2024 MCAS Sample Student Work and Scoring Guide

High School Biology
Question 37: Constructed-Response

Reporting Category: Evolution
Practice Category: Evidence, Reasoning, and Modeling
Standard: HS.LS.4.2 - Construct an explanation based on evidence that Darwin's theory of evolution by natural selection occurs in a population when the following conditions are met: (a) more offspring are produced than can be supported by the environment, (b) there is heritable variation among individuals, and (c) some of these variations lead to differential fitness among individuals as some individuals are better able to compete for limited resources than others
Item Description: Explain why individuals with a particular trait are more likely to survive in a certain environment and how having multiple mates can increase genetic diversity in a population.

View item in MCAS Digital Item Library

Scoring Guide

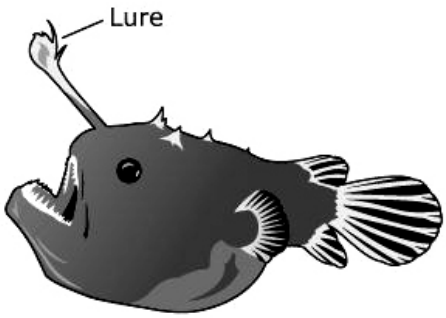
Select a score point in the table below to view the sample student response.

Score*	Description
3A	The response demonstrates a thorough understanding of evolution by natural selection. The response clearly explains why a male anglerfish's sense of smell is important to the male's survival in this environment. The response also clearly describes and explains the evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish.
3B	
2	The response demonstrates a partial understanding of evolution by natural selection.
1	The response demonstrates a minimal understanding of evolution by natural selection.
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

An anglerfish is a type of fish that can live in the ocean at depths of more than 1,000 meters, where there is no sunlight. The female anglerfish has an organ called a lure, which produces light. The diagram shows a female anglerfish.



A female anglerfish uses the light from the lure to attract prey and mates. Bacteria in the lure generate the light. To speed up the chemical reaction that produces the light, the bacteria produce an organic molecule called luciferase.

Male anglerfish are much smaller than females. Males have an enhanced sense of smell that allows them to track the scent of a female. A female anglerfish typically mates with several males. Before a male mates with a female, he attaches to her with his teeth. The male obtains nutrients from the female's blood when he is attached to her. A female may have several males attached to her at one time. Individual eggs are fertilized by the sperm of the different males attached to the female as she lays her eggs.

This question has two parts.

Anglerfish may have difficulty finding a mate because the anglerfish's environment is dark, and the number of individuals in a population is relatively small.

Part A

Explain why a male anglerfish's sense of smell is important to the male's survival in this environment.

A male anglerfish's sense of smell is important to the male's survival because they are able to smell the female anglerfish in the environment, and therefore track them down to mate and reproduce with the female.

Part B

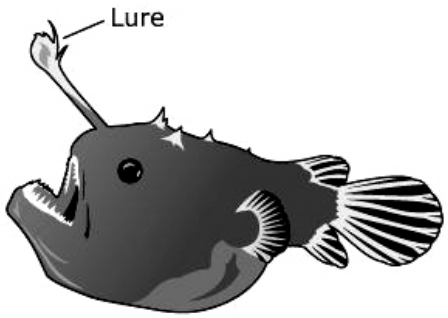
Describe the evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish. Explain your reasoning.

This is an evolutionary advantage because there will most likely be more genetic diversity within the offspring of the anglerfish. More genetic diversity will be helpful because then these offspring can survive if they have good genes and traits passed down, and those useful traits will be passed on to further generations.

Back to Scoring Guide

Score Point 3B

An anglerfish is a type of fish that can live in the ocean at depths of more than 1,000 meters, where there is no sunlight. The female anglerfish has an organ called a lure, which produces light. The diagram shows a female anglerfish.



A female anglerfish uses the light from the lure to attract prey and mates. Bacteria in the lure generate the light. To speed up the chemical reaction that produces the light, the bacteria produce an organic molecule called luciferase.

Male anglerfish are much smaller than females. Males have an enhanced sense of smell that allows them to track the scent of a female. A female anglerfish typically mates with several males. Before a male mates with a female, he attaches to her with his teeth. The male obtains nutrients from the female's blood when he is attached to her. A female may have several males attached to her at one time. Individual eggs are fertilized by the sperm of the different males attached to the female as she lays her eggs.

This question has two parts.

Anglerfish may have difficulty finding a mate because the anglerfish's environment is dark, and the number of individuals in a population is relatively small.

Part A

Explain why a male anglerfish's sense of smell is important to the male's survival in this environment.

