FEATURE ARTICLE

AS WE SEE IT

Sturgeon and paddlefish research focuses on low risk species and largely disregards endangered species

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ABSTRACT: Sturgeons and paddlefish are among the most commercially valuable groups of fishes and include both low risk and highly endangered species. However, a recent bibliometric study on sturgeon and paddlefish research revealed that disproportionately little attention has been paid to those species that are endangered or face a high probability of extinction. With the exception of European sturgeon *Acipenser sturio*, all of the 8 species that are highly threatened with extinction or functionally extinct, were each addressed in less than 1% of the publications dealing with sturgeons or paddlefishes. Information on the biology and sensitive life-cycle phases of threatened sturgeon and paddlefish species, as well as knowledge of their interactions with their respective habitats, is especially deficient or lacking, thus rendering the planning and execution of protection measures even more difficult. We argue that a more stringent focus has to be placed upon conservation research and management for vulnerable species and populations that are threatened with a high risk of extinction. This also makes it a necessity to overcome the apparent lack of commitment which has been observed in some regions to developing and/or implementing effective and concerted regional actions which address sturgeon and paddlefish rehabilitation.

KEY WORDS: Sturgeon · Paddlefish · *Acipenser* · Extinction risk · Endangered · IUCN · Bibliometric

Tagged European sturgeon *Acipenser sturio* at release into the Elbe River system.

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BACKGROUND AND CURRENT SITUATION

The order Acipenseriformes, which includes 27 species of sturgeon and paddlefish, represents the most commercially valuable and at the same time most threatened groups of fishes. Of these 27 species, 70% are currently classified by the IUCN as Endangered or Critically Endangered, indicating an alarming deterioration of status compared to earlier surveys (IUCN 2013).

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Current research status

A recent bibliometric study on sturgeon and paddlefish research reviewed the Web of Knowledge listed literature published between 1996 and 2010 (Jarić & Gessner 2012), revealing a steady increase in peer-reviewed publications over time. However, although all 27 sturgeon and paddlefish species have been objects of research, species that are endangered or face a high probability of extinction have received disproportionately little attention. On average, species classified by the IUCN as Near Threatened (NT), Vulnerable (VU), Endangered (EN) and Critically Endangered (CR) have been the subject of 157, 97, 53 and 12 scientific publications, respectively (Jarić & Gessner 2012). In addition, with increased conservation status of a species, the impact of the publications decreased (i.e. on average, these studies received a lower number of citations; Jarić & Gessner 2012). Over the last decade, the focus of research has shifted to some extent towards Vulnerable and Endangered species but it has remained practically unchanged for those species classified as Critically Endangered. The 8 species that are highly threatened with extinction or are functionally extinct comprise the Sakhalin sturgeon *Acipenser mikadoi*, Yangtze sturgeon *A. dabryanus*, European sturgeon *A. sturio*, Syr-darya shovelnose sturgeon *Pseudoscaphirhynchus fedtschenkoi*, dwarf sturgeon *P. hermanni*, false shovelnose sturgeon *P. kaufmanni*, Chinese paddlefish *Psephurus gladius*, and Alabama sturgeon *Scaphirhynchus suttkusi* (IUCN 2013). With the exception of *A. sturio*, none of the 8 species was addressed in more than 1% of the total number of publications.

Reasons for lack of research

The reasons for biased scientific focus might be associated with the regional economic value of the respective species, which probably acts as a driver for aquaculture and fisheries-related research funding, given that the most important aquaculture species are less endangered (Jarić & Gessner 2012). Limited access to specimens plays a considerable role in the involvement of scientists in research on highly endangered fish, while the utilization of model species might also disguise the direction of research in other cases (Williot & Castelnaud 2011). Additional factors might also be regional interest in conservation issues related to relict populations, involvement of primarily local researchers in remote

areas without access to international journals, as well as the conflict of interests in areas where the conversation measures for such species might potentially have a strong impact on management and resource utilization, such as water diversion and hydropower. The limited publication output might also indicate a lack of research funding for Critically Endangered species. An exception to the observed lack of focus on such species is the Critically Endangered European sturgeon *Acipenser sturio*, for which there have been 51 published papers that have focused almost exclusively on conservation-related issues. This species received long-term attention from both the French and the German ministries for the environment, which supported scientifically-based rehabilitation measures and concerted actions as outlined in the Bern Convention Action Plan and its follow-up (Gessner et al. 2011).

