BOTANICAL SOCIETY

OF OTAGO

Newsletter Number 91

October 2020

BSO Meetings and Field Trips October 2020 - March 2021

14th October, 5:20 pm: A search for the co-evolutionary partner(s) of New Zealand's sequestrate fungi. Speaker: Dr Toni Atkinson. New Zealand has long been known as a "land of birds". The idea that the array of sequestrate fungi found here, many of which are colourful, may have arisen through coevolution with birds was first mooted in mycology around 20 years ago. It seemed a natural progression from the widely accepted hypothesis that New Zealand's diverse divaricating plants evolved due to selective pressure from the now extinct moa species. The suggestion appears to have been taken up by mycologists, and is becoming part of the story of science in this land. Last year, an international team using high-throughput sequencing techniques to analyse the DNA in moa coprolites, revealed the first real evidence that moa may have eaten fungi.

But what happens if we take a fresh look at the whole question? Are moa the most likely coevolutionary partners of our sequestrate fungi, out of all the vertebrate and invertebrate inhabitants of prehistoric New Zealand? In this recently humanised but greatly altered land, it is challenging to hold in mind the relationships that might have played out over evolutionary time. What might we have missed?

6-8th November: Weekend Field trip to the Hokonui Hills, Southland. We plan to stay at the Dunsdale Recreation Reserve, which is near the township of Hedgehope southwest of Gore. The facilities are basic so you will need to bring a tent. You are responsible for providing your own food but plan to bring a meal for Saturday evening to share with the group. A track from the campground gives access to the Hokonui Forest where there is some interesting riparian forest along the Dunsdale Stream. Expect to see several species of orchid and some impressive specimens of the rare *Coprosma*, *Coprosma wallii*. Other places that we can visit are Forest Hill Scenic Reserve and Croydon Bush Scenic Reserve. We will leave Dunedin on Friday evening and return Sunday afternoon. If you wish to go on this trip please contact David Lyttle (03) 454 5470 email djl1yttle@gmail.com

11th November, 5:20 pm: The 'other half' of New Zealand's flora: how distinct are the non-native plants from the native? Speaker: Dr. Angela Brandt, Ecologist, Manaaki Whenua – Landcare Research. Non-native species make up about half of New Zealand's plant species, and those that have naturalised have added 68 families and 650 genera to the New Zealand flora. Non-native plants that are introduced and then naturalise are not a random subset of the global flora, but how distinct are these species from the native flora as a whole? I will give an overview of recent inventories of native and non-native plant species in New Zealand and the challenges involved in documenting the ever-changing composition and distribution of the 'other half' of New Zealand's flora.

12-14th February: Weekend Field Trip to the Oteake Conservation Park. We plan to stay at the DOC Homestead Camp Site, Hawkdun Runs Road. The camp site has stunning views of the Hawkdun Range. The facilities are basic so you will need to bring a tent. You are responsible for providing your own food but plan to bring a meal for Saturday evening to share with the group. There are a number of tracks accessible from the Homestead Camp Site giving access to the Hawkdun Range, the St Bathans Range and the East and West branches of the Manuherikia River. The vegetation of the Oteake Conservation Park is diverse and very interesting especially in the alpine zone. There are well-developed screes which have their own specialised flora and a number of species reach their southern limit in the region. Final details will depend on the number of people attending and the number of 4WD vehicles available. We will leave Dunedin on Friday evening and return Sunday afternoon. If you wish to go on this trip please contact David Lyttle (03) 454 5470 email djl1yttle@gmail.com

10th February 2021, 5:20 pm: Petrified Forests of Zealandia. Speaker: Mathew Vanner, Department of Geology. This talk explores the history of Zealandia's forest tree flora from a palaeontological perspective. Forests are our oldest and most persistent ecosystems and New Zealand, the Chathams and Auckland Islands have all yielded identifiable fossil wood from a range of ages and families. The fossils reveal an unbroken line of conifers, including Araucariaceae and Podocarpaceae, from the Jurassic (~170 Ma) to the Miocene (~10 Ma). New records of angiosperms, (Araliaceae, Myrtaceae, and Legumes), appear in the Eocene (~50 Ma) and other taxa (Casuarinaceae) disappear from New Zealand in the Miocene. Wood characters can be used to investigate palaeoclimate and show when key features developed in New

Zealand lineages. My talk illustrates the exquisite preservation of fossil wood, the range of information that can be derived from wood features, and the history of many of the distinctive trees currently growing in New Zealand.

10th March 2021, 5:20 pm: End Peak. Speaker: Cara-Lisa Schloots, Masters student, Botany Department. The End Peak wetland complex is situated within the Mahu Whenua covenants near Wanaka at approximately 1800 m a.s.l. in a south facing basin. It has a variety of vegetation types including uncommon species and a number of plants not typically found at such high altitudes. It is a fine example of a southern hemisphere patterned wetland, and a unique system about which very little is known. My Masters project was carried out over the five months of summer 2018-19 when the wetland complex was free of snow. Cameras were set up at six locations to record water level throughout the growing season from mid-December 2018 until mid-May 2019. Water level patterns were found to vary largely within the wetland complex, although some seasonal changes were observed across all sites. Transects were used to investigate standing vegetation and the seed bank. Plant assemblages also varied across the wetland, although some species were present at all locations. These patterns were related to water level regimes at respective sites. From this we can see that even relatively small wetland areas can contain a remarkable variety of environments and communities, and it is unlikely that such an area will respond as one unit to the climatic changes that are taking place. There will be specific areas and communities within the system which are more threatened, in particular those sites which currently experience more stable conditions and are not adapted to as extreme environmental fluctuations.

27-28th March 2021: Weekend Field Trip to Mahu Whenua. This trip will allow us to explore the flora of a spectacular part of Central Otago not typically accessible to the public. The Mahu Whenua landscape is in the midst of a huge transformation from farmland to conservation land and supports a number of interesting remnant and transitional vegetation types as well as a many rare species including *Olearia lineata, Alepis flavida, Sonchus novae-zelandiae, Pachycladon cheesemanii, Carmichaelia crassicaulis* ssp. *crassicaulis, Azorella exigua, Carex lachenalii* ssp. *parkeri* and *Carex enysii.* There will be a number of options associated with this trip which will suit all interests and abilities. We will depart Dunedin at 07:00 on Saturday, arriving at the hut where we will have lunch at ~13:30. In the afternoon we will explore the beech forest and shrublands up Highland Creek. Depending on interest a group may also head up above the bushline.

Sunday options include remaining at Highland Creek hut to continue exploring that area, heading up the expansive Motatapu Valley via 4WD to explore beech patches, tussock and shrublands, and visiting a spectacular high alpine patterned wetland. This last option includes helicopter flights, which will need to be paid for in advance. There will be a maximum of four people + guide (Cara-Lisa) and the cost will be $260 for the return flight.

We will be leaving at 13:00 and will stop for afternoon tea in Alexandra on our way back to Dunedin. The trip will be taking a maximum of 20 people (you must be a BSO member). You will need to provide your own breakfast, lunch and snacks. Dinner will be a potluck/BBQ. We will be camping next to a hut with toilet and cooking facilities, so you will need to BYO sleeping arrangements (tent/mat/bag etc.). Please register your interest with Matt Larcombe (matt.larcombe@otago.ac.nz, 027 919 9709) by the 22nd March.

10th April 2021, 8:30 am: Quoin Point. This trip offers another opportunity (a previous field trip has been to the mouth of the Akatore River) to look at the distinctive plant communities defined as coastal turfs. These salt tolerant (halophytic) plants are made up of low growing (generally less than 50mm in height), herbs, sedges and grasses, and are well adapted to living in the exposed marine shoreline locations, like this one on the southern Otago coast. Contact Robyn Bridges 021 235 8997.

Meeting details: Talks are usually on Wednesday evening starting at 5.20 pm with drinks and nibbles (gold coin donation), unless otherwise advertised. Venue is the Zoology Benham Building, 346 Great King Street, behind the Zoology car park by the old Captain Cook Hotel. Please use the main entrance of the Benham Building to enter and go to the Benham Seminar Room, Room 215, located on the second floor. Please be prompt as we have to hold the door open. Items of botanical interest for our buy, sell and share table are always appreciated. When enough people are feeling sociable we go to dinner afterwards: everyone is welcome to join in. The talks usually finish around 6.30 pm. Keen discussion might continue till 7 pm.

Field trip details: Field trips leave from Botany car park 464 Great King Street unless otherwise advertised. Meet there to car pool (10c/km/passenger to be paid to the driver, please). Please contact the trip leader before Friday for trips with special transport and by Wednesday for full weekend trips. A hand lens and field guides always add to the interest. It is the responsibility of each person to stay in contact with the group and to bring sufficient food, drink and outdoor gear to cope with changeable weather conditions. Bring appropriate personal medication, including anti-histamine for allergies. Note trip guidelines on the BSO web site: www.bso.org.nz

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Cover: Artwork by Sharon Jones, Medium: Watercolour. ***Anemone Stinkhorn*** **(Aseroe rubra)**, *illustrated using a live specimen and photographs collected from Saddle Hill, Dunedin.*

Chair's Notes

Gretchen Brownstein

Kia ora koutou.

I hope this finds you well. I know it's been rough winter for many of us but I'm hopeful of a more cheerful spring.

We recently held the 19th annual Baylis Lecture. This year the lecture was given by Dr Leon Perrie, Curator of Botany at Te Papa Tongarewa. Leon gave a great talk explaining how and why plant names change, which led onto a spirited question time. See Duncan's report below.

The 2021 BSO calendar is now on sale. Many thanks to the expanded team of John Barkla, Aidan Braid and Taylor Davies-Colley for creating a wonderful calendar utilising some of the photos from the photography competition. You can buy your copy now for $15 at the botany department, BSO meetings or order them on the website. Get in quick as the calendar always sells out!

I would like to remind everyone about the Audrey Eagle Publishing Fund run by the BSO. The purpose of the fund is to promote the dissemination of New Zealand botanical literature by contributing to publishing costs. The Fund originated in 2006 from a donation given to Audrey Eagle CNZM, from various sources, to publish supplementary notes to accompany her notable contribution to New Zealand botanical publications, *Eagle's Complete Trees and Shrubs of New Zealand*. The Supplement, published by BSO, came out in October 2006 and profits from this were the basis of this self-perpetuating fund. The Fund was considerably enhanced in 2014 when the first recipient, Allison Knight, not only paid back the loan but also contributed all profits from her publication *Lichens of New Zealand - an introductory illustrated guide.* Please see the BSO website (https://bso.org.nz/aepfund) for more information and how to apply.

