

REDESCRIPTION OF *SHEINA ORRI* HARDING, 1966,
A MYODOCOPID OSTRACODE COLLECTED ON
FISHES OFF QUEENSLAND, AUSTRALIA

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Abstract.—*Sheina orri* Harding, 1966 (Myodocopina: Cypridinidae), an ostracode collected on the gills of fishes from Heron Island, Queensland, Australia, and type species of the genus, is redescribed from type specimens. The coxa of the mandible does not lack an endite as stated in the original description, but the endite is reduced. The endite is also sexually dimorphic, a condition not previously observed in the Cypridinidae. Several other morphologic characters are described and illustrated, and the diagnosis of the genus is emended.

While examining two paratypes of *Sheina orri* Harding, 1966, that had been deposited at the National Museum of Natural History by Dr. Harding, I observed some interesting morphologic characters not mentioned in the original description. Additional types borrowed from the British Museum (Natural History) showed the characters to be consistent, and they are described and illustrated herein. In addition, appendages of the male, female, and a juvenile, are described, but in general, the description is intended to supplement that of Harding (1966:371). The specimens are from gills of the fishes *Taeniura lymna*, a ray, and *Hemiscyllium ocellatus*, a shark, captured in the vicinity of Heron Island, Queensland, Australia.

Sheina Harding, 1966

Type species.—*Sheina orri* Harding, 1966, by monotypy.

Type locality.—Heron Island, Queensland, Australia, from the gills of either *Taeniura lymna*, a ray, or *Hemiscyllium ocellatus*, a shark.

Diagnosis (emended).—Harding (1966:374) stated that the diagnostic features of *Sheina* are: "The short, strong claws on the end of the maxilla, the absence of an endite on the coxa of the mandibles and the shape

of the upper lip." Because the present study revealed a reduced endite on the coxa of the mandible, it is necessary to revise the part of the diagnosis pertaining to the mandible as follows: Endite of coxa reduced to a backward-pointing process with a single terminal spine on adult males and with many spines on adult females and juveniles.

Sheina orri Harding, 1966
Figs. 1, 2

Sheina orri Harding, 1966:371, figs. 8-20.

Type material.—British Museum (Natural History): 1965.11.9.1, holotype, adult male in alcohol; 1965.11.9.2 (B), adult male in alcohol; 1965.11.9.3 (specimen 1), 1 partly dissected juvenile in alcohol + 1 slide with right 1st antenna, right maxilla, both mandibles, and both 7th limbs; 1965.11.9.3, 9 adult males and 2 juveniles in alcohol; 1965.11.9.4, 1 adult male in alcohol; 1965.11.9.5, 4 adult females and 5 juveniles in alcohol; 1965.11.9.6 (A), 1 empty carapace in alcohol; 1965.11.9.7, adult male appendages on 2 slides; 1965.11.9.8 (female D), 1 female body and shell in alcohol (2 vials) + 1 slide with left mandible; 1965.11.9.9, 1 slide with left 1st antenna and left 2nd antenna; 1965.11.9.10 (C), 1 empty carapace and 1 body in separate vials

with alcohol; 1965.11.9.11, 1 slide with a 1st and 2nd antenna, a right mandible, and copulatory limb of a male. National Museum of Natural History: USNM 112675, adult male and adult female in alcohol and on slides.

Description of male and female appendages.—First antenna, male: 1st joint bare. 2nd joint with abundant medial spines forming rows. 3rd joint short with 2 bristles (1 ventral, 1 dorsal). 4th joint about 3 times length of 3rd and broader, with 2 terminal bristles (1 ventral, 1 dorsal). 5th joint trapeziform, about same length as 4th but broader; sensory bristle stout in proximal part, with 9 or 10 long, narrow, proximal filaments, 2 long slender filaments near midlength, and 1 short subterminal filament (all filaments on dorsal margin of bristle). 6th joint with short medial bristle near dorsal margin. 7th joint: a-bristle about same length as bristle of 6th joint; b-bristle with short stout proximal filament (with bulbous base, large sucker, and small process near pointed tip) followed by 2 short filaments each with 4 or 5 minute suckers; c-bristle with stout proximal filament (similar to that of b-bristle except for sucker having twice diameter of large sucker of b-bristle) followed by 2 filaments with 4 minute suckers followed by about 9 slender filaments; c-bristle more than twice length of b-bristle. 8th joint: d- and e-bristles about same length as b-bristle, bare with blunt tips; f-bristle with about 9 bare marginal filaments (proximal 3 shorter than others); g-bristle with 11 marginal filaments (proximal 4 shorter than others).

