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Revision of the Neotropical Scleropactidae (Crustacea: Oniscidea)

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The species of Scleropactidae from America are revised and redescribed. A phylogeny hypothesis based on an analysis of morphological characters is presented. The genera are redefined and the generic placement of several species is corrected. The Neotropical Scleropactidae include *Colomboscia*, *Scleropactes*, *Circoniscus*, *Neosanfilippia*, *Sphaeroniscus*, *Richardsoniscus*, *Spherarmadillo*, *Colomboniscus*, *Amazoniscus* and *Protosphaeroniscus*. The genus *Chileoniscus* is excluded from the Scleropactidae. *Sphaerobathytropa* is excluded from the Scleropactidae and its previous record from Argentina is revealed to be erroneous. *Synuropus* is revalidated and excluded from the Scleropactidae. The following new genera are introduced: ***Scleropactoides* gen. nov.**, ***Globopactes* gen. nov.**, ***Caecopactes* gen. nov.**, and ***Troglopactes* gen. nov.** Thirteen species are described as new: ***Caecopactes minimus* sp. nov.**, ***Colomboscia parva* sp. nov.**, ***Globopactes falconensis* sp. nov.**, ***Globopactes hispidus* sp. nov.**, ***Globopactes meridae* sp. nov.**, ***Scleropactes cotopaxii* sp. nov.**, ***Scleropactes ecuadoriensis* sp. nov.**, ***Scleropactes pululahua* sp. nov.**, ***Scleropactoides curvatus* sp. nov.**, ***Circoniscus hirsutus* sp. nov.**, ***Sphaeroniscus quintus* sp. nov.**, ***Spherarmadillo nebulosus* sp. nov.**, and ***Chileoniscus armadillidioides* sp. nov.** Identification keys to all species are provided.

ADDITIONAL KEYWORDS: Crinocheta – identification keys – Isopoda – phylogeny – taxonomy.

INTRODUCTION

To date, 49 nominal species of Scleropactidae have been described from Central and South America. The name Scleropactinae was first introduced by Verhoeff (1938) to include the genera *Scleropactes*, *Sphaeroniscus* and *Spherarmadillo*. Later, Verhoeff (1942) transferred the latter two to their own subfamily, the Sphaeroniscinae. Then, Vandel (1963) and subsequent authors used the name Sphaeroniscidae, until Holdich *et al*. (1984) corrected the error. Owing to the discovery of new species and the transfer of other taxa of uncertain affinities, the Scleropactidae 'grew' to their present extent. Before the present study, the Scleropactidae included the south-east Asian genera *Adinda* (18 species), *Protoradjia* (five species), *Paratoradjia* (four species), and *Toradjia* (four species), the European genera *Xeroporcellio* (one species) and *Kithironiscus* (one species), the South African genera *Exzaes* (three species) and *Hekelus* (one species), and the South American genera *Amazoniscus* (one species), *Chileoniscus* (one species), *Circoniscus* (seven species), *Colomboniscus* (one species), *Colomboscia* (three species, one of them not named), *Microsphaeroniscus* (five species), *Neosanfilippia* (two species), *Protosphaeroniscus* (one fossil species), *Richardsoniscus* (one species), *Scleropactes* (14 species), *Sphaerobathytropa* (one species), *Sphaeroniscus* (ten species), and *Spherarmadillo* (three species). Unfortunately, up to now no apomorphies of a group of this extent have been found, which casts serious doubt on the monophyly of the Scleropactidae. The Oriental species were united in a taxon Toradjinae by Arcangeli (1948). Ferrara, Meli & Taiti (1995) published a revision of this group, with descriptions of new species, discussion of phylogeny and biogeography, and keys for the identification of the species.

The Neotropical species are the subject of the present article. During the re-examination of the type material and other samples, it became obvious that some of the genera were insufficiently defined. This situation had led to incorrect generic placement of several species. Furthermore, some samples were found that have been misidentified by earlier authors. As two attempts have already been made to reconstruct a phylogenetic dendrogram of the South American genera (Schmalfuss, 1980, Taiti, Ferrara & Schmalfuss, 1986), here the phylogenetic relationships are evalu-

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ated on a broader base of morphological data. In the present article, diagnoses of all genera and identification keys are given for all species for which material was available.

HISTORICAL REVIEW

The first species of the Scleropactidae was described by Gerstäcker (1854) under the name *Sphaeroniscus flavomaculatus* and assigned to the supraspecific taxon 'Armadillini'. Budde-Lund (1879) included *Sphaeroniscus* in his 'Tribus Armadillidii', which embraced all terrestrial Isopoda with conglobational ability, except for *Tylos* and *Helleria*. Budde-Lund (1885) placed all species that today are in the Scleropactidae in his 'Familia I: Onisci', but in different sections. The species *Sphaeronicus flavomaculatus* was placed in 'Sectio I: Armadilloidea', whereas the new genus *Scleropactes*, including three new species, is found under 'Sectio II: Oniscoidea'.

Van Name (1936) classified all conglobating terrestrial isopods, except for the Tylidae and Armadillidiidae, in the Family Cubaridae, which is an example of a polyphyletic group. The non-conglobating *Synuropus* was placed in the Oniscidae, a paraphylum embracing most of the non-conglobating Crinocheta except for the Scyphacidae.

Verhoeff (1938) included all scleropactids known at that time in the family Eubelidae. He proposed a classification in subfamilies in the form of a dichotomic key. *Circoniscus*, with a two-jointed flagellum of the second antenna, was in the subfamily Ethelinae, and *Scleropactes*, *Sphaeroniscus* and *Spherarmadillo*, with three-jointed flagella, constituted the subfamily Scleropactinae. Verhoeff (1942), in a revised key to the subfamilies of the Eubelidae, introduced a new subfamily Sphaeroniscinae for the genera *Sphaeroniscus* and *Spherarmadillo*, based on the presence of a schisma on coxal plate 1, leaving only *Scleropactes* in the Scleropactinae. In the same key, *Circoniscus* was assigned to the subfamily Periscyphisinae, on the basis of plesiomorphic characters, such as the absence of spine-like tubercles on the tergites, the inner endite of the second maxilla with two penicils, eyes composed of several ommatida, and the two-jointed flagellum, which is apomorphic, but convergent for the genera included there.

Vandel (1968), recognizing the Eubelidae as an artificial assembly, excluded the subfamily Sphaeroniscinae and raised it to family rank. He established the hypothesis that the Sphaeroniscidae were derived from the Philosciidae (which were classified as a subfamily of the Oniscidae). The genera included were: *Sphaeroniscus*, *Scleropactes*, *Coxopodias*, *Circoniscus*, *Neosanfilippia* and *Richardsoniscus* from the Neotropical region, and *Sphaerobathytropa* from Europe. As these are with one exception, all Neotropical, Vandel supposed that the Sphaeroniscidae derived from American Philosciidae.

He defined the family by the following seven characters:

1. cephalothorax with large frontal lamina that covers the whole frontal face of the head; the upper margin of this lamina is the linea frontalis
2. flagellum of second antenna three-jointed or two-jointed
3. inner lobe of first maxilla with two penicils
4. first coxal plate without sulcus arcuatus
5. pleopod exopodites without 'pseudotrachea'
6. uropod exopodite inserting on the inner corner of protopodite
7. pleotelson triangular, with posterior margin rounded

Characters (1) and (3)–(7) were used by Vandel (1963) to define the subfamily Sphaeroniscinae. Characters (2)–(5) and (7) are plesiomorphic. The three-jointed flagellum was present in the groundpattern of the Oniscoidea (*sensu* Schmalfuss 1989), and the inner lobe of the first maxilla had only two penicils in the groundpattern of Crinocheta (Wägele, 1989; Schmidt, 2002); only in a number of Eubelidae and in the Mediterranean genus *Xeroporcellio* (Scleropactidae) is this number increased secondarily. The sulcus arcuatus is an autapomorphy of the Eubelidae (Taiti, Ferrara & Schmalfuss, 1991); its absence cannot be used for definition of any other taxon. The pleopods lack internal lungs, as a plesiomorphy, but some species possess open respiratory fields located on the dorsal face of pleopod exopodites 1 and 2. The shape of the uropods varies between the genera, but the exopodite is always inserted on the inner corner of the protopodite, a situation that is not exclusive to the Scleropactidae. A short pleotelson with a rounded posterior margin represents a plesiomorphic condition still present in *Ligia* and the Scyphacidae. A frontal lamina is present in most species, but in *Colomboscia* and some species of *Scleropactes* there are well-developed lateral lobes; in *Colomboscia* there is even a median lobe. However, *Colomboscia* was first described in 1972, and the species of *Scleropactes* were probably not studied in sufficient detail. In consequence, none of the characters on which Vandel (1968) founded the family Sphaeroniscidae can be regarded as an apomorphy of this taxon.

Coxopodias was reduced to a synonym of *Synarmadillo* Dollfus, 1892 by Arcangeli (1927), which is currently regarded as belonging in the Armadillidae (Taiti, Paoli & Ferrara, 1998).

The name Sphaeroniscidae was later replaced by Scleropactidae. Holdich *et al*. (1984) argued that Scleropactinae Verhoeff, 1938 was first used as a subfamily name for *Scleropactes*, *Sphaeroniscus* and *Spherarmadillo*. Verhoeff (1942) transferred *Sphaeroniscus* and *Spherarmadillo* to a new subfamily, Sphaeroniscinae. Vandel (1963) retained all three in the same subfamily but adopted the name Sphaeroniscinae Verhoeff, 1942, despite the priority of the name Scleropactinae Verhoeff, 1938.

Regarding phylogenetic research, the family Scleropactidae has received more attention than the other families of the terrestrial isopods. Schmalfuss (1980) constructed a cladogram of seven extant and one fossil genus of the Sphaeroniscidae, and discussed the relationships to some 'Philosciidae' (*Ischioscia*). The five apomorphies supporting the monophyly of the Scleropactidae (excluding *Synuropus granulatus*) were:

1. conglobation ability, a convergence to other families
2. telson shorter than uropod protopodites
3. uropod protopodites flattened (except for *Chileoniscus*)
4. uropod exopodite inserting on inner corner of protopodite
5. uropod exopodite shorter than the endopodite

He included the genera *Sphaeroniscus*, *Spherarmadillo*, *Circoniscus*, *Neosanfilippia*, *Amazoniscus*, *Richardsoniscus*, *Colomboniscus* and *Scleropactes* in the Scleropactidae; *Richardsoniscus* was not considered for the cladogram because of lack of data. The genus *Coxopodias* (syn. *Minca*) was synonymized with *Synarmadillo* and removed from the Scleropactidae. He suggested that the closest relatives are found within the South American 'Philosciidae', e.g. the genus *Ischioscia*. A common character of *Ischioscia* and the Scleropactidae is the apical cone (also called the 'terminal organ') of the second antenna, which is longer than the apical article of the flagellum. The fact that the uropod sympodites exceed the comparatively short pleotelson [character 2 in Schmalfuss (1980)] more probably is plesiomorphic in respect to Ligiidae, *Olibrinus*, and some 'Philosciidae' (e.g. *Burmoniscus* and *Ischioscia*).

A new genus *Chileoniscus* was added in a revised version of this cladogram by Taiti *et al*. (1986), who used the name Scleropactidae for this group. In the same year, Schmalfuss (1986) described a new genus, *Kefalloniscus* (synonym of *Xeroporcellio* Strouhal, 1954), from Greece, and proposed some arguments for regarding it as a sister group of *Scleropactes*. Concerning the geographical distribution, he pointed out, that except for the majority of species, which occur in South America, the genera *Kefalloniscus* from Greece, *Exzaes* and *Hekelus* from South Africa and *Parapeiscyphis* from south-east Asia might belong to the Scleropactidae. Ferrara *et al*. (1995) revised the south-east Asian taxon Toradjinae, and transferred it from the Eubelidae to the Scleropactidae. Schmalfuss (1995) described a second species of Scleropactidae (*Kithironiscus paragamiani*) from Greece, and emphasized that the Scleropactidae, including all the genera subsequently transferred to this family, are not supported by unambiguous synapomorphies. Regarding these two very different species, he considered the indigenous occurrence of Scleropactidae in the Mediterreanean area as confirmed. However, he emphasized that the monophyly of the family is not yet supported by unambiguous synapomorphies, for which convergence can be excluded. Nevertheless, the assumption of monophyly was the most plausible interpretation of the data at hand.

Taiti, Allspach & Ferrara (1995) transferred the genus *Colomboscia* Vandel, 1972 from the 'Bathytropidae' to the Scleropactidae; their arguments are discussed below. Vandel (1972) had described the genus *Colomboscia* and placed it in the Bathytropidae, based solely on the similarity of the tergal and cephalic tuberculation.

Ferrara *et al.* (1995) revised the Toradjinae, with 15 known and 17 new species, and transferred them to the Scleropactidae. Synapomporphies with the other Scleropactidae seem to be:

1. apical organ of second antenna very long
2. disposition of telson and uropods
3. exoantennal conglobation ability

The presence of a groove on pereiopod 7 belonging to the water-conducting system led the authors to the conclusion that the Toradjiinae possess an open water-conducting system, which, within the Crinocheta, is only present in the 'Scyphacoidea'. As the water-conducting structures are present only on the base of pereiopod 7, it remains doubtful by which mechanism water can be taken in. One possible explanation is that the situation in the Toradjiinae could represent a reduced stage in respect to the open water-conducting system in the Ligiidae or Synocheta. If this is the case, it is a plesiomorphic character that cannot be used to define the group. The shape of the pleotelson is a plesiomorphy, as pointed out above, and the shape of the uropods may be a synapomorphy of the South American Scleropactidae excluding *Synuropus,* and the Toradjiinae, but convergence cannot be excluded. Concerning the exoantennal conglobation ability, it must be kept in mind that only *Scleropactes* and *Colomboscia* among the South American Scleropactidae show this character, whereas *Synuropus* is a non-conglobating species and all others are endoantennal rollers.

The members of the subfamily Toradjiinae have extremely small noduli laterales at the posterior margins of the tergites. This was mentioned but not illustrated by Ferrara *et al.* (1995). The South American genera (except *Spherarmadillo*) also have very small noduli laterales at the posterior margins of the tergites. However, owing to the lack of description and illustration, representatives of both groups will have to be examined in order to find similarities or differences. Noduli laterales of similar size and location are present in *Exalloniscus*, which at present is incertae sedis, and in *Trichorhina*, currently included in Platyarthridae. Given that these small noduli evolved once, a further question is whether they are a synapomorphy of all taxa that possess them or whether they represent a plesiomorphic condition with respect to the large noduli laterales in part distant from the posterior margins of the tergites, as found in the 'Philosciidae', 'Trachelipodidae', etc.

The Neotropical genera currently included in the Scleropactidae are *Sphaeroniscus*, *Scleropactes*, *Circoniscus*, *Spherarmadillo*, *Neosanfilippia*, *Richardsoniscus*, *Amazoniscus*, *Colomboniscus*, *Protosphaeroniscus* and *Chileoniscus*. It is considered doubtful that *Sphaerobathytropa* and *Globarmadillo* also belong to the Scleropactidae (Taiti *et al.*, 1986). The same authors gave a cladogram of the genera and a discussion of their relationships. They also mentioned some similarities between *Chileoniscus* and the South African *Exzaes* (incertae sedis).

Taiti & Howarth (1997) described the new genus and species *Aulaconiscus caecus* from Hawaii. They discussed the differences from all other exoantennal species of the Scleropactidae, and regarded the phylogenetic relationships within the family as being still unclear. The species has longitudinal antennal furrows on the frontal shield; no information on the position and shape of the noduli laterales is given. According to these authors, *Au. caecus* is certainly not native to Hawaii, but was most probably introduced from the Neotropics.

The enigmatic terrestrial isopod species *Sphaerobathytropa ribauti* from the Pyrenees was described by Verhoeff (1908), who did not find convincing arguments for placement in the system of the terrestrial isopods and therefore discussed the similarities with several taxa. He found some similarities with the Armadillidiidae, the Porcellionidae, *Cylisticus* Schnitzler, 1853, *Spelaeoniscus* Racovitza, 1907, *Bathytropa* Budde-Lund, 1885 and *Saidjahus* Budde-Lund, 1904, all of which differed distinctly in other characters. *Saidjahus* was thought to be the closest relative, which means that Verhoeff placed *Sphaerobathytropa* in or near a group that later was known under the family name Eubelidae. Verhoeff (1938) united *Sphaerobathyropa* with *Circoniscus*, *Microcercus*, *Synarmadillo* and *Periscyphis* in the subfamily Ethelinae of the family Eubelidae. Later, Verhoeff (1942) established a new subfamily Sphaerobathytropinae for *Sphaerobathytropa* and two new genera from east Africa, *Cooperaulax* and *Myrmecethelum*, based on the 'weakly developed sulcus arcuatus'. Vandel (1962a) enumerated *Sphaerobathytropa* and *Circoniscus* as specialized forms of the Eubelidae. In the same book, after the discussion of a Gondwanian origin of the Eubelidae, Vandel characterized *Sphaerobathytropa ribauti* as a 'reduced' form and relic of the tropical fauna that populated Europe at the beginning of the Tertiary period. Then, Vandel (1962a) pointed out the similarities and differences in relation to *Circoniscus*, which he regarded as the closest relative. Vandel (1968) included *Sphaerobathytropa* in the Sphaeroniscidae (now Scleropactidae); Schmalfuss (1980) questioned this family placement, and proposed probable affinities with the Armadillidae.

In a world list of terrestrial isopod species, Schmalfuss (2003) included in the family Scleropactidae the genera *Adinda*, *Amazoniscus*, *Aulaconiscus*, *Chileoniscus*, *Circoniscus*, *Colomboniscus*, *Colomboscia*, *Microsphaeroniscus*, *Neosanfilippia*, *Paratoradjia*, *Parcirconiscus*, *Protosphaeroniscus*, *Scleropactes*, *Sphaeroniscus*, *Spherarmadillo*, and *Toradjia*, and included, with doubt ('?'), also *Globarmadillo*, *Haplarmadillo* and *Matazonellus*. In contrast, *Sphaerobathytropa* was not included, but listed as incertae sedis. In this list, the family name Sphaeroniscidae also reappears, although only as a mistake for Spelaeoniscidae in two cases.

MATERIAL AND METHODS

Most specimens of Neotropical Scleropactidae existing anywhere in collections were examined for the present study. Habitus illustrations were drawn through a dissecting microscope with camera lucida device (Olympus SZX 12 for large specimens and Leica for specimens smaller than approx. 5 mm). Appendages were dissected and mounted in Euparal resin on slides. For drawing the dissected appendages, a microscope (Olympus BX 40) with camera lucida was used.

The phylogenetic analysis was done following the principles of phylogenetic systematics.

In addition, the morphological data were transformed into a data matrix, which was analysed with the computer program PAUP, version 4.0. The matrix includes 39 Neotropical species currently classified as Scleropactidae, three representatives of the Toradjinae, the groundpattern of *Ischioscia* (Leistikow & Schmidt, 2002) and *Sphaerobathytropa ribauti* as terminal taxa. Most species with incompletely known morphology were excluded.

Character polarity was determined by including a synthetic outgroup representing the plesiomorphic state [0] for each character. Details of the hypotheses on character polarity are given under each character. Characters were given the weight 1 or 3. Weight 1 was applied for all characters for which the presumed apomorphic state is the absence of a character, e.g. no eyes, no pigment, and for characters believed to have a high probability of parallelism, because similar situations occur in diverse outgroup taxa. Structural characters were given the weight 3, following their assumed complexity.

Abbreviations

AMNH, American Museum of Natural History, New York; BMNH, Natural History Museum, London; CV, Collection Vandel in the MNHN; IRSNB, Institut royal des Sciences naturelles de Belgique, Bruxelles; ZMB, Museum für Naturkunde, Berlin; MNHN, Muséum National d'Histoire Naturelle de Paris; MNRJ, Museu Nacional, Universidade Federal do Rio de Janeiro; SMF, Senckenberg-Museum Frankfurt am Main; SMNS, Staatliches Museum für Naturkunde, Stuttgart; UCV, Universidad Central de Venezuela, Maracay; USNM, United States National Museum, Washington; ZMG, Zoologisches Museum Göttingen, now in Senckenberg-Museum, Frankfurt am Main; ZMUC, Zoological Museum, University of Copenhagen; ZSM, Zoologische Staatssammlung München; cCS, author's collection.

An asterisk after the year of a citation means that the name is cited without reference to specimens.

♀m: female with marsupium.

12/13 ommatidia: The specimen has a left eye with 12 ommatidia and a right eye with 13 ommatidia. As the number of ommatidia differs between both eyes of the same specimen, it is denoted in this way.

PHYLOGENETIC ANALYSIS

Characters

An attempt has been made to describe every detail that can be distinguished as a character or character state. Characters that are common to all species are not considered. If possible, the 'significance' of these characters is discussed, e.g. facts or hypotheses concerning their function or their complexity, as well as the occurrence of similar traits outside the Scleropactidae.

This way of defining characters is, like all attempts to define morphological characters, certainly not an objective procedure.

Habitus

[1-0] Runner type
[1-1] Clinger type
[1-2] Exoantennal conglobation
[1-3] Endoantennal conglobation

Within the Oniscidea, four main habitus types can be distinguished (Schmalfuss, 1984): runner, clinger, conglobating forms, and slender, elongate animals inhabiting the soil interstitium. Most species of the Scleropactidae have conglobational ability. The antennae may remain outside the conglobating animal (exoantennal) or may be protected inside the ball (endoantennal). It is not known whether one of these forms can be regarded as plesiomorphic with respect to the other. Conglobational ability has evolved several times within the Oniscidea, as well as in other taxa (Sphaeromatidea, Diplopoda, Blattodea). Whether this is also the case within the Scleropactidae is not known. Only *Synuropus* and *Colomboscia* are non-conglobating and belong to the clinger type. It should be taken into consideration that this may be a primary or a secondary state. The runner type is mentioned only because it occurs in outgroup taxa, and is considered as the plesiomorphic condition (Leistikow, 2001; Schmidt, 2002, 2003).

Cephalothorax (Fig. 1)

[2-0] Median lobe present
[2-1] Median lobe absent
[3-0] Lateral lobes present, as long as eyes or longer
[3-1] Lateral lobes present, shorter than eyes
[3-2] No distinct lateral lobes
[4-0] Transverse furrow on cephalothorax absent
[4-1] Transverse furrow present, evenly arcuate
[4-2] Transverse furrow medially straight
[5-0] Antennal lobes absent
[5-1] Antennal lobes present
[6-0] Linea supraantennalis present
[6-1] Linea supraantennalis medially interrupted
[6-2] Linea supraantennalis absent
[7-0] Linea frontalis present
[7-1] Linea frontalis absent or indistinct

In the groundpattern of the Oniscidea, the cephalothorax had neither lateral lobes nor a median lobe. If the ancestral habitus of the Crinocheta resembles that of the Philosciidae (Schmidt, 2002), then the absence of cephalic lobes is also plesiomorphic for the Crinocheta. These lobes obviously evolved in correlation with the evolution of the clinger-type habitus. Other species without these lobes are mostly of the conglobating form. If these evolved from clinger-type forms, then the lack of cephalic lobes is secondary. However, we do not know a priori whether the conglobators evolved from clingers or directly from runners.

The transverse furrow (character 4) was earlier believed to be an autapomorphy of the genus *Scleropactes* (Schmalfuss, 1980). Later, *Colomboscia* was transferred from the Bathytropidae to the Scleropactidae, and the furrow was regarded as a homologous structure in both genera (Taiti *et al*., 1995). The present investigation revealed the presence of a similar furrow in nearly all Neotropical Scleropactidae that have eyes. It is absent in *Synuropus*, *Chileoniscus*, *Heptapactes* and *Sphaeroniscus pilosus*. All species with reduced or missing eyes never have such a transverse furrow.

Two transverse ridges on the cephalothorax, the linea frontalis and the linea supraantennalis, are present in the groundpatterns of the Oniscidea, Crinocheta, and Oniscoidea. If a median lobe is present, then its margin is probably formed by the linea frontalis. The linea frontalis is also counted as present if either a distinct median lobe or a so-called frontal shield is present. This is not the case only in *Chileoniscus* and *Caecopactes*. Both lines have been lost in numerous cases within the Oniscoidea. The linea supraantennalis is often interrupted in the middle.

The margin of the antennal lobes is formed by the linea supraantennalis. Among the species included in the present study, antennal lobes are present only in both species of *Chileoniscus*. Similar structures are also found in the Armadillidiidae and Delatorreidae (Schmidt, 2003).

Eyes

[8-0] Eyes present, composed of several ommatidia
[8-1] Only dark pigment visible, no lenses
[8-2] Eyes entirely absent

The presence of eyes is the plesiomorphic condition. Eyes have been reduced many times independently within the Oniscidea. Among the species of Neotropical Scleropactidae, there are two stages of reduction: the loss of lenses, and the loss of lenses and pigment. There are at least three species that have lost the lenses but retained black pigment spots in place of the eyes: *Sphaeroniscus gerstaeckeri*, *Spherarmadillo schwarzi*, and *Richardsoniscus portoricensis*. The latter two are not included in the data matrix, because most of their morphology remains unknown, owing to the lack of sufficient material.

It may be noticed here that there is one species lacking eyes [8-3] but that is well pigmented. Vandel (1958) had argued that this is impossible, and eyeless specimens may appear pigmented only because they have been preserved together with millipedes and stained by the secretions of these animals. The specimens of *Spherarmadillo nebulosus* are eyeless and strongly pigmented (I have seen them alive). The pigmentation of *Spherarmadillo nebulosus* is slate grey and lacks any trace of brown colour, whereas the other species of Neotropical Scleropactidae, if they have pigment, always have some brown or ferrugineus colour.

Pigment

[9-0] Pigment present
[9-1] Pigment absent

In the case of museum specimens that are preserved in alcohol for long time, it is sometimes not possible to know whether the lack of pigment is original or a preservation artefact.

Tergites and coxal plates (Fig. 2)

[10-0] Coxal plate 1 simple
[10-1] Coxal plate 1 with anterior corner delimited by scales differing from the scales on the rest of the tergite
[11-0] Coxal plate 1 simple
[11-1] Coxal plate 1 with hind corner cleft, the ventral lobe protruding more than the dorsal lobe
[11-2] Coxal plate 1 with hind corner cleft, the dorsal lobe more protruding
[11-3] Coxal plate 1 with entire lateral margin cleft
[12-0] Coxal plate 2 with convex lateral margin
[12-1] Coxal plate 2 with concave lateral margin
[13-0] Coxal plate 3 with convex lateral margin
[13-1] Coxal plate 3 with concave lateral margin
[14-0] Coxal plate 4 as broad as coxal plate 3
[14-1] Coxal plate 4 narrower than coxal plate 3
[15-0] Coxal plate 5 with convex lateral margin
[15-1] Coxal plate 5 with concave lateral margin
[16-0] Tergites smooth
[16-1] Tergites granulate
[16-2] Tergites tuberculate
[17-0] Tergal scale setae small
[17-1] Tergal scale setae long, producing a pilose appearance
[18-0] Noduli laterales small, sometimes not discernible from the other tergal sensilla
[18-1] Noduli laterales larger than the scale setae, distinctly visible
[19-0] One pair of noduli laterales per tergite, all at same distance (or indistinct)
[19-1] Tergite 7 with two pairs of noduli

The function of the special scales on the anterior corner of coxal plate 1 [10-1] is unknown, whereas modifications of the shape of coxal plates 1–5 functionally correlate with the conglobation ability. Some clefts or lobes on the anterior coxal plates are frequently found in terrestrial isopods with a conglobating habitus. A cleft separating an inner (ventral) and an outer (dorsal) lobe is usually termed ‘schisma’ in the Oniscidea literature (Schmidt 2002). There is a wide variation in the shape and extent of these structures. In conglobating species, coxal plate 4 is often distinctly narrower than coxal plate 3, and sometimes has an acute angle. However, there are also species with perfect conglobation ability, and no difference betweeen coxal plates 3 and 4. In contrast, the convex lateral margins of coxal plates 2 and 3 are found only in three species of *Globopactes*, and there seems to be no other case within the Crinocheta.

Noduli laterales different from the other tergal sensilla were present in the groundpattern of a taxon consisting of the Oniscoidea excluding the Alloniscidae (Schmidt, 2002, 2003). In the Philosciidae, the noduli are often much larger than the other tergal sensilla, but in the Scleropactidae or putative Scleropactidae, they are usually small and inconspicuous. Exceptions are *Spherarmadillo*, *Troglopactes*, *Sphaerobathytropa* and *Chileoniscus*, in which the noduli are large and distinctly visible.

First antenna (Fig. 3)
[20-0] First antenna three-jointed, second article the shortest
[20-1] Second article as long as third
[21-0] Distal article with a pair of larger aesthetascs on the tip and a group of several smaller aesthetascs in subapical position, or distal aesthetascs not distinctly larger
[21-1] Distal article with subapical group of aesthetascs exceeded by a tip of soft appearance

In all species examined for the present study, the first antenna is three-jointed. The same is also assumed for the Oniscidea and Crinocheta groundpattern. The distal article has a varying number of subapical aesthetascs and a pair of slightly larger aesthetascs at the tip. These larger aesthetascs are frequently broken off in the examined material, but then their insertion can be seen. They are absent or not different from the subapical aesthetascs in *Circoniscus*, where the tip of the first antenna has a soft appearance.

Second antenna (Figs 4, 5)
[22-0] Flagellum three-jointed
[22-1] Flagellum two-jointed
[23-0] Flagellum with articles equally broad
[23-1] Flagellum conical
[24-0] Apical cone short with long lateral setae
[24-1] Apical cone slender with short lateral setae
[25-0] Apical cone much shorter than distal flagellar article
[25-1] Apical cone as long as or longer than distal flagellar article
[26-0] Apical cone with two lateral sensilla
[26-1] Apical cone with one lateral sensillum
[27-0] Peduncular article 5 normal
[27-1] Peduncular article 5 swollen
[28-0] Peduncular article 4 normal
[28-1] Peduncular article 4 swollen

The apical cone of the second antenna flagellum consists of a number of sensory setae that are included in a common sheath. Two sensilla are usually not included in the sheath, but project freely. These sensilla have the same length as those included in the sheath, or are much shorter. In the latter case, in some species there is only one free lateral sensillum on the cone. The sheath was new in the groundpattern of the Oniscoidea (*sensu* Schmalfuss, 1989). A short cone with long lateral sensilla is probably plesiomorphic within the Oniscoidea.

In all species examined, there are two rows of aesthetascs, usually with only one or two aesthetascs per row. In specimens with a three-jointed flagellum, one row is on the second article and one on the third; in specimens with a two-jointed flagellum, both rows are on the distal article.

In *Caecopactes* and *Colomboniscus*, articles 4 and 5 of the second antenna are enlarged.

Mandible (Fig. 6)
[29-0] Pars incisiva and lacinia mobilis both with some sharp cusps
[29-1] Pars incisiva and lacinia mobilis forming a broad masticatory surface
[30-0] Pars molaris represented by a tuft of hairy setae
[30-1] Pars molaris represented by one single hairy seta
[31-0] External face of mandible with scales
[31-1] External face of mandible without scales

In most Crinocheta, the pars incisiva is an incisory edge with several cusps. The lacinia mobilis has two or three cusps, and is larger on the left mandible than on the right mandible. The pars molaris is a short, massive process with a rough masticatory surface in the Oniscidea, except for the Crinocheta, where the process and masticatory surface are absent and a tuft of prominent hairy setae on a common socket is found in its place. A single hairy seta instead of a tuft of hairy setae is found in numerous Philosciidae and in some Scleropactidae. The situation found in the Armadillidae is only superficially similar (Schmidt, 2002). In *Spherarmadillo* and a few species of *Scleropactes*, the shape of the mandible suggests that a secondary masticatory surface evolved from the pars incisiva and lacinia mobilis.

First maxilla (Fig. 7)
[32-0] Mesal endite with laterodistal corner acute
[32-1] Mesal endite with laterodistal corner rounded
[33-0] Mesal endite: penicils slender
[33-1] Mesal endite: penicils stout
[34-0] Mesal endite without hairs
[34-1] Mesal endite distally hairy
[35-0] Lateral endite: inner group of six tooth setae
[35-1] Lateral endite: inner group of fewer than six tooth setae

[36-0] Lateral endite: some tooth setae of the inner group cleft
[36-1] Lateral endite: all teeth of the inner group simple
[37-0] Lateral endite: lateral group of five simple teeth, and one slender seta
[37-1] Lateral endite: lateral group of four large teeth, one small triangular lobe, and one slender seta
[38-0] Lateral endite: lateralmost tooth seta hardly longer than second longest seta
[38-1] Lateral endite: lateralmost tooth seta about 1.5 times as long as second longest seta, or longer
[39-0] Lateral endite: a pair of very small subapical setae on the caudal face, near the inner group of tooth setae
[39-1] Lateral endite: only one very small seta at this place
[39-2] Lateral endite: small subapical setae absent

The mesal endite of the first maxilla may have an acute or rounded laterodistal corner, bearing hairs or being hairless, and the two penicils are slender or stout and rounded. The number of penicils is usually two, as in the groundpattern of the Crinocheta (Schmidt, 2002). Among the species considered here, only two deviate from this number. *Heptapactes quadrisaetosus* has four penicils, and *Sphaeroniscus quintus* is variable: two, or two large and one very small, or four penicils were found in three specimens. Therefore, the number of penicils was not included in the character matrix.

The lateral endite of the first maxilla has a number of setae on and near its distal margin. They may be divided into two groups. An outer or lateral group consists of five tooth setae and a very slender seta. One of the five tooth setae is often distinctly smaller than the others, or even reduced to a small triangular lobe. The slender seta is hairy in the more primitive forms, and hirsute or smooth in the more derived forms. The inner or mesal group consists of six more slender setae, which are cleft or pectinate in the Crinocheta groundpattern (Schmidt, 2002). In the Scleropactidae, they are usually cleft, but in some species they are simple. Beside the inner group, there is a pair of very small subapical setae. Sometimes only one seta is found there, and in other species they are absent.

Second maxilla (Fig. 8)
[40-0] Distally bilobate; lateral lobe, mesal lobe and a distinct incision between them
[40-1] Distally with only faint or without incision

The second maxilla is distally bilobate in the groundpattern of the Crinocheta, and also of the Oniscidea. The mesal lobe is larger than the lateral lobe. In the Oniscoidea, both lobes are either equal, or the mesal lobe is smaller. An indistinct incision between the lobes is therefore apomorphic.

Maxilliped (Fig. 9)
[41-0] Maxilliped endite hairy and with penicil
[41-1] Endite not hairy and with subapical long setae (or seta-shaped lobe?)
[42-0] Proximal article of palp with two large setae
[42-1] Proximal article of palp with only one large seta; the lateral seta is lost
[43-0] Second article of palp with distal tuft of setae without socket
[43-1] Second article of palp with distal tuft of setae on a long socket
[44-0] Second article of palp with proximal tuft consists of more than five setae
[44-1] Second article of palp with proximal tuft consists of three or four setae
[44-2] Second article of palp with proximal tuft consists of two setae
[44-3] Second article of palp with proximal tuft consists of one seta
[45-0] Second article of palp with proximal tuft of setae of normal size, distant from the socket of the distal tuft by more than half of their length, or setae as long as socket
[45-1] Distal tuft of two setae of half the length of the setae on the distal tuft, immediately beside the distal tuft

In the Crinocheta groundpattern, the maxilliped endite is hairy, with a penicil on the frontal face, and a seta on the caudal face. The latter seta is usually difficult to find among the hairs. In the derived state, the endite is hairless, the penicil is reduced to a very small cone or entirely absent, and the seta on the caudal face is large. The proximal article of the maxilliped palp has two large setae in almost all species of the Crinocheta, but in many Scleropactidae, the lateral one of these two setae is absent. The second article has two tufts of setae. In most taxa currently united as Scleropactidae and in some 'Philosciidae', the setae of the distal tuft are inserted on a long socket. Nothing similar is known from any other species within the Crinocheta. The number of setae of both tufts has decreased within the Crinocheta.

Pereiopod 1 (Fig. 10)
[46-0] Carpus with oblique antenna-grooming brush
[46-1] Carpus with longitudinal antenna-grooming brush
[46-2] Carpus with indistinct or vestigial brush

A brush for grooming the second antennae (and probably also the mouthparts?), located on the frontal face of the pereiopod 1 carpus, composed of a field of scales with a fringed margin, and a distal row of larger scales with a simple margin. Such a structure is present in *Mesoniscus*, many Synocheta and most Crinocheta, but is absent from some other Synocheta and a few Crinocheta. Within the Crinocheta, this brush can be parallel to the longitudinal axis of the carpus, or oblique. In some species, mainly of very small body size, no brush is present.

Pereiopods 1–7

[47-0] Male anterior pereiopods without brushes composed of setae or scale-fields
[47-1] Male anterior pereiopods with ventral setae brushes on merus and carpus
[47-2] Male anterior pereiopods with ventrofrontal scale-fields

Anterior pereiopods 1–3 or 1–4 of males often have some specializations that seem to be related to mating behaviour. These are either dense scale-fields, or the number of ventral setae is increased to form dense brushes. Both seem to be important for the attachment of males to the smooth tergites of females. They are best developed in species with very smooth surfaces. According to Schmidt (2002), the Crinocheta groundpattern had neither ventral brushes composed of setae nor ventrofrontal scale-fields. Therefore, both are regarded as derived conditions.

Dactyli (Fig. 11)

[48-0] Inner claw much shorter than half of outer claw
[48-1] Inner claw slightly shorter, as long as, or longer than outer claw
[49-0] Dactylar seta bifurcate, feathery
[49-1] Dactylar seta simple, feathery
[49-2] Dactylar seta simple, without setules
[50-0] Small seta beside the ungual seta long, one-third to half as long as the dactylar seta
[50-1] Small seta beside the ungual seta short, one to two times as long as the diameter of the dactylar seta

The dactylus of the Crinocheta groundpattern most probably did not have an inner claw (Schmidt, 2002, 2003). The inner claw seems to be a specialized seta. Among the taxa included in the present analysis, two character states are found: the claw is either shorter than half the length of the outer claw, or as long as or even slightly longer than the latter. A bifurcate, feathery dactylar seta belongs to the groundpattern of the Crinocheta, and is simplified within this group to a simple feathery, hirsute or smooth seta. The slightly curved ungual seta (nearly?) always has a smaller seta beside it, which may be up to half as long as the ungual seta, but most frequently it is very small.

Male pereiopod 7 (Fig. 12)

[51-0] Ventral margin of ischium with scales of same size as on the other legs
[51-1] Ventral margin of ischium fringed with hair-like scales
[52-0] Ventrodistal corner of the ischium without prolongation
[52-1] Ventrodistal corner of the ischium prolonged into a tubercle
[53-0] Membrane of the ischium–merus joint as on the other legs
[53-1] Membrane of the ischium–merus joint enlarged to form a sac-like protrusion
[54-0] Merus simple
[54-1] Merus with an acute lobe in the middle of the frontal face
[54-2] Merus with a rounded lobe
[55-0] Merus simple
[55-1] Merus with a dorsodistal tubercle on the frontal face
[56-0] Merus ventrally as on the other legs
[56-1] Merus with ventroproximal scaly tubercle

Within the Crinocheta, the male pereiopod bears various specializations, such as tubercles, lobes, tufts of setae, brushes, and ridges, in different taxa. All these cannot be exhaustively discussed here. It should be noted that no plausible explanations concerning their function are available. The presence of these sexually dimorphic structures is regarded as apomorphic.

Male pleopod 1 (Figs 13, 14)

[57-0] Exopodite with marginal setae
[57-1] Exopodite without marginal setae
[58-0] Exopodite without dorsal respiratory field
[58-1] Exopodite with dorsal respiratory field
[59-0] Exopodite with more or less developed median lobe
[59-1] Exopodite without distinct median lobe, all margins convex
[60-0] Exopodite length greater than width
[60-1] Exopodite length smaller than width

The pleopod 1 exopodite has a row of feathery marginal setae in the groundpattern of the Crinocheta. Simple marginal setae are ascribed to the groundpattern of a taxon including the Scyphacidae *s.s.* and the Oniscoidea (Schmidt, 2002, 2003). Within the Oniscoidea, the marginal setae are frequently absent. Dorsal respiratory fields or more complex structures on the pleopod exopodite have evolved several times convergently within the Crinocheta (Schmidt & Wägele, 2001). The plesiomorphic condition for the Oniscidea is a very thin ventral cuticle of the exopodite, whereas the dorsal cuticle is thicker, providing rigidity to the exopodite. If a dorsal respiratory field is present, the ventral cuticle is thicker. Dorsal respiratory fields are usually discernible by a fold along their mesal margin that delimits them from the rest of the dorsal surface

of the exopodite. Among the species included in the present study, the most complicated respiratory structures are strongly wrinkled respiratory fields. More species have weakly wrinkled or smooth fields, and often no perceptible respiratory fields are present on the pleopod exopodites.
[61-0] Endopodite simple: slightly bent outwards, apically more or less acute, or specialization different
[61-1] Endopodite with very narrow distal part
[62-0] Endopodite simple: slightly bent outwards, apically more or less acute, or specialization different
[62-1] Endopodite with straight distal part
[63-0] Endopodite simple: slightly bent outwards, apically more or less acute, or specialization different
[63-0] Endopodite distally rugose
[64-0] Endopodite simple: slightly bent outwards, apically more or less acute, or specialization different
[64-1] Endopodite with lateral subapical hook
[65-0] Endopodite tip not bent ventrally
[65-1] Endopodite tip bent ventrally
[66-0] Row of small, spine-like setae along the dorsal spermatic furrow of the endopodite, all simple
[66-1] Row of small, spine-like setae with the apical four or five setae having their tip cleft into several hairs

The male pleopod 1 endopodite, involved in mating behaviour, evolved in the Crinocheta extremely diverse specializations, including variations in the general shape and the presence of lobes and tubercles. The same comment made about male pereiopod 7 applies here. Despite the astonishing diversity of protuberances, outgrowths, membraneous lobes etc., knowledge of their function is still lacking. The endopodite is normally bent ventrally in *Chileoniscus*. This can be seen on the specimen in lateral view. In slide mountings, the distal part of the endopodite of *Chileoniscus* is distorted laterally.

Pleopod 2
[67-0] Exopodite without dorsal respiratory field
[67-1] Exopodite with dorsal respiratory field

Pleopod 3
[68-0] Exopodite without dorsal respiratory field
[68-1] Exopodite with dorsal respiratory field

Pleopod 4
[69-0] Exopodite without dorsal respiratory field
[69-1] Exopodite with dorsal respiratory field

Pleopod 5 (Fig. 15)
[70-0] Exopodite without dorsal respiratory field
[70-1] Exopodite with dorsal respiratory field
[71-0] Male exopodite with simple mesal margin, as in female
[71-1] Male exopodite with hairy groove along the mesal margin

The hairy groove on the mesal margin of male pleopod 5 serves to hold the pleopod 2 endopodite when in the rest position. It is found in most species of the Oniscidae, Trachelipodidae, Cylisticidae, Agnaridae, Porcellionidae and Armadillidiidae, and also in many 'Philosciidae' and Scleropactidae.

Uropod (Fig. 16)
[72-0] Uropod sympodite shape as in the 'Philosciidae', not adapted for conglobation
[72-1] Uropod sympodite plate-like, enlarged
[73-0] Exopodite lanceolate or small
[73-1] Exopodite plate-like, enlarged
[74-0] Endopodite laterally flattened, inner face hairy
[74-1] Endopodite dorsoventrally flattened, inner face not hairy
[75-0] Sympodite laterodistally rounded
[75-1] Sympodite angular
[76-0] Sympodite length greater than width
[76-1] Sympodite width greater than length
[77-0] Exopodite reaching or exceeding the distal margin of the sympodite
[77-1] Exopodite very small, its tip not reaching the distal margin of the sympodite

The last common ancestor of Crinocheta was most probably an isopod with a runner habitus; all adaptations for conglobation ability, such as plate-like sympodites, plate-like exopodites, or exopodites reduced in size, are therefore considered to be apomorphic. In the most perfectly conglobating species, the sympodite has an angular laterodistal corner, and the size of the exopodites is reduced.

Pleotelson
The pleotelson is distally more or less rounded, sometimes with concave sides, and is exceeded by the uropod sympodites. Distinctly different shapes (angular, truncate, exceeding the uropods, or with a central tubercle) are apomorphies of single species and are not useful for phylogeny reconstruction.

RESULTS

The morphological characters were evaluated according to the principles of phylogenetic systematics. It is obvious that there are only few characters that allow unambiguous support of a clade. For most characters, several or multiple cases of homoplasy and/or subsequent loss must be assumed. A further impediment was the lack of data for many species, for which only incomplete or insufficiently preserved specimens were available.

The analysis with PAUP yielded 147 equally shortest trees, with 308 steps and CI = 0.3994. Obviously, there is much incompatible information in the dataset; this means many putative homologies are in fact homoplasies. In the present case, it was difficult to assess homology, because the complexity of most structures that are variable between the species seems to be low. For the criterion of complexity in the assessment of homology, see Wägele (2000). This problem is probably inherent to phylogenetic studies at the species level, where species often have only minor differences.

A strict consensus of the 147 shortest trees (Fig. 17) is used as a base for the following substantiation of monophyla. The clades that appear to be supported by apomorphies are enumerated, and the supporting characters are discussed. Plesiomorphic states are given in brackets behind the apomorphic states, if necessary. The number of parallelisms and reversals given behind the character states in the following list refer to the total number of state changes in the consensus cladogram on which the discussion is based. Further parallelisms in taxa not included in the present matrix are mentioned in the Discussion.

Clade 1: *Sphaeobathytropa*, *Chileoniscus*

[1-3] Endoantennal conglobation (runner): two parallelisms
[3-2] No distinct lateral lobes (lateral lobes present): three parallel reductions
[18-1] Noduli laterales large and distinctly different from the remaining tergal sensilla (noduli small or not different from tergal sensilla): two parallelisms
[41-1] Maxilliped endite without hairs, with subapical large seta (hairy, with penicil): two parallelisms
[46-1] Pereiopod 1 carpus with longitudinal brush (with oblique brush): two parallelisms
[49-2] Dactylar seta simple (distal part fringed with setules): three parallelisms

Among the taxa included in the data matrix, this clade is supported by a number of characters; none of them is unique to the three species included. All these characters are not only paralleled in some taxa included in the matrix, but are also common in crinochete taxa not included; for example, endoantennal conglobation is also found in the Armadillidae, Eubelidae, Armadillidiidae, and others. Large noduli laterales are found in most of the Crinocheta, as well as the maxilliped endite without hairs. The only conclusion that can drawn from the position of the species here included in clade 1 is that they do not belong to the Scleropactidae.

Clade 2: *Chileoniscus*

[5-1] Cephalothorax with antennal lobes (without antennal lobes)
[19-1] Noduli 7 in a more mesal position than 5 and 6 (all at same distance to the margin)
[65-1] Male pleopod 1 endopodite bent ventrally
[73-1] Uropod exopodite plate-like, enlarged

Chileoniscus seems to be a monophyletic taxon. Antennal lobes are also found in the Armadillidiidae and Delatorreidae. A plate-like uropod endopodite is found in the Armadillidiidae. The Armadillidiidae are more closely related to the Porcellionidae or part of them, and therefore can be excluded as putative close relatives of *Chileoniscus*. The position of the noduli laterales of tergite 7 is shared with some 'Philosciidae'. Concerning this character, there is a difference between the species of *Chileoniscus*: *Chileoniscus marmoratus* has the noduli 7 in a more median position than 5 and 6, but *Chileoniscus armadillidioides* has two pairs of noduli on tergite 7, one at the same distance to the margin as noduli 5 and 6, and one in a more median position.

Clade 3: *Ischioscia*, Scleropactidae

[24-1] Apical cone of second antenna long, with short lateral setae (short, with long lateral setae): two parallelisms
[25-1] Apical cone as long as or longer than distal flagellar article (much shorter than distal flagellar article): one reversal
[43-1] Maxilliped palp second article with distal tuft of setae on a long socket (without socket)

The apical cone is long and slender, with a pair of short lateral sensilla in the Scleropactidae and numerous members of the 'Philosciidae'. The present study revealed that the same shape is also found in *Sphaerobathytropa*, which, on the basis of other characters, is excluded from the Scleropactidae. The cone is longer than the distal flagellar article in the Neotropical Scleropactidae and in numerous members of the 'Philosciidae'. The shape of the maxilliped palp seems to be a unique character, which is apomorphic for a taxon including the Scleropactidae and part of the 'Philosciidae'. Clade 3 is regarded as a well-founded monophylum. A close relationship between *Ischioscia* and the Scleropactidae was proposed by Schmalfuss (1980).

Clade 4: Scleropactidae

[1-2] Exoantennal conglobation (runner): one reversal
[72-1] Uropod sympodite plate-like, enlarged (simple): two parallelisms

Although the Scleropactidae appear as monophyletic in the present computer-based analysis, one has to admit that the support for this clade, seen in a wider context, is very weak. The exoantennal conglobation ability probably evolved multiple times within the

Crinocheta, e.g. in *Tendosphaera*, the Spelaeoniscidae, *Porcellium*, and the Cylisticidae. An enlarged uropod sympodite is present in most conglobating Crinocheta.

Clade 5: Toradjinae

[25-0] Apical cone of second antenna much shorter than distal flagellar article (as long as or longer than distal flagellar article): reversal from the condition in clade 3
[34-0] Mesal endite of first maxilla: laterodistal corner hairy (without hairs): two parallelisms, two parallel reversals, one second reversal
[58-1] Pleopod 1 exopodite with respiratory field (without): two parallelisms
[67-1] Pleopod 2 exopodite with respiratory field (without): four parallelisms, four reversals

The short apical cone is here explained by reversal from a long cone. Respiratory fields or lungs in pleopod exopodites evolved multiple times within the Crinocheta (Schmidt & Wägele, 2001). On the basis of the characters included in the present study, the monophyly of the Toradjinae is only weakly supported.

Hairs on the laterodistal corner of the mesal endite of the first maxilla evolved twice convergently, were lost twice convergently, and reappeared in one case. It seems that this character does not have a high complexity and may easily appear or disappear.

Clade 6: Neotropical Scleropactidae

[42-1] Maxilliped palp proximal article with only one large seta = one seta disappeared (two large setae present): two parallelisms, three reversals
[44-1] Maxilliped palp second article with distal tuft consisting of three or four setae (more than five setae): multiple convergent reductions and reversals

Both putative apomorphies are reductive ‘characters’ that lack any complexity. Therefore, there is no sufficient argument for the hypothesis that the Neotropical Scleropactidae form a monophyletic group.

Clade 7: *Heptapactes*, *Sphaeroniscus gerstaeckeri*, *Colomboniscus*, *Neosanfilippia*, *Troglopactes*, *Spherarmadillo*

[1-3] Endoantennal conglobation (exoantennal conglobation): one reversal, one parallelism
[1-2] No distinct lateral lobes of cephalothorax (lateral lobes present): one parallelism, one reversal

The change from exoantennal conglobation to endoantennal conglobation occurred convergently in clade 27. Within clade 7, *Troglopactes* again has an exoantennal conglobation ability. Both modes of conglobation evolved in numerous other taxa apart from those included in the data matrix.

A cephalothorax without distinct lateral lobes is also present in clade 1 (*Sphaerobathytropa* and *Chileoniscus*) and in many conglobating forms not included in the present analysis. The presence of distinct lateral lobes in clade 19 (*Colomboscia cordillierae* and *Colomboscia bituberculata*) is thus due to a reappearance, or to the lobes evolving secondarily.

Clade 7 is also only weakly supported.

Clade 8: *Sphaeroniscus gerstaeckeri*, *Colomboniscus*, *Neosanfilippia*, *Troglopactes*, *Spherarmadillo*

[8-1] Eyes represented by pigment spots without lenses (eyes with lenses)

Although this putative apomorphy appears to be consistent among the taxa included in the present study, but as long as it is not clear whether the lenses were lost by the same mutations in all species, homology is questionnable. There is no convincing argument supporting this clade.

Clade 9: *Colomboniscus*, *Neosanfilippia*, *Troglopactes*, *Spherarmadillo*

[8-2] Eyes absent (eyes represented by dark pigment spots or complete)
[9-1] Pigment absent (present): one reversal
[41-1] Maxilliped endite not hairy, but with a long subapical seta

Both reductive traits are without complexity. The loss of pigment appears to be reversed in the species *Sphe. nebulosus*. In this species, only a grey coloration is seen (live specimens were examined), whereas all remaining species have brown or ferrugineous pigment. Not only did the maxilliped endite lose the hairs and penicil, but also a subapical setae evolved, or enlarged from a previously inconspicuous size. The derived condition is also present in ‘Taxon 4’ of Schmidt (2003), which includes the Rhyscotidae, Squamiferae, Pudeoniscidae, Bathytropidae, Tendosphaeridae, Eubelidae, Armadillidae, Oniscidae, Trachelipodidae, Agnaridae, Porcellionidae, and Armadillidiidae, and in some of the ‘Philosciidae’, which may actually belong to that taxon. Convergent evolution has to be assumed.

Clade 10: *Colomboniscus* and *Caecopactes*

[27-1] Article 4 of second antenna swollen (slender)
[28-1] Article 5 of second antenna swollen (slender)
[46-2] Pereiopod 1 carpus without or with vestigial brush (oblique brush for grooming the second antenna)

The inflated articles 4 and 5 of the second antenna are unique among the taxa included. The reduction of the antennal grooming brush occurred only once among the taxa included in the present analysis, but there are other taxa with vestigial brushes among the Crinocheta, e.g. *Stenoniscus*. Probably there is a correlation between the decrease in body size and the reduction of the brush on the carpus of pereiopod 1.

Clade 11: *Neosanfilippia*

[53-1] Male pereiopod carpus: membrane of the ischium–merus joint enlarged to form a sac-like protrusion. (normal, not enlarged)

Both species of *Neosanfilippia* share the enlargement of the ischium–merus membrane of male pereiopod 7. Nothing similar is found in any outgroup taxon. The genus *Neosanfilippia* therefore can be regarded as a well-founded monophylum. The ventrodistal process of the ischium of *Amazoniscus arlei* is not homologous, and, in contrast to the results of Taiti *et al*. (1986), it does not represent a synapomorphy of *Neosanfilippia* and *Amazoniscus*.

Clade 12: *Troglopactes* and *Spherarmadillo*

[18-1] Noduli laterales large and different from the remaining tergal sensilla (noduli small or not differentiated from the other tergal sensilla): two parallelisms
[29-1] Mandibles: pars incisiva and lacinia mobilis form a (secondary) masticatory surface (no masticatory surface): three parallelisms
[30-1] Pars molaris of mandibles represented by a single hairy seta (represented by a tuft of several hairy setae): three parallelisms
[33-1] First maxilla: penicils on inner endite stout (slender): two parallelisms
[38-1] First maxilla lateral endite: lateralmost tooth seta about 1.5 times as long as second longest tooth seta (lateralmost tooth seta only slightly longer)
[64-1] Male pleopod 1 endopodite with large lateral subapical hook (without hook)

Large noduli laterales are also found in *Sphaerobathytropa*, *Chileoniscus* and many taxa of the Crinocheta not included in the data matrix. Within clade 3, formed by part of the 'Philosciidae' and the Scleropactidae, large noduli seem to have evolved only once. The conformation of the mandibles, although appearing to be very specialized, is also found in *Scleropactes zeteki* and clade 26 (*Scleropactes cotopaxii* and *Scleropactes ecuadoriensis*). However, the mandibles of *Troglopactes botosaneanui* are unknown, and this character can be assumed to have been present in the groundpattern of *Spherarmadillo* only. A single hairy seta in place of the pars molaris is common among the 'Philosciidae'. In the present analysis, it is paralleled in *Caecopactes* and *Paratoradjia*. On the inner endite of the first maxilla, there are stout instead of slender penicils in clade 12 and in clade 21 (*Scleropactes s.s.*). The size relation of the tooth setae of the lateral endite of the first maxilla is paralleled by some of the 'Philosciidae', e.g. *Pseudophiloscia* (Leistikow, 1998), not included in the present data matrix.

The sister-group relationship between *Troglopactes* and *Spherarmadillo* is well founded by several structural apomorphies, although their habitus is not very similar.

Clade 13: *Spherarmadillo*

[11-2] Coxal plate 1 with hind corner cleft, dorsal lobe more protruding (not cleft): two parallelisms
[36-1] First maxilla lateral endite: tooth setae of inner group simple (most tooth setae of inner group apically cleft): three parallelisms
[45-1] Maxilliped palp second article: distance between proximal and distal tuft of setae smaller than half length of a seta (larger than half length of a seta)
[75-1] Uropod sympodite angular (uropod sympodite rounded): three parallelisms
[76-1] Uropod sympodite wider than long
[77-1] Uropod exopodite very small, not reaching the distal margin of the sympodite

The shape of the schisma of coxal plate 1 evolved convergently in some Toradjinae. The simple teeth on the lateral endite of the first maxilla are shared with *Adinda stebbingi* and *Scleropactes s.s*. Angular uropod sympodites are also found in *Sphaeroniscus gerstaeckeri* and clade 30 (*Sphaeroniscus* excl. S. gerstackeri), and in some Eubelidae and Armadillidae, which are not included in the present analysis. The last two characters are unique among the species included in the present study, but they are also found in some Eubelidae and Armadillidae. For the structure of the mandibles, see comment under clade 12.

The genus *Spherarmadillo* is well defined and represents a monophyletic taxon.

Clade 14

[4-1] Cephalothorax with transverse furrow extending to the inner margin of the eyes (absent)
[46-1] Pereiopod 1 with longitudinal brush for cleaning the second antennae (with oblique brush): two parallelisms

The transverse groove on the cephalothorax seems to be an autapomorphy of clade 14. Something similar is described from *Mahehia maculata* Budde-Lund, 1913 (redescription by Ferrara & Taiti, 1983), but it is absent from the other two species of the same genus. No material of that genus has been examined. A longitudinal brush on the pereiopod 1 carpus is common among the outgroups not included in the present analysis.

Clade 14 can be regarded as well founded because of the presence of the transverse furrow.

Clade 15: *Scleropactoides* and *Colomboscia*

[6-0] Linea supraantennalis present, complete (absent): several parallelisms and reversals
[10-1] Coxal plate 1 with scales forming a field of fine parallel ridges on the anterior corner (without this structure): three parallelisms, one reversal

According to the present analysis, the linea supraantennalis reappeared in clade 15 after having disappeared in clade 4 (Scleropactidae). There are also losses of the linea supraantennalis in various outgroups and within clade 15. Therefore, the presence of a linea supraantennalis is not an argument supporting a closest relationship of *Scleropactoides* and *Colomboscia*. The structure of the anterior corner of coxal plate 1 evolved three times convergently, in clade 15, in *Circoniscus* and in *Sphaeroniscus*, and disappeared once within clade 15. Also, this structure is difficult to see, and it cannot be excluded that it was overlooked in some species.

Clade 16: *Colomboscia*

[37-1] Lateral endite of first maxilla with lateral group of four large teeth, one triangular lobe and one slender seta (with five large teeth and one slender seta): two parallelisms, two reversals, one second reversal
[54-1] Male pereiopod 7 merus with an acute lobe (not differentiated or with other shape)

The first character is no more than the reduction of a large tooth seta to a small triangular lobe, or the 'regrowth' to large tooth seta. The cladogram based on the present analysis requires the assumption of parallel reduction and reversal, followed by a reappearance of the derived condition.

The acute lobe on the merus is found only in *Colomboscia*, among the taxa included in the analysis, but there are similar differentiations in outgroup taxa. Lobes of similar size and position, but with a broadly rounded margin, are found in *Sphaeroniscus gerstaeckeri*, and within *Circoniscus*.

Clade 17: *Colomboscia* excl. *C. andina*

[46-0] Pereiopod 1 carpus with oblique brush (with longitudinal brush): reversal from clade 14
[47-0] Male pereiopods simple (anterior pereiopods with ventrofrontal scale-fields): five reversals, one second reversal

The transverse brush on the pereiopod 1 carpus is seen as a change from a longitudinal brush present in the groundpattern of clade 14, which includes all species with a tranverse furrow on the cephalothorax, and therefore can be regarded as a well-founded monophylum. The brushes found on the anterior pereiopods of males are often reduced. Probably, these brushes are necessary for males to attach to the smooth surface of females. In species with granulate or tuberculate tergites, they are usually less developed or absent.

Clade 18: *Colomboscia gaigei*, *C. cordillierae*, *C. bituberculata*

[10-0] Anterior corner of coxal plate 1 simple (coxal plate 1 with scales forming a field of fine parallel ridges on the anterior corner): reversal of one of three parallelisms
[16-2] Tergites tuberculate (smooth)

The structure of the anterior corner of coxal plate 1 evolved three times convergently, in clade 15, within *Circoniscus* and in *Sphaeroniscus*, and disappeared in clade 18. Also, this structure is difficult to see, and it cannot be excluded that it was overlooked in some species.

Tuberculate tergites evolved only once among the taxa included in the cladogram, but there are three parallel cases of granulate tergites. Tergites with very small tubercles (granulate) or with more or less large tubercles (tuberculate) are widespread among other species of the Oniscidea not included here. In any case, one has to assume multiple parallelisms.

Clade 19: *Colomboscia cordillierae* and *C. bituberculata*

[1-1] Clinger-type habitus (exoantennal conglobation): reversal from clade 4
[2-0] Cephalothorax with median lobe (lobe absent): reversal

In clade 4 (Scleropactidae), the habitus was influenced by the exoantennal conglobation ability, according to the present analysis. Therefore, the clinger habitus of two species of *Colomboscia* evolved by reduction of the exoantennal conglobation ability. Despite the clinger habitus of these two species, Taiti *et al*. (1995) described them as having an 'incomplete exoantennal ability to roll up'. The presence of a median lobe of the cephalothorax coincides with the clinger habitus. Here, the presence of a median lobe was regarded as plesiomorphic, but it is not known for sure whether the exoantennal conglobation habitus evolved from the plesiomorphic runner habitus directly, or via a clinger-type habitus.

Clade 20: *Scleropactes*, *Globopactes*, *Sphaeroniscus*, *Amazoniscus*, *Circoniscus*

[4-2] Transverse furrow on the cephalothorax medially straight (evenly curved): two parallelisms
[58-1] Pleopod 1 exopodite with dorsal respiratory field (without): two parallelisms
[67-1] Pleopod 2 exopodite with dorsal respiratory field (without): two parallelisms

The transverse furrow from the groundpattern of clade 14 became medially straight in *Colomboscia parva* and clade 20. A respiratory field on pleopod 1 and 2 exopodites evolved convergently in the Toradjinae (clade 5), and is also found in outgroup taxa. In the evolution of respiratory structures within the Crinocheta, multiple convergence is very probable (Schmidt & Wägele, 2001).

Clade 21: *Scleropactes s.str.*

[33-1] Inner endite of first maxilla with stout penicils (slender penicils): two parallelisms
[34-0] Distal corner of inner endite hairy (without hairs): three parallelisms
[36-1] Inner endite with all tooth setae simple (some tooth setae of the inner group are cleft): three parallelisms
[42-0] Maxilliped palp proximal article with two large setae (one large seta): reversal from clade 6

The penicils on the inner endite of the first maxilla are also stout in clade 12 (*Troglopactes* and *Spherarmadillo*). Hairs on the distal corner are found also in *Spherarmadillo nebulosus* and the Toradjinae (clade 5). The tooth setae of the inner endite are all simple in *Scleropactes s.str.*, *Spherarmadillo*, and *Adinda*. Within the Scleropactidae, there are species that have two large setae on the proximal article of the maxilliped palp, and other species that have only one seta in this place. From the position of these two setae, it can be concluded that in the species with only one seta, this is the mesal seta, the lateral seta having been lost. Almost all outgroup species in the Crinocheta have two setae. Given the present cladogram, the lateral seta was lost in *Protoradjia paeninsulae* and clade 6 (Neotropical Scleropactidae), and reappeared in *Colomboscia*, *Neosanfilippia*, and *Scleropactes s.str*.

The above characters can all be ascribed only a low complexity, because they are either quantitative changes or reductions. At present, the species included in clade 21 can be maintained in a genus *Scleropactes s.str.*, but the support for this taxon is rather weak.

Clade 22: *Scleropactes s.str.* ex *Scleropactes zeteki*

[48-0] Pereiopod dactyli: inner claw much shorter than half of outer claw (as long as or longer than outer claw): five parallelisms, one reversal
[60-1] Male pleopod 1 exopodite shorter than wide (longer than wide): four parallelisms, two reversals

Both are weak characters.

Clade 23: *Scleropactes pululahua*, *Scleropactes cotopaxii*, *Scleropactes ecuadoriensis*, *Scleropactes colombiensis*, *Scleropactes concinnus*

[63-1] Male pleopod 1 endopodite distally rugose (simple): four parallelisms, one reversal

Distal rugosity of the male pleopod 1 endopodite is also found in *Colomboscia andina*, *C. cordillierae* and *Sphaeroniscus quintus*. Within clade 23, *Scleropactes pululahua* has an endopodite tip without rugosity.

Clade 24: *Scleropactes pululahua*, *Scleropactes cotopaxii*, *Scleropactes ecuadoriensis*, *Scleropactes colombiensis*

[44-1] Maxilliped palp second article with proximal tuft of two setae (tuft of three or four setae): numerous parallelisms

Within clade 24, *Scleropactes cotopaxii* has three or four setae in the proximal tuft on the second article of the maxilliped palp, which is secondary, according to the cladogram. This character has no complexity, as it describes only the loss in number of some setae.

Clade 25: *Scleropactes pululahua*, *Scleropactes cotopaxii*, *Scleropactes ecuadoriensis*

[59-1] Male pleopod 1 exopodite without distinct median lobe (with median lobe): five parallelisms, two reversals

The shape of the male pleopod 1 exopodite seems to have changed very often: the median lobe disappeared five times convergently, in *Sphaerobathytropa ribauti*, clade 7, *Colomboscia*, clade 25, and *Globopactes*. Within clade 7, the lobe reappeared twice, in *Neosanfilippia* and *Spherarmadillo*. Taking into consideration the fact that there are numerous examples of either shape of the pleopod 1 exopodite in outgroup taxa not included in the present analysis, this character must have a high probability of parallelism.

Clade 26: *Scleropactes cotopaxii* and *Scleropactes ecuadoriensis*

[29-1] Mandible: pars incisiva and lacinia mobilis forming a broad masticatory surface (normal): three parallelisms

Mandibles with a secondary masticatory surface are also present in *Scleropactes zeteki* and in *Spherarmadillo*. Despite the parallelism, this is a structural character and not only a loss of some structure. It cannot be refuted that *Scleropactes zeteki* is probably the closest relative of these two species, because clades 22, 23, 24, and 25, including species of *Scleropactes s.str.*, but excluding *Scleropactes zeteki*, are based on characters that definitely or probably are less complex than the change in the mandible structure, which has functional consequences.

Clade 27: *Globopactes*, *Sphaeroniscus*, *Amazoniscus*, *Circoniscus*

[1-3] Endoantennal conglobation (exoantennal conglobation): two parallelisms
[3-2] No distinct lateral lobes (lateral lobes present): three parallelisms

Endoantennal conglobation is also present in clade 7. In both cases, it seems to have evolved from exoantennal conglobation. Furthermore, endoantennal conglobation is found in clade 1 (*Sphaerobathytropa* and *Chileoniscus*) and in several taxa not included in the present analysis. Lateral lobes on the cephalothorax are present in species of clinger habitus and with exoantennal conglobation. In contrast, they are often absent in species of runner habitus and species with endoantennal conglobation. Probably, the absence of lateral lobes is primary for the runner-type habitus and secondary for the endoantennal conglobation.

Clade 28: *Globopactes*

[56-1] Male pereiopod 7 merus with ventroproximal scaly tubercle (without such tubercle)
[62-1] Male pleopod 1 endopodite with straight distal part (distal part slightly curved laterally)
[59-1] Male pleopod 1 exopodite without distinct median lobe (with median lobe): five parallelisms, two reversals
[60-1] Male pleopod 1 exopodite shorter than wide (longer than wide): four parallelisms, two reversals

The genus *Globopactes* can be regarded as well founded, based on characters 56 and 62, both of which concern the male sexual differentiations. The other two characters are weak.

Clade 29: *Globopactes falconensis*, *Globopactes senex*, *Globopactes granulatus*

[12-1] Coxal plate 2 with concave lateral margin (convex)
[13-1] Coxal plate 3 with concave lateral margin (convex)

The shape of coxal plates 2 and 3 is unique among the Crinocheta; therefore, this clade is a well-founded monophyletic group. The shape of these two coxal plates is clearly an adaptation to the conglobational ability. It is remarkable that coxal plate 1 has no special adaptations, such as a schisma or lobe.

Clade 30: *Sphaeroniscus* excl. *Sphaeroniscus gerstaeckeri*

[10-1] Coxal plate 1 anterior corner with scales forming very fine parallel ridges (simple): four parallelisms
[11-1] Coxal plate 1 with hind corner cleft, ventral lobe more protruding (simple, not cleft): two parallelisms
[15-1] Coxal plate 5 with concave lateal margin (convex lateral margin): two parallelisms
[55-1] Male pereiopod 7 merus with dorsodistal tubercle on the frontal face (without)
[75-1] Uropod sympodite angular (rounded): three parallelisms

The structure of the anterior corner of coxal plate 1 is paralleled in clade 15, within *Circoniscus*, and is reversed in clade 18. However, these scales are somewhat difficult to see, and may be overlooked in less well-preserved specimens. The shape of the schisma of coxal plate 1 is similar in *Sphaeroniscus gerstaeckeri*. A concave lateral margin of coxal plate 5 is paralleled only in *Neosanfilippia zoiai*, and is not known from outgroup crinochetes. The uropod sympodite has an angular laterodistal corner also in *Sphaeroniscus gerstaeckeri* and *Spherarmadillo*. The only unambiguous character supporting the monophyly of *Sphaeroniscus* is therefore the tubercle on the male pereiopod 7 merus.

Clade 31: *Sphaeroniscus flavomaculatus* and *Sphaeroniscus frontalis*

[68-1] Pleopod 3 exopodite with respiratory field (without): two parallelisms, one reversal
[69-1] Pleopod 4 exopodite with respiratory field (without): two parallelisms
[79-1] Pleopod 5 exopodite with respiratory field (without): two parallelisms

Dorsal respiratory fields on the pleopod 3 exopodite are paralleled in clade 33 (*Amazoniscus* and *Circoniscus*), and lost in *Circoniscus hirsutus*. Among the taxa included in the present analysis, respiratory fields on pleopods 4 and 5 are also found in *Circoniscus bezzii*. *Circoniscus gaigei*, which was excluded from the data matrix because of the lack of data, also has respiratory structures on pleopod exopodites 1–5.

CLADE 32: *SPHAERONISCUS QUINTUS* AND *SPHAERONISCUS PILOSUS*

[66-1] Male pleopod 1 endopodite: apical four or five small setae distally cleft into several tips (simple): two parallelisms

On the male pleopod 1 endopodite, there is a row of very small setae along the spermatic furrow. The distalmost four or five of these setae are cleft into several tips in *Sphaeroniscus quintus*, *S. pilosus* and *S. gerstaeckeri*. The last of these species is placed together with the eyeless species in the present analysis. The hypothesis that *S. gerstaeckeri* is the closest relative of *S. quintus* and *S. pilosus* requires the assumption that the lenses disappeared convergently to the other eyeless species, and that the tubercle on the male pereiopod 7 merus changed to a rounded lobe. On the other hand, character [66-1] would have evolved only once under this hypothesis. Unfortunately, for *S. gerstaeckeri*, only the incompletely preserved holotype was available for study. I suggest that *S. gerstaeckeri* shoud be provisionally retained in the genus *Sphaeroniscus*, until more specimens can be examined.

CLADE 33: *AMAZONISCUS* AND *CIRCONISCUS*

[21-1] Distal article of first antenna with subapical group of aesthetascs exceeded by a soft tip (subapical group of aesthetascs and a pair of somewhat larger apical aesthetascs)
[22-1] Second antenna flagellum two-jointed (three-jointed): four parallelisms, one reversal
[23-1] Second antenna flagellum conical (slender)
[32-0] First maxilla: laterodistal corner of inner endite acute (rounded): three parallelisms, one reversal
[40-1] Second maxilla distally without incision or only with faint incision (distinctly bilobate): two parallelisms

According to the cladogram, there are two unambiguous characters supporting the sister-group relationship between *Amazoniscus* and *Circoniscus*. In fact, only the conical flagellum of the second antenna can be taken as synapomorphy of both taxa, because the first antenna is not sufficiently described for *Amazoniscus*.

The two-jointed flagellum is not a strong character. According to the present analysis, there are four parallel reductions from three to two flagellar articles, and one reversal. Apart from the question of whether a reversal is a plausible assumption, it is certain that within the Crinocheta the number of flagellar articles decreased from three to two several times. The mesal endite of the first maxilla has an acute laterodistal corner in *Chileoniscus marmoratus*, in clade 33, and in outgroup taxa not included here. Within clade 33, it is reversed to a rounded corner in *Circoniscus hirsutus* and *Ci. bezzii*.

The second maxilla with an unincised or hardly incised distal margin is also found in *Caecopactes*, *Colomboniscus* and *Neosanfilippia*; according to the tree topology, two or three parallelisms have to be assumed.

Clade 33 is regarded as being comparatively well supported by the shape of the second antennar flagellum.

CLADE 34: *CIRCONISCUS*

[11-2] Coxal plate 1 with hind corner cleft, dorsal lobe more protruding (not cleft)
[61-1] Male pleopod 1 endopodite with very acute distal part (apex not very acute)
[68-1] Pleopod 3 exopodite with respiratory field (without): two parallelisms, one reversal

The shape of coxal plate 1 and of the male pleopod 1 endopodite are characteristic for the genus *Circonisus*. In addition, the structure of the first antenna is probably a third unambiguous autapomorphy (see comment to clade 33). The presence of a respiratory field on the pleopod 3 exopodite also belongs to the groundpattern of *Circoniscus*, but there are other cases of respiratory fields on pleopod 3 (and 4 and 5).

TAXONOMY

SCLEROPACTIDAE

Diagnosis of the Neotropical Scleropactidae
Oniscidea with exoantennal or endoantennal conglobation ability, short pleotelson exceeded by the uropod sympodites, and long apical cone on the second antenna. If the habitus is of the clinger type, then a deep transverse furrow on the cephalothorax is present, as in most species with eyes.

***HEPTAPACTES* GEN. NOV.**

Type species: Heptapactes quadrisaetosus sp. nov.

Diagnosis
Endoantennal conglobation. All coxal plates simple. Cephalothorax with a transverse groove not projected along the eye margin. Linea supraantennalis absent. Eyes composed of seven ommatidia. Second antenna flagellum two-jointed. Pleopod exopodites without distinct dorsolateral respiratory fields.

KEY TO THE AMERICAN GENERA OF 'SCLEROPACTIDAE'

This key also includes some genera that have recently been classified as 'Scleropactidae' but that are excluded by the present phylogenetic analysis.

1. Cephalothorax with distinct median and lateral lobes parallel to the longitudinal axis. Coxal plates enlarged, directed outwards; species with clinger habitus. 2
1.* Cephalothorax with a frontal lamina vertical to the longitudinal axis; at most, small lateral lobes delimited. Coxal plates vertical, exoantennal or endoantennal conglobation ability 3
2. Cephalothorax with a deep, semicircular transverse furrow . . . . *Colomboscia* pro parte
2.* Without such a furrow . . . . *Synuropus granulatus*
3. Cephalothorax with distinct antennal lobes, second antenna apical cone short; flagellum two-jointed . . . . *Chileoniscus*
3.* Cephalothorax without antennal lobes, second antenna apical cone long 5
4. Eyes absent or represented only by a spot of dark pigment, without lenses. Pigment absent or present; transverse furrow behind the frontal shield always absent. 4
4.* Eyes present, with lenses; pigment always present; transverse furrow behind the frontal shield often present, may reach the inner margin of the eyes 11
5. Exoantennal conglobation, frontal shield with two furrows for the second antennae . . *Troglopactes botosaneanui*
5.* Endoantennal conglobation 6
6. Coxal plate 1 with schisma at the posterior corner 9
6.* Coxal plate 1 with posterior corner simple. 7
7. Flagellum of second antenna two-jointed; pigment absent; male pereiopod 7 ischium with ventrodistal process . . . . *Neosanfilippia*
7.* Flagellum three-jointed 8
8. Visible portion of uropod sympodite about twice as long as broad; larger specimens with pigment. . . . . *Richardsoniscus portoricensis*
8.* Visible portion of uropod sympodite about as long as broad; minute specimens 2–3 mm in length; without pigment . . . . *Colomboniscus*
9. Second antennae stout, with fourth and fifth articles strongly enlarged, as long as broad, and with the shape of an equilateral triangle, one corner of which projects ventrally. Body without pigment, about 2 mm long . . . . *Caecopactes minimus* sp. nov.
9.* Second antennae not very stout, its articles longer than wide. Body larger, with or without pigment. > 5 mm 10
10. Uropod sympodite about as long as broad . . . . *Sphaeroniscus gerstaeckeri*
10.* Uropod sympodite about twice as long as broad . . . . *Spherarmadillo* Richardson, 1907
11. Coxal plates 2 and 3 with strongly concave lateral margin . . . . *Globopactes* gen. nov.
11.* Coxal plates 2 and 3 with convex lateral margin 12
12. Coxal plate 1 with schisma 13
12.* Coxal plate 1 margin simple 14
13. Flagellum two-jointed. . . . . *Circoniscus*
13.* Flagellum three-jointed . . . . *Sphaeroniscus*
14. Flagellum two-jointed; male pereiopod 7 ischium with ventrodistal appendix. . . . . *Amazoniscus*
14.* Flagellum three-jointed 15
15. Pleopod 1 and 2 exopodites with strongly wrinkled dorsal respiratory fields. . . . . *Scleropactes*
15.* Pleopod exopodites not distinctly wrinkled or without respiratory fields 16
16. Transverse groove on cephalothorax in dorsal view evenly curved . . . . *Colomboscia* pro parte
16.* Transverse groove medially straight and only laterally curved 17
17. Coxal plate 4 with acute angle 18
17,* Coxal plate 4 more rounded. 19
18. Male pereiopod 7 merus with ventroproximal scaly tubercle . . . . *Globopactes* gen. nov.
18.* Male pereiopod 7 merus withiout such tubercle . . . . *Scleropactoides* gen. nov.
19. Proximal article of maxilliped palp with only one large seta, male pereiopod 7 merus with triangular lobe on the frontal face; pleopod 1 endopodite distally smooth . . . . *Colomboscia parva*
19.* Proximal article of maxilliped palp with two large setae, male pereiopod 7 merus simple; pleopod 1 endopodite on the lateral face of the apex with small tubercles. . . . . *Scleropactes s.str.*

HEPTAPACTES QUADRISAETOSUS GEN. NOV., SP. NOV.

Material examined

Type specimens: One ♂, holotype (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321); one ♀m, paratype (same data, MNRJ 18645) (Map Fig. 24).

Description (Figs 18–23)
Male 0.9 mm wide, cephalothorax 0.51 mm wide. Female with marsupium, cephalothorax 0.65 mm wide. Both specimens with 7/7 ommatidia. No linea supraantennalis. Cephalothorax is behind the upper margin of the frontal shield with a transverse furrow, which laterally terminates near the eyes.

According to the preserved traces of pigment, the specimens may have been uniformly brown with pale muscle insertions. Details of the surface could not be seen, due to the poor preservation of the specimens; noduli laterales could not be found with certainty, but, if present, they are small (otherwise it would have been possible to see at least their insertions).

First antenna three-jointed, with two large apical aesthetascs and two smaller subapical aesthetascs on the distal article. Second antenna about as long as pereiopod 7, but much thicker. Flagellum two-jointed, with one (?) aesthestasc on the distal article. Apical cone as long as the flagellum, slender, and with one lateral free sensillum. Fifth article of second antenna bears a subapical seta, which is as long as the flagellum.

Left mandible: pars incisiva large, with five cusps, lacinia mobilis with two cusps, lobe proximal of the lacinia bearing few scales and two hairy setae, one hairy seta between this lobe and the pars molaris, which is represented by a tuft of (few) hairy setae. Right mandible: pars incisiva, lacinia mobilis and lobe smaller, the latter with only one hairy seta. Otherwise as left mandible. Both mandibles with one (?) scale setae (and some scales?) on the outer surface. First maxilla lateral endite with lateral group of five large simple tooth setae and one slender seta, and mesal group of six more slender setae, four of them apically cleft. One very small seta in subapical position beside the mesal group of tooth setae, on the caudal face. Distal third of lateral endite fringed with hairs (pectinate scales). Mesal endite bearing four penicils, the lateralmost slightly smaller than the other three. Second maxilla apically bilobate, mesal lobe with some coarsely scattered sensilla on the margin. One (?) sensillum between the lobes. Lateral lobe appears hairy (pectinate scales). Maxilliped palp three-jointed, proximal article with only one seta near the median margin; second article on the mesal margin with distal tuft of setae on a long socket, and proximal 'tuft' represented only by a single seta on a short socket; lateral margin of second article with one stout and one slender seta. Apical article with an apical tuft of setae and three (?) single setae on the lateral margin. Maxilliped endite with some pectinate scales, one simple seta near the inner corner on the caudal face, and a very large and stout penicil on the frontal face. Maxilliped basis with scales and scale setae on the caudal face and fine hairs on the laterodistal edge.

Pereiopods with relatively large scales, as is usual in small Oniscidea. Pereiopod 1 on frontal face of carpus with large brush composed of scales; on the propodus there is a smaller field of spine-shaped scales (or setae?). Other pereiopods without anything special (e.g. without ventral brushes and without any protrusions). Dactyli with slender inner claw nearly as long as outer claw, ungual seta distally somewhat enlarged, dactylar seta distally with a fringe of setules on one side, and a number of other scales and setae (the exact number could not be determined because of the poor condition of the specimen). Whether there is a small seta beside the ungual seta could not be determined.

All pleopod exopodites without conspicuous respiratory fields. Male pleopods: pleopod 1 exopodite without marginal setae, exopodites 2–5 with one (two) marginal seta and some pectinate scales near the mesal margin. Pleopod 1 exopodite wider than long. Pleopod 5 exopodite with a groove along the median margin, and with pectinate scales on the caudal face. Owing to the poor state of preservation of the specimen, it remains unclear whether the irregular arrangement of these pectinate scales is natural or an artefact. Pleopod 1 endopodite with straight distal portion directed laterally at an angle of about 35°. The distal portion shows no row of small spine-like setae; this may be a preservation artefact. Pleopod 2 endopodite broken on both sides, so that its length remains unknown. However, the preserved part is already about one and a half times as long as the exopodite.

Remark
The two available specimens are poorly preserved, but they clearly represent a previously undescribed species. They have well-developed eyes, and their transverse groove on the cephalothorax is not projected laterally as far as in the other members of the Scleropactidae with eyes.

NEOSANFILIPPIA BRIAN, 1957

Type species: Neosanfilippia venezuelana Brian, 1957 (m).

Diagnosis
Endoantennal conglobation. Eyes and pigment absent. Flagellum of second antenna two-jointed.

KEY TO SPECIES OF *NEOSANFILIPPIA*

1. Coxal plate 5 laterally concave. Cephalothorax with transverse ridge below the upper margin of the frontal shield. Coxal plates 6 and 7, pleon epimera 3–5 and uropod sympodites with strong ridge on their inner face .... *Neosanfilippia zoiai* Manicastri, 1991

1.* Coxal plate 5 laterally convex. Cephalothorax and hind part of body without such ridges..................... .... *Neosanfilippia venezuelana* Brian, 1957

Coxal plates without schisma. Male pereiopod 7 ischium with a ventrolateral process, which appears to be a membraneous structure; it does not bear any setae or scales. Pleopod exopodites without dorsal respiratory fields and without marginal setae. Uropods of same shape as in *Scleropactes*.

Relationships

The process on male ischium 7 was regarded as a putative synapomorphy shared with *Amazoniscus* (Taiti *et al.*, 1986), but the processes may be not homologous: In *Neosanfilippia*, it seems to be an outgrowth of the articular membrane, which lacks scales or setae, whereas in *Amazoniscus*, it is a prolongation of the apical margin of the ischium.

NEOSANFILIPPIA VENEZUELANA BRIAN, 1957

Neosanfilippia venezuelana Brian, 1957 – Vandel (1968); Schultz (1981*); Paoletti (1989); Manicastri (1991); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

One ♂, one ♀ (Venezuela, Sierra de San Luis, Hueque, leg.?, April 1971, MNHN); six ♂, three ♀m, six ♀ (Falcón, Sierra de San Luis, near Cueva San Luis, 11°07′21″ N, 69°40′46″ W, leg. C. Schmidt, 20 March 1998, cCS 194b); three ♂, three ♀m, two immatures (Andes, between Valera and La Puerta, 9°09′30″ N, 70°41′31″ W, altitude 1500 m, leg. C. Schmidt, 23 March 1998, cCS 202a); 26 ♂, 30 ♀ with marsupium, 37 ♀, six juvenile ♂, six juvenile ♀, two mancas (Venezuela, Edo. Lara, Humocaro Alto, Cueva de la Segunda Cascada, 9°36′20″ N, 70°00′ W, altitude 1235 m, zona no-guanifera, leg. H. Escalona & O. Villareal, 7 July 1998, UCV, SMNS, cCS 284); 16 ♂, one juvenile ♂, 16 ♀m, five ♀, one juvenile ♀ (Venezuela, Edo. Lara, Cueva de la Segunda Cascada, leg. O. Villareal & H. Escalona, 7 August 1998, UCV, cCS 285); four ♂, eight ♀m, five ♀, three juvenile (Venezuela, Edo. Trujillo, Cueva de los Justos, leg. K. Ginei, 23 December 1998, UCV); two ♂, one ♀m (Venezuela, Edo. Trujillo, Vega de Guaramacal, Sector Agua Fria, Cueva del Burro, leg. H. Escalona, 24 December 1998, UCV); two ♂ (Venezuela, Edo. Yaracuy, Aroa, Tierra Fria, Cueva de los Añadidos, altitude 800 m, on guano of the Guacharo *Steatornis caripensis*, leg. H. Escalona, 22 December 1998; UCV); one ♀m (five eggs), one ♀ (Venezuela, Lara, Barbacoas, Hierbabuena, Cueva del Indio, altitude *c.* 2000 m, at the entrance of the cave, leg. H. Escalona, 21 April 2000, UCV); 33 ♂, 20 ♀m, 33 ♀, eight immature/juvenile, one manca (Venezuela, Lara, Humocaro Bajo, 9°40′N 69°58′W, Cueva Na Diega, leg. H. Escalona, 7 March 2000, UCV, cCS 359); ten ♂, three ♀m, 17 ♀, immature or juvenile (Venezuela, Edo. Falcón, Cueva Combote 1, 11°11′00″ N, 68°36′30″ W, altitude 202 m, Capadare, El Cayude, leg. H. Escalona, 4 August 1998, UCV); five ♂/immature ♂, three ♀/immature (Venezuela, Edo. Falcón, Sector Yaravaco, Cueva El Viento, 11°09′17″ N, 68°36′27″ W, altitude 200 m, sobre detritus, leg. H. Escalona, 19 April 1999, UCV).

Previous records

Venezuela – Estado Falcon, ‘Cueva de Rio Gueque’ (Brian, 1957); P. N. Henri Pittier, Rancho Grande, selva nublada (Paoletti, 1989).

Description (Figs 25–30)

Male maximum 8.4 × 3.5 mm. Eyeless and unpigmented isopod with endoantennal conglobation ability. Cephalothorax with frontal shield slightly exceeding vertex. Coxal plates all simple. Noduli laterales very small and forming part of the posterior row of tricorn setae on the posterior margin of each pereion tergite. Difference between noduli and tricorns is seen only in the sensory setae, the free portion of which is equal in length to the scaly portion in the noduli, whereas in the tricorns only the tip of the sensory seta is free. First antenna three-jointed, apical article bearing some irregularly arranged aesthetascs on the frontal face. Second antenna with two-jointed flagellum, with apical cone slightly longer than the distal article, provided with one small lateral seta. The distal article also has two aesthetascs (or groups of aethetascs). Mandibles with left two/right one penicil on the hairy lobe, one penicil between the hairy lobe and the pars molaris; the latter is represented by a tuft of hairy setae. First maxilla lateral endite on the distal margin with four stout teeth, triangular lobe and slender stalk on the lateral portion, and six slender setae, four of which are cleft, on the mesal portion. Mesal endite with two acute penicils and rounded laterodistal corner. Maxilliped endite without scales; one seta on the caudal face and two setae or lobes on the apical margin are present. Maxilliped palp basal article with two large setae, second article on the mesal margin with distal tuft of numerous equal setae on a socket, two single setae near the socket, and a proximal 'tuft' represented by only one stout seta located near the socket; on the lateral margin with two small setae. Distal article with apical tuft of setae and a single seta on the outer margin. Pereiopod 1 with antennal brush. Ventral brush of scales present on carpus of male pereiopods 1–4 and merus of male pereiopods 1–6. Male pereiopod 7 ischium with ventral or ventrofrontal row of large scales and a process on the ventrodistal corner. This process has a membraneous aspect and lacks any scales or setae. Dactylus with ungual seta with small seta beside it, dactylar seta with hirsute apex and not exceeding the claw, and some other setae and scales. Pleopod exopodites without dorsal respiratory fields and without marginal setae. Pleopod 5 exopodite with area of pectinate scales on the caudal face. Male pleopod 1 endopodite slightly curved outwards, with row of minute setae. On the lateral margin of exopodite 1, there is a very narrow margin that is thinner than the remaining portion of the exopodite and therefore resembles a respiratory field delimited by a sulcus. Male pleopod 2 endopodite slightly exceeding the exopodite; exopodite 5 on the medial margin with a furrow to receive endopodite 2. Male exopodite 1 lateral margin slightly indented. Uropod protopodite with outer corner rounded. Exopodite inserted on the inner corner, about half as wide as the apical margin of the protopodite.

Biology

Females with marsupium are found in March–April, July–August, and December (probably during the whole year). Number of eggs (or embryos) in the marsupium: five ($N = 2$), six ($N = 1$), seven ($N = 1$), eight ($N = 3$), nine ($N = 3$), ten ($N = 6$), 11 ($N = 1$), and 15 ($N = 1$). In the smallest females, there are eight eggs in rows of two. Lower numbers refer to larger females, which are presumed to have lost some eggs or embryos. In the largest females, eggs can be arranged in transverse rows of up to four eggs.

Although most specimens were collected in caves, we found N. venezuelana outside caves in two cases.

Remarks

Samples from different localities show considerable variation concerning male characters. The distal process of ischium 7 may appear longer or shorter; this is probably an artefact caused by the hyaline nature of the process. Also, the scale-row on the ischium is more or less curved and more or less strongly developed. The pleopod 1 exopodite has a weakly sinuous lateral margin in small (subadult) males, but a pronounced notch in large males. In the male characters, *N. zoiai* Manicastri, 1991 much resembles immature specimens of *N. venezuelana*. Furthermore, it should be considered that the sides of the pleotelson may appear straight or sinuous, depending on the angle under which the pleotelson is viewed. However, a clear difference is seen in the lateral margin of coxal plate 5.

The last two samples of the list contain specimens deviating from the above description in their distinctly smaller body size, although they are adult, as proven by the presence of a marsupium in females and of sperm bundles in males. Furthermore, they have a strongly hirsute appearance, the dorsal scale setae being longer than in typical *N. venezuelana* specimens of the same body size. As the male characters are within the range of variation described above, the question of whether these samples represent a separate species remains open to future research.

Geographical distribution

Venezuela, States Falcón, Lara, Trujillo, Aragua.

NEOSANFILIPPIA ZOIAI MANICASTRI, 1991

Neosanfilippia zoiai – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Types: One ♂, one ♀ (paratypes, Ecuador, Esmeraldas district, Borbon, Valdez, at sea level, leg. S. Zoia, 28 July 1984, MZUF 2740).

Description (Fig. 32)

4.1–4.5 mm long, 1.9 mm wide, cephalothorax 1.21 mm ($N = 2$).

Animals devoid of any pigment and eyes, with endoantennal conglobation ability. Cephalothorax with a weak ridge parallel to the upper margin and a strong transverse ridge at some distance below the upper margin of the frontal shield. Tergites smooth, with only small scale setae. Noduli laterales not discernible on entire specimens. Coxal plate 1 with a slight concavity near the hind corner, coxal plate 5 with distinctly concave lateral margin. Coxal plates 6 and 7, pleon epimera 3–5 and uropod sympodites with a strong ventral ridge at some distance from the lateral margin. This ridge seems to fit with structures on the cephalothorax (and anterior part of the body) and thus enforces the stability of the enrolled animal.

Geographical distribution
Known only from the type locality (Map Fig. 31).

Remarks
This species was separated from *N. venezuelana* on the basis of the following characters: (1) pleotelson with sinuous margins (straight margins); (2) frontal line straight (frontal line folding to the back, narrower in the middle); (3) shape of male pleopod 1; and (4) morphology of the distal process of the male pereiopod 7 ischium. Characters 1 and 2 are dependent on the angle under which the specimen is seen, and are therefore not reliable. The shape of the male pleopod shows variation relative to the body size that is greater than the differences said to distinguish *N. zoiai* and *N. venezuelana*. The distal process of male pereiopod 7 ischium is smaller in *N. zoiai*. Examination of numerous specimens of *N. venezuelana* showed considerable variation, which seems to be due to the fact that the process is an outgrowth of the articulation membrane, which is soft and does not have a stable shape.

However, both species are separated by very distinct characters that can be seen in males and females (and most probably also in immature specimens). These are a concave lateral margin of coxal plate 5, a transverse ridge on the frons, with some distance to the upper margin of the frontal shield, and a ridge on the inner face of coxal plates 6 and 7, pleon epimera 3–5, and uropod sympodites. The first two of these were drawn in the illustrations of the original description, but not mentioned in the text, and the conspicuous marginal ridge on the posterior half of the body was entirely overlooked.

In contrast to the information in the original description, there are no paratype specimens in SMNS.

COLOMBONISCUS VANDEL, 1972

Type species: Colomboniscus regressus Vandel, 1972 (by monotypy).

Diagnosis
Endoantennal conglobation. Very small: maximum 3.5 mm. Integument smooth, with very fine and short 'hairs'. Eye reduced, represented only by a spot of pigment without lens, or entirely absent. Cephalothorax rounded, without any rectangular corner. Pleotelson rounded, with straight sides. Flagellum of second antenna three-jointed, and very slender. All coxal plates simple. Noduli laterales small, on the hind margins of the tergites.

Remark
Vandel (1972) defined this genus by its 'numerous regressive traits'.

COLOMBONISCUS REGRESSUS VANDEL, 1972

Colomboniscus regressus Vandel, 1972 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: Two ♀ [Colombia, montane forest (Robles) between La Mesa and Mosquera, altitude 2600–2700 m, leg. Sturm, 28 June 1967, MNHN-CV]; slides with cephalothorax, second antenna, maxilliped, tergites 1 and 2, pleotelson + uropod of ♀ (CV 5818-1 to 5818-6) and pleopods 1 and 2 of ♂ (CV 5819) [it is not indicated from which of the five samples mentioned by Vandel (1972) the dissected specimens were taken); one anterior half, two juveniles, two mancas [Colombia, montane forest (Robles) between La Mesa and Mosquera, altitude 2600–2700 m, leg. Sturm, 28 June 1967, SMF 12453]. All these specimens are syntypes (Map Fig. 36).

Description (Figs 31–35)
Tergites hirsute. Pale yellowish white, with only some patches of reticulate pigment of pale brown colour. Cephalothorax slightly more pigmented, with distinctly visible muscle insertion spots. Eyes absent, but with a concentration of pigment in the place where the eyes usually are. Cephalothorax with upper margin of

KEY TO SPECIES OF *COLOMBONISCUS*

1. In frontal view, the upper margin of the frontal shield is evenly curved; in dorsal view, it is distinctly bent backwards 2
1.* In frontal view, the upper margin of the frontal shield is medially straight; in dorsal view, it is straight and not bent backwards . . . . *Colomboniscus* species 2
2. Second antenna not inflated. Tergal face with traces of reticulate pigment, especially in the region of the eyes . . . . *Colomboniscus regressus* Vandel, 1972
2.* Fifth peduncular article of second antenna strongly inflated; very small, unpigmented animals about 1 mm in width; coxal plate 1 without schisma . . . . *Colomboniscus tristani* (Arcangeli, 1930).

frontal shield in frontal view evenly curved, in dorsal view medially somewhat bent backwards. Noduli laterales distant from the lateral margin but near the posterior margin of the tergites, as small as scale setae, differing from them by the shorter sheath and the more protruding sensory seta.

First antenna three-jointed, distal article as long as first and second articles together, and bearing one or two subapical and two apical aesthetascs. Second antenna of the two females from Robles and of the male (on slide) with three-jointed flagellum; the distal two articles delimited by a weak but visible suture.

Maxilliped base approximately rectangular, with some scale setae on the surface and some hairs on the laterodistal corner. Endite long and rectangular, two large setae and one lobe (or one seta and two lobes?). Maxilliped palp proximal article with two large setae, the lateral seta being somewhat smaller than the mesal seta. Second article on the mesal margin with distal tuft of one large and about five slender setae on a common socket, one smaller seta beside the socket, and one seta representing the proximal 'tuft'. Lateral margin with one broad and one slender seta. Distal article with apical tuft of one large and more than five slender setae, and two slender setae on the lateral margin.

Male genital papilla distally truncate, with subapical orifices. Male pleopod 1 endopodite weakly curved, with a row of small setae along the dorsal spermatic furrow. In the single male examined, the row has nine setae and ends before reaching the tip. Probably this is an artefact, and the more distal setae were lost, so more specimens need to be examined. Exopodite shorter than wide, without any marginal setae or respiratory field, longer mesally than laterally. Male pleopod 2 endopodite straight, exceeding the exopodite.

Pleotelson with convex distal margin. Uropod sympodites laterally rounded, exopodites as long as visible part of the sympodites, exceeding the latter by half of their length; endopodites protruding slightly more than sympodites.

Habitat

Montane forest and Páramo. The specimens were found in moss, grass, and *Espeletia*, and in leaf litter (Vandel, 1972).

Remark

The first-mentioned two females are different from the single female specimen from Tibabita. Whereas the weak pigmentation and the somewhat hirsute surface are identical, the frontal shield has a very different shape: in the two females from Robles, the upper margin is strongly curved in frontal view, as illustrated by Vandel (1972), and medially bent backwards in dorsal view; in contrast, in the female from Tibabita, the upper margin of the frontal shield is medially straight in both frontal and dorsal views. Differences like this are otherwise not known to occur within one species, and so both are provisionally regarded as distinct. Unfortunately, it is not known from which sample the male preparations were taken.

COLOMBONISCUS SPECIES 2

Colomboniscus regressus Vandel, 1972 pro parte.

Material examined

One ♀ [montane forest at Tibabitá, approx. 11 km north of Bogotá (Calle 80), altitude 2600–2800 m, moss on/at (?) trees, leg. Sturm, 19 July 1967; CV, syntype of *Colomboniscus regressus* Vandel, 1972].

Description (Fig. 37)

Female 3.6 mm. Tergites hirsute, with only some patches of very weak, reticulate pale brown pigment, otherwise yellowish white (specimen preserved in alcohol). Cephalothorax slightly more pigmented, with distinctly visible muscle insertion spots. Eyes absent, but with a concentration of pigment in the place where eyes usually are. Frontal shield of cephalothorax in frontal view medially straight, in dorsal view approximately straight over most of its width. The frontal shield also covers a larger portion of the vertex than in *C. regressus*. Second antenna with three-jointed flagellum; the distal two articles are delimited only by a weak suture. Apical cone as long as the distal two flagellar articles. Pleotelson short, with nearly straight sides, medially curved. Uropod exopodites and endopodites ending at the same level.

Habitat

Montane forest at 2600–2800 m, in moss.

Remark

Different from the other syntypes in the shape of the frontal shield of the cephalothorax. As only a single female specimen is available, the new species is not named.

COLOMBONISCUS TRISTANI (ARCANGELI, 1930) COMB. NOV.

Scleropactes tristani Arcangeli, 1930 – Arcangeli (1931b); Van Name (1936*); Schmalfuss (1980*); Leistikow (1997*); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined
Four ♂, three ♀m, one ♀, one juvenile (Venezuela, Caripe, 10°10′31″ N, 63°30′12″ W, 7 April 1998, cCS 229a), one ♂, one ♀m, one ♀ (same data, UCV); one ♂, seven ♀ (Costa Rica, San José, leg.?, November 1911, MZUF 3958); four ♂, five ♀ (Costa Rica, Originaco, leg.?, MZUF 3957); two ♀m [Costa Rica, 'Fed. Hort. Board.', *Amaryllis* bulbs, leg. C. A. Davis (without date), USNM 60596] (Map Fig. 36).

Description (Figs 38–44)
Male 2.9×1.0 mm, cephalothorax 0.68 mm wide. Females with marsupium: cephalothorax width 0.74–0.78 mm.

Very small, with endoantennal conglobation ability. Eyes and pigment entirely absent. Frontal shield in frontal and dorsal views with an obtuse angle on its upper margin. Coxal plate 1 with a weak furrow parallel to its margin. All coxal plates simple. Pleotelson short, slightly rounded. Noduli laterales very small, located on the hind margins of the tergites/coxal plates. Scale setae distinct, giving the animal a hirsute appearance.

First antenna three-jointed, apical article as long as basal two articles together, three subapical and two apical aesthetascs. Second antennae stout, the five-segmented peduncle, especially its fifth article, strongly inflated. Flagellum of normal shape, three articles, and an apical cone equal in length to all three flagellar articles together. Apical cone with one small lateral sensillum.

Mandibles with pars incisiva of four cusps (or five cusps?) and lacinia mobilis of two cusps; left lacinia larger than right lacinia. Lobe basal to the lacinia mobilis with one penicil on the right mandible and two penicils on the left mandible. Both mandibles with one penicil between lobe and pars molaris, the latter consisting of a tuft of hairy setae. First maxilla mesal endite with two penicils, and distolateral corner rounded. Lateral endite with lateral group of four stouter and mesal group of six more slender teeth. At the base of the lateral group, there is a small, acute lobe and a short, slender tooth. Four teeth of the mesal group have their tip cleft. Second maxilla indistinctly bilobate, with some sensory spines on the mesal lobe. Maxilliped endite with three setae or lobes on the apical margin, and one extremely small spine or seta on the laterodistal corner. Maxilliped palp three-jointed. Basal article with two large setae, second article on the mesal margin with basal 'tuft' of only one seta, and distal tuft consisting of one very large and some smaller and more slenderer setae on a common socket. Distal article with one tuft of setae, among them one larger, similar to the large seta of the second article.

Pereiopod 1 carpus and propodus with brush of scales for cleaning the second antennae. Male pereiopods 1–4 on ventral face of merus and carpus with weakly developed brushes of scales. Pereiopod 7 on frontal face of basis and ischium with vestigial water-conducting scale-rows that seem to be non-functional. Ventral margin of male ischium 7 concave, with a submarginal fringe of scales. These are smaller in subadult males (cCS 229a). Dactyli with slightly curved ungual seta and dactylar seta apically hirsute. Inner claw at most half as long as outer claw. Uropods similar in shape to those of *Scleropactes* and *Neosanfilippia*.

Male pleopod 1 endopodite with row of setae that are large in comparison with those of *Neosanfilippia*. Apex simply rounded, with some hairs. Endopodite 2 exceeds the exopodite by about half its length. Pleopod 1 exopodite roughly triangular, and apically rounded, without marginal seta. Exopodites 2–5 with one marginal seta each. Pleopod 5 on the caudal (dorsal) face with a multiple row of pectinate scales.

Diagnosis
This species is easily distinguished from other small, unpigmented Scleropactidae by its three-jointed flagellum and the inflated appearance of the fifth peduncular article of the second antenna, in combination with the frontal shield, which is slightly recurved on the vertex. In frontal and dorsal view, the upper margin of the frontal shield is curved, not straight.

Habitat
Without doubt, this minute, unpigmented and eyeless species is adapted to an endogeic life. Two of the four samples were collected in gardens, one under flower pots, and the other in (?) *Amaryllis* bulbs; for the other two samples, no habitat information is known. Until this species is found in a natural habitat, its geographical origin will remain dubious.

Biology
The samples mentioned in Arcangeli (1930) contained 40 males and 149 females, which is a male/female ratio of 0.268 (Arcangeli, 1931b). In the marsupium, he always counted four eggs or embryos.

Remarks
The type specimens are most probably lost (Ferrara & Taiti, pers. comm.), but fortunately specimens from one of the places mentioned in the original description (San José) were available for study. Schmalfuss (1980) noted that this species does not belong in the genus *Scleropactes*, as currently defined.

CAECOPACTES GEN NOV.

Diagnosis
Very small, eyeless and unpigmented specimens. Endoantennal (?) conglobation ability. Frons of cephalothorax concave. First coxal plate with schisma on hind corner. Second antenna with two-jointed flagellum and strong proximal articles. Fourth and fifth articles triangular, with one corner projecting ventrally.

Type species: Caecopactes minimus sp. nov.

Derivation of the name
caecus (Latin) (blind) and *pactes* derived from the name *Scleropactes*.

CAECOPACTES MINIMUS SP. NOV.

Material examined

Types: One ♂ holotype and two ♀ paratypes (Ecuador, Napo Prov., Rio Hollin, altitude *c*. 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF) (Map Fig. 24).

Description (Figs 45–51)
Male 2.0×0.95 mm, cephalothorax width 0.71 mm. Tergites smooth, with scattered bristle-like scale setae. Each tergite with one pair of noduli laterales, which are broader than the ordinary scale setae; all noduli at the same distance from the margin. Cephalothorax with neither eyes nor lobes, the frontal face concave. First coxal plate with schisma on the hind corner, the lower lobe exceeding the upper lobe in the lateral direction, whereas the upper lobe is slightly longer posteriorly. Coxal plates 2–7 are simple, more rounded (2–4) or more angular (5–7), as it is common for conglobating Oniscidea. Sternite 7 with truncate median lobe (bent frontad in the drawing). Sternite 5 with (vestigial) female gonopores (although the specimen has male pleopods and testes). Between sternites 6 and 7, there is a paired structure of unknown function. Pleotelson short, exceeded by uropods.

First antenna three-jointed, basal article slightly longer than the approximately equally long articles 2 and 3. Distal article bearing two aesthetascs. Second antennae short and stout. Fourth and fifth articles ventrally enlarged, resulting in a nearly triangular shape. Flagellum two-jointed, distal joint approximately twice as long as basal joint, and bearing a (row of?) aesthetasc(s) and a long apical cone with one small lateral sensillum.

Right mandible with three-lobed pars incisiva, small, but three-cusped lacinia mobilis, and a lobe with one penicil basal to the lacinia. Right mandible with five-lobed pars incisiva, larger, three-cusped lacinia mobilis, and a lobe with two penicils. Both mandibles with one penicil between the lobe and the pars molaris, which is represented by a single hairy seta. First maxilla lateral endite on the distal margin with lateral group of four stronger teeth and a triangular lobe and mesal group of six setae, only two of them apically cleft (mesal endite lost during preparation). Second maxilla indistinctly bilobate, with a row of few (seven?) sensilla along the margin of the mesal lobe. Maxilliped basis with few scales and few scale setae, and a few hairs on the distolateral corner. Maxilliped palp with proximal article bearing only one seta near the mesal margin; the other articles fused. On the mesal margin with a basal group of two small setae, mesal group of one large and two (?) smaller setae on a common socket, and the apical tuft of equal-sized setae. Lateral margin with a group of one large and one slender seta and two slender setae.

Pereiopod 1 with antennal brush on carpus and propodus, on the latter consisting only of a row of setae. Male pereiopods 1–4 with ventral fields of only few scales. Dactyli with inner claw only 0.2 times as long as outer claw. Ungual seta slightly curved, not exceeding the outer claw, with a small seta beside it. One smaller seta each on frontal and caudal face. Dactylar seta slightly curved, simple, and reaching the tip of the outer claw. One or two aesthetasc-like setae beside the dactylar seta. Male pereiopod 7 ischium with a strong ventrodistal projection.

Male genital papilla with strong ventral shield exceeding by two processi, which bear the gonopores. Male pleopod 1 endopodite straight, with a row of 16 small setae along the spermatic furrow on the distal half. Proximal half enlarged, nearly as broad as the exopodite, which is more short than broad, and has no setae or hairs at all. Male pleopod 2 exopodite triangular with concave lateral margin and hairy mesal margin. Endopodite 2 twice as long as exopodite. Pleopods 3 and 4 on the mesal margin with some pectinate scales, pleopods 4 and 5 with a very small subapical seta on the lateral margin. No trace of lungs or dorsal respiratory fields could be found.

Uropods consisting of flat, enlarged sympodite, endopodite, and exopodite. The exopodite is inserted in a more distal position, but the tips of endopodite and exopodite are on the same level, somewhat exceeding the sympodite.

Biology
The specimen on which the drawing is based has two parasitic fungi, probably Laboulbeniales, one on the cephalothorax and one on the second antenna. No information on the habitat was given.

Derivation of the name
Latin *minimus* (the smallest, or very small).

TROGLOPACTES GEN. NOV.

Type species: Scleropactes botosaneanui Vandel, 1973.

Diagnosis
Exoantennal conglobation. Cephalothorax with two longitudinal furrows, and without transverse furrow behind the frontal shield. Eyes and pigment absent. All coxal plates simple. Noduli laterales distinct, much larger than the other dorsal sensilla. Second antenna with three-jointed flagellum.

TROGLOPACTES BOTOSANEANUI (VANDEL, 1973)

Scleropactes botosaneanui Vandel, 1973 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: Slides with appendages of a ♂ (lectotype, designated here) (CV 5870-1 to 12, Cuba, Prov. de Matanzas, Cueva de Bellamar, 1.4 km south of 'Bahia de Matanzas', leg. Expedition Biospéologique Cubano-Roumaine, 3 July 1969); one ♂, one ♀ (both paralectotypes, designated here) (Cuba-15, March–June 1969).

Description (Figs 52–54)
Female 5.4 × 1.8 mm. Male 5 mm. Without any trace of pigment (after Vandel, 1973), eyes absent. Frontal shield of cephalothorax with two shallow longitudinal furrows that indicate exoantennal conglobation ability. No transverse furrow behind the frontal shield. Coxal plates 2–5 somewhat constricted due to conglobation ability, otherwise simple: no schisma or internal notches or lobes present. First coxal plate with shallow sulcus along the lateral margin (not to be confused with a sulcus arcuatus). Surface with minute scale setae and one pair of noduli laterales, which lie near, but not on, the apical margin. The noduli laterales are large in comparison with the scale setae, but small when compared with those of the 'Philosciidae'. Pleotelson apically evenly rounded, uropods with small exopodite inserted on the mediodistal corner and exceeded by the mediolateral corner of the sympodite. Endopodites laterally compressed, filling the space between the sympodites/exopodites.

First antenna three-jointed. Second antenna with three-jointed flagellum bearing a long apical cone, which, however, is shorter than the very long apical article. Second article with two and apical article with three aesthetascs in transverse rows. (the peduncular articles of the antenna on the slide were much too compressed and distorted to be drawn properly). First maxilla mesal endite with rounded laterodistal corner and two stout penicils, which, in the specimen examined, show traces of abrasion and thus appear stouter than they might have originally been. Lateral endite on the distal margin with lateral group of four simple teeth, one very small triangular lobe, and a small 'slender stalk'. Mesal group of six more slender teeth, some of which are cleft. Lateral margin of lateral endite with fringe of hair-like structures. Maxilliped base partly covered with cuticular scales and few scale setae. Maxilliped palp three-jointed; basal article bearing only one large seta, second article on the inner margin with apical tuft of setae on a socket and a 'group' of two setae basal to this, and two unequal setae and a tuft of 'hairs' on the outer margin. Apical article with two single setae and a tuft of 'hairs' on the outer margin and a tuft of setae on the tip. Endite with one setae on the caudal face and two acute lobes (or setae?) on the apical margin. Male pleopod exopodite 1 rounded, without marginal setae; exopodites 2–5 with only one marginal seta each. Male pleopod 1 endopodite on lateral face with a subapical, acute lobe; row of small setae straight, apically more closely spaced. Exopodite 5 with groove along the mesal margin and acute posterior corner.

Habitat
Cave.

Remark
Vandel (1973) placed the species in the genus *Scleropactes* because it fits with a previously published (Vandel, 1968) definition of the genus *Scleropactes*. The resemblances of *T. botosaneanui* with this definition are the conglobation ability, the lack of a schisma of coxal plate 1, the short pleotelson, the insertion of the uropod exopodite, and pleopod exopodites without lungs. According to the present phylogenetic analysis, all these characters are plesiomorphic within the Scleropactidae. The exoantennal conglobation, which is not included in the definition of the genus *Scleropactes* by Vandel (1968), seems to be derived from an endoantennal conglobation ability, and constitutes an apomorphy of *T. botosaneanui*. In consequence, the exoantennal conglobation of *T. botosaneanui* and the species of *Scleropactes s.str.* is convergent. Furthermore, *T. botosaneanui* lacks a transverse furrow on the cephalothorax, and is therefore excluded from clade 14 (see above).

RICHARDSONISCUS VANDEL, 1963

Type species: Sphaeroniscus portoricensis Richardson, 1901 (by monotypy).

Diagnosis
By endoantennal conglobation ability and simple coxal plates. Eyes represented by dark pigment, but no lenses are visible. In dorsal view, the visible portion of the uropod sympodite is nearly twice as wide as long. Pleotelson with median shallow tubercle.

RICHARDSONISCUS PORTORICENSIS (RICHARDSON, 1901)

Sphaeroniscus portoricensis Richardson, 1901 – Richardson (1905); Pearse (1917); Van Name (1925).

Richardsoniscus portoricensis comb. nov. Vandel, 1963.

Material examined

Types: Three ♀m, one ♀ (all damaged), syntypes (Puerto Rico, El Yunque, altitude 850 m, leg. C. W. Richmond, 26 February 1900, USNM 23914).

Description (Fig. 56)
Female without marsupium 5.8 × 2.4 mm, female with marsupium maximum 2.8 mm wide. Endoantennal conglobation ability. None of the coxal plates cleft. Frontal line of cephalothorax in frontal view almost evenly curved. No ommatidial lenses visible, but dark pigment is seen under the integument of the frontal corners of the head. Tergites smooth. (Colour not preserved.) Pleotelson with a medial shallow tubercle. In dorsal view, the visible part of the uropod sympodite is nearly twice as wide as long, slightly shorter than the exopodite length.

Geographical distribution (Map Fig. 55)
Puerto Rico. Pearse (1917) also reported the occurrence of this species in Guyana, but his specimens were not seen.

Remark
Deviates from species of *Sphaeroniscus* by the simple margin of the first coxal plate. Therefore, the species is assigned to a separate genus, following Vandel (1963). The phylogenetic position can only be tentatively determined, because the appendages remain unknown.

SPHERARMADILLO RICHARDSON, 1907

Type species: Spherarmadillo schwarzi Richardson, 1907 (by original designation and monotypy).

Diagnosis
Crinocheta with endoantennal conglobating ability. Cephalothorax with frontal shield appressed to the vertex. Eyes at most represented by a patch of dark pigment. First coxal plate with schisma. Pleotelson exceeded by uropods, not reaching the body outline. Noduli laterales distinct, larger than tergal scale setae, at small distance from the posterior margin of the tergites.

Second antenna with three-jointed flagellum bearing a slender apical cone with one small lateral free sensillum (or a pair of small sensilla?). Mandibles: right mandible with pars incisiva forming a broad surface exceeded by four short cusps; small, simple lacinia mobilis. Left mandible with well-developed four-cusped pars incisiva and very large lacinia mobilis with three short cusps. Paris molaris represented by a single, strong hairy seta. First maxilla lateral endite with nine simple tooth setae, one smaller 'triangular lobe' (a reduced tooth seta), and one very small, thin seta (homologous with the 'slender stalk' found in other taxa). Mesal endite with two stout penicils, and laterodistal corner rounded, but bearing a small point or seta. Maxilliped endite without penicil, but with three simple setae. Maxilliped palp on the proximal article with one large seta. Pereiopod 1 with a scale-brush (for cleaning the second antennae) that is very oblique, nearly perpendicular to the longitudinal axis of the carpus. Pleopod exopodites lacking distinct respiratory fields. Male pleopod 1 endopodite with subapical hook on the lateral face. Uropod sympodite angular; the portion visible in dorsal view is broader than long, exopodite very small, inserted on the dorsal face near the median margin.

Remark
As well as the type species, two species from Mexico were assigned to this genus (Mulaik, 1960). One new species is described below, so the genus includes four species.

SPHERARMADILLO SCHWARZI RICHARDSON, 1907

Spherarmadillo schwarzi Richardson, 1907 – Van Name (1936); Mulaik (1960*); Schultz (1970, 1984), Schmalfuss (1980), Leistikow & Wägele (1999*); Schmalfuss (2003*).

KEY TO THE SPECIES OF *SPHERARMADILLO*

1. Lateral margins of pleon epimera and uropod sympodites serrate; male pleopod 1 endopodite simple, curved laterally . . . . *Spherarmadillo schwarzi* Richardson, 1907
1.* Lateral margins of these parts smooth; male pleopod endopodite 1 with a small, acute lobe on the lateral margin, curved laterally 2
2. Body well pigmented, with a dark slate grey/pale colour pattern . . . . *Spherarmadillo nebulosus* sp. nov.
2.* Pigment entirely absent 3
3. Distal half of uropod endopodites projecting beyond the body outline . . . . *Spherarmadillo huatuscensis* Mulaik, 1960
3.* Uropod endopodites not exceeding the sympodites only slightly . . . . *Spherarmadillo cavernicola* Mulaik, 1960

Material examined

Types: One ♀ holotype (Guatemala, Livingston, leg. Schwarz & Barber, April 1906; USNM 33471). *Other samples:* (?) One immature ♀ (Mexico, Palenque, leg. P. Beron, 18 Janaury 1982; MZUF 1442).

Description (Fig. 57)
Female 18 × 7.7 mm (coloration not preserved). Eyes without lenses, but represented by patches of dark pigment. Tergites smooth, with small tricorn setae. Noduli laterales broken off, but their insertion pits are in a similar position as in *Sphe. nebulosus*. Coxal plate 1 on dorsal face along the margin with a furrow that is confluent with the schisma on the hind corner. Lower lobe of schisma shorter than upper lobe, but laterally more extended. Apical cone of the second antenna slightly shorter than the apical article of the flagellum. Visible part of uropod protopodites in dorsal view wider than long, with very small exopodite inserted on its medial margin. Apical margins of pleon epimera and uropod protopodites finely serrated.

Remark
The male character used in the key was taken from Schultz (1970), who described some characters based on specimens from Trece Aguas, Guatemala. Schultz (1984) erroneously wrote that the holotype is 8.1 mm long.

A small (2.1 mm wide, cephalothorax 1.25 mm wide), supposedly juvenile, specimen may also belong to this species. The lateral margins of pleon epimera and uropod sympodites are finely serrated, and weaker than in the holotype, but this can be attributed to the smaller size. The proportions of the uropods are similar, although the sympodites are slightly longer (Map Fig. 55).

Geographical distribution
Guatemala, Mexico. The place where the second specimen was collected could not be located with certainty. There are several places named 'Palenque' in Mexico.

SPHERARMADILLO CAVERNICOLA MULAIK, 1960

Spherarmadillo cavernicola Mulaik, 1960 – Leistikow & Wägele (1999*); Souza-Kury (2000*).

Spherarmadillo schwarzi – Schultz (1984); Schmalfuss (2003*).

Material examined

Types: Not seen.

Other samples: One ♀m, two ♀, two ♂ (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441); one ♂, two ♀ (same data, SMNS 10094).

Description (Figs 58–64)
Male maximum 6.4 × 2.5 mm (cephalothorax 1.55 mm wide), female with marsupium 7.1 × 3.3 mm (cephalothorax 1.85 mm wide). Eyes and pigment entirely absent. Tergal surface smooth, with scales (not shown on Fig. 59). Cephalothorax with frontal shield separated from vertex only by a suture. Its upper margin in frontal view is evenly convex, and in dorsal view is medially slightly recurved. First coxal plate with a schisma, the outer lobe much exceeding the inner lobe caudally, the inner lobe slightly exceeding the outer lobe laterally. All tergites with one pair of noduli laterales, at the same distance from the lateral margin, and at some distance (decreasing from one to seven) from the posterior margin. Noduli four to five times longer than the ordinary scale setae.

First antenna three-jointed; distal article is approximately six times as long as second article and 1.3 times as long as basal article. Distal article with two large distal aestethascs with narrow tips, and two transverse rows of smaller aesthetascs. Second antenna slightly longer than pereiopod 7, with thickened fifth article and a three-jointed flagellum. Distal articles of the latter are separated by a suture that is weaker than the joint between the first and second article and appears not to allow movement. Apical cone long, but shorter than the distal flagellar article, with only one (not a pair) indistinct structure which may be a (vestige of?) lateral free sensillum.

Mandibles: right mandible with pars incisiva forming a broad surface exceeded by four short cusps, small, simple lacinia mobilis. Left mandible with well-developed four-cusped pars incisiva, and very large lacinia mobilis with three short cusps. Hairy lobe with one hairy seta each and one hairy seta between the lobe and the simple pars molaris represented by a single, thick, hairy seta. Probably the left mandible has two hairy setae on the hairy lobe and none between lobe and pars molaris; this is not completely visible (Fig. 60). Exterior part of both mandibles with some scales and few scale setae. First maxilla lateral endite on the apical margin with one large lateral tooth seta and eight smaller tooth setae, plus one seta that is about half as long and more lobe-like; as well as the latter, there seems to be a very slender and short seta, probably a vestigium of the 'slender stalk'. All setae have simple tips, and according only to the position of the lobe-like seta, three of the smaller setae, together with the large lateral one, can be identified as the lateral group, whereas five setae form the mesal group. No small subapical setae could be seen. Distal third of the lateral margin of the lateral endite fringed with hairs (pectinate scales); the fringe is not continuous. Mesal endite of first maxilla bearing two stout penicils with dense setules, the distolateral corner bearing a small, but sharp tip. Second maxilla apically bilobate, the mesal lobe being somewhat broader than the lateral lobe and bearing a field of sensilla on the mediodistal margin. One single sensillum between lobes. Maxilliped basis on the proximal two-thirds with rather irregular scales, and some scale setae. Endite rectangular, with one long, sharp lobe in the distal margin, one seta on the lateral corner, a fringe of hairs on lateral margin, and one seta on the caudal face, in a subapical position. Maxilliped palp three-jointed, the proximal article bearing a single large setae near the medial margin, the second article with a tuft of three setae of unequal size on a long socket; at the base of a socket, two small setae thought to be homologous with the basal tuft as found, for example, in *Scleropactes*. One small seta beside the socket. Lateral margin of the second article with one slender and one stout seta. Distal article with an apical tuft of numerous small setae, one such seta in a subapical position on the inner margin, and one seta and a tuft of hairs (pectinate scale?) on the lateral margin. On the frontal face of the distal article there is a longitudinal fold and a small seta beside it.

Pereiopod 1 with transverse brush composed of scales on the carpus, and row of small scales or setae on the proximal portion of the ventral face of the propodus. Male pereiopods 1–3 with enlarged scales on the ventral face of the carpus. Male pereiopod 7 with elongated ischium with concave ventral margin, but no further special structures. Dactyli with outer claw, slightly shorter inner claw, a more or less curved ungual seta even shorter than both claws, and a very small seta beside the ungual seta. Dactylar seta also not reaching the tip, distally slightly enlarged, and with a fringe of setules. Beside the dactylar seta there are two aesthetasc-like setae and some scales.

None of the pleopod exopodites have obvious lungs or respiratory fields (but, at least in the dissected specimen, there is a proximal area with a diffuse structure, which might turn out to be either an artefact or something related to respiration, if fresh specimens are examined). Exopodites 2–5 have one or two marginal setae, the number differing even between the pleopods of one pair. Male pleopod 1 endopodite distally slightly curved, with a recurved lobe on the lateral face and a row of long spines along the spermatic furrow. Exopodite 1 is transverse, with a weakly developed distal lobe. Male pleopod 2 exopodite is distally elongate, and only slightly shorter than the endopodite. Male pleopod 5 exopodite distally extended to an acute lobe, with a distinct furrow along the medial margin and a transverse band of pectinate scales on the caudal (dorsal) face.

Habitat
Cave.

Geographical distribution (Map Fig. 55)
Mexico, States Tamaulipas and San Luis Potosi (Souza-Kury 2000).

Remark
Spherarmadillo cavernicola was reduced to a synonym of *S. schwarzi* by Schultz (1984). The present investigation suggests that these are separate species. *Spherarmadillo schwarzi* is distinguished from *S. cavernicola* at least by the serrated margin of the pleon epimera and uropod sympodites.

SPHERARMADILLO NEBULOSUS SP. NOV.

Material examined
One ♂ holotype, one ♀m paratype (Venezuela, Parque Nacional Henri Pittier, near Estación Biológica Rancho Grande, leg. C. Schmidt, 14 March 1998, UCV); one ♀m, paratype (Venezuela, Parque Nacional Henri Pittier, above Estación Biológica Rancho Grande, leg. C. Schmidt, 14 March 1998, UCV); one ♀m, one ♀, paratypes (Venezuela, Parque Nacional Henri Pittier, above Estación Biológica Rancho Grande, leg. C. Schmidt, 14 March 1998, cCS 181b).

Description (Figs 65–71)
Male 8.7 × 3.8 mm, cephalothorax 2.05 mm wide; adult females (with marsupium) *c*. 8.5 mm long, 4.1–4.3 mm ($N = 3$) wide, cephalothorax 2.25–2.30 mm ($N = 3$) wide. Eyes absent. The animals can roll up into a perfectly spherical ball. Dorsal surface dark slate-grey, with pale muscle insertion spots and pale patches. Ventral surface pale, with some isolated chromatophores scattered over pereiopods, sternites and genital papilla. Tergites smooth and shining, with small tricorns and large, distinct noduli laterales at a short distance from the posterior margin of the tergites; distances to the lateral margins all equal and similar to those in other members of the Scleropactidae. One row of scale setae along the posterior margin of the tergites. Behind the position of the noduli, there is a gap in this row.

First antenna three-jointed; the distal article has two apical aesthetascs and a row of subapical aesthetascs. Second antenna has a three-jointed flagellum that is longer than the fifth article of the peduncle. Both the second and third articles bear aesthetascs. The apical cone is shorter than the apical flagellar article, but nevertheless represents the elongate type, with one short lateral sensillum.

Mandibles: left mandible with enlarged lacinia mobilis provided with only very shallow teeth. Pars incisiva as usual, hairy lobe with two penicils; one penicil between the hairy lobe and the pars molaris, which is represented by a single, densely hirsute seta. This seta seems to be not a true seta, but a tuft of hairy setae, where the basal part, on which the setae are inserted, is elongate and the setae are very short. The lacinia mobilis has the appearance of a masticatory plate. Right mandible with pars incisiva enlarged, with shallow marginal teeth; lacinia mobilis very small; pars incisiva and lacinia mobilis of the right mandible seem to form the counterpart of the masticatory surface of the left mandible. Hairy lobe of the right mandible reduced in size, bearing one penicil. One penicil between the hairy lobe and the pars molaris, which is represented by a large seta as in the left mandible. First maxilla lateral endite with lateral group of one large tooth with some structure on its inner face, and three small teeth that correspond in size to the teeth of the mesal group, one short, triangular lobe and a slender stalk, which does not exceed in length the triangular lobe. Mesal group of six teeth, one of them smaller. Whether one subapical small seta exists could not be determined with sufficient clarity. Inner endite with two stout, densely hirsute penicils and rounded laterodistal corner. Second maxilla with two subequal apical lobes; the mesal one is provided with a group of sensilla. Maxilliped endite rectangular, with one subapical seta on the caudal face and two setae on the apical margin. Frontal face with some pectinate scales, but not on the apical part. Maxilliped palp three-jointed. Proximal article with one large mesal seta; a minute vestige of a lateral seta can be seen. Second article on inner margin with distal tuft of one large and several small setae on a socket. The proximal tuft is composed of only two small setae, and approaches near to the base of the socket of the distal tuft. Lateral margin of mesal article with two setae and some long 'hairs' (pectinate scales). Apical article with apical tuft of setae, some irregularly placed setae on the frontal face, and one seta on the lateral margin. Pereiopod 1 with antennal brush composed of scales. Male pereiopods 1-4 with scale brushes on the ventral face of merus and carpus. Similar scale brushes or only a few scales are present on ischium and merus of most pereiopods. On male pereiopod 7, these brushes are composed of spine-shaped scales and are much more dense than on the other pereiopods. No trace of water-conducting scale rows on pereiopods 6 and 7. Dactyli with apically hirsute dactylar seta, simple, slightly curved ungual seta accompanied by a minute basal seta, short inner claw, one more seta on frontal and caudal face each, and some other setae or scales. Sternite 7 medially very narrow. Pleopod exopodites without distinct dorsolateral respiratory fields. Male pleopod 1 endopodite curved outwards, with subapical sharp process on its lateral margin. Proximal part of the endopodite (containing muscle M47) with lateral margin angulate. Pleopod 2 endopodite exceeds the exopodite, the tip of which is curved to fit endopodite 1. Exopodite 5 with medial furrow to receive endopodite 2 and field of pectinate scales on the caudal face. Exopodites 2–5 with one to three marginal setae. Uropod protopodite enlarged and flattened; outer edge angulate; the exopodite reduced in size, inserting on the medial margin of the protopodite.

Derivation of the name
Latin *nebulosus* (foggy), because the specimens were found in the cloud forest (selva nublada).

Remarks
The new species is distinguished from *Spherarmadillo schwarzi* by smaller size, margins of pleon epimera and uropod protopodites not serrated. Concerning male characters, which Schultz (1970) described for *Sphe. schwarzi*, the new species differs by the presence of an acute lobe on the lateral margin. Schultz's specimens should be re-examined, to confirm the conspecificity with *Spherarmadillo schwarzi*.

The disposition of the noduli and the marginal row of tricorn setae implies that the position of the noduli distant from the margin represents a derived condition. The ancestral condition was a row of tricorn setae along the posterior margin of the tergites, and the pair of noduli per tergite was part of this row. When the noduli moved in a frontal direction, they left a gap in the marginal row of setae.

This species (probably also the whole genus) is remarkable for the combination of a fully pigmented body with the absence of eyes. Vandel (1958) denied the existence of pigmented oniscids without eyes, and explained their description by an observation error; in the cases that he examined, this was correct. Here, the existence of a blind, but pigmented oniscid is demonstrated for the first time.

Habitat
Cloud forest at the level of the Biological Station and above. The specimens were found in leaf litter and under stones.

SPHERARMADILLO HUATUSCENSIS MULAIK, 1960

Spherarmadillo huatuscensis – Schultz (1970); Leistikow & Wägele (1999*); Souza-Kury (2000*); Schmalfuss (2003*).

No specimens were available.

According to the original description, this could be a distinct species. The main difference from the other species of *Spherarmadillo* are the extremely elongate uropod endopodites. Similar enlarged endopodites are not known from any other species of Oniscidea, and it would be interesting to study their function.

Geographical distribution
Mexico: Huatusco (Veracruz Prov.).

Habitat
Cave.

COLOMBOSCIA VANDEL, 1972

Type species: Colomboscia cordillerae Vandel, 1972 (by monotypy).

Diagnosis
Conglobating or not conglobating. Small noduli laterales inserted on the posterior margin of the pereionites. Strongly convex, protruding eyes. Cephalothorax with distinct lateral lobes, median lobe present or absent. Linea supraantennalis present. Profrons with a median obtuse longitudinal carina; frontal region separated from vertex by a deep groove that continues along the inner margin of eyes. This groove is evenly curved (except for *Colomboscia parva*). All coxal plates simple. No interruption in the body outline between pereion and pleon. Pleotelson distally rounded or triangular, distinctly shorter than pleon-epimera 5 and uropodal protopodite. First antenna of three articles, third article conical, bearing a tuft of aesthetascs on the mesal face and two aesthetascs on the apex. Second antenna short, when bent backwards, slightly surpassing the posterior margin of tergite 1. Flagellum of three articles, the apical cone as long as the flagellum (unknown in *C. bituberculata*). Pars molaris of mandible consisting of a tuft of hairy setae. First maxilla mesal endite with two penicils, lateral endite with outer group of five stout teeth (or four teeth and a basal lobe?) and a slender seta, which is apically hairy, and inner group of six slender teeth, five of which are apically cleft. Maxilliped with hairy endite bearing a penicil on its frontal face. Maxilliped palp with basal article bearing one large seta near the mesal margin. Medial article with basal tuft of several small setae, distal tuft of setae on a socket. Pereiopods with a long hairy dactylar seta. Male pereiopod 7 with a triangular process on the frontal surface. Pleopod exopodites without dorsal respiratory structures. Uropod protopodite flattened, rectangular. Exopodite inserting on the posteromedial corner. Endopodites laterally flattened and distinctly exceeding the pleotelson and the protopodites. [Based on the diagnosis given by Taiti *et al*. (1995).]

Remarks
Vandel (1972) described *Colomboscia cordillerae* as a species of Bathytropidae, without any argument supporting this placement and obviously because of a superficial similarity of the habitus. Taiti *et al*. (1995) redescribed the species, described a new species, and transferred the genus to the Scleropactidae. Their arguments for the inclusion in the latter family are

1. ability to roll up
2. cephalic groove similar to that in species of *Scleropactes*
3. telson distinctly shorter than uropod protopodite
4. antenna with very long apical organ
5. outer branch of the first maxilla with a setose stalk among the outer group of teeth
6. dactylar seta very similar to that of *Scleropactes*
7. uropod protopodite flattened, exopod inserting in a notch on posteromedial corner, endopodite projecting beyond tip of telson

Characters (3) and (5), and probably also (6), are plesiomorphic. The telson is shorter than the uropod protopodite in *Olibrinus*, Scyphacidae, *Actaecia*, some ‘Philosciidae’, and *Ligia*. In consequence, this has to be regarded as a character that was been present in the groundpatterns of the Crinocheta and Oniscidea. The conglobational ability (1) should be regarded with caution. On the one hand, conglobation ability evolved many times independently, e.g. in the Armadillidae, Tylidae, and Armadillidiidae, some species of the Porcellionidae and Eubelidae, some species of *Armadilloniscus*, *Actaecia*, *Buddelundiella*, and the Tendosphaeridae, and even some taxa outside the Oniscidea or the Isopoda. On the other hand, within the Scleropactidae, two modes of conglobation are found, the exoantennal in *Colomboscia* and *Scleropactes* and the endoantennal in the remaining species. Also, conglobational species usually have coxal plates 2 and 3 or 2–4 somewhat laterally constricted, which is not the case for *Colomboscia*. Despite the assumption of Taiti *et al.* (1995) that *Colomboscia* spp. have exoantennal conglobation ability, the morphology of the body and coxal plates is clearly of the 'creeper type' (Schmalfuss, 1984).

Character (2) could be regarded as a synapomorphy with *Scleropactes*.

The cephalic transverse groove as a putative synapomorphy justifies the inclusion of *Colomboscia* in the Scleropactidae.

The presence of distinct cephalic lobes is a plesiomorphy compared with the lamina frontalis of most of the Scleropactidae. The same is true regarding the three-jointed flagellum with the long apical organ.

The present study suggests that the two named and one unnamed species previously included in *Colomboscia* form a monophylum characterized by the clinger habitus, which evolved secondarily from a conglobating habitus. Furthermore, the species *andinus* and *gaigei*, formerly included in the genus *Scleropactes*, and one new species, are successively related to that monophylum. In order to avoid paraphyletic genera, these three species are here included in the genus *Colomboscia*. The alternative would have been the introduction of three new genus names for the latter three species.

One of the characters reported by Taiti *et al.* (1995) can be regarded as an autapomorphy of *Colomboscia*: ♂ pereiopod 7 merus on the frontal face with a triangular process; the base of this process occupies the basal half of the merus.

The genus *Colomboscia* includes four named and one unnamed species.

COLOMBOSCIA ANDINA (VANDEL, 1972) COMB. NOV.

Scleropactes andinus Vandel, 1972 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Lectotype – one ♂ (Colombia, Bogotá, above calle 71, altitude 2750 m, 14 February 1969, CV) (other syntype specimens transferred to *Colomboscia parva* sp. nov.).

Description (Figs 72–74)

Male; *c*. 3.6 × 2.1 mm. Coloration: irregular pattern of approximately one-third dark brown and two-thirds pale yellow (or colourless). Pereiopod basipodites somewhat darkly pigmented, ischium pale, merus, carpus and propodus weakly pigmented. Otherwise ventrally not pigmented. Surface not perfectly smooth, but with only very shallow tuberculation. Cephalothorax with distinct lateral lobes. Transverse furrow deep, evenly curved, and laterally reaching the eyes. Eyes large, composed of 16 ommatidia.

Anterior corner of first coxal plate delimited by a distinct ridge. (This is the ridge that delimits the lateral sulcus.) Noduli laterales very small but distinct, located on the posterior margins of tergites and all at same distance from lateral margin.

