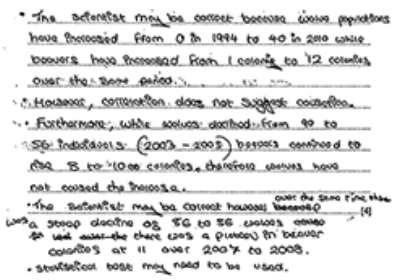
Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1			rotate the trees that are harvested ✓ (rotational) coppicing ✓ replant trees (rather than rely on natural regrowth) ✓ selective felling / described ✓	1 max	**Mark first answer given** **ALLOW** 'rotational felling' **ALLOW** pollarding **ALLOW** description (e.g. 'cut trees so that a stump remains near the ground') e.g. 'cut only the largest / oldest / most valuable / fastest growing, trees (each year) **ALLOW** 'strip felling' **IGNORE** clear felling **Examiner's Comments** Nearly all candidates were able to identify a way of producing timber sustainably, coppicing being the one most often described. While in this case the mark could be given for naming the technique, it was pleasing to see that many candidates picked up on the command word and give some description, which allowed the mark to be awarded, even if the technique was not named.
			Total	**1**	
2	a		**1** overall / AW , decrease ✓ **2** fluctuates (before 2006) ✓ **3** little / no , change after 2006 ✓ **4** figures that illustrate any of the above points ✓	3 Max (AO2.6)	**1** **IGNORE** 'decrease' unless the whole period (or until 2006) is implied **2** **IGNORE** individual descriptions of short-term rises and falls **3** **ALLOW** plateau after 2006 **4** **ALLOW** e.g., fall of 39000 (67%) from 1993 to 2010 / around 20000 (after 2006) **4** **AWARD** only if the m.p. that the figures illustrate has been awarded **3&4** varies by < 2000 after 2006 = **2 marks**

					Examiner's Comments This question differentiated well between candidates and all marking points were regularly seen. Common responses that did not achieve marks included describing every micro-change in population on an almost year-by-year basis as opposed to giving the 'big picture' (in 6 lines for a total of 3 marks). Other common mistakes included the use of the term 'populations' as a unit of population or quoting the deer population as 20 (rather than 20 000), and explaining, rather than describing, the changes in deer population.
	b	i	**FIRST CHECK ON ANSWER LINE** **If answer = 350 award 2 marks** 90− 20 = 70 **70/20 × 100 ✓** **= 350 ✓**	2 (AO2.6)	*Max 1* if answer given to > 3 s.f. *If answer is incorrect* **ALLOW 1 mark for** 90−20/20 **ALLOW** 350% **Examiner's Comments** Most candidates achieved both marks here but significant minorities offered either 450 (using the wolf population in 2003, rather than the increase) or 77.7 (dividing by the 2003 figure). Calculating percentage change is an important biological skill that is regularly tested in examinations and candidates would do well to make sure that they can do it. **OCR support** We have a range of resources available to support you and your students on maths skills: Maths for Biology resources Include tutorials and student activities for all the statistical skills that candidates need to know for the course. Mathematical skills Handbook

					Provides guidance on the statistical skills and explains how they can be used within a biology context.
		ii	fall in deer (population) ✓ means less , food / prey (for wolves) ✓ *idea that* spike in wolf population in 2007 related to higher deer population in 2005 ✓	2 (AO2.6)	**Examiner's Comments** Although over half of responses gained both marks here, many wrote answers that were inappropriately long for a question worth only 2 marks, particularly as the question directed them to give only **one** explanation. Despite having been told that wolves feed on deer many candidates struggled to find non-obvious and often implausible explanations, such as the arrival of new predator of deer (or even wolves) or the wolf population having emigrated. Candidates were also told that deer are herbivores and wolves were introduced (by humans) so responses suggesting that wolves competed with deer (or badgers) for food or that humans had begun to hunt the wolves, were not credited.
	c	i	*idea that* living in water makes them hard to count ✓ easier to count (big) mounds (of wood) ✓	1 (AO3.3)	**ALLOW** living , in dams / underneath wood **IGNORE** nocturnal **Examiner's Comments** Around a quarter of candidates scored this mark but too many offered generic responses, such as 'there being too many to count' without linking their answer to the context provided in the stem of the question.
		ii	*claim supported because*… **1** beaver and wolf population both increase ✓ **2** beaver (population) increases <u>after</u> wolf population increases ✓ **3** *idea that* lag in increase in beaver population is consistent with allowing sufficient time for wolf population to have affected ecosystem ✓ *claim not supported because*…	4 Max (AO3.2)	*Assume points support the claim unless context states otherwise* **IGNORE** refs to deer **1 & 2** 'wolf population increases <u>then</u> beaver population does' **= 2 marks** **2 ALLOW** beaver population increases after wolf introduction (for mp 2 only) **2 & 7** Figures that illustrate must reference a time delay

