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## Research article

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# Description of five new *Aname* L. Koch, 1873 (Araneae, Anamidae) species collected on Bush Blitz expeditions

Jeremy Dean WILSON<sup>1,\*</sup>, Michael Gordon RIX<sup>2</sup> & Mark Stephen HARVEY<sup>3</sup>

<sup>1,2</sup>Biodiversity and Geosciences Program, Queensland Museum Collections and Research Centre, Hendra, Queensland 4011, Australia.

<sup>1,2,3</sup>Collections and Research, Western Australian Museum, 49 Kew Street, Welshpool, Western Australia 6106, Australia.

<sup>1,3</sup>School of Biological Sciences, University of Western Australia, Crawley, Western Australia 6009, Australia.

\*Corresponding author: [jeremydwilson91@gmail.com](mailto:jeremydwilson91@gmail.com)

<sup>2</sup>Email: [michael.rix@qm.qld.gov.au](mailto:michael.rix@qm.qld.gov.au)

<sup>3</sup>Email: [mark.harvey@museum.wa.gov.au](mailto:mark.harvey@museum.wa.gov.au)

<sup>1</sup>urn:lsid:zoobank.org:author:4DC424BA-5662-4EF0-BAE9-2147953BDF57

<sup>2</sup>urn:lsid:zoobank.org:author:B7D4764D-B9C9-4496-A2DE-C4D16561C3B3

<sup>3</sup>urn:lsid:zoobank.org:author:FF5EBAF3-86E8-4B99-BE2E-A61E44AAEC2C

**Abstract.** *Aname* L. Koch, 1873 is an incredibly diverse genus of mygalomorph spiders endemic to Australia, occurring from coast to coast in tropical, semi-arid and arid bioregions. They are relatively gracile mygalomorph spiders that build open burrows, sometimes with a secondary entrance that functions as an escape chute. The genus currently contains 48 species, but the true diversity is likely to be closer to 200 species. Here we describe five new species (*A. ningaloo* sp. nov., *A. salina* sp. nov., *A. tatarnici* sp. nov., *A. tenuipes* sp. nov. and *A. wongalara* sp. nov.), primarily based on specimens collected on Bush Blitz expeditions in Western Australia (Cape Range, 2019), South Australia (Great Victoria Desert, 2017) and the Northern Territory (Wongalara, 2012). We complement these descriptions with a molecular phylogenetic analysis to place all new species into an existing phylogenetic framework.

**Keywords.** Australian Biological Resources Study, integrative taxonomy, Nemesioidina, trapdoor spider, wishbone spider.

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## Introduction

*Aname* L. Koch, 1873 is an incredibly diverse mygalomorph spider genus endemic to Australia, occurring from coast to coast in tropical, semi-arid and arid bioregions. Spiders in the genus are quite gracile and

come in a range of sizes and colours, and many are beautiful, with bi-coloured bodies and legs, and silver or golden reflective setae on the carapace (e.g., see Figs 1, 7). The genus previously belonged to the family Nemesiidae Simon, 1892, however recent phylogenetic analyses led to the recognition of the Australian endemic family Anamidae Simon, 1889, which contains *Aname* and most other Australian ‘nemesiids’, and which falls within the superclade Nemesoidina (Opatova *et al.* 2020). Spiders of this superclade can generally be recognised by the combined lack of tarsal claw tufts and the presence of two rows of teeth on the tarsal claws in both males and females (Raven 1985). Anamid spiders are commonly referred to as ‘open-holed trapdoor spiders’, and like most members of this family, *Aname* construct burrows with an open entrance (Harvey *et al.* 2018). Most species of *Aname* make a Y-shaped ‘wishbone’ burrow that has a secondary ‘escape chute’ that projects from the main shaft and terminates just under the surface of the ground, through which the spider can escape from predators if required (Main 1982: fig. 1).

The genus *Aname* currently contains 48 described species (World Spider Catalog 2023). Of these, 26 were described prior to the last decade, mostly from eastern Australia (Koch 1873; Rainbow & Pulleine 1918; Raven 1985, 2000). However, several recent contributions have focused on the Western Australian fauna, complementing alpha-taxonomy with molecular phylogenetic analyses (Harvey *et al.* 2012, 2020; Castalanelli *et al.* 2020). The gradual collection of these molecular data eventually culminated in two critical publications: the first was a phylogenetic analysis and relimitation of the Australian Nemesiidae (the family which until recently included *Aname*), in which the presence of a ventral asetose depression on the pedipalpal tibia was recognized as a diagnostic morphological feature of *Aname* (Harvey *et al.* 2018). The second was a continent-wide phylogenetic and biogeographic analysis of *Aname*, which revealed the existence of eight major clades in three radiations, each of which occurs over large tracts of the continent, with areas of highest diversity where these clades overlap (Rix *et al.* 2021). These phylogenetic contributions, along with ongoing curatorial work in Australian museums, have led to a rough estimate of total diversity for the genus at 150–200 species (MSH, MGR, pers. obs.).

Since 2009, the Australian Biological Resources Study (ABRS) Bush Blitz program (<https://bushblitz.org.au>) has been conducting expeditions to understudied regions of Australia to catalogue biodiversity. Specimens of *Aname* belonging to undescribed species have been collected on several recent Bush Blitz trips (Wongalara, Northern Territory, 2012; Great Victoria Desert, South Australia, 2017; Cape Range, Western Australia, 2019) providing specimens for taxonomy and fresh material for sequencing, allowing these species to be both described and placed within the existing phylogenetic framework for the genus (Fig. 1). Here, we describe five new species using specimens collected on Bush Blitz expeditions, and include a phylogenetic analysis using a combination of existing and new sequence data to infer their phylogenetic positions. This project represents a contribution to Taxonomy Australia (2020), a national initiative organised under the auspices of the Australian Academy of Science that brings together the taxonomic community to develop approaches that will significantly increase the rate at which new species are discovered, resolved and named, with a view to completely documenting the Australian biota within a generation.

## **Material and methods**

### **Species concept**

Herein, we employ the unifying species concept of De Queiroz (2007), forming and testing species hypotheses with multiple lines of evidence. Our primary evidence was morphological, with species hypotheses representing groups of geographically proximate specimens that share a morphological autapomorphy that allows their diagnosis. Then, when possible, we confirmed that these hypotheses represented monophyletic lineages using molecular phylogenetic methods.





was often removed and stored in 100% ethanol at -70°C for genomic DNA extraction. Digital auto-montage images were taken using a Leica M165C stereo microscope with mounted DFC425 digital camera and processed using Leica Application Suite ver. 3.7 software (Leica, Wetzlar, Germany). The left leg I and pedipalp were dissected from specimens for photography, except when the left appendage was damaged or lost, in which case the right appendage was used and the image reflected in the taxonomic plates for easy comparison. The right bulb (copulatory organ) of males was also dissected from the specimen for the two images of this structure. Plate structure is modified slightly from Harvey *et al.* (2022). Pedipalp and leg measurements and ratios were calculated using the terminology and reference points defined by Castalanelli *et al.* (2020). Species are treated in alphabetical order. When listing material, coordinates are rounded to the nearest minute, to prevent providing exact coordinates that could be used for poaching. The following abbreviations are used: D = dorsal; MID = metatarsus I depth (width); MIL = metatarsus I length; MIPEL = metatarsus I proximal excavation length; PDL = pedipalpal depression length; PL = prolateral; PTL = pedipalpal tibia length; RL = retrolateral; TID = tibia I depth (width); TIL = tibia I length; TIS = tibia I length to spur; TISH = tibia I spur height; V = ventral.

### Molecular phylogenetics

The sequencing dataset used in this study consists of the complete multi-locus dataset published previously for *Aname* (see Rix *et al.* 2021), augmented with new sequences for some of the species described herein. Markers include three mitochondrial and four nuclear loci: cytochrome *c* oxidase subunit I (COI), 12S ribosomal RNA (12S), 16S ribosomal RNA (16S), histone H3 (H3), 18S ribosomal RNA (18S), 28S ribosomal RNA (28S), and elongation factor 1-gamma (EF-1 $\gamma$ ). New sequences (labeled in Supplementary File 1) were generated using primers and PCR conditions detailed in previous published studies of Anamidae by the authors (Harvey *et al.* 2018), in the WAM Molecular Systematics Unit. Editing of sequence chromatograms, alignment and concatenation were performed using the Geneious software package (Biomatters Ltd). Alignment was performed using the MAFFT ver. 1.3.6 plug-in in Geneious (Kato *et al.* 2002), and all sequence data are deposited in GenBank (see Supplementary File 1). The full concatenated dataset is 5067 bp and includes sequence data for 190 specimens including 24 outgroup taxa and 166 specimens of *Aname*. A phylogenetic analysis of this expanded dataset was conducted using maximum likelihood (ML), in the WIQ-TREE online interface (Nguyen *et al.* 2015; Trifinopoulos *et al.* 2016). ModelFinder (Kalyaanamoorthy *et al.* 2017) was used to choose models of DNA evolution, and the alignment was partitioned by locus, and by codon for coding genes (COI, H3, EF-1 $\gamma$ ). To assess node support, 1000 ultrafast bootstrap replicates (Minh *et al.* 2013) were implemented. The output ML tree was visualized in FigTree ver. 1.4.42 (<http://tree.bio.ed.ac.uk/software/figtree>).

