



# Three new species of the open-holed trapdoor spider genus *Kwonkan* (Mygalomorphae: Anamidae) from central Australia




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## Abstract

The open-holed trapdoor spider genus *Kwonkan* Main, 1983 is endemic to Australia, and currently contains nine named species, predominately from south-western Australia. We describe three new species from central Australia: *Kwonkan dissitus*, sp. nov. and *Kwonkan procul*, sp. nov. from the Simpson Strzelecki Dunefields bioregion of South Australia, and *Kwonkan seductus*, sp. nov. from the Great Sandy Desert bioregion of the Northern Territory. The gender of the name *Kwonkan* is discussed, and assumed to be masculine.

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ZooBank LSID: <http://zoobank.org/References/5189F541-31E2-4D46-A0FA-CBD88AB10F46>

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## Introduction

The Australian endemic mygalomorph spider family Anamidae currently contains 10 genera within two distinct subfamilies, Anaminae and Teylinae (Harvey *et al.* 2018, 2020; Opatova *et al.* 2020). Members of the family are widespread across the continent but its beta-diversity is highest in south-western Australia.

The genus *Kwonkan* Main, 1983 was first described for six species from southern Western Australia and South

Australia which included *Dekana wonganensis* Main, 1977 and five new species (Main 1983). The genus was primarily diagnosed on the presence of spines on at least one pedal tarsus. A comprehensive multi-gene analysis of numerous anamids (then considered part of the family Nemesiidae) by Harvey *et al.* (2018) found that species that were easily assigned to the genus *Yilgarnia* Main, 1986 due to the presence of cuspules on the posterior coxae nested within *Kwonkan*. Accordingly, they treated *Yilgarnia* as a synonym of *Kwonkan* and

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transferred *Y. currycomboides* Main, 1986 and *Y. linnaei* Main, 2008 to *Kwonkan*. Evidence for numerous undescribed species is apparent in molecular and morphological data (Castalanelli et al. 2014; Harvey et al. 2018; MSH, MGR, unpublished data). To further document the genus *Kwonkan* in Australia, we here describe three new species from central Australia.

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.

## Methods

The specimens examined in this study are lodged in the Museums and Art Galleries of the Northern Territory (MAGNT) and the South Australian Museum, Adelaide (SAM), and are preserved in 75% ethanol. Auto-mounted images were taken at different focal planes (ca. 20–30 images) with a Leica DFC500 digital camera attached to a Leica MZ16A stereo microscope, using Leica Application Suite (LAS) version 2.5.OR1 software.

Terminology follows Raven (1985a, 1985b) and Castalanelli et al. (2020). The following abbreviations are used: AME: anterior median eyes; ALE: anterior lateral eyes; PLE: posterior lateral eyes; PME: posterior median eyes. Pedipalp and leg measurements and ratios were calculated using the terminology and reference points defined by Castalanelli et al. (2020).

Morphological characters were scored using DELTA 1.4 (CSIRO, Canberra, Australia) (Dallwitz et al. 2010), which was also used to generate a natural language description that was subsequently edited further.

## Taxonomy

### Family Anamidae Simon, 1899

#### Subfamily Anaminae Simon, 1899

### *Kwonkan* Main, 1983

*Kwonkan* Main 1983: 925.

*Yilgarnia* Main 1986: 396.

#### Type species

*Dekana wonganensis* Main, 1977, by original designation.

*Yilgarnia currycomboides* Main, 1986, by original designation.

#### Diagnosis

See Harvey et al. (2018).

#### Description

See Harvey et al. (2018).

## Remarks

In her description of *Kwonkan*, Main (1983) failed to specify the gender of the name. Article 30.2 of the International Code of Zoological Nomenclature has directions concerning retroactively determining the gender of genus-group names.

Articles 30.2.1 and 30.2.2 don't apply as the name *Kwonkan* was derived from a noun that does not have gender in a modern European language (Article 30.2.1) and Main (1983) did not nominate a gender (Article 30.2.2). Article 30.2.4 does not apply as the name does not end in *-a*, *-um*, *-on* or *-u*.

Article 30.2.3 states "If no gender was specified, the name takes the gender indicated by its combination with one or more adjectival species-group names of the originally included nominal species." Of the six originally included names, we can deduce the following:

- *Kwonkan anatolion* is a non-classical rendition of the Greek *anatole*, "a rising, sunrise, east" (Brown 1956). The gender is uncertain.
- *Kwonkan eboracum* is an indeclinable noun.
- *Kwonkan goongarriensis* and *K. wonganensis* are Latin adjectives, either masculine or feminine, but not neuter (which would result in *-ense* suffixes).
- *Kwonkan moriartii* is an indeclinable patronym.
- *Kwonkan silvestre* is derived from *silvestre*, a Latin adjective meaning "living in woodlands" (Brown 1956) which is neuter. The other form of this word, *silvestris*, is a Latin adjective that can be male and female.

