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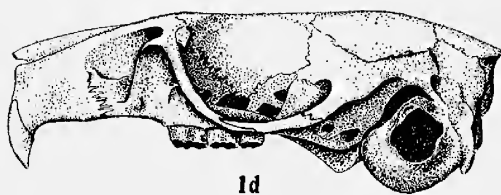
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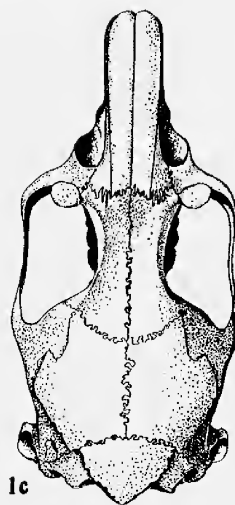
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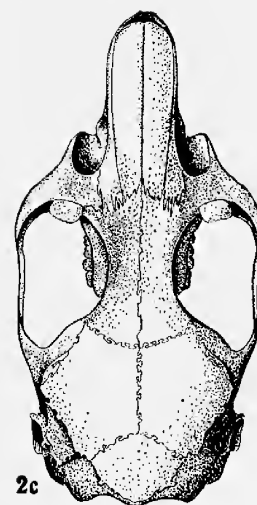
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Communities

Cover images—Comparison is an essential aspect of discovery in the natural sciences. In the example shown on the cover, the skulls of two indigenous rodent species are depicted. Australian Museum zoologist Troughton (1923, *Records of the Australian Museum* 14[1]: 23–41) determined them to belong to the species *Leporillus conditor* (Gould) (Figs. 1c,d) and *L. jonesi* Thomas (Figs. 2c,d). He noted that the genus, at that time, was represented by species from west of the Lower Darling River in New South Wales, from Alice Springs to the Nullarbor Plains, and on islands of the Nuyts Archipelago in South Australia. Their large stick nests had been noted by early explorers Sturt and Mitchell and figured by Gould.

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Uncovering Local Endemism in the Kimberley, Western Australia: Description of New Species of the Genus *Amplirhagada* Iredale, 1933 (Pulmonata: Camaenidae)

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ABSTRACT. In this work twenty-six species of the camaenid land snail *Amplirhagada*, which is endemic to the Kimberley region in Western Australia, are newly described. In addition, the anatomy of two further species, *A. katerana* and *A. combeana*, is described and a further, yet undescribed species is reported from Boongaree Island based on dry shell material. Most of these species occur on islands of the Bonaparte Archipelago off the mainland coast. The patterns of distribution and differentiation of these island species are comparable, however, with those found on the mainland. Mainland species are usually restricted to single rainforest patches. Frequently, single patches harbour only one or two congeneric species. Similarly, smaller islands usually support one endemic *Amplirhagada* species whereas on larger islands up to four species are found to occur in sympatry. Species are distinguishable particularly by the characteristic anatomy of the inner penial wall. Sympatric species generally exhibit marked morphological differences in shells and genital anatomy. A molecular phylogeny based on partial sequences of the mitochondrial cytochrome c oxidase unit I gene (COI) reveals a basal polytomy among species of the genus, which are generally genetically well differentiated. Relationships among species in the molecular tree mainly reflect geographical patterns.

KÖHLER, FRANK, 2010. Uncovering local endemism in the Kimberley, Western Australia: description of new species of the genus *Amplirhagada* Iredale, 1933 (Pulmonata: Camaenidae). *Records of the Australian Museum* 62(2): 217–284.

Camaenid land snails of the genus *Amplirhagada* Iredale, 1933, are endemic to the Kimberley region of Western Australia, where they have radiated extensively. Thirty species are currently considered valid, most of which usually occupy small distributional ranges along the Kimberley coast from the Buccaneer Archipelago in the south to Kalumburu in the north as well as in inland areas of the Napier, Harding, and King Leopold Ranges, the Drysdale

River Reserve, Mt Elizabeth Station and the region south of Wyndham (Solem, 1981a, 1988). Many of these species are restricted to single localities, such as rainforest patches or more open woodlands (Solem, 1991). Supposed exceptions, with species occupying larger ranges, are likely to result from the inadequate delimitation of morphologically cryptic species (Solem, 1981a). Earlier accounts were predominantly based on dry shells (e.g., Smith, 1894; Iredale, 1933,

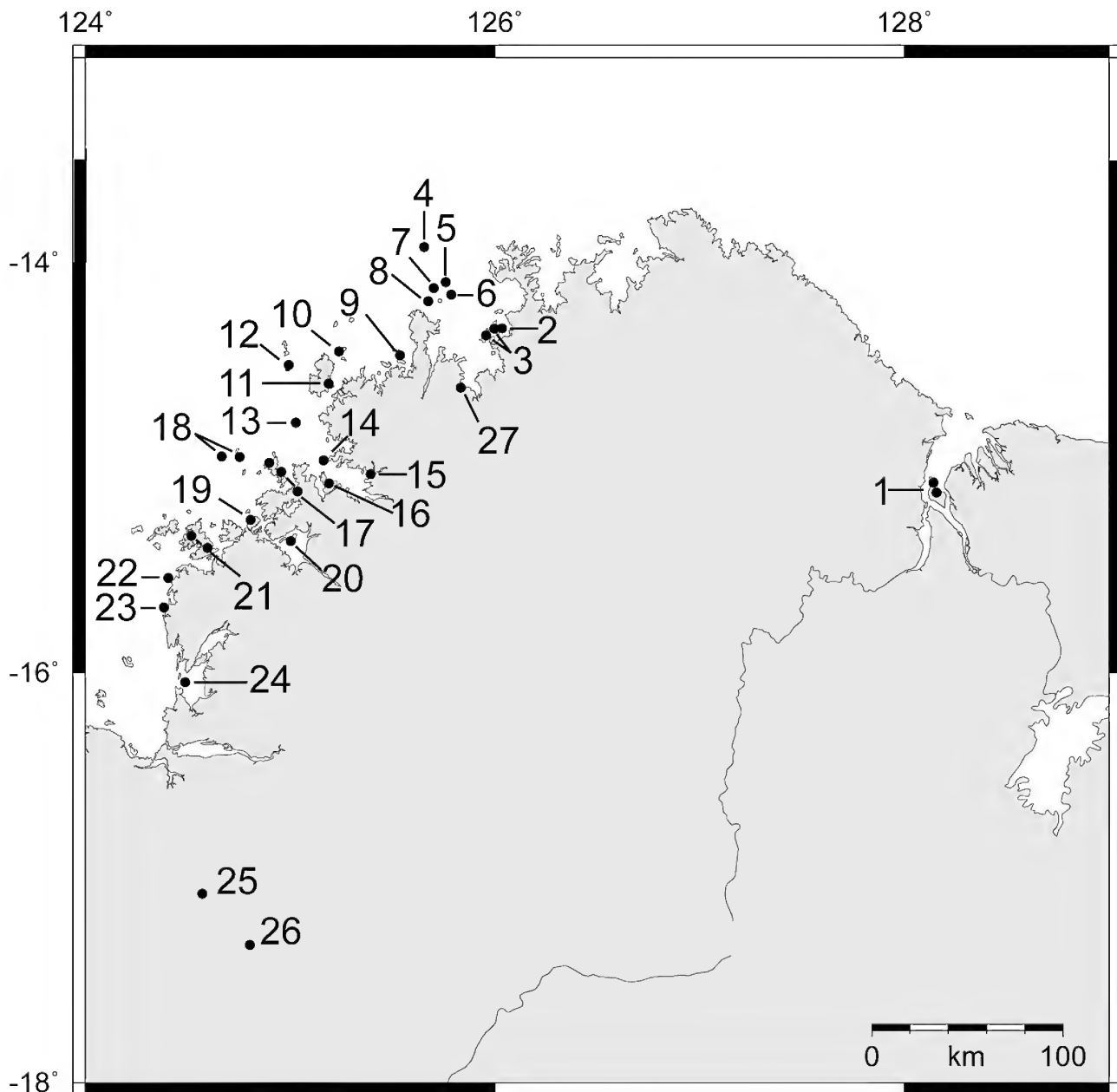


Figure 1. Distribution of *Amplirhagada* species in the Kimberley region, northwestern Australia. (1) *A. euroa* n.sp., Adolphus Island. (2) *A. solemiana* n.sp., Middle Osborn Island. (3) *A. indistincta* n.sp., Southwest Osborn Island, Kidney Island. (4) *A. combeana*, Cassini Island. (5) *A. mckenziei* n.sp., Oliver Island. (6) *A. ponderi* n.sp., Kingsmill Island. (7) *A. montesquieuana* n.sp., Fenelon Island. (8) *A. descartesana* n.sp., Descartes Island. (9) *A. katerana*, Katers Island. (10) *A. puscheli* n.sp., unnamed island near Prudhoe Island. (11) *A. decora* n.sp., *A. kessneri* n.sp., Bigge Island. (12) *A. berthierana* n.sp., Berthier Island. (13) *A. lamarckiana* n.sp., Lamarck Island. (14) *A. andersonensis* n.sp., unnamed island, Anderson Islands. (15) *A. tricenaria* n.sp., Prince Frederick Harbour, north of Hunter River mouth. (16) *A. regia* n.sp., *A. boongareensis* n.sp., *A. gibsoni* n.sp., and *Amplirhagada* sp., Boongaree Island. (17) *A. yorkensis* n.sp., Coronation Island. (18) *A. buffonensis* n.sp., Buffon Island. (19) *A. uwinsensis* n.sp., Uwins Island. (20) *A. sphaeroidea* n.sp., St. Andrews Island. (21) *A. basilica* n.sp., and *A. camdenensis* n.sp., Augustus Island. (22) *A. kimberleyana* n.sp., NW of Wilson Point. (23) *A. gemina* n.sp., 1.5 km SE of Hall Point. (24) *A. dubitabile* n.sp., Steep Island. (25) *A. napierana*, north Napier ranges. (26) *A. percita*, Napier ranges. (27) *A. castra*, *A. mitchelliana*, and *A. varia*, Mitchell Plateau.

1938, 1939). However, Solem (1981a, 1988) demonstrated that *Amplirhagada* species frequently show only subtle differences in shell features, such as colour, shape, and sculpture. In addition, shells are prone to homoplasy, which renders the delimitation of species by shell features alone difficult or impossible. In fact, proper species delimitation requires the study of genital anatomy, which was identified

as a convenient source of key morphological characters for the recognition of species not only in this genus but also in other camaenid genera (Solem, 1979, 1981a, 1981b, 1984, 1985; Willan *et al.*, 2009; Köhler, 2010). In *Amplirhagada* structure of the inner penial wall and development of the main stimulatory pilaster provide particularly valuable diagnostic characters for delimiting species (Solem, 1988).

A comparative study, mainly of the genital anatomy, enabled Solem (1981a) to identify a large number of species that were unrecognized by previous authors, who relied exclusively on shell features. Solem showed that relatively restricted areas in the Kimberley, such as the Mitchell Plateau, may support a surprisingly large number of species that can be differentiated on morphological criteria only by their genital anatomy. Solem's milestone publications on the Camaenidae in Western Australia (Solem, 1979, 1981a, 1981b, 1984, 1985, 1988, 1991; Solem & Christensen, 1984) highlighted the remarkable diversity and patterns of local endemism within this group of land snails. Even though he published extensively on Western Australian Camaenidae, Solem was not able to approach a complete documentation of their extant diversity (Cameron *et al.*, 2005).

In addition to thirty named species of *Amplirhagada*, Solem (1991) listed 25 undescribed species from rainforest patches and woodlands throughout the Kimberley region. When Alan Solem died in 1990 he left numerous examples of undescribed *Amplirhagada* species that are currently housed in the Field Museum in Chicago. Given the poor documentation of camaenid land snails from vast areas, such as most of the islands off the Kimberley coast, and with documented but undescribed material being kept in the collections of various museums, many more species undoubtedly remain to be discovered (Solem, 1988). Taking this high proportion of undiscovered diversity into consideration; *Amplirhagada* is surely the most species diverse camaenid genus in northwestern Australia, with only a small fraction of its actual species diversity having been described.

The aim of the present work is to enhance the documentation of diversity of this endemic genus in the Western Australian Kimberley region. Special attention is paid to islands off the Kimberley coast, which have previously been neglected. Twenty-seven *Amplirhagada* species are newly described herein based on a comparative study of samples from various sources. The core material was collected in 2007–2008 during the Kimberley Island Survey of the Department of Environment and Conservation, Western Australia. This material is supplemented by samples that were collected as early as 1987 and are housed in museum collections.

In addition to the study of morphological differentiation, molecular phylogenies have been reconstructed based on sequences of a partial fragment of the mitochondrial cytochrome c oxidase gene (COI) in order to compare rates of genetic and morphological differentiation and to assess the diagnostic value of anatomical characters in a phylogenetic context.

Material and methods

This study is primarily based on ethanol preserved specimens and supplementary dry shell material collected during the Kimberley Island Survey (KIS) of the Department of Environment and Conservation, Western Australia (DEC) in 2007–2009, the Kimberley Rainforest Survey of the then Department of Conservation and Land Management, Western Australia (RFS) in 1987–1988 and additional field work conducted between 1988 and 2002 by various parties. Types and other voucher material are deposited in the Western Australian Museum, Perth (WAM), the Field Museum of Natural History, Chicago (FMNH), and the Australian Museum, Sydney (AMS).

Morphological descriptions focus on characters of the shell, the mantle cavity, the genital organs, and the radula. Morphometric shell parameters, such as height of shell (H), diameter of shell (D), height of last whorl (LW), and width of umbilicus (U) were measured with callipers precise to 0.1 mm. The numbers of whorls (N), including the protoconch, were counted as described Barker (1999: Fig. 6). The parameter “angle of aperture” describes the angle formed between aperture and the horizontal in degrees when the shell is in an upright position. The morphometric shell parameters H, D, LW, U, N, H/D were subjected to morphometric analyses when considered necessary for the delimitation of species with similar shells.

Anatomy of mantle and genital organs was studied using a binocular microscope with drawing mirror. If not stated otherwise, the final inking of drawings was done by Martin Püschel (Sydney). Radulae and jaws were extracted manually, cleaned by soaking in 10% KOH solution for about six hours followed by rinsing in water and ethanol. They were mounted on carbon specimen tabs for electron scanning microscopy. Radular tooth formula gives the numbers of teeth as follows: C (central row of teeth)+number of lateral rows of teeth+number of transitional rows of teeth+number of marginal rows of teeth. The anatomy was studied in two (in small series) to five specimens per sample in order to confirm that morphological observations are consistently found among conspecific specimens.

DNA was extracted from small pieces of foot muscle by use of a QIAGEN DNA extraction kit for animal tissue following the standard procedure of the manual. A fragment of the mitochondrial cytochrome c oxidase gene (COI) was amplified by PCR using the standard primers LCO1490 and HCO2198 of Folmer *et al.* (1994). Reactions were performed under standard conditions with an annealing temperature of 50°C. Phylogenetic trees were reconstructed by application of Maximum Likelihood (ML) using the software TREEFINDER version October 2008 (Jobb *et al.*, 2004), Bayesian Inference (BI) using the software MRBAYES 3.1.2 (Ronquist & Huelsenbeck, 2003), and Maximum Parsimony using the Ratchet implemented in WINCLADA (Nixon, 1999) with 1,000 iterations, 10 trees kept at each step. Nodal support of topologies was inferred by applying MP bootstrapping (Felsenstein, 1985) or by calculating Bayesian posterior clade probabilities (Larget & Simon, 1999) and Expected-Likelihood Weights of Local Rearrangements of tree topology (LR-ELW) (Strimmer & Rambaut, 2002). Pair-wise genetic distances were calculated with the software DAMBE (Xia & Xie, 2001). Sequences have been deposited with GenBank under the accessions GU302247 to GU302299.

Systematic descriptions

Gastropoda

Heterobranchia

Stylommatophora

Camaenidae Pilsbry, 1895

Amplirhagada Iredale, 1933

Amplirhagada Iredale, 1933: 52; Solem, 1981a: 147–320; Solem, 1988: 28–32; Solem, 1991: 187–202. Type species *Helix (Hadra) sykesi* Smith, 1894 by original designation. *Tenuigada* Iredale, 1939: 68. Type species *Tenuigada percita* Iredale, 1939 by original designation.

Diagnosis

Rock or free sealer with medium sized (15–30 mm in diameter), thin and translucent to moderately thick, broadly conical to dome-shaped shell with moderately to strongly elevated spire. Umbilicus concealed by columellar reflection or narrowly open. Protoconch with weak to strongly developed radially elongated pustulations; transition to teleoconch inconspicuous. Teleoconch with very weak axial growth lines that may become almost invisible on last whorl or sculptured by well-developed, regular axial lirae. Last whorl moderate to wide in cross-section; periphery well rounded to slightly angulate (often transitions are found within single populations). Shell colour usually variable even within populations, background often yellowish brown to horn, frequently with darker, brown bands located below suture and on periphery of whorl; some species are uniform in colour. Genitalia typically; development depends on seasonal activity and maturity. Penis with well-developed sheath, extending entire length, thin proximally, thick distally. No well-developed epiphallus present. Penial retractor muscle attached at apex of penial complex. Vas deferens entering sheath from halfway up to almost apically; entering penial chamber through verge. Inner penial wall supports characteristic pustulation and basal pilasters; a main stimulatory pilaster varies in development from undifferentiated to very large, cone-shaped. Spermatheca relatively simple, short reaching base of spermoviduct; duct and head usually well differentiated; inner spermathecal and vaginal wall with longitudinal pilasters that vary in development and finer structure. Albumen gland elongate. Hermaphroditic duct tightly undulating. Radula rectangular in shape, usually between 3.5 and 5.5 mm long with 120–170 rows of teeth. Tooth formula variable, C+12–20+3–4+15–22.

Amplirhagada euroa n.sp.

Type locality (Fig. 1). Western Australia, eastern Kimberley, Cambridge Gulf, eastern section of Adolphus Island, 15°06'32"S 128°09'08"E; KIS 3–113. East-facing gully with ephemeral stream and patches of vine thicket, fig trees. Scree on very steep slopes. In loose soil under large boulders (leg. V. Kessner, 7 August 2008).

Type material. Holotype WAM S34601 (Pl. 1.1). Paratypes AMS C463680 (6 preserved specimens, as holotype), WAM S37083 (12

preserved specimens, as holotype), WAM S37390 (3 shells, 15°06'18"S 128°09'04"E), WAM S37391 (shell, 15°06'35"S 128°09'57"E), AMS C463723 (6 shells, 15°06'32"S 128°09'08"E), WAM S37392 (11 shells, 15°06'32"S 128°09'08"E), WAM S37393 (3 shells, north of Adolphus Island, 15°04'19"S 128°08'18"E).

Etymology. From *euroa* (Latin = eastern), for this species occurring at the easternmost limits of the known range of the genus.

Sealing strategy. Rock sealer.

Shell (Fig. 2A–B, Pl. 1.1–2). Broadly conical with low to medium high spire, thin to translucent. Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, narrowly winding, 50–90 percent concealed by columellar reflection. Background colour yellowish brown with chestnut brown, thin to moderately broad, diffuse to well defined sub-sutural and mid-whorl bands, clearly visible on last whorls only; ventral colour brownish horn to whitish; outer lip colour tends to be lighter than shell till whitish; inner lip translucent. Protoconch c. 3 mm in diameter, comprising about 1.7 whorls, with faint, indistinct axial riblets. Teleoconch with fine axial lirae, curved if viewed from above, pointed in cross-section, irregularly spaced, spaces as wide as thickness of lirae. Lirae evenly distributed across whorl diameter, with reduced height underneath suture; present on all whorls. Angle of aperture 45°. Outer lip simple rounded, sharp, slightly to well expanded, slightly reflected; basal node absent or very weak; palatal node absent. Parietal wall of inner lip absent or inconspicuous.

Pallial morphology. Pallial cavity deep, extending one whorl; mottled or spotted black mantle pigmentation. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 3–4). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens coils before entering penis. Penial retractor muscle shorter than penis complex. Penial verge short, less than 1/3 of length of penial chamber, slender with rounded tip. Penial wall pustules normal to elongated, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster large, cone-shaped, comprising entire length of inner penial wall; sculptured by ridges with smooth, flattened pustules. Vas deferens entering penial sheath in upper third. Vagina of medium length, posteriorly inflated; inner vaginal wall supports undulating longitudinal pilasters. Spermatheca short, reaching base of spermoviduct; duct wide, inner wall with smooth longitudinal pilasters; head globular to elongately inflated, connected with oviduct by connective tissue, wall of head delicate, smooth. Free oviduct rather straight comprising about half of length of anterior part of oviduct. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 2C–E). Rectangular. Tooth formula C+12–13+3–4+20–21. Average number of rows of teeth 146±7 with 36.2±0.7 rows of teeth per mm (n = 2). Central teeth with sharply pointed triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed triangular mesocones, length equal to

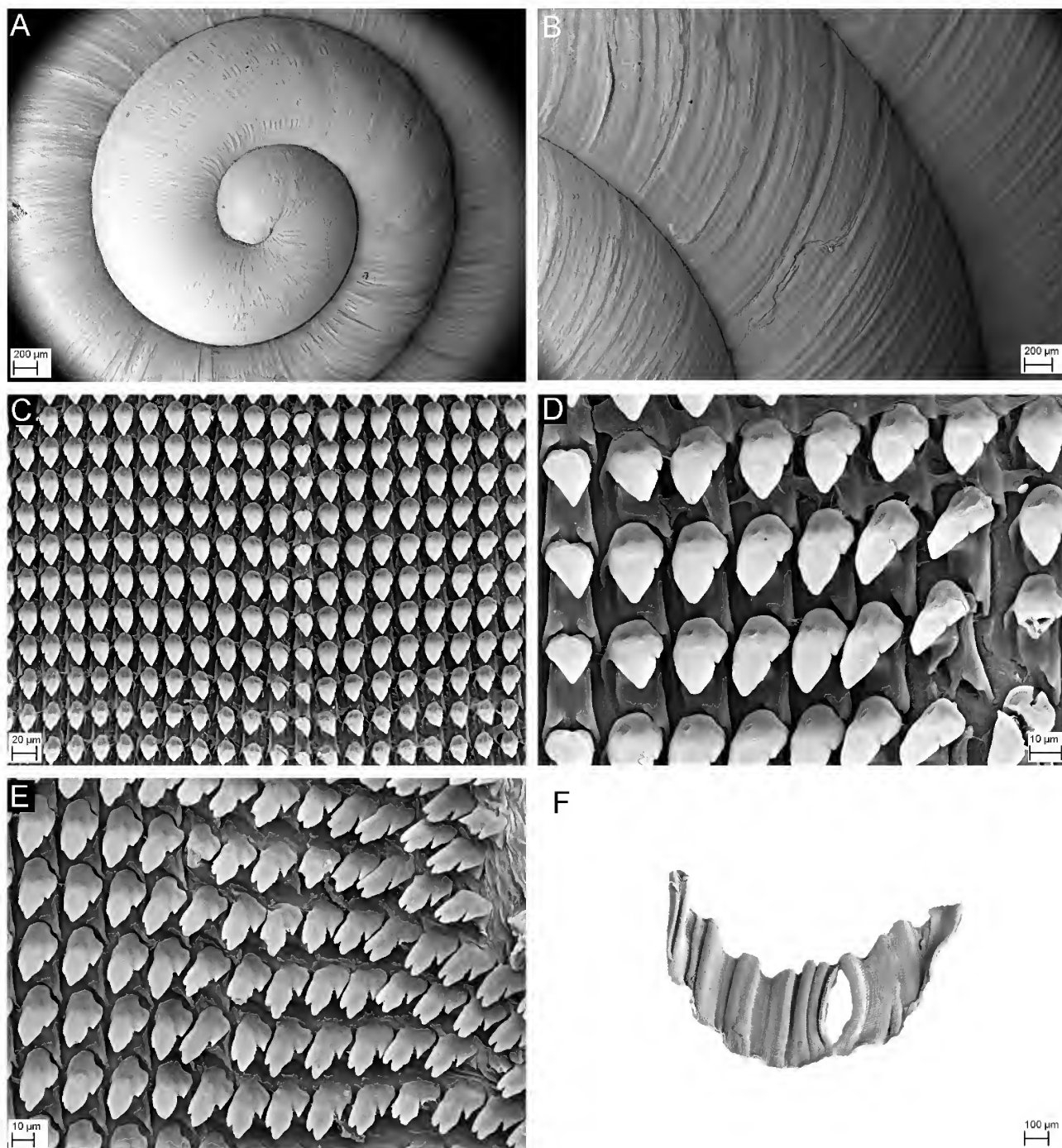


Figure 2. SEM photographs of *Amplirhagada euroa* n.sp., paratype AMS C463680: (A) apical whorl viewed from above (scale 200 µm); (B) penultimate whorls viewed from above (scale 200 µm); (C) central and lateral radular teeth (scale 20 µm); (D) details of central and lateral teeth (scale 10 µm); (E) details of outer lateral and inner marginal teeth (scale 10 µm); (F) jaw (scale 100 µm).

base of tooth; small ectocones; endocones absent. Marginal teeth multicuspic, mesocone and endocone similar in length, ectocone smaller than endocone, occasionally subdivided.

Comparative remarks. *Amplirhagada euroa* is geographically well separated from most other congeneric species. *Amplirhagada cambridgensis* Solem, 1988 (from the western bank of Cambridge Sound) and *A. questronana* Solem, 1981a (from El Questro Station near Wyndham, c. 100 km S of Adolphus

Island) occur in closer proximity. The shell of *A. cambridgensis* is very similar but this species differs in the morphology of the inner penial wall with pustules being arranged to form corrugated longitudinal pilasters. *Amplirhagada euroa* differs from *A. questronana* by umbilicus forming a chink instead of being open and by its long main stimulatory pilaster that supports flattened pustules (*A. questronana* has a short pilaster with corrugations). Otherwise, both species have rather similar shells with regard to shape and size.

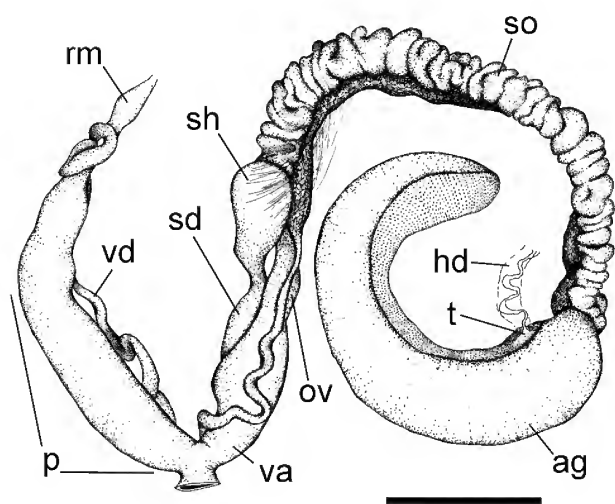


Figure 3. Genitalia of *Amplirhagada euroa* n.sp., paratype AMS C463680 (7 August, scale 10 mm). Labelling of structures: ag, albumen gland; hd, hermaphroditic duct; p, penial complex (penis and penis sheath); ov, oviduct (free anterior part); rm, penial retractor muscle; sd, spermathecal duct; sh, spermathecal head; sp, spermoviduct (uterus, prostate); t, talon; va, vagina; vd, vas deferens.

***Amplirhagada solemiana* n.sp.**

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Admiralty Gulf, west coast of Middle Osborn Island, 14°18'18"S 125°59'35"E; KIS 2–030. Small vine thicket at base of hill, west facing slopes. Common on trees and bushes (leg. V. Kessner, 13 February 2008).

Type material. Holotype WAM S34602 (Pl. 1.3). Paratypes AMS C463681 (8 preserved specimens, as holotype), WAM S36860 (20 preserved specimens, as holotype), AMS C463683 (4 shells, 14°18'37.4"S 125°59'18.4"E), WAM S36572 (10 shells, 14°18'37.4"S 125°59'18.4"E), AMS C463682 (2 preserved specimens, east coast, 14°18'53.5"S 126°02'06.7"E), WAM S36859 (6 preserved specimens, east coast, 14°18'53.5"S 126°02'06.7"E).

Additional, non-type material. WAM S36471, WAM S36566–71, WAM S36573, WAM S36585–99, WAM S36858, WAM S36861, WAM S36971, AMS C463684–5 (Middle Osborn Island).

Etymology. Named in honour of Alan Solem, in recognition of his achievements in camaenid systematics.

Sealing strategy. Rock sealer.

Shell (Fig. 5A–E, Pl. 1.3–4). Semi-globose with moderately high spire. Thin to solid, translucent. Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls well rounded. Umbilicus open, forming a chink, to 80–90 percent concealed by columellar reflection. Background colour horn to yellowish brown, with brown, well defined to diffuse, moderately broad, sub-sutural and

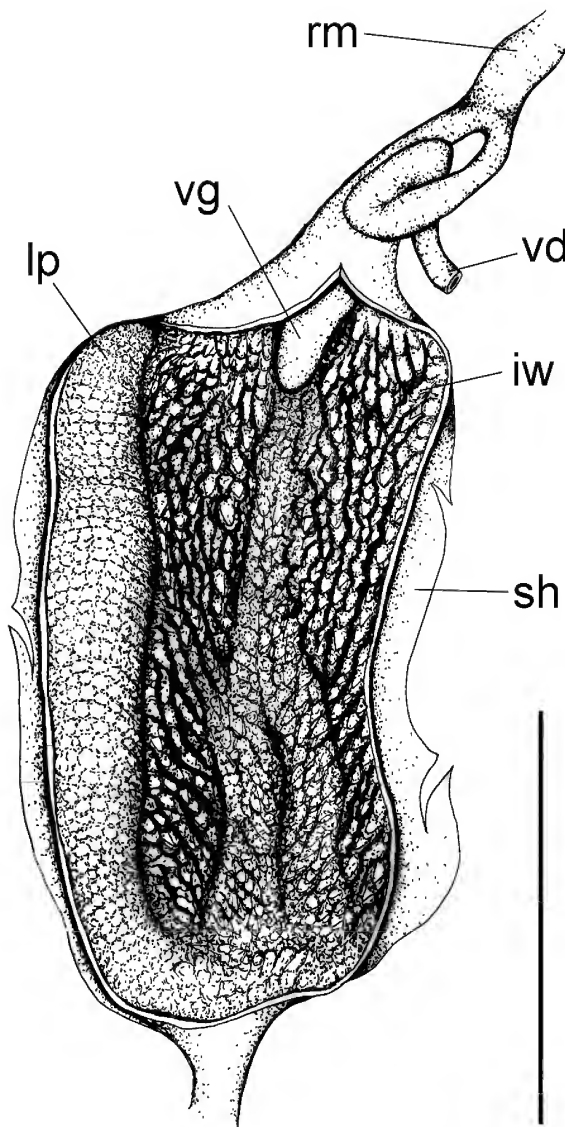
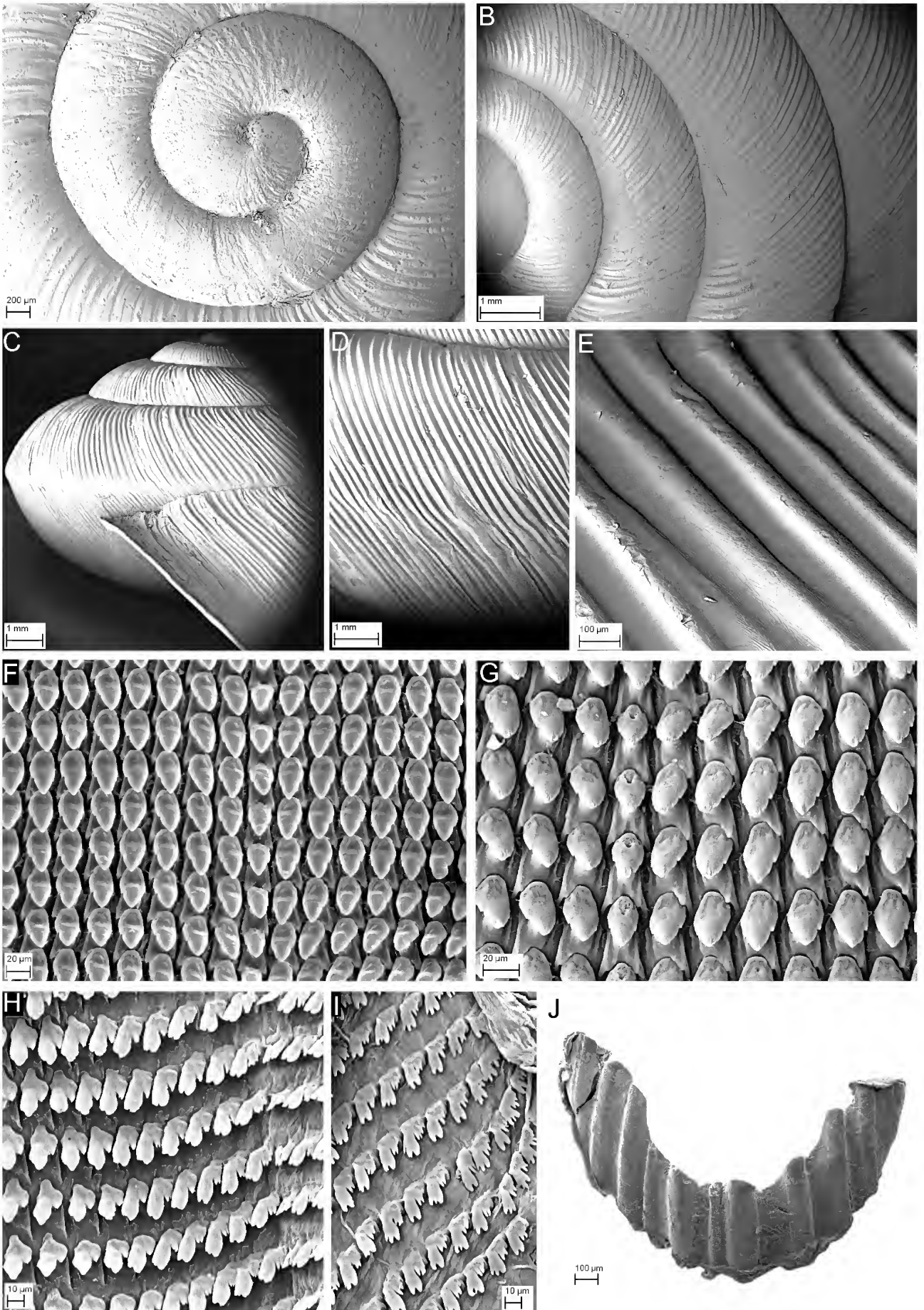


Figure 4. Interior of penial chamber of *Amplirhagada euroa* n.sp., paratype AMS C463680 (7 August, scale 5 mm). Labelling of structures: iw, inner penial wall; lp, longitudinal (main) pilaster; rm, penial retractor muscle; sh, penial sheath; vd, vas deferens; vg, penial verge.

mid-whorl bands, visible on entire shell; ventral and outer lip colour horn; inner lip translucent, pale. Protoconch c. 1.8 mm in diameter, comprising about 1.5 whorls, sculptured by comparatively strong axial ribs. Teleoconch sculptured by coarse, regular lirae, rounded in cross-section; spaces equal to thickness of lirae; sculpture evenly distributed across whorls of shell and across whorl diameter, height of lirae reduced underneath suture. Angle of aperture 45°; outer lip sharp to moderately thick, rounded, slightly expanded, slightly reflected; basal and palatal node absent. Parietal wall of inner lip inconspicuous.

Figure 5 (facing page). SEM photographs of *Amplirhagada solemiana* n.sp. (A–E). Shell, paratype AMS C463683: (A) apical whorl viewed from above (scale 200 µm); (B) first four whorls viewed from above (scale 1 mm); (C) shell, lateral view (scale 1 mm); (D) details of axial sculpture on last whorl, lateral view (scale 1 mm); (E) close-up of axial lirae on last whorl (scale 100 µm). (F–J) Radula, paratype AMS C463681: (F) rows of central and lateral teeth (Scale 20 µm); (G) details of central and lateral teeth (scale 20 µm); (H) outer lateral and inner marginal teeth (scale 10 µm); (I) middle and outer marginal teeth (scale 10 µm). (J) jaw, paratype AMS C463681 (scale 100 µm).



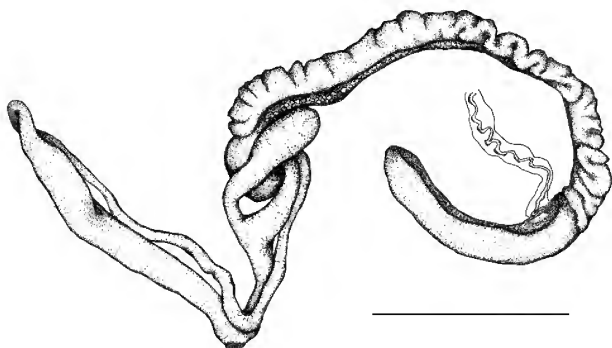


Figure 6. Genitalia of *Amplirhagada solemiana* n.sp., paratype WAM S36581 (13 February, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Pallial morphology. Pallial cavity deep, extending one whorl. Pigmentation on mantle consists of sparsely spaced dark grey-black spots. Kidney extending about half of pallial cavity or slightly more.

Genital morphology (Figs. 6–7). Penis straight to slightly curved; same length as anterior part of oviduct or slightly longer. Vas deferens forms simple loop before entering penis. Penial retractor muscle about as long as penis. Penial verge long to very long (c. $\frac{1}{3}$ to $\frac{1}{2}$ of penial chamber), slender to spatulate with pointed tip. Pustulation comprising entire length of inner penial wall; pustules small to moderate in size, densely arranged in rows, some of which form four to five corrugated longitudinal pilasters along entire length of penial chamber; main stimulatory pilaster not differentiated. Vas deferens entering penial sheath apically. Vagina of medium length, tubular or posteriorly inflated. Inner vaginal wall densely ciliated, ciliae arranged to form smooth longitudinal pilasters, pilasters may be weakly developed. Spermathecal duct of medium thickness; internally with smooth longitudinal pilasters. Spermathecal head elongately inflated, connected with oviduct by connective tissue; inside entirely smooth; wall moderately thick. Length of free oviduct equivalent to about half of anterior part of oviduct; coiled underneath entrance to spermoviduct. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end.

Radular morphology (Fig. 5F–I). Rectangular. Tooth formula C+9–12+3–4+19–21. Average number of rows of teeth 131 ± 22 with 29.9 ± 0.6 rows per mm ($n = 3$).

Central teeth with bluntly pointed, ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed ovate mesocones, length equal to base of tooth; small ectocones; endocones absent. Marginal teeth multicuspate, mesocone and endocone similar in length, ectocone smaller than endocone, occasionally subdivided.

Comparative remarks. Shells are close to *Amplirhagada imitata* (E. A. Smith, 1894) in overall shape, colouration, and sculpture, but see Fig. 8. The type locality of *A. imitata* was restricted to Baudin Island by Solem (1981a). *Amplirhagada imitata* and *A. solemiana* exhibit the most sharply defined and prominent axial sculpture among all congeners except for *A. indistincta*. The anatomy of *A. imitata* is unknown for only dry shells were available to Solem (1981a). In between

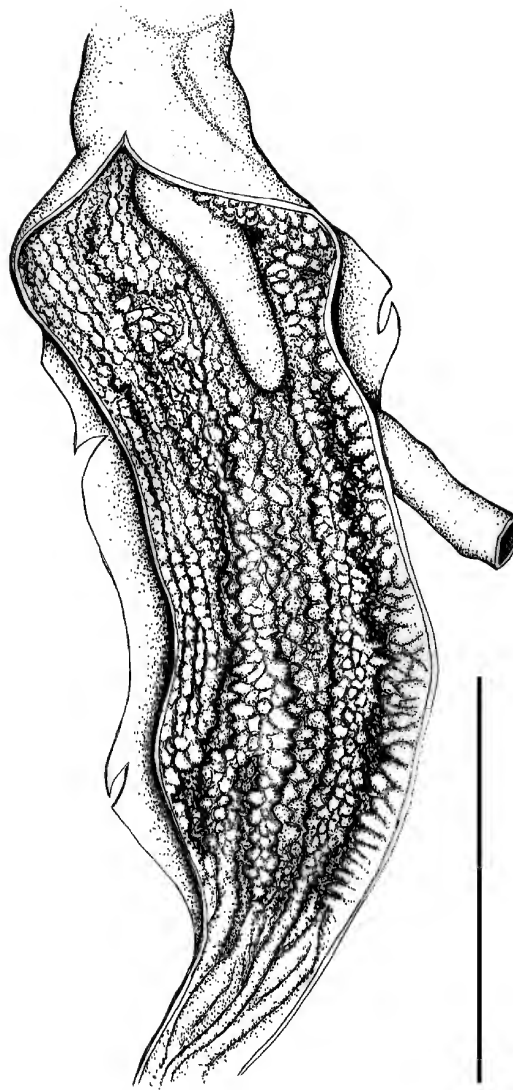


Figure 7. Interior of penial chamber of *Amplirhagada solemiana* n.sp., paratype AMS C463681 (13 February, scale 3 mm). Compare with Fig. 4 for labelling of structures.

Baudin Island (*A. imitata*) and the two Osborn Islands (*A. solemiana* and *A. indistincta*) there are numerous other islands that are occupied by *Amplirhagada* species (e.g., Kingsmill, Corneille, Fenelon, and Descartes Islands) (Fig. 1). Given the usually very restricted occurrence of *Amplirhagada* species and the marked genetic differentiation of *A. solemiana* and *A. indistincta*, it is considered very unlikely that either of them could be conspecific with *A. imitata* from Baudin Island, which is located in a considerable distance (c. 50 km NW of Osborn Islands). Based on shell features only, Solem (1981a) also synonymized *A. burrowsena* Iredale, 1938 from Vansittart Bay (c. 80 km E of Baudin Is) with *A. imitata* and reported this species to further occur in rainforest patches on the mainland (RFS 03/3, 11/1). These reports, however, almost certainly refer to extralimital populations. Species such as *A. imitata*, *A. solemiana*, *A. indistincta*, *A. burrowsena* and likely an undescribed species from the rainforest patches on the mainland may possibly form a group of sibling species that are not clearly differentiated by means of their shell morphology as is also known from the species group of *A. mitchelliana* Solem, 1981 from the Mitchell Plateau.

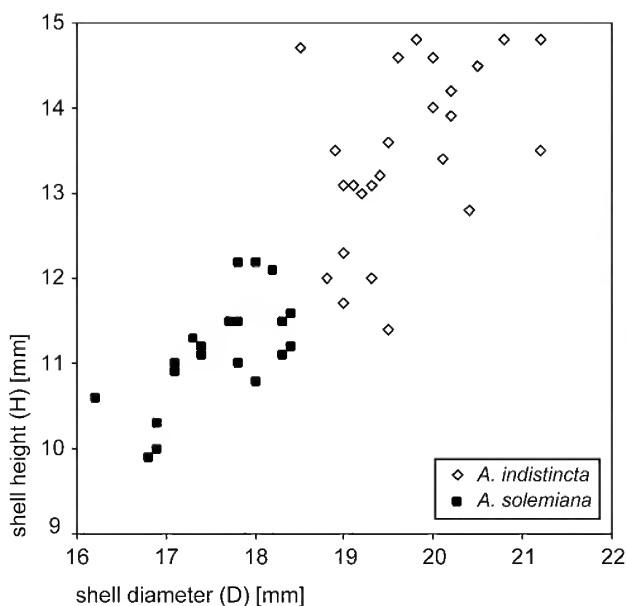


Figure 8. Comparison of *A. solemiana* and *A. indistincta* by means of shell parameters. Scatter-plot showing the ratio of shell height (*H*) versus diameter (*D*).

Amplirhagada indistincta n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Admiralty Gulf, West coast of South West Osborn Island, 14°22'26"S 125°56'13"E; KIS 3-7. Isolated vine thicket patch on dune behind sand beach, on trees, under logs (leg. V. Kessner, 29 July 2007).

Type material. Holotype WAM S34603 (Pl. 1.5). Paratypes AMS C463686 (5 preserved specimens, as holotype), WAM S36617 (10 preserved specimens, as holotype), AMS C463688 (5 shells, 14°22'26"S 125°56'13"E), WAM S36575 (15 shells, 14°22'26"S 125°56'13"E), AMS C463687 (20 preserved specimens, 14°22'26.5"S 125°56'17.8"E), WAM S36865 (40 preserved specimens, 14°22'26.5"S 125°56'17.8"E), AMS C463689 (11 shells, east coast, 14°22'47.3"S 125°56'00.6"E), WAM S36962 (25 shells, east coast, 14°22'47.3"S 125°56'00.6"E).

Additional, non-type material. WAM S28521, WAM S36491–501, WAM S36574, WAM S36577, WAM S36612–16, WAM S36618–25, WAM S36863–4, WAM S36866, AMS C463690–1 (South West Osborn Island); WAM S41454, AMS C463724 (Kidney Island; 14.329°S 125.985°E).

Etymology. From *indistincta* (Latin = indistinct) referring to the close morphological resemblance with *A. solemiana*.

Sealing strategy. Rock sealer.

Shell (Fig. 11A–D, Pl. 1.5–6). Semi-globose to broadly conical with moderate to high spire; solid to thick, not translucent. Periphery well rounded to slightly angulate. Umbilicus completely concealed by columellar reflection. Background colour yellowish to brownish white; with thin to moderately broad brown to yellowish brown sub-sutural and mid-whorls bands that are visible on most whorls, sub-sutural band diffuse, mid-whorl band well marked; ventral colour whitish to greyish white; outer lip colour differs from shell, whitish; inner lip translucent, white. Protoconch

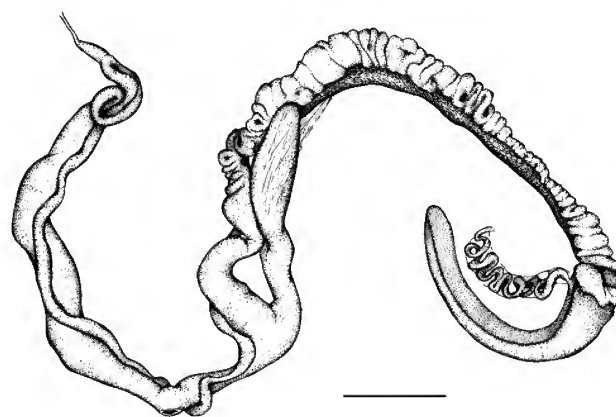


Figure 9. Genitalia of *Amplirhagada indistincta* n.sp., paratype AMS C463687 (11 February, scale 10 mm). Compare with Fig. 3 for labelling of structures.

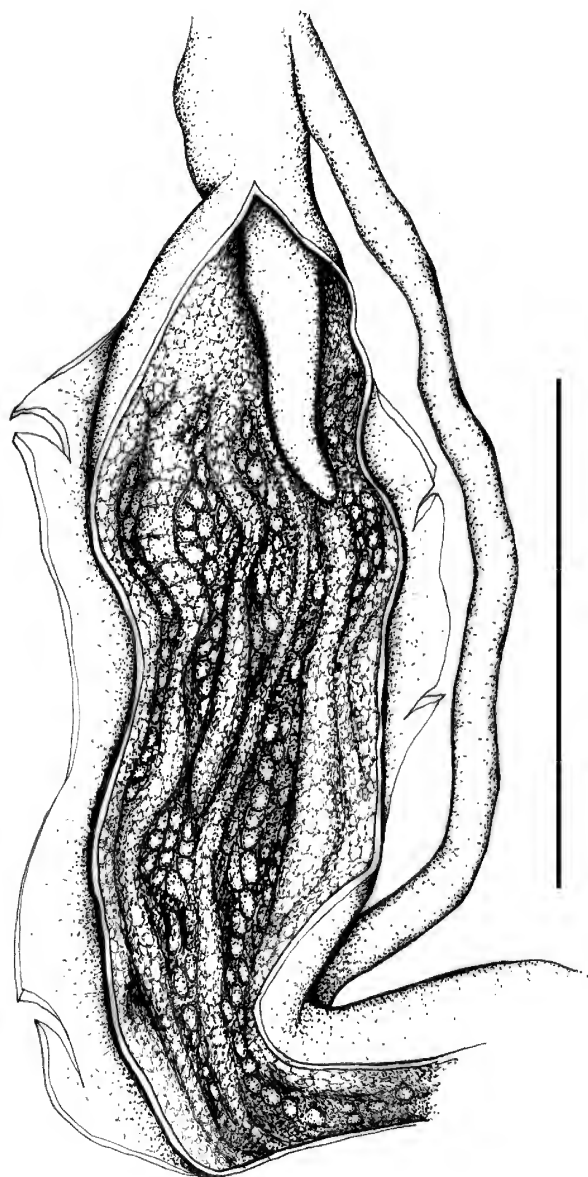


Figure 10. Interior of penial chamber of *Amplirhagada indistincta* n.sp., paratype AMS C463687 (11 February, scale 5 mm). Compare with Fig. 4 for labelling of structures.

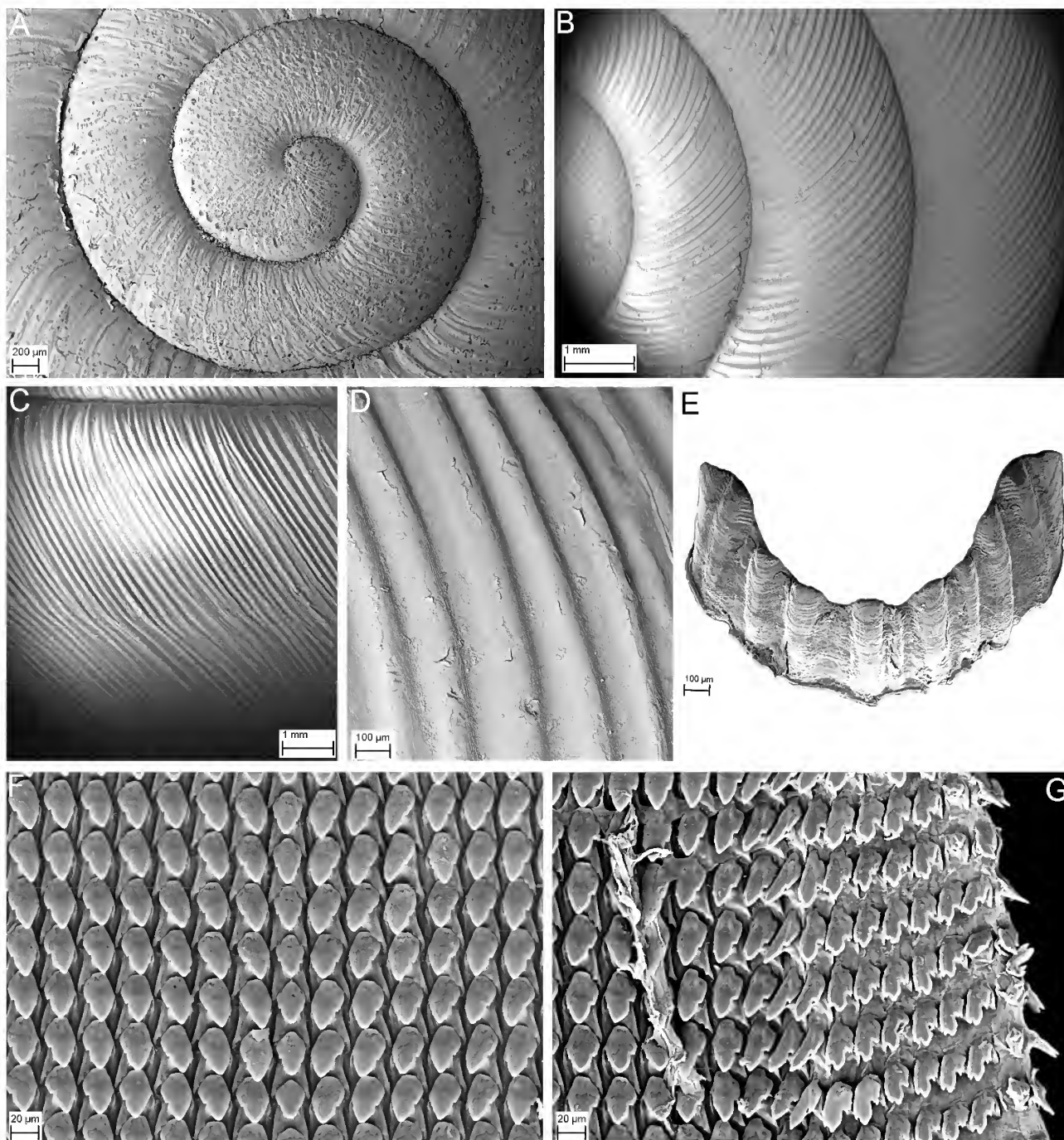


Figure 11. SEM photographs of *Amplirhagada indistincta* n.sp. (A–D) Shell: (A) apical whorl viewed from above, paratype AMS C463688 (scale 200 µm); (B) first four whorls viewed from above, paratype AMS C463689 (scale 1 mm); (C) details of axial sculpture on last whorl, lateral view, paratype AMS C463689 (scale 1 mm); (D) close-up of sculpture on last whorl, paratype AMS C463689 (scale 100 µm); (E) jaw, paratype AMS C463687 (scale 100 µm). (F–G) Radula, paratype AMS C463687: (F) rows of central and lateral teeth (Scale 20 µm); (G) outer lateral and inner marginal teeth (scale 10 µm).

c. 2 mm in diameter, comprising about 1.5 whorls, with strong axial sculpture. Teleoconch sculptured by coarse, regular, curved, in cross-section rounded lirae; sculpture evenly distributed across shell and whorl diameter; spaces between lirae equal to thickness of lirae, height of lirae reduced underneath suture. Angle of aperture 30°; outer lip rounded, sharp to moderately thick, expanded, slightly reflected; basal node of lip weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity deep, extending one whorl. Pigmentation on mantle consists of sparsely distributed dark brown to black spots. Kidney extending more than half of pallial cavity.

Genital morphology (Figs. 9–10). Penis straight to slightly curved; same length as anterior part of oviduct or slightly longer. Vas deferens forms simple loop before entering penis. Penial retractor muscle about as long as penis. Penial verge

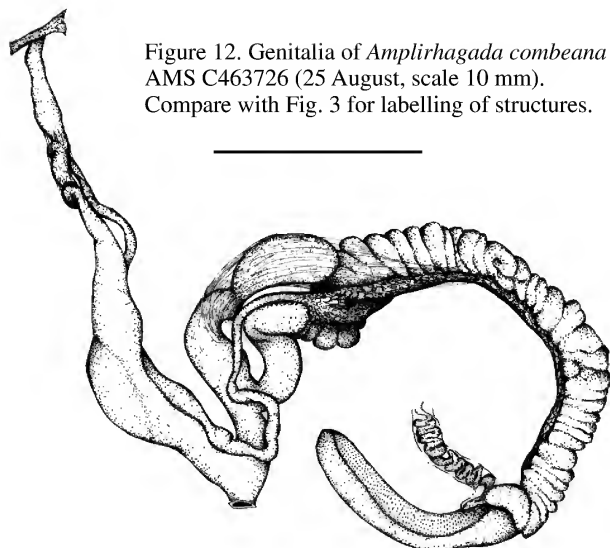


Figure 12. Genitalia of *Amplirhagada combeana* AMS C463726 (25 August, scale 10 mm). Compare with Fig. 3 for labelling of structures.

long to very long (c. $\frac{1}{3}$ to $\frac{1}{2}$ of penial chamber), slender to spatulate with pointed tip. Pustulation comprising entire length of inner penial wall; penial wall pustules small to moderate in size, densely arranged in rows, some of which form four to five longitudinal pilasters along entire length of penial chamber; main stimulatory pilaster not differentiated. Vas deferens entering penial sheath apically. Vagina of medium length, tubular or posteriorly inflated. Inner vaginal wall densely ciliated, ciliae arranged to form smooth longitudinal pilasters, pilasters may be weakly developed. Spermathecal duct of medium thickness; internally with smooth longitudinal pilasters. Spermathecal head elongately inflated, connected with oviduct by connective tissue; inside entirely smooth; wall moderately thick. Length of free oviduct equivalent to about half of anterior part of oviduct; coiled underneath entrance to spermoviduct. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end.

Radular morphology (Fig. 11F–G). Rectangular. Tooth formula C+12+3–4+20–21. Average number of rows of teeth 126 ± 14 with 26.3 ± 1.5 rows per mm ($n = 2$). Central teeth with bluntly pointed, ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed, ovate mesocones, shorter than base of tooth; ectocones small, endocones absent. Marginal teeth multicuspoid; ectocones shorter and narrower than mesocones, split into two denticles; endocones of approximately same size as ectocones.

Comparative remarks. Most similar to *A. solemiana* in shell and genital anatomy. Shells of *A. indistincta* are larger than those of *A. solemiana* (Table 1); a one-way ANOVA revealed that both species differ significantly in the shell parameters H, D, and H/D (Fig. 8). Specimens from Kidney Island, which is located in between Middle and Southwest Osborn Island, tend to have slightly larger and more robust shells than specimens from the type locality. In the molecular phylogeny they cluster closely together with *A. indistincta* and are therefore considered conspecific because their anatomy corresponds with the specimens from Southwest Osborn Island. *Amplirhagada solemiana* and *A. indistincta* exhibit a virtually identical genital anatomy but cluster as clearly distinct lineages in the mitochondrial phylogeny (see below). For relationship with *A. imitata* see under *A. solemiana*.

Amplirhagada combeana Iredale, 1938

Helix (Hadra) imitata var. *cassiniensis* Smith, 1894: 92, pl. 7, fig. 16 (Cassini Island). *Amplirhagada combeana* Iredale, 1938: 113 (nomen novum), Solem, 1981a: 310–312, pl. 12b, figs. 71h–i).

Nomenclatural remarks. The original specific epithet “*cassiniensis*” employed by Smith (1894) is preoccupied and has been replaced with “*combeana*” by Iredale (1938), who elevated the taxon to the rank of an independent species. Solem (1981a: 310–312) described details of the shell but was not able to describe the anatomy because no preserved material was available.

Material examined. WAM S41450, AMS C463725 (Western Australia, northwestern Kimberley, Bonaparte Archipelago, Cassini Island, $13^{\circ}57'04''\text{S}$ $125^{\circ}38'39''\text{E}$), WAM S41455, AMS C463726 ($13^{\circ}57'22''\text{S}$ $125^{\circ}37'53''\text{E}$) (Fig. 1).

Sealing strategy. Rock sealer.

Shell (Fig. 14A–C, Pl. 1.7). Broadly conical with low to medium spire; solid (not translucent). Periphery well rounded to slightly angulate. Umbilicus completely concealed by columellar reflection or forming a chink. Background colour horn to yellowish brown; with diffuse to well defined, thin to moderately broad, chestnut brown sub-sutural and

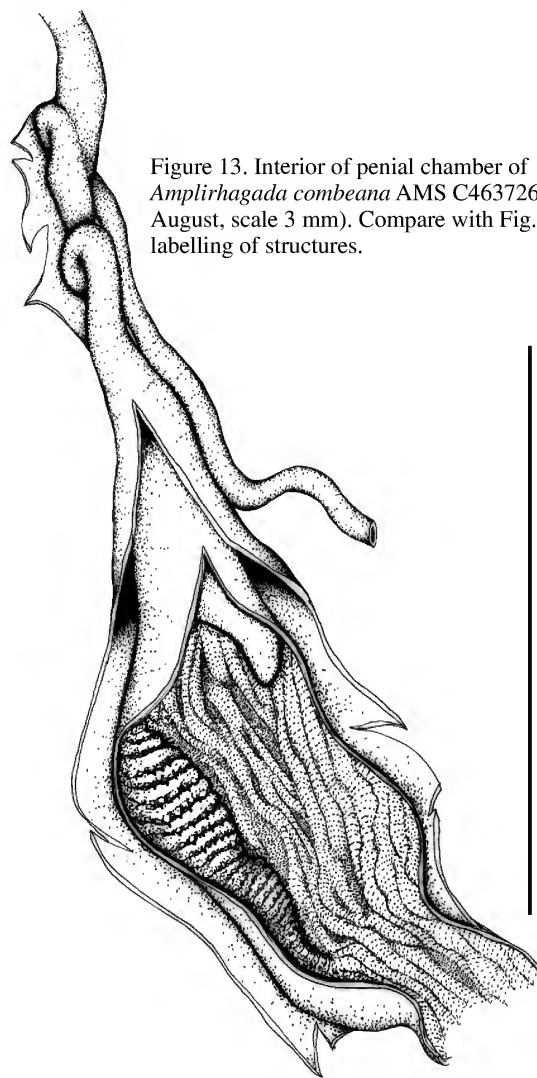


Figure 13. Interior of penial chamber of *Amplirhagada combeana* AMS C463726 (25 August, scale 3 mm). Compare with Fig. 4 for labelling of structures.

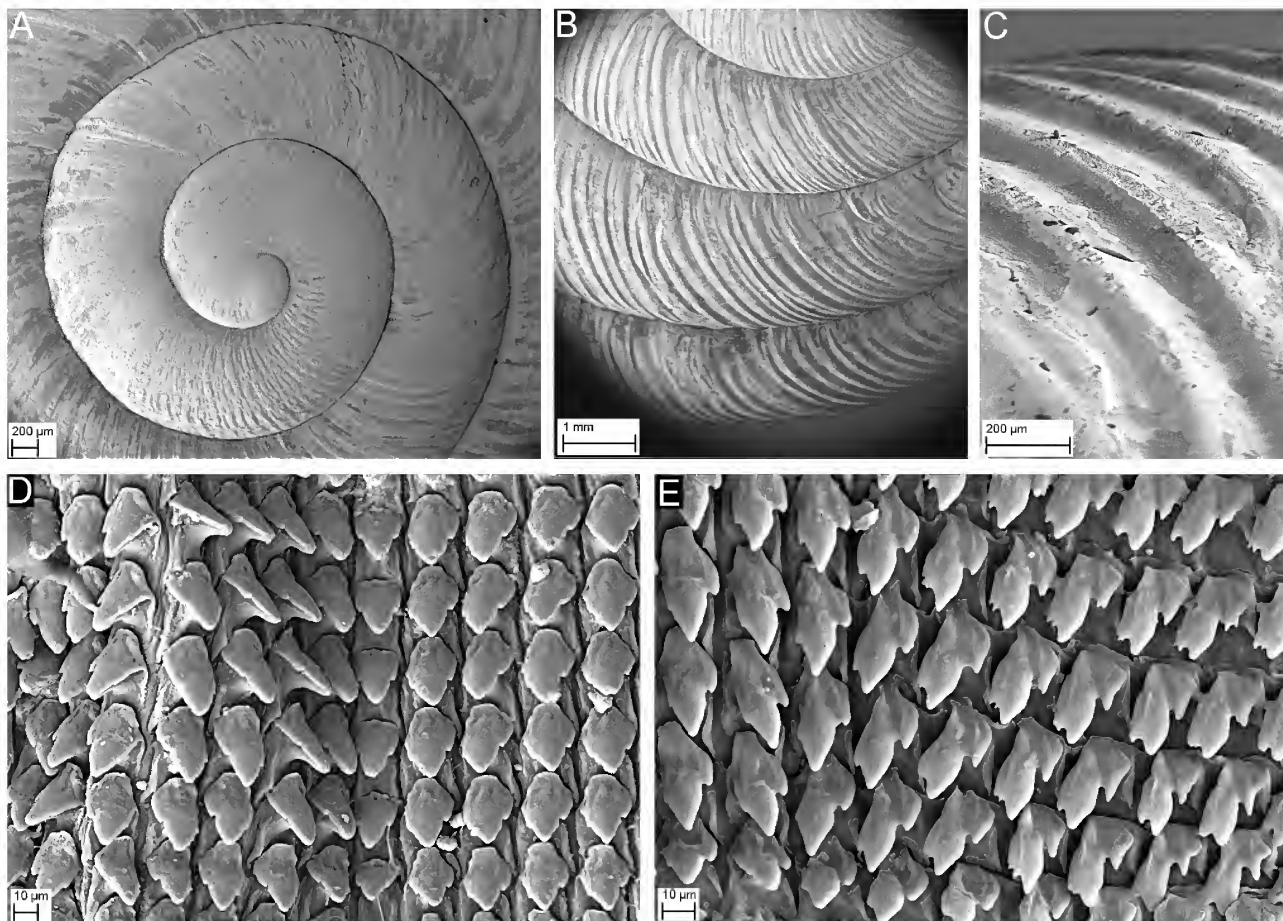


Figure 14. SEM photographs of *Amplirhagada combeana*, AMS C463725. (A–C) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) first four whorls viewed from above (scale 1 mm); (C) details of axial sculpture on last whorl (scale 100 µm). (D–E) Radula: (D) close-up of central and lateral radular teeth (Scale 10 µm); (E) outer lateral and inner marginal teeth (scale 10 µm).

mid-whorl bands that are most conspicuous on last whorl; ventral colour horn; outer lip colour same as shell; inner lip translucent. Protoconch c. 1.7 mm in diameter with 1.5 whorls, comparatively strong axial sculpture. Teleoconch sculptured by coarse, curved, in cross-section rounded, irregularly spaced lirae; spaces equal to thickness of lirae; lirae evenly distributed across shell and whorl diameter, height reduced underneath suture. Angle of aperture 30°; outer lip rounded, moderately thick, expanded, slightly reflected; basal node of lip weak, palatal node absent.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Pigmentation on mantle consists of sparse greyish patches or spots. Kidney extending not more than half of pallial cavity.

Genital morphology (Figs. 12–13). Penis straight; more or less of same length as anterior part of oviduct or longer. Vas deferens forms simple loop before entering penis. Penial retractor muscle shorter than penis. Penial verge short ($<\frac{1}{8}$ penial chamber), broad with pointed to rounded tip. Penial wall covered by a number of smooth longitudinal pilasters; pustulation absent. Main stimulatory pilaster well-differentiated, extending apical to median portion of penial chamber, cone-shaped, corrugated by ridges that support little hooks. Vas deferens entering penial sheath in upper third. Vagina of medium thickness, posteriorly inflated. Inner vaginal wall with smooth, longitudinal pilasters. Spermathecal duct

moderately thick, inside with smooth longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, inside entirely smooth with delicate wall. Free oviduct comprising about half of anterior part of oviduct; coiled underneath entrance to spermooviduct. Spermooviduct longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermooviduct.

Radular morphology (Fig. 14D–E). Rectangular. Tooth formula C+12+2–3+18–20 with 162.5 ± 3.5 rows of teeth, 33.5 ± 1.9 rows per mm ($n = 2$). Central teeth with bluntly pointed, triangular to ovate mesocones, shorter than base of tooth; ectocones well developed. Lateral teeth with bluntly pointed, triangular to ovate mesocones; length equal to base of tooth; ectocones well developed, endocones vestigial. Marginal multicuspate; ectocones shorter and narrower than mesocones; endocones approximately same size as ectocones; divided into two denticles.

Comparative remarks. This species differs from all previous species by the absence of penial wall pustules and the presence of a well-developed main stimulatory pilaster. Axial sculpture is not as regular as in *A. solemiana* and *A. indistincta* but more pronounced as in *A. euroa*. With respect to penial morphology *A. solemiana* and *A. indistincta* differ most markedly by absence of a well-differentiated main stimulatory pilaster. For comparison with *A. mckenziei* and *A. montesquieuana* see below, with other species see Solem (1981a: 310).

Amplirhagada mckenziei n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Admiralty Gulf, Montesquieu Islands, Oliver Island, 14°05'42"S 125°44'30"E; KC-062 (leg. V. Kessner & A. Longbottom, 18 June 1988).

Type material. Holotype WAM S34604 (Pl. 1.8). Paratypes WAM S41488 (3 preserved specimens), FMNH 219253 (3 preserved specimens).

Additional, non-type material. AMS C463727, FMNH 219250, WAM S41487 (Western Australia, northwestern Kimberley, Bonaparte Archipelago, Admiralty Gulf, Montesquieu Islands, unnamed island SE of Oliver Island, 14°05'55"S 125°44'50"E; KC-061).

Etymology. Named in honour of Norman L. McKenzie, Western Australian Department of Environment and Conservation, in recognition of his promotion of malacological research in Western Australia.

Sealing strategy. Rock sealer.

Shell (Fig. 17A–C, Pl. 1.8–9). Broadly conical to almost flat with low to medium spire. Thin to solid, translucent. Periphery rounded. Umbilicus concealed by columellar reflection to 50–100 percent, forming a chink or narrowly winding opening. Background colour brownish horn, ventrally lighter; with diffuse to well marked, thin, yellowish brown sub-sutural and mid-whorl bands that are most conspicuous on last whorl; outer lip colour same as shell; inner lip translucent, whitish. Protoconch c. 2.2 mm in diameter with 1.5 whorls, sculptured by strong axial elements. Teleoconch with coarse axial lirae; curved when viewed from above; rounded in cross-section with irregular spacing; spaces equal to thickness of lirae; distributed evenly across shell and across whorl diameter, reduced underneath suture. Angle of aperture 30°; outer lip rounded, sharp to moderately thick, slightly expanded, not or slightly reflected; basal node absent or weak; palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity short, extending half whorl. Mantle pigmentation consists of blackish spots. Kidney extending more than half of pallial cavity.

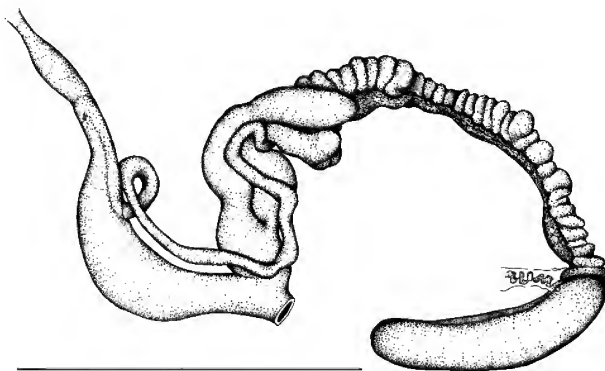


Figure 15. Genitalia of *Amplirhagada mckenziei* n.sp., paratype WAM S41488 (18 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Genital morphology (Figs. 15–16). Penis straight, slightly longer than anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle shorter than penis. Penial verge very short (barely visible) to short ($< \frac{1}{8}$ penial chamber), slender to spatulate with pointed tip. Penial wall pustules small, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster well-differentiated, relatively thin, cone-shaped, sculptured by ridges with little hooks, on apical portion of inner penial wall. Vas deferens rather straight to undulated, rather thick, entering penial sheath in upper third of penis. Vagina rather thick, tubular to posteriorly inflated. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct wide, with smooth longitudinal pilasters inside. Spermathecal head globular to elongately inflated, connected with oviduct by connective tissue; inside entirely smooth with thin wall. Free oviduct more or less straight comprising less than half to about half of length anterior part of oviduct of anterior part of oviduct. Spermoviduct of same length as anterior part of oviduct. Talon embedded in albumen gland at junction with spermoviduct.

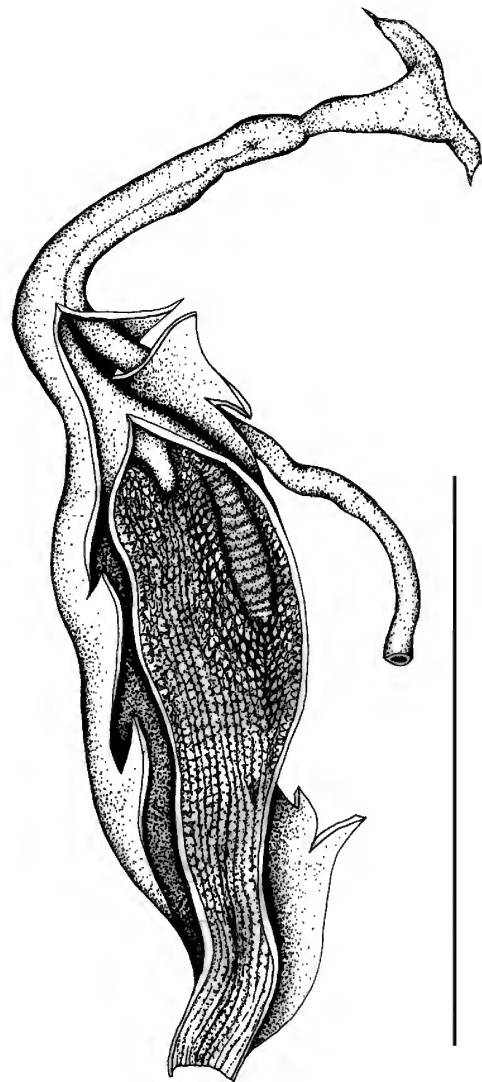


Figure 16. Interior of penial chamber of *Amplirhagada mckenziei* n.sp., paratype FMNH 219253 (18 July, scale 10 mm). Compare with Fig. 4 for labelling of structures.

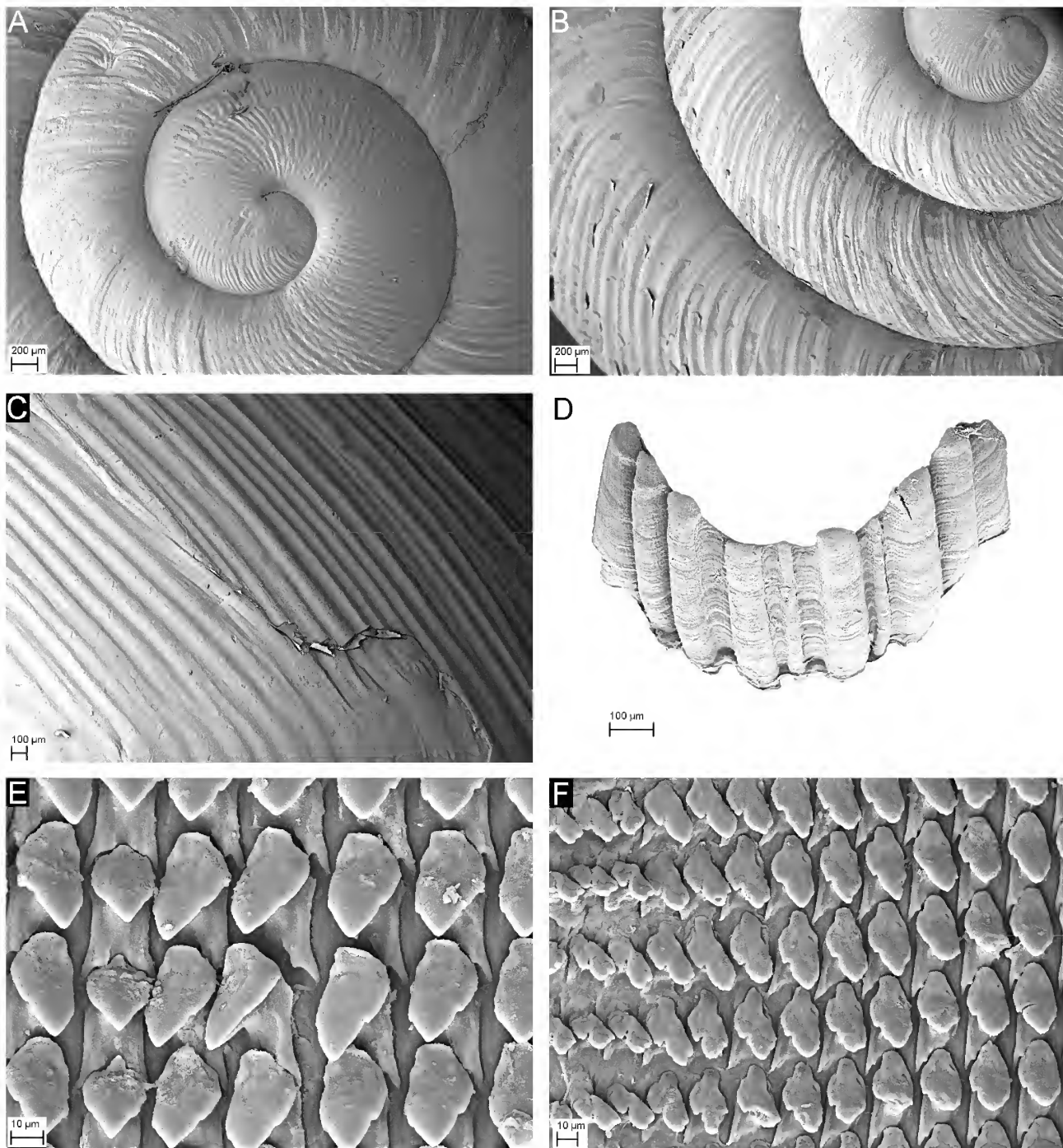


Figure 17. SEM photographs of *Amplirhagada mckenziei* n.sp., paratypes WAM S41488. (A–C) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) first four whorls viewed from above (scale 200 µm); (C) details of axial sculpture on last whorl (scale 100 µm). (D) Jaw (scale 100 µm). (E–F) Radula: (E) close-up of central and inner lateral radular teeth (Scale 10 µm); (F) outer lateral and inner marginal teeth (scale 10 µm).

Radular morphology (Fig. 17E–F). Rectangular. Tooth formula C+12–18+2–3+18–20. With in average 135 ± 12.5 rows of teeth, 31.2 ± 1.2 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones tiny, endocones vestigial. Marginal teeth with triangular to ovate mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. The studied museum material was labelled as “*Amplirhagada* sp. 72” by Solem. This species is closely related to *A. montesquieuana* (see below) and *A. combeana*, both inhabiting islands in relative proximity. *Amplirhagada combeana* is similar in exhibiting a relatively pronounced but irregular axial sculpture but differs in having smaller main stimulatory pilaster, penial verge and no penial wall pustules.

***Amplirhagada ponderi* n.sp.**

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Admiralty Gulf, Kingsmill Island, 14°09'24"S 125°46'16"E; KC-067 (leg. V. Kessner & A. Longbottom, 19 July 1988).

Type material. Holotype WAM S34605 (Pl. 1.10). Paratype WAM S41489 (1 preserved specimen), FMNH 219268 (1 preserved specimen).

Etymology. Named in honour of Winston F. Ponder, senior fellow of the Australian Museum, in recognition of his achievements in malacological research.

Shell (Pl. 1.10). Broadly conical, with low spire; thin (translucent) to solid. Periphery slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, narrowly winding, c. 40–60 percent concealed by columellar reflection. Background colour yellowish brown to horn; with diffuse, thin, light brown sub-sutural and mid-whorl bands being most conspicuous on last whorl; ventral colour whitish horn; outer lip colour same as shell; inner lip colour horn to translucent. Protoconch and teleoconch smooth except for growth lines. Angle of aperture 45°; outer lip rounded, sharp to moderately thick, expanded, slightly reflected; basal node of lip weak to moderately developed; palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Blackish mottled pigmentation on mantle. Kidney extending half of pallial cavity.

Genital morphology (Figs. 18–19). Penis bent; much longer than anterior part of oviduct. Vas deferens forms complex coiling before entering penis. Penial retractor muscle stubby, much shorter than penis. Penial verge medium sized to long ($\frac{1}{8}$ – $\frac{1}{3}$ of penial chamber), slender to spatulate with pointed tip. Penial wall pustules very small, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster well-differentiated, narrow and quite long comprising apical to median portion of penial chamber; corrugated by ridges of undifferentiated pustules that support little hooks. Vas deferens entering

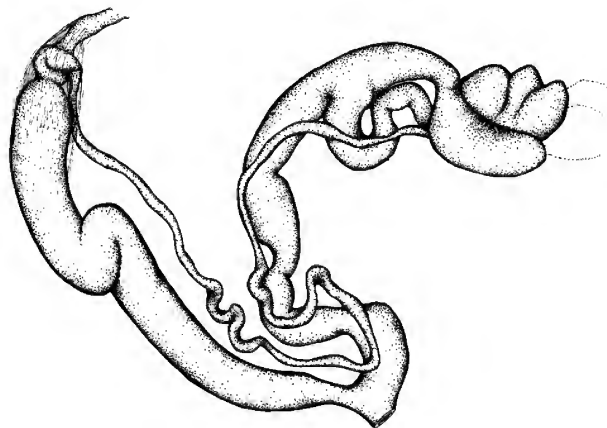


Figure 18. Genitalia of *Amplirhagada ponderi* n.sp., paratype FMNH 219268 (19 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

penial sheath in upper third. Vagina relatively long, tubular, posteriorly slightly inflated. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct moderately thick with smooth longitudinal pilasters inside. Spermathecal head elongately inflated, connected with oviduct by connective tissue, entirely smooth inside; wall delicate. Length of free oviduct less than half of anterior part of oviduct, zig-zag-folded underneath entrance to spermoviduct. Posterior part of genitalia unknown.

Radular morphology (Fig. 20A–C). Rectangular. Tooth formula C+16+3+18. Average number of rows of teeth 165 ($n = 1$) with 35.6 rows per mm ($n = 1$). Central teeth with sharply pointed, elongate to triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, elongate to triangular mesocones, not exceeding base of tooth; ectocones well developed, endocones vestigial. Marginal teeth with elongate to triangular mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. The studied museum material was labelled as "*Amplirhagada* sp. 73" by Solem. The shell of this species is similar to those of other species from the Montesquieu Islands, such as *A. mckenziei*, *A. montesquieuana* or *A. puescheli* (for comparison with the latter two see below), and is not readily differentiated from the former in shell characters alone. The inner penial wall

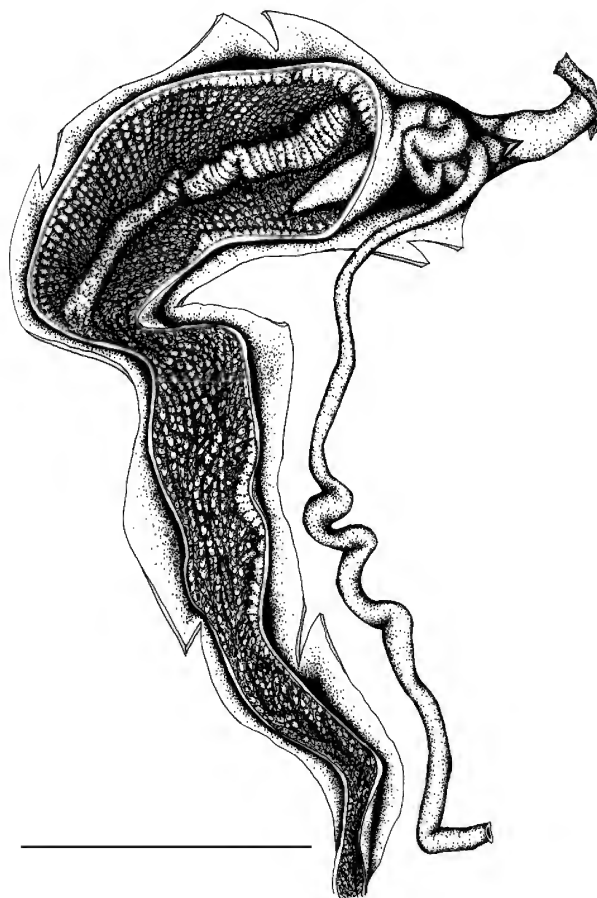


Figure 19. Interior of penial chamber of *Amplirhagada ponderi* n.sp., paratype FMNH 219268 (19 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

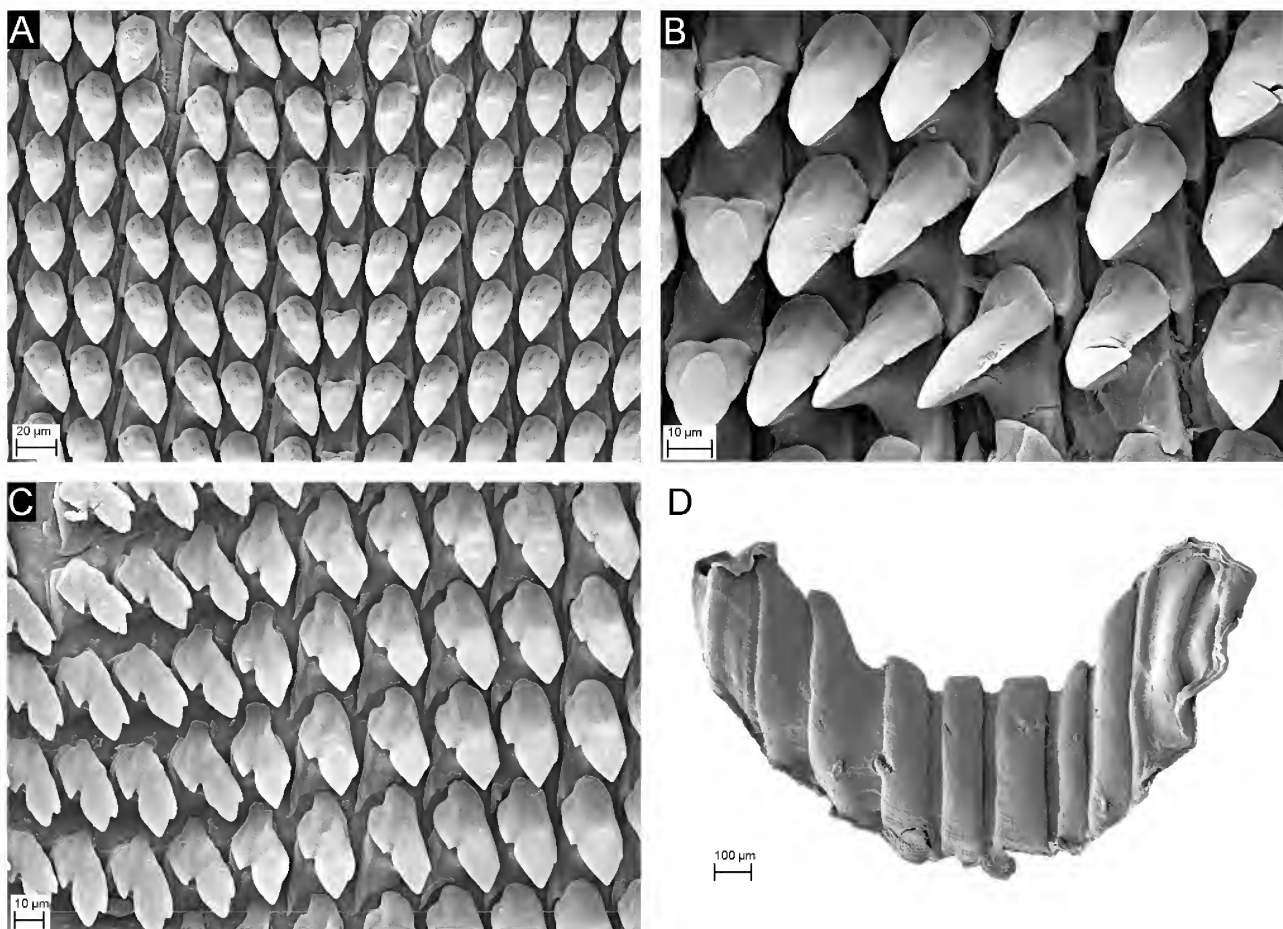


Figure 20. SEM photographs of the radula of *Amplirhagada ponderi* n.sp., paratype FMNH 219268: (A) central and inner lateral teeth (Scale 20 µm); (B) close-up of inner lateral teeth (scale 10 µm); (C) outer lateral and inner marginal teeth (scale 10 µm); (D) jaw (scale 100 µm).

of *A. ponderi*, however, is very characteristic. It differs from *A. mckenziei* most markedly by its much longer and narrow main pilaster, which extends almost to the anterior end of the penial chamber. The penis of *A. ponderi* is proportionally longer. For comparison with other species from the Montesquieu Islands see below. Phylogenetically, *A. ponderi* is more closely related to *A. varia*, *A. solemiana*, and *A. indistincta*. From all these it differs by possessing a well-developed, corrugated main pilaster.

Amplirhagada montesquieuana n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Admiralty Gulf, Fenelon Island, 14°08'16"S 125°41'55"E; FERT 04 (leg. Harvey, 28.08.2002).

Type material. Holotype WAM S34606 (Pl. 1.11). Paratypes AMS C463748 (9 preserved specimens), WAM S41453 (15 preserved specimens).

Etymology. In reference to Montesquieu Islands, to which Fenelon Island belongs.

Sealing strategy. Rock sealer.

Shell (Fig. 21A–B, Pl. 1.11). Broadly conical with low spire; thin (translucent). Whorls evenly rounded in cross-section. Umbilicus open, forming a chink to narrowly winding

opening, 80–95 percent concealed by columellar reflection. Background colour whitish or yellowish to golden brown; with diffuse, thin, brown sub-sutural and mid-whorl bands most conspicuous on last whorl; ventral colour whitish; outer lip colour same as shell or lighter; inner lip whitish and translucent. Protoconch c. 2 mm in diameter with 1.5 whorls, sculptured by fine but distinct axial lirae. Teleoconch with coarse axial lirae, rounded in cross-section with regular spacing, spaces equal to thickness of lirae. Sculpture evenly distributed across shell and whorl diameter, height reduced underneath suture. Angle of aperture 30°, outer lip rounded, sharp to moderately thick, slightly expanded and reflected; basal node of lip weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Mantle with mottled, black pigmentation. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 22–23). Penis straight, of more or less same length as anterior part of oviduct to slightly longer. Vas deferens coils once before entering penis. Penial retractor muscle clearly shorter than penis. Penial verge very short, slender to spatulate, with pointed tip. Penial wall pustules of normal size, slightly elongated, arranged in sparsely distributed, distinct rows over entire length of inner penial wall. Towards base of penial chamber, pustules fuse to form corrugated, narrow pilasters. Main stimulatory pilaster

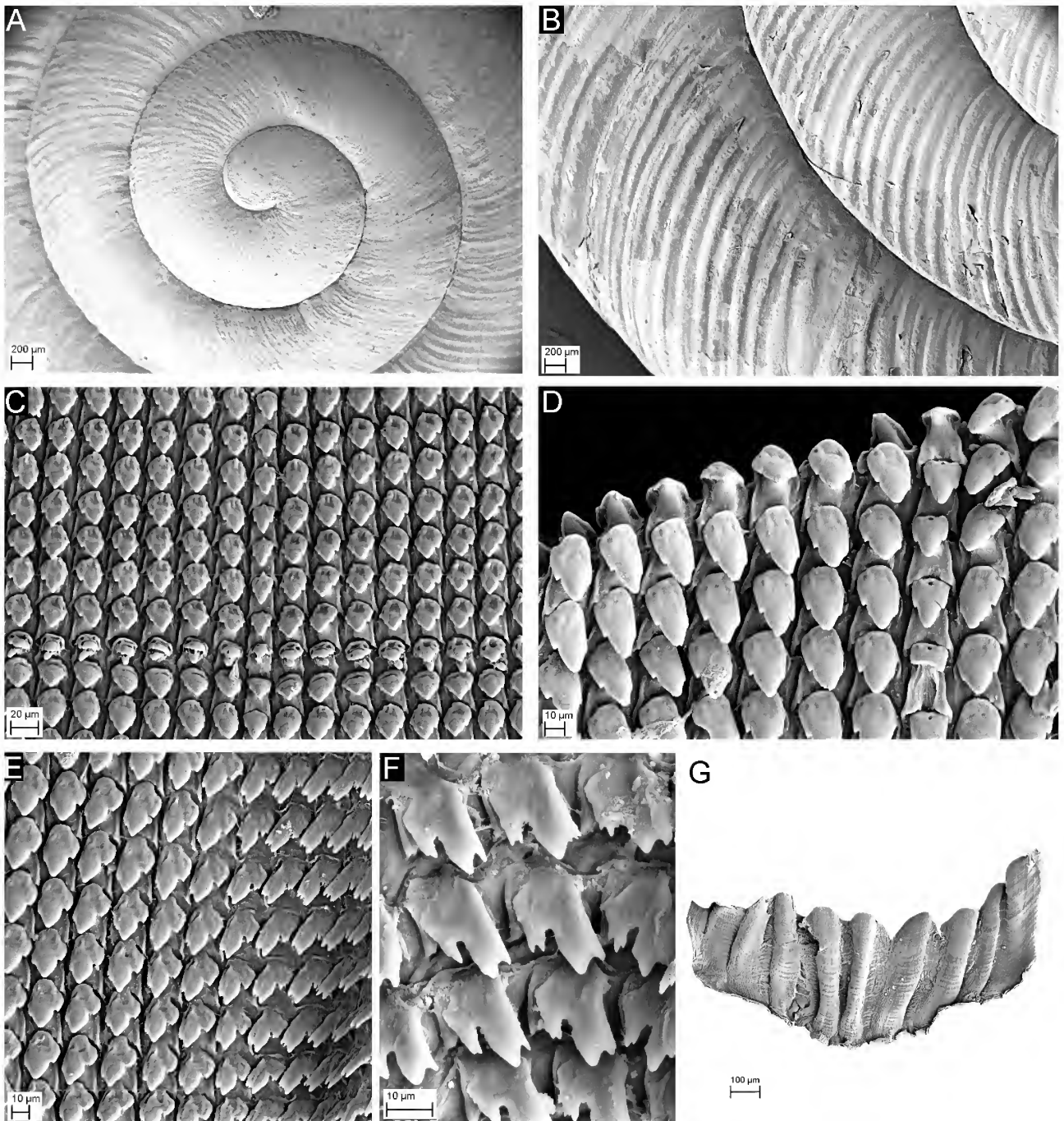


Figure 21. SEM photographs of *Amplirhagada montesquieuana* n.sp., paratypes AMS C463748. (A–B) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on last two whorls viewed from above (scale 200 µm). (C–F) Radula: (C) central and lateral teeth (Scale 20 µm); (D) close-up of central and inner lateral teeth (scale 10 µm); (E) outer lateral and inner marginal teeth (scale 10 µm); (F) close-up of middle marginal teeth (scale 10 µm). (G) Jaw (scale 100 µm).

differentiated, forming cone-shaped, prominent ridge covered by enlarged pustules at apical to median portion of penial chamber. Pilaster ridges carry little toe-shaped extensions that support hooks. Vas deferens entering penial sheath in upper third. Vagina moderately long, tubular. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct wide; inner wall with transversely structured, longitudinal pilasters. Spermathecal head globular to elongate, connected with oviduct by connective tissue; wall delicate. Free oviduct comprising \pm half of anterior part of oviduct, rather straight. Spermoviduct longer than anterior part of oviduct. Talon

embedded in albumen gland at junction with spermoviduct.

Radular morphology (Fig. 21C–F). Rectangular. Tooth formula C+11+4+14. Average number of rows of teeth 150 ± 32.5 with 38.1 ± 0.3 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones small. Lateral teeth with bluntly pointed, triangular mesocones, length equal to base of tooth; ectocones well developed, endocones vestigial. Marginal teeth with elongate mesocones; ectocones shorter and narrower than mesocones, split into two denticles; endocones reduced in size.

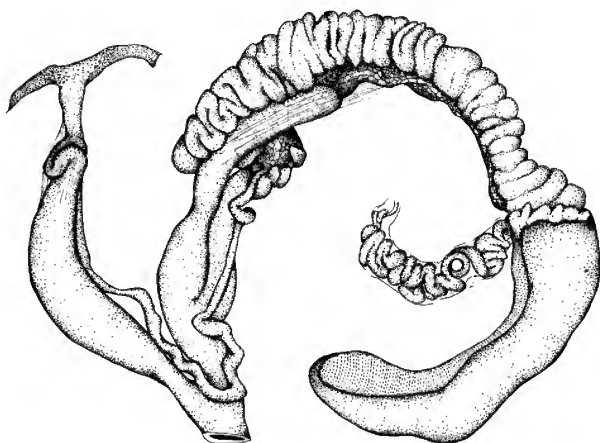


Figure 22. Genitalia of *Amplirhagada montesquieuana* n.sp., paratype AMS C463748 (28 August, scale 10 mm). Compare with Fig. 3 for labelling of structures.

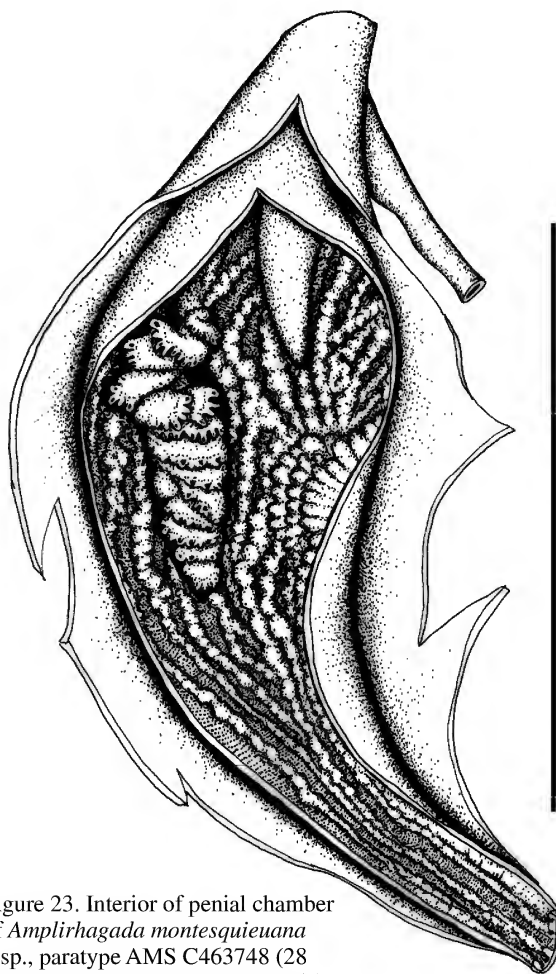


Figure 23. Interior of penial chamber of *Amplirhagada montesquieuana* n.sp., paratype AMS C463748 (28 August, scale 5 mm). Compare with Fig. 4 for labelling of structures.

Comparative remarks. The shell of this species is smaller than that of other species from the Montesquieu Islands but otherwise difficult to differentiate by means of colour, sculpture and shape (Table 1). Its axial sculpture is more regular than that of *A. combeana* and *A. mckenziei*. From *A. mckenziei* it also differs by a smaller and comparatively

flatter shell; a one-way ANOVA revealed that both species differ significantly in the shell parameters H, D, FW and H/D. The inner penial wall is characteristic by its rather sparsely distributed rows of pustules that give rise to corrugated, narrow, longitudinal pilasters towards the base of the penial chamber, and the shape and development of the main stimulatory pilaster being shorter and broader than in *A. ponderi* and larger than in *A. mckenziei*. The possession of well-developed “toe-shaped” extensions of the pilaster ridges is unique amongst species from Montesquieu Islands.

Amplirhagada descartesana n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Admiralty Gulf, Institute Islands, Descartes Island, 14°10'26"S 125°40'38"E; KC-071 (leg. V. Kessner & A. Longbottom, 19 July 1988).

Type material. Holotype WAM S34607 (Pl. 1.12). Paratypes WAM S41491 (4 preserved specimens, as holotype), FMNH 219276 (5 preserved specimens, as holotype), FMNH 219272 (16 preserved specimens, unnamed island SW of Descartes Island, 14°10'45"S 125°40'00"E, KC/070), WAM S41490 (10 preserved specimens, same as FMNH 219272), AMS C463749 (7 preserved specimens, same as FMNH 219272).

Additional, non-type material. WAM S41452 (Descartes Island, 125°40'47"E 14°09'50"S).

Etymology. In reference to Descartes Island, where this species occurs.

Shell (Fig. 24A–D, Pl. 1.12). Semi-globose to broadly conical with medium high spire; thin (translucent) to solid. Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus forming a chink to narrowly winding opening, 30–100 percent concealed by columellar reflection. Background colour brownish horn; uniform or banded; if present sub-sutural and mid-whorl bands diffuse, thin, brown, on last whorl(s) only; ventral colour, outer and inner lip colour whitish to cream. Protoconch c. 2.8 mm in diameter with 1.7 whorls, almost smooth, sculptured by faint axial lirae. Teleoconch sculptured by coarse lirae, rounded in cross-section, regularly spaced, spaces equal to thickness of lirae, evenly distributed across shell and whorl diameter even, reduced underneath suture. Angle of aperture 45°, outer lip rounded, moderately thick, slightly expanded, slightly reflected; basal node absent or weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Mottled pigmentation on mantle dark grey. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 25–26). Penis straight to slightly curved, longer than anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle shorter than penis. Penial verge short ($<\frac{1}{4}$ penial chamber), slender to spatulate, with pointed tip. Penial wall pustules present, of average size, slightly elongated, arranged in rows across entire length of inner penial wall. Main stimulatory pilaster well-differentiated, large, cone-shaped, sculptured by smooth horizontal ridges, comprising entire length of penial chamber. Vas deferens entering penial sheath in upper third. Vagina comparatively

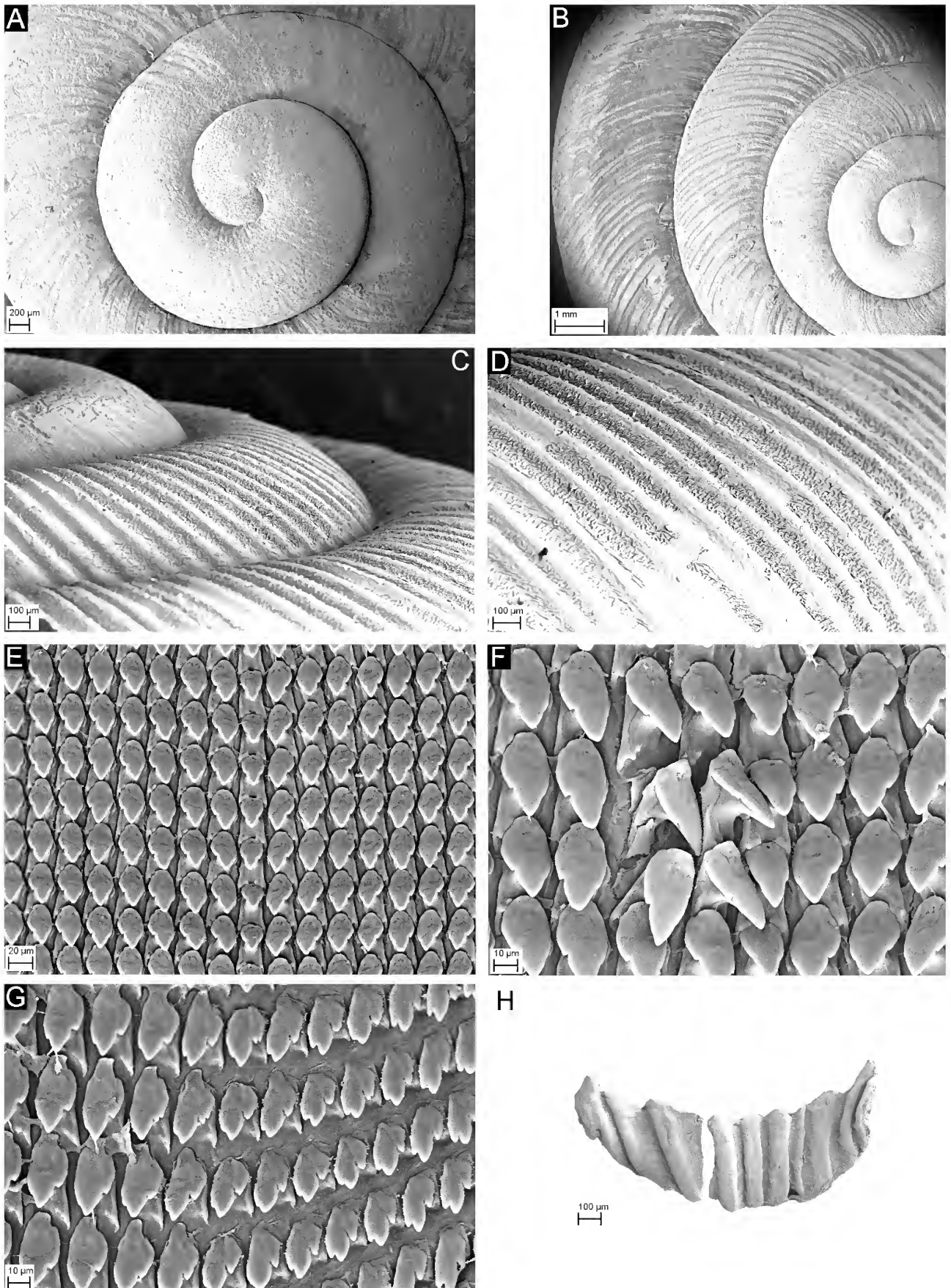


Figure 24. SEM photographs of *Amplirhagada descartesana* n.sp., paratype AMS C463749. (A–D) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on first four whorls viewed from above (scale 1 mm); (C) sculpture, lateral view (scale 100 µm); (D) close-up of sculpture, obliquely from above (scale 100 µm). (E–G) Radula: (E) central and lateral teeth (Scale 20 µm); (F) close-up of central and inner lateral teeth (scale 10 µm); (G) outer lateral and inner marginal teeth (scale 10 µm). (H) Jaw (scale 100 µm).

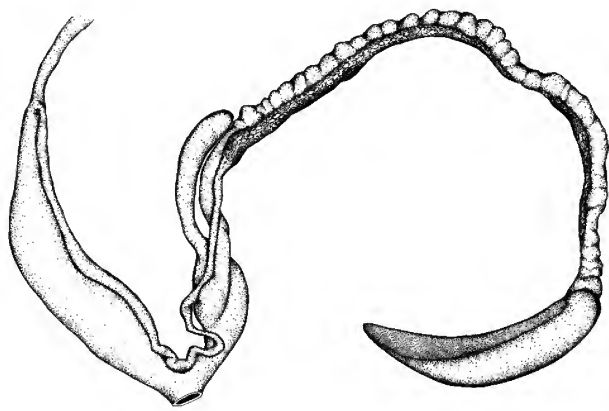


Figure 25. Genitalia of *Amplirhagada descartesana* n.sp., paratype WAM S41491 (20 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

short to moderately long, posteriorly inflated. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct comparatively wide, internally with smooth longitudinal pilasters. Spermathecal head elongately inflated, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising about half of anterior part of oviduct, rather straight. Spermoviduct clearly longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end.

Radular morphology (Fig. 24E–G). Rectangular. Tooth formula C+16–17+3–4+18–20. In average with 139 ± 5.5 rows of teeth, 31.4 ± 0.2 rows per mm ($n = 2$). Central teeth with bluntly pointed, triangular mesocones, shorter than base of tooth; ectocones small. Lateral teeth with bluntly pointed, triangular mesocones, length equal to base of tooth; ectocones small, endocones vestigial. Marginal teeth with elongate mesocones; ectocones shorter and narrower than mesocones, divided into two denticles; endocones smaller than ectocones.

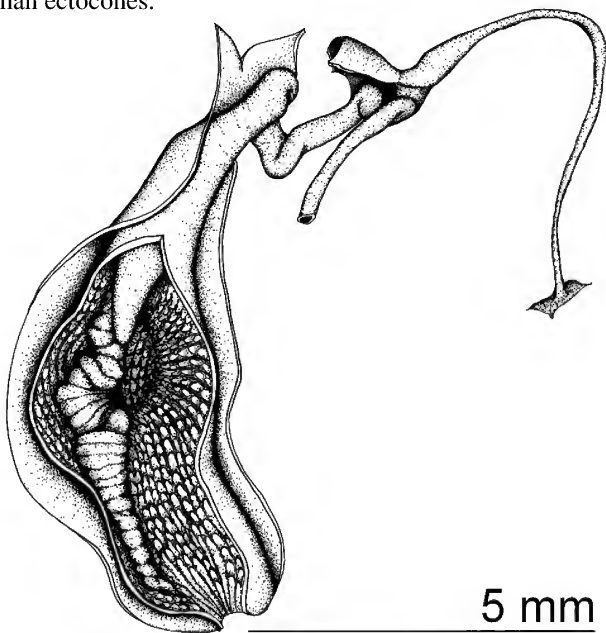


Figure 26. Interior of penial chamber of *Amplirhagada descartesana* n.sp., paratype FMNH 219276 (20 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

Comparative remarks. The present material has been labelled as “*Amplirhagada* sp. 74” by Solem. The species is most readily distinguished from other species from the Montesquieu Islands by its more turreted shell. Similar to *A. montesquieuana*, its axial sculpture is more regular than that of *A. combeana* and *A. mckenziei*. From *A. montesquieuana* it differs by its larger size and more conical shape. The main stimulatory pilaster is similar to that in *A. montesquieuana* in shape but lacks “hooked toes”; broader than pilaster in *A. ponderi* and *A. mckenziei*; penial wall pustulation differs markedly from that in *A. montesquieuana*.

Amplirhagada katerana Solem, 1981

Amplirhagada katerana Solem, 1981a: 198–201, figs. 37d, 41a, 43e–f.

Material examined. AMS C463692, WAM S36601 (preserved specimens, Bonaparte Archipelago, Montague Sound, Kater’s Island, $14^{\circ}26'51.6''S$ $125^{\circ}31'07.1''E$), WAM S36878 (preserved specimens, $14^{\circ}26'52''S$ $125^{\circ}31'13''E$), AMS C463695, WAM S36879 (preserved specimens, $14^{\circ}26'49''S$ $125^{\circ}31'15''E$), AMS C463696, WAM S36880 (preserved specimens, $14^{\circ}26'56.8''S$ $125^{\circ}31'11.0''E$) (Fig. 1).

Sealing strategy. Free sealer.

Shell (Fig. 27A–C, Pl. 1.13). Semi-globose with medium spire; solid. Periphery evenly rounded to angulate. Umbilicus forming a chink or narrowly winding opening, 80–90 percent concealed by columellar reflection. Background colour horn; with diffuse to well marked, dark brown, moderately to very thick sub-sutural and mod-whorl bands; bands may fuse with each other concealing background colour completely; ventral colour, outer lip and inner lip horn. Protoconch c. 2.3 mm in diameter, comprising 2 whorls, sculptured by fine, indistinct axial lirae. Teleoconch smooth except for axial growth lines. Angle of aperture 30° ; outer lip rounded, sharp to moderately thick, slightly expanded, not or slightly reflected, basal and palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity deep, comprising one whorl. Mottled pigmentation on mantle dark greyish brown. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 28–29). Penis straight, of about same length as anterior part of oviduct. Vas deferens forms simple loop or coils before entering penis. Penial retractor muscle shorter than penis of same length. Penial sheath evenly thick. Penial verge short ($\frac{1}{8}$ – $\frac{1}{4}$ of penial chamber), broad, with pointed tip. Penial wall covered by small pustules, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster not differentiated. Three pilasters are formed by rows of thickened pustules comprising entire length of inner penial wall. Vas deferens slightly undulated, entering penial sheath close to apical portion. Vagina elongated, tubular. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct and head not well-differentiated; duct moderately thick, internally with smooth longitudinal pilasters; head globular to elongately inflated, internally smooth, with delicate wall; only tip of head connected with oviduct by connective

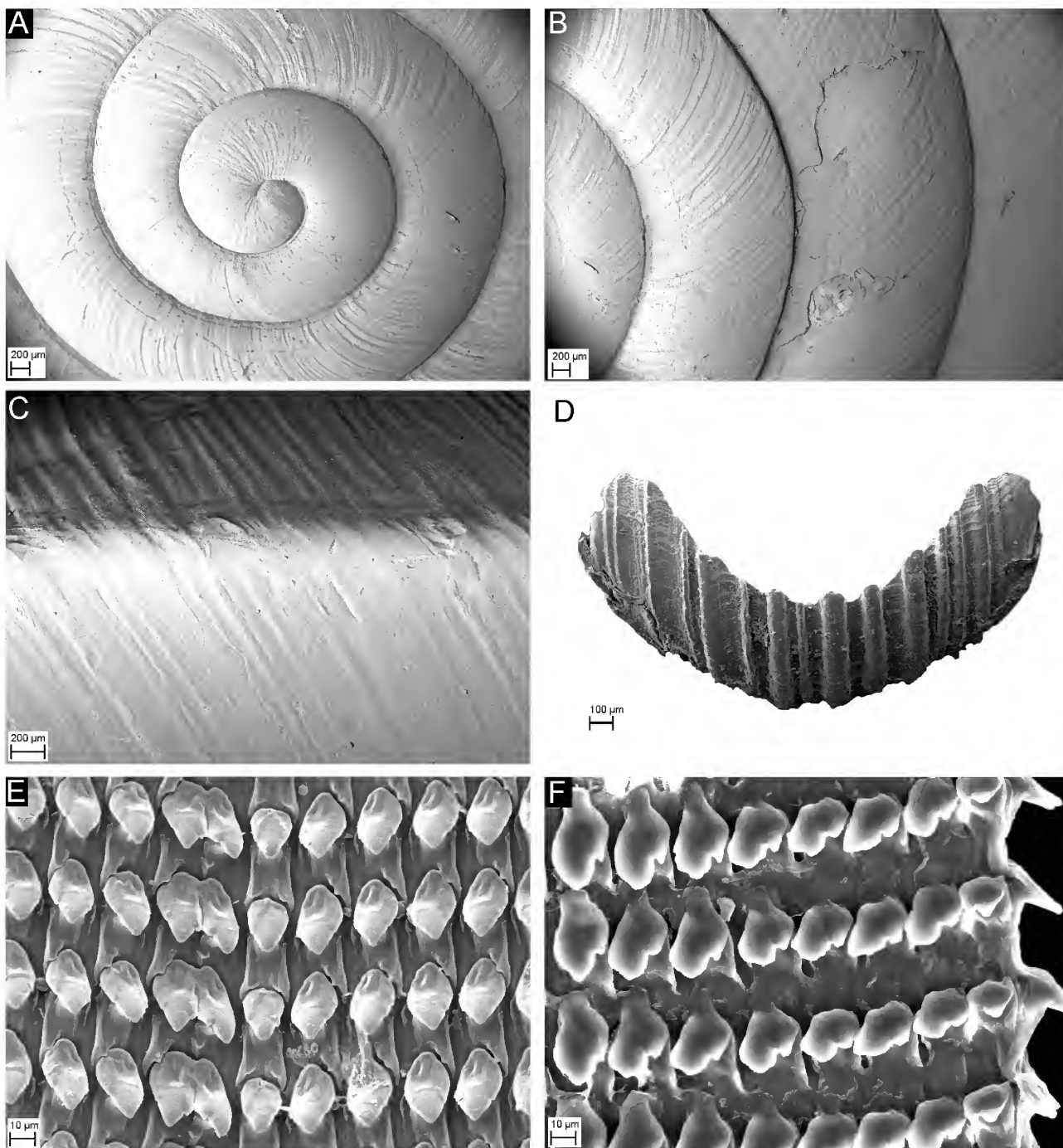


Figure 27. SEM photographs of *Amplirhagada katerana*. (A–C) Shell, AMS C463697: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on first three whorls viewed from above (scale 200 µm); (C) close-up of the peripheral keel and sculpture on last whorl (scale 200 µm). (D) Jaw, WAM S36603 (scale 100 µm). (E–F) Radula, WAM S36603: (E) close-up of central and inner lateral teeth (scale 10 µm); (F) close-up of middle marginal teeth (scale 10 µm).

tissue. Free oviduct comprising more than half of anterior part of oviduct, more or less straight. Spermoviduct slightly longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 27E–F). Rectangular. Tooth formula C+14–20+3–4+15–22. In aerege with 126 ± 7.0 rows of teeth. 30.7 ± 0.1 rows per mm ($n = 2$). Central teeth with bluntly pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed, triangular mesocones, shorter than base of tooth;

ectocones and endocones vestigial. Marginal teeth with rounded mesocones; ectocones shorter and narrower than mesocones, simple; endocones vestigial.

Comparative remarks. Shell more conical in shape and whorls more flattened in diameter than in any species listed so far. Dark brown colour of most shells with pronounced different ventral colour is very characteristic. Penial interior with three longitudinal pilasters formed by enlarged wall pustules is peculiar to this species. For comparison with other species also see Solem (1981a: 198–199).

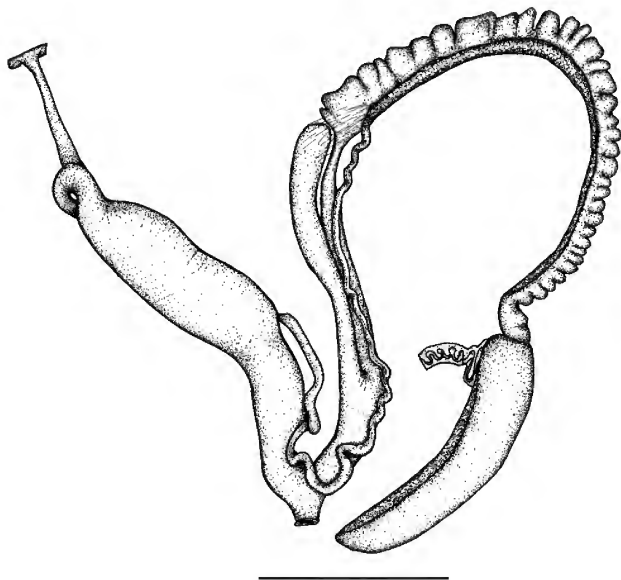


Figure 28. Genitalia of *Amplirhagada katerana* AMS C463692 (27 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

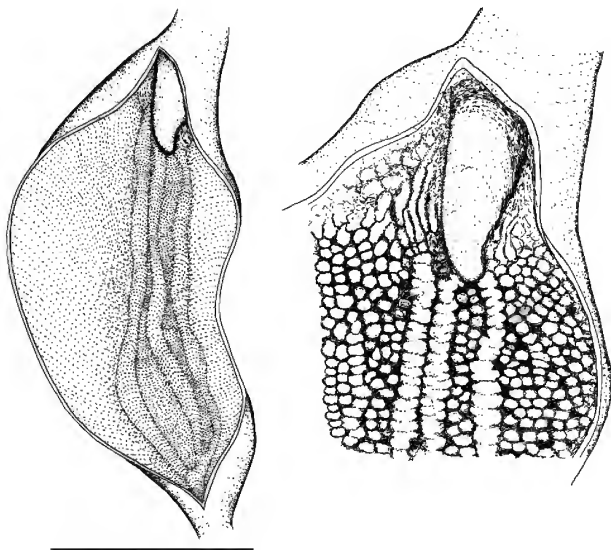


Figure 29. Interior of penial chamber of *Amplirhagada katerana* AMS C463692 (27 July, scale 5 mm) (general overview and magnification of pustulation; drawing F.K.). Compare with Fig. 4 for labelling of structures.

Amplirhagada puescheli n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Montague Sound, unnamed island near Prudhoe Island, 14°25'19"S 125°14'23"E; KC-075 (leg. V. Kessner & A. Longbottom, 21 July 1988).

Type material. Holotype WAM S34608 (Pl. 1.14). Paratypes AMS C463750 (8 preserved specimens), FMNH 219290 (18 preserved specimens), WAM S41486 (10 preserved specimens).

Etymology. Named in honour of Martin Püschel, acknowledging his indispensable help with producing most illustrations used in this publication.

Shell (Fig. 32A–C, Pl. 1.14). Broadly conical with low to medium spire; thin to solid (translucent). Periphery

slightly angulate; upper and basal sectors of whorls rounded. Umbilicus forming a chink or narrowly winding opening, 30–90 percent concealed by columellar reflection. Background colour horn to yellowish brown; with diffuse to well marked, brown sub-sutural and mid-whorl bands being most conspicuous on last whorls; ventral colour horn; outer lip colour same as shell; inner lip translucent, whitish. Protoconch c. 2.5 mm in diameter, comprising 1.5 whorls, smooth. Teleoconch smooth except of faint axial growth

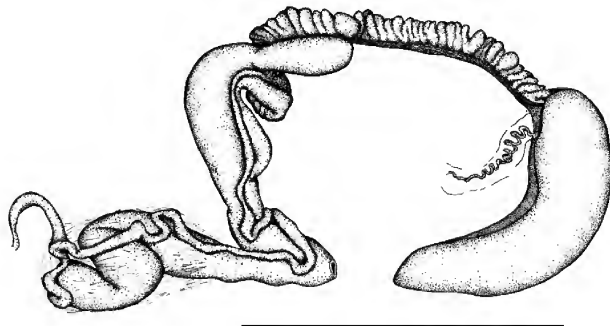


Figure 30. Genitalia of *Amplirhagada puescheli* n.sp., paratype AMS C463750 (21 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

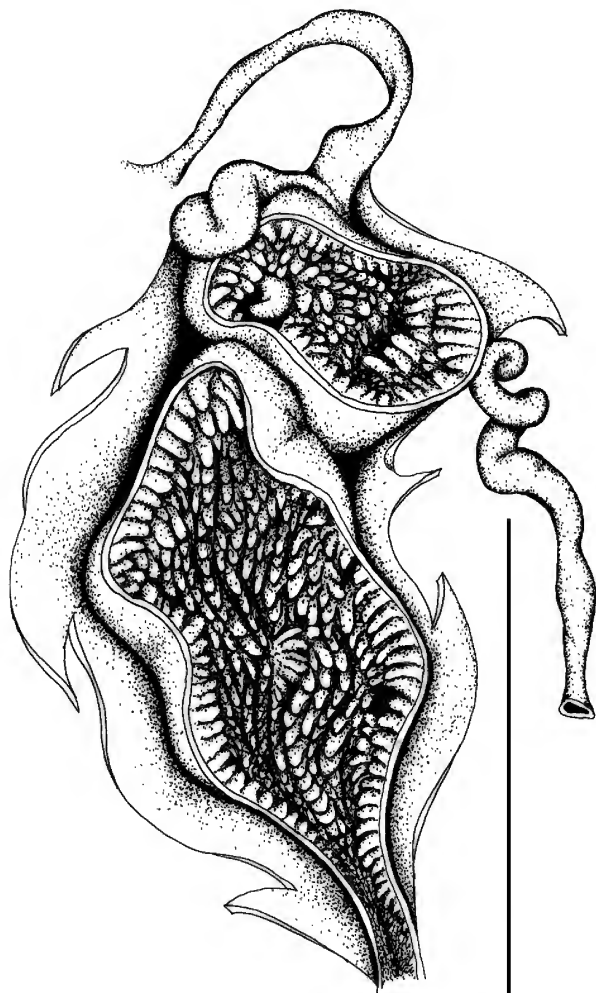


Figure 31. Interior of penial chamber of *Amplirhagada puescheli* n.sp., paratype AMS C463750 (21 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

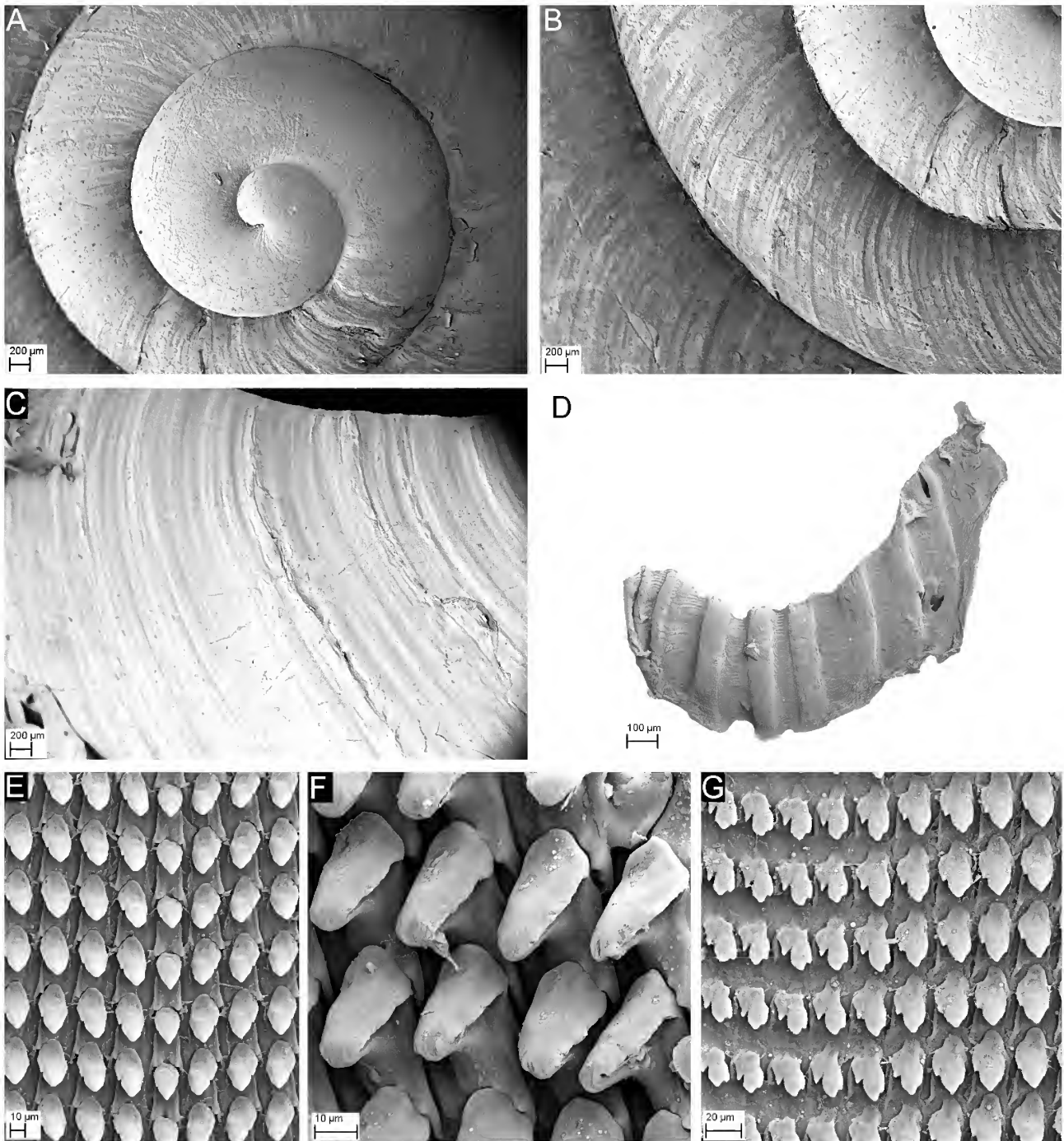


Figure 32. SEM photographs of *Amplirhagada puescheli*, paratype AMS C463750. (A–C) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on first three whorls viewed from above (scale 200 µm); (C) sculpture on last whorl (scale 200 µm). (D) Jaw, broken (scale 100 µm). (E–G) Radula: (E) central and inner lateral teeth (scale 10 µm); (F) close-up of lateral teeth (scale 10 µm); (G) outer lateral and inner marginal teeth (scale 20 µm).

lines. Angle of aperture 30°; outer lip rounded, sharp, slightly expanded, slightly reflected; basal node of lip absent weak; palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Mantle pigmentation consist of black spots. Kidney extending half of pallial cavity or more.

Genital morphology (Figs. 30–31). Penis curved or sharply bent, of more or less of same length as anterior part of oviduct. Vas deferens coils before entering penis. Penial

retractor muscle shorter than penis. Penial verge tiny (barely visible), slender to spatulate with pointed tip. Penial wall pustules small, elongated, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster absent. Vas deferens entering penial sheath in upper third. Vagina moderately wide, posteriorly inflated; inner vaginal wall with undulating longitudinal pilasters. Spermatheca long, clearly extending over base of spermoviduct. Spermathecal duct internally with undulating longitudinal pilasters. Spermathecal head globular to elongately inflated, connected with oviduct by connective tissue, internally smooth with

delicate to thin wall. Free oviduct shorter than half of anterior part of oviduct, more or less straight. Spermooviduct of same length as anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 32E–G). Rectangular. Tooth formula C+12–15+2–3+19–20. In Average with 156 ± 10 rows of teeth, 32.5 ± 0.4 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones absent. Lateral teeth with bluntly pointed, triangular mesocones, length equal to base of tooth; ectocones and endocones vestigial. Marginal teeth with triangular to rounded mesocones; ectocones shorter and narrower than mesocones, simple, pointed; endocones greatly reduced.

Comparative remarks. The present material has been labelled as “*Amplirhagada* sp. 70” by Solem. Shell is rather generic and similar to a number of species especially from islands in the Admiralty Gulf. It differs by its sharply bent penis with strongly developed pustulation of inner whorl and absence of well-differentiated main pilaster and a rather tiny verge.

Amplirhagada decora n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Bigge Island, 4.3 km north of Savage Hill, $14^{\circ}35'15''\text{S}$ $125^{\circ}11'05''\text{E}$; KIS 1–41. Vine thicket on lower and mid slopes north of small stream, dolerite, on trees and bushes in wetter sections (leg. V. Kessner, 17 February 2008).

