Biology Educators of Aotearoa, New Zealand
Te Rōpū Whakaako Koiora o Aotearoa

Term 1 2023 Newsletter

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President's Report

In this issue:

In recent A.J.Fass (2023) article called "*When Disaster Tests the Strength of Human Cooperation*" on Sapiens (https://www.sapiens.org/), the author explains that although the perception that humans are naturally selfish is popular, when a disaster occurs, altruistic behaviour, whereby complete strangers help each other and whole communities work together to rebuild, refutes this assumption. Whether we examine our behaviour in the immediate and ongoing aftermath of the Christchurch and Kaikoura earthquakes, the Westport floods, the COVID-19 pandemic, or the recent flooding and devastation of many North Island communities, this is a recurrent theme with natural disaster events in New Zealand.

For our North Island colleagues, term one has once again been a term of disruption, and for some, a time of loss and grief. Our hearts and minds are with you, your students, and your wider community as you pick-up the pieces and try to provide some normality for our rangatahi. If you are feeling overwhelmed yourself, please remember that the Ministry of Education have a contract with the counselling service - EAP services. This is available for all teachers in public schools, and provides three free counselling sessions. An appointment can be made by phoning: 0800 327 669 or online at: https://www.eapservices.co.nz/book-an-appointment.

If you need any support with teaching activities please remember that the BEANZ website https://beanz.org.nz/ continues to be populated with resources that teachers can pick up 'off-the-shelf' and run with in their classrooms (or adapt to their personal style, or classroom needs). These resources have been developed by Biology teachers of Aotearoa New Zealand, for Biology teachers of Aotearoa New Zealand, and therefore are fit for purpose within the New Zealand Curriculum.

Ngā mihi nui *Erica Jar*

Reference:
Fass A.J. (2023) When Disaster Tests the Strength of Human Cooperation. *Sapiens.* https://www.sapiens.org/culture/minga-mutual-aid/

Redeveloping the Biology curriculum: Skills universities would like school leavers to have.

Nic Rawlence: Department of Zoology, University of Otago, Dunedin
BEANZ Tertiary Representative

With the redevelopment of the NCEA Levels 1-3 Biology curriculum, I thought it was an excellent opportunity to ask academic conveners and course coordinators of entry level university papers at Otago University what general and 'biology' specific skills school leavers should have. I cast the net wide to any paper that uses 'biology'.

Some of these skills you may already be teaching your students. Some skills may be taught at high school outside of Biology. Some could be incorporated into a redeveloped curriculum. Other skills you may like help with in terms of professional development and/or getting scientists to come and talk to your class.

Below is a summary, in no order of importance, divided into general, mathematical, and biology specific skills.

General:

- Literacy – willingness to read in terms of stamina to read longer passages and efficient ways to review content.
- Critical thinking and an ability to comprehend content.
- Numeracy.
- Good writing skills.
- Good general knowledge background.
- A love of scientific discovery.
- Good data interpretation skills.
- An understanding of scientific principles.

- Understanding that students want to go to university, not because they have to go to university – i.e. students are attending university for themselves.
- The ability to reflect on your work and take feedback on board to improve your work.
- The ability and willingness to carry out self-directed learning (i.e. take responsibility for own learning), time management skills, and realistic expectations of the amount of work involved at university (e.g. reading, writing, notetaking, discussion, and collaboration/working with other people).
- Willingness for risk taking/stepping outside their comfort zone about asking questions or for help, and engaging with teaching staff.

Mathematical skills relevant to biology:

- Increased familiarity with units and unit conversion (e.g. litres to millilitres, seconds to milliseconds, metres to centimetres or millimetres, grams to milligrams, osmoles to milliosmoles, and vice versa).
- Ability to convert fractions to a fraction of 100 (e.g. if a test score is 18/20, this converts to 80/100).
- Ability to convert fractions of 100 to % (e.g. 80/100 to 80%).

- Ability to convert percentages to decimals (e.g. 80% is 0.8).
- Basic arithmetic skills (e.g. parenthesising calculations for correct order-of-operation)
- Reading simple mathematical formulae (e.g. summation signs like in the formula for the standard deviation of a dataset).

Biology specific skills:

- Level Two Biology – despite our best efforts, school liaison people say if you have to drop a science, drop Biology rather than Chemistry and Physics.
- Genetics and cell division – some school leavers have a good background, others don't. Some secondary teachers do not teach this as they are not confident or high school students find it too hard, with the possibility genetics may be dropped from the curriculum – specific examples we have heard of regarding difficulty are punnet squares, Mendelian inheritance, gene expression (especially simplifying for Level 2), and epigenetics.
- Better linkages between Physical Education (PE) and Biology – in some PE classes high school students are taught human anatomy and physiology basics, with applications to health, exercise and sport.

