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Therodamas tamarae, a new species of copepod (Poecilostomatoida: Ergasilidae) parasitic on *Plagioscion squamosissimus* (Heckel) from the Araguaia River, Brazil; with a key to the species of the genus

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Abstract

Therodamas tamarae n.sp. is described based on females removed from branchial filaments of *Plagioscion squamosissimus* (Teleostei, Sciaenidae) caught in a lake near the Araguaia River, State of Goiás, Brazil. The new species shares with *Therodamas elongatus* (Thatcher, 1986) the same host, a similar reaction from the host to the presence of the parasites, and the same general shape of body; in addition, the two species are from the Amazon basin. On the other hand, it resembles *T. fluviatilis* Paggi, 1976 in the structure of legs 1 to 4. An identification key for *Therodamas* species, as well as comments on the distribution of the species, are included.

Introduction

Therodamas comprises five known species. The type species, *Therodamas serrani*, was incompletely described by Krøyer (1863) from specimens collected in the West Indies. Thomsen (1949) redescribed the species based on material collected in Uruguay. Carvalho (1955) accepted Thomsen's identification and reported *T. serrani* in gills of *Mugil* sp. from Cananéia, State of São Paulo, Brazil. The distance of the South American records from the type locality leads to some suspicion about Thomsen's identification. But it is taken here as valid, because Krøyer's material is no longer available for examination.

Wilson (1917) placed *Therodamas* within the Lernaeidae based on the peculiarity of theses copepods in having some body segments elongated into a 'neck' Thomsen (1949) reviewed this assumption, pointing out the different origins of the necks of *Therodamas* and lernaeids. He also mentioned that the mouthparts, legs and caudal rami of *Therodamas* had similarities with those of the Ergasilidae, to which he transferred *Therodamas*.

In 1960, Tripathi created the family Therodamasidae to contain *Therodamas*. *Mugilicola* and *Paeonodes*. Boxshall (1986) called attention to the different origins of the necks of *Mugilicola* and *Therodamas* and stressed the affinities of these two genera with the ergasilids, particularly the structure of the cephalic appendages and the absence of maxilipeds in adult females. Therodamasidae was considered an invalid taxon, and *Mugilicola* and *Therodamas* together with *Paeonodes*, were reallocated to the Ergasilidae. In spite of this, Piasecki et al. (1991) referred to Therodamasidae as a valid taxon when describing *Mugilicola kabatai*.

The phylogenetic study on Ergasilidae carried out by Amado (1992) corroborated Boxshall's proposal. Amado (1992) also found that *Amazonicopeus elongatus* Thatcher, 1986, the only species of the genus, shared all its generic characteristics with *Therodamas*, and proposed the new combination *Therodamas elongatus*. The oral tube of *Amazonicopeus elongatus*, reported by Thatcher as an important diagnostic character of the genus and family Amazonicopeidae has not been observed in *Therodamas*. Thatcher mentioned that the oral tube was not observed in all of his specimens, leading to suppose that it might be a protractile structure not always visible. So, if only *Therodamas elongatus* has an oral tube, this is a diagnostic charac-

teristic for the species that does not justify the separation of it into new genus and family. Abdelhalim et al. (1993) also considered *Amazonicopeus* as a junior synonym of *Therodamas*.

Material and methods

Copepods were collected from gills of fishes of the species *Plagioscion squamosissimus*. Each fish had 1–5 parasites. Each branchial arch was dissected to remove the copepods. For this the two layers of the epithelial tissue produced by the fish over the entire neck of the copepod were incised and separated. A careful dissection of the soft tissues of the branchial arch was performed to expose without damage the inflated part of the neck, as well as the head.

Whole copepods were examined in temporary lactic acid mounts. Fragments of a cover glass were used to support the cover glass in such preparations. Drawings were made with the aid of a camara lucida on a Leitz SM Lux microscope.

The terminology used for the appendage descriptions was based on Abdelhalim et al. (1993).

Undissected branchial filaments containing parasites were embedded in paraffin wax and cut in a mechanical microtome for studying the reaction of the host to the presence of the parasite. The sections were stained following the haematoxylin eosin method.