In summary, *K. silvestre* is neuter, and *K. goongarriensis* and *K. wonganensis* are either masculine or feminine, but definitely not neuter. Therefore, we feel that Article 30.2.3 does not resolve the issue and we adopt Article 30.2.4 which states "If no gender was specified or indicated, the name is to be treated as masculine...." Most names retain the current spelling, except for the following:

- *Kwonkan silvestre* becomes *K. silvestris*.
- *Kwonkan turrigera* becomes *K. turriger*.

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### *Kwonkan dissitus* Harvey, Wilson & Rix, sp. nov.

Figs 2–18

ZooBank LSID: <http://zoobank.org/NomenclaturalActs/75094185-CB01-4F32-943A-10CBDBB6757B>

#### Holotype

AUSTRALIA: *South Australia*: ♂, Lake Eyre North, Prescott Point, Madigan Gulf, 28°59'S, 137°42'E, on sand, 1–5 May 1965, J. Mitchell, N. McFarland (SAM NN26509).

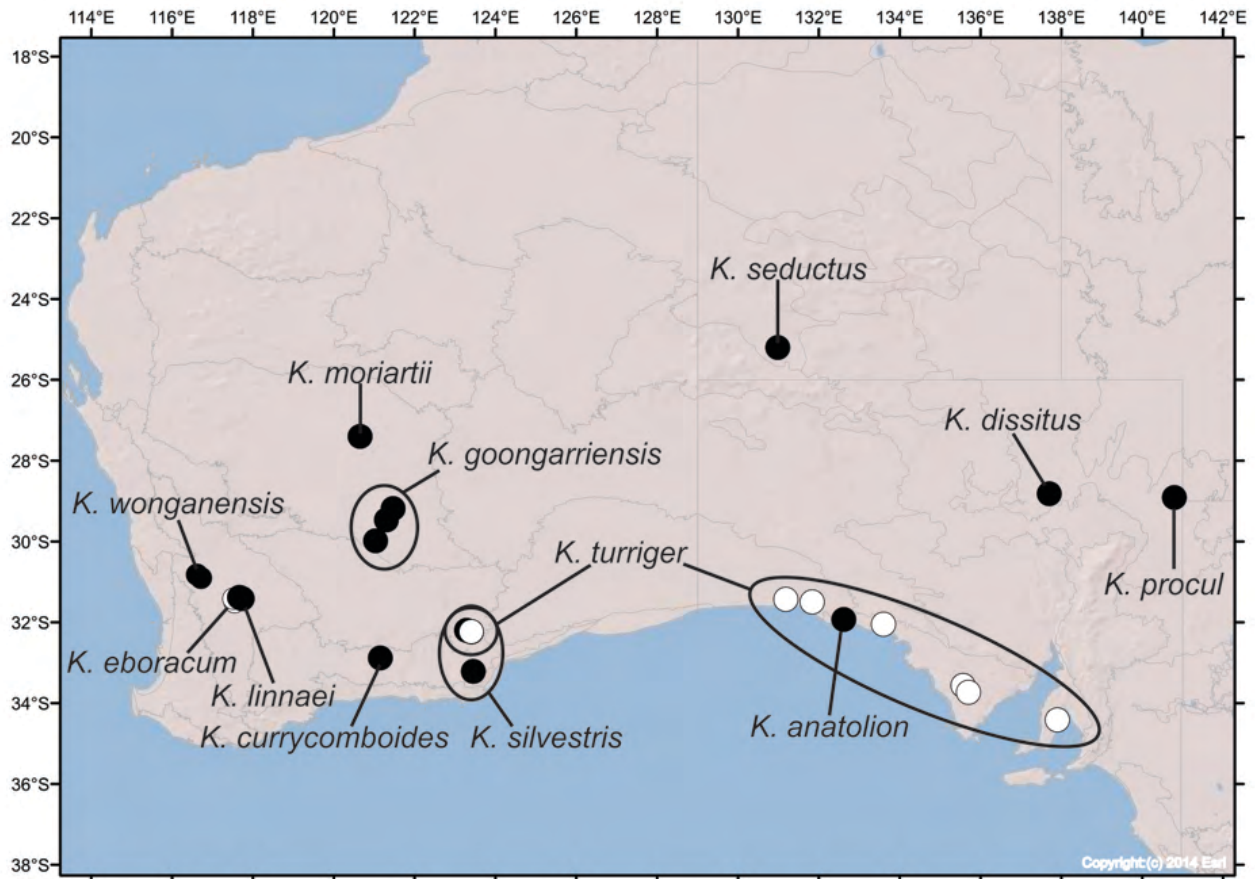


Figure 1. Map of southern Australia showing known distribution of named *Kwonkan* species.

