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Ergasilus barai Batish and Brar, 1990 (Copepoda: Ergasilidae): A gill parasite of freshwater fish *Wallago attu* Bloch and Schneider, 1801 from Haleji Lake, Sindh, Pakistan

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Abstract

Ergasilus Nordmann, 1832 (Copepoda: Ergasilidae) is described from freshwater catfish *Wallago attu* parasite on the gills from Haleji Lake, Sindh, Pakistan.

This species differs from all its congeners by a combination of characteristics including the shape of the body, structure and armature of the swimming legs.

Keywords: Copepod fish parasite, *Ergasilus brari*, *Wallago attu*, gill parasites, Haleji Lake, Sindh, Pakistan

1. Introduction

Ergasilidae is a widespread family of copepods and comprises many species. Members of the Ergasilidae Nordmann, 1832 have adult females that are parasitic mainly on teleost fishes with the exception the genus *Teredophilus* Rancurel, 1954, which occurs on brackish-water bivalve molluscs, *Paraergasilus rylovi* Markevich, 1937, which sometimes occurs on freshwater molluscs, and *Ergasilus ogawai* Kabata, 1992 which occurs on an elasmobranch fish.

Species of *Ergasilus* Nordman, 1832 are parasitic copepods found world-wide in aquatic environments, and are considered an important plague of pisciculture Thatcher, 2006. Only females are found on fish hosts. Males are free-living in the zooplankton. Most species are found on freshwater fishes, but a few infect marine fishes of coastal waters Amado *et al.* 1995, Boxshall and Halsey, 2004^[17]. Luque and Tavares, 2007 reported 26 valid species plus 10 unidentified species of *Ergasilus* from Brazilian waters, of which 23 are from freshwater hosts and 13 are from brackish or marine hosts. Later, Thatcher and Brasil-Sato, 2008^[21] described *Ergasilus salmini* Thatcher and Brasil-Sato, 2008^[21] from *Salminus franciscanus* Lima and Britsky, 2007 (Characidae) from the upper São Francisco River, Brazil. *Ergasilus* with a few doubtful exceptions all ergasilids are parasitic on fishes.

Species of *Ergasilus* are primarily parasites of freshwater hosts but are also common on coastal marine fishes, especially the more euryhaline species such as killifish, needlefish, and grey mullets. The species *Ergasilus brari* (Batish and Brar, 1990) was reported from India from the host *Wallago attu* (Schneider).

During a parasitological survey of freshwater fishes of Haleji lake Sindh, Pakistan, one of the author collected specimens of Ergasilids (Copepoda: Poecilostomatoida) from *Wallago attu* (Bl and Schn.), *Xenentodon cancila* (Ham.), *Oreochromis mossambicus* (Peter), *Mastacembelus armatus* (La'cep), *Ophiocephalus punctatus* (Block), and *Cirrhina mrigala*.

During a parasitological examination of the fishes a member of the genus *Ergasilus* was found on the gills.

2. Materials and Methods

The specimens of *Ergasilus barai* were collected from freshwater fishes of *Wallago attu* (Bl&Schn.), captured from Haleji lake Thatta 70 km away from Karachi.

A total of 60 host fishes were captured during 2002 to 2004. The total of 89 female parasite specimens of *Ergasilus barai* were transported live to the laboratory, where copepod parasites were removed from the gill filaments under a dissecting microscope, fixed and preserved in 70% ethanol.

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They were cleared in 90% lactic acid before dissection, using the wooden slide method.

Illustrations were made using a camera lucida on a Yaseen compound microscope and expressed in mm.

3. Results and Discussion

3.3.1. Females Based on 12 females studied and measured. Body (Figures 1 A, B; 2A; 3 A, B) long, cylindrical and cyclopoid shaped 735 to 837 (800) in total length. Anterior portion broad while posterior narrow (Figures 1; 2; 3). Head fused with first segment of thorax forming cephalothorax. Total length 0.90 mm - 1.60 mm.

