Prehendorastrus n. g. (Poecilostomatoida, Ergasilidae) with descriptions of two new species from the gill rakers of Hypophthalmus spp. (Teleostei, Siluriformes) from the Brazilian...

Article *in* Systematic Parasitology · October 1990

DOI: 10.1007/BF00009801

CITATIONS
5

READS
72

2 authors, including:

Walter Antonio Boeger
Universidade Federal do Paraná
419 PUBLICATIONS **5,417** CITATIONS

SEE PROFILE

Systematic Parasitology **17**: 133–141, 1990.

Prehendorastrus n. g. (Poecilostomatoida, Ergasilidae) with descriptions of two new species from the gill rakers of *Hypophthalmus* spp. (Teleostei, Siluriformes) from the Brazilian Amazon

Walter A. Boeger[1] and Vernon E. Thatcher[2]
[1]*Estação de Biologia Marinha, Universidade Federal Rural do Rio de Janeiro, rua Sereder s/n, Itacuruçá, RJ 23860, Brazil and Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil*
[2]*Laboratório de Ictiopatologia, Instituto Nacional de Pesquisas da Amazônia, Manaus, AM 69000, Brazil*

Accepted for publication 5th January, 1990

Abstract

Prehendorastrus n.g. (Poecilostomatoida, Ergasilidae) is proposed for two new species (*P. bidentatus* and *P. monodontus*) collected from the gill rakers of the catfishes *Hypophthalmus edentatus* Spix, 1829 and *H. fimbriatus* Kner, 1857, from the Furo do Catalão, near Manaus, Amazonas, Brazil. Species of the new genus are principally characterised by having antennae modified to individually grasp the gill rakers and latch, and second antennal segment with one or two prominent teeth. *Prehendorastrus* spp. are the first species of the Ergasilidae reported from the gill rakers of fish.

Introduction

Recent studies on ectoparasites of Neotropical fishes have disclosed a considerable range of sites of infestation among ergasiloids. Species of *Ergasilus*, *Acusicola* and *Brasergasilus* parasitise the gill filaments (see Thatcher & Boeger, 1983); *Rhinergasilus* spp. (see Boeger & Thatcher, 1988) and the Vaigamidae (see Thatcher & Boeger, 1984a,b) are found in the nasal cavities; and *Ergasilus euripedesi* (see Montú, 1980) was collected from the skin and fins of larval fishes.

Necropsy of specimens of *Hypophthalmus edentatus* Spix, 1829, and *H. fimbriatus* Kner, 1857, disclosed a hitherto unrecognised site of parasitism for ergasiloids. Three undescribed species of ergasilids were recovered from the gill rakers of these catfishes captured near Manaus, Brazil. This paper includes the description of two of these species and the proposal of a new genus.

Materials and methods

Specimens of *Hypophthalmus* spp. were captured in the Furo do Catalão, at the mouth of the Rio Negro, near Manaus, Brazil, in July 1988 (*H. edentatus*) and January 1989 (*H. fimbriatus*). Gills were removed and preserved in 5% formalin. Ergasilids were collected from the gill rakers with the aid of forceps and probes under a dissecting microscope. Some specimens were stained with a mixture of eosin and orange G in 95% ethanol. Permanent preparations of stained or unstained specimens were made by dehydrating in phenol, clearing in methyl salicylate or creosote, and mounting in balsam. Other specimens were dissected with glass microprobes under a dissecting scope in Gray and Wess' mounting medium (prepared as explained in Humason, 1979). Drawings were made with the aid of a camera lucida. Measurements were obtained with a measuring ocular

and are given in micrometres: the average is given followed by the range in parentheses. Colour determinations were made according to Smithe (1975). Specimens were deposited in the collections of the Instituto Nacional de Pesquisas da Amazônia (INPA), the Instituto Oswaldo Cruz (IOC), the USNM Helminthological Collection (USNM) and the University of Nebraska State Museum (HWML).

Ergasilidae Nordmann, 1832
Prehendorastrus n.g.

Diagnosis

Female: Antennule 5-segmented. Antenna 4-segmented, modified to individually grasp gill raker and latch; second segment with 1 or 2 prominent teeth. First maxilla with 3 setae. Five pairs of biramous legs; endopod of leg 1, exopod of leg 4 2-segmented; remaining podites of swimming legs 1-4 3-segmented; leg 5 reduced to 2 setules. Parasites of gill rakers of fish. *Male*: Unknown.

Type-species: *Prehendorastrus bidentatus* n. sp. from *Hypophthalmus edentatus* and *H. fimbriatus*.

Other species: *P. monodontus* n. sp. from *Hypophthalmus edentatus* and *H. fimbriatus*.

Etymology: The generic name is derived from Latin (*prehendere*, to grasp; *rastrum*, a rake) and refers to the attachment strategy and infestation site in the host.

