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SHORT COMMUNICATION

A new species of blind subterranean *Tetrablemma* (Araneae: Tetrablemmidae) from Australia

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Abstract. The first blind Australian species of Tetrablemmidae and only the fourth in the world, *Tetrablemma alaus*, new species, is described from subterranean habitats in northwestern Australia. The total loss of eyes is correlated with its subterranean existence and is complemented by other troglomorphies including slightly elongated appendages and pale coloration.

Keywords: taxonomy, morphology, eye loss, troglomorphy

Spiders of the family Tetrablemmidae are found in tropical regions of the world where they inhabit leaf litter and soil, and are very occasionally found in caves. With 30 named genera and some 133 species (Platnick 2009), they are amongst the smallest of all spider families, but have attracted considerable interest and are moderately well known, at least at the generic level (Shear 1978; Lehtinen 1981; Tong & Li 2008). Two subfamilies are recognized, with the Pacullinae found in southeastern Asia, and the Tetrablemminae distributed worldwide. Amongst the most distinctive morphological features of tetrablemmids is the presence of strap-like sclerites situated between the dorsal and ventral scutes of the opisthosoma.

Eye reduction is a common feature amongst Tetrablemmidae, and although most species have six eyes, species with four eyes, two eyes or only one eye occur in many different genera (e.g. Shear 1978; Lehtinen 1981). Total eye loss is, however, very rare and limited to cave-dwelling troglobites from Thailand and Mexico (Shear 1978; Deeleman-Reinhold 1993). Amongst arthropods recently collected from subterranean ecosystems in northwestern Australia was a series of male tetrablemmids belonging to the genus *Tetrablemma* O. Pickard-Cambridge 1873 showing obvious troglobitic adaptations including total eye loss, pale coloration and slightly elongated legs. We present here a description of this unusual species, which is clearly a member of the widespread genus *Tetrablemma*. It is the first blind member of the genus and only the second fully blind tetrablemmid spider from the Old World.

METHODS

The *Tetrablemma* material was collected by staff from Subterranean Ecology using litter traps suspended down mining exploration drill holes. Litter traps are designed to capture terrestrial subterranean fauna and are made from PVC pipe (55 mm diameter × 140 mm in length) with aviary mesh over the top end to provide access to invertebrates and a PVC cap sealing the trap bottom. Each PVC cap had a hole drilled in it to allow any excess moisture to drain away to prevent the trap from becoming and remaining flooded in the event of surface water inflow. Each trap was packed with organic material, consisting mostly of spinifex, *Acacia* and some *Eucalyptus* litter sourced from the survey area. Prior to packing in the trap, organic material was sterilised in a microwave on high power for 10 min to ensure any invertebrates that may have been present were destroyed. Before deployment down drill holes, organic contents of each trap were moistened. Traps were left *in situ* for just over 7 wk (28 February–23 April 2008). On recovery, traps were individually sealed in ziplock bags for transport to the laboratory, where fauna was extracted from litter samples using Tullgren funnels and preserved in 100% ethanol.

Specimens were examined and measured using a Leica MZ16A microscope, and digital images were taken using a Leica DFC 500 digital camera and the software program AutoMontage Pro Version 5.02 (p). Legs and pedipalps were measured from a lateral aspect. Drawings were made under an Olympus BH-2 compound microscope with attached drawing mirror and then scanned and edited using the software program Adobe Photoshop Elements 2.0. All specimens are lodged in the Western Australian Museum, Perth (WAM) and the American Museum of Natural History, New York (AMNH).