Hope to see everyone at the upcoming talks and trips!

Kia kaha
Gretchen

Secretary's Notes

Angela Brandt

In my notes for the last newsletter, I mused on how the COVID lockdown changed the way we interact with each other and our local environments, including moving BSO talks to online meetings and the annual iNaturalist City Nature Challenge being altered to focus on the biodiversity in our own neighbourhoods. Now that we find ourselves in our second round at Alert Level 2, we continue to adjust and learn new ways to maintain our community. One new option hot off the virtual presses is the creation of a Facebook group for NZ bryophyte enthusiasts -- please check out the "New Zealand mosses and liverworts" group if you're on Facebook and join if you're keen (https://www.facebook.com/groups/nzbryophytes). This is just one of many online groups which enable us to continue to share our interests in nature and species identification while we are kept from our normal annual or monthly botanical gatherings. Other New Zealand-based groups focus on insects and invertebrates, and birds. I've also found bryophyte and lichen-focused groups from Tasmania and the UK. Happy virtual botanising!

Stegostyla lyallii - *Lake Monowai, December 2019 (Photo: Warren Jowett)*

Editor's Notes

Lydia Turley

Many thanks to everyone who has contributed to another wonderful newsletter. I hope you all enjoy reading it! Check out James' excellent (questionably accurate) report on the Tavora field trip. It sounds like we need to keep a closer eye on these spider people infiltrating our society!

If you've got anything you'd like published in the next edition, send it in – contributions are always welcome! Copy for the next newsletter is due on *10 January 2021* and earlier submissions are most welcome.

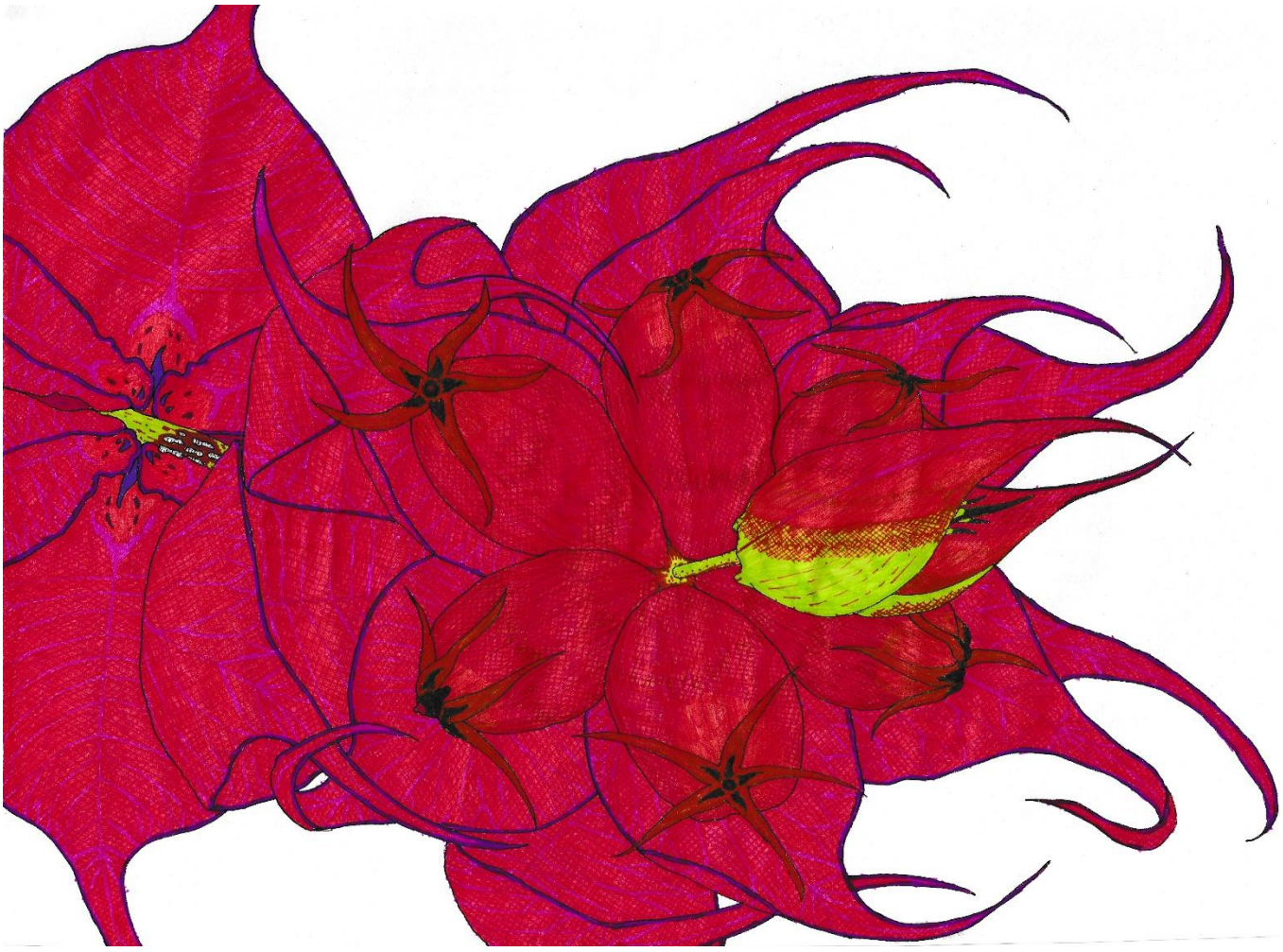
Editor's guidelines: Try to aim for a 0.5–1 page of 14 pt. Times for news, trip/meeting reports and book reviews and 1–5 pages, including illustrations, for other articles. Electronic submission by email to lydiamturley@gmail.com is preferred. Send photos as separate files and remember to include photo captions and credits. We encourage stories, drawings, reviews, opinions, articles, photos or letters – or anything else you think might be of botanical interest to our diverse range of members.

Disclaimer: The views published in this newsletter reflect the views of the individual authors and are not necessarily the views of the Botanical Society of Otago.

New Members

A warm welcome is extended to Harvey Rubbo and Joshua Harrison. To our existing members, thank you for your continuing support.

Thank you very much to Ann Wylie and Tess and Tony Molteno for their generous donations.



Sheathed in deep, indigo scales, like a great writhing serpent the bract sticks out among the dead leaf litter of Outram glen. The Himalayan honeysuckle terminates in a great beak surrounded by a bloated ruff of blossoms. Slaanesh couldn't paint a finer image of decadence (Drawing: James Crofts-Bennett)

Correspondence and News

Publications available on loan

The following hard copy publications were recently received by BSO:

- Pīpipi No 51 May 2020
- Auckland Botanical Society Journal Vol. 75(1) June 2020
- NZ Botanical Society Newsletter No 140 June 2020

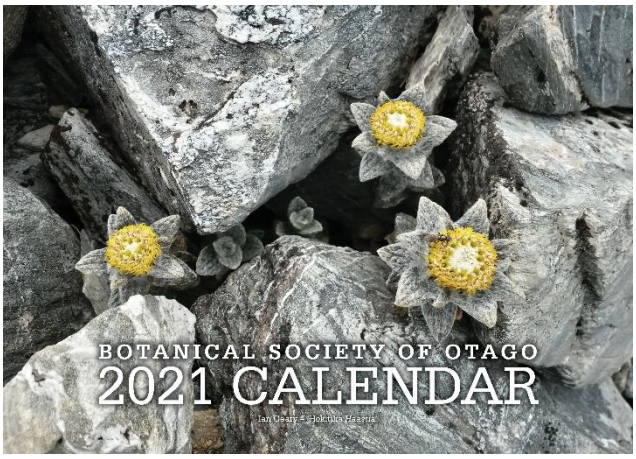
If you would like to borrow any of the above please contact maryanne.miller53@gmail.com

Calendar

The Botanical Society of Otago 2021 Calendar is on sale now for $15 each.

Available 9-11 am and 2-5 pm from the Botany Department Reception, University of Otago (cheque or correct amount of cash only) and at Society meetings.

For electronic payment email the Botanical Society of Otago (bso@otago.ac.nz) with your name, address, and whether you want to collect the calendar from Botany Department reception or have it posted (add $2.50 for mailing).



Allan Mere Award 2020 to Bill and the late Nancy Malcolm

The Botanical Society of Otago recently supported the Nelson Botanical Society's nomination of Bill and the late Nancy Malcolm for this prestigious award. We are delighted to learn that this nomination was successful and they are to be the recipients of the 2020 award.

"The Allan Mere is awarded by the New Zealand Botanical Society to outstanding botanists to acknowledge their contribution and work. The mere is a traditional Maori hand club made from greenstone / pounamu / nephrite and carved at Westland Greenstone Ltd in Hokitika. It was originally presented to the former DSIR Botany Division by the late Dr Lucy Moore in 1982 to commemorate the 100th anniversary of the birthday of Harry Howard Allan – the first Director of the former DSIR Botany Division, and author of the first volume of the DSIR New Zealand Flora series. It was Lucy's intention that the award be presented – not necessarily annually – to those staff members who had made the most significant contribution to New Zealand Botany.

With the demise of the DSIR Botany Division the Allan Mere was passed over to the New Zealand Botanical Society who now award, on much the same basis as Lucy Moore had intended, to those candidates nominated by the various regional botanical societies. The Allan Mere is displayed in the entrance to the Allan Herbarium at Landcare Research in Lincoln". [From the New Zealand Botanical Society website]

The award will be presented to Bill in Nelson later in the year, at a Botanical Society function in keeping with the Covid level at the time.

The work of Bill and Nancy that made them such worthy recipients will be outlined in a subsequent newsletter.