Remarks

Prehendorastrus n. g. is distinguished from all other genera of Ergasilidae by the combination of the following characters: (1) antennules with five segments; (2) prehensile antenna modified to individually grasp gill rakers and latch; (3) second segment of antennae with one or two prominent teeth; and (4) endopod of leg 1 and exopod of leg 4 with two segments. Recognition of specimens of *Prehendorastrus* spp. on the gill rakers of the host is relatively easy under the dissecting microscope due to the mode of attachment of these copepods. Unlike other previously described ergasilids, each prehensile antenna of members of this genus individually grasps the gill raker in a way analogous to hands holding a lance (Figs 19, 20).

Prehendorastrus bidentatus n. sp. (Figs 1–9, 19, 20)

Hosts: *Hypophthalmus edentatus* and *H. fimbriatus*.

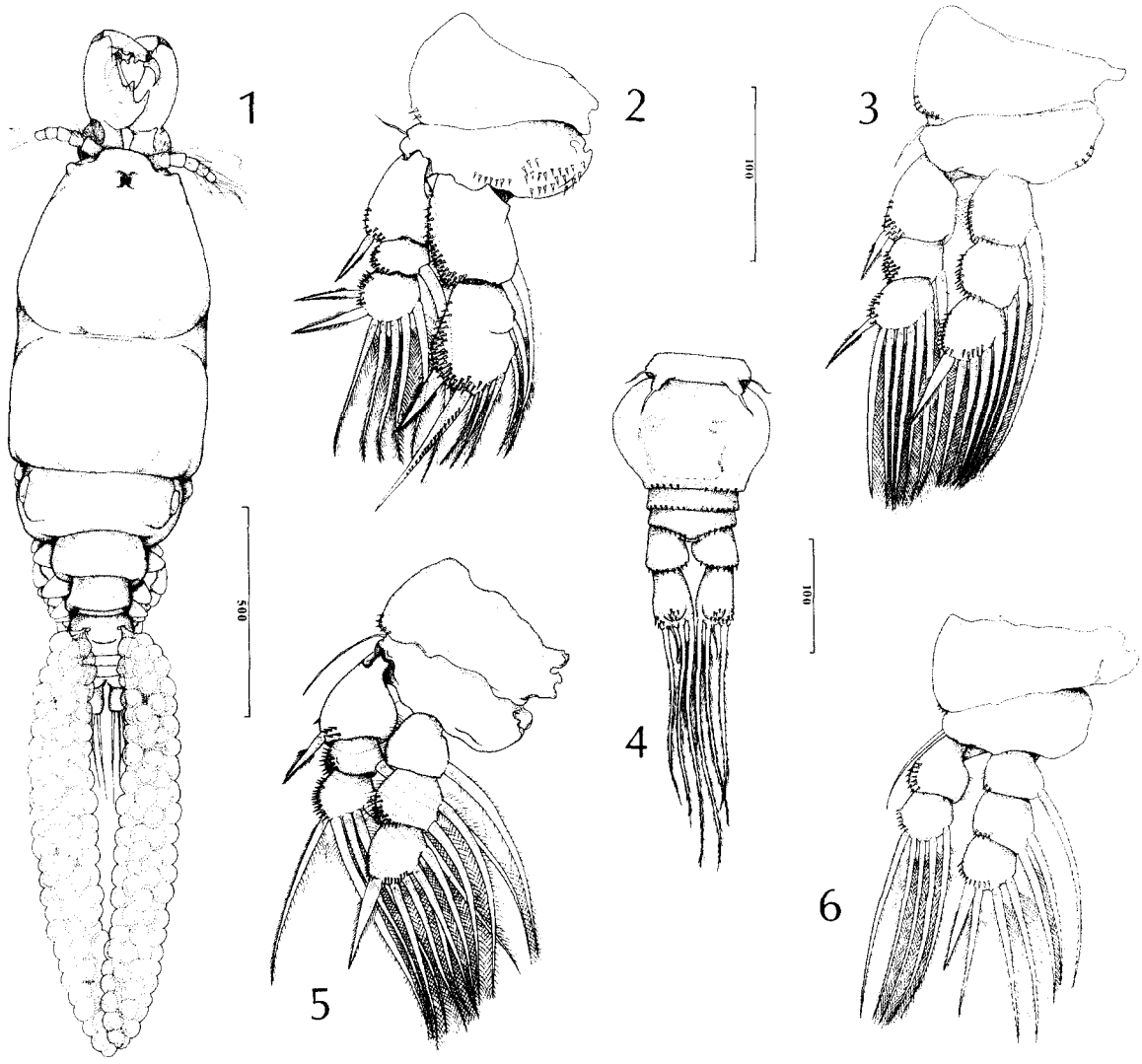
Type-locality: Furo do Catalão at the mouth of the Rio Negro, near Manaus, Amazonas, Brazil.

Type-specimens: Holotype, INPA Platy 191a; paratypes, INPA Platy 191b–l, IOC 100.005-010. USNM 81021, HWML 32804.

Etymology: The specific name is from the Latin roots (*bi-*, two; *dentat-*, toothed) and refers to the presence of two large teeth in the second segment of the antenna.

