BOTANICAL SOCIETY

OF OTAGO

NEWSLETTER NUMBER 95

FEBRUARY 2022

BSO Meetings and Field Trips February – June 2022

9th February 2022, 5:30 pm: A Vegetation Map for Dunedin City. Speaker: Richard Ewans, Biodiversity Advisor, Dunedin City Council. In 2019, Dunedin City Council commissioned a vegetation cover map for Dunedin City which was completed in 2020. The map provides a detailed picture of vegetation cover across Dunedin City that compliments and enhances data sets from regional and national agencies. Together this information will be used to identify priority areas for ecological restoration and protection, and for district-wide monitoring of the extent of indigenous ecosystems to support improved outcomes for indigenous biodiversity in the city. I will give an overview of the map and its potential utility for a range of users, show how the map is an improvement on what was previously available, and describe some of the limitations to be aware of when interpreting or using the map and underlying data.

12-13th February 2022: Tautuku weekend field trip. Join us for a weekend exploring the varied vegetation around the Lenz Reserve and Tautuku. The reserve is 550 hectares of conservation land owned and managed by Forest and Bird. There is something for everyone here: old growth podocarp forests, beech forests, peat bogs, and estuaries. In February the ratas should be flowering, the fungi popping up and, if it happens to drizzle, the lichens and bryophytes will be at their best. There are numerous adventurous tracks or easy paths to ramble along and, for the aquatically inclined, a kayak option to explore the estuary. Gavin White, trapper for the reserve, will be our guide for the weekend. Gavin will show us the hidden gems he had found over many years of working the reserve. There are options for all fitness levels: from well-formed tracks on level ground to rough routes up the hills. We will stay at the Forest and Bird Lodge on Saturday night (costs $22 pp). BYO bedding, towels, etc. (more information about the lodge here: https://www.forestandbird.org.nz/our-community/lodges/tautuku-forest-cabins). You will need to bring your own breakfast, lunch and snacks. Bring a dish to share at the Saturday night potluck dinner. Space in the lodge is limited to 14 people, so book your spot early! Contact Gretchen Brownstein brownsteing@landcareresearch.co.nz for more information and to book.

9th March 2022, 5:30 pm: What's cooking with kānuka? Speaker: Matt McGlone, Manaaki Whenua-Landcare Research. As a successional tree species after fire or other disturbance, kānuka plays a key ecological role in the lowland and montane landscapes of New Zealand. It is also highly variable, with some populations contributing to lowland forest canopies 25 m or more in height and others consisting of scattered, low-growing, multi-stemmed shrubs on gravelly soils in frosty basins. Until recently, two species and several varieties were formally recognized - along with a swag of tag names. In 2014, a comprehensive revision of the kānuka group attempted to rationalize the situation and expanded the number of species to 10. The revision has had a mixed reception with many of the species proving difficult to confidently identify whether in the field or herbarium. In this talk I will present the results of a recently published genetic study of nearly 900 kānuka specimens spanning the entire geographic range of the complex and all the current species. I will discuss the implications for kānuka taxonomy but also for how we decide what is and what is not a 'species'.

12th March: Silver Peaks (Robyn) Possum Hut/Green Ridge circuit – Silver Peaks. The trip will follow the new contour track from Mountain Rd down to the north branch of the Waikouaiti River, then swing right following the gully to Possum Hut (relic). We will follow a spur out of the gully which eventually connects with the Green Hut/Pulpit Rock track, and then head back to Semple/Mountain Road. It's a good track, quite steep in places both downwards and upwards, but only for short bursts. The vegetation is quite modified and comprises of regenerating coastal bush. Good footwear and appropriate clothing needed as

the Silver Peaks can be quite exposed. About a 4 hour trip. Rain date Sunday 13th March. Contact Robyn Bridges 021 235 8997

6th April, 6pm. Geoff Baylis lecture: Taxonomic revision of native New Zealand forget-me-nots (*Myosotis*, Boraginaceae): An update. Speaker: Heidi M. Meudt, Researcher Botany, Museum of New Zealand Te Papa Tongarewa. Location TBA.

New Zealand is a main centre of *Myosotis* diversity, with about half of the c. 90 total species worldwide. Taxonomic revision is a high priority in New Zealand forget-me-nots (*Myosotis*, Boraginaceae), a genus in which most of the species are classified as Threatened, At Risk-Naturally Uncommon, or Data Deficient according to the New Zealand Threatened Classification System (NZTCS). The core focus of my research is to produce a taxonomic revision of all native southern hemisphere *Myosotis* species using analyses of morphological, pollen, genetic and field data. We aim to answer the following questions: How many native southern hemisphere *Myosotis* species are there? How can they be identified? Where are they found? What is their conservation status? Since starting on this project in 2010, my collaborators and I have revised two-thirds of the southern hemisphere species, with the remaining 20 species and tag-names currently under study. This research continues to contribute fundamental data to biodiversity knowledge and databases, and to the NZTCS assessment panel. For example, of the c. 1700 *Myosotis* specimens at Te Papa's herbarium (WELT), almost 30% were collected since 2010, all are databased and imaged, many have been recently curated, and most are online. In this talk, I will give a broad overview of the *Myosotis* research project results, discoveries, field work, and taxonomic implications to date. I will also highlight work-in-progress and future directions.

Biography: Heidi Meudt is a Researcher in Botany at Te Papa (since 2006). She completed her PhD in Botany in 2004 at the University of Texas at Austin, and was an Alexander von Humboldt Experienced Research Fellow at the University of Oldenburg, Germany from 2012-2014. Her main research focus is on the taxonomy and systematics of southern hemisphere plants, particularly Plantaginaceae and Boraginaceae. Her research integrates data from morphology, DNA, pollen, chromosomes and other sources to revise the taxonomy and better understand the geographical, morphological and phylogenetic patterns of plant species, especially New Zealand species radiations.

30th April 2022, 9 am: Field trip to Okia Reserve. Okia is a large coastal reserve on the Otago Peninsula that is jointly owned by the DCC and Yellow-eyed Penguin Trust. It comprises an old dune system that is rapidly changing from its dominant bracken fern cover to woody coastal species. There are also interesting hollows between the dunes that hold a variety of wetlands that include turf, bogs and ponds. On this trip we'll focus on taking photos and making observations for iNaturalist https://inaturalist.nz/observations. The trip coincides with the iNaturalist City Nature Challenge where cities around the world compete to gather the most nature observations. Participants will find it helpful to download the iNaturalist app to their phone before the trip. Meet at Botany Department carpark at 9am or the Okia Reserve carpark at the end of Dick Road at 9.40 am. Bring lunch and expect to be back in Dunedin by 4 pm. Contact John Barkla 027 326 7917 or mjbarkla@xtra.co.nz.

