

Eichler Research Fund Report

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The Australian Rhamnaceae a preliminary molecular analysis

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The Rhamnaceae are one of the larger plant families, with over 900 species worldwide. In Australia there are currently about 200 species recognised in 21 genera. There is a high level of endemism with approximately 90% of Australian species occurring only on the continent. A significant number of species (approx. 30%) are classified as nationally rare or threatened (Coates 1999). Bentham (1863) first recognised three distinct groups within Australia, according to the distribution of the genera involved. These biogeographic groups are still accepted today (Kevin Thiele, pers. comm. 2001).

The first group contains ca. 20 species from 12 sub-tropical and tropical genera (*Alphitonia*, *Colubrina*, *Emmenosperma*, *Gouania*, *Hovenia*, *Noltea*, *Rhamnella*, *Rhamnus*, *Sageretia*, *Schistocarpea*, *Ventilago*, *Ziziphus*), most of them only represented by one or two species in Australia. The second group comprises only one genus, *Discaria*, with two species restricted to the mountainous regions of south-eastern Australia and Tasmania. Together with relatives in New Zealand (1 sp.) and South America (5 spp.), this genus is an example of the Gondwanan connection of the southern floras. The third group is composed of five endemic and very species-rich genera from southern, temperate to semi-arid regions of Australia, namely *Cryptandra* (30-35 spp.), *Pomaderris* (65 spp. in Australia and 8 spp. in New Zealand), *Spyridium* (ca. 35 spp.), *Stenanthemum* (25-30 spp.) and *Trymalium* (ca. 15 spp.). Most members of these genera have stellate hairs on leaves and/or flowers, a feature that distinguishes them from all other Rhamnaceae species. These five Australian genera form the tribe Pomaderreae Reiss. ex Endl., which was recently reinstated by Richardson et al. (2000).

The systematic position of two Western Australian genera, *Blackallia* (2 spp.) and *Siegfriedia* (1 sp.), is still uncertain. The monotypic Western Australian *Granitites*, which was recently split from *Pomaderris* (Rye 1996a), is now seen to be most closely related to *Alphitonia* (Fay et al. 2001, Kellermann 2001).

The aim of my Ph.D. project is to examine the infra- and suprageneric relationships of the Australian Rhamnaceae, both with molecular and morphological methods. I am focussing particularly on the tribe Pomaderreae and related Australasian/Pacific genera (e.g. *Alphitonia*, *Granitites*, *Discaria*, etc.). I was awarded \$1000 from the Hansjörg Eichler Scientific Research Fund to commence the molecular work of my Ph.D. by conducting a pilot study with a limited number of species.

Sixteen taxa were sampled for two adjoining regions in the chloroplast genome, the trnL (UAA) 5' intron and the intergenic spacer between the trnL (UAA) 3' exon and trnF (GAA); these two regions are commonly referred to as trnL-F. The species were also sampled for both internal transcribed spacer regions (ITS1 and ITS2) and the 5.8 rDNA region of the nuclear ribosomal DNA. At the time of writing, not all ITS sequences have been finalised, therefore only the trnL-F tree is presented here (Fig. 1). If a node in the tree is supported by preliminary ITS results, this is indicated. An extended version of the trnL-F analysis with 28 taxa can be found in Kellermann (2001).

The tribe Pomaderreae as reinstated by Richardson et al. (2000) receives very strong jackknife support (JS) with the trnL-F dataset as well as with ITS, as sequenced so far. This is supported at a morphological level by the presence of stellate hairs in the members of this tribe (Suessenguth 1953, Richardson 2001). The grouping of the monotypic genus *Granitites* from granite outcrops in Western Australia with the tropical *Alphitonia* is also strongly supported with both datasets (ITS: 100% JS) and confirms earlier findings. Fay et al. (2001) assume that *Granitites* is a relict of the rainforest flora that dominated Western Australia in the Cretaceous, resulting in today's disjunct distribution of the two genera in the 'Alphitonioid Clade'.

Within the Pomaderreae there is very strong support for the grouping of the atypical genus *Siegfriedia* with *Pomaderris* (ITS: 100% JS). This Western Australian genus from the

Ravensthorpe Range differs from other Australian Rhamnaceae mainly by having Darwinia-like flower heads with 4-partite flowers and opposite leaves. It shares with *Pomaderris* the same type of fruit with basal valves ('operculi') on each fruitlet (Rye 1996b). *Trymalium* is the sister group to *Pomaderris* and *Siegfriedia* in this analysis, although this relationship gained only weak jackknife support.

Stenanthemum is retained as a separate genus with moderate jackknife support in the trnL-F tree, supporting the recent reinstatement of the genus by Rye (1995). Surprisingly, the Victorian *Trymalium daltonii*, endemic to the Grampians, does not group with *T. floribundum* and *T. monospermum* (both from W.A.) but seems to be more closely related to *Spyridium*. The trichotomy at node B in Fig. 1 receives moderate jackknife support in the trnL-F tree and very high support (100%) in the preliminary ITS analysis. A morphological study of *T. daltonii* will be conducted in order to ascertain its status.

The grouping of the *Siegfriedia-Pomaderris-Trymalium* clade with *Stenanthemum* and *Spyridium* (including *T. daltonii*) has not yet been resolved. The trichotomy at node A in Fig. 1 receives only weak jackknife support. The sister group to these genera, being also the basal group within the tribe Pomaderreae, is *Cryptandra*.

