Newsletter

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In this issue

New Research Committee

Hervé Sauquet Vice-President

The ASBS Council recently went through the process of renewing the ASBS Research Committee, whose role is to evaluate proposals for the Hansjörg Eichler Scientific Research Fund (twice a year) and the Marlies Eichler Postdoctoral Fellowship (once a year). The last time the Research Committee was renewed was in 2016.

To this effect, the Research Committee welcomes five new members:

- Ms Janet Gagul, Researcher at the Centre for Biodiversity and Natural Products, University of Papua New Guinea (Port Moresby, Papua New Guinea)
- Dr Jennifer Tate, Associate Professor and Genetics, Genomics, and Evolution Research Group Leader at the School of Fundamental Sciences, Massey University (Palmerston North, New Zealand)
- Dr Benjamin Anderson, Research Scientist at Department of Biodiversity, Conservation and Attractions (Perth, Western Australia)
- Dr Peter Heenan, Senior Scientist at Manaaki Whenua – Landcare Research (Lincoln, New Zealand)
- Dr Hervé Sauquet, Senior Research Scientist at the Royal Botanic Gardens and Domain Trust (Sydney, Australia)

These new members were formally approved by the CSIRO Chief Executive on 8 April 2022. In addition, Heidi Meudt (previous ex officio Chair), Jo Birch, and Katharina Nargar have decided to step down, while Sarah Mathews and Murray Henwood will remain on the Committee.

I would like to warmly welcome the new members of the Research Committee and look forward to working with everyone in my new role as Vice-President. On behalf of the Society, I would also like to express our sincere thanks to all members of the previous Research Committee for their continued service over the past five years. Lastly, many thanks to the previous Vice-President, Heidi, and our President, Mike Bayly, for leading the process of this renewal.

Previous Research Committee (2016-2021):

Heidi Meudt (*ex officio* Chair)

Joanne Birch

Murray Henwood

Sarah Mathews

Katharina Nargar

New Research Committee (2022-):

Hervé Sauquet (*ex officio* Chair)

Benjamin Anderson

Janet Gagul

Peter Heenan

Murray Henwood

Sarah Mathews

Jennifer Tate

Recent ASBS Eichler Funding News

Hervé Sauquet Vice-President, ex officio Chair of the Hansjörg Eichler Research Committee

The March 2022 round of the ASBS Hansjörg Eichler Scientific Research Fund was again a very competitive round, with six high-quality applications submitted. The ASBS Research Committee has now reviewed all the applications and are pleased to announce the latest recipients of research grants from the March 2022 round:

Grace Boxshall PhD student, University of Melbourne
Supervisors: Joanne Birch, University of Melbourne and Teresa Lebel, Botanic Gardens and State Herbarium of South Australia.
Chapter title: The application of diversity arrays technology (DArT) for species complex resolution in *Agaricus*. PhD title: "Phylogenetic investigation of *Agaricus* (Basidiomycota: Agaricales) biodiversity across eastern Australasia".

Paulo Baleeiro PhD student, University of Queensland
Supervisors: Dr Roderick Fensham, Dr Lyn Cook, Dr Richard Jobson.
Project: "Systematics of *Eriocaulon* L. in Australia: Phylogenomics and Population Genetics".

A full list of the winners of the Hansjörg Eichler Research Fund (1997-present) can be seen here: http://www.asbs.org.au/asbs/hesrfund/index.html. This page also has additional links to the resulting reports from most of the previous winners.

A reminder that there are two more Eichler deadlines coming up this year:

- 31 July 2022: Marlies Eichler Postdoctoral Fellowship
- 14 September 2022: Hansjörg Eichler Research Fund

For those intending to apply, all the important information and the application form can be found on the ASBS website. If you have any questions, please contact Hervé Sauquet at vicepres.asbs@gmail.com.

Phylogenetic inference of Australian *Caesia* and *Corynotheca* (Asphodelaceae subf. Hemerocallidoideae)

Aiden Webb *The University of Melbourne*

Introduction

Caesia R.Br. and *Corynotheca* F.Muell. ex Benth. (Asphodelaceae subfamily Hemerocallidoideae) are tepaloid monocot genera, often referred to as 'grass-lilies' (*Caesia*) and 'sand-lilies' (*Corynotheca*). They occupy much of the diverse Australian landscape, including a variety of habitats in tropical north Queensland, the arid interior, and alpine regions of southern Australia including grasslands, tall eucalypt woodlands, heathlands, and bogs. Although widespread in Australia, finding and identifying them can be challenging as they are often inconspicuous or cryptic in nature. This is exacerbated by the few characters that can be used to separate species, which includes root tubers, flower colour and seed characteristics, and mostly relies on observations of different life history stages for each plant.

Caesia comprises 14 species, of which 10 are Australian while the remaining species extend to South Africa, Madagascar, and New Guinea. At least another 10 putative Australian species have been identified. They are distinguished by their grass-like leaves, fleshy or tuberous roots, and tiny flowers in various shades of white, blue, or purple (Pate & Dixon 1982; Henderson 1987a). *Corynotheca* are quite similar to *Caesia*, distinguished primarily by their shrubby habit with large, divaricately branching inflorescences (Macfarlane et al. 2020). *Corynotheca* leaves are regularly reduced to bracts on the inflorescence, which is the main photosynthetic structure of the plant. Their roots are not fleshy as in *Caesia*, but rhizomatous. Flowers are typically white, and as is typical in both genera, they twist closed following anthesis (Henderson 1987b). *Corynotheca* was recently reviewed by Barrett *et al*. (2021) based on morphological taxon concepts. Following this publication, it includes 13 species.

Caesia and *Corynotheca* are included in the Johnsonioid clade (Wurdack & Dorr 2009), which is exclusively found in the southern hemisphere, with the majority of genera native to Australia (Kubitzki 1998). Previous studies, based on morphological and molecular data, have indicated a close relationship between *Caesia* and *Corynotheca*, although their taxonomic boundaries and their relationships to each other, and to other Johnsonioid taxa, remain unclear. Notably, several Western Australian species, referred to as the 'rigid-leaved' *Caesia*, have morphological features, such as a fleshy aril and rigid leaves, that are more akin to *Corynotheca*. However, previous phylogenetic studies of the johnsonioid clade (e.g., Wurdack & Dorr 2009) included only one representative of each of the eight genera. Therefore, the monophyly of *Caesia* and *Corynotheca* had not been tested and almost all species remained unplaced in a phylogenetic context. In 2019, I completed a pilot study screening a selection of candidate molecular markers and selecting two plastid markers to infer the *Caesia* and *Corynotheca* phylogeny based on an initial 14 taxa. The results from this pilot study recovered *Caesia* and *Corynotheca* as monophyletic. However, species representation remained incomplete (Webb, unpublished data).

Within *Caesia*, additional taxonomic issues warrant field- and herbarium-based study. For example, *Caesia parviflora* R.Br., *Caesia calliantha* R.J.F.Hend., and *Caesia alpina* Hook.f. are morphologically and geograph-

ically overlapping species from eastern Australia (Queensland, New South Wales, ACT, Victoria, Tasmania, and South Australia) that require taxonomic revision (Henderson 1987a). Specifically, taxonomic boundaries in the *C. parviflora* species complex are not well defined (Henderson 1987a). Three varieties are currently recognised that are not clearly distinguished from each other, nor from other species *C. alpin*a and *C. calliantha*. Historically, delimitation of these taxa has been troublesome due to a lack of taxonomically informative morphological features, such as flower and filament colour, and root morphology, on herbarium specimens. Additionally, and while some of these taxa are widespread across their geographic range, collections are infrequent as they are often diminutive and inconspicuous in surrounding vegetation, especially outside of the flowering season. A deficiency of accurate distribution data for *Caesia parviflora* var. *parviflora* and var. *vittata* contributes to the issues regarding their taxonomic delineation, as do differences among treatments of widespread species across state boundaries.

With my master's research, supported by a Hansjörg Eichler Research Grant and an ABRS Masters scholarship, I sought to provide the first phylogenetic reconstruction of Australian *Caesia* and *Corynotheca* with comprehensive taxonomic sampling. This would enable estimation of Johnsonioid clade generic relationships and of *Caesia* and *Corynotheca* species relationships, placement of putative *Caesia* species in a phylogenetic context, assessment of the monophyly of noted *Caesia* species complexes and of *Corynotheca* species recognised in a recent revisionary work (Barrett *et al.* 2021).

Methods

Reconstructing relationships within *Caesia* and *Corynotheca* required comprehensive sampling of currently recognised and putative species. During a brief respite from COVID-associated lockdowns in Melbourne, during the 2020-2021 field season, I conducted fieldwork throughout Victoria facilitated

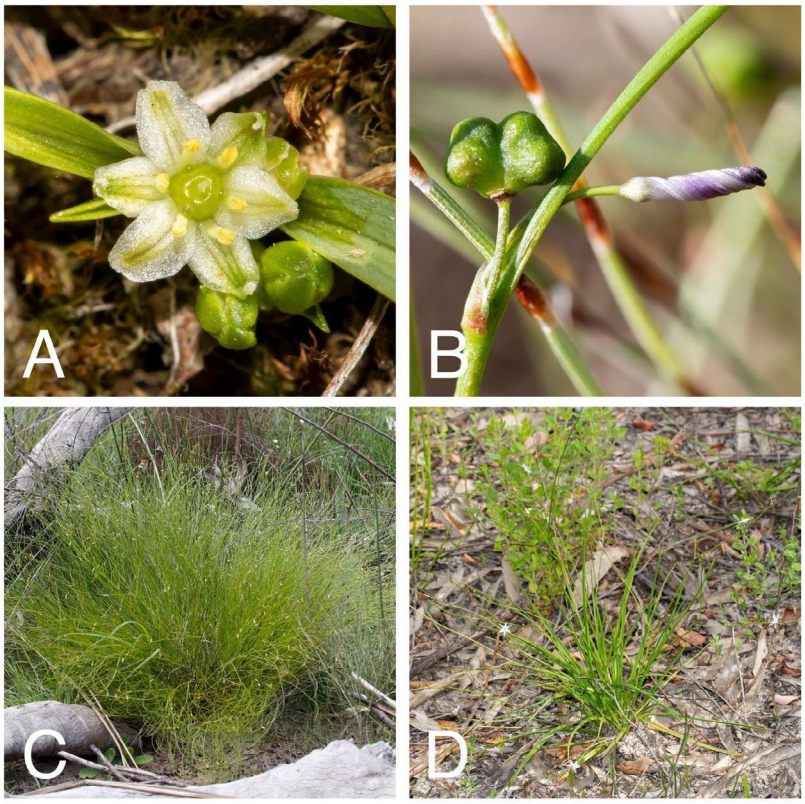

Figure 1 A *Caesia alpina* flower and buds, Bogong High Plains, Victoria. **B** *Caesia parviflora* fruit and flower characteristically twisted closed, Langwarrin, Victoria. **C** *Corynotheca licrota* habit, Kakadu National Park, NT. **D** *Caesia parviflora* habit, Bemm Forest, Victoria. Photos by Aiden Webb.

by this Hansjörg Eichler Research Grant. This fieldwork enabled collection of *Caesia parviflora* samples from throughout Victoria, from the Grampians in western Victoria to Mallacoota in Far East Gippsland and enabled observation of putatively taxonomically informative morphological features in the field. These features such as anther filament colouration and the extent of fleshiness in root structures are frequently used in *Caesia* taxonomic keys but are seldom evident on herbarium specimens. Voucher specimens (including duplicates) were collected for accession and distribution to Australian herbaria. Fieldwork in the Victorian Alps also supported collection of multiple *Caesia alpina* specimens increasing our knowledge of how locally common this species is in this area and, as this species was previously represented by only a small number of specimens in herbaria, contributing valuable new specimens into our collections. Fieldwork planned for locations outside of Victoria was not possible due to COVID-associated state border closures during the field season. However, I made visits to Australian herbaria in Brisbane (BRI), Melbourne (MEL) and Hobart (HO) which facilitated assessment of variable morphological characters in *Caesia*, annotation of specimens, and permitted collection of material for DNA sequencing. In total, 73 individuals, covering 10 recognised *Caesia* species and nine putative species, alongside all 13 *Corynotheca* species and one informally recognised taxon were included in the phylogeny. All other genera in the Johnsonioid clade were represented by at least one individual.

