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Tirohia te uhi o muri e kitea ai te whakapākehātanga o tēnei uhi

3

91605M

916055

Tuhia he (☒) ki te pouaka mēnā kāore koe i tuhi kōrero ki tēnei puka

NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Mātai Koiora, Kaupae 3, 2024

91605M Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga.	Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga, kia hōhonu.	Te whakaatu māramatanga ki ngā tukanga o te kukuwhatanga e puta ai te whakamomotanga, kia tōtōpū.

Tirohia kia kitea ai e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapatanga o ngā whārangi 2-23 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi i ngā paenga (////). Ka poroa ēnei wāhanga ka mākahia ana te pukapuka.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TE TŪMAHI TUATAHI: Te kōura

Kua hia miriona tau te roa o te kōura i Aotearoa. He pōuri ngā angawaho kia hāngai ai ki te taiao (hei tauira, i waenga i ngā kōporo, i roto hoki i te paru), koia hei kirihuna e pai ai te karo konihi. He rite tonu te noho a te kōura hei kāhui iti, ā, ka moea ngā whanaunga, ka pūpukurua ai. I te pō, ka rapu kai, ā, ka kitea ngā ika, ngā otaota me ngā pūpū.

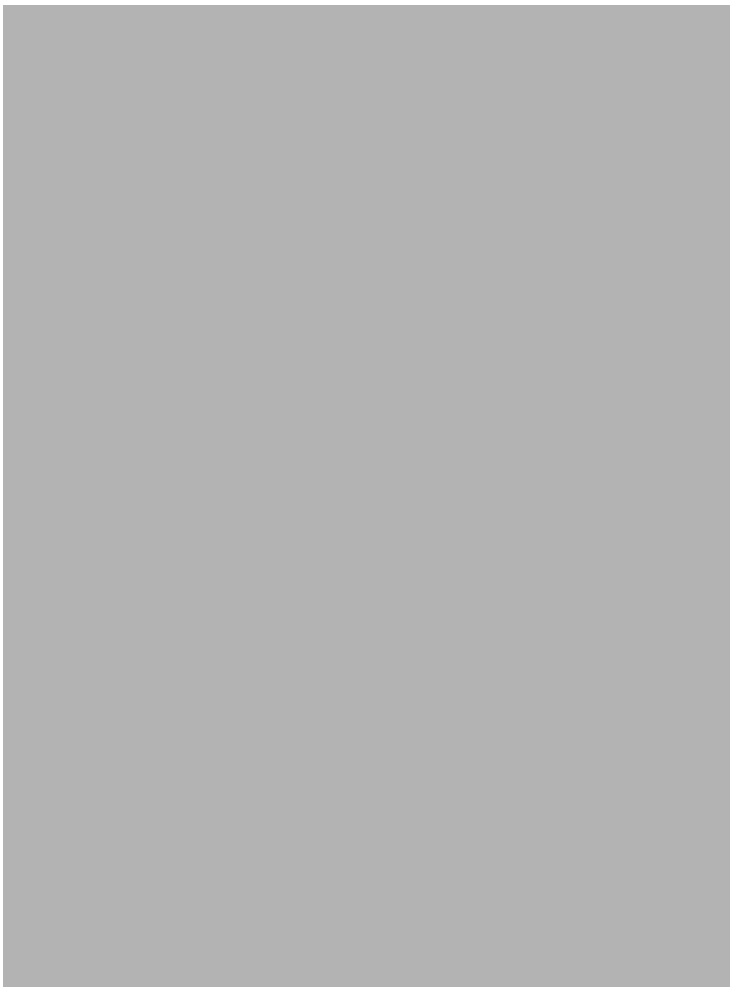
Ka mānawatia te kōura e te Māori hei kai. I ngā rā o mua, i whitia ngā kōura e whiwhi ai ki ētahi atu momo kai. He rite tonu tā te Māori neke i ētahi kōura i tētahi wāhi ki tētahi, ā, i kitea nā tēnei mahi i ora ai ngā kāhui.

I ngā kaimātai pūtaiao e mātai ana i te pītau ira pata pūngao (mtDNA), i kitea ngā kāhui matua e toru, e tohua nei i te mahere i raro nei. E tata ake ana te whanaungatanga o te kāhui o Te Tai Poutini (kākāriki) ki te kāhui ki te tonga (kōwhai), tēnā i te whanaungatanga ki te kāhui ki te raki (waiporoporo). E matapaehia ana i tīhoi ngā kāhui i te wā o te putanga mai o Kā Tiritiri o te Moana, i mua hoki i te huanga mai o Raukawa Moana.

Ahakoa e rua anake ngā momo kua tapaina (ko te *Paranephrops planifrons* me te *P. zealandicus*), e toru kē ngā kāhui motuhake ka tohua e ngā taunakitanga ā-ira. Ka tohu tēnei i te hē pea o te mātai weteira kua whakamahia ki te whakarōpū i ngā momo e rua.

