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THE NEOTROPICAL GENUS *POTAMOCARIS* DUSSART
(COPEPODA: HARPACTICOIDA: PARASTENOCARIDIDAE),
WITH DESCRIPTIONS OF TWO NEW SPECIES

Janet W. Reid

A B S T R A C T

The diagnosis of the South American parastenocaridid harpacticoid genus *Potamocaris* Dussart, 1979, is extended. "*Parastenocaris*" *dentata* Dussart, 1979, is synonymized with *Potamocaris bifida* Dussart, 1979; species included in the genus for the first time are *Parastenocaris bidens* Noodt, 1955, and *Parastenocaris bidentata* and *Parastenocaris tridentata* Dussart, 1981. Two new species, *Potamocaris cuiabaensis* and *P. estevesi*, are described from Brazil. Members of the genus appear to be confined to sand substrates in the drainage basins of the Rio Paraná and smaller coastal rivers in southern Brazil and northern Argentina.

Collection from Brazil of two previously undescribed species belonging to the parastenocaridid harpacticoid genus *Potamocaris* Dussart, 1979, led to extension of the genus diagnosis and inclusion of three previously described species. The new species are described below.

MATERIALS AND METHODS

Specimens were washed from samples of sand preserved in 5% buffered Formalin and stained with Rose Bengal, then transferred to 70% ethanol for long-term storage. For description, specimens were placed in 70% ethanol-10% glycerin which was allowed to evaporate to nearly pure glycerin, then examined in glycerin and lactic acid, and finally dissected and mounted in commercial polyvinyl lactophenol with chlorazol black E added.

Drawings were made at 400 \times , 600 \times , and 1,000 \times , the latter with oil immersion, using a Wild M50 microscope fitted with a camera lucida.

Parastenocarididae Chappuis, 1933

Potamocaris Dussart, 1979

Dussart (1979) proposed the genus *Potamocaris* for a female parastenocaridid collected from the Río Santa Fé, at Santa Fé, Argentina, and given the species appellation *P. bifida*. The original diagnosis of the genus is as follows (Dussart, 1979:12): "La ausencia de machos en la muestra estudiada impide establecer una diagnosis completa de este género. Sin embargo, será caracterizado por la ausencia del endopodito en la P3 de la hembra y P5 trapezoidal y terminado en dos espínulas que le dan el aspecto de una lengüeta bífida."

From the same sample as *P. bifida*, Dussart (1979) described a male parastenocaridid of similar habitus to *P. bifida*, which

he named "*Parastenocaris*" *dentata*. He stated (Dussart, 1979:10) that "'*P.*' *dentata* será considerada, seguramente algún día como tipo de un género o subgénero nuevo, si se juzga por la configuración de su P5, de su P4 y de su P1. Especie ciega, tiene apéndices extraordinariamente poco ornamentados, especialmente el endopodito de su P4 y su P3 que parece no tener os. La furca misma está muy simplificada. La estructura del endopodito de P1 le da su nombre."

Additional specimens of "*P.*" *dentata* and *Potamocaris bifida* and males of two new parastenocaridid species morphologically similar to *P. dentata* and named "*Parastenocaris*" *bidentata* and "*Parastenocaris*" *tridentata* were later described from the psammon of the Upper Paraná River, Argentina (Dussart, 1981). The latter two species differ from "*P.*" *dentata* in details of legs 1-5 and in that their anal opercula are not produced posteriorly. "*Parastenocaris*" *tridentata* is further distinguished by having short caudal rami, less than 2 times as long as broad, while the rami of "*P.*" *dentata* and "*P.*" *bidentata* are about 4.5 times and 3.5 times longer than broad, respectively. The female, *Potamocaris bifida*, and the three species described from males resemble each other in having cylindrical caudal rami, set wide apart at their bases and strongly divergent, with all caudal setae inserted terminally and subterminally. This form and armament of the caudal ramus is unusual in the Parastenocarididae.

Potamocaris bifida and the male called "*Parastenocaris*" *dentata* have been reported twice (Dussart, 1979, 1981) from the same sample or in apparently similar hab-

itats, in two different and mutually distant localities. Although Dussart was understandably reluctant to unite two sexes of such dimorphic animals, these repeated coincident finds are highly suggestive that a single species is involved. Additionally, these two forms resemble each other and differ from other known species of the group in having the anal operculum produced posteriorly past the posterior margin of the anal somite. Therefore, I consider that *Potamocaris bifida* represents the female, and "*Parastenocaris*" *dentata* the male of the species, with "*Parastenocaris*" *dentata* being a synonym of *Potamocaris bifida*.