7th May 2022, 9 am: 108 years on – revisiting the great Dunedin-Waititi fire of 1914. This trip will look at the vegetation change 108 years after a large fire burned through *Libocedrus bidwillii* cloud forest near Leith Saddle. We will walk up Leith saddle track and look at the nature of vegetation on either side of the fire boundary and I'll talk about some student projects that have been investigating the demographic

effects of the fire; and the longer-term consequences of the fire on the flammability of plant communities in the area. Contact Matt Larcombe 027 919 9709 or matt.larcombe@otago.ac.nz

11th May, 5:30 pm: BSO Annual General Meeting and Photographic Competition. The photographic competition is a popular and eagerly anticipated event for anyone interested in botanical photography. Enter your best photos and learn what makes a good photograph and how to improve your photographic skills from our panel of expert judges. Your photographs may be chosen for the BSO Calendar so this is your opportunity to have one month of fame. Start organising your entries now and don't wait until the last minute.

8th June, 5:30 pm: Exploration of the functional significance of serrated leaves in New Zealand forest trees. Speaker: Bill Lee (with Jennifer Bannister and Tammo Reichgelt). Many NZ trees have toothed/serrated leaf margins and diverse explanations exist for their functional significance, mostly derived from overseas studies on deciduous species. We survey the leaves of forest trees in NZ, investigating the presence/absence of serrations and any associated leaf pores or glands. We also compare the environmental distribution of species with either entire or serrated leaves. Serrated leaves are associated with leaf-margin and leaf-lamina hydathodes, permanent openings generally larger than stomata that are frequently attached to major veins. They may also have colletors, complex glands that appear to secrete fluid. Our previous study in New Zealand showed that trees with serrated leaves were commonly associated with high rainfall areas. The strong association between marginal hydathodes and toothed leaves supports the suggestion that serrated leaves may have a key function in regulating internal plant water pressure on regularly saturated soils.

18th June: Botanical drawing at Orokonui. More details to come.

Meeting details: Talks are usually on Wednesday evening starting at 5.30 pm unless otherwise advertised. We are unable to use the Zoology Benham Building under the orange alert level, so we have booked the Otago Pioneer Women's Memorial Association Hall on Moray place. All attendees need to be fully vaccinated. The hall has no WiFi, so we will be unable to share talks via Zoom while this arrangement lasts. Please check the website before each talk to confirm the location.

Items of botanical interest for our buy, sell and share table are always appreciated. The talks usually finish around 6.30 pm. Keen discussion might continue till 7 pm. Meetings may be held online via Zoom while gathering restrictions remain.

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: Cross-section of a foot from the umbrella moss Canalohypopterygium tamariscinum. *Photo by Stella Fish. More details on page 12.*

Chair's Notes

Gretchen Brownstein

Kia ora koutou

I trust this finds you well. I'm writing this at the start of January with high hopes that 2022 will be an improvement on 2021 (fingers crossed!).

Over the holidays, we spent a few days with friends camping on their newly purchased bush block in North Otago. It's a lovely place, with koura in the stream, damp ferny gullies, and tui singing in kanuka. Yes, there are bits with gorse and broom, and pigs and possums but it's got potential. We spent a fun evening discussing all the plans they have for looking after and restoring the native bush. It was a great reminder that every little bit helps, whether you have 30 ha or 3 ha, volunteer with a community group or do guerrilla gardening on the road verge. It all means a few less weeds and a better chance for native species. If you are keen on plant restoration, this year's NZPCN conference is all about restoration ecology in New Zealand. The conference is happening in Queenstown 20-23 March. I'm headed over with a contingent of BSO members, so perhaps we will see you there.

In other news: the postponed Baylis Lecture is happening in April (see the website for details). Also, the photo competition is back, so get clicking! There is new category: "Wetland Plants", and I am looking forward to seeing what people submit for this.

Happy botanising

Gretchen

Secretary's Notes

Angela Brandt

A very happy new year to everyone - ngā mihi o te tau hou! I hope you've all had a great holiday and summer season. The second half of 2021 was certainly a challenge for all of us, including for planning BSO events, but it was great to have the option to host our monthly talks via Zoom when we couldn't meet in person. It was also great to have more of our out-of-town members able to join us for the talks even when we could also meet in person. Thanks to all who sent in positive feedback about attending the talks via Zoom - it's so helpful to the committee to know what is working well and what we should try to do differently.

Happily, we've renewed our Zoom arrangement for this year and plan to continue streaming the talks online when possible. I will email the links for these online meetings to all members in the week leading up to the talk. If you haven't received any reminder or other emails from me in the past couple of months, be sure to check that we have an up-to-date email address for you and that you've marked my email address as a "safe sender" - I do occasionally receive notices that my BSO messages have not be able to be delivered to certain addresses.

Treasurer's Notes

Mary Anne Miller

Reminder:

Subscriptions Due.

2022 subscriptions are now due. Please see the inside back page for a membership form. If unsure whether your membership is valid please contact me at maryanne.miller53@gmail.com to receive an update.

End of 2021 financial update:

I'm pleased to report that our end of 2021 financial position (not the end of the financial year, which is 31 March) was healthy. We had $6,400 in our Everyday account, $12,700 in The Audrey Eagle Publishing Fund and $5,700 in our Online Business Saver account.

Publications and Newsletters available on loan:

The following hard copy publications were recently received. Contact me if you would like to borrow them:

NZ Botanical Society Newsletter No. 145, September 2021

Pīpipi Hinewai Reserve Newsletter No. 54, November 2021

Folia Botanica Extremadurensis Vol 15, Diciembre 2021

Publications for sale:

Please contact me if you would like to purchase:

Lichens of New Zealand: An Introductory Illustrated Guide by Allison Knight, $20

Mosses, Liverworts and Lichens: A Guide for Beginners, $18

Plus postage, if necessary

maryanne.miller53@gmail.com

New Members

A warm welcome is extended to Noelyn Hung. Thanks to Tony Aldridge for his generous donation. To our existing members, thank you for your continuing support.