## Results

### Phylogenetic analysis

The best log-likelihood score recovered in the ML analysis was -72612.334, and the recovered topology generally agreed with that recovered previously, in Rix *et al.* (2021), with some minor differences in relationships between lineages at the base of the tree (Fig. 1). However, all major clades were recovered as they were in the original analysis. The five species described in this publication (see below) were recovered as separate species-level lineages, and belong to disparate evolutionary groups covering the breadth of the *Aname* phylogeny: *Aname wongalara* sp. nov., collected on the 2012 Bush Blitz expedition to the Wongalara Sanctuary, belongs to the ‘Tropical Radiation’; *A. tatarnici* sp. nov., collected on the 2017 Great Victoria Desert expedition, is the sister species to the eastern *pallida* group (Clade 3); *A. tenuipes* sp. nov. (2017 Great Victoria Desert expedition) was recovered in the *pulchella* group (Clade 5); *A. ningaloo* sp. nov. (2019 Cape Range expedition) in the *mellosa* group (Clade 8); and *A. salina* sp. nov. (2019 Cape Range expedition) in the *mainae* group (Clade 7) (Figs 1–2).



### **Taxonomy**

Class Arachnida Cuvier, 1812  
Order Araneae Clerck, 1757  
Family Anamidae Simon, 1889  
Subfamily Anaminae Simon, 1889

Genus *Aname* L. Koch, 1873

### **Type species**

*Aname pallida* L. Koch, 1873, by monotypy.

### **Diagnosis**

See Harvey *et al.* (2018).

### **Description**

See Harvey *et al.* (2018).

### *Aname ningaloo* sp. nov.

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Figs 1–3

### **Diagnosis**

Males of *A. ningaloo* sp. nov. are currently unknown. Females can be distinguished from all other described species of *Aname* by their genitalia: each spermatheca is divided into two clearly demarcated, short vesicles. The only other species with similar genitalia is *A. watsoni* Castalanelli, Framenau, Huey, Hillyer & Harvey, 2020; however *A. ningaloo* can be distinguished from this species by the much shorter outer vesicles (Fig. 3L; cf. Castalanelli *et al.* 2020: figs 146–147).

### **Etymology**

The specific epithet is a noun in apposition in reference to the type locality of this species within the Ningaloo Coast World Heritage Area, Western Australia.

### **Material examined**

#### **Holotype**

AUSTRALIA – **Western Australia** • ♀; Cape Range, [light trap site]; 21°50' S, 114°08' E; 17 Jun. 2019; P. Kay and A.L. McMahan leg.; WAM T148012.

#### **Paratype**

AUSTRALIA – **Western Australia** • 1 ♀; Cape Range, site SS2; 21°50' S, 114°08' E; 19 Jun. 2019; L.S. Umbrello leg.; WAM T148030.

### **Description**

#### **Female holotype** (WAM T148012)

**DIMENSIONS** (mm). Total body length 17.4. Carapace length 7.0, width 5.9; abdomen length 7.0, width 4.2. Leg I: femur 5.5; patella 3.7; tibia 3.8; metatarsus 3.4; tarsus 2.0.

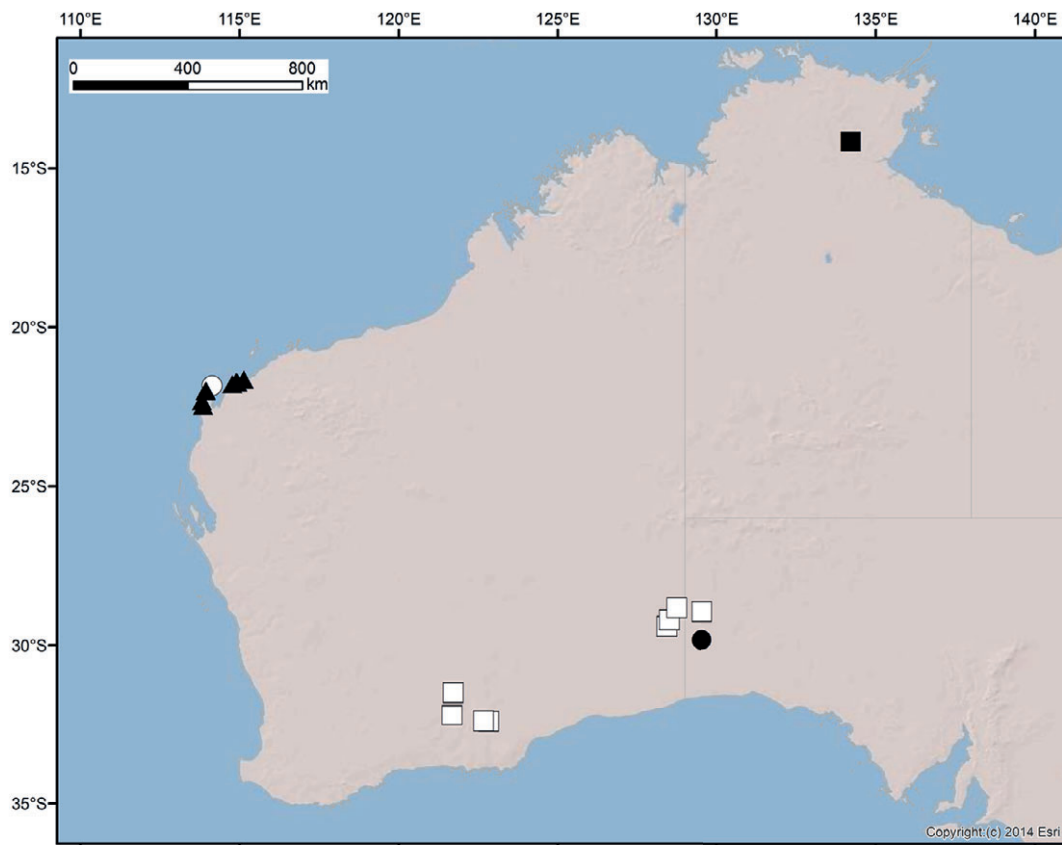
**COLOUR** (in alcohol) (Fig. 3). Carapace uniformly orange-brown; legs and ventral prosoma concolorous; chelicerae darker red-brown; abdomen entirely yellow-brown without pattern. In life carapace and legs darker, chocolate-brown (Fig. 1B)

CARAPACE, CHELICERAE, ABDOMEN (Fig. 3A–F). Carapace  $1.18 \times$  longer than broad; virtually glabrous; clypeal edge slightly convex; fovea slightly procurved. Eye group rectangular (width/length 2.06), on distinct tubercle. Chelicerae with small rastellum. Abdomen  $1.65 \times$  longer than wide, lightly pilose.

MOUTHPARTS AND STERNUM (Fig. 3G–I). Labium width/length 2.17, without cuspules. Left maxilla with 140–150 cuspules, spread laterally on inner 50% of maxilla. Coxae without cuspules. Sternum length/width 1.15; with setae over entire surface; with 3 pairs of sigilla, each pair increasing in size from anterior to posterior; all pairs close to sternum margin; posterior pair elongate.

LEG I (Fig. 3J–K). Spination, femur 2 dorsal bristles, patella 2 (2PL), tibia 8 (3PL, 1V and 4RL), metatarsus 6 (3PL, 3RL), tarsus 0, total 18; metatarsus length/width 4.36; scopulae present on tarsus and metatarsus.

GENITALIA (Fig. 3L). Each spermatheca with two strongly sclerotised sections, presumably two vesicles. The inner vesicle is short and circular. The outer vesicle is short (about as long as wide) and globular.



