

***Cineraria* L. (Senecioneae, Asteraceae) - its taxonomy,
phylogeny, phytogeography and conservation.**

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Declaration

I declare that this thesis is my own, unaided work. It is being submitted for the Degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

_____ day of _____ 2005.

Abstract

This study aimed to investigate the phylogeny of *Cineraria* L. to elucidate its position in the tribe Senecioneae (Asteraceae), to delimit its generic and species boundaries, explore species relationships (infrageneric structure) and produce a monograph of the genus. It also aimed to examine its distribution, phytogeographic affinities, levels of rarity and endemism in *Cineraria*, to identify some of the factors contributing to rarity in *Cineraria* and to highlight implications for conservation.

Phylogenetic analyses were performed using morphological and molecular (DNA sequence) characters to elucidate relationships within the genus and between *Cineraria* and selected related genera in the subtribe Senecioninae. The phylogenetic species concept was applied - suites of diagnostic characters were used to characterise species. The phenetic approach, using Cluster Analysis and Principal Coordinates Analysis, was applied to investigate variation in two highly variable species, *C. deltoidea* Sond. and *C. lobata* L'Hér. Species distributions were mapped and the number of species per degree square was plotted for southern Africa to identify centres of diversity and endemism. Rare species were identified and categorised according to Rabinowitz's criteria of geographic range, habitat specificity and local population size.

Cineraria now has a more homogenous generic concept, characterised as herbs or subshrubs with palmately veined leaves, radiate, calyculate capitula, penicillate style apices and obovate, compressed cypselae with two distinct margins or wings and a substantial carpodium. Eleven species have been removed from the genus and two new genera, *Bolandia* Cron and *Oresbia* Cron & B.Nord. have been established to accommodate three of the species. Two species have been reassigned to and another reinstated in *Senecio* L. The affinities of five species remain unresolved.

Cineraria now comprises 35 species with four new subspecies and two new varieties recognised. Eight species have been placed in synonymy and five new species have been described during this revision. The status of *C. deltoidea* as a single, highly variable species, widespread throughout the eastern mountains of Africa, has been confirmed. *Cineraria lobata* has been shown to be a very variable species and the geographic and morphological variation has been formally (and informally) recognised. No infrageneric classification has been applied to *Cineraria* as a robust phylogeny of all the species has yet to be hypothesised.

A southern African origin for *Cineraria* in the Western and/or Eastern Cape is postulated, based on the current distribution of the sister genus *Bolandia* and *Cineraria mollis* DC.

Cineraria appears to have undergone rapid speciation fairly recently, as indicated by the lack of variation in the molecular data analysed, with reticulate evolution playing an important role in its evolutionary history (as seen by the lack of congruence between the chloroplast and nuclear DNA sequences).

The centre of diversity of *Cineraria* is the KwaZulu-Natal Midlands, part of the Maputaland-Pondoland Centre of endemism in southern Africa. *Cineraria* has an afromontane affinity, and fifteen species endemic to specific mountains or regions of endemism and five near-endemics have been identified in *Cineraria*. Eleven species have been shown to be rare (in the sense of low abundance, restricted range and high habitat specificity), however only five are considered to be threatened as indicated by IUCN Red Data Criteria. However, at least seven species are Data Deficient and require further investigation. Causes of rarity in *Cineraria* are linked to narrow habitat specificity, particularly soil or rock type and/or altitudinal range.

For Mike, my husband and friend,
and
in memory of my parents, Richard and Muriel.

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