

## *Caridina spelunca*, a new species of freshwater shrimp (Crustacea: Decapoda: Atyidae) from a Western Australian cave

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**Abstract** – A new species of freshwater atyid shrimp, *Caridina spelunca* sp. nov., collected from a series of tufa dams within the outflow tunnel of Old Napier Downs Cave in the northern Napier Range, Western Australia, is described and illustrated. It is the first species of *Caridina* to be reported from Western Australia. *Caridina spelunca* sp. nov. can be distinguished from other species of *Caridina* by a combination of the following diagnostic characters: deep cephalothorax (depth about 0.8 times length), relatively small but normal eyes, presence of epipods on the first four pairs of pereopods, lack of a median spine on the posterior telsonic margin and the absence of an appendix interna on the endopod of the first male pleopod.

### INTRODUCTION

Although at least seventeen species of atyid shrimps are presently known from Australia (Choy and Horwitz 1995), only three species (*Stygiocaris lancifera* Holthuis, 1960, *S. stylifera* Holthuis, 1960 and *Pycneus morsitans* Holthuis, 1986) have been reported from Western Australia (Holthuis 1960, 1986). All three species are obligate troglobites, with short-stalked, pyriform eyes which are devoid of retinal pigmentation. Most species of the genus *Caridina* are epigeal and, although several species have been collected from troglons (subterranean water bodies), only a few of these exhibit troglomorphic characters (Guo *et al.*, 1996). One Australian species, *Caridina thermophila* Riek, 1953 was collected in water from an artesian bore but neither this nor any of the other seven described Australian species of this genus exhibit troglomorphic characters. This paper describes a new species of *Caridina* from Old Napier Downs Cave in the northern Napier Range in the Kimberley, Western Australia. Specimens were collected from a series of freshwater tufa dams within the outflow tunnel of the cave in the twilight zone (Humphreys 1995). These dams are well above the level of the plain and no water was flowing out of the cave when the samples were collected. The lack of troglomorphic characters suggests that this species may be a facultative troglobite.

### MATERIALS AND METHODS

The material studied was obtained from the Western Australian Museum, Perth (WAM) and

the Australian Museum, Sydney (AM). The format of the description and morphological terms follow Choy (1991). Cuticle spination and setation terminology follows (Felgenhauer 1992).

Abbreviations used in the text: CL, post-orbital carapace length measured from dorso-lateral invagination of the posterior margin to orbital margin of carapace; RL, pre-orbital rostral length measured from orbital margin of carapace to tip of rostrum; SL, body length from tip of telson to orbital margin of carapace;  $\bar{x}$ , mean value; s.e., standard error.

### SYSTEMATICS

Family ATYIDAE De Haan, 1849

*Caridina* H. Milne Edwards, 1837

*Caridina spelunca* sp. nov.

Figure 1

*Caridina* sp. nov.: Humphreys, 1995: 57.

