**All change**

Warmer weather causes chicks to go hungry.

Exeter, Edinburgh and Sheffield Universities have been studying the effect of climate change on bird populations.

Their research suggest that warmer springs could cause some bird populations to fall.

Great tits, Blue tits and Pied flycatcher chicks feed on caterpillars soon after they hatch from their eggs, but the caterpillars they eat are maturing earlier each year, as spring gets earlier. The caterpillars are only active for a few weeks, after this they fall from trees and become a pupa.

The researchers found that Great tits hatched on average two days later than the caterpillar peak, Blue tits were on average three days later and Pied flycatchers hatched 13 days too late.

It is important that the chicks hatch when the caterpillars are at their peak as this is when the chicks are at their hungriest.



Some children talk about what may happen in the future to the birds in the article.

**Denis**

If the birds do not start to lay eggs earlier the population of birds will fall.

**Charlie**

The birds could evolve and start laying eggs earlier.

**Hattie**

If the climate continues to change and the caterpillars hatch earlier each year the situation could worsen.

**Saffron**

We can’t predict what will happen, we don’t know what will happen to the temperatures over in the future.

**To talk about in your group**

1. Which population has the changing environmental condition had a positive effect on?
2. Which population has the changing environmental conditions had a negative effect on?
3. Which student considers if the situation will worsen?
4. Which student suggests a way in which the situation could resolve?
5. Which student considers the future in terms of uncertainty?

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

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| --- |
| **Response activity** |
| **All change** |

**Overview**

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| --- | --- |
| 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. |
| Activity type: | Discussion |
| Key words: | population, climate change, ecosystem |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Reasons why

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| --- | --- |
| **B** | **BRIDGING**  This activity explores ideas that are usually taught at age 14-16, to build a bridge to later stages of learning. |

**What does the research say?**

A study by Jin et al. (2019) investigated student ability to explain the interdependent relationships in ecosystems. Students were presented with real world phenomena about relations in ecosystems and their responses were graded based on the content within their explanations. Jin et al. found that only 3% of the students were able to discuss mechanisms in their answers and the majority of students were unable to “use systems thinking concepts to construct a causal mechanism that explains phenomena about interactions in ecosystems”. 33% of students were able to identify distant relations and interactions in ecosystems but were not able to construct explanations, whilst most students (57%), simply explained the relationships in terms of individual organism needs.

**Ways to use this activity**

Students should complete this activity in small groups. The focus of the activity should be on group discussion to answer the questions about the effect of the changing environmental conditions on the maturation of caterpillars and the subsequent effect on a number of bird populations, students are then asked to consider what the future may hold for these populations.

It is through the discussions that students can check their understanding and develop their explanations. Listening in to the conversations of each group will often give you insights into how your students are thinking. The quality of the discussions can be improved with a careful selection of groups, or by allocating specific roles to students in each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers; they may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

After their discussions, each group should be prepared to report the key points of their discussion to another group, or to the class.

**Expected answers**

1. The population that the changing environmental condition had a positive effect on is the caterpillars. They are maturing earlier and less are being eaten.
2. The population that the changing environmental conditions have a negative effect on are the Great tits, Blue tits and Pied flycatcher. The greatest effect is on the Pied flycatcher, the numbers of this species are decreasing and the IUCN lists climate change as one of the factors.
3. Hattie considers if the situation will worsen.
4. Charlie suggests a way in which the situation could resolve.
5. Saffron considers the future in terms of uncertainty.

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Images: pixabay.com/kridneh (3436616)

**References**

Jin, H., et al. (2019). Secondary Students' Understanding of Ecosystems: A Learning Progression Approach. *International Journal of Science and Mathematics Education,* 17(2)**,** 217-235.