I te tau 2016, i ine ngā kaimātai pūtaiao nō te Whare Wānanga o Waitaha i te kanorau ā-ira o ngā kāhui kōura. E ai ki ngā kitenga, e pāpaku ana te kanorau ā-ira i **roto** i ngā kāhui kōura, engari e nui ana te kanorau ā-ira i **waenga** i ngā kāhui rerekē. Ka tohu tēnei i te kaha o te pūpukurua i roto i ngā kāhui, engari e kaha ana ngā rerekētanga ā-ira i waenga i ngā kāhui.

He kātua kōura nō Rotomā.



Te tuari o ngā kāhui mtDNA matua e toru.

QUESTION ONE: Kōura

Kōura (freshwater crayfish) have inhabited New Zealand for millions of years. Their exoskeletons are dark and blend into the environment (e.g. between logs and in mud), giving them good camouflage to protect them from predators. They often live in small populations, where mating among relatives leads to inbreeding. At night, they search for food, finding fish, plants, and snails.

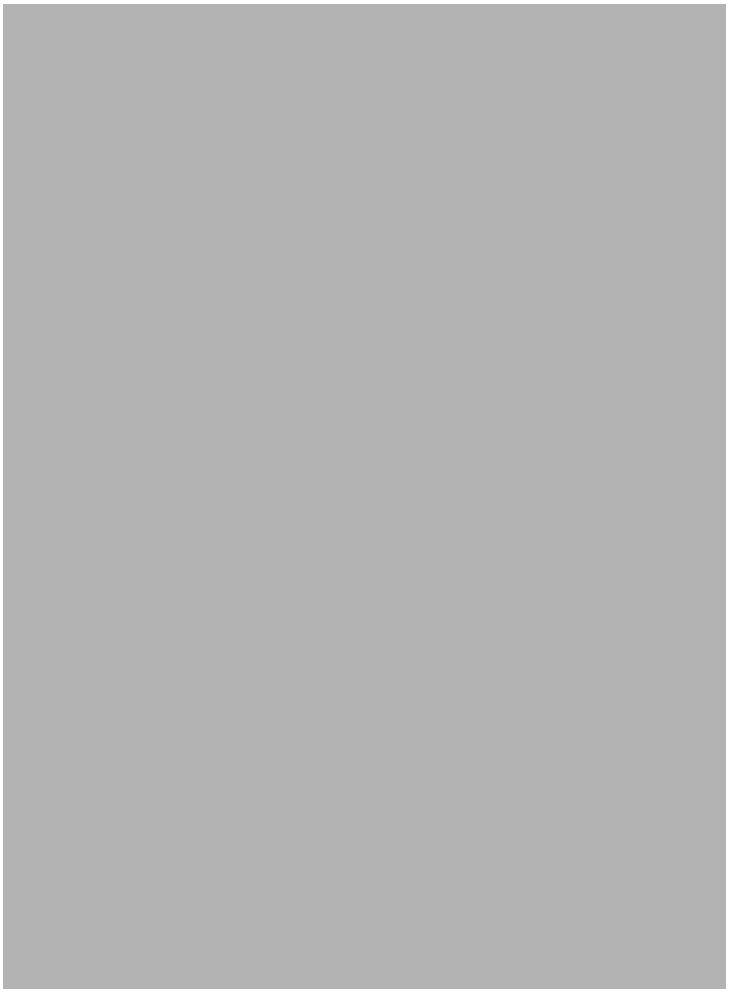
Kōura are a species valued by Māori as kai. In the past, they were also traded for other food items. Māori used to move some kōura between areas, and this was found to help with the success of each of the populations.

When looking at mitochondrial DNA (mtDNA), scientists found three major groups, indicated on the map below. The West Coast group (green) is more closely related to the southern group (yellow) than the northern group (purple). The groups were thought to diverge around the time of mountain building that formed the Southern Alps and before the formation of the Cook Strait.

Although there are two named species (*Paranephrops planifrons* and *P. zealandicus*), there are three distinct groups shown by genetic evidence. This suggests that the morphology used to classify the two species could be misleading.

In 2016, scientists at the University of Canterbury measured the genetic diversity of kōura populations. Results showed low genetic diversity **within** kōura populations but high genetic diversity **between** populations. This means populations were highly inbred but had strong genetic differences between the populations.

An adult kōura from Lake Rotomā.



Distribution of the three major mtDNA groups.

Matapakina ngā āhuatanga e whai pānga ana ki te kukuwhatanga o te kōura. I tō tuhinga, me whai wāhi te matapakinga o:

- ngā kīanga nei, o te kāhui motuhake me te ia ā-ira
- te wāhi pea ki te putanga o Kā Tiritiri o te Moana ki te kukuwhatanga tīhoi nā te whakarōpū ā-wāhi
- te take ka ārai te nekehanga o ngā kōura i tētahi wāhi ki tētahi i te whakarōpū ā-wāhi.

