ENVIRONMENTAL SCIENCE JOURNAL FOR TEENS

JANUARY 2021

Why are catfish bad neighbors for allis shad?

Authors:
Stéphanie Boulêtreau, William Bouyssonnie, Frédéric Santoul, and others
Associate Editors:
Liesa Ziegler and Lindsay Martin

Abstract

The allis shad is a type of migratory fish. While they typically live in the ocean, they travel to rivers during the spring months to lay eggs. Sadly, this journey can be deadly for many allis shad. This is because humans fish for them, they get blocked by dams, or the rivers are too polluted. And if these dangers weren't enough, a new species called the European catfish likes to eat the allis shad.

We wanted to find out if catfish truly are a threat to the already endangered allis shad. To do this, we monitored a part of the Garonne (a large river in France) where allis shad like to lay their eggs, and then we studied catfish hunting behavior.

Introduction

Adult allis shad live in the northeastern Atlantic Ocean. However, to *reproduce* (lay eggs) they need other water conditions – for example, fresh water instead of salt water like the ocean. Once in their lifetime, allis shad *migrate* to large rivers (mostly in France, Spain and Portugal) to lay their eggs.

It is very dangerous for the allis shad to travel from the Atlantic Ocean to rivers. This is mostly due to humans. We have built dams that are hard for fish to get past and we fish for sport or for food. Water conditions have changed due to climate change and human activities, which can cause things like lower water levels and more pollution that are harmful for many animal species. For all these reasons, the allis shad is an *endangered species*.

There is also a big new threat to the journey of the allis shad. Not long ago, fishermen introduced the European catfish – a very large *freshwater fish* (up to 2.7m/8.8ft) to the rivers where allis shad lay eggs. It normally lived in the rivers of eastern Europe, but was introduced to western Europe because humans wanted to catch bigger fish. This makes them by far the largest *predators* in western European rivers.

Allis shad *(Alosa alosa)* is a widespread fish from the herring family which spends most of its life at sea but swims up rivers to lay its eggs.
(Image: Krüger - Bibliothèque Nationale de France)

During their journey, allis shad are usually protected from being attacked by other fish because of their body size. Most predators are not large enough to eat them. This changed with the introduction of the catfish because most catfish are big enough to eat allis shad. Therefore, we took a closer look at catfish and allis shad in the Garonne River in France.

Methods

We used low-light cameras and audio recorders to monitor a river stretch in the Garonne. It is important to know that in order to reproduce, at least one male and one female allis shad need to swim side by side in a circle. By doing this, they disturb the water surface with their tail, which creates a splashing noise (Fig. 1). We recorded these noises and counted the number of *spawning acts* during that time. Additionally, we recorded the number of spawning acts that were interrupted by catfish.

We also measured the number of catfish in the area and the content of their stomachs. All trapped catfish were *euthanized* by professional fishermen and later used for food production (so we know they weren't counted twice). The smallest catfish that had allis shad in their stomach measured 129cm/4ft long, so we assumed that fish need to be over 128cm/4ft long to be able to eat allis shad.

Figure 1: A spawning act is the process of fish laying eggs to produce offspring. The allis shad spawning act creates a splashing noise. Unfortunately, the splashing also attracts predators.
Source: **https://www.lanuv.nrw.de/alosa-alosa/en/maifisch/lebenszyklus/index.html**

Results

We found that:

- Between 12% and 37% of allis shad spawning acts were interrupted, depending on the time and method that we monitored the river. This could lead to fewer offspring.
- 88.5% of catfish with full stomach had allis shad in their stomach. That means most of the catfish diet comes from allis shad (Fig. 2).

This led us to examine the effect that catfish have on allis shad. We estimated how much a catfish of a certain size would need to eat to survive. We looked at 251 catfish and found that they could eat at least 1,401 allis shad over a two-month period. We counted only 1,620 allis shad passing through the river during that same period of time.