Hopefully this snapshot of views from Otago University academics is helpful. I'll be extending this exercise to other universities in the near future. I'd be especially interested in what help you as biology teachers feel you need (e.g. genetics) in terms of professional development and educational resources that could be developed. I can be contacted at nic.rawlence@otago.ac.nz

Hoiho – a charismatic and accessible indicator species.

Report from Mattias Wieland, 2022 BEANZ Scholarship holder

The beguiling Hoiho

As the 2022 BEANZ Research Scholarship recipient I had eight weeks available to work towards generating new teaching resources. I chose penguins as a focus topic because of their charisma, accessibility and usefulness as an indicator species for human influences on both land and marine environments.

We have three native species breeding on the NZ mainland: kororā/little blue penguins, hoiho/yellow-eyed penguins and tawaki/fiordland-crested penguins. Of these, hoiho are the rarest and most critically endangered Their numbers have crashed to 166 breeding pairs in 2021 in the South Island and are also declining strongly on Rakiura/Stewart Island, including on predator free islands. This suggests that marine ecosystem changes are to blame with both climate change and commercial fishing taking a toll.

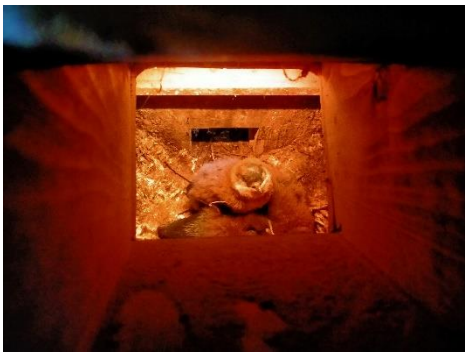
Bushy beach near Oamaru used to be a hoiho breeding site, now only visited by the odd male (and seals).

There are both ecological and evolutionary lessons to be learned from studying hoiho, along with some ingenious research methods. We now know that hoiho are a recent South Island arrival, replacing the Waitaha penguin that was hunted to extinction by humans. We also know that hoiho are foraging in areas disturbed by trawling on the seafloor, where they consume blue cod instead of the preferred red cod. This diet switch is likely very poor for raising chicks (labelled as junk food), and could explain the low survival rates of the chicks.

Tawaki are poorly studied due to their remote and secretive nesting habits, but the Tawaki Project has uncovered some fascinating information. They have successfully tracked their pre-moult migration involving over 4000km of travel to the south-west. Tawaki are also special for their strategy of laying two differently sized eggs, of which usually only one hatches.

By far the most numerous of the three penguins in New Zealand is the kororā, but they have been increasingly in the news for washing ashore dead due to starvation. The problem are warmer oceans, resulting in fish seeking deeper water, which makes them harder to reach for this shallow diving specialist. I have visited kororā at the picturesque Pohatu Bay near Akaroa as well as in Oamaru and in captivity at the International Antarctic Centre. They are very successful breeders that can produce two pairs of chicks annually for up to 20 years. However, storms can lead to murky water due to sedimentation, meaning the adults will stay at sea and leave the chicks to starve at the nest. Dogs and cars are also deadly threats. Whilst being adaptable and highly fecund, it appears kororā still need our help to survive and thrive.

A well fed kororā adult enjoys a nap.



5 week old kororā chick in Oamaru Blue Penguin Colony nest box

There are many interesting teaching contexts, including the species question, which suggests that kororā in Otago are recent arrivals from Australia whilst the white-flippered morph on Banks Peninsula are genetically barely distinguishable.

My resources are still in development, but please email me on mattias.wieland@aotawhiti.school.nz if you are using penguins as a teaching context and would like to have more information.

Mātauranga Māori Workshop in 2022

A report from Sancta Maria – republished with permission from their staff news report .

Staff learning and development in action

On 1 December 2022, the Science department at Sancta Maria College hosted a workshop for Science teachers from the Auckland region to learn how they can engage Year 9 and 10 students in Mātauranga Māori. Stephen Williams hosted the workshop and shared resources for a unit of lessons based on the use of harakeke (flax).