Type material. Holotype WAM S34609 (Pl. 1.15). Paratypes AMS C463698 (8 preserved specimens, as holotype), WAM S36873 (17 preserved specimens, as holotype), AMS C463699 (4 preserved specimens, $14^{\circ}35'13.3''\text{S}$ $125^{\circ}11'10.5''\text{E}$), WAM S36874 (9 preserved specimens, $14^{\circ}35'13.3''\text{S}$ $125^{\circ}11'10.5''\text{E}$), AMS C463700 (shell, $14^{\circ}35'15''\text{S}$ $125^{\circ}11'05''\text{E}$), WAM S36963 (2 shells, $14^{\circ}35'15''\text{S}$ $125^{\circ}11'05''\text{E}$).

Additional, non-type material. WAM S36461–7, WAM S36652–4, WAM S36872 (Bigge Island).

Etymology. From *decora* (Latin = elegant, beautiful) in reference to its beautiful shell.

Shell (Fig. 35A–C, Pl. 1.15). Globose, with medium to high spire; solid. Periphery angulate; upper sector of whorls flattened to rounded; basal sector rounded. Umbilicus completely concealed by columellar reflection. Background colour brownish horn; with well defined, dark brown, moderately broad sub-sutural and mid-whorl bands being most conspicuous on last whorls; ventral colour horn; outer lip colour same as shell; inner lip translucent. Protoconch c. 2 mm in diameter, comprising 1.5 whorls, sculptured by fine, indistinct axial lirae. Teleoconch with fine axial lirae, rounded in cross-section, regularly spaced, spaces equal to thickness of lirae, lirae distributed evenly across shell surface, reduced underneath suture. Angle of aperture 30° , outer lip rounded, sharp to moderately thick, not or slightly expanded, not reflected; basal and palatal node absent. Parietal wall of inner lip absent.

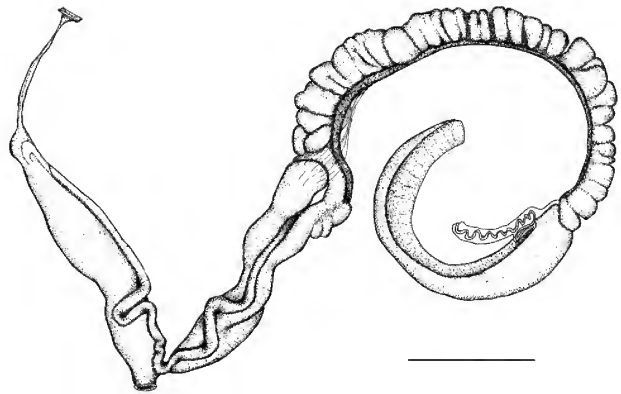


Figure 33. Genitalia of *Amplirhagada decora* n.sp., paratype AMS C463699 (17 February, scale 10 mm) (drawing F.K.). Compare with Fig. 3 for labelling of structures.

Pallial morphology. Pallial cavity deep, extending one whorl. Mottled pigmentation on mantle dark grey. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 33–34). Penis straight, of more or less same length as anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle of about same length as penis. Penial sheath evenly thin. Penial verge tiny (barely visible), with truncated tip. Penial wall pustules of average size, densely arranged

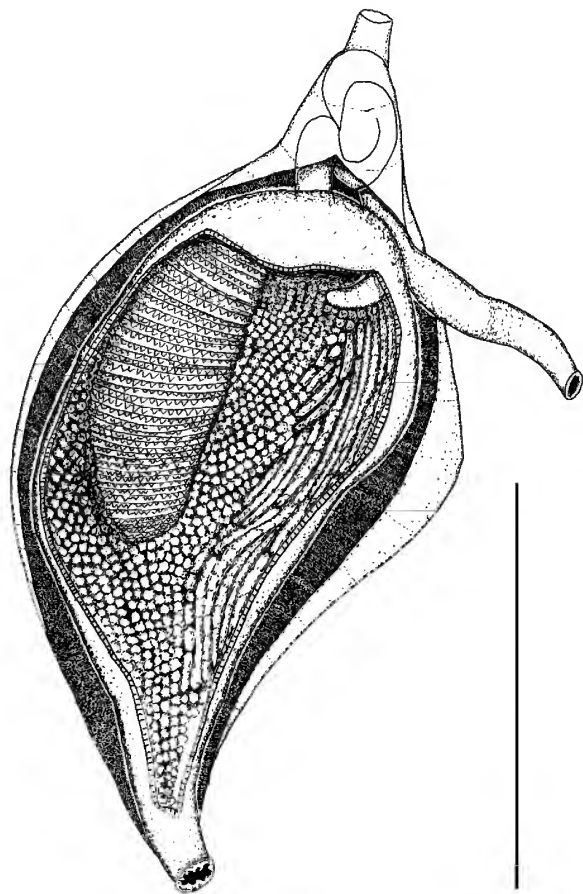


Figure 34. Interior of penial chamber of *Amplirhagada decora* n.sp., paratype AMS C463698 (17 February, scale 5 mm) (drawing F.K.). Compare with Fig. 4 for labelling of structures.

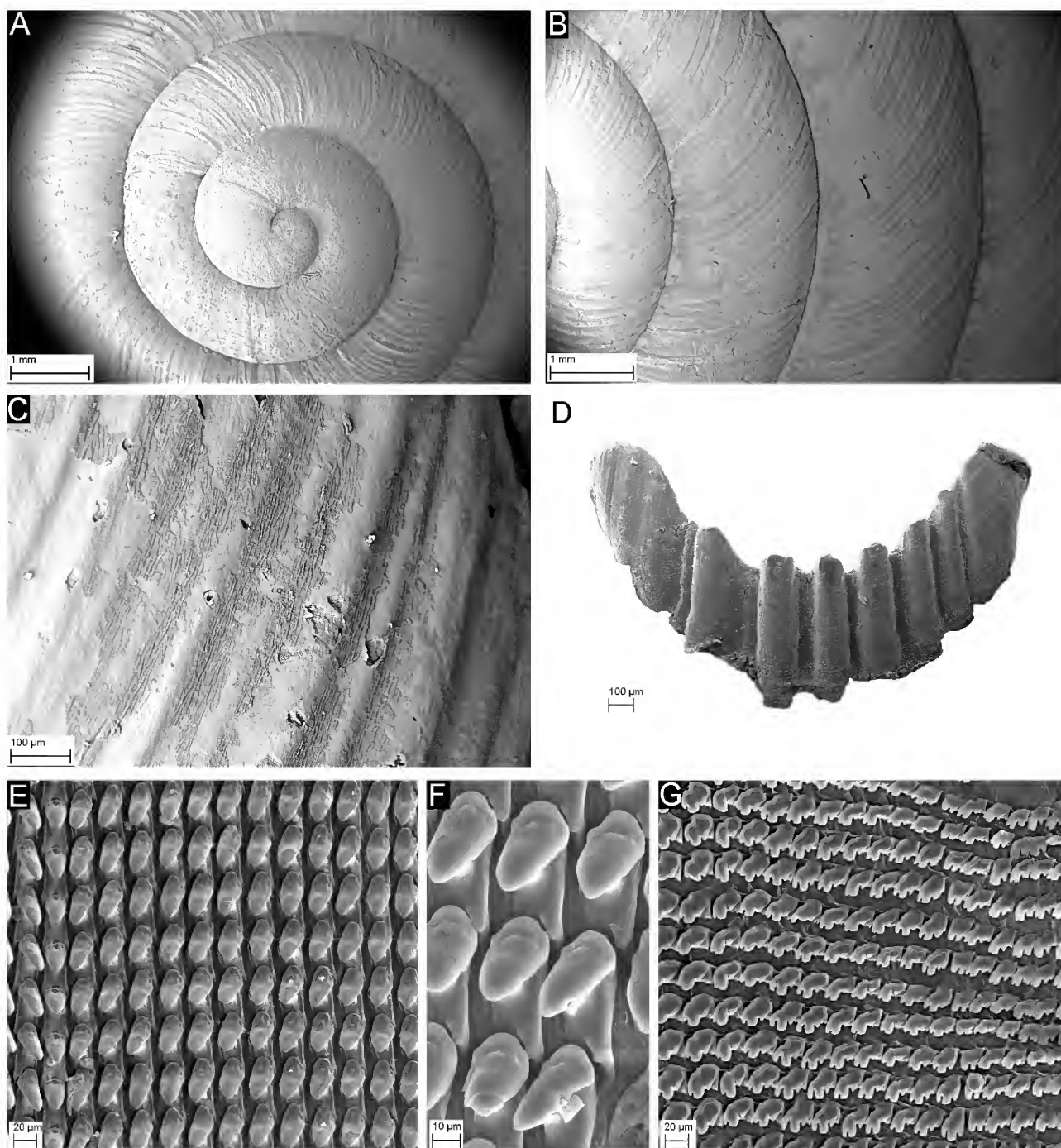


Figure 35. SEM photographs of *Amplirhagada decora* n.sp. (A–C) Shell, paratype AMS C463700: (A) apical whorl viewed from above (scale 1 mm); (B) sculpture on first three whorls viewed from above (scale 1 mm); (C) sculpture on last whorl (scale 100 µm). (D) Jaw, paratype AMS C463698 (scale 100 µm). (E–G) Radula, paratype AMS C463698: (E) central and lateral teeth (scale 20 µm); (F) close-up of lateral teeth (scale 10 µm); (G) inner and middle marginal teeth (scale 20 µm).

in rows over entire length of inner penial wall; partly fused to small elongated ridges. Main stimulatory pilaster well-differentiated, forming a very large cone sculptured by dense ridges comprising apical to median portion of penial chamber; pilaster ridges support little hooks. Vas deferens rather undulated, moderately thick, entering penial sheath in upper third of penis. Vagina short, tubular, posteriorly inflated; inner wall with longitudinal pilasters. Spermathecal duct of medium thickness, internally with smooth longitudinal pilasters. Spermathecal head globular

to elongately inflated, connected with oviduct by connective tissue, internally smooth, with thin wall. Free oviduct comprising more than half of anterior part of oviduct, rather straight. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 35E–G). Rectangular. Tooth formula C+16–18+0–3+20–21. In average 137.3 ± 25.4 rows of teeth, 27.8 ± 2.7 rows of teeth ($n = 3$). Central teeth

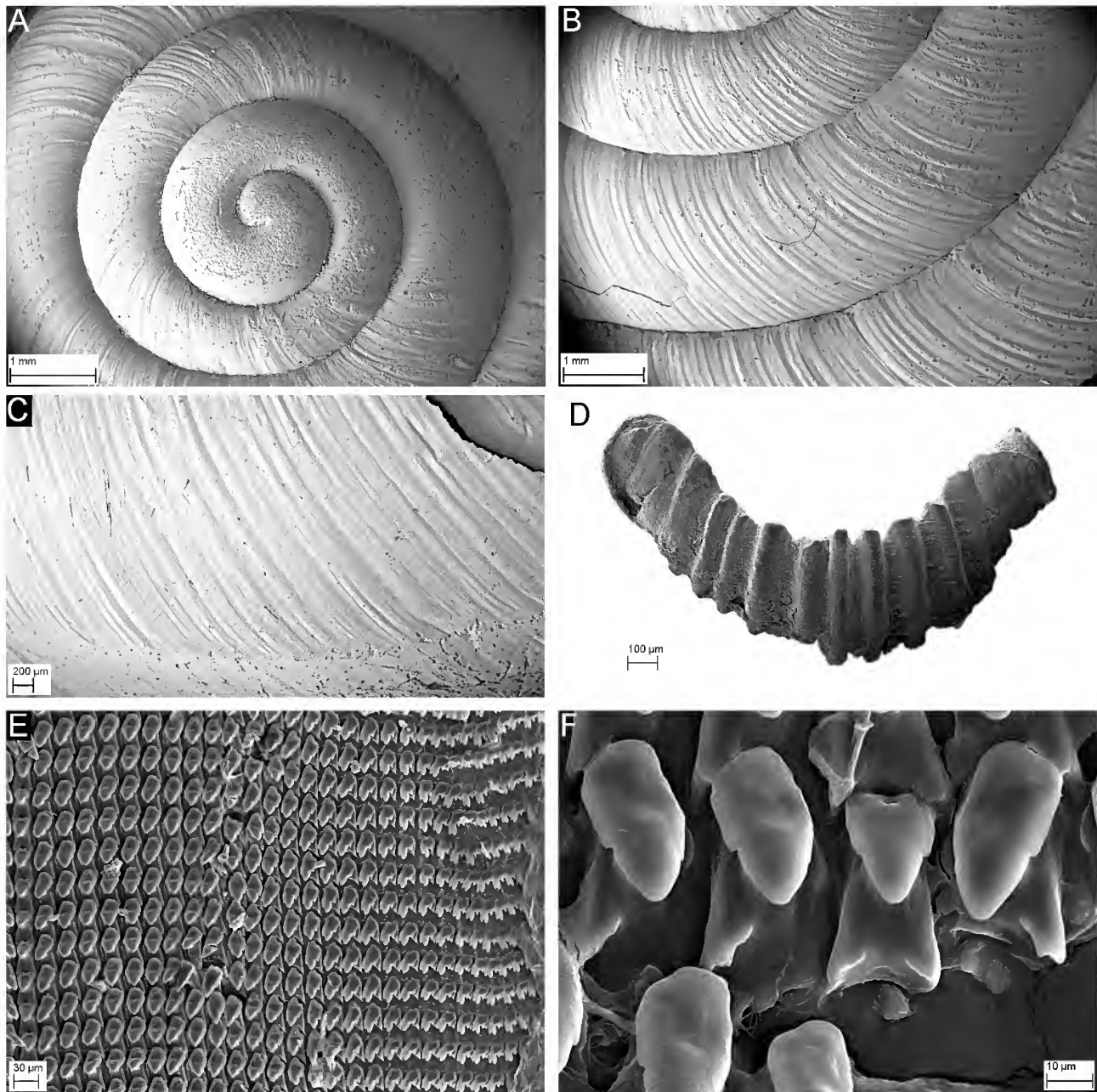


Figure 36. SEM photographs of *Amplirhagada kessneri* n.sp. (A–C) Shell, paratype AMS C463703: (A) apical whorl viewed from above (scale 1 mm); (B) sculpture on second to fourth whorl viewed from above (scale 1 mm); (C) detail of sculpture on mid of last whorl (scale 200 µm). (D) Jaw, paratype AMS C463701 (scale 100 µm). (E–G) Radula, paratype AMS C463701: (E) central and lateral teeth (scale 20 µm); (F) close-up of lateral teeth (scale 10 µm); (G) inner and middle marginal teeth (scale 20 µm).

with bluntly pointed, triangular to ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed, triangular to ovate mesocones, shorter than base of tooth; ectocones and endocones vestigial. Marginal teeth with broad, flattened mesocones; ectocones shorter and narrower than mesocones, divided into two denticles, endocones reduced in size.

Comparative remarks. Its highly elevated, dome-shaped shell being characteristic (H/D larger than in many other species with more conical shells). Comparatively large, cone-shaped main pilaster, rather large pustules of inner penial wall and tiny verge are diagnostic. This species was referred to as “*Amplirhagada* sp. 23” by Solem (1991).

Amplirhagada kessneri n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Bigge Island, 4.3 km north of Savage Hill, 14°35'15"S 125°11'05"E; KIS 1-41. Vine thicket on mid slopes north of small stream, dolerite, on trees and bushes in drier sections (leg. V. Kessner, 17 February 2008).

Type material. Holotype WAM S34610 (Pl. 1.16). Paratypes AMS C463701 (4 preserved specimens, as holotype), WAM S36875 (10 preserved specimens, as holotype), WAM S36477 (5 shells, 14°35'16"S 125°11'02"E), AMS C463702 (9 preserved specimens, 14°35'16"S 125°11'02"E), AMS C.463703 (2 shells, 14°35'16"S 125°11'02"E), WAM S36658 (10 preserved specimens, 14°35'16"S 125°11'02"E), WAM S36876 (16 preserved specimens, 14°35'18.5"S 125°10'54.7"E), WAM S36475 (3 shells, 14°35'16"S 125°11'06"E), WAM S36476 (6 shells, 14°35'14"S 125°11'08"E).

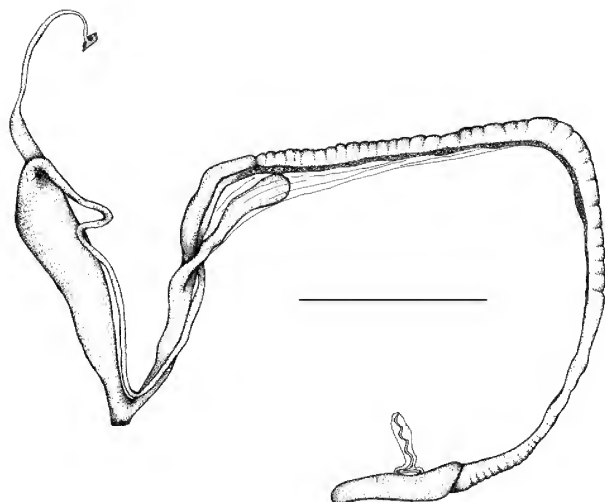


Figure 37. Genitalia of *Amplirhagada kessneri* n.sp., paratype WAM S36876 (17 February, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Etymology. Named in honour of Vince Kessner in recognition of his lasting achievements as one of Australia's finest experts in the field.

Shell (Fig. 36A–C, Pl. 1.16). Semi-globose to conical with low spire; thin to solid (translucent). Periphery evenly rounded to slightly angulate; upper sector of whorls rounded, basal sector somewhat flattened. Umbilicus open, forming a chink or narrowly winding opening, 30–90 percent concealed by columellar reflection. Background colour horn to light brown, exceptionally dark brown; sub-sutural and mid-whorl bands absent or diffuse to well marked, brown, thin to moderately thick, most conspicuous on last whorls; ventral colour horn to light brown; outer lip colour lighter than shell, horn; inner lip translucent. Protoconch c. 2 mm in diameter, comprising 2 whorls, almost smooth. Teleoconch with regularly spaced axial lirae becoming somewhat oblique on last whorl. Angle of aperture 45°; outer lip rounded, sharp to moderately thick, slightly expanded, not or slightly reflected, basal node absent or very weak, palatal node absent. Parietal wall of inner lip absent.

Pallial morphology. Pallial cavity deep, extending one whorl. Mottled mantle pigmentation dark grey to black. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 37–38). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle longer than penis. Penial sheath evenly thin. Penial verge short (<1/8 penial chamber), slender to spatulate, with truncated tip. Penial wall pustules small, densely arranged in rows over entire length of inner penial wall. Main stimulatory pilaster well-differentiated, forming a large, elongated cone, sculptured by smooth horizontal ridges, comprising apical to median portion of penial chamber. Vas deferens entering penial sheath in upper third. Vagina rather long, tubular; inner vaginal wall densely covered by tiny pustules. Spermathecal duct moderately thick, internally with longitudinal rows of densely packed ciliae. Spermathecal head globular to elongately inflated, connected with oviduct by connective tissue, internally smooth, densely ciliated, with thin wall. Free oviduct comprising ± half of anterior part of oviduct, straight. Spermoviduct longer to much longer than anterior

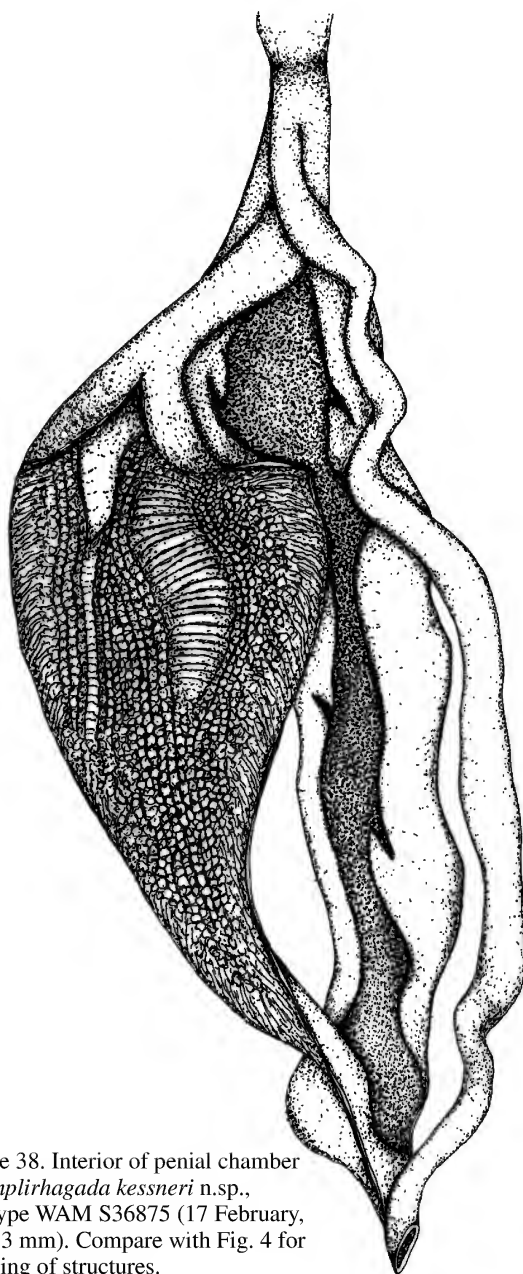


Figure 38. Interior of penial chamber of *Amplirhagada kessneri* n.sp., paratype WAM S36875 (17 February, scale 3 mm). Compare with Fig. 4 for labelling of structures.

part of oviduct. Talon embedded in albumen gland close to anterior end.

Radular morphology (Fig. 36E–G). Rectangular. Tooth formula C+14–17+0–4+18–21. In average with 117 ± 2.9 rows of teeth, 27.6 ± 0.7 rows per mm ($n = 3$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones tiny. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones tiny, endocones vestigial. Marginal teeth with broad, flattened mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. Differs from *A. decora*, its congener from Bigge Island, by flatter, uniformly coloured shell, much smaller main pilaster and finer pustulation of inner penial wall.

Amplirhagada berthierana n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, Berthier Island, 14°29'49"S 124°59'34.1"E (leg. C. Whisson, 11 November 2006).

Type material. Holotype WAM S34611 (Pl. 1.17). Paratypes AMS C463754 (8 preserved specimens), WAM S33029 (10 preserved specimens).

Etymology. In reference to Berthier Island, where this species occurs.

Sealing strategy. Rock sealer.

Shell (Fig. 41A–C, Pl. 1.17). Globose to broadly conical with medium high spire; thick. Whorls evenly rounded. Umbilicus open, forming a chink, 95 percent concealed by columellar reflection. Background and ventral colour cream; banded. Sub-sutural band well defined, red-brown. Mid-whorl band well marked, red brown, moderately broad, visible on entire shell becoming more diffuse on upper whorls, blends with sub-sutural band to cover entire surface of whorl in reddish brown towards tip of shell; outer lip colour white; inner lip translucent, white. Protoconch c. 2.2 mm in diameter, comprising 1.7 whorls, with fine, indistinct axial lirae. Teleoconch with strong axial growth lines. Angle of aperture 45°; outer lip rounded, moderately thick to thick, slightly expanded, slightly reflected; basal node of lip weak; palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Pigmentation on mantle comprising sparsely distributed, dark brown spots. Kidney extending more than half of pallial cavity.

Genital morphology (Figs. 39–40). Penis curved, thick, more or less of same length as anterior part of oviduct. Vas deferens coils once before entering penis. Penial retractor muscle stubby to short. Penial sheath evenly thick. Penial

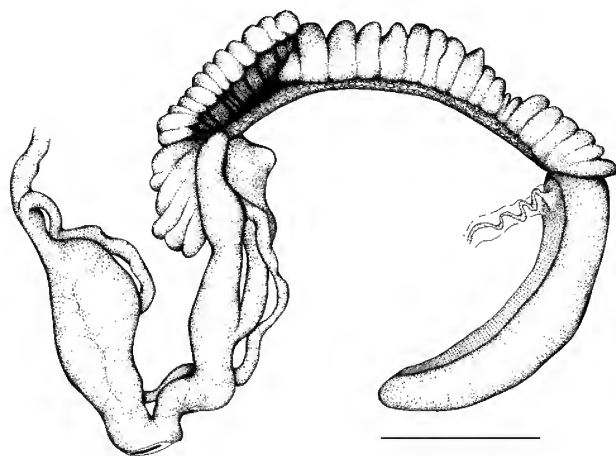


Figure 39. Genitalia of *Amplirhagada berthierana* n.sp., paratype AMS C463754 (11 November, scale 10 mm). Compare with Fig. 3 for labelling of structures.

verge short ($<\frac{1}{4}$ penial chamber), broad with rounded tip. Penial wall pustules small, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster well-differentiated, elongated, cone-shaped, sculptured by smooth horizontal ridges, comprising apical two thirds of penial chamber. Vas deferens entering penial sheath in upper third. Vagina moderately thick, medially inflated; inner vaginal wall with undulating longitudinal pilasters. Spermatheca long, clearly extending over base of spermoviduct. Spermathecal duct wide, internally with undulating longitudinal pilasters. Spermathecal head elongately inflated, connected with oviduct by connective tissue, internally smooth with delicate wall. Free oviduct comprising more or less half of anterior part of oviduct, straight. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermoviduct.

Radular morphology (Fig. 41E–G). Rectangular. Tooth formula C+13–15+3–4+20–24. In average 133 ± 5.0 rows of teeth, 29.2 ± 0.2 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular to ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones and endocones vestigial. Marginal teeth with triangular mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. Distinctive species; its broadly conical, almost dome-like shell with widely rounded, almost depressed last whorl with pronounced spiral banding, and the corrugated, large main pilaster are diagnostic.

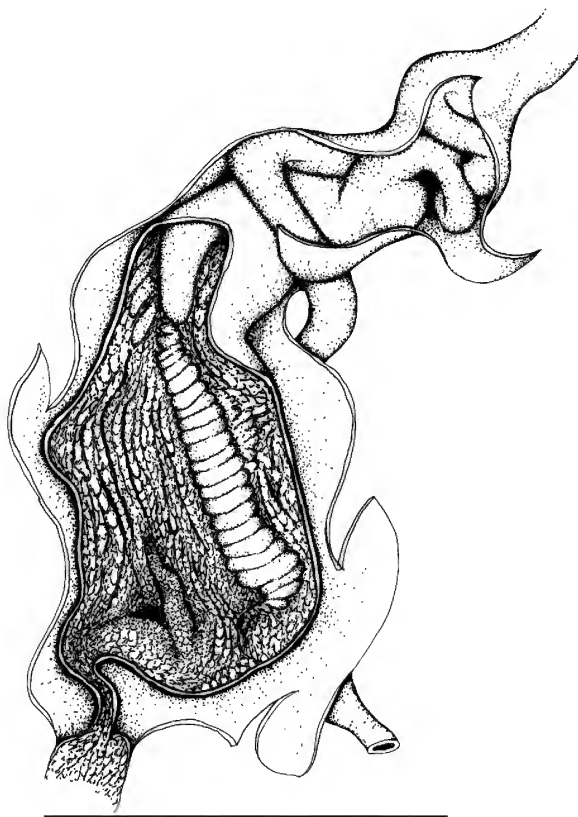


Figure 40. Interior of penial chamber of *Amplirhagada berthierana* n.sp., paratype AMS C463754 (11 November, scale 5 mm). Compare with Fig. 4 for labelling of structures.

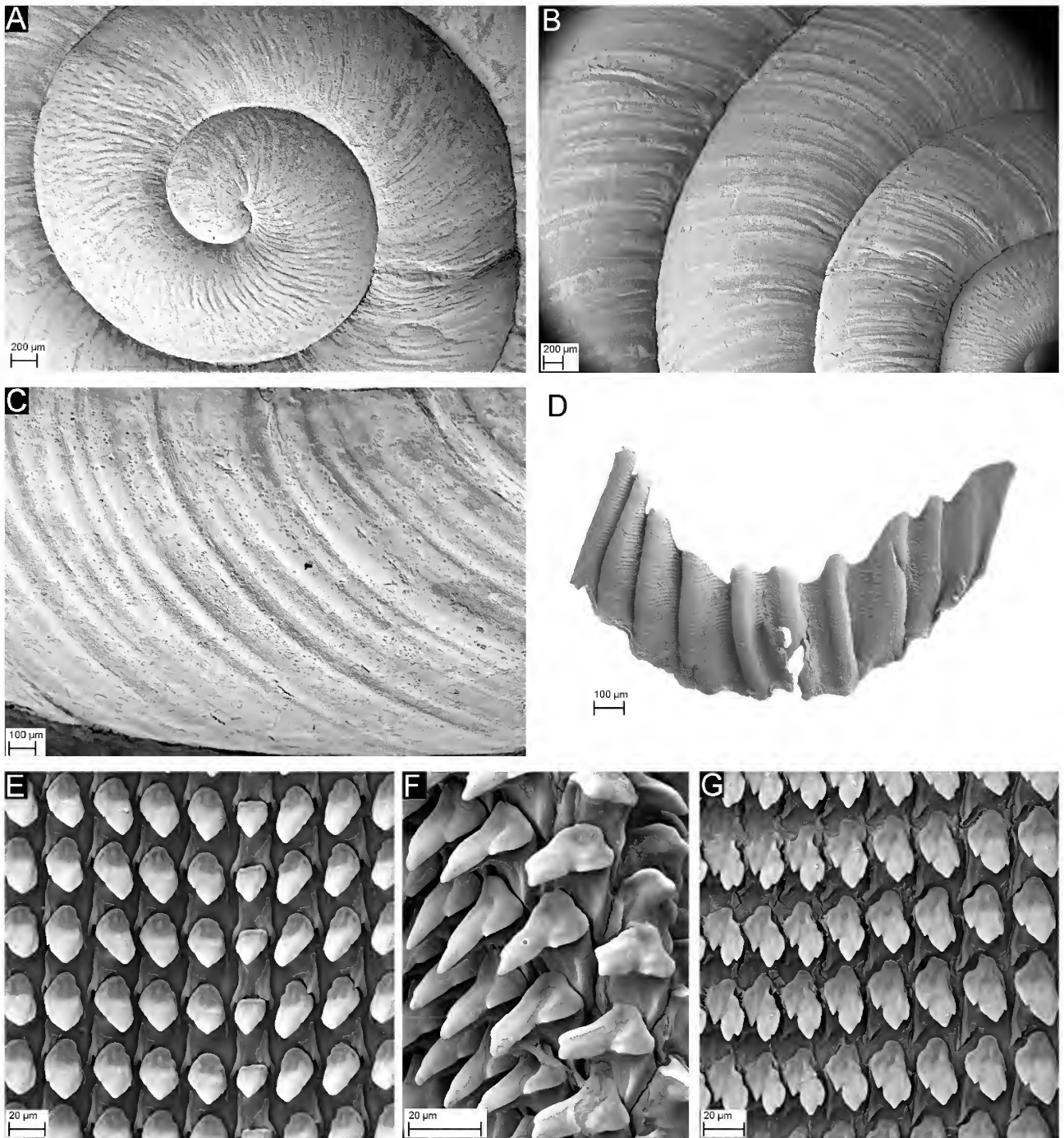


Figure 41. SEM photographs of *Amplirhagada berthierana* n.sp., paratype AMS C463754. (A–C) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second to fourth whorl viewed from above (scale 200 µm); (C) sculpture on upper part of last whorl (scale 200 µm). (D) Jaw (scale 100 µm). (E–G) Radula: (E) central and lateral teeth (scale 20 µm); (F) close-up of lateral teeth (scale 20 µm); (G) outer lateral and inner marginal teeth (scale 20 µm).

Amplirhagada lamarckiana n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, York Sound, Lamarck Island, 14°46'50"S 125°1'23"E; KC-042 (leg. V. Kessner & A. Longbottom, 14 July 1988).

Type material. Holotype WAM S34612 (Pl. 1.18). Paratypes AMS C463755 (5 preserved specimens), FMNH 219163 (15 preserved specimens), WAM S41485 (8 preserved specimens).

Etymology. In reference to Lamarck Island, where this species occurs.

Shell (Fig. 42A–C, Pl. 1.18). Semi-globose to broadly conical, with medium high spire; thin (translucent). Periphery evenly rounded to slightly angulate; upper sector of whorls rather flattened, basal sector rounded. Umbilicus forming a chink, 90–100 percent concealed by columellar reflection. Background colour light brownish horn, banded. Sub-sutural and mid-whorl bands diffuse to well defined, light brown,

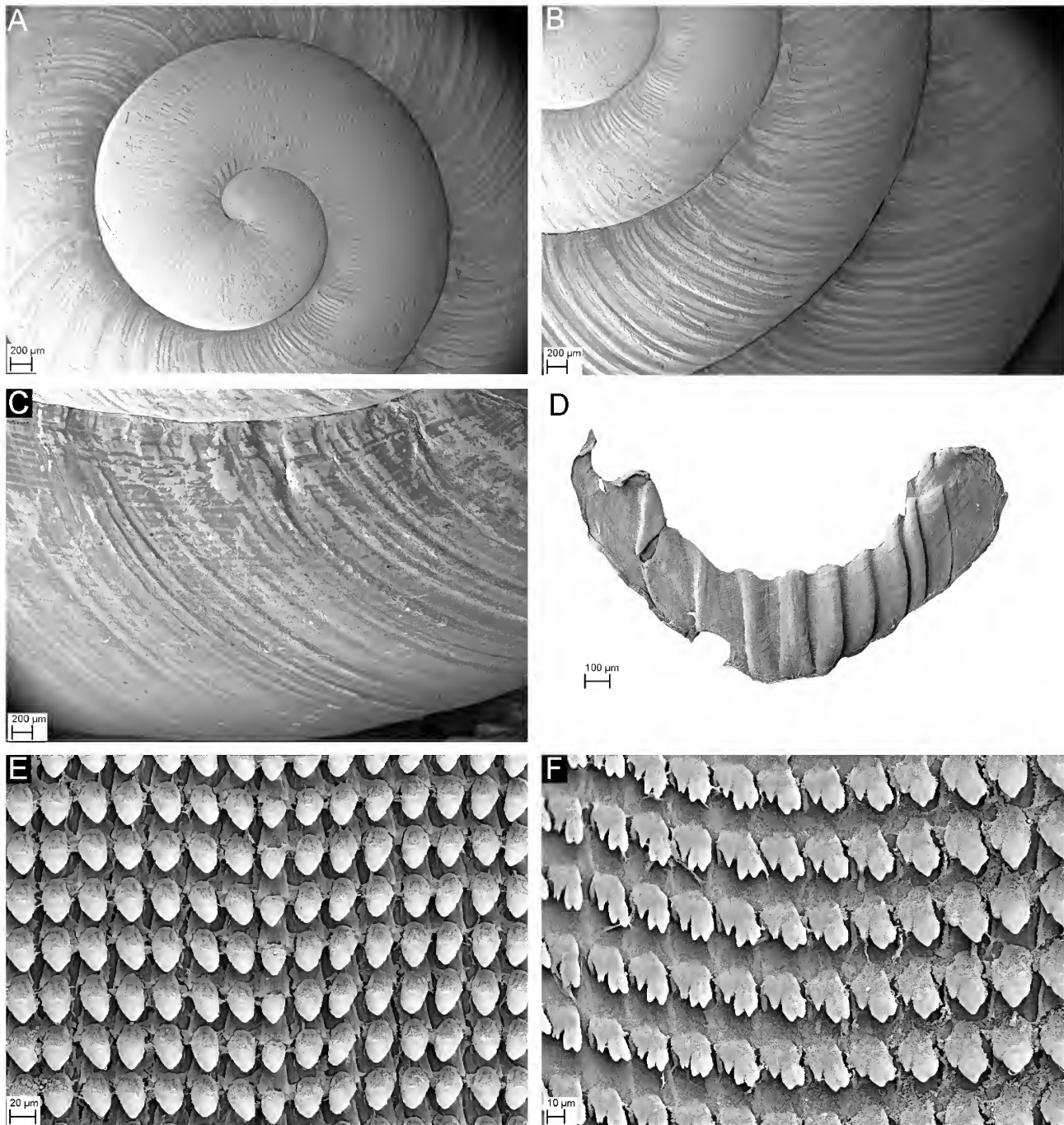


Figure 42. SEM photographs of *Amplirhagada lamarckiana* n.sp., holotype WAM S34612. (A–C) Shell: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second to fourth whorl viewed from above (scale 200 µm); (C) sculpture on upper part of last whorl (scale 200 µm). (D) Jaw (scale 100 µm). (E–F) Radula: (E) central and lateral teeth (scale 20 µm); (F) middle marginal teeth (scale 10 µm).

thin, visible on last whorl(s) only; ventral colour horn; outer lip colour same as shell; inner lip translucent. Protoconch c. 3 mm in diameter, comprising 1.7 whorls, with fine and indistinct lirae. Teleoconch with rather strong axial growth lines. Angle of aperture 45°; outer lip rounded, sharp to moderately thick, slightly expanded, reflected, basal node of lip absent or weak; palatal node absent. Parietal wall of inner lip absent or inconspicuous.

Pallial morphology. Pallial cavity deep, extending $\frac{3}{4}$ whorl. Pigmentation on mantle mottled, black. Kidney extending more than half of pallial cavity.

Genital morphology (Figs. 43–44). Penis straight to curved, of about same length as anterior part of oviduct. Vas deferens coils before entering penis. Penial retractor muscle shorter than penis. Penial sheath delicate. Penial verge tiny (barely visible), slender to spatulate, with pointed tip. Penial wall small, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster elongated, sculptured by horizontal ridges that support little hooks, comprising apical to median portion of penial chamber. Two to three additional pilasters are covered by undifferentiated pustules. Vas deferens entering penial sheath half way up. Vagina moderate, posteriorly inflated; inner vaginal wall with

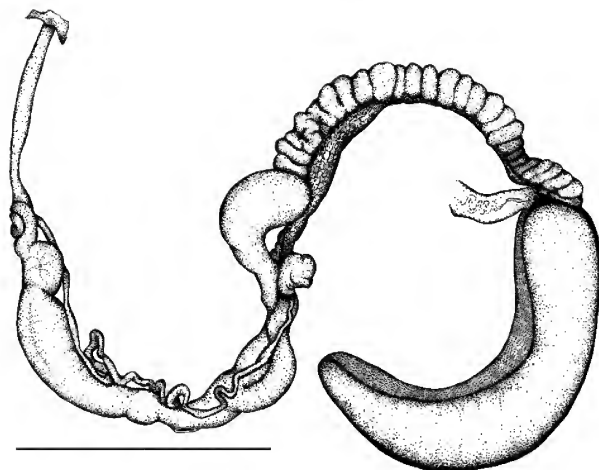


Figure 43. Genitalia of *Amplirhagada lamarckiana* n.sp., holotype WAM S34612 (14 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

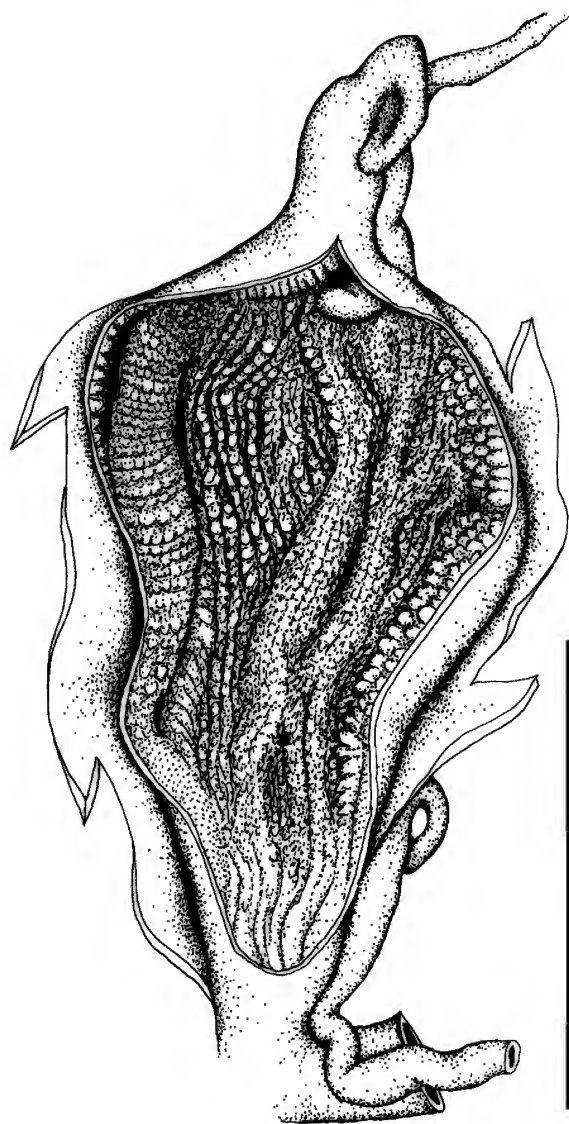


Figure 44. Interior of penial chamber of *Amplirhagada lamarckiana* n.sp., paratype FMNH 219163 (14 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

smooth longitudinal pilasters. Spermathecal duct moderately thick, internally with smooth longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprises more or less half of anterior part of oviduct, straight. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermoviduct.

Radular morphology (Fig. 42E–F). Rectangular. Tooth formula C+14+4+18. With 157 rows of teeth, 27.9 rows per mm ($n = 1$). Central teeth with bluntly pointed, triangular to ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones and endocones vestigial. Marginal teeth with triangular mesocones; ectocones shorter and narrower than mesocones, occasionally divided into two denticles, endocones reduced in size.

Comparative remarks. Pustulation of inner penial wall somewhat similar to *A. indistincta* and *A. solemiana*, which lack a well-differentiated main pilaster and differ by more conical shape of shell. Main pilaster differs in shape and surface pattern from the two species from Bigge Island. Material of the present species has been labelled as “*Amplirhagada* sp. 68” by Solem.

Amplirhagada andersonensis n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Prince Frederick Harbour, Anderson Islands, unnamed island c. 8 km ENE of Cape Torrens, 14°57'49"S 125°09'30"; KC-084 (leg. V. Kessner & A. Longbottom, 22 July 1988).

Type material. Holotype WAM S34613 (Pl. 1.19), AMS C463756 (5 preserved specimens), FMNH 219330 (16 preserved specimens), WAM S41492 (10 preserved specimens).

Etymology. In reference to Anderson Islands, where this species occurs.

Sealing strategy. Rock sealer.

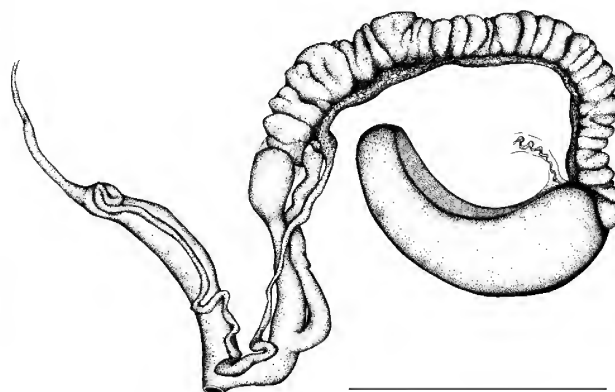


Figure 45. Genitalia of *Amplirhagada andersonensis* n.sp., paratype FMNH 219330 (22 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

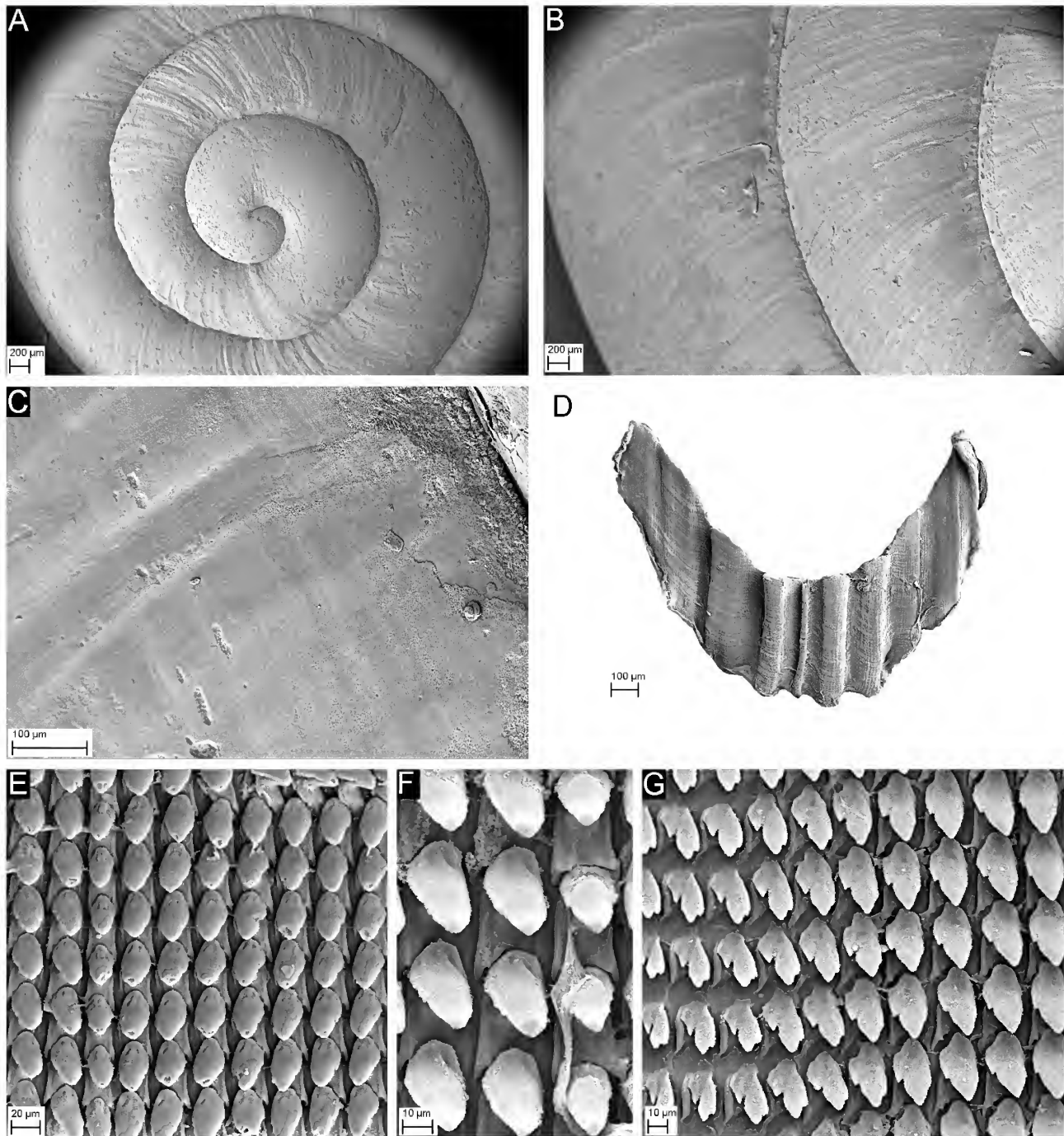


Figure 46. SEM photographs of *Amplirhagada andersonensis* n.sp. (A–C) Shell, paratype AMS C463756: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second and third whorl viewed from above (scale 200 µm); (C) sculpture on upper part of last whorl (scale 100 µm). (D) Jaw (scale 100 µm). (E–G) Radula, paratype FMNH 219330: (E) central and lateral teeth (scale 20 µm); (F) close-up of lateral teeth (scale 10 µm); (G) outer lateral and inner marginal teeth (scale 10 µm).

Shell (Fig. 46A–C, Pl. 1.19). Broadly conical with medium high spire, solid. Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus forming a chink, 90–100 percent concealed by columellar reflection. Background colour greenish ochre to yellowish brown; sub-sutural and mid-whorl band absent or diffuse, darker than background, thin, most conspicuous on last whorl; ventral colour cream; outer lip colour same as shell; inner lip translucent, whitish. Protoconch c. 2 mm in diameter, comprising 1.7 whorls, almost smooth. Teleoconch with inconspicuous axial growth lines, last whorl smooth.

Angle of aperture 30°; outer lip rounded, moderate to thick, slightly expanded, slightly reflected; basal node of lip absent or weak; palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity deep, extending one whorl. Pigmentation on mantle consists of sparse greyish to brown spots. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 45, 47). Penis straight to slightly curved, more or less of same length as anterior part

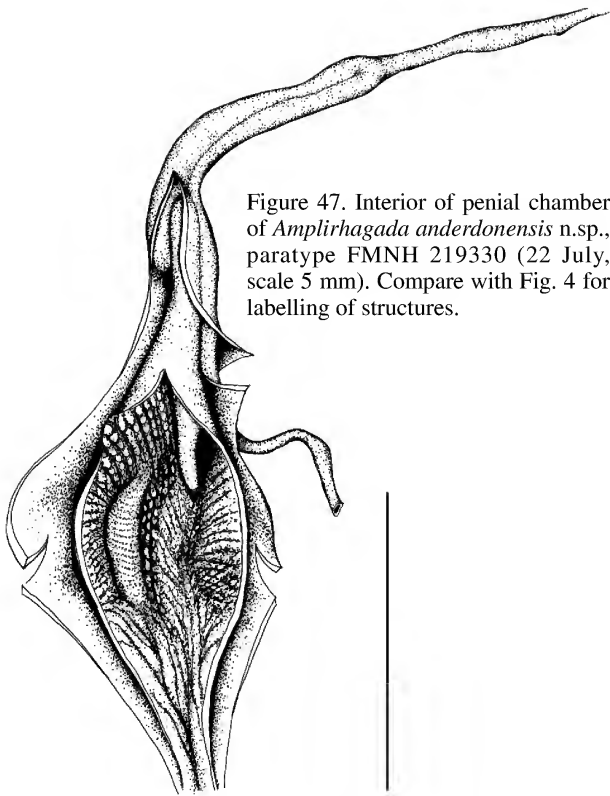


Figure 47. Interior of penial chamber of *Amplirhagada andersonensis* n.sp., paratype FMNH 219330 (22 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

of oviduct. Vas deferens coils once before entering penis. Penial retractor muscle shorter than penis. Penial verge moderately long ($\frac{1}{8}$ – $\frac{1}{4}$ penial chamber), slender to spatulate, with pointed tip. Penial wall pustules small, arranged in rows. Main stimulatory pilaster differentiated, relatively thin, cone-shaped, with horizontal ridged that support little hooks, comprising apical to median portion of penial chamber. Vas deferens entering penial sheath in upper third. Vagina moderately long, tubular, posteriorly inflated; inner vaginal wall with smooth longitudinal pilasters. Spermatheca very short, barely reaching base of spermooviduct. Spermathecal duct normal, internally with smooth longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising more than half of anterior part of oviduct, more or less straight. Spermooviduct longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermooviduct.

Radular morphology (Fig. 46E–G). Rectangular. Tooth formula C+14–15+2+20–23. In average with 145 ± 12.0 rows of teeth, 31.6 ± 4.2 rows per mm ($n = 2$). Central teeth with bluntly pointed, ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed, ovate mesocones, length equal to base of tooth; ectocones small, endocones vestigial. Marginal teeth with triangular to rounded mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. Shell colour very distinctive, similar only to *A. tricenaria* (see below). Penis proportionally smaller than in other species. In addition, it differs from *A. lamarckiana* by finer pustulation of inner penial wall and smaller main pilaster. Material of the present species has been labelled as “*Amplirhagada* sp. 75” by Solem.

Amplirhagada tricenaria n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Prince Frederick Harbour, north of Hunter River mouth, $15^{\circ}01'54''\text{S}$ $125^{\circ}23'13''\text{E}$; KC-080 (leg. V. Kessner & A. Longbottom, 22 July 1988).

Type material. Holotype WAM S34614 (Pl. 1.20). Paratypes AMS C463757 (2 preserved specimens), FMNH 219322 (6 preserved specimens), WAM S41476 (4 preserved specimens).

Etymology. From *tricenaria* (Latin = thirty), in reference to manuscript name assigned to this species by Solem (“*Amplirhagada* n.sp. 30”).

Shell (Fig. 49A–D, Pl. 1.20). Semi-globose, with medium high spire; thin to solid (translucent). Periphery slightly angulate; upper and basal sectors of whorls rounded. Umbilicus forming a chink, 90–100 percent concealed by columellar reflection. Background colour dark horn to ochre; sub-sutural and mid-whorl bands diffuse to well defined, yellowish brown, thin to moderately broad, most conspicuous on last whorls; ventral colour horn; outer lip colour same as shell; inner lip yellowish white. Protoconch c. 2.6 mm in diameter, comprising 2 whorls, almost smooth. Teleoconch with pronounced axial growth lines, last whorl almost smooth. Angle of aperture 30° , outer lip rounded, sharp to moderately thick, slightly expanded, slightly reflected, basal

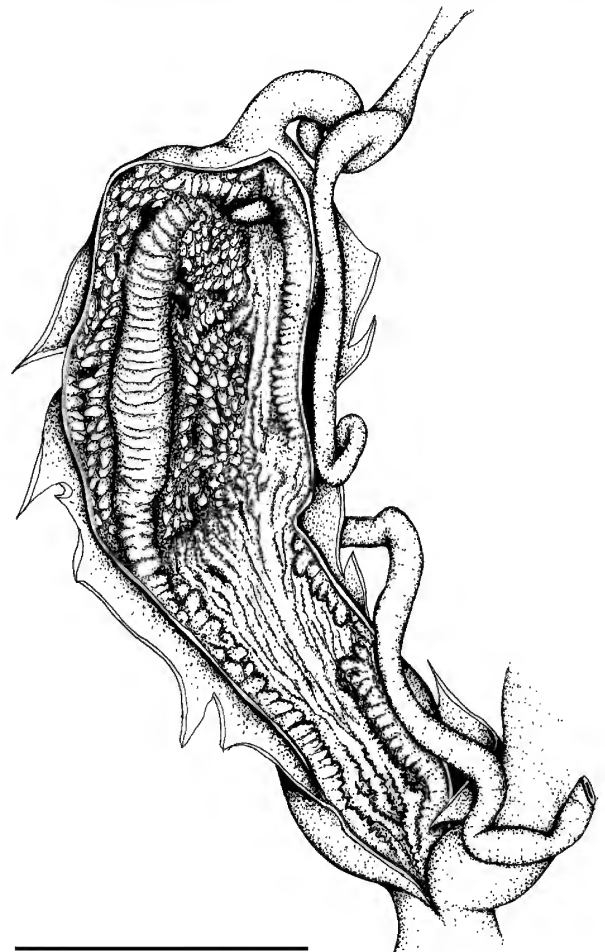


Figure 48. Interior of penial chamber of *Amplirhagada tricenaria* n.sp., paratype FMNH 219332 (22 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

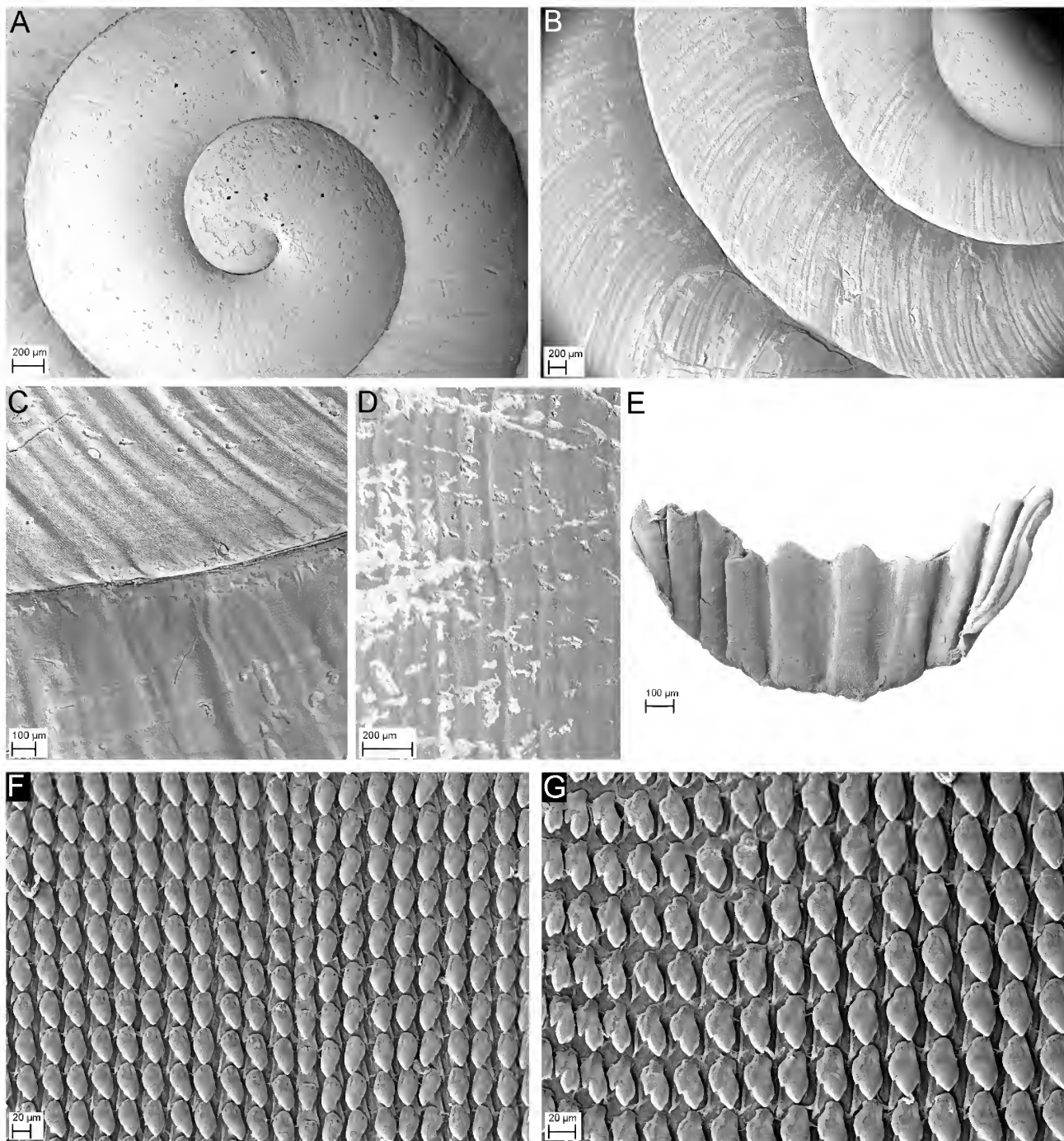


Figure 49. SEM photographs of *Amplirhagada tricenaria* n.sp. (A–D) Shell, paratype AMS C463757: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second to third whorl viewed from above (scale 200 µm); (C) suture between last and penultimate whorl with details of sculpture (scale 100 µm); (D) surface of last whorl, viewed rectangularly from above (Scale 200 µm). (E) Jaw, paratype FMNH 219322 (scale 100 µm). (F–G) Radula, paratype FMNH 219332: (F) central and lateral teeth (scale 20 µm); (G) outer lateral and inner marginal teeth (scale 20 µm).

node of lip absent or weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity deep, extending one whorl. Pigmentation on mantle mottled, greyish or brownish (probably leached in actual specimens). Kidney extending about half of pallial cavity.

Genital morphology (Figs. 48, 50). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor

muscle shorter than penis. Penial verge very short (barely visible), slender to spatulate with pointed tip. Penial wall pustules small, elongated, arranged in rows on apical to median portion of penial chamber. Base of inner penial walls with many smooth longitudinal pilasters. Main stimulatory pilaster well-differentiated, elongate to cone-shaped, sculptured by smooth ridges, comprising apical to median portion of penial chamber. Vas deferens entering penial sheath in upper third. Vagina of medium length and thickness, tubular, posteriorly slightly inflated. Inner vaginal wall with

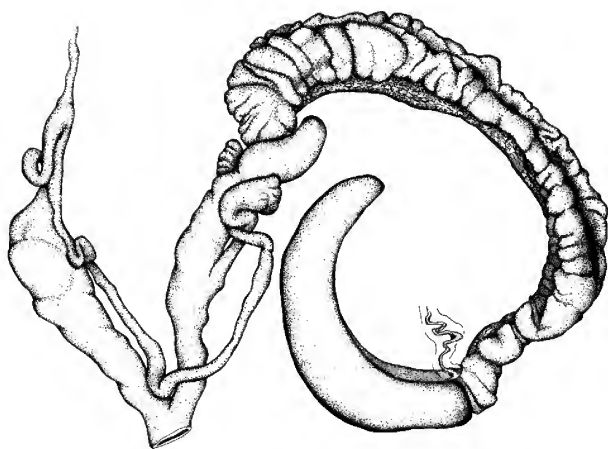


Figure 50. Genitalia of *Amplirhagada tricenaria* n.sp., paratype AMS C463757 (22 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

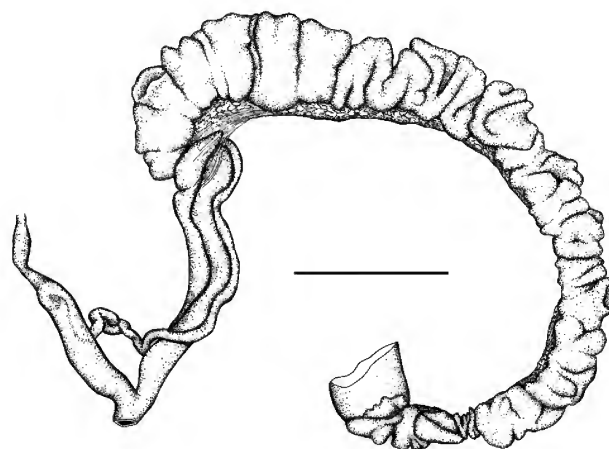


Figure 51. Genitalia of *Amplirhagada regia* n.sp., paratype WAM S36647 (9 August; scale 10 mm). Compare with Fig. 3 for labelling of structures.

smooth longitudinal pilasters. Spermathecal duct moderately thick, internally with smooth longitudinal pilasters. Spermathecal head globular to elongately inflated, connected with oviduct by connective tissue, internally smooth, with thin wall. Free oviduct comprising less than half of anterior part of oviduct, more or less straight. Spermooviduct longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermooviduct.

Radular morphology (Fig. 49F–G). Rectangular. Tooth formula C+15–17+3+18–23. In average with 152 ± 3.0 rows of teeth, 28.1 ± 0.8 rows per mm ($n = 2$). Central teeth with sharply pointed, ovate mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed, ovate mesocones, length equal to base of tooth; ectocones small, endocones vestigial. Marginal teeth with triangular mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. This species has a very distinctive colour, similar only to *A. andersonensis*, which differs by smaller shell size, less globose shell shape, higher position of peripheral angulation. Rather flattened diameter of whorls and very broadly conical shape of shell are diagnostic. Material of the present species has been labelled as “*Amplirhagada* sp. 30” by Solem.

Amplirhagada regia n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, central section of Boongaree Island, $15^{\circ}04'15''\text{S}$ $125^{\circ}11'14''\text{E}$; KIS 1–30. Dry vine thicket on west facing sandstone scree below escarpment, under rocks (leg. M. Shea, 9.8.2007).

Type material. Holotype WAM S34615 (Pl. 1.21). Paratypes AMS C463705 (4 preserved specimens, as holotype), WAM S36647 (3 preserved specimens, as holotype), WAM S36449 (6 preserved specimens, $15^{\circ}04'00''\text{S}$ $125^{\circ}11'11''\text{E}$), AMS C463704 (6 shells, $15^{\circ}04'31''\text{S}$ $125^{\circ}11'07''\text{E}$), WAM S36480 (12 shells, $15^{\circ}04'31''\text{S}$ $125^{\circ}11'07''\text{E}$).

Additional, non-type material. WAM S36479, WAM S36481–5, WAM S36648 (Boongaree Island).

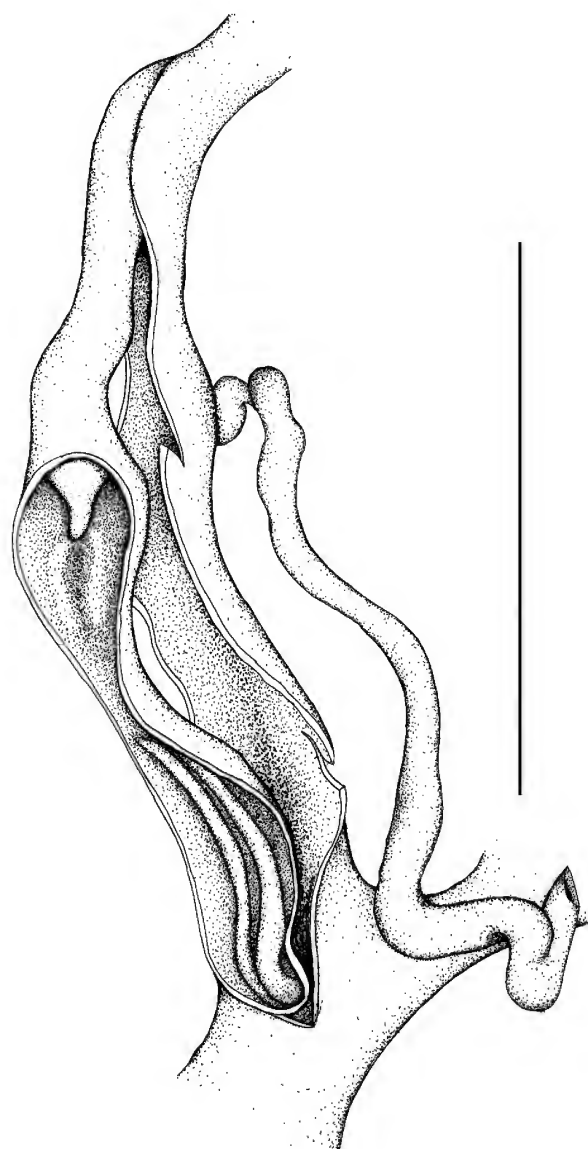


Figure 52. Interior of penial chamber of *Amplirhagada regia* n.sp., paratype WAM S36647 (9 August; scale 5 mm). Compare with Fig. 4 for labelling of structures.

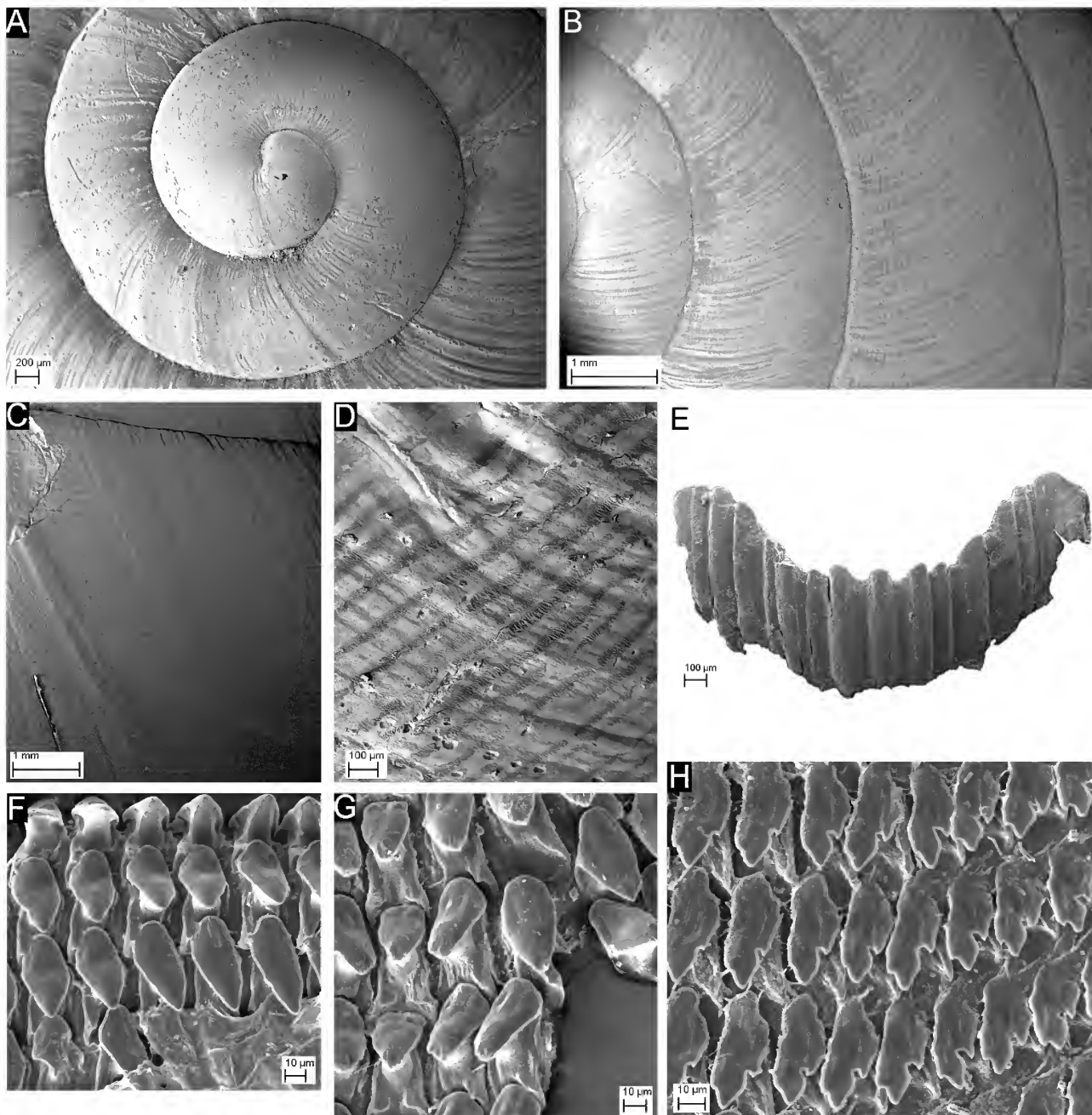


Figure 53. SEM photographs of *Amplirhagada regia* n.sp. (A–D) Shell, paratype AMS C463704: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second to fourth whorl viewed from above (scale 1 mm); (C) surface of last whorl (scale 1 mm); (D) close-up showing axial growth lines on last whorl (Scale 100 µm). (E) Jaw, paratype WAM S36647 (scale 100 µm). (E–G) Radula, paratype WAM S36647: (E) close-up of lateral teeth (scale 10 µm); (F) close-up of central and inner lateral teeth (scale 10 µm); (G) close-up of middle marginal teeth (scale 10 µm).

Etymology. From *regia* (Latin = royal), referring to fact that this species is among the largest of the genus.

Sealing strategy. Free sealer.

Shell (Fig. 53A–D, Pl. 1.21). Globose with medium high to high spire; solid to thick. Periphery angulated; upper sector of whorls rather flattened, basal sector rounded. Umbilicus forming chink or narrowly winding opening, 60–100 percent concealed by columellar reflection. Background colour uniform, creamish horn; outer lip purple; inner lip pale purple. Protoconch c. 2.2 mm in diameter, comprising 1.5

whorls, sculpture almost smooth. Teleoconch smooth except for faint axial growth lines. Angle of aperture 45; outer lip simple rounded; moderate; slightly expanded; not reflected, or slightly reflected; basal node of lip present; weak; palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity deep, extending one whorl. Pigmentation on mantle comprising brownish grey spots. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 51–52). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens

forms simple loop before entering penis. Penial retractor muscle shorter than or equal to penis length. Penial sheath evenly thin. Penial verge short ($< \frac{1}{8}$ penial chamber), slender to spatulate, with pointed tip. Penial wall pustules absent. Main stimulatory pilaster absent. Two longitudinal pilasters present at basal portion of penial chamber, two additional weakly developed pilasters visible at apical portion. Vas deferens entering penial sheath in upper third. Vagina short to moderately long, tubular. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct moderately wide, internally with smooth longitudinal pilasters. Spermathecal head globular to elongately inflated, connected with oviduct by connective tissue, internally entirely smooth, with delicate wall. Free oviduct comprising about half of anterior part of oviduct, more or less straight. Spermoviduct of same length as anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 53F–H). Rectangular. Tooth formula C+20+3+20. In average with 147 ± 2.5 rows of teeth, 29.6 ± 1.7 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones and endocones vestigial. Marginal teeth with elongate mesocones; ectocones shorter and narrower than mesocones; endocones greatly reduced in size.

Comparative remarks. Diagnostic features are the broadly conical to dome-shaped shell, smooth inner penial wall with lack of pustulation and main pilaster.

Amplirhagada boongarensis n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Boongaree Island, central section, $15^{\circ}04'36''\text{S}$ $125^{\circ}11'12''\text{E}$; KIS 1-28. Rainforest on north facing sandstone scree below escarpment, under rocks (leg. M. Shea, 8.8.2007).

Type material. Holotype WAM S34616 (Pl. 1.22). Paratypes WAM S36655

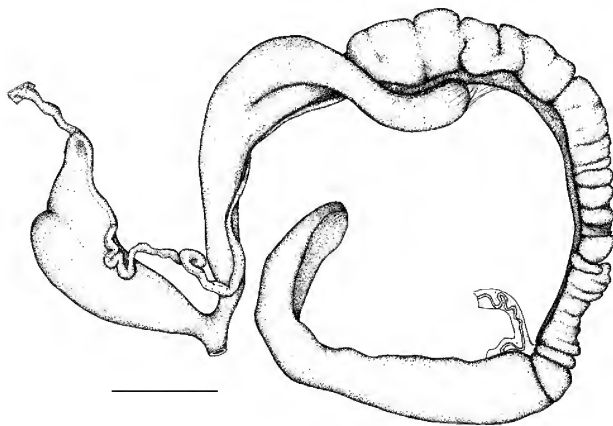


Figure 54. Genitalia of *Amplirhagada boongarensis* n.sp., paratype WAM S36655 (8 August, scale 10 mm). Compare with Fig. 3 for labelling of structures.

(3 preserved specimens, as holotype), AMS C463707 (8 shells, $15^{\circ}04'31''\text{S}$ $125^{\circ}11'07''\text{E}$), WAM S36455 (12 shells, $15^{\circ}04'31''\text{S}$ $125^{\circ}11'07''\text{E}$), WAM S36456 (15 shells, $15^{\circ}04'31''\text{S}$ $125^{\circ}11'07''\text{E}$), AMS C463706 (6 shells, $15^{\circ}04'16''\text{S}$ $125^{\circ}10'47''\text{E}$), WAM S36458 (8 shells, $15^{\circ}04'16''\text{S}$ $125^{\circ}10'47''\text{E}$), WAM S36656 (3 preserved specimens, $15^{\circ}04'09''\text{S}$ $125^{\circ}10'49''\text{E}$).

Additional, non-type material. WAM S36457, WAM S36459–60 (Boongaree Island).

Etymology. In reference to Boongaree Island, where this species occurs.

Shell (Fig. 56A–D, Pl. 1.22). Semi-globose, with rather high spire; solid. Periphery slightly to clearly angulate; upper sector slightly shouldered, basal sector rounded. Umbilicus forming chink or narrowly winding opening, 50–100 percent concealed by columellar reflection. Background colour light brown; sub-sutural and mid-whorl bands may be absent; if present, bands are diffuse to well marked, dark reddish brown, thin to moderately broad, most conspicuous on last whorl; bands may blend into each other and covering entire surface of tip of the shell with purplish brown colour; ventral colour horn; outer lip colour same as shell; inner lip colour blends from reddish brown near parietal wall of shell into horn in outer sections. Protoconch c. 2.3 mm in diameter, comprising 2 whorls, with fine, indistinct axial lirae. Teleoconch with fine axial lirae, rounded in cross-section, spacing regular, spaces equal to thickness of elements, evenly distributed across shell surface, reduced underneath suture. Angle of aperture 30° ; outer lip rounded to slightly angulate, with moderate to thick parietal notch at lower margin, slightly expanded, not or slightly reflected, basal node of lip present, palatal node absent.

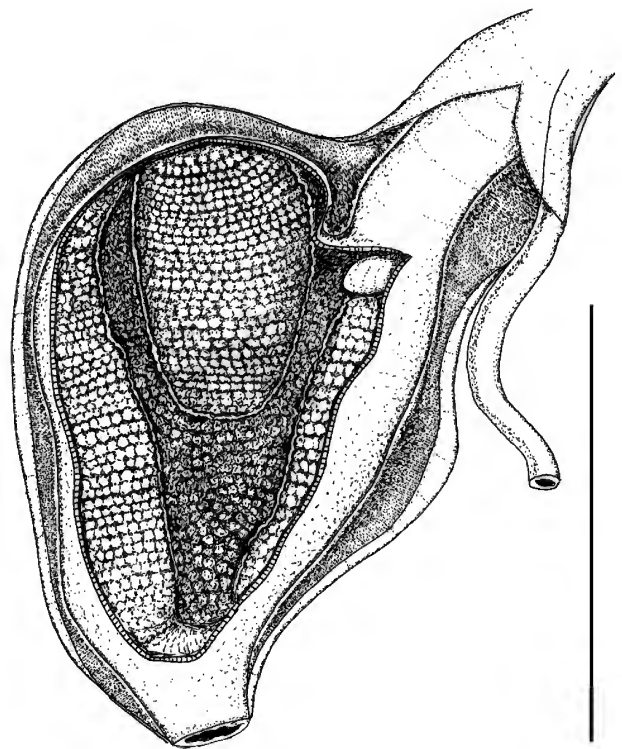


Figure 55. Interior of penial chamber of *Amplirhagada boongarensis* n.sp., paratype WAM S36655 (8 August, scale 5 mm) (drawing by F.K.). Compare with Fig. 4 for labelling of structures.

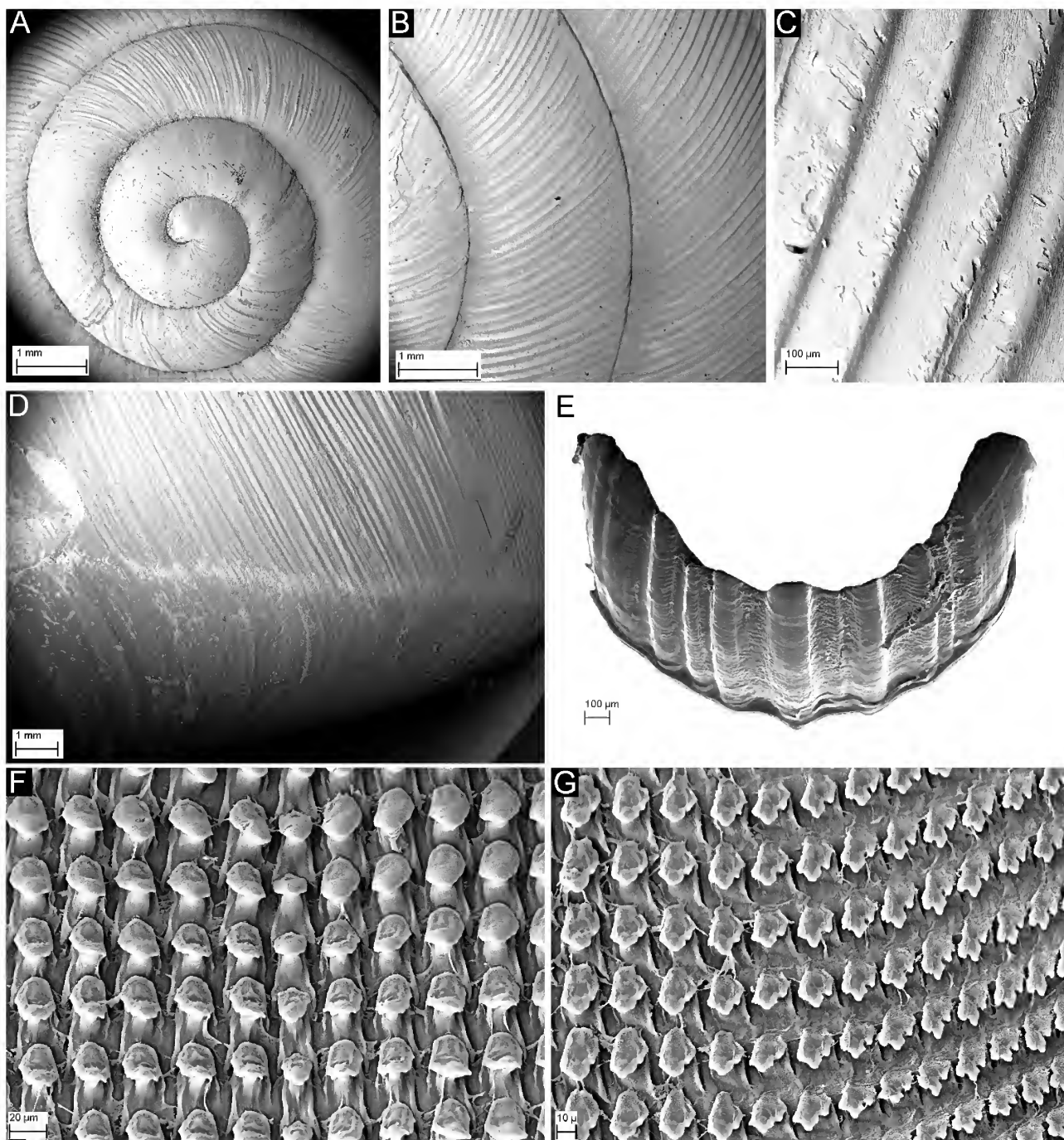


Figure 56. SEM photographs of *Amplirhagada boongareensis* n.sp. (A–D) Shell, paratype AMS C463706: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second and third whorl viewed from above (scale 1 mm); (C) close-up showing axial sculpture on last whorl (scale 100 µm); (D) close-up showing axial periphery of last whorl (Scale 1 mm). (E) Jaw, paratype WAM S36655 (scale 100 µm). (E–G) Radula, paratype WAM S36655: (E) central and inner lateral teeth (scale 20 µm); (F) outer lateral and inner marginal teeth (scale 10 µm); (G) close-up of inner and middle marginal teeth (scale 10 µm).

Pallial morphology. Pallial cavity deep, extending one whorl; mantle pigmentation mottled, dark grey. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 54–55). Penis straight to curved, more or less of same length as anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle shorter than penis. Penial verge very short (barely visible), spatulate, with pointed tip. Penial wall pustules of average size, dense, randomly arranged on

entire length of inner penial wall. Main stimulatory pilaster well-differentiated; large, cone-shaped, covered by smooth, flattened pustules arranged in horizontal rows, comprising apical to median portion of penial chamber. Two additional pilasters comprise entire length of penial chamber, supporting undifferentiated pustulation. Vas deferens entering penial sheath in upper third. Vagina moderately wide, tubular; inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct of medium width, internally with smooth longitudinal pilasters. Spermathecal head elongately inflated,

connected with oviduct by connective tissue, internally entirely smooth, with delicate wall. Free oviduct comprising more than half of anterior part of oviduct, zig-zag-folded underneath entrance to spermoviduct. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 56F–G). Rectangular. Tooth formula C+16+3+20. With 165 rows of teeth, 19.9 rows per mm ($n = 1$). Central teeth with sharply pointed, triangular mesocones, shorter than base of teeth; ectocones vestigial. Lateral teeth with sharply pointed, triangular to ovate mesocones; ectocones and endocones vestigial. Marginal teeth with triangular mesocones; ectocones smaller and narrower than mesocones; endocones smaller than ectocones.

Comparative remarks. His report that it also occurs on the opposite mainland requires confirmation. The bee-hive shape of the shell and its dark purplish brown colour are diagnostic. *Amplirhagada regia* from Boongaree Island also differs by absence of penial wall pustules or main pilaster. This species was referred to as “*Amplirhagada* sp. 27” by Solem (1991).

Amplirhagada gibsoni n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Boongaree Island, central section, 15°04'15"S 125°11'14"E; KIS 1-30. Dry vine thicket on west facing sandstone scree below escarpment, under rocks (leg. M. Shea, 09 August 2007).

Type material. Holotype WAM S34617 (Pl. 2.1). Paratypes AMS C463709 (1 preserved specimen, as holotype), WAM S36650 (2 preserved specimens, as holotype), WAM S36468 (6 shells, 15°04'15"S 125°11'14"E), AMS C463708 (4 shells, 15°04'36"S 125°11'18"E), WAM S36469 (10 shells, 15°04'36"S 125°11'18"E), WAM S36651 (1 preserved specimen, 15°04'36"S 125°11'18"E).

Etymology. Named in honour of Lesley Gibson, Western Australian Department of Environment and Conservation, in recognition of her support for my work.

Sealing strategy. Free sealer.

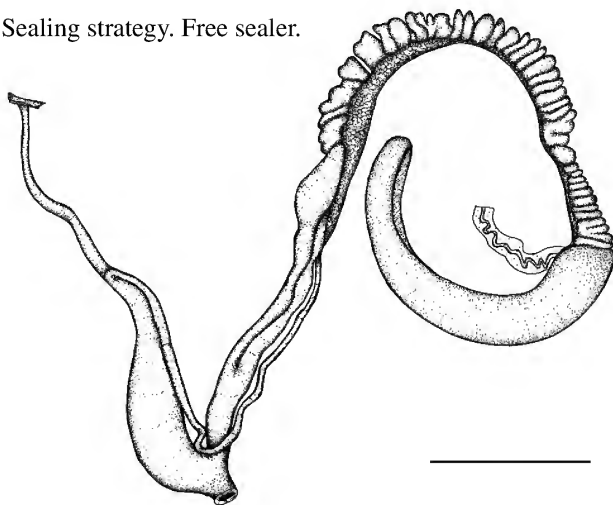


Figure 57. Genitalia of *Amplirhagada gibsoni* n.sp., paratype AMS C463709 (8 August, scale 10 mm). Compare with Fig. 3 for labelling of structures.

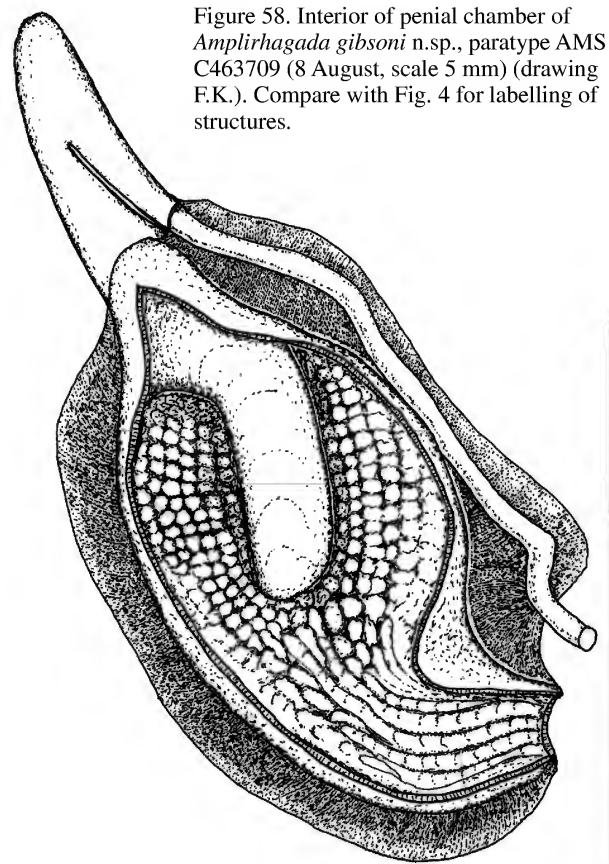


Figure 58. Interior of penial chamber of *Amplirhagada gibsoni* n.sp., paratype AMS C463709 (8 August, scale 5 mm) (drawing F.K.). Compare with Fig. 4 for labelling of structures.

Shell (Fig. 59A–C, Pl. 2.1–2). Semi-globose to conical with medium high spire; thin (translucent) to solid. Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, forming a narrowly winding chink, about 90 percent concealed by columellar reflection. Background colour light brownish to horn; uniform. Outer lip colour same as shell, inner lip colour white. Protoconch c. 2.2 mm in diameter, comprising 2 whorls, with fine and distinct axial lirae. Teleoconch with fine axial lirae, rounded in cross-section, regularly spaced, spaces equal to thickness of lirae, evenly distributed across shell surface, reduced underneath suture; across whorls of shell. Angle of aperture 30°; outer lip rounded, sharp to moderately thick, slightly expanded, slightly reflected; basal node absent or very weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity deep, extending one whorl; mantle pigmentation mottled, black. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 57–58). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle as long as penis. Penial sheath evenly thick. Penial verge very long (c. 1/3 penial chamber), broad, with pointed tip. Penial wall pustules of normal size, randomly and densely arranged over entire length of inner penial wall. At base of penial chamber fused rows of pustules form 3–4 smooth longitudinal pilasters. Main stimulatory pilaster absent. Vas deferens entering penial sheath in upper third. Vagina

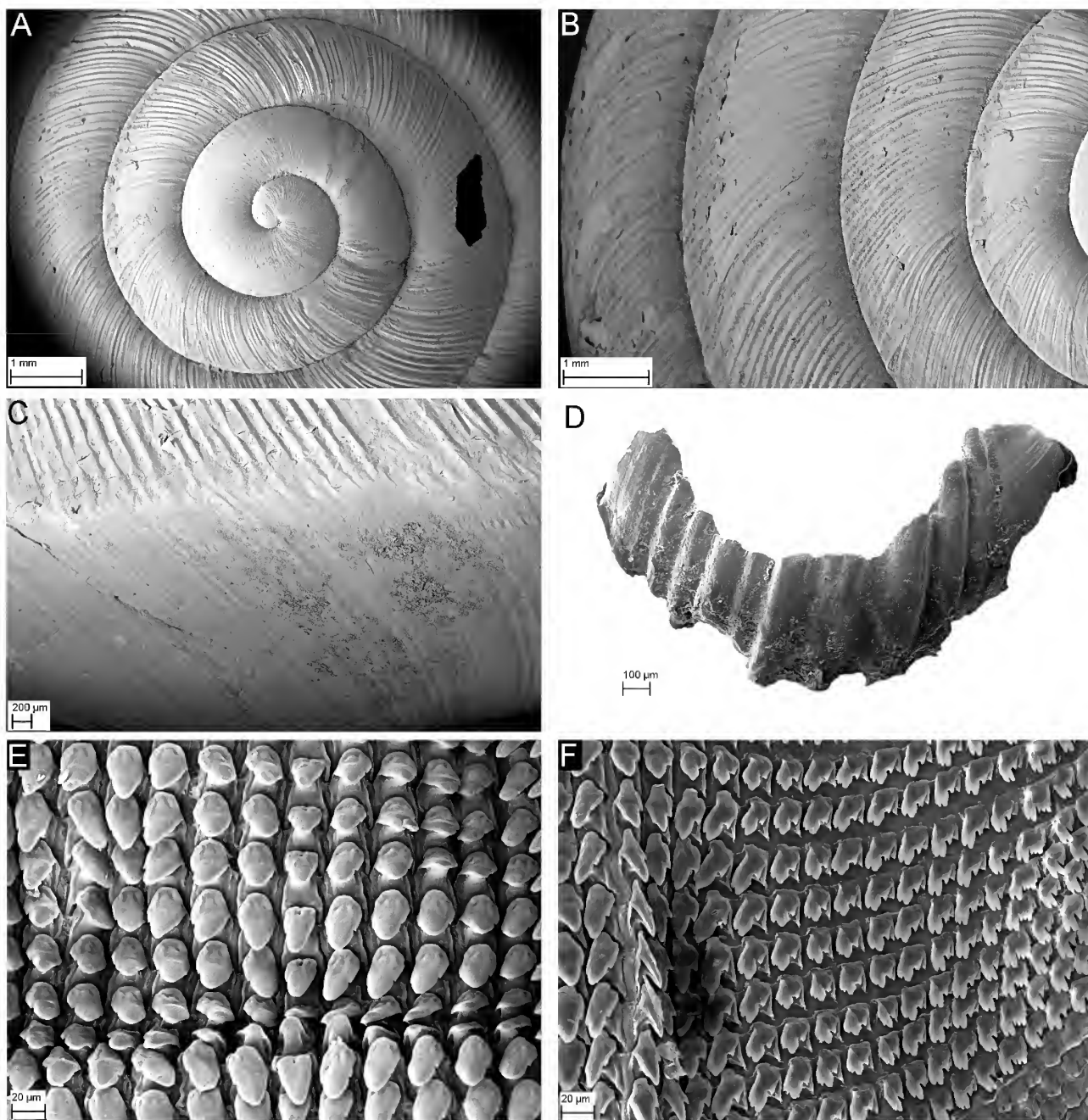


Figure 59. SEM photographs of *Amplirhagada gibsoni* n.sp. (A–D) Shell, paratype AMS C463708: (A) apical whorl viewed from above (scale 1 mm); (B) sculpture on second to fourth whorl viewed from above (scale 1 mm); (C) close-up showing axial periphery of last whorl (Scale 200 µm); (D) Jaw, paratype AMS C463709 (scale 100 µm). (E–F) Radula, paratype AMS C463709: (E) central and inner lateral teeth (scale 20 µm); (F) outer lateral and inner marginal teeth (scale 20 µm).

tubular; inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct moderately wide, internally with smooth longitudinal pilasters. Spermathecal head elongately inflated, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising about half of anterior part of oviduct, more or less straight. Spermooviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 59E–F). Rectangular. Only a partial fragment was studied with 32 rows per mm. Central teeth with sharply pointed, triangular mesocones, shorter

than base of teeth. Central ectocones reduced. Lateral teeth with sharply pointed, triangular to ovate mesocones. Lateral ectocones tiny, endocones reduced. Marginals with triangular mesocones. Marginal ectocones smaller and narrower than mesocones, endocones smaller than ectocones.

Comparative remarks. Shell smaller in size, not as elevated in shape as in congeners from the same island. Large pustules and very large penial verge are also diagnostic. A lateral pocket off the penial chamber as mentioned by Solem (1991) was not observed. This species was referred to as “*Amplirhagada* sp. 32” by Solem (1991).

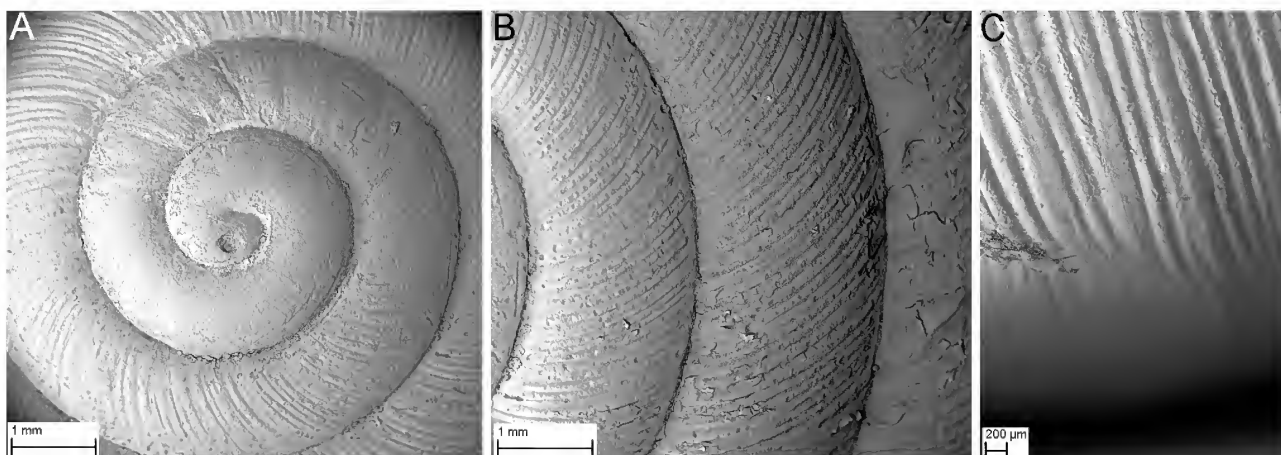


Figure 60. SEM photographs of the shell of *Amplirhagada* sp. AMS C463710: (A) apical whorl viewed from above (scale 1 mm); (B) sculpture on second and third whorl viewed from above (scale 1 mm); (C) close-up showing axial sculpture and keel on periphery of last whorl (scale 200 µm).

Amplirhagada sp.

Material studied. WAM S36953 (Pl. 2.3), AMS C463710 (shells, central section of Boongaree Island, 15°04'00"S 125°11'11"E), WAM S36740 (2 shells, 15°04'36"S 125°11'18"E).

Shell (Fig. 60A–C, Pl. 2.3). Semi-globose with medium to high spire; solid. Whorls evenly rounded in cross-section. Umbilicus completely concealed by columellar reflection. Background colour brownish horn (shells worn); with well defined, chestnut brown, moderately broad sub-sutural and mid-whorl bands, most conspicuous on last whorl(s); ventral colour horn; outer lip colour lighter than shell. Protoconch c. 2.2 mm in diameter, comprising 1.7 whorls, almost smooth. Teleoconch with fine axial lirae, rounded in cross-section, regularly spaced, spaces narrower than thickness of ribs, distributed evenly across shell surface, reduced underneath suture. Angle of aperture 30°, outer lip rounded, moderately thick, expanded, slightly reflected, basal node of lip weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Comparative remarks. Of this species, only five dry shells from Boongaree island are available. Although these shells differ clearly from those of all other species on this island, the limited data available are considered insufficient to justify formal description of this species. *Amplirhagada regia* and *A. boongareensis* have much larger and more dome-shaped shells. *Amplirhagada gibsoni* differs by having a flatter shell. Adult shells of the present species are generally higher than 14.7 mm, those of *A. gibsoni* are lower.

Amplirhagada yorkensis n.sp.

Type locality (Fig. 1). Western Australia, northwestern Kimberley, Bonaparte Archipelago, York Sound, Coronation Island, southern section, 15°01'52"S 124°56'56"E; KIS-3–085. Vine thicket on upper slopes of a volcanic hill behind mangroves, under rocks (leg. V. Kessner, 30 May 2008).

Type material. Holotype WAM S34619 (Pl. 2.4). Paratypes AMS C463711 (24 preserved specimens), WAM S36979 (42 preserved specimens).

Additional, non-type material. WAM S41477, FMNH 219151 (12 preserved specimens, Port Nelson, 5 km N of Mt. Knight, c. 3 km E of

Careening Bay; 15°06'41"S 125°01'53"E; KC-040), WAM S37376–8, WAM S36980–6, WAM S37394–404, AMS C463712–4 (Coronation Island, southern section).

Etymology. In reference to York Sound, where this species occurs on islands and likely adjacent mainland.

Sealing strategy. Free sealer.

Shell (Fig. 62A–B, Pl. 2.4–5). Broadly conical to almost flat with low spire; thin (translucent). Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, narrowly winding, 30–90 percent concealed by columellar reflection. Background and ventral colour brownish horn; sub-sutural band absent; mid-whorl band absent or diffuse, light yellowish brown, thin, generally not very pronounced, only visible on last whorl(s); outer lip colour same as shell; inner lip translucent, whitish. Protoconch c. 2.7 mm in diameter, comprising 2 whorls, with fine, indistinct axial lirae. Teleoconch smooth except of axial growth lines. Angle of aperture 30°; outer lip rounded, sharp, expanded to largely expanded, reflected; basal and palatal node absent. Parietal wall of inner lip inconspicuous.

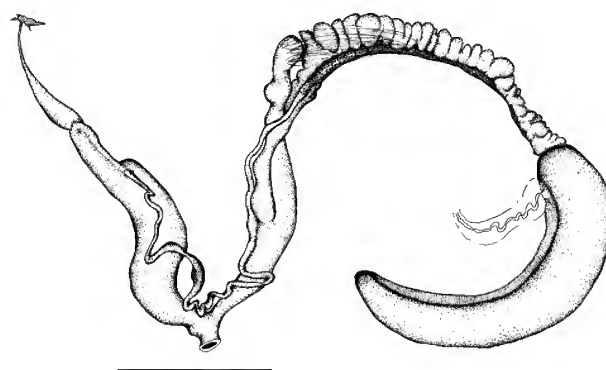


Figure 61. Genitalia of *Amplirhagada yorkensis* n.sp., paratype AMS C463711 (30 May, scale 5 mm). Compare with Fig. 3 for labelling of structures.

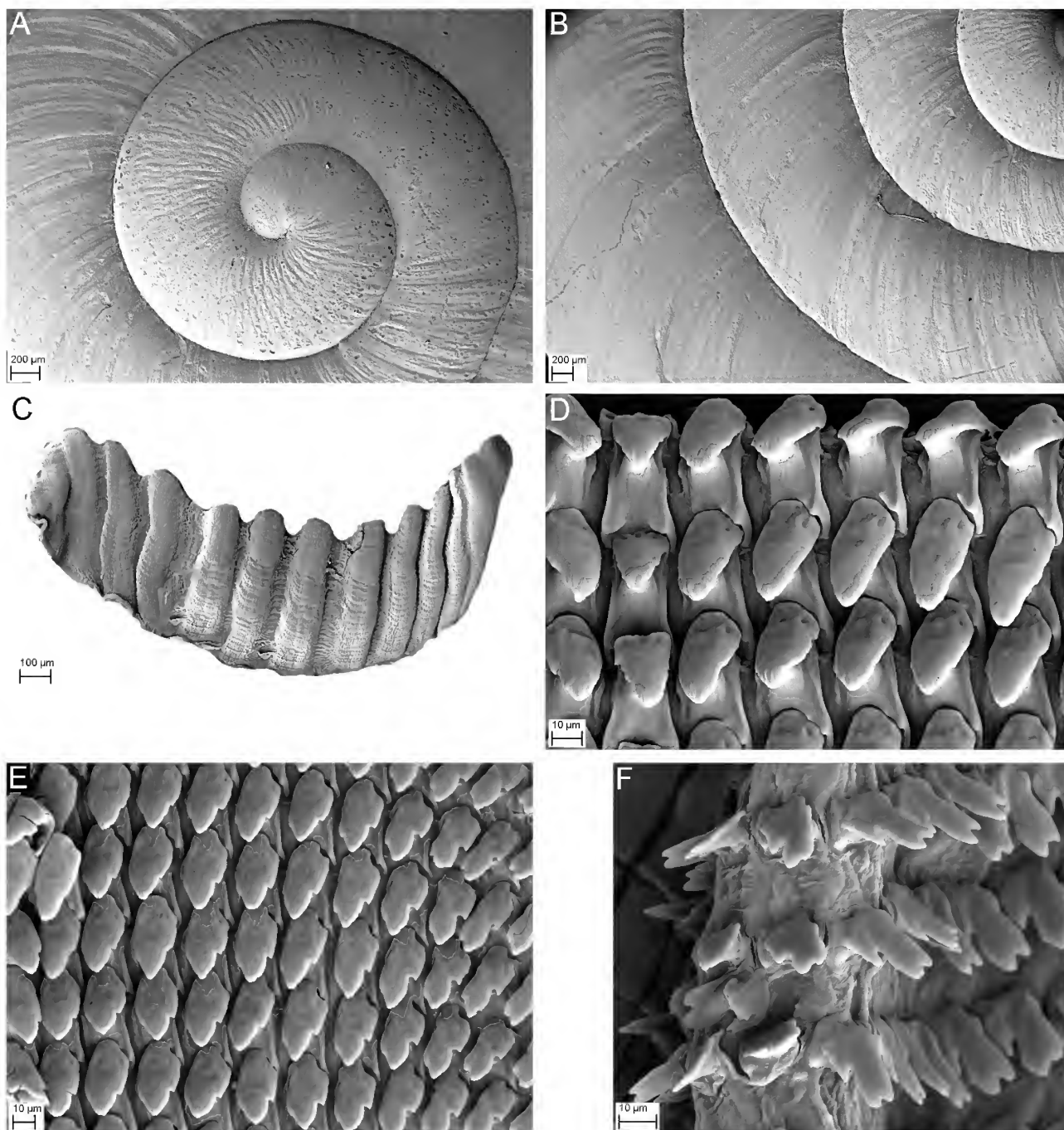


Figure 62. SEM photographs of shell, jaw and radula of *Amplirhagada yorkensis* n.sp., paratype AMS C463711: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second to fourth whorl viewed from above (scale 200 µm); (C) jaw (scale 100 µm); (D) close-up of central and inner lateral teeth (scale 10 µm); (E) outer lateral and inner marginal teeth (scale 10 µm); (F) close-up of middle marginal teeth (scale 10 µm).

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl; mantle pigmentation spotted, black. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 61, 63). Penis curved to sharply bent, more or less of same length as anterior part of oviduct. Vas deferens coils once before entering penis. Penial retractor muscle very short, stubby. Penial verge very short, slender to spatulate, with pointed tip. Penial wall pustules of average size, arranged in rows over entire length of inner penial wall. Main stimulatory pilaster well-differentiated, large,

cone-shaped, sculptured by horizontal ridges that support little hooks, comprising about $\frac{3}{4}$ of length of penial chamber. Vas deferens entering penial sheath in upper third. Vagina moderately wide, posteriorly inflated; inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct wide, internally with smooth longitudinal pilasters. Spermathecal head pyriform, connected with oviduct by connective tissue, internally smooth with thin wall. Free oviduct comprising about half of anterior part of oviduct, more or less straight. Spermooviduct longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermooviduct.

Amplirhagada buffonensis n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Buffon Island, 14°54'40"S 124°44'13"E; KC-086 (leg. V. Kessner & A. Longbottom, 23 July 1988).

Type material. Holotype WAM S34620 (Pl. 2.6). Paratypes AMS C463758 (2 preserved specimens, as holotype), FMNH 219337 (8 preserved specimens, same as holotype), WAM S41482 (5 preserved specimens, as holotype), FMNH 219365 (8 preserved specimens, unnamed islet W of Buffon Island, 14°54'29"S 124°43'28"E), AMS C463759 (2 preserved specimens, as FMNH 219365), WAM S41483 (5 preserved specimens, same as FMNH 219365).

Additional, non-type material. FMNH 219374, WAM S41484 (preserved specimens, unnamed island S of Buffon Island, 14°57'07"S 124°44'50"E).

Etymology. In reference to Buffon Island, where this species occurs.

Shell (Fig. 65A–C, Pl. 2.6). Broadly conical to almost flat with low spire; thin (translucent). Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, forming narrowly winding opening, 10–20 percent concealed by columellar reflection. Background and ventral colour greyish horn to slightly beige, whitish cracks and growth lines visible; sub-sutural band absent; mid-whorl band absent or diffuse, yellowish brown, thin, only visible on last whorl; outer and inner lip whitish. Protoconch c. 2.7 mm in diameter, comprising 1.7 whorls, smooth. Teleoconch with faint axial growth lines only. Angle of aperture 45°, outer lip rounded, sharp to moderately thick, expanded, slightly reflected, basal node of lip absent to weak, palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl; mantle pigmentation comprises densely packed black spots or patches. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 64, 66). Penis straight to slightly curved, more or less of same length as anterior part of oviduct. Vas deferens forms simple loop or coils before

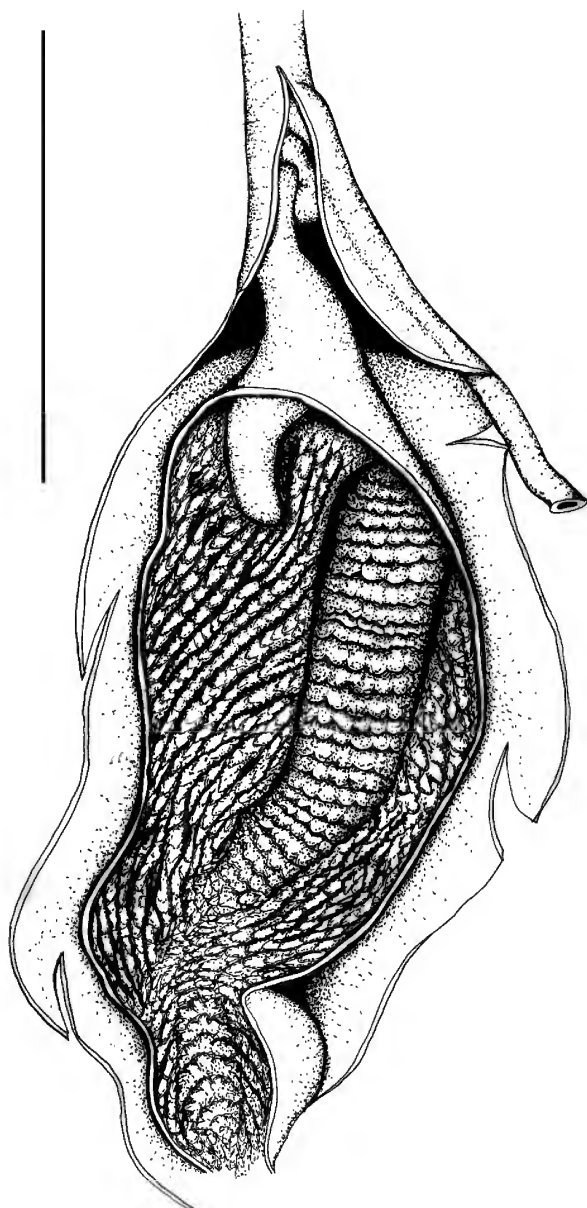


Figure 63. Interior of penial chamber of *Amplirhagada yorkensis* n.sp., paratype AMS C463711 (30 May, scale 3 mm). Compare with Fig. 4 for labelling of structures.

Radular morphology (Fig. 62D–F). Rectangular. Tooth formula C+13–14+3+18. In average with 122 ± 1.5 rows of teeth, 32.4 ± 2.0 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with bluntly pointed, triangular to ovate mesocones, length equal to base of tooth; ectocones and endocones vestigial. Marginal teeth with triangular to elongate mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

Comparative remarks. The shell is low spired with a rounded periphery and light colouration; penis with a comparatively large main pilaster. This species was referred to as “*Amplirhagada* sp. 34” by Solem (1991).

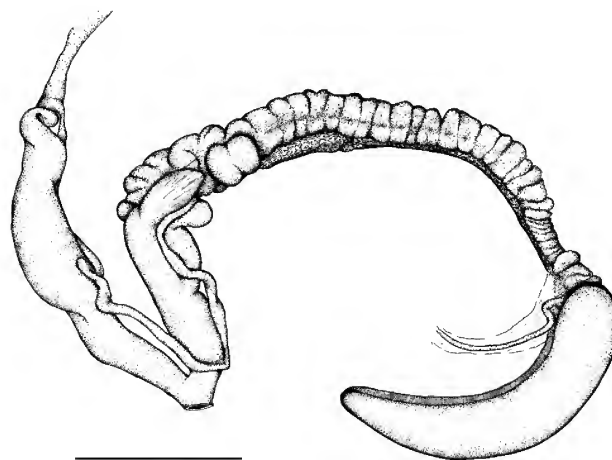


Figure 64. Genitalia of *Amplirhagada buffonensis* n.sp., paratype AMS C463758 (23 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

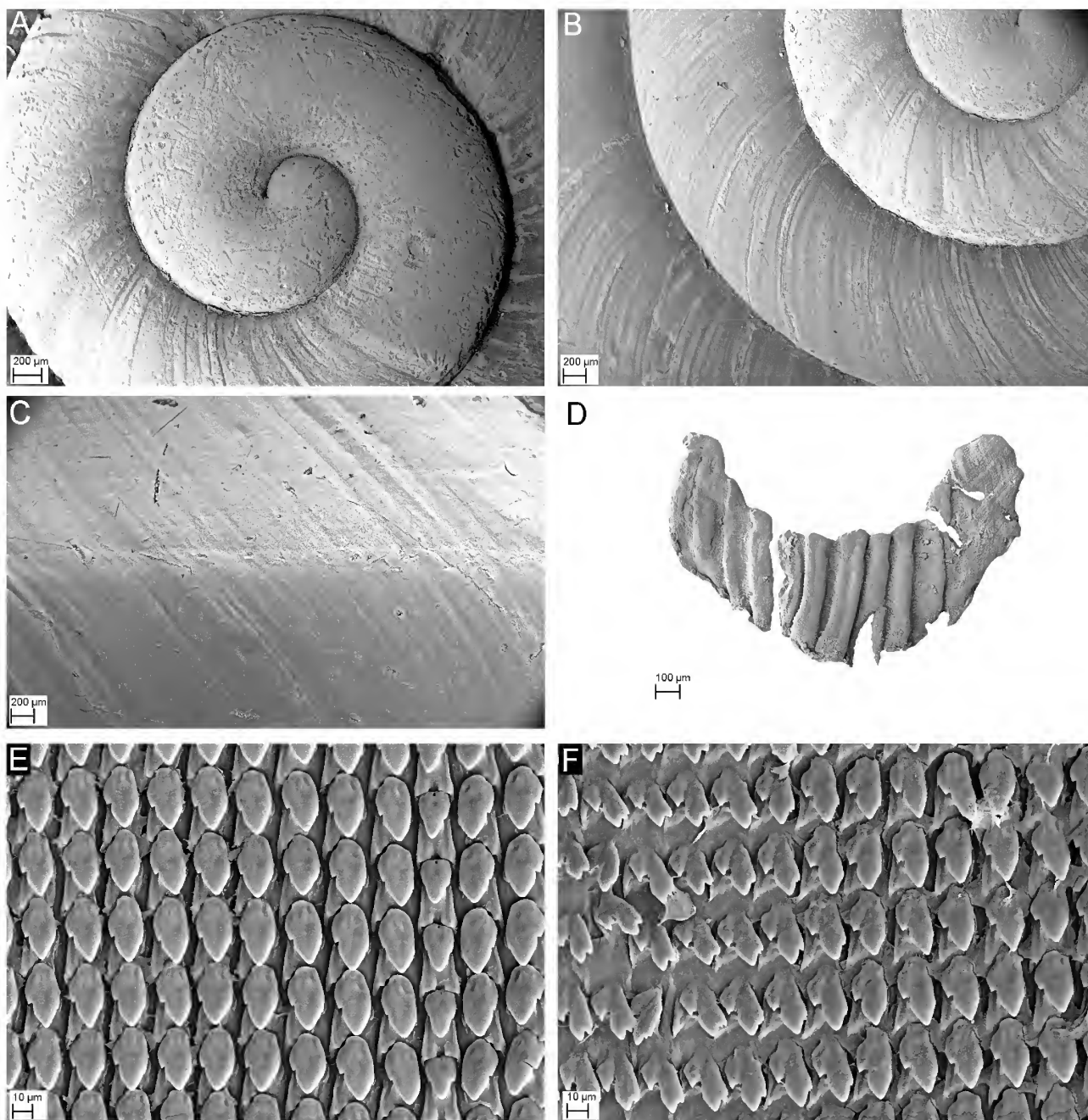


Figure 65. SEM photographs of shell, jaw and radula of *Amplirhagada buffonensis* n.sp., paratype AMS C463759: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on first three whorls viewed from above (scale 200 µm); (C) close-up of periphery of last whorl (scale 200 µm); (D) jaw (scale 100 µm); (E) central and inner lateral teeth (scale 10 µm); (F) outer lateral and inner marginal teeth (scale 10 µm).

entering penis. Penial retractor muscle shorter than penis. Penial verge very short (barely visible), slender to spatulate, with pointed to rounded tip. Penial wall pustules very small, densely arranged in rows on apical to median portion of penial chamber, becoming oblique towards base of penial chamber. Main stimulatory pilaster well-differentiated, large, cone-shaped, sculptured by horizontal ridges that support little hooks, comprising almost entire length of penial chamber. Vas deferens entering penial sheath in upper third of penis. Vagina moderately wide, posteriorly inflated; inner vaginal wall with smooth longitudinal pilasters. Spermatheca of long, clearly extending over base of spermoviduct.

Spermathecal duct rather wide, internally with smooth longitudinal pilasters. Spermathecal head elongately inflated with extended tubular or pyriform tip, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising less than half of anterior part of oviduct, more or less straight. Spermoviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 65E–F). Rectangular. Tooth formula C+14–15+3–4+18–22. In average 153 ± 17.5 rows of teeth, 27.4 ± 0.1 rows per mm ($n = 2$). Central teeth with

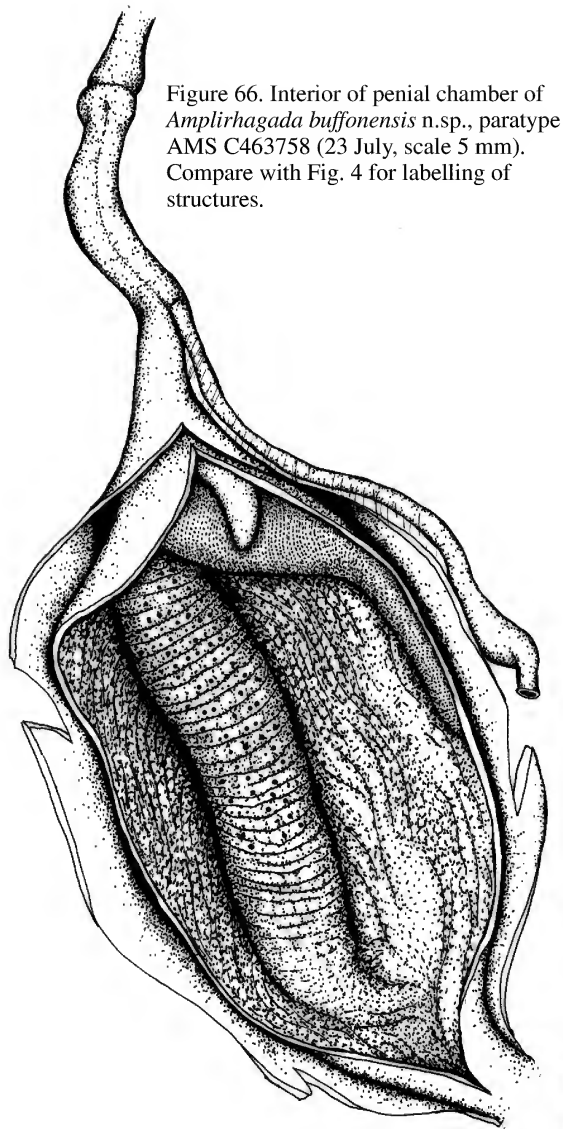


Figure 66. Interior of penial chamber of *Amplirhagada buffonensis* n.sp., paratype AMS C463758 (23 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

bluntly pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular to ovate mesocones, length equal to base of tooth; ectocones well developed, endocones vestigial. Marginal teeth with triangular mesocones; ectocones shorter and narrower than mesocones; endocones reduced in size.

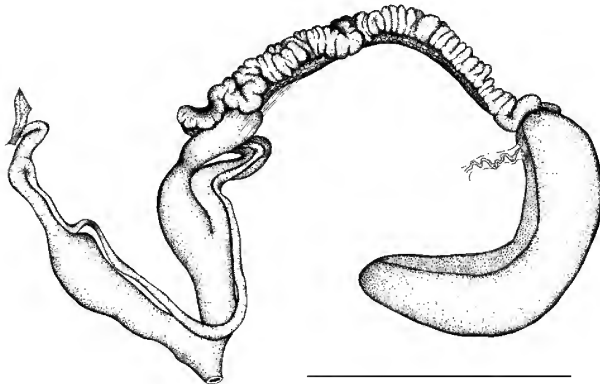


Figure 67. Genitalia of *Amplirhagada uwinsensis* n.sp., paratype AMS C463715 (7 August, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Comparative remarks. It has a low spired shell with reduced banding pattern. Differs from its sister species in the phylogeny, *A. yorkensis*, by angulate periphery, slightly larger shell size (Table 1), and smaller verge. Material of this species has been labelled as “*Amplirhagada* sp. 67” by Solem.

Amplirhagada uwinsensis n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Hanover Bay, Uwins Island, 15°15'32"S 124°46'08"E; KIS-3-106. Vine thicket and large fig trees on upper slopes, piles of sandstone rocks, under large slabs. (leg. V. Kessner, 09 June 2006).

Type material. Holotype WAM S34621 (Pl. 2.7). Paratypes AMS C463715 (15 preserved specimens, as holotype), WAM S36991 (35 preserved specimens, as holotype), AMS C463716 (15 shells, 15°15'25"S 124°48'04"E), WAM S37441 (30 shells, 15°15'25"S 124°48'04"E).

Additional, non-type material. WAM S36987-90, WAM S37440, WAM S37442-4, AMS C463717 (Uwins Island).

Etymology. In reference to Uwins Island, where this species occurs.

Sealing strategy. Free sealer.

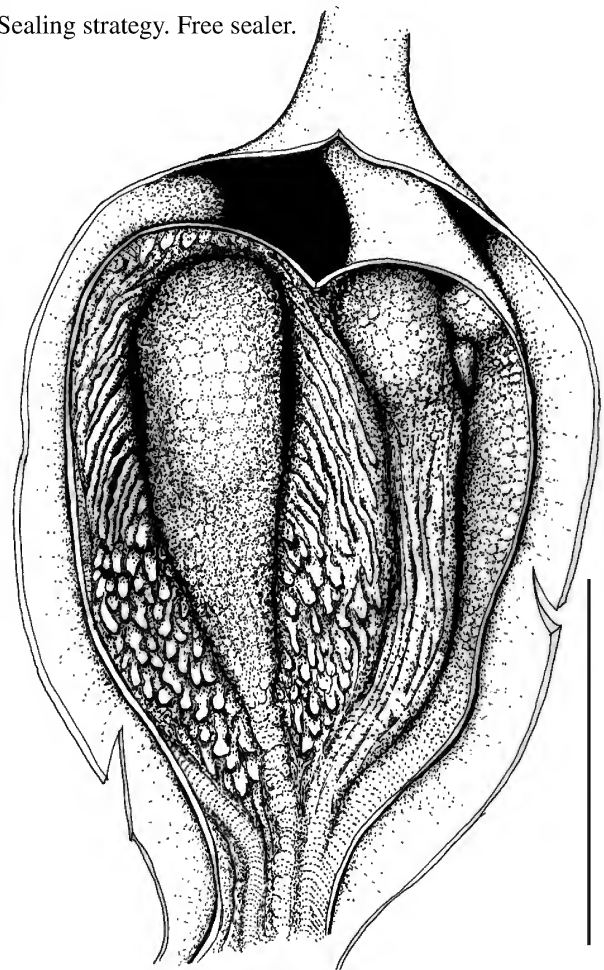


Figure 68. Interior of penial chamber of *Amplirhagada uwinsensis* n.sp., paratype AMS C463715 (7 August, scale 5 mm). Compare with Fig. 4 for labelling of structures.

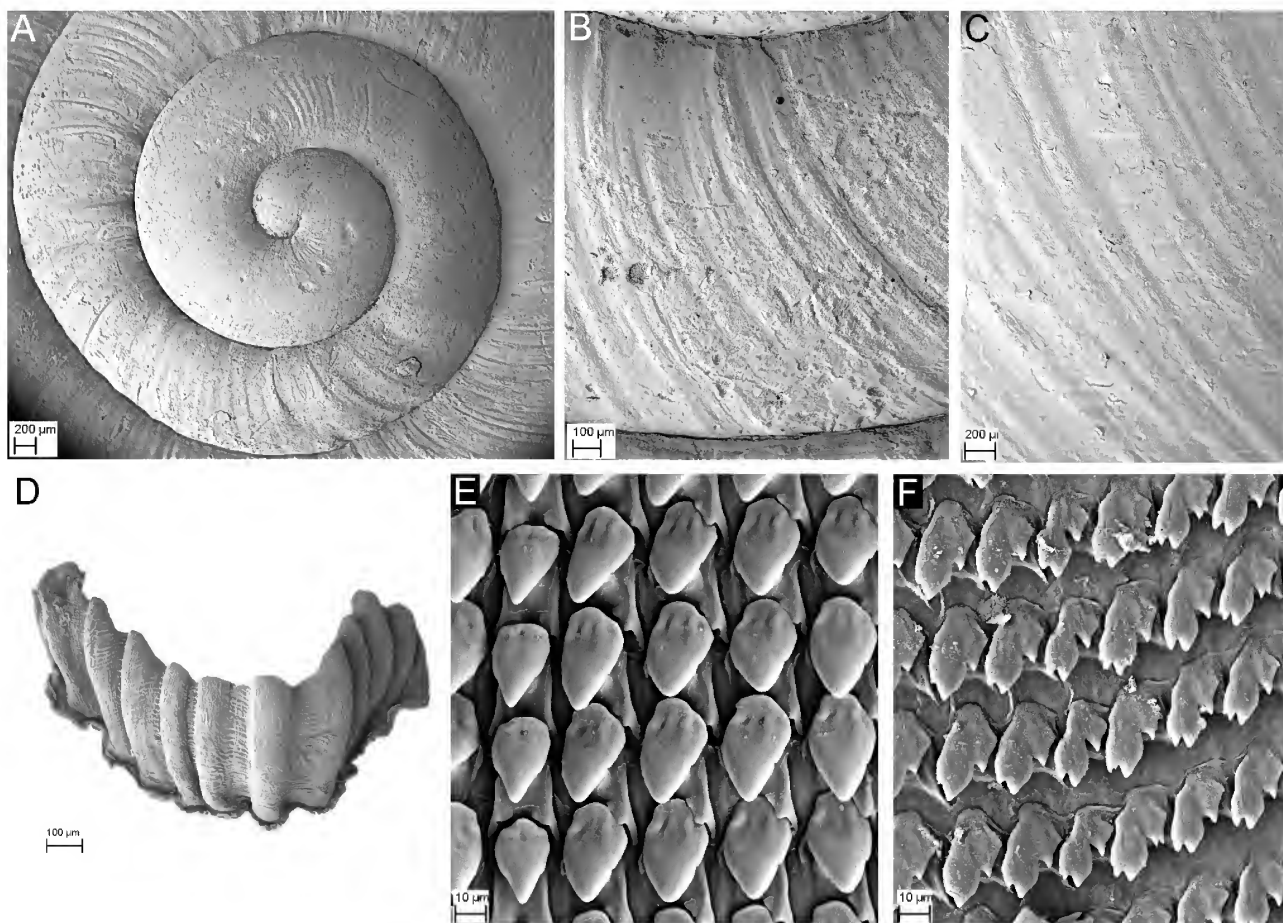


Figure 69. SEM photographs of *Amplirhagada uwinsensis* n.sp. (A–C) Shell, paratype AMS C463716: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture penultimate whorl viewed rectangularly from above (scale 100 µm); (C) close-up of periphery of last whorl (scale 200 µm). (D) Jaw, paratype AMS C463715 (scale 100 µm). (E–F) Radula, paratype AMS C463715: (E) close-up of central and inner lateral teeth (scale 10 µm); (F) close-up of inner to middle marginal teeth (scale 10 µm).

Shell (Fig. 69A–C, Pl. 2.7–9). Semi-globose with medium high spire; solid. Periphery angulate; upper and basal sectors of whorls rounded. Umbilicus completely concealed by columellar reflection. Background colour light reddish brown; sub-sutural band diffuse to well defined, light brown to chestnut brown, varies greatly in thickness and contrast; mid-whorl band diffuse, brownish to chestnut brown, thin, varies greatly in contrast and thickness, visible on last whorl(s) only; bands may blend into each other across whorl surface; ventral colour yellowish-greenish brown to ochre; outer lip colour blending into chestnut brown; inner lip blending into dark ochre to chestnut brown. Protoconch c. 2.7 mm in diameter, comprising 1.7 whorls, with fine, indistinct axial lirae. Teleoconch with marked growth lines, becoming oblique towards base of shell. Angle of aperture 45°; outer lip rounded, slightly expanded, not reflected, basal node of lip weak, palatal node absent. Parietal wall of inner lip absent.

Pallial morphology. Pallial cavity short, extending $\frac{1}{2}$ to $\frac{3}{4}$ whorls; mantle pigmentation consists of indistinctive, sparsely distributed brown spots. Kidney extending about half or more than half of pallial cavity.

Genital morphology (Figs. 67–68). Penis rather straight, more or less of same length as anterior part of oviduct. Vas deferens coils once before entering penis. Penial retractor

muscle very short to stubby. Penial verge very short (barely visible), slender to spatulate, with pointed tip. Penial wall pustules comparatively large, elongated, arranged in rows on median and basal portion of penial chamber, forming densely packed, narrow longitudinal pilasters at apical end of penial chamber. Main stimulatory pilaster well-differentiated, large, cone-shaped, covered with flattened pustules, comprising anterior to median portion of penial chamber. Two additional pilasters are formed that are covered by flattened pustules or smooth narrow ridges. Vas deferens entering penial sheath in upper third. Vagina moderately wide, tubular to posteriorly inflated; inner vaginal wall with weakly developed longitudinal pilasters. Spermathecal duct wide, internally with smooth longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising less than half to about half of anterior part of oviduct, more or less straight. Spermooviduct of same length as anterior part of oviduct or longer. Talon embedded in albumen gland close to anterior end of albumen gland.

