# *Ergasilus salmini* sp. nov. (Copepoda: Ergasilidae) a branchial parasite of "dourado", *Salminus franciscanus* from the upper São Francisco River, Brazil [1]

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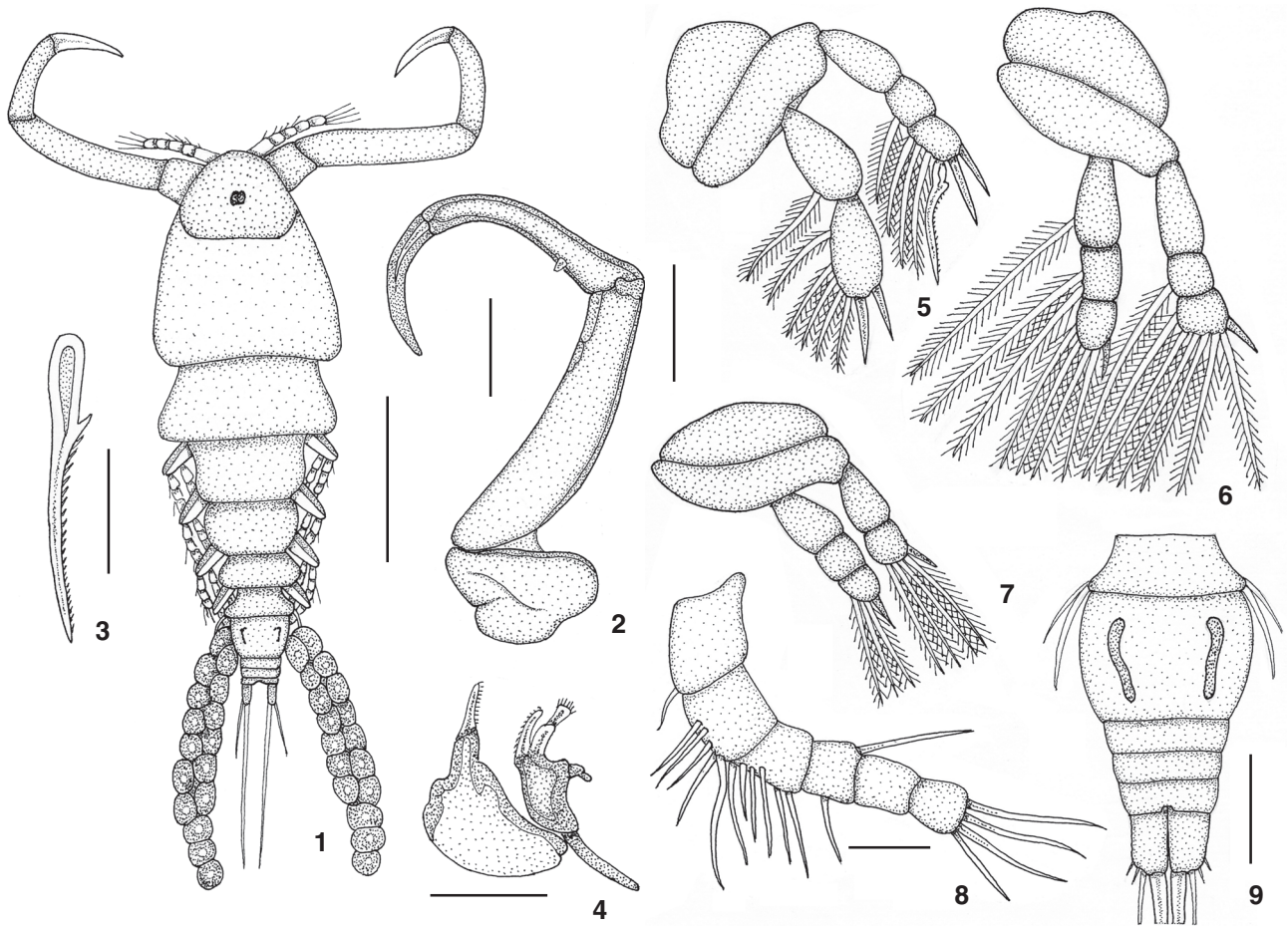
ABSTRACT. *Ergasilus salmini* **sp. nov.** a branchial parasite of the "dourado", *Salminus franciscanus* Lima & Britski, 2007, from the upper São Francisco river, Minas Gerais State, Brazil, is described based on female specimens. The new species has a serrate, curved seta on the first exopod as do most of the known South American species of the genus. Other than that, it does not closely resemble any known species of this genus. Many of the known ergasilids have head, and first two thoracic segments completely fused to form a cephalothorax. In the new species, the head is incompletely fused, the first thoracic segment is fused, but thoracic segment two is free. *Ergasilus hydrolycus* Thatcher, Boeger & Robertson, 1984, also has a free second thoracic segment but in that species the head is completely fused and the third abdominal segment is the longest. In the new species, the third segment is the shortest of the three. Also, the new species is smaller averaging 691 x 207 µm compared to 784 x 278 µm for *E. hydrolycus*. The latter species has a two-segmented fourth endopod whereas in the new species this structure is three-segmented. In addition, the new species is from a different host and a separate river system.
KEY WORDS. Copepod parasite; crustacean parasite; freshwater fish; São Francisco River Basin; South America.

