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## A NEW GENUS AND SPECIES OF SUBTERRANEAN SHRIMP FROM WESTERN AUSTRALIA (CRUSTACEA: DECAPODA: ATYIDAE)

by

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Key words: Crustacea Decapoda; Atyidae; Paratyinae; Caridellinae; Typhlatyinae; *Pycneus morsitans*; new genus; new species; cave shrimp; Western Australia.

Description of a new genus and species of stygobiont shrimp from a cave in the Gibson Desert of Western Australia, showing aggressive behaviour.

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In the last decennia the exploration of the subterranean aquatic habitats has increased in intensity, which resulted in the discovery of a surprisingly great number of stygobiont shrimps.

Until 1960 no subterranean shrimps were known from Australia. In that year a new genus with two new species was described (Holthuis, 1960). Four years later two more Australian species were described (Williams, 1964). The first two originated from the northern part of Western Australia, the other two from the Northern Territory. Now a fifth species, again from Western Australia, is described in the present paper, based on three specimens collected in a cave in the Gibson desert. Unfortunately all three specimens are females and not in optimal condition, but the material is quite sufficient to permit its recognition as a new genus and species.

I want to express my gratitude to Mrs. Diana S. Jones, Department of Crustacea, Western Australian Museum Perth, Australia, for the privilege to examine this interesting material, which forms part of the collection of the Western Australian Museum. Mrs. Jones also provided me with detailed information about colour, habits, and habitat of the species.

**Pycneus** gen. nov.

Definition. — A whitish atyid shrimp. Eyes degenerated without pigment. Rostrum very short, wider than long, depressed, unarmed. Carapace without any spines. Antennal flagella very long. Second maxilliped with podobranch, third with small arthrobranch. Pereiopods without exopods or arthrobranches. Epipods absent from fourth and fifth pereiopods. Pleurobranches present at the base of the first to fourth pereiopods. Fingers of chelipeds with sharp-hooked tips and relatively few hairs. Diaeresis with numerous spinules. Behaviour aggressive.

Type species. — *Pycneus morsitans* new species.

Etymology of generic name. — *Pycneus*, quasi-latinization of the Dutch word “pikneus” (= pecking nose), name for a fierce water ghost biting little children, invented to scare (skippers-)children from getting (falling) into the water as long as they cannot swim.

Gender of generic name. — Masculine.

Remarks. — *Pycneus* belongs to the subfamily Caridellinae of the family Atyidae. This subfamily is characterized by having no exopodites on the pereiopods (except *Caridinides*, which has an exopod on the first pereiopod only); neither are there arthrobranches at the bases of the pereiopods. Furthermore the carapace has no supra-orbital spine, and the diaeresis bears several spinules.

This subfamily was dealt with by Bouvier (1925: 41) under the name “série caridellienne”; he also recognized a “série paratyienne” and a “série caridinienne”. A recent review of these series was given by Monod & Cals (1970), who also included in their revision the “série typhlatyienne” first proposed by Holthuis (1965: 6). The various series in my opinion should be elevated to the subfamily level. The série paratyienne then becomes Paratyinae **subfam. nov.**, the série caridellienne Caridellinae **subfam. nov.**, the série typhlatyienne, Typhlatyinae **subfam. nov.** The série caridinienne becomes the nominate subfamily Atyinae De Haan, 1849, as it contains the genus *Atya* Leach, 1816. For the subfamily containing the genus *Xiphocaris* Von Martens, 1872 (Bouvier's, 1925, “forme acanthéphyroïde”) the subfamily name Xiphocaridinae Ortmann, 1895, is available.

The subfamily Caridellinae contains the following genera listed by Monod & Cals (1970: 101) for the série caridellienne: *Atyella* Calman, 1906; *Caridella* Calman, 1906 (type genus); *Caridinides* Calman, 1926; *Caridinopsis* Bouvier, 1912; *Halocaridina* Holthuis, 1963; *Limnocaridella* Bouvier, 1913; *Limnocaridina* Calman, 1899; and *Parisia* Holthuis, 1956. After 1970 the following genera, also belonging to this subfamily, were described: *Halocaridinides*

Fujino & Shokita, 1975 (with its synonym *Palauatya* Hart, 1980) and *Edoneus* Holthuis, 1978. Whether *Typhlocaridina* Liang & Yan, 1981, belongs in the present subfamily or in the Atyinae cannot be decided from the original description (Liang & Yan, 1981: 31–35, figs, 1–19), as nothing is said about the branchial formula. From the figures it is clear that the legs have no exopods, and that the diaeresis bears spinules; the dentition of the rostrum shows some resemblance to that of *Caridinopsis*.

