TRILEPIDEA

Newsletter of the New Zealand Plant Conservation Network

No. 229

May 2023

Deadline for next issue:
Friday 16 June 2023

SUBMIT AN ARTICLE TO THE NEWSLETTER

Contributions are welcome to the newsletter at any time. The closing date for articles for each issue is approximately the 15th of each month.

Articles may be edited and used in the newsletter and/or on the website news page.

The Network will publish almost any article about plants and plant conservation with a particular focus on the plant life of New Zealand and Oceania.

Please send news items or event information to info@nzpcn.org.nz

Postal address:
PO Box 147
Mangonui 0442
NEW ZEALAND

PLANT OF THE MONTH, p. 4

Pomaderris phylicifolia subsp. *phylicifolia*. Photo: Jeremy Rolfe.

First insights into the propagation of Gastrodia cooperae, an elusive orchid with unusual eating habits

Jennifer Alderton-Moss (jennifer.alderton-moss@wcc.govt.nz) [a,b], *Karin van der Walt* [a], *and Carlos A. Lehnebach*[b]

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The genus *Gastrodia* contains 95 species, found through Africa, Asia, Australia, New Zealand, and the Pacific (Govaerts, 2022), and all of these are fully mycoheterotrophic. This means they obtain all their energy from a fungal partner, instead of through photosynthesis. For most of the year they are dormant and exist only underground, where they form starch-rich tubers similar to a yam. In late spring/early summer *Gastrodia* plants emerge as a leafless spike, holding bell shaped flowers in shades of yellows and browns.

In New Zealand there are five species of *Gastrodia*: *G. cooperae, G. cunninghamii*, *G. minor*, *G. molloyi* and *G. sesamoides*, and all except *G. sesamoides* are endemic. The most threatened of these is *Gastrodia cooperae*. Classified as Nationally Critical and with less than 250 individuals, this orchid is known from only a handful of sites (Lehnebach et al., 2016). The only remaining North Island population can be found at Marangai Station, in the Eastern Wairarapa. This population has found refuge within a patch of remnant bush and the neighbouring pine plantation, under the watchful eye of the landowner, Tony O'Boyle. Growing nearby you can also find *G. minor*, *G. molloyi* and *G. sesamoides*; whatever it is *Gastrodia* need to survive, clearly it can be found here!