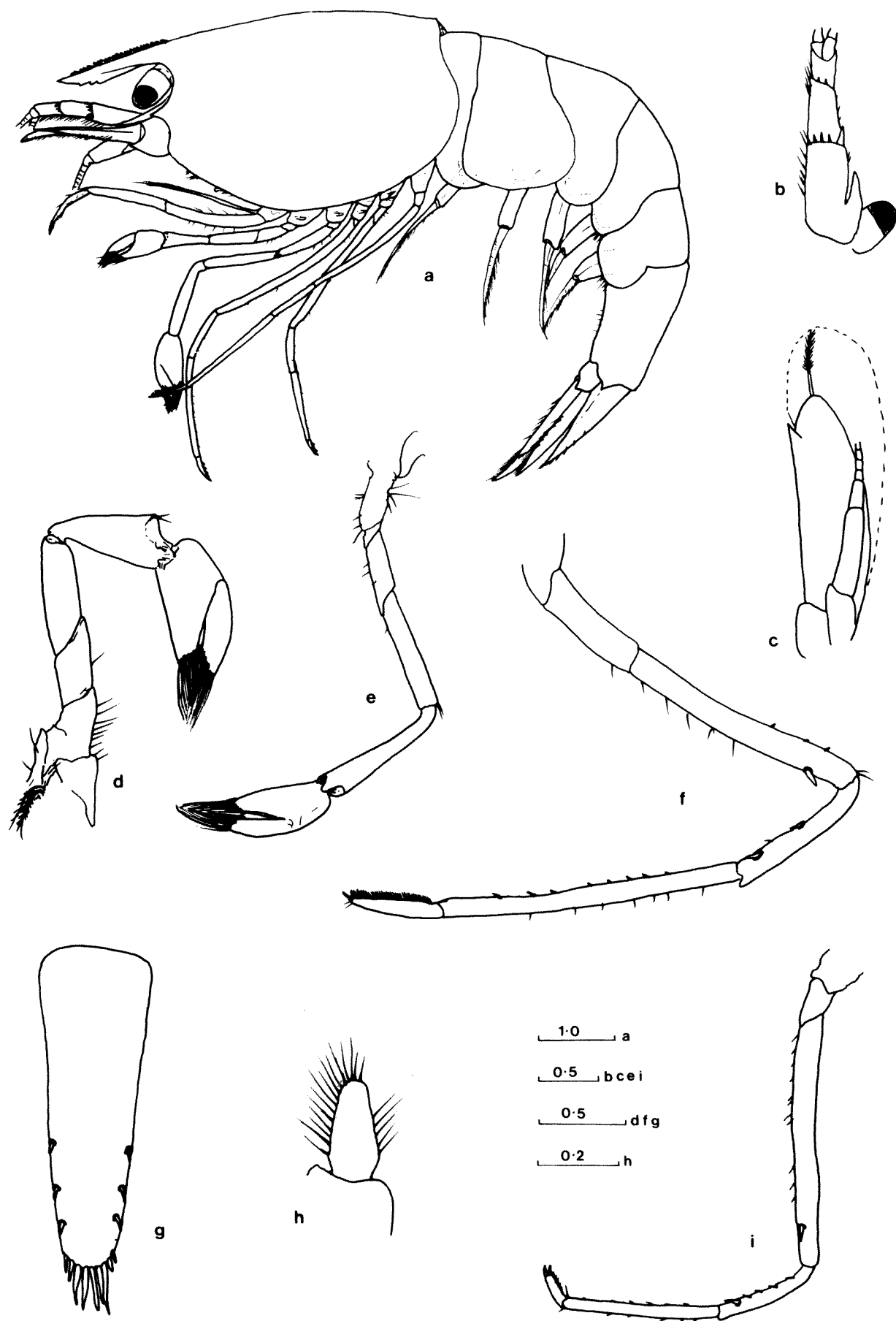
### Material Examined

#### *Holotype*

Adult ♂, Karst KN-1, Old Napier Downs Cave, Western Australia, Australia, 17°14'S 124°39'E, 12 July 1994, W.F. Humphreys (WAM 422-95), 13.2 mm SL, 3.48 mm CL, 1.72 mm RL.

#### *Allotype*

Adult ♀ Karst KN-1, Old Napier Downs Cave, Western Australia, Australia, 11 July 1994, B. Vine (WAM 423-95) 15.8 mm SL, 3.64 mm CL, 1.69 mm RL.



**Figure 1** *Caridina spelunca* sp. nov.: a, body, lateral aspect; b, antennule and eye; c, antenna; d, first pereiopod; e, second pereiopod; f, fifth pereiopod; g, telson; h, endopod of first male pleopod; i, third pereiopod. Scale in mm.

*Paratypes*

**Australia: Western Australia:** 1 juvenile ♀, Karst KN-1, Old Napier Downs Cave, 9 June 1966, A. Douglas and G. Kendrick (WAM 424-95), 1.79 mm CL; 2 ♂, 1 ♀ same collection data as holotype (WAM 425-95), 3.00-3.60 mm CL; 1 ♀ same locality as allotype (WAM 426-95), 3.38 mm; 8 poorly preserved specimens, stn. K10, outer pool, Old Napier Cave, 17°14'S 124°41'E, water depth ca. 1 m, water clear, pH 7.66, substrate mainly limestone rock with some loose rocks, gravel and sand, outermost pool also with tree roots, water temperature 20°C in outermost pool and 28°C in innermost pool that could be easily reached, outermost and adjacent pools contained shrimps, 3 July 1988, W.F. Ponder (AM. P.38512); 1 ♀, same data (AM P.40859), 2.9 mm CL; 1 ♂, same data (AM P.40856, ex P.38512), 1.9 mm CL.

**Diagnosis**

Small atyid shrimp with deep cephalothorax and small but well developed eyes; rostrum laterally compressed, dorsally and ventrally toothed, lateral carina ending before apex; epipods on first four pairs of pereopods; telsonic margin without median spine; endopod of first male pleopod without appendix interna.

**Description**

Body (Figure 1a) small, subcylindrical; males in collection up to 13.2 mm SL, females up to 15.8 mm SL.