Description (based on 29 females; measurements in Table I)

Cephalothorax bullet-shaped. Blue pigment (colour 68, cobalt of Smithe (1975)) distributed in 2 longitudinal ventral bands from cephalothorax to genital segment, penetrating legs. Thorax with 5 free segments; segment VI reduced. Genital segment (thoracic VII) subrectangular. Abdomen 3-segmented (Fig. 4); each segment with row of ventral spinules along posterior margin; segment III almost completely separated into bilateral segments by deep posterior cleft. Uropod (Fig. 4) with 3 long and one short setae, ventral spinules. Antennule (Fig. 7) comprising 5 segments with setae; setal formula 8–5–4–2–7 (total 26). Antenna 4-segmented (Fig. 9); basal segment inflated; segment 2 with 2 large teeth, cutting edge on internal margin, numerous small lateral sensilla; segment 3 with distal spine-like sensillum, proximal sensillum associated with cutting edge; segment 4 (claw) with proximal spine-like sensillum, subterminal inconspicuous sensillum; ratio of segmental length 1:0.8:0.6:0.3. Mouth parts (Fig. 8): mandible with long subterminal spinule, 2 blades with falciform bristles, palp with blunt, coarse teeth; maxillule with 3 setae; maxilla with many subterminal teeth, spike-like bristles. Leg 1



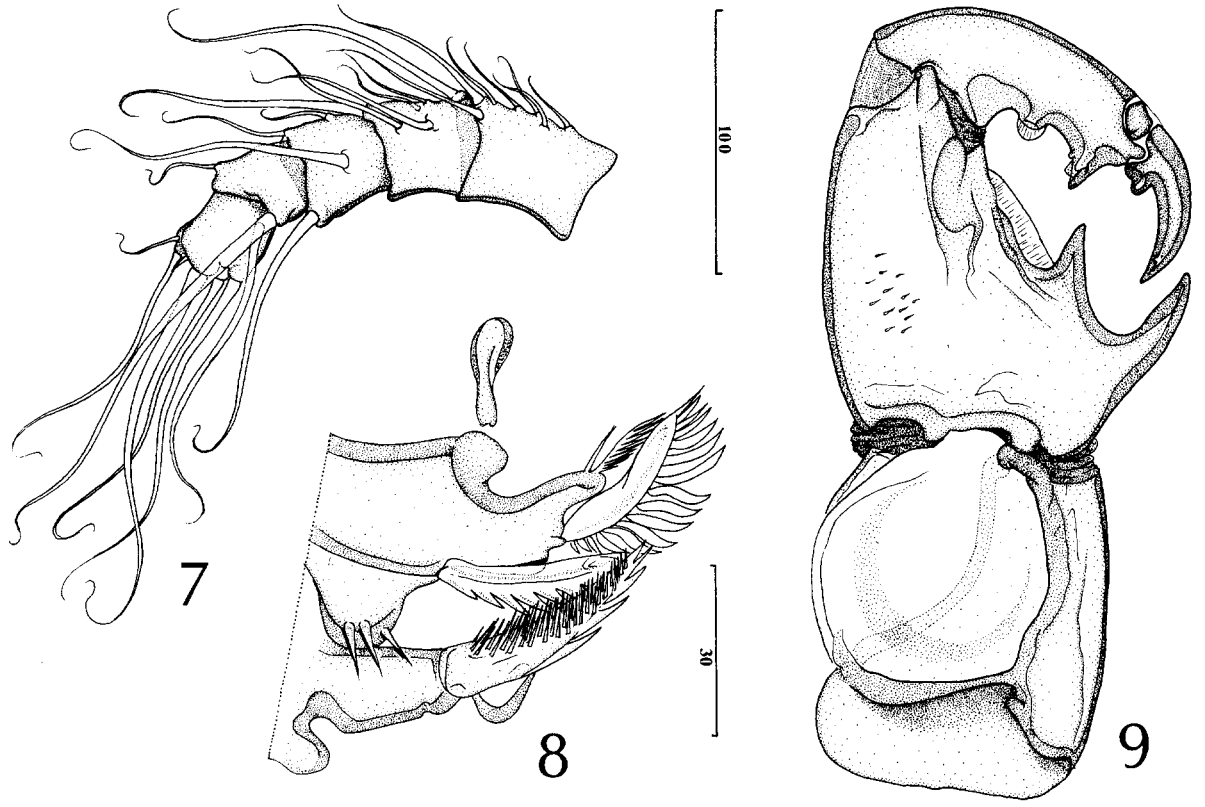
Figs. 1–6. Prehendorastrus bidentatus n. sp. 1. Composite drawing, whole-mount (dorsal). 2. Leg 1. 3. Leg 2. 4. Posterior end of a specimen showing leg 5, genital segment, abdomen, uropod (ventral). 5. Leg 3. 6. Leg 4. *Scale-bars*: Figs. 2, 3, 5, 6 relate to the upper 100 μm scale; Figs. 1 and 4 relate to their respective scales (500 μm and lower 100 μm).