Extraction of total genomic DNA for *Caesia* and *Corynotheca* from dried leaf material was completed in the Plant Systematics Group lab in the School of BioSciences at the University of Melbourne. Extractions were utilised for generation of DNA sequence data for five chloroplast markers which were identified for their variability and informativeness in separating species (Shaw *et al*. 2005, 2007). This resulted in a concatenated alignment of 3,637 base pairs. In generating these data, we followed a targeted amplicon sequencing approach developed by Dr Todd McLay, adapted from a protocol published by Bybee *et al*. (2011). Resulting pooled libraries were sequenced using Illumina MiSeq technology at the Walter and Eliza Hall Institute of Medical Research using the MiSeq Nano kit. The phylogeny was reconstructed using both Maximum Likelihood and Bayesian Inference analyses.

Results

In this study, I reconstructed the phylogeny for both *Caesia* and *Corynotheca*, with comprehensive sampling, for the first time. These results provide support for the recognition of *Caesia* and *Corynotheca* as distinct. However, these analyses recovered *Corynotheca* as paraphyletic and *Caesia* as polyphyletic, as an undescribed *Caesia* species from Western Australia, which is morphologically similar to members of the 'rigid-leaved' *Caesia* also from Western Australia, was sister to *Corynotheca s.str.* Additional samples of the 'rigid-leaved' *Caesia* species are now available and further sequencing will be completed to enable inclusion of these species into the phylogeny to further investigate support for these relationships. This preliminary result is of considerable interest, given the noted morphological similarities of the 'rigid-leaved' *Caesia* species with *Corynotheca*, and warrant careful further consideration.

Within *Caesia*, two major clades were identified. One contained all species from western Australia, plus *C. alpina*, which was recovered as monophyletic, and *C. parviflora*, which was polyphyletic. The second clade contained the remaining *Caesia* species from northern and eastern Australia, with interesting additions of putative species from central Australia. Notably, in this clade, molecular variation was observed in *C. chlorantha*, a species which extends from south-eastern Queensland inland across to north-eastern Western Australia, and in *C. setifera*, which is found across the north of Australia including far-north Queensland, the Northern Territory top end and north-eastern Western Australia. These two species complexes in particular warrant further investigation, although a

concerted effort will be required to sample them across their ranges given their ephemeral and often cryptic nature. The placement of *C. parviflora* var. *vittata* individuals nested within *C. chlorantha* and *C. calliantha* also merits focussed study on the morphological boundaries of *Caesia parviflora* varieties, as currently circumscribed. Application of DArTseq sequencing and ongoing morphological assessments of eastern Australian *Caesia* taxa is underway, which will provide additional data for consideration alongside this phylogeny to assess the taxonomic boundaries of the *Caesia parviflora* species complex.

The phylogeny also provided support for recognition of at least three new species in *Caesia*, including *C.* sp. Koolanooka Hills (R.Meissner & Y.Caruso 78) and *C.* sp. Mt Mann (D.E.Albrecht 13118). These were made available for inclusion in our analyses by our interstate collaborators Terry Macfarlane, Dave Albrecht, and Peter Jobson. Placing these putative taxa into the phylogeny supports an integrated approach to understanding taxonomic boundaries and relationships.

Despite the inclusion of all recognised *Corynotheca* taxa in this study, infrageneric relationships were not well resolved. However, the phylogeny does provide a framework for assessment of relationships and identifies persistent taxonomic issues in *Corynotheca*. The elevation of *Corynotheca micrantha* varieties to specific rank in the recent revision of the genus (Barrett *et al*. 2021) were largely supported in our phylogeny, as species formerly treated as *C. micrantha* varieties were not all closely related. Assessment of relationships within *Corynotheca* will require additional sampling and genetic data.

This master's study was successful in providing a phylogenetic framework for *Caesia* and *Corynotheca*, greatly progressing our understanding of species relationships and their evolutionary history. Hence, the next steps in expanding our understanding of these genera were identified. Further study is underway to finalise the *Caesia* and *Corynotheca* phylogeny and develop our understanding of relationships between species. We will incorporate sequence data for missing taxa, particularly the 'rigid-leaved' *Caesia* from western Australia. Future work to describe new taxa in *Caesia* and investigate the various species complexes it contains is expected.

Acknowledgements

I would like to acknowledge and sincerely thank the Australasian Systematic Botany Society for their support of my master's research through the Hansjörg Eichler Research Fund. This facilitated DNA sequencing integral in reconstructing the *Caesia* and *Corynotheca* phylogeny, and much needed fieldwork for collections of Victorian *Caesia*. I'd also like to thank my supervisors Dr. Jo Birch and Dr. Russell Barrett for their invaluable guidance and support. Further sequencing was made possible with a grant provided by the Australian Biological Resources Study. I'd like to acknowledge the institutional support of the University of Melbourne, School of BioSciences, as well as Australian herbaria (BRI, HO, MELU and MELU) for access to their collections, and Parks Victoria and the Department of Environment, Land, Water and Planning for access and scientific permits for plant collections. Many thanks to our collaborators, Dr. Terry Macfarlane, Dr. Bee Gunn, Dave Albrecht, Dr. Richard Jobson, Peter Jobson, and Cate Tauss, who have been able to provide *Caesia* and *Corynotheca* samples and DNA extractions for taxa we undoubtedly couldn't have included without your aid. Thanks to Stephen Wilcox of the Walter and Eliza Hall Medical Institute for Illumina sequencing and Dr. Todd McLay and the Plant Systematics Group Lab for support in sequencing preparation.

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Field sampling for a phylogeny of the subtribe Celmisiinae (Asteraceae)

Duncan Nicol *The University of Otago*

Nearing the end of my bachelor degree in ecology, I met Dr. Patricio Saldivia at a paper reading group. Patricio had started his PhD investigating the *Celmisia* group and after we got to talking about it, we went on a field trip to Mt. Burns on the edge of Fiordland. Our discussions about the *Celmisia* group from then on led my research interests toward systematics. I had also been thinking about how I could continue into postgraduate research by combining maps and fieldwork (even though I wasn't a geologist or a surveyor). I was captured by the diversity of *Celmisia*, back then in 2017 and now, five years on, I am doing my own PhD on the *Celmisia* group.

The informal *Celmisia* group proposed by Nesom (1994) has since been circumscribed as the subtribe Celmisiinae Saldivia (Astereae) (Nesom 2020, Saldivia et al. 2020). To reflect this change, my research has also expanded by incorporating genera beyond the shrubby resinous *Celmisia* that it started with. These wider genera include the other *Celmisia* subgenera, *Olearia* (*pro parte*), *Pachystegia, Pleurophyllum,* and *Damnamenia*. The delimitation of the subtribe Celmisiinae is clear but the relationships amongst its genera are not. One of the aims of my research is to find support for the relationships between these genera. Similarly, the taxonomy of the resinous *Celmisia*, including *Celmisia* subgen. *Lignosae*, *C.* subgen. *Caespitosae*, and *C.* subgen. *Glandulosae*, was revised by Patricio but the molecular resolution for species differentiation still requires support. Hence, another aim of my research is to provide more detail for speciation within this clade.

One of the recent innovations in genome sequencing has meant that both these goals can be achievable. Target enrichment has been developing over the last decade and is the method I chose to retrieve the necessary se-

Figure 1 **A** *Celmisia macmahonii*, Mt. Richmond; **B** *C. lateralis,* Waingaro Peak; **C** *Olearia virgata,* Cobb Valley; **D** *Pachystegia*, Mt. Fyffe; **E** *C. cockayniana,* Mt. Fyffe; **F** *C. ramulosa,* Eyre Mountains. Photos: D. Nicol

quence data. Target enrichment is a technique where specific regions of the nuclear genome are 'targeted', amplified and sequenced. Initially, fragmented DNA strands are tagged with identifying index-sequences. Probes are then added amongst these strands, binding to 'target' regions. The probes can then be extracted along with the DNA regions bound to them. The unwanted DNA strands which were not targeted are washed away, leaving only the probes with the target DNA. These targeted DNA strands are then amplified using conventional PCR. The end result is enriched, targeted DNA, all with identifying sequences so that we can reference the sequence to a sample. Researchers at Kew Gardens developed a specific set of probes which were chosen to capture the variability across the flowering plants, hence the name of the set, Angiosperms353 (Johnson *et al*. 2019). This target enrichment approach has been used, and is currently being used, by many researchers in the ASBS. Indeed, members of the ASBS organised a workshop series alongside the ASBS conference in 2021, which I am very much grateful to have attended.

In 2020 I was awarded a Hansjörg Eichler Research Grant which would provide me with the support needed to collect and study populations within the subtribe Celmisiinae. Although DNA can be extracted from herbarium specimens, fresh samples can yield better quality extractions. Also, specific col-

lections have been declining over the last few decades in herbaria like OTA and CHR, the local herbaria for the South Island Celmisiinae species. Many of the herbarium records for species that I want to include in the phylogeny are more than 30 years old, an age not optimal for DNA extractions. But there are also invaluable experiences that come with exploring new sites and collecting plants so I used the grant to fund fieldwork.

My first stop was to collect specimens from the Otari Bush Gardens in Wellington. I was very grateful to be met by Eleanor Burton whom I had met at the drawing workshop at the 2019 ASBS/NZPCN conference. Eleanor helped me find the particular plants which I needed and had been nursed from wild seed. With the help of Eleanor, I was able to sample around 30 species which were scattered across the premises. These collections provided me the ability to be more particular about the species that I included in the phylogeny. It felt like I had done more than a month of collecting in one morning!

The rest of the species that I needed to include in my phylogeny were only available from natural sites or from herbarium specimens. Because of delays with the Department of Conservation permit processing, I missed the 2020-2021 field season for collecting these populations and so I postponed fieldwork to the following season.

I got out into the field with my advisor Michael Heads in the 2021-2022 season. We started in south Canterbury at Mt. Peel, a site name that has a duplicate up in Kahurangi National Park, almost misleading our geo-referencing a couple of times. Then up the eastern coast to Kaikoura to explore Mt. Fyffe, another well-known site which had *Celmisia cockayniana*. I had visited Mt. Stokes previously to find *C. machmahonii* unsuccessfully, so this time I tried Mt. Richmond along the Wairau valley instead, and fortunately the species was covering the bouldering mountain slopes. We also found *C. sinclairii* up in Molesworth Station.

Our trip took us around the northern part of the South Island. The Cobb Valley in the Tasman District was interesting for the grove of *Olearia virgata* along the trackside with some growing to four or more metres. Just as the same as my two previous trips around this area, *Celmisia gibbsii* was elusive once more. We made our way around to the Paparoa Range and had to cut the trip short because of the incoming storm, another similar situation to a previous trip. A similar situation happened in 2018 when Patricio and I had to retreat from Gita, a cyclone which cut out the roads connecting Takaka and Motueka causing strandings of up to two weeks. Fortunately in both cases we were able to get out before the floods.

Thanks to the Hansjörg Eichler Research Fund Grant, I have now collected species for the phylogeny to continue my systematic research. I can build a phylogeny from these using recent target enrichment techniques and with this phylogeny I aim to provide generic- and specific-level support for the subtribe Celmisiinae.

Acknowledgements

I would like to thank the ASBS for the Hansjörg Eichler Research Fund Grant. Thanks to Matt Larcombe, Janice Lord, Ralf Ohlemuller, Tina Summerfield, Michael Heads, and Patricio Saldivia for their support. Thanks to Eleanor Burton at the Wellington Otari Gardens for sampling organisation.

