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Mixohaline Environment, Southern Brazil*

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CYTHERURA PURPERAE ORNELLAS ET FALLAVENA, sp. nov., A LIVING OSTRACODA FROM MIXOHALINE ENVIRONMENT, SOUTHERN BRAZIL

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Sinopse

No presente trabalho é descrita uma nova espécie de ambiente mixohalino (polihalino e mesohalino) da família Cytheruridae, *Cytherura purperae* Ornellas et Fallavena, sp. nov. que ocorre na areia lodosa da margem do canal que liga a Lagoa de Tramandaí ao mar.

Abstract

A new species of brackishwater ostracoda is described: *Cytherura purperae* Ornellas et Fallavena of the family Cytheruridae from the muddy sand marginal area of the canal linking the Tramandaí Lagoon to the sea.

Introduction

Part of the general research of the Departamento de Paleontologia e Estratigrafia, Universidade Federal do Rio Grande do Sul, is the study of the living ostracodes of Rio Grande do Sul State, in Southern Brazil. As a partial result of this study a new mixohaline ostracode *Cytherura purperae* is described, with paleontological and ecological purposes.

The recent mixohaline ostracodes which are being studied here, occur in southeast coastal area of South America, called the coastal plain. The data about this area and the geographical position of the collecting localities from which the types ostracodes were found (T10, T11 and T12), were described by the senior author in previous work (Ornellas, 1974). A detailed description about the coastal region geology and physiography can be found in the complete study made by Delaney (1965).

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Ecological Data of Type Area

The collections of these ostracodes by the author in the Tramandaí area lagoons had as a primary finality a systematic study because without this knowledge it would be practically impossible to make any accurate ecological study.

The type locality is T12, situated on the left bank of the canal which joins the lagoons with the sea. The ostracodes were collected with a planktonic net dragged on the bottom beside the bridge between the city of Tramandaí and Imbé beach. The water was shallow (about 40cm in depth) and the bottom was constituted of muddy sand rich in organic remains where can be found a large number of crustaceans dead and alive. The temperature varied between 15°C to 25°C. Registered salinity on various occasions, was between 6,1‰ to 28,47‰.

Species registered in this local were *Minicythere heinii* Ornellas, 1974; *Perissocytheridea kroemmelbeini* Pinto et Ornellas, 1970; *Cyprideis multidentata* Hartmann, 1955[†] and *Cytherura purperae* Ornellas et Fallavena, sp. nov.

In samples closer to the ocean (localities T10 and T11) the same species of the ostracodes of T12 were encountered even next to the bar. In this local carapaces of marine species (*Cytheretta*) also appeared in association.

† According Sandberg and Plusquellec, 1974, *Cyprideis riograndensis* Pinto et Ornellas, 1965 is synonymous of *C. multidentata* Hartmann, 1955.

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SYSTEMATIC DESCRIPTION *

PHYLUM ARTHROPODA
CLASSIS CRUSTACEA
SUB-CLASSIS OSTRACODA
ORDO PODOCOPIDA
SUB-ORDO PODOCOPINA
SUPER-FAMILIA Cytheracea Baird, 1850
FAMILIA Cytheruridae G.W. Müller, 1894
SUB-FAMILIA Cytherurinae G.W. Müller, 1894

Genus *Cytherura* Sars, 1865

Generic Diagnosis - Carapace small, bilamellar, anterior margin broadly rounded but pointed in dorsal view, widening backward strongly, posterior margin usually with subdorsal caudal process; RV overhanging LV along dorsal margin; ornament variable, irregularly ribbed, reticulate, or punctate; eyes present in living forms; eye tubercles very feeble if developed; males commonly more inflated in dorsal view than females (owing to the bulky copulative organs). Adductor muscle scars in vertical row of 4, with another scar in front of most

dorsal and 2 irregular scars in front of this one; 2 elongated mandibular scars at antero-ventral angle; anterior and posterior parts of zone of concrescence extremely broad, internal margin and line of concrescence mostly coincident; radial pore canals few, unbranched, long, thin; normal pore canals open; RV hinge with 2 terminal smooth or weakly notched teeth, united by furrow that widens terminally, where it also becomes deeper. Larval forms slightly different, large instars having lower caudal process. Sexual dimorphism relatively strong.

Type-Species: *Cythere gibba* O.F. Müller, 1785.

*The Suprageneric classification and the generic diagnosis used in this report is that proposed in the Treatise of Invertebrate Paleontology, Part Q-Moore, 1961.

The type-specimens of the new species are being deposited in the collections of the Museu de Paleontologia da U.F.R.G.S., under the number MP-0-594 to MP-0-600.

Cytherura purperae Ornellas et Fallavena, sp. nov.

Pl. I-VI

Derivatio nominis: In honor of our friend Dr. Ivone Purper, Professor at the Departamento de Paleontologia e Estratigrafia da Universidade Federal do Rio Grande do Sul.

Holotypus: Female MP, U.F.R.G.S., n^o MP-0-594.

Paratypi: Adults and instars MP, U.F.R.G.S., (males and females) MP, U.F.R.G.S., n^o MP-0-595 to MP-0-600.

