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Underestimated diversity in one of the world's best studied mountain ranges: The polyploid complex of *Senecio carniolicus* (Asteraceae) contains four species in the European Alps

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Abstract

Senecio carniolicus (Asteraceae) is an intricate polyploid complex distributed in the European Alps (di-, tetra- and hexaploids) and Carpathians (hexaploids only). Molecular genetic, ecological, and crossing data allowed four evolutionary groups within *S. carniolicus* to be identified. Here, we establish that these four groups (two vicariant diploid lineages, tetraploids and hexaploids) are also morphologically differentiated. As a consequence, we draw taxonomic conclusions by characterizing four species, including the more narrowly circumscribed *S. carniolicus* (lectotypified here), the taxonomically elevated *S. insubricus* comb. nov. (lectotypified here), and the two newly described species *S. disjunctus* and *S. noricus*.

Key words: Asteraceae; European Alps; polyploidy; *Senecio*; species nova

Introduction

The European Alps are among the world's best-explored mountain ranges with respect to their plant diversity, but additions to the inventory of Alpine plants still occur due to the discovery of species hitherto unknown from the Alps—e.g. *Saxifraga carpatica* Sternberg (1831: 32; published in Schneeweiss 1998) or *Carex glacialis* Mackenzie (1910: 244; published in Blanchemain *et al.* 2004)—or of so far overlooked species such as *Pinguicula poldinii* J. Steiger & Casper (published in Casper & Steiger 2001: 28), *Saxifraga styriaca* Köckinger (2003: 82) and *Alyssum neglectum* Magauer, Frajman & Schönswetter (published in Magauer *et al.* 2014: 500). Further additions to the Alpine flora resulted from disentangling the components of polyploid complexes composed of lower-ploid parental entities and their higher-ploid derivatives such as in the group of *Cardamine amara* Linnaeus (1753: 656), *Achillea pratensis* Saukel & R. Länger (1992: 160) or *Gymnadenia conopsea* (Linnaeus 1753: 942) R.Br. in W.T.Aiton (1813: 191) *s.l.* (Marhold 1992, Saukel & Länger 1992, Marhold *et al.* 2005).

Senecio carniolicus Willdenow (1803: 1993) has only recently been identified as an intricate polyploid complex (Suda *et al.* 2007, Sonnleitner *et al.* 2010). Within the long-recognised *Senecio* sect. *Jacobaea* (Miller 1754: 667) Gray (1821: 469), a monophyletic group of mostly western Eurasian species (Pelser *et al.* 2002, 2003), the species belongs to the informal *Incani*-clade containing mountain species distributed from the Spanish Sierra Nevada to the Carpathians. Delimitation and taxonomic status of *S. carniolicus* as well as its evolutionary relationships to close relatives have been discussed controversially. Although sometimes treated as subspecies of Western Alpine *S. incanus*

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