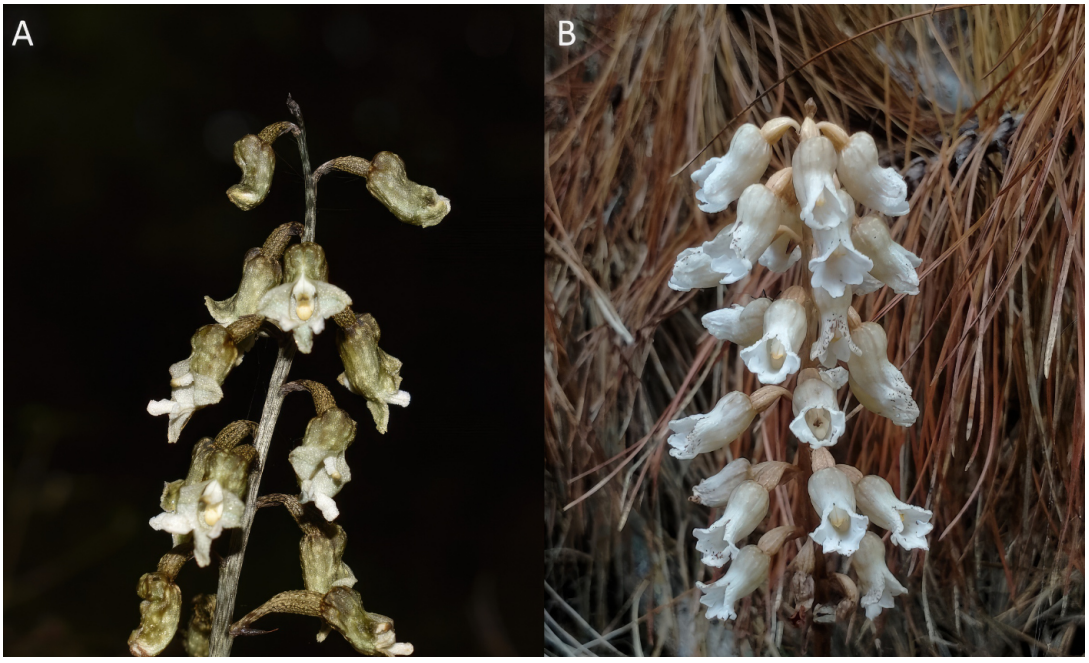

Figure 1. Flowering spikes of *Gastrodia cooperae* (A) and *G. sesamoides* (B)

Our project

Our study of *G. cooperae* has been made possible thanks to a Te Tahua Taiao Ngā Taonga (Lottery Environment and Heritage) grant. This three-year conservation project, run as a collaboration between Ōtari and Te Papa, aims to improve the conservation outcomes of several threatened orchids through population assessments, the identification of pollinator and mycorrhizal partners, the establishment of germination protocols, and long-term storage of seed and fungal partners. Presently, we will share what we have learnt about the mycorrhiza of *G. cooperae* and *G. sesamoides*, and their role in germination.

Mycorrhizal associations – what's on the menu?

For a plant that obtains all its energy, throughout its entire life, from fungi, understanding which fungi it can associate with and what those fungi need to thrive becomes an essential aspect of conservation. In the context of our project, culturing and identifying fungi from *G. sesamoides* and *G. cooperae* will allow us to germinate seed and generate seedlings; these can then be used to increase numbers in wild populations, establish new populations within protected land, and/or form ex situ collections for research, education, and conservation. Being able to germinate seed also allows us to verify viability of seed during long-term storage.

Orchid mycorrhizal fungi can be isolated by dissecting roots from mature plants and, under a microscope, finding and extracting tiny coiled fungal structures (known as pelotons). Instead of digging up and cutting into the root system of *G. cooperae*, we employed these methods on a common species found at the same site: *G. sesamoides*. Pelotons were located within lateral roots of this species, teased out, and grown on a nutritious medium. One fungus obtained this way has shown promise as a partner capable of promoting germination of *G. sesamoides* (Figure 2).

Figure 2. Germination of *Gastrodia sesamoides* using the fungus *Resinicium bicolor* after 12 weeks (A), 16 weeks (B) and 20 weeks (C).

Isolating fungi from *G. cooperae* may prove more complicated; the *G. cooperae* tubers we have carefully examined so far do not have lateral roots and we are wary of disturbing the tubers of many individuals. Luckily, the fungus isolated from *G. sesamoides* has germinated *G. cooperae* seed too (Figure 3)!

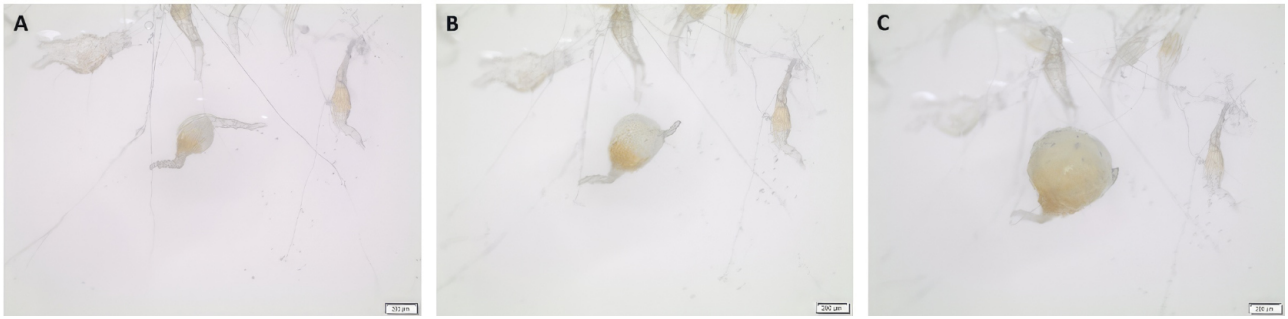

Figure 3: Seeds of *Gastrodia cooperae* germinated with the fungus *Resinicium bicolor* after 12 weeks (A), 16 weeks (B) and 20 weeks (C).