Locus typicus: Muddy sand margin of the canal that links the Tramandai Lagoon to the sea in the State of Rio Grande do Sul, Brazil.

Diagnosis:

Carapace subquadrangular to subovate in lateral view; dorsal margin straight; very conspi-

cuous cardinal angles.

Caudal process blunt and central in the females.

Surface irregularly reticulated, except ventrally, where it has a linear and horizontal arrangement.

Antennulae with four setae in the fourth article. Second antennal article with two setae in the female and three setae in the male. Third antennal article presents three setae, and the last one with a slender seta between the two terminal claws. The mandibular branchial plate is formed by a single long seta. The first article of the maxilar palp presents five distal setae and the second one has a ventral seta abruptly slender at the middle. Branchial plate with eighteen setae. Brush-shaped organ with two semi-distal internal setae and a internal distal row of hairs. The dorsal portion of the copulative appendage is evenly semicircular and the antero-distal end presents an almost fusiforme downward projection.

DESCRIPTION

The female carapace (Pl. I, fig. 1-3; Pl. II, fig. 5,6.)

Carapace subquadrangular in lateral view. Dorsal border straight in both valves; the anterior margin broadly rounded forming with the dorsal margin an anterior cardinal angle; posterior margin drawn out into a caudal process, situated almost centrally. Ventral margin with a slight sinuosity in the mid-length, that is obscured by an angular alar process in the posterior region.

The greatest height is slightly longer than a half of the length, coincident with the posterior cardinal angle.

The valves present one vertical median depression on the dorsal median portion and the surface is irregularly reticulated, except in the ventral region where it presents a linear horizontal arrangement.

In dorsal view, carapace ovate. Anterior portion ends in a rounded angle. The greatest width of carapace is situated in the posterior third, tapering to form the posterior extremity, that ends in an acute angle. Left valve slightly larger than right. The female carapace is smaller than the male.

Internally (Pl. II, fig. 5,6)

Hinge of the right valve consists of terminal elevated, elongated smooth teeth, separated by a long smooth groove. Hinge of the left valve consists of terminal elongated sockets, separated by a medium bar, where the two distal ends are slightly enlarged. The duplicature is distinct and narrow. The line of concrescence coincident with the internal margin, except in the anterior and posterior ends, where there are a small vestibulum. Selvage parallel and situated at a short distance of the outer margin. The porecanals are single, few in number, almost straight and normally assembled in groups of two in the anterior end, leaving a free space between the groups. Posteriorly only about three porecanals are present, being the longest ones. Muscle scars in vertical row of four adductors; the frontal scar is split into a larger elongate posterior part and a smaller rounded anterior one.

The male carapace (Pl. I, fig. 4-6; Pl. II, fig. 7,8) - The male carapace differs from the female by the following characteristics: It is longer and subovate in lateral view. The cardinal angles and the alar process are less developed. In dorsal view, the male carapace is sagittate in shape.

Internally (Pl. II, fig. 7,8) - It presents a wider duplicature; porecanals of the antero-ventral region two or three branched. It presents at the posterior portion a great and rounded marked area indicating the copulatory organ situation.

The Instars Carapace (Pl. I, fig. 7-12) - Seen laterally the carapace is triangular in shape. The highest part being about one-third from the anterior margin. Posteriorly, it ends in an acuter angle. The surface reticulation is very delicate. The size of the specimens in the first, second, third, fourth and fifth stage are respectively 0,163mm; 0,203mm; 0,233mm; 0,300mm and 0,358mm.

SOFT PARTS OF THE FEMALE

Antennulae (Pl. III, fig. 1) - The antennulae are hexa-articulated with longer rather than wider articles. The basal article is the strongest one. The second article is the longest one, with a long, slender and haired centro-ventral seta, two-and-a-half times the size of the third article. It also presents a proximal tuft of long and silky hairs, and a row of short hairs in the distal third of the dorsal region. Third article is approximately a half of the an-

terior one. It presents a hairy seta as long as one and three-fourth times the length of the next article. It also presents a dorsal row of short hairs. Fourth article with three distal setae. The central smooth and ventral haired ones are slightly than two times the length of this article. The dorsal smooth seta is as long as the fifth article. Fifth article is slightly longer than the anterior one and presents three distal and smooth setae: the dorsal one is the shortest; the central and the ventral ones are one-and-a-half times the length of the last article. It also presents a row of short hairs in the last third of the dorso-distal region. Sixth article with four smooth setae: the longest one is slightly shorter than two times the size of the fourth article; the shortest one is as long as the last article and the other ones are slightly longer than the same article.

Antennae (P1. III, fig. 2) - The antennae are pentarticulated, with longer rather than wider articles. The first article is the strongest and longest one. At the junction of the basal article with the second one there is a very long natatory seta with a single division. This seta does not attain the distal claws of the last article. The second article is shorter than a half of the first article. It presents two ventro-distal haired setae with different size: the shortest one is as long as a half of the next article, and the longer one is slightly shorter than the second article. Third article with a ventral row of short hairs in the distal half and three ventro-distal smooth setae. The shortest one is slightly shorter than a half of the third article. The club-shaped and the third ones are as long as a half of the fourth article. Fourth article with a ventro-distal haired seta slightly longer than the last article. About the middle of the dorsal side there is a thin seta as long as two times the last article. It also presents in the distal quarter a ventral row of short hairs. The last article is the shortest one and presents two strong distal claws: the shortest one is as long as the shortest setae of the second article; the longest one is about two times the length of this last article. It also presents a central seta among the claws, with the same size of the distal ventral seta of the fourth article.