First antenna, female: Joints 1–3 similar to those of male except 3rd joint not as short. Joint 4 about twice length of 3rd joint and about same width, with 2 terminal bristles (1 ventral, 1 dorsal). 5th joint rectangular (not trapeziform as on male); sensory bristle with 10 long, narrow, proximal filaments, 2 long slender filaments near midlength, and 1 short subterminal filament (all filaments on dorsal margin of bristle). 6th joint with

short medial bristle near dorsal margin. 7th joint: a-bristle similar to short bristle of 6th joint; b-bristle almost twice length of a-bristle, with 4 slender, short, hair-like, proximal filaments on dorsal margin (tip broken on specimen examined); c-bristle reaching past tip of sensory bristle of 5th joint, with about 11 marginal filaments. 8th joint: d- and e-bristles similar to those of male; f-bristle only slightly shorter than c-bristle, with about 9 marginal filaments; g-bristle about same length as c-bristle, with about 11 marginal filaments.

Second antenna, male: Protopodite with small, distal, medial bristle. Endopodite 3-jointed (Fig. 1a, b): 1st joint with 4 proximal bristles (3 short, 1 longer) and 1 long distal bristle; 2nd joint with short terminal bristle; 3rd joint with long terminal filament. Exopodite: bristle of 2nd joint reaching to 6th joint, with 6 or 7 ventral spines (small proximal spine followed by 2 to 4 stout curved spines, then few small spines); bristles of joint 3–8 long, with natatory hairs but no spines; 9th joint with 4 bristles (3 long with natatory hairs, 1 small, bare); 3rd joint with minute basal spine; joints 4–8 with large basal spines increasing in length on distal segments (basal spine of 8th joint about twice length of 9th joint; dorsal edge of spines with minute tooth near midlength); 9th joint with lateral spine about same length as basal spine of 8th joint; minute, indistinct spines forming row along distal lateral edge of 2nd joint.

Second antenna, female: Same as that of male.

Mandible, male (Figs. 1c, 2): Coxal endite consisting of backward-pointing process with stout spine at tip and with or without 2 additional marginal spines; small bristle present ventral to process on some specimens. Basis: ventral margin with 2 a-bristles (1 unusually long), 1 small lateral b-bristle, and 4 c- and d-bristles (distal d-bristle long, hirsute); dorsal margin with 3 distal bristles (1 subterminal, 2 terminal). Exopodite hirsute reaching past midlength of dorsal margin of 1st endopodial joint, with 2 bare sub-



Fig. 1. *Sheina orri*, male, paratype, BM 1965.11.9.11: a, b, Medial views of endopodites of left and right 2nd antennae. Male, paratype, BM 11965.11.9.7: c, Medial view of coxa of left mandible showing endite; d, Posterior view of 1st exopodial joint of 5th limb; e, Furcal lamella. Male, paratype, USNM 112675: f, Tip of 7th limb; g, Lateral view of left furcal lamella; h, Anterior of body showing lateral eye, medial eye and bellonci organ, upper lip, 1st and 2nd joints of right 1st antenna, and anterior end of esophagus (dashed); i, Medial eye and bellonci organ; j, Right lateral eye; k, Upper lip, anterior towards right; l, Left Y-sclerite, anterior towards left. Female, paratype, BM 1965.11.9.8: m, Medial view of coxa of left mandible showing endite; n, Medial view of tip of left mandible. Female, paratype, USNM 112675: o, Lateral view of right lamella. A-1 instar, paratype, BM 1965.11.9.3: p, Lateral outline of complete specimen showing right lateral eye as seen through shell; q, Right furcal lamella.