Second antenna with three-jointed flagellum; the three articles slightly increase in length from proximal to distal. Apical cone slender, nearly as long as the flagellum. Maxilliped basis with scales on the proximolateral quarter of its caudal (ventral) surface, and with few scale setae; laterodistal edge with fine hairs (pectinate scales). Epipodite without hairs or

KEY TO THE SPECIES OF *COLOMBOSCIA*

1. Tergite 1 with two pairs of very large, finger-like protruding tubercles, and tergites 2–7 and cephalothorax with one pair of such tubercles . . . . *Colomboscia bituberculata* Taiti, Allspach & Ferrara, 1995
1.* Tergites with small tubercles only or without tubercles 2
2. Non-conglobating forms with well-developed median lobe of the cephalothorax 3
2.* Conglobating forms with lateral lobes only 4
3. Lateral and median lobes of cephalothorax divided by an acute angle; median lobe triangular . . . . *Colomboscia cordillierae* Vandel, 1972
3.* Lateral and median lobes divided by a right angle; median lobe rounded . . . . one unnamed species (Taiti *et al*. 1995)
4. Tergites with large but shallow tubercles . . . . *Colomboscia gaigei* (Pearse, 1915)
4.* Tergites smooth. 5
5. Transverse groove on cephalothorax evenly rounded . . . . *Colomboscia andina* (Vandel, 1972)
5.* Transverse groove in its median part more or less straight . . . . *Colomboscia parva* sp. nov.

scales. Endite rectangular, distally and on the mesal margin hairy (elongate scales), with a short (?) penicil near the inner corner. Maxilliped palp on proximal article with only one large seta (the lateral seta lacking), second article on inner margin with a proximal tuft of three subequal setae and a distal tuft of numerous equal setae on a common socket, and two single setae beside this socket, and one slender and one broad seta on the lateral margin; distal article with an apical tuft of numerous setae and one single seta on the lateral margin. Pereiopod 1 with brush composed of elongate, partly fringed scales on the carpus and of spines and scales on the propodus. As only one male was available for examination, it is not known exactly to what extent the scales belong to the brush present in both sexes, or to the ventrofrontal scale-fields present only in males. On the carpus, approximately the ventral two-thirds are covered with scales belonging to either of the mentioned structures; on the merus, only the ventral face is occupied by the male scale-field. The other pereiopods were not dissected, but no scale-fields were seen on the following pereiopods. Male pereiopod 7 with distinct scale-rows belonging to the water-conducting system on basis and ischium, and less distinct scale-rows on merus and carpus. Ischium with a concave area on the frontal face, near the distal margin; merus with an acute triangular dorsolateral lobe on the frontal face, near the midlength. Dactyli with frontal and caudal subapical setae, curved ungual seta with smaller seta beside it, which reaches about half the length of the inner claw. Dactylar seta in its distal portion with one row of setules and apically narrowed into a very fine tip. In addition, there are some scales and few other structures probably setae.

Male pleopod 1 endopodite only very weakly curved, with a row of 25 small setae beside the medial margin of the spermatic furrow, some backwards-directed lobes or scales on the lateral face of the distal portion, a row of scales along the base of the spermatic furrow, and some pectinate scales on the portion that is opposite to the genital papilla and on the lateral margin, near the base. Pleopod 1 exopodite rounded triangular, with only a few pectinate scales along its margins; no distinct respiratory area can be seen. Male pleopod 2 with slender endopodite exceeding the exopodite. Exopodite 2 with convex lateral margin, a furrow covered with pectinate scales along the medial margin, and a single marginal seta. Pleopod 2 sympodite laterally with one small seta.

Pleotelson short, with sinuate posterior margin. Pleon-epimera 5 with convex inner margin. Uropod sympodite distal margin with narrowly rounded tip, exopodite as long as visible part of the sympodite. Endopodites in dorsal view ending at the same level as the exopodites.

Remark

Known only from the lectotype. The species can probably be recognized by the distinctive colour pattern and by the structure of the anterior corner of the first coxal plate. In the original description, Vandel (1972) referred to two localities, without indicating the number of specimens. In Vandel's collection, there is one male specimen from Bogotá, labelled *Scleropactes andinus*, and another male from Resina, labelled *Scleropactes gaigei* Pearse. As the collecting data of the second specimen are identical with those in the original description of *Scleropactes andinus* and the name *Scleropactes gaigei* is not mentioned by Vandel (1972), the identity of both specimens as syntypes of *Scleropactes andinus* is confirmed. Obviously, Vandel later recognized the differences and (mis)identified the second specimen as *Scleropactes gaigei* Pearse. This seems to be unpublished. Here, the first specimen is designated as a lectotype of *Scleropactes andinus*, and the second is made a holotype of a new species, *Sclerópractes parvus* (see above).

COLOMBOSCIA PARVA SP. NOV.

Scleropactes andinus Vandel, 1972 *pro parte*.

Type specimen: One (immature?) ♂ holotype (Colombia; Resina, village on the west slope of the east Cordillera, between Altamira and Florencia, altitude between 1800 and 2300 m, montane forest, in leaf litter, leg. H. Sturm, 8 June 1956, det. Vandel, MNHN, syntype of *Scleropactes andinus*).

Description (Figs 76–78)

Male; 3.0 × 1.35 mm, cephalothorax 0.76 mm wide. Coloration: dark brown with irregular pale patches and pale muscle insertion spots. Coxal plates lighter than tergites. Second antenna flagellum pale, uropod exopodites and endopodites pigmented in the proximal half, pale in the distal half. Surface not perfectly smooth, but with very shallow, nearly inconspicuous tuberculation. Cephalothorax with distinct lateral lobes. Transverse furrow laterally reaching the eyes, with medial portion slightly recurved. A weak ridge at some distance from the anterior margin of the first coxal plate; the distance is three to four times as large as the distance from the ridge parallel to the lateral margin. Eyes composed of 13 ommatidia, protruding beyond the level of the vertex, so that not all ommatidia can be seen in a strictly lateral view. Body flat in comparison to species with 'eusphaerical' conglobation ability; somewhat resembles the creeper type. Very small noduli could be seen on the posterior margins of coxal plates 1–4 (but this could not be confirmed on dissected and mounted material).

First antenna three-jointed, apical article with some aesthetascs. Second antenna: apical cone as long as all three flagellar articles together. Maxilliped base with large scales in the lateroproximal third and few scale setae. Epipodite without scales. Endite long, parallel-sided, apically truncate with rounded corners. One seta on the caudal face, one elongate penicil on the frontal face, near the distal margin, and scales or spines on distal and medial margins of the endite. Maxilliped palp basal article with a single large seta near the medial margin, the second article on the medial margin with a proximal tuft one large and one very small seta, and two single setae beside the distal tuft, and one slender and one broad seta on the lateral margin (distal tuft of second article and distal part of apical article broken off). Apical article with one single seta on the lateral margin. Pereiopod 1 with a brush of scales on the carpus; some scales are very long, others appear to be distally fringed (propodus and dactylus broken off). Pereiopod 7 with distinct rows of scales (vestiges of the water-conducting structures) on the base and less distinct scale-rows on ischium and merus. Ischium with a shallow groove and merus with a rounded dorsofrontal lobe at the midlength. Dactyli with outer claw, inner claw of same length, stout ungual seta between the claws, and a smaller seta of half its length beside the ungual seta. Dactylar seta long, with a fringe of long setules in the distal portion. Except for these, one seta each on frontal and caudal faces and a few scales. Male genital papilla with ventral shield, more than half as long as the endopodite. The endopodite slightly bent outwards, with simple tip and a row of spine-shaped setae along the dorsal spermatic furrow. In the only known specimen, the row consists of 18 setae on the left and 16 setae on the right endopodite. Pleopod 2 endopodite exceeding the exopodite by about one-third. Pleopod exopodites without conspicuous respiratory structures. Pleopod 1 exopodite broader than long, without any visible setae or scales. Pleopod exopodites 2–5 with one small marginal seta on the outer margin, and an area of pectinate scales along the medial margin. Pleopod 5 exopodite on the caudal face with one or two rows of large pectinate scales, and the space between this row and the margin covered with smaller pectinate scales; median margin with distinct lateral furrow. Pleotelson short and apically sinuate. Uropod sympodites with narrow lateral lobe. Exopodite as long as visible portion of sympodite (in dorsal view) and half as broad as sympodite.

Remark

The only specimen known up to now was first identified as *Scleropactes andinus* by Vandel (1972), and later as *Scleropactes gaigei* Pearse, by Vandel (unpublished). As there are no spermatozoa visible in the genital papilla, it is not certain whether the specimen is adult. At present, it seems to be distinguished from *Scleropactes andinus* by the transverse furrow on the cephalothorax, which is medially slightly recurved, the less smooth tergal surface, and the shorter male pleopod 1 exopodite. However, more material is needed to estimate the intraspecific variation in that species.

COLOMBOSCIA GAIGEI **(PEARSE, 1915) COMB. NOV.**

Sphaeroniscus gaigei Pearse, 1915.
Parsphaeroniscus gaigei – comb. Lemos de Castro (1967*).
Scleropactes gaigei – comb. Schultz (1970) – Leistikow & Wägele (1999*); Schmalfuss (2003*).
Not: *Scleropactes gaigei* – Vandel (1972) (misidentification).

Material examined

Types: One ♀ or immature and one anterior half (paratypes, Colombia, Sierra Nevada de Santa Marta, on highest timber on San Lorenzo, altitude 2380 m, under leaves in ground, leg. F. M. Gaige, 23 July 1913, USNM 47946).

Other samples: One immature ♂ (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-8, altitude 2250 m, bamboo cloud forest, in litter and Sphagnum, leg. H. G. Müller, 18–25 August 1985, SMF 19378); one ♀m (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-7, altitude 2200 m, wayside, from moss and litter, leg. H. G. Müller, 18–25 August 1985, SMF 19379); one ♀m, one ♀, one juvenile ♂ (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-8, altitude 2250 m, bamboo cloud forest, in litter and Sphagnum, leg. H. G. Müller, 18–25 August 1985, SMF 19380); one ♂, one juvenile ♂, two ♀m (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381); one ♀m (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10a, altitude 2250 m, bamboo cloud forest, in leaf litter, leg. H. G. Müller, 23 August 1985, SMF 19382); one ♀m (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-11, altitude 2250 m, bamboo cloud forest, in leaf litter, leg. H. G. Müller, 24 August 1985, SMF 19383).

Description (Figs 79–85)

Adult female approx. 4.5–6.5 mm long ($N = 5$), 2.5–3.3 mm wide ($N = 6$), cephalothorax 1.25–2.53 mm wide ($N = 6$). Male; 4.6×2.4 mm, cephalothorax 1.25 mm wide.

Colour poorly preserved. Articles 4 and 5 of the second antenna have brown pigment; traces of brown pigment are found on the anterior part of tergite and coxal plates 1. Habitus similar to that of *Scleropactes parvus*, able to conglobate to a lemon shape. Cephalothorax with distinct lateral lobes; transverse furrow evenly curved, deep and reaching the posterior margin of the eyes. First coxal plate with anterior corner delimited. Tergites with large but shallow tubercles. Hind margins of tergites fringed with scale setae that are broader than long. Eyes composed of 16–21 ommatidia.

First antenna three-jointed, second article shortest, distal article with a pair of apical aesthetascs and a group of (seven?) slightly smaller, subapical aesthetascs. Second antenna flagellum three-jointed, apical cone slightly shorter than entire flagellum, with a pair of very small lateral free sensilla. Mandibles both with pars incisiva of four cusps, lacinia mobilis with three (?) cusps, hairy lobe, one hairy seta between the lobe and the pars molaris, and pars molaris represented by a tuft of hairy setae. Left mandible with larger lacinia mobilis and with two hairy setae on the hairy lobe, right mandible with smaller lacinia mobilis and one hairy seta on the hairy lobe. First maxilla lateral endite with lateral group of five simple teeth and one slender seta, and median group of six more slender setae, five of them distally cleft. One tooth of lateral group distictly smaller, about half as long as the others. On caudal face with one small subapical seta beside the median group. Distal quarter of the lateral margin fringed with hairs. Mesal endite with laterodistal corner rounded, mediodistal corner bearing two penicils. Second maxilla distally bilobate, mesal lobe with field of sensilla, both lobes with hairs. Maxilliped basis with some scale setae, scales and, especially on the distal margin, long tongue-shaped scales; laterodistal corner with a fringe of hairs. Maxilliped palp with only one large seta on the proximal article. On second article, proximal tuft on inner margin composed of two setae, distal tuft of several setae on a common socket, and one smaller seta beside the socket; lateral margin with one slender and one stout seta. Apical article with distal tuft of several setae, one of them distinctly larger. Maxilliped endite roughly rectangular, hairy, with a small seta on the caudal face and a penicil on the distal face. (The exact size and shape of the penicil could not be seen, because in both examined specimens this part was damaged or covered with dirt.)

Pereiopod 1 carpus with broad, oblique brush of scales on the frontal face (for cleaning the second antennae). Males with dense ventral scale-fields on pereiopod 1–3 ischium, merus and carpus, and on pereiopods 6 and 7 ischium. Male pereiopod 7 ischium with subapical depression and merus with a dorsolateral, sharp, triangular lobe, on the frontal face. Pereiopod dactyli with inner claw slightly longer than outer claw, curved ungual seta with a slender seta of about half its length beside it, long dactylar seta bearing three fringes of setules in its distal half, and some more setae and scales.

Pleopod 1 exopodite with a weakly delimited margin, probably a respiratory field; on the other exopodites; no distinct lateral fields. Male pleopod 1 exopodite about as long as wide, rounded, distally fringed with small hairs. Pleopod 1 endopodite distal portion straight, with a row of 38 minute setae along the dorsal spermatic furrow. Pleopod 2 exopodite (distorted on the slide) somewhat shorter than the slender endopodite, with a single, large marginal seta. Pleopods 3–5 exopodite with one marginal seta each. Pleopod 5 exopodite in the caudal face with a transverse band of pectinate setae arranged in two indistinct rows. Lateral lobe of sympodite with four small setae in pleopod 1 and one small seta in pleopods 2–5.

Pleotelson short, with sinuate posterior margin. Pleon-epimera 5 with slightly convex inner margin. Uropod sympodite distal margin with narrowly rounded tip, exopodite longer than visible part of the sympodite. Endopodites in dorsal view ending at the same level as the sympodites.

Reproduction

Seven females were collected between 18 and 25 August 1985. Six of them have a marsupium. Only one has five eggs; two have an empty marsupium.

Habitat

Seven specimens were collected in bamboo cloud forest, in leaf litter or moss, one at a wayside (habitat not further specified), one in a coniferous forest (with Cupressus), and one in 'timber', altitude 2200–2380 m.

Geographical distribution (Map Fig. 75)

Until now found only in the vicinity of San Lorenzo, Sierra Nevada de Santa Marta, Colombia.

Remark

Differences to *Scleropactes parvus* are the distinctly tuberculate tergites, the broader coxal plate 4, and a row of transverse scale setae on the hind margins of the tergites.

The identification of the single male specimen by Vandel (1972) is incorrect; Vandel did not mention that he had re-examined the type specimen, and nor did the original description contain any information on male characters.

COLOMBOSCIA CORDILLIERAE VANDEL, 1972

Colomboscia cordillierae Vandel, 1972 – Taiti *et al*. (1995); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: Two ♂ and two ♀ (Colombia, Resina, approx. 35 km north-north-west of Florencia, montane forest, altitude 1800–2300 m; leg. H.Sturm, 8 June 1956, CV). The largest male was selected as lectotype by Taiti *et al*. (1995).

Remark
There must be a further male specimen, as both males in the tube are complete, but Taiti *et al*. (1995) drew details of mouthparts, pereiopods and pleopods, which is not possible without dissection.

Description (Fig. 86)
Ovigerous female 4.0 × 3.0 mm (but the specimen seems to be shrunk in length), larger male 3.3 mm wide. The dorsal tuberculation is somewhat variable: the ovigerous female differs slightly from the description in Taiti *et al*. (1995), in having four small tubercles on the cephalothorax, and in having no tubercles on the pleon. Eyes composed of 18 or 19 ommatidia; the anteriormost three ommatidia are distinctly smaller than the others.

Pereiopod 1 carpus with oblique antennal brush.

A detailed description was provided by Taiti *et al*. (1995).

Biology
The ovigerous female has six eggs in the marsupium.

COLOMBOSCIA SP.

Colomboscia cordillierae Vandel, 1972, *pro parte*.

Specimen: One ♀ (Colombia, Páramo de Chisaquá, *c*. 40 km south-south-west of Bogotá, altitude 3400–3650 m, *Espeletia grandiflora*, leg., 25 June 1968, CV) (not seen).

Remark
Taiti *et al*. (1995) excluded one specimen from *Colombos. cordillierae* and wrote that it represents a different species. They did not name and describe it, because there was only one incomplete specimen available.

COLOMBOSCIA BITUBERCULATA TAITI, ALLSPACH & FERRARA, 1995

Colomboscia bituberculata – Leistikow (1999*); Schmalfuss (2003*).

Material examined

Type specimens: One ♀ holotype (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Pedro de la Sierra, *c*. 50 km south-west of Santa Marta, KT-14, altitude 1000 m, leaf litter, leg. H. G. Müller, 12 April 1986, SMF 19375); one ♂ paratype specimen with appendages dissected and slides with ♂ appendages (same data, MZUF 4768); two ♂, one ♀ paratypes (same data, SMF 22048).

Description (Figs 87–91)
Male maximum *c*. 4.1 × 2.6 mm, cephalothorax 0.90–1.00 mm wide. Female maximum 6.0 × 3.3 mm, cephalothorax 1.20 mm wide.

Body flat, with long, fingerlike tubercles. The specimens do not look like conglobating isopods. Eyes composed of 13–15 ommatidia (they were difficult to count).

First antenna three-jointed, second article shortest. Third article with longitudinal row of four or five aesthetascs, and two slightly larger aesthetascs at the tip [the latter are broken off in the specimen examined, but are shown in Taiti *et al.* (1995), fig. 5]. Second antenna stout, approximately as long as a pereiopod. Flagellum three-jointed, at its base about half as wide as fifth peduncular article, evenly narrowing towards the tip. Second flagellar article with a single aesthetasc, third article with a pair of aesthetascs. Apical cone broken off [in all specimens, cf. Taiti *et al*. (1995)].

Left mandible with pars incisiva of four sharp cusps, large lacinia mobilis with three sharp cusps, 'hairy' lobe covered with broad scales and bearing two hairy setae, pars molaris represented by a tuft of several hairy setae, and one hairy seta between the hairy lobe and the pars molaris. Right mandible with pars incisiva also of four sharp but narrower cusps, lacinia mobilis smaller, with two (?) cusps, 'hairy' lobe with some hairs and long scales and bearing one hairy seta, pars molaris represented by a tuft of hairy setae, and one hairy seta between the hairy lobe and the pars molaris. First maxilla lateral endite with lateral group of five simple tooth setae, one of which is much smaller, and a slender seta, and mesal group of six more slender tooth setae, five of them cleft or double cleft, and one simple. Whether there are small, subapical setae could not be seen, because in the preparation mounted on a slide, this part is covered by other objects. It is also not shown in the original description (Taiti *et al*., 1995). Distal portion of lateral margin fringed with hairs. Mesal endite of first maxilla with a very small latero-distal corner and two subequal penicils. Second maxilla with two subequal lobes, both covered with hairs, three sensilla between the lobes and a group of loosely arranged sensilla on the distal margin of the mesal lobe. Maxilliped base with some scales and scale setae; some long scales near the distal margin. Epipodite with a few hairs at the tip. Endite approximately rectangular, with hairs and one large simple seta on the caudal face and one penicil on the inner corner of the frontal face. Maxilliped palp proximal article bearing only one small seta near the mesal margin. Second article on lateral margin with one broad and one slender seta, on mesal margin with a distal tuft of numerous equal setae on a common socket, two similar setae beside the socket, and proximal tuft consisting of only two setae. Distal article only indistinctly delimited from second article, bearing an apical tuft of numerous equal setae and two single setae on the lateral margin. A longitudinal crest on the frontal face could not be seen. Paragnaths mesally with strong, spine-shaped scales, laterally with fine hairs.

Pereiopod 1 with antenna-cleaning brush. On the propodus, the brush consists of a longitudinal field of small spine-shaped setae or scales (?), and more irregularly spaced large spine-shaped setae or scales (?) on the frontal face. Carpus with a field of scales, some (or all?) of which are distally fringed, on the frontal face. This field is distally delimited by a row of large hyaline scales on the distal margin of the carpus. The distal, ventral seta of the carpus of pereiopods 1–6 (1–7?) is as long as the propodus. Ventral scale-fields, as present in males of many species of Scleropactidae, could not be seen on any pereiopod. The male pereiopod 7 has a triangular lobe on the frontal face of the merus. No water-conducting scale-rows seem to be present on pereiopod 7 (unfortunately, the periopod 7 on the slide is obscured by air-bubbles and damaged). Dactyli with outer claw, ungual seta longer than outer claw, and a smaller seta beside it; in place of the inner claw, there is a structure like a broad hyaline scale, slightly projecting beyond the outer claw. Dactylus and distal part of propodus on the frontal face bearing numerous similarly looking, long hyaline scales, and more slender structures, some of which may be sensilla. Dactylar seta large, with two (or three) broad fringes of setules. Between the dactylar seta and the outer claw, the cuticle of the dorsal side of all examined dactyli has an inflated appearance, but this looks like an artefact caused by the preservation medium.

Pleopod exopodites 1–5 without distinct respiratory fields. Male pleopod 1 exopodite rounded, about 0.8 times as long as wide, endopodite bent outwards, distal portion straight, with a row of 27 spine-like setae along the spermatic furrow. The hyaline lamella on the lateral side (Fig. 91) is probably an artefact. Male pleopod 1 sympodite with four setae on lateral part. Male pleopod 2 exopodite long, with broad hairy field along the median margin, endopodite exceeding exopodite. Male pleopod 1 and 2 exopodites without marginal setae, the second exopodite with some hairs on the lateral margin. Pleopod 3–5 exopodites with one strong marginal seta each. Pleopods 3 and 5 (and most probably also 4) with one seta on the lateral part of the sympodite. Pleopod 5 exopodite with angulate lateral margin and transverse band of pectinate scales on the caudal face. This band consists of one row at the lateral end, two rows in the middle, and several irregular rows of pectinate scales at the median margin. A slight furrow along the median margin is also present.

SCLEROPACTOIDES **GEN. NOV.**

Type species: Sphaeroniscus curvatus sp. nov.

Diagnosis

Scleropactids with exoantennal conglobation. Distinct transverse groove on cephalothorax evenly curved. Unspecialized coxal plates. Pleopods with at most very

KEY TO THE SPECIES OR FORMS OF *SCLEROPACTOIDES*

1. Upper margin of frontal shield between lateral lobes and the median part curved. Male pleopod 1 exopodite without respiratory fields . . . . *Scleropactoides tukeitanus* (Van Name,1936)

1.* Upper margin of frontal shield between lateral lobes and median part with an obtuse angle 2

2. Linea supraantennalis medially downcurved. Male pleopod 1 endopodite with very acute tip, exopodite with very narrow marginal (?respiratory) field . . . . *Scleropactoides curvatus* sp. nov.

2.* Linea supraantennalis straight or absent (?) 3

3. Pale with dark brown transverse bands along the hind margins of the tergites. Male pleopod 1 endopodite with acute tip, exopodites 1 and 2 with narrow respiratory fields. . . . . *Scleropactoides guianensis* (Van Name,1936)

3.* Coloration different; male pleopod 1 endopodite with truncate tip, exopodites 1 and 2 without respiratory fields . . . . *Scleropactoides bonitanus* (Van Name, 1942) narrow vestiges of respiratory fields, if present at all. Male pereiopod 7 merus with triangular lobe. Male pleopod 1 endopodite with very slender distal portion.

Derivation of the name
Scleropactes + suffix '-oides', meaning 'similar to *Scleropactes*'.

SCLEROPACTOIDES CURVATUS SP. NOV.

Material examined
One ♂ holotype, two ♂, one ♀m, one juvenile paratypes (Venezuela, Bolivar, km 118, leg. F. Yoris, 25 September 1967, MNRJ 9677); one ♀ (Venezuela, Bolivar, km 125, leg. F. Yoris, 26 September 1967, MNRJ 9678).

Description (Figs 92–97)
Holotype male, 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, 22/22 ommatidia; paratype female with marsupium, 11.5 × 6.5 mm, cephalothorax 3.08 mm wide, 24/26 ommatida; paratype male, cephalothorax 2.22 mm wide, 20/20 ommatidia.

With conglobating ability, as can be concluded from habitus, especially the latterally narrow coxal plates 4. The cephalothorax morphology allows the hypothesis that the second antennae are not included in the ball when the animal is rolled up. Cephalothorax behind the frontal shield with a deep, slightly curved transverse groove, extending to the midlength of the eyes. In the median portion, posterior margin of groove with a row of pectinate scales. Distinct lateral lobes about half as long as eyes and separated from median part of frontal shield by obtuse angles. In frontal view, linea supraantennalis medially downcurved and laterally upcurved before leading down towards the sockets of the second antennae. Eyes composed of 20–26 ommatidia. Tergites smooth. Anterior corner of first coxal plate with enlarged margin and 'striate' appearance. Colour not preserved. Noduli laterales small, all near the posterior margin of the tergites and all at the same distance to the lateral margin.

First antenna three-jointed, third article approximately as long as first and second together, with two large apical aesthetascs and some (exact number could not be counted) smaller subapical aesthetascs. Second antenna about as long as pereiopod 7, with three-jointed flagellum. Apical cone is longer than third flagellar article, with only one small lateral sensillum. Flagellar articles 2 and 3 with a transverse 'row' of two (?) aesthetascs each.

Mandibles both with four-cusped pars incisiva, and a pars molaris represented by a tuft of hairy setae. Left mandible with larger, three (or 3.5)-cusped lacinia mobilis and two hairy setae on the hairy lobe. Right mandible with smaller, two-cusped lacinia mobilis and one hairy seta on the hairy lobe (broken off in the specimen after which the drawing has been prepared). Both mandibles with one hairy seta between the hairy lobe and the pars molaris. Beside this seta, there are some fine hairs. First maxilla lateral endite on the distal margin with lateral group of four stout, simple tooth setae, and a fifth seta that is slightly longer than half of the smallest of the larger four setae. Beside the latter, there is a slender seta. Mesal group of six more slender tooth setae, five of which are apically cleft. One small subapical seta on caudal face near mesal group of tooth setae. Mesal endite of first maxilla with two penicils, laterodistal end rounded. Second maxilla apically bilobate, mesal lobe slightly narrower than the lateral lobe. Mesal lobe with a marginal field of small sensory setae, two (or three?) small sensory setae between the lobes. Both lobes hairy. Maxilliped base with scale setae and with scales that are distinct in the proximal part, and that form a 'sulcus lateralis' (cf. Leistikow, 2001). Maxilliped palp three-jointed, the proximal article bearing only one large seta. Second article on mesal margin with proximal tuft of three or four small setae and distal tuft of numerous (> 15) small setae on a socket, beside which there are two small setae; on lateral margin with one slender and one broad seta. Distal article with distal tuft of numerous (> 20) small setae, three single small setae on the lateral margin and a longitudinal crest on the frontal face. Maxilliped endite rounded rectangular, with a stout seta on the caudal face, one small seta on the laterodistal corner, and a subapical penicil on the frontal/distal face; otherwise densely hairy.

Pereiopod 1 of male with antenna-grooming scale-brush on carpus and propodus. The part on the propodus consists of a scale-field occupying about half length of propodus, the part on carpus extends about half length of carpus and is somewhat oblique; distal margin is formed by a row of larger hyaline scales. Carpus also with scale-field on frontal face, along the ventral margin, merus with smaller scale-field along ventral margin. Male pereiopod 2 carpus with less dense scale-field on distal and ventral part of frontal face, and small group of scales on ventral face of merus. On all pereiopods, the largest, distal seta of the carpus is distinctly longer than half length of the propodus (0.65–0.75). Male pereiopod 7 base with several scale-rows, but no distinct groove, ischium with ventral margin almost straight, merus bearing a small lobe on the frontal face. Merus, ischium and carpus with distal scale-fields on the caudal face. Pereiopod dactyli with inner claw longer than outer claw, ungual seta with very acute tip, smaller seta beside the ungual seta, dactylar seta enlarged medially and fringed with long hairs in its distal half. One smaller seta each on frontal and caudal faces. Besides these setae, the proximal portion of the dactylus bears many long, tongue-shaped scales.

Pleopod exopodites 1 and 2 with with very narrow differentiation at lateral margin (probably vestigial respiratory fields). Pleopod exopodites 3–5 without distinct respiratory fields. Male pleopod 1 exopodite of nearly semicircular shape, with lateral margin straight, and few very small marginal setae on medial margin; endopodite twice as long as exopodite, its distal part very slender and slighly curved laterally. Row of small setae along the spermatic furrow (34 setae in the holotype). Male pleopod 2 exopodite only slightly shorter than endopodite, with hairy area along the median margin, and five marginal setae on the lateral margin; the distalmost seta is larger and spaced further than the others. Pleopod 3 exopodite with seven marginal setae, pleopod 4 exopodite with five marginal setae, the distal one larger. Pleopod 5 exopodite with two equally small marginal setae and broad transverse band of pectinate scales on the caudal face. Medial margin of male pleopod 5 exopodite simple, without any groove. Pleopod 3–5 endopodites distally concave.

Uropod sympodite laterally projecting beyond the insertion of the exopodite, laterodistally rounded. Beside exopodite, insertion with few gland pores (? not distinctly visible). Endopodite as long as exopodite, with inner face hairy, exopodite shorter than endopodite, elongate conical.

Differences from *Scleropactoides guianensis* are the linea supraantennalis, which is medially downcurved, and the less developed respiratory areas at the margins of pleopod exopodites 1 and 2.

Remark

The specimens were labelled as *Scleropactes guianensis* (Van Name, 1936), but this identification obviously had not been published.

The species *curvatus*, *guianensis*, *curvatus* and *bonitanus* are all very closely related. Future research may lead to the decision on whether they can be regarded as distinct species or whether they represent slightly different forms of one widespread species. On the basis of the available material, this cannot be decided, and I prefer to formally describe the above specimens as belonging to a new species. If the alternative interpretation proves to be correct, then the correct name will be *Scleropactoides guianensis*, and the other three will fall into its synonymy.

SCLEROPACTOIDES GUIANENSIS (VAN NAME, 1936) COMB. NOV.

Sphaeroniscus guianensis Van Name, 1936 – Boyko (1997); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Parsphaeroniscus guianensis – comb. Lemos de Castro (1967*).

Material examined

Type specimens: One ♂, one ♀, one anterior half + slides (British Guiana, Kaieteur, leg. F. E. Lutz, 11 August 1911, AMNH 3562) (Kaieteur Falls, *c*. 5°11′ N, 59°27′ W).

Description (Figs 98–99)

Female 13.5 × 6.3 mm, 'upper parts marbled or irregularly mottled with brown or dark grayish brown pigmented areas and pale yellowish unpigmented areas; under moderate magnification the pigmented parts are seen to be not continuous but composed of more or less separated dark spots of small size' (Van Name, 1936) (colour not preserved). The 'pale yellowish unpigmented areas' are probably the muscle insertion spots. Tergites smooth; coxal plates 2–5 laterally constricted, especially coxal plate 4. Hind corners of coxal plates 4–6 acute-angled. Cephalothorax with small but distinct lateral lobes that can be seen in frontal view as well as in dorsal view. Upper margin of frontal shield between lateral lobes and median part with an obtuse angle. Transverse furrow extending behind inner margins of the eyes. Linea supraantennalis distinct in the middle, but invisible above the antennal sockets. Eyes composed of about 25 ommatidia. Male pleopod exopodites 1 and 2 with very narrow lateral respiratory fields. Male pleopod 1 endopodite with acute apex curved laterally, exopodite 1 rounded-triangular, about as long as wide. Male pleopod 2 exopodite slightly shorter than endopodite, with one marginal seta.

Pleotelson short, evenly curved. Uropod sympodites on outer margin rounded; exopodites shorter than visible portion of sympodite. Endopodites slightly projecting beyond sympodites.

Remark

In contrast to species of *Sphaeroniscus*, any schisma or inner lobes of the coxal plates are absent. *Scleropactoides guianensis* is most similar to *Scleropactoides bonitanus*, with respect to the large body size, the shape of coxal plates, cephalothorax, and male pleopods. It is distinguished from *Scleropactoides bonitanus* by the presence of distinct respiratory areas, a very sharp apex of the male pleopod 1 endopodite, the presence of a linea supraantennalis, and probably by the coloration.

Geographical distribution

Known only from the type locality, Guyana, Kaieteur.

SCLEROPACTOIDES BONITANUS (VAN NAME, 1942) COMB. NOV.

Sphaeroniscus bonitanus Van Name, 1942 – Boyko (1997); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: One ♂, five ♀ + slides (Venezuela, San Esteban, Palo Bonito, leg. G. Vivas-Berthier, 27 September 1937, AMNH 9526).

Description (Fig. 100)
Female approx. 13 × 7 mm. Colour pattern preserved only very weakly, but described by Van Name (1942) as follows: 'The ground colour of the back in the alcoholic specimens is a yellowish white (unpigmented). The thoracic and abdominal segments each have a dark blackish brown transverse band along the rear border; on each specimen there is an additional small oblique dark marking, and others on the median line and medio-lateral regions. The head, segment I of the thorax (except its anterolateral corners) and the telson and uropoda are mostly unpigmented. The general effect of the large bands is a very conspicuous black and white cross striping, while the smaller markings described above indicate also a more or less interrupted and imperfect longitudinal striping.' Cephalothorax with conspicuous lateral lobes. Upper margin of frontal shield between lateral lobes and median part with an obtuse angle. Eyes composed of 23 or 24 ommatidia. Coxal plates (except 1) laterally constricted. Pleotelson with posterior margin straight in the middle. Male pleopod 1 and 2 exopodites without distinct respiratory fields; exopodite 1 somewhat longer than broad, its lateral margin concave. Endopodite 1 with constricted distal part slightly outcurved and apically truncate.

Remarks
Owing to the poor condition of the type specimens, no detailed description could be prepared. The species differs from *Scleropactoides guianensis* by the absence of respiratory fields and the truncate, instead of acute, male pleopod 1 endopodite.

The place where the specimens had been collected could not be located exactly. In Venezuela there are at least seven places named 'San Esteban', in the states of Carabobo, Zulia, Falcón, and Lara.

SCLEROPACTOIDES TUKEITANUS (VAN NAME, 1936) COMB. NOV.

Sphaeroniscus tukeitanus Van Name, 1936 – Boyko (1997); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Parsphaeroniscus tukeitanus – comb. Lemos de Castro (1967*).

Material examined

Type specimens: One ♂, broken into two halves, and slides with ♂ pleopods (paratypes, Guyana, Tukeit, leg. F. E. Lutz, 16 July 1911, AMNH 3542).

Description (Fig. 101)
Female, about 16 mm (Van Name, 1936). Coloration not preserved; after Van Name (1936), it is 'slaty gray with a narrow yellow edging to each segment and small irregular bars and rounded spots (the muscle insertion spots) on the lateral regions of the back. Under parts and legs yellowish (without pigment)'. Surface smooth.

Cephalothorax with conspicuous lateral lobes. Upper margin of frontal shield between lateral lobes and median part smoothly curved. Eyes composed of 23 or 24 ommatida. Coxal plates laterally constricted. Pleotelson apically rounded. Uropod protopodites almost quadrangular, outer corner more rounded. Male pleopod 1 and 2 exopodites without conspicuous dorsolateral respiratory fields, at their lateral margin there is a fold that could be regarded as a vestige of such a field. Exopodite 1 without, exopodite 2 with several (eight) marginal setae. Exopodite 1 semicircular, with outer margin approximately straight. Endopodite 1 with narrow distal portion slightly outcurved. Endopodite 2 slightly exceeding the exopodite.

Remarks
Very similar to *Scleropactoides guianensis* and *Scleropactoides bonitanus*, in body size as well as in the shape of coxal plates. It is distinct from *Scleropactoides guianensis* by the characters that Van Name (1936) pointed out in the original description: Upper margin of the frontal shield between lateral lobes and median part curved, not angulate, and the uropod protopodites broader and less rounded. The same characters are also useful to distinguish *Scleropactoides tukeitanus* from *Scleropactoides bonitanus*, which in addition differs by the presence of narrow respiratory fields.

In Van Name's (1936) original description, he refers to two females and one male specimen. However, I received one broken male specimen and slides with male pleopods 1 and 2; the broken male still had its pleopods, so there must be an error somewhere.

SCLEROPACTES BUDDE-LUND, 1885

Type species: Scleropactes concinnus Budde-Lund, 1885 [designated by Mulaik (1960)].

Diagnosis
Cephalothorax with frontal shield, behind frontal line with transverse furrow that laterally is recurved and ending medially to the eyes. Mandible with right one/left two penicils on the hairy lobe, and one penicil between the lobe and the pars molaris, which is represented by a tuft of hairy setae. First maxilla with two laterally flattened penicils on the median endite, lateral endite with four plus six teeth, an additional tooth, and a cuticular stalk with a hirsute apex on the rostral surface (cf. Ferrara *et al*. 1995). Second maxilla with fine setation on the mesal and lateral lobe, both lobes subequal in length. Mesal lobe with a field of sensilla. Maxilliped with a large or vestigial penicil on the frontal face of the endite. Maxilliped palp with one large and one somewhat smaller seta on the basal joint, and the distal tuft of setae on the medial article on a socket. Second and distal article weakly delimited. Carpus of first pereiopod with a well-developed antenna-grooming brush in both sexes. Males with brush-like fields of scales, at least the merus and carpus of pereiopods 1 and 2. Exopodites of first two pairs of pleopods have a respiratory area, delimited mesally by a sulcus (no respiratory field visible in *Scleropactes pululahua*). Male endopodite 2 slender and straight. Protopodites of uropods filling the gap between pleotelson and epimera of pleonites. Endopodite inserted on the inner edge of protopodite, which is dorsoventrally flattened [based on the definition given by Leistikow (1997)].

Remark
Vandel (1972) enumerated several characters that *Scleropactes* has in common with the Scyphacidae (first antenna with aesthetascs in several rows, second antenna with three-jointed flagellum, maxilliped endite with penicil, 'well-developed' dactylar seta, pleopod exopodites with haemolymph sinus). All these are plesiomorphies, and after Vandel they prove that *Scleropactes* is the most primitive genus of the Scleropactidae. Schultz (1995) erroneously mentioned that the flagellum of the second antenna of *Scleropactes* has two joints.

The mention of *Scleropactes concinnus* as 'genotipo' of *Scleropactes* by Mulaik (1960) is regarded as the designation of the type species, according to ICZN Art. 69 a iii.

At present, the genus *Scleropactes* is probably still paraphyletic. The present analysis revealed only very weak characters as putative apomorphies.

SCLEROPACTES CONCINNUS BUDDE-LUND, 1885

Scleropactes concinnus Budde-Lund, 1885 – Budde-Lund (1904*); Van Name (1936); Schmalfuss (1980*); Leistikow & Wägele (1999*); Jeppesen (2000); Schmalfuss (2003*).
Not: *Scleropactes concinnus* – Vandel (1968) (misidentification).

KEY TO THE SPECIES OF *SCLEROPACTES*

1. Dorsal surface tuberculate or granulate 2
1.* Dorsal surface smooth 5
2. Dorsal scale-setae strongly developed, long, and perpendicular to the surface, giving the tergite a hairy appearance 3
2.* Dorsal scale setae smaller, no hairy appearance. 4
3. Male pleopod 1 exopodite with distinct median lobe; therefore, the distal margin is concave . . . . *Scleropactes pilosus* Vandel, 1968
3.* Male pleopod 1 exopodite ovoid, with convex distal margin . . . . *Scleropactes pululahua* sp. nov.
4. Tergites strongly granulate; male pleopod 1 endopodite approximately straight; adults large, about 15 mm . . . . *Scleropactes zeteki* Van Name, 1926
4.* Tergites shallowly granulate; small specimens (insufficiently known) . . . . . . *Scleropactes incicus* Budde-Lund, 1885
5. Median part of frontal shield and outer margin of uropod protopodite more angulate (Fig. 106); male pleopod 1 endopodite with very narrow acute tip projecting beyond the row of spine-like setae along the dorsal spermatic furrow . . . . *Scleropactes colombiensis* (Pearse, 1915)
5.* Median part of frontal shield (in dorsal view) and outer margin of uropod protopodites more rounded (Fig. 102); male pleopod 1 endopodite apex with shorter tip not much projecting beyond the row of spine-like setae 6
6. Male pleopod 1 endopodite distally enlarged . . . . *Scleropactes concinnus* Budde-Lund, 1885
6.* Male pleopod 1 endopodite distally acute 7
7. Linea frontalis in dorsal view medially straight and laterally strongly curved. Lateral lobes in frontal view with distinct gland pores. Usually larger: ♂ 11 mm, ♀ > 15 mm . . . . *Scleropactes cotopaxii* sp. nov.
7.* Linea frontalis in dorsal view medially curved, with straight lateral parts, about 15° from the transverse. Coloration brown with some pale patches at the base of the coxal plates. Usually smaller: ♂ 10 mm, ♀ 12 mm . . . . *Scleropactes ecuadoriensis* sp. nov.

Material examined

Lectotype (designated here): one ♂, 10.0 × 4.7 mm (Peru, leg. Stolzmann, ZMUC cru-1686).

Paralectotypes: One ♂, 10.0 × 4.2 mm (same data as Lectotype, ZMUC cru-1686); fragments of two ♂ and one more specimen ['S*cleropactes concinnus* B.L., Peru (Mus. Wars.)'], three heads without mouthparts, some pleopod exopodites, one second antenna without flagellum, one pleotelson with uropod protopodites ('S*cleropactes concinnus* B.L.') BMNH 1921.10.18.961–964 types: Tambillo, Peru, leg. J. Stolzmann); one ♀m (Ecuador, Tambillo, 'e Mus. Warschau', SMF 634).

Description (Figs 102–104)
Male maximum 10 × 4.7 mm; adult female maximum 11.4 × 5.0 mm. (Coloration not preserved in any of the specimens examined.) Tergal surface perfectly smooth, covered with microscales, which give the animal a pubescent appearance only at high magnification. Dorsal sensilla visible as small bristles; no noduli laterales could be recognized using a dissection microscope only. No coxal plate with any modification. Lateral sulcus distinct on all coxal plates and pleon epimera 3–5. Head with deep furrow behind the frontal line, laterally extending behind the eyes. Eyes composed of 20–23 ommatidia. Second antenna with long apical cone with small lateral sensilla (one sensillum present; whether there is a second small sensillum could not be checked without seeing the specimen).

Maxilliped basis scaly in the lateroproximal quarter; the scales become obsolete towards the median and distal margins. Endite apically not much narrower than basally, distal third hairy, bearing one setae on the caudal face and a very broad, laterally bent penicil near the distal margin. Maxilliped palp composed of three distinct articles: basal articles with two large setae, second article with distal tuft of several equal setae on a socket, two single small setae beside this socket, and proximal tuft consisting of only two setae, located directly beside socket of distal tuft, lateral margin of second article with two thin setae and one broad seta. Distal article of maxilliped palp with apical tuft of equal setae, and two single, similar setae on the lateral margin. Pereiopod 1 carpus with almost longitudinal brush consisting of extremely long scales that resemble hairs. Length of some of these scales equals diameter of carpus. Also, this antennal brush is confluent with 'male' brush consisting of much shorter scales. Male pereiopods 1–3 (?) with number of ventral setae increased, and field of scales, pereiopod 4 with less extended scale-fields. Male pereiopod 7 simple. Dactyli (at least of pereiopods 1 and 6 of male, which were solely examined) with a small but distinct dorsal tubercle near the base. Dactylar seta apically hairy. Ungual seta curved, shorter than outer claw, small accessory seta nearly half as long as ungual seta. Inner claw about one-third as long as outer claw, very thin. Besides this, dactyli bearing one subapical, ventrolateral seta each on frontal and caudal faces, and with some aesthetasc-like setae beside the dactylar seta and various scales. Male pleopod 1 endopodite with apex slightly bent outwards and enlarged to a tuberculate plate. Row of 26 very small spine-like setae along the spermatic furrow. Exopodite short, with pronounced medial lobe, the margin of which bears some simple setae; a narrow lateral area (?probably respiratory) is set off by a sulcus (other pleopods not examined). Pleotelson short, medially with obtuse angle. Sides of pleotelson straight when whole animal viewed from a above, but concave when pleotelson is perpendicular to viewing direction (Fig. 102). Uropod exopodite as long as sympodite. Endopodite nearly reaching tip of the exopodite. Sympodite with distinct oblique ridge; laterally, there seem to be some gland pores.

Remarks
The juvenile identified by Vandel (1968) as *Scleropactes concinnus* does not belong to this species. The basal article of the maxilliped palp seems to have only one large seta, whereas two large setae are present in the type specimens. It also has only 14 or 15 ommatidia, although this could be correlated with the smaller body size (2.4 mm wide). The species name has been cited by several authors, but here the species is illustrated for the first time and rendered identifiable. The specimen from the SMF also belongs to the type series, according to the data, although it is not labelled as such. Then, because of the designation of one male from ZMUC as lectotype, it becomes a paralectotype.

Reproduction
One female (SMF 634) has 11 eggs in the marsupium, which are arranged in transverse rows of 2–2–2–3–2.

Geographical distribution
Only known from the type locality, Peru: Tambillo (Budde-Lund, 1885). After Budde-Lund (1904), Tambillo is located in Ecuador.

SCLEROPACTES COLOMBIENSIS (PEARSE, 1915)

Sphaeroniscus colombiensis Pearse, 1915.
Scleropactes columbiensis – comb. Schultz (1970) (specific name misspelled).

Scleropactes colombiensis – Schmalfuss (1980, 1986); Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Types: One ♀m, broken into pieces [holotype, Colombia, Sierra Nevada de Santa Marta, Cincinnati Coffee Plantation, altitude 4800 feet (11°02′ N, 74°02′ W, altitude *c*. 1500 m), leg. A. S. Pearse, 12 July 1913, USNM 98374].

Other samples: One ♂ (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 1600 m, cloud forest, leg. H. Schmalfuss, 8 December 1974, SMNS 10048e + slides); one ♀m (Colombia, Magdalena, Sierra Grande de Santa Marta, near El Campano, KT-12, altitude 1000 m, from leaf litter, leg. H. G. Müller, 20 April 1986, SMF 19377).

Description (Figs 106–111)
Adult female 16 mm long, 5.5–5.8 mm wide, cephalothorax 2.92 mm wide; male 5.8 mm wide, cephalothorax 2.90 mm wide. Dark brown with pale muscle insertion spots, coxal plates lighter (in the female the colour was not preserved).

Eyes composed of 20–23 ommatidia. Cephalothorax with deep furrow behind frontal line. Frontal shield with shallow grooves for second antennae; a medial area is distinctly set off the grooves. Small lateral lobes projecting about half of length of the eyes. Tergites smooth. All coxal plates simple. Tergal scale setae small and inconspicuous. Noduli laterales small, on posterior margin of tergites, seemingly at equal distance from the lateral margin, but this could not be clearly seen in the entire specimen.

First antenna three-jointed, second joint shortest. Distal joint with a pair of apical aesthetascs, and about 12 slightly smaller, irregularly arranged subapical aesthaescs.

Second antenna approximately as long as pereiopod 7, but more slender. Flagellum consisting of three subequal articles. Second and third articles have a transverse row of two or three aesthetascs, the third bears a slender apical cone. Apical cone somewhat shorter than distal flagellar article, with a pair of small lateral sensilla at 0.25 from its base (the sensilla are broken off, but their insertions are visible).

Left mandible with long pars incisiva apically indistinctly four-cusped, lacinia mobilis with two cusps, larger than pars incisiva. Hairy lobe with two hairy setae, and one hairy seta between hairy lobe and pars molaris that is represented by a tuft of indistinctly separated hairy setae. Right mandible with short, apically indistinctly four-cusped pars incisiva, small, irregular conical lacinia mobilis, hairy lobe with one hairy seta, and one hairy seta between the hairy lobe and the pars molaris, which is represented by (probably) a single hairy seta (?). First maxilla lateral endite on apical margin with lateral group of four stout, simple tooth setae, a small triangular lobe and one slender seta, which is apically hirsute, and with mesal group of six more slender, simple tooth setae. A pair of very small setae beside the mesal group of tooth setae on the caudal face. Mesal endite with two stout penicils, the laterodistal corner rounded and covered with small hairs. The examined specimen has two penicils on mesal endite of one side, and two penicils of same size and one smaller penicil of about half the size on the other side. Second maxilla apically bilobate, both lobes hairy, the mesal lobe with a field of sensilla along its mesodistal margin. Two (or three?) small sensilla between both lobes. Maxilliped base with scales and scale-setae. Palp three-jointed, proximal article bearing one large and one smaller seta; second article one broad and several slender setae on lateral margin, and a tuft of setae on a long socket on distal end of mesal margin. There are two single setae beside the latter socket, and the proximal tuft of setae present in other Crinocheta here is represented by a single seta, located near the socket of the distal tuft. Distal article with apical tuft of setae, and several setae on the lateral margin. Maxilliped endite distally somewhat narrower than basally, and distally covered with hairs; one large penicil is located on the frontal face of the endite, near the distal margin.

Male pereiopods 1–3 with ventral scale-brushes on merus and carpus; on pereiopod 3 these are much less extended than on pereiopods 1 and 2. Pereiopod 1 with antennal cleaning brush consisting of a small field of scales (or spines) on propodus and a long field with acute, tongue-shaped scales on carpus. Distal margin of carpal field concave and provided with a fringe of long scales with rounded tips. A smaller field also present on pereiopod 2, and a small group of scales can also be seen on pereiopod 3 near the distal margin of the carpus. Surface of all pereiopods covered with scales, which appear to be more regularly arranged on basipodites than on more distal parts. Large setae are found on ventral faces of merus, carpus and propodus, and on the distal margins of joints; small scale setae scattered among the scales. Male pereiopod 7 with elongate ischium bearing a dorsodistal depression on the frontal face and having a very slightly concave ventral margin. On basipodite, a distinct longitudinal goove is seen on the frontal face. This is without doubt homologous with the groove that is part of the water-conducting system in some other species of Oniscidea, but no scale-rows can be seen (at least not in the specimen examined).

Male pleopods: pleopod 1 and 2 exopodites with weakly wrinkled respiratory fields. Exopodite 1 broader than long, distal margin concave, without marginal setae. Exopodites 2–5 with marginal setae. Exopodite 5 on dorsal (caudal) face with irregular transverse band of pectinate scales, and with a furrow along mesal margin. Endopodite 1 apically slightly curved in lateral direction. Row of 31 small setae along the spermatic furrow. End of this row exceeded by a narrow tip bearing short longitudinal sulci. Endopodite 2 slightly exceeding exopodite. Sympodites 3 and 5 with acute, sympodite 4 with less acute, mediodistal process.

Uropod sympodite more than four times as wide as exopodite. Sympodite as long as wide (at the base), with rounded outer corner. Endopodite slightly longer than sympodite, with dense fringe of scales (and/or setae) on the inner surface.

Geographical distribution (Map Fig. 105)
Colombia: Sierra Nevada de Santa Marta.

Habitat
Cloud forest, 'under leaves and logs in forest, not common; females carrying young were collected on July 3 and 12' (Pearse, 1915).

Remark
The transfer of this species from *Sphaeroniscus* to *Scleropactes* by Schultz (1970) is accepted. It is justified by the presence of putative synapomorphies with other species of *Scleropactes* (see clade 21), and the absence of the apomorphies of *Sphaeroniscus*.

SCLEROPACTES COTOPAXII SP. NOV.

Material examined

Type specimens: ♂ holotype (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF); paratypes – one ♂, six ♀m, three ♀ without marsupium, one juvenile (same data as holotype); two ♂, two ♀m and one ♀ without, one juvenile (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 22–27 February 1993, MZUF); one ♂ (Ecuador, Cotopaxi Prov., around San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, in soil of epiphytes of Lauraceae, leg. L. Bartolozzi, 22 February 1993, MZUF); two (immature?) ♂, one (immature?) ♀ (Ecuador, Cotopaxi Prov., Otonga c/o San Francisco de las Pampas, altitude *c*. 1900 m, 'mag. 1460', leg. G. Onore, 7 October 1993, MZUF).

Description (Figs 112–117)
Male 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, 28/28 ommatidia; adult female 15.4 × 8.0 mm, cephalothorax 3.95 mm wide, 26/26 ommatidia.

Dorsal face of animals of this species extensive, irregular dark (black?) patches on pale ground. The pale areas occupy less than half of the surface and are concentrated at margins. Fourth and fifth articles of second antenna always dark, whereas flagellum in all specimens pale. However, as the animals were examined after being preserved in alcohol for 7 years, this preservation may have altered the coloration. Therefore, it cannot be stated whether the pale areas originally were yellow (as they appear now) or probably white, or red.

Cephalothorax with deep furrow behind frontal line. Frontal shield with shallow grooves for the second antenna; a median area is distinctly set off the grooves. Small lateral lobes projecting about half of length of eyes. Tergites smooth. All coxal plates simple. Tergal scale setae small and inconspicuous. Noduli laterales not visible on entire animal.

First antenna three-jointed; second article shortest and bears one small seta. Distal article has a sharp tip, two large apical aesthetascs and *c*. 12 smaller aesthetascs. Second antenna approximately as long as pereiopod 7, but more slender. Flagellum consisting of three subequal articles, second and third articles with a transverse row of three or four aesthetascs, third bearing a slender apical cone. The apical cone as long as distal flagellar article and has one small lateral sensillum at 0.25 from its base (only one sensillum could be seen). Holotype male with flagellum of only two articles, distal one twice as long as basal one. As all other specimens had a three-jointed flagellum, the condition found in the holotype male is considered to be an individual variation.

Mandibles with a pars molaris represented by a tuft of numerous hairy setae, and one hairy seta between the pars molaris and the hairy lobe. Hairy lobe with one hairy seta on right and two hairy setae on left mandible. Both mandibles seem to have a secondary molar surface formed by pars incisiva and lacinia mobilis; the latter is larger in the left mandible. First maxilla lateral endite on distal margin with lateral group of four large tooth setae, one small triangular lobe and one slender seta, and mesal group of six more slender tooth setae, all with simple tips. In subapical position near the mesal group of tooth setae, there is a pair of small serrate setae. Mesal endite of first maxilla with two equal, stout penicils, laterodistal margin hairy. Second maxilla apically bilobate, with small group of sensilla on the mesal lobe and hairs (pectinate scales) on both lobes. Two or three sensilla between lobes. Maxilliped base covered with scales in lateral portion, and with scale setae. Epipodite with some fine hairs. Endite densely hairy, with one strong seta on caudal face (partly covered by the hairs; therefore not easily visible on the drawing), and short, stout penicil on the frontal face. Maxilliped palp on the basal article with two large setae. Second article on mesal margin with proximal tuft of three small setae, distal tuft with numerous small setae on a common socket, and two single small setae beside socket, and one broad seta with rounded tip and three small, slender setae on lateral margin. Distal article with a ridge on frontal face, apical tuft of numerous small setae, and one or two small, slender setae on the outer margin.

Male pereiopods 1–4 with ventral scale-brushes on merus and carpus; pereiopod 5 with scale-field on merus only. Pereiopod 1 with antennal cleaning brush consisting of a small field of scales (or spines) on propodus, which has a distal transverse row of hyaline scales with rounded tips (partly covered by other scales and therefore not distinct) and a long field with tongue-shaped scales, at least some of which have a fringed distal margin, on the carpus. Surface of all pereiopods is covered with scales, which appear to be more regularly arranged on basipodites than on more distal parts. Large setae are found on ventral faces of merus, carpus and propodus, and on the distal margins of joints; small scale setae are scattered among the scales. Male pereiopod 7 with elongate ischium bearing a dorsodistal depression on the frontal face and having a very slightly concave ventral margin. Merus with subbasal, ventral depression covered with scales. On basipodite, a distinct longitudinal groove with one row of scales is seen on the frontal face. At least some of these scales have a fringed distal margin. Pereiopod dactyli with curved ungual seta, the thinner seta beside it being longer than the short inner claw, one small seta on frontal and caudal surfaces, dactylar seta apically fringed on one side, and numerous scales.

Male pleopods: pleopod 1 and 2 exopodites with weakly wrinkled respiratory fields. Exopodite 1 broader than long, distal margin concave, with one or two minute marginal setae. Exopodites 2–5 with 9–16 marginal setae. Exopodite 5 on dorsal (caudal) face with irregular transverse band of pectinate scales, and with a furrow along the medial margin. Endopodite 1 apically slightly curved in lateral direction. Row of 36 small setae along the spermatic furrow; apex of endopodite with a tuft of fine hairs and some subapical wrinkles on the lateral face. Endopodite 2 as long as exopodite. Uropod sympodite more than four times as wide as exopodite. Sympodite approximately as long as wide (at the base), with rounded outer corner. Endopodite slightly longer than sympodite, with dense fringe of scales (and/or setae) on the inner surface.

SCLEROPACTES ECUADORIENSIS SP. NOV.

Material examined

Types: Five ♂, three juvenile ♂, 23 ♀m, ten ♀/juvenile (one ♂ holotype, the others paratypes, Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF); four ♂, one ♀m, 44 ♀ or juvenile (paratypes, Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude approx. 1300 m, leg. L. Bartolozzi, 22–27 February 1993, MZUF).

Other samples: One ♂, one juvenile ♂, two juvenile ♀ (Ecuador, Prov. Cotopaxi, San Francisco de las Pampas dintorni, altitude *c*. 1300 m, in soil of epiphytes of Lauraceae, leg. L. Bartolozzi, 22 February 1993, MZUF); one ♂, one juvenile ♂, one ♀m, nine ♀ or juvenile (Ecuador, Cotopaxi Prov., location Otonga c/o San Francisco de las Pampas, altitude 1900 m, leg. G. Onore, 7 October 1993, MZUF); five ♀m, two immature, seven mancas and juvenile (Ecuador, Cotopaxi Prov., distr. San Francisco de las Pampas, location Naranjito, altitude *c*. 2000 m, leg. L. Bartolozzi, 3 February 1993, MZUF).

Description (Figs 118–123)

Adult female 2.8–5.8 mm wide (cephalothorax 1.65–2.96 mm wide), up to 11.3 mm long; male maximum 9.9 × 4.5 mm (cephalothorax 2.38 mm wide). Nineteen to 27 ommatidia, more frequently asymmetrical. In dorsal view, linea frontalis evenly arcuate. Lateral lobes about half as long as the eyes, not distinctly delimited. Frontal shield with median part forming a broad ridge between the antennae, in dorsal view with approximately even frontal face, which is delimited by the lateral parts by angles. In frontal view, linea frontalis weakly convex, lateral lobes forming acute outer angles. Dark brown, with slightly brighter coxal plates and epimera. Pale patches at base of coxal plates and in the middle of tergites. Noduli laterales small and inconspicuous, all at the posterior margins and at the same distance from the lateral margin. In most specimens, they are broken off, so the position as shown in the habitus drawing has been combined from several specimens.

First antenna triarticulate, medial article shortest. Distal article with sharp, acute tip, two large, subapical aesthetascs and a group of approx. ten smaller aesthetascs on the frontal face. Second antenna with triarticulate flagellum; apical cone as long as the distal article, with one (?) small lateral sensillum. Second and third articles with a transverse row of few (exact number unknown) aesthetascs.

Left mandible with pars incisiva of four cusps, large, rounded lacinia mobilis, hairy lobe with two hairy setae, one single hairy seta between hairy lobe and pars molaris the latter represented by a tuft of hairy setae. Right mandible with pars incisiva of four very blunt cusps and smaller lacinia mobilis, hairy lobe with one hairy seta, one single hairy seta between hairy lobe and pars molaris. The latter composed of less hairy setae than on the mandible. Both mandibles on outer face with some setae and scales. First maxilla lateral endite on the distal margin with lateral group of four strong, simple tooth setae, a small triangular lobe and a slender seta, and mesal group of six more slender, simple teeth. (At low magnification, the mesal group may appear to be composed of four teeth only.) A pair of very small subapical setae on caudal face beside mesal group. Distal third of lateral margin densely fringed with hairs (pectinate scales). Mesal endite bearing two stout penicils; there is no distinct lateral corner of the penicils. Lateral margin distally hairy. Second maxilla distally bilobate; lobes are subequal. Both lobes hairy, the mesal lobe with a group of sensilla on the frontal face, near the margin, and two small setae between the lobes. Maxilliped base distinctly scaly in the basal and lateral parts, epipodite with few hairs. Endite approximately rectangular, longer than wide, distal part covered with acute scales; one penicil near the mediodistal corner, on the frontal face. A very small knob (probably homologous with a seta) in a more proximal position, also on the frontal face. Maxilliped palp proximal article bearing two large setae, the lateral one somewhat smaller. Second article with distal tuft of equal setae on a long socket, two equally sized setae beside the socket, and a pair of two more setae of the same size near the base of the socket. On lateral margin of second article one broad seta and three slender setae. Distal article with apical tuft of equal setae, one seta on the lateral margin, and a longitudinal ridge on the frontal face.

Pereiopod 1 carpus with transverse brush of long, hair-like scales. The distal margin formed by a transverse row of tongue-shaped, hyaline scales. Propodus only with a few ventral spine-like scales. Male pereiopods with ventral scale-fields on ischium, merus and carpus of pereiopods 1 and 2, on merus and carpus of pereiopod 3, and ischium of pereiopod 6. Carpus of pereiopods 2–5 on the frontal face with a small, distal scale-field, decreasing in size from 2 to 5. Male pereiopod 7 ischium with concave ventral margin; on the frontal face with a dorsodistal depression and a small scale-field in ventrodistal position. Pereiopod dactyli with large outer claw, very small inner claw, dactylar seta apically double-fringed, curved ungual seta with smaller seta beside it, one small seta on frontal and caudal face each, and some scales. Proximal to the dactylar seta are two (?) aesthetasc-like setae.

Pleopod exopodites with rows of eight to ten marginal setae, the size of these setae increasing from proximal to distal. Open, hardly wrinkled respiratory fields on exopodites 1 and 2. Male pleopod 1 exopodite broader than long, its distal margin very slightly concave. Male pleopod 1 endopodite curved laterally, with a constriction, following a subapical enlargement. Row of small, spine-shaped setae (39 in the holotype) along the dorsal spermatic furrow. Distal portion with rounded, longitudinal warts on the lateral part, and acute, posteriorly directed tubercles on the median part. Male pleopod 2 endopodite slightly exceeding exopodite. Pleopod 3 and 4 endopodites apically bilobate. Pleopod 4 and 5 sympodites with a transverse ridge bearing a fringe of hairs. Uropods with a concavity delimited by a semicircular ridge; distinct gland pores could not be seen. Exopodite as long as sympodite; exopodite and endopodite reaching approximately the same level.

Derivation of the name

Named after the country, Ecuador.

Biology

Female carrying 8–23 eggs, depending on body size and time of gravidity. During development, the embryos seem to grow larger, whereas some other eggs are lost. One female had ten embryos and three undeveloped, distinctly smaller eggs in the marsupium.

SCLEROPACTES INCICUS BUDDE-LUND, 1885

Scleropactes incicus Budde-Lund, 1885 – Jeppesen (2000).
Scleropactes incisus – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Types: Fragments of ♂ holotype (‘*Scleropactes incisus* B-L. Peru’, BMNH 1921. 10.18.968 holotype).

Description

Male *c*. 2.4 mm wide. Tergal surface slightly granulate. No coxal plate with any modification. Male pleopod 1 endopodite tip strongly bent laterally.

Geographical distribution

Peru (Budde-Lund, 1885).

Remark

The holotype specimen lacks a head and most pereiopods. A sufficient description could not be based on the remaining fragments.

SCLEROPACTES PILOSUS VANDEL, 1968

Scleropactes pilosus Vandel, 1968 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: One ♀m (Ecuador: Archidona, 0°55′ S, 77°48′ W, leg. Leleup, April 1965, CV); one ♀ (Ecuador, Conocoto, 0°20′ S, 78°29′ W, Santo Domingo, leg. Leleup, May 1965); slides with cephalothorax, second antenna, mandible, first maxilla, second maxilla, maxilliped, pleopods 1–5, pereiopods 1 and 4, and tergites 1–3 (CV 5238-1 to 13), and slides with male pereiopods 1 and 7, and pleopods 1 and 2 [CV 5270-1 to 3, Ecuador, from one of the locations reported by Vandel (1968); the exact location could not be traced); one manca (Ecuador, Santo Domingo, leg. Leleup, April 1965, IRSNB 24421) (all syntypes).

Other samples: One ♀m (Ecuador, Napo Prov., Rio Hollín, altitude *c*. 1000 m, leg. Bartolozzi, 17 February 1993, MZUF).

Description (Figs 124–127)
Female 9.4×4.2 mm to 11.0×5.0 mm, manca 2.9×1.5 mm.

Tergites with exceptionally large scale-like setae that produce a pilose appearance. These setae are much larger in relation to body size in small individuals. Noduli laterales situated on posterior margins and smaller than scale setae. First coxal plate with very concave hind margin. Cephalothorax with transverse furrow, and small but distinct lateral lobes. Eyes composed of approximately 23 ommatidia in adult specimens. First antenna three-jointed, the apical article with aesthetascs arranged in three rows. Second antenna with three-jointed flagellum; second and distal articles with a transverse 'row' of two aesthetascs; apical organ as long as the distal article, with (one?) minute lateral free seta. Mandibles: right lacinia mobilis smaller, hairy lobe with right one/left two penicils, one penicil each between hairy lobe and pars molaris, the latter represented by a tuft of numerous hairy setae. First maxilla lateral endite on distal margin with lateral group of four large, simple setae and a very short and stout seta (homologous with the 'triangular lobe' found in many other species of Scleropactidae) and a slender seta; mesal group of six more slender, simple teeth, and two subapical small setae with furcate tip; distal third of lateral margin fringed. Mesal endite bearing two stout penicils, laterodistal corner rounded. Second maxilla bilobate, mesal lobe with row of sensilla, both lobes covered with pectinate scales; between both lobes are two setae. Maxilliped endite hairy, with strong penicil near the apical margin and one seta on the caudal face. Maxilliped palp three-jointed, basal article bearing two subequal large setae; second article on the mesal margin with proximal tuft of only one small seta, distal tuft of several setae on a socket, and two single small setae near this socket, lateral margin with three slender setae and one broad seta; distal article with distal tuft of setae and one seta on the lateral margin. Pereiopod 1 with antennal brush. Dactylus with bifurcate, feathery dactylar seta, slightly curved ungual seta, one seta on the frontal face, some scales and setae or seta-like structures and a small seta in place of the inner claw. Pleopod exopodite 1 without marginal setae, exopodites 2–5 with two to six marginal setae. A distinct, but small dorsal respiratory field could only be seen with certainty on the second exopodite. Male exopodite 1 with concave apical margin, endopodite 1 not distinctly constricted beyond the basal portion, with a row of small spine-shaped setae along the spermatic furrow. Genital papilla long, ventral shield exceeded by a rounded lobe with orifices in subapical position. Male exopodite 2 distally extended into a long lobe, only slightly shorter than the endopodite. Pleopod 5 exopodite on caudal face with transverse strip of several rows of pectinate scales. Uropod endopodites exceptionally large.

Comparison of the manca, the female with marsupium and the smaller female shows that the number of ommatidia and steepness of coxal plates increases, whereas the relative size of the dorsal tricorn-like setae decreases, with body size. The number of ommatidia of the manca could not be precisely counted, but is clearly lower than 23 (of the adult specimen).

Biology
The female has six embryos in the marsupium.

SCLEROPACTES PULULAHUA SP. NOV.

Material examined

Type specimens: Holotype ♂; paratypes four ♂, five ♀ (Ecuador, Pichincha Prov., Pululahua volcano, altitude *c*. 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

Other samples: Six ♀m, three ♂, seven ♀ and immatures (Ecuador, Imbabura, road Cahuasqui-Buenos Aires, altitude 3500 m, leg. G. Onore, 10 March 1993, MZUF); one ♀, three ♂ (Ecuador, Esmeraldas Prov., Mayronga, altitude 100 m, leg. G. Onore, 25 October 1993, MZUF).

Description (Figs 128–133)
Female 7.2×3.5 mm, cephalothorax 1.80 mm wide, 20 or 21 ommatidia; male 6.6×3.0 mm, cephalothorax 1.57 mm, 18/18 ommatidia.

Tergites brown, with pale muscle insertions and a row of pale patches at the base of the coxal plates. Second antenna brown, the distal part of the fifth peduncular article and the flagellum white.

In dorsal view, the linea frontalis is medially straight and curved forwards in the region of the lateral lobes. Lateral lobes about half as long as eyes, not distinctly delimited. Frontal shield with median part forming a broad ridge between antennae, in dorsal view with slightly concave frontal face. In frontal view, linea frontalis weakly convex, lateral lobes forming slightly acute outer angles. Dark brown, with slightly brighter coxal plates and epimera. Pale patches at the base of the coxal plates and in the middle of the tergites. Noduli laterales could not be discerned from the other large tergal sensilla, which give the animal a pilose appearance, although they are distinctly weaker than in *Scleropactes pilosus*.

First antenna triarticulate, medial article shortest. Distal article with sharp, acute tip, two large, subapical aesthetascs and a group of *c*. ten smaller aesthetascs on the frontal face. Second antenna with triarticulate flagellum; apical cone longer than the distal article. Apical cone with only one free lateral sensillum (not a pair of sensilla). Medial and distal articles with a transverse row of two aesthetascs.

Left mandible with pars incisiva of four cusps, large lacinia mobilis with two cusps, hairy lobe with two hairy setae, one single hairy seta between hairy lobe and pars molaris, the latter represented by a tuft of hairy setae. Right mandible with pars molaris of four very blunt cusps and smaller lacinia mobilis, hairy lobe with one hairy seta, but no small hairs, one single hairy seta between hairy lobe and pars molaris. The latter is similar to that on left mandible. Both mandibles on the outer face with some setae. First maxilla lateral endite on distal margin with lateral group of four strong, simple tooth setae, a small triangular lobe and a slender seta, and a mesal group of six more slender, simple teeth. (At low magnification, the mesal group may appear to be composed of four teeth only.). Only one very small subapical, serrate seta on the caudal face beside mesal group (observed in two specimens). Distal third of lateral margin densely fringed with hairs (pectinate scales). Mesal endite bearing two stout penicils; there is a very short, obtuse-angled corner lateral of the penicils. Lateral margin distally hairy. Second maxilla distally bilobate, the lobes subequal. Both lobes hairy, mesal lobe with group of sensilla on frontal face, near margin, and two small setae between lobes. Maxilliped basis distinctly scaly in the basal and lateral parts, epipodite with few hairs. Endite approximately rectangular, longer than wide, distal part covered with acute scales; one penicil near the mediodistal corner, on the frontal face. A very small knob (probably homologous with a seta) in a more proximal position, also on the frontal face. Maxilliped palp proximal article bearing two large setae, the lateral one somewhat smaller. In holotype male, only the left maxilliped lacks the smaller lateral seta (Fig. 129). Second article with distal tuft of several equal setae, and one slightly larger and more acute seta on a long socket, two equally sized setae beside the socket, and a pair of two more setae of the same size near the base of the socket. On lateral margin of second article, one broad seta and one to three slender setae. Distal article with apical tuft of equal setae, and one seta on the lateral margin. A longitudinal ridge on frontal face, as present in many Oniscidea, could not be seen.

Pereiopod 1 carpus with transverse brush of long, hair-like scales. Distal margin formed by a transverse row of tongue-shaped, hyaline scales. Propodus only with a small area with ventral spine-like scales. Male pereiopods with ventral scale-fields on merus and carpus of pereiopods 1–4. Carpus of pereiopods 2–5 on frontal face with a small, distal scale-field, decreasing in size from 2 to 5. Male pereiopod 7 ischium with concave ventral margin; on frontal face with a dorsodistal depression. Pereiopod dactyli with large outer claw, very small inner claw, dactylar seta apically double fringed, curved interungual seta with smaller seta beside it, one small seta on frontal and caudal face each, and some scales. Proximal of dactylar seta there are two aesthetasc-like setae.

Pleopods 1 and 2 with very indistinct lateral areas, which may represent vestigial respiratory fields. Male pleopod 1 exopodite broader than long, without marginal setae. Pleopod 1 endopodite slightly curved laterally, with simple tip bearing some wrinkles on the outer side. Row of small, spine-shaped setae (29 in the holotype) along the dorsal spermatic furrow. Male pleopod 2 endopodite slightly exceeding exopodite, the latter with four marginal setae. Pleopod 3 and 4 endopodites apically bilobate. Pleopod 3–5 exopodites with two marginal setae each, and without distinct respiratory fields. Pleopod sympodites with one or two small setae. Female pleopod 1 exopodite less than half as long as wide, without marginal setae, endopodite lacking. Female pleopod 2 exopodite with one marginal seta, endopodite represented by a short cone. Uropods: distinct gland pores could not be seen. Exopodite shorter than sympodite; exopodite and endopodite reach approximately the same level.

The specimens from Mayronga are assigned to this species with some doubt. Differences are in the shape of coxal plate 4, which is narrower, and probably in the male pleopod 1 endopodite. As the specimens are also larger, the male characters could not be compared in a sensible way (see variation in *Scleropactes zeteki*).

Derivation of the name
After the locus typicus, the Pululahua volcano.

Biology
Females carry eight eggs in the marsupium ($N = 4$). Females with marsupium were in the sample collected in March, but not in the sample collected in February. However, the total numbers are too low for conclusions to be drawn.

Remark
This species is most closely related to *Scleropactes pilosus*, which is similar in the pilose tergites, coloration, and morphology of the cephalothorax. Differences are in the shape of coxal plates 2–4, and the male pleopod 1 exopodite.

Scleropactes zeteki Van Name, 1926

Scleropactes zeteki Van Name, 1926 – Van Name (1936); Arcangeli (1930); Leistikow & Wägele (1999*); Leistikow (1999*); Schmalfuss (2003*).

Material examined

Type specimens: Two ♂, two ♀m, two ♀ without marsupium, two immature ♂, one immature ♀ (Paratypes, Panama, Canal Zone, Gatun Lake, Barro Colorado Island, leg. Van Name, April 1924, AMNH 5347).

Other samples: Six ♂, two ♀m, three immature (Panama, Canal Zone, Barro Colorado Island, leg. J. Zetek, September–December 1941, AMNH 9635); eight ♂ and one posterior half, two ♀m, eight ♀ and six immatures (Panama, Canal Zone, Barro Colorado Island, leg. J. Zetek, January–February 1943, USNM 87610); five adult ♂, 49 immature ♂ attributable to three distinct stages, seven ♀m, 11 adult ♀ without marsupium, 87 juveniles and immature &female', four mancas and fragments of 40 further specimens (Panama, Canal Zone, Barro Colorado Island, leg. J. Zetek, January–June 1944, USNM 87595).

Description (Fig. 134)
Female 14.9×6.7 mm, immature males in three distinct stages: *c.* 4×2 mm, *c.* 6.5×3.5 mm, 10×5 mm. Adult male maximum 15.5×7.2 mm [illustrations are in Schmidt (2003)].

Tergites distinctly tuberculate, each tubercle bearing a tricorn-like seta; in contrast to *Scleropactes pilosus*, the surface is not pilose, but looks somewhat rough. Tergites medially light brown with pale muscle insertion spots; coxal plates and epimera mottled in some specimens and pale in others. The pigment seems to be more strongly developed at the posterior margins of the coxal plates. Second antennae with weak pigment on the basal two articles and the distal two flagellar articles; stronger pigment on peduncular articles 3 and 4 and the proximal half of article 5; distal half of peduncular article 5 and proximal flagellar article white. Lateral lobes of cephalothorax distinct in dorsal view, but not in frontal view. Along posterior margin of transverse furrow a row of pectinate scales. Eyes composed of 24–27 ommatidia in adult specimens; the number of ommatidia depends on body size: small specimens about 2 mm wide have only nine or ten ommatidia.

First antenna third article with two long apical aesthetascs and a group of subapical aesthetascs. Second antenna with three-jointed flagellum bearing a slender apical cone that is slightly longer than the third article and has a pair of short lateral setae. Mandibles with a large grinding surface formed by the pars incisiva in the right mandible and by the enormously enlarged lacinia mobilis in the left mandible. Left mandible with hairy lobe bearing two penicils and one single penicil between lacinia mobilis and the original pars molaris, right mandible with only a few very small hairs between the lacinia mobilis and the original pars molaris, which is represented by a tuft of hairy setae. First maxilla mesal endite with two very stout penicils and the laterodistal corner rounded and provided with a fringe of hairs. Lateral endite on distal margin with lateral group of four simple, stout teeth and a small triangular lobe and a short, slender seta, and mesal group of six more slender teeth with simple tips and a pair of very small subapical setae. The six mesal teeth are much smaller than the lateralmost three tooth setae. Second maxillae apically bilobate, both lobes equal in size and hairy; mesal lobe with a rounded corner bearing a field of sensilla. Maxilliped endite rectangular, hairy, with a small seta on the caudal face and a stout penicil on the frontal face near apical margin. Maxilliped palp three-jointed; basal article with two large setae, second article on inner margin with proximal group of two or three small setae, and a distal tuft of setae on a socket, beside which there are two small setae. Lateral margin of the second article with two or three slender setae and one broad seta. Distal article with apical tuft of setae and a single seta on the lateral margin. Delimitation between second and third article distinct only in caudal view; the frontal face bears some pectinate scales.

Pereiopod 1 with antennal brush composed of scales on carpus and propodus. Male pereiopod 2 carpus with a small, distal field of scales and pereiopod 3 carpus with only a small group of scales in the same position. Male pereiopod 7 ischium with very shallow depression along the distal margin, on the frontal face. Base of pereiopod 7 with water-conducting scale-row along a furrow. (The scale-row was quite indistinct at 100× magnification, and could easily be overlooked, but at 400× magnification it was clearly visible.) Dactyli with dactylar seta slightly projecting beyond the outer claw, apically with two fringes of setules. No inner claw present, but at its place there are three setae, two of which are supposed to be the ungual seta and its accessory seta. Uropods with gland pores on their lateral face (these were not seen, but their existence could be concluded from the presence of secretion at this place).

Pleopod 1 and 2 exopodites strongly and coarsely wrinkled, giving rise to some short and wide air tubules. Lateral margins of these respiratory fields irregularly folded. Exopodites 3–5 without trace of such fields. Male pleopod 1 endopodite approximately straight, with row of minute setae along the dorsal spermatic furrow. Male endopodite 2 at least as long as exopodite, which is extended into a long apical lobe (the tip of the endopodite is broken off, so the exact length could not be determined). All exopodites with marginal row of one to several setae, which are irregular in size and position.

Thanks to the abundant material, the (postmarsupial) development of the male pleopod 1 can be described. The exopodite has well-developed respiratory areas already present in small specimens (5.3 × 2.6 mm), and the mesal lobe increases slightly in length and bears one apical seta at all stages. The endopodite of the small male is approximately straight, except for the tip, and bears a small number of spine-shaped setae in a row along the spermatic furrow. In medium-sized immature males (8.0 × 3.6 mm and 10.9 × 4.8 mm), the shape remains similar and the row along the spermatic furrow consists of 34 setae. In contrast, adult males have a row of approximately 50 spine-like setae along the spermatic furrow, and the distal third of the portion projecting beyond the genital papilla is distinctly narrower and stick-shaped.

Geographical distribution

Up to now, *Scleropactes zeteki* has been recorded only from Barro Colorado Island, where it seems to be abundant.

Remarks

Owing to the presence of numerous specimens of varying size, it was possible to examine growth stages of the male pleopod 1. If the adult male is looked at, a distinctly constricted distal portion is seen, as in *Globopactes*. If only an immature male is examined, the shape appears more simple and, in a phylogenetic analyis, would be coded differently. Therefore, it is necessary to compare the same stages in an analysis.

Scleropactes zeteki is most similar to *Scleropactes pilosus*, with regard to the general shape and the surface structure. It is easily distinguished from all other species of *Scleropactes* by the much more differentiated respiratory fields. A remarkable feature is seen in the mandibles, with their enlarged grinding surface, which is not formed by the original pars molaris but by the pars incisiva and lacinia mobilis. An odd similarity to this is found in *Scleropactes cotopaxii*, *Scleropactes ecuadoriensis* and also in *Spherarmadillo nebulosus* (see below). However, the pars molaris is simple in *Spherarmadillo nebulosus* but composite in *Scleropactes zeteki*, and the conformation of right lacinia and hairy lobe is different. Together with the other differences, this favours the assumption of convergency rather than synapomorphy of *Scleropactes zeteki* and *Spherarmadillo nebulosus.* In contrast, the similar structure of the mandibles of the three species of *Scleropactes* may be inherited from a common ancestor; they do not group together in the present analysis, but the characters that in the cladogram contradict the homology assumption for the grinding surface in Scleropactes zeteki, S. cotopaxii and S. ecaudoriensis have a low complexity. Research concerning the function of these mandibles and of the food of both species would be of great interest.

In some other, probably related, species of *Scleropactes*, the mandibles could not be examined due to lack of material.

GLOBOPACTES GEN. NOV.

Type species: Globopactes falconensis sp. nov.

Diagnosis

Scleropactids with endoantennal conglobation ability. Eyes and pigment well developed. Coxal plate 1 simple (without schisma). Uropod sympodites longer than broad and with outer corner rounded. Maxilliped palp proximal article with only one large seta. Anterior pereiopods of male with scale-fields. Pleopods 1 and 2 with simple dorsal respiratory fields.

Apomorphies of Globopactes

1. male pereiopod 7 merus with ventroproximal scaly tubercle (without such tubercle)
2. male pleopod 1 endopodite with distal portion straight (distal part bent laterally)

Derivation of the name

Latin *globus* (sphere), referring to the conglobation ability, and *-pactes* as posterior part of the name *Scleropactes*, to indicate that the new genus belongs to the Scleropactidae.

Phylogeny within the genus Globopactes

Within the genus, *G. senex*, *G. falconensis* and *G. granulatus* are clearly identifiable as most closely related species. In the phylogenetic analysis (see above), they form clade 28. Their common derived characters are coxal plates 2 and 3, which have deeply concave lateral margins, adapted to conglobation. This is one of the few characters that does not require the assumption of convergency within the Scleropactidae.

GLOBOPACTES HISPIDUS SP. NOV.

Material examined

Types: ♂ holotype and one ♀m paratype (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c*. 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

Description (Figs 135–140)

Male 6.8 × 3.1 mm, cephalothorax 1.43 mm wide; female 7.0 × 3.2 mm, cephalothorax 1.52 mm wide.

Dorsum with light brown and pale areas. On the coxal plates, some chromatophores form a reticulate pattern. Pereiopods also with brown reticulate pigment. Second antenna brown, distal half of fifth peduncular article and proximal flagellar article white. Tergites with shallow tubercles, each bearing a strong, stick-like scale seta. Noduli laterales could not be seen; presumably, they are similar to or smaller than the scale setae.

Endoantennal conglobation ability. Cephalothorax with lateral lobes about half as long as the eyes, not distinctly delimited. Frontal shield convex between the antennae, in dorsal view slightly arcuate. In frontal view, linea frontalis weakly convex, corners of lateral lobes forming almost right angles. In frontal view, two cavities above the insertions of the second antennae are delimited by elevated areas along the upper margin and between them.

First antenna triarticulate, second article shortest. Distal article with sharp, acute tip, two large, subapical aesthetascs and approximately seven slightly smaller aesthetascs on the frontal face. Second antenna with triarticulate flagellum; apical cone 1.5 times as long as the distal article. Second and third articles with a transverse row of two aesthetascs.

Left mandible with pars incisiva of four cusps, large lacinia mobilis with two large cusps and one small cusp, hairy lobe with two hairy setae, one single hairy seta immediately adjacent to the hairy lobe. Pars molaris represented by a tuft of hairy setae. Right mandible with pars incisiva of four blunt cusps and smaller, conical lacinia mobilis, hairy lobe with one hairy seta, one single hairy seta between hairy lobe and pars molaris. The latter represented by a tuft of hairy setae. Both mandibles on the outer face with some setae and scales. First maxilla lateral endite on distal margin with lateral group of four strong, simple tooth setae, a triangular lobe, which is about half as long as the adjacent tooth seta, a slender seta, and an inner group of six more slender teeth, five of them distally cleft. Two small subapical seta on caudal face beside inner group. Distal third of lateral margin densely fringed with hairs (pectinate scales). Mesal endite bearing two slender penicils; there is no distinct corner laterally of penicils. Second maxilla distally bilobate, lobes subequal. Both lobes hairy, mesal lobe with group of sensilla on frontal face, near the margin, and two small setae between the lobes (?). Maxilliped base distinctly scaly in the basal and lateral parts, epipodite without hairs. Endite approximately rectangular, longer than wide, distal part

KEY TO THE SPECIES OF *GLOBOPACTES*

1. Coxal plates 2 and 3 with strongly concave lateral margins 2
1.* All coxal plates with convex lateral margins, as usual 4
2. Male pereiopods 1–3 merus and carpus with ventral field of scales; tergites smooth, coloured dark and light brown; 7–9 mm; frontal shield various 3
2.* Male pereiopods 1–2 merus and carpus with ventral field of scales; juveniles distinctly hirsute, immatures distinctly granulate; tergites red with black and yellow patches; 12–15 mm; frontal shield less appressed to vertex, i.e. the transverse furrow is more exposed . . . . . *Globopactes granulatus* (Dollfus, 1893)
3. Frontal shield more appressed to the vertex, its median part even . . . . . *Globopactes falconensis* sp. nov.
3.* Frontal shield less appressed to vertex, with transverse furrow forming deep grooves laterally, median part of frontal shield strongly concave . . . . . *Globopactes senex* (Budde-Lund, 1893)
4. Tergites with shallow tubercles bearing strong upright scale-setae . . . . . *Globopactes hispidus* sp. nov.
4.* Tergites smooth 5
5. Pereiopods pale. Second antenna: distal half of fifth article and flagellum pale. Male pleopod 1 exopodite broader than long, distally truncate. . . . . *Globopactes talamancensis* (Leistikow, 1997)
5.* Pereiopods pigmented. Second antenna: entire fifth article dark, flagellum pale. Male pleopod 1 exopodite approximately as long as broad, of roughly triangular shape . . . . . *Globopactes meridae* sp. nov.

covered with acute scales; one penicil near mediodistal corner, on frontal face. A very small knob (probably homologous with a seta) in a more proximal position, also on frontal face. One seta on caudal face of endite, difficult to see among the hairs (scales). Maxilliped palp proximal article bearing one large seta, in a mesal position. Second article with proximal tuft of three small setae, distal tuft of equal setae on a long socket, two equally sized setae beside the socket. On lateral margin of second article, one broad seta and one slender seta. Distal article with apical tuft of > 20 equal setae and four setae on lateral margin. A longitudinal ridge on frontal face is not present.

Pereiopod 1 carpus with oblique brush of long, hair-like scales. Distal margin formed by a transverse row of tongue-shaped, hyaline scales. Propodus only with large scale-field. Male pereiopods with frontoventral scale-fields on ischium, merus and carpus of pereiopods 1 and 2, and on merus and carpus of pereiopod 3. Male pereiopod 7 ischium with very weakly concave, almost straight, ventral margin fringed with scales. Merus 7 with ventrocaudal tubercle in a proximal position. Distal of this tubercle a deep excavation; The tubercle is not seen in strictly frontal view. On pereiopod 7 basis, no traces of a water-conducting structure could be found. Pereiopod dactyli with large outer claw, long inner claw, dactylar seta apically double fringed, curved ungual seta with smaller seta beside it, one small seta on frontal face and on caudal face, and some scales. Proximal of dactylar seta there are two aesthetasc-like setae.

Male pleopod 1 exopodite rounded-triangular, wider than long, without any marginal setae. Endopodite 1 with straight distal part and a row of 26 (in holotype) small setae along the spermatic furrow on the caudal/dorsal side. Male pleopod 2 exopodite with two or three marginal setae and some pectinate scales along the inner margin. Endopodite 2 slightly longer than exopodite. Pleopods 3–5 expodites with some marginal setae, sympodites with long, acute and hairy tip at the mesal margin. Male pleopod 5 exopodite with indistinct angle bearing one seta on the lateral margin, a furrow along the mesal margin, and a transverse band of several rows of pectinate scales on the caudal face. Lateral respiratory field on dorsal face of pleopod exopodite 1 and indistinct lateral (respiratory?) fields on exopodites 2–5. Uropod sympodites probably with some gland pores on the dorsal face (could not be seen with certainty). Endopodite as long as sympodite; exopodite distally projecting beyond endopodite.

Habitat

Moist forest on the east slope of the Andes, 1500 m altitude. In leaf litter.

Derivation of the name

From Latin *hispidus* (spiny), because of the spine-like dorsal scale setae.

GLOBOPACTES MERIDAE SP. NOV.

Material examined

Types: Holotype ♀ (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short grazed meadow beside a small brook, at lower border of the Páramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV); paratypes – two ♀ with empty marsupium and one juvenile ♀ (same data).

Other samples: One ♂ [Venezuela, Mérida, Páramo La Negra, 8°16′ N, 71°52′ W, altitude 980 m (?), leg. G. Lozano, 22 March 1959, MNRJ 9688, labelled as *Scleropactes colombiensis*].

Description (Figs 142–147)

Male 7.0 × 3.0 mm, cephalothorax width 1.64 mm, 19/17 ommatidia. Adult females (with marsupium) 9.4 × 4.0 mm, cephalothorax width 2.08 mm, 19/19 ommatidia; 10.8 × 4.6 mm, cephalothorax width 2.36 mm, 20/20 ommatidia. Juvenile female 4.8 × 2.3 mm, cephalothorax width 1.23 mm, 15/15 ommatidia.

Dorsum dark brown, with pale muscle insertions and a row of pale patches at the base of the coxal plates. One female with orange patches on the posterior margin of the tergites and orange uropod endopodites, the other female with the basal third of the uropod endopodites orange. Pereiopods also with dark brown pigment.

Lateral lobes about half as long as the eyes, not distinctly delimited. Frontal shield convex between the antennae, in dorsal view slightly arcuate. In frontal view, linea frontalis weakly convex, corners of lateral lobes forming almost right angles. In frontal view, two cavities above the insertions of the second antennae are delimited by elevated areas along the upper margin and between them. This suggests an endoantennal conglobation ability. Noduli laterales small and inconspicuous, all at the posterior margins and at the same distance to the lateral margin.

Females with one cotyledon per sternite.

First antenna triarticulate, second article the shortest. Distal article with sharp, acute tip, two large, subapical aesthetascs and approx. five slightly smaller aesthetascs on the frontal face. Second antenna with triarticulate flagellum; apical cone 1.5 times as long as the distal article, with one small lateral sensillum. Second and third articles with a transverse row of two (?) aesthetascs.

Left mandible with pars incisiva of four cusps, large lacinia mobilis with three large and two small cusps, hairy lobe with one (?) hairy seta, one single hairy seta immediately adjacent to the hairy lobe. Pars molaris represented by a tuft of hairy setae. Right mandible with pars incisiva of four blunt cusps and smaller, conical lacinia mobilis, hairy lobe with one hairy seta, one single hairy seta between hairy lobe and pars molaris. The latter is represented by a tuft of hairy setae. Both mandibles on the outer face with some setae and scales. First maxilla lateral endite on distal margin with lateral group of four strong, simple tooth setae, a triangular lobe, which is about half as long as the adjacent tooth seta, a slender seta, and a mesal group of six more slender teeth, five of them distally cleft. (At low magnification, the inner group may appear to be composed of five teeth only.). A single very small subapical seta on the caudal face beside the inner group. Distal third of lateral margin densely fringed with hairs (pectinate scales). Mesal endite bearing two slender penicils; there is no distinct corner lateral to the penicils. Lateral margin distally with only few minute hairs. Second maxilla distally bilobate, the lobes subequal. Both lobes hairy, the mesal lobe with group of sensilla on the frontal face, near the margin, and two small setae between the lobes (in the specimen from which the illustration was drawn, the inner lobe has lost many hairs). Maxilliped base distinctly scaly in the basal and lateral parts, epipodite without (?) hairs. Endite approximately rectangular, longer than wide, distal part covered with acute scales; one penicil near the mediodistal corner, on frontal face. A very small knob (probably homologous with a seta) in a more proximal position, also on frontal face. One seta on caudal face of endite, difficult to see among the hairs (scales). Maxilliped palp proximal article bearing one large seta, in a mesal position. Second article with proximal tuft of two or three small setae, distal tuft of equal setae on a long socket, two equally sized setae beside the socket. On lateral margin of medial article, one broad seta and one slender seta. Distal article with apical tuft of > 20 equal setae and four setae on the lateral margin. A longitudinal ridge on the frontal face is not present.

Pereiopod 1 carpus with transverse brush of long, hair-like scales. Distal margin formed by a transverse row of tongue-shaped, hyaline scales. Propodus only with large scale-field. Male pereiopods with frontoventral scale-fields on ischium, merus and carpus of pereiopods 1 and 2, on merus and carpus of pereiopod 3, and ventral scale-fields on ischium of pereiopods 6 and 7. Carpus 1 and 2 strongly enlarged (more than 0.6 times as high as long), carpus 3 weakly enlarged. Male pereiopod 7 ischium with very weakly concave, almost straight, ventral margin fringed with scales. Merus 7 with ventrocaudal, scaly tubercle in a proximal position. Distally of this tubercle, a small scale-field. Basis of pereiopod 7 with only very indistinct vestiges of a water-conducting structure. Pereiopod dactyli with large outer claw, long inner claw, dactylar seta apically double-fringed, curved ungual seta with smaller seta beside it, one small seta on frontal face and on caudal face, and some scales. Proximally of dactylar seta there are two aesthetasc-like setae.

Male pleopod 1 exopodite rounded-triangular, wider than long, without any marginal setae. Endopodite 1 with straight distal part and a row of 36 (in the holotype) small setae along the spermatic furrow on the caudal/dorsal side. Male pleopod 2 expodite with three marginal setae and a hairy area along the mesal margin. Endopodite 2 slightly longer than exopodite. Pleopod 3–5 expodites with some marginal setae, sympodites with long, acute and hairy tip at the mesal margin. Male pleopod 5 exopodite with indistinct angle, bearing one seta on the lateral margin, a furrow along the mesal margin, and a transverse band of several rows of pectinate scales on the caudal face. Indistinct lateral respiratory fields on the dorsal face of pleopod exopodites 1 and 2 only. Uropod sympodite probably with some gland pores on the dorsal face (could not be seen with certainty). Endopodite as long as sympodite; exopodite distally projecting beyond endopodite.

Habitat
At lower border of the Páramo region. The specimens were found in a grazed area near a small brook, under stones and in *Espeletia* rosettes.

Derivation of the name
The species is named after the state Mérida.

GLOBOPACTES TALAMANCENSIS (LEISTIKOW, 1997) COMB. NOV.

Scleropactes talamancensis Leistikow, 1997 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined
Paratypes: three ♂, one immature ♂, eight ♀m, two immature ♀, one manca (Costa Rica, San José, Cordillera de Talamanca, Valle de Coto Bruz, Altamira, 9°02′ N, 83°01′ W, altitude 1400 m, leg. A. Leistikow, 23 July to 8 August 1994, cCS 539); two ♀m (Costa Rica, San José, Cordillera de Talamanca, Valle de Coto Bruz, Altamira, 9°02′ N, 83°01′ W, altitude 1400 m, leg. A. Leistikow, 20 July 1994, cCS 540).

Description
Male 7 mm, female 9 mm. Tergites greyish-brown with pale patches on the bases of the coxal plates, and

pale muscle insertion spots. Second antennae: brown, distal half of fifth peduncular article and flagellum pale. Sternites and appendages not pigmented. Cephalothorax lacks a linea supraantennalis. In dorsal view, the linea frontalis is straight.

Mouthparts as in *Globopactes meridae*. Male pereiopods 1–3 with scale-fields that occupy the ventral half of the frontal face of the slightly enlarged carpus and ventral face of the merus. Male pereiopod 7 merus with a ventroproximal scaly tubercle. Dactyli with inner claw as long as outer claw and long dactylar seta double-fringed in the distal half. Ungular seta straight, with a shorter seta beside it. Pleopod 1 and 2 exopodites with distinctly delimited dorsal respiratory fields with a smooth surface. Male pleopod 1 exopodite broader than long. Male pleopod 1 endopodite distally straight. Male pleopod 2 endopodite distinctly longer than exopodite.

For further details and illustrations, see original description.

Geographical distribution (Map Fig. 141)
Costa Rica, Puntarenas province, Cordillera de Talamanca.

Remark
Leistikow (1997) concludes from the cephalothorax morphology that the specimens may have an endoantennal conglobation ability or do not conglobate at all. His observations on living animals suggest that they do not roll up when disturbed. Further, Leistikow discussed the relationships of *talamancensis* and wrote that the ascription to the genus *Scleropactes* was only provisional.

The above-mentioned specimens, at least the first sample, are those mentioned as '4 M 11 F author's collection; same data as holotype' in the original description. The holotype (USNM 280185) and further paratypes (USNM, SMNS, UCR) were not examined; see detailed data in Leistikow (1997).

GLOBOPACTES SENEX (BUDDE-LUND, 1893)

Scleropactes senex Budde-Lund, 1893.
Sphaeroniscus senex – Budde-Lund (1904); Van Name (1936*); Leistikow & Wägele (1999*); Jeppesen (2000*); Schmalfuss (2003*).
Not: *Sphaeroniscus senex* – Vandel (1952).

Material examined

Types: One ♂, one ♀ (distorted), one ♀m (broken), syntypes (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN-Is5722).

Description (Figs 148–153)
The description is based on three syntype specimens.

Female with marsupium, cephalothorax 2.36 mm wide, with 20/20 ommatidia. Male, cephalothorax 2.44 mm wide, 21/21 ommatidia. The third specimen, a female, has 20/19 ommatidia. Colour not preserved. Budde-Lund (1893) in the original description did not mention the colour.

Cephalothorax with frontal shield covering the transverse groove except for its lateral parts. Upper margin of frontal shield in dorsal view weakly curved caudally, in frontal view medially straight, lateral parts also straight, but separated from the median part by obtuse angles. Transverse furrow deep; lateral parts just behind frontal shield have rounded frontal edge. Linea supraantennalis strongly upcurved near the middle, and interrupted in the middle. Coxal plate 1 simple, with a sharp posterior corner. Lateral margin of coxal plate 2 weakly concave, that of coxal plate 3 strongly incised. Female marsupium with one cotyledon each on sternites 2–5.

First antenna three-jointed, second article shortest. Apical article with group of irregularly placed aesthetascs (minimum six) and two larger apical aesthetascs (broken off, but insertions are visible). Second antenna not preserved in any of the three specimens.

Mandibles: right mandible with pars incisiva of four cusps, lacinia mobilis with two acute distal cusps and one more proximal, rounded cusp, hairy lobe with scales and one hairy seta. One hairy seta between hairy lobe and pars molaris (the latter broken off). Left mandible with pars incisiva of four cusps, lacinia mobilis with two cusps and larger than on right mandible. Hairy lobe with scales and two hairy setae. One hairy seta between the hairy lobe and the pars molaris, which is represented by a tuft of numerous hairy setae. Outer face of both mandibles with scales and scale setae. First maxilla lateral endite laterally fringed with hairs (pectinate scales?) along slightly less than distal half. Distal margin with lateral group of four stout tooth setae, a smaller, triangular lobe (or seta), and a slender seta with hairy tip; mesal group of six more slender setae, at least four of them cleft. (Whether small, subapical setae are present on the caudal face could not be seen: the putative insertions are obscured by dirt.) Mesal endite distally with two hairy penicils (one lost, but insertion is visible), laterodistal corner rounded. Second maxilla apically bilobed; lobes of approximately equal size. Mesal lobe with row (or field?) of sensilla and densely covered with hairs; lateral lobe less densely covered with hairs, between both lobes with two larger sensilla. Maxilliped composed of a small coxa, a large base covered with scales and scale setae, an epipodite, endite and palp. Endite roughly rectangular, distal margin convex, covered with hairs (many of them broken in the drawn specimen), with a small seta on caudal face and a stout penicil on distal face. Maxilliped palp proximal article with a single large seta near the median margin; distal portion too much damaged to allow a description.

Male pereiopod 1 with slightly enlarged carpus covered with scales, including the antennal brush, on the frontal face. Also propodus with large scale-field extending from ventral to dorsal margin. Merus and ischium also with ventral scale-fields. Male pereiopod 2 similar to pereiopod 1 except for carpus, which is slightly narrower and has no distinct antennal brush, but is entirely covered with scales. Male pereiopod 3 with scale-fields as the preceding, but somewhat less extended and with carpus not enlarged. Pereiopods 4–6 without conspicuous scale-fields. Male pereiopod 7 with long ischium with weakly concave ventral margin, merus with ventroproximal tubercle and distally adjacent groove; both groove and tubercle covered with scales. Pereiopod dactyli with slightly curved ungual seta, about half as long as outer claw, dactylar seta apically fringed with setules, one smaller seta on frontal face, and a number of scales and/ or setae (more details are not preserved).

Pleopod exopodites 1 and 2 with delimited smooth fields, exopodites 3–5 without any distinct or delimited respiratory structures. All exopodites with rather small marginal setae. Male pleopod 1 endopodite straight, with row of > 25 small spine-like setae (part of the row is obscured by a bundle of sperm). Exopodite 1 wider than long, with obtuse apical margin. Male pleopod 2 endopodite distinctly exceeding the exopodite. Male pleopod 5 exopodite with transverse strip of small pectinate scales. Pleopod 3–5 sympodites with long and acute median lobes.

Reproduction

In the tube with the syntype specimens there is only one female with marsupium; 14 eggs were found, some of which had fallen out of the broken specimen. Therefore, it cannot be stated with certainty that no eggs had been lost, but according to the egg size, the number of 14 seems to fit, and the real number cannot have been much higher.

Remark

After the original description by Budde-Lund (1893), which was not provided with illustrations, no other author re-examined the type material. According to Budde-Lund, the specimens were in the 'Staatliches Museum für Tierkunde Dresden'. The samples in that museum were destroyed during World War II. The geographical distance between the type locality and the place where the specimens identified by Vandel (1952) had been collected raised doubt concerning the conspecificity of these samples, although the original description also fits Vandel's samples.

Recently, I discovered a tube with three specimens in the MNHN Paris which, according to the data on the label, which had been written by Budde-Lund himself, have to be considered as syntypes. Budde-Lund received them from the Staudinger collection ('Mus. Staudinger'). Re-examination of these specimens revealed that they represent a species distinct from those identified as Sphaeroniscus sexen by Vandel.

GLOBOPACTES FALCONENSIS SP. NOV.

Scleropactes especie 1 – Schmidt (2001).
Scleropactes sp. – Schmidt (2003).

Material examined

Types: Holotype ♂ (Venezuela, Falcón, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, forest/banana plantation, under leaf litter, stones and decaying wood, leg. C. Schmidt, 21 March 1998, UCV). Paratypes: seven ♀/immature ♀, five immature ♂, one adult ♂ (same data, UCV); one juvenile ♂, one juvenile and one adult ♀ (same data, MNRJ 19253); one immature ♂, two ♀ (same data, SMNS); two ♂, one immature ♂, one ♀, one ♀m (same data, cCS 199b).

Other samples: One juvenile ♂, one juvenile ♀ (Venezuela, Trujillo, Vega de Guaramacal, Sector Agua Fria, Cueva del Burro, leg. H. Escalona, 24 December 1998, UCV).

Description (Figs 154–159)

Male 8.8×3.6 mm to 9.2×3.6 mm (cephalothorax width 2.07 mm); adult female 11.7×5.0 mm (cephalothorax width 2.62 mm).

Dorsum dark brown, with a row of pale patches at the base of the coxal plates and some additional irregular pale patches. Apical 0.4–0.3 of fifth peduncular article of second antenna and basal flagellar article pale. Pleopod 4 and 5 exopodites slightly pigmented.

Cephalothorax with frontal shield bearing slight excavations for second antennae. Upper margin of frontal shield in frontal view slightly, evenly curved, in dorsal view approximately straight. Distance from eyes to posterior margin of frontal shield approximately equal to diameter of one ommatidium; distinct lateral lobes and median lobe not present. Transverse furrow deep behind frontal shield, but rather shallow in the lateral portions, which do not reach the posterior ends of the eyes. Linea supraantennalis present, medially strongly bent upwards. Eyes composed of 21 or 22 ommatidia. Tergites nearly smooth, with small scale setae. Noduli inconspicuous on the entire specimens. Lateral margins of coxal plate 2 concave, those of coxal plate 3 deeply concave, forming a cleft in which following coxal plates fit when conglobating.

First antenna three-jointed, apical article longer than basal and medial articles, and provided with aesthetascs that are irregularly arranged on medial face. One large aesthetasc on the tip.

Mandibles with left two and right one penicil on the 'hairy lobe' basal to lacinia mobilis, on each mandible one penicil between lobe and pars molaris which is represented by a tuft of numerous hairy setae. First maxilla mesal endite with two penicils of equal size and laterodistal corner rounded. Lateral endite on distal margin with lateral group of four stout teeth, a triangular lobe and a slender stalk on caudal surface, and mesal group of six slender hardly cleft teeth. Near inner group, on the caudal face, there is a very small subapical seta (or two setae). Second maxilla bilobate, mesal lobe with sensory setae and both lobes with hair-like scales. Maxilliped with large base with some scale setae, epipodite, endite, and palp. Endite distally truncate-rounded, hairy, with one (two?) small setae on the caudal face between hairs, and penicil near mesodistal corner on frontal face. Maxilliped palp three-jointed, proximal article with one large seta in mesal position, second article mesal margin with proximal tuft of at least five setae, and distal tuft of more than ten unequal setae on a common socket, lateral margin with one broad seta. Distal article with four or five single setae on the lateral margin and a tuft of unequal setae on the tip. Frontal face of distal article without longitudinal crest.

Male pereiopod 1–3 merus, carpus and propodus with ventrofrontal scale-fields. Ventral setae arranged in a single row along scale fields. Pereiopod 6 ischium ventrally hirsute. Pereiopod 7 ischium ventral margin concave, merus with proximal ventrocaudal protrusion covered with spines. Dactyli with slender inner claw that may reach length of outer claw. Ungual seta abruptly constricted to a very fine tip. Dactylar seta feathery. Dorsal margin of dactylus with some aesthetasc-like setae.

Pleopod exopodites 1 and 2 with respiratory fields; lateral margins with row of setae. Exopodite 5 on dorsal face with multiple row of pectinate scales. Male pleopod 1 endopodite with a straight distal portion, 30 small setae along the dorsal spermatic furrow. Male pleopod 1 exopodite wider than long, with four very small marginal setae on the distal margin. Male pleopod 2 endopodite somewhat longer than exopodite. Pleopod 4 with pectinate scales on the sympodite. Male pleopod 5 exopodite with a hairy groove along the mesal margin.

The scale-fields and increased number of ventral setae on pereiopods 1–3 are not present in a juvenile male of width 2.05 mm (cephalothorax width 1.12 mm), but already distinctly visible in an immature male of width 2.5 mm (cephalothorax width 1.36 mm). The characteristic shape of the adult male pleopod 1 exopodites is also not yet present in younger stages.

Affinities

The male pleopods show hardly any differences from *Globopactes talamancensis* and from *G. granulatus*. A common character of the new species, *G. senex* and *G. granulatus*, is the shape of coxal plates 2 and 3.

Habitat

Near the entrance of a cave and in the surrounding forest; under stones and wood, and beneath leaf litter.

Derivation of the name

The species is named after the State Falcón.

GLOBOPACTES GRANULATUS (DOLLFUS, 1893)

Slhaeroniscus granulatus Dollfus, 1893 (typographic error for '*Sphaeroniscus*').
Sphaeroniscus granulatus – Richardson (1914) (?); Van Name (1936*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Sphaeroniscus senex – Vandel (1952).
Scleropactes especie 2 – Schmidt (2001).

Material examined

Type: One immature ♀, holotype (Venezuela, Colonia Tovar, *c*. 10°N, 67°W, leg. E. Simon, February 1888, MNHN Is5721).

Other samples: One ♀ (Venezuela, Parque Nacional Henri Pittier, Rancho Grande, leg. Marcuzzi, 12 July 1949; with label '*Scleropactes senex*'), slides with second antenna, mandible, first maxilla, second maxilla, maxilliped, tergites 2 and 3, pleopods 1–5 of ♂ (slide with pleopods 1 and 2 destroyed) and first antenna, second antenna, maxilliped and pereiopod 1 of ♀ (CV 3761-1 to 6 and 5276-1 to 4, Venezuela, Rancho Grande, leg. Marcuzzi, II or VII, no further data); one immature ♂ [Venezuela, DF (Districto Federal), El Limón, Hacienda El Guacatal, altitude 1400 m, leg. O. Linares, 26 June 1966, MNRJ 9682]; one ♂, five ♀m, one ♀ (Venezuela, DF, El Limón, Hacienda El Guacatal, altitude 1400 m, leg. A. J. Perez, 7 September 1968); seven ♂, 11 ♀m (same data, MNRJ 9684); one immature ♀ (same data, MNRJ 9687); one immature ♂, one immature ♀ (Venezuela, Aragua, Rancho Grande, altitude 1100 m, leg. Garcia and Joly, 2 October 1967, MNRJ 9680); six ♀m, one ♀, one immature ♂ (Venezuela, DF, El Limón, Hacienda El Guacatal, altitude 1400 m, leg. P. Ojeda, 6 April 1966, MNRJ 9686); eight ♂, six ♀m, four ♀ (Venezuela, Caracas, Altagracia, altitude 950 m, leg. I. Ramirez, 28 October 1966; MNRJ 9685); one immature ♂, one immature ♀ (Venezuela, Miranda, leg. L. J. Joly, 28 December 1967, MNRJ 9683); 13 mancas (Venezuela, Miranda, Hacienda El Limón, leg. L. J. Joly, 28 December 1967, MNRJ 8769; these specimens were obviously collected together with the preceding sample); four ♂, ten ♀m, five immature ♀ (Venezuela, PN Henri Pittier, eastern road to the coast, at 30–31 km along the road, 1 km below pass, in cloud forest, leg. C. Schmidt, 26 March 1998, UCV); one ♂, one ♀m, one ♀ (same data, MNRJ); one ♂, two ♀m, one ♀ (same data, cCS 212).

Description (Figs 160–165)
Adult female maximum 15.8 × 7.0 mm, cephalothorax 3.37 mm wide; smallest female with marsupium with cephalothorax 2.43 mm wide. Males maximum 14.0 × 5.9 mm. Adults with 20–25 ommatidia.

Large adult female cephalothorax width 2.43–3.34 mm, e.g. female with marsupium 13.5 × 7.2 mm, cephalothorax 3.03 mm, male 14.0 × 5.9 mm. Smallest female with marsupium has a cephalothorax width of 2.43 mm and 21/21 ommatidia.

Endoantennal conglobation ability. Dorsum dark red with black and yellow patches. Cephalothorax behind cephalic shield with a deep furrow, lateral parts of which extend behind the eyes. Lateral parts of transverse furrow distally enlarged, whereas the median portion is partly covered by upper margin of frontal shield. Females with marsupium have four transverse rows of three cotyledons each. Appendages almost identical with those of *Globo. falconensis*.

In contrast, despite the larger size of the animal, ventral scale-fields present only on pereiopods 1 and 2 (this was observed on all available male specimens). Ventral setae of these legs curved, whereas they are straight in *Globopactes falconensis*.

Adults have the lateral margins of coxal plates 2 and 3 strongly concave, forming a cleft in which the following coxal plates fit when conglobating.

Mancas 2.31–2.69 × 1.31–1.38 mm, seven ommatidia each. Mancas are grey, without red pigment; tergites are strongly hirsute, and coxal plates 2 and 3 are convex. The conspecificity of mancas and adults was proven by rearing several females with marsupium until hatching of the mancas.

Remark
The specimens are conspecific with those examined by Vandel (1952), who referred to them as *Sphaeroniscus senex* (Budde-Lund, 1893). In the Vandel collection, a tube with one female specimen is labelled *Scleropactes senex*. A re-examination of the holotype of *Sphaeroniscus granulatus* showed that it does not differ from the recently collected specimens of the same size, either in morphology or coloration, remains of which are preserved in the holotype. Regarding the geographical closeness, it is very probable that all these specimens belong to the same species. In contrast, the type specimens of *Scleropactes senex* Budde-Lund, 1893 show strong differences, and were collected in a geographically distant area (see above).

Reproduction
Three females with marsupium had 19 eggs (with embryos), 31 eggs (with embryos), and 23 eggs (undeveloped?), respectively.

Habitat
Cloud forest, on the northern slope of the coastal cordillera. The specimens were found under stones in the forest and beside the road. When disturbed, they either appressed to the surface of the stone or conglobated.

Remark
Richardson (1914) reported two specimens from Colombia (Cauca, Puerto de los Pobres, altitude 800 m). Taking into consideration the known localities of the *Globopactes* species, it seems unlikely that these two specimens actually are *G. granulatus*.

Sphaeroniscus Gerstäcker, 1854

Type species: Sphaeroniscus flavomaculatus Gerstäcker, 1854 (by monotypy).

Diagnosis
Eyes present, with lenses (in *Sphaeroniscus gerstaeckeri* only with pigment spots). Endoantennal conglobation, surface smooth. First coxal plate with schisma, anterior corner delimited by a weak ridge. Coxal plate 5 enlarged, with concave lateral margin. (convergent in *N. zoiai*, not in *Sphaeroniscus gerstaeckeri*). Noduli laterales, as far as known, very small and located on the posterior margin of the tergites. Flagellum of second antennae with three articles. Male pereiopod 7 ischium with concavity and merus with a triangular lobe on the frontal side of the dorsodistal corner. Uropod sympodites angulate at outer corner.

KEY TO THE SPECIES OF *SPHAERONISCUS*

1. Dorsal surface appears hairy or spiny because of the large tricorn setae . . . . . *Sphaeroniscus pilosus* Vandel, 1972
1. Dorsal surface smooth 2
2. Coxal plate 5 with convex lateral margin; eyes represented by pigment spots without lenses . . . . *Sphaeroniscus gerstaeckeri* Vandel, 1968
2.* Coxal plate 5 with concave lateral margin; eyes with lenses present 3
3. Frontal shield exceeding vertex by about eye length; pleopod exopodites without marginal setae; uropod sympodites without dorsal gland pores . . . . *Sphaeroniscus flavomaculatus* Gerstäcker, 1854
3.* Frontal shield exceeding vertex by less than half of eye length; pleopod exopodites with numerous small marginal setae; uropod sympodites on dorsal face with a group of gland pores 4
4. Male pereiopod 7 merus in frontal view with tubercle at dorsal margin; pleopod 1 endopodite tip with a slight swelling on the median margin, the small setae along the spermatic furrow are simple. First maxilla inner endite with two penicils . . . . *Sphaeroniscus frontalis* Richardson, 1914
4.* Female pereiopod 7 merus in frontal view with tubercle below dorsal margin; pleopod 1 endopodite tip with a tubercle on the lateral margin; the small setae along the spermatic furrow are simple except for the five distalmost, which are cleft. First maxilla inner endite with number of penicils greater than two and instable (two large and one or two smaller) . . . . *Sphaeroniscus quintus* sp. nov.

SPHAERONISCUS FLAVOMACULATUS GERSTÄCKER, 1854

Sphaeroniscus flavomaculatus Gerstäcker, 1854 – Stuxberg (1875); Budde-Lund (1879*); Stebbing (1893*); Richardson (1914); Van Name (1936*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Not: *Sphaeroniscus flavomaculatus* – Vandel (1972) (misidentification).

Material examined

Holotype: One ♂ [ZMB*27267 (white label) '*Sphaeroniscus* Gerst.' (blue label) '*flavomaculatus* Gerst., Nov. Gran., Goud.'). The holotype, from which Gerstäcker's figure had been drawn, was found in the J. F. Brandt collection, mounted on an insect pin.

Other samples: One ♂ (lacks second antennae and pigment) (Colombia, between Bosca del Monte and Tambo, altitude 2000 m, leg. Otto Fuhrmann, USNM 43458).

Description (Figs 166–171)
Male 17 × 7.6 mm. (Female unknown.) Dorsal face dark brown with pale muscle insertion spots. Coxal plates paler than tergites. With endoantennal conglobation ability. Cephalothorax frontally flat, lamina frontalis and clypeus less protruding than in most other species. Eyes composed of about 18 or 19 ommatidia. Frontal shield far exceeding the vertex. Between vertex and posterior face of the frontal shield a distinct transverse furrow, which laterally ends at some distance from eyes. Coxal plates and pleon-epimera enlarged, first coxal plate with distinct schisma on the posterior corner. Anterior corner of first coxal plate striated and delimited by a weak ridge. Lateral margin of first coxal plate bent upwards; in consequence, a broad margin of ventral surface is visible in strictly lateral view, and the dorsal face is deeply concave. Coxal plates 2–4 narrower. Coxal plates 2–7 laterally simple. Coxal plate 2 with shallow transverse sulcus near the anterior margin of the inner face. Coxal plate 5 wide, its lateral margin slightly concave. Coxal plates 5–7 with small lobes arising from the posterior margin of the leg insertions; these lobes fit with the anterior margins of following tergites. Size of coxal plates slightly decreasing from 5 to 7 (in the Oniscidea, seventh usually broadest of these three). Pleon-epimeron 3 in lateral view broader than coxal plate 7. Very small noduli laterales near hind margins of tergites 2–6.

First antenna three-jointed, third article 1.5 times as long as articles 1 and 2 together, *c*. 20 rather small aesthetascs arranged in irregular transverse rows. Second antenna with three-jointed flagellum (apical cone broken off in the holotype), of which proximal and medial articles are equal and distal article is longer.

Mandibles with four-cusped pars incisiva, lacinia mobilis on left mandible with three cusps, on right with two cusps, hairy lobe with one hairy seta on the right and two on the left mandible, pars molaris represented by a tuft of numerous hairy setae, and one hairy seta each between the hairy lobe and the pars molaris. External face of mandible with some small scale setae. First maxilla lateral endite on distal margin with lateral group of four stout teeth and mesal group of six more slender teeth, five of them with cleft tips. A triangular lobe and a slender seta, which appears to be furcate (probably artefact?), on the caudal face beside lateral group. Beside mesal group of tooth setae, on caudal face a small seta could not be seen with certainty. Lateral margin of lateral endite distally fringed with hairs (pectinate scales). Mesal endite of first maxilla distally rounded, with two slender subapical penicils. Second maxilla apically bilobate, mesal lobe with a distal field of numerous (*c*. 120) presumed sensilla on the frontal face, and a slightly broader lateral lobe covered with pectinate scales. Maxilliped basis roughly rectangular, with small scale setae and scales; near the insertion of the palp, on the caudal face; some longer scales resemble the scales of water-conducting structures. Epipodite (apically damaged). Endite elongate rectangular, covered with pectinate scales and bearing a small seta on the caudal face and a small penicil on the frontal face, near the mesal corner. Maxilliped palp proximal article with only one large seta near the mesal margin, second article on the mesal margin with two tufts of several equal setae, the distal tuft on a long socket and with two single setae beside it; lateral margin with one slender and one broad seta. Distal article (damaged in the specimen on which the drawing is based) with apical tuft of numerous small setae, and six single setae on the lateral margin. Some pectinate scales are also found in the medioproximal region of the second article.

Pereiopod 1 with antennal brush not distinctly discernible from the scale-field. Male pereiopods 1–3 with large ventrofrontal scale-fields on carpus, pereiopod 1 also on propodus. Ventral scale-fields on pereiopods 1 and 2 ischium and on pereiopods 1–4 merus. Pereiopod 1 base frontal face enlarged. Male pereiopod 7 ischium slender, approximately 1.5 times as long as ischium 6, with dorsofrontal depression in the distal third of the article. Merus with small but sharp tubercle in dorsofrontal position near the distal margin. Dactyli with dactylar seta, some aesthetasc-like setae beside the dactylar seta, slightly curved ungual seta that is shorter than the outer claw and accompanied by a small seta, one smaller seta each on frontal and caudal faces. Inner claw 0.2 times as long as outer claw.

Pleopod 1 exopodite with distinct lateral respiratory field and outcurved distal lobe. Pleopod exopodites 2–5 with less distinctly delimited, probably respiratory fields. Exopodites 1–5 without marginal setae (the exopodites were somewhat distorted during preparation, but neither setae nor articulation holes were found). Endopodite 1 slightly and evenly bent outwards, evenly narrowed and with a row of 46 small spine-shaped setae along the spermatic furrow. Genital papilla with subapical, lateral orifices surpassed by a lobe. The lobe appears truncate, but this is probably an artefact. Endopodite 2 slender and straight (on the drawing it is shown as distorted by the preparation). Exopodites 2 and 5 with distinct hairy furrow on the medial face. Exopodite 5 with broad transverse band of several irregular rows of pectinate scales.

Pleotelson rounded-triangular, not reaching body outline, exceeded by distally angulate, truncate uropod sympodites. Uropod exopodites shorter than distal margin of sympodites. Endopodites inserted more proximally, their tips reaching body outline. Tergites smooth.

Apomorphies of Sphaeroniscus flavomaculates

1. extended frontal shield
2. pleopod exopodites without marginal setae

Remark

Beside the holotype specimen, only two authors referred to other specimens identified as *Sphaeroniscus flavomaculatus*. Richardson (1914) recorded the species from Colombia, referring to the second known specimen. Vandel (1968) erroneously identified a specimen of *S. frontalis* as *S. flavomaculatus*.

SPHAERONISCUS FRONTALIS RICHARDSON, 1914

Sphaeroniscus frontalis Richardson, 1914 – Van Name (1936).
Sphaeroniscus frontalis Richardson, 1912 (*) – Leistikow & Wägele (1999); Schmalfuss (2003).
Sphaeroniscus flavomaculatus – Vandel (1968) (misidentification).

Material examined

Types: Two ♂ (lectotype ♂ 5.0 mm wide described here, others become paralectotypes), two ♀ (Colombia, Argelia, 4°22′ N, 74°45′ W, near Viota), one ♂ ('Colombia, Buenavista, nr. Viota', all specimens collected by O. Fuhrmann, BMNH 1928.5.1.84-87 syntypes).

Other samples: One ♀m (5.1 mm wide) (Colombia, 'Capote, locality in the Magdalena valley ca. 250 km N. of Bogotá, approx. 40 km E of Barrancabermeja between the tributaries Carare and Opon, moist tropical rainforest, leaf litter, humus, leg. H. Sturm, 29 July to 4 August 1968, CV, identified as *Sphaeroniscus flavomaculatus* by Vandel).

Description (Figs 173–175)

Males 5.0–5.2 mm wide, female maximum 6.3 mm wide. Tergites brown with pale muscle insertion spots. Cephalothorax, coxal plates, pleon-epimera and uropods pale. Second antenna fifth article with little pigment, flagellum pale. Pereiopods and pleopods not pigmented. After Richardson (1914), six specimens from Argelia had a 'uniform orange brown color, with light wavy lines of yellow on either side of the median line', whereas one specimen from Buenavista was 'dark grey, with wavy lines of yellow on either side of the median line'. Endoantennal conglobation. Dorsal surface smooth and shiny, with only very small tricorn setae. Noduli laterales could not be seen without dissection. Cephalothorax with frontal shield only slightly exceeding vertex. Behind frontal shield a transverse furrow, bent backwards at both ends and then becomes obsolete. First coxal plate with schisma, inner lobe distinctly shorter but laterally more protruding. Anterior corner of first coxal plate delimited by a weak ridge, with striation. Second coxal plate with anterior thickened sulcus. All margins of tergites, pleon-epimera and uropod sympodites fringed with minute, hyalinous hairs or scales. Vandel's female specimen has agglutinated secret drops regularly at the ventral anterior corners of the coxal plates. This may indicate the presence of gland pores or gland pore fields.

Eyes composed of *c*. 15–20 ommatidia; because of the shallow lenses and the degradation of the pigment (due to preservation), the exact number could not be counted.

First antenna three-jointed. Second antenna with three-jointed flagellum, apical cone longer than the distal article. Mandibles with four-cusped pars incisiva, lacinia mobilis on left mandible with three cusps, on the right with two cusps, hairy lobe with one hairy seta on right and two on left mandible, pars molaris represented by a tuft of numerous hairy setae, and one hairy seta each between hairy lobe and pars molaris. External face of mandible with some small scale setae. First maxilla lateral endite with lateral group of four stout teeth and mesal group of six more slender teeth, five of them with cleft tips. A triangular lobe and a slender seta, which bears some subapical setules, on the caudal face beside lateral group. Beside mesal group a subapical, extremely small seta on the caudal face. Lateral margin of lateral endite distally fringed with hairs (pectinate scales). Mesal endite of first maxilla distally rounded, with two subapical penicils (one of which is strongly bent in the examined specimen which seems to be an artefact) of unequal size. Second maxilla apically bilobate, mesal lobe with a distal field of presumed sensilla on the frontal face, and a slightly broader lateral lobe covered with pectinate scales. Maxilliped basis roughly rectangular, with small scale setae and scales; near the insertion of palp on caudal face some longer scales resemble the scales of water-conducting structures. Epipodite slightly hairy at its tip. Endite elongate rectangular, covered with pectinate scales and bearing a small seta on the caudal face and a penicil on frontal face, near inner corner. Maxilliped palp proximal article with only one large seta near mesal margin, second article on mesal margin with two tufts of several equal setae, distal tuft on a long socket and with two single setae beside it; lateral margin with one slender and one broad seta. Distal article with apical tuft of numerous small setae, and three single setae on the lateral margin. Some pectinate scales are also found in the medioproximal region of the second article.

Pereiopod 1 with antennal brush composed of rather long scales on merus. Male pereiopod 7 carpus with dorsofrontal tooth-like process near the distal margin. Water-conducting scales could be seen only on the base and near the articulation with the ischium (the other scales may be absent or only be rubbed off after the death of the specimen). Dactylus with inner claw much shorter than outer claw, ungual seta and distally setulate dactylar seta.

Pleopod 1 exopodite with respiratory field, the following without conspicuous structures. Lateral margin with numerous (17) small marginal setae. Male pleopod 1 endopodite with a row of 34 small, spine-shaped setae along the dorsal spermatic furrow and a slight subapical swelling on the mesal margin, bearing the distalmost three of these setae. Pleotelson with rounded triangular tip and concave sides. Uropod sympodite approximately as long as broad, with angular outer corner, exopodite projecting beyond endopodite and sympodite, slightly shorter than the visible portion of the sympodite. Dorsal face of uropod sympodite with a group of gland pores.

Apomorphies

1. uropod sympodites on the dorsal face with a group of gland pores
2. slight subdistal swelling of male pleopod 1 endopodite

Geographical distribution (Map Fig. 172)
Colombia.

Remark
Sphaeroniscus frontalis is distinguished from *S. flavomaculatus* by the non-protruding frontal shield and the characters indicated in the key. Otherwise, it is very close to *S. flavomaculatus*, as Richardson (1914) stated.

SPHAERONISCUS QUINTUS SP. NOV.

Material examined

Type specimens: Holotype ♂, paratypes one ♀m, four immature ♀ (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

Other samples: One ♂ (Colombia, Cundinamarca, Pacho, *c*. 5°N, 74°W, leg. O. Bürger, 24 March 1897, SMF ZMG 469).

Specimens tentatively identified as Sphaeroniscus quintus
One ♂, one ♀ (Columbia, Cundinamarca, Sibote, altitude 2800 m, leg. O. Bürger, 1897, SMF ZMG 468)

Description (Figs 176–181)
Male 5.0 mm wide, cephalothorax width 2.36 mm. Female with marsupium *c.* 12 × 5.9 mm, cephalothorax width 2.80 mm, 22 ommatidia.

The coloration seems to have faded as a result of preservation, and therefore cannot be described in detail. Tergites brown, area of muscle insertions, coxal plates, pleon epimera, and also the cephalothorax pale. Second antennal fifth article with little pigment, flagellum pale. Pereiopods and pleopods not pigmented. Endoantennal conglobation. Dorsal surface smooth and shiny, with only very small tricorn setae. Noduli laterales could not be seen without dissection. Cephalothorax with frontal shield only slightly exceeding the vertex. Behind frontal shield a transverse furrow, which is bent backwards at both ends and then becomes obsolete. First coxal plate with schisma, inner lobe distinctly shorter but laterally more protruding. Anterior corner of first coxal plate delimited by a weak ridge, with striation. Second coxal plate with anterior thickened sulcus. All margins of tergites, pleon-epimera and uropod sympodites fringed with minute, hyalinous hairs or scales.

First antenna three-jointed, second article shortest. Distal article with a pair of apical aesthetascs and eight subapical aesthetascs. Second antenna with three-jointed flagellum, apical cone longer than distal article. Second and third articles with one and two aesthetascs.

Mandibles with three-cusped pars incisiva, lacinia mobilis on left mandible with two cusps, on right with two cusps, hairy lobe with one hairy seta on right and two on left mandible, pars molaris represented by a tuft of numerous hairy setae, and one hairy seta each between hairy lobe and pars molaris. Outer face of mandible with some small scale setae. First maxilla lateral endite with lateral group of four stout teeth and mesal group of six more slender teeth, five of them with cleft tips. A triangular lobe and a slender seta on the caudal face beside lateral group. Beside mesal group, a subapical, extremely small seta on caudal face. Lateral margin of lateral endite distally fringed with hairs (pectinate scales). Mesal endite of first maxilla distally rounded; one specimen has two larger and two slightly smaller penicils on both sides, another specimen has two large and one much smaller penicil on one side. A third specimen from another locality has only two penicils on one side. Second maxilla apically bilobate, mesal lobe with a distal field of presumed sensilla on the frontal face, and a slightly broader lateral lobe covered with pectinate scales. Maxilliped basis roughly rectangular, with small scale setae and scales; near insertion of palp, on caudal face, some longer scales resembling scales of water-conducting structures. Epipodite slightly hairy at its tip. Endite elongate rectangular, covered with pectinate scale and bearing a small seta on caudal face, and a penicil on frontal face, near the inner corner. Maxilliped palp proximal article with only one large seta near mesal margin, second article on mesal margin with two tufts of several equal setae, distal tuft on a long socket and with two single setae beside it; lateral margin with one slender and one broad seta. Distal article with apical tuft of numerous small setae, and three single setae on the lateral margin.

Pereiopod 1 with antennal brush composed of rather long scales on merus. Male pereiopod 7 carpus with dorsofrontal tooth-like process near distal margin. Scales resembling those of a water-conducting system could be seen only on base, near articulation with ischium. Dactylus with inner claw much shorter than outer claw, ungual seta and distally setulate dactylar seta.

Pleopod 1 and 2 exopodites with respiratory field, the latter without conspicuous structures. Lateral margin with small marginal setae. Male pleopod 1 endopodite with median subapical tubercle, some lateral subapical rugosity, and a row of 32–39 small setae along the dorsal spermatic furrow. The small setae are spiniform, except for the distalmost five, which are two to three times as long as the preceding setae, and have the tip cleft into four long 'hairs'. Pleotelson with rounded triangular tip and concave sides. Uropod sympodite approximately as long as broad, with angular outer corner, exopodite slightly projecting beyond endopodite and sympodite. Dorsal face of uropod sympodite with a group of gland pores.

Remark
Sphaeroniscus quintus is similar in size and shape to *S. frontalis*, but the male pereiopod 7 and pleopod 1 endopodite indicate a closer relationship to *S. pilosus*.

The specimens from Cundinamarca are one male, cephalothorax 1.8 mm wide, and one female, cephalothorax 1.9 mm wide. Both were covered with mould, and due to the poor preservation, it was not possible to see the important characters sufficiently clearly.

Derivation of the name
Latin *quintus* = the fifth.

Geographical distribution
Known only from the type locality, which could not be exactly identified.

SPHAERONISCUS PILOSUS VANDEL, 1972

Sphaeroniscus pilosus Vandel, 1972 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: One ♂, one ♀, syntypes (Colombia, Bogotá, Montserrate montane forest, *c.* 3 km east of eastern border of the city, approximately in the prolongation of Calle 45; altitude *c.* 3150 m, in raw humus under moss; leg. H. Sturm, 7 February 1969, CV).

Other samples: One ♂, three ♀m (Colombia, Valle de la Quebrada, Chico, near Bogotá, montane forest, altitude *c.* 3500 m, under sandstones, leg. W. Joost, 8 November 1987).

Description (Figs 182–184)
Adult males 4.8 × 2.0 mm (syntype) to 8.7 × 3.5 mm, adult females 8.7 × 3.6 mm to 8.4 × 3.7 mm. Coloration brown, with pale muscle insertion spots and also slightly paler towards the coxal plates and posterior margins of the tergites; coxal plates 2–4 pale, coxal plates 5–7 and pleon-epimera centrally pale but marginally darker. All pereion tergites with a dorsofrontal paler area. Pleon medially somewhat lighter, so that it has two darker longitudinal stripes. Pereiopods weakly pigmented. Uropods dark. Second antenna also pigmented, only flagellum pale (all specimens seem to be somewhat faded). Endoantennal conglobation ability. Hairy or spiny appearance due to the long and strong tricorn setae. Noduli laterales, if present, cannot be distinguished from tricorns when viewing the whole animal. Frontal lamina tightly appressed to vertex. Eyes composed of 12 ommatidia. First coxal plate with a schisma near the posterior corner. Fifth coxal plate with slightly concave lateral margin.

First antenna three-jointed. Second antenna with three-jointed flagellum and apical cone that is longer than the distal article. Maxilliped consisting of large and quadrangular basipodite, endite, palp, epipodite. Endite distally rounded-truncate, hairy, with a simple seta on the caudal face and a small penicil on the frontal face, near the mesodistal corner. Basis covered with scales and scale setae. Maxilliped palp proximal article with one large seta in mesal position. Second article on mesal margin with proximal 'tuft' consisting of one seta and distal tuft of more than ten setae on a socket, two setae beside socket, and on lateral margin with one broad and one slender seta. Distal article with apical tuft of > 15 setae, and a single seta on the lateral margin.

Pereiopod 1 carpus with antennal brush of rather long scales. Male pereiopod 7 basipodite on frontal side with several longitudinal rows of scales of water-conducting system, merus with distofrontal tubercle. Dactyli with inner claw half as long as outer claw. Ungual seta with small seta beside it, which is somewhat less than half as long as the ungual seta. Dactylar seta in distal quarter fringed with setules. One smaller seta on frontal and caudal face of dactylus, and some further scales and setae.

Male pleopod 1 endopodite distally slightly curved laterally, on lateral margin with two small tubercles; row of 25 small setae along the dorsal spermatic furrow; distalmost five setae cleft into several fine hairs in their distal half. Pleopod 1 exopodite with distinct mesodistal lobe, a narrow respiratory field at the lateral margin, and small hairs on the mesal margin; no marginal setae. Male pleopod 2 endopodite slender, slightly exceeding exopodite; exopodite with strip of hairy pectinate scales along mesal margin, and some (six) marginal setae on lateral margin.

Autapomorphies
Enlarged tricorn setae producing a pilose appearance (convergency with *Scleropactes pilosus*).

Remark
The syntype male is adult, despite its small size compared with the other male, as in the genital papilla, a bundle of collagen stalks can be seen.

Sphaeroniscus pilosus clearly belongs to the genus *Sphaeroniscus*, as defined above. Coxal plate 5 is enlarged and has a slightly concave lateral margin; both features are more weakly developed than in the other two species, but clearly visible. Moreover, a tubercle on the merus of male pereiopod 7 constitutes the second synapomorphy.

Remarkable is the superficial similarity with *Scleropactes pilosus*. Both are comparatively small and have a strongly pilose tergal surface. Probably this can be correlated with their habitat, but the data on the latter are too scarce.

Biology
All six specimens were collected in montane forest between 3100 and 3500 m altitude. Three females collected in November 1987 have a marsupium, which is empty in two females and contains eight embryos in the third.

SPHAERONISCUS GERSTÄCKERI VANDEL, 1968

Sphaeroniscus gerstäckeri Vandel, 1968 – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Types: ♂, 6 mm, slides with cephalothorax, second antenna, mandible, first maxilla, second maxilla, maxilliped, tergites 1 and 2, pereiopods 1 and 7, pleopods 1 and 2 [CV 5244-1 to 5244-10, Ecuador, Prov. Oriente, Archidona, in humus of a tropical forest, altitude 750 m, leg. Leleup, April 1965 (?)].

Description (Figs 185–188)

Male 6 mm, female unknown. Tergites brown with yellow spots. Yellow colour largely extended on the posterior part and on the sides of the head. The four proximal articles of the second antenna are brown, whereas the fifth article and flagellum lack any pigment. Frontal angle of first coxal plate yellow. Pleonepimera 3 and the pleotelson and uropodes unpigmented (Vandel, 1968). Endoantennal conglobation.