Stephen is an accredited facilitator with a wealth of expertise in supporting Science teachers – he was a teacher himself and Head of Biology. He has written resources on TKI (Te Keke Ipurangi) for Māori medium kura. He completed a teaching fellowship in 'the Science and Technology of harakeke'. During the practical session, teachers learnt about the origin of harakeke and its biology, why it is considered a taonga, and they extracted fibres from the harakeke leaves. The workshop was very helpful at introducing context for teachers and how they will be able to engage students in Mātauranga Māori.

Mātauranga Māori Workshops for 2023

This year BEANZ will offer the above workshop to the four regions that did not get it in 2022. Stephen is putting the finishing touches to a second Mātauranga Māori workshop, (not a sequel to the above) presenting new and different material. ***Would you like a Mātauranga Māori workshop in your region?***

It starts with locating a host school. Contact the Administrator (admin@beanz.org.nz) for what that would involve, and we can get wheels rolling for your region in Term 2 or beyond

What Can BEANZ Offer Members?

- In person support via our trained facilitators and regional representatives. See who is in your region on our interactive map on our website.
- Scholarships to attend conferences that will cover conference registration and travel expenses.
- Research scholarships to develop unique relevant materials for other teachers to use in their teaching and learning programmes.
- Access the NZQA accredited quality assured (QAAM) tasks
- Access to quality practice examinations for L3 Bio and Scholarship
- Access to resource kete for Biology topics from year 7-13.
- Access to online webinars
- Opportunities to meet teachers from all over NZ
- Opportunities to grow your profession with leadership roles within the organisation and collaborations with the Ministry of Education, Teacher Development Aotearoa, PPTA and NZQA.
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Attention Biology Teachers
BEANZ Regional Representatives needed

IN…

Auckland
Nelson Marlborough
Porirua / Lower Hutt
Canterbury
Southland

Looking for your next challenge? Or perhaps an opportunity to give something back to the biology community?

Regional representatives are a key link between biology teachers in their region and play a key role in facilitating professional development opportunities with support and input from BEANZ.

If you are in a school in one of the five regions mentioned above and are interested in taking up this position, or would like more information contact Mike Stone (BEANZ Regional Rep Liaison)
at: mikhal@actrix.co.nz
A job description is available from the BEANZ National Administrator at: admin@beanz.org.nz

Feature Article

Can customary harvesting of NZ's native species be sustainable?

Archaeology and palaeoecology provide some answers

Aotearoa's wilderness areas are the jewel in our ecotourism crown. But conservation laws may soon be in for a radical shake-up.

Recent proposals would, among other things, allow Māori to resume traditional harvesting practices (mahinga kai) on conservation land.

This has elicited heated emotions from some conservationists, who fear that biodiversity protection will be compromised, as well as from proponents of mahinga kai, who have been alienated from their traditional lands and customs for more than 130 years.

What does this all mean for our native species?

Article Two of Te Tiriti o Waitangi guaranteed Māori authority over natural resources but with government-administered and legally enforced "no take" policies covering most conservation land and native species, it is little wonder that many Māori feel alienated from their traditional lands and practices.

Article Four of the Conservation Act 1987 states the government must give effect to the principles of Te Tiriti o Waitangi. In 2022, in response to these disparities, the Department of Conservation released a report calling for an overhaul of Aotearoa's conservation laws to have Māori at their heart. This was a move away from "preservation and protection" to "maintenance, enhancement and sustainable use".

The report received a lukewarm reception from the government. But it is likely only a matter of time before many of these changes begin to be implemented.

Read more: ***Fishing with Elders builds these children's Oji-Cree language, cultural knowledge and writing***

There are many precedents. Indigenous peoples in many countries lawfully practice traditional harvesting of some protected species. Customary management areas in Aotearoa, such as mātaitai reserves and taiāpure, demonstrate that community and indigenous leadership can be effective at managing resources.

In many instances, communities may be more motivated to support conservation measures if species can also be used as a resource, such as the harvesting of tītī (sooty shearwaters).

How do we ensure any harvesting is sustainable in this fast-changing world? Mātauranga (knowledge) and tikanga (custom) Māori, developed over centuries, can provide many of these answers. Combined with scientific methods and data, these bodies of knowledge create a powerful base from which managers can make robust and evidence-based decisions about harvest practices.

Māori in Foveaux Strait have practiced traditional harvesting of tītī (sooty shearwaters) for hundreds of years. Hocken Collection

Read more: ***Indigenous hunters are protecting animals, land and waterways***

The past is the key to the present

Kia whakatōmuri te haere whakamua – I walk backwards into the future, with my eyes fixed on my past.