			4 beaver and wolf population curves are different shapes ✓ **5** correlation does not imply causal link ✓ **6** plausible alternative reason for increase ✓ **7** figures that illustrate **1**, **2** or **4** ✓		**4 ALLOW** example of where curves differ **4 IGNORE** wolf increase is bigger than beaver increase **5 IGNORE** (no) statistical tests **6 ALLOW** e.g. climate change / other management strategies / change in abiotic factor **7 IGNORE** time delay as figs to support m.p. **4** **<u>Examiner's Comments</u>** Many candidates knew how to present their answer in a clear format that demonstrated which pieces of evidence they thought supported the claim and which did not. In support of the claim most candidates cited either a version of the first marking point or the extra guidance version of marking point 2. Very few combined these two points by stating that there was a lag between a rise in the wolf population and a subsequent rise in the beaver population. In fact, many candidates cited a delay between changes in the wolf and beaver population as evidence against the claim, an approach that could still lead to the award of marking point 4. Marking point 3 was seen on only a handful of occasions. Marking point 5 was only creditworthy when it was given in the correct context (i.e., when questioning a claim drawn from an apparent correlation). Marking point 6 was rarely given; when attempted, most responses either did not specify a plausible alternative cause or suggested an implausible biotic factor such as the arrival of a new predator. A number of candidates attempted to explain the plausibility of the claim and were not credited.

					Exemplar 3  The response in line 1, has a clear statement with figures and achieves marking points 1 and 7. The 'However', in line 5 gives the correct context to the statement that follows (the candidate has been given the benefit of the doubt about the meaning of the word 'suggest') and marking point 5 has been given. The 3rd sentence is clearly in the same context (of not supporting the claim) and so has gained marking point 4.
		iii	population of trees near water ✓ proportion of damaged trees near water ✓ time spent by deer near water / AW ✓	1 (AO3.2)	**ALLOW** count the trees near the water **Examiner's Comments** A minority of answers achieved this mark, usually for a version of the first or third marking points. Many answers offered something imprecise (e.g. where the deer live) or difficult to measure (e.g. the health of the trees used to build the dams) and some offered explanations rather than evidence.
	d	i	*idea of* human intervention ✓ habitat / ecosystem / biodiversity , changed / restored , (when they were reintroduced) ✓	2 (AO2.1)	**ALLOW** e.g., population actively moved **IGNORE** maintain **Examiner's Comments** Most candidates knew what conservation was and achieved at least 1 mark. Many missed out on a second mark because they used the phrase 'maintain biodiversity', whereas, in the example given,

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td>biodiversity is clearly being increased.</td></tr>
<tr><td></td><td></td><td>ii</td><td>idea of habitat being sensitive to damage ✓</td><td>1
(AO1.1)</td><td>ALLOW e.g., a rare / endangered / threatened , species lives there

<u>Examiner’s Comments</u>

A large minority of candidates achieved this mark but many merely stated an area of the world, e.g. the Galapagos Islands, without further qualification.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>16</td><td></td></tr>
<tr><td>3</td><td></td><td>i</td><td>(genetic) bottleneck ✓</td><td>1
(AO1.1)</td><td>ALLOW population bottleneck

<u>Examiner’s Comments</u>

Most candidates correctly answered this question. Common incorrect answers included genetic drift or mass extinction.</td></tr>
<tr><td></td><td></td><td>ii</td><td><table><tr><th>Kakapo trait</th><th>Type of adaptation</th></tr><tr><td>Active at night to avoid predators</td><td>behaviour(al)</td></tr><tr><td>Green feathers that camouflage with its surroundings</td><td>anatomical</td></tr><tr><td>Slow digestion to extract nutrients from a high-fibre, low-protein diet</td><td>physiological</td></tr><tr><td>Strong beak and claws to climb trees</td><td>anatomical</td></tr></table>✓ ✓</td><td>2
(AO2.1)</td><td>2 correct = 1 mark
4 correct = 2 marks

ALLOW ‘anatomy’ for ‘anatomical’

ALLOW ‘physiology’ for ‘physiological’

ALLOW ‘anatomy’ for ‘anatomical’

