Assessment Schedule – 2016

Scholarship Biology (93101)

Evidence Statement

Question One: Tomtits and Robins: Evidence Statement

Reasons (R) why the Black robin has a higher risk of extinction than the Chatham Island tomtit include:

	Evidence		**Justification**
RH	**H**abitat of robins is more specific / restricted to mature forests (with closed canopy and open understory) compared to tomtits.	**RH$_J$**	Resulting in robins being more susceptible to habitat change or loss so unable to obtain their food / nesting sites needed for survival. OR Tomtits inhabit a wide variety of habitats so have less risk of limitations in food / nesting sites.
RG **RN**	Robins are **G**round feeders while tomtits forage at all forest levels. Robins **N**est in tree cavities about 1.8 m from ground while tomtits are well concealed in vegetation.	**RG$_J$** **OR** **RN$_J$**	Robins ground foraging food habit makes them more vulnerable to predation than tomtits. Can have either RGJ or RNJ, not both as too similar. Robins nests more exposed than tomtits so more vulnerable to predation.
RF	Robins are specialized **F**eeders / Feed on invertebrates only compared to tomtits.	**RF$_J$**	More at risk of lack of food following habitat loss / competition while tomtits eat a range of food / are generalists.
RR	**R**eproductive rate is lower in robins compared to tomtits. E.g. as robins only one clutch per year while tomtits up to three clutches a year.	**RR$_J$**	Resulting in robins being unable to increase population size reducing risk of extinction / tomtits able to increase population size avoiding extinction.
RD	Robins are poor flyers (so have limited powers of **D**ispersal) so are unable to move to and repopulate other islands (with suitable habitat / no predators unlike tomtits).		
RO	Robins **O**utcompeted by tomtits / other birds.	**RO$_J$**	Chances of surviving and reproducing reduced resulting in decrease in population numbers.
RB	Robins have experienced a (severe) **B**ottleneck effect / have greatly reduced genetic diversity.	**RB$_J$**	Increasing chances of deformities / reduced fitness / less likely to survive environmental change.

Impact of human intervention on the **Survival (S)** of the Black robin population includes:

	Evidence		
SD	Eggs placed with surrogate parents causes **D**ouble clutching/ multiple clutches.	**SD_J**	Resulting in an increase in population numbers (from 5 – 200 in 20 years).
	Relocation of birds to Mangere and Rangitira islands.	**SR_J1** **SR_J2**	Provides robins with suitable habitat / food supply so population numbers increase / maintain. If one robin population crashes (due to new predator/ disease/ natural disaster) another population will still remain.
SE	**E**gg nudging of rim eggs so that these eggs were then incubated, increasing their **survival** chances.		Only get an SE if clearly lnked to human impact on survival only and not evolution.
ST	**T**omtits **replaced warblers** as surrogates.	**ST_J1** **ST_J2**	Resulted in robins being fed correct type of food / invertebrates by tomtits so more likely to survive. Tomtits are more closely related/ same genus so **behaviour patterns / imprinting** more likely to resemble those of robin.

Impact of human intervention on the **Evolution (E)** of the Black robin population includes:

ER	**R**elocation of birds to different habitats of Mangere and Rangitira islands.	**ER_J**	Robin populations exposed to different selection pressures environmental factors which could result in change of allele frequencies in gene pool.
EH	Robins may imprint on tomtits during surrogacy	**EH_J**	Could result in **H**ybridisation of tomtits and robins OR possible speciation in robins .
EM	Rim egg laying in robins the result of a **M**utation (dominant).		
		EN_J	Human impact (egg nudging) replaced **N**atural selection occurring which would have resulted in the rim eggs not surviving eg falling or not incubated.
EE	**E**gg nudging resulted in chicks / robins that had the rim laying / dominant allele surviving.	**EE_J**	Humans (accidently) selected for rim laying resulting in the allele increasing in frequency in the population (in 6 years 50% of females were laying rim eggs).
ES	Egg nudging **S**topped which resulted in return to natural selection.	**ES_J**	Resulted in the decrease of the frequency of the rim laying allele / behaviour in the gene pool (today only 9% of females lay rim eggs).
EI	**I**nbreeding / inbreeding depression occurred Not interbreeding.	**EI_J**	Increased chances of harmful alleles being expressed resulted in genetic disorders such as deformed beaks / featherless / weak bones.