*Pycneus* differs from the other genera in the peculiar shape of the chelipeds in which the fingers are compressed and have the tips sharply hook-shaped. The depressed rostrum also is a characteristic feature. *Pycneus* resembles *Atyella*, *Caridella*, *Halocaridina*, *Halocaridinides*, *Limnocaridella* and *Limnocaridina* in having no pleurobranch at the base of the fifth pereopod, and differs in that respect from *Caridinopsis*, *Edoneus*, *Parisia*, and possibly *Caridinides*. The podobranch of the second maxilliped and the arthrobranch of the third are absent in *Edoneus*, *Halocaridina*, *Halocaridinides* and *Limnocaridina*. In *Atyella*, *Caridella* and *Limnocaridella* a rudimentary arthrobranch seems to be present at the third maxillipede. In *Caridinopsis* the carpus of the first cheliped is not excavated anteriorly. Epipodites are absent from all pereopods in *Limnocaridina*, from the last three legs (P3 to P5) in *Caridinides*, and from P5 only in *Caridinopsis*, *Edoneus* and *Parisia*. In *Atyella*, *Caridella*, *Halocaridina*, *Halocaridinides* and *Limnocaridella*, as well as in the present genus, the last two legs (P4 and P5) are without epipodites.

The genera *Edoneus*, *Halocaridina*, *Halocaridinides*, and some species of *Parisia* have the rostrum unarmed as in *Pycneus*, in the other caridelline genera teeth or spines are present on the rostrum.

Several of the genera (*Edoneus*, *Halocaridina*, *Halocaridinides*) and some species of *Parisia*, like the present genus, belong to the stygofauna. In all the eyes are reduced; in *Halocaridina*, *Halocaridinides* and in two of the species of *Parisia* traces of pigment remain in the eyes, in *Edoneus*, *Pycneus* and two other species of *Parisia* all pigment seems to be lacking.

So far only one species is known of the present genus:

***Pycneus morsitans* spec. nov.**

(figs. 1-2)

Material. — Cave at Munjingerra, Gibson Desert, Western Australia, at about 22° 30' S 124° 10' E; 25 May 1985; leg. Mr. Harvey Webster. - 3 ♀♀, cl. 4-7 mm. Western Australian Museum, no. 615-85. Holotype is the second largest specimen (cl. 5 mm).

Etymology. — The latin word *morsitans* means biting, and refers to the aggressive behaviour of the species.

Description. — The carapace is thin and very flexible; in most specimens it has become entire or partly loose. There are no spines at all on the carapace. The rostrum is a shallow, rounded, dorsoventrally depressed median lobe on the anterior margin of the carapace; it hardly reaches beyond the eyes. The lower orbital angle is indicated by a shallow, indistinct convexity of the anterior margin of the carapace. The pterygostomian angle is broadly rounded.

The pleura of the abdominal somites are rounded. The sixth somite is 1.5 times as long as the fifth and 0.6 times as high as long. The pleura of the sixth somite are narrowly rounded, the posterolateral angles more broadly so. The telson is slightly shorter than the sixth abdominal somite. It narrows gradually to a rather wide, broadly rounded posterior margin, which bears eight spines. The outer of these spines are shortest, being less than half as long as the next pair, which are the longest. The four intermediate spines are somewhat shorter than the longest pair. The upper surface of the telson carries two or three pairs of spines, the anterior of which is placed slightly before the middle of the telson; the next pair is somewhat closer to the anterior pair than to the posterior margin of the telson.

The eyes lack all pigment. They are bullet-shaped and hardly reach beyond the rostrum if at all, and are largely covered by it.

The stylocerite is bluntly pointed and reaches beyond the middle of the basal segment of the antennular peduncle. The outer anterolateral angle of the basal segment is forwards-produced to about the middle of the second segment. The second segment is about half as long as the first and about as long as the third. The flagella are long and simple, the outer is wider (especially in the basal part) and longer than the inner.

The scaphocerite fails to reach to the end of the antennular peduncle. It is somewhat more than twice as long as wide. The lamella reaches distinctly beyond the final tooth, which is quite broad. The outer margin of the scaphocerite is slightly sinuous. There are no spines on the antennal peduncle, neither is there a finger-like process on the inner margin (a character brought to my attention by Miss A. Gurney, in litt.). The flagellum is very long, distinctly longer than the whole body.