Palaeo-ecology, archaeology and matāuranga Māori share the philosophy that we can learn from the past. All three allow us to reconstruct how past ecosystems functioned, how people and species adapted to harvest pressures and climate change, and how we can use this information moving forward.

Palaeo-ecology and archaeology draw on many tools:

- radiocarbon-dating anchors archaeological and fossil remains in time
- stable dietary isotopes help determine diet and where animals fitted into the food chain
- ancient DNA is used to determine how and when genetic diversity and population sizes changed through time

Archaeological middens contain the remains of animals and trace changes in areas of food gathering. Justin Maxwell, CC BY-ND

- statistical modelling can show how abundance and distributions of plants and animals have changed, and may continue to change in the future.

This information can paint a picture of how past ecosystems responded to human impacts as well as predicting how future impacts may affect species and populations.

To harvest or not to harvest?

Globally, waves of human settlement generally correlated with the rapid extinction of local species. Hunting rates that would have been sustainable for closely related species still culminated in the flightless great auk's extinction.

While sealions have been harvested in the past, modelling shows slow-reproducing species cannot be taken sustainably. Wikipedia/Hase, CC BY-SA

Many of Aotearoa's plants and animals are slow to reproduce. Ancient DNA analysis and modelling have shown even very low levels of human harvesting resulted in the rapid decline and extinction of numerous New Zealand sea lion lineages. Less than one sea lion killed per person per year, despite a small human population at the time, was enough to seal their fate.

Other charismatic, slow-breeding animals that would be similarly vulnerable to even low levels of harvest, even if we managed to restore their populations to moderately "healthy" levels, include kākāpō, tawaki (Fiordland crested penguin), hoiho (yellow-eyed penguin) and matapo (Otago shag).

Conversely, several locally abundant species, such as weka, kererū and kakīānau (black swan) could probably be sustainably harvested in some areas as long as careful guidelines are in place. The archaeological record shows some of these species were regularly hunted for hundreds of years with little evidence of population decline.

Looking to the future

No-one is proposing free-for-all harvesting. Poorly managed and unregulated harvest would be a terrible set-back to recent restoration and conservation efforts. But conservation and mahinga kai principles are not mutually exclusive. Both stand to benefit from ecosystem restoration.

Weka are an important mahinga kai species. But they are also a predator and can affect other taonga species. Wikimedia/Bernard Spragg, CC BY-SA

Palaeo-ecological tools and insights from archaeology can help inform ecosystem restoration projects by establishing which species or lineages were present in a region. They can also facilitate translocations without unexpected ecological consequences or failure due to lack of suitable habitat or food.

Modern ecosystems in Aotearoa are highly degraded and not comparable to those of centuries ago. They are vulnerable to a range of old and new threats, including invasive predators, habitat loss or modification, and climate change. An open-ended ethical question driving much of the controversy is whether endangered species should ever be intentionally killed.

Some endangered species might eventually sustain a harvest of, at most, only one or two individuals per year. Such exceedingly limited harvest may be enough to preserve some of the tikanga and mātauranga associated with mahinga kai.

In Te Tiriti o Waitangi, Māori were guaranteed the right to manage and use natural resources. Integrating traditional management practices with a range of scientific tools could enable communities to make evidence-based decisions around what constitutes “sustainable” harvesting. Mahinga kai, science and conservation need not be at odds with one another: they all have a future in Aotearoa.

- **Native species**
- **Treaty of Waitangi**
- **Conservation land**

Dr Nic Rawlence

BEANZ Tertiary Representative
Director - Otago Paleogenetics Laboratory
Senior Lecturer in Ancient DNA
Department of Zoology
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Free digital Subscription to New Zealand Geographic

Did you know that the Ministry of Education has a sector-wide digital subscription to the New Zealand Geographic online (NZGeo.com)? This means that every student in every school has free access to the site (it recognises school IP addresses), so there’s nothing stopping them from browsing widely. You might be interested in the content under their ‘Life’ department which looks at biology subjects: https://www.nzgeo.com/department/life/, or their special focus subject areas such as https://www.nzgeo.com/seas/ and https://www.nzgeo.com/climate/ etc, which NZGeo can curate from content anywhere on the site. If there was a set of NZGeo resources you wanted to access all in one place, just send them the links and they would happy to make up a Biology special focus area that contained all your favourites.

Biology Educators of Aotearoa New Zealand

Te Rōpū Whakaako Koiora o Aotearoa

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