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***Atractosteus spatula*, a first-record exotic alligator gar from Dal Lake in Kashmir, India, poses a potential threat to local fish species**

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ABSTRACT

On May 11, 2023, the discovery of an exotic alligator gar, *Atractosteus spatula* (Lacepède, 1803), from Kashmir's Dal Lake made an enormous hue and cry among common masses. So far, fisheries experts and other researchers have not reported any adverse effect of these exotic fishes on local species except common carp, which compete with schizothorax for food and space in Dal Lake. The import of fish seed or unregulated ornamental fish trade is likely to blame for the invasion of exotic fish into the natural ecosystem. Considering the threats of this predatory fish becoming invasive, it could disturb the native fish diversity of the Lake. A thorough investigation should be done to ascertain whether Alligator Garfish have emerged in Dal Lake.

Key words: Alligator gar, Exotic fish, Dal Lake, Schizothorax, Potential threat

Introduction

Dal Lake is located in the heart of Srinagar, the summer capital of Jammu and Kashmir. The lake lies between the geographic coordinates of 34°07'2N 74°52'2E. And is often referred as the "Jewel in the crown of Kashmir" or "liquid heart" due to its fame as a popular tourist attraction (Masoodi and Kundangar, 2018). The lake is a vital source of income for local inhabitants involved in tourism, fishing, and agriculture (Mir *et al.*, 2022). However, in the past four decades, there has been a drastic change in the water quality of the lake (Kumar *et al.*, 2022) due to many anthropogenic activities like the continuous influx of untreated sewage, agricultural and surface runoff (Khan and Ansari, 2005; Zargar *et al.*, 2012; (Rashid *et al.*, 2017; Mushtaq *et al.*, 2018;

Kumar *et al.*, 2022) is posing a threat to the aquatic ecology of the lake Ganaie and Hashia (2020). More specifically, the native *schizothorax* fish species have drastically declined in absolute terms (Qureshi *et al.*, 2019).

As of right now, there are nine fish species found in the Dal lake viz: *Schizothorax curvifrons* (Heckel, 1838), *Schizothorax niger* (Heckel, 1838), *Cyrinuscarpio communis* (Linnaeus, 1758), *Cypriniscar piospecularis* (Linnaeus, 1758), *Carassius carassius* (Linnaeus, 1758), *Puntius conchoni* (Hamilton, 1822), *Crossochelius diplochilus* (Heckel, 1838), *Gambusiahol brooki* (Girard, 1859) and *Botiabirdi* (Chaudhuri, 1909) (Ahmed *et al.*, 2017). Out of which only *Schizothorax curvifrons*, *Schizothoraxniger*, *Crossochelius diplochilus* and *Botiabirdi* are the native ones while as *Cyrinus carpio communis*, *Cypriniscar*

carpiospecularis, *Carassius carassius*, *Puntius conchoni* and *Gambusia holbrooki* are the exotic fishes, either accidentally or purposely introduced to Kashmir's waterbodies, including Dal Lake. So far, fisheries experts and other researchers have not reported any negative effect of these exotic fishes on local species except common carp, which competes with *schizothorax* for food and space in Dal Lake (Qureshi *et al.*, 2016; Qureshi *et al.*, 2020).

However, on May 11, 2023, a non-native alligator gar, *Atractosteus spatula*, was accidentally caught by Lake Conservation and Management Authority (LCMA) while de-weeding Dal Lake of Kashmir. After two days, a local fisherman caught one more specimen of *Atractosteus spatula* from the lake. This is of concern to the scientific fraternity, which believes that its presence in the lake could pose a serious threat to the regional aquatic environment. Against this background, a detailed review on the biology of alligator gar, *Atractosteus spatula*, was done to investigate if it could change the trophic level and be a potential threat to the native fish species of the lake.