Rouch (1988) called attention to the similarity between *Parastenocaris bidens* Noodt, 1955, known only from a single female, and *P. bifida*; *P. bidens* is also clearly a *Potamocaris*. The present collection includes two previously unknown species, *P. cuiabaensis* and *P. estevesi*, described below. The original genus diagnosis is extended as follows:

Potamocaris Dussart, 1979,
characters emended

Parastenocarididae with transverse dorsal hyaline windows on urosomites, no urosomite with more than 1 window. Caudal rami cylindrical and slightly expanded proximomedially, rami set wide apart and, at least in preserved specimens, strongly divergent. Total number of caudal setae 4–7, possibly variable between sexes and on each ramus of same individual. "Lateral" setae inserted at posterolateral corner of ramus, dorsal seta inserted near posteromedial corner of ramus, all caudal setae thus terminal or subterminal. Ramus lacking ornament except for setae. Anal operculum narrowly to broadly convex. Antenna with allobasis and exopodite of 1 article bearing 1 terminal seta.

Females.—Antennule of 7 articles, articles 4 and 7 each with esthetasc. Leg 1 endopodite article 1, medial margin with row of slender spines. Leg 2 endopodite uniaarticulate, with several appendages, longest appendage reaching to or past end of exopodite article 1. Leg 3 endopodite lacking. Leg 4 endopodite uniaarticulate, reaching midlength of leg 4 exopodite article 1, or shorter, with few appendages at or near tip. Leg 5 subquadrate, distomedial tip produced,

sclerotized, bifurcate; in one species (*P. bifida*) with 2 hairs on tip. Oblique outer distal margin of leg 5 with 1 or 2 pairs of setae, usual case probably being 2 pairs, noting that Noodt (1955) expressed doubt about the number of setae in *P. bidens*. Plates of legs 5 set close together at proximomedial corners.

Males.—Ventral margin of one or more urosomites expanded posteriorly over succeeding somite. Antennule of 8 articles, geniculate, article 5 not much expanded, articles 5 and 8 each with esthetasc. Leg 1 endopodite article 1 with 1–3 strong, curved spines and, sometimes, smaller accessory spines along medial border, lateral border with few small spines. Leg 2 endopodite uniaarticulate, cylindrical or expanded, reaching midlength of exopodite article 1 or shorter, with few simple appendages. Leg 3 endopodite reduced to small knoblike process on inner margin of basipodite, or to small spine, or entirely absent; leg 3 exopodite with well-developed, slender spiniform lateral "thumb." Leg 4 endopodite uniaarticulate or biarticulate, not reaching level of distal end of exopodite article 1, without appendages, irregularly formed, chitinous. Leg 5 long, subquadrate with more or less blunt tip, lateral margin with 2 setae, distal margin with or without laterally directed clawlike extension.

Type Species, by Monotypy.—*Potamocaris bifida* Dussart, 1979 (female); synonym "*Parastenocaris*" *dentata* Dussart, 1979 (male).

Composition.—The genus *Potamocaris* comprises six species: *P. bifida*; *P. bidens* (Noodt, 1955), known only from the female; *P. bidentata* and *P. tridentata* (Dussart, 1981), each known only from the male; *P. cuiabaensis*, new species, described from the female; and *P. estevesi*, new species, described from the male, below.

Relationships.—Dussart (1979) stated without elaboration that *P. bifida* showed affinities with several species of parastenocaridids described from Colombia by Noodt (1972). This observation apparently referred to the *columbiensis* group of *Parastenocaris*, defined by Noodt (1972). Members of this group resemble *Potamocaris* in possessing not more than one transverse