Carapace (Figure 1a) glabrous, depth 0.68-0.9 CL; rostrum short, 0.37-0.49 CL, length 6.1-6.5 X height, curving downward, reaching tip of second antennular segment, 11-24 dorsal rostral teeth ( $\bar{x}$  = 18, s.e. = 1.33), 0-4 ( $\bar{x}$  = 2.6, s.e. = 0.4) situated behind posterior orbital margin, setose, 0-4 ( $\bar{x}$  = 2.7, s.e. = 0.4) ventral rostral teeth; lateral carina dividing rostrum into two unequal parts, continuing anteriorly from orbital margin to about 0.7 of rostrum; antennal spine short, strong, placed on lower orbital angle; pterygostomian angle obtuse, pterygostomian spine absent.

Eyes (Figure 1a) small, 0.13-0.20 CL, pyriform, corneal diameter 0.45-0.65 X eyestalk length, retinal pigmentation present.

Antennular peduncle (Figure 1b) not reaching beyond scaphocerite, 0.50-0.60 CL; stylocerite length 0.7 X proximal antennular segment length; anterolateral angle of proximal segment acute, reaching to about 0.27 X intermediate segment length; intermediate segment 0.68 X proximal segment length, about 1.8 X distal segment length; all segments with submarginal plumose setae; distal segment fringed laterally and apically with plumose setae.

Antennal peduncle (Figure 1c) about 0.5 X

scaphocerite length; scaphocerite slightly longer than antennular peduncle, 0.70 CL, outer margin straight to slightly concave, asetose, ending in strong subapical spine, length 3.5 X width, proximal lamella and interior margin with plumose setae.

Mandibles without palp; right mandible with about 6 strong, sharp incisor teeth laterally; medially two groups of setae, one group with bent hamate setae, other group with finer straight plumose setae; molar process ridged; left mandible with 6 strong teeth; medially three groups of setae, molar process ridged.

Maxillula with simple palp, slightly expanded distally, with long plumose setae distally, few simple setae proximally; lower lacinia with broadly rounded margin, bearing several rows of plumose and simple setae; upper lacinia broadly elongate, inner edge straight, with several rows of strong spiniform, hamate, denticulate and plumose setae, outer and lower inner margins with plumose setae.

Maxilla with slender tapering palp, shorter than upper endite cleft, setose; margin and submargin of upper and middle endite with simple, hamate, plumose and denticulate setae; lower endite with hamate setae; scaphognathite with regular row of long plumose setae on distal margin, with shorter hamate ones continuing down proximal triangular process which has about eleven long simple setae, some with prominent dilation at base.

First maxilliped with broadly triangular lamellar palp, ending in pointed tip, margins with plumose setae; ultimate and penultimate segments of endites indistinctly divided; inner margin of ultimate segment with long denticulate setae, long rows of plumose, simple and hamate setae submarginally, transverse rows of plumose setae proximally; exopod flagellum distinct, well developed, with submarginal and marginal plumose setae; caridean lobe narrow, with marginal and submarginal plumose setae.

Second maxilliped with dactylar and propodal segments of endopod fused; inner margins of all three proximal segments with long simple, hamate and plumose setae; exopod long, narrow with marginal long plumose setae distally and shorter ones proximally.

Third maxilliped reaching beyond tip of antennular peduncle; endopod three-segmented, basal segment length 7.1 X width, with few hamate setae on distal outer margin; penultimate segment length 8.7 X width, 0.95 X basal segment length, with transverse rows of spiniform hamate setae; distal segment ca. 0.94 X as long as penultimate segment, ending in large claw-like apical hamate seta surrounded by simple and plumose ones, behind which there are 7-9 hamate setae on distal third of posterior margin, clump of serrate and pappose setae proximally; exopod reaching about

0.4 of second endopod segment, distal margin with long plumose setae.

First pereopod (Figure 1d) reaching tip of basal antennular segment; chela length 2.3 X width, movable finger 1.3 X as long as palm, length 3.3 X width; finger tips rounded, without hooks, setal brushes well developed. Carpus attached to chela ventrally, excavated disto-dorsally, length 2.5 X width, 0.91 X chela length, 1.2 X merus length. Merus 0.7 X as wide as carpus. Ischium length 0.48 X merus length. Epipod present.

Second pereopod (Figure 1e) reaching tip of second segment of antennular peduncle, more slender and longer than first pereopod. Chela length 2.4 X width; movable finger length 3.2 X width, 1.5 X as long as palm; finger tips without hooks, setal brushes well developed. Carpus slightly excavated distally, length 5.3 X width, 1.3 X chela length, 1.2 X merus length. Ischium length 0.52 X merus length. Epipod present.