TAXONOMY

Family Tetrablemmidae O. Pickard-Cambridge 1873
Subfamily Tetrablemminae O. Pickard-Cambridge 1873
Genus *Tetrablemma* O. Pickard-Cambridge 1873

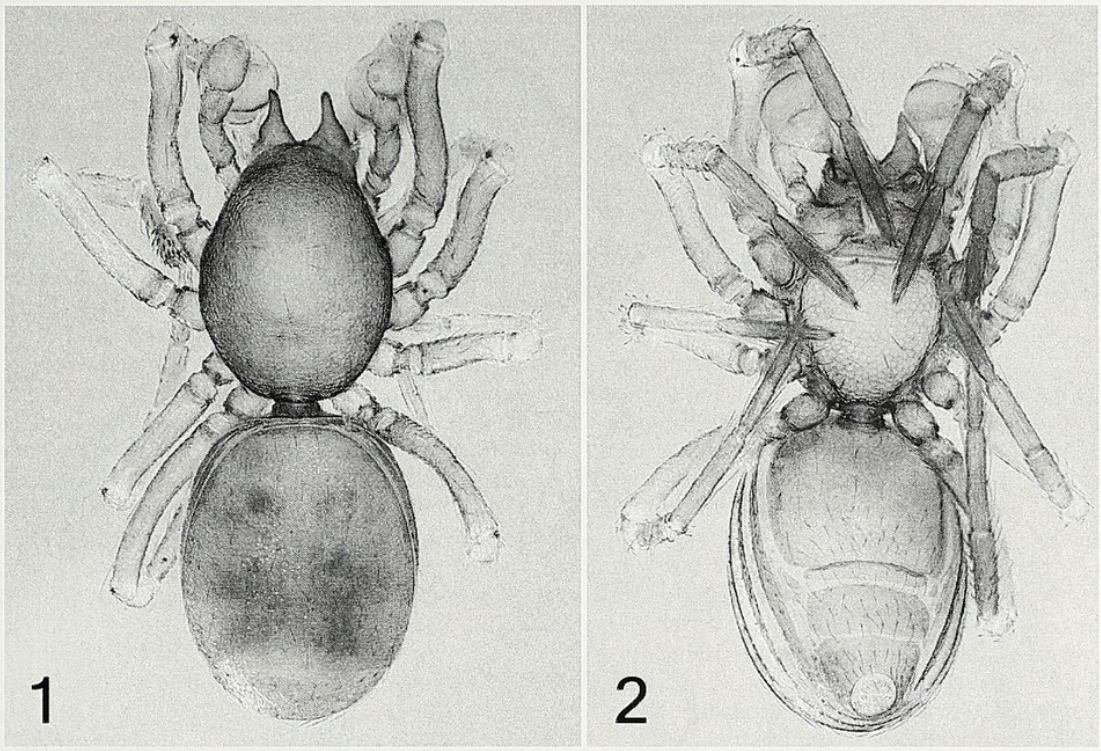
Tetrablemma O. Pickard-Cambridge 1873:114.

Type species.—*Tetrablemma mediocula tum* O. Pickard-Cambridge 1873, by monotypy.

Remarks.—*Tetrablemma* currently contains 20 species (Platnick 2009) and has been divided into three subgenera (Lehtinen 1981): *T. (Kumaonia)* Lehtinen 1981 with a single species from India; *T. (Indonops)* Tikader 1975 with 11 species from India, Samoa, Angola, Saint Helena, Seychelle Islands, Indonesia, Vietnam, Nepal, South Marianas; *T. (Tetrablemma)* with five species from Sri Lanka, India, Trinidad, Angola and Australia; as well as three recently described species that have not been included in either of these subgenera (Burger 2008; Tong & Li 2008; Labarque & Grismado 2009). Like these recent authors, we choose to disregard the subgeneric arrangement.

Tetrablemma alaus new species
Figs. 1–8

Material examined.—AUSTRALIA: *Western Australia*: *Holotype*: male, Callawa Ridge, Yarrie Station, hole #CA0022R, 20°38′36.4″S, 120°17′05.2″E, 28 February–24 April 2008, troglofauna trap (WAM T91751).



Figures 1–2.—*Tetrablemma alaus* new species, male holotype (WAM T91751). 1. Dorsal aspect. 2. Ventral aspect.