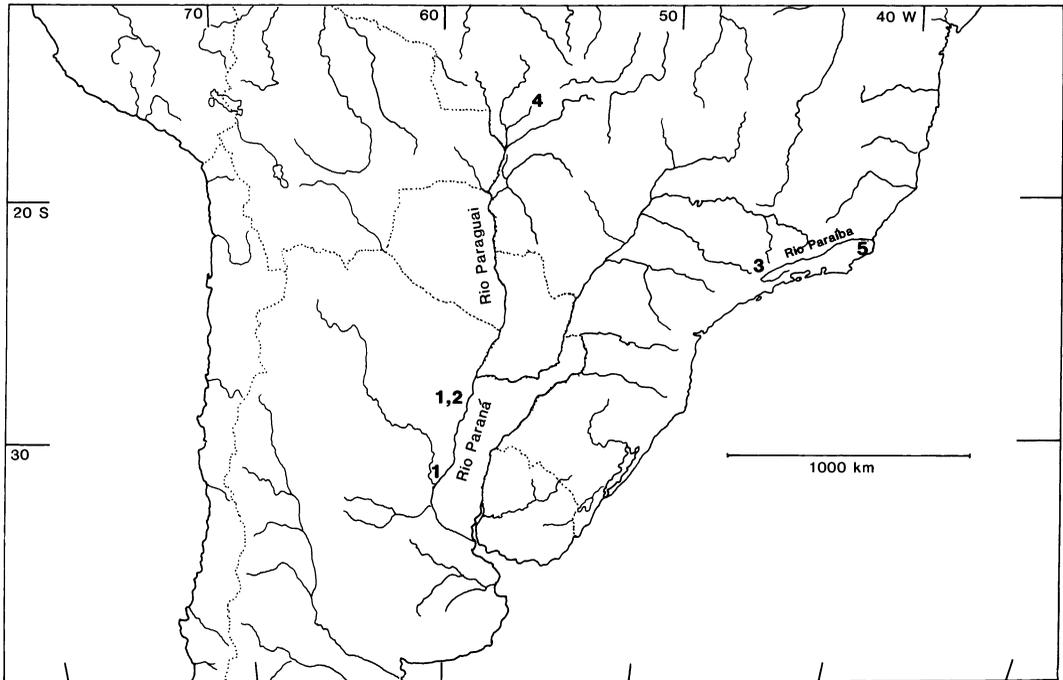


Fig. 1. Approximate collection sites of species of *Potamocaris* in northern Argentina and southern Brazil: 1, *bifida*; 2, *bidentata* and *tridentata*; 3, *bidens* (but see text); 4, *cuiabaensis*; 5, *estevesi*.

dorsal hyaline window on any urosomite, and in having the lateral caudal setae inserted far distally, although not quite at the posterolateral corner of the caudal ramus; in females, leg 3 lacks an endopodite, and leg 5 is subquadrate with 4 setae on the outer distal margin; in males, the leg 3 endopodite is much reduced or possibly lacking entirely, and the leg 4 endopodite is much contorted and sclerotized. Differences are that species of the *columbiensis* group show no sexual dimorphism in leg 1; leg 5 of the female ends in a simple acute inner distal tip; and leg 5 of the male resembles that of the female.

Distribution and Ecology.—Most species of *Potamocaris* have been collected from the drainage basin of the Rio Paraná in northern Argentina and southern Brazil (Fig. 1). The locality of *P. bidens* is somewhat in doubt, as Noodt (1955) named only the Rio Paraíba and the town of Caeté, not the state, and in Brazil there are at least three rivers with this name. However, Herbst (1959:53) gave a locality for a species of *Eucyclops* taken by the same collector, A. Remane, as “Caète” on the Rio Paraíba in the State of

São Paulo. Therefore, it seems most likely that the Rio Paraíba do Sul was meant by Noodt, although no town named Caeté appears along that river on local maps of the state (C. E. F. da Rocha, personal communication, 1990). Lagoa de Cima, site of collection of *P. estevesi*, is formed by a broadening of the Rio do Imbé, another coastal river directly south of Rio Paraíba do Sul in the State of Rio de Janeiro (Reid and Esteves, 1984). It is noteworthy that the genus, although tropical and subtropical in distribution, has never been collected from the Amazon basin where many river beaches have been prospected for interstitial fauna. Likewise, it was not found in recent surveys of wetlands in the central Brazilian cerrado region (Reid, in press a, b).

Available collection data indicate that the genus is strictly psammic in lotic and lentic habitats. *Potamocaris bidens* and *P. cuiabaensis* were collected from sandy beaches of rivers. *Potamocaris estevesi* was found in medium-coarse sand lake bottom sediments. *Potamocaris bifida* was first collected from riverine “sediments” of the Rio Santa Fé (Dussart, 1979), and later, along with *P. bidentata* and *P. tridentata*, as “psammic

fauna" from the Upper Paraná River in Argentina (Dussart, 1981).

Potamocaris cuiabaensis, new species

Figs. 2, 3

Potamocaris a.—Reid, in press a, b.

Material Examined.—Type: Adult ♀, dissected on 1 slide; from upper 2 cm of medium-coarse sand of beach of Rio Coxipó, within city limits of Cuiabá, State of Mato Grosso, Brazil, 15°35'S, 56°06'W, 26 July 1988, collected by J. Reid; Museu de Zoologia da Universidade de São Paulo (MZUSP) 10540.