Radular morphology (Fig. 69E–F). Rectangular. Tooth formula C+14–16+4+22. In average 149 ± 16.0 rows of teeth, 29.5 ± 1.0 rows per mm ($n = 2$). Central teeth with sharply pointed, triangular mesocones, shorter than base of teeth; ectocones vestigial. Lateral teeth with sharply

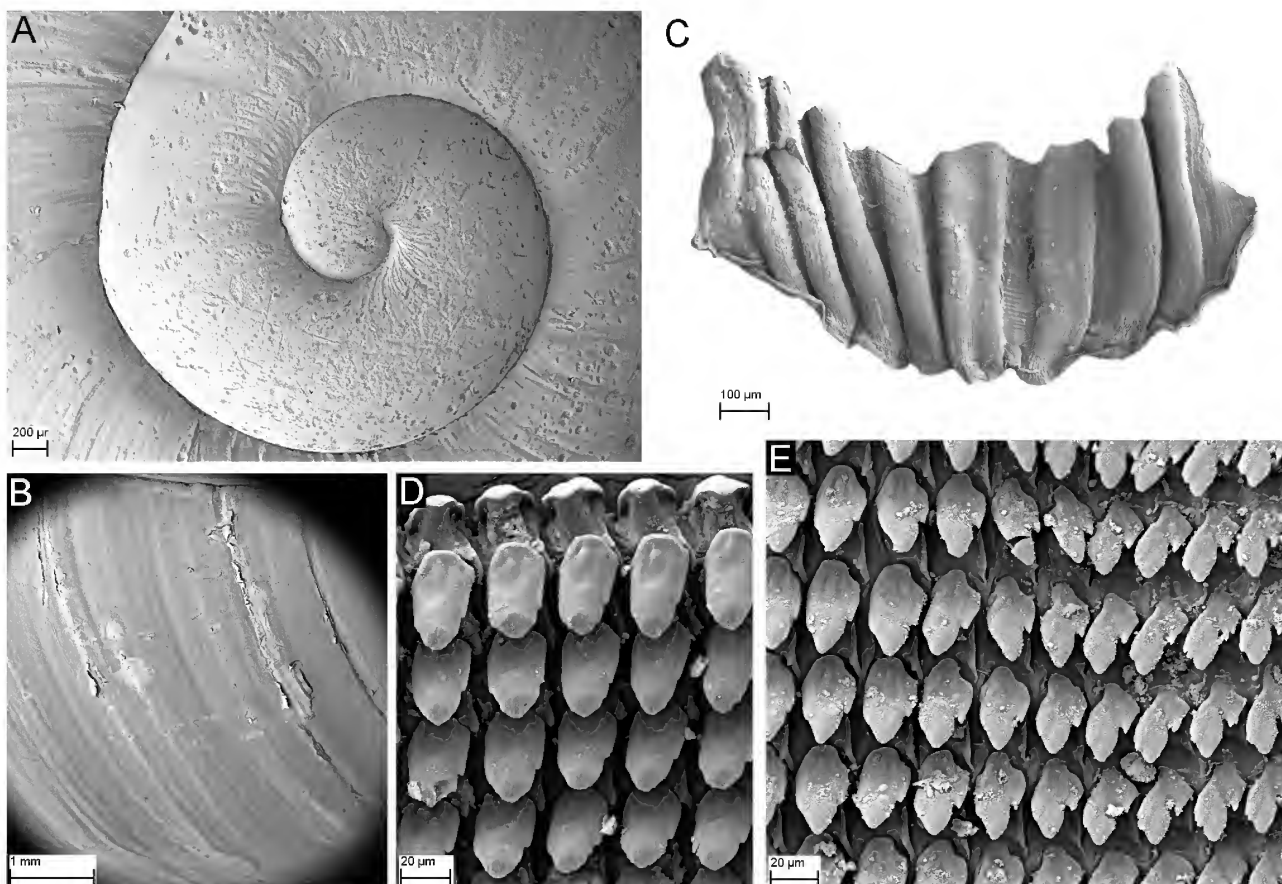


Figure 70. SEM photographs of *Amplirhagada sphaeroidea* n.sp. (A–B) Shell, paratype AMS C463719: (A) apical whorl viewed from above (scale 200 µm); (B) close-up of periphery of last whorl (scale 1 mm); (C) jaw, paratype WAM S37027 (scale 100 µm). (D–E) Radula, paratype WAM S37027: (D) close-up of inner lateral teeth (scale 20 µm); (E) Close-up of outer lateral and inner marginal teeth (scale 20 µm).

pointed, triangular mesocones, length equal to base of teeth; ectocones and endocones vestigial. Marginal teeth with elongate mesocones; ectocones smaller and narrower than mesocones; endocones shorter than ectocones.

Comparative remarks. One of the few species with large, dome-shaped shells. Differs from *A. tricenaria* and *A. regia* by conspicuously dark brown outer lip colour and by huge, cone-shaped main pilaster, presence of additional pilasters and characteristically elongated pustules of inner penial wall.

Amplirhagada sphaeroidea n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Saint George Basin, St. Andrews Island, 15°21'24"S 124°59'46"E; KIS-2–40. Volcanic boulder scree, vine thicket, under rocks (leg. R. Teale, 25 May 2008).

Type material. Holotype WAM S34622 (Pl. 2.10). Paratypes AMS C463718 (2 preserved specimens, same as holotype), WAM S37029 (7 preserved specimens, same as holotype), AMS C463719 (shell, 15°21'34"S 125°00'07"E), WAM S37027 (3 preserved specimens, 15°21'34"S 125°00'07"E), WAM S37411 (1 dry shell, 15°21'34"S 125°00'07"E).

Additional, non-type material. WAM S37028, WAM S37030, WAM S37410, WAM S37412 (St. Andrews Island).

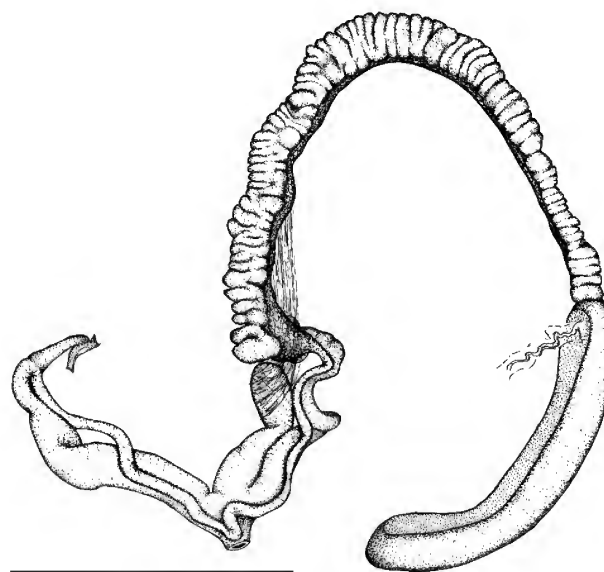


Figure 71. Genitalia of *Amplirhagada sphaeroidea* n.sp., paratype WAM S37027 (24 May, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Etymology. From *sphaerooides* (Greek = globular, spherical), referring to globular shape of shell.

Sealing strategy. Free sealer.

Shell (Fig. 70A–B, Pl. 2.10). Globose to semi-globose, with medium high spire; solid to thick. Periphery angulate; upper sector of whorls rather flattened, basal sector rounded. Umbilicus forming a chink, 90–100 percent concealed by columellar reflection. Background colour blends from horn at base to lightly brownish at top of shell; sub-sutural band absent or diffuse, indistinct, brownish; mid-whorl band absent or diffuse, brownish, thin, indistinct, visible on last whorl(s) only; ventral colour cream; outer lip colour differs from shell, dark brownish-purple; inner lip blends from dark pink outside to horn deeper inside. Protoconch c. 2.4 mm in diameter, comprising 1.7 whorls, smooth. Teleoconch smooth, except of faint growth lines. Angle of aperture 45°; outer lip rounded, thick, slightly expanded to expanded, slightly reflected, basal node of lip weak, palatal node absent. Parietal wall of inner lip absent or inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\pm\frac{3}{4}$ whorl; mantle pigmentation mottled, diffuse dark grey. Kidney extending about half of pallial cavity.

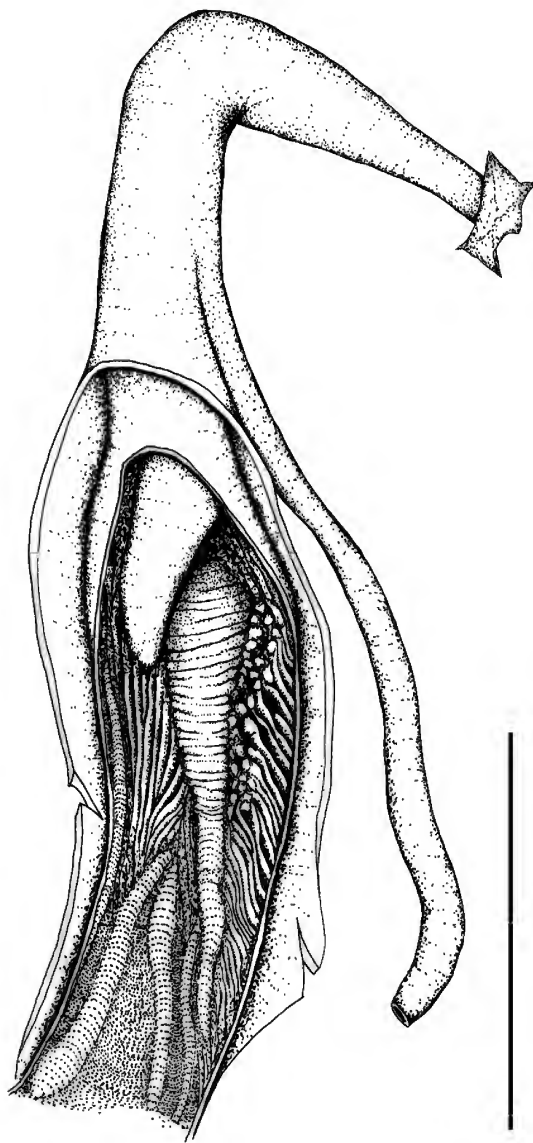


Figure 72. Interior of penial chamber of *Amplirhagada sphaeroidea* n.sp., paratype WAM S37027 (24 May, scale 3 mm). Compare with Fig. 4 for labelling of structures.

Genital morphology (Figs. 71–72). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens forms simple loop before entering penis. Penial retractor muscle very short, stubby. Penial sheath evenly thick. Penial verge short ($<\frac{1}{8}$ penial chamber), slender to spatulate, with pointed tip. Penial wall pustules fused to regular, smooth, diagonal and delicate lamellae on apical portion, becoming more and more oblique towards base of penial chamber. Main stimulatory pilaster well-differentiated; elongated, large, cone-shaped, corrugated, comprising mainly the apical portion of penial chamber and gradually decreasing in size towards base. Three additional, smooth, narrow, rather indistinct pilasters are formed at base of penial chamber. Vas deferens entering penial sheath apically. Vagina rather short, posteriorly inflated; inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct moderately wide, internally with smooth longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, internally entirely smooth, wall delicate. Free oviduct comprising about half of anterior part of oviduct, or more than half of anterior part of oviduct; more or less straight. Spermooviduct much longer than anterior part of oviduct. Talon embedded in albumen gland anteriorly.

Radular morphology (Fig. 70D–E). Rectangular. Tooth formula C+15+4+18. With 118 rows of teeth, 26.0 rows per mm ($n = 1$). Central teeth with bluntly pointed, broadly elongate mesocone, length equal to base of teeth; ectocones vestigial. Lateral teeth with bluntly pointed, broadly elongate mesocone, length equal to base of teeth; ectocones small, endocones vestigial. Marginal teeth with broadly elongate mesocones; ectocones smaller and narrower than mesocones; endocones greatly reduced.

Comparative remarks. One of the few species with large, dome-shaped shells. Differs from *A. tricenaria* and *A. regia* by dark outer lip and from *A. uwinsensis* purplish colour of outer lip. Covering of inner penial wall with lamellae, elongate-conical, corrugated main pilaster, and relatively large verge are diagnostic.

Amplirhagada basilica n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Augustus Island, southern section, Brecknock Harbour, 15°23'53"S 124°03'03"E; KIS 2-51. Weathered south facing sandstone scree in deep gorge, under rocks (leg. R. Teale, 1 June 2008).

Type material. Holotype WAM S34623 (Pl. 2.11). Paratypes AMS C463720 (4 preserved specimens, same as holotype), WAM S37004 (11 preserved specimens, same as holotype), AMS C463721 (3 shells, 15°22'54"S 124°35'24"E), WAM S37414 (4 shells, 15°22'54"S 124°35'24"E).

Additional, non-type material. WAM S37000–3, WAM S37413 (Augustus Island).

Etymology. From *basilica* (Latin = royal, splendid, magnificent), referring to its large shell. *Amplirhagada regia* is among the largest species of the genus.

Sealing strategy. Free sealer.

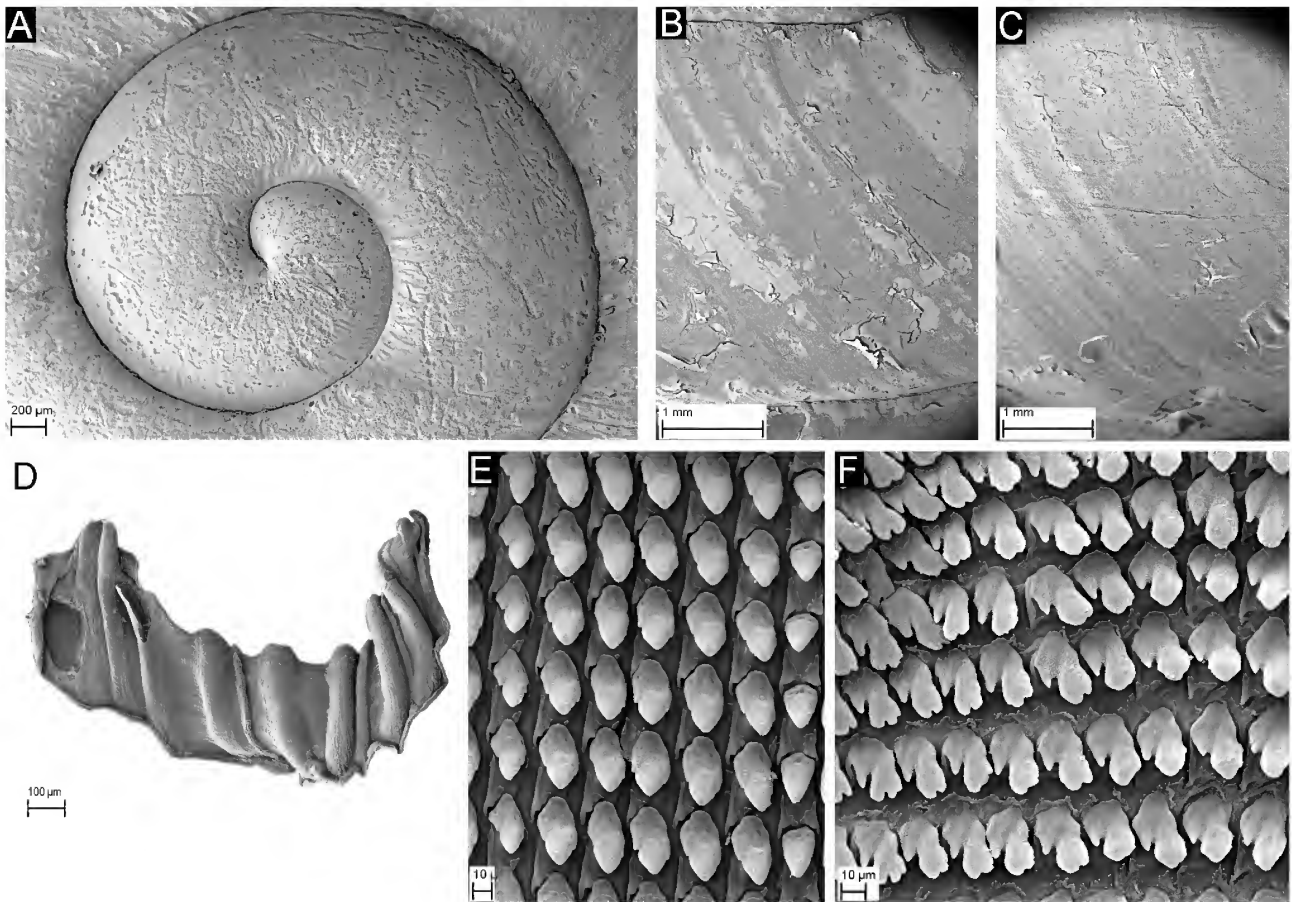


Figure 73. SEM photographs of *Amplirhagada basilica* n.sp. (A–C) Shell, paratype AMS C463721: (A) apical whorl viewed from above (scale 200 µm); (B) close-up of periphery of penultimate whorl (scale 1 mm); (C) close-up of periphery of last whorl (scale 1 mm). (D) Jaw, paratype AMS C463720 (scale 100 µm). (E–F) Radula, paratype AMS C463720: (E) central and inner lateral teeth (scale 10 µm); (F) outer lateral and inner marginal teeth (scale 10 µm).

Shell (Fig. 73A–C, Pl. 2.11). Semi-globose, with medium high spire; solid to thick. Periphery slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, forming a chink to narrowly winding opening, 80–95 percent concealed by columellar reflection. Background colour blends from cream into brownish (upper sector of lower whorls darker); sub-sutural band diffuse, light brownish; mid-whorl band diffuse, thin, brownish, most pronounced, visible on last whorls only, blurring towards tip of shell; ventral colour horn; outer lip colour differs from shell, brownish purple; inner lip colour pinkish. Protoconch 2.4 mm in diameter, comprising 1.7 whorls, smooth. Teleoconch smooth except of indistinct growth lines. Angle of aperture 45°; outer lip rounded, moderate to thick, expanded, slightly reflected, basal node of lip weak, palatal node absent. Parietal wall of inner lip absent.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl; mantle pigmentation mottled, dark grey. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 74–75). Penis straight, shorter than anterior part of oviduct, very thin. Vas deferens forms simple loop before entering penis. Penial retractor muscle of same length as penis. Penial sheath evenly thick. Penial verge comprising $\frac{1}{8}$ – $\frac{1}{4}$ of penial chamber, slender to spatulate, with rounded tip. Penial wall pustules absent. Main

stimulatory pilaster absent. Two smooth, narrow longitudinal pilasters comprise entire length of penial chamber; two additional smooth, narrow pilasters develop at base of penial chamber. Vas deferens rather thick, entering penial sheath apically. Vagina rather short, posteriorly inflated; inner vaginal wall densely covered by tiny pustules and smooth longitudinal pilasters. Spermatheca long, extending over base of spermoviduct. Spermathecal duct moderately

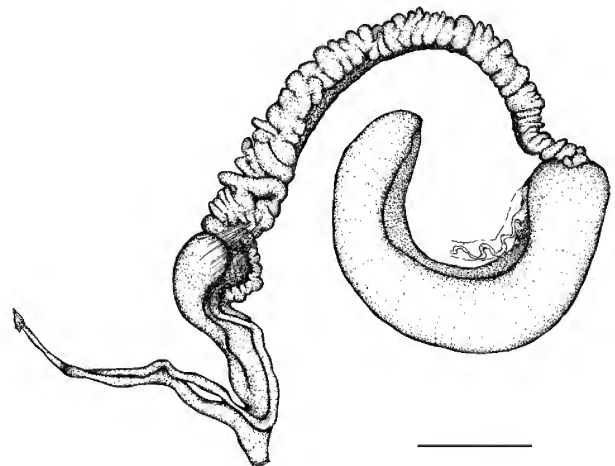


Figure 74. Genitalia of *Amplirhagada basilica* n.sp., paratype AMS C463720 (1 June, scale 10 mm). Compare with Fig. 3 for labelling of structures.

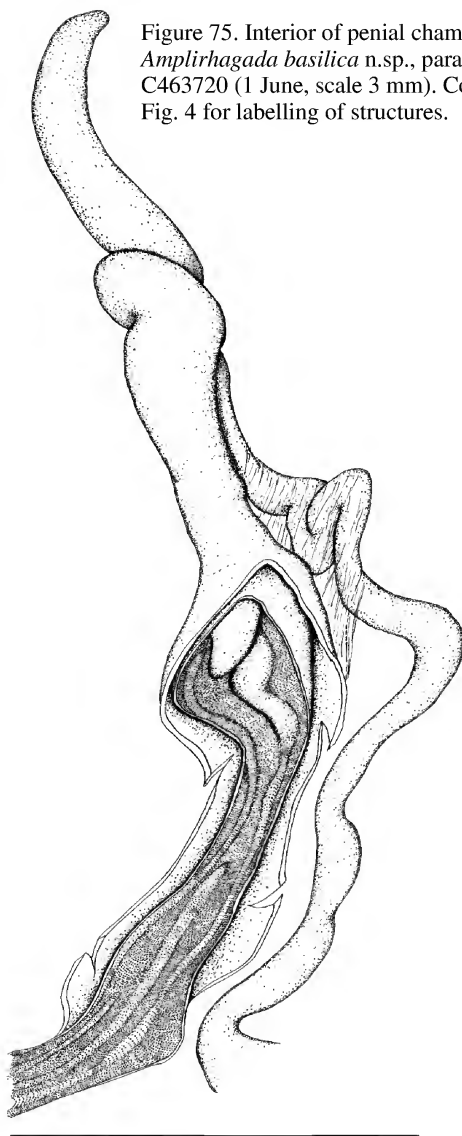


Figure 75. Interior of penial chamber of *Amplirhagada basilica* n.sp., paratype AMS C463720 (1 June, scale 3 mm). Compare with Fig. 4 for labelling of structures.

wide, internally with pustules. Spermathecal head globular, connected with oviduct by connective tissue, internally smooth, with thin wall. Free oviduct comprising half of anterior part of oviduct or more; more or less straight. Spermoviduct much longer than anterior part of oviduct. Talon embedded in albumen gland anteriorly.

Radular morphology (Fig. 73E–F). Rectangular. Tooth formula C+14+4+22. In average 119 ± 19.0 rows of teeth, 28.0 ± 0.4 rows per mm ($n = 2$). Central teeth with bluntly pointed-ovate mesocone, shorter than base of teeth; ectocones vestigial. Lateral teeth with bluntly pointed, ovate mesocones, shorter than base of teeth; ectocones and endocones vestigial. Marginal teeth with broadly rounded mesocones; ectocones pointed, much smaller and narrower than mesocones; endocones vestigial.

Comparative remarks. One of the few species with large, dome-shaped shells. Differs from *A. tricenaria* and *A. regia* by dark outer lip. Purplish colour of outer lip similar to *A. sphaeroidea*. Absence of penial wall pustules is characteristic for this species.

Amplirhagada camdenensis n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Camden Sound, Augustus Island, northwestern section, $15^{\circ}20'16''\text{S}$ $124^{\circ}31'16''\text{E}$; KIS 1-49. Vine thicket amongst boulders at base of sandstone cliffs, under rocks (leg. M. Shea, 25 May 2008).

Type material. Holotype WAM S34624 (Pl. 2.12). AMS C463722 (3 preserved specimens, as holotype), WAM S37006 (5 preserved specimens, as holotype), WAM S37005 (3 preserved specimens, $15^{\circ}20'59''\text{S}$ $124^{\circ}31'30''\text{E}$).

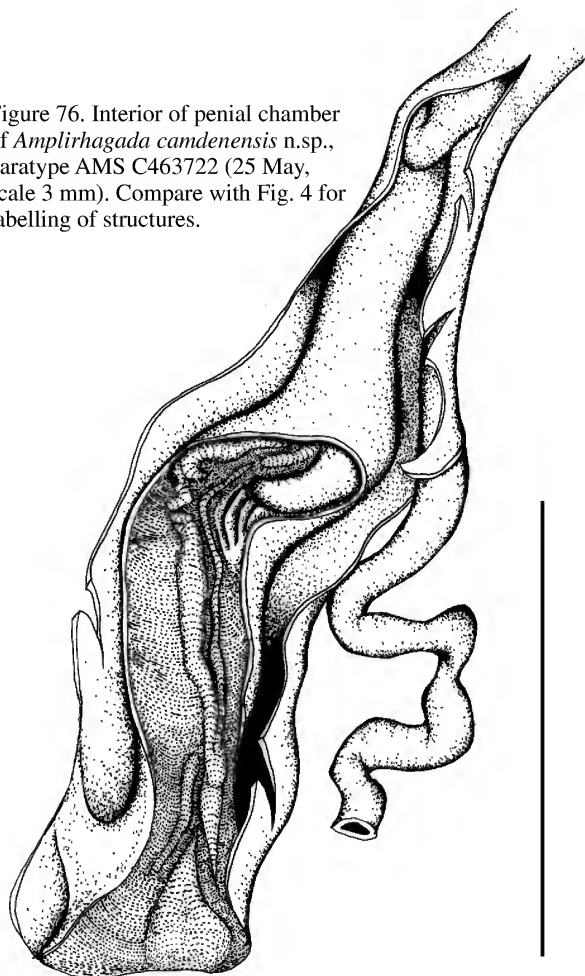
Additional, non-type material. WAM S37007–8, WAM S37445–50, WAM S41481, FMNH 219063 (Augustus Island).

Etymology. In reference to Camden Sound, in which Augustus Island is situated.

Sealing strategy. Free sealer.

Shell (Fig. 77A–B, Pl. 2.12). Globose, with medium to high spire; solid. Periphery evenly rounded to slightly angulate; upper sector of whorl flattened to slightly shouldered, basal sector rounded. Umbilicus forming a chink to narrowly winding opening, 40–100 percent concealed by columellar reflection. Background colour yellowish brown to horn; sub-sutural band diffuse, dark to chestnut brown, becomes more indistinct or blurs towards tip of whorl, may fuse with mid-whorl band to cover shell in light brown colour;

Figure 76. Interior of penial chamber of *Amplirhagada camdenensis* n.sp., paratype AMS C463722 (25 May, scale 3 mm). Compare with Fig. 4 for labelling of structures.



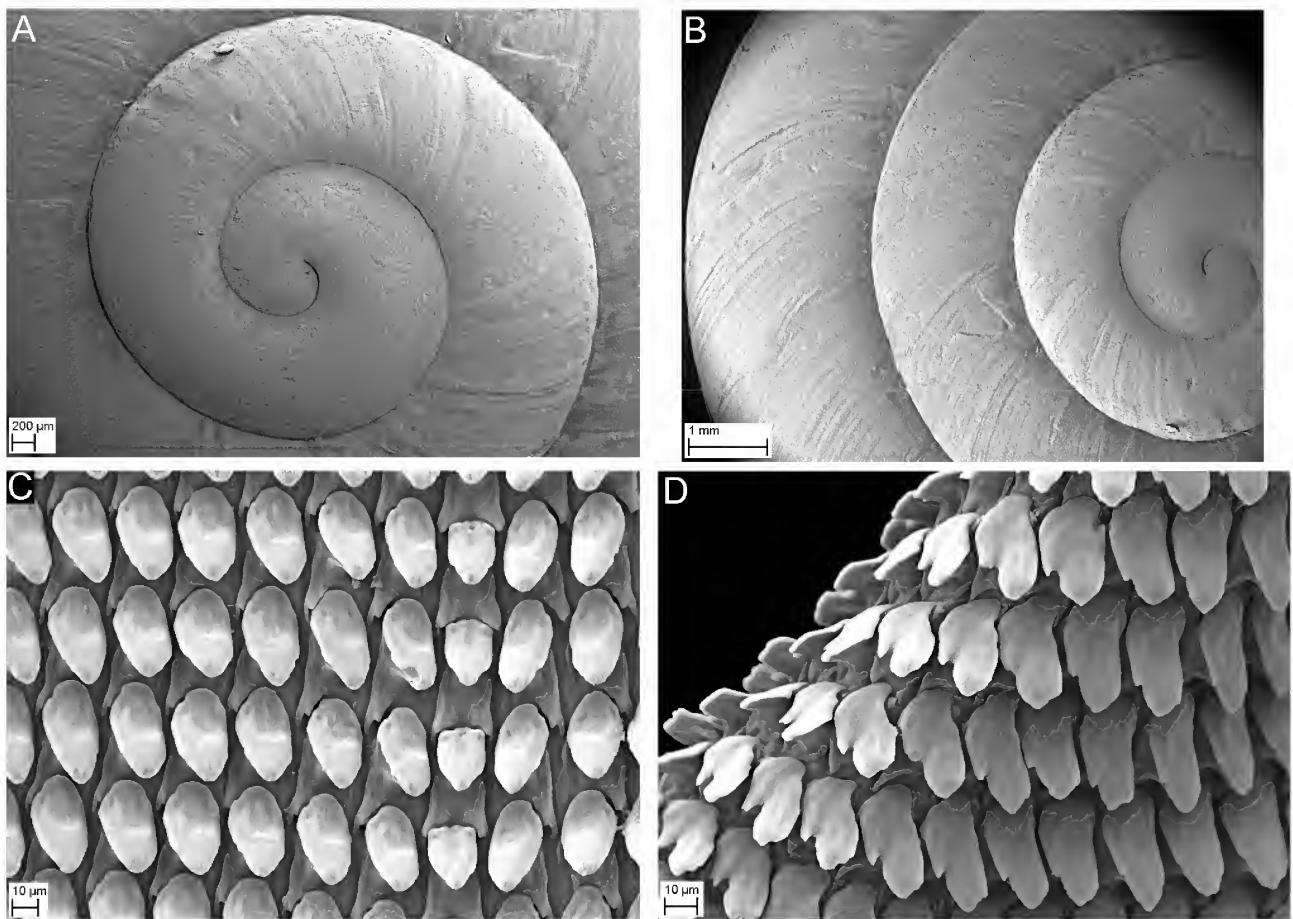


Figure 77. SEM photographs of shell and radula of *Amplirhagada camdenensis* n.sp., paratype AMS C463722: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on first three whorls viewed from above (scale 1 mm); (C) close-up showing central and inner lateral teeth (scale 10 µm); (D) close-up showing inner and middle marginal teeth (scale 10 µm).

mid-whorl band diffuse, dark to chestnut brown, thin to moderately broad, visible on last whorl(s) only; ventral colour whitish cream to yellowish brown; outer and inner lip colour differs from shell, pinkish brown. Protoconch c. 3.5 mm in diameter, comprising 2 whorls, smooth. Teleoconch smooth except of faint axial growth lines. Angle of aperture 30°; outer lip rounded, moderately thick, expanded, not or slightly reflected, basal and palatal node absent. Parietal wall of inner lip absent.

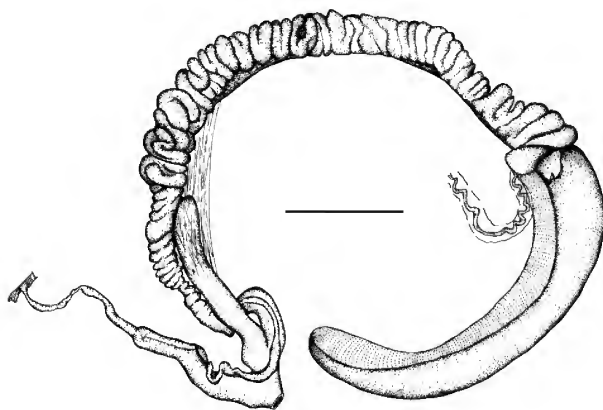


Figure 78. Genitalia of *Amplirhagada camdenensis* n.sp., paratype AMS C463722 (25 May, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Pallial morphology. Pigmentation on mantle mottled, dark grey. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 76, 78). Penis straight, shorter than anterior part of oviduct, very thin. Vas deferens forms simple loop before entering penis. Penial retractor muscle as long as penis. Penial verge rather short ($\frac{1}{8}$ – $\frac{1}{4}$ of length of penial chamber), broad, with pointed to rounded tip. Penial wall pustules absent. Main stimulatory pilaster not well differentiated, narrow, smooth, on apical to median portion of penial chamber. One to three additional, smooth, narrow pilasters on apical portion. Vas deferens entering penial sheath in upper third. Vagina rather short, medially to posteriorly inflated; inner vaginal wall predominantly smooth, with few weakly developed longitudinal pilasters. Spermathecal duct moderately wide, internally smooth. Spermathecal head globular to elongately inflated, connected with oviduct by connective tissue, internally smooth, with thin wall. Free oviduct comprising about half of anterior part of oviduct; more or less straight. Spermoviduct much longer than anterior part of oviduct. Talon embedded in albumen gland at junction with spermoviduct.

Radular morphology (Fig. 77C–D). Rectangular. Tooth formula C+16+4+?. With 122 rows of teeth, 27.4 rows per mm ($n = 1$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular to ovate

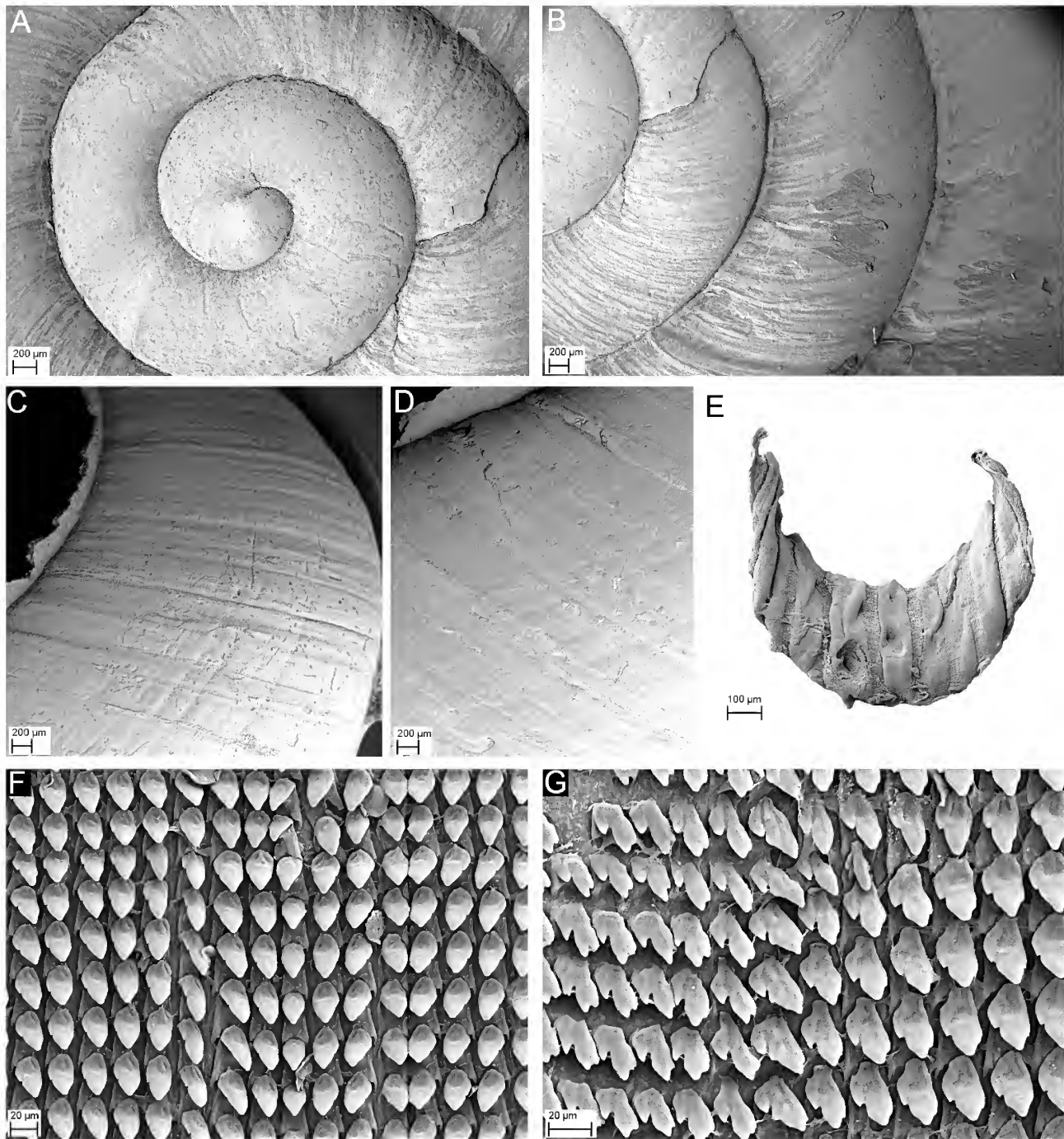


Figure 79. SEM photographs of *Amplirhagada kimberleyana* n.sp. (A–D) Shell, paratype FMNH 219055: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on first three whorls viewed from above (scale 1 mm); (C) close-up showing sculpture on penultimate whorl (scale 200 µm); (D) close-up showing surface of last whorl (scale 200 µm). (E) Jaw, paratype AMS C463760 (scale 100 µm). (F–G) Radula, paratype AMS C463760: (F) central and lateral teeth (scale 20 µm); (G) outer lateral and inner marginal teeth (scale 20 µm).

mesocones, length equal to base of tooth; ectocones and endocones vestigial. Marginal teeth with triangular to broadly flattened mesocones; ectocones shorter and narrower than mesocones; endocones vestigial.

Comparative remarks. Material of this species has been labelled as “*Amplirhagada* sp. 65” by Solem. It has the smallest of all dome-shaped shells with a significantly higher H/D ratio as most other species (Table 1). Absence of penial wall pustules and pattern of smooth, longitudinal pilasters are diagnostic.

Amplirhagada kimberleyana n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Camden Sound, northern Slate Islands, 2.4 km NW of Wilson Point, 15°32'10"S 124°23'56"E; KC-005 (leg. V. Kessner & A. Longbottom, 09 July 1988).

Type material. Holotype WAM S34625 (Pl. 2.13). Paratypes AMS C463760 (5 preserved specimens), FMNH 219055 (21 preserved specimens), WAM S41480 (15 preserved specimens).

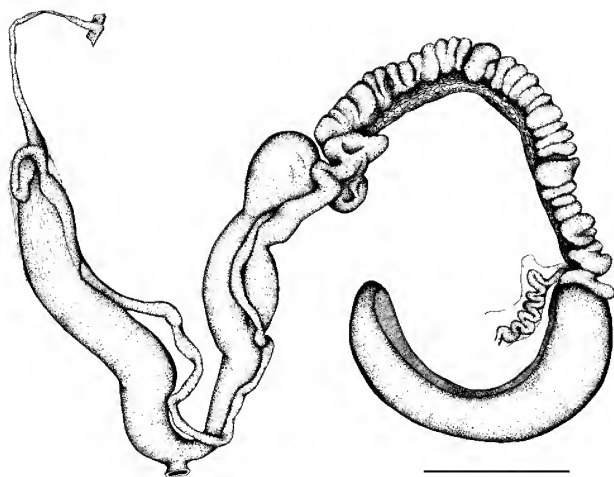


Figure 80. Genitalia of *Amplirhagada kimberleyana* n.sp., paratype AMS C463760 (9 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

Etymology. In reference to the Kimberley region.

Shell (Fig. 79A–D, Pl. 2.13). Semi-globose to broadly conical, with medium high spire; thin to solid (translucent). Periphery evenly rounded to slightly angulate; upper sector of whorl and basal sector rounded. Umbilicus forming a chink to narrowly winding opening, 60–100 percent concealed by columellar reflection. Background colour beige-brown; sub-sutural band absent or diffuse, brown; mid-whorl band absent or diffuse, brown, thin, visible on last whorl only; ventral colour lighter, horn or whitish; outer lip colour differs from shell, light brown to whitish; inner lip whitish. Protoconch c. 3 mm in diameter, comprising 2 whorls, smooth. Teleoconch smooth except of axial growth lines. Angle of aperture 45°; outer lip rounded, moderately thick, slightly expanded, not or slightly reflected, basal and palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl. Pigmentation on mantle mottled, black. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 80–81). Penis straight, more or less of same length as anterior part of oviduct or longer. Vas deferens coils once before entering penis. Penial retractor muscle shorter than penis. Penial verge moderately long ($\frac{1}{8}$ – $\frac{1}{4}$ penial chamber), slender to spatulate, with pointed tip. Penial wall pustules large, arranged in rows on apical to median portion of the penial chamber. Main stimulatory pilaster undifferentiated, formed by few rows of slightly enlarged, hooked pustules. Base of penial wall smooth, supporting two smooth and narrow pilasters. Vas deferens entering penial sheath in upper third. Vagina moderately long, tubular to posteriorly slightly inflated; inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct wide, internally with corrugated longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, internally smooth, with thin wall. Free oviduct comprising about half of anterior part of oviduct, more or less straight. Spermoviduct of same length as anterior part of oviduct. Talon embedded in albumen gland at junction with spermoviduct.

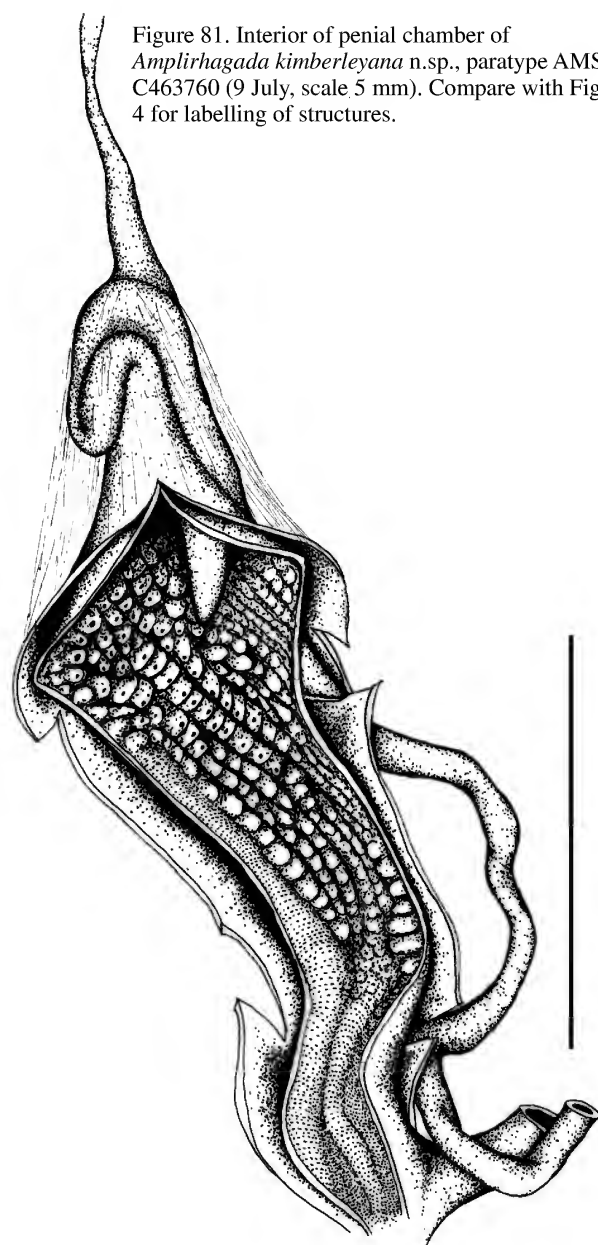


Figure 81. Interior of penial chamber of *Amplirhagada kimberleyana* n.sp., paratype AMS C463760 (9 July, scale 5 mm). Compare with Fig. 4 for labelling of structures.

Radular morphology (Fig. 79F–G). Rectangular. Tooth formula C+16+3+22. With 147 rows of teeth, 31.9 rows per mm ($n = 1$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones small, endocones vestigial. Marginal teeth with elongate to triangular mesocones; ectocones shorter and narrower than mesocones, divided into two denticles; endocones greatly reduced.

Comparative remarks. Shell broadly conical to dome-shaped but smaller than species with similar shell shape. Inner penial wall with strong developed pustulation and undifferentiated main pilaster is diagnostic. Material of the present species has been labelled as “*Amplirhagada* sp. 64” by Solem.

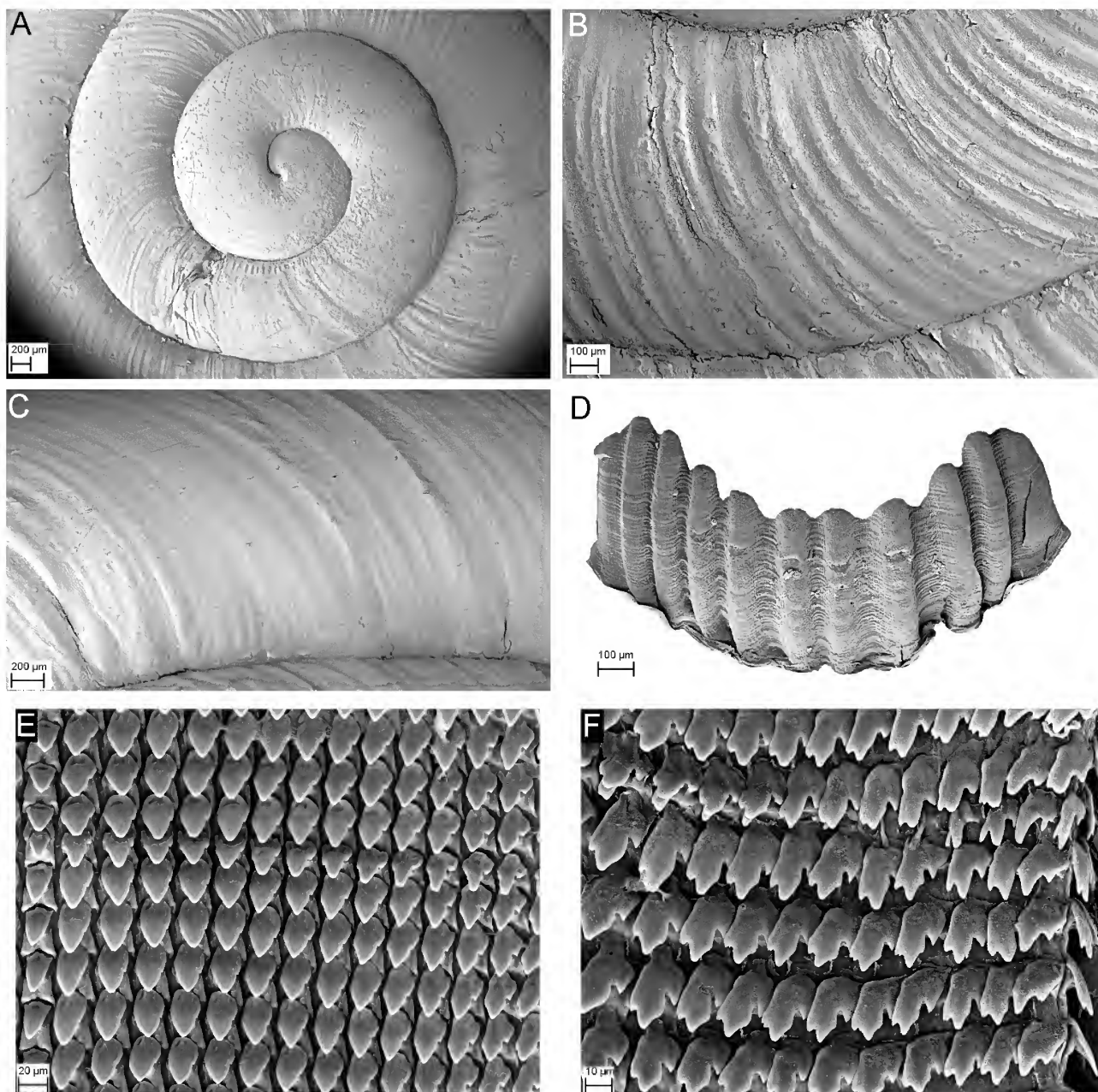


Figure 82. SEM photographs of *Amplirhagada gemina* n.sp. (A–B) Shell, holotype WAM S34626: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on second whorl viewed from above (scale 100 µm); (C) close-up showing sculpture on penultimate whorl (scale 200 µm). (D) Jaw (scale 100 µm), paratype FMNH 219049. (E–F) Radula, paratype FMNH 219049: (E) central and lateral teeth (scale 20 µm); (F) middle marginal teeth (scale 10 µm).

Amplirhagada gemina n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Camden Sound, mainland 4.5 km N of Prior Point, 1.5 km SE of Hall Point; KC-005 (leg. V. Kessner & A. Longbottom, 09 July 1988).

Type material. Holotype WAM S34626 (Pl. 2.14). Paratypes AMS C463761 (preserved specimen), FMNH 219049 (5 preserved specimens), WAM S41479 (3 preserved specimens).

Etymology. From *gemina* (Latin = twin-born), in reference to its close overall similarity with its sibling species *A. kimberleyana*.

Shell (Fig. 82A–C, Pl. 2.14). Semi-globose to broadly conical, with medium spire, thin to solid (translucent). Periphery evenly rounded to slightly angulate; upper and basal sectors of whorls rounded. Umbilicus forming a chink to narrowly winding opening, 60–100 percent concealed by columellar reflection. Background colour beige brown sub-sutural band absent or diffuse, brown; mid-whorl band absent or diffuse, brown, thin, visible on last whorl only; ventral colour lighter, horn or whitish; outer lip colour differs from shell, light brown to whitish; inner lip whitish. Angle of aperture 45°, outer lip moderately thick, slightly expanded, not or slightly reflected, basal and palatal node absent. Teleoconch with pronounced axial growth lines

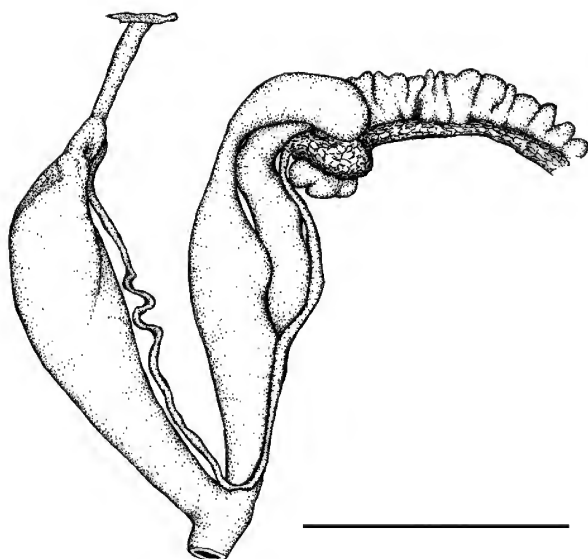


Figure 83. Genitalia of *Amplirhagada gemina* n.sp., holotype WAM S34626 (9 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

which become more oblique towards the base of the shell. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity moderately deep, extending $\frac{3}{4}$ whorl; mantle pigmentation mottled, black. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 83–84). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens coils once before entering penis. Penial retractor muscle shorter than penis. Penial verge short ($< \frac{1}{8}$ penial chamber), slender to spatulate, with pointed tip. Penial wall pustules rather large, arranged in rows on entire wall of penial chamber, becoming more oblique towards base. Main stimulatory pilaster not well differentiated, covered by undifferentiated pustules, comprising apical to median portion of penial chamber. Vas deferens entering penial sheath in upper third. Vagina moderately long, tubular to posteriorly inflated. Inner vaginal wall with smooth longitudinal pilasters. Spermathecal duct wide, inflated, internally with smooth longitudinal pilasters. Spermathecal head elongately inflated, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising about half of anterior part of oviduct, more or less straight. Posterior parts of genital system unknown.

Radular morphology (Fig. 82E–F). Rectangular. Tooth formula C+16+4+20. With 150 rows of teeth, 34.2 rows per mm ($n = 1$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular mesocones, length equal to base of tooth; ectocones tiny, endocones vestigial. Marginal teeth with elongate to triangular mesocones; ectocones shorter and narrower than mesocones; endocones smaller than ectocones.

Comparative remarks. Smaller than other species with broadly conical to dome-shaped. Inner penial wall pustules

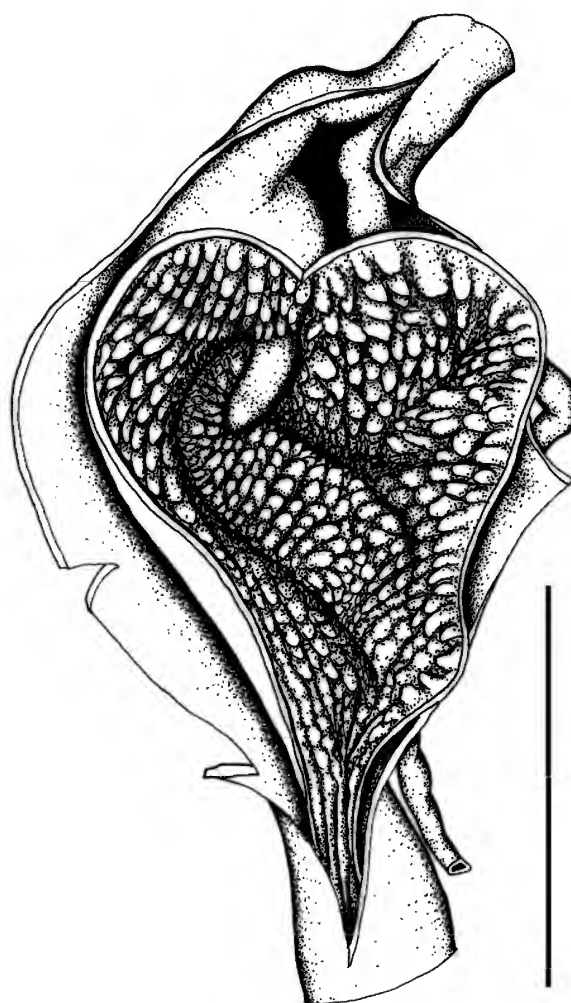


Figure 84. Interior of penial chamber of *Amplirhagada gemina* n.sp., holotype WAM S34626 (9 July, scale 3 mm). Compare with Fig. 4 for labelling of structures.

larger and denser than in *A. kimberleyana*. Although morphologically similar, both species are genetically well-differentiated. Material of the present species has been labelled as “*Amplirhagada* sp. 64” by Solem together with material of *A. kimberleyana*, which has a similar shell.

Amplirhagada dubitabile n.sp.

Type locality (Fig. 1). Western Australia, Kimberley, Bonaparte Archipelago, Doubtful Bay, Steep Island, 2.3 km NE of Raft Point, 16°03'36"S 124°22'03"E; KC-002 (leg. V. Kessner & A. Longbottom, 08 July 1988).

Type material. Holotype WAM S34627 (Pl. 2.15). Paratypes AMS C463762 (3 preserved specimens), FMNH 219047 (8 preserved specimens), WAM S41478 (5 preserved specimens).

Etymology. From *dubitabile* (Latin = doubtful), in reference to Doubtful Bay, where this species occurs on Steep Island.

Shell (Fig. 85A–C, Pl. 2.15). Semi-globose to broadly conical, with medium high spire; solid. Periphery slightly angulate; upper and basal sectors of whorls rounded. Umbilicus open, forming narrowly winding opening, 30–70

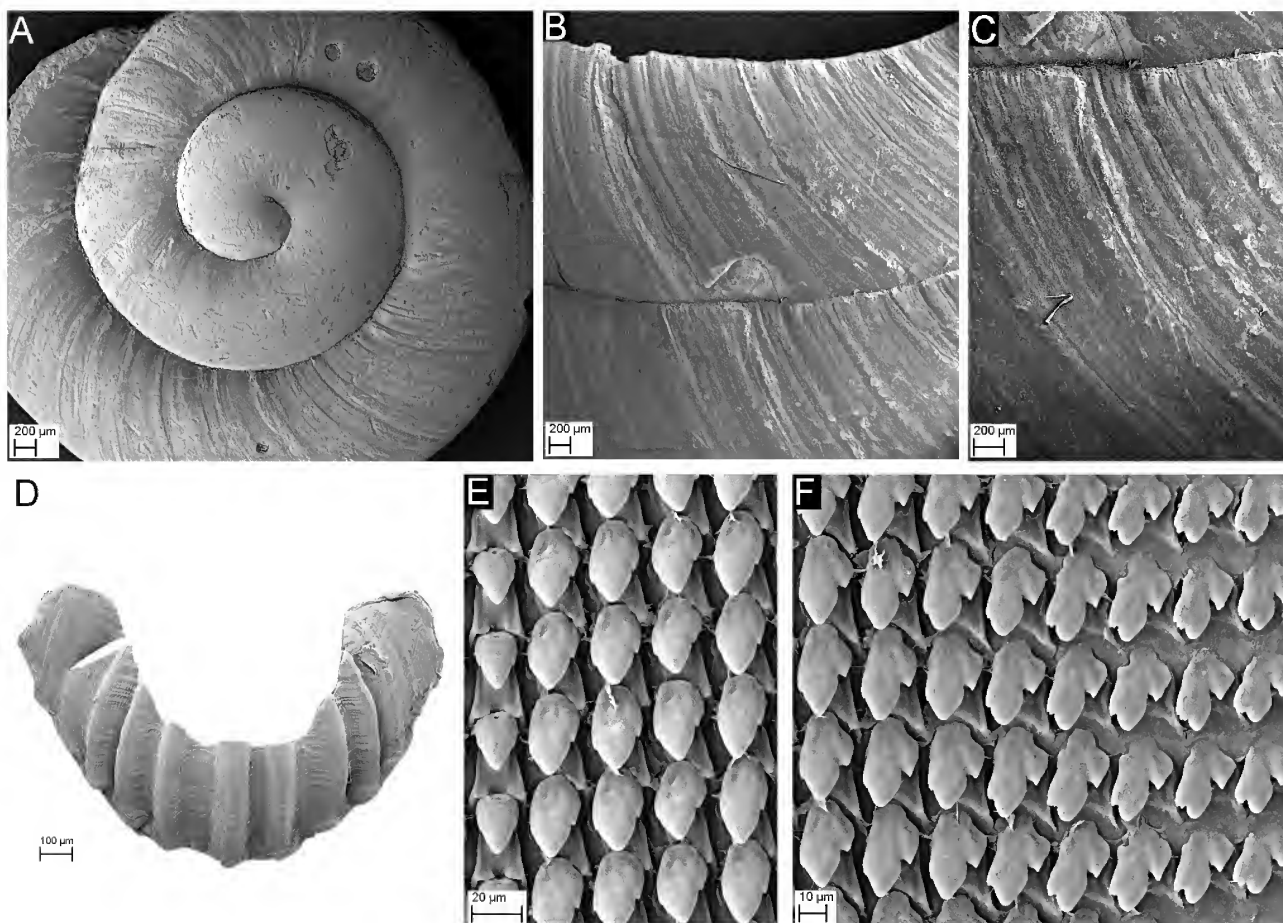


Figure 85. SEM photographs of shell, jaw and radula of *Amplirhagada dubitabile* n.sp., paratype FMNH 219047: (A) apical whorl viewed from above (scale 200 µm); (B) sculpture on penultimate whorl viewed rectangular from above (scale 200 µm); (C) close-up showing growth lines on last whorl (scale 200 µm); (D) jaw (scale 100 µm); (E) central and inner lateral teeth (scale 20 µm); (F) outer lateral and inner marginal teeth (scale 20 µm).

percent concealed by columellar reflection. Background colour brownish beige, may display irregular pattern of hornish growth lines; sub-sutural band absent; mid-whorl band absent or diffuse, yellowish brown, thin, visible on last whorl only; ventral colour horn; outer lip colour differs from shell, horn; inner lip whitish. Protoconch c. 2.8 mm in diameter, comprising 2 whorls, smooth. Teleoconch with pronounced axial growth lines. Angle of aperture 45°; outer lip rounded, moderately thick, slightly expanded, not or slightly reflected, basal and palatal node absent. Parietal wall of inner lip inconspicuous.

Pallial morphology. Pallial cavity short, extending half a whorl; mantle pigmentation mottled, greyish black. Kidney extending about half of pallial cavity.

Genital morphology (Figs. 86–87). Penis straight, more or less of same length as anterior part of oviduct. Vas deferens coils once before entering penis. Penial retractor muscle shorter than penis. Penial verge short (<1/8 penial chamber), broad, pointed. Penial wall pustules absent; wall covered by delicate, narrow, longitudinal pilasters. Main stimulatory pilaster well-differentiated; smooth undulating, well developed at apical portion, decreasing in size in median portion, largely reduced at basal portion of penial chamber. Vas deferens entering penial sheath in upper third.

Vagina rather short, posteriorly inflated; inner vaginal wall with weakly developed longitudinal pilasters. Spermatheca slightly extending over base of spermooviduct. Spermathecal duct wide, internally with smooth longitudinal pilasters. Spermathecal head globular, connected with oviduct by connective tissue, internally smooth, with delicate wall. Free oviduct comprising about half of anterior part of oviduct, more or less straight. Spermooviduct longer than anterior part of oviduct. Talon embedded in albumen gland close to anterior end of albumen gland.

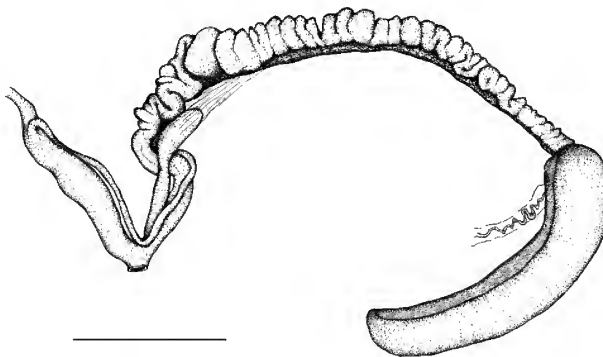


Figure 86. Genitalia of *Amplirhagada dubitabile* n.sp., paratype FMNH 219047 (8 July, scale 10 mm). Compare with Fig. 3 for labelling of structures.

***Amplirhagada napierana* Solem, 1981**

Amplirhagada napierana Solem, 1981a: 225–232, pl. 14d, figs. 36b, 48a–b, 50, 51a (Barker Gorge, Napier Range).

Material examined. AMS C150457 (Western Australia, Napier Range, E side, 1.2 km N of Napier Downs, 17°19.5'S 124°48.0'E) (Fig. 1, Pl. 2.16).

Remarks. This species was described from various localities in the Napier Range, where it occurs in three disjunct areas in close proximity but not sympatrically with *A. percita*. The anatomy was described by Solem (1981a). The penial morphology of the present sample corresponds with the original description. This species is represented in the molecular tree shown below.

***Amplirhagada percita* (Iredale, 1939)**

Tenuigada percita Iredale, 1939: 68, pl. V, fig. 14 (northern end of Napier Range), Solem, 1981a: 211–225, pl. 14e–f, figs. 47a–j, 50c, 51b–c.

Tenuigada ignara Iredale, 1939: 68, pl. V, fig. 13 (north end of Napier Range).

Nomenclatural remarks. Iredale (1939) described the two species, *A. percita* and *A. ignara*, based on series of dry shells. Subsequently, the two names were synonymized by Solem (1981a), who revised the genus, on the grounds that no significant difference in the shells were found, which would justify treatment as distinct species. However, Solem (1981a) also stated that he found distinct differences between allopatric populations of this species. Hence, it remains to be critically tested whether the taxon as currently delimited by Solem (1981a) encompasses more than a single species.

Material examined. AMS C144028 (Western Australia, Napier Range, 24 km N of Wagon Pass, 17°04.5'S 124°34'E) (Fig. 1, Pl. 2.17).

Remarks. A sample of this species is represented in the molecular tree shown below.

***Amplirhagada varia* Solem, 1981**

Amplirhagada varia varia Solem, 1981a: 294–300, pl. 13c, figs. 36e, 65b, 66a, 67a–b, 69a–d (Mitchell Plateau, AMAX port, Warrender Road).

Material examined. AMS C460963 (track to Crystal Creek, 1.5 km from Walsh Point, 14.446°S 125.792°E) (Fig. 1, Pl. 2.18).

Remarks. Solem (1981a) described two subspecies, *A. varia varia* and *A. varia depressa*, which essentially differ in the length of the penial verge. Both taxa are found in very close geographical proximity. They were apparently treated as subspecies because of their otherwise very close anatomy. However, as they do not meet the criteria of geographical races that replace each other, I suggest elevating both to the rank of distinct species. Consequently, herein I refer to the species name *A. varia* for the so-called nominate form. The penis anatomy of the present sample corresponds with the figures shown by Solem (1981a). This species is represented in the molecular tree shown below.

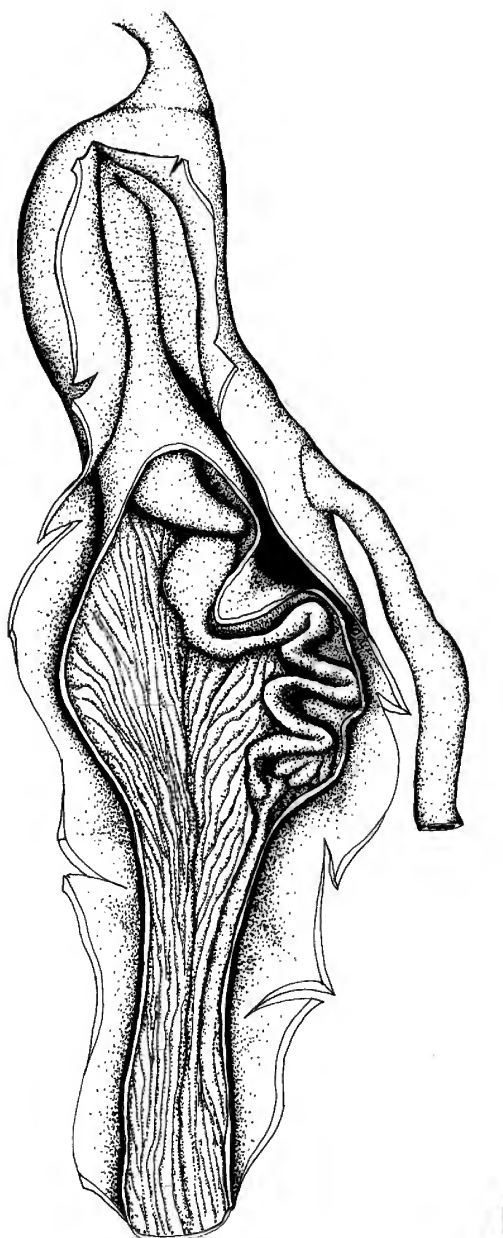


Figure 87. Interior of penial chamber of *Amplirhagada dubitabile* n.sp., paratype FMNH 219047 (8 July, scale 3 mm). Compare with Fig. 4 for labelling of structures.

Radular morphology (Fig. 85E–F). Rectangular. Tooth formula C+16+3+22. With 139 rows of teeth, 32.3 rows per mm ($n = 1$). Central teeth with sharply pointed, triangular mesocones, shorter than base of tooth; ectocones vestigial. Lateral teeth with sharply pointed, triangular to ovate mesocones, length equal to base of tooth; ectocones small; endocones vestigial. Marginal teeth with elongate to triangular mesocones; ectocones shorter and narrower than mesocones; endocones smaller than ectocones.

Comparative remarks. Material of this species has been labelled as “*Amplirhagada* sp. 63” by Solem. Shell similar to *A. kimberleyana* and *A. gemina* in shape, size, and colouration. Inner penial wall structure (lamellae, no pustules with long, undulating main pilaster) very characteristic.

***Amplirhagada mitchelliana* Solem, 1981**

Amplirhagada mitchelliana Solem, 1981a: 272–280, pl. 13b, figs. 37i, 55c–d, 61c–e, 62a–b, 64a (Mitchell Plateau, Warrender Road).

Material examined. WAM S41462 (lookout on track between Mitchell Plateau camp and Walsh Pool) (Fig. 1, Pl. 2.19), AMS C144039 (Mitchell Plateau, Mitchell Plateau Road, 43.6 km W of Gibb Road-Kalamburu turnoff).

Remarks. Found in the same area as *A. varia*, this species differs most significantly from the former by a distinct anatomy of the interior penial wall. The penis anatomy of the present sample corresponds with that shown by Solem (1981a). This species is represented in the molecular tree shown below. The two samples sequenced herein do not form a monophyletic cluster but are separated by a considerable uncorrected pair-wise genetic distance of 17% and are shown as non-monophyletic with respect to *A. varia*. This indicates problems with the species recognition and probably the presence of an unidentified species.

***Amplirhagada castra* Solem, 1981**

Amplirhagada castra Solem, 1981a: 286–293, pl. 13d, figs. 37h, 63a–b, 64b, 67e–f, 68 (Mitchell Plateau, Camp Creek).

Material examined. AMS C460966 (track to Mitchell Plateau ranger Station, 14.821 S 125.721 E) (Fig. 1, Pl. 2.20).

Remarks. Found in the same area as *A. varia* and *A. mitchelliana* this species differs most significantly from the former two by a distinct anatomy of the interior penial wall. The penis anatomy of the present sample corresponds with that shown by Solem (1981a). This species is represented in the molecular tree shown below.

Molecular phylogeny

Phylogenetic trees were reconstructed for a sequence data set with a length of 655 bp that comprised 53 sequences representing 28 species of *Amplirhagada* and two out-group sequences of *Carinotrachia*. DNA was successfully extracted from up to 20 years old museum samples but it was not possible to amplify the mitochondrial COI fragment from all studied *Amplirhagada* species because DNA quality was sometimes low. Nevertheless, the phylogeny contains a representative subsample of the species treated in this paper.

Rates of transitions and transversions were plotted against sequence divergence (corrected after Tamura & Nei, 1993) by use of DAMBE (Xia & Xie, 2001) in order to test for substitution saturation. Both curves showed nearly linear relationships indicating no significant levels of saturation. A hierarchical likelihood ratio test implemented in Treefinder revealed the generally time reversible model of sequence evolution (GTR+I+ Γ) as the best-fit model. Settings were adjusted accordingly in the following ML and BI analyses.

Trees obtained by the three different analytical techniques (MP, ML, BI) revealed widely congruent topologies that differed only in minor aspects. The maximum parsimony tree found by the MP Ratchet (length 2052 steps, Ci = 25, Ri = 66) showed *A. napierana* as the most basal offshoot within the genus (Fig. 88). By contrast, the BI tree (Fig. 89) and the ML trees (not depicted) showed this species in an unresolved relationship with respect to the out-group and all other *Amplirhagada* species. Next to *A. napierana*, all trees reveal essentially five species clusters (Figs. 88–89). The basal relationships between these clusters are not well supported in terms of branch support values and are unresolved in the Bayesian tree (Fig. 89). Nodal support within the clusters, however, is usually high. The sister pair of *A. buffonensis* and *A. yorkensis* (Cluster 1) is consistently shown in a position basal to all other clades. Monophyly of this species pair receives high nodal support. The four other clusters contain species that do not always restricted to certain geographical areas. Cluster 2 (*A. kimberleyana* and other species) encompasses taxa from Boongaree Island and all coastal areas south of it. Most of these species have rather dome-shaped shells (except for *A. kimberleyana*) and are free sealers; the branching order is consistently revealed by all three trees. Cluster 3 contains species that are distributed to areas between the Napier Ranges in the hinterland (*A. percita*) to islands of the central Kimberley coast (*A. katerana*, *A. berthierana*). The MP cladogram indicates that species of Cluster 4 from the Mitchell Plateau (*A. castra*, *A. mitchelliana*) and *A. kessneri* from Bigge Island are more closely related to Cluster 2, while the BI shows the relationships between them and *A. tricenaria* as unresolved. Cluster 5 contains species from islands in the Admiralty Gulf and the Mitchell Plateau (*A. varia* and others).

Pair-wise genetic distances within species did not exceed the maximum of 4% found between the two sequences of *A. combeana*. Average pair-wise distances between species usually range between 26 and 35% (corrected sequence divergence, Tamura & Nei, 1993) or 16 and 23% of uncorrected p-distance. Average interspecific distances between some species, which are very close to each other in the phylogenetic tree were not lower than 10% (Tamura-Nei distances) or 8% (p-distances).

Discussion

Species delimitation by means of morphology and molecules

Solem (1981a) established that the most informative and convenient source of information for identifying species of *Amplirhagada* is the genital anatomy, particularly the structure of the inner penial wall and development of the main stimulatory pilaster. Naturally, the development and relative size of some genital structures depends on the maturity of the animal and on its actual reproductive state. Among fully mature specimens (with adult shell features and fully developed albumen gland), a simple pattern of seasonal variation is found with the genitalia being inactive and reduced in size during the early to middle dry season between May and August (Solem & Christensen, 1984). As figures and descriptions of genital features herein are based exclusively on the examination of adult specimens collected at the end of the dry or during the wet season (November to April), this phenomenon should not seriously affect the assessment of these features with respect to the delimitation of taxa.

The marked interspecific differentiation in the reproductive anatomy and the observation that differences are greater when species occur in sympatry led Solem (1981a) to argue that the structure of penial and vaginal walls may have a significant function in mate recognition. Recent findings of reproductive character displacement in genital morphology of Asian camaenids (*Satsuma*) seem to provide evidence in support of this idea (Kameda *et al.*, 2009).

Contrasting the significance of reproductive anatomy, Solem (1981a) found that shell features often are of limited value for the recognition of species. Species that occur under allopatric conditions may exhibit quite similar shells while conversely species found in sympatry are usually well recognisable by their shells. Radulae and jaws have been considered rather useless for the differentiation of taxa at species level by Solem (1981a). Similar assessments of anatomical characters have been made also with regard to other Australian (Willan *et al.*, 2009; Köhler, 2010), Asian (e.g., Chiba, 1999a; Kameda *et al.*, 2007; Chiba & Davison, 2008) and New Guinean Camaenidae (e.g., Jordaens *et al.*, 2009).

In the present study, the observations and conclusions of Solem (1981a) with regard to the significance of morphological characters for the recognition of species are generally confirmed. The considerable genetic differentiation of species supports the appraisal of reproductive features. Species delimited by their anatomy are differentiated on average by Tamura-Nei distances of about 30% in the mitochondrial marker COI. In the few exceptions to this general rule, species were found to be separated by as little as 10% sequence divergence (such as *A. combeana* and *A. montesquieuana*). However, even these rates of genetic differentiation do not seriously contradict the supposed status as distinct species. Corresponding with Solem's (1981a) statements on *Amplirhagada* (see also Solem, 1979, 1981b, 1984, 1985, 1988, 1993; 1997 for other camaenid groups from Western Australia), the anatomy of the penis (i.e., the structure and development of inner penial wall, main stimulatory pilaster, and penial verge) is most informative on the species level. Differentiation within populations was generally negligible compared to the well-marked differences between species. Also, the differences in the genital anatomy

between sympatric species (e.g., *A. kessneri* and *A. decora* on Bigge Is., *A. boongareensis*, *A. gibsoni*, *A. regia* on Boongaree Is) are often pronounced – well in agreement with the statement of Solem (1981a). Only in one allopatric species pair, *A. solemiana* and *A. indistincta*, were virtually no differences observed in the genital anatomy. Both species occur on neighbouring islands and form a sister pair. They are genetically well-differentiated and can be distinguished by their shell size (Fig. 8).

Shell characters have otherwise been revealed as being of limited value for the discrimination of *Amplirhagada* species. Shells of most species are within a size range of 15 to 25 mm in diameter with few exceptions from this rule (Table 1). The general shape of the shell (i.e., broadly conical or dome-shaped) is a feature often found in a clade with little differentiation among the constituent species. This is illustrated by the example of the clade of dome-shaped species (*A. uwinsensis*, *A. sphaeroidea*, *A. regia*, and *A. camdenensis*), all of which have very similar shells. It is correct, though, that sympatric species tend to show more pronounced differences in the shell, which may facilitate species recognition even without examination of the genitalia. This is exemplified by the sympatric (an in part closely related) species on Boongaree and Bigge islands, which are readily recognisable by their remarkably different shells.

Patterns of endemism and diversity among Kimberley camaenids

In the Kimberley Rainforest Survey (1987–1988) large numbers of camaenid species were found only in one or two rainforest patches (Solem, 1991; Solem & McKenzie, 1991). These patches and similarly suitable habitats are usually surrounded by areas that are uninhabitable for the snails. Most camaenid land snails have limited dispersal abilities. For snails, these patches function as islands just as the “real islands” of the Bonaparte Archipelago off the mainland coast, which are also inhabited by these camaenids. If islands are simply seen as areas surrounded by hostile environments (Gittenberger, 2007), from a biogeographical point of view the entire Kimberley region is best understood as a huge island archipelago. Camaenid land snails in the Kimberley therefore exhibit distributions that are similar with those found in snails on oceanic islands. Most camaenid species in the Kimberley have very short ranges with a calculated median range of only 20 km. This holds true not only for species of *Amplirhagada*, but also for many other genera with few notable exceptions, such as species of *Xanthomelon* inhabiting open woodland (Solem, 1991). This highly insular distribution is inevitably connected with narrow-range endemism in many camaenids groups in the Kimberley. Documenting these patterns will provide the basis for a better understanding of the biogeography of the region and the evolution of its biota and facilitate the development of appropriate conservation strategies (e.g., Willan *et al.*, 2009; Köhler, 2010).

Solem & McKenzie (1991) concluded that camaenid land snails reveal geographic patterns, which reflect their low dispersal abilities and multiple centres of endemism; the phylogeographic relationships within *Amplirhagada* are fully consistent with this. The mitochondrial phylogeny reveals a basal polytomy, which is not caused by sequence saturation and hence considered as a “hard polytomy”. The branching pattern of the tree corresponds closely with geographical

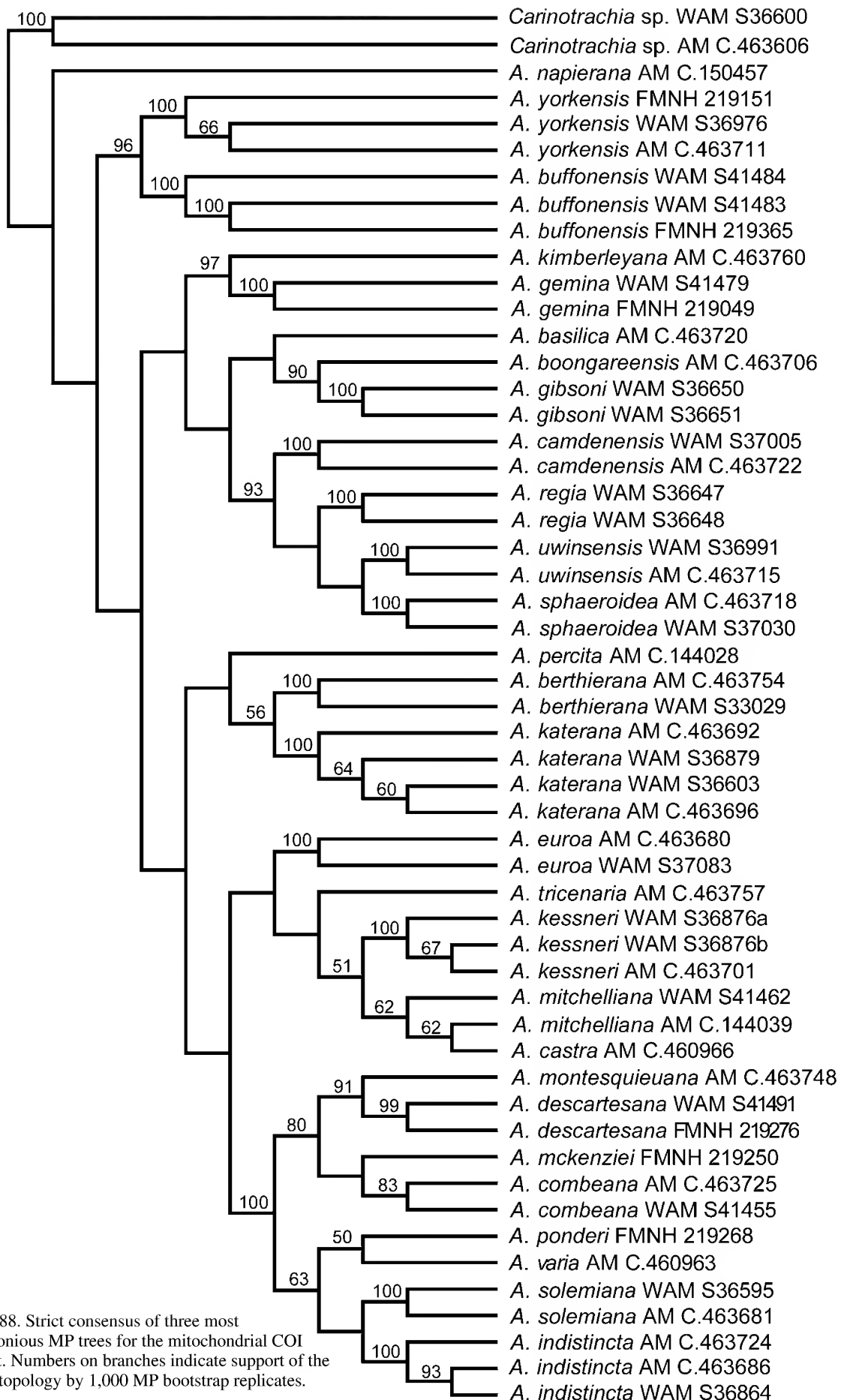


Figure 88. Strict consensus of three most parsimonious MP trees for the mitochondrial COI data set. Numbers on branches indicate support of the shown topology by 1,000 MP bootstrap replicates.

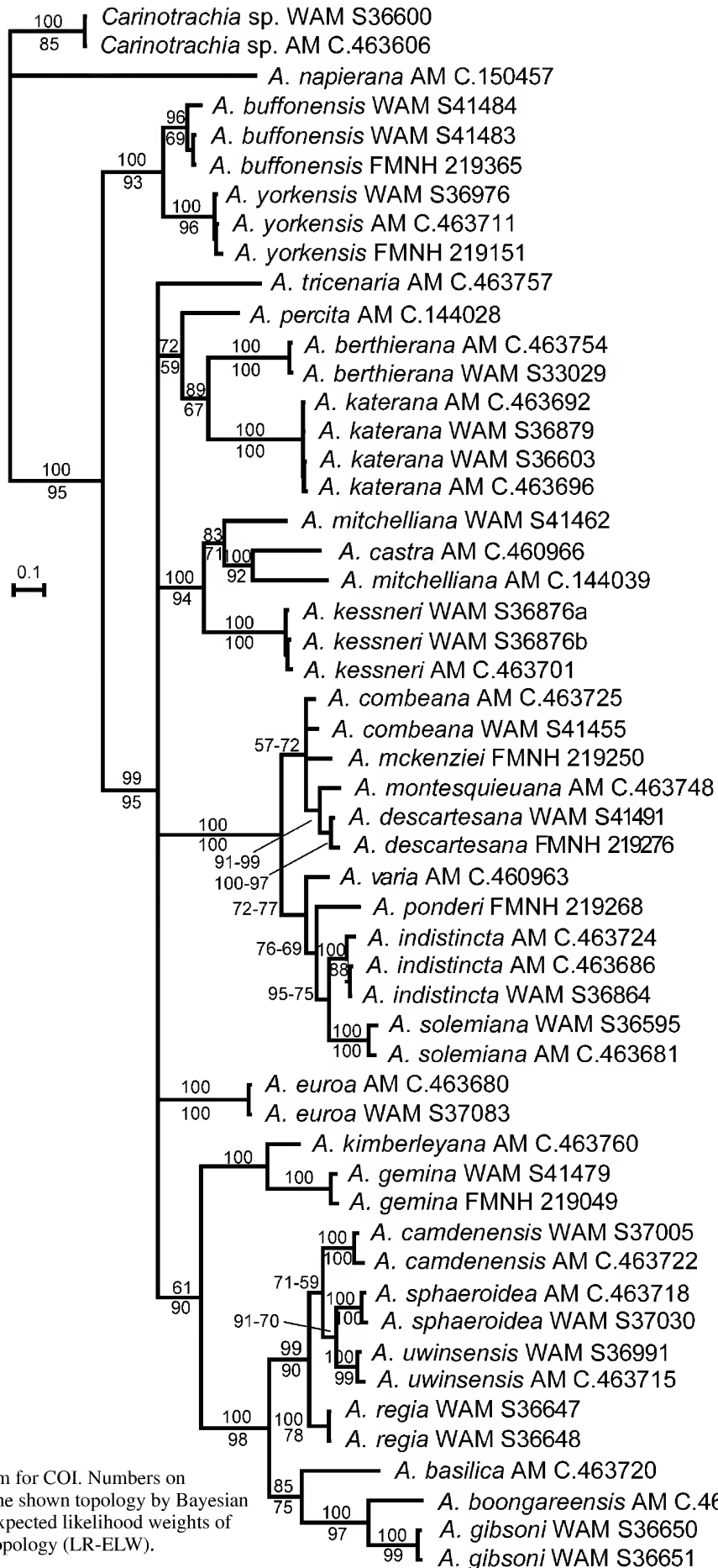


Figure 89. Bayesian phylogram for COI. Numbers on branches indicate support of the shown topology by Bayesian posterior clade probabilities/expected likelihood weights of local rearrangements of tree topology (LR-ELW).

Table 1. Shell parameters of *Amplirhagada* species, given in the form maximum–minimum (mean±standard deviation) measures of shells for *n* specimens.

	<i>n</i>	height (H)	diameter (D)	height of last whorl (LW)	umbilicus (U)	number of whorls (N)	H/D ratio
<i>A. euroa</i>	13	12.3–13.9 (13.0±0.5)	18.5–20.3 (19.6±0.4)	9.6–11.0 (10.4±0.4)	chink	4.6–4.9 (4.8±0.1)	0.62–0.70 (0.66±0.02)
holotype		13.0	19.2	10.6	chink	4.8	0.68
<i>A. solemiana</i>	20	9.9–12.2 (11.2±0.6)	16.2–18.4 (17.6±0.6)	8.3–10.0 (9.3±0.4)	0–1.0	4.0–5.1 (4.6±0.3)	0.59–0.69 (0.63±0.03)
holotype		11.0	18.5	9.3	1.0	4.4	0.59
<i>A. indistincta</i> (SW Osborn Is)	25	11.4–14.8 (13.5±1.0)	18.5–21.2 (19.7±0.7)	7.9–11.8 (9.4–1.3)	close–chink	4.2–5.0 (4.6±0.2)	0.58–0.79 (0.68±0.05)
holotype		12.7	20.0	10.3	close	4.5	0.64
<i>A. indistincta</i> (Kidney Is)		13.2–16.6 (14.8±1.1)	18.5–21.0 (19.9±0.7)	10.9–12.7 (11.7±0.6)	close	4.5–5.3 (5.0±0.3)	0.68–0.81 (0.74±0.04)
<i>A. combeana</i>	23	11.5–13.9 (12.8±0.7)	16.0–18.9 (17.5±0.8)	9.2–11.3 (10.2–0.5)	close–chink	4.2–4.8 (4.5±0.2)	0.65–0.80 (0.73±0.03)
<i>A. mckenziei</i> (Oliver Is)	7	12.3–14.4 (13.4±0.8)	18.0–19.8 (18.7±0.6)	10.0–11.0 (10.8–0.4)	0–1.5	4.3–4.8 (4.5±0.2)	0.65–0.76 (0.71±0.04)
holotype		12.3	19.0	11.0	chink	4.3	0.65
<i>A. mckenziei</i> (islet nr Oliver Is)	14	10.5–13.0 (11.6±0.7)	15.5–18.2 (16.7±0.8)	8.8–10.3 (9.3±0.5)	close–narrow	3.9–4.5 (4.3±0.2)	0.64–0.74 (0.69±0.02)
<i>A. ponderi</i> holotype		13.8	20.0	11.8	2.0	4.6	0.65
paratype		13.8	21.3	11.6	2.5	4.6	0.69
<i>A. montesquieuana</i>	17	9.4–11.6 (10.4±0.6)	15.0–17.8 (16.3±0.8)	7.9–9.5 (8.7±0.5)	chink	4.0–4.5 (4.3±0.2)	0.55–0.70 (0.64±0.04)
holotype		11.6	17.8	9.4	chink	4.5	0.65
<i>A. descartesana</i>	23	11.6–14.5 (13.3±0.8)	16.5–18.8 (17.9±0.7)	9.3–11.4 (10.5±0.5)	0–2.5	4.3–5.1 (4.7±0.2)	0.66–0.81 (0.74±0.03)
holotype		13.8	17.7	10.8	chink	4.8	0.78
<i>A. katerana</i>	45	12.8–20.9 (15.9±1.8)	19.3–25.0 (22.1±1.5)	10.0–14.2 (11.9±1.0)	chink to narrow	4.3–5.6 (5.0±0.3)	0.60–0.84 (0.72±0.06)
<i>A. puescheli</i>	18	11.0–13.3 (12.0±0.8)	17.8–21.8 (19.3±1.0)	9.0–11.2 (10.0±0.6)	0–2.0	4.0–5.0 (4.5±0.4)	0.57–0.72 (0.62±0.03)
holotype		13.0	20.0	10.9	chink	4.5	0.65
<i>A. decora</i>	23	14.8–20.6 (17.8±1.4)	18.2–22.0 (19.9±0.9)	10.4–14.4 (12.6±0.8)	close	3.5–4.7 (4.3±0.3)	0.79–1.04 (0.89±0.06)
holotype		16.8	20.0	12.7	close	4.4	0.84
<i>A. kessneri</i>	16	9.7–14.9 (12.4±1.4)	15.0–21.6 (19.0±1.8)	6.7–8.5 (7.6±0.5)	0–2.5	4.0–5.0 (4.6±0.3)	0.61–0.71 (0.65±0.03)
holotype		13.2	20.0	10.0	2.5	5.0	0.66
<i>A. berthierana</i>	9	15.5–19.8 (18.3±1.3)	21.0–23.2 (22.3±0.7)	12.5–15.7 (14.2±0.9)	close–chink	4.7–5.5 (5.1±0.2)	0.74–0.87 (0.82±0.04)
holotype		19.0	23.1	14.8	chink	5.2	0.82
<i>A. lamarckiana</i>	16	14.8–19.0 (16.5±1.2)	18.6–23.4 (20.4±1.1)	10.8–14.3 (12.6±0.8)	close–chink	4.2–5.1 (4.6±0.2)	0.75–0.89 (0.81±0.04)
holotype		17.6	22.2	14.1	close	4.8	0.79
<i>A. andersonensis</i>	14	13.7–16.1 (14.6±0.7)	19.0–21.6 (20.4±0.8)	10.8–12.1 (11.6±0.4)	close–chink	4.6–5.2 (4.9±0.2)	0.66–0.76 (0.72±0.03)
holotype		14.8	20.2	12.1	close	4.6	0.73
<i>A. tricenaria</i>	7	16.0–19.8 (18.1±1.3)	23.1–24.5 (23.9±0.5)	13.5–14.3 (13.9±0.3)	chink	5.1–5.6 (5.3±0.2)	0.69–0.83 (0.76±0.05)
holotype		18.5	24.2	14.1	chink	5.4	0.76
<i>A. regia</i>	20	14.5–18.2 (16.6±1.0)	21.8–26.0 (23.4±1.1)	11.4–14.6 (13.0±0.7)	close–chink	5.0–5.5 (5.3±0.1)	0.64–0.79 (0.71±0.05)
holotype		18.2	23.4	13.1	chink	5.5	0.78
<i>A. boongareensis</i>	28	15.1–22.8 (20.0±1.8)	18.9–21.9 (20.6±0.8)	8.1–12.9 (9.4±1.2)	close–chink	4.5–6.8 (6.0±0.6)	0.80–1.12 (0.97±0.07)
holotype		21.0	21.2	12.9	close	5.3	0.99
<i>A. gibsoni</i>	16	12.0–14.9 (13.3±0.7)	17.1–19.2 (18.1±0.7)	6.4–10.6 (8.1±1.4)	chink	4.4–5.6 (5.2±0.3)	0.70–0.82 (0.74±0.03)
holotype		13.7	18.3	10.5	chink	5.4	0.75
<i>Amplirhagada</i> sp.	4	14.4–16.7 (15.5±0.8)	17.3–18.8 (18.4±0.6)	7.6–8.9 (8.3±0.5)	close	5.0–5.9 (5.6±0.4)	0.81–0.89 (0.84±0.03)
typical specimen		15.6	18.5	7.6	close	5.8	0.84
<i>A. yorkensis</i>	15	8.4–10.4 (9.4±0.6)	15.5–18.8 (17.3±0.9)	7.2–8.6 (8.0±0.4)	2.0–2.5	4.1–4.5 (4.3±0.1)	0.49–0.60 (0.54±0.03)
holotype		9.4	17.9	8.1	2.0	4.4	0.53
<i>A. buffonensis</i> (Buffon Is)	11	10.5–11.8 (11.1±0.4)	16.1–19.3 (18.2±1.0)	7.8–9.4 (8.7±0.5)	2.2–2.8 (2.6±0.2)	4.3–5.0 (4.5±0.2)	0.55–0.62 (0.59±0.02)
holotype		10.5	18.9	9.4	2.5	4.6	0.56

Table 1 (continued). Shell parameters of *Amplirhagada* species, given in the form maximum–minimum (mean±standard deviation) measures of shells for *n* specimens.

	<i>n</i>	height (H)	diameter (D)	height of last whorl (LW)	umbilicus (U)	number of whorls (N)	H/D ratio
<i>A. buffonensis</i> (islet nr Buifon Is)	5	9.5–9.8 (9.7±0.1)	16.1–17.3 (16.8±0.5)	7.8–8.5 (8.1±0.2)	2.2–2.7 (2.4±0.2)	4.3–4.5 (4.4±0.1)	0.55–0.61 (0.58±0.02)
<i>A. uwinsensis</i>	23	14.3–17.1 (15.6±0.7)	20.0–23.2 (21.7±0.8)	11.3–13.2 (12.2±0.4)	close	4.8–5.4 (5.1±0.2)	0.66–0.76 (0.72±0.02)
holotype		15.4	21.9	12.2	close	5.2	0.70
<i>A. sphaeroides</i>	8	13.5–15.8 (14.9±0.7)	20.9–23.0 (22.0±0.7)	11.1–12.9 (11.9±0.5)	close–chink	5.2–5.5 (5.3±0.1)	0.62–0.72 (0.68±0.03)
holotype		15.8	22.4	12	chink	5.5	0.71
<i>A. basilica</i>	13	14.4–17.2 (15.7±0.7)	22.1–27.0 (23.6±1.2)	11.9–13.1 (12.6±0.4)	chink	5.1–5.4 (5.2±0.1)	0.56–0.73 (0.66±0.04)
holotype		16.4	24.2	13.1	chink	5.4	0.68
<i>A. camdenensis</i>	11	14.8–17.3 (16.2±0.8)	18.7–19.8 (19.2±0.4)	11.1–12.3 (11.6±0.3)	0–2.5	4.8–5.3 (5.2±0.1)	0.78–0.89 (0.85±0.03)
holotype		16.7	19.2	11.6	chink	5.3	0.87
<i>A. kimberleyana</i>	13	11.0–15.3 (12.7±1.1)	16.2–19.6 (17.6±1.0)	8.8–11.5 (10.0±0.7)	0–1.5	4.1–4.8 (4.4±0.2)	0.65–0.78 (0.72±0.04)
holotype		15.3	19.6	11.5	chink	4.8	0.78
<i>A. gemina</i>	3	12.3–13.7 (13.1±0.6)	18.2–19.8 (19.2±0.7)	9.7–11.1 (10.6±0.6)	chink	4.3–4.6 (4.4±0.1)	0.68–0.69 (0.68±0.01)
holotype		13.3	19.6	11.0	chink	4.6	0.68
<i>A. dubitabile</i>	9	10.6–12.0 (11.4±0.5)	16.6–19.7 (17.9±0.9)	8.4–9.6 (9.2±0.4)	2.0–2.5 (2.1±0.2)	4.1–4.6 (4.3±0.1)	0.56–0.66 (0.64±0.03)
holotype		11.4	17.5	9.2	2.0	4.2	0.65

distributions, with clades comprising species from regional island groups plus the adjacent mainland. This is consistent with several clades having colonized islands more or less simultaneously from different centres of origin along the mainland coast. Rates of genetic differentiation between species are generally high, suggesting that species became separated a long time ago. Moreover, genetic distances between the mainland species are not significantly different from those between the island species or between species from islands and mainland. This seems to indicate that for the evolution of these snails it is not relevant whether their insular habitats are isolated by means of surrounding sea or other hostile environments.

It would be helpful to know when exactly the islands of the Bonaparte Archipelago were colonized by *Amplirhagada* snails in order to understand whether dispersal or vicariance played a major role. However, attempting to deduce the age of the group from estimated rates of sequence evolution, would be an arbitrary endeavour. Wilke *et al.*, (2009) have suggested the applicability of a local molecular clock for small invertebrates. However, it has also been demonstrated that evolutionary rates on islands may be accelerated (Chiba, 1999b; Millien, 2006). In addition, it remains unclear whether the clock suggested by Wilke *et al.* (2009) for freshwater caenogastropods would be applicable to pulmonates, which were stated to show accelerated rates of molecular evolution (Thomaz *et al.*, 1996; Chiba, 1999b; Watanabe & Chiba, 2001; Pinceel *et al.*, 2005). The latter two phenomena undermine the reliability of a molecular clock approach by assuming rates similar to those in caenogastropods. When a very coarse general estimate of 1 to 2% substitution rates per million years in the COI gene of invertebrates was considered (Wilke *et al.*, 2009), observed substitution rates of around 30% were taken to indicate divergence times for most species of several million years and that sea level changes during the Pleistocene, which may have periodically re-connected islands with the mainland, did not have a great impact on the patterns that may well have evolved prior to these events.

Johnson *et al.* (2010) studied *Amplirhagada* species on 16 Kimberley islands that are only partly covered by the present study on a finer spatial scale and came to very similar conclusions. They showed that the mitochondrial variation across the populations on the 16 islands correlates tightly with the geographical patterns. Genetic divergence was generally found to be low within local populations but much higher when populations from different islands were compared. Unfortunately, this study remained inconclusive with respect to the number of species involved. The authors found 16–27% sequence divergence in a small fragment of the 16S rRNA gene between major clades of *Amplirhagada* that are separated by 10 to 160 km. It is demonstrated herein that such distances are equivalent to the differentiation at the species level, which implies that Johnson *et al.* (2010) dealt indeed with several distinct, yet mostly unrecognized species. The phylogeographic patterns further revealed that species are restricted to single islands or smaller groups of closely adjacent islands. This finding corresponds well with the results of the present study. Johnson *et al.* (2010) concluded that even when accelerated evolutionary rates of 10 to 12.9 % per million years were considered, as reported from some land snails (Thomaz *et al.*, 1996; Chiba, 1999b; Thacker & Hadfield, 2000), the amount of differentiation found in *Amplirhagada* would indicate divergence times of species of at least 1.5 to

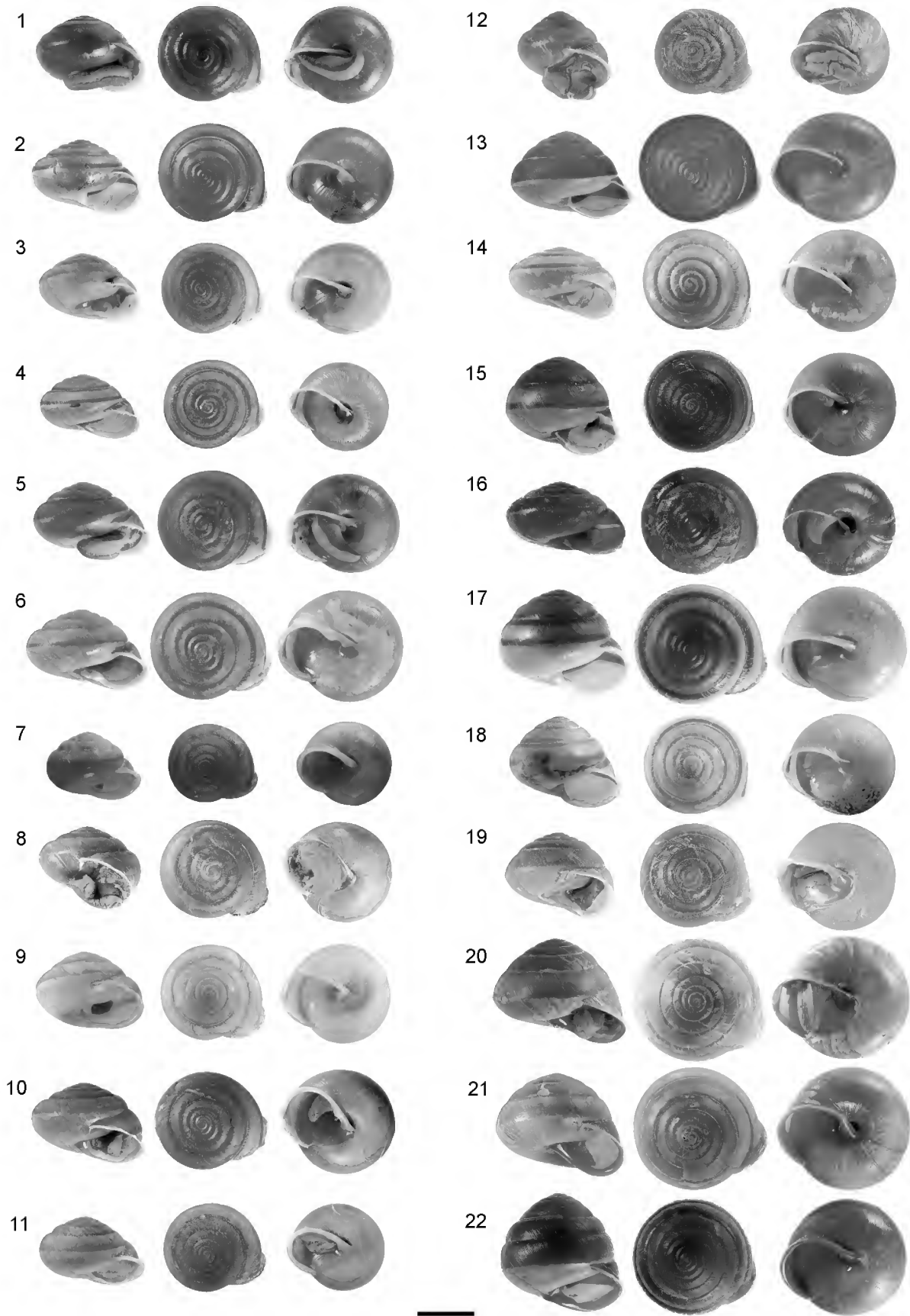


Plate 1. [Shells of *Amplirhagada* species (natural size, scale bar = 10 mm) . Caption given on page 282].

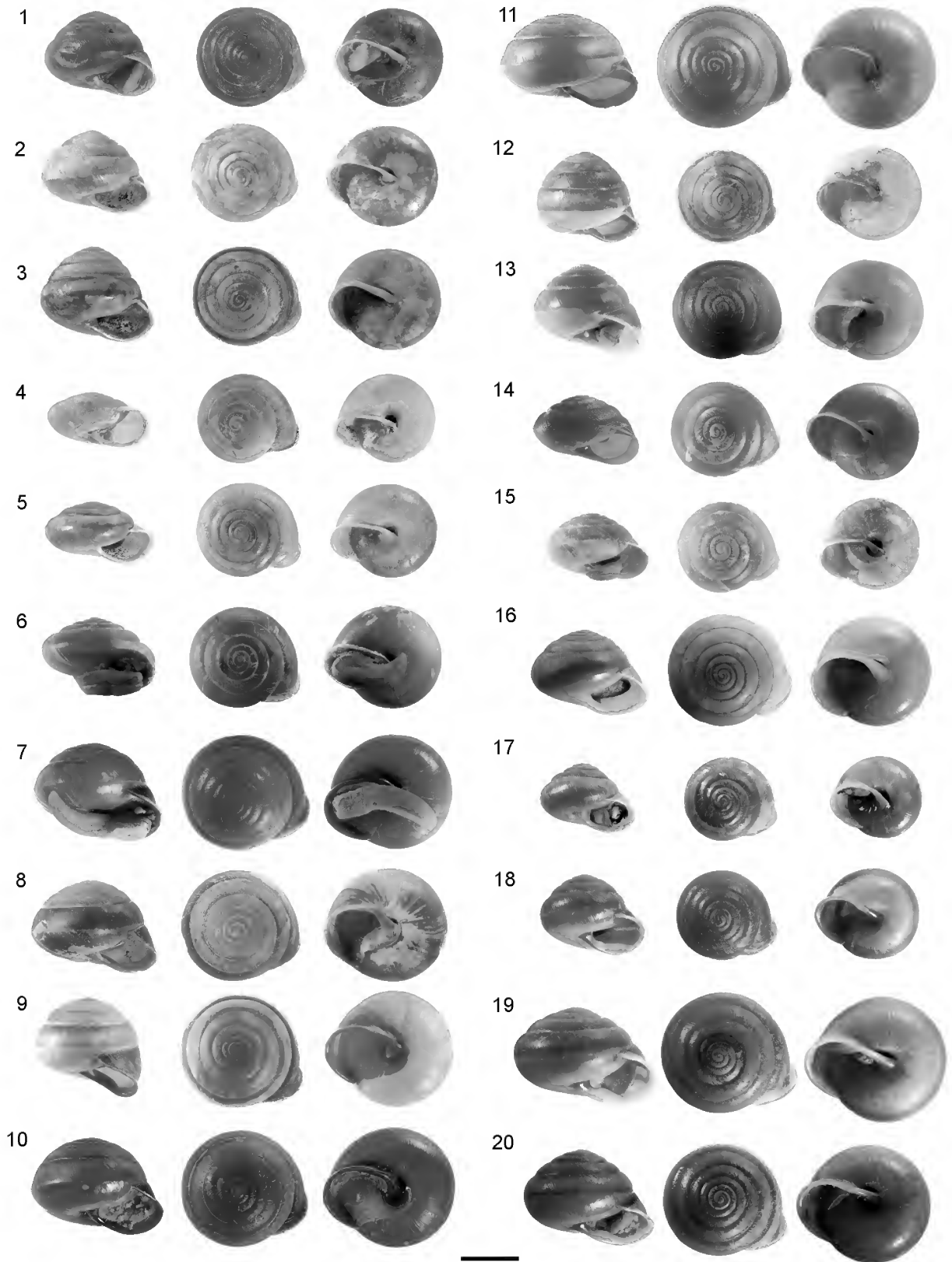


Plate 2. [Shells of *Amplirhagada* species (natural size, scale bar = 10 mm) . Caption given on page 282].

Plate 1 (page 280). Shells of *Amplirhagada* species (natural size, scale bar = 10 mm). (1.1) *A. euroa* n.sp. holotype WAM S34601. (1.2) *A. euroa* n.sp. paratype WAM S37392. (1.3) *A. solemiana* n.sp. holotype WAM S34602. (1.4) *A. solemiana* n.sp. paratype WAM S36572. (1.5) *A. indistincta* n.sp. holotype WAM S34603. (1.6) *A. indistincta* n.sp. paratype WAM S36499. (1.7) *A. combeana* WAM S41450. (1.8) *A. mckenziei* n.sp. holotype WAM S34604. (1.9) *A. mckenziei* n.sp. paratype FMNH 219253. (1.10) *A. ponderi* n.sp. holotype WAM S34605. (1.11) *A. montesquieuana* n.sp. holotype WAM S34606. (1.12) *A. descartesana* holotype WAM S34607. (1.13) *A. katerana* WAM S36580. (1.14) *A. puescheli* n.sp. holotype WAM S34608. (1.15) *A. decora* n.sp. holotype WAM S34609. (1.16) *A. kessneri* n.sp. holotype WAM S34610. (1.17) *A. berthierana* n.sp. holotype WAM S34611. (1.18) *A. lamarckiana* n.sp. holotype WAM S34612. (1.19) *A. andersonensis* n.sp. holotype WAM S34613. (1.20) *A. tricenaria* n.sp. holotype WAM S34614. (1.21) *A. regia* n.sp. holotype WAM S34615. (1.22) *A. boongareensis* n.sp. holotype WAM S34616. Note that foot protrudes from shell in some cases.

Plate 2 (page 281). Shells of *Amplirhagada* species (natural size, scale bar = 10 mm). (2.1) *A. gibsoni* n.sp. holotype WAM S34617. (2.2) *A. gibsoni* n.sp. paratype AMS C463708. (2.3) *Amplirhagada* sp. Bigge Island, WAM S36953. (2.4) *A. yorkensis* n.sp. holotype WAM S34619. (2.5) *A. yorkensis* n.sp. paratype WAM S37401. (2.6) *A. buffonensis* n.sp. holotype WAM S34620. (2.7) *A. uwinsensis* n.sp. holotype WAM S34621. (2.8) *A. uwinsensis* n.sp. paratype WAM S37441. (2.9) *A. uwinsensis* n.sp. paratype AMS C463716. (2.10) *A. sphaeroidea* n.sp. holotype WAM S34622. (2.11) *A. basilica* n.sp. holotype WAM S34623. (2.12) *A. camdenensis* n.sp. holotype WAM S34624. (2.13) *A. kimberleyana* n.sp. holotype WAM S34625. (2.14) *A. gemina* n.sp. holotype WAM S34626. (2.15) *A. dubitabile* n.sp. holotype WAM S34627. (2.16) *A. napierana* AMS C150457. (2.17) *A. percita* AMS C144028. (2.18) *A. varia* AMS C460963. (2.19) *A. mitchelliana* WAM S41462. (2.20) *A. castra* AMS C460966. Note that foot protrudes from shell in some cases.

2 million years. In this period of time, particularly during the Pleistocene, the studied islands were repeatedly interconnected due to periodically lowered sea levels. However, the species have maintained distinctiveness on a small geographical scale over this period of time, which implies that fluctuating sea levels during Pleistocene did not influence the processes of genetic differentiation or allopatric speciation.

In general, narrow-range endemics, such as the Kimberley camaenids, are promising candidates for the study of speciation and adaptation. While the isolated occurrence of most species may suggest allopatric speciation as the predominant mode, Schilthuizen & Scott (2004) have stressed that for a number of model cases including Western Australian camaenids, a strong ecological component may also be involved. Observed cases of character displacement in sympatric species also points towards the relevance of ecological factors and sexual selection in these species. Hence, further studies are needed that address aspects of speciation, adaptation and radiation in *Amplirhagada* in more detail. Markedly different patterns of morphological versus genetic differentiation were found in the camaenid snail *Rhagada* in Dampierland, Western Australia. In these snails, high levels of morphological differentiation were accompanied by generally very low levels of genetic differentiation (Johnson *et al.*, 2004). A comparative study of the contrasting patterns in these two Western Australian camaenid genera may help to better understand the factors that drive the evolution of Australian Camaenidae.

With respect to overall species diversity, the Kimberley with its approximately 180 known camaenid species (Solem, 1998) is comparable with many textbook cases of mega-

diverse island faunas (Whittaker, 1998). Moreover, given the large number of still unsurveyed islands off the mainland coast and other equally inaccessible regions on the mainland, the number of yet undiscovered species in the Kimberley is without doubt considerable. *Amplirhagada* may be taken as a prime example to estimate the proportion of yet undescribed species in relation to what is already known. Thirty species are currently considered as valid (Solem, 1981a, 1988). However, museum material examined by Solem contains some further 35 *Amplirhagada* species to be described, which includes the 25 unnamed species reported by Solem (1991). Here, only eleven of these species are described. Additional species descriptions are based on materials collected during the ongoing Kimberley Island Survey in 2007–2008 on eight larger islands. During survey work conducted in 2009 we found probably another six currently unknown species of *Amplirhagada*, which are not included here. Consequently, at this stage there are 57 named plus 30 yet to be described *Amplirhagada* species. These numbers include species collected on approximately 25 islands of the Bonaparte Archipelago, which includes the 19 largest islands of this archipelago. However, the snail fauna of at least 50 larger islands in this region remains entirely unknown. If only every second island supports an endemic *Amplirhagada* species, which is probably a conservative estimate, than there might be 25 undiscovered species on top of the numbers given above. It can only be speculated, how many species await discovery on the mainland but less than half of the species diversity in *Amplirhagada* is likely documented so far. There is no reason to assume that these figures are different for other camaenid genera in the area.

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A Revision of the Australian Funnel-web Spiders (Hexathelidae: Atracinae)

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ABSTRACT. The Australian funnel-web spiders of the subfamily Atracinae are revised. The Atracinae are divided into three genera—*Atrax* O.P.-Cambridge with three species (two new), *Hadronyche* L. Koch with 31 species (18 new), and *Illawarra* n.gen. with one new species. *Hadronyche* is divided into four species groups—the *lamingtonensis*, *adelaidensis*, *infensa* and *cerbera* groups. Fourteen previously described species are redescribed or diagnosed. Twenty one new species are described: *Atrax sutherlandi* n.sp., *A. yorkmainorum* n.sp., *Illawarra wisharti* n.sp., *Hadronyche alpina* n.sp., *H. emmalizae* n.sp., *H. marracoonda* n.sp., *H. monaro* n.sp., *H. tambo* n.sp., *H. nimoola* n.sp., *H. mascordi* n.sp., *H. jensenae* n.sp., *H. orana* n.sp., *H. lynabrae* n.sp., *H. kaputarensis* n.sp., *H. levittgreggae* n.sp., *H. macquariensis* n.sp., *H. walkeri* n.sp., *H. raveni* n.sp., *H. lamingtonensis* n.sp., *H. annachristiae* n.sp. and *H. monteithi* n.sp. Two species described from Melanesia, *H. hirsuta* Rainbow and *Styphlopis insularis* Rainbow, are regarded as *nomen dubia*.

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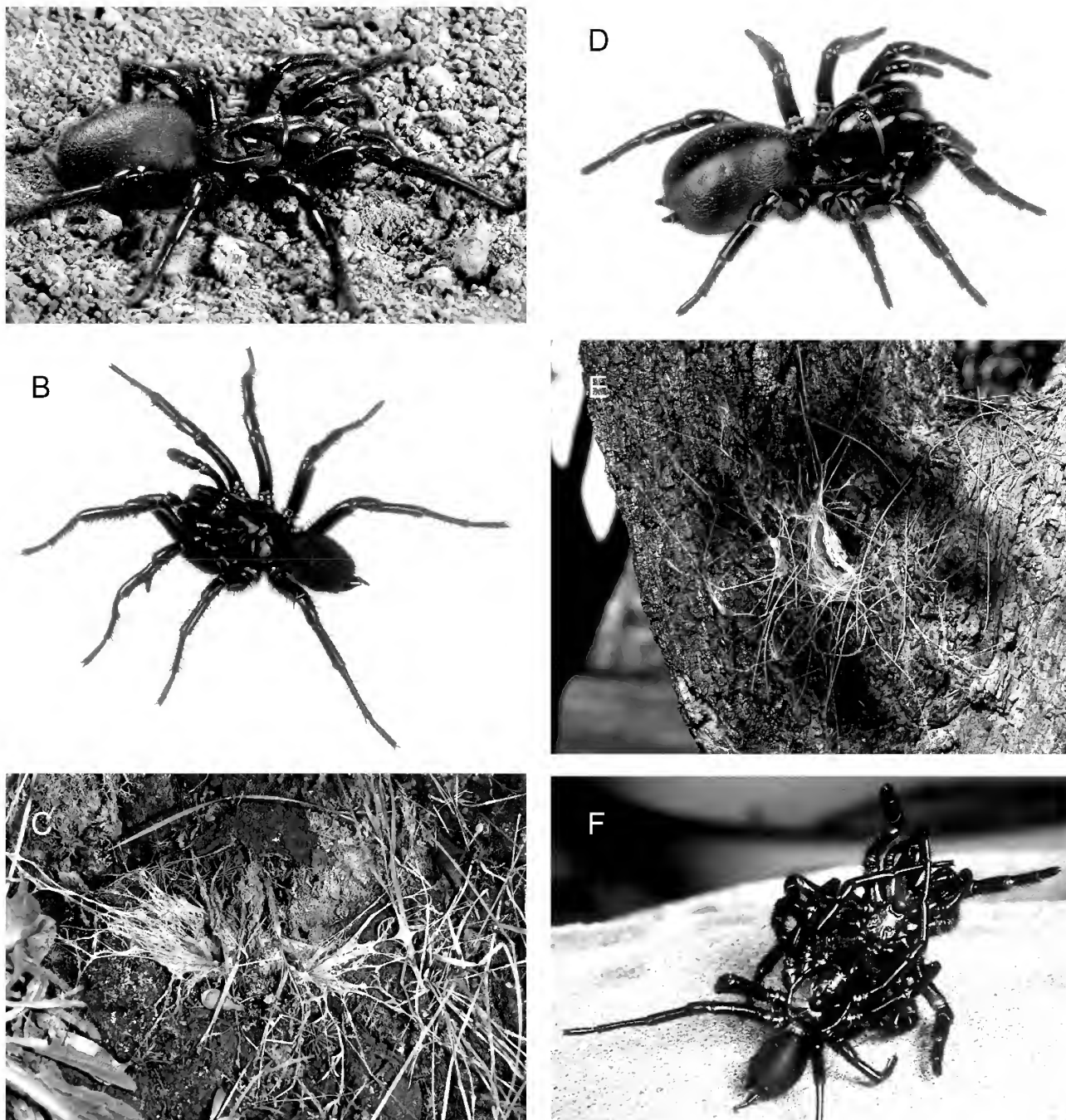
The atracine spiders include some of the most venomous animals in the world. They have been responsible for many serious envenomations and at least 13 deaths in Australia (Sutherland & Tibballs, 2001). Much of their notoriety can be attributed to a single species, *Atrax robustus* O.P.-Cambridge, 1877, better known as the Sydney funnel-web spider.

Fourteen valid atracine species have been described previously (Table 1)—the first by L. Koch (1873) as *Hadronyche cerberea*. Work by Gray (1986) resulted in preliminary reports on atracine spider relationships and distribution (Gray, 1987, 1988). This publication provides the first taxonomic revision of the group. It includes re-descriptions of valid genera and species, and descriptions of a new genus (*Illawarra* n.gen.) and twenty-one new species (*Atrax sutherlandi* n.sp., *A. yorkmainorum* n.sp., *Illawarra wisharti* n.sp., *Hadronyche alpina* n.sp., *H. emmalizae* n.sp., *H. marracoonda* n.sp., *H. monaro* n.sp., *H. tambo* n.sp., *H. nimoola* n.sp., *H. mascordi* n.sp., *H. jensenae* n.sp., *H. orana* n.sp., *H. lynabrae* n.sp., *H. kaputarensis* n.sp., *H. levittgreggae* n.sp., *H. macquariensis* n.sp., *H. walkeri* n.sp., *H. raveni* n.sp., *H. lamingtonensis* n.sp., *H. annachristiae* n.sp., *H. monteithi* n.sp.). A full list of atracine species is given in Appendix 1. Recent genetic studies (e.g., Beavis &

Rowell, 2006) and morphological observations suggest that many more species await characterization.

Valid distribution records of atracine spiders are limited to eastern Australia, including Tasmania and the Gulf region of South Australia—the Eyre Peninsula marks the current western limit of the group (Fig. 2; Gray, 1987). The description of *Hadronyche anzses* Raven, 2000 from the Mosman region in north Queensland greatly extended knowledge of the northern distribution of the group from its former known limits in southeastern Queensland.

The Atracinae are typically a moist-adapted forest dwelling group, but they can be found in habitats ranging from montane hermland and open woodland to closed forest. Most species are ground dwellers that occupy burrow retreats in sheltered microhabitats—under rocks and logs, inside rotting logs and stumps, and on stable, vegetated or mossy soil banks (Fig. 1C). Ground burrowers often make use of natural soil crevices such as rotted root channels. At least two species (*H. cerberea* and *H. formidabilis* [Rainbow, 1914]) are associated with standing trees, their retreats occupying trunk holes resulting from branch fractures or borer damage, as well as the rotted internal pipes of older trees (Fig. 1E). Most atracine spider retreats are characterized



The original caption has been corrected by the author on this replacement page. The original PDF of the entire work (dated 25 November 2010) has been replaced by the present PDF (dated 7 August 2012) which has the replacement page inserted [Editor, 7 August 2012].

Figure 1. (A) *Atrax robustus*, female; (B) *A. robustus*, male; (C) *Hadronyche macquariensis* n.sp., burrow with two entrances on soil bank; (D) *H. versuta*, female; (E) *H. cerbera*, single entrance retreat in rot-hole on tree trunk (*Casuarina* sp.); (F) *H. formidabilis*, mating (photo: P. Walker).

by the presence of silk trip-lines radiating out from a silk entrance sheet (Fig. 1E). The entrance tunnel (typically one to three) usually has a crescentic opening with the surface part of the silk lumen more or less collapsed when not in use—perhaps as a predator deterrent. A few, more specialized atracine species have burrow entrances opening within the litter layer, and they lack any trip-lines. These species include *Illawarra wisharti* n.sp., and the “*adelaidensis* group” species of *Hadronyche*—the latter species are unique in having an internal burrow chamber with a trapdoor (Main,

1967; Gray, 1984). Biological data on atracine spiders are mostly anecdotal (e.g., McKeown, 1963) or associated with field collecting observations (Main, 1976; Gray, 1986), apart from a few studies by Levitt (1961), Bradley (1993) and Wishart (1993). Of particular interest are atracine eco-evolutionary studies by Cooley (1989) on diet related character displacement in sympatric species, Woodman *et al.* (2006) on climatic impacts on saproxylic habitats and demography of associated atracines, and a genetic phylogeographic study by Beavis & Rowell (2006).

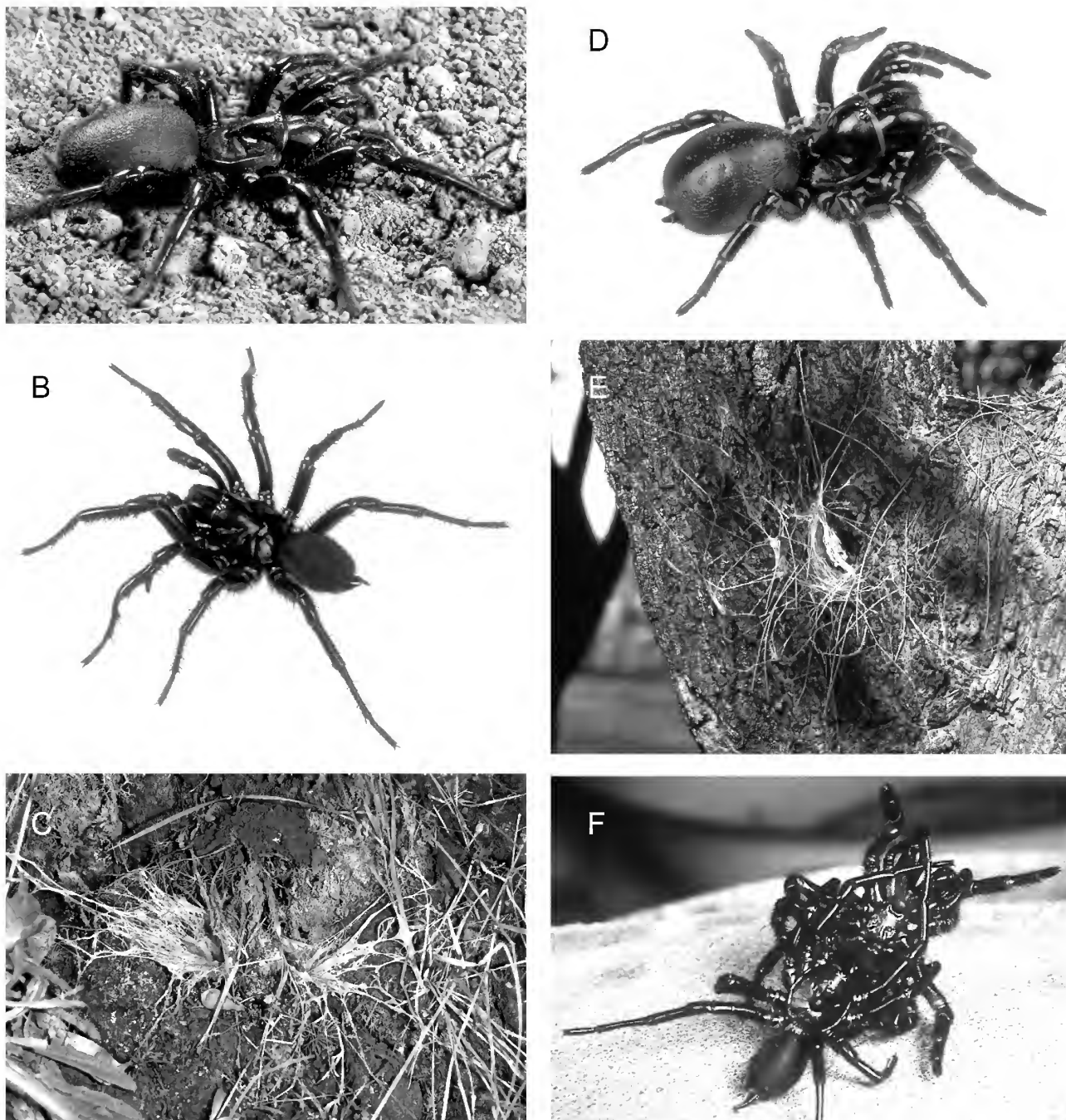


Figure 1. (A) *Atrax robustus*, female; (B) *Hadronyche versuta*, female; (C) *A. robustus*, male; (D) *H. cerbera*, single entrance retreat in rot-hole on tree trunk (*Casuarina* sp.); (E) *H. macquartiensis* n.sp., burrow with two entrances on soil bank; (F) *H. formidabilis*, mating (photo: P. Walker).

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Table 1. Atracinae—list of valid taxa, synonyms and transfers.

valid species—current placement (transfers from <i>Atrax</i> to <i>Hadronyche</i> by Gray, 1988)	original name, synonyms and transfers
<i>Hadronyche cerbera</i> L. Koch, 1873 <i>Atrax robustus</i> O.P.-Cambridge, 1877	<i>Hadronyche cerbera</i> L. Koch, 1873 <i>Atrax robustus</i> O.P.-Cambridge, 1877 <i>Euctimena tibialis</i> Rainbow, 1914 (synonymy with <i>A. robustus</i> by Musgrave, 1927). <i>Poikilomorpha montana</i> Rainbow, 1914 (transfer to <i>Atrax</i> by Main, 1985 after Gray, 1978. Synonymy with <i>A. robustus</i> by Gray, 1988).
<i>Hadronyche modesta</i> (Simon, 1891) <i>Hadronyche meridiana</i> Hogg, 1902 <i>Hadronyche versuta</i> (Rainbow, 1914)	<i>Atrax modesta</i> Simon, 1891 <i>Hadronyche meridiana</i> Hogg, 1902 <i>Atrax versutus</i> Rainbow, 1914 <i>Pseudatrx moreaui</i> Rainbow, 1914 (transfer to <i>Atrax</i> by Main, 1985 after Gray, 1978. Synonymy with <i>H. versuta</i> by Gray, 1988). <i>Aname bicolor</i> Rainbow, 1914 (transfer to <i>Atrax</i> by Rainbow & Pulleine, 1918. Synonymy with <i>H. versuta</i> by Gray, 1988).
<i>Hadronyche formidabilis</i> (Rainbow, 1914) <i>Hadronyche valida</i> (Rainbow & Pulleine, 1918)	<i>Atrax formidabilis</i> Rainbow, 1914 <i>Atrax validus</i> Rainbow & Pulleine, 1918. Transfer to <i>Hadronyche</i> by Gray, 1988). <i>Anepsiada ventricosa</i> Rainbow & Pulleine, 1918. Synonymized with <i>A. validus</i> (Gray, in Main, 1985).
<i>Hadronyche pulvinator</i> (Hickman, 1927) <i>Hadronyche venenata</i> (Hickman, 1927) <i>Hadronyche infensa</i> (Hickman, 1964) <i>Hadronyche adelaidensis</i> (Gray, 1984) <i>Hadronyche flindersi</i> (Gray, 1984) <i>Hadronyche eyrei</i> (Gray, 1984) <i>Hadronyche anzsas</i> Raven, 2000	<i>Atrax pulvinator</i> Hickman, 1927 <i>Atrax venenatus</i> Hickman, 1927 <i>Atrax infensus</i> Hickman, 1964 <i>Atrax adelaidensis</i> Gray, 1984 <i>Atrax flindersi</i> Gray, 1984 <i>Atrax eyrei</i> Gray, 1984 <i>Hadronyche anzsas</i> Raven, 2000
nomen dubia <i>Styphlopis insularis</i> Rainbow, 1913. Solomon Islands. <i>Hadronyche hirsuta</i> Rainbow, 1920. Papua [= Papua New Guinea]. (Listed with comments in Main, 1985).	