Targeted DNA sequencing of this fungus has tentatively identified it as *Resinicium bicolor* (>99% identity with other *Resinicium bicolor* ITS sequences in GenBank). This is not an unprecedented

finding: *Gastrodia similis* from Réunion was found to associate with *Resinicium* sp. (Martos et al., 2009), and *Resinicium bicolor* was identified as the dominant fungus during one developmental stage of *G. elata* from China (Chen et al., 2019).

Introducing *Resinicium*

Resinicium (Hymenochaetales; Agaricomycetes) is a genus of saprotrophic, corticioid fungi (Yu et al., 2021). Saprotrophic refers to how these fungi obtain their energy—through decomposition of organic matter, while corticioid refers to the growth form—typically flattened, sprawling fruit bodies on the underside of branches—sometimes referred to as crust fungi. In New Zealand, *Resinicium bicolor* has been suggested to play a role in decomposition of *Pinus radiata* debris (Hood et al., 2011), and in the present study, we isolated *Resinicium bicolor* (Figure 4) from *G. sesamoides* growing in a pine plantation. This *R. bicolor* has germinated seed from both *G. cooperae* and *G. sesamoides*.

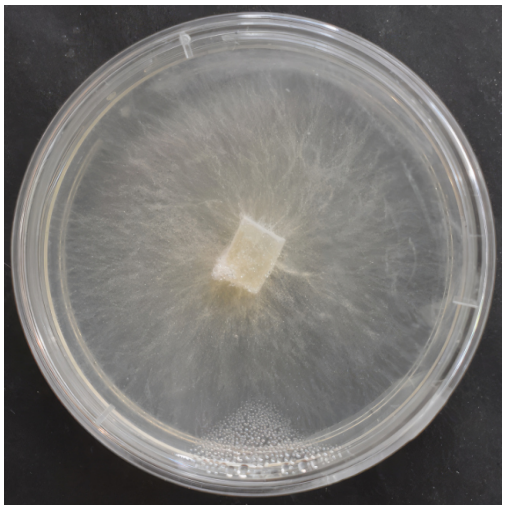

Figure 4. *Resinicium bicolor* culture from *G. sesamoides* growing on medium in the lab.

Germination of *Gastrodia* is not the most exciting process in the world. It takes months until the germination process starts and not all seeds germinate simultaneously. Seedlings do not turn green, or sprout leaves, or send curious winding roots deep into the ground. What we have seen is that embryos grow with the apparent aim of forming a tuber. In *G. sesamoides*, we are seeing an appendage similar to a leaf primordium initiation during this growth stage, but our seedlings are still too young to produce subsequent shoot growth. At this stage, we are not sure how much the tuber will have to develop before it sends up a spike – we may be waiting years! However, we are moving in the right direction!

Conclusions

We have made some important progress in understanding the ecology of *G. cooperae* and how to apply this to its conservation, but we by no means have the full picture yet! We are still exploring various conservation tools, including long-term storage of fungi and seed. Having fungi and seed in storage, and the ability to regenerate these into plants, provides an invaluable conservation action for plants that are confined to small populations. However, the optimal method for long-term storage needs to be identified for each species—some do better in liquid nitrogen (-196°C), while others prefer -18°C or even 5°C. Pollination biology is another key aspect in the conservation of this orchid that still requires our attention. Understanding whether *G. cooperae* can self-pollinate or relies entirely on pollinators for the fertilisation of its flowers is critical to secure ongoing seed production. If it is pollinator-dependant, identification of the pollinator(s) will allow us to assess their conservation status and whether any conservation actions are needed to secure their long-term survival.