Description.—Length 0.40 mm. Habitus (Fig. 2a) cylindrical, vermiform. Cephalothorax without discernible hyaline window; all urosomites except anal somite with dorsal transverse hyaline windows, window on urosomite 1 narrowest. Genital field not discernible. Anal somite (Fig. 2a, b) longer than preceding somite, without ornament except fine hairs bordering anal groove; anal operculum narrowly crescentic. Caudal ramus generally cylindrical, slightly produced medially at anterior one-third in oblique dorsal view, about 2.5 times longer than broad. Caudal ramus bearing total of 5 setae: 2 stout terminal setae, inner terminal seta stouter than outer terminal seta and about 3 times length of ramus; 1 slender inner subterminal seta; 1 dorsal seta, inserted at posteromedial corner of ramus, dorsally and anteriorly to inner subterminal seta; and 1 slender outer subterminal seta; all caudal setae naked.

Rostrum (Fig. 2c) small, subtriangular, appearing continuous with cephalothorax, with 2 subapical hairlike sensilla. Esthetascs of articles 4 and 7 of antennule (Fig. 2c) slender. Antenna (Fig. 2c) as described for genus. Remaining mouthparts not dissected, all reduced; maxilliped prehensile.

Leg 1 (Fig. 3a) with exopodite of 3 articles; endopodite of 2 articles, not prehensile, endopodite 1 with row of stiff hairs along medial margin and several small spines along lateral margin. Leg 2 (Fig. 3b, c) with exopodite of 3 articles, distomedial corner of each article with fringe. Leg 2 endopodite of 1 nearly cylindrical article, distal half slightly enlarged, reaching nearly midlength of exopodite 1, bearing 1 long acute terminal spine reaching distal end of exopodite 1, and 4 small terminal spines inserted on anterior side of base of long spine. Leg 3 (Fig. 3d) with exopodite of 2 articles, article

1 with spine and article 2 with fringe at distomedial corner. Leg 4 (Fig. 3e,f) with exopodite of 3 articles, distomedial corner of article 1 with no special structure, distomedial corners of articles 2 and 3 each with fringe. Leg 4 endopodite not reaching midlength of exopodite article 1, cylindrical with slight S-curve, ending in acute conical point, bearing 4 spines in subterminal transverse row. Couplers of legs 1, 2, and 4 small, naked; coxopodites of legs 3 closely appressed, coupler not visible.

Leg 5 (Fig. 3g) subtriangular with 2 crescentic expansions on outer distal margin, each expansion bearing 2 naked setae, 3 medial setae shorter than maximum breadth of leg, proximalmost seta about 3 times maximum breadth of leg; long distomedial extension of leg with bifid tip. Fifth legs separated by distance equal to one-third length of insertion of each leg.

Male.—Unknown.

Remarks.—Of the species for which females have been described, *P. bidens* differs from *P. cuiabaensis* in having longer caudal rami each with a total of 6 rather than 5 caudal setae, in having 1 tiny and 1 long slender hairlike terminal setae on the leg 2 endopodite, 2 terminal spines on the leg 4 endopodite, and 2 setae on the outer margin of leg 5. *Potamocaris bifida* differs in having the anal operculum produced posteriorly, the caudal ramus 3.5 times longer than broad (measured from Dussart, 1979: fig. 7), the leg 2 endopodite armed similarly to that of *P. bidens*, and more than one-third of the tip of the leg 4 endopodite extending past the ring of the tiny subterminal hairs. Species known only from males are compared together with *P. estevesi*.

Etymology.—Named for the city of Cuiabá.

Potamocaris estevesi, new species

Figs. 4, 5

Parastenocarididae sp., *Parastenocaris* sp. a.—Reid and Esteves, 1984:310, 314, 321, table 2.

Material Examined.—Holotype: adult ♂, dissected on 2 slides, MZUSP 10747; paratypes: adult ♂, alcohol-preserved, and CV copepodid, mounted whole on slide, National Museum of Natural History (USNM 250635). All from nearshore sand sediments of Lagoa de Cima, State of Rio de Janeiro, Brazil, 21°45'S, 41°30'W, 30 January 1983, collected by F. A. Esteves.

Description.—Length of holotype 0.320 mm, length of adult male paratype 0.340 mm.



Fig. 2. *Potamocaris cuiabaensis*, new species, type, adult female: a, habitus, dorsal; b, anal somite and caudal rami, dorsal; c, cephalothorax, antennule, and antenna, right lateral. Scale applies to Fig. 2a only.

