BEANZ
BIOLOGY EDUCATORS OF AOTEAROA NZ
TE RŌPŪ WHAKAAKO KOIORA O AOTEAROA

TERM 3 NEWSLETTER 2026

Kia ora koutou,

As part of ongoing work to improve our membership systems and administration, the BEANZ Executive will be refreshing the membership database process for 2027.

What does this mean for current members?

All current BEANZ memberships will conclude on **December 2026.**
This will allow us to complete an administrative reset of our membership database over the summer period and prepare an improved membership and invoicing process for the new year.

From **early February 2027,** schools and individual members will be invited to renew their BEANZ membership for 2027. New membership invoices will be issued at this time.

This refresh will allow BEANZ to:

- ensure our membership records and contact information are current
- improve the membership renewal and invoicing process
- reduce administrative errors and manual processing
- provide a clearer annual membership cycle moving forward

You do not need to take any action at this stage. Further information about the 2027 membership process, including renewal and invoicing, will be sent in early February.

We appreciate your continued support of BEANZ and look forward to continuing to support Biology educators across Aotearoa New Zealand in 2027.

If you're heading to the Biolive/ChemEd conference in November, feel free to come up and say Kia ora to our exec team. We're looking forward to connecting with our members again there.

Also a massive shoutout to the all the mahi Jennie Merchant and the conference committee have done for organising a (successful and sold out) conference!

Kia pai tō rā

Kenneth Loh

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Update from the BEANZ facilitator Sarah Oliveira

As we move through the busy second half of the school year, Term 3 has focused on supporting biology teachers in further developing their practice while navigating the challenges and opportunities of assessment preparation and curriculum change. Our professional learning sessions have continued to provide an important opportunity for beginning teachers, rural teachers, and those working in solo biology departments to connect with colleagues from around the country, share experiences, and learn from one another.

This term featured four professional development sessions, each offering practical ideas that teachers could apply in their own classrooms. The first session explored the science of learning, focusing on how teachers can capture and maintain students' attention and support the transfer of knowledge into long-term memory. Building on this, our second session examined Cognitive Load Theory and considered factors that can contribute to cognitive overload in biology classrooms, along with practical strategies for managing these challenges and improving student learning.

As external assessments draw closer, Jennie Merchant led a session on revision strategies, sharing evidence-informed approaches that teachers can use to help students prepare effectively and confidently for their examinations. To conclude the term, we hosted a panel of three teachers who reflected on their experiences implementing aspects of the refreshed curriculum this year. Their willingness to share successes, challenges, and lessons learned generated valuable discussion and gave participants the opportunity to hear a variety of perspectives from colleagues currently navigating the same changes.

Several of these sessions have been recorded - if you would like access to any of them, please reach out to me via email. (beanz.facilitator@gmail.com) We know that after-school commitments can make attendance difficult, so we hope these recordings continue to provide flexible access to professional learning. If you have any questions about the sessions or experience difficulties accessing the recordings, please feel free to get in touch.

Across many of our discussions this term, teachers have also spoken openly about the increasing demands on their time and energy. The implementation of the refreshed curriculum, alongside existing assessment and moderation requirements, has understandably created additional pressure for many schools and departments. For some teachers, the pace of change can feel challenging, particularly when balancing curriculum development with the everyday demands of teaching. While each school's situation is different, these conversations have highlighted the importance of teachers continuing to support one another and share resources, ideas, and practical solutions.