<u>Examiner’s Comments</u>

This question was well answered with most candidates gaining at least 1 mark. A minority thought that green feathers, strong beak and claw were physiological adaptations and ‘slow digestion’ was anatomical adaptation.</td></tr>
<tr><td></td><td></td><td>iii</td><td>evidence for sympatric speciation
species live(d) in the same (geographical) area / AW ✓

ecological / behavioural / temporal ,</td><td>4 max
(AO3.1)
(AO3.2)</td><td>ALLOW ref to same location
IGNORE ref to same / similar, environment / habitat

ALLOW divergence / separation for isolation IGNORE reproductive / mechanical , isolation</td></tr>
</table>

			isolation ✓ (because) they occupy different , niches / AW ✓ *idea that* (some) kaka flew to North Island after speciation ✓ *evidence for allopatric speciation* geographical isolation as mountain range emerged / AW ✓ *idea that* (some) proto-kaka flew to the North Island and evolved into kaka / AW ✓ *idea that* (some) kaka later returned (to South Island) ✓		e.g. 'differences in diet' / 'time of activity' e.g. 'Alps creates physical barrier between populations' **Examiner's Comments** This was intended as a challenging question that required more than the standard descriptions of reproductive isolation, and few candidates were given full marks. Good answers linked the presence in the same geographical area and the differences in diets as evidence for the possibility of ecological or behavioral isolation, which can lead to sympatric speciation. Many answers also linked the emergence of the Southern Alps with possible geographical isolation, leading to allopatric speciation.
		iv	species richness is the number of (different) species (in an area or community or ecosystem) ✓ species evenness is the (relative) abundance (of individuals) in each species (in an area or community or ecosystem) ✓	2 (AO1.1)	**IGNORE** amount of different species (in an area or community or ecosystem) **ALLOW** 'species evenness is (a comparison of) the number (of individuals) in each species (in an area or community or ecosystem)' **Examiner's Comments** Many candidates had a good understanding of the difference between species richness and species evenness although less successful candidates' responses often lacked the precision required to gain both marks. For example, referring to 'amount' instead of 'number' when describing species richness, and the 'spread' or 'distribution' of a species rather than the relative abundance of each

					species, when describing species evenness.
			Total	**9**	
4		i	**FIRST CHECK ON ANSWER LINE** **If answer = −3400 award 2 marks** $\frac{110\,000}{32}$ ✓ (correct answer) as whole number with minus sign ✓	2(AO2.6)	*Max 1 if no '−' sign*. **ALLOW** −3440 / −3438 / −3000 / −3437.5 **ALLOW** 1 mark for −3437 **Examiner's Comments** Almost three quarters of candidates correctly read off the graph and performed the calculation. However, fewer than half of those included the correct sign and so only achieved one mark.
		ii	*__Level 3 (5–6 marks)__ Evaluates the support given by discussing aspects of the graph that support **and** do not support the claim **and** discusses the validity of the data. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated*. **Level 2 (3–4 marks)** Describes evidence that supports the claim **and** either describes evidence that does not support the claim **or** questions the validity of the data. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence*. **Level 1 (1–2 marks)** Describes evidence that supports the claim **or** describes evidence that does not support the claim **or** questions the validity of the data. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.*	6(AO3.2)	**Indicative points may include** *Evidence in support* • decline in populations of wild species • domestic animals increase associated with decrease in wildebeest since 1995 • figures used to support *Evidence not in support* • number of species recorded on graph remains unchanged • before 1995 here was little change in domestic animals but concurrent decrease in wild animals • little or no change in gazelle and zebra since 1995 • figures used to support *Issues with validity* • graph does not show human population • only 3 species of wild animal shown • Simpson's Index not calculated • correlation does not mean causation

			0 marks *No response or no response worthy of credit.*		• no statistical test to assess correlation between populations of domestic & wild species **Examiner's Comments** Almost all candidates scored something in this question usually for citing a decrease in wild animal populations as support for the claim and usually supporting this with some reference to the graph. However, the key to scoring highly in this question was to appreciate that the command word was 'evaluate' and what candidates were being asked to evaluate was the evidence in the graph, insofar as it could be used to support the given claim. Only a minority made a valid comment about the limitations of the evidence in terms of supporting a claim about the effect of rising human population and so only around a third of candidates were given a level higher than Level 1. A still smaller number offered any convincing evidence against the claim along the lines of the points listed in the indicative content but without it a response could not achieve Level 3, as considering both sides is necessary for a full evaluation. Many candidates referenced the overall trend of decreased wild and increased domestic populations over time but most did not notice the distinct differences pre- and post-1995, some of which could be used as evidence against the claim. Common themes in answers that were not given marks included reference to minor fluctuations from one data collection year to the next (a single data point is not enough from which to infer a trend) and the absence of any post-2007 data (as this does not invalidate the claim). Common misconceptions that were noted in candidates' answers were that domestic animals made a positive contribution to biodiversity

