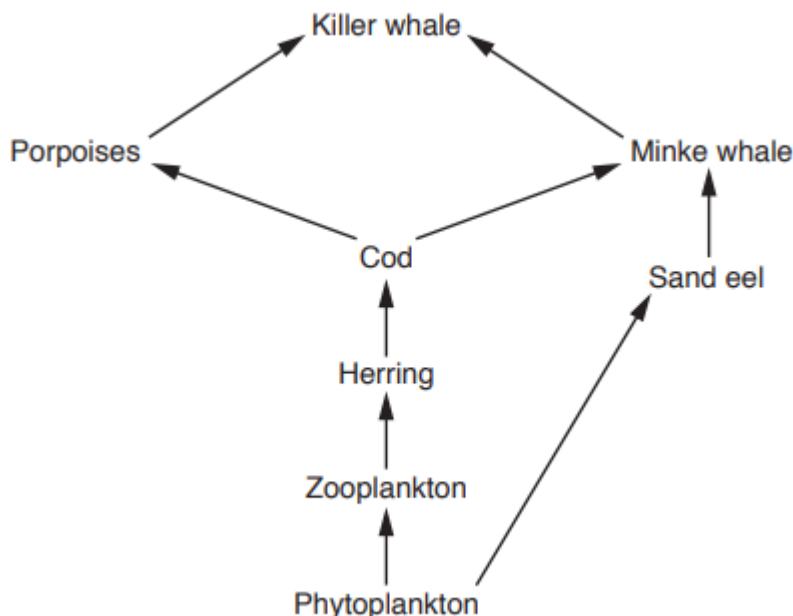


GCSE Biology B (Twenty First Century Science)
J257/03 Breadth in Biology (Higher)

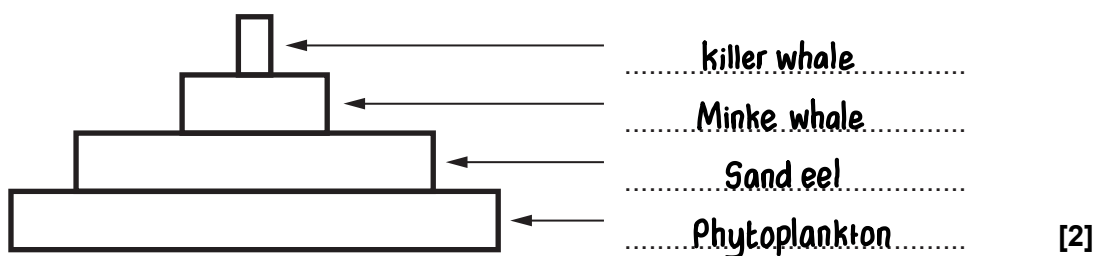
Question Set 17

1 (a) Killer whales can be found off the coast of Scotland.

The diagram shows part of their food web.



(i) Use the food web to label this pyramid of biomass correctly.



(ii) Describe how biomass is lost at each stage of a food chain.

Energy stored as biomass is lost at each trophic level of the food chain. It is lost as heat energy from respiration, in indigestible parts which are not consumed, through egestion and through excretion. [2]

(b) (i) A killer whale was found dead off the coast of Scotland.

The post mortem found that chemicals called PCBs had bioaccumulated in the whale's body.

Use your knowledge of food chains to explain how the PCBs bioaccumulated.

Small amounts of PCBs are absorbed by phytoplankton. The phytoplankton is consumed by primary consumers. The PCBs cannot be excreted so remain in the primary consumer. The primary consumers require a lot of phytoplankton so the concentration of PCB in them increases. The primary consumers are eaten by secondary consumers and the process repeats. The concentration of PCB in the bodies of higher level consumers gradually increases, becoming most concentrated in the apex predator, the killer whale. [3]

- (ii) Scientists have worked out that the quantity of PCBs required to damage marine mammal health is 9 mg/kg.

The dead killer whale's blubber (fat) was analysed. They found 9×10^2 mg/kg in the blubber.

Do you think scientists would be concerned by this figure?

Explain your answer.

[1]

Yes, 900 mg/kg is 100× more than the concentration required to damage marine mammal health.

- (iii) Whale calves feed on their mother's milk for 11 months. The milk is high in fat.

Suggest why scientists are concerned about the effect of PCBs on the whale population.

[2]

If the milk is high in fat, it is likely that some of the PCB present in the whale's blubber & contaminate the mother's milk and transfer to the calves during feeding. The calves are fed for a long period of time, increasing the quantity of PCB transferred. Moreover, the calves are significantly smaller in size than the mothers, so even a small quantity of PCB will have a much greater and more damaging effect on the calves. This will affect the survival of the whale population.

- (c) Explain what would happen to the dead whale's body if it was left in the sea.

[2]

Other smaller predators will feed on the digestible components of the dead whale carcass. Indigestible parts will decompose with the help of decomposing microorganisms such as bacteria and fungi. The PCBs will be absorbed by other organisms or released into the ocean. This would endanger the ecosystem of the ocean.

Total Marks for Question Set 17: 12

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