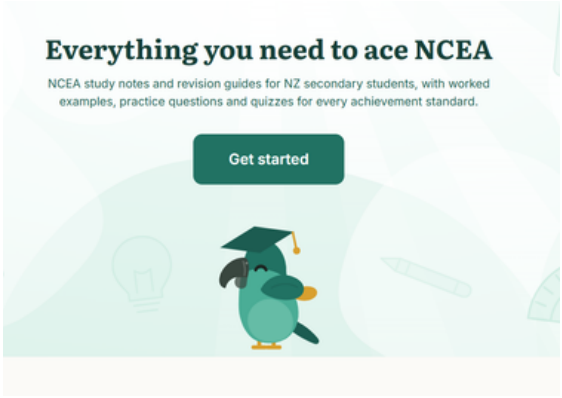
One of the most encouraging themes to emerge from this term has been the value teachers place on the BEANZ community. Members frequently comment on how helpful it is to connect with others who understand the unique opportunities and challenges of teaching biology. For teachers who may be the only biology specialist in their school or who work in geographically isolated settings, these connections can provide both practical support and a reassuring sense of community. The combination of live online sessions and recorded content continues to help ensure that teachers can engage with professional learning in ways that suit their individual circumstances.

As always, thank you to everyone who has contributed to discussions, shared resources, asked questions, and supported colleagues throughout the term. Your willingness to engage and collaborate is what makes this community such a valuable space for biology teachers across Aotearoa New Zealand. We look forward to continuing these conversations in Term 4.

Level 2 student builds revision resource

My name is Rico McWilliams. I am 16, in Year 12 at St Peter's College in Epsom, Auckland.

Over the past year I have built highstandards.co.nz, an NCEA revision site covering 15 subjects at Level 2, Level 3 and Scholarship. Every page is mapped to its achievement standard, and each standard has notes, worked examples, diagrams, practice questions with model answers, flashcards and links through to the NZQA past papers.



You can contact Rico directly at hello@highstandards.co.nz

Awards for the best and brightest of New Zealand science

On June 30th this year, BEANZ Exec member and Tertiary Representative, Dr. Nic Rawlence, was one of eight recipients of a 2025 Prime Minister's Science Prize

The recipients. Nic is second from left.

A 'critic and conscience' approach to science communication

Nic is Associate Professor and head of the paleogenetics group at the University of Otago, which researches the prehistoric ecology of New Zealand. He has been awarded the Prime Minister's Science Communication Prize.

Early family fossil-hunting road trips are what Associate Professor Nic Rawlence credits with driving both his interest in paleoecology and science communication.

He speaks often about his lab's research and findings, and what they mean, but he also believes it's important to contribute his scientific knowledge to relevant conversations, to help inform debate.

"It's very much, where are the gaps in the scientific commentary or the science news media where I think I could make a difference having that critic and conscience role? Being able to provide real time critical commentary to dispel mis-information and provide that information for the public to make free prior and informed decisions about whether they sign on to things."

Nic will be a speaker at the ChemEd Biolive Conferecne in November

Studying Biology in high school is crucial for Health Science pathways, despite what the universities say.

Assoc. Prof. Nic Rawlence, Ancient Ecology Lab, Department of Zoology, University of Otago, Dunedin

If you were going to have to pick subjects to study in high school that would stand you in good stead for Heath Science at university, then taking biology should be a no brainer. Yet, for years, the University of Auckland and Otago University have recommended against taking biology, much to the dismay of high school biology teachers and university lecturers. I increasingly get emails from concerned biology teachers about this, coupled with real concerns about the co-incident decline in the number of students taking the subject in high school.

Until recently, the two medical schools in Aotearoa New Zealand recommended that high school students do Chemistry, Physics, Calculus or Statistics, and English in Years 12 and 13. In some cases, Biology is recommended as an alternative English-rich subject. Auckland's new Health Science First Year programme has only four core papers, with none having a strong focus on Physics. In this case, doing Biology and Chemistry at high school will certainly be more helpful than Physics and Chemistry if students want to go to Auckland.

The Otago Health Science First Year programme has said that being able to do maths, and communicate and write (i.e. English), are more important skills than Biology, which students could learn in first year. This is not helped by the view, rightly or wrongly, that Year 13 Biology has no relevance to Health Science, giving the perception that Biology is the 'easy' science, when in reality it is not (it's the exceptions to the rules that make Biology so fascinating). Professor Peter Dearden recently wrote as much and took aim at these recommendations (https://peterkdearden.substack.com/p/on-biology-in-schools). The programme at Otago is currently undergoing a review and I would not be surprised if they adopted a similar model to Auckland.

