

Past-paper walk-through

Aquaculture ■ 5.16

eXercise

Questions in this set

- 2023 Set 2 Q2

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 2

2023 Set 2 ■ Q2

Asian carp were first introduced in the southern United States in the 1970s by fish farmers wanting to control algal growth in fish ponds. Asian carp can eat up to 40

****Distribution of the Asian Carp in the United States****

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The Great Lakes are a group of five major freshwater inland lakes that all share the same watershed.

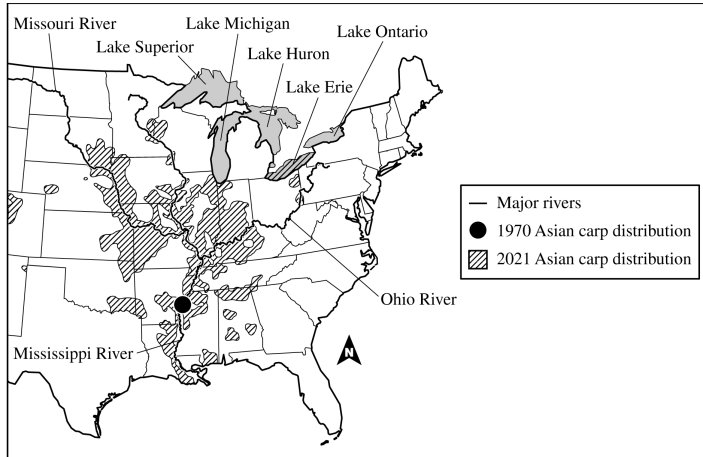
The following is an example of a simple food chain in the Great Lakes.

Algae → Zooplankton → Macroinvertebrates → Yellow perch → Rainbow trout

The blue pike, a fish that was endemic to the Great Lakes, was commercially fished from the late 1800s until their population crashed in 1958. In 1970, the species was declared to be extinct.

(a) Based on the information given, **identify** a body of water invaded by Asian carp that is labeled on the map.

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(b) Based on the information shown in the map, **describe** the change in the distribution of Asian carp since their introduction in the 1970s.

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(c) Describe one impact the introduction of Asian carp could have on the ecosystem services provided by the Great Lakes region.

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(d) Propose a realistic solution to help reduce the spread of the Asian carp from their current distribution.

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(e) Justify the solution proposed in part (d) by providing an additional advantage.

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(f) Identify the primary consumer in the Great Lakes food chain.

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(g) Describe what the arrows in the aquatic food chain represent.

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(h) Describe one possible effect of the introduction of the Asian carp on the Great Lakes food chain.

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(i) Describe one way that overfishing of blue pike illustrates the tragedy of the commons.

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(j) One potential solution to reduce overfishing is to use aquaculture. **Describe** one disadvantage of this solution.

Solution 2

(a)

Mark scheme

- A body of water labeled on the map, e.g.: the Mississippi River, Lake Erie, the Missouri River, or the Ohio River.

Solution 2

(b)

Mark scheme

- Since their introduction in the 1970s, Asian carp have become far more widely distributed — found in most of the watershed / a much larger area than before — moving up and down the Mississippi River and up the Missouri and Ohio Rivers (i.e., spreading northwest and northeast up the river systems).

Solution 2

(c)

Mark scheme

- One impact on ecosystem services, e.g.: improved drinking water quality as carp consume algae; decreased recreational opportunities (boating/swimming) from the larger carp population; decreased fishing as carp outcompete native fish species; decreased drinking water quality as carp displace filter feeders like native mussels; or a decreased algae population leading to decreased photosynthesis and either increased greenhouse gases/warming or decreased oxygen production.

Solution 2

(d)

Mark scheme

- A realistic solution such as: offering incentives for fishers to catch and kill carp; encouraging consumption of carp; building fencing/netting between waterways; using shock treatment (a dispersal barrier system); creating/using an Asian-carp-specific poison or deterrent (e.g., carpicide, CO₂, microparticles); implementing a high-frequency sound deterrent system; or prohibiting the transfer of bait or ballast water from one body of water to another.

Solution 2

(e) Mark scheme

- An additional advantage that matches the solution proposed in (d). For fencing/netting, sound deterrents, carp-specific poison/deterrent, or shock treatment: creates jobs in the Great Lakes fishing industry, causes little/no harm to native animal/plant populations, reduces carp's negative impact on watershed feeding relationships, or maintains revenue for the existing fishing industry/tourism. For encouraging carp consumption or incentivizing fishers to catch/kill carp: increases revenue in the fishing industry/from carp sales, reduces carp's negative feeding-relationship impacts, provides a new food source (domestically/internationally) or combats hunger, or allows native species to return as competition from carp decreases. For prohibiting bait/ballast transfer:

Solution 2

causes no harm to native populations, reduces carp's negative feeding impacts, or maintains existing fishing/tourism revenue.

Solution 2

(f)

Mark scheme

- Zooplankton — the primary consumer in the Great Lakes food chain.

Solution 2

(g)

Mark scheme

- The arrows represent the flow of energy (or equivalently, the flow of matter) through the aquatic food chain.

Solution 2

(h)

Mark scheme

- One possible effect, e.g.: there will be fewer zooplankton/macroinvertebrates/yellow perch/rainbow trout; there will be less food available for other species at the same trophic level; or there will be less food for species that don't eat carp but are higher on the food chain.

Solution 2

(i)

Mark scheme

- The blue pike were a shared/common resource with unregulated access, so fishers maximized their own profits/catch, depleting (and ultimately causing the extinction of) the shared resource — illustrating the tragedy of the commons.

Solution 2

(j)

Mark scheme

- One disadvantage of aquaculture, e.g.: it contaminates water with excess organic waste/antibiotics; escaped fish compete or breed with wild fish; facilities can spread disease to wild fish; high fish density increases disease; it causes job losses in the fishing industry; it puts pressure on wild fish stocks used to make food pellets; it decreases the genetic diversity of farm-raised fish; it causes habitat degradation from converting ecosystems to fish farms; or antibiotic overuse creates antibiotic-resistant bacteria harmful to humans.