Paratypes: AUSTRALIA: *Western Australia*: 1 ♂, Cundaline Ridge, Yarrie Station, hole #CU0063R, 20°32′24.9″S, 120°09′18.5″E, 28 February–23 April 2008, litter trap (WAM T91745); 1 ♂, Callawa Ridge, Yarrie Station, hole #CA0023R, 20°38′25.9″S, 120°18′23.8″E, 28 February–23 April 2008, litter trap (WAM T91748); 1 ♂, same data (AMNH); 1 ♂, Cundaline Ridge, Yarrie Station, hole #CU0059R, 20°32′27.1″S, 120°09′17.3″E, 28 February–23 April 2008, litter trap (WAM T91744); 1 ♂, Cundaline Ridge, Yarrie Station, hole #CU0062R, 20°32′29.2″S, 120°09′23.7″E, 28 February–23 April 2008, litter trap (WAM T91746); 3 ♂, Callawa Ridge, Yarrie Station, hole #CA0024R, 20°38′24.2″S, 120°18′23.9″E, 28 February–23 April 2008, litter trap (WAM T91750). All specimens were collected by staff from Subterranean Ecology.

Etymology.—The specific epithet refers to the lack of eyes in this species; Greek: *alaos* = blind (Brown 1956).

Diagnosis.—*Tetrablemma alaus* is easily distinguished from all other species of Tetrablemmidae (except for *Bacillema leclerci* Deeleman-Reinhold 1993 from Thailand) by the complete lack of eyes or eye-spots. It differs from *B. leclerci* by the much shorter legs.

Description.—*Male:* color (in alcohol): prosoma, scuta of opisthosoma, chelicerae, palps and legs light orange; spinnerets pale yellow; membranous areas white.

Carapace: strongly elevated in lateral view, box-like (Fig. 3); entirely covered with fine mosaic-like pattern; without any long setae (Figs. 1, 3, 4). Eyes completely absent (Figs. 1, 3, 4). Clypeus steeply ascending.

Sternum and pleurae: sternum (Fig. 5) approximately as long as wide, covered with short setae and fine mosaic-like sculpture, separating coxae IV by slightly less than their diameter: pleurae sclerotized, fused with carapace and sternum.

Labium: somewhat triangular, anteriorly rounded, approximately twice as wide as long; separated from sternum (Figs. 2, 5).

Chelicera: basal segment anteriorly with hump extending into long, straight horn with slightly curved tip (Fig. 3); base of hump with slightly wrinkled cuticle; cheliceral horn approximately 0.6 times as long as basal segment; thin transparent lamina on mesal margin of basal segment protecting beyond tip of fang; fang with small teeth on inner side (Fig. 7).

