

Rainforest pelican spiders (Archaeidae: *Austrarchaea*) of south-eastern Queensland, Australia: two new species and a distributional reassessment of regional endemic clades

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Abstract. Two new species of pelican spiders (family Archaeidae) are described from rainforest habitats in south-eastern Queensland, Australia – *Austrarchaea davidi* Rix, sp. nov. and *A. laidlawae* Rix, sp. nov. – and the female of *A. clyneae* Rix & Harvey, 2011 is described for the first time. Phylogenetic analysis of a mitochondrial molecular dataset for the genes cytochrome *c* oxidase subunits I and II reveals that these two new species are the closest relatives of *A. judyae* Rix & Harvey, 2011 and *A. clyneae*, respectively, with mitochondrial sequencing also used to identify newly-collected specimens of *Austrarchaea* from populations throughout south-eastern Queensland. These recent collections were largely made during dedicated survey work conducted after the devastating 2019–20 summer bushfires in eastern Australia. We further provide a synopsis of the archaeid fauna of south-eastern Queensland, which is comprised of 11 species in two monophyletic regional-endemic clades. A revised key to species is presented for both clades, along with updated distributional information, and live habitus images for nine of the 11 species.

Keywords: Assassin spider, biogeography, conservation, Palpimanoidea, phylogeny, taxonomy

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The pelican¹ spiders of the family Archaeidae are among the world's most unusual and iconic spiders, with a unique, highly modified and instantly-recognizable carapace morphology (Wood et al. 2012; Wood & Parkinson 2019), a specialized araneophagic biology (Legendre 1961), a rich fossil record with an ancient and vicariant biogeography (Wood et al. 2013, 2014, 2018), and a remarkable male palpal organ morphology in Australian taxa, representing the only known example of a 'poly-embolic' reproductive system in spiders (Rix et al. 2021). Over the last decade, significant advances have been made in our understanding of archaeid spider evolution and biogeography, especially in Madagascar (e.g., Wood et al. 2012, 2013, 2014, 2018) and Australia (e.g., Rix & Harvey 2012c), with recent revisionary taxonomic studies highlighting how diverse these spiders are at the species level, in both the Afrotropics (e.g., Wood 2008; Wood & Scharff 2018) and Australia (e.g., Rix & Harvey 2011, 2012a, b). The family Archaeidae is currently comprised of 90 extant species in five genera (World Spider Catalog 2021), of which three genera are endemic to the Afrotropics, and two are endemic to mainland Australia (Wood et al. 2018).

The Australian archaeid fauna is currently comprised of 38 described species, most of which (27 species) belong to the genus *Austrarchaea* Forster & Platnick, 1984 from eastern Queensland and New South Wales (Rix & Harvey 2011, 2012b). Like their Afrotropical and southern Australian counterparts, species of *Austrarchaea* are highly specialized cursorial spiders with a strictly araneophagic biology. They are rare denizens of rainforests or wet sclerophyll forests and

heathlands, usually in upland mountainous areas, and are all closely tied to complex 'suspended leaf litter' microhabitats, the latter highly susceptible to fire and disturbance. Crown-group *Austrarchaea* are of Eocene age, with three main lineages and a history of speciation throughout the eastern Australian mesic zone during the Miocene (Rix & Harvey 2012c). The genus is characterized by exclusively short-range endemic species (Harvey 2002; Harvey et al. 2011), all with distributions which are largely allopatric and consistent with a latitudinal series of mesic-forest 'islands' along the Great Dividing Range (Rix & Harvey 2012c; see also Bryant & Krosch 2016). Following the devastating eastern Australian summer bushfires of 2019–20 (Hyman et al. 2020; Marsh et al. 2021), these restricted, regional endemic species of Archaeidae became a focus of efforts to understand immediate post-fire impacts on invertebrates, in New South Wales (Hyman et al. 2020), South Australia, Western Australia and Queensland, and research in this space is ongoing (Marsh et al. 2021). While the genus *Austrarchaea* was thoroughly revised a decade ago using museum and newly acquired specimens collected during dedicated field surveys in 2010–2012 (Rix & Harvey 2011, 2012b), the distributions of numerous species were imperfectly known based on only sparse collection records, and the prospect of further undescribed species being discovered was highlighted.

In this paper, we taxonomically describe two new species of *Austrarchaea* from south-eastern Queensland, discovered as a result of dedicated surveys conducted throughout rainforest habitats following the 2019–20 Australian summer bushfires, the latter of which burnt millions of hectares in eastern Australia, and impacted large areas of fire-sensitive archaeid habitat (Hyman et al. 2020). In doing so, we also provide an

¹ We adopt the common name 'pelican spiders', as used by Wood et al. (2012, 2014), in place of 'assassin spiders' (*sensu* Wood 2008; Rix & Harvey 2011, 2012a, b, c).

updated synopsis of the archaeid fauna of south-eastern Queensland, which is comprised of 11 species in two monophyletic regional-endemic clades. A revised key to species is presented for both clades, along with a phylogenetic analysis of new mitochondrial sequence data, updated distributional information, and live habitus images for nine of the 11 species. This work brings the number of described species of *Austrarchaea* to 29, the total Australian archaeid fauna to 40 species, and the total number of extant Archaeidae to 92 species.

METHODS

Field collections and survey methods.—Specimens of *Austrarchaea* were collected during post-fire field survey work at various locations in south-eastern Queensland in 2020–21, with a single specimen also collected in 2018 (see Supplementary File S3). Specimens were denoted with a collection code according to the field work conducted, either as part of the ‘Bushfire Recovery Program’ Phase I emergency response funding from the Australian Government’s ‘Bushfire recovery package for wildlife and their habitat’ (see Acknowledgments, below) (code ‘BRP’), or as part of general collecting conducted for a broader archaeid research program led by the senior author (code ‘ARP’) (see Supplementary Files S1–S3). The latter also included four specimens collected at Mary Cairncross Scenic Reserve (MCSR), as part of the ‘Tiny Giants’ invertebrate survey conducted at MCSR in October 2021 (see Acknowledgments, below). In total, 87 new archaeid specimens were collected from south-eastern Queensland between December 2018 and October 2021 (see New Material Examined for each species, below, and Supplementary File S3), 40 of which were tissue-sampled and DNA sequenced for identification and phylogenetic purposes (Supplementary Files S1–S3). Most specimens were directly sampled in the field by beating and sifting suspended leaf litter in low vegetation in rainforest, with one specimen sampled using a wet pitfall trap (120 ml plastic vial three-quarters filled with 70% ethanol), another by hand collecting at night, and one other by hand collecting under a fallen log.

Molecular methods and phylogenetics.—Nucleotide sequence data for two contiguous mitochondrial protein-coding genes (cytochrome *c* oxidase subunits I and II; *COI* and *COII*) were generated from 40 specimens of *Austrarchaea* (see Supplementary Files 1–3), such that newly sampled populations from south-eastern Queensland could be unequivocally identified to species using an existing molecular framework (see Rix & Harvey 2011, 2012c). Methods used for DNA extraction and polymerase chain reaction (PCR) amplification of sequences have been detailed previously (Rix & Harvey 2011, 2012c), with PCR chemistry, Sanger sequencing, sequence editing, alignment and matrix generation as per Rix et al. (2020). New sequence data for *COI* and *COII* (Supplementary File S1), including an additional *COI* sequence from GenBank for *A. nodosa* (Forster, 1956) (Accession No. KP201244) were added to the taxon sample of Rix & Harvey (2012c), for a final aligned matrix of 207 taxa and 1612 bp (see Rix & Harvey 2012c for details of outgroup taxa). This matrix was analyzed under a general time reversible (GTR plus gamma plus invariant sites) nucleotide substitution model using MrBayes ver. 3.2.6 (Huelsenbeck & Ronquist 2001; Ronquist &

Huelsenbeck 2003), via the CIPRES Science Gateway (Miller et al. 2010). Four Markov Chain Monte Carlo (MCMC) chains were run for 40 million generations, with the first 10% of sampled trees discarded as ‘burn-in’ (see Supplementary File S1). The output 50% majority-rule consensus tree and node posterior probabilities were visualized using FigTree ver. 1.4.2 (online at <http://tree.bio.ed.ac.uk/software/figtree/>; accessed October 2021).

Morphological methods.—Standard morphological methods, including the format of species descriptions, follow previous revisionary taxonomic studies of Australian Archaeidae (see Rix & Harvey 2011, 2012a, b). Digital images were taken using a Leica M165C stereomicroscope with mounted DFC425 digital camera and processed using Leica Application Suite software (ver. 3.7). Specimens are lodged at the Queensland Museum, Brisbane (QMB), and the following abbreviations are used throughout the text: CH, carapace height; CL, carapace length; HPC, highest point of pars cephalica; HT, abdominal hump-like tubercles; TS1–3, tegular sclerites 1–3. Superscript DNA voucher codes are listed in the Material Examined sections for those specimens sequenced for the phylogenetic analysis (Supplementary Files 1–3).

RESULTS

Phylogenetic analysis of the *COI–COII* molecular dataset, expanded from Rix & Harvey (2012c) with the addition of 40 specimens of *Austrarchaea*, plus a single additional sequence from GenBank, recovered an overall topology broadly congruent with previous studies. The genus *Austrarchaea* and the ‘mid-eastern Australian lineage’ were both monophyletic with high support, and three of the four major internal clades within the mid-eastern Australian lineage were also recovered as monophyletic, i.e., the ‘temperate New South Wales clade’, the ‘subtropical New South Wales clade’ and the ‘south-eastern Queensland clade’ (Fig. 1). While the ‘Border Ranges clade’ (*sensu* Rix & Harvey 2012c) was recovered as a collapsed polytomy in this analysis of the *COI–COII* mitochondrial dataset (Fig. 1), previous phylogenetic studies using additional genes have shown that this is a well-supported natural group (e.g., see Rix & Harvey 2012c), comprised of the *A. nodosa* species-group and the *A. cunninghami* species-group (Fig. 1). As expected, all of the 41 newly added taxa were recovered within either the Border Ranges or south-eastern Queensland clades, and all eight previously sequenced species within these two clades were recovered as monophyletic species lineages with high support (see Fig. 1; Supplementary File S3). This species-level sampling included two new specimens of *A. cunninghami* Rix & Harvey, 2011, 12 new specimens of *A. dianneae* Rix & Harvey, 2011, six new specimens (plus one new GenBank sequence) of *A. nodosa*, and two new specimens of *A. judyae* Rix & Harvey, 2011. Specimens of *A. clyneae* Rix & Harvey, 2011 were sequenced for the first time in this study (five specimens), confirming the phylogenetic position of this species in the *A. nodosa* species-group within the Border Ranges clade (Fig. 1). Two new species lineages were also recovered: one in the Border Ranges clade sister to *A. clyneae* (*A. laidlawae* Rix, sp. nov.; nine specimens); and one within the south-eastern Queensland clade sister to *A. judyae* (i.e., *A. davidi* Rix, sp. nov.; four specimens).

DISCUSSION

Extensive sampling of Archaeidae from throughout south-eastern Queensland between 2018 and 2021, combined with complementary mitochondrial sequencing for identification purposes (especially of juvenile specimens; see Supplementary Files S1–S3), has greatly improved our understanding of the diversity and distribution of the 11 species of *Austrarchaea* now known to occur in the region (Figs. 2, 36). Many of these recent collections were made in 2020 or 2021, following the devastating summer bushfires in eastern Australia that burnt from October 2019 to February 2020 (Hyman et al. 2020; Marsh et al. 2021). As a result, species of Archaeidae have become something of a focal group for understanding immediate post-fire impacts on invertebrates in Australia (e.g., Hyman et al. 2020; Marsh et al. 2021), due in part to an existing and well-resolved taxonomy, as well as their niche conservatism, tight habitat associations in the mesic biome, low fecundity, limited dispersal ability, and phylogenetic antiquity. In Queensland, species of Archaeidae from impacted rainforest habitats were specifically included as priority taxa under the ‘Bushfire Recovery Program’ (BRP) Phase I emergency response funding from the Australian Government’s ‘Bushfire recovery package for wildlife and their habitat’, resulting in many of the new records and data presented in this synopsis.