As we continue to deepen our understanding of *G. cooperae*, we hope to bring you answers to some of these questions! Until then, please share in our excitement of welcoming some new *G. cooperae* plants into the world (or if not the world, at least into a Petri dish).

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PLANT OF THE MONTH – *POMADERRIS PHYLICIFOLIA* SUBSP. *PHYLICIFOLIA*

Bill Campbell (billcampbell@xtra.co.nz)

The plant of the month for May is *Pomaderris phylicifolia* subsp. *phylicifolia*. This indigenous species has a limited distribution, only being found now at scattered sites from Te Paki in the far north south to near Orewa. It is also present in Australia and is known there from Victoria and southern New South Wales.

Pomaderris phylicifolia subsp. *phylicifolia* is usually associated with nutrient poor, open sites amongst low growing scrub and sedges and is often found on clay banks and roadsides. It can be locally common where it still persists.

The plant is generally a spreading, much-branched shrub, growing up to 1.5 metres in height and 2.0 metres across. It has hairy twigs and also hairy leaves, which are wrinkly with in-rolled margins. It can be very striking when flowering, with its glossy green leaves and clusters of white flowers.

Pomaderris phylicifolia subsp. phylicifolia: (left) flowers, Albany (in cultivation), 19 October 2007. Photo: Jeremy Rolfe; (centre) upper leaf surface and immature flower buds. Photo: Peter J. de Lange; (right) plant showing growth habit, Te Paki, 10 December 2011. Photo: Bill Campbell.

The only taxon with which it could be confused possibly is *Pomaderris amoena* but that species has significantly smaller leaves. The leaves of *P. amoena* are recurved almost to the midrib, obscuring the fuzzy leaf underside obvious in *P. phylicifolia* subsp *phylicifolia*.

Pomaderris phylicifolia subsp. *phylicifolia* has a current threat ranking of Threatened – Nationally Critical. The northernmost population at least appears to be secure, with fire, roadside spraying and browsing by animals being the biggest threats. Natural succession causing habitat loss is also an issue.

The genus name *Pomaderris* means 'lid skin', referring to the valves of the fruit. The species epithet *phylicifolia* means 'having leaves like phylica' a South African shrub.

You can view the NZPCN website factsheet for *Pomaderris phylicifolia* subsp. *phylicifolia* at https://www.nzpcn.org.nz/flora/species/pomaderris-phylicifolia-subsp-phylicifolia/

Otago botanical hotspot – Mahaka Katia Scientific Reserve

John Barkla (mjbarkla@xtra.co.nz)

Mahaka Katia Scientific Reserve (Pisa Flats) is situated on elevated terraces above Lake Dunstan just north of Cromwell, at the foot of the Pisa Range. Its special botanical values have been long-recognised and this culminated in the gazettal of the reserve in 2001, following its purchase from two neighbouring famers by the Nature Heritage Fund.

In an earlier *Trilepidea* article, Geoff Rogers gave a comprehensive account of the rare plants of the upper Clutha River/Mata Au catchment (Rogers 2021), many of which occur at Mahaka Katia Scientific Reserve. Participants in the NZPCN Queenstown conference dryland field trip got a first-hand look at the reserve in December 2022.

The 27 hectare reserve is a small protected example of the extensive, alluvial terraces that extend over 50 km down the Clutha valley from the Wanaka and Hawea Lakes to Cromwell. The native vegetation on most of these terraces has succumbed to pastoral farming, horticultural development and residential subdivision but at Mahaka Katia populations of several rare, endemic dryland species, can still be found on the post-glacial, outwash gravels.