Cephalothorax with frontal shield bearing furrows to hold the antennae. Vandel (1968) described the eyes as relatively small and composed of eight ommatidia, but in the micropreparation of the cephalothorax, prepared by Vandel, only dark pigment below the integument of the frontal corners could be seen. There is no trace of ommatidial lenses, as in *Richardsoniscus portoricensis* (see below). Coxal plate 1 with a short schisma on hind corner; lower lobe much shorter than the upper lobe. Coxal plate 2 laterally constricted (as common in conglobating species; recognizable noduli laterales not preserved).

First antenna three-jointed, second article very short, apical article bearing two aesthetascs beside the small, acute apex and two (?) on the mesal margin. Second antenna stout, with three-jointed flagellum. Proximal flagellar article is slightly longer than the second, third twice as long as the proximal article. Second and third articles with one (or one row?) of aethetascs, third article bearing antennal cone, which has one short lateral seta and is longer than third and second articles together. Mandibles with four-lobed pars incisiva; left lacinia mobilis with two corners, as broad as the pars incisiva, right lacinia mobilis smaller. Lobe base of the lacinia mobilis covered with spines and one penicil on right mandible and two penicils on left mandible. One penicil between lobe and pars molaris, the latter represented by a tuft of several hairy setae. First maxilla mesal endite with two penicils and laterodistal corner angular, but without a sharp tip. Lateral endite with lateral group of four stout, simple teeth and a triangular lobe and a slender stalk bearing few setules near its apex; inner group of six more slender teeth, five of them cleft, one of these with three tips. No subapical small setae were seen. Distal part of lateral margin with fringe of 'hairs' (which might be pectinate scales?). Second maxilla apically bilobate; mesal lobe with scattered sensilla, between both equal-sized lobes with two setae. Maxilliped base only in lateral portion with distinct cuticular scales and with only a few tricorn-like seta. Endite covered with pectinate scales, bearing one stout penicil subapically on frontal face and one seta on caudal face. Palp three-jointed; proximal article with only one large seta (in the same position as the inner seta of most other Oniscidea), second article on mesal margin with distal tuft of setae on a socket, proximal tuft represented only by one small seta, and two small setae beside socket of distal tuft, on lateral margin two different setae. Distal article with apical tuft of setae and two or three setae on lateral margin.

Pereiopod 1 with antennal brush on carpus and propodus; both are composed of both scales with acute tip and scales with fringed apical margin. Merus and carpus with ventral scale-fields. Dactyli on frontal face with large, feathery dactylar seta, ungual seta accompanied by a thin seta of nearly half its length. Ungual seta slightly shorter than outer claw, but more than twice as long as the very small inner claw. One more seta each on frontal and caudal faces. Some more sensilla-like structures and cuticular scales on basal part of dactylus. Pereiopod 7 ischium with shallow distal depression on frontal surface, merus with dorsofrontal triangular lobe on the proximal half. Vestigial scale-rows belonging to the water conducting system present on basis and ischium. Genital papilla with long ventral shield exceeded by a lobe; orifices in lateral position near end of lobe. Pleopod 1 exopodite shorter than long, with narrow probable respiratory field and lacking marginal setae; pleopod 2 exopodite long, with a single marginal seta, a hairy stripe along the inner margin, and lacking any trace of a dorsal respiratory field. Endopodite 1 straight, with row of *c.* 16 small setae; the distalmost four of these are slightly longer and angulate, and bear some setules. Endopodite 2 exceeding the exopodite. Uropod sympodites with obtuse angled corners, small exopodite about one-third as wide as sympodite.

Geographical distribution

Known only from type locality (only one specimen).

Remark

Sphaeroniscus gerstaeckeri differs from the remaining species of *Sphaeroniscus* by the absence of lenses on the eyes, convex coxal plate 5, and the different position of the rounded lobe on the male pereiopod 7 merus. In the cladistic analysis, it groups together with the other eyeless species, not with the four species of *Sphaeroniscus*. However, the male pleopod 1 endopodite in the row of setae along the spermatic furrow has the distalmost setae apically cleft into several setules. The same is also found in *Sphaeroniscus pilosus* and *S. quintus*, but not in *S. flavomaculatus* and *S. frontalis*. Here *Sphaeroniscus gerstaeckeri* is provisonally retained in the genus *Sphaeroniscus*, because the hypotheses of a closer relation with the eyeless species forming clade 9 in the cladistic analysis does not appear to be more plausible.

AMAZONISCUS LEMOS DE CASTRO, 1967

Type species: Amazoniscus arlei Lemos de Castro, 1967.

Diagnosis (after Lemos de Castro 1969):
Exoantennal conglobation. Linea frontalis distant from vertex to form a frontal shield, linea supraantennalis present. Coxal plates all simple, coxal plate 1 sinuous near the hind corner (as in *Circoniscus*, but without schisma). Second antenna with two-jointed flagellum. Male pereiopod 7 ischium with ventrocaudal tubercle on the distal margin. Pleotelson triangular, with concave sides. Uropod protopodites rectangular, distinctly projecting beyond the pleotelson. Exopodites not exceeding endopodites.

AMAZONISCUS ARLEI LEMOS DE CASTRO, 1967

Amazoniscus arlei Lemos de Castro, 1967 – Lemos de Castro (1969); Souza-Kury (1998*); Leistikow & Wägele (1999*).

Material examined

Types: One ♂, one juvenile, one isolated pleon, one manca, paratypes (Brazil, Pará, Belém, Parque do Museu Goeldi, leg. H. Schubart, February 1964, MNRJ 3313); three ♂, two ♀ paratypes (Brazil, Amapá, Serra do Navio, leg. R. Arlé, 10 December 1959, MNRJ 6208).

Other samples: One ♀m (Brazil, Pará, Mangabeira, Tocantins, sob pau podre, leg. Osvaldo Cunha, May 1953, MNRJ 3312); one ♂, one ♀m, one juvenile ♂, one juvenile ♀ (Brazil, Pará, Belém, Parque do Museu Goeldi, leg. H. Schubart, 5 February 1967, MNRJ 3314); one ♂ [Brazil, MG (= Minas Gerais), Leopoldina, 21°31′ S, 42°38′ W, leg. L. A. Souza, 10 July 1983, MNRJ 8198]; one ♀m, one ♀, one immature ♀? (Brazil, Jacarepaguá, Estrada de Barra, 'No chão, sob folhas', leg. Lemos de Castro, 20 August 1972, MNRJ 3318), one ♀m, one ♀ (Brazil, RJ, Tijuca, Sítio antigo na Rua Maracanã, leg. Schubart, 27 September 1939, MNRJ 3319); one ♀ (Brazil, Pará, Jacareacanga, leg. M. Alvarenga, December 1968, MNRJ 3320) (Map Fig. 196).

Description (Figs 189–195)
Male 10.1×4.1 mm, adult female 5.3×2.3 mm, cephalothorax 1.39 mm/6.5×2.8 mm, cephalothorax 1.67 mm.

Endoantennal conglobation ability (not exoantennal, as described by Lemos de Castro), tergites smooth. Frontal shield of cephalothorax slightly but distinctly exceeding the vertex, behind it with a transverse furrow. Linea frontalis present, but weak and medially obsolete. Coxal plates all without schisma or lobes, the first coxal plates with a sinuous portion near the hind corner. Eyes composed of 20 ommatidia (not nine, as indicated in the original description) (coloration not preserved), smaller specimens with lower number of ommatidia (e.g. male 5.9×2.6 mm, cephalothorax 1.55 mm, 12/13 ommatidia).

Pereiopod 1 with longitudinal antenna-cleaning brush composed of long scales. Male pereiopods 1–3 with ventral scale-fields on merus and carpus. All pereiopods covered with somewhat irregular, distally projecting scales. Ventral large setae apically furcate, their tip exceeded by free protruding end of the sensory hair. Male pereiopod 7 ischium with a process on caudal side of ventrodistal corner, merus with an interrupted ventrolateral ridge on frontal side. Pereiopod 7 basis and ischium on frontal face with distinct scale-rows belonging to the water-conducting system.

Pleopod 1 and 2 exopodites with distinct respiratory fields, pleopod 3–5 exopodites without respiratory fields. Male pleopod 1 exopodite distally with a narrow tip, endopodite stout, distally outcurved, but the extreme apex bent mediad. In smaller (immature?) males distal lobe of exopodite 1 is shorter and simply bent laterally. Row of small, slender spine-shaped setae along spermatic furrow is strongly curved subapically and, after a right angle, the distalmost three setae in a straight row. Male pleopod 2 endopodite only slightly exceeding exopodite, the latter with a hairy field along medial margin. Exopodite 1 with simple marginal seta on lateral and medial margins, exopodites 2 and 3 with marginal setae only on lateral margin. Also, the lateral margins of the respiratory fields bear marginal setae.

Remark
The paratype male described here differs from the figures given by Lemos de Castro (1969) by the shorter process on ischium 7 and a much narrower and longer distal lobe of the pleopod 1 exopodite. The other males have the distal lobe of the pleopod 1 exopodite shorter, more like the specimen illustrated by Lemos de Castro, but in contrast to this, they lack a distal process on ischium 7. As these specimens are about half as large as the paratype described above, the differences may be explained by the assumption that the smaller spec-

imens are immatures with less developed male sexual characters. However, more material needs to be examined before this assumption, or the alternative assumption, that the smaller specimens represent a distinct species, can be substantiated. If there actually are two species, then the larger male (paratype) would need a new name, provided that the specimen on which the illustrations in Lemos de Castro (1969) are based can be considered to be the holotype. However, this specimen was not available for study.

Circoniscus Pearse, 1917

Type species: Circoniscus gaigei Pearse, 1917 (m).

Diagnosis

Endoantennal conglobation. Cephalothorax with frontal shield. Coxal plate 1 with schisma, coxal plates 2 and 3 with ventral notch or simple. Second antenna with two-jointed flagellum. Apical cone longer than flagellar article and with small lateral setae. Mandible with right one/left two penicils on the hairy lobe and one penicil between hairy lobe and pars molaris, the latter represented by a tuft of hairy setae. First maxilla lateral endite on distal margin with lateral group of four stout, simple teeth, triangular lobe, slender seta, and mesal group of six slender teeth, four or five of them cleft. Mesal endite with two penicils. Second maxilla with inner lobe slightly narrower than outer lobe and bearing a field of sensilla. Maxilliped endite covered with scales. Maxilliped palp proximal article with one large seta in mesal position; second article with distal tuft of numerous equal setae on a socket and proximal tuft of few equal setae near socket; two single setae on mesal margin and two setae on lateral margin; apical article with distal tuft of setae and few setae on lateral margin. Pereiopod 1 with antennal brush. Pereiopods of male with scale-fields of various extent. Hairy ridges on male pereiopod 7 ischium and merus are not present in all species. Dactyli with apically hirsute dactylar seta, simple ungual seta with basal seta of one-third to half the length of ungual seta, some other setae and numerous scales. Vestigial water-conducting scale-rows are present on pereiopod 7. Pleopod 1 and 2 exopodites with dorsal respiratory fields. Male pleopod 1 endopodite tip bent outwards.

The structure of coxal plate 1 is assumed to be an autapomorphy of the genus (Souza & Lemos de Castro 1991).

Arcangeli (1927) argued that *Circoniscus* should be a subgenus of *Synarmadillo*, based on the published descriptions. In his paper, no reference to specimens is made; obviously, he did not examine any material.

Andersson (1960) regarded *Circoniscus bezzii*, *C. hamatus* and *C. pallidus* as synonymes of *C. gaigei*. Souza & Lemos de Castro (1991) found that *C. bezzii* is distinct from *C. gaigei*, cited *C. hamatus* as species inquirenda, and described three further species. Schultz (1995) set the three new species in synonymy of either *C. gaigei* or *C. bezzi*, keeping only these two as valid species. Souza & Lemos de Castro (1991) obviously overlooked the slender seta on the lateral endite of the first maxilla. Only in specimens described as *Circoniscus gracilidens* did they find it, and they

Key to the species of *Circoniscus*

1. Coxal plates 1–3 with schisma or inner lobes. Coxal plates 6 and 7 and pleon-epimera 3–5 and uropod sympodites with distinct ridge at a short distance from the margin, on the inner face . . . . *Circoniscus bezzii* Arcangeli, 1931
1.* Coxal plates 1 or 1 and 2 with schisma or lobes. Posterior half of body without ridge along margin 2
2. Only coxal plate 1 with a schisma at its posterior corner 3
2.* Coxal plates 1 and 2 with notches on ventral face . . . . *Circoniscus incisus* Souza & Lemos de Castro, 1991
3. Transverse furrow behind frontal lamina deep and wide, reaching midlength of eyes; male pleopod 1 endopodite thick, apically truncate . . . . *Circoniscus hirsutus* sp. nov.
3.* Transverse furrow less developed, ending in front of the inner corner of the eyes; male pleopod 1 endopodite slender, apically acute 5
4. Male pereiopod 7 ischium and merus with scaly lobes, adult males *c*. 5 mm wide. Male pleopod 1 endopodite with a row of setae interrupted by a subapical, short recurrent or perpendicular part; exopodite with a constricted distal lobe . . . . *Circoniscus ornatus* (Verhoeff, 1941)
4.* Male pereiopod 7 simple (or at least with much weaker lobes; see description of *Ci. hamatus*) 5

The following are known only by the type-specimens, and not all characters could be described.

5. Male pleopod 1 endopodite with continuous row of setae . . . . *Circoniscus intermedius* Souza & Lemos de Castro, 1991
5.* Male pleopod 1 endopodite with a row of setae interrupted by a subapical, short recurrent or perpendicular part; exopodite distally rounded; distal lobe of male pleopod 2 exopodite outcurved; adult males *c*. 5 mm wide . . . . *Circoniscus hamatus* Van Name, 1936
5.** Male pleopod 1 endopodite apex unknown; adult males *c*. 7 mm wide . . . . *Circoniscus gaigei* Pearse, 1917

thought that it was characteristic of that species. Actually, a slender seta in this position is present in all Scleropactidae as a plesiomorphic character that was already present in the groundpattern of Crinocheta. Modifications of male pereiopod 7 are present in *C. gaigei*, absent in *C. gracilidens*, and not described in the remaining species.

Some of the doubtful species are quoted below formally as distinct species, because they are incompletely described on the basis of poorly preserved or fragmentary material, and their few known characters differ from those of the better known species. This situation is quite unsatisfactory, but can only be improved by examination of further samples, preferably from the type localities.

CIRCONISCUS HIRSUTUS SP. NOV.

Material examined

Holotype ♂, one ♀m and two ♀ without marsupium (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b) (pitfall trap with formalin, mixed water inundation forest, narrow strip between Rio Negro and Rio Solimões, opposite of Manaus).

Description (Figs 197–202)

Holotype male 5.0 × 2.4 mm (cephalothorax 1.37 mm wide), paratype female 5.8 × 2.75 mm (cephalothorax 1.55 mm wide) to 3.1 mm wide (cephalothorax 1.75 mm wide). Dark brown, with cephalothorax, coxal plates, pleon-epimera, uropods, muscle insertions and some patches on tergites pale (as the specimens had been stored in alcohol for 28 years, the original coloration is not exactly known). First coxal plate pale at posterior corner. A pale patch on anterior corner of first coxal plate might be an artefact. Coxal plate 1 with a schisma as typical for the genus, the following coxal plates simple. Tegites appear hirsute due to the raised scale setae and large, band-shaped scales. In the median portion of hind margin of tergites a row of scale setae that are broader than on the main surface. Pereion-tergites with one pair of noduli laterales each, all at the same distance from lateral margin and near posterior margin. Noduli differ from tergal scale setae mainly in that the sensory seta is more protruding. Pleotelson roughly triangular, with broadly rounded tip and weakly concave sides, exceeded by uropod sympodites, which are rounded and seem to bear some gland pores.

Eyes composed of 15–17 ommatidia. First antenna three-jointed, third article about as long as first article and bearing six aesthetascs in three transverse rows. (Whether the scale-like object beside the distal aesthetascs shown on the drawing belongs there or is an artefact will be shown by examination of more specimens.) Second antenna shorter than pereiopod 1 and rather stout. Flagellum stout, conical, two-jointed; distal article with aethetascs in two transverse rows and a slender apical cone. Apical cone as long as distal article of flagellum plus half of basal article. It has one small, free lateral sensillum (neither a second sensillum nor an insertion of a broken sensillum could be found; however, three of the four specimens lacked both apical cones).

Mandibles: right mandible with pars incisiva forming a broad surface exceeded by four long cusps and one short cusp, small lacinia mobilis with two sharp cusps and one blunt cusp, and hairy lobe with one hairy seta. Left mandible with well-developed four-cusped pars incisiva, lacinia mobilis with two long and two short cusps, and hairy lobe bearing two hairy setae. One hairy seta between lobe and pars molaris represented by a tuft of hairy setae. Lateral face of both mandibles with some scales and few scale setae. First maxilla lateral endite on distal margin with lateral group of four long, simple setae, one simple seta of about half length, and one slender seta with one or two subapical setules, and mesal group of six more slender setae, one of which is simple, and the others of which have one or two subapical clefts. No small, subapical setae could be seen. Distal 0.4 of lateral margin of lateral endite fringed with hairs (pectinate scales). Mesal endite of first maxilla bears two penicils and a rounded distolateral corner. Second maxilla apically bilobate, lateral lobe being broader than mesal lobe and bearing an irregular row of sensilla on the distal margin. Three single sensilla between the lobes. Maxilliped base on whole surface except for laterodistal corner with rather irregular, large and protruding scales, and some scale setae. Endite rectangular, hairy, with one seta on the lateral corner, one small seta on the caudal face in a subapical position, and one penicil near the mesal corner on the frontal surface; one small, conical seta in a more basal position on the frontal face. Maxilliped palp basal article bearing a single large setae near the mesal margin. (The distal portions of the palp were damaged or lost.)

Pereiopods with large scales, which are irregular and protruding on articles except for basipodite; on the latter, scales more regularly arranged, and in pereipods 2–6 several rows of raised scales form a structure like water-conducting scale rows (pereiopod 7 lost). Pereiopod 1 with a brush of fringed scales on carpus and spine-like scales or setae and few fringed scales on propodus. Several scales with fringed apical margin also present on carpus of pereiopod 2, and one such scale on the carpus of pereiopod 3. Some scales on ventral face of male pereiopod 1 merus and pereiopod 2 merus and carpus. Dactyli with inner claw about one-third as long as outer claw. Ungual seta as long as outer claw or somewhat shorter, beside its base with a more slender seta exceeding half its length. Dactylar seta with two fringes of setules on distal portion. One smaller, simple seta in a subapical position on both the frontal and caudal faces. No distinct aesthetasc-like setae beside the dactylar seta have been seen (some irregular inflations on setae and dactyli of the pereiopods are thought to be caused by a fungal infection). One object probably representing a reproductive part of a fungus is seen on distalmost seta of pereiopod 1 carpus (pereiopod 7 was lost).

Genital papilla with strong lanceolate ventral shield exceeding by a cordiform lobe bearing the genital orifices on its corners. Pleopods: male pleopod 1 exopodite lost, others partly damaged. Male pleopod 1 endopodite very broad, only subapically slightly constricted, with a row of small setae that has a short recurrent part before changing from the caudal face to the frontal face approximately at the transverse distal margin. Pleopod 2–4 (and 5?) exopodites with one simple marginal seta. Male pleopod 2 exopodite long, somewhat exceeded by the (incompletely preserved) endopodite. Male pleopod 5 exopodite on dorsal face with irregular field of pectinate scales of different size and a distinct and deep furrow along the medial margin.

Uropod exopodite about half as long as endopodite but 1.5 times as broad. Sympodite and exopodite with some rounded structures; these could not be seen with sufficient precision to confirm which of them are gland pores and which are insertion lines of shed scales.

Remarks

Unfortunately, the only male lacked both pereiopod 7 and pleopod 1 exopodites, so the description remains incomplete. Mouthparts and pleopods were partly damaged, and moreover stuck together by amorphous material, which presented a strong obstacle to proper dissection. Nevertheless, the species is easily recognizable among the other species of the genus by the much more developed transverse furrow on the cephalothorax.

Circoniscus gaigei Pearse, 1917

Circoniscus gaigei Pearse, 1917 – Van Name (1925, 1936); Arcangeli (1927*); Paulian de Félice (1944); Lemos de Castro (1967); Boyko (1997*).
? *Paracubaris spinosus* Collinge, 1917 – syn. Van Name (1925).
Synarmadillo spinosus – Arcangeli (1927*).
Circoniscus spinosus – Van Name (1925); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Not: *Circoniscus gaigei* – Andersson (1960); Lemos de Castro (1967); Schmalfuss (1980); Souza & Lemos de Castro (1991); Schultz (1995*); Warburg *et al*. (1997); Souza-Kury (1998*); Leistikow & Wägele (1999*).

Material examined

Types: Three ♀m, three ♀ or immatures, fragments of one ♂ and six other specimens (syntypes of *Ci. gaigei*, British Guiana, Dunoon, leg. F. M. Gaige, 17 July 1914, Walker Expedition, University of Michigan, USNM 98371).

Description (Figs 204–208)

Male 7.3 mm wide, adult females (with marsupium) 6.2–7.5 mm wide. Pigment incompletely preserved, some specimens have patches of dark pigment near the posterior margins of the tergites. Cephalothorax short, with a weak but distinct transverse furrow behind the frontal shield. Coxal plate 1 with schisma as typical for the genus, the following coxal plates simple.

Eyes composed of 26–27 ommatidia.

Pereiopods covered with scales, these distally somewhat projecting from surface. Male pereiopods with ventral brushes as follows: carpus 1 with large ventrofrontal scale-field confluent with antenna-cleaning brush; carpus 2–5 with ventral scale-field of decreasing extent and density; carpus 1–7 with ventral scale-fields of slightly decreasing density; ischium 1 with ventrocaudal scale-field. Male pereiopod 7 ischium and merus without any scaly lobes and base without distinct water-conducting scale-row. Dactyli with large outer claw, small inner claw, ungual seta and small seta beside it, dactylar seta with hirsute apical portion, some aesthetasc-like setae beside base of dactylar seta, one frontal and one caudal subapical simple seta and some scales.

Pleopod 1–5 exopodites with distinct, weakly wrinkled respiratory fields and small marginal setae. Male exopodite 1 with triangular distal lobe, exopodites 2–4 with medial margin hairy, and exopodite 5 apically acute, with a median furrow (to which is still attached part of endopodite 2 in the specimen from which the drawing was made). In the only male specimen of the type series, the apex of both pleopod 1 endopodites is damaged, so this character remains unknown. Male pleopod 2 endopodite longer than exopodite. Uropod sympodites angulate; the distal margin is about three times as wide as the endopodite.

Geographical distribution (Map Fig. 203)

Guyana.

Remark

The type series contains only one male specimen. The characteristics of male pereiopod 7, as found in *Circoniscus gaigei* auct., are not present: the absence of these characters cannot be attributed to the possibility that the specimen is immature. In contrast, both males and females are distinctly larger than in *C. gaigei* auct. This implies that the type specimens of *C. gaigei* belong to a different species than the specimens determined as *C. gaigei* by subsequent authors. For the latter, the name *C. ornatus* (Verhoeff, 1941) is valid (see below).

The description of *Paracubaris spinosus* Collinge, 1917 does not contain any useful information. The type specimens were not available for study. According to the size of the specimens (20.5 mm), it is a synonym of *C. gaigei*, as proposed by Arcangeli (1927), rather than a synonym of *C. ornatus*.

CIRCONISCUS ORNATUS (VERHOEFF, 1941)

Parcirconiscus ornatus Verhoeff, 1941 – Schmalfuss (2003*).
Circoniscus gaigei – Andersson (1960); Lemos de Castro (1967); Schmalfuss (1980); Souza & Lemos de Castro (1991); Schultz (1995*); Warburg *et al*. (1997); Souza-Kury (1998*); Leistikow & Wägele (1999*).
Circoniscus amazonicus Brasil Lima, 1996 – Souza-Kury (1998*); Leistikow & Wägele (1999*); Schmalfuss (2003*) – syn. nov.
Not: syn. of *Circoniscus gaigei* – Schmalfuss (1980); Leistikow & Wägele (1999*).

Material examined

Type specimens: One ♀ without cephalothorax, broken in two halves and covered with mycelia, and five microscopic slides: (1) ♂ cephalothorax frontal, mouthparts, second antenna; (2) ♂ coxal plates 1 and 2 and pereiopods 1 and 2; (3) pleon segment 5 + pleotelson + uropods of ♂; (4) coxal plates and pereiopods 7 and pleopods 1–5 of ♂; (5) cephalothorax, mouthparts, second antenna [syntypes, Guyana (now: Suriname): Paramaribo, leg. A. Heyne, ZSM).

Other samples: Two ♂, two ♀ (paratypes of *Circoniscus amazonicus*; Brazil, Amazonas, Rio Solimões, Ilha Marchantaria, 59°58′ W, 3°15′ S, leg. Chr. Martius, 22 April 1986, MNRJ 6845); two ♂, one ♀ (Peru, Dept. Huánuco, Rio Yuyapichis, 9°37′ S, 74°56′ W, altitude 260 m, leg. M.v. Tschirnhaus, September 1981, cCS 137); six ♂, five of them broken into fragments, and three ♀ (Brazil, Pará, Belém, Fazenda Velha, leg. O. Roppa, 11 November 1963, MNRJ 8512); one ♀ (Peru, Panguana, '102-105 A1-3 Ex', leg. Hanagarth, 23 November 1975, SMNS); one ♂ [Peru, Panguana, '8 S A1 Ex yar', leg. Hanagarth, 16 November 1975, SMNS); one ♂, one ♀m (> habitus drawing], Peru, Panguana, 'Caña breva Ex2', leg. Hanagarth, 2 July 1975, SMNS]; six ♂, one immature ♂, four ♀m, ten ♀, 14 juvenile/immature (Peru, Panguana, 'KL 1,2,3,4,5,6,7', leg. Hanagarth, 20 September 1975 to 10 January 1976, SMNS); three ♂, one immature ♂, four ♀m, three ♀, ten juvenile/immature (Peru, Panguana, 'Ku 1,2,4,5,8,11,12,13', leg. Hanagarth, 1 May to 27 December 1975, SMNS); ten ♂, eight immature ♂, ten ♀m, 12 ♀, 78 juvenile/immature (Peru, Panguana, 'Y 2,3,4,5,6,7,8,9,11', leg. Hanagarth, 26 June to 27 December 1975, SMNS); five ♂, one immature ♂, seven ♀m, nine ♀ without marsupium, nine juvenile/immature (Peru, Panguana, 'Ku 1,2,4,5,6,7,8,11,13', leg. Hanagarth, 7 May 1975 to 10 January 1976, SMNS); four ♂, ten immature ♂, seven ♀m, four ♀ without marsupium, 35 juvenile/immature (Peru, Panguana, 'Y 1,3,5,7,11,12', leg. Hanagarth, 5 March to 27 December 1975, SMNS); six ♂, ten immature ♂, 27 ♀m, four ♀ without marsupium, 45 juvenile/immature (Peru, Panguana, 'KL 1,2,4,5,6,7', leg. Hanagarth, 12 June to 27 December 1975, SMNS); two ♂, two juvenile (Peru, Panguana, leg. Hanagarth, '87.88 A 3.4. 16.11.75 Yar', cCS 412); one juvenile (Ecuador, 'on roots of a bromeliad, pres. L. Kilby, M.A.F.F.', without further data, BMNH 1982.456.1); one ♂, fragmented ('Guyana, Kartabo, A.M.N.H. 9019', MNRJ 3180); one immature ♂, one ♀ (Brazil, Amazonas, Tabatinga, leg. J. Candido e Argentina, 26 May 1950, MNRJ 3178); one ♂ (Brazil, Amazonas, Manaus, Reserva Ducke, 'sob cascos de arvore morta', leg.?, 6 April 1966, MNRJ 3197); 25 ♂, 37 ♀m, 18 ♀ (Brazil, Amazonas, Manaus, 2°53′36″ S, 59°58′22″ W, under leaf litter of *Cocos nucifera*, *Bactris gasipaes*, *Elaeis guineensis*, leg. M. Garcia, 15 July 2002, cCS 478a).

Female specimens tentatively identified as *Circoniscus ornatus*: one ♀ (Brazil, Pará, Belém, Museu Goeldi, 'no chão', leg. H. Schubart, January 1967, MNRJ 3179); one ♀ (Brazil, Amazonas, Manaus, Reserva Ducke, leg. J. Becker, 30 July 1971, MNRJ 3196); one ♀ (Brazil, bras. Guayana, upper Rio Paru do Oeste, Igarape, '"Komadeveni" bei neuer Tintgo-Maloca', leg. Sattler, 25 January 1961, SMF 11341).

Description (Figs 209–215)
Male maximum about 11 mm long, 5.0 mm wide, cephalothorax 2.57–2.71 mm wide; largest non-ovigerous female 8.5 × 3.9 mm; ovigerous females 9.6 mm long, 4.2–5.1 mm wide, cephalothorax 2.66 mm wide.

Surface smooth. Tergites light brown with pale muscle insertion spots, margins pale; the extent of pale margins and the degree of contrast between dark and pale areas varies. Flagellum of second antenna always pale. Rest of second antenna ferrugineous in some specimens. Cephalothorax with frontal shield appressed to head; a weak transverse furrow can be seen in dorsocaudal view. Eyes composed of 18–24 ommatidia. First coxal plate with schisma of the shape that is typical for the genus. Second and following coxal plates without lobes etc.

First antenna three-jointed, with some aesthetascs on distal half of apical article. Apical cone slender, with one small lateral sensillum.

Mandibles with one penicil between lobe and pars molaris, the latter represented by a tuft of hairy setae. First maxilla lateral endite on distal margin with distal group of four stout teeth, a slender seta, and a triangular lobe. Mesal group of six slender teeth, five of them cleft. An extremely small subapical seta is present near the base of the mesal group. Mesal endite with two subequal penicils and a pointed laterodistal corner. Maxilliped endite rounded, covered with spines. Maxilliped palp basal article with inner large seta in mesal position; lateral seta typical for most Oniscidea absent. Second article with basal tuft of few setae and distal tuft of numerous setae on a socket on the mesal margin and two setae on the lateral margin. Distal article with apical tuft of setae and two setae on the lateral margin.

Pereiopod 1 with only a small field of scales on frontal face of carpus. Ischium 1 on ventrocaudal face with field of spines or scales. Male pereiopods 4–6 with fields of scales on ventral faces of merus and carpus. Male pereiopod 7 ischium on frontal face with a short distal ridge, ventral of this a field of scales. Ischium 7 with ventral scale-field and a small, semicircular ridge covered with scales on the frontal face. No differentiations are visible in caudal view on pereiopod 7. Pereiopod 7 with distinct irregular scale-rows in the base and indistinct scale-rows on ischium and merus, which are vestigia of the water-conducting structures. Dactyli with inner claw at most half as long as outer claw, ungual seta curved, basal accessory seta one-third as long as the ungual seta, dactylar seta with hirsute tip.

Male genital papilla with narrow ventral shield and lateral, subapical orifices exceeded by a truncate lobe. Male pleopod 1 endopodite with apex curved outwards. The dorsomesal row of setae changes from the dorsal (= caudal) face to the ventral face. At this location, a short distance of the row runs perpendicular to the longitudinal axis. Endopodite 2 exceeds exopodite in length. Male exopodite 5 with narrow, prolongated apex and medial furrow for endopodite 2. Dorsal face of exopodite 5 with field of pectinate scales. Pleopod 1–3 exopodites of males and females with dorsal, weakly wrinkled respiratory fields. Exopodites 4 and 5 with a marginal ridge that probably represents a vestigium of a respiratory field.

Pleotelson triangular with concave sides. Uropod sympodites with distal margin at least two times as wide as the exopodites, with more or less distinct angle on the outer corner. Exopodites conical, short, hardly projecting beyond the body outline.

In immature males of width 3.5 mm, the pereiopod 7 ischium is not differentiated, and the ridge on merus is smaller, although distinctly visible. On pleopod 1 endopodite, the peculiar shape of the row of setae is already the same as in the adult males.

Remarks

Examination of the type series of *Circoniscus gaigei* revealed that these specimens belong to a different species than the specimens determined as *C. gaigei* by all subsequent authors. The next nominal species that with certainty is conspecific with the present material is *Parcirconiscus ornatus* Verhoeff, 1941, according to the structure of male pereiopod 7.

The pleopod 1 endopodite of a male syntype is somewhat different from the other material: the basal portion (before the spermatic furrow begins) is distally constricted, so that there is a narrow zone in the middle and the distal part of the endopodite is broader than this narrow zone. This is here regarded as an artefact.

The description of *C. amazonicus* does not specify the differences from other species, and the figures are not sufficiently detailed. Male characters and maxilliped are identical to those of *C. ornatus*; after re-examination of the paratypes, *C. amazonicus* is regarded as a synonym of *C. ornatus*.

In total, 466 specimens were examined, and this allowed the description some intraspecific variation as well as the characters of immature males.

Ecology

Warburg *et al*. (1997) in a central Amazonian floodplain (3°02′ S, 60°17′ W) made some ecological observations on a species of *Circoniscus*, which they refer to as *C. gaigei*. According to the body size (up to 7 mm) and the known distribution, these animals probably belong to *C. ornatus*. Eight specimens were found per square metre. During the inundation, the animals migrated into the canopies, where they were found under bark and in bromeliads. The gut contained detritus, root fragments, leaf litter, bark, moss, fresh leaves, spicules of freshwater sponges, a few algae, and hyphae and spores of fungi (Map Fig. 203).

Geographical distribution

Guyana (Pearse, 1917), Peru (Schmalfuss, 1980), and northern half of Brazil (Souza & Lemos de Castro, 1991). (Map Fig. 216)

CIRCONISCUS SP.

Specimen: One ♀ (Brazil, PA, Carajás, 'em floresta', leg. Paulo R. Maguro, March 1988, MNRJ 8506).

Remark
This specimen could not be identified to species level. It has a schisma only at the first coxal plate, like *Circoniscus ornatus*, *C. gaigei*, *C. hirsutus*, *C. hamatus* and *C. intermedius*. The cephalothorax differs from all these species, in that the transverse groove has no distinct ends running backwards along the eyes as in *C. hirsutus*, but is distinctly wider than in the remaining species.

CIRCONISCUS HAMATUS VAN NAME, 1936

Circoniscus hamatus Van Name, 1936 – Paulian de Félice (1944); Souza & Lemos de Castro (1991*); Boyko (1997); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Circoniscus gaigei (*pro parte*) – Lemos de Castro (1967); Schultz (1995).

Material examined

Type specimens: Five ♂, one ♀, slides with male pleopods 1 and 2 (paratypes, Guyana, Kamakusa, AMNH 6534).

Description
Male 9.0 × 4.8 mm.

Coxal plate 1 with schisma, the following coxal plates simple.

Cephalothorax: linea supraantennalis somewhat distant from sockets of the second antennae. Male pereiopod 7 on frontal face not with the modifications seen in *C. ornatus* (although poorly preserved and partly obscured by dirt, there seem to be no such ridges, or at least these are much more shallow than in the preceeding species). The ischium has a distinct conical protrusion on the caudal face of the distal margin (not drawn).

Pleopod 1 and 2 exopodites with dorsal respiratory fields. Male pleopod 1 exopodite rounded, not with a distinct distal lobe as in *Ci. ornatus*. Pleopod 1 endopodite apically curved outwards, with a row of small spine-shaped setae along the dorsal spermatic furrow. This row is broken by a short recurrent portion in the subapical position. (In the paratype, the small setae of the apical part could be seen at 400× magnification.) Male pleopod 2 exopodite with lateral margin evenly concave; distal lobe distinctly curved outwards. Inner margin of exopodite 2 with pectinate scales forming a hairy furrow.

Affinities
Circoniscus hamatus is probably the sister species of *C. ornatus*. On the male pleopod 1 endopodite, the dorsal row of small spine-shaped setae, which is broken by a short subapical transverse or recurrent portion, can be considered as a synapomorphy of both species.

Geographical distribution
Guyana, French Guiana.

Remark
Circoniscus hamatus was cited in the synonymy of *C. gaigei* by Lemos de Castro (1967) and Schultz (1995). As *C. gaigei* auct. has proven to be *C. ornatus*, whereas *C. gaigei* Pearse, 1917 represents a different species, this synonymy cannot be maintained. *Circoniscus hamatus* is provisionally regarded as a distinct species, because the known characters differ from both *C. gaigei* and *C. ornatus*. The examination of more specimens from the respective type localities may determine whether the specimens described as *C. hamatus* belong to a distinct species, or are probably immature or abnormal specimens of *C. gaigei* or *C. ornatus*.

CIRCONISCUS INTERMEDIUS SOUZA & LEMOS DE CASTRO, 1991

Circoniscus intermedius Souza & Lemos de Castro, 1991 – Souza-Kury (1998*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Circoniscus gaigei – (*pro parte*) Schultz (1995).

Material examined

Types: One ♂ holotype and 13 ♀ paratypes, at least nine of them with marsupium (Brazil, Mato Grosso, Fazenda São João Diamantino, 14°25′ S, 56°28′ W, leg. H. N. Cunha, October 1979, MNRJ 3171).

Description (Fig. 217)
Holotype male 4.6 mm wide, cephalothorax 2.15 mm wide.

Pigmentation not preserved; it had been described as follows: 'Light brown background with small yellow spots on the head, more densely grouped on the sides of the pereionites, scarcely on the pleon. Margins of pereion and pleon whitish. Some vestiges of wine coloured pigmentation' (Souza & Lemos de Castro, 1991). The yellow spots are muscle insertion spots. Cephalothorax with a distinct, deep furrow behind the frontal shield. The frontal margin of the frontal shield in strictly dorsal view is medially curved. In frontal view, a linea supraantennalis is visible, which is downcurved medially, and laterally somewhat distant from the sockets of the second antennae. The number of ommatidia could not be counted exactly on the bleached specimens; it seems to be *c*. 20.

Unfortunately, the dissected appendages of the male holotype seem to be lost, so I can only refer to the drawings in the original description.

Remark

This species was set in synonymy of *C. gaigei* by Schultz (1995), but the figures given in the original description suggest that both are not conspecific. The male holotype had been dissected, but the preparations were not available for study; obviously, they are lost. *Circoniscus intermedius* is provisionally regarded as a distinct species, provided that the holotype, of which the male characters are illustrated by Souza & Lemos de Castro (1991), is a normal, adult specimen. Examination of more specimens from the type locality is needed to confirm this assumption. The paratypes discussed below posed further problems.

At least one, and probably both, of the following 'paratypes' do not belong to this species: two ♀ (paratypes, Brazil, Pará, Apeú, leg. R. Arle, 3 February 1964, MNRJ 3172).

Label: 'Circoniscus intermedius, Proc: Apeú, Pará, Col. R. Arle, Data: 03-II-1964, Parátipo'. Content: two ♀ with empty marsupium; both lost their pigment.

1. 10.6 × 5.0 mm, 11/11 ommatidia (?), frontal shield appressed to the head, transverse furrow concealed except for the ends. Schisma on coxal plate 1 narrower. Uropod sympodites angulate, at distal margin approx. three times as wide as exopodite. Uropods and pleotelson as figured in the original description, whereas the shapes of the cephalothorax and coxal plates 1 differ. In all characters except for the number of ommatidia, it perfectly resembles *C. ornatus* (probably, the ommatidia became indistinct through fixation).
2. 7.7 × 3.9 mm, eight to ten (?) ommatidia (exact number could not be counted), frontal shield exceeding the vertex, the transverse furrow entirely visible in dorsocaudal view. Schisma on coxal plate 1 wider. Uropod sympodites rounded, at distal margin *c*. two times as wide as exopodites. This specimen fits the original description of *C. intermedius*, except for the shape of the uropods, which are distinctly different.

The holotype is more similar to specimen (1), but unfortunately lacks the appendages, which have important diagnostic characters. Both specimens differ from the original description in having mnay fewer ommatidia.

In the original description, one male holotype and 13 female paratypes from two localities in Mato Grosso, which are stored in the MNRJ, and one paratype from Pará, stored in the MZUSP, are mentioned. The data of the latter correspond to sample MNRJ 3172. Either one of the specimens was erroneously added to the tube, or the label is wrong.

CIRCONISCUS INCISUS SOUZA & LEMOS DE CASTRO, 1991

Circoniscus incisus Souza & Lemos de Castro, 1991 – Schultz (1995*); Souza-Kury (1998*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Circoniscus gracilidens Souza & Lemos de Castro, 1991 – Souza-Kury (1998*); Leistikow & Wägele (1999*); Schmidt & Wägele (2001); Schmalfuss (2003*) – syn. nov.
? *Circoniscus bezzii* – Schultz (1995), misidentification.

Material examined

Types: One ♂ holotype, one ♀ paratype [Brazil, RJ, Excelsior, leg. O. Schubart, MNRJ 3174 (holotype transferred to separate tube)]; one ♂ without cephalothorax, one ♀ (paratypes, Brazil, RJ, Ilha d'Agua, under stones and rotting wood leg. Lemos de Castro, 28 February 1950, MNRJ 3173); one ♀ (paratype, Brazil, RJ, Grajaú, leg. Lemos de Castro, 17 July 1950, MNRJ 3175); one ♀, one cephalothorax without appendages (paratypes, Brazil, RJ, Pico de Tijuca, leg. M. Schubart, 20 June 1940, MNRJ 3176).

Other samples: One ♂ without cephalothorax (paratype of *Ci. gracilidens*, Brazil, RJ, Recreio dos Bandeirantes, Pedra de Itaúna, leg. Lemos de Castro, January 1950, MNRJ 3195); one ♂, one ♀ (Brazil, Minas Gerais, at the road from Ouro Preto to Ouro Branco, leg. K. H. Schwammberger, 27 March 1998; cCS 241a); one ♂, one ♀ (Brazil, E. Santo, Reserva do Museu Santa Tereza, leg.?, 12 November 1955, MNRJ 8510); one immature (?) ♂ (Brazil, RJ, Ilha Grande, leg.?, 6 March 1943, MNRJ 3177).

Description (Figs 218–223)

Holotype male *c*. 8 × 3.2 mm, cephalothorax 1.81 mm wide; other male 7.6 × 3.5 mm; female with marsupium 10 × 4.8 mm. Tergites smooth, shiny, dark greyish brown with pale muscle insertion spots, coxal plates paler than tergites. On coxal plates pigment appears finely reticulate. Dorsal scale setae very small, noduli also very small (those noduli that could be seen on the female specimen, on coxal plates 2 and 3, are located on the posterior margin and at some distance from the lateral margin). Ventral face and appendages pale, only second antenna and uropods with pigment. Frontal shield of cephalothorax distinctly exceeding the vertex. First coxal plate with schisma, second coxal plate with inner lobe, third coxal plate simple.

First antenna three-jointed, with some aesthetascs on the distal half of the apical article. Second antenna stout, flagellum two-jointed. Distal article of flagellum with two rows of aethetascs and a long apical cone with a pair of short lateral sensilla. Mandibles with one penicil between lobe and pars molaris, the latter represented by a tuft of hairy setae. First maxilla lateral endite on distal margin with lateral group of four stout teeth, a slender seta, and a triangular lobe. Mesal group of six slender teeth, four of them cleft. Mesal endite with two subequal penicils and an acute laterodistal corner. Second maxilla indistinctly bilobate, mesal lobe with field of sensilla and two sensilla between both lobes; both lobes with small hairs (pectinate scales?). Maxilliped endite rounded, covered with spines; caudal face with a tooth seta. Maxilliped palp basal article with inner large spine, outer spine absent. Second article with basal tuft of two setae and distal tuft of numerous setae on a socket and two single small setae on the mesal margin and two unequal setae on the lateral margin. Distal article with apical tuft of setae and three setae on the lateral margin.

Pereiopod 1 with antennal brush composed of scales. Male pereiopods 1 and 2 with weak scale-fields on ventral faces of merus and carpus. Pereiopod 6 merus and carpus on caudal face and pereiopod 7 basis, ischium, and merus on frontal face with WCS scale rows or vestiges of these. Male pleopod 1 endopodite abruptly constricted to a very slender apical portion; row of small setae along the dorsal spermatic furrow straight and continuous. Pleopod 1 and 2 exopodites with faint respiratory fields. Exopodite 5 with small, prolonged apical tip and dorsal transverse band of pectinate scales.

Pleotelson rounded-triangular, with slightly concave sides. Uropod sympodites with rounded outer corner and distal margin less than two times as wide as the exopodites. Beside the insertion of the exopodite, there is a small group of gland pores. Although the exact number could not be determined with certainty, there seem to be fewer than ten pores, the presence of which is confirmed by adhering secretion.

Geographical distribution
Brazil (Rio de Janeiro, Espirito Santo, Mato Grosso); Paraguay.

Remark
All type specimens are poorly preserved. Schultz (1995) set both names in the synonymy of *Circoniscus bezzii*. This cannot be agreed with, because clear differences could be found, e.g. lack of modifications of male pereiopod 7 and simple coxal plate 3 in *C. gracilidens*. On the other hand, *C. gracilidens* and *C. incisus* are conspecific; the differences pointed out by Souza & Lemos de Castro (1991) seem to be based on distortion of appendages, different stages of abrasion of the mouthparts, and inexact observation. The specimens mentioned by Schultz (1995) as *C. bezzii* are probably *Ci. incisus*, due to the description.

Circoniscus bezzii Arcangeli, 1931

Circoniscus bezzii Arcangeli, 1931a – Van Name (1936*); Vilela, Kudo & Loureiro (1971); Souza & Lemos de Castro (1991); Souza-Kury (1998*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
? Not: *Circoniscus bezzii* – Schultz (1995).

Material examined
One ♀m (Brazil, São Paulo, Tabatinga, Fazenda Itaquerê, 'mata, em pau podre', leg. K. Lenko, 23 April 1968, MNRJ 3165); two ♀ (Brazil, Fazenda Itaquerê, Nova Europa, São Paulo, leg. K. Lenko, 23 January 1964, MNRJ 3166); one ♂ (same data, leg. K. Lenko, 1 May 1960, MNRJ 3169); one ♀ (Brazil, Pirassununga, 21°59′ S, 47°23′ W, Fazenda Rio das Pedras, leg. Schubart, 15 December 1948, MNRJ 8508); one ♀m (Brazil, Pirassununga, 51°29′ S, 47°23′ W, Pedra Branca, leg. Schubart, 30 December 1938, MNRJ 3167); one ♀m (Brazil, São Paulo, Tabatinga, Fazenda Itaquerê, leg. K. Lenko, 23 April 1968, MNRJ 3165); one ♂, one ♀m (Brazil, São Paulo, Emas, leg. Schubart, without date, MNRJ 3168; one ♂, five ♀ (Brazil, São Paulo, Tabatinga, Fazenda Itaquerê, leg. K. Lenko, 23 April 1968, MNRJ 3170).

Description (Figs 224–229)
Male 9.5×4.4 mm to 11×5.5 mm, cephalothorax 2.61–2.72 mm wide. Eyes 15/14 ommatidia. Adult female (i.e. with marsupium) 10.2–10.4 mm long, 4.6 mm wide ($N = 2$), cephalothorax 2.35 mm wide. Eyes 11/12 ommatidia. Coloration not preserved.

Endoantennal conglobation ability. Tergites smooth, with very small scale setae, which are arranged irregularly, except for a row along the posterior margins. Cephalothorax with frontal shield only slightly exceeding the vertex. Behind frontal shield a transverse furrow, the ends of which curved backwards and visible near the eyes. Eyes composed of approximately 11–15 ommatidia. Coxal plates 1 and 2 with schisma, coxal plate 3 with distinct lobe on inner face. Coxal plates 6 and 7 and pleon-epimera 3–5 and uropod sympodites with a continuous ridge on their inner face, running parallel with the margin. Marsupium with 3/3/3/3 cotyledons. Only a few large eggs; in one specimen, eight eggs were counted.

First antenna three-jointed, with very short second article. Apical article longer than proximal article, with (*c*.) 11 aesthetascs arranged irregularly on the distal half. Distalmost aesthetascs of same size as the others, exceeded by a tip of soft appearance. Second antennae short, when bent backwards not reaching the hind margin of first tergite. Apical cone slightly longer than distal flagellar article, with only one small lateral sensillum. Distal flagellar article with two rows of four (?) aesthetascs.

Mandibles both with pars incisiva of four cusps, one hairy seta between hairy lobe and pars molaris, which is represented by a tuft of numerous hairy setae. Left lacinia mobilis large, with two large and one smaller cusps, left hairy lobe with two hairy setae. Right lacinia mobilis smaller, with two more acute cusps, right hairy lobe with one hairy seta. Both mandibles on outer surface densely covered with scales, and with some scale setae. First maxilla mesal endite with two slender, equal penicils, and laterodistal corner rounded. Lateral endite on distal margin with mesal group of six more slender tooth setae, of which two are simple, one bifurcate and three trifurcate (in the specimen examined), and lateral group of five stouter, simple tooth setae, one of them half as long as smallest of the remaining four, and one slender seta. No small subapical setae could be found (in the drawing of the frontal view of the first maxilla, there is one large tooth seta of the outer group missing, which has broken off). Lateral margin fringed with hairs in the distal third. Second maxilla apically bilobate, the lateral lobe more than twice as large as the mesal lobe. Lateral lobe hairy, mesal lobe also with area of numerous densely spaced sensilla. Maxilliped palp three-jointed, on basal article with one large seta, second article with one broad and one slender seta on the lateral margin and a proximal tuft of four small setae and a distal tuft of numerous small setae on a long socket; two small setae beside the socket. Apical article with apical tuft of numerous (> 20) small setae, and some (four?) small setae on the lateral margin. Maxilliped endite with approximately parallel sides, and rounded corners one small seta near mesal corner and one smaller seta near lateral corner, on caudal face otherwise hairy (scales). Frontal face of endite with dense field of hair-like scales. A penicil could not be seen in the examined specimen, but may be broken off or hidden between the scales. Maxilliped base with scales and scale setae.

Pereiopods covered with somewhat protruding scales. Pereiopod 1 with antenna brush composed of rather long scales. Merus and carpus of male pereiopod 1 distinctly enlarged in comparison to female. Except for the antenna brush, no further scale-fields can be seen on any pereiopod (without dissection). Male pereiopod 2 with some scales arranged like a rudimentary antenna brush on the carpus, and a very small ventral scale-field on the merus. Following pereiopods without any special scale-fields. Male pereiopod 7 with distinct water-conducting scale-row on base only. Ischium with slightly concave ventral margin, otherwise ischium and merus simple. Dactyli with numerous scales, a dactylar seta with a fringe of setules in the distal portion, an ungual seta and a smaller seta beside the ungual seta.

Pleopod exopodites 1 and 2 with respiratory fields, which are covered with fringed, oval scales. Male pleopod 1 exopodite with large, broadly rounded distal lobe; marginal setae absent. Respiratory fields with shallow radial wrinkles. Endopodite 1 rather broad on the basal two-thirds of the spermatic furrow, then evenly constricted towards the pointed apex. Row of 36 slender spine-like setae along the spermatic furrow straight. These setae longer than distances between their insertions on most of the length of the row. Male pleopod 2 exopodite distally extended to a long lobe, but distinctly shorter than the slender endopodite. Exopodite with distinct respiratory field with almost semicircular lateral margin, and a hairy field along the medial margin. Exopodite 3 with distinctly delimited dorsolateral fields, and exopodites 4 and 5 with less distinctly delimited fields, none of which shows any wrinkles. Male pleopod 5 exopodite with furrow on the ventral face, along the mesal margin, and a transverse field of very small pectinate scales which could be seen only at higher magnification (400×). None of the pleopod exopodites has any marginal setae.

Pleotelson rounded-triangular. Uropod sympodites angular, about three times as wide as the exopodites. Sympodites with a small group of gland pores near the insertion of the exopodites (could not be seen in the dissected uropods).

Data of type specimens

Brazil, Carasinho (two ♂, two ♀, leg. Dr A. Borelli). The specimens could not be located. According to Vilela *et al*. (1971), there is no locality named 'Carasinho' in Brazil, but the name is probably derived from 'Caranda', which is a species of Arecaceae (*Copernicia* sp.) grown on plantations in Mato Grosso.

Geographical distribution

Brazil (São Paulo, Mato Grosso); Paraguay. (Map Fig. 230)

Remark

As the type specimens were not available for reexamination, the ascription of the above-mentioned specimens to *Circoniscus bezzii* is somewhat tentative. The specimens identified by Schultz (1995) more probably belong to *C. incisus*, because, according to the description, they have 'notches' on coxal plates 1 and 2.

PROTOSPHAERONISCUS SCHMALFUSS, 1980

Type species: Protosphaeroniscus tertiarius Schmalfuss, 1980.

Diagnosis
Endoantennal conglobation. Hind corners of coxal plate 1 without schisma. Pleotelson shorter than uropod protopodites; exopodites inserted on their inner corner. Apical organ of second antennae longer than apical flagellar article; flagellum three-jointed. Male pereiopod 7 merus with frontal ridge. Apex of male pleopod 1 endopodite bent laterally.

PROTOSPHAERONISCUS TERTIARIUS SCHMALFUSS, 1980

Protosphaeroniscus tertiarius – Schmalfuss (2003).

Description
Approximately 6 × 2.5 mm. Eyes with *c*. 12 ommatidia. Pleotelson triangular with straight sides.

Distribution
Hispaniola, fossil enclosed in Dominican Amber, age probably 25–30 million years (Schmalfuss, 1980).

Remark
Schmalfuss (1980) proposed a sister-group relationship between *Protosphaeroniscus* and a clade composed of *Circoniscus*, *Sphaeroniscus* and *Spherarmadillo*. The published description does not allow determination of the place of *P. tertiarius* in the phylogenetic hypothesis (cladogram) constructed in the present study. It seems to have had an endoantennal conglobation ability; the first coxal plate has a ridge, but not a schisma, on the inner side. The eyes are well developed, but there is no transverse furrow seen on the drawing (Schmalfuss, 1980, fig. 4). The latter would exclude *P. tertiarius* from clade 14 of the present article, if the lack of the furrow is regarded as primary. In the case of *Sphaeroniscus pilosus*, the lack of the transverse furrow has to be seen as secondary, because the other species of the genus *Sphaeroniscus*, and all other species of clade 14, which includes *Sphaeroniscus*, have a transverse furrow. Therefore, a close relationship to *Circoniscus* and *Sphaeroniscus* cannot be excluded (*Spherarmadillo* belongs to a more distant clade, according to the present analysis).

TAXA EXCLUDED FROM THE SCLEROPACTIDAE

INCERTAE SEDIS

SYNUROPUS RICHARDSON, 1901

Type species: Synuropus granulatus Richardson, 1901 (m).

Diagnosis
Habitus corresponds to the 'clinger type' (Schmalfuss, 1984), with enlarged coxal plates and pleon-epimera. Cephalothorax comparatively flat, with small medial and lateral lobes. Second antenna with three-jointed flagellum; apical cone longer than distal flagellar article.

SYNUROPUS GRANULATUS RICHARDSON, 1901

Synuropus granulatus – Van Name (1936*).
Scleropactes grandulatus (misspelling) – Schultz (1970); Schmalfuss (1980).
Scleropactes granulatus – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Types: One ♀ holotype (Puerto Rico, El Yunque, altitude 850 m, leg. L. Stejnegen, Type; USNM 23912).

Description (Fig. 231)
Female 6.3 × 3.35 mm. Pigment not preserved: 'brown, mottled with black' (after Richardson, 1901). Body dorsoventrally flattened, with oval outline, non-conglobating. Cephalothorax with distinct median and lateral lobes. Eyes composed of 19 ommatidia. Tergites shallowly tuberculate. Coxal plate 1 with right-angled hind corners, coxal plates 2–7 with acute angles, the corners pointing backwards. Epimeres of pleon segments 3–5 decreasing in length and width. Pleotelson triangular with rounded tip, slightly projecting beyond the uropod protopodites. Second antenna with three-jointed flagellum. The apical cone exceeds the length of the terminal article. Uropod sympodite massive, not flattened, slightly surpassed by the tip of the pleotelson. Exopodites and endopodite approximately equal-sized, lanceolate, as long as the visible part of the sympodite.

Geographical distribution
Puerto Rico.

Habitat
The specimen was collected at 850 m altitude; no further information on the habitat was given.

Remark
The synonymization of *Synuropus* with *Scleropactes* was certainly wrong. Schmalfuss (1980) assumed that '*Scleropactes grandulatus*' does not belong to the Scleropactidae. *Synuropus* does not even resemble species of *Scleropactes* very much. Besides the lack of the transverse furrow on the cephalothorax, it is not clear why *Synuropus* should be a member of the Scleropactidae. The length of the apical cone of the second antennae is similar to that in most of the Scleropactidae and Philosciidae. The flattened body shape is to be considered plesiomorphic with respect to the conglobating Scleropactidae, but apomorphic with respect to the Philosciidae. The shape of the uropod protopodites is also intermediate between *Scleropactes* and representatives of the Philosciidae. In consequence, *Synuropus* might be considered as a sister group of the Scleropactidae or of the South American Scleropactidae only.

However, as only the type specimen is known, most phylogenetically important characters, such as mouthparts and pleopods, remain unknown. It is also not certain that the specimen is adult.

CHILEONISCUS TAITI, FERRARA & SCHMALFUSS, 1986

Type species: Chileoniscus marmoratus Taiti, Ferrara & Schmalfuss, 1986.

Diagnosis
Endoantennal conglobation. Cephalothorax with a frontal triangular shield that is ventrally delimited by the antennal grooves. Distinct antennal lobes protruding frontally. Eyes and pigment present. Coxal plates simple, or coxal plate 1 with a notch. Noduli laterales distinct and larger than remaining tergal scale setae. Second antenna with two-jointed flagellum and a short apical cone. Mandibles with pars molaris represented by a tuft of hairy setae.

Apomorphies of the genus
[5-1] Cephalothorax with antennal lobes (without antennal lobes)
[19-1] Nodulus 7 in a more median position than 5 and 6 (all at same distance to the margin)
[65-1] Male pleopod 1 endopodite bent ventrally (in lateral view)
[73-1] Uropod expodite plate-like enlarged

CHILEONISCUS MARMORATUS TAITI, FERRARA & SCHMALFUSS, 1986

Chileoniscus marmoratus – Leistikow & Wägele (1999*); Schmalfuss (2003*).

Material examined

Type specimens: Six ♂, two ♀m and seven ♀ without marsupium (Chile, Coquimbo, Nague, leg. Peña, 26 September 1980, SMNS T205, paratypes).

Other samples: 25 ♂ and immature ♂, three ♀m, 20 ♀ and immature ♀ (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, '#1a', MZUF) (Map Fig. 239).

Description (Figs 232–238)
Male minimum 4.15 × 1.7 mm, cephalothorax 1.0 mm wide, maximum 4.8 × 1.95 mm, cephalothorax 1.15 mm wide; female minimum 5.4 × 2.3 mm, cephalothorax 1.3 mm wide, maximum 6.0 × 2.6 mm, cephalothorax 1.5 mm wide. Cephalothorax with small lateral lobes, below which there are prominent antennal lobes. Eyes composed of 13–15 ommatidia. Tergites light brown, with dark brown and pale mottling. Muscle insertions pale. Pale areas in female more extended than in males. Second antennae dark, pereiopods with only few pigment spots. Lateral margin of first coxal plate near hind corner bent on ventral face, the coxal plate being thinner behind that location. This is not a true schisma. Pleon dorsally stronger curved than pereion, with more straight lateral sides. Pereion more evenly curved. Tergal scale setae enlarged, on the tergites about twice as long as broad, on the posterior margins as long as broad. Noduli laterales distant from lateral margins, on fourth tergite in a more medial position. On seventh tergite there seems to be a second pair of noduli in a more lateral position, but this could not be seen with sufficient clarity.

First antenna three-jointed, second article shortest and apical article bearing seven aesthetascs, the distalmost two being slightly larger than the others. Second antenna flagellum two-jointed, the distal article 2.5 times as long as proximal article and bearing two (rows?) of aesthetascs and a short apical cone. On the apical cone, a pair of lateral sensilla could not be dis-

KEY TO THE SPECIES OF *CHILEONISCUS*

1. Pleotelson distally truncate; the gap between the uropod exopodites is filled by the flattened endopodites; male pleopod 1 endopodite distally downcurved . . . . *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986
1.* Pleotelson elongate, distally reaching the body outline and covering the uropod endopodites, which are laterally flattened; male pleopod 1 endopodite distally straight . . . . *Chileoniscus armadillidioides* sp. nov.

cerned. In contrast to other Oniscoidea, the sensilla are visible for the whole length and do not seem to be covered. However, the shape is like that found in the Oniscidea and not like the irregular tuft of sensilla found in the Detonidae, etc. (Schmidt, 2002).

Right mandible with simply rounded lacinia mobilis and one penicil on the hairy lobe. Left mandible with two-cusped lacinia mobilis and two penicils on the hairy lobe. Both mandibles with one hairy seta between hairy lobe and pars molaris, which is represented by a tuft of hairy setae. First maxilla lateral endite with lateral group of four strong teeth and a small triangular lobe and mesal group of five more slender teeth, one (or two?) of which are apically cleft. Distal quarter of lateral margin fringed with hairs. Mesal endite with acute lobe on laterodistal corner and two penicils on mediodistal corner. Second maxilla indistinctly bilobate, with a field of numerous sensilla on the inner lobe. Maxilliped base covered with scales except for the distal portion, and with some scale setae. Maxilliped endite distally truncate, with an enlarged lobe on the lateral side, bearing a small, short seta on the mesal margin, one large seta in a subapical position on the caudal face, and one strong, but short, seta in a more basal position on the frontal face. Proximal article of maxilliped palp bears two strong setae, mesal one larger than lateral one. Distal articles fused; on mesal margin one group of one large and one small seta, one group of one large seta and two small setae, and apical tuft of several equal setae. Lateral margin with group of one slender and one stout seta, and two single, slender setae.

Pereiopods (and second antenna) covered with scales and scale setae. Ventral faces of merus, carpus and propodus with setae; in males the number of setae is increased on pereiopods 1 and 2. Male pereiopods 1–7 with ventral scale-fields of varying extent (Figures 235–237). First pereiopod with antennal brush on carpus and propodus; the portion on the carpus is parallel to the longitudinal axis of the carpus. Dactyli with inner claw about three-quarters as long as outer claw. Ungual seta shorter than inner claw, slightly curved and with a small seta beside it. One smaller seta on the frontal face, and one larger seta on the caudal face. Dactylar seta simple, weakly curved, with a row of four aesthetasc-like setae dorsally beside it, and one setae ventrally beside it. Male pereiopod 7 with dorsofrontal depressions on ischium, merus and, weaker, on carpus.

Pleopod exopodites without any visible respiratory fields. Pleopod 2–5 exopodites with four to seven simple marginal setae. Male endopodite 1 strongly curved ventrally, with a row of 15 small setae along the dorsal spermatic furrow. Exopodite 1 mesally rounded, distally acute, longer than broad, and with a very narrow lateral field delimited by a sulcus. Male pleopod 2 endopodite slightly longer than exopodite, with very slender distal portion. Exopodite 2 with broad hairy area along the mesal margin, and without conspicuous lateral field. Exopodites 3 and 4 with weakly developed medial hairy portion, exopodite 5 with indistinct medial furrow. Dorsal face of exopodite 5 with a transverse band of pectinate scales.

The pleotelson has approximately the shape of a half-octagon. Uropod exopodites and endopodites both dorsoventrally flattened and contributing to the body outline.

Chileoniscus marmoratus differs from the new species *Ch. armadillidioides* in many details. In many cases, it is not obvious which of the species conserved the plesiomorphic character. Probable autapomorphies of *Chileoniscus marmoratus* are:

1. uropod endopodite dorsoventrally flattened
2. coxal plate 1 with a notch

?3. maxilliped endite on frontal face with a conical seta
?4. scale setae enlarged

Dorsoventrally enlarged uropod endopodites are also found in the Spelaeoniscidae, a taxon of minute endogeous or cavernicolous Oniscidea which populate the western Mediterranean. No arguments that could support a closer relationship are known (but see below). The notch of coxal plate 1 is clearly apomorphic with respect to *Chileoniscus armadillidioides.* Secondary loss of such structures related to the conglobational ability has not yet been demonstrated. The third character is doubtful, as the homology of this seta is not clear. Enlarged scale setae are widespread in the 'Dubioniscidae' and 'Platyarthridae', as well as in the Spelaeoniscidae. In some 'Philosciidae', the scale setae are also enlarged, but have a different structure.

CHILEONISCUS ARMADILLIDIOIDES SP. NOV.

Material examined

Type specimens: One ♂ holotype, two ♀m, ten immature ♀, four ♂ paratypes (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

Other samples: One ♀ (Chile, X Reg. Prov. Chiloé, PN Chiloé, Rancho Grande near Cuaco, altitude 300–600 m, Fitzroya forest, leg. Agosti and Burckhardt, 4 January 1991, #30a, MZUF); three ♂ (Chile, X Reg. Prov. Chiloé, Rancho Grande near Cuaco, 42°33′ S, 74°02′ W, altitude 250–400 m, leg. Agosti and Burckhardt, 29 December 1992, #35b, MZUF); one ♀m, three ♀/immature ♀, four ♂ (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, 42°37′ S, 74°08′ W, altitude 10–70 m, leg. Agosti and Burckhardt, 28 December 1992 to 1 January 1993, #34b, MZUF).

Description (Figs 240–246)
Male 4.1×1.8 mm (cephalothorax width 1.03 mm) to 4.45×1.95 mm (cephalothorax width 1.10 mm). Coloration marmorate, with brown and pale. Cephalothorax with vertex and frons separated only by a shallow furrow. While conglobated, the second antennae are held in furrows, between which there is a 'frontal triangle'. Distinct antennal lobes present. Eyes composed of 11 or 12 ommatidia. Tergites smooth, with hair-like scale setae and large noduli laterales. Noduli 2 and 3, and 5 and 6, are approximately at the base of the coxal plates, 1 and 4 are in a more mesal position, and on tergite 7 there are two pairs, in lateral and mesal positions. Distance to posterior margin decreases from 1 to 7, the first being at the midlength of its tergite, and the seventh near the posterior margin. One male specimen with six additional noduli laterales between the mesal pair of noduli of seventh tergite. This is only an individual variation. All coxal plates simple; 2, 3 and 5, and even more 4, are short, due to conglobation ability. Pleotelson triangular, with rounded tip reaching the body outline. The space between pleotelson and the fifth pleon-epimera filled mainly by platelike uropod exopodites.

First antenna three-jointed, second article shortest, distal article bearing two apical and one or two subapical aesthetascs. Second antenna about as long as the seventh pereiopod. Flagellum two-jointed, distal article five times as long as proximal article, bearing a short apical cone; a single pair of free lateral sensilla could not be found. Mandibles: lacinia mobilis of left mandible with three cusps, that of right mandible with some small, sharp cusps; hairy lobe on left mandible with one penicil, and on right mandible with two penicils. Pars molaris represented by a tuft of numerous hairy setae. Between hairy lobe and pars molaris, one hairy seta. First maxilla lateral endite on the distal margin with lateral group of four stout tooth-setae, one small, short seta and a very small, triangular lobe, and mesal group of six more slender setae, at most one of them apically indistinctly cleft. Distal quarter of lateral margin fringed with hairs (pectinate scales). Mesal endite with no laterodistal corner; the whole width of the distal margin is occupied by two equal penicils. Second maxilla distally bilobate, mesal lobe narrower and bearing a field of sensilla. Two sensilla between lobes. Maxilliped base with scale setae and, in proximal part, also with scales. Maxilliped palp proximal article with two large setae, distal articles fused except for an indistinct suture, on mesal margin with two tufts of one large and one or two smaller setae, both on small sockets, at apex with a tuft of numerous small setae, on lateral margin with two single, subapical setae and a pair of one broad and one slender seta. Endite approximately rectangular, with small lobe near the outer corner and one large seta on the caudal face.

Pereiopods 1–5 slender, pereiopods 6 and 7 stouter. All pereiopods with scale setae and large ventral setae. Male pereiopods 1 and 2 with number of ventral setae increased on merus and carpus. First pereiopod with longitudinal brush (scale-field) on frontal face of carpus and group of scales on ventrofrontal part of proximal half of propodus. Dactyli with long and slender inner claw projecting beyond outer claw, ungual seta also longer than outer claw. Dactylar seta with knife-shaped, enlarged tip. One small seta beside ungual seta, one larger seta each on frontal and caudal faces, and few (four?) aestetasc-like setae beside dactylar seta. Male pereiopod 7 on caudal face of carpus with shallow concavity.

Pleopod exopodites 1–5 without obvious lungs or respiratory fields, with 2–5 simple marginal setae in subapical or apical position. Male pleopod 1 exopodite longer than broad, roughly triangular, with slightly constricted distal lobe, which bears marginal setae. Male endopodite 1 slender, distally downcurved. Approximately 20 small setae in a row along spermatic furrow. Male pleopod 2 exopodite long, its hairy inner margin as long as the endopodite. Pleopod 5 exopodite on dorsal (caudal) face with field of pectinate scales in distal third. These are not arranged in distinct rows. Sympodites 2–5 on lateral portion with one small seta each.

Uropod endopodite laterally flattened, as long as the sympodite, on which it inserts in a basal position. Uropod exopodite plate-like, about as long as wide, rounded, with a number of large gland pores on dorsal face.

Probable apomorphies of *Ch. armadillidioides* are (compared with *Ch. marmoratus*):

1. frontal shield with excavate upper corners, which leave the eyes uncovered in frontal view (eyes partly covered by the frontal shield)
2. nodulus of tergite 4 in a more medial position (in same position as noduli 1–3 and 5 and 6)
3. male pereiopod 7 with concavity on caudal face of carpus (slight concavities on frontal face of ischium, merus and carpus)

Derivation of the name
Because of the strong superficial resemblance to the Mediterranean genus *Armadillidium*, the present species is named *armadillidioides*.

SPHAEROBATHYTROPA VERHOEFF, 1908

Includes only the type species; a second nominal species is synonymized below. The phylogenetic affinities of this species have been enigmatic since its discovery, so a review of the published opinions is given and discussed here.

Discussion of the phylogenetic position of Sphaerobathytropa

Concerning the genus *Sphaerobathytropa*, the aim of the cladistic analysis included in the present article was only to assess whether or not this genus belongs to the Scleropactidae. The various hypotheses on the systematic position of *Sphaerobathytropa* are discussed here. *Sphaerobathytropa* was originally placed in the Eubelidae. As the Eubelidae were redefined and several taxa removed from this family, this needs reconsideration. The Eubelidae, as defined by Taiti *et al*. (1991), are characterized by two apomorphies: the sulcus arcuatus, a deep furrow along the lateral margin of the first coxal plate, and the shape of the uropods. The sulcus arcuatus is absent only in species that secondarily gave up the conglobational ability. *Sphaerobathytropa* does not show these apomorphies, and also lacks apomorphies of subordinate taxa of the Eubelidae, e.g. number of penicils on inner endite of first maxilla greater than two, or pleopodal lungs of some complexity. Therefore, placement of *Sphaerobathytropa* in the Eubelidae is not supported. Vandel (1963) included *Sphaerobathytropa* in the subfamily Sphaeroniscinae of the family Eubelidae, together with *Sphaeroniscus*, *Scleropactes* and *Circoniscus*. This subfamily was elevated to family rank by Vandel (1968). Later, Holdich *et al*. (1984) replaced the name Sphaeroniscidae by Scleropactidae, because the latter has priority. The Scleropactidae are most closely related to some South American Philosciidae, with which they share an apomorphic, long antennal cone (Schmalfuss, 1980) with a pair of short lateral sensilla; also, on the maxilliped palp, the setae of the distal tuft of the second article are inserted on a common socket (Leistikow, 2001; Schmidt, 2002, 2003). The antennal cone of *Sphaerobathytropa* is only half as long as the distal flagellar article, but the lateral sensilla are short, approx. 0.25 of the length of the apical cone. This condition can be said to be intermediate, and does not clearly favour a close relationship with the Neotropical Scleropactidae or Philosciidae. The maxilliped palp does not exhibit the apomorphy of the above-mentioned groups.

A third hypothesis suggests a relationship of *Sphaerobathytropa* with the Armadillidae. No phylogenetic system of the Armadillidae has existed before now. The discussion concerning the groundpattern of the Armadillidae has only recently been opened (Taiti *et al*. 1998). *Sphaerobathytropa* does not have the hourglass shape of the pleotelson that is characteristic of the great majority of the Armadillidae, but there are also some (putative) members of the Armadillidae with a differently shaped pleotelson. Probably, the molar penicil, which consists of several hairy seta on an elongate socket, could support a relationship with the Armadillidae.

The dorsal tricorns are similar to those found in the non-conglobating genera *Trichorhina* and *Calycuoniscus*, Neotropical representatives of Platyarthridae or closely related to these. They are also similar to the tricorns of the west Mediterranean Spelaeoniscidae. The species of that taxon are of a similar size but leave the second antennae outside when conglobating. Furthermore, they have the uropods specialized in a completely different way than *Sphaerobathytropa*. In contrast to all these forms, the noduli of *Sphaerobathytropa* are large and prominent.

Recently, some enigmatic species were described from Greece and tentatively placed in the Scleropactidae (Schmalfuss, 1995). One of them, *Xeroporcellio pandazisi* Strouhal, 1954, has exoantennal conglobation ability, small lateral lobes of the cephalothorax, a three-jointed flagellum of the second antenna, and a long apical cone. In these characters, as well as in the shape of the pleotelson and uropods, it closely resembles the South American genus *Scleropactes*, and the same arguments can be used for rejecting a close relationship with *Sphaerobathytropa*. The other species, *Kithironiscus paragamiani* Schmalfuss,1995, is an endoantennal conglobator with a schisma on the posterior corners of the first coxal plates. The noduli laterales are small, but distant from the posterior margins of the tergites, as in *Sphaerobathytropa*. In contrast, the conformation of the uropods of *Kithironiscus* resembles more the condition found in the Spelaeoniscidae.

The conclusion of these considerations is that the sister group of *Sphaerobathytropa* cannot be identified at present, because the taxa that need to be considered are still insufficiently known, their monophyly is not supported, or their groundpattern is not yet reconstructed. It is also possible that *Sphaerobathytropa* separated from its sister group early in the evolutionary history of the Crinocheta, and numerous characters were transformed during its own evolution, a circumstance that does not facilitate comparison with other taxa.

For the time being, it is proposed to retain *Sphaerobathytropa* as 'incertae sedis', until new data allow its phylogenetic position to be revised.

SPHAEROBATHYTROPA RIBAUTI VERHOEFF, 1908

Sphaerobathytropa ribauti Verhoeff, 1908 – Verhoeff (1938*); Vandel (1940, 1941, 1946*); Legrand (1944, 1954); Vandel (1962a,b, 1968); Schmölzer (1965*, 1971); Cifuentes (1983); Vivar, de la Vega & Cifuentes (1984); Schmalfuss (1980, 2003*).

Sphaerobathytropa antarctica Vandel, 1962b – nomen nudum.

Sphaerobathytropa antarctica Vandel, 1963 – Vandel (1968); Leistikow & Wägele (1999*); Schmalfuss (2003*) – syn. nov.

Material examined

Type specimens: Two ♀, and four microscopic slides: (1) pleon and pereion segment 7; (2) pereion segments 2–5 with legs; (3) pleon and some fragments; (4) two juveniles, one entire, the other broken into three pieces (syntypes, France, St Béat, leg. Ribaut, ZSM). Slides 1–3 are poorly preserved.

Other samples: [For the South American localities, see Remarks on next page.] One ♂ holotype of *Sphaerobathytropa antarctica*, dissected second antenna, maxilliped, second maxilla, mandible, tergites 1–3, pereiopod 7, pleopods 1 and 2 and pleon with uropod on slides CV 4955-1 to 4955-9 (Argentina, Réserve du Nahuel Huapi, 40°50′ S, 71°30′ W, altitude 1200 m, Los Cantaros, près de Puerto Blest, forêt valdivienne très humide, leg. Delamare Deboutteville, 8 March 1959); fragments of one specimen (1.5 mm wide) – segment 1 with maxilliped, segments 4–6 with 4 pereiopods, pleon without pleotelson and with two pleopod exopodites only, and two separate pereiopods (with labels 'Ecuador, Archidona, iv.1965' and '*Sphaeroniscus gerstaeckeri* Vandel', IRSNB 24421); two ♂, three ♀ (France, St Béat, leg. Ribaut, April 1939, CV); one ♂, one ♀ (France, Ste. Engrace, 13 March 1956, CV); one ♀ (Pyrénées, K. W. Verhoeff collection, USMN 56114); one ♀m, two ♀ (Pyrénées mountains, with contradictory labels, leg. Verhoeff 1917 or leg. Ribaut, ZMG 467).

Description (Figs 247–256)

Male maximum 2 mm long, female maximum 4 mm long. Dorsally with light brown pigment and pale muscle insertion spots. Second antennae pigmented. Endoantennal conglobating ability (Fig. 1). Cephalothorax approximately as long as high. In lateral view, the lateral end of the linea marginalis is below the middle. Eyes composed of five (male) or six (female) ommatidia (in the examined specimens). Frontal shield hardly exceeding vertex, its upper margin in frontal view evenly rounded. Behind frontal shield a simple transverse furrow. No delimited 'frontal triangle' as described by Verhoeff. Linea supraantennalis absent. First coxal plate without any trace of a sulcus arcuatus, but with schisma along whole lateral margin, lower lobe on both corners somewhat shorter than upper lobe. Second coxal plate with a large transverse lobe on inner face, third coxal plate with a very small transverse lobe on the inner face. Fourth coxal plate laterally narrowed, fifth broadly rounded, and sixth and seventh laterally truncate. Tergites covered with approximately circular scales with narrow distance between them (not overlapping) and broad, shell-shaped tricorn setae similar to those found, for example, in *Trichorhina*, *Calycuoniscus* or the Spelaeoniscidae. These tricorn setae irregularly arranged on the tergites, except for a row along posterior margins. Noduli laterales distinctly larger than tricorn setae (resembling simple setae at lower magnification); their sheath has lateral lobes at the base, and is as long as the free distal portion of the seta. Noduli located at distance from posterior margin; on the first tergite, the nodulus is more approximate to the anterior margin than to the posterior margin.

First antenna three-jointed, second article shortest, and distal article bearing a number (six?) of aesthetascs, with no gap or difference between apical and subapical aesthetascs. Second antenna (Fig. 4) short and stout, if bent backwards hardly reaching posterior margin of first tergite. Two-jointed flagellum bearing apical cone of about half the length of the apical article; lateral setae approximately 0.25 times as long as apical cone, and inserted at its basal 0.2. Articles of second antenna with narrow setae and overlapping cuticular scales.

Mouthparts: right mandible: pars incisiva with three teeth, lacinia mobilis with slender base and several small 'teeth', hairy lobe with scales of different size and one penicil, one more penicil proximal to the lobe. Left mandible with pars incisiva of four teeth, lacinia mobilis strong, with three teeth, hairy lobe with some scales and two penicils, one more penicil proximal of the obe. Pars molaris of both mandibles represented by tuft of hairy setae (exact number could not be counted) on a common socket. Outer faces of both mandibles with some overlapping scales and a few simple tricorn setae.

First maxilla mesal endite with two slender penicils, its laterodistal corner rounded (?probably distorted). Lateral endite with lateral group of four teeth (or tooth setae) and mesal group of five (simple?) teeth. On caudal (ventral) face, small triangular lobe beside lateral group and small, simple seta at some distance from mesal group. Distal 0.25 of lateral margin fringed with 'hairs' (= pectinate scales?). Second maxilla apically indistinctly bilobate, mesal lobe much narrower and bearing a group of sensory pegs. Between the lobes with two small setae, lateral lobe only with a few small 'hairs'.

Maxilliped base bears overlapping scales and slender setae, like the second antenna. Maxilliped endite rectangular, with two produced, acute-angled lobes on apical margin and a large seta on caudal face. Palp three-jointed, basal article with two large setae, second article bearing one proximal tuft of one enormously large and one or two minute setae and one distal tuft of one large and several smaller setae on mesal margin and two unequal setae on lateral margin. Apical article with apical tuft of setae and one (or two?) smaller setae on lateral margin.

All pereiopods with large, overlapping epicuticular scales and few, but large tricorn-like setae. Ventral faces of merus, carpus and propodus with two to four large setae. Dactyli with simple dactylar setae with a few aesthetasc-shaped setae beside it, one seta each on frontal and caudal faces, and a simple, curved ungual seta. Inner 'claw' shorter than outer claw. Pereiopod 1 with antenna-cleaning brush composed of comparatively few, large scales on carpus and a row of ventral, spine-shaped structures (setae or scales?) on the propodus. One of the ventral setae of the carpus has several tips. Pereiopod 7 has overlapping scales and different setae. Scale-rows belonging to water-conducting system absent. Genital papilla ventral shield exceeded by a truncate lobe; orifices near apical corners.

Pleopods: male pleopod 1 endopodite straight, with distalmost tip strongly curved outwards. Spermatic furrow with basal row of scales and distal row of 10–15 small spine-shaped setae along the medial margin. Pleopod 1 exopodite transverse, as wide as endopodite, without marginal setae. Male pleopod 2 endopodite slender, slightly longer than exopodite. Pleopod 2 exopodite triangular, with elongate distal part, one or two lateral marginal setae and a field of hair-like pectinate scales beside the medial margin (not drawn). Pleopod exopodites 3–5 each have one or two marginal setae and a few 'hairs'. Pleopod 5 exopodite on the caudal (dorsal) face with a transverse stripe of few large pectinate scales.

Pleotelson with medial lobe slightly projecting beyond the uropod protopodites and with convex sides. The median portion is strongly convex. Uropod protopodites dorsoventrally flattened, exopodites short and stout, inserting near the inner corner, endopodites inserting basally on the protopodite, laterally flattened.

Remark

Re-examination of the type specimen of *Sphaerobathytropa antarctica* and of specimens of *S. ribauti* clearly demonstrated that no substantial differences exist. The differences mentioned by Vandel (1963) are erroneous. The obvious identity of both nominal species raised the question of how the species was transferred from South America to the Pyrénées or vice versa. Vandel (1963) mentioned only one male specimen. Re-examination of samples of terrestrial isopods from the IRSNB revealed a second specimen, which was labelled '*Sphaeroniscus gerstaeckeri*'. As that species is so different from *Sphaerobathytropa* that confusion can be excluded, doubt arises concerning how the labels and the specimen were placed in this tube. Probably, Vandel had examined specimens of *Sphaerobathytropa ribauti* from his personal collection (now in MNHN), probably for comparison with the South American Scleropactidae that he was working on at that time, and then added the two specimens to the wrong tubes. If he had used a pipette for handling these minute animals, it can be easily imagined that the specimen and the fragments of another specimen (even smaller than an entire specimen) adhered inside the pipette and then were released unnoticedly.

Some minor differences seen between the drawings presented here probably represent intraspecific variation, and others certainly depend on the preservation of the specimens. For example, the second antenna looks stouter in the holotype of *Sphaerobathytropa antarctica* than in the other specimen, because it is more compressed between slide and cover glass. The size of the lobe on the inner face of the second coxal plates differs even between left and right side of the same specimen (Fig. 248).

The occurrence of *Sphaerobathytropa* in the Pyrénées is well established by a large number of localities and specimens. In contrast, only one specimen is recorded from Argentina. Taking into consideration the small size of the specimens, these data led to the conclusion that the two specimens were accidentally added to the tubes with other samples from South America, and that specimens of *Sphaerobathytropa* were actually never found in South America. Vandel's first thought, a labelling error (Vandel, 1962b, 1963), was correct.

Geographical distribution and ecology (Map Fig. 257)

According Vandel (1962a), *Sphaerobathytropa ribauti* is very common on the north slope of the Pyrénées. It is frequently found at altitudes up to 1000–1200 m, but rarely up to 1600 m. Several scattered records are known from the Aquitaine basin and the south of the Massif Central.

The habitat is described as gorges with forest and high humidity. There, the animals are found in decaying wood, in leaf litter, under stones, and in soil crevices.

DISCUSSION

The phylogenetic analysis is based on part of the species only. Some species could not be included, because no comprehensive documentation of the morphological characters could be prepared, due to the lack of sufficiant material. This gap needs to be filled. However, the comparatively low complexity of most characters that are variable among the species included here is an impediment to their interpretation in a phylogenetic context. Independent of the method of analysis, the resulting phylogeny hypothesis requires multiple parallelisms and reversals for most characters. A similar situation was also found in phylogenetic analyses at the species level in other members of the Oniscidea: *Ischioscia* (Leistikow & Schmidt, 2002) and *Androdeloscia* (Schmidt & Leistikow, 2005). Molecular data may help to clarify the phylogeny in such cases; for this purpose sufficient material suitable for DNA extraction is necessary.

Probably, a more clearly resolved phylogeny hypothesis at the species level cannot be expected if numerous species that differ only in variable details are studied.

Analysis with the computer program PAUP led to almost the same results as without. This is not surprising, because both analyses are based on the same set of previously defined morphological characters. The only important difference is the position of *Sphaeroniscus gerstaeckeri*. Owing to the absence of eyes, it is grouped together with other eyeless species because of the lack of ommatidial lenses. This reduction is not sufficient to assume a closer relationship with the other eyeless species, and *S. gerstaeckeri* is provisionally retained in the genus *Sphaeroniscus*, because of the distally cleft distal setae on the male pleopod 1 endopodite shared with *S. quintus* and *S. pilosus*.

The taxonomic revision revealed that most nominal species are valid, and only a few were identified as synonyms. Taking into consideration that most samples were collected in few scattered localities, mainly by collectors expert in taxa other than isopods, it can be assumed that the diversity of the Neotropical Scleropactidae is much higher than currently known, and that the species described in the present article probably represent only a small proportion of the species that actually exist. The distribution data are too scarce for conclusions on the biogeography to be drawn. Many species are known only from the type locality, and in some cases this place could even not be identified.

I hope that the present revision will facilitate further research on the Neotropical Scleropactidae.

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APPENDIX

List of nomina

Amazoniscus arlei Lemos de Castro, 1967
Amazoniscus Lemos de Castro, 1967
Caecopactes gen. nov.
Caecopactes minimus sp. nov.
Chileoniscus Taiti, Ferrara & Schmalfuss, 1986
Chileoniscus armadillidioides sp. nov.
Chileoniscus marmoratus Taiti, Ferrara & Schmalfuss, 1986
Circoniscus Pearse, 1917
Circoniscus amazonicus Brasil Lima, 1996 .... *Circoniscus ornatus*
Circoniscus bezzi Arcangeli, 1931a
Circoniscus gaigei Pearse, 1917
Circoniscus gracilidens Souza & Lemos de Castro, 1991 .... *Circoniscus incisus*
Circoniscus hamatus Van Name, 1936
Circoniscus hirsutus sp. nov.
Circoniscus incisus Souza & Lemos de Castro, 1991
Circoniscus intermedius Souza & Lemos de Castro, 1991
Circoniscus ornatus (Verhoeff, 1941)
Circoniscus pallidus Arcangeli, 1936 .... ?
Colomboniscus Vandel, 1972
Colomboniscus regressus Vandel, 1972
Colomboniscus tristani (Arcangeli, 1930)
Colomboscia Vandel, 1972
Colomboscia andina (Vandel, 1972)
Colomboscia bituberculata Taiti, Allspach & Ferrara, 1995
Colomboscia cordillierae Vandel, 1972
Colomboscia gaigei (Pearse, 1915)
Colomboscia parva sp. nov.
Globopactes gen. nov.
Globopactes falconensis sp. nov.
Globopactes granulatus (Dollfus, 1893)
Globopactes hispidus sp. nov.
Globopactes meridae sp. nov.
Globopactes senex Budde-Lund, 1893
Globopactes talamancaensis (Leistikow, 1997)
Heptapactes gen. nov.
Heptapactes quadrisaetosus sp. nov.
Neosanfilippia Brian, 1957
Neosanfilippia venezuelana Brian, 1957
Neosanfilippia zoiai Manicastri, 1991
Paracubaris Collinge, 1918 .... *Circoniscus*
Paracubaris spinosus Collinge, 1918 .... ? *Circoniscus gaigei*
Parcirconiscus Verhoeff, 1941 .... *Circoniscus*
Parcirconiscus ornatus Verhoeff, 1941 .... *Circoniscus ornatus*
Parsphaeroniscus Vandel, 1963 .... invalid name (2)
Parsphaeroniscus apeuensis Lemos de Castro, 1967 .... ?
Parsphaeroniscus gaigei (Pearse, 1915) .... *Colomboscia gaigei*
Parsphaeroniscus guianensis (Van Name, 1936) .... *Scleropactoides guianensis*
Parsphaeroniscus senex (Budde-Lund, 1893) .... *Globopactes senex*
Pittieroniscus Paoletti, 1989 .... nomen nudum (3)
Protosphaeroniscus Schmalfuss, 1980
Protosphaeroniscus tertiarius Schmalfuss, 1980
Richardsoniscus Vandel, 1963
Richardsoniscus portoricensis (Richardson, 1901)
Scleropactes Budde-Lund, 1885
Scleropactes andinus Vandel, 1972 .... *Colomboscia andina*
Scleropactes botosaneanui Vandel, 1973 .... *Troglopactes botosaneanui*
Scleropactes cavifrons .... invalid name (1)
Scleropactes cedrosensis Mulaik,1960 .... *Armadilloniscus lindahli* Richardson, 1905 (Detonidae)
Scleropactes colombiensis (Pearse, 1915)
Scleropactes concinnus Budde-Lund, 1885

APPENDIX *Continued*

Scleropactes cotopaxii sp. nov.	
Scleropactes ecuadoriensis sp. nov.	
Scleropactes estherae Arcangeli, 1930	?
Scleropactes gaigei (Pearse, 1915)	*Colomboscia gaigei*
Scleropactes granulatus (Richardson, 1901)	*Synuropus granulatus*
Scleropactes incicus Budde-Lund, 1885	nomen dubium?
Scleropactes peruvianus Budde-Lund, 1885	nomen dubium
Scleropactes pilosus Vandel, 1968	
Scleropactes pululahua sp. nov.	
Scleropactes senex Budde-Lund, 1893	*Globopactes senex*
Scleropactes talamancaensis Leistikow, 1997	*Globopactes talamancaensis*
Scleropactes tatei Van Name, 1936	*Scleropactoides tatei*
Scleropactes tristani Arcangeli, 1930	*Colomboniscus tristani*
Scleropactes zeteki Van Name, 1926	
Scleropactoides bonitanus Van Name, 1942	
Scleropactoides curvatus sp. nov.	
Scleropactoides guianensis (Van Name, 1936)	
Scleropactoides gen. nov.	
Scleropactoides tatei (Van Name, 1936)	
Scleropactoides tukeitanus (Van Name, 1936)	
Sphaeroniscus bonitanus Van Name, 1942	*Scleropactoides bonitanus*
Sphaeroniscus cacahuamilpensis Bilimek, 1867	*Venezillo cacahuamilpensis* (Armadillidae)
Sphaerobathytropa ribauti Verhoeff, 1908	
Sphaeroniscus colombiensis Pearse, 1915	*Scleropactes colombiensis*
Sphaeroniscus flavomaculatus Gerstäcker, 1854	
Sphaeroniscus frontalis Richardson, 1914	
Sphaeroniscus gaigei Pearse, 1915	*Colomboscia gaigei*
Sphaeroniscus Gerstäcker, 1854	
Sphaeroniscus gerstaeckeri Vandel, 1968	
Sphaeroniscus granulatus Dollfus, 1893	*Globopactes granulatus*
Sphaeroniscus guianensis Van Name, 1936	*Scleropactoides guianensis*
Sphaeroniscus intrusus	invalid name (1)
Sphaeroniscus pilosus Vandel, 1972	
Sphaeroniscus portoricensis Richardson, 1901	*Richardsoniscus portoricensis*
Sphaeroniscus quintus sp. nov.	
Sphaeroniscus tukeitanus Van Name, 1936	*Scleropactoides tukeitanus*
Spherarmadillo cavernicola Mulaik, 1960	
Spherarmadillo nebulosus sp. nov.	
Spherarmadillo Richardson, 1907	
Spherarmadillo schwarzi Richardson, 1907	
Synuropus granulatus Richardson, 1901	
Troglopactes gen. nov.	
Troglopactes botosaneanui (Vandel, 1973)	

1. The names *Scleropactes cavifrons* Budde-Lund and *Sphaeroniscus intrusus* Budde-Lund are mentioned by Jackson (1928) in a paper on head morphology, as manuscript names of specimens from the Budde-Lund collection. According to ICZN §16b, both names are invalid, because they are mentioned as labels in a collection. On the other hand, for the specimen of *Scleropactes cavifrons*, a description and illustration of the cephalothorax is given, which would render the name available as *Scleropactes cavifrons* Jackson, 1928 according to §12 and §16a. Van Name (1936) regarded *Scleropactes cavifrons* as a valid name and *Sphaeroniscus intrusus* as an invalid name. Leistikow & Wägele (1999) and Schmalfuss (2003), in their species lists, refer to '*Scleropactes cavifrons* Jackson, 1928', thus accepting Van Name's view. I prefer to regard both names as invalid, because Jackson (1928) obviously did not intend to describe a new species or to introduce a new name. He described the cephalothorax under the name '*Scleropactes* sp.', and only in a remarks section mentioned that the specimen is from the Budde-Lund collection and is labelled 'S. *cavifrons* B.-L.'.
2. *Parsphaeroniscus* Vandel, 1963: Vandel (1963), in a footnote, mentioned that *Sphaeroniscus* should be restricted to the species *flavomaculatus* Gerstäcker and *frontalis* Richardson, and that all other species, because of the lack of a schisma on coxal plate 1, should be placed in a particular genus, *Parsphaeroniscus*. This name is not available, at least according to ICZN §13b. As no description and no mention of any species included was given, it could also be regarded as nomen nudum. Vandel (1968) reduced *Parsphaeroniscus* to a synonym of *Scleropactes*.
3. The name '*Pittieroniscus* gen. nov, sp. nov.' is mentioned by Paoletti (1989) without a species epitheton and without description. Therefore, it is a nomen nudum.

Character matrix for the cladistic analysis

Character states: 0, 1, 2, 3
Character types: u = unordered, o = ordered

Character	0000000001	1111111112	2222222223	3333333334	4444444445
	1234567890	1234567890	1234567890	1234567890	1234567890
outgroup	0000000000	0000000000	0000000000	0000000000	0000000000
ribauti	3120020000	3000000100	0101000000	01010?1010	1002010121
armadillidioides	3120110000	0000000110	0100000000	0101001020	1002011121
marmoratus	3120110000	0000000110	0100000000	0001101020	1002011121
variegata	0120000000	0000000000	0001100000	?101001000	001000211?
stebbingi	2110020000	0000010000	01010?0000	?100011010	0010001100
paeninsulae	2110020000	2000000000	01010?0000	?100001010	011000010?
beroni	2110020000	2000010000	01010?0001	?100001000	001000011?
gerstaeckeri	3120020100	1000000000	0001110000	?101000020	0113002010
quadrisaetosus	3120020000	0000000000	0101110000	0101000010	0113000110
minimus	3120021210	1000000001	0101111101	1???000021	1112022020
tristani	3120020210	0000000000	0001111100	0101001021	1013022010
venezuelana	3120020210	0000000000	0101110000	0101001021	1013002011
zoiai	3120020210	0000100000	01011?0000	?10100102?	10130?201?
botosaneanui	2120020210	000000010?	?0011?00??	011100112?	11120?????
nebulosus	3120020200	2000000100	0001110011	0110011120	1112102011
cavernicola	3120020210	2000000100	0001110011	0111111120	1112102111
andinus	21110?0001	0000000000	00011?00??	??????????	0111012110
parva	21120?0001	000000000?	?0011?000?	0?????????	01?2000110
gaigei_Col	2111010000	0000020000	0001100000	0101000010	0111002110
cordillierae	1001000000	0000020000	?0011?0000	?1010000??	0111000110
bituberculata	1001000000	0000020000	00011?0000	0101000020	0112000?10
curvatus	2111000001	0001000000	0001110000	0101001010	0111012110
zeteki	2112020000	0000010000	0001100010	0110011000	0011010110
pilosus_Scl	2112020000	0000001000	00011?0000	?110011000	00110??000
pululahua	2112020000	0000010000	0001110000	0110011010	0012012010
concinnus	2112020000	0000000000	?0011000??	??????????	0011012010
colombiensis	2112010000	0000000000	0001100000	0110011000	0012012010
cotopaxii	2112010000	0000000000	0001110010	0110011000	0011012010
ecuadoriensis	2112020000	0000000000	0001110010	0110011000	0012012010
talamancensis	3122020000	0000000000	00011?0000	0101001020	0112012110
meridae	3122010000	0001000000	0001110000	0101001010	0111012110
falconensis	3122000000	0111000000	0001100000	0101001000	0110012110
senex	3122010000	0111000000	00????0000	0101001?0	01??12110
granulatus_Glo	3122010000	0111010000	0001100000	0101001000	0110012110
hispidus	3122010000	0000010000	0001100000	0101001000	0111012110
flavomaculatus	3122020001	1000100000	00011?0000	0101001020	0110012?0
frontalis	3122020001	1000100000	?0011?0000	0101001010	01100??01?
quintus	3122020001	1000100000	0001100000	0101001010	0111012010
pilosus_Sph	31220?0001	1000101000	?0011?00??	??????????	0112012010
arlei	3122010000	0000000000	?111000?0	00?1?010?1	0112???111
hirsutus	3122000001	2000000000	1111110000	0101001021	01??12010
bezzii	3122010000	2000000000	1111110000	0101001021	01110?0011
ornatus	3122000001	2000000000	1111110000	0001001021	01100?2011
incisus	3122010001	2000000000	1111100000	0001001021	0112012010
Char. type	uooooooooo	uooooooooo	oooooooooo	oooooooooo	oooooooooo
excluded		x	x		
Char. weight	1113311111	3331111111	31313-1111	11111111-1	1131111111

Character	5555555556	6666666667	7777777
	1234567890	1234567890	1123456
outgroup	0000000000	0000000000	0000000
ribauti	0000000010	0000000000	0100000
armadillidioides	0000000000	0000100000	1010000
marmoratus	0000000000	0000100000	1011000
variegata	0000001000	0000000000	0000000
stebbingi	1000000100	0000001000	1100000
paeninsulae	0002000100	0000001000	1100000
beroni	0002000100	0000001000	1100000
gerstaeckeri	0002001011	000010???	?100100
quadrisaetosus	0000001011	0000000000	1100000
minimus	0100001011	0000000000	0100000
tristani	0000001011	0000000000	1100000
venezuelana	1010001000	0000000000	1100000
zoiai	1010001000	0000000000	1100000
botosaneanui	????0?1011	0001000000	1100000
nebulosus	1000001000	0001000000	1100111
cavernicola	0000001001	0001000000	1100111
andinus	1001001010	00100000??	?100000
parva	0001001011	0000000000	1100000
gaigei_Col	1001001010	0000000000	1100000
cordillierae	0001001010	0010000??0	1100000
bituberculata	?001001010	0000000000	1100000
curvatus	0000001000	0000000000	0100000
zeteki	0000000100	0000001000	1100000
pilosus_Scl	??????1101	0000001000	?100000
pululahua	0000001?11	0000000000	1100000
concinnus	??????0101	001000????	?100000
colombiensis	0000001101	0010001000	1100000
cotopaxii	0000001111	0010001000	1100000
ecuadoriensis	0000000111	0010001000	1100000
talamancensis	0000010111	0100001000	1100000
meridae	1000011111	0100001000	1100000
falconensis	0000010111	0100001000	1100000
senex	1000010111	0100001000	1100000
granulatus_Glo	1000010111	0100001000	1100000
hispidus	0000011111	0100001000	1100000
flavomaculatus	0000101100	0000001111	1100100
frontalis	0000100100	000000????	?100100
quintus	0000100100	0010011000	1100100
pilosus_Sph	?000101100	0000010???	?100100
arlei	0100000100	0000001000	1100000
hirsutus	??????????	????00?000	1100000
bezzii	0000001100	1000001111	1100000
ornatus	0002000100	1000001100	1100000
incisus	0000001100	1000001100	1100000
Char. type	oooooooooo	oooooooooo	ooooooo
excluded	x		
Char.– weight	–113331111	1111111111	1311111

NOMINA DUBIA

CIRCONISCUS APEUENSIS (LEMOS DE CASTRO, 1967)

Parsphaeroniscus apeuensis Lemos de Castro, 1967 – Lemos de Castro (1970); Schmalfuss (1980*); Souza-Kury (1998*); Leistikow & Wägele (1999*).

Circoniscus apeuensis – Schmalfuss (2003*).

Remark
The type specimens were not seen. They are not present in the MNRJ.

CIRCONISCUS PALLIDUS ARCANGELI, 1936

Circoniscus pallidus – Souza & Lemos de Castro (1991); Souza-Kury (1998*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Holotype ♀ (Brazil, São Paulo, Piraju, leg. E. Caroli, 1911).

Remark
The type was not seen. It is unknown whether it still exists in any collection. According to the description, it is a female of length 2.84 mm and width 1.3 mm width. The illustrations allow us to state that it belongs to the genus *Circoniscus*; therefore, the size may indicate that it is a juvenile specimen. Therefore, if the type is found, in all probability its examination will not clarify the identity of this nominal species.

SCLEROPACTES ESTHERAE ARCANGELI, 1930

Scleropactes estherae – Van Name (1936); Schultz (1970*); Schmalfuss (1980*); Leistikow & Wägele (1999*); Schmalfuss (2003*).
Holotype ♂ (Costa Rica, La Palma, altitude 1500 m, leg. Tristán).

The type specimen was not available, and it is doubtful whether it still exists anywhere. This species does not belong to the genus *Scleropactes*, after Schmalfuss (1980). Here the name is reduced to a nomen dubium, because the original description does not allow identification of the species. The examination of the holotype or of new specimens from the type locality is necessary for a revalidation of the species name.

SCLEROPACTES PERUVIANUS BUDDE-LUND, 1885

Sphaeroniscus (?) *peruvianus* – Budde-Lund (1904).
Sphaeroniscus peruvianus – Van Name (1936*); Leistikow & Wägele (1999*); Jeppesen (2000); Schmalfuss (2003*).

Remark
Described from an incomplete specimen, which is destroyed. Specimens from the type locality can also not help to identify this species, because the type locality is 'Peru', without further precision.

SCLEROPACTES TATEI VAN NAME, 1936

Scleropactes tatei Van Name, 1936 – Leistikow & Wägele (1999*); Schmalfuss (2003*).
Not: syn. of *Scleropactes concinnus* – Vandel (1968).

Material examined

Type specimen: one (immature?) ♀, paratype (Ecuador, Naupon, Takinon Mountain, leg. G. H. Tate, December 1922, AMNH 6530).

Description
Cephalothorax with well-developed lateral lobes. Posterior margin of coxal plate 1 slightly concave. Colour not preserved, surface structure (tricorns, etc.) not in sufficiently good condition for a description. From Van Name's drawing and description, it seems that the surface is slightly granulate. Uropod endopodites very large.

Remarks
On the basis of a poorly preserved immature female only, no useful comparison with other species of *Scleropactes* can be made. This species is certainly not a synonym of *Scleropactes concinnus*, as Vandel (1968) suggested. It seems to have close relationships to *Scleropactes pilosus*. It is distinguished from *Scleropactes pilosus* by the much weaker curved posterior margin of the first coxal plate, and probably by the non-enlarged tricorn setae. Both have in common the comparatively large uropod endopodites.

UNIDENTIFIED SPECIMENS

SCLEROPACTES SP.

One juvenile [Ecuador, Santo Domingo, 65 km west of Quito, altitude 600 m, leg. Leleup, April 1965, IRSNB; incorrectly identified as *Scleropactes concinnus* by Vandel (1968)].

2.4 mm wide. Pigment not preserved. Eyes composed of 14 or 15 ommatidia.

SPHAERONISCUS SP.

One juvenile (Kolumbien, Depto. de Santander, Capote, town in Magdalena valley approx. 250 km north of Bogota, approx. 40 km south of Barrancabermeja between Nebenflüssen Carare and Opou, leg. H. Sturm, 29 July to 4 August 1968, SMF 12451): Identified as *Sphaeroniscus flavomaculatus* Gerstäcker, 1854; new identification, *Sphaeroniscus flavomaculatus*, *frontalis*, or *quintus*.

One juvenile (Columbia, Robles, between La Mesa and Mosquera, Montane forest, altitude 2600–2700 m, ü. M., leaf litter, leg. H. Sturm, 28 June 1967, SMF 12452). *Sphaeroniscus* sp.

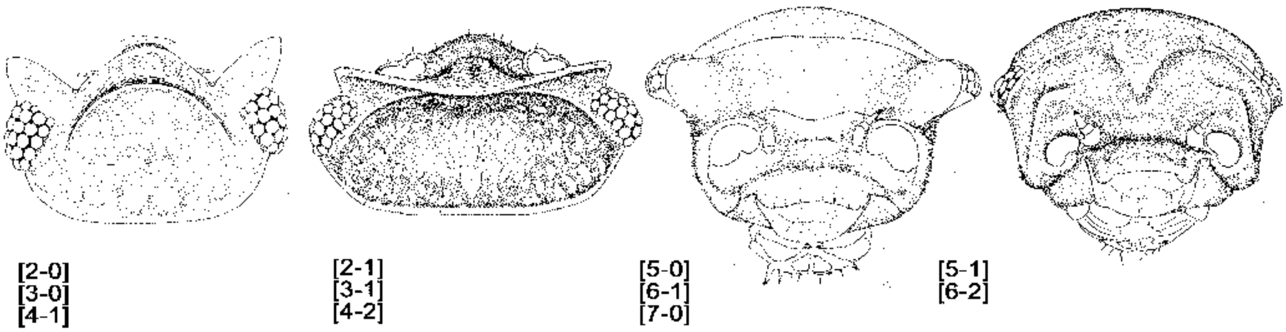

Figure 1. Cephalothorax: *Colomboscia cordillierae*, *Scleropactes ecuadoriensis*, *Scleropactoides curvatus*, *Chileoniscus marmoratus* (from left).

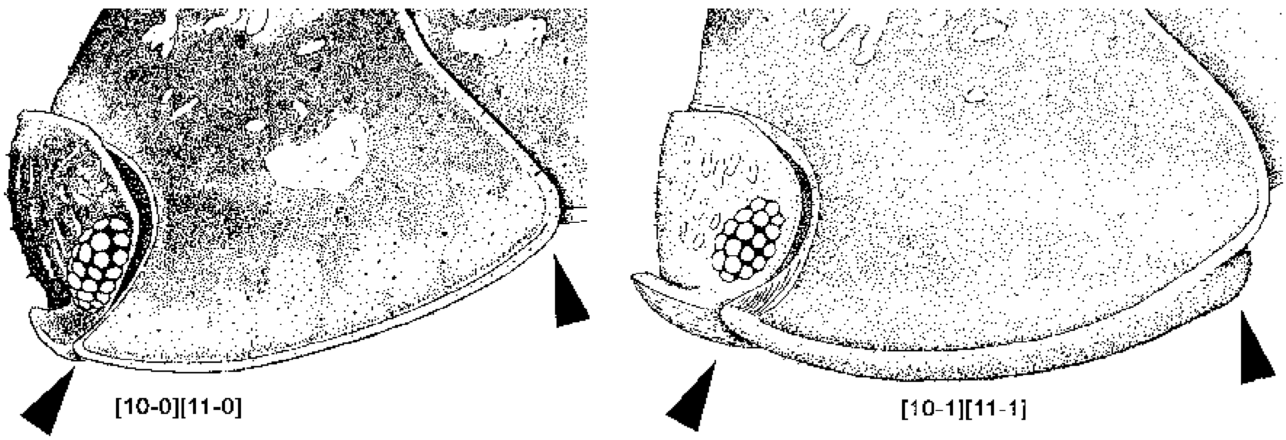

Figure 2. First coxal plate: *Scleropactes ecuadoriensis*, *Sphaeroniscus frontalis*.

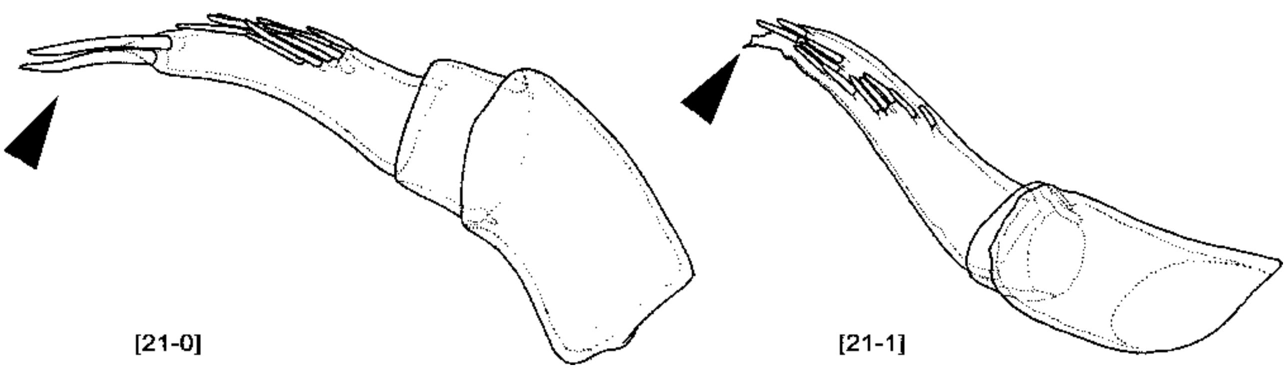

Figure 3. First antenna: *Scleropactes pululahua*, *Circoniscus bezzii.*

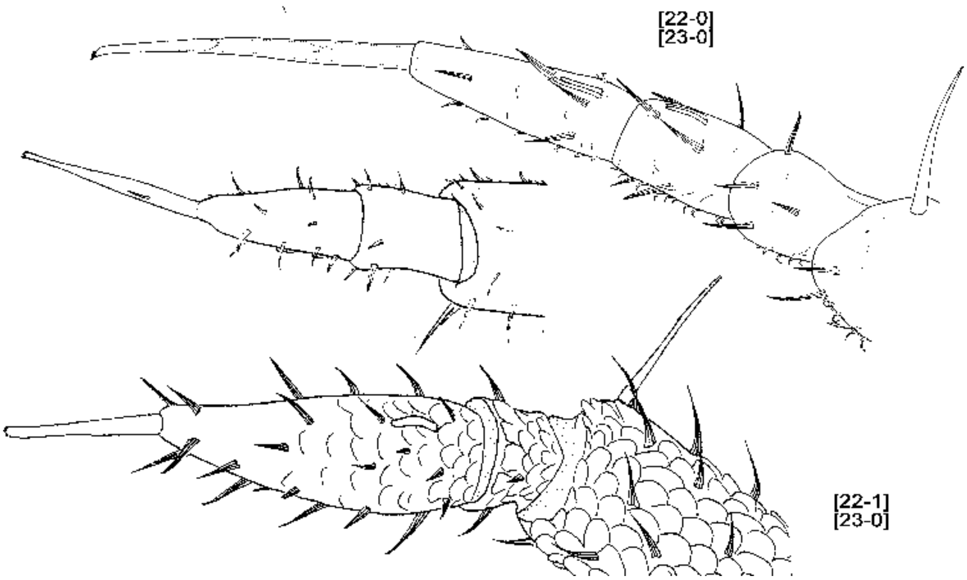

Figure 4. Second antenna, flagellum: *Globopactes hispidus* (above), *Circoniscus incisus* (middle), *Sphaerobathytropa ribauti* (below).

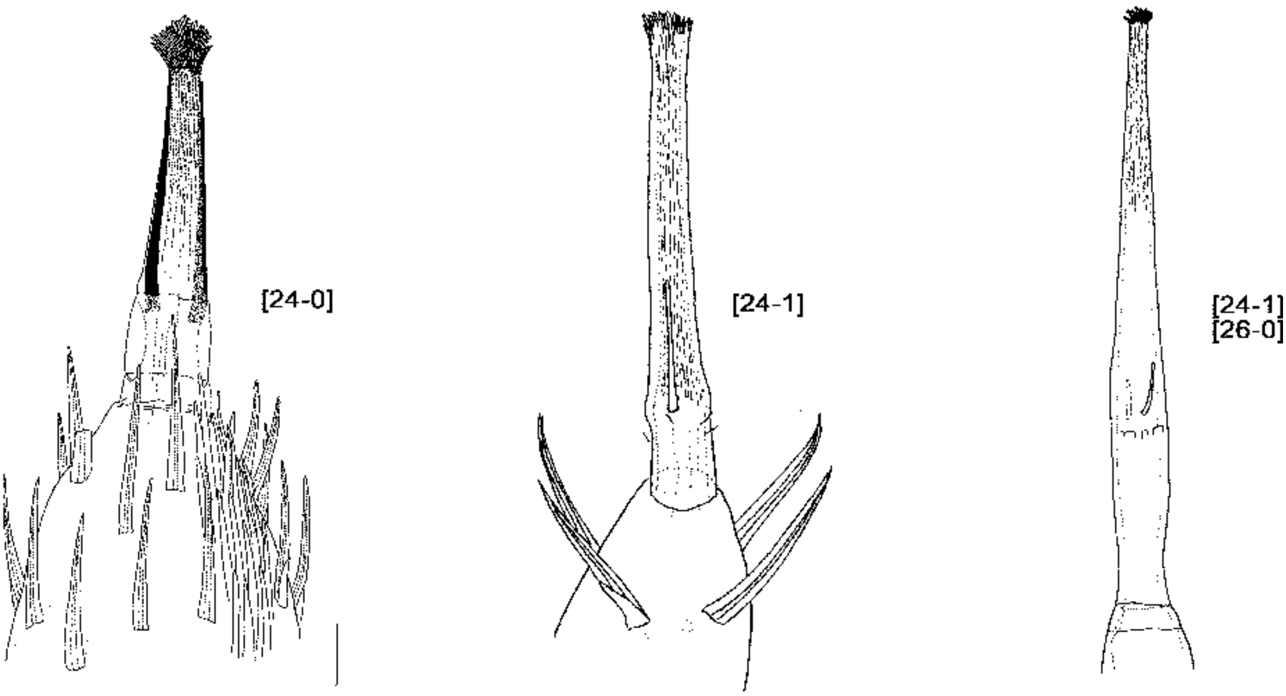

Figure 5. Apical cone of second antenna: *Porcellio* (left, from Schmidt 2003), *Sphaerobathytropa ribauti* (middle), *Globopactes granulatus* (right).

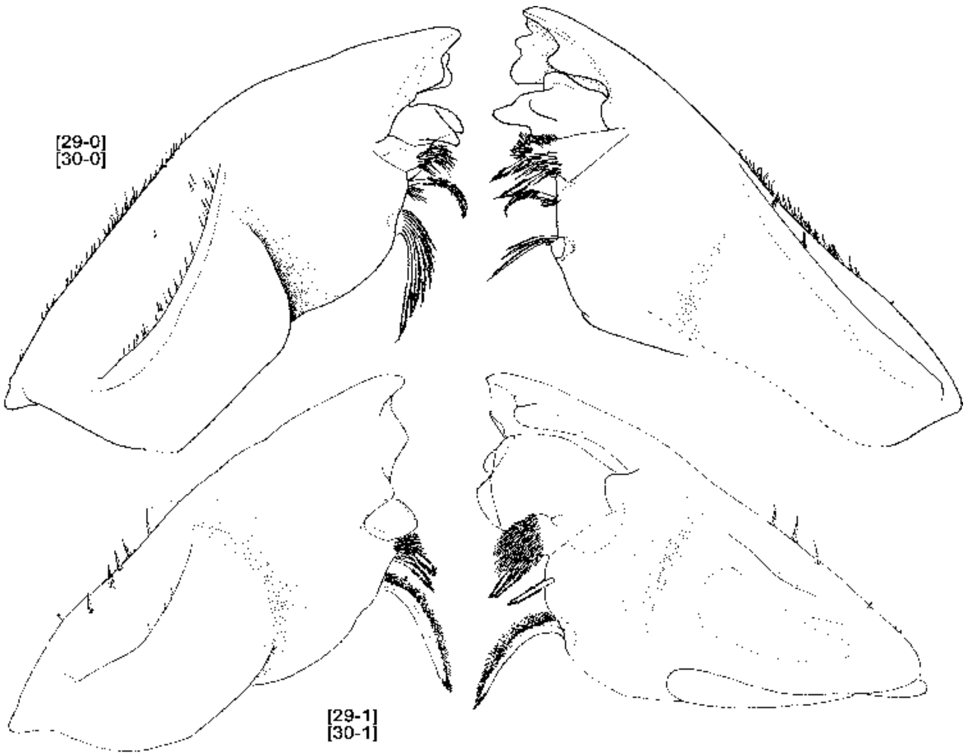

Figure 6. Mandibles: *Scleropactoides curvatus* (above), *Spherarmadillo nebulosus* (below).

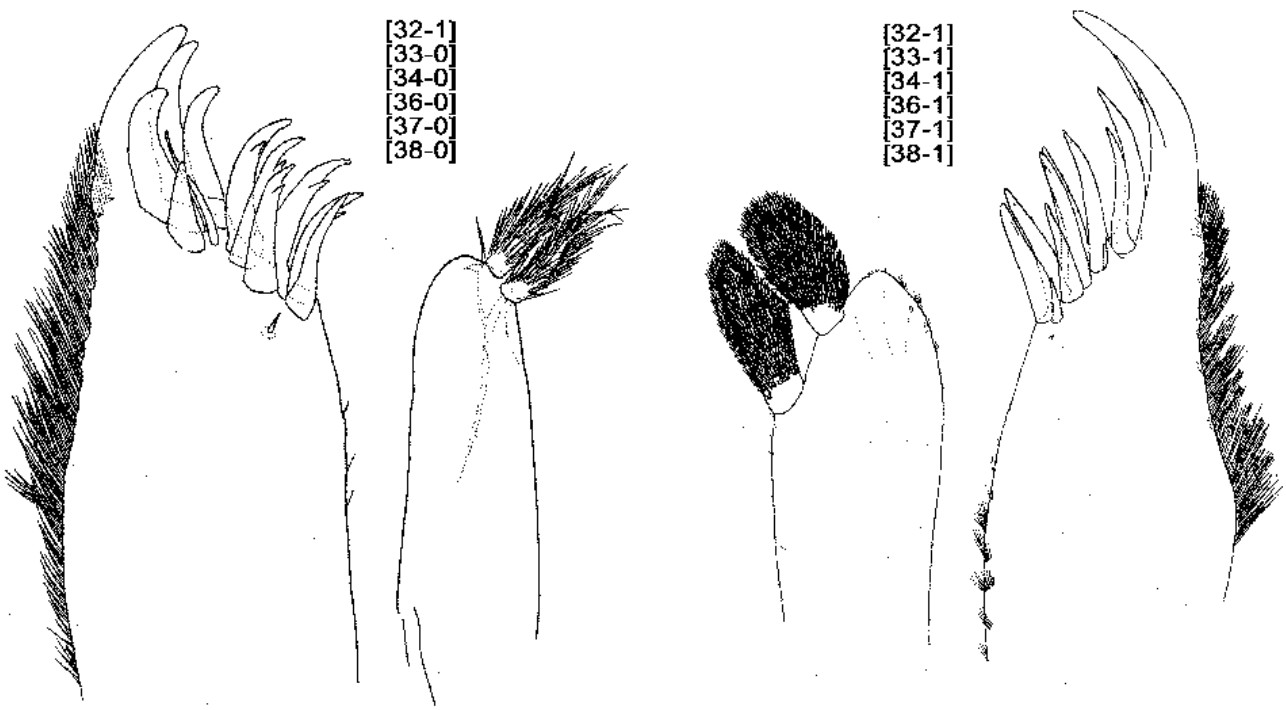

Figure 7. First maxillae: *Colomboscia gaigei* (left), *Spherarmadillo nebulosus* (right).

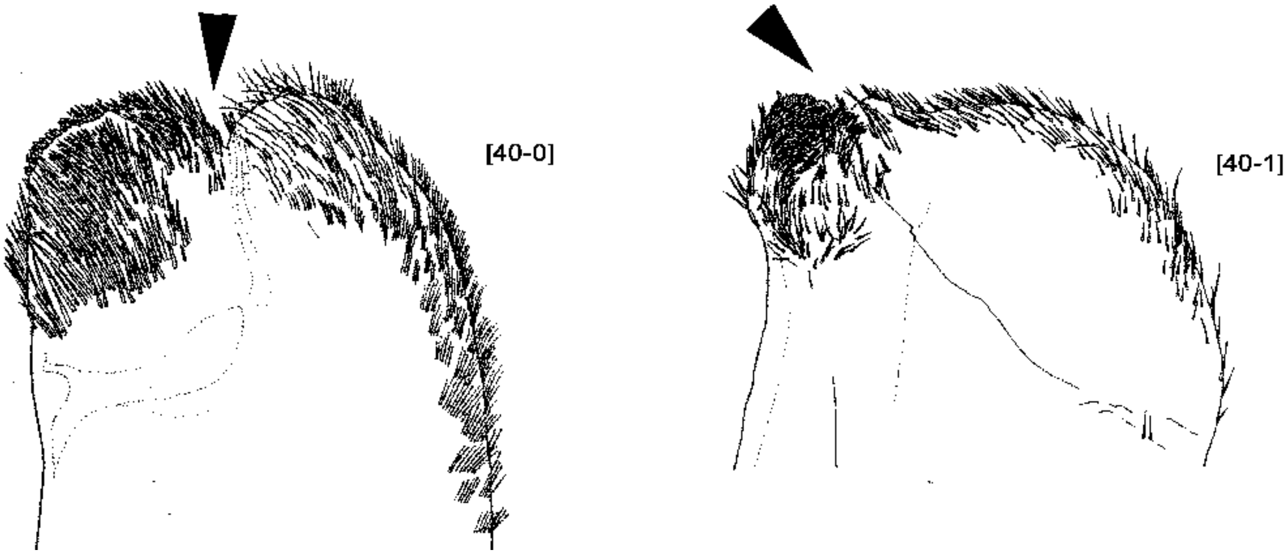

Figure 8. Second maxillae: *Scleropactes pululahua* (left), *Circoniscus bezzii* (right).

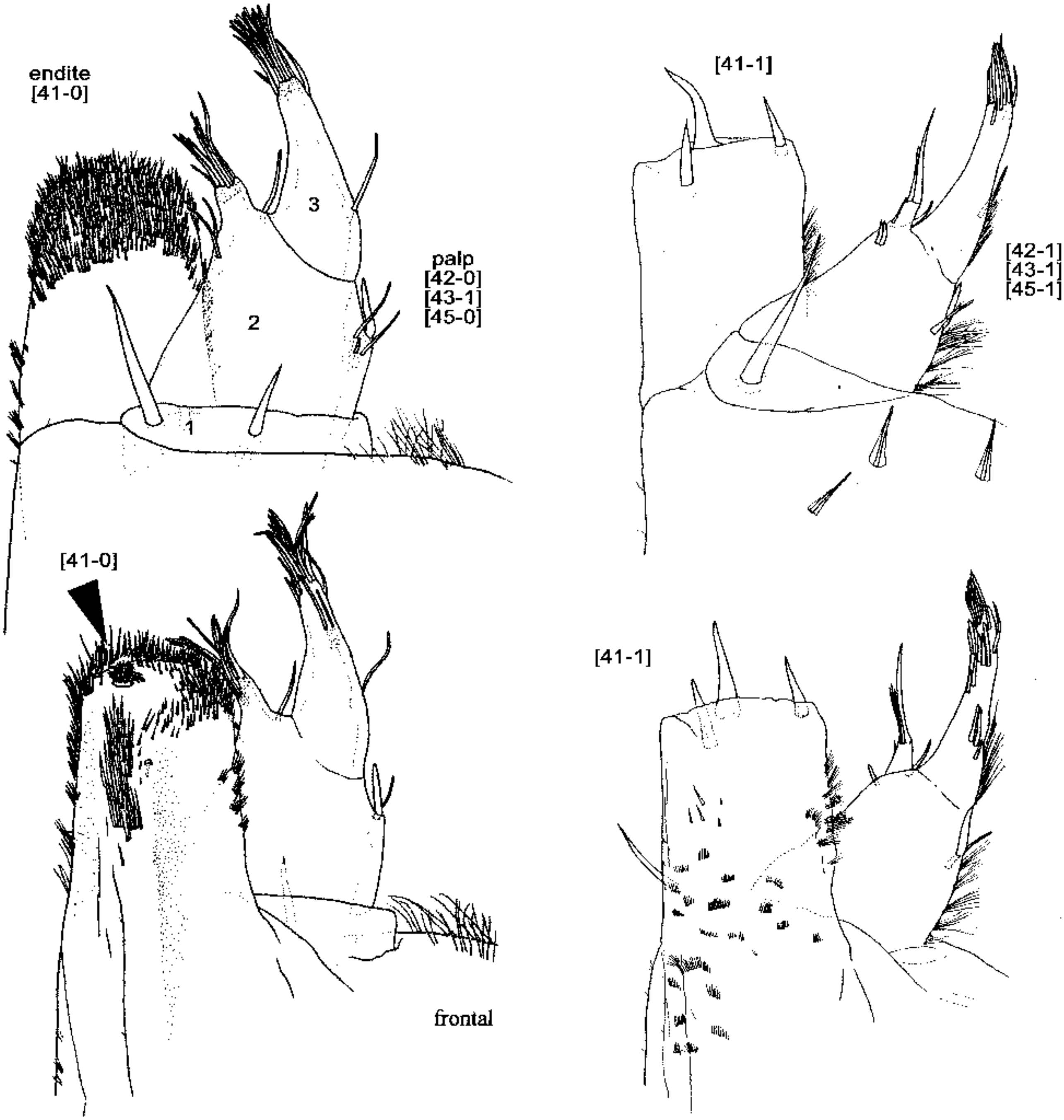

Figure 9. Maxillipeds: *Scleropactes pululahua* (left), *Spherarmadillo nebulosus* (right).

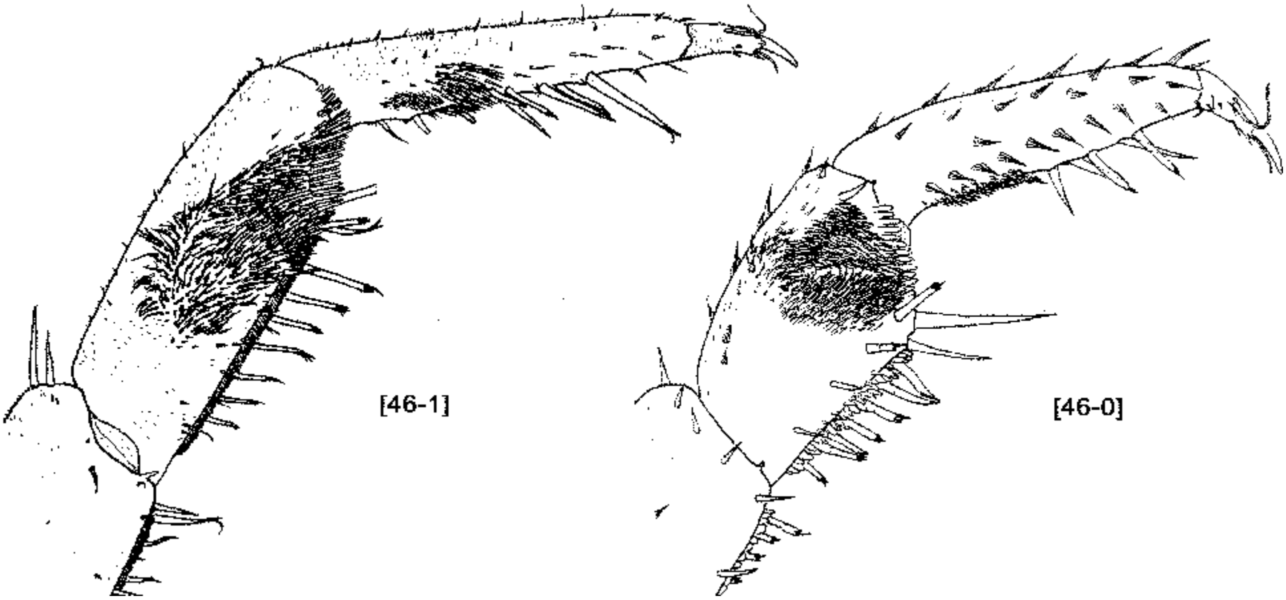

Figure 10. Pereiopod 1 carpus and propodus: *Scleropactes colombiensis* (left), *Spherarmadillo nebulosus* (right).

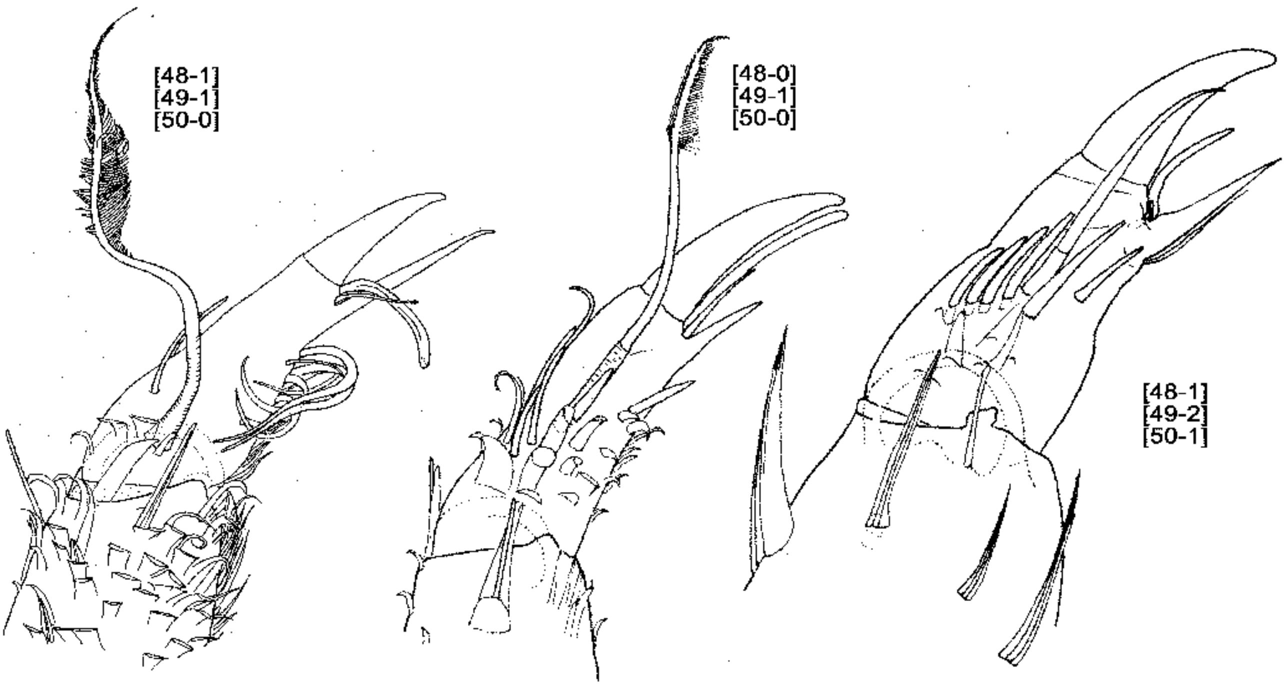

Figure 11. Pereiopod dactyli: *Colomboscia gaigei* (left), *Circoniscus incisus* (middle), *Chileoniscus marmoratus* (right).

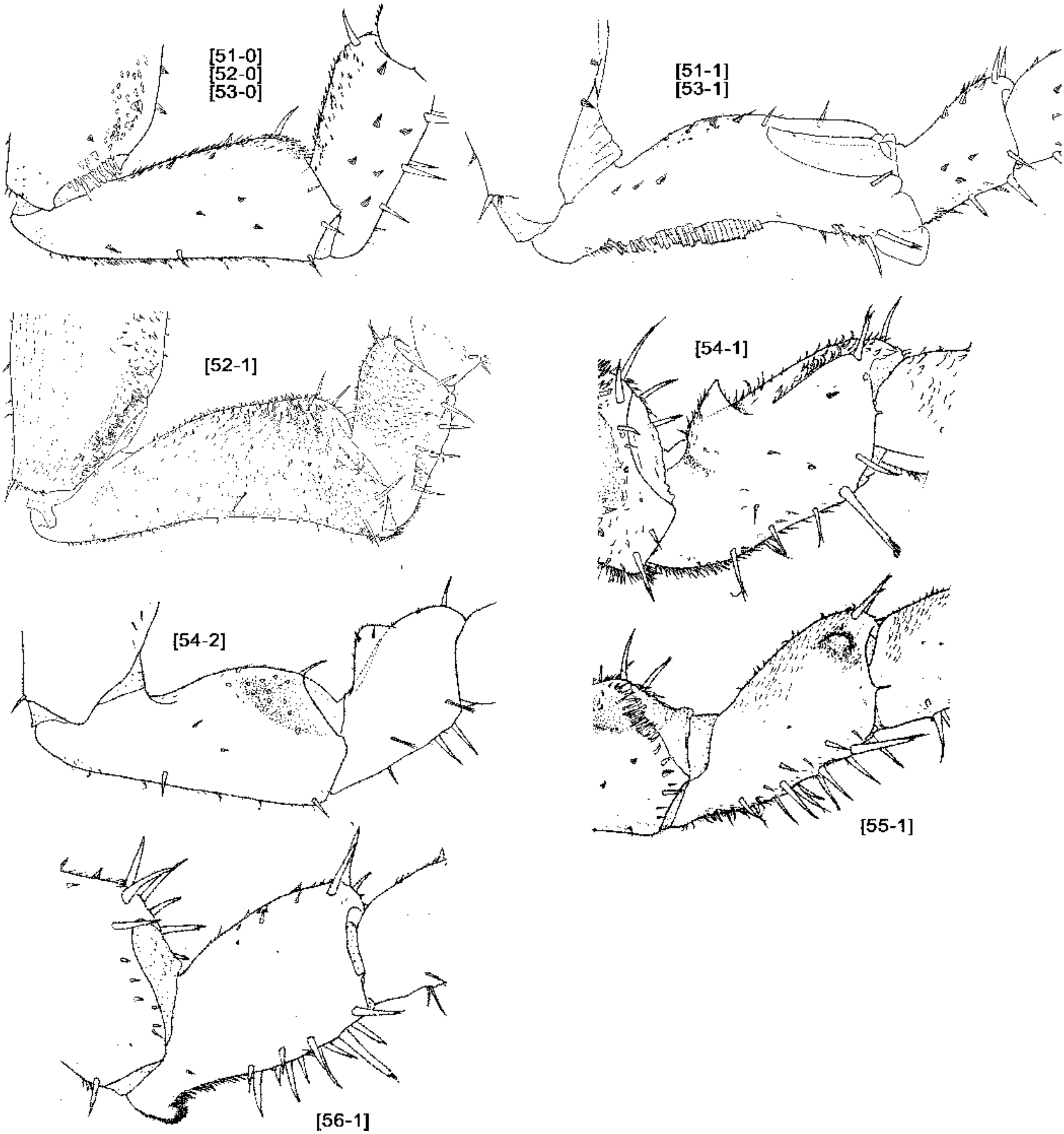

Figure 12. Male pereiopod 7 ischium and merus: *Circoniscus incisus*, *Amazoniscus arlei*, *Sphaeroniscus gerstaeckeri*, *Globopactes falconensism*, *Neosanfilippia venezuelana*, *Colomboscia gaigei*, *Sphaeroniscus quintus*.

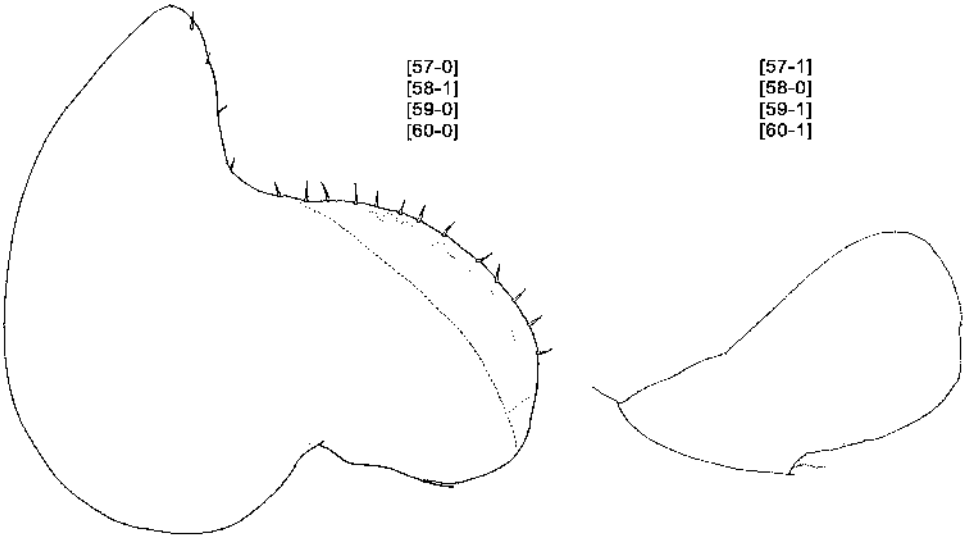

Figure 13. Male pleopod 1 exopodites: *Sphaeroniscus frontalis* (left), *Colomboniscus regressus* (right).