Within the Scenic Rim subregion of the Gondwana Rainforests of Australia World Heritage Area (see Narsey et al. 2020), much of which was severely impacted by fire, surveys and new collections were instrumental in greatly expanding the known distribution of *A. clyneae* (which was previously known from a single adult specimen), and further clarifying the ranges of *A. dianneae* and *A. nodosa* (Fig. 2). Perhaps most importantly, a previously unknown yet fire-impacted species from the Mistake Mountains in the northern Main Range (*A. laidlawae* Rix, sp. nov.; Fig. 2) was newly discovered as a result of BRP field work, providing strong evidence for the cryptic extinction risk that exists for undiscovered or taxonomically unnamed species in the face of threatening processes and/or biotic change (e.g., see Meegaskumbara et al. 2007; White et al. 2019; McDonald et al. 2022). Like *A. dianneae* and *A. nodosa* on the Lamington Plateau, the distribution of *A. laidlawae* on the Main Range closely abuts that of *A. cunninghami*, with apparent altitudinal separation consistent with a higher altitude lineage of three species (the *A. nodosa* species-group, with *A. nodosa*, *A. clyneae*, *A. laidlawae*) sister to a lower altitude lineage of two species (the *A. cunninghami* species-group, with *A. dianneae*, *A. cunninghami*) (Fig. 1). Such differential distributions of species and lineages in subtropical rainforests are indicative of potentially contrasting risk profiles in the face of future fires or climate change (e.g., Marsh et al. 2021), with factors such as temperature seasonality, mean temperature anomaly and lifting cloud layers (Narsey et al. 2020) likely to have differential conservation impacts depending on the species and location.

Within the south-eastern Queensland clade of *Austrarchaea*, the discovery of a new species (*A. davidi* Rix, sp. nov.) in the Gympie hinterland region, sister to *A. judyae* (Fig. 1), is indicative of a potentially poorly sampled fauna in the area between the Blackall/Conondale Ranges and Bulburin National Park (Fig. 36). Within this large and complex area exist numerous rainforest remnants which have never been surveyed for Archaeidae, along with at least one location (at Oakview National Park) from which

a juvenile specimen has been collected but no adults have ever been found (Fig. 36). Future field surveys in this region should target complex notophyll vine forest habitats (or other mesic upland vine forests) for additional populations of *Austrarchaea*, which if present will likely represent new species.

TAXONOMY

Family Archaeidae Koch & Berendt, 1854
Genus *Austrarchaea* Forster & Platnick, 1984

Austrarchaea Forster & Platnick, 1984: 21.

Type species.—*Archaea nodosa* Forster, 1956, by original designation.

Diagnosis.—Species of *Austrarchaea* can be distinguished from species of *Zephyrarchaea* by their taller carapace (height to length ratio ≥ 2.0), by the presence of accessory setae on the distal (rather than proximal) bulge of the male cheliceral paturon, and by the fusion of the two conductor sclerites on the male pedipalp (Rix & Harvey 2012a). Australian Archaeidae can further be distinguished from Afrotropical taxa by the presence of clustered spermathecae in females, and by the presence of a remarkable ‘double-embolic’ conformation of the male pedipalp, whereby each palpal bulb has a bifurcate spermophor and two embolic sclerites (E and E*, the latter equivalent to sclerite 2a in previous taxonomic treatments) (see Rix et al. 2021).

Distribution.—Pelican spiders of the genus *Austrarchaea* occur in the mesic zone of eastern Australia, extending from the Mount Finnigan Uplands (Wet Tropics) of north-eastern Queensland, south to at least the Deua National Park and Badja regions of southern New South Wales (Rix & Harvey 2011, 2012b, c).

Composition and remarks.—The genus *Austrarchaea* includes 29 named species, two of which are newly described in this study. The diverse ‘mid-eastern Australian lineage’ (*sensu* Rix & Harvey 2011, 2012c) includes four major clades—the south-eastern Queensland clade, the Border Ranges clade, the subtropical New South Wales clade, and the temperate New South Wales clade (Fig. 1).

THE BORDER RANGES CLADE

(Figs. 1–35)

The Border Ranges clade of *Austrarchaea* includes five known species from the rainforests of the mountainous ‘Scenic Rim’ region bordering Queensland and New South Wales (Fig. 2) – part of the Gondwana Rainforests of Australia World Heritage Area (Narsey et al. 2020). This clade was first recovered by Rix & Harvey (2011, fig. 3B), and formally recognized for three species following the multi-gene phylogenetic analysis of Rix & Harvey (2021c, fig. 6). The addition here of molecular data for *A. clyneae* Rix & Harvey, 2011 indicates that this previously unplaced species is also a member of this clade, along with a newly discovered species from the northern Main Range. Two monophyletic species-groups are recognized – the *A. nodosa* species-group and the *A. cunninghami* species-group (Fig. 1).

Composition.—Five species: *Austrarchaea clyneae* Rix & Harvey, 2011, *A. cunninghami* Rix & Harvey, 2011, *A. dianneae* Rix & Harvey, 2011, *A. laidlawae* Rix, sp. nov. and *A. nodosa* (Forster, 1956).

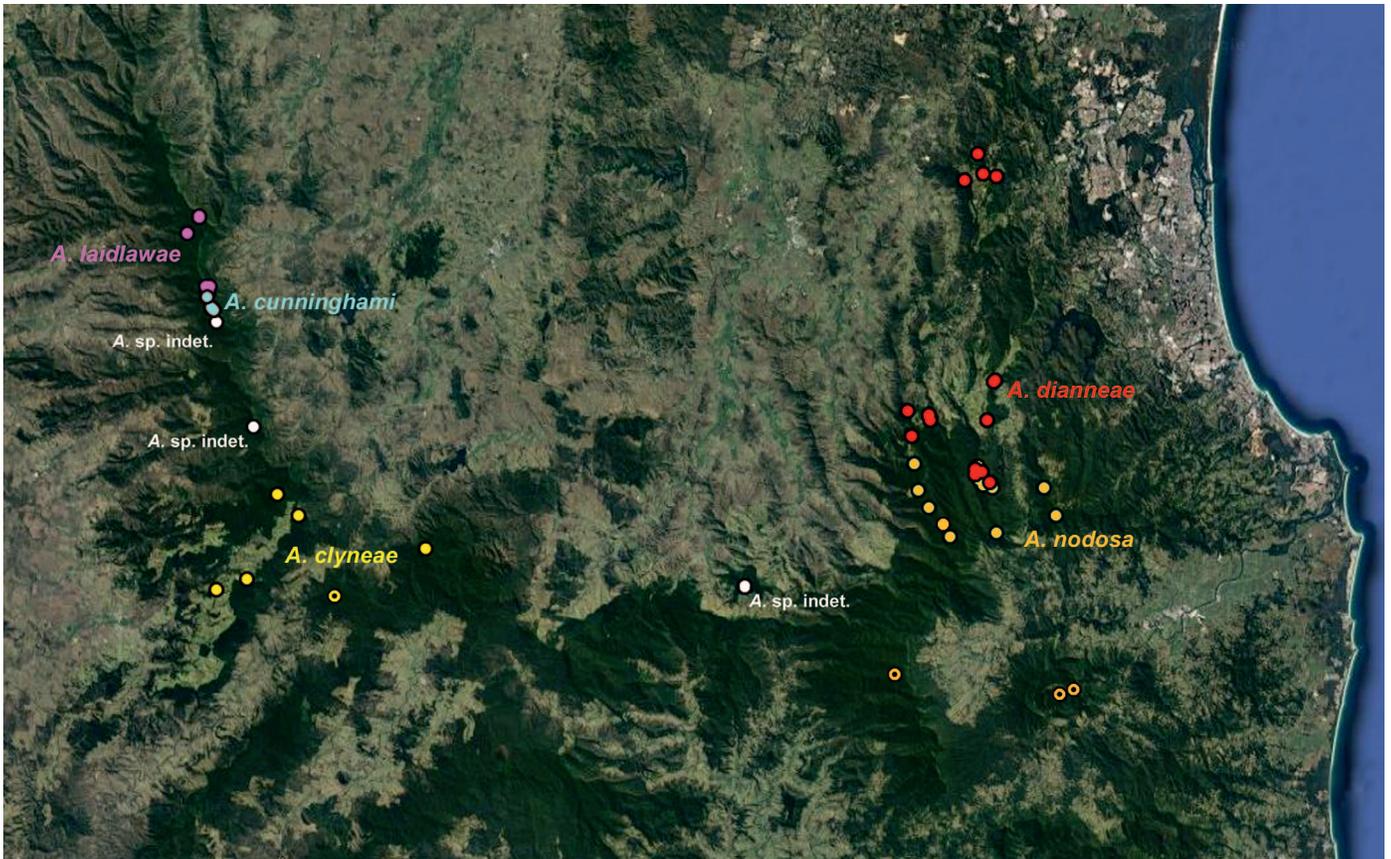


Figure 2.—Map of the Scenic Rim subregion of south-eastern Queensland, showing collection records for species belonging to the Border Ranges clade of *Austrarchaea*. Note that four records of *A. clyneae* and *A. nodosa* from northern New South Wales are also shown (with black dots in the centre of colored circles), along with three juvenile records of indeterminate identification (white dots).

KEY TO THE BORDER RANGES
CLADE OF *AUSTRARCHAEA*

Modified from Rix & Harvey (2011).

- 1. Males 2
- Females 6

MALES

- 2. Conductor narrow; proximal portion of embolic sclerite overlapping retro-ventral base of conductor (Figs. 26, 27; see also Rix & Harvey 2011, figs. 10E, 13D) – *Austrarchaea nodosa* species-group (Fig. 1) 3
- Conductor broader, foliate; proximal portion of embolic sclerite enclosed by retro-ventral base of conductor (see Rix & Harvey 2011, figs. 11E, 12E) – *Austrarchaea cunninghami* species-group (Fig. 1) 5
- 3. Proximal portion of embolic sclerite very broad and flanged, overlying proximal conductor (see Rix & Harvey 2011, fig. 10E) *A. nodosa*
- Proximal portion of embolic sclerite not flanged, embraced by proximal conductor (Fig. 27; see also Rix & Harvey 2011, fig. 13D) 4
- 4. Conductor directed antero-ventrally in retrolateral view, with evenly convex ventral margin in retrolateral view (see Rix & Harvey 2011, fig. 13D). *A. clyneae*
- Conductor directed more anteriorly in retrolateral view, with slightly sinuous, distally-concave ventral margin in retrolateral view (Fig. 27). *A. laidlawae* Rix, sp. nov.
- 5. Tegular sclerite 1 (TS1) short, ca. three times as long as wide, with rectangular base and sharply-tapered apex (see Rix & Harvey 2011, fig. 12F). *A. cunninghami*
- TS1 longer and spiniform (see Rix & Harvey 2011, fig. 11F) *A. dianneae*