(Fig. 2): coxopod with few posterolateral spinules; basipod with medio-posterior rows of spinules, lateral seta; first endopodal segment with medial pinnate seta, postero-lateral rows of spinules; terminal segment with 2 subterminal serrate spines, 5 medial pinnate setae, postero-lateral rows of spinules; first exopodal segment plumose medially with posterolateral serrate spine, few postero-lateral spinules; second exopodal segment with medial pinnate seta, postero-lateral spinules; terminal exopodal segment with 2 lateral serrate spines, one serrate and 4 pinnate subterminal setae, lateral spinules. Leg 2 (Fig. 3): coxopod with few postero-lateral spinules; basipod with lateral seta, postero-medial row of few spinules; first endopodal segment laterally plumose with medial pinnate seta, postero-lateral row of spinules; second endopodal segment laterally plumose with 2 medial pinnate setae, postero-lateral row of spinules; terminal segment with terminal serrate spine, 4 subterminal pinnate setae, postero-lateral row of spinules; first exopodal segment medially plumose

Table I. Measurements (μm) of adult females of *Prehendorastrus bidentatus* n. sp.

	Length	Width
Body (less caudal setae)	1,038(931–1,112)	376(339–423)
Cephalothorax	610(494–780)	376(339–423)
Free thoracic segments:		
III	115(88–139)	317(278–377)
IV	77(61–96)	219(194–244)
V	70(53–98)	154(139–166)
VI	21(16–27)	99(88–104)
VII (genital)	92(95–104)	150(143–158)
Abdominal segments:		
I	16(13–18)	86(81–90)
II	14(13–16)	86(81–89)
III	41(38–45)	84(78–90)
Uropod	55(47–64)	34–35
Egg sac	834(711–1,103)	116(108–137)
Antennule	162(151–174)	34(27–42)
Antenna segments:		
1	181(153–209)	95(86–104)
2	159(148–174)	87(78–94)
3	114(101–129)	31(29–34)
4	63(59–70)	21(17–25)

with postero-lateral serrate spine, postero-lateral rows of spinules; second exopodal segment with medial pinnate seta, postero-lateral rows of spinules; terminal exopodal segment with subterminal serrate spine, one serrate and 5 pinnate subterminal setae, lateral rows of spinules. Leg 3 (Fig. 5): coxopod with few postero-lateral spinules; basipod with lateral seta; first endopodal segment laterally plumose with medial pinnate seta; second endopodal segment with 2 medial pinnate setae, postero-lateral rows of spinules; terminal segment with terminal serrate spine, 4 subterminal pinnate setae, postero-lateral row of spinules; first exopodal segment medially plumose with postero-lateral serrate spine, few postero-lateral spinules; second exopodal segment with medial pinnate seta, postero-lateral rows of spinules; terminal exopodal segment with one serrate and 5 pinnate subterminal setae, lateral row of spinules. Leg 4 (Fig. 6):

