

Preface

General Introduction, Context, Origin and Setting Up of the Project

The European sturgeon, *Acipenser sturio* L. 1758, used to be one of the most widespread sturgeon species (Magnin 1959). However, like most Eurasian sturgeon species, its status has now become critical (Williot et al. 2002), it has been extirpated from the great majority of its natural biotopes, and survives only in the French Atlantic coast façade, the Garonne basin, with a population on the verge of extinction (Rochard et al. 1990). The species was exploited more or less intensively for decades and even centuries, as it was in most European countries bordering the Mediterranean Sea (Italy, France, and Spain), the Eastern Atlantic Ocean (Spain, France), the North Sea (the Netherlands and Germany), and the Baltic Sea (Classen 1944; Holčík 1989).

The species can therefore be looked upon as an emblematic European species.

Compared with terrestrial animals or plants, fish combine several handicaps: they are not visible, they move, sometimes far away from the administrative limits of human societies. Fisheries are under-managed, as can be seen from changes in fish population status, and fish conservation is almost ignored. The sturgeon is no exception. Moreover, the European sturgeon is further handicapped. It is an anadromous species which colonises alternately a great variety of biotopes in fresh, brackish, and marine waters which do not tick the administrative boxes. Other biological characteristics such as longevity, late puberty, and non-yearly oogenesis make them even more susceptible to exploitation in spite of their apparent robustness (Boreman 1997; Jager et al. 2008).

Much has been done in France in the last few decades in favour of the preservation–conservation–restoration of the species, especially by research bodies. However, despite great efforts and protection, the status of the species has deteriorated.

The conservation programme of the European sturgeon in France was begun in the early 1970s. In 2007 for the first time, a breakthrough was achieved with the first

reproduction of cultured brood fish (Williot et al. 2009) which made it possible for the restoration programme to start again. This was the opportunity to draw up an extensive assessment of the long-term programme, to update available knowledge, describe the context, and make known some long-term concerns.

The European sturgeon restoration–conservation programme has been a complicated programme, full of pitfalls. We realised that, among other things, besides its unusual scientific and technical aspects, conservation does not only have scientific relevance. Indeed, social, economic, political, financial, and administrative aspects are an integral part of any preservation–conservation programme.

In the field of science, conservation issues are facing many difficulties. Research into biodiversity is favoured but not protection *stricto sensu*, and conservation actions are not considered with much enthusiasm in France. Thus, grants from this source are for the most part not accessible for concrete actions. In addition, in the absence of training courses in Conservation Biology, most people working in the field are undereducated, at least when they begin their careers. Thus, it is necessary to take time to explain, to discuss, to exchange and finally to get the consensus of all those involved, even though a specific decision might be not considered as the optimal one from scientific and technical points of view. Consensus is a key issue for going further. Many biological sciences are potentially concerned by fish management and conservation, sometimes at both fundamental and applied levels. Unfortunately, it is often difficult to mobilise specialists. One of the great challenges of conservation biology is that the situation of certain species is so critical that waiting for supposedly needed data would inexorably lead to the extinction of a species. The European sturgeon conservation programme was a good example of the difficulties that have been faced. Due to the high depletion status of the species, the decision was taken by a few people in a research institute to acquire experience and set up methods using another sturgeon species as a biological model, the Siberian sturgeon, *Acipenser baerii* Brandt 1869. Not only did the species play its role of model species almost to perfection, but also the further economic development achieved by farming the species enabled the leading French institute to obtain a new research facility. And this proved to be a key point for building the *ex situ* European sturgeon brood stock. Another fruitful consequence was that conservation and farming sturgeon activities enabled us to hold ACIPENSER, the first International Symposium on sturgeon (ISS1) in Bordeaux in 1989 (Williot (ed) 1991).

The evaluation of the primary project submitted to Springer was rapid, positive and accompanied by two requests. The first was to include the restoration plan of the Atlantic sturgeon (*Acipenser oxyrinchus*) in the US, and the second to update the data regarding the status of the European sturgeon in the River Rioni in Georgia. No recent paper has been published on the status of the species in Georgia since the synthesis by Ninua (1976).

At the time, it had been known for some years that the Atlantic sturgeon (*A. oxyrinchus*) inhabited the Baltic Sea (Ludwig et al. 2002; Tiedemann et al. 2007). Consequently, restoration actions for the species have started in both Poland and Germany. At almost the same time as our book project got underway, a French

archaeozoologist was publishing a scoop showing that the Atlantic sturgeon had inhabited the French Atlantic coasts for a long time (Desse-Berset 2009), from 5000 YBP to 300 YAD, which strongly suggested that the two species were sympatric in the area. We therefore seized the opportunity offered by the Springer incentive, and decided to broaden the Atlantic sturgeon issues in this book by introducing several actions in favour of the species, and looking for somebody able to provide the latest available data from the Georgian population. So this book is timely in taking into account the new situation of sturgeons in Western Europe, especially in France. It is worth noting that it was only recently in the 1960s that the two species were recognised as different (Magnin 1962, 1964; Magnin and Beaulieu 1963). And further genetic investigations have constantly pointed out the great proximity of the two species (e.g., Fontana et al. 2008).