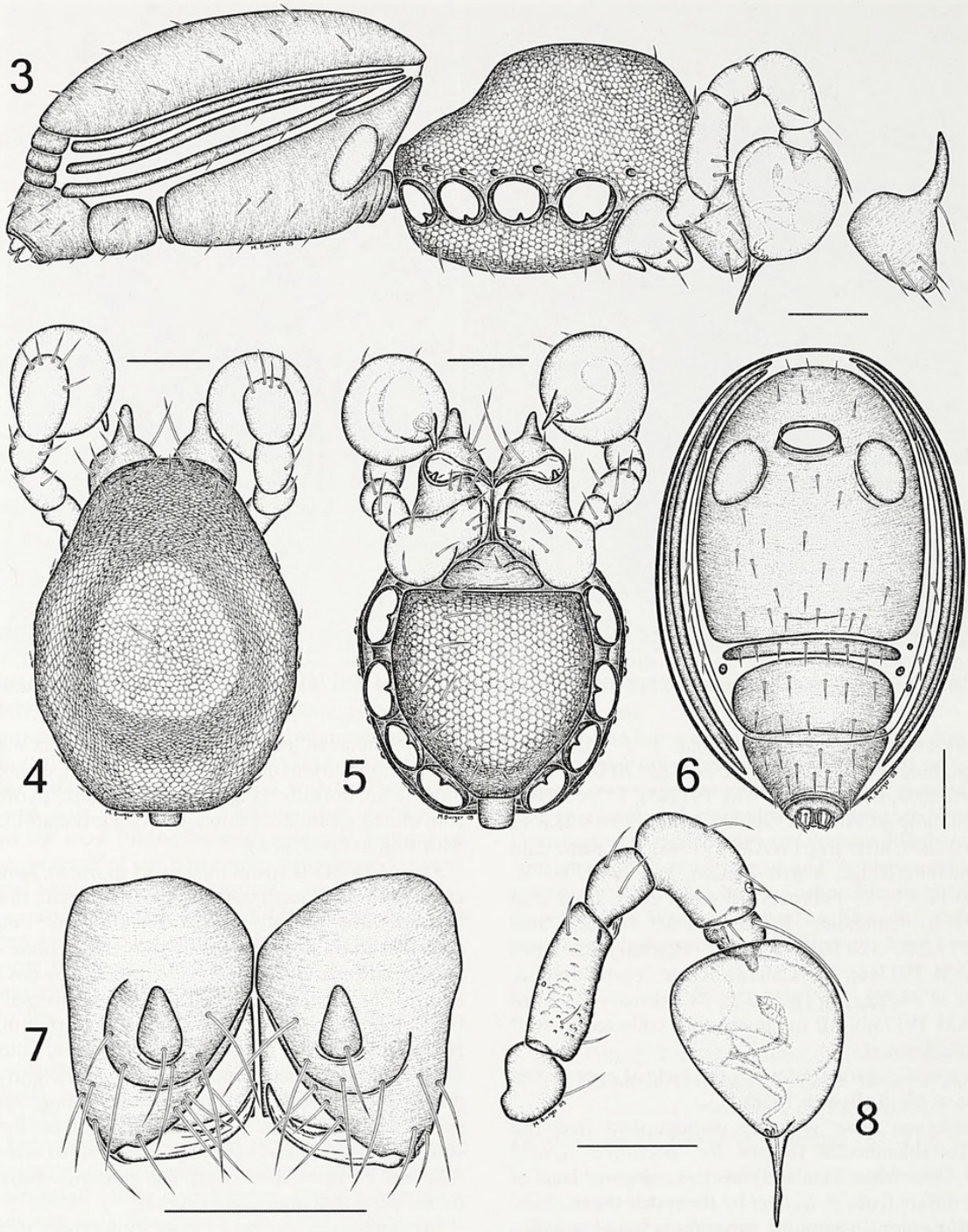
Palp: cuticle of femur partly squamous; tibia slightly enlarged, with one trichobothrium dorsally near distal end; cymbium short, with few long setae dorsally (Fig. 8). Palpal bulb: pyriform, longish, with convoluted sperm duct shining through; thread-like embolus straight, with simple tip (Fig. 8).

Legs: I-IV-III-II (from longest to shortest); femora with squamous cuticle and small teeth ventrally; patellae small; tibiae II–IV with three trichobothria dorsally, tibia I with four; metatarsi with one trichobothrium dorsally; tarsus with two dentate claws.

Opisthosoma: ovoid; large sclerotized plate covering dorsal surface (Figs. 1, 3); ventrally covered by four sclerotized plates (Figs. 2, 6): large pulmonary plate with rounded anterior margin, surrounding pedicel and bearing simple book-lung plates, followed posteriorly by short and broad postgenital plate, long and slightly less broad preanal plate, and conical anal plate surrounding spinnerets; few tiny perigenital plates near postgenital plate; laterally with four pairs of strap-like plates, most ventral pair very short and situated anteriorly, followed by three short strap-like posterior plates situated between dorsal plate and anal plate (Fig. 3).

Measurements (n = 1, male holotype): total length (without chelicerae) 1.210. Prosoma length 0.548, width 0.400, height 0.250. Opisthosoma length 0.818, width 0.517. Lengths of palp and leg segments: palp: femur 0.210, patella 0.061, tibia 0.130, tarsus 0.326, total 0.727; leg I: femur 0.416, patella 0.146, tibia 0.297, metatarsus 0.274, tarsus 0.250, total 1.383; leg II: femur 0.352, patella 0.129, tibia 0.270, metatarsus 0.146, tarsus 0.137, total 1.034; leg III: femur 0.278, patella 0.124, tibia 0.225, metatarsus 0.198, tarsus 0.218, total 1.043; leg IV: femur 0.378, patella 0.123, tibia 0.226, metatarsus 0. 238, tarsus 0.277, total 1.242.