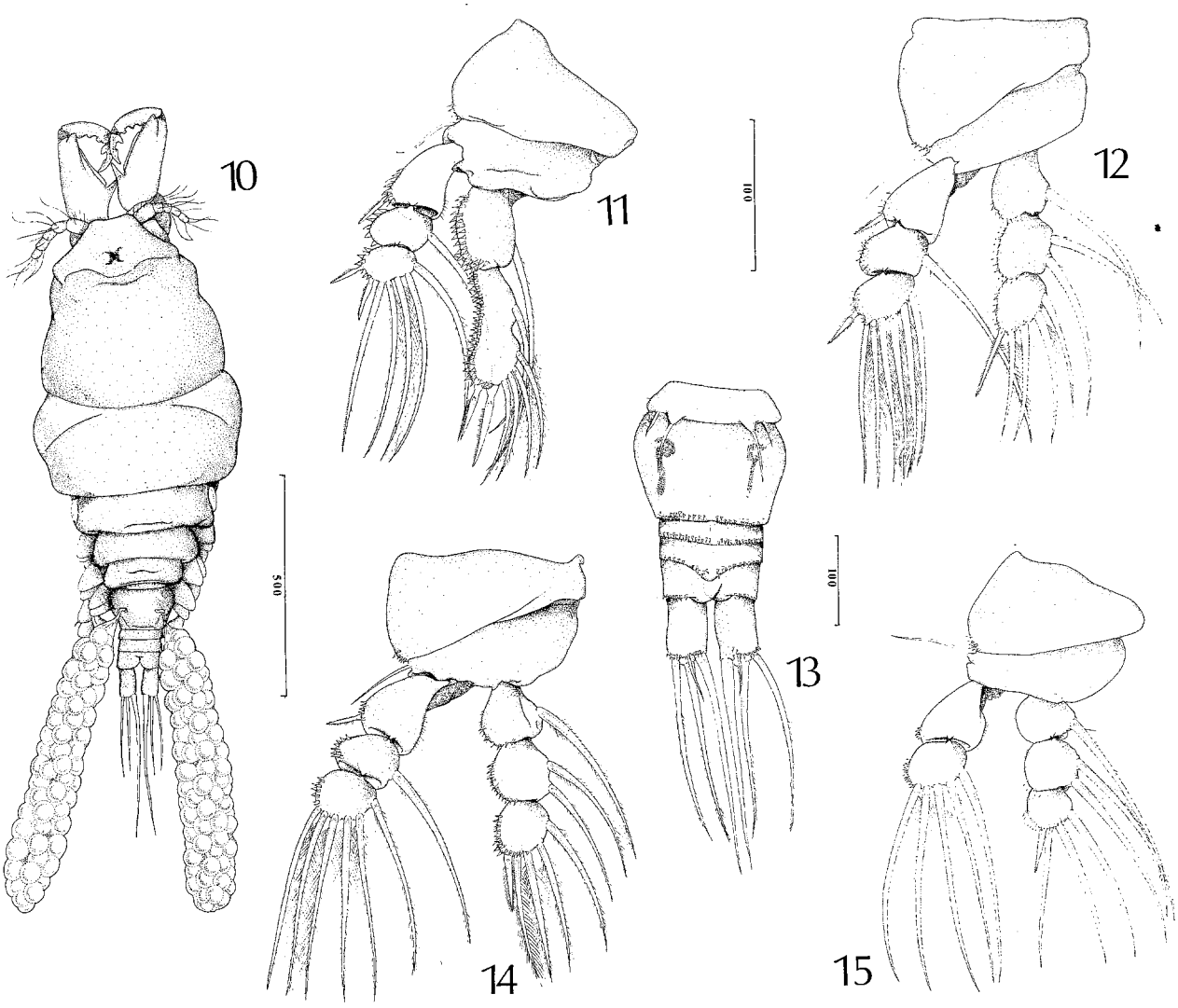


Figs. 7–9. Prehendorastrus bidentatus n. sp. 7. Antenna. 8. Mouth parts. 9. Prehensile antenna. *Scale-bars*: Figs. 7 and 9 relate to the 100 μm scale; Fig. 8 relates to the 30 μm scale.

coxopod with few postero-lateral spinules; first endopodal segment laterally plumose with medial pinnate seta, few postero-lateral spinules; second endopodal segment laterally plumose with 2 medial pinnate setae, few postero-lateral spinules; terminal segment laterally plumose with subterminal serrate spine, 3 subterminal pinnate setae, postero-lateral rows of spinules; first exopodal segment medially plumose with postero-lateral rows of spinules; terminal segment with one serrate and 4 pinnate subterminal setae, lateral row of spinules. Leg 5 (Fig. 4) reduced to 2 setae.

***Prehendorastrus monodontus* n. sp.** (Figs 10–18)

Hosts: *Hypophthalmus edentatus* and *H. fimbriatus*.
Type-locality: Furo do Catalão at the mouth of Rio Negro, near Manaus, Amazonas, Brazil.



Figs. 10–15. Prehendorastrus monodontus n. sp. 10. Dorsal view of holotype. 11. Leg 1. 12. Leg 2. 13. Posterior end of a specimen showing leg 5, genital segment, abdomen, uropod (ventral), 14. Leg 3. 15. Leg 4. *Scale-bars*: Figs 11, 12, 14, 15 relate to the upper 100 μm scale; Figs. 10 and 13 relate to their respective scales (500 μm and lower 100 μm).

Type-specimens: Holotype, INPA Platy 192a; paratypes, INPA Platy 192b–c, IOC 100.001–004, USNM 81022, 81023, HWML 31135, 32805.

