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The *Crotonia* fauna of New Zealand revisited (Acari: Oribatida): taxonomy, phylogeny, ecological distribution and biogeography

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Abstract

New Zealand contains 13 of the 69 species of *Crotonia* described globally and is the only place where all three genera of the Crotoniinae—*Crotonia*, *Austronothrus* and *Holonothrus*—have been recorded. Due to the pioneering work of Hammer (1966) and Luxton (1982) it also has the highest number of distribution records of *Crotonia* spp. anywhere. In the present study I build upon previous work to re-examine the *Crotonia* fauna of New Zealand in the light of recent taxonomic and biogeographical research. A new species is described, *C. ramsayi* sp. nov., a member of the Unguifera species group, and supplementary descriptions are provided for *C. brachyrostrum* (Hammer 1966), *C. caudalis* (Hammer, 1966), *C. cophinaria* (Michael, 1908), and *C. unguifera* (Michael 1908), as well as a key to species. *Crotonia* spp. from New Zealand occur predominantly in localities with relatively low mean annual temperature and high water balance, reflecting a requirement for cool, moist conditions. In New Zealand *Crotonia* spp. occur in an extremely wide variety of vegetation communities compared with other regions in its range (Australia, Africa and South America), and this is indicative that water balance requirements are met, regardless of vegetation type. Some elements of the New Zealand *Crotonia* fauna, notably the Cophinaria species group, are common to Australia, Africa and South America, indicating a shared evolutionary history pre-dating the separation of Africa from Gondwana 110 mya. The high proportion of species that occur west of the Alpine Fault is consistent with a relictual distribution of Gondwanan elements on the Australian Plate. However, it is unclear whether uplift of the Southern Alps formed a barrier to dispersal. A high representation of the morphologically closely-related Obtecta, Flagellata and Unguifera groups, shared only with South America (and, for Unguifera, with Oceania) represents a dramatically different faunal composition compared with other former Gondwanan landmasses and is consistent with submergence of most of New Zealand during the Oligocene (ca. 25 mya). All of these characteristics indicate a distinctive evolutionary pathway for the *Crotonia* fauna since New Zealand separated from the rest of Gondwana 80 mya.

Key words: Mite, species group, environmental envelope, vegetation communities, environmental dissimilarity, Alpine Fault hypothesis, Oligocene drowning

Introduction

The oribatid genus *Crotonia* is of biogeographical and evolutionary significance for its combination of harmonic Gondwanan and disjunct trans-Pacific vicariant distribution patterns (Colloff 2009b; 2010a). In a phylogenetic analysis, Colloff and Cameron (2009) recognised the subfamily Crotoniinae, containing *Crotonia*, *Holonothrus* and *Austronothrus*. Despite recent findings of *Austronothrus* on Norfolk Island and Borneo (Colloff & Cameron 2014), New Zealand is the only place where all three genera have been recorded. Crotoniine mites are a characteristic element of the oribatid fauna of New Zealand, with 13/69 species of *Crotonia* (including the new species described here), second only to 26 spp. from mainland Australia; compared with 13 from South and Central America and nine from Africa and its offshore islands. New Zealand also has the highest density of point-source locality data records for *Crotonia* spp. anywhere recorded.

whether these undescribed species will represent a continuation of the current pattern of radiation from the closely-related Flagellata, Obiecta and Unguifera, species groups, or whether they will represent broader species-group diversification.

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