

Genetics, populations, evolutions and ecosystems – A2 Biology

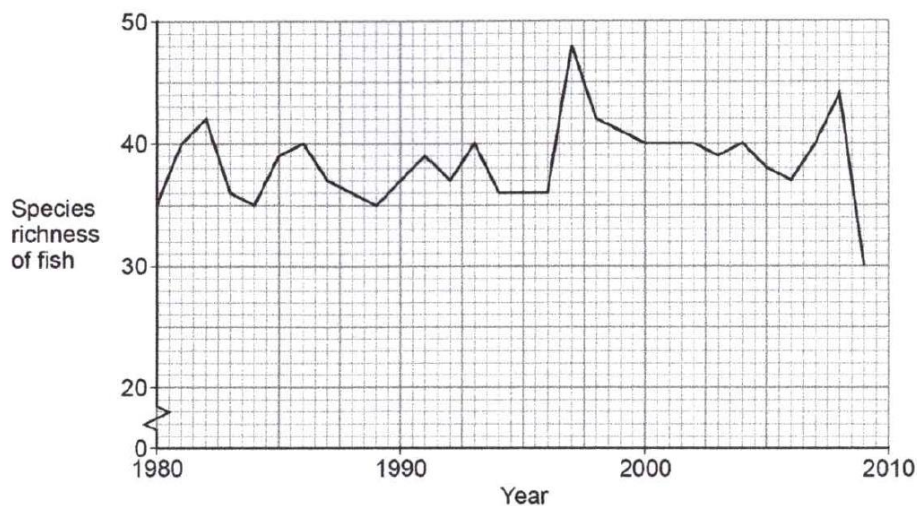
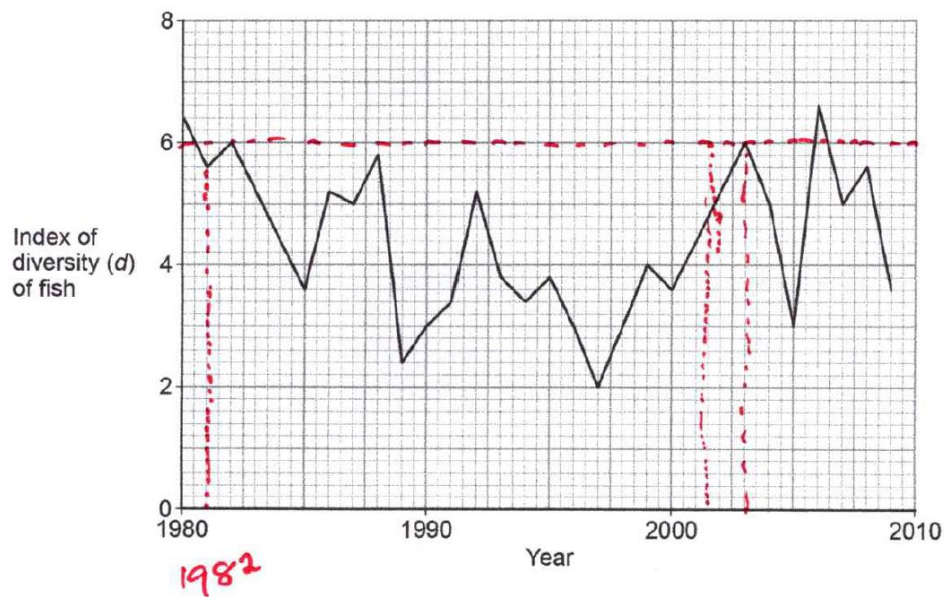
1. No.5

0 5

Scientists investigated the effect that the release of heated water into a river from a power station had on the biodiversity of a local fish community over 29 years.

They measured the species richness and the number of fish of each species at the same site in October every year. The scientists used this information to calculate an index of diversity (d) of fish for each year.

Figure 7 and **Figure 8** show their results.

Figure 7**Figure 8**

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The scientists used the following formula to calculate the index of diversity (d) of fish.

$$d = \frac{N(N-1)}{\sum n(n-1)}$$

where N = total number of fish of all species
and n = total number of fish of each species

In some years, the values were $N = 624$ and $\sum n(n-1) = 64\,792$

Which years had these values?

Use **Figure 8** and the formula above to work out your answer.

[1 mark]

$$d = \frac{624(624-1)}{64\,792} = \frac{624 \times 623}{64\,792} = 6$$

from graph, $d=6$ is in 1982 and 2003

Answer 1982 and 2003

0 5 . 2

In 1997, the scientists recorded the highest species richness, but the lowest value of d over the 29 years.

Describe and explain how these results for 1997 were possible.

[2 marks]

There were many different species. However, there were a few species present in very large numbers.

05.3

A journalist studied **Figure 7** and **Figure 8** (on page 16) and concluded that releasing heated water from a power station has no effect on local fish communities.

Use all the information to suggest reasons why the journalist's conclusion might **not** be valid.

[4 marks]

The species richness values are lower after 29 years. However, data presented is only for one community. So, the data is not representative of all fish communities. The data measurements were taken only in October. The volume of heated water released each year is not given. Moreover, timing of heated water release each year is not known. All these reasons make the claim to be invalid.