Generic and family transfers, and nomina dubia for orb-weaving spiders (Araneae, Araneidae) in the Australasian, Oriental and Pacific regions

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http://zoobank.org/C7DB2091-FB54-40E8-BDC2-7C92F218D53F

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Abstract

As part of a current revision of the Australasian and Pacific orb-weaving spider fauna (family Araneidae Clerck, 1757), a number new combinations are proposed in the genera Acroaspis Karsch, 1878 (3 species), Carepalxis L. Koch, 1872 (1 species), Cyclosa Menge, 1866 (5 species), and Neoscona Simon, 1864 (7 species): Acroaspis lancearia (Keyserling, 1887), comb. n., A. mamillana (Keyserling, 1887), comb. n., A. scutifer (Keyserling, 1886), comb. n., Carepalxis furcifera (Keyserling, 1886), comb. n., Cyclosa anatipes (Keyserling, 1887), comb. n.; Cyclosa apoblepta (Rainbow, 1916), comb. n., Cyclosa argentaria (Rainbow, 1916), comb. n., Cyclosa ichenensis (Rainbow, 1916), comb. n., Cyclosa poderi (Rainbow, 1916), comb. n.; Neoscona decolor (L. Koch, 1871), comb. n.; Neoscona enucleata (Karsch, 1879), comb. n.; Neoscona flavopunctata (L. Koch, 1871), comb. n.; Neoscona floriata (Hogg, 1914), comb. n.; Neoscona granti (Hogg, 1914), comb. n.; Neoscona insta (L. Koch, 1871), comb. n.; and Neoscona notanda (Rainbow, 1912), comb. n.

The following two Australian species, currently placed in Araneus, are not Araneidae but comb-footed spiders (family Theridiidae Sundevall, 1833): Anelosimus dianiphus (Rainbow, 1916), comb. n. and Theridion xanthostichus (Rainbow, 1916), stat. and comb. n.

The following six species are considered nomina dubia as their type material is immature or otherwise unidentifiable (e.g. partly destroyed): Araneus acachmenus Rainbow, 1916; Araneus agastus Rainbow, 1916; Araneus excitus Rainbow, 1904; Araneus suavis Rainbow, 1899; Carepalxis coronata (Rainbow, 1896); and Heurodes turritus Keyserling, 1886. Heurodes fratellus (Chamberlin, 1924) is considered a nomen dubium and Heurodes porcula (Simon, 1877) is returned to Erivoxia Archer, 1951, Erivoxia porcula (Simon, 1877).

Type material of predominantly Australian species described by E. v. Keyserling (1 species), W. J. Rainbow (10 species), A. T. Urquhart (8 species), and C. A. Walckenaer (2 species) is here considered destroyed or otherwise lost. As it is impossible to identify these species from their original descriptions and considering the known spider fauna from their respective type localities, they are all considered nomina dubia: Anepia crinata Rainbow, 1893; Epeira diabrosis (Walckenaer, 1841); Epeira diversicolor Rainbow, 1893; Epeira fctiona Rainbow, 1896; Epeira hamiltoni Rainbow, 1893; Epeira lacrymosa (Walckenaer, 1841); Epeira leai Rainbow, 1894; Epeira mortoni Urquhart, 1891; Epeira notacephala Urquhart, 1891; Epeira obscura Urquhart, 1893; Epeira phalerata Urquhart, 1893; Epeira promubga Rainbow, 1894; Epeira rara Keyserling, 1887; Epeira singulara Urquhart, 1891; Epeira sub-flavida Urquhart, 1893; Epeira similis Rainbow, 1896 (= Araneus urquharti Roewer, 1942 replacement name); Epeira ventriosa Urquhart, 1891; and Epeira viridula Urquhart, 1891.

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Introduction

Generic transfers and synonymies

The genus *Araneus* Clerck, 1757 (and its junior synonym *Epeira* Walckenaer, 1805) has been used as a ‘dumping ground’ for many orb-weaving spiders (*Araneidae* Clerck, 1757) of uncertain affinities world-wide (e.g. Grasshoff 1983; Scharff et al. in press). Many of these species bear only a remote similarity to the type species of the genus, *Araneus angulatus* Clerck, 1757 (see Kluge 2007). Recent taxonomic studies have rectified this undifferentiated picture for the *Araneidae* at least for parts of the Palearctic (e.g. Grasshoff 1976) and for the New World (generic revisions in the *Araneidae* by Levi (1971; 1973; 1981; 1991a) and many other revisions by the same author). However, in other parts of the world, orb-weaving spiders still require extensive revision at the generic and species level. For example, Yin et al. (1997) listed six different ‘groups’ for the species of *Araneus* in China (*deaahani, ejusmodi, sturmi, diadematus, ventricosus, and henanensis* groups), most of which appear to warrant generic status. Confusion on the generic place of these spiders is reflected in the fact that one of the nominal species of Yin et al.’s (1997) species-groups of *Araneus* is currently listed in *Parawixia* F. O. Pickard-Cambridge, 1904, *P. deaahani* (Dolenschall, 1859), although molecular and morphological data suggest the species to be misplaced in both *Araneus* and *Parawixia* (Scharff et al. in press).

Almost 90 species of *Araneus* are currently listed for Australia and many more for adjacent biogeographic regions such as South-East Asia and the South Pacific (World Spider Catalog 2019). Many of these species have not been treated taxonomically since their original description. Levi (1991a) provided a detailed diagnosis and description of *Araneus*, which can be used to critically evaluate the validity of these species to be listed in the genus, and detailed investigations as part of a comprehensive revision of the *Araneidae* suggested that true *Araneus* do not occur in Australia (see Scharff et al. in press). Davies (1988) already acknowledged the misplacement of Australian *Araneus*, as many of the local species within this genus have a paramedian apophysis on the male pedipalp (absent in true *Araneus*) and a single tibial spine on the pedipalp (two spines in *Araneus*) (e.g. Levi 1991a). About 30 putative new genera have been identified for Australia (V.W. Framenau & N. Scharff unpublished data; Scharff et al. in press) in addition to some that have recently been established as part of ongoing revisions of the Australian orb-weaving spiders (Framenau 2011; Framenau et al. 2010a; Framenau and Scharff 2009; Harmer and Framenau 2008; Joseph and Framenau 2012). The review of type material as part of this revisionary work also found that a number of Australian species currently listed in *Araneus* belong to well-established genera. For example, four Australasian *Araneus* were transferred to *Cyrtophora* Simon, 1864 (Framenau and Scharff 2009) and previously presumed Australian *Araneus* have been shown to belong to established genera of the American and New Zealand faunas (Framenau et al. 2009).

The main aim of this study is to transfer species currently listed in *Araneus*, but also some *Carepaxliss* L. Koch, 1872 and *Verrucosa* McCook, 1888, to the correct currently recognised genera that occur in Australia and neighbouring regions, such as *Aeroaspis* L. Koch, 1872, *Carepaxliss*, *Cyclosa* Menge, 1866, and *Neoscona* Simon, 1864. Two species are transferred to a different family altogether, the comb-footed spiders (*Theridiidae* Sundeval, 1833). These transfers will allow consideration of these species in future revisionary work in relation to the respective genera, in particular within an Australian context, studies in which they would otherwise likely be overlooked. Similarly, for example, extensive evaluation of Australian type material allowed *Araneus mastersi* Bradley, 1876 to be considered in a recent study of Australasian Phonognathidae Simon, 1894 (*sensu* Kuntner et al. in press) (Kallal and Hormiga 2018). However, this current study does not aim to solve the taxonomic placement of those Australian species listed in *Araneus* that require the establishment of new genera and therefore many species of the Australian fauna remain listed in *Araneus* until these new genera are established.

**Nomina dubia**

For a large proportion of Australian *Araneidae*, including many in the genus *Araneus*, type material is problematic: either it only includes immature or poorly preserved specimens, or it must be considered lost as it could not be found during intensive investigations of museum collections as part of this study. This includes species described by W. J. Rainbow from Queensland and New South Wales and by A.T. Urquhart from Tasmania, in addition to Australian species described by Graf E. von Keyserling (mainly from the Bradley Collection), and those described by C. A. Walckenaer.

Between ca. 1893 and 1920, William J. Rainbow (1856–1919) published extensively on Australian spiders, but also described spiders from Papuan and Pacific regions (e.g. Rainbow 1897; 1898; 1899a; b). He was an entomologist at the Australian Museum in Sydney and most of his types are housed there or at the Queensland Museum, Brisbane. However, some types of selected works by Rainbow (1893; 1894; 1896a; b; 1912; 1916a; b) could not be located at these museums and are here considered lost. Arthur T. Urquhart (?–1919) was a New Zealand arachnologist who also published two papers on the Tasmanian spider fauna. However, none of Urquhart’s (1891; 1893) types of Tasmanian species have been located at the Canterbury Museum, New Zealand, where all known types of the scientist are housed (Nicholls et al. 2000). Therefore, these types are considered lost (see also Paquin et al. 2008). Unfortunately, Urquhart’s (1891) figure plate is missing in any of the copies of the article I could examine and his monotypic genus *Collina* Urquhart, 1891, type
species *C. glabiceps* Urquhart, 1891, cannot be recognised by the verbal description alone (see also Kallal and Moriaga 2018). Rainbow’s (1911) ‘Census of Australian Araneae’ and Bonnet’s (1955) ‘Bibliographia Araneorum’ omitted all of Urquhart’s (1891) Tasmanian species.