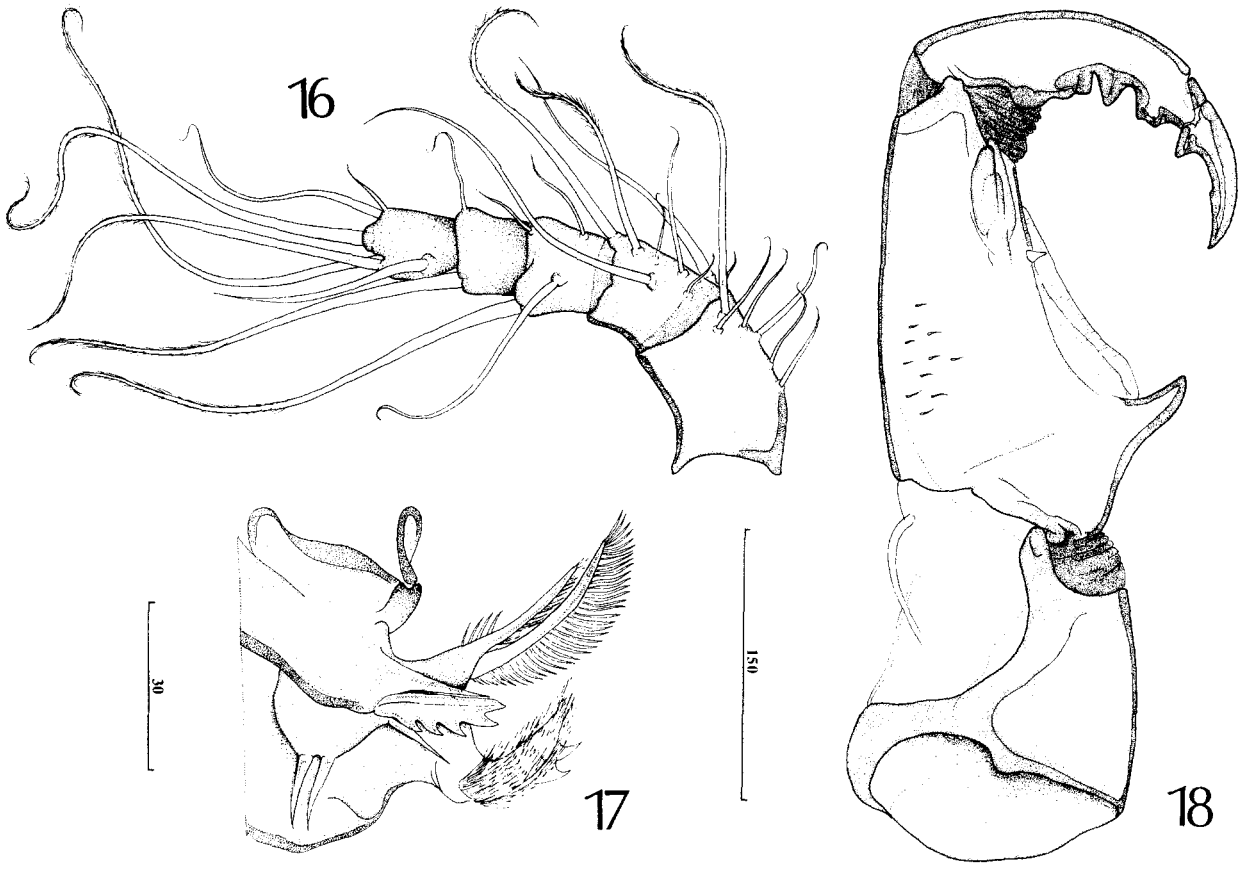
Etymology: The specific name is derived from the Greek roots (*mono-*, single; *odonto-*, tooth) and refers to the presence of a single tooth on the second segment of the antenna.

Description (based on 18 females; measurements in Table II)

Cephalothorax bullet-shaped. Blue pigment (colour 70, smalt blue of Smithe (1975)) distributed in 2 longitudinal ventral bands from cephalothorax to uropods, penetrating legs and mouth parts. Thorax with 5 free segments; segment VI reduced. Genital segment (thoracic VII) sub-rectangular. Abdomen 3-segmented (Fig. 13); each segment with row of ventral spinules along posterior margin; segment III invaginated posteriorly. Uropod (Fig. 13) with 3 long and one short setae, ventral spinules. Antennule (Fig. 16) comprising 5 segments with setae; setal formula 8–6–4–2–6 (total 26). Second antenna 4-segmented (Fig. 18); basal segment inflated; segment 2 with large tooth, cutting edge, large sensillum on internal margin, numerous small sensilla clustered laterally; segment 3 with proximal spine-shaped sensillum, distal conspicuous sensillum; segment 4 (claw) sickle-shaped with proximal spine-shaped sensillum, distal inconspicuous sensillum; ratio of segmental length 1:1.7:0.6:0.4. Mouth parts (Fig. 17); mandible with long subterminal spinules, 2 blades with long bristles, palp with blunt and coarse teeth; maxillule with 3 setae; maxilla with 2 large subterminal teeth, splinter-shaped bristles. Leg 1 (Fig. 11); coxopod with few postero-lateral spinules; basipod with lateral seta; first endopodal segment with medial pinnate seta, postero-lateral rows of spinules; terminal segment with 2 subterminal serrate spines, 5 subterminal pinnate setae, postero-lateral rows of spinules; first exopodal segment medially plumose with postero-lateral serrate spine, postero-lateral rows of spinules; second exopodal segment with medial pinnate seta, postero-lateral row of spinules; terminal exopodal segment with 2 lateral serrate spines, one serrate and 4 pinnate subterminal setae, postero-lateral row of spinules. Leg 2 (Fig. 12); coxopod with few postero-lateral spinules; basipod with lateral seta; first endopodal segment laterally plumose with medial pinnate seta, postero-lateral row of spinules; second endopodal segment laterally pinnate, 2 medial pinnate setae, postero-lateral row of spinules; terminal endopodal segment laterally plumose with subterminal serrate spine, 4 pinnate setae, postero-lateral row of spinules; first exopodal segment medially plumose with postero-lateral serrate spine, lateral row of few spinules; second exopodal segment with medial pinnate seta, postero-lateral rows of spinules; terminal exopodal segment with subterminal serrate spine, one serrate and 5 pinnate subterminal setae, few postero-lateral spinules. Leg 3 (Fig. 14); coxopod with few postero-lateral spinules; basipod with lateral seta; first endopodal segment laterally plumose with medial pinnate seta, postero-lateral row of few spinules; second endopodal segment laterally plumose with 2 medial pinnate setae, postero-lateral row of spinules; terminal endopodal segment laterally plumose with subterminal serrate spine, 4 subterminal pinnate setae, postero-lateral row of spinules; first

Table II. Measurements (μm) of adult females of *Prehendoraster monodontus* n. sp.