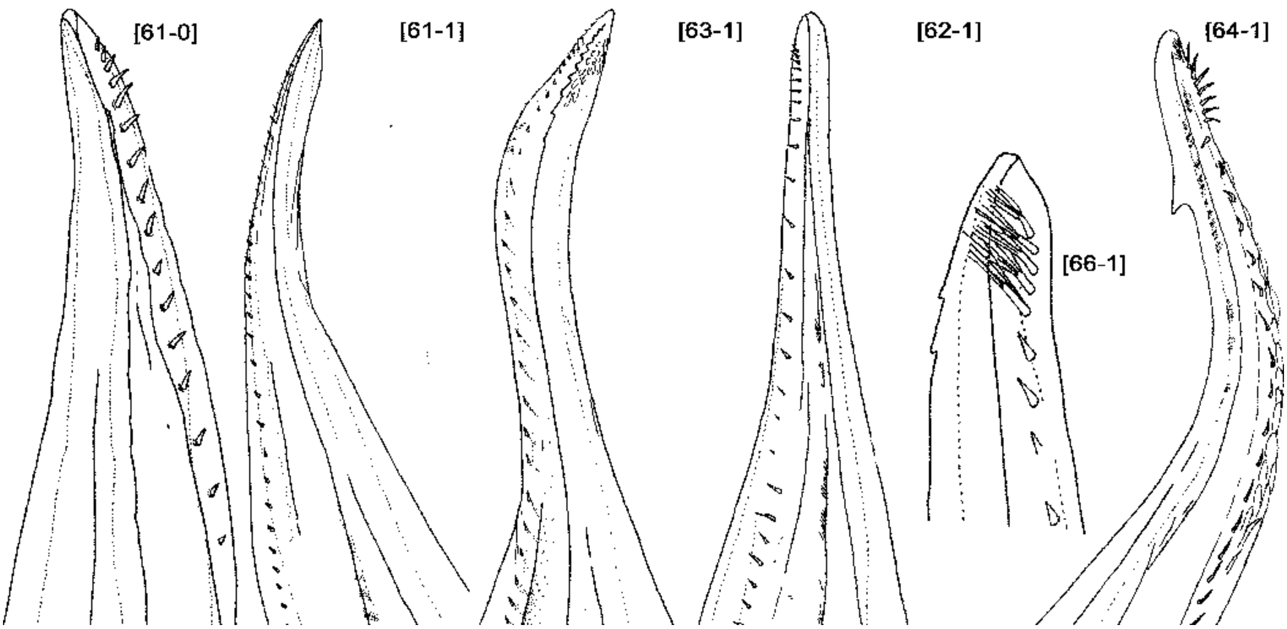

Figure 14. Male pleopod 1 endopodites: *Colomboscia parva*, *Scleropactoides curvatus*, *Scleropactes ecuadoriensis*, *Globopactes falconensis*, *Sphaeroniscus pilosus*, *Spherarmadillo nebulosus*.

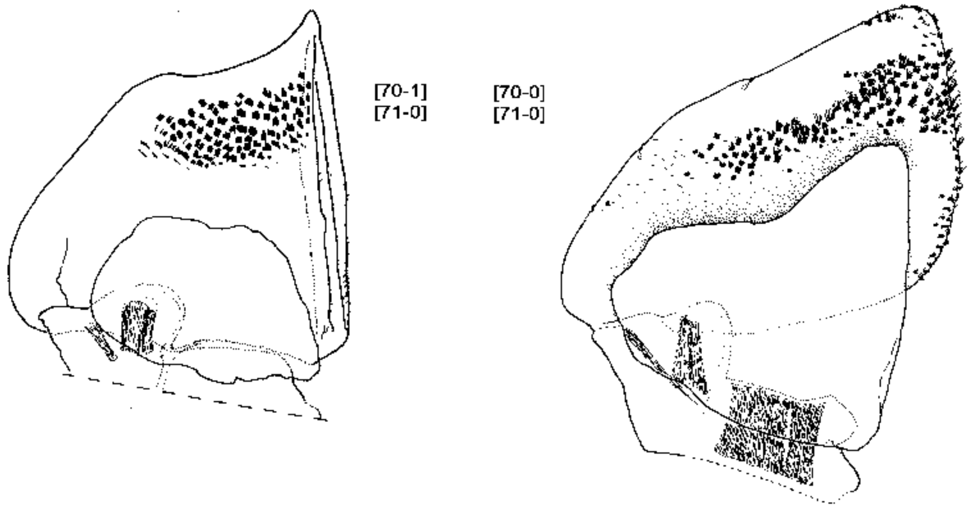

Figure 15. Male pleopod 5 exopodites: *Circoniscus bezzii* (left), *Scleropactoides curvatus* (right).

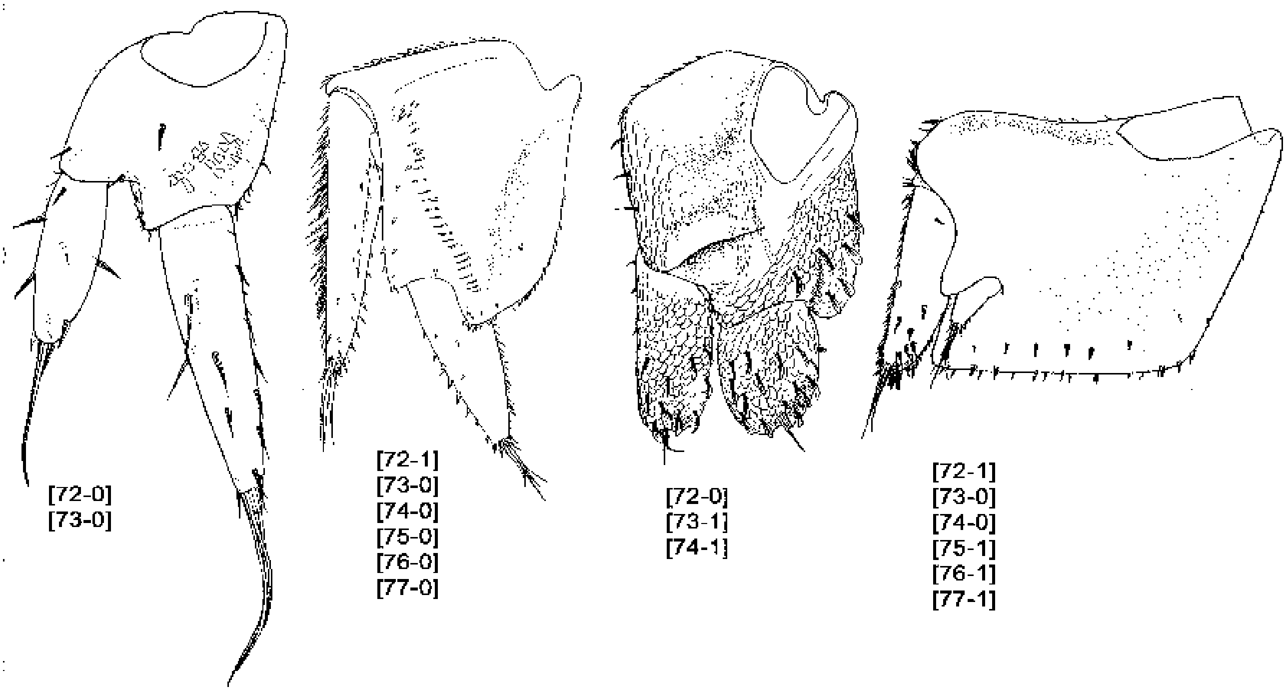

Figure 16. Uropods: *Androdeloscia* sp. ('Philosciidae'), *Scleropactes falconensis*, *Chileoniscus marmoratus*, *Spherarmadillo nebulosus*.

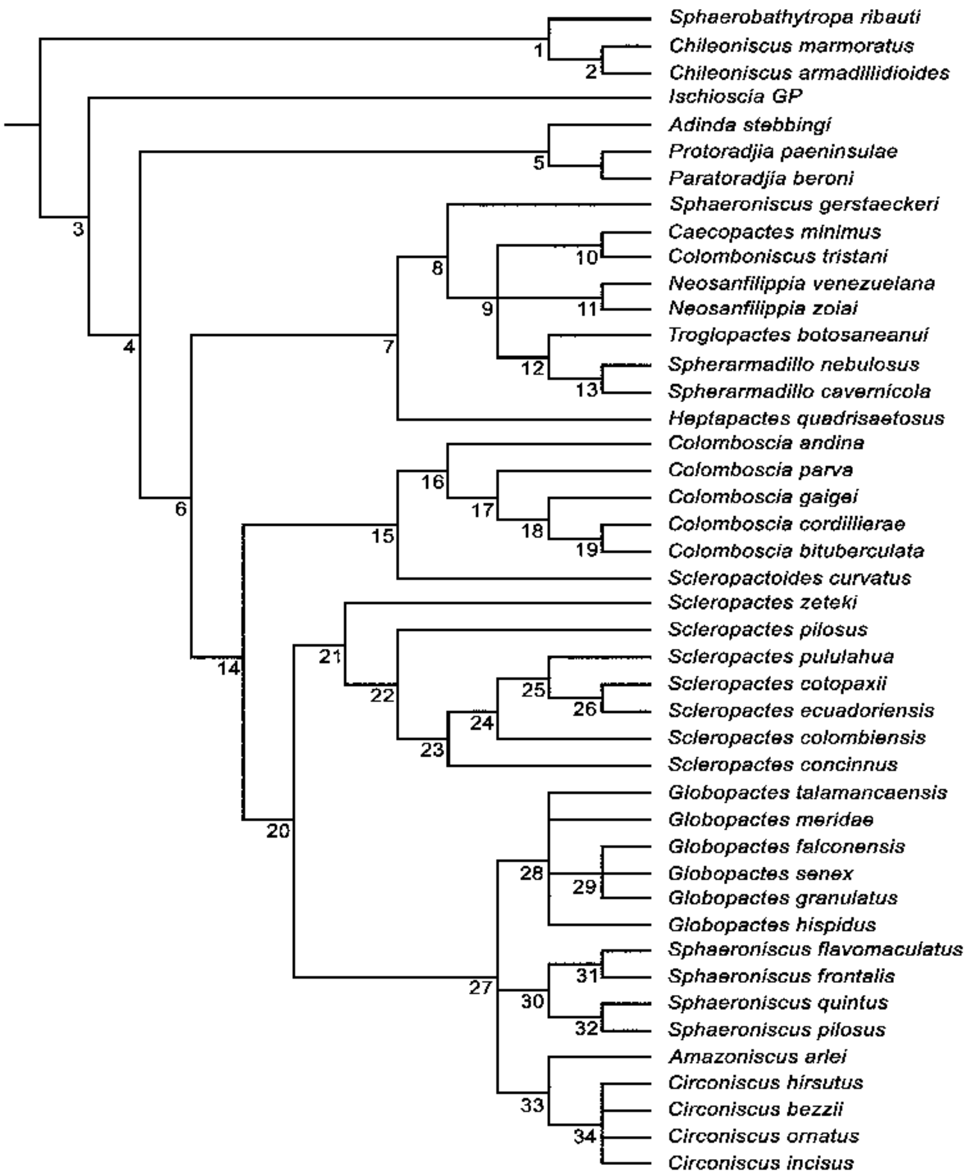

Figure 17. Strict consensus tree of 147 shortest trees with a length of 308 steps and CI = 0.3994. The node numbers refer to the clades in the text.

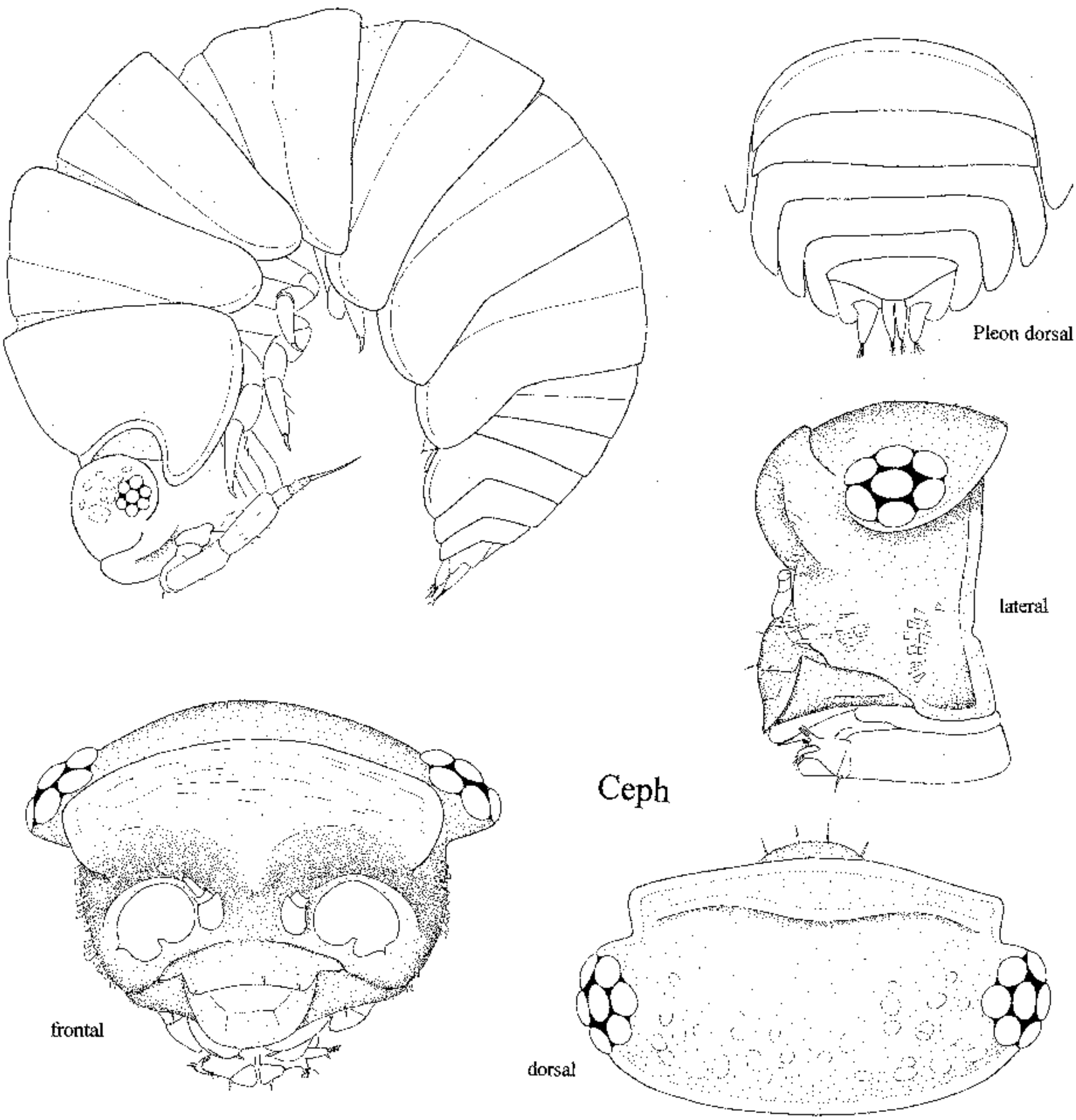

Figure 18. ***Heptapactes quadrisaetosus*** **gen. nov, sp. nov.**: ♀m paratype, cephalothorax 0.65 mm wide, habitus lateral, pleon dorsal; ♂ holotype, 0.9 mm wide, cephalothorax 0.51 mm wide, cephalothorax dorsal, frontal, lateral (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321).

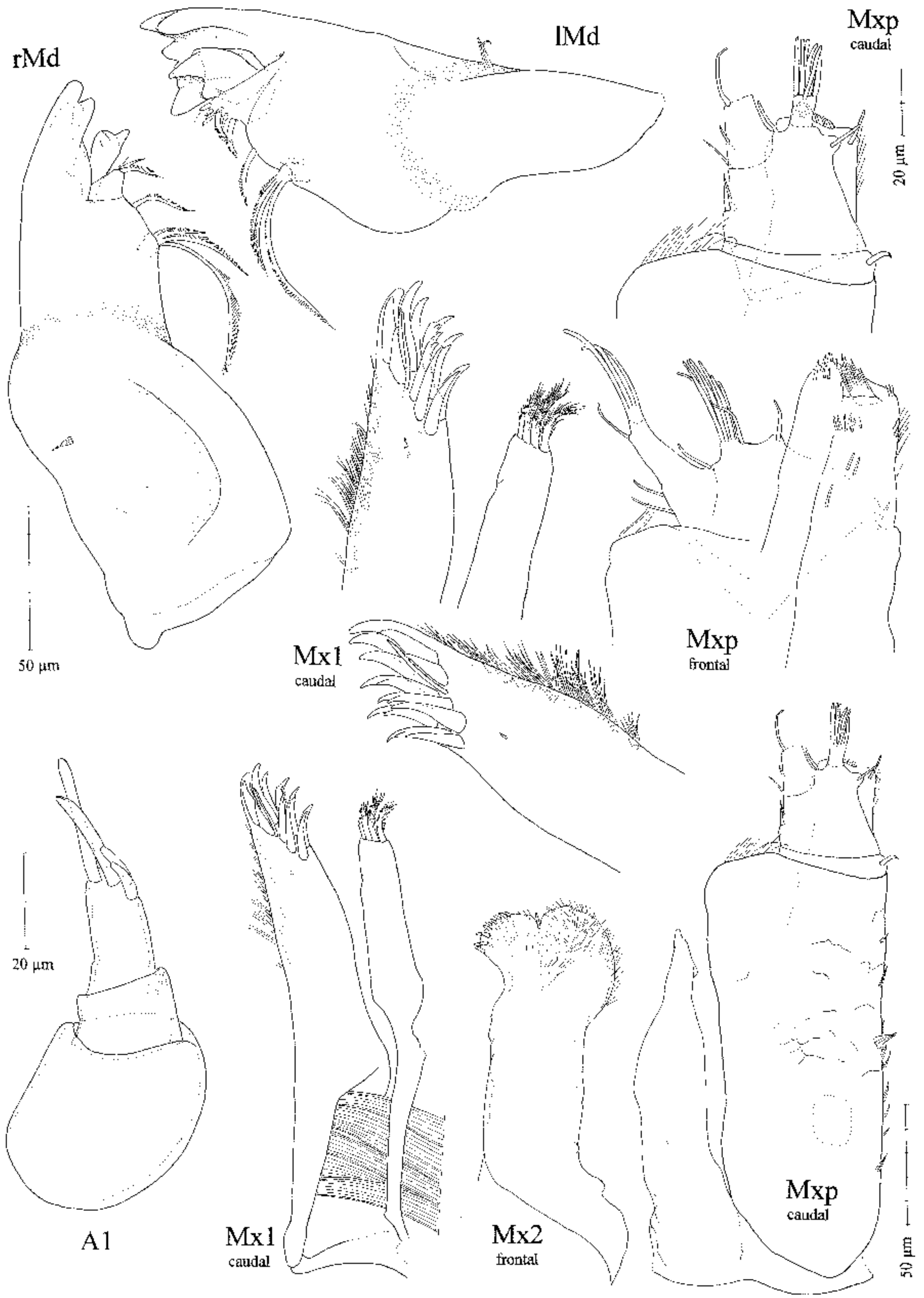

Figure 19. ***Heptapactes quadrisaetosus*** **gen. nov., sp. nov.**: ♂ holotype, 0.9 mm wide, cephalothorax 0.51 mm wide, mouthparts, first antenna (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321).

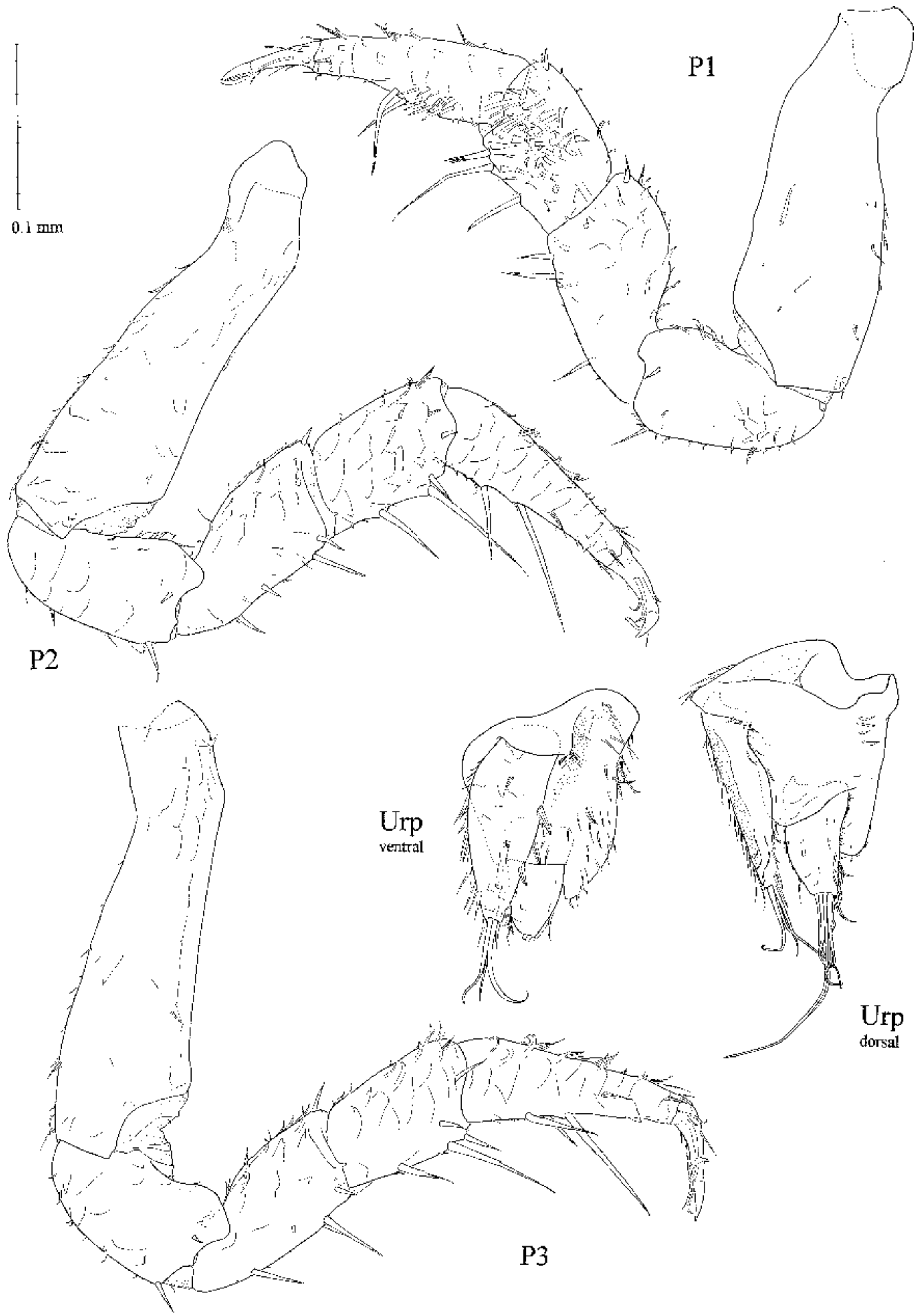

Figure 20. ***Heptapactes quadrisaetosus*** **gen. nov, sp. nov.**: ♂ holotype, 0.9 mm wide, cephalothorax 0.51 mm wide, pereiopods 1–3, uropods (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321).

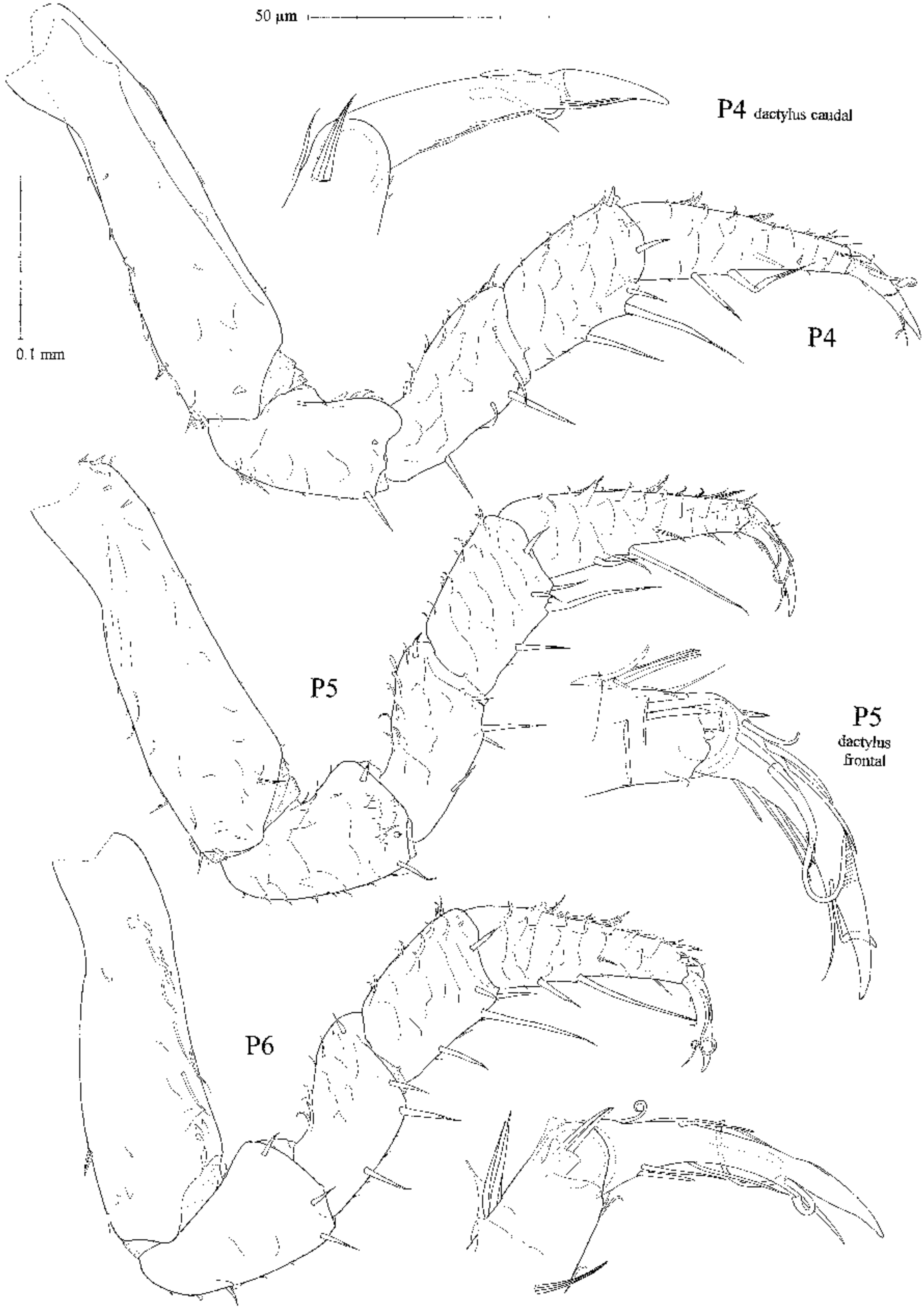

Figure 21. ***Heptapactes quadrisaetosus*** **gen. nov., sp. nov.**: ♂ holotype, 0.9 mm wide, cephalothorax 0.51 mm wide, pereiopods 4–6, dactyli (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321).

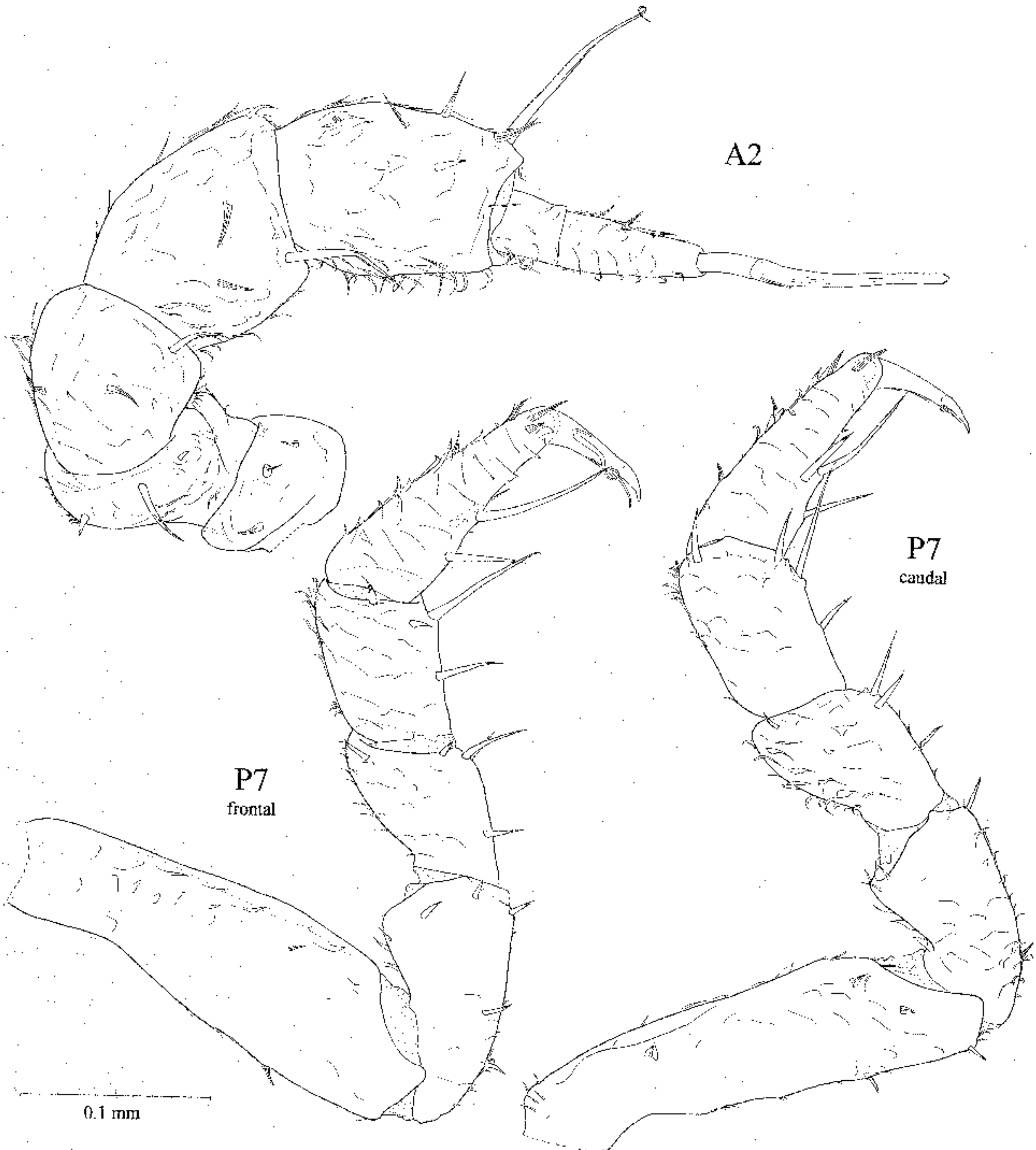

Figure 22. ***Heptapactes quadrisaetosus* gen. nov., sp. nov.**: ♂ holotype, 0.9 mm wide, cephalothorax 0.51 mm wide, pereiopod 7, second antenna (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321).

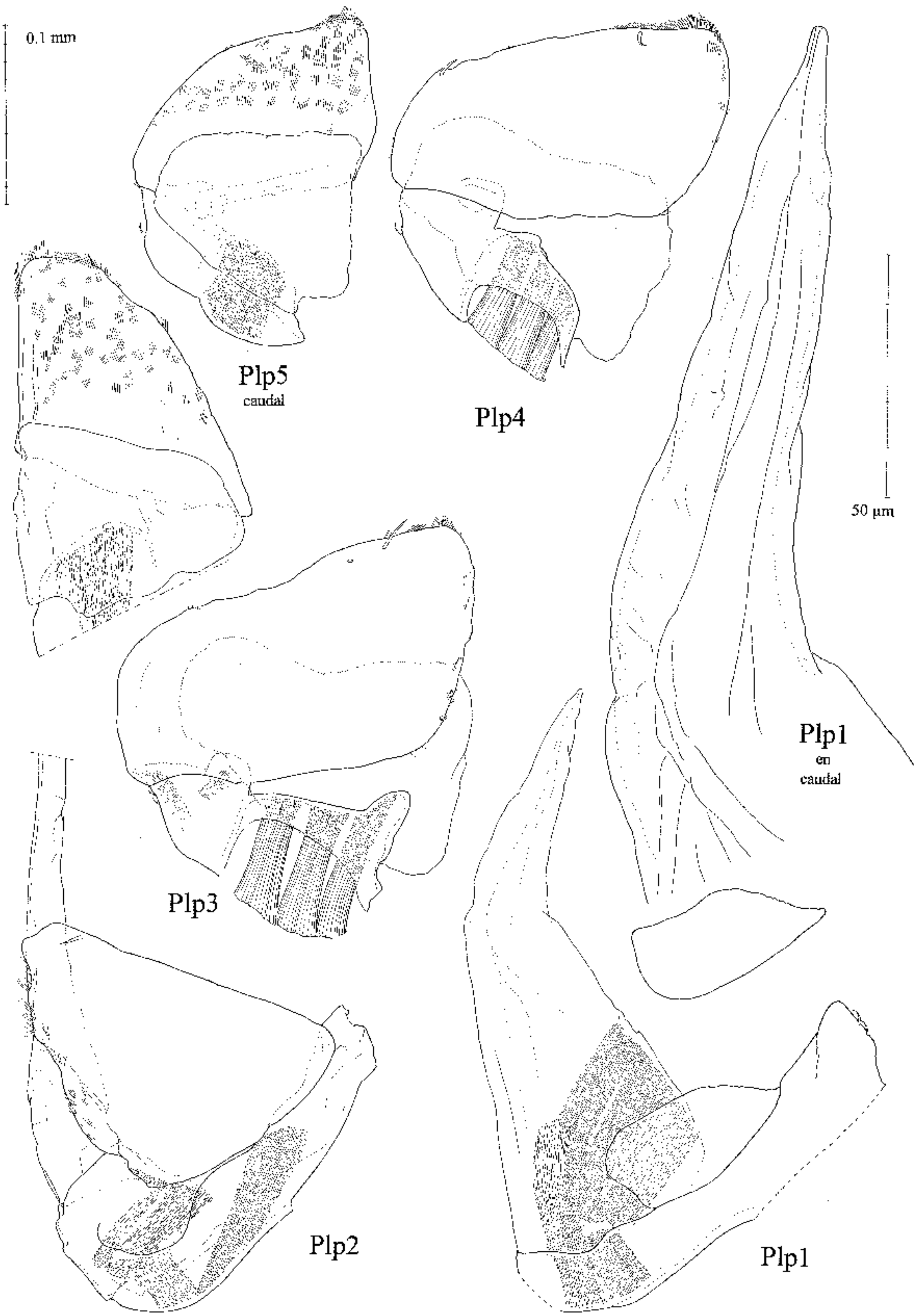

Figure 23. ***Heptapactes quadrisaetosus*** **gen. nov., sp. nov.**: ♂ holotype, 0.9 mm wide, cephalothorax 0.51 mm wide, pleopods 1–5 (Brazil, Amazonas, Manaus, leg. H. Schubart, 17 April 1966, MNRJ 3321).

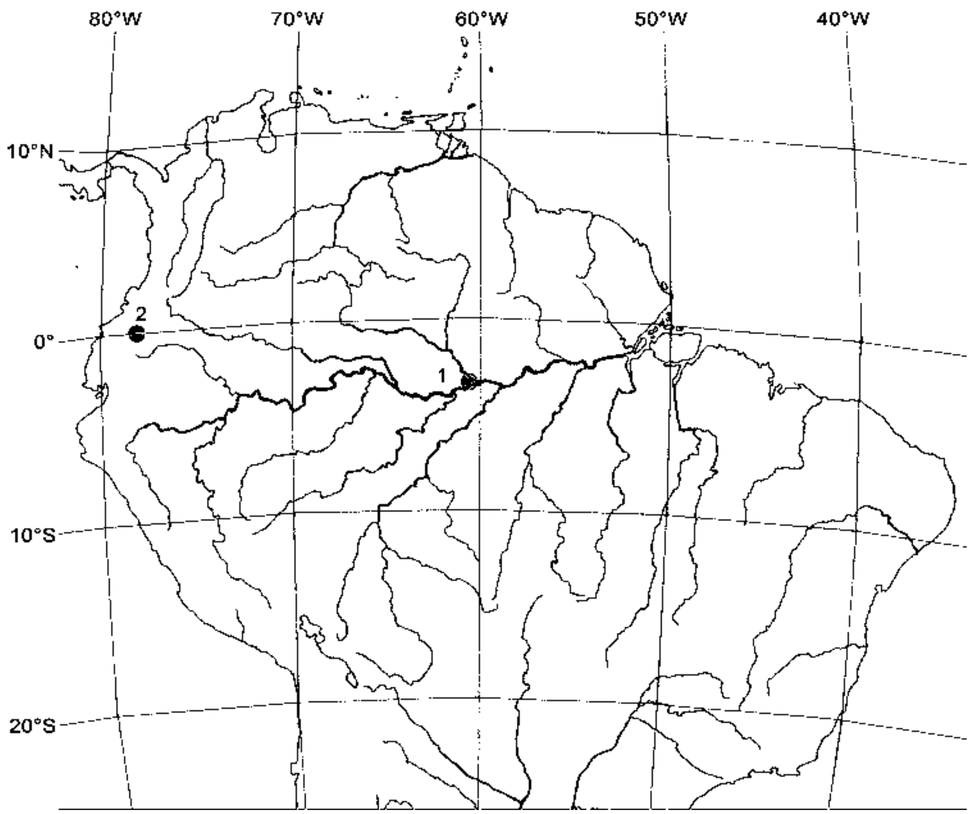

Figure 24. Geographical distribution of *Heptapactes quadrisaetosus* (1) and *Caecopactes minimus* (2).

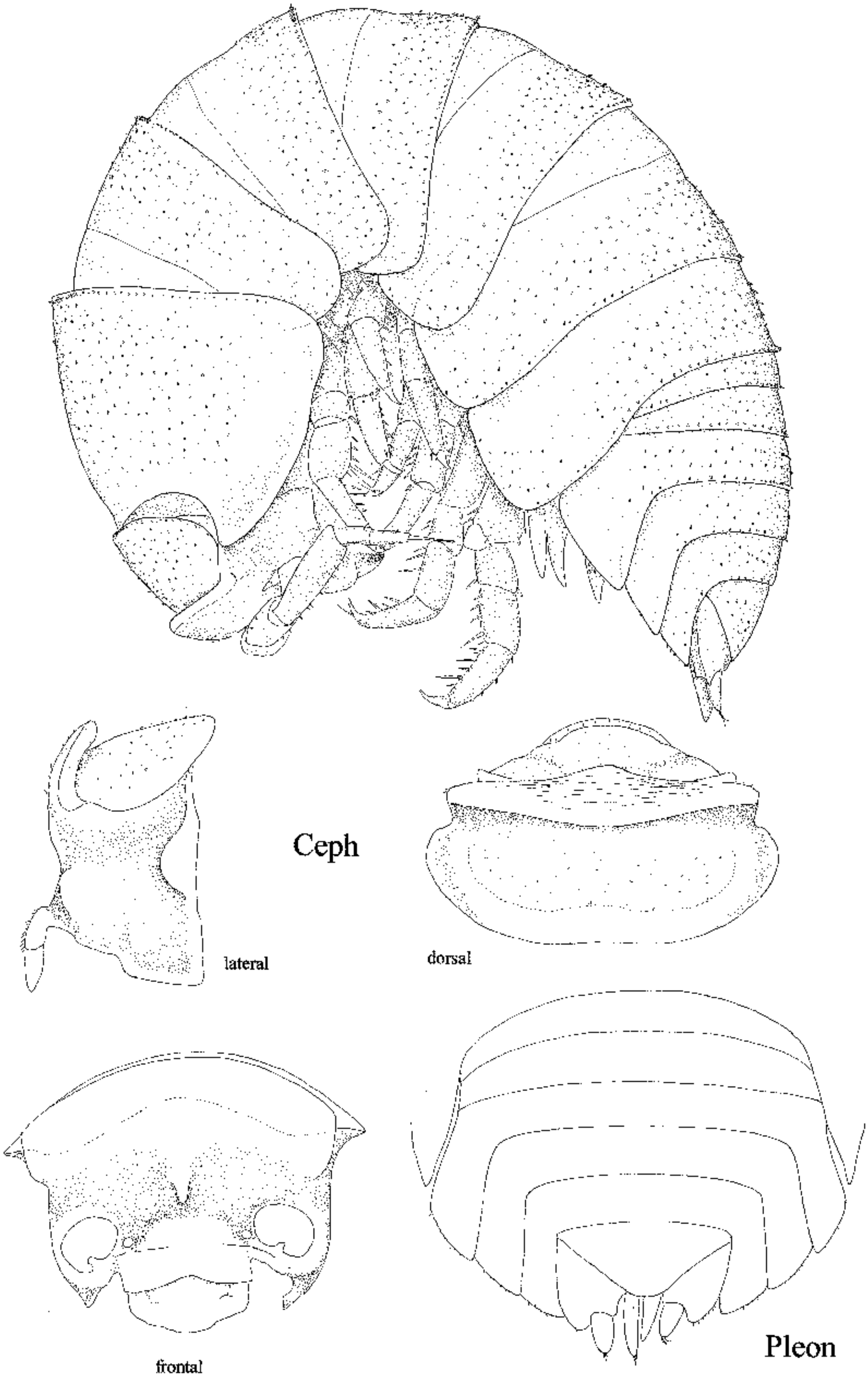

Figure 25. *Neosanfilippia venezuelana* Brian, 1957: ♂, 1.8 mm wide, habitus; ♂, 6.3 × 2.5 mm, cephalothorax, pleon (Venezuela, near Cueva San Luis, 11°07′35″ N, 69°40′76″ W, leg. C. Schmidt, 20 March 1998, cCS 194b).

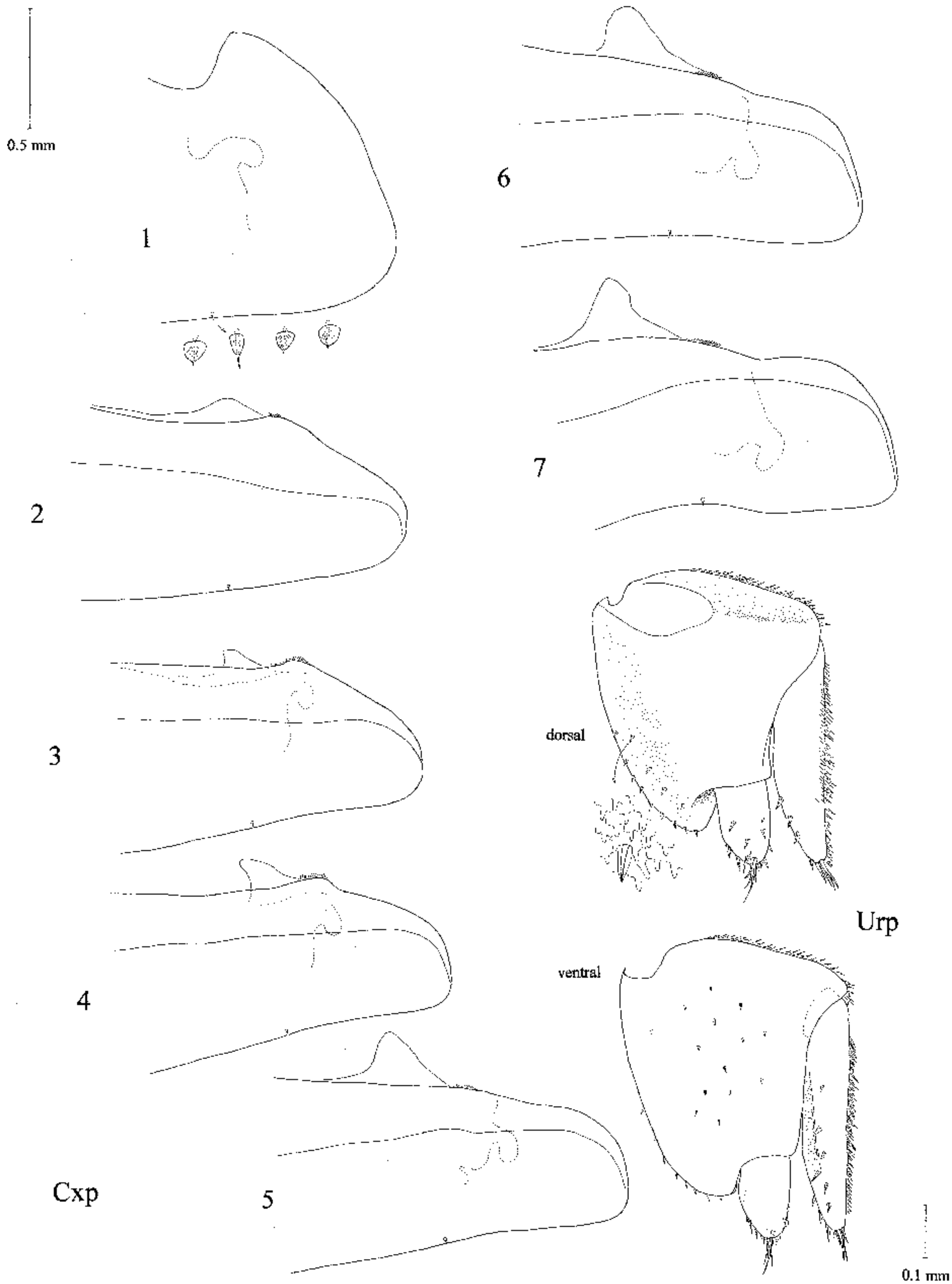

Figure 26. *Neosanfilippia venezuelana* Brian, 1957: ♂, 6.3 × 2.5 mm, coxal plates, uropods (Venezuela, near Cueva San Luis, 11°07′35″ N, 69°40′76″ W, leg. C. Schmidt, 20 March 1998, cCS 194b).

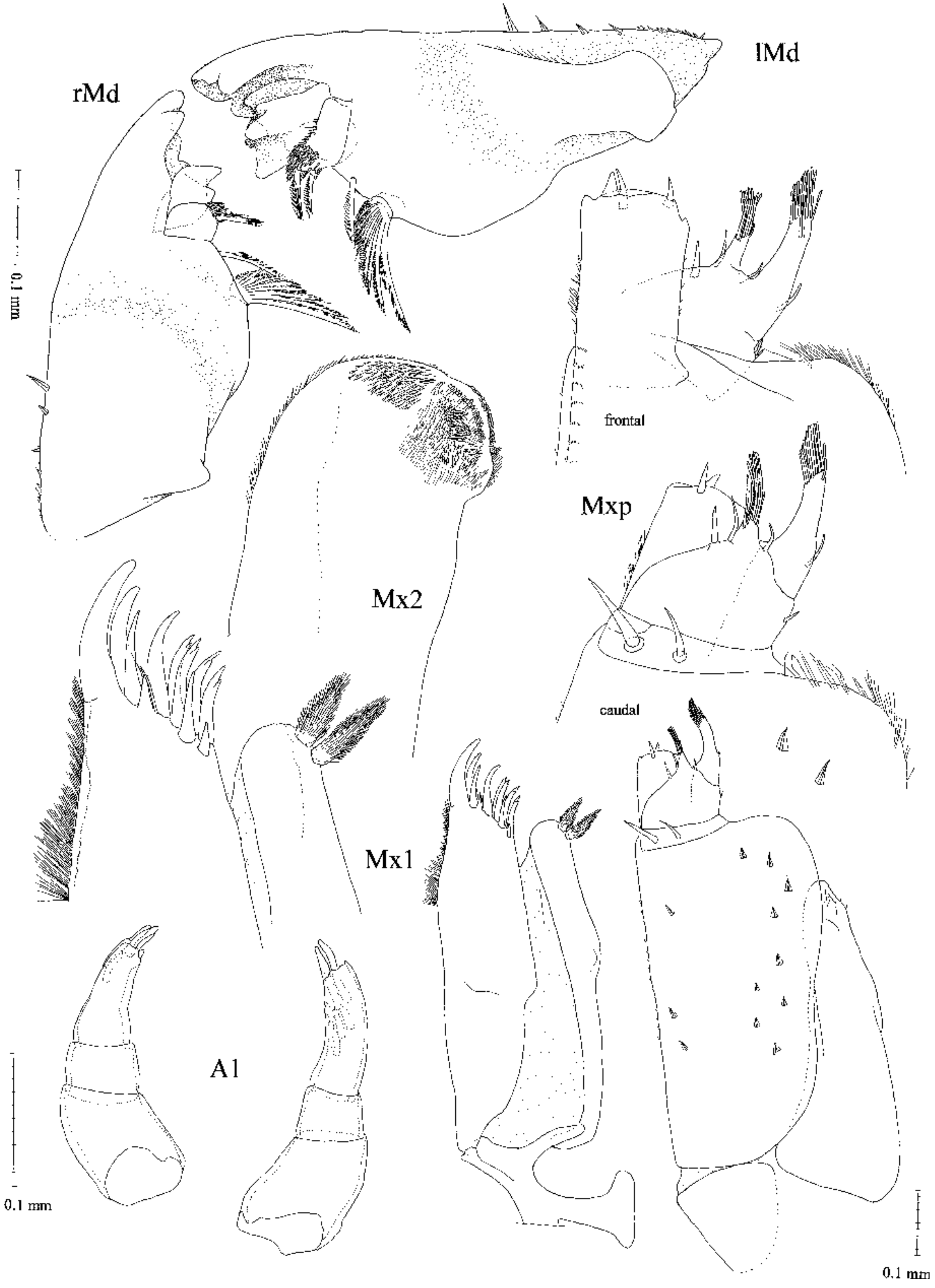

Figure 27. *Neosanfilippia venezuelana* Brian, 1957: ♂, 6.3 × 2.5 mm, mouthparts, first antennae (Venezuela, near Cueva San Luis, 11°07′35″ N, 69°40′76″ W, leg. C. Schmidt, 20 March 1998, cCS 194b).

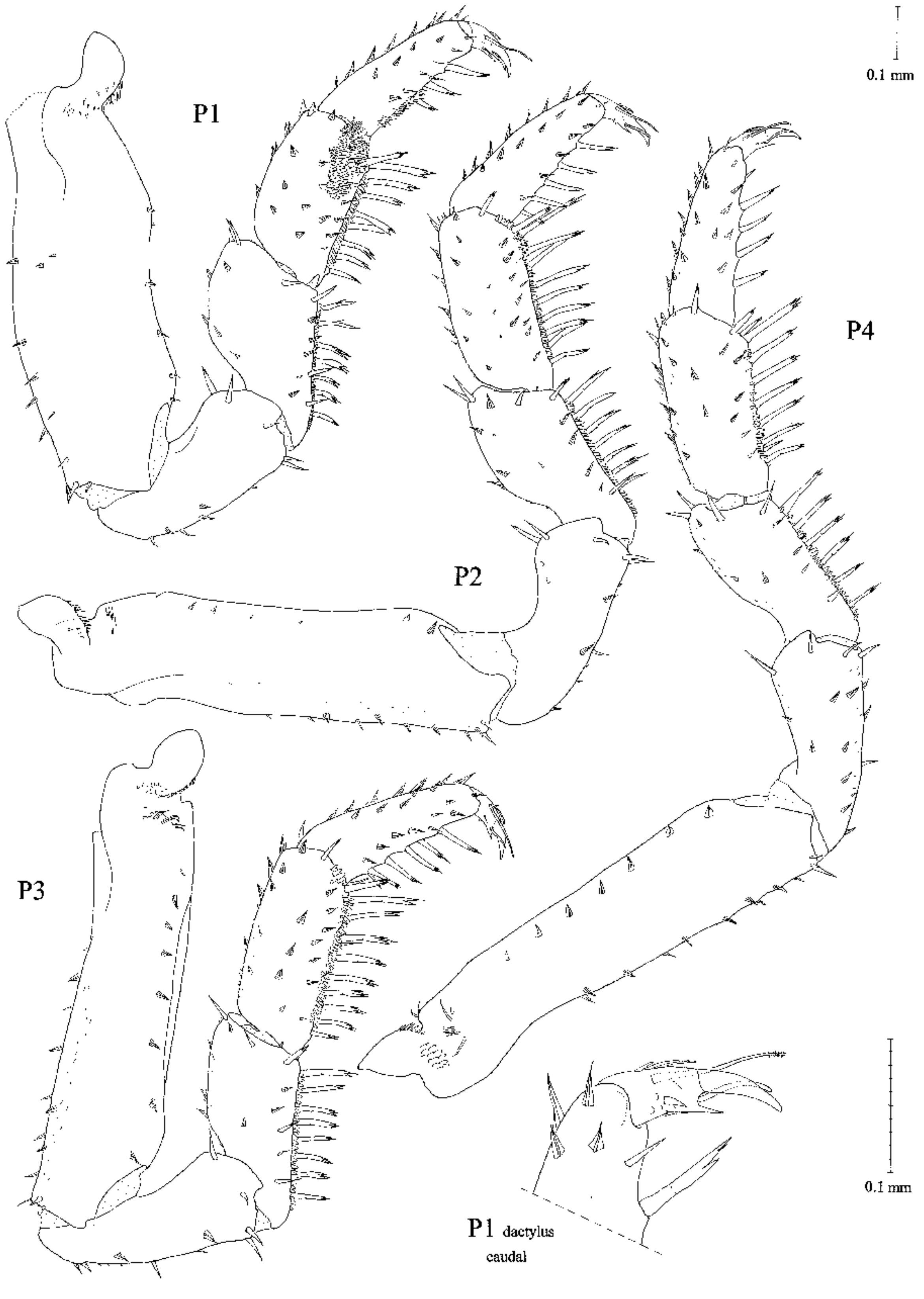

Figure 28. *Neosanfilippia venezuelana* Brian, 1957: ♂, 6.3 × 2.5 mm, pereiopods 1–4 (Venezuela, near Cueva San Luis, 11°07′35″ N, 69°40′76″ W, leg. C. Schmidt, 20 March 1998, cCS 194b).

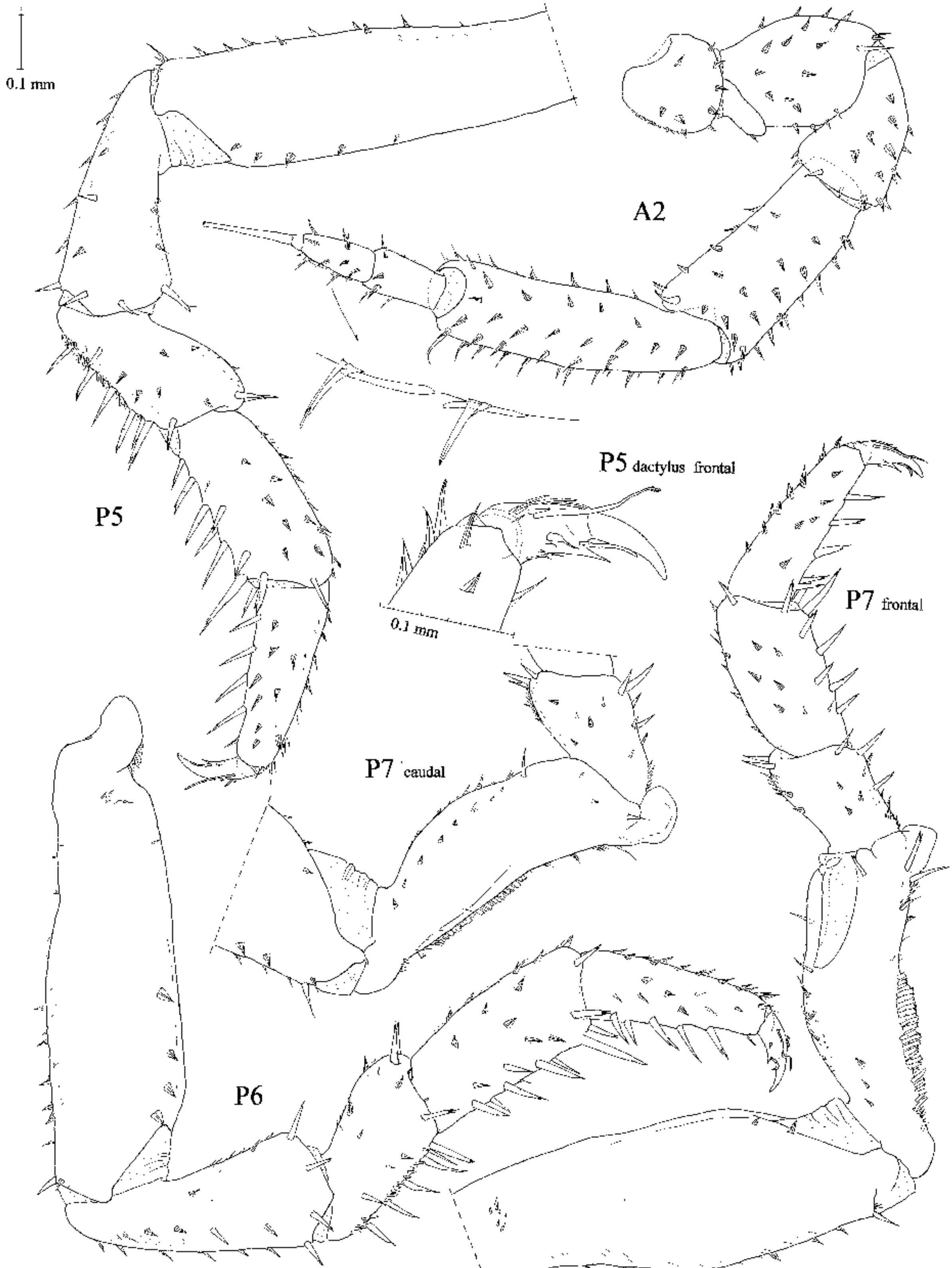

Figure 29. *Neosanfilippia venezuelana* Brian, 1957: ♂, 6.3 × 2.5 mm, pereiopods 5–7, second antenna (Venezuela, near Cueva San Luis, 11°07′35″ N, 69°40′76″W, leg. C. Schmidt, 20 March 1998, cCS 194b).

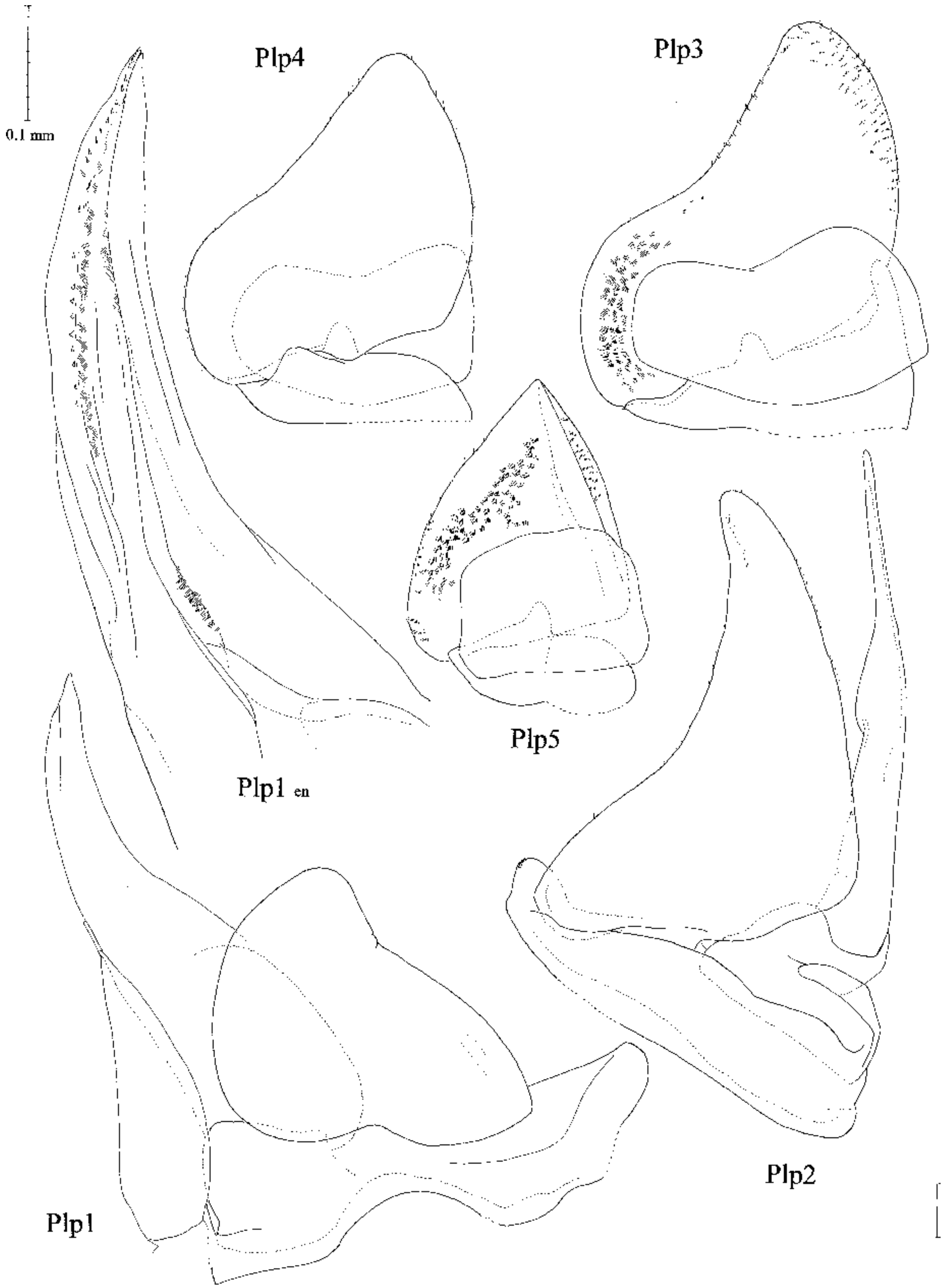

Figure 30. *Neosanfilippia venezuelana* Brian, 1957: ♂, 6.3 × 2.5 mm, pleopods 1–5 (Venezuela, near Cueva San Luis, 11°07′35″ N, 69°40′76″ W, leg. C. Schmidt, 20 March 1998, cCS 194b).

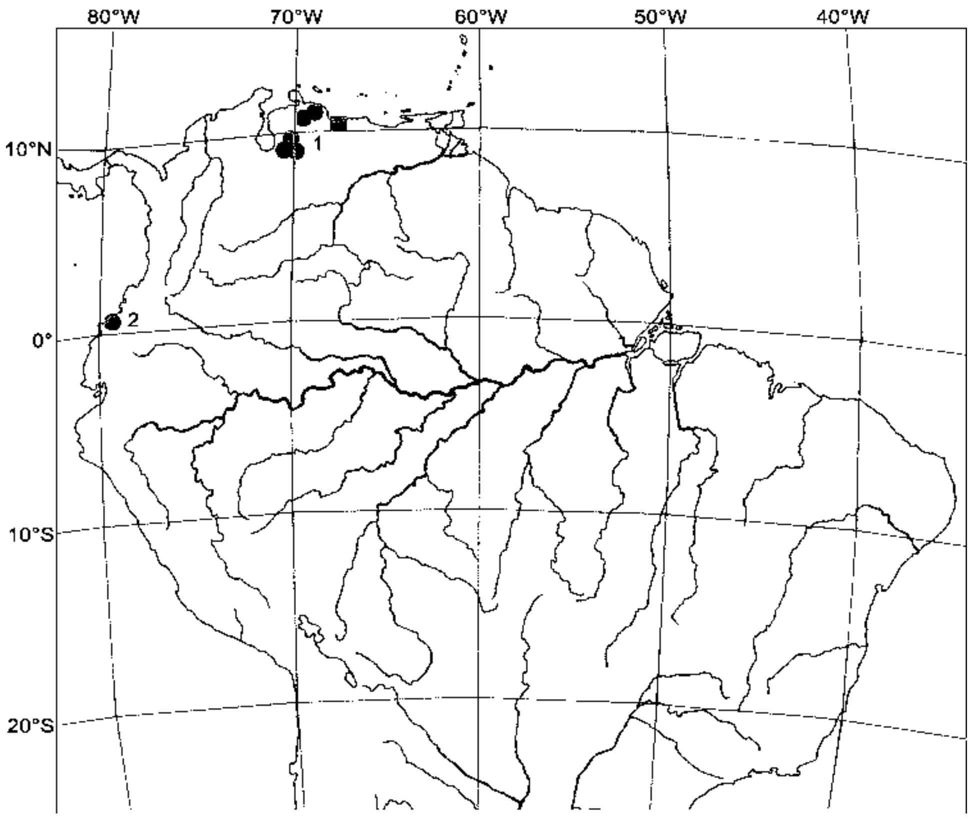

Figure 31. Geographical distribution of *Neosanfilippia venezuelana* (1) and *N. zoiai* (2): circles, material examined; squares, literature data.

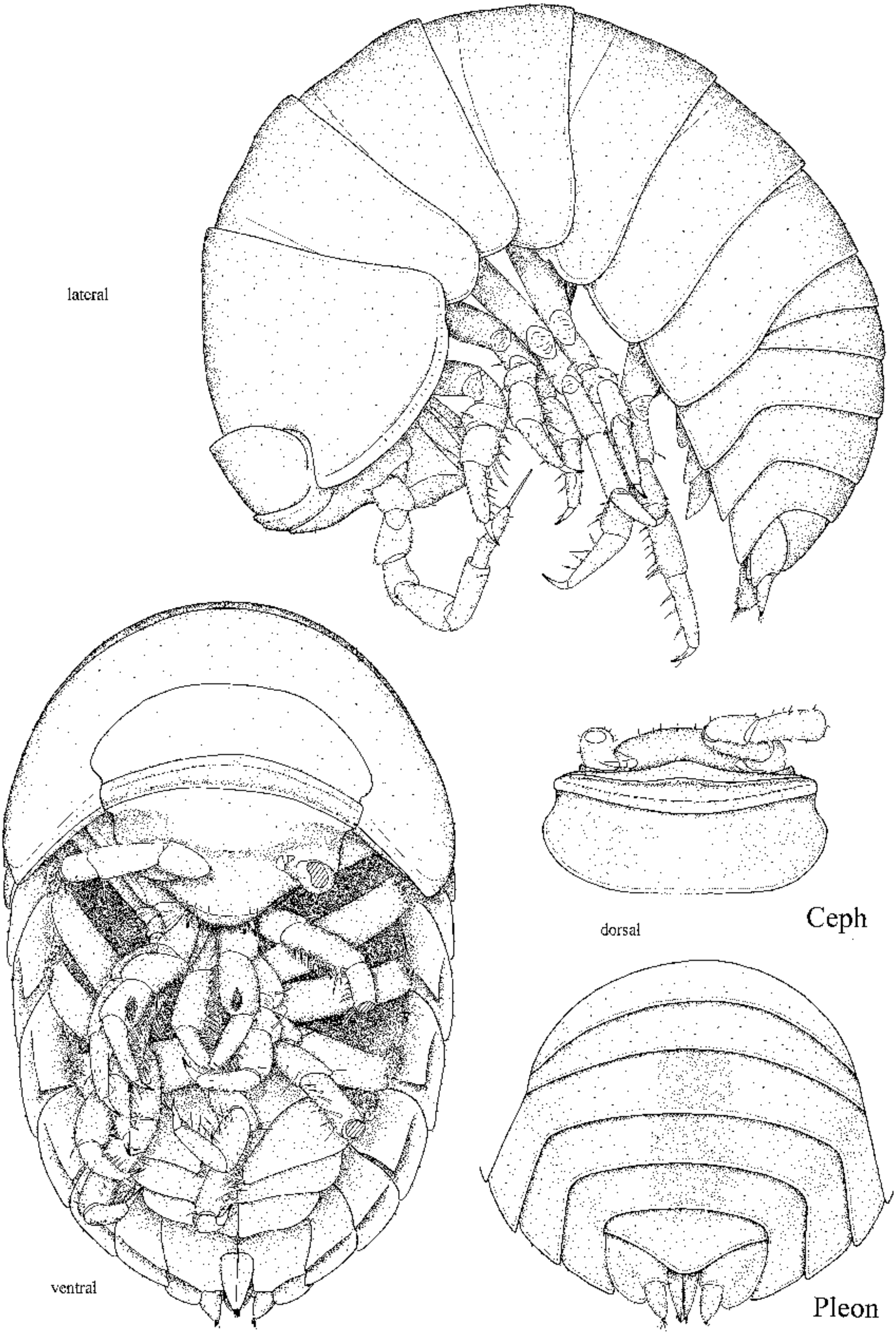

Figure 32. *Neosanfilippia zoiai* Manicastri, 1991: ♀, 4.5 × 1.9 mm, cephalothorax 1.21 mm wide, habitus lateral; ♂, 4.1 × 1.9 mm, cephalothorax 1.21 mm wide, ventral view, cephalothorax and pleon dorsal, both paratypes (Ecuador, Esmeraldas District, Borbon, Valdez, at sea level, leg. S. Zoia, 28 July 1984, MZUF 2740).

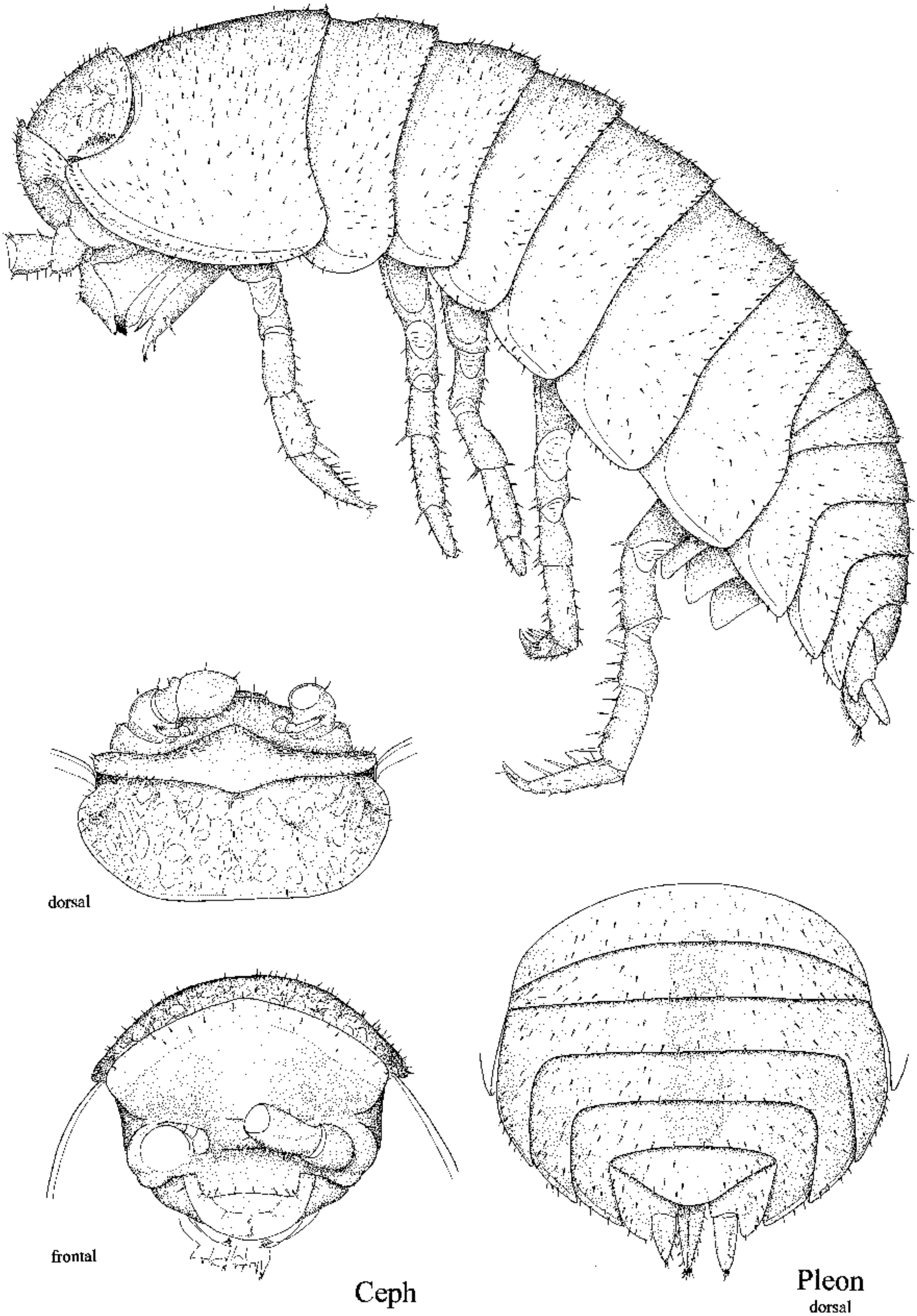

Figure 33. *Colomboniscus regressus* Vandel, 1972: ♀ syntype, 3.2 mm, cephalothorax width 0.85 mm [Colombia, montane forest (Robles) between la Mesa and Mosquera, altitude 2600–2700 m, leg. H. Sturm, 28 June 1967, MNHN].

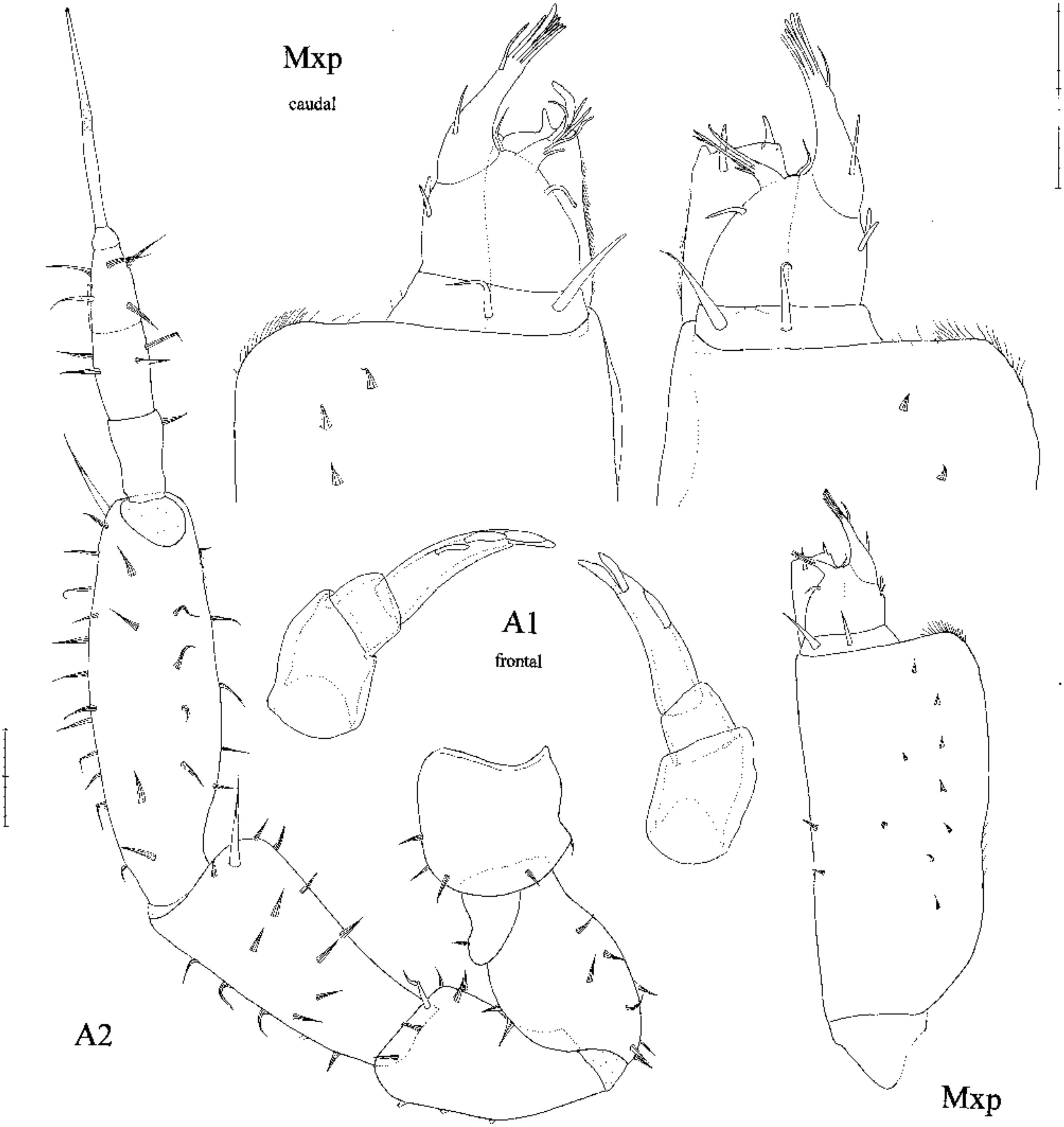

Figure 34. *Colomboniscus regressus* Vandel, 1972: ♀, second antenna, first antenna, maxilliped (Colombia, exact locality unknown, leg. H. Sturm MNHN CV 5818).

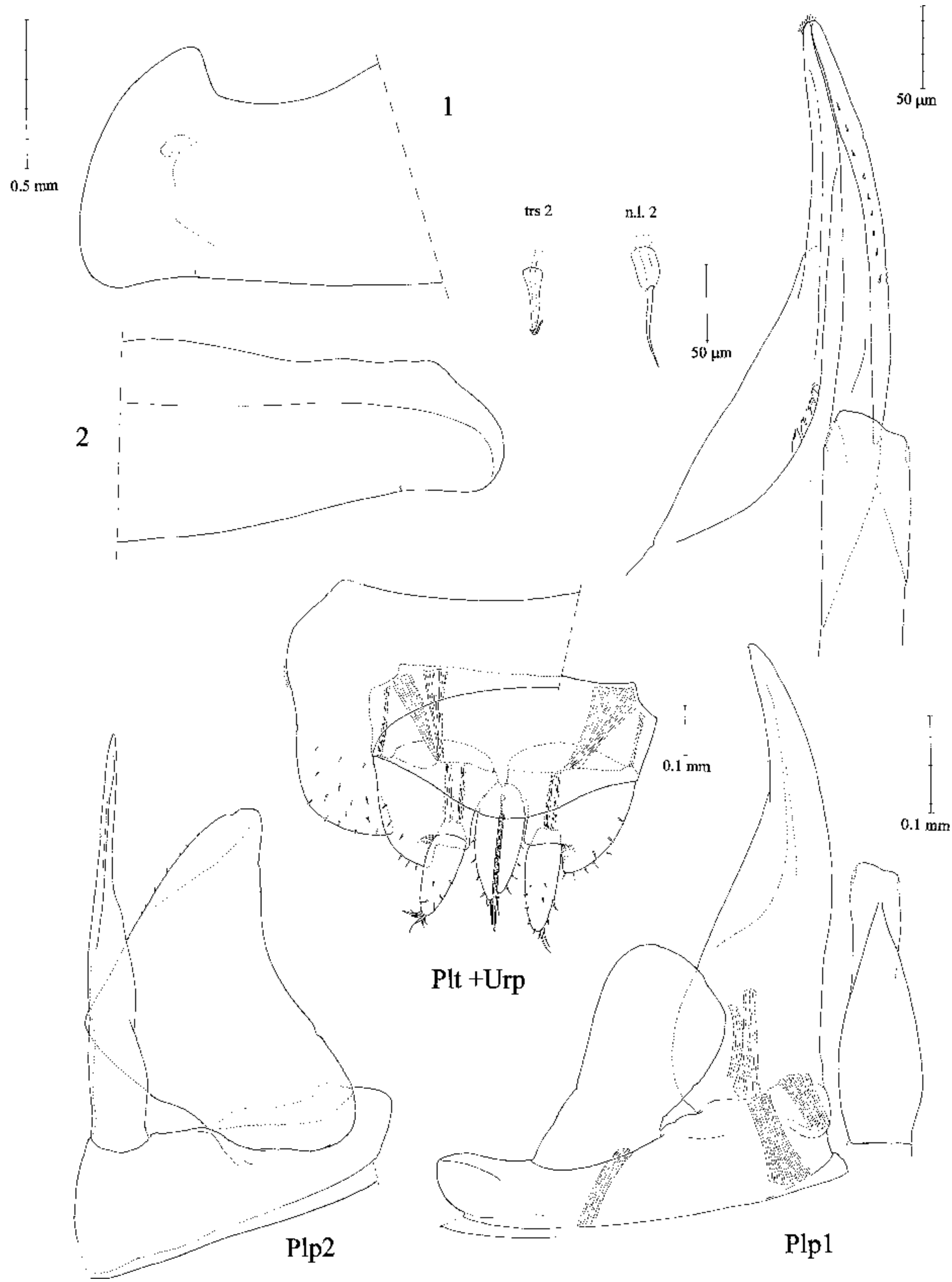

Figure 35. *Colomboniscus regressus* Vandel, 1972: ♀, coxal plates 1 and 2, ♂, pleopods 1 and 2, pleotelson and uropods (Colombia, exact locality unknown, leg. H. Sturm MNHN CV 5818–5819).

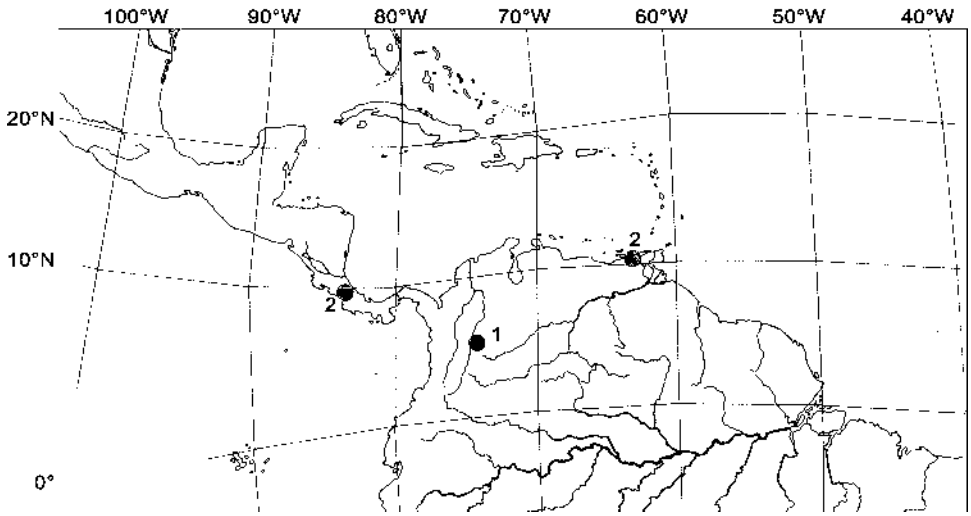

Figure 36. Geographical distribution of *Colomboniscus*: 1, *C. regressus*; 2, *C. tristani*.

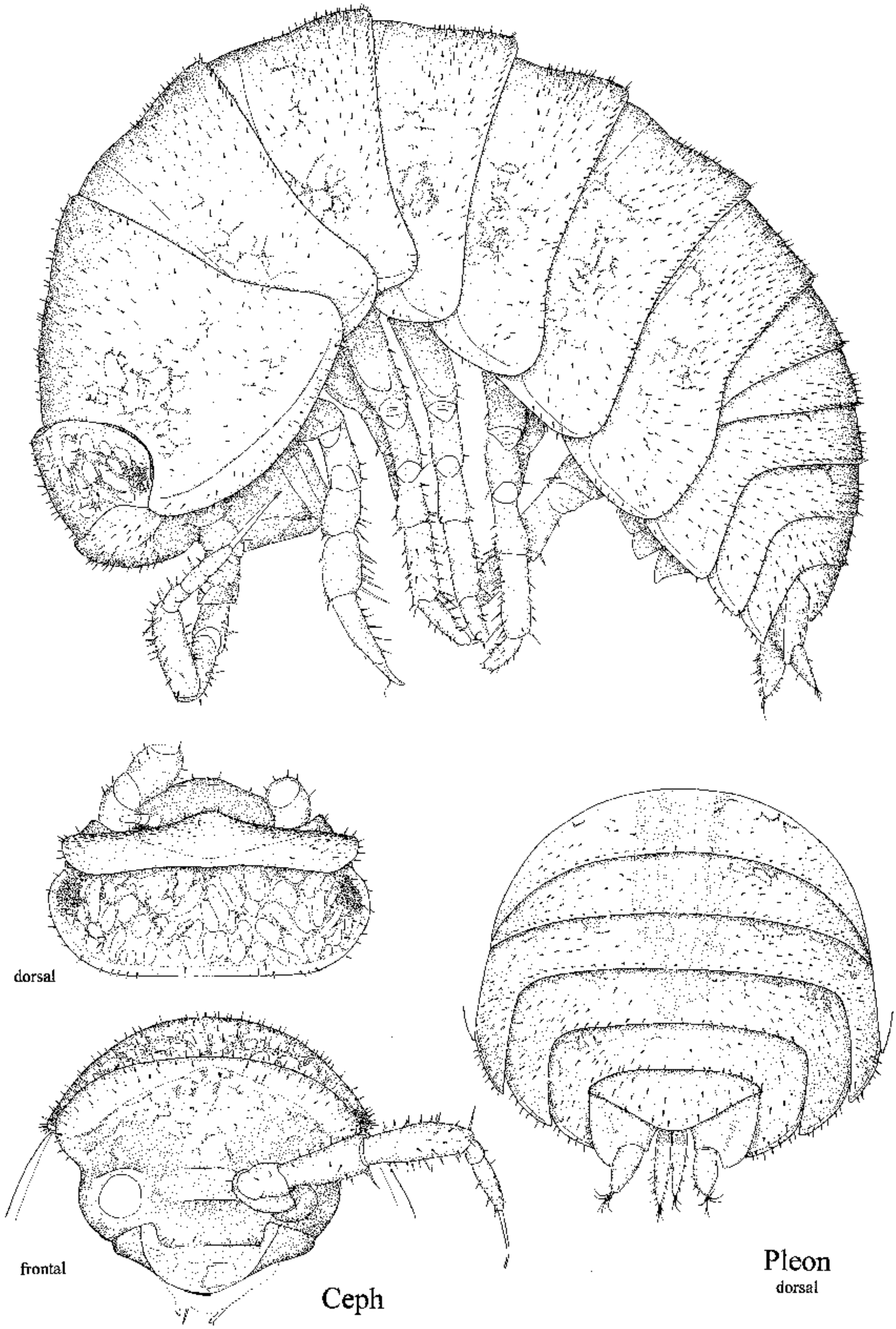

Figure 37. *Colomboniscus* species 2: ♀, 3.6 mm, cephalothorax 1.03 mm wide, Colombia, montane forest at Tibabitá, *c.* 11 km north of Bogotá, altitude 2600–2800 m, leg. H. Sturm, 10 July 1967, MNHN).

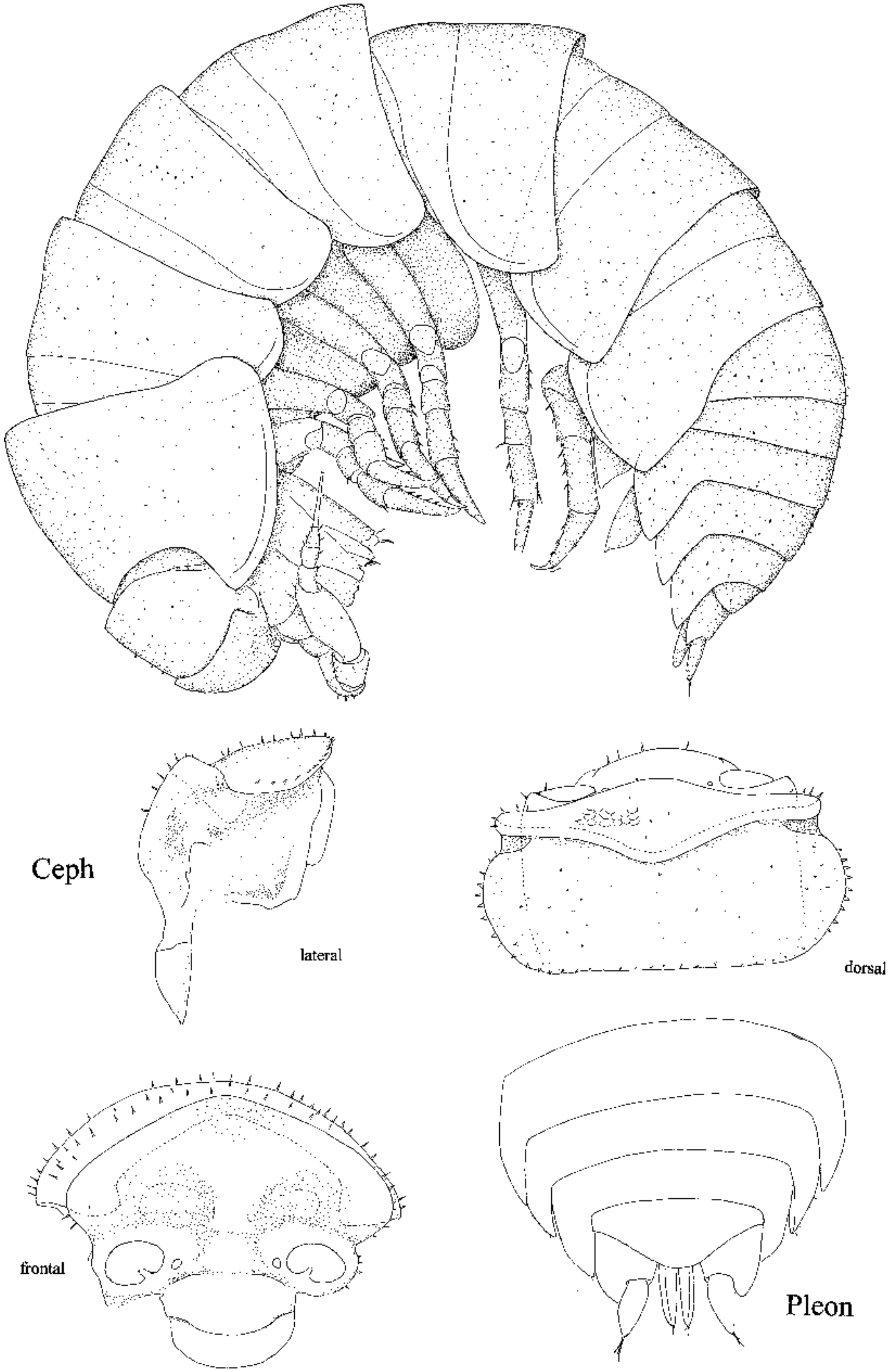

Figure 38. *Colomboniscus tristani* (Arcangeli, 1930): ♀m, 1.05 mm wide, habitus and pleon; ♂, 0.75 mm, cephalothorax (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

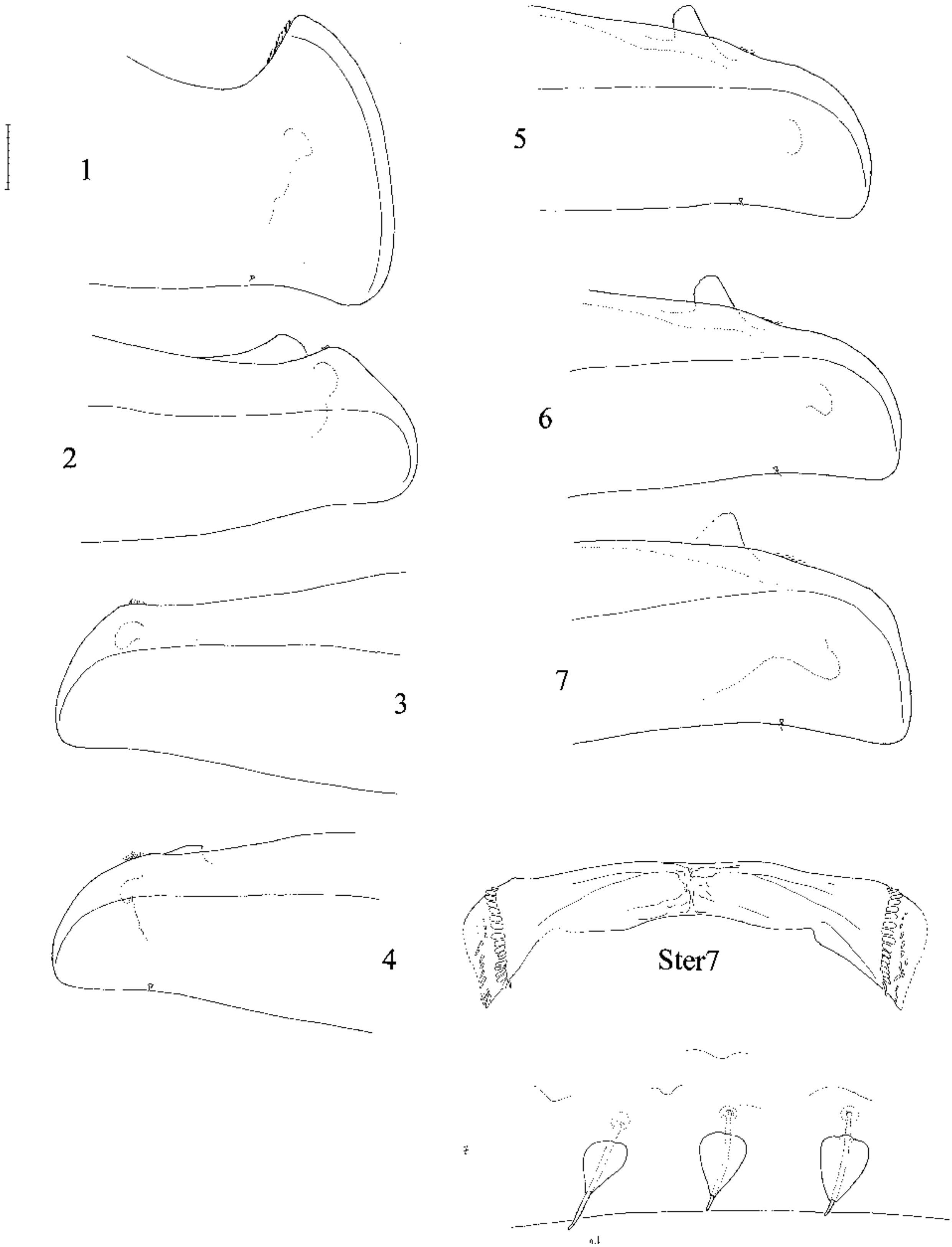

Figure 39. *Colomboniscus tristani* (Arcangeli, 1930): ♂, 0.75 mm wide, coxal plates, sternite 7 (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

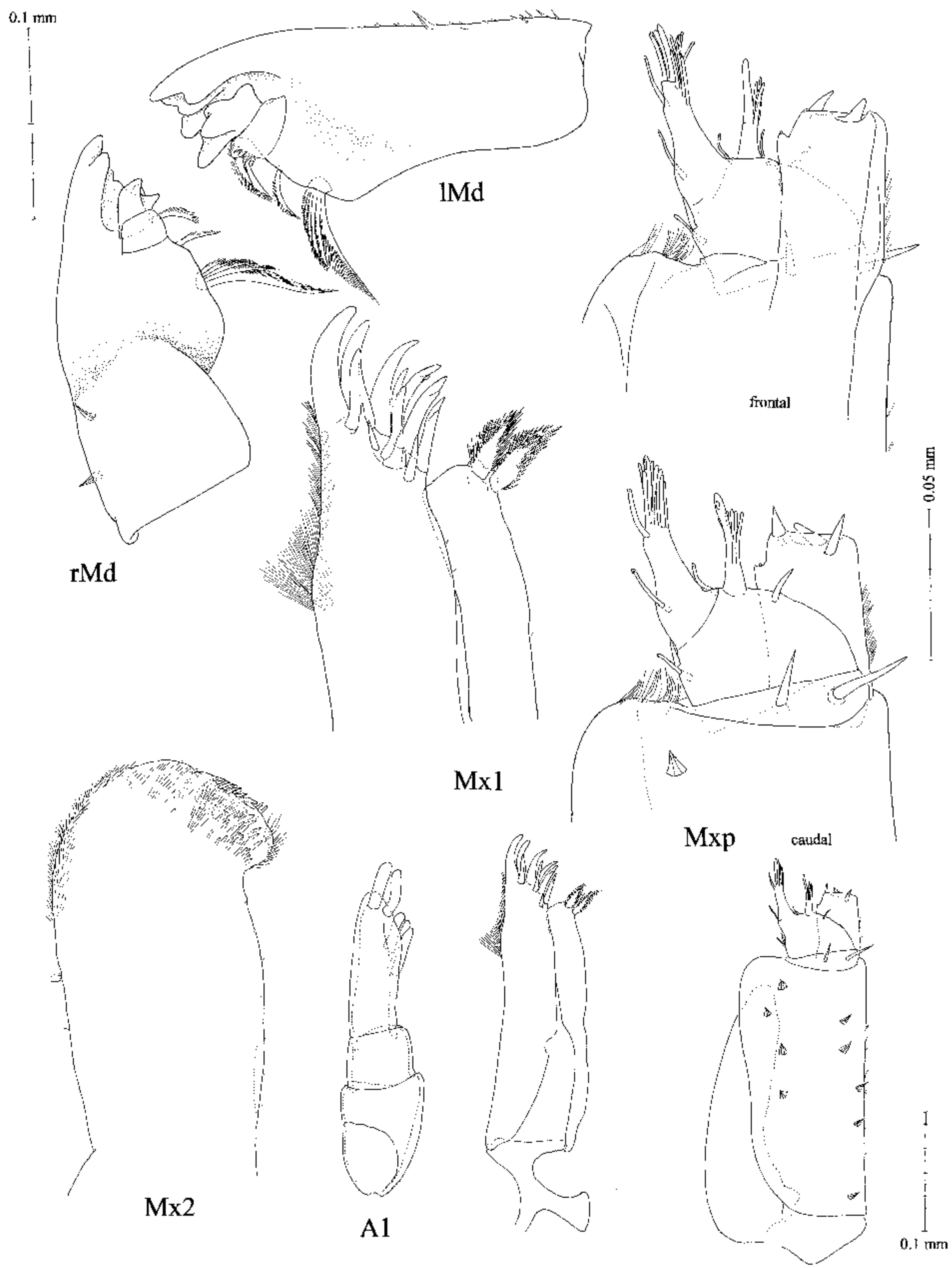

Figure 40. *Colomboniscus tristani* (Arcangeli, 1930): ♂, 0.75 mm wide, mouthparts (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

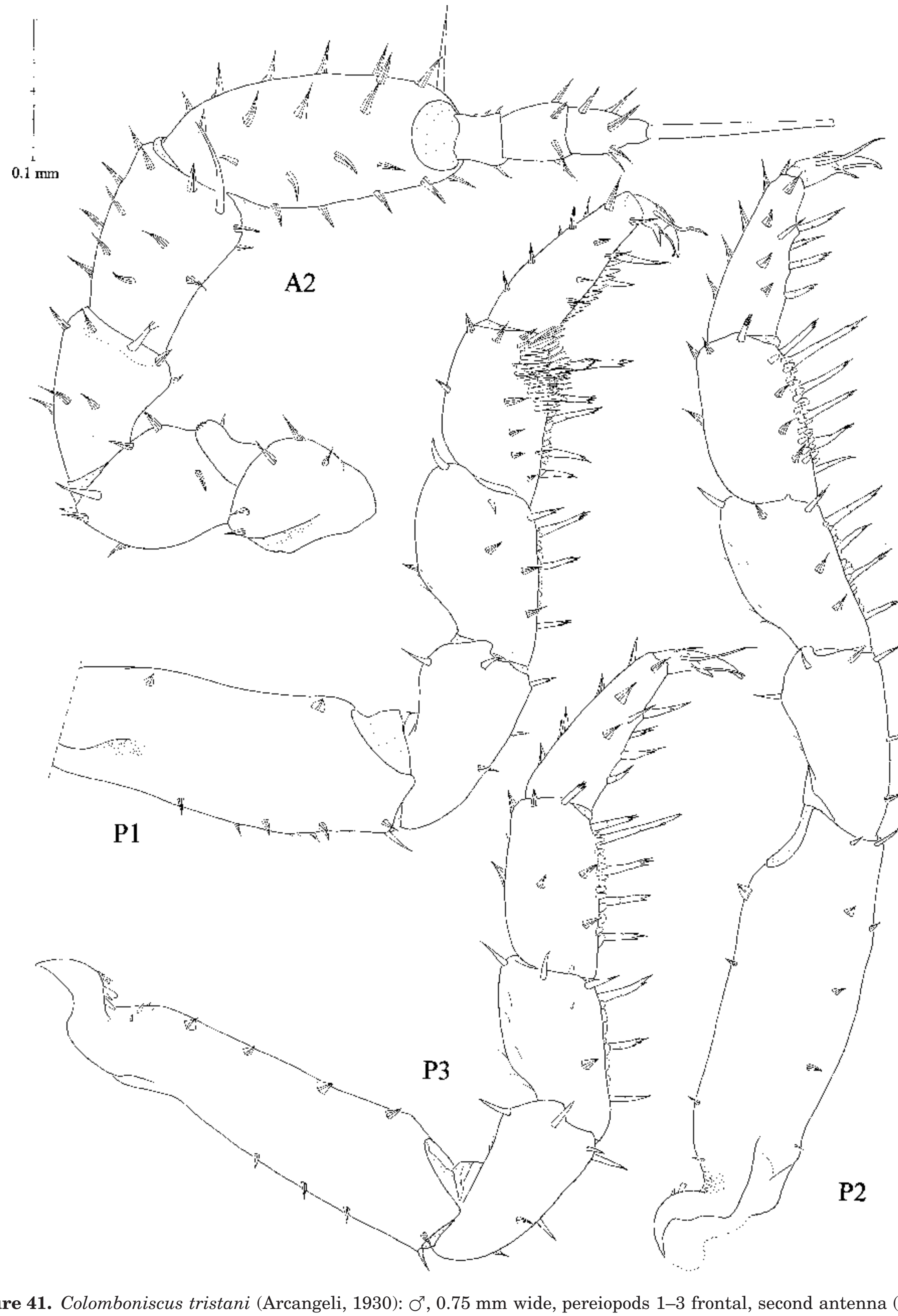

Figure 41. *Colomboniscus tristani* (Arcangeli, 1930): ♂, 0.75 mm wide, pereiopods 1–3 frontal, second antenna (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

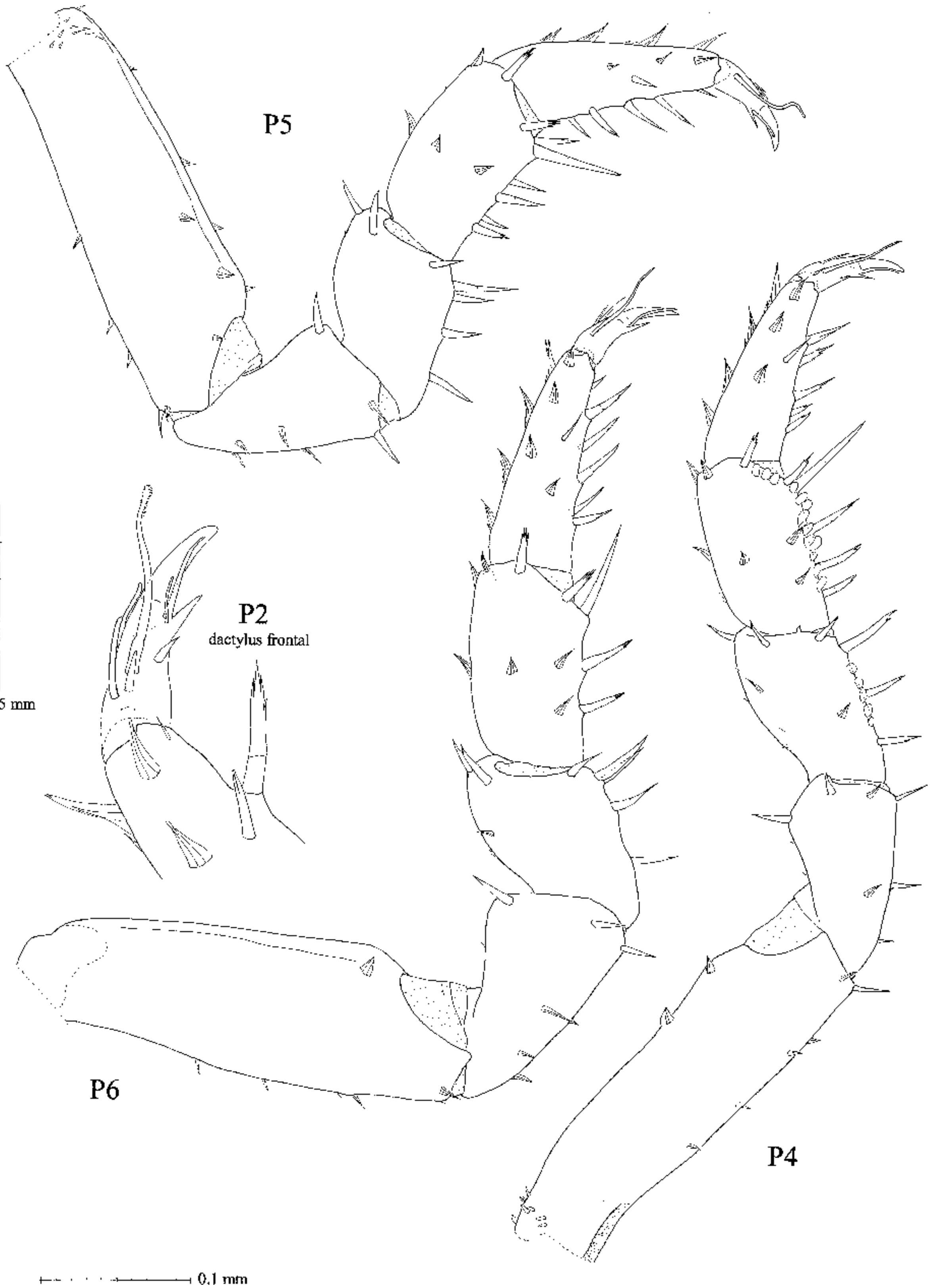

Figure 42. *Colomboniscus tristani* (Arcangeli, 1930): ♂, 0.75 mm wide, pereiopods 4–6 and pereiopod 2 dactylus, frontal (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

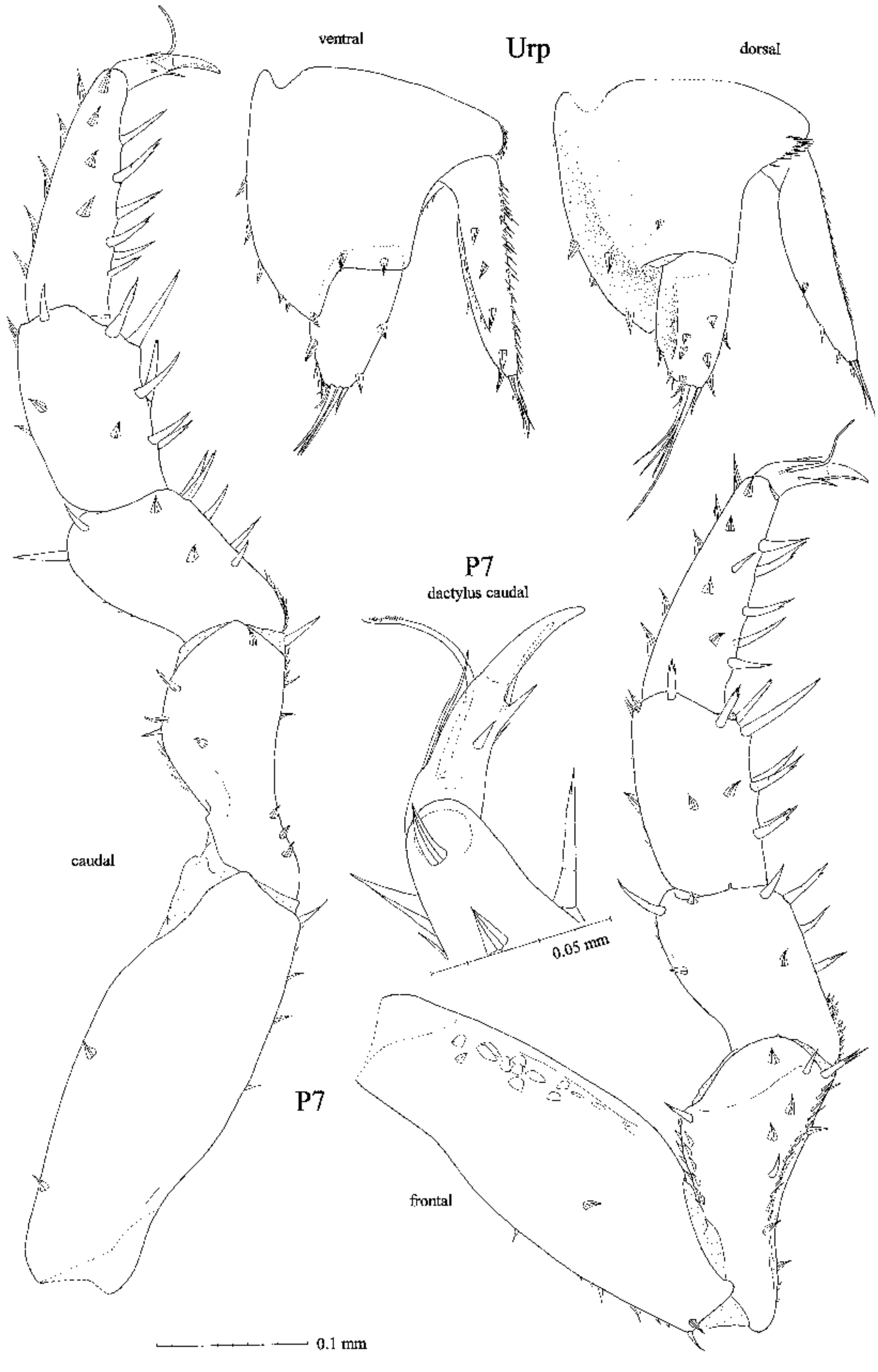

Figure 43. *Colomboniscus tristani* (Arcangeli, 1930): ♂, 0.75 mm wide, pereiopod 7, uropods (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

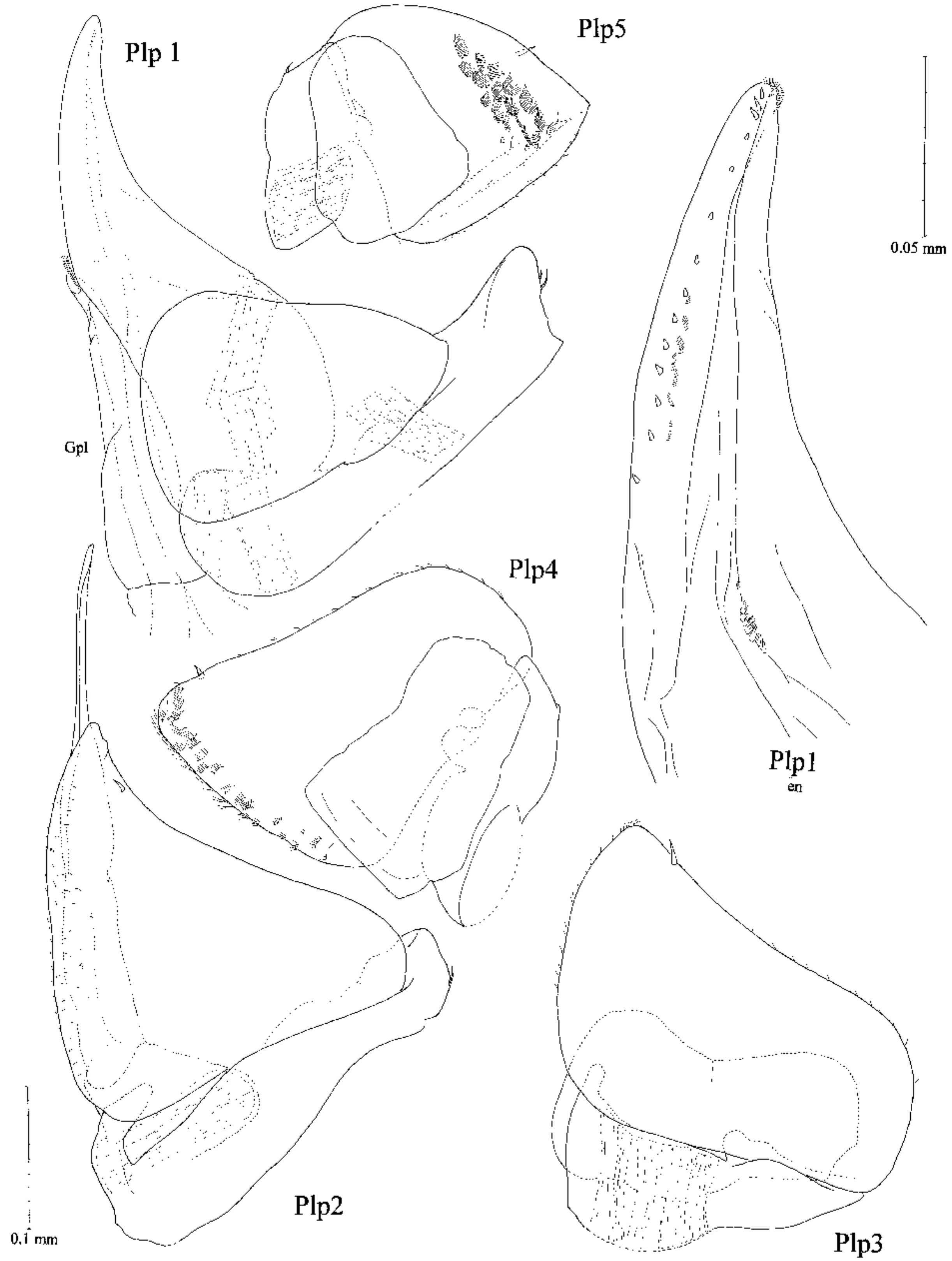

Figure 44. *Colomboniscus tristani* (Arcangeli, 1930): ♂, 0.75 mm wide, pleopods 1–3 frontal, pleopods 4 and 5 caudal (Venezuela, Caripe, leg. C. Schmidt, 7 April 1998, cCS 229a).

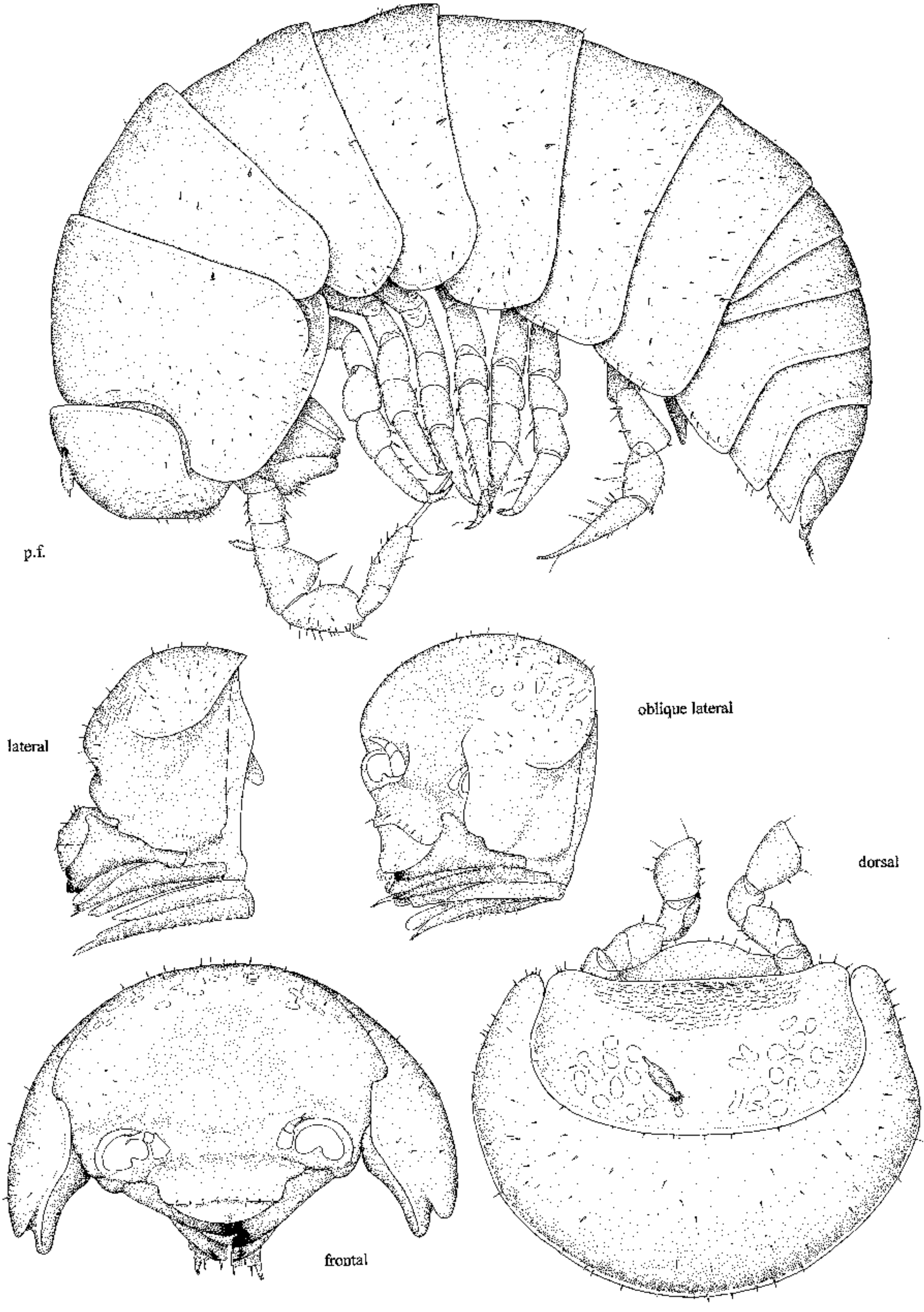

Figure 45. ***Caecopactes minimus*** **gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, habitus, cephalothorax (Ecuador, Napo Prov., Rio Hollin, altitude *c*. 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

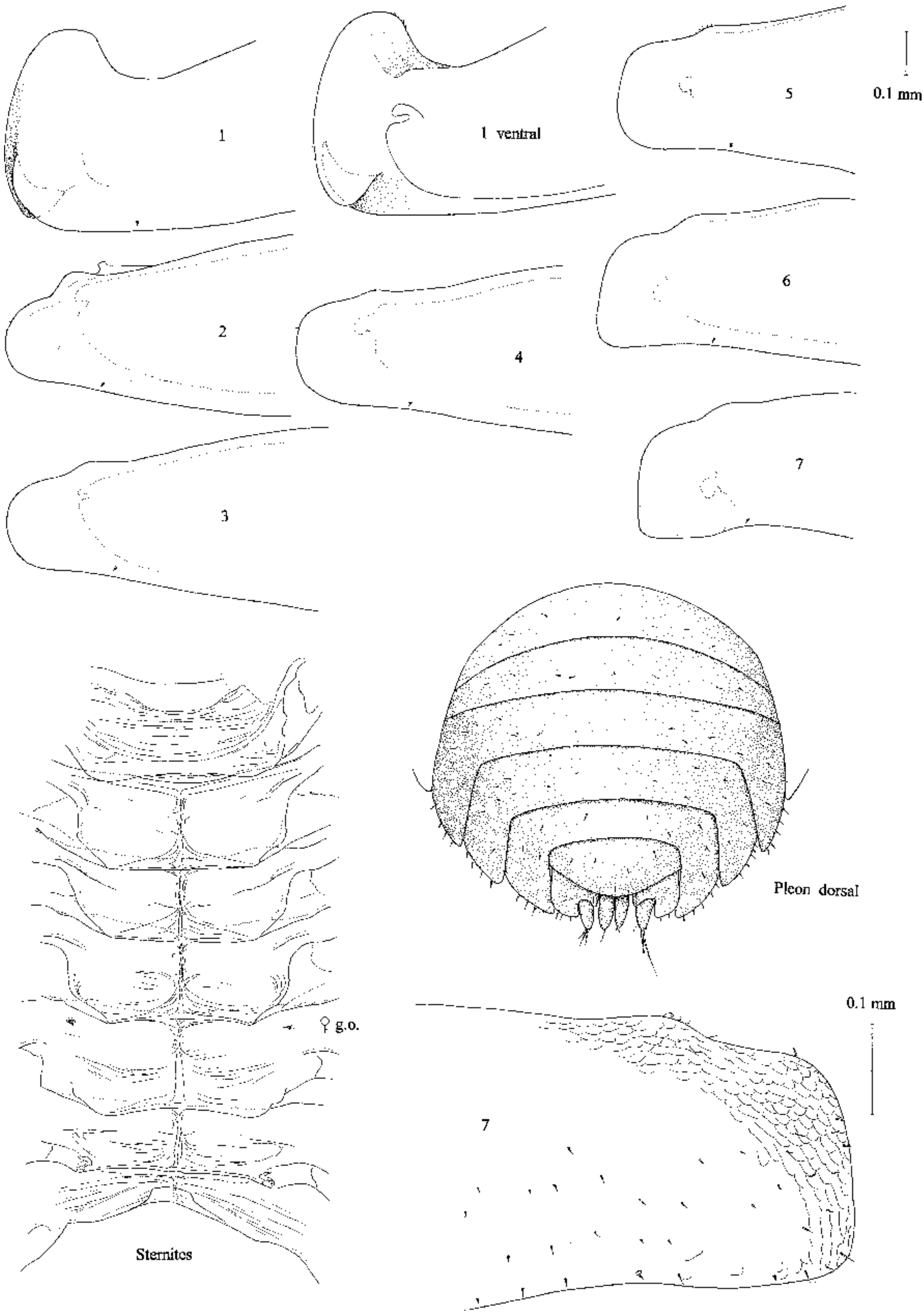

Figure 46. ***Caecopactes minimus*** **gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, coxal plates, sternites, pleon dorsal (Ecuador, Napo Prov., Rio Hollin, altitude *c.* 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

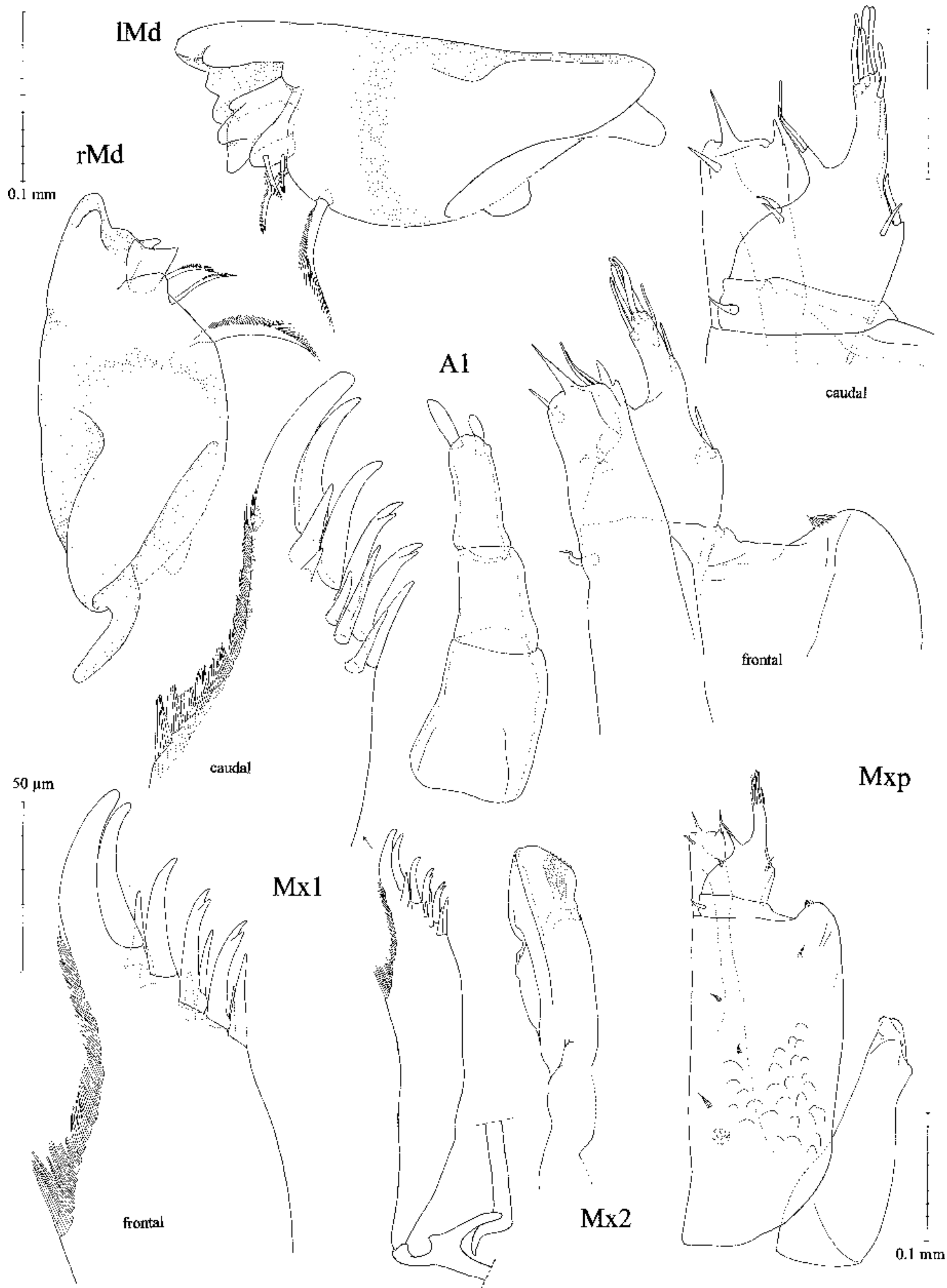

Figure 47. ***Caecopactes minimus* gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, first antenna, mouthparts (Ecuador, Napo Prov., Rio Hollin, altitude *c.* 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

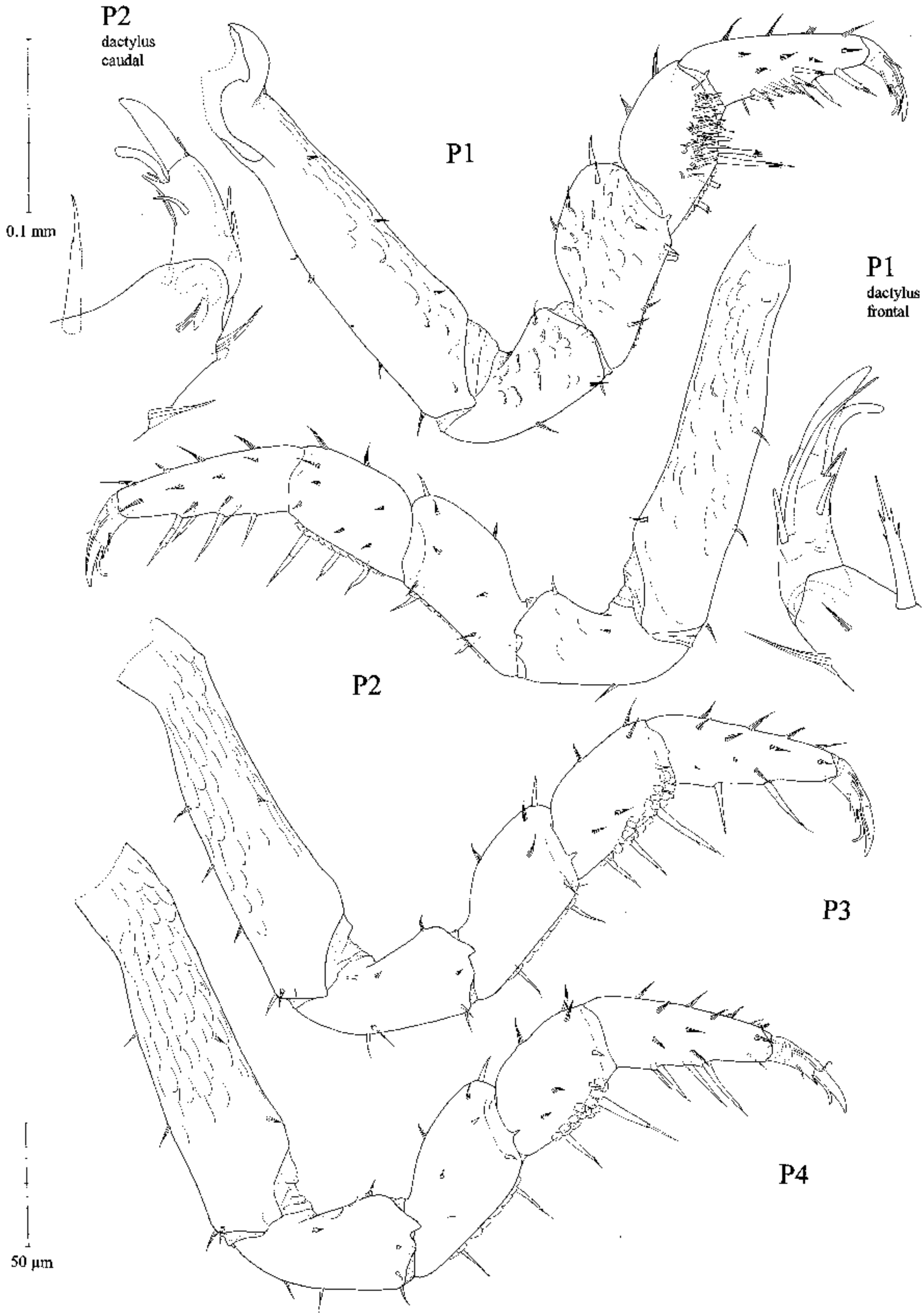

Figure 48. ***Caecopactes minimus* gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, pereiopods 1–4, pereiopod 1 dactylus frontal, pereiopod 2 dactylus caudal (Ecuador, Napo Prov., Rio Hollin, altitude *c*. 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

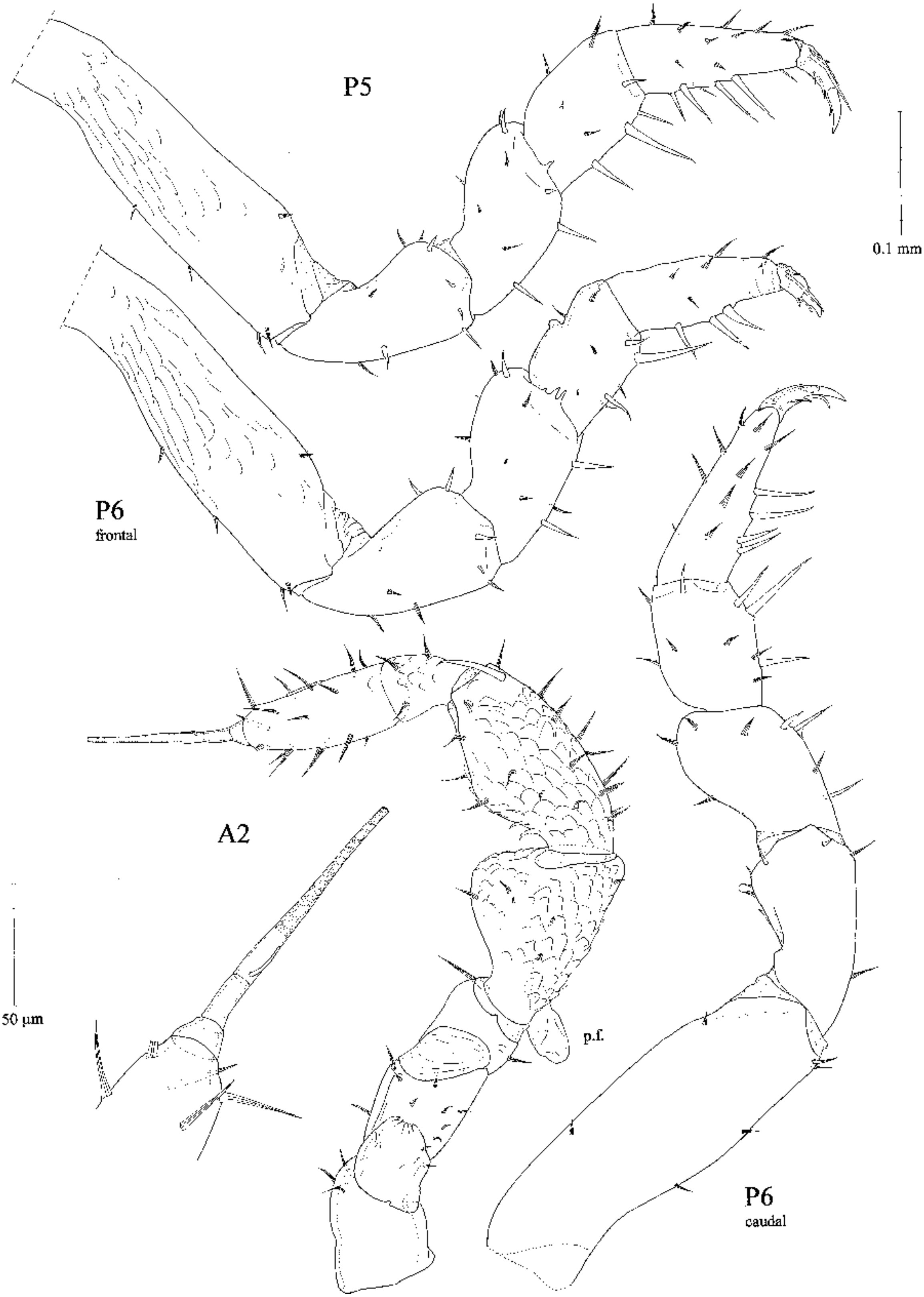

Figure 49. ***Caecopactes minimus*** **gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, second antenna, pereiopods 5 and 6 frontal, pereiopod 6 caudal (Ecuador, Napo Prov., Rio Hollin, altitude *c*. 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

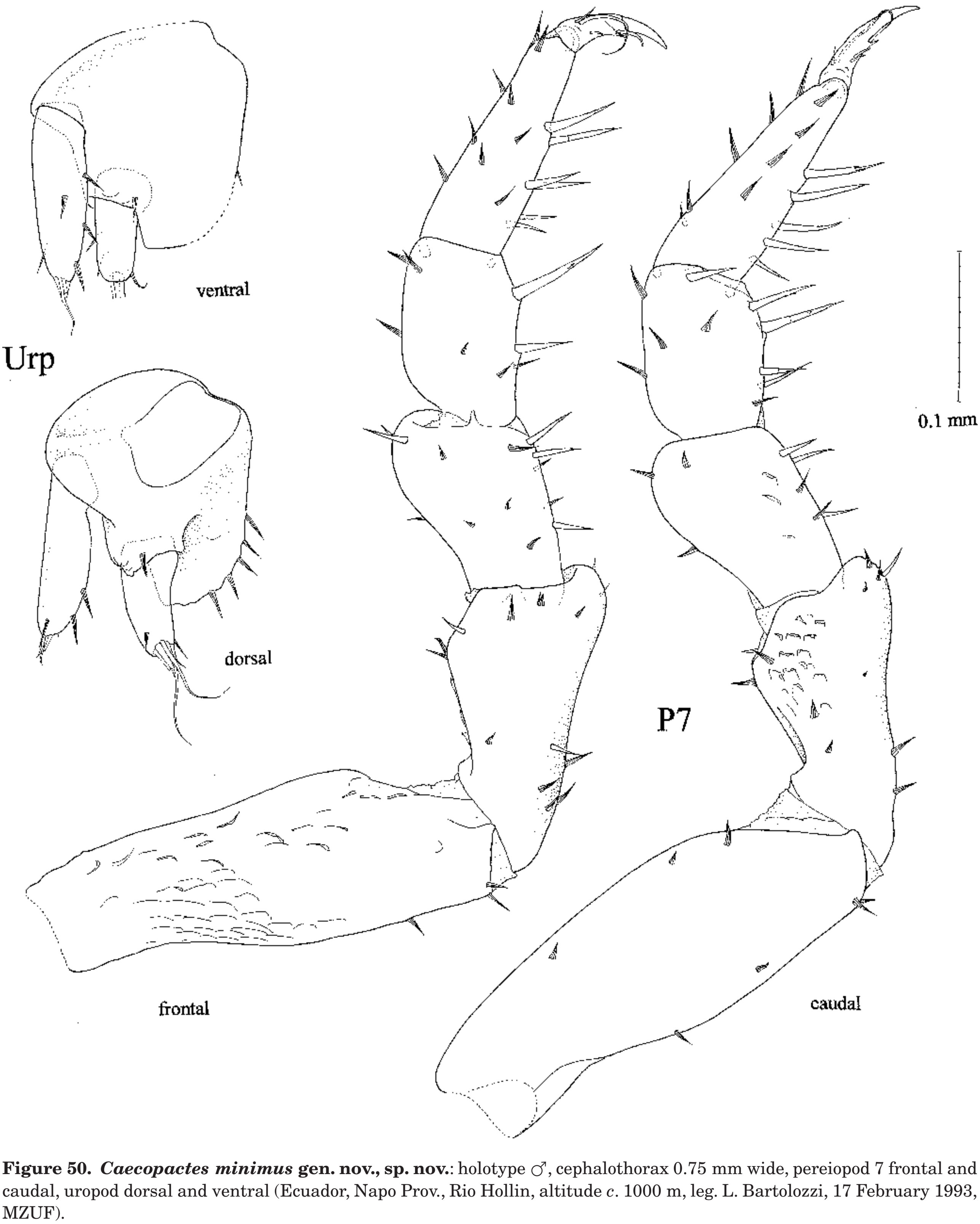

Figure 50. ***Caecopactes minimus*** **gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, pereiopod 7 frontal and caudal, uropod dorsal and ventral (Ecuador, Napo Prov., Rio Hollin, altitude *c*. 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

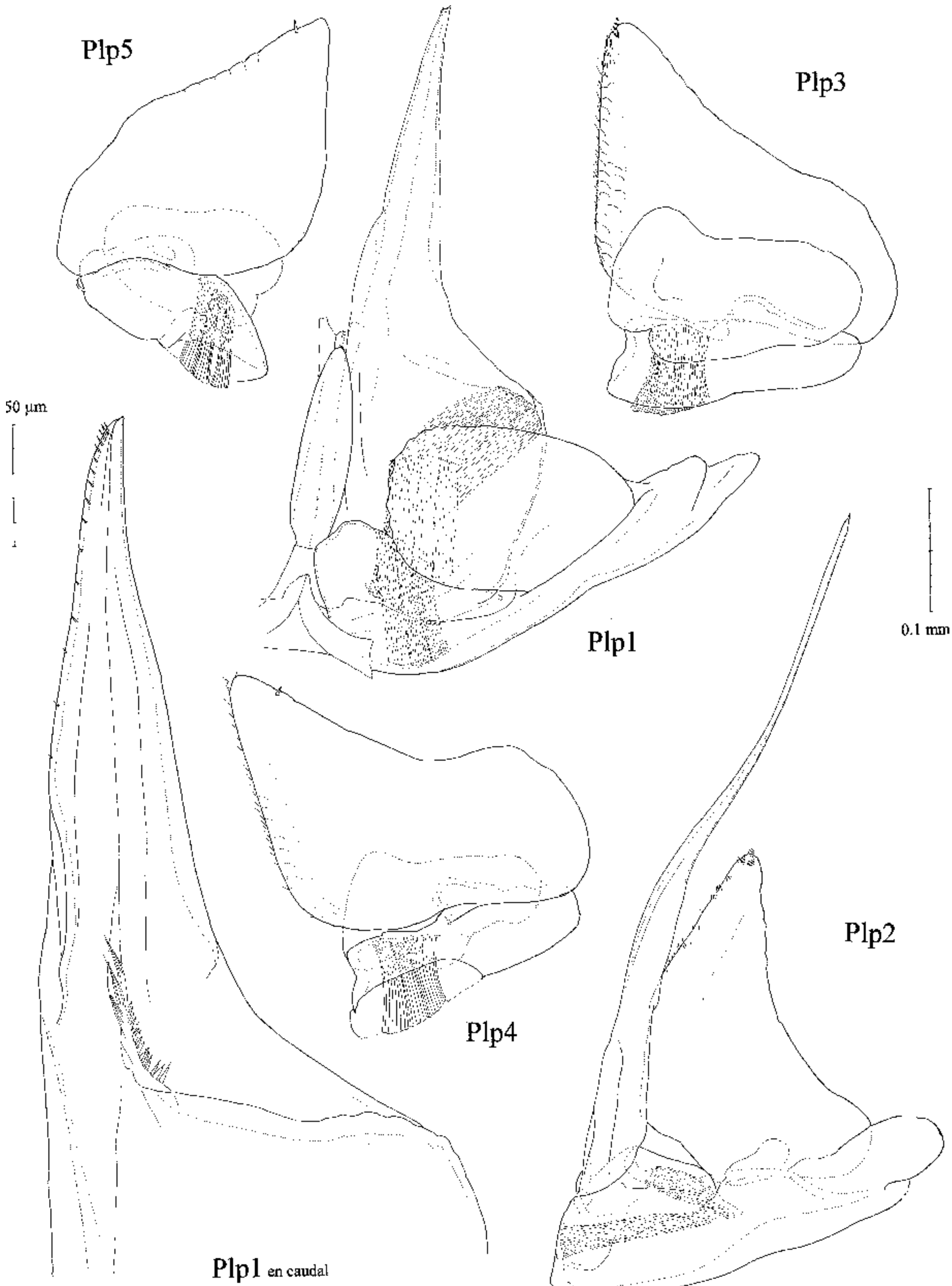

Figure 51. ***Caecopactes minimus*** **gen. nov., sp. nov.**: holotype ♂, cephalothorax 0.75 mm wide, pleopods 1, 4 and 5 frontal, pleopods 3 and 4 caudal, pleopod 1 endopodite caudal (Ecuador, Napo Prov., Rio Hollin, altitude *c*. 1000 m, leg. L. Bartolozzi, 17 February 1993, MZUF).