Species descriptions in ‘Die Arachniden Australiens nach der Natur beschrieben und abgebildet’ (Koch and Keyserling 1871–1890), published by L. Koch (1825–1908) and Graf E. von Keyserling (1833–1889), were based on several collections, including that of Henry H. B. Bradley (1845–1918), a Sydney-based lawyer and naturalist who himself published on spiders (e.g. Bradley 1871; 1876). None of Koch and Keyserling’s type specimens from the Bradley collection have been found and the collection seems to be lost (e.g. Framenau 2005). Charles A. Walckenaer (1771–1852), was based in Paris when he authored the “Histoire naturelle des insectes. Aptères” (e.g. Walckenaer 1841; Walckenaer and Gervais 1837) describing a number of Australian spiders from early collections (i.e. Quoy and Gaimard 1824), but the material on which his descriptions are based has frequently been reported lost. Koch (1871; p. VII) commented that Walckenaer’s (from German) “quantitatively not insignificant material cannot be used in certain cases due to its inadequate condition”.

Not all species with lost types are here designated *nomina dubia*. Some of Urquhart’s species could be identified based on the original description; for example, *Aerea alticephala* Urquhart, 1891 and *A. monticola* Urquhart, 1893 were recognised as junior synonyms of *Arksys similis* (Simon, 1893) (Framenau et al. 2010b). Similarly, some of Rainbow’s original descriptions were sufficient to allow an accurate species identification. Moreover, the original descriptions of *Araneus rubripunctatus* (Rainbow, 1893) and *Araneus sinuosus* (Rainbow, 1893) in combination with the type localities (both from Sydney) clearly identified these species as junior synonyms of *Plebs eburnus* (Keysrlering, 1887) (Joseph and Framenau 2012).

In summary, the second aim of this paper is to critically evaluate the species descriptions of species of which type material is uninformative or presumed lost and, in combination with a detailed examination of the respective local fauna, to establish if they can be attributed to a known or undescribed species from collections. If not, they are considered *nomina dubia* here. Some scientists working on mainly the Australian fauna also published papers on spiders from neighbouring regions (e.g. Hogg 1914; Rainbow 1899b) and some of their type material was examined in the respective museums. Therefore, some taxonomic changes in the Araneidae from outside Australia are proposed here.

**Methods**

This study is based on a comprehensive investigation of more than 12,500 records of orb-weaving spiders representing more than 26,000 specimens from collections of all Australian museums and type material lodged overseas, in particular the Natural History Museum, London, the Centrum für Naturkunde (CeNak), Universität Hamburg (Germany), and the Museum für Naturkunde, Zentralinstitut der Humboldt-Universität, Berlin (Germany), where many of the historic types are housed. It forms part of an ongoing revision of the Australian Araneidae that commenced in 2005.

All designations of *nomina dubia* are based on either examination of type material or, in case of lost type material, a critical evaluation of the original description in combination with a consideration of spiders investigated from the respective region where the type material was found.

Some images of type material were taken during visits to the respective institutes with a very simple photographic setup through a tube of a stereomicroscope provided by the institute using an adapter and a Canon Rebel 300D digital camera. The reproductions of these photos here are not necessarily diagnostic at species level but serve to support the taxonomic decisions proposed here.

Species are treated in order of Table 1 and Table 2, generally alphabetical by genus and species, but in cases of *nomina dubia*, species with immature and damaged types are listed first, followed by those of which the types are considered lost.

**Abbreviations:** AM – Australian Museum, Sydney (Australia); BMNH – Natural History Museum, London (England); CMNZ – Canterbury Museum, Christchurch (New Zealand); MCSN – Museo Civico di Storia Naturale di Genova (Italy); ZMB – Museum für Naturkunde, Zentralinstitut der Humboldt Universität, Berlin (Germany); ZMH – Zoologisches Institute und Zoologisches Museum, Universität Hamburg (Germany), MNHN – Muséum National d’Histoire Naturelle, Paris (France).

**Results**

A total of 18 new combinations are here proposed within the Araneidae and Theridiidae, including 13 from Australia (Table 1). Thirteen species of *Araneus* (eight known from Australia) are transferred to *Acroaspis* (three species), *Cyclosa* (three species) and *Neoscona* (seven species), in addition to two species which are transferred to the Theridiidae. One species is transferred from *Verrucosa* to *Carepalxis*, thereby excluding the former genus from the Australian fauna; in turn, two species previously listed in *Carepalxis* are transferred to *Cyclosa* (Table 1).

A total of 22 species currently listed in *Araneus* (21 from Australia, one from the Solomon Islands) are considered *nomina dubia* (Table 2). In addition, one species each of *Carepalxis*, *Collina* and *Heurodes* Keyserling, 1886 (all from Australia) are considered *nomina dubia*. These taxonomic decisions are based on unidentifiable type material (five immature, one damaged) or type material considered lost (16 species). In total, twelve of W. J. Rainbow’s species are considered *nomen dubia* (including *Araneus urquharti* (Roewer, 1942), a replacement name for *Epeira similis* Rainbow, 1896), nine of A. T. Urquhart, two of C. A. Walckenaer, and two of E. v. Keyserling (Table 2).
Table 1. Summary of proposed new generic combinations.

<table>
<thead>
<tr>
<th>Species (with new combination)</th>
<th>Previous genus</th>
<th>Type locality/localities</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Araneidae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acroaspis lancearia (Keyserling, 1887)</td>
<td>Araneus</td>
<td>Sydney (New South Wales)</td>
<td>Australia</td>
</tr>
<tr>
<td>Acroaspis mammillana (Keyserling, 1887)</td>
<td>Araneus</td>
<td>Sydney (New South Wales)</td>
<td>Australia</td>
</tr>
<tr>
<td>Acroaspis scutellaris (Keyserling, 1886)</td>
<td>Araneus</td>
<td>Sydney (New South Wales)</td>
<td>Australia</td>
</tr>
<tr>
<td>Carepalxis furcifera (Keyserling, 1886)</td>
<td>Verrucosa</td>
<td>Rockhampton (Queensland)</td>
<td>Australia</td>
</tr>
<tr>
<td>Cyclosa anatipes (Keyserling, 1887)</td>
<td>Araneus</td>
<td>Peak Downs, Rockhampton (Queensland), Palau</td>
<td>Australia, Palau</td>
</tr>
<tr>
<td>Cyclosa apolepta (Rainbow, 1916)</td>
<td>Araneus</td>
<td>Gordonvale (Queensland)</td>
<td>Australia</td>
</tr>
<tr>
<td>Cyclosa argentinaria (Rainbow, 1916)</td>
<td>Araneus</td>
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</tr>
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<td>Cyclosa lichens (Rainbow, 1916)</td>
<td>Carepalxis</td>
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<td>Australia</td>
</tr>
<tr>
<td>Cyclosa poweri (Rainbow, 1916)</td>
<td>Carepalxis</td>
<td>Narrabeen (New South Wales)</td>
<td>Australia</td>
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<td>Neoscona decorol (L. Koch, 1871)</td>
<td>Araneus</td>
<td>Fiji</td>
<td>Fiji</td>
</tr>
<tr>
<td>Neoscona enucleata (Karsch, 1879)</td>
<td>Araneus</td>
<td>Sri Lanka</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>Neoscona flavopunctata (L. Koch, 1871)</td>
<td>Araneus</td>
<td>Fiji</td>
<td>Fiji</td>
</tr>
<tr>
<td>Neoscona florianta (Hogg, 1914)</td>
<td>Araneus</td>
<td>Setakwa and Utakwa Rivers (Indonesia)</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Neoscona granti (Hogg, 1914)</td>
<td>Araneus</td>
<td>Setakwa and Utakwa Rivers (Indonesia)</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Neoscona insula (L. Koch, 1871)</td>
<td>Araneus</td>
<td>Bowen (Queensland)</td>
<td>Australia</td>
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<tr>
<td>Neoscona notanda (Rainbow, 1912)</td>
<td>Araneus</td>
<td>Blackall Range (Queensland)</td>
<td>Australia</td>
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<tr>
<td>Theridiidae</td>
<td></td>
<td></td>
<td></td>
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<td>Anelosimus dianthus (Rainbow, 1916)</td>
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<td>Australia</td>
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<tr>
<td>Theridion xanthostichus (Rainbow, 1916)</td>
<td>Araneus</td>
<td>Gordonvale (Queensland)</td>
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</tbody>
</table>

Table 2. Summary of proposed nomina dubia.