FEMALES

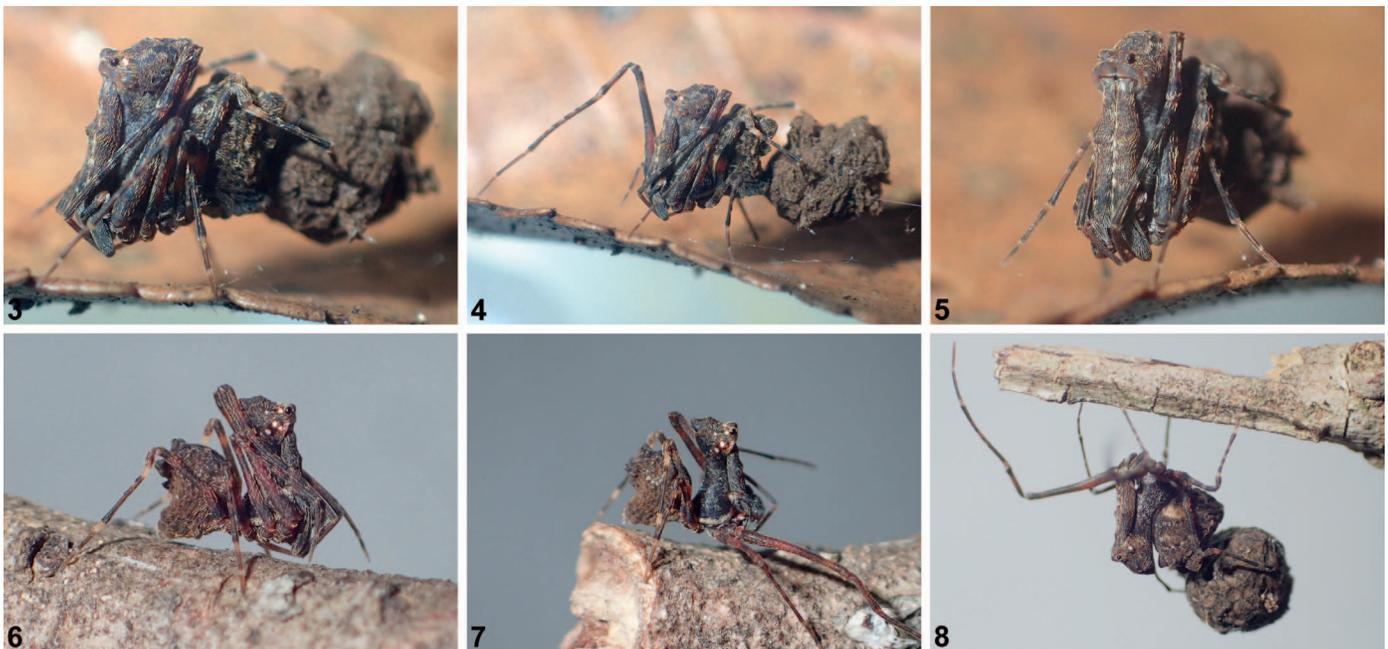
6. Posterior 'head' with shallow but distinct concave depression in lateral view (Figs. 9, 23; see also Rix & Harvey 2011, fig. 7I) – *Austrarchaea nodosa* species-group (Fig. 1)* 7
- Posterior 'head' without concave depression in lateral view (see Rix & Harvey 2011, fig. 7G, H) – *Austrarchaea cunninghami* species-group (Fig. 1)* 9
7. Body color in life a rich reddish-brown (Figs. 30–32); ratio of highest point of pars cephalica (HPC) to post-ocular length close to posterior third of 'head' (ca. 0.63) *A. nodosa*
- Body color in life reddish-brown but overall greyer and darker (Figs. 3–5, 17–19); ratio of HPC to post-ocular length between half and posterior third of 'head' (ca. 0.58) 8
8. Internal genitalia with ≤ 12 variably shaped spermathecae on either side of gonopore (Fig. 10) *A. clyneae*
- Internal genitalia with fewer (≤ 8) variably shaped spermathecae on either side of gonopore (Fig. 29) *A. laidlawae* Rix, sp. nov.
9. Posterior 'head' angled downwards in lateral view (see Rix & Harvey 2011, figs. 7G, 12A) *A. cunninghami*
- Posterior 'head' flat, only marginally angled downwards in lateral view (see Rix & Harvey 2011, Figs 7H, 11A) *A. dianneae*
- * NB. Females within the *A. nodosa* and *A. cunninghami* species-groups are difficult to distinguish based on morphology alone, and are generally distinguished by subtle morphometric differences in the shape of the 'head' region of the pars cephalica (in lateral view). However, as far as is known, the distributions of all species within each species-group are fully allopatric (Fig. 2), aiding identification.

Austrarchaea clyneae Rix & Harvey, 2011
Mount Clunie Pelican Spider
(Figs. 1–7, 9, 10)

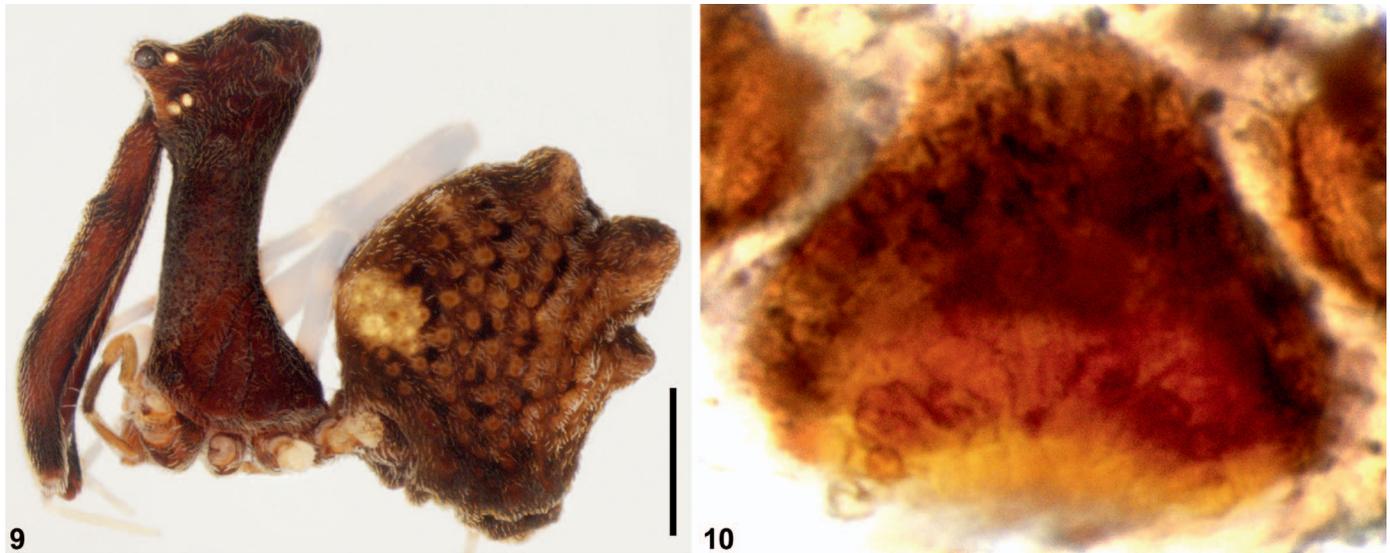
Austrarchaea clyneae Rix & Harvey, 2011: 26, figs. 8F, 13A–E.
Austrarchaea cunninghami Rix & Harvey, 2011: 24 (in part; misidentified juveniles from Mount Superbus, QMB S38509).

New material examined.—AUSTRALIA: *Queensland*: 1 ♂, Carabeen Nature Refuge, off Spring Creek Road, 28°18'22"S, 152°23'52"E, 943 m, 1 January 2021, hand collected from suspended leaf litter, rainforest (microphyll vine forest), M.

Rix (QMB S119205^{DNA}); 1 juvenile, same data except 28°18'20"S, 152°23'53"E, 960 m (QMB S119204^{DNA}); 1 ♀, Mount Barney National Park, Mount Ballow, summit, 28°16'10"S, 152°36'51"E, 1307 m, 15 December 2018, hand collected from under log, *Nothofagus moorei* cool-temperate rainforest, M. & C. Rix (QMB S111349^{DNA}); 1 juvenile, N. of Koreelah National Park, off Spring Creek Road, 28°17'50"S, 152°25'45"E, 1021 m, 1 January 2021, hand collected from suspended leaf litter, rainforest (microphyll vine forest), M. Rix (QMB S119206^{DNA}); 1 juvenile, The Head, NW. of Wilsons Peak, off Spring Creek Road, 28°14'16"S, 152°28'55"E, 754 m, 1 January 2021, hand collected from



Figures 3–8.—Live habitus images of *Austrarchaea clyneae* Rix & Harvey, 2011 and *A. cunninghami* Rix & Harvey, 2011: 3–5, female *A. clyneae* from Mount Barney National Park, carrying egg sac (QMB S111349); 6, 7, male *A. clyneae* from Carabeen Nature Refuge (QMB S119205); 8, female *A. cunninghami* from Main Range National Park, carrying egg sac (QMB S119158). Images by M. Rix.



Figures 9–10.—*Austrarchaea clyneae* Rix & Harvey, 2011: 9, female (QMB S111349) cephalothorax and abdomen, lateral view; 10, female internal genitalia, dorsal view, showing genital plate and clustered spermathecae. Scale bar: 9 = 1.0 mm.

suspended leaf litter, rainforest (CNVF), M. Rix (QMB S119207^{DNA}).

Other material examined (with updated identification).—AUSTRALIA: *Queensland*: 2 juveniles, Main Range National Park, Mount Superbus, summit, 1300 m, 8–9 February 1990, pyrethrum, trees and logs, G. Monteith, G. Thompson, H. Janetzki (QMB S38509).

Description (female QMB S111349).—Total length 3.45. Cephalothorax dark reddish-brown; legs tan-brown with darker annulations; abdomen mottled brown and beige-brown (Fig. 9). Carapace tall (CH/CL ratio 2.29); 1.24 long, 2.84 high; ‘neck’ 0.63 wide; bearing two pairs of rudimentary horns; highest point of pars cephalica (HPC) between half and posterior third of ‘head’ (ratio of HPC to post-ocular length 0.58), carapace with shallow concave depression posterior to HPC; ‘head’ not strongly elevated dorsally (post-ocular ratio 0.26). Chelicerae without accessory setae on anterior face of paturon. Abdomen 2.21 long, 2.62 high; with three pairs of dorsal hump-like tubercles (HT 1–6). Internal genitalia with cluster of ≤ 12 variably shaped spermathecae on either side of gonopore, clusters meeting near midline of genital plate (Fig. 10); innermost (anterior) spermathecae longest, sausage-shaped, curved antero-laterally; outermost (posterior) spermathecae bulbous; other spermathecae variably pyriform, directed antero-laterally.

Distribution and remarks.—*Austrarchaea clyneae* is currently known only from the south-western ‘Scenic Rim’, with a distribution encompassing the southern Main Range, Mount Clunie and western Mount Barney National Parks, usually at altitudes above 750 m, and a number of populations occurring at or over 1300 m altitude (e.g., on Mount Superbus and Mount Ballow) (Fig. 2). Previously known from only a single male specimen from Mount Clunie, significant new populations of this species were discovered throughout its range during dedicated survey work conducted after the 2019–20 summer bushfires, and the identity of subadult specimens originally collected in 1990 at 1300 m elevation on Mount Superbus (and previously tentatively identified as *A. cunning-*

hami) has now been clarified based on comparative morphology. Egg sacs are irregular, ‘dirt-shaped’ and formed by parchment-like brown silk, and held behind the female abdomen with leg IV (Figs 3–5).

Austrarchaea cunninghami Rix & Harvey, 2011
Main Range Pelican Spider
(Figs. 1, 2, 8)

Austrarchaea cunninghami Rix & Harvey, 2011: 24, figs. 7G, 8G, 12A–G.

New material examined.—AUSTRALIA: *Queensland*: 1 ♀, Main Range National Park, 220 m NW. of Cunninghams Gap carpark, 28°02′52″S, 152°23′33″E, 810 m, 20 October 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. Rix, C. Burwell, C. Lambkin, M. Laidlaw, T. Churchill (QMB S119158^{DNA}); 1 juvenile, Main Range National Park, Cunninghams Gap, 28°02′56″S, 152°23′33″E, 757 m, 22 October 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. Rix, C. Burwell, C. Lambkin, S. Levy (QMB S119159); 1 juvenile, Main Range National Park, Mount Cordeaux-Bare Rock track, 28°02′22″S, 152°23′18″E, 932 m, 23 October 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin, S. Levy (QMB S119165^{DNA}).

