

Assessment Schedule – 2015**Scholarship Biology (93101)****Evidence Statement****Question One: Moa a goer: Evidence Statement**

Extinction (E) factors that decline popⁿ numbers leading to extinction and very large increase in extinction rate in modern times with examples.

	Evidence		Justification
EG	Reduction in genetic diversity / variation.	EG_{J1}	Due to bottleneck effect / genetic drift causing a loss of alleles.
ES	Species which are specialists.	EG_{J2}	Less chance of surviving changing environmental conditions / natural selection.
EC	Climate change / natural disaster / ice age linked to loss of habitat.	EC_J	Lack of food sources / breeding sites reduces numbers.
EI	Populations become isolated so no gene flow / breeding.	EI_J	As there is no gene flow this reduces genetic variation so less chance of surviving changing environmental conditions.
EM	Lack of beneficial mutations.	EM_J	Mutations allow for new adaptations for natural selection to act on.
	Numbers become too small to be sustainable.	EN_{J1}	Lack of reproduction possible / slow reproductive rate / mortality greater than birth rate means species numbers are unable to increase.
		EN_{J2}	Increased inbreeding so more likely harmful recessive alleles are expressed.
EO	Out competed by other organisms	EO_J	out competed linked to unable to obtain resources / food / space / sunlight to survive.
EP	Natural predator / disease enters the ecosystem.		
		EF_J	With one species becoming extinct / low in numbers others may not have food / be more heavily predated leading to extinction / greatly reduced numbers / a food web or ecosystem collapse.
EH	Human impact Causing 2 of: <ul style="list-style-type: none"> • habitat destruction • introduced species • over-hunting / fishing • pollution. 	EH_J	resulting in 2 of: <ul style="list-style-type: none"> • habitat destruction removing food source / nesting sites etc • introduced species causing increased predation / competition • over hunting/fishing reducing numbers below sustainable • pollution causes poisoning of individuals / destroying habitat.

h1,h1_J,h2,h2_J are codes to help determine the **EH** and **EH_J**

eg 1, 2, 3 etc codes for named relevant examples

Manipulation (M) of moa DNA to restore a moa population in the RFP

	Evidence		
MC	Need to obtain moa DNA from fossils / bones.	MC_{J1}	Cloning by placing moa DNA in enucleated egg of a surrogate bird and implant egg into the surrogate.
		MC_{J2}	Another ratite as closely related / turkey because they are large birds are the best surrogate.
MS	Need to clone both sexes / male and female moa.	MS_J	To ensure get a breeding population so moa restored.
MM	Need cloning of different DNA / multiple DNA samples.	MM_J	To produce the genetic variation necessary to restore them.

Biological **Implications (I)** of restoring a moa population

IE	Moas have increased risk of repeat extinction / unlikely to survive	IE_{J1}	Linked to lack of genetic variation in the population so unable to survive environmental change eg new diseases.
		IE_{J2}	linked to increased chances of harmful recessive alleles / mutations coming together through inbreeding.
IV	Moa's consume large amounts of vegetation	IV_J	Loss of producers causes herbivore numbers to decrease.
IC	Moa's may outcompete existing species for space / food / resources	IC_J	Species composition of community changes.

Justification (Just) if moa is a goer

	Yes moa is a goer	Just	Re-establish natural fauna/biodiversity.
	No moa is not a goer		Cloning of birds has not been successful. OR Waste of scientific effort / time / money with a reason eg better spent on conserving current species / ecosystems.

Judgement statement (4 areas are E M, I and Just)

8	8J's OR 7J's and 2 descriptions. Must have 2 J's in 2 areas and 1 J in 2.(eg 2 EJ's,2IJ's and 1 MJ and Just)2 eg needed Answer displays: <ul style="list-style-type: none"> • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
7	7J's OR 6J's and 2 descriptions Must have 2 J's in 2 areas and 1 J in 1 area. (eg 2EJ's, 2 M J's and 1 I J/Just)1 eg needed Answer displays aspects of: <ul style="list-style-type: none"> • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
6	6J's OR 5J's and 2 descriptions OR 4J's and 4 descriptions. Must have 2 J's in 2 areas OR 1J in 3 areas. 1 eg needed Answer displays: <ul style="list-style-type: none"> • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas.
5	5J's OR 4J's and 2 descriptions OR 3 J's and 4 descriptions. Answer displays aspects of: <ul style="list-style-type: none"> • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding; • logical development, precision and clarity of ideas.
4	4J's OR 3J's and 2 descriptions OR 2 J's and 4 descriptions.
3	3J's OR 2J's and 2 descriptions OR 1 J and 4 descriptions.
2	2J's OR 1J and 2 descriptions OR 4 descriptions.
1	1J OR 2 descriptions.
0	Lack of relevant evidence