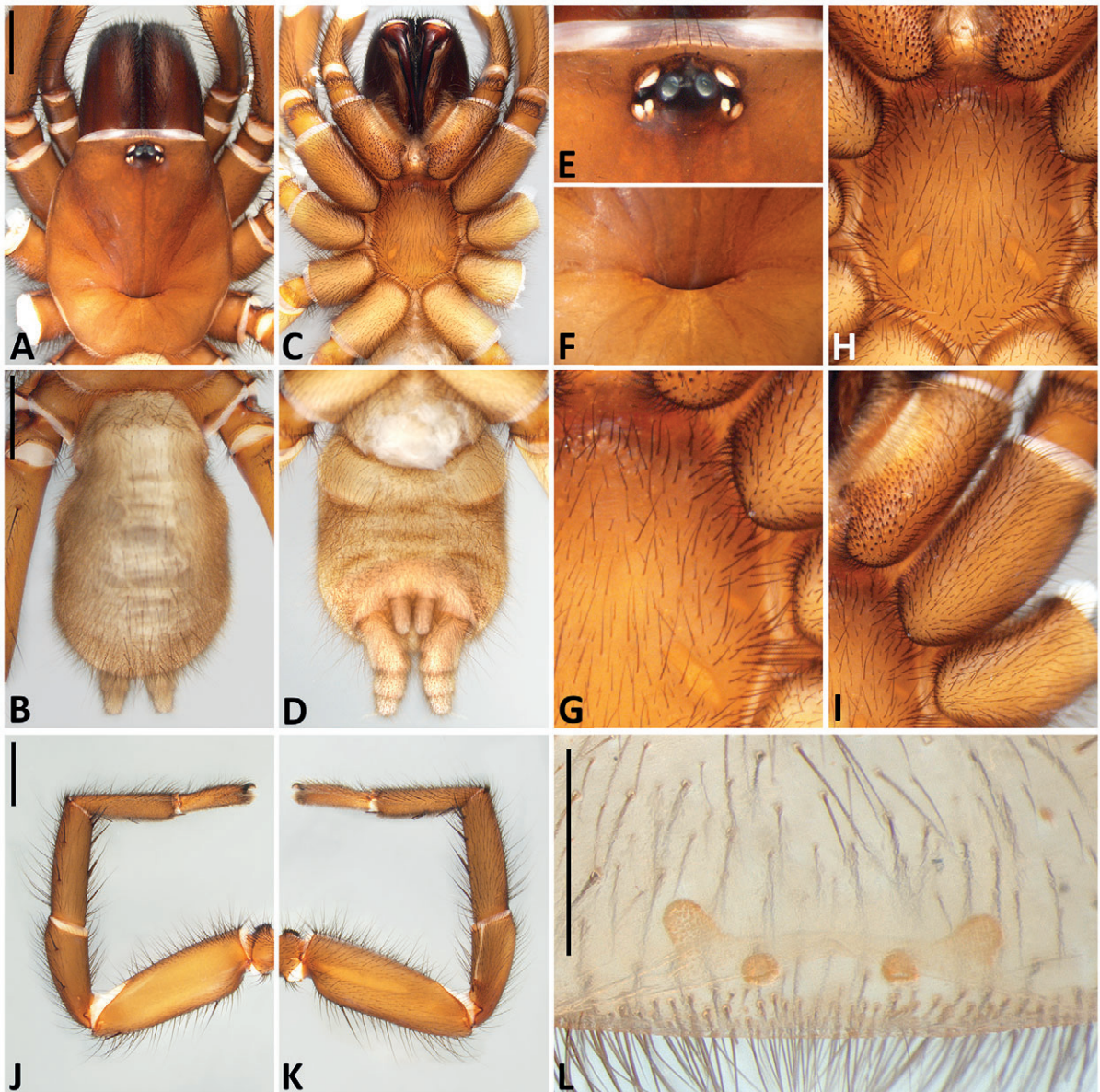
**Fig. 2.** Distribution map of the five species of *Aname* L. Koch, 1873 described herein: empty circle = *A. ningaloo* sp. nov.; solid triangles = *A. salina* sp. nov.; solid circle = *A. tatarnici* sp. nov.; empty squares = *A. tenuipes* sp. nov.; solid square = *A. wongalara* sp. nov.

**Remarks**

This species was previously known under the code name *Aname* ‘MYG728’. It is a member of the *mellosa* group (Clade 8) sensu Rix *et al.* (2021) (Fig. 1).

**Distribution and natural history**

*Aname ningaloo* sp. nov. is only known from the Cape Range, with the habitat in this area dominated by spinifex grasslands on limestone hills, and coastal sandplains (Fig. 2).



**Fig. 3.** *Aname ningaloo* sp. nov., holotype, ♀ (WAM T148012). **A.** Cephalothorax, dorsal view. **B.** Abdomen, dorsal view. **C.** Cephalothorax, ventral view. **D.** Abdomen, ventral view. **E.** Ocular region. **F.** Fovea. **G.** Sternal sigilla, left view. **H.** Sternum and labium. **I.** Maxillae and coxae I–II, left. **J.** Left leg I, prolateral view. **K.** Left leg I, retrolateral view. **L.** Internal genitalia, dorsal view. Scale bars: A–D, J–K = 2 mm; L = 0.5 mm.



*Aname salina* sp. nov.

urn:lsid:zoobank.org:act:0C1B6CB6-2BEF-4204-82C4-1E9A7B1E67EA

Figs 1–2, 4–5

### Diagnosis

Males of *A. salina* sp. nov. can be distinguished from those of other *Aname* except members of the *mainae* group (see below) by the combination of highly elongate posterior sigilla (Fig. 4G), abdominal chevrons or pattern (more conspicuous in ethanol than in life, see Figs 1C–D, 4B) and the shape of metatarsus I, which has a short proximal excavation and a relatively long and elongate distal section with a straight or concave ventral edge (Fig. 4Q). They can be distinguished from those of other members of the *mainae* group as follows: from *A. lorica* Castalanelli, Framenau, Huey, Hillyer & Harvey, 2020 by the more elongate embolus and more elongate asetose depression on the pedipalpal tibia (PDL/PTL 0.65 cf. 0.60) (Fig. 4K–M; cf. Castalanelli *et al.* 2020: fig. 55); from *A. aragog* Harvey, Framenau, Wojcieszek, Rix & Harvey, 2012 and *A. mcleeryorum* Harvey & Huey, 2020 by their much more elongate embolus (Fig. 4L–M; cf. Harvey *et al.* 2012: figs 32–33; Harvey *et al.* 2020: fig. 73); from *A. exulans* Harvey & Huey, 2020 by the embolus, which is clearly demarcated from the bulb (Fig. 4L–M; cf. Harvey *et al.* 2020: fig. 15); and from *A. mainae* Raven, 2000 by the longer asetose depression on the pedipalpal tibia (Fig. 4K; cf. Main 1982: fig. 2B).

Females of *A. salina* sp. nov. can be distinguished from all those of other species of *Aname* by their spermathecae, which consist of single, elongate vesicles with several articulations, and tiny accessory vesicles near the base. Only *A. lorica* possesses a similar conformation, but in *A. salina* the primary vesicles are more elongate (Fig. 5L; cf. Castalanelli *et al.* 2020: figs 60–61). Like in males, females of *mainae* group species (including *A. salina*) also generally have highly elongate posterior sigilla and faint abdominal chevrons (Figs 1C, 5B, G).

### Etymology

The species epithet refers to the coastal distribution of this species (*'salina'*, Latin, for 'salt', 'salty') (Brown 1956).