<table>
<thead>
<tr>
<th>Species (current combination)</th>
<th>Type locality</th>
<th>Country</th>
<th>Type material condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Araneus acachmenes Rainbow, 1916</td>
<td>Gordonvale (Queensland)</td>
<td>Australia</td>
<td>immature</td>
</tr>
<tr>
<td>Araneus agastus Rainbow, 1916</td>
<td>Gordonvale (Queensland)</td>
<td>Australia</td>
<td>immature</td>
</tr>
<tr>
<td>Araneus exsertus Rainbow, 1904</td>
<td>Mornington Island (Queensland)</td>
<td>Australia</td>
<td>immature</td>
</tr>
<tr>
<td>Araneus suavis Rainbow, 1899</td>
<td>St Cruz (Solomon Islands)</td>
<td>Australia</td>
<td>abdomen missing</td>
</tr>
<tr>
<td>Carepalxis coronata (Rainbow, 1896)</td>
<td>New England (New South Wales)</td>
<td>Australia</td>
<td>immature</td>
</tr>
<tr>
<td>Heurodes turritus Keyserling, 1886</td>
<td>Tasmania</td>
<td>Australia</td>
<td>immature</td>
</tr>
<tr>
<td>Araneus crinitus (Rainbow, 1883)</td>
<td>Manly (New South Wales)</td>
<td>Australia</td>
<td>considered lost</td>
</tr>
<tr>
<td>Araneus diabrosis (Walckenaer, 1841)</td>
<td>Port Jackson (Sydney)</td>
<td>Australia</td>
<td>considered lost</td>
</tr>
<tr>
<td>Araneus diversicolor (Rainbow, 1893)</td>
<td>Sydney (NSW)</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus fuscus (Rainbow, 1896)</td>
<td>New England district (New South Wales)</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus hamiltoni (Rainbow, 1893)</td>
<td>Gutawang, near Mudgee (New South Wales)</td>
<td>Australia</td>
<td>considered lost</td>
</tr>
<tr>
<td>Araneus lacrymosus (Walckenaer, 1841)</td>
<td>Port Jackson (Sydney)</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus leat (Rainbow, 1894)</td>
<td>Bungendore (New South Wales)</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus mortoni (Urquhart, 1891)</td>
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<td>Australia</td>
<td>considered lost</td>
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<td>Araneus notacephalus (Urquhart, 1891)</td>
<td>Tasmania</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus obscuritus (Urquhart, 1893)</td>
<td>Tasmania</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus phaleratus (Urquhart, 1893)</td>
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<td>considered lost</td>
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<td>Araneus promus (Rainbow, 1894)</td>
<td>Bungendore (New South Wales)</td>
<td>Australia</td>
<td>considered lost</td>
</tr>
<tr>
<td>Araneus rarus (Keyserling, 1887)</td>
<td>Cape York (Queensland)</td>
<td>Australia</td>
<td>considered lost</td>
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<td>Araneus singularis (Urquhart, 1891)</td>
<td>Tasmania</td>
<td>Australia</td>
<td>considered lost</td>
</tr>
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<td>Araneus sulflavids (Urquhart, 1893)</td>
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<td>Araneus ventriosus (Urquhart, 1891)</td>
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<td>Araneus viridulus (Urquhart, 1891)</td>
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<td>considered lost</td>
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<tr>
<td>Collina glabricra Urquhart, 1891</td>
<td>Tasmania</td>
<td>Australia</td>
<td>considered lost</td>
</tr>
</tbody>
</table>

Discussion

This study reduces the number of Australian species in *Araneus*, a genus that presumably does not occur in this country, by 35% from 87 (including 3 subspecies) to 56 (2 subspecies) species. However, it also shows the unsatisfactory taxonomic status within the Australian orb-weaving spiders, as for the remaining 56 *Araneus* species, new genera need to be established. Similarly, *Eriophora* Simon, 1864 (three Australian species) and *Parawixia* F. O. Pickard-Cambridge, 1904 (one Australian species) are unlikely to have true representatives in the Australian fauna as confirmed by multi-loci molecular data (Scharff et al. in press) (see also non-monophyly of *Araneus* and *Eriophora* in Kallal and Hormiga 2018). Both genera were originally described based on type material from the Americas (Levi 1970; 1992). A similar taxonomic legacy is still prevalent in many other Australian spider families, e.g. the wolf spiders (Lycosidae Sundevall, 1833) in which 17 species are currently placed in the
Mediterranean genus *Lycosa* Latreille, 1804 where they were originally placed by early European arachnologists (e.g. Framenau and Baehr 2016; Framenau and Leung 2013; Framenau and Vink 2001).

Three genera of orb-weaving spiders are eliminated from the Australian fauna, one based on a misplaced species (*Verrucosa*) and two now considered *nomen dubium* (*Collina* and *Heurodes*).

### Taxonomy

**Synonyms and generic and family transfers**

**Family Araneidae** Clerck, 1757

**Acroaspis** Karsch, 1878

The genus *Acroaspis* was established primarily based on the unique shape of the carapace of the female, specifically the large height of the clypeus and the forward-facing four median eyes that are all placed on a slight forward reaching elevation that forms an extension of the clypeus (Karsch 1878). The cephalic area represents the highest part of the carapace.

The holotype of the type species of *Acroaspis*, *A. olorina* Karsch, 1878 (ZMB 1423; dry pinned, examined), was collected in Perth (Western Australia) (‘Swan River’) and putative males and females of the species have been identified in the Western Australian Museum pending a thorough revision of the genus at the species level.

The genus has not been treated taxonomically since its description and it is beyond the scope of this study to provide detailed synapomorphies of *Acroaspis* without treating its diverse fauna in Australia, but the examination of male and female genitalia of many *Acroaspis* males and females in Australian collections representing more than 20 species allows a preliminary characterisation of its genitalic and somatic characters in addition to the characteristic shape of the cephalothorax of the female as described by Karsch (1878).

The male pedipalp has a single patella spine and a distinct, spoon-shaped paramedian apophysis. The median apophysis is elongated, often with a fleshy protrusion at about half its length, and a curved tip that is armed with two lobes (Fig. 1B). The base of the median apophysis forms an arch over the radix as is common in Australian ‘Backobourkiines’ (*sensus* Scharff et al. in press). The female epigyne generally has a triangular base plate with a scape that originates anteriorly and is narrow triangular (Figs 2C, D). This scape is often broken off in females (Fig. 2D). The abdomen invariably has humeral and posterior humps (Figs 2A, E), but it is also regularly drawn out into a high turret (Fig. 1A; also Framenau et al. 2014, p. 160). The shape and colour of the abdomen appears to display high intraspecific variation (unpublished data).

In addition to the type species, two other species are currently listed in *Acroaspis*: *Acroaspis tuberculifera* Thorrell, 1881 from northern Queensland, placed in the genus when originally described and not examined for the current study, and *A. decorosa* (Urquhart, 1894) from New Zealand, transferred to the genus by Framenau et al. (2010a) also based on the genus-level characteristics as listed above.

**Acroaspis lancearia** (Keyserling, 1887), comb. n.

Fig. 1A, B

*Epeira lancearia* Keyserling, 1887: 157–158, pl. 13, figs 3, 3a, 3b.


**Type material.** Holotype of *Epeira lancearia* Keyserling, 1887: male, Sydney [33°53’S, 151°13’E, New South Wales, AUSTRALIA], Museum Godeffroy (ZMH Rack (1961)-catalog 247) (examined).

**Remarks.** The holotype male of *Epeira lancearia* displays the typical features of *Acroaspis* as detailed above, including the genus-specific characters of the male pedipalp (Fig. 1B) and the elevated abdomen (Fig. 1A). The species is therefore here transferred to *Acroaspis, A. lancearia* (Keyserling, 1887), comb. n.

**Acroaspis mamillana** (Keyserling, 1887), comb. n.

Fig. 2A, C

*Epeira mamillana* Keyserling, 1887: 154–155, pl. 12, figs 8, 8a, 8b.

*Araneus mamillanus* (Keyserling). Rainbow 1911: 189; Bonnet 1955: 533.

**Type material.** Syntypes of *Epeira mamillana* Keyserling, 1887: 3 females, Sydney [33°53’S, 151°13’E, New South Wales, AUSTRALIA], Museum Godeffroy (ZMH Rack (1961)-catalog 251); 2 females, same data (BMNH 1890.7.1.4151–2) (all examined).

**Remarks.** The syntype females of *Epeira mamillana* agree with the genus-specific characterisation as detailed above, including the characteristic shape of the carapace and humeral and posterior humps of the abdomen (Fig. 2A) and the morphology of the epigyne (Figs 2B, C). The species is therefore transferred to *Acroaspis, A. mamillana* (Keyserling, 1887), comb. n.

**Acroaspis scutifer** (Keyserling, 1886), comb. n.

Fig. 2D, F

*Epeira scutifera* Keyserling, 1886: 152–153, pl. 12, figs 7, 7a.

*Araneus scutiferus* (Keyserling). Rainbow 1911: 192.


**Type material.** Holotype of *Epeira scutifera* Keyserling, 1887: female, Sydney [33°53’S, 151°13’E, New South Wales, AUSTRALIA], Museum Godeffroy (ZMH Rack (1961)-catalog 271) (examined).
**Figure 1.** Acroaspis lancearia (Keyserling, 1887), comb. n., holotype male (ZMH 247). A, habitus, dorsal view; B, pedipalp, ventral view. Abbreviations: ar – basal arch of median apophysis, cp – fleshy central projection of median apophysis, ma – median apophysis, pa – paramedian apophysis, ra – radix, sp – patellar spine.

**Remarks.** The female holotype of *Epeira scutifera* clearly shows the somatic and genital characters that are here considered characteristic for the genus, in particular the shape of the carapace and the shape of the epigyne (Figs 2D–F). Therefore, I here transfer the species to *Acroaspis, Acroaspis scutifer* (Keyserling, 1887), comb. n.

The specific epithet is not an adjective, but derived from the Latin masculine noun (*scutifer* – squire, armiger), and therefore Keyserling’s (1887) ‘*scutifera*’ was correctly adjusted to *scutifer* by Bonnet (1955).