Taxonomic history

Atracine spiders were first described by L. Koch (1873) who erected the genus *Hadronyche* for *H. cerbera* L. Koch, 1873 from Sydney, New South Wales. Four years later O.P.-Cambridge erected a second genus, *Atrax*, for *A. robustus* O.P.-Cambridge, 1877 (locality “Australia”). Both species were described from females. The female syntypes of *H. cerbera* were destroyed during World War II (Main, 1985). The resultant uncertain identity of this species was discussed by Gray (1981, 1986) and *H. cerbera* was fixed as the southern tree funnel-web spider, a species common in the Sydney region.

By 1920, 14 species had been described, some more than once, in no less than eight genera. Of these taxa, only seven species and two genera are now recognized as valid (Table 1). Most species described during that period were based only upon females or, even more uninformatively, juveniles, i.e. generally character poor and taxonomically difficult specimens—and several had suspect locality data. The only species described from male spiders were *H. meridiana* Hogg, 1902 and *Euctimena tibialis* Rainbow, 1914—the latter spider proved to be a male of *Atrax robustus* (Musgrave, 1927). Rainbow (1914) also described the female of *Atrax robustus* as *Poikilomorpha montana* Rainbow (synonymized by Gray, 1988—Table 1).

After 1920, the older generic name, *Hadronyche*, largely fell into disuse (although still listed in catalogues) and Atracinae were associated almost exclusively with the genus *Atrax* (Table 1). This process was facilitated both by

uncertainty about the taxonomic identity of the type species, *H. cerbera*, and the increasing medical notoriety of *A. robustus*. *Hadronyche* was listed in synonymy with *Atrax* by Raven (1980), from which it was implicitly removed by Main (1985) when she listed 11 species in *Atrax* and three in *Hadronyche*. Most of the species listed under *Atrax* in Main (1985) were subsequently transferred to *Hadronyche* (Gray, 1988). All atracine species now regarded as valid have been described from Australia. These species and their synonyms are listed in Table 1. Collection data for two species from Melanesia are regarded as unreliable (Main 1982, 1985).

The relationships of the Atracinae remain uncertain. Simon (1892) placed *Atrax* and *Hadronyche* within his Macrotheleae in the family Dipluridae. His key grouped them with the genera *Macrothele* and *Porrhothele* Simon, 1892 by the presence of labial cuspules. In 1901, Hogg erected the group Atracinae to distinguish these genera from the remaining members of Simon’s Macrotheleae. This distinction was based upon the sternal sigilla (large size and marginal position), presence of three rows of cheliceral teeth and the relatively short apical segment of the PLS.

Raven (1980, 1985) removed Simon’s Hexatheleae from the Dipluridae, elevating it to family status. Within his Hexathelidae he included part of Simon’s Macrotheleae, i.e., those quadrithelinae genera possessing labial cuspules (*Atrax*, *Porrhothele* and *Macrothele* Ausserer, 1871), making the possession of numerous labial cuspules the unifying character for the Hexathelidae. Gray (1988) re-instated the Atracinae, comprising *Hadronyche* and *Atrax* (Atracinae of Hogg, 1901), additionally distinguishing these taxa from

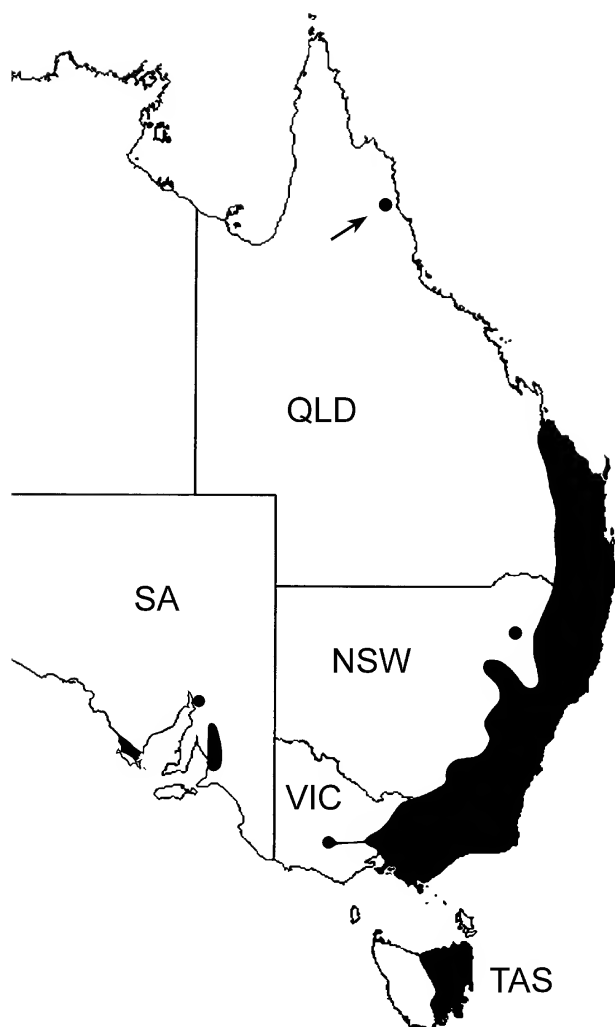


Figure 2. Distribution of atracine spiders in eastern Australia arrow points to locality of *Hadronyche anzses*).

Porrhothele and *Macrothele* by the presence of a wider embolus, strong retromarginal cheliceral teeth, maxillary lobe and procurved fovea.

Raven (1985) acknowledged difficulties with the placement of *Atrax* in the Hexathelidae and noted several characters that suggested possible (but less parsimonious) affinity with the Cyrtaucheniidae. Goloboff (1993), in his morphologically based reanalysis of mygalomorph relationships, found weak support for a monophyletic Hexathelidae. A molecular study of mygalomorph relationships (Hedin & Bond, 2006) did not find support for the monophyly of the Hexathelidae—*Atrax* and *Hadronyche* were always recovered as sister taxa but were not associated with other hexathelid taxa. However, as similar anomalies were recorded for several well established families, interpretation of these results is problematic.

Material and methods

Observations, measurements and illustrations were made using a Wild M5 stereomicroscope with measuring graticle and drawing attachment. All measurements are given in millimetres. Appendage illustrations are of the left hand side unless otherwise stated. Genitalic preparations were made using lactic acid or 4% KOH solution. SEM micrographs were made from ethanol dehydrated specimens, air dried and gold coated.

Notes on descriptions

Keys are given to atracine genera and species of *Hadronyche* and *Atrax*; *Illawarra* is monotypic. Identification to species requires male specimens.

In the species descriptions given below, measurement/count data given are for the holotype or specified paratype specimens. Additional range, mean and ratio data (which includes the paratype specimens) are given in tables accompanying the descriptions (males) or in Table 34 (females). Qualitative data given in descriptions refers to both holotype and paratype specimens. On a few occasions when type material was not available for re-description, non-type material is described and illustrated. Types, non-type figured or described material and *Other material examined* are listed with the descriptions.

Undescribed species dealt with in Gray (1986, 1987, 1988) were then identified by number codes. These codes are given in Appendix 2 with the corresponding species names allocated here.

Measurements and counts. Body, leg and palpal measurement positions are illustrated in Appendix 1. Measurements, counts and ratios given in keys and diagnoses refer to male spiders unless specifically noted as data from females.

Palpal organ (bulb). “Tegular area” refers to tegulum/subtegulum region of bulb. Palpal organ measurements, viz., bulb length; bulb width; embolus length and mid-width, plus other bulbal characters, viz. “basal embolus offset from tegulum” and “twisting of distal embolus”, are illustrated in Appendix 1. (Note: palpal orientation should be as shown in Appendix 1 “A”)

Colour. Atracine spiders are typically glossy black on the carapace and mat black, often with a plum tinge, on the dorsolateral abdomen. They rarely possess distinctive colour patterning that can be used to characterize species, and melanic pigmentation intensity and distribution may vary intraspecifically (pigment intensity also fades with preservation). In species descriptions any consistent variations in colour pattern are noted.

Leg spination. In descriptions, the total spine count per leg segment is given first. This count includes the ventral/retroventral spines (usually the most numerous spine category on the tibia, metatarsus and tarsus), plus any dorsal, prolateral and retrolateral spines present. Counts for the dorsal (d), prolateral (p) and retrolateral (r) spines are given in brackets after the total count. Total spine counts for selected leg segments are given in tables with the descriptions. Patellal counts include total ventral and prolateral dorsal spines, with the latter also numbered in brackets (pd) if present. Tibial and metatarsal counts refer to total ventral or retrolateral ventral (retroventral) spines, including apical ventrolateral spines and prolateral spines; the latter are also given separately in brackets when present.

Abbreviations

Morphology. BulbL—palpal bulb length; BulbW—palpal bulb width; CL—carapace length; CW—carapace width; CFW—carapace anterior width; CH—carapace height; ChGL—cheliceral groove length; ChGW—cheliceral groove width; ChGCT—cheliceral groove central row teeth number; CUSP—labium cuspule number; EmbL—embolus length; EmbmidW—width of embolus at middle; Fe1S—femur I spine number; LL—labium length; LW—labium width; Mt1S—metatarsus I spine number; Mt2S—metatarsus II spine number; Pa1S—patella I spine number; PalpTibL—male palpal tibia length; PalpTibW—male palpal tibia width; PalpFemS—male palpal femur spine number; PalpPatS—male palpal patella spine number; PalpTibS—male palpal tibia spine number; PLSAPL—posterior lateral spinneret apical segment length; PLSAPW—posterior lateral spinneret apical segment width; SL—sternum length; SW—sternum width; Ta1S—tarsus I spine number; Ti1S—tibia I spine number; Ti2S—tibia II spine number; STC—superior tarsal claws; STC2teeth—number of teeth on tarsus II superior claws; Pa3proS—patella III prolateral dorsal spine number.

Australian political boundaries (states). Qld—Queensland; NSW—New South Wales; VIC—Victoria; SA, South Australia.

Repository institutions. AMS—Australian Museum, Sydney; MNHN—Muséum national d'Histoire naturelle, Paris; NHM—Natural History Museum, London; QMB—Queensland Museum, Brisbane; QVM—Queen Victoria Museum, Launceston; MV—Museum Victoria, Melbourne; SAM—South Australian Museum, Adelaide; TM—Tasmanian Museum and Art Gallery, Hobart; ANIC—Australian National Insect Collection.

Specimen registration codes. AMS KS—prefix of Australian Museum, Sydney register numbers; S—prefix of Queensland Museum, Brisbane, register numbers.

Systematics

Family Hexathelidae Simon

Subfamily Atracinae Hogg

- Macrotheleae (part): Simon, 1892: 182.
 Atracinae Hogg, 1901: 250; Simon, 1903: 961, 968; Rainbow, 1913: 4, 1914: 252.
 Pseudotracheae Rainbow, 1914: 258, 259.
 Poikilomorphae Rainbow, 1914: 260, 162.
 Anaepsiadiidae Rainbow & Pulleine, 1918: 166; Roewer, 1942: 208.
 Atraxae Roewer, 1942: 207.
 Pseudoatraxae Roewer, 1942: 208.
 Atraxini Bücherl, 1971: 211.
 Macrothelinae (part): Musgrave, 1948: 77; Gray, 1978: 125; Raven, 1980: 254, 1985: 71, 441.
 Atracinae.—Gray, 1988: 115.

Diagnosis. Atracinae differs from Hexathelinae in having only 2 pairs of spinnerets and from Macrothelinae in having a relatively broad embolic shaft (not spiniform), cheliceral

retromargin with row of large teeth, posterior sternal sigilla large, maxillae with coniform anterior lobe, PLS relatively short, and fovea a transverse groove.

Description. Basic colour pattern: carapace, chelicerae and legs dark brown to black, sometimes a lighter reddish brown; carapace with a polished appearance; Abdomen brown to black often with a maroon tint; anterodorsal abdomen with a pair of unpigmented sigilla (often subdivided) which flank a weakly pigmented mid-dorsal patch of cuticle. Posterior to the sigilla are 3–5 pairs of more or less distinct, narrow chevron markings made up of small unpigmented sigilla-like spots. Abdomen with thin cover of dark hairs and bristles. Carapace almost glabrous, with striae, midline and marginal setae. Carapace with caput arched and weakly to strongly raised (Fig. 1A,D). Thoracic margins grooved. Fovea a transverse groove, straight to strongly procurved. Eye tubercle low or absent. Cheliceral groove with promarginal (few in *H. anzses*) and retromarginal tooth rows plus smaller teeth in a central irregular row(s) of variable length of (Figs. 3D, 5F); paturon robust, more so in females, with a distally widening dorsal band of strong dark hairs and bristles and a medial dorsofrontal swelling developed into boss-like protuberance in many *Hadronyche* spp. No intercheliceral tumescence. Fangs with ventrolateral longitudinal keels. Maxillae longer than wide with a strong coniform lobe anteromedially (Figs. 5A, 21E); serrula usually present (absent in *adelaidensis* group), serrula teeth variably clustered on apicodorsal face of maxillary lobe (Fig. 3H); numerous cuspules along medioventral surface of maxilla, dense basally, diminishing toward lobe (Fig. 3H). Labium large, more or less rectangular and rounded anteriorly, varying from clearly wider than long (i.e., relatively short) (Fig. 5A) to about as long as wide (i.e., relatively long) (Fig. 21E). Labial cuspules usually numerous, occasionally relatively few (c. 50–500); cuspules clustered over anteroventral half to two-thirds of labium (Fig. 3E). Labiosternal sigilla typically a wide transverse groove, rarely reduced to a pair of small, lateral sigilla (*H. mascordi*). Sternum ovoid, wide to moderately narrow, six submarginal to central sigilla, anterior pair small, circular, posterior pair large, ovoid. Cuticle with scaliform patterning. Legs moderately to weakly hirsute with longitudinal glabrous strips on dorsal and lateral surfaces. Leg tarsi ventrally spinose, spines usually confined in two lateral rows (Fig. 3A), sometimes with isolated central spines (1–3), rarely with a full central spine row (Fig. 3B). Three tarsal claws, each STC with a sigmoid row of 7–15 strong teeth, ITC with few slender to short teeth; numerous long fimbriated hairs arise at base of claws (Fig. 3F). Tarsal scopulae absent in females, weak to moderate in males, sometimes extending onto distal metatarsus; scopula hairs short, thick, tapering (Fig. 3C). Metatarsal preening combs absent. Male tibiae I and metatarsi I often strongly spinose with spines placed on retroventral and ventral surfaces respectively. Male tibiae II either unmodified with clustered or scattered ventral spines, or weakly sinuous (distoventrally concave) with a ventral spined apophysis or apophyseal swelling. Male metatarsus II either unmodified, or sinuous (proximoventrally concave) with small mid-ventral apophysis. Trichobothria filiform with weakly collariform bothria; in zig-zag row on tarsus, linear dorsal row on metatarsus, double row on tibia. Tarsal organ dome-like, with a few weak concentric ridges. (Fig. 11). Male palpal patella and tibia more or less swollen (least

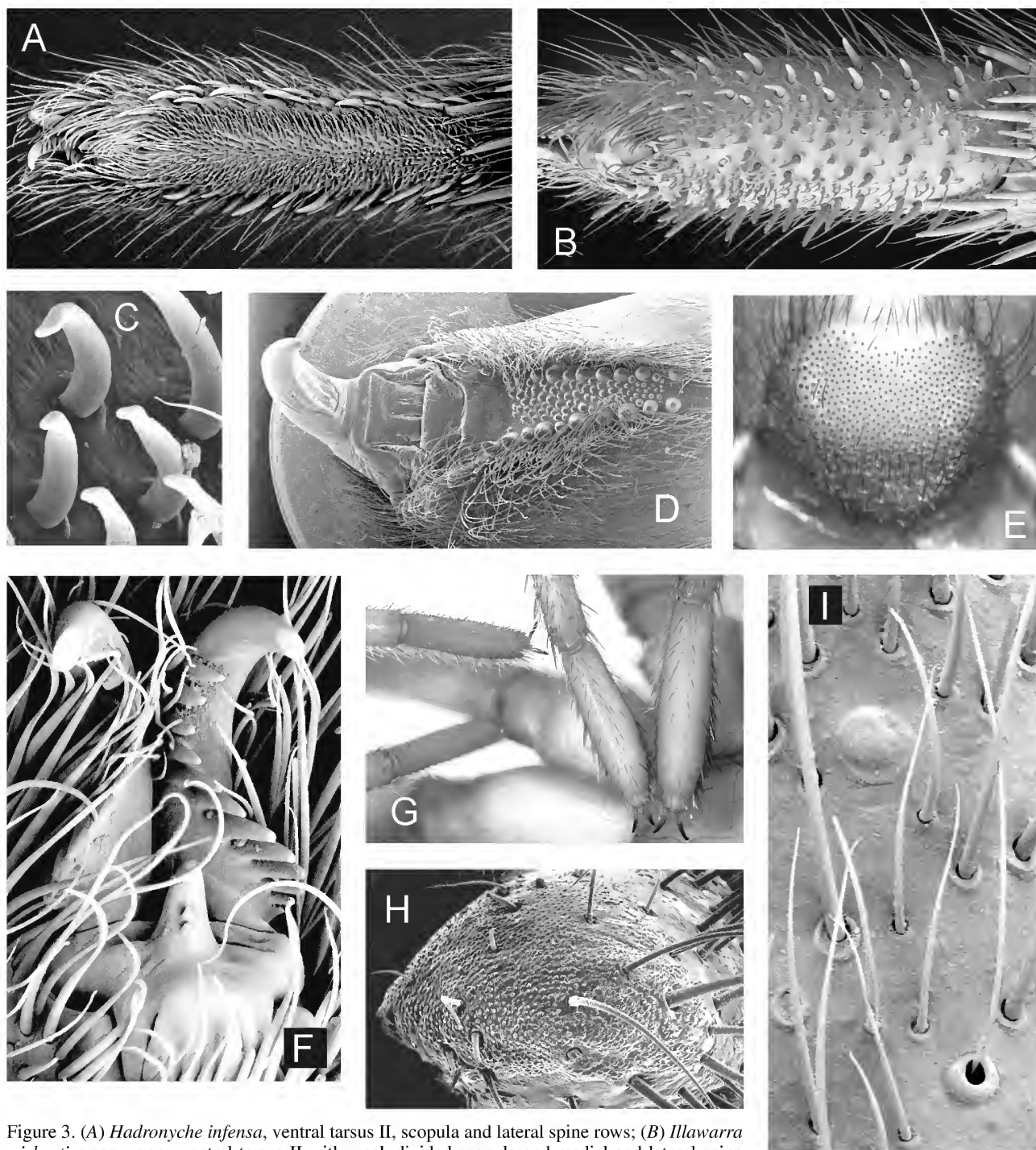


Figure 3. (A) *Hadronyche infensa*, ventral tarsus II, scopula and lateral spine rows; (B) *Illawarra wisharti* n.gen., n.sp., ventral tarsus II with weak divided scopula and medial and lateral spine rows; (C) *H. nimoola* n.sp., scopula setae; (D) *H. versuta*, fang and cheliceral groove teeth; (E) *H. infensa*, labium and cuspules; (F) *H. infensa*, tarsus I, claws, teeth and fimbriated hairs; G, *H. annachristiae* n.sp., male leg tarsi: I, II unmodified (left), III, IV enlarged (right); H, *H. formidabilis*, maxillary serrula; I, *H. tambo* n.sp., tarsus II, distal trichobothrium and tarsal organ.

in some *Atrax* spp.), patella about as wide or wider than the femur; (Figs. 10A, 77A, 100A). Cymbium short, equally bilobed anteriorly, without spines. Bulb with ovoid-pyriform tegular area, a deep, longitudinal groove separating tegulum and subtegulum; groove occasionally broadly open, exposing middle haematodocha (Fig. 102D). Embolus a relatively wide, flattened rod, variable in taper, length and curvature, more or less twisted distally; apical embolus with a broad or

narrow ejaculatory groove with a flange-like lower margin (Figs. 6B, 29B, 59B). Female genitalia with a pair of simple, unilobate spermathecae, often slightly constricted subapically (Figs. 5G, 31H). Four spinnerets. PMS separated by width of basal segment; PLS with long or short digitiform terminal segment, spigots present on all segments; spigot shafts with scaliform patterning. Mating involves leg II embrace—male tibia II/metatarsus II clasping base of female leg II.

Included genera. *Hadronyche* L. Koch, 1873; *Atrax* O.P.-Cambridge, 1877; *Illawarra* new genus

Distribution. Eastern Australia, including Tasmania (Fig. 2).

Melanesian species of uncertain status. Two atracine species have been described from Melanesia—*Styphlopis insularis* Rainbow 1913 from the Solomon Islands (AMS KS993); and *Hadronyche hirsuta* Rainbow 1920 from Papua (Chevert Expedition) (KS992). These species are regarded here as *nomen dubia* (Table 1). Both were described from large female specimens that are attributable to the genus *Hadronyche*. Female atracines mostly lack defining specific characters, but the presence of a relatively long labium suggests that both species could be placed in either the *infensa* or *cerberaea* species groups. At present, these species groups are known only from southeastern Australia. Although atracine spiders were recently found in northeastern Australia (Mosman region), they belong to a different, highly distinctive species group. Neither melanesian species has been validated by subsequent collecting and no other atracine species have been recorded outside Australia. Consequently, both species are regarded here as mislocated, possibly Australian taxa of uncertain species status. Main (1982, 1985) had reached the same conclusions regarding *H. hirsuta*.

Comments on morphology

Body size (carapace length). Some 14 species of Atracinae have a relatively small body size (male CL 4.5–7.5). These include the *lamingtonensis* and *adelaidensis* group species, plus *H. jenseanae*, *H. mascordi*, *H. meridiana*, *H. modesta*, *H. monaro* and *H. nimoola* (currently members of the *cerberaea* group). Most of the remaining species fit, with some overlap, into the medium (CL 7.5–10.0) or large (CL 10–12) male size classes.

Carapace height and cheliceral robustness. The arched cephalic area or caput is weakly to strongly raised in Atracinae. It is lowest in *Atrax* and *Illawarra* spp. (male CH/CW 0.35–0.37) (Figs. 4B, 16B). It is more strongly raised in *Hadronyche* spp. (male CH/CW 0.40–0.53). (Fig. 30A). The higher caput in *Hadronyche* spp. is associated with broadening of the carapace and a deeper, more robust cheliceral paturon, both in males and especially females (cf. Fig. 9B,F and Fig. 21B,C).

Cheliceral groove and teeth. The cheliceral groove is usually widest distally and clearly tapering proximally, but the margins of narrower grooves may be subparallel or only weakly tapered. The groove is narrow in *Atrax* and *Illawarra* (Figs. 4C, 16C), and in the *lamingtonensis* group of *Hadronyche*. In most other *Hadronyche* spp. the groove is relatively wider, particularly in females (Fig. 3D). Three tooth rows are present—two more or less full (long) rows of large teeth on the prolateral and retrolateral groove margins, plus a mid-groove, central row of much smaller teeth. This central row is always short and basal in *Atrax*, *Illawarra* (Figs. 4C, 16C) and the *lamingtonensis* group spp.

of *Hadronyche*. In most *Hadronyche* spp. the central teeth typically occupy the full groove length, with one (males) to several (females) irregular rows of small teeth (Figs. 20G, 21D). In *H. meridiana* a few mid row or distal teeth may be missing, making some individuals difficult to key out. *Hadronyche anzses* is unusual in having the prolateral tooth row reduced to a few basal teeth (Raven, 2000).

Labium and cuspules. The labium is typically wider than long, but varies considerably in relative length. It is consistently short and wide in both *Atrax* and *Illawarra* (Figs. 5A, 16D) and in the *lamingtonensis* and *adelaidensis* species groups of *Hadronyche* (0.700.80). By contrast, the labium is relatively longer (occasionally about as long as wide) in the *cerberaea* and *infensa* species groups of *Hadronyche* (Figs. 27A, 72A), except in four *cerberaea* group species (see group diagnosis) including *H. modesta* (Fig. 57E). A short labium is also seen in *H. mascordi* (Fig. 50A). In this species the labiosternal sigilla is uniquely divided into 2 lateral sigilla (usually an entire groove-like sigilla), with fusion of the medial labium and sternum between them—the short labium is regarded as a probable apomorphic condition related to these modifications.

The short, coniform to bluntly pointed labial cuspules (similar in males and females) are mostly clustered on the anterior part of the ventral labium (Fig. 3E). They are usually numerous (200–500), but may be relatively few in some species (e.g., 50–125 in most *lamingtonensis* group spp.). Cuspule numbers in males are categorized as follows: high, >250; moderate, 125–250; low, <125.

Maxillary serrula. A serrula is usually present on the maxillary apical lobe (absent in *adelaidensis* group spp.). The serrula field consists of many minute pointed teeth spreading from the anterior lobe surface onto the dorsomedial face (Fig. 3H). There is considerable variation in serrula size and number of teeth.

Anterolateral sternal bristles. This is a group of bristles, stronger and thicker than those generally found on the sternum, placed at the sternal angles on each side of the labium (Fig. 20H). They are best developed in *H. cerberaea* (both sexes) and variably present in a few related species (e.g., *H. emmalizae*), but absent in *H. versuta*.

Coxal setae. Setae on the anterobasal surface of coxae 1, 2 are usually hair-like. In a few species some of these may be shortened and basally thickened. This is best developed in *H. cerberaea*, resulting in thorn-like setae (Fig. 21H) in both sexes (absent in *H. versuta*).

Posterior lateral spinnerets. The PLS are much shorter than in *Macrothele* and *Porrhothele*. However, PLS length still varies considerably in the Atracine, especially the apical segments—from relatively long digitiform (c. length 4X mid-width) to short, wide digitiform (c. length 1.5X mid-width). The longest spinnerets are found in *Atrax* spp. (Fig. 4G), while shorter states are found in *Illawarra* (Fig. 17F) and in *Hadronyche*, notably in the *lamingtonensis* species group (Fig. 97A). Many *Hadronyche* spp. have spinnerets of intermediate length but a few species (e.g., *H. formidabilis*) have PLS almost as long as *Atrax* spp.

Male tarsi III, IV shape. Typically, Atracinae have more or less “cylindrical” tarsi. Occasionally, tarsi III and IV are swollen and lengthened (tarsus IV is usually most affected) compared with tarsi I and II, giving them a “boat-shaped” appearance (Fig. 3G). This character is associated with several species in the *lamingtonensis* species group of *Hadronyche*, including the north Queensland species, *H. anzses*. Comparable swelling of tarsi III, IV is seen in *H. lynabrae*, and weaker swelling of these tarsi has been observed in *H. flindersi* and *H. jensenae*, and of tarsus IV in *H. mascordi* and *H. monaro* all species outside the *lamingtonensis* group.

Tarsal scopulae. Scopulae are present only in males. Scopula setae are numerous to relatively few in number (Fig. 3A,B). The setae are short, thick and curved (rather vermiform), and set in ovoid bases (Fig. 3C). The shafts have finely circumferentially ribbed or annulate patterning while the tapering distal region may be more or less flattened apically. The structure of these scopula setae is quite different from that seen in the dense scopulae of barychelids and theraphosids, but I am unfamiliar with scopula setal morphology in other mygalomorph groups.

Male legs I, II spination.

Femur. The presence of mid-dorsal spines (one to row of several), with or without some distad prolateral dorsal spines, is characteristic of all *Atrax* and *Illawarra* spp. In *Hadronyche* these spines are absent in both the *infensa* and the *lamingtonensis* species groups. They are present in *cerberea* group species, but a few species have individuals that lack dorsal spines.

Patella. Both prolateral dorsal spines (sometimes with additional prolateral spines) and distal ventral spines are often present, sometimes absent.

Tibia. Tibia I spines may be numerous and distributed ventrally and retrolaterally (retroventrally) (Fig. 22D,E), or less numerous and more ventrally placed, with one to several lateroventral apical spines; prolateral surface with 0–4 spines. Tibia II spines are mostly placed ventrally, either scattered or more or less midventrally grouped, with 0–5 spines placed prolaterally and one to several lateroventral apical spines. Both scattered and clustered spine patterns are associated with species lacking tibial modifications. (Figs. 55H,I; 93H,I). Tibial apophyses and swellings are always associated with clustered spines (Fig. 32H,I).

Metatarsus. Ventrally spinose, metatarsus I with spines often denser proximomidventrally, sometimes associated with proximal–midventral metatarsal thickening (Fig. 32F). Metatarsus II with ventral spines mostly placed midventrally to distally (Fig. 55J,K), sometimes associated with a midventral apophysis/swelling (Fig. 32J,K). Prolateral surface with 0–1 spines.

Tarsus. Typically with two rows of small spines ventrolaterally (Fig. 3A). An additional complete row of midventral spines characterizes males of the genus *Illawarra* (Fig. 3B).

Male leg II apophyses. Apophyses, and less prominent

apophyseal swellings, are found on both the second tibia and metatarsus of some atracine species. They are any ventral cuticular projections or swellings, placed in the middle to proximal part of the segment and clustered with spines. These leg II structures are found in all *Atrax* spp. and several species currently placed in the *cerberea* species group of *Hadronyche*. All other atracines, comprising *Illawarra* and most *Hadronyche* spp., lack such structures. Tibial apophyses are best developed in *Atrax* spp., as a prominent coniform apophysis with short, stubby spines (Figs. 4F; 6H,I). In *Hadronyche*, a less specialized structure occurs in the form of a broad, ovoid to rounded ventral swelling, placed midventrally to proximally and clustered with strong, often somewhat shortened spines. This type of apophysis is most strongly developed in *H. formidabilis* (Fig. 32H,I). In other species it is represented as a weaker apophysis or apophyseal swelling (Figs. 22J, 36I, 40I). The latter term refers to a low ventral tibial thickening upon which spines are clustered—however tibial apophyses and apophyseal swellings tend to intergrade into each other. Tibial apophyses and apophyseal swellings are associated with a variably developed distoventral concavity that adjoins a similar anteroventral concavity on the metatarsus. Metatarsal apophyses are strongly to weakly developed, spinose, and typically associated with a variable sinuosity of the metatarsus, (Figs. 22K, 29K). However, in *H. venenata* the apophyseal swelling is very weak and there is no metatarsal apophysis (Fig. 38E); and in *H. monaro* the tibia is unmodified but the metatarsus has a small apophysis (Fig. 47G).

Male palp (Figs. 6A,B,C; 43A,B,C; 65A,B,C) (Appendix 1). The palpal bulb is rather simple in structure, comprising an ovoid-pyriform tegular area and a rod-like embolus. The tegular area consists of an ovoid tegulum separated by a deep, curved groove from the smaller subtegulum (Fig. 48B). The tegulum and subtegulum are sometimes widely separated in *lamingtonensis* group spp. (and often in *Illawarra wisharti* also), exposing the membranous median haematodocha spanning the widened space (Figs. 97H, 100B). The relatively wide embolic shaft is quite different from the slender spiniform embolus of macrotheline and hexatheline spiders. It is variably basally offset from the tegulum and varies in width, length, curvature, taper and degree of distad axial twisting. On the distal part of the embolus the ejaculatory duct opens into a broad or narrow distal groove, the lower margin of the groove appearing as a more or less flange-like structure.

The male palpal patella and tibia are enlarged in many atracine species. Raven (2000) suggested that the greater width of the palpal patella compared to the femur represents a synapomorphy for the genus *Hadronyche*—in most other mygalomorph spiders (as in *Atrax*) the palpal patella may be as wide but not wider than the femur. A limited survey confirms Raven’s observation in both smaller-sized *Hadronyche* species—*lamingtonensis* and *adelaidensis* group species and most smaller *cerberea* group species (Figs. 64G, 100A)—and several larger species examined, e.g., *H. venenata* (Fig. 40A). While this character state is present in many *Hadronyche* species, it does not seem to be universal (e.g., in *H. levittgreggae* the femur is as wide as the patella). Interestingly, the wider patella state is present in *Illawarra wisharti*. A fuller survey of atracine species is needed to determine both the distribution of this character and its status in *Hadronyche*.

Keys to Atracinae

The information given in these keys relies upon characters taken from male spiders—the keys require male specimens. Measurements, counts and ratios given in these keys refer to male spiders unless specifically noted as female data. Leg and palp spine counts represent totals for the segment, unless otherwise noted.

Species attributed to the diverse *cerberea* group show intra-specific variation in dorsal femoral I, II spination (spines present in most spp., but absent in some individuals of a few spp.). This means that some species have two (part

key outcomes. The use of ratio data in some parts of the key make it less user friendly than one would like, especially for inexperienced users.

No species key is given for the genus *Illawarra* (monotypic). Males of the Tasmanian species, *H. pulvinator* (Hickman, 1927) and the South Australian species, *H. eyrei* (Gray, 1984), are unknown and these species are not included in keys—their species diagnoses and apparently limited distributions should assist with their identification.

Key to genera

- 1 Male tibia II with large, prominent, conical apophysis (Fig. 6I). Caput weakly raised (Figs. 4B, 5B). Central cheliceral tooth row short, basal (Fig. 5F). Labium short (Fig. 4A) *Atrax* O.P.-Cambridge
- Male tibia II not with a prominent conical apophysis—tibia II either unmodified or with bluntly rounded apophysis or apophyseal swelling. Caput weakly to strongly raised 2
- 2 Male tibia II unmodified (Fig. 16F). Caput weakly raised and frontally narrow, cheliceral paturon relatively weak (Figs. 16A,B; 17B,D). Male tarsi I, II with a midventral spine row as well as two lateral rows (Fig. 3B). Central cheliceral tooth row short, basal (Fig. 16C). Labium short. PLS short (Figs. 16E, 17F) *Illawarra* n.gen.
- Caput moderately to strongly raised and frontally broad, cheliceral paturon robust (Figs. 20B,E; 21B,C). Male tarsi I, II lacking a full midventral spine row. Male tibia II either unmodified (Fig. 68F), or with rounded apophysis/apophyseal swelling (Figs. 30C, 34G). Central cheliceral tooth row long or short. Labium long or short *Hadronyche* L. Koch

Genus *Atrax*—Key to species

- 1 Palpal tibia with 4–11 spines, dorsal spines present *A. robustus*
- Palpal tibia with few or no spines (0–4), dorsal spines absent 2
- 2 Embolus long and slender, strongly curved; base strongly offset from tegulum (Fig. 10B) *A. yorkmainorum*
- Embolus relatively shorter, wider and more weakly curved (Fig. 14B) *A. sutherlandi*

Genus *Hadronyche*—Key to species

- 1 Large spiders (male CL 10.0–12.0). Tibia II with a large, protuberant, rounded apophysis (Fig. 30C). PLS relatively long (PLSASL > 3×W) (Figs. 1F, 30D) *H. formidabilis*
- Spiders usually smaller. Tibia II apophysis less prominent or absent. PLS often shorter 2
- 2 Tibia I and metatarsus I incrassate (Fig. 106F) *H. adelaidensis*
- Tibia I and metatarsus I not incrassate 3
- 3 Palpal patella with many spines (12–16) (Fig. 103F). Leg II unmodified *H. flindersi*
- Palpal patella spines absent or fewer (0–9). Leg II modified or unmodified 4
- 4 Labium and sternum fused medially, labiosternal sigilla divided (Fig. 50A) *H. mascordi*
- Labium and sternum not fused, labiosternal sigilla entire 5

- 5 Caput high and wide frontally, almost bulbous, rising relatively steeply from fovea ($CH \geq 0.5 \times CW$) (Figs. 53A,C; 54B). Metatarsus II unmodified (Fig. 53E) *H. nimoola*
 — Not in above combination 6
- 6 Chelicerae with central tooth row short, basal (Fig. 82D). Labium almost as long as wide ($LL/LW 0.96$) (Fig. 82A) *H. kaputarensis*
 — Not in above combination 7
- 7 Embolus short, with distal flanged part set at distinct angle to shaft (Fig. 65B,C) *H. jensenae*
 — Distal embolus not as above 8
- 8 Chelicerae with central tooth row short, basal. (Fig. 97E). Palpal middle haematodocha widely exposed (Figs. 97H, 100B). Caput strongly raised (Fig. 97B). PMS apical segment short (Fig. 97A) (*lamingtonensis* species group) 9
 — Chelicerae with central tooth row typically long (Fig. 20G), rarely short. Palpal middle haematodocha not or rarely exposed (Fig. 48B). Caput height and PMS length variable 13
- 9 Cuspules on labium relatively numerous (200–225). Cheliceral margins diverge distally (Fig. 94C) *H. raveni*
 — Cuspules on labium relatively sparse (40–100). Cheliceral margins subparallel (Fig. 97E) 10
- 10 Male tarsi III and IV unmodified *H. lamingtonensis*
 — Male tarsi III and IV swollen (“boat-shaped”) than tarsi I and II (Fig. 3G) 11
- 11 Cheliceral promargin with few teeth (c. 3), in short basal row. Embolus straight *H. anzses*
 — Cheliceral promargin with several teeth (c. 6–12) in longer row (Figs. 99D, 102C). Embolus strongly curved (Figs. 100A,B; 102D) 12
- 12 Male tarsus I strongly spinose (24–43) *H. annachristiae*
 — Male tarsus I weakly spinose (5–7) *H. monteithi*
- 13 Labium relatively short ($LL/LW 0.70-0.80$) (Figs. 57E, 60D). Tibia II and metatarsus II with apophyseal swellings 14
 — Labium relatively long ($LL/LW 0.85-1.05$) (Figs. 23A, 68A). Tibia II and metatarsus II apophyses/apophyseal swellings present or absent 15
- 14 Embolus short ($BulbW/EmbL 0.80$), not apically twisted (Fig. 59B,C) *H. modesta*
 — Embolus longer ($BulbW/EmbL 0.60$), twisted apically (Fig. 62B,C) *H. meridiana*
- 15 Dorsal femur I and/or II with spines 16
 — Dorsal femur I, II with no spines 23
- 16 Tibia II with weak, proximad, spinose apophyseal swelling (Figs. 38F; 40H,I); metatarsus II lacks apophyseal swelling (Fig. 40K). Carapace relatively low ($CH/CL 0.40$) (Fig. 38B) *H. venenata* (Tasmania)
 — Not as above 17
- 17 Tibia II unmodified, with few spines (7–11); metatarsus II with small apophyseal swelling (Figs. 47G; 48H,I). Carapace relatively high ($CH/CL 0.49$) (Fig. 47B) *H. monaro*
 — Not as above 18

18	Tibia II and metatarsus II with apophyses/apophyseal swellings	19
—	Tibia II and metatarsus II lacking apophyses/apophyseal swellings	22
19	Embolus with strongly curved shaft (Fig. 29B)	<i>H. emmalizae</i>
—	Embolus shaft weakly curved–straight (Fig. 25B)	20
20	Male (and female) coxae I, II with thorn-like setae anterobasally (Fig. 21H), and anterolateral sternal angles with tuft of bristle-like hair (Fig. 20C,H)	<i>H. cerebera</i>
—	Not as above	21
21	Tibia II with spines distributed over apophysis and distoventral tibia (Figs. 23C; 25H,I). PLS relatively short (PLSAPW/ L 0.49) (Fig. 23E)	<i>H. versuta</i> (part)
—	Tibia II with spines grouped on apophyseal swelling, few or none on distoventral tibia (Figs. 34G; 36H,I). PLS relatively long (PLSAPW/ L 0.33) (Fig. 34F)	<i>H. alpina</i> (part)
22	Tibia II and metatarsus II ventrally concave (bowed) (Fig. 43I,K). Embolus relatively wide (EmbmidW/ L 0.12) (Fig. 43B)	<i>H. marracoonda</i>
—	Tibia II and metatarsus II more or less straight, not bowed (Fig. 46I, K). Embolus narrower (EmbmidW/ L 0.08) (Fig. 46B)	<i>H. tambo</i> (part)
23	Tibia II and metatarsus II with apophyses/apophyseal swellings	24
—	Tibia II and metatarsus II lacking apophyses/apophyseal swellings	25
24	Tibia II with spines distributed over apophysis and distoventral tibia (Figs. 23C; 25H,I). PLS relatively short (PLSAPW/ L 0.49) (Fig. 23E)	<i>H. versuta</i> (part)
—	Tibia II with spines grouped on apophyseal swelling, few or none distributed onto distoventral tibia (Figs. 34G; 36H,I). PLS longer (PLSAPW/ L 0.33) (Fig. 34F)	<i>H. alpina</i> (part)
25	Embolus relatively broad (EmbmidW/L 0.12–0.16); moderately to strongly twisted distally (Fig. 86B,C)	26
—	Embolus relatively narrow (EmbmidW/L 0.06–0.09); weakly to moderately twisted distally (Fig. 74B,C)	29
26	Embolus base strongly offset from tegulum (Figs. 70B, 81B)	27
—	Embolus base weakly offset from tegulum (Figs. 86B, 89B)	28
27	Embolus shaft strongly curved proximally, distal third strongly twisted (Fig. 81B,C). Tarsi III, IV swollen, “boat-shaped”	<i>H. lynabrae</i>
—	Embolus shaft curvature and distal twisting less strongly developed (Fig. 70B,C). Tarsi III, IV unmodified	<i>H. infensa</i>
28	Tibia II sinuous ventrally, with ventral spines clustered in proximal half, (Fig. 89H,I). Tarsus I spines 8–38	<i>H. walkeri</i>
—	Tibia II not sinuous, ventral spines more scattered (Fig. 86H,I). Tarsus I spines often more numerous (30–63)	<i>H. macquariensis</i>
29	Embolus slender, elongate (Embl 3.53–4.15) (Fig. 93B)	<i>H. levittgreggae</i>
—	Embolus not as long (Embl 2.18–3.06)	30
30	Labial cuspule number moderate (149–184). Bulb shorter than palpal tibia (BulbL/TibL 0.77) (Fig. 46A)	<i>H. tambo</i> (part) (Gippsland, Victoria)
—	Labial cuspules numerous (246–393) Bulb almost as long as palpal tibia (BulbL/TibL 0.86–0.89) (Fig. 77A)	31
31	Leg spines relatively few: tarsus I with 4–10, metatarsus I with 10–16, tibia II with 3–7 spines	<i>H. orana</i>
—	Leg spines more numerous: tarsus I with 23–46, metatarsus I with 31–56, tibia II with 13–25 spines	<i>H. valida</i>

Generic and Species Descriptions

Atrax O.P.-Cambridge

Atrax O.P.-Cambridge 1877: 26. Type species *Atrax robustus* O.P.-Cambridge 1877 by monotypy. Simon, 1891: 302; 1892: 175, 182, 186; 1903: 967–969. Hogg, 1901: 272; Rainbow, 1911: 121; 1913: 4; 1914: 252. Rainbow & Pulleine, 1918: 165. Hickman, 1927: 63; 1964: 107. Musgrave, 1927: 33; 1948: 77. Roewer, 1942: 207. Bonnet, 1955: 772. Main, 1976: 70; 1981: 839; 1985: 40. Gray, 1978: 121, 125. Raven, 1980: 255; 1985: 55, 71; Brignoli, 1983: 122. Gray, 1984: 441; Gray, 1988: 114. Goloboff, 1993: 6. Hedin & Bond, 2006: 467. Platnick, 2010.

Euctimena.—Rainbow 1914: 248. Type species *Euctimena tibialis* Rainbow 1914 by monotypy. First synonymized by Musgrave, 1927: 33. Hickman, 1964: 107. Gray, 1978: 125. Raven, 1980: 255. Main, 1985: 40. Gray, 1988: 114.

Poikilomorpha.—Rainbow 1914: 264. Type species *Poikilomorpha montana* Rainbow 1914 by monotypy. First synonymized by Gray, 1978: 125. Raven, 1980: 255. Main, 1985: 40. Gray, 1988: 114.

Diagnosis. Differs from other atracine genera by presence of a large coniform apophysis on male tibia II (Fig. 6H,I); and from *Hadronyche* by lower caput height.

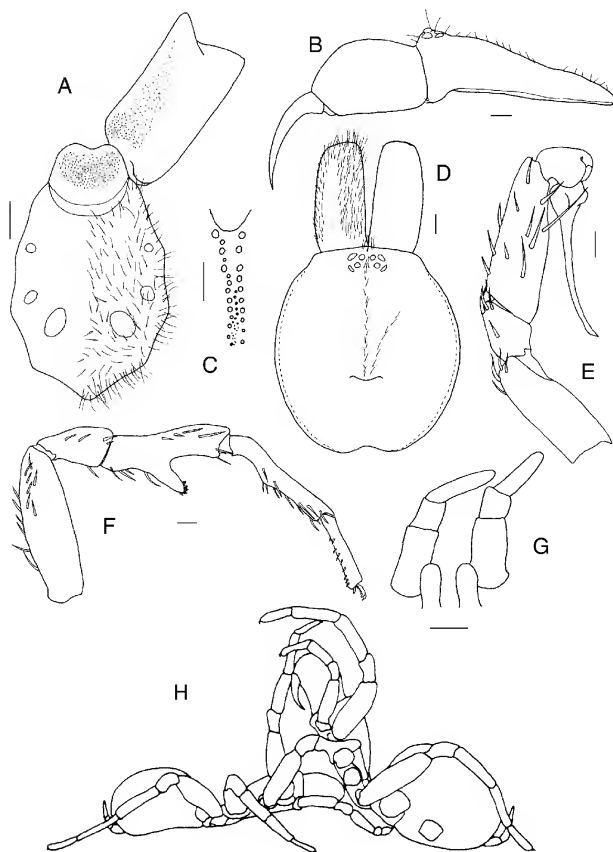


Figure 4. *Atrax robustus*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) cephalothorax and chelicerae, dorsal; (E) palp, prolateral; (F) leg II, prolateral; (G) spinnerets. Scale lines 1 mm.

Description. With characters of Atracinae. Medium to large sized Atracinae. Carapace longer than wide, caput only weakly raised (CH/CW 0.35–0.36) and narrow frontally (CFW/CL 0.55–0.62). Cheliceral paturon relatively less robust and narrower than in most *Hadronyche* spp. (Figs. 4B,D; 5B,E). Cheliceral groove narrow, V-shaped; central teeth in single short row confined to the basal half of the groove, lateral marginal tooth rows run full length of groove. (Fig. 4F). Labium relatively short (LL/LW 0.70–0.75) (Fig. 4A). Sternum ovoid to narrow ovoid. Apical segment of posterior lateral spinnerets relatively long, digitiform (PLSAPW 0.25–0.28) (Fig. 4G). Male femora I, II with dorsal spines (Fig. 4F). Male palp with patella width less than or equal to femur width. Bulb with a long, slender, curved embolus (EmmidW/L 0.06–0.08) (Fig. 6B). Male tibia II with a large mid-ventral conical apophysis, the narrow apex surmounted by short, peg-like spines (Fig. 6H,I); metatarsus II sinuous (proximoventrally concave) with a small mid-ventral apophysis (Fig. 6J,K). Spermathecal sacs narrow, elongate (Fig. 5G).

Included species. *Atrax robustus* O.P.-Cambridge, *A. sutherlandi* n.sp., *A. yorkmainorum* n.sp.

Distribution. Southeastern coast and highlands of Australia, from the Hunter River region, New South Wales, to eastern Victoria.

Comments. Burrows often with a weak or incomplete silk lining, typically sited under rocks and logs

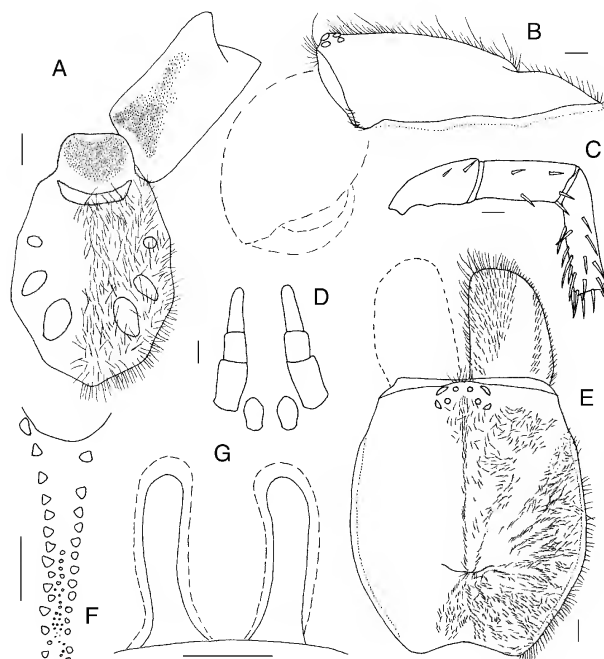


Figure 5. *Atrax robustus*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg III, prolateral, patella, tibia, metatarsus; (D) spinnerets; (E) cephalothorax and chelicerae, dorsal; (F) cheliceral groove teeth; (G) spermathecae. Scale lines 1 mm.

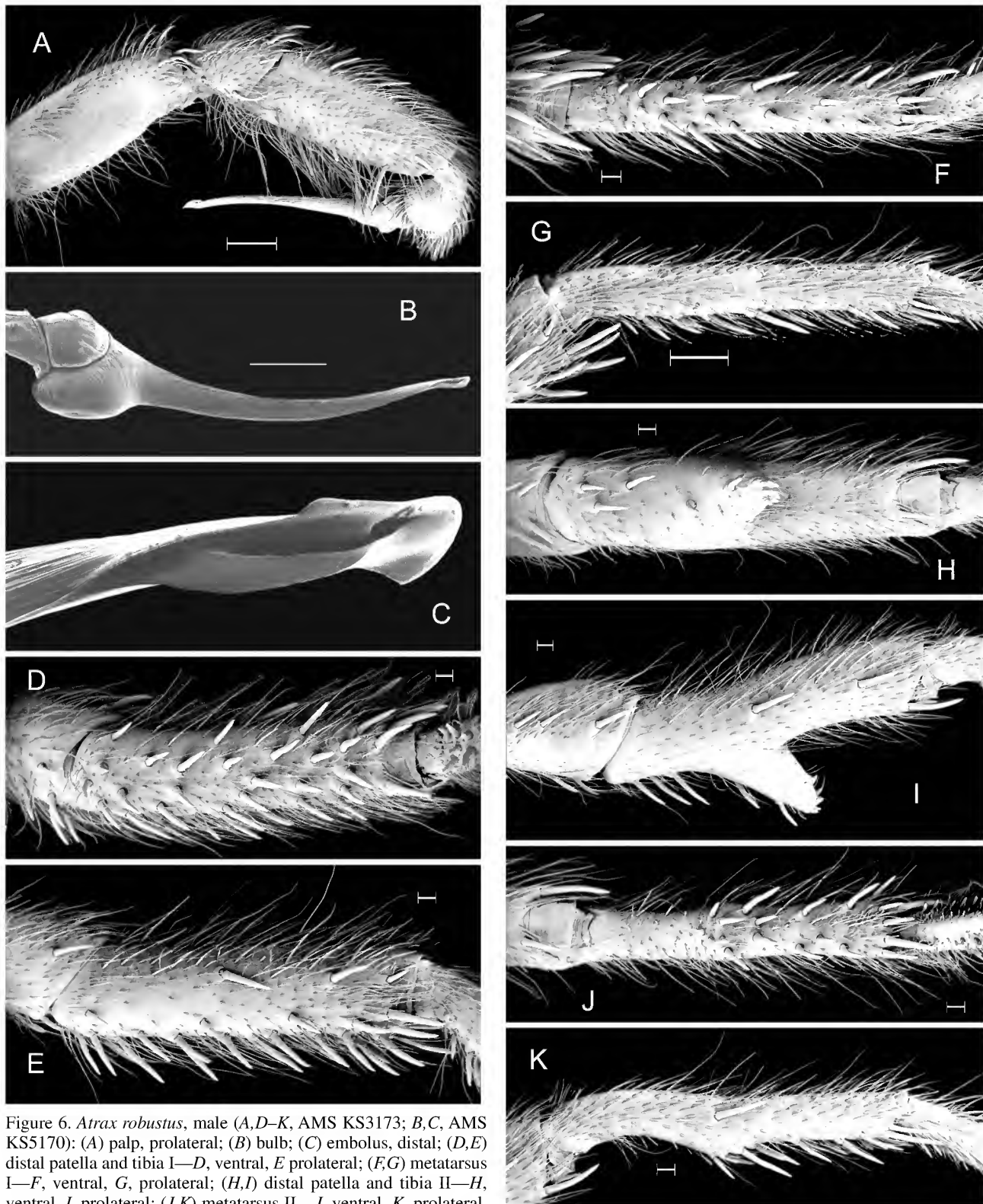


Figure 6. *Atrax robustus*, male (A,D–K, AMS KS3173; B,C, AMS KS5170): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A,B,G, 1.0 mm.

Atrax robustus O.P.-Cambridge

Figures 4–7; Tables 2, 34

Atrax robustus O.P.-Cambridge, 1877: 26. Hogg, 1901: 273. Musgrave, 1927: 33. Nishikawa, 1976: 179. Main, 1985: 41. Gray, 1978: 122. Gray, 1987: 314. Gray, 1988: 114.

Euctimena tibialis.—Rainbow, 1914: 249. First synonymized by Musgrave, 1927: 33.

Poikilomorpha montana.—Rainbow, 1914: 265.

Atrax montana.—Main, 1985: 41 (Transferred from *Poikilomorpha*). First synonymized by Gray, 1988: 114.

Types. Holotype female: BMNH 71 (NMH). Type dry, pinned, labelled “New Holland”, no other data (not seen).

Other material examined. New South Wales (males): AMS KS2698, Austinmer, 6 January 1959, N. Mitchell; AMS KS4812, Avalon Beach, 14 March 1976, Porritt; AMS KS4837, Avoca, 11 January 1975; AMS KS4197, Balgowlah, 7 January 1960, Burch; AMS KS4946, Balmoral, 18 April 1974, Robinson & Hoey; AMS KS4902, Bankstown, 14 April 1965; AMS KS5137, Baulkham Hills, 18 January 1973, M. Gray; AMS KS4080, Bayview, 2 April 1974, S. Thompson; AMS KS2956, Beecroft, 25 April 1979, D. Dean; AMS KS3999, Belrose, 19 January 1967, Anderson; AMS KS1152, “The Mists”, Berambing, December 1976, K.J. Street; AMS KS8376, Berowra, December 1981, J. Hingley; AMS KS1852, Bilgola Plateau, 26 May 1977, H. Newton; AMS KS1148, Bilpin, 17 January 1930, E.M. Hunt; AMS KS4961, Burraneer Bay, 15 December 1972; AMS KS1154, Camden, 21 February 1974, G. Seymour; AMS KS4914, Campsie, 12 February 1975, R.N. Peck; AMS KS4915, Caringbah, 4 April 1972, M. Sinclair; AMS KS4773, Cardiff, 21 January 1979; AMS KS4194, Castlecrag, May 1963, I. Webb; AMS KS4484, Charlestown, 1 February 1980, G. Anderson; AMS KS4372, Chatswood, 16 April 1972, W. Leonard; AMS KS3990, Cheltenham, 2 April 1974, S.K. Pearson; AMS KS14383, Cherrybrook, 1 April 1984, M. Backing; AMS KS2957, Chester Hill, 27 May 1979, J. Paull; AMS KS4395, Clarendale Beach, 16 January 1976, K.H. Sinfield; AMS KS4378, Clifton Gardens, 20 April 1972, Dr C.A. Monticone; AMS KS5013, Cobbitty, 11 March 1959, T. Down; AMS KS4066, Collaroy, near Dee Why Lagoon, 14 December 1958, A. Kabanoff; AMS KS5072, Cromer, 6 April 1980, M. Duncan; AMS KS3036, Denistone, 26 April 1979, M. Richison; AMS KS4001, Dundas, 1 March 1976, B. & A.C. Oldsen; AMS KS7470, Dural, March 1981; AMS KS2432, East Maitland, H. Miller; AMS KS4815, Eastwood, 30 March 1976, D. Griffith; AMS KS7477, Elizabeth Bay, 5 May 1981, D.T. Cave; AMS KS1153, Engadine, 28 November 1972, S. Couglin; AMS KS1132, Epping, January 1977, W.J. Bunton; AMS KS1143, Faulconbridge, 8 January 1973, Stewart; AMS KS5694, Fox Valley Reserve, near Wairoonga, 22 June 1980, B. Henke; AMS KS4071, Frenchs Forest, 5 June 1972, N. Hailstone; AMS KS13409, Galston, 2 February 1981, G. Jackson; AMS KS10976, Galston Gorge, 4 May 1983, G. Jackson; AMS KS1156, Gladesville, 20 February 1970, McElwaine; AMS KS13752, Gordon, 22 December 1983, M. Gray; AMS KS4771, Gosford, 21 January 1979, R.E. Mascord; AMS KS4005, Grays Point, 5 February 1977, P. Poppett; AMS KS4382, Greenwich/Willoughby; AMS KS1160, Hartley Vale, 8 December 1952, E.S. Miller; AMS KS4297, Hazelbrook, 8 January 1980, S. Clark; AMS KS5071, Heathcote, 20 April 1980, R. Witchard; AMS KS2323, Helensburgh, 6 January 1979, N. West; AMS KS1157, Hornsby, 3 March 1976, Reed; AMS KS4949, Hurstville, 5 June 1972, A. Osten; AMS KS1161, Kembla Heights, 11 November 1963, G. Pearce; AMS KS8678, East Beach, Kiama area, 20 January 1982, D. Bennedett; AMS KS4377, Killara, February 1972, P. Mayman; AMS KS3200, Kurrajong Heights, 30 November 1969, G. Hunt; AMS KS4944, Lakemba, 7 January 1948; AMS KS1159, Lane Cove, 22 April 1930, ? Graham; AMS KS1146, Lawson, March 1956, R. Schleicher; AMS KS8920, Lindfield, 14 April 1982, B. Henstridge; AMS KS4078, McMahons Point, May 1972, N. Mayfield; AMS KS6067, Manly, 3 November 1980; AMS KS10783, Matcham, near Gosford, 27 March 1983, van Derbruggen; AMS KS1162, Minnamurra Falls, 12 May 1964, R. Mascord; AMS KS4022, Mona Vale, 26 February 1973, T. Govranik; AMS KS4948, Mortdale, 13 February 1975; AMS KS5314, Mosman, 19 June 1980, S. Pfeiffer; AMS KS4947, Mount Colah, 25 January 1979, M. Gray; AMS KS1155, Mount Irvine, 14 November 1944, E.L. Troughton; AMS KS5016, Mount St. Thomas, near Wollongong, 17 June 1956, L. Evans; AMS KS2146, Mount Wilson, 15 November 1978–11 December 1978, C. Horseman; AMS KS4009, Neutral Bay, AMS KS3189, Newport, September 1959, A.J. Wright; AMS KS13560, Northbridge, 30 December 1983, J. Mayer; AMS KS4950, Parramatta, 25 March 1959, W.G. Ashford; AMS KS4951, Peakhurst, 24 April 1945, H. Inder; AMS KS2712,

Pennant Hills, 21 March 1979, Thompson; AMS KS4045, Penrith, 25 August 1979, A. Johnson; AMS KS4399, Potts Point, 5 July 1956, P. Berry Smith; AMS KS4015, Pymble, 14 March 1949; AMS KS7466, Queenscliff, April 1981; AMS KS4027, Rhodose, 12 May 1930, T. White; AMS KS4921, Riverwood, 12 April 1966, R.E. Mascord; AMS KS2995, Roseville, 3 June 1979, ? Hidder; AMS KS4869, Rydalmere, 13 March 1974, R. Hood; AMS KS4070, Ryde, January 1971; AMS KS4007, St. Ives, 12 May 1971; AMS KS4083, Scotland Island, 1 April 1974; AMS KS3457, Springwood, 1978, A. McLean; AMS KS4922, Stanmore, 1949, January; AMS KS4971, Telopea, 25 April 1971, K.P. Reid; AMS KS2713, The Oaks, Apr 1979, P. McIntosh; AMS KS4203, The Spit, 4 July 1948, Page; AMS KS4013, Thornleigh; AMS KS4373, Turramurra, 1 April 1970; AMS KS8664, Wairoonga, 31 January 1982, A.S. Martin; AMS KS4008, Waitara, 11 March 1949; AMS KS10782, Warrawee, 12 April 1983, Ralleston; AMS KS5146, Waverley, 15 May 1973, L. Gibson; AMS KS4367, Waverton, 4 March 1971, Dr C. Brown; AMS KS5131, West Pennant Hills, 19 May 1973, R. McDonald; AMS KS6148, West Ryde, 1 January 1980, W. Bennett; AMS KS4000, Whale Beach, 21 April 1974; AMS KS4025, Willoughby, 30 July 1973, A.C. Jones; AMS KS3185, Winston Hills, 21 July 1973, M. Gray; AMS KS3404, AMS KS5720, Woonona, near Bulli, December 1960, S.H. Roberts; AMS KS4662, Wyoming, near Gosford, 14 March 1980; AMS KS2670, New Lambton, near Newcastle, 1979, L. Hallinan; AMS KS1150, Newcastle, 13 March 1963, B.C. Dyson; AMS KS4125, Wyong, 18 March 1978; AMS KS2923, Benandarah State Forest, 22 March 1979–25 April 1979, C. Horseman; AMS KS5205, Foxground, near Gerringong, 10 April 1980, G. Wishart; AMS KS5170, Ryde, 33°49'S 151°06'E, 20 May 1980, A. Brown. **New South Wales (females):** AMS KS4076, Artarmon, Apr 1927, J. Stewart; AMS KS4930, Ashfield, 20 December 1930, E. Hudson; AMS KS1826, Austinmer, 23 November 1959, F.E. Havand; AMS KS1377, Avalon, 15 May 1978, L. Reneman; AMS KS5017, Avoca, 20 September 1968, N. Tweedale; AMS KS4825, Balgowlah, 2 May 1970, G. Smith; AMS KS4987, Bankstown, 19 April 1949, E.A. Cox; AMS KS5140, Baulkham Hills, 18 January 1973, M. Gray; AMS KS2716, Bayview, 20 April 1979, B. Makins; AMS KS4358, Beecroft, February 1928, G.A. Heumann; AMS KS4903, Belmore, 25 April 1924, M. Codd; AMS KS4803, Belrose, 19 January 1967, Anderson; AMS KS1827, Bilpin, 12 April 1972, R. McDonald; AMS KS7564, Birmingham Gardens, near Newcastle, 6 December 1978, R. Mascord; AMS KS1674, Blackheath, 24 April 1948, R. McKay; AMS KS4887, Bowral; AMS KS8733, Bundanoon, February 1982, B. Erdman; AMS KS4913, Camden, 21 February 1974, G. Seymour; AMS KS4408, Berowra, 15 September 1973, J. Disney; AMS KS3524, Carlingford, 26 September 1979, J. Armitage; AMS KS3175, Castle Hill, Apr 1979, F. Pearce; AMS KS4206, Castlecrag, 17 July 1973, J. Bunce; AMS KS4242, Chatswood, 14 November 1928, R. Barnes; AMS KS4325, Cheltenham, Apr 1972, D. Levy; AMS KS4211, Clarendale Beach, L. & M. Mortimer; AMS KS4030, Clifton Gardens, 21 April 1961, Bradley; AMS KS3188, Collaroy, February 1928, E. Osborne; AMS KS4400, Collaroy Plateau, July 1966, B. Tye; AMS KS4892, Colo Vale, July 1958, D.H. Wallace; AMS KS4905, Coogee, November 1926, Stokes; AMS KS4233, Cremorne, 21 June 1927, F.L. Grutzmacher; AMS KS4962,

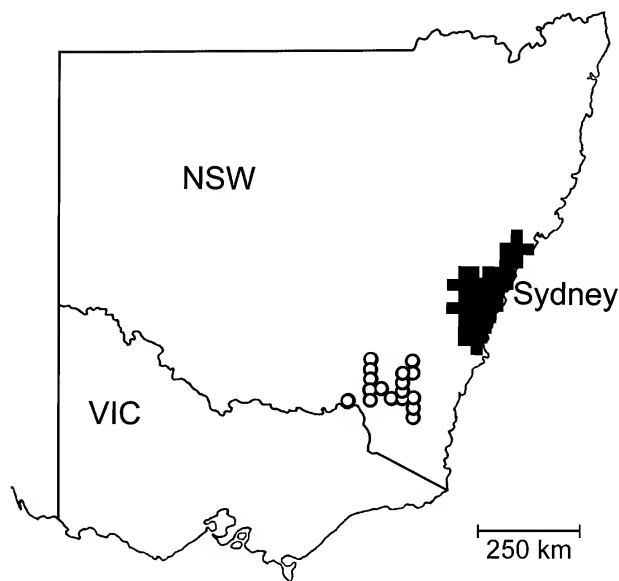


Figure 7. Collection records for *Atrax robustus* (squares) and *A. yorkmainorum* (circles).

Cronulla, 13 January 1971; AMS KS4828, Dee Why, May 1932, Rowe; AMS KS4804, Dundas, January 1975, M. Denham; AMS KS4865, Dural, 18 January 1971, M. Thornley; AMS KS3319, Eastwood, 8 July 1979, J. Cullen; AMS KS4829, Elanora, 1 March 1967, S. Marshall; AMS KS4989, Elizabeth Bay, 9 January 1958, D.T. Cave; AMS KS1830, Emu Plains, 30 July 1957, G.D. Sutherland; AMS KS4770, Enfield, 5 June 1905; AMS KS4546, Epping, 17 February 1980, J. Brand; AMS KS4990, Five Dock, May 1928, R. Williams; AMS KS4361, Forestville, 19 August 1971; AMS KS8868, Freeman's Reach, near Windsor, 26 January 1982, M. Gray; AMS KS8377, French's Forest, 24 October 1981, R. Scott; AMS KS4661, Galston, 3 February 1980; AMS KS4963, Garrie Beach, 7 October 1965, R. Mascord; AMS KS4839, Gosford, 25 September 1964, E. Worrell; AMS KS4207, Greenwich, 5 May 1970, K. Burns; AMS KS4966, Guildford West, 27 August 1957, S.R. Kirkwood; AMS KS1220, Hazelbrook, 23 November 1976, G. Weatherspoon; AMS KS1675, Hazelbrook, February 1976; AMS KS4985, Heathcote, 26 June 1975, R. Witchard; AMS KS4967, Helensburgh, 11 June 1951, L. Reed; AMS KS4225, Hornsby, 7 May 1940; AMS KS1208, Jamieson Valley, 22 June 1953, A.W. Gayley; AMS KS4065, Killara, 8 March 1928; AMS KS5078, Kingsgrove, 1952; AMS KS4993, Kingswood, May 1962; AMS KS4410, Kuring-ai Chase National Park, 23 January 1980, M. Gray; AMS KS1310, Kurrajong, February 1978; AMS KS4945, Lakemba, 17 March 1930; AMS KS4853, Lane Cove, 15 March 1973; AMS KS4968, Leichhardt, 2 September 1913, D. Hunter; AMS KS1834, Linden, 3 September 1950, K. Baames; AMS KS5031, Lindfield, 29 September 1962, M. & V. Gregg; AMS KS4234, McMahon's Point, Apr 1972, J. Suich; AMS KS6025, Manly, Manly Hospital, 3 November 1980; AMS KS4907, Matraville South, 20 October 1952, A. Brown; AMS KS4238, Meadowbank, March 1963, R.H. Hall; AMS KS1829, Megalong Valley, R. Ibbow; AMS KS4856, Middle Harbour, 6 September 1933, Kaufman; AMS KS4896, Mittagong, 30 December 1975, M. & V. Gregg; AMS KS4360, Mona Vale, 9 November 1975, J. Walker; AMS KS1125, Morpeth; AMS KS4204, Mortdale, 31 January 1974, C. Stewart; AMS KS4403, Mosman, 3 March 1932, Patton; AMS KS3693, Mount Colah, 29 July 1979, J. Fairlie; AMS KS4189, Mount Fairy, 25 November 1979; AMS KS1835, Mount Irvine, 14 November 1944, E. Troughton; AMS KS2960, Mount Keira, 12 May 1979, Walsh; AMS KS4832, Mount Kuring-ai, 5 November 1972; AMS KS4808, Naremburn, 26.ii.1961, M. Fairburn; AMS KS1126, Narara, 20 March 1930, B.R. Everingham; AMS KS4405, Narrabeen, 29 September 1957, L.B. Trapp; AMS KS4046, Neutral Bay, 3 November 1979; AMS KS797, Newport, 7 December 1977; AMS KS4064, Normanhurst, 6 April 1969, ? Dymock; AMS KS4085, Northbridge, 26 July 1975, D. Dickerson; AMS KS3401, Northmead, March 1973, J. Deviana; AMS KS4195, North Narrabeen, 11 June 1952, L.J. Lizara; AMS KS4232, North Sydney, May 1925, Dr S.J.W. Moreau; AMS KS4908, Oatley, 15 February 1963; AMS KS4858, Palm Beach, 1 February 1951, H.R. Swaine; AMS KS4909, Parramatta, 21 March 1910; AMS KS1131, Peakhurst, 15 November 1969, D. Fantom; AMS KS1837, Pearl Beach, 24.iii.1966, J. Cooks; AMS KS1930, Pennant Hills, 6 October 1978, S. el-Issa; AMS KS4045, Penrith, 25 July 1979, A. Johnson; AMS KS4969, Penhurst, R. Pollett; AMS KS1844, Picton, November 1946, J.K. McFarlane; AMS KS4072, Pittwater, 1927, A. Musgrave; AMS KS4824, Point Clare, T.A. Trewheeler; AMS KS4910, Potts Point, 5 October 1969, C. Catterall; AMS KS4931, Punchbowl, 17 July 1947, F.J. Donald; AMS KS4809, Pymble, November 1971, A. Ritchie; AMS KS1850, Richmond, 12 October 1977, Ambulance Station; AMS KS3168, Roseville, 18 January 1948, H. Chadwick; AMS KS4964, Royal National Park, October 1966, R. Mascord; AMS KS4911, Rushcutters Bay, 24 May 1971, S.J. Penlington; AMS KS4810, Ryde, 28 October 1969, J. Garden; AMS KS4084, St. Ives, March 1967; AMS KS4912, St. Peters, 2 February 1959, D.J. Gilks; AMS KS5240, Scotland Island, 29 February 1980, J. Lowry; AMS KS5023, Somersby, J. Brown; AMS KS1839, Springwood, 4 August 1971; AMS KS1135, Sydney, 17 November 1969; AMS KS2715, Terry Hills, 30 April 1979, R. Gleeson; AMS KS4891, The Oaks, 25 February 1956; AMS KS4899, Thirroul, September 1933, D. King; AMS KS796, Thornleigh, 8 January 1978; AMS KS4844, Tuggerah, September 1927, H.W. Legge; AMS KS4376, Turramurra, 1928, H.S. Wales; AMS KS13791, Wahroonga, 2 February 1984, A.S. Martin; AMS KS4845, Wamberal, 4 December 1972, J.N. Kgor; AMS KS4243, Warrawee, 24 December 1972, ? Ricketts; AMS KS4063, West Pennant Hills, 15 May 1973, S. Zucher; AMS KS6069, West Ryde, 10 November 1980; AMS KS4846, West Wallsend, 30 May 1956, J. Donne; AMS KS4847, Weston, 4 November 1969, I. Waugh; AMS KS4357, Willoughby, 17 August 1969; AMS KS5151, Winston Hills, 9 September 1972, J. Deviana; AMS KS1848, Warrimbirra Sanctuary, 9 July 1969, M.N. Fackender; AMS KS4862, Woolwich, May 1927, H. Switzer; AMS KS4848, Woy Woy, 13 July 1933, B. Hynson; AMS KS8295, Yagoona, February 1981; AMS KS1274, Yerranderie, 20 February 1978, H. Kenny.

Diagnosis. CL 9.22–12.30 (male). Differs from other species by having a relatively spinose palpal tibia (4–11) with dorsal spines present. Differs from *A. sutherlandi* by having a more elongate embolus (BulbW/Embl 0.30) (Fig. 6B), and from *A. yorkmainorum* by larger body size (CL 9.22–12.30) and shallower offset of embolus base from tegulum (Fig. 6B).

Male (AMS KS4016, Gordon, New South Wales, 32°38'S 148°39'E, F. Hatton, 10 December 1949). —*Size*. Carapace length 10.20, width 8.70. Abdomen length 9.52, width 7.38. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide. Height 2.86. Frontal width 5.14. Fovea narrow, procurved. Mid-dorsal cephalic setae reach fovea. Anterior striae setae numerous. Anterolateral carapace angle with small, weak bristles. —*Eyes*. Central eye region weakly raised. Eye group width 1.85. Median ocular quadrangle length 0.70; anterior width 0.76, posterior width 1.13. Diameters: AME 0.28, ALE 0.58, PLE 0.38, PME 0.26. —*Chelicerae*. Cheliceral groove narrow, weakly divergent. Groove length 2.92, middle width 0.41. Cheliceral teeth: 18 central, occupying proximal half of groove; 12 prolateral; 13 retrolateral. —*Labium*. Much wider than long, apically indented. Length 1.08, width 1.68. Labiosternal sigilla broad, entire. Cuspules c. 300, number high, in crescentic transverse band. —*Sternum*. Ovoid, long. Length 5.45, width 3.88. Posterior sigilla ovoid, broad. Strong bristles on posterior margin. —*Palp*. Bulb about as long as tibia. Tegular region rather small, slightly wider than long. Base of embolus weakly offset from tegulum. Embolus shaft long, gently curved, strongly tapered. Distal embolus weakly twisted, ejaculatory groove wide. Bulb length 4.62, width 1.12. Embolus length 3.60, midwidth 0.25. Length of femur 4.35, patella 1.96, tibia 4.71. Width of tibia 1.80. Spination: femur 7, patella 5, tibia 10 (dorsal spines present). Some distal femoral bristles and spines sinuous. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.43	4.21	6.36	6.69	3.87	29.56
2	7.75	3.86	6.36	6.28	3.89	28.14
3	7.14	3.18	5.15	6.03	3.94	25.44
4	8.32	3.81	6.80	7.41	4.40	30.74

Tibia I width 1.50. Femora I and II with dorsal spines. Leg I unmodified, tibial and metatarsal spines numerous. Tibia II with large, conical, apophysis set just proximal of centre. A few ventral tibial spines placed proximally, absent in distal half (except apical ventral spines). Distal tibia II ventrally concave. Metatarsus II sinuous, curved proximally, ventral spines placed upon and distal to a small, subcentral apophysis. Anterior coxal hairs unmodified. Scopulae legs I–IV: tarsus, weak; distal metatarsus, absent to weak. Tarsal claw teeth legs I, II: superior 13, 11; inferior 2, 2. Trichobothria legs I, II: tarsus 20, 19; metatarsus 15, 12; tibia p9 r9, p8 r8. —*Leg spination*. Leg I: femur 9 (d6 p3), patella 13 (p2), tibia 51 (p8), metatarsus 29, tarsus 20. Leg II: femur 12 (d6 p6), patella 6 (p2–3); tibia 18 (p4), metatarsus 22(p1), tarsus 23. Leg III: femur d7 (plus strong bristles), patella 5 (p3 r2), tibia 15 (p2 r3), metatarsus 25, tarsus 25. Leg IV: femur 0 (long bristles present), patella r1, tibia 18 (p1 r4), metatarsus 20, tarsus 21. —*Abdomen*. Posterior lateral spinnerets, lengths: total 4.68; basal segment 1.52; middle 1.08; apical 2.08. Apical segment width 0.60.

Table 2. Male morphological data—*Atrax robustus* (n = 24).

character	range	mean	character	range	mean	character	ratio	SD
CL*	9.22–12.30	10.48	Mt1S	24–32 (p0–1)	27	CW/CL	0.89	0.033
CW	8.27–10.59	9.28	Ta1S	12–27	19	CH/CW	0.35	0.025
CH	2.86–4.06	3.28	Ti2S	13–27 (p2–5)	18	CFW/CL	0.55	0.038
CFW	4.49–7.38	5.78	STC2teeth	10–15	13	CHGW/L	0.14	0.015
ChGL	2.84–3.60	3.09	BulbL	4.08–9.06	5.79	SW/SL	0.74	0.043
ChGW	0.41–0.55	0.44	EmbL	3.28–5.26	4.25	LL/LW	0.75	0.052
ChGCT	10–29	20	BulbW	1.12–1.48	1.28	PLSAPW/L	0.25	0.032
LL	1.08–1.62	1.41	EmbmW	0.20–0.30	0.27	BulbW/EmbL	0.30	0.055
LW	1.60–2.16	1.87	PalpTibL	4.65–6.61	5.53	EmbmW/L	0.06	0.012
CUSPS*	261–494	340	PalpTibW	1.59–2.08	1.83	PalpTibW/L	0.33	0.035
SL	5.30–6.56	5.81	PalpTibS*	4–11	8	BulbL/Tib L	0.97	0.068
SW	3.88–5.83	4.31	PalpPatS*	1–8	5			
PLSAPW	0.46–0.64	0.53	PalpFem*	5–9	6			
PLSAPL	1.64–2.40	2.03						
Fe1S	2–10	6						
Pa1S	6–13 (p2–4)	10						

Female (AMS KS13470, Gordon, N.S.W., 32°38'S 148°39'E, 1 November 1983, C. Horseman). —*Size*. Carapace length 12.63, width 10.41. Abdomen length 14.82, width 12.07. —*Colour*. Basic colour pattern. —*Carapace*. Much longer than wide. Height 2.72, frontal width 8.28. Cephalic length 8.50. Fovea narrow, procurved, anterior margin slightly indented. Mid-dorsal cephalic setae numerous, reach back to fovea. Anterior strial setae numerous. Strial and marginal setae numerous, rather short. Anterolateral carapace angle with several short, weak bristles. —*Eyes*. Central eye region slightly raised. Eye group width 2.60. Diameters: AME 0.26, ALE 0.60, PLE 0.44, PME 0.36 Interdistances: AME–AME 0.39, AME–ALE 0.27, ALE–PLE 0.27, ALE–PME 0.14, PME–PME 1.05. Median ocular quadrangle length 0.90, anterior width 0.94, posterior width 1.73. —*Chelicerae*. Groove narrow, margins diverging distally; groove length 3.70, middle width 0.59. Cheliceral teeth: 29 central, occupying basal half of groove; 15 prolateral; 14 retrolateral. —*Labium*. Wider than long, anterior margin weakly indented. Length 2.18, width 2.64. Cuspules occupying central two thirds of labium. Labiosternal sigilla entire. —*Sternum*. Ovoid. Length 6.89, width 5.17. Posterior sigilla ovoid: length 1.10, width 0.60. —*Palp*. Spination: patella p1 (bristle-like), tibia 5, tarsus 12. Trichobothria: tibia p11 r10, tarsus 22. Tarsal claw with 10 teeth. —*Legs*. 4123. Legs I, IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	9.50	5.32	7.32	6.40	3.44	31.98
2	8.45	4.88	6.15	5.79	3.28	28.55
3	7.46	3.94	4.80	5.66	3.69	25.55
4	9.00	4.88	6.71	7.18	4.22	31.99

Tibia I width 2.30. Metatarsus I proximal width 1.44. Coxae I, II with short, anteromedial bristle-like setae. Tarsal claw teeth legs I, II: superior 11, 11; inferior III, IV. Trichobothria legs I, II: tarsus 24, 24; metatarsus 21, 19; tibia p10 r9, p9 r10. —*Leg spination*. Leg I: femur p1, patella p1, tibia 3 (p2), metatarsus 11, tarsus 15. Leg II: femur p2, patella p2, tibia 5 (p2), metatarsus 14, tarsus 14. Leg III: femur 0, patella

3 (p2 r1), tibia 8 (p2 r2), metatarsus 23 (p9 r2), tarsus 17. Leg IV; femur 0, patella r1, tibia 6 (p1 r2), metatarsus 22 (p6 r2), tarsus 25. —*Abdomen*. Posterior lateral spinnerets-lengths: total 6.20; basal segment 2.40, middle 1.32, apical 2.48. Apical segment width 0.77. —*Genitalia*. Spermathecae long, slender; gently curved toward midline. Basal separation twice the width of a spermatheca. Length 1.50, width 0.41.

Distribution. Sydney, Central Coast and Illawarra regions and west to the Blue Mountains (Fig. 7).

Comments. Specimens from the Hunter River/Newcastle region are typically larger than other individuals (male CL c. 12 mm) and the palpal tibia and embolus may be more elongate.

Mating position in *A. robustus*. Mating was observed for *A. robustus* (Gray, 1986), a species with well-developed apophyses on tibia and metatarsus II. The position adopted during its mating is almost identical to that recorded for *H. formidabilis* (Fig. 1F: Walker, in Mascord, 1980; Walker, 1982), another species with large apophyses, the *A. robustus* male, uses his second legs to clasp the basal parts of the female femora II, locking them in the cavity between the tibial and metatarsal apophyses. At the same time he braces his first legs against the chelicerae and palps of the rearing female, pushing her up and backwards. The main difference in the *H. formidabilis* mating was the distal crossing of the bracing first legs (Fig. 1F)—this was not seen in the *A. robustus* matings. Hickman (1964) described mating in *H. infensa*, a species lacking leg II apophyses. The accompanying plate shows the spiders in an almost identical position to that observed for *A. robustus* (although Hickman's notes are somewhat contradictory).

Snazel & Allison (1989) noted the marked similarities between mating in *H. formidabilis* and *Macrothele*, another genus in which leg II modifications are present or absent. Coyle (1986) observed similar mating behaviour in *Euagrus* sp., a diplurid genus with tibia II apophyses.

Atrax yorkmainorum n.sp.

Figures 7–10; Tables 3, 34

Etymology. The species is named for Dr Barbara York Main and Professor Bert Main, in recognition of their remarkable achievements in Arachnology and Ecology.

Types. Holotype male: AMS KS1042, Batlow, New South Wales, 35°30'S 148°08'E, H.V. Smith, 16 June 1951. Paratypes (AMS). New South Wales. *Males:* AMS KS4104, Bago Forest, nr. Batlow, 35°41'S 148°09'E, 5 November 1979, J. Kovacs; AMS KS4607, Batlow-Tumut area, 35°25'S 148°10'E, 5 March 1980, N. Robinson; AMS KS4718, Tumbarumba, 35°45'S 148°00'E, 25 Mar AMS KS1043, Batlow, 35°30'S 148°08'E, 1980; AMS KS12361, AMS KS1050, Wondalga, 35°23'S 148°07'E, 14 October 1948, C.H. Jagoe; *Females:* AMS KS16451, Batlow, 35°30'S 148°08'E, 16 June 1951, H.V. Smith; AMS KS5054, Bago Forest, 35°41'S 148°09'E, 8 January 1979, J. Kovacs; AMS KS1047, Tumut, 35°18'S 148°13'E, 4 May 1977, B. Buckley. Australian Capital Territory. *Males:* Uriarra Forest, Brindabella Range, 35°18'S 148°56'E, 9 July 1983, M.R. Gray; AMS KS13396, Tidbinbilla Nature Reserve, 35°28'S 148°54'E, 26 October 1983, W. Osborne. *Females:* AMS KS3542, Tidbinbilla Nature Reserve, 35°28'S 148°54'E, November 1978, P. Ormay; AMS KS928, Gibraltar Falls, 35°29'S 148°56'E, 24 October 1971, T. McGregor.

Other material examined. New South Wales (*males*). AMS KS13534, Bago Forest, near Batlow, 5 November 1979, J. Kovacs; AMS KS1041, Batlow, December 1948, C.H. Jagoe; AMS KS1042, Dora Dora National Park, Jingellic near Albury, 16 January 1979, A.B. Rose (AMS). New South Wales (*females*): AMS KS1041, Batlow, December 1948, C.B. Jagoe; AMS KS4608, Batlow-Tumut area, 5 March 1980, N. Robinson; AMS KS7566, Cooma, 19 January 1980, R. Mascord; AMS KS13545, Gundagai, 25 October 1983. Australian Capital Territory (*males*). AMS KS13397, Tidbinbilla Nature Reserve, 26 October 1983, W. Osborne; AMS KS13592, Canberra area, 35°17'S 149°13'E, 13 Dec 1983, T. Mitchell. Australian Capital Territory (*females*): AMS KS654, Honeycucklee Creek, 24 February 1977, M. Noble; AMS KS12032, Gudgenby National Park; AMS KS929, near Piccadilly Circus, 25 January 1972, K. Watson.

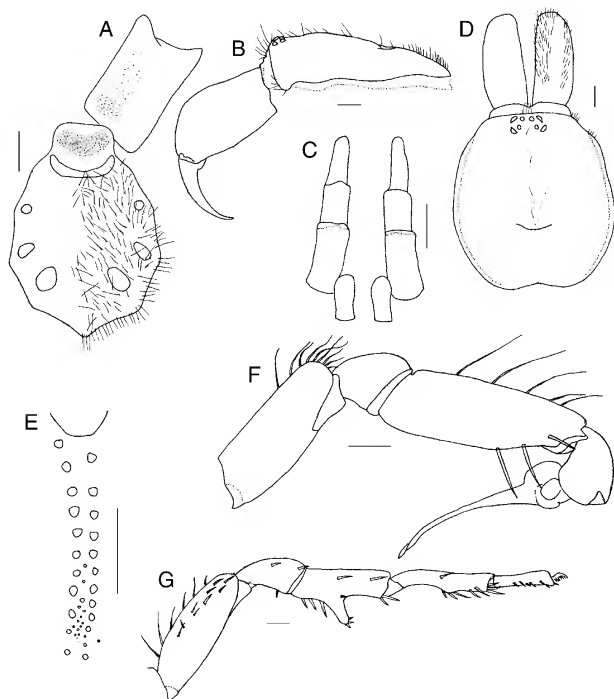


Figure 8. *Atrax yorkmainorum*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cephalothorax and chelicerae, dorsal; (E) cheliceral groove teeth; (F) palp, proximal; (G) leg II, proximal. Scale lines 1 mm.

Diagnosis. CL 7.39–9.22 (male). Usually smaller than *A. robustus* and differs from it by palp lacking dorsal tibial spines, embolus base more strongly offset from tegulum, and apical part of embolus set at angle to strongly curved embolic shaft (Fig. 10B,C). Differs from *A. sutherlandi* by its more elongate, slender and curved embolus.

Male (holotype). —*Size.* Carapace length 8.42, width 7.48. Abdomen length 8.50, width 6.90. —*Colour.* Basic colour pattern. —*Carapace.* Height 2.69. Frontal width 4.57. Fovea narrow, procurved. Mid-dorsal cephalic setae few, reach fovea. Anterior striae setae present. Anterolateral carapace angle with small, weak bristles. —*Eyes.* Central eye region weakly raised. Eye group width 1.66. Median ocular quadrangle length 0.57, anterior width 0.69, posterior width 1.05. Diameters: AME 0.20, ALE 0.36, PLE 0.35, PME 0.19. —*Chelicerae.* Cheliceral groove narrow, margins subparallel, diverging slightly distally. Groove length 2.48, middle width 0.26. Cheliceral teeth: 16 central, confined to basal half of groove; 11 prolateral; 12 retrolateral. —*Labium.* Much wider than long, apically weakly indented. Length 1.49, width 1.08. Labiosternal sigilla broad, entire. Cuspules c. 193, number moderate, in crescentic transverse band; frequency moderate. —*Sternum.* Ovoid. Length 4.43, width 3.62. Posterior sternal sigilla ovoid, broad. Strong bristles on posterior margin. —*Palp.* Tegular area small, slightly wider than long. Embolus long, slender; shaft tapered and strongly curved. Distal embolus very slender, apical region weakly twisted and set at angle to the embolic axis; ejaculatory groove narrow. Embolus base strongly offset from tegulum. Bulb length 4.16, width 1.10. Embolus length 3.23, midwidth 0.18. Length of femur 3.48, patella 1.57, tibia 4.61. Width of tibia 1.71. Spination: femur 3, patella 0, tibia 3 (all bristle-like). Distal femoral bristles and spines sinuous. —*Legs.* 4123.

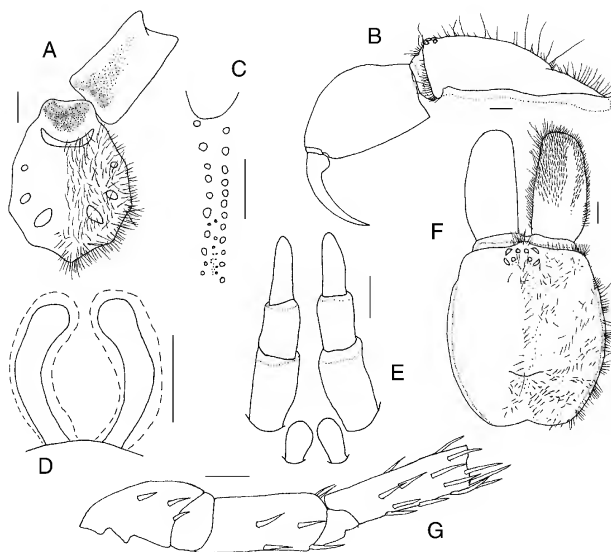


Figure 9. *Atrax yorkmainorum*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) spermatacae; (E) spinnerets; (F) cephalothorax and chelicerae, dorsal; (G) leg III, proximal, patella, tibia, metatarsus. Scale lines 1 mm.

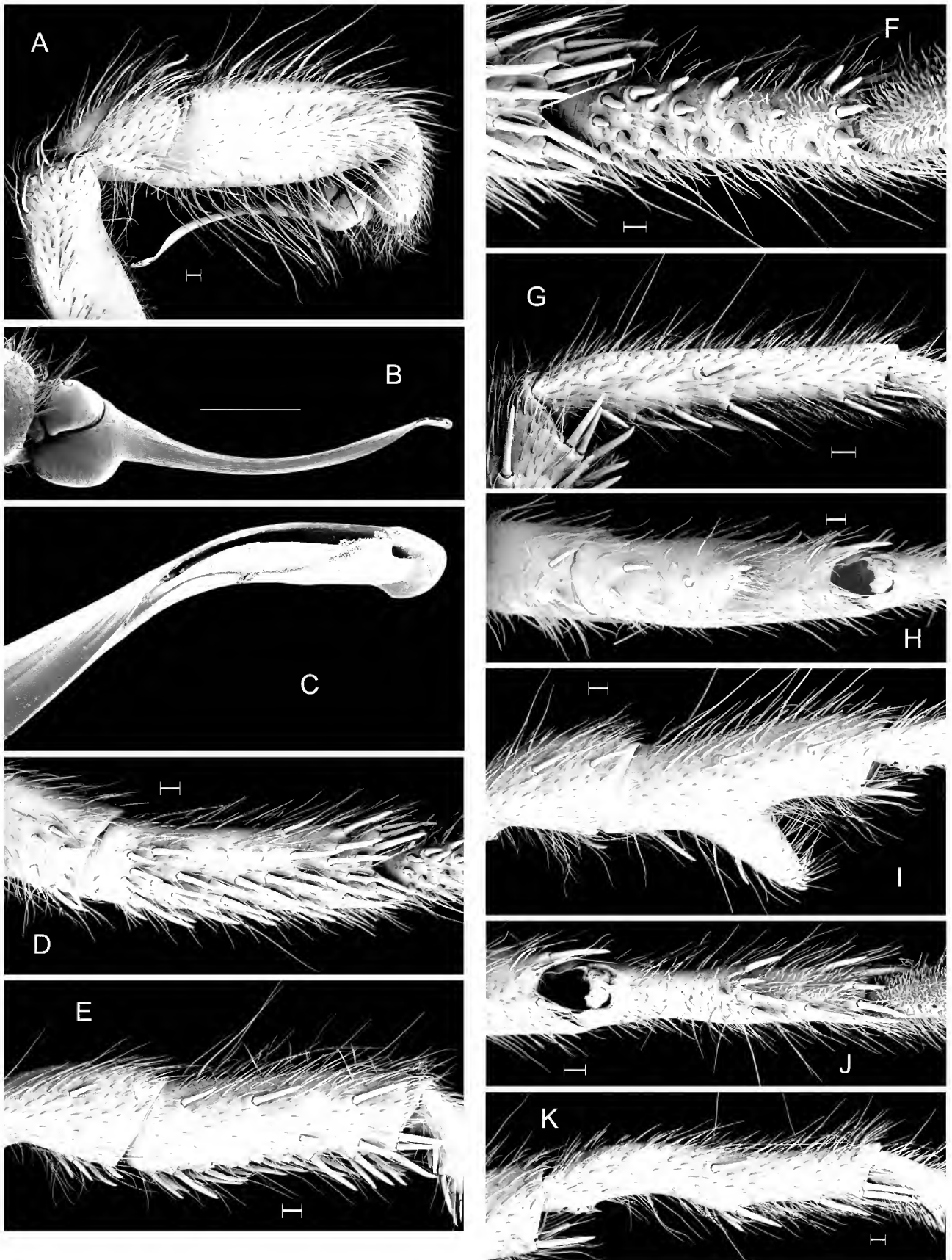


Figure 10. *Atrax yorkmainorum*, male (A, D–K, AMS KS13592; B, C, AMS KS1034): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D, E) distal patella and tibia I—D, ventral, E, prolateral; (F, G) metatarsus I—F, ventral, G, prolateral; (H, I) distal patella and tibia II—H, ventral, I, prolateral; (J, K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A, F, K 0.2 mm and B 1.0 mm.

Table 3. Male morphological data—*Atrax yorkmainorum* (n = 10).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.83–9.22	8.47	Mt1S	12–26 (p0–1)	19	CW/CL	0.92	0.027
CW	7.14–8.60	7.76	Ta1S	7–13	10	CH/CW	0.35	0.021
CH	2.53–3.03	2.72	Ti2S	13–20 (p1–3)	16	CFW/CL	0.56	0.042
CFW	4.14–5.20	4.69	STC2teeth	12–15	13	CHGW/L	0.11	0.016
ChGL	2.33–2.70	2.59	BulbL	3.93–4.78	4.36	SW/SL	0.77	0.032
ChGW	0.22–0.35	0.28	EmbL	2.92–3.71	3.37	LL/LW	0.72	0.023
ChGCT	9–18	14	BulbW	1.08–1.22	1.12	PLSAPW/L	0.28	0.023
LL	1.03–1.30	1.16	EmbmW	0.18–0.25	0.20	BulbW/EmbL	0.34	0.019
LW	1.41–1.77	1.58	PalpTibL	4.32–5.10	4.72	EmbmW/L	0.06	0.008
CUSP	167–228	199	PalpTibW	1.56–1.87	1.69	PalpTibW/L	0.36	0.022
SL	4.19–5.06	4.56	PalpTibS	1–4	3	BulbL/TibL	0.92	0.047
SW	3.28–3.83	3.52	PalpPatS	0–2	<1			
PLSAPW	0.36–0.51	0.42	PalpFemS	3–4	3			
PLSAPL	1.15–1.84	1.51						
Fe1S	5–13	8						
Pa1S	5–12 (p2–4)	8						

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.40	3.40	4.98	4.73	2.69	22.20
2	5.98	3.26	4.69	4.61	2.61	21.15
3	5.30	2.79	4.01	4.59	3.06	19.75
4	6.19	2.92	5.00	5.44	3.40	22.95

Tibia I width 1.35. Femora I and II with dorsal spines. Leg I unmodified, tibial spines numerous. Tibia II with large, conical apophysis placed centrally. Metatarsus II sinuous, curved proximally with a weak, spined apophysis centrally; ventral spines lacking proximally. Anterior coxal hairs unmodified. Tarsal scopulae legs I–IV: weak. Distal metatarsal scopulae legs I–IV: absent to weak. Tarsal claw teeth leg I, II: superior 14, 13; inferior 0, 2. Trichobothria legs I, II: tarsus 15, 15; metatarsus 14, 14; tibia p8 r8, p8 r8. —*Leg spination*. Leg I: femur 7 (d3 p4) (some bristle-like), patella 5 (p2), tibia 36 (p2), metatarsus 19, tarsus 10. Leg II: femur 10 (d4 p6) (plus several bristle-like), patella 5 (p2), tibia 16 (p2), metatarsus 16 (p1), tarsus 10. Leg III: femur 0 (long bristles), patella 5 (p4 r1), tibia 14 (p2 r3), metatarsus 23, tarsus 12. Leg IV: femur 0 (long bristles), patella r1, tibia 13 (p1 r3), metatarsus 20, tarsus 17. Abdomen. Posterior lateral spinnerets, lengths: total 4.41; basal segment 1.63; middle 1.18; apical 1.60. Apical segment width 0.41.

Female (paratype AMS KS16451). —*Size*. Carapace length 8.57, width 7.14. Abdomen length 10.27, width 7.89. —*Colour*. Basic colour pattern. —*Carapace*. Much longer than wide. Height 3.16; frontal width 5.64. Cephalic length 6.05. Fovea narrow, procurved. Mid-dorsal cephalic setae few, alternating large and small, reach back to fovea. Anterior striae setae numerous. Anterolateral carapace angle with weak bristles. —*Eyes*. Eye region slightly raised centrally. Eye group width 1.65. Diameters: AME 0.20, ALE 0.45, PLE 0.35, PME 0.26. Interdistances: AME–AME 0.23, AME–ALE 0.15, ALE–PLE 0.14, PLE–PME 0.07, PME–PME 0.59. Median ocular quadrangle length 0.59, anterior width 0.63, posterior width 1.05. —*Chelicerae*. Cheliceral groove narrow, margins subparallel, weakly divergent distally. Groove length 2.63, middle width 0.35. Cheliceral teeth: 16 central in basal half of groove; 11 prolateral, 12 retrolateral. —*Labium*. Wider than long, anterior margin indented. Length 1.36, width 1.78. Cuspules spread in shallow v-shape across anterior two-thirds of labium. Labiosternal sigilla

entire or narrowed centrally. —*Sternum*. Ovoid, moderately wide. Length 4.59, width 3.84. Posterior sigilla moderately short, ovoid: length 0.75, width 0.37. —*Palp*. Spination: tibia 4, tarsus 14. Trichobothria: tibia p6 r7, tarsus 12. Tarsal claw with 7 teeth. —*Legs*. 4123. Legs I, IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.98	3.57	4.56	3.71	2.24	20.06
2	5.30	3.37	3.88	3.47	2.24	18.26
3	4.56	2.82	3.15	3.30	2.38	16.21
4	5.59	3.18	4.28	4.38	2.75	20.18

Tibia I width 1.51. Metatarsus I proximal width 1.02. Coxal setae unmodified. Tarsal claw teeth legs I, II: superior 9, 9; inferior 2, 2. Trichobothria legs I, II: tarsus 13, 15; metatarsus 12, 11; tibia p9 r8, p8 r7. —*Leg spination*. Leg I: femur 0, patella 0, tibia 2, metatarsus 11, tarsus 10. Leg II: femur 0, patella 0, tibia 2 (p1), metatarsus 12, tarsus 8. Leg III: femur 0, patella pd3, tibia 6 (p2 r1), metatarsus 20 (p6 rd2). Leg IV: femur 0, patella 0, tibia 4, metatarsus 14, tarsus 12. —*Abdomen*. Posterior lateral spinnerets, lengths: total 4.20; basal segment 1.73, middle 1.08, apical 1.39. Apical segment width 0.45. —*Genitalia*. Spermathecae elongate, strongly curved, approximated basally and apically but well separated in middle. Apical region slightly wider than remainder of spermatheca. Length 1.84, width 0.35.

Distribution. Southeastern New South Wales and Australian Capital Territory (Fig. 7).

Atrax sutherlandi n.sp.

Figures 11–14; Tables 4, 34

Etymology. The species is named for the late Professor Struan Sutherland, whose venom research resulted in the production of a successful funnel-web spider antivenom.

Types. Holotype male: AMS KS1076, Bermagui, New South Wales, 36°25'S 150°04'E, K Walker. Paratypes. New South Wales (AMS). *Males*: AMS KS7464, Bega, 36°40'S 149°54'E, K. Walker; AMS KS1595, Nadgee Nature Reserve; AMS KS1074, Bermagui, 36°25'S 150°04'E, K. Walker; AMS KS11748, Bondi State Forest, nr. Bombala, 37°06'S 149°15'E, 14 November 1980, G. Gowing *et al.*; AMS KS1075, Bermagui, 36°25'S 150°04'E, K. Walker. *Females*: AMS KS5127, Bermagui, 36°25'S 150°04'E, 18 May 1973, M. Gray; AMS KS4886, Bockelo Creek, 18 May 1972, M. Gray;

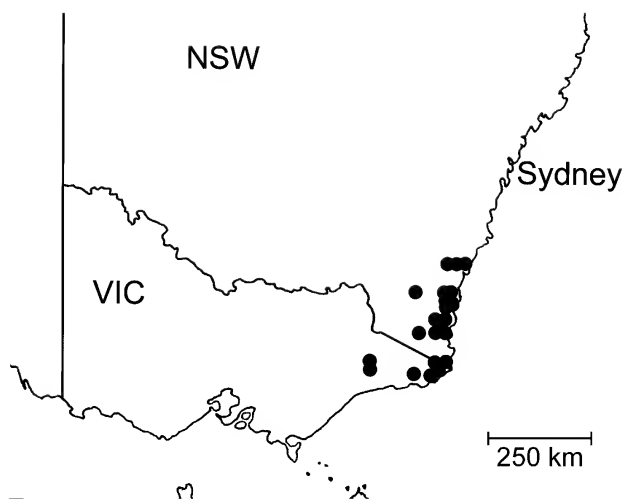


Figure 11. Collection records for *Atrax sutherlandi*.

AMS KS11848, Bondi State Forest, nr. Bombala, 37°06'S 149°15'E, 14 November 1980, G. Gowing; AMS KS3618, Merimbula, 36°53'S 149°54'E, 6 September 1976, H. Harvey. *Males*. K11078 (MV), Noorinbee, 37°31'S 149°10'E, Vic., 12 November 1969, A. Neboiss; K11088 (MV), Cann River, 37°34'S 149°09'E, 5 March 1964. *Females* (AMS): AMS KS3397, Mallacoota Inlet, 37°33'S 149°46'E, 9 October 1971, S. Sutherland; AMS KS1092, Genoa, 37°28'S 149°35'E, 1 November 1964.

Other material examined. New South Wales (males): AMS KS8467, Bombala, 1981; AMS KS5118, Bega, 17 May 1973, Ambulance Station; Merimbula, March 1965 (MV); AMS KS9561, Monga; AMS KS5120, Mount Doctor George, near Bega, 17 May 1974; AMS KS6072, Mumbulla State Forest, near Bega, November 1980, R. Wells; AMS KS1085, Bomboka, 10 May 1970, M. Clune; AMS KS14232, Bermagui, 8 April 1984; AMS KS11528, Bondi State Forest, near Bombala, 14 November 1980, G. Gowing *et al.*; AMS KS1084, Brogo, 4 December 1962, K. Walker; AMS KS5497, Kioloa State Forest, 4 October 1979–30 October 1979, C. Horseman; AMS KS5121, Beckelo Creek, 18 May 1973, M. Gray;

AMS KS5119, Bega, March 1974, Ambulance Station; AMS KS5126, Bega, Autumn 1973; AMS KS1086, Bomboka, July 1977, G. Wishart; AMS KS1074, Bermagui, K. Walker; AMS KS3619, Bombala, 17 January 1930, A.J. Barrett; AMS KS11445, Bondi State Forest, near Bombala, 31 March 1981, G. Gowing; Brown Mountain, 30 March 1967, R.J.B. (ANIC); AMS KS5042, Candelo, 17 May 1973, M. Gray; AMS KS7299, Cooma, 6 April 1981, A.N. Wallace; AMS KS1102, Merimbula, 5 June 1964; AMS KS1595, Nadgee Nature Reserve; AMS KS1088, Narooma, 29 January 1959, R. Martin; AMS KS3624, Narooma, 15 June 1971, J. Cobcroft; AMS KS1083, Nerrigundah, 1 October 1977, C. Cowall. **Victoria (males):** AMS KS1055, Murrindal, 2 km N. of, 3 June 1973, L. Windsor; Buchan, 9 January 1964, Dingey & Penschurst (MV); AMS KS1087, Cobargo, June 1957, C.G. Bradford; Cobargo, 5 November 1964 (MV); Mallacoota, 26 September 1963 (MV); AMS KS1057, Gelantipy, 6 May 1947; AMS KS1091, Mallacoota, May 1957; Mallacoota, January 1963, C. McArthur; AMS KS3397, Mallacoota Inlet, October 1971, S. Sutherland; AMS KS1055, Murrindal, 3 June 1973, L. Windsor; AMS KS1095, Noorinbee, 17 June 1957, N.A. Wakefield; AMS KS1096, Noorinbee, 25 September 1963, D.S. Broome; AMS KS1108, Wingan, 27 February 1946.

Diagnosis. CL 7.22–10.20 (male). Differs from other *Atrax* spp. by having a relatively shorter and wider embolus, and a shorter palpal tibia (PalpTibW/ L 0.43) (Fig. 14A–C; Table 4).

Male (holotype). —*Size*. Carapace length 7.56, width 6.59. Abdomen length 6.93, width 5.76. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide. Height 2.55. Frontal width 4.12. Fovea narrow, procurved. Mid-dorsal cephalic setae reach fovea, anterior strial setae present. Anterolateral carapace angle with small, very weak bristles. —*Eyes*. Central eye region weakly raised. Eye group width 1.58. Median ocular quadrangle length 0.63, anterior width 0.71, posterior width 1.03. Diameters: AME 0.19, ALE 0.44, PLE 0.32, PME 0.25. —*Chelicerae*. Cheliceral groove narrow, margins subparallel except distally where they diverge. Groove length 2.27, middle width 0.24. Cheliceral teeth: 23 central, confined to basal half of groove; 13 prolateral;

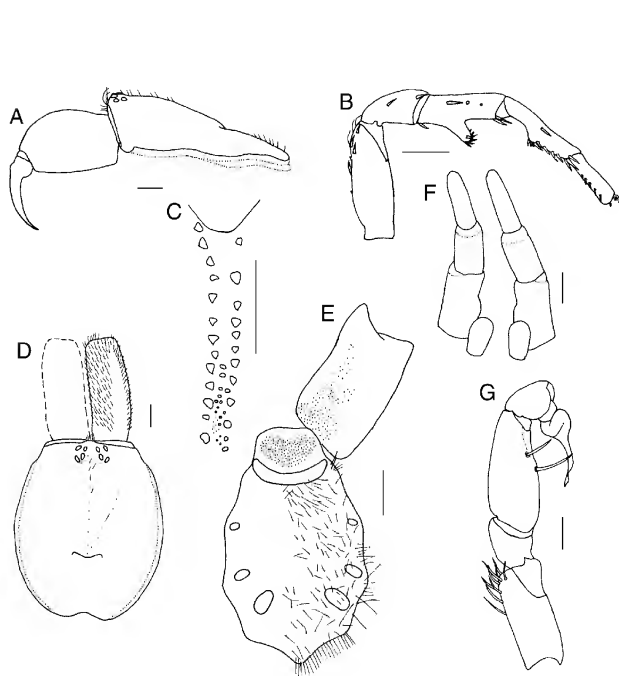


Figure 12. *Atrax sutherlandi*, male: (A) cephalothorax and chelicerae, lateral; (B) leg II, prolateral; (C) cheliceral groove teeth; (D) cephalothorax and chelicerae, dorsal; (E) sternum, labium and maxilla; (F) spinnerets; (G) palp, prolateral. Scale lines 1 mm.

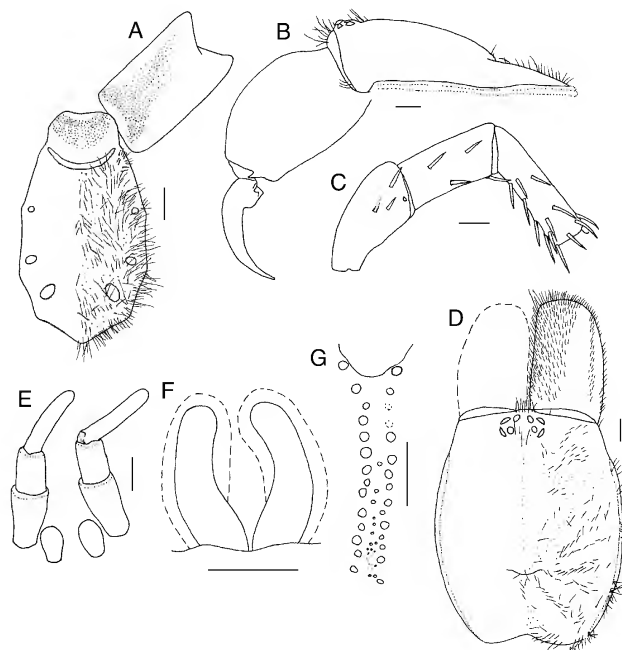


Figure 13. *Atrax sutherlandi*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg III, prolateral, patella, tibia, metatarsus; (D) cephalothorax and chelicerae, dorsal; (E) spinnerets; (F) spermathecae; (G) cheliceral groove teeth. Scale lines 1 mm.

Table 4. Male morphological data—*Atrax sutherlandi* (n = 17).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.22–9.64	8.23	Mt1S	18–35	23	CW/CL	0.87	0.039
CW	6.49–8.45	7.21	Ta1S	9–24	13	CH/CW	0.36	0.025
CH	2.13–3.36	2.62	Ti2S	10–23 (1–4)	15	CFW/CL	0.62	0.039
CFW	3.81–5.57	4.45	STC2teeth	12–14	13	CHGW/L	0.12	0.018
ChGL	2.15–3.16	2.41	BulbL	2.79–4.40	3.26	SW/SL	0.70	0.042
ChGW	0.19–0.34	0.28	EmbL	2.02–3.01	2.34	LL/LW	0.70	0.056
ChGCT	10–32	21	BulbW	0.90–1.21	1.02	PLSAPW/L	0.25	0.023
LL	0.92–1.39	1.07	EmbmidW	0.15–0.22	0.19	BulbW/EmbL*	0.44	0.043
LW	1.36–1.77	1.53	PalpTibL	3.24–4.56	3.65	EmbmidW/L*	0.08	0.012
CUSP	142–295	209	PalpTibW	1.34–1.85	1.56	PalpTibW/L*	0.43	0.035
SL	4.25–5.47	4.83	PalpTibS	1–3	3	BulbL/TibL	0.89	0.077
SW	2.82–3.85	3.41	PalpPatS	0–1	<1			
PLSAPW	0.38–0.66	0.44	PalpFemS	0–4	2			
PLSAPL	1.26–2.07	1.53						
Fe1S	2–10	6						
Pa1S	5–16 (p0–3)	10						

13 retrolateral. —*Labium*. Much wider than long, apically weakly indented. Length 0.99, width 1.49. Labiosternal sigilla broad, entire. Cuspules c. 218, number moderate, grouped in broad, central band. —*Sternum*. Ovoid, long. Length 4.73, width 3.28. Posterior sigilla ovoid. Bristles on posterior margin strong. —*Palp*. Tegular area wider than long. Embolus of moderate length, shaft gently curved and strongly tapered. Distal embolus slender, weakly twisted, ejaculatory groove wide. Embolus base moderately to strongly offset from tegulum. Bulb length 2.82, width 0.96. Embolus length 2.10, midwidth 0.19. Length of femur 3.32, patella 1.47, tibia 3.26. Width of tibia 1.48. Spination: femur 3, patella 0, tibia 2. Distal femur with sinuous spines and strong bristles. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.63	3.16	4.23	4.08	2.41	19.51
2	5.10	2.98	4.10	4.00	2.43	18.60
3	4.75	2.61	3.41	3.92	2.81	17.50
4	5.28	2.79	4.61	4.80	3.04	20.52

Tibia I width 1.26. Femora I and II with dorsal spines. Leg I unmodified, patella and tibial ventral spines numerous. Tibia II with large, conical apophysis placed just proximal of centre. Metatarsus II sinuous, strongly curved proximally, with a small, spined, central apophysis. Anterior coxal hairs unmodified. Tarsal scopulae legs I–IV: weak to moderate. Distal metatarsal scopulae legs I–IV: absent to weak. Tarsal claw teeth legs I, II: superior 13, 13; inferior 3, 2. Trichobothria legs I, II: tarsus 14, 13, metatarsus 14, 14; tibia p9 r9, p9 r8. —*Leg spination*. Leg I: femur d6, patella 11 (p2), tibia 39 (p2), metatarsus 24, tarsus 12. Leg II: femur d7, patella 5 (p2), tibia 16 (p3), metatarsus 16 (p1), tarsus 13. Leg III: femur 0 (long bristles), patella 6 (p5 r1), tibia 11 (p4 r3), metatarsus 15, tarsus 11. Leg IV: femur 0 (long bristles), patella r1, tibia 8 (p1 r2), metatarsus 21, tarsus 17. —*Abdomen*. Posterior lateral spinnerets, lengths: total 3.82, basal segment 1.36; middle 0.98; apical 1.48. Apical segment width 0.41.

Female (paratype AMS KS3397). —*Size*. Carapace length 10.20, width 8.16. Abdomen length 10.88, width 9.18. —*Colour*. Basic colour pattern. —*Carapace*. Much longer than

wide. Height 3.74; frontal width 6.39. Cephalic length 7.11. Fovea narrow, procurved. Mid-dorsal cephalic setal row with alternating large and small bristles which extend back to the fovea. Anterior strial setae numerous. Anterolateral carapace angle with weak bristles. —*Eyes*. Eye region weakly raised. Eye group width 1.99. Diameters: AME 0.21, ALE 0.41, PLE 0.45, PME 0.27. Interdistances: AME–AME 0.27, AME–ALE 0.20, ALE–PLE 0.20, PLE–P.M.E 0.12, PME–PME 0.81. Median ocular quadrangle length 0.78, anterior width 0.78, posterior width 1.34. —*Chelicerae*. Cheliceral groove narrow, margins subparallel, divergent distally. Groove length 3.26, middle width 0.47. Cheliceral teeth: 25 central, occupying basal half of groove; 14 prolateral; 14 retrolateral. —*Labium*. Much wider than long, anterior margin indented. Length 1.60, width 2.28. Cuspules occupy anterior two-thirds of labium. Labiosternal sigilla entire. —*Sternum*. Long, ovoid. Length 6.12, width 4.01. Posterior sigilla short, ovoid: length 0.48, width 0.27. —*Palp*. Spination: tibia 5, tarsus 11. Trichobothria: tibia p8 r8, tarsus 18. Tarsal claws with 8 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.48	4.15	5.64	4.84	2.72	24.83
2	6.58	3.88	4.73	4.32	2.65	22.11
3	5.81	3.16	3.50	4.35	2.92	19.74
4	7.11	3.84	5.03	5.54	4.01	25.53

Tibia I width 1.77. Metatarsus I proximal width 1.13. Tarsal claw teeth legs I, II: superior 10, 11; inferior 3, 2. Trichobothria legs I, II: tarsus 20, 16; metatarsus 20, 13; tibia p10 r9, p9 r9. —*Leg spination*. Leg I: femur 0, patella 0, tibia 2, metatarsus 12, tarsus 15. Leg II: femur p1, patella 0, tibia 4 (p2), metatarsus 11, tarsus 12. Leg III: femur 0, patella pd3 r1, tibia 7 (p2 r2), metatarsus 17 (p6 rd2), tarsus 17. Leg IV: femur 0, patella 0, tibia 7 (r2), metatarsus 21 (p4 rd2), tarsus 18. —*Abdomen*. Posterior lateral spinnerets, lengths: total 5.55; basal segment 2.04, middle 1.16, apical 2.35. Apical segment width 0.54. —*Genitalia*. Spermathecae moderately elongate, gently curved, basally approximated. Length 1.66, width 0.52.

Distribution. Southeastern New South Wales and north-eastern Victoria (Fig. 11).

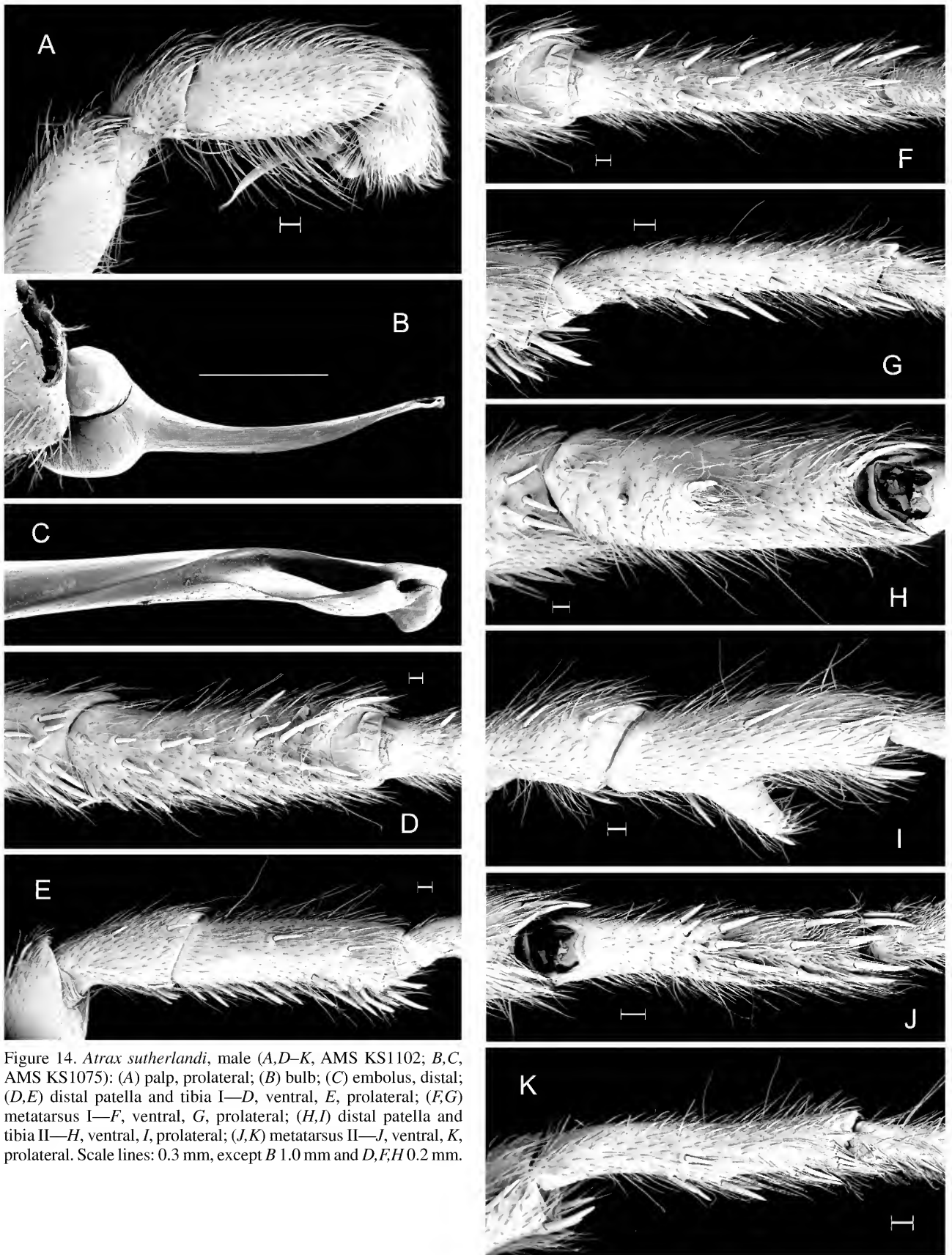


Figure 14. *Atrax sutherlandi*, male (A, D–K, AMS KS1102; B, C, AMS KS1075): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D, E) distal patella and tibia I—D, ventral, E, prolateral; (F, G) metatarsus I—F, ventral, G, prolateral; (H, I) distal patella and tibia II—H, ventral, I, prolateral; (J, K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except B 1.0 mm and D, F, H 0.2 mm.

***Illawarra* n.gen.**

Type species *Illawarra wisharti* new species.

Diagnosis. Differs from other atracine species as follows—in males, by having broad midventral spine row on male tarsi I–IV (Fig. 3B); in females, by having a robust, aspinose leg I with metatarsus partially fused to tarsus and tarsal claws enlarged.

Description. With the characters of the Atracinae. Colour light to dark brown with distinct abdominal chevrons. Carapace longer than wide; relatively low with caput weakly raised (CH/CW 0.37) and narrow frontally (CFW/CL 0.54). Cheliceral paturon less robust than in other genera. (Figs. 16A,B; 17B,C). Cheliceral groove narrow, lateral margins parallel; central tooth row short; basal; prolateral tooth row may be incomplete; retrolateral row complete (Fig. 16C). Labium short (LL/LW 0.70) (Fig. 16D), cuspule numbers low to moderate (85–154). Apical segment of posterior lateral spinnerets relatively short. Leg I more robust than other legs, especially in females; female leg I without spines, tarsal claws enlarged and metatarsus thickened proximally (wedge-shaped) and partially fused to the tarsus (Fig. 17H,I). Male tarsi highly spinose (43–93 spines), with two lateral spine rows and a full midventral spine row (Fig. 3B). Female tarsi with few spines. Male femora I, II with slender dorsal spines (Fig. 16F,H); legs I, II without apophyses; tibia I, II and metatarsus I, II spinose, spines slender and scattered (Fig. 18D–J). Male palpal patella a little wider than femur. Palpal bulb with a broad tegular area; groove between tegulum and subtegulum sometimes wide, exposing middle haematodocha.; embolus short, wide. (Figs. 16I, 18B). Female spermathecae two very short, distally broad sacs (Fig. 17E).

Included species. *Illawarra wisharti* n.sp.

Distribution. The Illawarra region of southern New South Wales.

***Illawarra wisharti* n.sp.**

Figures 3B, 15–18; Tables 5, 34

Etymology. The species is named for Graeme Wishart, Australian Museum Associate, idiopid spider researcher, and collector of many mygalomorph spiders in the Illawarra region.

Types. Holotype male: AMS KS5357, Nowra, New South Wales, 34°52'S 150°36'E, 17 March 1980. Paratypes (AMS). New South Wales. *Males*: AMS KS15748, Willowvale near Gerringong, 34°45'S 150°47'E, 25 Mar 1985, G. Wishart; AMS KS920, Avondale, 34°30'S 150°45'E, March 1956 R.K. Hayes; AMS KS2721, Figtree, 34°25'S 150°50'E, 16 March 1979, J. Lewis; AMS KS919, AMS KS5355, Nowra, 34°52'S 150°36'E, 7 April 1980; AMS KS8921, Swan Lake, nr. Sussex Inlet, 35°10'S 150°34'E, 10 April 1982, A. McLaughlin; AMS KS15746, Willowvale, nr Gerringong, 34°52'S 150°36'E, 29 April 1977, G. Wishart; AMS KS16450, Unanderra, 34°27'S 150°50'E, 8 February 1979, J. Wafle; AMS KS5356, Bangalee Scout Camp, Nowra area, 14 March 1980; *Females*: AMS KS30273, Willowvale, 4km W. of Gerringong, 34°35'S 149°37'E, November 1979, G. Wishart; AMS KS2667, AMS KS4778, Nowra South, 34°54'S 150°35'E, March 1959; AMS KS13781, Farmborough Heights, near Unanderra, 34°27'S 150°48'E, J. Wafle, 8 February 1979.

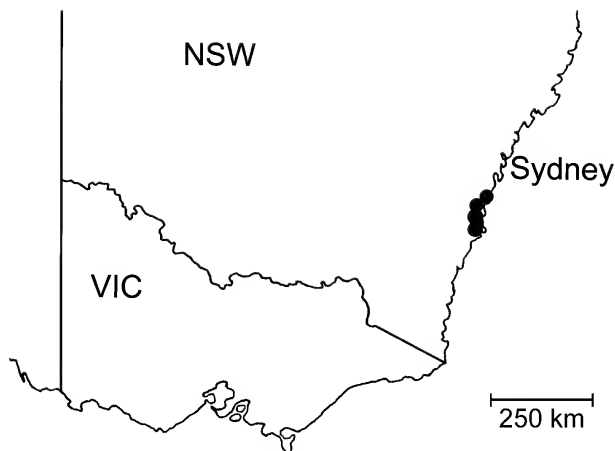


Figure 15. Collection records for *Illawarra wisharti*.

Other material examined. New South Wales (*males*): AMS KS921, Willowvale, 4 km W. of Gerringong, 11 May 1977, G. Wishart; AMS KS922, Willowvale, 4 km W. of Gerringong, 20 May 1977, G. Wishart; AMS KS1448, Willowvale, 4 km W. of Gerringong, 5 April 1978, G. Wishart; AMS KS918, Ulladulla, Ulladulla Ambulance Station; AMS KS10796, Unanderra, January 1983, M. Senior.

Diagnosis. CL 6.77–10.13 (male). Male tarsi I–IV strongly spinose (tarsus I with 43–93 spines), with a middle ventral spine row as well as lateral ventral rows (Fig. 3B). Female leg I robust, aspinose; metatarsus I thickened proximally and partially fused with tarsus I, tarsal claws enlarged (Fig. 17H,I).

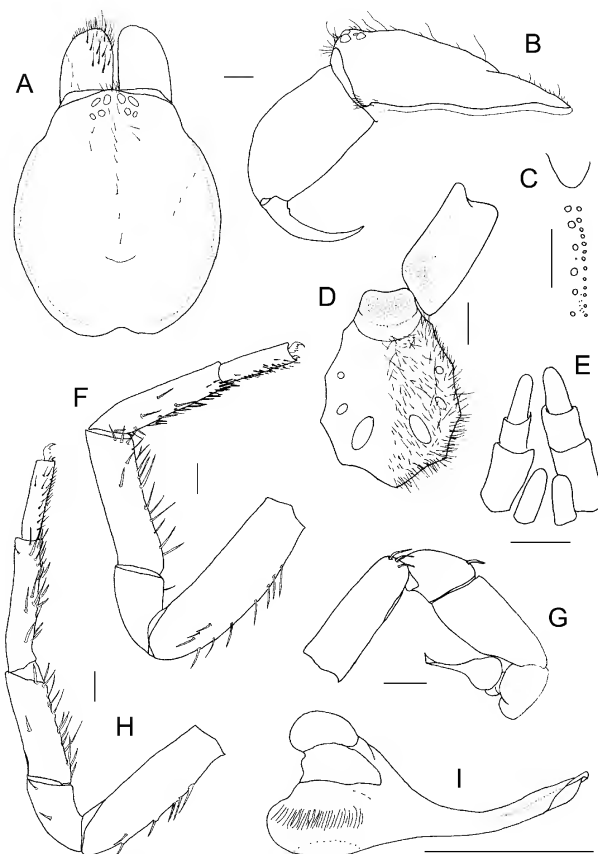


Figure 16. *Illawarra wisharti*, male: (A) cephalothorax and chelicerae, dorsal; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) sternum, labium and maxilla; (E) spinnerets; (F) leg I, prolateral; (G) palp, prolateral; (H) leg II, prolateral; (I) palpal organ. Scale lines 1 mm.

Table 5. Male morphological data—*Illawarra wisharti* (n = 12).

character	range	mean	character	range	mean	character	ratio	SD
CL	6.77–10.13	8.00	Mt1S	28–76 (p0–1)	48	CW/CL	0.90	0.031
CW	6.36–9.36	7.18	Ta1S*	43–93	70	CH/CW*	0.37	0.02
CH	2.50–2.83	2.66	Ti2S	10–17 (p0–1)	13	CFW/CL*	0.54	0.021
CFW	3.94–5.17	4.32	STC2teeth*	6–10	8	CHGW/L*	0.11	0.016
ChGL	2.01–2.42	2.19	BulbL	1.73–2.11	1.89	SW/SL	0.82	0.021
ChGW	0.20–0.32	0.23	EmbL	1.02–1.22	1.12	LL/LW*	0.70	0.038
ChGCT	7–17	11	BulbW	0.76–0.98	0.84	PLSAPW/L	0.45	0.034
LL	0.86–1.18	0.98	EmbmW	0.10–0.19	0.14	BulbW/EmbL*	0.76	0.047
LW	1.31–1.62	1.39	PalpTibL	2.36–2.92	2.65	EmbmW/L	0.13	0.024
CUSP*	85–154	113	PalpTibW	1.10–1.46	1.24	PalpTibW/L	0.47	0.022
SL	3.60–4.79	4.28	PalpTibS	0–3	1	BulbL/TibL	0.72	0.027
SW	2.95–3.91	3.51	PalpPatS	0–3	1			
PLSAPW	0.30–0.42	0.35	PalpFemS	0–1	1			
PLSAPL	0.68–0.93	0.79						
Fe1S*	3–16	9						
Pa1S	0–4 (p0–1)	2						

Male (holotype). —*Size*. Carapace length 7.54, width 6.75. Abdomen length 7.88, width 5.90. —*Colour*. Basic colour pattern, often brown overall, with distinct, narrow abdominal chevrons. —*Carapace*. Longer than wide, weakly raised. Height 2.62. Frontal width 4.06. Fovea procurved. Mid-dorsal cephalic setae few, almost reach fovea. Anterior striae setae absent basally. Anterolateral angle of carapace with weak hairs only. —*Eyes*. Central eye region sessile to slightly raised. Eye group width 1.62. Median ocular quadrangle length 0.78, anterior width 0.75, posterior width 1.05. Diameters: AME 0.30, ALE 0.48, PLE 0.27, PME 0.24. —*Chelicerae*. Anterodorsal paturon bristles strong, sparse. Cheliceral groove very narrow, margins parallel. Groove length 2.15, middle width 0.26. Cheliceral teeth: 10 central, confined to base of groove; 7 prolateral; 13 retrolateral. —*Labium*. Much wider than long, broadly indented apically. Length 0.90, width 1.37. Labiosternal sigilla broad, complete.