Let's be clear here, amongst those of us who teach in the biology related fields at Otago, there is little to no support for the exclusion of Biology in these recommendations. Importantly, this includes those teaching into the first year Biology papers that feed into Health Sciences. It is becoming increasingly clear that students who have not taken both Year 12 and 13 Biology can struggle when they reach university, countering the argument that Year 13 Biology has no relevance to Health Science. It should also be

noted that if you are passionate about Biology, you should not have to drop it to get into Health Science. It is obvious that some schools still prioritise Biology, as students come to university with experience of microscopy and gel electrophoresis for example, but obtaining these skills is very much related to school decile levels.

If students are considering taking Health Science at university, they need a back-up biology related plan they will be happy with if they don't get into second-year Heath Science. Both these routes will require an understanding of biology.

So all in all, ignore what Auckland and Otago are saying and seriously recommend your students do both Year 12 and 13 Biology. Pass your feedback onto your careers advisors and the university liaison people when they visit and tell them to stop recommending that if a science should be dropped, then drop Biology. The teaching staff and your grades at university will thank you for doing this.

With this in mind and the redevelopment of the Year 12 and 13 Biology curriculum, I thought it was an excellent opportunity to refresh what academic conveners and course coordinators of entry level papers at Otago University want school leavers to have in terms of general and 'biology' specific skills.

Some of these skills you may already be teaching your students, while others may be taught outside of Biology. Several will be incorporated into the redeveloped curriculum. There may be skills that you would 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 and being able to read longer passages and developing 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 centimeters or millimeters, 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:

- 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 – specific examples include punnet squares, Mendelian inheritance, recombination, meiosis, gene expression, 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 academics is helpful. I'd be especially interested in what help you as biology teachers feel you need in terms of professional development and educational resources that could be developed. I can be contacted at nic.rawlence@otago.ac.nz

Kiwi Biologists Bring Home Medals from the 37th International Biology Olympiad

The 37th International Biology Olympiad was held at the Lithuanian National Expo Centre LITEXPO in Vilnius, Lithuania, from 12 to 19 July 2026. The competition was hosted in partnership with the Ministry of Education, Science and Sport of the Republic of Lithuania, Lithuanian Non-Formal Education Agency (LINEŠA), and Vilnius University.
Demonstrating the strength of Kiwi science talent, all four team members returned with medals—an outstanding result at the world's premier high school biology competition involving 78 countries.

- Nichole Luo (Macleans College) – Silver Medal (Top 30%, World Rank: 53rd)

- Ericsson Ye (Christ's College) – Silver Medal (Top 30%, World Rank: 75th)