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The origin and diversification of *Libertia* (Iridaceae)

Sophie Newmarch *Massey University Manawatū*

Polyploidy and biogeography generate evolutionary opportunities that are widely thought to have contributed to angiosperm diversification. Polyploids have more than two sets of chromosomes due to having undergone whole genome duplication. Palaeopolyploidy has been associated with the origin and diversification of angiosperms (Van der Peer *et al*., 2017), whilst neopolyploidy has contributed significantly to extant angiosperm diversity (Wood *et al.,* 2009; Rice *et al*., 2015). It is thought that this association is partially due to the enhanced genomic and phenotypic novelty provided by polyploidy. To be successful, however, polyploids appear to require environmental opportunity. Palaeopolyploidy events appear to align with periods of environmental upheaval (Van der Peer *et al*., 2017), while neopolyploids occur most frequently in temperate areas that have seasonal climates and lower overall species diversity (Rice *et al*., 2019). Consequently, consideration of biogeography - a lineage's distribution across time and space - may be key to understanding the role of polyploidy in angiosperm diversification. Biogeographic processes have been used to explain lineage divergences, including those of angiosperms. For instance, long-distance dispersal amongst the austral landmasses is

Figure 1 Floral morphological and ecological diversity of New Zealand *Libertia* species. The diploid species, *L. micrantha*, has near identical tepal whorls (**a**) and occurs in subalpine environments (**a** & **b**). The polyploid species have differentiated tepal whorls (**c** & **d**) and occur in habitats from inland forest (**e**) to coastal forest (**f**). Photos: S. Newmarch

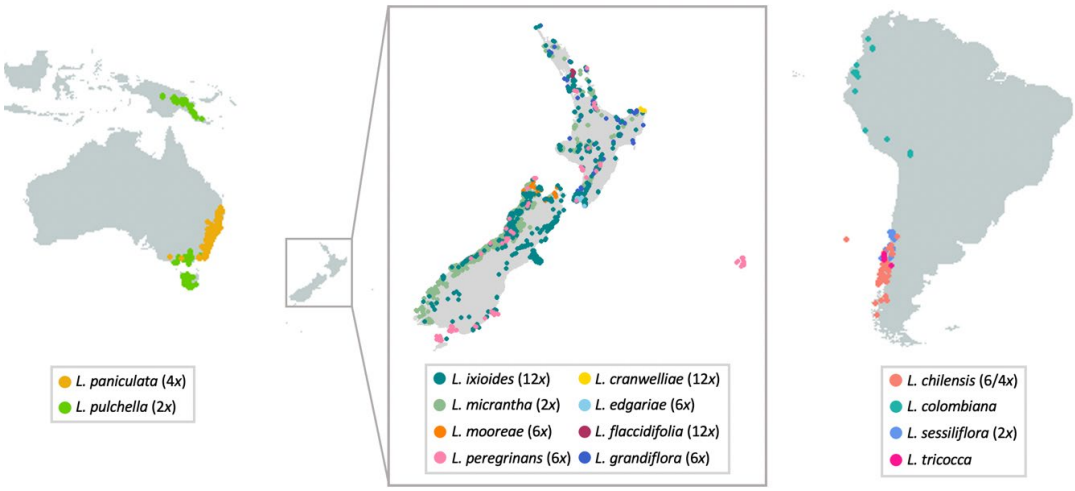

Figure 2 Distribution of Libertia species and ploidal levels across the austral landmasses. Australia and New Guinea (**left**), New Zealand (**middle**, within magnified box), and Andean South America (**right**).

thought to largely explain the strong floristic links amongst the floras (e.g., Sanmartín *et al.*, 2007; Winkworth *et a*l., 2015). Given that biogeographic processes may provide the environmental opportunities that are key to polyploid evolutionary success and that distributional change may also favour the formation of polyploids, there appears to be a dynamic between the factors. Therefore, we need to consider both polyploidy and biogeography, and how they may interact (e.g., Meudt *et al.*, 2021), when trying to understand the diversification of angiosperm lineages.

Libertia (Iridaceae) is a good system to investigate the contributions of polyploidy and biogeography on plant diversification due to its ploidal diversity and distribution. The genus consists of 14-17 species ranging in ploidal level from diploid (2x) to dodecaploid (12x) with a base chromosome number of x=19 (Figure 1). Species occur in New Zealand, Australia, New Guinea, and Andean South America (Figure 2). Notably, New Zealand has the greatest diversity in terms of species (8) and ploidal range (2x-12x) (Blanchon & Braggins, 2002). Given a relatively recent origin, estimated at ~22 mya (Goldblatt *et al.*, 2008; Joyce *et al.*, 2018), dispersal is the most plausible explanation for the distribution of the genus. However, the location of origin and pattern of dispersal are currently ambiguous. The distribution of diploid species provides no clue (Figure 2), whilst previous biogeographic studies of the Iridaceae were inconclusive (Goldblatt *et al.*,, 2008; Joyce *et al.*, 2018). Moreover, since Antarctica was not fully glaciated until 14-4 mya (Winkworth *et al.*, 2015) it may have played an important role. In terms of diversification, species relationships are unknown. Consequently, whether species diverged following dispersal or polyploidization, or whether these events coincided is also currently unknown. In terms of phenotype, it does appear that floral morphology and ecological diversity differ based on ploidal status as well as distributional range (Figures 1 & 2). However, the significance of these patterns remains to be investigated.

I was fortunate enough to be granted an Australasian Systematic Botany Society (ASBS) Hansjörg Eichler Research Grant to support the collection of nuclear sequence data for phylogenetic analyses. Due to the amount of data I have been able to generate, and an ever-increasing enthusiasm for this research, my project was converted from a MSc to a PhD. My project now consists of three research questions that concern the impacts of polyploidy and biogeography on the origin and diversification of *Libertia* at increasingly finer evolutionary scales. The scope of these questions goes from the whole genus to the

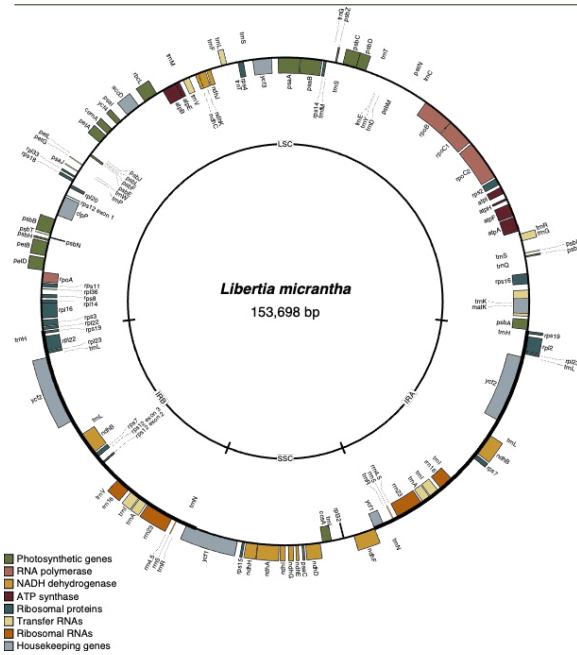

Figure 3 The complete plastome of *L. micrantha* (2x). The plastome size, structure, and overall gene content is similar to the other *Libertia* species and outgroup taxa. Genes on the interior of the outer circle are transcribed in the forward direction; those to the exterior are transcribed in the reverse direction. The inner circle indicates the extent of the inverted repeat (IRA and IRB), the small single copy (SSC) region, and large single copy (LSC) region. The bold sections on the outer circle indicate the IR regions. The plastome was drawn using OrganellarGenomeDraw (Lohse *et al.* 2013).

species within New Zealand, to populations of a widely distributed polyploid species, *L. peregrinans* (6x).

To date, I have obtained samples of all *Libertia* species in all geographic locations as well as samples of its sister, *Orthrosanthus*, from Australia and South America. This could not have been achieved without the help of my collaborators and numerous herbaria located around the world. I have conducted sequencing on nearly all species. Whole chloroplast genomes (e.g., Figure 3) have been assembled for all species that I currently have data for, with phylogenetic analyses underway. Nuclear sequence data have also been generated for nearly all species using the funds of the Hansjörg Eichler Research Grant. Assembly and analyses of these data is about to be embarked upon.

A preliminary Bayesian phylogenetic analysis using the protein-coding regions of the chloroplast genomes has been conducted (Figure 4). Relationships amongst some of the New Zealand polyploid species are not fully resolved, hence further phylogenetic analyses will be conducted that incorporate intergenic and flanking regions of the chloroplast genomes (e.g., Figure 3). Overall, however, this tree gives tentative indication of multiple dispersal events amongst the austral landmasses. The order and direction of events is still unclear as is the origin of the genus. Hence, subsequent dating and ancestral area reconstruction analyses will be conducted to try answer these questions.

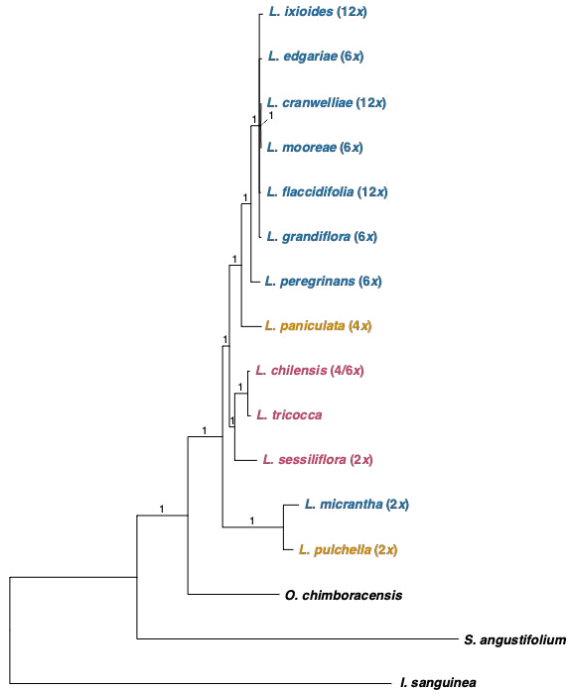

Figure 4 Preliminary Bayesian phylogenetic analysis based on protein-coding regions from the chloroplast genomes of *Libertia* species and outgroups. Text colour for *Libertia* species indicates geographic region as follows; blue for New Zealand, yellow for Australia, and pink for South America. Numbers in brackets indicate ploidal level of a species where known. Numbers near branches are posterior probabilities that indicate branch support.

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Progress report on the systematics of Australian Ajugoideae

Trevor Wilson ABRS Fellow, Australian Institute of Botanical Science, Royal Botanic Gardens and Domain Trust, Sydney

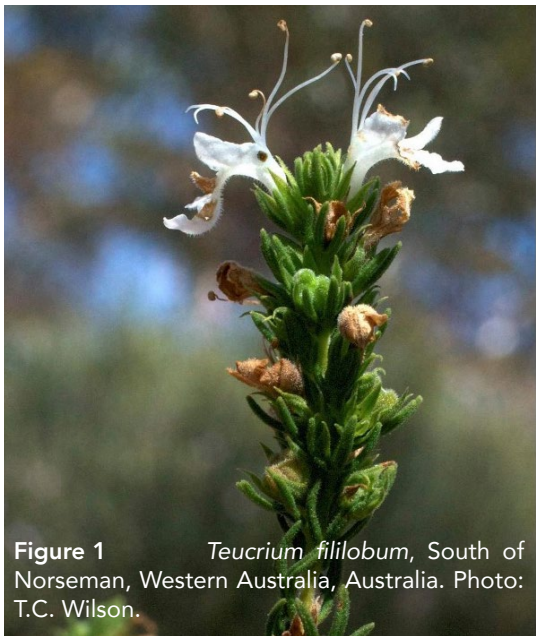

Figure 1 *Teucrium fililobum*, South of Norseman, Western Australia, Australia. Photo: T.C. Wilson.

I am currently leading an international team studying the systematics of the Ajugoideae (Lamiaceae), a project which is funded by an Australian Biological Resources Study (ABRS) grant. The group is widespread across Australia and currently totals 50 described species (cf. four genera) of forbs and shrubs. The most widespread genera such as *Ajuga* L. and *Teucrium* L. are well-known to the trade of horticulture and each have species that produce important medicinal phytochemicals that have been employed in traditional remedies for millenia (Bouderbala *et al.* 2010; Fekete *et al.* 2004; Harley et al. 2004; Acquaviva *et al.* 2017). Although it is evident each have a centre of diversity elsewhere, the relative diversity in Australia remains unexplored asthere has been no comprehensive examination of systematics and taxonomy for the

continent. The current aim is to remove this ambiguity and improve our ability to identify species through generating phylogenetic studies for each genus.

Our last report on this project was provided in the *ASBS Newsletter* (December 2020) and introduced our research on *Ajuga*. *Ajuga australis* is currently the only species recognised in Australia. It is a perennial rosette-forming forb that generally inhabits riparian areas and drainages across a wide number of habitats on the eastern side of the Australian continent (Figure 3). It is indisputably clear that it consists of several distinct morphological forms that, usually based on anecdotal examination, appear associated with a particular habitat. However, closer observation of this morphological diversity leads one to a bewildering continuum between these morphotypes. This challenge was evident even when four Australian species were recognised (Bentham 1834; 1870; Stapf 1933), which has been the basis of reason for later authors to recognise the Australian complex as a single species until a comprehensive investigation is made (Eichler 1965; Conn 1999). Such a task is further complicated because the same limited understanding of systematics and taxonomy exists for the entire genus, whose distribution extends throughout Africa, Asia and Europe.

In order to assess the merit of delineating species boundaries within the morass of diversity in Australian *Ajuga*, we comprehensively sampled and acquired a genetic dataset representing the breadth of its morphological and geographic diversity. This led to the accumulation of over 500 samples belonging to nearly 90 populations, representing all of the morphological forms across the known distribution. In addition to these samples, another 94 samples representing approximately 70% of species in the genus have been acquired for sequencing in order to provide the first understanding of evolutionary history and diversification in the genus, and how it was introduced in Australia. Given the heavy travel restrictions over the last two years, we owe a large part of successful sampling to the generosity of many volunteers and colleagues.