Cuspules c. 122, number low to moderate. —*Sternum*. Ovoid, moderately broad. Length 4.12, width 3.32. Posterior sigilla of moderate size, ovoid. —*Palp*. Tegular area almost as long as wide, pear shaped. Middle haematodocha sometimes exposed, in broad tegular-subtegular groove. Embolus short, moderately broad and gently curved, embolus weakly to moderately twisted distally. Embolus weakly offset from tegulum. Bulb length 1.80, width 0.80. Embolus length 1.08, midwidth 0.12. Length of femur 2.96, patella 1.24, tibia 2.36. Width of tibia 1.13. Spination: spines bristle-like; femur 2 sinuous, patella 1 sinuous, tibia 0. Sinuous bristles on femur and patella, strong bristles on tibia. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.64	3.06	5.08	5.12	2.54	22.44
2	5.72	2.79	4.10	4.59	2.71	19.91
3	5.33	2.54	3.44	4.55	2.95	18.81
4	6.31	2.87	4.55	5.95	3.53	23.21

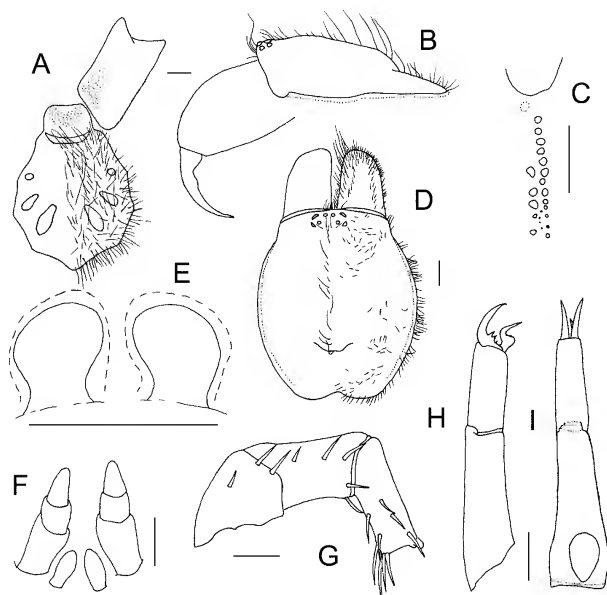


Figure 17. *Illawarra wisharti*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cephalothorax and chelicerae, dorsal; (D) cheliceral groove teeth; (E) spermathecae; (F) spinnerets; (G) leg III, prolateral, patella, tibia, metatarsus. (H, I) Leg I, metatarsus and tarsus—H, prolateral; I, dorsal. Scale lines 1 mm.

Tibia I width 1.44. Femora I–III with dorsal spines, bristle like spines on femur IV. Metatarsus I slightly thickened proximally, dorsal sigilla broad. Metatarsus II slightly bent proximally, tibial and metatarsal spines scattered. Anterior coxal hairs normal. Tarsal spines very numerous with a mid-ventral spine row as well as lateral ventral spine rows. Tarsal scopulae very weak to absent, distal metatarsal scopulae absent. Tarsal claw teeth legs I, II: superior 8, 10; inferior 0, 2. Trichobothria legs I, II: tarsus 10, 8; metatarsus 9, 10; tibia p5 r5, p6 r5. —*Leg spination*. Leg I: femur 9 (d7 p2), patella 1, tibia 23 (p1) metatarsus 56 (p1), tarsus 93. Leg II: femur 7 (d6), patella p2, tibia 16 (p1), metatarsus 48, tarsus 79. Leg III: femur 5, patella 9 (p6 r3), tibia 25 (p7 r6), metatarsus 38, tarsus 80. Leg IV: femur 0 (strong bristles), patella 4 (p2 r2), tibia 19 (p4 r6), metatarsus 42, tarsus 67. —*Abdomen*. Numerous weak dorsal bristles, hair cover sparse. Posterior lateral spinnerets with apical segment rather short. Lengths: total 2.68; basal segment 1.12, middle 0.66, apical 0.90. Apical segment width 0.35.

Female (paratype AMS KS2667). —*Size*. Carapace length 8.12, width 6.72. Abdomen length 9.79, width 7.48. —*Colour*. Commonly brown in colour overall, abdominal chevrons distinct. Otherwise colour pattern basic. —*Carapace*. Longer than wide, moderately-weakly raised and

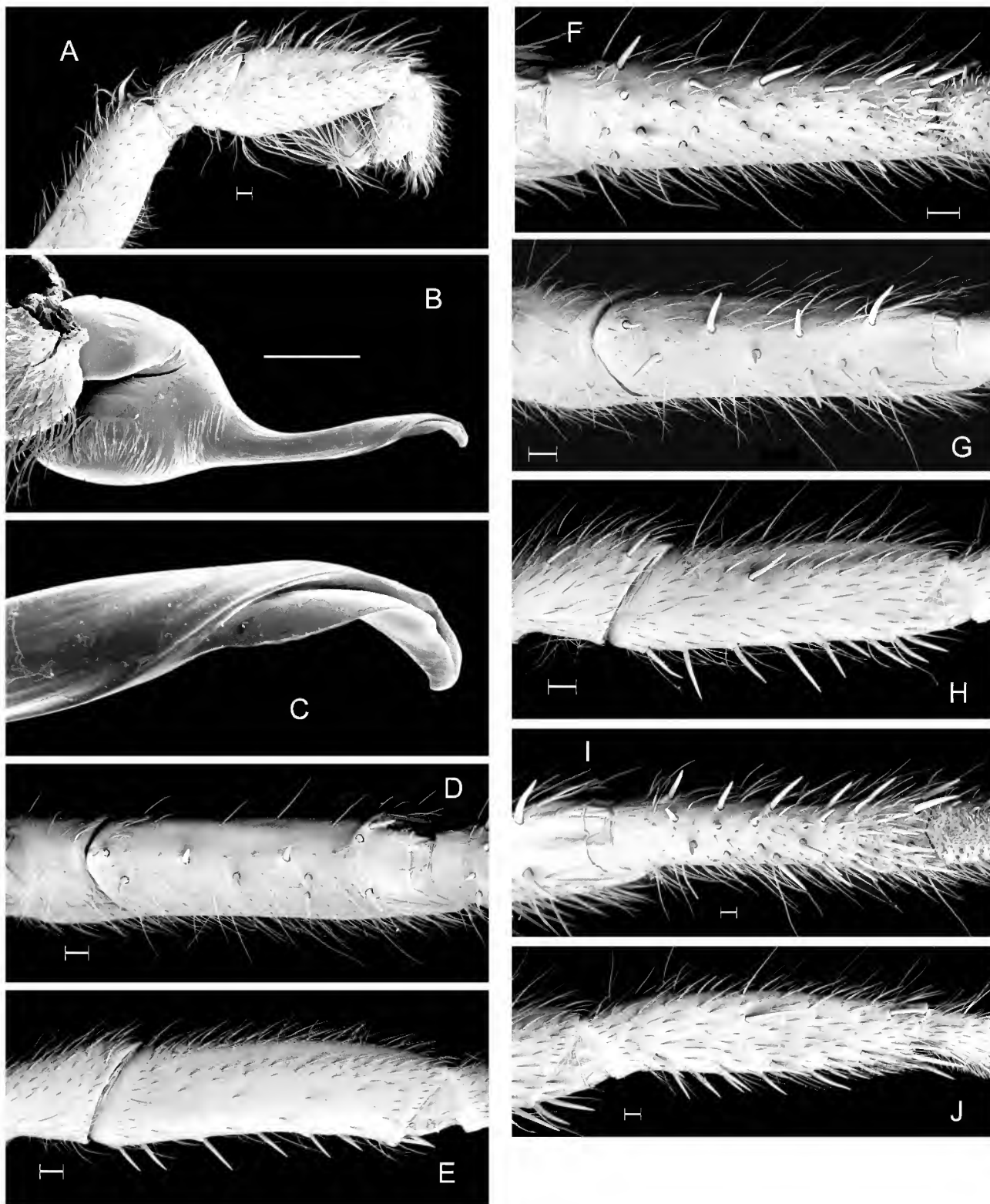


Figure 18. *Illawarra wisharti*, male (A,D–J, AMS KS15748; B,C, AMS KS5356): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F) metatarsus I, ventral; (G,H) distal patella and tibia II—G, ventral, H, prolateral; (I,J) metatarsus II—I, ventral, J, prolateral. Scale lines: 0.3 mm, except A 0.2 mm, and B 1.0 mm.

frontally narrow. Height 2.87, frontal width 4.72. Cephalic length 6.19. Fovea strongly procurved, anterior margin indented. Mid-dorsal cephalic setae long, in single row, may or may not extend back to fovea. Anterior strial setae absent basally. Anterolateral carapace angle with a few very weak

bristles. —*Eyes*. Central eye region slightly raised. Eye group width 1.56. Diameters: AME 0.21, ALE 0.43, PLE 0.24, PME 0.18 Interdistances: AME–AME 0.24, AME–ALE 0.18, ALE–PLE 0.22, PLE–PME 0.12, PME–PME 0.66. Median ocular quadrangle length 0.52, anterior width 0.60,

posterior width 1.05. —*Chelicerae*. Cheliceral groove very narrow, margins parallel. Groove length 2.14, middle width 0.32. Cheliceral teeth: 5 central, confined to basal third of groove; 6 prolateral, a gap separating the distal tooth from the rest; 13 retrolateral. —*Labium*. Wider than long, anterior margin widely indented. Cuspules distributed in shallow V-shaped band on anterior half of labium. Labiosternal sigilla narrow. —*Sternum*. Broad. Length 4.29, width 3.70. Posterior sigilla ovoid: length 0.72, width 0.38. —*Palp*. Spination: tarsus 4. Trichobothria: tibia p5 r5, tarsus 5. Tarsal claw long, slender with two basal teeth. —*Legs*. 1423. Leg I robust, spines absent.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.66	3.28	4.43	3.44	2.00	18.81
2	4.43	2.62	2.79	2.61	1.74	14.19
3	4.13	2.17	2.11	2.61	1.89	12.91
4	5.91	2.79	3.32	3.77	2.38	18.17

Tibia I width 1.62. Metatarsus I wedge shaped, wide proximally with a large dorsal sigilla, fused distally with tarsus; proximal width 1.15. Tarsus I claws enlarged, strong, hook-like. Coxal hairs unmodified, long. Tarsi I–IV with few ventral spines, all lateral. Tarsal claw teeth few, basal—legs I, II: superior claws 3, 2; inferior 0, 0. Trichobothria legs I, II: tarsus 8, 10; metatarsus 10, 8; tibia p6 r5, p5 r6. Short setae interspersed with trichobothria. —*Leg spination*. Leg I: spines absent. Leg II: femur 0, patella 0, tibia 0, metatarsus 5, tarsus 4. Leg III: femur 0, patella p3, tibia 5 (p3), metatarsus 9 (p3), tarsus 8. Leg IV: femur 0, patella 0, tibia 2, metatarsus 9 (p3), tarsus 8. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 2.38; basal segment 1.14, middle 0.52, apical 0.44. Apical segment width 0.35. —*Genitalia*. Spermathecae very short, only slightly longer than wide. Length 0.78, width 0.58. Apical two-thirds bulbous.

Distribution. Illawarra region of New South Wales (Fig. 15).

Comments. Burrows are found in the ground litter layer or under rocks. The entrance is at ground level and lacks silk trip-lines. The burrow silk lining is very weak to absent. The spiders are often noted to have a characteristic “ant-like” smell.

Hadronyche L. Koch

Hadronyche L. Koch, 1873: 463. Type species by monotypy *Hadronyche cerberaea* L. Koch, 1873. Ausserer, 1875: 143. Simon, 1892: 186; 1903: 969. Hogg, 1901: 274. Rainbow, 1911: 121; 1913: 4; 1914: 252. Roewer, 1942: 208. Bonnet, 1957: 2070. Main, 1976: 74; 1985: 42. Gray, 1978: 125. Gray, 1981: 265; 1988: 114. Raven, 1980: 225 (synonymized with *Atrax*); 2000: 225. Goloboff, 1993: 6. Hedin & Bond, 2006: 467. Platnick, 2010.

Styphlopis.—Rainbow, 1913: 5. Type species by monotypy *Styphlopis insularis* Rainbow, 1913. Roewer, 1942: 208. Bonnet, 1958: 4193. Gray, 1978: 125 (synonymized with *Atrax*). Raven, 1980: 255. Main, 1985: 40. First synonymized by Gray, 1988: 114.

Pseudatrx.—Rainbow, 1914: 260. Type species by monotypy *Pseudatrx moreau* Rainbow, 1914. Bonnet, 1958: 3807. Gray, 1978: 125 (synonymized with *Atrax*). Raven, 1980: 255. Main, 1985: 40. First synonymized by Gray, 1988: 114.

Anepsiada.—Rainbow & Pulleine, 1918: 167. Type species by monotypy *Anepsiada ventricosa* Rainbow & Pulleine, 1918. Roewer, 1942: 208. Bonnet, 1955: 323. Gray, 1978: 125 (synonymized with *Atrax*). Gray, 1981: Raven, 1980: 255. Main, 1985: 40. First synonymized by Gray, 1988: 114.

Diagnosis. Differs from *Atrax* in tibia II being either unmodified or having a blunt, rounded apophysis or apophyseal swelling. Differs from both *Atrax* and *Illawarra* in having caput moderately to strongly raised and cheliceral paturon more robust. Differs from *Illawarra* by male tarsi having two instead of three ventral spine rows.

Description. With characters of the Atracinae. Carapace broad, often not much longer than wide, or as wide; caput moderately to strongly raised (CH/CW 0.40–0.53) and wide frontally (CFW/CL 0.61–0.83). (Figs. 20B,E; 23B,G). Cheliceral paturon typically more robust than in other Atracinae, thicker both dorsoventrally and laterally. Cheliceral groove a wide to narrow V-shape with central cheliceral teeth distributed along its full length, in a staggered row (males—Fig. 20G) or one to several irregular rows (females—Fig. 21D); or, less commonly, central teeth confined to a short, basal row (Fig. 97E). Labium subquadrate, often almost as long as wide (LL/LW 0.86–1.20) (Fig. 20C), sometimes shorter (LL/LW 0.64–0.79) (Fig. 18E). Sternal sigilla ovoid to narrowly elongate. Terminal segment of posterior lateral spinnerets short to moderately long digitiform. Male tibia II either unmodified with ventral spines grouped or scattered (Fig. 43H,I); or with a rounded spined ventral apophysis or low apophyseal swelling (Figs. 32H,I; 36H,I). Metatarsus II either sinuous (proximoventrally concave) with a small, spined mid-ventral apophysis (Fig. 29K), or weakly sinuous to unmodified (Fig. 70K). Tibia and metatarsus I ventrally spinose (tibial spines may extend retrolaterally); metatarsus sometimes proximally thickened. Male palpal patella large, often wider than the femur, or about as wide. Palpal organ morphology variable but, compared to *Atrax* spp., the tegular area of the bulb is often larger, the embolus broader and shorter with the distal ejaculatory groove narrow and slanting above the flange-like lower margin (Figs. 25B,C; 32B,C). Spermathecal shape variable, basic pattern a pair of relatively short, broad sacs.

Included species. 31 species They are placed here in four species groups: the *lamingtonensis* group; the *adelaidensis* group; the *infensa* group; and the *cerberaea* group.

Distribution. Eastern Australia from northeast Queensland to Tasmania and the Gulf Ranges region of South Australia.

Comments on genera and species groups. Both *Atrax* and *Illawarra* are easily characterized genera with few species. By contrast, *Hadronyche* is a diverse and speciose genus, mainly characterized by the caput being relatively higher and broader than in the other two genera. The separation of *Atrax* and *Hadronyche* was supported by results from electrophoretic studies (Gray, 1988), and more recently, Raven (2000) has suggested that greater palpal patella/femur width may be an apomorphy of *Hadronyche*. Another source of differentiation between *Hadronyche* and both *Atrax* and *Illawarra* comes from mass profile analyses of funnel-web

spider venom peptides by Wilson (2001). This study found that *Atrax robustus* and *Illawarra wisharti* had similar venom profiles. However, the *Hadronyche* species sampled, viz. *Hadronyche versuta*, *H. cerbera* and *H. formidabilis*, had profiles that were similar to each other but quite different from those observed for *Atrax* and *Illawarra* spp.

Of the four putative *Hadronyche* species groups recognized here, only two seem likely to be natural groups—the morphologically distinctive *lamingtonensis* group and the isolated door building *adelaidensis* group. Both groups lack leg II modifications and retain the short labium present in *Atrax* and *Illawarra*. The short, basal central cheliceral tooth row seen in these genera is also present in the *lamingtonensis* group. However, in the *adelaidensis* group this is replaced by a long central tooth row, a character shared with species in the *infensa* and *cerbera* groups. The *infensa* and *cerbera* groups are united by the longer labium (with a few exceptions in the latter group). The *infensa* group is characterized by the absence of dorsal femoral spines—these spines are present in most, but variable in a few, *cerbera* group species. The *cerbera* group is currently a diverse “dump” taxon for species of uncertain affinities, and includes all *Hadronyche* species with leg II modifications.

cerbera species group

Description. (Figs. 30–32, 41–43). Small to large sized Atracinae. Male femora I, II usually with dorsal spines, sometimes spines absent. Labium relatively long, (LL/LW 0.86–0.99), sometimes shorter (LL/LW 0.64–0.79) (see comments below). Male tibia II shape and spination variable: unmodified cylindrical to weakly sinuous, with a few ventral spines clustered proximally or scattered; or sinuous with a spinose, rounded apophysis or apophyseal swelling placed mid-ventrally to proximally. Metatarsus II either cylindrical to weakly sinuous and without an apophysis, or sinuous (often ventrally concave proximally) with a mid-ventral apophysis/apophyseal swelling. Male palp with embolus often moderately short and broad, weakly curved and twisted. Ratio of bulb length to palpal tibia length 0.64–0.77. Central cheliceral tooth row long. Apical segment of posterior lateral spinnerets short to long (PLSAPW/L 0.29–0.51).

Included species: *H. versuta* (Rainbow), *H. formidabilis* (Rainbow), *H. venenata* (Hickman), *H. cerbera* L. Koch, *H. modesta* (Simon), *H. meridiana* Hogg, *H. pulvinator* (Hickman), *H. marracoonda* n.sp., *H. jensenae* n.sp., *H. tambo* n.sp., *H. monaro* n.sp., *H. emmalizae* n.sp., *H. alpina* n.sp., *H. nimoola* n.sp., *H. mascordi* n.sp.

Distribution. *Cerbera* group species are found mainly from south of the Hunter River region in mid-eastern New South Wales, into Victoria and Tasmania. Only *H. formidabilis* occurs north of the Hunter River and into southeastern Queensland.

Comments. The *cerbera* group is a diverse and problematic “convenience” grouping of 15 species. These spiders usually have dorsal spines on male femora I or II, but these spines may be absent in some individuals of *H. alpina*, *H. versuta*, *H. tambo* and *H. nimoola*. Eight of the 14 species for which males are known have variably developed apophyseal structures on tibia II and, usually, metatarsus

II. The remaining species, *H. nimoola*, *H. mascordi*, *H. tambo*, and *H. marracoonda*, lack such structures, except *H. monaro* which has a weak apophysis on metatarsus II. Most *cerbera* group species have a relatively long labium (a character also present in *infensa* group species). However, a putatively related group of four species from Victoria and Tasmania—*H. modesta*, *H. meridiana*, *H. jensenae* and *H. pulvinator*—have a shorter labium (LL/LW 0.69–0.79). Gray (1987, 1988) placed them as a separate species group. A short labium state also exists in *H. mascordi* (LL/LW males 0.64), but this is probably associated with the partial fusion of the labium with the sternum in this species. Excluding these 5 species, the remainder have a male LL/LW almost identical to that of the *infensa* group.

Hadronyche cerbera L. Koch

Figures 19–22; Tables 6, 34

Hadronyche cerbera L. Koch, 1873: 463. Karsch, 1878: 798. Main, 1985: 43. Gray, 1988: 114.

Types. SYNTYPES: females from Sydney region, New South Wales, lost (see below). NEOTYPE, here designated as follows: one male, registered AMS KS6873 in the research collection of the Australian Museum, Sydney; with label-data: Blackwall, near Woy Woy, New South Wales, 33°30'S 151°20'E, R. McDonald, 10 June 1973, from paperbark tree.

Other material examined. New South Wales (males): AMS KS6874, Antonio, 21 September 1973, R. McDonald; AMS KS4597, Avalon, 15 January 1980; AMS KS8729, Awabakal Nature Reserve, near Newcastle, 7 August 1981, G. Anderson; AMS KS4104, Bago Forest way, near Batlow, 5 November 1979, AMS KS. Kovacs; AMS KS6871, Bilgola, 18 February 1974, B. Mercer; AMS KS6872, Bilgola Heights, 5 February 1978; AMS KS2261, Blackheath, November 1978; AMS KS4782, Empire Bay, near Gosford, 18 March 1978, L. Abra; AMS KS8568, Gosford, 12 April 1979; AMS KS13367, Gosford area; AMS KS1347, Kuringai Chase National Park, 1978, M. Arena; AMS KS14058, Mudgee, 13 February 1984, W. Bennett; AMS KS13346, Mullion Creek, near Orange, September 1983, D. Ogilvy; AMS KS16587, Olinda, near Rylstone; AMS KS5850, Orange; AMS KS5900, Springwood, 21 February 1930; AMS KS4485, Swansea, 4 February 1980, G. Anderson; AMS KS4783, Terrigal, 18 March 1978, L. Abra; Terrigal, 10 January 1959, T.E. Dence; AMS KS8923, Toukley, 4 April 1982, R. Hay; AMS KS5901, Valley Heights, 21 October 1921, R.S. Thornthwaite; AMS KS10784, Walang, near Bathurst, 23 March 1983, A. Boesen; AMS KS5902, Wentworth Falls, 27 April 1943. New

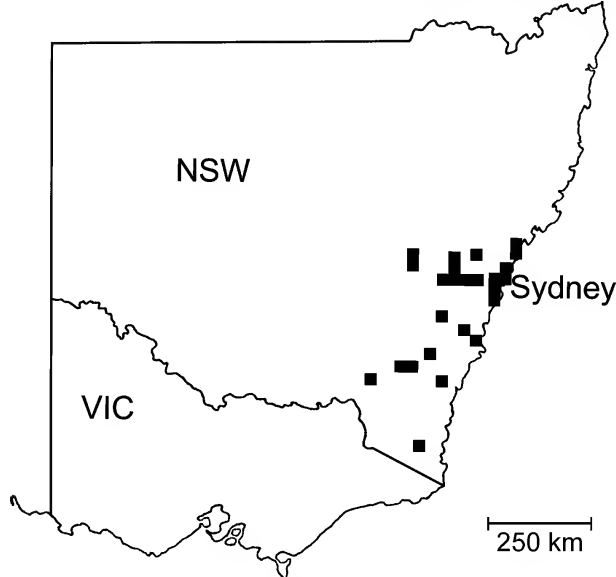


Figure 19. Collection records for *Hadronyche cerbera*.

South Wales (females): AMS KS6874, Antonio/Rydal, 21 September 1973, R. McDonald; AMS KS3438, Baulkham Hills, 27 March 1979, K. Moore; AMS KS6870, Bobbin Head, 18 March 1972, A.B. Rose; AMS KS7296, Bombala, 16 April 1981; AMS KS2331, Burrawang, May 1977, R. Merrick; Collaroy Plateau, February 1975, A. Goodridge; AMS KS13978, Dooralong, 24 February 1984, L. Abra; AMS KS3461, Gosford, May 1979, D. Jones; AMS KS4606, Highfields, 7 February 1980, G. Anderson; AMS KS5362, Monga, 1980, D. Rowell; Mount Fairy, 25 November 1979; AMS KS5903, Newcastle area, 1973; AMS KS5842, Pearl Beach, 27 July 1980, V. Serventy; AMS KS5976, AMS KS6217, Wamberal, 6 March 1980, M. Gray & C. Horseman.

Comments on syntype loss and erection of neotype. with the inadequacy of the original description based on female characters and loss of the type material, the identity of *Hadronyche cerberea* L. Koch, the type species of the genus, has long been conjectural. The syntype female specimens, labelled "Sydney", were formerly housed in the Staatliche Museum, Stuttgart, West Germany. They were lost during World War II (pers. comm., Dr M. Janus, formerly Hauptconservator, Staatliche Museum, Stuttgart). Determination of the identity of *H. cerberea* was facilitated by the presence of only two common atracine species in the Sydney region. These are *Atrax robustus*, the Sydney funnel-web spider, and a then unidentified tree dwelling species of *Hadronyche*, common in forest habitats of southeastern New South Wales, including the Sydney region (where wood cutting and clearing activities could have facilitated encounters with this spider). The description of the female

spider given by Koch (1873) indicated that he was dealing with a species of *Hadronyche*. Consequently, the decision was made to identify Koch's *H. cerberea* with the tree dwelling Sydney *Hadronyche* species (Gray, 1981, 1988).

Designation of a neotype will stabilise the taxonomic status of *Hadronyche cerberea* L. Koch as the type species of the genus. The presence of a raised caput, a long labium and a bluntly rounded tibia II apophysis refers the species unequivocally to the genus *Hadronyche* as here defined. A diagnosis and description of the species is given below. The original type locality was given as "Sydney" but this locality could refer to anywhere from the Hawkesbury River/Central Coast region in the north to the Illawarra region in the south, where these spiders are common. The neotype male specimen is held in the research collections of the Australian Museum, Sydney.

Diagnosis. CL 7.18–8.77 (male). Tree-dwelling spiders in sclerophyll forests. Differs from most species by presence (in both sexes) of thorn-like setae on coxae I, II and a bristle-like tuft of setae at anterolateral sternal angles (Figs. 20H, 21H); from *H. formidabilis* by smaller size of tibia II apophysis; and from *H. emmalizae* by embolus almost straight (Fig. 22B), not strongly curved.

Neotype male Size. Carapace length 8.18, width 7.83. Abdomen length 7.87, width 6.97. —**Colour.** Basic colour

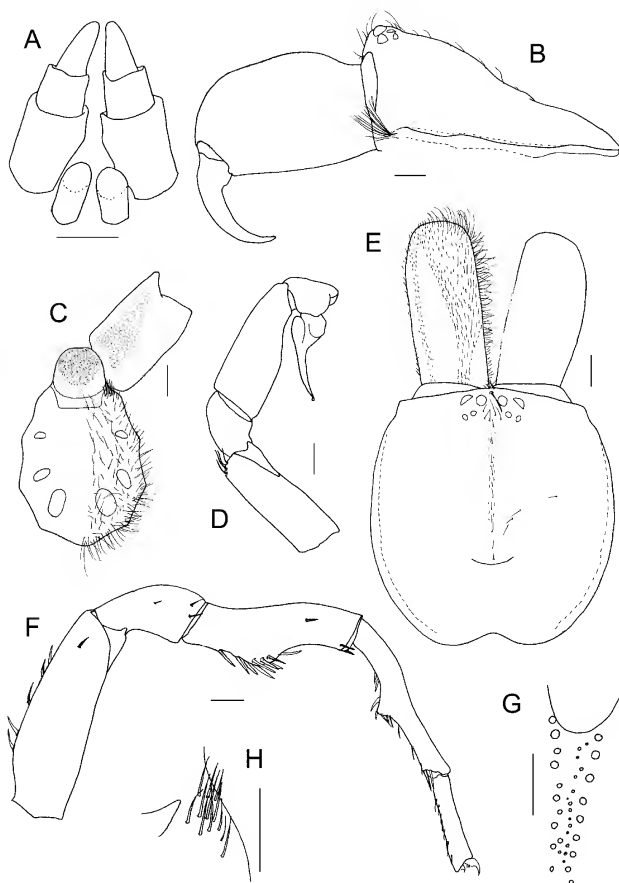


Figure 20. *Hadronyche cerberea*, male: (A) spinnerets; (B) cephalothorax and chelicerae, lateral; (C) sternum, labium and maxilla; (D) palp, prolateral; (E) cephalothorax and chelicerae, dorsal; (F) leg II, prolateral; (G) cheliceral groove teeth; (H) sternum, anterolateral bristles. Scale lines 1 mm.

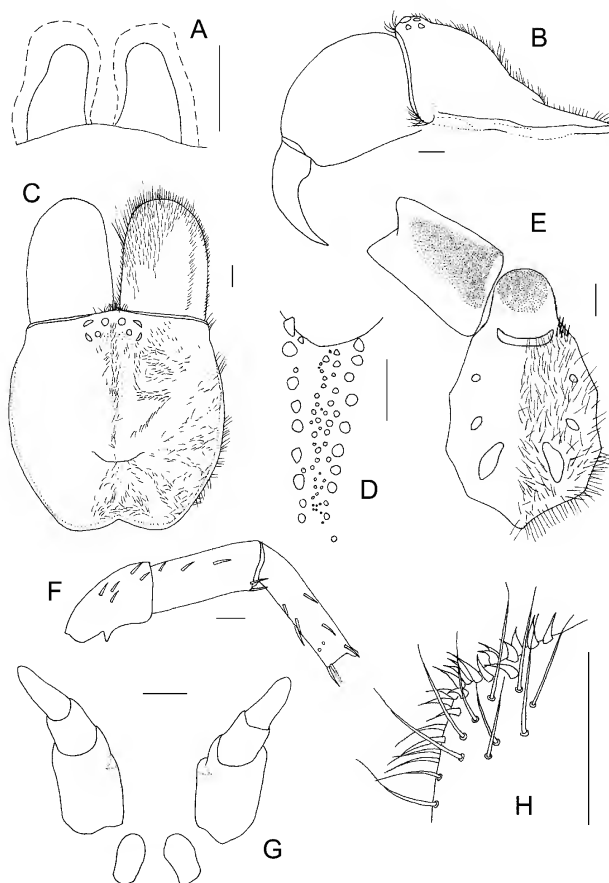


Figure 21. *Hadronyche cerberea*, female: (A) spermathecae; (B) cephalothorax and chelicerae, lateral; (C) cephalothorax and chelicerae, dorsal; (D) cheliceral groove teeth; (E) sternum, labium and maxilla; (F) leg III, prolateral, patella, tibia, metatarsus; (G) spinnerets; (H) coxa I, anteromedial thorn-like setae. Scale lines 1 mm.

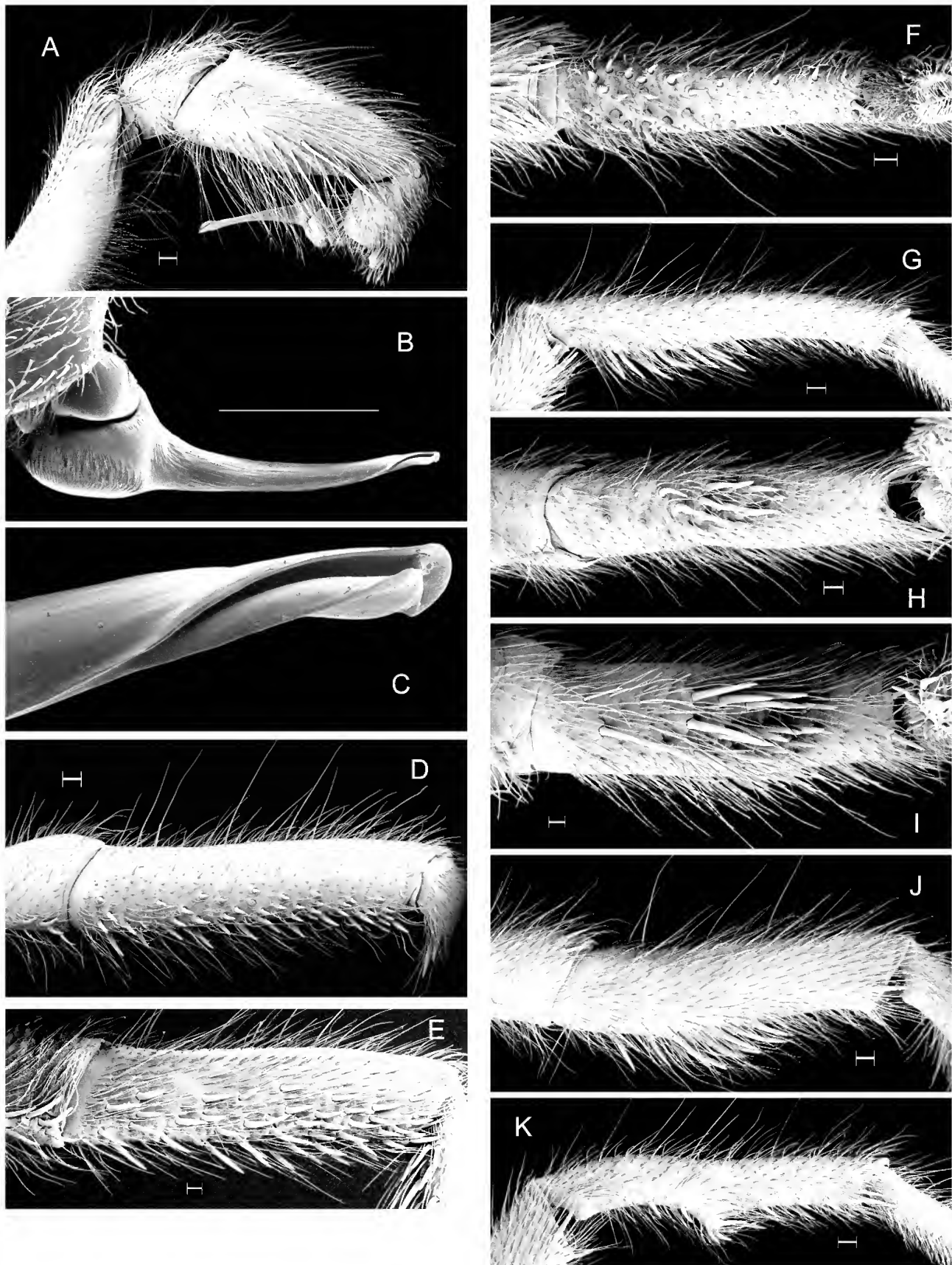


Figure 22. *Hadronyche cerbera*, male (A,D,F-H,J,K, AMS KS4783; B,C,E,I, AMS KS16587): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal tibia I, retrolateral—D, small spines (Terrigal); E, large spines (Rylstone); (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II, ventral—H, Terrigal; I, Rylstone; (J) tibia II, prolateral; (K) metatarsus II, prolateral. Scale lines: 0.3 mm, except B 1.0 mm and E,I 0.2 mm.

Table 6. Male morphological data—*Hadronyche cerbera* (n = 12).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.18–8.77	8.17	Mt1S	26–46	34	CW/CL	0.95	0.034
CW	6.84–8.39	7.77	Ta1S	8–17	10	CH/CW	0.46	0.018
CH	3.12–3.94	3.54	Ti2S	15–39 (p0–1)	26	CFW/CL	0.71	0.02
CFW	5.25–6.31	5.81	STC2teeth	10–14	12	CHGW/L	0.21	0.022
ChGL	2.00–2.70	2.33	BulbL	2.66–3.07	2.82	SW/SL	0.75	0.031
ChGW	0.37–0.58	0.43	EmbL	1.64–2.11	1.86	LL/LW	0.97	0.08
ChGCT	15–26	20	BulbW	1.01–1.24	1.09	PLSAPW/L	0.42	0.047
LL	1.28–1.89	1.51	EmbmW	0.18–0.24	0.20	BulbW/EmbL	0.60	0.056
LW	1.36–1.74	1.57	PalpTibL	4.02–4.82	4.37	EmbmW/L	0.10	0.014
CUSP	194–293	252	PalpTibW	1.48–1.93	1.78	PalpTibW/L	0.41	0.027
SL	4.92–5.81	5.26	PalpTibS	0–4	2	BulbL/TibL	0.64	0.025
SW	3.63–4.35	3.95	PalpPatS	0	—			
PLSAPW	0.34–0.68	0.50	PalpFemS	0–3	1			
PLSAPL	1.00–1.42	1.18						
Fe1S	2–12	7						
Pa1S	3–14 (p1–5)	7						

pattern. Abdomen colour variable, light maroon brown to dark brown. —*Carapace*. Slightly longer than wide, moderately raised. Height 3.65. Frontal width 5.99. Fovea procurved. Mid-dorsal cephalic setae reach fovea. Anterior strial setae present. Anterolateral angle of carapace with strong bristles. —*Eyes*. On slight tubercle. Eye group width 2.05. Median ocular quadrangle length 0.77, anterior width 1.10, posterior width 1.35. Eye diameters: AME 0.32, ALE 0.47, PLE 0.32, PME 0.27. —*Chelicerae*. Groove broad, margins diverging distally, length 2.36, middle width 0.56. Cheliceral teeth: 17 central, running full length of groove, 10 prolateral; 9 retrolateral. —*Labium*. Almost as long as wide; shape as in female. Length 1.64, width 1.66. Labiosternal sigilla entire. Cuspules c. 223, number moderate to high. —*Sternum*. Ovoid to broadly ovoid. Length 5.37, width 4.06. Posterior sigilla large, broadly elongate. Bristle-like hairs grouped in anterolateral angles. —*Palp*. Tegular area slightly longer than wide. Embolus shaft weakly curved, of medium length and taper. Distal embolus weakly to moderately twisted. Embolus weakly offset from tegulum. Bulb length 2.86, width 1.09. Embolus length 1.88, midwidth 0.19. Length of femur 4.12, patella 1.72, tibia 4.30. Width of tibia 1.79. Spination: femur 3, tibia 2. Sinuous bristles on distal femur. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.93	3.24	6.03	5.66	2.95	24.81
2	6.72	3.44	5.74	5.74	2.99	24.63
3	7.28	3.08	5.00	5.41	3.03	23.80
4	7.46	3.40	6.40	6.48	3.36	27.10

Tibia I width 1.23. All femora with dorsal spines. Metatarsus I proximally thickened, larger ventral spines grouped proximally. Ventral tibia II with centrally placed, low, spinose apophyseal swelling; distoventral tibia concave and without spines (except apically). Metatarsus II moderately to weakly sinuous with small central, spined apophysis. Coxae I and II with basally thickened and thorn-like setae on anteromedial surface. Tarsal and distal metatarsal scopulae weak on legs I and II, well developed on legs III and IV. Tarsal claw teeth legs I, II: superior 12, 11; inferior 4. Trichobothria legs I, II: tarsus 14, 14; metatarsus 12, 13; tibia p6 r6, p5 r7. —*Leg spination*. Leg I: femur 12(d9p3), patella 6(p5 v1), tibia 41(p2), metatarsus 29, tarsus 8. Leg II: femur 6(d5p1), patella

p3, tibia 19(p1), metatarsus 20, tarsus 11. Leg III: femur d8, patella 5(p4 r1), tibia 9(p2 r3), metatarsus 26(pd3 rd3), tarsus 16. Leg IV: femur d6, patella 2(p1 r1), tibia 6(r2), metatarsus 19, tarsus 13. —*Abdomen*. Posterior lateral spinnerets with moderately short apical segment. Lengths: total 3.14; basal segment 1.44, middle 0.70, apical 1.00. Apical width 0.46.

Female (AMS KS6869, Canalack Gully, Hornsby Heights, 33°39'E 151°05'S, New South Wales, 19 February 1973, M. Gray and M. Robinson, from tree web). —*Size*. Carapace length 9.95, width 9.93. Abdomen length 14.62, width 12.24. —*Colour*. Basic colour pattern except that abdomen is often weakly pigmented dorsally (light maroon brown colour) and dark pigment is weak or absent ventrally (light maroon colour). —*Carapace*. Broad, about as long as wide, cephalic area strongly raised. Height 4.52; frontal width 8.67. Cephalic length 6.66. Fovea strongly procurved, anterior margin slightly indented. Mid-dorsal cephalic setae numerous, reach back to fovea. Anterior strial setae present. Anterolateral carapace angle with numerous bristles. —*Eyes*. Eye region raised centrally. Eye group width 2.76. Diameters: AME 0.34, ALE 0.54, PLE 0.48, PME 0.29. Interdistances. AME–AME 0.41, AME–ALE 0.43, ALE–PLE 0.37, PLE–PME 0.19, PME–PME 1.87. Median ocular quadrangle length 0.85, anterior width 1.16, posterior width 1.83. —*Chelicerae*. Groove wide, margins diverge distally; groove length 3.26, middle width 1.02. Cheliceral teeth: 45 central in 2–3 irregular rows occupying full length of groove; 11 prolateral; 12 retrolateral. —*Labium*. Long; as long as wide or longer, sides sloping to a narrower rounded apex, anterior margin not indented apically. Length 2.38, width 2.31. Cuspules grouped on anterior two-thirds. Labiosternal sigilla broad, entire. —*Sternum*. Ovoid. Length 6.90, width 5.10. Bristle-like hairs grouped in anterolateral angles. Posterior sigilla elongate: length 1.43, width 0.54. —*Palp*. Spination: tibia 3, tarsus 6. Trichobothria: tibia p8 r8, tarsus 13. Tarsal claw with 7 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.45	4.01	6.00	5.29	2.99	25.74
2	6.83	3.77	5.30	4.98	2.97	23.85
3	6.04	3.26	4.18	4.69	2.99	21.16
4	7.72	3.98	5.81	5.81	3.13	26.45

Tibia I width 1.73. Metatarsus I proximal width 1.14. Coxae I, II with basally thickened thorn-like setae anteromedially. Tarsal claw teeth legs I, II: superior 10, 10; inferior 4, 4. Trichobothria legs I, II: tarsus 17, 15; metatarsus 18, 16; tibia p8 r7, p8 r7. —*Leg spination*. Leg I: femur 0, patella 0, tibia 3, metatarsus 13, tarsus 8. Leg II: femur 0, patella 0, tibia 3 (p1), metatarsus 13, tarsus 9. Leg III: femur rd2, patella p5 r1, tibia 7(p3 r2), metatarsus 15 (p3 r2), tarsus 8. Leg IV: femur 0, patella 0, tibia 5 (r3), metatarsus 11, tarsus 10. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 4.05; basal segment 1.60, middle 1.02, apical 1.43. Apical segment width 0.65. —*Genitalia*. Spermathecae short, digitiform, apical third slightly narrower than basal region; basal separation equivalent to spermatheca width. Spermatheca length 1.09, width 0.63.

Distribution. Southeastern coast and highlands in New South Wales as far north as the Hunter River, Central Coast region (Fig. 19).

Comments. Thorn-like setae (short, strongly thickened basally) on coxae I, II (Fig. 21H) and bristle-like tuft of anterolateral sternal hairs (Fig. 20H) are well developed in both sexes. Thorn-like setae are also present in males of *H. formidabilis* and, more weakly, in some *H. tambo* and *H. emmalizae* males.

Male tibia I retroventral spines are sometimes reduced in size (Fig. 22D). The extent of such variation in this widely distributed species needs further examination.

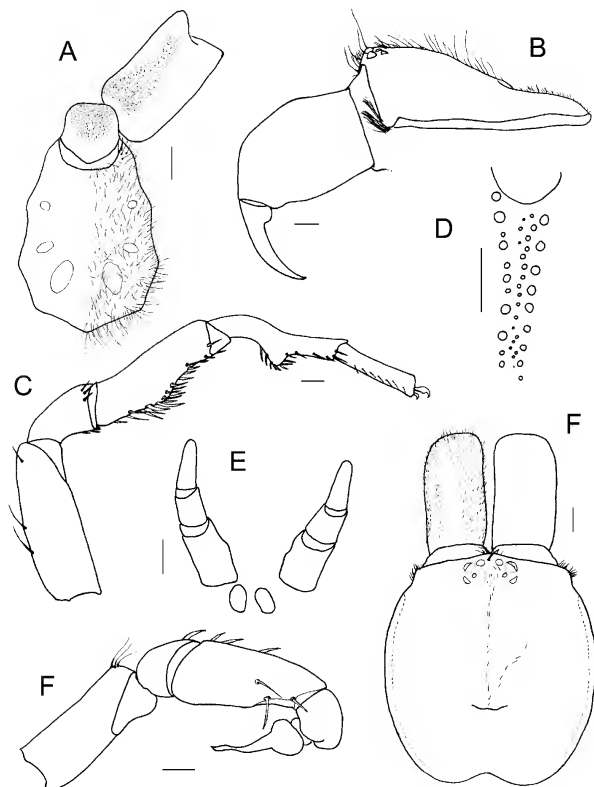


Figure 23. *Hadronyche versuta*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg II, prolateral (NB, dorsal femoral spines present or absent); (D) cheliceral groove teeth; (E) spinnerets; (F) palp, prolateral; (G) cephalothorax and chelicerae, dorsal. Scale lines 1 mm.

Biology. This is a tree-dwelling species that is widely distributed in open forest habitats. It is often associated with rough-barked trees such as Melaleuca, Banksia, Casuarina and some eucalypts (Fig. 1D). Burrows are associated with tree-trunk fractures, rot-holes and borer holes, with the entrance sheet and trip-lines often disguised by bark/leaf detritus and frass.

Hadronyche versuta (Rainbow)

Figures 1, 23–26; Tables 7, 34

Atrax versuta Rainbow, 1914: 253.

Aname bicolor.—Rainbow, 1914: 233.

Pseudatrx moreaui.—Rainbow, 1914: 261.

Atrax bicolor.—Hickman, 1964: 107 (transferred from *Aname* after Rainbow & Pulleine, 1918: 139). Main, 1985: 40. First synonymized by Gray, 1988, 114.

Atrax moreaui.—Main, 1985: 40 (transferred from *Pseudatrx*). First synonymized by Gray, 1988, 114.

Hadronyche versuta.—Gray, 1988: 114 (transferred from *Atrax*).

Types. Two subadult syntypes: AMS KS969 (old catalogue number K12907). Jenolan, New South Wales, J. Wiburd, 1901.

Other material examined. New South Wales (males): AMS KS844, Antonio Creek, 28 April 1973, R. McDonald; AMS KS1008, Antonio, 26 December 1974, R. McDonald; AMS KS999, Blackheath, 11

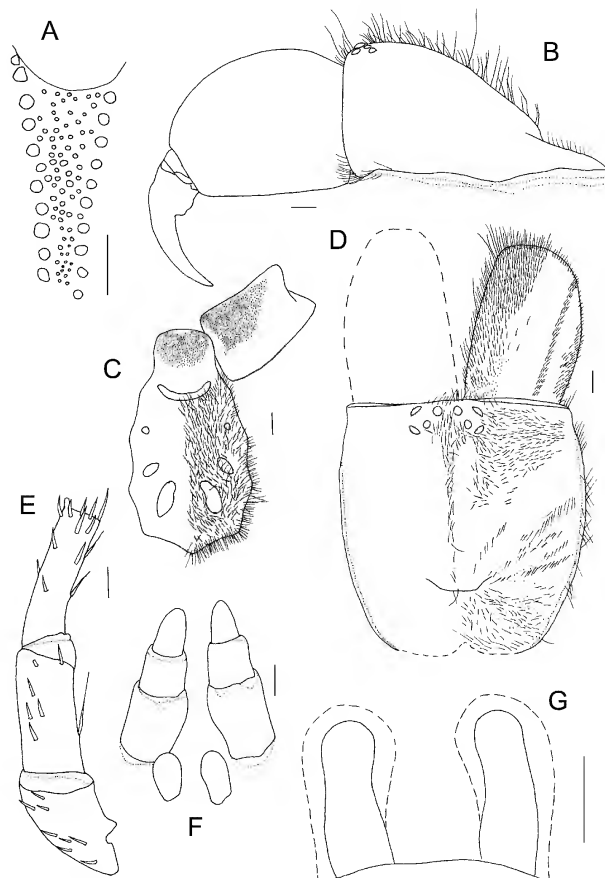


Figure 24. *Hadronyche versuta*, female: (A) cheliceral groove teeth; (B) cephalothorax and chelicerae, lateral; (C) sternum, labium and maxilla; (D) cephalothorax and chelicerae, dorsal; (E) leg III, prolateral, patella, tibia, metatarsus; (F) spinnerets; (G) spermathecae. Scale lines 1 mm.

Table 7. Male morphological data—*Hadronyche versuta* (n = 15).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.84–10.39	9.16	Mt1S	19–39	29	CW/CL	0.96	0.032
CW	8.13–9.84	8.83	Ta1S	8–26	14	CH/CW	0.44	0.027
CH	3.49–4.42	3.90	Ti2S*	37–75 (p0–1)	48	CFW/CL	0.70	0.039
CFW	5.95–7.17	6.43	STC2teeth	11–15	13	CHGW/L	0.22	0.019
ChGL	2.20–2.87	2.54	BulbL	2.88–3.44	3.25	SW/SL	0.72	0.025
ChGW	0.37–0.67	0.55	Embl	1.84–2.40	2.21	LL/LW	0.98	0.055
ChGCT	16–32	22	BulbW	1.15–1.34	1.26	PLSAPW/L*	0.49	0.071
LL	1.56–1.88	1.70	EmbmW	0.24–0.41	0.30	BulbW/Embl	0.57	0.031
LW	1.60–1.84	1.74	PalpTibL	3.79–4.90	4.51	EmbmW/L	0.14	0.016
CUSP	227–413	292	PalpTibW	1.82–2.24	1.98	PalpTibW/L	0.44	0.023
SL	5.37–6.39	5.90	PalpTibS*	4–13	8	BulbL/TibL	0.72	0.029
SW	3.90–4.76	4.28	PalpPatS	0–4	1			
PLSAPW	0.39–0.68	0.54	PalpFemS	2–7	4			
PLSAPL	0.82–1.49	1.11						
Fe1S*	0–3	1						
Pa1S	4–14 (p1–3)	9						

January 1930, Dr V.K. Spence; AMS KS4431, Bomaderry, 19 January 1980, G. Wishart; AMS KS13790, Bungonia Heights, near Goulburn, 21 January 1984; AMS KS1179, Callala Beach via Nowra, near Jervis Bay, January 1959, J. Coppin; AMS KS3607, Capertee, 25 July 1973, R. McDonald; AMS KS1182, Erowal Bay, Georges Basin, 3 December 1950, E.C. Hammond; AMS KS4620, Gerroa, 24 December 1979, D. Tidmarsh; AMS KS2433, Goulburn, 24 January 1979, T. Smith; AMS KS8535, Goulburn, December 1981; AMS KS2962, Gulgong, May 1979, Gillman; AMS KS5305, Hargraves, near Mudgee, 4 June 1980, C. Knott; AMS KS997, Hazelbrook, February 1976; AMS KS1177, Honeymoon Bay, near Jervis Bay, 25 December 1954, P. Harvey; AMS KS846, AMS KS857–8, Jenolan, February 1932, J.C. Wiburd; AMS KS1178, Jervis Bay, October 1958, K. Sanders; AMS KS860, Kanangra-Boyd National Park, 21 May 1971, M. Gray; AMS KS1003, Mount Wiburd, Kanangra-Boyd National Park, 9 January 1973, G.S. Hunt; AMS KS1200, Katoomba, 24 January 1950, C. Batty; AMS KS851, Echo Point, Katoomba, 14 February 1953, A. Henry; AMS KS843, Leura, December 1972, Maguire; AMS KS856, Lithgow area, 1961, Lithgow Pharmacy; AMS KS1007, Mittagong, N.S.W., R.N. Lochhead; AMS KS996, Mount Irvine, 1959, P.G. Valder; AMS KS2493, Mount Wilson, 12 January 1979–7 February 1979, C. Horseman; AMS KS1174, Nowra, February 1975; AMS KS3357–8, Nowra, 12 January 1979, Sister Green; AMS KS7690, Olinda, 28 May 1981, J. Kirk; AMS KS1176, Shoalhaven Heads, 7 April 1969, B. Virtue; AMS KS4123, Springwood, 1 February 1979, Mascord; AMS KS6840, Springwood, 1 February 1979, Mascord; AMS KS1001, Wentworth falls, January 1951, H. Holland; AMS KS1002, Wentworth falls, January 1951, H. Holland; AMS KS1114, Rydal, November 1973, R. McDonald; AMS KS1118, Mittagong, 12 February 1977, B. Telfer; AMS KS1014, Kandos, June 1968, G. Daniels; AMS KS1016, Mudgee, 29 April 1974, Ambulance Stn.; AMS KS1855, Peel, near Bathurst, 20 May 1974, P. Wolfe; AMS KS1010, Rylstone, 24 km N. on Bylong Road; AMS KS1013, Sodwalls, 29 January 1973, R. McDonald; AMS KS4411, Turondale, Apr 1979. **New South Wales (females):** AMS KS1671, Bilpin; AMS KS4776, Blackheath, 14 March 1959, Heywood; AMS KS4664, Bundanoon, February 1980; AMS KS1179, Callala Beach, January 1959, J. Coppin; AMS KS8296, Culburra, near Nowra, September 1966, R. Esgate; AMS KS6281, Currarong, 6.x.1980; AMS KS1207, Faulconbridge, 7 December 1976, C. Watson; AMS KS793, Gerroa, 28 March 1977, G. Wishart; AMS KS12625, Goulburn, 16 March 1983; AMS KS6732, Goulburn, January 1981, Ambulance Stn.; AMS KS1115, Hazelbrook, 8 October 1973, K. Lay; AMS KS9964, Jenolan, N.S.W., December 1979; AMS KS1862, Kanangra-Boyd National Park, 26 November 1974, M. Gregg; AMS KS3385, Kangaroo Valley, 1 July 1979, N.L. Boomer; AMS KS1859, Katoomba, N.S.W., February 1927, F. Walford; AMS KS1860, Kurrang Heights, 4 March 1973, R. McDonald; AMS KS4127, Lake Conjola, 29 April 1979, R. Mascord; AMS KS5926, Marulan, September 1980; AMS KS1117, Medlow Bath, 12 October 1945; AMS KS6216, Moss Vale, 6 October 1980; AMS KS10677, Nowra, 20 January 1983, W. Lamond; AMS KS5332, Shoalhaven Heads, 11 June 1980, H. Pepper; AMS KS2262, Sussex Inlet, 29.xi.1978, S. Prince; AMS KS1672, Wentworth Falls, 31 March 1936, K.K. Graham; AMS KS3814, Mittagong, 21 October 1979, B. Day; AMS KS1012.

Diagnosis. CL 7.84–10.39 (male). Differs from most species by male tibia II having spinose rounded apophysis with ventral spines always extending onto distal tibia (Fig. 25H,I); from *H. emmalizae* by having embolus almost straight; from *H. formidabilis* by having a less prominent tibia II apophysis and shorter spinnerets (Fig. 25C,E; Table 7).

Male (AMS KS4477), Lithgow, New South Wales, 33°28'S 150°09'E, J.W. Rayner, 18 January 1980). —*Size.* Carapace length 9.51, width 9.14. Abdomen length 10.58, width 6.97. —*Colour.* Basic colour pattern. Dorsum of abdomen usually with definite paler patch anteriorly flanked by small sigilla. —*Carapace.* Slightly longer than wide, moderately raised. Height 3.80. Frontal width 6.81. Fovea procurved. Mid-dorsal cephalic setae reach fovea. Anterior strial setae present. Anterolateral angle of carapace with strong bristles. —*Eyes.* Sessile. Eye group width 2.39. Median ocular quadrangle length 0.86, anterior width 1.07, posterior width 1.58. Diameters: AME 0.33, ALE 0.54, PLE 0.47, PME 0.29. —*Chelicerae.* Cheliceral groove of moderate length and width, margins diverging distally. Groove length 2.72, middle width 0.58. Cheliceral teeth: 21 central, running full length of groove; 11 prolateral; 9 retrolateral. —*Labium.* About as long as wide. Length 1.80, width 1.78. Labiosternal sigilla entire. Cuspules c. 288, number moderate to high. —*Sternum.* Ovoid. Length 5.90, width 4.27. Posterior sigilla large, broad, ovoid. —*Palp.* Tegular area wider than long. Embolus shaft broad, weakly tapered and curved. Distal embolus weakly to moderately twisted. Embolus slightly offset from tegulum. Bulb length 3.32, width 1.29. Embolus length 2.32, midwidth 0.32. Length of femur 4.24, patella 2.12, tibia 4.87. Width of tibia 1.99. Spination: femur 2, patella 1, tibia 6. Distal femur with sinuous bristles. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.75	3.67	6.28	6.22	3.75	27.67
2	7.41	3.66	5.85	6.20	3.69	26.81
3	6.56	3.36	5.33	5.67	3.73	24.65
4	8.28	3.36	6.88	6.97	4.10	29.59

Tibia I width 1.51. Femora I and II with few, weak dorsal spines, occasionally none. Metatarsus I proximally weakly thickened, larger ventral spines grouped proximally. Tibia II apophysis a low, blunt swelling, centrally placed; ventral

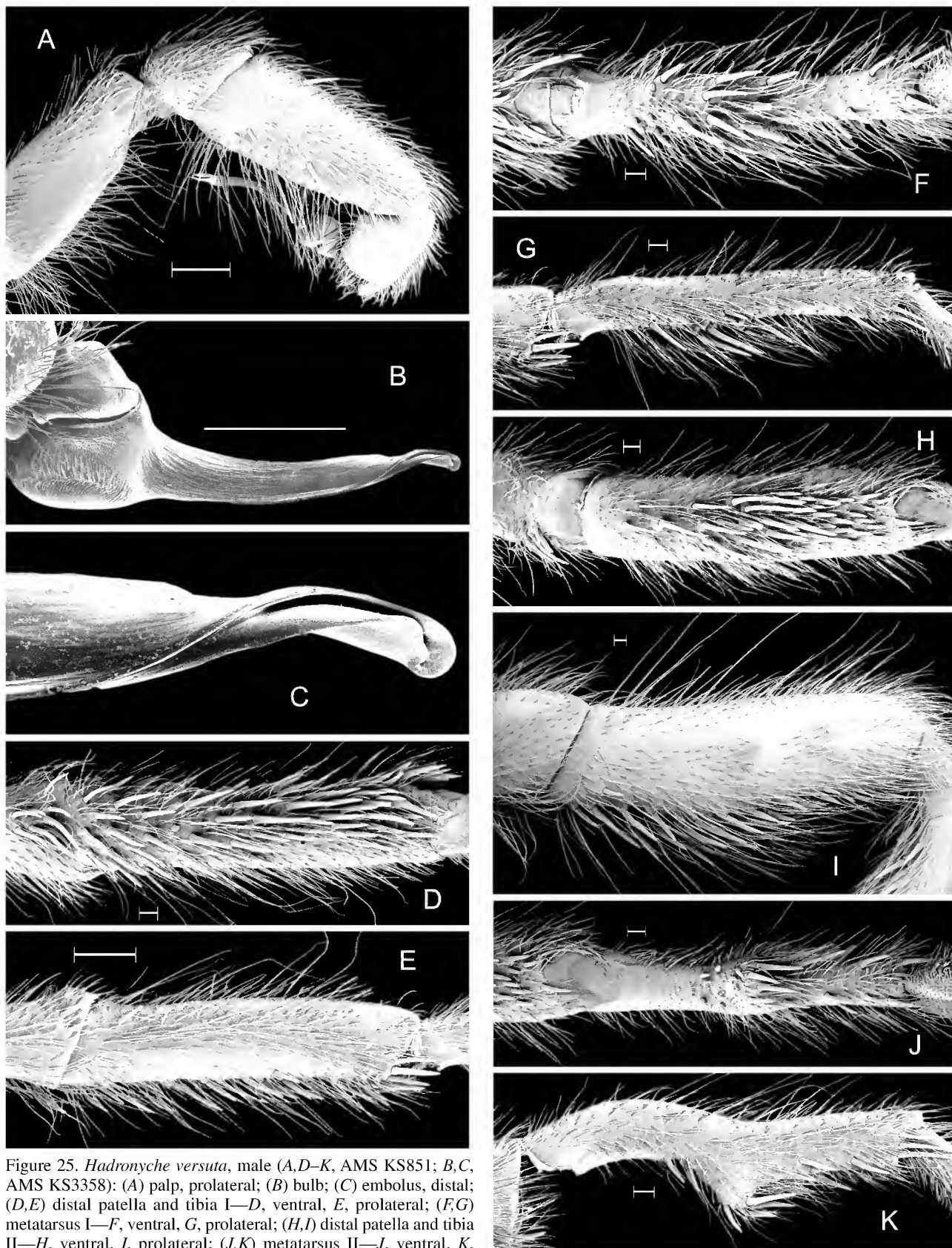


Figure 25. *Hadronyche versuta*, male (A,D–K, AMS KS851; B,C, AMS KS3358): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A,E 1.0 mm and I 0.2 mm.

spines numerous, larger spines grouped upon apophysis, shorter spines in weakly excavated distoventral region. Metatarsus II strongly sinuous with a prominent spined apophysis. Coxal hairs normal. Scopulae weak or lacking

on first and second tarsi and distal metatarsi; well developed on tarsi and distal metatarsi III and IV. Tarsal claw teeth legs I, II: superior 13, 13; inferior 3, 3. Trichobothria legs I, II; tarsus 14, 11; metatarsus 18, 18; tibia p7 r6, p8 r8. —*Leg*

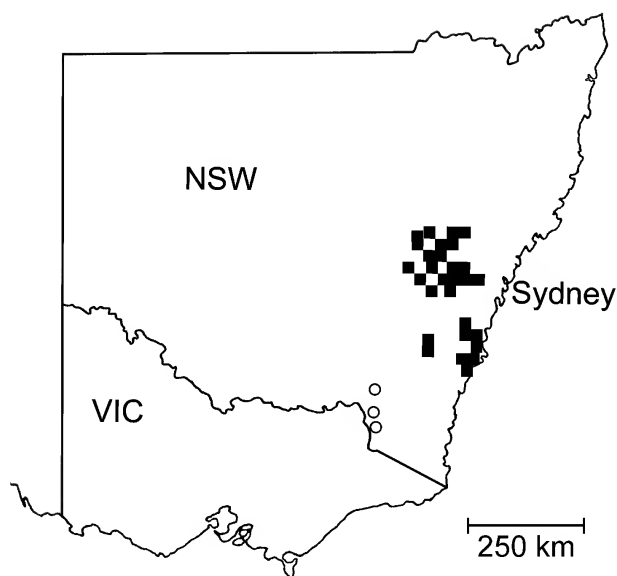


Figure 26. Collection records for *Hadronyche versuta* (squares) and *H. emmalizae* (circles).

spination. Leg I: femur d1, patella 14 (p3 v11), tibia 56 (p1), metatarsus 25, tarsus 12. Leg II: femur d1, patella 7 (p3 r4), tibia 45 (p1), metatarsus 23, tarsus 18. Leg III: femur 0, patella 9 (p8 v1), tibia 13 (p4 r2), metatarsus 30, tarsus 17. Leg IV: femur 0, patella 0, tibia 7 (r1), metatarsus 21, tarsus 21. —*Abdomen*. Numerous strong bristles dorsally. Posterior lateral spinnerets with rather short apical segment. Lengths: total 4.29; basal segment 1.76, middle 1.04, apical 1.49. Apical segment width 0.65.

Female (AMS KS1233), Mt. Wiburud, Kanangra-Boyd National Park, New South Wales, 33°49'S 150°01'E, G.S. Hunt, 10 January 1973). —*Size*. Carapace length 11.18, width 11.20. Abdomen length 16.12, width 12.72. —*Colour*. Basic colour pattern. Abdomen usually dark maroon brown, sometimes paler. —*Carapace*. About as wide as long, strongly raised, broad frontally. Height 5.54; frontal width 10.29. Cephalic length 9.86. Fovea strongly procurved, anterior margin slightly indented. Mid-dorsal cephalic setae numerous, reach back to fovea. Anterior striae setae present. Antero-lateral carapace angle with numerous bristles. —*Eyes*. Ocular area sessile or slightly raised centrally. Eye group width 3.60. Diameters: AME 0.37, ALE 0.72, PLE 0.60, PME 0.38. Interdistances: AME–AME 0.66, AME–ALE 0.50, ALE–PLE 0.46, PLE–PME 0.25, PME–PME 1.61. Median ocular quadrangle length 0.97, anterior width 1.42, posterior width 2.36. —*Chelicerae*. Cheliceral groove margins diverge distally, groove wide. Groove length 3.60, middle width 1.06. Cheliceral teeth: 66 central, in several irregular rows, occupying full length of groove; 11 prolateral; 10 retrolateral. —*Labium*. Long; about as long as wide, rounded, anterior margin not indented. Length 2.90, width 2.88. Cuspules grouped on anterior half. Labiosternal sigilla entire. —*Sternum*. Long. Length 8.46, width 5.74. Posterior sigilla elongate, length 1.64, width 0.76. —*Palp*. Spination: tibia 7, tarsus 11. Trichobothria: tibia p8 r8, tarsus 13. Tarsal claw with 4 teeth. —*Legs*. 1423 or 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.69	5.17	8.35	5.78	3.36	31.35
2	7.81	4.76	6.19	5.45	3.28	27.49
3	6.72	3.53	4.33	4.84	3.16	22.58
4	8.94	4.92	6.12	5.07	3.31	28.36

Tibia I width 2.00. Metatarsus I proximal width 1.31. Coxa I, II with weakly basally thickened or unmodified setae frontally. Tarsal claw teeth legs I, II: superior 9, 9; inferior 4, 4. Trichobothria legs I, II: tarsus 18, 18; metatarsus 18, 17; tibia p10 r9, p8 r8. —*Leg spination*. Leg I: femur 0, patella 0, tibia 7, metatarsus 11, tarsus 8. Leg II: femur 0, patella p2, tibia 5, metatarsus 16, tarsus 13. Leg III: femur 0, patella p8, tibia 10 (p5 r2), metatarsus 20 (p7 r4), tarsus 12. Leg IV: femur 0, patella 0, tibia 1, metatarsus 12, tarsus 19. —*Abdomen*. Posterior lateral spinnerets stout with short, thick apical segment. Lengths: total 5.11; basal segment 2.34, middle 1.23, apical 1.54. Apical segment width 0.94. —*Genitalia*. Spermathecae large, digitiform, slight constriction separating apical third from basal two thirds. Length 1.66, width 0.67.

Distribution. Blue Mountains to Illawarra region of New South Wales (Fig. 26). Specimens probably attributable to this species have been collected from as far south as the Eden region near the NSW border.

Notes. Retreat burrows are often built within rotting logs and stumps with entrance silk sometimes disguised by rotting wood particles and prey remains.

Hadronyche emmalizae n.sp.

Figures 26–29; Tables 8, 34

Etymology. The species is named for my daughter, Emma Elizabeth Jensen Gray.

Types. Holotype male: AMS KS13464, Geehi Rest Area, Swampy Plains River, Kosciuszko National Park, New South Wales, 36°22'S 148°10'E, A.B. Rose, 30 November 1983. Paratypes (AMS). New South Wales. *Males*: AMS KS4114, Bago State Forest, 35°41'S 148°09'E, 20 November 1979, L. Hedt; AMS KS6648, Geehi, 36°23'S 148°10'E, 27 January 1981, J. Robson; KS 113352, Khancoban, 36°13'S 148°08'E, 4 December 1980, S. Bates. *Females*: AMS KS10675, Paddy's River Dam, Bago State Forest, 35°41'S 148°09'E, L. Hedt, 5 November 1983; AMS KS4096, Bago, 35°37'S 147°59'E, 1 January 1979, L. Hedt; AMS KS4256–7, Bago State Forest, 35°41'S 148°09'E, 11 December 1979, L. Hedt.

Diagnosis. CL 8.06–9.78 (male). Differs from other species in having both a rounded apophysis on tibia II and a strongly curved embolus (Fig. 29B).

Male (holotype). —*Size*. Carapace length 9.78, width 8.91. Abdomen length 7.68, width 7.14. —*Colour*. Basic colour pattern. —*Carapace*. A little longer than wide, cephalic area moderately raised. Height 4.22; frontal width 6.87. Fovea weakly procurved, anterior margin not indented. Mid-dorsal cephalic setae reach fovea. Anterior striae setae numerous. Anterolateral carapace angle with strong bristles. —*Eyes*. Eye region raised. Eye group width 2.20. Median ocular quadrangle length 0.82, anterior width 1.04, posterior width 1.54. Diameters: AME 0.31, ALE 0.48, PLE 0.36, PME 0.22. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 2.87, middle width 0.68. Cheliceral teeth:

21 central, occupying full length of groove; 11 prolateral; 10 retrolateral. —*Labium*. About as long as wide, apically weakly indented. Length 1.73, width 1.70. Labiosternal sigilla entire, broad. Cuspules c. 229, number moderate to high, placed in anterior third to half of labium. —*Sternum*. Ovoid. Length 5.58, width 4.25. Posterior sternal sigilla narrow, elongate. —*Palp*. Tegular area wider than long. Embolus offset from tegulum; embolic shaft moderately wide and strongly curved with distal section recurved at angle to shaft. Bulb length 3.57, width 1.43. Embolus length 2.41, midwidth 0.27. Length of femur 5.17, patella 1.80, tibia 5.03. Width of tibia 2.26. Spinination: femur 1, patella 0, tibia 7 (3 dorsal). Distal femur with sinuous bristles. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.16	3.81	6.80	6.56	3.88	29.21
2	7.86	3.64	6.66	5.88	3.88	27.74
3	6.63	3.06	4.96	5.68	3.91	24.24
4	8.43	3.33	6.60	6.83	4.93	30.12

Tibia I width 2.35. Femora I and II with dorsal spines. Metatarsus I thickened proximally, ventral spines numerous. Metatarsus II strongly sinuous with ventral spined apophysis; ventral spines absent proximally. Ventral tibia II with a rounded, spined apophysis centrally; spines lacking proximally and distally (apart from distal apical spines). Coxae frontal thorn-like setae weak or absent. Tarsal, distal metatarsal scopulae: leg I, II weak to absent; leg 3, 4

moderate-strong. Tarsal claw teeth legs I, II: superior 13, 11; inferior 0, 0. Trichobothria legs I, II: tarsus 13, 13; metatarsus 17, 12; tibia p7 r6, p7 r7. —*Leg spination*. Leg I: femur 6 (d4p2), patella v2, tibia 43, metatarsus 24, tarsus 21. Leg II: femur 6 (d5p1), patella p2, tibia 31, metatarsus 32, tarsus 26. Leg III: femur d5 (bristle-like), patella p5, tibia 9 (p2 r2), metatarsus 30, tarsus 34. Leg IV: femur 0 (strong bristles), patella 0, tibia 3, metatarsus 27, tarsus 39. —*Abdomen*. Posterior lateral spinnerets with moderately long apical segment. Lengths: total 3.31; basal segment 1.29, middle 0.61, apical 1.41. Apical segment width 0.49.

Female (paratype AMS KS10675) —*Size*. Carapace length 11.05, width 10.34. Abdomen length 12.92, width 9.35. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, cephalic area broad, strongly raised. Height 5.10; frontal width 9.69. Cephalic length 7.96. Fovea procurved. Mid-dorsal cephalic setae numerous, reach back to fovea. Anterior strial setae present. Strial and marginal carapace hairs numerous. Anterolateral carapace angle with numerous, slender bristles. —*Eyes*. Central eye region slightly raised. Eye group width 2.72. Diameters. AME 0.29, ALE 0.65, PLE 0.36, PME 0.28. Interdistances: AME–AME 0.44, AME–ALE 0.37, ALE–PLE 0.29, PLE–PME 0.20, PME–PME 1.31. Median ocular quadrangle length 0.85, anterior width 1.09, posterior width 1.84. —*Chelicerae*. Cheliceral groove wide, margins diverging distally. Groove length 3.24,

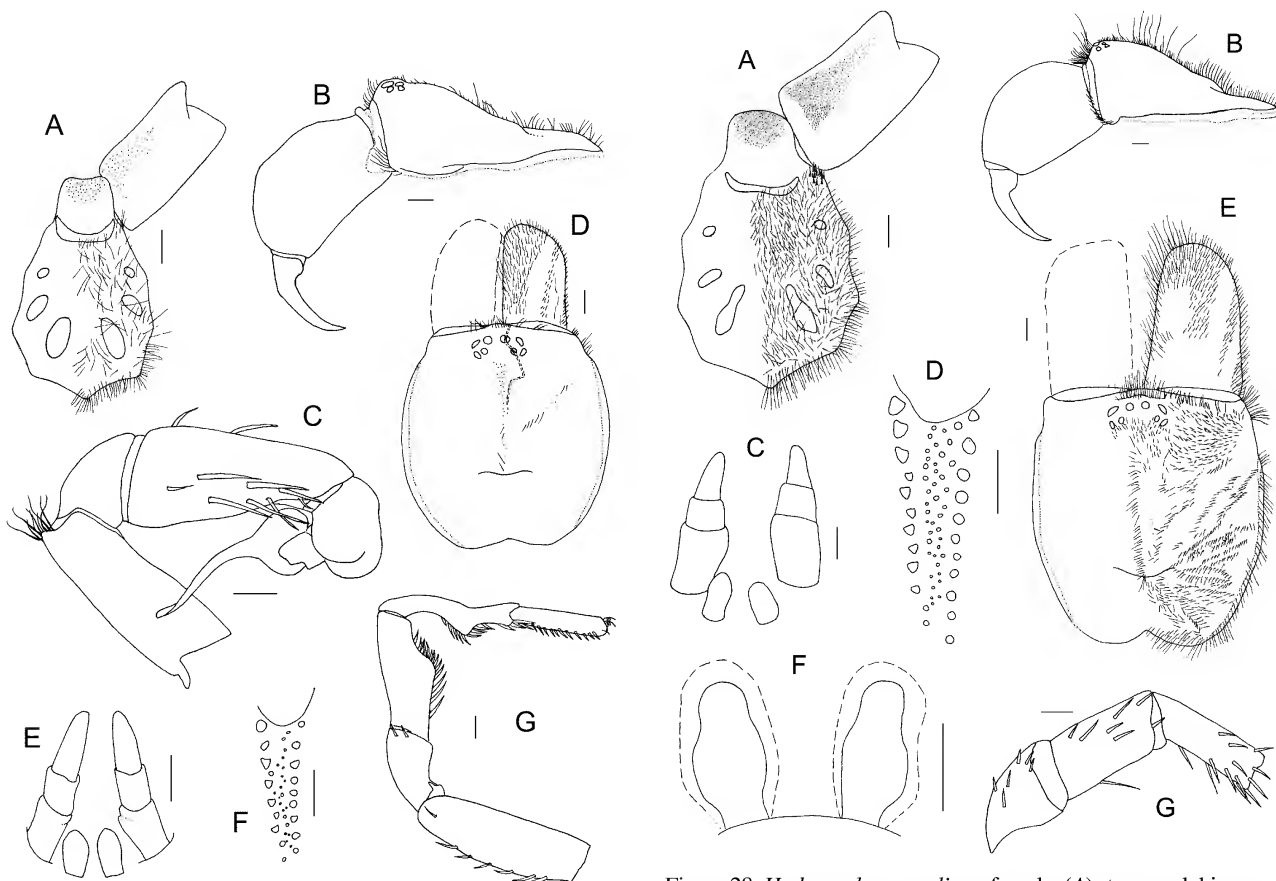


Figure 27. *Hadronyche emmalizae*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) palp, prolateral; (D) cephalothorax and chelicerae, dorsal; (E) spinnerets; (F) cheliceral groove teeth; (G) leg II, prolateral. Scale lines 1 mm.

Figure 28. *Hadronyche emmalizae*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) spermathecae; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

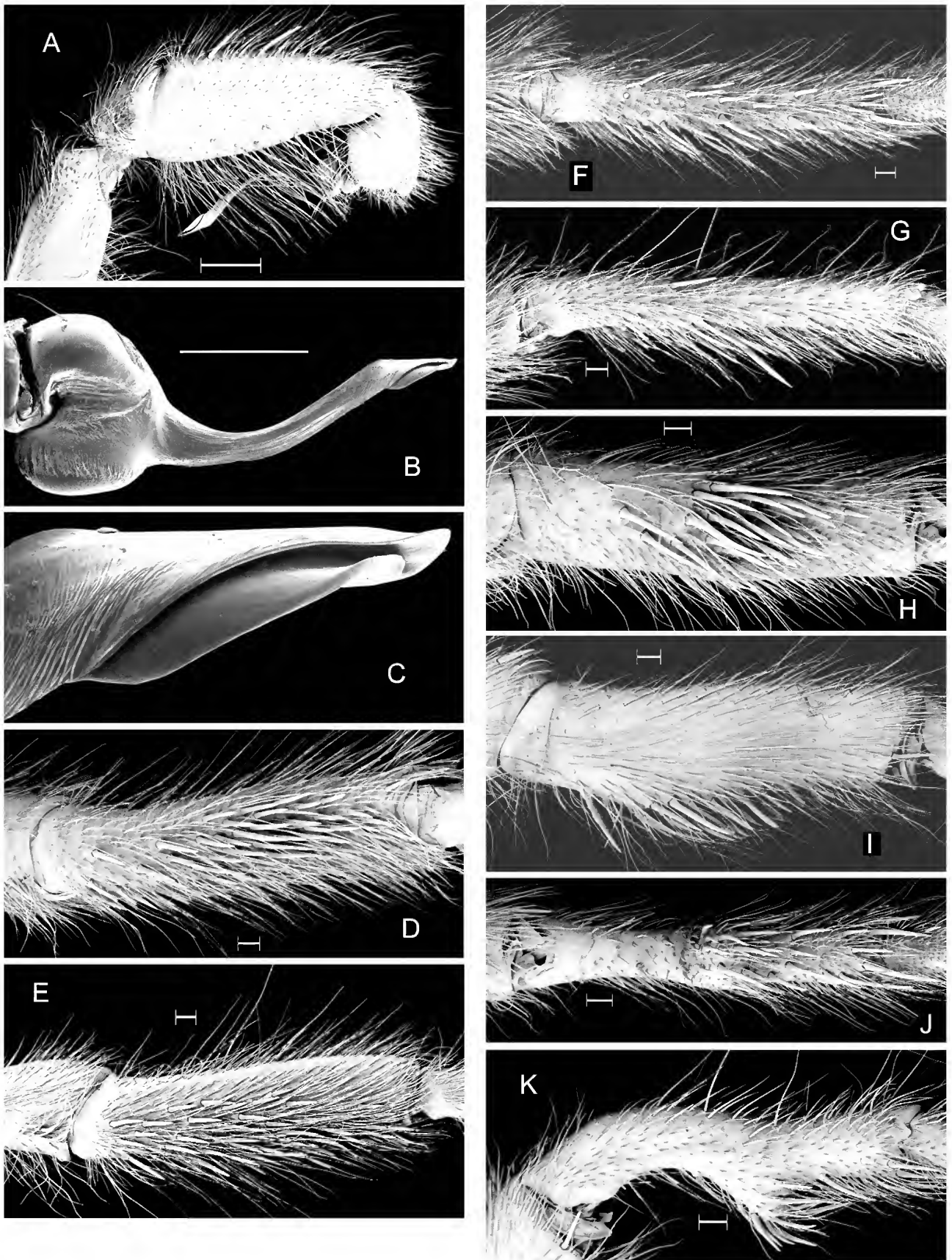


Figure 29. *Hadronyche emmalizae*, male (A,D–K, AMS KS113352, Khancoban, NSW; B,C, AMS KS4114): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A,B 1.0 mm.

Table 8. Male morphological data—*Hadronyche emmalizae* (n = 3).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.06–9.78	8.89	Mt1S	24–35 (p0–1)	28	CW/CL	0.93	0.021
CW	7.68–8.91	8.25	Ta1S	11–21	14	CH/CW	0.46	0.04
CH	3.40–4.22	3.81	Ti2S	25–35	31	CFW/CL	0.72	0.049
CFW	6.12–6.87	6.41	STC2teeth	11–14	13	CHGW/L	0.24	0.006
ChGL	2.52–2.87	2.71	BulbL	3.31–3.67	3.51	SW/SL	0.79	0.025
ChGW	0.60–0.68	0.64	EmbL	2.19–2.72	2.44	LL/LW	0.99	0.064
ChGCT	17–22	20	BulbW	1.23–1.46	1.37	PLSAPW/L	0.39	0.04
LL	1.65–1.73	1.70	EmbmidW	0.22–0.27	0.25	BulbW/EmbL	0.57	0.11
LW	1.67–1.80	1.72	PalpTibL	4.62–5.03	4.78	EmbmidW/L	0.10	0.021
CUSP	222–260	237	PalpTibW	2.09–2.26	2.18	PalpTibW/L	0.46	0.017
SL	5.22–5.58	5.41	PalpTibS	7	7	BulbL/TibL	0.74	0.038
SW	4.15–4.39	4.26	PalpPatS	0–2	1			
PLSAPW	0.41–0.59	0.49	PalpFemS	3–5	4			
PLSAPL	1.09–1.41	1.28						
Fe1S	2–6	4						
Pa1S	2–6 (p1–2)	3						

middle width 0.99. Cheliceral teeth: 47 central, occupying full length of groove in 2–3 irregular rows; 12 prolateral; 11 retrolateral. —*Labium*. Slightly wider than long, rectangular, anterior margin weakly indented. Length 2.24, width 2.52. Cuspules occupying anterior half of labium. Labiosternal sigilla entire, slightly narrowed centrally. —*Sternum*. Ovoid. Length 7.28, width 5.95. Anterolateral angles with basally thickened, bristle-like setae. Posterior sigilla narrow, elongate, length 1.84, width 0.54. —*Palp*. Spinination: patella 1 prolateral bristle, tibia 15, tarsus p6, 3 ventral bristles. Trichobothria: tibia p8 r7, tarsus 11. Tarsal claws with 7 teeth. —*Legs*. 1423.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.43	4.52	6.49	5.47	3.47	28.38
2	7.65	4.25	5.44	4.96	3.40	25.70
3	6.22	3.12	4.15	4.27	3.26	21.02
4	8.13	3.60	6.36	5.71	3.88	27.68

Tibia I width 1.98. Metatarsus I proximal width 1.29. Coxae I, II with several thorn-like setae fronto-medially. Tarsal claw teeth legs I, II: superior 10, 10; inferior 2, 2. Trichobothria legs I, II: tarsus 16, 16; metatarsus 19, 18; tibia p10 r9, p9 r9. —*Leg spinination*. Leg I: femur 0, patella 0, tibia 2, metatarsus 13, tarsus 11. Leg II: femur 0, patella 0, tibia 3, metatarsus 12, tarsus 12. Leg III: femur p1, patella pd8, tibia 11 (p7 r2), metatarsus 20 (p4 r4), tarsus 14. Leg IV: femur 0, patella 0, tibia 3 (p1), metatarsus 23, tarsus 25. —*Abdomen*. Frontal abdomen with a group of strong, spine-like bristles. Posterior lateral spinnerets with short apical segment. Lengths: total 4.85; basal segment 2.24, middle 0.99, apical 1.70. Apical segment width 0.89. —*Genitalia*. Spermathecae short. Basal two thirds strongly dilated, wider than digitiform apical third. Well separated basally (by the width of a spermatheca); apices rounded, diverging slightly from each other. Length 1.33, width 0.80.

Distribution. South from Bago State Forest to the Khancoban–Geehi region, western side of Snowy Mountains, New South Wales (Fig. 26).

Hadronyche formidabilis (Rainbow)

Figures 1F, 30–33; Tables 9, 34

Atrax formidabilis Rainbow, 1914: 255. 1955: 772. Main, 1967: 40. Walker, 1982: 4. Main, 1985: 40.

Hadronyche formidabilis.—Gray, 1988: 114 (transferred from *Atrax*).

Types. Holotype male: AMS KS1038 (old catalogue number K35282). Richmond River, New South Wales

Other material examined. New South Wales (males): QMB S13892, Dorrigo, 10 February 1984, R. Gordon; AMS KS950, Gibraltar Range, near Glen Innes, 12 May 1966, Schultz (matured as male 27 December 1967); AMS KS935, Karuah State Forest, near Dungog, 13 January 1976; AMS KS4514, Lakes Way, near Forster, 15 January 1980, G. Sanders; AMS KS951, South Grafton, July 1965, C. Snook; AMS KS8791, Taree, 29 December 1981; AMS KS934, Taree, 9 January 1976; AMS KS952, Tea Gardens, 3 January 1969, van Dreuten; AMS KS13390, Ulong, 60 km W. of Coff's Harbour, 23 November 1983, C. Martin; AMS KS3245, Wollomombi via Armidale, 2 May 1973, M. Wyndham; AMS KS946, Wongwibinda, 1951, D. Wright; AMS KS949, Armidale Caravan Park; QMB S383, Armidale, Apr 1979; AMS KS947, Barrington Tops, 12 November 1961, B. Salkind; AMS KS1667, Comboyne, 16 January 1946, H.J. Davidson; AMS KS4775, Dalby, 17 February 1938, N. Geary. New South Wales (females): AMS KS13391, Ulong, 23 November 1983, C. Martin; AMS KS13392, Ulong, 23 November 1983, C. Martin; AMS KS1313, Upper Allyn River area, 10 February 1978, A. D'Orbrain; AMS KS3547, Wauchope, 10 October 1934; AMS KS7293, Wilson Creek, 31 March 1981, P. Giraud; AMS KS3234, Wollomombi via Armidale, 2 May 1973, M. Wyndham; AMS KS946, Wongwibinda, 1951, D. Wright; AMS KS1864, Bellingen, AMS KS1058, Cascade, 6 February 1976, R. Holmes; AMS KS14225, Dorrigo, 2 April 1984; AMS KS4663, Dungog area, February 1980; AMS KS5175, Grevillia Saw Mill, May 1980; AMS KS1367, Kempsey, September 1977, B. Mercer; AMS KS2652, Kempsey, February 1979, Daniels; AMS KS13628, Lismore, 30 April 1982; AMS KS3544, Murwillumbah, 1 April 1971, J.O'Reilly; AMS KS5108, Newee Creek, 8 April 1980, T. Foley; AMS KS8363, Niangla, 2 October 1981, M. Keat. Queensland (males): QMB S186, Danabah, 1–7 March 1976, V.E. Davies & R. Raven; QMB S185, O'Reilly's, Lamington Plateau, 1 January 1973, R. Raven; QMB S184, Binna Burra, 12 March 1954, W. McIntyre; QMB S187, Binna Burra, 18 December 1976, T. Gynther.

Diagnosis. CL 10.03–12.30 (male). Large, tree dwelling Atracinae. Differs from most species by tibia II having a large, rounded spinose apophysis with spines extending onto distoventral tibia (Figs. 30C; 32H,I); Differs from

H. cerbera, *H. versuta* and *H. emmalizae* by the more prominent tibia II apophysis (Fig. 30C) and longer spinnerets, PLSAPW/L 0.29 (Fig. 30D; Table 9). Females differ from other atracine species by presence of dense cover of long, fine hairs laterally and ventrally on tibiae & metatarsi I, II (Fig. 31B).

Redescription of male holotype. *Size.* Carapace length 11.39, width 10.27. Abdomen length 10.20, width 7.48. — *Colour.* Basic colour pattern. — *Carapace.* Longer than wide, cephalic area moderately raised. Height 4.76; frontal width 7.48. Fovea weakly procurved, anterior margin indented centrally. Mid-dorsal cephalic setae extend almost to fovea. Anterior strial setae absent basally. Anterolateral carapace angle with strong bristles. — *Eyes.* Central eye region raised. Eye group width 2.65. Median ocular quadrangle length 0.90, anterior width 1.17, posterior width 1.80. Diameters: AME 0.37; ALE 0.56; PLE 0.39; PME 0.29. — *Chelicerae.* Cheliceral groove rather narrow, margins weakly divergent distally. Groove length 3.75, middle width 0.61. Cheliceral teeth: 22 central, occupying full length of groove; 12 prolateral; 11 retrolateral. — *Labium.* Slightly wider than long, apically weakly indented. Length 1.96, width 2.19. Labiosternal sigilla entire, broad. Cuspules c. 338 cuspules, number high. — *Sternum.* Long, ovoid. Length 6.87, width 4.56. Several bristles grouped at anterolateral angles. Posterior sternal sigilla broad, elongate. — *Palp.* Tegular area wider than long. Embolus of moderate length, weakly

offset from tegulum. Shaft moderately wide, weakly curved, moderately twisted distally. Bulb length 3.60, width 1.36. Embolus length 2.51, midwidth 0.29. Length of femur 5.24, patella 2.38, tibia 5.40. Width of tibia 2.31. Spination: femur 3; patella 2; tibia 12, (3 dorsal). Distal femur with sinuous bristles. — *Legs.* 1423. Legs I and IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	10.54	4.65	9.01	8.55	4.76	37.51
2	9.04	4.69	8.02	7.93	4.62	34.30
3	8.36	3.84	6.72	7.13	4.54	30.59
4	10.47	4.37	9.04	8.87	4.72	37.47

Tibia I width 1.72. Femora I and II with dorsal spines. Metatarsus I with numerous ventral spines grouped on thickened proximal region. Tibia I with many ventral spines, distal spines short, prolateral spines present. Tibia II with a large, rounded, strongly spined ventral apophysis placed slightly proximal of centre. Ventral spines proximal and distal to apophysis few and small; prolateral spines present. Metatarsus II strongly sinuous with a prominent spined ventral apophysis; ventral spines mainly on and distal to apophysis, few proximally. Thorn-like setae present on coxae I, II, frontal. Tarsal and distal metatarsal scopulae: legs I, II very weak to absent; legs 3, 4 weak to moderate. Tarsal claw teeth legs I, II: superior 13, 12; inferior 3, 3. Trichobothria legs I, II: tarsus 16, 14; metatarsus 16, 14; tibia p8r8, p8r8. — *Leg spination.* Leg I: femur 11 (d3 p8), patella 11 (p5), tibia 131

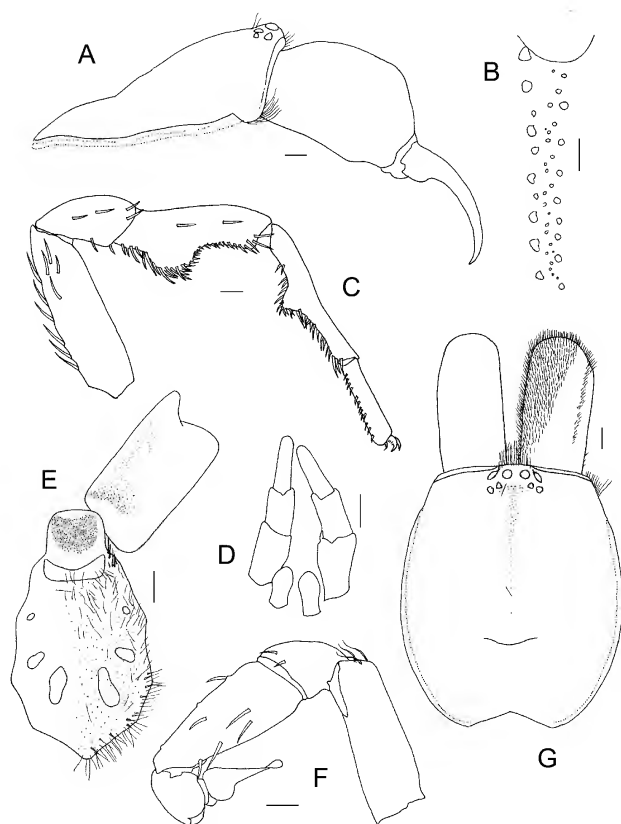


Figure 30. *Hadronyche formidabilis*, male: (A) cephalothorax and chelicerae, lateral; (B) cheliceral groove teeth; (C) leg III, prolateral; (D) spinnerets; (E) sternum, labium and maxilla; (F) palp, prolateral; (G) cephalothorax and chelicerae, dorsal. Scale lines 1 mm.

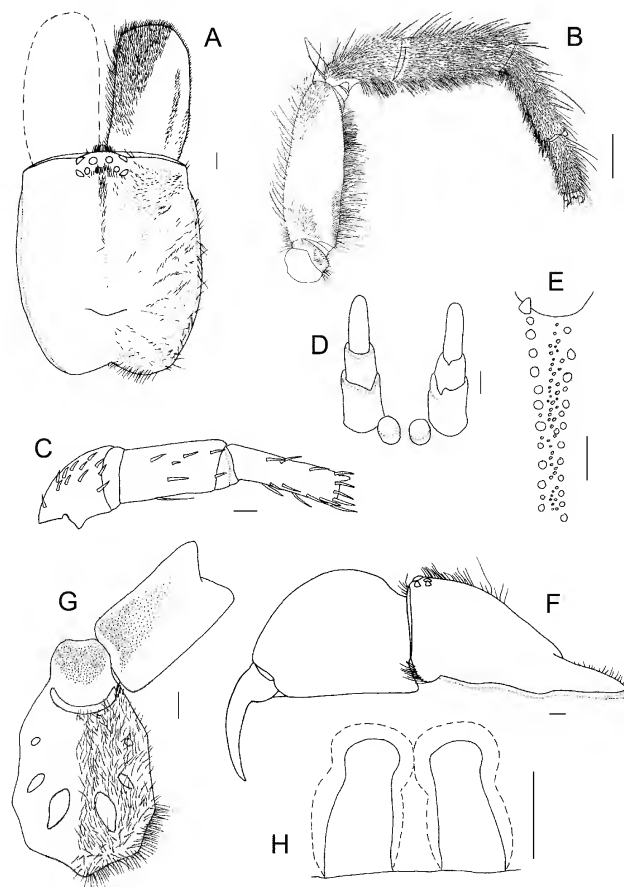


Figure 31. *Hadronyche formidabilis*, female: (A) cephalothorax and chelicerae, dorsal; (B) leg I, hair cover; (C) leg III, prolateral, patella, tibia, metatarsus; (D) spinnerets; (E) cheliceral groove teeth; (F) cephalothorax and chelicerae, lateral; (G) sternum, labium and maxilla; (H) spermathecae. Scale lines 1 mm.

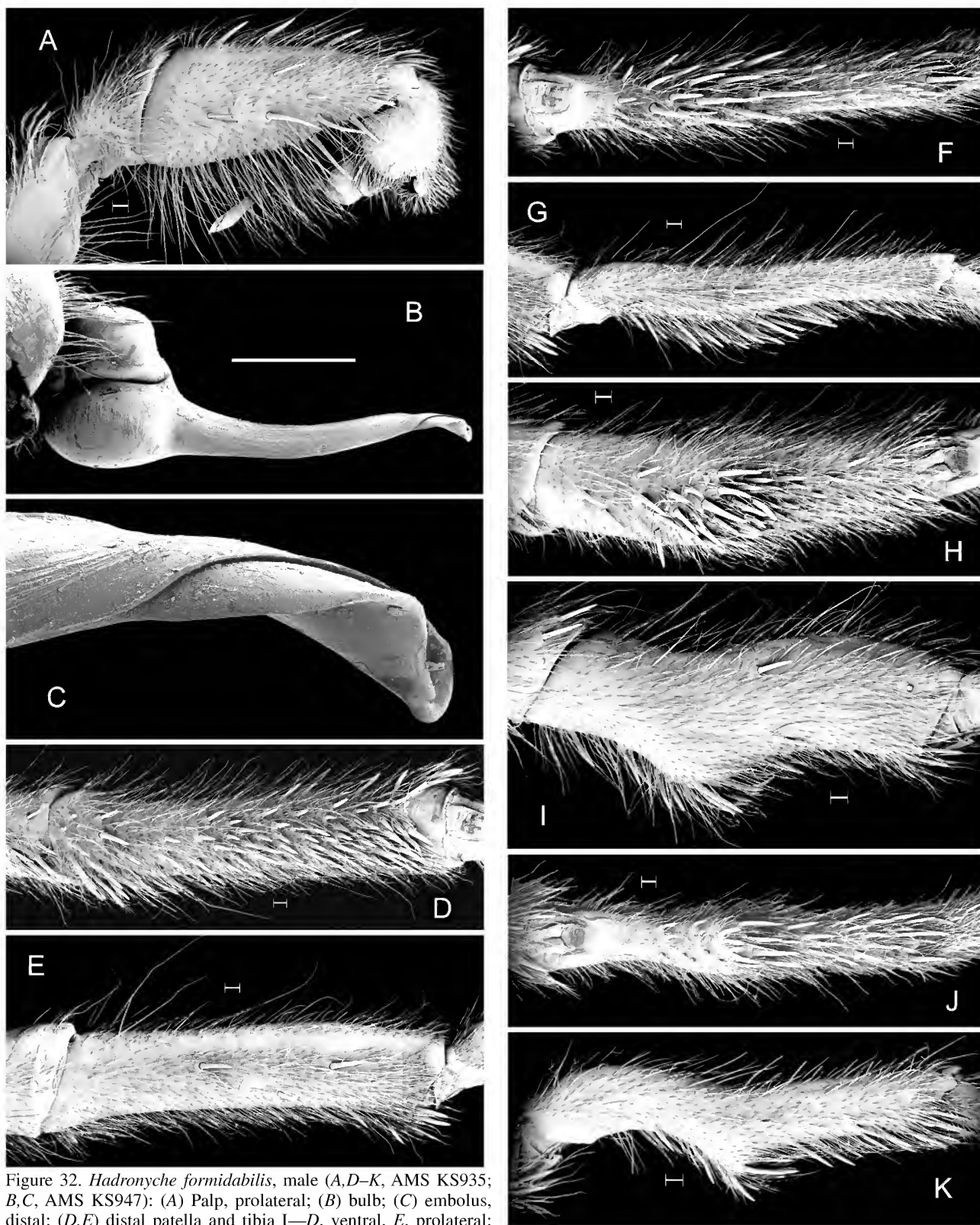


Figure 32. *Hadronyche formidabilis*, male (A,D–K, AMS KS935; B,C, AMS KS947): (A) Palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except B 1.0 mm.

(p7), metatarsus 45, tarsus 44 (2 mid ventral). Leg II: femur 14 (d7pd7), patella 5(p4), tibia 65 (p2), metatarsus 44, tarsus 35 (3 mid ventral). Leg III: femur pd10, patella 13 (p12 r1), tibia 24 (p6 r4), metatarsus 32 (p3 rd2), tarsus 24. Leg IV:

femur 0 (strong bristles), patella r1, tibia 11 (r3), metatarsus 26, tarsus 30. —*Abdomen*. Posterior lateral spinnerets with a rather long apical segment. Lengths: total 5.32; basal segment 2.09; middle 1.36; apical 1.87. Apical segment width 0.58.

Table 9. Male morphological data—*Hadronyche formidabilis* (n = 10).

character	range	mean	character	range	mean	character	ratio	SD
CL*	10.03–12.03	11.06	Mt1S	36–69 (p0–1)	49	CW/CL	0.91	0.02
CW	9.39–11.29	10.06	Ta1S	18–71 (0–5 midv)	39	CH/CW	0.45	0.026
CH	4.10–5.08	4.50	Ti2S*	38–88 (p0–2)	63	CFW/CL	0.67	0.031
CFW	6.36–8.64	7.41	STC2teeth	10–13	11	CHGW/L*	0.15	0.021
ChGL	3.23–3.94	3.55	BulbL	3.40–4.01	3.66	SW/SL	0.73	0.029
ChGW	0.45–0.61	0.53	EmbL	2.04–2.70	2.48	LL/LW	0.92	0.021
ChGCT	15–34	22	BulbW	1.30–1.56	1.39	PLSAPW/L*	0.29	0.024
LL	1.74–2.04	1.87	EmbmW	0.26–0.33	0.30	BulbW/EmbL	0.56	0.043
LW	1.94–2.26	2.04	PalpTibL	4.88–6.12	5.44	EmbmW/L	0.12	0.009
CUSP*	331–417	371	PalpTibW	2.13–2.58	2.30	PalpTibW/L	0.43	0.04
SL	6.27–7.28	6.72	PalpTibS	6–16	9	BulbL/TibL	0.67	0.044
SW	4.51–5.44	4.93	PalpPatS	1–3	2			
PLSAPW	0.50–0.67	0.57	PalpFemS	2–5	3			
PLSAPL	1.67–2.29	1.99						
Fe1S	2–17	9						
Pa1S*	5–25 (p2–8)	11						

Female (AMS KS4663), Dungog area, New South Wales, 32°23'S 151°45'E, February 1980). —*Size*. Carapace length 14.84, width 12.22. Abdomen length 14.28, width 10.54. —*Colour*. Basic colour pattern. Abdomen dark or light maroon brown. —*Carapace*. Clearly longer than wide, strongly raised. Height 6.46; frontal width 10.66. Cephalic length 11.36. Fovea procurved. Mid-dorsal cephalic setae weak but numerous anteriorly, few posteriorly, do not reach fovea. Anterior strial setae absent basally. Anterolateral carapace angle with many bristles. —*Eyes*. Eye region sessile, very slightly raised centrally. Eye group width 3.53. Diameters: AME 0.38, ALE 0.78, PLE 0.70, PME 0.40. Interdistances: AME–AME 0.58, AME–ALE 0.44, ALE–PLE 0.38, PLE–PME 0.12, PME–PME 1.54. Median ocular quadrangle length 1.08, anterior width 1.11, posterior width 2.38. —

Chelicerae. Cheliceral groove narrow, margins diverging distally. Groove length 4.72, middle width 0.82. Cheliceral teeth: 44 central, in irregular double row, occupying full length of groove; 13 prolateral; 13 retrolateral. —*Labium*. Almost as long as wide, rounded, anterior margin broadly indented. Length 3.08, width 2.95. Cuspules occupying anterior three quarters of labium. Labiosternal sigilla entire. —*Sternum*. Long. Length 9.10, width 6.60. Posterior sigilla elongate: length 1.85, width 0.80. —*Palp*. Spination: tibia 4, tarsus 7. Trichobothria: tibia p10 r9, tarsus 22. Tarsal claw with 6 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	10.40	5.60	8.36	7.01	4.10	35.47
2	9.43	5.49	7.13	6.48	3.98	32.51
3	8.12	4.51	5.41	5.99	3.98	29.01
4	10.66	5.62	8.20	7.63	4.59	36.70

Tibiae and metatarsi I, II with dense cover of long, fine hairs ventrally and laterally. Tibiae I, II with 0–1 spines. Tibia I width 2.62. Metatarsus I proximal width 1.64. Coxae I, II with a few thorn-like setae frontally. Tarsal claw teeth legs I, II: superior 7, 6; inferior 3, 3. Trichobothria legs I, II: tarsus 19, 15, metatarsus 26, 23; tibia p9 r9, p8 r8. —*Leg spination*. Leg I: femur 0, patella 0, tibia 1, metatarsus 6, tarsus 7. Leg II: femur 0, patella 0, tibia 1, metatarsus 8, tarsus 9. Leg III: femur 0, patella pd13 r1, tibia 11 (p4 r3), metatarsus 21 (p5 rd3), tarsus 11. Leg IV: femur 0, patella 0, tibia 4, metatarsus 7, tarsus 22. —*Abdomen*. Posterior lateral spinnerets stout, apical segment thick and moderately long. Lengths: total 6.73; basal segment 2.54; middle 1.44; apical 2.75. Apical segment width 0.94. —*Genitalia*. Spermathecae broad, converge slightly anteriorly. Apical third rounded, clearly set off from basal two thirds by a constriction. Spermatheca length 1.49, width 0.65.

Distribution. Northeastern New South Wales, from the Hunter River, to southeastern Queensland (Fig. 33). A single record exists from southeastern New South Wales (Robertson, southern highlands) but remains unconfirmed.

Comments. This is the largest atracine spider known. Both males and especially females have noticeably narrower carapaces than comparable species. They are a tree dwelling

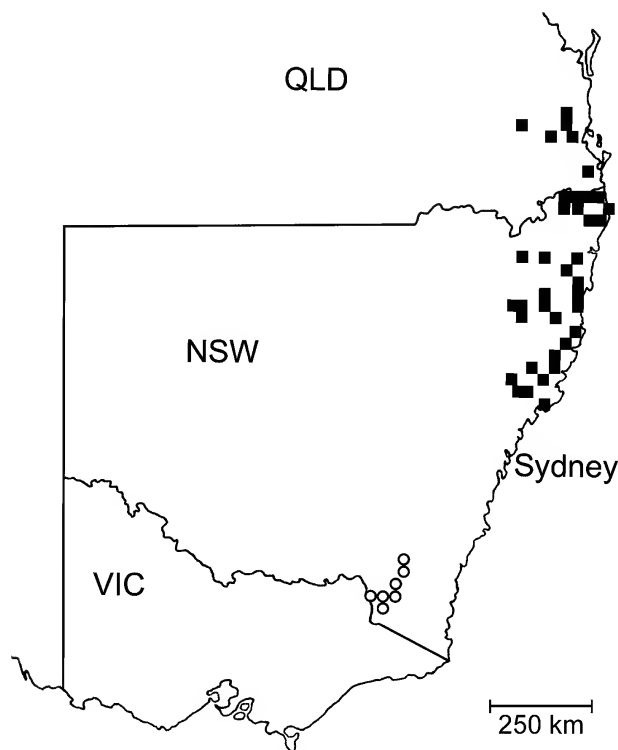


Figure 33. Collection records for *Hadronyche formidabilis* (squares) and *H. alpina* (circles).

species associated with tall open forest and rainforest habitats. Their retreats are associated with trunk/branch fracture holes, rotten heartwood pipes and epiphytic growths. During timber milling, these spiders are regularly found in the rotting wood and frass environment of heartwood pipes in large trees such as Tallowwood (*Eucalyptus microcorys*). They probably feed on wood eating beetles and associated fauna inhabiting the tree pipe habitat.

***Hadronyche alpina* n.sp.**

Figures 33–36; Tables 10, 34

Etymology. The specific epithet refers to the species presence in the Snowy Mountains alpine region of New South Wales.

Types. Holotype male: AMS KS872, Mt. Kosciuszko, Kosciuszko National Park, New South Wales, 36°27'S 148°15'E, 13 January 1968, J. Child. Paratypes (all AM). New South Wales. **Males:** AMS KS13808, Kosciuszko National Park, 5 December 1983, J. Gold; AMS KS8515, South Ramshead, Kosciuszko National Park, 36°31'S 148°14'E, 16 December 1981, W.S. Osborne; AMS KS875, West slope of Mt. Kosciuszko, Kosciuszko National Park, 36°27'S 148°15'E, 17 December 1971, R.L. Jenz; AMS KS871, Seaman's Hut, Mt. Kosciuszko, Kosciuszko National Park, 36°27'S 148°15'E, 28 November 1966, H. Cogger; AMS KS23643, Charlotte Pass area, Kosciuszko National Park, 36°26'S 148°19'E, J. Molan; AMS KS877, Mt. Kosciuszko, 7 January 1929, H.O. Fletcher & A. Musgrave. **Females:** AMS KS8730, Daner's Gap, Kosciuszko National Park, 36°21'S 148°28'E, W.S. Osborne, 12 January 1982; AMS KS8514, South Ramshead, Kosciuszko National Park, 36°31'S 148°14'E, 16 December 1981; AMS

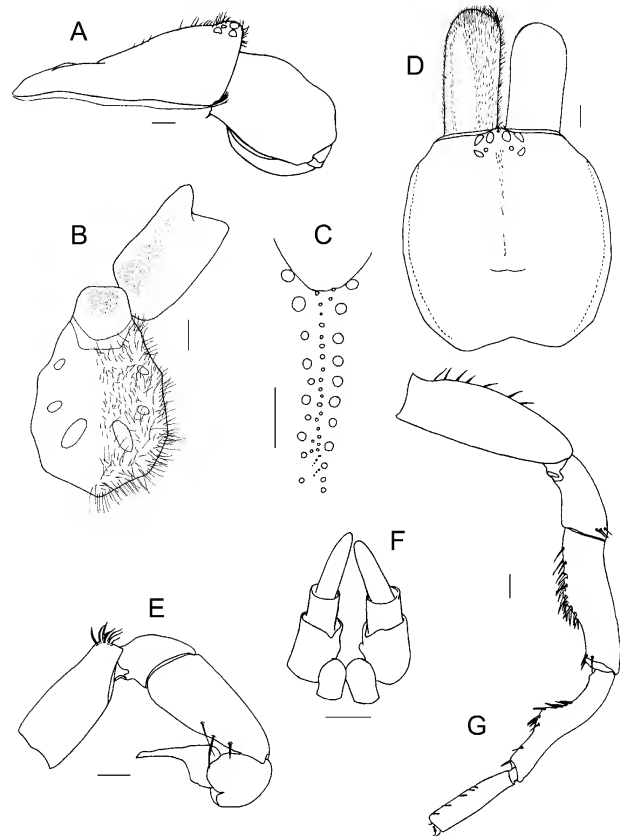


Figure 34. *Hadronyche alpina*, male: (A) cephalothorax and chelicerae, lateral; (B) sternum, labium and maxilla; (C) cheliceral groove teeth; (D) cephalothorax and chelicerae, dorsal; (E) palp, prolateral; (F) spinnerets; (G) leg II, prolateral (NB, dorsal femoral spines present or absent). Scale lines 1 mm.

KS876, Mt. Kosciuszko, Kosciuszko National Park, 36°27'S 148°15'E, 6 January 1929, H.O. Fletcher; AMS KS10602, Thredbo, 36°26'S 148°27'E, 13 January 1983, G. Jackson. Australian Capital Territory. **Male:** AMS KS870, Mt. Ginini, Brindabella Ranges, 35°31'S 148°46'E, 5 December 1966, R. Wood.

Other material examined. New South Wales (males): AMS KS878, Australian Alps, 1950, S.G. Alley; AMS KS876, Mount Kosciuszko, Kosciuszko National Park, 6 January 1929, H.O. Fletcher; AMS KS873, Mount Kosciuszko, Kosciuszko National Park, 31 January 1974; AMS KS874, Mount Kosciuszko near summit, Kosciuszko National Park, 9 February 1952, C.E. Chadwick.

Diagnosis. CL 8.16–10.06 (male). Apophyseal swelling present on tibia II (Fig. 36H,I). Differs from *H. versuta* by shorter embolus and *H. emmalizae* by shorter, straight embolus (BulbW/Embl 0.76) (Fig. 36B); from *H. cerebera* by absence of coxal thorns; from *H. venenata* by presence of metatarsus II apophysis (Fig. 36K); and from *H. meridiana* and *H. modesta* by longer labium (Fig. 34B).

Male (holotype). —**Size.** Carapace length 9.31, width 9.28. Abdomen length 9.02, width 6.72. —**Colour.** Basic colour pattern. —**Carapace.** Almost as wide as long, moderately raised. Height 3.81. Frontal width 5.95. Fovea weakly procurved-straight. Mid-dorsal cephalic setae almost reach fovea. Anterior striae area with none or few setae. Strong bristles on anterolateral carapace angle. —**Eyes.** Sessile to slightly raised. Eye group width 2.28. Median ocular

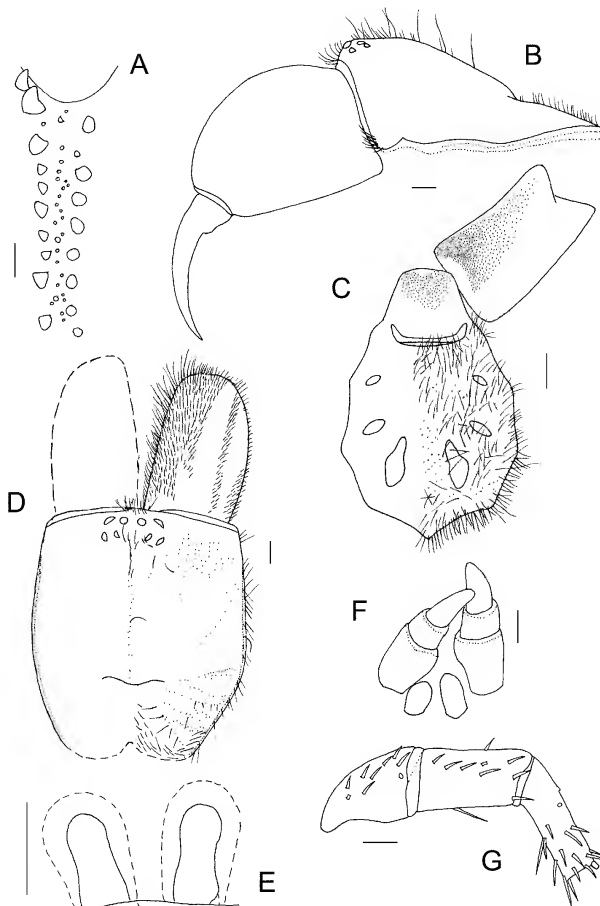


Figure 35. *Hadronyche alpina*, female: (A) cheliceral groove teeth; (B) cephalothorax and chelicerae, lateral; (C) sternum, labium and maxilla; (D) cephalothorax and chelicerae, dorsal; (E) palp, prolateral; (F) spinnerets; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

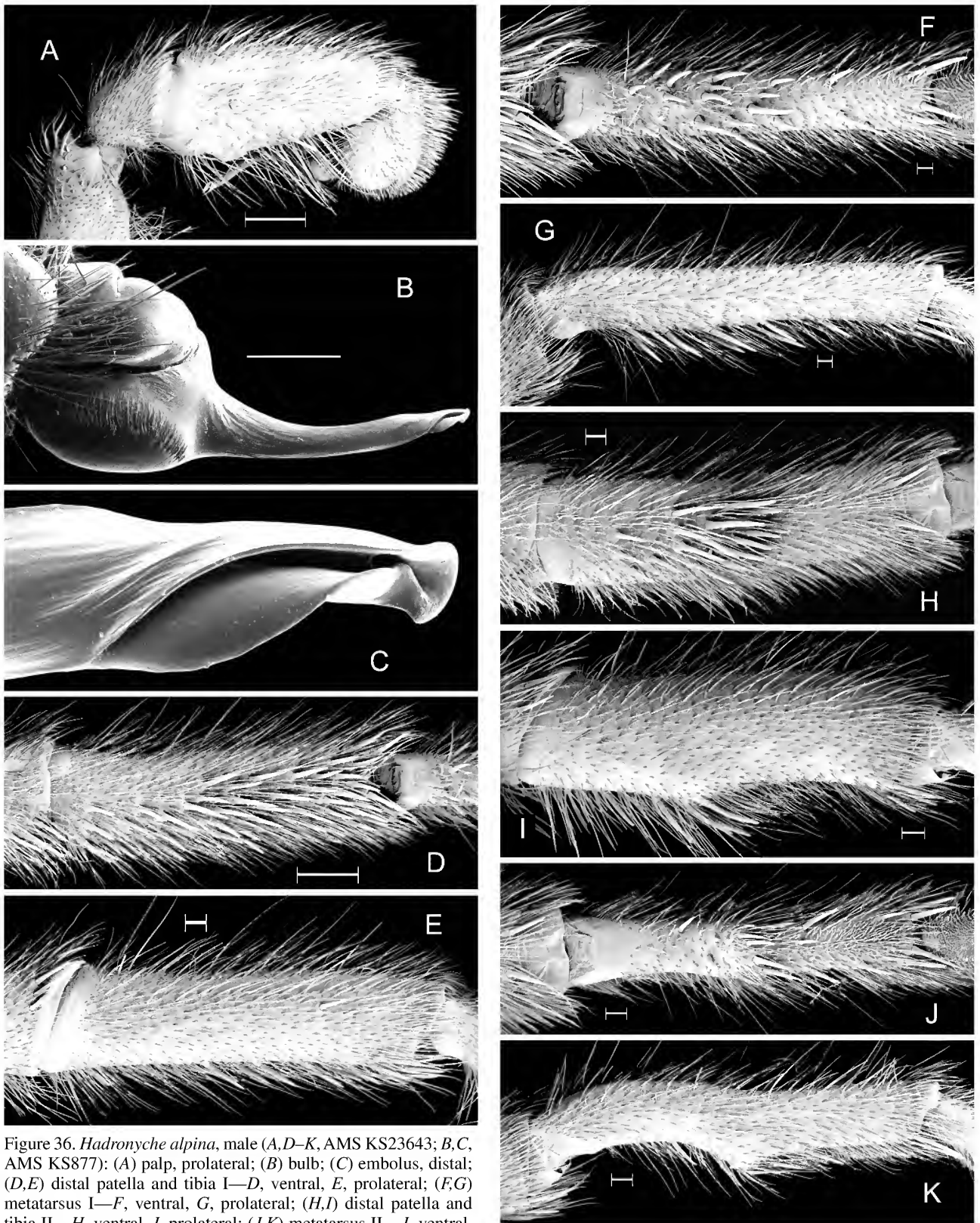


Figure 36. *Hadronyche alpina*, male (A,D–K, AMS KS23643; B,C, AMS KS877): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A 0.5 mm, D 1.0 mm and F,H, 0.2 mm.

quadrangle length 1.10, anterior width 1.04, posterior width 1.44. Diameters: AME 0.30, ALE 0.47, PLE 0.41, PME 0.21. —*Chelicerae*. Cheliceral groove rather narrow, margins subparallel to weakly divergent. Groove length 3.18, middle

width 0.58. Cheliceral teeth: 29 central, running full length of groove, many often proximally placed; 10 prolateral; 11 retrolateral. —*Labium*. Slightly wider than long. Length 1.60, width 1.74. Labiosternal sigilla, broad entire. Cuspules

Table 10. Male morphological data—*Hadronyche alpina* (n = 10).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.16–10.06	9.21	Mt1S	25–45	35	CW/CL	0.96	0.038
CW	7.63–9.32	8.81	Ta1S	8–15	12	CH/CW	0.41	0.021
CH	3.31–4.08	3.65	Ti2S	21–48	32	CFW/CL	0.66	0.045
CFW	5.44–6.36	6.04	STC2teeth	13–16	14	CHG/WL	0.18	0.029
ChGL	2.53–3.18	2.84	BulbL	2.61–3.20	2.87	SW/SL	0.77	0.037
ChGW	0.40–0.63	0.51	EmbL	1.59–1.96	1.75	LL/LW	0.89	0.038
ChGCT	4–29	15	BulbW	1.17–1.67	1.31	PLSAPW/L*	0.33	0.042
LL	1.07–1.64	1.49	EmbmW	0.21–0.28	0.23	BulbW/EmbL*	0.76	0.059
LW	1.25–1.84	1.67	PalpTibL	3.94–4.76	4.42	EmbmW/L	0.14	0.011
CUSP*	110–140	128	PalpTibW	1.87–2.28	2.10	PalpTibW/L	0.48	0.033
SL	4.66–6.05	5.55	PalpTibS	0–7	3	BulbL/TibL	0.66	0.041
SW	3.67–4.72	4.29	PalpPatS	0–1	1			
PLSAPW	0.41–0.56	0.48	PalpFemS	3–5	4			
PLSAPL	1.29–1.78	1.46						
Fe1S	0–8	3						
Pa1S	3–10 (p1–4)	6						

c. 130, number low to moderate. —*Sternum*. Ovoid. Length 5.58, width 4.32. Posterior sigilla large, elongate. —*Palp*. Tegular area slightly wider than long. Embolus short, weakly curved, with short, weakly twisted distal part; basal embolus slightly or not offset from tegulum. Bulb length 2.83, width 1.34. Embolus length 1.65, midwidth 0.27. Length of femur 4.31, patella 1.97, tibia 4.43. Width of tibia 2.12. Spination: femur 3; tibia 2. Femur with distal sinuous bristles. —*Legs*. 4213. Legs I, 2 subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.36	4.06	6.39	6.31	4.17	29.29
2	8.16	4.10	6.89	6.52	4.10	29.77
3	6.93	3.47	5.46	5.82	4.02	25.70
4	8.36	3.85	7.16	6.97	4.67	31.01

Tibia I width 1.62. Femora I and II usually with, sometimes without, dorsal spines. Femora III and IV with strong, long bristles. Metatarsus I slightly thickened proximally, larger ventral spines grouped proximally. Tibia II with small apophyseal swelling, centrally placed with spines grouped upon it. Tibia II weakly concave distoventrally. Metatarsus II sinuous with a prominent ventral, spined apophysis. Coxal hairs unmodified. Scopulae well developed on tarsi of all legs and distal metatarsi of legs II–IV. Tarsal claw teeth legs I, II: superior 4; inferior 2. Trichobothria legs I, II: tarsus 12, 13; metatarsus 17, 16; tibia p9 r8, p7 r6. —*Leg spination*. Leg I: femur d3 (plus bristles), patella 10 (p4 v6), tibia 72 (p4), metatarsus 39, tarsus 12. Leg II: femur d3 (plus bristles), patella 3 (p2 v1), tibia 32, metatarsus 21, tarsus 12. Leg III: femur 0, patella 8 (p7 v1), tibia 10 (p4 r2), metatarsus 22, tarsus 10. Leg IV: femur 0, patella 0, tibia 2, metatarsus 17, tarsus 18. —*Abdomen*. Posterior lateral spinnerets with moderately long apical segment. Lengths: total 3.36; basal segment 1.20, middle 0.64, apical 1.52; apical width 0.49.

Female (paratype AMS KS8730). —*Size*. Carapace length 10.02, width 9.35. Abdomen length 15.64, width 11.22. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, strongly raised. Height 5.07, frontal width 8.23. Cephalic length 7.14. Fovea procurved. Mid-dorsal cephalic

setae almost reach or reach fovea. Anterior strial setae few to absent basally. Anterolateral carapace angle with a few weak bristles and hairs. —*Eyes*. Central eye region weakly raised. Eye group width 2.72. Diameters: AME 0.25, ALE 0.52, PLE 0.44, PME 0.20. Interdistances: AME–AME 0.44, AME–ALE 0.31, ALE–PLE 0.42, PLE–PME 0.22, PME–PME 1.16. Median ocular quadrangle length 0.98, anterior width 1.03, posterior width 1.69. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 3.59, middle width 0.82. Cheliceral teeth: 28 central, in single row, occupying full length of groove; 11 prolateral; 9 retrolateral. —*Labium*. Slightly wider than long, sides sloping medially to convex anterior margin. Length 2.04, width 2.41. Cuspules on anterior half of labium. Labiosternal sigilla entire, narrow. —*Sternum*. Ovoid. Length 6.90, width 5.24. Posterior sigilla elongate: length 1.36, width 0.58. —*Palp*. Spination: tibia 2, tarsus 7. Trichobothria: tibia p6 r7, tarsus 8. Tarsal claw with 6 teeth. —*Legs*. 1423. Legs I, IV subequal.

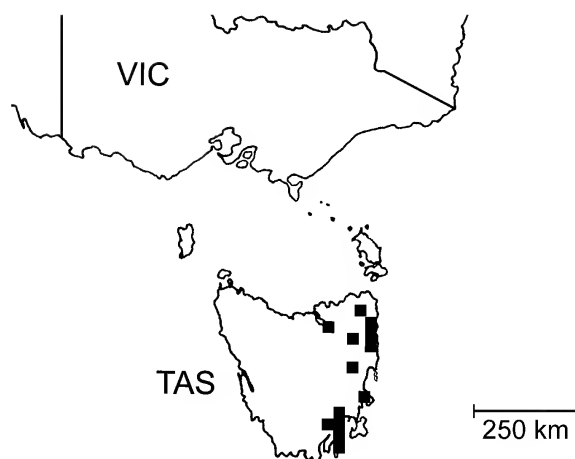
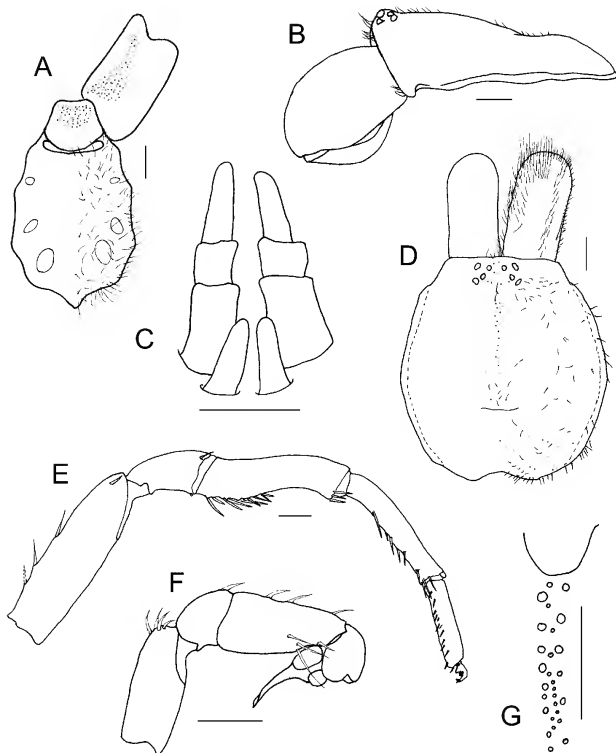
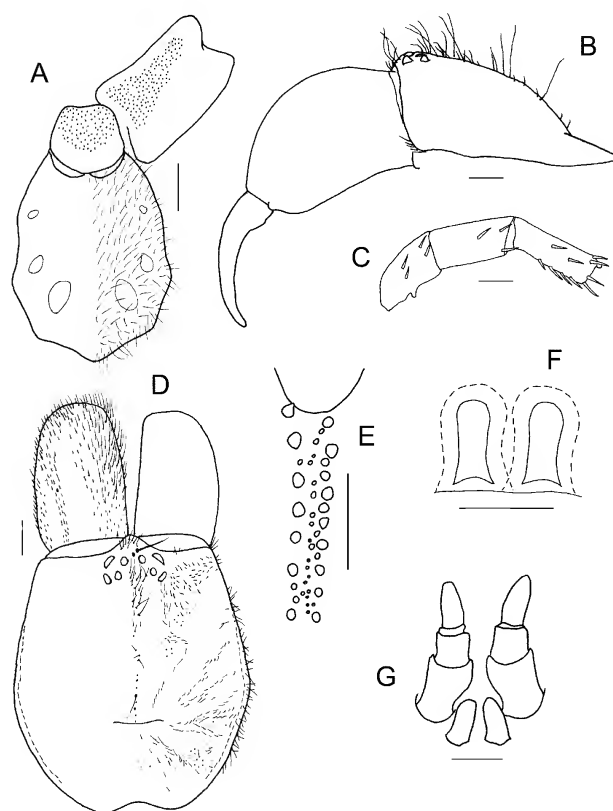
Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.15	4.32	5.81	4.79	3.20	26.27
2	7.00	3.94	5.24	4.28	2.86	23.32
3	6.12	3.37	3.77	3.92	2.99	20.17
4	7.75	4.22	5.62	5.09	3.33	26.01

Tibia I width 1.84. Metatarsus I proximal width 1.26. Coxa I with anterior setae thickened basally. Tarsal claw teeth legs I, II: superior 11, 11; inferior 3, 3. Trichobothria legs I, II: tarsus 11, 12; metatarsus 14, 14; tibia p9 r7, p7 r8. —*Leg spination*. Leg I: femur 0, patella 0, tibia 1, metatarsus 8, tarsus 6. Leg II: femur 0, patella 0, tibia 1, metatarsus 9, tarsus 8. Leg III: femur 0, patella pd8, tibia 15 (p8 r4), metatarsus 20 (p9 rd3), tarsus 16. Leg IV: femur 0, patella 0, tibia 2, metatarsus 22, tarsus 33. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 3.95; basal segment 1.63, middle 0.82, apical 1.50. Apical segment width 0.67. —*Genitalia*. Spermathecae about twice as long as wide, digitiform, apical half slightly enlarged. Length 0.95, width 0.45. Spermathecae diverge slightly anteriorly.

Distribution. Kosciuszko National Park, New South Wales and Brindabella Range, Australian Capital Territory (Fig. 33).