- Alex Brinkworth (Central Southland College) – Bronze Medal

- Luan Peterle (King's High School) – Bronze Medal

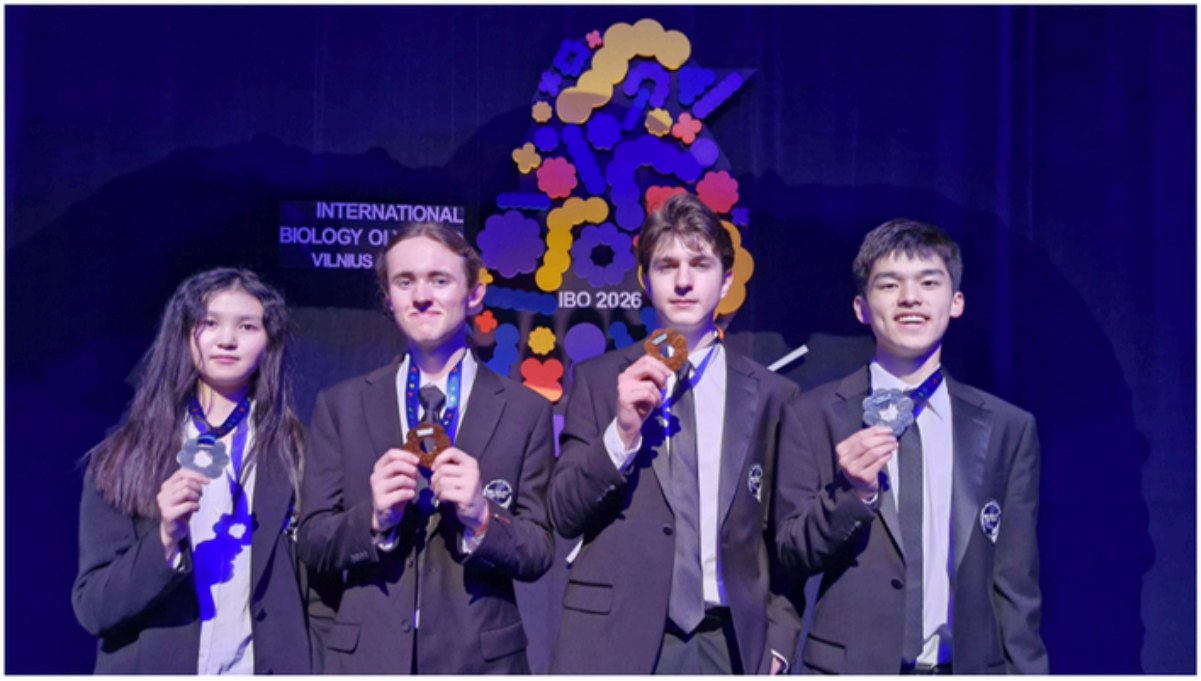
In addition to competing on the world stage, the team was able to visit a number of Lithuanian landmarks including the Hill of Crosses, the Vilnius Old Town, and Trakai, the old capital of Lithuania. The chance to meet students from around the globe, share their enthusiasm for Biology, network with other scientists, and explore a new corner of the world has been nothing short of a life-changing experience. A particular highlight was Alex Brinkworth being involved in the final opening moment of the ceremony; as the furthest-travelled student in the competition he was invited on stage with one of the most esteemed jury members to cut the sakotis, a traditional Lithuanian cake, to officially open the event.

The team was led by Ms Michelle Isbister (Hauraki Plains Area School) and Mr Aaron Hewson (University of Otago. The team leaders, as well as the entire NZIBO Executive Committee, are so proud of this team and the way that they represented New Zealand on the world stage. The NZIBO Committee extends its sincere thanks to Science OlympiaNZ for their financial support enabling the students to travel to Lithuania, as well as to the University of Otago for their continued support of the training and selection camp.

To make the team, these four tauira participated in all stages of the highly-selective NZIBO process: a national entrance exam sat by 518 students, a summer tutorial programme for 325 students, and a practical and theory-based residential training

camp for the top 25 students. Final team selection considered both academic performance and ambassadorial potential. To be selected for the NZIBO programme, demonstrates an outstanding academic ability in Biology as the learning in the tutorial is at the university level.

Our next cohort of potential international representatives has just begun their journey, with more than 500 learners from nearly 100 schools, representing fourteen NZ regions, participating in the 2026-2027 National Entrance Exam. NZIBO is immensely grateful to the many kaiako across the motu who have supported their tauira and continue to foster excellence in biology.



From left to right: Nichole Luo (Macleans College), Alex Brinkworth (Central Southland College), Luan Peterle (King's High School), and Ericsson Ye (Christ's College).

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The danger of using UK data to predict the impact of climate change on forests in Aotearoa.

By Assoc. Prof. Nic Rawlence and Erica Jar.

Figure 1: Southern beech tree leaves.
Image credit: Krzysztof Golik. CC

Warning: This is not a climate denial article. Climate change has disastrous impacts on populations and species. Increased frequency and size of storm surges wash away sea bird nests, predators gain greater access to previously inaccessible mountainous habitats that were refuges for many species, and invasive plants better suited to warm climates out compete slow growing and reproducing indigenous species. Our forests have been through changes as a result of climate change before, including during multiple Ice Ages and the eruption of Lake Taupo some 25,000 years ago. This article is about the potential danger of using evidence from the Northern Hemisphere to predict what will happen with New Zealand's native forests.