**Carepalxis L. Koch, 1872**

The genus *Carepalxis* was erected by L. Koch (1872) based on the description of a female of *C. montifera* L. Koch, 1872 collected at Port Mackay, Queensland. Currently, the genus includes twelve species worldwide, including seven species from Australia, three from the Americas and two from New Guinea (World Spider Catalog 2019). Levi (1991b) revised the genus for the Americas based on females only, as the only males known at the time were those of the Australian *C. tuberculata* Keyserling, 1886 lodged in the MNHN as reported by Simon (1896). The genus is diagnosed by two distinct humps in the cephalic region; males have one macroseta on the pedipalp patella, the pedipalp gnathoxae have a tooth and the first coxae a corresponding hook. The second tibia has a characteristic branched tipped with two macrosetae (Levi 1991b). This armature of the second leg of the male is similar to that of *Verrucosa*, a genus otherwise mainly known from the Nearctic (World Spider Catalog 2019). It therefore does no surprise, that Archer (1951a), in a review of araneid genera, placed an Australian representative of *Carepalxis* in *Verrucosa* based solely on the original description of the male and without an examination of specimens. This generic misplacement is corrected here.

**Carepalxis furcifera** (Keyserling, 1886), comb. n.


**Types material.** Holotype of *Epeira furcifera* Keyserling, 1886: male, Rockhampton [23°22’S, 150°30’E, Queensland, AUSTRALIA], Museum Godeffroy (ZMH Rack (1961)-catalog 239) (examined).

**Remarks.** The holotype male of *Epeira furcifera* clearly shows the somatic characters of *Carepalxis* as described by Levi (1991b), namely a domed carapace and two macrosetae on the tibia of the first leg. Unfortunately, the holotype is in poor condition and the pedipalps are missing, making a detailed evaluation of the genitalia impossible. However, the original description of the species by Keyserling (1886) clearly shows the typical, large C-shaped median apophysis of *Carepalxis* males.
Figure 2. *Acroaspis mamillana* (Keyserling, 1887), comb. n., female syntype (ZMH 251) (A–C) and *Acroaspis scutifer* (Keyserling, 1886), comb. n., female holotype (ZMH 271) (D–F). A, E, habitus dorsal view; E, G, habitus, ventral view; C, D, epigyne, ventral view.
as examined in many Australian specimens (unpublished data). Due to the lack of genitalia, it may not be possible to accurately identify this species pending a revision of Carepalxis for Australia. This will depend on a detailed evaluation of somatic characters in the genus and its diversity in the Rockhampton area, the type locality of E. furcifera. Based on the distinctive somatic features as listed above, I here transfer the species to Carepalxis, Carepalxis furcifera (Keyserling, 1886), comb. n.

Cyclosa Menge, 1866

Parazygia Caporiacco, 1955: 345 (synonymy established in Levi (1977, p. 73)).

Cyclosa is a large orb-weaving spider genus with currently over 170 species with a world-wide distribution (World Spider Catalog 2019). Nine species are currently listed from Australia; however, the taxonomy of the genus is poorly resolved in this country and in particular two species, C. fuliginata (L. Koch, 1872) and C. rhombocephala (Thorell, 1881) are clearly misplaced as they bear little resemblance to the genus as reviewed outside the Australian context (Levi 1977; 1999). Both likely require the erection of new genera as suggested by molecular data at least for C. fuliginata (Scharff et al. in press).

At the genus level, Cyclosa is well circumscribed. Revisions or reviews are available for a number of geographic areas, including the Americas (Levi 1977; 1999), India (Keswani 2013), and some Asian countries (e.g. Petcharad et al. 2014; Tanikawa and Ono 1993; Yin et al. 1997). The genus is easily characterised (Davies 1988; Levi 1999) by having: a characteristic carapace shape that differs between males and females (in males it is flat and the cephalothorax is less than half the width of the thoracic region, in females, the cephalic region is separated from the thoracic region by a distinct V-shaped groove); posterior median eyes with a full canoe-shaped tapetum; the presence of a paramedian apophysis in the male pedipalp; the pedipalp bulb being usually wider than long, with a large conductor holding the embolus in a rim and the base of the median apophysis close to the conductor; the abdomen with one to three posterior conical projections and generally reaching beyond the spinnerets.

Cyclosa species generally build small orb-webs with linear web decorations that incorporate undigested prey items. In some species this web decoration has been suggested to function primarily as camouflage to conceal the spider from insects rather than as prey attractant (e.g. Tan and Li 2009).

The unique morphology of Cyclosa facilitates referring a number of Australian species that are currently misplaced in Araneus and Carepalxis to the genus.

Cyclosa anatipes (Keyserling, 1887), comb. n.

Aranea anatipes (Keyserling). Roewer 1942: 824.
Araneus anatipes (Keyserling). Bonnet 1955: 432; Rainbow 1911: 182; Rainbow 1916a: 111.

Type material. Syntypes of Epeira anatipes Keyserling, 1887: 2 females, 1 juvenile, labelled “Australia” [no exact locality given, AUSTRALIA] (BMNH 1890.7.1.4152–4); 3 males, 2 females, Peak Downs [22°56’S, 148°05’E, Queensland, AUSTRALIA], Museum Godeffroy (ZMH Rack (1961)-catalog 220); 1 male, 1 female, 1 juvenile, Rockhampton [23°22’S, 150°30’E, Queensland, AUSTRALIA], Museum Godeffroy (ZMH Rack (1961)-catalog 220); 4 females, 1 juvenile, Palau [no exact locality, PALAU], Museum Godeffroy (ZMH Rack (1961)-catalog 220) (all examined).

Remarks. The examination of the syntypes of Epeira anatipes clearly show that this species conforms to the diagnosis of Cyclosa due to the shape of the cephalothorax and male and female genitalia. This species has close affinities to Cyclosa insulana (Costa, 1834) as illustrated in Levi (1977) and might be its junior synonym. Pending a revision of Cyclosa in the Australasian/Oriental regions, I propose the transfer of this species to Cyclosa, Cyclosa anatipes (Keyserling, 1887), comb. n.

Cyclosa apoblepta (Rainbow, 1916), comb. n.

Fig. 3A–E


Type material. Syntypes of Araneus apobleptus Rainbow, 1916: 2 & 4 males, 5 & 5 females of two different species (see below), [17°05’S, 145°46’E, Queensland, AUSTRALIA], May–July in 1912 and 1913; “from orbicular webs, and males chiefly by sweeping in forest and jungle. Two exemplars were taken from the window of a dwelling” (Rainbow 1916b, p. 114) (AM KS6507) (examined).

Remarks. The examination of the syntypes of Araneus apobleptus clearly showed that these specimens belong to the genus Cyclosa due to the shape of the cephalothorax and male and female genitalia. However, the type material represents two different species. Four of the 6 males and 5 of the 10 females (now separated from each other in the vial in the collection of the AM) very closely resemble C. insulana as illustrated in Levi (1977) (see Fig. 3A–E), whereas the remaining specimens have a distinctly different genital morphology. It is beyond the scope of this study to elucidate the true identity of the syntypes of Araneus apobleptus, which requires a comprehensive revision of the Australian/Oriental Cyclosa and the designation of a lectotype for the species. As part of this review, I propose the transfer of this species to Cyclosa, Cyclosa apoblepta (Rainbow, 1916), comb. n. to facilitate the consideration of this species in a future treatment of the genus.
Figure 3. *Cyclosa apoblepta* (Rainbow, 1916), comb. n., female and male syntypes (AM KS6507). **A, B**, female, dorsal and ventral view; **C**, dorsal view of male; **D**, epigyne, ventral view; **E**, male pedipalp, ventral view.
Cyclosa argentaria (Rainbow, 1916), comb. n.


Type material. Syntypes of Araneus argentarius Rainbow, 1916: 2 immature females, Gordonvale [17°05’S, 145°46’E, Queensland, AUSTRALIA], 30 August 1912; “from nests in low forest” (Rainbow 1916: 114) (AM KS6508) (examined).

Remarks. The examination of the immature syntypes of Araneus argentarius clearly shows that these specimens belong to the genus Cyclosa due to the shape of the cephalo-thorax and abdominal humps. Both specimens are immature and only a comprehensive revision of Australian Cyclosa may allow elucidating their true identity and relationships to C. insulana and C. apobrepta comb. n. As part of this study, I propose a transfer of this species to Cyclosa, Cyclosa argentaria (Rainbow, 1916), comb. n.

Cyclosa lichensis (Rainbow, 1916), comb. n.


Type material. Holotype of Carepalxis lichensis Rainbow, 1916: 1 female with three eggsacs, Gordonvale [17°05’S, 145°46’E, Queensland, AUSTRALIA], 30 May 1913; “forest” (Rainbow 1916: 114) (AM KS8882) (examined).

Remarks. It appears that Rainbow (1916a) placed this species in Carepalxis based on the shape of the abdomen (Fig. 4A). An examination of the holotype female of Carepalxis lichensis, however, shows that this species belongs to the genus Cyclosa based on the distinct shape of the cephalothorax and genital morphology (Figs 4A–B). It is closely related to C. mulmeinensis (Thorell, 1887) and C. vallata (Keyserling, 1886), both illustrated, for example, in Tanikawa (2007) and Chrysanthis (1961; 1971). It might be a junior synonym of either pending a detailed revision of the Australasian species of Cyclosa. Here, I propose the transfer of the species to Cyclosa, Cyclosa lichensis (Rainbow, 1916), comb. n.