terminal ventral bristles (distal about $\frac{3}{4}$ length of proximal). 1st endopodial joint with 4 bare bristles (2 short, 1 medium length, 1 long). 2nd endopodial joint with distinct ventral curvature; ventral margin with bristles forming 3 groups (proximal group of single small bristle just distal to joint midlength; middle group of single small bristle; and subterminal group of small, ringed, lateral bristle, and stout, unringed medial bristle (process) reaching well past end of joint); dorsal margin with 8 proximal bristles (including distal bristle about twice length of next longest bristle, and 1 short medial bristle with stout marginal spines). End joint with 3 strongly curving claws (dorsal claw bare, only slightly shorter than paired, finely dentate, ventral claws and with narrower base), and 4 bristles (dorsal bristle lateral to dorsal claw and not as long; 2 ventral medial bristles, very small; lateral ventral bristle coarsely ringed and with broad tip with dorsal hirsute pad).

Mandible, female (Fig. 1m, n): Coxal endite consisting of backward-pointing process with stout spine at tip and slender spines mostly along ventral edge; small ventral spine-like bristle at base of process. Limb otherwise similar to that of male.

Maxilla, male: Coxa with dorsal fringe of hairs. Endite I with 7 spinous and pectinate bristles; endite II with 4 spinous and pectinate bristles; endite III with 4 spinous and pectinate bristles (1 proximal, 3 terminal). Basis with 2 terminal bristles (1 dorsal, 1 lateral). Exopodite well developed, reaching midlength of 1st endopodial joint, with 3 hirsute bristles (1 subterminal, 2 terminal). 1st endopodial joint with hairs along anterior margin, 2 alpha-bristles (longer plumose, shorter bare), and 2 beta-bristles (outer bristle pectinate); cutting tooth bifurcate. 2nd endopodial joint with 3 bare, hook-like claws and 8 bristles (including 3 pectinate a-bristles).

Maxilla, female: Similar to that of male.

Fifth limb, male (Fig. 1d): Epipodite with 50 bristles. Protopodite with short anterior

tooth. Endites I and II each with 5 bristles; endite III with 6 bristles. 1st exopodial joint: main tooth with proximal, smooth, tapering peg and 4 constituent pectinate teeth (Fig. 1d); bristle proximal to smooth peg with few, long, proximal spines and many, short, distal spines; anterior side with 2 stout bristles (with long spines near middle) proximal to main tooth, and stout hirsute bristle near tooth of protopodite. 2nd exopodial joint with 4 pectinate a-bristles (proximal bristle short, ringed, others stout, unringed, claw-like), 9 ringed and pectinate b'- and b''-bristles, 1 hirsute c-bristle, and 1 hirsute d-bristle. 3rd joint: inner lobe with 3 bristles (proximal with long hairs proximally and short spines distally, others bare); hirsute outer lobe with 2 equi-length terminal bristles (1 or both with long proximal hairs). Fused 4th and 5th joints hirsute, with total of 2 bristles.

Fifth limb, female: Not examined in detail, but, in general, similar to that of male.

Sixth limb, male: 5 small bare bristles in place of epipodite. Endite I with 2 small hirsute bristles and 1 long terminal bristle with long marginal spines; endite II with 2 hirsute medial bristles and 1 long terminal bristle with long proximal spines; endites III and IV each with 1 small, distal, medial bristle with long proximal spines, and 2 long stout, terminal bristles with long proximal and short distal spines. End joint with 6 bristles (with long proximal and short distal spines) on anterior half (bristles 2-6 decreasing in length posteriorly) followed by wide space and then 3 hirsute bristles at posterior corner. Medial surface of end joint hirsute, with long hair-like spines along ventral edge, and shorter spines forming short rows just within edge of posterior half.

Sixth limb, female: Not examined in detail but, in general, similar to that of male.

Seventh limb, male (Fig. 1f): Each limb with 20-21 bristles, each with 3-6 bells. Limbs of USNM 1123675 with 20 bristles on each limb, 10 on each side (comb side with 5 proximal and 5 terminal; peg side

with 6 or 7 proximal, 3 or 4 terminal); terminal comb with about 12 teeth (3 short on each side of about 6 long); side opposite comb with single straight peg.

Seventh limb, female: Not examined in detail but, in general, similar to that of male.

