



## SPECIAL SECTION: ANGLING FOR DINOSAURS

# Introduction to a Special Section: Angling for Dinosaurs—Status and Future Study of the Ecology, Conservation, and Management of Ancient Fishes

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Gars (*Lepisosteidae*) and Bowfins (*Amiidae*), collectively known as holosteans, are members of an ancient lineage of fish dating back over 200 million years. Holosteans have outlasted the dinosaurs but presently face significant anthropogenic threats. Due to holosteans' perceived lack of value, their atypical morphology compared with traditional game fishes (e.g., Largemouth Bass *Micropterus salmoides* and Yellow Perch *Perca flavescens*), and misconceptions that they harm valuable sport fisheries, humans have historically sought to eradicate gars and bowfins from aquatic habitats (Scarnecchia 1992). Throughout much of their native range, gars and bowfins are often considered “trash fish” or “noxious species,” commanding the same level of disdain as invasive carps. This perception has been held by fisheries managers as well; it was historically illegal in several states to return gars to the water alive after they had been caught (Scarnecchia 1992). As a result, many holostean populations have declined due to habitat loss, overfishing, and removal efforts (Scarnecchia 1992; Kluender et al. 2016). As an extreme example, the Alligator Gar *Atractosteus spatula* has been extirpated from most of its historic northern range (Thomas and Hilsabeck 2011).

Fortunately, perceptions of gars and bowfins are changing as new research and renewed interest from anglers are fostering a more positive image of these misunderstood fishes. For example, gar fishing guides in Texas host anglers from all over the world who are seeking the opportunity to catch (and release) giant 200-lb (91 kg) Alligator Gars. In 2016, scientists discovered that the genome of the Spotted Gar *Lepisosteus oculatus* can bridge a gap between human and teleost biomedical models, improving our understanding of development and disease

(Braasch et al. 2016; Parichy 2016). Restoration efforts are also under way; in an attempt to recover what was lost decades ago, the Illinois Department of Natural Resources is reintroducing the Alligator Gar to several Illinois rivers to increase biodiversity and create a trophy sport fishery (Illinois Department of Natural Resources 2016).

Knowledge of the basic biology and life history of holostean species is limited, however (Binion et al. 2015; David et al. 2015; Smylie et al. 2015). Information on the vital rates (growth, mortality, and dispersal) of holostean populations lags far behind that for most other fisheries, and little is known about the behavior and habitats of juvenile holosteans (Solomon et al. 2013). We are only beginning to understand that species such as the Alligator Gar likely do not spawn every year while others like the Spotted Gar may be capable of spawning more than once annually. As anglers' conception of these ancient species begins to change from “rough fish” to “sport fish,” better understanding of the ecology and conservation status of holostean populations will be fundamental to effective management.

At the 146th Annual Meeting of the American Fisheries Society in Kansas City, Missouri, in 2016, fisheries scientists and managers gathered for a symposium focused on the ecology, conservation, and management of holostean fishes. The symposium provided the opportunity for scientists and managers to discuss past and current research on the life history, genetics, evolution, sampling methodologies, population dynamics, hybridization, aquaculture, and human dimensions of holosteans. The presentations and panel discussions provided valuable information, furthering our

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understanding of these ecologically important species as well as fostering new research collaborations to inform future conservation and management objectives.

This special section contains nine articles and one commentary based on the presentations at the symposium. Two articles (Buckmeier et al. 2018 and King et al. 2018, both this issue) and the commentary (Stein et al. 2018, this issue) on recent developments in the use of aging structures to assess gar populations highlight the importance of age estimation in the management of holosteans as sport fishes. Farley et al. (2018, this issue) provide primer designs for eDNA detection of several gar species. Floodplain inundation, an integral aspect of Alligator Gar recruitment success, is modeled by Robertson et al. (2018, this issue). Smith et al. (2018, this issue) address the management implications of Alligator Gar populations under different harvest regulations. Sex determination in gars has been an ongoing challenge; McDonald et al. (2018, this issue) compare two nonlethal biometric methods to determine the sex of Alligator Gars. Daugherty et al. (2018, this issue) investigate long-term trends and environmental influences on Alligator Gars in the coastal bays of Texas. Tracking holosteans is also important for their management; Midwood et al. (2018, this issue) provide a case study on the intracoelomic implantation of transmitters in Longnose Gars *Lepisosteus osseus*, and Fleming et al. (2018, this issue) report on the efficacy of low-cost side-scan sonar for surveying Alligator Gars. Together, these articles provide a snapshot of our current collective knowledge about holostean fishes, along with current research emphases and their importance for management.

It is our intention that the research presented in this special section will highlight the progress made in holostean fisheries science and management and identify gaps in our knowledge that will lead to future research collaborations. We expect that anglers' perception of holosteans as trash fish will continue to evolve to become a valued target of recreational angling reliant on sustainable management, making this assemblage of the state of knowledge regarding holostean research and management relevant and timely.

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