Although a combined analysis of trnL-F and ITS could not be conducted and the ITS results were only preliminary, this research confirms the monophyly of the tribe Pomaderreae as well as the association of *Alphitonia* and *Granitites* in an 'Alphitonioid Clade'. Bentham (1863) already

noted the special position of *Alphitonia* with its range extending from the Malay Archipelago and Australia into the Pacific, as far as Hawaii. It may therefore be useful to accept a fourth biogeographic group of Rhamnaceae in Australia, containing a tropical/pacific floral element with one relictual relative in south-western Western Australia, *Granitites*.

Acknowledgments

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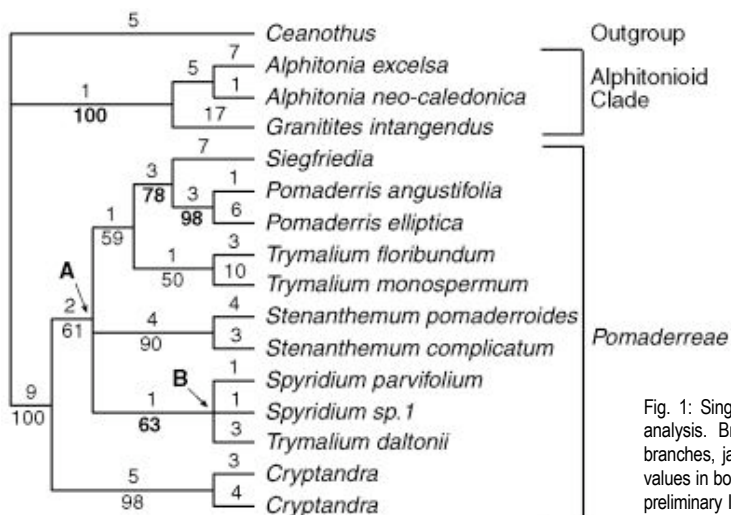


Fig. 1: Single most parsimonious tree of the trnL-F analysis. Branch lengths are indicated above the branches, jackknife support values below. Jackknife values in bold indicate that a node is supported in the preliminary ITS analysis as well.

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Rye, B.L. (1996b) A synopsis of the genera *Pomaderris*, *Siegfriedia*, *Spyridium* and *Trymalium* (Rhamnaceae) in Western Australia. *Nuytsia* 11, 109-131.

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News

Appointment at CANB

As a result of Bob Makinson's move to the National Herbarium of New South Wales, Brendan Lepschi has been appointed as Curator of the Australian National Herbarium (CANB), Centre for Plant Biodiversity Research.

Barry Conn
National Herbarium of New South Wales

AD news

Early in the new year the State Herbarium of South Australia (AD) has experienced a second retirement hard upon that of Munir last August (see the Newsletter 109), that of its Chief Botanist John Jessop. John joined the staff in this capacity in 1975 where he oversaw a growth in staff and two extensions to the herbarium building, and played a major role in promoting publication in the institution. He plans to continue with his encyclopaedic work on South Australian grasses in his retirement.

Uncertainty about the management position of the Plant Biodiversity Centre, which incorporates the State Herbarium, has been a drawn-out affair of over 16 months, resulting from secondments from Senior Botanist in the Herbarium up through the three executive levels in National Parks and Wildlife SA all the way to the Chief Executive of the Department for Environment and Heritage. The positions above at each level from the top down have now been filled with, on 27th March, the announcement that Laurie Haegi had accepted the position of Assistant Director, Biodiversity Branch, in which he has been acting since November 2000.

Laurie joined the State Herbarium from the Botanic Gardens of Adelaide at a difficult time and strove to bring it into a more central place in environmental knowledge provision. He undertook at times difficult negotiations to secure for the State Herbarium a suitable outcome from its move into the heritage Tram Barn A in the National Wine Centre and International Rose Garden project, successfully achieving the renaming of the building to the Plant Biodiversity Centre, which also houses the Botanic Gardens &

State Herbarium library and Manfred Jusaitis's Conservation Biology unit. From his acting position on the National Parks executive he sponsored the cause of the State Herbarium in the wider context of state-wide scientific and policy sections that he administered, while continuing as chair of Council of Heads of Australian Herbaria. And he played the major early part in achieving the inclusion of the State Herbarium in the multi-institutional Centre for Evolutionary Biology and Biodiversity (CEBB) led by Andy Austin of the Waite Institute, University of Adelaide.

Dr Bob Inns, an animal ecologist, has spent the last seven months assisting the Plant Biodiversity Centre by taking on the Acting Manager position along with his role as Manager, Biodiversity Conservation Strategies, following two month and seven month stints by Bob Chinnock and Bill Barker, respectively.

The filling of the Manager's position is being expedited.

Bill Barker
Plant Biodiversity Centre – Adelaide

Changes at UNSW

Chris Quinn retired from the School of Biological Science at the University of New South Wales on August 31st after more than 36 years there as a systematic botanist. He has been taken in by the Royal Botanic Gardens Sydney, who offered him Honorary Research Associate status. The move to the gardens made good sense, since he has had collaborative research projects with Peter Wilson on Myrtaceae, and with Elizabeth Brown on Epacridaceae, in recent years. He transferred his computers, laboratory equipment and his ABRIS research grant on the *Baeckea* complex (joint with Peter Wilson) to the gardens with him, although he says his much valued PC was deemed too old at 4 years of age to be connected to the RBG network, and was provided with a new replacement. No doubt other university academics will be as amazed by this as Chris was. His research assistant, Margaret Heslewood, has also transferred to the RBG. He reports that the change of environment has been very invigorating, and the switch to a ferry ride from