Current research opportunities at the State Herbarium of South Australia

- Orchidaceae
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Orchidaceae

South Australia is currently investing much in the management of individual threatened orchid species. Nearly 100 phrase names are listed currently by the State Herbarium under strict rules of deposition of a voucher specimen. However, these proposed new species or infraspecific taxa are urgently in need of measured evaluation within a taxonomic revision. The genetic heterogeneity of orchid species and subspecies should also be compared with that in other plant, algal and fungal groups. There is a danger that the investment in orchids is out of balance with the proportion of overall plant genetic diversity being conserved.

The taxonomy of the Orchidaceae in Australia is in a state of flux. Compounding major advances in taxonomic knowledge in recent years has been controversy on the recognition of new genera and of species that might be treated better as part of the complexity of variation within an existing species. In 2002, the Council of Heads of Australasian Herbaria ran a workshop on developing standards for classification of the Australian orchids but the momentum of change at the generic and species level has continued unchecked. The State Herbarium must develop expertise in the family if it is to assess the diversity of the family in this State and validity of proposed new species, and the investment in conservation management of orchid species, including proposed new species. This would service a revisional study of critical genera and generic groups, and the measured progressive testing of the proposed new species, using accepted taxonomic principles.

Macro fungi

The fungi are the most diverse group of organisms in the South Australian and Australian flora. They have huge impact on the environment: truffles are a food source for small Australian mammals, many of which are threatened; and mycorrhiza are critical to the nutrition of Australian plants, such as orchids. There is also a strong public interest, not just on the question of edibility. A strong group of volunteers are assisting Honorary Research Associate Pam Catcheside study fungi in her regular 'fungal forays'. There are similar groups in other states and the coordinated national *FungiMap* project has arisen from this interest. However, we have no long history of anecdotal evidence of poisonings to provide an authoritative list of edible species.

For all their importance in the natural and cultivated environment, fungi suffer from having the fewest taxonomists researching and documenting their diversity. Only Tom May and Teresa Lebel, both at the National Herbarium of Victoria, and Neale Bougher, based at WA Herbarium, are employed specifically for fungal taxonomy in Australian herbaria. Other taxonomists are employed voluntarily (Honorary Research Associate Pam Catcheside, State Herbarium of South Australia; Heino Lepp Australian National Herbarium; Tony Young, Queensland Herbarium) or with other duties (Nigel Fechner, Queensland Herbarium). Others deal with conservation or biological issues rather than taxonomy (e.g. the mycorrhizal research group at the Waite Institute, The University of Adelaide; fire response by Richard Robinson, WA Department of Environment and Conservation).

The State Herbarium has an asset of national and global significance in the mycological herbarium collected by Professor Sir JB Cleland. Comprising about 16,000 specimens, it contains approximately 400 type specimens (the specimens to which the name of each of his more than 200 new species are permanently associated). Cleland's major work, *Mushrooms and toadstools of South Australia*, and his many published papers, documented new species not just in South Australia but elsewhere, particularly New South Wales. His collection was researched further over three years in the 1990s by Cheryl Grgurinovic, culminating effectively in a second revised edition of the work which included a number of new species. Grgurinovic also helped reorganise this herbarium, which has proved invaluable for the international demand for loans to advance revisional studies in particular groups of fungi. This collection makes the State Herbarium the logical place in Australia to give impetus to fungal taxonomic research.

Weeds: the naturalised and potentially naturalised flora

One-third of the State's flora is naturalised. However, the State Herbarium collection is, as a generalisation, poorly represented by naturalised plants (weeds). The only groups well represented have been subject to recent research including focused field work – Blackberry (*Rubus*) and the Cactaceae are lone examples. A recent survey of *Erica* in the Mount Lofty Ranges, where it is a serious problem, extended the number of recognised species from four to almost 20.

Our knowledge of the taxonomy of our naturalised plants is probably at the same level as was the native flora when the second edition of the Flora of South Australia was published, in the 1950s. Since then the State Herbarium collection has grown from fewer than 50,000 specimens to over 800,000 mainly South Australian collections.

Weed practitioners generally assume that what is identified from current flora handbooks is adequately known taxonomically. After all, the taxonomy is based on work overseas, commonly Europe, where taxonomic research has had a much longer history. This is a very flawed view. Many introductions are garden plants, grown for aesthetics or food. The genetic and taxonomic relationships of cultivars are often complex and poorly researched. *Rubus* (blackberry) and Cactaceae are examples where considerable work has been required to clarify exactly what we have in this State.

Revisional studies of groups of weeds in Australia may give a much improved view of the taxonomy but they are only as good as the sample of collections and observations on which they are based. South Australia's biosecurity is flawed if it does not establish a capacity to assess the taxonomy of new introductions to the State in establishing the nature of the threat. The State Herbarium has promoted the need for taxonomic review as an important first step in the 'diagnostic' process being established as part of the new Biosecurity Strategy for South Australia, currently being drafted. The branched broomrape (*Orobanche ramosa* ssp. *incert*) has been the subject of a hugely expensive control program. However, despite indications of taxonomic uncertainty, no effort has gone into assessing the genetic and taxonomic relationships of the South Australian populations with closely related species in Europe, the Middle East and other parts of the world where it has become naturalised.

Establishing the correct identity of invasives is important evidence for assessing the nature of the threat and the control methods that might be available or need to be researched. In the case of the work done by the State Herbarium on blackberry, huge changes were made to the classification and understanding of the taxonomy. These changes helped direct genetic studies and establish a control program using host-specific rust fungi.

The role of a weed taxonomist would need to be resourced not only for taxonomic revisions of weed groups but also to encourage collection of naturalised species to significantly expand the State Herbarium collection as a foundation for rapid assessment of new threats to the State. National projects such as Weed Spotters (CRC for Australian Weed Management, pilot study in Queensland Herbarium) and the AVH Weed Tracker (Council of Heads of Australasian Herbaria and CRC for Australian Weed Management), have voucher herbarium specimens as authoritative evidence of the distribution of weeds.

Molecular systematics of Australian marine macroalgae

The Phycology Unit, in partnership with the University of Adelaide, is seeking Honours and PhD students interested in working on the molecular systematics, ecology and biogeography of Australian macroalgae. Two fully funded PhD scholarships are available for imminent start.