2025 Bi H1 Q23

Section: Sustainability and Interdependence

Topic: Biodiversity

Question Summary:

A population begins large and genetically diverse, is reduced to very low numbers with a loss of alleles, and later recovers without regaining much of its original genetic diversity. You are asked which process this sequence describes.

Worked Solution:

The key features of the sequence are:

- A **large, genetically diverse** population at the start.
- A **drastic reduction** to very low numbers $\rightarrow$ loss of alleles.
- A later **increase in numbers**, but the population does **not recover** its original genetic diversity.

This is characteristic of the **bottleneck effect**, which occurs when a population is dramatically reduced in size, causing a loss of genetic variation. Even if numbers recover, genetic diversity remains low because many alleles were lost during the reduction.

Other options:
- **Natural selection** changes allele frequencies gradually, not by a drastic reduction. ✘
- **Prevention of gene flow** refers to isolation, not population collapse. ✘
- **Recovery of genetic diversity** is the opposite of what is described. ✘

Therefore, the sequence describes the bottleneck effect.

Final Answer: D (the bottleneck effect).

Revision Tips:

- The **bottleneck effect** reduces population size dramatically → many alleles lost by chance.
- Genetic diversity stays low even after population recovery.
- Founder effect is similar but involves a small group colonising a new area.
- Genetic drift effects are strongest in small populations.