Judgement statement (3 areas are R, S, and E)

8	Analysis involves using information in the resource material and *Nature of Science* and *Living World* strands up to and including Level 8 in *The New Zealand Curriculum* to justify why the black robin has a higher risk of extinction than Chatham Island tomtit and has applied relevant biological concepts to present a comprehensive discussion on the impact of human intervention on the survival and evolution of the black robin population. Presents a well-planned discussion which if fully integrated and coherent. 8J's OR 7J's and 2 descriptions. Must have 2 J's in each area Answer displays: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
7	Analysis involves using information in the resource material and *Nature of Science* and *Living World* strands up to and including Level 8 in *The New Zealand Curriculum* to justify why the black robin has a higher risk of extinction than Chatham Island tomtit and has applied relevant biological concepts to present a comprehensive discussion on the impact of human intervention on the survival and evolution of the black robin population. Presents a well-planned discussion which if fully integrated and coherent. 7J's OR 6J's and 2 descriptions Must have 2 J's in 2 areas and 1 J in 1 area. Answer displays aspects of: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
6	Biological evidence is considered and a well-reasoned justified judgements are made on why the black robin has a higher risk of extinction than the Chatham Islands tomtit. Relevant evidence is selected and organised to develop a well-reasoned argument that discusses the impact of human intervention on survival and evolution of the black robin. 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. Answer displays: • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas
5	Biological evidence is considered and a well-reasoned justified judgements are made on why the black robin has a higher risk of extinction than the Chatham Islands tomtit. Relevant evidence is selected and organised to develop a well-reasoned argument that discusses the impact of human intervention on survival and evolution of the black robin. 5J's OR 4J's and 2 descriptions OR 3 J's and 4 descriptions. Answer displays aspects of: • 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: ORCA: Evidence Statement

Evolutionary and Ecological **processes (P)** that may have resulted in the distinct ecological niches of the resident and transient orca include:

	Evidence		**Justification**
PA	**A**ncestral orca population /common ancestor (likely inhabited one area / fed on same food (probably fish)).	**PA$_J$**	(Intraspecific) competition (for food) resulted in divergence/ movement into different areas/ niche differentiation.
PS	Different food source acted as a **S**election pressure (Don't give for just selection pressures – must relate to food / diet in some way – and not e.g. temp of water).	**PS$_J$1** **PS$_J$2**	Hunting mammals by stealth (rather than echolocation) selected for in transients / hunting salmon by echolocation selected for in residents. Smaller pods / fewer calls (4-6) selected for in transients as more successful hunting (of mammals) OR larger pods / many calls (up to 17) selected for in residents as more successful hunting(of salmon).
PF	Allele **F**requencies change due to favourable adaptations selected for / unfavourable adaptations selected against / genetic drift.		
PM	**M**utations occurred (in the gene pools) producing new alleles.	**PM$_J$**	Mutation linked to behavioural differences such as echolocation versus stealth / vocalisations / social structure / changes in shape of dorsal fins and type of saddle patch.
PR	**R**IMs exist between transients and resident populations.	**PR$_J$1** **PR$_J$2**	**Behaviour** differences such as social structure and communication / vocalisations result in orca not recognising or responding to orca from the other group so no reproduction / gene flow. **structural** differences in shape of dorsal fin / saddle patch mean orca only recognise and mate with orca with same shaped fin and patch (sexual selection).
PD	Populations **D**iverging / divergent evolution occurring.	**PD$_J$**	As transients and residents inhabit different areas / feed on different foods / occupy different niches.