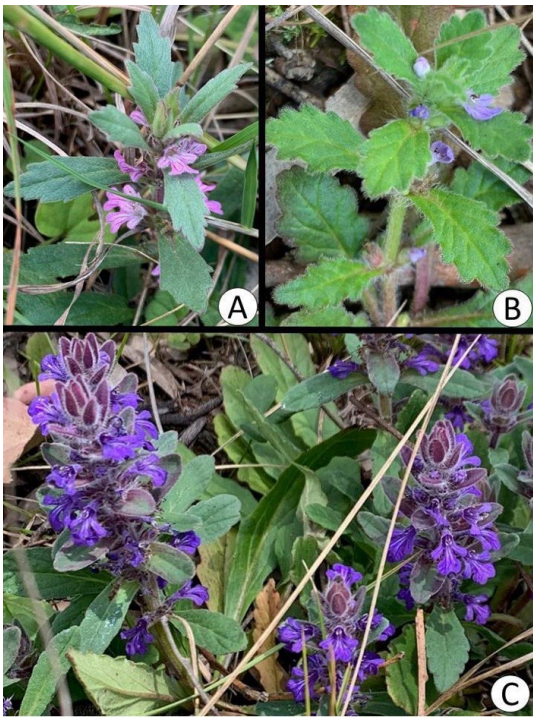

Figure 2 A sample of morphological diversity across *Ajuga australis*, located in the Wilton-Razorback area of south Western Sydney, New South Wales, Australia **A** individual at Razorback with cauline (inflorescence) leaves with a dentate margin, found growing with other individuals with cauline leaves with a sinuous margin; **B** individual at Razorback with cauline leaves with a sinuous margin; **C** individual with erect inflorescences with cauline leaves that have an entire margin, Wilton. Photos: T.C. Wilson.

A SNP (single nucleotide polymorphism)-based data set acquired by genomic scans through Diversity Arrays sequencing (DArTseq) was sought on the merits of affordability and flexibility with regards to examining the infra- and inter-specific relationships. This technique can quantify relationship at multiple taxonomic hierarchies, which allows for taxonomic insight, study on processes of speciation and an examination of genetic diversity for applications in conservation (Rutherford *et al.* 2020; Georges *et al.* 2018; Hundsdoerfer *et al.* 2019; Rossetto *et al.*, 2021).

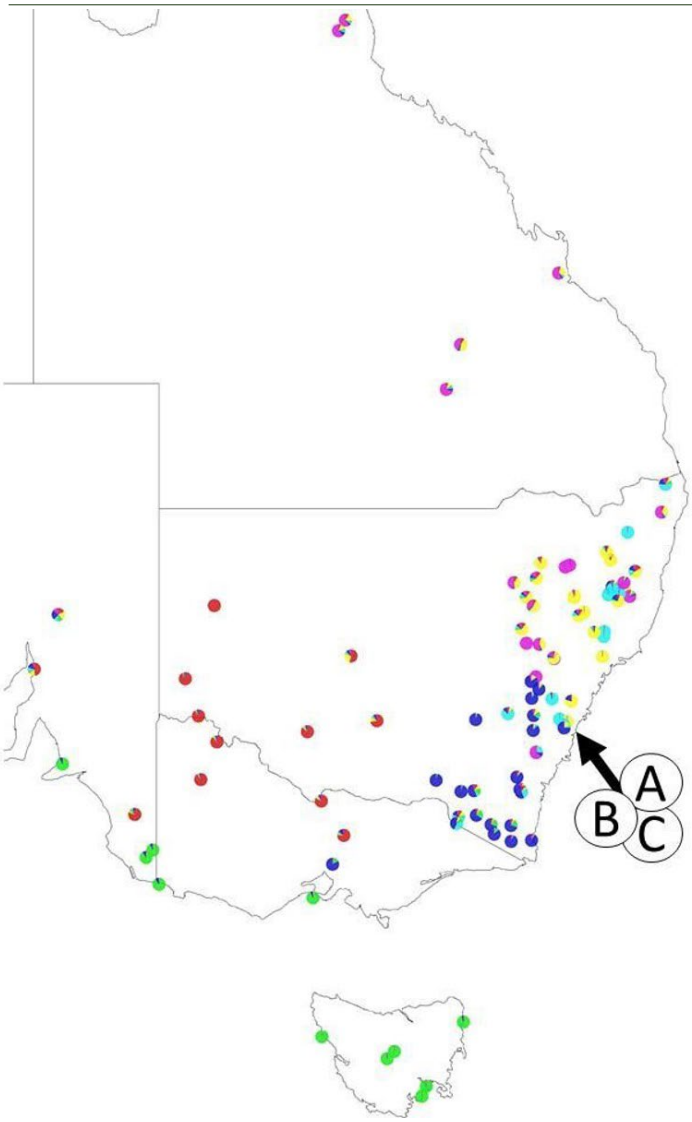

Figure 3 (left)
Distribution map of populations (represented by pie charts) sampled for *Ajuga australis* across the extent of its known distribution in Australia. Pie charts represent averaged snmf Q values obtained from the software program LEA according to six ancestral populations (K=6) for each population. Letters A, B & C represent morphotypes found in the Wilton-Razorback region of Western Sydney as demonstrated in Figure 2.

The analysis retrieved a surprisingly high number of informative loci after standard filtering processes, totalling over 40,000 SNPs. Results show an unmistakably large genetic distinctiveness between all Australian samples and the preliminary outgroup (not shown), which consists of ten Asian and one African species. Although the outgroup sampling we have integrated so far represents less than 10% of *Ajuga* diversity, it is interesting to note that species which have cauline (inflorescence) leaves similar to their rosette leaves (i.e. *A. integrifolia* and *A. lobata*) share the closest genetic resemblance to Australian taxa, which appear very similar to two Australian morphotypes.

Overall, evidence from our common garden experiment at Cranbourne Gardens (Royal Botanic Gardens Victoria) supports that distinct morphotypes are not solely the response to varying environmental conditions. We also have found that several of the recognised morphotypes are predictive of discrete genetic differences, including those found within the same population (e.g. Figure 2). Such a result suggests that the *Ajuga australis* complex constitutes much more than one species.

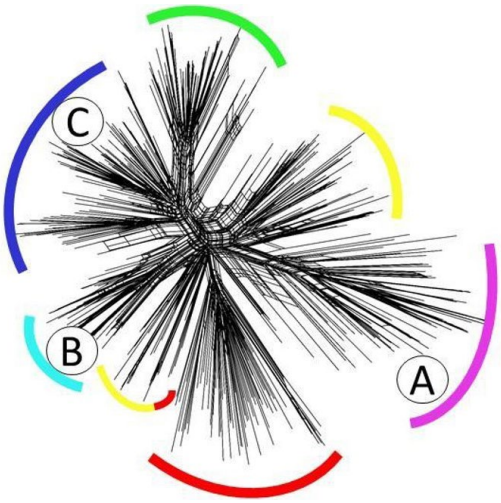

Figure 4 Splitstree network analysis of 40,848 SNP loci for 521 specimens sampled from across the *Ajuga australis* complex. The result is a shallowly structured network that organises *Ajuga* populations according to morphotype, albeit complicated by a considerably high demonstration of reticulate relationships by some individuals or populations. A, B, and C represent the position of morphotypes found in the same general location of Western Sydney, Australia, as illustrated in Figure 1. Colours match the genetic signatures identified by snmf analysis presented in Figure 3.

However, as should probably be expected, structure based on genetic similarity seems to be as difficult to interpret as the corresponding morphological diversity. A network based on genetic similarity for the most part is shallowly divided into clusters whose resolution is interrupted by lone populations or individuals found on branches associated with broad webbing (Figure 4). Such a structure can be indicative of a high amount of gene flow, although high Fst values (>0.5) allocated to many populations that even share the same genetic signature provided by an snmf analysis (Figure 3) seems to suggest otherwise. Hybridisation does appear to have occurred, however, since many of the singletons of the network are placed in intermediate positions between the network clusters of morphotypes that they share geographic space. When present putative hybrids are removed, coalescent-based analysis produces trees that lack strong branch support (not shown). We are currently investigating results using a more stringent filtering regime.

One of strongest correlations between morphology and genotype is that of the robust morphotype uniquely found within semi-arid areas (Figure 3, red). That its morphology and genetic structure are complementary seems to provide good support of species concept, and we are currently revising morphological characters for its description. However, even though genetic structure is nearly consistent across most of its range, a great deal of introgression appears to have occurred throughout the Flinders Ranges (Figure 3). Such a result suggests that care in the examination and description of this putative species will be a priority, and furthermore that this will be important to address in any future protocols to conserve genetic diversity.

We only have results from our analysis of *Ajuga* to report so far, however we are anticipating results for *Teucrium* shortly. *Teucrium* are woody shrubs and subshrubs found throughout Australia as well as New Zealand (Figure 1). However, the conspectus of Queensland *Teucrium* (Bean 2018) so far remains the largest examination of Australasian taxa. Recent synonymising of *Oncinocalyx* F.Muell., *Spartothamnella* Briq. and *Teucridium* Hook.f. as *Teucrium* by Salmaki *et al.* (2016) has highlighted a tantalising story about diversification and shift towards radial flower symmetry and zoochory. Unfortunately, poor resolution and low sampling (< 30% of Australasian species) from this previous work does not enable a test of species concept and relationships. Our work to understand species concepts and evolution of reproductive systems is capitalising on the ambitious project by Genomics for Australian Plants (GAP) to create infrastructure and data based on the Angiosperms353 probe kit (Johnson *et al.* 2019). Assembly is currently underway for a dataset of 110 samples that consists of all known species and phrase name taxa, including replicate samples to account for different

populations, morphological variability and geographic distribution.

Acknowledgements

The Ajugoideae team is exceptionally thankful for the support from the Marlies Eichler Postdoctoral grant as it has so far provided invaluable time for the principal investigator (T.C. Wilson) to organise and complete field trips, receive and organise material from other institutions and collaborators, and and arrange the sequencing and subsequently analyse data from Diversity Arrays and AGRF.

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ASBS Early Career Researcher Feature: Amelia-Grace Boxshall

Amelia-Grace Boxhall, known by 'Grace', is a PhD candidate at the University of Melbourne. After completing her Bachelor and Masters of Science in BioSciences at the University of Melbourne, she continued on to a mycology PhD project under the supervision of Joanne Birch and Teresa Lebel. She's now mid-way through her candidature, and updates us below on her awesome work in *Agaricus* taxonomy and systematics, and science communication.

What gets you excited in taxonomic and systematic research?

So far I've chosen applied projects with a focus on phylogenetics but I'm excited to dabble in phylogeography and divergence dating. I love the feeling of satisfaction that comes from inferring an evolutionary history which makes sense given the biology, morphology, ecology, etc. of a group. The pieces of the puzzle finally fall into place after months to produce a clear picture. And there's nothing quite like the thrill of discovery that comes with unearthing an undescribed taxon or the moment of realisation when you finally answer a question that hasn't ever been answered before.

What is your current study group?

I'm working to infer the phylogeny of eastern Australasian *Agaricus* using diverse arrays

technology to resolve two *Agaricus* species complexes, and determine the taxonomic informativeness of certain morphological characters given our revised understanding of the genus.

The mushroom genus *Agaricus* (aka field mushrooms) has been in cultivation for more than 300 years, and contains over 500 accepted species, both edible and poisonous. However, their Australasian biodiversity remains incompletely understood. To date, only 13 species have been described from Australian types and yet I'd estimate that we have as many as 100 species. In New Zealand, it's estimated that there are approximately 50 species to be revised and described. The relationships of Australasian taxa to their global counterparts are currently unknown.

It's exhilarating (and occasionally overwhelming) to be starting with such a blank slate!

Paper in focus

There are three species descriptions coming out shortly which I collaborated on:

Boxshall, A.-G., J. Broadbridge, T. Lebel, M. Barrett. (In press). *Agaricus albofoetidus*, sp. nov., in: P. Crous *et al.*, Fungal Planet. *Persoonia*.

Broadbridge, J., A.-G. Boxshall, T. Lebel, M. Barrett, G. Bonito. (In press). *Agaricus aureoelephanti*, sp. nov., IN: P. Crous *et al.*, Fungal Planet. *Persoonia*.

Broadbridge, J., A.-G. Boxshall, T. Lebel, M. Barrett, G. Bonito. (In press). *Agaricus parviumbrus*, sp. nov., IN: P. Crous *et al.*, Fungal Planet. *Persoonia*.