Description

Therodamas tamarae n.sp. Figs 1–12)

Material examined: Seven adult females from gills of *Plagioscion squamosissimus* (Heckel) (Sciaenidae) caught in Lake Rico, near Cocalinho (14 ° 25′ 50 ° 57′W), Araguaia River, State of Goias, Brazil, team of ENCOPA col., 1986. Holotype (10464) and pratypes (10465) are deposited in the Museu de Zoologia, Universidade de São Paulo.

Female. Cephalosome length 578 μm; neck and cephalic shield length 436 μm; genital double somite length 257 μm; caudal ramus length 43 μm.

The female holds to the gill filaments of the host as shown in Figure 1.

Body (Figure 2) divisible into head, neck and trunk. Head reduced, with short antennules and antenna, and covered by cephalic shield bearing retrospines on each posterior corner. Neck formed by elongation of cephalosomic part separating antennae and mouthparts; anterior part of neck dilated and transversely striated. Trunk (Figures 3 and 4) cylindrical, slightly compressed dorsoventrally. Each trunk somite with narrow dorsal transverse, cuticular thickenings; thickenings of pedigers 3 to 5 more conspicuous than those of two anterior somites. Fifth thoracic somite distinct only dorsally. Last segment of trunk (Figures 3 and 4) resulting from fusion of genital double somite and abdominal somites, six times smaller than rest of trunk, globose, bilobate terminally, and presenting row of spinules on posterior outer corners (Figure 5). Caudal ramus (Figure 5) implanted on dorsal lobule (probably differentiation of anal somite), short, length as long as width and having 4 setae; 3 outermost setae similar in length and 3 times longer than ramus; innermost seta broken in all specimens examined but certainly thicker and much longer than other caudal setae. Egg sacs (Figure 2)0 with variable number of eggs, arranged in multiple series.

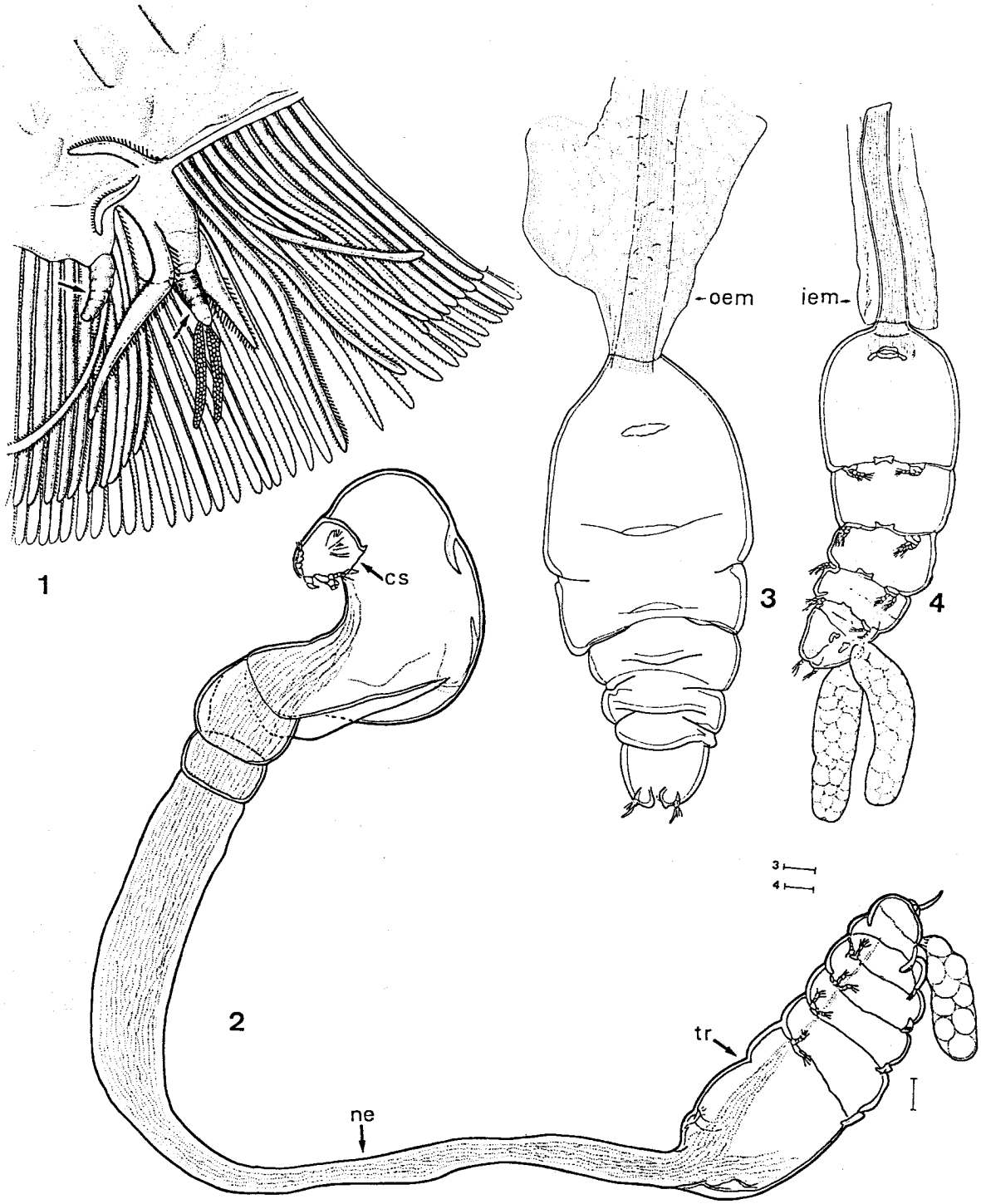
Antennule (Figure 6) 5-segmented, with few visible setae covered by mucus.