In late 2022 I surveyed the flora of the reserve and recorded 94 taxa of which 40 are native and 52 are exotic (a further two are of uncertain status). That the number of exotic plants exceed those of natives is a sad reflection of the general weediness of the Central Otago lowlands. On this survey I recorded several exotics that I'd not previously seen there. The natives are a generally resilient bunch, growing on the most well-drained stony soils, often near the terrace edges. Many are small and cryptic requiring a keen eye to spot, especially when the hot summers have reduced them to a crisp. A few, like the riverbed forget-me-not (*Myosotis uniflora*), are abundant enough to put on quite the flowering spectacle in spring (Fig. 1).

Figure 1. *Myosotis uniflora* flowering, October 2022.

Surprisingly, almost 40% of the native taxa are considered 'Threatened', 'At Risk', or 'Data Deficient' (Townsend et al. 2008). They are listed, with their most recent threat status (de Lange et al. 2018) in Table 1. One species, the recently named *Craspedia argentea* (Breitwieser & Ford 2022) is known only from this reserve (Fig 2.). It, along with several other taxa in the reserve such as *Lepidium solandri* and *Leptinella conjuncta*, are regarded by DOC as 'Species on the Brink', such is their perilous state.

Despite the dryness of the site and its predominantly herbaceous vegetation, a few relict shrubs of desert broom (*Carmichaelia petriei*) and other subshrubs suggest a woodier prehuman vegetation might have existed at the site. The desert broom population has been fenced off separately from the rest of the reserve to enable more intensive rabbit control there.

Another interesting feature of the reserve is patches of bare soil with alkaline sodic chemistry (commonly called salt pans—see Craw et al. 2022 for more explanation), that are surrounded by silver tussock. Just one plant, *Atriplex buchananii*, a species more usually associated with the coast, grows on the crusty surface of the pans.

Figure 2. *Craspedia argentea*, October 2022.

Table 1. 'Threatened', 'At Risk', and 'Data Deficient' taxa recorded

Threat Division	Taxon	Conservation Status (de Lange et al. 2018)
Threatened	*Atriplex buchananii*	Nationally Vulnerable
	Convolvulus verecundus f. verecundus	Nationally Vulnerable
	Craspedia argentea	Nationally Critical
	Lepidium solandri	Nationally Critical
	Leptinella conjuncta	Nationally Critical
	Muehlenbeckia ephedroides	Nationally Vulnerable
	Raoulia monroi	Nationally Vulnerable
At Risk	*Carmichaelia petriei*	Declining
	Colobanthus brevisepalus	Declining
	Myosotis uniflora	Naturally Uncommon
	Raoulia australis	Declining
	Raoulia beauverdii	Declining
	Raoulia parkii	Declining
Data Deficient	*Carex decurtata*	
	Rytidosperma maculatum	

Mahaka Katia Scientific Reserve is signposted off State Highway 6 between Cromwell and Wanaka. A short vehicle track leads to a carpark at the reserve boundary and a stile for access. Arguably the best time for a visit is spring (October – November) when many of its distinctive plants are flowering and most easily recognised.

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Range extension for *Corybas obscurus*

Bill Campbell (billcampbell@xtra.co.nz) (first published in the NZ Native Orchid Group Journal 169, May 2023 and reproduced with permission)

In late November 2022 Mike Lusk and I embarked on an "orchid odyssey", with the aim of seeing in flower as many South Island orchid species as was possible at that time of the year. Our first stop was St Arnaud in the Nelson Lakes District and we spent a full day in that area, very ably guided by Mark Moorhouse.

One of the species we managed to see in flower on that day, after some searching, was *Corybas obscurus*, at or near the type locality. Mark's local knowledge proved invaluable and we observed a number of species in flower that I had not previously encountered. This is not entirely surprising, given that I had not previously been orchid hunting in the South island.

From St Arnaud Mike and I headed for the West Coast, where we based ourselves in Greymouth for a couple of days so we could explore the pakihi areas near Charleston and some of the tracks in the Punakaikai area. The weather did its best to deter us but we still managed to find the majority of our target species in the area.