Mandibles (P1. III, fig. 3,4) - The mandible presents the protopodito narrowing toward the distal end, where it has three horizontal and parallel row of teeth, and ending by an anterior and posterior

blunt angle. In the first dorso-distal third there is a seta ending truncately, having a ventro-distal tuft of short hairs and a dorso-distal spine. The mandibular palp is tetra-articulated, with longer rather than wider articles, and presents inconspicuous articulation between the first and second article. The basal article with a ventro-distal smooth seta slightly longer than the next article. This article also presents the mandibular plate, with one proximal plumous and very long seta. The second article is the longest one with four distal setae of different size: the ventral one is as long as two times the length of the third article and presents almost at the mid-length a tuft of long and thin hairs. The second one is about four times the length of the last article, the more central one is two times the length of the third article. The dorsal and shortest one is slightly longer than two-and-a-half the length of the last article. Third article has three ventro-distal and smooth setae of different size. The central one is almost straight, as long as the last article and his distal claws. The shortest ventral seta is slightly shorter than a half of the central one. The longer ventral seta is two-and-a-half times the length of the last article. It also presents four smooth dorso-mid-length setae: one shortest, two with two-and-a-half times of the length of this article and a middle size one with about a half of the longest one. The fourth article is the shortest one. It presents four distal claws: the central one is the shortest and has the same size of the shortest dorsal seta of the third article, and the other three about two times this last article.

Maxillae (P1. IV, fig. 4) - The maxillae have three narrow and long masticatory lobes each one with a several setae at the free end. The palp with two articles. The basal one presents five dorsal setae of different size: the longest smooth ventral one is about two-and-a-half times the size of the second article; the shortest central seta is as long as one-and-a-half times the second article and the longest central one is two times the length of the same article. The other two ones with the same size, being one of them furnished with short hairs, they are two-and-a-half times the length of the second article. The second article with three distal claws. The dorsal one is the shortest, the central one is almost one-and-a-half times the length of the anterior seta; the longest and ventral one makes abruptly slender almost at the mid-length. This

article also presents at the ventral mid-length a smooth seta with two times the length of this article. The branchial plate presents eighteen long thin and plumose setae.

First thoracic legs (P1. IV, fig. 3) - The first thoracic legs are tetra-articulated and the smallest ones. The basal article is the strongest and the longest one. It presents three dorsal setae: one proximal haired and annulated, a half shorter than this article; and two distal haired setae: the longer one is one-and-a-half times as long as the shortest one. It also presents a ventral haired and annulated seta slightly shorter than a half the length of this article. The second article is slender and smaller than the basal one. It presents at the distal half a row of short hairs and a haired seta as long as two-third the next article. The third and fourth articles present a dorsal row of short hairs. The last article also has a distal slightly curved claw, as long as one-and-a-half this article, and with a constriction at the mid-length.

Second thoracic legs (P1. IV, fig. 2) - The second thoracic legs are tetra-articulated. The basal article has three dorsal setae: the proximal haired and annulated one is two-third the length of the next article; the second haired and annulated seta, attached about the mid-length, is as long as the proximal one; and the shortest haired one is at the distal end. The second article is slender and slightly shorter than two times the third article. It has a dorso-distal haired seta one-third shorter than the third article. The second, third and fourth articles present a dorsal row of short hairs. The last article has a slightly curved claw almost as long as the second article, with a constriction at the mid-length.

Third thoracic legs (P1. IV, fig. 1) - The third thoracic legs are tetra-articulated. The basal article is the strongest one. It presents a bristle at the dorsal mid-length and a short dorso-distal haired seta, slightly longer than one-quarter of this article. The second article with a dorsal row of short hairs and a dorso-distal haired seta, as long as two-third the length of the next article. The third and fourth articles present a dorsal row of short hairs. The last article also presents a long and slightly curved claw, two-third the length of the second article, with a constriction at the mid-length and furnished with short hairs in the distal end of the dorsal side.

Caudal rami (P1. III, fig. 5) - The two genital lobes are very simple, ending by a upturned triangular prominence garnished with short hairs.

SOFT PARTS OF THE MALE: The soft parts of the male present the same general characteristics ascribed to the female.

Antennulae (P1. V, fig. 1) - It differs from the female by having the three dorso-distal setae of the fourth article smooth.

Antennae (P1. V, fig. 2) - The antennae differ from that of the female in having three distal setae in the second article: the central smooth one is as long as two-third the length of the next article; the dorsal smooth one is as long as three-quarter of the second article and the ventral haired seta is the shortest one. They also differ from the female by having the three distal of the third article longer than that of the female. The ventro-distal seta of the fourth article is smooth and as long as two times the length of the last article. The claws of the last article are thinner and longer than that of the female.

Mandibles (P1. V, fig. 4) - The mandibles have the same characteristics as described to the female, but differ from it by having a ventro-distal haired seta in the basal article of the mandibular palp. They also differ by having the longest seta of the second article haired in the ventro-distal last half.