Editor's Notes

Lydia Turley

Thanks, as always, to all our wonderful contributors! Ahead of the 20th Baylis Lecture (now to be held in April), Bill Lee and Peter Johnson have written some memories of Geoff Baylis. Stella has supplied a cover photo which shows a part of plants that we don't so often see.

Suggestions and material for the newsletter are always welcome from our members. If you are keen to submit stories, drawings, reviews, opinions, articles, photos or letters – or anything else you think might be of botanical interest to our diverse range of members, don't hesitate to get in touch. Send your feedback, comments or contributions to lydiamturley@gmail.com. Copy for the next newsletter is due on *10 May 2022*. 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. Remember to include photo captions and credits.

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.

Correspondence and News

A very special day

In April this year one of our members will celebrate her 100th birthday. Ann Wylie has been a member of BSO since its inception and has supported us with great encouragement. We wish Ann all the best for her special day and hope to meet with her for a celebration soon.

Enter the Competition and support the Calendar
Entries due 26th April 2022

Categories are:

1. **Plant Portrait**
2. **Plants in the Landscape**
3. **Wetland Plants**

It's easier than ever - no prints required.

To enter just email up to 5 digital photos as JPEG files between 2 – 8 MB to BrownsteinG@landcareresearch.co.nz along with the electronic entry form. Label each image with the category number followed by a caption and email in batches of no more than 16 MB per batch. Entrants must be current members of the Botanical Society of Otago. Entry and membership forms will be posted on the BSO website: https://bso.org.nz/photo-competition

There will be a prize of $50 for the winner of each category. Entries will be judged on technical and artistic merit by a panel of three judges. A separate prize of $50 may be awarded for members' choice on the night. Photos will be displayed and winners will be announced at the meeting on 11th May. Only photos of native plants (with or without people and landscapes) will be considered for the calendar and pictures in landscape orientation are more suitable for this.

BSO Audrey Eagle Botanical Drawing Competition 2022

Submissions are now open for the 2022 Botanical Society of Otago's Audrey Eagle Botanical Drawing Competition and Art Auction. This year there are two age categories, and participants of all skill levels are warmly encouraged to submit. Artists will have the opportunity to present their works for auction after the awards have been presented, with all profits going back to the artist. You must be a current BSO member to enter.

Prizes

- First Prize $100
- Second Prize $75
- Third Prize $50
- People's Choice $25

Each winning artist will also receive a signed copy of Allison Knight's *Lichens of New Zealand, An Introductory Illustrated Guide*!

Lichen Ramalina celastri, *expressing discoid apothecia along the margins of the narrow branches. Illustrated using wind fallen specimens, collected from Ross Creek Reservoir, Dunedin, NZ. Artist: Sharon Jones 2021. Medium: watercolour.*

Judging criteria

1. Botanical accuracy.
2. Detail, especially of important identification features.
3. Clarity of lines.
4. Proportional representation and scale.
5. Layout.
6. Suitability for reproduction in newsletter.
7. Accurate caption, eg botanical name of plant, where it came from, date drawn.
8. Botanical notes or comments of interest eg. key to botanical details, history, distribution, uses, variations etc. (The NZPCN website could be helpful).
9. Preference will be given to plants that have been rarely illustrated.
10. Above all, artistic merit carries the highest rating.

Conditions of entry

1. Unframed entries must be submitted with an entry form, by **Monday August 1 2022** to Botanical Society of Otago, c/o Department of Botany University of Otago P.O. Box 56 Dunedin, New Zealand, or handed in to the Department of Botany Office, 479 Great King Street, between 1-3 pm on weekdays.
2. The drawing must be your original work. A drawing from life is preferable and a copy of an existing botanical drawing is not acceptable.
3. There is a limit of 3 entries, with a minimum size A5, maximum A3.
4. You should include a title and notes of botanical interest; these do not need to be written directly on the drawing and can be submitted alongside the drawing.
5. Judges will be kept unaware of your identity while judging - so don't sign the front! But please do put your name on the back(s) and number each entry.
6. Entries will be displayed and prizes awarded during the meeting on Wednesday 10th August 2022, in the Benham Seminar Room on the second floor in the Zoology building, 346 Great King St., beside the Captain Cook Hotel.
7. BSO may use copies, with due acknowledgement, in the Newsletter and website.
8. Entries are open to current BSO members – our subscription is very low!
9. If there are insufficient entries the competition may be postponed.
10. There is no entry fee, so please include an addressed, pre-paid envelope or tube if you would like your drawings returned.

You may put your entries up for sale or auction at the meeting if you wish.

Articles

GTSB – recollections of a grateful student

Bill Lee

Professor Geoff Baylis played a formative role in the careers of many botanists and ecologists in New Zealand. Geoff influenced us in diverse ways, as HOD of Botany at the University of Otago, and as an experimental mycologist and wide-ranging field botanist with an insatiable curiosity and fondness for plants, their form and function, beauty, and growth. He also created a departmental family, with gifts to post-graduates on birthdays and at Christmas, gourmet-quality meals at his home(s), and providing part-time employment for many as student gardeners.

The Department throughout Geoff's leadership was on the ground floor at the back of the Otago Museum, a rabbit warren of sheds, laboratories, glass houses, offices and a library. Morning tea was virtually mandatory and was in the laboratory prep room. Staff had chairs and the students sat on the benches. Conversations were wide-ranging, often initiated by Geoff who sat cross-legged on a wooden lab stool. He had several mannerisms, and one was swinging his upper crossed leg when talking. Geoff frequently wore a grey lab coat when collecting plants or weeding or observing phenology around the Botany Department garden and was on occasion mistaken for a university gardener.

Geoff was an old-school teacher; chalk and blackboard were the basic tools with some use of overheads in his later years. When lecturing he wandered across the front of the room deep in thought and rubbing his head, which at the end of the lecture was frequently covered in chalk dust. He trained us well, giving students a thorough grounding over four years in plant and fungal science.

Geoff's research on mycorrhizal fungi and vascular plants involved numerous post-graduate students and drew frequent international visitors which helped create a vibrant research environment. He also attracted quality staff to the Botany Department to provide what was arguably the best training in plant science available in New Zealand.

He introduced me to the power of a simple experiment where conditions were controlled to understand important processes in natural ecosystems. The ideas he developed about phosphorus limitation, fungal associations with plant roots, and vascular plant root morphology were formed from numerous experiments, often undertaken in collaboration with his students. His research highlighted the fundamental role of ancient mutualisms in community assembly ecology.