3.3.2. Cephalothorax barrel shaped having one depression on both sides and a quadrangular sculpture in the anterior half and small oral cone in the center of anterior half of ventral surface (Figures 1 A, B; 2A; 3 A, B). 315–511 (452) long and 333–448(395) in maximum width.

3.3.3. Cephalon with inverted T-shaped marking on dorsal surface (Figures 1 A, B; 2A; 3 A, B); second to fifth pedigerous somites narrowing posteriorly.

3.3.4. Antenna (Figure 4A) 549–603 (570) large and four segmented with single setule on basal part of second segment. Second segment longest, third segment (subchela) curved ventrally toward distal claw. Fourth segment well developed and consisting of a sharp claw (Figure 4B).

3.3.5. Antennule large 108–126 (118) in length (Figure 4B) and made up of six segments. Basal segment larger than apical segment. Remaining segments equal in size. First and four segments bear three setae. Eight setae are found on second segment while third has four setae. Two setae in fifth segment and seven terminal setae in sixth segment (Fig.4 A). Length 0.15 — 0.16 mm. Width 0.02 — 0.03mm.

3.3.6. Mandible (Figure 5A) unsegmented long bearing two distal blades. Anterior blade small and denticulated along the dorsal margin while posterior blade long and denticulated along both dorsal and ventral margins (Figure 5A).

3.3.7. First Maxilla (Figure 5B) short, sub-orbicular with narrow basal part. Apex two setiform processes of equal length (Fig.5B) a small lobe tipped with three long setae.

3.3.8. Second Maxilla (Figure 5C) unsegmented and sub-triangular shaped with fine hairs on both Margins comprising large syncoxa, second segment (basis) spatula-shaped, bearing long, sharp teeth anteriorly.

3.3.9. Maxilliped Absent.

3.3.10. Thoracic legs five pairs. **First to fourth swimming legs (Figures 6 A, B–7AB)** biramous.

3.3.11. First thoracic leg biramous with two segmented basipod. Basipod two rows of denticles on lateral margin of first segment and one seta laterally present on second segment near base of exopod. Both rami three segmented. Exopodal first segment single spine while second segment on the inner margin long seta. Two spines on dorsal margin of third segment and five unequal long setae at terminal end. Endopod of first and second segments one seta at dorsal margins while in third segment two spines are present on inner margin and four long, unequal setae at terminal end (Figure 6A).

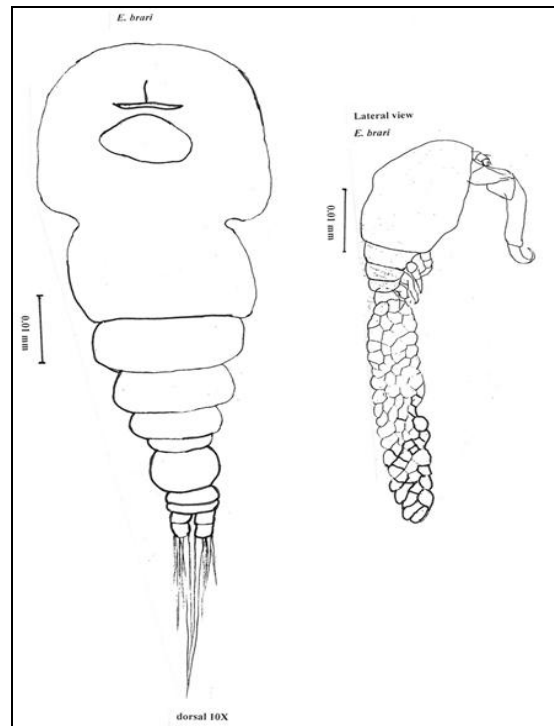


Fig 1: *Ergasilus barai* Batish and Brar, 1990
A. Dorsal view;
B. Lateral view.