The mandibles have the incisor process with a number of rather small, blunt teeth. The molar process has a ribbed surface. The right mandible has a small lobe, with setae apically, placed between the two processes; the left mandible has short spinules there.

In the maxillula the upper lacinia is narrow and with numerous short spinules on the inner margin; the lower lacinia is almost circular; the palp is elongate and rounded at the top, with a few minute spinules in the inner distal part.

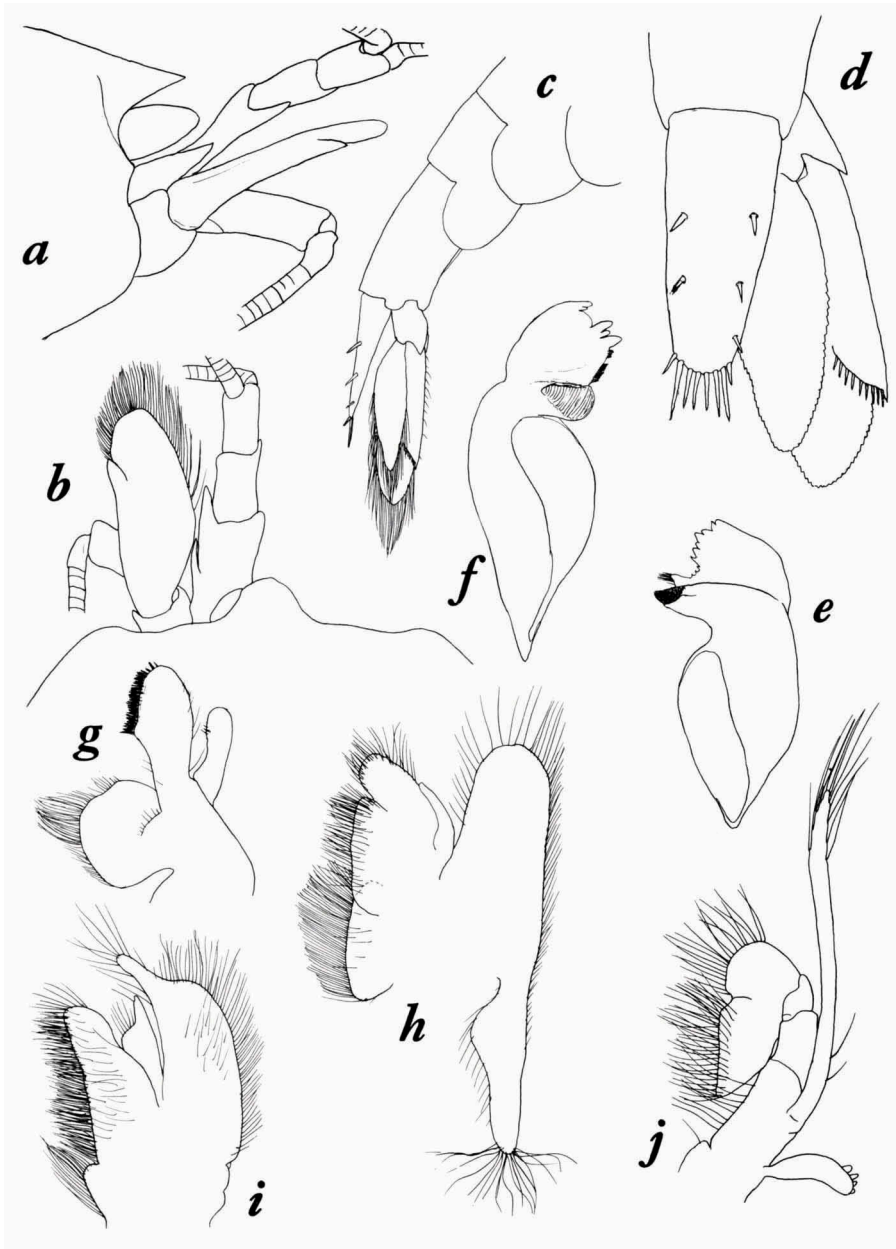


Fig. 1. *Pycneus morsitans* new genus, new species, female. a, anterior part of body in lateral view; b, rostrum and left cephalic appendages in dorsal view; c, abdomen in lateral view; d, telson and right uropod in dorsal view; e, right mandible; f, left mandible; g, maxillula; h, maxilla; i, first maxilliped; j, second maxilliped. a-c,  $\times 12.5$ ; d-j,  $\times 25$ .

The maxilla has the scaphognathite large and ending posteriorly in an elongate lobe crowned by a tuft of long, frizzly hairs. The palp is slender. The upper endite is sharply divided into two lobes, the upper of which is narrow and reaches slightly beyond the lower lobe, which is about as wide as the entire lower endite.