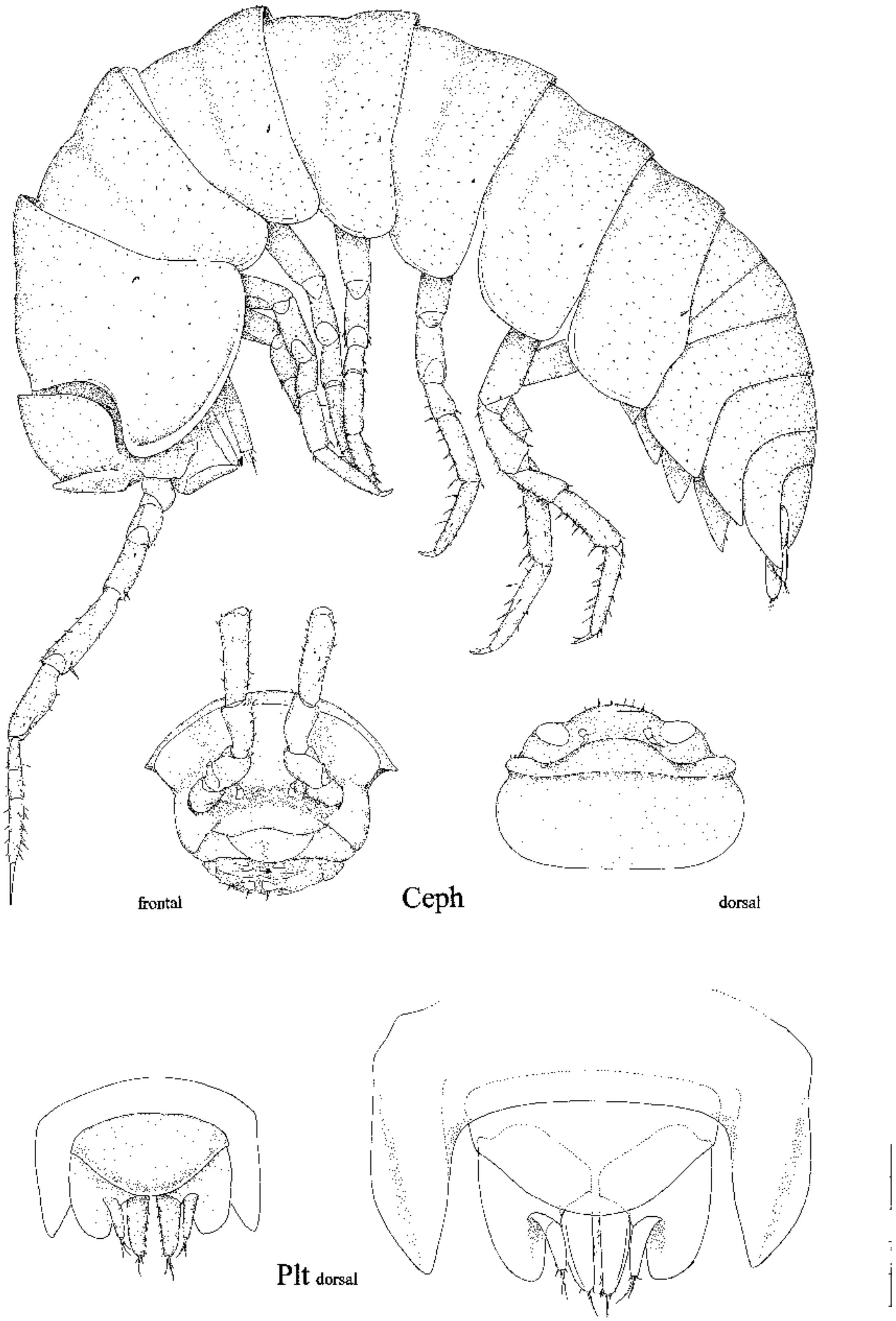

Figure 52. *Troglopactes botosaneanui* (Vandel, 1973): ♂ syntype, habitus, cephalothorax, pleotelson, and pleotelson of other specimen (Cuba, Provincia de Matanzas, Cueva de Bellamar, leg. Expédition biospéologique cubano-roumaine, March–June 1969, MNHN).

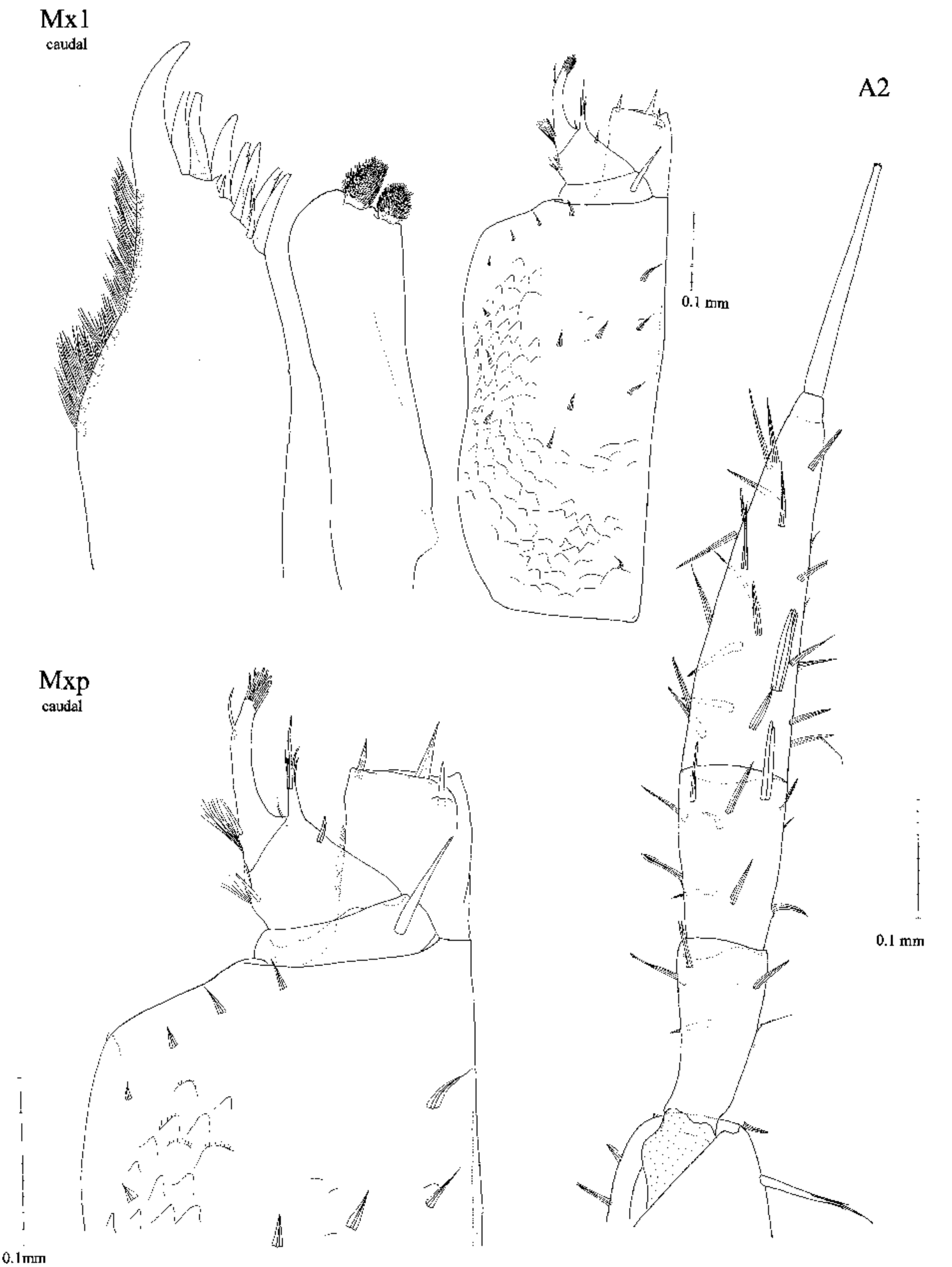

Figure 53. *Troglopactes botosaneanui* (Vandel, 1973): ♂ syntype, second antenna flagellum, maxilliped, first maxilla (Cuba, Provincia de Matanzas, Cueva de Bellamar, leg. Expédition biospéologique cubano-roumaine, March–June 1969, MNHN).

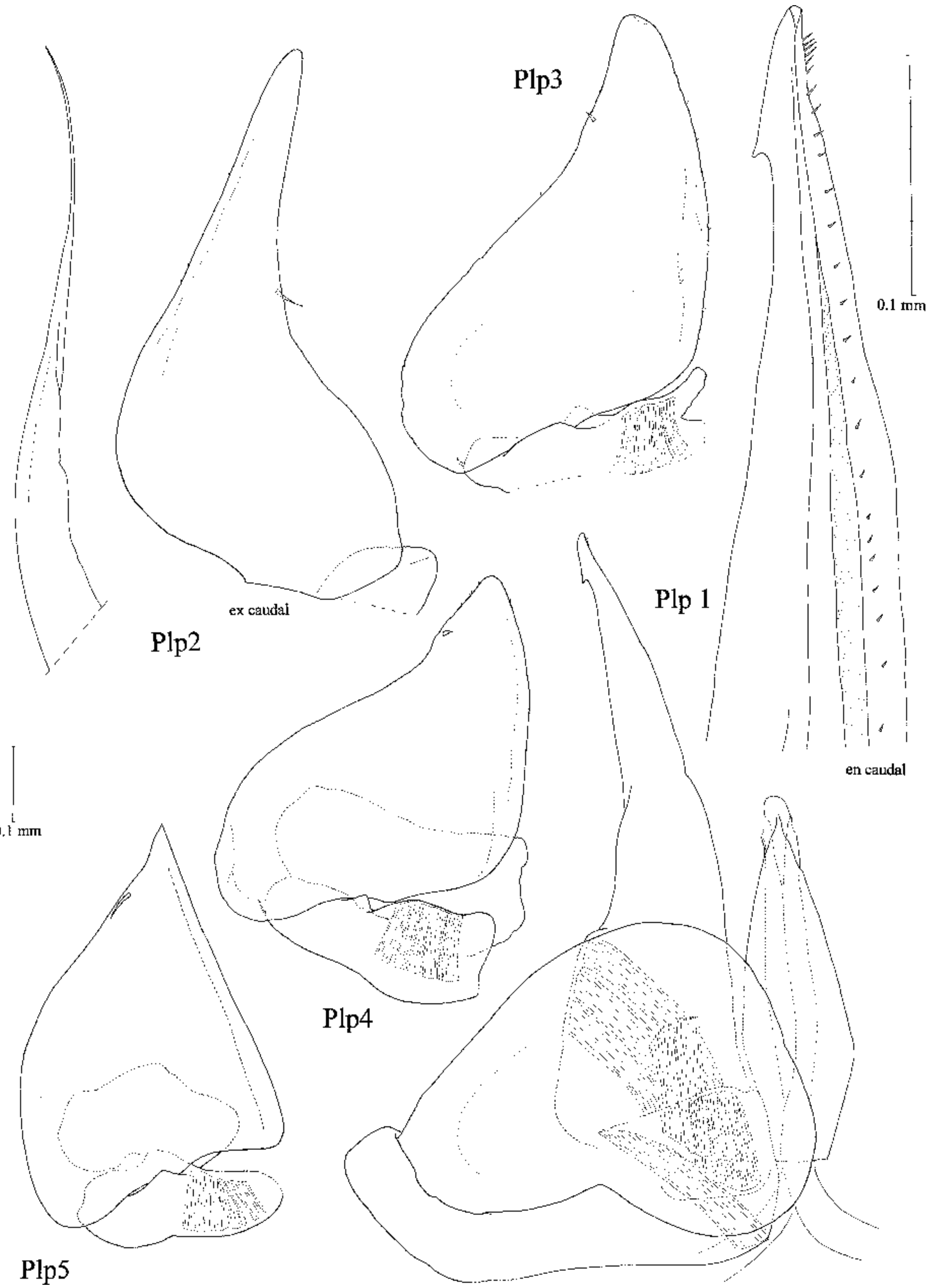

Figure 54. *Troglopactes botosaneanui* (Vandel, 1973): ♂ syntype, pleopods 1–5 (pleopod 2 and endopodite 1 caudal, others frontal) (Cuba, Provincia de Matanzas, Cueva de Bellamar, leg. Expédition biospéologique cubano-roumaine, March–June 1969, MNHN).

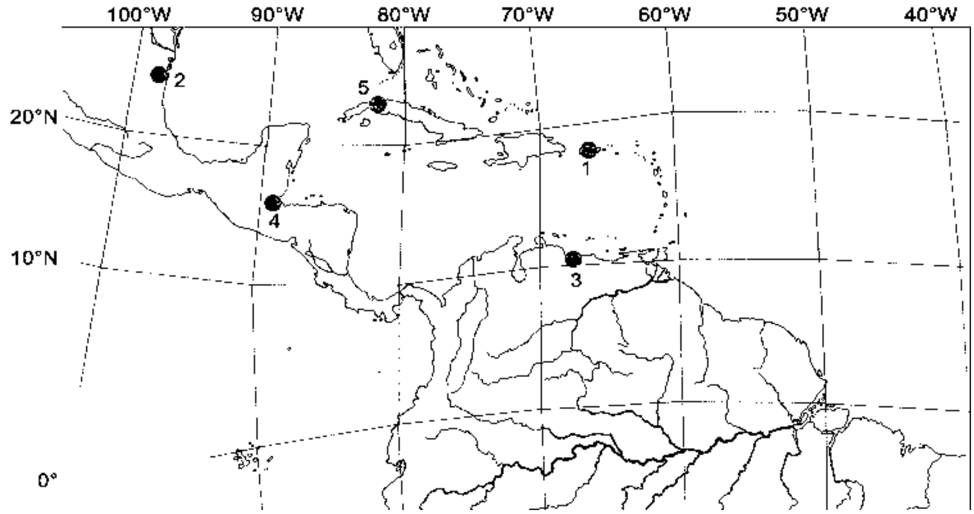

Figure 55. Geographical distribution of *Richardsoniscus portoricensis* (1), *Spherarmadillo cavernicola* (2), *Sphe. nebulosus* (3), *Sphe. schwarzi* (4), and *Troglopactes botosaneanui* (5).

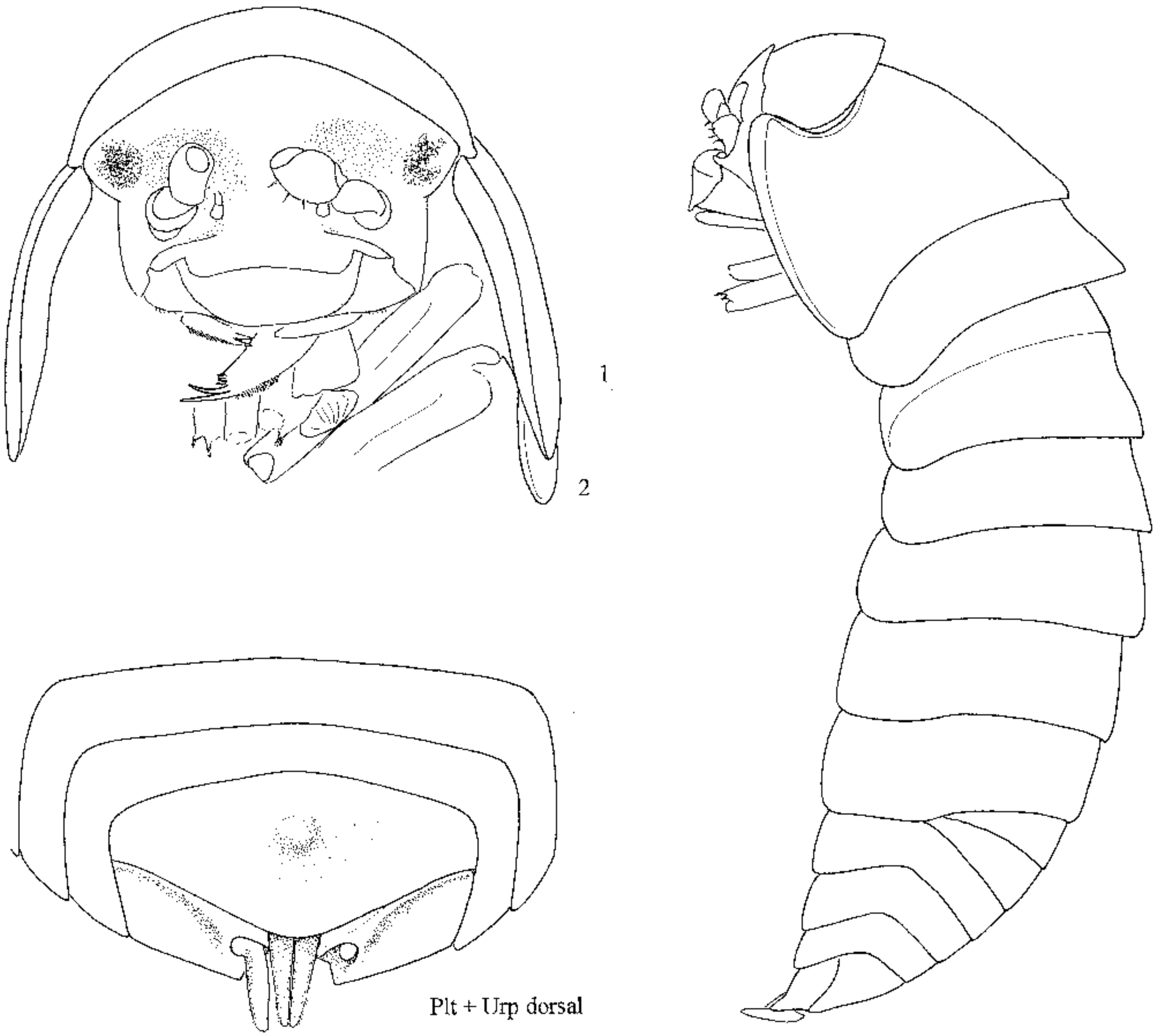

Figure 56. *Richardsoniscus portoricensis* (Richardson, 1901): syntypes: ♀, 5.8 × 2.4 mm, anterior part, ventral; ♀m, 2.8 mm wide; ♀ lateral view (Puerto Rico, El Yunque, altitude 850 m, leg. C. W. Richmond, 26 February 1900, USNM 23914).

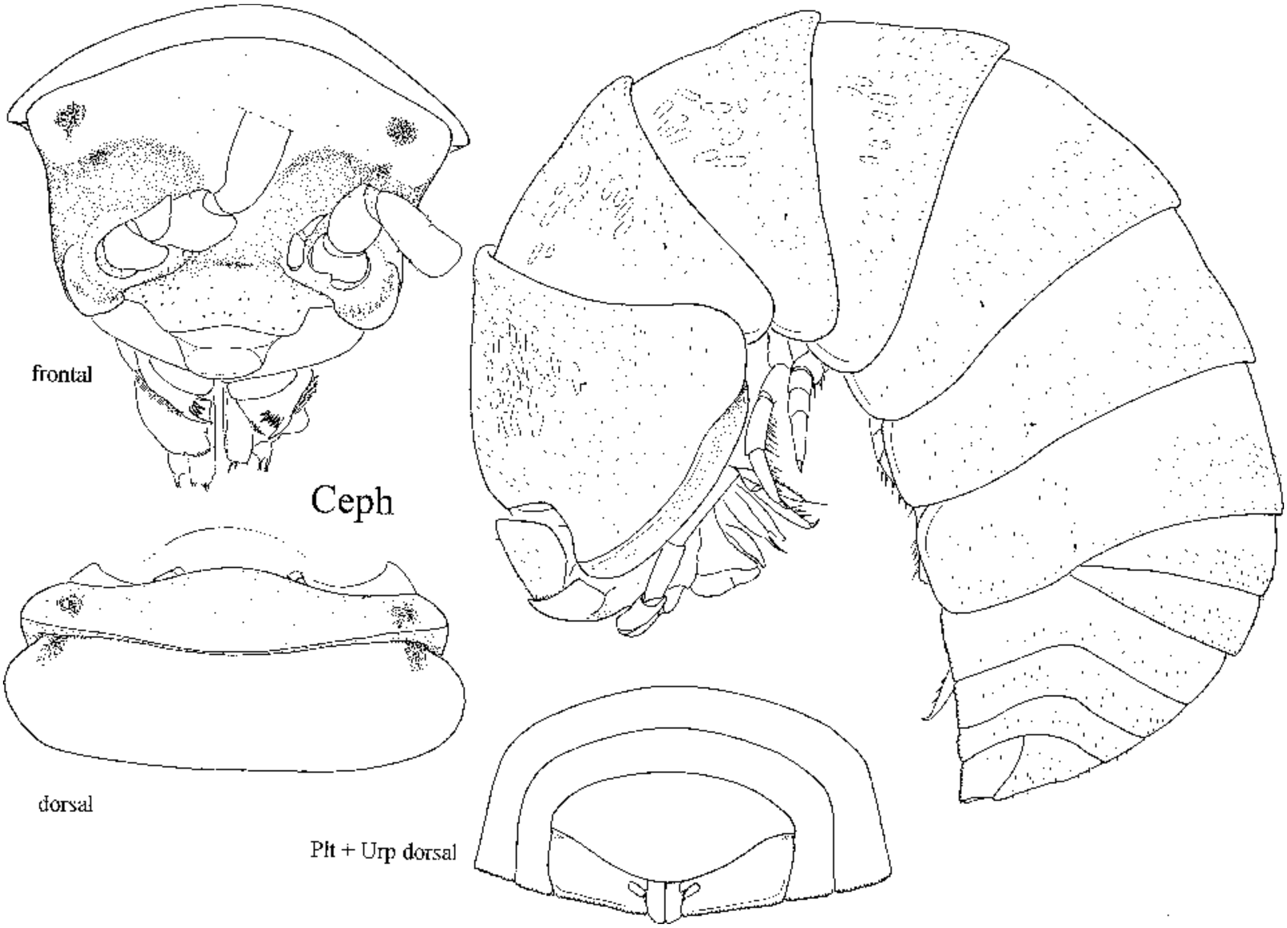

Figure 57. *Spherarmadillo schwarzi* Richardson, 1907: ♀ holotype, 18 × 7.7 mm, cephalothorax frontal and dorsal, pleotelson + uropods dorsal, habitus lateral (Guatemala, Livingston, leg. Schwarz and Barber, April 1906, USNM 33471).

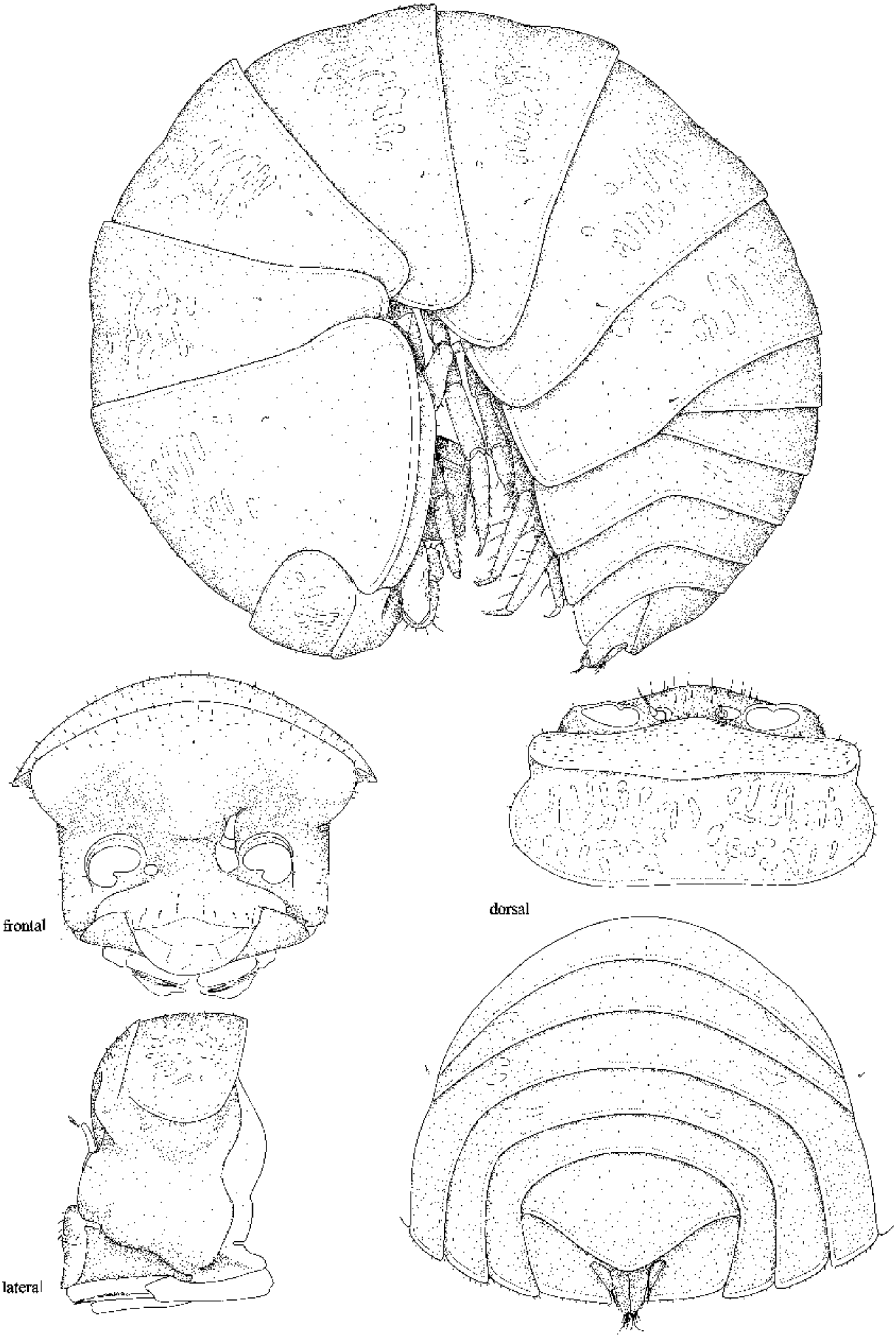

Figure 58. *Spherarmadillo cavernicola* Mulaik, 1960: ♀m, 7.1 × 3.3 mm (cephalothorax 1.85 mm), habitus lateral and pleon dorsal; ♂, 6.4 × 2.5 mm (cephalothorax 1.55 mm), cephalothorax lateral, dorsal, frontal (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441).

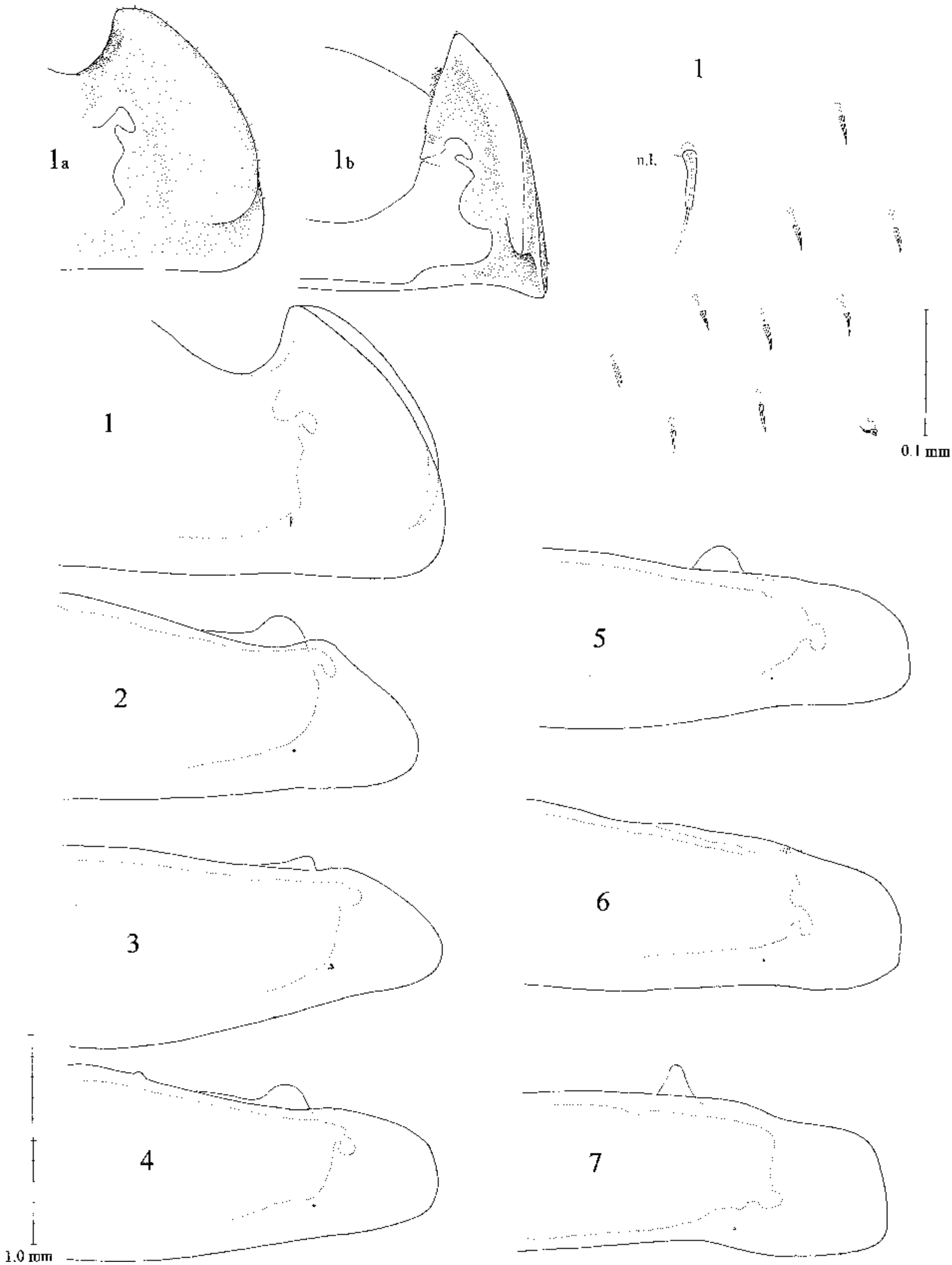

Figure 59. *Spherarmadillo cavernicola* Mulaik, 1960: ♂, 6.4 × 2.5 mm, cephalothorax 1.55 mm, 1a tergite 1 inner face, 1b tergite 1 strictly ventral; tergites 1–7 mounted on a slide, and detail of tergite 1 showing nodulus lateralis and scale-setae (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441).

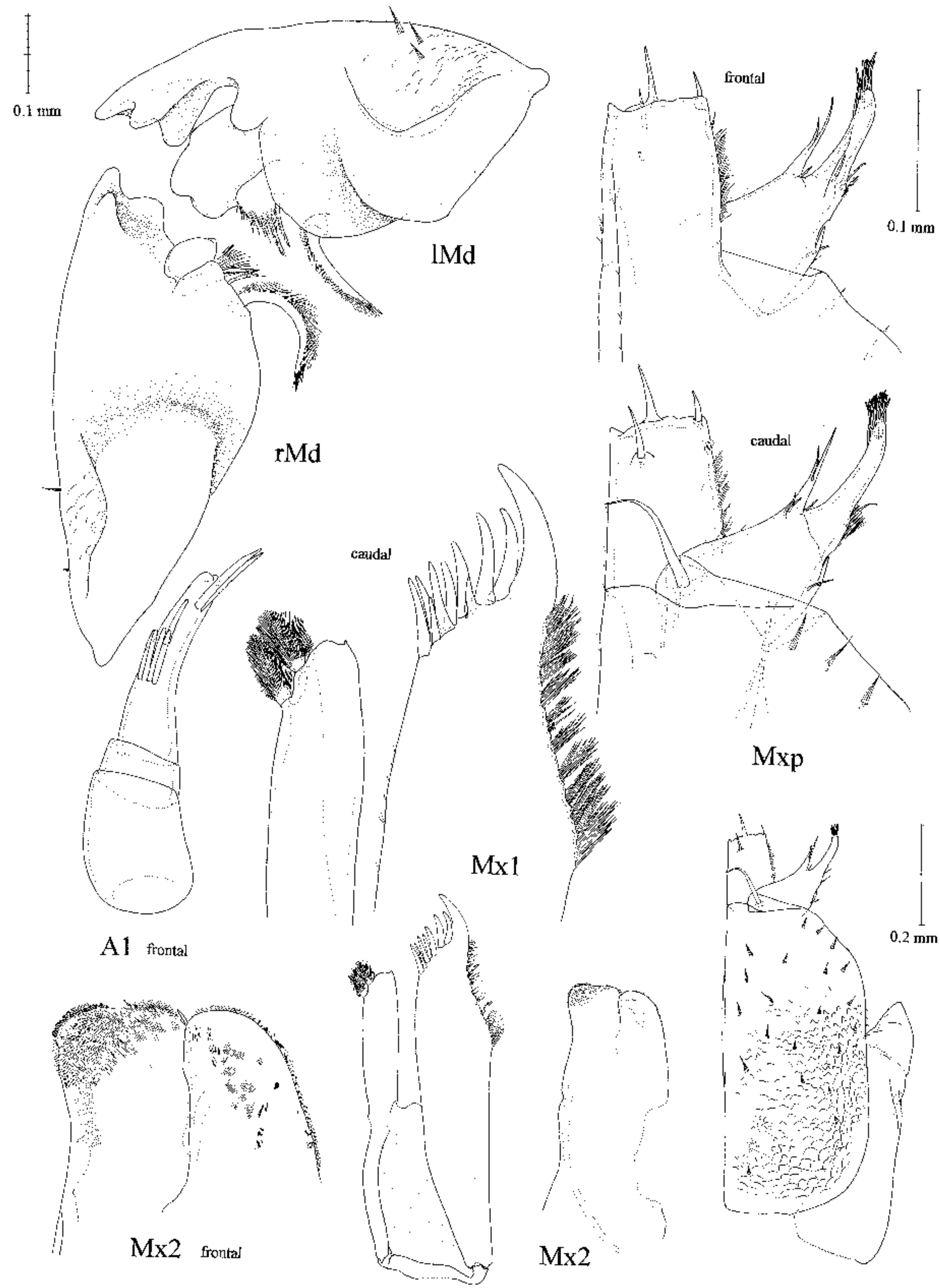

Figure 60. *Spherarmadillo cavernicola* Mulaik, 1960: ♂, 6.4 × 2.5 mm, cephalothorax 1.55 mm, mouthparts and first antenna (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441).

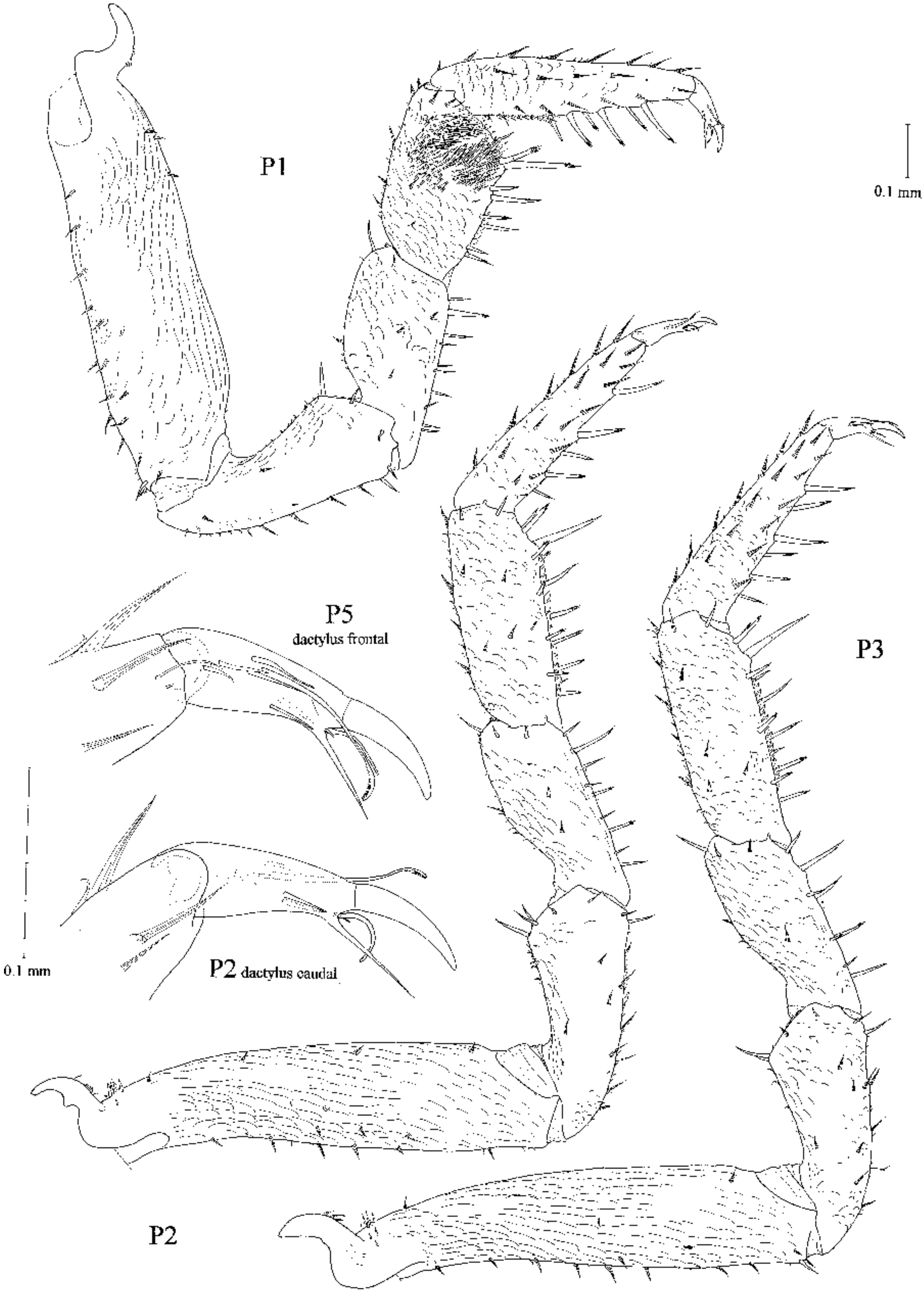

Figure 61. *Spherarmadillo cavernicola* Mulaik, 1960: ♂, 6.4 × 2.5 mm, cephalothorax 1.55 mm, pereiopods 1–3 frontal, pereiopod 6 dactylus frontal, pereiopod 2 dactylus caudal (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441).

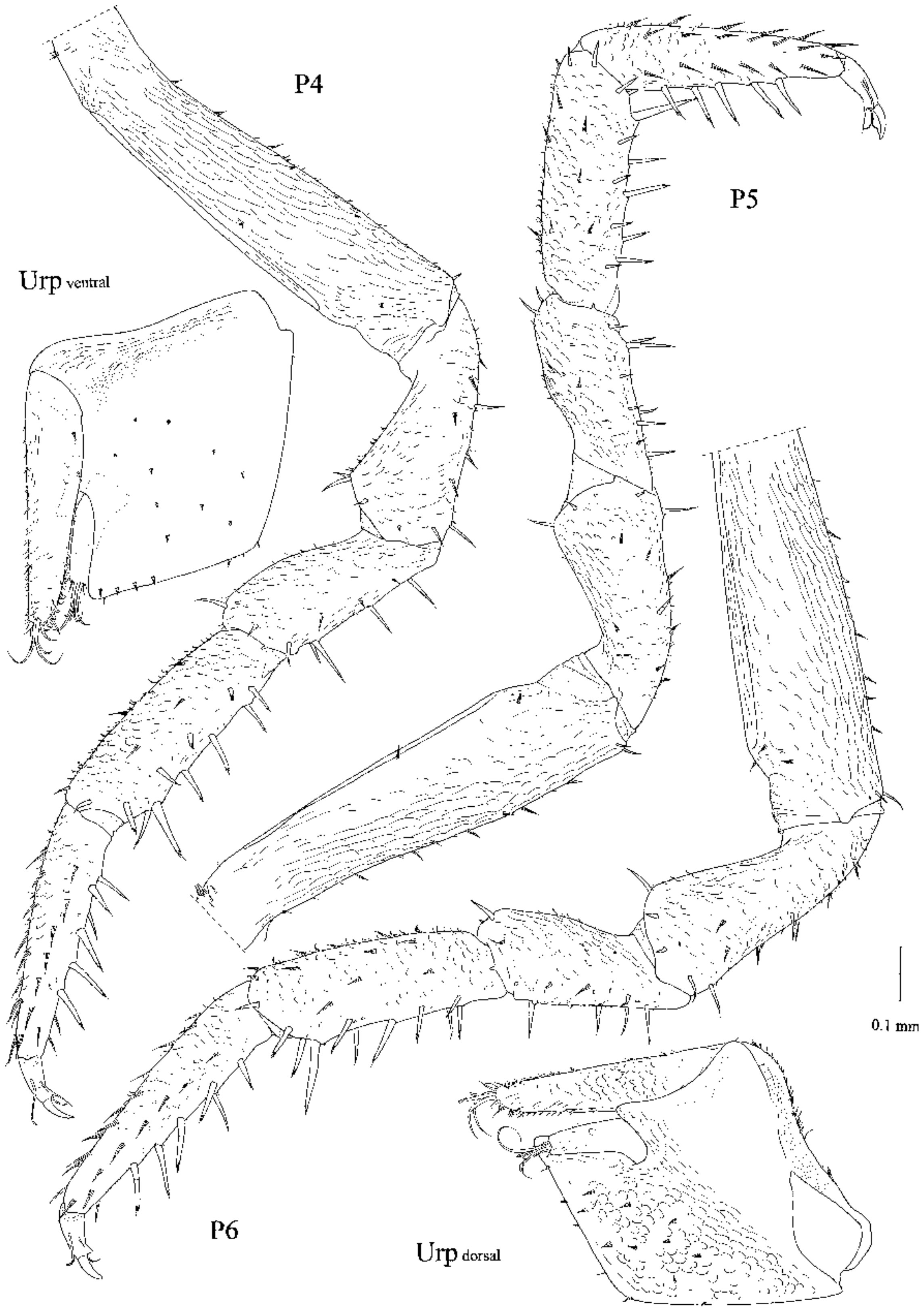

Figure 62. *Spherarmadillo cavernicola* Mulaik, 1960: ♂, 6.4 × 2.5 mm, cephalothorax 1.55 mm, pereiopods 4–6 frontal, uropods dorsal and ventral (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441).

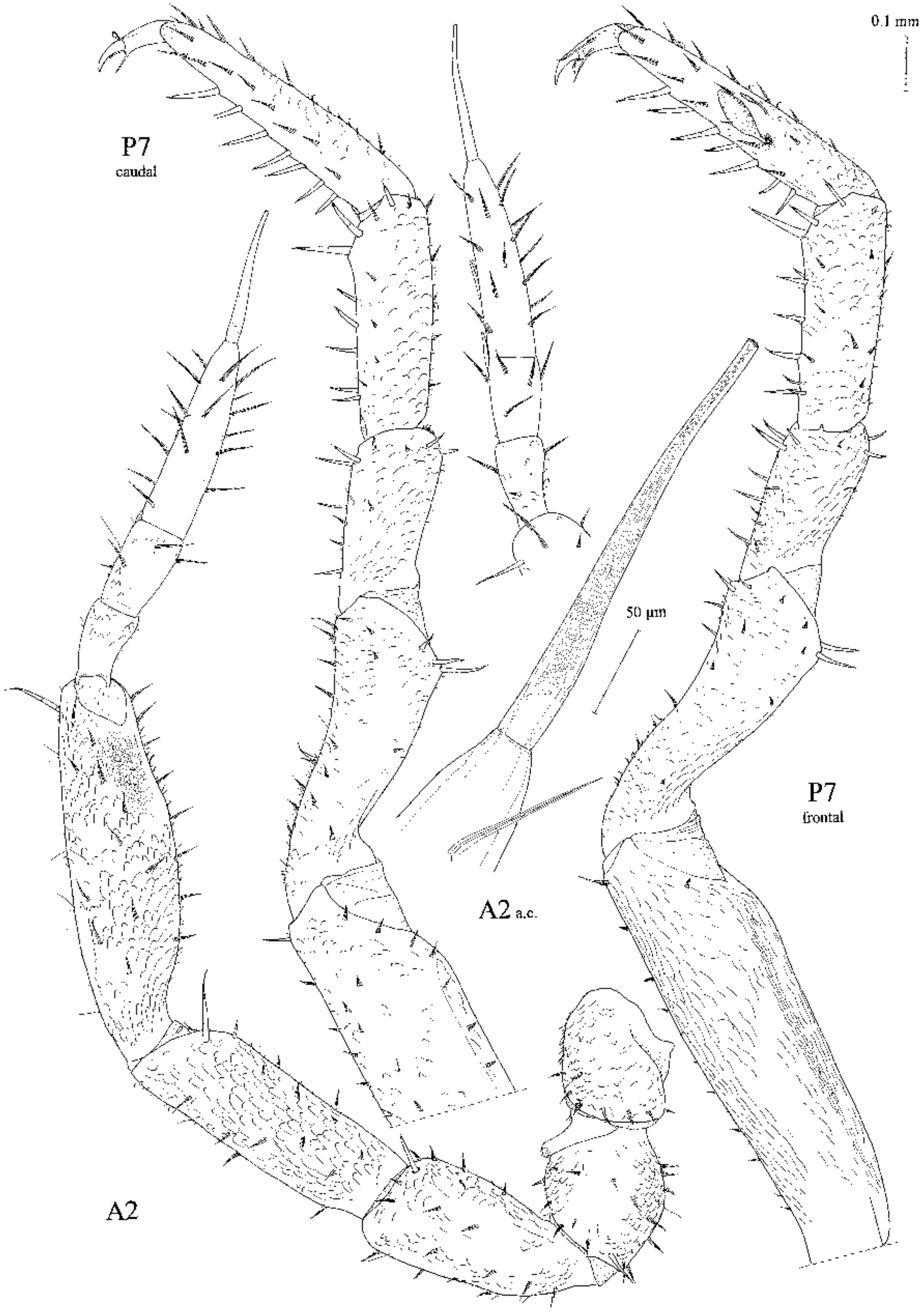

Figure 63. *Spherarmadillo cavernicola* Mulaik, 1960: ♂, 6.4 × 2.5 mm, cephalothorax 1.55 mm, second antenna ventral, flagellum of other second antenna dorsal, apical cone enlarged, pereiopod 7 frontal and caudal (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 110 m, leg. P. Beron, 31 January 1982, MZUF 1441).

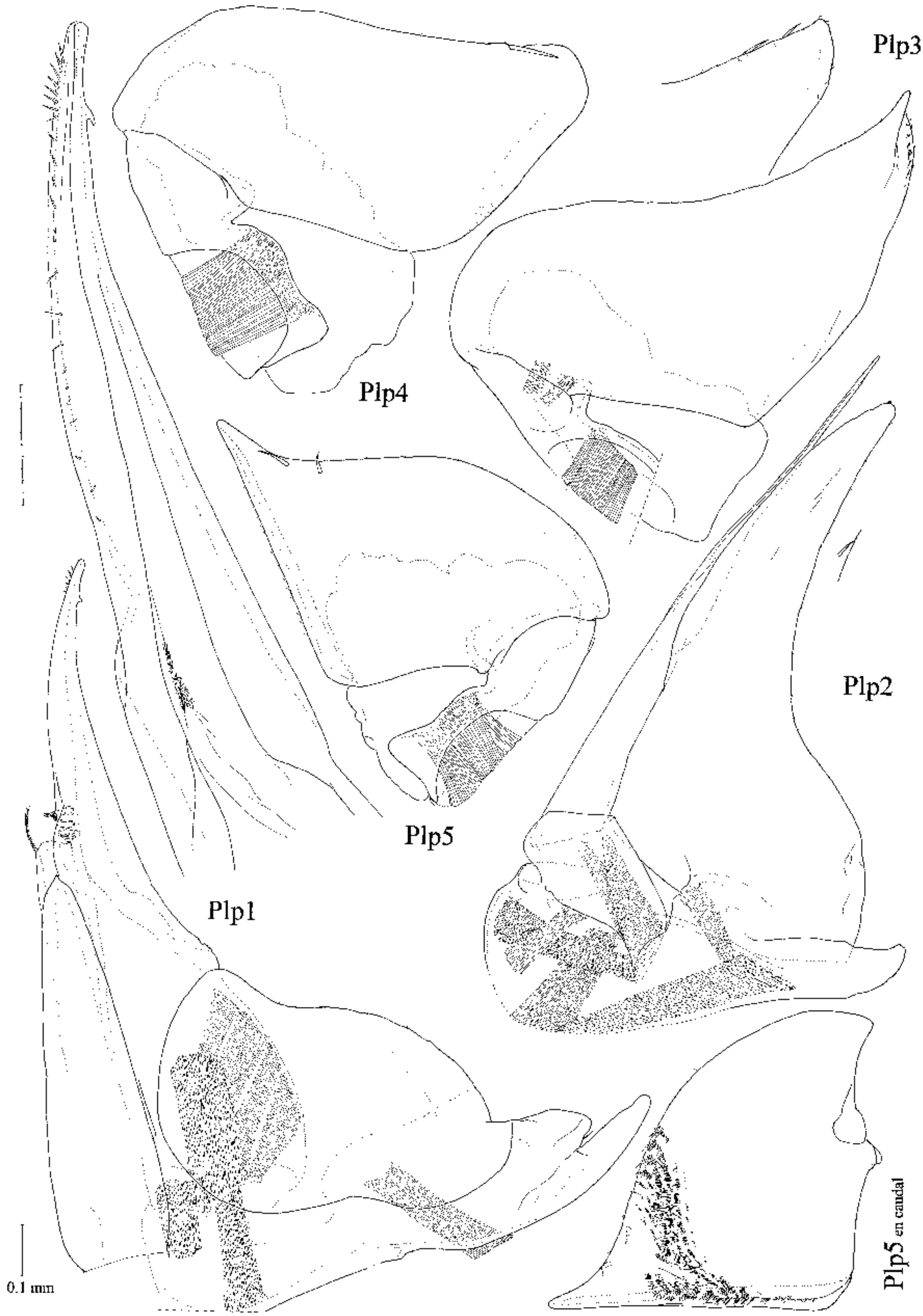

Figure 64. *Spherarmadillo cavernicola* Mulaik, 1960: ♂, 6.4 × 2.5 mm, cephalothorax 1.55 mm, pleopods 1–5; beside pleopods 2 and 3, a detail of the opposite pleopod is given to show the difference (Mexico, Tamaulipas, Rancho del Cielo, cave N. 4, altitude 1100 m, leg. P. Beron, 31 January 1982, MZUF 1441).

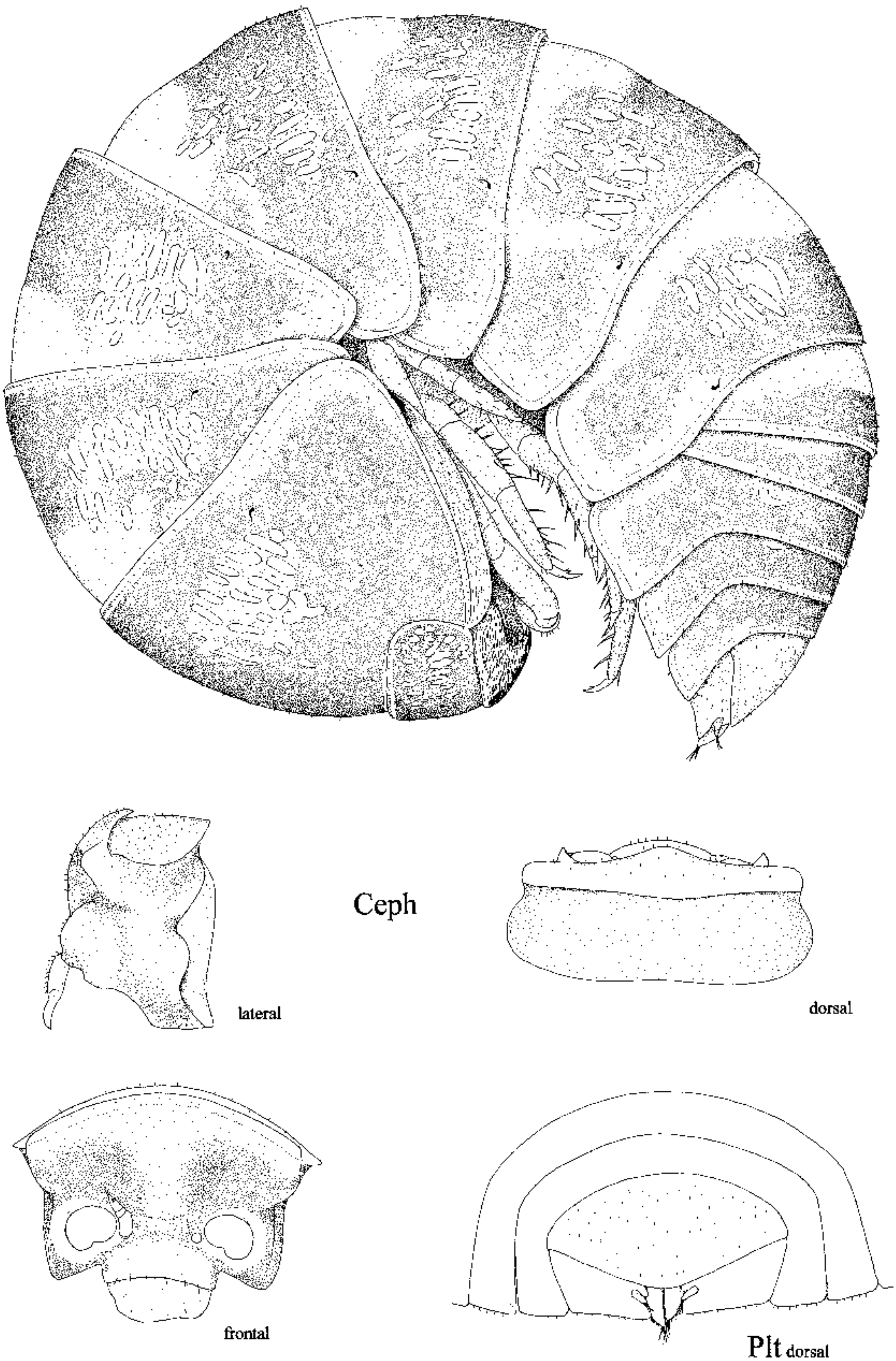

Figure 65. ***Spherarmadillo nebulosus* sp. nov.**: paratype ♀, 9.5 × 4.1 mm, habitus, pleon; ♂, 8.7 × 3.8 mm, cephalothorax (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

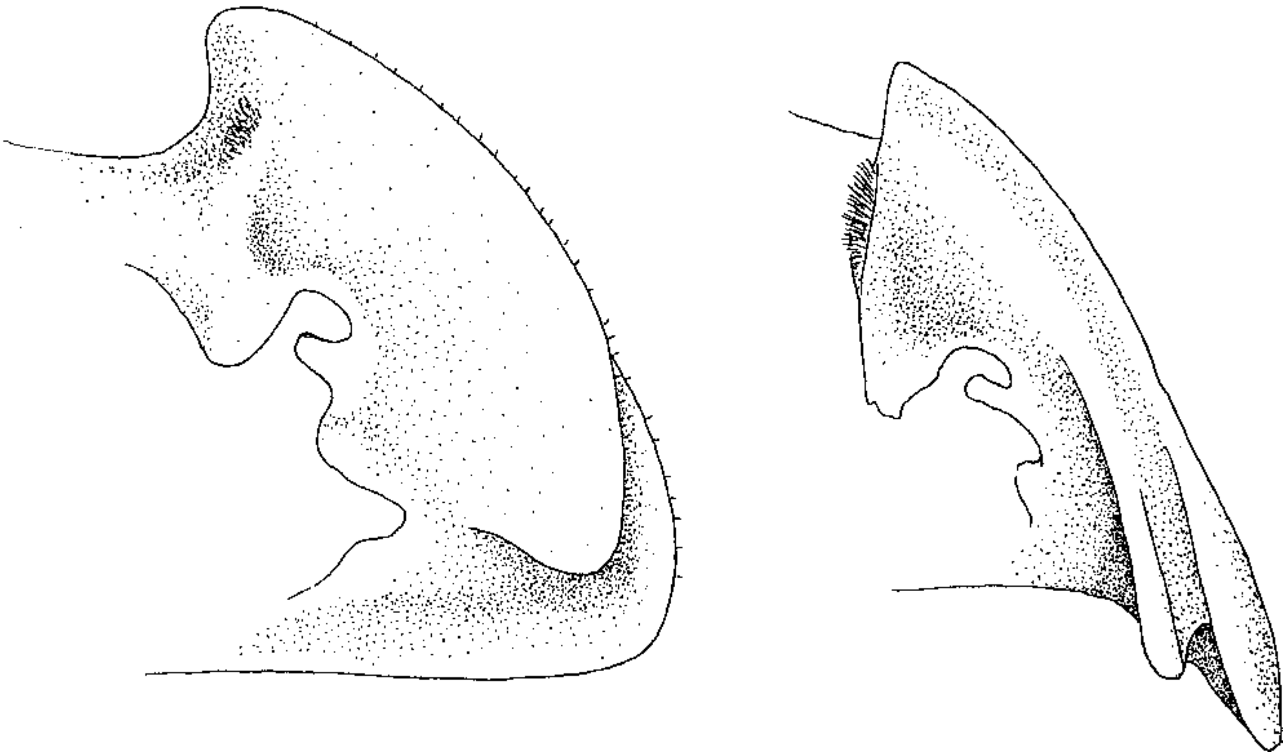

Figure 66. ***Spherarmadillo nebulosus* sp. nov.**: holotype ♂, 8.7 × 3.8 mm, coxal plate 1 (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

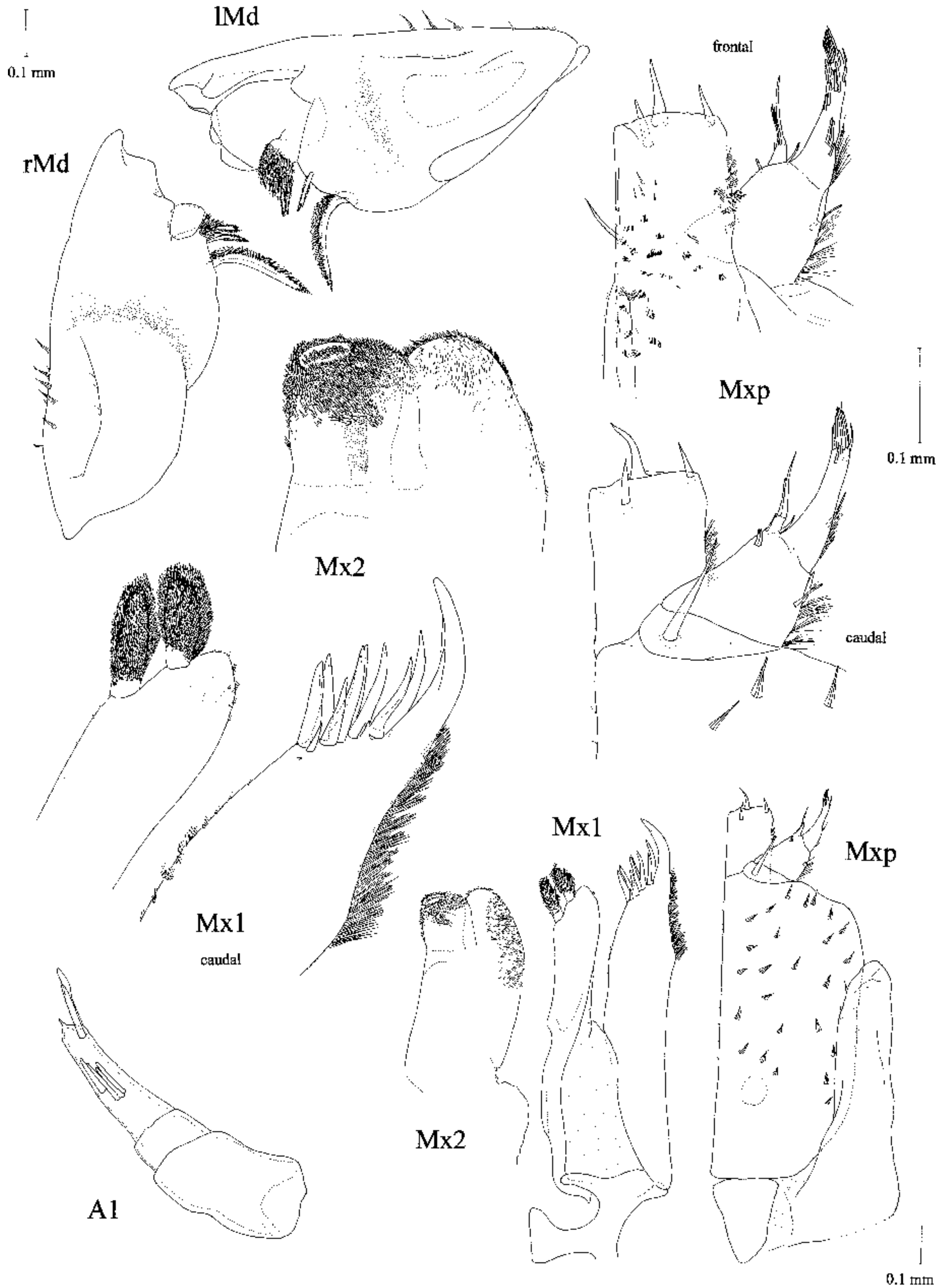

Figure 67. ***Spherarmadillo nebulosus* sp. nov.**: holotype ♂, 8.7 × 3.8 mm, mouthparts, first antenna (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

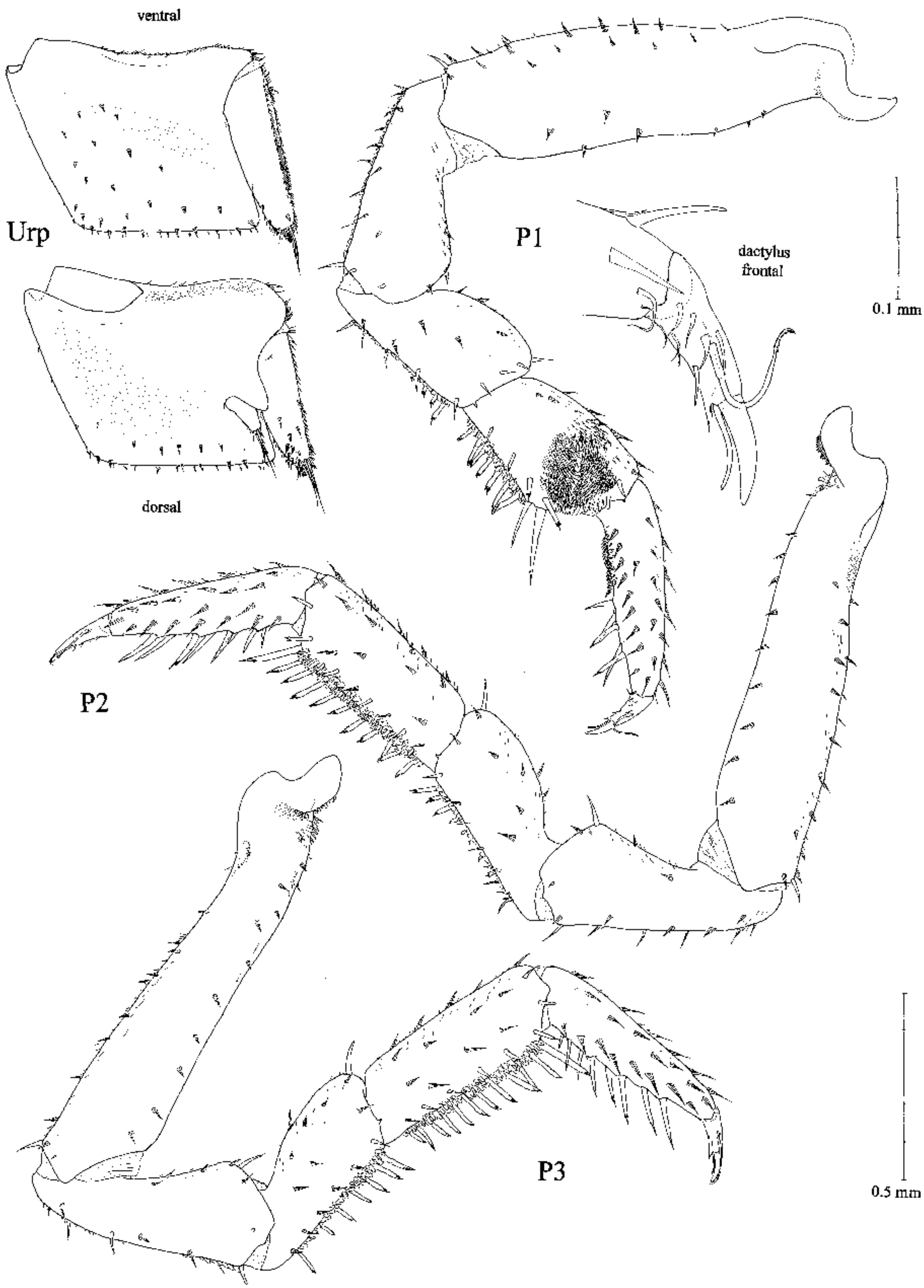

Figure 68. ***Spherarmadillo nebulosus* sp. nov.**: holotype ♂, 8.7 × 3.8 mm, pereiopods 1–3 frontal, uropods (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

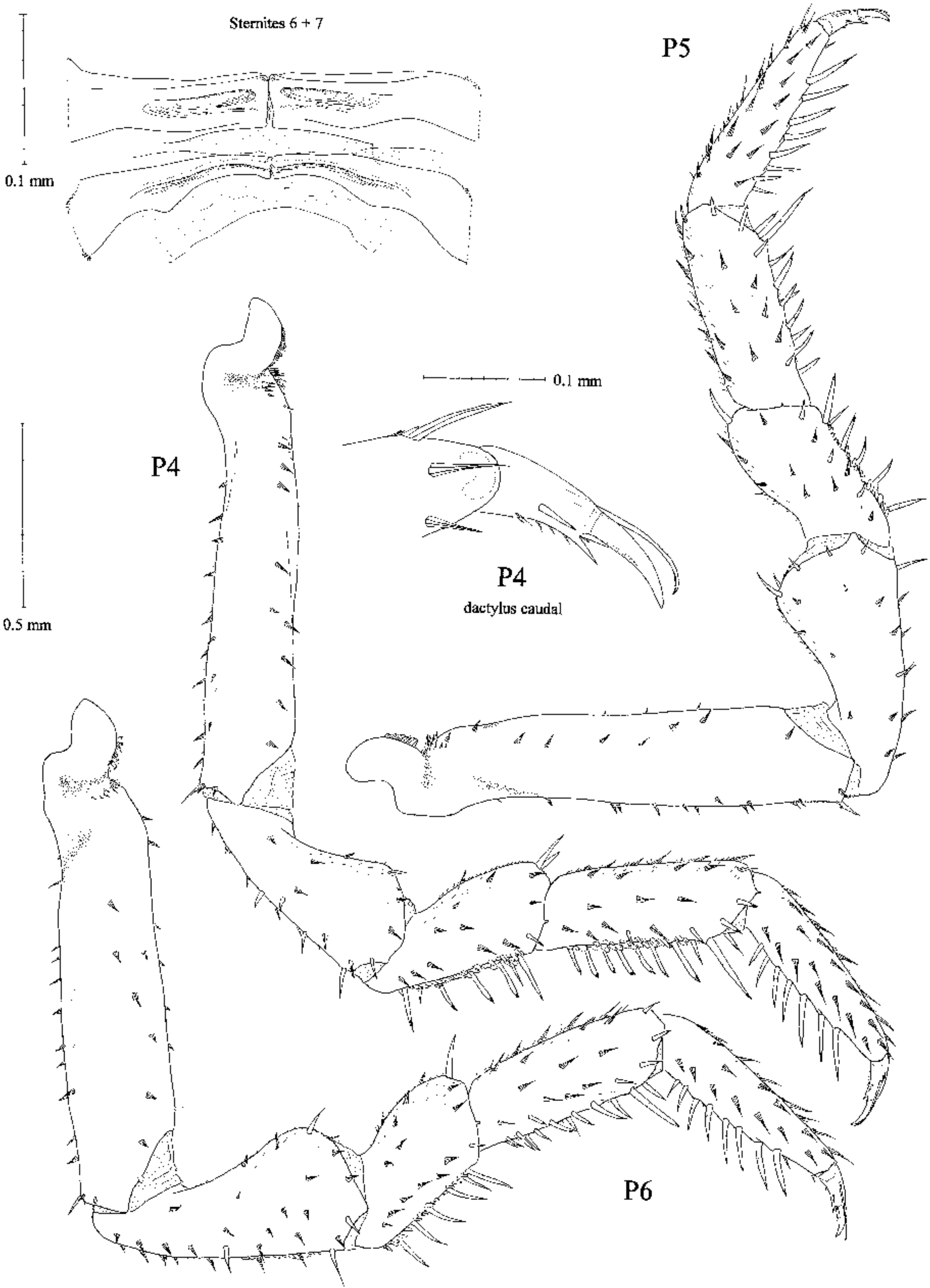

Figure 69. ***Spherarmadillo nebulosus*** **sp. nov.**: holotype ♂, 8.7 × 3.8 mm, pereiopods 4–6 frontal, sternites 6 and 7 (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

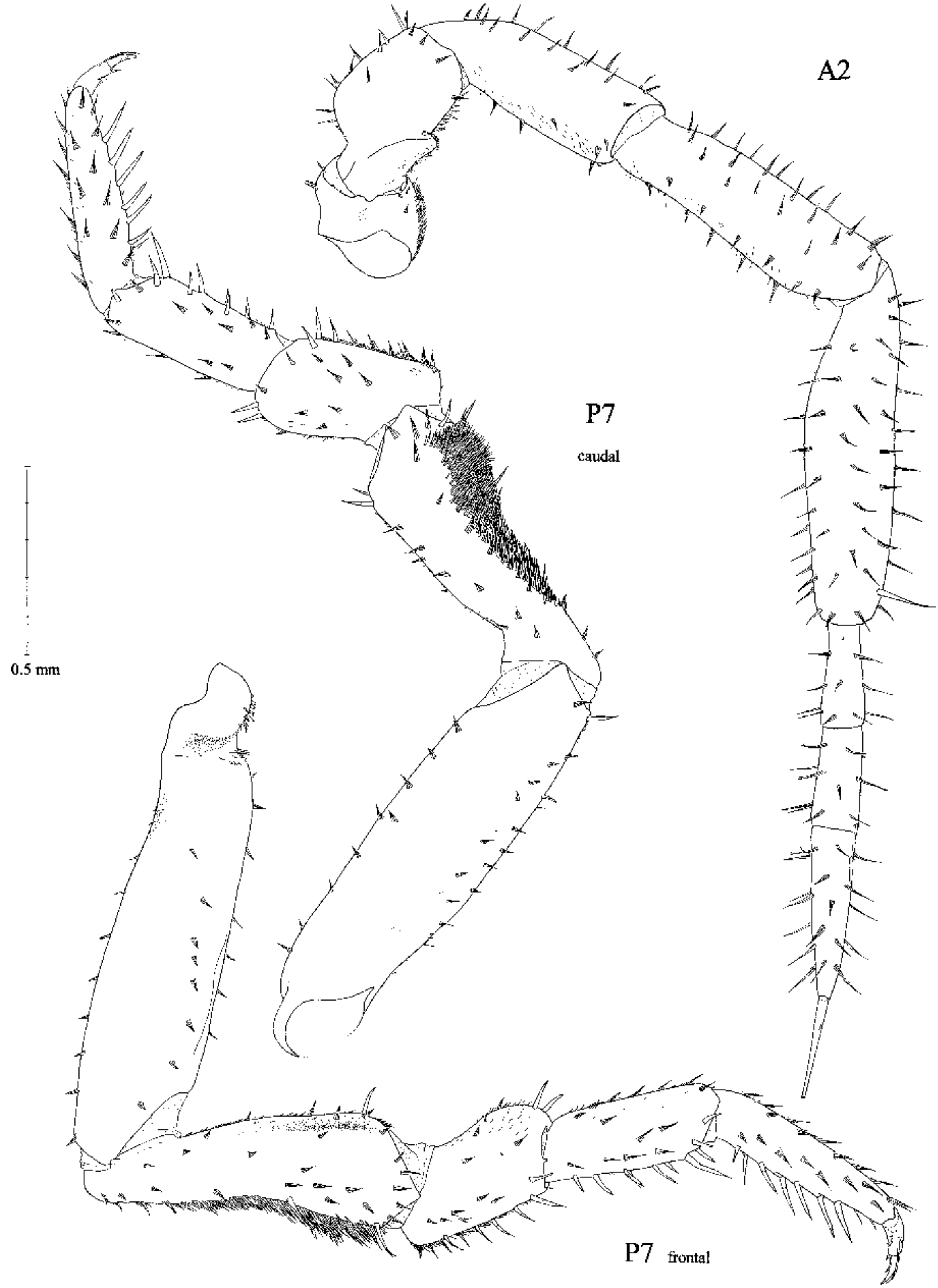

Figure 70. ***Spherarmadillo nebulosus* sp. nov.**: holotype ♂, 8.7 × 3.8 mm, pereiopod 7, second antenna (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

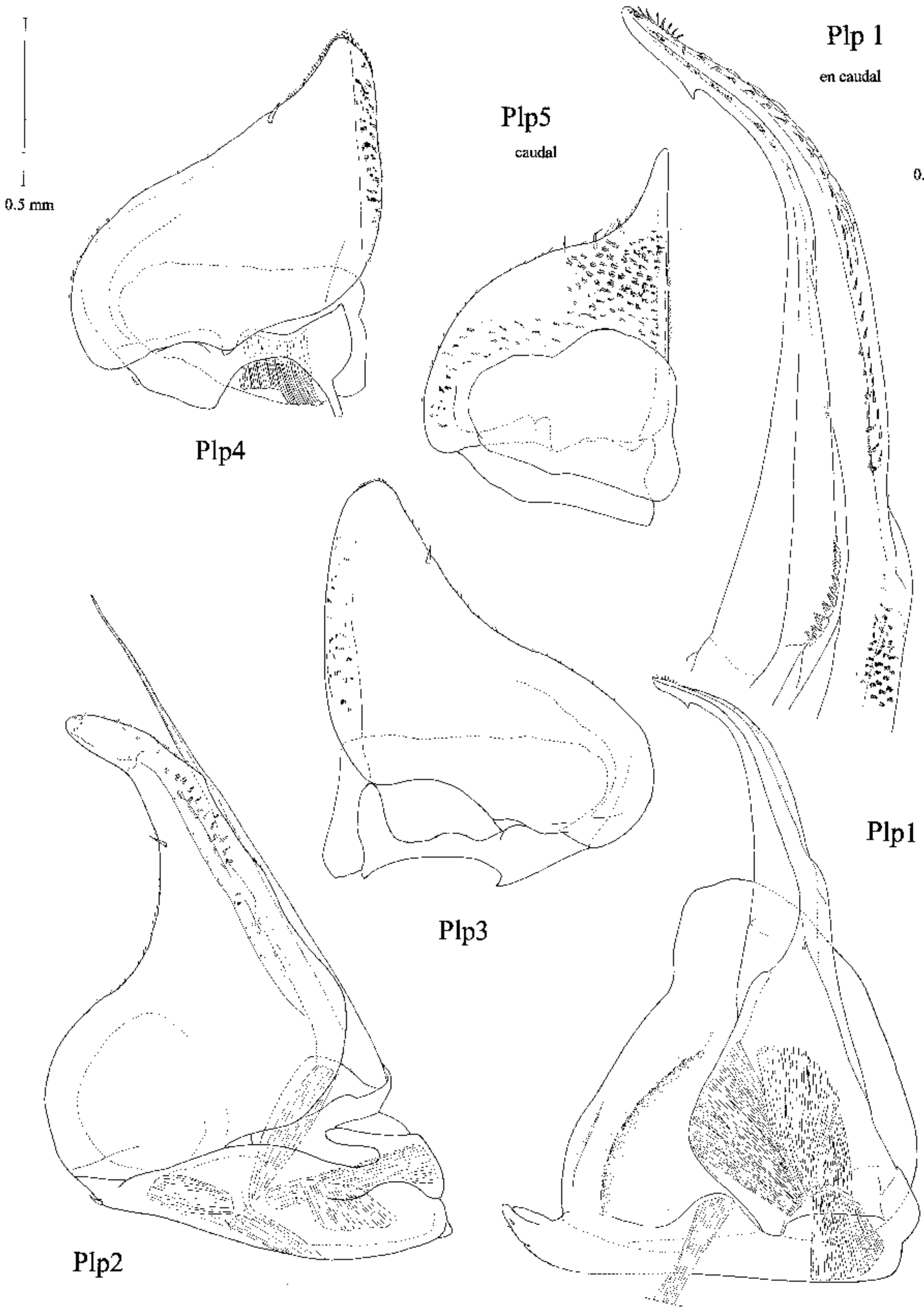

Figure 71. ***Spherarmadillo nebulosus* sp. nov.**: holotype ♂, 8.7 × 3.8 mm, pleopods 1–5 (Venezuela, P. N. Henri Pittier, leg. C. Schmidt, 14 March 1998, UCV).

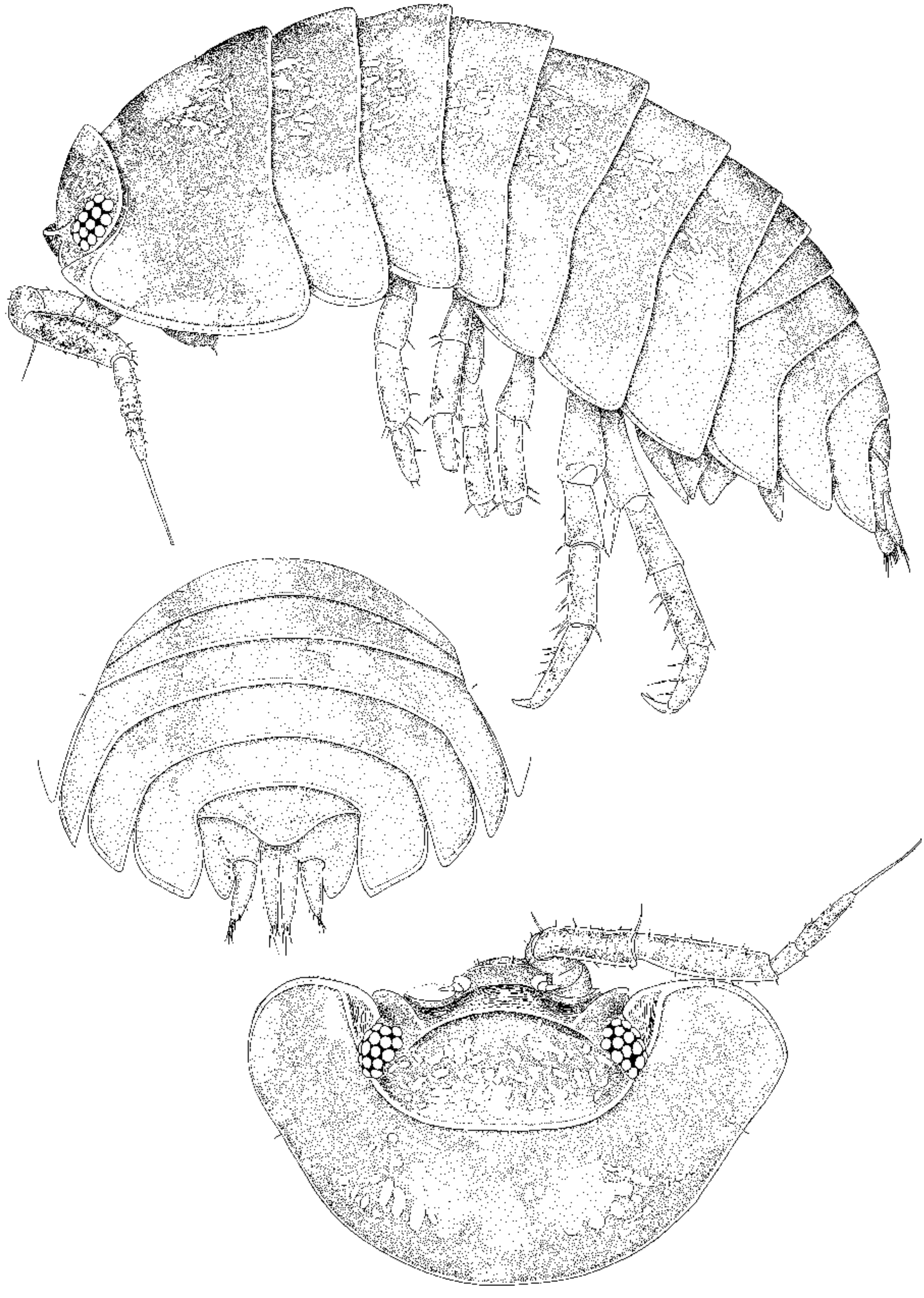

Figure 72. *Colomboscia andina* (Vandel, 1972): holotype ♂, *c*. 3.6 × 2.1 mm (Colombia, Bogotá, altitude 2750 m, leg. H. Sturm, 14 February 1969, MNHN).

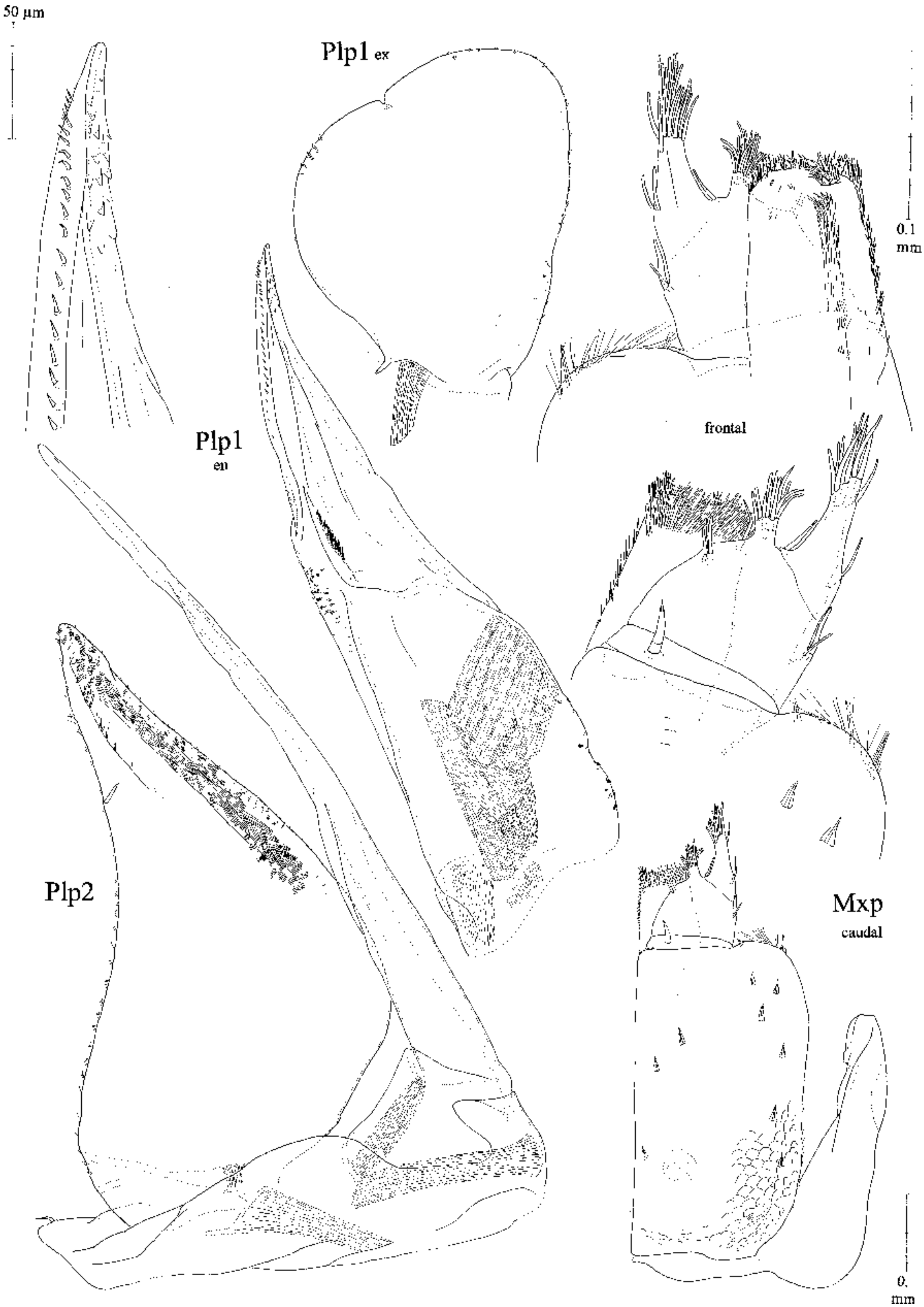

Figure 73. *Colomboscia andina* (Vandel, 1972): holotype ♂, *c.* 3.6 × 2.1 mm, maxilliped, pleopods 1 and 2 (Colombia, Bogotá, altitude 2750 m, leg. H. Sturm, 14 February 1969, MNHN).

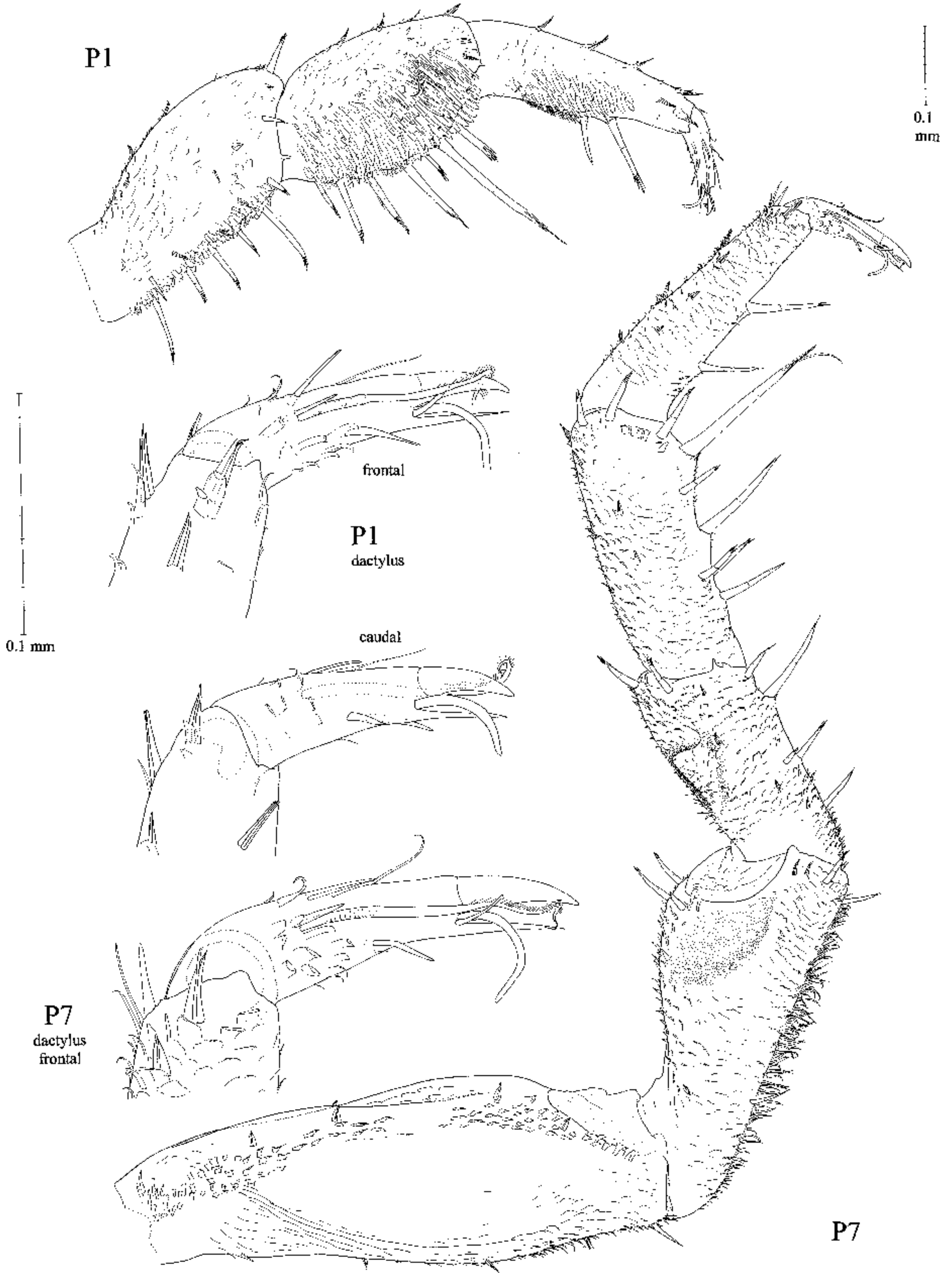

Figure 74. *Colomboscia andina* (Vandel, 1972): holotype ♂, *c.* 3.6 × 2.1 mm, pereiopods 1 and 7 (Colombia, Bogotá, altitude 2750 m, leg. H. Sturm, 14 February 1969, MNHN).

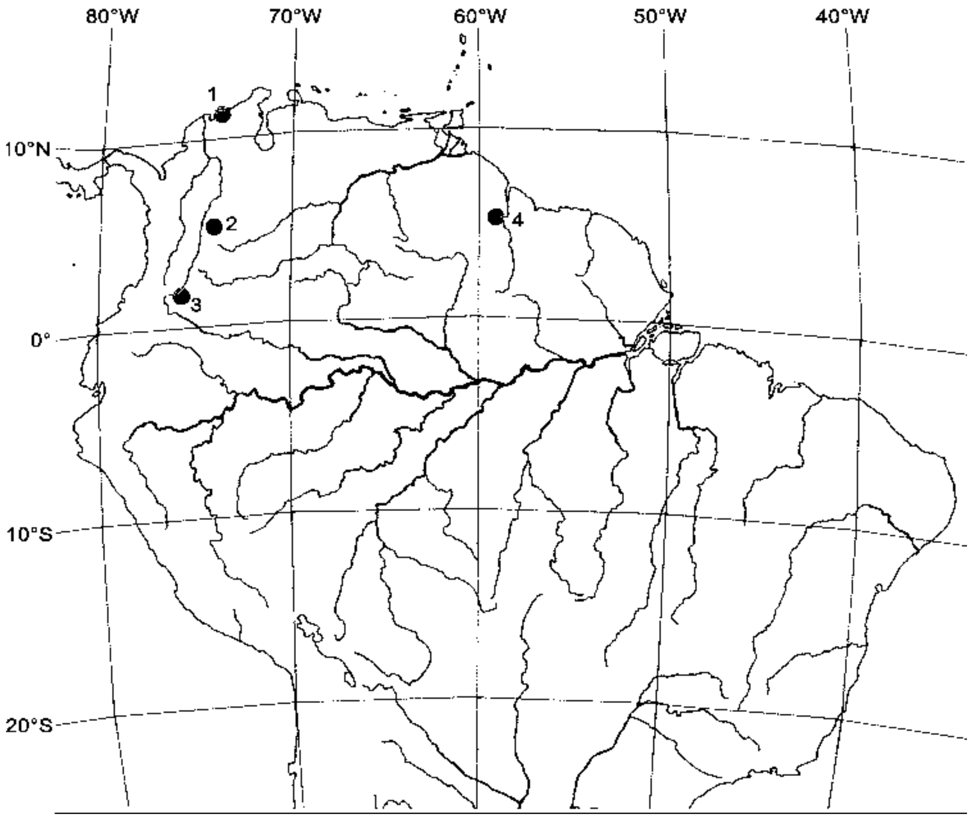

Figure 75. Geographical distribution of *Colomboscia* and *Scleropactoides*: 1, *Colomboscia gaigei*; 2, *C. cordillierae*, *parva*; 3, *andina*; 4. *Scleropactoides curvatus*.

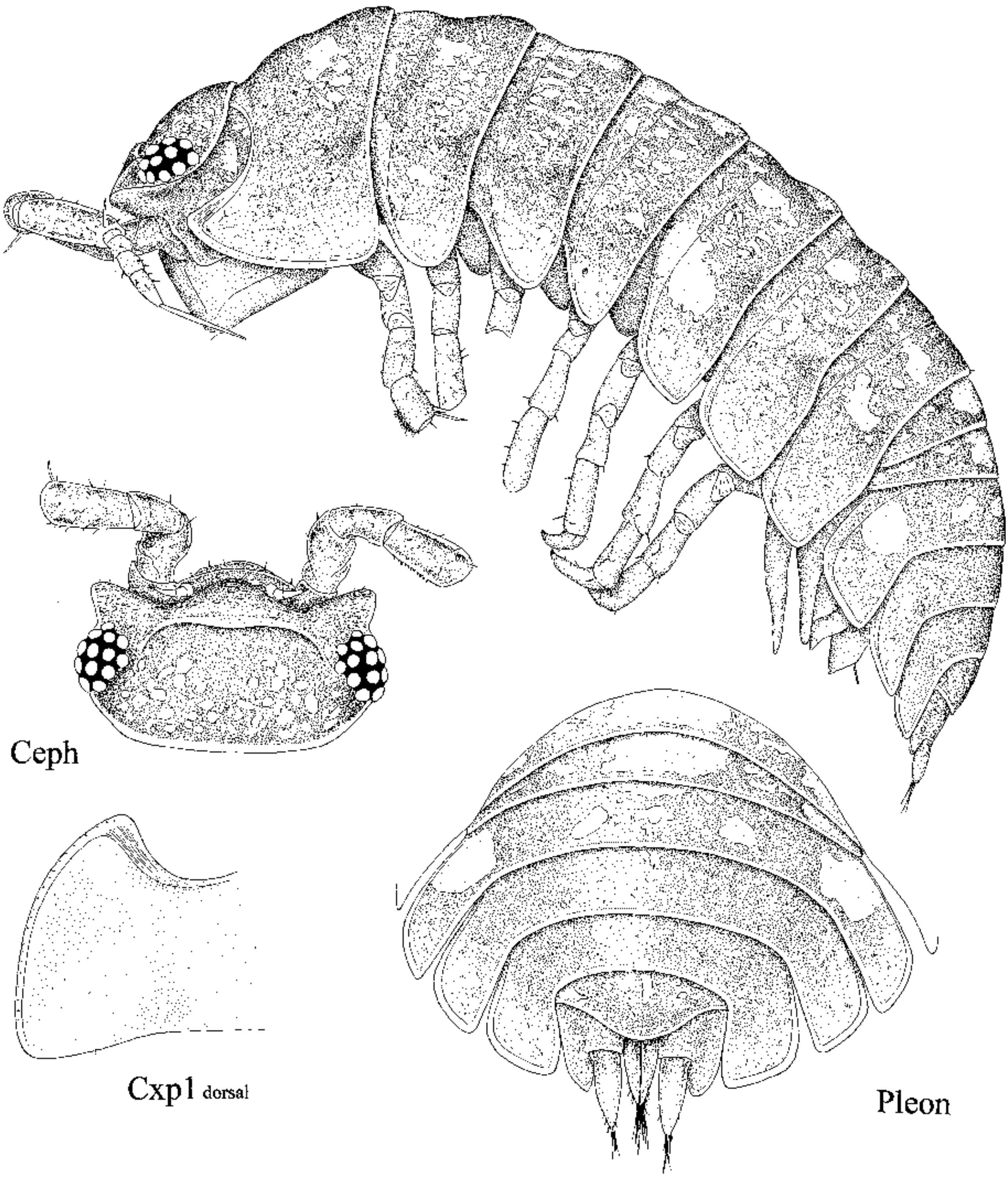

Figure 76. ***Colomboscia parva*** **sp. nov.**: holotype (immature?) ♂, 3.0 × 1.35 mm, cephalothorax 0.76 mm wide (Colombia; Resina montane forest, in leaf litter, leg. H. Sturm, 8 June 1956, MNHN).

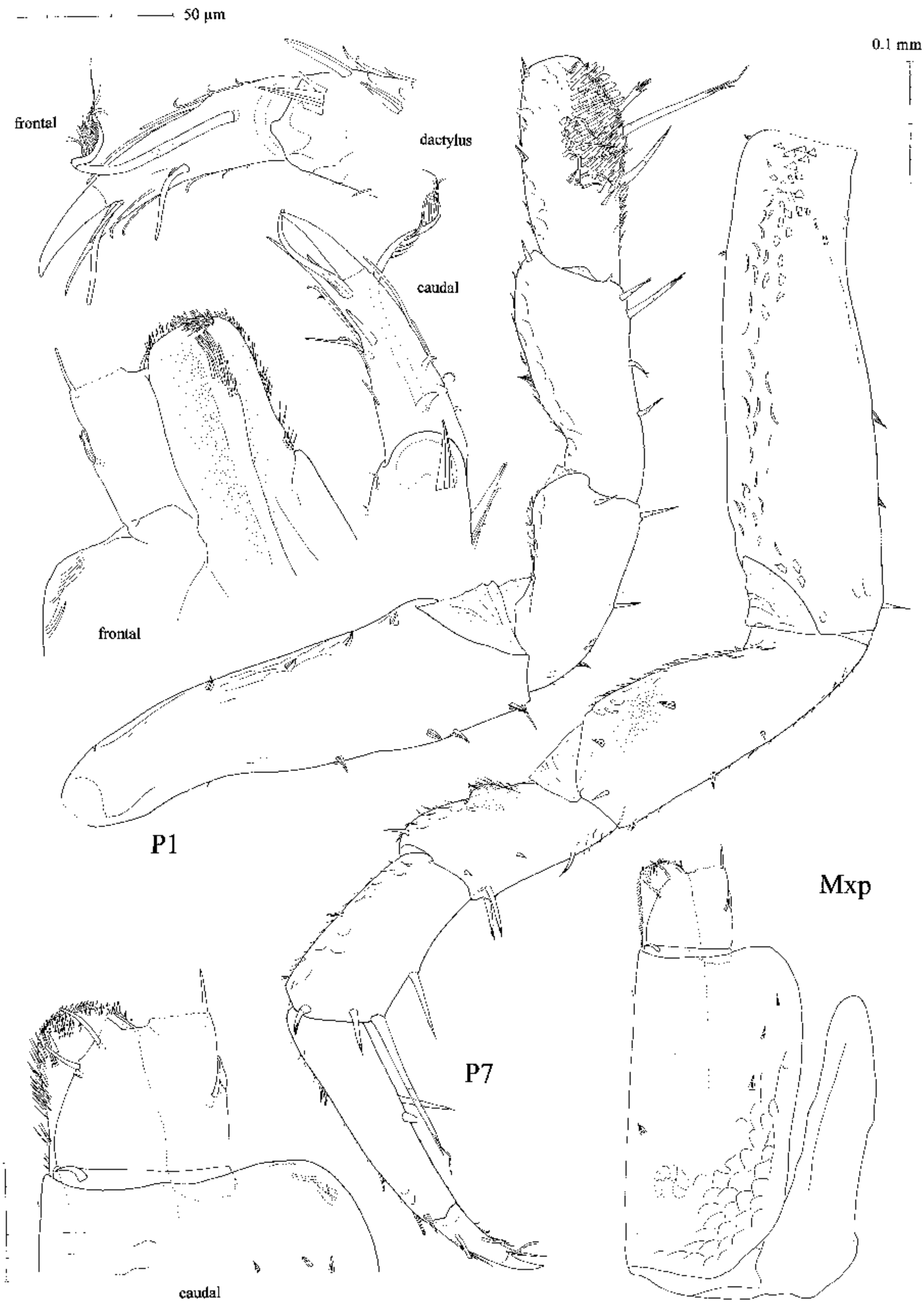

Figure 77. ***Colomboscia parva*** **sp. nov.**: ♂ holotype (immature?), 3.0 × 1.35 mm, maxilliped, pereiopods 1 (propodus and dactylus broken off) and 7 frontal (Colombia; Resina montane forest, in leaf litter, leg. H. Sturm, 8 June 1956, MNHN).

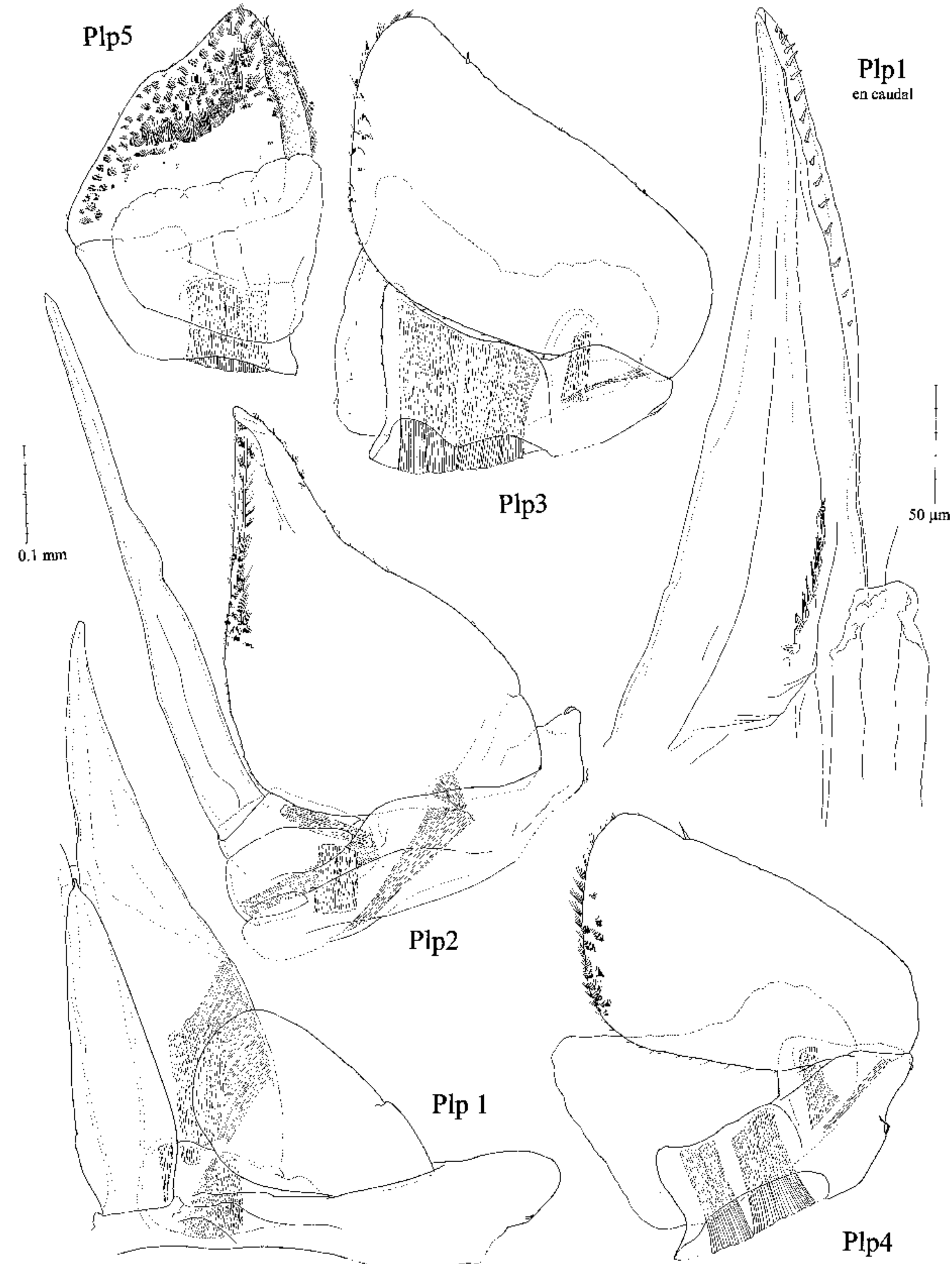

Figure 78. ***Colomboscia parva*** **sp. nov.**: ♂ holotype (immature?), 3.0 × 1.35 mm, pleopods 1–4 frontal, pleopod 4 and endopodite 1 caudal (Colombia; Resina montane forest, in leaf litter, leg. H. Sturm, 8 June 1956, MNHN).

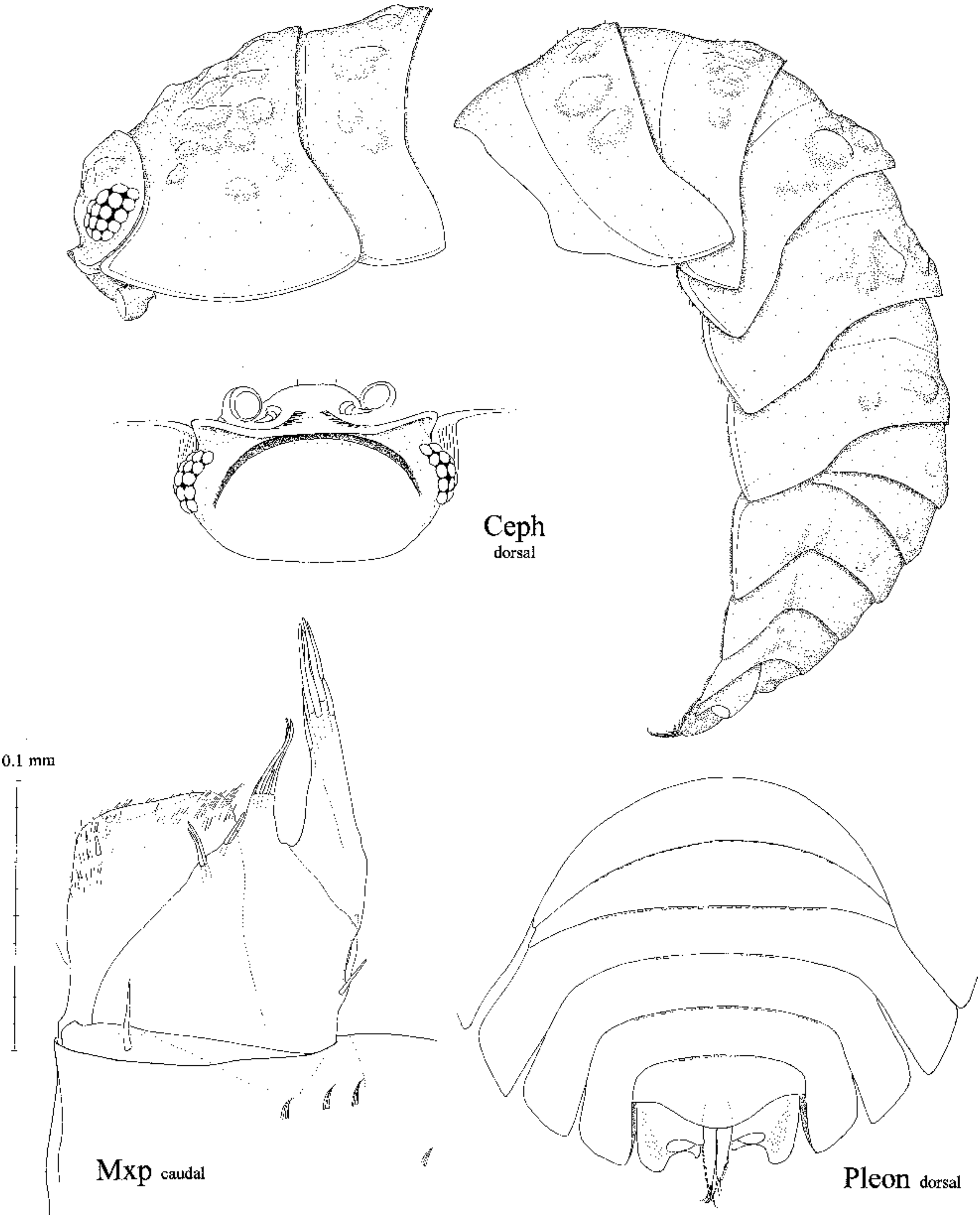

Figure 79. *Colomboscia gaigei* (Pearse, 1915): ♀ patatype, *c.* 4.2 × 2.1 mm (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 2380 m, leg. F. M. Gaige, 23 July 1913, USNM 47946).

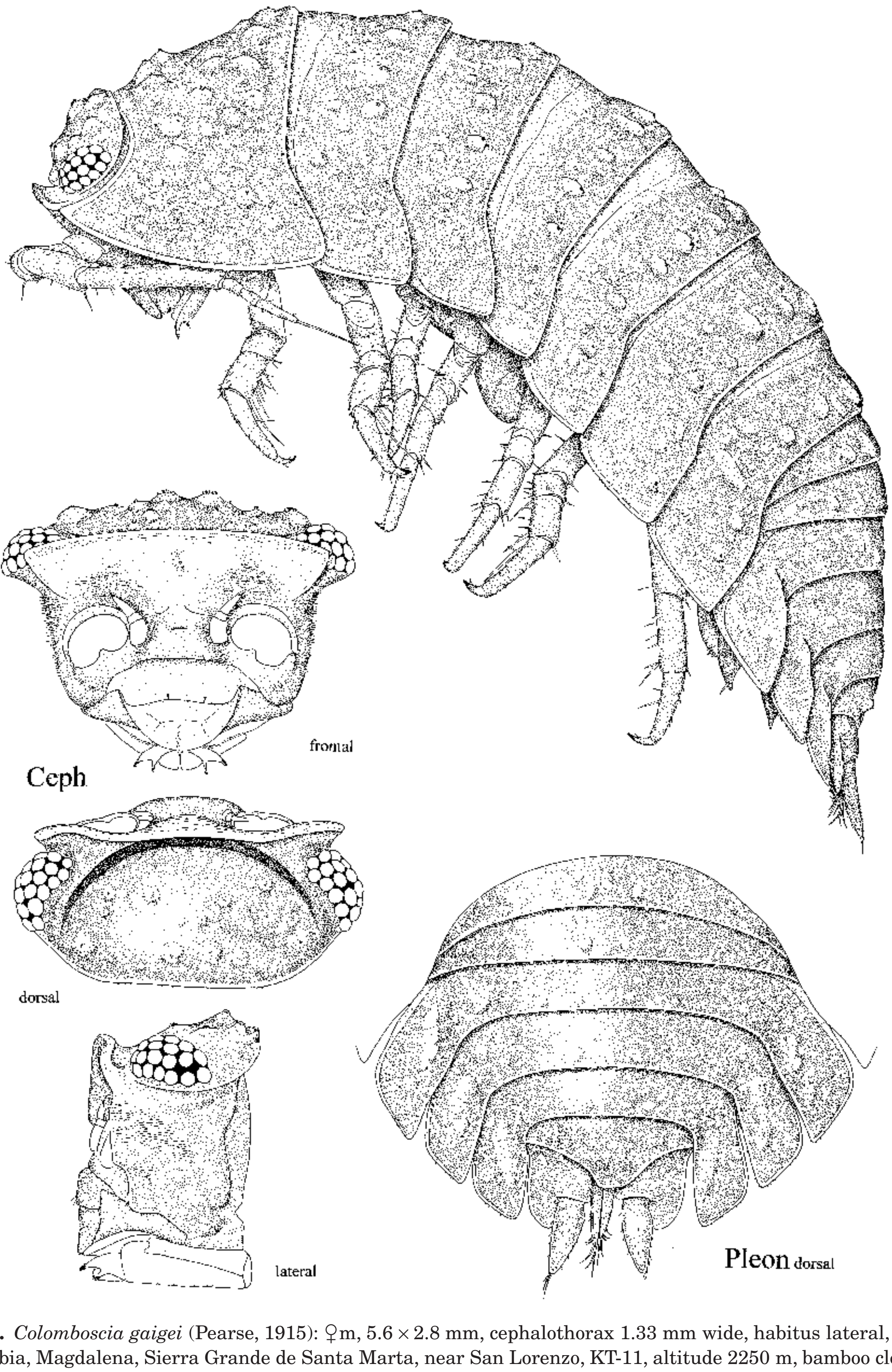

Figure 80. *Colomboscia gaigei* (Pearse, 1915): ♀m, 5.6 × 2.8 mm, cephalothorax 1.33 mm wide, habitus lateral, pleon dorsal (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-11, altitude 2250 m, bamboo cloud forest, in leaf litter, leg. H. G. Müller, 24 August 1985, SMF 19383); ♂, 4.6 × 2.4 mm, cephalothorax 1.25 mm wide, cephalothorax (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381).

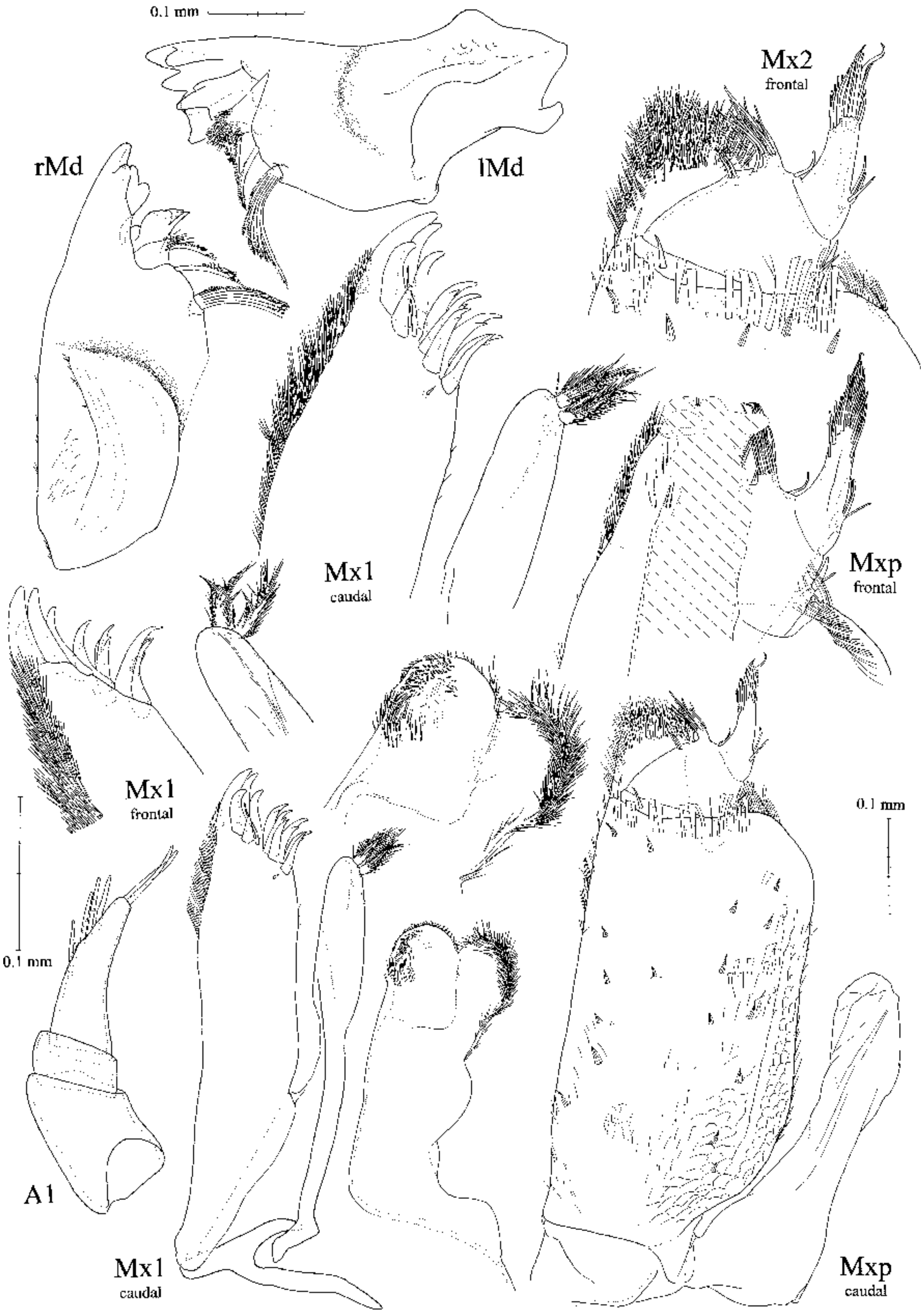

Figure 81. *Colomboscia gaigei* (Pearse, 1915): ♂, 4.6 × 2.4 mm, cephalothorax 1.25 mm wide, mouthparts, first antenna (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381).

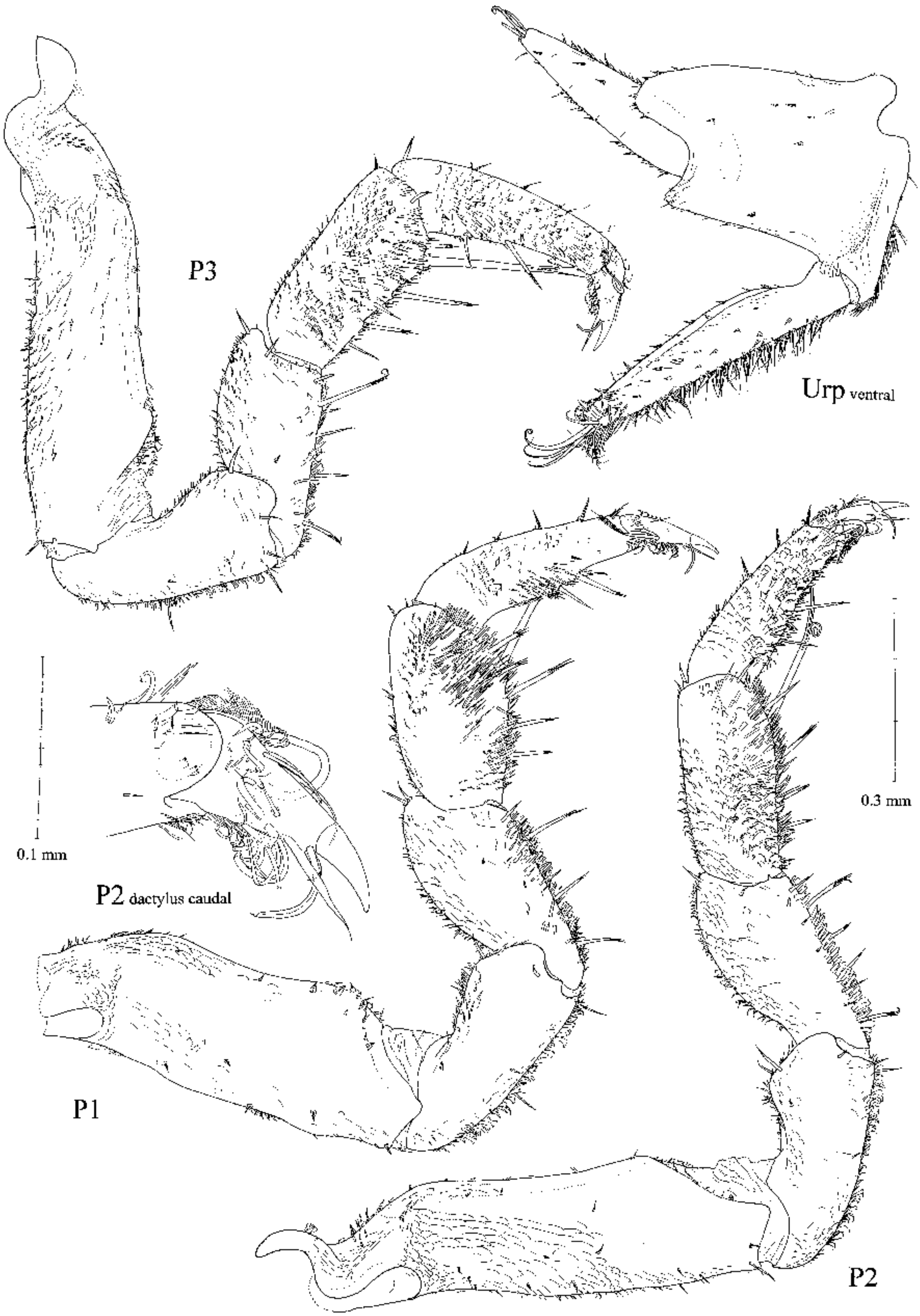

Figure 82. *Colomboscia gaigei* (Pearse, 1915): ♂, 4.6 × 2.4 mm, cephalothorax 1.25 mm wide, pereiopods 1–3, pereiopod 2 dactylus caudal, uropod ventral (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381).

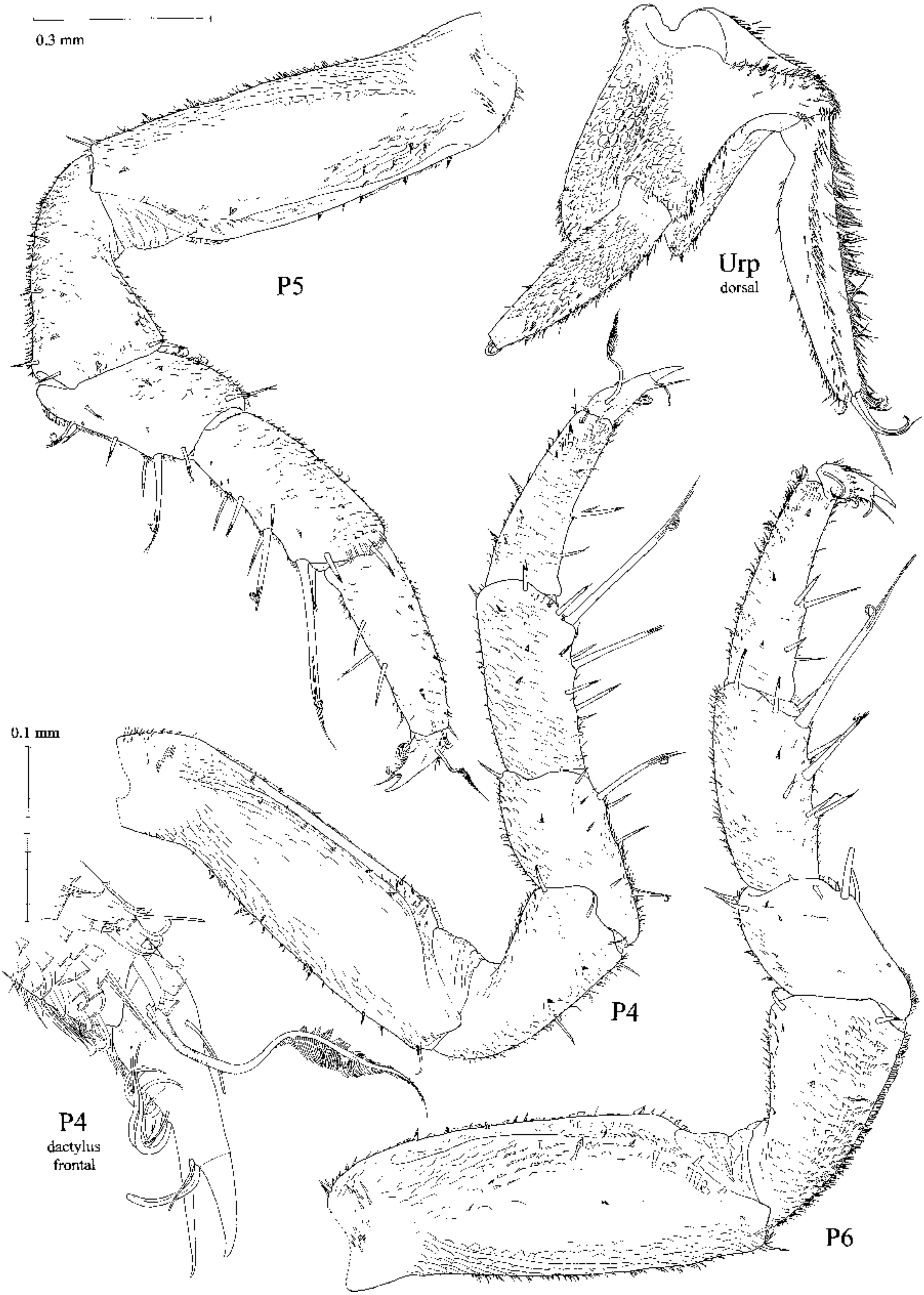

Figure 83. *Colomboscia gaigei* (Pearse, 1915): ♂, 4.6 × 2.4 mm, cephalothorax 1.25 mm wide, pereiopods 4–6, pereiopod 4 dactylus frontal, uropod dorsal (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381).

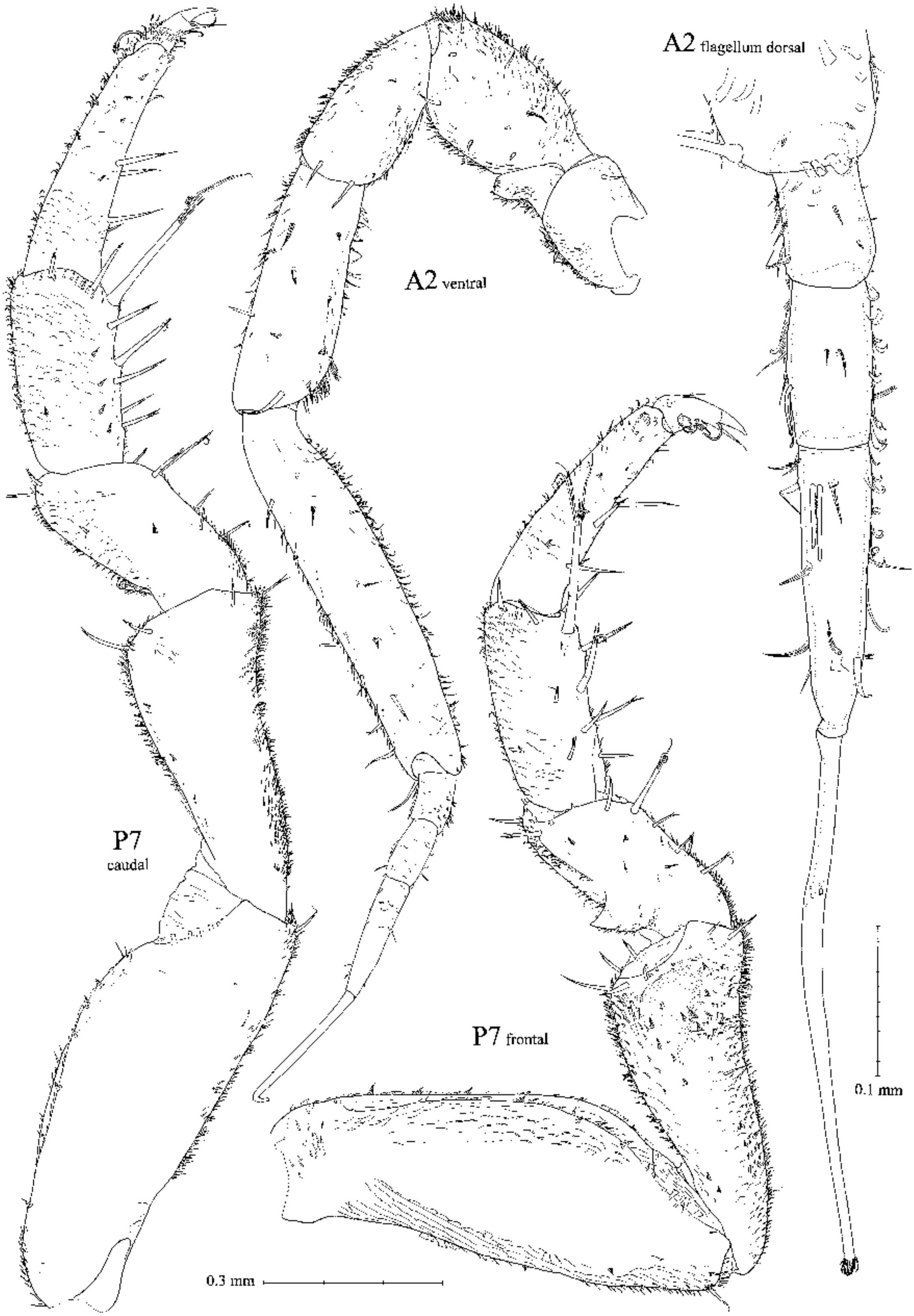

Figure 84. *Colomboscia gaigei* (Pearse, 1915): ♂, 4.6 × 2.4 mm, cephalothorax 1.25 mm wide, pereiopod 7, second antenna (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381).

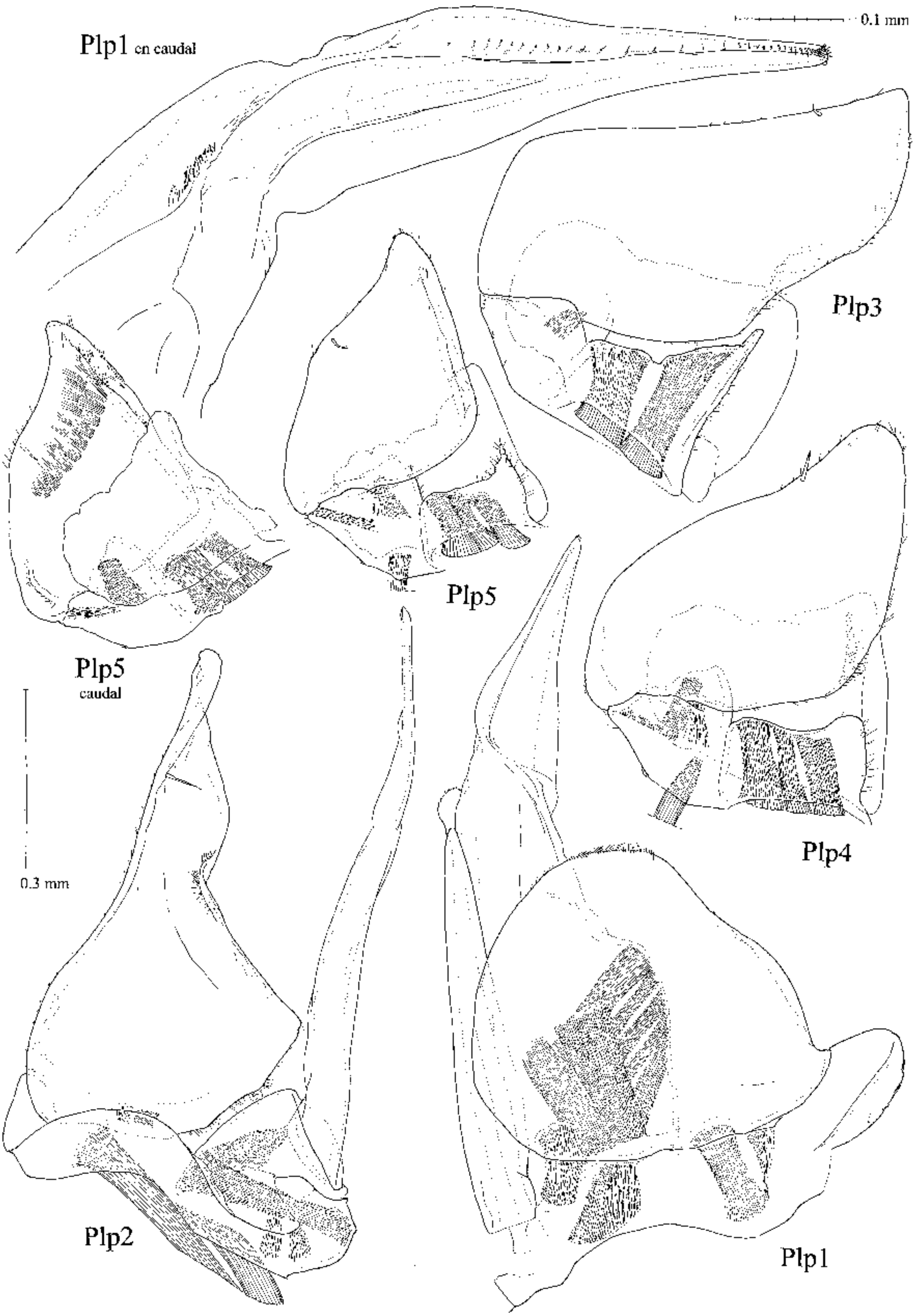

Figure 85. *Colomboscia gaigei* (Pearse, 1915): ♂, 4.6 × 2.4 mm, cephalothorax 1.25 mm wide, pleopods 1–5 (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Lorenzo, KT-10, altitude 2250 m, bamboo cloud forest, from moss and litter, leg. H. G. Müller, 22 August 1985, SMF 19381).