Around 80% of Aotearoa New Zealand's native plants are endemic species. Large trees with heavy seeds like rimu, kahikatea, miro, tōtara, may have moved with New Zealand's land mass as it split from eastern Gondwana 83-55 million years ago. Small seeds from plants such as the tongue orchid are easily carried by wind. Mānuka, rātā, harakeke, pōhutukawa, are all examples of plants whose seeds arrived in New Zealand by wind or floating on currents. Other plants, such as southern beech and wetland herbs, are often dispersed by migratory birds carrying seeds in mud on their feet or feathers, or in their faeces.

Once in New Zealand, these plants evolved to become uniquely specialized to their new environment, including to a climate that, at the time of speciation, was different to the climate today. Our forest species have survived multiple Ice Ages and the shift to the temperate climate New Zealand has experienced for the last 12,000 years.

Analysing the impact of climate change on plants is difficult and necessitates the need to ignore the potential impacts of predation of pollinators and herbivory of plants by introduced invasive species such as deer on the forest understory and possums in the canopy. This makes for rather artificial predictions since introduced herbivores have the ability to decimate forests faster than climate change.

However, should Predator Free 2050 be massively successful, and all possums are removed, will New Zealand's plants be able to withstand global warming?

In 2022 the publication of 39 years of data on beech masting in the UK was published, which demonstrated that northern beech tree species are being negatively affected by warming temperatures due to an increase in the frequency of mast years, and particularly 'mega-masts'. Dramatic newspaper headlines followed - like the one by the NZ Herald: "*How climate change is throwing beech forests 'out of synch'.*"

Seed masts are periodic high production of seeds by species and occur in response to temperature cues every 2-6 years. One way to look at plant responses to climate change is to look at changes in mast patterns.

Masts are about economies of scale. Large episodes of sexual reproduction are more efficient than small ones. Sexual reproduction takes a lot of energy, so large quantities of viable seeds is desirable. For plants with wind-pollinated flowers, this is achieved by synchronising large numbers of male flowers to release large quantities of pollen when large numbers of female flowers are receptive. Seed viability is just as important as lots of seeds, since only viable seeds have the potential to germinate and grow, replenishing the forest when old trees die. There is also greater attraction of animals who eat seeds, providing efficient dispersal is important for the fitness of the species.

Masts are an issue in New Zealand because massive amounts of seeds provide sufficient energy for the animals that eat them to have highly successful breeding seasons (e.g., kākāpō). Introduced predators such as rats and mice fare particularly well. Then when the seed resource is used up, they turn to other food sources such as native invertebrates, birds, and bird eggs, seriously impacting our unique ecosystems.

Mega-masts increase predator control work by the Department of Conservation (DOC), so changes in the predictability of mega-masts will impact successful predator control, to the detriment of endemic wildlife.

Temperature is a strong environmental cue for masting because it is uniformly experienced over a wide area, providing maximum synchrony between individuals. Temperature is such a strong environmental cue that many different species within the same forest will mast at the same time.

So how comparable are northern beech mast responses to southern beech masts, and therefore, how translatable is the study's findings? One issue is that northern beech and southern beech (in Aotearoa) are in completely different families of tree, not even closely related.

Northern Hemisphere beech are deciduous, whereas southern beech are evergreen. Being deciduous is a part of a dormancy cycle that is an adaptation of trees to survive the long and intensely cold winters of the pre-industrial revolution Northern Hemisphere.

Climate change has warmed the Northern Hemisphere more than the Southern Hemisphere (so far), and those long cold winters of the late 1700s and early 1800s where the Thames River in London froze over (imagine the Waikato River freezing) are no longer experienced.

Deciduous trees such as the northern beech now have shorter dormancy periods, a significant change in their response to temperature - the same environmental cue for masting. Southern beech in New Zealand do not go through the same dormancy cycle as their UK comparators, implying that southern beech may well respond differently to temperature as a cue for masting.