Distribution and remarks.—*Austrarchaea cunninghami* is currently known only from the Main Range National Park, in the vicinity of Cunninghams Gap, between Mount Mitchell and Mount Cordeaux (Fig 2). The range of this species closely abuts that of *A. laidlawae* Rix, sp. nov. north of Cunninghams Gap (Fig. 2), the latter of which has only been collected from sites > 950 m in altitude. While a number of new populations of *A. cunninghami* were discovered during dedicated survey work conducted after the 2019–20 summer bushfires, the distribution of this species remains poorly known, and additional survey work is required. Egg sacs are irregularly

spherical, ‘dirt-shaped’ and formed by parchment-like brown silk, and held behind the female abdomen with leg IV (Fig. 8).

Austrarchaea dianneae Rix & Harvey, 2011
Gold Coast Hinterland Pelican Spider
(Figs. 1, 2, 11–16)

Austrarchaea dianneae Rix & Harvey, 2011: 22, figs. 7H, 8H, 11A–G.

New material examined.—AUSTRALIA: *Queensland*: 1 ♀, Cedar Creek, Thunderbird Park, off Tamborine Mountain Road, 27°54′30″S, 153°11′12″E, 290 m, 28 November 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119195^{DNA}); 1 juvenile, Lamington National Park, IBISCA site IQ-300-A, 28°08′55″S, 153°08′11″E, 240 m, 26 November 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119186); 1 juvenile, same data except 28°08′51″S, 153°08′11″E, 250 m (QMB S119187^{DNA}); 1 juvenile, Lamington National Park, IBISCA site IQ-300-C, 28°09′03″S, 153°08′18″E, 280 m, 24–29 November 2020, pitfall trap, rainforest (notophyll vine forest), C. Burwell, T. Churchill, M. Rix, C. Lambkin, M. Laidlaw (QMB S119236); 1 juvenile, Lamington National Park, off Caves Circuit, 28°12′03″S, 153°11′05″E, 708 m, 27 November 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. Rix, C. Burwell, C. Lambkin (QMB S119189^{DNA}); 1 juvenile, same data except 28°12′02″S, 153°11′03″E, 630 m, rainforest (notophyll vine forest) bordering burnt wet sclerophyll forest (QMB S119190^{DNA}); 1 juvenile, same data except 28°11′45″S, 153°11′03″E, 652 m (QMB S119191^{DNA}); 1 juvenile, Lam-

ington National Park, off Binna Burra Road, 28°09′03″S, 153°11′48″E, 598 m, 27 November 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119194^{DNA}); 1 juvenile, Lamington National Park, off Lamington National Park Road, 28°08′35″S, 153°06′51″E, 703 m, 14 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix (QMB S119224^{DNA}); 1 juvenile, same data except 28°09′56″S, 153°07′10″E, 652 m (QMB S119225^{DNA}); 1 ♂, Rosins Lookout Conservation Park, 28°06′55″S, 153°12′16″E, 515 m, 27 November 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119193^{DNA}); 1 juvenile, same data except 28°06′57″S, 153°12′14″E, 525 m (QMB S119192^{DNA}); 1 ♂, Tamborine National Park, Palm Grove section, 27°55′41″S, 153°12′23″E, 517 m, 27 December 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. Rix (QMB S119196^{DNA}); 1 ♂, same data except Witches Falls section, 27°55′56″S, 153°10′28″E, 504 m, rainforest (piccabeen palm grove) (QMB S119198^{DNA}); 1 juvenile, same data (QMB S119197).

Other material examined (with updated identification).—AUSTRALIA: *Queensland*: 1 juvenile, Lamington National Park, IBISCA Plot IQ-300-C, 28°09′04″S, 153°08′17″E, 260 m, 23 January 2007, pitfall trap, K. Staunton (QMB S90181).

Distribution and remarks.—*Austrarchaea dianneae* is currently known only from the eastern ‘Scenic Rim’, with a distribution encompassing the Tamborine Plateau and lower elevation rainforests (< 750 m altitude) in the Lamington National Park, where it is sometimes sympatric or closely parapatric with *A. nodosa* between ca. 700–750 m altitude (Fig. 2). Significant new populations of this species were discovered throughout its range during dedicated survey work



Figures 11–16.—Live habitus images of *Austrarchaea dianneae* Rix & Harvey, 2011: 11–13, female from Cedar Creek (QMB S119195); 14, 15, male from Rosins Lookout Conservation Park (QMB S119193); 16, male from Tamborine National Park (QMB S119196). Images by M. Rix.

conducted after the 2019–20 summer bushfires, and the identity of specimens originally collected in 2007 at 260 m elevation has now been clarified using genetic analyses on newly collected material (Figs. 1, 2; Supplementary File S3).

Austrarchaea laidlawae Rix, sp. nov.

Mistake Mountains Pelican Spider

<http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:D49B66F3-903B-45E1-B786-8017981DF566>

org:act:D49B66F3-903B-45E1-B786-8017981DF566
(Figs. 1, 2, 17–29)

Type material.—*Holotype male*. AUSTRALIA: *Queensland*: Main Range National Park, Goomburra Section, off Mount Castle Lookout Track, 27°57'56"S, 152°22'47"E, 1000 m, 16 January 2021, hand collected from suspended leaf litter, rainforest (microphyll fern forest), M. & D. Rix (QMB S119232^{DNA}).

Paratypes. AUSTRALIA: *Queensland*: 1 ♀, Main Range National Park, Goomburra Section, off Lookout Road, 27°58'53"S, 152°22'02"E, 968 m, 16 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. & D. Rix (QMB S119229^{DNA}).

Other material examined.—AUSTRALIA: *Queensland*: 1 ♀, Main Range National Park, 400 m SE. of Bare Rock, 28°01'45"S, 152°23'15"E, 1140 m, 23 October 2020, hand collected from suspended leaf litter, rainforest (microphyll fern forest), M. Rix, C. Burwell, C. Lambkin, S. Levy (QMB S119160^{DNA}); 1 juvenile, same data except 28°01'45"S, 152°23'14"E (QMB S119162^{DNA}); 1 juvenile, Main Range National Park, off Morgan's Walk track, 28°01'44"S, 152°23'29"E, 1130 m, 23 October 2020, hand collected from suspended leaf litter, rainforest (severely burnt microphyll fern forest; on edge of unburnt rainforest), M. Rix, C. Burwell, C. Lambkin, S. Levy (QMB S119161^{DNA}); 1 juvenile, Main

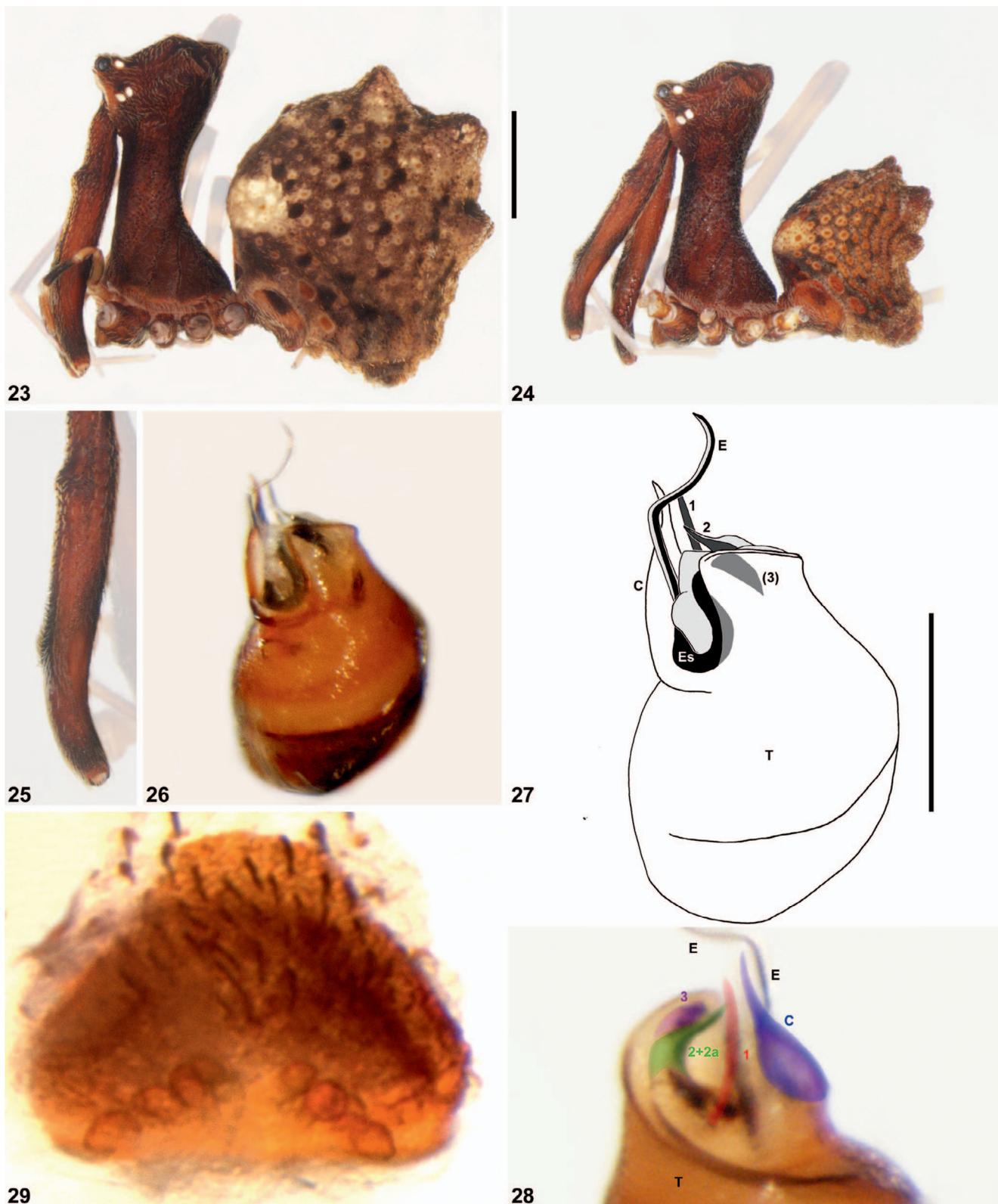
Range National Park, Mount Cordeaux-Bare Rock track, 28°01'58"S, 152°23'16"E, 1118 m, 23 October 2020, hand collected from suspended leaf litter, rainforest (microphyll fern forest), M. Rix, C. Burwell, C. Lambkin, S. Levy (QMB S119163^{DNA}); 1 juvenile, same data except 28°02'06"S, 152°23'21"E, 1108 m (QMB S119164^{DNA}); 1 juvenile, Main Range National Park, Goomburra Section, off Mount Castle Lookout Track, 27°57'56"S, 152°22'46"E, 975 m, 16 January 2021, hand collected from suspended leaf litter, rainforest (microphyll fern forest), M. & D. Rix (QMB S119231^{DNA}); 1 juvenile, same data (QMB S119233); 1 juvenile, Main Range National Park, Goomburra Section, off Lookout Road, 27°58'53"S, 152°22'02"E, 968 m, 16 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. & D. Rix (QMB S119228); 1 juvenile, same data except 27°58'52"S, 152°22'00"E, 964 m (QMB S119230^{DNA}).

Etymology.—The specific epithet is named in honor of Dr Melinda Laidlaw (Queensland Herbarium/Queensland Parks and Wildlife Service and Partnerships), for her contributions to our understanding of rainforest ecology in Australasia and Asia, and for her research on the impacts of climate change and fire on the Gondwana Rainforests of Australia World Heritage Area.

Diagnosis.—*Austrarchaea laidlawae* can be distinguished from all other Archaeidae from mid-eastern Australia, except *A. clyneae*, by the very long, spiniform tegular sclerite 1 (TS 1) (Fig. 28) combined with the unique shape of the conductor, which is thin, gently-curved ventrally and pointed distally (Fig. 28). This species can further be distinguished from *A. clyneae*, to which it is closely related (Fig. 1), by the shape of the conductor, which is directed more anteriorly in retrolateral view, with a slightly sinuous, distally-concave ventral margin in retrolateral view (Fig. 28; cf. Rix & Harvey 2011, fig. 13D).