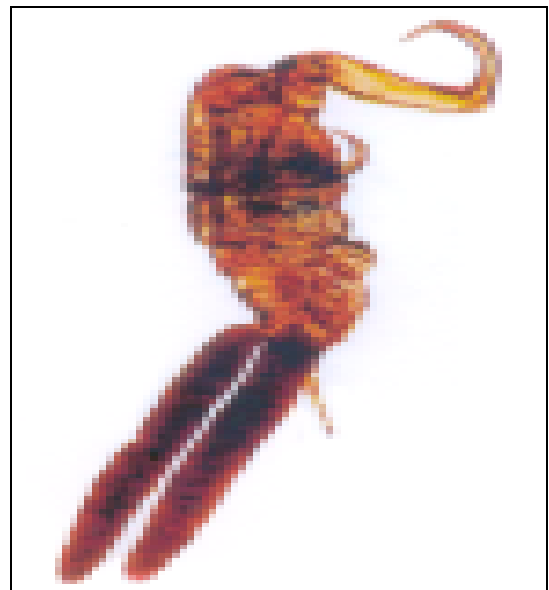


Fig 2: *Ergasilus barai* Batish and Brar, 1990
A. Lateral view. (4x 5mm)

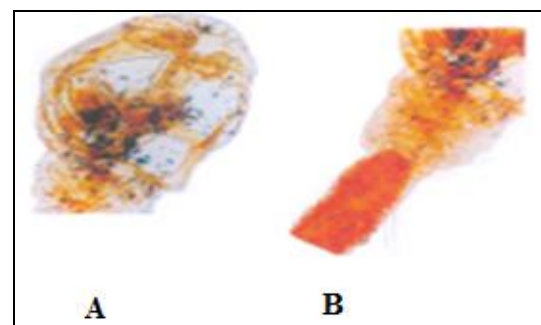


Fig 3: *Ergasilus barai* Batish and Brar, 1990
A. Ventral view of Cephalothorax (10 x 5mm)
B. Ventral view of Thorax (10 x 5mm)

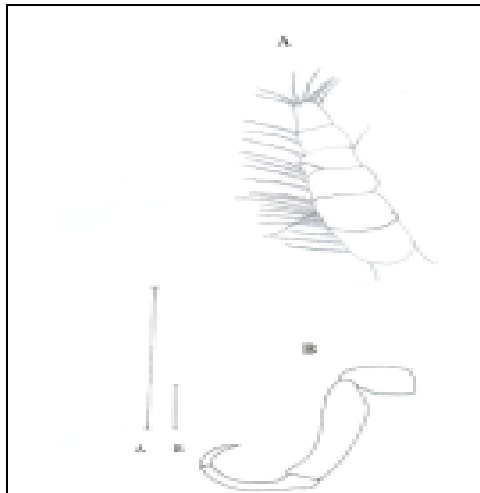


Fig 4: *Ergasilus barai* Batish and Brar, 1990
A. Antennule
B. Antenna (0.01mm)

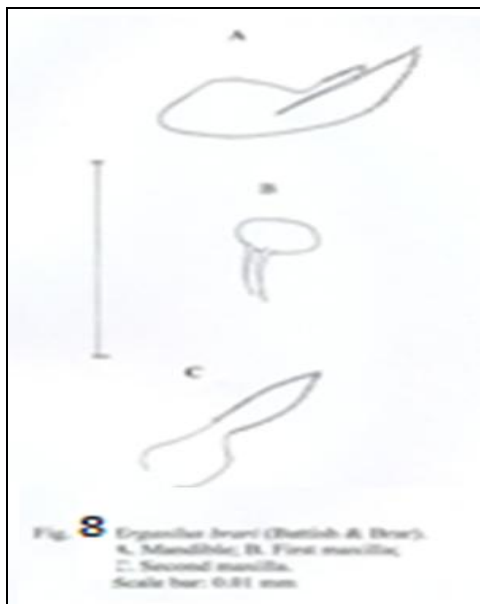


Fig 5: *Ergasilus barai* Batish and Brar, 1990
A. Mandible;
B. First Maxilla
C. Second Maxilla Scale (0.01mm)