***Hadronyche venenata* (Hickman)**

Figures 37–40; Tables 11, 34

Atrax venenatus Hickman, 1927: 63. Hickman, 1967: 20. Main, 1985: 42.*Hadronyche venenata*.—Gray, 1988: 114 (Transferred from *Atrax*).**Types.** Holotype male: QVM 957–13–16 Type 28. Newtown Creek, Hobart, Tasmania, V.V. Hickman, 22 December 1925. Allotype female: QVM 1957–13–17 Type 29. Data as for holotype.**Other material examined. Tasmania (males):** AMS KS6071, Lambert Park, near Hobart, 3 June 1980, M. Gray; Bicheno, 22 January 1972, B. Stephenson (QVM); Cape Lodi, near Bicheno, 5 March 1978, A. McBain (QVM); Cole's Bay, 27 April 1972, N.S. Freeman (QVM); Cole's Bay, 13 March 1978, Monaghan (QVM); Cole's Bay, 24 February 1971, M. O'Toole (QVM); Mathina, 16 February 1972 (QVM); Mathina, 10 February 1971, J. Turner (QVM); AMS KS972, Mount Ben Lomond, 11 April 1926, A.L. Meston; J1916 (TM), Geilston Bay, 16 May 1984, J. McDavitt; J1360 (TM), Rosny, Hobart, 17 April 1978, Mr Ward; E938 (TM), Blackman's Bay, 5 May 1974, E. Cunliffe; Hobart, June 1971, K. Hamilton (QVM); J1917 (TM), Winnebah, May 1984, F. Wagner; J 739 (TM), Tinderbox, 8 March 1971, D. Milledge; J1113 (TM), West Hobart, 26 March 1976, R. van de Uusse; J1025 (TM), Tarooma, Hobart, 9 March 1975, Ms Stottard. **Tasmania (females):** Blackman's Bay, Apr 1983 (TM); AMS KS975, Cascades, 3 January 1967; Coles Bay, February 1970, N. Lawson (TM); Cromwell, 20 April 1971, N. Toombs (TM); Golden Ridges, 13 February 1946, W. Bart (QVM); Hobart, June 1971, K. Hampton (QVM); Liffy, 28 October 1972, K. Watson (QVM); Mathina, 10 February 1971, J. Turner (QVM); Mount Victoria, 14 January 1972, N.B. Brown (QVM); Mount Young, 18 January 1971, ? Simpson (QVM); Poatina, 28 September 1963, F. Fishwick (QVM); Ringarooma, 7 June 1963, J. Kidd (QVM); Rosetier, 7 June 1971 (TM); AMS KS974, Sandy Bay, 12 December 1966, J. Cossum; St. Marys, 16 July 1971, K. Cook (QVM); AMS KS6214, Tarooma, near Hobart, 8 September 1980, R. Parrott; AMS KS973, Trevallyn, 1 February 1928.Figure 37. Collection records for *Hadronyche venenata***Diagnosis.** CL 6.88–9.59 (male). Differs from other *Hadronyche* spp. by having a weak spined apophyseal swelling on tibia II but metatarsus II not modified (Figs. 38E, 40H–K). Male caput relatively weakly raised (Fig. 38B; CH/CW 0.40).**Redescription of male holotype.** *Size.* Carapace length 6.88, width 6.19. Abdomen length 5.30, width 4.42. —*Colour.* Basic colour pattern. —*Carapace.* Longer than wide, cephalic area moderately raised, rather narrow frontally. Height 2.46. Frontal width 3.69. Fovea straight, narrow. Mid-dorsal cephalic setae reach fovea. Anterior strial setaeFigure 38. *Hadronyche venenata*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cephalothorax and chelicerae, dorsal; (E) leg II, prolateral; (F) palp, prolateral; (G) cheliceral groove teeth. Scale lines 1 mm.Figure 39. *Hadronyche venenata*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg III, prolateral, patella, tibia, metatarsus; (D) cephalothorax and chelicerae, dorsal; (E) cheliceral groove teeth; (F) spermathecae; (G) spinnerets. Scale lines 1 mm.

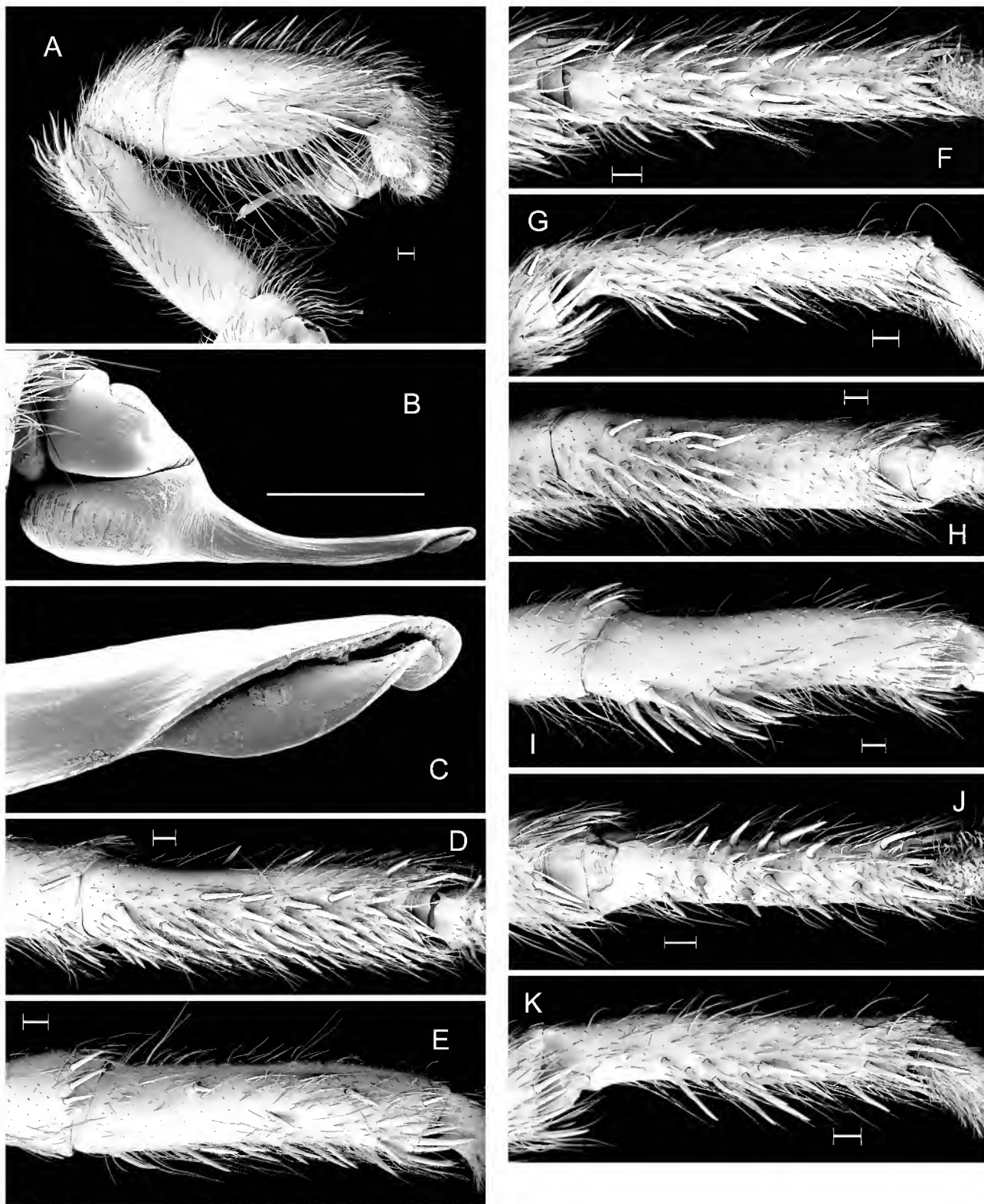


Figure 40. *Hadronyche venenata*, male (A,D–K, AMS KS6071; B,C, AMS KS972): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A 0.2 mm and B 1.0 mm.

present. Anterolateral carapace angle with several weak bristles. —*Eyes*. Central eye region raised. Anterior median eyes small. Eye group width 1.60. Median ocular quadrangle length 0.58, anterior width 0.70, posterior width 1.09. Diameters: AME 0.17, ALE 0.38, PLE 0.26, PME 0.20. —

Chelicerae. Groove margins subparallel, weakly divergent distally; length 2.02, middle width 0.26. Cheliceral teeth: 16 central, occupying full length of groove; 9 prolateral; 7 retrolateral. —*Labium*. Slightly wider than long, weakly indented apically. Length 1.14, width 1.24. Labiosternal

Table 11. Male morphological data—*Hadronyche venenata* (n = 12).

character	range	mean	character	range	mean	character	ratio	SD
CL	6.88–9.59	8.52	Mt1S	24–53 (p0–1)	37	CW/CL	0.95	0.029
CW	6.19–8.82	8.11	Ta1S	9–24	14	CH/CW*	0.40	0.016
CH	2.46–3.62	3.27	Ti2S	16–39	26	CFW/CL	0.65	0.047
CFW	3.69–6.45	5.49	STC2teeth	12–16	13	CHGW/L*	0.13	0.014
ChGL	2.02–2.83	2.53	BulbL	1.58–2.83	2.44	SW/SL	0.71	0.056
ChGW	0.26–0.39	0.32	EmbL	1.33–1.84	1.57	LL/LW	0.93	0.029
ChGCT	12–24	17	BulbW	0.94–1.44	1.09	PLSAPW/L*	0.36	0.057
LL	1.14–1.60	1.44	EmbmW	0.16–0.22	0.18	BulbW/EmbL	0.67	0.037
LW	1.24–1.72	1.56	PalpTibL	3.03–4.18	3.77	EmbmW/L	0.12	0.008
CUSP	213–325	269	PalpTibW	1.41–1.96	1.77	PalpTibW/L	0.47	0.042
SL	3.94–5.92	5.28	PalpTibS	4–8	6	BulbL/TibL	0.65	0.032
SW	2.84–4.20	3.53	PalpPatS	1–3	1			
PLSAPW	0.32–0.64	0.46	PalpFemS*	5–11	7			
PLSAPL	0.84–1.53	1.43						
Fe1S*	0–3	1						
Pa1S	4–14 (p1–3)	9						

sigilla narrowed toward midline. Cuspules c. 220, number moderate to high. —*Sternum*. Ovoid, moderately long. Length 3.94, width 2.84. Posterior sigilla ovoid, broad. —*Palp*. Tegular area wider than long. Embolus rather short, base hardly offset from tegulum. Embolus shaft weakly curved to straight, only slightly tapered distally. Distal part of embolus weakly twisted and short. Bulb length 2.07, width 0.94. Embolus length 1.37, midwidth 0.16. Length of femur 3.00, patella 1.34, tibia 3.03. Width of tibia 1.41. Spination: femur 4, patella 1, tibia 7 (3 dorsal). Some distal femoral spines and bristles sinuous. —*Legs*. 4123. Legs I, IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.99	2.87	4.94	4.55	2.96	21.31
2	5.90	2.83	4.72	4.26	2.80	20.51
3	5.03	2.43	3.85	3.53	2.79	17.62
4	5.99	2.68	4.84	4.90	2.94	21.35

Tibia I width 1.17. Femora I and II with dorsal spines. Tibia I ventral spines numerous. Metatarsus I slightly thickened proximally, larger ventral spines grouped proximally. Tibia II with weak apophyseal swelling in proximal half, ventral spines grouped upon it; distal ventral tibia II weakly concave, without spines (except apically). Metatarsus II without apophysis, straight to weakly sinuous (midventral region sometimes slightly thickened) with strong midventral to distal spines. Coxal setae unmodified. Scopulae legs I–IV: tarsus, weak to moderate; metatarsus, absent to weak. Tarsal claw teeth legs I, II: superior 13, 13; inferior 2, 1. Trichobothria legs I, II: tarsus 10, 10, metatarsus 10, 11; tibia p6 r6, p6 r6. —*Leg spination*. Leg I: femur 4(d3 p1), patella 6(p2 v4), tibia 46, metatarsus 28, tarsus 12. Leg II: femur d3, patella p1, tibia 26, metatarsus 16, tarsus 9. Leg III: femur d3, patella p3, tibia 11 (p2 r2 d2), metatarsus 15, tarsus 10. Leg IV: femur d4, patella 0, tibia 9 (r3), metatarsus 16, tarsus 12 —*Abdomen*. Posterior lateral spinnerets: apical segment moderately long. Lengths: total 2.36; basal segment 0.96, middle 0.56; apical 0.84. Apical segment width 0.32.

Redescription of female allotype. *Size*. Carapace length 7.38, width 6.81. Abdomen length 10.61, width 8.70. —*Colour*. Basic colour pattern. 3–4 pairs abdominal chevrons, middle pairs distinct and almost meeting mid-

dorsally. —*Carapace*. Slightly longer than wide, strongly raised. Height 3.03. Frontal width 5.13. Cephalic length 5.34. Fovea slightly procurved–straight, anterior margin slightly indented. Mid-dorsal cephalic setae numerous and run back to fovea. Anterior striae setae present. Anterolateral carapace angle with several hairs and weak bristles. —*Eyes*. Central eye region slightly raised. Eye group width 1.91. Diameters: AME 0.18, ALE 0.45, PLE 0.37, PME 0.24. Interdistances: AME–AME 0.30, AME–ALE 0.18, ALE–PLE 0.27, PLE–PME 0.14, PME–PME 0.79. Median ocular quadrangle length 0.60, anterior width 0.70, posterior width 1.25. —*Chelicerae*. Groove margins diverge weakly distally; length 2.20, middle width 0.40. Cheliceral teeth: 18 central, in single row occupying full length of groove; 11 prolateral; 11 retrolateral. —*Labium*. Slightly wider than long, rounded, apically indented. Length 1.47, width 1.65. Cuspules occupying anterior two-thirds. Labiosternal sigilla constricted at midline. —*Sternum*. Ovoid, moderately long. Length 4.80, width 3.54. Posterior sigilla ovoid: length 0.78, width 0.42. —*Palp*. Spination: tibia 2, tarsus 7. Trichobothria: tibia p5 r4, tarsus 9. Tarsal claw with 3 teeth. —*Legs*. 1423.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.58	3.12	4.31	3.44	2.13	18.58
2	5.08	2.92	3.49	3.02	2.05	16.56
3	4.26	2.46	2.71	2.67	2.05	14.15
4	5.25	2.87	3.90	3.36	2.42	17.80

Tibia I width 1.40. Metatarsus I proximal width 0.97. Coxal setae unmodified. Tibia I, II with few or no spines. Tarsal claw teeth legs I, II: superior 10, 9; inferior 3, 3. Trichobothria legs I, 2: tarsus 10, 9; metatarsus 11, 10; tibia p7 r7, p6 r5. —*Leg spination*. Leg I: femur 0, patella 0, tibia 0, metatarsus 11, tarsus 8. Leg II: femur 0, patella 0, tibia 0, metatarsus 10, tarsus 8. Leg III: femur 0, patella pd2, tibia 6 (p3 1r), metatarsus 13 (p4 r1), tarsus 12. Leg IV: femur 0, patella 0, tibia 2 (r1) metatarsus 9, tarsus 13. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 3.02; basal segment 1.30, middle 0.72, apical 1.00. Apical segment width 0.52. —*Genitalia*. Spermathecae digitiform, about three times longer than wide. Length 0.82, width 0.29. Apical third set off from basal two thirds by a slight constriction.

Distribution. Eastern Tasmania (Fig. 37).

Comments. Hickman (1927, 1967) described tibia II of this species as lacking “spurs or apophyses”, but with the “basal half ... slightly expanded and ... heavily spined”. This low spinose swelling on tibia II is interpreted here as a weak apophyseal swelling.

Hadronyche marracoonda n.sp.

Figures 41–44; Tables 12, 34

Etymology. The specific epithet is an Aboriginal word meaning toward the west, a reference to the western slopes distribution of this species in New South Wales.

Types. Holotype male: AMS KS892, Wagga Wagga Teachers College, Wagga Wagga, New South Wales, 35°06'S 147°22'E, 20 April 1971. Paratypes (all AM). New South Wales. *Males*: AMS KS890, “The Decca”, Bigga area, 34°04'S 149°09'E, 12 May 1972, M. Chudleigh; AMS KS13353, 3 km E. of Binda, 34°04'S 149°09'E, 28 March 1983, M. Gray & C. Horseman; AMS KS5223, Crookwell, 34°27'S 149°28'E, 19 May 1980, L.E. Willis; AMS KS879, Oberon, 33°41'S 149°52'E, May 1974, J. Bearup; AMS KS2719, Tumberumba, 35°45'S 148°00'E, 10 April 1979, J. Frost; AMS KS43617, Carcoar Dam, 55 km SW of Bathurst, 33°37'S 149°14'E, 17 May 1995, J. Chaffey; AMS KS6876, Caloola via Newbridge, 12 February 1981, Callan. *Females*: AMS KS10831, Bigga, 34°04'S 149°09'E, 60 km N.W. of Crookwell, 23 March 1983; AMS KS5740, Adelong area, 35°17'S 148°03'E, July 1980, M. Pearce; AMS KS8796, Gocup, 35°13'S 148°12'E, 9 March 1982, B. Laird; AMS KS1371, Oberon, 33°41'S 149°52'E, 16 May 1978, D.H. Clowes, AMS KS10681, Orange, 33°16'S 149°06'E, 17

January 1983, E.T. Bannigan; AMS KS2668, Tumut, 35°18'S 148°13'E, 30 January 1979, K. Pearce.

Other material examined. New South Wales (males): AMS KS900, “Bonniemuir”, Adelong area, 29 April 1955, J.D. McMahon; AMS KS893, Barry, 27 November 1975, Drs. Jones & Redhead; AMS KS891, “Yewrangara”, 8 km W. of Bigga, 11 July 1972, I. Chudleigh; AMS KS5202, 64 km W. of Crookwell & 20 km from Wyangla Dam, 6 May 1980, L.E. Willis; AMS KS13354, 3 km E. of Binda, 28 March 1983, M. Gray & C. Horseman; AMS KS888, Bloomfield, N.S.W.; AMS KS2720, Cowra, 18 April 1979, M. Henderson; AMS KS898, Crookwell, 22 February 1958, Clifton’s Pharmacy; AMS KS3077, 10 km N. of Goulburn, May 1979, N. Vickers; AMS KS884, Holbrook area, 15. iv.1971, R. Flynn; AMS KS9314, Humula, 19 May 1982; AMS KS894, Kanangra Walls, near Oberon, 5 June 1956, F.B. Ilann; AMS KS886, Limekilns, 20 October 1967, O. Stark; AMS KS8364, Livingstone State Forest, near Wagga Wagga, 16 September 1981, Dr Cook; AMS KS897, Nashdale, 10 February 1969, Dixon; AMS KS880, Oberon, 22 September 1972; AMS KS902, Orange, 20 February 1976, Bloomfield Hospital; AMS KS903, Orange, 1. ix.1969, F. Freeman; AMS KS905, Rosewood, 10 May 1972, O. Portors; AMS KS906, Rosewood, February 1976, G. Portors; AMS KS904, Spring Hill, 20 km E. of Orange, 28 March 1974; AMS KS883, Taralga area, 1977, Goulburn Ambulance; AMS KS885, Towac, 21 March 1965, J. Maybin; AMS KS6645, Trunkey Creek, 27 January 1981, J. Dellow; AMS KS889, Tumberumba, August 1957, R.A. Castle; AMS KS901, Tumorrana, 19 May 1972, M. Blundell; AMS KS2965, Tumut, 5 May 1979, P.D. Slater; AMS KS8922, Tumut, 6 April 1982, Pearce; AMS KS13424, Wagga Wagga, R. Faulder; AMS KS887, Yetholme, 19 October 1967, O. Stark; Binalong, 20 February 1975 (ANIC). **Australian Capital Territory (male):** Campbell, 1974, D.J. Belford (ANIC).

Diagnosis. CL 8.92–10.71. Larger spiders, leg II without apophyses/swellings, tibia II and metatarsus II ventrally

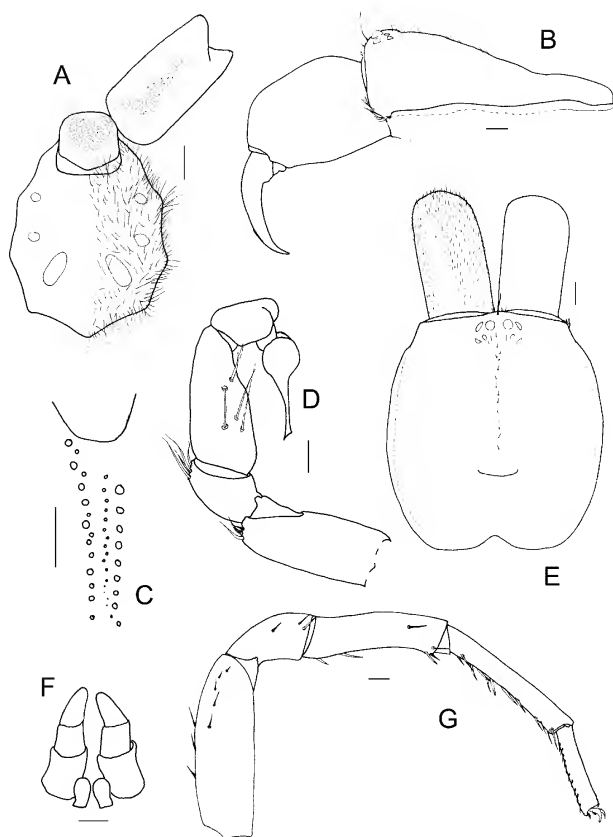


Figure 41. *Hadronyche marracoonda*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) palp, prolateral; (E) cephalothorax and chelicerae, dorsal; (F) spinnerets; (G) leg II, prolateral. Scale lines 1 mm.

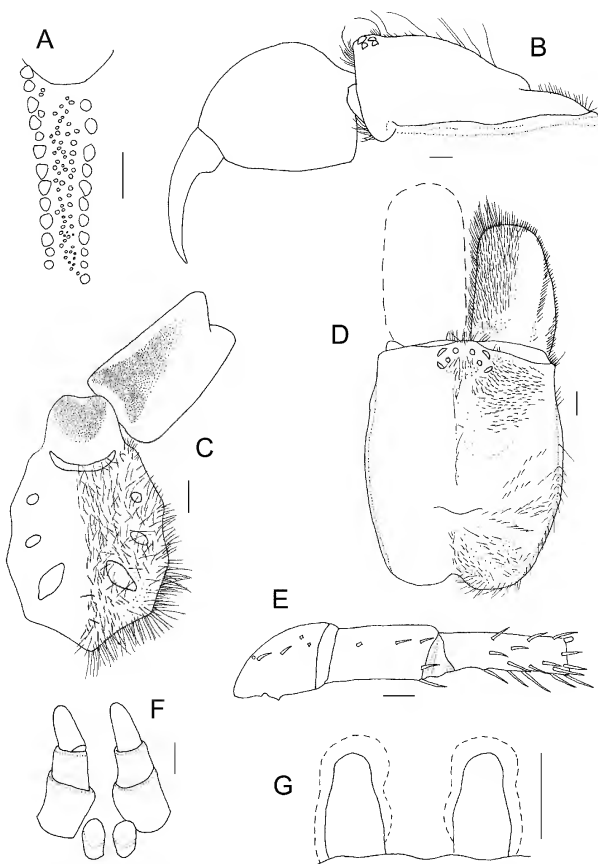


Figure 42. *Hadronyche marracoonda*, female: (A) cheliceral groove teeth; (B) cephalothorax and chelicerae, lateral; (C) sternum, labium and maxilla; (D) cephalothorax and chelicerae, dorsal; (E) leg III, prolateral, patella, tibia, metatarsus; (F) spinnerets; (G) spermathecae. Scale lines 1 mm.

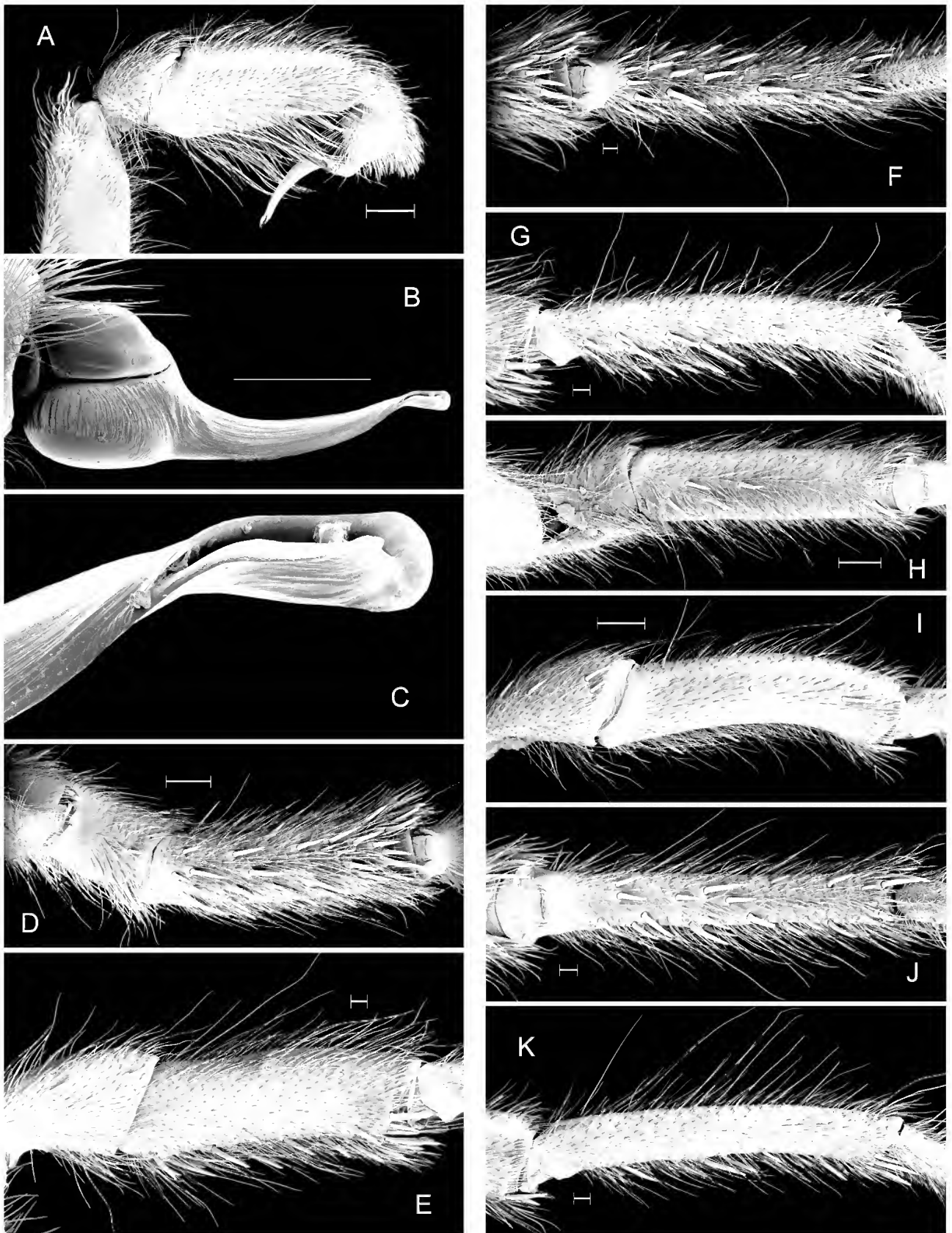


Figure 43. *Hadronyche marracoonda*, male (A,D–K, AMS KS43617; B,C, AMS KS6876): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 1.0 mm, except E–G,J,K 0.3 mm.

Table 12. Male morphological data—*Hadronyche marracoonda* (n = 21).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.92–10.71	9.99	Mt1S	29–50	40	CW/CL	0.92	0.026
CW	8.05–10.05	9.23	Ta1S	15–51	28	CH/CW	0.44	0.037
CH	3.44–4.63	4.10	Ti2S*	6–19 (p0–2)	11	CFW/CL	0.66	0.028
CFW	5.90–7.48	6.64	STC2teeth	12–16	14	CHGW/L	0.20	0.023
ChGL	2.51–3.09	2.83	BulbL	2.90–3.60	3.19	SW/SL	0.79	0.03
ChGW	0.48–0.70	0.56	EmbL	1.91–2.42	2.06	LL/LW	0.89	0.041
ChGCT	12–37	24	BulbW	1.15–1.46	1.32	PLSAPW/L*	0.34	0.026
LL	1.48–1.96	1.69	EmbmidW	0.18–0.31	0.24	BulbW/EmbL	0.65	0.032
LW	1.67–2.16	1.90	PalpTibL	3.98–4.85	4.50	EmbmidW/L	0.12	0.02
CUSP	230–384	280	PalpTibW	1.80–2.25	2.11	PalpTibW/L	0.47	0.02
SL	5.44–6.70	6.06	PalpTibS	2–5	3	BulbL/TibL	0.71	0.032
SW	4.12–5.18	4.77	PalpPatS	0	—			
PLSAPW	0.43–0.64	0.54	PalpFemS	0–4	1			
PLSAPL	1.43–1.91	1.59						
Fe1S	1–13	8						
Pa1S	2–12 (p2–7)	7						

concave, bowed (Fig. 431, K). Differs from *infensa* and *lamingtonensis* group species by having dorsal spines on femur I, II; from *adelaidensis* group species by having a long labium; from *H. monaro* by lacking metatarsus II apophyseal swelling, and having numerous tarsus II spines (Table 12); from *H. nimoola* by caput not as strongly raised; from *H. tambo* by more spinose femur I and palpal tibia (Table 12).

Male (holotype) —*Size*. Carapace length 9.68, width 8.86. Abdomen length 9.51, width 7.13. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, moderately raised. Height 3.69. Frontal width 5.99. Fovea gently procurved. Mid-dorsal cephalic setae do not reach fovea. Anterior striae absent. —*Eyes*. On low tubercle. Eye group width 2.08. Median ocular quadrangle length 0.90, anterior width 1.05, posterior width 1.37. Diameters: AME 0.37, ALE 0.52, PLE 0.43, PME 0.34. —*Chelicerae*. Cheliceral groove of moderate width, margins diverging. Groove length 2.64, middle width 0.55. Cheliceral teeth: 20 central, running full length of groove; 15 prolateral; 10 retrolateral. —*Labium*. Slightly wider than long. Length 1.54, width 1.82. Labiosternal sigilla narrowed centrally. Cuspules c. 248 cuspules, number moderate to high. —*Sternum*. Ovoid, broad. Length 5.74, width 4.84. Posterior sigilla large, elongate. —*Palp*. Tegular area slightly wider than long. Embolus rather short, wide and gently curved; distal embolus twisted. Embolus hardly offset from tegulum. Bulb length 3.01, width 1.24. Embolus length 1.91, mid width 0.22. Length of femur 4.17; patella 1.60; tibia 4.23. Width of tibia 2.02. Spination: tibia 4. Sinuous bristles on distal femur. —*Legs*. 4213.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.87	3.28	5.21	6.27	3.77	26.40
2	7.83	3.77	6.71	6.78	4.17	29.26
3	6.97	3.16	5.33	6.11	4.14	25.71
4	8.12	3.44	6.77	7.30	4.59	30.22

Tibia I width 1.72. Metatarsi longer than tibiae. Femora I and II with dorsal spines. Bristle-like spines on femora III and IV. Metatarsus I slightly thickened proximally. Tibia II without apophysis, slightly bowed and ventrally concave, spines few, grouped proximally. Metatarsus II straight to slightly bowed and ventrally concave and lacking an apophysis,

rarely weakly sinuous. Coxal hairs unmodified. Tarsal and distal metatarsal scopulae weakly developed, strongest on tarsi 3, 4. Tarsal claw teeth legs I, II: superior 15, inferior 4, trichobothria legs 1, 2: tarsus 12, 11; metatarsus 16, 14; tibia p6 r7, p6 r7. —*Leg spination*. Leg I: femur 9 (d3p6), patella 5 (p3), tibia 29 (p2), metatarsus 33, tarsus 19. Leg II: femur 10 (d4p6), patella 4 (p4), tibia 9 (p1), metatarsus 19, tarsus 29. Leg III: femur rd5 (long, bristle-like), patella 9 (p8), tibia 18 (r2 d2), metatarsus 21, tarsus 14. Leg IV: femur r8 (long, bristle-like), patella p1, tibia 9(r2), metatarsus 21, tarsus 19. —*Abdomen*. Numerous long bristles dorsally, strongest anteriorly. Posterior lateral spinnerets with moderately long apical segment. Lengths: total 3.90; basal segment 1.48, middle 0.92, apical 1.50; apical width 0.52.

Female (paratype AMS KS10831) —*Size*. Carapace length 11.64, width 9.35. Abdomen length 10.88, width 8.84. —*Colour*. Basic colour pattern. —*Carapace*. Clearly longer than wide, strongly raised. Height 4.84; frontal width 8.30. Cephalic length 8.16. Fovea procurved. Mid-dorsal cephalic setae do not reach fovea. Anterior striae absent. Anterolateral carapace angle with numerous strong bristles. —*Eyes*. Ocular area strongly raised, anteriorly protuberant. Eye group width 2.62. Diameters: AME 0.33, ALE 0.52, PLE 0.36, PME 0.22. Interdistances: AME–AME 0.44, AME–ALE 0.34, ALE–PLE 0.26, PLE–PME 0.20, PME–PME 1.30. Median ocular quadrangle length 0.80, anterior width 1.10, posterior width 1.81. —*Chelicerae*. Cheliceral groove margins diverge distally, groove wide. Groove length 3.37, middle width 0.87. Cheliceral teeth: 68 central, in several rows, occupying full length of groove; 15 prolateral; 11 retrolateral. —*Labium*. Slightly wider than long, rounded, anterior margin weakly indented. Length 2.36, width 2.68. Labiosternal sigilla entire. —*Sternum*. Ovoid. Length 7.05, width 5.54. Posterior sigilla long, ovoid: length 0.88, width 0.54. —*Palp*. Spination: tibia 4, tarsus 9. Trichobothria: tibia p9 r9, tarsus 13. Tarsal claw with 5 teeth. —*Legs*. 1423. Legs I, IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.12	4.51	5.99	5.05	3.06	26.73
2	7.30	4.20	5.33	4.89	3.12	24.84
3	6.17	3.28	3.77	4.39	3.08	20.69
4	7.83	4.06	5.58	5.37	3.42	26.26

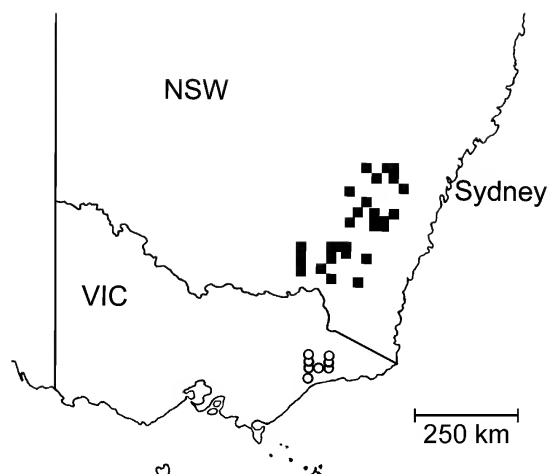


Figure 44. Collection records for *Hadronyche marracoonda* (squares) and *H. tambo* (circles).

Tibia I width 2.01. Metatarsus I proximal width 1.38. Coxae I, II with numerous basally thickened thorn-like setae anteriorly. Tarsal claw teeth legs I, II: superior 9, 9; inferior 5, 5. Trichobothria legs I, II: tarsus 15, 16; metatarsus 17, 15; tibia p9 r10, p10 r9. —*Leg spination*. Leg I: femur 0, patella 0, tibia 3, metatarsus 1, tarsus 7. Leg II: femur 0, patella p1, tibia 3 (p2), metatarsus 13, tarsus 8. Leg III: femur 0, patella pd6, tibia 7 (p3 r2), metatarsus 19 (p6 r2), tarsus 10. Leg IV: femur 0, patella 0, tibia 1, metatarsus 13, tarsus 15. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 5.24; basal segment 2.21, middle 1.31, apical 1.72. Apical segment width 0.88. —*Genitalia*. Basal two thirds of spermathecae wide, apical third narrower. Length 1.09, width 0.72.

Distribution. Southwestern region of the Great Dividing Range in New South Wales (Fig. 44).

Hadronyche tambo n.sp.

Figures 44–46; Table 13

Etymology. The specific epithet is taken from the Tambo River in Gippsland, Victoria.

Types. Holotype male: AMS KS8341, 10km north of Bairnsdale, Victoria, 37°49'S 147°37'E, February 1980, C. Brimblecombe. Paratypes. Victoria. *Males*: AMS KS10595, 3km NW. of Bairnsdale, 13 January 1983, N. Barton; AMS KS10561, Butchers Ridge, via Buchan, 37°15'S 148°14'E, December 1982, N. Barton; AMS KS14336, Granite Rock, NE. of Bairnsdale, 37°45'S 147°39'E, 28 April 1984; K11081 (MV), Nowa Nowa, Vic., 37°44'S 148°06'E, 23 November 1964; AMS KS16275, Bairnsdale area, 37°50'S 147°37'E, Dec 1985; AMS KS8362, Sarsfield, 37°45'S 147°43'E.

Diagnosis. Cl 8.23–9.59 (male). Differs from *H. modesta*, *H. meridiana*, *H. jensena* by leg II without apophysis/swelling (Fig. 46H–K) and labium long (LL/LW 0.94) (Fig. 45A); from *H. marracoonda* by tibia and metatarsus II not bowed (ventrally concave) (Fig. 46I,K); from *infensa* group species by presence of spines on femur I, II (but may be absent).

Male (holotype) —*Size*. Carapace length 9.59, width 8.41. Abdomen length 9.25, width 6.70. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, cephalic area moderately raised. Height 4.35. Frontal width 6.62. Fovea

procurved. Mid-dorsal cephalic setae almost reach fovea. Anterior strial setae few to absent. Anterolateral carapace angle with many strong bristles. —*Eyes*. Central eye region raised. Eye group width 2.20. Median ocular quadrangle length 0.84, anterior width 1.12, posterior width 1.43. Diameters: AME 0.38, ALE 0.50, PLE 0.37, PME 0.28. —*Chelicerae*. Cheliceral groove moderately short and wide, margins diverging distally. Groove length 2.64, width 0.76. Cheliceral teeth: 18 central, occupying full length of groove; 8 prolateral; 9 retrolateral. —*Labium*. About as long as wide, apical indentation weak to absent. Length 1.84, width 1.88. Labiosternal suture narrowed toward midline. Weak transverse groove behind cuspules. Cuspules c. 171, number moderate to low. —*Sternum*. Ovoid. Length 5.81, width 4.27. Posterior sigilla elongate, broad. Anterolateral angles of sternum with weakly grouped bristles. —*Palp*. Tegular area wider than long. Embolus of moderate length, gently curved, weakly to moderately offset from tegulum; shaft strongly tapered distally. Distal embolus weakly twisted, slender. flange narrow. Bulb length 3.40, width 1.28. Embolus length 2.33, midwidth 0.19. Length of femur 4.29, patella 1.58, tibia 4.45. Width of tibia 1.91. Spination: no spines; a few prolateral tibial bristles, several sinuous bristles on distal femur. —*Legs*. 1423. Legs strongly hirsute.

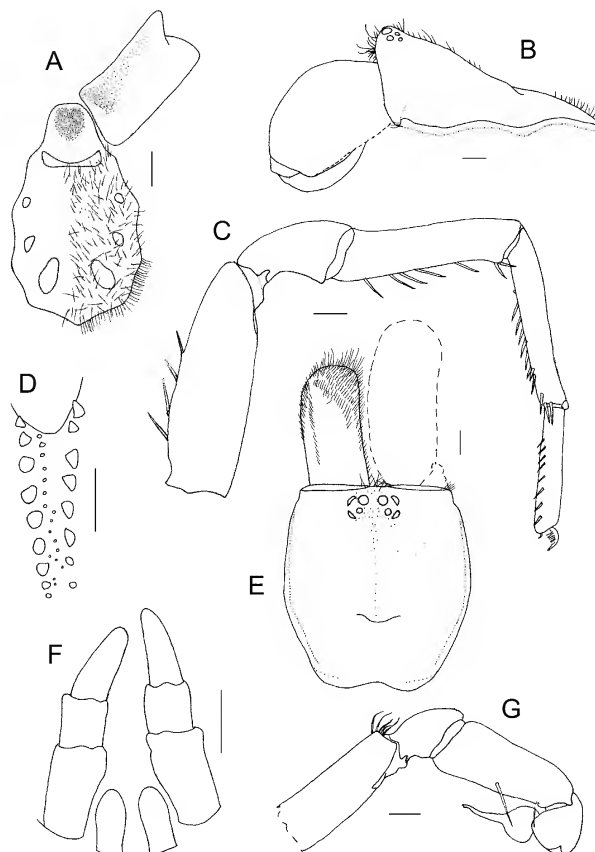


Figure 45. *Hadronyche tambo*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg II, prolateral (NB, dorsal femoral spines present or absent); (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) spinnerets; (G) palp, prolateral. Scale lines 1 mm.

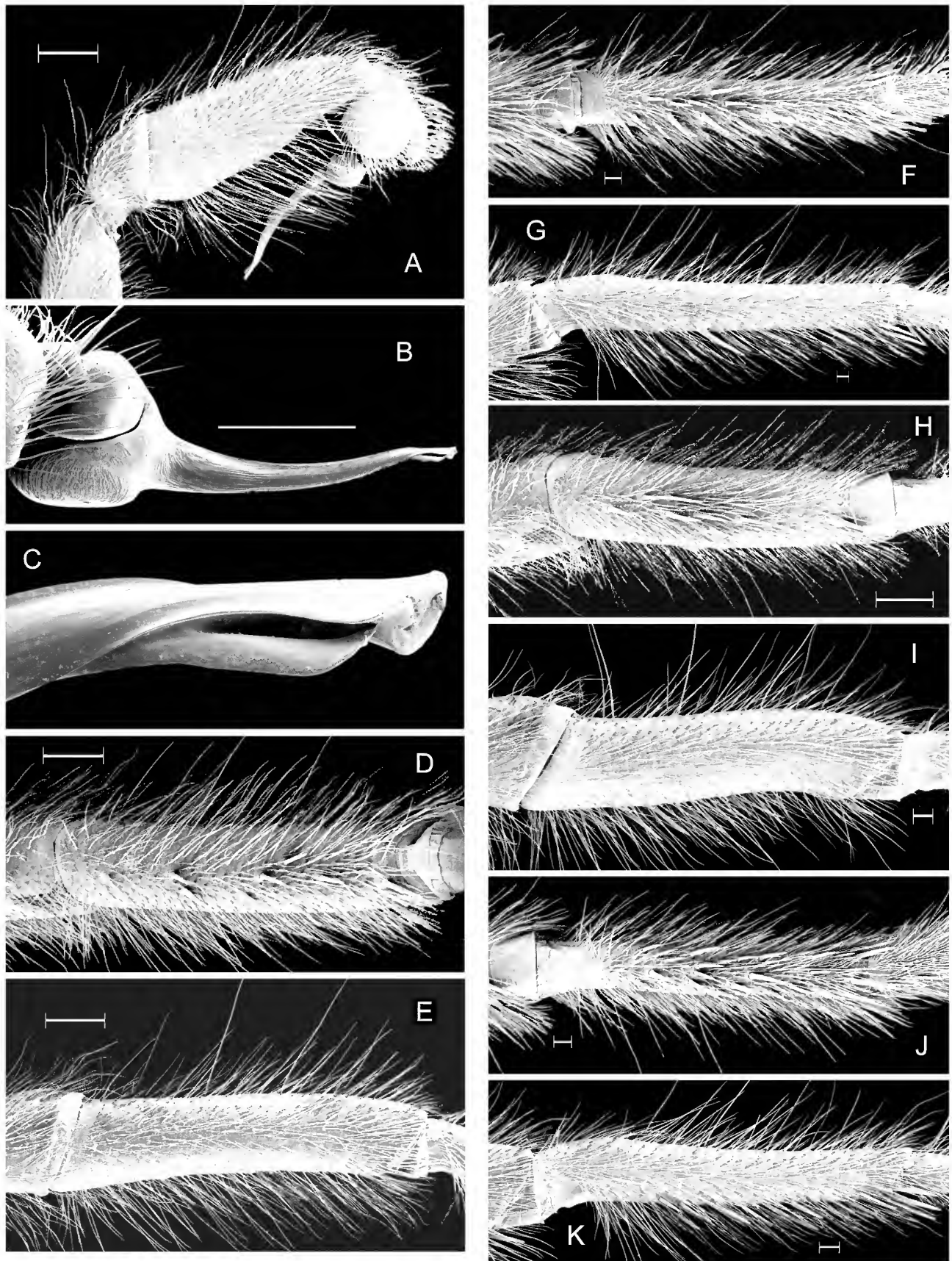


Figure 46. *Hadronyche tambo*, male (A,D–K, AMS KS16275; B,C, K11081 [MV]): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 1.0 mm, except F,I–K 0.3 mm and G 0.2 mm.

Table 13. Male morphological data—*Hadronyche tambo* (n = 4).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.23–9.59	8.66	Mt1S	13–41	27	CW/CL	0.96	0.017
CW	7.46–8.84	8.12	Ta1S	5–15	11	CH/CW	0.49	0.017
CH	3.61–4.42	4.08	Ti2S*	4–18	12	CFW/CL	0.74	0.038
CFW	5.80–7.07	6.42	STC2teeth	10–11	11	CHGW/L	0.26	0.035
ChGL	2.22–2.78	2.48	BulbL	3.17–3.77	3.38	SW/SL	0.77	0.028
ChGW	0.53–0.76	0.66	EmblL	2.18–2.65	2.35	LL/LW	0.94	0.04
ChGCT	18–24	20	BulbW	1.14–1.28	1.21	PLSAPW/L*	0.35	0.042
LL	1.43–1.90	1.67	EmbmW	0.16–0.21	0.19	BulbW/EmblL	0.52	0.029
LW	1.56–1.98	1.76	PalpTibL	3.94–4.76	4.39	EmbmW/L*	0.08	0.013
CUSP*	149–184	165	PalpTibW	1.66–1.92	1.80	PalpTibW/L	0.41	0.025
SL	4.74–5.99	5.47	PalpTibS	0–1	<1	BulbL/TibL	0.77	0.039
SW	3.74–4.59	4.20	PalpPatS	0–1	<1			
PLSAPW	0.40–0.60	0.51	PalpFemS	0				
PLSAPL	1.32–1.69	1.44						
Fe1S*	0–1	<1						
Pa1S	0–1	<1						

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.27	4.02	6.68	6.29	4.10	29.36
2	7.46	3.77	6.31	5.90	3.94	26.98
3	6.29	3.28	4.39	5.13	4.12	23.21
4	8.04	3.62	6.37	5.96	4.42	28.41

Tibia I width 1.46. Femur I usually without spines; dorsal spines present or absent on femur II. Patella III with few spines. Tibia II without apophysis, weakly sinuous; ventral spines few, scattered, larger proximally. Metatarsi I and II ventrally flexed basally, slightly concave dorsally; metatarsus II without apophysis. Anterior coxae with some basally thickened setae on frontal coxal surfaces. Tarsal scopulae: leg I weak; legs II–IV moderate to strong. Distal metatarsal scopulae: legs I, II absent; legs III, IV moderate to strong. Metatarsus IV weakly curved and dorsally concave distally, ventral scopula occupying most of distal half of segment. Tarsal claw teeth legs I, II: superior 11, 11; inferior 2, 3. Trichobothria legs I, II: tarsus 14, 13; metatarsus 17, 15; tibia p7 r7, p7 r7. —*Leg spination*. Leg I: femur 0, patella 1, tibia 20, metatarsus 25, tarsus 15. Leg II: femur d4, patella 2, tibia 10, metatarsus 23, tarsus 17. Leg III: femur 1 (strong bristles present), patella p2, tibia 13 (p5 r3), metatarsus 23, tarsus 22. Leg IV: femur 0 (strong bristles), patella 0, tibia 4, metatarsus 19, tarsus 27. —*Abdomen*. Posterior lateral spinnerets with moderately long apical segment. Lengths: total 3.72; basal segment 1.52; middle 0.82; apical 1.38. Apical segment width 0.50.

Distribution. Bairnsdale/Buchan region of Gippsland, Victoria (Fig. 44).

Comments. Dorsal spines are usually absent on leg I and present on leg II.

Hadronyche monaro n.sp.

Figures 47–49; Table 14

Etymology. The specific epithet refers to the Monaro region of New South Wales.

Types. Holotype male: AMS KS8744, Sawpit Creek, Kosciuszko National Park, New South Wales, 28°22'S 152°49'E, J. Gold, February 1982. Paratypes (all AM). New South Wales. *Males*: AMS KS6647, Sawpit Creek,

Kosciuszko National Park, 28°22'S 152°49'E, 27 January 1981, J. Robson; AMS KS1571, Braemar Caravan Park, Lake Eucumbene, 35°58'S 148°39'E, 6 December 1977, G. Goodfellow.

Diagnosis. CL 6.23–6.43 (male). Small Atracinae. Differs from most *Hadronyche* species by having tibia II unmodified, but metatarsus II with a small, low midventral apophyseal swelling (Figs. 47G; 48I,K). Differs from *H. jensenae* by labium almost as long as wide (Fig. 47A) and distal embolus not at angle to shaft (Fig. 48B,C).

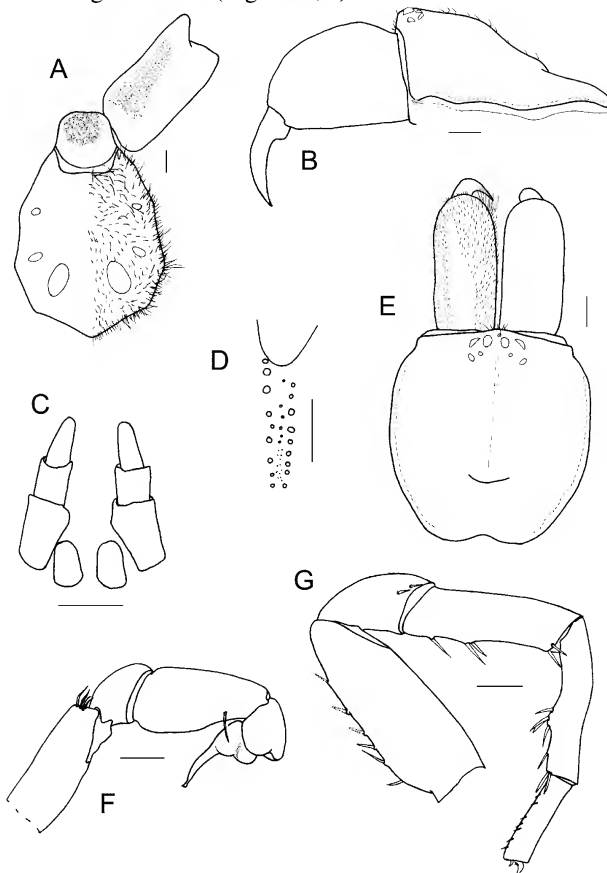


Figure 47. *Hadronyche monaro*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) palp, prolateral; (G) leg II, prolateral. Scale lines 1 mm.

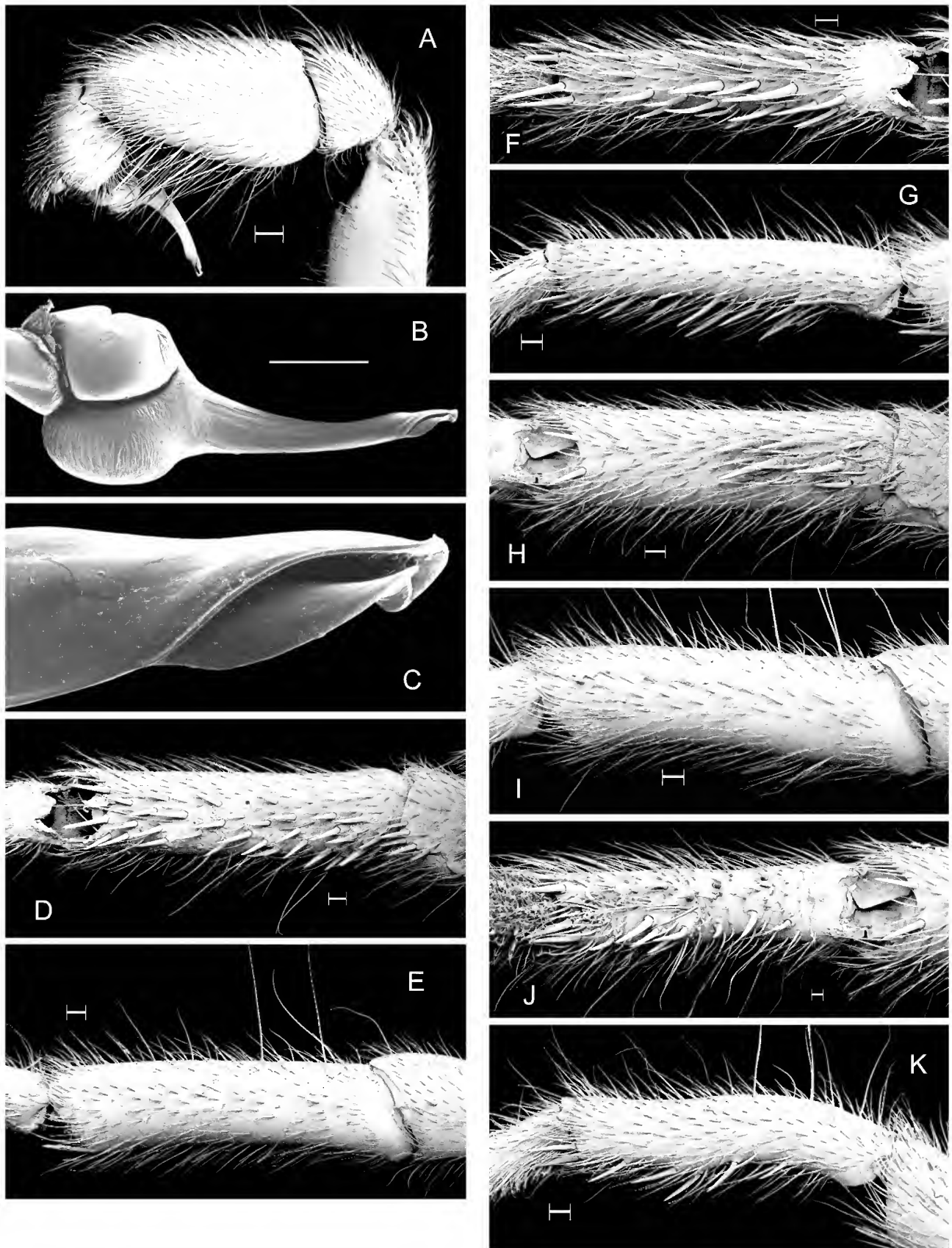


Figure 48. *Hadronyche monaro*, male (A,D–K, AMS KS1571, RHS; B,C, AMS KS6646): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.2 mm, except A 0.3 mm and J 0.1 mm.

Table 14. Male morphological data—*Hadronyche monaro* (n = 3).

character	range	mean	character	range	mean	character	ratio
CL*	6.23–6.43	6.33	Mt1S	23–30	27	CW/CL	0.97
CW	6.08–6.20	6.14	Ta1S*	7–9	8	CH/CW	0.49
CH	2.95–3.08	3.02	Ti2S*	7–11	9	CFW/CL	0.74
CFW	4.65–4.67	4.66	STC2teeth	10–11	11	CHGW/L	0.21
ChGL	1.85–1.94	1.90	BulbL	2.05–2.19	2.14	SW/SL	0.84
ChGW	0.37–0.41	0.39	EmblL	1.34–1.42	1.38	LL/LW*	0.97
ChGCT	19–26	23	BulbW	0.81–0.93	0.87	PLSAPW/L	0.43
LL	1.02–1.28	1.15	EmbmW	0.18–0.20	0.19	BulbW/EmblL	0.63
LW	1.07–1.29	1.18	PalpTibL	2.50–3.00	2.85	EmbmW/L	0.14
CUSP*	143–226	185	PalpTibW	1.46–1.50	1.48	PalpTibW/L	0.52
SL	3.86–4.08	3.96	PalpTibS	0	—	BulbL/TibL	0.75
SW	3.22–3.42	3.32	PalpPatS	0	—		
PLSAPW	0.32–0.46	0.39	PalpFemS	0–3	2		
PLSAPL	0.76–1.06	0.91					
Fe1S	2–9	6					
Pa1S	2–6 (p1–2)	5					

Male (holotype) —*Size*. Carapace length 6.23, width 6.08. Abdomen length 7.24, width 5.23. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, cephalic area moderately raised. Height 2.95. Frontal width 4.67. Fovea procurved, anterior margin weakly notched. Mid-dorsal cephalic setae do not reach fovea. Anterior strial setae absent. Anterolateral carapace angle with small, weak bristles. —*Eyes*. Central eye region slightly raised. Eye group width 1.76. Median ocular quadrangle length 0.66, anterior width 0.80, posterior width 1.14. Diameters: AME 0.20, ALE 0.33, PLE 0.20, PME 0.16. —*Chelicerae*. Cheliceral groove short, of medium width, margins diverging distally. Groove length 1.85, middle width 0.41. Cheliceral teeth: 19 central, occupying full length of groove; 9 prolateral; 9 retrolateral. —*Labium*. Almost as long as wide, not indented apically. Length 1.28, width 1.29. Labiosternal sigilla narrowed toward midline. Cuspules c. 226, number moderate. —*Sternum*. Ovoid. Length 4.08, width 3.22. Posterior sigilla oval, broad. —*Palp*. Tegular area wider than long. Embolus of moderate length and width; shaft straight to slightly curved, weakly tapered distally. Distal part of embolus weakly twisted and flange rather short. Embolus slightly offset from tegulum. Bulb length 2.19, width 0.93. Embolus length 1.42, midwidth 0.18. Length of femur 2.86, patella 1.40, tibia 3.00. Width of tibia 1.46. Spination: femur 2, patella 0, tibia 0. A few sinuous bristles on distal femur. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.04	2.50	4.12	3.77	2.26	17.69
2	4.76	2.38	3.76	3.47	2.26	16.63
3	4.22	1.81	2.61	3.33	2.31	14.28
4	5.03	2.38	3.69	4.22	2.85	18.17

Tibia I width 0.94. Femora I and II with dorsal spines. Leg I unmodified. Tibia II without apophysis, weakly excavated distoventrally; ventral spines grouped in proximal half. Metatarsus II weakly sinuous with a small spined mid-ventral apophyseal swelling. Metatarsus IV slightly enlarged distally, concavely arched dorsally. Anterior coxal hairs normal. Tarsal scopulae: legs I, II weak; legs III, IV moderate to strong. Distal metatarsal scopulae: legs I–III absent to weak; leg IV moderately developed, extending to midventral metatarsus. Tarsal claw teeth legs I, II: superior 11, 10,

inferior 1, 0. Trichobothria legs I, II: tarsus 11, 8; metatarsus 13, 10; tibia p6 r6, p5 r5. —*Leg spination*. Leg I: femur d9, patella 2 (p1 v1), tibia 25, metatarsus 23, tarsus 9. Leg II: femur d6, patella p2, tibia 7, metatarsus 13, tarsus 9. Leg III: femur d2, patella 12 (p10 r2), tibia 17 (p4 r4), metatarsus 25, tarsus 13. Leg IV: femur d4 (bristle-like), patella r1, tibia 6 (p1 r3), metatarsus 23, tarsus 21. —*Abdomen*. Sparsely covered with weak bristles and hairs. Posterior lateral spinnerets with medium length apical segment. Lengths: total 2.34; basal segment 1.00, middle 0.58; apical 0.76. Apical segment width 0.32.

Distribution. East of the Snowy Mountains in the Eucumbene/Jindabyne region of New South Wales (Fig. 49).

Hadronyche mascordi n.sp.

Figures 49–52; Tables 15, 34

Etymology. The species is named for Ramon Mascord—author, photographer and student of Australian spiders.

Types. Holotype male: AMS KS2065, Somersby, via Gosford, New South Wales, 33°21'S 151°17'E, L. Abra, October 1978. Paratypes (all AM). New South Wales. *Males*: AMS KS13393, Kulnura, 33°13'S 151°13'E, 25 October 1983; AMS KS13401, Kulnura, 33°13'S 151°13'E, September 1983, Nelson and Rodgers; AMS KS4102, Somersby, 33°21'S 151°17'E, 3 October

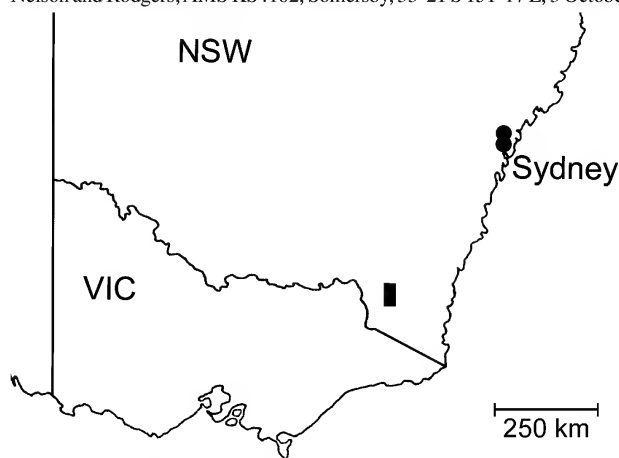


Figure 49. Collection records for *Hadronyche monaro* (squares) and *H. mascordi* (circles)

1979, R. Mascord; AMS KS8571, Somersby, 33°21'S 151°17'E, 12 October 1981, L. Abra; AMS KS4108, Somersby, 33°21'S 151°17'E, 3 October 1979, K. Mascord; AMS KS991, Somersby, 33°21'S 151°17'E, November 1956, J.V. Brown. AMS KS7335, Somersby, 33°21'S 151°17'E, 12 September 1956, J. Brown. *Females*: AMS KS15749, Kariong, near Gosford, 33°26'S 151°18'E, L. Abra, October 1984; AMS KS14381, Kulnura, 33°13'S 151°13'E, 23 March 1984, M. Gray; AMS KS14757, Kariong, 33°26'S 151°18'E, 4 June 1984; AMS KS14234, Kulnura, 33°13'S 151°13'E, 10 April 1984, B. Thomas; AMS KS14233, Kulnura, 33°13'S 151°13'E, 10 April 1984, B. Thomas; AMS KS14551, Kulnura, 33°13'S 151°13'E, 21 March 1984, E. Thompson; AMS KS14226, Kulnura, 33°13'S 151°13'E, 5 April 1984; AMS KS14547, Kariong, 33°26'S 151°18'E, 13 April 1984.

Other material examined. New South Wales (males): AMS KS13394, Kulnura, 25 October 1983; AMS KS13399, Kulnura, September 1983; AMS KS13400, Kulnura, September 1983; AMS KS13377, Somersby, 14 September 1983, K. Gould; AMS KS1929, Somersby, October 1978, L. Abra; AMS KS23333, Kulnura–Somersby area.

Diagnosis. CL 5.54–6.68 (male). Small Atracinae. Differs from other atracine species in having a short labium (LW/LL 0.64) that is fused with the sternum posteromedially (Figs. 50A, 51A).

Male (holotype) —Size. Carapace length 6.19, width 5.68. Abdomen length 6.07, width 4.51. —*Colour.* Basic colour pattern, dark brown to black. Abdomen with 4–5 pairs of small distinct chevron markings on lateral dorsal abdomen. —*Carapace.* Slightly longer than wide, strongly raised. Height 3.01. Frontal width 4.63. Fovea procurved. Mid-dorsal cephalic setae numerous, reach fovea. Anterior striae present. Anterolateral angle of carapace with strong bristles. —*Eyes.* Sessile. Eye group width 1.74. Median ocular quadrangle length 0.62, anterior width 0.79, posterior

width 1.22. Diameters: AME 0.25, ALE 0.42, PLE 0.33, PME 0.30. —*Chelicerae.* Anterodorsal paturon bristles rather short. Cheliceral groove moderately short and wide, margins diverging distally. Groove length 1.69, middle width 0.42. Cheliceral teeth: 7 central, running full length of groove; 8 prolateral; 6 retrolateral. —*Labium.* Short—length 0.98, width 1.39. Labium fused posteromedially with sternum. Labiosternal sigilla reduced to a weak, transverse line suture flanked by two small lateral sigilla. Cuspules c. 209, covering most of ventral labium, number moderate. —*Sternum.* Ovoid. Raised anteriorly and continuous with labium. Length 3.81, width 2.82. Posterior sigilla very small, ovoid to elongate. —*Palp.* Tegular area slightly wider than long. Embolus shaft short, tapering, weakly curved. Distal embolus weakly to moderately twisted, often with a subdistal “notch”. Embolus moderately offset from tegulum. Bulb length 2.10, width 0.84. Embolus length 1.34, midwidth 0.15. Length of femur 2.70, patella 1.40, tibia 2.68. Width of tibia 1.22. Spinination: femur 1; few weak sinuous bristles on distal femur. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.11	2.38	3.81	3.03	1.97	16.30
2	4.88	2.42	3.90	2.69	1.89	15.78
3	4.10	1.91	2.95	3.03	2.13	14.12
4	5.08	2.15	4.04	3.81	2.50	17.58

Tibia I width 0.88. All femora with dorsal spines. Metatarsus I normal to slightly thickened proximally. Tibia II lacking apophysis, spines centrally-proximally placed. Metatarsus II weakly sinuous, with a small mid-ventral swelling. Coxal hairs normal. Tarsal and distal metatarsal scopulae: weak to absent on legs I, II; well developed on legs III, IV. Tarsal claw teeth legs I, II: superior 13, 13; inferior 6, 5. Trichobothria legs I, II: tarsus 8, 9; metatarsus 12, 10; tibia p6 r6, p6 r6. —*Leg spinination.* Leg I: femur d4, patella 0,

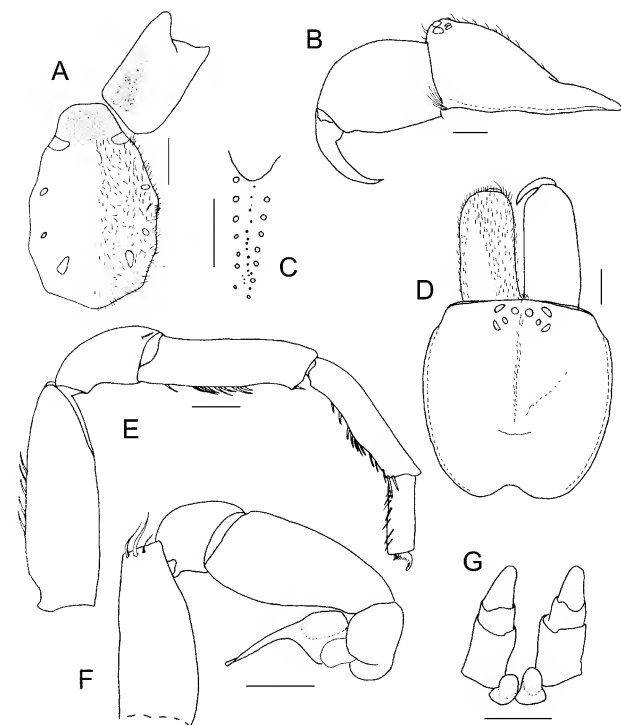


Figure 50. *Hadronyche mascordi*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) cephalothorax and chelicerae, dorsal; (E) leg II, prolateral; (F) leg III, prolateral, patella, tibia, metatarsus; (G) spinnerets. Scale lines 1 mm.

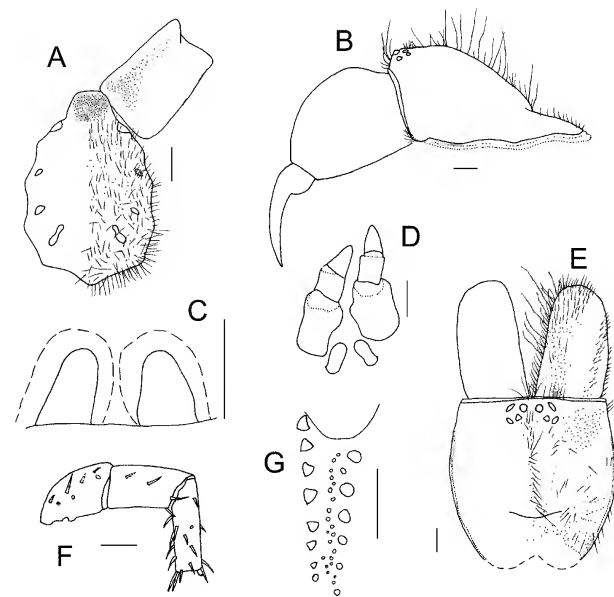


Figure 51. *Hadronyche mascordi*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spermathecae; (D) cephalothorax and chelicerae, dorsal; (E) leg III, prolateral, patella, tibia, metatarsus; (F) leg III, prolateral, patella, tibia, metatarsus; (G) cheliceral groove teeth. Scale lines 1 mm.

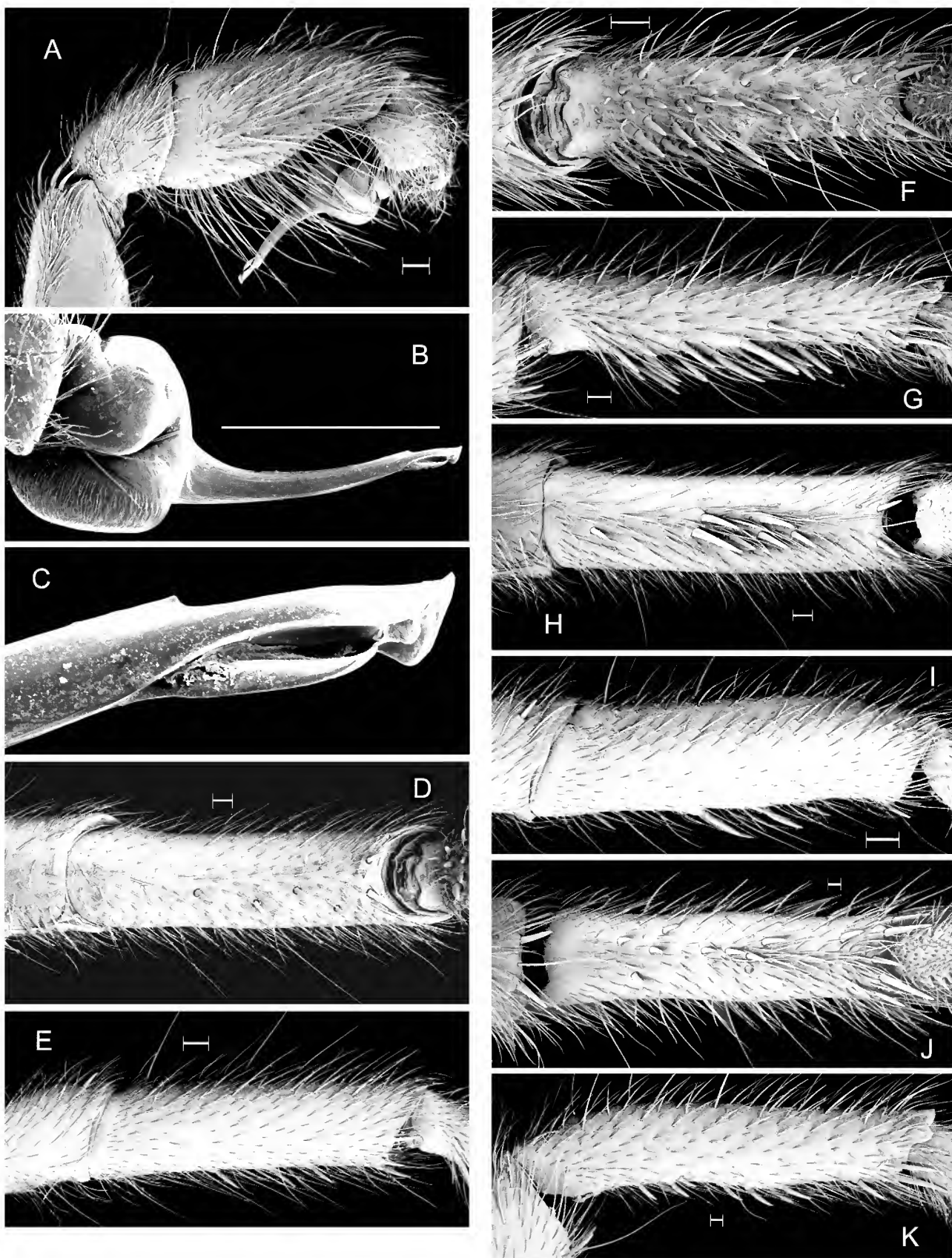


Figure 52. *Hadronyche mascordi*, male (A,D–K, AMS KS23333; B,C, AMS KS7335): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: A,E,F,I, 0.3 mm, B 1.0 mm, D,G,H 0.2 mm and J,K 0.1 mm.

Table 15. Male morphological data—*Hadronyche mascordi* (n = 8).

character	range	mean	character	range	mean	character	ratio	SD
CL*	5.54–6.68	6.27	Mt1S	22–43	33	CW/CL	0.97	0.061
CW	5.60–6.26	5.96	Ta1S	9–24	14	CH/CW*	0.50	0.018
CH	2.83–3.22	3.00	Ti2S*	8–13	10	CFW/CL	0.77	0.036
CFW	4.63–5.33	4.81	STC2teeth	13–14	14	CHGW/L	0.22	0.022
ChGL	1.69–1.86	1.80	BulbL	1.95–2.13	2.06	SW/SL	0.75	0.026
ChGW	0.33–0.46	0.40	EmbL	1.25–1.39	1.32	LL/LW*	0.64	0.051
ChGCT	7–18	12	BulbW	0.84–0.95	0.89	PLSAPW/L*	0.51	0.066
LL	0.8–1.03	0.94	EmbmidW	0.12–0.16	0.14	BulbW/EmbL*	0.68	0.033
LW	1.39–1.58	1.47	PalpTibL	2.68–3.00	2.88	EmbmidW/L	0.11	0.008
CUSP	194–260	223	PalpTibW	1.22–1.41	1.31	PalpTibW/L	0.45	0.01
SL	3.73–4.35	3.95	PalpTibS	0	—	BulbL/TibL	0.71	0.031
SW	2.70–3.05	2.94	PalpPatS	0	—			
PLSAPW	0.33–0.41	0.37	PalpFemS	1–3	2			
PLSAPL	0.60–0.87	0.75						
Fe1S	2–5	4						
Pa1S*	0	0						

tibia 10, metatarsus 30, tarsus 11. Leg II: femur d5, patella p1, tibia 10, metatarsus 13, tarsus 15. Leg III: femur d2, patella p4, tibia 10 (p5 r2), metatarsus 19, tarsus 18. Leg IV: femur d5, patella 0, tibia 6, metatarsus 20, tarsus 16. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 1.99; basal segment 0.76, middle 0.50, apical 0.73. Apical width 0.38.

Female (paratype AMS KS15749) —*Size*. Carapace length 7.14, width 7.04. Abdomen length 12.50, width 8.78. —*Colour*. Basic colour pattern. —*Carapace*. Almost as wide as long; strongly raised, broad frontally. Height 3.81; frontal width 6.05. Cephalic length 5.44. Fovea procurved. Mid-dorsal cephalic setae reach fovea. Anterior strial setae present. Anterolateral carapace angle with a few bristles. —*Eyes*. Central eye region slightly raised. Eye group width 2.11. Diameters: AME 0.22, ALE 0.46, PLE 0.34, PME 0.28. Interdistances: AME–AME 0.37, AME–ALE 0.20, ALE–PLE 0.26, PLE–PME 0.14, PME–PME 0.95. Median ocular quadrangle length 0.73, anterior width 0.91, posterior width 1.45. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 2.31, middle width 0.65. Cheliceral teeth: 22 central in a single row occupying full length of groove; 8 prolateral; 6 retrolateral. —*Labium*. Short (length 1.09, width 1.67), fused with sternum as in male; anterior margin not indented. Cuspules distributed over most of ventral labium. —*Sternum*. Ovoid, fused anteriorly with labium, surface strongly convex. Length 4.62, width 3.81. Posterior sternal sigilla small, narrow and elongate: length 0.61, width 0.21. —*Palp*. Spination: tibia 0 (strong bristles), tarsus 6. Tarsal claw with 8 teeth. Trichobothria: tibia p5 r6, tarsus 10. —*Legs*. 4123. Legs I and IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.66	2.99	4.11	3.32	2.21	18.29
2	5.10	2.79	3.88	3.18	2.18	17.13
3	4.22	1.97	2.48	2.89	2.24	13.80
4	5.58	2.58	3.89	3.77	2.48	18.30

Tibia I width 1.20. Metatarsus I proximal width 0.86. Coxal setae unmodified. Tarsal claw teeth legs I, II: superior 10, 10; inferior 5, 5. Trichobothria legs I, II: tarsus 11, 11; metatarsus 13, 10; tibia p6 r6. —*Leg spination*. Leg I: femur 0, patella 0, tibia 1, metatarsus 6, tarsus 5. Leg II: femur 0, patella 0, tibia 2, metatarsus 11, tarsus 7. Leg III: femur 0,

patella p4, tibia 8 (p4 r2), metatarsus 23 (p6 r3), tarsus 13. Leg IV: femur 0, patella 0, tibia 3, metatarsus 21, tarsus 21. —*Abdomen*. Sparse cover of weak hairs and bristles. Posterior lateral spinnerets with short apical segment. Lengths: total 2.58, basal segment 1.53, middle 0.82, apical 0.82. Apical segment width 0.55. —*Genitalia*. Spermathecae short, bluntly conical, lateral margins sloping medially; wide basally, separated by about half basal width. Length 0.75, width 0.68.

Distribution. Kulnura/Somersby region, Central Coast, New South Wales (Fig. 49).

Comments. A female spider from Kulnura, NSW was collected (apparently dead) in her burrow with 14 young (KS14551). These “spiderlings” were remarkable because of their large size—their mean carapace length was 4.0 mm, compared with 8.0 mm for the female.

Hadronyche nimoola n.sp.

Figures 53–56; Tables 16, 34

Etymology. The specific epithet is taken from an aboriginal word for a steep slope, a reference to the caput profile of this species.

Types. Holotype male: AMS KS867, Batemans Bay, New South Wales, 35°43'S 150°13'E, J.R. Mylott, 3 March 1973. Paratypes (all AM). New South Wales *Males*: AMS KS2276 Benandarah State Forest, 35°39'S 150°15'E, 30 November 1978–4 January 1979, C. Horseman; AMS KS863, Bermagui, 36°25'S 150°04'E, K. Walker; AMS KS12124, Bondi State Forest, nr. Bombala, 37°06'S 149°15'E, 26 January 1981, G. Gowing *et al.*; AMS KS2665, Bowral, 34°28'S 150°25'E, 7 February 1979, G. Goodfellow; AMS KS2081, Crookwell, 34°27'S 149°28'E, 28 November 1978, L.E. Willis; AMS KS862, Narooma, 36°12'S 150°08'E, 14 February 1971, B. Plunkett-Cole; AMS KS88199, Exeter, 34°36'S 150°19'E, 21 January 2004; AMS KS3876, Narooma, 36°13'S 150°08'E, January 1979, B.H. Plunkett-Cole. *Females*: AMS KS4664, Bundanoon, 34°39'S 150°18'E, February, 1980; AMS KS16446, Bermagui, 36°25'S 150°04'E, K. Walker; AMS KS12139, Bondi State Forest, nr. Bombala, 37°06'S 149°15'E, 26 January 1981, G. Gowing *et al.*; AMS KS6163, Bowral, 34°28'S 150°25'E, October 1980, H. Styles; AMS KS6825, Grabben Gullen, 34°32'S 149°24'E, 16 December 1980, R. Chown; AMS KS4506, Moruya, 35°54'S 150°06'E, January 1980; AMS KS3625, Narooma, 36°12'S 150°08'E, 15 June 1971, J. Cobcroft.

Other material examined. New South Wales (males): AMS KS2032, Benandarah State Forest, 5 October 1978–2 November 1978, C. Horseman; AMS KS867, Bateman's Bay, 3 March 1973; AMS KS12150, Bondi State Forest, near Bombala, 26 January 1981, G. Gowing *et al.*; AMS KS3460, Yass River, 30 July 1966, A.B. Thompson; AMS KS6163, Bowral, October 1980, H. Styles; AMS KS13806, Bundanoon, 5 February 1984, W. Nooijen; AMS KS6825, Grabben Gullen, 16 December 1980, R. Chown; AMS KS7567, Grabben Gullen, 23 October 1980, R. Chown; AMS KS2117, Kioloa State Forest, 2 November 1978–30 November 1978, C. Horseman; AMS KS2293, Kioloa State Forest, 30 November 1978–4 January 1979, C. Horseman; AMS KS1163, Mittagong, 13 January 1978, M. Johnson; AMS KS6275, Moss Vale, 27 December 1980, J. Kelly; AMS KS868 & 869, Nerrigundah, December 1945, V. Haskell; AMS KS861, Narooma, 16 November 1974, B. Plunkett-Cole. **New South Wales (females):** AMS KS1865, Bega, 24 January 1976, H.W. Kemp; AMS KS1867, Bermagui, May 1964, K. Walker; AMS KS11996, Bondi State Forest, near Bombala, 14 November 1980, G. Gowing *et al.*; AMS KS1872, Bowral, H.H. Florence; AMS KS1873, Bundanoon, 8 January 1952, N.C. de Meyrick; Merimbula, 5 June 1964 (MV); AMS KS4777, Mittagong, June 1937, A. Livingstone; AMS KS2961, Narooma, 29 April 1979, A. Brown. **Australian Capital Territory (male):** AMS KS13824, Tidbinbilla Nature Reserve, 9 March 1978, P. Ormay.

Diagnosis. CL 5.85–7.22 (male). Small atracine spiders without leg II apophyses. Differs from most *Hadronyche* spp. by caput being high and wide, almost bulbous (CH/CW: male 0.53 [Fig. 53A], female 0.61 [Fig. 54B]), and having relatively few STC teeth (7–9) on tarsi I, II; from *H. mascordi* by having an entire labiosternal sigilla; from *lamingtonensis* group species by having a long central cheliceral tooth row.

Male (holotype) —*Size.* Carapace length 7.01, width 7.30. Abdomen length 8.44, width 6.03. —*Colour.* Basic colour

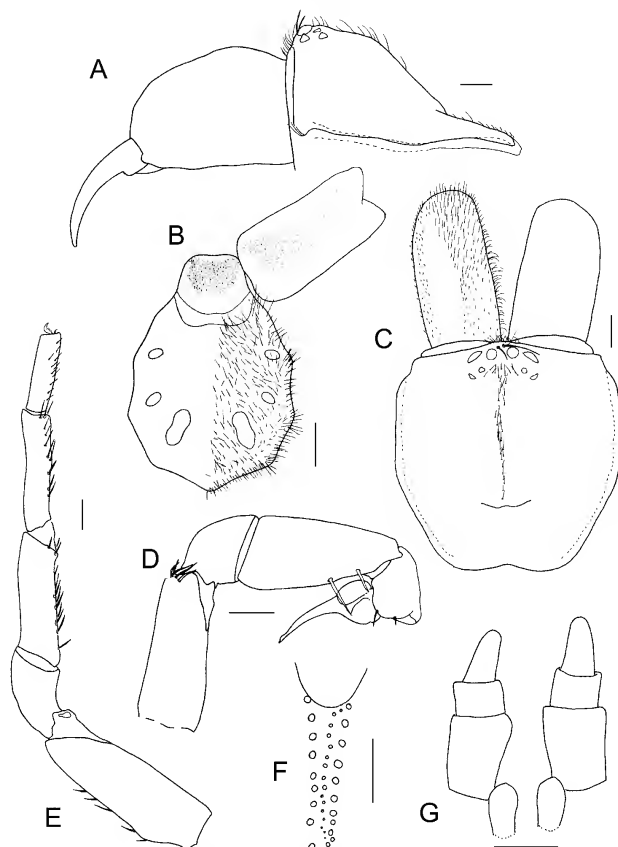


Figure 53. *Hadronyche nimoola*, male: (A) cephalothorax and chelicerae, lateral; (B) sternum, labium and maxilla; (C) cephalothorax and chelicerae, dorsal; (D) palp, prolateral; (E) leg II, prolateral (NB, dorsal femoral spines present or absent); (F) cheliceral groove teeth; (G) spinnerets. Scale lines 1 mm.

pattern. —*Carapace.* About as wide as long, strongly raised. Height 3.61. Frontal width 5.99. Fovea broad, procurved, anterior margin weakly indented. Mid-dorsal cephalic setae small, closely spaced, reach, or almost reach, fovea. Anterior strial setae absent. Anterolateral angle of carapace with weak bristles. —*Eyes.* Sessile to slightly raised in central eye region. Eye group width 2.32. Median ocular quadrangle length 0.78, anterior width 1.05, posterior width 1.60. Diameters: AME 0.33, ALE 0.47, PLE 0.37, PME 0.25. —*Chelicerae.* Cheliceral groove broad, margins diverging distally. Groove length 2.28, middle width 0.52. Cheliceral teeth: 16 central, running full length of groove; 9 prolateral; 11 retrolateral. —*Labium.* Wider than long. Length 1.44, width 1.66. Labiosternal sigilla narrowed in midline. Cuspules c. 234, number moderate. —*Sternum.* Ovoid, broad. Setae weak. Length 4.35, width 3.65. Posterior sigilla elongate, ovoid. —*Palp.* Tegular area wider than long. Embolus rather short, strongly tapered distally, weakly curved. Distal part moderately twisted, embolic groove sometimes rather wide. Embolus weakly to moderately offset from tegulum. Bulb length 2.43, width 0.99. Embolus length 1.61, midwidth 0.18. Length of femur 3.50, patella 1.45, tibia 3.49. Width of tibia 1.64. Spination: femur with 7 sinuous bristle-like spines, tibia with 2 bristle-like spines. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.23	3.01	4.80	4.26	2.65	20.95
2	5.66	2.87	4.43	3.90	2.46	19.32
3	4.82	2.34	3.28	3.62	2.65	16.71
4	6.10	2.88	4.92	4.74	3.15	21.79

Tibia I width 1.15. Femur I with few or no dorsal spines; femur II usually with spines, occasionally none; femora III and IV with spines. Legs I and II unmodified, spines small, scattered. Metatarsus IV thickened distally, concavely arched

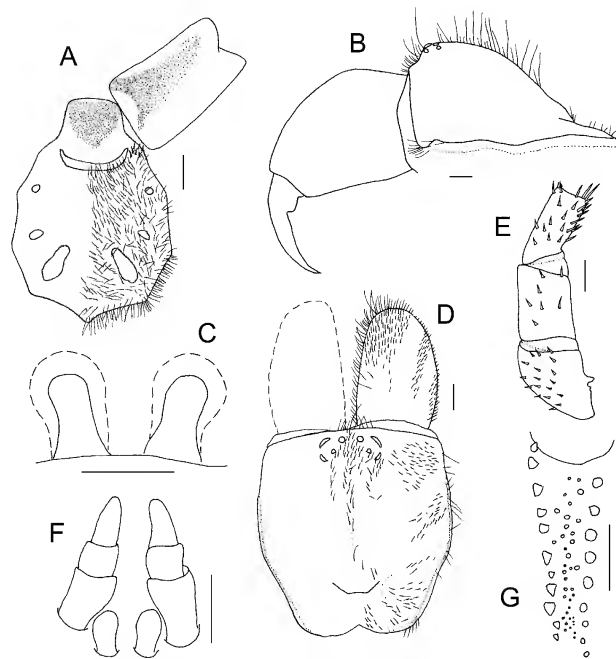


Figure 54. *Hadronyche nimoola*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spermathecae; (D) cephalothorax and chelicerae, dorsal; (E) leg II, prolateral; (F) spinnerets; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

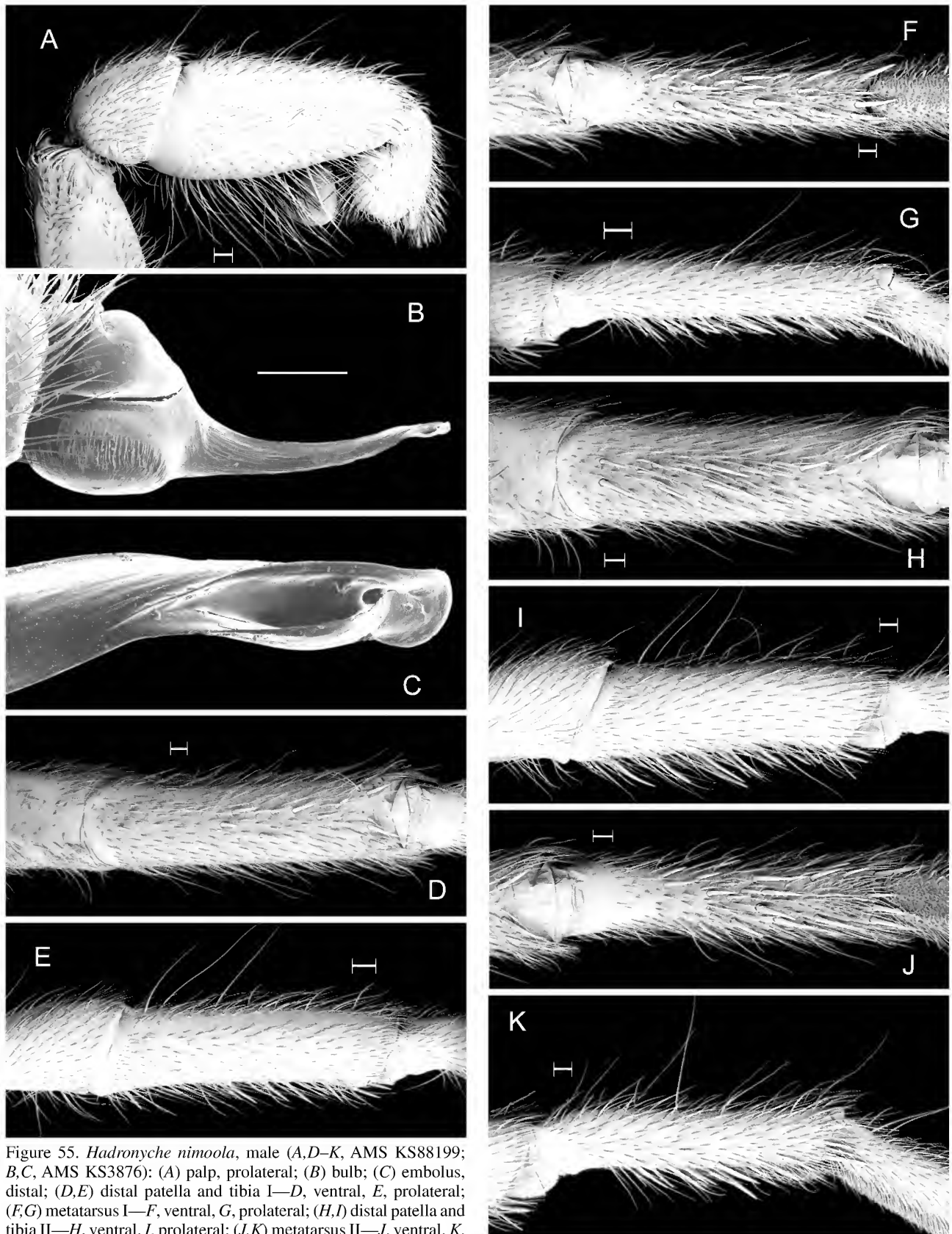


Figure 55. *Hadronyche nimoola*, male (A,D–K, AMS KS88199; B,C, AMS KS3876): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.2 mm, except B 0.5 mm and E,G 0.3 mm.

Table 16. Male morphological data—*Hadronyche nimoola* (n = 17).

character	range	mean	character	range	mean	character	ratio	SD
CL*	5.85–7.22	6.62	Mt1S	6–25	17	CW/CL*	1.01	0.032
CW	6.07–7.46	6.72	Ta1S	6–22	13	CH/CW*	0.53	0.029
CH*	3.20–4.03	3.56	Ti2S*	4–18	10	CFW/CL*	0.83	0.042
CFW	4.81–6.23	5.5	STC2*teeth	7–9	8	CHGW/L	0.24	0.041
ChGL	1.97–2.56	2.17	BulbL	2.14–2.70	2.38	SW/SL*	0.88	0.034
ChGW	0.42–0.78	0.51	EmblL	1.30–1.75	1.54	LL/LW	0.85	0.053
ChGCT	9–26	17	BulbW	0.90–1.40	0.99	PLSAPW/L	0.45	0.029
LL	1.06–1.60	1.28	EmbmW	0.12–0.18	0.15	BulbW/EmblL	0.64	0.053
LW	1.34–1.68	1.49	PalpTibL	2.65–3.77	3.21	EmbmW/L	0.10	0.012
CUSP	160–281	219	PalpTibW	1.44–1.74	1.58	PalpTibW/L	0.49	0.031
SL	3.82–4.67	4.12	PalpTibS	0–2	<1	BulbL/TibL	0.74	0.029
SW	3.25–4.14	3.63	PalpPatS	0	—			
PLSAPW	0.38–0.49	0.42	PalpFemS	0–4	1			
PLSAPL	0.82–1.20	0.95						
Fe1S	0–5	<1						
Pa1S	0–3	<1						

dorsally. Anteromedial hairs on coxae I, II usually thickened basally. Tarsal and distal metatarsal scopulae moderately developed on legs I, II; strongly developed on legs III, IV. Metatarsi IV scopulae extend to mid ventral area. Tarsal claw teeth legs I, II: superior 7, 8; inferior 0, 0. Trichobothria legs I, II: tarsus 11, 10, metatarsus 13, 13; tibia p6 r6, p6 r6. —*Leg spination*. Leg I: femur 0, patella p1, tibia 11 (p3), metatarsus 25, tarsus 22. Leg II: femur d5, patella p1, tibia 17, metatarsus 32, tarsus 23. Leg III: femur d6, patella 33 (p26 r7), tibia 22 (p7, r2, d2), metatarsus 40, tarsus 27. Leg IV: femur d7, patella r5, tibia 8 (r1 d2), metatarsus 22, tarsus 35. —*Abdomen*. Sparse, fine hair cover, bristles lacking or very weak. Posterior lateral spinnerets with moderately short apical segment. Lengths: total 2.88; basal segment 1.32; middle 0.58; apical 0.98. Apical segment width 0.48.

Female (paratype AMS KS4664) —*Size*. Carapace length 8.74, width 8.65. Abdomen length 12.24, width 8.30. —*Colour*. Basic colour pattern. —*Carapace*. About as long as wide, cephalic area broad and very strongly raised. Height 5.08; frontal width 7.84. Cephalic length 6.90. Fovea wide, deeply procurved, anterior margin indented. Mid-dorsal cephalic setae variable, may or may not reach fovea. Anterior strial setae absent. Anterolateral carapace angle with several weak bristles. —*Eyes*. Eye region sessile. Eye group width 2.76. Diameters: AME 0.28, ALE 0.47, PLE 0.38, PME 0.24. Interdistances: AME–AME 0.55, AME–ALE 0.43, A.L.E–PLE 0.40, PLE–PME 0.26, PME–PME 1.36. Median ocular quadrangle length 0.88, anterior width 1.17, posterior width 1.88. —*Chelicerae*. Cheliceral groove wide, margins diverging distally. Groove length 2.83, middle width 0.74. Cheliceral teeth: 36 central, occupying full length of groove in irregular double row; 11 prolateral; 9 retrolateral. —*Labium*. Slightly wider than long, anterior margin weakly or not indented. Length 2.10, width 2.46. Cuspules occupy anterior two-thirds of labium. Labiosternal sigilla entire, narrow. —*Sternum*. Broad, subcircular. Length 5.78, width 5.08. Anterolateral angles with a few short, basally thickened, bristle-like setae. Posterior sigilla long, ovoid: length 1.31, width 0.49. —*Palp*. Spination: tibia 1, tarsus 8. Trichobothria: tibia p6 r5, tarsus 14. Tarsal claws with 6 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.11	3.36	4.18	3.28	2.12	19.05
2	5.45	3.20	3.62	3.03	2.26	17.56
3	4.58	2.36	2.59	2.83	2.35	14.71
4	6.15	3.77	4.63	3.98	2.74	21.27

Tibia I width 1.48. Metatarsus I proximal width 1.03. Coxae I, II with basally thickened and thorn-like setae anteriorly. Tarsal claw teeth legs I, II: superior 7, 7; inferior 2, 2. Trichobothria legs I, II: tarsus 11, 11, metatarsus 12, 11; tibia p6 r5, p6 r5. —*Leg spination*. Leg I: femur 0, patella 0, tibia 1, metatarsus 10, tarsus 7. Leg II: femur 0, patella 0, tibia 1, metatarsus 14, tarsus 7. Leg III: femur 0, patella pd 20, tibia 12 (p6 r3), metatarsus 33 (p14 r6), tarsus 15. Leg IV: femur 0, patella 0, tibia 1, metatarsus 14, tarsus 7. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 3.95; basal segment 1.79, middle 0.87, apical 1.29. Apical segment width 0.69. —*Genitalia*. Spermathecae short, digitiform, well separated basally (by slightly more than basal spermatheca width); diverge toward rounded and slightly enlarged apices. Length 0.87, width 0.44.

Distribution. Southern highland and south coastal regions of New South Wales (Fig. 56).

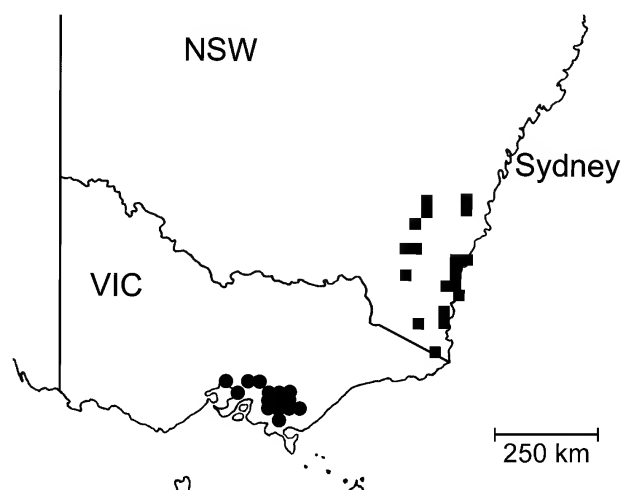


Figure 56. Collection records for *Hadronyche nimoola* (squares) and *H. modesta* (circles).

Hadronyche modesta (Simon)

Figures 56–59; Tables 17, 34

Atrax modesta Simon, 1891: 302. Hogg, 1901: 272. Main, 1985: 41.*Hadronyche modesta*.—Gray, 1988: 114 (transferred from *Atrax*).**Types.** Holotype female: MNHN, Paris (not seen). Melbourne, Victoria.

Other material examined. Victoria (males): Ellinbank via Warragul, 11 May 1962, J. Copley (MV); AMS KS8471, Emerald, 3 April 1978; AMS KS8472, Emerald, 20 April 1979; Leongatha, 6 June 1963, I. Bissett (MV); AMS KS7292, Back Creek Rd., Gembrook State Forest, near Gembrook, Victoria, L. Gibson, 10 March 1981; Mirboo North 15 April 1966, G.B. Burr (MV); 6 km NE. of Mirboo North, 26.iii.1967, J. Seebeck (MV); AMS KS8473, Mount Eliza, 23 April 1979; AMS KS8930, Mount Tassie, Strezelecki Ranges, 25 March 1982, R. Waters; AMS KS8933, Tanjil South, near Moe, February 1982, N. Barton; AMS KS8474, Thorpdale, 10 April 1980; Wright, SE of Emerald, September 1951, C. Oke (MV); Yallourn, 6 February 1963, J. Irving (MV); Yarra Junction, 4 May 1964, J. Mooney (MV); Yarra Junction 20 April 1964, J. Mooney (MV). **Victoria (females):** AMS KS10775, Cockatoo, 10 October 1982, ? McKelvey; AMS KS8477, Ferny Creek, 6 October 1979; AMS KS12618, Hawthorn, 23 January 1983, M. Harvey; AMS KS8476, Milford, 26 October 1976; AMS KS8339, Mirboo North, Apr 1980; AMS KS8932, Moe area, October 1981, N. Barton; AMS KS8470, Mount Evelyn, Lilydale Shire, 5 June 1979; AMS KS8931, Newborough, near Moe, March 1982, N. Barton; AMS KS8926, Sassafras, 14 February 1982, N. Wentworth; AMS KS10560, Warragul, January 1983, N. Barton; AMS KS3386, Yinnar, 9 July 1979, N. Barton.

Diagnosis. CL 5.48–7.30 (male). Small atracine spiders with leg II apophyseal swellings (Figs. 57G, 59H–K). Differs from *H. meridiana* and *H. jensena* by having a short, straight embolus but with the distal part neither twisted nor angled, respectively (Fig. 59B,C). Differs from other *Hadronyche* spp. with leg II apophyses/swellings by having a relatively short labium (LL/LW 0.71) (Fig. 57E).

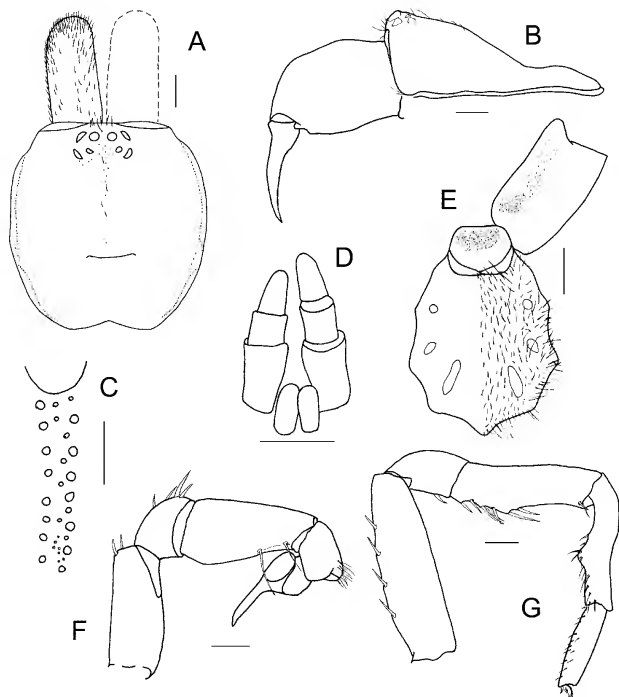


Figure 57. *Hadronyche modesta*, male: (A) cephalothorax and chelicerae, dorsal; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) spinnerets; (E) sternum, labium and chelicerae, dorsal; (F) palp, prolateral; (G) leg II, prolateral. Scale lines 1 mm.

Male (AMS KS8475, Lilydale, 14 May 1980). —*Size.* Carapace length 6.40, width 6.10. Abdomen length 5.85, width 6.12. —*Colour.* Basic colour pattern. —*Carapace.* Slightly longer than wide, cephalic area moderately raised. Height 2.68, frontal width 4.16. Fovea slightly procurved. Mid-dorsal cephalic setae few, do not reach fovea. Anterior striae setae absent. Anterolateral carapace angle with a few very weak bristles. —*Eyes.* Central eye region raised. Eye group width 1.82. Median ocular quadrangle length 0.64, anterior width 0.86, posterior width 1.14. Diameters: AME 0.28, ALE 0.32, PLE 0.22, PME 0.14. —*Chelicerae.* Cheliceral groove margins subparallel to weakly divergent. Groove length 2.06, middle width 0.34. Cheliceral teeth: 23 central, occupying full length of groove; 8 prolateral, 9 retrolateral. Central tooth row occasionally shorter. —*Labium.* Wider than long, apically indented. Length 1.00, width 1.38. Labiosternal sigilla narrowed toward midline. Slight transverse groove behind cuspules. Cuspules c. 123, number low-moderate. —*Sternum.* Ovoid. Length 4.01, width 3.28. Posterior sigilla elongate, narrow. —*Palp.* Tegular area wider than long. Embolus short and broad, almost straight, base moderately offset from tegulum; distal embolus straight, hardly twisted. Bulb length 2.26, width 1.03. Embolus length 1.37, midwidth 0.20. Length of femur 3.06, patella 1.36, tibia 3.18. Width of tibia 1.71. Spination: femur 3, patella 4, tibia 0. Distal femur spined, sinuous bristles few to absent. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.16	2.69	4.82	4.45	2.75	20.87
2	5.91	2.61	4.82	4.20	2.75	20.29
3	5.22	2.23	3.76	4.20	2.92	17.33
4	6.32	2.72	5.24	5.44	3.48	23.20

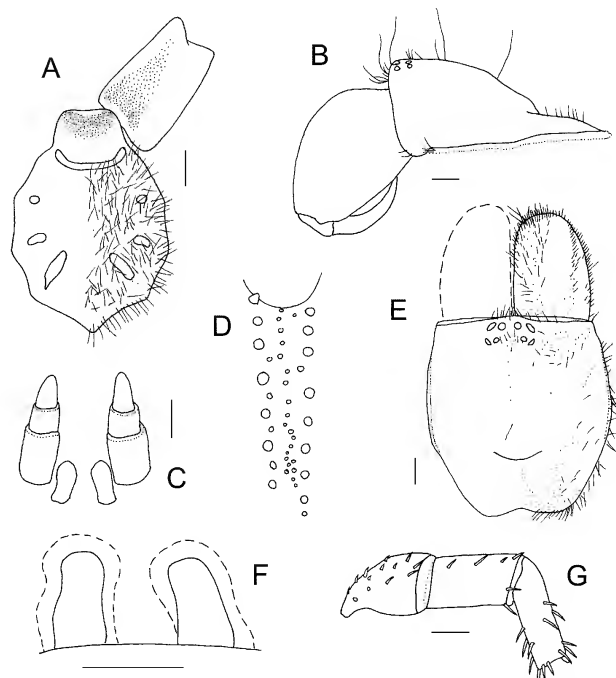


Figure 58. *Hadronyche modesta*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) spermathecae; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

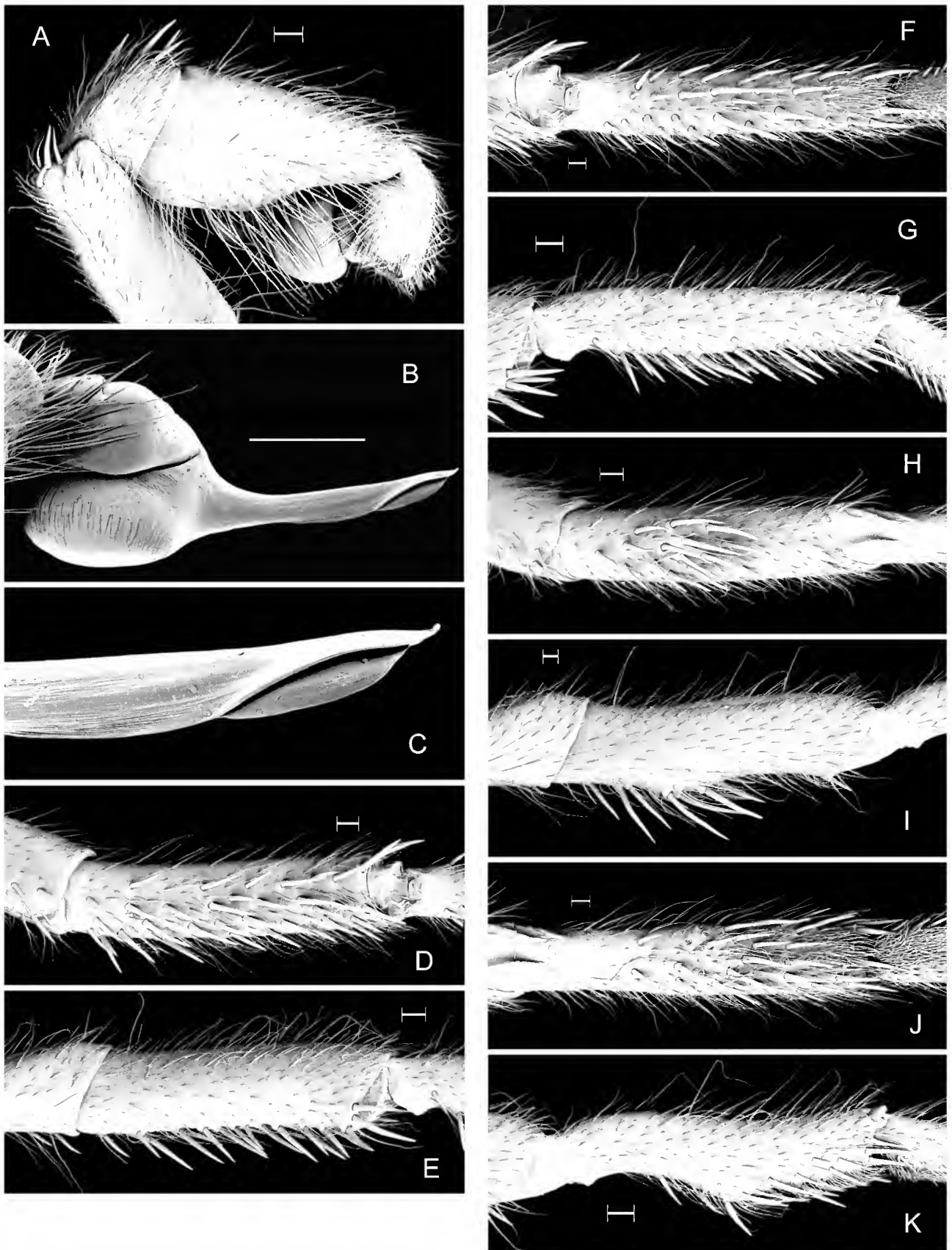


Figure 59. *Hadronyche modesta*, male (KS7292): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except B 0.5 mm and F,I,J 0.2 mm.

Table 17. Male morphological data—*Hadronyche modesta* (n = 26).

character	range	mean	character	range	mean	character	ratio	SD
CL*	5.48–7.30	6.24	Mt1S	20–49	36	CW/CL	0.96	0.026
CW	5.28–6.85	5.97	Ta1S*	15–41	28	CH/CW	0.44	0.025
CH	2.36–3.03	2.64	Ti2S	5–19	13	CFW/CL	0.67	0.015
CFW	3.73–4.96	4.20	STC2*	7–10	8	CHGW/L	0.17	0.011
ChGL	1.76–2.24	2.01	BulbL	1.89–2.38	2.13	SW/SL	0.81	0.027
ChGW	0.30–0.40	0.31	EmbL	1.12–1.41	1.28	LL/LW*	0.71	0.055
ChGCT	8–23	19	BulbW	0.91–1.15	1.03	PLSAPW/L*	0.51	0.053
LL	0.76–1.15	0.95	EmbmidW	0.15–0.24	0.17	BulbW/EmbL*	0.80	0.048
LW	1.13–1.52	1.37	PalpTibL	2.53–3.59	3.06	EmbmidW/L*	0.15	0.014
CUSP*	104–160	129*	PalpTibW	1.39–1.83	1.55	PalpTibW/L*	0.52	0.023
SL	3.50–4.70	3.93	PalpTibS	0–5	1	BulbL/TibL	0.70	0.024
SW	2.84–3.79	3.19	PalpPatS*	3–9	5			
PLSAPW	0.27–0.52	0.36	PalpFemS	3–7	5			
PLSAPL	0.53–0.92	0.70						
Fe1S	3–8	5						
Pa1S	0–4 (p0)	2						

Tibia I width 1.14. Femora I and II with dorsal spines. Leg I unmodified, tibial and metatarsal ventral spines numerous. Patella I and II lack prolateral spines. Ventral tibia II weakly swollen and spinose proximally-centrally; with a few enlarged central spines; distal tibia II concave ventrally and lacking spines (other than apical pair). Metatarsus II sinuous, with a small, spined, midventral apophysis. Coxal setae unmodified. Scopulae legs I–IV: tarsus, weak to moderate; distal metatarsus, all weak. Tarsal claw teeth legs I, II: superior 9, 8; inferior 0, 2. Trichobothria legs I, II: tarsus 9, 8; metatarsus 9, 9; tibia p5 r5, p6 r5. —*Leg spination*. Leg I: femur d4, patella 1, tibia 30, metatarsus 41, tarsus 32. Leg II: femur d4, patella 2, tibia 12, metatarsus 32, tarsus 32. Leg III: femur d2 (plus strong bristles), patella p9, tibia 15 (p1 r4), metatarsus 24, tarsus 31. Leg IV: femur 0 (strong bristles present), patella 0, tibia 12 (r3), metatarsus 21, tarsus 32. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 2.01; basal segment 0.94; middle 0.40; apical 0.67. Apical segment width 0.31.

Female (MV K11082), Hoddles Creek, Victoria, 37°50'S 145°36'E, S. Johnson, 18 October 1981). —*Size*. Carapace length 7.48, width 7.11. Abdomen length 10.74, width 7.21. —*Colour*. Basic colour pattern. Anterodorsal abdominal sigilla prominent. —*Carapace*. Slightly longer than wide, strongly raised. Height 3.60. Frontal width 6.02. Cephalic length 5.57. Fovea strongly procurved. Mid-dorsal cephalic setae few, reach only two-thirds way to fovea. Anterior striae absent. Anterolateral carapace angle with a few hairs, no bristles. —*Eyes*. Central eye region weakly raised. Eye group width 1.97. Diameters: AME 0.25, ALE 0.43, PLE 0.27, PME 0.18. Interdistances: AME–AME 0.37, AME–ALE 0.26, ALE–PLE 0.28, PLE–PME 0.30, PME–PME 0.84. Median ocular quadrangle length 0.71, anterior width 0.81, posterior width 1.24. —*Chelicerae*. Paturon with sparse anterodorsal bristle cover. Cheliceral groove moderately wide, margins diverging distally. Groove length 2.65, middle width 0.68. Cheliceral teeth: 18 central, in single row occupying full length of groove, occasionally row shorter; 11 prolateral; 9 retrolateral. —*Labium*. Wider than long, apically shallowly indented. Length 1.43, width 2.01. Cuspules grouped on anterior half. Labiosternal sigilla slightly narrowed toward midline. —*Sternum*. Broad, ovoid.

Length 5.08, width 4.38. Posterior sigilla elongate, length 1.02, width 0.39. —*Palp*. Spination: tibia 1–3 ventral bristle-like spines, tarsus 9. Trichobothria: tibia p5 r4, tarsus 7. Tarsal claw with 5 teeth. —*Legs*. 1423.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.08	4.04	5.29	4.11	3.01	23.53
2	6.29	3.13	4.74	3.64	2.41	20.21
3	4.83	2.72	3.01	3.11	2.62	16.29
4	6.30	3.70	4.82	4.32	3.05	22.19

Tibia I width 1.40. Metatarsus I proximal width 0.88. Coxal setae unmodified. Tibia I, II with no to few spines. Tarsal claw teeth legs I, II: superior 7, 8; inferior 0, 0. Trichobothria legs I, II: tarsus 10, 9; metatarsus 10, 9; tibia p6 r6, p6 r5. —*Leg spination*. Leg I: femur 0, patella 0, tibia 0, metatarsus 6, tarsus 12. Leg II: femur 0, patella 0, tibia 0, metatarsus 7, tarsus 16. Leg III: femur 0, patella pd13, tibia 5 (p2 r1), metatarsus 17 (pd4 rd2) tarsus 19. Leg IV: femur 0, patella 0, tibia 0, metatarsus 12, tarsus 24. —*Abdomen*. Sparse cover of weak hairs and bristles. Posterior lateral spinnerets with short apical segment. Length: total 3.16; basal segment 1.50, middle 0.67, apical 0.99. Apical segment width 0.56. —*Genitalia*. Spermathecae digitiform, short, apical third separated from basal two thirds by a slight constriction. Length 0.85, width 0.41.

Distribution. Melbourne/Dandenong Range region to eastern Gippsland, Victoria (Fig. 56).

Hadronyche meridiana Hogg

Figures 60–63; Tables 18, 34

Hadronyche meridiana Hogg, 1902: 122. Original description by Hogg (1901, 274) as mis-identified male of *H. cerbera*.

Types. Holotype male: BMNH 1903.2.10.6 (NHM). Mt. Macedon, Victoria, 37°23'S 144°35'E, H.R. Hogg.

Other material examined. New South Wales (males): AMS KS4503, Adelong, 22 July 1980, M. Pearce; AMS KS917, Kunama, 10 January 1971; AMS KS916, “Loch Haven”, Wantagong, 20 June 1971, R. Flynn; AMS KS915, Wantagong, 1 April 1971, R. Hunter; AMS KS913, Wondalga, 23 September 1948, C.H. Jago. New South Wales (females): AMS KS4973,

Adelong, 10 January 1980, M. Pearce; AMS KS6053, Rosewood, 20 October 1980, D.M. Fordham. **Victoria (males)**: AMS KS8488, Baranduda, 13 October 1978, A. McDonald; AMS KS10771, Lake Bolac, June 1982, H. Parnaby; Avenel, 6 September 1963 (MV); Benalla, 20 October 1968 (MV); Euroa, 19 June 1965 (MV); Pranjip, Longwood area, 4 July 1965 (MV); AMS KS8484, Trawool, near Seymour, 15 August 1980, P May Williams; Violet Town, 5 February 1980, A. Kube (MV); AMS KS8485, Willowmavin, near Kilmore, 29 April 1974. **Victoria (females)**: Rutherglen Research Institute; AMS KS13651–3, Shepparton, 15 January 1984, M. Gardener; Violet Town, 5 February 1980, A. Kube (MV); AMS KS3399, Hall's Gap, 26 March 1974, M. Gray.

Diagnosis. CL 5.44–7.04. Small atracrine spiders with weak apophyseal swellings on leg II (Figs. 60F, 62H–J). Differs from *H. modesta* and *H. jensena*e by having embolus apically twisted (Fig. 62B,C). Differs from other *Hadronyche* spp. with leg II apophyses/swellings by having a relatively short labium (LL/LW 0.78) (Fig. 60D).

Male (AMS KS8490), Avenel, Victoria, 36°54'S 144°12'E, May 1981). —*Size*. Carapace length 6.92, width 6.64. Abdomen length 7.17, width 5.23. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, cephalic area moderately raised. Height 3.12. Frontal width 5.45. Fovea straight to slightly procurved. Mid-dorsal cephalic setae do not reach fovea. Anterior strial setae present. Anterolateral angle of carapace with weak bristles. —*Eyes*. Central eye region slightly raised. Eye group width 1.86. Median ocular quadrangle length 0.75, anterior width 0.96, posterior width 1.24. Diameters: AME 0.32, ALE 0.46, PLE 0.43, PME 0.20. —*Chelicerae*. Cheliceral groove rather narrow, margins subparallel. Groove length 2.35, middle width 0.38. Cheliceral teeth: 7 central (6 in basal half, 1 in distal half); 12 prolateral; 12 retrolateral. Central tooth row distribution

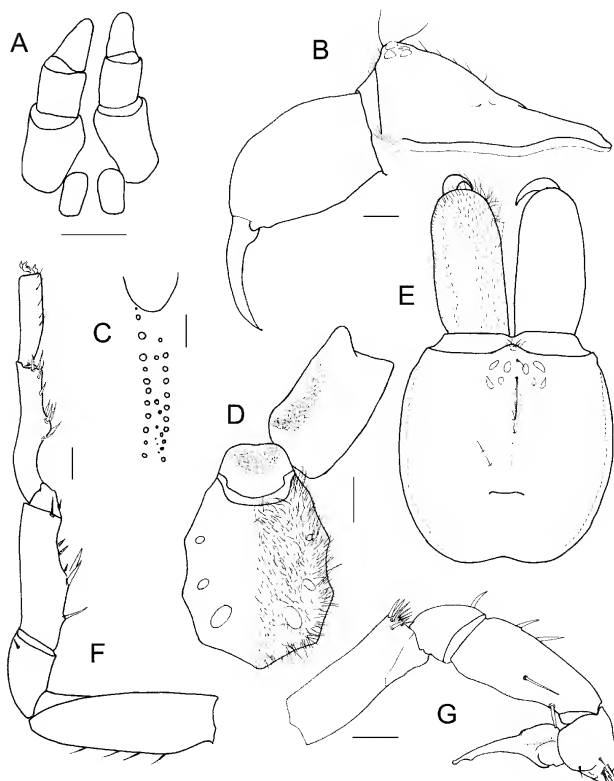


Figure 60. *Hadronyche meridiana*, male: (A) spinnerets; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) sternum, labium and maxilla; (E) cephalothorax and chelicerae, dorsal; (F) leg II, prolateral; (G) palp, prolateral. Scale lines 1 mm.

varies from basal area only to full length of groove. —*Labium*. Wider than long, surface flattened. Length 1.20, width 1.58. Labiosternal sigilla narrowed centrally. Cuspules c. 134, number low to moderate. —*Sternum*. Ovoid. Length 4.20, width 3.24. Posterior sigilla ovoid. —*Palp*. Tegular area slightly wider than long. Embolus of moderate length, rather broad, weakly curved and tapered, with distal part twisted. Embolus base weakly to moderately offset from tegulum. Bulb length 2.51, width 0.95. Embolus length 1.67, midwidth 0.30. Length of femur 3.24, patella 1.27, tibia 3.30. Width of tibia 1.48. Spination: femur 5, patella 1, tibia 3. Sinuous bristles and spines present on distal femur. —*Legs*. 4123. Legs I, 2 subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.15	2.87	4.59	4.48	2.99	21.08
2	5.82	2.81	4.84	4.43	3.05	20.95
3	5.01	2.40	3.52	4.16	3.09	18.18
4	6.03	2.68	4.89	5.09	3.35	22.04

Tibia I width 1.07. Femora I and II with dorsal spines; bristle-like spines on femora II, IV. Metatarsus I slightly thickened near middle, large ventral spines grouped here. Metatarsus II sinuous with spined midventral apophysis. Tibia II with weak, spined apophyseal swelling mid ventrally, ventral spines grouped with 2–4 central spines enlarged. Tibia II weakly excavated distally. Anterior coxal hairs normal. Tarsal scopulae: leg I weak; legs II–IV moderate to strong. Distal metatarsal scopulae: legs I, II weak to absent, legs III, IV moderate to strong. Tarsal claw teeth legs I, II: superior 12, 11; inferior 2, 2. Trichobothria legs I, II: tarsus 9, 9; metatarsus 11, 8; tibia p5 r5, p6 r5. —*Leg spination*. Leg I: femur d5, patella v1, tibia 26, metatarsus 33, tarsus 13. Leg II: femur d4, patella p1, tibia 9, metatarsus 20, tarsus 13. Leg III: femur d4 (bristle like), patella p7, metatarsus 17, tarsus 20. Leg IV: femur d5 (bristle like), patella 0, tibia 2 (d1), metatarsus 10, tarsus 19. —*Abdomen*. Sparsely covered with weak bristles and hairs with a pair of larger bristles above pedicel. Posterior lateral spinnerets with a rather short apical segment. Lengths: total 2.84; basal segment 1.24; middle 0.74; apical 0.86. Apical segment width 0.46.

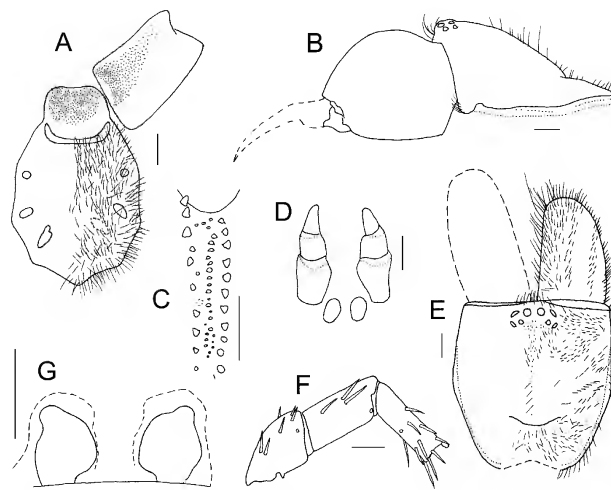


Figure 61. *Hadronyche meridiana*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) spinnerets; (E) cephalothorax and chelicerae, dorsal; (F) leg III, prolateral, patella, tibia, metatarsus; (G) spermathecae. Scale lines 1 mm.

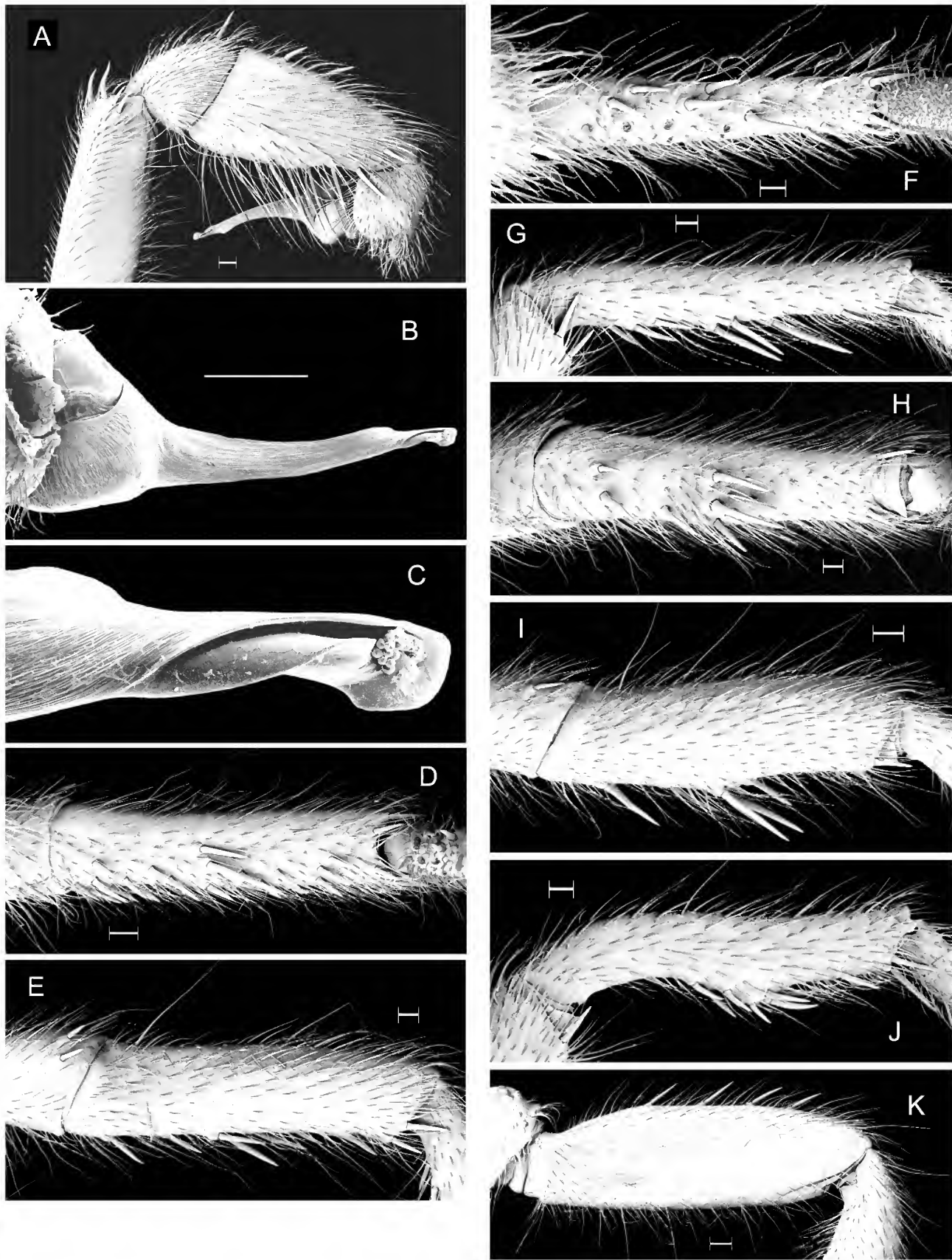


Figure 62. *Hadronyche meridiana*, male (A, D–K, AMS KS8485; B, C, Pranjip, Victoria, [MV]): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D, E) distal patella and tibia I—D, ventral, E, prolateral; (F, G) metatarsus I—F, ventral, G, prolateral; (H, I) distal patella and tibia II—H, ventral, I, prolateral; (J) metatarsus II, prolateral; (K) femur II, prolateral. Scale lines: 0.2 mm, except B 0.5 mm and D, I, J 0.3 mm.