Figures 17–22.—Live habitus images of *Austrarchaea laidlawae* sp. nov.: 17–19, female from Main Range National Park (QMB S119229); 20–22, male from Main Range National Park (QMB S119232). Images by M. Rix.



Figures 23–29.—*Austrarchaea laidlawae* sp. nov.: 23, allotype female (QMB S119229) cephalothorax and abdomen, lateral view; 24, holotype male (QMB S119232) cephalothorax and abdomen, lateral view; 25, holotype male chelicerae, lateral view; 26, 27, holotype male left palpal bulb, retrolateral view; 28, detail of distal tegular sclerites embedded within hematodochal membranes, prodistal view, with sclerite positions color-highlighted; 29, allotype female internal genitalia, dorsal view, showing genital plate and clustered spermathecae. Abbreviations: C, conductor; E, primary embolus; Es, primary embolic sclerite; T, tegulum; (TS)1–3, tegular sclerites 1–3. Scale bars 23, 24 = 1.0 mm; 27 = 0.2 mm.

Description (male holotype).—Total length 2.49. Cephalothorax dark reddish-brown; legs tan-brown with darker annulations; abdomen mottled brown and beige-brown, with darker reddish-brown dorsal scute and sclerites (Fig. 24). Carapace tall (CH/CL ratio 2.23); 1.07 long, 2.39 high; ‘neck’ 0.57 wide; bearing two pairs of rudimentary horns; highest point of pars cephalica (HPC) near posterior third of ‘head’ (ratio of HPC to post-ocular length 0.62), carapace with concave depression posterior to HPC; ‘head’ not strongly elevated postero-dorsally (post-ocular ratio 0.30). Chelicerae with short brush of accessory setae on anterior face of paturon (Fig. 25). Abdomen 1.42 long, 1.77 high; with three pairs of dorsal hump-like tubercles (HT 1–6); dorsal scute fused anteriorly to epigastric sclerites, extending posteriorly to first pair of hump-like tubercles; HT 3–6 each covered by separate dorsal sclerites. Unexpanded pedipalp (Figs 26–28) with thin, gently-curved, pointed conductor; tegular sclerite 1 (TS 1) very long, spiniform, reaching to near distal tip of conductor, visible in retrolateral view; TS 2+2a spur-like (equivalent to secondary embolus [E*]), shorter than TS 1; TS 3 indistinct, embedded within distal hematodocha, barely visible beyond retro-distal rim of tegulum.

Description (female paratype QMB S119229).—Total length 3.69. Cephalothorax dark reddish-brown; legs tan-brown with darker annulations; abdomen mottled brown and beige-brown (Fig. 23). Carapace tall (CH/CL ratio 2.19); 1.18 long, 2.59 high; ‘neck’ 0.57 wide; bearing two pairs of rudimentary horns; highest point of pars cephalica (HPC) between half and posterior third of ‘head’ (ratio of HPC to post-ocular length 0.58), carapace with shallow concave depression posterior to HPC; ‘head’ not strongly elevated dorsally (post-ocular ratio 0.24). Chelicerae without accessory setae on anterior face of paturon. Abdomen 2.50 long, 2.80 high; with three pairs of

dorsal hump-like tubercles (HT 1–6). Internal genitalia with cluster of \leq eight pyriform, antero-laterally directed spermathecae on either side of gonopore, clusters meeting near midline of genital plate (Fig. 29).

Distribution and remarks.—*Austrarchaea laidlawae* is a recently discovered species which is currently known only from high altitude (> 950 m) rainforest on the Mistake Mountains, in the northern Main Range National Park (Fig. 2). The range of this species closely abuts that of *A. cunninghami* north of Cunninghams Gap (Fig. 2), the latter of which has only been collected from sites < 950 m in altitude. Populations of *A. laidlawae* were discovered for the first time during dedicated survey work conducted after the 2019–20 summer bushfires.

Austrarchaea nodosa (Forster, 1956)

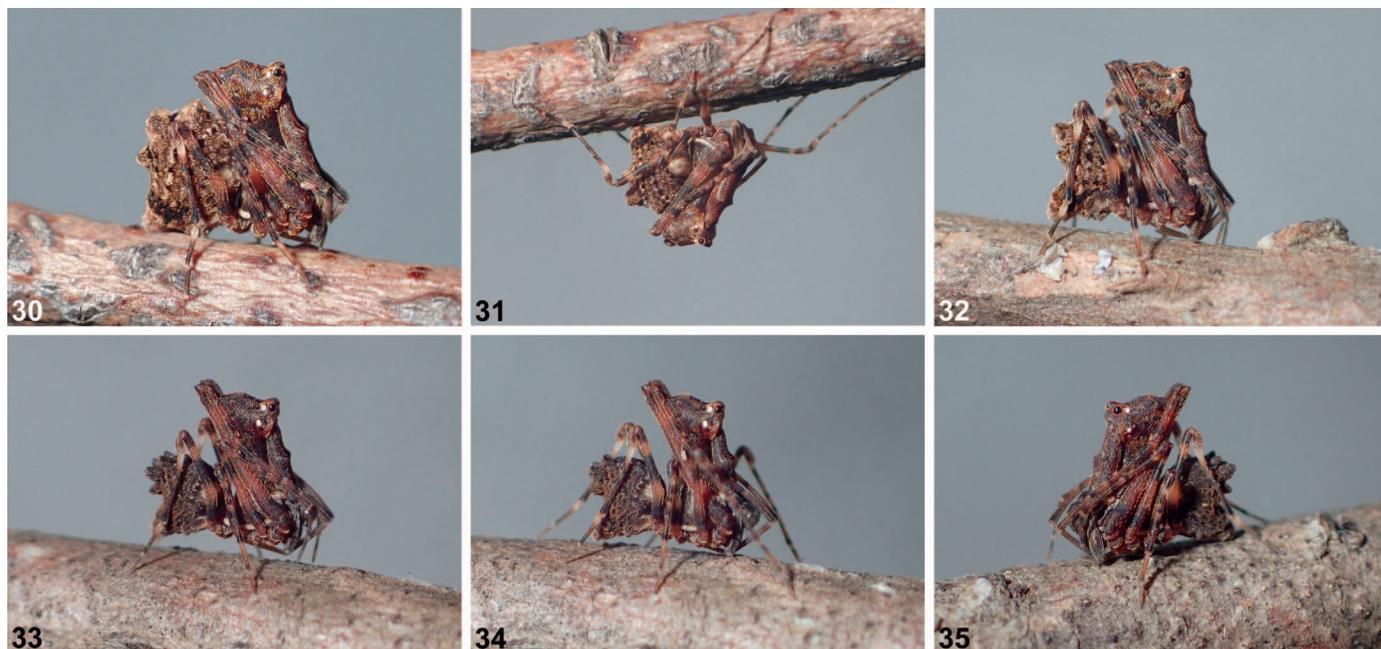
McPherson Range Pelican Spider

(Figs. 1, 2, 30–35)

Archaea nodosa Forster, 1956: 151, figs. 1–7.

Austrarchaea nodosa (Forster): Forster & Platnick, 1984: 21, figs. 4–6, 9–10, 19, 27, 34, 35, 57, 60–65. Rix & Harvey, 2011: 19, figs. 1A, B, 5D, 7I, 8I, 10A–G.

New material examined.—AUSTRALIA: *Queensland*: 1 ♀, Lamington National Park, off Bellbird Circuit, 28°11'57"S, 153°11'22"E, 782 m, 25 November 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. Rix, C. Burwell, C. Lambkin, M. Laidlaw, T. Churchill (QMB S119185^{DNA}); 1 juvenile, Lamington National Park, off Caves Circuit, 28°12'00"S, 153°11'11"E, 718 m, 27 November 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. Rix, C. Burwell, C. Lambkin (QMB S119188^{DNA}); 1 juvenile,



Figures 30–35.—Live habitus images of *Austrarchaea nodosa* (Forster, 1956): 30, 31, female from Lamington National Park (QMB S119185); 32, female from Springbrook National Park; 33–35, male from Springbrook National Park (QMB S119200). Images by M. Rix.

Lamington National Park, off Duck Creek Road, 28°12'52.80"S, 153°07'34.01"E, 828 m, 14 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix (QMB S119227^{DNA}); 1 juvenile, Lamington National Park, off Lamington National Park Road, 28°11'29"S, 153°07'17"E, 761 m, 14 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix (QMB S119226^{DNA}); 1 ♂, Lamington National Park, Green Mountains Section, IBISCA Site IQ-1100-A, 28°15'29"S, 153°09'32"E, 1138 m, 13 March 2021, hand collected from suspended leaf litter, *Nothofagus* rainforest, M. Rix, M. Laidlaw (QMB S119234); 1 ♀, Lamington

National Park, Green Mountains Section, off Border Track, W. of Elebana Falls, 28°14'39"S, 153°08'54"E, 962 m, 13 March 2021, hand collected from suspended leaf litter, rainforest, M. Rix, M. Laidlaw (QMB S119235); 1 ♂, Springbrook National Park, off Lyrebird Ridge Road, 28°12'46"S, 153°15'22"E, 778 m, 30 December 2020, hand collected from suspended leaf litter, rainforest (CNVF), M. & D. Rix (QMB S119199^{DNA}); 1 ♀, Springbrook National Park, off Repeater Station Road, NE. of Best of All Lookout, 28°14'18.27"S, 153°16'06.33"E, 1008 m, 30 December 2020, hand collected from suspended leaf litter, rainforest (microphyll vine forest), M. & D. Rix (QMB S119200^{DNA}).

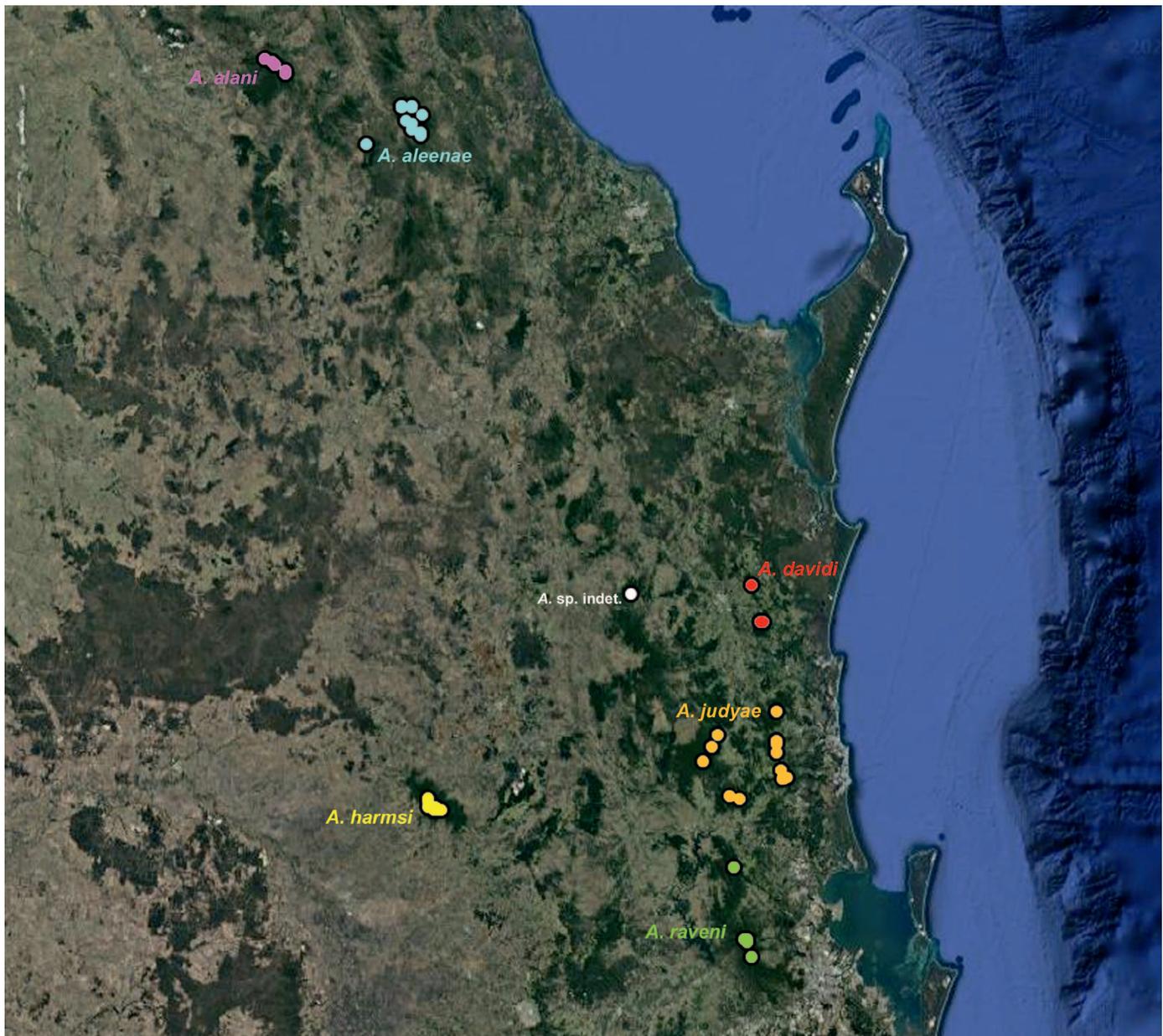


Figure 36.—Map of south-eastern Queensland (north of Brisbane), showing collection records for species belonging to the south-eastern Queensland clade of *Austrarchaea*. Note that a single juvenile record of indeterminate identification is also shown (white dot).