Antenna (Figure 7) short with 3 segments and apical claw. First segment (coxobasis) wider than long; first endopodal segment robust, with sensory process arising from inner margin; second endopodal segment small.

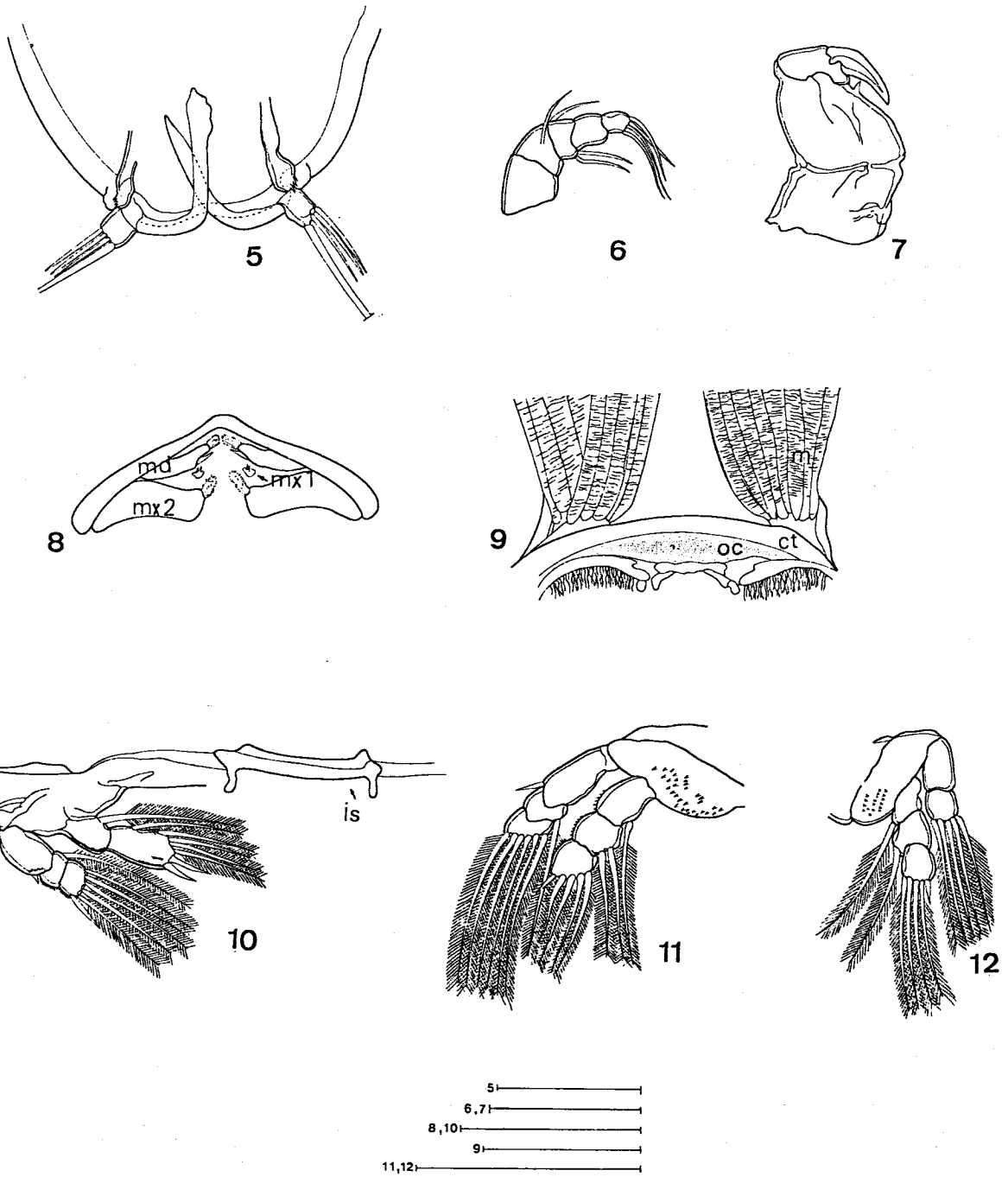
Mouthparts (Figures 8 and 9) reduced and located at bottom of depression with thick cuticular borders. General structure following ergasilid pattern. Mandible armed with two blades; distal blade cylindrical and armed with many tiny teeth; proximal blade spiniform and smooth. Maxillule comprising 2 short elements implanted on reduced lobe. Maxilla 2-segmented; proximal segment (syncoxa) large; second segment (basis) covered with tiny teeth.

Leg 1 (Figure 10) with outer margin of exopod and endopod armed with rows of spinules. Endopod 2-segmented and twice as long as than exopod; first segment bearing plumose inner seta; second segment with 5 plumose setae and 2 terminal spines. Exopod 3-segmented; first segment bearing outer spine on distal corner; second segment with inner plumose seta; third segment with 5 plumose setae and 1 spine.

Leg 2 (Figure 11) similar to leg 3. Basis with rows of spinules. Exopod and endopod 3-segmented. Outer margin of endopod armed with spinules. First and second segments of endopod bearing 1 and 2 inner plumose setae respectively; third segment with 4 plumose setae and 1 terminal spine. First exopodal



Figures 1–4. 1. Part of a branchial arch from *Plagioscion squamosissimus* (Heckel) showing the changes occurring in the filaments, as a reaction to the presence of two females of *Therodamas tamarae* n.sp., one of them ovigerous; 2. *Therodamas tamarae* n.sp. Female holotype. habitus, lateral (tr = trunk. ne = neck, cs = cephalic shield), 3. Trunk of a female paratype in dorsal view and the posterior part of the neck covered by the outermost layer of the epithelial mass (oem) produced by the host; 4. trunk of another female paratype in ventral view, and the posterior part of the neck involved by the innermost layer of the epithelial mass (iem) produced by the host. Scale bars = 100 μm.



Figures 5–12. Therodamas tamarae n.sp. Female. 5. extremity of the abdomen with caudal rami; ventral; 6. antennule; 7. antenna; 8. mouthparts (md = mandible, mx1 = maxillule. mx2 = maxilla); 9. oral area in frontal view (m = musculature, oc = opening of the oral cavity ct = cuticular thickening); 10. leg 1 (is = intercoxal sclerite); 11. leg 2; 12. leg 4. Scale bars = 100 μm.

segment bearing outer spine on distal comer, second and third segments with 1 and 6 inner plumose setae respectively.