Remarks.—The Australian tetrablemmid fauna consists of just two named species: *T. okei* Butler 1931 from Victoria and *T. magister* Burger 2008 from Queensland (Butler 1931; Burger 2008). Numerous new species of *Tetrablemma* and possibly other genera have been collected from tropical northern Australia, but are presently undescribed (Harvey unpubl. data). Due to the highly modified troglomorphic features and the localized distribution of the new species, we have chosen to describe this species separately from the epigean ones.



Figures 3–8.—*Tetrablemma alaus* new species, male paratype (WAM T91748). 3. body, lateral aspect. Lateral view of right chelicera on the right side. Only few hairs of opisthosoma shown. 4. Prosoma, dorsal aspect. 5. Prosoma, ventral aspect. 6. Opisthosoma, ventral aspect. 7. Chelicerae, anterior aspect. 8. Left palp, prolateral aspect. Scale lines = 100 μm.

As noted above, this is only the second completely blind Old World species of tetrablemmid, the first being *Bacillemma leclerci* from a cave in Thailand (Deeleman-Reinhold 1993). Eyeless and eyed populations have been reported for *Matta mckenziei* Shear 1978 and *Caraimatta sbordonii* (Brignoli 1972), both from caves in Mexico (Brignoli 1972; Shear 1978; Lehtinen 1981).

The subterranean fauna of Western Australia is now known to be diverse and widespread, with numerous new species of many different animal groups described over the past 20 years. Whilst pseudoscorpions (e.g. Harvey 1991; Harvey & Mould 2006; Harvey & Edward 2007a; Harvey & Volschenk 2007; Edward & Harvey 2008; Harvey & Leng 2008a, 2008b), schizomids (Harvey 1988; Harvey & Humphreys 1995; Harvey 2001; Harvey et al. 2008) and scorpions (Volschenk & Prendini 2008) have received detailed taxonomic attention, there have been relatively few blind troglobitic spiders described to date. The fully blind trochanteriid *Desognanops humphreysi* Platnick 2008 was recently described from Millbillillie Station [ca 26°41′S, 120°20″E] (Platnick 2008), as were three blind oonopids from the Pilbara and Kimberley regions of Western Australia (Harvey & Edward 2007b). Gray (1973, 1981, 1992) recorded several blind stiphidiids of the genus *Tartarus* Gray, and the monotypic ctenid genus *Janusia* Gray 1973 from the Nullarbor Plain, in southern Australia. The highly troglobitic *Bengalla bertmaini* Gray & Thompson 2001 occurs in the deep limestone cave of the Cape Range Peninsula (Gray & Thompson 2001); although originally described within the Lycosoidea, it was later transferred to the family Tengellidae (Raven & Stumkat 2005).

The Callawa and Cundaline Ridge systems in the Yarrie Station area are located approximately 200 km east of Port Hedland on the northern margin of the Pilbara Craton. The ridges are mostly comprised of sandstones, shales and Archaean banded irons within which there are many fractures and fissures providing habitat for subterranean invertebrates. Callawa and Cundaline Ridges are known to contain a variety of troglobitic arachnid species including the blind pseudoscorpions *Lagynochthonius leemouldi* Edward and Harvey 2008 (Edward & Harvey 2008) and new species of *Tyrannochthonius* and *Indohya* (M. Harvey unpubl. data), and a blind oonopid belonging to a new genus similar to *Camptoscaphiella* (B. Baehr and M. Harvey unpubl. data).

The discovery of diverse assemblages of troglofauna in non-karstic formations in the Pilbara are largely due to the recent increase in mining exploration and associated subterranean fauna surveys required as part of environmental impact assessments. Previously terrestrial subterranean fauna in Western Australia was mostly known from karst-associated habitats only (Eberhard et al. 2008). The level of species richness recorded from the Yarrie area is comparable to other non-karstic formations surveyed in the Pilbara (Eberhard et al. 2008; Subterranean Ecology 2007).

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