages for stocking. In the beginning of the project it was decided to use a mix of several salmon origins for stocking of the River Sieg (Salmon from Norway, Scotland and Ireland). The program was run by the ministry of environment of North Rhine-Westphalia which

made official funds available to the state agency for ecology and fisheries of the Land Northrhine-Westfalia responsible for operating the re-introduction of salmon.

Implementation: In the beginning of the project (1988 -1994) only low numbers of salmon have been released to the River Sieg. In 1990 the first adult salmon was recorded in the Bröl, tributary of the River Sieg and in 1994 the first successful reproduction was registered after the extinction of the species in the River Rhine.



Release of juvenile salmon by a school class

© G. Feldhaus, LANUV

From 1994 to 2000 more juveniles were released to the River Sieg but numbers of adult fish remained relatively low partly due to the lack of a systematic control at fish ladders. In 1998 the project was reorganized by the ministry and the fishery association of North Rhine-Westphalia stepped in as a cooperation partner within the new migratory fish program (1998-2010). Two permanent staff members of the fishery association went into the coordinating bureau of the program together with two project managers of the state agency for ecology and fisheries.

The key species in the migratory fish program are in addition to salmon, houting, eel and since 2007 Allis shad (see Beeck *et al.*, 2008). Since 2000, a control station is operating at the uttermost downstream dam in the River Sieg at Buisdorf as part of the monitoring which enables the counting of adult salmon ascending the river. The control station is run in close cooperation with the Land of Rhineland-Palatinate and this contribution is gratefully acknowledged. Since 2004 the use of different salmon origins in the River Sieg was abandoned and only one salmon stock from Denmark (transplanted originally from the River Åtran (Sweden) is used in accordance with the Land of Rhineland-Palatinate (responsible in middle stretch of the River Sieg). The translocation of salmon used for stocking is performed with young life stages (eyed eggs, alevins, parrs and smolts). The veterinarian control is done by Danish authorities as well as by the laboratory for fish health of the state agency for ecology and fisheries in North Rhine-Westphalia.

Post-release monitoring: One of the most important post-release monitoring techniques is electro-fishing in autumn. Selected habitats where alevins and parrs have been released in the beginning of the summer are fished every year. In the time period 1999-2003 only 1/3 of the habitats tested reached good or very good survival rates (>15, or 25 %, respectively). During this earlier period, stocking was mainly performed with unfed or shortly fed alevins. From 2004 to 2008 stocking



Salmon hatchery team of the state agency for nature and environment of Northrhine-Westfalia

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protocol was changed to summer parrs (1 g fish, fed between 8-12 weeks) and the proportion of habitats showing good to very good survival in autumn increased to more than 70 %. Electro-fishing is also used to monitor salmon juveniles originating from natural reproduction in some accessible tributaries of River Sieg. Since 2004, the number of juveniles per 100 m² of tested habitats is increasing in one major tributary (River Agger), reaching a mean value of about 148 individuals per unit. The number of adult salmon returning to the River Sieg is

counted at two control stations in the Sieg catchment. The maximum number was reached in 2007 with more than 400 individuals. As the efficiency for those traps is believed to reach only 50 % the number of returning salmon was probably twice as high. With a yearly estimate of the number of smolts leaving the River Sieg in spring, a return rate can be calculated in the range of 0.5% to 1.0%. This return rate is far too low to sustain the population and to stop stocking in coming years. Therefore a ranching program was started with about 100 adults captured at Buisdorf every year. The eggs of these fish are stripped at the hatchery of the state agency in Kirchhudem-Albaum and most off the offspring is used for stocking in the following spring (about 200,000 alevins). A small proportion is reared in the hatchery to feed a freshwater gene bank of offspring from returning fish. The eggs produced from those freshwater reared spawners will be used for stocking other tributaries of the River Rhine in North Rhine-Westphalia.

Major difficulties faced

- Transition of fish between freshwater and sea is hampered in the Rhine delta, the Netherlands, due to large dams constructed against sea floods.
- A large proportion of freshwater habitat is not accessible due to the presence of dams without fish passages.
- Losses of juveniles during downstream migration at hydropower plants with turbines without fish protection screens.
- Illegal fishing of protected adult salmon on their way to the spawning grounds in the Rhine (delta) and its tributaries.
- Poor habitat quality due to water pollution and erosion in the basin of spawning rivers.
- Observed decline of marine survival of Atlantic salmon in the sea in recent years.

Major lessons learned

- The re-introduction of salmon has to be coordinated not only on a national but on an international level to cope effectively with all problems faced in a large River System like the River Rhine.
- Intensive monitoring of all activities (especially stocking) in the project is necessary to evaluate the results. Control stations are mandatory in the main river (like River Sieg) to count returning adults.
- To establish a migratory fish species with a complex life cycle a long-term project funding is needed.

Success of project

Highly Successful	Successful	Partially Successful	Failure
		√	

Reason(s) for success/failure:

- The long-term funding of the project and the implication of stakeholders (fishery association) is important for the success of such an ambitious re-introduction.
- The coordination of the International Commission for the Protection of the River Rhine is important in a large river system like River Rhine.
- The integration of the efforts into the water framework directive of the EU is very important to improve fish passages and habitat quality.
- The initial project goal to establish a self-sustaining salmon population is still not met and the enhancement of the new population in the River Sieg by ranching is necessary probably until 2020.

References

Beeck, P.; Klinger, H.; Jatteau, P.; Chanseau, M., 2008: Re-introduction of Allis shad to the River Rhine system: Netherlands, Germany and France. In: GLOBAL RE-INTRODUCTION PERSPECTIVES: re-introduction case-studies from around the globe, 2008. Ed: Soorae, P. S: IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE, 19-21.