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# AP Biology

## Sample Student Responses and Scoring Commentary

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#### **Free Response Question 5**

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**2018 SCORING GUIDELINES**

**Question 5**

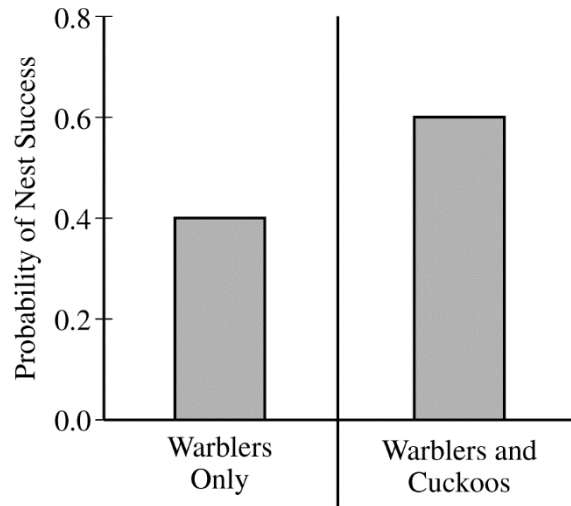


Figure 1. Probability of nest success in an environment with predators

Some birds, including great spotted cuckoos, lay their eggs in the nests of other birds, such as reed warblers. The warbler parents raise the unrelated chicks and provide them with food that would otherwise be given to their biological offspring. A researcher conducted an investigation to determine the type of relationship between warblers and cuckoos in an environment without predators. The researcher found that nests containing only warblers were more likely to be successful than nests containing warblers and cuckoos (data not shown). A successful nest is defined as a nest where at least one chick becomes an adult warbler.

In some geographic areas, several species of nest predators are present. Researchers have found that cuckoo chicks, while in the nest, produce a smelly substance that deters nest predators. The substance does not remain in the nest if cuckoo chicks are removed. Figure 1 shows the probability that nests containing only warblers or containing both warblers and cuckoos will be successful in an environment with predators. In a follow-up experiment, the researchers added cuckoos to a nest that contained only warblers (group 1) and removed cuckoos from a nest containing warblers and cuckoos (group 2).

- (a) **Describe** the symbiotic relationship that exists between the cuckoo and warbler in an environment without predators.

**Description (1 point)**

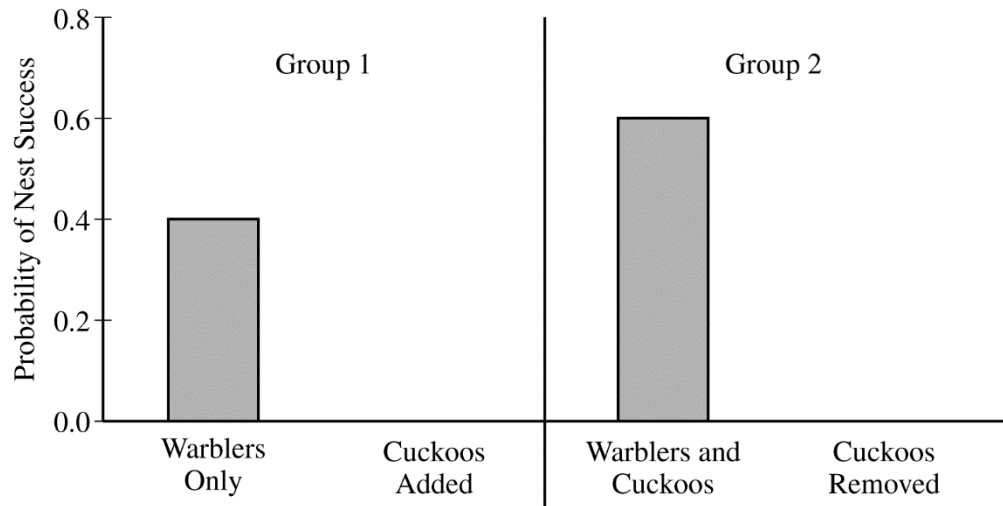
- Cuckoos are parasites (of the warbler).
- The cuckoo benefits from the relationship, and the warbler is harmed by the relationship.