Cyclosa poweri (Rainbow, 1916), comb. n.

Carepalxis poweri Rainbow, 1916b: 61, fig. 4; Bonnet 1956, p. 954.


Remarks. An examination of the female holotype clearly indicated that Carepalxis poweri belongs to the genus Cyclosa, based on the distinctive shape of the carapace with its V-shaped constriction (Fig. 4C, D; see also Rainbow 1916b, fig. 4). Similar to C. lichensis, the species resembles C. mulmeinensis or C. vallata and may be a junior synonym of either, pending a comprehensive revision of Australian Cyclosa. It is here transferred to Cyclosa to facilitate such a revision, Cyclosa poweri (Rainbow, 1916), comb. n.

Neoscona Simon, 1864

Afraranea Archer, 1951a: 21 (synonymy established in Grasshoff (1986, p. 4).
Chinestela Chamberlin, 1924: 20 (synonymy established in Archer (1958, p. 17).
Cubanella Franganillo, 1926: 54–56 (synonymy established in Franganillo (1936, p. 76).

With more than 110 species and subspecies, Neoscona belongs to one of the most diverse orb-weaving spider genera world-wide (World Spider Catalog 2019). The genus was comprehensively revised for North America (Berman and Levi 1971; Levi 1993) and the Afrotropical region (Grasshoff 1986) where the authors provided detailed diagnoses and descriptions for the genus and all species. Members of Neoscona are readily recognised by male and female genital characters, such as the large size of the basal haematodocha of the male pedipalp which only leaves a small part of the bulb for the genital sclerites (Levi 1993). The median apophysis of the male pedipalp is of characteristic shape with a proximal, recurved tooth (but see Grasshoff 1986 for the subgenus Afraranea). Females have a characteristic, spatula-shaped epigyne of variable length (e.g. Levi 1993). The abdomen often has a characteristic folium pattern dorsally. Generic transfers of species to Neoscona below are based on the presence of these diagnostic features. Neoscona occurs throughout all biogeographic regions but appears to be most diverse in the Oriental, Australian and Pacific regions. All currently recognised Australian representatives have strong links with the Oriental fauna and none of the species seems to be an Australian endemic pending a comprehensive revision of the Australasian Neoscona fauna.

Neoscona decolor (L. Koch, 1871), comb. n.

Epeira decolor L. Koch, 1871: 71–72, pl. 6, figs 8, 8a; Hasselt 1882: 21.
Araneus decolor (L. Koch). Hogg 1900: 74; Rainbow 1911: 184.
Aranea decolor (L. Koch). Roewer 1942: 826.

Type material. Holotype of Epeira decolor L. Koch, 1871: 1 female, “Viti Inseln” (= REPUBLIC OF FIJI [no exact locality], Museum Godeffroy 7554 (ZMH Rack 1961)-catalog no. 234) (examined).
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Figure 4. *Cyclosa lichensis* (Rainbow, 1916), comb. n., female holotype (AM KS8882) (AB) and *Cyclosa poweri* (Rainbow, 1916), comb. n., female holotype (AM KS8881) (C–D). A, C, habitus, lateral view; B, D, epigyne, ventral view.

**Remarks.** The holotype female of *Epeira decolor* is bleached but somatic characters (Figs 5A, B) and the spatula-shaped epigyne (Fig. 5C) clearly identify this species as *Neoscona*. Consequently, I propose the transfer of this species to this genus, *Neoscona decolor* (L. Koch, 1871), comb. n.

*Neoscona decolor* comb. n. was originally described from the Republic of Fiji (Koch 1871). Hasselt (1882) listed this species, with a question mark, from Padang (West Sumatra, Indonesia). Hogg (1900) firstly listed it for Australia (Macedon district, Victoria) and it was therefore recorded by Rainbow (1911) in his catalogue of Australian spiders. However, I could not find Hogg’s specimen in the BMNH, where it is expected to be housed, to confirm this record. It remains doubtful that a spider originally described from a tropical island state in the Pacific also occurs isolated in the temperate climate of south-eastern Australia. No *Neoscona* species has so far been found in Victoria in any of the collections investigated, including the Museum Victoria in Melbourne (unpublished data). The southern-most record of the genus is from ca. 35°S Latitude, south of Sydney (New South Wales). Therefore, the historic Australian record of this species must be considered very doubtful and is likely based on a misidentification.

**Neoscona enucleata** (Karsch, 1879), comb. n.

*Epeira albertisii* Thorell, 1887: 182 (synonymy established in Thorell (1895)).
*Epeira soronis* Thorell, 1890: 143–146 (synonymy established in Thorell (1895)).

**Type material.** Holotype of *Epeira enucleata* Karsch, 1879: 1 female, Ceylon (= Sri Lanka) [no exact locality], Nietner (ZMB 3074) (examined).
Holotype of *Epeira albertisii* Thorell, 1887: 1 female, Mawlamyine (formerly Mulmein or Moulmein) (16 29 N, 97 37 E, Mon State, MYANMAR], O. Beccari & E. D’Alberis (possibly MCSN, not examined).
Syntypes of *Epeira soronis* Thorell, 1890a: 2 females, Sumatra [no exact locality given, INDONESIA], coll. Forbes (possibly MCSN, not examined).

**Remarks.** Thorell (1895) himself established the synonymy of *Epeira enucleata* with both his *E. albertisii* and *E. soronis*. Curiously, Sherriffs (1929, p. 234) later discussed the morphology of *Araneus albertisii* as a valid
Figure 5. *Neoscona decolor* (Hogg, 1914), comb. n., female holotype (ZMH 234). A, habitus, dorsal view; B, habitus, ventral view; C, epigyne, ventral view.

species in the same publication in which he listed in a table (p. 237): “34. enucleata (Karsch), 1879=albertissi (Thorell). Burma, Cylon” and two pages later (p. 239): “117. soronis (Thor.), 1890=enucleata (Karsch).”

The examination of the holotype of *Epeira enucleata* and specimens identified by Thorell as *Epeira albertisii* from Myanmar (Thonghoe, Thanawaddy) (seen in BMNH) and collected by E. W. Oates support a placement of this species in *Neoscona*. In particular, the scape of the female epigyne has the typical shape of *Neoscona*. A placement in *Neosco*na is also suggested by Sheriffs (1929) who states close similarities of *A. albertisii* with *N. rumpfi* (Pocock 1900) (= *Neoscona vigilans* (Blackwall 1865)), and by Thorell (1895) who compares *E. enucleata* with *E. hispida* Doleschall, 1859 (= *Neoscona vigilans*) (World Spider Catalog 2019).

**Neoscona flavopunctata** (L. Koch, 1871), comb. n.

Fig. 6A–D

*Epeira flavopunctata* L. Koch, 1871: 79–80, plate 5, figs 4, 4a; Hasselt 1882: 20.


**Type material.** Holotype of *Epeira flavopunctata* L. Koch, 1871: 1 male, “Viti Inseln” (= REPUBLIC OF FIJI) [no exact locality], Museum Godeffroy 3837 (ZMH Rack (1961)-catalog no. 238) (examined).

**Remarks.** Somatic characters (Figs 6A, B) and pedipalp morphology (Figs 6C, D) of the male holotype of *Epeira flavopunctata* clearly identify this species as a *Neoscona*. Due to the shape of the median apophysis (lacking a median spine) this species belongs the subgenus *Afraranea* sensu Grasshoff (1986). *Neoscona flavopunctata* comb. n. was originally described from Fiji. Hasselt (1882) recorded it from Silago (Southern Leyte, Philippines).

**Neoscona floriata** (Hogg, 1914), comb. n.

Fig. 7A–D


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Figure 6. Neoscona flavopunctata (L. Koch, 1871), comb. n., male holotype (ZMH 238). A, habitus, dorsal view; B, habitus, ventral view; C, pedipalp, mesal view; D, pedipalp, retrolateral view.

Type material. Synotypes of Araneus floriatuus Hogg, 1914: 1 female, 2 juveniles, neighbourhood of the Setakwa and Utakwa Rivers, [no exact locality given, West Papua, INDONESIA], 1912, Wollaston Expedition, H30 (BMNH 1921.3.24.37–38) (examined).

Remarks. In his initial description Hogg (1914) listed two female and one male syntype of Araneus floriatuus. Curiously, his later, more elaborate description (Hogg 1915) omits the male and lists one mature female and one immature female. The vial here considered to contain
Figure 7. *Neoscona floriana* (Hogg, 1914), comb. n., female syntype (BMNH 1921.3.24.37). A, habitus, dorsal view; B, habitus, ventral view; C, epigyne, ventral view; D, epigyne, posterior view.

The type material contains one female, one juvenile and a third spider (lacking an epigyne if female), but no male. The epigyne of the female syntype (Figs 7C, D) conforms to the subgenus *Afraranea* sensu Grasshoff (1986). Hogg (1914) discusses similarities of this species with *Araneus ferrugineus* (Thorell, 1877) and *Araneus pfeifferae* (Thorell, 1877), both of which should therefore also be considered in a future revision of Oriental *Neoscona*. I have not been able to examine the types of these species, presumably housed in the MCSN.

*Neoscona granti* (Hogg, 1914), comb. n.

Fig. 8A–C


**Type material.** Holotype of *Araneus granti* Hogg, 1914: female, neighbourhood of the Setakwa and Utakwa Rivers, [no exact locality given, West Papua, INDONESIA], Wolleston Expedition (BMNH 1921.3.24.166) (examined).