	Length	Width
Body (less caudal setae)	1,276(1,110–1,421)	497(464–542)
Cephalothorax	737(622–826)	497(462–542)
Free thoracic segments:		
III	134(93–158)	399(375–421)
IV	106(92–123)	268(231–301)
V	88(56–90)	194(173–247)
VI	32(24–36)	122(106–141)
VII (genital)	116(111–128)	154(133–178)
Abdominal segments:		
I	22(19–31)	96(77–113)
II	26(20–30)	96(85–113)
III	44(41–47)	98(88–112)
Uropod	77(69–83)	41(34–50)
Egg sac	617(518–711)	114(98–152)
Antennule	218(183–244)	49(44–54)
Antenna segments:		
1	203(174–243)	98(91–127)
2	237(213–255)	74(80–104)
3	127(114–139)	37(34–56)
4	72(69–78)	30(26–35)



Figs. 16–18. Prehendorastrus monodontus n. sp. 16. Antenna. 17. Mouth parts. 18. Prehensile antenna. *Scale-bars*: Figs 16 and 18 relate to the 150 μm scale; Fig. 17 relates to the 30 μm scale.

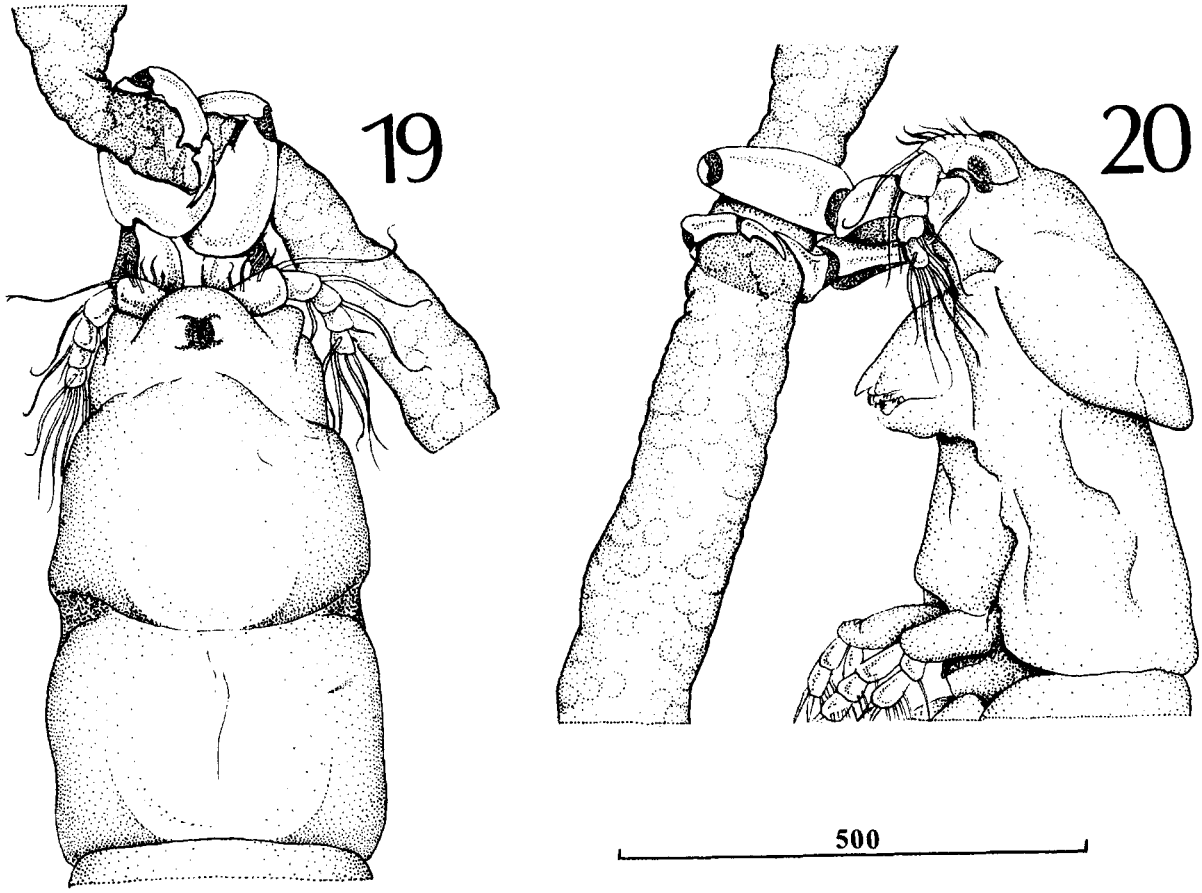
exopodal segment medially plumose with postero-lateral serrate spine, postero-lateral row of few spinules; second exopodal segment with medial pinnate seta, postero-lateral row of spinules; terminal exopodal segment with one serrate and 5 pinnate subterminal setae, lateral row of spinules. Leg 4 (Fig. 15): coxopod with postero-lateral row of spinules; basipod with lateral seta; first endopodal segment laterally plumose with medial pinnate seta; second endopodal segment medially plumose with 2 medial pinnate setae, postero-lateral row of few spinules; terminal endopodal segment laterally plumose with subterminal serrate spine, 3 subterminal pinnate setae, postero-lateral row of spinules; first exopodal segment medially plumose with few postero-lateral spinules; terminal exopodal segment with one serrate and 4 pinnate subterminal setae, postero-lateral row of spinules. Leg 5 (Fig. 13) reduced to 2 setae.