He was also a conservationist, working with the Department of Lands and Survey to improve protection and management of ecosystems. Through past connections, derived from his early years in Auckland and the navy, he was a driving force behind the establishment of the Miss EL Hellaby Indigenous Grasslands Research Trust which has fostered research into sustainable use of tussock grasslands over many decades.

Geoff's encouragement was instrumental in my advancement in botany. Following a mediocre early undergraduate record, Geoff allowed me to undertake 4th year and post-graduate studies. His experiments, curiosity, field work, fondness for plants, and management style were inspirational and excited me about both science and plants. In my view he was a true scholar and a gentleman, and it is wonderful that each year we remember him with the Baylis Memorial lecture.

Geoff Baylis: a further appreciation

Peter Johnson

These notes are supportive of, and additional to Bill Lee's recollections. Bill's mention of Geoff, in his grey lab coat, being mistaken for the Botany Department gardener, was a story that Geoff told himself: it arose especially when Peter Wardle first turned up to enrol in botany, and shyly asked 'the gardener' where he might find Professor Baylis.

In our student days it was the custom to address him simply as 'Prof'. Behind his back he was known also, from the term coined I think by bryology lecturer George Scott, as "The Boss". Over time he became known to us all, more familiarly, as Geoff.

Geoffrey Thomas Sandford Baylis (1913-2003) lived to be 90, which was celebrated in Auckland shortly before his death, when Geoff, with the culinary precision of a skilled chef, sliced though his birthday cake, right through the icing decoration of the Three Kings Islands, while narrowly avoiding the foliage representations of *Tecomanthe* and *Elingamita*, island endemics, both of which Geoff cultivated in Dunedin. For Geoff was a gardener, not just at the Department, but in the two large properties around his High Street and George Street mansions. These were two of the sources of copious flowering and fruiting specimens with which he filled the lab for lessons on plant families. I picture Geoff keeping the specimen trays fresh as he regularly used a wetted hand to spray them with flicks of water. His third plant source, he told me, was the Botanical Gardens, where he helped himself to armloads of flowers "early in the morning". Geoff was always an early riser. A field morning at Lake Manapouri, with Geoff and Alan: wake near dawn and there is Geoff splashing like a sparrow in the lake shallows. And Geoff the gardener, always sharing plants: we still have his cultivars of *Alstroemeria*, now extensive swathes, for Geoff did warn me that the genus can be "very willing" as illustrated by that part of his garden suffering from what he called "alstroemeriosus".

Bill Lee has mentioned how Geoff provided part-time work for students. I recall hours spent sanding varnish off his stairwell balustrade at 520 George Street. And gardening his poroporo plots. Geoff had an interest in the taxonomy of NZ *Solanum* and this somehow led to his growing experimental plots of poroporo for one of the drug companies, for use as precursor chemicals for birth control pills. My pocket-money job was weeding the rows, picking the ripe fruits, then cleaning the seed by squashing and washing it free of orange flesh and fibre. Poroporo became widely cultivated in eastern Europe, and I remember the surprise that Geoff shared during one morning tea. A postcard arrived with a stamp depicting the purple flowers of *Solanum laciniatum*, this native plant of New Zealand (and southern Australia), yet on a 10 kopeck stamp, from Russia. [The postcard quite likely a reprint request … who now remembers those?]

Geoff was generous with more than plants. In 1973 when he instigated my opportunity to join an expedition to the Auckland Islands there he was, at our departure from the harbour basin, lending me his camera with colour slide film (to augment my black-and-whites) plus a bottle of rum: in true navy fashion, for Geoff had been in the wartime navy. Geoff's naval friend and climbing companion, Paul Powell, wrote a poem about the two of them planting pohutukawa trees, in memory of their lost naval companions and boats, at Paul's seaside crib at Shag Point.

My photo, here, of Geoff was taken on a trip to Deep Cove in 1994, part of the 25th Anniversary celebration of 'Save Manapouri'. It must have been a cool Doubtful Sound morning, for he is wearing a woollen hat rather than his usual blue beret. Among Geoff's many contributions to conservation was his role as a founding, and long-standing, member of the Fiordland National Park

Board (a position he later passed on to me). So, Geoff, very many thanks for that. And I leave it for his words to finish the caption for the Deep Cove photo, as he spoke them at that moment. "It is lovely to be here among mountains and not feel that you still have to climb the damn things."

Geoff was wise, and quietly gave wise advice. Some examples that I think are worth passing on. Learn botany by growing plants. Devise simple experiments. Write short concise papers. Write a PhD thesis which an examiner can read in an evening!

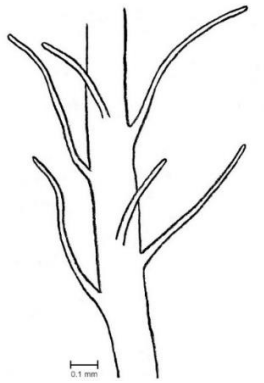
Geoff Baylis

Dendroid delight: A dendroid denizen of the bush

Stella Fish

Let me introduce you to the umbrella moss, *Canalohypopyterygium tamariscinum*. Commonly found throughout Dunedin, certain features enable it to be identified in the field without specialised equipment, making it a helpful moss to have under your belt.

C. tamariscinum has a dendroid or tree-like growth form up to 5 cm. The first thing to notice is its flat, circular frond which can be 4 cm across, comprising many fine branches which can be up to tripinnately divided. The phyllids (leaves) are of two types (dimorphic), with a smaller ventral row and two horizontal rows of larger, distichous phyllids (each row 180° to the other). This arrangement puts the moss into the Hypopterygiaceae and is helpful in distinguishing it from another dendroid moss family, the Hypnodendraceae.



Rudimentary branch arrangement in Canalohypopyterygium tamariscinum *(Drawing: Stella Fish)*

While admiring the leaves, notice fine green bristle-like structures tucked between the phyllids. These are rudimentary branches arranged in three rows: a ventral row with one branch above one ventral phyllid, and two alternately arranged lateral rows associated with the larger phyllids. These numerous rudimentary branches are a helpful diagnostic feature and Pelser (2002) suggests they may be a relic with a distinct function that has since been lost.