Articles

Wakatipu beech seeding project

Hilary Lennox

Restoration of native forests in New Zealand has previously been undertaken by planting young trees raised in nurseries and tending to those trees for several years to protect them from environmental risk factors. More recently, there have been studies into restoration methodologies using seed rather than seedlings. One such project was the 3-year Wakatipu Beech Seeding Project (WBSP), which trialled different methods of collecting, processing, treating and broadcasting seeds into areas of controlled (sprayed) wilding conifer forest around the Wakatipu with the aim of facilitating the restoration of exotic conifer stands back into native forest.

This was a joint venture between the Wakatipu Wilding Conifer Control Group and the Wakatipu Reforestation Trust, with funding from the Ministry for the Environment's Community Environmental Fund. Further support was provided by Scion, the University of Otago, Ahika Consulting Ltd, and a dedicated team of keen volunteers.

Several challenges were encountered along the way, including an extremely dry spring, lack of locally available viable seed, weed inundation and dangers associated with working beneath dead trees. Despite these challenges, by year 3 a range of locally sourced native tree species had been broadcast into several areas of controlled wilding conifers and seedlings had begun to emerge.

Coprosma propinqua and Mānuka seeds proved to be the easiest to collect, process, store and propagate. The germination strike rate of *Pittosporum tenuifolium* and *Griselinia littoralis* was also very good, but it was a bit more difficult to collect, process and store this seed. Mountain beech seed was relatively easy to collect (during the mast season) but germination strike rate was relatively low compared to the other species and then there is also the added complication of how to inoculate the seedlings with beneficial mycorrhizae at a large scale.

The germination strike rate of all species was improved greatly by removing the thick layer of decaying pine needles on the forest floor and exposing a more suitable growth medium. Seedling survival rate was improved by excluding herbivores from the trial sites.

Through this trial, it became apparent that when it comes to restoring controlled wilding stands back into native forest, there is a "sweet spot" between the control work being undertaken and the point where dead trees have decayed sufficiently to allow light-loving weeds to proliferate. It is during this sweet spot that seeding operations should be focused. Ensuring that the sweet spot is not missed would require planning of the restoration strategy prior to the wildings being sprayed, rather than this being an afterthought.

It also became apparent which factors must be considered for any seed-based restoration project to be successful. These include:

1. Undertaking a thorough assessment of the site first and foremost to identify what the risk factors are (weeds, pests, exposure etc.) and to identify optimal microsites in which to focus efforts.
2. Selecting quick-growing, colonising species that are suitable for the site rather than picking species based purely on personal preference. It may be necessary to develop a long-term restoration strategy involving the establishment of a suitable nursery crop to create more favourable conditions into which more desirable species can be sown later on.
3. Ensuring that sufficient viable seed is going to be available locally. This is far more likely during a mast season. Field conditions are going to be less suitable for germination than in a nursery and so the strike rate will be significantly lower. Some seeds won't make contact with a suitable growth substrate, will be ingested by animals, will blow away or may dry out. There needs to be enough seed broadcast to account for the relatively low strike rate. Consider how feasible it is to collect and process vast quantities of seed for the chosen species with the limited resources available - a different species may need to be targeted as a result.
4. Ensuring that there is an absence of stock and other grazing animals such as pest species throughout the formative years of the

project. Part of the initial site assessment should include an identification of which wild animals are likely to be present (e.g. rabbits, hares, goats, deer, pigs or wallabies) and determining appropriate control methods (e.g. poison, shooting, fencing).

5. Undertaking adequate site preparation to remove weeds and any other ground cover so that broadcast seeds make contact with the soil e.g. spraying with herbicide and screefing, bearing in mind that clearing the site also allows weeds to colonise more rapidly.
6. Controlling competing weeds and grasses during critical growth times (i.e. spring / summer) for several years to allow seeds to germinate and to allow the seedlings to grow big enough to out-compete the weeds. This may require pre-site treatments such as weed-suppressing mulches or the use of grass-specific herbicides.
7. Having optimal climatic conditions during the first few years of plant growth. This is not something which can be easily controlled, but by undertaking a thorough site assessment prior to seeding, it is possible to identify the most suitable microsites where seedlings will be less vulnerable to adverse climate conditions.

Another key success factor is how to manage people's expectations. Natural native forest restoration may take decades. However, there are growing expectations that restoration objectives should be achieved much more quickly than this. This may be due to a combination of funding timeframes (usually 3 years), election cycles and the ever-growing human cultural traits of impatience and the need for instant gratification. The human pace of life may have sped up, but native species have not evolved at the same pace.

Restoration projects which involve planting nursery-raised seedlings can provide instant gratification when the seedlings are planted in the ground, but seed-based restoration projects require a lot more patience. It is vitally important that the expectations of funders, landowners, volunteers, peer groups, employees and stakeholders are managed effectively with ongoing education.

By focusing restoration efforts on "seed islands" rather than diluting efforts across the whole site, localised success is far more likely, which helps to keep everyone involved engaged. It's more rewarding to take people to an island where a blanket of emerging seedlings can be seen, rather than scouring the whole site for the occasional seedling emerging here and there. By keeping people engaged, more seed islands can be added in subsequent years when seed becomes locally available, therefore accelerating and maintaining momentum of the restoration project.

Full results of the Wakatipu Beech Seeding Project and several helpful resources to assist other groups seeking to embark on seed-based restoration projects are available on both the Wakatipu Wilding Conifer Control Group website and the Wakatipu Reforestation Trust website (www.wakatipuwilding.co.nz/beech-seeding-project/ and www.wrtqt.org.nz/seed-project).

Collecting seed.

Brief observations of vegetation following a fire on Flagstaff, Dunedin

John Barkla

On Monday 16 September 2019 a fire swept through c. 30 ha of montane tussock-shrub/flaxland on the popular Pineapple Track that traverses Flagstaff (668m) above Dunedin. Billowing smoke and flames were clearly evident from the city and it took eight helicopters and 35 firemen to contain the fire. Dampening down continued through Tuesday, and surveillance of hot spots was ongoing for several days. The Pineapple Track was closed for a week.

Evidence from sub-fossil logs suggests there was a cover of montane forest on Flagstaff until about 1300 AD. *Chionochloa rigida*-dominant tussocklands are thought to have been present since at least the mid-19th Century and maintained by periodic fires (Wardle & Mark, 1956). A hot spring fire in late 1976 for example, burnt c. 100 ha. Given its close proximity to Dunedin, the area around Flagstaff has been a convenient research site for investigating the effects of fire on snow tussock e.g. Gitay *et al.* (1991).

I walked through the burn site on 28 September, almost two weeks after the fire started (Fig. 1). As expected, it was a scene of blackened devastation with bare charred rocky ground punctuated by tussock and flax stumps and burnt stems of exotic broom and native shrubs.

I returned to the burn site on 25 April 2020, some seven months or one growing season later (Fig. 2). Mountain flax or whaririki (*Phormium cookianum*) has universally survived and vigorous regrowth was clear (Fig. 2, bottom left). Some snow tussocks have perished but the majority have survived as evidenced by modest new tiller growth. Near the lower altitude margins of the burn some native shrubs, especially *Olearia arborescens*, have resprouted extensively from their bases (Fig. 2, bottom right).

Much of the previously burnt bare ground has been colonised by a range of native and exotic plants. Common native species include mountain astelia

Figure 1. *Top: View east towards Dunedin over south-facing burnt slopes. September 2019.*
Bottom left: A bare charred tussock-flax-shrubland. September 2019.
Bottom right: Burnt flax. September 2019.

Figure 2. *Top: View east towards Dunedin over south-facing burnt slopes. April 2020.*
Bottom left: Recovering flax. April 2020.
Bottom right: Tussock hawkweed with basal resprout of Olearia arborescens *behind. April 2020.*

(*Astelia nervosa*), prickly shield fern (*Polystichum vestitum*), mountain kiokio (*Blechnum montanum*), and alpine clubmoss (*Lycopodium fastigiatum*). Common exotics include a range of pasture grasses, especially browntop (*Agrostis capillaris*), sweet vernal (*Anthoxanthum odoratum*), catsear (*Hypochaeris radicata*), tussock hawkweed (*Hieracium lepidulum*), and swathes of seedling exotic broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*). Burnt tussock stumps in particular seem to be favoured establishment sites for wild broom seedlings.

There are encouraging signs of recovery of native species, including some structural dominants, and it seems inevitable that the vegetation will rapidly transition towards its pre-burn state. That vegetation, without intervention, is likely to include a significant and increasing component of woody weeds like exotic broom and gorse.

References

Gitay H, Wilson JB, Lee WG, Allen RB 1991. *Chionochloa rigida* tussocks 13 years after spring and autumn fire, Flagstaff, New Zealand. *New Zealand Journal of Botany* 29: 459-462.

Wardle, P & Mark, A. 1956. Vegetation and Climate in the Dunedin District. *Transactions of the Royal Society of New Zealand*. 84. 33.

This article was first published in Trilepidea No. 198 May 2020.

City Nature Challenge 2020: Ōtepoti/Dunedin April 24-27, 2020

David Lyttle

Last year Allison Knight and I went to Christchurch to participate in the 2019 City Nature Challenge. It was very enjoyable catching up with old friends and making new ones. It was a hectic few days that had many memorable moments. Our Christchurch hosts suggested Dunedin might like to participate in 2020 Challenge and so it came to pass that Kimberley Collins, John Barkla and myself formed a Committee to promote Dunedin's participation in 2020. Kimberley worked hard to get us registered. We were all set to go when New Zealand went into COVID-19 lockdown. This meant we needed to stay at home or close to it and remain within our bubble, so any group engagement or interaction - as had been the case at Christchurch the previous year - was not possible.

I was fortunate in that my bubble included my own property, my brother's farm with a patch of native bush, and approx. 1 km of road between them. My strategy was to record as many wild species as I could find over the over the four days encompassing the 24th to 27th May. I started in my garden with the goal of recording as many species as possible. I set the camera to record the images as jpegs rather than as RAW files which enabled me to upload the photos directly to the iNaturalist site and minimise the time spent on photo processing. I used a 105 mm autofocus macro lens which is really quite good for plant photography and is useful for grabbing shots of any insects and birds when the opportunity presents itself.