Leg 4 (Figure 12) with rows of spinules on basis. Endopod 3-segmented; first and second segments each bearing inner plumose seta; third segment with 4 plumose setae and distal spine. First segment of exopod unarmed; second segment with 5 plumose setae.

Intercoxal sclerites of legs 1–4 (Figures 4 and 10) considerably wider than long, and distinct from corresponding legs.

Leg 5 absent.

Male. Unknown.

Etymology: The species is named after Dr Tamara V. Worsmann, from Departament of Histology of USP – São Paulo, Brazil, for her valuable collaboration in the histological study of gills infested by *Therodamas.*

Reaction of the host to the action of parasite. The copepod fixes itself near the main arteries of the branchial septum causing an epithelial hyperplasia on the part of the host represented by two superimposed layers covering the neck (Figures 3 and 4). The gills filaments of the fish become remarkably transformed, with atrophies and folds (Figure 1). The head as well as the anterior part of the neck are surrounded by a fibrotic capsule but calcification of this tissue, as reported by Thatcher (1986) for *T. elongatus*, was not observed.

Figures 13. Distribution of the species of *Therodamas* in Neotropical region. ● *T. serrani* Krøyer, 1863. ∗ *T. sphyricephalus* Thomsen, 1949. ⚹ *T. dawsoni* Cressey, 1973. ■ *T. fluviatilis* Paggi, 1976. ▲ *T. elongatus* (Thatcher, 1986). ★ *T. tamarae* n.sp.

Discussion

Therodamas tamarae n.sp. shares with *T. elongatus* the shape of the body, as well as the structure of the antenna and mouthparts. In addition, the two species parasitize the same host, their presence causing a very similar reaction on the part of the host, and finally, both were collected in the Amazon River drainage system. However, the new species can be separated from *T. elongatus* mainly by possessing the endopod of leg 1 bi-segmented and the caudal ramus with 4 setae. The presence of only 2 setae on the caudal ramus of *T. elongatus* was confirmed by re-examination of the type material.

T. tamarae n.sp. also shows several affinities with *T. fluviatilis*. Both have the endopod of leg 1 bi-segmented, similar spine and seta formula on the swimming legs. and retrospines on each corner of the cephalic shield. The two species differ through the absence of lobes on the anterior inflated part of the neck in *T. tamarae*. The latter species also has peculiar, transverse, narrow, cuticular thickenings that do not appear in *T. fluviatilis*.

The six known species of *Therodamas* are restricted to the Neotropical region. The species *T. serrani T. sphyricephalus* and *T. dawsoni* were collected from marine fishes belonging to the families Serranidae, Carangidae and Dactyloscopidae. *Therodamas serrani* was reported from Uruguay and Brazil parasitizing carangid and mugilid fishes, respectively Mugilids are shallow coastal water fishes, whereas carangids are euryhaline fishes moving easily through environments with different levels of salinity (Paggi 1976). These three species have in common the presence of an enlarged anterior area of the neck transformed into lobules, as well as their rounded corner of the cephalic shield lacking retrospines.

T. fluviatilis was collected on true freshwater fishes in the Parana River basin. Because of occurrence a close relationship with the brackish/marine species *T. serrani* and *T. sphyricephalus* was expected. However, the most outstanding feature relating *T. fluviatilis* to the two latter species as well as to the other marine species *T. dawsoni*, is the neck with anterior lobes. Surprisingly, from other morphological characteristics the Argentinian species resembles *T. tamarae* close-

ly, as mentioned above. Based on the knowledge we have now, it is possible to suppose that *T. tamarae* and *T. fluviatilis* have evolved from the same ancestral species, although nowadays they occur in separate drainage systems. The absence of lobes on the inflated area of neck in both Amazonian species may be a consequence of their association with the same host.

The distribution of the species of *Therodamas* is shown in Figure 13.