Rudimentary branches with lateral phyllids (Photo: Stella Fish)

The lateral phyllids are asymmetrical and ovate (egg-shaped), reaching 2 mm in length with an acuminate apex i.e., tapering to a point with slightly concave margins. The margins are toothed, the wider side denticulate (finely toothed) with shorter cells, and the narrower side serrulate (finely serrated) with longer cells. The costa reaches ¾ up the phyllid and the cells are hexagonal.

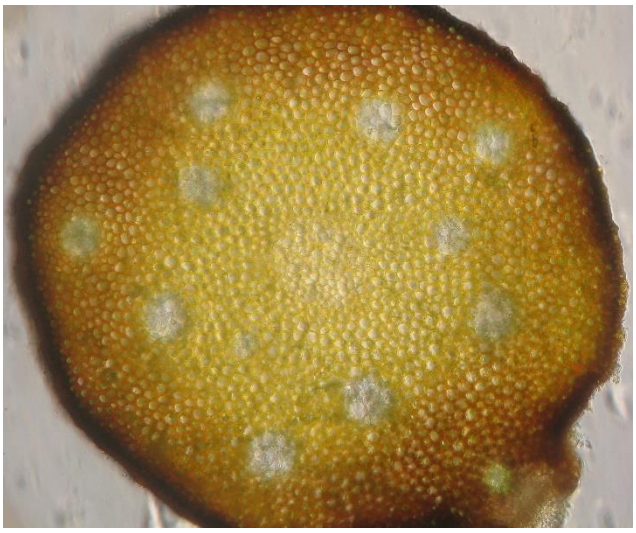
The smaller, ventral phyllids are ovate-lanceolate with an acute to acuminate apex. Their teeth are between one and three cells long and two cells wide. The costa can be simple or forked, reaching between ¾ up the phyllid to being percurrent i.e., reaching the apex but not extending beyond (Kruijer 2002).

Ventral phyllid, note the teeth and costa (Photo: Stella Fish)

The stipe (stem) of *C. tamariscinum* is erect and naked with eight rows of spreading phyllids that are ovate to obovate (upside down egg-shaped) with an acuminate apex and an entire margin. The costa is weak to absent and the lamina cells are mostly elongated with rounded ends.

Close up of stipe and phyllid (Photo: Stella Fish)

The stipe consists of three main cell types: epidermal, cortical, and the central strand. The epidermis is protective, comprising small, thick-walled cells. The cortex is split into two, the inner and the outer, and within this are axial cavities which contain an oil-like substance. In the centre is the hydrome or central strand composed of hydroids thought to conduct water (Kruijer 2002).



Close up of the stipe, showing the internal differentiation (Photo: Stella Fish)

C. tamariscinum can be found in groups and on some occasions these individuals, or modules, are linked by creeping stoloniform shoots (underground stem), some of which have scale-like phyllids. These stolons are held to the substrate by rhizoids which contribute to water transport (Jones and Dolan 2012).

C. tamariscinum is a dioecious moss, meaning that the male and female reproductive organs are on different plants. The seta (stalk) of the spore producing capsule is hooked and red, reaching 8 mm in length. It has a collection of rhizoids and is clasped by oblong to short ovate perichaetial phyllids. Up to ten sporophytes (seta and capsule) can emerge from a single frond.

The base of the seta is called the foot and functions as a nutrient transfer zone between the sporophyte and the parent moss. As seen in the cross section (cover image), the seta is the red and clear central cells, the gold ring is the transfer cells where enzyme activity enables nutrient passage, and the remaining epidermal and cortical cells, collectively referred to as the vaginula, are the parent moss (Shaw and Goffinet 2000; Glime 2021).

The capsules of *C. tamariscinum* are pale brown and approximately 2 mm long. When developing they are surrounded by a protective yellow calyptra with lobed

margins. The calyptra forms from the wall of the archegonium which is the female reproductive organ (Malcolm *et al.* 2020). The capsule also has an operculum or lid which is green and pointed and covers the perfect (double) peristome which controls spore release. The outer row of teeth (exostome) is shorter and darker brown than the inner row (endostome). The spores are round and between 10 - 14 μm.

Calyptra, operculum and mature capsule (Photos: Stella Fish)

C. tamariscinum is in the family Hypopterygiaceae and is endemic to New Zealand. It is found in moist forest with an altitude range of 100 - 850 m in the North Island but only 0 - 600 m in the South Island. It is known from both main islands of New Zealand, Stewart Island, Enderby Island, Auckland Island (Kruijer 2002), and Raoul Island (Te Papa 2021). It has been reported in forests of mixed podocarp/broadleaf. It can be found on the forest floor, on rocks (granite, limestone, greywacke) on tree roots, and rotting logs, and grows with other bryophytes but can form pure stands (Malcolm *et al.* 2020; Kruijer 2002). Within Dunedin, I have found it at Evansdale Glen Scenic Reserve, Leith Saddle Track, Orokonui Ecosanctuary, Pipeline Track, Racemans Track, Ross Creek, Waipori Falls, and Sullivans Dam.

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Meeting and Trip Reports

A search for the co-evolutionary partner(s) of New Zealand's sequestrate fungi, a talk by Dr Toni Atkinson, 14th October 2020

Bill Lee

Toni, a mycologist, began by introducing us to the sequestrate fungi, a diverse group of macro-fungi known for their large colourful fruiting bodies on the forest floor. They form the extensive fungal/root ectomycorrhizal associations in beech forest where the bright red, purple and blue coloured emergent fruiting bodies are common. In an era when moa are being reconsidered as major drivers in the evolution of NZ ecosystems, Toni challenged the prevailing perspective that brightly coloured sequestrate or pouch fungi evolved to enhance dispersal by birds. She suggested that we look elsewhere, in more ancient relations, to identify the biological partners behind the evolution of these distinctive fungal fruiting bodies.

Most pouched fungi are apparently not conspicuously coloured, and birds tend to avoid the coloured ones in choice experiments. Toni believes fungal DNA detected in bird coprolites is most likely incidental, perhaps reflecting birds eating insects that consumed fungi. This was confirmed with motion-sensitive cameras by David Mudge that showed there was little interest by birds and lizards in fungal fruiting bodies but some attention by weta in NI forests. Bats (short-tailed) are possible dispersers of fungi given their terrestrial foraging behaviour, but none were seen investigating the fruiting bodies. However, Toni and David were able to demonstrate the incredible longevity of fruiting bodies, between 50-100 days.