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**Question 5 (continued)**

(b) On the template provided, **draw** bars in the appropriate locations to predict the relative probability of success for the nest in the presence of predators where:

- the cuckoos were added to the nest containing only warblers (group 1)
- the cuckoos were removed from the nest containing warblers and cuckoos (group 2)



**Graph (2 points)**

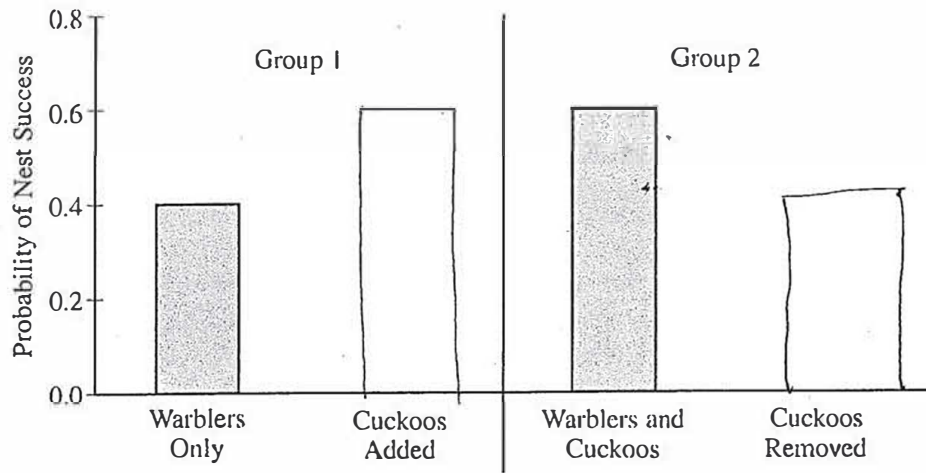
- Cuckoo added (group 1): Bar must be HIGHER than the “Warblers Only” bar.
- Cuckoo removed (group 2): Bar must be LOWER than the “Warblers and Cuckoos” bar.

(c) **Identify** the symbiotic relationship that exists between the cuckoo and the warbler in the presence of predators.

**Identification (1 point)**

- Mutualism
- Both organisms benefit

## PAGE FOR ANSWERING QUESTION 5

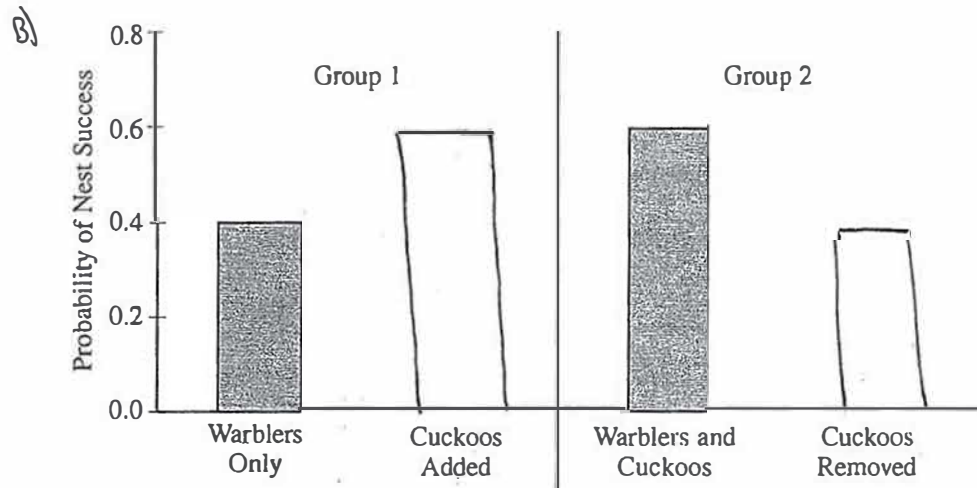


a) without predators, cuckoos are helped by warblers because the warblers feed the cuckoo chicks. warbler chicks, on the other hand, are negatively effected because the warbler parents care less for their own chicks when cuckoos are present, and the warbler chicks get less food.

c) when predators are present, the relationship between warblers and cuckoos is mutualistic.

