Biotic factors

4.7.1.3 · Ecology · revision notes

Biotic factors are the living parts of the environment that affect a community: food, predators, pathogens and competition. Expect questions asking you to explain how a change in one of these affects population sizes, often with a food web, a graph of population changes or an example such as red and grey squirrels.

Key facts

- Biotic = living
- More food → more survive and breed → population rises
- New pathogen → no resistance → many die
- Biotic factors: food availability, new predators, new pathogens, being outcompeted
- New predator → prey not adapted to escape → prey numbers fall
- Outcompeted → numbers too low to breed → species can disappear from the area

Notes

The biotic factors

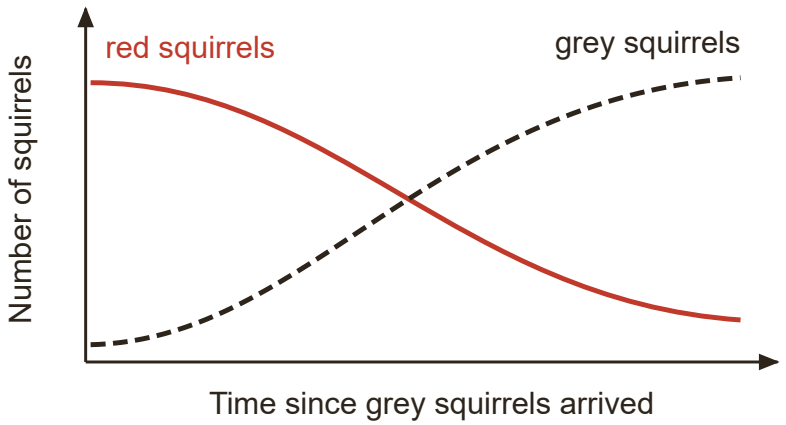
- Biotic factors are **living** factors that can affect a community:
- **availability of food**;
- **new predators** arriving;
- **new pathogens** (microorganisms that cause disease);
- **one species outcompeting another**, so the numbers of the losing species are no longer large enough to breed.

How they change populations

- **Food**: when food is plentiful, more animals survive and reproduce, so the population grows. When food is scarce, competition increases and some animals starve or breed less.
- **New predators**: prey may not be adapted to escape a predator they have never met, so their numbers can fall sharply.
- **New pathogens**: a population with no resistance to a new disease can be badly affected, and the species that depend on it are then affected too.
- **Competition**: if a new species is better at getting the same food or space, the original species may decline. If its numbers fall too low, individuals rarely meet to mate and it can die out in that area.

Example: red and grey squirrels

- Grey squirrels were brought to Britain from North America. They compete with native red squirrels for food and habitat.
- Grey squirrels are larger and feed well on acorns, so in many areas they get more of the food than red squirrels do.
- Grey squirrels also carry a virus (squirrelpox) that rarely harms them but kills red squirrels, so a new pathogen adds to the decline.
- Red squirrels now survive mainly in areas with few or no grey squirrels.



Grey squirrels outcompete red squirrels and spread squirrelpox, so as greys increase, reds decline.

Linking factors together

- Changes often combine: a cold winter (abiotic) can reduce the food available (biotic), which then affects the predators.
- Always give the reason for each effect, not just 'the numbers go down'.

How to answer each type of question

Recall: identify biotic factors

1 to 2 marks | **Grade 3**

1. A biotic factor is an organism or is caused by one: food, predators, pathogens, competitors.
2. Check each option in a list: is it living, or a physical or chemical condition?

Example. Which **two** of the following are biotic factors?
soil pH / a new species of predator / wind speed / a new fungal disease / temperature

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Model answer. A new species of predator (1); a new fungal disease (1)

Interpret data on population changes

2 to 3 marks **Grade 5**

1. Describe what happens to each population, with dates or values.
2. Look for cause and effect: which change came first?
3. Suggest a biotic reason, e.g. more food, a new disease or more predators.

Example. Ecologists counted the rabbits and foxes in an area each spring. In summer 2020 a new disease that kills rabbits arrived in the area.

Year	Number of rabbits	Number of foxes
2019	810	40
2020	800	40
2021	150	33
2022	170	25

Suggest why the number of foxes fell between 2020 and 2022. (2 marks)

Model answer. The disease killed many rabbits, so the foxes had less food (1). So fewer foxes survived or reproduced (1).

Explain the effect of a new predator or pathogen

2 to 3 marks **Grade 5**

1. State the effect on the population (e.g. it decreases).
2. Explain why: many are eaten or killed, because the prey are not adapted to escape or have no resistance.
3. Add a knock-on effect on another species if the question asks about the community.

Example. American mink escaped from fur farms and now live wild along British rivers. Mink are predators of water voles.
Explain why the number of water voles fell after mink arrived. (3 marks)

Model answer. Mink were a new predator, so many water voles were eaten (1). The water voles were not adapted to escape mink, e.g. mink can swim and can get into their burrows (1). So fewer water voles survived to breed and the population fell (1).

Explain how one species outcompetes another 3 to 4 marks **Grade 7**

1. Name the resource they compete for (food, space, territory, mates, light, water).
2. Say which species is better at getting it and why, using the information given.
3. Explain the effect: fewer of the other species survive and reproduce.
4. If numbers fall very low, too few are left to breed, so the species can disappear from the area.

Example. A non-native plant grows rapidly and covers the surface of a pond.
Explain how this could affect the native plants that grow underwater. (4 marks)

Model answer. The non-native plant absorbs most of the light at the surface / shades the water (1). The underwater plants get less light, so they photosynthesise less (1). So they grow less, and fewer survive and reproduce (1). The non-native plant outcompetes them for light and space, so the native plants may disappear from the pond (1).

Don't lose marks

- Giving abiotic factors (temperature, light) when biotic factors are asked for.
- Writing 'they die' without saying why: eaten, starved or killed by disease.
- Missing the last step for competition: numbers become too low to breed, so the species can disappear from the area.
- Calling a pathogen a predator. Pathogens are microorganisms that cause disease.

More tips

Memory tricks

- Biotic factors 'FPPC': Food, Predators, Pathogens, Competition.
- 'New' means dangerous: prey have no adaptations to a new predator and no resistance to a new pathogen.
- Sense check: less food, fewer consumers; fewer predators, more prey (at least at first).

Exam technique

- Use the organisms named in the question; general answers score fewer marks in 'suggest' questions.
- In data questions, describe first (with numbers), then explain.
- Most of these questions reward a chain of 2 to 4 linked points. Put 'so' between the links.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 **Define a biotic factor**
A living factor, such as another organism, that can affect a community.

Grade 4 **List the four biotic factors in the specification**
Availability of food, new predators arriving, new pathogens, and one species outcompeting another.

Grade 5 **Explain the effect of food availability**

More food means more organisms survive and breed, so the population grows; less food has the opposite effect.

Grade 5

Explain effects of new predators or pathogens

Prey may not be adapted to escape a new predator and organisms may have no resistance to a new pathogen, so numbers can fall fast.

Grade 7

Explain how competition can make a species decline

If one species outcompetes another, the other's numbers can fall until too few are left to breed.

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