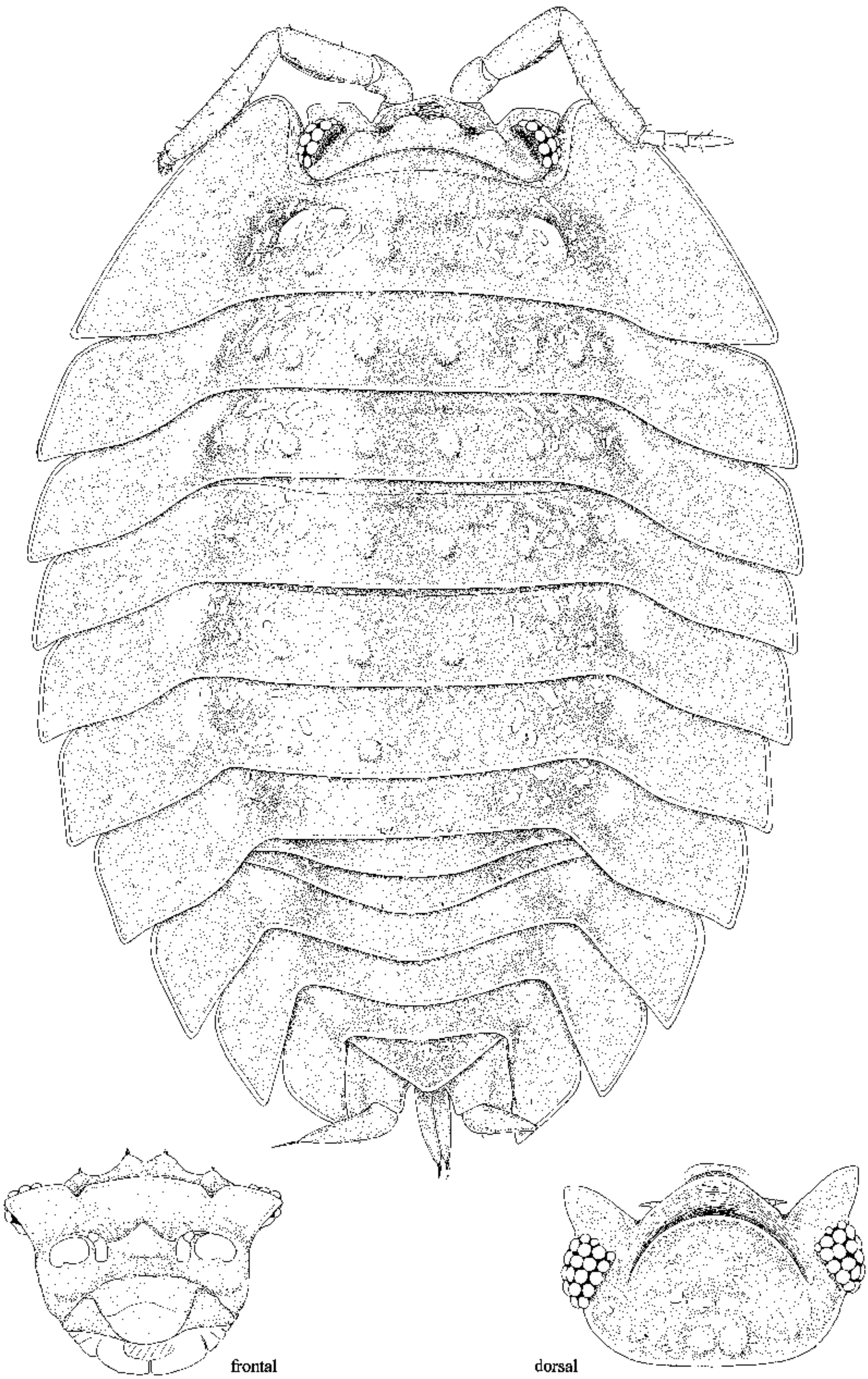

Figure 86. *Colomboscia cordillerae* Vandel, 1972: paralectotype ♀, 4.0 × 3.0 mm, habitus and cephalothorax dorsal; ♀, 4.0 × 2.5 mm, cephalothorax frontal (Colombia, Resina, *c.* 35 km north-north-west of Florencia, montan forest, altitude 1800–2300 m, leg. H. Sturm, 6 August 1956, MNHN).

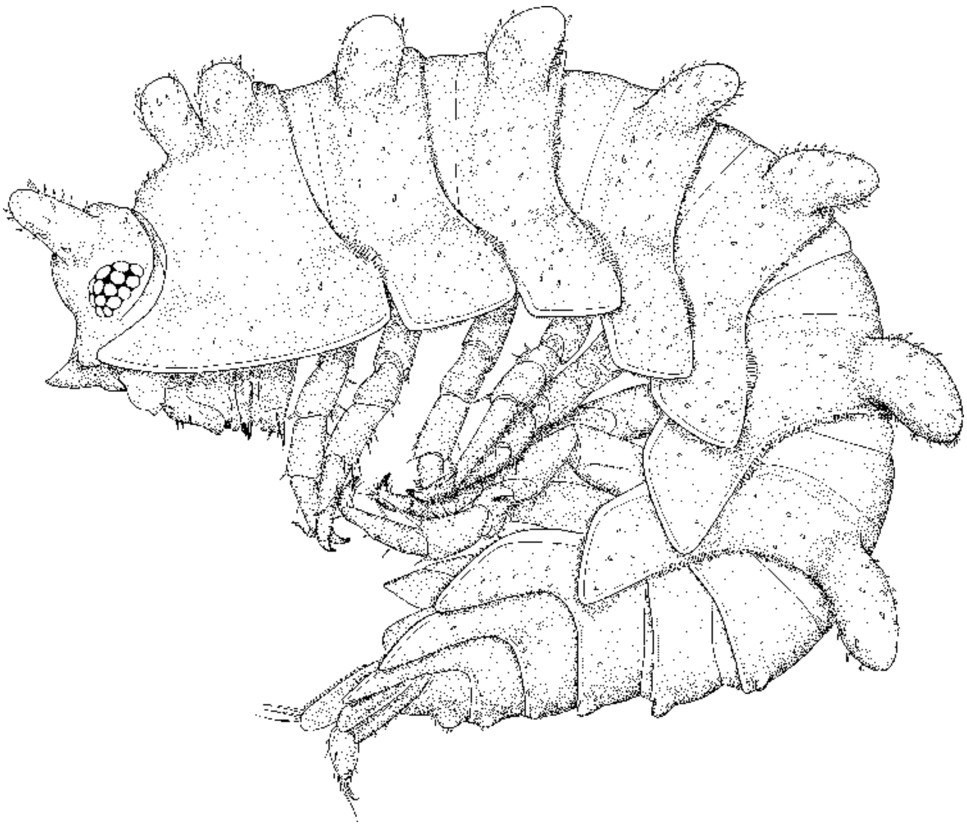

Figure 87. *Colomboscia bituberculata* Taiti, Allspach & Ferrara, 1995: holotype ♂, 2.1 mm wide, cephalothorax 0.93 mm wide, habitus lateral (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Pedro de la Sierra, *c.* 50 km southwest of Santa Marta, KT-14, altitude 1000 m altitude, leaf litter, leg. H. G. Müller, 12 April 1986, SMF 19375).

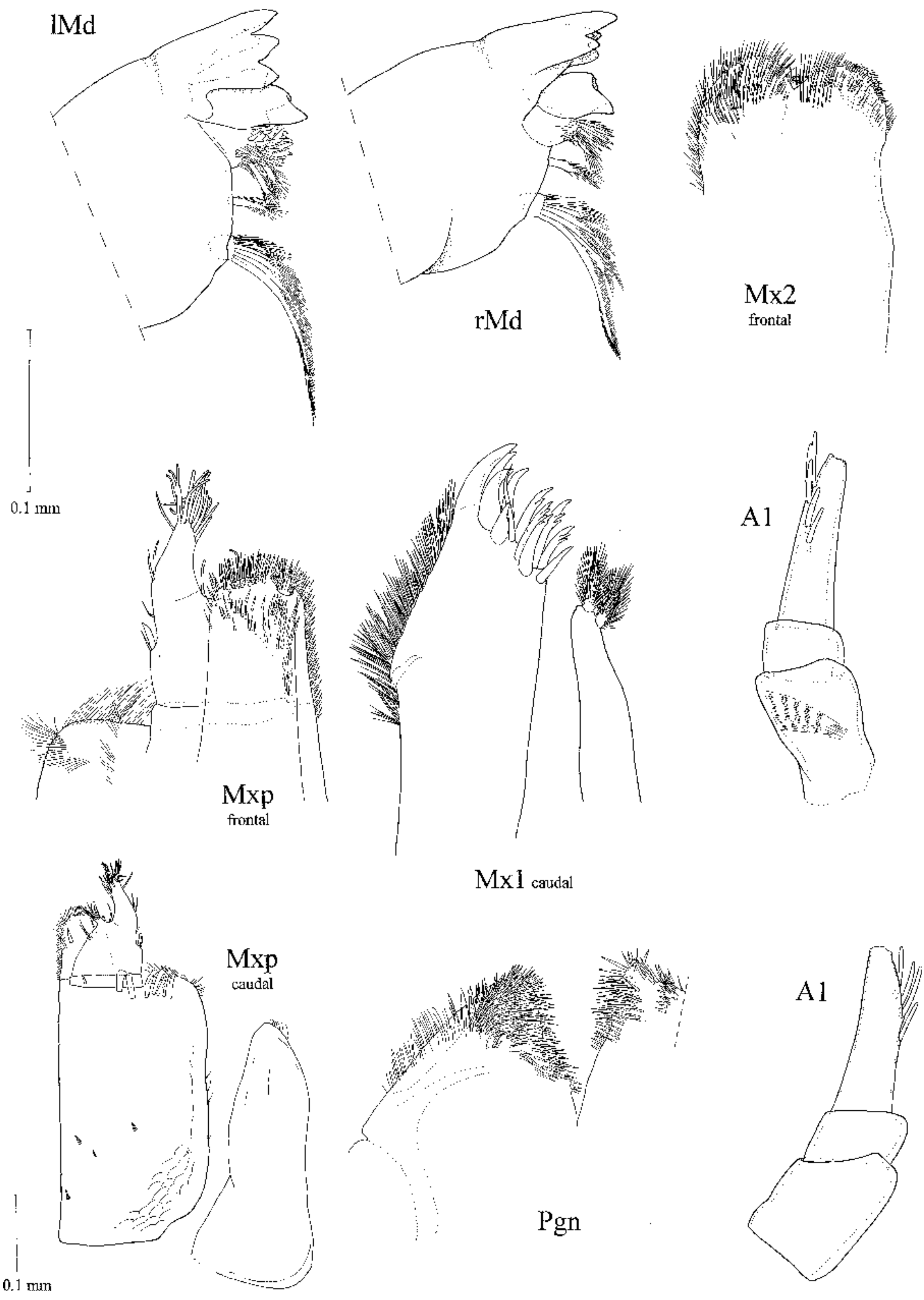

Figure 88. *Colomboscia bituberculata* Taiti, Allspach & Ferrara, 1995: paratype ♂, mouthparts, first antennae (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Pedro de la Sierra, *c*. 50 km south-west of Santa Marta, altitude 1000 m, leaf litter, leg. H. G. Müller, 12 April 1986, MZUF 4768).

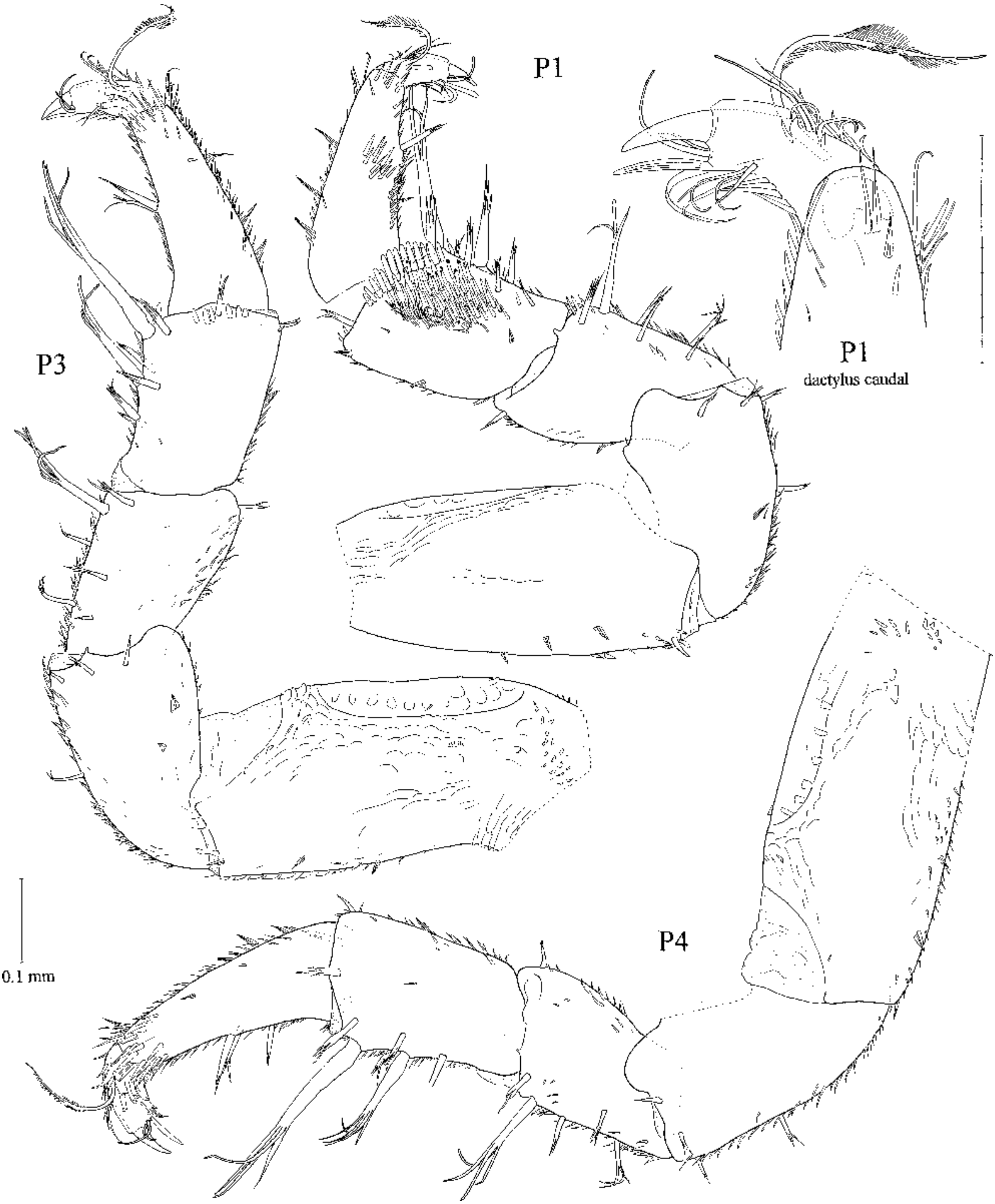

Figure 89. *Colomboscia bituberculata* Taiti, Allspach & Ferrara, 1995: paratype ♂, pereiopods 1, 3 and 4, pereiopod 1 dactylus caudal (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Pedro de la Sierra, *c.* 50 km south-west of Santa Marta, altitude 1000 m, leaf litter, leg. H. G. Müller, 12 April 1986, MZUF 4768).

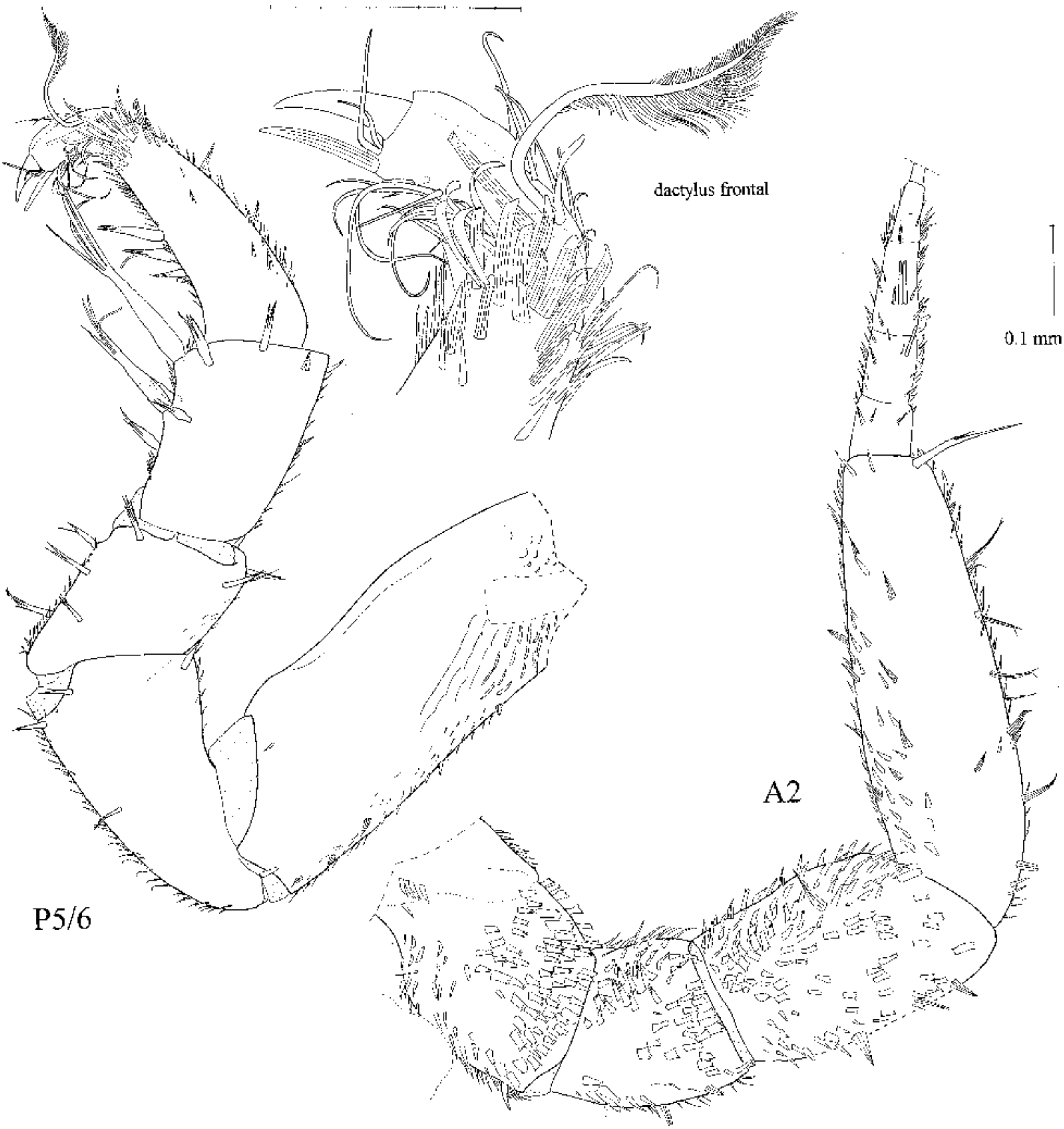

Figure 90. *Colomboscia bituberculata* Taiti, Allspach & Ferrara, 1995: paratype ♂, pereiopod 5 or 6, second antenna (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Pedro de la Sierra, *c*. 50 km south-west of Santa Marta, altitude 1000 m, leaf litter, leg. H. G. Müller, 12 April 1986, MZUF 4768).

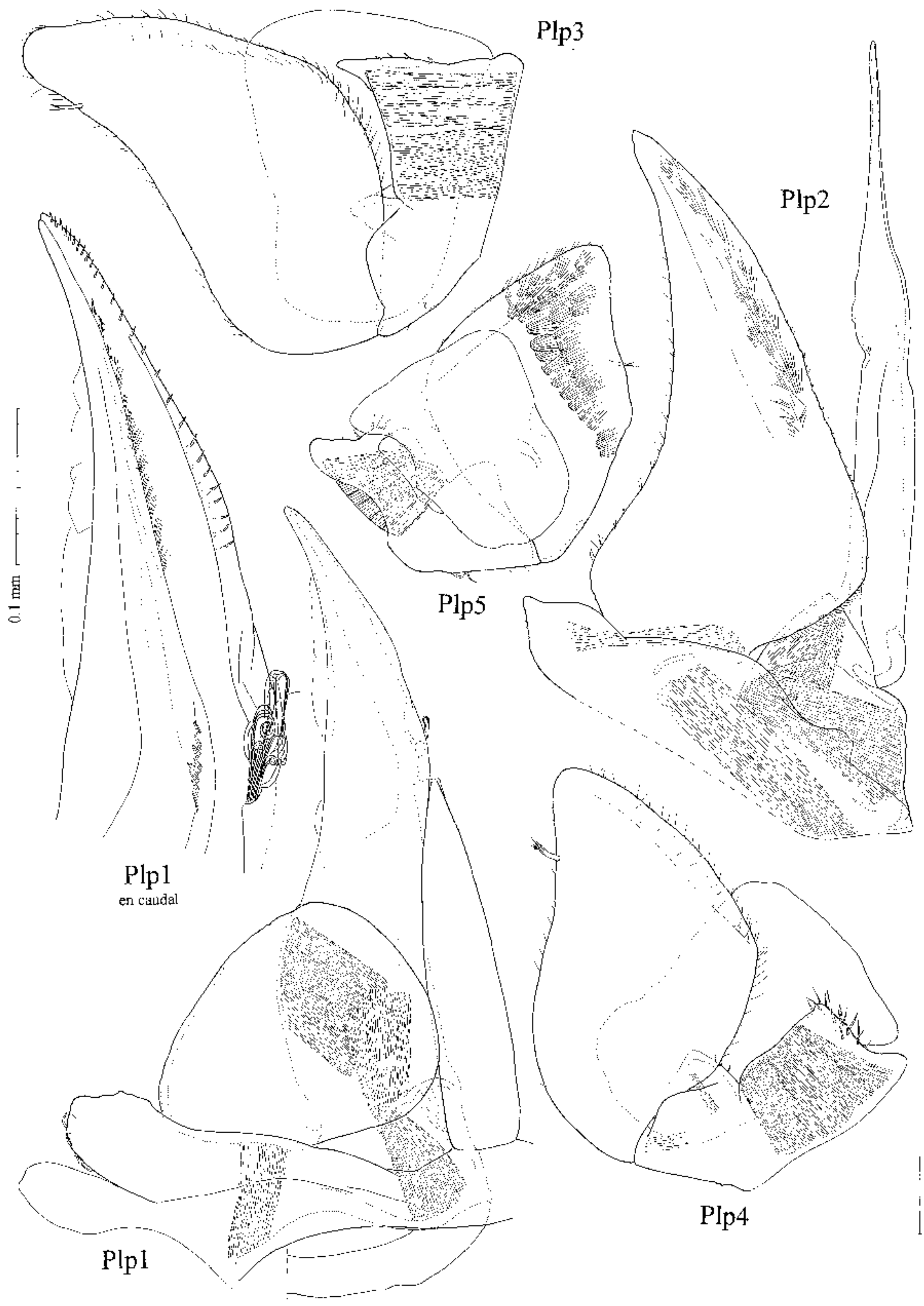

Figure 91. *Colomboscia bituberculata* Taiti, Allspach & Ferrara, 1995: paratype ♂, pleopods 1–5 (Colombia, Magdalena, Sierra Grande de Santa Marta, near San Pedro de la Sierra, *c.* 50 km south-west of Santa Marta, altitude 1000 m, leaf litter, leg. H. G. Müller, 12 April 1986, MZUF 4768).

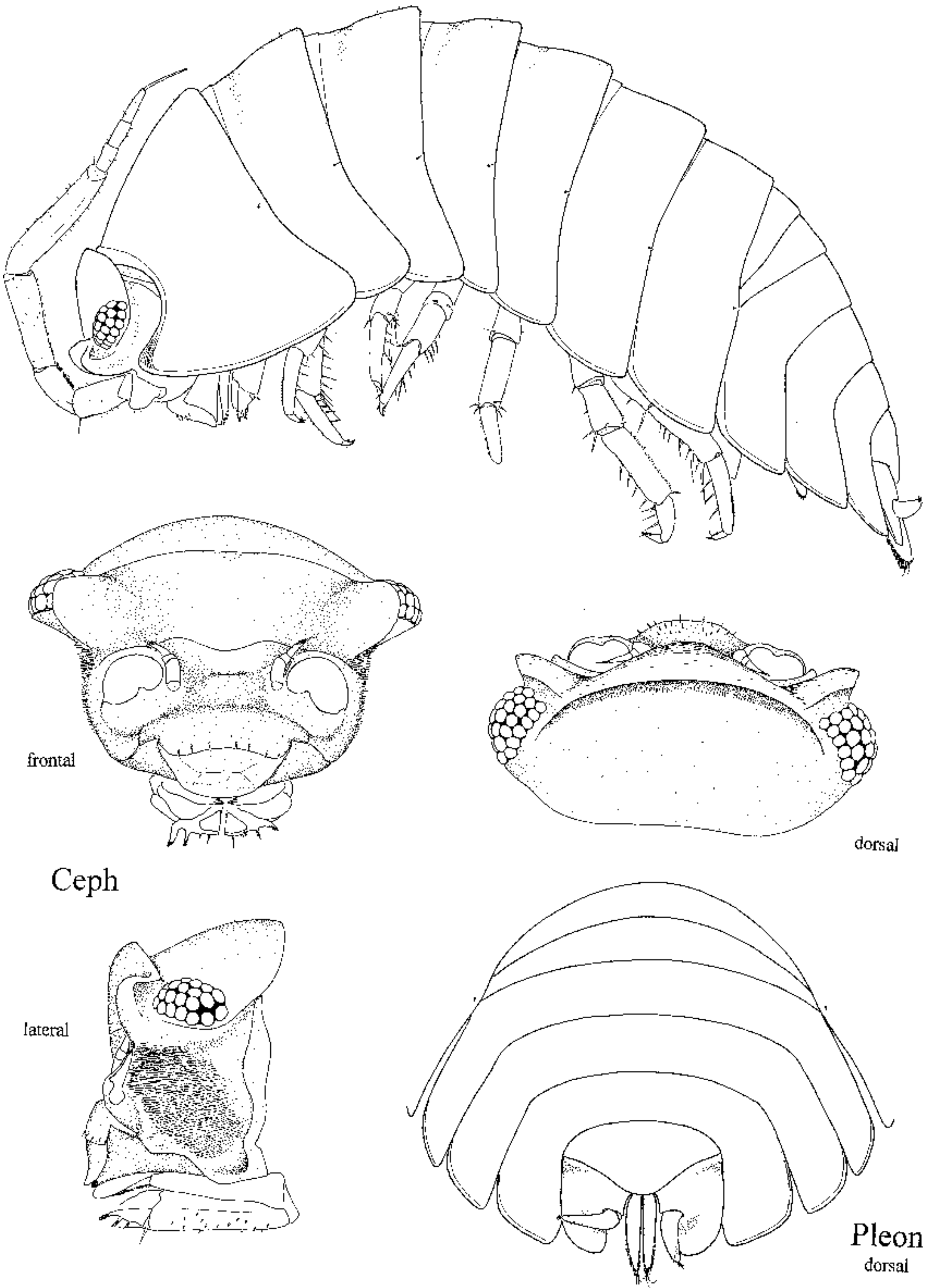

Figure 92. ***Scleropactoides curvatus* sp. nov.**: ♂ *c.* 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, habitus and pleon dorsal, cephalothorax dorsal, frontal and lateral (Venezuela, Bolivar, leg. F. Yoris, 25 September 1967, MNRJ 9677).

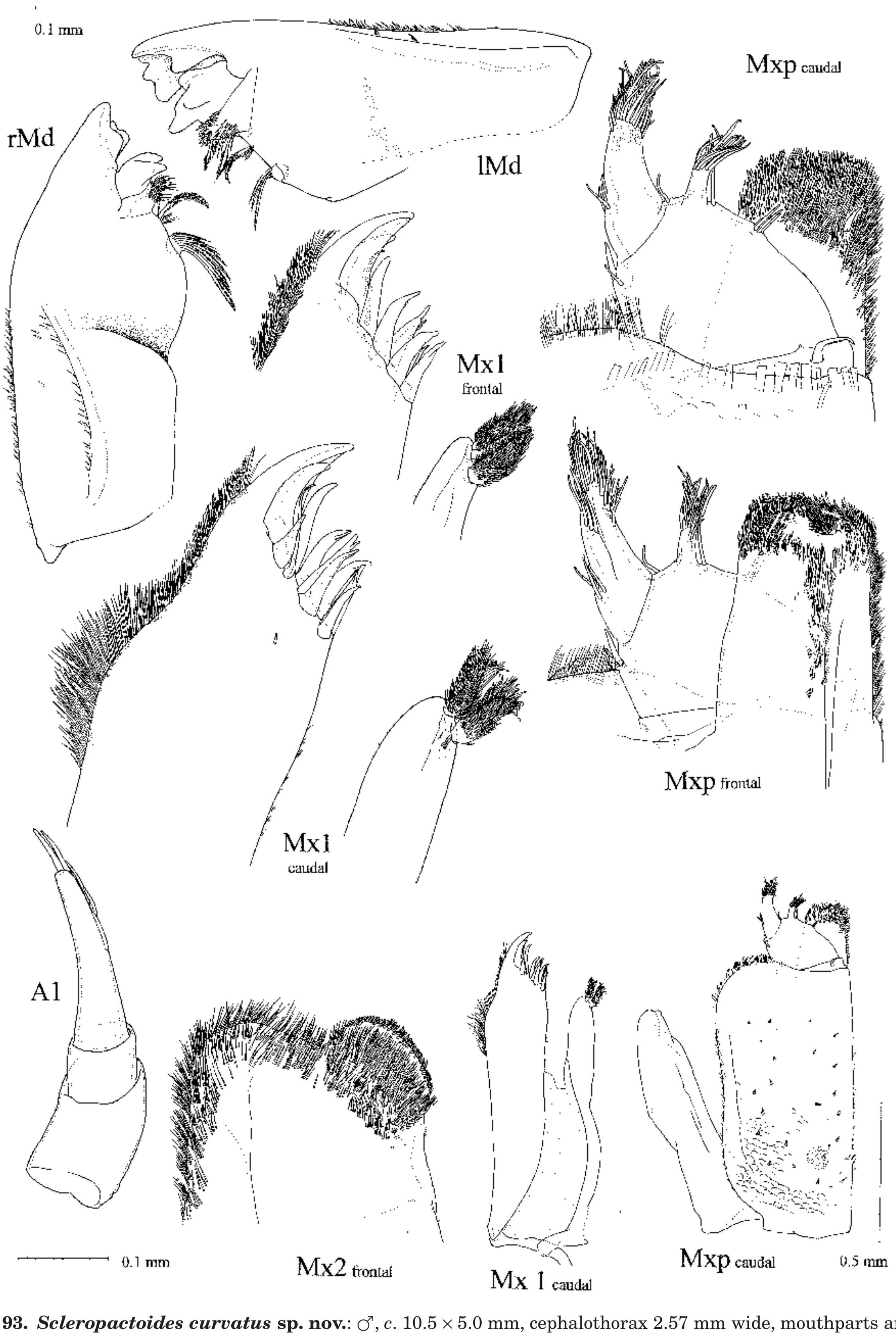

Figure 93. ***Scleropactoides curvatus*** **sp. nov.**: ♂, *c*. 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, mouthparts and first antenna (Venezuela, Bolivar, 118 km, leg. F. Yoris, 25 September 1967, MNRJ 9677).

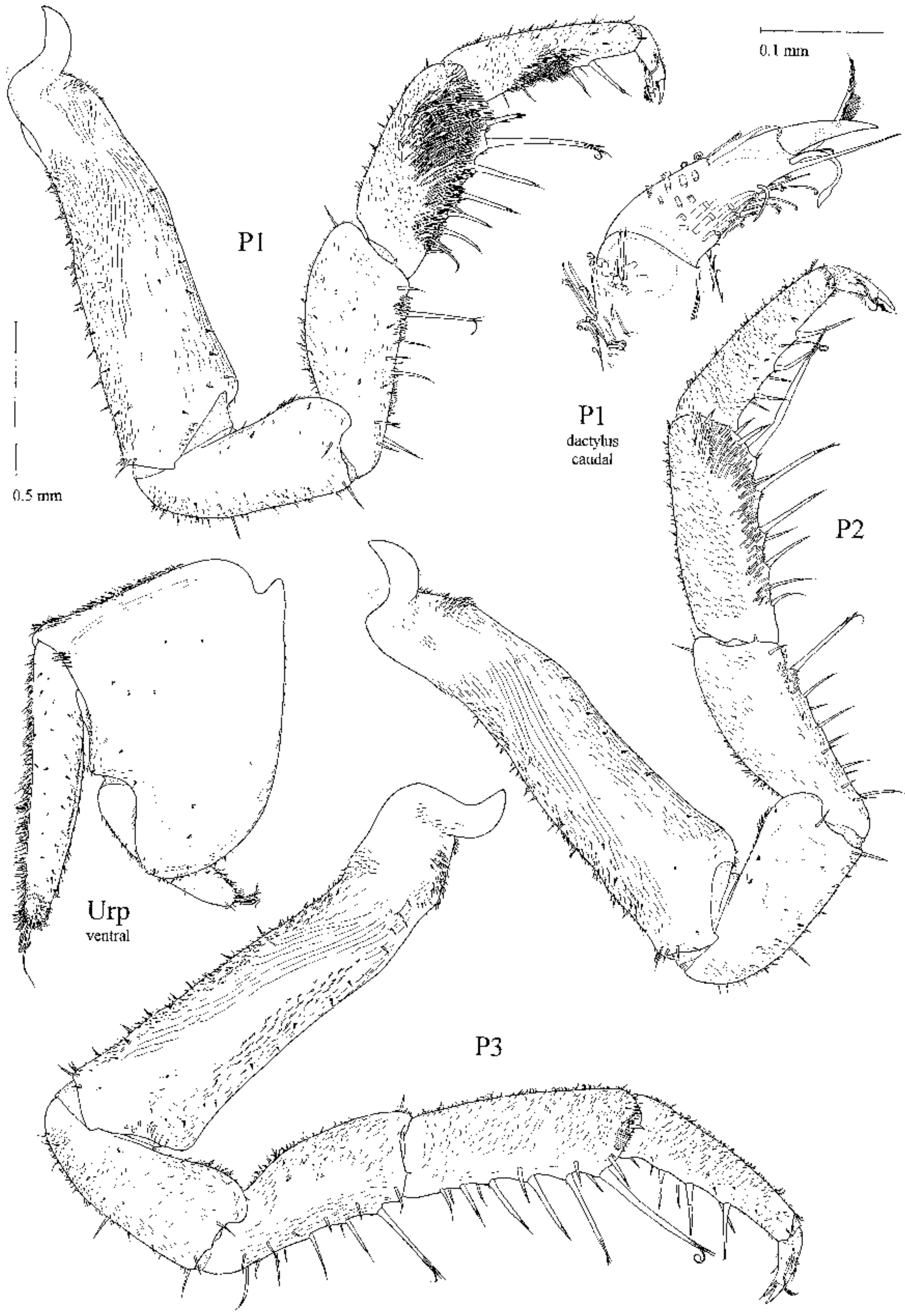

Figure 94. ***Scleropactoides curvatus* sp. nov.**: ♂, *c*. 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, pereiopods 1–3 frontal, pereiopod 1 dactylus caudal, uropod ventral (Venezuela, Bolivar, 118 km, leg. F. Yoris, 25 September 1967, MNRJ 9677).

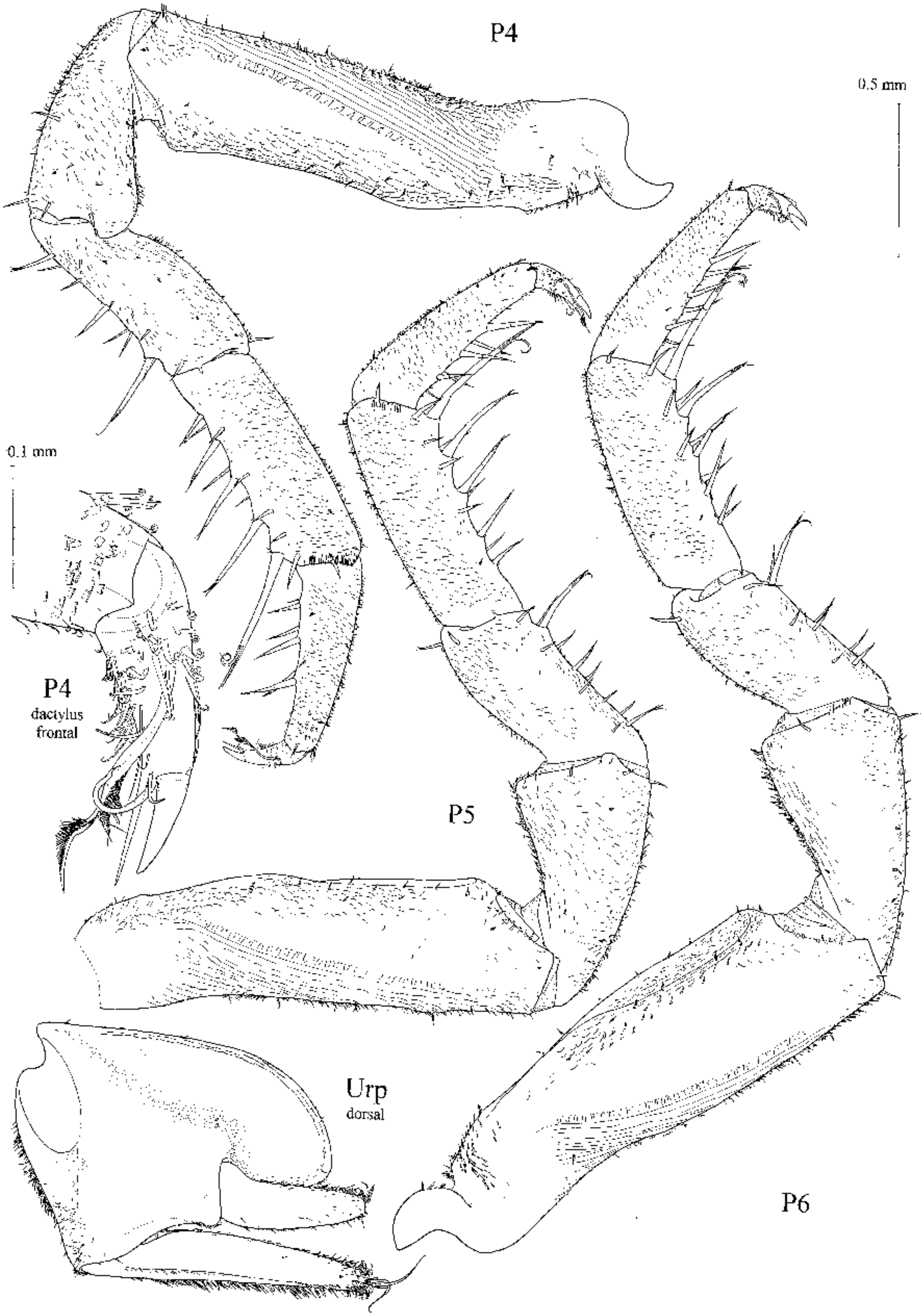

Figure 95. ***Scleropactoides curvatus*** **sp. nov.** (Van Name, 1942): ♂, *c.* 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, pereiopods 4–6 and dactylus 4 frontal, uropod dorsal (Venezuela, Bolivar, 118 km, leg. F. Yoris, 25 September 1967, MNRJ 9677).

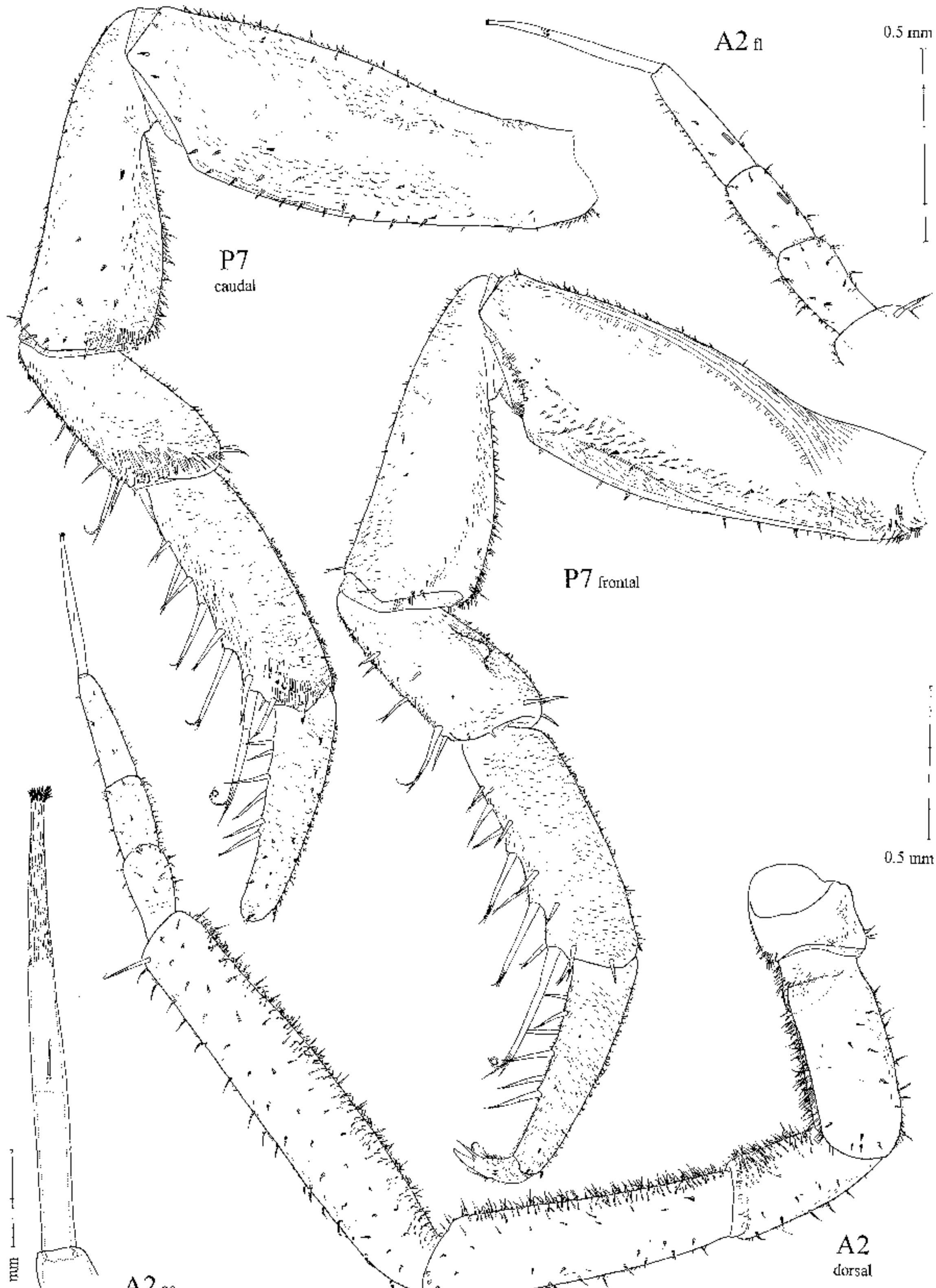

Figure 96. ***Scleropactoides curvatus*** **sp. nov.**: ♂, *c.* 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, pereiopod 7 frontal and caudal, second antenna (Venezuela, Bolivar, 118 km, leg. F. Yoris, 25 September 1967, MNRJ 9677).

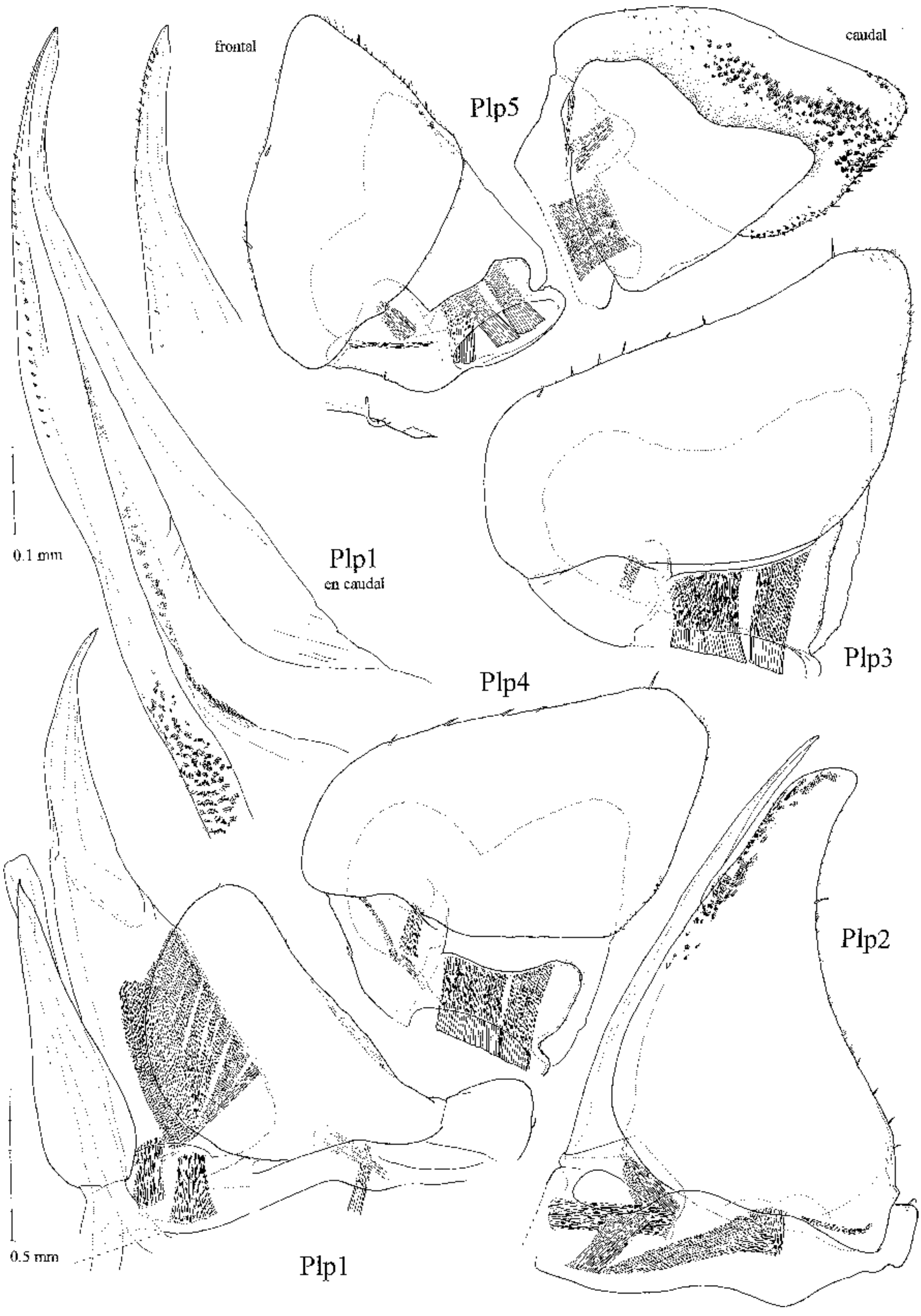

Figure 97. ***Scleropactoides curvatus* sp. nov.**: ♂, *c*. 10.5 × 5.0 mm, cephalothorax 2.57 mm wide, pleopods 1–5 (Venezuela, Bolivar, 118 km, leg. F. Yoris, 25 September 1967, MNRJ 9677).

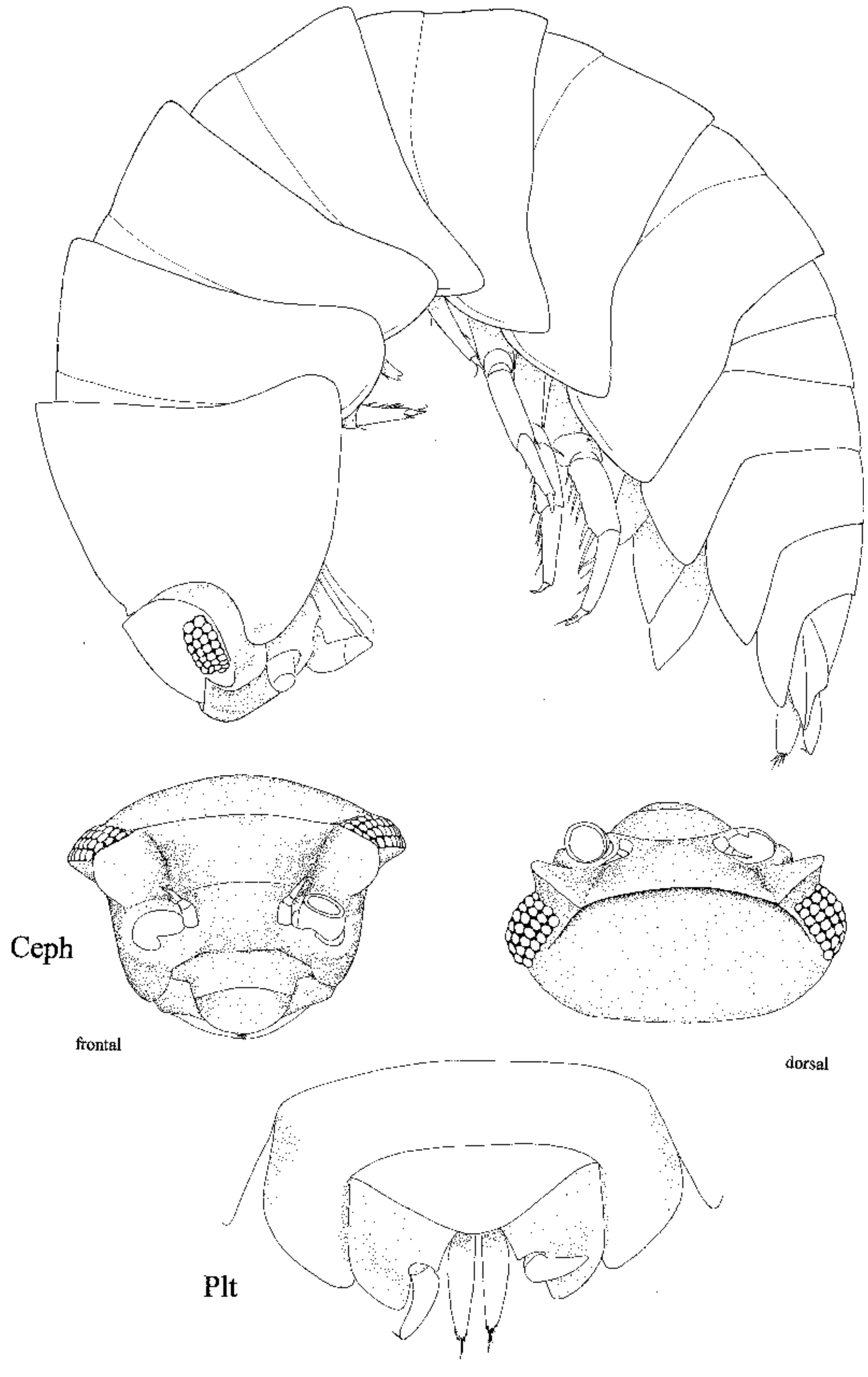

Figure 98. *Scleropactoides guianensis* (Van Name, 1936): paratype ♀, 13.5 × 6.3 mm (Guyana, Kaieteur, leg. F. E. Lutz, 11 August 1911, AMNH 3562).

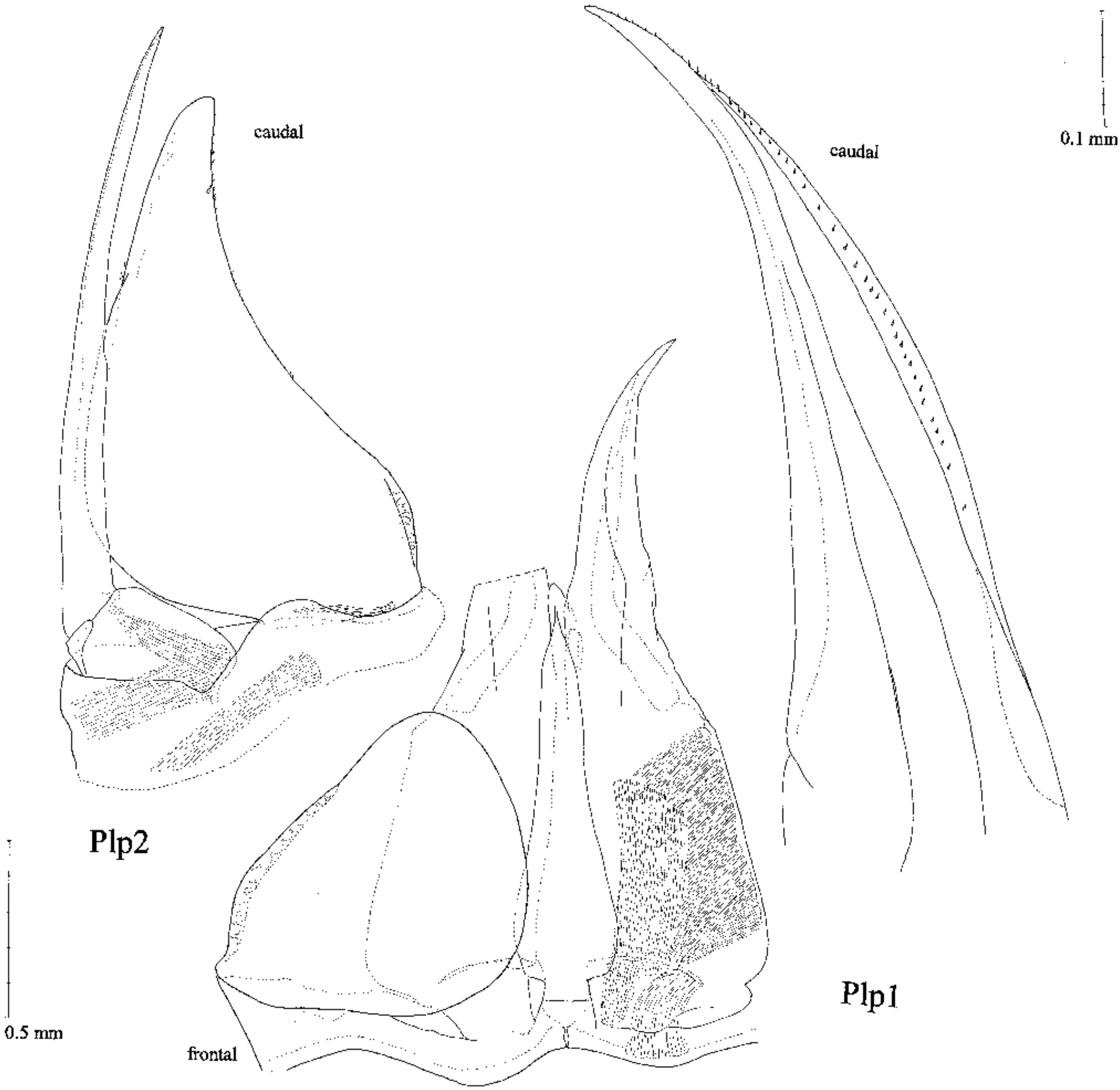

Figure 99. *Scleropactoides guianensis* (Van Name, 1936): paratype ♂, pleopods 1 and 2 (Guyana, Kaieteur, leg. F. E. Lutz, 11 August 1911, AMNH 3562).

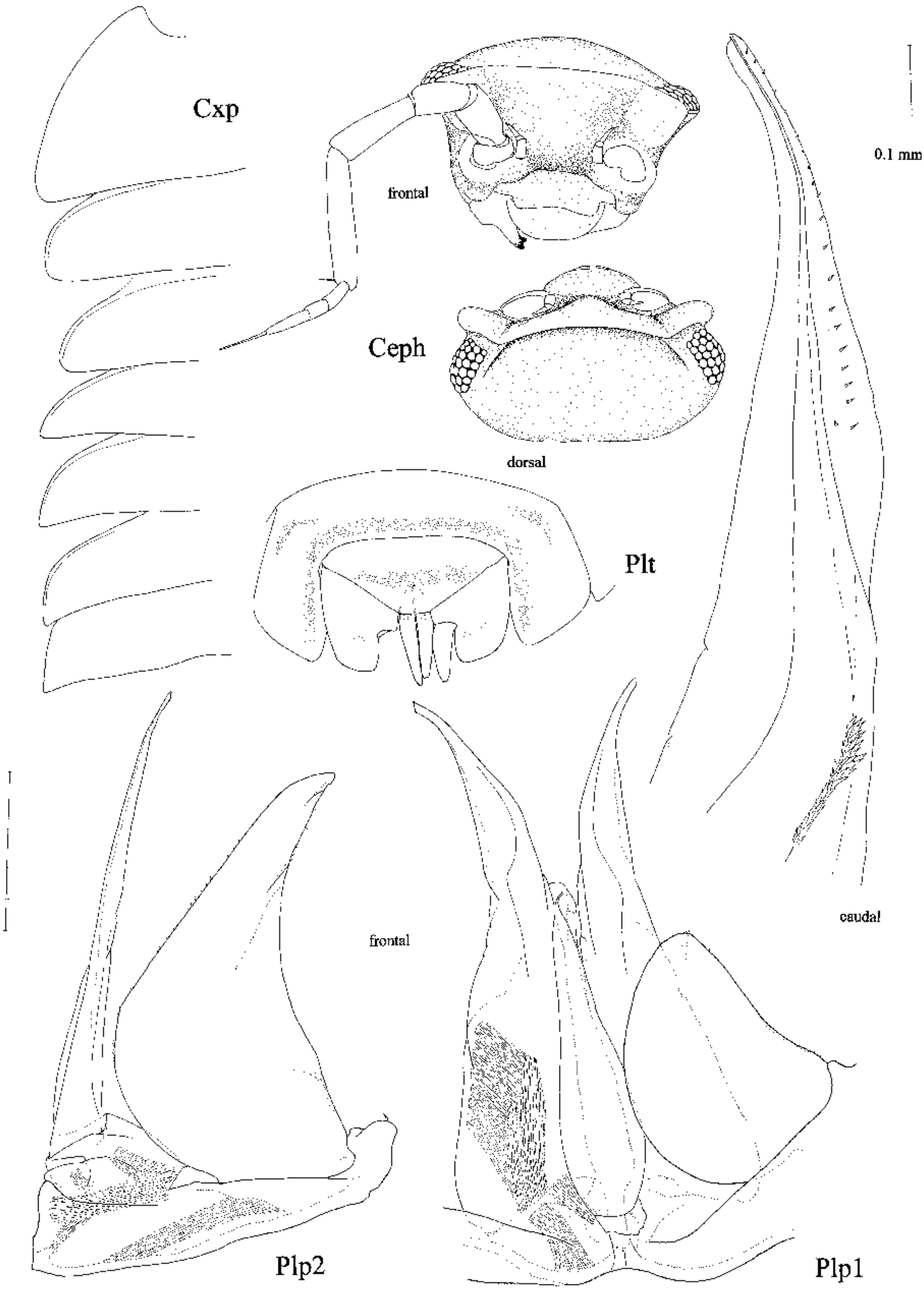

Figure 100. *Scleropactoides bonitanus* (Van Name, 1942): paratypes, pleopods 1 and 2, cephalothorax, pleotelson, coxal plates (Venezuela, San Esteban, Palo Bonito, leg. G. Vivas-Berthier, 27 September 1937, AMNH 9526).

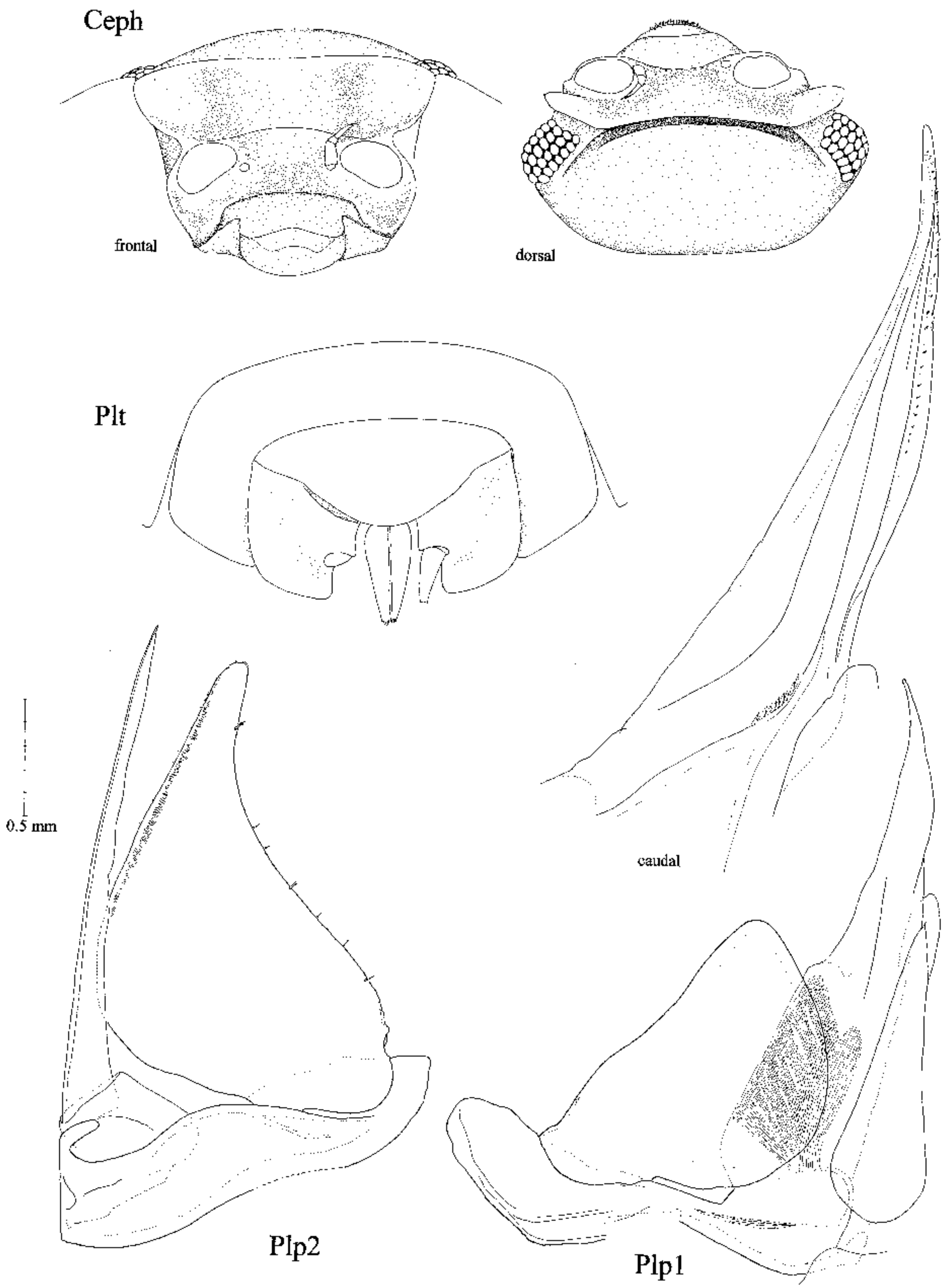

Figure 101. *Scleropactoides tukeitanus* (Van Name, 1936): paratype ♂, cephalothorax, pleotelson + uropods, pleopods 1 and 2 (Guyana, Tukeit, leg. 16 July 1911, AMNH 3542).

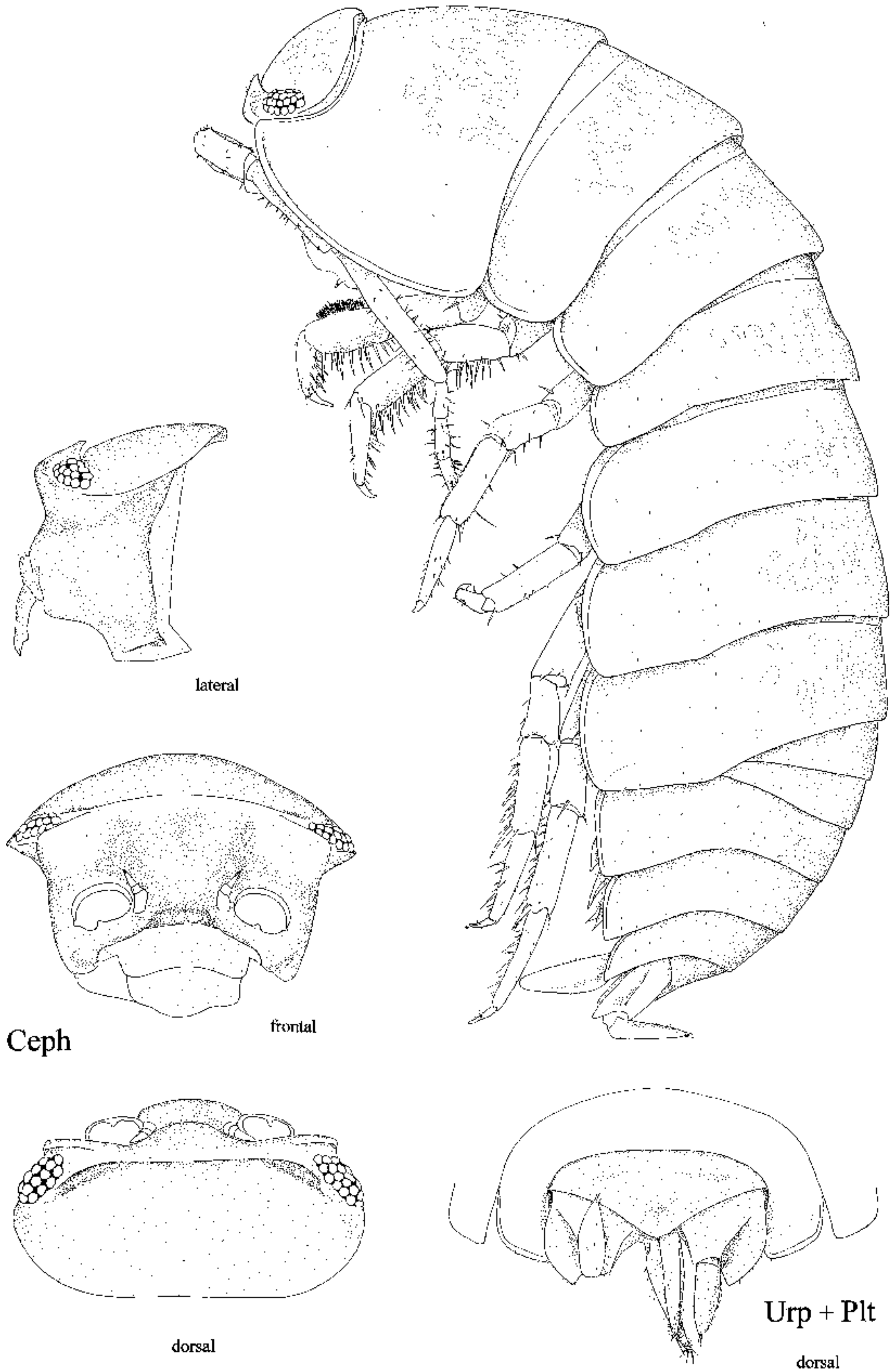

Figure 102. *Scleropactes concinnus* Budde-Lund, 1885: lectotype ♂, 10.0 × 4.2 mm (Peru, leg. Stolzmann, ZMUC cru-1686).

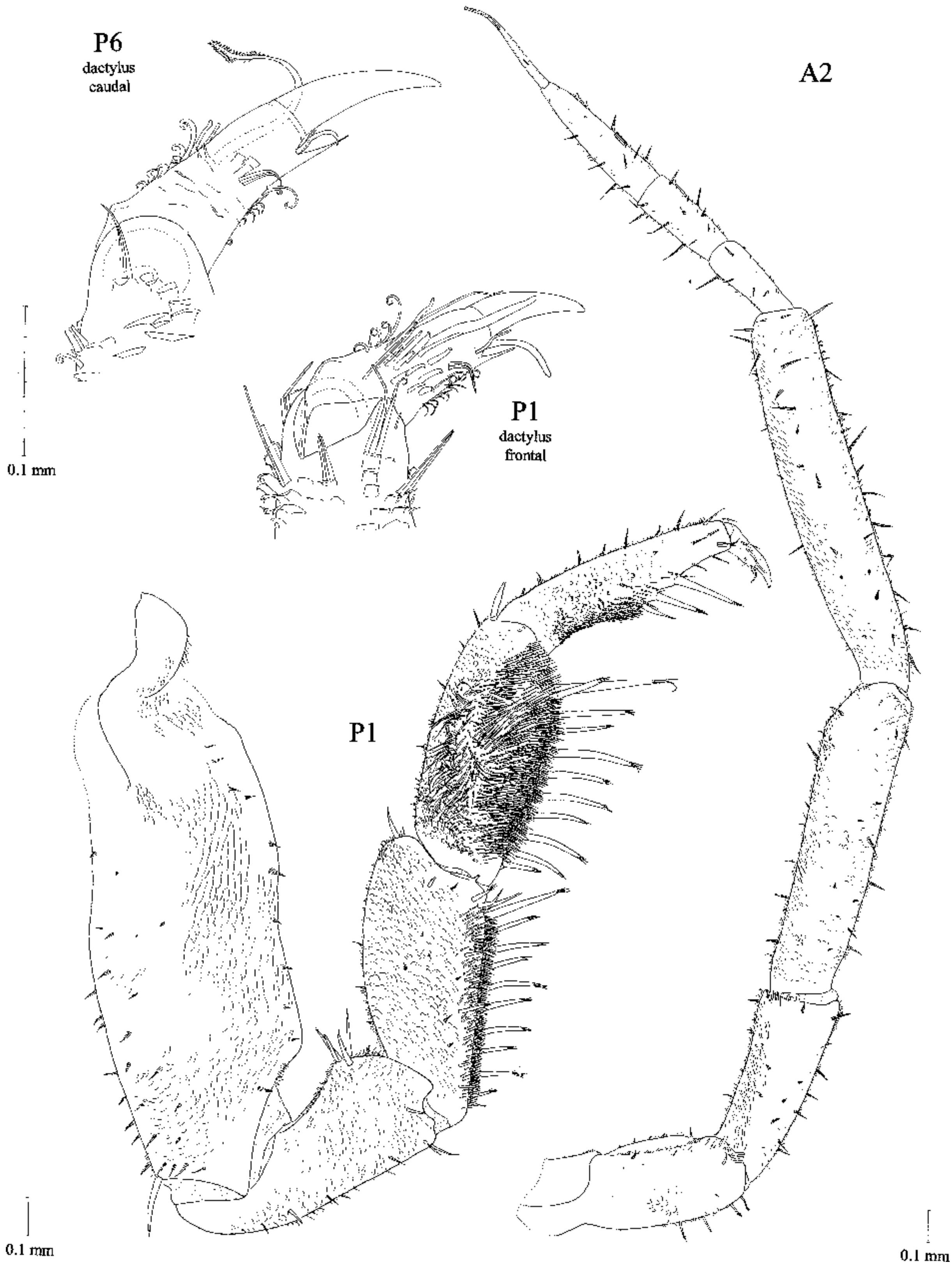

Figure 103. *Scleropactes concinnus* Budde-Lund, 1885: lectotype ♂, 10.0 × 4.7 mm, pereiopod 1, second antenna (Peru, leg. Stolzmann, ZMUC cru-1686).

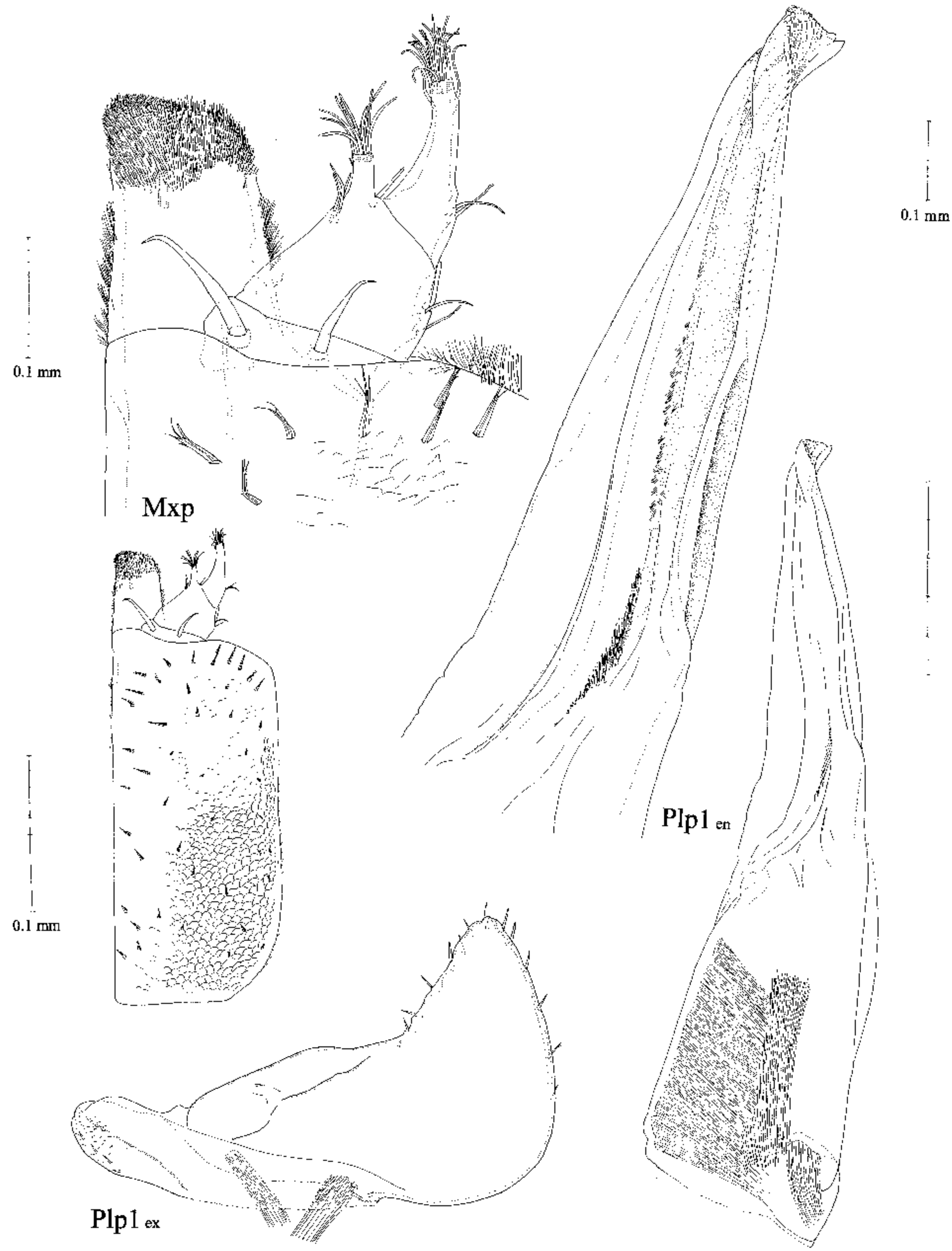

Figure 104. *Scleropactes concinnus* Budde-Lund, 1885: lectotype ♂, 10.0 × 4.7 mm, pleopod 1, maxilliped (Peru, leg. Stolzmann; ZMUC cru-1686).

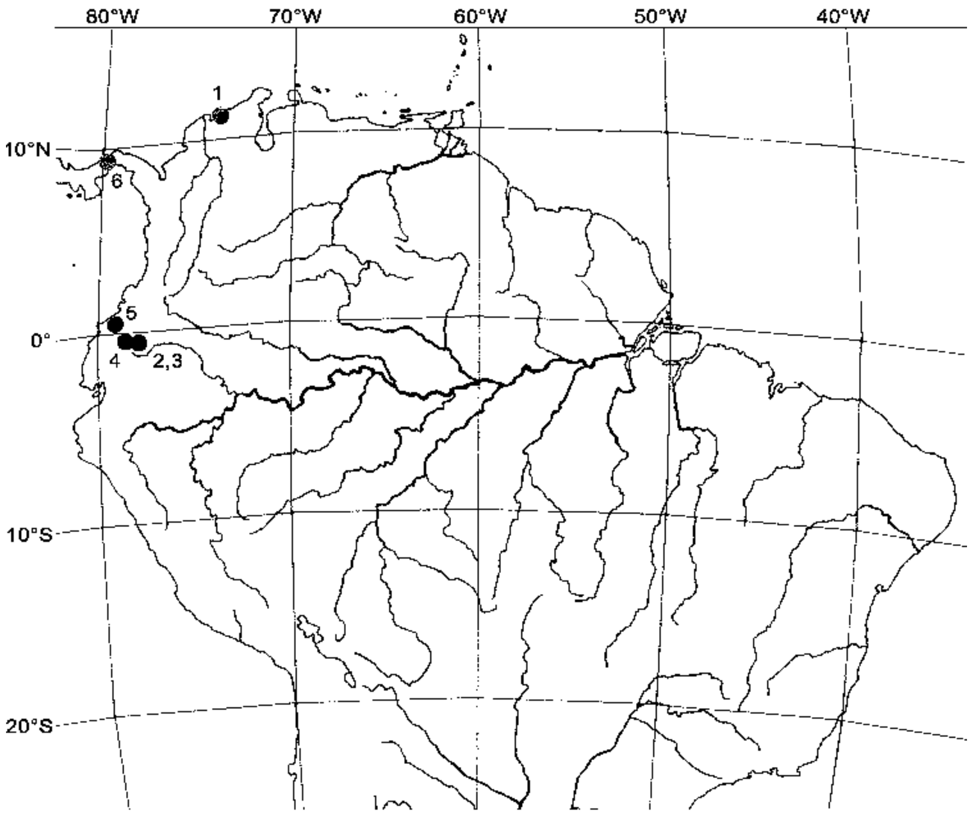

Figure 105. Geographical distribution of *Scleropactes colombiensis* (1), *Scleropactes cotopaxii* (2), *Scleropactes ecuadoriensis* (3), *Scleropactes pilosus* (4), *Scleropactes pululahua* (5), and *Scleropactes zeteki* (6).

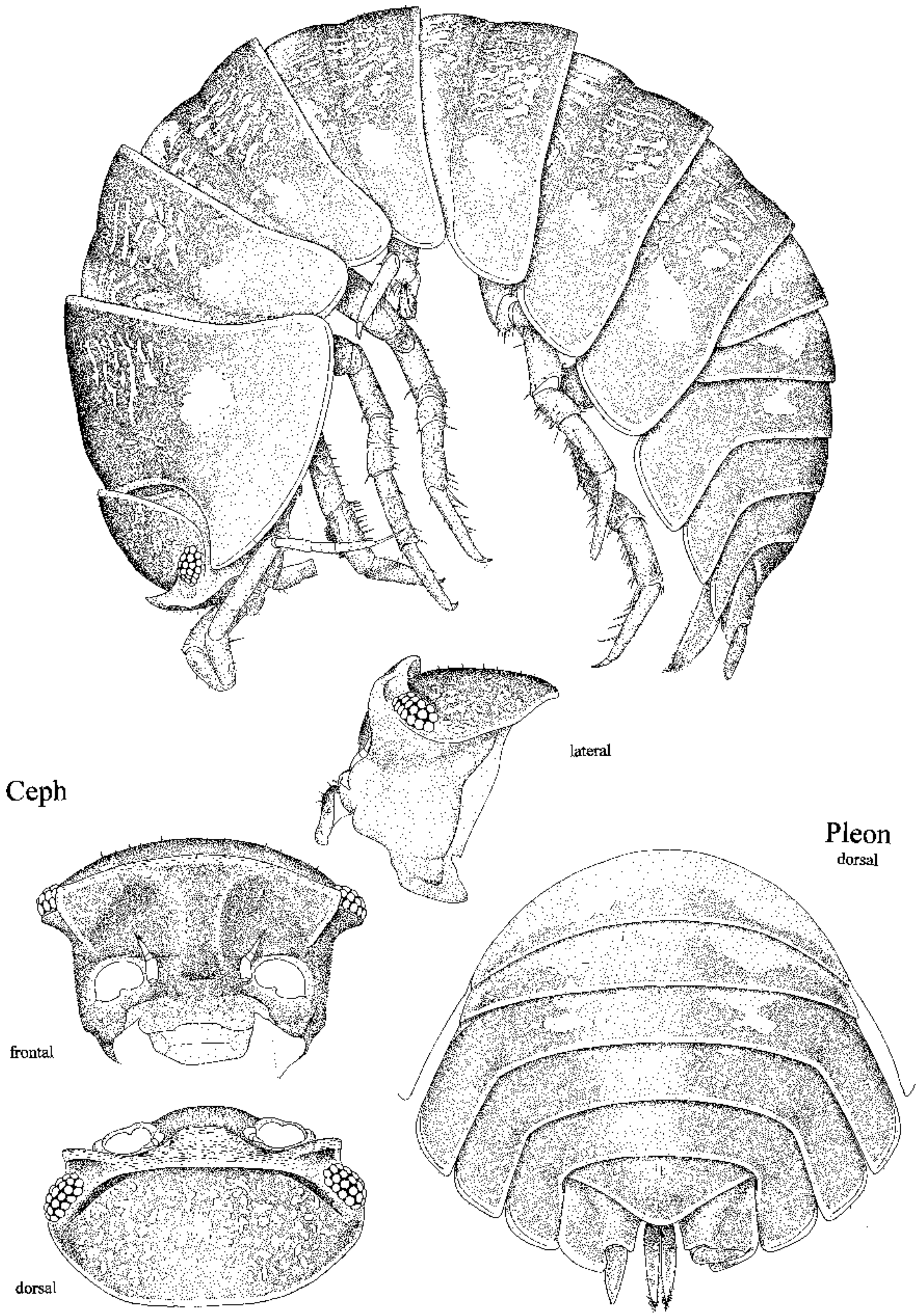

Figure 106. *Scleropactes colombiensis* (Pearse, 1915): ♂, 5.8 mm wide, cephalothorax 2.90 mm wide, habitus lateral, cephalothorax (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 1600 m, cloud forest, leg. H. Schmalfuss, 8 December 1974, SMNS 10048e).

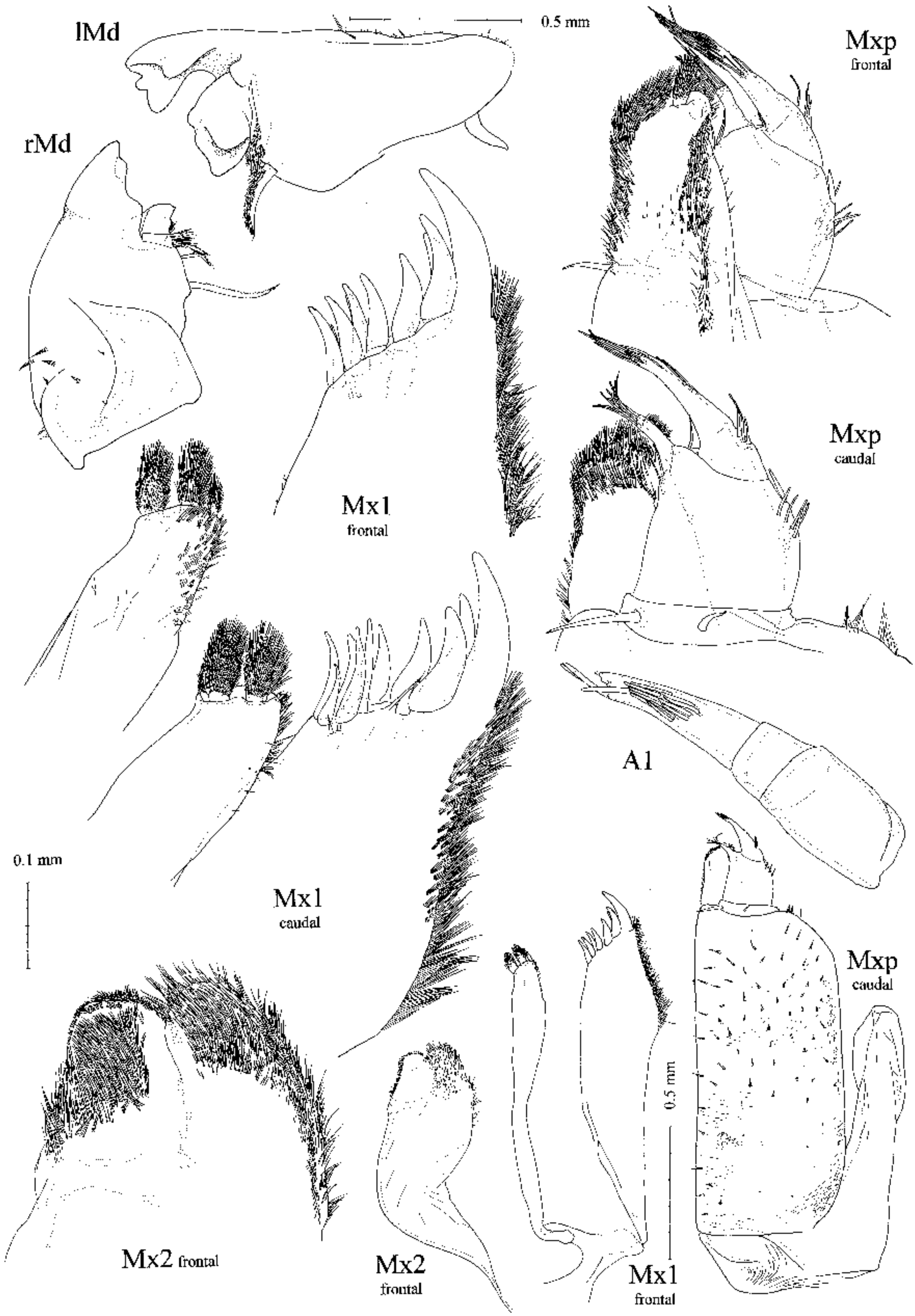

Figure 107. *Scleropactes colombiensis* (Pearse, 1915): ♀m, cephalothorax 2.92 mm wide, mouthparts, first antenna (Colombia, Magdalena, Sierra Grande de Santa Marta, near El Campano, KT-12, altitude 1000 m, from leaf litter, leg. H. G. Müller, 20 April 1986, SMF 19377).

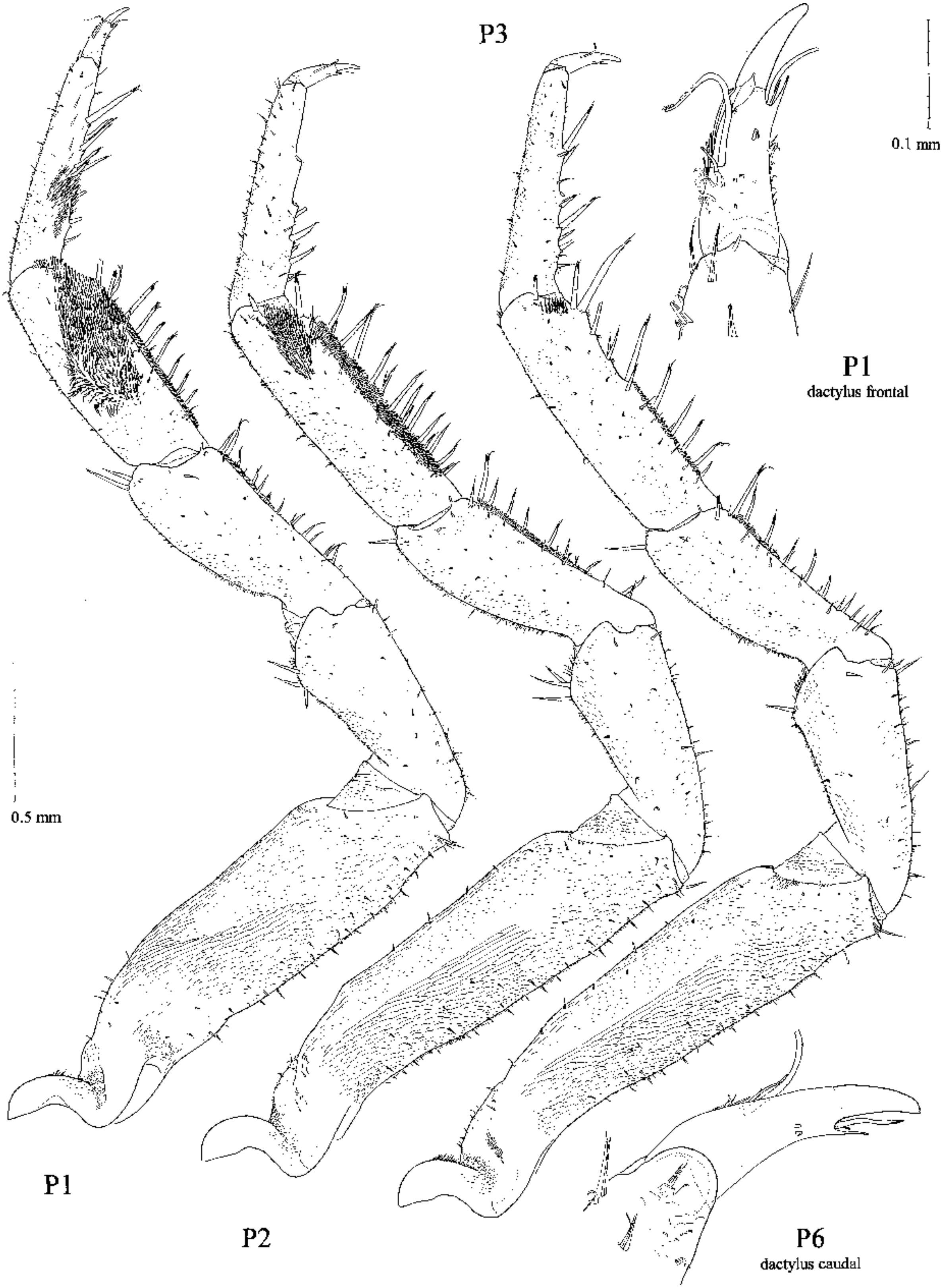

Figure 108. *Scleropactes colombiensis* (Pearse, 1915): ♂, 5.8 mm wide, cephalothorax 2.90 mm wide, pereiopods 1–3 frontal (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 1600 m, cloud forest, leg. H. Schmalfuss, 8 December 1974, SMNS 10048e).

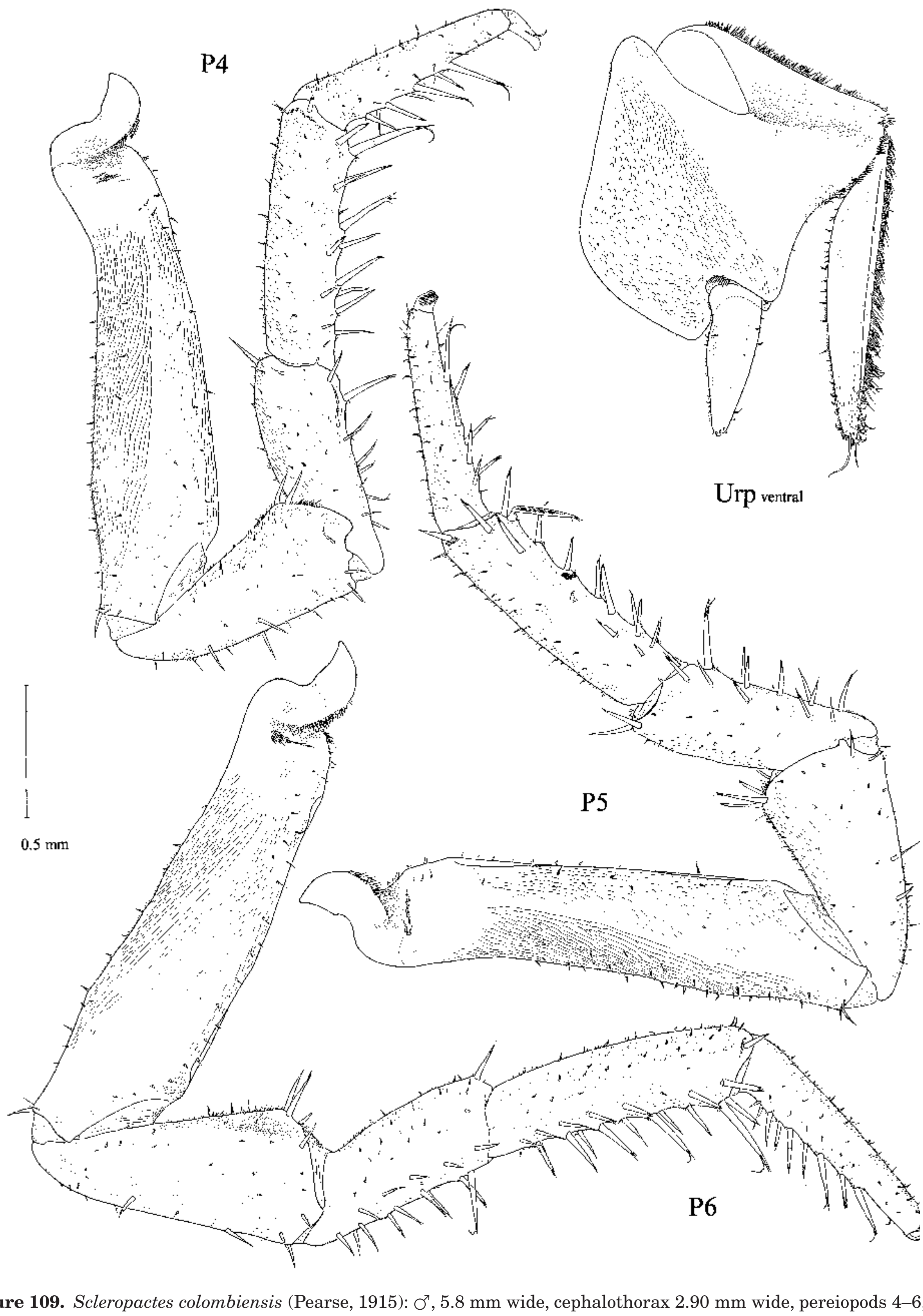

Figure 109. *Scleropactes colombiensis* (Pearse, 1915): ♂, 5.8 mm wide, cephalothorax 2.90 mm wide, pereiopods 4–6, uropod dorsal (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 1600 m, cloud forest, leg. H. Schmalfuss, 8 December 1974, SMNS 10048e).

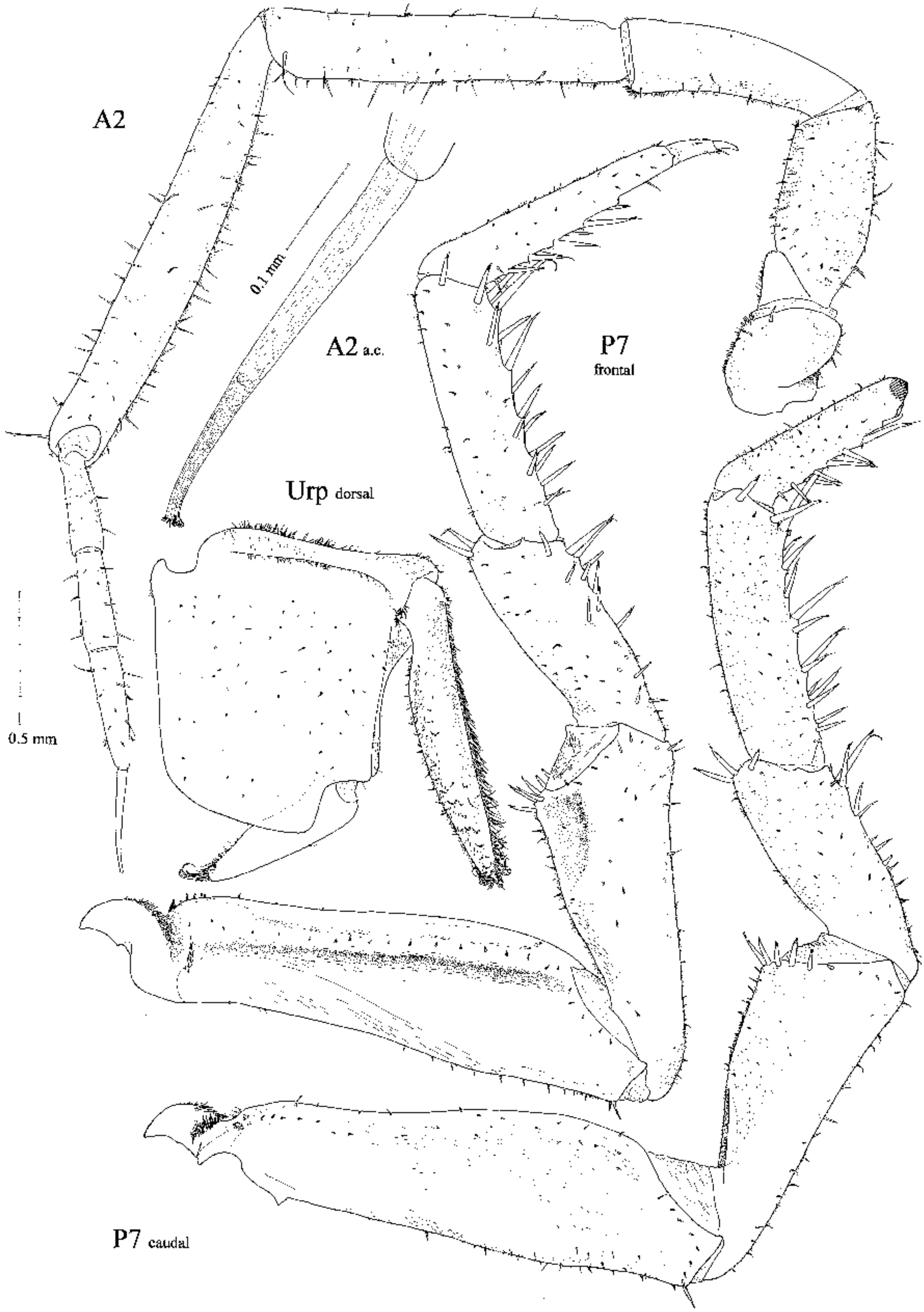

Figure 110. *Scleropactes colombiensis* (Pearse, 1915): ♂, 5.8 mm wide, cephalothorax 2.90 mm wide, pereiopod 7 frontal and caudal, second antenna, uropod ventral (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 1600 m, cloud forest, leg. H. Schmalfuss, 8 December 1974, SMNS 10048e).

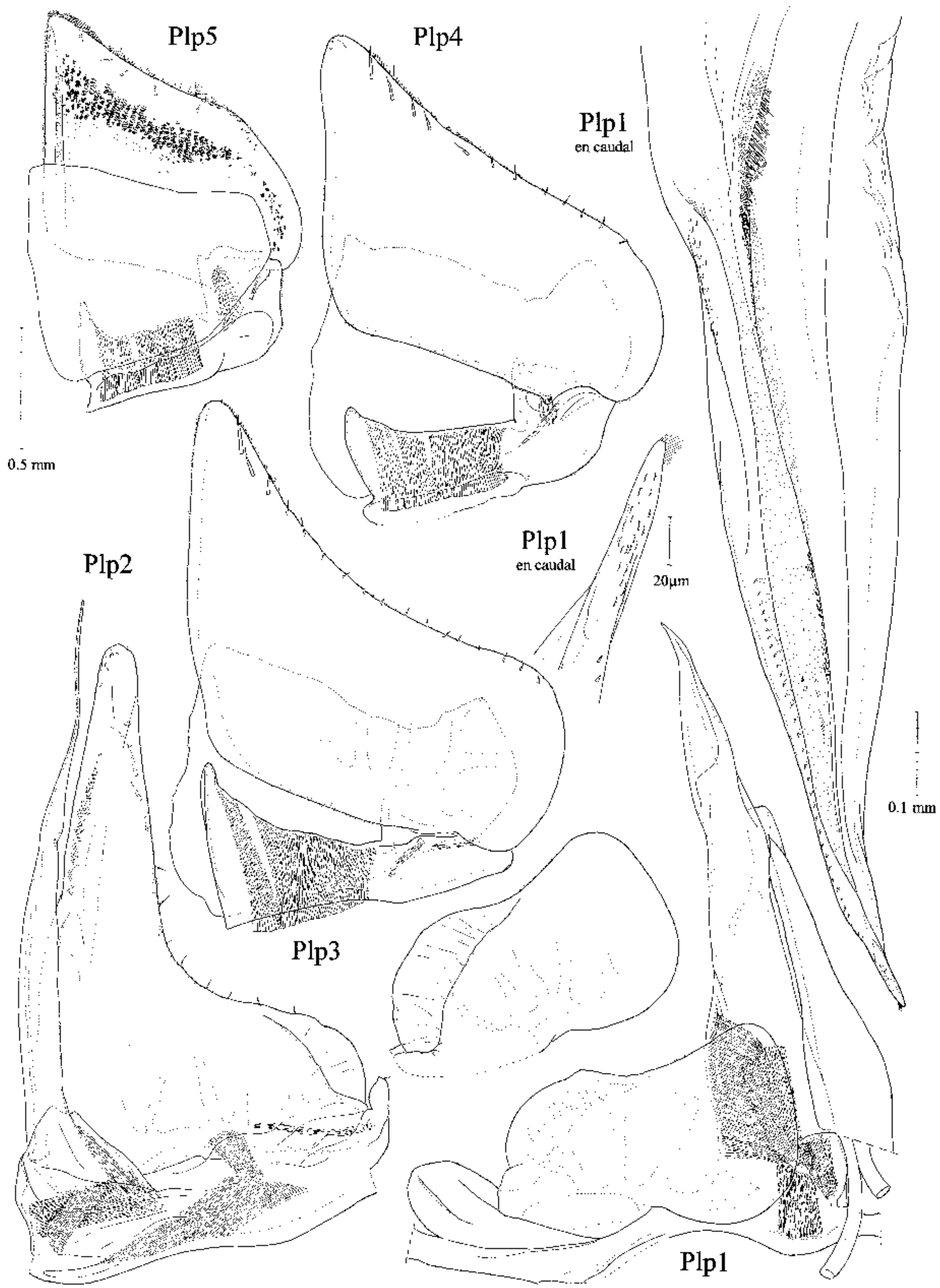

Figure 111. *Scleropactes colombiensis* (Pearse, 1915): ♂, 5.8 mm wide, cephalothorax 2.90 mm wide, pleopods 1–5 (Colombia, Sierra Nevada de Santa Marta, San Lorenzo, altitude 1600 m, cloud forest, leg. H. Schmalfuss, 8 December 1974, SMNS 10048e).

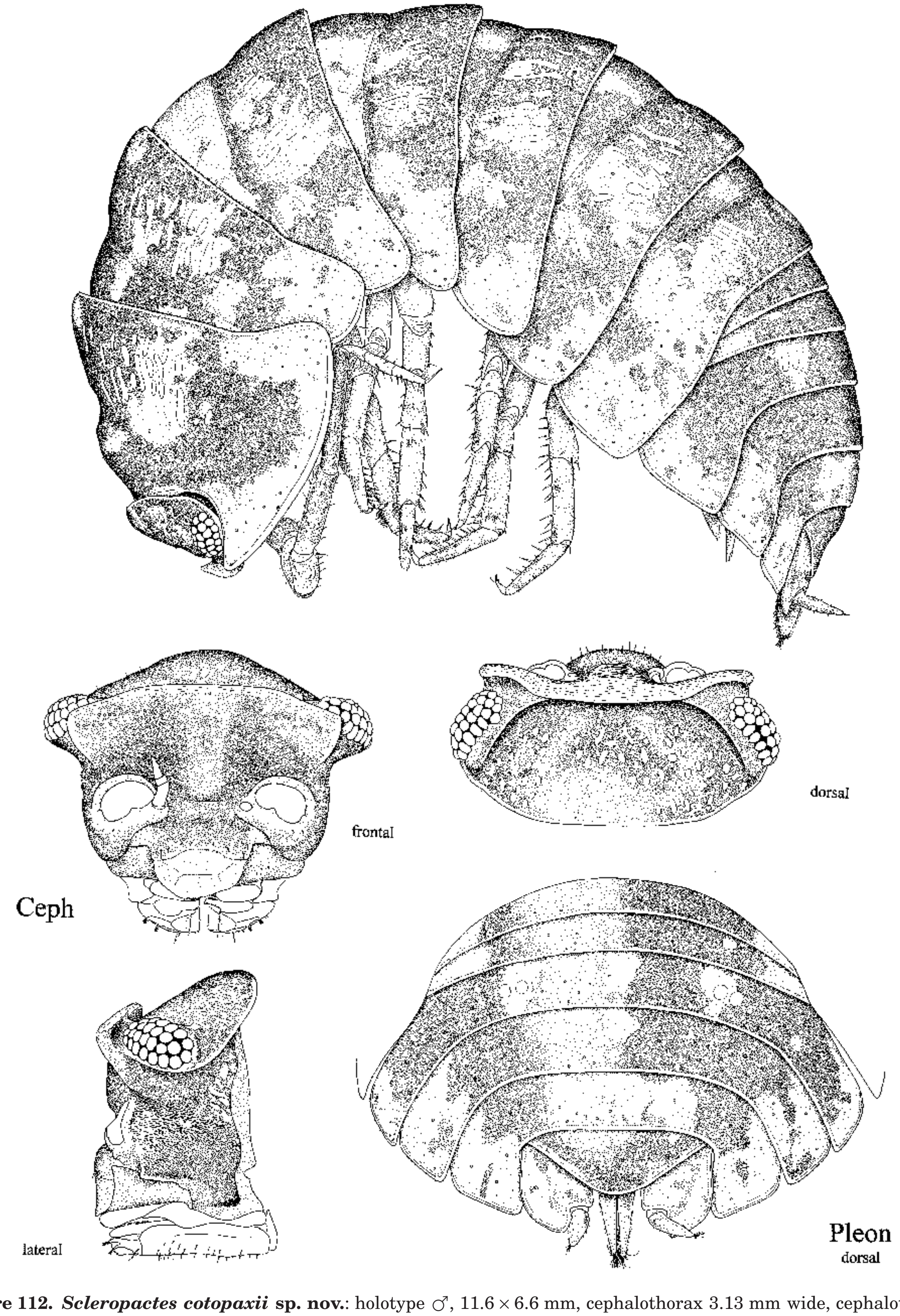

Figure 112. ***Scleropactes cotopaxii* sp. nov.**: holotype ♂, 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, cephalothorax; paratype ♀, 15.8 × 8.0 mm, cephalothorax 3.95 mm wide, habitus, pleon (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

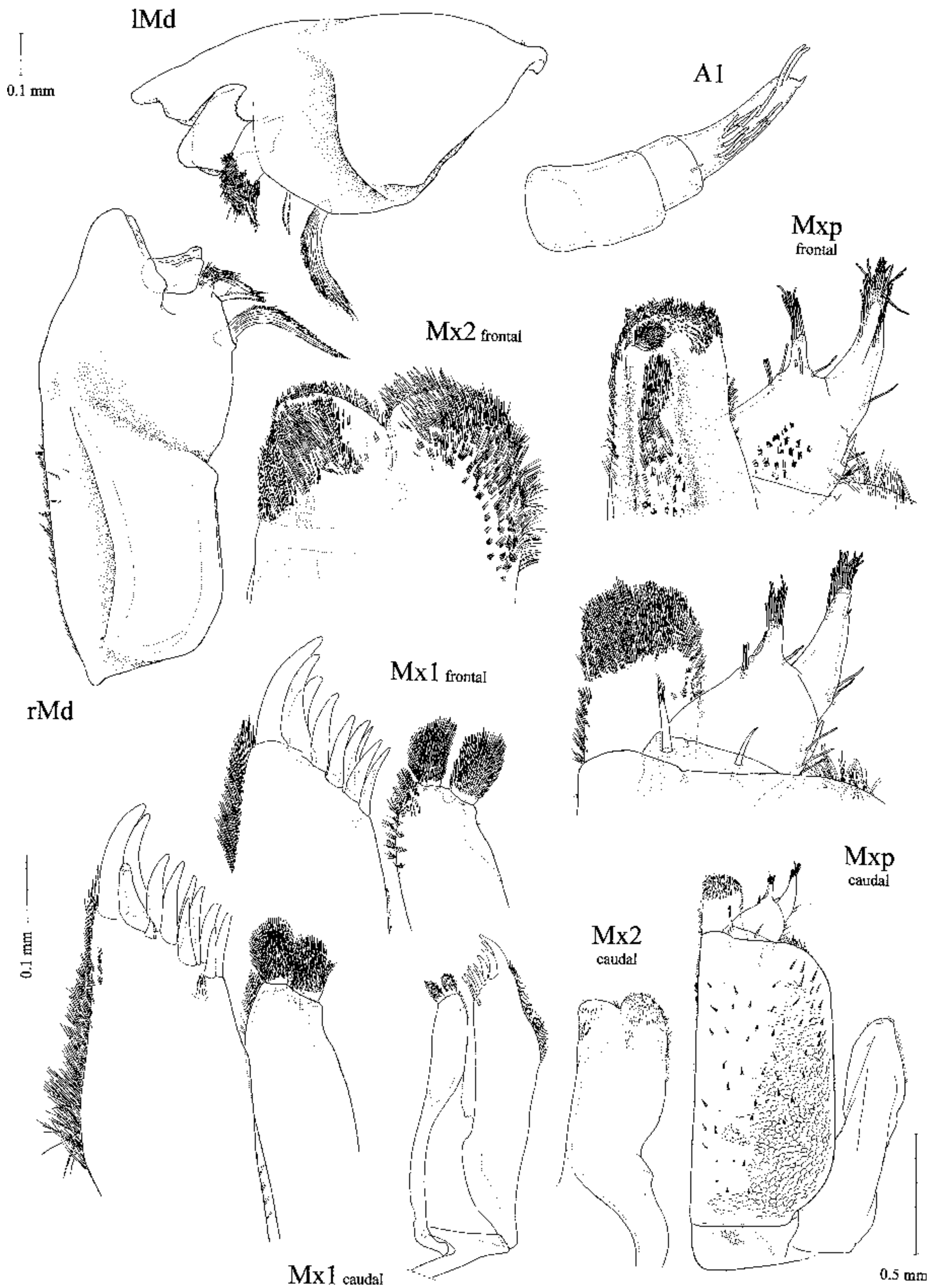

Figure 113. ***Scleropactes cotopaxii* sp. nov.**: holotype ♂, 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, mouthparts, first antenna; paratype ♀, 14.5 × 7.0 mm, cephalothorax 3.10 mm wide, mandibles (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

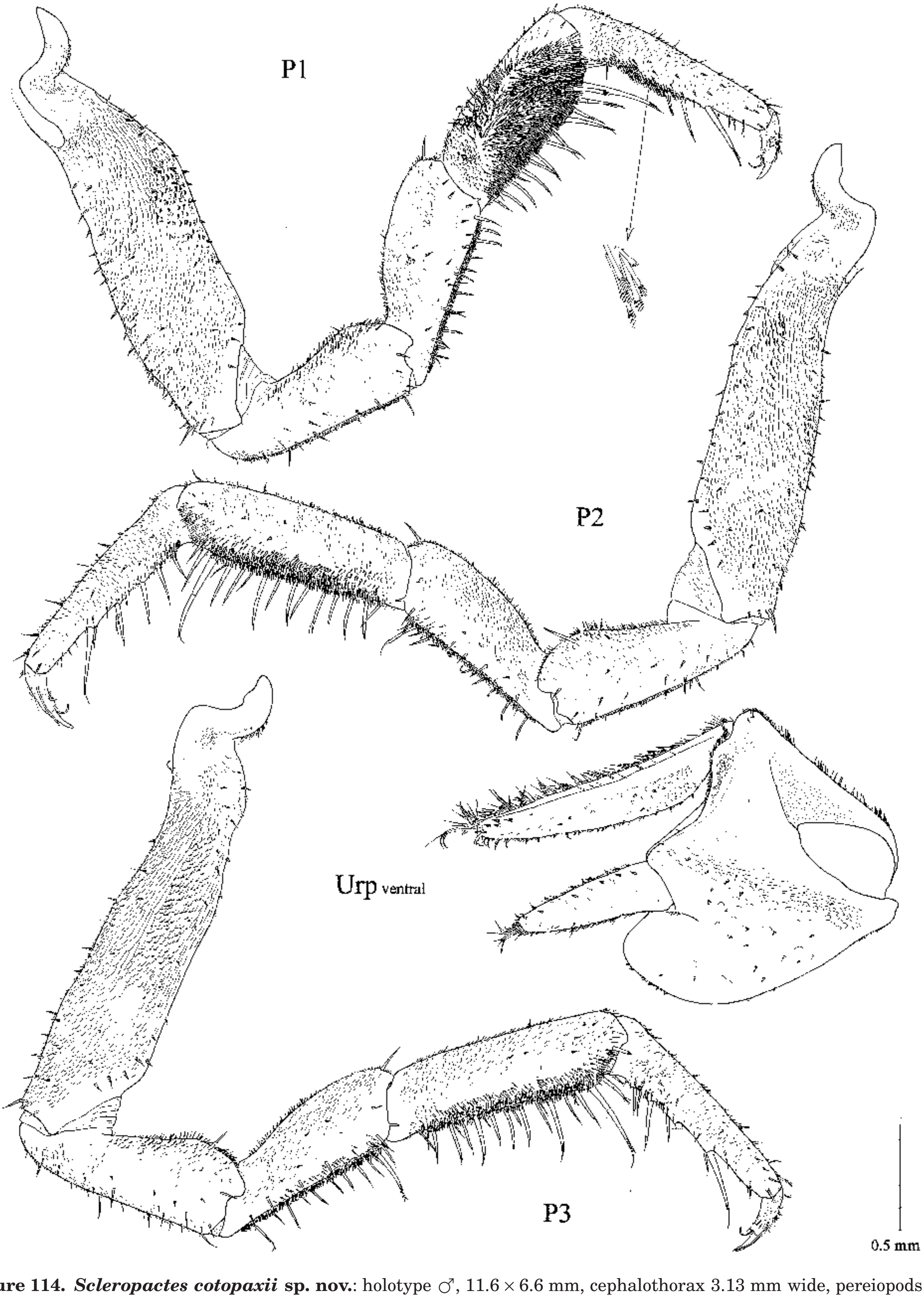

Figure 114. ***Scleropactes cotopaxii* sp. nov.**: holotype ♂, 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, pereiopods 1–3 frontal, uropod dorsal (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

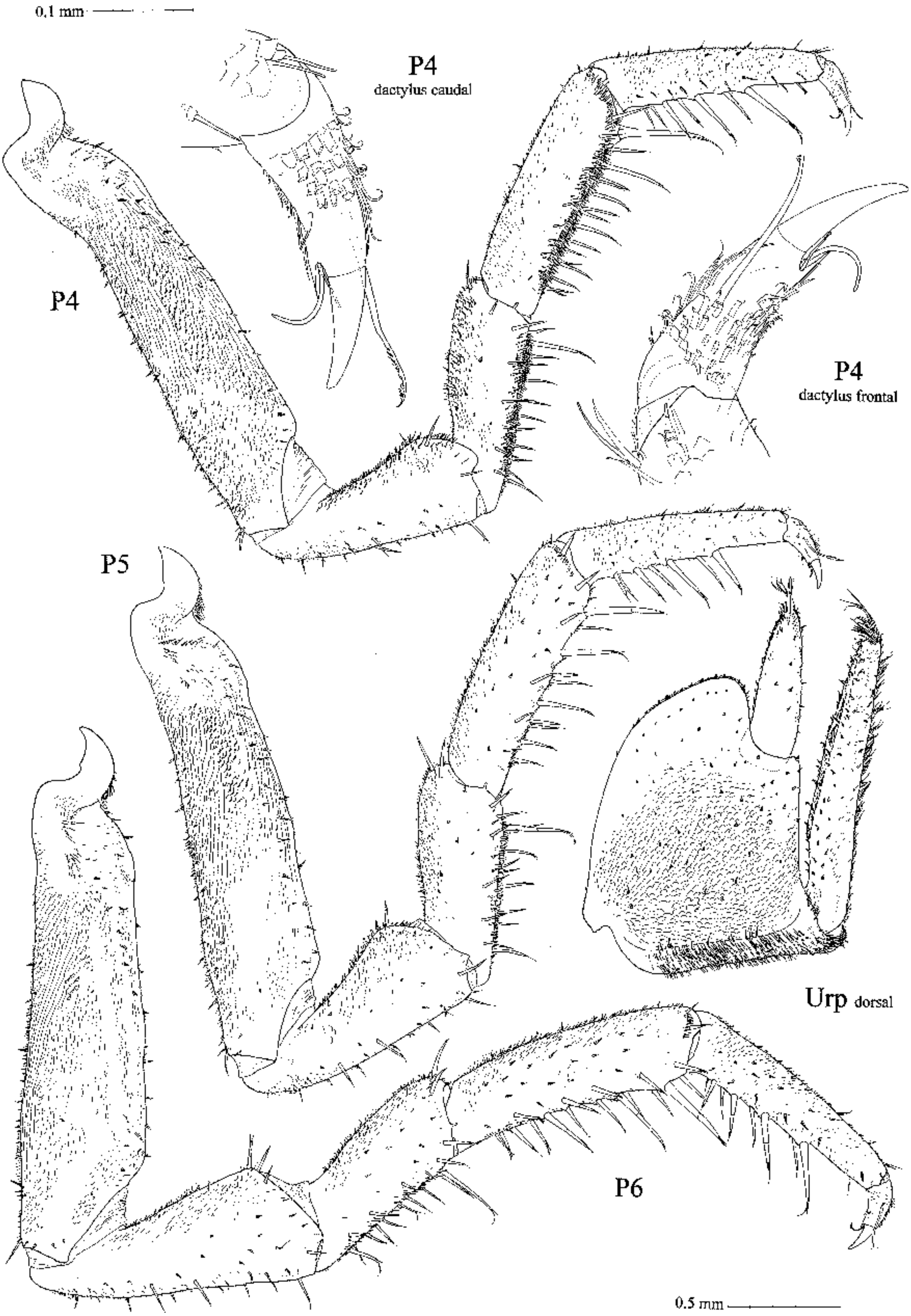

Figure 115. ***Scleropactes cotopaxii* sp. nov.**: holotype ♂, 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, pereiopods 4–6 frontal, P4 dactylus frontal and caudal, uropod ventral (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

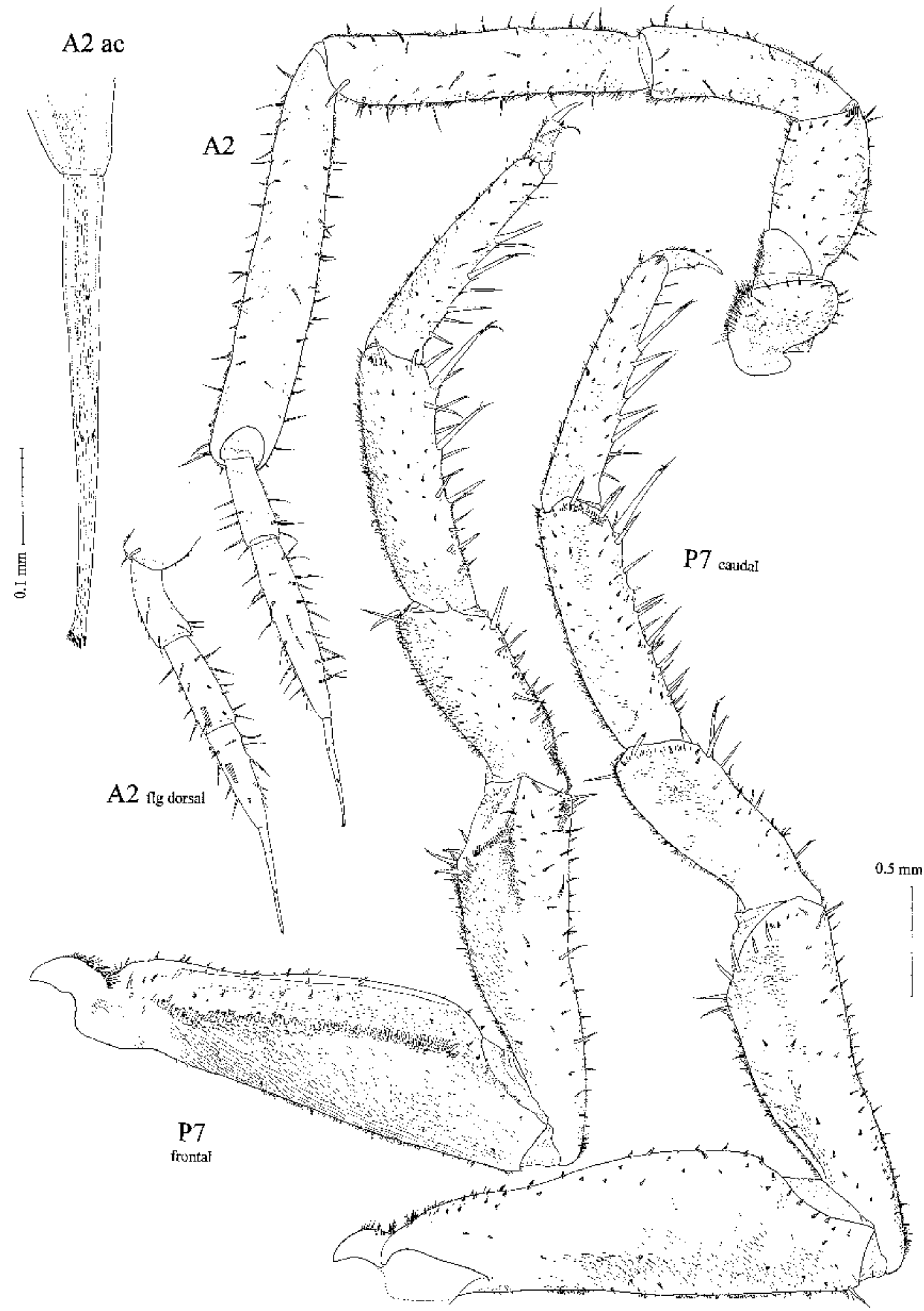

Figure 116. ***Scleropactes cotopaxii*** **sp. nov.**: holotype ♂, 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, pereiopod 7 frontal and caudal, second antenna ventral and apical cone enlarged; paratype ♀, 15.8 × 8.0 mm, cephalothorax 3.95 mm wide, second antenna flagellum (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

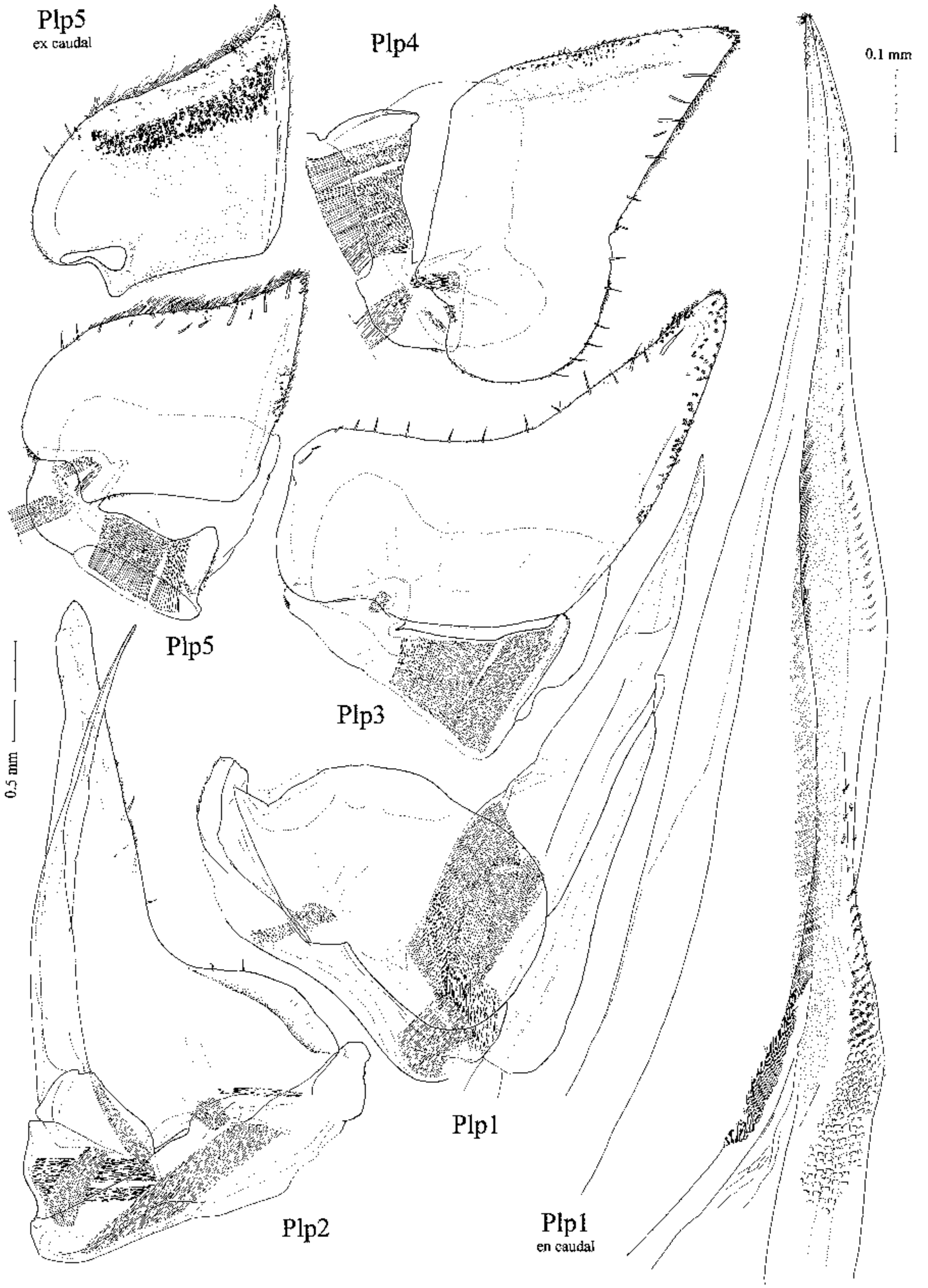

Figure 117. ***Scleropactes cotopaxii*** **sp. nov.**: holotype ♂, 11.6 × 6.6 mm, cephalothorax 3.13 mm wide, pleopods 1–5 (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c.* 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

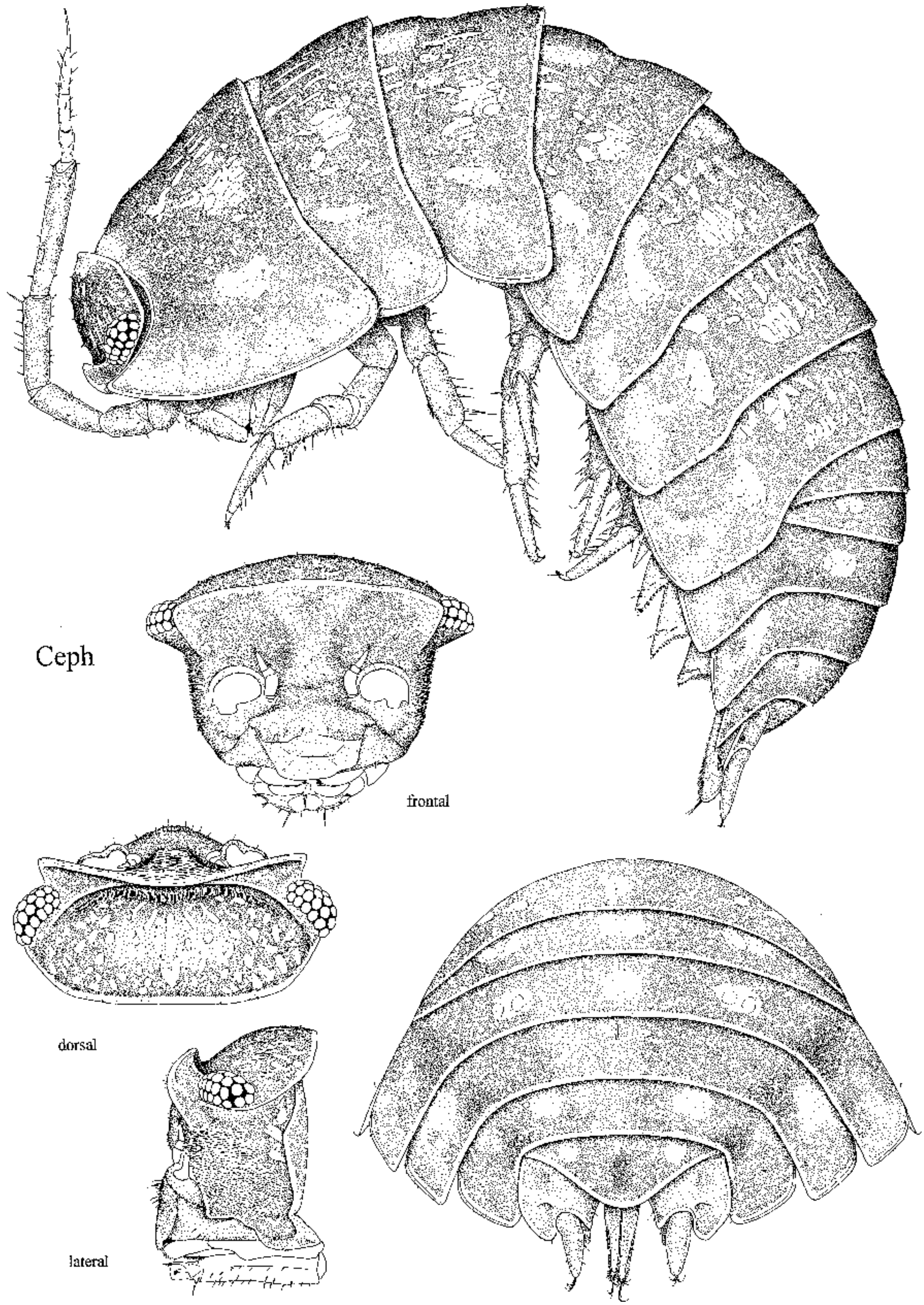

Figure 118. ***Scleropactes ecuadoriensis* sp. nov.**: paratype ♀m, 11.3 × 5.8 mm, habitus lateral and pleon dorsal; holotype ♂, 9.9 × 4.5 mm, cephalothorax 2.38 mm wide, cephalothorax (more enlarged) (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c.* 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

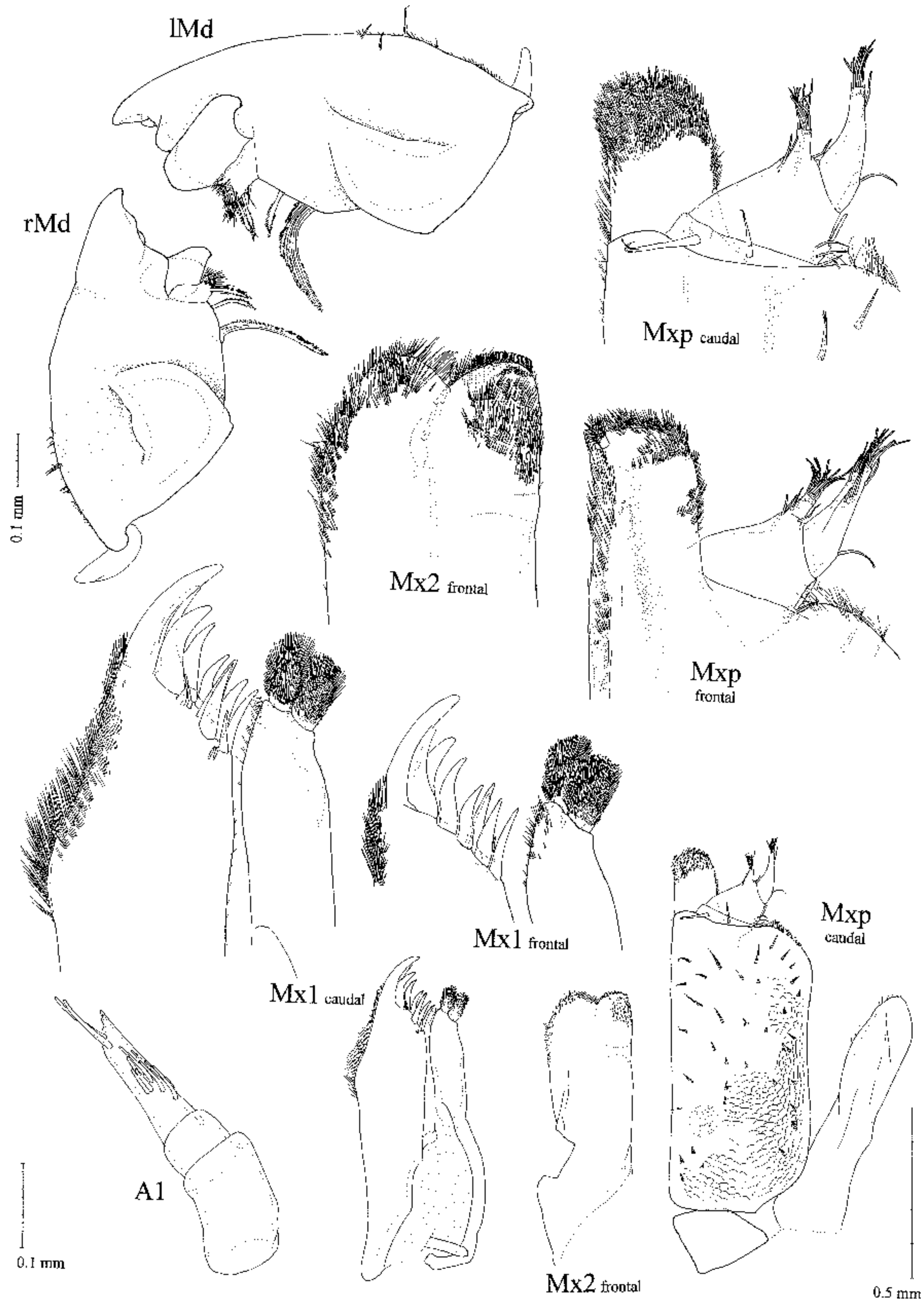

Figure 119. ***Scleropactes ecuadoriensis* sp. nov.**: holotype ♂, 9.9 × 4.5 mm, cephalothorax 2.38 mm wide, mouthparts and first antenna (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c.* 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

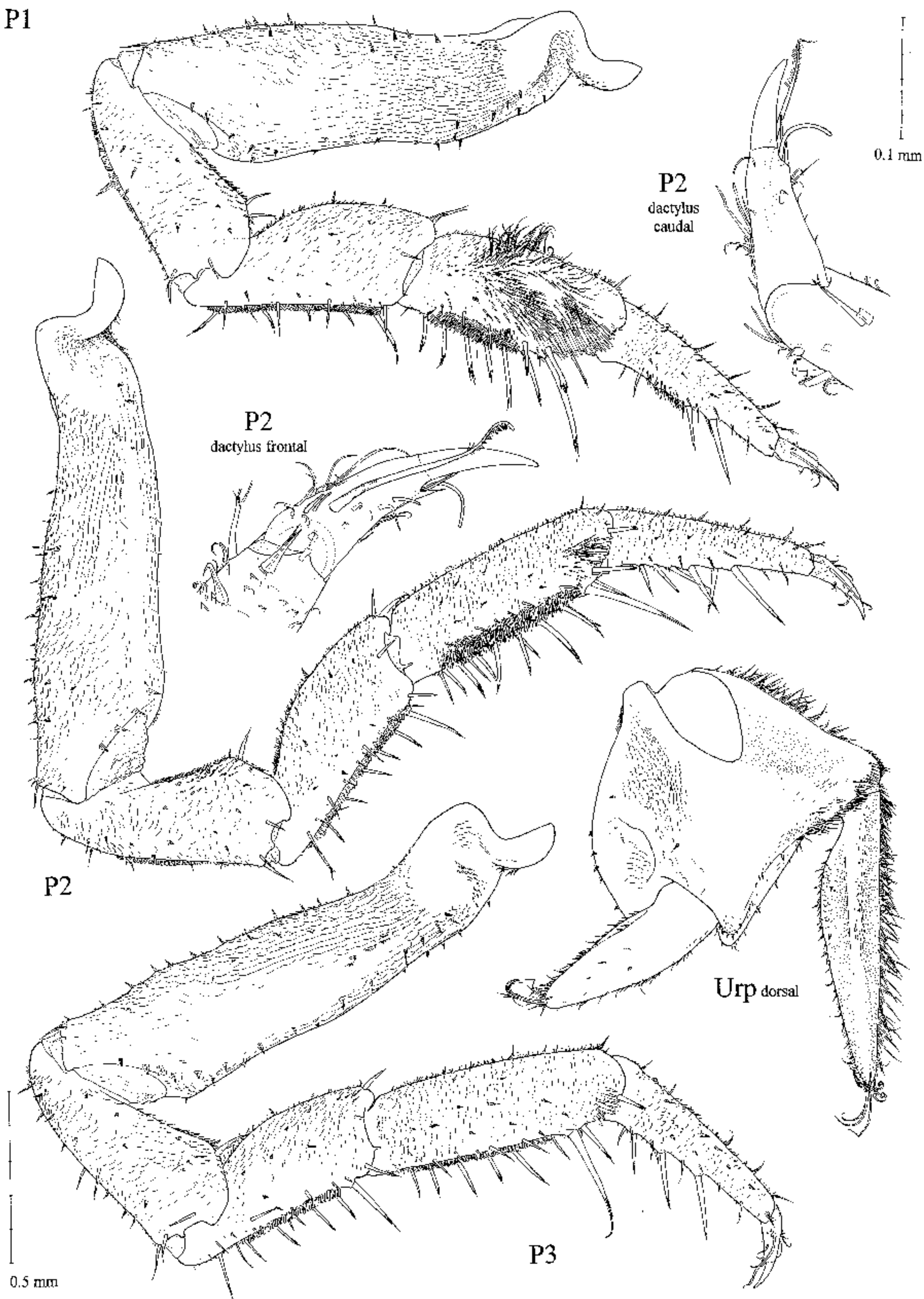

Figure 120. ***Scleropactes ecuadoriensis* sp. nov.**: holotype ♂, 9.9 × 4.5 mm, cephalothorax 2.38 mm wide, pereiopods 1–3 (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c.* 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

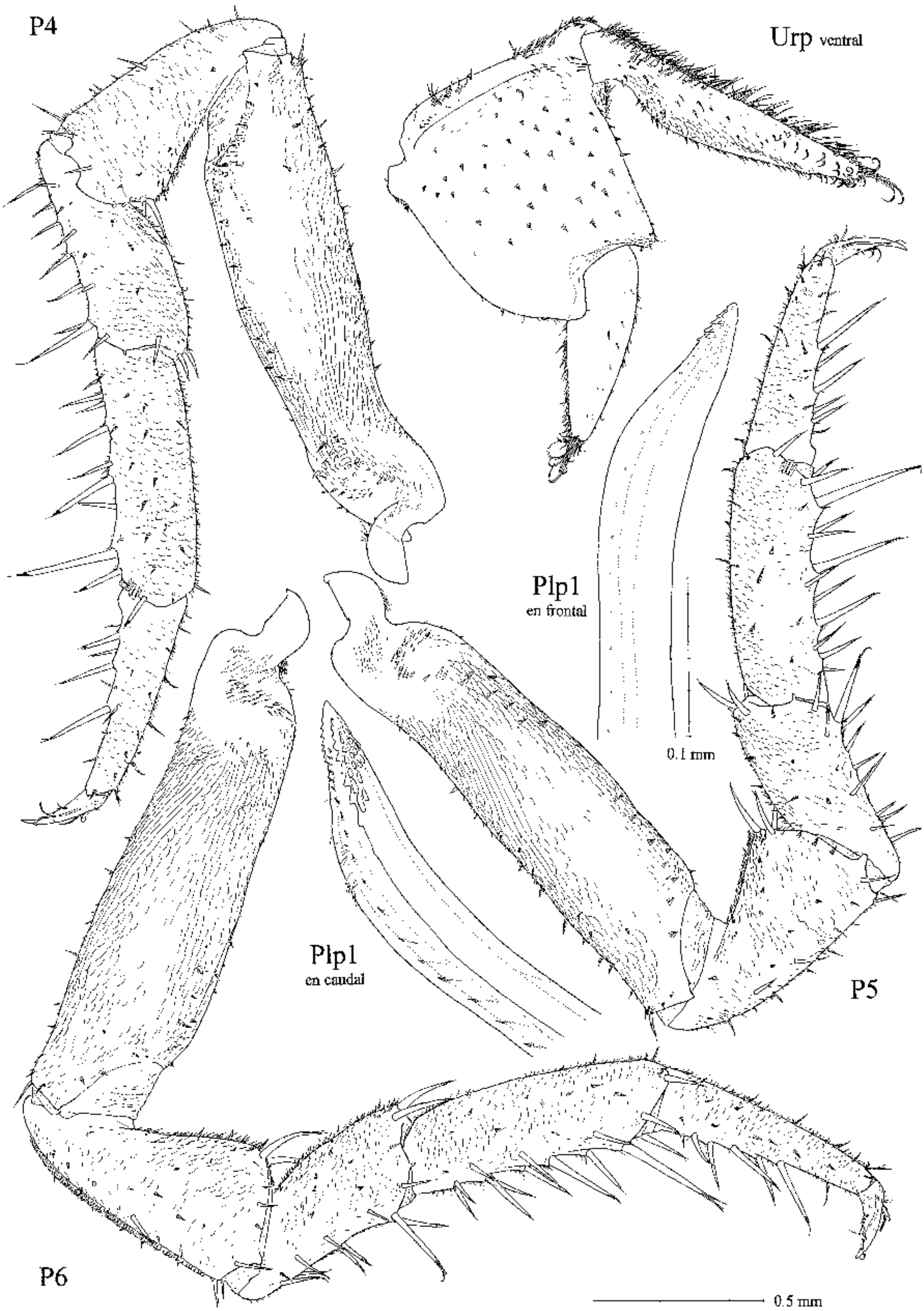

Figure 121. ***Scleropactes ecuadoriensis*** **sp. nov.**: holotype ♂, 9.9 × 4.5 mm, cephalothorax 2.38 mm wide, pereiopods 4–6 (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

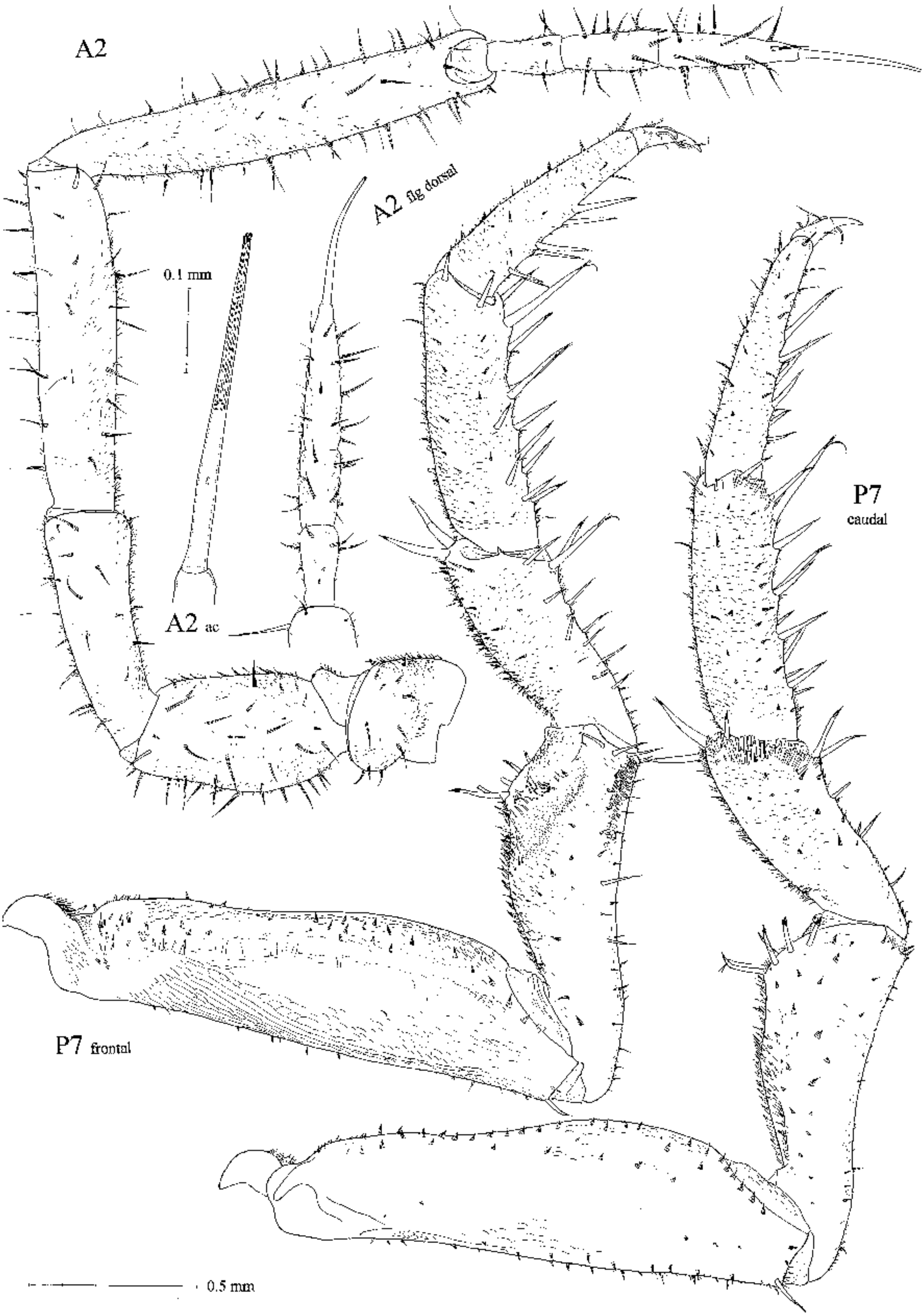

Figure 122. ***Scleropactes ecuadoriensis*** **sp. nov.**: holotype ♂, 9.9 × 4.5 mm, cephalothorax 2.38 mm wide, second antenna, pereiopod 7 (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c.* 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

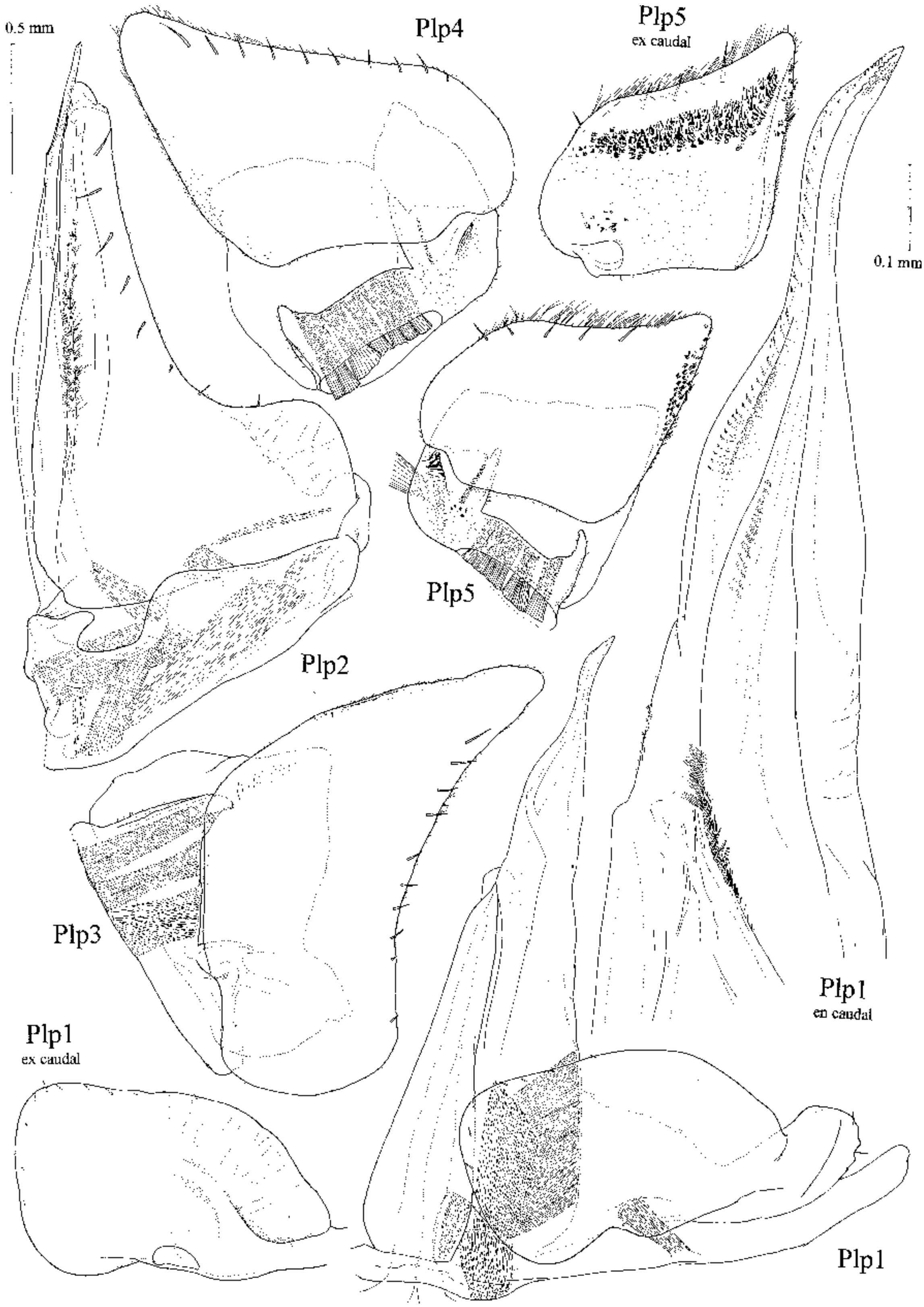

Figure 123. ***Scleropactes ecuadoriensis*** **sp. nov.**: holotype ♂, 9.9 × 4.5 mm, cephalothorax 2.38 mm wide, pleopods 1–5 (1 endopodite, 2–5 exopodite caudal (Ecuador, Cotopaxi Prov., San Francisco de las Pampas, 0°26′ S, 78°58′ W, altitude *c*. 1300 m, leg. L. Bartolozzi, 23–24 February 1993, MZUF).