The observed lack of focus on most endangered species reflects a dramatic mismatch between scientific effort and conservation status of the studied species. This phenomenon has previously also been observed in other fields of conservation biology (Trimble & van Aarde 2010, Fisher et al. 2011). Farrier et al. (2007) noted that, although classifying species as endangered is expected to result in appropriate prioritisation of activities and efforts, such as establishment of research priorities, other values and factors (e.g. local socio-political pressures to prioritise economic development, flood protection, hydropower utilisation) often influence the decision-making process in practice.

RECOMMENDATIONS FOR FUTURE RESEARCH AND MANAGEMENT

Little is known about the biology or sensitive life-cycle phases of threatened sturgeon and paddlefish species or about their interactions with their respective habitats. A lack of scientific focus on such species means that there is not a sufficient level of information on critical aspects of their life cycle. Such deficits render the planning and execution of protection measures much more vague and difficult to justify. To help rectify this, conservation research involving vulnerable species and populations which face a high risk of extinction must be promoted to facilitate and close gaps in the implementation of effective protection. This is in line with de Lima et al. (2011) who argue that conservation research efforts should prioritise those species which are classified in the higher threat categories of the IUCN Red List. Funding allocation

and prioritization need to be refocused in order to overcome this first obstacle for effective conservation management. However, as a second step it will be imperative to overcome the apparent lack of commitment to the development and/or implementation of effective and concerted regional actions addressing sturgeon and paddlefish rehabilitation which has been observed in certain regions. Such lack of commitment mostly results from potential interference with economic interests affecting the habitat of the species in question (Gessner 2000). Adequate national and international funding must be provided to enable further research on the biology of sturgeons and paddlefishes and to support immediate measures for their protection. Moreover, management efforts and funding should be directed at the most threatening impacts, such as habitat fragmentation and habitat loss, as well as bycatch or poaching (Rochard et al. 1990). Recent research has provided agencies with effective tools to identify and prioritise conservation measures with which to increase the effectiveness of investment in species protection and risk mediation (Nel et al. 2011, Linke et al. 2011). Furthermore, the implementation of effective ex-situ measures could at least prevent impending extinction, since the development of captive broodstock would be buying time for effective habitat mitigation through temporary augmentation of wild populations. It is essential that commitment to, and funding for, management and research should improve rapidly and throughout the range of threatened sturgeon and paddlefish populations because it is anticipated that the number of sturgeon and paddlefish species extirpated or threatened with extinction will increase over the next 10 years due to continued poaching and an increased rate of habitat loss through the damming of rivers (Tockner & Stanford 2002).

Due to their wide ranges, diverse habitat requirements and their public appeal, sturgeons and paddlefishes match perfectly with the definitions of both flagship and umbrella species (Barua 2011). They are charismatic species with a potential to attract public attention and become symbols of conservation campaigns, while at the same time being rheophilic species that are sensitive to habitat fragmentation, changes in water flow, siltation and water and sediment pollution. The use of sturgeons as umbrella species has recently been proposed for river management in Germany, as a tool to facilitate communication on the conservation of habitat for other threatened species (Gessner et al. 2011). It is necessary to increase public awareness of the high extinction risk that sturgeons and paddlefishes face and of the

importance of effective protection and management for these species, as baselines can shift rapidly following extirpation or extinction (see e.g. Turvey et al. 2010) and result in a skewed public perception of expected functional habitats and species diversity.

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