Furca, male (Fig. 1e, g): Each lamella with 7 or 8 claws; claws 2 and 4 fused to lamella, others separated from lamella by suture; all claws with tiny teeth along posterior margins; claws 3 and 4 about same width and length, otherwise, claws decrease in length and width posteriorly; claw 2 reaching to about midlength of claw 1.

Furca, female (Fig. 1o): Claw 4 broader than claw 3; limb otherwise similar to that of male.

Bellonci organ, male (Fig. 1i): Short, cylindrical with tapering tip.

Bellonci organ, female: Similar to that of male.

Eyes, male: Lateral eyes with black pigment and about 16 ommatidia (Fig. 1j). Medial eye light amber (Fig. 1h, i).

Eyes, female: Similar to those of male.

Upper lip, male (Fig. 1k): In ventral view, unpaired anterior part narrow, wedge-shaped, with several rows of small glandular tubercles; posterior part consisting of paired tusks with 4 or 5 glandular openings along posterior margin and 2 or 3 at tip.

Upper lip, female: Similar to that of male.

Genitalia: Copulatory limbs of male well developed, lobate, with several small bristles on lobes (Harding, 1966:fig. 18). Genitalia of female not observed.

Posterior of body, male and female: Smooth, without folds, spines, or postero-dorsal process.

Y-Sclerite, male (Fig. 1l): Ventral branch forming right angle with posterior end of middle branch, typical for subfamily Cyridininae.

Eggs: No eggs observed.

Description of juvenile (Fig. 1p, q): Carapace similar in shape to that of adult (Fig. 1p).

Size: BM 1965.11.9.3, specimen 1, length 2.21 mm, height 1.15 mm.

First antenna: 1st and 2nd joints without bristles; 3rd and 4th joints each with 2 bristles (1 ventral, 1 dorsal); 5th and 6th joints broad and with same number of bristles as on adult (armature of bristles not examined in detail).

Second antenna: Protopodite and exopodite similar to those of adult. Endopodite 3-jointed: 1st joint with 3 proximal bristles (2 short, 1 longer) and 1 long distal bristle; 2nd and 3rd joints similar to those of adult.

Mandible: Similar to that of adult female, with 3 recurved terminal claws.

Maxilla: Similar to that of adult, with 3 recurved terminal claws.

Fifth and sixth limbs: Not examined in detail but well developed.

Seventh limb: With 11 strongly tapering proximal bristles, each with single terminal bell; terminal part fragmented on examined specimen, remaining part with 4 slightly tapering bristles on one side, each bearing up to 4 terminal bells.

Furca (Fig. 1q): Similar to that of adult except claw 2 reaching well past midlength of claw 1.

Bellonci organ: Similar to that of adult.

Eyes (Fig. 1p): Medial and lateral eyes similar to those of adult.

Upper lip: Similar to that of adult.

Genitalia: Not observed.

Sex: Unknown, but broad 5th and 6th joints of 1st antenna resemble those of adult male.

Discussion.—The three terminal claws of the end joint of the endopodite of the mandible of *Sheina orri* (Figs. 1n, 2b, c) are more recurved than those on other species of Cyridinidae and may be used by the ostracodes, along with three recurved claws of the maxilla, to cling to the gills of the fish, but no direct evidence is available. The stout lateral bristle of the end joint of the endopodite also differs from those of other species in terminating in a broad flattened pad (Fig.