**Remarks.** The holotype female of *Araneus granti*, including its somatic (Figs 8A, B) and genital (Fig. 8C) characters, conform to the circumscription of the genus *Neoscona* above. The proposed placement in *Neoscona* is also confirmed by Hogg’s (1915) discussion, who places the species close to *Araneus vatius* (Thorell 1877), today a junior synonym of *Neoscona punctigera* (Doleschall 1857). Chrysanthus (1960) subsequently reported and
Figure 8. *Neoscona granti* (Hogg, 1914), comb. n., female holotype (BMNH 1921.3.24.166). A, habitus, dorsal view; B, habitus, ventral view; C, epigyne, ventral view.

illustrated *Araneus granti* males and females (and other species of *Araneus* today listed in *Neoscona*) from West Papua and his illustrations also show the typical characters of *Neoscona*. Here, this species is transferred to *Neoscona*, *N. granti* (Hogg, 1914), comb. n.

*Neoscona inusta* (L. Koch, 1871), comb. n.

*Epeira inusta* L. Koch, 1871: 94–95, plate 7, figs 3, 3a–b.  
*Epeira weyersi* Simon, 1885: 38 (synonymy established in Thorell (1870)).  

**Type material.** Holotype of *Epeira inusta* L. Koch, 1871: 1 female, Bowen (Port Denisson) [20°00'S, 148°14'E, AUSTRALIA] Museum Godeffroy (depository unknown).

**Remarks.** The holotype female of *Epeira inusta* was not found in the collections of the BMNH, ZMH or ZMB where most specimens of the Godeffroy Museum are expected to be housed. The BMNH purchased parts of the collection of L. Koch and has a female identified by L. Koch as *Epeira inusta* (BMNH 1915.3.5.781, examined); however, this female is labelled Gayndah (Queensland), not Bowen and it is unlikely the missing holotype. A further two females from Rockhampton (Queensland) were part of Keyserling’s collection (BMNH 1890.7.1.4121.2, examined) but neither can be the missing type. However, there is no doubt about the identity of this species which is not only very common along the east-coast of Aus-
tralia (unpublished data), but also occurs in eastern and south-eastern Asia (Barrion and Litsinger 1995; Chrysanthus 1960; 1971; Song et al. 1999).

I have examined many males and females of this species. It is clearly misplaced in Araneus. Somatic and genitalic characters (in particular the female epigyne and male pedipalp, e.g. the shape of the median apophysis) (see Chrysanthus 1960) clearly place this species in Neoscona: Neoscona insta (L. Koch, 1871), comb. n. Chrysanthus (1960) flagged a potential synonym of N. insta with Araneus gestroi (Thorell, 1881) described from Papua New Guinea which should be further investigated in a review of Australian and South-East Asian Neoscona.

Neoscona notanda (Rainbow, 1912), comb. n.

Araneus notandus Rainbow, 1912: 196, figs 7–9; Bonnet 1955: 554.

Type material. Holotype of Araneus notandus Rainbow, 1912: 1 female, Blackall Range [26°37’S, 152°52’E, Queensland, AUSTRALIA], C. J. Wild (QM W2122) (examined).

Remarks. This species is closely related to Neoscona insta comb. n. The epigyne shape of the holotype of Araneus notandus is short and spatula-shaped, but some variation, in particular a different course of the fertilisation duct that shines through the scape suggest it to be a different species. A series from Sabai Island (Queensland) in the QM contains five males of this species (in addition to 6 females and 10 immatures) that also confirm it as another species. It is clearly misplaced in Neoscona insta to be a theridiid spider. It is more difficult to place this species in a currently recognised genus within the Theridiidae. Consultation with specialists working on Australian Theridiidae suggested a placement in Anelosimus based on somatic and genitalic characters (I. Agnarsson, H. Smith personal communication). Therefore, I propose to elevate the species to family Theridiidae pending a generic revision of Australian comb-footed spiders.

Both male and female syntypes of A. dianiphus were recorded in the old, handwritten register of the Australian Museum. The male apparently had disappeared by the time the types were first registered on computer in the 1980s. The original label in the vial of the syntype female mentions only the female, so presumably both syntypes were originally in separate vials. The whereabouts of the male syntype is currently unknown (H. Smith, personal communication).

It is curious to note that Rainbow (1916a), in the same publication that he described Araneus dianiphus, also described a theridiid with the same specific epithet, Theridion dianiphus Rainbow, 1916. Should both species, after a revision of the Australia theridiid fauna, show to be congeneric, a replacement name for one of the species needs to be found.

Theridion Walkenaer, 1805

Theridion xanthostichum (Rainbow, 1916), comb. n.


Type material. Holotype of Araneus dianiphus xanthostichus Rainbow, 1916: female, Gordonvale [17°05’S, 145°46’E, Queensland, AUSTRALIA], 3 September 1912; “forest, from folded leaf” (Rainbow 1916a, p. 107) (AM KS6514) (examined).

Remarks. Similar to A. dianiphus, examination of the holotype of Araneus dianiphus xanthostichus showed it to be a theridiid spider. It is more difficult to place this species in a currently recognised genus within the Theridiidae (I. Agnarsson, personal communication). It is clearly not conspecific and likely not congeneric with A. dianiphus comb. n. (see above). Somatic and genitalic characters suggest a placement in or near Theridion (Walkenaer 1805). Therefore, I propose to elevate the species from subspecies to species status, Theridion xanthostichum (Rainbow, 1916), stat. & comb. n. within the spider family Theridiidae, pending a revision of the Australian theridiid fauna.

Nomina dubia

Immature or damaged type material

Araneus acachmenus Rainbow, 1916


Type material. Holotype of Araneus acachmenus Rainbow, 1616: penultimate female, Gordonvale [17°05’S,
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145°46’, Queensland, AUSTRALIA], November 1913 (AM KS6505) (examined).

Remarks. The holotype of Araneus acachmenus is a penultimate female with close affinities to Australian Araneidae currently listed in Eriophora, i.e. E. transmarina (Keyserling 1885) and E. biapicata (L. Koch, 1871). Species in this group are somatically very similar and impossible to identify accurately without an investigation of fully developed male or female genitalia (e.g. Davies 1980). As more than one species in this group occurs at the type locality of A. acachmenus, Gordonvale (Queensland), the species is here considered a nomen dubium.

Araneus agastus Rainbow, 1916
Fig. 9A, B


Remarks. The holotype female of Araneus agastus (Figs 9A, B) is a penultimate female and cannot be identified at the species level. The species may be a junior synonym of Backobourkia heroine (L. Koch, 1871) or B. brounii (Urquhart 1885), but this cannot be ascertained. Therefore, the species-group name A. agastus is here proposed a nomen dubium.

Araneus exsertus Rainbow, 1904
Fig. 9C, D


Type material. Holotype of Araneus exsertus Rainbow, 1904: immature female, Mornington Island (16 36’S, 139 21’E, Queensland, AUSTRALIA), Mr. Chas Hedley (AM KS6516) (examined).

Remarks. The abdomen of the holotype of Araneus exsertus is characteristically extended with numerous humps (Figs 9C, D), suggesting an identification could be possible based on somatic characters alone. However, my investigations of Australian araneids revealed this abdomen shape to be shared by a number of species with extended distributions that include the type locality of A. exsertus. Therefore, species-level identification of this species is not possible and I consider it a nomen dubium.

Araneus suavis Rainbow, 1899


Type material. Holotype of Araneus suavis Rainbow, 1899: female (abdomen missing). Nendo (Nitendi, Santa Cruz) [ca. 10°25’S, 165°30’E, SOLOMON ISLANDS] (AM KS6524) (examined).

Remarks. The abdomen of the female holotype of Araneus suavis is missing and it is doubtful that it will be possible to accurately identify this species by somatic features of the cephalothorax alone. The original description suggests this species may belong to Neoscona, however, the illustration of the epigyne is stylised. Therefore, I consider the species-group name Araneus suavis a nomen dubium.

Carepalxis coronata (Rainbow, 1896)
Fig. 10A


Remarks. The holotype of Epeira coronata is immature and of unknown sex and does not allow an accurate species identification. Although the transfer to Carepalxis appears to correctly reflect the somatic characters of this specimen, i.e. the two-humped carapace (Fig. 10A), the genus is with at least 10 mainly undescribed species (unpublished data) too diverse in eastern Australia to allow associating mature spiders with it. Consequently, I consider Carepalxis coronata a nomen dubium.

Heurodes Keyserling, 1886

Simonarachne Archer, 1951b: 28 (synonymy established in Archer (1958, p. 14)).

Heurodes was established based on a juvenile spider from Sydney. Keyserling (1886, p. 116) alerted to similarities with Epeira Walckenaer 1805 (today a junior synonym of Araneus), but stressed differences in the spineless legs, high clypeus and the broad cephalic region. The genus was subsequently treated by Archer (1951a; b; 1958) and Yaginuma and Archer (1959), the latter describing genital characters although no mature spider had been associated with the type species at the time. These characters likely referred to specimens of Simonarachne Archer, 1951 (type species: Eriovixia laglaizei (Simon 1877)) (later considered a junior synonym of Heurodes) or Eriovixia Archer, 1951, considered a junior synonym of Heurodes by Yaginuma and Archer (1959). However, the latter synonymy was not accepted by Grasshoff (1986, p. 118) who listed Eriovixia as separate genus.