Discuss factors affecting the evolution of kōura. In your answer, include discussion of:

- the terms founder population and gene flow
- how the formation of the Southern Alps may have helped lead to divergent evolution by allopatric speciation
- why moving kōura between areas prevents speciation.

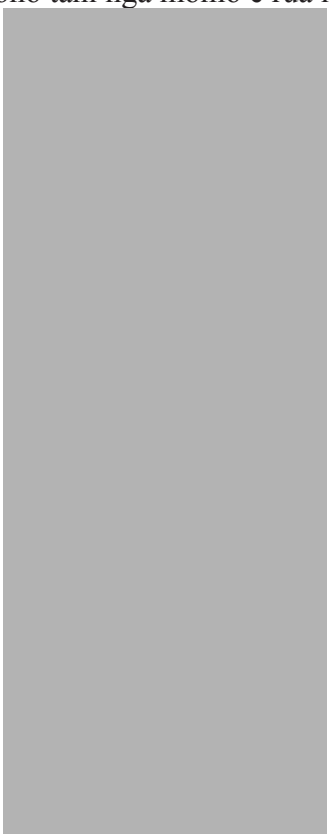
TE TŪMAHI TUARUA: Ngā tauira o te kukuwhatanga i ngā warapī

I ō rātou whenua taketake o Ahitereiria, e tūhāhā ana ngā warapī tamā (*Notamacropus eugenii*) me ngā warapī pāma (*N. parma*), ā, e tino rerekē ana te whakamahinga o te nōhanga, o te anga noho ā-kāhui, me ngā wā o te whakaputa uri.

He warapī tamā.

He warapī pāma e kai ana.

I Aotearoa, ka noho tahi ngā momo e rua i te moutere o Kawau nā te mea i kawea atu ki reira e te tangata i te hiku o te rautau 19. Kei ngā momo e rua ngā rerekētanga, pērā i ngā mea ka kitea i Ahitereiria. E tōtahi ake ana te *N. parma*, ā, ka kaha kitea i te ngahere, engari ka kitea a *N. eugenii* i ngā pārae pātītī. E ai ki ngā raraunga ā-ira, kāore he taunakitanga o te momoruatanga ahakoa kei te noho tahi ngā momo e rua i tētahi wāhi hou.



Te moutere o Kawau, e 60 km ki te raki o Tāmaki Makaurau.

Te hoahoa 1: Te kukuwhatanga e whakaatu ana i te urutaunga o ngā warapī i Ahitereiria.

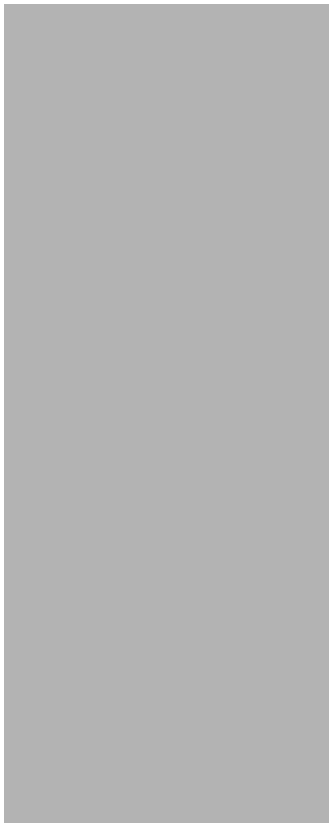
QUESTION TWO: Patterns of evolution in wallabies

In their native Australia, tammar (*Notamacropus eugenii*) and parma (*N. parma*) wallabies are allopatric and have very different habitat use, social structure, and mating times.

A tammar wallaby.

Parma wallabies grazing.

In New Zealand, they occur sympatrically on Kawau Island because of introductions in the late 19th century. Both species show differences, as seen in Australia. *N. parma* is more solitary and is frequently found in bush areas, while *N. eugenii* tend to be found in open grass areas. Genetic data shows no evidence of hybridisation despite living together in a new environment.



Kawau Island, 60 kms north of Auckland.

Figure 1: Phylogeny showing adaptive radiation of wallabies in Australia.

Matapakina ngā āhuatanga o te kukuwhatanga o ngā warapī i Ahitereiria, i Aotearoa hoki.

I tō tuhinga, me whai wāhi te matapakinga o:

- ngā kīanga nei: te noho tahi me te momo, tae atu hoki ki ngā tautuhinga
- te pāpātanga o te kukuwhatanga ka kitea i Te hoahoa 1, me te tautohu mēnā rānei he tauritenga āta tukutuku, mēnā rānei he tauritenga tāmutumutu
- te take ka kitea te urutaunga i ngā warapī i Ahitereiria, engari kāore tērā e kitea i Aotearoa
- ngā pūnaha wewehe ira (RIMs) e RUA mā reira pea e ārai ai te momoruatanga o ngā warapī, ahakoa te noho tahi i te moutere o Kawau.