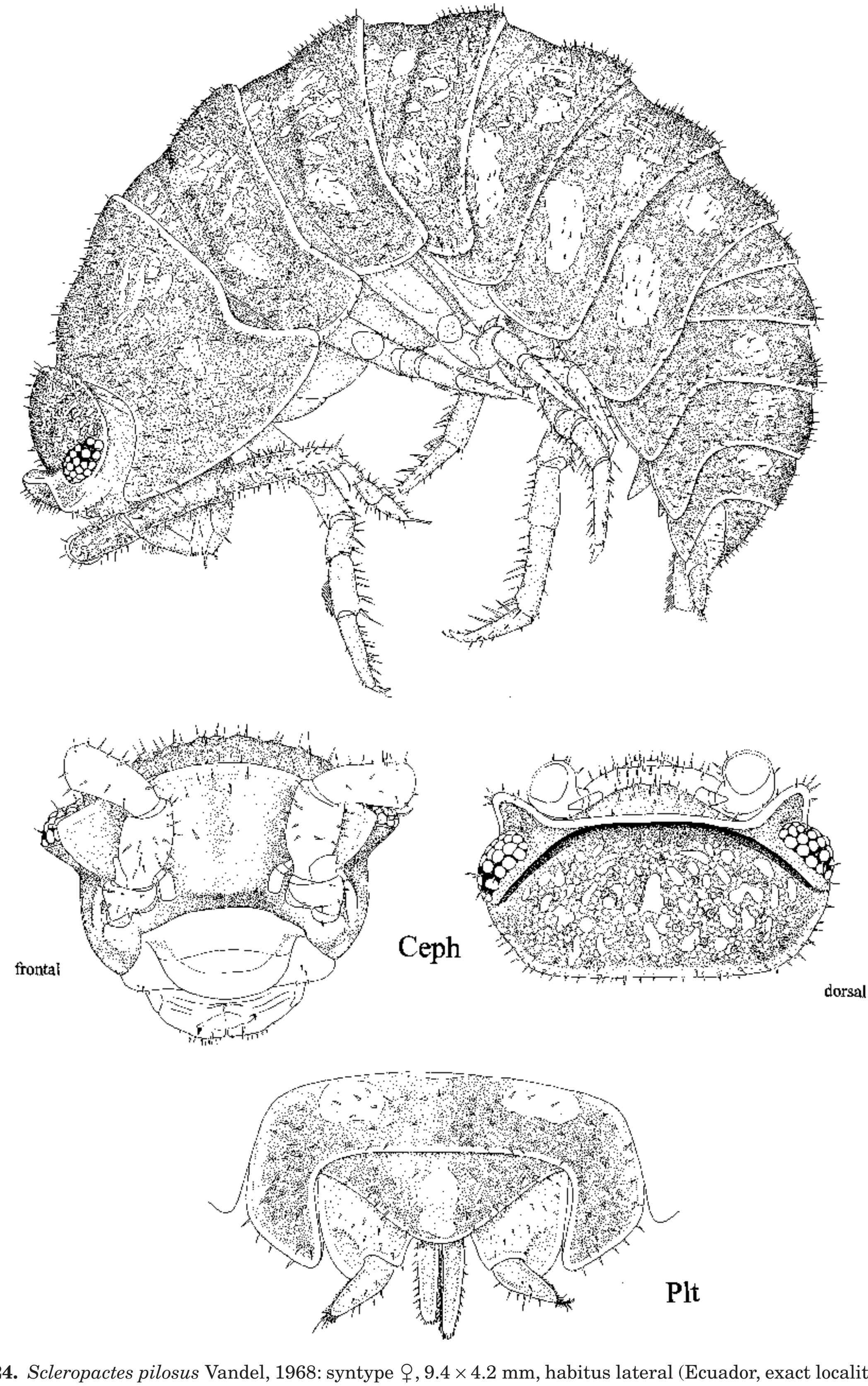

Figure 124. *Scleropactes pilosus* Vandel, 1968: syntype ♀, 9.4 × 4.2 mm, habitus lateral (Ecuador, exact locality unknown, altitude 600–4200 m, leg. N. Leleup, March–April 1965, MNHN).

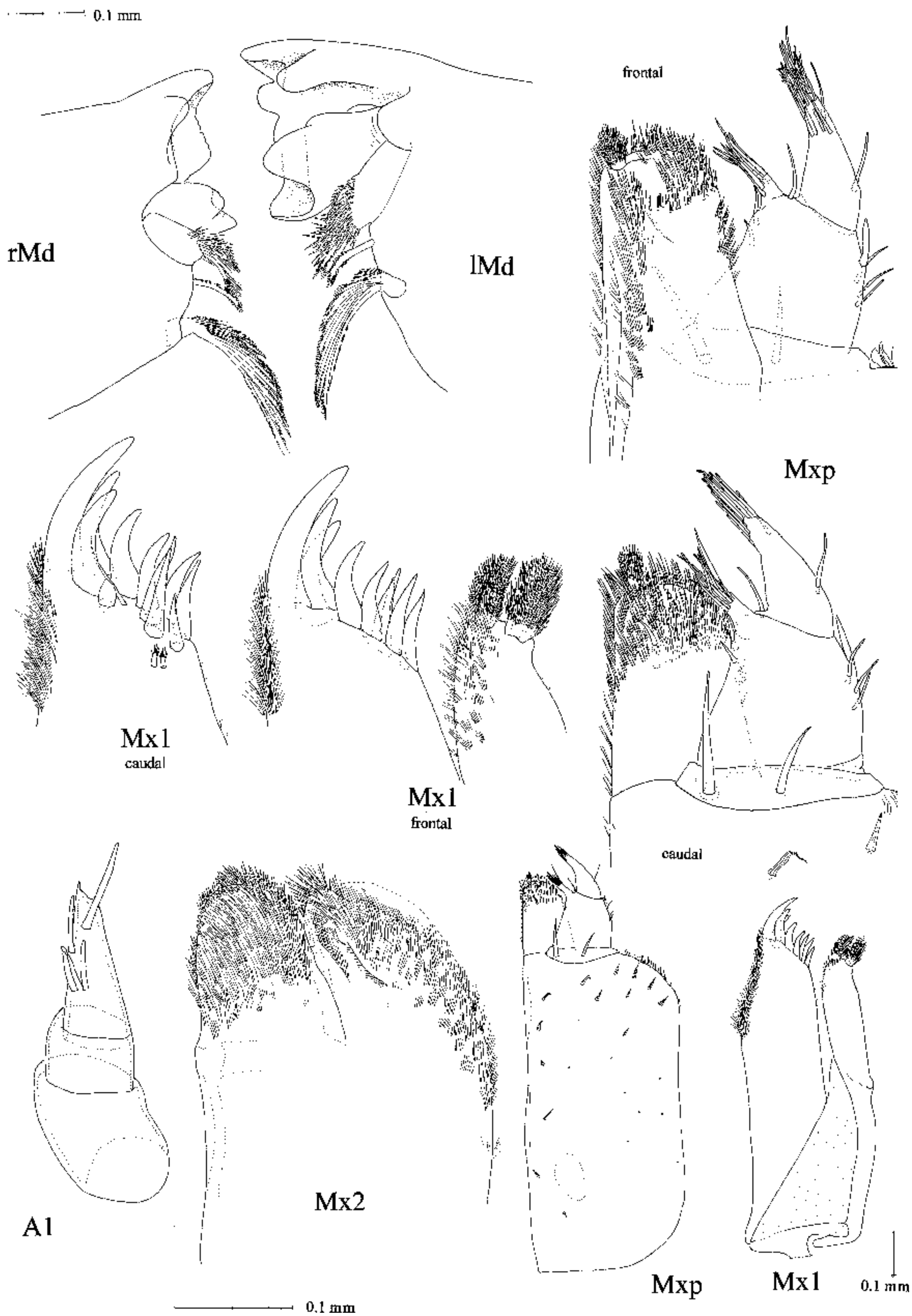

Figure 125. *Scleropactes pilosus* Vandel, 1968: syntype ♀, mouthparts, first antenna (Ecuador, exact locality unknown, altitude 600–4200 m, leg. N. Leleup, March–April 1965, MNHN).

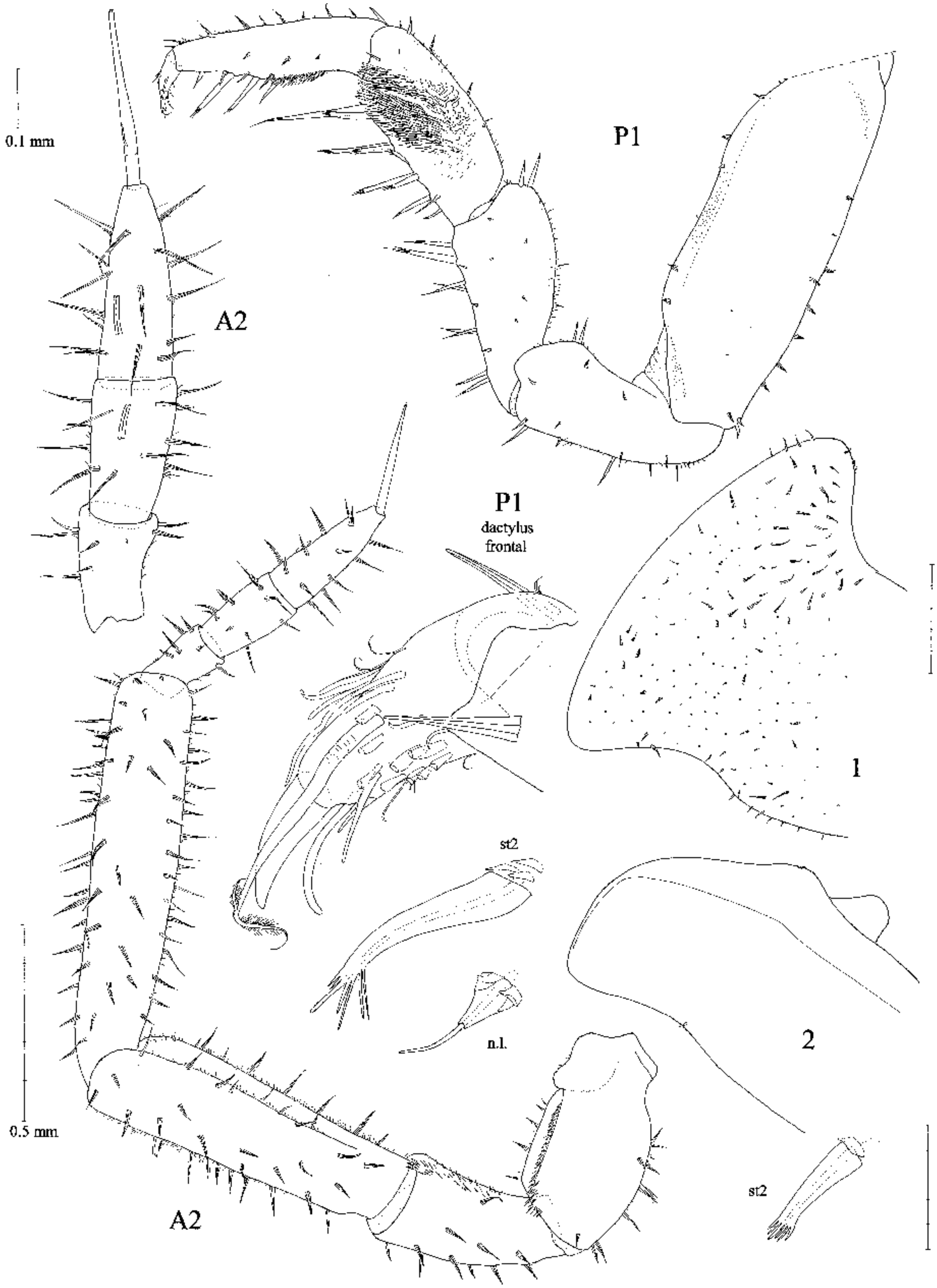

Figure 126. *Scleropactes pilosus* Vandel, 1968: syntype ♀, pereiopod 1, coxal plates 1 and 2, second antenna (Ecuador, exact locality unknown, altitude 600–4200 m, leg. N. Leleup, March–April 1965, MNHN).

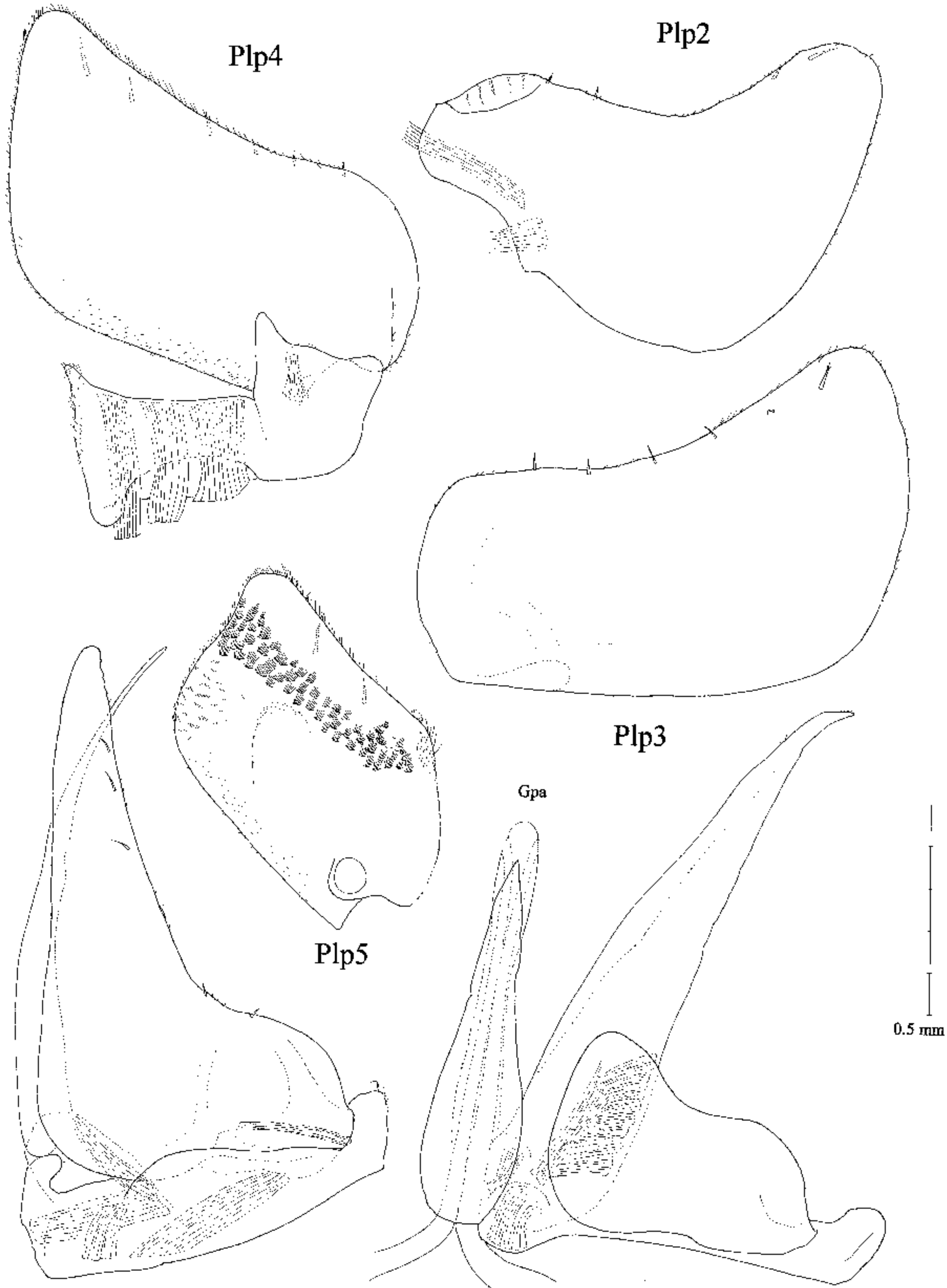

Figure 127. *Scleropactes pilosus* Vandel, 1968: syntype ♀, pleopods 1 and 2; ♀ syntype, pleopods 2–5 (Ecuador, exact locality unknown, altitude 600–4200 m, leg. N. Leleup, March–April 1965, MNHN).

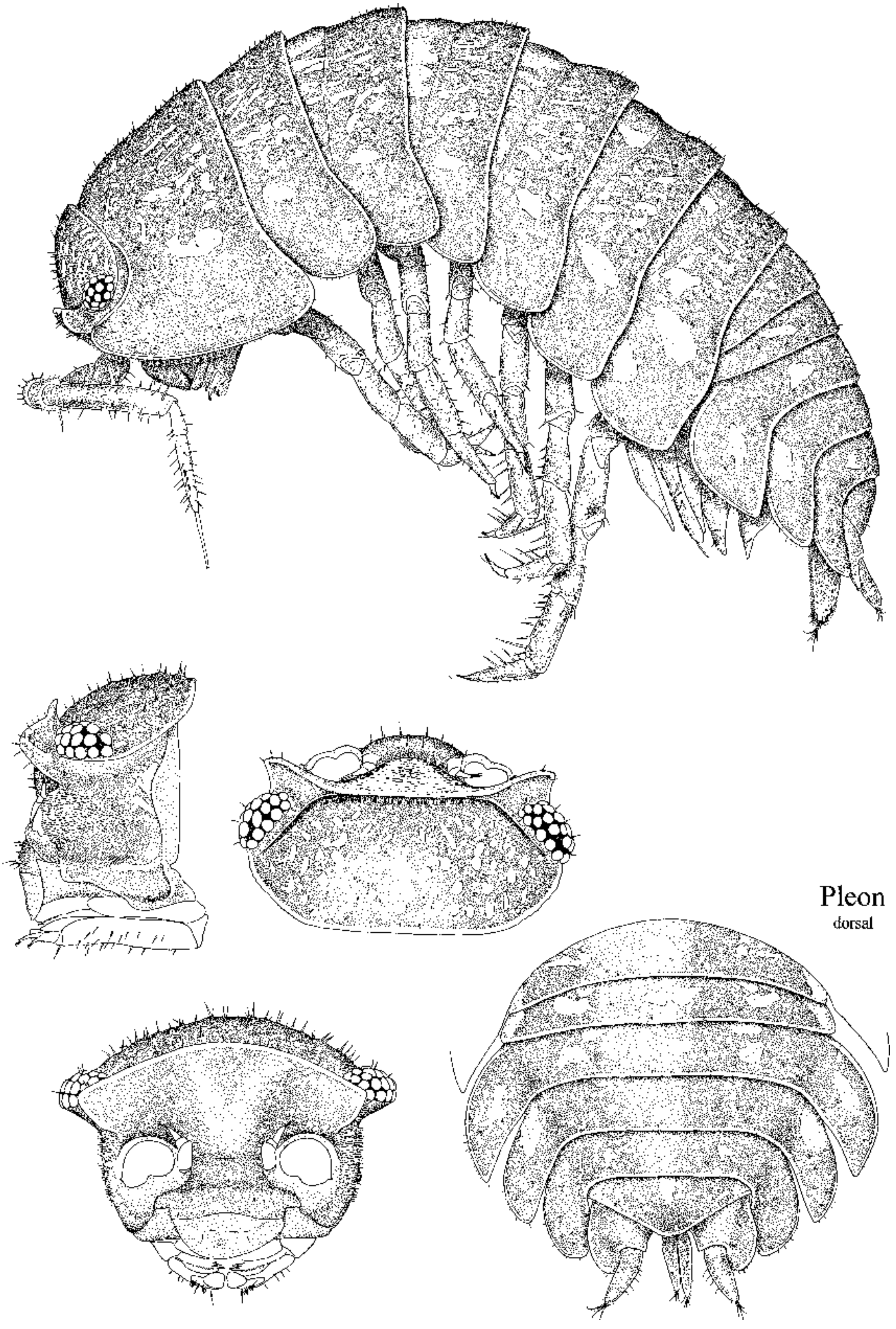

Figure 128. ***Scleropactes pululahua*** **sp. nov.**: paratype ♂, 6.5 × 3.3 mm, cephalothorax 1.82 mm wide, habitus lateral, pleon dorsal; holotype ♂, 6.6 × 3.0 mm, cephalothorax 1.57 mm wide, cephalothorax lateral, dorsal, frontal (Ecuador, Pichincha Prov., Pululahua volcano, altitude 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

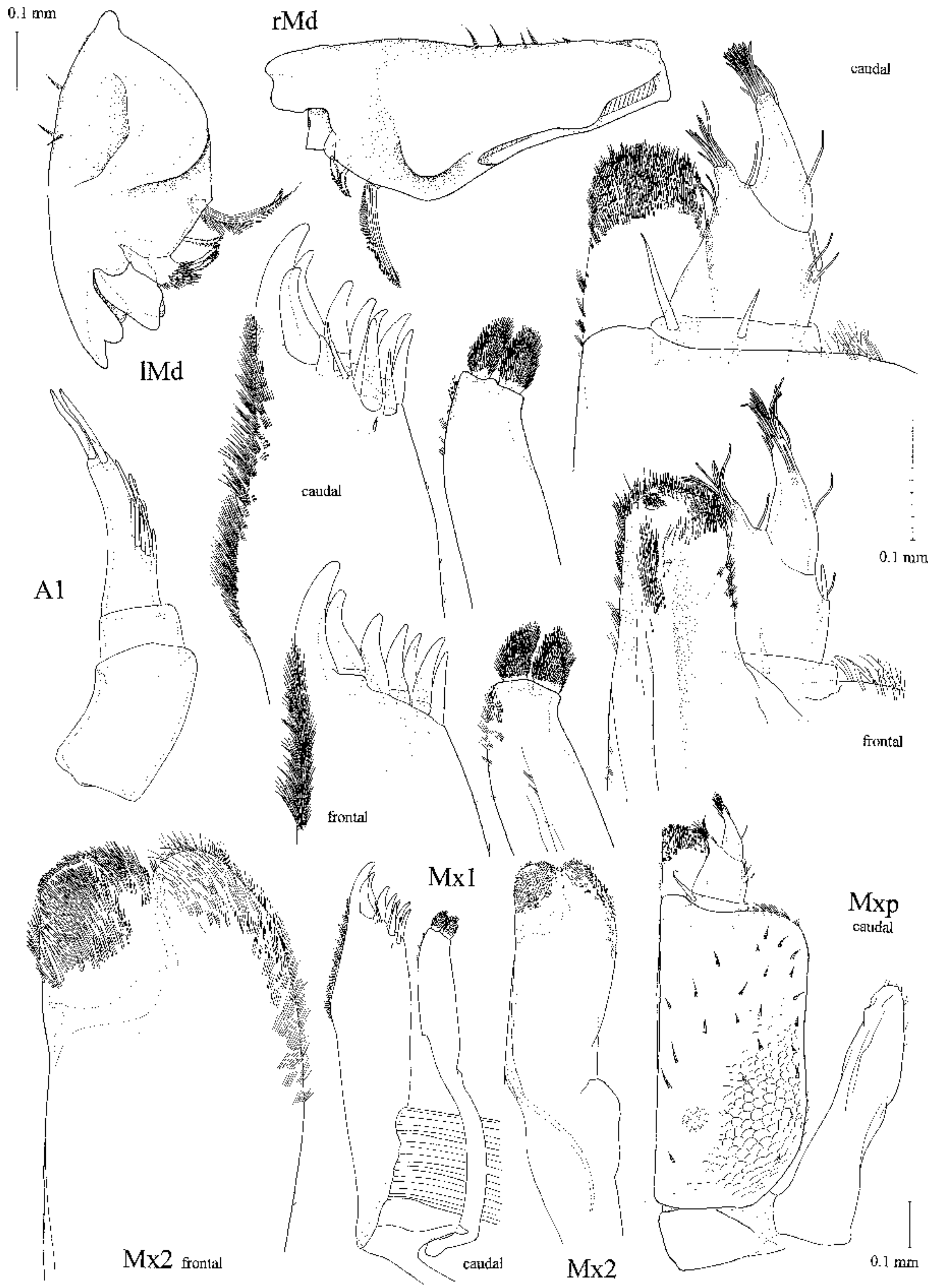

Figure 129. ***Scleropactes pululahua*** **sp. nov.**: holotype ♂, 6.6 × 3.0 mm, cephalothorax 1.57 mm wide, maxilliped caudal, maxilliped distal part enlarged, frontal; paratype ♀, 3.5 mm wide, cephalothorax 1.80 mm wide, all other mouthparts, first antenna (Ecuador, Pichincha Prov., Pululahua volcano, altitude 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

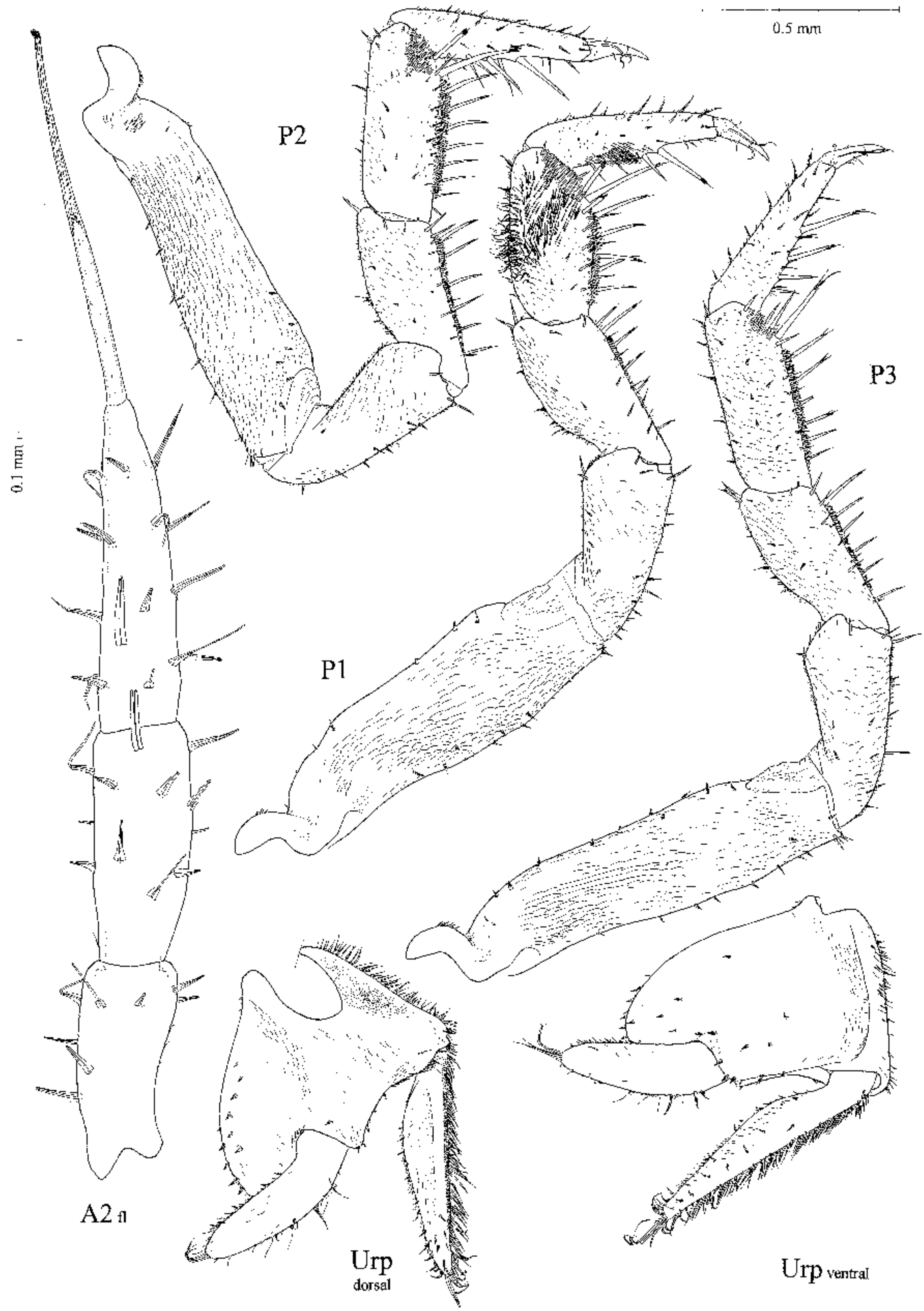

Figure 130. ***Scleropactes pululahua* sp. nov.**: holotype ♂, 6.6 × 3.0 mm, cephalothorax 1.57 mm wide, pereiopods 1–3 frontal, uropod dorsal and ventral; paratype ♀, 3.5 mm wide, cephalothorax 1.80 mm wide, second antenna flagellum (Ecuador, Pichincha Prov., Pululahua volcano, altitude 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

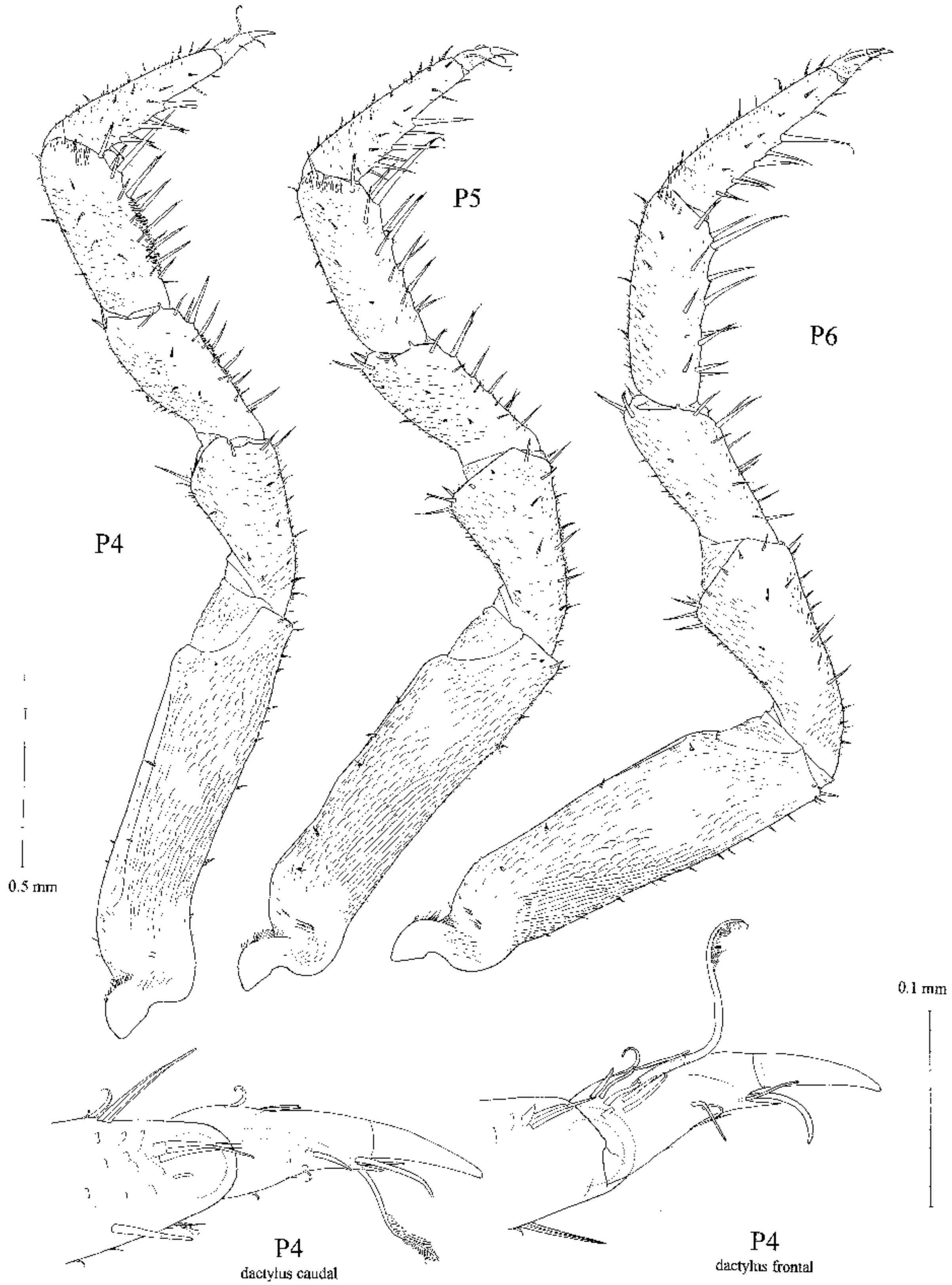

Figure 131. ***Scleropactes pululahua* sp. nov.**: holotype ♂, 6.6 × 3.0 mm, cephalothorax 1.57 mm wide, pereiopods 4–6 frontal, pereiopod 4 dactylus frontal and caudal (Ecuador, Pichincha Prov., Pululahua volcano, altitude 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

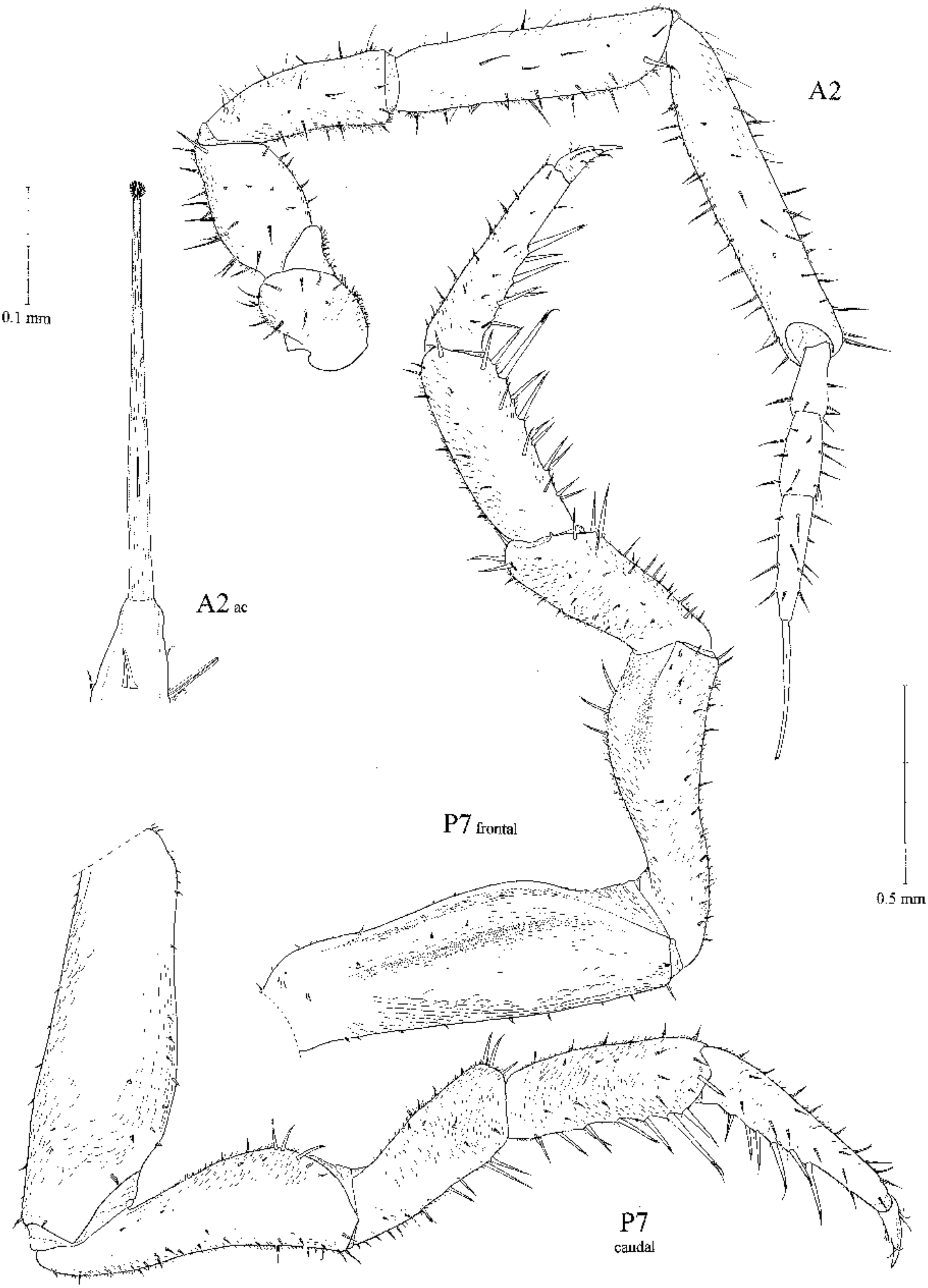

Figure 132. ***Scleropactes pululahua* sp. nov.**: holotype ♂, 6.6 × 3.0 mm, cephalothorax 1.57 mm wide, pereiopod 7 frontal and caudal, second antenna ventral, sesond antenna apical cone enlarged (Ecuador, Pichincha Prov., Pululahua volcano, altitude 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

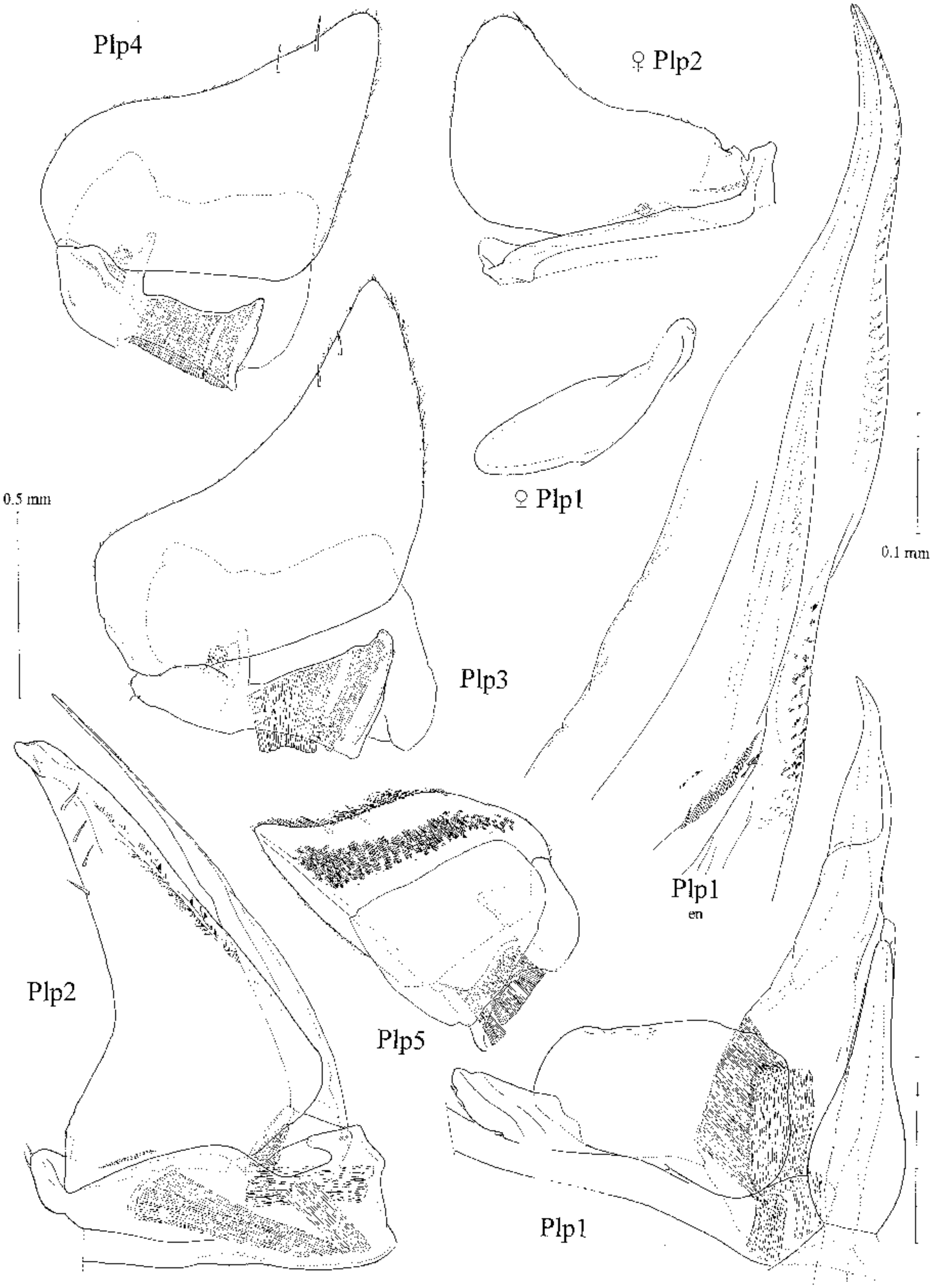

Figure 133. ***Scleropactes pululahua* sp. nov.**: holotype ♂, 6.6 × 3.0 mm, cephalothorax 1.57 mm wide, pleopods 1–4 frontal, pleopod 5 caudal; paratype ♀, 3.5 mm wide, cephalothorax 1.80 mm wide, pleopods 1 and 2 frontal (Ecuador, Pichincha Prov., Pululahua volcano, altitude 3000 m, leg. L. Bartolozzi, 14 February 1993, MZUF).

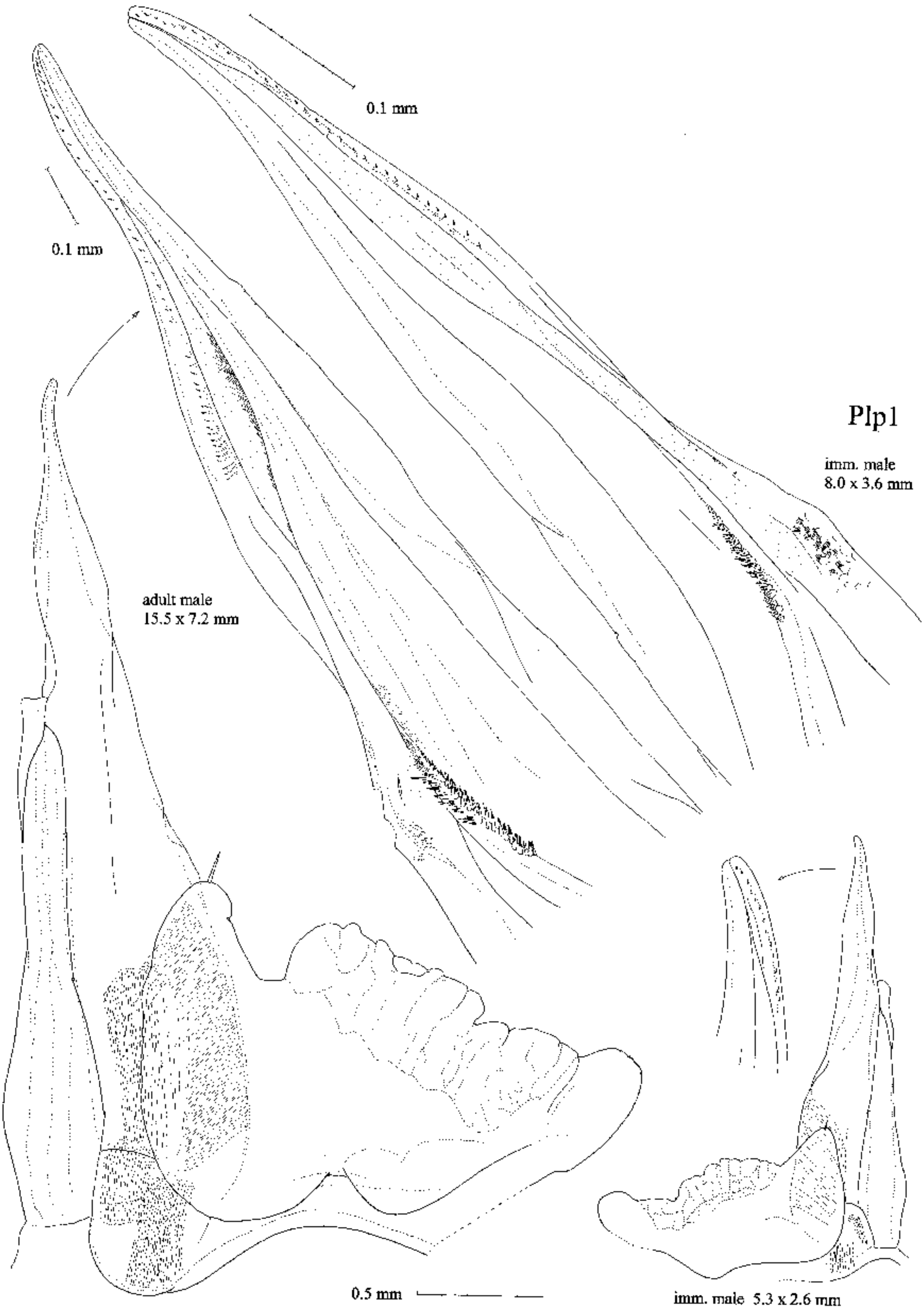

Figure 134. *Scleropactes zeteki* Van Name, 1926: pleopod 1 of males of different size: immature 5.3 × 2.6 mm, immature 8.0 × 3.6 mm, 15.5 × 7.2 mm [compare also with immature male of 10.9 × 4.3 mm in Schmidt (2003)]; whole pleopods drawn at the same scale, enlarged endopodites not at same scale (Panama, Canal Zone, Barro Colorado island, leg. J. Zetek, January–June 1944; USNM 87595).

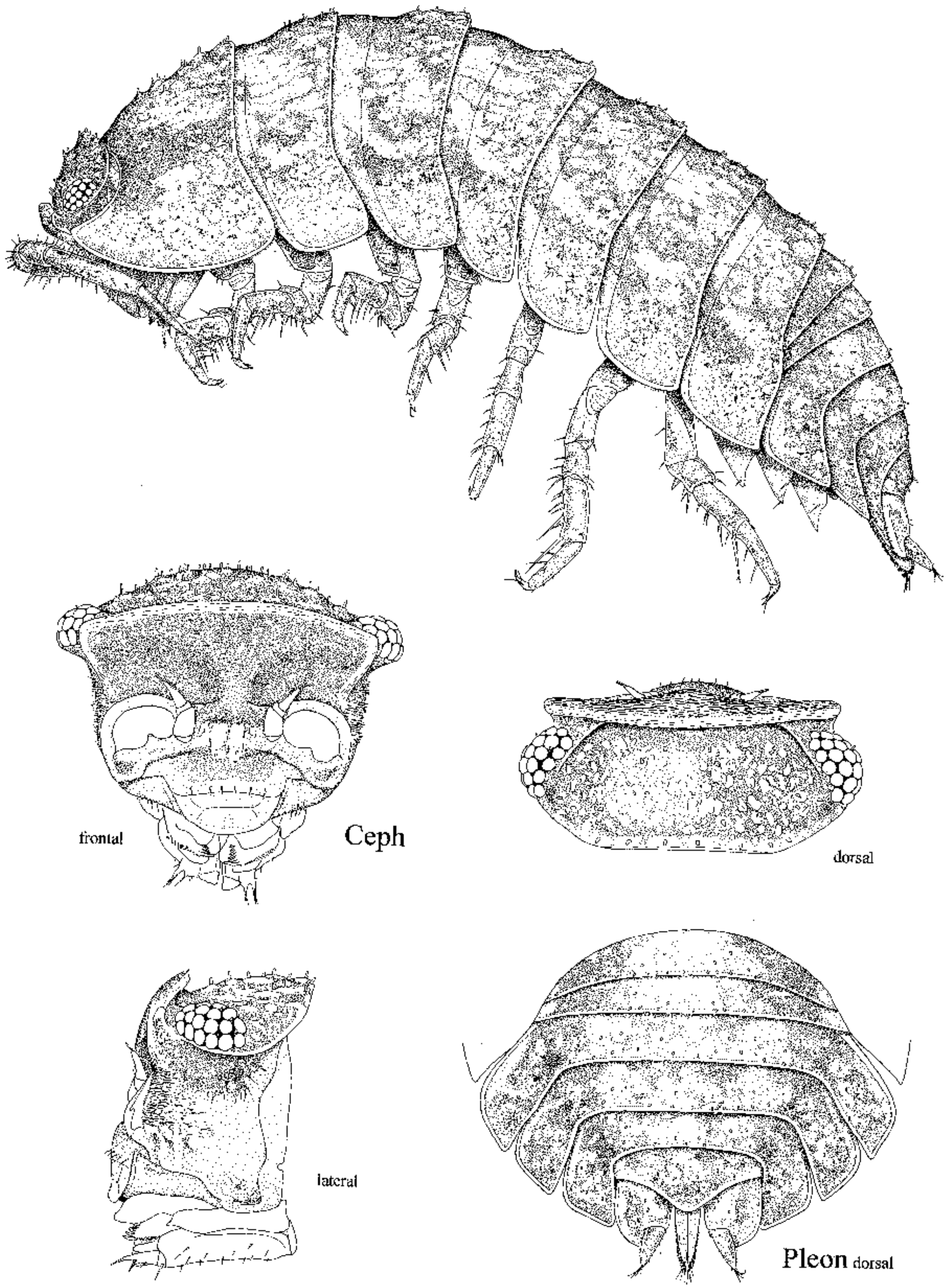

Figure 135. ***Globopactes hispidus*** **sp. nov.**: ♀m paratype, 7.0 × 3.2 mm, cephalothorax 1.52 mm wide, habitus lateral, pleon dorsal; ♂ holotype, 6.8 × 3.1 mm, cephalothorax 1.43 mm wide, cephalothorax lateral, dorsal and frontal (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c.* 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

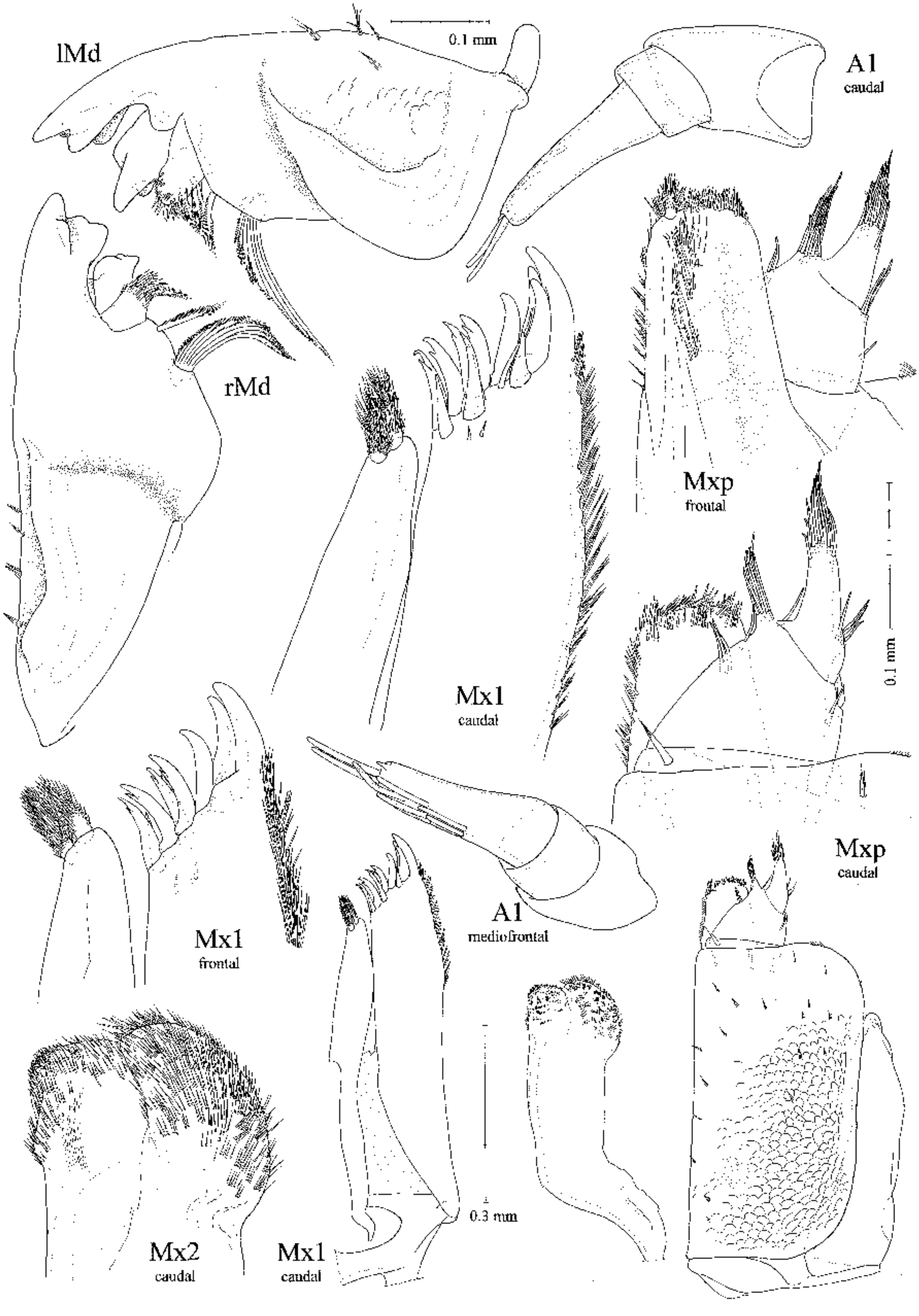

Figure 136. ***Globopactes hispidus*** **sp. nov.**: ♂ holotype, 6.8 × 3.1 mm, cephalothorax 1.43 mm wide, mouthparts, first antenna (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c*. 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

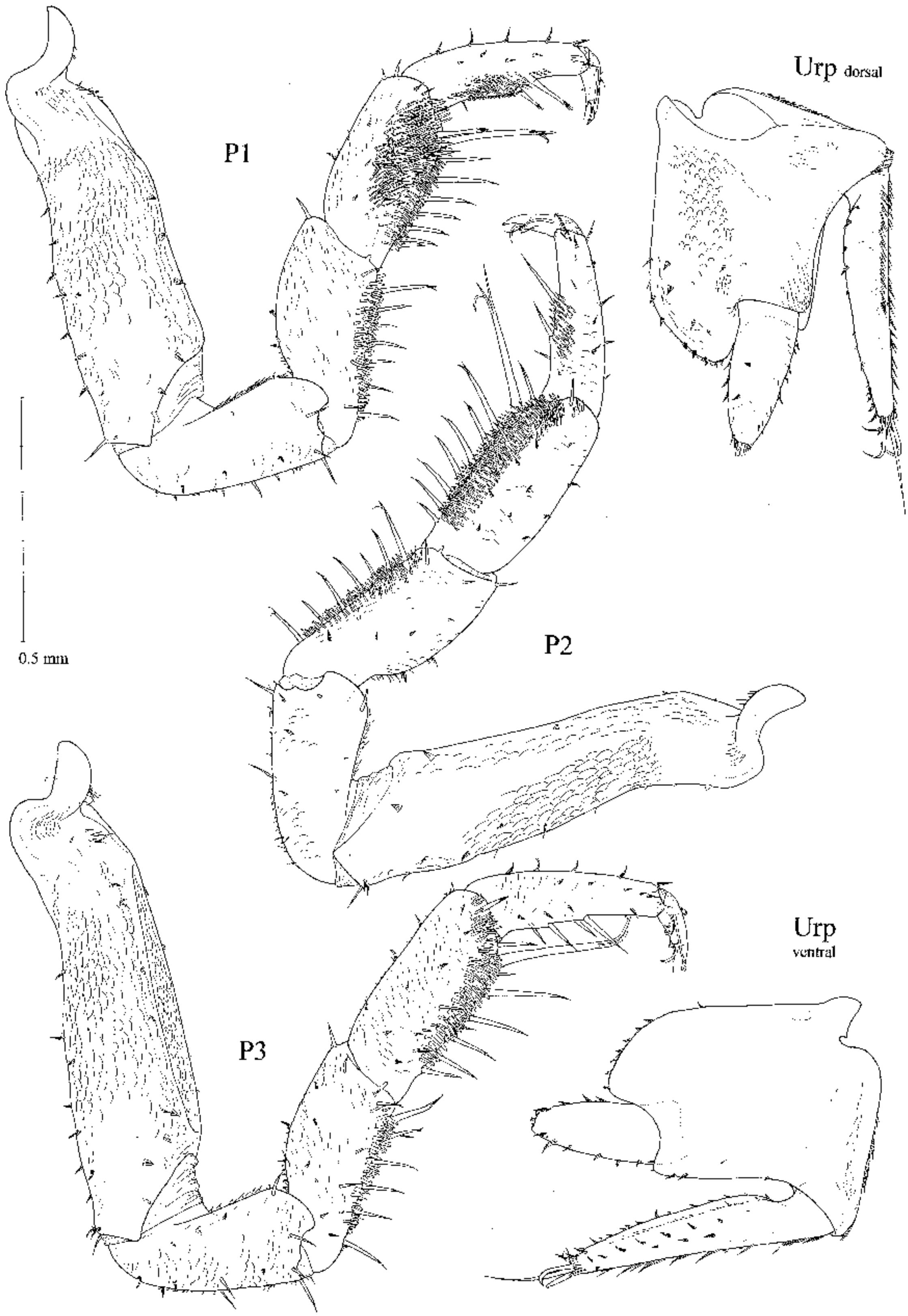

Figure 137. ***Globopactes hispidus* sp. nov.**: ♂ holotype, 6.8 × 3.1 mm, cephalothorax 1.43 mm wide, pereiopods 1–3, uropods (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c.* 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

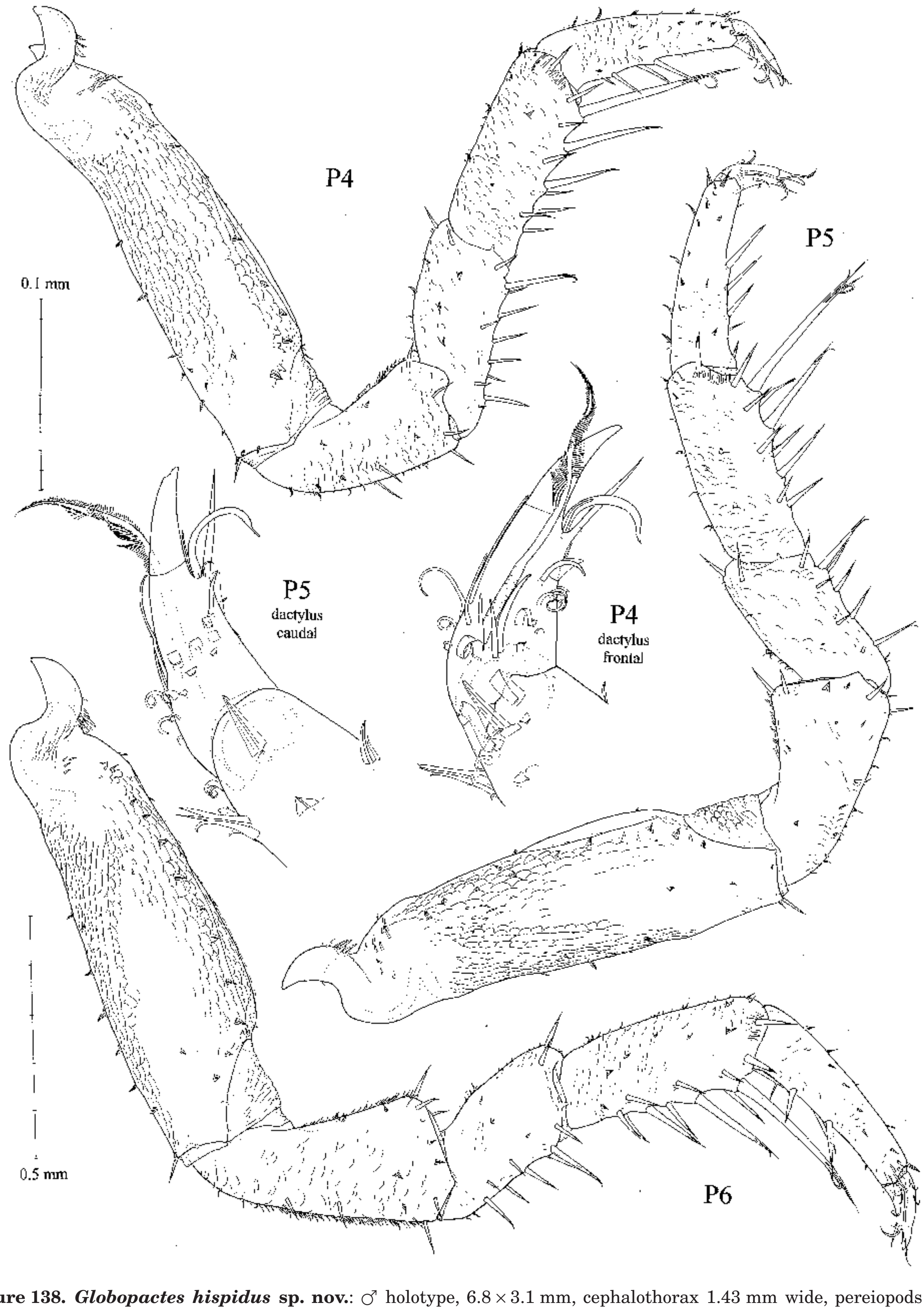

Figure 138. ***Globopactes hispidus*** **sp. nov.**: ♂ holotype, 6.8 × 3.1 mm, cephalothorax 1.43 mm wide, pereiopods 4–6, pereiopod 4 dactylus frontal, pereiopod 5 dactylus caudal (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c*. 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

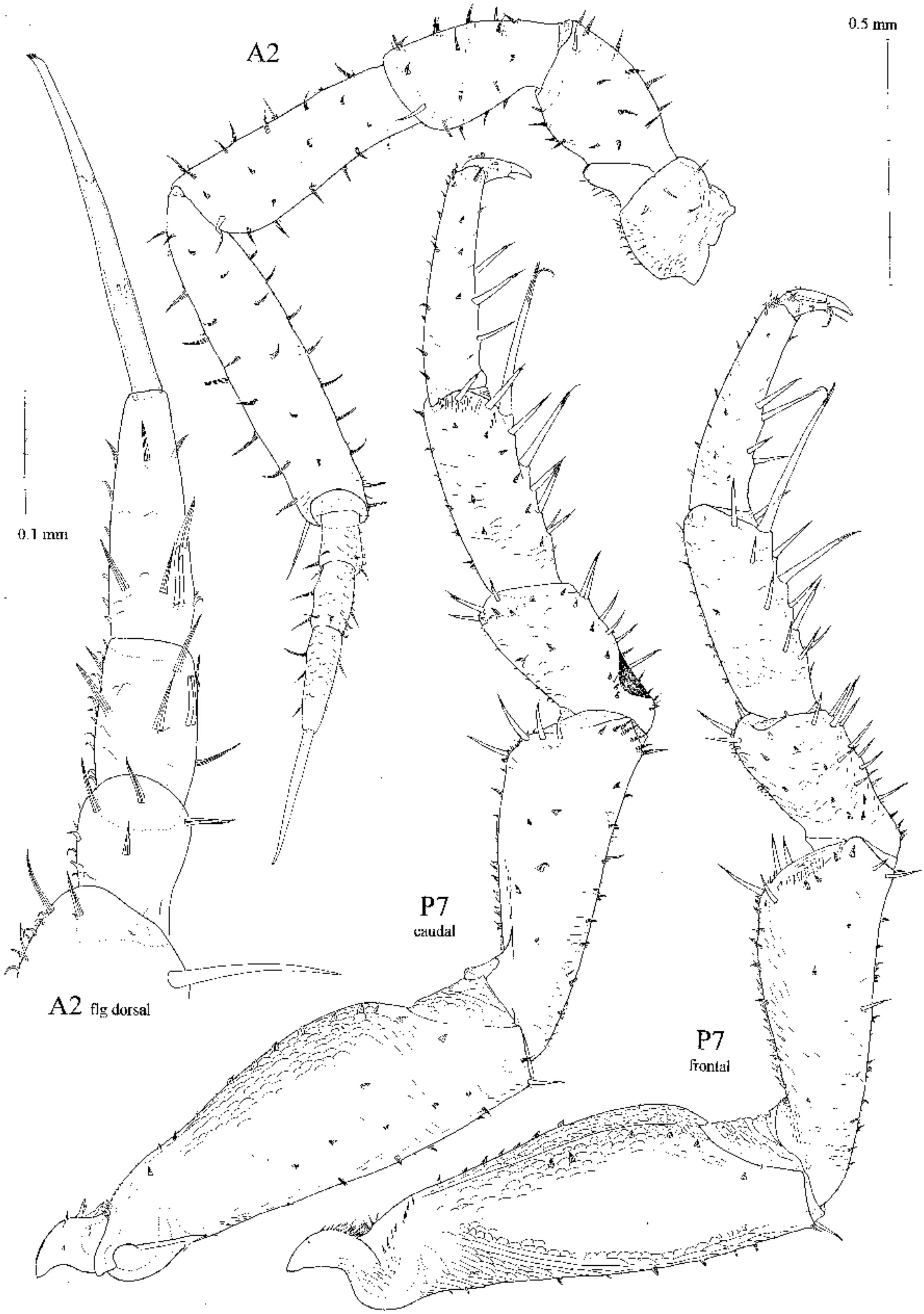

Figure 139. ***Globopactes hispidus* sp. nov.**: ♂ holotype, 6.8 × 3.1 mm, cephalothorax 1.43 mm wide, pereiopod 7 frontal and ventral, second antenna (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c.* 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

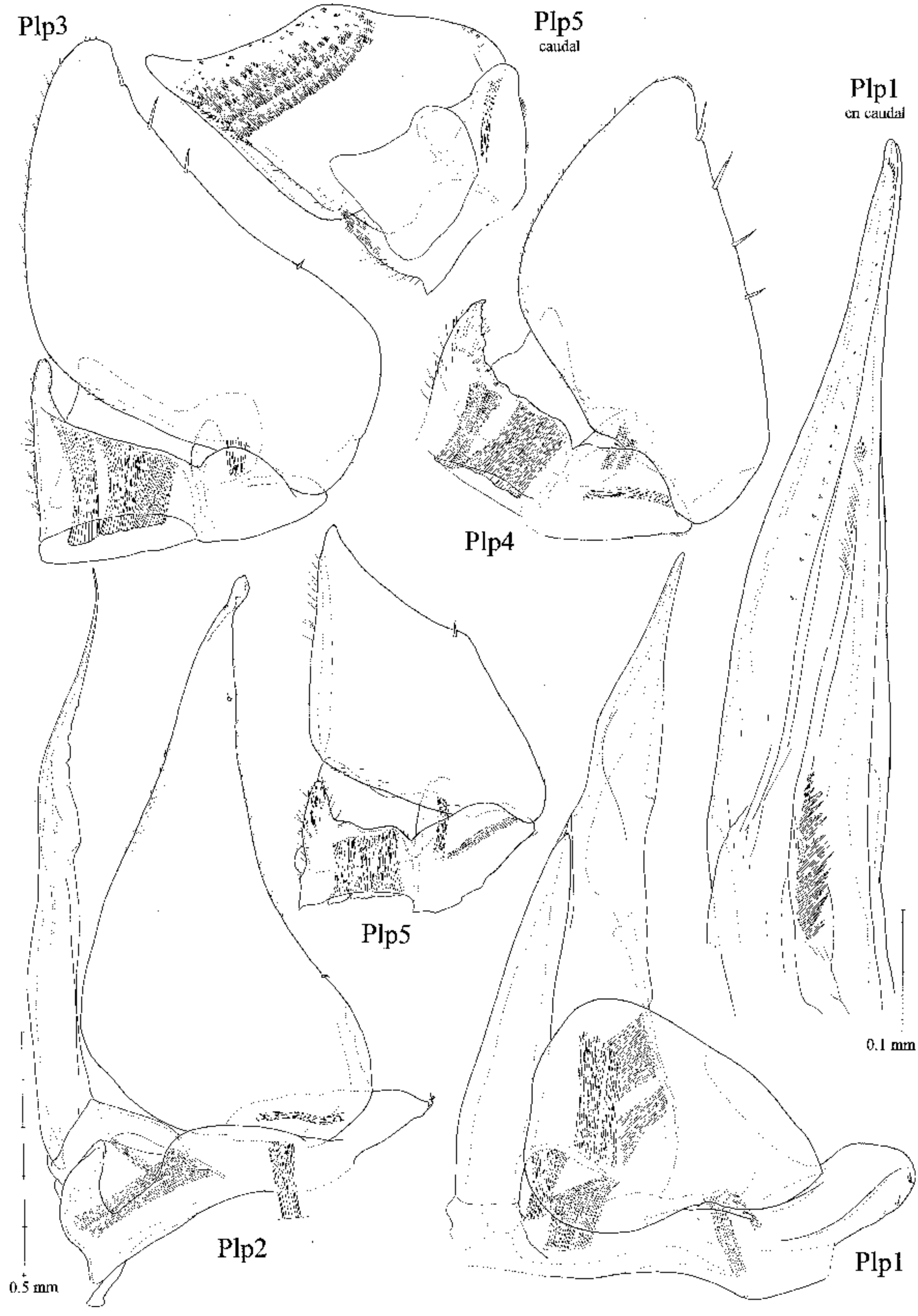

Figure 140. ***Globopactes hispidus*** **sp. nov.**: ♂ holotype, 6.8 × 3.1 mm, cephalothorax 1.43 mm wide, pleopods (Venezuela, Andes, east slope, 8°51′55″ N, 70°37′08″ W, altitude *c.* 1500 m, moist forest, in leaf litter, leg. C. Schmidt, 24 March 1998, UCV).

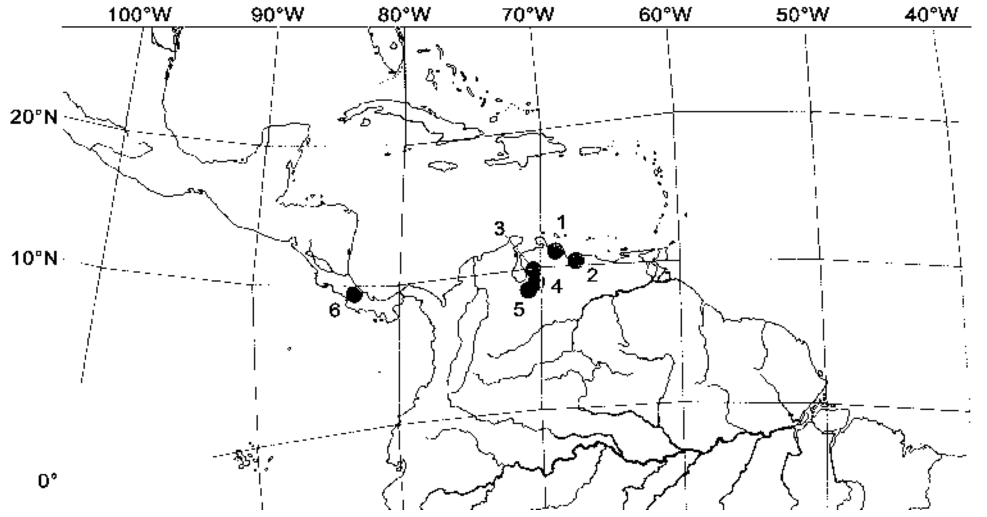

Figure 141. Geographical distribution of *Globopactes falconensis* (1), *G. granulatus* (2), *G. hispidus* (3), *G. meridae* (4), *G. senex* (5), and *G. talamancensis* (6).

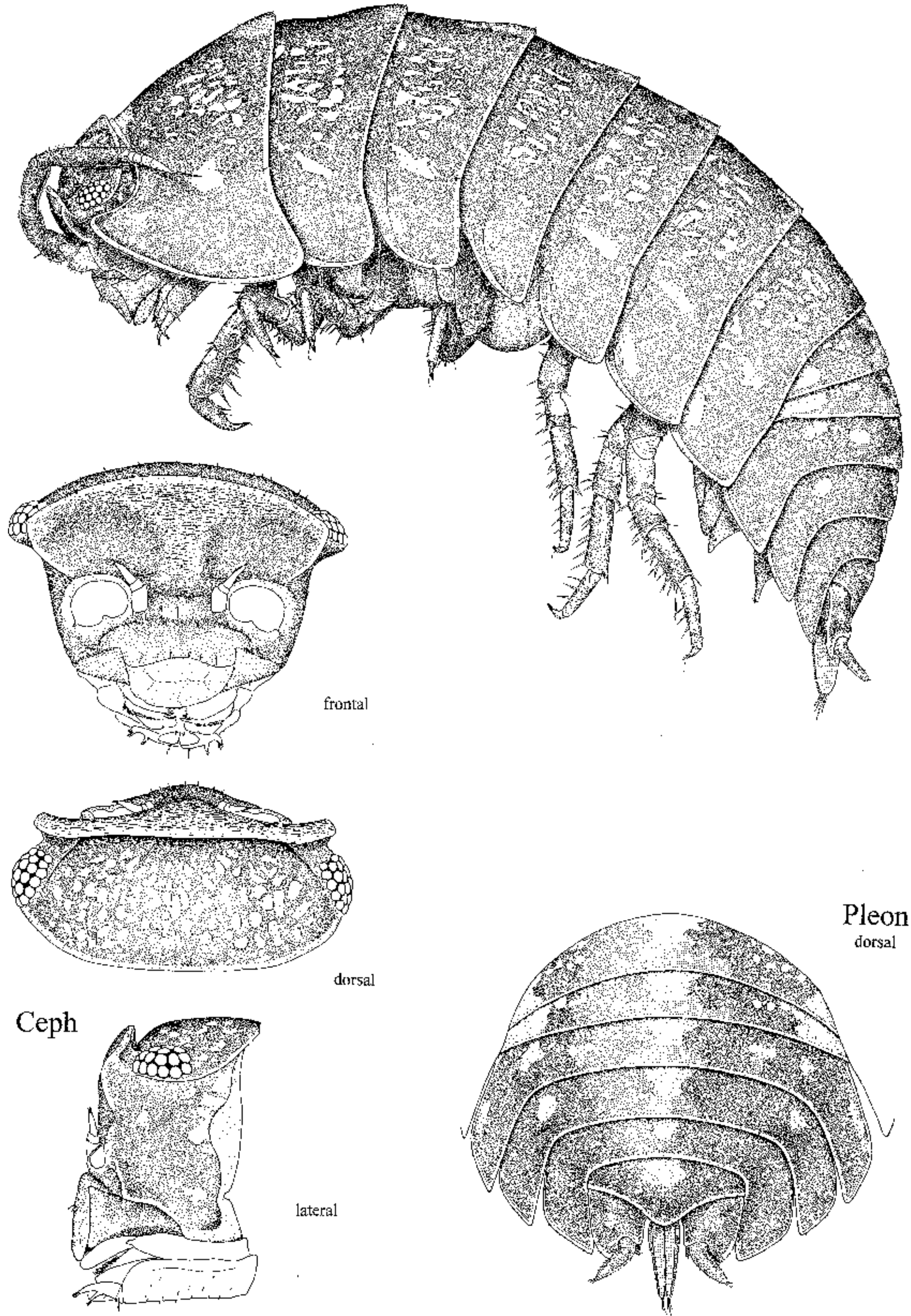

Figure 142. ***Globopactes meridae*** **sp. nov.**: paratype ♀m, 9.4 × 4.0 mm, cephalothorax 2.08 mm wide, habitus lateral, pleon dorsal; holotype ♂, 7.0 × 3.0 mm, cephalothorax 1.64 mm wide, cephalothorax lateral, dorsal and frontal (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short-grazed meadow beside a small brook, at lower margin of the Paramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV).

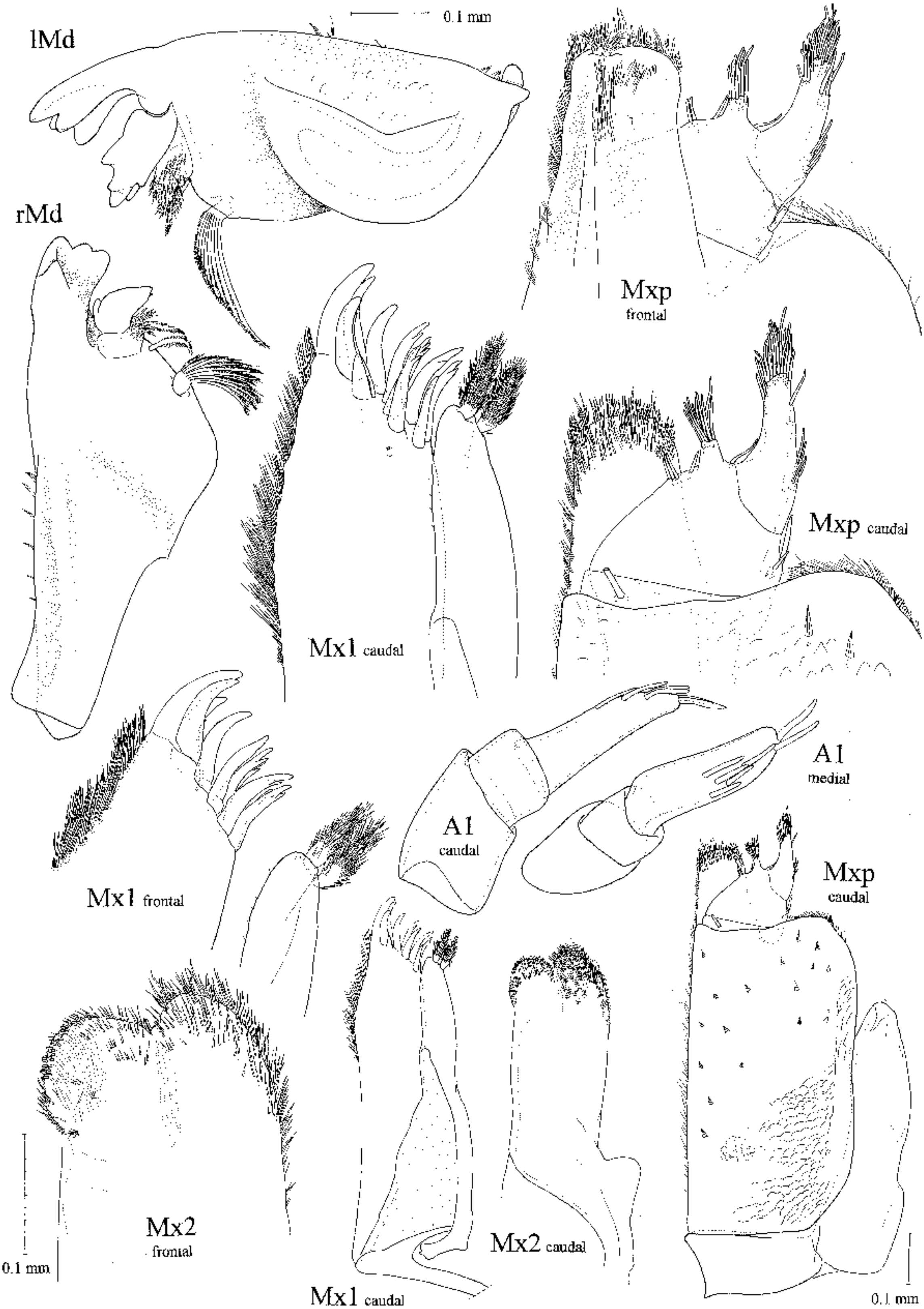

Figure 143. ***Globopactes meridae*** **sp. nov.**: holotype ♂, 7.0 × 3.0 mm, cephalothorax 1.64 mm wide, mouthparts and first antenna (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short-grazed meadow beside a small brook, at lower margin of the Paramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV).

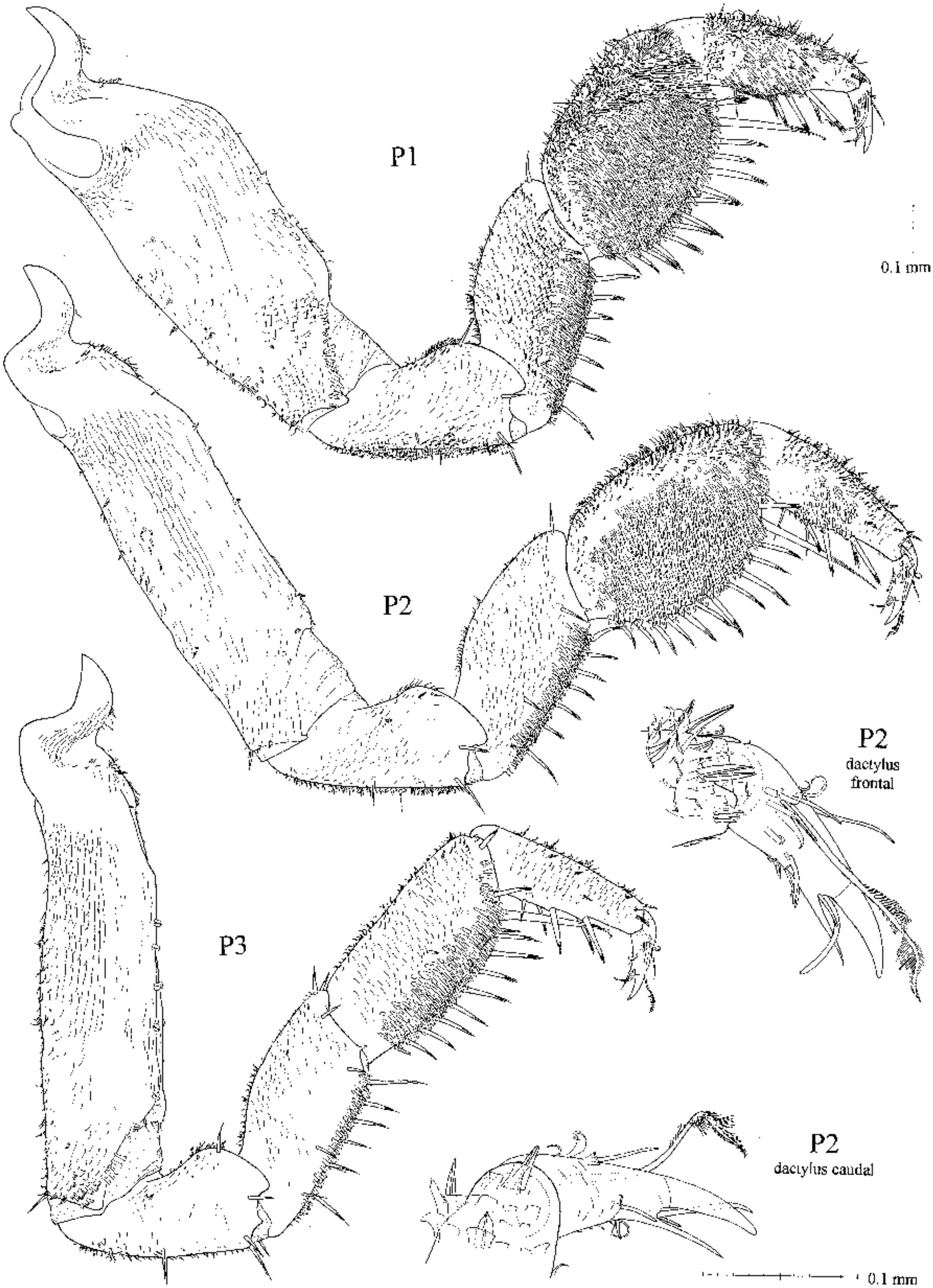

Figure 144. ***Globopactes meridae* sp. nov.**: holotype ♂, 7.0 × 3.0 mm, cephalothorax 1.64 mm wide, pereiopods 1–3 frontal, pereiopod 2 dactylus frontal and caudal (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short-grazed meadow beside a small brook, at lower margin of the Paramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV).

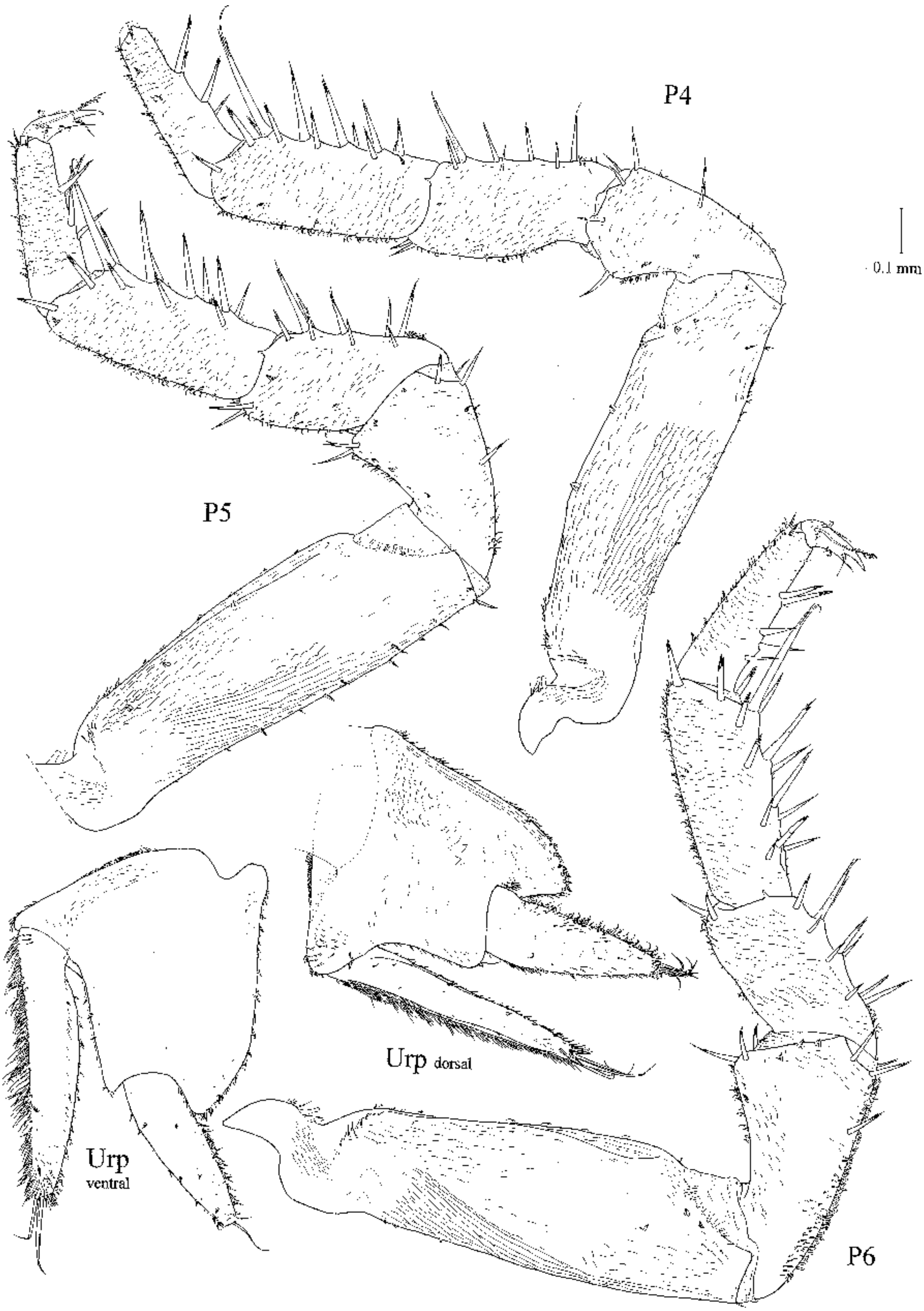

Figure 145. ***Globopactes meridae* sp. nov.**: holotype ♂, 7.0 × 3.0 mm, cephalothorax 1.64 mm wide, pereiopods 4–6 frontal (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short-grazed meadow beside a small brook, at lower margin of the Paramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV).

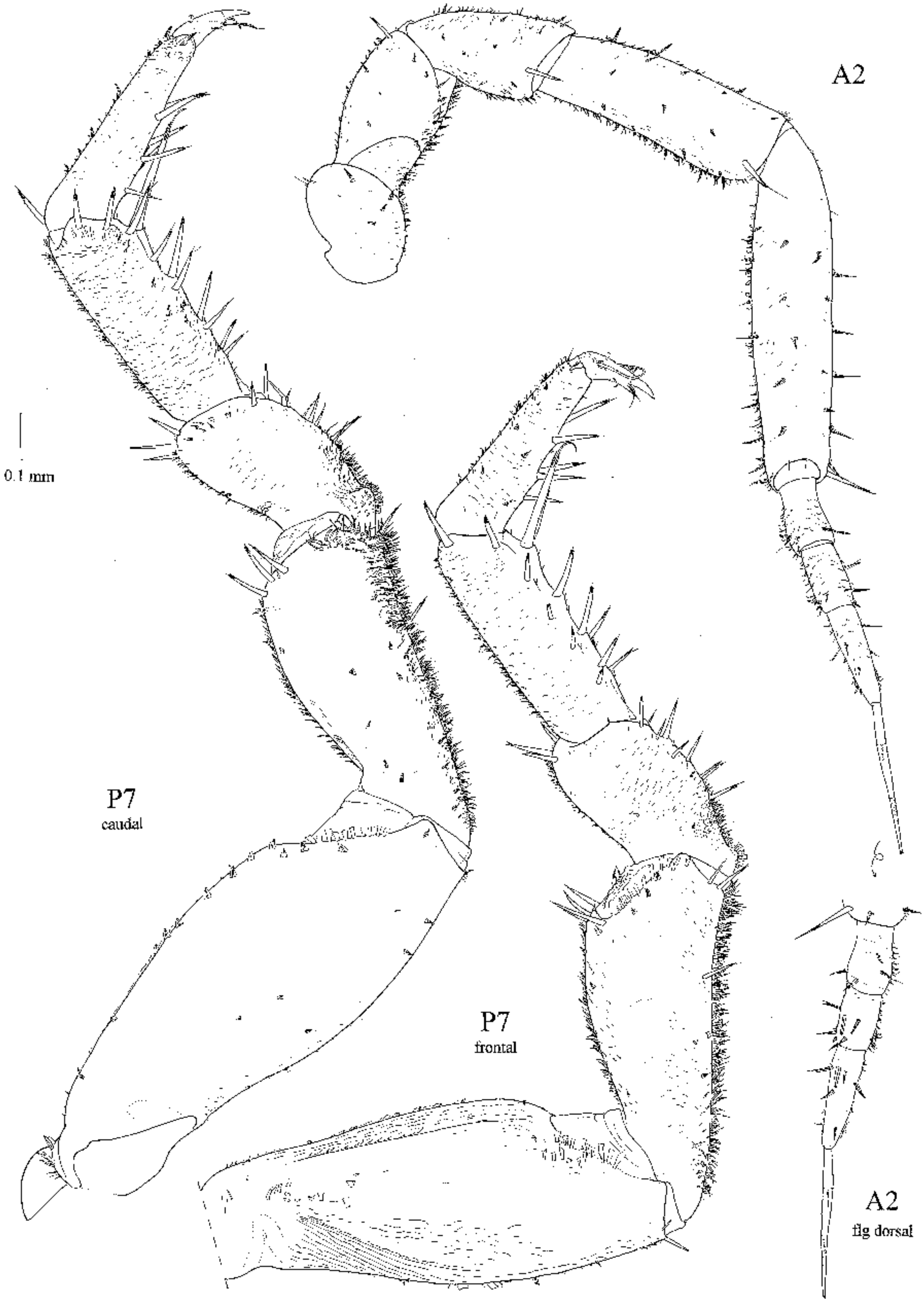

Figure 146. ***Globopactes meridae* sp. nov.**: holotype ♂, 7.0 × 3.0 mm, cephalothorax 1.64 mm wide, pereiopod 7 frontal and caudal, second antenna (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short-grazed meadow beside a small brook, at lower margin of the Paramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV).

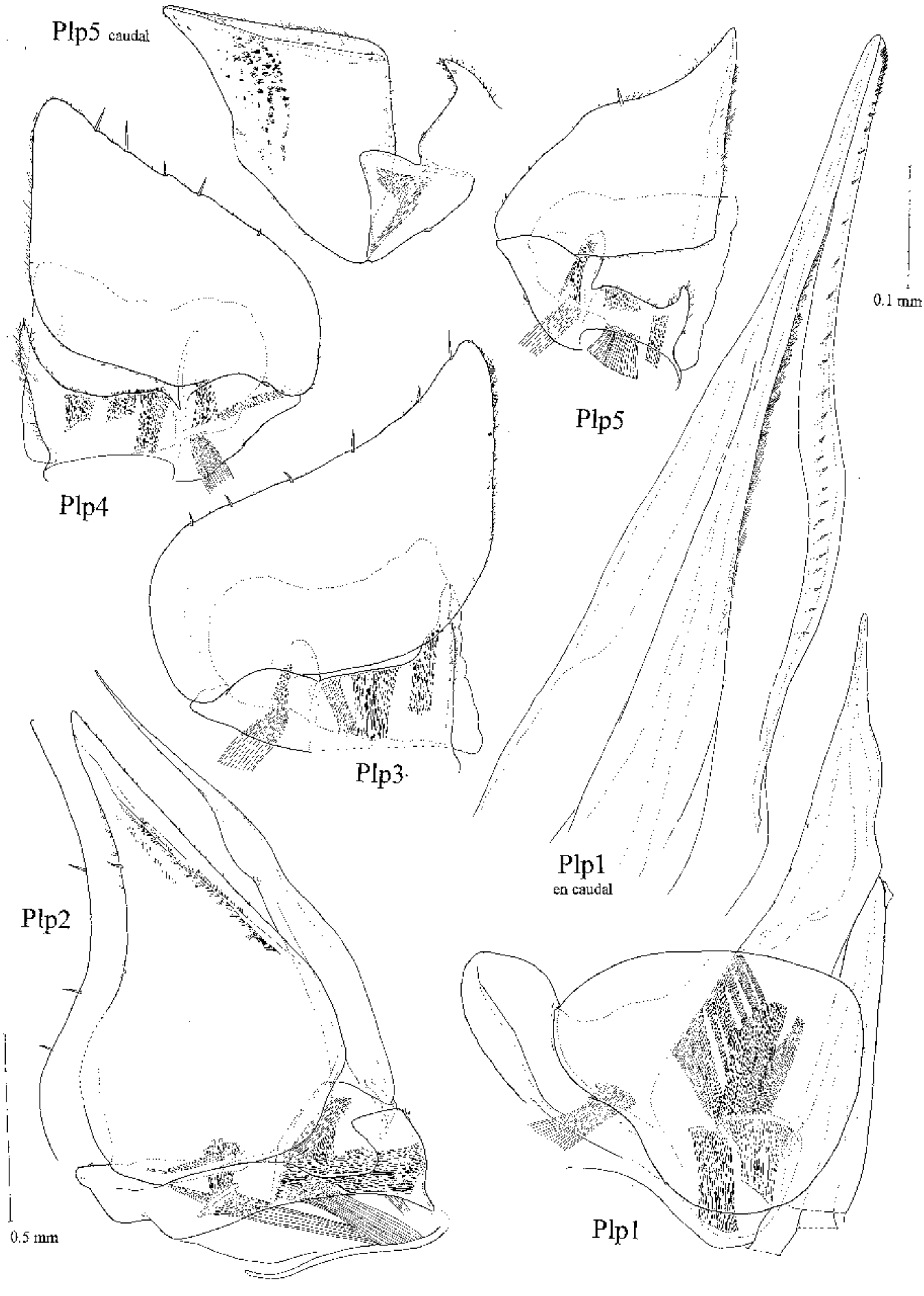

Figure 147. ***Globopactes meridae*** **sp. nov.**: holotype ♂, 7.0 × 3.0 mm, cephalothorax 1.64 mm wide, pleopods 1–5 (Venezuela, Andes, Estado Mérida, 8°43′07″ N, 70°46′02″ W, short-grazed meadow beside a small brook, at lower margin of the Paramo region, under stones and *Espeletia*, leg. C. Schmidt, 24 March 1998, UCV).

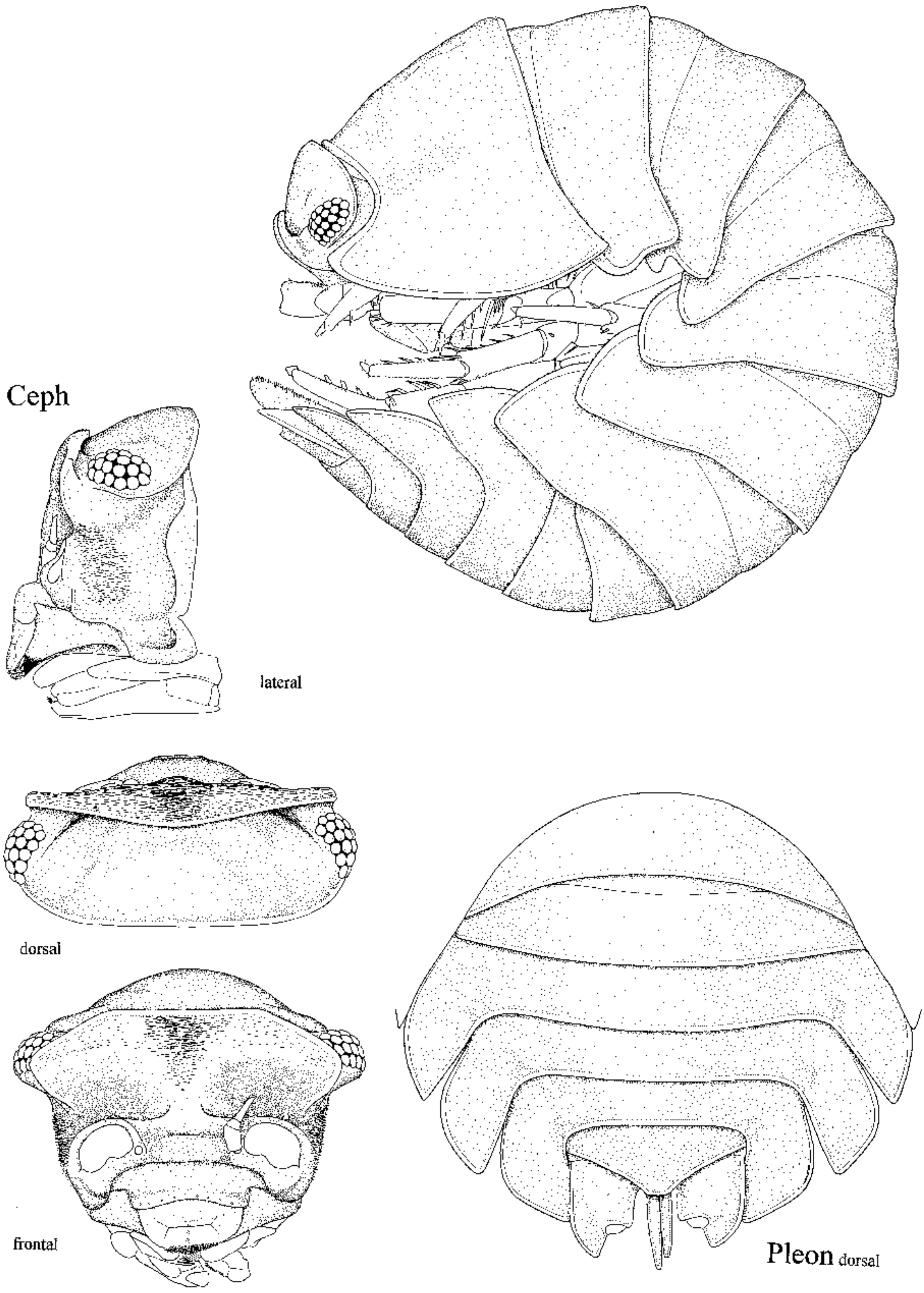

Figure 148. *Globopactes senex* (Budde-Lund, 1893): syntype ♂, cephalothorax 2.44 mm wide, habitus lateral; syntype ♀m, cephalothorax 2.36 mm wide, cephalothorax frontal, dorsal and lateral (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN Is5722).

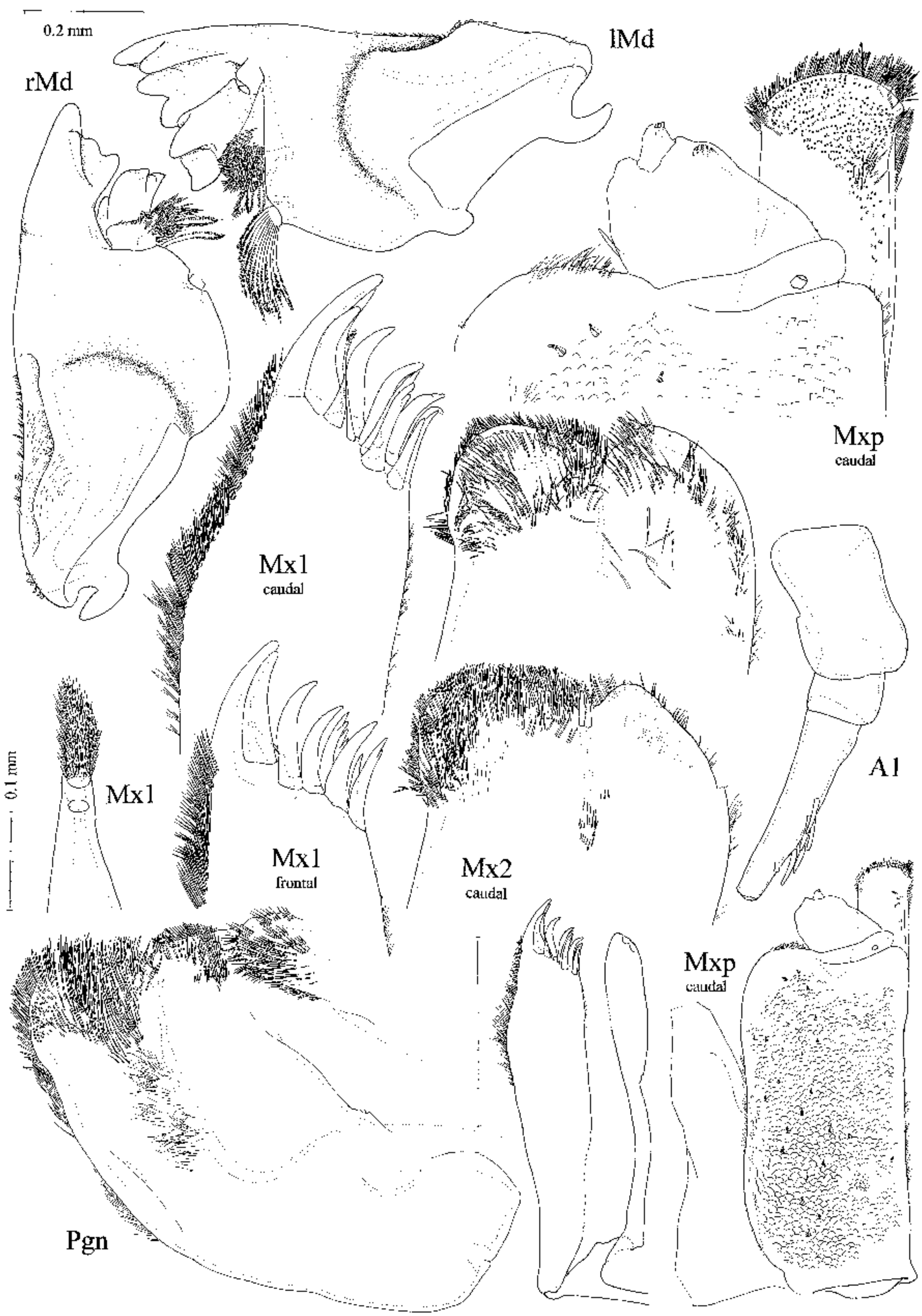

Figure 149. *Globopactes senex* (Budde-Lund, 1893): syntype ♀m, cephalothorax 2.36 mm wide, mouthparts and first antenna, damaged (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN Is5722).

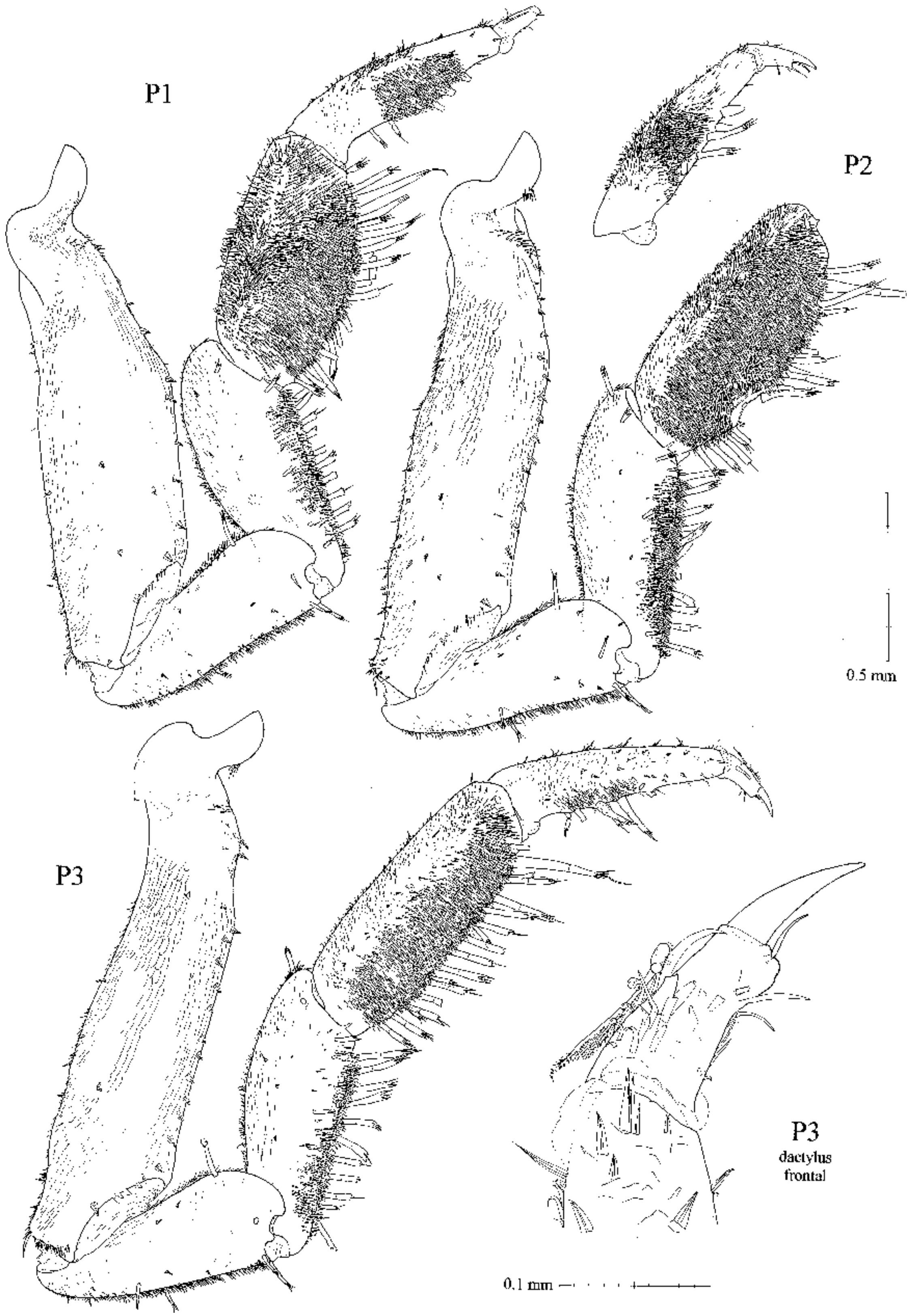

Figure 150. *Globopactes senex* (Budde-Lund, 1893): syntype ♂, cephalothorax 2.44 mm wide, pereiopods 1–3 frontal, pereiopod 3 dactylus frontal (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN Is5722).

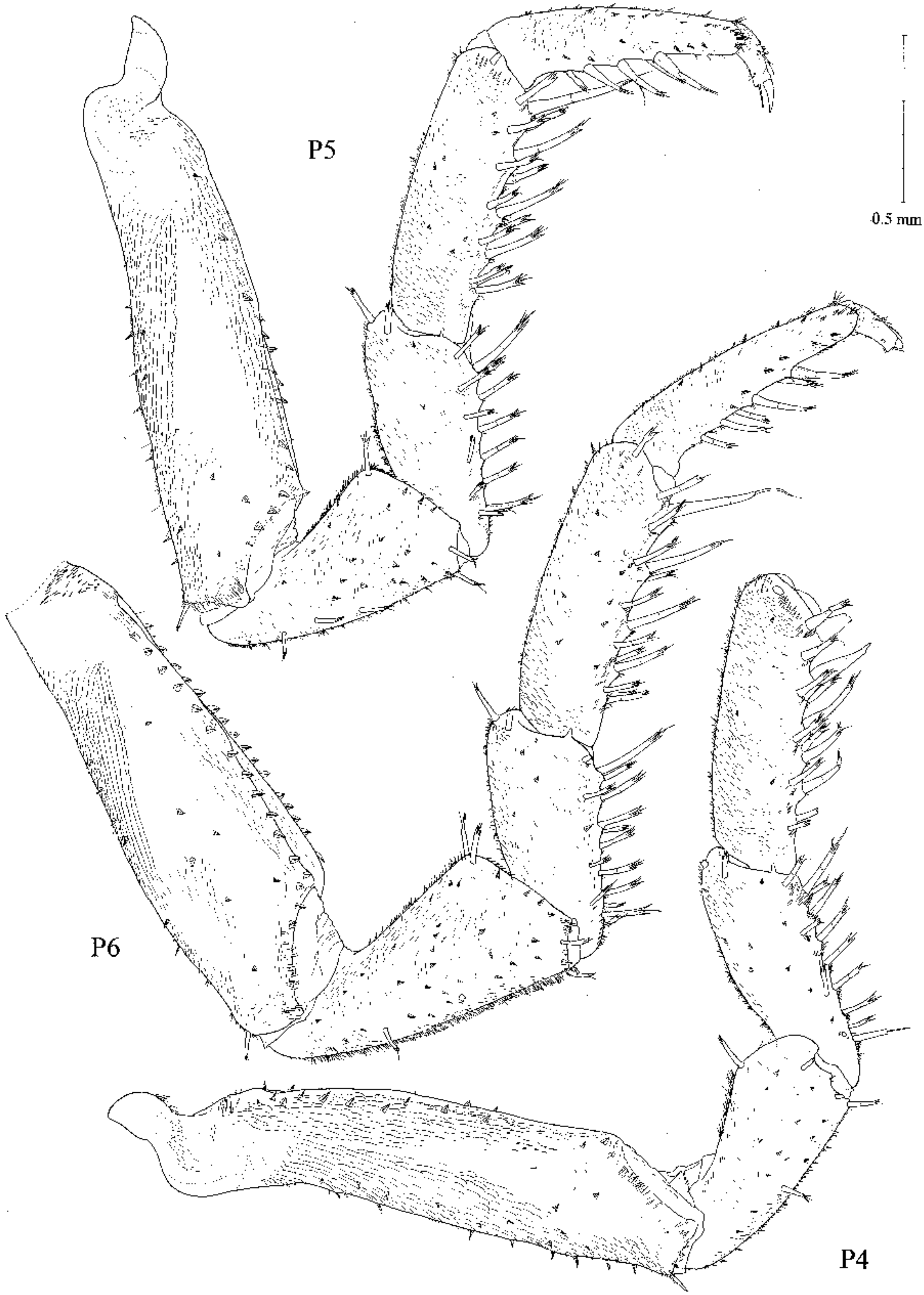

Figure 151. *Globopactes senex* (Budde-Lund, 1893): syntype ♂, cephalothorax 2.44 mm wide, pereiopods 4–6 frontal (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN Is5722).

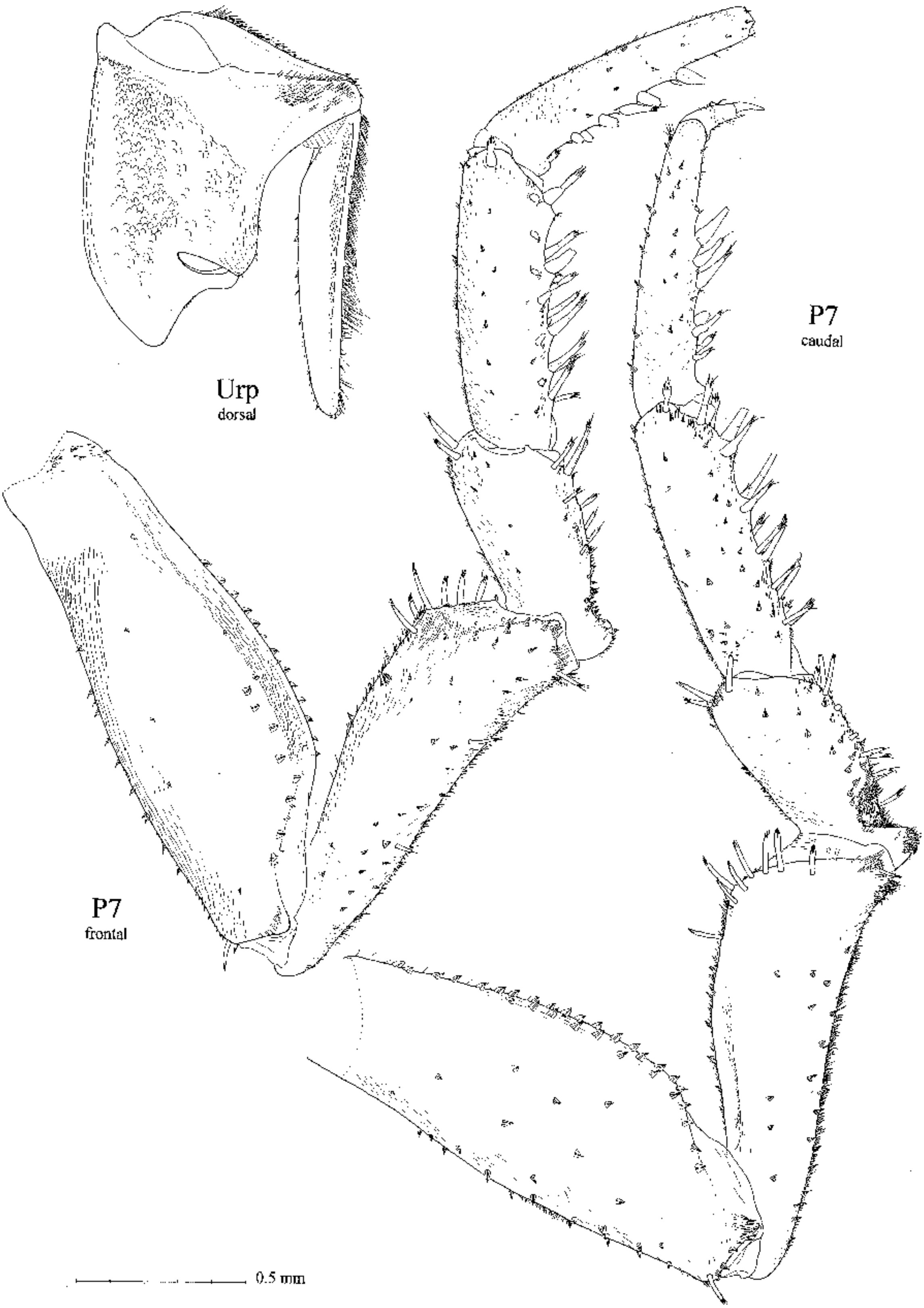

Figure 152. *Globopactes senex* (Budde-Lund, 1893): syntype ♂, cephalothorax 2.44 mm wide, pereiopod 7 frontal and caudal, uropod dorsal (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN Is5722).

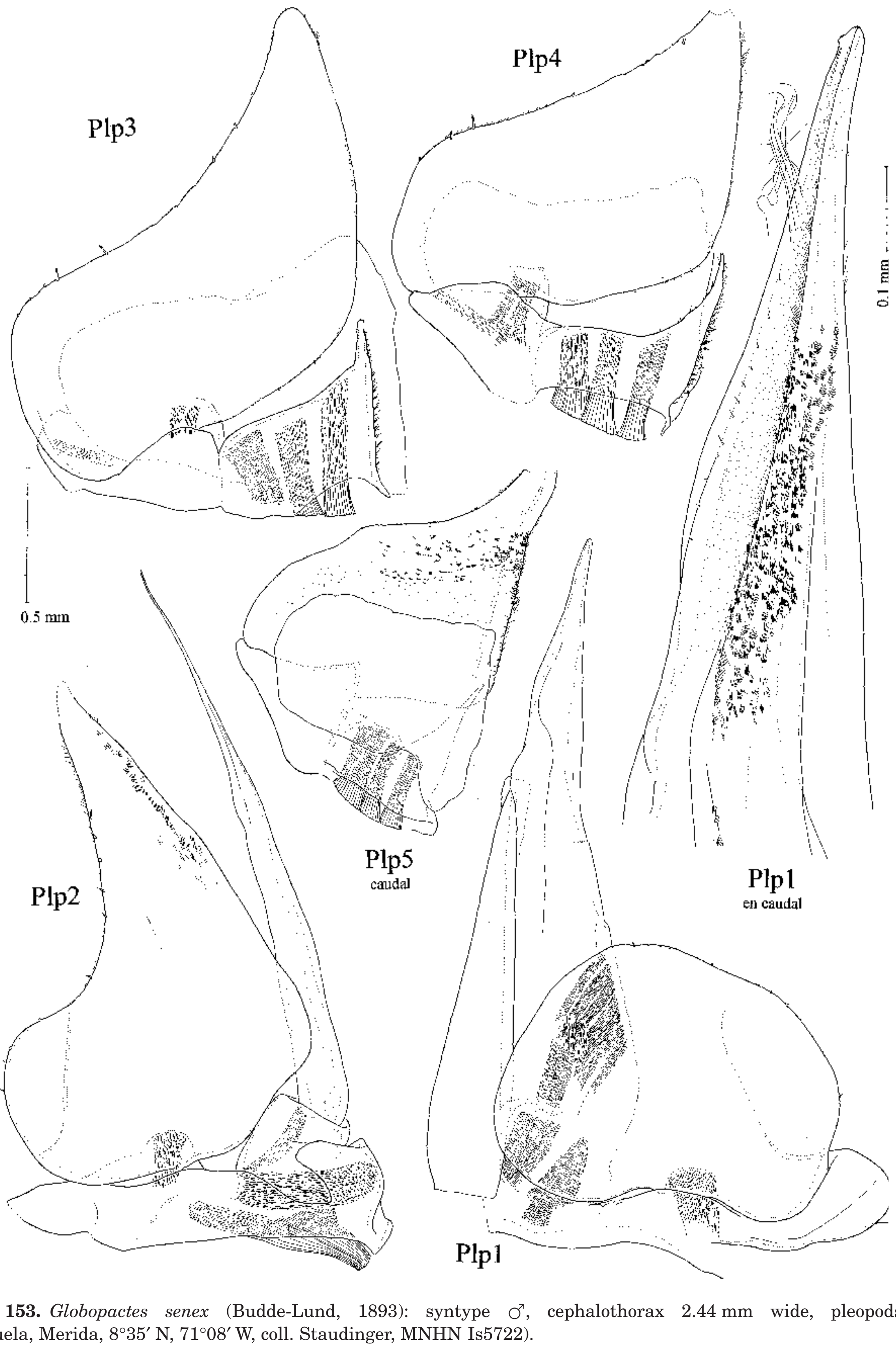

Figure 153. *Globopactes senex* (Budde-Lund, 1893): syntype ♂, cephalothorax 2.44 mm wide, pleopods 1–5 (Venezuela, Merida, 8°35′ N, 71°08′ W, coll. Staudinger, MNHN Is5722).

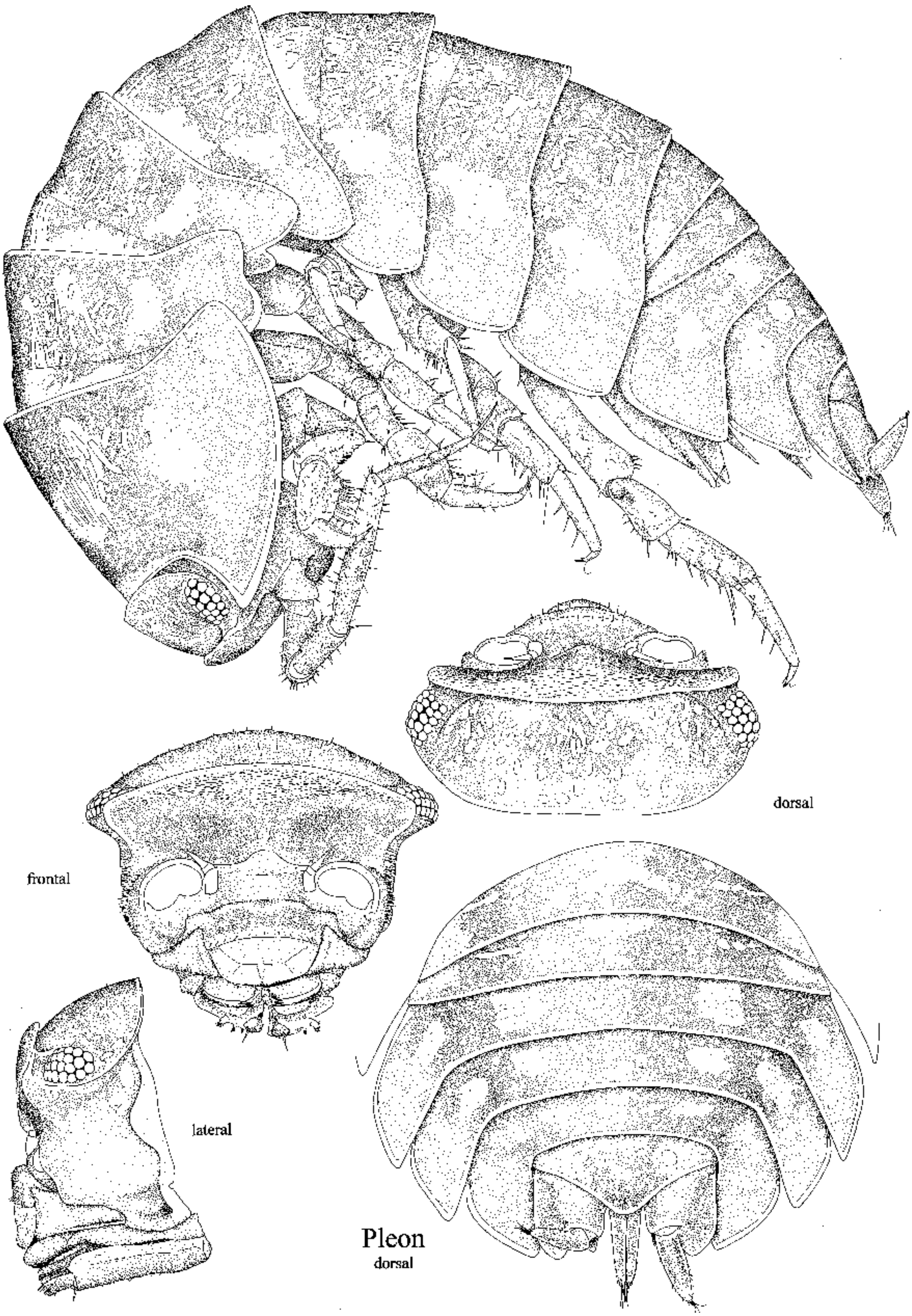

Figure 154. ***Globopactes falconensis* sp. nov.**: paratype ♂, 9.2 × 3.9 mm, cephalothorax 2.07 mm wide, habitus lateral, pleon dorsal; ♀, 11.7 × 5.0 mm, cephalothorax 2.62 mm wide, cephalothorax (Venezuela, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, leg. C. Schmidt, 21 March 1998, UCV).