Key for identification of the species of *Therodamas*

1. a - Anterior part of neck widened, but not forming lobes 2
   b - Anterior part of neck expanded into variable number of lobes 3
2. a - Endopod of leg 1 trisegmented; caudal ramus with 2 setae .....
   ... *T. elongatus* (Thatcher, 1986) (comb. n.)
   b - Endopod of leg 1 bisegmented; caudal ramus with 4 setae ..... *T. tamarae* sp. n.
3. a - Neck with several asymmetrically placed lobes, irregular in shape and size...
   ..... *T. sphyricephalus* Thomsen, 1949
   b - Neck with 4 symmetrical lobes, regular in shape and size 4
4. a - Caudal ramus with 2 setae; terminal exopodal segment of leg 4 with 4 setae
   ..... *T. serrani* Krøyer, 1863
   b - Caudal ramus with 4 setae; terminal exopodal segment of leg 4 with 5 setae 5
5. a - Second exopodal segment of leg 1 with an inner seta; terminal endopodal segment of leg 2 with 4 setae ..... *T. fluviatilis* Paggi, 1976
   b - Second exopodal segment of leg 1 without seta; terminal endopodal segment of leg 2 with 5 setae ..... *T. dawsoni* Cressey, 1972

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References

Abdelhalim. A. I., J. W. Lewis & G. A. Boxshall, 1983. The external morphology of adult female ergasilid copepods (Copepoda: Poecilostomatoida): a comparison between *Ergasilus* and *Neoergasilus*. Syst. Parasitolol. 24: 45–52.

Amado, M. A. P. M., 1992. Ergasilideos parasitas de peixes de águas continentais brasileiras (Copepoda: Poecilostomatoida), com uma hipótese de filogenia da familia. Thesis (Doctorate). Universidade de São Paulo, Brasil. 207 pp.

Boxshall, G. A., 1986. A new species of *Mugilicola* Tripathi (Copepoda, Poecilostomatoida) and a review of the family Therodamasidae. Proc. Linn. Soc. 108: 183–186.

Carvalho. J. P 1955. O gênero *Therodamas* Krøyer representado em águas brasileiras (Crustacea, Copepoda). Ciênc. Cult. São Paulo, 7: 97–98.

Cressey R., 1972. *Therodamas dawsoni*, a new species of parasitic copepod (Cyclopoida: Ergasilidae) from the west coast of Panama. Proc. Biol. Soc. Wash. 85: 265–269.

Krøyer H., 1863. Bidrag til Kundskab om snyltekrebsene. Naturh. Tidssky. 3: 75–426.

Paggi, J. C., 1976. Una nueva especie de *Therodamas* (Therodamasidae: Cyclopoida) copepoda parasito de peces de água dulce de la Republica Argentina. Physis, Buenos Aires. 35: 93–102.

Piasecki, W., N. R. Khamees & F. T. Mhaisen, 1991. A new species of *Mugilicola* Tripathi 1960 (Crustacea) (Copepoda, Therodamasidae) parasitic on Iraqi fish. Acta Ichth Pisc. 21: 143–5.

Thatcher, V. E., 1986. The parasitic crustaceans of fishes from the Brazilian Amazon 16. *Amazonicopeus elongatus* gen. et sp. nov. (Copepoda: Poecilostomatoida) with a proposal of Amazonicopeidae fam. nov. and remarks on its pathogenicity Amazoniana. 1: 49–56.

Tripathi, Y. R., 1960. Parasitic copepods from Indian fishes. 2. Two new families Therodamasidae and Catlaphilidae In: Libro Homenage al Docter Eduardo Caballero, Jubileo 1930. Mexico. Instituto Politechnico Nacional: 543–548.

Thomsen, R., 1949. Copepodos parasitos de los peces marinos del Uruguai. Comun. Zool. Mus. Hist. Nat. Montev. 3: 1–41.

Wilson, C. B., 1917. North American parasitic copepods belonging to the Lernaeidae with a revision of the entire family. Proc. U.S. Natn. Mus. 53: 1–150.