Distribution and remarks.—*Austrarchaea nodosa* is currently known only from the eastern ‘Scenic Rim’, with a distribution centered around the upper Tweed Caldera (Fig. 2). It has so far been collected in the Lamington, Springbrook, Border Ranges and Wollumbin National Parks, and on the Lamington Plateau is associated with higher elevation rainforests at > 700 m altitude, where it is sometimes sympatric or closely parapatric with *A. dianneae* between ca. 700–750 m altitude (Fig. 2). Significant new populations of *A. nodosa* were discovered throughout its range during dedicated survey work conducted after the 2019–20 summer bushfires, including the first specimens from the Springbrook Plateau.

THE SOUTH-EASTERN QUEENSLAND CLADE
(Figs. 1, 36–67)

The south-eastern Queensland clade of *Austrarchaea* includes six known species distributed between the Brisbane Valley and the St Lawrence Gap (Fig. 36). This clade was first recovered by Rix & Harvey (2011, fig. 3B), and formally recognized for five species following the multi-gene phylogenetic analysis of Rix & Harvey (2012c, fig. 6). The addition here of molecular data for a sixth, newly-discovered species from the Gympie region adds to the known diversity of this group.

Composition.—Six species: *Austrarchaea alani* Rix & Harvey, 2011, *A. aleenae* Rix & Harvey, 2011, *A. davidi* Rix, sp. nov., *A. harmsi* Rix & Harvey, 2011, *A. judyae* Rix & Harvey, 2011 and *A. raveni* Rix & Harvey, 2011.

KEY TO THE SOUTH-EASTERN QUEENSLAND
CLADE OF AUSTRARCHAEA

Modified from Rix & Harvey (2011).

- 1. Males 2
- Females 8

MALES

- 2. Male chelicerae with dense tuft of accessory setae on anterior face of paturon (see Rix & Harvey 2011, figs. 16C, 17C).. 3
- Male chelicerae with uniform brush or comb of accessory setae on anterior face of paturon..... 4
- 3. Tuft of accessory setae on anterior face of male paturon very strong, dorsally-directed, with ‘pick-like’ profile in lateral view (see Rix & Harvey 2011, fig. 16C); tegular sclerite 3 (TS3) relatively small, largely obscured by tegulum in retrolateral view (see Rix & Harvey 2011, fig. 16E)..... *A. harmsi*
- Tuft of accessory setae on anterior face of male paturon less pronounced, with shorter, densely-bunched profile in lateral view (see Rix & Harvey 2011, fig. 17C); TS3 very large, porrect, projecting well beyond rim of tegulum in retrolateral view (see Rix & Harvey 2011, fig. 17E) *A. aleenae*
- 4. Male chelicerae with short comb of accessory setae on anterior face of paturon (see Rix & Harvey 2011, figs. 14C, 18C).. 5
- Male chelicerae with longer brush of accessory setae on anterior face of paturon (Fig. 51; see also Rix & Harvey 2011, fig. 15C) 6
- 5. Conductor foliate, obliquely angled (see Rix & Harvey 2011, fig. 18E); TS 3 very large, porrect, with broadly pointed rectangular apex (see Rix & Harvey 2011, fig. 18E) *A. alani*
- Conductor ‘ear-shaped’, with large proximal lobe (see Rix & Harvey 2011, fig. 14E); TS3 smaller, triangular (see Rix & Harvey 2011, fig. 14E)..... *A. raveni*
- 6. Conductor ‘spade-shaped’, strongly laterally-incised (see Rix & Harvey 2011, fig. 15E); TS 1 spiniform (see Rix & Harvey 2011, fig. 15E)..... *A. judyae*
- Conductor ‘shovel-shaped’, with shallower lateral incision (Fig. 53); TS 1 shorter, spur-like (Fig. 54).... *A. davidi* Rix, sp. nov.

FEMALES

- 8. ‘Head’ with two equally highest points of pars cephalica (HPC) (Fig. 49; see also Rix & Harvey 2011, fig. 7C)..... 9
- ‘Head’ with single HPC (see Rix & Harvey 2011, fig. 7A, B, D, E) 10
- 9. Post-ocular ratio >0.45 (see Rix & Harvey 2011, fig. 7C) *A. judyae*
- Post-ocular ratio <0.40 (Fig. 49) *A. davidi* Rix, sp. nov.
- 10. HPC near posterior margin of ‘head’, post-ocular ratio ca. 0.80–0.85 (see Rix & Harvey 2011, fig. 7A, D) 11
- HPC closer to middle of ‘head’, post-ocular ratio ca. 0.60–0.65 (see Rix & Harvey 2011, fig. 7B, E)..... 12
- 11. Posterior margin of ‘head’ marginally bulging posteriorly (see Rix & Harvey 2011, fig. 7A)..... *A. alani*
- Posterior margin of ‘head’ not bulging posteriorly (see Rix & Harvey 2011, fig. 7D)..... *A. raveni*
- 12. Posterior ‘head’ angled downwards in lateral view (see Rix & Harvey 2011, fig. 7B); abdomen with pronounced bright guanine patches (Figs. 37–39; see also Rix & Harvey 2011, fig. 17A) *A. aleenae*
- Posterior ‘head’ flatter, only marginally angled downwards in lateral view (see Rix & Harvey 2011, Fig. 7H, 11A); abdomen with barely differentiated guanine patches (Figs. 56–58; see also Rix & Harvey 2011, fig. 16A)..... *A. harmsi*

Austrarchaea alani Rix & Harvey, 2011
Kroombit Tops Pelican Spider
(Figs. 1, 36)

Austrarchaea alani Rix & Harvey, 2011: 34, figs. 4A–E, 7A, 8A, 18A–G.

New material examined.—None.

Distribution and remarks.—*Austrarchaea alani* is currently known only from Kroombit Tops National Park, south-west of Gladstone (Fig. 36).

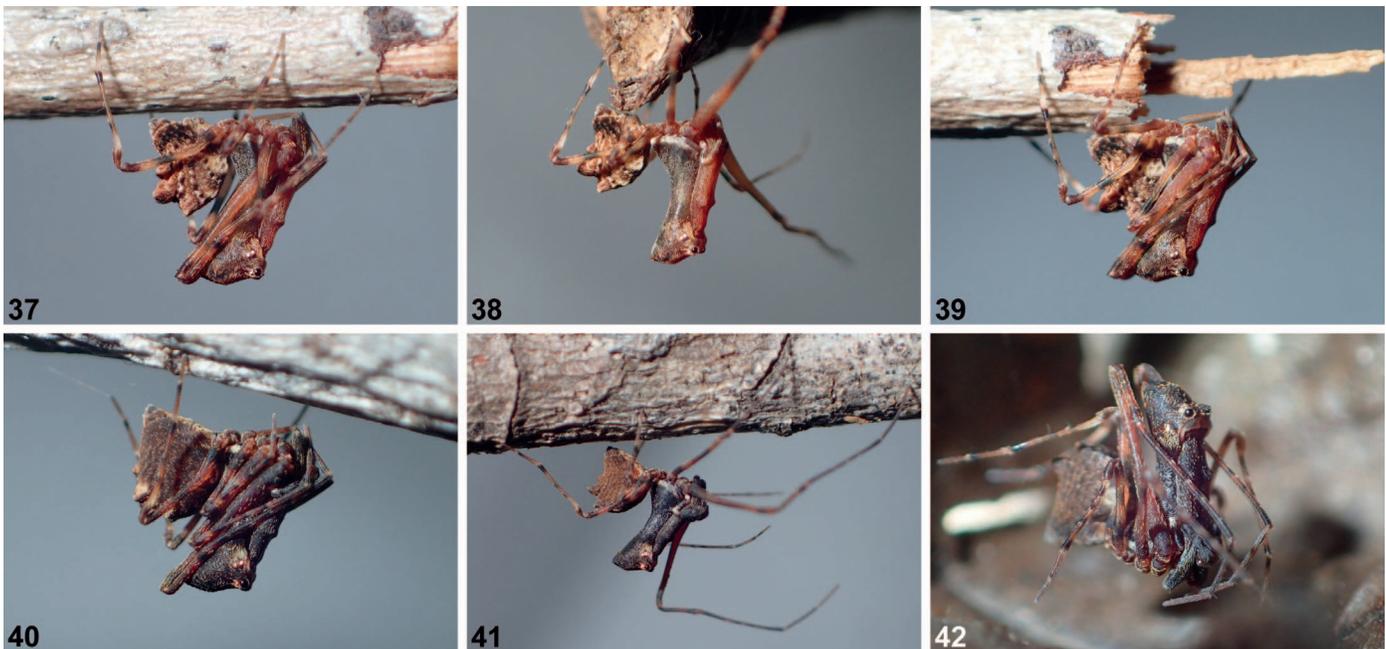
Austrarchaea aleenae Rix & Harvey, 2011
Bulburin Pelican Spider
(Figs. 1, 36–42)

Austrarchaea aleenae Rix & Harvey, 2011: 33, figs. 5G, 7B, 8B, 17A–G.

New material examined.—AUSTRALIA: *Queensland*: 1 ♂, Bulburin National Park, off Bobby Range Road, 24°32'48"S, 151°32'43"E, 618 m, 3 November 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin, M. Laidlaw, T. Churchill (QMB S119166); 1 ♂, same data except 24°32'46"S, 151°32'43"E, 622 m, 5 November 2020, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119177); 1 juvenile, same data except 24°32'42"S, 151°32'43"E, 619 m (QMB S119178); 1 ♂, Bulburin National Park, off Dawes Range Road, 24°35'52"S, 151°30'39"E, 639 m, 4 November 2020, hand collected from suspended leaf litter, rainforest (moderately burnt notophyll vine forest; 20 m from unburnt rainforest), M. Rix, C. Burwell, C. Lambkin, M. Laidlaw, T. Churchill (QMB S119167); 1 ♂, same data except 24°35'53"S, 151°30'40"E, 635

m, rainforest (notophyll vine forest) (QMB S119168); 1 juvenile, same data except 24°35'58"S, 151°30'50"E, 679 m (QMB S119169); 1 juvenile, same data except 24°35'59"S, 151°30'49"E, 663 m (QMB S119170); 1 juvenile, same data except 24°35'59"S, 151°30'51"E, 673 m (QMB S119171); 1 juvenile, same data except 24°35'58"S, 151°30'51"E, 670 m (QMB S119172); 1 juvenile, same data (QMB S119173); 1 juvenile, same data (QMB S119174); 1 juvenile, same data except 24°36'43"S, 151°32'12"E, 595 m, rainforest (severely burnt notophyll vine forest; 20 m from unburnt/low burn rainforest) (QMB S119175); 1 ♂, same data except 24°36'43"S, 151°32'11"E, 625 m, rainforest (notophyll vine forest; in unburnt patch within low burn area adjacent to severely burnt site) (QMB S119176); 1 juvenile, same data except 24°36'50"S, 151°32'14"E, 609 m, 6 November 2020, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119179); 1 juvenile, same data except 24°36'58"S, 151°32'22"E, 583 m (QMB S119180); 1 juvenile, same data except 24°35'59"S, 151°30'44"E, 682 m (QMB S119181); 1 ♀, same data except 24°34'58"S, 151°30'30"E, 677 m (QMB S119182); 1 juvenile, same data except 24°33'55"S, 151°29'27"E, 647 m (QMB S119183); 1 juvenile, Bulburin National Park, off Scott Road-Cabbage Tree Road, 24°31'11.47"S, 151°30'19.75"E, 443 m, 7 November 2020, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119184).