Discuss factors of the evolution of wallabies in Australia and New Zealand.

In your answer, include discussion of:

- the terms sympatric and species, including definitions
- the rate of evolution shown in Figure 1, identifying if it is either gradualism or punctuated equilibrium
- why adaptive radiation is seen in wallabies in Australia, but not in New Zealand
- TWO reproductive isolating mechanisms (RIMs) that may keep the wallabies from hybridising despite being sympatric on Kawau Island.

TE TŪMAHI TUATORU: He tauira nō te kukuwhatanga rūnā

He nui ngā wā kua kitea te kukuwhatanga i te rere i ngā momo kāhui kararehe, ā, nā runga i te kukuwhatanga, e rerekē ana ngā tukanga rere a tēnā kāhui, a tēnā kāhui. Hei tauira, kāore he kōiwi i te paihau o te pī, engari he ōrite tana mahi ki tā te paihau o te manu. He rerekē te āhua o ngā hononga uaua i te pī me te manu, ā, he rerekē hoki te āhua o te whakamahinga o te paihau kia rewa ai. Engari, nā te uauatanga o te rere, tērā ētahi ōritetanga i waenga i te paihau pī me te paihau manu.

He paihau pī.

He paihau manu.

He manu e whai ana i tētahi pāpapa i a rāua tahi e rere ana.

Matapakina te hononga o te kukuwhatanga rūnā ki ngā pēhanga o te whiringa.

I tō tuhinga, me whai wāhi te matapakinga o:

- ngā pēhanga o te whiringa, tae atu ki ngā whakamārama me ngā tauira
- te āhua o te whakamahinga o ngā raraunga ā-ira hei whakaatu i te kukuwhatanga rūnā
- te āhua o te huanga o ngā hanga e rite tahi ana nā te tukanga o te whiringa māori.

QUESTION THREE: A case of convergent evolution

Flight has evolved numerous times in different animal groups, and those different groups have evolved different mechanisms for flight. For example, the honeybee wing is not made of bone, but it does serve the same function as the bird wing. The pattern of muscle attachments is different in the honeybee and the bird, and the way in which the wing is used to achieve lift is also different. However, due to the demanding nature of flight, there are distinct similarities between bee and bird wings.

Honeybee wing.

Bird wing.

A bird catching a beetle while both are in flight.

Discuss how convergent evolution is linked to selection pressures.

In your answer, include discussion of:

- selection pressures, including descriptions with examples
- how genetic data is used to show convergent evolution
- how the process of natural selection has resulted in analogous structures.

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER	

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

Ngā Mihi

He mea whakahāngai ngā kōrero i ngā mātāpuna e whai ake nei hei whakamahinga i tēnei aromatawai:

Te whārangi 2

https://niwa.co.nz/te-kuwaha-and-maori/taonga-species-series-koura
https://docs.niwa.co.nz/library/public/NIWAis88.pdf
https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-294X.2007.03224.x

Te whārangi 8

https://www.sciencedirect.com/science/article/pii/S0169534722002932
https://stock.adobe.com/290844130
https://www.google.com/maps/@-36.6013948,174.4654726,10.8z?hl=en&entry=ttu
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5758907/

Te whārangi 14

https://raider.pressbooks.pub/biology2/chapter/9-trait-evolution/ (te whakaahua 1 me te 2)
https://en.wikipedia.org/wiki/Hawking_(birds)

Acknowledgements
Material from the following sources has been adapted for use in this assessment:

Page 3
https://niwa.co.nz/te-kuwaha-and-maori/taonga-species-series-koura
https://docs.niwa.co.nz/library/public/NIWAis88.pdf
https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-294X.2007.03224.x

Page 9
https://www.sciencedirect.com/science/article/pii/S0169534722002932
https://stock.adobe.com/290844130
https://www.google.com/maps/@-36.6013948,174.4654726,10.8z?hl=en&entry=ttu
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5758907/

Page 15
https://raider.pressbooks.pub/biology2/chapter/9-trait-evolution/ (images 1 and 2)
https://en.wikipedia.org/wiki/Hawking_(birds)

English translation of the wording on the front cover

Level 3 Biology 2024

91605M Demonstrate understanding of evolutionary processes leading to speciation

Credits: Four

91605M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of evolutionary processes leading to speciation.	Demonstrate in-depth understanding of evolutionary processes leading to speciation.	Demonstrate comprehensive understanding of evolutionary processes leading to speciation.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–23 in the correct order and that none of these pages is blank.

Do not write in the margins (▨). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.