The first plant I photographed was the ubiquitous Californian thistle, *Cirsium arvensis*. I then worked my way through all the weeds in my garden: *Cardamine hirsuta*, *Spergula arvensis*, *Senecio vulgaris* and *Lamium purpureum* (that is bittercress, spurrey, groundsel, henbit for the botanically challenged). This by no means exhausted the list as I found plenty more weeds. I carefully photographed the seed heads of the two species of dock (*Rumex crispus* and *Rumex obtusifolius*) so my querulous iNaturalist colleagues could identify them correctly. However, at the time of writing, no one has yet confirmed the ID of my observation of the common nettle (*Urtica urens*). It must be bliss to have a nettle-free garden and be totally unfamiliar with this species. Next stop was Centre Road where I found hawthorn (*Crataegus monogyna*) which my forebears had brought from Scotland for hedging along with gorse (*Ulex europaeus*) which was not hard to find either. Road verges are a happy hunting ground for collecting observations with self-sown exotic trees (*Pinus radiata*, *Cupressus macrocarpa*, *Betula pendula*) and annual weeds (*Arabidopsis thaliana*, *Nemesia floribunda*, *Epilobium ciliatum*) that benefit from the periodic and haphazard application of herbicides by the DCC and its contractors. It was good to see a native species, the uncommon coastal sedge *Carex trifida*, spreading from my original planting and colonising a new niche in the process. At the end of Day 1 I had made 111 observations of 103 species (4 fungi, 2 insects, 95 plants, 1 bird, 1 protozoan).

On Day 2 I made a round of the old farm house sites. Plants from old gardens are tenacious survivors; bits were passed on, planted and often left to fend for themselves as the gardener had enough other tasks like milking cows to occupy her time. The remnants of these gardens that have survived the depredations of livestock are still present; *Geranium robertianum*, *Pentaglottis sempervirens*, *Hedera helix*, *Vinca major*, *Brugmansia sanguinea* and *Oxalis articulata.* The latter plant was known as shamrock. The shamrock has mystical significance in Celtic folklore and became a symbol of Irish identity in the 19th century. My forebears who were Scots treasured this plant and thought it brought good fortune so they gave it a place in their gardens; however somehow the name Irish shamrock became associated with a species of Oxalis which originated in South America. The true Irish shamrock is considered to have been *Trifolium dubium.* Another South American plant that enjoyed popularity in these old gardens was *Brugmansia sanguinea.* These day it enjoys more notoriety than popularity on account of its hallucinogenic properties. Once established it is almost impossible to eradicate. The day ended with 61 observations of 58 species (3 arachnids, 3 birds, 9 fungi and lichens, 43 plants)

Day 3 started with some plants growing in the garden; *Ranunculus acris*, *Dactylus glomeratus* and *Cardamine heleniae*. *C. heleniae* is a small native bittercress which has adapted to nursery pots and has become a troublesome weed in that context. Since it is

almost unknown in the wild Peter Heenan designated my garden as the type locality for the species when he described it in his revision of the genus in New Zealand. John Barkla told me that I have a responsibility to ensure its continued existence in my garden on account of it being the type locality. I am happy to assure John that notwithstanding anything I do, it is unlikely to disappear from my garden in the foreseeable future. By this time I was becoming bored photographing common weeds so I headed up the hill on a farm track to a small patch of native bush. Since that particular block has never been cultivated there are a number of small native herbaceous plants that survive on the turfy banks. Included amongst the plants I recorded there were *Nertera ciliata*, *Plantago raoulii*, *Epilobium brunnescens*, *Helichrysum filicaule*, *Lagenophora pumila*, *Acaena microphylla* var *pauciglochidiata* and *Geranium brevicaule*. The forest yielded numerous species of fern, several *Coprosma* species and most of the common local native broadleaved tree species. I found the tree nettle *Urtica ferox* flourishing in a macrocarpa plantation. Back home I walked up Centre Road and recorded the sexy pavement lichen, *Xanthoparmelia scabrosa* (it was growing on the pavement but was otherwise indistinguishable from all the other species of *Xanthoparmelia* as Allison pointed out when I asked her to identify it for me), a little *Crassula*, (*Crassula colligata* ssp *colligata*) and the usual complement of roadside weeds. A pair of paradise ducks (*Tardorna variegata*), a couple of abandoned roosters (*Gallus gallus* var *domesticus*) and an engaging little fantail (*Rhipidura fuliginosa* ssp *fuliginosa*) represented the sum total of avian observations for the day. Cabbage trees *(Cordyline australis*) are colonising the road verge beneath the power lines where birds perch so they are able to avoid hungry sheep and herbicide and flourish. I collected some fungal observations in my brother's eucalyptus plantation, only one of which (*Leratiomyces erthrocephalus*) was satisfactorily identified. The total for the day was 102 observations of 93 species (1 arachnid, 3 birds, 17 fungi and lichens, 72 plants).

Day 4. My recollection is that it rained in the morning, so I went out again in the afternoon with my point and shoot camera which is waterproof. I did a quick round of the garden recording anything I had missed previously. I found a nice patch of *Asplenium flabellifolium* tucked away on a stone retaining wall and several fungi including orange pore fungus (*Favolaschia calocera*) which is a recent arrival to the Dunedin area. By this stage I was snapping anything that grew or moved so an observation of *Deroceras reticulatum* was added to the tally (that is the common garden slug, the one that eats your lettuces). I went back up the hill to the bush crawling through a tangled thicket of scrub in search of *Melicope simplex* which I eventually managed to find. That was pretty much the end as the light was fading apart from the last observation of a *Trichosurus vulpecula* which made it 2 min 41 seconds before the midnight cut off deadline. The total for the day was 68 observations of 64 species (19 fungi and lichens, 2 invertebrate animals, 42 plants, 1 mammal).

I was not alone in participating in City Nature Challenge 2020: Ōtepoti/Dunedin. Collectively, 99 observers made 2512 observations of 840 species. The top five most frequently observed species were *Amanita muscaria* (41) followed by *Cordyline australis* (26), kereru (*Hemiphaga novaeseelandiae*) (25), fantail (*Rhipidura fuliginosa*) (21), tui (*Prosthemadera novaeseelandiae*) (17) and karamu (*Coprosma robusta*) (16).

The stats for all three New Zealand cities that participated in 2020 are available via the following link: https://inaturalist.nz/projects/city-nature-challenge-2020-new-zealand. The total number of observations for Dunedin was far fewer than Christchurch (7608 observations of 1400 species from 167 observers) but ahead of Auckland (2277 observations of 910 species from 219 observers). Thanks to all those observers who participated in Dunedin City Nature Challenge 2020 for a very creditable effort considering the circumstances.

Sagina procumbens *(Photo: David Lyttle)*

Lucy Cranwell, Leon Croizat, and the biogeography of Manawatāwhi (Three Kings Islands)

John Grehan

Manawatāwhi (Three Kings Islands) is a geographically insignificant cluster of islands less than 60 km north of Cape Reinga, with a combined area of only 685 ha. But even the smallest of islands, down to the size of rock-stacks, may be of regional or even global biogeographic importance. As exemplified by the Galapagos and Hawaii, the biogeographic structure of island life can be as broad and complex as that found in continental biotas (Heads 2012).

Fig. 1. Botanists Lucy Cranwell (left) and Lucy Moore (right) during an ecological field study at Maungapōhatu, Te Urewera, in 1932. Photo PH-1999-11-1, Auckland War Memorial Museum Tāmaki Paenga Hira. by Norman Potts.

The biogeographic patterns involving Manawatāwhi and surrounding islands (including New Zealand as a whole) led Croizat (1952) to identify them as remnants of a half-crumbled landscape of the southern Pacific. This geological interpretation is very similar to the subsequent plate tectonic model of extension and submergence leaving only New Zealand and New Caledonia with continental basements still above sea level in the southwest Pacific. At the time he wrote, Croizat's model was at variance with the prevailing belief that New Zealand and other south Pacific islands derived their animals and plants by accidental or stray dispersal from continental centres of origin. Few people were willing to consider a central role for geological mechanisms causing *in-situ* evolution. One of those rare departures came from the New Zealand botanist Lucy Cranwell.

Lucy Cranwell (Fig. 1) was a pioneering New Zealand botanist, best known for her work on fossil and subfossil pollen from the Gondwanan landmasses (Cameron 2000, Davis 2000, Sohmer 2000). In 1960 she was sufficiently impressed by what she had read in Croizat's (1952) *Manual of Phytogeography* to write to Croizat and inform him of her research interests. Along with the letter, she sent a reprint of her paper on Antarctic Tertiary microfossils (Cranwell *et al*. 1960), and she stated her agreement with Croizat's views on the importance of Antarctica for global biogeography. Croizat wrote back and enthusiastically endorsed her "excellent" paper. He also wrote: "My thought is quite clearly expressed, and it rings with yours in the sense that Antarctica of today is on the fringe of a great dispersal centre as you write,..". Cranwell then mailed some reprints of her work, including a report on the vegetation of Poor Knights Islands (Cranwell 1937). This paper included a distribution map of the fern *Todea barbara* on Three Kings, Poor Knights, Hen and Chickens etc., and Croizat wrote that these islands:

> "…are a point of utmost biogeographic interest both for plants and animals. They are a particularly striking example of horstian station, and you will find the Three-Kings duly mentioned, for instance, in the Geographic Index of *Panbiogeography*..."

To Croizat, these small islands were not simply footnotes to biogeography. Instead, the distributions connecting them, but absent on the mainland, exemplified an important biogeographic pattern that he interpreted with reference to geology; one belt of crust had sunk (as a graben), leaving another belt raised (a horst). On the nature of horstian distribution Croizat continued:

> "Horstian dispersal is not so hard to understand against a background of geology. When a land 'slices off' in the direction of the sea, the part which is 'sliced' largely disappears, leaving behind but an

> insular chain. On this insular chain you will find forms which are connected with the mainland yet have had time enough to evolve on their own, curious relics no longer found in the mainland."

As an example, he discussed the fern *Todea barbara* as mapped by Cranwell (1937):

> "On the very basis of your Fig. 2, the distribution of *Todea barbara* is shown to run an almost straight line between Twilight Bay [by Cape Maria van Diemen] and Poor Knights, that is to occupy a 'front' narrowly facing the sea of which Poor Knights are a highlight. It is a case of horstian distribution all right, and a peculiarly interesting one at that because only one island (Poor Knights) happens to be emphasised...You may perhaps call attention to the fact that the Three Kings Group has been recognized throughout my work as a first-rate biogeographic center, and as they are not yet a "national park" they surely ought turned into one." [The islands were classified as a Nature Reserve in 1956].