Table 18. Male morphological data—*Hadronyche meridiana* (n = 12).

character	range	mean	character	range	mean	character	ratio	SD
CL*	5.44–7.04	6.37	Mt1S	18–37	27	CW/CL	0.98	0.035
CW	5.51–6.64	6.26	Ta1S	7–22	14	CH/CW	0.50	0.026
CH	2.68–3.53	3.10	Ti2S	8–20	12	CFW/CL	0.73	0.047
CFW	4.15–5.45	4.68	STC2teeth	9–12	10	CHGW/L	0.16	0.011
ChGL	1.96–2.48	2.20	BulbL	2.11–2.54	2.68	SW/SL	0.78	0.028
ChGW	0.27–0.42	0.35	EmblL	1.36–1.67	1.54	LL/LW*	0.78	0.02
ChGCT	3–16	10	BulbW	0.83–1.00	0.93	PLSAPW/L	0.47	0.055
LL	0.96–1.24	1.09	EmbmW	0.15–0.30	0.20	BulbW/Embl*	0.60	0.033
LW	1.19–1.58	1.38	PalpTibL	2.74–3.30	3.07	EmbmW/L	0.14	0.019
CUSP*	117–191	157	PalpTibW	1.26–1.53	1.41	PalpTibW/L	0.46	0.024
SL	3.52–4.40	4.02	PalpTibS	2–7	5	BulbL/TibL	0.77	0.031
SW	2.89–3.40	3.15	PalpPatS	1–2	1			
PLSAPW	0.31–0.46	0.35	PalpFemS	5–7*	6			
PLSAPL	0.68–0.98	0.70						
Fe1S	3–9	6						
Pa1S	0–7 (p0–3)	4						

Female (K11083 MV), Strathbogie Range, Victoria, 36°56'S 145°38'E, 7 March 1982) —*Size*. Carapace length 7.83, width 7.07. Abdomen length 11.02, width 7.48. —*Colour*. Basic colour pattern. Abdominal chevrons distinct, well separated. —*Carapace*. Slightly longer than wide, strongly raised. Height 4.01; frontal width 6.60. Cephalic length 5.60. Fovea wide, procurved anterior margin indented. Mid-dorsal cephalic setae do not reach fovea. Anterior striae absent basally. Anterolateral carapace angle with a few weak bristles. —*Eyes*. Central eye region raised. Eye group width 2.11. Diameters: AME 0.27, ALE 0.41, PLE 0.34, PME 0.23. Interdistances: AME–AME 0.36, AME–ALE 0.25, ALE–PLE 0.21, PLE–PME 0.17, PME–PME 0.96. Median ocular quadrangle length 0.70, anterior width 0.89, posterior width 1.43. —*Chelicerae*. Cheliceral groove margins diverge weakly distally. Groove length 2.65, middle width 0.54. Cheliceral teeth: 26 central, in single row occupying full length of groove; 13 prolateral; 11 retrolateral. Central tooth row length variable. —*Labium*. Wider than long, anterior margin slightly concave, sides rounded. Length 1.55, width 2.11. Cuspules occupying anterior two-thirds of labium. Labiosternal sigilla narrowed at midline. —*Sternum*. Ovoid. Length 5.10, width 4.01. Posterior sternal sigilla elongate, removed from margins: length 0.99, width 0.34. —*Palp*. Spination: tibia 0–1 (strong bristles present), tarsus 8. Trichobothria: tibia p6 r6, tarsus 8. Tarsal claw with 4 teeth. —*Legs*. 4123. Legs I, IV subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.92	2.82	4.59	3.60	2.37	19.30
2	5.10	2.62	3.94	3.47	2.38	17.51
3	4.60	2.55	2.84	3.12	2.52	15.91
4	5.71	2.96	4.08	4.09	2.92	19.76

Tibia I width 1.29. Metatarsus I proximal width 0.95. Coxae I, II with a few basally thickened setae frontally. Tibia I, II with few to no spines. Tarsal claw teeth legs I, II: superior 7, 7; inferior 3, 3. Trichobothria legs I, II: tarsus 9, 10; metatarsus 14, 12; tibia p6 r6, p6 r5. —*Leg spination*. Leg I: femur 0, patella 0, tibia 0, metatarsus 5, tarsus 4. Leg II: femur 0, patella 0, tibia 0, metatarsus 7, tarsus 5. Leg III: femur 0, patella p7, tibia 9 (p5 r2), metatarsus 15 (p5 rd2), tarsus 12. Leg IV: femur 0, patella 0, tibia 0, metatarsus 10, tarsus 14. —*Abdomen*. Posterior lateral spinnerets stout,

apical segment short. Lengths. total 3.07; basal segment 1.43; middle 0.69; apical 0.95. Apical segment width 0.56. —*Genitalia*. Spermathecae very short and broad. Apical area narrower than expanded central region. Spermatheca length 0.82, width 0.68.

Distribution. Western side of Great Dividing Range in Southern New South Wales and northern Victoria (Fig. 63). This species is provisionally recorded from the Grampian Ranges on the basis of a single female from the Hall's Gap area—male records are needed to confirm this.

Comments. In some males a few mid row or distal teeth may be missing, making keying such individuals difficult.

Hadronyche jensenae n.sp.

Figures 63–65; Table 19

Etymology. The species is named for my wife, Greta Jensen Gray.

Types. Holotype male: K11085 (MV), Woodside, Victoria, 38°32'S 146°53'E, 15 August 1966. Paratypes. Victoria. *Males*: K11086 (MV), Woodside, data as for holotype; K11087 (MV), Morwell, 38°14'S 146°24'E., 28 August 1967.

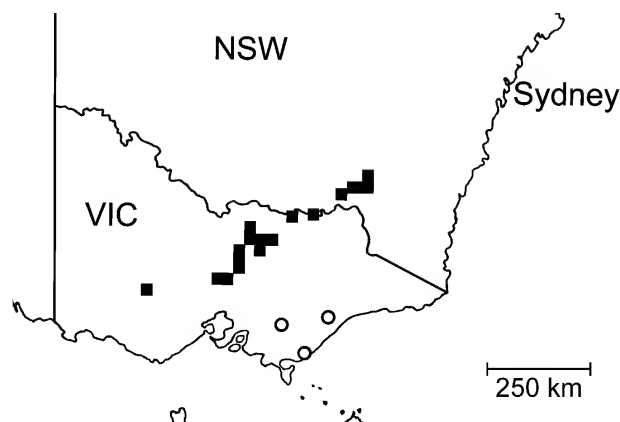


Figure 63. Collection records for *Hadronyche meridiana* (squares) and *H. jensenae* (circles).

Table 19. Male morphological data—*Hadronyche jensena* (n = 4).

character	range	mean	character	range	mean	character	ratio	SD
CL*	4.72–6.60	5.77	Mt1S	14–27 (p0)	19	CW/CL	0.99	0.029
CW	4.84–6.60	5.72	Ta1S	6–10	8	CH/CW	0.45	0.03
CH	2.0–3.16	2.60	Ti2S*	5–7 (p0)	6	CFW/CL	0.70	0.043
CFW	3.36–4.85	4.06	STC2teeth	10–11	11	CHG/W/L	0.16	0.013
ChGL	1.66–2.18	1.94	BulbL	1.25–2.34	2.17	SW/SL	0.81	0.022
ChGW	0.27–0.34	0.31	EmbL	1.15–1.36	1.28	LL/LW*	0.79	0.075
ChGCT	15–19	17	BulbW	0.86–1.09	0.99	PLSAPW/L	0.47	0.055
LL	0.78–1.29	1.02	EmbmidW	0.18–0.21	0.19	BulbW/EmbL*	0.77	0.022
LW	1.06–1.43	1.28	PalpTibL	2.71–3.09	2.82	EmbmidW/L	0.16	0.006
CUSP*	112–169	145	PalpTibW	1.26–1.52	1.40	PalpTibW/L*	0.50	0.003
SL	3.11–4.15	3.64	PalpTibS	1–2	2	BulbL/TibL*	0.77	0.053
SW	2.43–3.41	2.95	PalpPatS	1–3	2			
PLSAPW	0.29–0.35	0.34	PalpFemS	0–3	1			
PLSAPL	0.64–0.82	0.73						
Fe1S	2–5	4						
Pa1S*	0	0						

Other material. AMS KS112636, Vic. Dept. Agric., Bairnsdale (locality unknown), 20 June 1978.

Diagnosis. CL 4.72–6.60 (male). Small atracine spiders. Differ from other atracine species by having a short, broad embolus with distal part set at distinct angle to shaft (Fig. 65B,C).

Male (holotype) —*Size.* Carapace length 5.74, width 5.70. Abdomen length 6.5, width 4.7. —*Colour.* Basic colour

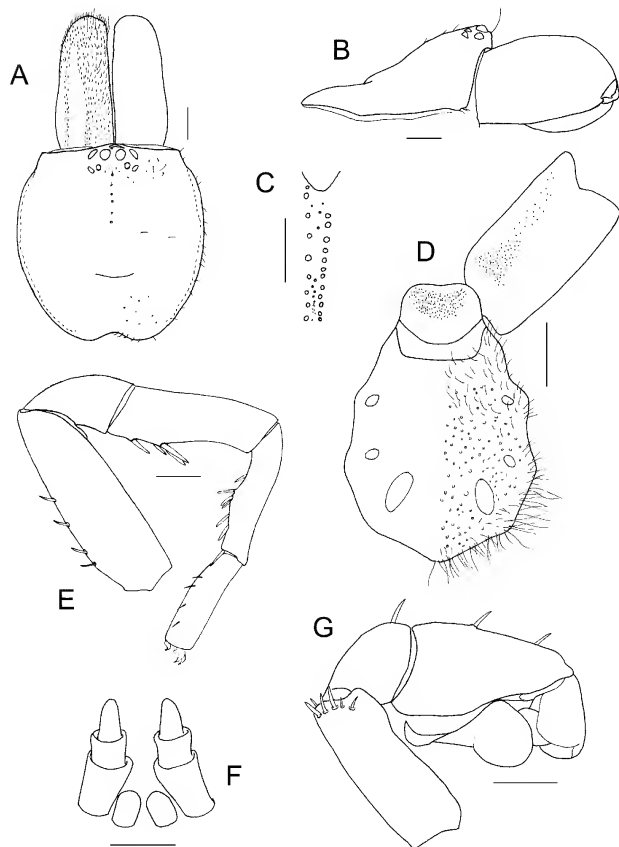


Figure 64. *Hadronyche jensena*, male: (A) cephalothorax and chelicerae, dorsal; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) sternum, labium and maxilla; (E) leg I, prolateral; (F) spinnerets; (G) palp, prolateral. Scale lines 1 mm.

pattern; abdomen partly discoloured or damaged in all specimens. —*Carapace.* About as wide as long, cephalic area moderately raised. Height 2.65; frontal width 4.21. Fovea procurved. Mid-dorsal cephalic setae few, do not reach fovea. Anterior strial setae absent. Anterolateral carapace angle with weak hairs only. —*Eyes.* Central eye region slightly raised. Eye group width 1.57. Median ocular quadrangle length 0.60, anterior width 0.74, posterior width 1.10. Diameters: AME 0.20; ALE 0.35; PLE 0.29; PME 0.23. —*Chelicerae.* Groove margins diverge weakly distally. Groove length 2.00, middle width 0.30. Cheliceral teeth, 15 central, occupying full length of groove; 9 prolateral; 12 retrolateral. —*Labium.* Much wider than long, rectangular, apically weakly indented. Length 0.92, width 1.25. Labiosternal sigilla broad. Cuspules c. 160, number moderate to low. —*Sternum.* Ovoid. Length 3.59, width 2.98. Posterior sternal sigilla ovoid to elongate; middle sigilla small. —*Palp.* Tegular area slightly wider than long. Embolus very short and broad, base strongly offset from tegulum. Distal part of embolus not twisted, but angled strongly at about 45° to shaft. Bulb length 2.23, width 1.01. Embolus length 1.31, midwidth 0.20. Tibia short, strongly incrassate proximally. Length of femur 2.71, patella 1.12, tibia 2.71. Width of tibia 2.01. Spination: femur 6; patella 1; tibia d2. Distal femur with spines, without sinuous bristles. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.34	2.52	3.94	3.46	2.38	17.64
2	4.79	2.30	3.74	3.19	2.38	16.40
3	4.08	2.14	2.89	3.03	2.24	14.38
4	5.17	2.28	4.08	3.90	2.82	18.25

Tibia I width 0.94. Femora I, II with dorsal spines. Metatarsus I slightly thickened in proximal half, spines strong, scattered. Tibia II without apophysis, ventral spines few, grouped proximally with c. two larger spines toward middle; distoventral tibia weakly concave. Metatarsus II weakly to moderately sinuous with small, apophysis mid-ventrally. Tarsi III, IV slightly swollen. Anterior coxal hairs unmodified. Tarsal and distal metatarsal scopulae: legs I, II weak; legs III, IV moderate. Tarsal claw teeth legs I, II: superior 11, 11; inferior 0, 0. Trichobothria legs I, II: tarsus 8, 7; metatarsus 6, 6; tibia p5 r5, p5 r5. —*Leg spination.* Leg I: femur d5, patella 0, tibia 18, metatarsus 19, tarsus 10. Leg

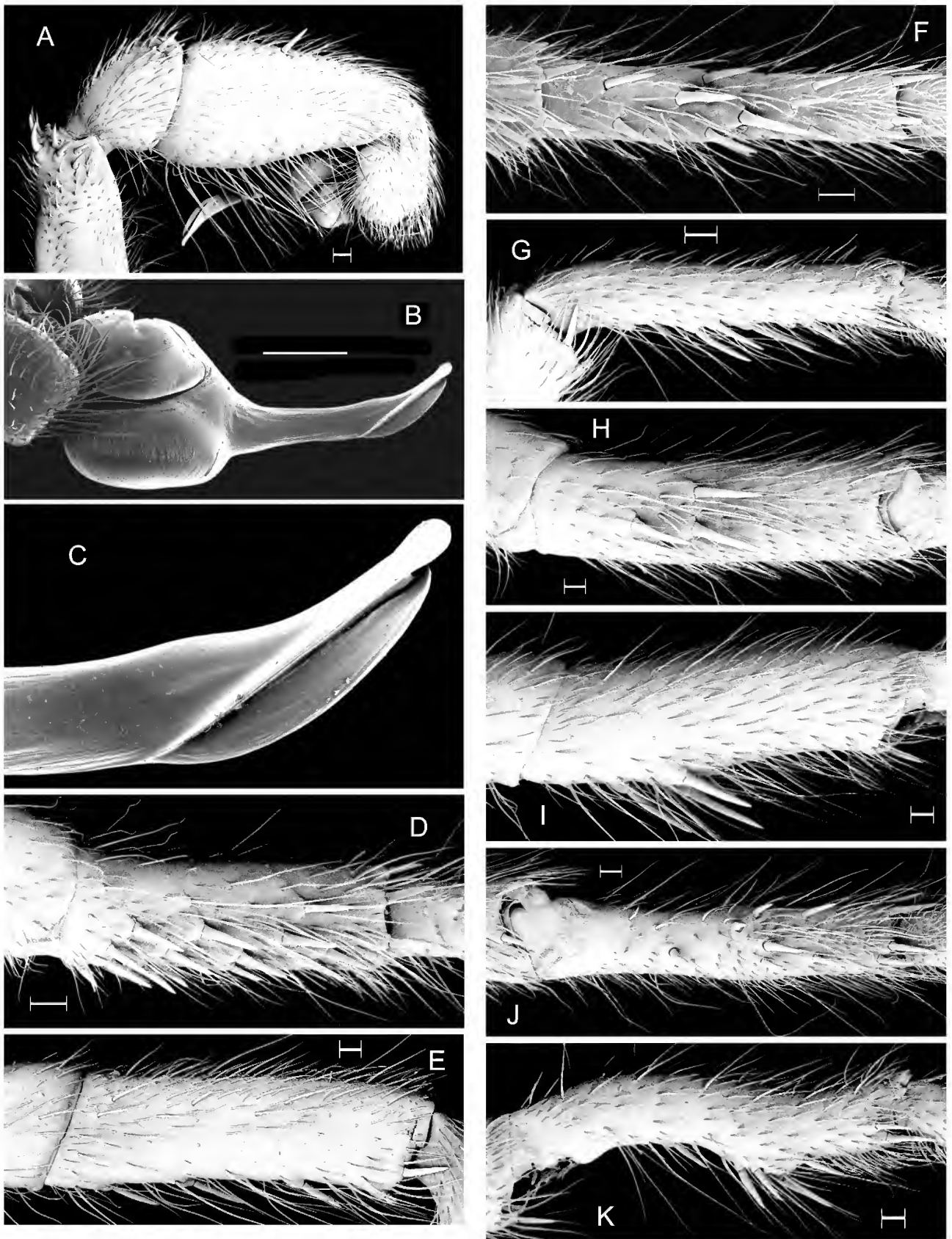


Figure 65. *Hadronyche jensena*, male (A,D–K, AMS KS112636; B,C, 11086 [MV]): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.2 mm, except B 0.5 mm and D,F,G 0.3 mm.

II: femur d4, patella 0, tibia 5, metatarsus 11, tarsus 9. Leg III: femur d1, patella pd10, tibia 10 (r2), metatarsus 17 (p5 r2), tarsus 8. Leg IV: femur d1–2 (strong bristles present), patella 0, tibia 3 (rd1), metatarsus 10, tarsus 11. —*Abdomen*. Bristles stronger anteriorly with a prominent frontal pair. Posterior lateral spinnerets with rather short apical segment. Lengths: total 1.90; basal segment 0.84; middle 0.42; apical 0.64. Apical segment width 0.34.

Distribution. Central Gippsland, Victoria (Fig. 63).

Hadronyche pulvinator (Hickman)

Figures 66, 67

Atrax pulvinator Hickman, 1927: 70. Main, 1985: 41.
Hadronyche pulvinator.—Gray, 1988: 114 (Transferred from *Atrax*).

Types. Holotype female: QVM 1957–15–20 Type 17. The Cascades, Hobart, Tasmania, 42°54'S 147°17'E, V.V. Hickman.

Diagnosis. CL 6.15 (female). Small atracine spiders. Differs from *H. venenata* having central cheliceral teeth in a short, basal row (Fig. 66D), and relatively short labium and spinnerets (Fig. 66A,G).

Redescription of holotype female. *Size*. Carapace length 6.15, width 5.64. Abdomen length 10.20, width 8.50. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, strongly raised. Height 2.71. Frontal width 4.94. Cephalic length 4.69. Fovea procurved, anterior margin slightly indented. Mid-dorsal cephalic setae do not reach fovea. Anterior strial setae absent. Anterolateral carapace angle with a few very weak bristles. —*Eyes*. Central eye region very weakly raised. Eye group width 1.72. Diameters:

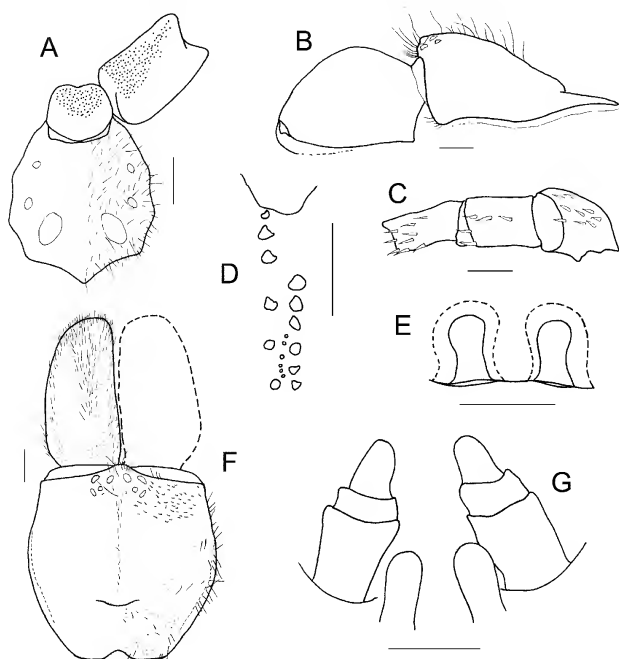


Figure 66. *Hadronyche pulvinator*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg III, prolateral, patella, tibia, metatarsus; (D) cheliceral groove teeth; (E) spermathecae; (F) cephalothorax and chelicerae, dorsal; (G) spinnerets. Scale lines 1 mm.

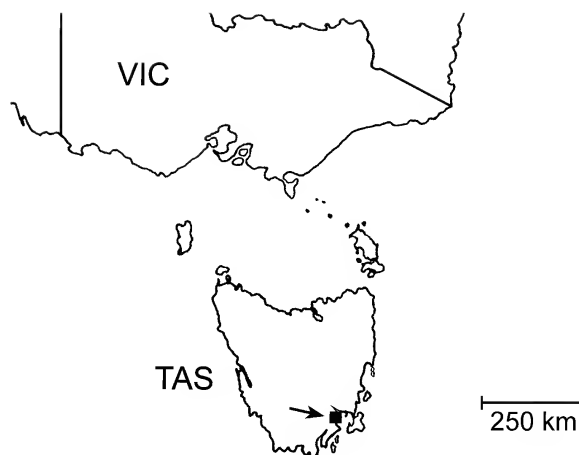


Figure 67. Collection records for *Hadronyche pulvinator*.

AME 0.20, ALE 0.34, PLE 0.25, PME 0.22. Interdistances: AME–AME 0.30, AME–ALE 0.17, ALE–PLE 0.20, PLE–PME 0.07, PME–PME 0.82. Median ocular quadrangle length 0.50, anterior width 0.70, posterior width 1.25. —*Chelicerae*. Paturon with a medial line of long, weak bristles, remaining anterodorsal bristles shorter. Groove narrow, margins diverge slightly distally. Groove length 1.91, middle width 0.50. Distal half of groove transversely ridged. Cheliceral teeth: 7 central, in basal third of groove; 6 prolateral; 6 retrolateral, absent from distal third of margin. —*Labium*. Wider than long. Length 1.22, width 1.48. Anterior margin indented apically, lateral margins rounded. Cuspules grouped antero-centrally. Labiosternal sigilla narrowed centrally. —*Sternum*. Broad, ventrally domed. Length 3.85, width 3.44. Posterior sigilla ovoid: length 0.76, width 0.44. —*Palp*. Spinination: tarsus 3. Trichobothria: tibia p4 r5, tarsus 4. Tarsal claw with 2–3 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	3.94	1.89	2.50	1.97	1.60	11.90
2	3.36	1.89	2.13	1.79	1.46	10.63
3	3.44	1.64	1.89	1.64	1.48	10.09
4	4.14	2.26	2.46	2.50	1.84	13.20

Tibia I width 1.10. Metatarsus I short, proximal width 0.83. Coxal hairs unmodified. Tibia I, II without spines. Tarsal claw teeth legs I, II: superior 5, 5; inferior 2, 1. Trichobothria legs I, II: tarsus 7, 6; metatarsus 7, 7; tibia p4 r5, p5 r4. —*Leg spinination*. Leg I: femur 0, patella 0, tibia 0 (2 bristles distally), metatarsus 3; tarsus 2. Leg II: femur 0, patella 0, tibia 0, metatarsus 3, tarsus 2. Leg III: femur 0, patella pd9, tibia 6 (p3 r1), metatarsus 12 (p6 r2), tarsus 5. Leg IV: femur 0, patella p1, tibia 2 (p1), metatarsus pv8, tarsus 6 —*Abdomen*. Sparse cover of fine hairs and bristles. Posterior lateral spinnerets with short apical segment. Lengths: total 1.87; basal segment 0.91, middle 0.36, apical 0.60. Apical segment width 0.34. —*Genitalia*. Spermathecae short, weakly bulbous apically. Length 0.68, width 0.41.

Distribution. Known only from the Cascades area, Hobart, Tasmania (Fig. 67).

Comments. This species is known only from the holotype female, collected more than 80 years ago. Sporadic collecting efforts at the type locality have failed to locate additional specimens, leading to real concern about the status of the species. Collecting activities have mostly been restricted to

visual (daytime) searching in bushland areas in the Cascades region, mainly targeting logs and rocks, often near creek banks. A regular program of short-term pitfall trapping and ground/litter slicing may be more successful in finding specimens of this elusive species. These techniques were used to good effect in trapping males and locating the in-litter burrows of females of *H. flindersi* in South Australia

infensa species group

Description (Figs. 87–89, 91–93). Medium to large sized funnel web spiders. Male femora I, II without spines. Labium relatively long (LL/LW 0.85–0.96) (cf. short labium in *lamingtonensis* group species). Central cheliceral tooth row long (uniquely short, basal in *H. kaputarensis*). Tibia II without apophysis—either more or less sinuous (sometimes slightly thickened proximally) with ventral spines clustered in proximal half; or more cylindrical with clustered to scattered spines. Metatarsus II without apophysis, cylindrical to weakly sinuous, sometimes slightly swollen mid-ventrally. Male palp with few spines (tibia 0–3, patella 0–1, femur 0–2). Embolus with shaft broad or narrow, moderately curved and weakly to not tapered. Distal part of embolus weakly to strongly twisted (Figs. 77B, 81B)—twisting often extended back along shaft as a deep, longitudinal fold, well developed in species with wider, weakly tapered emboli (Fig. 86B,C). Ratio of bulb length to palpal tibia length 0.78–0.95 (i.e., usually greater than in *cerbera* group species). Posterior lateral spinnerets with moderately long apical segment (PLSAPW/L 0.32–0.37).

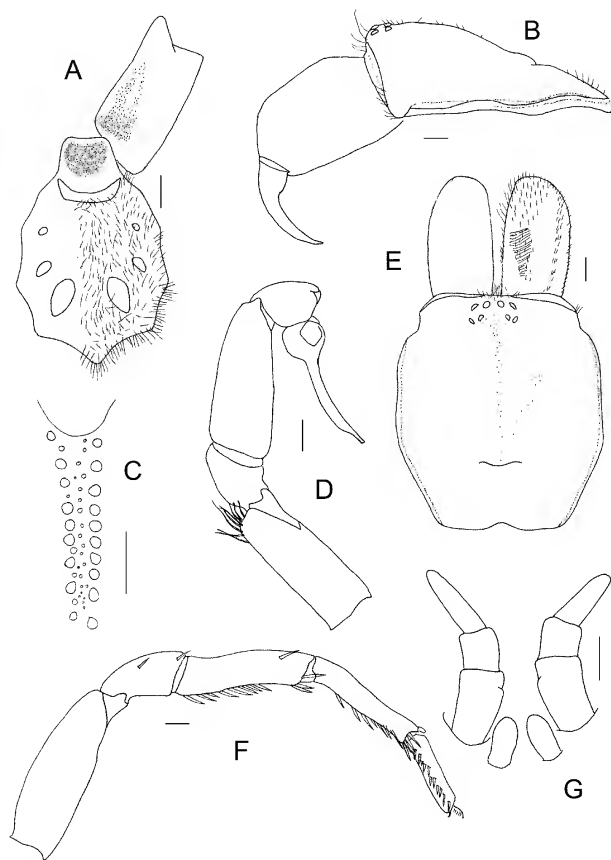


Figure 68. *Hadronyche infensa*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) palp, proximal; (E) cephalothorax and chelicerae, dorsal; (F) leg II, proximal; (G) spinnerets. Scale lines 1 mm.

Included species: *H. infensa* (Hickman), *H. valida* (Rainbow & Pulleine), *H. orana* n.sp., *H. lynabrae* n.sp., *H. macquariensis* n.sp., *H. levittgreggae* n.sp., *H. kaputarensis* n.sp., *H. walkeri* n.sp.

Distribution. Coast and highlands from Hawkesbury River region of mid-eastern New South Wales to southeastern Queensland.

Comments. These species are distributed across a very dissected coastal and highland landscape and it is likely that many more species await recognition—for example males from the Barrington Tops and Mount Banda Banda regions probably represent new species.

Hadronyche infensa (Hickman)

Figures 68–71; Tables 20, 34

Atrax infensus Hickman, 1964: 108. Main, 1985: 41.

Hadronyche infensa.—Gray, 1988: 114 (transferred from *Atrax*).

Types. Holotype male: AMS KS953 (old catalogue number K68385). Toowoomba, Queensland, 27°33'S 151°57'E, P. Walker, 26 January 1963. Allotype female: AMS KS954 (old catalogue number K68386). Data as for holotype.

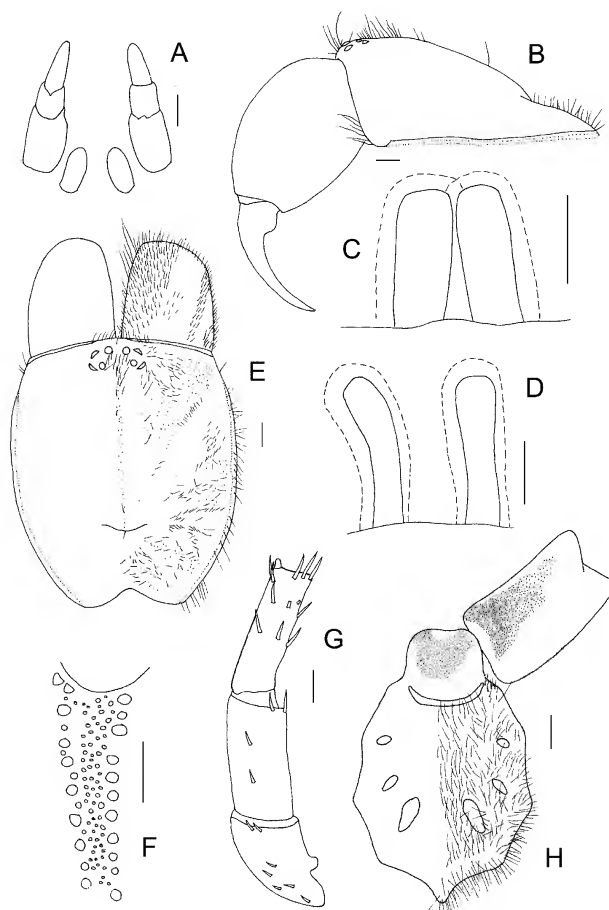


Figure 69. *Hadronyche infensa*, female: (A) spinnerets; (B) cephalothorax and chelicerae, lateral; (C and D) spermathecae variation; (E) cephalothorax and chelicerae, dorsal; (F) cheliceral groove teeth; (G) leg III, proximal, patella, tibia, metatarsus; (H) sternum, labium and maxilla. Scale lines 1 mm.

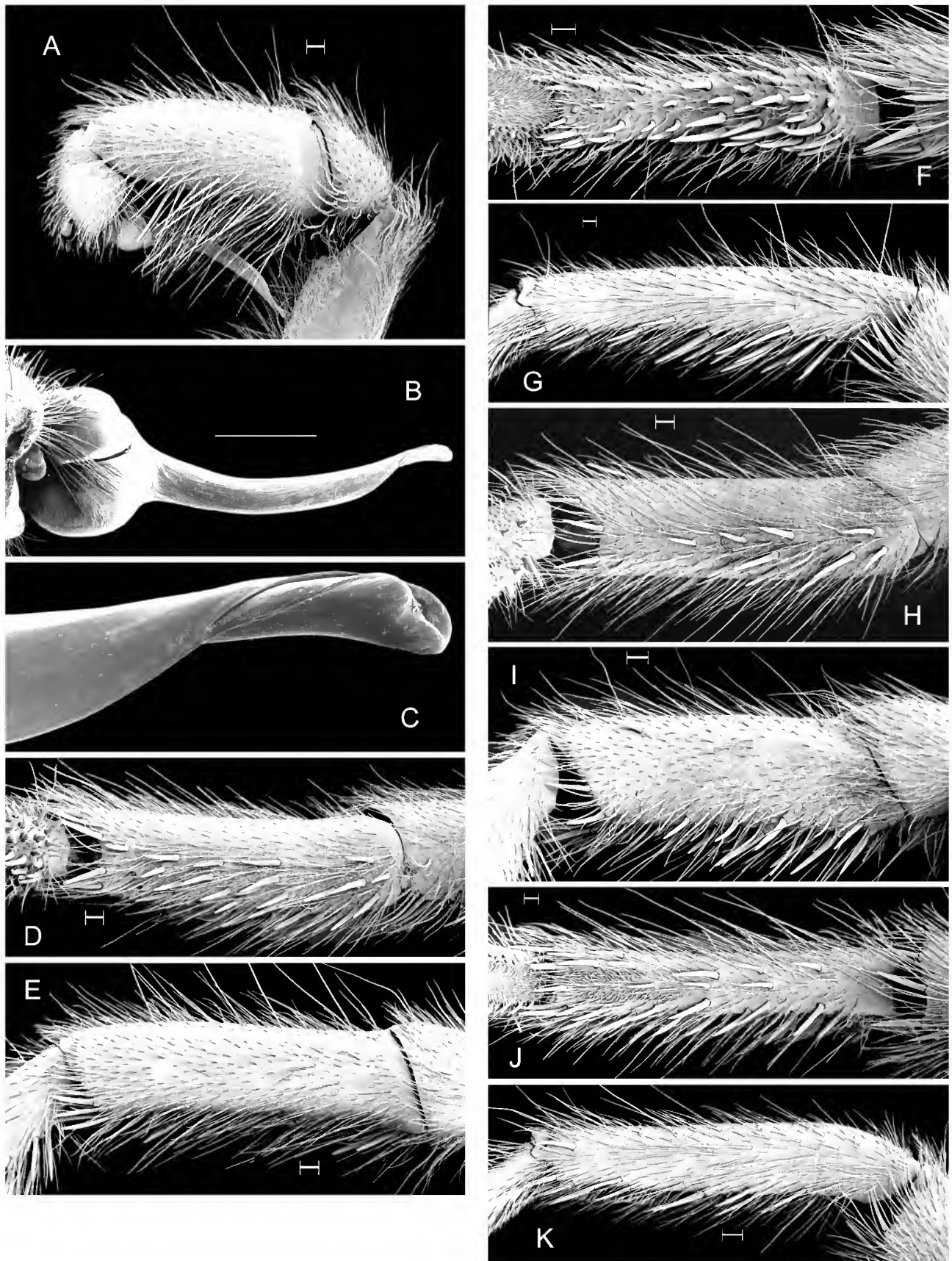


Figure 70. *Hadronyche infensa*, male (AMS KS4716, RHS except *B,C* LHS): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except *B* 1.0 mm and *G,J* 0.2 mm.

Table 20. Male morphological data—*Hadronyche infensa* (n = 13).

character	range	mean	character	range	mean	character	ratio	SD
CL	9.04–11.48	10.35	Mt1S	25–52	37	CW/CL	0.93	0.038
CW	8.70–10.58	9.58	Ta1S	24–51	36	CH/CW	0.42	0.031
CH	3.43–4.84	4.02	Ti2S	11–29 (p0–1)	17	CFW/CL	0.66	0.022
CFW	5.95–7.41	6.8	STC2teeth	11–13	12	CHGW/L	0.18	0.015
ChGL	2.58–3.38	2.73	BulbL	3.82–4.86	4.37	SW/SL	0.75	0.034
ChGW	0.46–0.60	0.52	EmbL	2.82–3.58	3.15	LL/LW	0.93	0.04
ChGCT	8–26	15	BulbW	1.22–1.64	1.47	PLSAPW/L	0.30	0.035
LL	1.48–1.94	1.71	EmbmW	0.35–0.49	0.41	BulbW/EmbL	0.47	0.049
LW	1.58–1.98	1.83	PalpTibL	4.41–5.78	5.00	EmbmW/L*	0.13	0.013
CUSP	320–494	383	PalpTibW	1.91–2.34	2.11	PalpTibW/L	0.42	0.029
SL	4.93–6.89	5.74	PalpTibS	0–1	<1	BulbL/TibL*	0.88	0.044
SW	3.76–5.00	4.49	PalpPatS	0	—			
PLSAPW	0.49–0.74	0.58	PalpFemS	0	—			
PLSAPL	1.69–2.24	1.78						
Fe1S	0							
Pa1S	0–5 (p0–1)	3						

Other material examined. Queensland (males): QMB S672, Bellthorpe West, 5 December 1979, G. Hodges; QMB S392, Royce Reserve, near Toowoomba, 24 October 1975–30 April 1976, G.B. & S.R. Monteith; AMS KS8790, Buderim, January 1982; QMB S147, Casey Creek via Imbil, 31 December 1974–27 March 1975, G.B. & S.R. Monteith; QMB S173, Cooran Plateau via Traveston, 31 December 1974–27 March 1975, G.B. & S.R. Monteith; QMB S396, Elginvale, 12 December 1976–26 March 1977, G.B. & S.R. Monteith; QMB S158, Flaxon, 30 November 1973, J.J. Roth; QMB S168, Gallangowan, 10 November 1974–29 December 1974, G.B. & S.R. Monteith; QMB S376, Mount Glorious, 7 March 1978, T. Hillier; QMB S165, Kingaroy, 23 November 1977, L. Briskey; QMB S673, Maleny, 4.x.1979, I. Joyce; QMB S152, Mount Nebo, 26 October 1972, D. Dale; QMB S171, Maleny, 23 November 1973, M. Erskine-Wyse; QMB S153, Mapleton, 2 December 1975, P. Allsop; QMB S395, Mistake Mountains, 10 October 1976–9 January 1977, G.B. & S.R. Monteith; QMB S160, Montville, 7 November 1977, J. Channon; QMB S670, Montville, 23 November 1979, D. Roberts; QMB S674, Nambour, 17 November 1979, R. Cook; QMB S379, Nambour, 16 November 1978, S. Martin; QMB S671, Mount Nebo, 22 December 1979, D. Webster; QMB S188, Mount Nebo, 28 April 1979, A. Rozetelds; QMB S170, Mount Tensionwoods, near Mount Glorious, 12 November 1975–27 January 1976, G.B. & S.R. Monteith; QMB S151, Toowoomba, 15 January 1952, T. Passlow; QMB S167, Upper Yarraman State Forest via Maidenwell, 17 July 1974–10 November 1974, G.B. & S.R. Monteith; AMS KS4716, Toowoomba, 27°36'S 151°57'E, 12 Jan 1980, P. Walker. **Queensland (females):** AMS KS13423, Cunninghams Gap; QMB S376, Mount Glorious, 7 March 1978, T. Hillier; QMB S374, Maleny; AMS KS990, Toowoomba, 20.v.1972, J. Cann; AMS KS4596, Toowoomba, February 1979, P. Walker. **New South Wales (males):** Tenterfield, 29°03'S 152°01'E, (AMS); Tooloom, 28°37'S 152°25'E, (AMS).

Diagnosis. CL 9.04–11.48 (male). Differs from *H. walkeri* and *H. macquariensis* by embolus base strongly offset from tegulum (Fig. 70B) and greater length of bulb (BulbL/TibL 0.88) (Figs. 68D, 70A); differs from *H. levittgreggae*, *H. valida*, *H. orana* and *H. kaputarensis* by more slender embolus shaft (EmbmW/L 0.13) and from *H. lynabrae* by less pronounced distal embolic twisting (Fig. 70B,C).

Redescription of holotype male. *Size.* Carapace length 10.78, width 9.38. Abdomen length 9.86, width 7.48. — *Colour.* Basic colour pattern. Abdomen often with a small anterodorsal pale patch flanked by small sigilla. — *Carapace.* Longer than wide, cephalic area moderately raised. Height 4.18; frontal width 7.15. Fovea narrow, procurved. Mid-dorsal cephalic setae reach fovea. Anterior striae setae present. Anterolateral angle of carapace with numerous bristles. — *Eyes.* Central eye region weakly raised. Eye group width 2.31. Median ocular quadrangle length 0.88,

anterior width 0.97, posterior width 1.44. Diameters: AME 0.31, ALE 0.49, PLE 0.42, PME 0.24. — *Chelicerae.* Dorsal paturon with oblique ridges proximally. Cheliceral groove with margins diverging distally. Groove length 3.03, middle width 0.52. Cheliceral teeth: 22 central, occupying full length of groove; 14 prolateral; 10 retrolateral. — *Labium.* Wider than long, weakly indented apically. Length 1.67, width 1.97. Labiosternal sigilla broad, entire. Cuspules c. 379, number high. — *Sternum.* Ovoid. Length 6.15, width 4.83. Posterior sigilla long, ovoid. — *Palp.* Tegular area wider than long. Embolus moderately long and wide, base strongly offset from tegulum. Embolus moderately long and broad, shaft curved and hardly tapered; distal embolus moderately twisted with twisting extended back along shaft as a rolled margin. Bulb length 4.42, width 1.43. Embolus length 3.26, midwidth 0.38. Length of femur 4.62, patella 2.38, tibia 4.90. Width of tibia 1.94. Spines absent. Tibia with several strong ventral bristles. Several sinuous bristles on distal femur. — *Legs.* 4.123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.87	4.39	6.66	5.78	3.60	29.30
2	8.08	3.91	6.46	6.10	3.63	28.08
3	7.04	3.57	5.17	5.81	3.52	25.11
4	8.33	4.15	6.50	6.57	4.28	29.83

Tibia I width 1.58. Femora I and II without spines. Metatarsus I slightly thickened proximally with larger ventral spines grouped in proximal half. Tibia II without apophysis, most ventral spines loosely grouped proximocentrally. Metatarsus II weakly sinuous proximally, otherwise unmodified. Coxae I and II with anteromedial setae weakly thickened, sparse. Scopulae: tarsi (legs I–IV), moderate to strong; distal metatarsi, absent to weak (legs I, II), moderate (legs III, IV). Tarsal claw teeth legs I, II; superior 14, 12; inferior 4, 3. Trichobothria legs I, II: tarsus 13, 12; metatarsus 17, 13; tibia p6 r7, p7 r8. — *Leg spination.* Leg I: femur 0, patella 0, tibia 33, metatarsus 38, tarsus 27. Leg II: femur 0, patella p2, tibia 19 (p1) metatarsus 24, tarsus 35. Leg III: femur 0, patella p5, tibia 12 (p2 r2), metatarsus 31, tarsus 33. Leg IV: femur 0, patella 0, tibia 10 (r1), metatarsus 22, tarsus 30. — *Abdomen.* Posterior lateral spinnerets with apical segment moderately long. Lengths: total 4.48; basal segment 1.70; middle 1.05; apical 1.73. Apical segment width 0.56.

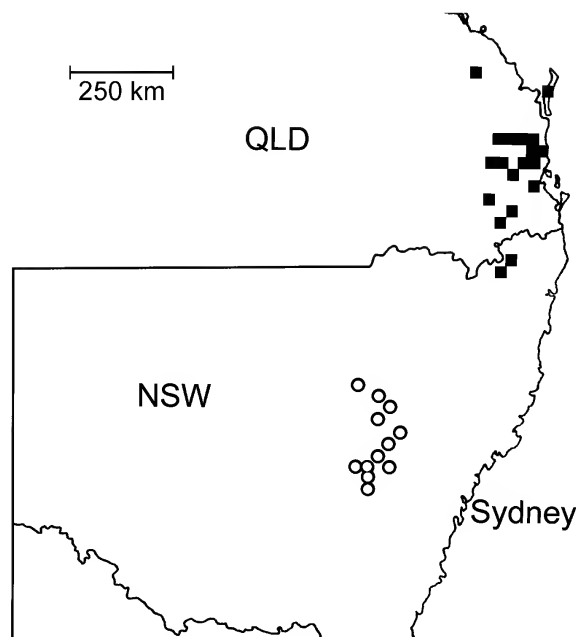


Figure 71. Collection records for *Hadronyche infensa* (squares) and *H. orana* (circles).

Redescription of allotype female. *Size.* Carapace length 11.63, width 10.27. Abdomen length 15.98, width 10.88. —*Colour.* Basic colour pattern. —*Carapace.* Longer than wide, strongly raised. Height 4.76; frontal width 8.77. Cephalic length 8.76. Fovea procurved, narrow. Mid-dorsal cephalic setae numerous, reach back to fovea. Anterior striae setae very few basally. Anterolateral carapace angle with several bristles. —*Eyes.* Eye region sessile or very slightly raised centrally. Eye group width 2.52. Diameters: AME 0.29, ALE 0.58, PLE 0.41, PME 0.26. Interdistances: AME–AME 0.46, AME–ALE 0.31, ALE–PLE 0.29, PLE–PME 0.10, PME–PME 1.22. Median ocular quadrangle length 0.97, anterior width 1.09, posterior width 1.70. —*Chelicerae.* Cheliceral groove moderately wide, margins diverging distally. Groove length 3.40, middle width 0.82. Cheliceral teeth: 67 central, in several rows, occupying full length of groove; 15 prolateral; 12 retrolateral. —*Labium.* Slightly wider than long. Length 2.31, width 2.52. Anterior margin weakly indented. Cuspules spread in broad v-shape over anterior three quarters of labium. —*Sternum.* Ovoid. Length 5.44, width 4.22. Posterior sigilla moderately small, elongate: length 0.68, width 0.27. —*Palp.* Spination: tibia 4, tarsus 8. Trichobothria: tibia p8 r7, tarsus 7. Tarsal claw with 7 teeth. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.30	4.69	6.12	4.86	3.06	27.03
2	7.45	4.52	5.44	4.59	2.89	23.89
3	6.43	3.64	4.49	4.59	3.06	22.21
4	8.23	4.42	5.98	5.66	3.40	27.69

Tibia I width 2.07. Metatarsus I proximal width 1.43. Coxae I, II with basally thickened setae anteriorly. Tarsal claw teeth legs I, II: superior 10, 10; inferior 4, 4. Trichobothria legs I, II: tarsus 12, 12; metatarsus 16, 14; tibia p8 r7, p7 r7. —*Leg spination.* Leg I: femur 0, patella 0, tibia 3, metatarsus 11, tarsus 7. Leg II: femur 0, patella p1, tibia 2, metatarsus 12, tarsus 9. Leg III: femur 0, patella pd8, tibia 6 (p2 r1), metatarsus 18 (p6 rd2), tarsus 12. Leg IV: femur 0, patella 0,

tibia 4 (r1), metatarsus 15, tarsus 13. —*Abdomen.* Posterior lateral spinnerets with slender apical segment of moderate length. Lengths: total 4.28; basal segment 1.70, middle 0.88, apical 1.60. Apical segment width 0.65. —*Genitalia.* Spermathecae digitiform, usually elongate. Length 1.41, width 0.44.

Distribution. Southeastern Queensland to upper north-eastern New South Wales (Fig. 71).

Hadronyche orana n.sp.

Figures 71–74; Tables 21, 34

Etymology. The specific epithet refers to the Orana region of New South Wales, part of the distribution of this species.

Types. Holotype male: AMS KS7811, Mt. Deba near Coolah, New South Wales, 31°52'S 149°39'E, 1 June 1981, P. Esdaile. Paratypes (AMS). New South Wales. *Males:* AMS KS5288, Hargraves, 32°44'S 149°27'E, 11 May 1980, N. Mattick; AMS KS967, Mandurama, 33°38'S 149°04'E, 20 June 1976, P. Bremner; AMS KS968, Molong, 33°05'S 148°51'E, 12 July 1969, R.H. Keeling; AMS KS5203, Mt. Deba, nr. Coolah, 31°52'S 149°39'E, 8 May 1980, S. Esdaile; AMS KS10974, “Stonehenge” on Cassilis Road, Mudgee area, 3 May 1983, E.H. Elward; AMS KS7563, Warrumbungle Mtns., 31°19'S 149°00'E, 10 November 1981, C. Martin. *Females:* AMS KS1071, “Hill Top” near Hargraves, 32°44'S 149°27'E, 30 June 1978, N. Mattick; AMS KS4053, Binnaway, 31°33'S 149°23'E, September 1979, R. England; AMS KS4476, Dunedoo area, 32°00'S 149°23'E, 15 January 1980; AMS KS3429, Hargraves, 32°44'S 149°27'E, 18 May 1979; AMS KS8593, Mudgee, 32°34'S 149°35'E, 4 January 1982, P. Schiemer; AMS KS977, Warrumbungle Mtns, 23°19'S 149°00'E, 3 April 1967; AMS KS5980, Munghorn Gap Nature Reserve, nr. Mudgee, 32°24'S 149°47'E, 21 August 1980, M. Gray & C. Horseman.

Other material examined. **New South Wales (males):** AMS KS8793, Borenore, nr. Orange, December 1981, G. Scarvell; AMS KS7691, Clergate, 15 May 1981; AMS KS964, Hargraves, 10 October 1977, J. Sibley; AMS KS2963, Hargraves, May 1979, Gillman; AMS KS965, Hargraves area, 22 October 1977, L.M. Mattick; AMS KS960, Mudgee, December 1977, M.P.P.B.; AMS KS961, Mudgee, 23 November 1973, M.P.P.B.; AMS KS10975, Mudgee, 5 May 1983; AMS KS976, “Tara”, Warrumbungle Mountains, 28 November 1977, E. Edmonson; AMS KS966, Orange district, AMS KS14262, Siding Springs in Warrumbungle Mountains, Apr 1984, D. Rowell. **New South Wales (females):** AMS KS8746, Hargraves, January 1982; AMS KS978, Warrumbungle Mountains; AMS KS6219, Munghorn Gap Nature Reserve, nr. Mudgee, 21 August 1980, M. Gray & C. Horseman.

Diagnosis. CL 7.76–9.72 (male). Differs from *H. levittgreggae* and *H. valida* by having few tibiae II ventral spines (3–7) (Fig. 74D,H); from *H. infensa*, *H. walkeri*, *H. macquariensis*, *H. lynabrae* by having a slender, weakly twisted embolic shaft (EmbmidW/L 0.06) (Fig. 74B,C); and from *H. kaputarensis* by having a long central cheliceral tooth row.

Male (holotype) —*Size.* Carapace length 7.76, width 7.41. Abdomen length 8.04, width 6.57. —*Colour.* Basic colour pattern. —*Carapace.* Slightly longer than wide, cephalic area moderately raised. Height 3.57. Frontal width 5.93. Fovea procurved, anterior margin indented. Mid-dorsal cephalic setae almost reach fovea. Anterior striae setae absent. Anterolateral carapace angle with a few bristles of moderate size. —*Eyes.* Central eye region slightly raised. Eye group width 2.16. Median ocular quadrangle length 0.78, anterior width 1.02, posterior width 1.48. Diameters; AME 0.30, ALE 0.51, PLE 0.36, PME 0.23. —*Chelicerae.* Cheliceral groove of medium width, margins diverging distally.

Table 21. Male morphological data—*Hadronyche orana* (n = 11).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.76–9.72	8.77	Mt1S*	10–16	13	CW/CL	0.93	0.042
CW	7.41–8.87	8.14	Ta1S*	4–10	6	CH/CW	0.48	0.03
CH	3.32–4.48	3.88	Ti2S*	3–7	5	CFW/CL	0.70	0.031
CFW	5.59–6.87	6.13	STC2teeth	10–15	11	CHGW/L	0.21	0.036
ChGL	2.19–2.65	2.35	BulbL	3.21–3.77	3.48	SW/SL	0.81	0.04
ChGW	0.43–0.63	0.50	EmblL	2.19–2.63	2.39	LL/LW	0.90	0.065
ChGCT	11–26	19	BulbW	1.14–1.36	1.23	PLSAPW/L	0.35	0.025
LL	1.29–1.76	1.54	EmbmW	0.14–0.19	0.16	BulbW/EmblL	0.52	0.02
LW	1.60–1.90	1.71	PalpTibL	3.74–4.42	4.06	EmbmW/L*	0.06	0.009
CUSP	246–390	309	PalpTibW	1.59–1.90	1.76	PalpTibW/L	0.43	0.02
SL	4.83–5.74	5.28	PalpTibS	0–1	<1	BulbL/TibL	0.86	0.035
SW	3.96–4.86	4.28	PalpPatS	0	—			
PLSAPW	0.33–0.68	0.55	PalpFemS	0	—			
PLSAPL	1.44–1.86	1.63						
Fe1S	0	—						
Pa1S	0–1p	(<<1)						

Groove length 2.19, middle width 0.54. Cheliceral teeth: 18 central, occupying full length of groove; 8 prolateral; 9 retrolateral. —*Labium*. Wider than long, with long hairs laterally. Weakly indented apically. Length 1.32, width 1.60. Shallowly grooved behind cuspules. Labiosternal sigilla entire. Cuspules c. 309, number moderate to high. —*Sternum*. Ovoid. Length 5.00, width 4.02. Posterior sigilla ovoid, elongate. —*Palp*. Tegular area a little wider than long. Embolus shaft long, slender, weakly tapering distally, gently

curved. Distal embolus slender, only slightly twisted, flange elongate. Basal embolus strongly offset from tegulum. Bulb length 3.57, width 1.24. Embolus length 2.55, midwidth 0.17. Length of femur 4.04, patella 1.93, tibia 4.22. Width of tibia 1.77. Spination: spines absent; weak sinuous bristles on distal femur. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.01	3.35	5.19	4.98	3.13	23.66
2	6.44	3.20	4.90	5.00	3.24	22.58
3	5.63	2.75	4.02	5.16	3.62	21.88
4	7.22	3.18	5.36	6.55	4.22	26.53

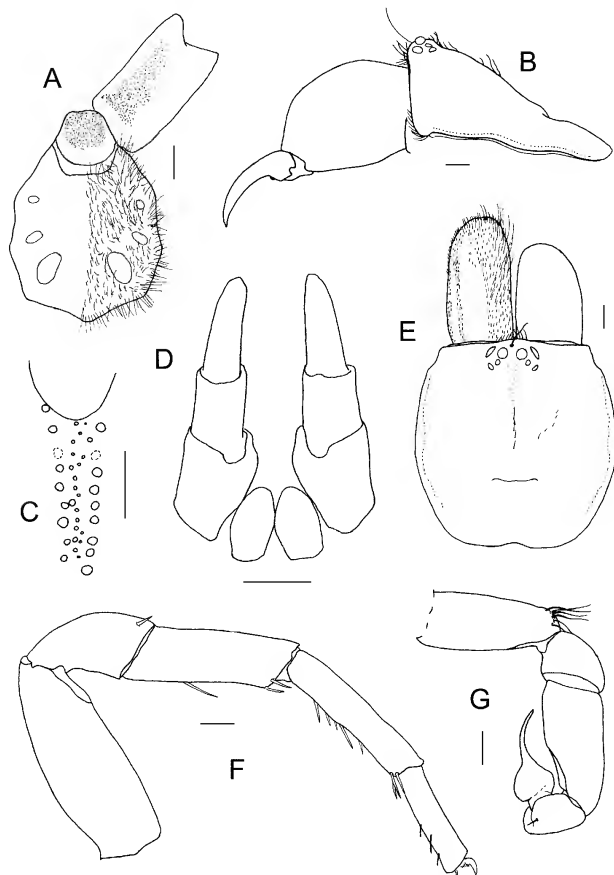


Figure 72. *Hadronyche orana*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg III, prolateral, patella, tibia, metatarsus; (D) cephalothorax and chelicerae, dorsal; (E) spermathecae; (F) cheliceral groove teeth; (G) leg II, prolateral; (G) palp, prolateral. Scale lines 1 mm.

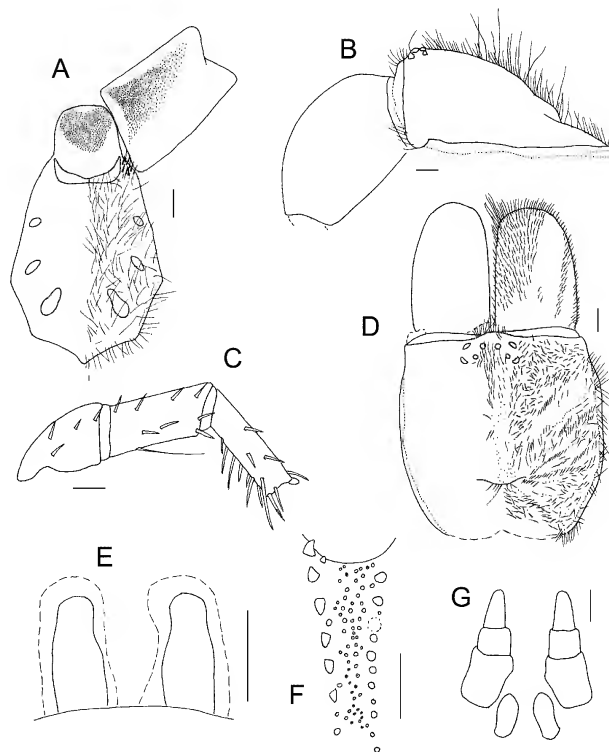


Figure 73. *Hadronyche orana*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) leg III, prolateral, patella, tibia, metatarsus; (D) cephalothorax and chelicerae, dorsal; (E) spermathecae; (F) cheliceral groove teeth; (G) spinnerets. Scale lines 1 mm.

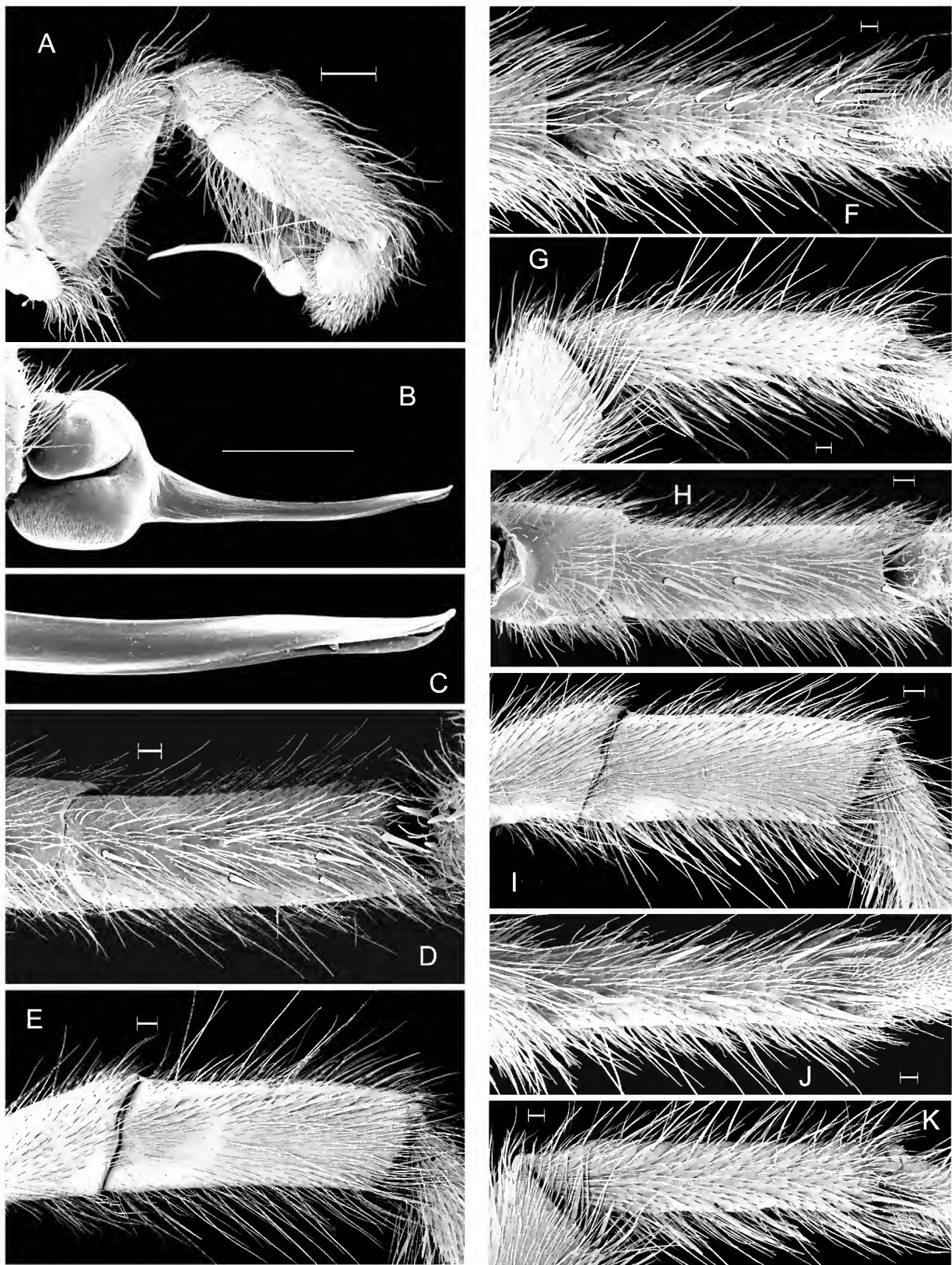


Figure 74. *Hadronyche orana*, male (A,D–K, AMS KS960; B,C, AMS KS5203): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.2 mm, except A,B 1.0 mm and D,E,H,I 0.3 mm.

Tibia I width 1.48. Femora I and II lacking dorsal spines. Metatarsus I slightly thickened proximally. *Tibia II* and metatarsus II unmodified. *Tibia I* and II with few ventral spines, scattered. Tarsus I, II with few spines. Anterior coxal hairs normal. Tarsal scopulae: legs I, II weak; legs III, IV moderate to strongly developed. Distal metatarsal scopulae: legs I, II absent; legs III, IV moderate. Tarsal claw teeth legs I, II: superior 10, 10; inferior 4, 4. Trichobothria legs I, II: tarsus 13, 11; metatarsus 15, 14; tibia p7 r7, p7 r7. —*Leg spination*. Leg I: femur 0, patella 0, tibia 6, metatarsus 13, tarsus 6. Leg II: femur 0, patella p1, tibia 3, metatarsus 11, tarsus 9. Leg III: femur 0, patella p3, tibia 10 (p1 r2), metatarsus 23, tarsus 15. Leg IV: femur 0, patella 0, tibia 4 (r2), metatarsus 19, tarsus 21. —*Abdomen*. Posterior lateral spinnerets with apical segment of moderate length. Lengths: total 4.65; basal segment 1.68, middle 1.35, apical 1.62. Apical segment width 0.59.

Female (paratype AMS KS2071) —*Size*. Carapace length 8.57, width 8.67. Abdomen length 14.21, width 11.22. —*Colour*. Basic colour pattern. —*Carapace*. About as long as wide, cephalic area strongly raised. Height 3.85; frontal width 7.99. Cephalic length 7.11. Fovea procurved. Mid-dorsal cephalic setae numerous, extend back to fovea. Anterior strial setae numerous. Strial, cephalic and marginal setae numerous. Anterolateral carapace angle with several weak bristles. —*Eyes*. Central eye region slightly raised. Eye group width 2.52. Diameters: AME 0.31, ALE 0.60, PLE 0.41, PME 0.31. Interdistances: AME–AME 0.44, AME–ALE 0.31, ALE–PLE 0.28, PLE–PME 0.16, PME–PME 1.09. Median ocular quadrangle length 0.80, anterior width 1.02, posterior width 1.67. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 3.06, middle width 0.75. Cheliceral teeth: 64 central occupying full length of groove in 2–3 irregular rows; 11 prolateral; 10 retrolateral. —*Labium*. As long as wide, anterior margin not indented. Length 2.10, width 2.12. Cuspules occupying anterior half of labium. Labiosternal sigilla entire, narrowed centrally. —*Sternum*. Ovoid, strongly convex. Length 6.24, width 4.82. A few strong bristle-like setae grouped at anterolateral corners. Posterior sternal sigilla elongate: length 1.02, width 0.44. —*Palp*. Spination: tibia 5, tarsus 11. Trichobothria: tibia p7 r7, tarsus 14. Tarsal claws with 7 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.75	3.77	5.30	4.39	2.58	22.79
2	6.19	3.40	4.76	4.08	2.65	21.08
3	5.44	3.13	3.74	4.01	2.82	19.14
4	6.90	3.67	5.20	4.92	2.92	23.61

Tibia I width 1.60. Metatarsus I proximal width 1.05. Coxae I, II with thorn-like setae frontally. Tarsal claw teeth legs I, II: superior 10–11, 10; inferior 5, 4. Trichobothria legs I, II: tarsus 15, 14; metatarsus 15, 14; tibia p7 r7, p8 r8. —*Leg spination*. Leg I: femur 0, patella 0, tibia 4, metatarsus 12, tarsus 9. Leg II: femur 0, patella p1, tibia 4 (p1), metatarsus 13, tarsus 10. Leg III: femur 0, patella p6 r1, tibia 12 (p5 r2), metatarsus 23 (p3 r3), tarsus 14. Leg IV: femur 0, patella 0, tibia 5 (r1), metatarsus 18, tarsus 24. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths; total 3.74; basal segment 1.60, middle 0.95, apical 1.36. Apical segment width 0.82. —*Genitalia*. Spermathecae short, apical third narrower than basal two thirds. Length 1.02, width 0.48.

Distribution. Western Great Dividing Range from the Warrumbungles Range south to the Mudgee region, New South Wales (Fig. 71).

Hadronyche valida (Rainbow & Pulleine)

Figures 75–78; Tables 22, 34

Atrax valida Rainbow & Pulleine, 1918: 165.

Anepsiada ventricosa Rainbow & Pulleine, 1918: 167.

Gray, 1984: 441 (inferred synonymy as juvenile of *Atrax validus*). First synonymized after Gray in Main, 1985: 42.

Atrax validus.—Main, 1985: 41

Hadronyche valida.—Gray, 1988: 114 (Transferred from *Atrax*).

Types. Holotype female: AMS KS955 (old catalogue number K40961). Tamborine Mountain, Queensland, 27°55'S 153°11'E, 5 October 1912. Paratype females: AMS KS956–9, data as above.

Other material examined. Queensland (males): QMB S163, Binna Burra, Lamington Plateau, November 1973, R.J. Raven; QMB S157, Lamington Plateau, 13 April 1974, R.J. Raven; QMB S390, Lower Albert River, Lamington National Park, 1 November 1975–4 April 1976, G.B. & S.R. Monteith; AMS KS13629, Mount Tamborine, 5 December 1983; QMB S175, Eagle Heights, Mount Tamborine, 17 August 1973, G. Walker; QMB S176, Springbrook, October 1976, J. Mainwaring; QMB S381, Tamborine North, 26 March 1979, J. Aagaad; AMS KS988, Tyalgum, 7 January 1972, H.G. Suttolk; AMS KS989, Tunttable Falls, January 1975, McGovern; QMB S164, Warrie National Park, Lamington Plateau, 15 November 1971, Balwin. **New South Wales (males)**: AMS KS13539, Huonbrook, 5 December 1983, G. Watson; AMS KS987, Jiggi, November 1962, F.J. Hartridge; QMB S183, Brindle Creek, nr. Wiangaree, 2 July 1975–15 November 1975, G.B. & S.R. Monteith; AMS KS13500, Coffee Camp, nr. Lismore, 9 December 1983, C. McQueen; QMB S393, Mount Clunie, nr. Woodenbong, 22 February 1976–8 May 1976, G.B. & S.R. Monteith; QMB S391, Mount Warning, 16 November 1975–7 March 1976, G.B. & S.R. Monteith; AMS KS4255, Lismore, 14 December 1979; AMS KS13407, Nimbin, 23 November 1983, A. Frame; AMS KS6824, Mullumbimby, 29 December 1980, W. Dawes; AMS KS2431, Murwillumbah, 11 January 1979, J. Morris; AMS KS22460, Murwillumbah, 28°20'S 153°24'E, 08 Dec 1989, A.W. Tucker.

Diagnosis. CL 8.73–10.61 (male). Differs from *H. infensa*, *H. walkeri*, *H. macquariensis* and *H. lynabrae* by having embolus moderately slender (EmbmidW/L 0.09), weakly curved and twisted (Fig. 77A,B,C); differs from *H. orana* and *H. levittgreggae* by more numerous spines on metatarsus I (23–46) and tibia II (13–25) (Table 22); and from *H. kaputarensis* by presence of long central cheliceral tooth row (Fig. 75G).

Redescription of holotype female. *Size*. Carapace length 10.40, width 9.28. Abdomen length 13.60, width 9.86. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, cephalic area strongly raised. Height 4.83, frontal width 8.33. Cephalic length 7.82. Fovea strongly procurved. Mid-dorsal cephalic setae numerous, reach back to fovea. Anterior strial setae numerous. Strial and marginal setae numerous, weak. Anterolateral carapace angle with many weak bristles. —*Eyes*. Eye region slightly raised centrally. Eye group width 2.92. Diameters: AME 0.36, ALE 0.68, PLE 0.50, PME 0.31. Interdistances: AME–AME 0.42, AME–ALE 0.31, ALE–PLE 0.34, PLE–PME 0.17, PME–PME 1.29. Median ocular quadrangle length 0.95, anterior width 1.22, posterior width 1.93. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 3.16, middle width 0.82. Cheliceral teeth: 43 central, in irregular double row occupying full

Table 22. Male morphological data—*Hadronyche valida* (n = 13).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.73–10.61	9.60	Mt1S	31–56	45	CW/CL	0.91	0.031
CW	7.92–9.57	8.71	Ta1S	23–46	34	CH/CW	0.41	0.025
CH	3.13–3.94	3.58	Ti2S	13–25 (p0–2)	21	CFW/CL	0.64	0.034
CFW	5.61–7.00	6.08	STC2teeth	10–12	11	CHG/W/L	0.19	0.013
ChGL	2.42–2.98	2.64	BulbL	3.59–4.25	4.00	SW/SL	0.76	0.043
ChGW	0.43–0.56	0.50	EmbL	2.49–3.06	2.96	LL/LW	0.93	0.03
ChGCT	11–52	27	BulbW	1.16–1.43	1.26	PLSAPW/L	0.37	0.05
LL	1.36–1.72	1.56	EmbmidW	0.20–0.30	0.26	BulbW/EmbL	0.43	0.053
LW	1.53–1.84	1.67	PalpTibL	4.12–4.86	4.51	EmbmidW/L*	0.09	0.014
CUSP	265–393	325	PalpTibW	1.79–2.13	1.94	PalpTibW/L	0.43	0.029
SL	5.30–6.39	5.58	PalpTibS	0–3	1	BulbL/TibL	0.89	0.035
SW	4.16–4.59	4.24	PalpPatS	0	—			
PLSAPW	0.43–0.72	0.59	PalpFemS	0	—			
PLSAPL	1.36–1.87	1.61						
Fe1S	0	—						
Pa1S	0–2 (p1)	1						

length of groove; 11 prolateral; 9 retrolateral. —*Labium*. Wider than long, anterior margin not indented. Length 2.07, width 2.58. Cuspules occupying anterior two thirds of labium. Labiosternal sigilla narrow, entire. —*Sternum*. Ovoid. Length 6.94, width 5.32. Posterior sternal sigilla elongate: length 1.50, width 0.54. —*Palp*. Spination: tibia 3 (bristle-like), tarsus 9. Trichobothria: tibia p8 r8, tarsus 13. Tarsal claw with 7 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.89	4.76	5.98	4.93	2.85	26.41
2	6.94	4.28	5.61	4.56	2.79	24.18
3	6.53	3.67	4.42	4.59	3.06	22.27
4	7.89	4.66	6.19	5.78	3.50	28.02

Tibia I width 2.01. Metatarsus I proximal width 1.41. Coxae I, II with basally thickened to thorn-like setae anteriorly.

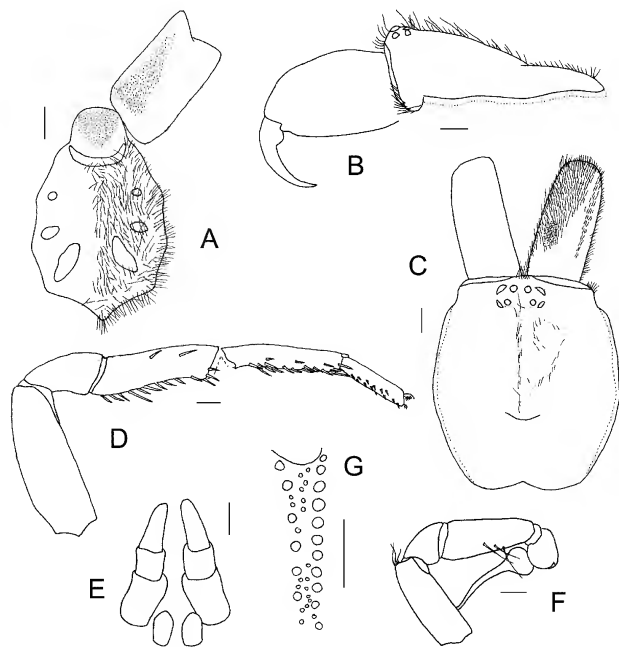


Figure 75. *Hadronyche valida*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cephalothorax and chelicerae, dorsal; (D) leg II, prolateral; (E) spinnerets; (F) palp, prolateral; (G) cheliceral groove teeth. Scale lines 1 mm.

Tarsal claw teeth legs I, II: superior 10, 9; inferior 4, 4. Trichobothria legs I, II: tarsus 12, 12; metatarsus 15, 12; tibia p8 r8, p8 r8. —*Leg spination*. Leg I: femur 0, patella 0, tibia 2, metatarsus 11, tarsus 10. Leg II: femur 0, patella 0, tibia 3, metatarsus 11, tarsus 7. Leg III: femur 0, patella p1, tibia 10 (p3 r3), metatarsus 19 (p2 r1), tarsus 14. Leg IV: femur 0, patella 0, tibia 4 (r2), metatarsus 15, tarsus 20. —*Abdomen*. Posterior lateral spinnerets with apical segment of moderate length. Lengths: total 3.80; basal segment 1.46, middle

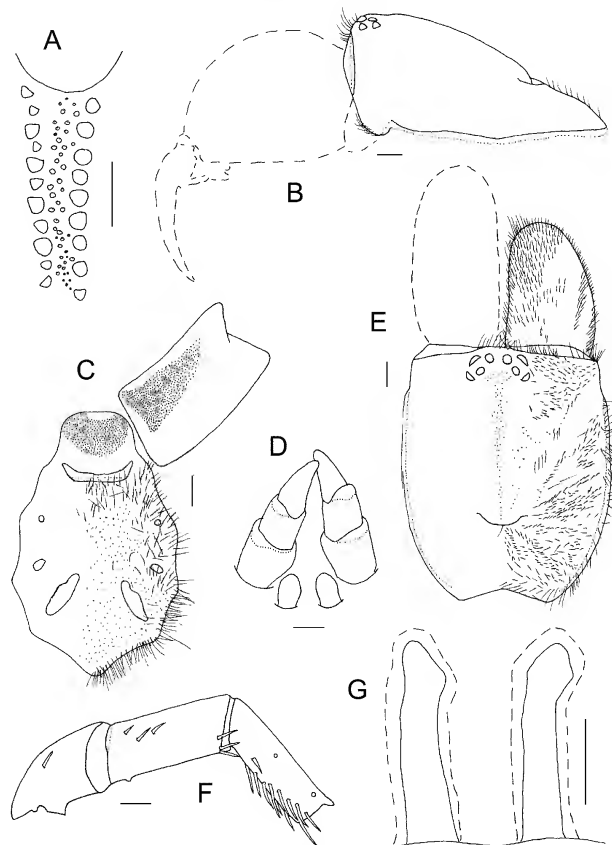


Figure 76. *Hadronyche valida*, female: (A) cheliceral groove teeth; (B) cephalothorax and chelicerae, lateral; (C) sternum, labium and maxilla; (D) spinnerets; (E) cephalothorax and chelicerae, dorsal; (F) leg III, prolateral, patella, tibia, metatarsus; (G) spermathecae. Scale lines 1 mm.

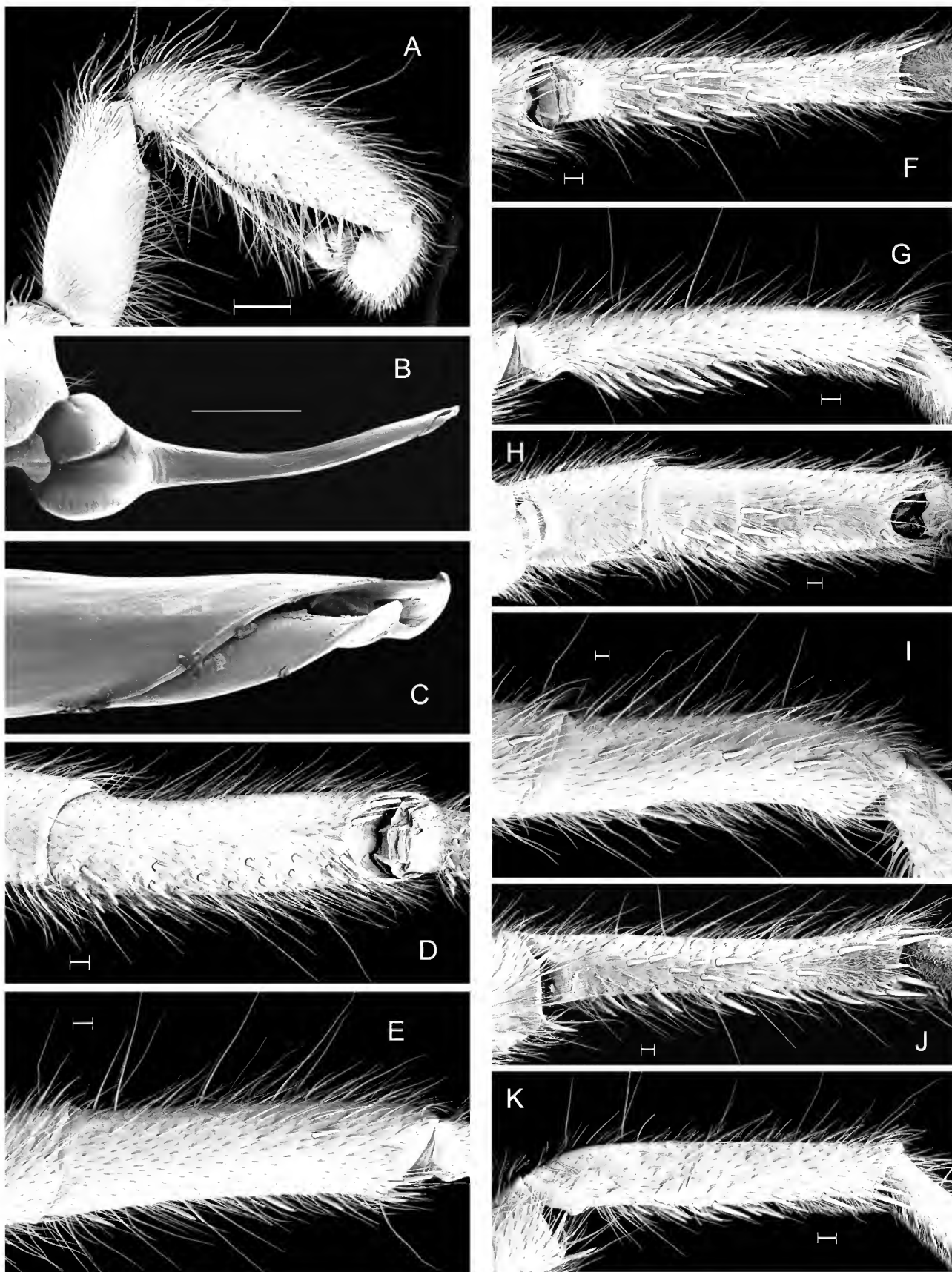


Figure 77. *Hadronyche valida*, male (A, D–K, AMS KS22460; B, C, AMS KS6824): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D, E) distal patella and tibia I—D, ventral, E, prolateral; (F, G) metatarsus I—F, ventral, G, prolateral; (H, I) distal patella and tibia II—H, ventral, I, prolateral; (J, K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except A, B 1.0 mm and I, J 0.2 mm.

0.90, apical 1.43. Apical segment width 0.68. —*Genitalia*. Spermathecae digitiform, long and thin, straight except for apical region which may be angled slightly. Apical quarter of spermathecae slightly enlarged and set off from basal part by a weak constriction. Length 1.71, width 0.48.

Male (S175 (QMB), Eagle Heights, Mt. Tamborine, Queensland, 27°54'S 153°12'E, G. Walker, 17 August 1973). —*Size*. Carapace length 8.72, width 8.12. Abdomen length 9.35, width 7.13. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, moderately raised. Height 3.61. Frontal width 5.70. Fovea procurved. Mid-dorsal cephalic setae reach fovea. Anterior strial setae numerous. Antero-lateral angle of carapace with numerous weak bristles. —*Eyes*. Sessile to slightly raised. Eye group width 2.17. Median ocular quadrangle length 0.86, anterior width 0.96, posterior width 1.38. Diameters: AME 0.33, ALE 0.52, PLE 0.37, PME 0.20. —*Chelicerae*. Dorsal paturon slightly ridged proximally. Cheliceral groove narrow, margins diverging distally. Groove length 2.42, middle width 0.50. Cheliceral teeth: 14 central, running full length of groove; 9 prolateral; 12 retrolateral. —*Labium*. Slightly wider than long. Length 1.60, width 1.69. Labiosternal sigilla normal, complete. Cuspules c. 336, number high. —*Sternum*. Ovoid. Length 5.40, width 4.16. Posterior sigilla large, elongate. —*Palp*. Tegular area wider than long. Embolus long and moderately slender, weakly curved but shaft hardly tapered. Distal embolus weakly to moderately twisted with twisting extended back along shaft as a shallow longitudinal fold. Basal embolus offset from tegulum. Bulb length 3.92, width 1.30. Embolus length 2.88, midwidth 0.27. Length of femur 4.19, patella 1.80, tibia 4.35. Width of tibia 1.80. Spination: tibia with 2–4 bristle-like spines. Sinuous bristles on distal femur weakly developed. —*Legs*. 4213. Legs I, II subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.05	3.69	5.66	5.54	3.20	25.14
2	6.81	3.69	5.90	5.58	3.20	25.38
3	6.35	3.36	4.92	5.54	3.61	23.78
4	7.91	3.85	6.47	6.85	4.22	29.30

Tibia I width 1.48. All femora lack dorsal spines. Metatarsus I weakly thickened proximally, larger ventral spines grouped proximally. Tibia II without apophysis but slightly thickened proximally and weakly excavated distoventrally; spines scattered, largest grouped proximally. Metatarsus II slightly bent at base, no apophysis, spines scattered. Anterior coxal hairs fine, unmodified. Tarsal scopulae weak on legs I, II, strong on legs III, IV. Distal metatarsal scopulae absent to weak legs I, II; moderately strong legs III, IV. Tarsal claw teeth legs I, II: superior 11, 11; inferior 3, 3. Trichobothria legs I, II: tarsus 15, 11; metatarsus 12, 13; tibia p7 r7, p7 r6. —*Leg spination*. Leg I: femur 0, patella p1, tibia 32 (p1), metatarsus 56, tarsus 41. Leg II: femur 0, patella p0, tibia 23 (p2), metatarsus 41, tarsus 29. Leg III: femur 0, patella r1, tibia 13 (p3 r2), metatarsus 31, tarsus 27. Leg IV: femur 0, patella r1, tibia 11 (r4), metatarsus 20, tarsus 34 —*Abdomen*. Posterior lateral spinnerets: apical segment of moderate length. Lengths: total 3.91; basal segment 1.60; middle 0.75; apical 1.56. Apical segment width 0.70.

Distribution. Eastern Border Ranges area of northern New South Wales and southern Queensland (Fig. 78).

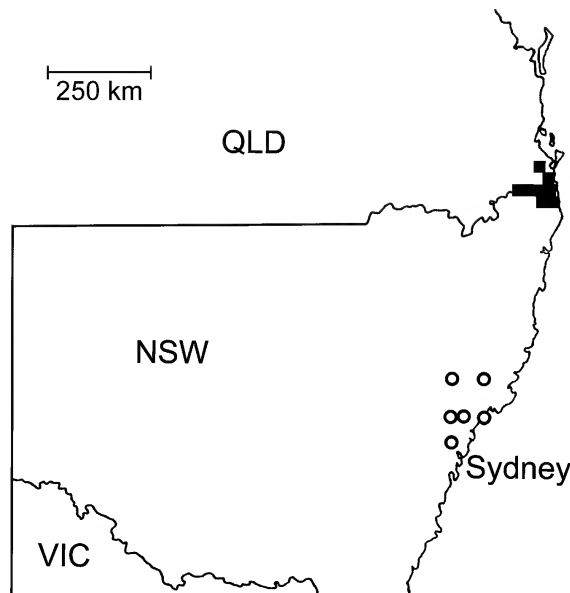


Figure 78. Collection records for *Hadronyche valida* (squares) and *H. lynabrae* (circles).

Hadronyche lynabrae n.sp.

Figures 78–81; Tables 23, 34

Etymology. The species is named for Lyn Abra who sent many funnel-web and other spiders to the Australian Museum while working at the Australian Reptile Park.

Types. Holotype male: AMS KS8379, Wollombi near Maitland, New South Wales, 32°40'S 151°04'E, November 1981. Paratypes (all AM). New South Wales. *Males*: AMS KS13462, Dharug National Park, Mill Creek, 33°21'S 151°05'E, September 1983, G.P. Clancy; AMS KS16449, Dharug National Park, Mill Creek, August 1983, 33°21'S 151°05'E, G.P. Clancy; AMS KS5741, Morriset district, 33°06'S 151°30'E, 24 July 1980; AMS KS1065, Stratford, 32°06'S 151°56'E, 26 June 1956, L. Davenport; AMS KS1066, Newcastle, 32°55'S 151°47'E, 23 May 1955, J. Kennewell; AMS KS1064, Weston, 32°48'S 151°27'E, 7 November 1966. *Females*: AMS KS13463, Mill Creek, Dharug National Park, 33°21'S 151°05'E, August 1983, G.P. Clancy. AMS KS1063, Kurri Kurri, 32°48'S 151°29'E, September 1966, C. Dew.

Diagnosis. CL 7.68–8.20 (male). Differs from other *infensa* group species by presence of swollen (boat-shaped) tarsi III, IV and strong proximal curvature and distal twisting of embolus (Fig. 81B,C); differs from *lamingtonensis* group spp. by presence of full row of central cheliceral teeth (Fig. 79D) and longer PLS apical segment (Fig. 79C).

Male (holotype) —*Size*. Carapace length 7.73, width 7.46. Abdomen length 8.04, width 6.70. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, cephalic area moderately raised. Height 3.44. Frontal width 5.16. Fovea procurved. Mid-dorsal cephalic setae reach fovea. Anterior strial setae present. Anterolateral carapace angle with several weak bristles. —*Eyes*. Central eye region slightly raised. Eye group width 1.92. Median ocular quadrangle length 0.74, anterior width 0.96, posterior width 1.34. Diameters: AME 0.31, ALE 0.47, PLE 0.36, PME 0.26. —*Chelicerae*. Cheliceral groove of medium width, margins diverging distally. Groove length 2.72, middle width 0.42. Cheliceral teeth: 22 central occupying full length of groove; 11

Table 23. Male morphological data—*Hadronyche lynabrae* (n = 6).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.68–8.20	7.79	Mt1S	13–29	22	CW/CL	0.94	0.038
CW	6.80–7.88	7.35	Ta1S	11–24	18	CH/CW	0.45	0.019
CH	3.06–3.44	3.29	Ti2S*	8–13	11	CFW/CL	0.70	0.04
CFW	5.10–6.12	5.45	STC2teeth	10–13	11	CHGW/L	0.16	0.013
ChGL	2.38–2.72	2.52	BulbL	3.13–3.28	3.20	SW/SL	0.76	0.029
ChGW	0.35–0.44	0.41	EmblL	2.28–2.38	2.32	LL/LW	0.87	0.049
ChGCT	18–23	21	BulbW	1.02–1.16	1.10	PLSAPW/L	0.36	0.035
LL	1.22–1.46	1.32	EmbmW	0.24–0.30	0.27	BulbW/EmblL	0.47	0.027
LW	1.33–1.63	1.52	PalpTibL	3.28–3.61	3.38	EmbmW/L	0.12	0.013
CUSP	250–333	283	PalpTibW	1.52–1.70	1.61	PalpTibW/L	0.48	0.015
SL	4.47–4.88	4.68	PalpTibS	0	—	BulbL/TibL*	0.95	0.013
SW	3.24–3.88	3.57	PalpPatS	0–1	1			
PLSAPW	0.36–0.73	0.48	PalpFemS	0–1	1			
PLSAPL	1.04–2.04	1.34						
Fe1S	0							
Pa1S	0–3 (p0–1)	1						

prolateral; 11 retrolateral. —*Labium*. A little wider than long, apical indentation weak to absent. Length 1.31, width 1.52. Labiosternal sigilla narrowed toward midline. Cuspules c. 316, number moderate-high. —*Sternum*. Ovoid. Length 4.76, width 3.62. Posterior sigilla long, ovoid. —*Palp*. Tegular area small, wider than long. Embolus moderately long; shaft broad and strongly curved proximally, hardly tapered. Distal shaft of embolus very strongly twisted (flange reflexed almost 180°) with twisting extended back along shaft as a deep longitudinal fold. Basal embolus strongly offset from tegulum. Bulb length 3.20, width 1.11. Embolus length 2.32, midwidth 0.29. Length of femur 3.49, patella 1.07, tibia 3.44. Width of tibia 1.64. Spination: femur 1, patella 1, tibia 0; spines bristle-like. Several strong sinuous bristles on distal femur. —*Legs*. 4123.

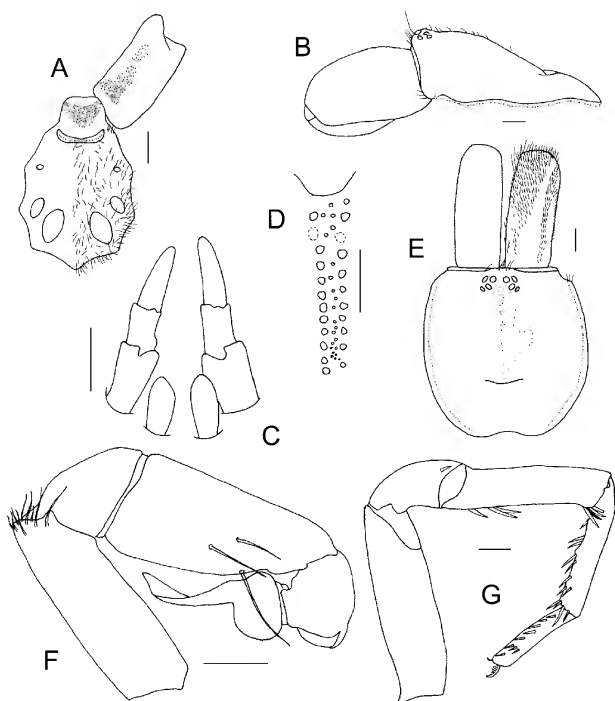


Figure 79. *Hadronyche lynabrae*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) palp, prolateral; (G) leg II, prolateral. Scale lines 1 mm.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.81	3.57	5.33	5.06	2.98	23.75
2	6.36	3.36	5.17	4.82	3.03	22.74
3	5.86	2.65	3.67	4.54	3.45	20.17
4	7.04	3.02	5.09	5.83	4.02	25.00

Tibia I width 1.20. Femora I and II lack dorsal spines. Some anterior setae on coxae I, II thickened basally. Leg I unmodified. Tibia II without apophysis; ventral spines few, with 3–5 grouped proximally. Distoventral tibia slightly

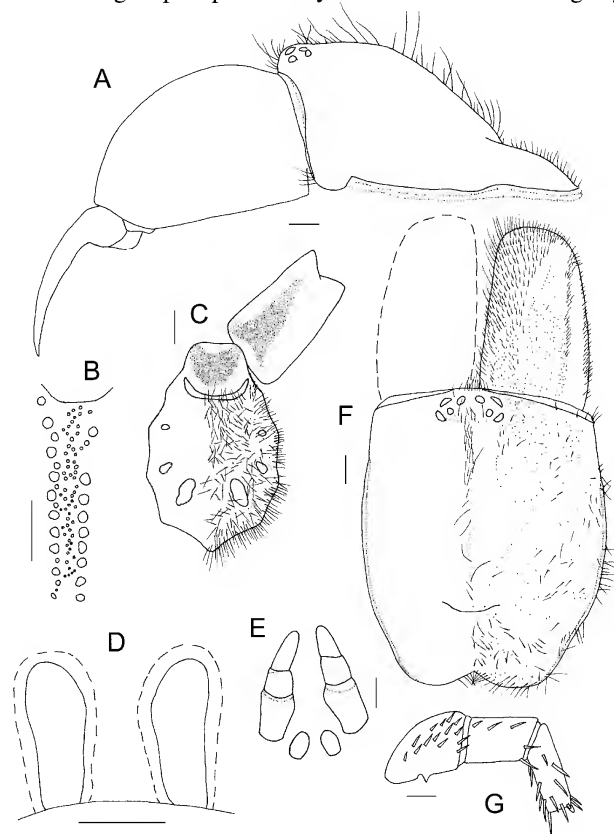


Figure 80. *Hadronyche lynabrae*, female: (A) cephalothorax and chelicerae, lateral; (B) cheliceral groove teeth; (C) sternum, labium and maxilla; (D) spermathecae; (E) spinnerets; (F) cephalothorax and chelicerae, dorsal; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

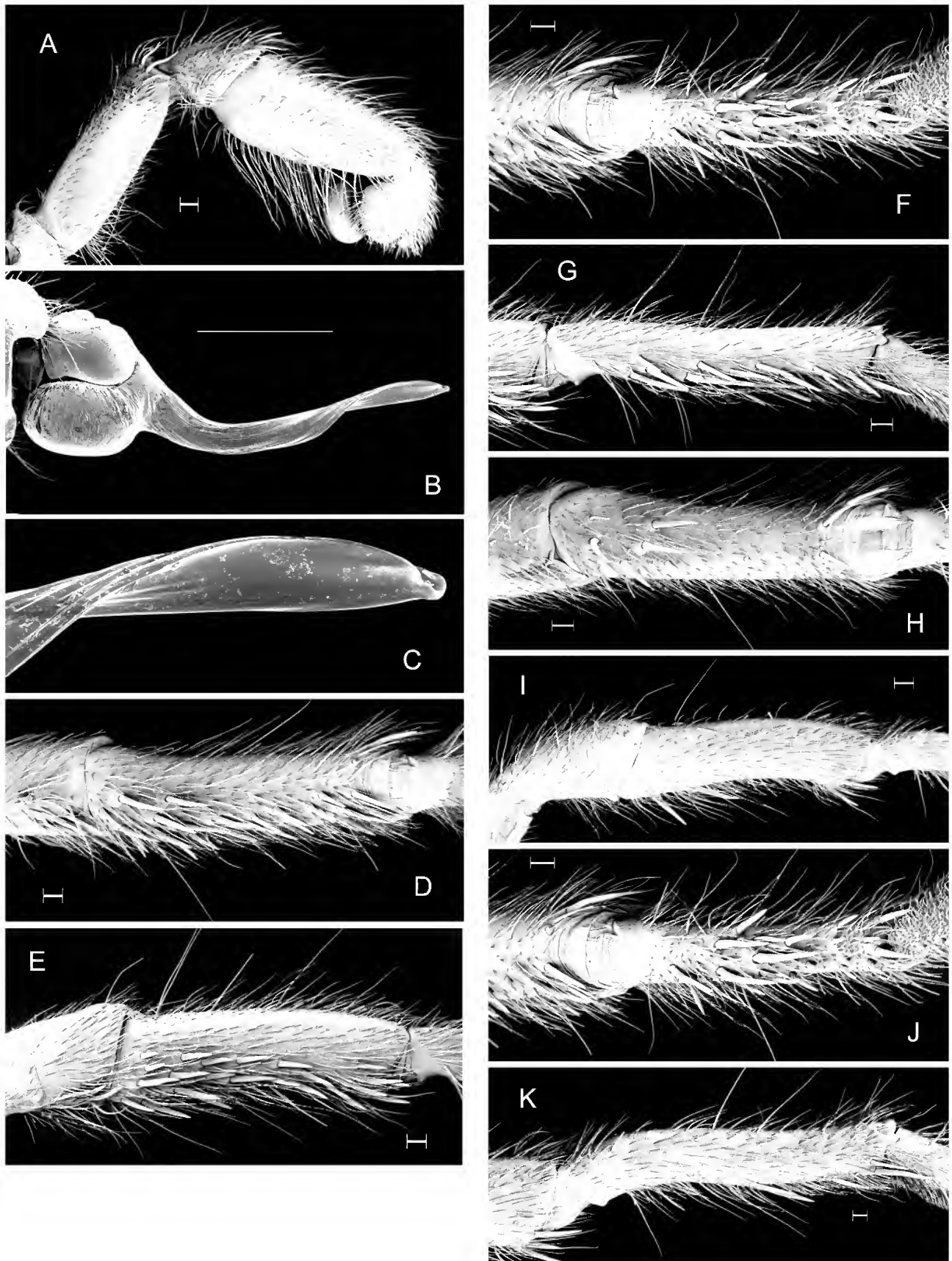


Figure 81. *Hadronyche lynabrae*, male (A,D–K, AMS KS52488; B,C, AMS KS1005): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except B 1.0 mm and K 0.2 mm.

concave. Metatarsus II weakly sinuous to straight. Tarsi III, IV swollen (boat-shaped) and longer than tarsi I, II. Tarsal scopulae: leg I weak; legs II–IV moderate to strong. Distal metatarsal scopulae legs I–IV, absent to weak. Tarsal claw teeth legs I, II: superior 13, 13; inferior 1, 0. Trichobothria legs I, II: tarsus 10, 9; metatarsus 12, 11; tibia p7 r7, p6 r7. —*Leg spination*. Leg I: femur 0, patella 2 (p1 v1), tibia 23, metatarsus 29, tarsus 24. Leg II: femur 0, patella p1, tibia 13, metatarsus 23, tarsus 23. Leg III: femur 0, patella 15 (p14 r1), tibia 12 (p1 r2), metatarsus 23, tarsus 18. Leg IV: femur 0 (strong bristles), patella 0, tibia 9 (r2), metatarsus 14, tarsus 27. —*Abdomen*. Posterior lateral spinnerets with apical segment of moderate length. Lengths: total 2.90; basal segment 1.10; middle 0.60; apical 1.20. Apical segment width 0.36.

Female (paratype AMS KS13463) —*Size*. Carapace length 9.45, width 8.18. Abdomen length 13.60, width 10.20. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, strongly raised. Height 4.49; frontal width 7.41. Cephalic length 7.28. Fovea procurved. Mid-dorsal cephalic setae reach fovea. Anterior striae setae present. Anterolateral carapace angle with few bristles. —*Eyes*. Central eye region slightly raised. Eye group width 2.18. Diameters: AME 0.27, ALE 0.47, PLE 0.37, PME 0.22. Interdistances: AME–AME 0.32, AME–ALE 0.37, ALE–PLE 0.27, PLE–PME 0.13, PME–PME 1.09. Median ocular quadrangle length 0.68, anterior width 0.86, posterior width 1.52. —*Chelicerae*. Cheliceral groove margins diverge weakly distally. Groove length 3.26, middle width 0.67. Cheliceral teeth: 58 central occupying full length of groove; 16 prolateral; 11 retrolateral. —*Labium*. Wider than long, apical indentation weak to absent. Length 1.73, width 2.13. Cuspules distributed in a broad V-shape over central labium. Labiosternal sigilla entire. —*Sternum*. Ovoid. Length 6.02, width 4.42. Posterior sternal sigilla ovoid to elongate; length 1.05, width 0.51. —*Palp*. Spination: tibia 2 (bristle-like), tarsus 5. Tarsal claw with 4 teeth. Trichobothria: tibia p6 r6, tarsus 10. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.56	3.88	4.59	3.67	2.11	20.81
2	5.64	3.62	3.94	3.23	2.14	18.57
3	4.96	2.89	3.06	3.11	2.65	16.67
4	6.44	3.57	4.28	4.42	3.16	21.87

Tibia I width 1.50. Metatarsus I proximal width 1.03. Coxa I with a few thorn shaped setae frontally. Legs I, II with few spines. Tarsal claw teeth legs I, II: superior 6, 6; inferior 2 (small), 0. Trichobothria legs I, II: tarsus 10, 10; metatarsus 12, 10; tibia p7 r7, p6 r7. —*Leg spination*. Leg I: femur 0, patella 0, tibia 0, metatarsus 5, tarsus 6. Leg II: femur 0, patella 0, tibia 0, metatarsus 5, tarsus 7. Leg III: femur 0, patella p14, tibia 8 (p3 r2), metatarsus 16 (p6 r2), tarsus 14. Leg IV: femur 0, patella 0, tibia 2, metatarsus 15, tarsus 29. —*Abdomen*. Posterior lateral spinnerets with apical segment of moderate length. Lengths: total 3.89; basal segment 1.70, middle 0.85, apical 1.33. Apical segment width 0.61. —*Genitalia*. Spermathecae widen markedly towards apices; narrow bases well separated by c. 1.5× spermatheca width. Spermatheca length 1.50, width 0.73.

Distribution. From the Hawkesbury River region near Sydney, north to the southeastern foothills of the Barrington Tops massif, New South Wales (Fig. 78).

Hadronyche kaputarensis n.sp.

Figures 82, 83; Table 24

Etymology. The specific epithet is taken from Mount Kaputar, the type locality.

Types. Holotype male: AMS KS1378, Mount Kaputar National Park, New South Wales, 30°11'S 150°09'E, R. Cronin, November–December 1977.

Diagnosis. CL 9.72 (male). Differs from other *infensa* group species by having the central tooth row of cheliceral groove short and basal (Fig. 82D) and male femora I, II with a dorsal row of bristles (Fig. 82F).

Male (holotype) —*Size*. Carapace length 9.72, width 8.97. Abdomen length 10.40, width 7.96. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, cephalic area moderately raised. Height 4.14, frontal width 6.49. Fovea procurved. Mid-dorsal cephalic setae stop short of fovea. Anterior striae setae absent. Anterolateral carapace angle with moderately strong bristles. —*Eyes*. Central eye region raised. Eye group width 2.12. Median ocular quadrangle length 0.76, anterior width 0.89, posterior width 1.43. Diameters: AME 0.23, ALE 0.39, PLE 0.22, PME 0.12. —*Chelicerae*. Cheliceral groove margins subparallel to slightly divergent distally. Groove length 2.99, middle width 0.48. Cheliceral teeth: 6 central, occupying proximal third of groove; 10 prolateral; 12 retrolateral. —*Labium*. Slightly wider than long, apically very weakly indented. Length 1.68, width 1.75.

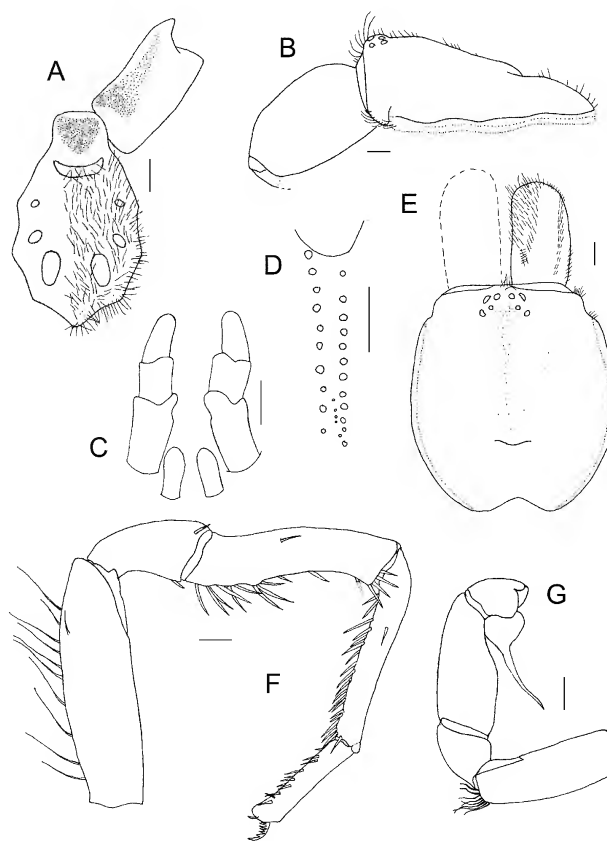


Figure 82. *Hadronyche kaputarensis*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) leg II, prolateral; (G) palp, prolateral. Scale lines 1 mm.

Table 24. Male morphological data—*Hadronyche kaputarensis* (n = 1).

character		character		character	ratio
CL	9.72	Mt1S	40	CW/CL	0.92
CW	8.97	Ta1S	21	CH/CW	0.46
CH	4.14	Ti2S	35 (p1)	CFW/CL	0.67
CFW	6.49	STC2teeth	14	CHGW/L	0.19
ChGL	2.99	BulbL	3.42	SW/SL	0.71
ChGW	0.48	EmbL	2.53	LL/LW	0.96
ChGCT*	7	BulbW	1.22	PLSAPW/L	0.34
LL	1.68	EmbmidW	0.19	BulbW/EmbL	0.48
LW	1.75	PalpTibL	4.49	EmbmidW/L*	0.08
CUSP	254	PalpTibW	1.87	PalpTibW/L	0.42
SL	5.86	PalpTibS	0	BulbL/TibL	0.76
SW	4.15	PalpPatS	0		
PLSAPW	0.57	PalpFemS	0		
PLSAPL	1.68				
Fe1S	0				
Pa1S	7 (p1)				

Labiosternal sigilla entire, broad. Cuspules c. 254, number moderate. —*Sternum*. Ovoid, long. Length 5.86, width 4.15. Posterior sigilla large, ovoid. —*Palp*. Tegular area wider than long. Embolus moderately long and slender, weakly offset from tegulum; shaft gently curved. Distal embolus weakly to moderately twisted. Bulb length 3.42, width 1.22. Embolus length 2.43, midwidth 0.19. Length of femur 4.53, patella 1.97, tibia 4.49. Width of tibia 1.87. Spination: femur 0; patella 0; tibia 2–3 prolateral bristle-like spines. Distal femur with several strong, sinuous bristles. —*Legs*. 4123. Legs I and II subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.32	3.94	6.97	6.43	3.64	29.30
2	8.02	3.88	6.97	6.46	3.74	29.07
3	6.97	3.20	5.47	6.10	3.96	25.70
4	8.64	3.40	7.14	7.73	4.41	31.32

Tibia I width 1.43. Femora I and II without dorsal spines, but with long dorsal bristles; 1–2 small prolateral dorsal or retrolateral spines may be present. Proximal metatarsus I weakly swollen, ventral spines largest proximally. Tibia and metatarsus I with numerous spines. Tibia II without apophysis; with numerous ventral spines, most grouped in

proximal half; ventral tibia gently concave. Metatarsus II weakly sinuous, ventral spines evenly distributed. Coxal setae unmodified. Tarsal scopulae: legs I, II weak; III, IV moderate-strong. Distal metatarsal scopulae: legs I, II absent; III, IV weak-moderate. Tarsal claw teeth legs I, II: superior 14, 14; inferior 2, 2. Trichobothria legs I, II: tarsus 11, 10; metatarsus 11, 11; tibia p5 r5, p6 r6. —*Leg spination*. Leg I: femur p1–2, patella 7 (p1 v6), tibia 65 (p1), metatarsus 40, tarsus 21. Leg II: femur p1r1, patella 2 (p1), tibia 35 (p1), metatarsus 33, tarsus 24. Leg III: Femur 0 (long, strong bristle), patella p4, tibia 20 (p5 r5), metatarsus 33, tarsus 21. Leg IV: Femur 0 (long bristle), patella 0, tibia 11 (r3), metatarsus 25, tarsus 26. —*Abdomen*. Posterior lateral spinnerets with apical segment of moderate length. Lengths: total 4.23; basal segment 1.53; middle 1.02; apical 1.68. Apical segment width 0.57.

Distribution. Known only from the type locality (Fig. 83).

Hadronyche macquariensis n.sp.

Figures 83–86; Tables 25, 34

Etymology. The specific epithet refers to the Port Macquarie region of New South Wales, where this species is common.

Types. Holotype male: AMS KS1315, Taree, New South Wales, 31°54'S 152°27'E, 31 January 1978. Paratypes (all AM). New South Wales. *Males*: AMS KS836, Bellingen, 30°26'S 152°54'E, 10 October 1948, G.H. Hewitt; AMS KS4515, Burgess Beach, near Forster, 32°11'S 152°32'E, 15 January 1980, G. Sanders; AMS KS832, Taree, 31°54'S 152°27'E, 21 February 1974; AMS KS838, Timmsvale, 30°12'S 152°52'E, February 1956, H.J. Stokes; AMS KS13531, Coffs Harbour, 30°18'S 153°07'E, 19 December 1983, C.S. Martin; AMS KS829, Pt. Macquarie, 31°25'S 152°55'E, 26 December 1960, D.H. Thomson. *Females*: AMS KS1165, Port Macquarie, 31°25'S 152°55'E, 28 April 1954, C.M. Edwards; AMS KS7565, Allyn River, 10 December 1980, G. Anderson; AMS KS13589, Coffs Harbour, 7 December 1983; AMS KS13351, Gloucester, 31°59'S 151°58'E, September 1983, A. D'Ombrain; AMS KS8775, Kerewong State Forest, nr. Taree, 31°35'S 152°33'E, 28 March 1982, H. Parnaby; AMS KS834, Pt. Macquarie, 31°25'S 152°55'E, February 1973; AMS KS3229, Taree, 31°54'S 152°27'E, 10 May 1975.

Other material examined. New South Wales (*males*): AMS KS840, Bellingen, G.H. Hewitt; AMS KS8794, Blackhead, February 1982; AMS KS10797, Bowraville, 28 February 1983, D. Channels; AMS KS833, Taree, 4 March 1972, K. Walters; AMS KS6457, Tullymorgan, December 1980, Ambulance Station; AMS KS6827, Wardell, 14 January 1981, M.

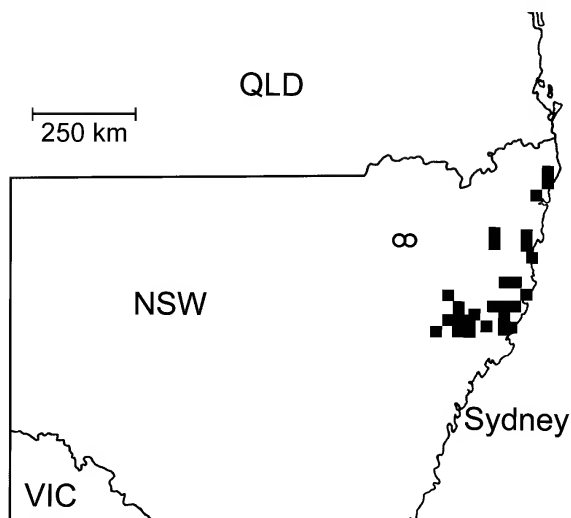


Figure 83. Collection records for *Hadronyche kaputarensis* (circles) and *H. macquariensis* (squares).

Kajewski; AMS KS13591, Woolgoola, near Red Rock, 5 December 1983, J.W. Kramer; AMS KS911, Chatsworth Island, near. Grafton, 20 December 1975, A. Mills; AMS KS13590, Coffs Harbour, 7 December 1983; AMS KS14036, Coffs Harbour, 18 March 1984, C.S. Martin; AMS KS8743, Evans Head, 29 January 1982, V. Bridges; AMS KS10679, Forster, 25 January 1983, A. D'Ombrain; AMS KS839, Halliday's Point, near Manning, 25 February 1976, Manning Council; Boambee, October 1974 (ANIC); AMS KS912, Kororo, March 1965, D.M. Lee; AMS KS837, Kranbach, Wallamba River, 40 km from Taree, 22 March 1959, J. Bidner; AMS KS1111, Lorne State Forest, near Taree, 16 January 1978, D. Milledge; AMS KS1112, Lorne State Forest, near Taree, 17 January 1978, D. Milledge; AMS KS10680, Maclean, 31 December 1982; AMS KS10769, Maclean, 12 October 1982; AMS KS13530, Moonee Beach, near Coffs Harbour, 19 December 1983, C.S. Martini AMS KS13532, Mullaway, near Coffs Harbour, 19 December 1983, C.S. Martin; AMS KS826, Port Macquarie, February 1976, A. Proudman; AMS KS827, Port Macquarie, 5 March 1976; AMS KS13814, Smiths Lake, near Myall Lakes, 16 January 1984, J. Rawle; AMS KS828, Taree, 18 March 1974. **New South Wales (females):** AMS KS5201, Nambucca Heads, 16 May 1980, S. Johnson; AMS KS841, Port Macquarie, February 1955, W. Cleland; AMS KS3227, Taree, 10 May 1975.

Diagnosis. CL 8.74–11.22 (male). Differs from *H. levittgreggae*, *H. valida*, *H. orana* and *H. kaputarensis* by having a shorter, broader embolus (EmbmidW/L 0.16) (Fig. 86B); from *H. infensa* by weak offset of basal embolus from tegulum; from *H. walkeri* by ventral tibia II only weakly concave, and spines loosely grouped (Fig. 86H,I); from *H. lynabrae* by embolus less strongly twisted (Fig. 86B) and tarsus I more strongly spinose (30–63 spines).

Male (holotype) —*Size.* Carapace length 9.32, width 9.04. Abdomen length 11.42, width 8.30. —*Colour.* Basic colour pattern. —*Carapace.* Slightly longer than wide, cephalic area moderately raised. Height 3.57. Frontal width 6.07. Fovea procurved, rather narrow. Mid-dorsal cephalic setae numerous, reach fovea. Anterior striae present. Anterolateral carapace angle with numerous strong bristles.

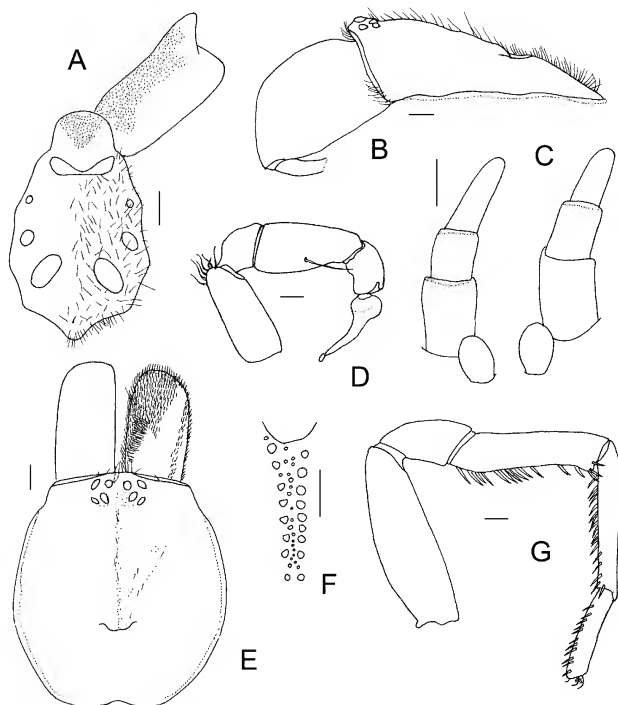


Figure 84. *Hadronyche macquariensis*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) palp, prolateral; (E) cephalothorax and chelicerae, dorsal; (F) cheliceral groove teeth; (G) leg II, prolateral. Scale lines 1 mm.

—*Eyes.* Central eye region raised. Eye group width 2.37. Median ocular quadrangle length 0.93, anterior width 1.16, posterior width 1.64. Diameters: AME 0.33, ALE 0.57, PLE 0.39, PME 0.30. —*Chelicerae.* Dorsal paturon obliquely ridged proximally. Cheliceral groove margins divergent. Groove length 2.93, middle width 0.53. Cheliceral teeth: 18 central, occupying full length of groove; 10 prolateral; 9 retrolateral. —*Labium.* Slightly wider than long, not or weakly apically indented. Length 1.68, width 1.74. Labiosternal sigilla narrowed toward midline. Cuspules c. 274, number moderate-high. —*Sternum.* Ovoid. Length 5.95, width 4.32. Posterior sigilla ovoid, long. —*Palp.* Tegular area wider than long. Embolus of moderate length, base weakly offset from tegulum. Embolus shaft curved, broad and blade-like, not tapered. Distal part of embolus strongly twisted and grooved, apical flange reflexed. Bulb length 3.90, width 1.37. Embolus length 2.80, midwidth 0.40. Length of femur 4.39, patella 1.76, tibia 4.67. Width of tibia 2.21. Spination: none, sinuous bristles on distal femur. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.45	3.85	7.01	6.94	3.80	30.05
2	7.85	4.02	6.97	6.40	3.77	29.01
3	7.41	3.37	5.78	6.83	4.08	27.47
4	8.77	3.77	7.07	8.09	4.49	32.19

Tibia I width 1.43. Femora I and II without spines. Leg I with numerous tibial and metatarsal ventral spines. Metatarsus I slightly thickened proximally, proximal ventral spines largest. Tibia II without apophysis, ventrally weakly concave; ventral spines loosely grouped proximocentrally, fewer spines distally. Metatarsus II unmodified. Coxal hairs unmodified. Tarsal scopulae: legs I, II weak; legs III, IV

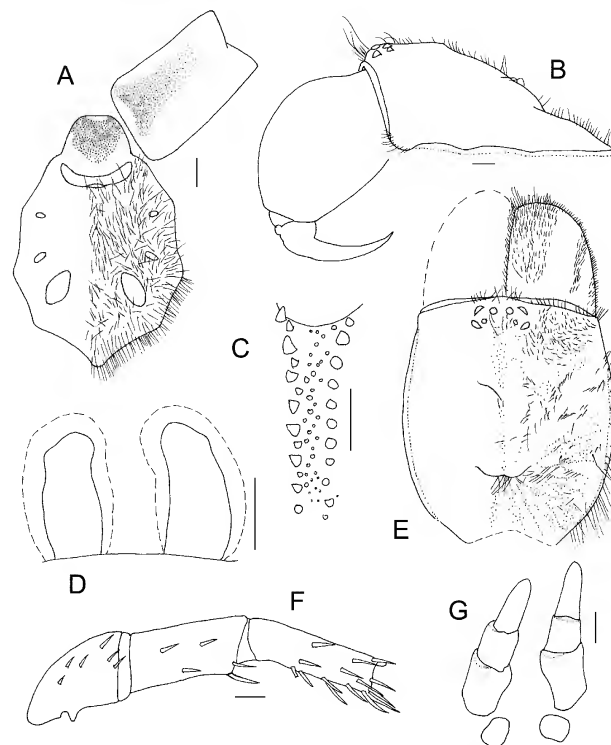


Figure 85. *Hadronyche macquariensis*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) spermathecae; (E) cephalothorax and chelicerae, dorsal; (F) leg III, prolateral, patella, tibia, metatarsus; (G) spinnerets. Scale lines 1 mm.

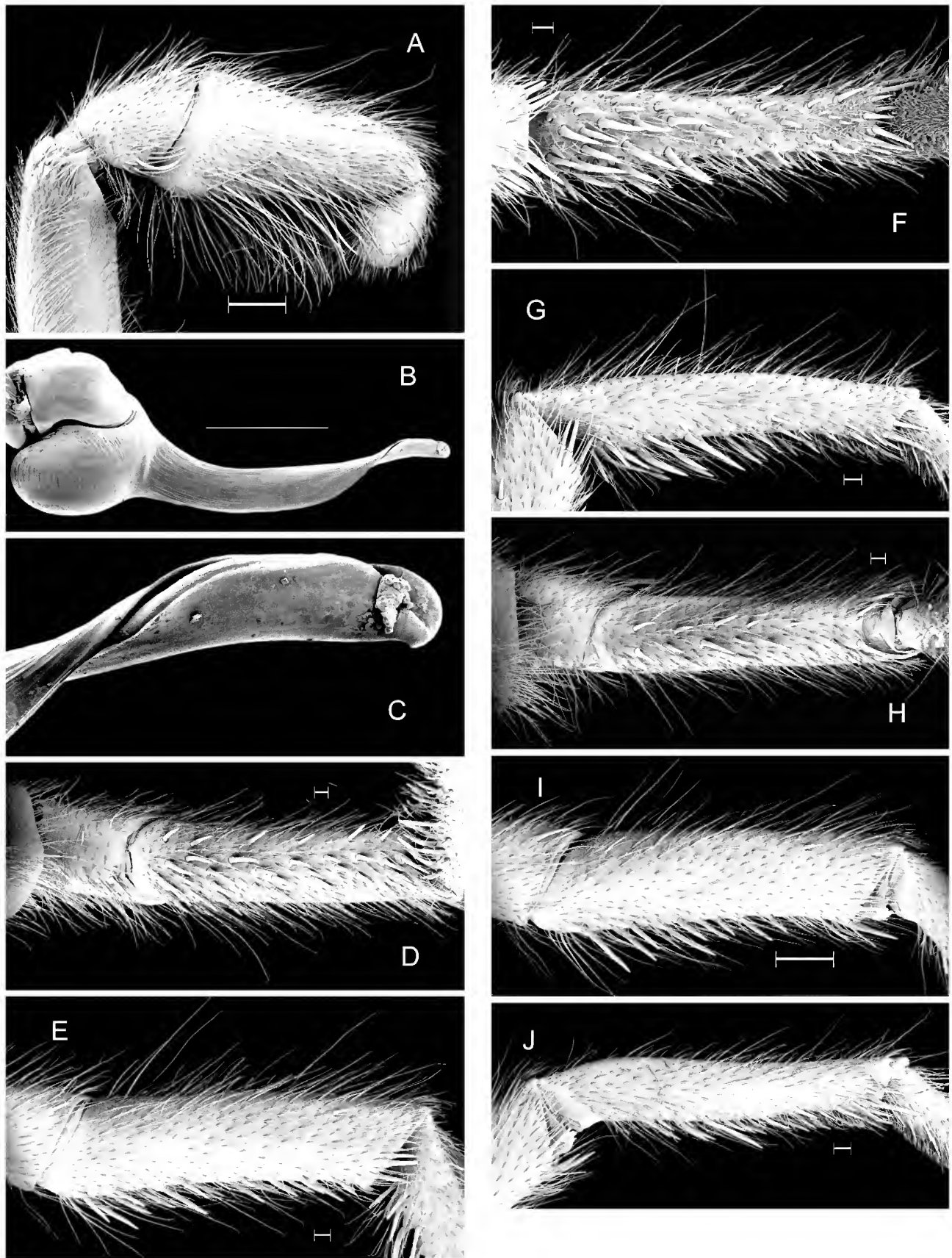


Figure 86. *Hadronyche macquariensis*, male (A, D–J, AMS KS10679; B, C, AMS KS4515): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D, E) distal patella and tibia I—D, ventral, E, prolateral; (F, G) metatarsus I—F, ventral, G, prolateral; (H, I) distal patella and tibia II—H, ventral, I, prolateral; (J), metatarsus II, prolateral. Scale lines: 0.3 mm, except A, B, I 1.0 mm.

Table 25. Male morphological data—*Hadronyche macquariensis* (n = 15).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.74–11.22	9.79	Mt1S	34–76	53	CW/CL	0.92	0.029
CW	8.15–10.09	9.05	Ta1S*	30–63	43	CH/CW	0.42	0.033
CH	3.28–4.51	3.79	Ti2S	7–38 (p0–1)	23	CFW/CL	0.64	0.037
CFW	5.10–6.83	5.99	STC2teeth	10–15	12	CHGW/L	0.18	0.02
ChGL	2.58–3.32	2.82	BulbL	3.26–4.16	3.64	SW/SL	0.77	0.04
ChGW	0.43–0.66	0.51	Embl	2.21–2.80	2.54	LL/LW	0.93	0.038
ChGCT	18–34	25	BulbW	1.22–1.64	1.39	PLSAPW/L	0.32	0.052
LL	1.36–1.96	1.64	EmbmidW	0.33–0.48	0.40	BulbW/Embl	0.55	0.037
LW	1.60–2.06	1.76	PalpTibL	3.85–5.03	4.65	EmbmidW/L*	0.16	0.014
CUSP	231–346	283	PalpTibW	1.93–2.42	2.16	PalpTibW/L	0.46	0.02
SL	5.20–6.33	5.77	PalpTibS	0–3	1.40	BulbL/TibL	0.78	0.035
SW	3.94–4.92	4.47	PalpPatS	0	—			
PLSAPW	0.48–0.88	0.60	PalpFemS	0–2	1			
PLSAPL	1.67–2.36	1.86						
Fe1S	0							
Pa1S	0–13	3						

moderate-strong. Distal metatarsal scopulae: legs I, II absent; legs III, IV moderate. Tarsal claw teeth legs I, II: superior 12, 11; inferior 3, 2. Trichobothria legs I, II: tarsus 14, 13; metatarsus 14, 14; tibia p9 r7, p8 r8. —*Leg spination*. Leg I: femur 0, patella 1, tibia 44, metatarsus 57, tarsus 41. Leg II: femur 0, patella 0, tibia 26, metatarsus 44, tarsus 49. Leg III: femur 0, patella 3, tibia 26, metatarsus 44, tarsus 49. Leg IV: femur 0, (long bristles present), patella 0, tibia 6 (r1), metatarsus 26, tarsus 47. —*Abdomen*. Posterior lateral spinnerets: apical segment moderately long. Lengths: total 5.08, basal segment 1.72; middle 1.15; apical 2.21. Apical segment width 0.71.

Female (paratype AMS KS1165) —*Size*. Carapace length 11.25, width 10.03. Abdomen length 14.80, width 11.80. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, cephalic area strongly raised. Height 5.13; frontal width 8.64. Cephalic length 8.09. Fovea procurved, anterior margin indented. Mid-dorsal cephalic setae numerous, extend back to fovea. Anterior striae setae numerous. Strial and marginal setae numerous. Anterolateral carapace angle with many weak bristles. —*Eyes*. Eye region sessile to weakly raised centrally. Eye group width 2.75. Diameters: AME 0.39, ALE 0.62, PLE 0.54, PME 0.34. Interdistances: AME–AME 0.34, AME–ALE 0.27, ALE–PLE 0.20, PLE–PME 0.10, PME–PME 1.19. Median ocular quadrangle length 0.88, anterior width 1.10, posterior width 1.78. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 3.26, middle width 0.80. Cheliceral teeth: 34 central occupying full length of groove in an irregular double row; 13 prolateral; 11 retrolateral. —*Labium*. Slightly wider than long, anterior margin very weakly indented. Length 2.07, width 2.28. Cuspules occupying anterior three quarters of labium. Labiosternal sigilla entire. —*Sternum*. Ovoid, moderately wide. Length 6.80, width 5.68. Posterior sternal sigilla ovoid: length 1.09, width 0.54. —*Palp*. Spination: tibia 4, tarsus 8. Trichobothria: tibia p6 r7, tarsus 10. Tarsal claws with 6 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	8.09	4.56	6.12	5.17	3.06	27.00
2	7.31	4.08	5.51	4.79	2.92	23.61
3	6.53	3.74	4.39	4.85	3.40	22.91
4	8.19	4.08	5.98	6.09	3.74	28.08

Tibia I width 2.14. Metatarsus I proximal width 1.43. Coxae I, II with setal bases slightly thickened, otherwise unmodified. Tarsal claw teeth legs I, II: superior 9, 9; inferior 3, 3. Trichobothria legs I, II: tarsus 12, 12; metatarsus 12, 12; tibia p8 r8, p9 r8. —*Leg spination*. Leg I: femur 0, patella 0, tibia 2, metatarsus 10, tarsus 6. Leg II: femur 0, patella p1, tibia 4 (p1), metatarsus 14, tarsus 9. Leg III: femur 4 (pd3, rd1) patella 7 (p6 r1), tibia 10 (p3 r2), metatarsus 20 (p6 r2), tarsus 14. Leg IV: femur 0, patella 0, tibia 8 (r2), metatarsus 21, tarsus 24 —*Abdomen*. Sparse cover of weak hairs and bristles. Posterior lateral spinnerets with apical segment of medium length. Lengths: total 4.86; basal segment 2.11, middle 0.88, apical 1.94. Apical segment width 0.82. —*Genitalia*. Spermathecae rather short, broad, separated basally by a spermathecal width. Length 1.43, width 0.75.

Distribution. Mid northeastern region of New South Wales (Fig. 83).

Hadronyche walkeri n.sp.

Figures 87–90; Tables 26, 34

Etymology. The species is named for Mr Pat Walker, North Queensland Naturalist and Photographer.