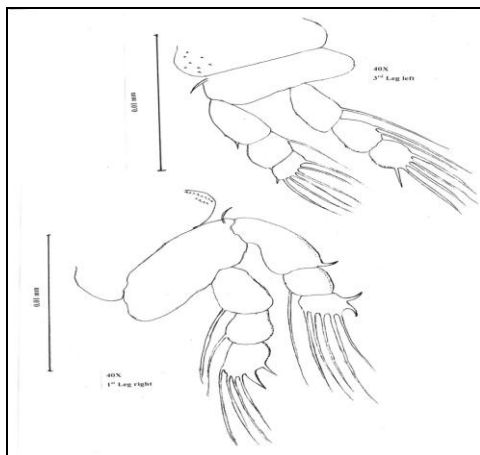


Fig 6: *Ergasilus barai* Batish and Brar, 1990
A. First thoracic leg left;
B. Third thoracic leg, Right; Scale 0.01mm

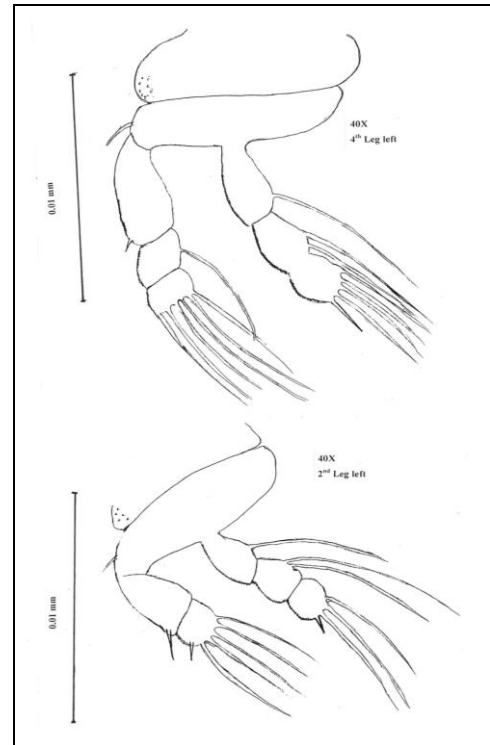


Fig 7: *Ergasilus barai* Batish and Brar, 1990
A. Second thoracic leg left;
B. Fourth thoracic leg, Right; Scale 0.01mm

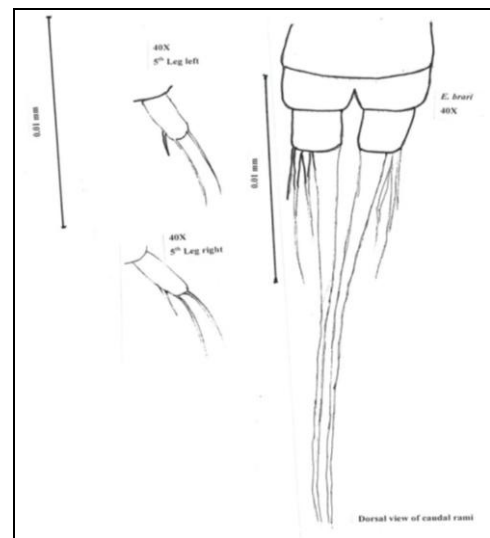


Fig 8: *Ergasilus barai* Batish and Brar, 1990
A. Fifth thoracic leg left;
B. Fifth thoracic leg, Right;
C. Dorsal view of caudal rami. Scale 0.01mm

3.3.12. Second thoracic leg biramous also with two segmented basipod. Two rows of denticles present on lateral margin of first segment and a seta present on second segment. Both rami three segmented. Exopod three segmented. First segment one short spine. Second segment a single long seta on inner margin. Third segment no spine with six unequal long setae at terminal end. Edopodal first segment one long seta and second with two long setae. Third segment one spine at inner side and four unequal setae at apical end (Figure 7A).