Question Two: Human dispersal: Evidence Statement

Presence (P) of the rare variant of EPAS1 gene in modern human populations

	Evidence		Justification
PM	Mutation in Denisovans / first <i>H.sapiens</i> in Asia.	PM_J	Mutation found in <i>H.sapiens</i> due to interbreeding between Denisovans and <i>H.sapiens</i> .
PS	EPAS1 rare variant conferred an adaptive advantage / selected for at high altitude .	PS_{J1}	Individuals with rare variant survive and breed at high altitude so allele increases in frequency in the gene pool.
		PS_{J2}	Individuals without rare variant with common variant don't survive and breed at high altitude so normal allele decreases in frequency in the gene pool.
PN	EPAS1 rare variant is not disadvantaged / is neutral at low altitudes	PN_J	Individuals with the rare variant survive / persist in the population

Distribution (**location**) (**L**) of the rare variant of EPAS1 gene in modern human populations

	Evidence		Justification
LT	Tibetans live at high altitude / 4000m so there is a strong selection pressure for the rare allele so very common / 87% have the allele.		
LH	9% / low percentage of Han Chinese have the variant due to interbreeding / migration / gene flow from Tibetans / Mongolians / Nepalese / Denisovans OR Tibetans have the rare variant from interbreeding with the Chinese.		
		LL_J	9 % / low percentage in Han Chinese is due to the rare variant not selected against / neutral so is present in a low % in the population.
LN	A few Nepalese / Mongolians / sherpas have the rare variant from interbreeding / migration / gene flow.		
LO	Oceania bred with Denisovans / Asians / <i>H.sapiens</i> but don't have rare variant.	LO_J	If they inherited the rare variant it was lost due to genetic drift .
LE	Europeans didn't breed with Denisovans / Asians / <i>H.sapiens</i> with rare variant so it's not found there .	LE_J	European <i>H.sapiens</i> interbred with European <i>H. neanderthalensis</i> not Altai <i>H. neanderthalensis</i> so rare variant not introduced.
LA	Africans didn't breed with Denisovans / Asians / <i>H.sapiens</i> with rare variant so it's not found there.	LA_J	<i>H.sapiens</i> originated in Africa so those Africans remaining in Africa / modern Africans never encountered the rare variant .

Judgement statement (2 areas are P and L)

8	7 J's OR 6 J's and 2 description Must have 2 J's from each P and L area Answer displays: <ul style="list-style-type: none"> • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
7	6 J's OR 5 J's and 2 descriptions Must have 2 J's from each P and L area Answer displays aspects of: <ul style="list-style-type: none"> • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
6	5 J's OR 4 J's and 2 description Must have 1 J from each P and L area Answer displays: <ul style="list-style-type: none"> • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas
5	4 J's Must have 1 J from each P and L area Answer displays aspects of: <ul style="list-style-type: none"> • analysis and critical thinking • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas
4	3 J's
3	2 J's
2	1 J's
1	1 description
0	Lack of relevant evidence

Question Three: Hawaiian Honeycreepers: Evidence Statement

Distribution and diversity (D) of the honeycreepers on the Hawaiian islands

	Evidence		Justification
DF	Colonisers create Founder effect so unlikely to have alleles representative of original population.	DF_J	Small population so genetic drift could lead to fixation / loss of alleles.
DN	Formation of Kaua'i / islands provides new niches with different selection pressures .	DN_J	New niches result in divergent evolution / adaptive radiation of honeycreeper.
DA	Allopatric speciation due to geographical barrier.	DA_J	Due to the vast ocean separating / geographical barrier Asia and Kaua'i or between islands with named examples or reason.
DM	Mutations create variation eg colour / beaks.	DM_J	These mutations are selected for in new niches / if advantageous.
DE	Punctuated equilibrium as 56 species in 5-7 million years.		
DS	Sympatric speciation occurs on islands with different niches.	DS_J	To reduce competition with named example eg different beaks utilise different food sources.
DR	Reproductive isolating mechanisms develop preventing gene flow / interbreeding.	DR_{J1} DR_{J2}	Sexual selection selects for different colours / courtship behaviours. Development of reproductive isolating mechanisms due to niche differentiation eg eating different food sources with different beaks.
		DD_J	Disruptive selection occurs within islands eg different food sources such as big nuts, little nuts , nectar selecting for extremes of different shaped beaks.
DP	Convergent / parallel evolution occurs.	DP_J	For same colours / beaks with a named example eg Maui creeper and akepa which do not have a recent common ancestor.
DC	Co-evolution has occurred between nectar feeders and flowering plant.	DC_J	This would affect the beak length with named examples eg the Akialoa compared to Iiwi.
		DL_J	Finches have evolved on one of the main islands and migrated to their present locations and no longer present on original island(s).
	Some birds are found on multiple islands eg Iiwi while others are found only on one eg Nihoa.	DZ_J	This is likely due to niche / food source specialization that are not present in other islands / other species outcompete them on main islands.

Judgement statement

8	8J's OR 7J's and 1 descriptions OR 6J's and 3 descriptions Answer displays: <ul style="list-style-type: none"> • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
7	7J's OR 6J's and 1 descriptions OR 5J's and 3 descriptions Answer displays aspects of: <ul style="list-style-type: none"> • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
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4	4J's OR 3J's and 1 descriptions OR 2 J's and 3 descriptions
3	3J's OR 2J's and 1 descriptions OR 1 J and 3 descriptions
2	2J's OR 1J and 1 descriptions OR 3 descriptions
1	1J OR 1 descriptions
0	Lack of relevant evidence