First thoracic legs (P1. VI, fig. 4) - They differ from the female because the dorsal seta of the second article is smooth and longer. The distal claw of the last article is stronger.

Second thoracic legs (P1. VI, fig. 3) - They differ from the second thoracic legs of the female by having the dorso-distal seta of the second article longer, and the distal claws of the last article stronger and longer, with the constriction at the first proximal third.

Third thoracic legs (P1. VI, fig. 2) - They differ from the female because the basal article is wider and stronger and the dorso-distal haired seta of the same article is longer. They also present the dorso-distal seta of the second article one-third shorter. The distal claw of the last article is stronger.

Brush-shaped organ (P1. V, fig. 5) - It is a small

appendage placed between the first pair of thoracic legs. In *Cytherura purperae*, this appendage is very delicate and presents two cylindrical and slender branches each one with two long external semidistal setae and a internal row of thin and very long hairs at the distal third.

Copulative Appendage (Pl. VI, fig. 1) - Each hemipenis presents a chitinized strong and evenly semicircular dorsal portion. At the basal part it presents: an external ventro-median spiral and chitinous ejaculatory ductus, and two irregular antero-ventral downward projection. The antero-distal end presents a strong almost fusiform and downward projection. On the posterior portion of the body between the two basal parts of hemipenis there is a triangular and hairy protuberance.

Dimensions:

Holotype - A female carapace, M.P., U.F.R.G.S., n^o MP-0-594; length: right valve 0,390 mm, left valve 0,392mm.

Paratypes - A male carapace, M.P., U.F.R.G.S., n^o MP-0-595; length: right valve 0,421mm, left valve 0,424mm. Juvenile forms from 0,163mm to 0,358mm, n^o MP-0-596 to MP-0-600.

Remarks - The carapace of the present species presents the same general characteristics ascribed to the carapace of the genus *Cytherura* Sars, 1865. The carapace more closely related to the present species is that of *Cytherura wardensis* Howe and Brown, 1935, from the Miocene of Florida; but *C. purperae* Ornellas et Fallavena n. sp. differs from it by the following characteristics:

Outline more quadrangular in shape, dorsal margin elongate, with more neat cardinal angles. Surface with irregular reticulation, without striae. The caudal process more centrally situated forming a triangular posterior region. The alar process is more angular in the postero-ventral region and by this the ventral outline became more sinuous. Median element of the hinge is longer and the inner lamella narrower. Comparing with the soft parts of other species of the genus *Cytherura* the structure of *C. purperae* appendages presents differences from all of them.

Occurrence:

At locality T12 in a muddy sand margin at the beginning of the canal that links the Tramandai Lagoon to the sea, just below the bridge, on the Imbé side.

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PLATE I

Cytherura purperae Ornellas et Fallavena, sp. nov.

Female. Holotype M. P. UFRGS, n.º MP-0-594.

- Fig. 1 — Left valve of the female - lateral view.
- Fig. 2 — Right valve of the female - lateral view.
- Fig. 3 — Female carapace - dorsal view.

Male. Paratype M.P. UFRGS, n.º MP-0-595.

- Fig. 4 — Left valve of the male - lateral view.
- Fig. 5 — Right valve of the male - lateral view.
- Fig. 6 — Male carapace - dorsal view.

Juvenile instars. Paratypes M.P. UFRGS, n.º MP-0-596 to MP-0-600.

- Fig. 7 — Fifth instar - dorsal view - Paratype M.P. UFRGS, n.º MP-0-600.
- Fig. 8 — Fourth instar - dorsal view - Paratype M.P. UFRGS, n.º MP-0-599.
- Fig. 9 — Fourth instar - lateral view - Paratype M. P. UFRGS, n.º MP-0-599.
- Fig. 10 — Third instar - dorsal view - Paratype M. P. UFRGS, n.º MP-0-598.
- Fig. 11 — Second instar - dorsal view - Paratype M. P., UFRGS, n.º MP-0-597.
- Fig. 12 — First instar - dorsal view - Paratype M. P. UFRGS, n.º MP-0-596.