Fig. 1. A Specimen of *Atractosteus spatula* caught from Dal Lake, Kashmir (Source: The Kashmir walla)

The Lepisosteidae family member *Atractosteus spatula* is indigenous to North America and is most commonly found in the Mississippi River basin. As a result of the ornamental fish trade, alligator gar has become widespread (Salnikov, 2010). Recent reports of this highly predatory species from several water bodies in different Indian states, including Assam (Anonymous, 2020), West Bengal (Thakur, 2016), Odisha (Anonymous, 2017a), Andhra Pradesh (Vadlamudi, 2021), Kerala (Kumar *et al.*, 2019), and Maharashtra (Ghai, 2018, Patil *et al.*, 2019), show that it is likely to interact amicably with the variety of habitats. The present paper documents the first record of the alligator gar from Dal Lake of Jammu and Kashmir, India, along with a description of the native fish species.

Biology, Life cycle and Reproduction cycle

The ray-finned fish alligator gar (*Atractosteus spatula*), a member of the infraclass Holostei, is euryhaline in nature. With a maximum length of about 3 meters and a weight of up to 137 kilograms, this species is the biggest of the gars and one of the biggest freshwater fishes in North America. It is the largest species of gar and one of the largest freshwater fish.

An alligator gar's body has a torpedo form. They are usually brown or olive in colour, fading to a ventral surface that is deeper grey or yellow. Their dorsal and anal fins are placed towards the back of their bodies, and their caudal fins are asymmetrical or heterocercal (Goddard and Nathaniel, 2014). In extremely rare instances, they can even be black in colour due to the high content of melanin pigment (Page and Burr, 1991). They have rhombic-shaped ganoid scales, resemble bones, frequently have serrated edges, and are covered in a material resembling enamel. Ganoid scales offer great defence against predation and are almost impenetrable (Knopf, 2002). The top jaw of an alligator gar features two rows of large, sharp teeth that are used to impale and hold onto prey, in contrast to other gar species. All gars have torpedo-shaped bodies, but adult alligator gar can be identified by their enormous size, heavy bodies, broad heads, short, broad snouts, large, sharp teeth, and a double row of teeth on their upper jaws (Etnier, 1993; Knopf, 2002).

In the wild, females may live longer and are larger than males (Etnier and Starnes, 1993). The alligator gar is a solitary fish that appears lethargic and quiet but is a deadly ambush hunter. They are opportunistic piscivores who hunt at night. In addition to eating small mammals floating on the water's surface, they also ambush and kill waterfowl, turtles, and other floating animals in water bodies. These fish can eat gamefish since they are predators (Shultz, 2004). The alligator gar is primarily found in large lakes, rivers, and bays. They frequently inhabit bottomland wetlands and backwaters. They are common in brackish and freshwater environments but rarely venture into marine ones (Etnier, 1993; Knopf, 2002). This species has little known about reproduction; alligator gars may take ages to attain sexual maturity. Female alligator mainly lays Dark green or red eggs. They are attached to rocks and other types of vegetation. Eggs can be toxic if eaten (Goddard, 2005). Young alligator gars hatch from eggs and float to the water's surface. They are ca-

pable of adhering to rocks and other surfaces until their yolk is absorbed (Shultz, 2004). After that, the young begin their search for nourishment. Thus, they provide a challenge for humans regarding consumption and recreational fishing. There are numerous unconfirmed claims of human injuries.

Discussion

Alligator gar has been reported to live in both freshwaters as well as in marine environments, despite the lack of knowledge of its habitat preferences (Goodyear, 1967). As reported in Indonesia (Hasan *et al.*, 2020) and Texas (Buckmeier, 2008), this fish can endure a wide range of salinity gradients, giving it an edge in terms of survival, growth, and potential establishment. The alligator gar is thought to have been purposefully released into the rivers, lakes, marsh etc., by some aquarium enthusiasts, which is a normal approach to get rid of a pet when it develops to a size that surpasses the capacity of an indoor aquarium. Aside from intentional releases by hobbyists, extreme climatic occurrences have frequently been found as a route for the entrance of foreign fishes into Indian inland open waters (Raj *et al.*, 2021). A thorough investigation should be done to ascertain whether Alligator Garfish have emerged in Dal Lake.

Conflict of interest

There is no conflict of interest among the authors of this study.

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