Habitus (Fig. 4a) cylindrical, vermiform. Cephalothorax with dorsal ringlike hyaline window; all urosomites except anal somite with dorsal transverse hyaline windows, window on urosomite 3 broadest. Posterior ventral margin of urosomite 1 slightly lo-

bate; ventral surface of urosomite 2 enlarged, extending posteriorly over urosomite 3, with distinct ventrolateral lobe on each side, but with posterior ventral margin entire; ventral surface of urosomite 3 also somewhat expanded ventrally; dense glan-

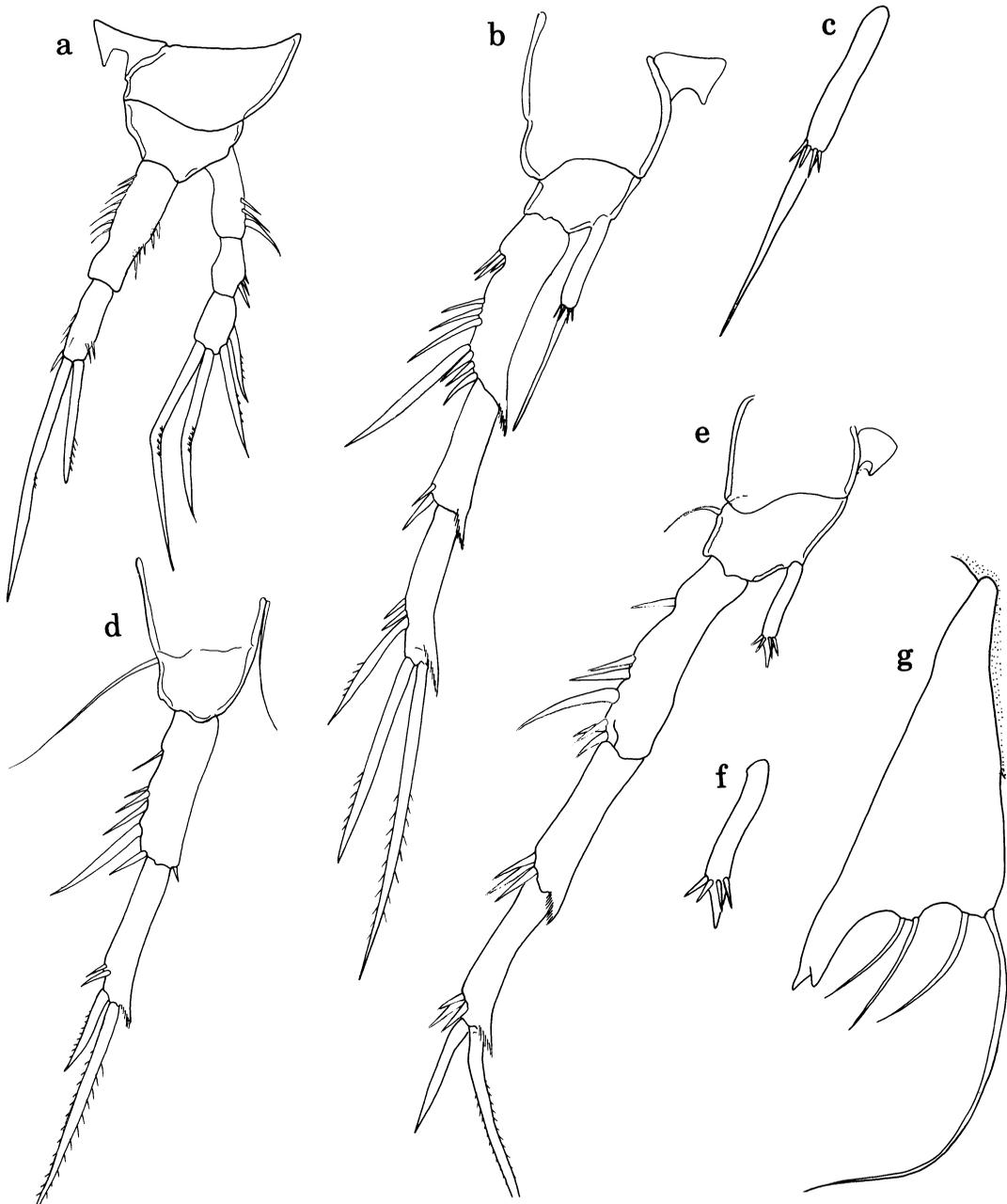


Fig. 3. *Potamocaris cuiabaensis*, new species, type, adult female: a, left leg 1 and coupler, anterior; b, right leg 2 and coupler, anterior; c, leg 2 endopodite, enlarged; d, right leg 3, anterior; e, right leg 4 and coupler, anterior; f, leg 4 endopodite, enlarged; g, left leg 5, lateral oblique.

dular tissue beneath ventral surface of urosomites 1–3. Anal somite (Fig. 4a–c) with row of slender spines on ventral surface medial to insertion of each caudal ramus, otherwise ornamented only with fine hairs bordering anal groove. Anal operculum

crescentic, not protruding beyond posterior margin of anal somite. Caudal ramus about 3 times longer than broad, approximately cylindrical with anterior one-third slightly produced medially. Caudal ramus with 7 terminal and subterminal setae: 2 slender