Types. Holotype male: S389 (QMB). Devils Pinch, north of Armidale, New South Wales, 33°09'S 150°17'E, C. Anderson, 1 February 1979. Paratypes. New South Wales. *Males*: QMB S382 (QMB), Armidale, 30°30'S 151°39'E, 17 May 1979, K. McWilliam. Others all AM: AMS KS936, Ben Lomond, 30°00'S 151°39'E, February 1963, M. Trudgeon; AMS KS943, "Wongwibinda", 48km E. of Guyra, 30°12'S 151°40'E, December 1952, M. Wyndham; AMS KS944, Bullock Creek, Point. Lookout, New England National Park, 30°29'S 152°30'E, 25 November 1969, M. Gray; AMS KS4455, Walcha, 30°58'S 151°35'E, 11 January 1980, C. Easton; AMS KS44614, Guyra, 30°13'S 151°40'E, May 1971, D.I. Clay; AMS KS936, Ben Lomond Public School, 30°01'S 151°40'E, February 1963, M. Trudgeon. *Females*: AMS KS15750, Styx River near Jeogla, 30°35'S 152°08'E, 8 June 1979; AMS KS13805, Ulong, nr. Dorrigo, 30°13'S 152°53'E, January 1980, C. Martin; AMS KS7524, Lower Wattle Flat, Pt. Lookout, New England National Park, 30°29'S 152°30'E, 12 May 1981, G. Hunt; AMS KS14037, Dorrigo, 30°19'S 152°43'E, 18 March 1984, C. Martin.

Other material examined. **New South Wales (males)**: AMS KS937, Ben Lomond, February 1963, M. Trudgeon; QMB S675, Black Mountain, 28 February 1977, Snell; AMS KS940, Glen Innes, February 1952, ? Every; QMB S384, 42 km E. of Guyra, January 1972; AMS KS945, Point. Lookout,

New England National Park, 26 November 1969, M. Gray; QMB S386, "Newholme", near Armidale, 2 February 1974, Jenkins. **New South Wales (females):** AMS KS13596, Dorrigo, 22 December 1983; AMS KS14384, Ulong, nr. Dorrigo, 26 April 1984; AMS KS7525-7, Lower Wattle Flat, Point Lookout area, New England National Park, 12 May 1981, G. Hunt; AMS KS14038, Dorrigo, 18 March 1984, C. Martin.

Diagnosis. CL 7.34–10.54 (male). Differs from *H. infensa* and *H. macquariensis* by tibia II ventrally sinuous/concave with strong ventral spines clustered proximocentrally (Figs. 87G; 89H,I); from *H. infensa* by basal embolus weakly offset from tegulum (Fig. 89B); from *H. lynabrae* by tarsi III, IV not swollen, and embolus less twisted; and from *H. valida*, *H. orana*, *H. kaputarensis* and *H. levittgreggae* by greater width of embolus (EmbmidW/L 0.14) (Fig. 89B).

Male (holotype) —*Size.* Carapace length 8.69, width 8.43. Abdomen length 8.84, width 6.80. —*Colour.* Basic colour pattern. Posterior abdominal chevrons often joined across abdomen. —*Carapace.* A little longer than wide, cephalic area moderately raised. Height 3.63. Frontal width 5.82. Fovea procurved. Mid-dorsal cephalic setae almost reach fovea. Anterior striae few to absent. Anterolateral carapace angle with a few strong bristles. —*Eyes.* Central eye region strongly raised. Eye group width 2.02. Median ocular quadrangle length 0.80, anterior width 0.92, posterior width 1.42. Diameters: AME 0.64, ALE 0.80, PLE 0.62, PME 0.50. —*Chelicerae.* Cheliceral groove margins divergent. Groove length 2.52, middle width 0.46. Cheliceral teeth: 32 central, occupying full length of groove; 13 prolateral; 12 retrolateral. —*Labium.* Slightly wider than long, weakly apically indented. Length 1.68, width 1.72. Labiosternal sigilla entire. Slight transverse groove behind cuspules. Cuspules c. 344, number high. —*Sternum.* Ovoid, long. Length 5.51, width 4.02. Posterior sigilla ovoid, elongate. —*Palp.* Tegular area wider than long. Embolus rather short,

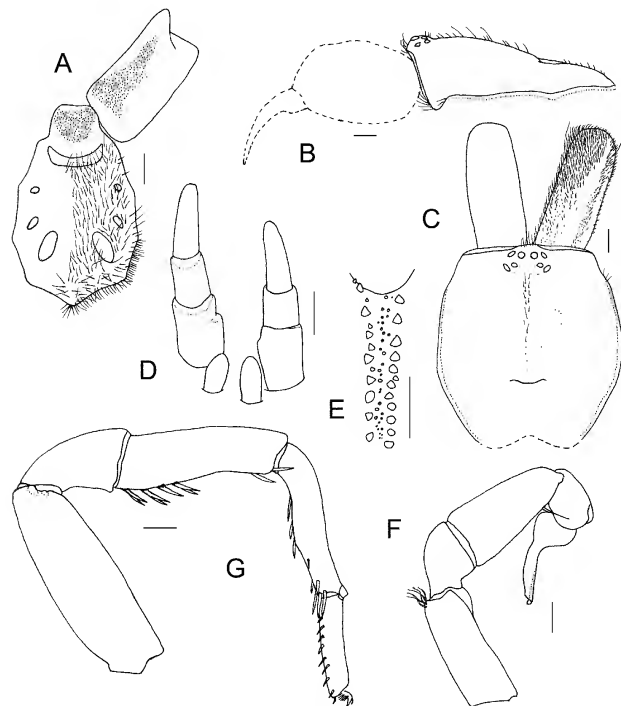


Figure 87. *Hadronyche walkeri*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) cephalothorax and chelicerae, dorsal; (D) spinnerets; (E) cheliceral groove teeth; (F) palp, prolateral; (G) leg II, prolateral. Scale lines 1 mm.

not or very weakly offset from tegulum. Embolus shaft gently curved, broad, not tapered. Distal part of embolus moderately twisted with twisting extended back along shaft as a deep longitudinal fold; distal flange moderately reflexed. Bulb length 3.32, width 1.40. Embolus length 2.28, midwidth 0.39. Length of femur 4.10, patella 1.76, tibia 3.98. Width of tibia 2.08. Spinination: tibia with 2 prolateral bristle like spines, absent elsewhere. Distal femur with several sinuous bristles. —*Legs.* 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.46	3.53	5.78	5.49	3.44	25.70
2	7.01	3.57	5.74	5.33	3.36	25.01
3	6.32	2.99	4.56	5.54	3.67	23.08
4	7.75	3.48	5.77	6.80	4.32	28.12

Tibia I width 1.52. Femora I and II without spines. Metatarsus I slightly thickened proximally, proximal ventral spines largest. *Tibia II* without apophysis, moderately sinuous (concave distoventrally), ventral spines rather large, grouped proximally. Distal *tibia II* concave ventrally, lacking spines (except apically). Metatarsus II weakly sinuous-straight, strong ventral spines centrally. Coxal hairs unmodified. Tarsal scopulae: leg I weak; legs II–IV moderate to strong. Distal metatarsal scopulae: leg I absent; legs II–IV weak to moderate. Tarsal claw teeth legs I, II: superior 12, 12; inferior 2, 2. Trichobothria legs I, II: tarsus 11, 9; metatarsus 15, 14; tibia p8 r7, p8 r8. —*Leg spinination.* Leg I: femur 0, patella 5 (p1), tibia 34, metatarsus 25, tarsus 27. Leg II: femur 0, patella 0, tibia 13, metatarsus 23, tarsus 21. Leg III: femur 0, patella p6, tibia 9 (p2 r2), metatarsus 22, tarsus 22. Leg IV: femur 0 (long bristles present), patella 0, tibia 8

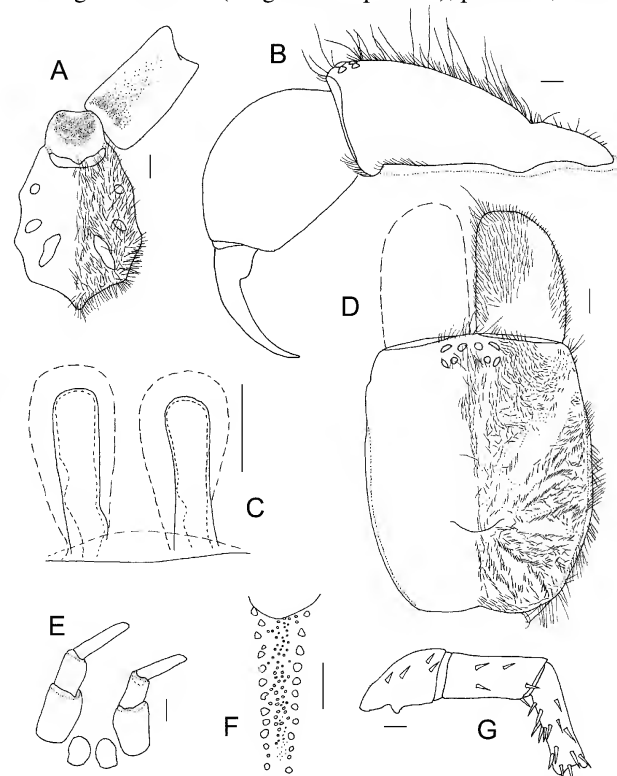


Figure 88. *Hadronyche walkeri*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spermathecae; (D) cephalothorax and chelicerae, dorsal; (E) spinnerets; (F) cheliceral groove teeth; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

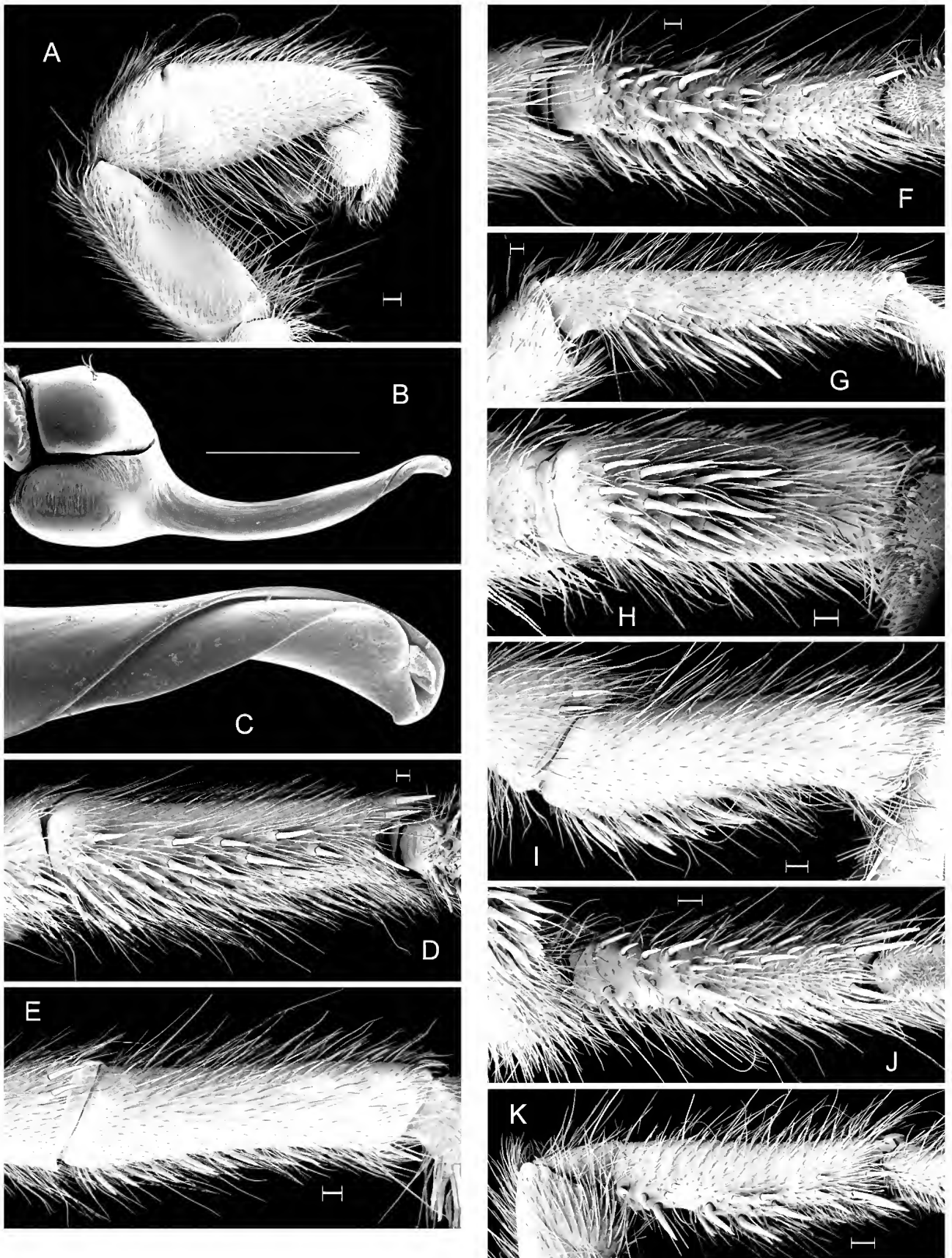


Figure 89. *Hadronyche walkeri*, male. (A,D–K, AMS KS44614; B,C, AMS KS936): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral (image foreshortened), I, prolateral; (J,K) metatarsus II—J, ventral, K, prolateral. Scale lines: 0.3 mm, except B 1.0 mm and D–G 0.2 mm.

Table 26. Male morphological data—*Hadronyche walkeri* (n = 11).

character	range	mean	character	range	mean	character	ratio	SD
CL	7.34–10.54	8.77	Mt1S	23–55	36	CW/CL	0.91	0.032
CW	6.60–9.28	8.01	Ta1S	8–38	21	CH/CW	0.41	0.031
CH	2.91–3.85	3.34	Ti2S	10–29	20	CFW/CW	0.65	0.034
CFW	5.50–6.31	5.65	STC2teeth	10–15	12	CHGW/L	0.17	0.027
ChGL	2.21–2.86	2.50	BulbL	2.63–3.40	3.02	SW/SL	0.77	0.025
ChGW	0.31–0.55	0.42	EmbL	1.76–2.40	2.05	LL/LW	0.92	0.053
ChGCT	5–46	23	BulbW	1.15–1.40	1.25	PLSAPW/L	0.35	0.034
LL	1.11–1.69	1.44	EmbmidW	0.22–0.39	0.27	BulbW/EmbL*	0.62	0.04
LW	1.31–1.72	1.56	PalpTibL	3.28–4.49	3.93	EmbmidW/L*	0.14	0.02
CUSP	144–344	240	PalpTibW	1.72–2.11	1.94	PalpTibW/L	0.49	0.03
SL	4.26–5.83	5.17	PalpTibS	0–2	<1	BulbL/TibL	0.78	0.037
SW	3.37–4.49	4.02	PalpPatS	0	—			
PLSAPW	0.37–0.60	0.49	PalpFemS	0	—			
PLSAPL	1.07–1.70	1.41						
Fe1S	0	—						
Pa1S*	0–13 (p0–2)	6						

(r1), metatarsus 22, tarsus 27 —*Abdomen*. Posterior lateral spinnerets: apical segment moderately long. Lengths: total 4.44; basal segment 1.72, middle 1.04, apical 1.68. Apical segment width 0.60.

Female (paratype AMS KS15750) —*Size*. Carapace length 12.34, width 10.13. Abdomen length 15.30, width 11.70. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, moderately raised. Height 5.24. Frontal width 8.84. Cephalic length 8.67. Fovea strongly procurved. Mid-dorsal cephalic setae numerous, reach fovea. Anterior striae setae numerous. Strial setae well developed. Anterolateral carapace angle with several moderately strong bristles. —*Eyes*. Eye region sessile to weakly raised centrally. Eye group width 2.70. Diameters: AME 0.34, ALE 0.54, PLE 0.55, PME 0.35. Interdistances: AME-AME 0.34, AME-ALE 0.29, ALE-PLE 0.24, PLE-PME 0.14, PME-PME 1.17. Median ocular quadrangle length 0.95, anterior width 1.05, posterior width 1.84. —*Chelicerae*. Cheliceral groove margins diverge distally. Groove length 3.58, middle width 0.82. Cheliceral teeth: 79 central, in two to three rows occupying full length of groove; 15 prolateral; 12 retrolateral. —*Labium*. Almost as long as wide, anterior margin broadly indented. Length 2.43, width 2.68. Cuspules occupying anterior half of labium. Labiosternal sigilla narrowed to divided in midline. —*Sternum*. Ovoid. Length 7.55, width 5.71. Posterior sigilla elongate: length 1.73, width 0.61. —*Palp*. Spination: tibia 6, tarsus 7. Trichobothria: tibia p8 r8, tarsus 14. Tarsal claws with 9 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.46	3.53	5.78	5.49	3.44	25.70
2	7.01	3.57	5.74	5.33	3.36	25.01
3	6.32	2.99	4.56	5.54	3.67	23.08
4	7.75	3.48	5.77	6.80	4.32	28.12

Tibia I width 2.04. Metatarsus I proximal width 1.43. Coxae I, II with frontal setae thickened basally. Tarsal claw teeth legs I, II: superior 12, 11; inferior 4, 4. Trichobothria legs I, II: tarsus 15, 16; metatarsus 20, 20; tibia p7 r8, p9 r10. —*Leg spination*. Leg I: femur 0, patella 0, tibia 4, metatarsus 14, tarsus 8. Leg II: femur 0, patella 0, tibia 7, metatarsus 16, tarsus 9. Leg III: femur 0, patella pd4, tibia 7 (p2 r2), metatarsus 25 (pd4 rd3) tarsus 18. Leg IV: femur 0, patella 0, tibia 6 (r2), metatarsus 18 (r1), tarsus 25. —*Abdomen*.

Posterior lateral spinnerets with long apical segment. Lengths: total 6.76; basal segment 2.62, middle 1.63, apical 2.53. Apical segment width 0.75. —*Genitalia*. Spermathecae straight, digitiform, rather long, distal third slightly enlarged; well separated (by about twice the width of a spermatheca). Spermatheca length 1.53, width 0.48.

Distribution. Great Dividing Range, New South Wales from the Armidale region east to the Dorrigo region.

Comments. Specimens from the Barrington region may belong to this species.

Hadronyche levittgreggae n.sp.

Figures 90–93; Tables 27, 34

Etymology. The species is named in recognition of the late Vera Levitt-Gregg, former Associate of the Australian Museum, naturalist and funnel-web worker.

Types. Holotype male: AMS KS13528, Annangrove, New South Wales, 33°39'S 150°56'E, P.G. Nield, November 1978. Paratypes (all AM). New South Wales. *Males*: AMS KS2076, Fairs Creek, Cattai area, 33°33'S 150°55'E, 9 November 1978, R.H. Eastment; AMS KS1062, Dural, 33°40'S 151°01'E, 5 June 1977; AMS KS2066, Kellyville, 33°43'S 150°57'E, 6 November 1978, M.J. Fletcher; AMS KS1059, Kenthurst, 33°41'S

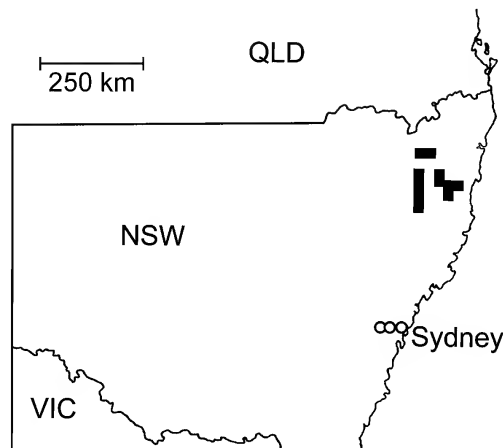


Figure 90. Collection records for *Hadronyche walkeri* (squares) and *H. levittgreggae* (circles).

Table 27. Male morphological data—*Hadronyche levittgreggae* (n = 11).

character	range	mean	character	range	mean	character	ratio	SD
CL	8.72–10.30	9.69	Mt1S	27–43 (p0–2)	34	CW/CL	0.95	0.027
CW	8.61–10.17	9.15	Ta1S	10–20	13	CH/CW	0.42	0.019
CH	3.57–4.06	3.86	Ti2S	19–46 (p0–2)	31	CFW/CL	0.69	0.023
CFW	5.99–7.14	6.67	STC2teeth	12–14	13	CHGW/L	0.20	0.017
ChGL	2.57–2.99	2.70	BulbL	4.62–5.44	4.86	SW/SL	0.72	0.031
ChGW	0.48–0.59	0.53	EmblL	3.53–4.15	3.80	LL/LW	0.96	0.04
ChGCT	15–27	22	BulbW	1.21–1.36	1.26	PLSAPW/L	0.37	0.043
LL	1.50–1.78	1.67	EmbmW	0.21–0.28	0.25	BulbW/Embl*	0.34	0.021
LW	1.66–1.84	1.73	PalpTibL	4.51–5.66	5.26	EmbmW/L*	0.07	0.005
CUSP	210–345	285	PalpTibW	1.82–2.45	1.99	PalpTibW/L*	0.38	0.033
SL	5.49–6.41	5.92	PalpTibS*	2–3	2	BulbL/TibL	0.93	0.058
SW	3.77–4.59	4.30	PalpPatS	0	—			
PLSAPW	0.39–0.69	0.56	PalpFemS	0–1	<1			
PLSAPL	1.27–1.73	1.51						
Fe1S	0	0						
Pa1S	3–10 (p1–3)	6						

150°59'E, 12 November 1969, A. Adamson; AMS KS7336, Lower Portland, Hawkesbury River, 33°25'S 150°53'E, February 1980; AMS KS6274, Tennyson, nr. Windsor, 33°31'S 150°44'E, 8 August 1980, M. Gray & R. McDonald; AMS KS23457, Galston, 33°39'S 151°03'E, 07 Nov 1990, T. Dixen. *Females*: AMS KS1061, Annangrove, 33°39'S 150°56'E, R. Redfern, January 1976; AMS KS9036, Dural/Kenthurst area, 33°38'S 151°01'E, 6 May 1982, M. Gray; AMS KS6273, Tennyson, near. Windsor, 33°31'S 150°44'E, 8 August 1980, M. Gray & R. McDonald; AMS KS2964, Arcadia, 33°37'S 151°02'E, 10 May 1979, Sharples.

Other material examined. New South Wales (males): AMS KS1060, Kenthurst, 1969, A. Adamson; AMS KS6073, Kenthurst, 26 October 1980; AMS KS8378, Kenthurst, 3 November 1981, L. Taylor; AMS KS10795, Kenthurst, 7 December 1982, L. Millard.

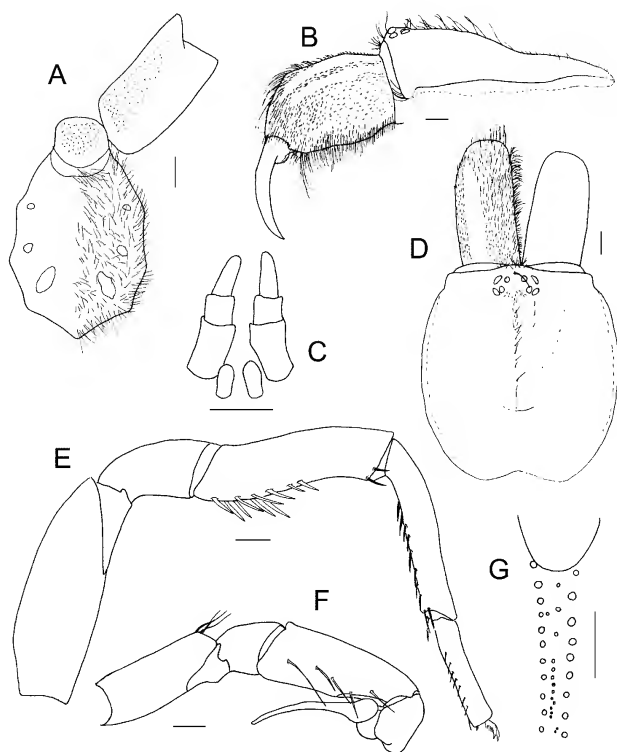


Figure 91. *Hadronyche levittgreggae*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cephalothorax and chelicerae, dorsal; (E) leg II, prolateral; (F) palp, prolateral; (G) cheliceral groove teeth. Scale lines 1 mm.

Diagnosis. CL 8.72–10.30 (male) Differs from *H. infensa*, *H. lynabrae*, *H. macquariensis* and *H. walkeri* by relatively long, slender embolus (EmbmW/L 0.07); from *H. orana* by strongly spinose tibia II (19–46 spines) (Fig. 93H,I); from *H. valida* by longer, narrower embolus (EmblL 3.53–4.15) (Fig. 93B); and from *H. kaputarensis* by long central cheliceral tooth row.

Male (holotype) —*Size.* Carapace length 8.94, width 8.61. Abdomen length 8.85 width 6.97. —*Colour.* Basic colour pattern. —*Carapace.* Slightly longer than wide, moderately raised. Height 3.84. Frontal width 6.36. Fovea procurved, narrow. Mid-dorsal cephalic setae reach fovea. Anterior strial area with few setae. Anterolateral angle of carapace with weak bristles. —*Eyes.* Sessile to slightly raised. Eye group width 2.32. Median ocular quadrangle length 0.84, anterior

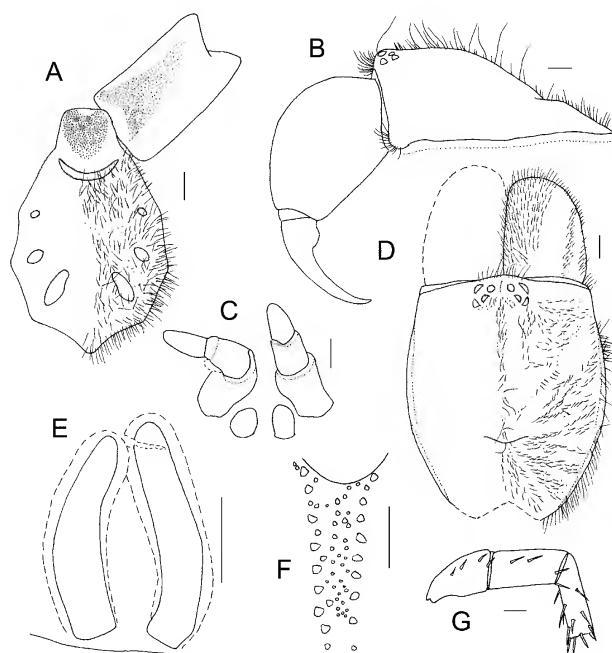


Figure 92. *Hadronyche levittgreggae*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cephalothorax and chelicerae, dorsal; (E) spermathecae; (F) cheliceral groove teeth; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

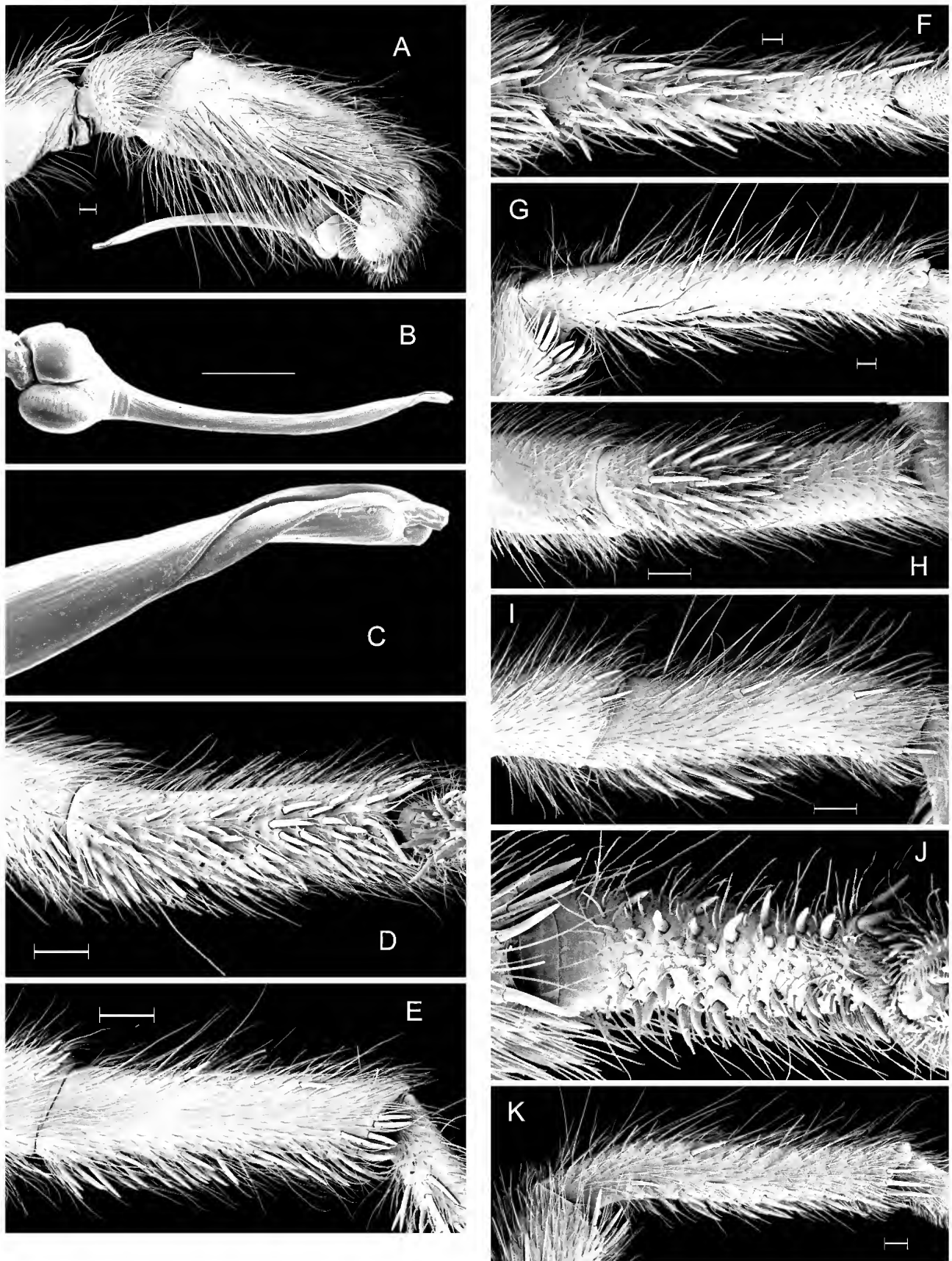


Figure 93. *Hadronyche levittgreggae*, male (A,D–K, AMS KS23457; B,C, AMS KS2066): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D,E) distal patella and tibia I—D, ventral, E, prolateral; (F,G) metatarsus I—F, ventral, G, prolateral; (H,I) distal patella and tibia II—H, ventral, I, prolateral; (J,K) metatarsus II—J, ventral (image foreshortened), K, prolateral. Scale lines: 1.0 mm, except A,F,G 0.3 mm and K 0.2 mm.

width 1.07, posterior width 1.53. Diameters: AME 0.26, ALE 0.46, PLE 0.48, PME 0.25. —*Chelicerae*. Cheliceral groove margins weakly divergent. Groove length 2.57, middle width 0.51. Cheliceral teeth: 15 central, running full length of groove; 11 prolateral; 9 retrolateral. —*Labium*. Slightly wider than long. Length 1.50, width 1.70. Labiosternal sigilla entire. Cuspules c. 262, number moderate to high. —*Sternum*. Ovoid; length 5.67, width 4.19. Posterior sigilla ovoid, elongate. —*Palp*. Tegular area slightly wider than long. Embolus shaft long, slender and gently curved, with little distal taper. Distal embolus moderately twisted. Embolus base offset from tegulum. Bulb length 4.68, width 1.24. Embolus length 3.76, midwidth 0.21. Tibia long. Length of femur 4.00, patella 1.78, tibia 5.00. Width of tibia 1.86. Spination: tibia 3 (bristle-like). Sinuous bristles on distal femur. —*Legs*. 4123. Legs I, II subequal.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.30	3.40	6.27	5.78	3.44	26.19
2	6.90	3.75	6.38	5.79	3.44	26.04
3	6.11	3.28	5.17	5.56	3.90	24.02
4	7.38	3.57	6.56	6.89	4.43	28.83

Tibia I width 1.44. Femora I, II lack dorsal spines. Femora III, IV with long dorsal bristles. Metatarsus I slightly thickened proximally, larger ventral spines grouped proximally. Tibia II sinuous, weakly concave distoventrally, ventral spines grouped proximally. Metatarsus II slightly sinuous, apophysis absent. Coxal hairs normal. Tarsal scopulae: legs I, II weak; legs III, IV strong. Distal metatarsal scopulae weak. Tarsal claw teeth legs I, II: superior 14; inferior III, IV. Trichobothria legs I, II: tarsus 13, 12; metatarsus 15, 17; tibia p8 r7, p8 r7. —*Leg spination*. Leg I: femur 0, patella 7 (p1), tibia 65, metatarsus 30, tarsus 11. Leg II: femur 0, patella 1–2 (p0–1), tibia 28, metatarsus 21, tarsus 12. Leg III: femur 0, patella p5, tibia 7 (p2 r1), metatarsus 23, tarsus 17. Leg IV: femur 0, patella r1, tibia 4 (r1), metatarsus 16, tarsus 17 —*Abdomen*. Posterior lateral spinnerets with moderately long apical segment. Lengths: total 3.91; basal segment 1.64, middle 0.88, apical 1.39; apical width 0.58.

Female (paratype AMS KS1061) —*Size*. Carapace length 10.80, width 9.28. Abdomen length 11.42, width 8.74. —*Colour*. Basic colour pattern. —*Carapace*. Longer than wide, cephalic area strongly raised. Height 5.02, frontal width 8.01. Cephalic length 7.51. Fovea narrow, procurved. Mid-dorsal cephalic setae numerous, extend back to fovea. Anterior stria setae present. Anterolateral carapace angle with several weak bristles. —*Eyes*. Central eye region weakly raised. Eye group width 2.62. Diameters: AME 0.34, ALE 0.62, PLE 0.46, PME 0.29. Interdistances: AME–AME 0.55, AME–ALE 0.25, ALE–PLE 0.26, PLE–PME 0.15, PME–PME 1.32. Median ocular quadrangle length 0.80, anterior width 1.16, posterior width 1.85. —*Chelicerae*. Cheliceral groove wide, margins diverge distally. Groove length 2.94, middle width 0.85. Cheliceral teeth: 44 central occupying full length of groove in 2–3 irregular rows; 14 prolateral; 10 retrolateral. —*Labium*. Almost as long as wide, anterior margin not indented. Length 2.14, width 2.21. Cuspules occupying anterior three quarters of labium. Labiosternal sigilla narrow, entire. —*Sternum*. Ovoid. Length 8.02, width 5.20. Posterior sternal sigilla elongate: length 1.19, width 0.46. —*Palp*. Spination: tibia 2–3, tarsus 9. Trichobothria: tibia p7 r7, tarsus 20. Tarsal claws with 8 teeth. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	7.48	4.05	5.70	4.52	2.80	24.55
2	6.54	3.79	5.18	4.24	2.62	22.37
3	5.92	3.28	4.01	4.25	2.99	20.45
4	7.49	4.05	5.51	5.47	3.52	26.04

Tibia I width 1.90. Metatarsus I proximal width 1.21. Coxae I, II with basally thickened setae frontally. Tarsal claw teeth legs I, II: superior 9, 9; inferior 4, 4. Trichobothria legs I, II: tarsus 16, 13; metatarsus 20, 17; tibia p8 r8, p8 r7. —*Leg spination*. Leg I: femur 0, patella 0, tibia 1, metatarsus 10, tarsus 8. Leg II: femur 0, patella p1, tibia 1–2, metatarsus 12, tarsus 7. Leg III: femur 0, patella p4, tibia 6 (p2 r2), metatarsus 14 (p4 r1), tarsus 14. Leg IV: femur 0 patella 0, tibia 2 (r1), metatarsus 13, tarsus 16. —*Abdomen*. Posterior lateral spinnerets with moderately short apical segment. Lengths: total 4.50; basal segment 1.83, middle 1.29, apical 1.43. Apical segment width 0.76. —*Genitalia*. Spermathecae long and thin, digitiform, separated basally but gently curved so that apices are contiguous. Length 2.58, width 0.54.

Distribution. Hawkesbury River region, northwest of Sydney, New South Wales (Fig. 90).

lamingtonensis species group

Description. (Figs. 3G, 94–102; Tables 28–31). Small to medium sized atracine spiders (CL 5.0–8.0). Males without leg II apophyses; femora I, II typically without dorsal spines (rarely a bristle-like spine on femur II). Middle haematodocha usually exposed between tegulum and subtegulum. Carapace broad, strongly raised (CW/CL 0.48–0.51). Cheliceral groove narrow, central teeth few, basal. Posterior lateral spinnerets with short apical segment (PLSAPW/L 0.53–0.63). Labium relatively short (LL/LW 0.74–0.83), cuspule number usually low (44–102), but moderate in *H. raveni* (mean = 213). Sternum moderately wide. Several species have swollen or “boat-shaped” tarsi III and IV. Palpal patella wider than femur; tibia without spines, rather short and basally broad.

Included species. *Hadronyche lamingtonensis* n.sp., *H. annachristiae* n.sp., *H. raveni* n.sp., *H. monteithi* n.sp., *H. anzses* Raven.

Distribution. Northeastern New South Wales to northeastern Queensland.

Comments. The morphology of the disjunct north Queensland species, *H. anzses*, clearly justifies its inclusion within this species group. Swollen (“boat-shaped”) tarsi III and IV are present in several species (*H. annachristiae*, *H. anzses*, *H. monteithi* and, more weakly, in *H. raveni*). This character provides an additional taxonomic link between *H. anzses* and its southern relatives. Two undescribed species are known from the Border Ranges region of NSW.

The *lamingtonensis* group species probably represent the remnants of a former more continuous distribution in the Tertiary rainforests of eastern Australia.

Note on *Anepsiada ventricosa* (Rainbow & Pulleine), AMS KS9624, old catalogue number K40965. This species was described for a small female specimen from Cloncurry,

central Queensland (Rainbow & Pulleine, 1918). The label data was subsequently found to be in error, resulting in the correction of the locality to Mount Tamborine in the Border Ranges area of southeast Queensland. The species was proposed for synonymy as a juvenile of *Atrax valida* (Gray, 1984). However, a recent re-examination of the type indicates that it is a female, and suggests that it belongs to the *lamingtonensis* species group of *Hadronyche*. At present, no other female specimens of this species group are known and the type specimen is in poor condition. If these findings are confirmed by additional female material, the synonymy of this species with *A. valida* (after Gray, in Main, 1985), and its status, will need to be reviewed.

***Hadronyche raveni* n.sp.**

Figures 94–96; Table 28

Etymology. The species is named for Dr Robert Raven, Senior Curator of Arachnology at the Queensland Museum and a distinguished spider researcher.

Types. Holotype male: QMB S161 (QMB), Bouloumba Creek, Conondale Range, Queensland, 26°31'S 152°39'E, G.B. and S.R. Monteith, 29 November 1974–22 February 1975. Paratypes (QMB). Queensland. *Males*: QMB S179, 19 April–23 August 1975; QMB S180, 22 February–14 April 1975; other data as for holotype.

Diagnosis. CL 5.82–5.94 (male). Small atracine spiders. Differs from other *lamingtonensis* group species by having cheliceral groove margins diverging distally (Fig. 94C) and 2–4 times as many labial cuspules (202–224); from *H.*

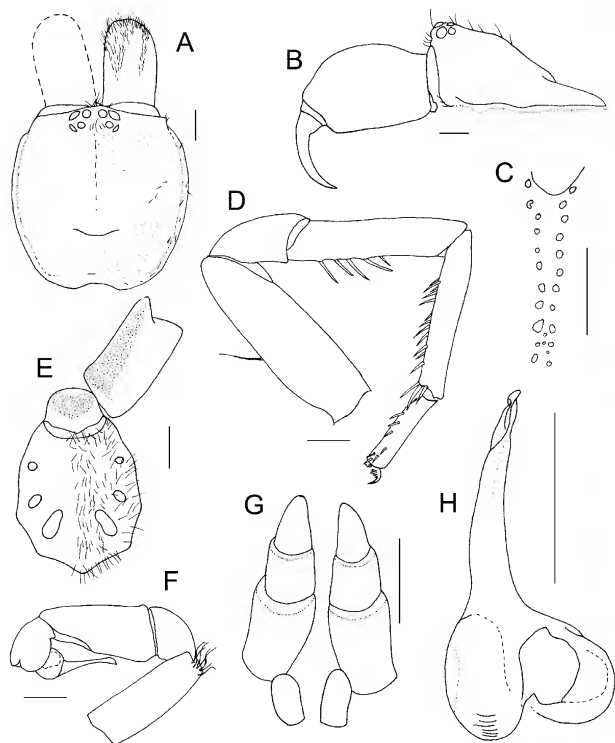


Figure 94. *Hadronyche raveni*, male: (A) cephalothorax and chelicerae, dorsal; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) leg II, prolateral; (E) sternum, labium and maxilla; (F) palp, prolateral; (G) spinnerets; (H) palpal organ. Scale lines 1 mm.

annchristiae and *H. monteithi* by the short, broad embolus; from *H. lamingtonensis* by tibia II with few spines (2–6) (Fig. 95D); and from *H. anzses* by having a full prolateral row of cheliceral teeth.

Male (holotype) —*Size.* Carapace length 5.82, width 5.70. Abdomen length 5.90, width 4.29. —*Colour.* Basic colour pattern. —*Carapace.* Almost as wide as long, cephalic area strongly raised. Height 2.75. Frontal width 4.47. Fovea wide, procurved. Mid-dorsal cephalic setae do not reach fovea. Anterior strial setae absent. Anterolateral carapace angle with a few weak bristles. —*Eyes.* Central eye region slightly raised. Eye group width 1.71. Median ocular quadrangle length 0.70, anterior width 0.85, posterior width 1.22. Diameters: AME 0.28, ALE 0.42, PLE 0.32, PME 0.26.

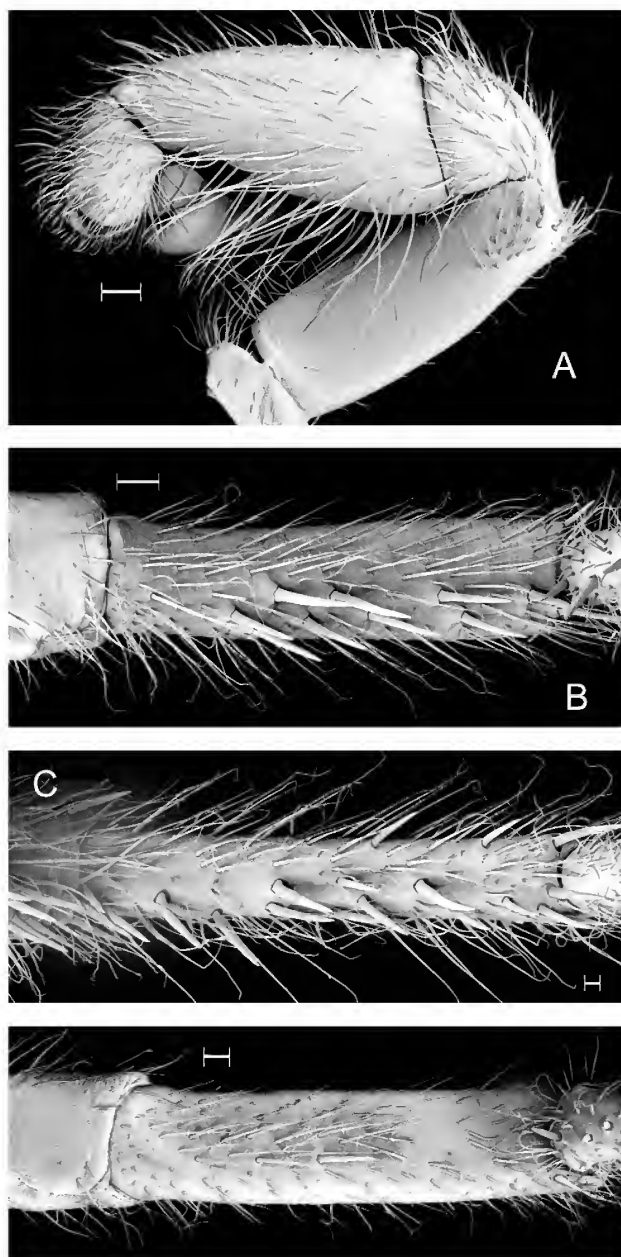


Figure 95. *Hadronyche raveni*, male (S179): (A) palp, prolateral; (B) distal patella and tibia I, ventral; (C) metatarsus I, ventral; (D) distal patella and tibia II, ventral. Scale lines: A, B, 0.3 mm, C 0.1 mm and D 0.2 mm.

Table 28. Male morphological data—*Hadronyche raveni* (n = 3).

character	range	mean	character	range	mean	character	ratio	SD
CL*	5.82–5.94	5.88	Mt1S	19–25	22	CW/CL	0.97	0.015
CW	5.62–5.74	5.69	Ta1S	10–15	13	CH/CW	0.49	0.012
CH	2.75–2.91	2.81	Ti2S*	2–6	4	CFW/CL	0.77	0.01
CFW	4.47–4.53	4.50	STC2teeth	9	9	CHGW/L	0.15	0.01
ChGL	1.80–1.93	1.87	BulbL	1.94–2.03	1.97	SW/SL	0.78	0.025
ChGW	0.27–0.30	0.28	EmblL	1.22–1.27	1.24	LL/LW	0.83	0.045
ChGCT	3–4	4	BulbW	0.88–0.98	0.92	PLSAPW/L*	0.63	0.038
LL	1.04–1.07	1.05	EmbmW	0.15–0.16	0.16	Bulb/Embl*	0.74	0.026
LW	1.22–1.34	1.26	PalpTibL	2.76–2.93	2.85	EmbmW/L*	0.13	0.006
CUSP*	202–224	213	PalpTibW	1.32–1.38	1.34	PalpTibW/L	0.47	0.012
SL	3.61–3.88	3.75	PalpTibS	0	—	BulbL/TibL*	0.69	0.017
SW	2.92–2.97	2.94	PalpPatS	0	—			
PLSAPW	0.40–0.46	0.42	PalpFemS	0	—			
PLSAPL	0.64–0.68	0.65						
Fe1S	0							
Pa1S	0							

—*Chelicerae*. Groove narrow, margins diverging distally; length 1.90, middle width 0.27. Cheliceral teeth: 3 central, at base of groove; 11 prolateral; 11 retrolateral. —*Labium*. Wider than long, not apically indented, shallow groove behind cuspules. Length 1.04, width 1.24. Labiosternal sigilla slightly narrowed toward midline. Cuspules c. 202, number moderate. —*Sternum*. Ovoid. Length 3.76, width 2.92. Posterior sigilla narrow, elongate. —*Palp*. Tegular area wider than long. Middle haematodocha exposed. Embolus short, shaft of moderate width, weakly curved and tapered. Distal embolus weakly twisted. Embolus base weakly offset from tegulum. Bulb length 1.94, width 0.88. Embolus length 1.22, midwidth 0.15. Length of femur 2.76, patella 1.10, tibia 2.76. Width of tibia 1.32. Spination: spines absent. Sinuous bristles on distal femur. —*Legs*. 4213 or 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.08	2.13	4.10	3.81	2.38	17.50
2	5.00	2.46	4.26	3.99	2.46	18.17
3	4.25	2.06	3.18	3.52	2.35	15.36
4	5.36	2.22	4.62	4.56	2.55	19.31

Tibia I width 0.80. Femora I–III lacking dorsal spines. Leg I unmodified, tibial and metatarsal spines scattered. Leg II without apophysis, tibial spines few, grouped proximally. Anterior coxal hairs weak, unmodified. Scopulae leg I–IV: tarsus weak-moderate; metatarsus weak-absent. Tarsi III, IV weakly swollen, longer than tarsi I, II. Tarsal claw teeth legs I, II: superior 9, 9; inferior 3, 3. Trichobothria legs I, II: tarsus 10, 8; metatarsus 7, 6; tibia p4 r6, p5 r6. —*Leg spination*. Leg I: femur 0, patella 0, tibia 16, metatarsus 25, tarsus 14. Leg II: femur 0 (1 large bristle), patella 0, tibia 6, metatarsus 19, tarsus 25. Leg III: femur 0, patella 12 (p11 r1), tibia 8 (p3 r2), metatarsus 20, tarsus 27. Leg IV: femur 6 bristle-like spines, patella 0, tibia 0, metatarsus 16, tarsus 38. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 2.21; basal segment 1.00; middle 0.56; apical 0.65. Apical segment width 0.40.

Distribution. Conondale Range, southeastern Queensland (Fig. 96).

Comments. This species has both the largest labium and the largest number of labial cuspules in the species group.

Hadronyche lamingtonensis n.sp.

Figures 96–98; Table 29

Etymology. The specific epithet is taken from Lamington National Park, the type locality.

Types. Holotype male: QMB S394 (QMB), O'Reillys, Lamington National Park, Queensland, 28°14'S 153°08'E, G.B. and S.R. Monteith, 31 January–11 April 1976 (in pit fall trap). Paratypes (all QMB). Males: Queensland. QMB S159, Palm Grove, Tamborine Mtn., 27°55'S 153°10'E, 25 May–13 October 1975, G.B. & S.R. Monteith. New South Wales. QMB S166, Whian Whian State Forest, via Dunoon, 28°36'S 153°22'E, 26 December 1974–23 March 1975, G.B. & S.R. Monteith.

Diagnosis. CL 6.77–8.04 (male). Small to medium sized atracine spiders. Differs from *H. raveni* by having fewer labial cuspules (44–58) and tibia II more spinose (15–23) (Fig. 97F); from *H. annachristiae* and *H. monteithi* by the embolus being relatively short and weakly curved (Fig. 97); and from *H. anzses* by male tarsi III, IV unmodified and full row of promarginal cheliceral teeth.

Male (holotype) —*Size*. Carapace length 7.86, width 7.75. Abdomen length 8.38, width 5.96. —*Colour*. Basic colour pattern. —*Carapace*. Slightly longer than wide, cephalic

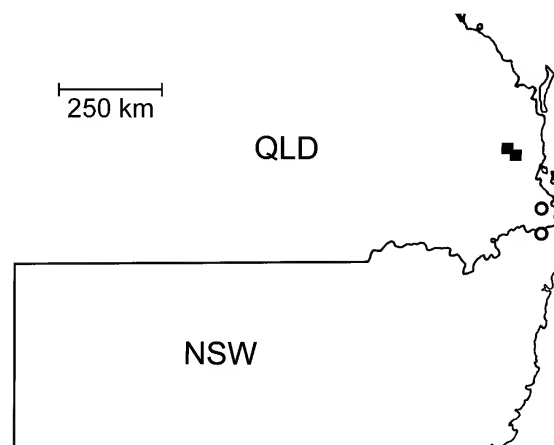


Figure 96. Collection records for *Hadronyche raveni* (squares) and *H. lamingtonensis* (circles).

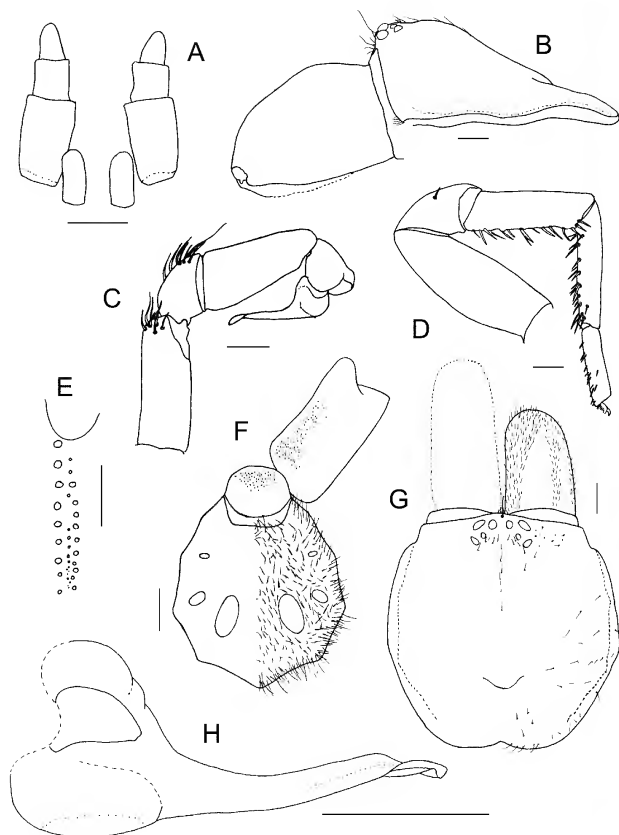


Figure 97. *Hadronyche lamingtonensis*, male: (A) spinnerets; (B) cephalothorax and chelicerae, lateral; (C) palp, prolateral; (D) leg II, prolateral; (E) cheliceral groove teeth; (F) sternum, labium and maxilla; (G) cephalothorax and chelicerae, dorsal; (H) palpal organ. Scale lines 1 mm.

area moderately raised. Height 3.49. Frontal width 5.41. Fovea strongly procurved. Mid-dorsal cephalic setae few, reaching only halfway to fovea. Anterior striae absent. Anterolateral angle of carapace with a few very weak hairs only. —*Eyes*. Sessile. Eye group width 1.97. Median ocular quadrangle length 0.65, anterior width 0.84, posterior width 1.39. Diameters: AME 0.30, ALE 0.41, PLE 0.37, PME 0.20. —*Chelicerae*. Anterodorsal paturon bristles short. Cheliceral groove narrow, margins parallel. Groove length 2.55, middle width 0.40. Cheliceral teeth: 13 central, confined mainly to basal half of groove (one distal tooth); 12 prolateral; 9 retrolateral. —*Labium*. Wider than long, not indented apically. Length 1.28, width 1.41. Labiosternal sigilla entire. Cuspules c. 58, small in size, number low. —*Sternum*. Very broad, subcircular. Length 4.55, width 4.02. Posterior sigilla large, broad, elongate, anterior margin almost at same level as anterior margin of middle sigilla. —*Palp*. Tegular area wider than long, middle haematodocha exposed. Embolus gently curved, medium length, shaft hardly tapering distally. Distal embolus twisted, flange partially reflexed. Embolus base weakly offset from tegulum. Bulb length 2.51, width 1.10. Embolus length 1.67, midwidth 0.17. Length of femur 3.32, patella 1.25, tibia 2.99. Width of tibia 1.38. Spination: femur 3, patella 2, tibia 0. Sinuous bristles on distal femur. —*Legs*. 4123.

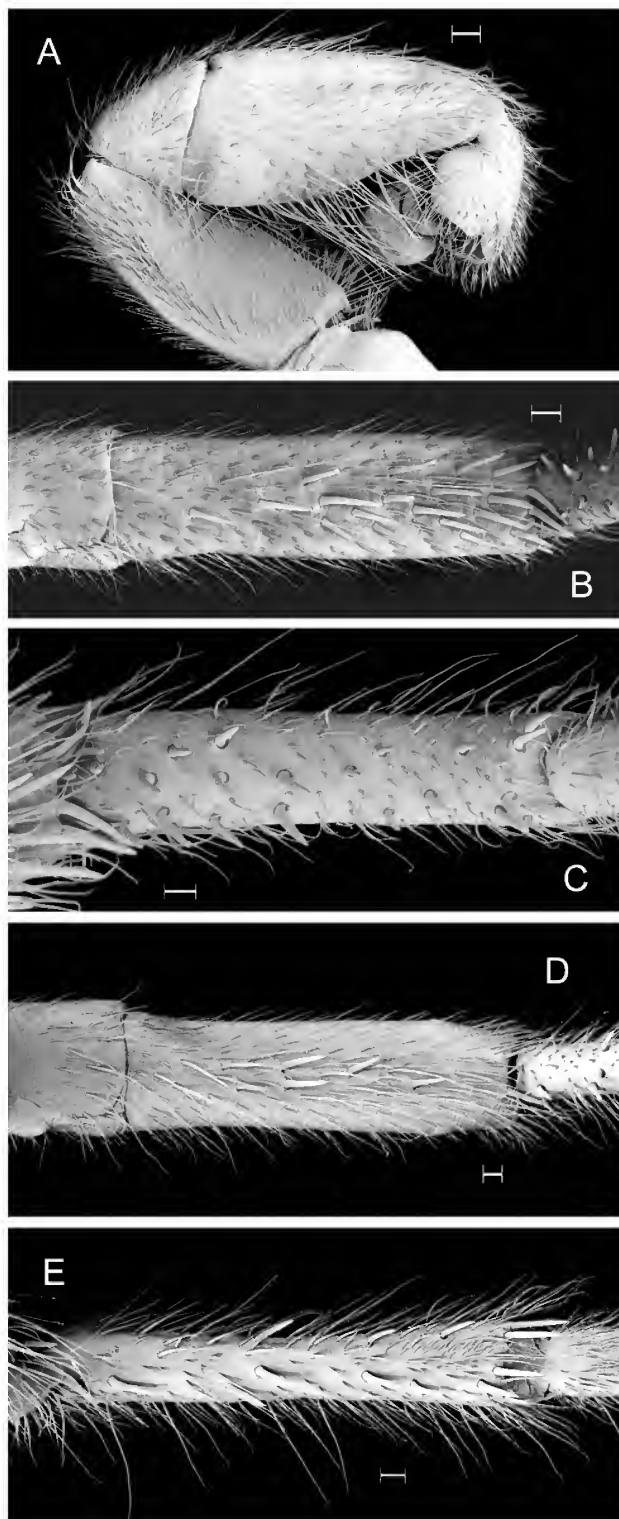


Figure 98. *Hadronyche lamingtonensis*, male (S1058): (A) Palp, prolateral; (B) distal patella and tibia I, ventral; (C) metatarsus I, ventral; (D) distal patella and tibia II, ventral. (E) metatarsus II, ventral. Scale lines: A, B 0.3 mm and C–E 0.2 mm.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	6.72	2.91	4.77	4.76	2.79	21.95
2	5.82	2.75	4.39	4.22	2.75	19.93
3	5.70	2.48	3.35	4.25	2.88	18.66
4	6.77	2.88	4.98	5.90	3.62	24.15

Table 29. Male morphological data—*Hadronyche lamingtonensis* (n = 3).

character	range	mean	character	range	mean	character	ratio	SD
CL	6.77–8.04	7.55	Mt1S	35–39 (p0–3)	37	CW/CL	0.95	0.036
CW	6.26–7.75	7.20	Ta1S	29–49	36	CH/CW	0.48	0.03
CH	3.20–3.65	3.44	Ti2S	15–23	19	CFW/CL	0.69	0.01
CFW	4.59–5.62	5.20	STC2teeth	7–8	8	CHGW/L	0.15	0.012
ChGL	2.28–2.68	2.50	BulbL	1.90–2.51	2.28	SW/SL	0.85	0.055
ChGW	0.32–0.40	0.36	EmblL	1.20–1.67	1.47	LL/LW	0.78	0.028
ChGCT	4–14	7	BulbW	0.73–1.10	0.92	PLSAPW/L	0.53	0.027
LL	1.00–1.28	1.16	EmbmW	0.12–0.17	0.14	BulbW/Embl*	0.63	0.029
LW	1.32–1.50	1.41	PalpTibL	2.46–2.99	2.75	EmbmW/L	0.10	0.006
CUSP*	44–58	53	PalpTibW	1.19–1.40	1.32	PalpTibW/L	0.48	0.02
SL	3.94–4.69	4.39	PalpTibS	0	—	BulbL/TibL	0.83	0.051
SW	3.52–4.02	3.74	PalpPatS	0–3	2			
PLSAPW	0.33–0.42	0.38	PalpFemS	0–3	2			
PLSAPL	0.60–0.78	0.72						
Fe1S	0							
Pa1S	0–5 (p0–2)	3						

Tibia I width 1.23. Femora I and II typically without dorsal spines, but occasionally on femur II. Legs I, II unmodified, tibial and metatarsal ventral spines scattered. Patellae III, IV with many prolateral spines. Coxal hairs unmodified. Tarsi III, IV unmodified. Tarsal scopulae weak to moderately developed, distal metatarsal scopulae weak to absent. Tarsal claw teeth legs I, II: superior 10, 8; inferior 2, 1. Trichobothria legs I, II: tarsus 7, 6; metatarsus 9, 9; tibia p5 r5, p4 r4. — *Leg spination*. Leg I: femur 0, patella 4, tibia 29, metatarsus 36 (p3), tarsus 31. Leg II: femur 0, patella 3 (p1), tibia 23, metatarsus 51, tarsus 29. Leg III: femur 4, patella 34 (p29 r5), tibia 30 (p8 r5), metatarsus 38, tarsus 34. Leg IV: femur 10, patella 20 (p14 r6), tibia 22 (p4 r7), metatarsus 29, tarsus 46. Femoral spines mostly bristle-like, a few strong bristles on legs I, II. — *Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 2.84; basal segment 1.40; middle 0.66; apical 0.78. Apical segment width 0.39.

Distribution. Macpherson and Tweed Ranges in eastern Border Ranges of New South Wales and Queensland (Fig. 96).

Hadronyche annachristiae n.sp.

Figures 99–101; Table 30

Etymology. The species is named for Anna-Christie Gray, my younger daughter.

Types. Holotype male: AMS KS5438, Kerewong State Forest, nr Lorne, 31°35'S 152°33'E, D. Milledge, 1980. Paratypes (AMS). New South Wales. Males: AMS KS1551, Kerewong State Forest, nr Taree, 31°35'S 152°33'E, 11 May–19 June 1978, D. Milledge; AMS KS5409, Kerewong State Forest, 31°35'S 152°33'E, 30 May–1 September 1979, D. Milledge; AMS KS10770, Kerewong State Forest, Wedding Cake Road, nr. Taree, 31°35'S 152°33'E, 28 March 1982, H. Parnaby; AMS KS5637, Lorne State Forest, nr. Taree, 31°33'S 152°37'E, 1 Sept–9 December 1979, D. Milledge; AMS KS5420, Lorne State Forest, nr. Taree, 31°33'S 152°37'E, 30 May–1 September 1979, D. Milledge.

Diagnosis. CL 6.19–6.66 (male). Small atracine spiders with (“boat shaped”). Differs from *H. raveni* and *H. lamingtonensis* and by embolus long and curved with base strongly offset from tegulum (Fig. 100B) and presence of swollen tarsi III, IV (Fig. 3G); from *H. monteithi* by

tarsus more spinose (24–43); and from *H. anzses* by long promarginal cheliceral tooth row.

Male (holotype) — *Size*. Carapace length 6.52, width 6.41. Abdomen length 6.97, width 5.56. — *Colour*. Basic colour pattern. — *Carapace*. Slightly longer than wide, moderately raised. Height 3.12. Frontal width 4.85. Fovea strongly procurved. Mid-dorsal cephalic setae almost reach fovea. Anterior strial setae absent. Anterolateral angle of carapace with a few weak bristles. — *Eyes*. Sessile. Eye group width

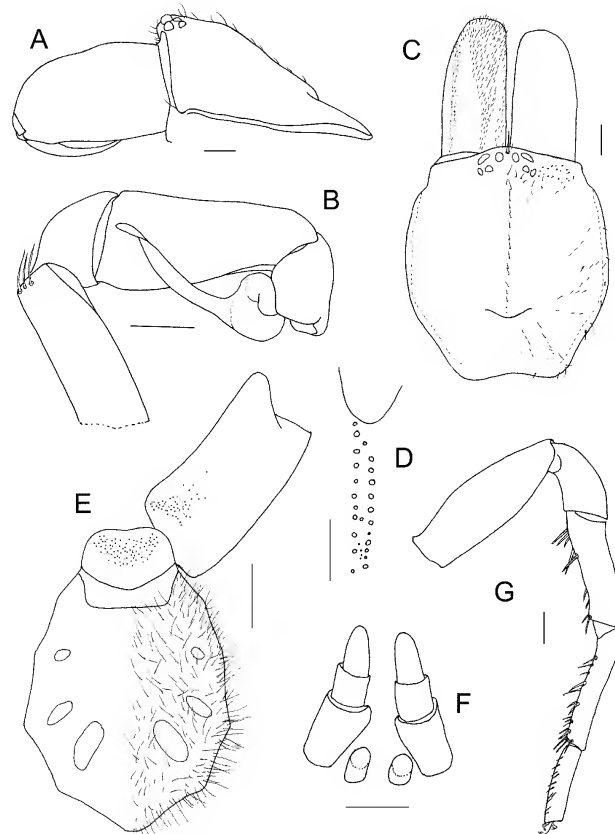


Figure 99. *Hadronyche annachristiae* Male. (A) cephalothorax and chelicerae, lateral; (B) palp, prolateral; (C) cephalothorax and chelicerae, dorsal; (D) cheliceral groove teeth; (E) sternum, labium and maxilla; (F) spinnerets; (G) leg II, prolateral. Scale lines 1 mm.

1.90. Median ocular quadrangle length 0.68, anterior width 0.85, posterior width 1.36. Diameters: AME 0.26, ALE 0.50, PLE 0.28, PME 0.25. —*Chelicerae*. Anterodorsal bristles on paturon rather short. Cheliceral groove narrow, margins parallel. Groove length 2.22, middle width 0.34. Cheliceral teeth: 4 central placed at base of groove (occasionally a few teeth apically); 10 prolateral; 10 retrolateral. —*Labium*. Wider than long with long anterior hairs. Length 1.06, width 1.42. Labiosternal sigilla broad, complete. Cuspules c. 83, number low. —*Sternum*. Ovoid. Length 4.08, width 3.21. Posterior sigilla large, elongate. —*Palp*. Tegular area much

wider than long, middle haematodocha exposed. Embolus moderately long, shaft hardly tapering distally, strongly curved. Distal embolus moderately twisted, flange partially reflexed. Embolus base strongly offset from tegulum. Bulb length 2.99, width 1.18. Embolus length 2.18, midwidth 0.16. Length of femur 2.84, patella 1.24, tibia 3.39. Width of tibia 1.54. Spination: none; sinuous bristles on distal femur. —*Legs*. 4123.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	5.79	2.67	4.06	4.22	2.34	19.08
2	5.29	2.67	3.87	3.98	2.50	18.31
3	5.02	2.35	3.25	3.69	3.02	17.33
4	5.93	2.68	4.56	4.96	3.52	21.65

Tibia I width 0.92. Femora I and II without dorsal spines. Legs I and II unmodified. Scattered ventral spines on metatarsus I and tibia II, with largest spines grouped proximally. Tarsi III, IV swollen and longer (boat-shaped) than tarsi I, II. Coxal hairs unmodified. Tarsal scopulae:

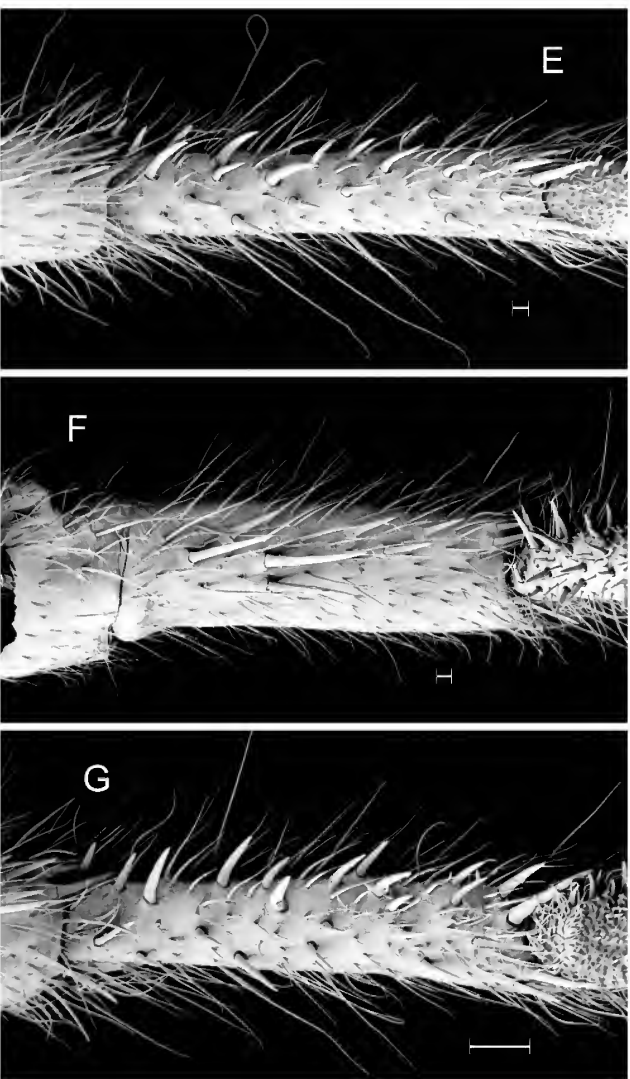
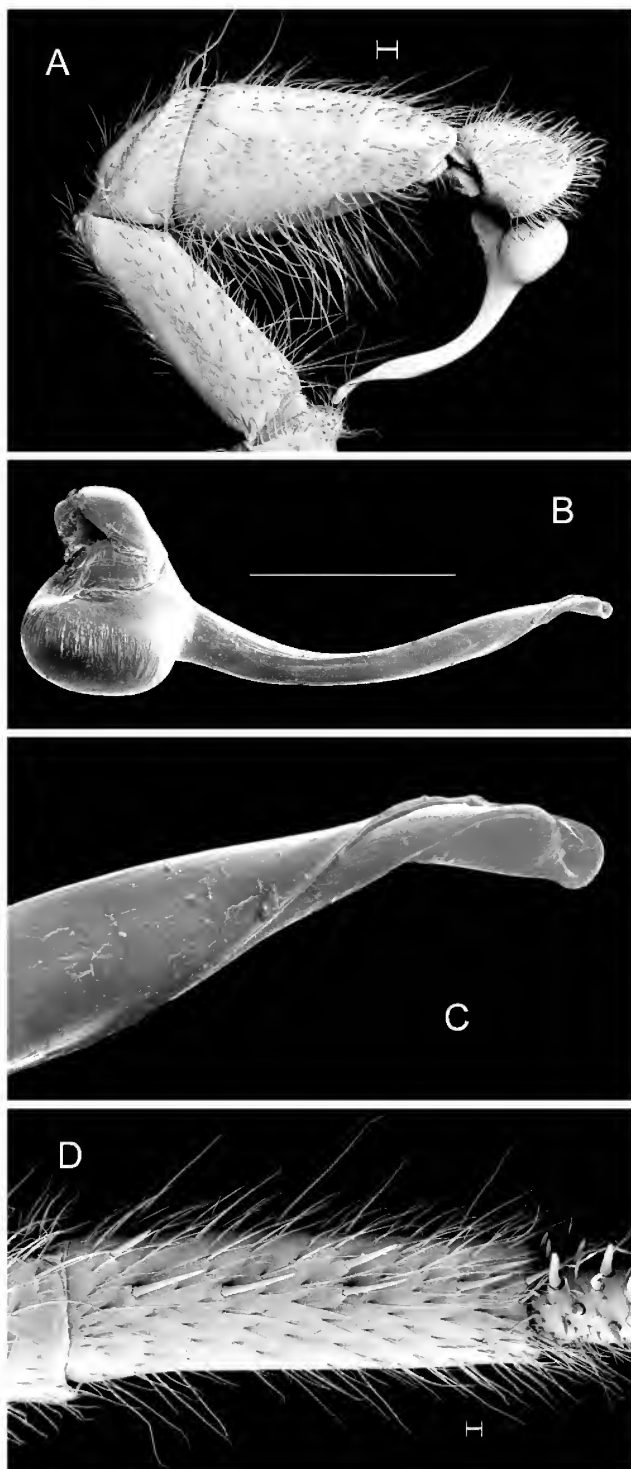


Figure 100. *Hadronyche annachristiae*, male (A,D–G, AMS KS5049; B,C, AMS KS5420): (A) palp, prolateral; (B) bulb; (C) embolus, distal; (D) distal patella and tibia I, ventral; (E) metatarsus I, ventral; (F) distal patella and tibia II, ventral. (G) metatarsus II, ventral. Scale lines: A 0.2 mm, B 1.0 mm, D–F 0.2 mm and G 0.3 mm.

Table 30. Male morphological data—*Hadronyche annachristiae* (n = 6).

character	range	mean	character	range	mean	character	ratio	SD
CL*	6.19–6.66	6.44	Mt1S	23–32	27	CW/CL	0.94	0.036
CW	5.85–6.41	6.06	Ta1S	24–43 (1–4 mv)	35	CH/CW	0.48	0.03
CH	2.87–3.12	2.93	Ti2S	9–16	12	CFW/CL	0.71	0.01
CFW	4.42–4.69	4.59	STC2teeth	8–10	8	CHGW/L	0.13	0.012
ChGL	2.11–2.63	2.26	BulbL	2.72–2.99	2.87	SW/SL	0.80	0.055
ChGW	0.27–0.34	0.29	EmbL	1.97–2.48	2.14	LL/LW	0.79	0.028
ChGCT	4–8	6	BulbW	1.01–1.18	1.07	PLSAPW/L	0.56	0.027
LL	0.96–1.16	1.05	EmbmW	0.15–0.20	0.17	BulbW/EmbL*	0.50	0.029
LW	1.24–1.42	1.33	PalpTibL	3.01–3.39	3.14	EmbmW/L*	0.08	0.006
CUSP	83–102	89	PalpTibW	1.39–1.54	1.49	PalpTibW/L	0.47	0.02
SL	3.63–4.08	3.84	PalpTibS	0	—	BulbL/TibL	0.91	0.051
SW	2.92–3.28	3.08	PalpPatS	0	—			
PLSAPW	0.36–0.41	0.38	PalpFemS	0–3	1			
PLSAPL	0.66–0.72	0.67						
Fe1S	0							
Pa1S*	0							

leg I weak; legs II–IV moderately to strongly developed. Distal metatarsal scopulae absent legs I–III, very weak leg IV. Tarsal spines numerous, a few small mid-ventral spines sometimes present. Tarsal claw teeth legs I, II: superior 8, 8; inferior 1, 1. Trichobothria legs I, II: tarsus 7, 7; metatarsus 7, 8; tibia p5 r5, p5 r5. —*Leg spination*. Leg I: femur 0, patella 0, tibia 12, metatarsus 32, tarsus 42. Leg II: femur 0, patella 0, tibia 16, metatarsus 35, tarsus 42. Leg III: femur 0, patella 31 (p30 r1), tibia 15 (p5 r3), metatarsus 25, tarsus 47. Leg IV: femur 1, patella p8, tibia 6 (p1), metatarsus 27, tarsus 88. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths; total 2.44; basal segment 1.14; middle 0.58; apical 0.72. Apical segment width 0.38.

Distribution. Known only from the Kerewong and Lorne State Forests near Comboyne, New South Wales (Fig. 101).

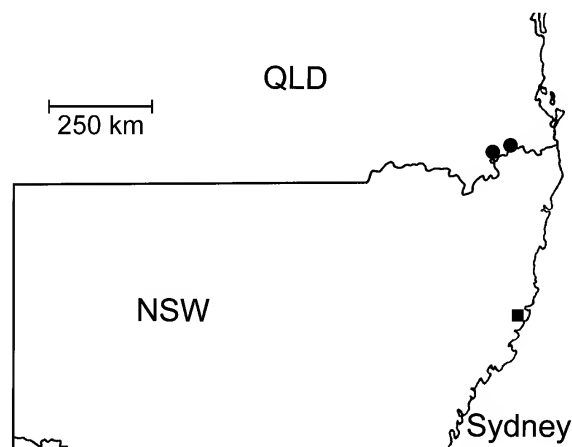


Figure 101. Collection records for *Hadronyche annachristiae* (squares) and *H. monteithi* (circles).

Hadronyche monteithi n.sp.

Figures 101–102; Table 31

Etymology. The species is named for Dr Geoff Monteith, a collector of the type specimens and many other spider species.

Types. Holotype male: QMB S181 (QMB). The Head, via Killarney, Queensland, 28°20'S 152°18'E, G.B. and S.R. Monteith, 31 Mar–2 August 1975.

Other material. Queensland. Male: QMB S148, Bald Mountain, via Emuval, 28°14'S 152°25'E, G.B. and S.R. Monteith, 28 December 1974–30 March 1975.

Diagnosis. CL 5.00–5.19 (male). Small atracine spiders. Differs from *H. raveni* and *H. lamingtonensis* by having slender, curved embolus (Fig. 102D and tarsi III, IV swollen; from *H. annachristiae* by relatively few tarsus I spines (5–7); and from *H. anzses* by strongly curved embolus.

Male (holotype) —*Size*. Carapace length 5.00, width 4.70. Abdomen length 5.00 width 3.94. —*Colour*. Basic colour pattern. Small paler area on anterodorsal abdomen flanked

by a pair of sigilla. —*Carapace*. Slightly longer than wide, narrowing rapidly posteriorly, moderately raised. Height 2.54. Frontal width 3.57. Fovea strongly procurved. Mid-dorsal cephalic setae do not reach fovea. Anterior strial setae few or absent. Anterolateral angle of carapace with a few hairs only. —*Eyes*. Sessile. Eye group width 1.39. Median ocular quadrangle length 0.49, anterior width 0.68, posterior width 0.93. Diameters: AME 0.23, ALE 0.32, PLE 0.27, PME 0.18. —*Chelicerae*. Sparse-moderate anterodorsal cover of short bristles on paturon. Cheliceral groove very narrow, margins subparallel. Groove length 1.68, middle width 0.25. Cheliceral teeth: 2 central, in proximal end of groove; 6 prolateral; 9 retrolateral, absent from distal third of retromargin. —*Labium*. Wider than long. Length 0.78, width 1.05. Cuspules c. 68, number low. Labiosternal sigilla entire. —*Sternum*. Broad, ovoid. Length 2.99, width 2.58. Posterior sigilla large, ovoid. —*Palp*. Tegular area much wider than long, middle haematodocha exposed. Embolus shaft strongly curved, moderately long and slender but hardly tapered distally. Distal embolus twisted and set at obtuse angle to shaft. Embolus base weakly offset from tegulum. Bulb length 1.96, width 0.79. Embolus length 1.44, midwidth 0.10. Length of femur 2.20, patella 0.90, tibia 2.18. Width of tibia 1.07. Spination: femur 4 (bristle-like). —*Legs*. 4123.

Table 31. Male morphological data—*Hadronyche monteithi* (n = 2).

character	range	mean	character	range	mean	character	ratio
CL*	5.00–5.19	5.09	Mt1S	16–19	18	CW/CL	0.95
CW	4.70–5.02	4.86	Ta1S*	5–7	6	CH/CW	0.51
CH	2.44–2.54	2.49	Ti2S*	3–7	5	CFW/CL	0.72
CFW	3.57–3.81	3.69	STC2teeth	6–11	9	CHGW/L	0.15
ChGL	1.68–1.86	1.77	BulbL	1.96–1.97	1.97	SW/SL*	0.85
ChGW	0.25–0.30	0.27	EmbL	1.42–1.44	1.43	LL/LW	0.74
ChGCT*	3	3	BulbW	0.79–0.80	0.80	PLSAPW/L	0.60
LL	0.78–0.84	0.81	EmbmW	0.10–0.11	0.11	BulbW/EmbL	0.55
LW	1.05–1.13	1.09	PalpTibL	2.18–2.40	2.29	EmbmW/L*	0.07
CUSP	68–81	75	PalpTibW	1.07–1.54	1.30	PalpTibW/L*	0.56
SL	2.99–3.26	3.12	PalpTibS	0	—	BulbL/TibL	0.86
SW	2.58–2.72	2.65	PalpPatS	0	—		
PLSAPW	0.32–0.33	0.33	PalpFemS	2–4	3		
PLSAPL	0.44–0.68	0.56					
Fe1S	0						
PalS	0						

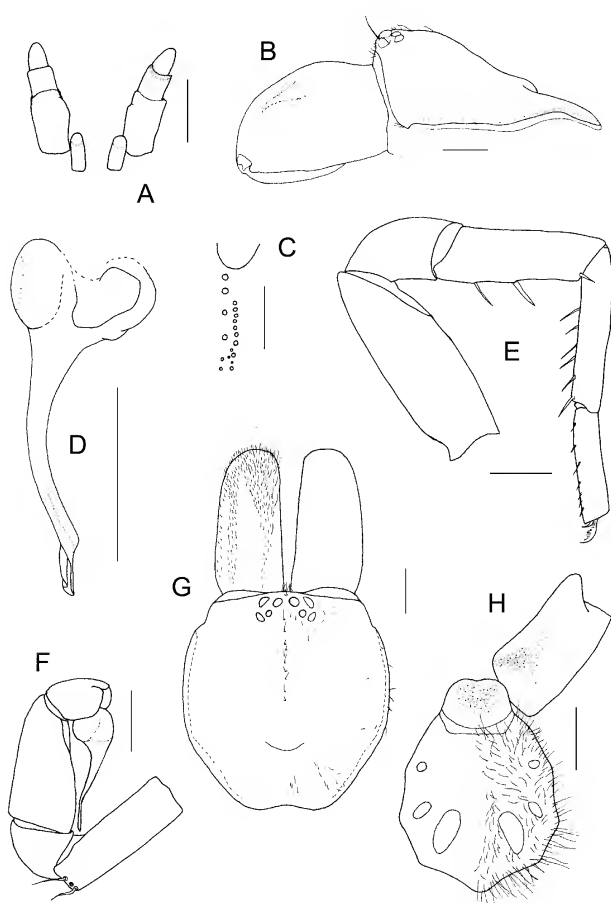


Figure 102. *Hadronyche monteithi*, male: (A) spinnerets; (B) cephalothorax and chelicerae, lateral; (C) cheliceral groove teeth; (D) palpal organ; (E) leg II, prolateral; (F) palp, prolateral; (G) cephalothorax and chelicerae, dorsal; (H) sternum, labium and maxilla. Scale lines 1 mm.

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	3.92	1.90	2.87	2.82	1.86	13.37
2	3.48	1.62	2.73	2.64	1.86	12.33
3	3.32	1.60	1.92	2.52	2.12	11.48
4	3.92	1.76	2.76	3.30	2.62	14.36

Tibia I width 0.74. Femora I and II without spines. Legs I and II unmodified, tibial spines few and metatarsal ventral spines scattered. Coxal hairs unmodified. Tarsi III, IV swollen, “boat-shaped”. Scopulae absent on distal metatarsi, weak to moderately developed on tarsi I–IV. Tarsal claw teeth legs I, II: superior 7, 6; inferior 0, 0. Trichobothria legs I, II: tarsus 5, 6; metatarsus 8, 6; tibia p4 r4, p4 r4. —*Leg spination*. Leg I: femur 0, patella 0, tibia 6, metatarsus 16, tarsus 7. Leg II: femur 0, patella 0, tibia 2–3 (ventral spines ± weak). Leg III. femur 1, patella 27 (p26 r1), tibia 11 (p6 r2) metatarsus 18 (pd6 rd4), tarsus 8. Leg IV: femur 1, patella p3, tibia 6 (p3 d1), metatarsus 16, tarsus 13. —*Abdomen*. Posterior lateral spinnerets with short apical segment. Lengths: total 1.76; basal segment 0.88, middle 0.44, apical 0.44. Apical segment width 0.32.

Distribution. Border Ranges in Killarney region, south-eastern Queensland (Fig. 101).

Hadronyche anzses Raven

Hadronyche anzses Raven, 2000: 225

Types. Holotype male: QMB S18825. Mossman Bluff summit, 10Km west of Mosman, 16°26'54"S 145°16'59"E, N.E. Queensland, 20 December 1989–15 January 1990, G. Monteith, G. Thompson and ANZSES Expedition.

Diagnosis. CL 5.31 (male). Small atracine spiders. Differs from other *lamingtonensis* group species in having only a few basal teeth (3) on the cheliceral promargin (Raven, 2000, Fig. 1G) and metatarsus I with fewer spines (c. 10); and from *H. raveni* and *H. lamingtonensis* by tarsi III, IV swollen, “boat-shaped”.

Distribution. Known only from the type locality.

adelaidensis species group

Description (Figs. 103–104; Tables 32–33). Small atracinae (CL 5.4–6.9). Burrow entrance without triplines, with side-chamber closed by a trap-door. Carapace broad, strongly raised. Labium and sternum wide. Serrula absent. Cheliceral groove narrow with long central tooth row. STC teeth few (8–9). Male femora I, II with dorsal spines or bristles. Males without leg II apophyses; leg I modified (incrassate tibia and metatarsus) or unmodified. Male palpal tibia bulbous basally; patella wider than femur.

Included species. *Hadronyche adelaidensis* (Gray), *H. flindersi* (Gray), *H. eyrei* (Gray).

Distribution. Limited to the Gulf Ranges region of South Australia.

Comments. Burrows of adult and subadult spiders have a side chamber with a robust soil door and a simple collapsible, collar-like silk entrance opening in or under leaf litter in open forest and woodland habitats (Main, 1976; Gray, 1984). The burrows lack surface triplines. Interestingly, juveniles of *H. adelaidensis* make burrows that lack side chambers but have well-formed, flap-like surface trapdoors (Gray, 1984).

These spiders are separated from the main eastern distribution of the Atracinae by the dry shrublands/woodlands of the southern Murray Basin (Fig. 2). They may originally have been isolated as a western atracine population during a Tertiary marine incursion into the Murray Basin.

Hadronyche flindersi (Gray)

Figures 103–105; Table 32

Atrax flindersi Gray, 1984: 446.

Hadronyche flindersi.—Gray, 1988: 114.

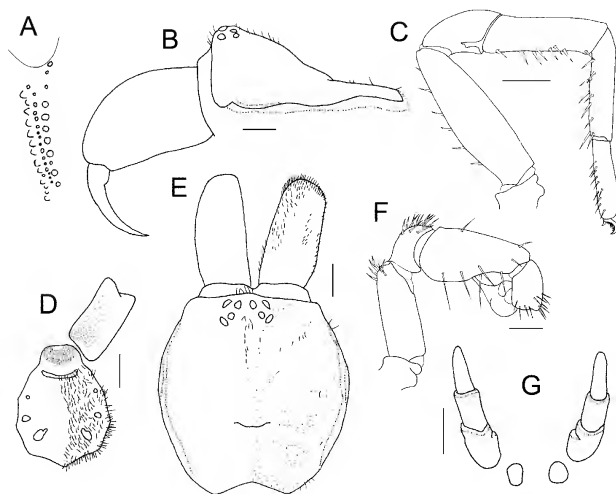


Figure 103. *Hadronyche flindersi*, male: (A) cheliceral groove teeth; (B) cephalothorax and chelicerae, lateral; (C) leg I, prolateral; (D) sternum, labium and maxilla; (E) cephalothorax and chelicerae, dorsal; (F) palp, prolateral; (G) spinnerets. Scale lines 1 mm.

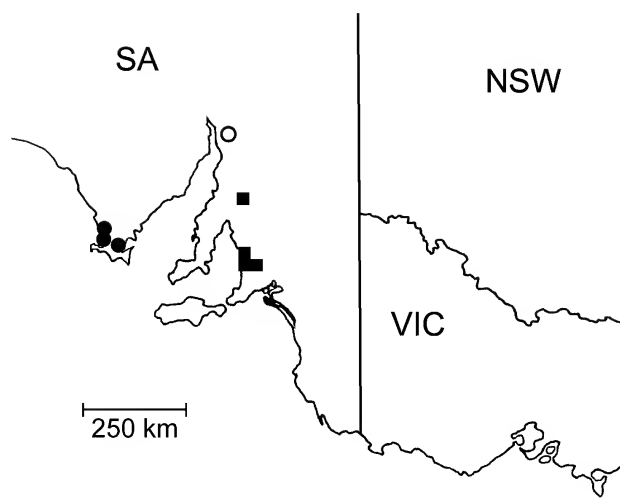


Figure 105. Collection records for *Atrax flindersi* (open circles), *A. adelaidensis* (black squares) and *A. eyrei* (closed circles).

Types. Holotype female: AMS KS983, Mt. Remarkable (lower slopes), 3km north of Melrose, Flinders Range, South Australia, 32°47'S 138°04'E, 23 April 1973, M. and G. Gray. Paratype male: AMS KS980, same data as holotype, 25 April 1973.

Diagnosis. CL 5.4–6.9 (male and female). Small atracine spiders. Males differ from *H. adelaidensis* by row of strong dorsal spines (8–9) on femur I; and tibia I, II with 6–9 spines. Male palp with straight, slender embolus. and 12–16 spines on patella. Male tarsi III, IV weakly swollen. Females with moderately slender spermathecae with a subapical constriction; few prolateral spines on tibia III (8–9).

Distribution. The southern end of the Flinders Ranges, South Australia (Fig. 105).

Comments. Female burrow with juvenile spiders in side passage closed by trapdoor in April, 1973.

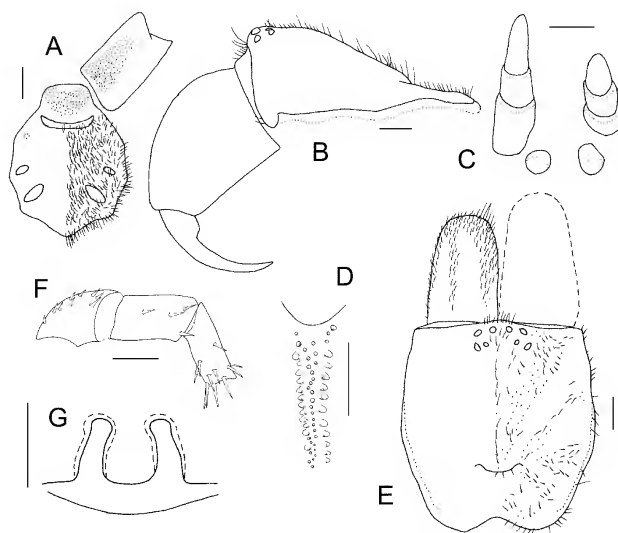


Figure 104. *Hadronyche flindersi*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) leg III, prolateral, patella, tibia, metatarsus; (G) spermathecae. Scale lines 1 mm.

Table 32. Male morphological data—*Hadronyche flindersi* (n = 2).

character	range	mean	character	range	mean	character	ratio
CL*	5.44–5.86	5.65	Mt1S	15–18	17	CW/CL	0.98
CW	5.33–5.72	5.52	Ta1S	18–21	20	CH/CW	0.45
CH	2.38–2.62	2.50	Ti2S	9	9	CFW/CL	0.70
CFW	3.81–4.10	3.95	STC2teeth	8–9	9	CHGW/L	0.13
ChGL	1.74–1.86	1.80	BulbL	2.20–2.36	2.28	SW/SL	0.90
ChGW	0.24–0.25	0.25	EmbL	1.28–1.42	1.35	LL/LW	0.72
ChGCT	16–18	17	BulbW	1.02–1.04	1.03	PLSAPW/L	0.35
LL	0.90–1.00	0.95	EmbmidW	0.10–0.12	0.11	BulbW/EmbL	0.76
LW	1.31	1.31	PalpTibL	2.81–2.95	2.88	EmbmidW/L*	0.08
CUSP	171–185	178	PalpTibW	1.43–1.54	1.48	PalpTib/L	0.51
SL	3.16–3.47	3.31	PalpTibS	2–3	3	BulbL/TibL	0.79
SW	2.92–3.10	3.01	PalpPatS*	14–15	15		
PLSAPW	0.36–0.38	0.37	PalpFemS	2–7	5		
PLSAPL	1.03–1.08	1.05					
Fe1S*	8–9	9					
Pa1S	0						

***Hadronyche adelaidensis* (Gray)**

Figures 105–107; Table 33

Atrax adelaidensis. Gray, 1984: 442.

Hadronyche adelaidensis.—Gray, 1988: 114.

Types. Holotype female: N1979146 (SAM). Hackney, Adelaide, South Australia, 34°54'S 138°37'E, 16 November 1973, J. Batt. Paratype male: N1979145 (SAM). St. Peters C.G.S. Adelaide, South Australia, 3 June 1971, D. Edwards.

Diagnosis. CL 5.5–6.8 (male and female). Small atracine spiders. Males differ from *H. flindersi* by presence of incrassate tibia I and metatarsus I, reduced spination on

tibia I, II (0–2), and absence of dorsal spines (bristles only) on femur I. Male palp with short, broad embolus. Females are distinguished by strongly dilated spermathecae; and numerous prolateral spines on patella III (18–26).

Distribution. Mount Lofty Ranges and the Adelaide region, South Australia (Fig. 105).

Comments. Williams & Goode (1978) found evidence that the Miocene Murray River in South Australia may have run west into the Spencer Gulf south of Port Pirie, before its flow was diverted southward near Morgan. The progenitor populations of *H. adelaidensis* and *H. flindersi* may have speciated on either side of a barrier formed by the ancient Murray River in South Australia.

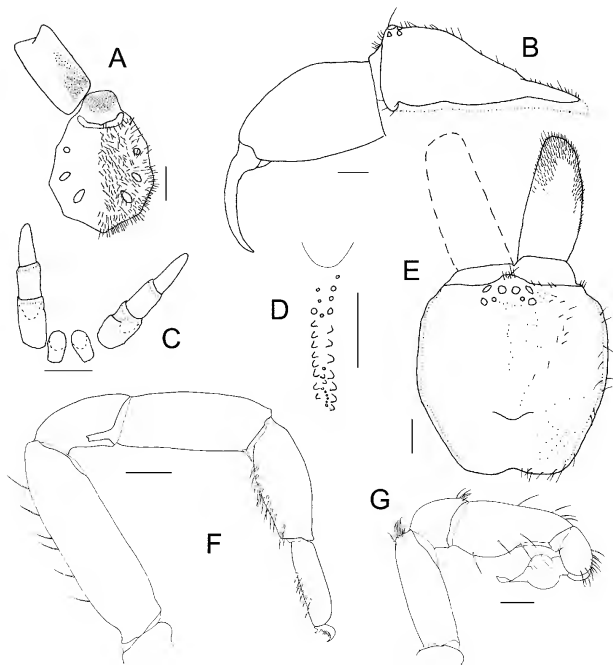


Figure 106. *Hadronyche adelaidensis*, male: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) leg I, prolateral; (G) palp, prolateral. Scale lines 1 mm.

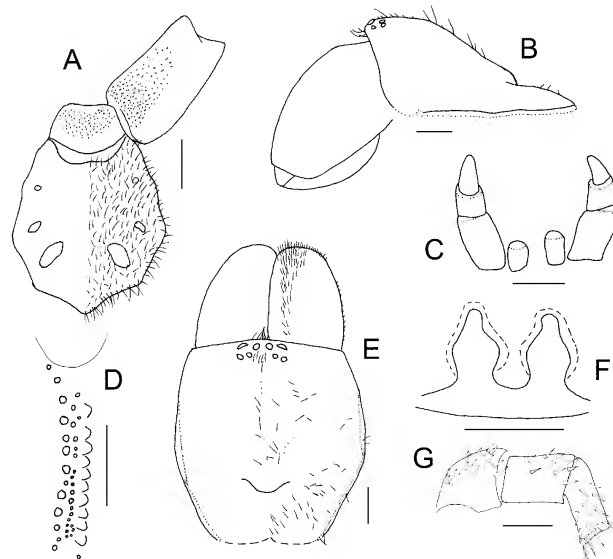


Figure 107. *Hadronyche adelaidensis*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) spinnerets; (D) cheliceral groove teeth; (E) cephalothorax and chelicerae, dorsal; (F) spermathecae; (G) leg III, prolateral, patella, tibia, metatarsus. Scale lines 1 mm.

Table 33. Male morphological data—*Hadronyche adelaidensis* (n = 3).

character	range	mean	character	range	mean	character	ratio	SD
CL*	5.55–6.40	6.04	Mt1S	19–31	25	CW/CL	0.93	0.064
CW	5.30–6.15	5.63	Ta1S	12–20	16	CH/CW	0.47	0.046
CH	2.57–2.75	2.65	Ti2S*	1–2	1	CFW/CL	0.74	0.017
CFW	4.21–4.67	4.45	STC2teeth	8	8	CHGW/L	0.10	0.006
ChGL	2.07–2.39	2.22	BulbL	2.10–2.26	2.18	SW/SL	0.89	0.02
ChGW	0.22–0.24	0.22	EmblL	1.24–1.36	1.30	LL/LW	0.76	0.021
ChGCT	10–12	11	BulbW	1.02–1.06	1.04	PLSAPW/L	0.40	0.015
LL	1.00–1.06	1.03	EmbmW	0.22–0.24	0.23	BulbW/EmblL	0.80	0.05
LW	1.30–1.44	1.37	PalpTibL	2.95–3.14	3.03	EmbmW/L*	0.18	0.006
CUSP	181–230	207	PalpTibW	1.48–1.60	1.54	PalpTibW/L	0.51	0.006
SL	3.45–3.73	3.59	PalpTibS	0	—	BulbL/TibL	0.72	0.01
SW	3.14–3.26	3.20	PalpPatS	0	—			
PLSAPW	0.36–0.38	0.37	PalpFemS	0–1	1			
PLSAPL	0.92–0.94	0.93						
Fe1S	0*							
Pa1S	0							

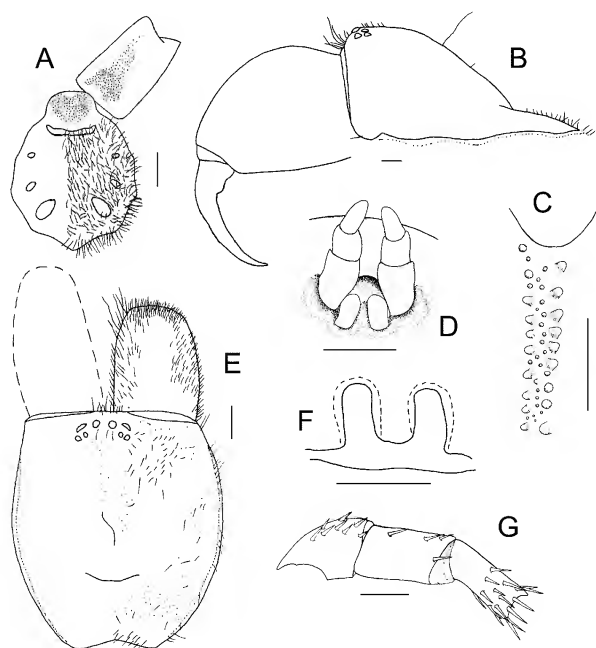


Figure 108. *Hadronyche eyrei*, female: (A) sternum, labium and maxilla; (B) cephalothorax and chelicerae, lateral; (C) heliceral groove teeth; (D) spinnerets; (E) cephalothorax and chelicerae, dorsal; (F) spermathecae; (G) leg III, proteral, patella, tibia, metatarsus. Scale lines 1 mm.

Hadronyche eyrei (Gray)

Figures 105, 108

Atrax eyrei. Gray, 1984: 444.

Hadronyche eyrei.—Gray, 1988: 114.

Types. Holotype female: AMS KS4509, 6.5km south of Coult, Eyre Peninsula, South Australia, 34°23'S 135°28'E, 18 December 1952, B.Y. Main.

Diagnosis. CL 6.6 (female). Small atracine spiders. Differs from other *adelaidensis* group species by its rather uniform maroon-brown abdominal pigmentation (much lighter laterally and ventrally in other species). Prolateral patella with 5–10 spines. Spermathecae unmodified, sac-like.

Distribution. Southern Eyre Peninsula, South Australia (Fig. 105).

Comments. This species represents the known western extent of the atracine spiders in Australia.

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Table 34. Female morphological data for *Atrax*, *Illawarra* and *Hadronyche* species; means within parentheses, ratios within square brackets, measurements in mm; n = 6 for each species except *H. emmalizae* and *H. lynabrae* n = 3. Abbreviations: *CL*, carapace length; *CW*, carapace width; *CH*, carapace height; *SL*, sternum length; *SW*, sternum width; *LL*, labium length; *LW*, labium width; *ChGL*, cheliceral groove length; *ChGW*, cheliceral groove width; *PLSAPL*, posterior lateral spinneret apical segment length; *PLSAPW*, posterior lateral spinneret apical segment width; *TiLS*, tibia I spine number; *Pa3proS*, patella III prolateral dorsal spine number.

species	<i>A. robustus</i>	<i>A. yorkmainorum</i>	<i>A. sutherlandi</i>	<i>I. wisharti</i>	<i>H. ceriberea</i>	<i>H. versuta</i>
CL	9.69–13.89 (12.45)	7.39–9.18 (8.23)	7.72–10.20 (8.53)	7.98–9.94 (8.90)	6.67–10.72 (9.30)	8.78–11.18 (9.60)
CW	7.96–11.99 (10.30)	6.41–8.42 (7.35)	6.20–8.31 (7.10)	6.72–8.40 (7.65)	6.42–9.93 (8.64)	8.42–11.20 (9.20)
CH	2.72–5.70 (4.38)	2.76–3.86 (3.31)	2.65–4.30 (3.31)	2.87–3.93 (3.41)	3.59–5.24 (4.61)	4.06–5.83 (5.02)
SL	5.72–8.20 (6.97)	4.19–5.23 (4.81)	4.05–6.12 (5.04)	4.29–5.70 (4.84)	4.81–7.32 (6.39)	5.92–8.46 (6.81)
SW	4.41–6.30 (5.25)	3.79–4.34 (3.91)	3.24–4.19 (3.75)	3.70–4.91 (4.35)	3.55–5.50 (4.84)	4.69–5.74 (5.08)
LL	1.81–2.49 (2.15)	1.18–1.73 (1.44)	1.17–1.60 (1.38)	1.28–1.55 (1.41)	1.55–2.44 (2.18)	2.11–2.90 (2.34)
LW	2.10–3.03 (2.62)	1.69–2.10 (1.82)	1.57–2.28 (1.85)	1.56–1.95 (1.77)	1.57–2.24 (2.08)	2.08–2.88 (2.26)
ChGL	3.13–4.45 (3.74)	2.33–3.08 (2.64)	1.97–3.26 (2.70)	1.70–2.96 (2.46)	2.10–3.90 (2.94)	2.54–3.60 (2.92)
ChGW	0.42–0.66 (0.60)	0.35–0.62 (0.44)	0.28–0.47 (0.39)	0.32–0.46 (0.37)	0.54–1.02 (0.77)	0.69–1.06 (0.82)
PLSAPL	2.11–3.26 (2.57)	0.77–1.78 (1.43)	1.39–2.35 (1.72)	0.44–1.14 (0.86)	0.93–1.90 (1.41)	0.92–1.54 (1.34)
PLSAPW	0.66–0.96 (0.81)	0.45–0.66 (0.55)	0.51–0.63 (0.55)	0.35–0.58 (0.48)	0.56–0.80 (0.71)	0.69–0.94 (0.79)
TiLS	2–3 (3)	2–5 (3)	2–3 (2)	0 (0)	0–3 (2)	4–7 (5)
Pa3proS	2–3 (2)	1–5 (3)	3–5 (4)	3–7 (5)	3–12 (6)	3–9 (6)
CW/CL	[0.83]	[0.89]	[0.83]	[0.86]	[0.93]	[0.96]
CH/CW	[0.42]	[0.45]	[0.47]	[0.44]	[0.53]	[0.55]
SW/SL	[0.75]	[0.81]	[0.74]	[0.90]	[0.76]	[0.74]
LL/LW	[0.82]	[0.79]	[0.75]	[0.79]	[1.05]	[0.97]
ChGW/L	[0.16]	[0.17]	[0.14]	[0.15]	[0.26]	[0.28]
PLSAPW/L	[0.31]	[0.38]	[0.32]	[0.56]	[0.50]	[0.59]

species	<i>H. emmalizae</i>	<i>H. formidabilis</i>	<i>H. alpina</i>	<i>H. venenata</i>	<i>H. marracoonda</i>	<i>H. mascordi</i>
CL	8.50–11.25 (10.28)	11.55–14.84 (13.00)	7.87–10.55 (9.18)	6.96–9.72 (8.27)	10.15–11.71 (10.98)	6.42–8.66 (7.27)
CW	7.86–10.90 (9.78)	9.14–12.71 (11.19)	7.01–9.35 (8.36)	6.71–8.93 (7.63)	8.65–10.07 (9.43)	6.29–7.31 (6.80)
CH	4.47–6.62 (5.55)	4.57–6.75 (5.77)	3.68–5.50 (4.67)	3.03–4.57 (3.92)	4.13–5.37 (4.69)	2.69–4.03 (3.55)
SL	5.87–7.72 (7.07)	6.56–9.17 (8.18)	4.70–6.90 (6.01)	4.80–7.10 (5.77)	6.27–7.86 (7.19)	4.18–5.46 (4.73)
SW	4.73–6.51 (5.81)	5.40–6.88 (6.26)	3.90–5.24 (4.70)	3.54–4.83 (4.16)	5.02–5.90 (5.55)	3.16–3.93 (3.55)
LL	1.70–2.55 (2.33)	2.07–3.08 (2.65)	1.65–2.36 (1.95)	1.47–2.34 (1.78)	2.23–2.99 (2.58)	1.09–1.41 (1.23)
LW	2.16–2.62 (2.40)	2.08–2.95 (2.65)	1.72–2.41 (2.14)	1.60–2.37 (1.88)	2.29–2.72 (2.56)	1.47–2.16 (1.70)
ChGL	3.00–3.65 (3.44)	3.41–4.85 (4.27)	2.59–3.93 (3.27)	2.20–2.99 (2.58)	3.24–3.56 (3.40)	2.04–2.33 (2.21)
ChGW	0.68–1.11 (0.96)	0.60–1.06 (0.85)	0.52–0.92 (0.72)	0.40–0.62 (0.51)	0.85–0.93 (0.90)	0.63–0.79 (0.69)
PLSAPL	1.17–2.42 (1.81)	1.76–2.75 (2.08)	0.93–1.72 (1.33)	1.00–1.72 (1.33)	1.55–2.07 (1.77)	0.69–1.18 (0.91)
PLSAPW	0.62–1.17 (0.90)	0.67–0.94 (0.79)	0.42–0.69 (0.60)	0.52–0.68 (0.63)	0.79–1.22 (0.97)	0.52–0.73 (0.59)
TiLS	0–4 (2)	0–1 (<1)	1–4 (2)	0–2 (2)	3–5 (4)	1–2 (1)
Pa3proS	4–9 (7)	5–13 (8)	4–11 (8)	2–5 (4)	5–6 (5)	3–9 (5)
CW/CL	[0.95]	[0.86]	[0.91]	[0.92]	[0.86]	[0.93]
CH/CW	[0.57]	[0.52]	[0.56]	[0.51]	[0.50]	[0.52]
SW/SL	[0.82]	[0.76]	[0.78]	[0.72]	[0.77]	[0.75]
LL/LW	[0.97]	[1.00]	[0.91]	[0.95]	[1.00]	[0.72]
ChGW/L	[0.28]	[0.20]	[0.22]	[0.20]	[0.26]	[0.31]
PLSAPW/L	[0.50]	[0.38]	[0.45]	[0.47]	[0.55]	[0.65]

Table 34 (continued).

species	<i>H. nimoola</i>	<i>H. modesta</i>	<i>H. meridiana</i>	<i>H. infensa</i>	<i>H. orana</i>	<i>H. valida</i>
CL	5.88–9.24 (8.00)	6.68–8.12 (7.29)	5.90–7.86 (6.84)	9.56–12.97 (11.18)	7.93–10.74 (9.16)	7.96–12.05 (9.89)
CW	5.76–8.65 (7.78)	5.97–8.19 (6.95)	6.29–7.39 (6.77)	9.42–10.73 (10.05)	8.15–9.17 (8.76)	7.19–10.40 (8.69)
CH	3.08–5.44 (4.76)	3.16–4.43 (3.72)	3.55–4.43 (3.97)	4.76–6.42 (5.49)	3.85–5.37 (4.82)	3.84–6.18 (4.80)
SL	3.80–5.78 (4.99)	4.22–5.65 (4.95)	4.21–5.21 (4.77)	5.44–7.58 (6.69)	5.48–6.71 (6.31)	5.21–7.68 (6.42)
SW	3.34–5.08 (4.46)	3.45–4.64 (4.13)	3.52–4.06 (3.78)	4.22–5.95 (5.22)	4.68–5.54 (5.12)	4.11–5.76 (4.91)
LL	1.11–2.10 (1.66)	1.24–1.70 (1.47)	1.44–1.57 (1.51)	2.08–2.49 (2.22)	1.81–2.33 (2.03)	1.38–2.21 (1.84)
LW	1.24–2.46 (1.67)	1.59–2.10 (1.85)	1.70–2.11 (1.87)	2.04–2.59 (2.34)	1.87–2.23 (2.08)	1.69–2.58 (2.16)
ChGL	1.59–2.83 (2.43)	2.10–3.01 (2.62)	2.29–2.83 (2.56)	3.16–3.80 (3.39)	2.72–3.06 (2.86)	2.49–3.39 (2.89)
ChGW	0.46–0.79 (0.69)	0.38–0.68 (0.56)	0.45–0.54 (0.51)	0.67–0.90 (0.79)	0.72–1.01 (0.86)	0.60–0.85 (0.74)
PLSAPL	0.67–1.29 (1.06)	0.69–1.06 (0.92)	0.67–1.14 (0.92)	1.31–2.12 (1.74)	1.36–1.83 (1.57)	1.43–2.21 (1.61)
PLSAPW	0.42–0.92 (0.67)	0.31–0.56 (0.50)	0.41–0.58 (0.51)	0.52–0.99 (0.73)	0.67–0.82 (0.75)	0.55–0.69 (0.65)
TiIS	0–1 (<1)	0–3 (1)	0–4 (2)	1–4 (3)	0–5 (2)	2–4 (3)
Pa3proS	14–27 (21)	4–19 (11)	4–8 (6)	4–8 (6)	3–6 (5)	1–7 (5)
CW/CL	[0.97]	[0.95]	[0.99]	[0.90]	[0.96]	[0.88]
CH/CW	[0.61]	[0.53]	[0.59]	[0.55]	[0.55]	[0.55]
SW/SL	[0.89]	[0.83]	[0.79]	[0.78]	[0.81]	[0.76]
LL/LW	[0.99]	[0.79]	[0.81]	[0.95]	[0.98]	[0.85]
ChGW/L	[0.28]	[0.21]	[0.20]	[0.23]	[0.30]	[0.26]
PLSAPW/L	[0.63]	[0.54]	[0.55]	[0.42]	[0.48]	[0.40]

species	<i>H. lynabrae</i>	<i>H. macquariensis</i>	<i>H. walkeri</i>	<i>H. levittreggae</i>
CL	8.52–9.45 (8.95)	7.86–14.48 (10.97)	8.65–12.42 (10.96)	7.21–11.16 (9.56)
CW	7.90–8.41 (8.16)	7.28–10.35 (9.34)	8.24–10.80 (9.37)	5.90–10.28 (8.34)
CH	4.47–4.54 (4.52)	3.67–5.19 (4.49)	3.47–5.74 (4.88)	3.42–5.83 (4.55)
SL	5.48–6.30 (5.93)	5.11–7.48 (6.49)	5.74–7.72 (6.72)	4.30–8.02 (6.28)
SW	4.32–4.56 (4.43)	4.23–5.86 (5.27)	4.11–5.87 (5.18)	3.30–5.74 (4.66)
LL	1.73–1.95 (1.83)	1.57–2.45 (2.01)	1.64–2.55 (2.14)	1.41–2.29 (1.92)
LW	1.94–2.23 (2.10)	1.79–2.69 (2.21)	1.70–2.90 (2.27)	1.45–2.36 (1.98)
ChGL	3.04–3.28 (3.19)	2.74–3.90 (3.33)	2.72–4.06 (3.32)	2.16–3.26 (2.78)
ChGW	0.66–0.73 (0.69)	0.66–0.80 (0.75)	0.63–0.92 (0.80)	0.46–0.85 (0.70)
PLSAPL	1.33–1.85 (1.54)	1.44–2.36 (1.89)	1.49–2.53 (1.98)	1.11–1.43 (1.28)
PLSAPW	0.61–0.68 (0.64)	0.51–1.02 (0.81)	0.59–0.90 (0.76)	0.59–0.76 (0.67)
TiIS	0–1 (<1)	1–3 (2)	0–4 (2)	1–2 (2)
Pa3proS	12–17 (14)	6–11 (7)	4–7 (6)	4–8 (6)
CW/CL	[0.91]	[0.85]	[0.85]	[0.87]
CH/CW	[0.55]	[0.48]	[0.52]	[0.55]
SW/SL	[0.75]	[0.81]	[0.77]	[0.74]
LL/LW	[0.87]	[0.91]	[0.94]	[0.97]
ChGW/L	[0.23]	[0.22]	[0.24]	[0.25]
PLSAPW/L	[0.42]	[0.43]	[0.38]	[0.52]

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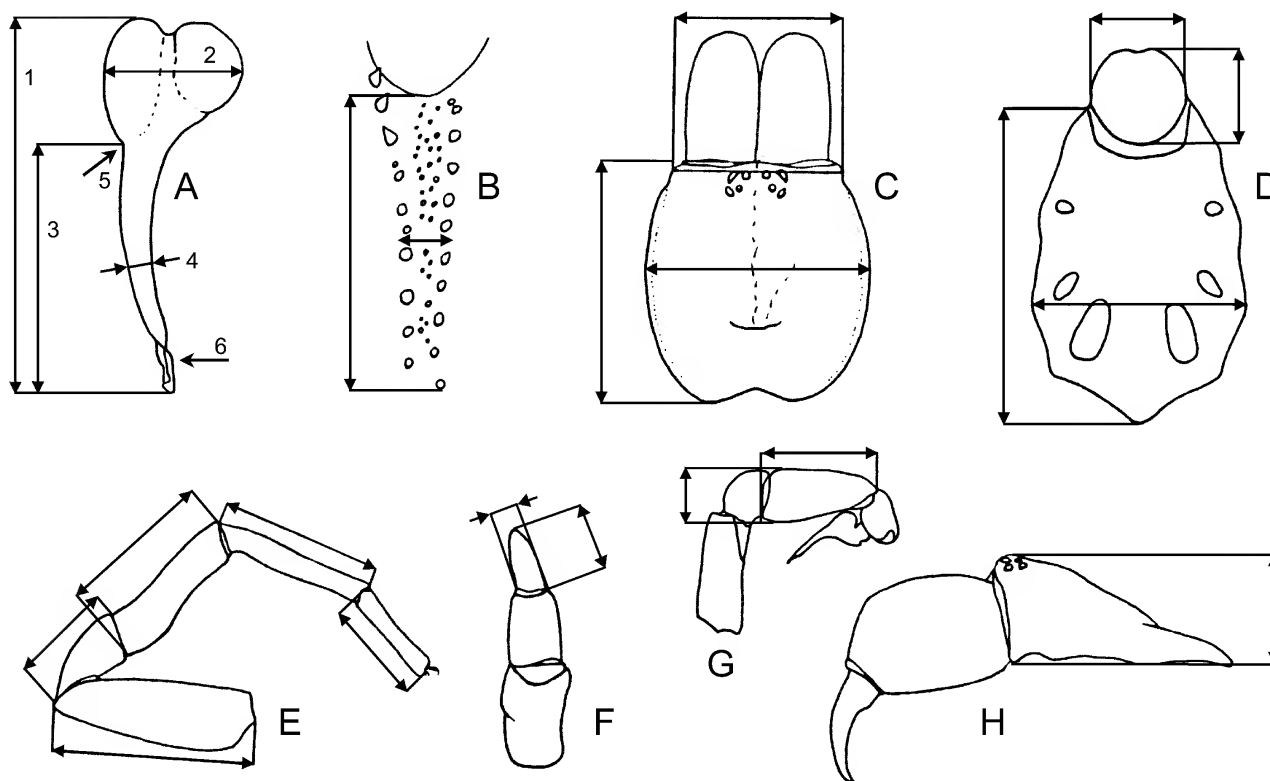
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Appendix 1

Morphological characters and measurement points

- A Palpal organ. (1) Bulb length—tegulum+embolus. (2) Bulb width—across tegulum and subtegulum. (3) Embolus length. (4) Embolus mid-width. (5) Offset of basal embolus from tegulum. (6) Twisted and “flanged” distal part of embolus.
- B Cheliceral tooth row: length and mid-width.
- C Carapace, dorsal: length, width and clypeal frontal width.
- D Labium: length, width. Sternum: length, width. (Note: the presence of setae on the posterior labium helps differentiate it from the smooth hairless cuticle of the labiosternal sigillum)
- E Leg segment lengths: femur, patella, tibia, metatarsus, tarsus.
- F Posterior lateral spinnerets, apical segment: length and mid-width.
- G Male palpal tibia: length, width.
- H Carapace, lateral: height.



Appendix 2

List of atracine spider species, with numbers previously allocated to new species. Undescribed species dealt with in Gray (1986, 1987, 1988) were identified by species numbers. These numbers are given below with the corresponding new species names allocated here. Note that number 5 in the *Hadronyche* species number list is intentionally omitted.

species names	species number
<i>Atrax robustus</i> O.P.-Cambridge, 1877	
<i>Atrax sutherlandi</i> n.sp.	<i>Atrax</i> sp.1
<i>Atrax yorkmainorum</i> n.sp.	<i>Atrax</i> sp.2
<i>Hadronyche adelaidensis</i> (Gray, 1984)	
<i>Hadronyche anzses</i> Raven, 2000	
<i>Hadronyche cerberaea</i> L. Koch, 1873	
<i>Hadronyche eyrei</i> (Gray, 1984)	
<i>Hadronyche formidabilis</i> (Rainbow, 1914)	
<i>Hadronyche flindersi</i> (Gray, 1984)	
<i>Hadronyche infensa</i> (Hickman, 1964)	
<i>Hadronyche meridiana</i> Hogg, 1902	
<i>Hadronyche modesta</i> (Simon, 1891)	
<i>Hadronyche pulvinator</i> (Hickman, 1927)	
<i>Hadronyche valida</i> (Rainbow & Pulleine, 1918)	
<i>Hadronyche venenata</i> (Hickman, 1927)	
<i>Hadronyche versuta</i> (Rainbow, 1914)	
<i>Hadronyche emmalizae</i> n.sp.	<i>Hadronyche</i> sp. 1
<i>Hadronyche alpina</i> n.sp.	<i>Hadronyche</i> sp. 2
<i>Hadronyche marracoonda</i> n.sp.	<i>Hadronyche</i> sp. 3
<i>Hadronyche monaro</i> n.sp.	<i>Hadronyche</i> sp. 4
<i>Hadronyche tambo</i> n.sp.	<i>Hadronyche</i> sp. 6
<i>Hadronyche nimoola</i> n.sp.	<i>Hadronyche</i> sp. 7
<i>Hadronyche mascordi</i> n.sp.	<i>Hadronyche</i> sp. 8
<i>Hadronyche jensenae</i> n.sp.	<i>Hadronyche</i> sp. 9
<i>Hadronyche orana</i> n.sp.	<i>Hadronyche</i> sp. 10
<i>Hadronyche lynabrae</i> n.sp.	<i>Hadronyche</i> sp. 11
<i>Hadronyche kaputarensis</i> n.sp.	<i>Hadronyche</i> sp. 12
<i>Hadronyche levittgreggae</i> n.sp.	<i>Hadronyche</i> sp. 13
<i>Hadronyche macquariensis</i> n.sp.	<i>Hadronyche</i> sp. 14
<i>Hadronyche walkeri</i> n.sp.	<i>Hadronyche</i> sp. 15
<i>Hadronyche raveni</i> n.sp.	<i>Hadronyche</i> sp. 16
<i>Hadronyche lamingtonensis</i> n.sp.	<i>Hadronyche</i> sp. 17
<i>Hadronyche annachristiae</i> n.sp.	<i>Hadronyche</i> sp. 18
<i>Hadronyche monteithi</i> n.sp.	<i>Hadronyche</i> sp. 19
<i>Illawarra wisharti</i> n.sp.	<i>Hadronyche</i> sp. 20

Note on *Hydroides malleolaspinus* from the Kimberleys of Western Australia (Polychaeta: Serpulidae)

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ABSTRACT. Pillai (2009) described a series of specimens from the Kimberley area, Western Australia, considered them to belong to an unknown species and proposed the name “*Hydroides trihamulatus*” for them. In error, no type material was designated, so the name is unavailable. After reexamination of the same specimens, as well as the holotype of *Hydroides malleolaspinus* Straughan, 1967, we found that the specimens correspond to this latter species.

MURRAY, ANNA, PAT HUTCHINGS & T. GOTTFRIED PILLAI, 2010. Note on *Hydroides malleolaspinus* from the Kimberleys of Western Australia (Polychaeta: Serpulidae). *Records of the Australian Museum* 62(3): 393–394.

Pillai (2009: 131–134) described a new species for which no types were designated (“*Hydroides trihamulatus*”). Because of this error the name is unavailable. Initially we thought to correct this by reexamining the same specimens, nominating type material, and describing them as a new species. However, as *Hydroides malleolaspinus* Straughan, 1967, was considered to be most similar to “*H. trihamulatus*” (see Pillai’s remarks on p.132), we also examined that holotype and other specimens identified by Straughan as *H. malleolaspinus*. We then discovered features on the holotype of *H. malleolaspinus* that were not included in Straughan’s original description, and which Pillai (2009) used as distinguishing characters separating the two species. We herein expand the description of *Hydroides malleolaspinus* Straughan, 1967, to include these characters.

Genus *Hydroides* Gunnerus, 1768

Type species. *Hydroides norvegica* Gunnerus, 1768.

Diagnosis. See Pillai (2009), and ten Hove & Kupriyanova (2009).

Hydroides malleolaspinus Straughan, 1967

Fig. 1A–B

Hydroides malleolaspina Straughan, 1967:222–224, figs. 7a–f.
“*Hydroides trihamulatus*” Pillai, 2009: 131–134, figs. 24A–G,
25A–C, 26A–L (name unavailable, types not designated).

Material examined. Holotype of *Hydroides malleolaspinus* Straughan, 1967, AM W3999, coll. from Pinalba, Queensland, 25°16'44"S 152°50'32"E, June 1962 by G. McKeon. AM W3996 (1) identified by D. Straughan, from Shoal Point, Mackay, Queensland, coll. 7 Aug 1964, by I. Straughan. AM W4109 (1) identified by D. Straughan, from Heron Island, Queensland, coll. 1955 by B. Dew.

“*Hydroides trihamulatus*”: AM W202944 (5 specimens, all incomplete and only one with operculum present, removed from tubes, one posterior end also in vial), from Kimberley area, Western Australia, from sand cay on Port George IV, 15°20'S 124°39'E, St. 26, coll. 12 July 1988, by dredge. AM W21412 (5 specimens, of which two are anterior ends only and lack tubes, one is juvenile, incomplete posteriorly but possesses a tube, and one consists of radiolar crown of one side only), from Kimberley area, Western Australia, from sand cay on Port George IV, 15°20'S 124°39'E, St. 26, coll. 12 July 1988, by dredge. AM W202939 (1 radiolar crown from one side only, plus operculum), from sand cay on Port George IV, 15°20'S 124°39'E, 12 July 1988, St. 26. AM W202943 (1 adult specimen lacking tube), from reef north west of Buffon Island, 14°55'S 124°48'E, 12 July 1988, St. 85.

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AM W21469, (1 juvenile), from south west corner of Lucas Island, Kimberleys, Western Australia, 15°13'S 124°31'E, 30 m, 24 July 1988, St. 101. All specimens coll. by P.A. Hutchings.

Description. Holotype incomplete posteriorly, tube missing, with 7 thoracic and c. 80 abdominal chaetigers for length of 22 mm, maximum thoracic width 2.0 mm, 17 radioles plus operculum on right side, 21 radioles plus rudimentary operculum on left side, opercular length 2.1 mm, length of operculum with peduncle 5.5 mm, operculum with 9 unmodified coronal spines with T-shaped tips, plus 1 enlarged modified coronal spine with distal lateral “points” and large bulbous process directed medially, 21 infundibular spines with T-shaped tips (Fig. 1A); all spines lack a basal process.

Variation. Specimen from AM W3996 complete but damaged posteriorly, 17.0 mm in length, maximum thoracic width 2.0 mm, tube present for most of abdomen, dirty-white with 3 longitudinal ridges, radioles regrowing, 19 radioles on each side plus rudimentary operculum on left and operculum on right, opercular length 2.0 mm, 10 unmodified coronal spines with T-shaped tips, plus 1 enlarged modified coronal spine with small distal lateral “points” and large medial beak-like process directed perpendicular to axis of spine, 28 infundibular spines with T-shaped tips (Fig. 1B). Specimen from AM W4109 incomplete, damaged, juvenile, length of 1.5 mm with 3 abdominal chaetigers, maximum thoracic width 0.4 mm, tube missing, 6 radioles on each side plus rudimentary operculum on right and operculum on left, opercular length 0.7 mm, 7 unmodified coronal spines with T-shaped tips, plus one modified, enlarged coronal spine with slight medial bulge, 20 infundibular spines with blunt tips.

All specimens cited by Pillai (2009) under “*Hydroides trihamulatus*” are incomplete posteriorly, and are smaller than the type specimen of *H. malleolaspinus* and specimen AM W3996, but most are larger than specimen AM W4109. Maximum thoracic width ranges from 0.5–1 mm, opercular length ranges from 0.6–1.3 mm, number of radioles varies from 6–10 per side (plus operculum or rudimentary operculum), coronal spine number varies from 10–15, shape of the modified spine ranges from a small bulge to a beak-like process perpendicular to the axis of the spine. Number of infundibular lobes/spines ranges from 17–26. Coronal and infundibular spines show variations associated with ontogenesis. For a description of the size-related variability of spine shape/form, refer to Pillai (2009: 131, figs. 24C–G, 25A–C, 26E–F). Tube is square to trapezoidal in cross-section; 2–3 longitudinal ridges present along tube: smaller specimens possess two longitudinal ridges (Pillai, 2009: figs. 24A,B, 26A–C), which may only be weakly developed (Pillai, 2009: fig. 24E); the larger specimen AM W3996 possesses three longitudinal ridges along the tube. For detailed description of chaetae refer to Pillai (2009: 131–132, fig. 26G–L).

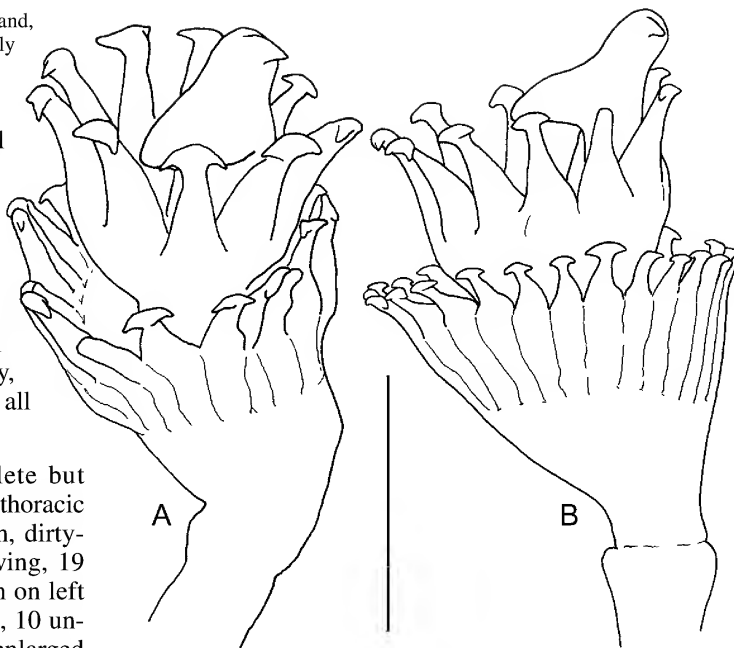


Figure 1. *Hydroides malleolaspinus*. (A) operculum of AM W3999, holotype; (B) operculum of AM W3996. Scale bar is 1 mm.

Remarks. Straughan (1967) described the enlarged modified coronal spine on the operculum of *H. malleolaspinus* as being “somewhat hammer-shaped”, she made no mention of a medial process, and her illustration (1967: fig. 7a) is ambiguous. Having confirmed that the holotype and another specimen identified by Straughan, possess a “bifid” tip and a large beak-like medial process on the modified coronal spine of the operculum, we have expanded the description of *H. malleolaspinus* to include these characters. We thus conclude that the specimens cited by Pillai (2009) under “*Hydroides trihamulatus*” represent this species. The variability in opercular spine form and count lies within the range that we regard as normal for conspecific individuals of varying age and size. The name “*Hydroides trihamulatus*” should be treated as unavailable. The geographical distribution of *H. malleolaspinus* is thus expanded to include NW Australia.

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