Croizat identified the evolutionary significance of these islands' biotas through analysis of their biogeographic origin and connections, rather than their local uniqueness, which is the usual focus of conservation in New Zealand (Heads 2017a, Grehan 2020). By referring to the horstian characteristics, Croizat was identifying a geological-biological correlation in which the submergence of land, other than its high points (now forming islands), results in some island taxa showing closer phylogenetic connections to other islands than with the nearest mainland. The *T. barbara* example discussed by Croizat and Cranwell was based on documentation of the species distribution at that time, but its mainland range is now known to be more extensive. An example of a horstian distribution for Manawatāwhi is the species *Nestegis apetala* (Fig. 2) that is also present on Norfolk Island, the North Island at Whangarei, and islands offshore of the North Island (Heads 2017a).

Croizat's emphasis on the role of subsidence was later included by Cranwell in an article on endemism on Manawatāwhi in which she noted Croizat's (1958) stress on the relict or "horstian" component (Cranwell 1962). Cranwell recognized that there was a debate about the origins of the islands' biota – relict origin or recent stray dispersal – and she expressed the hope that her contribution would at least add fuel to the "zestful fire". She argued that the systematic relationships of the endemic plants were inconsistent with their origin as chance waifs and strays from the New Zealand mainland. She noted, for example, that the Three Kings fern *Davallia tasmanii* was the only temperate outlier of a genus that she considered to have Tethyan affinities (This fern is now treated as *D. tasmanii* subsp. *tasmanii*, the sister group of *D. tasmanii* sunsp. *cristatus*, in Puketi Forest of Northland (Konrat et al. 1999)).

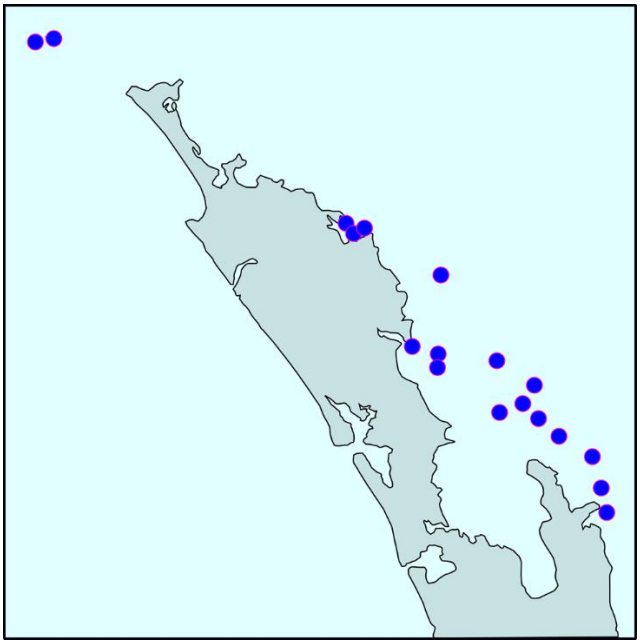


Fig. 2. Horstian distribution Nestegis apetala *(Oleaceae) present on the mainland only at Whangarei. Norfolk Islands record not included. From Heads (2017a: fig. 5.3).*

The endemics that Cranwell (1962) referred to were terrestrial organisms that might be attributed solely to the formation of the sea strait between Manawatāwhi and the North Island, but this would not explain the presence of endemic marine taxa, or why other widespread marine organisms are absent. This suggests long-term biogeographic differentiation caused by major tectonic change. As intimated by Cranwell (1962), there are also Three Kings endemics that have sister groups that are widespread rather than just local species in Northland (Buckley & Leschen 2013, Heads 2017a). Again, this conflicts with the idea that the insular groups simply dispersed from the nearest mainland. For example the Manawatāwhi endemic tree *Pittosporum fairchildii* has a

widespread, diverse sister group made up of 13 species distributed across North, South, Stewart, and Kermadec Islands (Fig. 3). This indicates that vicariance between the Manawatāwhi species and its sister group represents an early phylogenetic break in the geological history of New Zealand, rather than a recent dispersal from Northland.

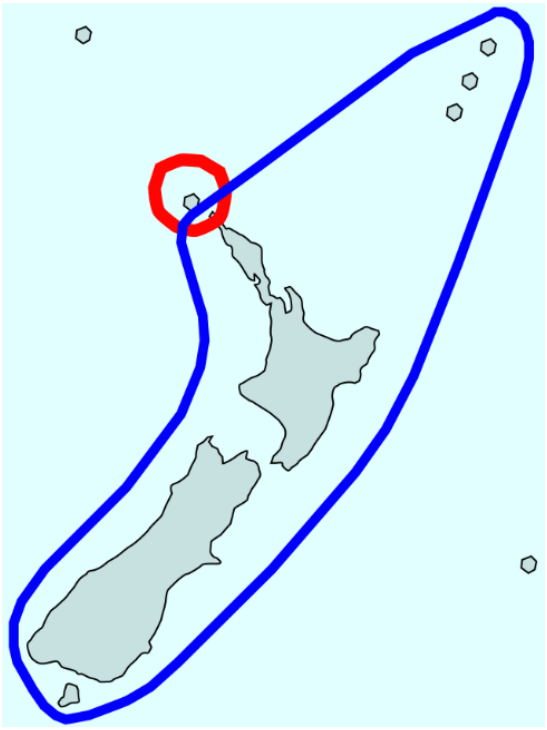


Fig. 3. Distribution of the Manawatāwhi endemic Pittosporum fairchildii *(red outline) and its sister group (blue outline) (Heads 2017a).*

In an even more dramatic example, the endemic Manawatāwhi beetle *Phanodesta manawatawhi* has a sister group that ranges across New Zealand, including the Three Kings Islands and Chatham Islands, and also the Juan Fernández Islands on the other side of the Pacific (Fig. 4). The short distance separating Manawatāwhi from the New Zealand mainland does not explain the origin of the beetle on Juan Fernández, which is also an eastern biogeographic boundary for groups such as *Haloragis* and *Coprosma* in the narrow sense (Heads 2017b). The distribution of the *Phanodesta* group is consistent with vicariance of a widespread trans-Pacific ancestor in which the initial phylogenetic break occurred in the vicinity of the Manawatāwhi region.

Other Manawatāwhi groups have immediate affinities that do not involve mainland New Zealand at all. The Manawatāwhi earthworm '*Megascolides*' *tasmani* is the sister group of *Digaster lingi* from Queensland (Fig. 5). This Australian relationship is also seen in the Manawatāwhi species of the beetle *Scabritiopsis* and three lichen species (Heads 2017a). A Pacific island relationship is seen in groups such as the tree *Streblus smithii* of Manawatāwhi which belongs to a clade with three other species, one each in the Solomon Islands, Tahiti, and Fiji/Samoa/Niue/ Cook Islands. This whole complex is the sister group of *S. heterophyllus*, widespread on the mainland but not on Manawatāwhi (Fig. 6).

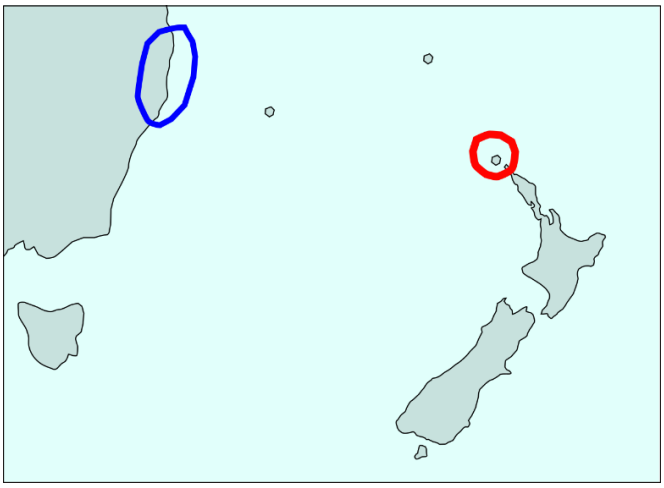


Fig. 5. Distribution of the Manawatāwhi endemic 'Megascolides' tasmanii *and its sister species* Digaster lingi *from central eastern Australia (Heads 2017a).*

Another island relationship is seen in the Manawatāwhi endemic tree *Pennantia baylisiana* and its sister group, *P. endlicheri* of Norfolk Island. Together these species are sister of the mainland New Zealand *P. corymbosa* (Fig. 7). This distribution is consistent with a widespread ancestor ranging over the New Zealand –

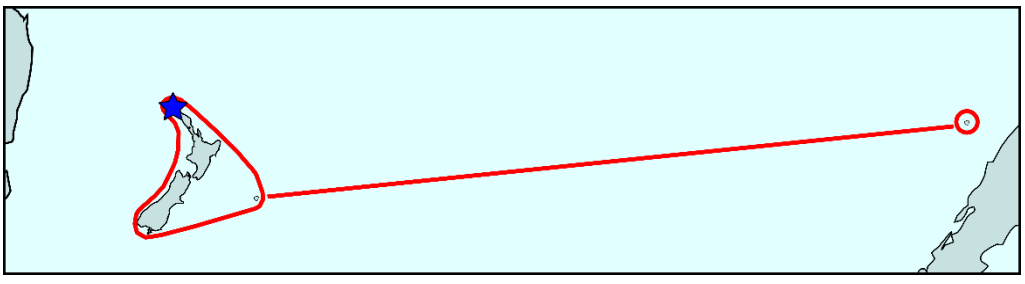


Fig. 4. Distribution of the beetle Phanodesta manawatawhi *endemic to the Three Kings Islands (blue star) and its sister clade ranging across New Zealand and Juan Fernández Islands (red line) (Leschen & Lackner 2013).*

Manawatāwhi – Norfolk region. The initial phylogenetic break occurred, not between New Zealand and the Three Kings, as might be expected by geographic proximity, but between the mainland on one hand and Three Kings plus Norfolk on the other. The break between Manawatāwhi and Norfolk Island corresponds with extension and subsidence along the ridge (Heads 2017a).

