**Through the food web**

Look at the food web diagram.

blackbird

chaffinch



bee



caterpillar



lavender

cabbage

owl



1. Imagine all the **lavender** died.

Some children have suggested possible effects of the lavender dying out.

How do you feel about each suggestion?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Suggestion** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | The number of bees could decrease. |  |  |  |  |
| **2** | The number of blackbirds could decrease. |  |  |  |  |
| **3** | The number of cabbages could decrease. |  |  |  |  |
| **4** | The number of caterpillars could increase. |  |  |  |  |

Look at the food web diagram.

blackbird

chaffinch



bee



caterpillar



lavender

cabbage

owl



1. Imagine all the **chaffinches** died.

Some children have suggested possible effects of the chaffinches dying out.

How do you feel about each suggestion?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Suggestion** | | I am **sure** this is right | I **think** this is right | I **think** this is wrong | I am **sure** this is wrong |
| **1** | The number of caterpillars could increase. |  |  |  |  |
| **2** | The number of cabbages could decrease. |  |  |  |  |
| **3** | The number of blackbirds could decrease. |  |  |  |  |
| **4** | The number of bees could increase at first, and then decrease. |  |  |  |  |

*Biology > Big idea BOE: Organisms and their environments > Topic BOE2: Organisms in their environments > Key concept BOE2.1: Ecosystem components and dynamics*

|  |
| --- |
| **Diagnostic question** |
| **Through the food web** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The environmental conditions in different ecosystems, and in different parts of an ecosystem, affect and are affected by the organisms that live there. |
| Observable learning outcome: | Describe how changes in environmental conditions may lead to population change in ecosystems. |
| Question type: | Confidence grid |
| Key words: | food web, food chain, interdependence, community, ecosystem |

**What does the research say?**

Food webs are key concepts that enable the development of understanding of more complex ecological principles and environmental issues, including population management and food security (Alexander, 1982). As Allen (2014) has pointed out, “Anyone who is not able to fully appreciate the far-reaching impacts of changes to a single population may trivialize a media report about an endangered species, only believing that species alone is under threat, when the likelihood is that many members of an ecosystem will be adversely affected”.

Griffiths and Grant (1985) drew a distinction between students’ ability to recall that populations in a food web interact, and their ability to apply that principle to predict possible effects of a change in one population on others in the same food web.

Research has shown that when students are asked to predict possible effects of a change in a population within a food web, they tend to focus only on single food chains within the web, struggle to trace changes through more than one chain, struggle to think about the impact of a change in a population more than one trophic level away, and are more able to trace changes upwards through a chain than downwards (Webb and Boltt, 1990; Leach et al., 1992; Gotwals and Songer, 2010; Griffiths and Grant, 1985; Barman, Griffiths and Okebukola, 1995). These authors and others have identified specific misunderstandings about changes in food webs that are commonly held by school children, including that:

* a change in the size of a population will only affect another population if they are related as predator-prey;
* a change in the size of a population will only affect other populations in the same food chain within a food web (and will not affect populations in other food chains within the food web);
* if the size of one population changes, all other populations in the food web will change in the same way (e.g. a decrease in one population means all other populations will also decrease).

**Ways to use this question**

Students should complete the confidence grids 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 suggestions 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**

In both parts, students should recognise that the disappearance of one population could affect other populations in different ways in all parts of the food web, both up and down food chains, and in different interconnected food chains.

Students should be able to trace the implications of the disappearance of a population through the food web in various directions to provide justifications for the suggested potential effects.

*Part 1*

1. The number of bees could decrease – **right** (because their food source – lavender – has disappeared)
2. The number of blackbirds could decrease – **right** (because their food source – bees – have decreased due to the lack of lavender for them to feed on)
3. The number of cabbages could decrease – **right** (because in the absence of lavender, caterpillars will eat more cabbages)
4. The number of caterpillars could increase – **right** (because if bees and blackbirds decrease, owls will eat more chaffinches, meaning there are fewer predators for caterpillars)

*Part 2*

1. The number of caterpillars could increase – right (because their predator – the chaffinch – has disappeared)
2. The number of cabbages could decrease – right (because the number of caterpillars will increase, so more cabbages will be eaten)
3. The number of blackbirds could decrease – right (because in the absence of chaffinches, owls will eat more blackbirds)
4. The number of bees could increase at first, and then decrease – right (because owls will eat more blackbirds, so there will be fewer predators for the bees; however, an increase in the bee population and an increase in the caterpillar population will cause a decrease in the lavender population, so eventually the bees’ food source will become scarce)

**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.

A number of authors have suggested using role play (e.g. Ford and Smith, 1994) and games (e.g. Biffi et al., 2016; Hartweg et al., 2017) to increase engagement and help develop students’ understanding of food chains and food webs. Accordingly, the following BEST ‘response activity’ could be used in follow-up to this diagnostic question:

* Response activity: Food web role play

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