### Material examined

#### Holotype

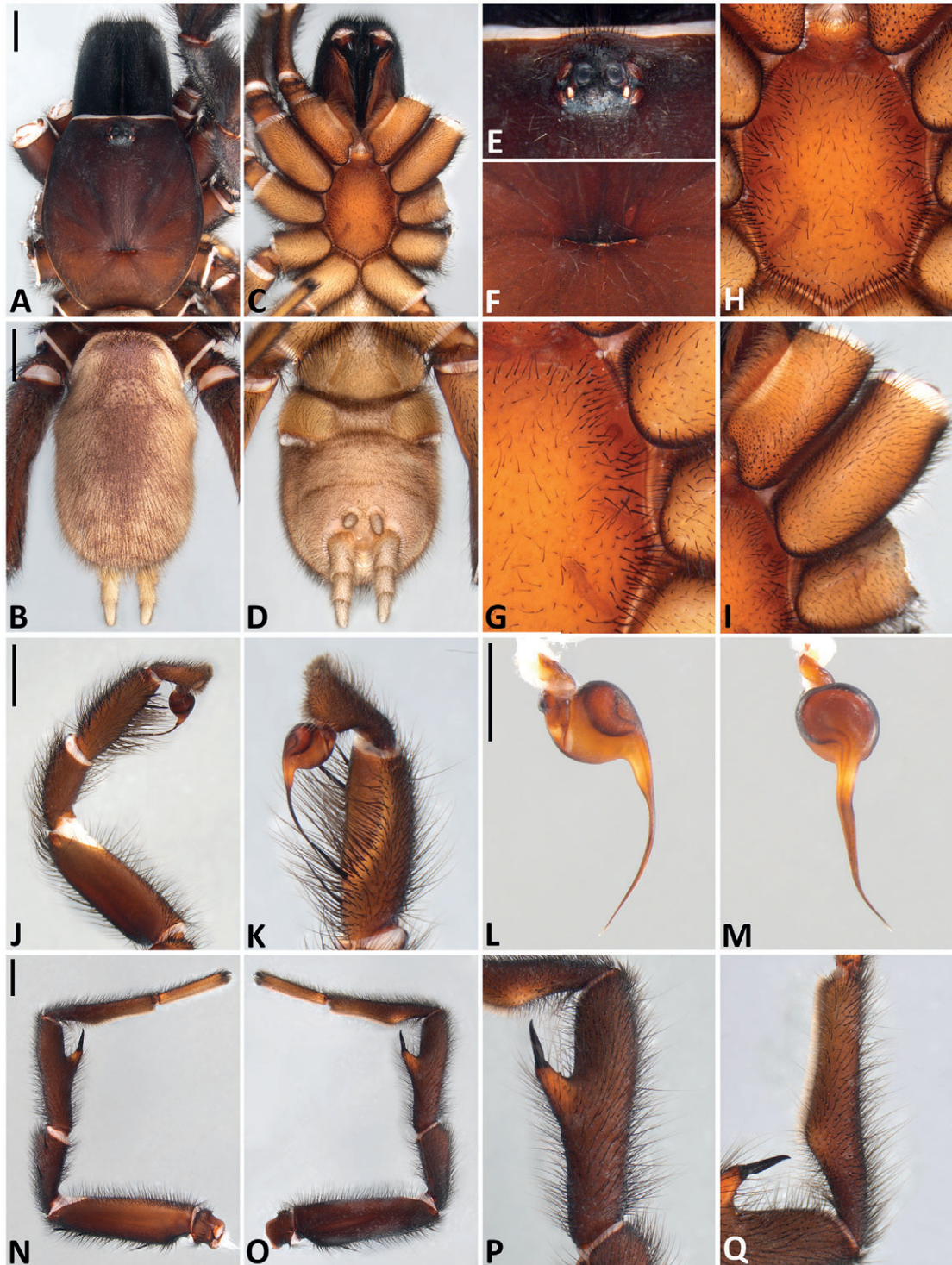
AUSTRALIA – **Western Australia** • ♂; Ashburton Salt, ca 25.2 km WSW of Onslow; 21°43' S, 114°53' E; 12 Apr. 2019; D. Kamien and M. Greenham leg.; WAM T148204.

#### Paratypes

AUSTRALIA – **Western Australia** • 1 ♂; Ashburton Salt, ca 2 km ESE of Onslow; 21°39' S, 115°08' E; 11 Apr. 2019; P. Brooshooft and M. Greenham leg.; WAM T148195 • 1 ♂; Ashburton Salt, ca 22 km WSW. of Onslow; 21°44' S, 114°56' E; 15 Apr. 2019; J. Keen and M. Greenham leg.; WAM T148216 • 1 ♀; Ashburton Salt, ca 25.2 km WSW of Onslow; 21°43' S, 114°53' E; 12 Apr. 2019; M. Greenham and D. Kamien leg.; WAM T148205 • 1 ♂; Ashburton Salt, ca 39 km SW of Onslow; 21°48' S, 114°46' E; 13 Apr. 2019; J. Keen and M. Greenham leg.; WAM T148209 • 1 ♂; Ashburton Salt, ca 39.5 km WSW of Onslow; 21°48' S, 114°46' E; 12 Apr. 2019; P. Brooshooft and M. Greenham leg.; WAM T148203 • 1 ♂; same collection data as for preceding; WAM T148202 • 1 ♂; same collection data as for preceding; 15 Apr. 2019; WAM T148217.

#### Other material examined

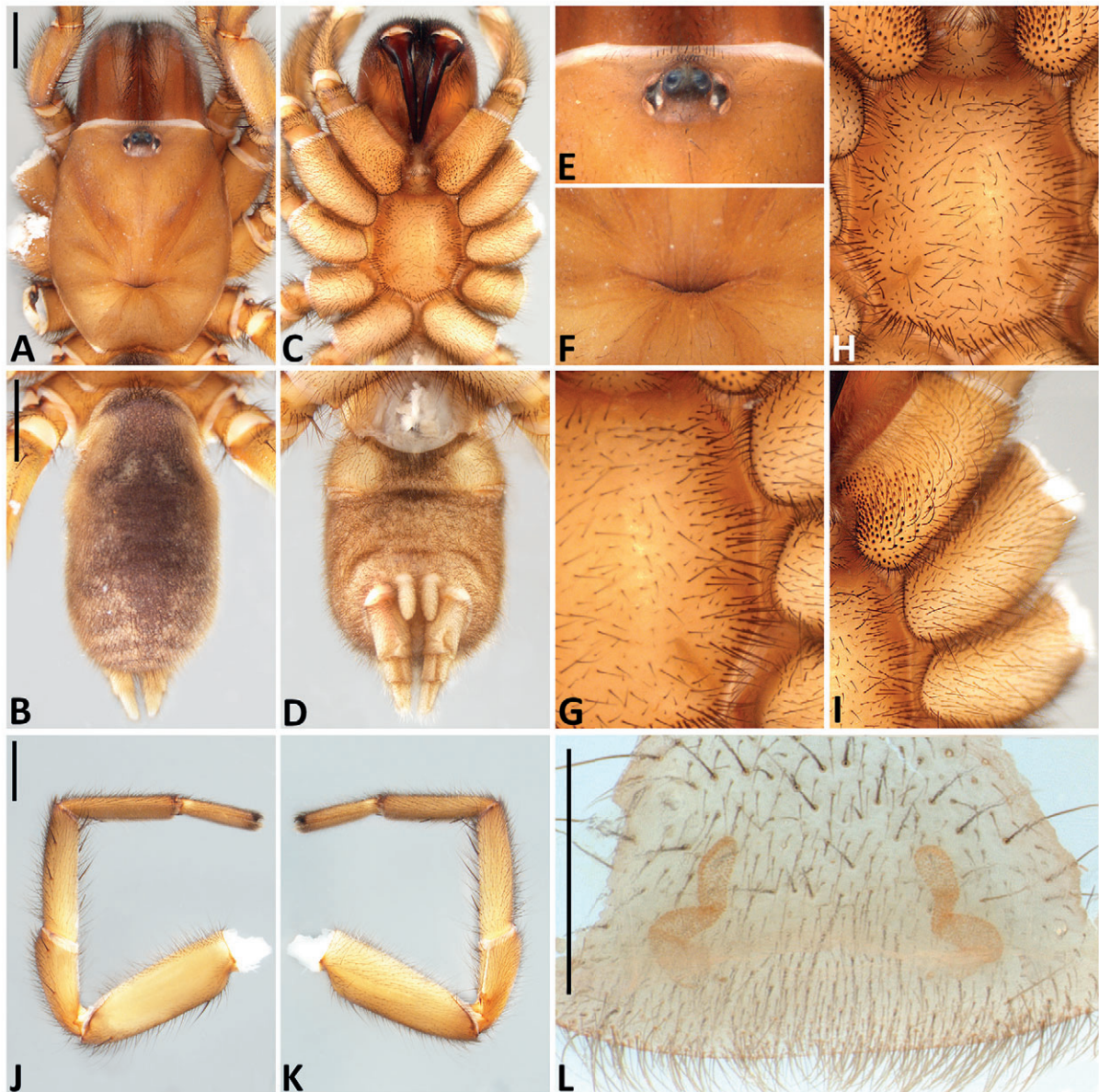
AUSTRALIA – **Western Australia** • 1 juvenile; Ashburton Salt, ca 39 km SW of Onslow; 21°48' S, 114°46' E; 3 Nov. 2018; P. Brooshooft leg.; WAM T148716 • 1 ♂; Cape Range National Park, camps; 22°01' S, 113°56' E; 7 Apr. 1998; R. Karniewicz leg.; WAM T44339 • 1 ♂; Cape Range National



**Fig. 4.** *Aname salina* sp. nov., holotype ♂ (WAMT148204). **A.** Cephalothorax, dorsal view. **B.** Abdomen, dorsal view. **C.** Cephalothorax, ventral view. **D.** Abdomen, ventral view. **E.** Ocular region. **F.** Fovea. **G.** Sternal sigilla, left view. **H.** Sternum and labium. **I.** Maxillae and coxae I–II, left view. **J–K.** Left pedipalp, full prolateral view (J), partial retrolateral view (K). **L–M.** Right bulb, ventral view (L), and retrolateral view (M). **N–Q.** Left leg I, full prolateral view (N), full retrolateral view (O), tibia retrolateral view (P), metatarsus retrolateral view (Q). Scale bars = 2 mm.