While walking the Pororari River Track near Punakaikai we were surprised to find one of the trilobate leaved *Corybas* species still in flower. Based on the flower colour, it could only be *Corybas confusus* or *Corybas obscurus*, although the latter was only recorded as being found in the Nelson Lakes region. A number of photos were taken to aid identification later.

More flowering plants were observed the following day on the Fox Caves Track and these were also photographed. Based on the fact that the dorsal sepal didn't project beyond the labellum our initial ID was *Corybas obscurus*. However, given that its stated distribution is limited to the Nelson Lakes region, we weren't 100 percent confident that we had the species ID right. Of note is that all three sites are adjacent to a significant river system.

While attending the NZPCN conference in Queenstown in early December I had the opportunity to show the photos to Carlos Lehnebach to get another opinion. Although initially unsure, Carlos eventually concluded that the species was indeed *Corybas obscurus*.

These two finds on the West Coast represent a significant range extension for the species and highlight the fact that that our knowledge of orchid distribution is still quite limited in some instances. It is highly likely that the range of *C. obscurus* will be further extended as more people are out and about at the right time of the year to catch the species in flower.

Corybas obscurus: (left) Pororari River Track, Punakaikai, 26 November 2022; (right) Fox Caves Track, Fox River, 27 November 2022. Photos: Bill Campbell.

A search for maire tawake (swamp maire) in Tāmaki

Hanareia Ehau-Taumaunu (hanareia.ehau-taumaunu@plantandfood.co.nz)

Kia ora koutou. My name is Hanareia and I am a plant pathologist with Plant and Food Research and Bioprotection Aotearoa based in Tāmaki Makaurau Auckland. My research seeks to describe all the microorganisms present on the leaves of maire tawake (swamp maire) and other Myrtaceae plants in the ngahere and link the variations of microbes to the presence and absence of myrtle rust.

I am trying to find populations of maire tawake (swamp maire) in forest stands within Tāmaki Makaurau Auckland region with or without myrtle rust, and areas that are not being sprayed to reduce myrtle rust infection. If you know of any examples of maire tawake fitting this description and are willing share please email me at hanareia.ehau-taumaunu@plantandfood.co.nz.

Your help will be much appreciated!

Hei kōna,
Hanareia
Hanareia Ehau-Taumaunu
Post-doctoral Scientist
Ngāti Uepōhatu, Ngāti Porou, Te Ātiawa, Te Whānau-ā-Apanui

UPCOMING EVENTS

If you have events or news that you would like publicised via this newsletter please email the Network (info@nzpcn.org.nz), prior to the published copy deadline, with details of meetings, field trips or other events taking place during the following month or later. The deadline for copy for the following month's *Trilepidea* is at the top of the front page of each issue.

If you intend to participate in one of the advertised botanical society meetings or field trips please check with the relevant society beforehand to confirm that the published details still stand.

Auckland Botanical Society

Meeting: Wednesday 7 June at 7.30pm. Special General Meeting followed by speaker. **Speaker:** Dr Yumiko Baba. **Topic:** Japanese flora.	**Venue:** Unitec, School of Natural Sciences, 139 Carrington Road, Mt. Albert (Gate 4, Building 115, Room 1028).
Field Trip: Saturday 17 June to a private bush block, 129 Laingholm Drive, Laingholm. **Meet:** Tangiwai Reserve carpark (by playground) on right of Huia Road just past the Langholm Drive turnoff at 10.00am.	**Leaders:** Geoff Davidson, ph. 09 813 0229 or 021 764 967 and Mike Wilcox.

Waikato Botanical Society

Field Trip: Saturday 10 June to Waharoa QEII Covenant (combined with Rotorua Botanical Society). Meet: At Rotorua carpark (time to be confirmed) or at entrance to Hawes Bush, Walker Road, Waharoa (time to be confirmed). **Grade:** Easy.	**Leader:** Del Hood, email dhood@xtra.co.nz, ph. 027 521 9260.