The first maxilliped has the lower endite small and protruding beyond the larger upper. The palp is wide, ending in a narrow lobe. The exopodite has the caridean lobe wide, the flagellar part is short and blunt. Below the exopod are some very shallow lobes; it is not clear whether one of these is an epipod.

The second maxilliped is of the usual shape. The line between the distal two segments is only partially visible. The exopod is strong and reaches well beyond the endopod. The epipod is distinct and bears a small podobranch.

The third maxilliped reaches with about half the distal segment beyond the antennular peduncle. The ultimate segment is slightly shorter than the penultimate. It gradually narrows into a sharp point and bears some small spines in the distal half. The proximal half shows a dense pubescence on the posterior margin. The penultimate segment is slightly wider than the base of the ultimate, but narrower than the antepenultimate; it bears hairs, some of which are placed in transverse rows in the posterior half. The antepenultimate segment is shorter than the penultimate. The exopod is well-developed and reaches beyond the base of the penultimate segment. A strap-like epipod is present as well as a small but distinct arthrobranch.

The branchial formula of the species is as follows:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
pleurobranchs	—	—	—	1	1	1	1	—
arthrobranchs	—	—	1	—	—	—	—	—
podobranchs	—	1	—	—	—	—	—	—
epipods	?	1	1	1	1	1	—	—
exopods	1	1	1	—	—	—	—	—

Exopods are present on the maxillipeds only, not on the pereiopods. Epipods are lacking altogether from the fourth and fifth pereiopods, their presence at the first maxilliped is doubtful. Pleurobranchs are present only at the bases of the first four pereiopods. As already mentioned above, a small arthrobranch is present on the third and a podobranch on the second maxilliped.

The first pereiopod is short and reaches only as far as the end of the anten-

nal peduncle. The chela is most peculiar as the fingers are somewhat compressed and end in a sharp, hook-shaped claw. The tufts of hair, so characteristic for Atyidae, are rather thin here and not very conspicuous. Most of the hairs are plumose and rather slender, but behind the tip of the fixed finger there is a tuft of shorter, stiffer hairs, which have one side serrate. The cutting edges of the fingers are unarmed. The fingers themselves are as long as the palm, which is somewhat swollen posteriorly. The carpus is slightly more than half as long as the chela; it is deeply excavate anteriorly for the reception of the basal part of the chela. It is less than twice as long as high and tapers towards the base. The following segments are short.

The second pereiopod is more slender than the first. It reaches with the fingers beyond the antennal peduncle. The chela is similar to that of the first pereiopod, only slightly more slender. The carpus is elongate, it is about three times as long as high and only slightly shorter than the chela; it is not excavated anteriorly and very gradually narrows posteriorly. The merus is about as long as the carpus and longer than the ischium.

The third pereiopod reaches with the greater part of the propodus beyond the first pereiopod. The dactylus is slender, being more than three times as long as high, and slightly less than  $1/3$  of the length of the propodus. It ends in a sharp tooth and has about six or seven spinules on the posterior margin. The propodus is long, its posterior margin carries many spine-like hairs or small spinules. The carpus is almost  $2/3$  as long as the propodus and bears no spine. The merus is somewhat longer and broader than the propodus and shows two strong, movable spines on the posterior half of the outer surface; in one specimen an additional spine is placed close to the proximal of the two spines. The ischium is about half as long as the merus; in some specimens it bears a large, movable spine, which is absent in others. A strap-like epipod is present.

The fourth leg reaches with the dactylus or slightly more beyond the first leg. It is very similar to the third pereiopod, but lacks the epipod; in all specimens a movable spine is present on the ischium.

The fifth pereiopod also overreaches the first with the dactylus. The dactylus is long and slender, measuring more than  $1/3$  of the length of the propodus. It ends in a sharp point and carries on its posterior margin about 60 small, comb-like arranged spinules. The posterior margin of the propodus carries more than 20 small spinules. The carpus is about half as long as the propodus, and, like in the previous two legs, bears two strong, movable spines in the posterior half of the outer surface. The ischium is about half as long as the merus; in some specimens it bears a large, movable spine.

The first pleopod of the female has the endopod ending in a narrowly

elongate, bluntly topped point. The following pleopods all are provided with an appendix interna on the endopod. The pleopods of the male are unknown.