**Diagnosis**

Males of *Kwonkan dissitus* differ from *K. currycomboides* and *K. linnaei* by the lack of cuspsules on coxae III and IV (Figure 3); from *K. eboracum*, *K. goongarriensis*, *K. moriartii* and *K. silvestris* by the more elongate pedipalpal tibia (Figures 12–14); from *K. procul* by the less acutely angled ventral spur and megaspine on tibia I (Figures 16, 17), and the thicker embolus, which curves gradually to a point (Figures 12–14), as opposed to the thinner, straighter embolus of *K. procul*; and from *K. seductus*, to which it is most similar, by their lighter colour (Figures 2, 3, 7, 8) and by fewer spines on the pedipalpal tibia (Figures 12–14).

**Description (male holotype, SAM NN26509)**

Medium-large anamid spider.

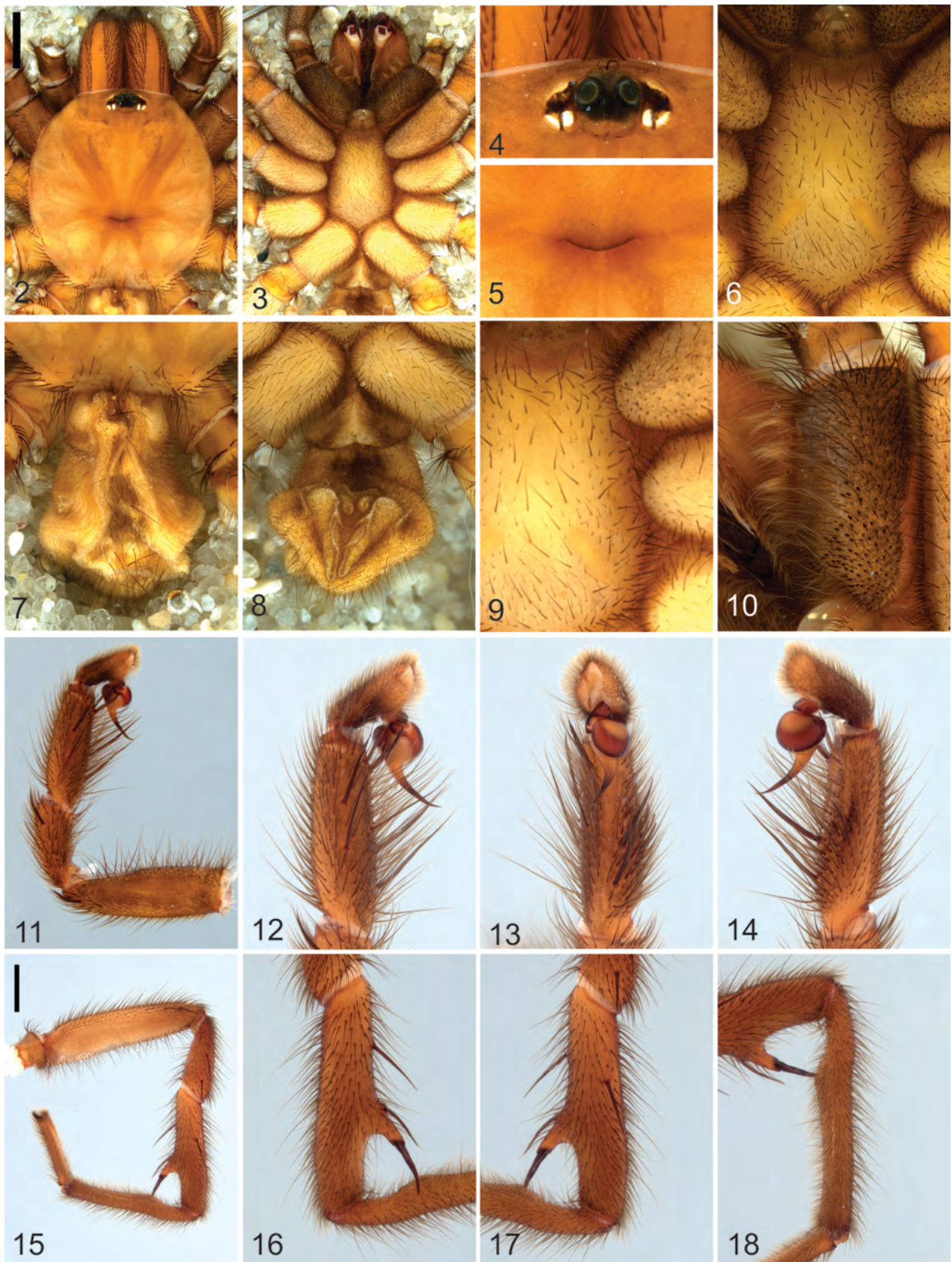
*Colour (in alcohol)*: Carapace uniformly yellow-brown (Figure 2); leg I red-brown (Figure 15), legs II to IV uniformly yellow-brown; chelicerae yellow-brown with darker infuscations anteriorly and laterally (Figure 2); abdomen dorsally pale creamy-yellow (Figure 7), and ventrally pale yellow-brown (Figure 8).