					and that some of the wild animals (usually the wildebeest) were predators of the other species. A very large proportion of candidates spent a lot of time suggesting possible explanations for the trends seen in the graph. Such discussions may have been plausible but, in terms of evaluating the claim as the question asked, they were irrelevant. **Exemplar 3** 17 ~~1850~~ 655 – 495 The graph has been used to support the claim that rising human population in the Massai Mara has a negative impact on biodiversity in the area. + ~~[illegible]~~ [illegible] ↑ [illegible] Use the evidence in the graph to evaluate this claim. – [illegible] [illegible] [illegible] On the one hand, as the human population has increased over time, the populations of all the wild species shown in the graph have decreased e.g. zebras had an estimated population of 70000 in 1995 which fell to just under 20000 in 2009. Meanwhile, overall domestic species have shown an increase in numbers e.g. 195000 goats/sheep in 1995 vs. 245000 sheep in 2009. It is possible that increasing numbers of humans has meant wild species have lost their ~~[illegible]~~ [illegible] space to those domestic species as well as having to compete for the grasses which all the species present rely on for food ~~[illegible]~~ ~~[illegible]~~ as more humans would likely mean farming more goats, sheep and cattle as food for their own population. However, it is possible that another factor is responsible for the loss of biodiversity. There are overall fewer animals in total in 2009 compared to 1995 (~~[illegible]~~ 655000 vs 495000), so it is possible another pressure has had an effect such as climate change creating more droughts in the area. In addition, the numbers given are estimates and methods of measuring animal populations may have been less accurate in 1995 than 2009 as technology has evolved. ~~[illegible]~~ ~~[illegible]~~ It may be easier to count the domestic species than the wild ones. Also biodiversity encompasses all life in an area ~~[illegible]~~ such as other species and types of animal and other kinds of life like plants. A negative impact on biodiversity for some specific species may not be reflected elsewhere such as among birds or plants, so this claim is incomplete without such information. We also don't know how much the human population has grown. Lines 2 to 4 contain evidence to support the claim, backed up by figures, so this response achieved Level 1 easily; most of the extra response space, and below it, discusses some limitations in the validity of the data, which means the response achieves Level 2. Level 3 has not been achieved because no evidence against the claim has been offered. Lines 6 to 11 and 14 to 16 contain suggested explanations for the events on the graph. In the context of this question such explanations are not relevant.
			Total	**8**	
5		i	**1** quotas / limiting (mass of) fish caught ✓	3max(AO1.1)	*Mark first three answers only or first answer on each prompt line, which ever gives the candidate most*

			2 use nets with larger mesh ✓ **3** limit fishing to certain times (of year) ✓ **4** areas where fishing is banned ✓ **5** allow catching of certain (non-endangered) species only ✓ **6** *idea of* strict enforcement of any one of the above ✓		*benefit*. **1 ALLOW** limit , number / amount , of fish caught **1 IGNORE** restrict fishing / limit boats **2 ALLOW** different shaped mesh **2 IGNORE** different sized nets / different mesh size **3 ALLOW** regulate fishing seasons **4 ALLOW** regulate areas where you can catch fish **5 ALLOW** regulate which fish can be caught **6 ALLOW** e.g., issuing licences **Examiner's Comments** Most candidates answered this well and many achieved full marks. All marking points were seen, although the final one rarely so. Some candidates mentioned 'net size' rather than 'mesh size' and hence could not be given marking point 2. A number of responses discussed fish farms and was a clear example of the need for candidates to read the question carefully.
		ii	fish swim between countries ✓ much of ocean does not belong to any one country ✓ people catch fish in countries other than their own ✓	1 max(AO2.1)	**ALLOW** fish are caught in countries far from where they are sold **Examiner's Comments** Around half of candidates achieved a mark here – usually for a version of the 2nd alternative on the mark scheme. The most common style of non-creditworthy response discussed the general importance of preventing extinction, maintaining biodiversity or preserving global food supply, rather than focussing their answer on the 'case of sustainable fishing'.
			Total	**4**	
6			C ✓	1(AO1.2)	
			Total	**1**	