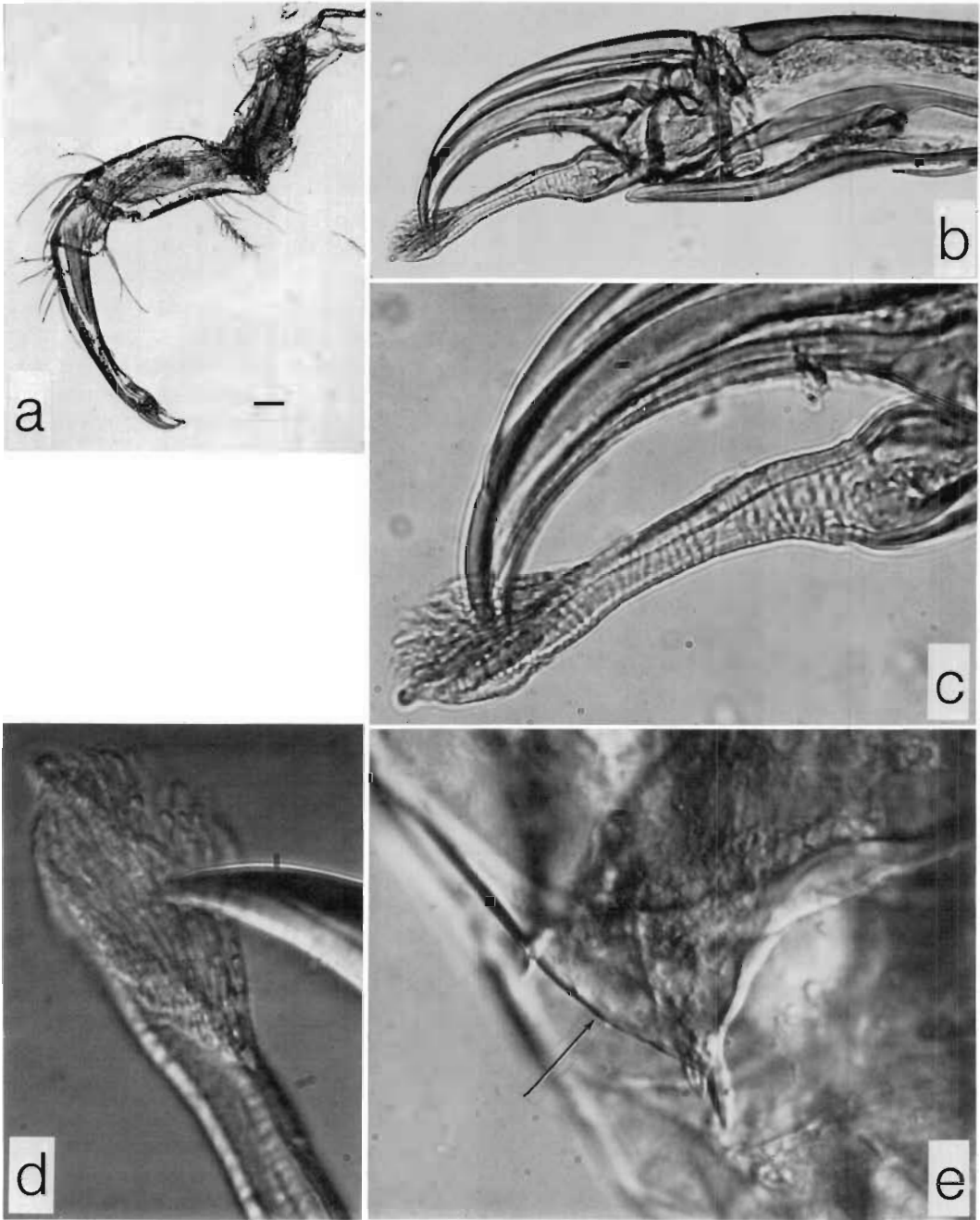


Fig. 2. *Sheina orri*, male, paratype, USNM 112675, medial views of left mandible: a, Complete limb (length of scale bar $0.10\ \mu\text{m}$); b, Detail of tip of endopodite in a; c, Detail from b; d, Detail from c showing pad at tip of lateral bristle; e, Coxal endite (arrow) from a (interference contrast). Photographs by Dr. Robert P. Higgins.

2c, d). The function of this peculiar bristle is unknown.

The coxal endite of the mandible of *S. orri* is reduced to a small process with 1–3 spines in the male (Figs. 1c, 2e) and many spines in the female (Fig. 1m). In other species of Cypridinidae the coxal endite is not sexually dimorphic, but in the Philomedidae and Rutidermatidae the male coxal endite is always poorly developed. The similarity of the dimorphism in *S. orri* and the Philomedidae and Rutidermatidae is attributed to convergence, and the dimorphism in *S. orri* is interpreted to be an autapomorphic character state within the Cypridinidae. It is possible that adult males of *S. orri* in the collection are not conspecific with adult females and juveniles, having more spines on the coxal endite, but it seems unlikely because of similarities in many other morphologic characters.