*Cephalothorax*: Carapace (Figure 2) 1.08 x longer than broad; sparse fine setae, larger setae around margin; silver setae absent; with brown bristles dorsally; clypeal

edge straight. Fovea (Figure 5) slightly procurved. Eyes (Figure 4): on distinct mound; from above, anterior eye row straight, posterior eye row nearly straight; AME about same size as ALE; ALE and AME the largest; AME and ALE both same and smallest; eye group length 0.6, width 1.41. Chelicerae (Figure 2) with 3 well-defined strips of brown bristles; rastellum absent; promargin of tooth row with 8 teeth, retromargin with 3 teeth. Labium (Figure 6) fused to sternum, without cuspsules. Maxillae (Figure 10) with ca. 100 cuspsules; located on the basal half. Maxillae noticeably darker than coxae I–IV (Figure 3). Sternum (Figure 6): oval; 1.31 x longer than broad; bristles sparsely over entire surface; with 3 pairs of sigilla (Figure 9), each pair increasing in size from anterior to posterior; posterior pair elongate.

*Pedipalp (Figures 11–14)*: Tibia cylindrical, narrow; ase-tose depression absent. tarsus short; densely setose; bulb ovoid; embolus slightly longer than bulb and gently curved.

*Legs*: Coxa I with 18 cuspsules (Figure 9); other coxae without cuspsules (Figure 3). Tibia I with large megaspur (Figures 16, 17); TIL/TID 3.92; TIS/TIL 0.40; TISH/TID 0.73; metatarsus incrassate (Figure 18); MIL/MID 6.73; MIPEL/MIL 0.37; scopula present on all tarsi, absent on metatarsi; trichobothria: tibia with numerous trichobothria in 2 rows, metatarsi with several trichoboth-



Figures 2–18. *Kwonkan dissitus* Harvey, Wilson & Rix, sp. nov., male holotype (SAM NN26509): 2, cephalothorax, dorsal; 3, cephalothorax, ventral; 4, eyes, dorsal; 5, fovea, dorsal; 6, sternum, ventral; 7, abdomen, dorsal; 8, abdomen, ventral; 9, left sigillae, ventral; 10, left maxilla, ventral; 11–14, left pedipalp: 11, prolatateral; 12, tibia and tarsus, prolatateral; 13, tibia and tarsus, ventral; 14, tibia and tarsus, retrolateral; 15–18, left leg I: 15, prolatateral; 16, tibia, prolatateral; 17, tibia, retrolateral; 18, metatarsus, prolatateral. Scale bars = 2.0 mm.

ria; tarsi with numerous trichobothria, claws: with 2 rows of teeth; claw tufts absent. Dimensions (mm): Femur I 7.1; tibia I 5.0; metatarsus I 5.9; II 6.7; III 6.4; IV 8.2.

**Abdomen (Figures 7, 8):** densely pilose with bristles. Spinnerets: AMS short; ALS long.

**Dimensions (mm):** Total body length unknown (shrivelled). Carapace length 7.0; width 6.5. Sternum length 3.8; width 2.9. Abdomen unknown (shrivelled).

### Remarks

*Kwonkan dissitus* has been collected from the northern region of Lake Eyre, South Australia (Figure 1), which is located in the Simpson Strzelecki Dunefields bioregion.

### Etymology

The species epithet is an adjective that refers to the presence of this species in north-eastern South Australia (*dissitus*, Latin, apart, remote) (Brown 1956).