The protopod of the uropods ends in a sharp, triangular outer lobe over the base of the exopod and a rounded lobe over that of the endopod. The outer margin of the exopod is straight and ends in a sharp tooth. The diaeresis carries six to nine slender spinules. The exopod reaches beyond the elongate, oval endopod. The preanal carina is convexly rounded, without a spine.

Colour. — The living animals were described as “white”. No pigment whatever, not even in the eyes, could be found in the preserved specimens.

Habitat. — The species was found in a pool in a limestone cave, about 40 to 50 feet (= 12 to 15 m) below the surface. The measured depth of the pool is up to 5 feet, its water is stagnant. The collector noted that “In the general

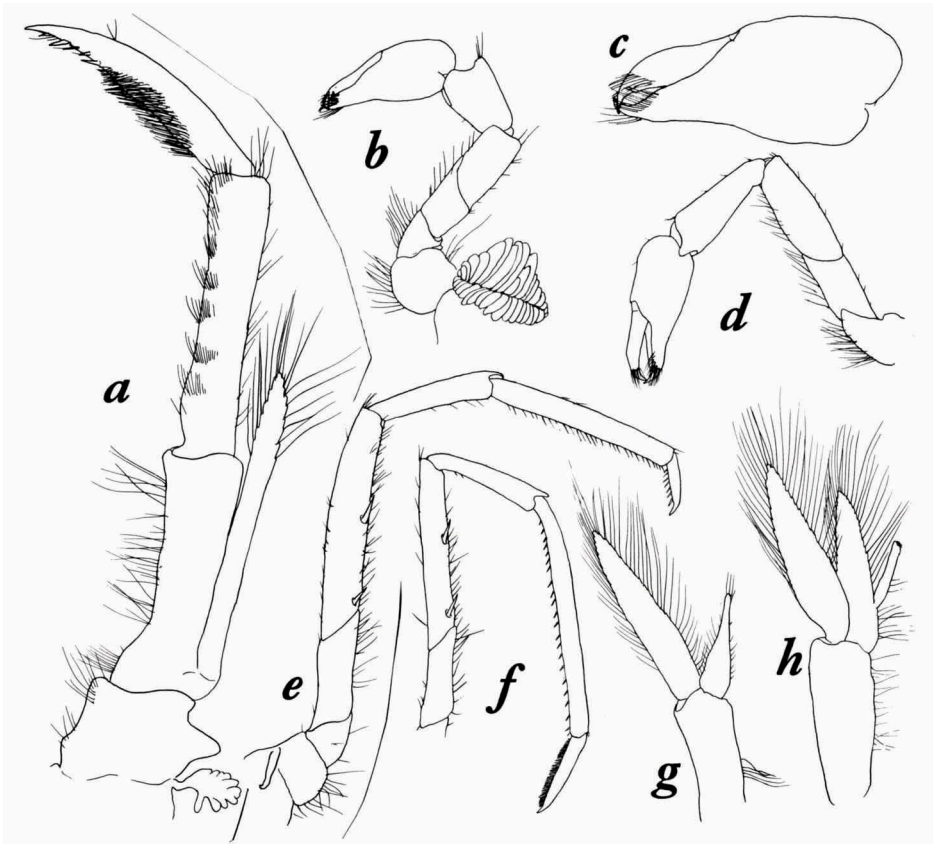


Fig. 2. *Pycneus morsitans* new genus, new species, female. a, third maxilliped; b, first pereiopod; c, chela of first pereiopod; d, second pereiopod; e, third pereiopod; f, fifth pereiopod; g, first pleopod of female; h, second pleopod of female. a, c,  $\times 25$ ; b, d-h,  $\times 12.5$ .



area of the cave there is a surface layer of dirt and rock of 12-15 feet [= 4-5 m] depth, with a layer of limestone, also 12 to 15 feet deep, below. However, this limestone outcrops in the area of the cave. There is a sloping narrow tunnel in the east corner of the cave which leads down to three smaller caves. One of these caves (Cave 1) is dry, one has stagnant water on a sloping floor (Cave 2) and the maximum water depth is 5 feet, off this cave leads a smaller cave (Cave 3) and apparently one has to dive under a natural bridge, formed by the low roof, to get into it. Mr. Webster sampled from Cave 2. Rocks in the narrow tunnel leading down from the main cave to the three smaller caves stop light getting in, and therefore these smaller caves are in total darkness. Mr. Webster believes the water is stagnant and the level does vary slightly due to rains" (Mrs. Diana S. Jones, in litt., 14 August 1985).

Biology. — The behaviour of the animals was described by the collector as aggressive. They attacked him and attached themselves to his arms and chest. This is a very unusual behaviour for an atyid.

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