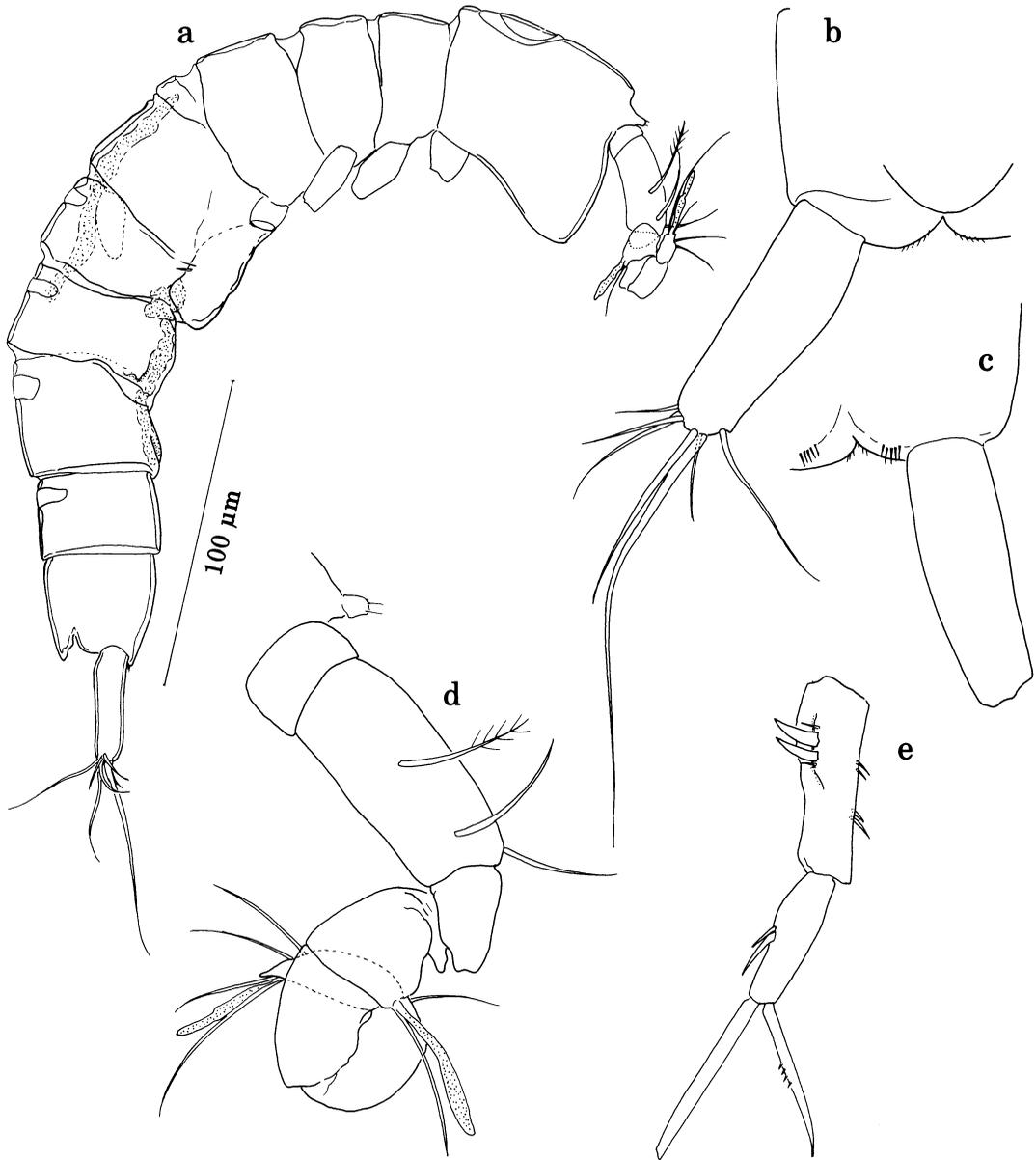


Fig. 4. *Potamocaris estevesi*, new species; a, adult male paratype, USNM 250635; b–d, adult male holotype, MZUSP 10747; a, habitus, right lateral; b, anal somite and caudal ramus, dorsal; c, caudal ramus, ventral; d, rostrum and right antennule, dorsal; e, left leg 1 endopodite, medial-oblique, longer terminal seta broken. Scale applies to Fig. 4a only.

terminal setae, inner terminal seta slightly stouter than outer terminal seta and about 2 times length of ramus, outer terminal seta about three-fourths length of ramus; 1 slender subterminal seta, slightly shorter than breadth of ramus and inserted ventral to insertion of inner terminal seta; group of 3 “lateral” setae inserted at distolateral corner

of ramus; and 1 dorsal seta inserted at distomedial corner of ramus, slightly dorsal and proximal to level of insertion of terminal and lateral setae; all caudal setae naked.