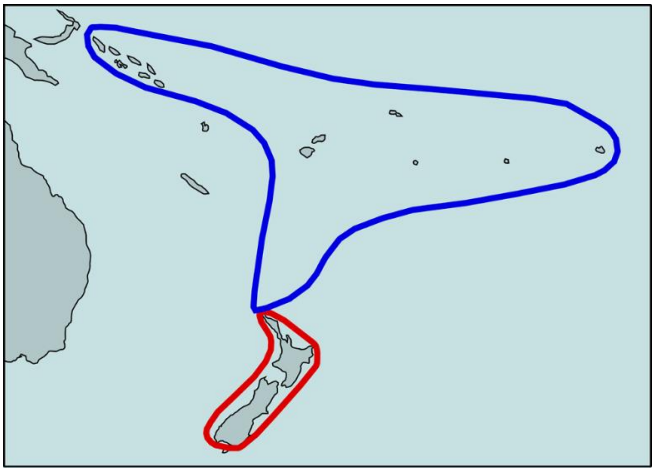


Fig. 6. Distribution of Streblus smithii *of Manawatāwhi plus its immediate relatives (blue line), and the sister group* S. heterophyllus *of mainland New Zealand (red line) (Heads 2017a).*

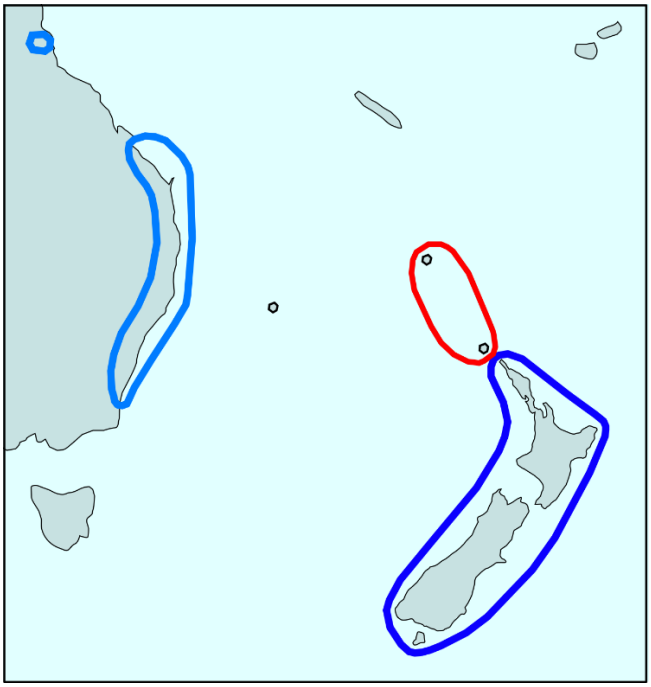


Fig. 7. Distribution of Pennantia: P. corymbosa *(dark blue line),* P. baylisiana *(Manawatawhi),* P. endlicheri *(Norfolk Island) (red line), and* P. cunninghamii *(light blue line) (Gardner & de Lange 2002).*

The islands of Manawatāwhi include rocks of the Mount Camel terrane, which is also exposed at 90 Mile Beach, Mt Camel (Houhora Harbour), Karikari Peninsula and Whangaroa. The distribution of the terrane indicates a tectonic connection between Manawatāwhi and Northland. The terrane hosts a distinctive biota with local endemics at various localities, including Manawatāwhi. The land snail genus *Cytora* includes two species endemic to Manawatāwhi while on the mainland is a localized species each at Mount Camel and Karikari Peninsula. A more localized connection with the Mount Camel terrane is seen in the fern *Davallia tasmanii* (noted earlier), present on Manawatāwhi and Puketi forest, Northland, just 12 km south of Mount Camel terrane exposures (Fig. 8).

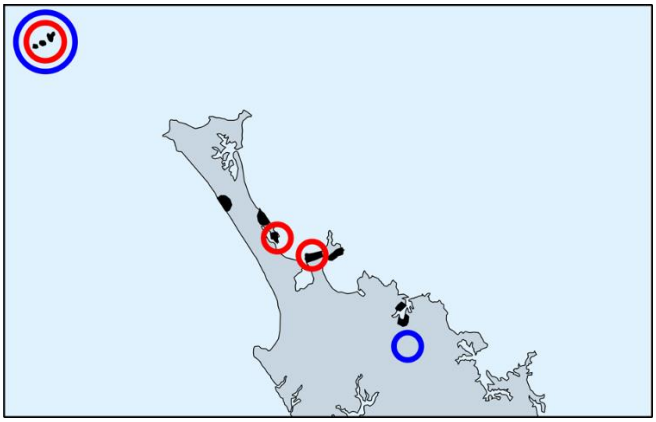


Fig. 8. Distribution of Mount Camel terrane exposures (black shading) (Heads 2017a) and associated local endemics in the land snail genus Cytora *(red circles) on Manawatāwhi* (C. hirsutissima, C. filicosta), *Mount Camel* (C. houhora) *and Karikari Peninsula* (C. parrishi), *and the fern* Davallia tasmanii *(blue circles). Distributions from Konrat & Braggins 1999, Marshall & Barker 2007, and see also Heads 2017.*

The Mount Camel terrane is largely made up of Cretaceous to early Cenozoic mudstones and sandstones derived from a terrestrial source. It also includes Late Cretaceous continental lavas and Miocene intrusions that may have formed along an Eocene-Oligocene subduction zone at the Loyalty-Three Kings Ridge. Geochemically similar lavas in New Caledonia were erupted during continental arc volcanism along the New Zealand-New Caledonia margin of Gondwana about 101-103 Ma. This was at a time when New Zealand's tectonic regime was changing from one of compression (and mountain building) to one of extension (and the formation of rifts and ocean basins).

Collectively, the biogeographic relationships of Manawatāwhi documented by Buckley & Leschen (2013) and Heads (2017a) support Cranwell and Croizat's contention that the islands' biodiversity involves the geological history of the islands and the submerged Three Kings Plateau (covering 10,000 km^2). The terrane and distributional correlations are consistent with these islands having inherited portions of the East Gondwana biota before most of the region crumbled and was submerged with tectonic extension and erosion. Although Buckley and Leschen (2013) regarded the diverse distributional relationships of Manawatāwhi with other Pacific regions to be 'extraordinary for a small group of islands within eyeshot of the New Zealand mainland', similar, far-flung biogeographic relationships have been well documented for many islands around the world (Croizat 1952, 1958, Heads 2012, 2017a, Grehan 2017). They are a consequence of differentiation in ancestral communities that are already biogeographically complex. The biogeographic and tectonic evidence for a Mesozoic origin of the Manawatāwhi biota is also consistent with molecular dating. The oldest molecular clock age found by Buckley and Leschen (2013) for a Manawatwhi endemic was 24 Ma, but this was a fossil calibrated minimum estimate and so it does not contradict an earlier, Mesozoic origin.

The biogeographic connection between the Manawatāwhi and northern New Zealand parallels Māori spiritual beliefs, in which the spirits of the deceased descend from Cape Reinga into the underworld through the sea. They travel underwater to Manawatāwhi before climbing out onto Ōhau (West Island) to bid their last farewell to Aotearoa, before returning to Hawaiki of their ancestors. In this context the scientific and spiritual understanding of Manawatāwhi is the same – the connection between Manawatāwhi and mainland New Zealand is under the sea, over a land now submerged. Both the biogeographic and Māori understanding of Manawatāwhi recognizes that geographically separated localities are connected. Current government biodiversity programs do not recognize this, as they do not incorporate the biogeographic structure of biodiversity. But since science is based on the principle of objective evidence I remain hopeful that conservationists will come to appreciate that local biodiversity does not exist in isolation as a unique phenomenon, but as a network of connections as recognized in Māori tradition.

Robin Craw and Michael Heads first drew my attention to Lucy Cranwell when I was preparing an article on the history of New Zealand panbiogeography (Grehan 1989). Later, my wife and I contacted Lucy, and over the next decade we continued to have regular conversations about her involvement with Croizat and biogeography. Lucy was pleasantly surprised to learn about the renewed New Zealand interest in Croizat, and she expressed her support for those efforts. Although she had not worked directly on biogeography for a considerable time, she was quick to appreciate the issues and challenges involved with supporting Croizat's work. Soon after her final visit to New Zealand she fell ill, and in 2000 she passed away. We had enjoyed our conversations with her, but for such a short time. The present seems as if it will last forever, until it is gone. In her acknowledgment of Croizat's work, Lucy Cranwell was indeed a pioneer in biogeography who stepped up to the frontier of the discipline – from the shores of Cape Reinga to the islands of Manawatāwhi.

Acknowledgements

Thank you to Susan Tolich (Auckland War Memorial Museum Tāmaki Paenga Hira) for assistance with photograph of Lucy Cranwell.

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Meeting and Trip Reports

Sexy Lichens, a talk by Allison Knight, 10th June 2020

Melissa Hutchison

Allison took us a on a richly-illustrated journey into the fascinating and little-known world of lichens. These often-overlooked organisms are the result of a symbiotic association between a fungus and a photosynthetic partner (photobiont), either a green alga or a cyanobacterium (or sometimes both). In other words, “lichens are fungi that have discovered agriculture”. Allison described the evolutionary origins of lichens, their unique chemical compounds, and their importance as ecosystem pioneers, carbon sinks, indicators of atmospheric pollution and climate change (bio-indicators), and habitat for fauna. Lichens come in a variety of different life forms, and can be broadly categorised into foliose, fruticose, crustose, squamulose, filamentous, and leprose forms. Allison took us through the basics of how to identify lichens in the field according to their habitat (urban/disturbed, forest, coastal, and alpine environments), where they grow (e.g. on the ground, bark, rock, or artificial substrates), and their morphological characteristics (e.g. life form, photobiont type, colour, reproductive structures).

New Zealand has exceptional lichen diversity, with more than 2030 species recorded (almost as many as indigenous vascular plants) – about 10% of the world’s lichen species (in only 0.18% of the land area). Currently, 275 species are classified as Threatened or At Risk by the Department of Conservation, but very little is known about the distribution and abundance of most of our species, with 1107 species being classified as ‘Data Deficient’ (https://nztcs.org.nz/reports/55). There are, no doubt, many more species waiting to be discovered and formally described, but there are not enough lichenologists to go around!