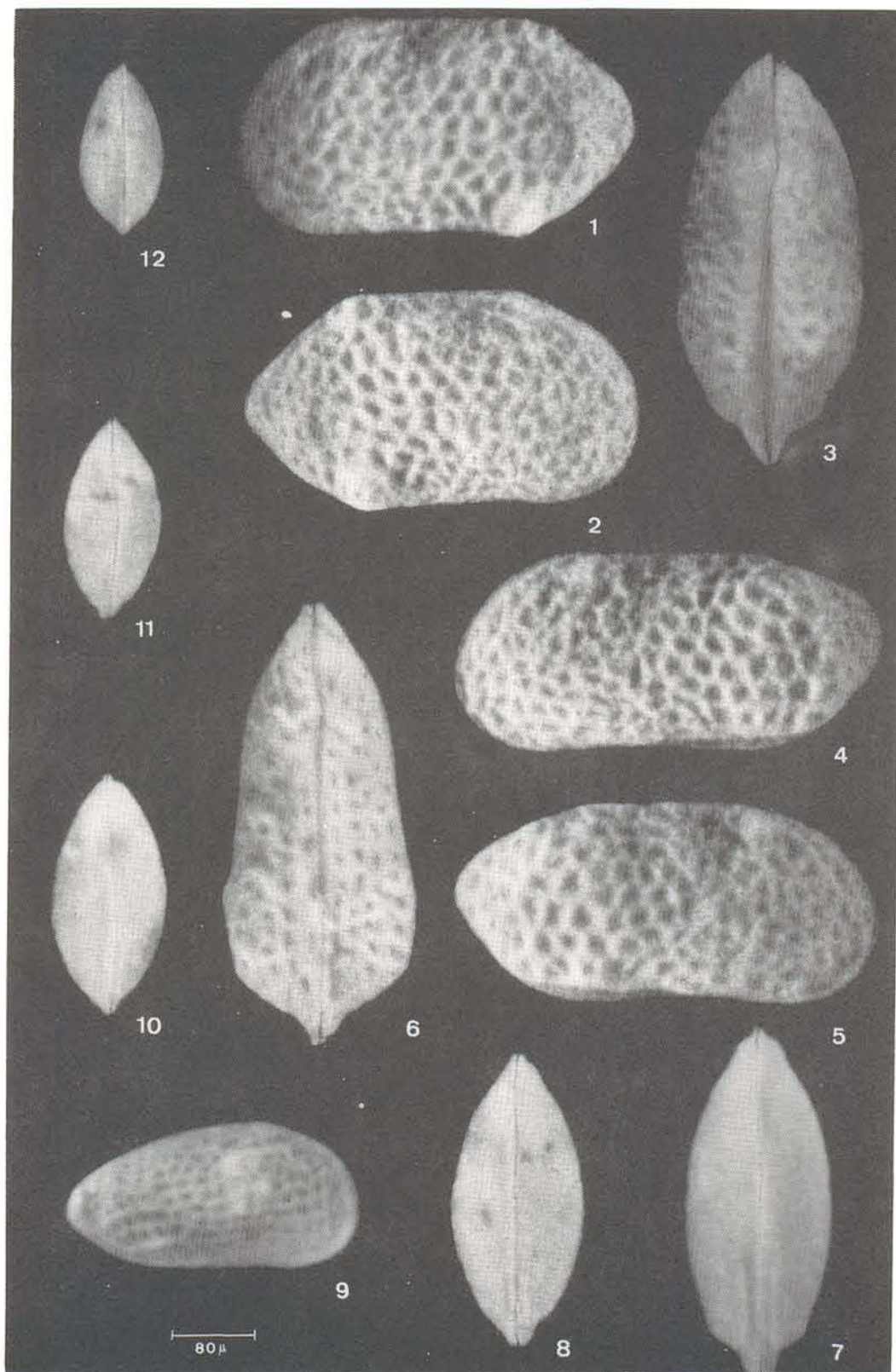


PLATE II

Cytherura purperae Ornellas et Fallavena, sp.nov.

Female. Holotype M.P., UFRGS, n.º MP-0-594.

- Fig. 1 – Detail of the left antennula.
- Fig. 2 – Detail of the left antenna.
- Fig. 3 – Detail of the left mandibular palp.
- Fig. 4 – Detail of the left maxilar palp.
- Fig. 5 – Left valve - Internal view.
- Fig. 6 – Right valve - Internal view.

Male. Paratype M.P., UFRGS, n.º MP-0-595.

- Fig. 7 – Left valve - Internal view.
- Fig. 8 – Right valve - Internal view.