3.3.13. Third thoracic leg biramous with two segmented basipod. Dentition found on posterior margin of first segment.

Both rami three segmented. Lateral margins of second and third segments of exopod partially covered by rows of denticles. First segment bears a single short spine while one long seta present on inner margin of second segment. Third segment one spine on dorsal margin and four long setae on terminal end. First segment of endopod a long seta on outer margin and two long setae on second segment. Third segment a single spine on inner margin and four setae at apical end. All endopodal segments bear denticulation on inner side (Figure 6B).

3.3.14. Fourth thoracic leg biramous with two segmented basipod. Exopod two segmented while endopod made up of three segments. Denticulation on outer side of exopod and on inner side of endopod. First segment of endopod a single long seta on outer margin while second segment two long setae. Third segment short spine and three long setae (Figure 7B).

3.3.15. Fifth leg (Figure 8A, B) consisting of two segments: basal segment with single outer seta; distal segment with two long setae at tip and one seta on lateral margin. Length 0.024 — 0.025 mm and Width 0.022 — 0.023 mm.

3.3.16. Genital double-somite (Figure 8) with rounded lateral margins, just slightly wider 90–108 (99) than long 81–93(87). Free abdomen 81–126 (95) in length, three-segmented, each somite with single spinule row on ventral surface, near posterior margin. Anal segment with deep posterior incision.

3.3.17. Caudal rami Uropods slightly longer than broad and denticulated 18–28 (24) than wide 18–28 (21) (Figure 8C). Caudal ramus tipped with four unequal setae at the terminal region of each ramous. Among them, inner one is long. The remaining three setae are unequal and comparatively short. Longest seta is broad at the base and tapering posteriorly Egg sac shorter than body 500–599 (561).

4. Discussion

This species described for the first time from Pakistan (Haleji lake Sindh) and second time from the world. The characteristic feature of this species is the presence of inverted “T” shaped dorsal chitinized marking on the cephalothorax. This species was reported by Battish and Brar, 1990 from India from the host *Wallago attu* (Bl & Schn.) only. However it is collected from *Xenentodon cancila* (Ham.), *Oreochromis mossambicus* (Peter), *Mastacembelus armatus* (La'cep), *Ophiocephalus punctatus* (Block) and *Cirrhina mrigala* (Ham.) in addition to *Wallago Attu* (Bl & Schn.). His specimens are small having slight depression than the present reported species. The long denticulated palp and protuberance were present in his specimens which are absent in the present species.

Walter and Boxshall listed 152 valid species in *Ergasilus*, 9 of those were described or recorded from Iraq. *Ergasilus boleophthalmi* Adday and Atheer, 2011 shares with the majority of its congeners, the presence of two inner setae on the middle endopod segments of legs 2 and 3. This serves to distinguish this species from four of the known Iraqi *Ergasilus* species viz. *E. barbi*, *E. mosulensis*, *E. iraquensis* and *E. pararostralis*. Species can be distinguished from *E. rostralis* by the number of antennular segments, which is six in the former compared to five in the latter, by the presence of

an outer spine on the distal segment of the exopod of leg 3 and 4, by the arrangement of setae on the distal exopodal segment of legs 1–4.

This species can be distinguished from *E. ogawai* by the presence of spine on the distal segment of the exopod of leg 4, the absence of a single spine on the distal segment of the exopod of leg 2, by the arrangement of setae on distal segment of the exopod of legs 1–4 and by the number of setae on the middle and distal segments of the endopod of leg 4 and distal segment of the endopod of legs 2 and 3. Also distinguished from *E. sieboldi* by the absence of a single outer spine on the middle segment of the exopod of leg 1 and the distal exopodal segment of leg 2, by presence of spine on the distal exopodal segment of leg 4.

Differs from *E. synanceiensis* by the possession of a single spine on the distal exopodal segment of legs 3 and 4, and on the distal endopodal segment of leg 4.

There are just three species which have leg 1–4 setal formula plus 6-segmented antennules very similar to those of the species viz. *Ergasilus anchoratus* Markevich, 1946, *E. magnicornis* Yin, 1949 and *E. peregrines* Heller, 1868. These species can be distinguished from a species by presence spine on the distal segment of the exopod of leg 2.

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