Clearly, such a project would have missed its objectives without the participation of co-editors, including the unusual involvement of an archaeozoologist. This illustrates the need to open up conservation biology to new fields, and the need for cooperation, as mentioned above. All of them have brought very decisive inputs to the book, which would have been much less valuable otherwise. I would like to gratefully acknowledge Eric, Nathalie, Jörn and Frank for their enthusiasm, kindness and efficiency in contributing to our work.

The contents of the book were based on the following central themes: (a) providing a book on conservation in practice, with the European sturgeon as an example, (b) updating knowledge in the field, (c) broadening the range of concerned disciplines, (d) highlighting aspects that are not strictly scientific, (e) assuming new issues from the presence of two sturgeon species, the European and the Atlantic sturgeons, and (f) showing internal coherence, illustrated by the numerous cross-references.

The very great majority of those we contacted agreed to contribute. The contributors are greatly acknowledged, all the more so since many of them provided unpublished inputs, either results or analysis.

The book is divided into six unequal parts. The first part deals with all the available biological data on species population. A very brief introduction provides the reader unfamiliar with sturgeon with some basic characteristics, with a special focus on the European sturgeon. In addition to cytogenetic matters, a large section is devoted to geographical extension, present and past, with different approaches, literature, archaeozoology, and palaeogenetics, to the history of populations and fisheries in diverse countries, especially those for which there was no recent synthesis, and to some specific biological traits. As the Atlantic sturgeon was “invited” to participate in the book, two chapters deal with comparisons of the two species in terms of morphology and osteometry of the bones and morphology for the juveniles.

It is noteworthy that most of the physiological functions of the species were, and still are, to a great extent under-documented, e.g., reproduction, osmoregulation, endocrinology, nutrition, and haematology, with the exception of a preliminary investigation on the hydromineral balance (Magnin 1962), and on reproductive endocrinology (Davail-Cuisset et al. 2008).

The second part is an illustrated interlude devoted to part of the iconography of the European sturgeon, i.e., mainly photos and stamps. The sources are limited to France for the photos.

The third part focuses on the restoration–conservation actions that have been undertaken in France and later in Germany. Apart from the two chapters that draw an historic overview of European sturgeon-related management issues in France and Germany, the other chapters can be arranged under three topics dealing with: population, ex situ efforts, and efforts relying rather on non-scientific actions. The chapters reporting on population studies focus on methods and their applications, e.g., age determination, marking and tagging, monitoring of post-release sturgeon, and an attempt to model the future of these released fish. The ex situ actions cover sex determination and maturation staging, reproduction with two alternatives, wild and farmed brood fish because the management logics are different, larval rearing, brood stock building, its genetic variability, and sperm cryoconservation. The third topic in this part deals with the role of non-governmental stakeholders, awareness campaigns among marine professional fishermen, and a synthesis on French–German cooperation.

The fourth part is focused entirely on Atlantic sturgeon management, illustrated by fisheries in Québec (Ca), conservation in the US, and restoration in the Baltic Sea.

Some perspectives and prospective concerns are described in part five. They deal with the in situ life history, the potential effects of climate change, a population viability analysis, some preliminary investigation into cryobanking of somatic cells, and biological variability.

Finally, part six contains some thoughts on the future of the species.

As a preface to part 1, I am very pleased to dedicate the book to the memory of two renowned scientists because the present European sturgeon combined biology–restoration programme benefited from their previous studies and investment in the species. Dr Etienne Magnin started his career in France by publishing the first documented compendium on the biology of the European sturgeon and then went on to work in Québec, Canada where he also spent time working on sturgeon, especially (but not only) the Atlantic sturgeon. He was responsible for the first documented distinction between the two species, the European and Atlantic sturgeons. E. Magnin unfortunately missed our invitation to participate in ACIPENSER, the ISS1 in 1989. The second scientist is Dr Juraj Holčík, well known for many important works, but in particular for publishing *The Freshwater Fishes of Europe*, focusing on Petromyzontiformes and Acipenseriformes, with the last edition published in 1989. He personally wrote with colleagues the chapter that dealt with the European sturgeon, and continued to be involved in those issues. Due to health problems, he declined our invitation to contribute to the present book. Many thanks are due to Pierre Dumont and Peter Harper for the lines on E. Magnin. I am very grateful to Kristina Holčík for her kind offer of a text on Juraj's activities.

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Biology and Conservation of the European Sturgeon

Acipenser sturio L. 1758

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