## *Kwonkan procul* Harvey, Wilson & Rix, sp. nov.

Figures 19–35

ZooBank LSID: <http://zoobank.org/NomenclaturalActs/3D18C35E-E02E-4BAB-8D8E-14D1A143CB70>

### Holotype

AUSTRALIA: *South Australia*: ♂, Quinyambie Station, 7.5 km SSE. of Coonanna Bore, 29°54'39"S, 140°47'42"E, open shrubland, *Acacia ligulata* over *Brassica* & *Crotalaria eremaea*, 27 October–1 November 2008, Waterhouse Survey (SAM NN30453).

### Paratypes

AUSTRALIA: *South Australia*: 2 ♂, collected with holotype (SAM NN29034, NN30452).

### Diagnosis

Males of *Kwonkan procul* differ from *K. currycomboides* and *K. linnaei* by the lack of cuspules on coxae III and IV (Figure 20); from *K. eboracum*, *K. goongarriensis*, *K. moriartii* and *K. silvestris* by the more elongate pedipalpal tibia (Figures 29–31); from *K. dissitus* and *K. seductus* by the more acutely angled ventral spur and megaspine on tibia I (Figures 33, 34), and the thinner, straighter embolus (Figures 29–31) as opposed to the thicker gradually-curving emboli of those species.

### Description (male holotype, SAM NN30453)

Medium-large anamid spider (total body length 13.5).

**Colour (in alcohol):** Carapace dark red-brown with darker markings in cephalic region (Figure 19); legs brown, some segments with longitudinal pale stripes, tarsi paler; chelicerae uniformly dark red-brown (Figure 19); abdomen dorsally grey-brown (Figure 24), and ventrally pale creamy-yellow (Figure 25).

**Cephalothorax:** Carapace (Figure 19) 1.19 x longer than broad; densely pilose; silver setae present; with brown bristles dorsally; clypeal edge straight. Fovea (Figure 22) slightly procurved. Eyes (Figure 21): on distinct mound; from above, anterior eye row slightly procurved, posterior eye row nearly straight; AME about same size as ALE; ALE and AME the largest; PME smallest; eye group length 0.5, width 1.1. Chelicerae (Figure 19) densely setose with black bristles and silver setae; rastellum absent; promargin of tooth row with 10 teeth, retro-margin with 4 teeth. Labium (Figure 23) fused to sternum, without cuspules. Maxillae (Figure 27) with ca. 110 cuspules; located on the basal half. Maxillae noticeably darker than coxae I–IV (Figure 20). Sternum (Figure 23): oval; 1.28 x longer than broad; bristles sparsely over entire surface; with 3 pairs of sigilla (Figure 26), each pair increasing in size from anterior to posterior; posterior pair elongate and slightly curved or anterior pair located near edge of sternum.

**Pedipalp (Figures 28–31):** Tibia cylindrical, narrow, aetose depression absent; tarsus short; densely setose; bulb ovoid; embolus slightly longer than bulb and gently curved.

**Legs:** Coxal cuspules absent (Figure 20). Tibia I with large megaspur (Figures 33, 34); TIL/TID 4.24; TIS/TIL 0.61; TISH/TID 0.47; metatarsus incrassate; MIL/MID 7.33; MIPEL/MIL 0.40; scopula present on all tarsi, absent on metatarsi, trichobothria: tibia with numerous trichobothria in 2 rows, metatarsi with several trichobothria; tarsi with numerous trichobothria, claws: with 2 rows of teeth; claw tufts absent. Dimensions (mm): Femur I 6.8; tibia I 4.9; metatarsus I 5.5; II 6.5; III 5.9; IV 7.6.

**Abdomen (Figures 24, 25):** 1.53 x longer than broad; densely pilose with bristles. Spinnerets: AMS short; ALS long.

**Dimensions (mm):** Total body length (with chelicerae, but excluding spinnerets) 13.5. Carapace length 6.4; width 5.4. Sternum length 3.2; width 2.5. Abdomen length 6.1; width 4.0.