RESUMO. ***Ergasilus salmini* sp. nov. (Copepoda: Ergasilidae) parasito das brânquias do "dourado", *Salminus franciscanus* do alto rio São Francisco, Brasil.** *Ergasilus salmini* **sp. nov.** um parasito das brânquias do "dourado", *Salminus franciscanus* Lima & Britski, 2007, do alto rio São Francisco, Minas Gerais, Brasil, é descrita baseada em espécimes fêmeas. A nova espécie tem uma seta curva, serrilhada, no primeiro exopodito como a maioria das espécies conhecidas deste gênero. A maioria dos ergasilídeos tem a cabeça e os dois primeiros segmentos torácicos completamente fusionados formando o cefalotórax. Na nova espécie, a cabeça é incompletamente fusionada, o primeiro segmento torácico é fusionado, mas o segundo segmento torácico é livre. *Ergasilus hydrolycus* Thatcher, Boeger & Robertson, 1984, também possui o segundo segmento torácico livre mas nessa espécie a cabeça é completamente fusionada e o terceiro segmento abdominal é o mais comprido. Na nova espécie, o terceiro segmento é o mais curto dos três. A nova espécie também é menor medindo 691 x 207 ìm comparado com 784 x 278 ìm em *E. hydrolycus*. Essa espécie tem o quarto endopodito bi-segmentado enquanto na nova espécie essa estrutura é tri-segmentada. Adicionalmente, a nova espécie é de um hospedeiro diferente e de um sistema hídrico distinto.
PALAVRAS-CHAVE. América do Sul; Bacia do rio São Francisco; copépodes parasitos; crustáceos parasitos; peixe de água-doce.

Species of *Ergasilus* von Nordmann, 1832, are found world-wide and are considered to be one of the plagues of pisciculture. Only the females are parasitic on fish hosts while the males are free-living in the zooplankton. Most species are found on freshwater fishes but a few infect marine fishes of the litoral. Yamaguti (1963) reported 69 species of this genus world-wide. Hoffman (1998) listed 32 species for North America and Thatcher (2006) cited 15 species of *Ergasilus* from South America (most from the Amazon region). The present paper describes the first species of the genus known from the São Francisco river of Minas Gerais State, Brazil.

## MATERIAL AND METHODS

Thirty-six fish hosts were captured with nets in the upper São Francisco River in the municipality of Três Marias, Minas Gerais State, Brazil, from August to September, 2000. Identification of the host species follows Lima & Britski (2007) and a fish specimen was deposited in the Museu de Zoologia, Universidade




Figures 1-9. *Ergasilus salmini* **sp. nov.**, female, of "dourado", *Salminus franciscanus*, from the upper São Francisco river: (1) entire, dorsal; (2) antenna; (3) serrate seta; (4) mouthparts; (5) leg 1; (6) legs 2 and 3; (7) leg 4; (8) antennule; (9) genital segment and abdomen. Scales: 1 = 200 µm; 2 = 100 µm; 3 = 25 µm; 4-9 = 50 µm.

de São Paulo (MZUSP). Copepod parasites were removed from the gill filaments with dissecting needles and fixed in 70% alcohol. They were transported to a laboratory of the Universidade Federal do Paraná, Curitiba, PR, where permanent slide preparations were made using the phenol-balsam method explained in Thatcher (2006). The parasitological terminology (prevalence, mean intensity and mean abundance) follows Bush *et al.* (1997). Digital photographs made through a light microscope were used to make the drawings. Measurements were made utilizing a measuring ocular and are expressed in micrometers (µm).

## RESULTS

### *Ergasilus salmini* sp. nov.

#### Figs 1-9

Species diagnosis (based on ten females studied and measured; measurements in tables I and II). Body tapered towards both extremities; head incompletely fused to first thoracic segment. Thorax of six free segments (Fig. 1), including genital segment(Fig. 9). Abdomen (Fig. 9) of three segments. Uropod with two setae and two spinules. Antennule (Fig. 8) of six articles, provided with simple setae; setal formula = 1:5:6:2:0:4. Antenna (Fig. 2) of four segments with prominent sensillum on segment 3; ratio of segmental lengths = 1:2:1.5:1. Mouthparts (Fig. 4). Mandible with terminal bristles; palp denticulate posteriorly; maxilla bristled anteriorly; maxillule not observed. Legs (Figs 5-7). Leg 1 (Fig. 5) endopod two-segmented, exopod three-segmented; first endopodal segment with one pinnate medial seta; terminal endopodal segment with two large spines and five short pinnate setae; first exopodal segment without spines and setae; second exopodal segment with one pinnate medial seta; terminal segment with two large spines, one curved serrate seta and three small pinnate setae. Legs 2 and 3 (Fig. 6) both rami three-segmented; first endopodal segment with a single medial pinnate seta; second endopodal segment with two medial pinnate setae; terminal segment with one spine and four pinnate