Distribution and remarks.—*Austrarchaea aleenae* is currently known only from Mount Fort William and Bulburin National Park, both south-west of Miriam Vale (Fig. 36). However, significant new populations of this species were discovered throughout Bulburin National Park during dedicated survey work conducted after the 2019–20 summer



Figures 37–42.—Live habitus images of *Austrarchaea aleenae* Rix & Harvey, 2011: 37–39, female from Bulburin National Park (QMB S119182); 40, male from Bulburin National Park (QMB S119167); 41, male from Bulburin National Park (QMB S119177), 42, male from Bulburin National Park (QMB S119168). Images by M. Rix.

bushfires, and the spiders are now known to occur on both the Bobby and Dawes Ranges in upland rainforest.

Austrarchaea davidi Rix, sp. nov.

Gympie Hinterland Pelican Spider

<http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:99773EBB-A9BB-47BD-8F2A-9BAAA4DC504E>

(Figs. 1, 36, 43–55)

Type material.—*Holotype male*. AUSTRALIA: *Queensland*: Woondum National Park, off Hill Road, 26°15'43"S, 152°48'59"E, 310 m, 13 January 2021, hand collected from suspended leaf litter, mixed rainforest and wet sclerophyll, M. & A. Rix (QMB S119223^{DNA}).

Paratypes. AUSTRALIA: *Queensland*: 1 ♀, same data as holotype except 26°15'48"S, 152°48'40"E, 285 m, 5 January 2021, M., A. & D. Rix (QMB S119208^{DNA}); 1 ♀, same data (QMB S119209^{DNA}); 1 juvenile, same data except 26°15'42"S, 152°48'58"E, 300 m, 13 January 2021, M. & A. Rix (QMB S119220); 1 juvenile, same data except 26°15'42"S, 152°48'59"E, 319 m (QMB S119221); 1 juvenile, same data except 312 m (QMB S119222).

Other material examined.—AUSTRALIA: *Queensland*: 1 ♂, Goomborian National Park, near Coes Creek, 26°08'15"S, 152°46'48"E, 89 m, 5 January 2021 [NB. reared to maturity on 2 February 2021], hand collected from suspended leaf litter, rainforest (notophyll vine forest), M., A. & D. Rix (QMB S119210); 1 juvenile, same data (QMB S119211^{DNA}).

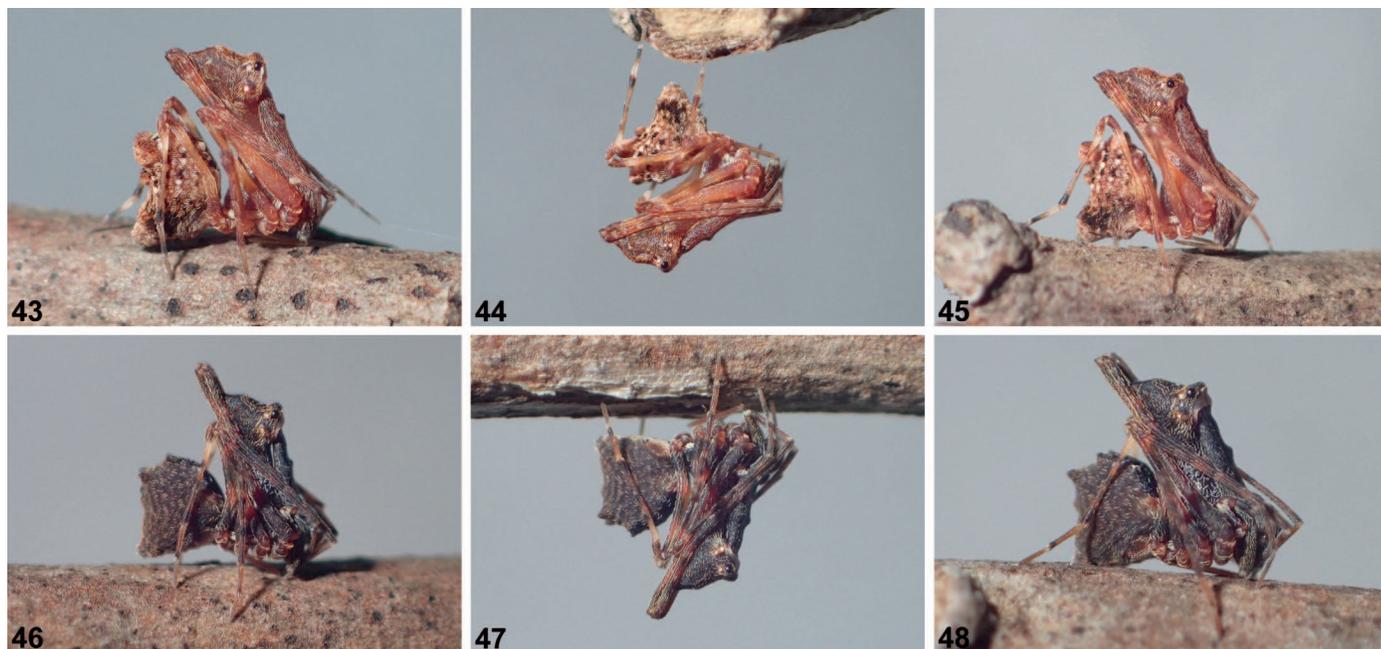
Etymology.—The specific epithet is named in honor of the senior author's son, David Rix, for helping to discover this species in January 2021.

Diagnosis.—*Austrarchaea davidi* can be distinguished from all other Archaeidae from mid-eastern Australia, except *A. judyae*, by the small body size (carapace length of ♂♂ ≤ 0.95; of ♀♀ ≤ 1.10) yet very high carapace height to carapace

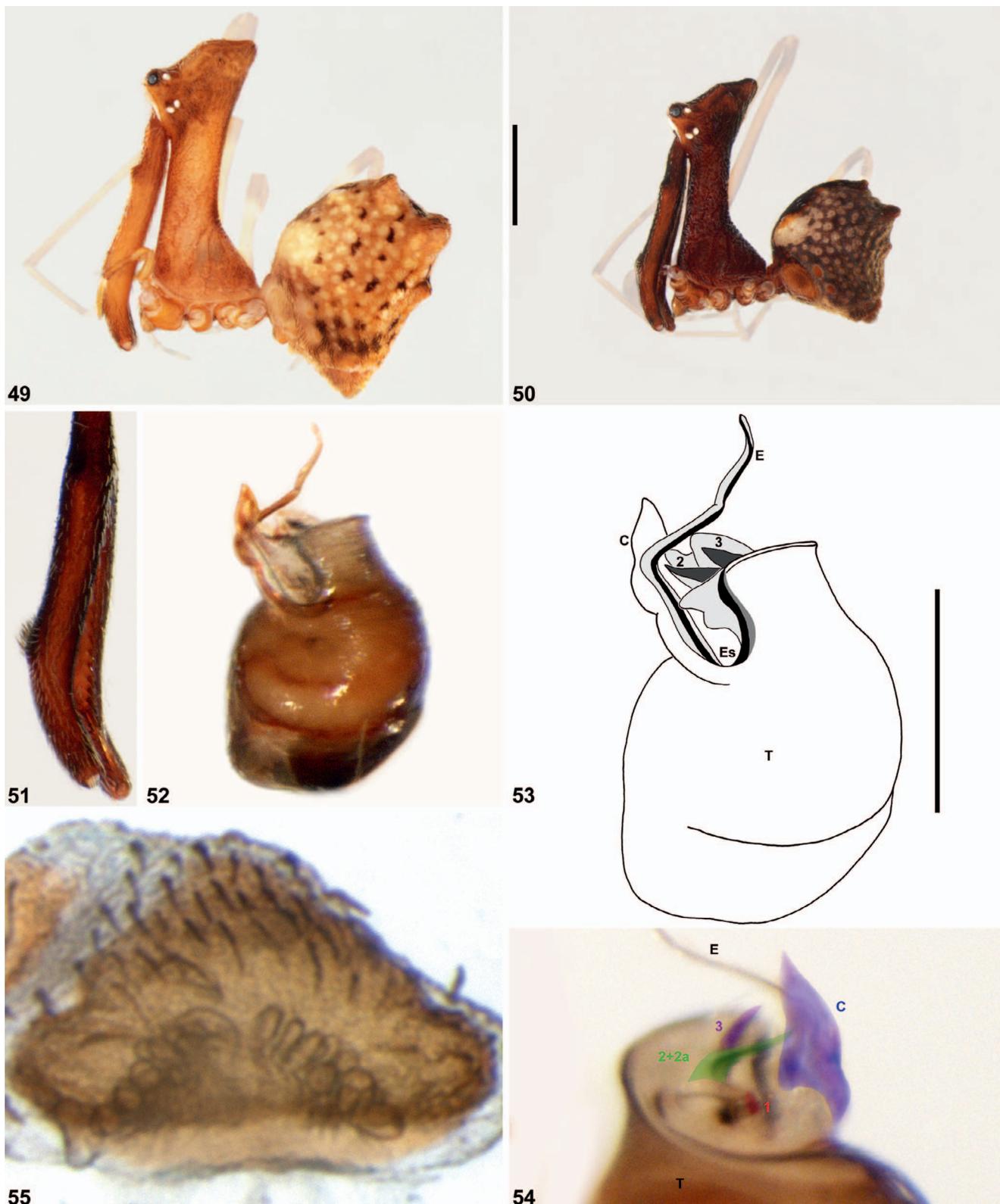
length (CH/CL) ratio (of ♂♂ ≥ 2.37; of ♀♀ ≥ 2.30) (see Rix & Harvey 2011, fig. 6). This species can further be distinguished from *A. judyae*, to which it is closely related (Fig. 1), by the unique shape of the conductor, which is 'shovel-shaped', with a shallower lateral incision (Fig. 53; cf. Rix & Harvey 2011, fig. 15E); and by the shape of tegular sclerite 1 (TS 1), which is shorter and spur-like (Fig. 54; cf. Rix & Harvey 2011, fig. 15F).

Description (male holotype).—Total length 2.09. Cephalothorax dark reddish-brown; legs tan-brown with darker annulations; abdomen mottled brown and beige-brown, with darker reddish-brown dorsal scute and sclerites (Fig. 50). Carapace very tall (CH/CL ratio 2.38); 0.89 long, 2.12 high; 'neck' 0.41 wide; bearing two pairs of rudimentary horns; highest point of pars cephalica (HPC) near posterior margin of 'head' (ratio of HPC to post-ocular length 0.90), carapace slightly concave anterior to HPC; 'head' strongly elevated postero-dorsally (post-ocular ratio 0.41). Chelicerae with short brush of accessory setae on anterior face of paturon (Fig. 51). Abdomen 1.20 long, 1.35 high; with three pairs of dorsal hump-like tubercles (HT 1–6); dorsal scute fused anteriorly to epigastric sclerites, extending posteriorly to first pair of hump-like tubercles; HT 3–6 each covered by separate dorsal sclerites. Unexpanded pedipalp (Figs. 52–54) with laterally slightly incised, 'shovel-shaped' conductor; tegular sclerite 1 (TS 1) short, spur-like, obscured by conductor in retrolateral view; TS 2+2a (equivalent to secondary embolus [E*]) spini-form, much longer than TS 1, visible in retrolateral view; TS 3 embedded proximally within distal hematodocha, with pointed apex projecting beyond retro-distal rim of tegulum.