These descriptions represent three of the four undescribed *Agaricus* species collected from *Eucalyptus* woodland and subtropical

A rare find: mature and immature *Agaricus* found in subtropical rainforest in Nightcap National Park, NSW in February 2022. In tropical conditions, *Agaricus* and other fungi can emerge, mature and decay within a day, making it even more difficult to be in the right place at the right time to collect. Photo: A. Boxshall

"Grace's baby," the soon-to-be-described poisonous and native species of *Agaricus*, here collected from Mt Macedon, VIC. Photo: A. Boxshall

mixed forest in the Northern Territory by Teresa Lebel, Greg Bonito, Matt Barrett, and Christy Barrett in 2014. Relatively few *Agaricus* have been collected, let alone described, from the Northern Territory, which makes these species particularly special.

Traditional amplification and sequencing techniques were used to produce fungal barcode (ITS1, ITS2, LSU) sequences for these taxa, which were analysed using Maximum Likelihood in RAxML 8.2.12. Additionally, microscopic and macroscopic characters were compared against known, closely related taxa.

Agaricus consists of 26 molecularly supported sections, each of which are typically recognised using characters such as odour and staining (a colour change reaction when the mushroom tissue is damaged). So far, published Australian *Agaricus* have placed within only six of those sections. However, we identified that *A. aureoelephanti* placed within section *Rarolentes* – the first Australian taxon to fall within the section – which is characterised by solvent or rubber odour and lack of staining. We also observed that while *A. parviumbrus* placed within section *Minores* which is typically characterised by marzipan odour and persistent yellow or gold staining, *A. parviumbrus* failed to stain yellow or gold. Instead, *A. parviumbrus* stained distinctly orange.

The addition of three native species has increased our knowledge of Australian native *Agaricus* by 23%.

What is the next step in this research?

Two more *Agaricus* species descriptions are in the works to follow on from these publications: one more from the Northern Territory, and one poisonous species which has been informally dubbed "Grace's baby" (hopefully not a reflection on my personality) arising from my master's research. However, for now, my priority is producing a multigene phylogeny of eastern Australasian *Agaricus* – including these new species – using targeted amplicon

A close up of the lamellae on an Agaricus sp. collected while hiking at Cape Pillar National Park at Easter 2021. Photo: A. Boxshall

After a week of unsuccessfully hunting for *Agaricus* in NE TAS 2021, Murphy dictated that Grace would finally find them on a walk around the accommodation!

sequencing of the ITS1, ITS2, LSU, tef1α, and rpb2 regions. Field work for this project has just been completed, yielding 120 new collections from QLD, NSW, VIC, SA, and TAS. Herbarium sampling has yielded another 57 collections from QLD, WA, NSW, SA, ACT, and TAS.

This investigation aims to improve our understanding of Australasian *Agaricus* and *Agaricus* evolution, as well as identifying a number of potential undescribed taxa.

Opening eyes through FungiSight

While I love science, I'm also passionate about science communication. In the absence of iNaturalist in Australia, I started FungiSight on Facebook in 2016 to gather current "fruiting" data on *Agaricus xanthodermus.* I've subsequently added an Instagram account and have transitioned the page to a science communication and fungal education hotspot. I share insights into what the life of a mycologist/PhD student looks like, including the many painful challenges and ecstatic celebrations. I've released a few videos on fungi biology and *A. xanthodermus* identification, and plan to share other educational videos in the future. I also share insights from my research and exciting new papers when I can. Over 2,000 people follow FungiSight and my most popular video has had 16,000 views. I've made some great connections through the page and have been granted the opportunity to guest feature on two podcasts.

Outside of FungiSight, I was recently interviewed for a Broadsheet Magazine piece on mushrooms around Melbourne. It was my first journalist interview and was a nerve wracking but electrifying experience!

Grace talks through how to identify *Agaricus xanthodermus* around Melbourne in her FungiSight video that has accumulated over 16,000 views.

Follow Grace and find out more about her research here:

ResearchGate: https://www.researchgate.net/profile/Amelia-Grace-Boxshall
Instagram: @graceaceae – https://www.instagram.com/graceaceae/
FungiSight: www.facebook.com/fungisight and www.instagram.com/fungi.sight

Introducing the Orchid Taxonomy Advisory Group Australasia (OTAGA)

Heidi Zimmer *Australian National Herbarium/Centre for Australian National Biodiversity Research, Heidi.Zimmer@csiro.au*

Katharina Nargar *Australian Tropical Herbarium & National Research Collections Australia (CSIRO), James Cook University, Katharina.Nargar@csiro.au*

Anthony Whalen *Department of Agriculture, Water and the Environment (AWE), Anthony.Whalen@awe.gov.au*

When faced with issues of orchid taxonomy, some people run in the opposite direction – this is understandable. With their extreme morphological diversity and more than 28,000 species, the Orchidaceae can seem overwhelming. Combine these factors with the passion which orchids can inspire – including something called 'orchidelirium' in Victorian times – and heighten the stakes with many rare and threatened species, and you can get some tense situations.

Throughout its history, the taxonomy of the Orchidaceae has been subject to change, as a result of advancements in our understanding of evolutionary relationships within the family. Initially this understanding was based only on morphological studies, but increasingly it is being refined by the results of molecular research. Australian orchids have been subject to many taxonomic changes, in particular over the past two decades (Hopper et al. 2009). This has resulted in uncertainty about applicable names, creating challenges for those who work with orchids including researchers, land managers, government departments, and enthusiasts. It is a particular problem for synthesis of orchid data across jurisdictions (states and territories, and internationally) and can create a frustrating hurdle in communication and collaboration. This problem has been highlighted with the development of large-scale biodiversity databases (e.g., Atlas of Living Australia, Australasian Virtual Herbarium), where data harmonisation can present challenges due to differing taxonomic concepts and associated nomenclature. The usefulness of these databases, which in many cases supply the data which drive conservation prioritisation and action, is reliant on a strong taxonomic backbone.

Instead of running in the opposite direction, we have decided to address the challenges in orchid taxonomy directly, by establishing the Orchid Taxonomy Advisory Group for Australasia (OTAGA).

The purpose of OTAGA is discussion and

Above Members of OTAGA

Left Examples from the five subtribes which are currently being considered by OTAGA (clockwise from top left, naming as per *Australian Plant Census*). *Pterostylis nutans* R.Br, Pterostylidinae; *Corybas dowlingii* D.L.Jones, Acianthinae; *Microtis unifolia* (G. Forst.) Rchb.f., Prasophyllinae; *Caleana major* R.Br., Drakaeineae; *Caladenia fuscata* (Rchb.f.) M.A.Clem. & D.L.Jones, Caladeniinae. Photos by Heidi Zimmer except *Caleana major* (credit: Zoe Groeneveld) and *Pterostylis nutans* (credit: Mark Clements).

review of orchid taxonomic concepts at generic rank (issues with species delimitation are expressly outside the scope of currently planned OTAGA activities). Moreover, OTAGA is only considering names/taxonomies which are validly published – it is not suggesting new names/taxonomies.

OTAGA is focussed on critical review of taxonomic concepts and the systematics research in support of them. While OTAGA is reviewing all published studies relevant to Australasian orchid systematics, consideration is also given to new phylogenomics data: over 2,500 orchid samples have been sequenced in a collaborative effort between the Australian Tropical Herbarium and the Australian National Herbarium resulting in a well-resolved and highly-supported phylogenomic framework to re-assess generic concepts in Australasian Orchidaceae (Nargar et al., unpublished data). For the first round of OTAGA meetings, five subtribes were prioritised due to their high relevance to the Australian orchid flora and its conservation: Acianthinae, Caladeniinae, Drakaeinae, Prasophyllinae, and Pterostylidineae.

The Council of Heads of Australasian Herbaria (CHAH) were supportive of OTAGA and emphasised that OTAGA's documented expert recommendations would be helpful in guiding CHAH institutional representatives, as they make taxonomic decisions as part of the standard Australian Plant Census process (APC). A report on OTAGA discussions and recommendations will be presented to CHAH as discussion papers for future APC considerations.

Through CHAH we asked for nominations for OTAGA members from Australian herbaria. To ensure a broader Australasian viewpoint, members from herbaria in New Zealand, New Caledonia, and the Royal Botanic Gardens Kew were also invited. OTAGA now has 14 members, including: Gill Brown (chair, BRI); Katharina Nargar (phylogenomics/presentation of meeting papers, ATH); Heidi Zimmer (co-ordinator, CANBR), and Anthony Whalen (observer, ABRS).

We are optimistic that having an expert group dedicated to rigorous review of taxonomic concepts in these subtribes will lead to recommendations which in turn will lead to a more cohesive understanding of Australia's orchid diversity and increased consistency in the application of taxonomic names for Australasian orchids.

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Ethical authorship

Kelly Shepherd ASBS Councillor kelly.shepherd@dbca.wa.gov.au

Publications are considered to be one of the most important measures of academic productivity to such an extent that the term "publish or perish" has become an aphorism. Authorship confers significant social and financial value, as the number of publications a researcher produces can impact their career advancement and ability to secure grant funding. As such, publication authorship can be seen as a form of currency exchange and consequently this may be exploited through unethical practices.

Under the Australian Code for the Responsible Conduct of Research developed jointly by the National Health and Medical Research Council (NHMRC), Australian Research Council (ARC) and Australian Universities (National Health and Medical Research Council 2018), it is expected that scientific research is undertaken in an ethical and honest manner. While the responsibility for this lies with the individuals involved in undertaking research, it is appropriate that institutions and their scientific journals also employ clear guidelines that support a culture of transparency and integrity. This can be achieved by clearly stating the standards expected to justify authorship.

The Australasian Systematic Botany Society can also play an important role in promoting good practices. By developing and endorsing a set of guidelines for authorship, we are sending a clear message about what standards of behaviour are expected of our members but also how our members should be treated. This will hopefully provide indirect support to our younger members that may find it very challenging to navigate this often-contentious issue, particularly if their own institutions are yet to develop such guidelines. Our endorsement may also encourage various national scientific journals to implement better procedures around authorship responsibilities.

Ethical authorship guidelines should be developed to ensure all authors:

- disclose any potential conflicts of interest (both financial or non-financial interests that may be a perceived, potential or actual conflict of interest);
- meet conditions to ensure they warrant authorship (see Author contributions);
- acknowledge others who have contributed to the research;
- cite other relevant work accurately.

Author contributions

Recommendation 25 of the Australian Code for the Responsible Conduct of Research states that all authors "are all those, and only those, who have made a significant intellectual or scholarly contribution to the research and its output, and that they agree to be listed as an author."

To provide guidance as to what constitutes a significant contribution to warrant authorship, several international scientific journals are following the criteria outlined by the International Committee of Medical Journal Editors (ICMJE) (2019).

This states that authors must meet all four of the following conditions:

1. substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and
2. drafting the work or revising it critically for important intellectual content; and
3. final approval of the version to be published; and
4. agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are ap-

propriately investigated and resolved.

According to *Authorship: A guide supporting the Australian Code for the Responsible Conduct of Research* (2019), a researcher should not be attributed Authorship simply based on the provision of infrastructure, equipment, technical support, and materials or data. Authorship should also not be influenced by the following:

- the position or profession of an individual, such as their role as the author's supervisor or head of department ("gift authorship");
- whether the contribution was paid for or voluntary;
- the status of an individual who has not made a significant intellectual or scholarly contribution but would elevate the esteem of the research ("guest authorship").

Furthermore, all researchers that meet the conditions above in any given research should be awarded authorship. For example, the contribution of a junior researcher (e.g., postgraduate student, postdoc, volunteer etc.) may go unrecognised even though they have participated in data generation, analyses and writing/reviewing ("ghost authorship") (Bavdekar 2012).

Even following these guidelines, it is difficult to determine what is considered a substantial contribution as this is subjective. These days many researchers are often involved in large collaborations where individuals may provide significant input; however, it is confined to only certain aspects of the overall research. One such grey area can arise if researchers or technical staff provide substantial intellectual input in early discussions about methodology or in obtaining data that is critical for the study, but they are perhaps less involved in the analyses and writing of a paper (and may still contribute more time and expertise than other authors). In these cases, it is still important they are offered authorship in recognition of their input, as the research would not have been completed without them.

In recognition of these issues, standards for increasing transparency about how authors have contributed to the overall work have been developed (McNutt et al. 2018). Many international scientific journals are adopting a policy whereby the role of every author of a paper must be accurately defined using definitions published by CRediT (https://casrai.org/credit/) at the time of submission (Table 1) and it may be expected that authors need to contribute in more than one area to warrant authorship. Again, advocacy for this to be implemented widely will help cultivate a strong culture of ethical and honest reporting.