Analyse (A) the data to discuss what may occur in the future evolution of the three groups of orca

	Evidence		**Justification**
NO ***AP***	**P**opulations of all three groups / named group are small / been through bottleneck therefore: (transients 250; offshore 250; north residents 200; south residents 90)	**AP_J1** **AP_J2**	Populations could be wiped out by catatrophic environmental event / human impact and become extinct Lack of genetic diversity reduces chances of surviving environmental change so at risk of becoming extinct / alleles lost
AR	All groups / named group have slow reproductive rate / breeding eg sexual maturity at 18 / breed only once every 4-8 years	**AR_J**	Populations unable to increase numbers / rate of increase very slow resulting in all groups being at risk of extinction
		AS_J	(named group(s) have been isolated for a long period of time) so if Continued reproductive isolation / no gene flow / presence of RIMs is **likely to result in (Sympatic) speciation** (not yet)
AT	All three groups / named groups come together as a single population	**AT_J**	Resulting from a limited resource especially food or mates so gene flow / breeding occurs the groups

Justified (Just) opinion – A clear opinion eg I believe, I predict, It is likely that etc with reasons

	Evidence		**Justification**
	Extinction	**JE_J**	Justification link to AP or AR-populations small and/or reproductive rate
	Speciation	**JS_J**	Justification links to AS.-Populations are genetically and behaviourally isolated so will continue down pathway to speciation / full species (RIM's likely already present)
	All orca one population	**JT_J**	Justification links to AT-Increasing interactions occur between the groups enabling / becoming a single population

Judgement statement (3 areas are P , A and Just)

8	A fully integrated, coherent and relevant discussion using information in the resource material and *Nature of Science* and *Living World* strands up to and including Level 8 in *The New Zealand Curriculum* on the evolutionary and ecological processes that may have resulted in the distinct niches occupied by the orcas applying relevant biological processes is presented. The response shows thorough planning, processing and linking of ideas to discuss the possible future evolution of the 3 populations of orca along with a well-reasoned personal opinion on this. 7 J's OR 6 J's and 2 description Must have 2 J's from P and A areas and a Just Answer displays: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
7	A fully integrated, coherent and relevant discussion using information in the resource material and *Nature of Science* and *Living World* strands up to and including Level 8 in *The New Zealand Curriculum* on the evolutionary and ecological processes that may have resulted in the distinct niches occupied by the orcas applying relevant biological processes is presented. The response shows thorough planning, processing and linking of ideas to discuss the possible future evolution of the 3 populations of orca along with a well-reasoned personal opinion on this. 6 J's OR 5 J's and 2 descriptions Must have 1 J from each area: P, A and a Just Answer displays aspects of: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
6	A well written discussion that includes evolutionary and ecological processes that may have resulted in the distinct niches and the possible future evolution of the orca considering biological evidence to present a well-reasoned, coherent answer. 5 J's OR 4 J's and 2 description Must have 1 J from each P and A area only (Don't need a Just) Answer displays: • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas.

5	A well written discussion that includes evolutionary and ecological processes that may have resulted in the distinct niches and the possible future evolution of the orca considering biological evidence to present a well-reasoned, coherent answer. 4 J's Must have 1 J from each P and A area Answer displays aspects of: • 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: *Homo naledi*: Evidence Statement

Justified opinion (J) on genus ***A****ustralopithecus* or ***H****omo* (Can't just quote the table on pg 6)

	Evidence		**Justification**
	Primitive shoulder position and long curved fingers.	**JA1**	Are adaptations for arboreal lifestyle which is a feature of early Australopithecines (e.g. Lucy)
	Pelvis flared outward / shorter back to front.	**JA2**	A feature shared with Australopithecines while *Homo* have a bowl shaped pelvis.
	Brain size is 450 – 550 cm^3.	**JA3**	Brain size is smaller than Homo (*H.habilus* average 610 cm3) / falls within top range of other Australopithecines eg africanus (420-500 cm^3).
	As with A.sediba, analysis of the bones and reconstructed skeletons identified an interesting mosaic of both primitive features and those characteristic of modern humans.	**JA4**	Fossils are sufficiently similar to *A.sediba* so likely to be another australopithecine / variant of *A. sediba* (as in same location). OR Only Australopithecines have been found in south Africa and no Homo have been found in East Afica / only found in South Africa.
	Generalised shape of skull is advanced.	**JH1**	May have possessed features (such as Broca's and Wernickes area) which are linked to communication / advanced thinking (a *Homo* characteristic).
	Humanlike hands.	**JH2**	Indicates *H.naledi* may have made / used tools which is a *Homo* characteristic (until recent *Australo* evidence). OR Uses Australopithecus tool data to place in genus *Australopithicus*.
	Legbones long and slender / humanlike feet indistinguishable from ours (except curved toes).	**JH3**	These characteristics are associated with *Homo* only /more advanced bipedalism like other *Homo* / compares efficiency of bipedalism between A and H. *Characteristic of a modern human gait.*
	Bodies deliberately placed in the cave.	**JH4**	Possible burial of the dead suggests an advanced behaviour /spirituality only seen in recent *Homo*.