Description (female paratype QMB S119208).—Total length 2.67. Cephalothorax reddish-brown; legs pale tan-brown with darker annulations; abdomen mottled red-brown and beige (Fig. 49). Carapace very tall (CH/CL ratio 2.44); 1.08 long,



Figures 43–48.—Live habitus images of *Austrarchaea davidi* sp. nov.: 43–45, female from Woondum National Park (QMB S119208); 46–48, male from Woondum National Park (QMB S119223). Images by M. Rix.



Figures 49–55.—*Austrarchaea davidi* sp. nov.: 49, allotype female (QMB S119208) cephalothorax and abdomen, lateral view; 50, holotype male (QMB S119223) cephalothorax and abdomen, lateral view; 51, holotype male chelicerae, lateral view (right side, flipped horizontal for comparison); 52, 53, holotype male left palpal bulb, retrolateral view; 54, detail of distal tegular sclerites embedded within hematodochal membranes, prodistal view, with sclerite positions color-highlighted; 55, allotype female internal genitalia, dorsal view, showing genital plate and clustered spermathecae. Abbreviations: C, conductor; E, primary embolus; Es, primary embolic sclerite; T, tegulum; (TS)1–3, tegular sclerites 1–3. Scale bars 49, 50 = 1.0 mm; 53 = 0.2 mm.

2.63 high; ‘neck’ 0.51 wide; bearing two pairs of rudimentary horns; dual highest points of pars cephalica (HPC1–2) near posterior third of ‘head’ (ratio of HPC1 to post-ocular length 0.64) and near posterior margin of ‘head’ (ratio of HPC2 to post-ocular length 0.91), carapace slightly concave between HPC1 and HPC2; ‘head’ strongly elevated postero-dorsally (post-ocular ratio 0.38). Chelicerae without accessory setae on anterior face of paturon. Abdomen 1.59 long, 2.02 high; with three pairs of dorsal hump-like tubercles (HT 1–6). Internal genitalia with dense cluster of ≤ 15 variably shaped spermathecae on either side of gonopore, clusters meeting near midline of genital plate (Fig. 55); innermost (anterior) spermathecae longest, sausage-shaped, curved antero-laterally; outermost (posterior) spermathecae bulbous; other spermathecae variably pyriform, directed antero-laterally.

Distribution and remarks.—*Austrarchaea davidi* is a recently discovered species which is currently known only from the Woondum and Goomboorian National Parks, east of Gympie (Fig. 36).

Austrarchaea harmsi Rix & Harvey, 2011
 Bunya Mountains Pelican Spider
 (Figs. 1, 36, 56–61)

Austrarchaea harmsi Rix & Harvey, 2011: 31, figs. 7E, 8E, 16A–G.

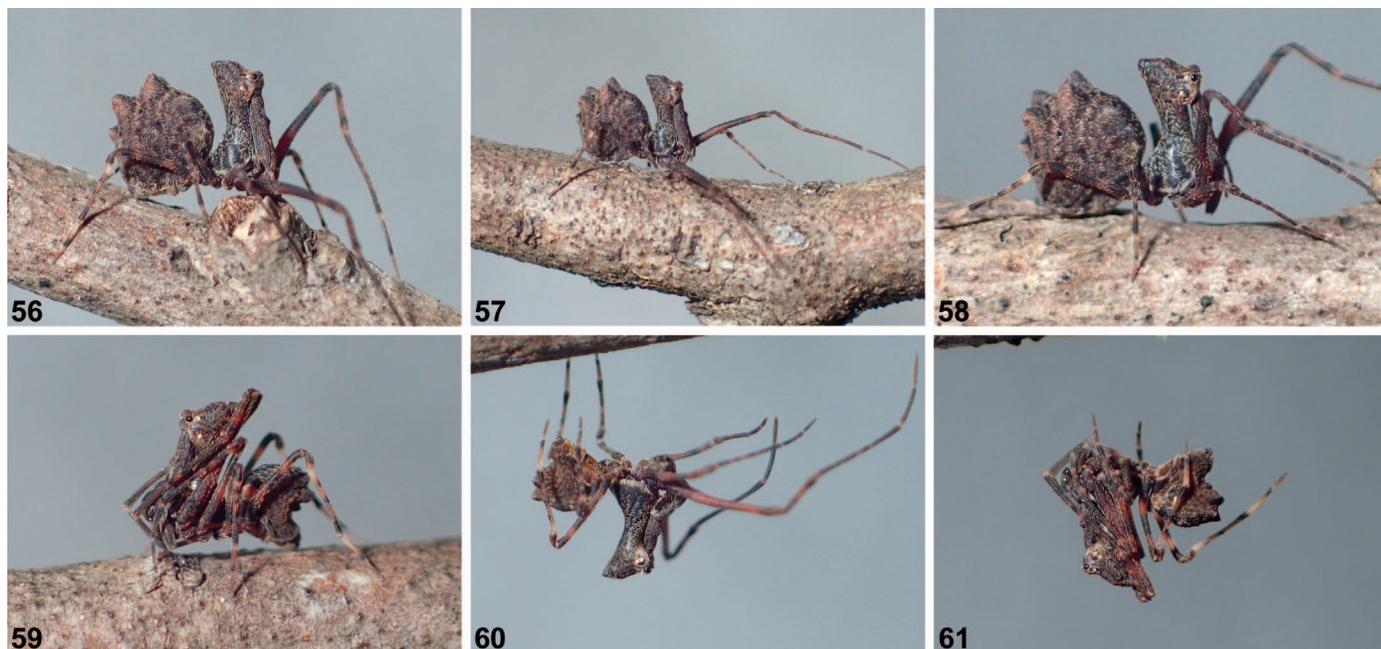
New material examined.—AUSTRALIA: *Queensland*: 1 ♀, Bunya Mountains National Park, off Bunya Mountains Road, 26°53′39″S, 151°36′48″E, 1019 m, 31 December 2020, hand collected from suspended leaf litter, rainforest (Araucarian notophyll vine forest), M. & A. Rix (QMB S119201); 1 ♂, same data except 26°52′44″S, 151°35′15″E, 1040 m (QMB S119202); 1 juvenile, same data except 26°51′25″S, 151°34′10″E, 1076 m (QMB S119203).

Distribution and remarks.—*Austrarchaea harmsi* is currently known only from the Bunya Mountains National Park, north-east of Dalby (Fig. 36).

Austrarchaea judyae Rix & Harvey, 2011
 Sunshine Hinterland Pelican Spider
 (Figs. 1, 36, 62–67)

Austrarchaea judyae Rix & Harvey, 2011: 29, figs. 4F–G, 5A–C, 7C, 8C, 15A–G.

New material examined.—AUSTRALIA: *Queensland*: 1 ♂, Bellthorpe National Park, Branch Creek, 26°51′47″S, 152°41′23″E, 455 m, 22 October 2021, hand collected from suspended leaf litter, riparian rainforest with *Eucalyptus grandis*, M. Rix, C. Burwell (QMB S119241); 1 ♂, same data (QMB S119242); 1 juvenile, Bellthorpe National Park, near Stony Creek Day Use Area, 26°52′44″S, 152°43′52″E, 173 m, 22 October 2021, hand collected from suspended leaf litter, riparian rainforest, M. Rix, C. Burwell (QMB S119243); 1 juvenile, Glens Road, Maleny, 26°45′50″S, 152°53′25″E, 438 m, 12 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix (QMB S119212^{DNA}); 1 ♂, Kondalilla Falls National Park, off track to falls, 26°40′21″S, 152°52′05″E, 350 m, 12 January 2021, hand collected from suspended leaf litter, mixed rainforest and wet sclerophyll, M. Rix (QMB S119216); 1 juvenile, Kondalilla National Park, N. of Lake Baroon, 26°41′52″S, 152°52′07″E, 217 m, 12 January 2021, hand collected from suspended leaf litter, mixed rainforest and wet sclerophyll, M. Rix (QMB S119213); 1 juvenile, same data except 26°41′52″S, 152°52′08″E, 215 m (QMB S119214); 1 juvenile, same data except 26°41′51″S, 152°52′07″E, 225 m (QMB S119215); 1 juvenile, Kondalilla National Park, Sunshine Coast Hinterland Great Walk, off Flaxton Mill Road, 26°39′37″S,



Figures 56–61.—Live habitus images of *Austrarchaea harmsi* Rix & Harvey, 2011: 56–58, female from Bunya Mountains National Park (QMB S119201); 59–61, male from Bunya Mountains National Park (QMB S119202). Images by M. Rix.



Figures 62–67.—Live habitus images of *Austrarchaea judyae* Rix & Harvey, 2011: 62–64, female from Kondalilla National Park (QMB S119219); 65, male from Bellthorpe National Park (QMB S119241); 66, male from Mary Cairncross Scenic Reserve (QMB S119238); 67, male from Kondalilla Falls National Park (QMB S119216). Images by M. Rix.

152°51'58"E, 388 m, 12 January 2021, hand collected from suspended leaf litter, rainforest (notophyll vine forest), M. Rix (QMB S119217); 1 ♂, same data except 26°39'36"S, 152°51'58"E, 401 m (QMB S119218^{DNA}); 1 ♀, same data except 26°39'35"S, 152°51'58"E, 377 m (QMB S119219); 1 ♂, Mary Cairncross Scenic Reserve, site C6, 26°46'48"S, 152°52'55"E, 440 m, 16 October 2021, hand collected at night near buttress of large tree, rainforest (complex notophyll vine forest), M. Rix, C. Burwell (QMB S119240); 1 ♀, same locality data except near site C6, 26°46'48"S, 152°52'56"E, 446 m, 16 October 2021, hand collected from suspended leaf litter, rainforest (complex notophyll vine forest), M. Rix, C. Burwell, C. Lambkin (QMB S119237); 1 ♂, same data except near site E5, 26°46'40"S, 152°53'05"E, 438 m, *Eucalyptus robusta* with piccabeen palm understory (QMB S119238); 1 ♀, same data except near site C3, 26°46'33"S, 152°52'48"E, 385 m, 17 October 2021, rainforest (piccabeen palm gallery rainforest along drainage line) (QMB S119239).

Distribution and remarks.—*Austrarchaea judyae* is currently known from a number of localities around the Sunshine Coast Hinterland, on both the Conondale and Blackall Ranges and at Bellthorpe National Park (Fig. 36).

Austrarchaea raveni Rix & Harvey, 2011
D'Aguilar Range Pelican Spider
(Figs. 1, 36)

Austrarchaea raveni Rix & Harvey, 2011: 27, figs. 1E–F, 7D, 8D, 14A–G.

New material examined.—None.

Distribution and remarks.—*Austrarchaea raveni* is a rare species, currently known only from the D'Aguilar Range

north of Brisbane, with a distribution extending from Mount Nebo north to Mount Mee (Fig. 36).

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SUPPLEMENTAL MATERIALS

Supplementary file S1—New GenBank data, online at <https://doi.org/10.1636/JoA-S-21-071.s1>

Supplementary file S2—Nexus file of aligned mitochondrial sequence data with Bayesian analysis command block, online at <https://doi.org/10.1636/JoA-S-21-071.s2>

Supplementary file S3—Phylogeny inferred from Bayesian analysis of the mitochondrial sequence data, online at <https://doi.org/10.1636/JoA-S-21-071.s3>

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