Rotorua Botanical Society

Field Trip: Saturday 10 June to Waharoa QEII Covenant (combined with Waikato Botanical Society). **Meet:** At Rotorua carpark (time to be confirmed) or at entrance to Hawes Bush, Walker Road, Waharoa (time to be confirmed). **Grade:** Easy.	**Leader:** Del Hood, email dhood@xtra.co.nz, ph. 027 521 9260.

Wellington Botanical Society

Field Trip: Saturday 10 June to Reikorangi Road Bush, Waikanae. **Meet:** Waikanae Railway Station north end carpark at 9.30am.	**Co-Leaders:** Andy McKay, ph. 027 555 653 and Eleanor Burton, ph. 021 058 8324.
Working Bee: Saturday 17 June at Te Marua Bush, Upper Hutt. Meet: Te Marua Bush at 9.30am.	**Co-Leaders:** Glennis Sheppard, ph. 04 526 7450 and Sue Millar, ph. 04 526 7440.
Meeting: Monday 19 June at 7.30pm. Speaker: Dr Nicola Day. Topic: Ecological impacts of fire in Canada and Aotearoa New Zealand.	**Venue:** Victoria University, Wellington, Lecture Theatre EALT206.

Nelson Botanical Society

Field Trip/Meeting: Please refer to the website: https://www.nelsonbotanicalsociety.org/trips-meetings for details.

Canterbury Botanical Society

Meeting: Saturday 10 June at 10.30am. AGM followed by up to five short presentations on topics of interest and then a shared lunch.	**Venue:** St Albans Community Centre,1049 Colombo Street, Christchurch.

Botanical Society of Otago

Meeting: Wednesday 14 June at 5.20pm. Speaker: Josie McGovern. Topic: Takahe, scouts for fungal diversity.	**Venue:** Main seminar room, Manaaki Whenua Landcare Research, 764 Cumberland Street, Dunedin.
Field Trip: Saturday 17 June to Ferntree Reserve, Dunedin. **Meet:** Meet and park at the southwestern extension of Helensburgh Road, near the entrance of Leslie Groves Hospital, at 9.00am. **Grade:** Easy.	**Leaders:** John Barkla, email mjbarkla@xtra.co.nz, ph. 027 326 7917 and Sharon Jones.

WAIKATO BOTANICAL SOCIETY
STUDENT SCHOLARSHIP
CALL FOR APPLICATIONS FOR 2022/23

Applications are invited for the Waikato Botanical Society Student Scholarship. The scholarship is open to any student studying for any degree or diploma with a research component in any tertiary institution in Aotearoa New Zealand. The scholarship allocation awarded will be up to $2,000.

Priority will be given to research projects which most align with two key aims of the Waikato Botanical Society. Which are:

- To encourage the study of botany, particularly that of New Zealand and the Waikato Region.
- To encourage the conservation of indigenous flora of New Zealand and the Waikato Region.

Applicants will also be assessed against the following set of criteria:

- Relevance and value in terms of filling gaps in existing New Zealand flora information
- Application, use or recognition of mātauranga Māori
- Ability to implement the research findings for the benefit of flora conservation
- Practical, feasible and achievable research
- Ability of the student

Another key aim of the Waikato Botanical Society is to disseminate knowledge about and encourage interest in the flora of New Zealand. The successful recipient of the grant will be invited to give a presentation to Waikato Botanical Society members on the findings of the research and contribute a summary article for the Botanical Society newsletter. Recipients of the award will be asked to acknowledge the society where possible in research publications such as a thesis.

The grant will be given in instalments as a contribution to expenses associated with the research project, identified in the application form.

Closing date for applications: 30th June 2023

A copy of the Application Form and the Rules of the award may be downloaded from the Waikato Botanical Society website.

Contact for enquiries: Waikato Botanical Society Secretary.
Email: secretary@waikatobotsoc.org.nz