The above description of *S. orri* differs in several details from that of Harding (1966: 371). Some differences are: (1) Proximal filaments of the 5th joint of the 1st antenna are shown to be short instead of long. (The short filaments in the illustration of Harding (1966:fig. 8) probably represent remnants of longer bristles.) (2) The four bristles of joints 3 and 4 of the 1st antenna are not shown on the limb illustrated by Harding (1966: fig. 11). (3) Harding (1966:373, fig. 12) described the 2nd joint of the endopodite of the 2nd antenna as not having a bristle. (4) Harding (1966:373) described the mandibles of both the male and female as lacking an endite on the coxa. (5) The illustration of the maxilla (Harding 1966:fig. 7) shows the base of the proximal bristle to be at the base of the exopodite rather than subterminal. (6) The illustration of the 6th limb (Harding 1966:fig. 17) does not show the long terminal bristle of the 1st endite (the bristle is missing on one of the limbs on Harding's slide but was clearly torn off and is present elsewhere on the slide). (7) Harding (1966:373) described the furca as having only the 2nd claw fused to the lamella,

but both the 2nd and 4th are fused, although this is not clearly shown on the single lamella on the slide prepared by Harding.

Specimens interpreted to be adult females herein do not have eggs in the marsupium, nor were they observed within the ovaries but these could have been obscured on some of the specimens. Genitalia also were not observed. Because of the possible absence of the adult characters, it may be that the females, interpreted to be adults are, in fact, next-to-last instars. On the other hand, the bristles of the 7th limbs are cylindrical (not strongly tapered) and have several distal bells, all characteristic of adults. Also, the relative lengths of the "adult" females and adult males are consistent with differences in other Cypridininae. Therefore, the large females in the collection are treated as adults here.

The gut of all specimens examined is gorged with a fine-grained, brownish, unidentified substance. The full gut of the males suggests that the relatively few spines of the coxal endite of the male mandible does not result in a decrease in feeding by the male, as seems to occur in the Philomedidae and Rutidermatidae, families in which the coxal endite of the male is also reduced.

Sheina orri is closely related to *Vargula*, which it resembles in the endopodite of the 2nd antenna having a bristle on the 2nd joint, in the mandible having a stout medial bristle (process) at the distal end of the ventral margin of the 2nd endopodial joint, and in having long tusks on the upper lip. It differs from *Vargula* in having reduced and sexually dimorphic endites on the coxa of the mandible.

Skogsberg (1920:262–265), Harding (1966:369), and Cohen (1983:255) have discussed occurrences of Cypridinidae associated with fish and other organisms. Only with *Sheina orri* is there the suggestion that appendages are adapted for a commensal habit. The hook-like terminal claws of the maxillae and mandibles of *S. orri* would seem to be useful for clinging to fish gills.

But if the ostracodes had been collected in the substrate or swimming freely in the water column rather than on the gills of fish, the hook-like claws would probably have been associated with predatory feeding rather than with commensalism. The recorded occurrences of ostracodes in orifices of fish may be instances of the ostracodes attacking the fish after it has been caught, while it is suspended in the water, a hypothesis previously advanced by Cohen (1983:255). Dr. Gavin Naylor, University of Maryland, (in litt. 1985) has reported such an occurrence in a shark about 1 meter long that had been captured on a long line in about 7 meters of water off Curlew Cay, Belize. The line had been set at 6 pm, 21 Aug 1985, and retrieved at 6 am, 22 Aug 1985. The heart and gill filaments were absent, apparently eaten by a swarm of ostracodes and a few isopods found in the vicinity of those organs as well as in the anterior part of the liver. The ostracodes, which I identified as *Skogsbergia leneri* Kornicker, 1958, had previously been studied in Belize by Cohen (1983:243) who found that they ate dead fish and did not attack uninjured invertebrates (amphipods, copepods, tanaids, worms). Attacks of the ostracode *Vargula tsujii* Kornicker and Baker, 1977, on live fish have recently been described by Stepien and Brusca (1985). The ostracodes appeared to feed on mucus and small pieces of fish skin, and remained on the fishes without harming them for long periods and in large numbers, especially along the dorsal and anal fin bas-

es, around the anus, and along the opercula (Stepien and Brusca 1985:96). Thus, a relationship between members of the family Cypridinidae and both live and dead fish appears established, but whether or not the ostracodes are true commensals must remain open.

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