Toni then went on to develop a compelling case for viewing key features of these remarkable mushrooms as selective adaptations for sustaining early life-cycle phases of fungal gnats, an association that has lasted over 100 million years. She provided evidence that in this enduring relationship the fungi provide a predator-proof, food-packed home for the gnats during the egg and larval stages. The larva in turn transfer the fungal spores beneath the litter into the soil where they are well positioned, in close contact with the regularly produced new crop of tree fine roots, for establishing the essential ectomycorrhizal relationship.

Toni's detective work in the literature highlighted a complex cocktail of chemicals in these fungal fruiting bodies including some with bird antifeedant properties, others involved in preventing insect activities, and including a suite of volatiles well-known for attracting insects. Although we lack measurements of these chemicals in NZ species, overseas data provide tantalising evidence supporting the different feeding behaviours of animals observed in NZ.

In my experience, strong reciprocal dependencies in mutualisms are rare amongst insects, birds and plants, but Toni's example may be an exception where there is evidence of extensive and convergent chemical and morphological evolution in fungi to utilise the reproductive and establishment requirements of a specialised group of ancient invertebrates to maintain an intimate and widespread connection with tree roots that assists in nutrient acquisition and pathogen protection for our rainforest trees.

In my view, this was a wonderful talk, well-illustrated and structured, rich in hypotheses, aware of exceptions, embedded in natural history, and providing a coherent framework for diverse biochemical, behavioural, systematic, and ecological research. Toni gave us insight into an ancient, extensive partnership in our forests and, for me, a new appreciation of our wonderful colourful fungi on the forest floor. I look forward to seeing Toni's ideas formally published.

Field trip to Portobello QEII Covenant, September 25th 2021

Stella Fish

A warm September day greeted the large Botanical Society group who had been invited for the first time to Peter and Jeannie Hayden's Portobello property. Gathering in the courtyard, Peter provided a helpful description and map, explaining how this was one of several large covenants of native bush in the area.

Attempting to distract from this informative talk was their excitable puppy which was eventually satiated by playing tug of war with a broom. Tasked with creating a species list for the couple, the keen eyes of all in attendance would be required.

The track began in the garden where we encountered the first of many lichens on an interesting assortment of specimen trees. Allison Knight helpfully pointed out *Physcia jackii*, *Ramalina inflexa* and *Xanthoria parietina*. A gate marked the shift into the bush and the group split, with those interested in the minute quickly falling behind to admire the damp banks of *Achrophyllum dentatum* with some sad *Cyathophorum bulbosum* lining the edges. For those interested in vascular plants this section also provided several ferns to record, including a sori laden *Paesia scaberula*, the auriculate *Parablechnum minus*, and *P. montanum* with its falcate pinnae.

Soon we were surrounded by the characteristically flaky trunks of *Kunzea robusta* dotted with patches of yellow *Chrysothrix candelaris* and blue *Lepraria* lichens. Among the *Kunzea* was the endemic *Urtica ferox*, its fearsome spines providing plenty of warning to us to keep a healthy distance. A large *Dryopteris affinis* beside the track provided a convenient rest for our aching calves and a chance to note on the rachis the diagnostic black dots used to distinguish it from *D. filix-mas*. Further along was an exciting find of an uncommon fern species in Dunedin, *Asplenium oblongifolium*. It is distinguished from *A. obtusatum* by the long, hair-like apices of the scales.

U. ferox *spines (Photo: Stella Fish)*

Leaving the tranquility of the *Kunzea* behind, the top of the track was reached, and participants were promptly greeted by strong winds. A *Podocarpus* further along provided respite and a place to admire the harbour view. Conveniently, sitting down also meant lessening the chance of being blown over! Further along the path were a circle of towering *Cordyline australis*, a flowering *Pseudopanax arboreus*, and small patches of *Polytrichum juniperinum* dotting the path.

Asplenium oblongifolium *scale (Photo: Stella Fish)*

Moving downhill, the track was lined with *Eucalyptus regnans* and *Cupressus macrocarpa* shaking in the wind. The promise of sitting on the verandah in the sun provided ample motivation to hurry along, and upon arrival we were rewarded with a welcome surprise of coffee, tea, and scones from Jeannie. Out of the wind and in the sun was a perfect setting to discuss all things botanical with a trip highlight of Kacey spotting the pileus of a *Leotia* mushroom peeking out of a dry clay bank. Once unearthed and

examined it was realised that the stipe was not the typical gelatinous texture of this genus, instead it was dry: an unusual find! Interrupting these botanical discussions once again was the puppy taking advantage of the large group and revelling in the attention.

Harbour (Photo: Jess Paull)

Leotia *(Photo: John Steel)*

Many thanks to Peter and Jeannie for allowing us onto their land and to David Lyttle for leading the trip.

Participants included: Alf Webb, Allison Knight, Angelina Young, Beth Wishart, David Lyttle, Finn Dobbie, Gretchen Brownstein, James Crofts-Bennett, Jeannie Hayden, Jessica Paull, John Steel, Kacey Hutchison, Lala Fraser, Matthias Spall, Moira Parker, Peter Jayden, Peter Johnson, Rosemary Leader, Stella Fish

For a copy of the species list, contact john.steel@otago.ac.nz

On seeing the Trees and the Wood! Field Trip to Herbert Forest, 9th October 2021

Robyn Bridges

The provenance of this lovely remnant of coastal podocarp forest lies in a timely act of civil disobedience 50 years ago by a group of forestry workers. Tasked with destroying ('cut notches in the trees and administer a teaspoon of poison') the remaining specimens of the indigenous forest cover to make way for douglas fir plantations, forestry worker Ian Davies and co-workers, baulked. 'It's just not the right thing to do' he is recorded as saying, and they followed up this 'act of defiance' by alerting the local MP and subsequently the Ministry of Forestry, to the trees' plight.

We have a lot to be grateful for as their actions led to the preservation of what is likely to be the last remnant of good podocarp forest on the east coast of the South Island between Dunedin and Christchurch. And despite the area still being under private ownership, it is now fully protected and this 'hidden gem' has been saved. The access tracks, which are excellent, were developed by the original 'rebelling' forestry workers, and are now maintained by the North Otago Tramping Club who regularly co-ordinate work parties with local school and community groups. They do weed control and re planting as well as track work and our grateful thanks goes to them as well. It is such a wonderful story of resistance, preservation, restoration.