Authorship order

The importance of the order in which authors are listed on a paper can vary between disciplines. In some instances, particularly in very large collaborative papers, the authors may be listed alphabetically. In many journals the sequence of authors reflects their contribution, and the most "valuable" positions are those listed either first or last. The first author is generally accepted as the one that has contributed the most work on the research project, while the last author is considered to be the senior author, who may have taken a more supervisory role in guiding the research. Unfortunately, as the order confers a perceived value, there have been anecdotal accounts of junior colleagues being pressured from seniors to change the author list to maximise the credit given to themselves or to reward others in a team. Consequently, junior colleagues may be pressured into giving up either the first, last or corresponding authorship or are required to change the order of other contributors.

In all cases it is important that not only authorship but also authorship order is discussed amongst all collaborators at the initiation of the research process to avoid conflict at a later stage. However, it must be acknowledged that what collaborators agree upon at an early stage may not be realised, as some researchers may not contribute as agreed but still expect authorship. Therefore, it is important to develop a culture where it is acceptable to revisit the discussion and

Table 1 Definitions of the various roles of authors contributing to scientific research outputs (as developed by CRediT https://casrai.org/credit/).

Contributor Role	Role Definition
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims.
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse.
Formal Analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.
Funding Acquisition	Acquisition of the financial support for the project leading to this publication.
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.
Methodology	Development or design of methodology; creation of models
Project Administration	Management and coordination responsibility for the research activity planning and execution.
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.
Validation	Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.
Writing – Original Draft Preparation	Creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).
Writing – Review & Editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.

revise both authorship inclusion and order, as required. At every stage, all collaborators should be aware of each decision, which should be recorded in writing.

How to ensure compliance

Ensuring compliance, particularly by researchers in positions of authority, can be difficult. For example, when senior colleagues "demonstrate a public involvement in one or more of the authorship criteria by discussing study design and enrolment plans, reviewing study progress, and agreeing to provide inputs for the manuscript drafts… [however] at all stages, they put in only a token effort" it can be difficult to prove that they did not

make a significant contribution if challenged (Bavdekar 2012).

To help mitigate issues arising around authorship, clear guidelines should be established and made available to all collaborators to ensure a lack of awareness cannot be cited as a reason for non-compliance. This can be done through advocating for the inclusion of clear statements about author contribution requirements in institutional codes of conduct and journal publication policies. For example, any author submitting a research paper could be required to sign a form confirming that all co-authors meet Recommendation 25 of the Australian Code for the Responsible Conduct of Research for Author Contributions. This may help a authors push back for example, when a senior colleague inappropriately requests gift authorship when they have contributed minimally or have only supplied material or financial support.

Acknowledgments

It should also be expected that any contributors that do not meet the criteria for authorship could be included in the Acknowledgments section (and where appropriate, seeking their explicit consent to be so listed).

Conflict resolution

Authorship can be a contentious issue and may be challenging to resolve when conflicts arise. As such, education to push for cultural changes are required as well as clear guidelines to support conflict resolution (and an appeal process) particularly where there may be a power differential, either perceived or real, between authors. To try and address this, institutional peer review committees could be established to address authorship disputes. Committee members should declare any conflict of interest and in cases of strong conflict, such as being an author on a paper being reviewed, recuse themselves from the process. "Decisions by knowledgeable and neutral experts could reduce bias, have greater authority, and could be appealed. Not only can peer-based approaches be leveraged to resolve authorship disagreements, but they may also enhance collegiality and promote a healthy team environment" (Master & Tenenbaum 2019).

This authorship review/dispute team ought to comprise:

- students, contract, and permanent staff ranging in seniority;
- should not be from the same programme as the research team;
- should be aware of the guidelines and remain open-minded.

Discussing authorship with a committee could improve understanding by all parties and "avoid escalating the situation and creating an uncomfortable environment" (Master & Tenenbaum 2019).

Conclusion

It is hoped that by raising this issue we can start a community-wide conversation about how to collectively improve ethical standards and support those that seek positive change within their own institutions. It is important that we send a clear message, particularly to junior researchers, that there are standards that all should abide by. Just because certain research groups may promote expectations about authorship "because that is the way it has always been done" doesn't mean that is the way it should be done. Times are changing and all need to be held accountable to ensure research is indeed conducted in an ethical and honest manner.

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In the beginning: A brief history of ASBS research grants

John Clarkson ASBS Treasurer

Introduction

Since the Society began offering research grants from the Hansjorg Eichler Research Fund in 1997, over $290,000 has been awarded to students and early career scientists. A brief history of the fund with some statistics of successful applicants follows.

The Initial Proposal

The initial suggestion that the Society should set up a research fund was put to Council by Helen Hewson and Judy West in 1989. Helen and Judy expanded on the idea in a short article published in the June Newsletter that year (Hewson & West 1989). They suggested that such a fund would increase the amount of taxonomic work being done in Australia. Any member of ASBS would be able to apply for funding, with preference given to unemployed or amateur botanists and students. So that the fund might have core funding to build on, they suggested that ASBS could initially invest some money in the scheme. Additional funding could then be sought through donations, sponsorships, a levy on members or fund-raising activities. Judy West spoke to the proposal at a General Meeting of the Society held in Sydney on 28 June 1989 (West 1989). Support from those present at the meeting was far from enthusiastic. The general feeling was that the project was overly ambitious. Issues raised included doubts concerning the lack of resources to establish such a fund (the Society's total assets amounted to just under $32,000 at the time), the difficulty of obtaining corporate support, and that the interests of the Society would be better served by maintaining and improving current activities. The meeting resolved, but not unanimously, to establish a sub-committee to investigate the proposal. The sub-committee was chaired by Helen Hewson assisted by Jocelyn Powell, Gordon Guymer, David Morrison and Molly Whalen.

The matter was discussed again at the General Meeting held in Canberra the following year. Helen Hewson, summarised progress (Hewson 1990a). It had been hoped that donations to the fund might be tax deductible, but Helen reported that this would

Figure 1 Some of the early merchandise. Sweaters and mugs produced in 1990. Photos John Clarkson. Artist's impression of a mouse cozie by Marion Clarkson.

not be possible because the Society was not an institution. However, by then, the initial reluctance seems to have dissipated somewhat and reports on the Research Fund became regular discussion points at General Meetings. In 1992, Council resolved to set up an investment account and a cheque account to manage any funds raised (Conn 1992a). At the General Meeting that year, it was announced that interest from the investment account would be used to fund grants and that grants would be offered when the fund reached $5,000 (Conn 1992b). This seems to have been later amended for, in his president's column in Newsletter 80, Mike Crisp (1994a) noted that use of the fund would begin after the balance exceeded $10,000.

Following the death of Hansjorg Eichler in June 1992, Council decided to name the Research Fund in his memory (Crisp 1994a). This was particularly fitting given that Hansjorg, a foundation member of the Society who was held in high esteem by the Australian botanical community, was dedicated to assisting and mentoring young systematists, and this was, and remains, the purpose of the research fund.

Fund Raising

Early fundraising was initially slow and piecemeal. Some chapters were more involved than others. Not surprisingly, the Canberra Chapter was particularly active. Its fundraising efforts included raffles, lucky door prizes and sales of secondhand books, craft and novelty items (Hewson 1990b). Amongst the novelty items were things referred to as mouse cozies. I wasn't able to track one of these down but, with the help of my artist wife, Marion, I let my imagination run wild (Figure 1). The financial report for the year ended 31 December 1990 (Foreman 1992) records a payment of $4,777.50 for the purchase of mugs, t-shirts and sweaters (Figure 1). These were advertised for sale in Newsletter no. 65 (mugs $8, t-shirts $15; sweaters $25). Council agreed to set aside 50% of the profits from sales of these for the Research Fund (Conn 1992a). Once the cost of producing the items had been recouped, all income from sales would be invested in the Research Fund. Although popular with some members (Figure 2), it is doubtful whether sales of these items ever turned a profit and a super clearance sale was held in 1998 with remaining stock sold off well below cost (Mowatt 1998). Over the years there have been other novel attempts at fund raising. A couple of notable ones include an auction of books donated by Simone Farrer from CSIRO Publishing held in Melbourne in 2009 (Bayly 2010) (Figure 2) and a silent auction held association with the New Zealand Plant Conservation Network at the joint conference held in Wellington in 2019 (Boxshall 2019).

Over the years, ASBS conferences have often returned a profit. In 1992 a small part ($644) of the profit from the 1990 conference held in Canberra was transferred to the Research Fund (Conn 1992c). In 1994, all of the net profit ($5,000) from the conference held in Kuranda was invested in the Research Fund (Crisp 1994a). While there is no expectation that conferences should turn a profit, they often do, especially if organising committees secure external sponsorship. Once the General Fund had accumulated a large

Figure 2 **Left** Bryan Simon wears his ASBS sweater as he plays his violin at the conference dinner in Adelaide in 2008. Photo Bill Barker. **Right** Frank Udovicic auctions books donated by Simone Farrer in Melbourne in 2010. Photo Mike Bayly

enough surplus to meet the day to day needs of the Society, it became almost traditional for any profit from conferences to be transferred to the Research Fund. The latest was $7,000 from the virtual conference held in 2021.

Donations have been the principal source of funds. Just one year after the proposal to establish a Research Fund was put to Council, the financial statement for the year ended 31 December 1990 (Foreman 1992) records donations totalling $239. This has continued to the present day with many members including a donation to the Research Fund with their annual membership fee. Twenty-five percent did so in the 2020/21 financial year. With the members' permission, these donations are acknowledged in the annual Treasurer's report to the AGM. In addition, several members have left significant sums to the Research Fund in their wills and a number of others have advised the Society that it is their intention to do so. While the Society values this support and thanks all members for their support, it would be remiss not to single out one donor in particular – Mrs Marlies Eichler. Between 1994 and 2010, Marlies donated a total of $300,000 to the fund and, following her death in January 2011, the Society received two thirds of her liquid assets amounting to $562,800 from her estate. In 1998, the Society acknowledged her extraordinary generosity in naming her as its first Honorary Life Member (Entwisle 1998). Her generous support of plant taxonomy was also acknowledged, along with her husband Hansjorg's outstanding contribution to systematic botany, on a plaque unveiled by Barbara Briggs at a memorial service held in the National Botanic Gardens in Canberra in 2015 (Barker 2015a) (Figure 3).

Management of the Research Fund

Finances

With the Research Fund edging slowly to $60,000, there was discussion at the Annual General Meeting held in Melbourne in October 1996 whether funds held in the Research Fund cheque account could be better invested in order to maximise returns (Anon 1996). It fell to the Treasurer, John Clarkson, to investigate a restructure. The challenge was that not only did the Research Fund have to generate sufficient income to allow the Society to offer research grants, but its real value had to be hedged against inflation. The restructure, which was approved unanimously by Council, was described in detail at the following AGM (Clarkson 1997a).

At the same time, negotiations began with the Australian Taxation Office (ATO) to secure tax deductibility for donations to the Research Fund (Clarkson 1997b). This required

Table 1 Current and former members of the Research Fund. Members who have served as *ex officio* chairs are marked with an asterisk and their terms as chair noted in brackets

Benjamin Anderson	2022–	Murray Henwood	2016–
Bill Barker*	(2000—2002) 2010–2012	Betsy Jackes	2004–2014
Robyn Barker	1997–2003	Greg Leach	2010–2016
Mike Bayly*	(2013—2015)	Kristina Lemson	2008–2011
Joanne Birch	2016–2021	Terry Macfarlane	1997–2003
Barbara Briggs	2004–2009	Sarah Matthews	2015–
John Clarkson*	1997–2003 (2003—2005)	Tom May	2004–2007
Barry Conn	1998–2003	Heidi Meudt*	2016–2018 (2019—2021)
Darren Crayn*	(2006—2008)	Dan Murphy*	2010–2014 (2016—2018)
Dale Dixon*	(2009—2012)	Nathalie Nagalingum	2011–2014
Tim Entwisle	1997–2003	Katharina Nargar	2016–2021
Janet Gagul	2022–	Chris Quinn	2004–2015
Phil Garnock-Jones	2011–2015	Hervé Sauquet*	(2022—)
David Glenny	2013–2020	Jennifer Tate	2022–
Peter Heenan	2022–	Peter Weston*	1997–2003
Rod Henderson	2004–2009		

a number of minor changes to the Society's Rules which were approved by a ballot of members in 1998 (Anon 1998). The Society was formally notified by the ATO that it had secured Approved Research Institute Status on 5 November 1998. Donations and certain gifts to the Society for the purposes of scientific research would now qualify as allowable income tax deductions.

