

2023 MCAS Sample Student Work and Scoring Guide

High School Biology

Question 37: Constructed-Response

Reporting Category: Ecology

Practice Category: Evidence, Reasoning, and Modeling

Standard: [HS.LS.2.4](#) - Use a mathematical model to describe the transfer of energy from one trophic level to another. Explain how the inefficiency of energy transfer between trophic levels affects the relative number of organisms that can be supported at each trophic level and necessitates a constant input of energy from sunlight or inorganic compounds from the environment.

Item Description: Identify the ecological role of an organism in an ecosystem, analyze a food web to determine how an increase in one population would affect another population, and explain why producers have the most available energy in an ecosystem.

[View item in MCAS Digital Item Library](#)

Scoring Guide

Select a score point in the table below to view the sample student response.

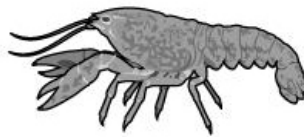
Score*	Description
3A	The response demonstrates a thorough understanding of how changes to the population size of one organism can affect the population sizes of other organisms. The response correctly identifies the ecological role of the marbled crayfish. The response clearly describes how a large increase in the size of the marbled crayfish population would most likely affect the size of the dragonfly larvae population and clearly explains the reasoning. The response also correctly identifies the organism in the food web that has the most available energy and clearly explains the answer.
3B	
2	The response demonstrates a partial understanding of how changes to the population size of one organism can affect the population sizes of other organisms.
1	The response demonstrates a minimal understanding of how changes to the population size of one organism can affect the population sizes of other organisms.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

*Letters are used to distinguish between sample student responses that earned the same score (e.g., 3A and 3B).

Score Point 3A

Crayfish are freshwater crustaceans that look like small lobsters. They are found in many parts of the world. Crayfish typically reproduce sexually, but the marbled crayfish reproduces asexually.

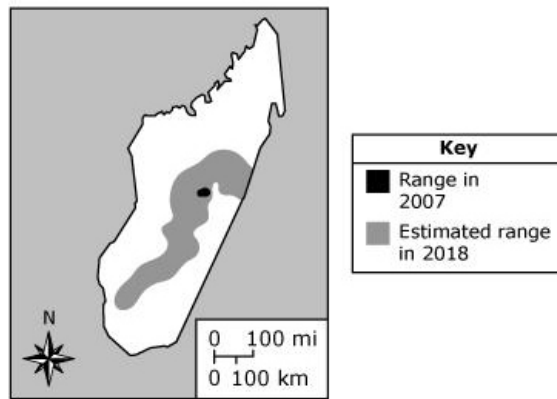
The marbled crayfish was first discovered in an aquarium in 1995 and was not originally found in the wild. Since then, it has been released into the wild. Because the marbled crayfish can reproduce asexually, a single crayfish can start a new population in the wild. It has become an invasive species across Europe and in parts of Africa. A picture of the marbled crayfish is shown.



Madagascar is an island about 400 km off the coast of Eastern Africa. In 2003, the marbled crayfish was introduced to Madagascar. Since then, it has spread quickly across Madagascar and lives in the same areas where several native crayfish species live. The native crayfish species reproduce sexually.

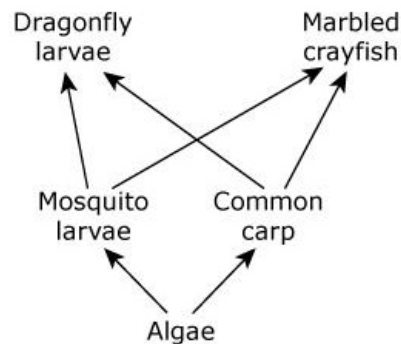
The map shows the range of marbled crayfish across Madagascar in 2007 and 2018.

Spread of Marbled Crayfish in Madagascar



This question has three parts.

An aquatic food web with the marbled crayfish is shown.



Part A

Identify the ecological role (decomposer, producer, primary consumer, or secondary consumer) of the marbled crayfish.

The **marbled crayfish is a secondary consumer** as it eats primary consumers (which eat algae, a producer).

Part B

Describe how a large increase in the size of the marbled crayfish population would most likely affect the size of the dragonfly population. Explain your reasoning.

A large increase in the size of the marbled crayfish population will most likely decrease the size of the dragonfly population because they compete for the same food source. An increase in the marbled crayfish population would mean more mosquito larvae and common carp are being eaten. Therefore, there will be less mosquito larvae and common carp for the dragonfly population to eat, and as a result, the dragonfly population will decrease.

Part C

Identify the organism in the food web that has the most available energy. Explain your answer.

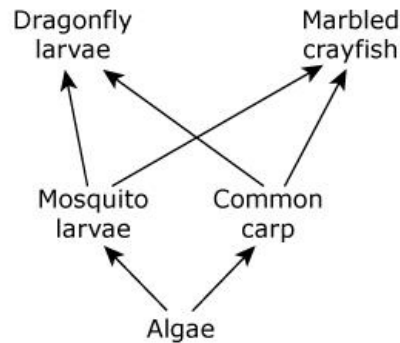
Algae has the most available energy as it is in the lowest trophic level (producers). Algae gets its energy from the sun, which is an "unlimited" source of energy. As you move up trophic levels, the organisms will have 10% of the available energy that the trophic level below them has. With algae at the lowest trophic level, it has the most available energy.