Professor Dave Kelly spent 33 years collecting data on rimu (*Dacrydium cupressinum*) masts. Kelly's team found that the size of each year's seed crop could be predicted with temperature information using a three year cycle with the following formula: $\Delta T = T_{n-1} - T_{n-2}$ where T_{n-1} is the summer immediately prior and T_{n-2} is the summer two years prior to the current year.

Scenario 1
Summer Year 1 (n-1) = hotter than average
Summer Year 2 (n-2) = cooler than average
ΔT is a large positive change = mast year

Scenario 2
Summer Year 1 (n-1) = cooler than average
Summer Year 2 (n-2) = hotter than average
ΔT is a large negative change = low seed year

Professor Kelly's study of rimu identified that in non-mast years, the energy saved on not heavily investing in sexual reproduction is spent on tree growth.

So does this mean that beech trees in the Northern Hemisphere are growing more slowly because they are having more masts? Using the data collected on an endemic New Zealand species to make an inference regarding northern beech is as unhelpful as using data from the Northern Hemisphere to predict how southern beech masts will change with increasing global temperatures.

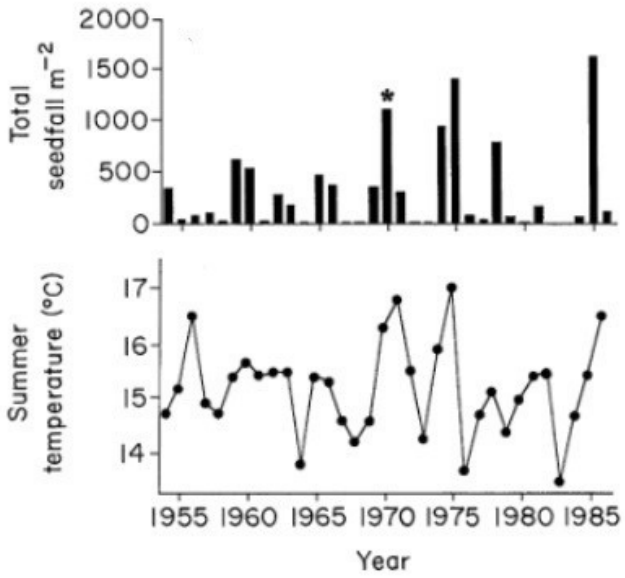

Figure 2: Total seedfall (February to May m^{-2}) in rimu over 33 years. Seed fall (top) and summer temperature (bottom).

So what does this mean for New Zealand and its biodiversity-rich beech forests? Kelly himself isn't sure and identifies that it may be changes in interspecies interactions - particularly introduced predators - in response to warmer climates that will have the greatest impact. "*For example, ship rats in New Zealand have been spreading to higher altitudes in recent decades, which will alter local responses to southern beech mast seed crops*" he said.

Another model used by scientists to predict seed masts is the T1 model. This model works on the basis that plants respond to high temperature, nutrient availability and energy reserves from the previous year's summer.

Both models - the ΔT and T1 – are consistent with the observational data, but make different predictions under climate change. If climate change causes summer temperatures to become more variable, the T1 model predicts more frequent masting. The ΔT on the other hand predicts a similar frequency of masts since it is reliant on a three year cycle of variation.

DOC use the ΔT method for predicting beech masts. When we look at the maps published by DOC to demonstrate their predictions of where masts will occur, the ΔT pattern is apparent.

