Oxford Cambridge and RSA

AS Level Biology A

H020/02 Depth in biology

Question Set 15

1. (a) The Scottish wildcat and European wildcat are both classified in the same species, *Felis silvestris*. Researchers have suggested that both wildcats originated from the same population.

During the Ice Age, the British Isles were connected by ice to mainland Europe.

- After the Ice Age, sea levels rose and the British Isles became isolated from the restof Europe. The isolated population of wildcats in the British Isles developed slightly different characteristics from the mainland population in Europe.
- A subspecies is a group of individuals that is geographically isolated from others of the same species and that is distinguishable from other populations of the same species.
- The Scottish wildcat is now classified as the subspecies *Felis silvestris grampia* andthe European wildcat as the subspecies *Felis silvestris silvestris*.

(i) Name the genus of the Scottish wildcat. **[1]**

Felis

(ii) The information above states that 'the isolated population of wildcats in the British Isles developed slightly different characteristics from the mainland population in Europe'.

What is the term used to describe the differences between the two populations of wildcat? **[2]**

Intraspecific variation **[2]**

(iii) Suggest why the Scottish wildcat and the European wildcat **cannot** yet be classified as different species.

They can still interbreed successfully to produce fertile offspring. They have not undergone sufficient evolutionary divergence so their biochemistry remains very similar.

(b) By the 19th century, the wildcat population in the British Isles had decreased as it had beenunder threat from deforestation and hunting. The wildcat could only be found in Scotland.

(i) Suggest one reason why the wildcat was hunted. **[1]**

Hunted to protect game bird species which the wildcat preyed on.

(ii)* Current estimates of the Scottish wildcat population vary. Recent reports by the Scottish Wildcat Association indicate that fewer than 100 individuals, possibly as few as 35, remain in the wild. These individuals occur only in the most remote, uninhabited areas of the Scottish Highlands.

Biodiversity can be considered at several levels. A scientist concluded that the biodiversity of the Scottish Highlands would continue to reduce because of the small population of Scottish wildcats.

Evaluate the scientist's conclusion with reference to genetic biodiversity and species biodiversity.

[6]

As the remaining Scottish wildcat population is small, over time genetic biodiversity of the population will decrease. The population is more susceptible to genetic drift or the loss of alleles due to random chance Inbreeding is also more likely to occur, further reducing genetic diversity. The reduction in the variety of genes in the wildcat population will contribute to the loss of biodiversity in the Highlands more generally. Moreover, as the wildcat population has been under threat from deforestation (which has lead to the decline in population numbers) it is likely that other species are under threat due to habitat destruction. The maintenance of a small wildcat population, or a further decline in their numbers, may suggest a decrease in the abundance of wildcat prey. The number of species in the highlands (species richness) and the abundance of individuals within each (species evenness) are likely low, leading to low species diversity. This, and biodiversity overall will continue to decrease, as suggested, unless deforestation is arrested. Presumably hunting of wildcats is now illegal. Alternative species may now be subject to hunting which could lead to similar patterns of species decline. The above points support the scientist's hypothesis. However, the decreased wildcat population may have created an opportunity for other species to flourish and increase in abundance. For example, the prey of wildcats may increase in number or new species may evolve or migrate into areas vacated by the wildcats. This may increase biodiversity. However, the disruption of the food chain in this way may lead to the unchecked prey overexploiting their own resources, resulting in a subsequent decline or loss of the prey species. This cascade effect may lead to continuous reductions in Highland biodiversity.

(c) With Scottish wildcat numbers at their lowest ever, decisive action has been taken.

In the West Highlands of Scotland, remote land has been targeted to establish a wildcat haven. The land chosen is mostly surrounded by sea, far away from other populations.

Table 1 lists some details of the action that has already been taken and will be taken in the future to protect the Scottish wildcat.

A	The wildcat haven has been established in an area of land mostly surrounded by sea.
B	Over the past few years all domestic cats, wild cats and Scottish wildcats in the area have been neutered.
C	Over the past few years all domestic cats, wild cats and Scottish wildcats in the area have been checked for disease.
D	In the near future, Scottish Natural Heritage and Chester Zoo plan to establish a breeding and release project for pure-bred Scottish wildcats.

Table 1

Indicate which of the **letter or letters**, **A** to **D**, in Table 1 apply to each of the following statements.

(i) An example of ex-situ conservation. **[1]**

D

(ii) Helps to prevent the domestic and wild cats mixing freely with the Scottish wildcats in the haven. **[1]**

A

(iii) Contributes to maintaining a healthy population in the wildcat haven. **[1]**

C

(iv) Contributes to maintaining the genetic purity of the Scottish wildcat. **[1]**

A,B,D

Total Marks for Question Set 15: 16