One of our native lichen species received international media attention last year because of its potential as a Viagra substitute. For a short time, Allison was overwhelmed with requests from journalists desperate to hear more about New Zealand’s own ‘sexy

pavement lichen' (*Xanthoparmelia scabrosa*). Despite their obvious appeal, the message is clear: please don't lick the sexy pavement lichen!

A striking display of lichen diversity on a twig in central Auckland – Dirinaria applanata, Parmotrema (perlatum), Ramalina celastri, Teloschistes chrysophthalmus, T. sieberianus *and* Usnea cornuta *(Photo: Marley Ford).*

Silken harp chords and the green choir, a talk by James Crofts-Bennett, 8th July 2020

Alex Wearing

A wet night did not deter people from attending an informative, interesting, and intriguing talk on the diverse and often complex relationships between spiders (Arachnid order, Araneae) and plants.

New Zealand has 1134 described and about 900 undescribed spider species, with 90% endemic and 10% introduced by people (directly and indirectly) or due to natural wind-distributed introductions[1]. There is much work to be done in the study of New Zealand spider ecology. To date there has been a focus on popular species or special interest species (e.g. fishing spiders, *Dolomedes*).

People tend to have extreme reactions about spiders. Most are negative, but spiders are undeniably a factor in people's lives and interactions with soils, plants, and animals. The global annual consumption - of mostly insects - by spiders has been estimated at between 400 to 800 million tons. Many of the insects eaten are regarded as pests by people. The production of silk is probably regarded by many people as the supreme achievement of spiders. Silk is used in most aspects of spider life, from prey capture to ballooning. As spiders wander through plants they move upward and in so doing detect apical electrical fields, inducing ballooning behaviour.

Spiders are important in agriculture. In China, farmers use straw refuges doing periods of farm disturbance to preserve spider populations. Spiders can be significant biological control agents. They can also be used as environmental bio-indicators. Silk has been chemically analysed to determine local air quality.

Interspecific mutualistic relationships are a fundamental part of life, but they are not always obvious and may be very cryptic. Spider-plant associations are mutualistic if they facilitate spider protection (shelter) and nutrition (access to insect prey) and improve plant fitness (protection against herbivores[2]). Some plants produce floral volatiles to attract spiders. The relationships between spiders and plants are often difficult to discern. An example of difficult to discern relationships are those that occur between golden speargrass (*Aciphylla* sp.) and an undescribed species of spider.

Spiders are non-randomly distributed through vegetation. They are strongly influenced by plant structure, which creates a predatory network. Plant structure has a stronger impact on spider populations than prey availability. It also provides habitat for specialist spiders. The spatial distribution patterns of different species of spiders are often associated with particular types of plants, and/or particular plant species. The size and density of preferred plant species can also affect spider distribution, diversity and abundance. An increase in the diversity and structural complexity of plants results in an increased diversity and structural complexity of spiders. An Australian study showed that mistletoes and their host plants had distinct invertebrate populations.

There was an interesting account of spiders and plants research on the 'green roof' of the William James Building, Department of Psychology, at the University of Otago. This building was completed in 2010. The 3000 plants present include tussocks and other grasses, and species of *Coprosma*, *Pimelea*, and *Libertia*. In 2010, eight individual spiders were counted. In 2018, 97 individual spiders were counted, from 20 different species. At this site, spiders did not

exhibit a preference for particular species. Vegetation type was not as important as overall vegetation presence.

As human development shrinks habitats into isolated patches, ongoing and increasing species impoverishment is the likely result. With respect to the distribution, diversity, and abundance of spiders, fine-scale landscape features assume increased significance. The distribution patterns, diversity, abundance, and demographic and/or size structures of plants, whether in relatively unmodified, production-oriented, or urban landscape can have significant consequences with respect to the continuing sustainable presence of spider species and populations. The talk by James Crofts-Bennett effectively reinforced the notion that we have to see beyond the (more visible and more easily counted) plants to the prospects of other species, including the "silken harp chords" of spiders.

Notes

1.Paquin, P. *et al*. 2010. *Spiders of New Zealand. Annotated Family Key and Species List*. Manaaaki Whenua Press.

2. Spider-plant relationships can involve costs and benefits. For example, spiders can consume or deter pollinators.

The Tavora Investigation.

James Crofts-Bennett, Inquiry Agent.

Transcript of reports leading up to and regarding Tavora incident.

Saturday 11th of July 2020.

Group of interest gathered outside the University's Botany department, appropriate considering the Society's alleged interests. Setup was a pain in the ass, infiltrated the local entomology interest group to help establish cover story. Picked a suitable but removed interest to justify lack of botanical knowledge; spiders seemed like a good cover. Did some preliminary research regarding how spiders and plants might interact. Just as well, they asked me to present a seminar on it. I managed to scrape something together and passed off a shaky presentation as nerves. We've entered winter, online material suggests spiders should be rare during the winter period. Hope so, I'm not sure how long I can keep up the charade. They've got an ex-cop on staff and he picks up on these things fast. They want to set out around nine in the morning and there is still evidence of ground frost even in the city. Should work in our favour if what you're suggesting we will find out at the site is true. I still haven't pegged a distinct leader for the outfit. I have my suspicions of course, got it narrowed to one of four based on the groups in field interactions.

- The Ex-cop, he keeps a healthy distance from the direct leadership role, my closest bet so far. I also think he suspects me (it's crucial we wrap up before summer).
- The Ranger, more active in a leadership role. Very friendly, it's been difficult balancing healthy interaction and keeping my guard up. May be operating in conjunction with the Ex-cop. If I'm not careful he's gonna out me with the spider talk.
- The Scientist, also active in the leadership role. I think she's officially considered chair of the society, works in tandem with the ranger. Online bio places her in ecology and conservation. Dangerously broad topic, will have to watch what I say.
- The Botanist, quiet fella. Knows more than he's letting on, has this quiet laugh when I'm trying to look busy in field. Despite keeping to the background, I've seen all society members defer to him regarding infield knowledge. A real wild card.

Of course, this is idle speculation. There are other society functionaries that work in conjunction with the potential leadership caste, the immortal hydra and all that. No point thinking too hard about it at this point. They're organising to transport, I'll catch a ride with the Ex-cop, hiding in plain sight yeah?

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Trip out was uneventful, we ended up with two students and spent most of the ride engaging in idle banter. The group is hitting up a reserve site, Tarova or something like that. Sun was out but the proximity to the beach kept us fresh with the breeze. There had been recent showers and the ground was treacherous with mud and frost. No one could quite give a straight

answer regarding what we should expect at Tarova. The Ex-cop corrected me on the name.

“Tavora, it’s pronounced Tavora”.

I made a mental note to continue referring to the place as Tarova. Place was constantly shifting apparently. We were to expect anything from native coastal plants to chartreuse fields of marram grass. Apparently, the coastal area was home to penguins or something. The local authority had replaced pastureland with shrub and trees to offer proper sun cover. I had a quick poke around the parking space, nothing particularly notable.

“Most people typically look at the front of the signs” the Ranger noted with a smile. Caught off guard, I fired off the cuff.

“It’s these man-made structures, introduced spiders love them”.

He didn’t pursue further, smoothly done. The student acolytes noted, with some dismay, that dogs would be destroyed if brought beyond the threshold of the reserve. Innocent enough, I guess, but I had to remind myself that students attracted to the society included people with an interest in ecology. Ecology students formed a prominent cult with the university culture, perhaps best kept at arm’s length (and downwind).

I decided to forge ahead towards the shrub fringe. The society had a curious autonomy between members. They quickly distanced themselves from each other as they pursued personal interests. This, inconveniently, also formed a surveillance web that I couldn’t escape. I busied myself with a cabbage tree; previous experience had taught me that the layered leaf blades made a sure-fire way to find spiders. There were plenty of webs and empty egg sacks. I stumbled upon a web full of spider-lings. I quickly called the Scientist over, quick to reaffirm that I was, indeed, a spider scientist. It occurred, mid beckoning, that it was difficult to actually identify baby spiders to a species. I stumbled and, panicking, quickly tried to extract some context from the scene. I recalled reading that invasive house spiders made thick, messy webs like the one I had found.

“*Badumna longinqua*?”

They did kinda look like the baby spiders my windowsill was currently nursing. I couldn’t get a read of the Scientist, but things seemed to have gone over without incident. We continued on towards the beach proper.

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It was a murder scene. The victim had been exposed to the elements for quite some time, judging by the decay and rot. I was grateful for the frost, I felt like it kept the worst of the stench at bay. I tried to pick through some of the nearby driftwood for evidence, but my foot caught the frozen rot and smeared it broadly as I slipped. As the rot was ruptured, a writhing carpet of vermin was exposed. Kelp flies and amphipods lazily wiggled as the sunlight spurned them. The victim had recently bleached her hair marram blonde, though some darker Pīngao roots were present if you could stomach closer inspection. The group coalesced at the beach side. No one seemed to comment on our grim discovery, suspicious. I feel like there are some details you left out when you put me on this case. I put aside my feelings on the matter and busied myself on a large rotting driftwood log. Small webs lined the inner crevices, but no spiders were apparent. I tore at the weak wood as I investigated. The Botanist took note, commenting on my destructive methods.

“I’m putting it back” I said sheepishly, placing the fragments back carefully. No comment, I couldn’t get a read on this guy.

At this point, the crew split into two groups. The primary group consisting of most of the attending society members and then the Ex-cop’s group. I was alarmed, thinking myself discovered and quarantined from the inner cloister. Keeping calm, I made to regroup with the society. The beach side investigation was uneventful, a sealion gave us a careful once over before dismissing us. We made for the cliff side. At this point I had to make a decision; the group made straight for the cliff tops, but the Ex-cop had made for the cliff face. I didn’t want to risk leaving anyone alone with the body so I decided to lag behind and ultimately follow the Ex-cop. Mostly uneventful, he noted that birds had been picking through the decomposing flesh. Indeed, the expanse of brown mush was punctured with beak sized holes. I didn’t want to linger on the visual.

"A bloody tragedy" he lamented.

I nodded but didn't speak up. This was the first time anyone in the group had opened up to me about the incident. I waited for more, but he left his line hanging in the sea breeze. I regretted my earlier lack of trust, but had to stow it, sympathy could wait until we had a verdict. We made to catch up with the group.

