

Use the case study, lesson plans, learning activities, assessment questions, and the Aquatic Invader Investigator pages to enhance student understanding of Asian carp and connect these organisms to the community. Assign assessment questions as a homework assignment, or use the questions for classroom discussions or final evaluation.

LEARNING ACTIVITIES

- **Lesson: Physics oph Phlying Phish**
- **Lesson: Hazardous Paths to the Columbia Gorge**
- **Assessment questions**

CASE STUDY

“High-flying carp pose a threat to fishermen,” by J. J. Fialka, *Pittsburgh Post-Gazette*, November 8, 2006. www.post-gazette.com/pg/06312/736638-358.stm

LESSON PLANS

- Physics oph Phlying Phish
- Hazardous Paths to the Columbia Gorge

ASSESSMENT QUESTIONS AND ANSWERS

1 What family do Asian carp belong to?

Cyprinidae.

2 Describe the type of habitat that Asian carp prefer.

They prefer calm, slow-moving waters, such as lakes and backwaters of large rivers.

3 Do Asian carp care for their young?

No.

4 What conditions are necessary for Asian carp to reproduce?

Large riverine systems are needed for reproduction. Flooding, warmer water, and turbulence stimulate reproduction. Semi-buoyant carp eggs are carried downstream; flood plains are nursery habitat for larvae and juveniles.

5 Why were Asian carp introduced?

They were introduced for use in aquaculture ponds. Black carp were initially introduced accidentally as a contaminant.

6 Why have Asian carp been so successful in the Mississippi Basin?

The basin offers ideal conditions for reproduction and growth: large stretches of river, annual flooding, and plenty of plankton.

7 What physical feature distinguishes a grass carp from a black carp?

Pharyngeal teeth.

How is this feature different in each fish?

The grass carp’s pharyngeal teeth are long and serrated, adapted to eating aquatic vegetation. The black carp’s teeth are smooth rather than serrated, adapted to crushing mollusk shells.

8 Two riverine habitats are joined by an estuary (for example, San Francisco Bay). Asian carp invade one river. Is the other river at risk of invasion? Why or why not?

Yes, because Asian carp, except black carp, tolerate low levels of salinity.

9 How do bighead and silver carp use their pharyngeal teeth?

The fish use the pharyngeal teeth to grind their food to break the cells, since they do not have the digestive fluids necessary to break down the cells and get at the contents.

10 What physical features distinguish a silver carp from a bighead carp?

The gill rakers and the ventral keel are distinguishing features.

How is this feature different in each fish?

In the silver carp, the ventral keel extends forward all the way to the anterior part of the breast, and its gill rakers fuse together, forming a sponge-like appearance, adapted for eating plankton. Bighead carp have long, close-set gill rakers, and the ventral keel extends forward to the base of the pelvic fins.

Asian Carps

11 List three ways we have benefited from Asian carp.

The benefits have been many: various uses in aquaculture facilities, ornamental aquarium fish trade, and as a food, for example.

12 List three ways in which we have been negatively affected by Asian carp. Give an economic, a social, and an ecological impact.

The sound of an outboard motor often causes the silver carp to leap out of the water and collide with boaters, causing serious property damage and human injury. Carp can harm important fisheries by decreasing sport fish populations, and can harm ecosystems by altering the food web when the carp outcompetes native fish for food and consumes all the vegetation (e.g., grass carp).

13 Do you think the commercial harvest of Asian carp would be a good method for controlling them and reducing their ecological impact? Why or why not?

The situation in China is a good example. In China, Asian carp are scarce due to heavy fishing pressure. Models show that commercial harvest of Asian carp can reduce their numbers and reopen habitat for native species. However, native fish may be harmed as bycatch, and profits from the sale of Asian carp may lead to their purposeful introduction to new areas.

14 Bighead and silver carp may consume large amounts of blue-green algae. How may this behavior affect the use of Asian carp as a food fish?

Bighead and silver carp are practically immune to the algal toxins. However, if you grind the fish guts, there is a significant possibility the ground slurry will contain algal toxin, which could be lethal for zoo animals.

15 Do you think Asian carp would be able to survive and reproduce in a river near your home? Why or why not?

Students should relate what they know about a local river to Asian carp's reproduction requirements. Duane Chapman of USGS notes, "habitat requirements are debatable, and . . . some theorize that under the right conditions, as little as 28 km of river

would be enough to provide recruitment. The Karakum Canal [in Central Asia] has 80 km (with some fairly dead spots in it) and has reproduction most years. This is the shortest river I know of where fish are established and continue to recruit."

16 List some ways in which Asian carp could be accidentally introduced into your local river.

They could be accidentally introduced by anglers travelling from the Mississippi who use juvenile Asian carp as bait fish. Adult Asian carp brought to the West Coast for the live fish-food trade could be accidentally or purposefully introduced.

17 What are some things you can do to help prevent Asian carp from being introduced to the West Coast?

Organize an educational campaign in your school and informally educate others about how not to spread Asian carp. If you are a fisherman, inspect, clean, and dry all parts of your gear before entering a new body of water.

18 Cost benefit/risk analysis: You are the manager of a local pond valued for the wildlife diversity it supports. Unfortunately, your pond has recently been invaded by the aquatic plants elodea and parrot feather. The plants are causing huge problems: people can't swim or boat anymore, and the plants are taking up all the oxygen in the water and killing native species. Your supervisor suggests you stock the lake with grass carp to control the vegetation.

What are some potential benefits of stocking grass carp?

Carp will eat the vegetation and sterile triploid fish are available.

What are some of the risks or drawbacks of stocking grass carp?

Have students list some negative ecological impacts of grass carp. What would you do, and why?