A male anglerfish's sense of smell is important to the male's survival in this environment because if he didn't have his sense of smell finding a mate would be very difficult. In order to reproduce and keep the species alive, you have to reproduce. When the conditions are dark and only a few female fish are around, his sense of smell helps him find a mate to keep the species alive.

Part B

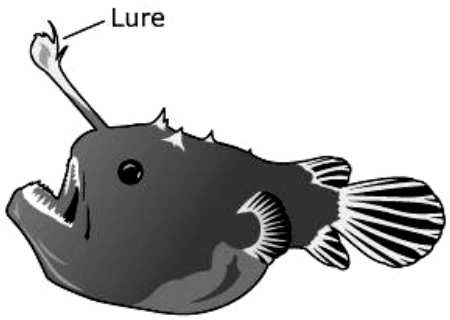
Describe the evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish. Explain your reasoning.

The evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish is that there will be more genetic diversity in the species. This is an advantage because the organsims will be better equiped to different challenges such as predators or disease, and will have a better likelyhood of surviving. Survival is a key piece in keeping a species alive because the offspring will go on to reproduce more anglerfish.

Back to Scoring Guide

Score Point 2

An anglerfish is a type of fish that can live in the ocean at depths of more than 1,000 meters, where there is no sunlight. The female anglerfish has an organ called a lure, which produces light. The diagram shows a female anglerfish.



A female anglerfish uses the light from the lure to attract prey and mates. Bacteria in the lure generate the light. To speed up the chemical reaction that produces the light, the bacteria produce an organic molecule called luciferase.

Male anglerfish are much smaller than females. Males have an enhanced sense of smell that allows them to track the scent of a female. A female anglerfish typically mates with several males. Before a male mates with a female, he attaches to her with his teeth. The male obtains nutrients from the female's blood when he is attached to her. A female may have several males attached to her at one time. Individual eggs are fertilized by the sperm of the different males attached to the female as she lays her eggs.

This question has two parts.

Anglerfish may have difficulty finding a mate because the anglerfish's environment is dark, and the number of individuals in a population is relatively small.

Part A

Explain why a male anglerfish's sense of smell is important to the male's survival in this environment.

A male anglerfish's sense of smell is important because they use it to locate prey and mates in its dark enviroment.

Part B

Describe the evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish. Explain your reasoning.

The evolutionary advatange of multiple males fetilizing an egg of a female anglerfish is it adds genetic diversity to the population.

Back to Scoring Guide

Score Point 1

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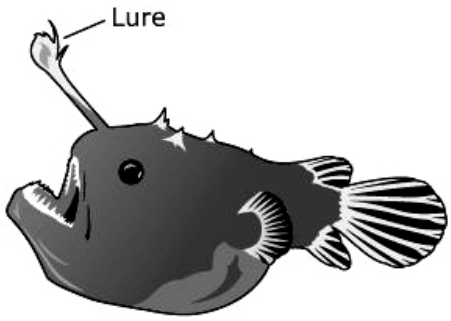

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This question has two parts.

Anglerfish may have difficulty finding a mate because the anglerfish's environment is dark, and the number of individuals in a population is relatively small.

Part A

Explain why a male anglerfish's sense of smell is important to the male's survival in this environment.

A males anglerfish's sense of smell is important because it allows them to track the scent of a female to mate with.

Part B

Describe the evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish. Explain your reasoning.

The evolutionary advantage of multiple males fertilizing the eggs of a female anglersish is that she can lay a lot of eggs at once and the population will start to increase more and more.

Back to Scoring Guide

Score Point 0

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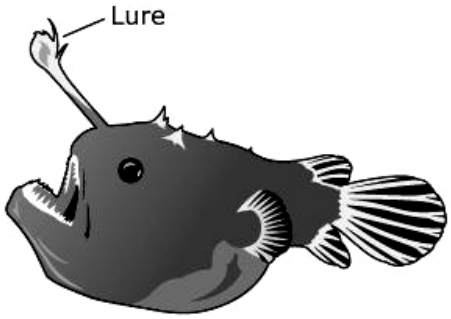

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Anglerfish may have difficulty finding a mate because the anglerfish's environment is dark, and the number of individuals in a population is relatively small.

Part A

Explain why a male anglerfish's sense of smell is important to the male's survival in this environment.

becasue the environment is dark and they cant see

Part B

Describe the evolutionary advantage of multiple males fertilizing the eggs of a female anglerfish. Explain your reasoning.

He attaches to the females.

Back to Scoring Guide