A male and female of H. turritus was illustrated by Davies (1988), however without elaborating on where the depicted specimens were found and without justification of their species identity.
Figure 9. *Araneus agastus* Rainbow, 1916, holotype, immature (AM KS6506) (A–B) and *Araneus exsertus* Rainbow, 1904, holotype, immature (AM KS6516) (C–D). A, C, habitus, dorsal view; B, D, habitus, ventral view. Both species are here considered *nomina dubia*. 
Figure 10. *Epeira coronata* Rainbow, 1896, holotype, immature (AM KS8683) (A) and *Heurodes turritus* Keyserling, 1886, holotype, immature (ZMH 384) (B). A, habitus, dorsal view; B, habitus, lateral view. Both species are here considered *nomina dubia*.

Within an Australian context it is likely that *Heurodes* is a junior synonym of *Acroaspis*, also characterised by a high clypeus and with many species that show a similar elevated abdomen as *H. turritus* (see above) (unpublished data). Consequently, Davies’ (1988) illustrations of *H. turritus* are consistent with the characterisation of *Acroaspis* as detailed above. However, as *Acroaspis* includes at least 20 species in Australia (unpublished data), it is not possible to identify *H. turritus* at the species level.

With the unidentifiable type species of *Heurodes* and a likely junior synonymy of the genus with *Acroaspis*, it seems most pragmatic to consider the species-group name *Heurodes turritus* and therefore also the genus-group name *Heurodes nomina dubia*.

In addition to the type species, *H. turritus* from Australia, two other species are currently listed in the genus and now require consideration at the genus level: *H. fratellus* (Chamberlin, 1924), originally described based on an immature female from China, and *H. porculus* (Simon, 1877), known currently only from females and initially described from the Philippines and later reported from Singapore (Workman 1896).
Heurodes porculus is here returned to Eriovixia, where it was previously placed by Archer (1951a; 1958). E. porcula (Simon, 1877) comb. reval. Similarly, Eriovixia pseudocentrotodes (Bösenberg & Strand, 1906) had temporarily been transferred to Heurodes by Yaginuma and Archer (1959).

Heurodes fratellus is here considered a nomen dubium. The type specimen is apparently a juvenile (Chamberlin, 1924, p. 19 “one not fully mature female”) and it was subsequently considered unidentifiable (Song et al. 1999).

Heurodes turritus Keyserling, 1886

Fig. 10B


Remarks. The type specimen of H. turritus is a juvenile collected in Sydney, New South Wales. It has a distinctly elevated abdomen (Fig. 10B) and based on this feature the genus was previously associated with Eriovixia. However, there are a number of species in south-eastern Australia with such elevated abdomen and currently referred to Acroaspis (e.g. Framenau et al. 2014). It is therefore impossible to identify H. turritus and the species is here considered nomen dubium. As H. turritus is the type species of Heurodes, this also renders the genus-group name Heurodes a nomen dubium.

Type material lost

Araneus clerckii, 1757


Remarks. The holotype of Anepsia crinita is not present in the Australian Museum and must be considered lost. The original description of this species does not include an illustration of the epigyne nor are female genitalia mentioned anywhere in the text in contrast to all other species described in the same publication. Rainbow (1893) may therefore have described an immature specimen. Simon (1895) did not believe the species to belong to the genus Anepsion Strand, 1929 and based on its description considered it a ‘normal Araneus’. It will not be possible to identify this species from the description alone and therefore I consider the species-group name Anepsia crinita a nomen dubium.

Araneus diabrosis (Walckenaer, 1841)


Araneus diobris (Walckenaer). Rainbow 1911: 185 (misspelled).

Type material. Holotype of Epeiropodia diabrosis Walckenaer, 1841: male, Port Jackson (Sydney) [33°50'S, 151°16'E, New South Wales, AUSTRALIA], J. R. C. Quoy and J. P. Gaimard collection (considered lost).

Remarks. The original description of the male of Epeiropodia diabrosis placed the species in a group with Eriophora pustulosa (Walckenaer, 1841), in Walckenaer’s (1841) family of ‘Irregulares’—i.e. the abdomen has tubercles—and within the race ‘Triangularae truncatae’, a triangular anteriorly truncated (not rounded) abdomen that is drawn out posteriorly by tubercles into a triangle. However, in contrast to E. pustulosa (which has five posterior humps) (e.g. Court and Forster 1988), Epeiropodia diabrosis was described to have only a single posterior tubercle in addition to distinct humeral humps (Walckenaer 1841). Within the Australian context, this description is most consistent with a new genus represented by C. fuliginata; however, a number of species of this genus are present in New South Wales (unpublished data) and it is unlikely that the species can be recognised by the short verbal original description alone. Therefore, I consider the species-group name Epeiropodia diabrosis a nomen dubium.

Araneus diversicolor (Rainbow, 1893)

Epeiropodia diversicolor Rainbow, 1893: 16–18, plate. 3, figs 1, 1a–b.


Remarks. The holotype female Epeiropodia diversicolor is not present in the collection of the AM and must be considered lost. The original description of this species, in particular the shape of the epigyne, suggests this species to belong to Cyrtophora Simon, 1864. Taking into account the diversity of this genus in eastern Australia (e.g. Framenau 2008; Framenau and Scharff 2009) it is unlikely that this species can be identified confidently. Therefore, I consider the species-group name Epeiropodia diversicolor a nomen dubium.
Araneus fictus (Rainbow, 1896)


Aranea ficta (Rainbow). Roewer 1942: 827.


Remarks. The holotype female of Aranea ficta is not present in the AM and must be considered lost. The original description suggests close affinities with Araneus psittaciatus (Keyserling, 1887) and Araneus ginninderranus Dondale, 1966, both of which can only be separated by detailed examination of the genitalia. As this is not possible due to the lost type, I consider Epeira ficta a nomen dubium.

Araneus hamiltoni (Rainbow, 1893)


Remarks. The holotype female of Epeira hamiltoni is not present in the Australian Museum and must be considered lost. The original stylised description of the epigyne suggests close affinities with Araneus lodicula (Keyserling, 1887), Araneus brisbanae (L. Koch, 1867) or Araneus lutulentus (Keyserling, 1886), none of which are true Araneus (see Scharff et al. in press). With the presumed loss of the type it is not possible to accurately identify this species and I consider it a nomen dubium.

Araneus lacrymosus (Walckenaer, 1841)


Type material. Holotype of Epeira lacrymosa Walckenaer, 1841: sex/life stage not given, Port Jackson (Sydney) [33°50’S, 151°16’E, New South Wales, AUSTRALIA], J. R. C. Quoy and J. P. Gaimard collection (considered lost).

Remarks. The original description of A. lacrymosus does not allow an accurate identification of this species. Based on this description, L. Koch (1871) keyed A. lacrymosus to a diverse, clearly paraphyletic group of orb-weaving spiders that also does not allow an interpretation of its morphological affinities: Cyrtophora cordiformis (L. Koch, 1871), Neoscona punctigera (as Epeira indagatrix L. Koch, 1871), Araneus flavopunctata (L. Koch, 1871) (from Fiji; currently unknown affinities) and Araneus speculabundus (L. Koch, 1871) (representing a new genus of Australian orb-weaving spiders; unpublished data). Considering the diversity of Australian orb-weaving spiders, it is unlikely that the true identity of A. lacrymosus will be revealed without examining the holotype. I therefore consider the species-group name Epeira lacrymosa a nomen dubium.

Araneus leai (Rainbow, 1894)


Remarks. The holotype female of Epeira leai is not present in the AM and must be considered lost. The original description suggests this species to belong to Neoscona, but the rudimentary description of the epigyne (Rainbow 1894, p. 289: “Epigyne a short blunt process”) does not allow to associate this species with any known Neoscona from New South Wales. Therefore, I consider Epeira leai a nomen dubium.

Araneus mortoni (Urquhart, 1891)


Type material. Holotype of Epeira mortoni Urquhart, 1891: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

Remarks. The holotype female of Epeira mortoni seems to be lost. The description suggests close affinities with either Plebs eburnus or P. bradleyi (Keyserling, 1887) (both of which, in addition to a P. patricius Joseph & Framenau, 2012, occur in Tasmania (Joseph and Framenau 2012)), but neither of these species can be confirmed as a synonym of A. mortoni with certainty. In addition, none of the copies of the volume that I was able to study contained the figure plate, which, as figure 1, was supposed to show the epigyne of this species. Not being able to undoubtedly identify this species based on the original description alone, I consider the species-group name Epeira mortoni a nomen dubium.

Araneus notacephalus (Urquhart, 1891)

**Type material.** Syntypes of *Epeira notacephala* Urquhart, 1891: “several examples” (females), Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The syntypes of *Epeira notacephala* appear to be lost. The original descriptions suggest close affinities with possibly *Araneus arenaceus* (Keyserling, 1886). However, there are several undescribed species within this group in south-eastern Australia (unpublished data) and it is not possible to identify *Epeira notacephala* based on the original description alone. I therefore consider this species-group name a *nomen dubium*.