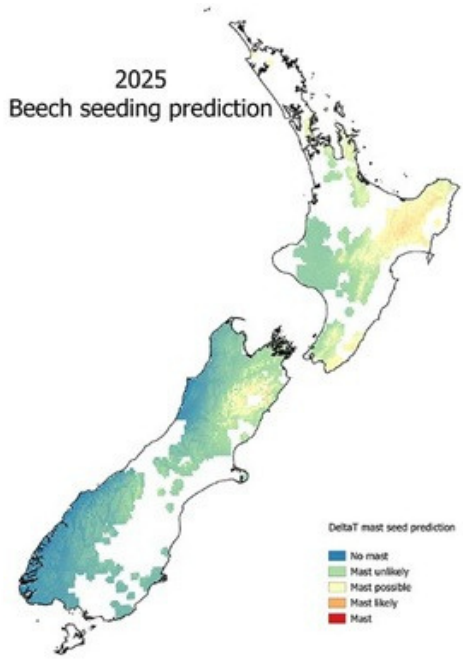

Figure 3: 2025 beech mast prediction. Image credit DOC

Conclusion:

It is often quoted that mast events are likely to increase with climate change. As recently as 2022 Predator Free NZ made an unreferenced statement about the possibility of increased frequency of mast years. But will beech masts in Aotearoa actually become more frequent as temperatures increase and what could increasing temperature mean for our forests? The forests will change, that is for certain. Plants can't move to a new location if they get 'a bit hot'. They need to rely on seed dispersal to shift geographic range. Plants responses to climate change can take thousands of years, relying on their ability to disperse, advantageous mutations or alleles that had seemed unimportant until the change began, and their corresponding physiological changes. Or they become extinct. These responses then change how the entire ecosystem functions.

What past experience shows is that comparing Northern Hemisphere ecosystems with New Zealand's ones, usually ends in disaster for our endemic species. Just ask the weasel.

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Understand, Know, Do:

Understand:

1. In your own words, describe what a beech mast is and why plants mast.
2. Why would DOC be worried that there might be more mast years as the climate in New Zealand warms?
3. The author of this article and the authors of several of the referenced articles use the words 'may' and 'could' a number of times. What does this infer about their analysis of the data?

Know:

4. Explain why data for beech masts takes so many years to collect.
5. Looking at the graphs (Figure 2), use the ΔT model to explain why some mast years can occur back-to-back before a non-mast year.

Do:

6. Research another situation whereby the New Zealand ecosystems have been damaged by using information about interspecies relationships in Northern Hemisphere ecosystems. Write a paragraph that summaries what wasdecidedandwhat the consequences were for species in New Zealand.

Glossary

Alleles - Different versions of a gene. Genes are sections of DNA that code for a trait. For example, the gene might be 'fur thickness' and the alleles might be 'not thick' or 'thick'.

Adaptation - A trait that makes an organism better able to survive in its environment.

Biodiversity - The total of all the different species in an ecosystem.

Deciduous - A tree that loses its leaves in autumn/annually.

Dispersal - The process of spreading things (seeds) over a wide area.

Dormancy - The state of having normal metabolic functions suspended or slowed down for a period of time (usually over winter).

Ecosystem - A biological community of interacting organisms and their physical environment.

Endemic - Organisms that are only found in one specific location in the world.

Evergreen - Trees and other plants that keep their leaves all year.

Evolve - To undergo gradual changes over time in the inherited traits of a population.

Germinate - A change in a seed that makes it start to grow into a plant.

Herbivory - The act of eating plant material by animals.

Indigenous - Existing naturally or having always lived in a place; native.

Interspecies - Relationships, interactions existing or occurring between different species.

Invertebrate - Animals that lack a back bone. For example, insects.

Mast - The periodic production of large amounts of seeds by a single species of plants in a specific location.

Mutation - A permanent change in the DNA sequence of an organism.

Physiological - The way in which the bodies of living things work. Includes chemical reactions.

Pollinators - Animals that transfer pollen from male flowers to female flowers.

Predators - An animal that hunts, kills, and eats other animals.

Speciation - The evolutionary process by which populations evolve to become distinct species.

Sexual reproduction - Combining of genetic material from two parents to produce an offspring.

Synchronisation - The act of making things happen at the same time.

Temperate - A region or climate that has mild temperatures. "Not too hot, not too cold".

Viable - Able to germinate and grow.

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Central North Island	Meredith Wilson	mwilson@ruapehu.school.nz
Gisborne	**Rep needed**	
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