

Ecological imbalance associated with invasive species in a pond ecosystem

Jivdaya Charitable Trust (JCT), an NGO in Gujarat, India, maintains a pond measuring 40 × 25 × 2 ft for the care of abandoned water birds, and fish. The pond environment supports a dense cover of duckweed *Lemna* spp., providing a natural food source and habitat for these species. A few Red-eared Slider *Trachemys scripta elegans* were also housed in the pond.

At a later stage, two Alligator Gar *Atractosteus spatula*, a predatory freshwater fish species brought by an individual unwilling to maintain them were released into the pond. This was the first time, this species was brought to Jivdaya Charitable Trust. After some time, eight abandoned Mallard *Anas platyrhynchos* chicks were brought to the trust and introduced into the same pond environment.

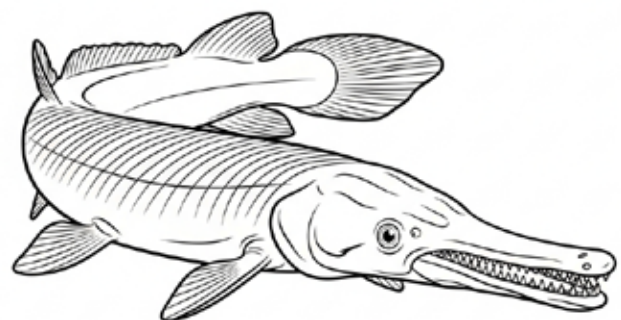
Regular monitoring was carried out to observe the feeding behavior and interactions between species. The number of chicks and other animals were also daily counted to detect any changes in population. The Mallard chicks quickly adapted to the pond, feeding on the abundant duckweed in the pond. On the third day of their arrival, a Mallard chick was missing. Since some time back, the area suffered the rat menace, the rat was considered culprit and accordingly preventive measures were undertaken. In spite of care and watch, the caretaker observed further disappearance of two more chicks in

subsequent days. No carcass residue or evidence of relocation was noted but the Alligator Gar was frequently observed making sudden movements near the chicks, especially when the chicks entered deeper water. Based on these observations and the absence of other possible causes, it was concluded that the predatory fish were responsible for the loss of the chicks.

Initial ecosystem

The pond was inhabited by two Alligator Gars, which are predatory fish known for their aggressive hunting habits and carnivorous diet.

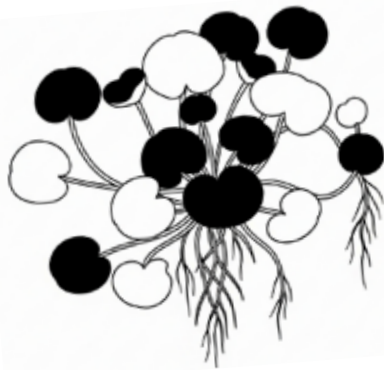
The Alligator Gar preys upon almost anything that will fit into its mouth, including smaller fish, turtles, birds, and even small mammals (Laird and Page, 1996). The Alligator Gar plays a crucial role in controlling the population of smaller fish and maintaining a balance within the aquatic food web. By preying on herbivorous fish, Alligator Gar can indirectly affect the vegetation in the pond, including the growth of aquatic plants. Laird and Page (1996) explained the diet of Gar and understanding of the



ecological impact of Gar on prey populations and on the overall fish community.

Turtles often feed on the bottom of ponds but also consume aquatic plants, small fish, and invertebrates. Their feeding and movement can help in the cycling of nutrients in the pond, aiding in the breakdown of organic material and maintaining water quality.

Duckweed is a primary producer, playing a crucial role in the pond's food web. It provides food for various

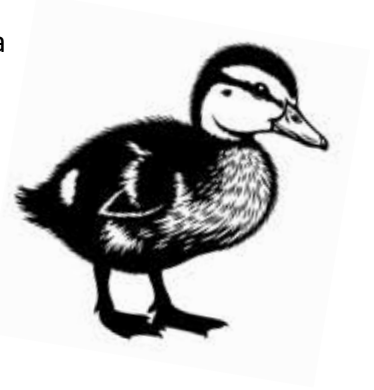


herbivores, including some fish and invertebrates. Duckweed also very much perished by the Mallard chicks. Landolt & Kandeler (1987) explained role of duckweed in nutrient cycling. Sue & Dumax (2005) also highlighted the effectiveness of duckweed in absorbing excess nutrients and improving water quality.

The inclusion of multiple species of different feeding habits in a pond may disturb the ecological balance in the following ways.

Competition for resources: The introduction of the Mallard chicks created a new dynamic in the pond. That gave rise to competition for resources. The Mallard chicks along with turtles rapidly started consuming duckweed while the chicks became a new source of prey

for the Alligator Gar. As a result, the Mallard chick population began to decline due to predation by the gars. Three chicks were lost due to predation.



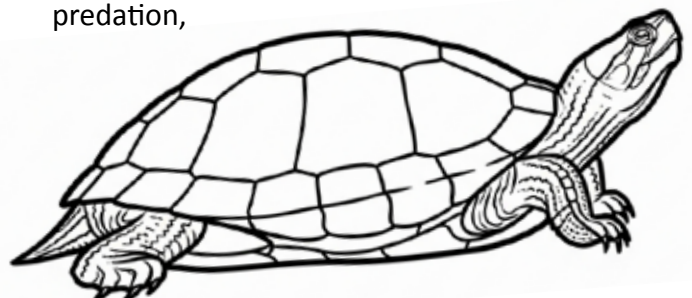
Bonvechio et al (2012) highlighted the importance of Alligator Gar in regulating fish populations and maintaining ecological balance in lake.

The presence of turtles: The presence of Red-eared Slider further complicated the ecosystem. Turtles are omnivorous and can feed on a variety of foods, including aquatic plants, insects, and small animals. This led to increased competition for food resources among the turtles, duck chicks, and gars. Ernst et al. (1994) discussed the ecological roles of turtles, including their feeding habits and impact on aquatic ecosystems.

Ecological imbalance: The primary issue of ecological imbalance arose from the introduction of Alligator gar preying on the Mallard chicks.

Impact of intervention: removal of Alligator Gar

Removal of the Alligator Gar from the pond aimed to protect the Mallard chicks from predation,



allowing them to feed on the duckweed and grow well. Continuous monitoring and adaptive management are essential to ensure long-term ecological balance in any ecosystem.

Therefore, following steps be considered.

Regular monitoring: Keep track of population dynamics of all species in the pond to detect any signs of imbalance early.

Stop introductions: Future introduction of new species should not be carried out to avoid any potential ecological impacts.

Habitat management: Implement habitat management practices to support the needs of all species and maintain a healthy ecosystem.

Conclusion

The case study showed that the introduction of an invasive predatory fish such as Alligator Gar into a confined pond can disturb the ecological balance and threaten the survival of other species, such as Mallard chicks. Even though the pond had sufficient natural food resources like duckweed, the presence of a strong predator changed the survival outcome.

This case highlights the importance of careful species management in captive or semi-natural habitats. Introducing non-native predators without ecological assessment can create serious risks for local or abandoned animals that depend on the same environment.

References

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Citation: Jadhav, K. & S. Everett (2025). Ecological imbalance associated with invasive species in a pond ecosystem. *Zoo's Print* 40(12): 12–14.