Third pereopod (Figure 1i) over-reaching antennular peduncle tip by about 0.33 distal propodus. Dactylus length 3.1–4.2 X width, ending in prominent claw-like hamate seta surrounded by simple setae; behind which posterior margin bears 4–7 shorter spiniform hamate setae. Propodus length 14.0–14.6 X width, 3.0–3.7 X dactylus length, posterior margin and lateral surface bearing two rows of small spiniform hamate setae. Carpus length 0.7 X propodus length, distal projection feebly developed, posterior and lateral surfaces with up to 5 small hamate setae. Merus 1.7–2.2 X length of carpus, with 1–3 strong, movable spiniform hamate setae along posterior margin. Ischium 0.2–0.3 X length of merus. Epipod present.

Fourth pereopod reaching tip of second segment to tip of third segment of antennular peduncle, morphology similar to third pereopod. Dactylus length 3.5 X width, ending in prominent claw-like hamate seta and 4–7 shorter spiniform hamate setae along posterior margin. Propodus length 14.0 X width, 4.5 X length of dactylus, bearing two rows of hamate setae along posterior and lateral surfaces. Carpus 0.7 X length of propodus, with up to 7 small hamate setae along posterior and lateral surfaces. Merus about 2.1 X length of carpus, with 3–4 spiniform hamate setae on postero-lateral margin. Ischium 0.25 X length of merus. Epipod present.

Fifth pereopod (Figure 1f) reaching tip of second segment to tip of third segment of antennular peduncle. Dactylus length 4.3 X width, ending in claw-like apical hamate seta, bearing comb-like row of 35–45 hamate setae on posterior margin. Propodus length 15.7 X width, 3.0 X dactylus length, bearing two rows of 15–20 short hamate setae on posterior margin. Carpus length 0.5–0.6 X propodus length, bearing 2–6 short hamate setae, distal projection well developed. Merus distinctly

shorter (0.8) but broader (1.3) than propodus, bearing 2–4 large spiniform hamate setae. Ischium about 0.4–0.5 X length of merus, with simple setae. Epipod absent.

Abdomen (1a) well developed, rotund, glabrous, 2.1 CL; sixth abdominal segment 0.47–0.67 CL, length 1.9–2.3 X depth. Second abdominal somite depth (from top of tergum to ventral margin of pleura) about 0.96 CL in fully developed non-ovigerous female, about 0.80 in males and juvenile females.

First pleopodal endopod (Figure 1h) length in adult male 2.2 X proximal width, 0.27–0.33 X exopod length, ovate, wider proximally, broadly rounded distally, inner margin bearing long plumose setae, outer margin with short plumose setae proximally and longer ones distally. Appendix interna absent.

Second pleopodal endopod length in adult male about 0.90 X exopod length, inner border near base with long marginal and submarginal hamate setae. Appendix interna reaching beyond middle of appendix masculina, with many retinaculae distally. Appendix masculina subcylindrical, long hamate setae distally and on inner lateral margin.

Telson (Figure 1g) 0.4–0.5 CL, equal to or just shorter than sixth abdominal segment, tapering posteriorly, ending in rounded margin, dorsal surface with 3–5 pairs of short hamate setae. Posterior margin rounded, with 8–10 spine-like setae, one or two outer-most pairs much shorter than adjacent, somewhat sigmoid, inner pair which in turn is generally thicker and longer than its adjacent inner ones. Uropods distinctly longer than telson; diaeresis on exopod with 8–10 small hamate setae.

### Etymology

The specific epithet refers to the habitat from where the species was collected (Latin: *spelunca* = cave). It is used as a noun in apposition.

### DISCUSSION

*Caridina spelunca* sp. nov. is the first in the genus to be described from Western Australia. Its habitat and sympatric fauna have been described by Humphreys (1995). It somewhat resembles *Caridina weberi* De Man 1892 (which is a wide ranging Indo-Pacific species but not yet reported from Australia) in rostral structure but can be easily distinguished from this and other morphologically similar species on the basis of a combination of the following characters in *C. spelunca*: absence of a median spine on the posterior telsonic margin; posterior telson margin with fewer and shorter intermediate setae, each lacking septum and annulus; carpus of first pereopod longer and not deeply excavated and the absence of an appendix interna on the endopod

of the first male pleopod. Of the atyid shrimps currently known from Australia, *C. spelunca* is morphologically most similar to *C. thermophila* which is known from an artesian bore in central Queensland (Riek 1953). However, *C. thermophila* possesses more ventral rostral teeth (4–6), more spiniform setae (8–11) on the dactylus of the third and fourth pereopods and more hamate setae (15–17) on the diaeresis of the uropodal exopod.

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