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## PAGE FOR ANSWERING QUESTION 5



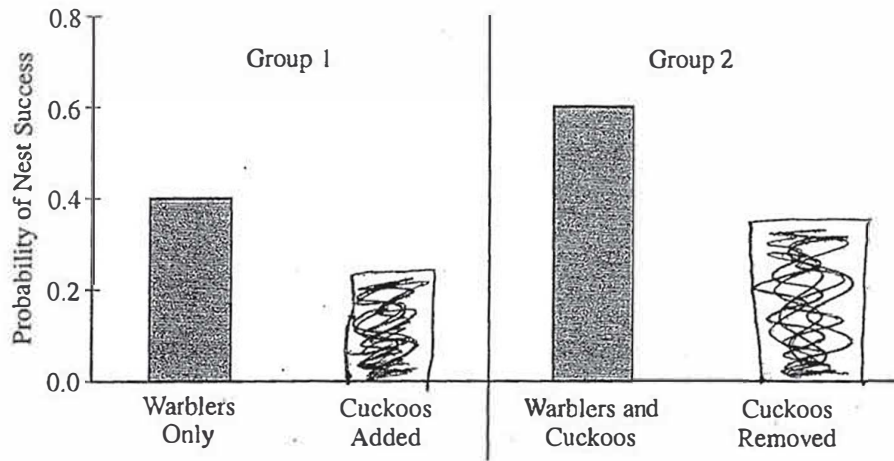
A) The symbiotic relationship between the cuckoo and the warbler is an example of commensalism because the cuckoos benefit by being raised and provided with food and the warbler remains neutral.

C) The symbiotic relationships between the cuckoo and the warbler with a predator present is an example of mutualism. This is because both groups benefit from the relationship with each other.

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5C

PAGE FOR ANSWERING QUESTION 5



a. The symbiotic relationship between cuckoos and warblers without predators is parasitism

b. on graphs

c. The symbiotic relationship between cuckoos and warblers with predators is mutualism

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## 2018 SCORING COMMENTARY

### Question 5

#### Overview

This question was about nest predation and the conditions under which a nest is successful. The prompt described the relationship between warbler chicks and cuckoo chicks that are raised in the same nests by warbler parents. In an environment without predators, nest success (where at least one warbler chick survives to adulthood) is reduced. Students were asked to describe the interaction between cuckoos and warblers in this environment. The prompt went on to describe an experiment in areas where predators are present, with the results of the experiment shown in a bar graph. The students were asked to predict the probability of nest success in the presence of predators under two different conditions: a warblers-only nest where cuckoos are added and a warblers-and-cuckoos nest where the cuckoos are removed. Finally, students were asked to identify the symbiotic relationship between the two bird species in the nest in the presence of predators.

The key understandings and skills students were expected to demonstrate included the following:

- Basic concepts of symbiotic relationships among organisms were used to consider how these relationships are affected by biotic factors and to identify patterns and relationships when provided with different variables and environmental conditions.
- Knowledge of experimental design was used to predict the results of an experiment.

#### Sample: 5A

**Score: 4**

The response earned 1 point in part (a) for correctly describing the symbiotic relationship as “cuckoos are helped by warblers” while “Warbler chicks ... are negatively effected [*sic*].” The response earned 1 point in part (b) for correctly drawing a “Cuckoos Added” bar for Group 1 that is higher than the “Warblers Only” bar. The response earned 1 point in part (b) for correctly drawing a “Cuckoos Removed” bar for Group 2 that is lower than the “Warblers and Cuckoos” bar. The response earned 1 point in part (c) for correctly identifying the symbiotic relationship as mutualistic.

#### Sample: 5B

**Score: 3**

The response earned 1 point in part (b) for correctly drawing a “Cuckoos Added” bar for Group 1 that is higher than the “Warblers Only” bar. The response earned 1 point in part (b) for correctly drawing a “Cuckoos Removed” bar for Group 2 that is lower than the “Warblers and Cuckoos” bar. The response earned 1 point in part (c) for correctly identifying the symbiotic relationship as mutualistic.

#### Sample: 5C

**Score: 2**

The response earned 1 point in part (b) for correctly drawing a “Cuckoos Removed” bar for Group 2 that is lower than the “Warblers and Cuckoos” bar. The response earned 1 point in part (c) for correctly identifying the symbiotic relationship as mutualistic.