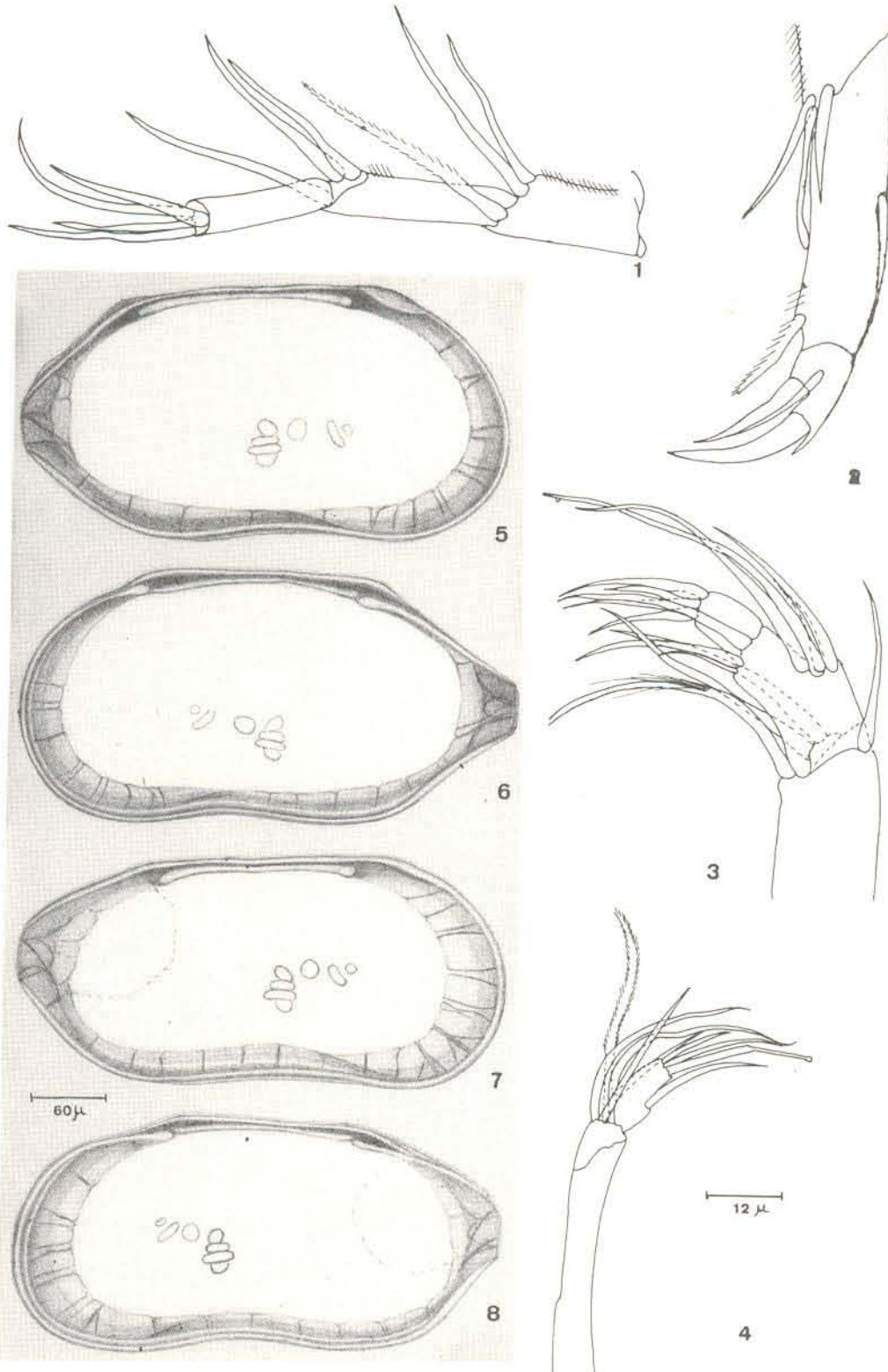


PLATE III

Cytherura purperae Ornellas et Fallavena, sp. nov.

Female. Holotype M. P., UFRGS, n.º MP-0-594.

- Fig. 1 – Left antennula.
- Fig. 2 – Left antenna.
- Fig. 3 – Detail of the mandible.
- Fig. 4 – Left mandible.
- Fig. 5 – Caudal rami.