Rostrum (Fig. 4a, d) small, rectangular, appearing continuous with cephalothorax, with 2 hairlike sensilla at distal corners. Es-

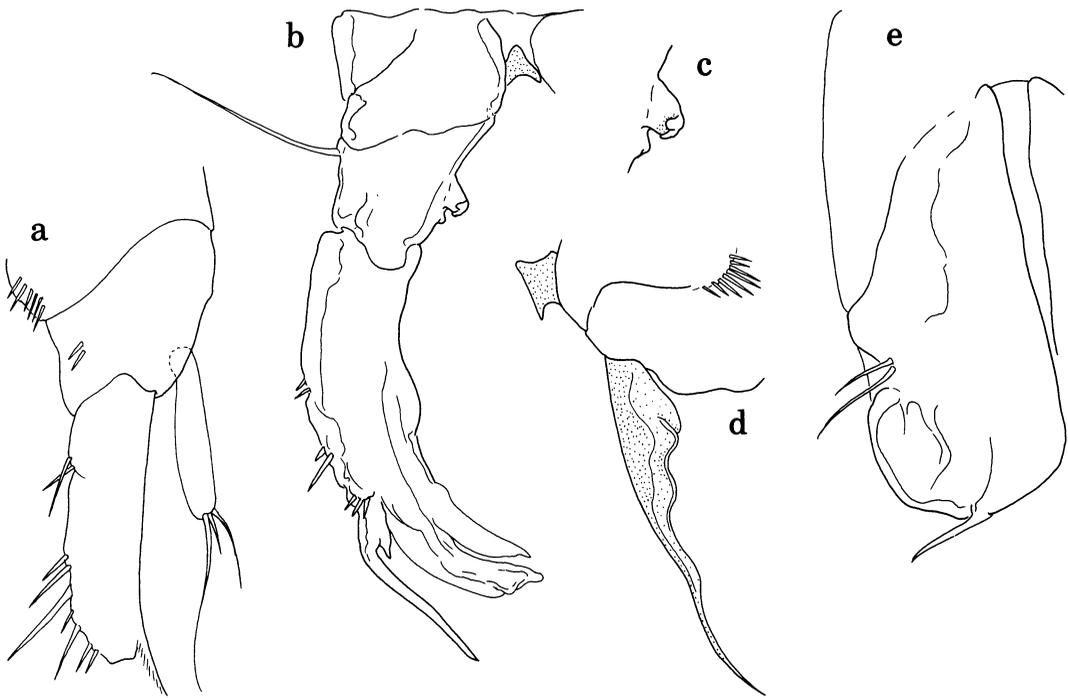


Fig. 5. *Potamocaris estevesi*, new species, adult male holotype, MZUSP 10747: a, right leg 2 basipodite, exopodite article 1 and endopodite, anterior oblique; b, right leg 3 and coupler, anterior; c, right leg 3 endopodite, anterior, enlarged; d, left leg 4 coupler, part of basipodite, and endopodite, anterior; e, right leg 5, anterior.

thetasc of articles 5 and 8 of antennule (Fig. 4d) slender, esthetasc of article 8 constricted near midlength. Antenna (not illustrated) as described for genus. Remaining mouthparts not dissected, all reduced; maxilliped slender, prehensile.

Leg 1 (Fig. 4e) with exopodite of 3 articles, similar to that of *Potamocaris cuiabaensis*; endopodite of 2 articles, endopodite 1 with 2 large spines and 2 stiff hairs in groove along inner margin, outer margin with 2 pairs of small spines. Leg 2 (Fig. 5a) with exopodite of 3 articles, similar to that of *P. cuiabaensis*; endopodite of 1 approximately cylindrical article, distal half enlarged, reaching nearly midlength of exopodite article 1, with 3 terminal setae, longest seta longer than endopodite and with fine hair-like tip. Leg 3 (Fig. 5b, c) modified as clasping organ; endopodite reduced to knoblike expansion incompletely separated from inner surface of basipodite, this expansion with bifurcate tip curved anteriorly; outer margin of exopodite 1 with 3 groups of small spines; exopodite 2 appearing continuous with exopodite 1, hyaline; inner hyaline

process nearly as long as exopodite 2, acuminate; outer thumb with short toothlike inner process near base, outer process long, stiff, slender. Leg 4 (Fig. 5d) with exopodite of 3 articles, similar to that of *P. cuiabaensis* except inner distal corners of all articles with fringe; endopodite not reaching end of exopodite article 1, modified as single irregularly sclerotized, lanceolate article.