*Araneus obscurus* (Urquhart, 1893)


*Araneus obstrictus* (Urquhart). Rainbow 1911: 190 (misspelled)


**Type material.** Holotype of *Epeira obscurta* Urquhart, 1893: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The holotype female of *Epeira obscurta* seems to be lost. Similar to *A. diabrosis, A. singularis* (Urquhart, 1891) and *A. viridulus* (Urquhart, 1891) (see below for the latter two species), this species appears to have affinities to *E. pustulosa*. Taking the diversity of this group in south-eastern Australian into account, it appears very unlikely that the identity of this species can be elucidated based on the original description alone. I therefore consider the species-group name *Epeira obscurta* a *nomen dubium*.

*Araneus phaleratus* (Urquhart, 1893)


*Araneus phaleratus* (Urquhart). Rainbow 1911: 190; Bonnet 1955: 566.


**Type material.** Holotype of *Epeira phalerata* Urquhart, 1893: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The holotype of *Epeira phalerata* seems to be lost. Similar to *A. diabrosis, A. singularis* (Urquhart, 1891) and *A. viridulus* (Urquhart, 1891) (see below for the latter two species), this species appears to have affinities to *E. pustulosa*. Taking the diversity of this group in south-eastern Australian into account, it appears very unlikely that the identity of this species can be elucidated based on the original description alone. I therefore consider the species-group name *Epeira phalerata* a *nomen dubium*.

*Araneus pronubus* (Rainbow, 1894)

*Epeira pronuba* Rainbow, 1894: 289–290, plate 10, figs 2, 2a–d.

*Araneus pronubus* (Rainbow). Rainbow 1911: 191; Bonnet 1955: 570.


**Type material.** Holotype of *Epeira pronubra* Rainbow, 1894: female, Bungendore [35°14’S, 149°127E, New South Wales, AUSTRALIA] (whereabouts unknown).

**Remarks.** The female holotype of *Epeira pronubra* is not present at the AM and must be considered lost. The original description suggests close affinities with *Larinia* Simon, 1874 or species associated with *Araneus talipe-datus* (Keyserling, 1887). However, the epigyne is not illustrated and the short verbal description (Rainbow 1894, p. 290: “Epigyne a short blunt dark process directed forwards”) does not allow an accurate identification of this species. Therefore, I consider the species-group name *Epeira pronubra* a *nomen dubium*.

*Araneus rarus* (Keyserling, 1887)

*Epeira rara* Keyserling, 1887: 193–194, plate 17, figs 2, 2a.

*Araneus rarus* (Keyserling). Hogg 1900: 74; Rainbow 1911: 192; Bonnet 1955: 581.

**Type material.** Holotype of *Epeira rara* Keyserling, 1887: male, Cape York [ca. 15°00’S, 143°00’E, Queensland, AUSTRALIA], Bradley Collection (whereabouts unknown).

**Remarks.** As other types from the Bradley collection, the male holotype of *Epeira rara* should be considered lost. Keyserling (1887) described two araneid species based on males from the Bradley collection, *Araneus rarus* and *Araneus mulierarius* (Keyserling, 1887). Whereas the latter can be identified based on the original description (and is congeneric with *Araneus dimidiatius* (L. Koch, 1871) in a new genus of Australian orb-weavers; see Scharff et al. in press), the description and illustrations of the former do not allow a species identification against material from northern Queensland as investigated primarily in the Queensland Museum. I therefore consider the species-group name *Epeira rara* a *nomen dubium*. The uncommented listing of *A. rarus* from Victoria (Hogg 1900) cannot be confirmed.

*Araneus singularis* (Urquhart, 1891)

*Epeira singulara* Urquhart, 1891: 240–242, fig. 2.


**Type material.** Holotype of *Epeira singulara* Urquhart, 1891: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The holotype of *Epeira singulara* seems to be lost. The original description suggests affinities with *E. pustulosa* (Urquhart 1891, p. 242: “posterior tubercles [of abdomen], 5; first row slightly developed; tubercle of second row most prominent”). Plate 1 with figure 2 of the
epigyne of this species was not present in the copies of Urquhart’s (1891) volume that were available to me and may never have been published. Despite postulated unique “remarkable irregular metallic markings on the abdomen” it is not possible to undoubtedly identify this species. I therefore consider Epeira singulara a nomen dubium.

_Early Araneus (Urquhart, 1893)_

_Aranea sub-flavida_ (Urquhart). Rainbow 1911: 193.
_Aranea subflavida_ (Urquhart). Roever 1942: 834.

**Type material.** Holotype of _Epeira sub-flavida_ Urquhart, 1893: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The holotype female of _Epeira sub-flavida_ seems to be lost. The original description suggests a large orb-weaving spider, possibly with affinities to _Eriophora biapicata_ or _Backobourkia heroine_. Taking the diversity of these large spiders in south-eastern Australia into account, it is unlikely that this species can be identified by the original description alone, and therefore I consider the species-group name _Epeira sub-flavida_ a nomen dubium.

_Araneus urquharti_ (Roever, 1942)

_Epeira similaris_ Rainbow, 1896a: 324, plate 18, fig. 3 (pre-occupied by _Epeira similaris_ Urquhart, 1891).
_Aranea urquharti_ Roever, 1942: 835 (replacement name for _Epeira similaris_ Rainbow, 1896).
_Araneus similaris_ (Rainbow). Bonnet 1955: 599; Rainbow 1911: 193.


**Remarks.** The holotype female of _Epeira similaris_ is not present at the AM and must be considered lost. The original species description (Rainbow 1896a) places this species in close affinity with _Araneus fictus_ described in the same publication. For the same reasons as for that species (see above), I consider _Epeira similaris_ a nomen dubium.

_Araneus ventriosus_ (Urquhart, 1891)

_Aranea ventriosa_ (Urquhart). Roever 1942: 835.

**Type material.** Holotype of _Epeira ventriosa_ Urquhart, 1891: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The holotype of _Epeira ventriosa_ seems to be lost. The original description, in particular of the epigyne (Urquhart 1891, p. 239: “long, tapering, flat, transversely rugose, hairy, yellowish scapus, curving backwards and upwards”) suggests close affinities with _E. biapicata_ or _B. heroine_. However, there are a number of very similar large araneids in south-eastern Australia and it is not possible to undoubtedly identify _Epeira ventriosa_ from the description alone. Therefore, I consider this species-group name a nomen dubium.

_Araneus viridulus_ (Urquhart, 1891)

_Epeira viridula_ Urquhart, 1891: 242–244.
_Aranea viridula_ (Urquhart). Roever 1942: 835.

**Type material.** Holotype of _Epeira viridulus_ Urquhart, 1891: female, Tasmania [no exact locality, AUSTRALIA] (whereabouts unknown).

**Remarks.** The holotype of _Epeira viridulus_ seems to be lost. The original description suggests a species with close affinities to _E. pustulosa_ (Urquhart 1891, p. 243: “posterior tubercles [of abdomen] well-developed, centre tubercle of first row much the largest and stoutest”) which belongs to a fairly diverse group with at least three different species in Tasmania (unpublished data). The description of the epigyne suggests the holotype to be a penultimate female (Urquhart 1891, pp. 243–244: “Vulva pale yellowish-brown; represents a low, transverse, oval elevation, prolonged into a broad, tapering, flatly convex, close lying scapus, fore-end slightly segmented”) and it does not seem to be possible to identify this species with certainty. Therefore, I consider the species-group name _Epeira viridula_ a nomen dubium.

_Collina_ Urquhart, 1891

The genus _Collina_ was described based on the single female of the type species, _C. glabicira_ Urquhart, 1891. This is currently the only species listed in the genus (World Spider Catalog 2019). The holotype of _C. glabicira_ seems to be lost and the genus _Collina_ has not been treated since its original description. It was omitted by Rainbow (1911) and Bonnet (1955). Urquhart’s (1891) did not provide a differential diagnosis for the genus and his description (including the description of the type species, see below) could not be matched up with any orb-weaving spider examined from Tasmania.

_Collina glabicira_ Urquhart, 1891

_Collina glabicira_ Urquhart, 1891: 247–249, fig. 4 (figure not present in any copies examined).

**Type material.** Holotype of _Collina glabicira_ Urquhart, 1891: Female, no exact locality, Tasmania, AUSTRALIA, Alex Morton (whereabouts unknown).

**Remarks.** The holotype female of _C. glabicira_ could not be found during my extensive examinations of Australian collections and does not appear to be present in
the CMNZ where types of the A. T. Urquhart collection are lodged (Nicholls et al. 2000; Paquin et al. 2008). It was also not possible to unequivocally identify any of the orb-weaving spiders examined from Tasmania (or south-eastern mainland Australia) as C. glabicira. None of the printed or electronic copies of Urquhart (1891) that I examined contained fig. 4 supposedly illustrating the species and it is likely that the plate containing the figure was never printed. As it is not possible to identify the species based on the description alone, I consider the species-group name C. glabicira Urquhart, 1891 a nomen dubium which therefore also renders the genus-group name Collina Urquhart, 1891 a nomen dubium.

Acknowledgements

I am indebted to a variety of curators, collection managers and museum staff for assistance in accessing their collections either as loan or during visits to their respective institutions and by providing access to their databases: Owen Seeman, Robert Raven and Barbara Baehr (QM), Graham Milledge and Helen Smith (AM), Janet Beccaloni (BMNH), Hieronymus Dastych (retired), Danilo Harms, Nadine Duperré (ZMH), and Jason Dunlop (ZMB). This study would have been impossible without the support of these institutions and their enthusiastic personnel. Suggestions by Bob Kallal, Robert Raven and Robert Whyte greatly improved the manuscript during the review stage.

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