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Leaving the grisly scene behind us, the trek up through the trees and shrub to the cliff tops was refreshing. We stopped and chatted about plants and mushrooms extensively. I attempted to avoid spiders lest he further suspect me. Inevitably I had to offer something. I had painted myself as an expert and "Well it's winter" was wearing thin.

"I noticed on the way in, nursey webs were rather prevalent."

"They always are, it's the first species anyone notes."

Ouch, he was sharp. I quickly laid out an observation. "True, but the webs are in good condition despite the frosts we've had. Some look like they've been re-woven as soon as yesterday. It's remarkable considering how cold it's been."

He didn't really give me anything from that, I guess I had made myself sound sufficiently spidery? If he suspected, he didn't let on.

We continued along the cliff top crest, reuniting with the group who had stopped to rest. I took a break, striking up conversation with the Scientist. I mentioned the kelp sitting just under the surface of the sea. It occurred to me that I should attempt to appear less two-dimensional, so I commented about the kelp being a good octopus refuge (I had read it multiple times growing up, had to have some truth to it?).

"Oh you're interested in Octopuses too?" Careful, don't overextend yourself.

"Yeah, pretty much anything with eight legs."

Smooth. She mentioned a recent seminar on cephalopods, damn this could be bad. "You watch it? They were talking about that one octopus mom."

Come on, think dammit. A memory came to me. "Oh that one that spent four years rearing her eggs?"

"Yeah that's the one!"

From the jaws of defeat I tell you. I had read about that on Facebook of all places, several years ago. Unwilling to push my luck further, I decided to take a lead position for the next part of the trip. Once again, mostly uneventful, I began to suspect this was due to my lack of expertise. The Ex-cop and an advanced student stopped to discuss yellow flowers and dandelions, sounded low level enough, might as well learn something while I'm here. I contributed that I had been pronouncing it dan-dilly-on, the Ex-cop's eyes were suddenly alive.

"Keep an eye out for a dandelion, I'll show you where the name comes from."

At that point I realised that I could not actually identify a dandelion in field. Thankfully I did not have too, the Ex-cop's eyes were sharp and he found his example. Apparently, the name's French, teeth of the lion or something. He pointed out that the leaves edge looked like fangs. I held on to that just in case anyone asked me any questions regarding the trip.

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The trip was coming to a close and I hadn't got any closer to a conclusion. I knew that we had witnessed something awful, anyone visiting that beach could have told you that. As it stood, everyone was just as much a suspect as when we had started. I hadn't learned much past dandelion leaf morphology. I had noticed that the trees had taken on some strange anthropogenic behaviours. Many had adorned themselves with rough, burlap sacks around their roots (initially mistaken for a lichen). As we pressed further, we found some trees had managed to drape themselves in metal sheets. One of the trees had a mass of foreign foliage near its centre. This green mass had a mesmerising effect on the society, drawing them into some form of worship. I heard murmurs about mistletoes, and something called Tupeia. I filed this term away for future reference. We made our way back to the cars; the heat of the sun was becoming overbearing despite the cold start to the day.

To review the day's events. We had made it to the site without incident, your tip about the body was correct

(I'll have some questions for you about that later), dandelions have leaf fangs and I haven't gotten any closer to cracking the Botanical Society of Otago. As I sit here in the car, trying not to burn my mouth with this 100% cocoa chocolate, I can see two magpies dog fighting a swamp harrier. I briefly consider augury. Could there be two heads? I note that one magpie occupies the hawk's attention while the other strikes from above. Had the Ex-cop occupied my attention while the other head furthered the Society's goals? Probably not, I suspect I was just sleep deprived and disappointed by the lack of spiders.

James Crofts-Bennett, Inquiry Agent, signing out.

Members Night, 9th August 2020

Gretchen Brownstein and John Barkla

For our August members meeting we had a small and cheerful 'Zoom' gathering to share our botanical themed finds and things of interest. Angela started by showing off her beautiful botanical knitwear – a Raglan pullover with a small sprig of foliage adorning the neck band and sleeve cuffs (see the pattern book 'Botanical Knits 2' by Alana Dakos). Gretchen shared some of her amazing willow basket weaving creations and spoke of the properties of various willows. David Lyttle gave us a virtual tour of his garden, spanning the range from early flowering purple crocus to the little white flowers on common shepherd's purse (*Capsella bursa-pastoris*) and the weedy native *Cardamine heleniae* (David's place is the type locality).

Peter Johnson did a whimsical botanical-year-in-review power point. He brought back pre-covid memories of large gatherings (including a Manapouri event with a young Alan Mark) and shared food. Lala Frazer shared a photo of the shrubby daisy *Olearia bullata* with its conspicuous wrinkly leaves. Only a single plant of the species was known to grow wild on the Otago Peninsula but more have now been propagated through cuttings. These are being established at new Peninsula sites. Jean Bretherton joined us from Wellington and shared her purple flowering orchid hoping to find a name for it. The group didn't disappoint and quickly settled on the Australian pink rock orchid *Dendrobium kingianum*.

John Barkla shared a dangerous new weed find - *Euphorbia paralias* which was only known from three places on the North Island's West Coast prior to his find on the West Coast of the South Island. It's a serious weed in Australia and takes over dunes once established, so needs to be reported to MPI if spotted. To close the session, David gave part 2 of his virtual garden tour, including an early flowering rata (*Metrosideros umbellata*) that has been flowering since the end of June, and great examples of three flowering *Sophora* (*S. microphylla*, *S.* aff *chathamica* and *S. molloyi*). It was a great wee virtual gathering but hopefully next time we can do it in person.

19th Annual Baylis Lecture: Name changes among New Zealand ferns the good, the bad and the ugly? Dr. Leon Perrie, Curator of Botany at Museum of New Zealand Te Papa Tongarewa, 16th September 2020

Duncan Nicol

Dr. Leon Perrie opened with a warning of ferns, ferns, ferns. Dr. Perrie is a fern and lycophyte specialist, so this warning of excluding our beloved flowering friends was no surprise. The talk never felt overwhelming with our flowerless relatives and, instead, Dr. Perrie was able to cover broad taxonomic ground using ferns as a platform for discussion. Focusing recent updates in fern names, Dr. Perrie showed us the many avenues and decisions taxonomists can take when confronted with evolutionary findings.

Dr. Perrie warned of controversy. But, if I am not mistaken, some of the most interesting scientific literature is in the controversy. To give a few examples: the postulated luminiferous aether to explain the propagation of light; the competing hypotheses to explain the origin of the moon; the many schools of theoretical physics developed in order to interpret (or not) quantum phenomena; the

contribution of selection or mutation, or both, to explain evolution; the different assumptions used to develop explanatory models of biogeographic patterns in panbiogeography and phylogeography; and, may I remind the reader, it was only a decade ago when everyone "hated" astronomers for similar nomenclatural reasons, where the recognised-by-minority definition of a planet resulted in the Pluto controversy. As a member of the scientific community, controversy is most welcome.

Unlike the facts and hype that make it to headlines of discovery, controversy is where scientists are still grappling with the unknown. As one of these practitioners, Dr. Perrie made a strong case for the need to be in communication with the public and end-users. It has been a bumpy ride for the relationship between the community and taxonomists. Dr. Perrie claims many of those uneasy bumps could have been avoided, including orchid and fern 'trauma' which had no benefit for either the practitioners nor the community. Without a thread linking knowledge-production to public understanding, scientists tend to science for the sake of science. The community may get dragged along on a nomenclatural rollercoaster. An interesting idea and one that reminds me of the advent of postmodern art, a style created and developed solely for the enjoyment of those within its sphere, leaving much consideration for public input and community interest behind. It is as if taxonomy, and perhaps knowledge more generally, should be calibrated or constrained to meet the standards of other scientists and at the same time meet the needs of the community.

To avoid a similar course for taxonomy, Dr. Perrie advocated for a balanced taxonomic approach. Nomenclatural changes are required to remain consistent with evolutionary understanding, but the approach to updates and changes ought to be done with the consideration of the wider community. Monophyly was a hot topic in this discussion. This is the concept of a group of entities containing all and only all those entities of a common ancestor. In an evolutionary tree, a monophyletic group is one that contains all descendants from any particular point of branching. Once shown on a diagram as Dr. Perrie did, this concept is very straight-forward. So what is the issue? Well, taxonomy has a history extending back to Linnaeus in the 18th century but it was not until the mid-20th century that evolutionary considerations were incorporated into naming organisms. Many of the names that we have inherited do not meet current evolutionary understanding and criteria. These names potentially stretch across lineages where they contain relatives not from a common ancestor. These names are not evolutionary consistent, are unscientific, and therefore need updating.

Dr. Perrie showed that there were a number of options open to a taxonomist when confronted with names inconsistent with evolution: (i) retain the names, thereby disregarding science and evolution for naming organisms; (ii) group all lineages which need updating into one name; (iii) provide new names for lineages which need updating. Option (ii) is commonly known as 'lumping' and (iii) is commonly known as 'splitting'. Dr. Perrie claims (i) is unacceptable for any taxonomist and that a choice between (ii) and (iii) should not be made by being in the 'lumping' club or the 'splitting' club, but instead should be made based on the amount of change. The best decision for other taxonomists and the public, Dr. Perrie claims and advocates, is the one that reduces the amount of change needed in order to meet the criteria of monophyly. This sounds like a balanced position as it requires the public to understand and accept the need for change as we explore Papatūānuku but it compensates by aiming to retain established usage. In this sense, Dr. Perrie described a feature of this naming process as primarily seeking nomenclatural stability.

Although evolutionary consistent nomenclatural stability was advocated by Dr. Perrie, he also presented the idea of taxonomic freedom. Anyone has the choice to name an organism or group of organisms as they please. He added a caution of responsibility to this idea where one should consider the audience, purpose, and meaning for the particular choice of name otherwise accurate communication about those organisms or groups of organisms could quickly deteriorate with no common usage between anyone.

Dr. Perrie presented a thought-provoking and interesting talk. It was well received and generated lots of discussion afterwards and probably for weeks and years to come.

Botanical Society of Otago

Patron: Audrey Eagle

Website: http://www.bso.org.nz

Email: bso@otago.ac.nz

Committee 2020

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Buttons for botanical pundits – still available at BSO meetings

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