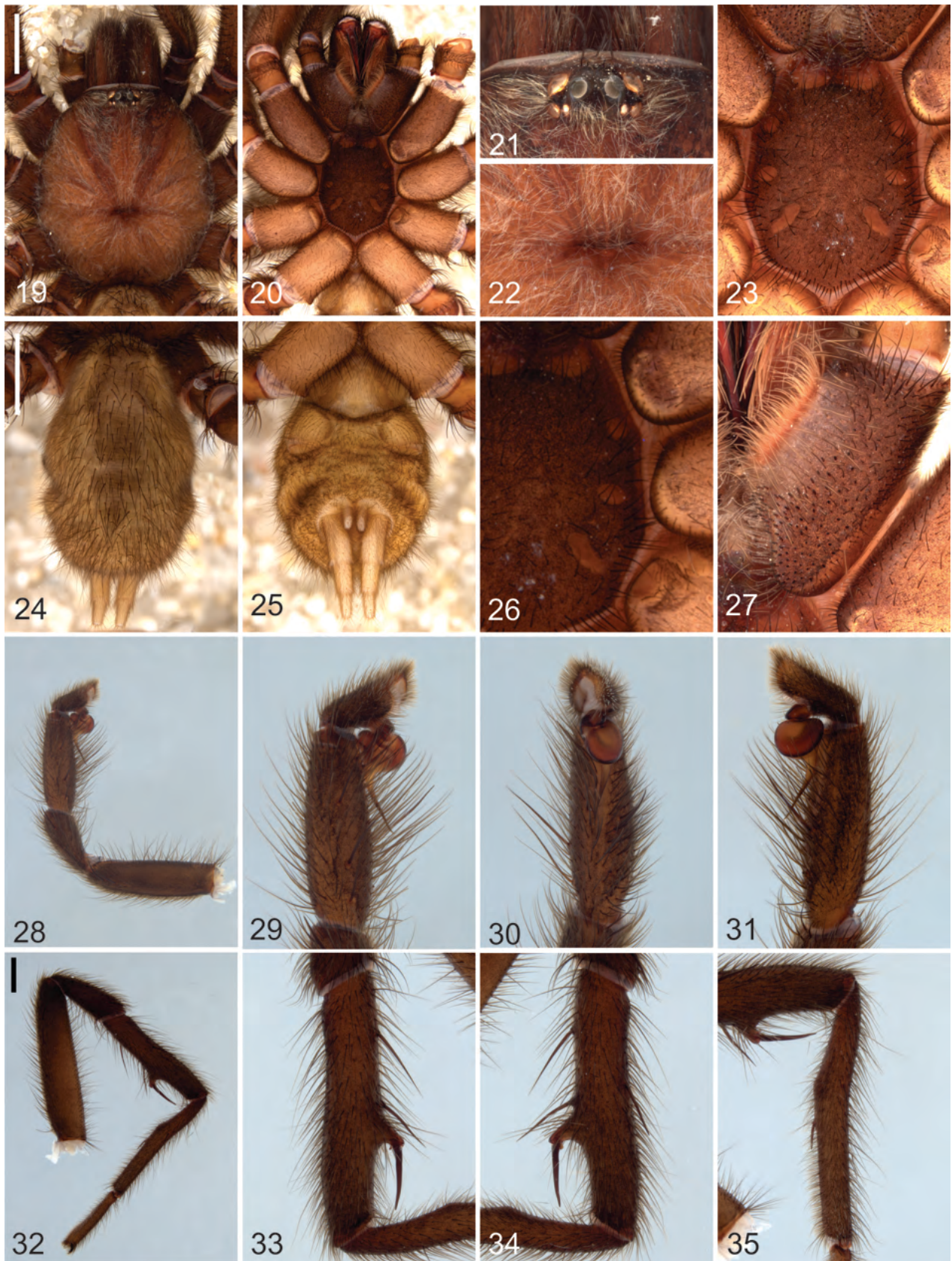
**Variation:** N= 2; carapace length: min 6.0; max 6.4; width: min 5.0; max 5.6; femur I length: min 6.3; max 6.8; metatarsus I length: min 4.8, max 5.5; femur IV length: min 6.4; max 7.8.