Evaluate possible **position (P)** of *naledi* in hominin lineage AND **implications (I)** of position

	Evidence		**Implications** of where *naledi* is positioned
P1	Primitive features (such as shoulder position / flared pelvis / curved fingers / toes) for arboreal lifestyle OR which match Australopithecines found in this time period eg *A.afarensis* /lucy indicates **Old position / Not Early or Recent**.	**I1**	*H.naledi* may have been an ancestor to all / named *Homo* species.
		I2	Cultural evolution such as burials / abstract thought occurred much earlier.
		I3	(Named) Cultural practice is not linked to a large brain volume.
P2	Naledi's brain size corresponds to australopithecines in the **Early position / Not Old or Recent**.	**I4**	Smaller brain of naledi may have been complex enough for advanced cultural practices.
			Origin of Homo may have been South and not East Africa.
P3	As naledi fossils found in same locality as A.sediba suggesting similar age - 2mya indicates **Early position**.	**I5**	Tool use may have evolved independently in East Africa (*afarensis*) and South Africa (*naledi*) OR from migration between East and South Africa.
P4	(Hand structure indicates) possible tool use which corresponds with other *Australopithecus* species who may have used tools in **Early position / Not Recent** (as tools too primitive) Old if linked to *A. afarensis / A platyops*.	**I6**	
P5	Possible burial of bodies supports **Recent position / NOT Old or Early**.		
P6	Modern bipedal gait matches recent *Homo* supporting **Recent position / NOT Old or Early**.		
P7	Advanced skull shape supports **Recent / NOT Old or Early**.		
P8	As *naledi* fossils have only been found in Africa indicates **Old or Early / NOT Recent position**.		

Judgement statement (2 areas are J and I- Positioning is Descriptions only-no justification)

8	Provides an in-depth response using information in the resource material and *Nature of Science* and *Living World* strands up to and including Level 8 in *The New Zealand Curriculum* using independent thought and relevant biological concepts. The response is indicative of thorough planning with ideas that are well thought through. The possible positions of *H.naledi* are evaluated and a fully integrated, coherent discussion on the implications of each position are presented. 8J's or 7J's and 2 descriptions. Must have 2 J's in each area. Answer displays: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
7	Provides an in-depth response using information in the resource material and *Nature of Science* and *Living World* strands up to and including Level 8 in *The New Zealand Curriculum* using independent thought and relevant biological concepts. The response is indicative of thorough planning with ideas that are well thought through. The possible positions of *H.naledi* are evaluated and a fully integrated, coherent discussion on the implications of each position are presented. 7J's or 6J's and 2 descriptions or 5J's and 4 descriptions. Answer displays aspects of: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
6	A coherent and well written discussion is presented involving selecting relevant fossil and stone tol evidence and applying relevant biological concepts to develop a well-reasoned argument of the possible positions of *H. naledi*. 6J's or 5J's and 2 descriptions or 4J's and 4 descriptions. Answer displays: • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas
5	A coherent and well written discussion is presented involving selecting relevant fossil and stone tol evidence and applying relevant biological concepts to develop a well-reasoned argument of the possible positions of *H. naledi*. 5J's or 4J's and 2 descriptions or 3J's and 4 descriptions. Answer displays aspects of: • 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 3 J's and 2 descriptions.
3	3J's OR 2 J and 2 descriptions.
2	2J OR 1J and 2 descriptions.
1	1J OR 2 descriptions .
0	Lack of relevant evidence.