Though much of the area has been cut over and there is in parts quite a lot of resulting weed infestation, the highlight of walk is the Podocarp Loop on the southern side of the forest where there is a magnificant stand of rimu and good specimens of totora, matai, miro and kahikatea. It's an aptly named track. The signage about the role native birds play in the pollination of rimu may not be correct (birds assist with seed dispersal. Rimu are wind pollinated), but is a reminder of the importance of bush reserves like this, each one becoming part of a 'coastal corridor' for native birds to move across the country and whose habitat reduces with each clearing and 'development'. It is a very precious green space.

The full Herbert Forest Walk is about 4.5 hours in total and involves several small stream crossings. This field trip comprised of two groups, with our group completing the full walk. A map of the area can be found on https://waitakinz.com/herbert-forest-walking-tracks/

Thank you, John, for another good day of botanising. Robyn for John, Marilyn, David, Lydia and Angelica.

Herbert Forest part II, 9th October 2021

Jessica Paull

Herbert Forest is a large patch of bush in northern Otago, largely composed of exotic plantation with some native podocarp patches dotted along the tracks. The all-day trip focused on the full 10 km loop track through the bush, which featured a measly thirteen stream crossings and a paltry 5 m steel ladder down a cliff face... **gulp**.

While this opportunity of great adventure is hard to pass up, those of us who are less inclined to such physical endeavours, or who can't help but stop every few metres to look at something exciting, decided to only trek a small portion of the loop track. This group (now referred to as Group 2) decided that while the distance may not be as impressive, there would still surely be plenty to see.

We started our journey straight out of the car, right along the roadside (Example 1 of why a 10 km trip was not possible for us). Sharon pointed out many beautiful stones in the gravel road—particularly red jasper. The weather was slightly rainy, so we set aside a few muddy bits of jasper stone in the hopes that they would be clean when we returned. Spoiler alert: They weren't. However, they were still very pretty.

Once we eventually meandered into the bush, we found ourselves on a trail alongside a very nettle-y stream. Still, we carefully poked our way through, searching for anything of interest. Slowly we wandered down the stream track, until James discovered a large millipede. He excitedly showed us all, took some photos, and then placed it back to continue on its own adventure. It was a very amiable interaction… or so we thought. The adorable, harmless-looking millipede had been excreting a chemical defence of hydrochloric acid and hydrogen cyanide. Luckily, the resulting burns healed a few days later without much pain and James has lived to tell the tale. In fact, he informs me that the Otago Museum has recently acquired huge tropical millipedes into the butterfly garden. Perhaps a repeat experience is on the menu.

The millipede in question (Photo: James Crofts-Bennett)

We continued on the trail, where I found a lovely patch of the liverwort *Hymenophyton flabellatum* bursting with capsules. One plant had two capsules, and I thought it looked like some kind of alien. Or perhaps a snail. Or maybe both. I also found some kind of fungus living on an old fertile fern frond. I took a picture because I thought it looked vaguely reminiscent of an octopus tentacle.

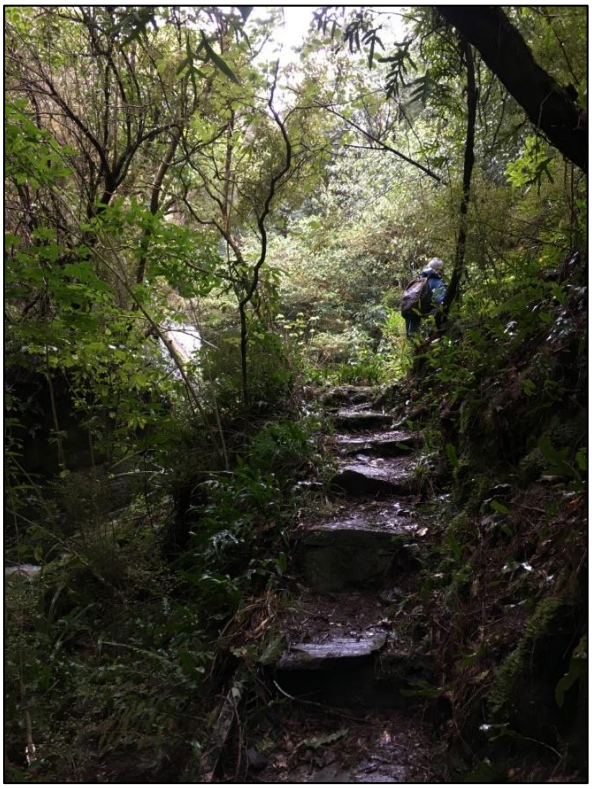
We eventually reached a spectacular stone staircase, straight out of a fantasy movie. At the top of the staircase, one was met with a beautiful waterfall view (which my phone camera was not able to capture with proper exposure, and therefore I cannot show it to you). So instead of a picture, just imagine this: There is a gorgeous, gushing waterfall flowing into a

tranquil pond below. Out of the pond stands a large epiphyte-laden tree trunk, towering above you and leaning against the opposite cliff face. What happened to the tree? What is its story? The mystery is compelling, but also leaves you slightly wary. The deep blue pond runs off into a babbling brook, cascading beyond the stone staircase. The water bounces playfully over large shale slabs and polished river stones, before finally settling into a gentle stream, parallel to the trail that we had walked up. In other words, it was really nice.

Hymenophyton flabellatum *capsules looking suspiciously like a snail alien… snalien? (Photo: Jess Paull)*

Fungus on an old fertile fern frond, looking exactly like an octopus tentacle. Definitely. (Photo: Jess Paull)

We continued on our merry way around the pond, where we eventually reached the 5 m metal staircase. At that point, Group 2 decided to head back for the day. I, however, being a stalwart thrill-seeker, decided to brave my way up the dangerous (not really), gravity-defying (it was 5 m) death trap (it had handrails) of a ladder. Once at the top, I was able to rejoice in my bravery and then shakily make my way back down. Aside from spiking my cortisol, this solo adventure spiked my interest in one last find of the day, the liverwort *Asterella tenera*. It was fertile with many archegonia, and it's now clear to me why it's referred to as the 'star liverwort'.



Stella Fish (who I wasn't quite quick enough to capture), the fantasy stone staircase, and a small glimpse of the waterfall mentioned above. (Photo: Jess Paull)

Possibly the greatest highlight of the trip, however, was the delightful homemade ginger crunch provided by James, crafted lovingly by his Auntie. There is no sweeter joy than homemade ginger crunch after a walk through the bush, especially on a cool, rainy day.