### Remarks

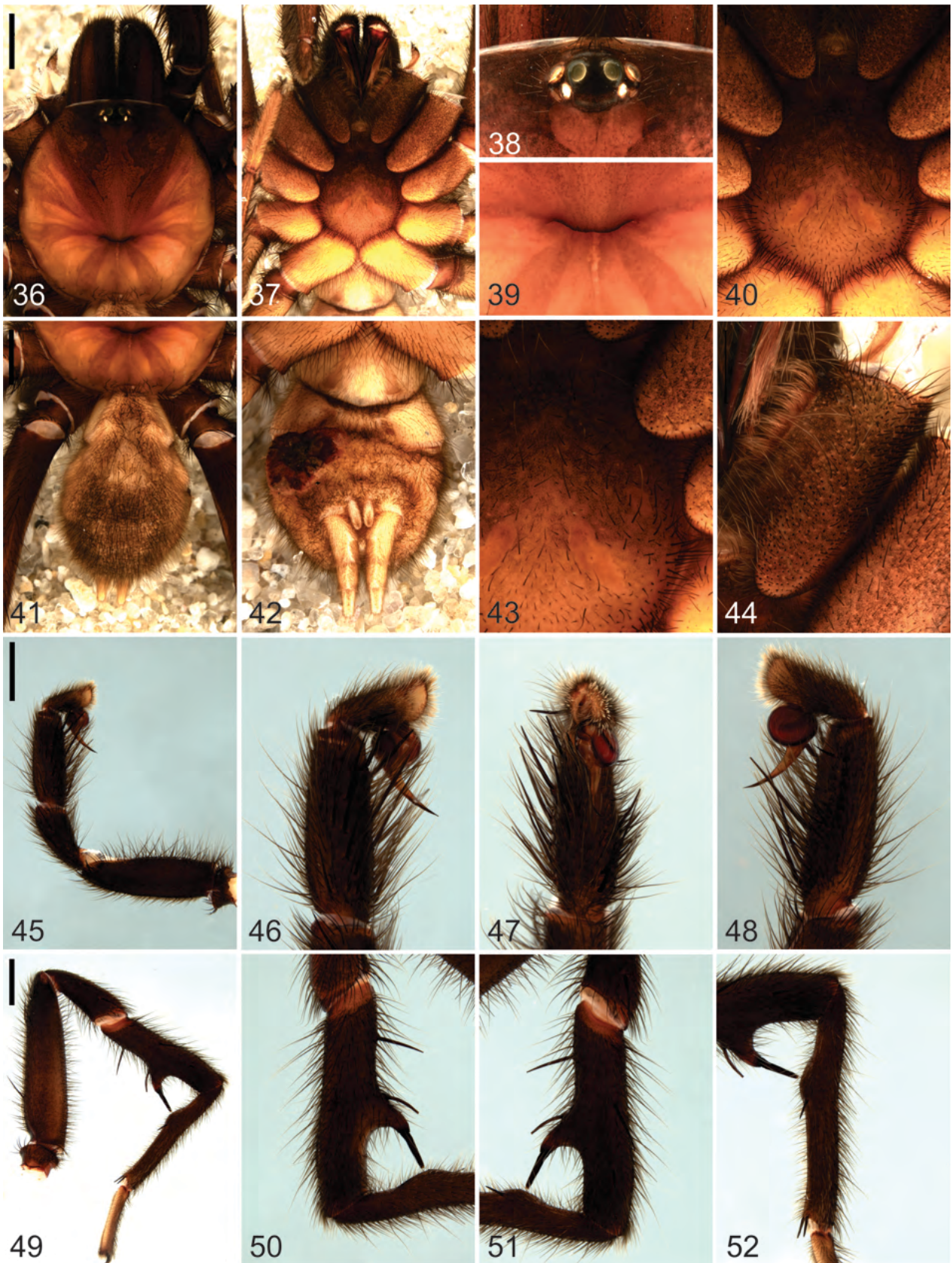
*Kwonkan procul* has been collected from a single location in north-eastern South Australia (Figure 1), which is located in the Simpson Strzelecki Dunefields bioregion.

### Etymology

The species epithet is an adverb that refer to the presence of this species in north-eastern South Australia (*procul*, Latin, far but within sight) (Brown, 1956).



Figures 19–35. *Kwonkan procul* Harvey, Wilson & Rix, sp. nov., male holotype (SAM NN30453): 19, cephalothorax, dorsal; 20, cephalothorax, ventral; 21, eyes, dorsal; 22, fovea, dorsal; 23, sternum, ventral; 24, abdomen, dorsal; 25, abdomen, ventral; 26, left sigillae, ventral; 27, left maxilla, ventral; 28–31, left pedipalp: 28, prolateral; 29, tibia and tarsus, prolateral; 30, tibia and tarsus, ventral; 31, tibia and tarsus, retrolateral; 32–35, left leg I: 32, prolateral; 33, tibia, prolateral; 34, tibia, retrolateral; 35, metatarsus, prolateral. Scale bars = 2.0 mm.



Figures 36–52. *Kwonkan seductus* Harvey, Wilson & Rix, sp. nov., male holotype (MAGNT A005348): 36, cephalothorax, dorsal; 37, cephalothorax, ventral; 38, eyes, dorsal; 39, fovea, dorsal; 40, sternum, ventral; 41, abdomen, dorsal; 42, abdomen, ventral; 43, left sigillae, ventral; 44, left maxilla, ventral; 45–48, left pedipalp: 45, prolateral; 46, tibia and tarsus, prolateral; 47, tibia and tarsus, ventral; 48, tibia and tarsus, retrolateral; 49–52, left leg I: 49, prolateral; 50, tibia, prolateral; 51, tibia, retrolateral; 52, metatarsus, prolateral. Scale bars = 2.0 mm.