Remarks

Prehendorastrus monodontus n. sp. can be distinguished easily from the type-species of the genus, *P. bidentatus* n. sp., by the number of teeth on the second segment of the prehensile antenna and shape of the cephalothorax.

Discussion

Neotropical ergasiloids may attach themselves to their hosts in a number of different ways (see Thatcher & Boeger, 1983). Species of *Ergasilus*



Figs. 19, 20. Prehendorastrus bidentatus n. sp. attached to a gill raker of *Hypophthalmus fimbriatus*. 19. Lateral view. 20. Dorsal view. Both figures are to the same scale.

may embrace, embrace and perforate, or simply perforate gill filaments. *Brasergasilus* spp. perforate the gill epithelium with their long third antennal segment (claw). The prehensile antennae of the Acusicolinae encircle the gill filament and the claw (fourth segment) of each antenna locks in a groove located on the third segment of the opposite antenna. The Vaigamidae possess retrostylets on the cephalothorax that help anchor them within the nasal cavities of their hosts. The method of attachment of *Prehendorastrus* spp. differs from those previously described for ergasiloids.

The antennae of *Prehendorastrus* spp. is modified to allow each individual prehensile antenna to grasp a gill raker and latch. Latching is accomplished by forcing the claw under the proximal tooth of the second segment of each antenna (Figs. 19, 20). The parasite secures itself on the long gill raker by using the cutting edge and additional tooth on the second antennal segment and by sensilla-associated structures on the third and fourth (claw) segments.

The pathology of the two species of *Prehendorastrus* described here appears to be associated solely with the mode of fixation. Deformations of gill rakers have been observed distal to the point of attachment suggesting a tourniquet-like action of the antennae. However, no damage to gill raker epithelium has been associated directly with the mouth parts which indicates that epithelial cells are not a significant part of the diet of these copepods. A possible source of food for *Prehendorastrus* spp. may be the mucous secretions from

the gill rakers or filaments. However, characteristics of the fish host suggest another possible feeding strategy which would be unique among parasitic copepods.

Hypophthalmus spp. use their long gill rakers to filter and collect planktonic species on which they feed. Thus, if the adult females of *Prehendorastrus* spp. retain the predacious habit observed in free-living larval stages and adult males of ergasilids, they may exploit the concentration of potential prey on the gill rakers of their hosts.

Acknowledgements

The authors wish to thank Mr Paulo Petry for the identification of the fish hosts; Drs Delane C. Kritsky and Robert C. Anderson for the help in the collection of specimens of *Hypophthalmus fimbriatus*; and Dr Z. Kabata for the critical review of the manuscript.

References

Boeger, W.A. & Thatcher, V.E. (1988) *Rhinergasilus piranhus* gen. et. sp. n. (Copepoda, Poecilostomatoida, Ergasilidae) from the nasal cavities of the piranha cajú, *Serrasalmus nattereri* (Kner), in the Central Amazon. *Proceedings of the Helminthological Society of Washington*, **55**, 87–90.

Humason, G.L. (1979) *Animal tissue techniques*. New York: W.H. Freeman and Company, 661 pp.

Montú, M. (1980) Parasite copepods of southern Brazilian fishes. I. *Ergasilus euripedesi* n. sp. (Copepoda, Cyclopidea). *Iheringia, série Zoologia*, **56**, 53–62.

Smithe, F.B. (1975) *Naturalist's color guide and supplement*. New York: American Museum of Natural History, Colors 1–86 + 229 pp.

Thatcher, V.E. & Boeger, W.A. (1983) Patologia de peixes da Amazônia Brasileira. 3. Alterações histológicas das brânquias provocadas por *Ergasilus*, *Brasergasilus*, *Acusicola* (Copepoda, Cyclopidea). *Acta Amazônica*, **13**, 441–451.

Thatcher, V.E. & Boeger, W.A. (1984a) The parasitic crustaceans of fishes from the Brazilian Amazon. 13. *Gamidactylus jaraquensis* gen. and sp. n. (Cyclopoidea, Vaigamidae) from *Semaprochilodus insignis*. *Amazoniana*, **8**, 421–426.

Thatcher, V.E. & Boeger, W.A. (1984b) The parasitic crustaceans of fishes from the Brazilian Amazon. 14. *Gamispinus diabolicus* gen. et. sp. n. (Copepoda, Poecilostomatoida, Vaigamidae) from the nasal fossae of *Ageneiosus brevifilis* Val. *Amazoniana*, **8**, 505–510.