6 Summary

The European sturgeon *Acipenser sturio* L., 1758 has nearly approached extinction in its original and overall distribution areas from the White and the Baltic Seas, to the Black Sea, including the North and Mediterranean Seas as well as the Eastern North Atlantic (HOLCIK et al., 1989). The species occurs regularly only in a recent population in the Gironde basin in France (ROCHARD et al., 1990; WILLIOT et al., 1997, KIRSCHBAUM et al., 2000). This population has still decreased dramatically since the 1970s, and recovery by natural reproduction does not seem likely (driven by a lack of sufficient adult and mature specimens).
The restoration of this species rests almost exclusively on the establishment of a broodstock as an *ex-situ* measure, in order to manage artificial reproduction to stabilize the endangered stocks. Additionally habitat improvement and protection efforts are major goals of a sturgeon conservation program, implemented in France in the early 1980s (WILLIOT et al., 1997). The 1981 and 1985 artificial reproduction booked limited success, the rearing of the larvae failed. A third reproduction and larvae rearing effort was successfully conducted in 1995 (WILLIOT et al., 2000). Some of these individuals have been used to build a broodstock to be reared in captivity.
Little is known about dietary requirements or other specific conditions for supporting optimal growth that provides a healthy stock during long-term captivity. First results in France indicated that *A. sturio* grew somewhat restrained under controlled conditions, and relied mainly on natural feed (as opposed to commercial dry feed). The species specific nutrition demands are considered limiting factors raising European sturgeon in captivity.
A Franco-German co-operation has been established to address the issue of the restoration of the European sturgeon in German rivers. 40 juveniles of the batch of 1995 were transferred to the Leibniz-Institute of Freshwater Ecology and Inland Fisheries in Berlin (IGB) in April 1996. To gain as much information as possible, two different keeping strategies were applied in France and Germany. In contrast to the French strategy, no special precaution was taken in terms of captivity at IGB. Sturgeons were tagged with passive integrated micro-transponders to identify each fish. Weighing intervals were continuously reduced from about two months in 1996 to two weeks in July 1999. Intimate illumination adopted to the natural photoperiod of Berlin imposed a natural periodicity and allowed for best observation of the feeding behaviour as well as the condition of the fish. The environmental factors of rearing under indoor conditions did not affect the fish or its growth performance.

Because of sub-optimal growth during the first three years (1996-1998) of breeding juveniles at IGB special feeding trials were designed to explore basic requirements of nutrition, and to support optimal growth rates to promote artificial reproduction as the basis for the restoration of this species in Germany. This PhD thesis is intending to understand these complex relationships.

Feeding trails were conducted with different natural feeds as well as commercial dry food. The growth was expressed as specific growth rate (RICKER, 1975) which allowed for comparison of growth between fish of different weights. A starvation experiment provided the basis of an assessment of a negative growth performance (HENSEL et al., 2002). Experiments relating to the impact of the tank size and keeping density on the growth characteristics as well as the chemical analysis of selected feed items were covered in these investigations.

An important result of the feeding trials is the ubiquitous feeding selectivity of the European sturgeon. This is not an artefact of indoor rearing under captivity confirmed by BROSSE et al. (2000) who verified this peculiar feeding behaviour also for the juveniles in the Gironde estuary, which preferred the polychaete species *Heteromastus filiformis* and *Polydora* sp. By comparing different feed items (also fed from 1996-1998) like frozen small marine fish, frozen small chironomids and frozen large chironomids the latter induced the best specific growth rates.

Large juvenile fish (total length 80 to 115 cm, 2.000 to 5.000 g in 2001) were intended to be accustomed to pieces of sprat *Sprattus* spr. as a new feed item for an experimental period of 29 weeks (from April to November 2001). These trials were based on the experience of the aquarium at Heligoland Island in the North Sea successfully feeding *A. sturio* on this item stock (GOEHMANN, personal comm., 2001). The European sturgeon at the IGB, however, rejected this food item despite the extended feeding trial. The only effect was a slight increase of the median SGR for the experimental group which was fed a mixed diet containing frozen large chironomids with a 10-25% addition of the frozen sprat pieces.

The individual feeding reactions observed towards different feed items results in a strategy which takes into account the individual food preferences to accustom the fish to new feed items, guaranteeing adequate nutrition promoting optimal growth performance.

Rearing conditions and the stocking densities influence the growth of fish in addition to the feeding strategy (JODUN et al. 2002). Experiments were undertaken to determine the effect of stocking densities and tank size on growth: two groups of fish were kept in 11.6 m^3 tanks at stocking densities of for example 2.7 kg/m^3 (N = 8) and 2.9 kg/m^3 (N = 6) respectively, whereas the two other groups were reared in 6.8 m^3 tanks at densities of e.g. 4.8 kg/m^3

(N = 5) and 4.4 kg/m^3 (N = 8) respectively. The average density of 3.7 kg/m^3 seemed to be the adequate density which did not affect the growth performance of our fish.

From all these results it is obvious that the breeding of the European sturgeon is possible and offers the possibility of restoration under consideration of the species specific characteristics.