In 2016, when the bequest from the estate of Marlies Eichler took the Research Fund to slightly more than $1.1M dollars, Council decided to review its policy for providing grants and to review its investment strategy. Two sub-committees were formed. The first, chaired by Vice-President Mike Bayly, was charged with recommending to Council a framework and scope of grants for furthering research and other aspects of plant systematics. The second, chaired by Treasurer John Clarkson, was to examine the Society's approach to investment of its substantial assets to ensure it could deliver the recommendations of the grants sub-committee (Barker 2015b). The grants sub-committee delivered its report to the AGM held in Canberra in 2015 (Bayly 2015). It recommended increasing the maximum grant to $5,000 while continuing to offer up to four research grants per year in two rounds. It also recommended introducing a new postdoctoral grant extending over two years. When fully operational the scheme would require an expenditure of up to $40K per annum. The recommendations were adopted by Council and used to inform the new investment strategy being developed by the Treasurer with the assistance of the financial advisory sub-committee and a financial planner. This was approved by Council in April 2017 and implemented before the end of the 2016-17 financial year (Clarkson 2017).

The Research Committee

One of the conditions imposed by the ATO before conferring Approved Research Institute Status was that the Society must appoint a Research Committee of not less than 5 persons that would be responsible for approving the disbursement of all monies received that were eligible for tax

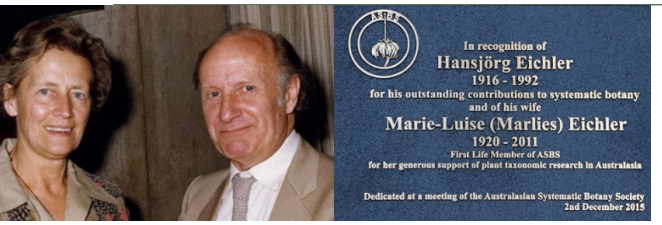

Figure 3 **Left** Marlies and Hanjorg Eichler. Photographer unknown (supplied by A.S. George). **Right** Plaque unveiled by Barbara Briggs at a memorial service held in the National Botanic Gardens in Canberra in 2015. Photo: Mike Bayly.

concessions. A majority of these persons is required to be qualified to advise on matters of systematic botany and their appointment must be approved by the CSIRO. The committee is chaired in an ex officio capacity by the incumbent Vice-President. A number of Vice-Presidents have also served as appointed members of the committee. The names of members who have served the Society as members of the Research Committee are listed in Table 1.

The Grant Program

In 1997, with just over $60K in the Research Fund, application forms for the inaugural research grants were included in March Newsletter (Entwisle 1997a). $2,000 was offered for grants up to $1,000. Twelve submissions were received. The successful applicants, Marco Duretto, Nikolas Lam, Bernard Pfeil and Elisa Raulings were announced at the AGM in Adelaide (Entwisle 1997b). Each were awarded $500. One of those original successful applicants, Marco Duretto, is still an active member of the Society who served six years as a member of Council between 2003 and 2009, one of those (2008-09) as President.

As the Research Fund continued to grow, Council decided to increase the maximum grant to $2,000 and to offer two rounds each year beginning in March 2005 (Clarkson 2004). By then the Research Fund held close to $250K.

With the recommendations from the Grants sub-committee having been adopted by Council, substantial changes were made to the grants on offer in 2017. $10,000 was set aside for Eichler grants up to $5,000 each in March and September and a new grant scheme for postdocs was offered for the first time (Web Ref. 1). The postdoctoral grant would be for $10,000 each year for two years. When fully operational, one grant would be offered each year. Council chose to acknowledge Marlies Eichler, whose extraordinary generosity over many years made this funding possible, by naming the postdoctoral grant the Marlies Eichler Postdoctoral Fellowship (Murphy 2107). The first Fellow was Bee Gunn from the Royal Botanic Gardens Victoria and the University of Melbourne.

A full list of grant recipients and Marlies Eichler Fellows, their affiliations and research topics is available on the Society's web site (Web Ref. 2, Web Ref. 3).

Some statistics

- The first Hansjorg Eichler Grants were offered in 1997
- 89 grants have been awarded since, totalling $195,121
- The ratio of women who have been awarded grants to men is 46:43
- Grants have gone to students enrolled in 14 Australian institutions and 4 in New Zealand
- 26 successful applicants have been associated with Melbourne University, 8 from the University of Adelaide, 7 from the University of Sydney, and 6 each from James Cook University and the University of New England
- Over half of the successful applicants (52.8%) remain active members of the Society
- The first Marlies Eichler Postdoctoral Fellowship was awarded in 2017
- 6 Fellowships have been awarded since, totalling $100,000
- 3 Fellowships have been awarded to men and 2 to women

- All Fellows remain active members of the Society.
- 27 members have served various terms on the Research Committee

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Web Reference. 3. Marlies Eichler Postdoctoral Fellowship: Past Award Recipients. https://asbs.org.au/awards/marlies-eichler-postdoc.html

Next (hybrid) AGM on 17 Nov 2022

Heidi Meudt ASBS Secretary

You are invited to join the ASBS Annual General Meeting on Thursday, 17 November 2022 at 11.00 AWST (Perth), 12.30 ACST (Darwin, Alice Springs), 13.00 AEST (Cairns, Brisbane), 13.30 ACDT (Adelaide), 14.00 AEDT (Sydney, Canberra, Melbourne, Hobart), 16.00 NZDT (Auckland, Wellington). The AGM will be held both in person and electronically. Details to participate in the videoconference will be emailed to you closer to the date. Please note that, as was the case last year, we have obtained confirmation from the Registrar-General that we are authorized to once again hold our AGM via methods of communication other than in person, because of the ongoing COVID-19 crisis. The AGM will be part of the hybrid 2022 ASBS student and early career researcher (SECR) conference being held at Mt Annan, Sydney from 15-17 November 2022.

Notice of special resolution to alter the Rules of the Society

Heidi Meudt ASBS Secretary

This is a notice of a special resolution to alter the Rules of the Society. A number of changes to the Rules of the Australasian Systematic Botany Society Inc. were outlined in two recent issues of the ASBS Newsletter (189:24-29 and 190:8-14). The proposed changes received no feedback or comments from members so far. As Secretary, I have received a letter signed by four members of the society, stating that the proposed changes, as published in the newsletters, will be tabled and discussed at the 2022 AGM on 17 November 2022 as a special resolution pursuant to Rule 34 and subrules 25(2), 30(5) and 30(6). Please familiarise yourself with the proposed changes ahead of the AGM. Any changes to the proposed Rule changes arising at the AGM will be voted on in a postal/email ballot. Anyone who has not voted in the postal/email ballot can cast their vote at a second meeting which will be held electronically (online) on Wednesday 1 February 2023 at 11.00 AWST (Perth), 12.30 ACST (Darwin, Alice Springs), 13.00 AEST (Cairns, Brisbane), 13.30 ACDT (Adelaide), 14.00 AEDT (Sydney, Canberra, Melbourne, Hobart), 16.00 NZDT (Auckland, Wellington). Details to participate in this online meeting will be emailed to you closer to the date.

IBC 2024 Call for Symposia

The Organizing Committee of the XX IBC

Two years ahead of the XX IBC, we are pleased to launch the Call for Symposia. We encourage researchers worldwide to submit symposium proposals on a variety of topics through the IBC website.The scientific committee will evaluate symposium proposals based on potential audience interest, scientific quality, and diversity of speakers in terms of gender, career stage, and geography, among others. Symposium proposals that bridge two or more of the 31 proposed topics, including novel views and/or multi-disciplinary research perspectives are especially encouraged. We will make an effort to accept as many proposals as possible. Each symposium will last for 2 hours and will consist of six 20-minute oral communications (15 min presentations + 5 min Q&A). To maximize the interchangeability of participants among concurrent symposia, changes to this schedule will not be allowed. Deadline for symposium proposals 30 December 2022. Proposal Submission

A multi-dimensional triumph

Bob Hill

The Four Dimensions of Terrestrial Plants: Reproduction, Structure, Evolution and Ecology

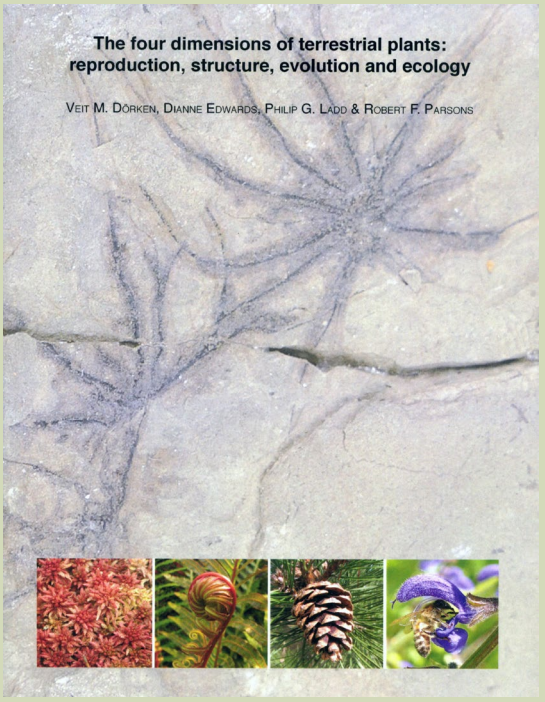
Veit M. Dörken, Dianne Edwards, Philip G. Ladd & Robert F. Parsons

ISBN 978-3-945941-80-5, (hardback) 17 x 22 cm

Kessel Publishing House, 2021, pp. 344

RRP 45.00 €

Published 2021



When I was an undergraduate student in Botany I was fortunate enough to be taught in a strong department with outstanding staff, several of whom were world class teachers and researchers. Amongst the taxonomy, field ecology, ecophysiology and biochemistry, one area immediately captivated me – plant anatomy. I had, through a somewhat circuitous pathway, already been exposed to quite a bit of animal anatomy and histology, but I just couldn't get excited about the fine cell detail of animals. But plants were something different – the sections of plant tissues were works of art, with extraordinary compartments clearly defining each cell and the whole complicated combination of thousands of cells making ultimate sense of how these plants interacted with the world. Then there was the special sectioning lab, with the smell of the key chemicals, the over-riding odour of molten wax, the ancient microtomes with the almost religious procedure for sharpening and caring for the massive and lethal-looking blades that produced the sections.

I haven't pursued plant anatomy all that much during my career, but I have never lost my interest in it or my admiration for those who have mastered what remains to me an art form combined with very solid science. Hence I was especially pleased when I was asked to review this book – *The four dimensions of terrestrial plants: reproduction, structure, evolution and ecology*. The four authors are all quite well known to me – Veit Dörken has fairly recently come to my attention and his superb plant anatomical work is of great interest to my ongoing attempts to understand the evolution of some of the key Australian plant taxa; Diane Edwards is, in my opinion, the premier palaeobotanist on Earth today; and Phil Ladd and Bob Parsons provide the Australian input and I feel like we have grown through our careers together, with their names showing up on research of interest to me for a long time now – they are deeply experienced Australian botanists.

The approach of considering four dimensions is an interesting one, combining classical plant structure, reproduction and evolution with a late section on ecology. The coverage is extensive, effectively including all terrestrial multicellular plants and the detail is impressive. The illustrations are simply outstanding – it is amazing to see such consistently high quality illustrations and accurate descriptions that don't get too tied up in terminology and hence remain clear, precise, understandable and informative. If you have an interest in a specific group you can go straight there and

look at it in isolation, but if you want the grand story from the simplest beginnings, then that is there too. The ecological section of the book is also broad in its coverage, but by necessity is more abbreviated – you simply can't cover plant ecology in all its detail in about 80 pages. Nevertheless, this section covers a huge amount of information and does so very effectively.

When I first see a book like this I tend to leaf through it quickly to see what the illustrations are like – I did that here and I was deeply impressed by what has been achieved. Then I read the text and I was even more impressed by the consistent high quality of this work. This book embodies what we are in danger of losing as botanists – the deep interest and attachment to this extraordinary group of organisms. Too much botany today is carried out in front of computer screens dealing with vast amounts of data and massaging it until the "correct" answer appears. I have no issues with big data approaches, except when it comes at the expense of a real understanding of the organisms being worked on. It is books like this that will help to restore the balance.

Worth delaying lunch for?