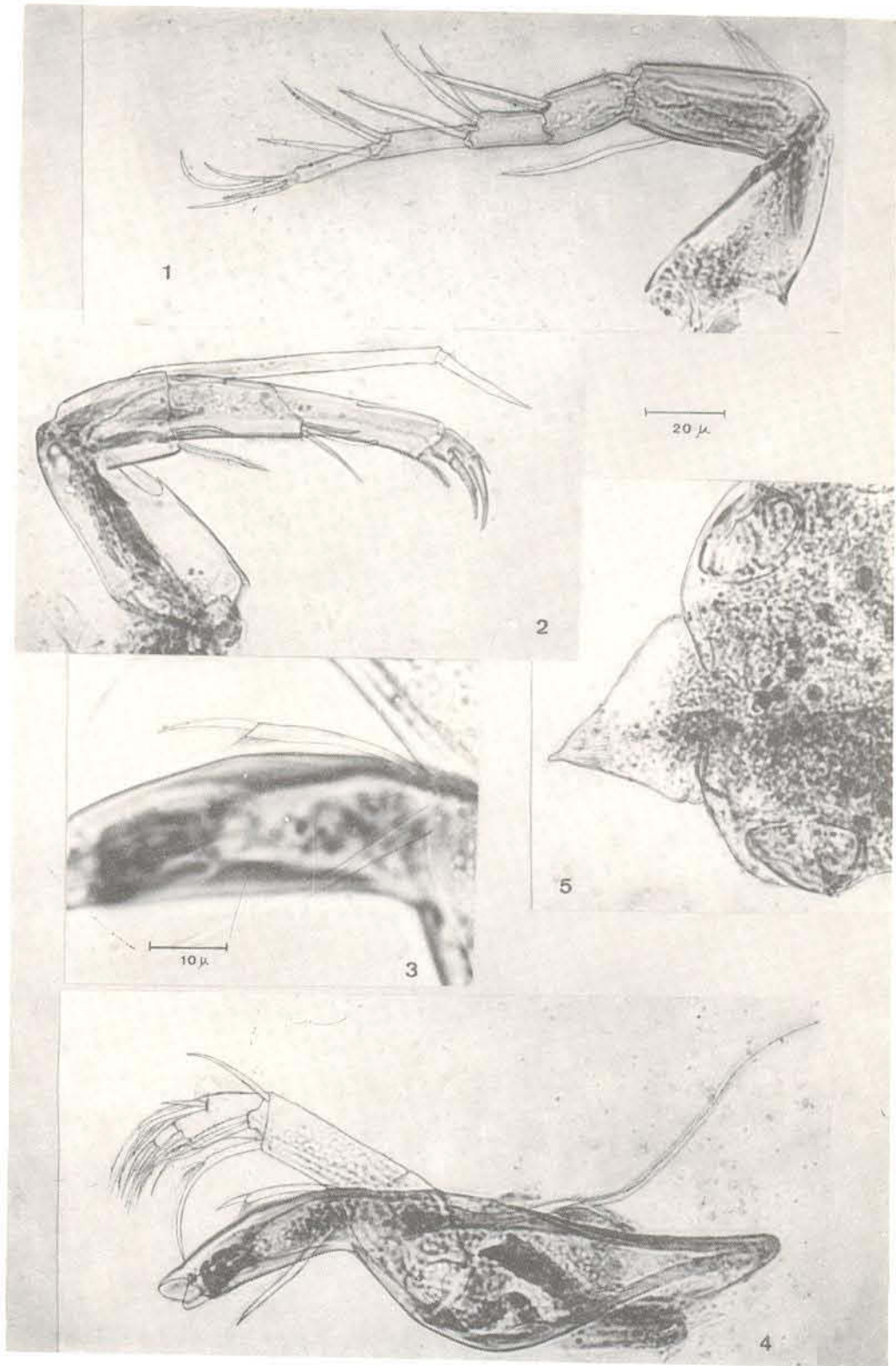


PLATE IV

Cytherurae purpurae Ornellas et Fallavena, sp. nov.

Female. Holotype M.P., UFRGS, n.º MP-0-594.

- Fig. 1 — Third left thoracic leg.
- Fig. 2 — Second left thoracic leg.
- Fig. 3 — First left thoracic leg.
- Fig. 4 — Left maxilla.

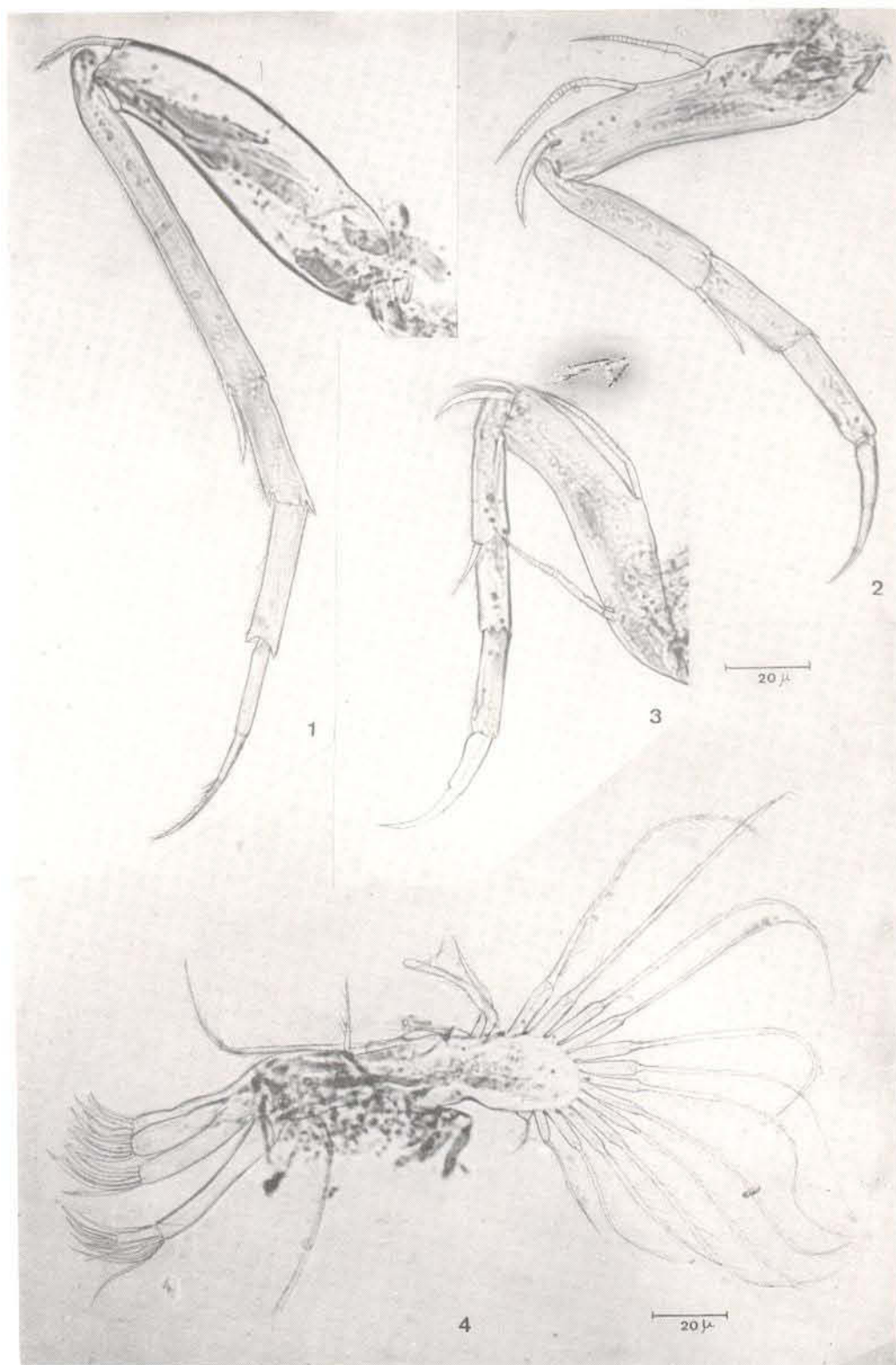


PLATE V

Cytherura purperae Ornellas et Fallavena, sp. nov.

