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## New species of mite harvestmen from southeast Queensland, Australia greatly extend the known distribution of the genus *Austropurcellia* (Arachnida, Opiliones, Cyphophthalmi)

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### Abstract

*Austropurcellia* Juberthie 1988 is a genus of mite harvestmen previously known from numerous localities in the Wet Tropics of northern Queensland and from one locality in central Queensland, Australia. As a result of the current study, the genus is now also known from localities in far southeast Queensland. We describe three new species of *Austropurcellia* from museum lots: *A. acuta* sp. nov., *A. barbata* sp. nov., and *A. superbensis* sp. nov. Each new species is known from only one to two localities, and from very few specimens. In addition, we describe a pair of previously overlooked dorsal anterior cuticular structures that may be sensory in nature and are found in all *Austropurcellia* specimens examined, including both new and previously described species. We present a new distribution map of *Austropurcellia*, greatly expanding its known range to almost the entire east coast of Queensland, and discuss the biogeography of the genus.

**Key words:** biogeography, evolution, Australia, Wet Tropics

### Introduction

Mite harvestmen (suborder Cyphophthalmi) are a globally distributed lineage of small arachnids around 2 mm long, which disperse minimally and inhabit temperate and tropical leaf litter habitats and (occasionally) caves. Queensland mite harvestmen (genus *Austropurcellia* Juberthie 1988) are part of a larger Gondwanan lineage (family Pettalidae Shear 1980) including representatives from Western Australia, New Zealand, South Africa, Madagascar, Sri Lanka and Chile (Boyer & Giribet 2007). Prior to 1988, Queensland Cyphophthalmi were described in the genera *Neopurcellia* Forster 1948 and *Rakaia* Hirst 1925, whose type species are found in New Zealand. In 1988, Christian Juberthie described a new Queensland genus, *Austropurcellia*, with the type species *A. scoparia* Juberthie 1988. More recently, molecular phylogenetic analyses have recovered monophyly of all Queensland mite harvestmen (e.g. Boyer & Giribet 2007, Giribet *et al.* 2012). As a result, Boyer and Giribet (2007) transferred all Queensland species (*Rakaia woodwardi* Forster 1955, *Neopurcellia capricornia* Todd Davies 1977, *R. arctica* Cantrell 1980, *R. daviesae* Juberthie 1989, and *N. forsteri* Juberthie 2000) to *Austropurcellia*.

Nine of the ten described *Austropurcellia* reside in the Wet Tropics (WT) of northern Queensland (Fig. 1), the one exception being *A. capricornia* from Finch Hatton in central Queensland (CQ) (Figs. 1, 2) (Boyer & Reuter 2012). The species here described are from southeast Queensland (SEQ), substantially further south than even *A. capricornia* (Fig. 1). Queensland's Burdekin and St Lawrence Gaps (Fig. 1) (Kikkawa & Pearse 1969) are dry habitat barriers marking the boundary between distinctly northern and southern faunal assemblages in numerous other taxa such as scarab beetles (Allsopp 1995), freshwater fishes (Unmack 2001), snails (Hugall *et al.* 2003), mammals (Winter 1988), leaf-tailed geckos (Couper *et al.* 2008), skinks (Dolman & Moritz 2006), centipedes (Giribet & Edgecombe 2006), and vascular plants (Burbidge 1960). The new species described here are from south of the St. Lawrence Gap, and as such could be expected to differ substantially from *A. capricornia* (from CQ) and the better-known WT *Austropurcellia* fauna.

The palynological fossil record indicates that rainforest was once much more widespread throughout Australia

subsequently transferred by Boyer and Giribet (2007). Some molecular phylogenetic analyses of the family Pettalidae have indicated that the sister of *Austropurcellia* may be the NZ genus *Rakaia*, and that *Austropurcellia* is not closely related to *Karripurcellia* from Western Australia (Giribet *et al.* 2012). However, although monophyly of each pettalid genus is well supported across analyses of molecular data, relationships among genera are highly inconsistent across datasets and methods of analysis, and await further clarification.

Although all molecular phylogenetic analyses to date continue to support monophyly of *Austropurcellia*, the discovery of the species described in the present study brings the diagnosis of *Austropurcellia* into question. The new species described here, as well as our re-examination of the type specimen of *A. capricornia*, have broadened the morphological diversity that is encompassed by the genus such that it is no longer distinguishable from *Rakaia* by the diagnosis of Boyer and Giribet (2007). Specifically, *Austropurcellia* now includes species with setae that could be considered scopulae on tergite VIII, species with thin blade-like adenostyles, and a species with first tarsi that lack a distinct solea—characters that were formerly known to occur in *Rakaia* but not in *Austropurcellia*. The trochanter of the palp of both *Austropurcellia* and *Rakaia* bears a distinct ventral process; in addition, we note that the chelicerae of *Austropurcellia* and *Rakaia* are extremely similar, sharing overall shape and robustness as well as a prominent lateral apodeme (found in all *Austropurcellia* species and many but not all *Rakaia* species). Characters of the palp and chelicera have proved important in defining genera (e.g. Boyer & Giribet 2007), and may prove useful in understanding higher-level relationships among genera of Pettalidae.

DNA sequence data have the potential to clarify the relationship between *Austropurcellia* and *Rakaia*, as well as relationships within *Austropurcellia*. A more thorough accounting of the morphological diversity of *Austropurcellia*, as well as molecular phylogenies of the family Pettalidae with wider taxonomic and geographic sampling, will no doubt aid in clarifying relationships both within *Austropurcellia* and among all pettalid genera. In the absence of detailed morphological study of the many undescribed WT *Austropurcellia* (authors' unpublished data), and in light of molecular phylogenetic support for a monophyletic *Austropurcellia* that may or may not be sister to *Rakaia*, we consider synonymization of *Austropurcellia* and *Rakaia* or the erection of one or more new genera to be premature. Future work by the authors and collaborators will address these taxonomic conundrums.

Ecological niche modeling suggests that the distribution of Pettalidae in Southeastern Australia could extend into New South Wales and even as far south as Victoria and Tasmania (Giribet *et al.* 2012), though these animals have never been collected in states south of Queensland. There is still much work to be done both in terms of mapping the distribution of mite harvestmen in Australia and in determining relationships between Australian mite harvestmen and relatives on other fragments of the former supercontinent Gondwana.

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