Score Point 3B

This question is part of a module with an introduction. The introduction can be seen in score point 3A.

This question has three parts.

An aquatic food web with the marbled crayfish is shown.

**Part A**

Identify the ecological role (decomposer, producer, primary consumer, or secondary consumer) of the marbled crayfish.

The marbled crayfish is a secondary consumer because the algae is the producer, the common carp eats the algae so it's the primary consumer, and then the marbled crayfish eats the common carp. Therefore, it is the second consumer in the food web and is the secondary consumer.

Part B

Describe how a large increase in the size of the marbled crayfish population would most likely affect the size of the dragonfly population. Explain your reasoning.

A large increase in the population size of the marbled crayfish would likely decrease the population size of the dragon fly because dragonfly larvae and marbled crayfish rely on the same food sources. The marbled crayfish is an asexual reproducer, so it can reproduce very quickly which could monopolize the food sources to only their species, leaving no food for the dragonfly larvae. Therefore, dragonfly larvae could not mature into adult dragonflies.

Part C

Identify the organism in the food web that has the most available energy. Explain your answer.

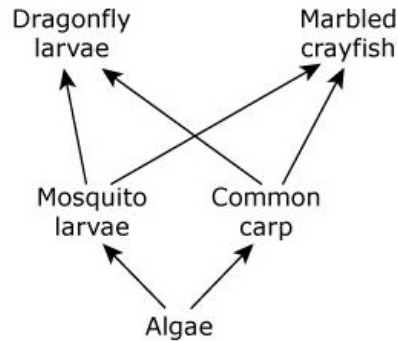
Algae has the most available energy because the amount of energy decreases as you go up the food chain or web. Each organism only gets 1/10 of the energy that the organism it consumed had.

Score Point 2

This question is part of a module with an introduction. The introduction can be seen in score point 3A.

This question has three parts.

An aquatic food web with the marbled crayfish is shown.

**Part A**

Identify the ecological role (decomposer, producer, primary consumer, or secondary consumer) of the marbled crayfish.

Marbled crayfish is a secondary consumer

Part B

Describe how a large increase in the size of the marbled crayfish population would most likely affect the size of the dragonfly population. Explain your reasoning.

The increase in the marbled crayfish population would make the size of the dragonfly population go down. This is because the dragonfly larvae eat mosquito larvae. Because the crayfish also eat mosquito larvae, an increase in crayfish would leave less mosquito larvae for the dragonflies to eat.

Part C

Identify the organism in the food web that has the most available energy. Explain your answer.

Algae, because it is a primary consumer, meaning it makes its own energy.

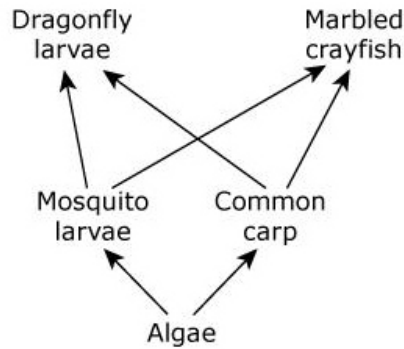
[Back to Scoring Guide](#)

Score Point 1

This question is part of a module with an introduction. The introduction can be seen in score point 3A.

This question has three parts.

An aquatic food web with the marbled crayfish is shown.



Part A

Identify the ecological role (decomposer, producer, primary consumer, or secondary consumer) of the marbled crayfish.

the marbled crayfish are secondary consumers

Part B

Describe how a large increase in the size of the marbled crayfish population would most likely affect the size of the dragonfly population. Explain your reasoning.

it would probably stay they same because i dont think they eat dragon flys

Part C

Identify the organism in the food web that has the most available energy. Explain your answer.

carp because they can swim all day and night without getting tired

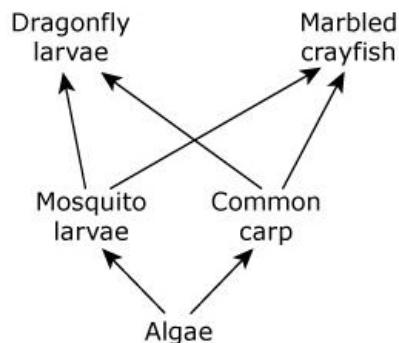
[Back to Scoring Guide](#)

Score Point 0

This question is part of a module with an introduction. The introduction can be seen in score point 3A.

This question has three parts.

An aquatic food web with the marbled crayfish is shown.

**Part A**

Identify the ecological role (decomposer, producer, primary consumer, or secondary consumer) of the marbled crayfish.

The marbled cray fish is a primary consumer

Part B

Describe how a large increase in the size of the marbled crayfish population would most likely affect the size of the dragonfly population. Explain your reasoning.

The dragon fly population will increase because the two consumers have the same diet.

Part C

Identify the organism in the food web that has the most available energy. Explain your answer.

the marbled cray fish and dragonfly larve because they are the highest on the food web

[Back to Scoring Guide](#)