And so, thus concluded our journey. While it took at least 3 hours to reach our destination, we walked back to the car in about 10 minutes. 10 km we walked not, but 10 minutes is still an achievement worthy of celebration. That's pretty good for us!

Trip participants: James Crofts-Bennett, Sharon Jones, Stella Fish, John Steel and Jessica Paull (group 2).

For a copy of the species list contact john.steel@otago.ac.nz

The Green-Strap Star liverwort, Asterella tenera. *The green "stars" sticking up out of the thallus are the archegonia. (Photo: Jess Paull)*

Modelling Niches and Phylogeny in Celmisiinae (Asteraceae), a talk via Zoom by Duncan Nicol, 10th November 2021

Alex Wearing

Duncan Nicol is currently undertaking a Ph. D at the University of Otago. He is studying many features of, and the relationships within, the subtribe Celmisiinae Saldivia (Asteraceae[1]: Astereae). Celmisiinae comprises eight genera and about 156 species that range across New Guinea, Australia, Tasmania, New Zealand, and the Sub-Antarctic islands to the south of New Zealand. The 'big picture' of his research is to use systematic, biogeographical and ecological studies to enhance understanding of biodiversity.

The talk described the characteristic and distinctive features, species, and species distributions of nine morphological groups. New Zealand and Sub-Antarctic genera in these groups are *Olearia, Pachystegia*, *Pleurophyllum*, *Damnamenia*, and *Celmisia*. Duncan Nicol said that there is a need to update naming of species to reflect current notions of systematics. Systematics constitutes the organization of biodiversity. Phylogenetics studies evolutionary relationships between taxa, to see how they related, to determine the structure of the family tree, and to identify the real groups (i.e., all members have a common ancestor). There are two objectives to this research: species resolution (clade[2] detail) and root support (clade arrangement).

The research tool being used to facilitate the investigation of species relationships is Angiosperm 353 (Johnson *et al*. 2019). Angiosperm 353 targets, gathers and sequences 353 single-copy protein-coding genes across all flowering plants. DNA is extracted and tagged with a unique code for reference. A library of genes is created. The targeted genes are collected and then sequenced to construct a molecular phylogeny. Angiosperm 353 has previously been used to analyze New Zealand *Veronica* (Thomas *et al*. 2021).

Duncan Nicol used the genus *Celmisia*, which has 26 species, to show the efficacy of Angiosperm 353. The 26 species had a common ancestor. The range of clades and species demonstrates that diversification has occurred. Possible causes of speciation are separation of populations, hybridization, and ecological niche divergence. There is no consensus, and it is possible that different causes, or combinations of causes, acted at different times and in different locations.

To construct a family tree for *Celmisia*, 66 morphological characters were assessed (e.g., flowers - hairs, shape, arrangement of parts; seeds - shape, hairs; leaves – hairs, shape, teeth). The analysis takes the form of determining (1), whether individual species have or lack characters 1-66, and (2), how different species are from one another.

Molecular phylogeny has been used to find and sequence the DNA of genes and regions between genes. Molecular phylogenetic sequences of *Olearia* and *Celmisia* occur in several places on the resulting family tree. According to systematic principles the two genera cannot be real groups and require taxonomic revision.

Duncan Nicol showed several intriguing distribution maps of New Zealand species of *Celmisia*. Some species are confined to one region, whereas others occur at several localities in the South and/or North Islands. Some possible explanations for these disparate geographies were advanced. Mountain building created barriers between separate valleys and prevented gene flow. Glaciation and the establishment of forests would also have acted as barriers and fragmented populations. Populations could also have become more specialized and diverged into narrower niches (e.g., becoming a rock crevice specialist). Alternatively, populations could have generalized from an ancestor and broadened their range (e.g., acquired features to increase tolerance to cold and exposure, and occupied multiple mountain tops). Significant influences on the evolution of and characteristics of species include, (1), regional variations in rock type, geological and geomorphological history, soil, climate, and biological communities, and (2), local variations in an area (e.g., snowfall occurrence and persistence, or soil moisture regime, on one mountain range, or on one mountain).

Duncan Nicol said that at the end of his Ph. D research he hopes "to put it all together." His talk was a fascinating account of what he has achieved so far in his studies: of the features of the Celmisiinae, the utility of Angiosperm 353, evidence of the probable need for taxonomic revisions, and additions to the phylogenetic and biogeographic knowledge of New Zealand *Celmisia*.

Notes

1. Comprising 20,000 to 30,000 species.
2. A clade is a group of organisms believed to contain all the evolutionary descendants of a common ancestor.

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Truby King Recreation Reserve, Seacliff - tree mapping, 21st November 2021

Maia Mistral

A rough plan for this project was conceived in March 2021 by Belinda Smith-Lyttle, Gretchen Brownstein and myself when the BSO made a written submission on the proposed management plan (first draft) for the Truby King Reserve. Our submission commented on the lack of recent data on tree health and dimensions, which we saw as essential for planning future maintenance of the stunning tree collection, and suggested we could undertake data collection as a community based project.

Belinda digitised the map and measurements made by Euan Cadzow in 1990 for over 250 trees in the Reserve greater than 50cm dbh, along with the hand drawn map made by Chuck Landis in early 2000 which included many additional trees. This has given us a platform to relocate specific trees, add new measurements and produce updated maps.

Around 20 people from BSO, Seacliff Truby King Reserve Committee, TBKR management committee and locals from the wider Blueskin Bay area were waiting at the gates at 9am keen to begin our first field work. Following a discussion and demonstration of equipment we separated into smaller groups, each armed with GPS, data sheets, measuring tapes and a set of maps to help re-locate individual trees recorded by Euan to start the project off. Presence/absence, dbh, estimated height, were recorded and any damage, disease and/or weed species interference noted. We stopped briefly for a picnic lunch beside the two iconic wych elms (*Ulmus glabra* 'Horizontalis') close to the main entrance while we caught up on the successes and obstacles experienced by each group during the morning. By 2pm we had collected data for 86 trees - a great start. Work on improvements for ongoing data collection has already started including better alignment of the tracks shown on earlier maps with current aerial maps. This will speed up the relocation of individual trees and ensure greater certainty in matching data.

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Committee 2021-2022

Please submit copy for next newsletter to Lydia Turley by 10th May 2022

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