Park, Yardie Creek; 22°19' S, 113°49' E; 24 Mar. 2021; M.S. Harvey and M.E. Blossfelds leg.; WAM T153270 • 1 ♂; Cape Range National Park, Yardie Creek campground; 22°19' S, 113°49' E; 24 Mar. 2021; M.S. Harvey and M.E. Blossfelds leg.; WAM T153269 • 1 ♀; Cape Range, coastal dune site; 21°59' S, 113°56' E; 24 Jun. 2019; R.J. Ellis leg.; WAM T148135 • 1 juvenile; Cape Range, Defence Land; 22°28' S, 113°51' E; 22 Jun. 2019; P. Doughty *et al.* leg.; WAM T148117.



**Fig. 5.** *Aname salina* sp. nov., paratype, ♀ (WAMT148205). **A.** Cephalothorax, dorsal view. **B.** Abdomen, dorsal view. **C.** Cephalothorax, ventral view. **D.** Abdomen, ventral view. **E.** Ocular region. **F.** Fovea. **G.** Sternal sigilla, left view. **H.** Sternum and labium. **I.** Maxillae and coxae I–II, left view. **J.** Right leg I (image reflected), prolateral view. **K.** Right leg I (image reflected), retrolateral view. **L.** Internal genitalia, dorsal view. Scale bars: A–B, J = 2 mm; L = 0.5 mm.



## Description

### Male holotype (WAM T148204)

**DIMENSIONS** (mm). Total body length 23.7. Carapace length 9.5, width 8.0; abdomen length 9.4, width 5.6. Leg I: femur 7.8; patella 4.8; tibia 6.1; metatarsus 6.1; tarsus 3.6.

**COLOUR** (in alcohol) (Fig. 4). Carapace chocolate-brown, caput slightly darker than thoracic region; chelicerae dark red-brown; legs and ventral prosoma concolorous with carapace; abdomen grey-brown with pale mottled chevrons; ventral abdomen pale. In life, carapace and legs darker, almost black (Fig. 1D)

**CARAPACE, CHELICERAE, ABDOMEN** (Fig. 4A–F). Carapace  $1.19 \times$  longer than broad; almost glabrous, but with inconspicuous silver hairs present; clypeal edge straight; fovea straight. Eye group rectangular (width/length 2.22), on distinct tubercle. Chelicerae without rastellum. Abdomen  $1.69 \times$  longer than wide, pilose.

**MOUTHPARTS AND STERNUM** (Fig. 4G–I). Labium width/length 2.19, without cuspules. Left maxilla with 150–160 cuspules, spread across inner 40% of maxillae. Coxae without cuspules. Sternum length/width 1.25; with setae over entire surface; with 3 pairs of sigilla, each pair increasing in size from anterior to posterior; all pairs close to sternum margin; posterior pair thin and elongate.

**PEDIPALP** (Fig. 4J–M). Tibia cylindrical, length/width 2.72; PDL/PTL 0.65; prolateral face with two distal spines, ventral face with 1 spine and 1 strong bristle proximally, at base of pedipalpal depression; cymbium length/width 2.78, medially constricted and broadest distally; scopula present distally; bulb ovoid,  $0.42 \times$  PTL; embolus, thin and curving, with slight basal flange; embolus  $2.2 \times$  longer than bulb.

**LEG I** (Fig. 4N–Q). Tibia I with large megaspor; TIL/TID 4.12; TIS/TIL 0.63; TISH/TID 0.56; metatarsus incrassate, with proximal excavation; MIL/MID 5.64; MIPEL/MIL 0.40; scopulae present on tarsus and distal metatarsus.

### Female holotype (WAM T148205)

**DIMENSIONS** (mm). Total body length 19.0. Carapace length 8.0, width 6.5; abdomen length 7.1, width 3.9. Leg I: femur 5.8; patella 3.7; tibia 4.1; metatarsus 3.9; tarsus 2.6.

**COLOUR** (in alcohol) (Fig. 5). Carapace uniformly tan-brown; legs and ventral prosoma concolorous; chelicerae darker red-brown; dorsal abdomen grey-brown with pale chevrons, ventral abdomen yellow-brown. In life much darker, carapace and legs almost black (Fig. 1C).

**CARAPACE, CHELICERAE, ABDOMEN** (Fig. 5A–F). Carapace  $1.23 \times$  longer than broad; virtually glabrous; clypeal edge slightly convex; fovea slightly procurved. Eye group rectangular (width/length 1.92), on distinct tubercle. Rastellum absent. Abdomen  $1.85 \times$  longer than wide, lightly pilose.

**MOUTHPARTS AND STERNUM** (Fig. 5G–I). Labium width/length 2.13, without cuspules. Left maxilla with 160–170 cuspules, spread laterally on inner 40% of maxilla. Coxae without cuspules. Sternum length/width 1.15; with denser setation around edge; with 3 pairs of sigilla, each pair increasing in size from anterior to posterior; all pairs close to sternum margin; posterior pair thin and elongate.

**LEG I** (Fig. 5J–K). Spination, femur 2 bristles (1PL, 1D), patella 2 (2PL), tibia 8 (3PL, 1V and 4RL), metatarsus 6 (3PL, 3RL), tarsus 0, total 18; metatarsus length/width 5.00; scopulae present on tarsus and metatarsus.

GENITALIA (Fig. 5L). Each spermatheca with one elongate receptacle and a small accessory vesicle at the base, positioned medially. The elongate receptacle is convoluted, with three articulations – from the base it angles laterally, medially, laterally, medially.

### Remarks

This species was previously recognised under two different code names – *Aname* ‘MYG627’ for a female specimen from Exmouth, and ‘MYG712’ for male specimens from Ashburton salt (not included in previous phylogenies). It is a member of the *mainae* group (Clade 7) sensu Rix *et al.* (2021) (Fig. 1).

### Distribution and natural history

Two reciprocally monophyletic populations of *Aname salina* sp. nov. are currently known (Fig. 2). One of these is around the town of Onslow (most specimens are from the west of the town, near the Ashburton River), the other is in Cape Range National Park. Although these were recovered as monophyletic groups (Fig. 1), average pairwise divergence in COI between them is just 5.15% (low for COI in mygalomorph spiders, see Castalanelli *et al.* 2014) and they show no evidence of morphological divergence based on the samples available to us. The habitat in the regions where this species occurs is a mix of bare sand and salt flats, tussock, and hummock (spinifex) grasslands, and coastal habitats. Based on when adult males of this species have been collected, they appear to mature in Autumn (March/April).

### *Aname tatarnici* sp. nov.

urn:lsid:zoobank.org:act:E5B60F53-FAAE-48FE-90F6-53C27CFA8FAD

Figs 1–2, 6

### Diagnosis

Males of *A. tatarnici* sp. nov. can be distinguished from those of all other species except *A. ellenae* Harvey, Framenau, Wojcieszek, Rix & Harvey, 2012, *A. grothi* Castalanelli, Framenau, Huey, Hillyer & Harvey, 2020, *A. mcalpinei* Castalanelli, Framenau, Huey, Hillyer & Harvey, 2020, and *A. sinuata* Castalanelli, Framenau, Huey, Hillyer & Harvey, 2020 by the presence of a conspicuous patch of short spinules on the retrolateral pedipalpal tibia, beside the asetose depression. They can be distinguished from those of these remaining species by the form of the embolus: the embolus of *A. tatarnici* is narrower at the base, longer, and more elongate than those of *A. ellenae*, *A. grothi* and *A. mcalpinei* (Fig. 6K–M; cf. Harvey *et al.* 2012: figs 41–42; Castalanelli *et al.* 2020: figs 38–40, 69–71); and less sinuous than that of *A. sinuata* (Fig. 6K–M; cf. Castalanelli *et al.* 2020: figs 105–107). Females of *A. tatarnici* are currently unknown.

### Etymology

The species epithet honours Dr Nikolai Tatarnic, curator of entomology at the Western Australian Museum, who has participated in several Bush Blitz expeditions, and who collected the holotype specimen of this species.