John Clarkson ASBS Treasurer

The Robert Brown Handbook: A Guide to the Life and Work of Robert Brown (1773–1858), Scottish Botanist

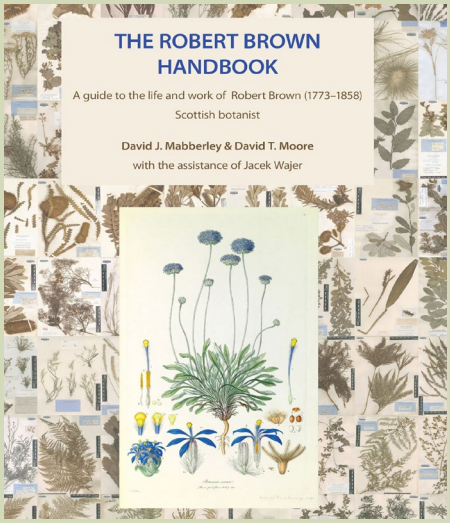
David J. Mabberley and David T. Moore with the assistance of Jacek Wajer

ISBN 978-3-946583-37-0 (hardback)

Regnum Vegetabile Vol. 160

Koeltz Botanical Books, Glashütten, Germany, pp. 624

RRP 173,83 € excl. VAT (Shipping extra)



While I was waiting for the review copy of *The Brown Handbook* to arrive, I was copied into an email exchange between Alex George and David Mabberley. In it, Alex announced that his copy had just arrived prompting him to put his lunch on hold. He finished by saying that the book could be reviewed in two words "Superb! and Indispensable!" and that "many people will be forever grateful". With those words ringing in my ears, I had to wait a few more days before the book arrived in Far North Queensland. Would it live up to Alex's first impression?

This book is the product of close to nine decades of collective interest and study by David Mabberley (DJM) and David Moore (DTM) on the life and work of Robert Brown, one of the greatest botanists of the nineteenth century. DJM's interest stems from the early 1970s and led to the publication of wonderfully readable biography of Brown, *Jupiter Botanicus: Robert Brown of the British Museum* in 1985 (Mabberley 1985) and over 30 papers and books since. DTM's interest dates from the 1980s when he was employed by the Natural History Museum in London (BM). This interest led to the publication of a transcription of Brown's diaries from the Flinder's voyage to Terra Australis with co- authors Tom Vallance and Eric Groves (Vallance *et al.* 2001) and at least a dozen papers. I have had the pleasure of taking both Davids to Robert Brown sites on Cape

York Peninsula and have had the privilege of seeing first-hand their interest and depth of knowledge. It is not surprising that the two would team up on a significant project such as this. While working on the transcription of Brown's diaries, DTM compiled a database of all of Brown's Investigator specimens in the Natural History Museum in London (BM). In 2000s, DJM approached DTM and suggested a collaboration that would make this database available to botanists. In the process, DTM's catalogue would be expanded to include all of Brown's taxa, not merely those related to Australian plants, and to include materials in herbaria other than just the BM. The scope of the project was outlined in this Newsletter in 2007 (Mabberley & Moore 2007). The monumental undertaking took 20 years to come to fruition and, sadly, DTM died before the book could be published. Jacek Wajer from the BM stepped in to help bring the work to fruition.

The book is divided into two parts. Part I includes a short biography of Brown (7 pp.); an eponymy (24 pp.) which includes phenomenon (1), rules and conventions (2), place names (6), journals (1) and organisms (23 animals, 13 algae, 375 land plants); a list of Brown's publications (7 pp.); and concludes with a list of Brown's botanical manuscripts at the BM (45 pp.). Part II begins with some brief introductory notes (1 p.) explaining the scope of the catalogue followed by a detailed discussion on the typification of Brown's names and the pitfalls that can befall modern authors when selecting material to typify Brown's names (7 pp). The rest of Part II is devoted to the Catalogue (507 pp.). This includes all names proposed by Brown and validly published by him or taken up by others. Work on the catalogue identified many errors or omissions of Brown's names in the International Plant Names Index (IPNI 2022). These included *nomina nuda* or combinations attributed to Brown but made by others. The authors were able to draw these and many Brown names that were missing from IPNI to the relevant authority.

Guided by the cautions outlined in the section on typification of Brown names, 27 specialists took the opportunity to publish five new combinations and three nomina nova and designate 20 lectotypes and two neotypes in the handbook. Where possible, for names in the catalogue that remain untypified, the authors have used their intimate knowledge of Brown and his plants to indicated material that appears GCL (Good Candidate for Lectotype). This should be of great assistance to specialists working on Brown's plants in the future.

Does the book have any problems? A few. I can't imagine the work involved in proof-reading a book of this nature. I found a few errors but none that I was unwilling to overlook. For me, the only short-coming is the lack of an index. I have heard a similar comment from other early users of the book. The arrangement of families in the catalogue could be confusing if the readers overlook the references at the beginning of the lyocopods and ferns (p. 113) and the angiosperms (p. 133). A full index to all names listed in the book would have added to what is an already large book. Alex George compiled an index to the orders and families which he kindly shared with me. I'll arrange to have this to be uploaded to the ASBS website.

The authors are to be commended on the scholarship and perseverance that has gone into the production of this book. It will be an invaluable resource for those interested in Brown or may have to deal with his material. Many people will be forever grateful. Would it be worth delaying your lunch for? Most certainly yes.

References

IPNI (2022). International Plant Names Index. Published on the Internet http://www.ipni.org. The Royal Botanic Gardens, Kew, Harvard University Herbaria & Libraries and Australian National Botanic Gardens.

Mabberley, D.J. (1985), Jupiter Botanicus: Robert Brown of the British Museum, J.Cramer, Braunschweig & British Museum (Natural History), London.

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Vallance, T.G., Moore, D.T. and Groves, E.W. (2001), Nature's Investigator: The Diary of Robert Brown in Australia, 1802–1805. Australian Biological Resources Study, Canberra.

ASBS student and ECR register

In order to promote the connectivity and visilbility of our students and early career researchers (ECRs) in ASBS, ASBS Newsletter publishes a student and ECR register. If you're a student or ECR and would like to opt-in to this register follow this link: https://forms.gle/wxSzGA9FpBTNXB6j8. For any questions or to change your details, contact Lizzy at editor.asbsnews@gmail.com

Name	Institution	Email
Masters students		
Aiden Webb	The University of Melbourne	aidenw@student.unimelb.edu.au
Jessica Bruce	Edith Cowan University	jessica.l.bruce90@gmail.com
Leo Carlo Sarion	University of Auckland	lsar983@aucklanduni.ac.nz
PhD students		
Catherine Clowes	The University of Melbourne	cclowes@student.unimelb.edu.au
Grace Boxshall	The University of Melbourne	boxshall@student.unimelb.edu.au
Matthew Adeleye	Australian National University	matthew.adeleye@anu.edu.au
Patrick Fahey	The University of Melbourne	psfahey@student.unimelb.edu.au
Paulo Baleeiro	The University of Queensland	p.baleeirosouza@uq.edu.au
Tombo Warra	James Cook University	tombo.warra@my.jcu.edu.au
Zoe Bloesch	The University of New South Wales	zoe.bloesch1@gmail.com
Ryan P. O'Donnell	Australian National University	Ryan.ODonnell@anu.edu.au
Early Career Researchers		
Jessie Prebble	Manaaki Whenua - Landcare Research	prebblej@landcareresearch.co.nz
Lalita Simpson	Australian Tropical Herbarium	lalita.simpson1@jcu.edu.au
Maren Preuss	Victoria University of Wellington	Maren.Preuss@vuw.ac.nz
Tim Hammer	The University of Adelaide	timothy.hammer@adelaide.edu.au
Lizzy Joyce	Ludwig-Maximillians Universität München	E.Joyce@lmu.de

Job advertisement

Australian Biological Resources Study

The Australian Biological Resources Study is looking for a new scientific officer for our team. We need a person with expertise in botanical taxonomy, especially for non-flowering plants/cryptogams (e.g., algae, mosses, bryophytes, fungi etc). Applications close on 27 July. https://awejobs.nga.net.au/?jati=5E324CE0-CAAB-015B-EA0E-C8BC8A800544

The newsletter

The ASBS newsletter keeps members informed of society events and news, and provides a platform for debate and discussion. The newsletter is published quarterly on the ASBS website and in print. Original articles, notes and letters (not exceeding ten published pages in length) are encouraged for submission by ASBS members.

Have an article or an idea for the newsletter?
Send it to Lizzy at
editor.asbsnews@gmail.com

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Full page: $200
Half page: $100
Flyers: $250

A 20% discount applies for regular advertisements. ASBS members are exempt from advertisement fees but not insertion costs for flyers ($50). For advertising enquiries please contact the editor.

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The society

The Australasian Systematic Botany Society is an incorporated association of over 300 people with professional or amateur interest in botany. The aim of the society is to promote the study of plant systematics.

Membership is open to all interested in plant systematics. Members are entitled to attend general and chapter meetings, and to receive the ASBS *Newsletter*. Any person may apply for membership by filling in a membership application form available at http://www.asbs.org.au/membership.html, and forwarding it to the Treasurer. Subscriptions become due on 1 January each year.

The ASBS annual membership subscription is AUD $45, and a concessional rate of AUD $25 is offered to full-time students, retirees and unemployed people. Payment may be by credit card or by cheque made out to Australasian Systematic Botany Society Inc., and remitted to the Treasurer. All changes of address should be sent directly to the Treasurer as well.

Chapter conveners

Adelaide
Robyn Barker
State Herbarium of SA
(+618)/(08) 8222 9348
robyn.barker@sa.gov.au

Armidale
Jeremy Bruhl
University of New England
(+612)/(02) 6773 2429
jbruhl@une.edu.au

Brisbane
Gill Brown
Queensland Herbarium
(+617)/(07) 3199 7699
Gillian.Brown@des.qld.gov.au

Cairns
Katharina Nargar
Australian Tropical Herbarium, CSIRO
(+617)/(07) 4232 1686
katharina.nargar@csiro.au

Canberra
Alexander Schmidt-Lebuhn
CSIRO
(+612)/(02) 6246 5498
Alexander.S-L@csiro.au

Christchurch
Rob Smissen
Allan Herbarium
(+643)/(03) 321 9803
smissenr@landcareresearch.co.nz

Darwin
Ian Cowie
Northern Territory Herbarium
(+618)/(08) 8999 4511
ian.cowie@nt.gov.au

Hobart
Miguel de Salas
Tasmanian Herbarium
(+613)/(03) 6226 1806
Miguel.deSalas@tmag.tas.gov.au

Melbourne
Frank Udovicic
National Herbarium of Victoria
(+613)/(03) 9252 2313
frank.udovicic@rbg.vic.gov.au

Perth
Juliet Wege
Western Australian Herbarium
(+618)/(08) 9219 9145
Juliet.Wege@dbca.wa.gov.au

Papua New Guinea
Janet Gagul
The University of Papua New Guinea
(+675) 7232 9121
gagulj@upng.ac.pg

Sydney
Peter Weston
National Herbarium of NSW
(+612)/(02) 9231 8111
peter.weston@rbgsyd.nsw.gov.au

Wellington
Heidi Meudt
Museum of New Zealand Te Papa Tongarewa
(+644)/(04) 381 7127
HeidiM@tepapa.govt.nz

Major Australasian herbaria and systematics institutions contacts

AD
(+618)/(08) 8222 9307
stateherbsa@sa.gov.au

HO
(+613)/(03) 6226 2635
herbarium@tmag.tas.gov.au

MEL
(+613)/(03) 9252 2300
pina.milne@rbg.vic.gov.au

NSW
(+612)/(02) 9231 8111
herbarium.nsw@rbgsyd.nsw.gov.au

CANB
(+612)/(02) 6246 5084
cpbr-info@anbg.gov.au

BRI
(+617)/(07) 3199 7699
queensland.herbarium@qld.gov.au

CNS
(+617)/(07) 4232 1837
enquiry@ath.org.au

PERTH
(+618)/(08) 9219 9130
herbarium@dbca.wa.gov.au

NT
(+618)/(08) 8951 8791
herbarium@nt.gov.au

DNA
(+618)/(08) 8999 4516
herbarium@nt.gov.au

AK
(+649)/(09) 306 7060
info@aucklandmuseum.com

CHR
(+643)/(03) 321 9999
schonbergeri@landcareresearch.co.nz

WELT
(+644)/(04) 381 7261
Antony.Kusabs@tepapa.govt.nz

Australian Biological Resources Study (ABRS)
(+612)/(02) 6250 9417
abrs@environment.gov.au

Council of Heads of Australasian Herbaria (CHAH)
Chair: John Huisman
Western Australian Herbarium
john.huisman@dbca.wa.gov.au

Australian University Herbaria
Rep.: Kristina Lemson
Edith Cown University
k.lemson@ecu.edu.au

Taxonomy Australia
taxonomyaustralia@science.org.au

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Cover image: Detail of illustration of *Veronica baylyi* Garn.-Jones, a New Zealand endemic, by Jodie McLay. This illustration was gifted to the current President by his previous PhD student Dr. Todd McLay upon completion of his PhD.