Leg 5 (Figs. 4a, 5e) subquadrate, partly sclerotized, with 2 setae on lateral margin and 1 laterally directed spiniform process on distal margin.

Female. — Unknown.

Remarks. — The males of three congeners have been described previously. *Potamocaris bifida* (= *P. dentata*) has the anal operculum produced beyond the posterior margin of the anal somite, 1 spine on the inner margin of the leg 1 endopodite 1, and 2 terminal setae on the leg 2 endopodite. Dussart's (1979: fig. 6) initial figure of leg 3 of *P. bifida* shows no trace of an endopodite, in agreement with his text. Dussart's later modification of this figure (Dussart, 1981:

fig. 1A) shows a small acute process. The accompanying text for leg 3 (Dussart, 1981: 1, translated) describes "a biarticulate endopodite and not unarticulate as figured in my note of 1979," which actually refers to leg 4 (Dussart, personal communication, 1990). The distomedial hyaline process of the leg 3 exopodite 1 is slender and acute. Leg 5 is shown by Dussart (1981) as more slender than that of *P. estevesi*, with the distal spiniform process proceeding from the inner distal corner rather than from the middle of the distal margin as in *P. estevesi*, and with 2 lateral setae. *Parastenocaris tridentata* has short caudal rami, less than 2 times longer than broad, with only 4 setae; leg 1 endopodite 1 has 3 spines on the inner margin; the endopodite of leg 2 was not described; leg 3 is very short, the endopodite apparently consisting of a small featureless knob; the endopodite of leg 4 is broad, with 2 terminal crossed spiniform processes; and leg 5 is without a distal spiniform process. *Parastenocaris bidentata*, like *P. estevesi*, has 2 stout spines on the medial surface of the leg 1 endopodite, but differs in having the leg 2 endopodite short, expanded, and bearing 2 setae; leg 3, as far as can be discerned from Dussart's figure (1981: fig. 1B), has the endopodite represented by a short hair, and the hyaline exopodite 2 and medial process of exopodite 1 deeply fringed; leg 4 endopodite with a large lobe at midlength; and leg 5 without a distal spiniform process.

Members of the Parastenocarididae display differing degrees of sexual dimorphism in the structure of the caudal ramus and the ornamentation of somites, as well as consistent extreme dimorphism in the structure and armament of legs 1–5. Therefore, *P. bidens* and *P. cuiabaensis* eventually may be found to correspond to one of the species now described only from the male. If the assumption that *P. dentata* is the male of *P. bifida* is correct, then the number of caudal setae may vary between sexes and also between populations, since Dussart (1979: fig. 7) showed *P. bifida* with 5 setae on each ramus, while showing the male (as *P. dentata*) with 6 setae on one ramus and 7 on the other (1979: fig. 6), and the male with 5 setae on each ramus in the subsequent description (Dussart, 1981: fig. 1A). However, the number of setae is the same on all three specimens of *P. estevesi*, and neither

in this species nor in *P. cuiabaensis* does the number of setae differ between caudal rami in a single specimen. It is unlikely that *P. estevesi* is the same species as *P. bifida*, since the operculum of the former is not produced, and the number of caudal setae differs in the two species. Likewise, although the anal opercula of *P. estevesi* and *P. bidens* are similar, *P. bidens* lacks a small caudal seta ventral to the 2 terminal setae, and also lacks the 2 rows of small spines on the anal somite which are present in *P. estevesi*. In *P. cuiabaensis* the number of caudal setae is 5, this species apparently lacking 2 of the normal 3 lateral caudal setae; *P. cuiabaensis* also lacks the 2 rows of anal somite spines present in *P. estevesi*, and the caudal ramus of *P. cuiabaensis* is slightly shorter than that of *P. estevesi*.

Etymology.—Named for the collector, Francisco de Assis Esteves.

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ANNOUNCEMENT

The Ray Society has announced the imminent publication of "Copepod Evolution" by Rony Huys and Geoffrey Boxshall. This volume, publication no. 159, examines the evolutionary pathways that generated the amazing diversity of these crustaceans. It contains: an introduction to the diversity of copepods, their importance, their fossil record, and their basic structure; order by order accounts of biology and morphological diversity; an analysis of the main evolutionary trends throughout the Copepoda; a review of existing classifications and phylogenies, and a new analysis of copepod evolution based on data in this volume. It also contains a full bibliography, a glossary of morphological terms, an outline of the methods of examining copepods, a list of material examined, and a taxonomic and biological index.

The book, in hardback, will be about 440 pages in length, profusely illustrated with more than 220 plates of finest quality line drawings and 43 halftone plates of electron microscope photographs.

The retail price will be £ 40.

Those interested should write for further information to:

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