Male. Paratype M. P., UFRGS, n.º MP-0-595.

- Fig. 1 – Right antennula.
- Fig. 2 – Right antenna.
- Fig. 3 – Left maxilla.
- Fig. 4 – Left mandible.
- Fig. 5 – Brush-shaped organ.

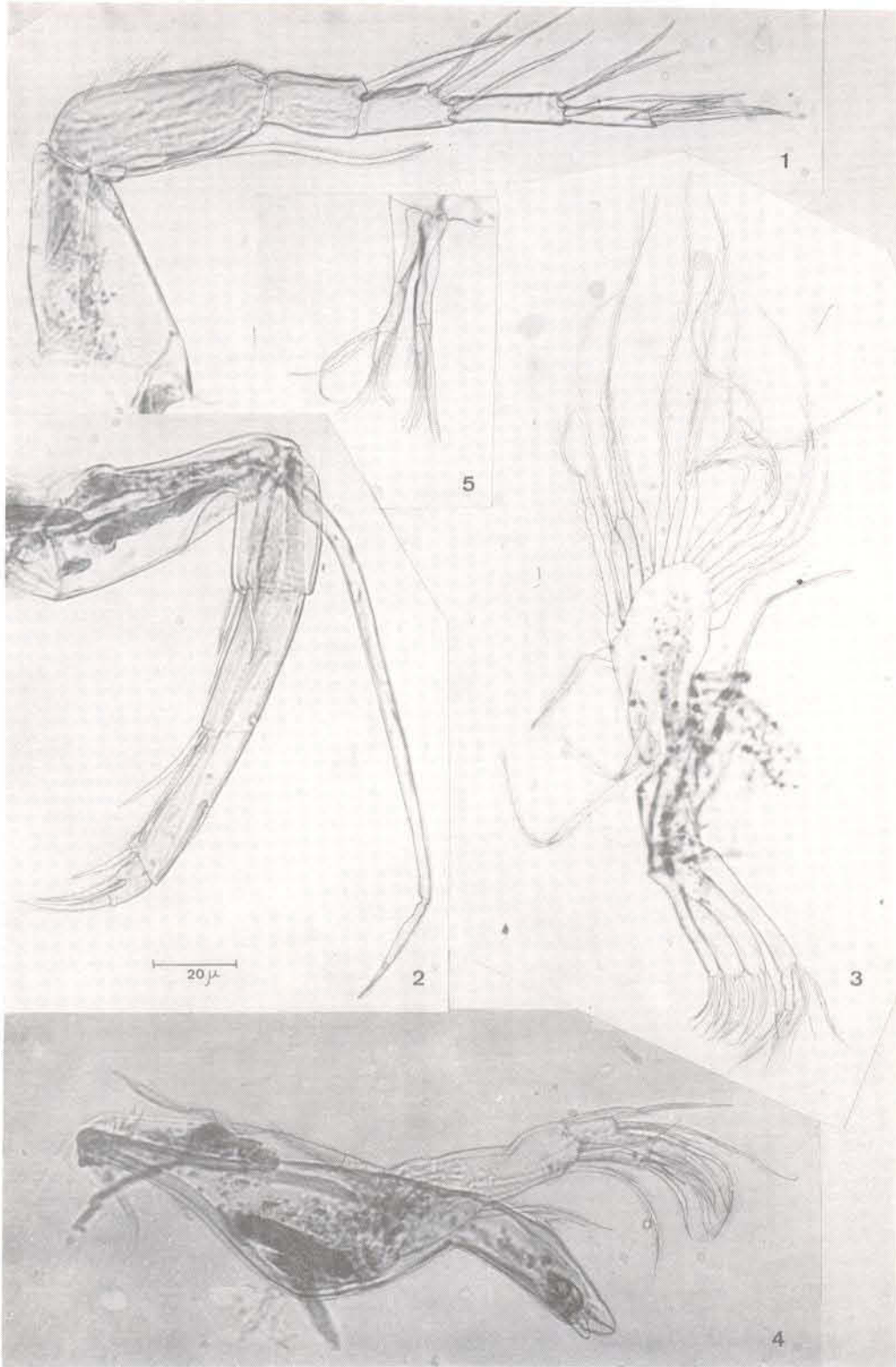


PLATE VI

Cytherura purperae Ornellas et Fallavena, sp. nov.

Male. Paratype M.P., UFRGS, n.º MP-0-595.

- Fig. 1 - Right copulative appendage.
- Fig. 2 - Third right thoracic leg.
- Fig. 3 - Second right thoracic leg.
- Fig. 4 - First right thoracic leg.

