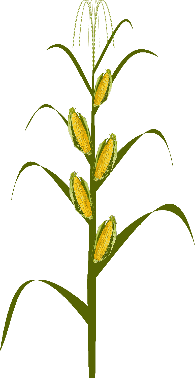
**The bees are disappearing**

The diagram shows a food chain.





birds

bees

flowering plants and crops

**Part 1**

Populations of bees are getting smaller very quickly. You might have heard about it on the news.

1. Could this affect other populations of organisms?

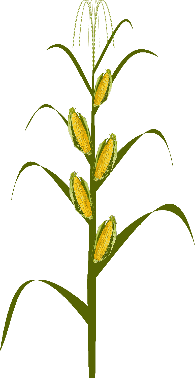
|  |  |
| --- | --- |
| **A** | It will not affect any other organisms. |
| **B** | It will only affect the birds. |
| **C** | It will only affect the flowering plants and crops. |
| **D** | It will affect the birds **and** the flowering plants and crops. |

1. What is the **best** explanation for your answer to question 1?

|  |  |
| --- | --- |
| **A** | It doesn’t matter if one population gets smaller. |
| **B** | The birds need the bees for food, but the flowering plants and crops don’t need them. |
| **C** | The flowering plants and crops need the bees to help them reproduce, but the birds don’t need them. |
| **D** | The birds and the flowering plants and crops all need the bees. |

**The bees are disappearing**

The diagram shows a food chain.





birds

bees

flowering plants and crops

**Part 2**

Populations of bees are getting smaller very quickly.

1. Could this cause the human population to decrease?

|  |  |
| --- | --- |
| **A** | No, it will not affect humans. |
| **B** | Yes, it could affect humans. |

1. What is the **best** explanation for your answer to question 1?

|  |  |
| --- | --- |
| **A** | Humans aren’t part of the food chain. |
| **B** | Humans depend on many crops that are pollinated by birds. |
| **C** | Humans depend on many crops that are pollinated by bees. |
| **D** | Humans only depend on organisms they eat. |

*Biology> Big idea BOE: Organisms and their environments > Topic BOE1: Interdependence of organisms > Key concept BOE1.2: Interdependence within ecosystems*

|  |
| --- |
| **Diagnostic question** |
| **The bees are disappearing** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | An ecosystem is made up of interdependent populations of organisms interacting with each other and the environment in which they live. |
| Observable learning outcome: | Apply understanding of ways in which organisms are interdependent to predict effects of a change in the size of a population. |
| Question type: | Two-tier multiple choice |
| Key words: | ecosystem, interdependence, pollination, pollinators, reproduction |

**What does the research say?**

It is important for students to appreciate that the interdependence of organisms within an ecosystem arises from more than just feeding relationships (Driver et al., 1994; Allen, 2014).

All of the organisms in a food chain can depend upon animals that pollinate plants and disperse their seeds, and human food security is critically dependent upon animals that perform these services for food crops (Díaz et al., 2006). Researchers have found that the misunderstanding that plants do not reproduce sexually (because they do not ‘have sex’) is common in teenagers (Okeke and Wood-Robinson, 1980; Hampshire Education Authority, 1986); this misunderstanding could prevent students from appreciating the important role of pollinators in ecosystems.

As frequently reported in news media (e.g. Briggs, 2019), pollinator populations are in decline, at least in part due to human activities that result in habitat loss, bioaccumulation of substances such as insecticides, and climate change (Potts et al., 2010), and learning about the important roles of pollinators in school can help to increase students’ engagement with biodiversity loss and conservation (Schönfelder and Bogner, 2017).

**Ways to use this question**

Students should complete the questions individually. This could be a pencil and paper exercise, or you could use the PowerPoint presentation with an electronic voting system or mini white boards.

*Differentiation*

You may choose to read the questions and answers to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

*Part 1*

1. **D** – It will affect the birds and the flowering plants and crops.
2. **D** – The birds and the flowering plants and crops all need the bees.

*Part 2*

1. **B** – Yes, it could affect humans.
2. **C** – Humans depend on many crops that are pollinated by bees.

**How to respond - what next?**

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs. Responses often work best when the activities involve paired or small group discussions, which encourage social construction of new ideas (meaning making) through dialogue.

If students struggle to think about interdependence beyond direct predator-prey relationships, modelling interdependence (or the “connectedness”) of organisms using an ecosystem role play may help to build their understanding (Ford and Smith, 1994). Accordingly, the following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Response activity: Ecosystem connections role play

Schönfelder and Bogner (2017) found that a visit to a real beehive was effective at increasing students’ engagement and their knowledge of conservation and its importance. This is in keeping with Barker and Slingsby (2011), who emphasise that developing understanding of key ecological concepts is best achieved in the context of real ecosystems that students can visit, observe and explore; as they put it, “What we are trying to do is make them leap out of the textbooks”.

As a class visit to a real beehive will not always be possible, an alternative is to allow students to observe and interact with a real beehive online. Schönfelder and Bogner (2017) investigated the impacts of using the HOBOS (Honey Bee Online Studies) website, and found that it was effective at increasing students’ engagement and their knowledge of conservation and its importance.

* Introduction to HOBOS: <https://www.hobos.de/en/what-is-hobos/>
* HOBOS “Bee biology” mini encyclopaedia: <https://www.hobos.de/en/learning-with-hobos/learning-with-hobos/bee-biology/>
* Live streams of HOBOS beehive cameras: <https://www.hobos.de/en/what-is-hobos/live-data/#/live/stations>

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