### Material examined

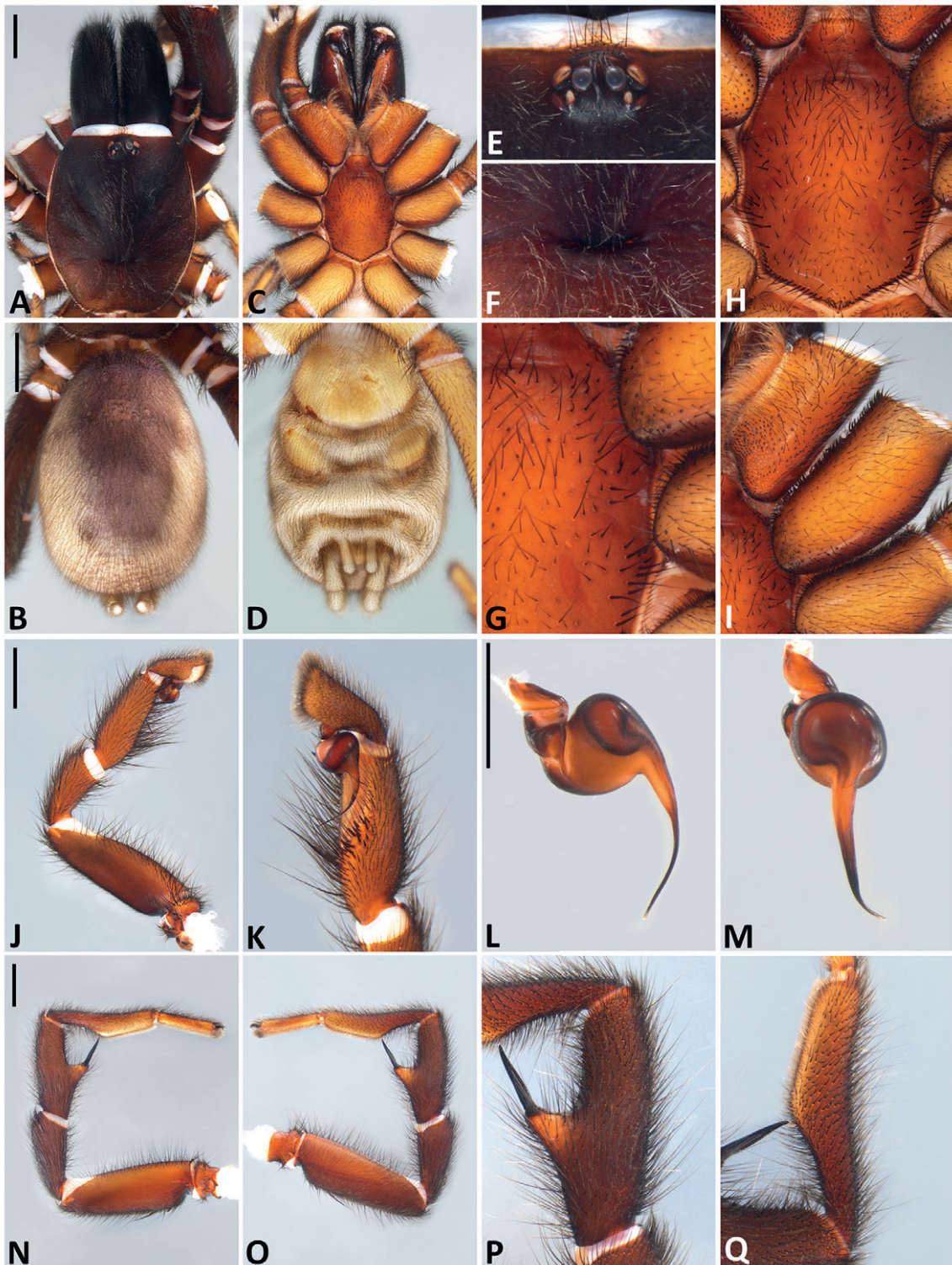
#### Holotype

AUSTRALIA – South Australia • ♂; Great Victoria Desert, main camp site, ca 96 km N of Hughes Siding; 29°50' S, 129°32' E; 22 Sep. 2017; N. Tatarnic leg.; SAM NN31515.

### Description

#### Male holotype (SAM NN31515)

DIMENSIONS (mm). Total body length 21.9. Carapace length 8.2, width 6.9; abdomen length 8.4, width 5.7. Leg I: femur 6.3; patella 4.4; tibia 4.5; metatarsus 5.2; tarsus 2.7.



**Fig. 6.** *Aname tatarnici* sp. nov., holotype, ♂ (SAM NN31515). **A.** Cephalothorax, dorsal view. **B.** Abdomen, dorsal view. **C.** Cephalothorax, ventral view. **D.** Abdomen, ventral view. **E.** Ocular region. **F.** Fovea. **G.** Sternal sigilla, left view. **H.** Sternum and labium. **I.** Maxillae and coxae I-II, left view. **J–K.** Left pedipalp, full prolateral view (**J**), partial retrolateral view (**K**). **L–M.** Right bulb, ventral view (**L**), and retrolateral view (**M**). **N–Q.** Left leg I, full prolateral view (**N**), full retrolateral view (**O**), tibia retrolateral view (**P**), metatarsus retrolateral view (**Q**). Scale bars = 2 mm.



COLOUR (in alcohol) (Fig. 6). Carapace chocolate-brown; chelicerae slightly darker red-brown; legs and ventral prosoma lighter, orange-brown; dorsal abdomen grey-brown, ventral and lateral abdomen pale.

CARAPACE, CHELICERAE, ABDOMEN (Fig. 6A–F). Carapace  $1.18 \times$  longer than broad; with light silver down of setae; clypeal edge straight; fovea slightly procurved. Eye group rectangular (width/length 2.21), on distinct tubercle. Chelicerae with small rastellum. Abdomen  $1.46 \times$  longer than wide, lightly pilose.

MOUTHPARTS AND STERNUM (Fig. 6G–I). Labium width/length 1.79, without cuspules. Left maxilla with 190–210 cuspules (some rubbed off), spread across inner 40% of maxillae. Coxa I with 15–20 cuspules on inner edge. Sternum length/width 1.24; with setae over entire surface, few scattered cuspules, and a ‘brush’ of setae along posterior edge; with 3 pairs of sigilla, each pair increasing in size from anterior to posterior; first two pairs close to sternum margin, third pair slightly medial and roughly ovoid.

PEDIPALP (Fig. 6J–M). Tibia roughly cylindrical, slightly thicker at base; length/width 2.60; PDL/PTL 0.59, prolateral face with two distal spines, ventral face with a strong bristle at base of pedipalpal depression; retrolateral face with a patch of spinules positioned medially, next to the pedipalpal depression. Cymbium length/width 2.73, medially constricted and broadest distally; scopula present distally; bulb ovoid,  $0.32 \times$  PTL; embolus, thin and curving gradually; embolus about  $1.7 \times$  longer than bulb.

LEG I (Fig. 6N–Q). Tibia I with large megaspor; TIL/TID 2.82; TIS/TIL 0.53; TISH/TID 0.55; metatarsus incrassate, with proximal excavation; MIL/MID 5.10; MIPEL/MIL 0.53; scopulae present on tarsus and distal metatarsus.

### Remarks

This species was included in recent molecular phylogenies of the Anamidae under the code name *Aname* ‘MYG644’. It is an unplaced member of the Temperate-Eastern Radiation sensu Rix *et al.* (2021), recovered here as the sister-species to the *pallida* group (Clade 3) (Fig. 1).

### Distribution and natural history

The holotype male of this species was collected on the eastern side of the Great Victoria Desert, in central South Australia, the habitat in this region is a mix of mallee, *Acacia* and *Casuarina* woodlands. The distribution of the species around this location is currently unknown.