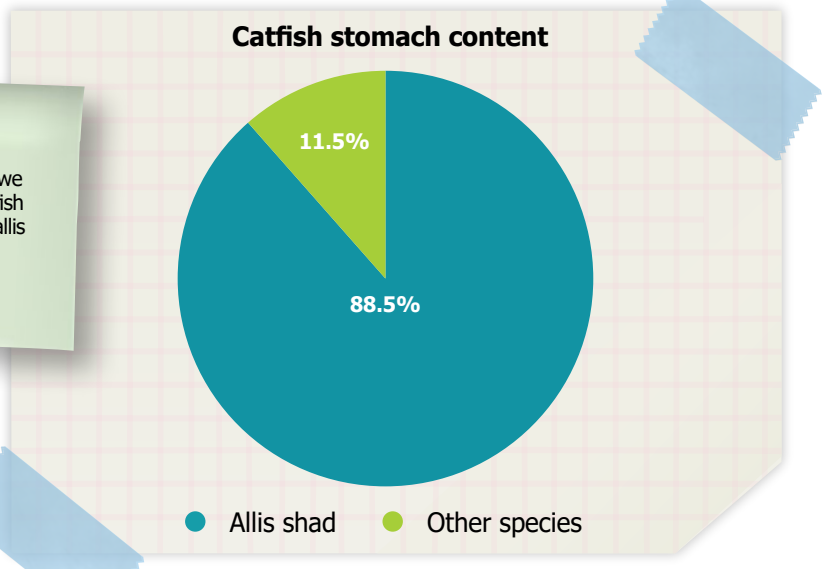

Figure 2: Most of the fish we found in the catfish stomachs were allis shad.

How would you describe the diet of catfish based on the graph?

Discussion

Our results suggest that one individual catfish could eat at least 5 allis shad during the spawning period in the river section we studied.

We observed that catfish developed a new hunting strategy in a very short period of time. The catfish seemed to wait on purpose for the allis shad to spawn. Shads aren't as careful about predators during reproductions and catfish were able to take advantage of this weakness. This makes the catfish *opportunistic predators*.

Based on all these assumptions and observations, it is clear that the new catfish, who are bigger than the allis shad, could be a significant threat. It is likely that they could also be partly responsible for the decrease in allis shad numbers.

Conclusion

Normally, allis shad are safe in rivers because the predators in the area are not large enough to eat them. But by introducing catfish in a habitat where they don't naturally belong, humans put a perfectly sized predator directly into the allis shad's home.

We now have the responsibility to protect this species, but also other endangered fish around the globe. Humans put invasive species in a lot of different places, sometimes even on continents where they don't belong, threatening the native fish populations.

All of us can also help to reduce other risks for allis shad and other fish. For example, you can only buy fish that is fished sustainably. Sustainable fishing means leaving enough fish in the ocean, respecting habitats and ensuring people who depend on fishing can maintain their livelihoods. Each of us can do our part to keep the oceans and rivers clean!

REFERENCES

Stéphanie Boulêtreau, Thomas Fauvel, Marion Laventure, Rémi Delacour, William Bouyssonnié, Frédéric Azémar and Frédéric Santoul (2020) *"The giants' feast": predation of the large introduced European catfish on spawning migrating allis shads.* Aquatic Ecology.
https://doi.org/10.1007/s10452-020-09811-8

Ontario's Invading Species Awareness Program: Wels Catfish
http://www.invadingspecies.com/wels-catfish/

Canal & River Trust: The Forgotten Story of Shad
https://canalrivertrust.org.uk/enjoy-the-waterways/fishing/related-articles/the-fisheries-and-angling-team/unlocking-the-severn-the-forgotten-story-of-shad

Find out more about catfish in these related articles in Science Journal for Kids:
What if a salmon meets a catfish?
What happens to sea lampreys if catfish move in?

Glossary of Key Terms

Endangered species – an animal or plant with such low numbers left alive on the planet that the entire species is in danger of vanishing forever.

Euthanize – the process of putting an animal to death in a way that causes minimal pain and distress.

Freshwater fish – fish that mostly live in water with a very little salt (like rivers or lakes).

Offspring – the young of a person, animal, or plant. Did you know that a baby fish is called a "fry"?

Predators – animals that live mostly by killing and eating other animals.

Migrate – to move from one place to another according to the seasons.

Reproduce – to create another living thing of the same kind.

Spawn – when many small eggs from an animal (like a fish) are deposited in water.

Spawning acts – the process where male and female fish swim together to release and fertilize eggs to make offspring (or "fry").

Opportunistic predators – predators that can very easily adapt to a new situation and make the best of it.

Check your understanding

1 What type of fish is the allis shad?

---

2 Where do allis shad live and why do they enter rivers?

---

3 How did we know that the catfish ate a lot of allis shad?

---

4 Why were allis shad safe from predators before humans introduced catfish into the Garonne river?

---

5 How big can catfish become and how does this compare with your own body size?