

# The Systematics of *Olearia* (Astereae)

## Hansjörg Eichler Research Grant Field Work Report

*Olearia* Moench. (Astereae, Asteraceae) is one of the largest (ca. 180 spp.) assemblages of daisies in the Australasian region (Nesom 1994). All *Olearia* species are shrubs and many occur in the montane regions of NSW, Victoria, Tasmania, New Zealand and New Guinea. The morphology of *Olearia* is highly variable (Nesom 1994). Such variability, if considered in the context of a family (Asteraceae) renowned for its convergent evolution (Carlquist 1976), has made assessing the affinities at both specific and suprageneric levels problematic.

Bentham (1867) divided *Olearia* into five sections based on variation of the indumentum on the abaxial leaf surface: *Dicerotriche* possessing divaricate or t-shaped hairs, *Asterotriche* having stellate hairs, *Eriotriche* with woolly hairs, *Merismotriche* with glandular hairs and *Adenotriche*, devoid of hairs. The validity of these groups and their application to the New Zealand and New Guinean members of *Olearia* have been queried. *Olearia ramulosa* (Australian endemic) has hairs placing it in several sections (Willis 1955), while *Olearia heterotricha* (New Guinean endemic) has hairs which do not conform to any section (Koster 1966).

Many suprageneric affinities have been proposed. Early taxonomists considered *Olearia* to be closely related to the Northern Hemisphere *Aster* (Cheeseman 1906, Hooker 1867). More recent studies have associated it with Australasian genera including *Achnophora*, *Celmisia*, *Damnamentia*, *Erigeron* (*pappocromus*), *Pachystegia*, *Pleurophyllum*, South American genera *Chiliotrichum* (Bremer 1994), *Oritrophium*, *Hinterhubera*, *Novenia* (Nesom 1994), the Madagascan genus *Madagaster* and the Hawaiian genus *Remya* (reviewed in Heads 1998). With the exception of Bremer, all these studies are not based on cladistic analyses and hence it is difficult to assess the validity of these relationships. Several of these studies have also directly brought into question the monophyly of *Olearia* as they consider different groups within *Olearia* such as the New Zealand macrocephalous group to be more closely related to members of other genera (Given 1973).

In cases such as this, molecular data has been especially useful in elucidating phylogenies (for eg. recent work on *Vittadinia* and relatives by Lowrey et al. in press). The use of molecular methods to generate hypotheses of phylogeny has many advantages including the large number of variable characters, often typified by relatively low levels of homoplasy and fewer problems of determining homologous states (Hillis 1987).

The main aims of my research were to

1. Use sequence data generated from the ITS region to test the monophyly of *Olearia* using a range of outgroup representatives.
2. Assess Bentham's sectional classification of *Olearia* as well as the affinities of *Olearia* to the genera with which it has been linked.
3. Investigate the evolution of a range of morphological characters considered useful in delimiting genera in Astereae.

In brief, the results suggest that *Olearia* is not monophyletic and that it requires re-appraisal. Within Astereae, relationships were complex: some Australasian members

of *Olearia* and the South American *Chiliotrichum* may have diverged early in the evolution of the tribe, while other groups of *Olearia* appear to have evolved much more recently. Although Betham's sections were only of limited use in defining monophyletic groups within *Olearia*, other characters such as the coverage of hairs on the achene were informative of relationships.

The Hansjörg Eichler Award of \$750 was imperative for the completion of this project. It enabled fresh leaves for molecular analysis and flowers and fruit for morphological analysis to be collected from Mount Kosciusko National Park and the ACT.

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