### *Aname tenuipes* sp. nov.

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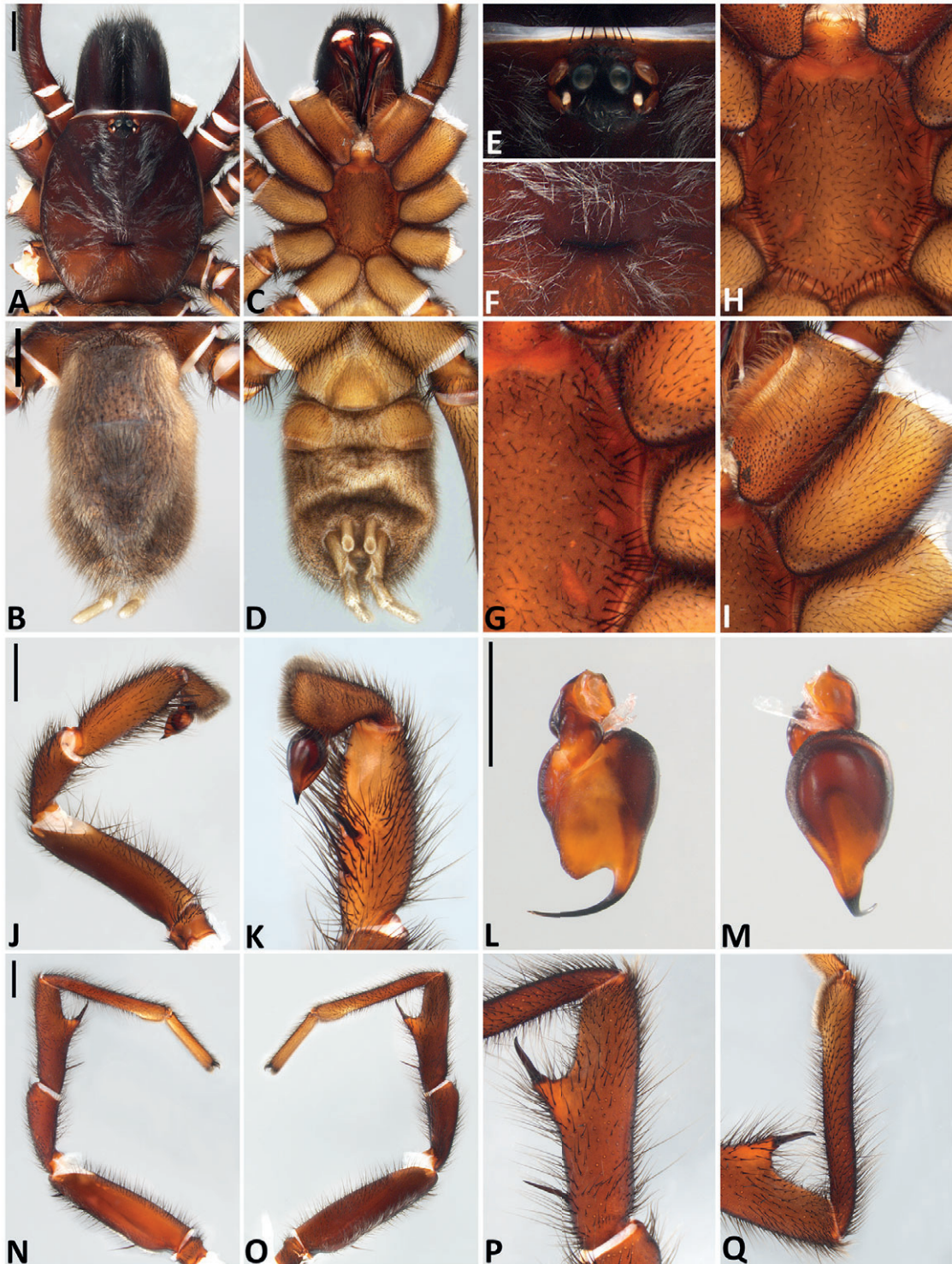
Figs 1–2, 7

### Diagnosis

Males of *Aname tenuipes* sp. nov. can be readily distinguished from those of all other described species by their metatarsus I, which possesses no conspicuous proximal excavation, and is instead elongate and cylindrical along its entire length (Fig. 7Q). They can further be distinguished by their unique embolus, which is very short (about  $0.8 \times$  bulb length), and curved, with a basal flange or embolic apophysis (Fig. 7K–M).

### Etymology

The specific epithet is an adjective meaning ‘thin-footed’, formed from the Latin ‘*tenuis*’, meaning ‘thin’, and ‘*pes*’ meaning ‘foot’ (Brown 1956). This is in reference to the elongate, cylindrical metatarsus I of this species, which lacks a proximal excavation – a distinguishing feature of this species.



**Fig. 7.** *Aname tenuipes* sp. nov., holotype, ♂ (WAM T101565). **A.** Cephalothorax, dorsal view. **B.** Abdomen, dorsal view. **C.** Cephalothorax, ventral view. **D.** Abdomen, ventral view. **E.** Ocular region. **F.** Fovea. **G.** Sternal sigilla, left view. **H.** Sternum and labium. **I.** Maxillae and coxae I-II, left view. **J–K.** Right pedipalp (image reflected), full prolateral view (J), partial retrolateral view (K). **L–M.** Left bulb (image reflected), ventral view (L), and retrolateral view (M). **N–Q.** Left leg I, full prolateral view (N), full retrolateral view (O), tibia retrolateral view (P), metatarsus retrolateral view (Q). Scale bars = 2 mm.

## Material examined

### Holotype

AUSTRALIA – **Western Australia** • ♂; Dundas Nature Reserve; 32°26' S, 122°50' E; 21 Oct. 2009; K. Tiedemann leg.; WAM T101565.

### Paratypes

AUSTRALIA – **Western Australia** • 2 ♂♂; same collection data as for holotype; 32°26' S, 122°40' E; E.D. Adams leg.; WAM T101547.

### Other material examined

AUSTRALIA – **Western Australia** • 1 ♂; 6 km SE. of Kambalda, Lake Lefroy, St Ives Gold Mine, Beta Hunt; 32°14' S, 121°41' E; 6 Sep.–21 Oct. 2010; M. Bamford leg.; WAM T110282 • 2 ♂♂; 6 km SE of Kambalda, Lake Lefroy, St Ives Gold Mine, K; 31°29' S, 121°43' E; 6 Sep.–21 Oct. 2010; M. Bamford leg.; WAM T110283 • 1 ♂; Cyclone [mine lease], ca 252 km NE of Forrest; 29°24' S, 128°26' E; 17–30 Nov. 2013; A. Slabber leg.; WAM T132371 • 1 ♂; same collection data as for preceding except Cyclone [mine lease], ca 273 km NE of Forrest; 29°12' S, 128°31' E; WAM T132369 • 1 ♂; Cyclone [mine lease], ca 320 km NE of Forrest, ca 22 km W of southern end of Serpentine Lakes; 28°50' S, 128°45' E; 27 Sep.–3 Oct. 2013; M. Young leg.; WAM T132362 – **South Australia** • 1 ♂; Great Victoria Desert, site ROD03, ca 23 km E of Serpentine Lakes; 28°57' S, 129°32' E; 21 Sep. 2017; P. Doughty *et al.* leg.; SAM NN31516.

## Description

### Male holotype (WAM T101565)

**DIMENSIONS** (mm). Total body length 23.1. Carapace length 9.5, width 8.2; abdomen length 8.9, width 5.0. Leg I: femur 8.3; patella 5.2; tibia 5.8; metatarsus 7.2; tarsus 3.6.

**COLOUR** (in alcohol) (Fig. 7). Carapace chocolate-brown, caput slightly darker than thoracic region; chelicerae dark red-brown; legs and ventral prosoma concolorous with thoracic region of carapace (dark orange-brown); abdomen grey-brown without pattern; ventral abdomen pale yellow-brown.

**CARAPACE, CHELICERAE, ABDOMEN** (Fig. 7A–F). Carapace 1.16 × longer than broad; with conspicuous down of silver hairs; clypeal edge slightly convex; fovea slightly procurved. Eye group rectangular (width/length 2.06), on distinct tubercle. Chelicerae without rastellum. Abdomen 1.76 × longer than wide, pilose.

**MOUThPARTS AND STERNUM** (Fig. 7G–I). Labium width/length 1.74, without cuspules. Left maxilla with 190–210 cuspules, spread across inner 50% of maxillae. Coxa I with 90–110 cuspules along inner and posterior edge. Sternum length/width 1.24; with short setae over entire surface and longer setae around the edge; with 3 pairs of sigilla, each pair increasing in size from anterior to posterior; all pairs close to sternum margin; posterior pair roughly oval. bulb ovoid, 0.32 × PTL; embolus, thin and curving gradually; embolus about 1.7 × longer than bulb.

**PEDIPALP** (Fig. 7J–M). Tibia cylindrical, length/width 2.68; PDL/PTL 0.46 retrolateral face with 5 strong spines clustered in distal half, prolateral face with two distal spines, ventral face with 2 spines proximally, at base of pedipalpal depression; cymbium length/width 1.95, medially constricted and broadest distally; scopula present distally; bulb triangular, 0.20 × PTL, transition between bulb and embolus indistinct, embolus very short, about 0.8 × length of bulb, with large flange/embolic apophysis at base.

**LEG I** (Fig. 7N–Q). Tibia I with large megaspor; TIL/TID 3.54; TIS/TIL 0.71; TISH/TID 0.51; metatarsus elongate, cylindrical, and without excavation; MIL/MID 9.00; scopulae present on tarsus and distal metatarsus.



**Remarks**

This species was included in recent molecular phylogenies of the Anamidae under the code name *Aname* ‘MYG223’. It is a member of the *pulchella* group (Clade 5) sensu Rix *et al.* (2021) (Fig. 1).