***Kwonkan seductus* Harvey, Wilson & Rix, sp. nov.**

Figures 36–52

ZooBank LSID: <http://zoobank.org/NomenclaturalActs/8B49B2EB-C179-4FF7-A63A-FCDBD1577858>**Holotype**AUSTRALIA: *Northern Territory*: ♂, Yulara, 25°12'S, 130°58'E, 1998, T.G. Spokes (MAGNT A005348).**Diagnosis**

Males of *Kwonkan seductus* differ from all other species of the genus by the presence of several long spines on the prolateral surface of the pedipalpal tibia (Figures 46, 47), and further from *K. dissitus*, to which they are most similar, by their darker colour (Figures 36–52).

**Description (male holotype, MAGNT A005348)**

Large anamid spider (total body length 17.2).

*Colour (in alcohol)*: Carapace deep brown (Figure 36); legs brown, some segments with longitudinal pale stripes, tarsi paler; chelicerae deep red-brown (Figure 36); abdomen dorsally pale creamy-yellow with grey-brown markings (Figure 41), and ventrally pale yellow-brown (Figure 42).

*Cephalothorax*: Carapace (Figure 36) 1.02 x longer than broad; sparse fine setae, or larger setae around margin; silver setae absent; without dorsal bristles; clypeal edge protruding medially. Fovea (Figure 39) strongly procurved. Eyes (Figure 38): on distinct mound; from above, anterior eye row straight, posterior eye row slightly recurved; AME about same size as PME; ALE and AME the largest; AME and ALE both same and smallest; eye group length 0.65, width 1.33. Chelicerae (Figure 36) with 3 well-defined strips of brown bristles; rastellum absent; promargin of tooth row with 6 teeth, retromargin with 0 teeth. Labium (Figure 40) fused to sternum; without cuspules. Maxillae (Figure 44) with ca. 110 cuspules; located on the basal half. Maxillae noticeably darker than coxae I–IV (Figure 37). Sternum (Figure 40): round; 1.09 x longer than broad; bristles sparsely over entire surface; with 3 pairs of sigilla, each pair increasing in size from anterior to posterior; posterior pair elongate and slightly curved.

*Pedipalp (Figures 45–48)*: Tibia cylindrical, narrow; ase-tose depression absent; tarsus short; densely setose; bulb ovoid; embolus slightly longer than bulb and gently curved.

*Legs*: Coxal cuspules absent (Figure 37). Tibia I with large megaspur (Figures 50, 51); TIL/TID 3.80; TIS/TIL 0.58; TISH/TID 0.75; metatarsus incrassate; MIL/MID 6.28; MIPEL/MIL 0.41; scopula present on all tarsi, present on distal half of metatarsi I and II, trichobothria: tibia with numerous trichobothria in 2 rows, metatarsi with several trichobothria; tarsi with numerous trichobothria,

claws: with 2 rows of teeth; claw tufts absent. Dimensions (mm): Femur I 7.9; tibia I 5.3; metatarsus I 6.5; II 7.8; III 7.3; IV 9.5.

*Abdomen (Figures 41, 42)*: 1.42 x longer than broad; densely pilose. Spinnerets: 2 pairs of spinnerets; PMS unsegmented and separated by about diameter of spinneret; PLS 3-segmented, apical segment elongate, digitiform.

*Dimensions (mm)*: Total body length (with chelicerae, but excluding spinnerets) 17.2. Carapace length 7.7; width 7.3, sternum length 4.1; width 3.75, abdomen length 7.5; width 5.3.

**Remarks**

*Kwonkan seductus* has been collected from Yulara in Central Australia (Figure 1), which is located in the south-eastern section of the Great Sandy Desert bioregion. The date of collection is unknown but, like many other male trapdoor spiders, it is likely to be during or soon after a rainfall event.

This species was included in a molecular phylogeny of Anamidae (Harvey et al. 2020) under the name *Kwonkan* sp. 'MYG650' for which the following sequences are available in GenBank: *COI*, MT656266; and *12S*, MT656258. The specimen was originally lodged in the Western Australian Museum (WAM T145316) but has since been transferred to Museums and Art Galleries of the Northern Territory.

**Etymology**

The species epithet is an adjective that refers to the presence of this species in central Australia (*seductus*, Latin, remote, apart) (Brown 1956).

**Disclosures**

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