Table I. Measurements in micrometers (μm) of ten adult females of *Ergasilus salmini* **sp. nov.** of "dourado", *Salminus franciscanus* from the upper São Francisco river.

| | Length | | Width | |
|---|---|---|---|---|
| | Range | Mean | Range | (Mean) |
| Body (less caudal filaments) | 640 - 740 | 691 | 200 - 225 | 207 |
| Cephalothorax | 260 - 285 | 262 | 190 - 225 | 207 |
| Free thoracic segments | | | | |
| II | 100 - 125 | 117 | 90 - 225 | 207 |
| III | 54 - 88 | 68 | 154 - 193 | 209 |
| IV | 50 - 66 | 59 | 131 - 156 | 138 |
| V | 46 - 56 | 51 | 88 - 104 | 99 |
| VI | 19 - 31 | 26 | 79 - 90 | 86 |
| VII (genital) | 60 - 69 | 65 | 68 - 88 | 80 |
| Abdominal segments | | | | |
| I | 5 - 22 | 18 | 50 - 66 | 58 |
| II | 0 - 12 | 11 | 47 - 60 | 58 |
| III | 5 - 24 | 19 | 40 - 52 | 47 |
| Uropod | 9 - 41 | 35 | 18 - 21 | 20 |
| Caudal filament | 75 - 290 | 250 | | |
| Egg sac | 20 - 415 | 386 | | |
| Egg (diameter) | 0 - 40 | 37 | | |

Table II. Measurements in micrometers (μm) of the antennae of ten adult females of *Ergasilus salmini* **sp. nov.** of "dourado", *Salminus franciscanus* from the upper São Francisco river.

| | Length | | Width | |
|---|---|---|---|---|
| | Range | Mean | Range | Mean |
| Antennule | 125 - 175 | 149 | 25 - 38 | 29 |
| Antenna segment | | | | |
| 1 | 87 - 115 | 102 | 56 - 87 | 71 |
| 2 | 215 - 250 | 235 | 48 - 62 | 53 |
| 3 | 150 - 165 | 160 | 30 - 50 | 41 |
| 4 (claw) | 103 - 112 | 108 | 18 - 21 | 19 |

setae; first exopodal segment without spines and setae; second exopodal segment with a single medial pinnate seta; terminal segment with one spine and six pinnate setae. Leg 4 (Fig. 7) endopod three segmented, exopod two-segmented; first and second endopodal segments without spines and setae; terminal segment with one spine and three pinnate setae; first exopodal segment without spines and setae; terminal segment with a single spine and four pinnate setae. Leg 5 (Fig. 9) of two simple setae.

Egg sac elongate, with few small eggs (Fig. 1).

Type host: *Salminus franciscanus* Lima & Britski, 2007, 'dourado'. Voucher specimen deposited: MZUSP 95165.

Site of infestation: Gill filaments.

Male: unknown.

Type locality: São Francisco river (18º12'32"S, 45º15' 41"W), downstream from the Três Marias Dam, State of Minas Gerais, Brazil.

Prevalence: 16,6%

Mean intensity: 1,7 copepods/host.

Mean abundance: 0,3 copepods/host.

Range: 1-2 copepods/host.

Type specimens: holotype female and 5 paratype females on permanent slides were deposited in the Crustacea Collection of the Instituto Nacional de Pesquisas da Amazonia.

Etymology: the generic name of the host fish is used as the specific name of the parasite, *i.e.* as genitive substantive.

## DISCUSSION

*Ergasilus salmini* **sp. nov.** has a two segmented first endopod and a curved serrate seta on the first exopod which makes it similar in these respects to the other South American species and serves to separate it from North American and Eurasian ones. The new species has a free second thoracic segment and the head is incompletely fused with the first thoracic segment. The antenna of the new species somewhat resembles that of *Ergasilus hydrolycus* Thatcher, Boeger & Robertson, 1984, since both have a prominent sensillum on segment three. The new species differs from that species, however, in that the third abdominal segment is the shortest. In *E. hydrolycus,* the third segment is much longer than the other two. Other differences that separate these two species are: the new species is smaller (691 x 207 μm compared to 784 x 278 μm); the fourth endopod of the new species has three segments while that of *E. hydrolycus* has only two and the two species are from different hosts and separate river systems.

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