**Distribution and natural history**

Currently, specimens of *Aname tenuipes* sp. nov. are known from two quite disjunct areas, the first is around the type locality in Dundas Nature Reserve and areas relatively close by such as Lake Lefroy, in central-southern Western Australia. The second is in or near the Great Victoria Desert, inland, around the border of Western Australia and South Australia. The species is presumably also found in the region between these areas. The habitat in these areas includes eucalypt, *Acacia* and *Casuarina* woodlands and mallee. Based on when adult males of this species have been collected, they appear to mature in Spring (September–November).

*Aname wongalara* sp. nov.

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Figs 1–2, 8

**Diagnosis**

Males of *Aname wongalara* sp. nov. can be distinguished from those of most other species by the combination of a dense down of silver setae on the carapace, no pattern on the abdomen, oval sigilla (as opposed to thin and elongate) and an elongate embolus, gradually tapering from the bulb. Other species with this combination of characters include *A. marae* Harvey, Framenau, Wojcieszek, Rix & Harvey, 2012, *A. pulchella* Harvey, Wilson & Rix, 2022, *A. watsoni* (all from Western Australia), and *A. barrema* Raven, 1985 and *A. distincta* (Rainbow, 1914) (both from eastern Australia). They can be distinguished from *A. barrema* and *A. distincta* by their stouter pedipalpal tibia and thicker embolus (Fig. 8K; cf. Raven 1985: figs 47–48); from *A. marae* by their metatarsus I, which has a more distinctly concave proximal excavation, resulting in a clearer demarcation of the proximal and distal sections of the metatarsus (Fig. 8Q; cf. Harvey *et al.* 2012: fig. 49); from *A. pulchella* by the longer proximal excavation on metatarsus I (MIPEL/MIL 0.52 vs 0.43 in respective holotypes) (Fig. 8Q; cf. Harvey *et al.* 2022: fig. 35); and from *A. watsoni* by the embolus, which has a more distinct articulation distally (Fig. 8K–M; cf. Castalanelli *et al.* 2020: figs 136–138).

**Etymology**

The specific epithet is a noun in apposition in reference to the Wongalara Wildlife Sanctuary, a conservation estate owned and managed by the Australian Wildlife Conservancy (AWC), where the holotype of this species was collected.

**Material examined****Holotype**

AUSTRALIA – Northern Territory • ♂; Wongalara Wildlife Sanctuary, pitfall trap site 4; 14°10' S, 134°13' E; 1–6 Jul. 2012; M.S. Harvey and R.J. Raven leg.; MAGNT A005438.

**Description****Male holotype** (MAGNT A005438)

DIMENSIONS (mm). Total body length 16.4. Carapace length 6.3, width 5.0; abdomen length 6.6, width 3.6. Leg I: femur 5.1; patella 3.6; tibia 3.9; metatarsus 4.0; tarsus 2.5.



**Fig. 8.** *Aname wongalara* sp. nov., holotype, ♂ (MAGNT A005438). **A.** Cephalothorax, dorsal view. **B.** Abdomen, dorsal view. **C.** Cephalothorax, ventral view. **D.** Abdomen, ventral view. **E.** Ocular region. **F.** Fovea. **G.** Sternal sigilla, left view. **H.** Sternum and labium. **I.** Maxillae and coxae I–II, left view. **J–K.** Left pedipalp, full prolateral view (**J**), partial retrolateral view (**K**). **L–M.** Right bulb, ventral view (**L**), and retrolateral view (**M**). **N–Q.** Left leg I, full prolateral view (**N**), full retrolateral view (**O**), tibia retrolateral view (**P**), metatarsus retrolateral view (**Q**). Scale bars = 2 mm.

COLOUR (in alcohol) (Fig. 8). Carapace red-brown, caput slightly darker than thoracic region; chelicerae dark red-brown; legs and ventral prosoma orange-brown; abdomen grey-brown without pattern; ventral abdomen pale.

CARAPACE, CHELICERAE, ABDOMEN (Fig. 8A–F). Carapace  $1.25 \times$  longer than broad; with conspicuous down of silver hairs; clypeal edge slightly convex; fovea slightly procurved. Eye group rectangular (width/length 2.04), on distinct tubercle. Chelicerae without rastellum. Abdomen  $1.84 \times$  longer than wide, pilose.

MOUHPARTS AND STERNUM (Fig. 8G–I). Labium width/length 1.88, without cuspules. Left maxilla with 100–110 cuspules, spread across inner 40% of maxillae. Coxae without cuspules. Sternum length/width 1.27; with setae over entire surface and longer setae around the edge. With 3 pairs of sigilla, each pair increasing in size from anterior to posterior; first two pairs all close to sternum margin, last pair slightly more central; posterior pair ovoid.

PEDIPALP (Fig. 8J–M). Tibia roughly cylindrical, slightly wider at base; length/width 2.41; PDL/PTL 0.60; prolateral face with two distal spines, ventral face with 2 spines proximally, at base of pedipalpal depression; cymbium length/width 2.21, slightly proximally constricted and broadest distally; scopula present distally; bulb triangular, transition between bulb and embolus indistinct; embolus gradually tapering and twisting to slightly flanged tip, about  $1.2 \times$  length of bulb.

LEG I (Fig. 8N–Q). Tibia I with large megaspor; TIL/TID 3.38; TIS/TIL 0.67; TISH/TID 0.56; metatarsus incrassate, with proximal excavation; MIL/MID 4.49; MIPEL/MIL 0.52; scopulae present on tarsus and distal metatarsus.

### Remarks

This species was included in recent molecular phylogenies of the Anamidae under the code name *Aname* ‘MYG261’. It is an unplaced member of the Tropical Radiation sensu Rix *et al.* (2021), recovered here as the sister-species to ‘MYG443’ (Fig. 1).

### Distribution and natural history

*Aname wongalara* sp. nov. is only known from a single specimen, collected in Wongalara Wildlife Sanctuary. The habitat in the area is tropical eucalypt and *Acacia* woodland and grasslands.

### Discussion

With this and other recent descriptions (Harvey *et al.* 2022), described species in the genus *Aname* now totals 53, and species have been described from all eight species groups identified in Rix *et al.* 2021. As new species are being described and added to the phylogenetic foundation, morphological characteristics of each of these groups may be identified that allow their diagnoses. For example, six species have now been described from the *mainae* group: *A. lorica*, *A. aragog*, *A. exulans*, *A. mainae*, *A. mcleeryorum*, and *A. salinas* sp. nov. and these have led to the recognition of the distinctive metatarsus shape, abdominal pattern and elongate sternal sigilla of that group. Other new species have extended the known variability encompassed by the genus, namely *A. tenuipes* sp. nov. with its cylindrical metatarsus, lacking the proximal excavation which is normally distinct and characteristic of the genus.

Two species described in this study, *Aname ningaloo* sp. nov. and *A. salina* sp. nov., appear to occur sympatrically in Cape Range National Park, Western Australia. As has become a recognised pattern in the Australian mygalomorph fauna (see Wilson *et al.* 2018; Rix *et al.* 2020, 2021), congeneric species in



sympatry are from distantly related radiations, which in this case diverged from one another about eight million years ago (Harvey *et al.* 2018; Rix *et al.* 2021).

## Acknowledgements

We would like to thank the collection managers of the Western Australian Museum (Julianne Waldock), South Australian Museum (Matthew Shaw), and Museum and Art Gallery of the Northern Territory (Gavin Dally), for the loan and use of specimens. We also thank Mia Hillyer, Joel Huey and the Molecular Systematics Unit of the Western Australian Museum for generation of the sequence data associated with these species. Zoe Hamilton, Helix Molecular Solutions, kindly supplied COI sequences of *Aname salina* that allowed us to recognise it as a new species; the specimens were then resequenced for COI and the other gene regions. Finally, we thank the Bush Blitz program run by the Australian Government in partnership with Broken Hill Proprietary Company Limited (BHP) and EarthWatch Australia, whose expeditions to Wongalara (2012), Great Victoria Desert (2017) and Cape Range (2019) led to the collection of several specimens and holotypes used to describe the new species herein. This study was supported financially by a Bush Blitz 2021-22 Taxonomy Research Project Grant (DNP-BCK-2021-007) to the authors, and further by an ABRS National Taxonomy Postdoctoral Fellowship (4-H3KOGBR).

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### **Supplementary material**

**Supp. file 1.** Table S1. Specimen information and GenBank numbers for sequenced *Aname* L. Koch, 1873 and outgroup specimens used in the molecular phylogenetic analysis presented in this study. <https://doi.org/10.5852/ejt.2023.890.2247.9625>