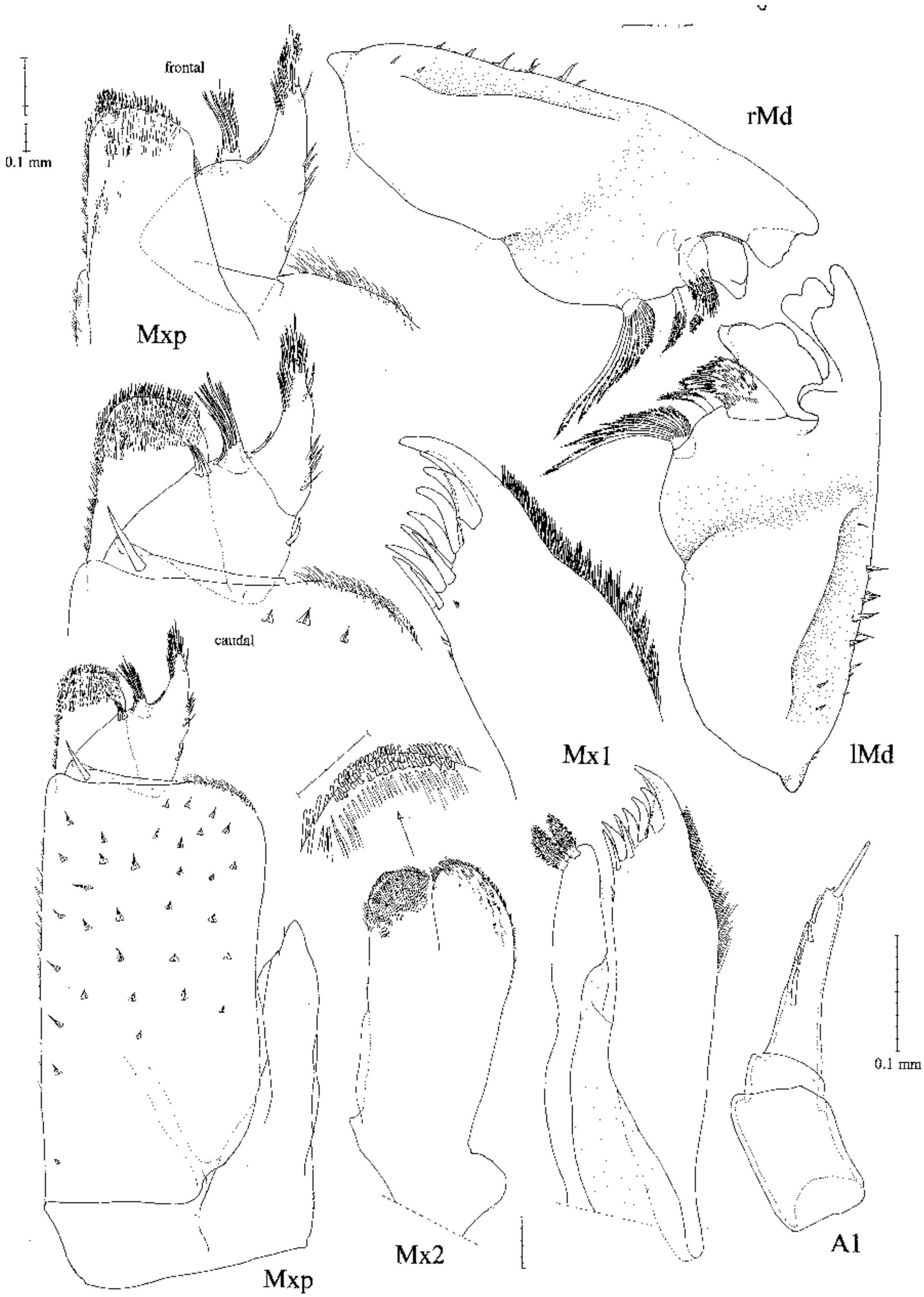

Figure 155. ***Globopactes falconensis* sp. nov.**: holotype ♂, 8.8 × 3.6 mm, mouthparts, first antenna (Venezuela, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, leg. C. Schmidt, 21 March 1998, UCV).

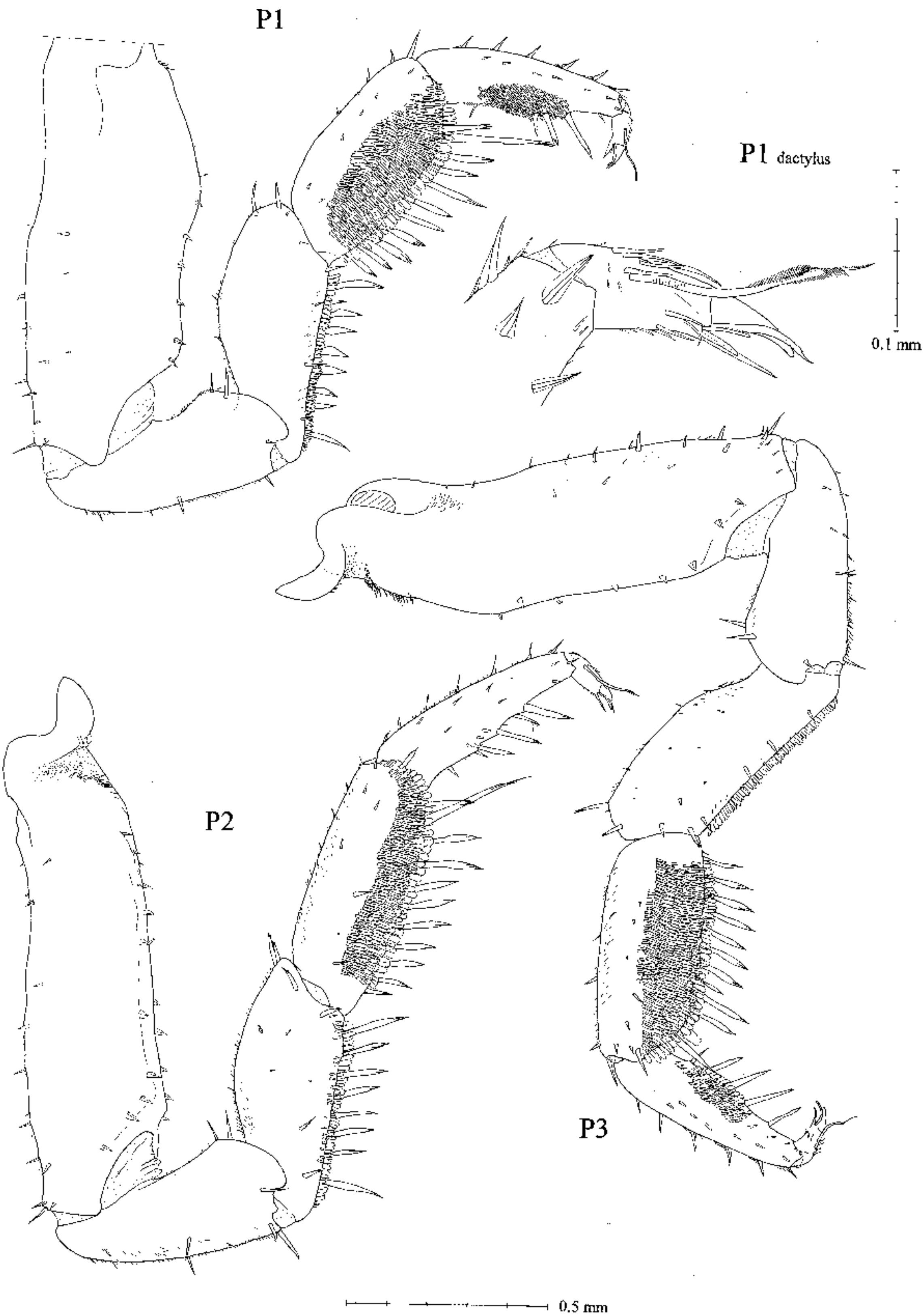

Figure 156. ***Globopactes falconensis*** **sp. nov.**: holotype ♂, 8.8 × 3.6 mm, pereiopods 1–3 (Venezuela, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, leg. C. Schmidt, 21 March 1998, UCV).

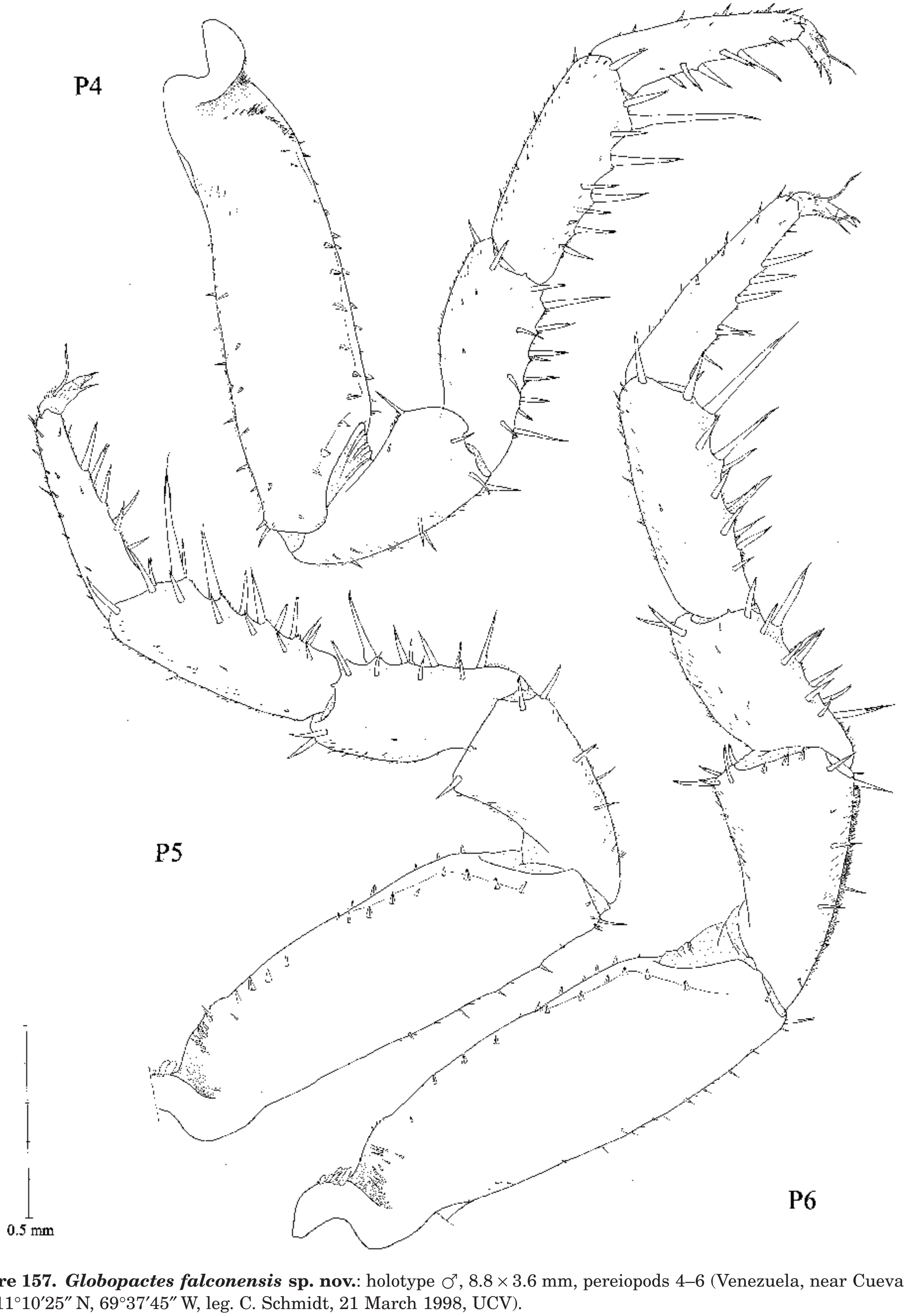

Figure 157. ***Globopactes falconensis* sp. nov.**: holotype ♂, 8.8 × 3.6 mm, pereiopods 4–6 (Venezuela, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, leg. C. Schmidt, 21 March 1998, UCV).

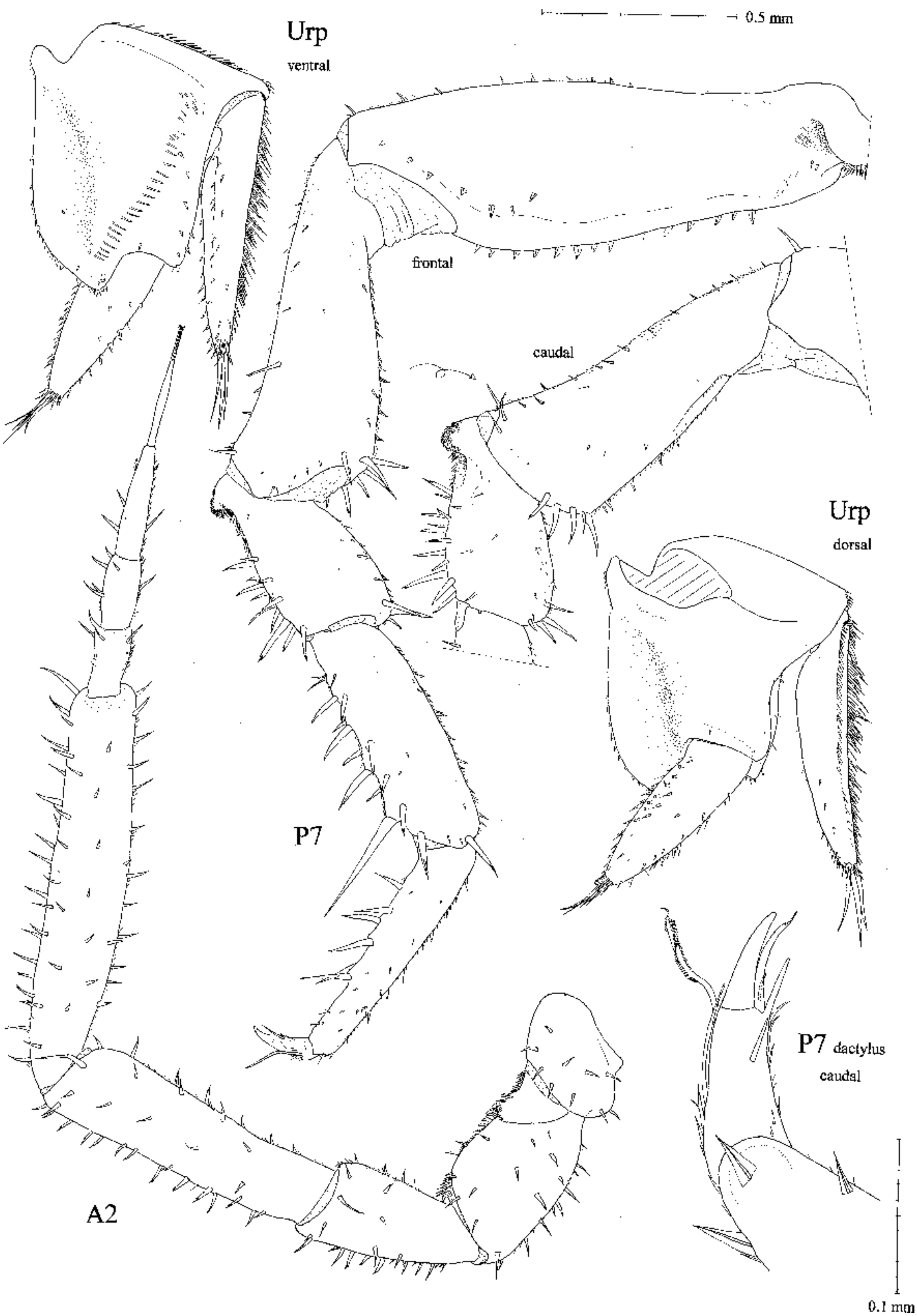

Figure 158. ***Globopactes falconensis*** **sp. nov.**: holotype ♂, 8.8 × 3.6 mm, pereiopod 7, second antenna, uropods (Venezuela, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, leg. C. Schmidt, 21 March 1998, UCV).

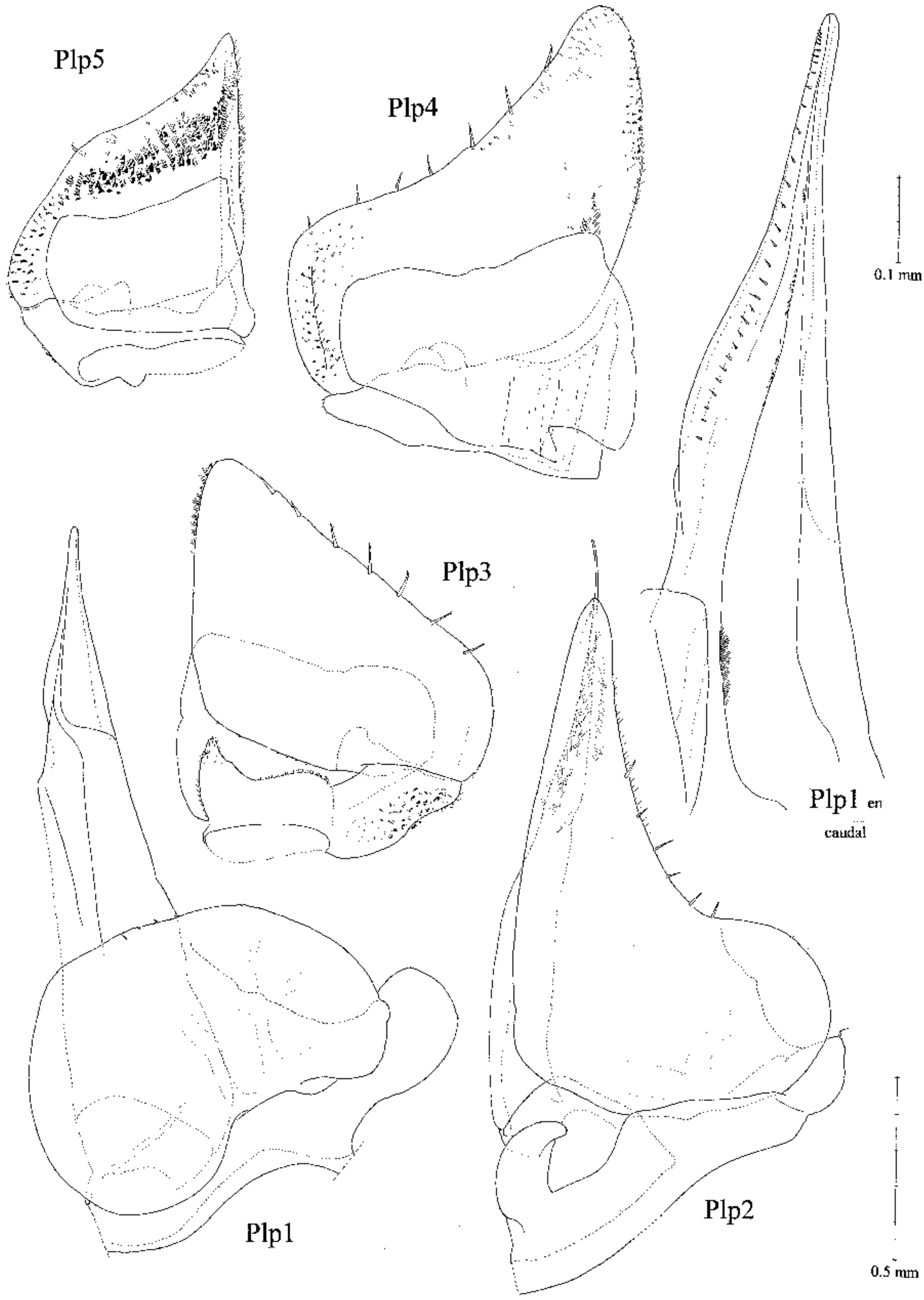

Figure 159. ***Globopactes falconensis*** **sp. nov.**: holotype ♂, 8.8 × 3.6 mm, pleopods 1–5 (Venezuela, near Cueva Acurite, 11°10′25″ N, 69°37′45″ W, leg. C. Schmidt, 21 March 1998, UCV).

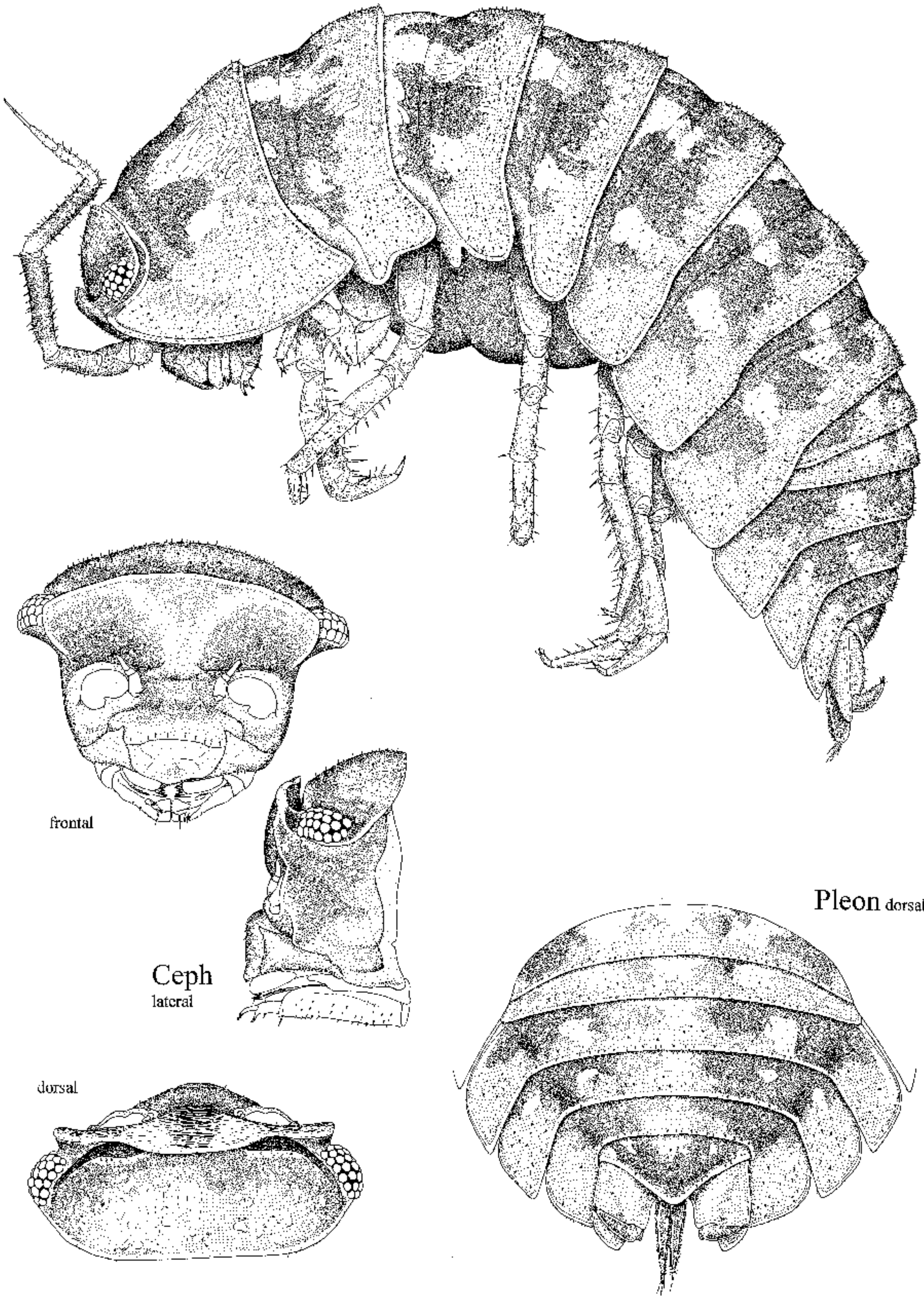

Figure 160. *Globopactes granulatus* (Dollfus, 1893): ♀m, 13.5 × 7.2 mm, cephalothorax 3.03 mm, habitus lateral, pleon dorsal; ♀m, 6.6 mm wide, cephalothorax 3.34 mm, cephalothorax frontal, lateral and dorsal (Venezuela, Parque Nacional Henri Pittier, eastern road to the coast, 1 km below pass, leg. C. Schmidt, 26 March 1998, UCV).

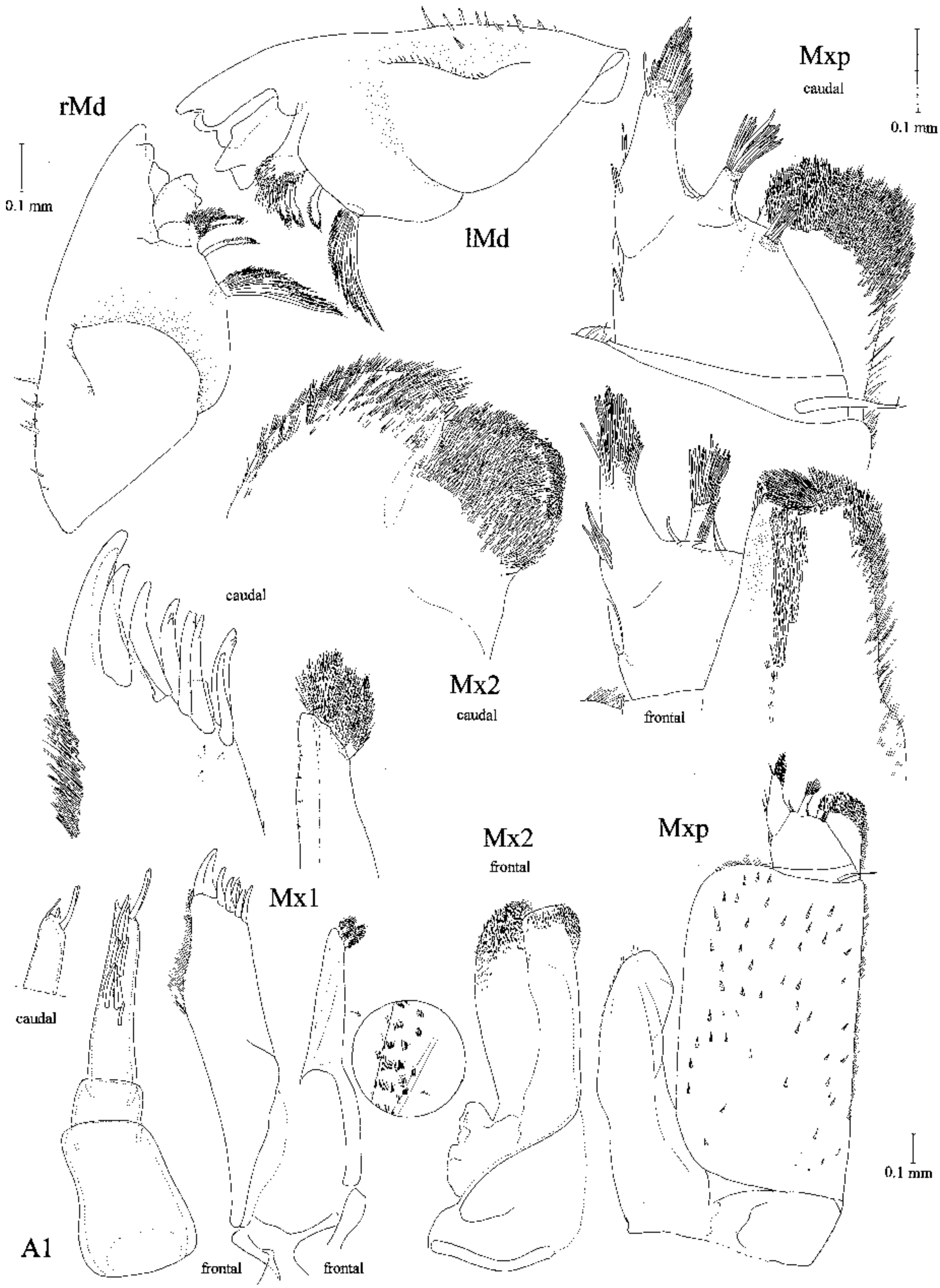

Figure 161. *Globopactes granulatus* (Dollfus, 1893): ♂, 14.0 × 5.9 mm, mouthparts, first antenna (Venezuela, P. N. Parque Nacional, 26 March 1998, leg. C. Schmidt, 26 March 1998, UCV).

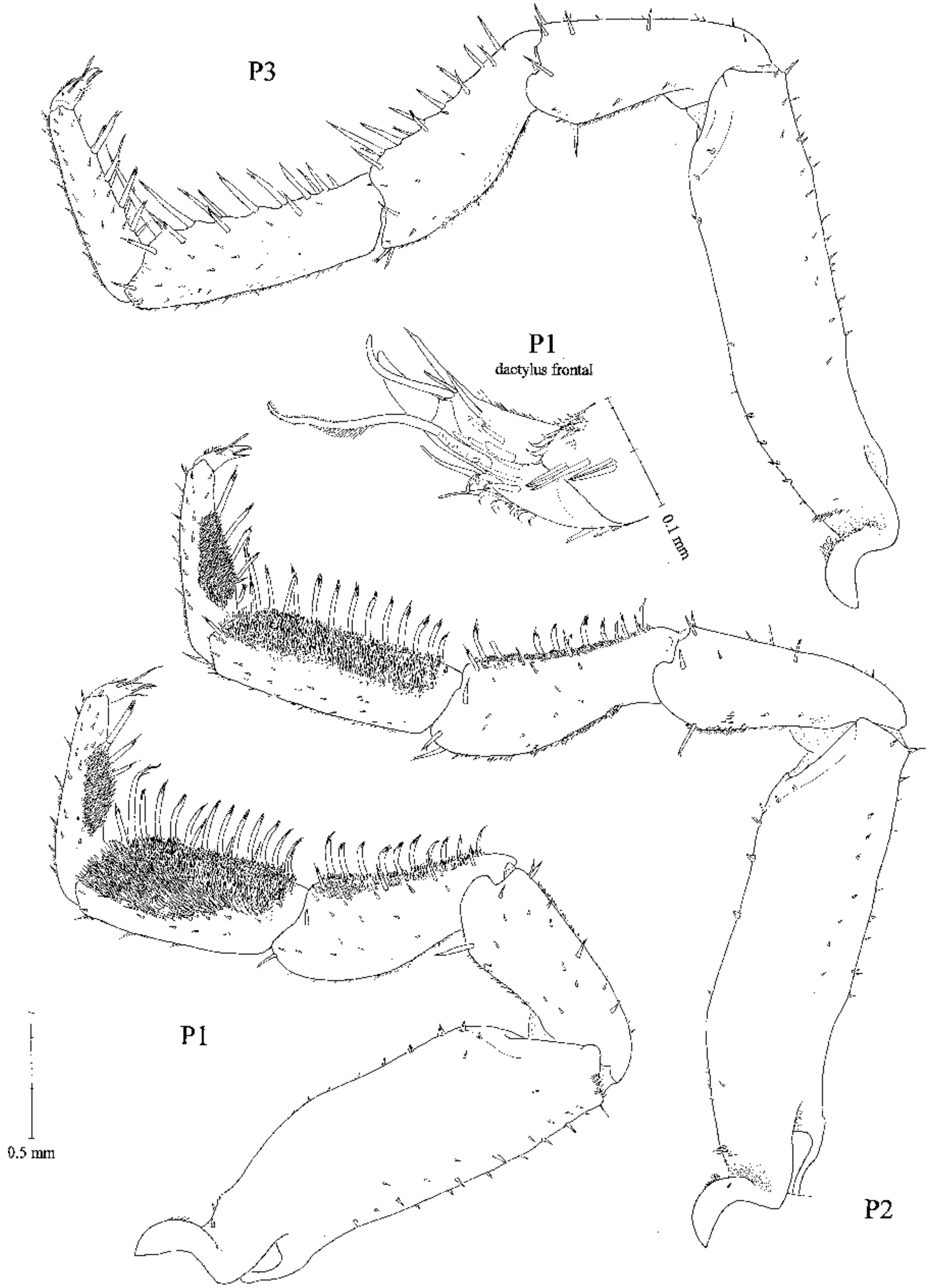

Figure 162. *Globopactes granulatus* (Dollfus, 1893): ♂, 14.0 × 5.9 mm, pleopods 1–3 (Venezuela, P. N. Parque Nacional, 26 March 1998, leg. C. Schmidt, 26 March 1998, UCV).

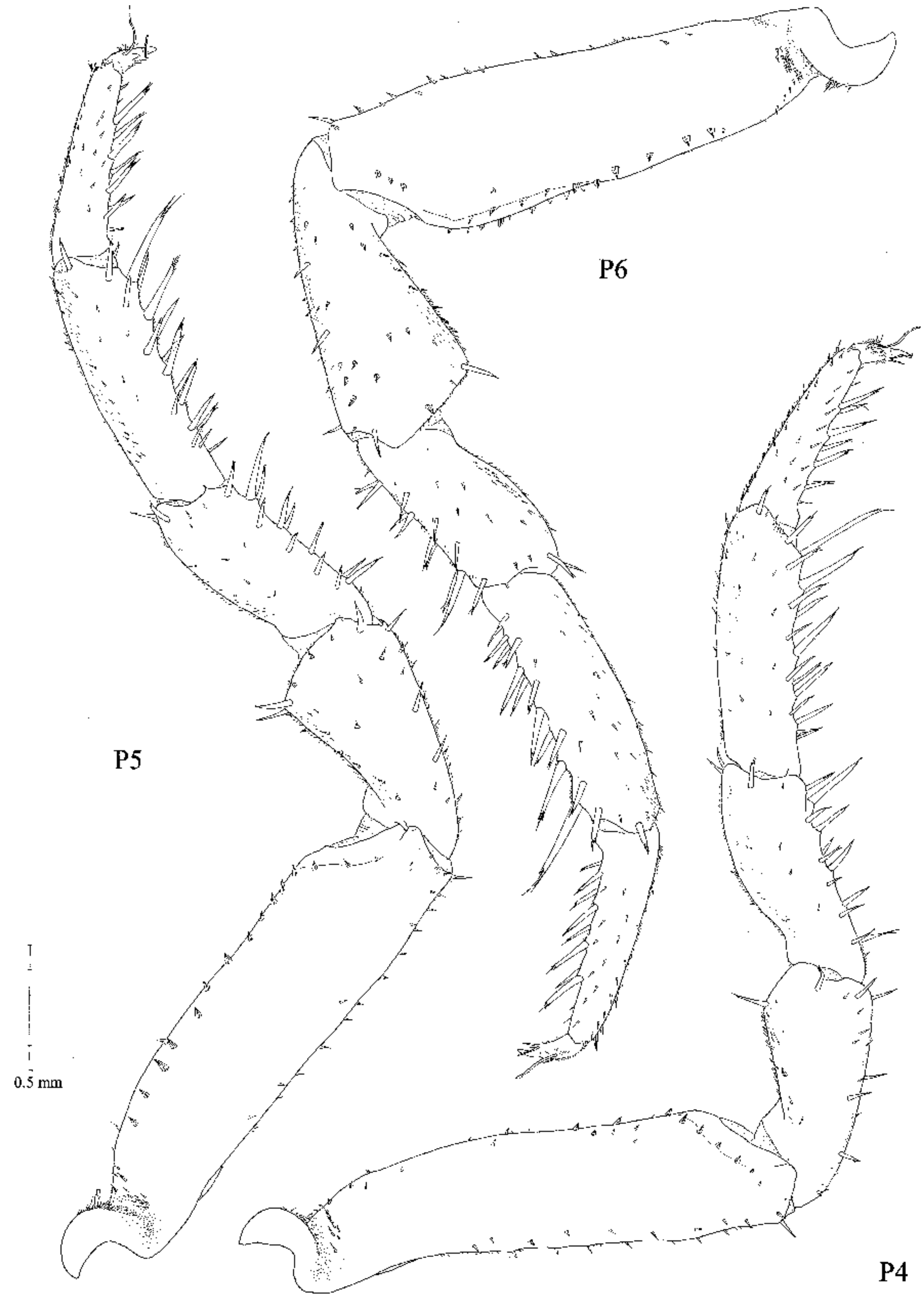

Figure 163. *Globopactes granulatus* (Dollfus, 1893): ♂, 14.0 × 5.9 mm, pereiopods 4–6 (Venezuela, P. N. Parque Nacional, 26 March 1998, leg. C. Schmidt, 26 March 1998, UCV).

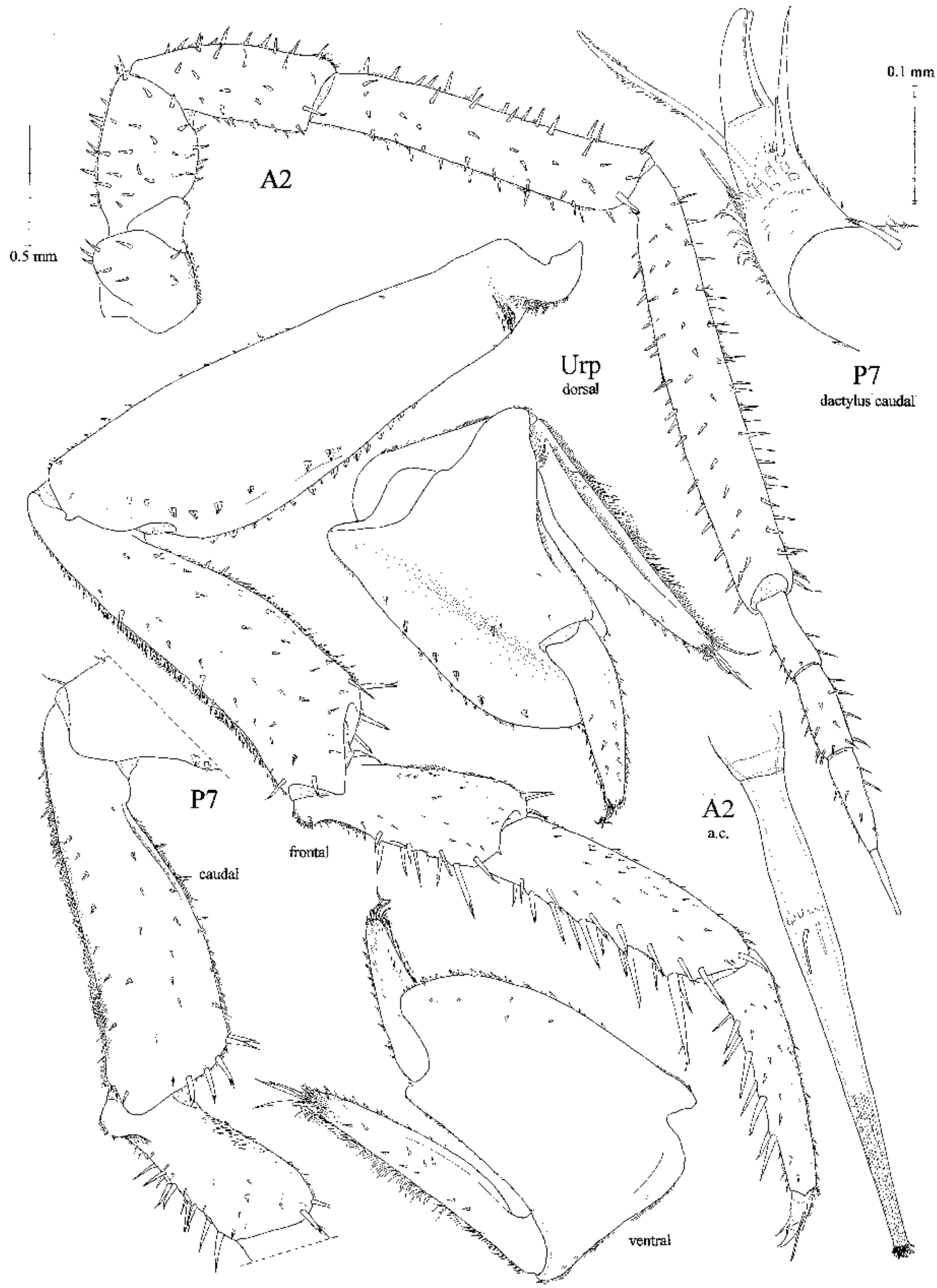

Figure 164. *Globopactes granulatus* (Dollfus, 1893): ♂, 14.0 × 5.9 mm, pereiopod 7, uropod, second antenna (Venezuela, P. N. Parque Nacional, 26 March 1998, leg. C. Schmidt, 26 March 1998, UCV).

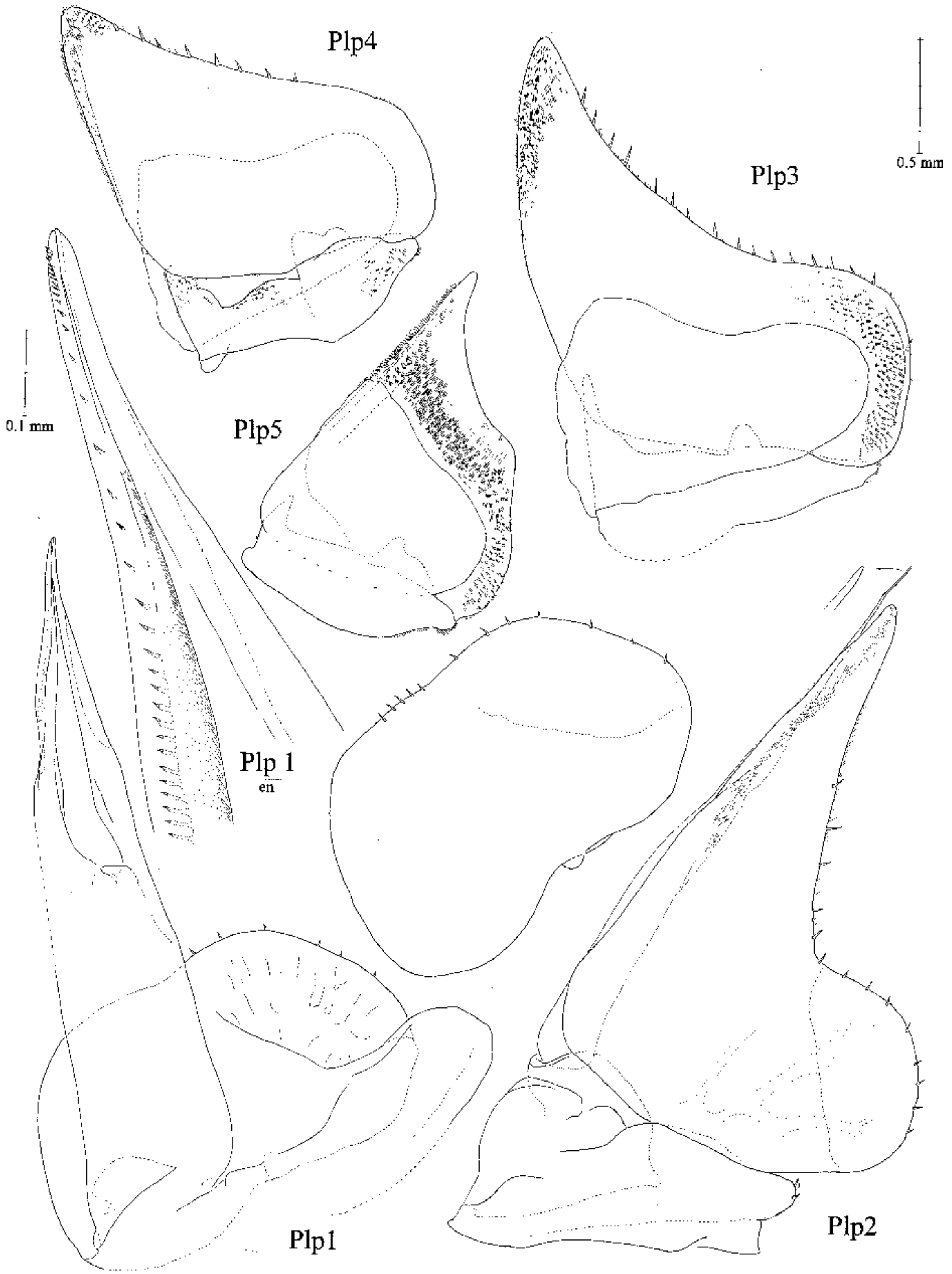

Figure 165. *Globopactes granulatus* (Dollfus, 1893): ♂, 14.0 × 5.9 mm, pleopods 1–5 (Venezuela, P. N. Parque Nacional, 26 March 1998, leg. C. Schmidt, 26 March 1998, UCV).

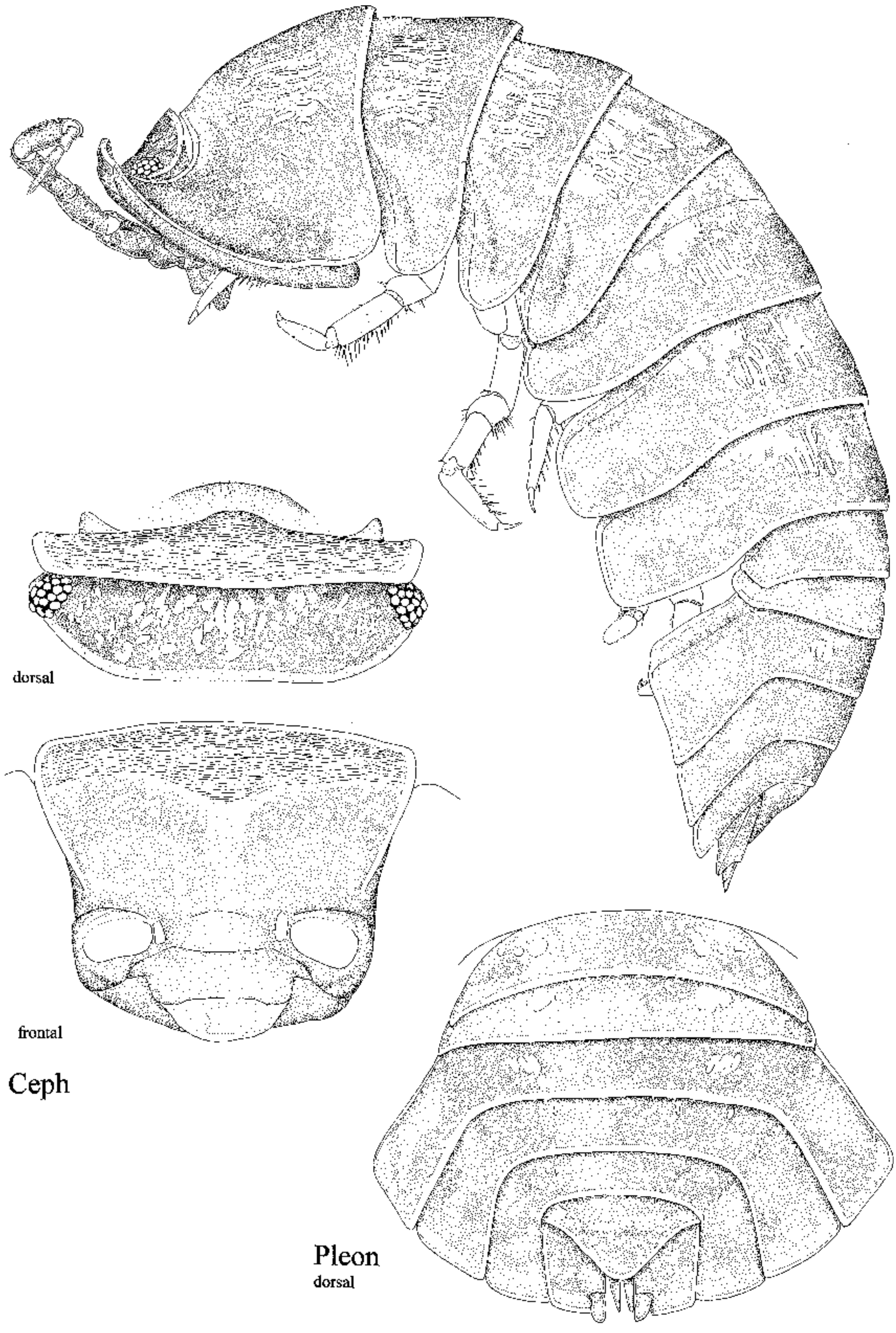

Figure 166. *Sphaeroniscus flavomaculatus* Gerstäcker, 1854: holotype ♂, 17 × 7.6 mm ('Neu Granada', leg. Goudot, ZMB *27267).

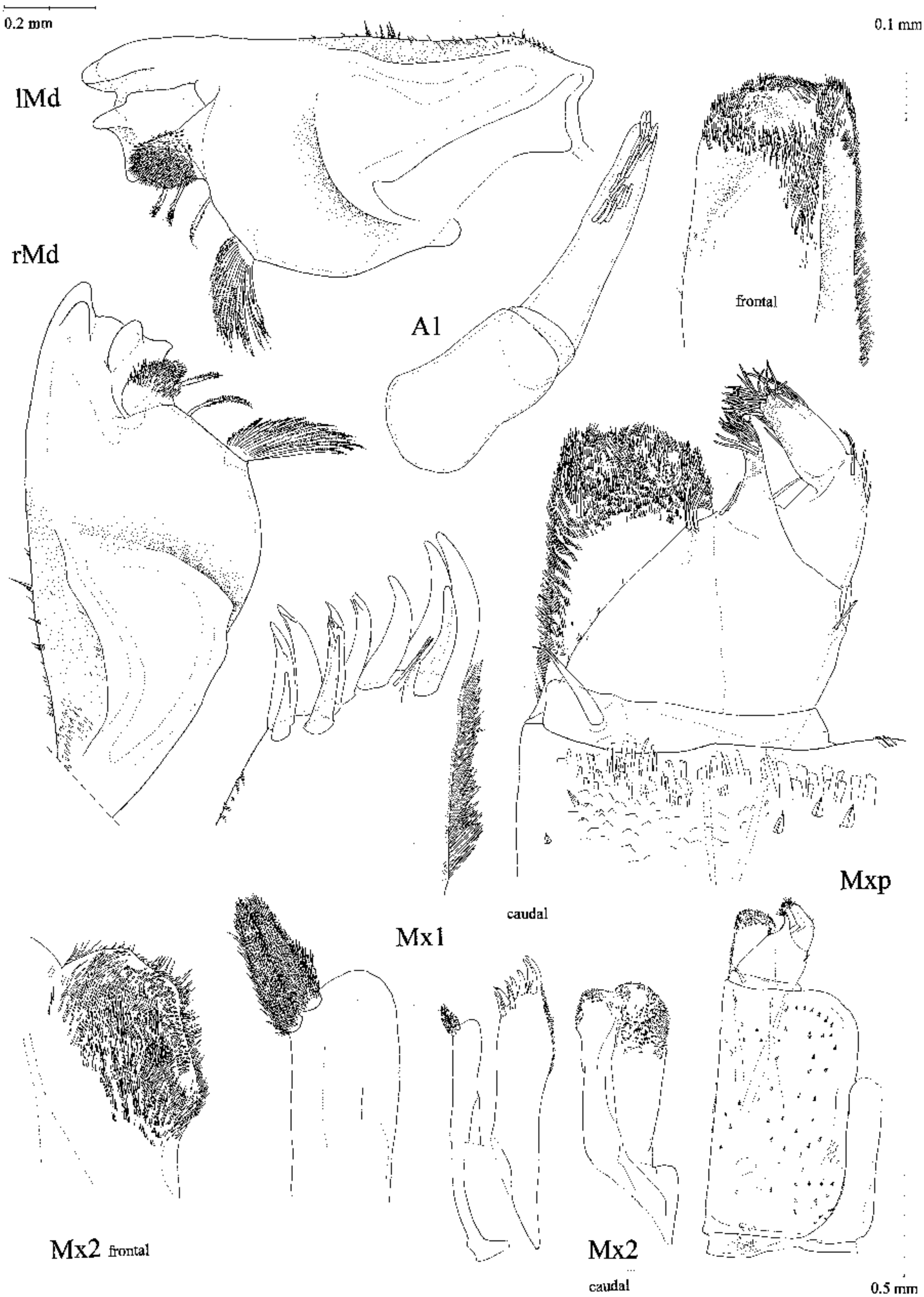

Figure 167. *Sphaeroniscus flavomaculatus* Gerstäcker, 1854: holotype ♂, 17 × 7.6 mm, coxal plates ventral, pereiopod 7, cephalothorax dorsal ('Neu Granada', leg. Goudot, ZMB *27267).

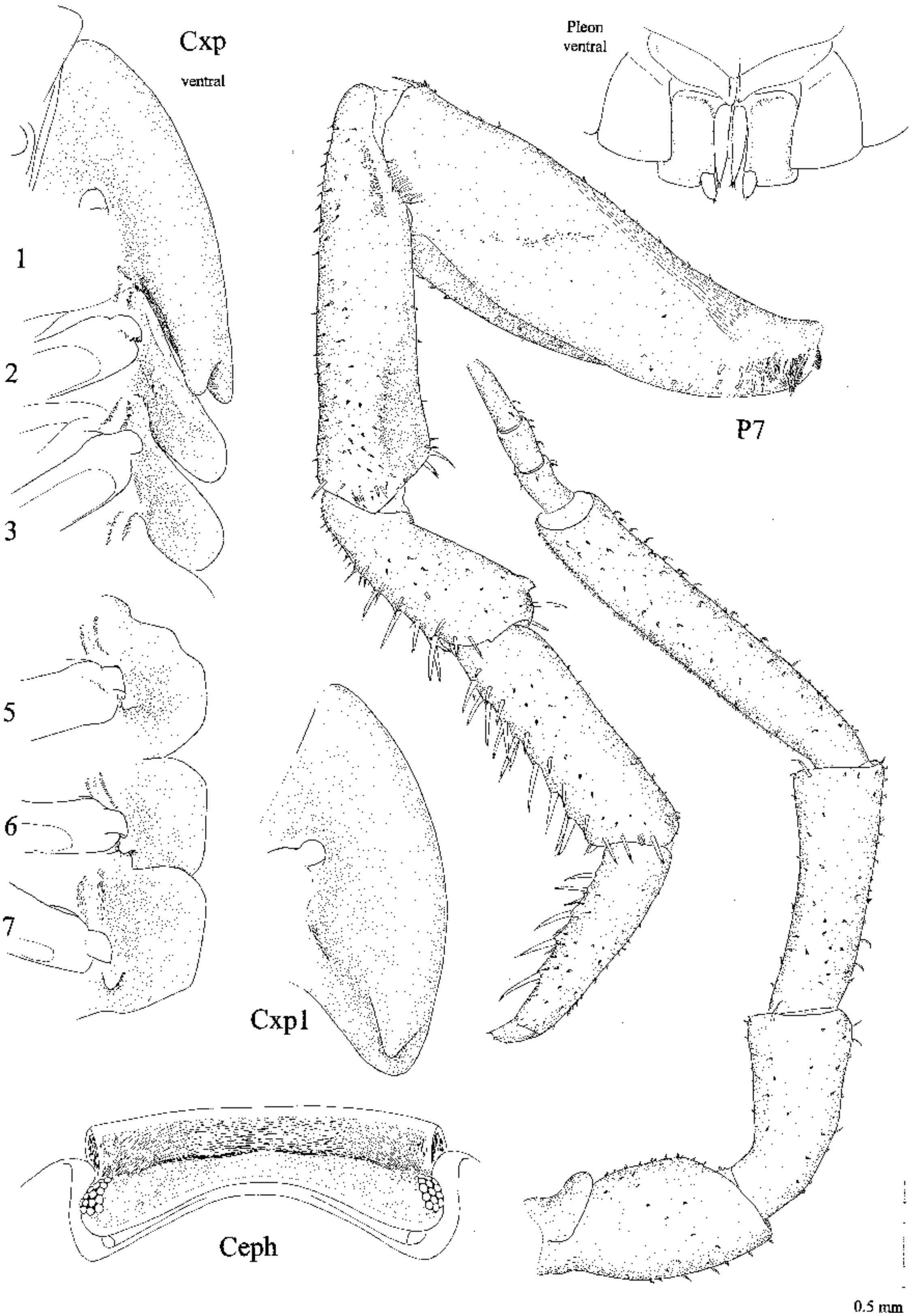

Figure 168. *Sphaeroniscus flavomaculatus* Gerstäcker, 1854: ♂, 7.6 mm wide, mouthparts, first antenna (Colombia, between Bosca del Monte and Tambo, altitude 2000 m, leg. O. Fuhrmann, USNM 43458).

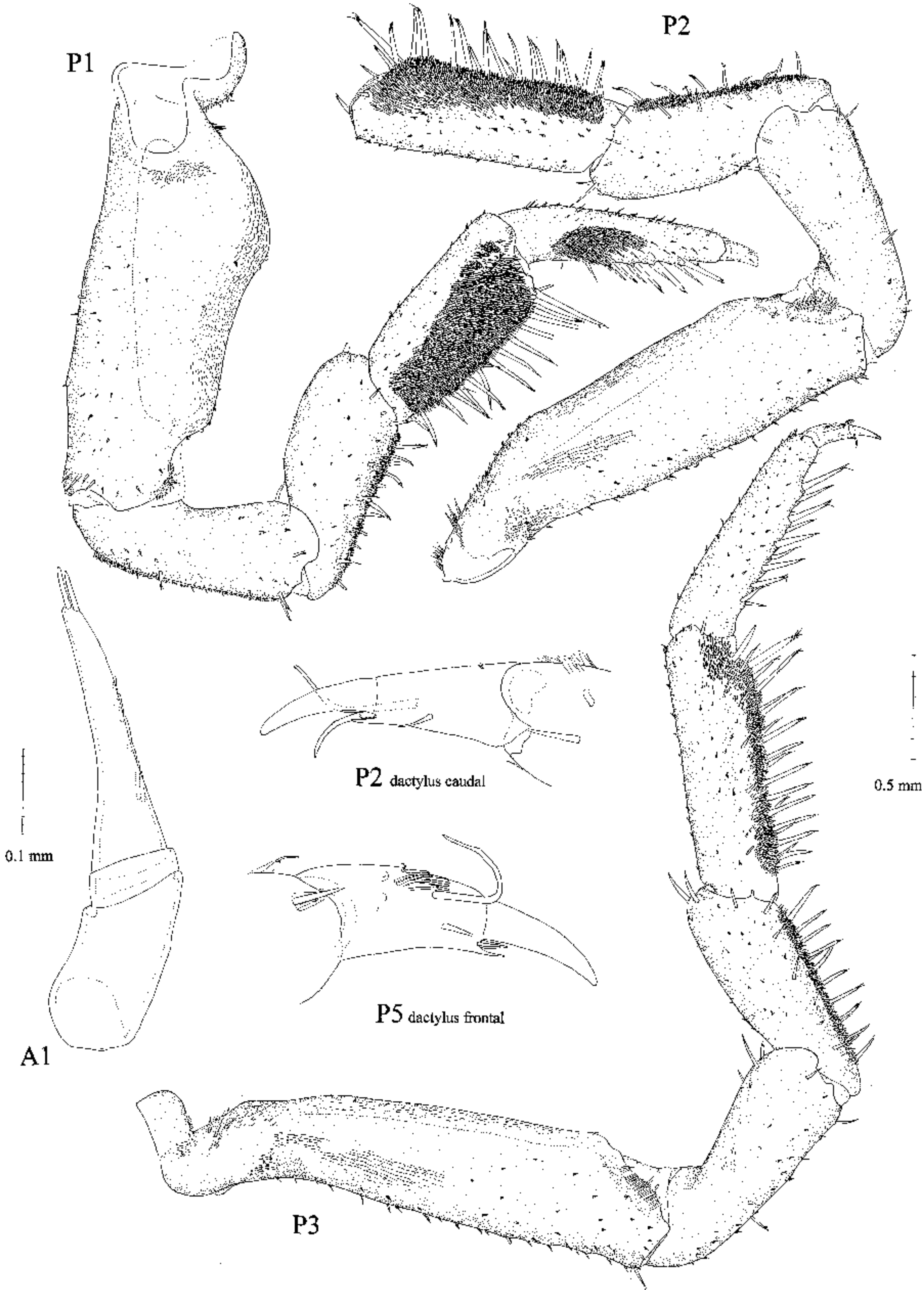

Figure 169. *Sphaeroniscus flavomaculatus* Gerstäcker, 1854: holotype ♂, 17 × 7.6 mm, pereiopods 1–3 frontal, first antenna ('Neu Granada', leg. Goudot, ZMB *27267).

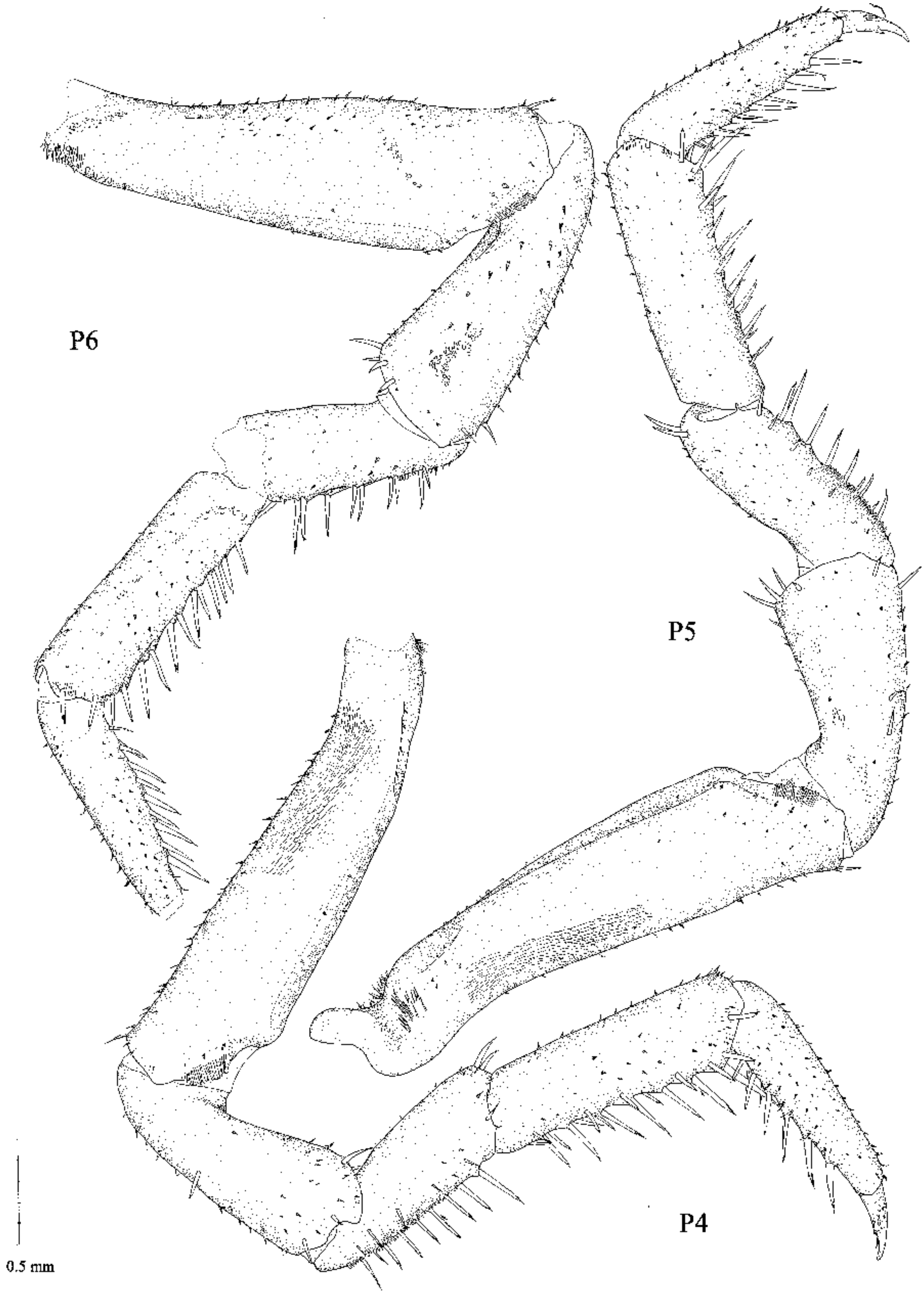

Figure 170. *Sphaeroniscus flavomaculatus* Gerstäcker, 1854: holotype ♂, 17 × 7.6 mm, pereiopods 4–6 frontal ('Neu Granada', leg. Goudot, ZMB *27267).

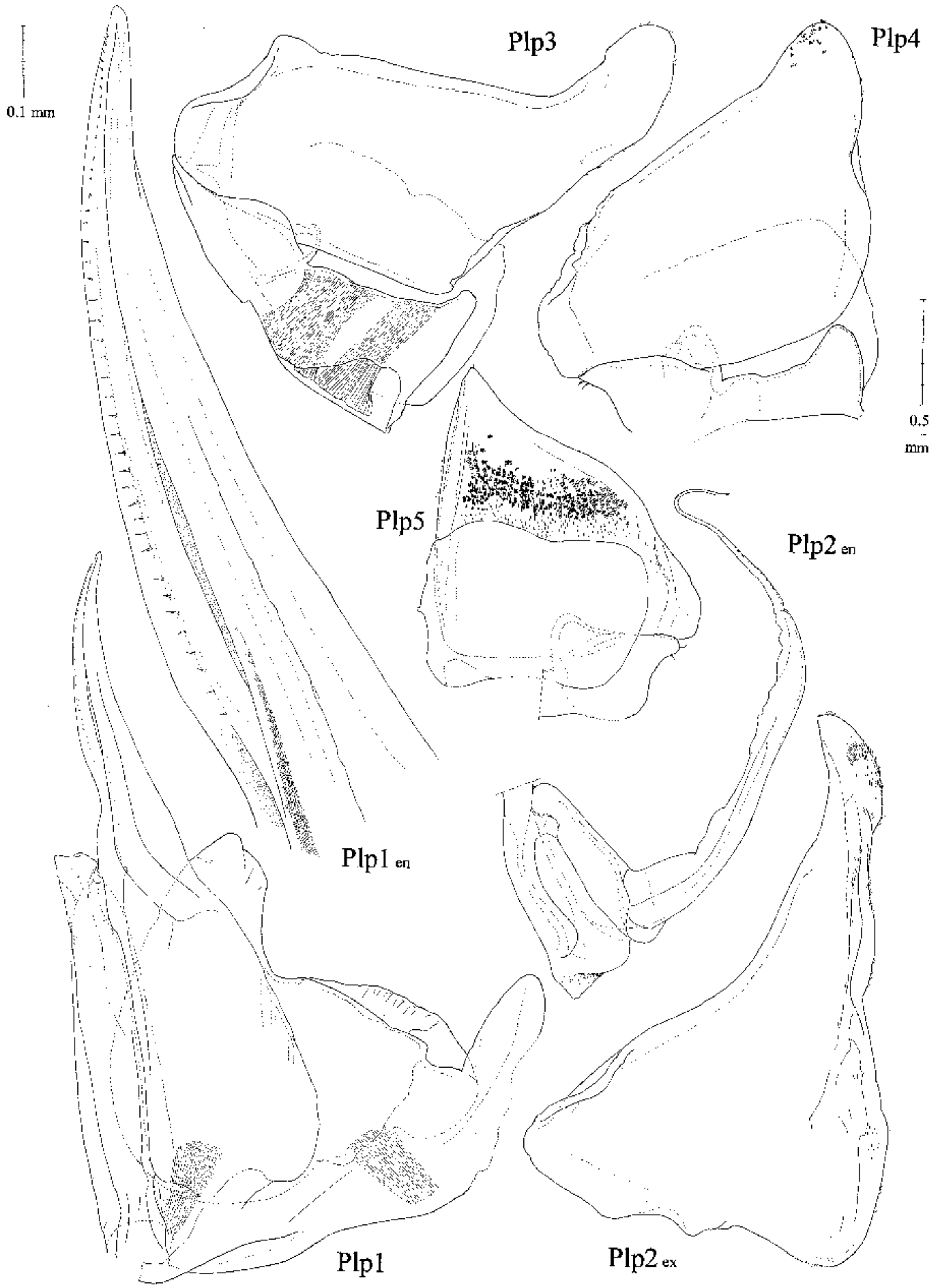

Figure 171. *Sphaeroniscus flavomaculatus* Gerstäcker, 1854: holotype ♂ 17 × 7.6 mm, pleopods 1–5 (‘Neu Granada’, leg. Goudot, ZMB *27267).

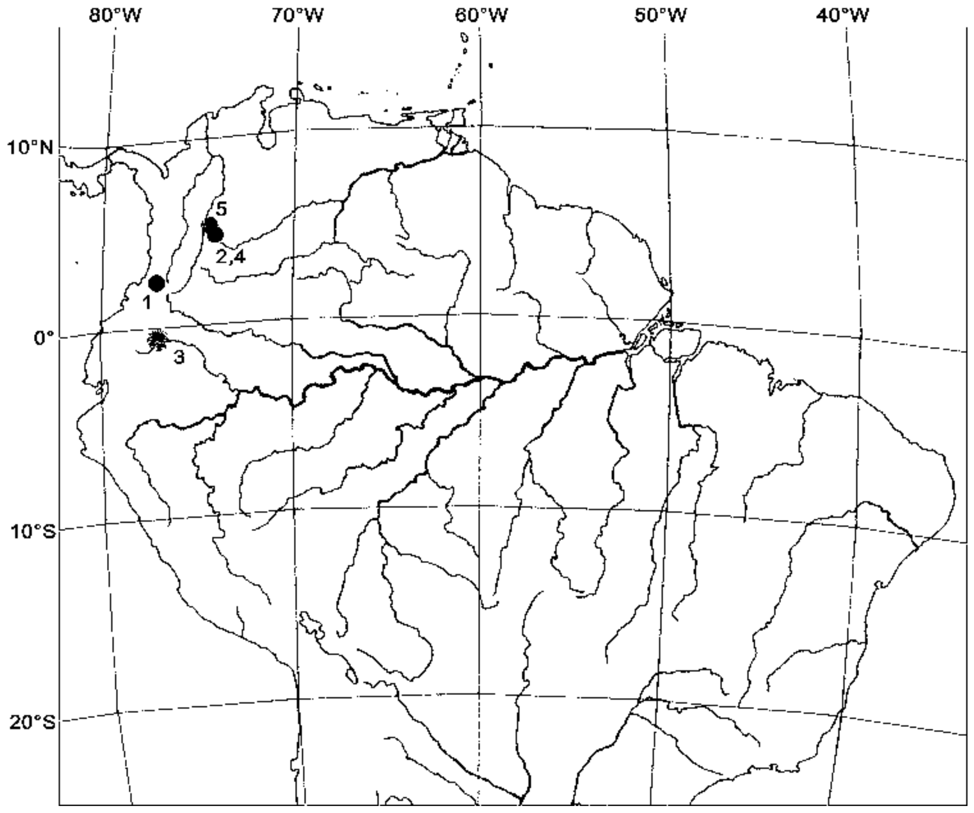

Figure 172. Geographical distribution of *Sphaeroniscus flavomaculatus* (1), *S. frontalis* (2), *S. gerstaeckeri* (3), *S. pilosus* (4), and *S. quintus* (5).

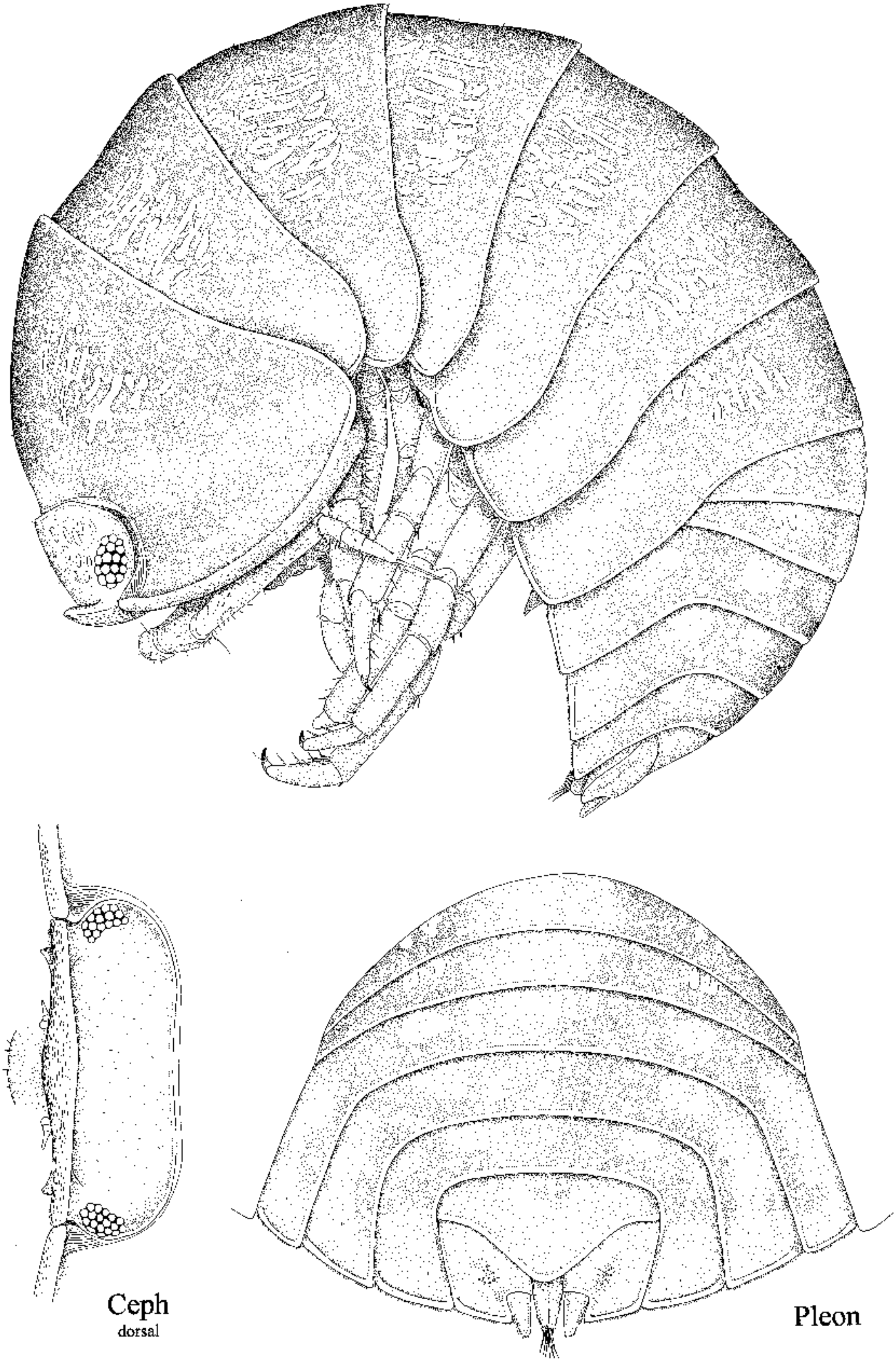

Figure 173. *Sphaeroniscus frontalis* Richardson, 1914: ♀m, *c.* 11 × 5.1 mm (Colombia, Capote, 250 km north of Bogota, 40 km south-east of Barrancabermeja, leg. H. Sturm, 29 July to 4 August 1968, MNHN).

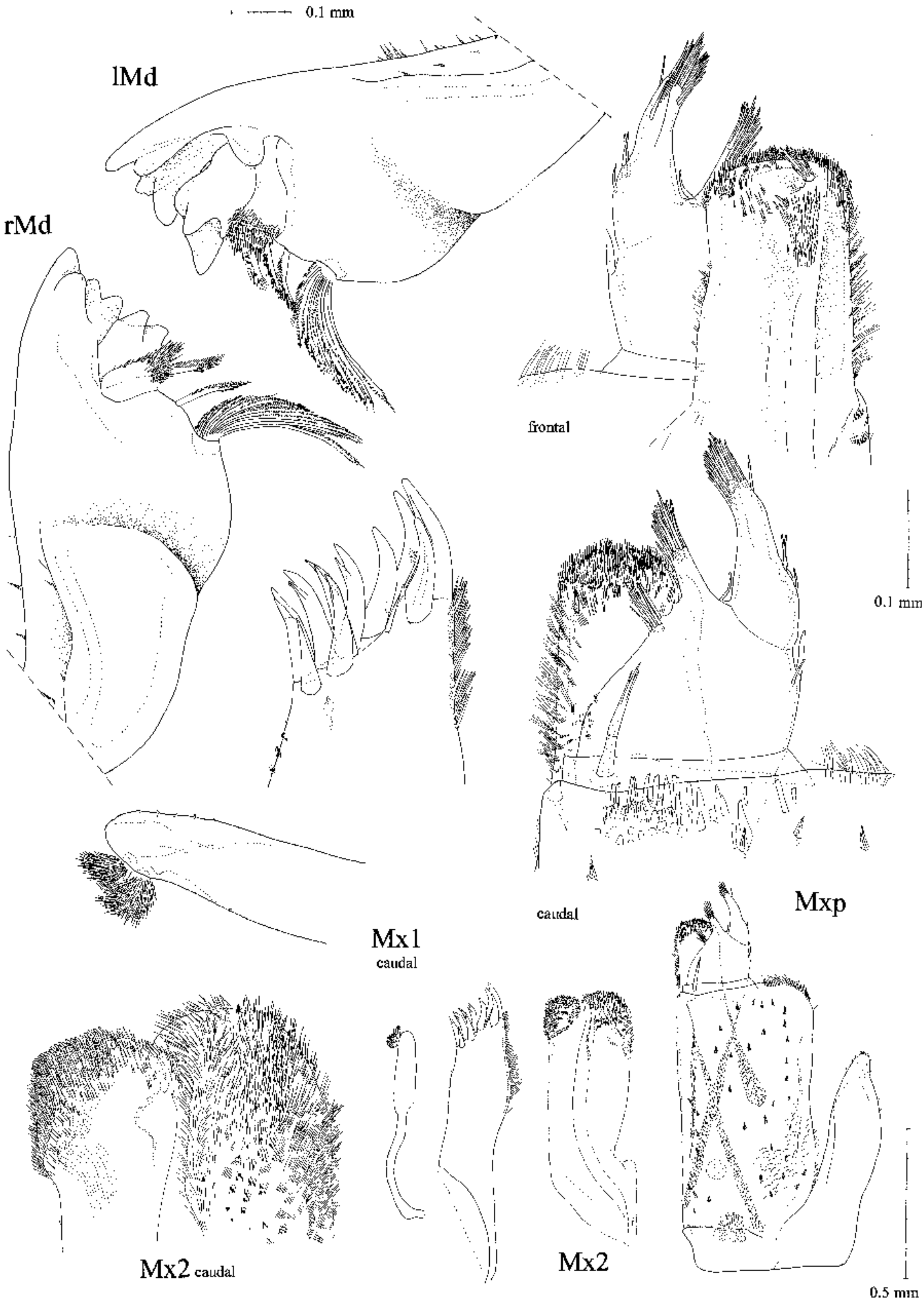

Figure 174. *Sphaeroniscus frontalis* Richardson, 1914: ♀m, *c*. 11 × 5.1 mm, mouthparts (Colombia, Capote, 250 km north of Bogota, 40 km south-east of Barrancabermeja, leg. H. Sturm, 29 July to 4 August 1968, MNHN).

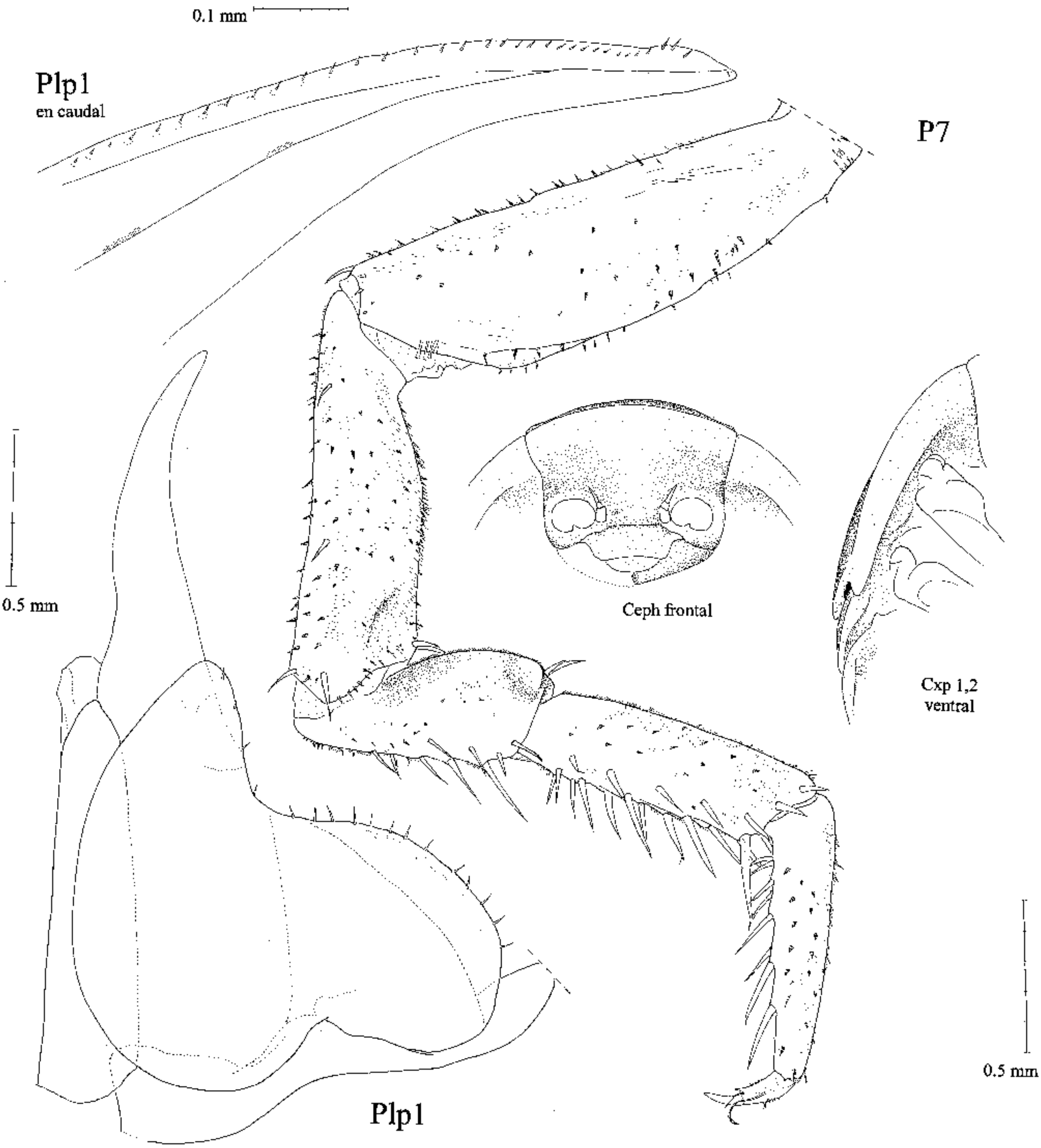

Figure 175. *Sphaeroniscus frontalis* Richardson, 1914: lectotype ♂, 5 mm wide, pereiopod 7 frontal, pleopod 1 + genital papilla frontal, cephalothorax frontal, coxal plates 1 and 2 ventral (Colombia, 'Buenavista near Viota', leg. O. Fuhrmann, BMNH 1928.5.1.84-87).

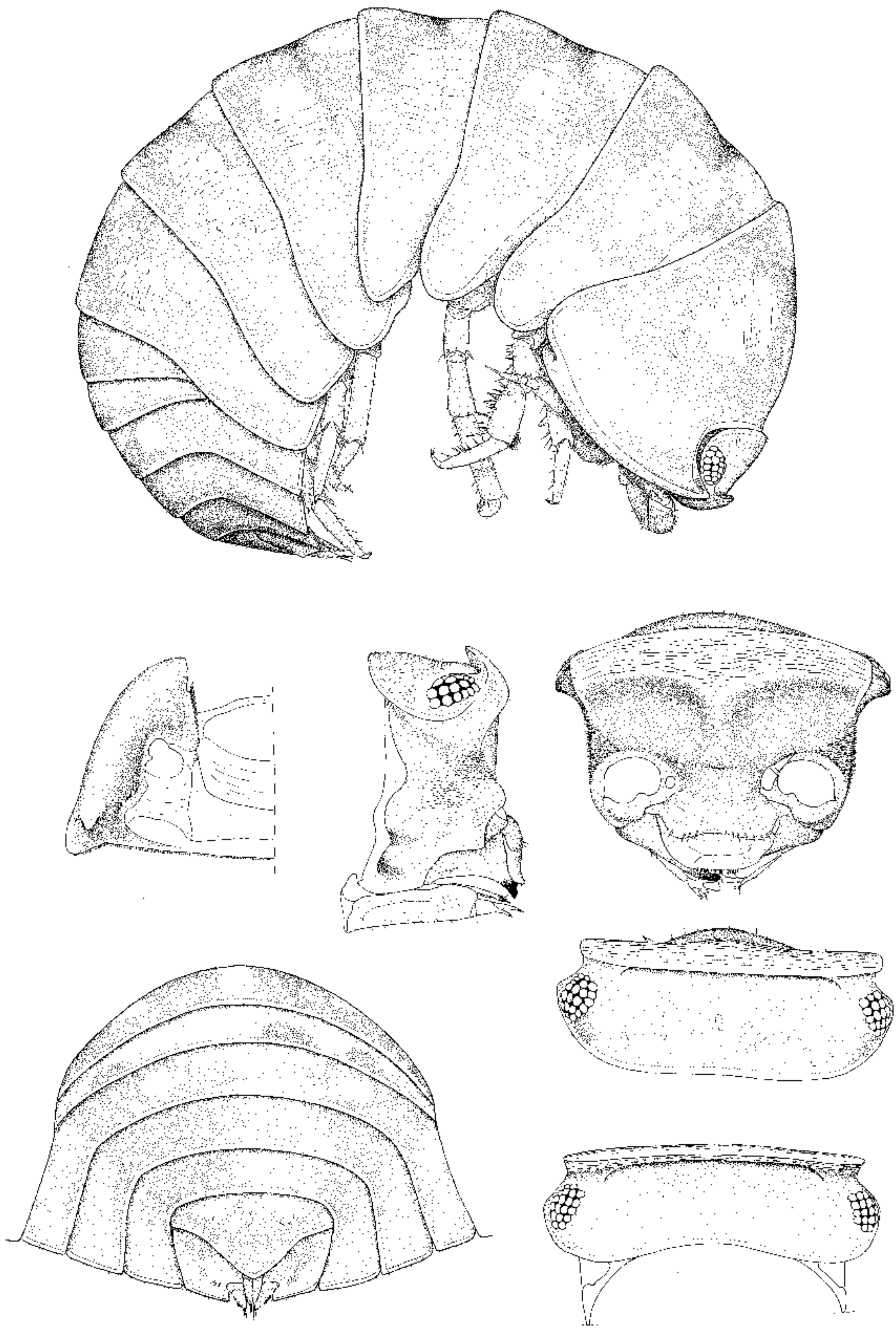

Figure 176. ***Sphaeroniscus quintus* sp. nov.**: holotype ♂, 5.0 mm wide, cephalothorax 2.36 mm wide, cephalothorax and coxal plate 1; paratype ♀m, *c*. 12 × 5.9 mm, cephalothorax 2.80 mm wide, habitus lateral and pleon dorsal (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

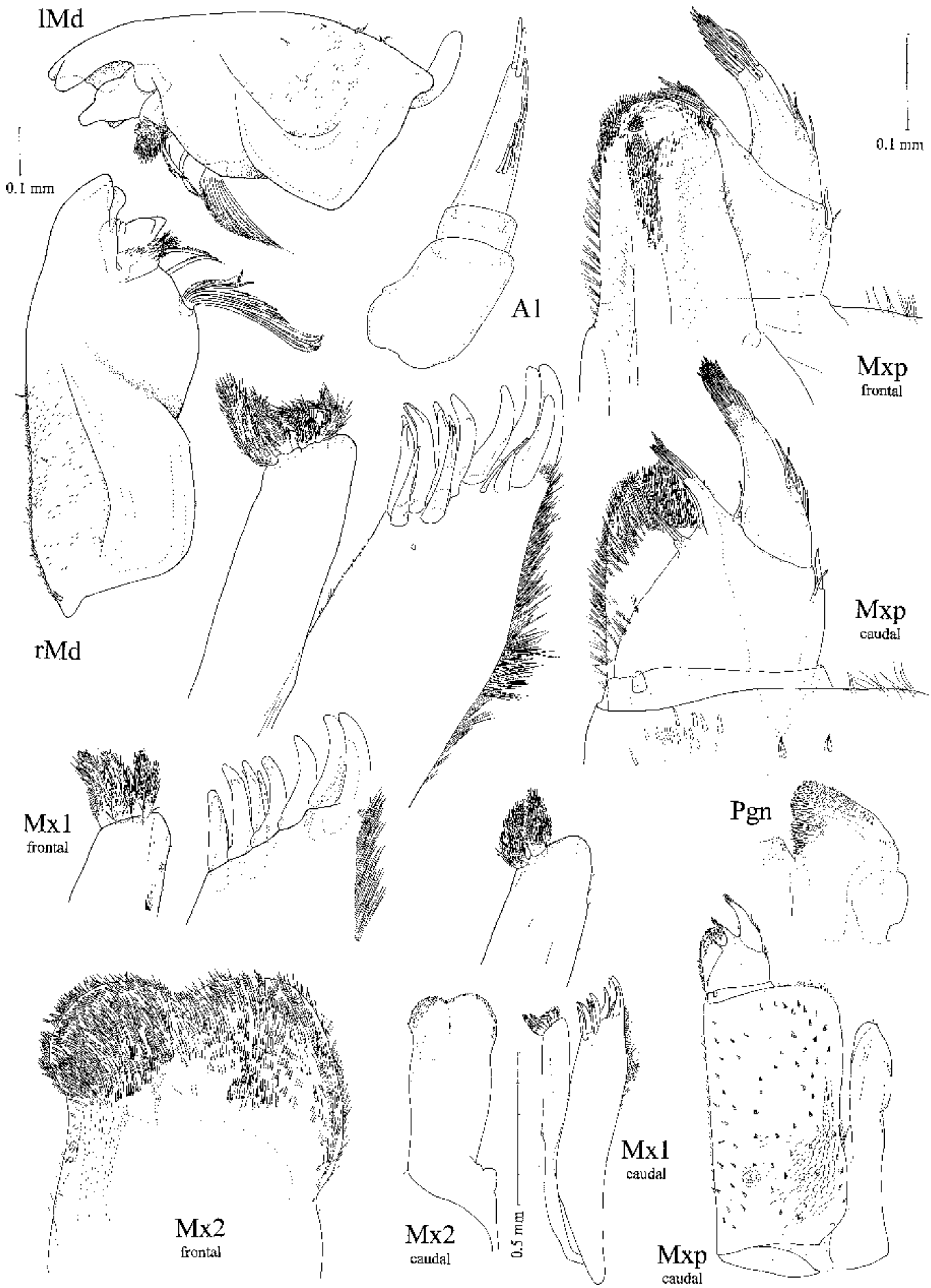

Figure 177. ***Sphaeroniscus quintus*** **sp. nov.**: holotype ♂, 5.0 mm wide, cephalothorax 2.36 mm wide, mouthparts, first antenna; paratype ♀, 4.5 mm wide, cephalothorax 2.20 mm wide, maxilliped 1 inner endite (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

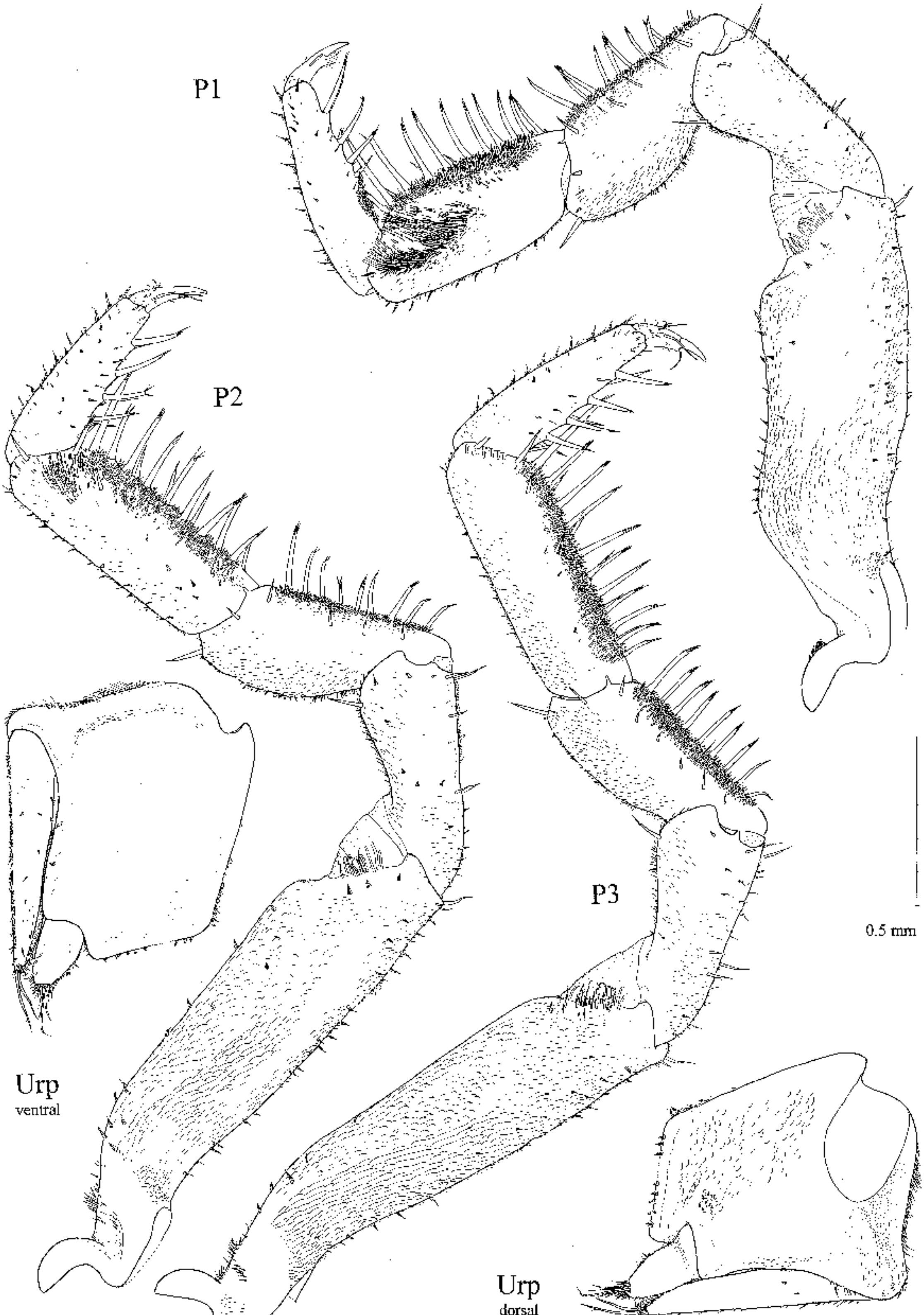

Figure 178. ***Sphaeroniscus quintus* sp. nov.**: holotype ♂, 5.0 mm wide, cephalothorax 2.36 mm wide, pereiopods 1–3, uropod (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

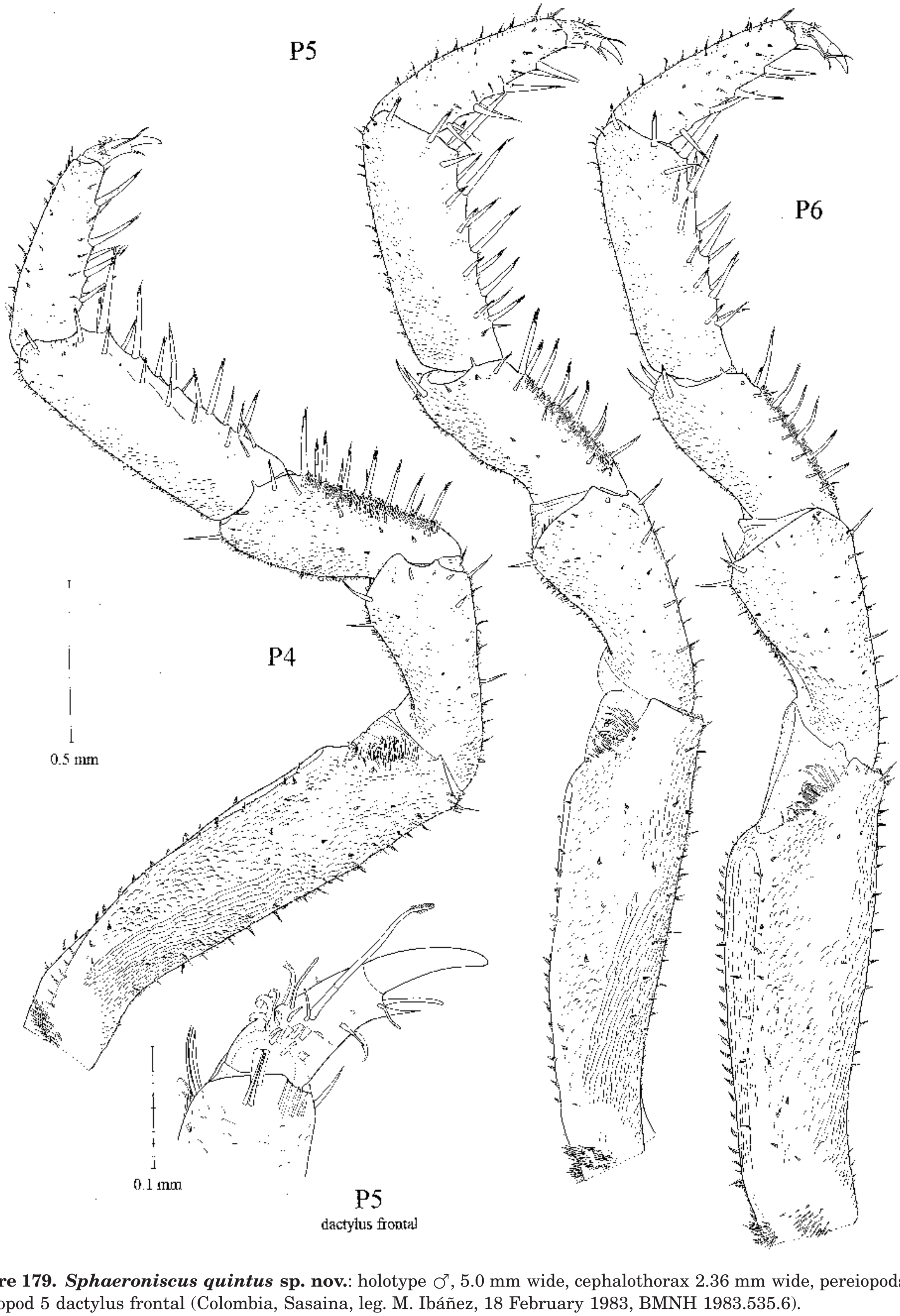

Figure 179. ***Sphaeroniscus quintus*** **sp. nov.**: holotype ♂, 5.0 mm wide, cephalothorax 2.36 mm wide, pereiopods 4–6, pereiopod 5 dactylus frontal (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

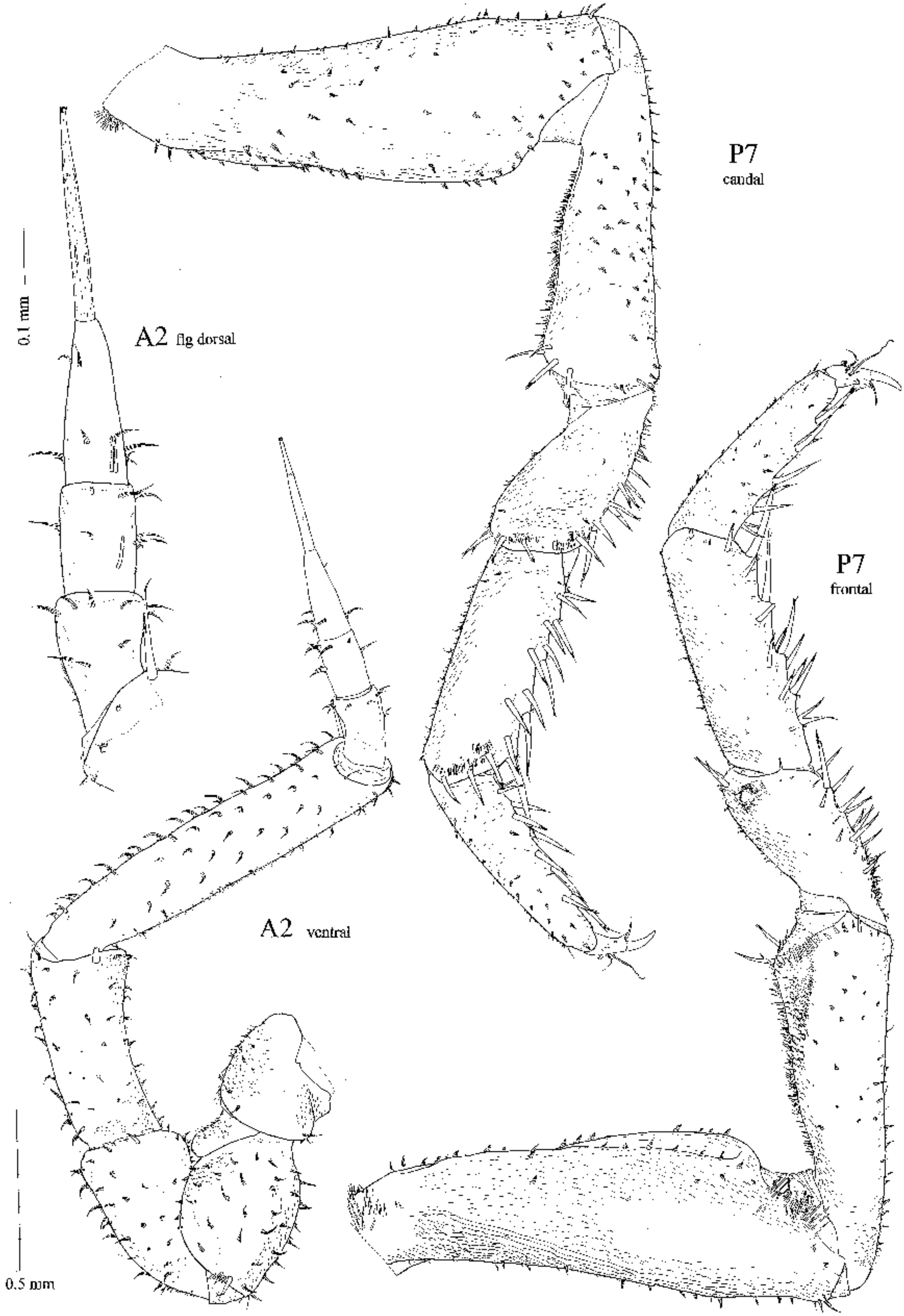

Figure 180. ***Sphaeroniscus quintus*** **sp. nov.**: holotype ♂, 5.0 mm wide, cephalothorax 2.36 mm wide, pereiopod 7, second antenna (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

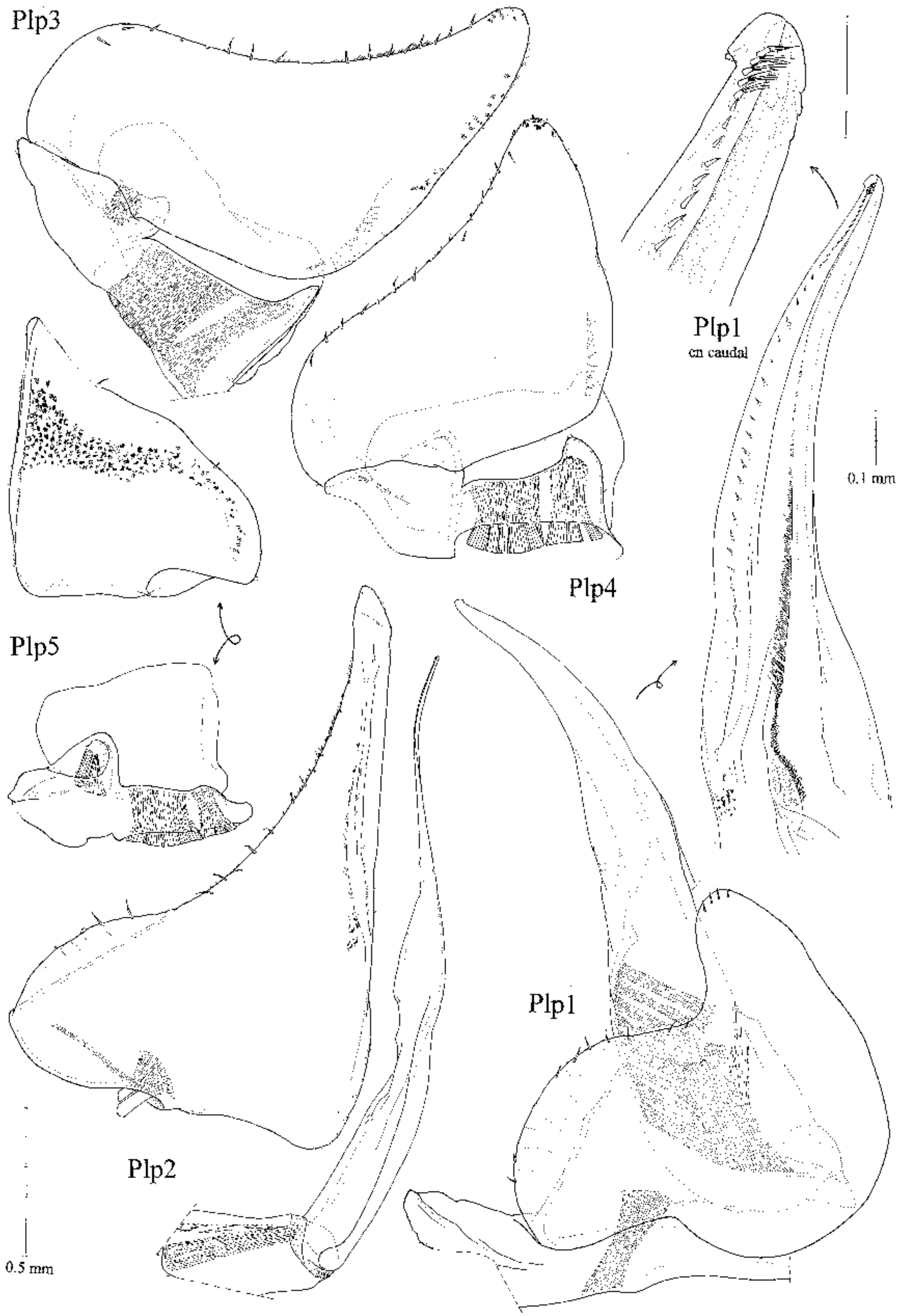

Figure 181. ***Sphaeroniscus quintus*** **sp. nov.**: holotype ♂, 5.0 mm wide, cephalothorax 2.36 mm wide, pleopods 1–5 (Colombia, Sasaina, leg. M. Ibáñez, 18 February 1983, BMNH 1983.535.6).

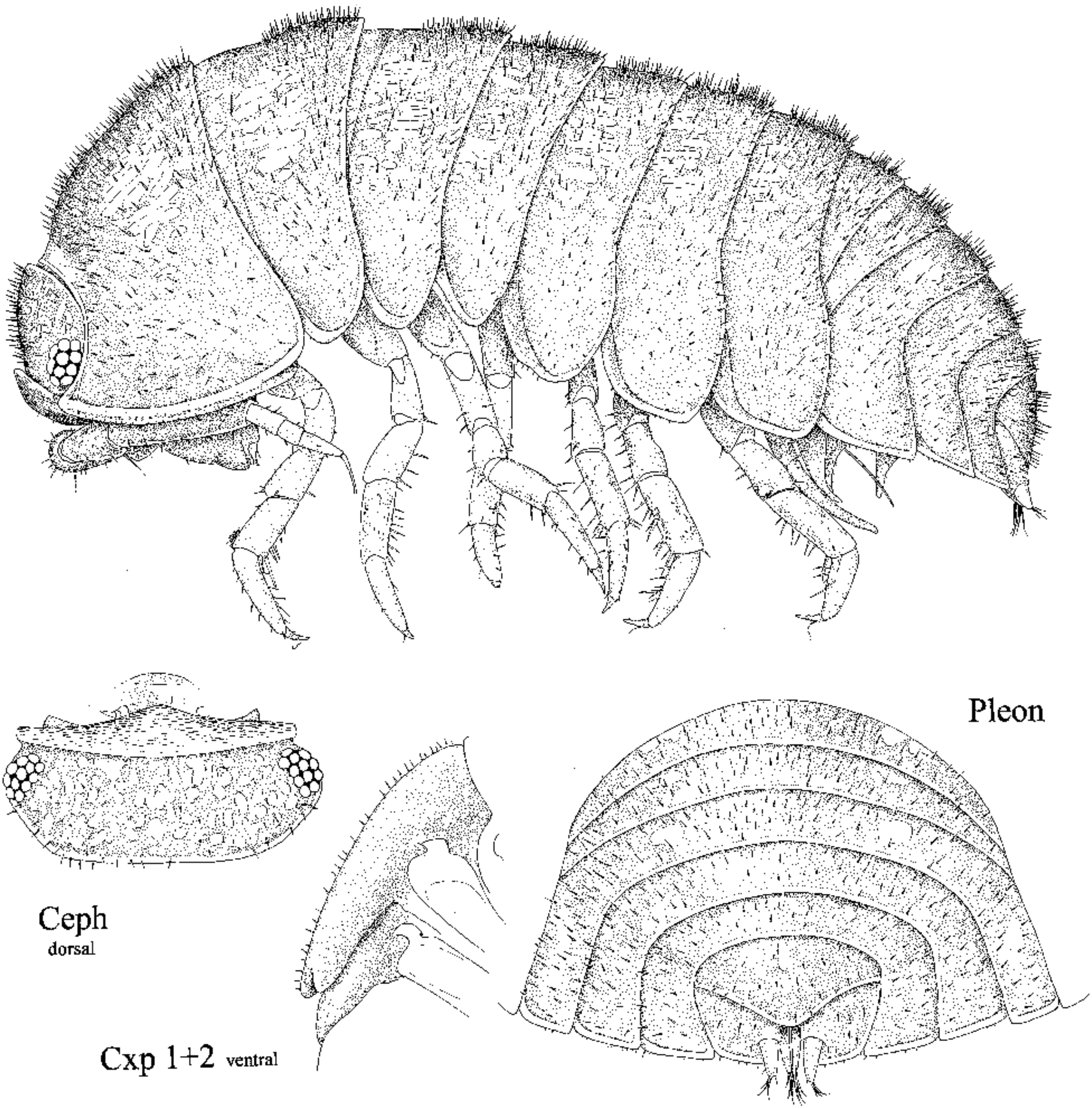

Figure 182. *Sphaeroniscus pilosus* Vandel, 1972: syntype ♂, 4.8 × 2.0 mm, habitus, pleon dorsal, cephalothorax dorsal (Colombia, Bogotá, Montserrate montane forest, altitude *c*. 3150 m, leg. H. Sturm, 7 February 1969, MNHN).

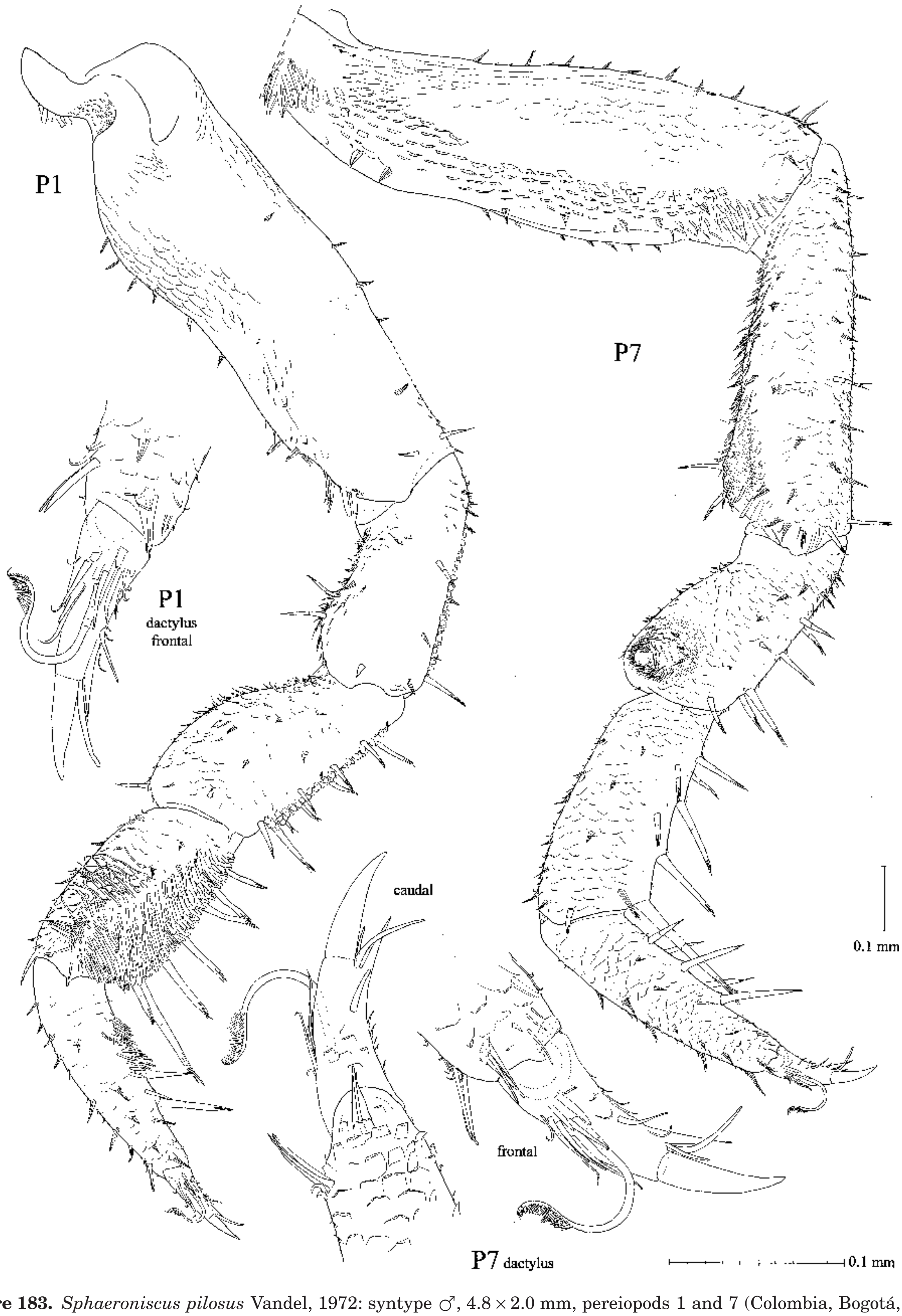

Figure 183. *Sphaeroniscus pilosus* Vandel, 1972: syntype ♂, 4.8 × 2.0 mm, pereiopods 1 and 7 (Colombia, Bogotá, Montserrate montane forest, altitude *c*. 3150 m, leg. H. Sturm, 7 February 1969, MNHN).

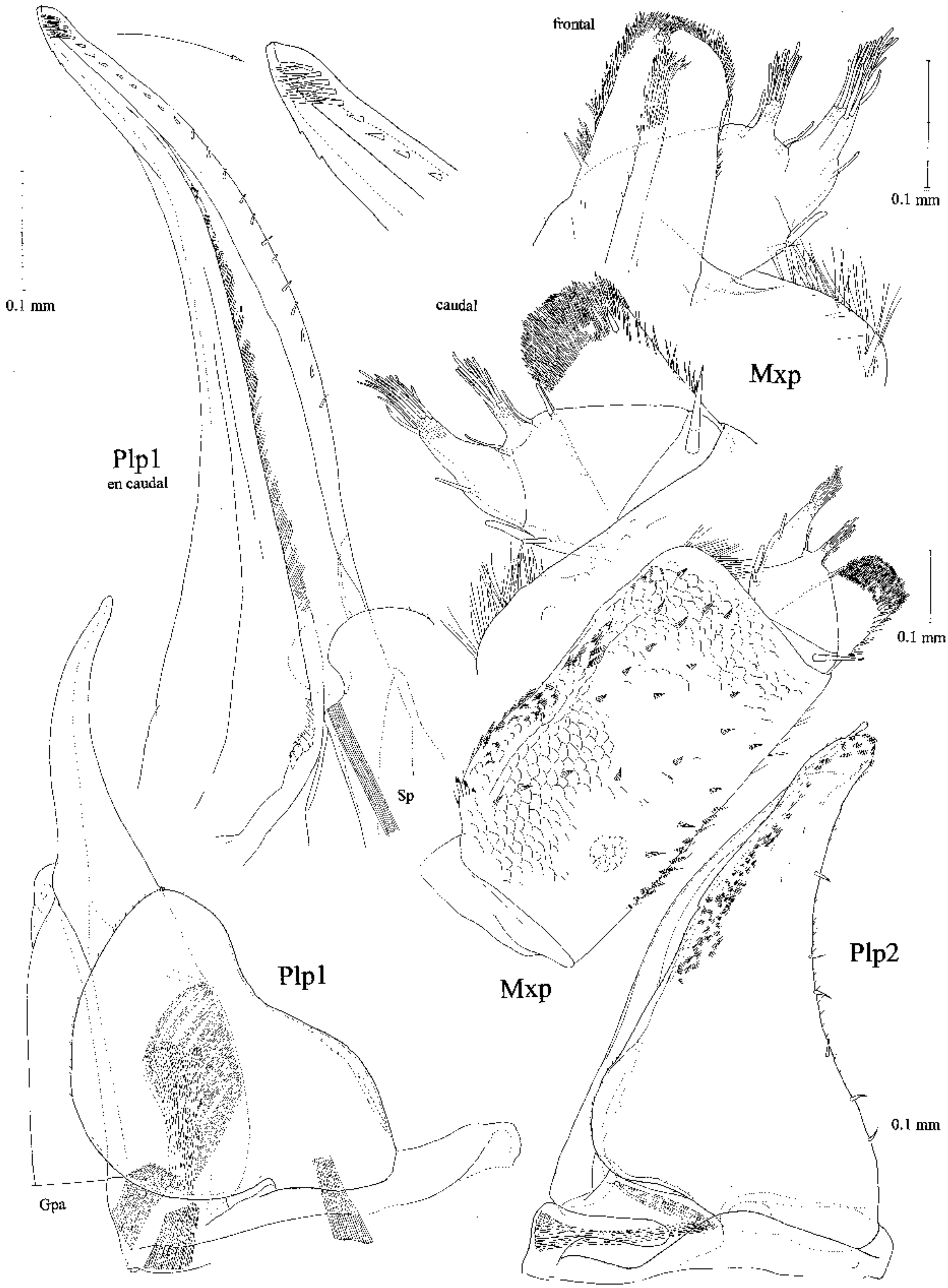

Figure 184. *Sphaeroniscus pilosus* Vandel, 1972: syntype ♂, 4.8 × 2.0 mm, maxilliped, pleopods 1 and 2 (Colombia, Bogotá, Montserrate montane forest, altitude *c.* 3150 m, leg. H. Sturm, 7 February 1969, MNHN).

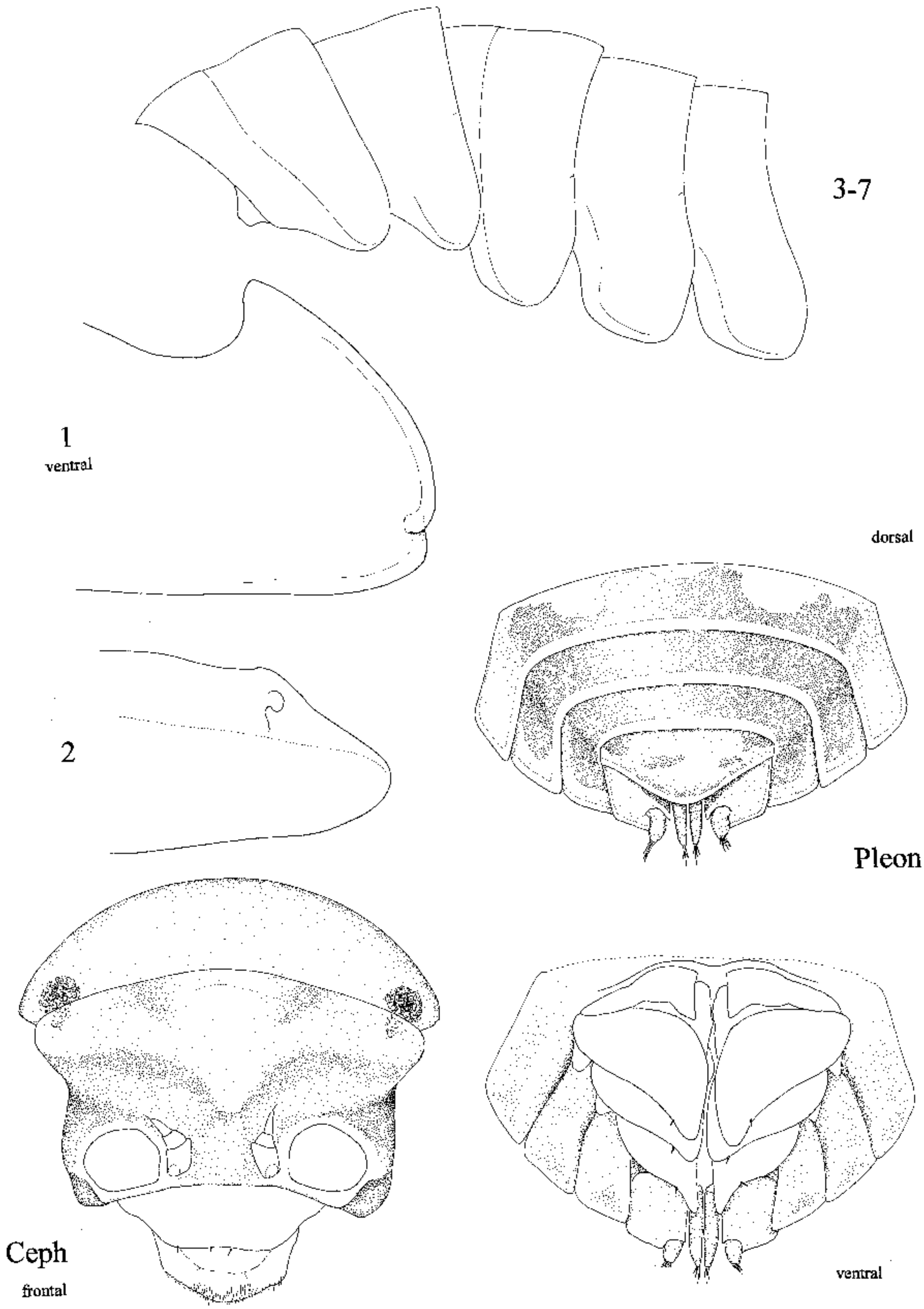

Figure 185. *Sphaeroniscus gerstaeckeri* Vandel, 1972: syntype ♂, tergites 3–7, pleon dorsal and ventral, cephalothorax frontal (Ecuador, Oriente Province, Archidona, altitude 750 m, leg. N. Leleup, April 1965, MNHN).

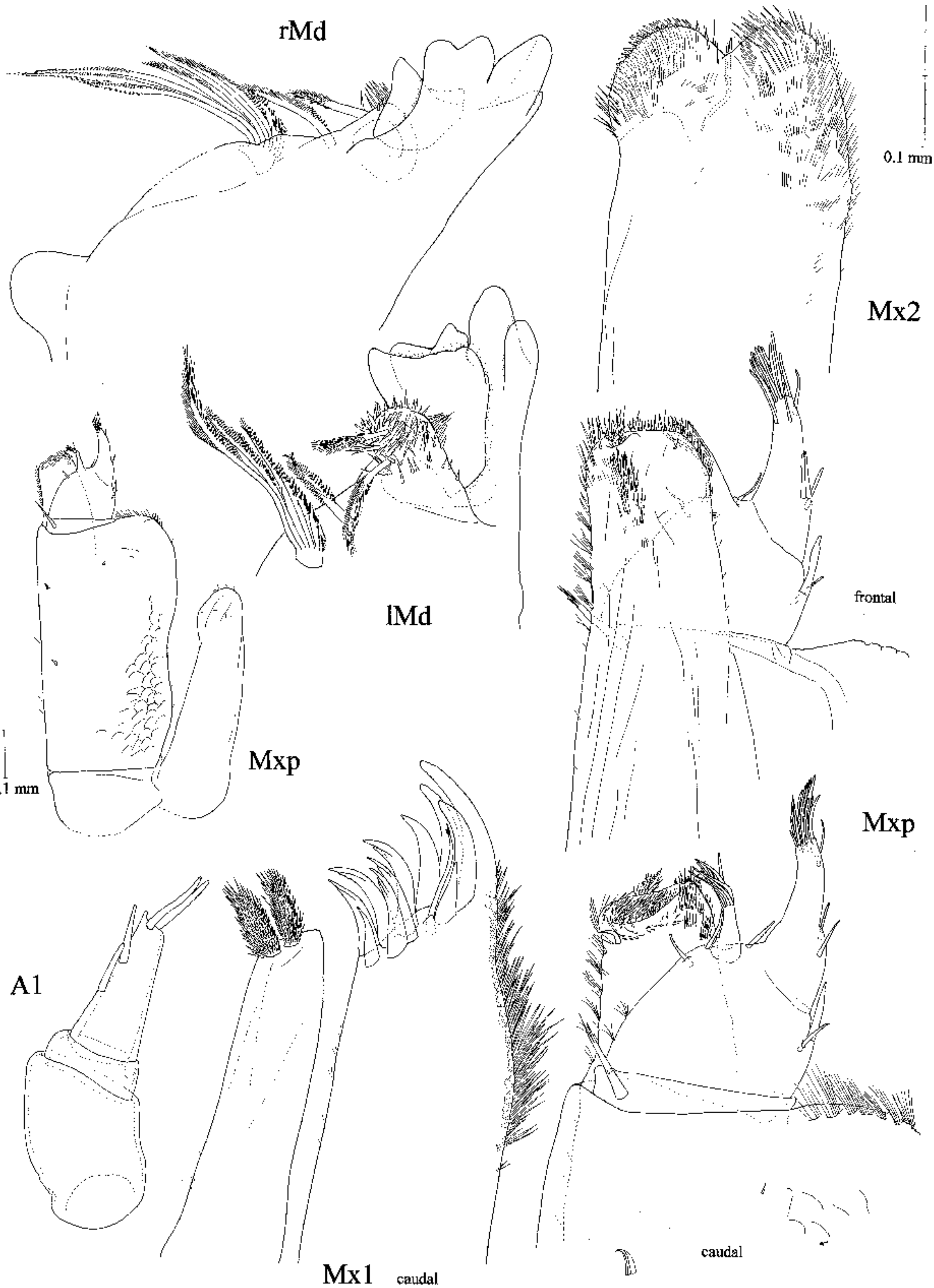

Figure 186. *Sphaeroniscus gerstaeckeri* Vandel, 1968: holotype ♂, mouthparts, first antenna (Ecuador, Oriente Province, Archidona, altitude 750 m, leg. N. Leleup, April 1965, MNHN).

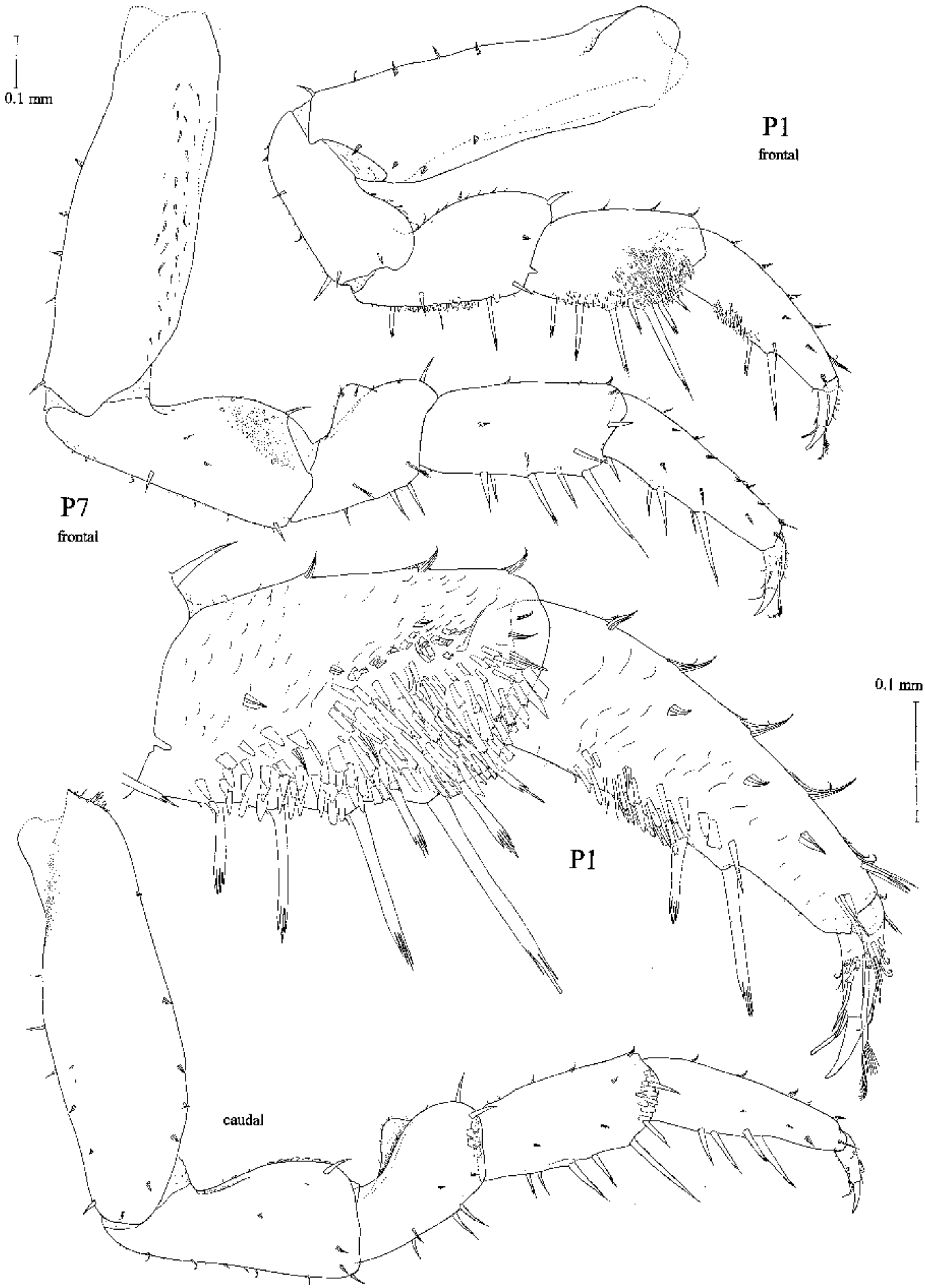

Figure 187. *Sphaeroniscus gerstaeckeri* Vandel, 1968: holotype ♂, 6 mm, pereiopods 1 and 7 (Ecuador, Oriente Province, Archidona, altitude 750 m, leg. N. Leleup, April 1965, MNHN).

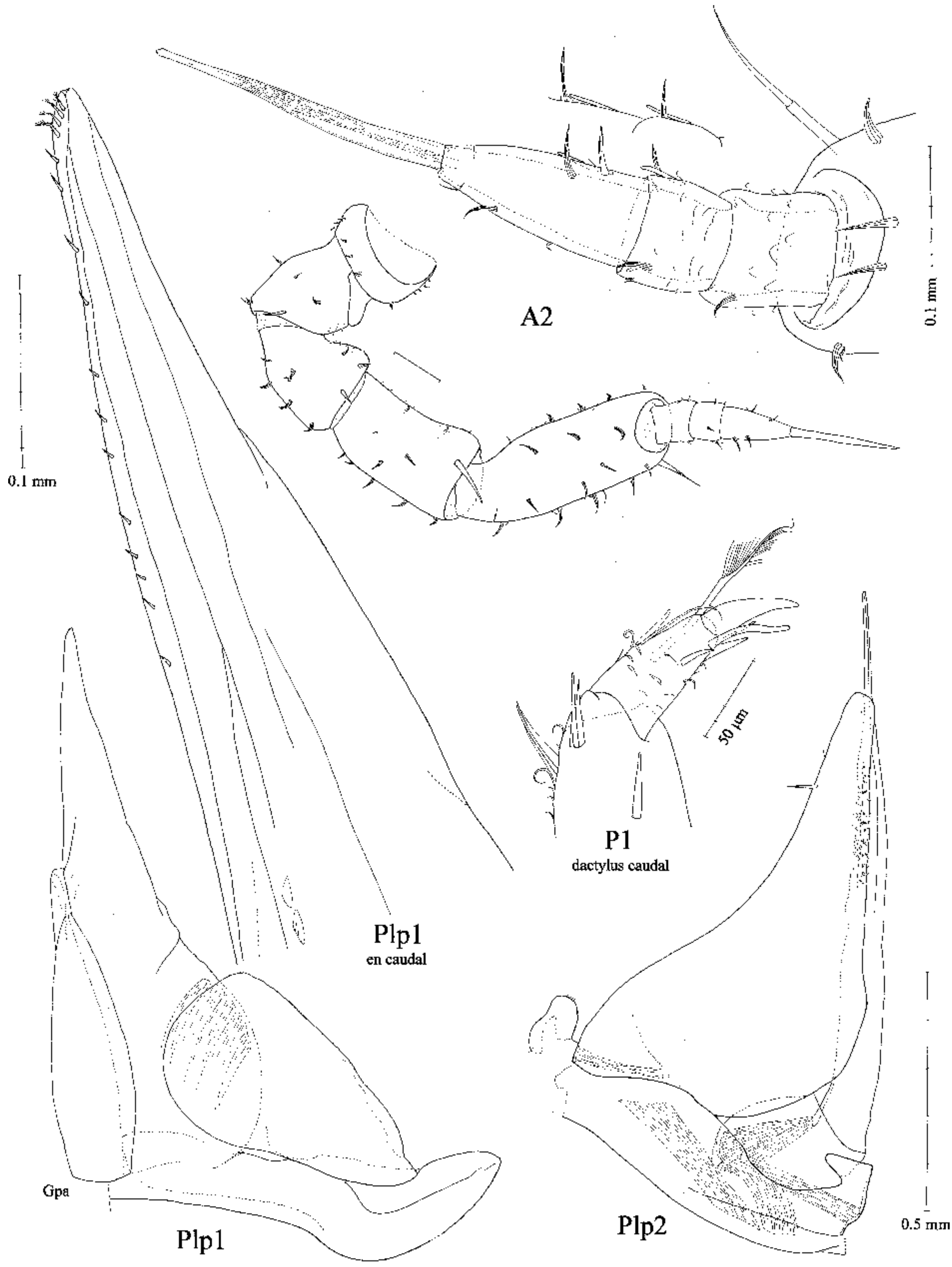

Figure 188. *Sphaeroniscus gerstaeckeri* Vandel, 1968: holotype ♂, 6 mm, pleopods 1 and 2, second antenna (Ecuador, Oriente Province, Archidona, altitude 750 m, leg. N. Leleup, April 1965, MNHN).

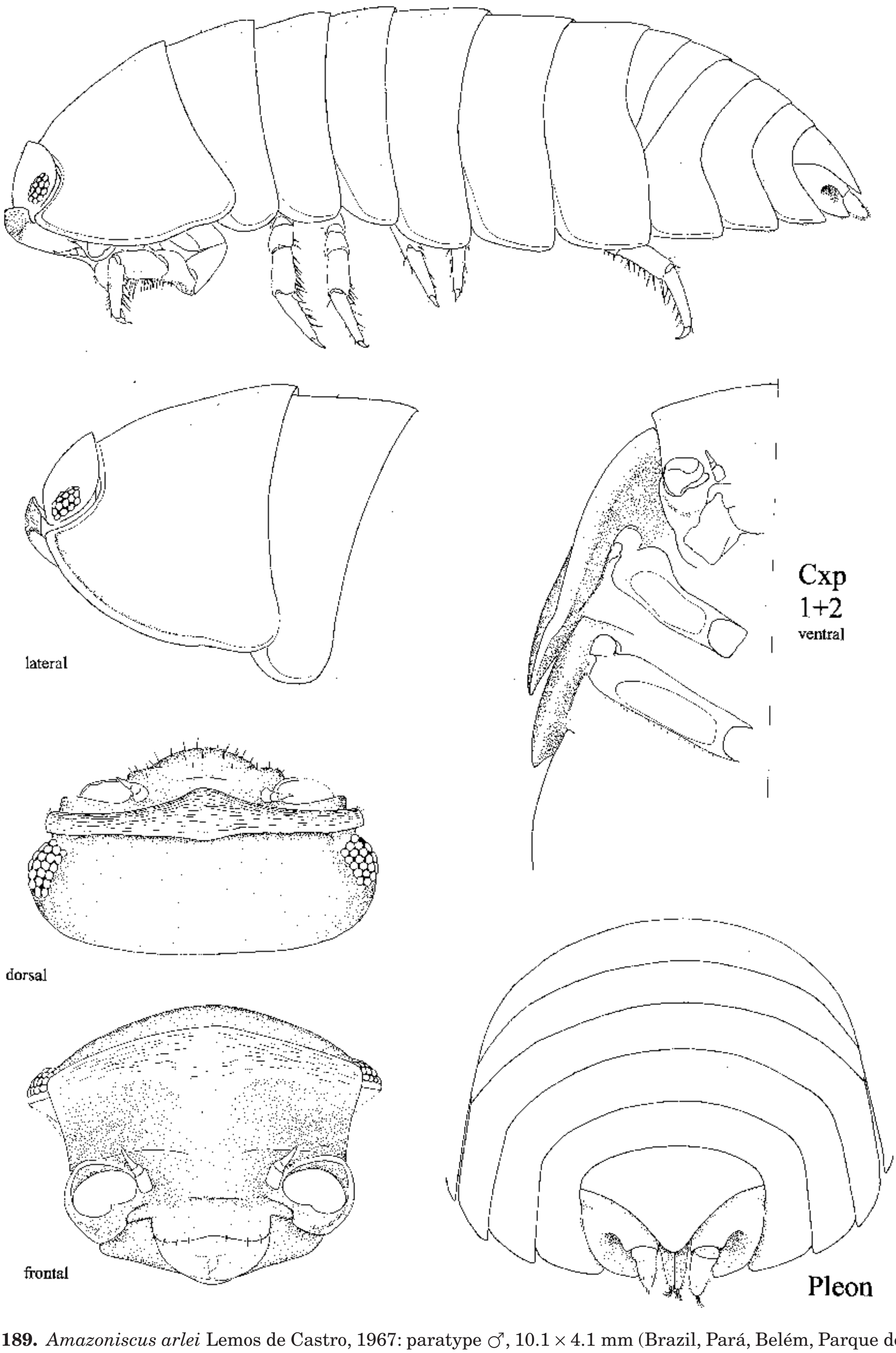

Figure 189. *Amazoniscus arlei* Lemos de Castro, 1967: paratype ♂, 10.1 × 4.1 mm (Brazil, Pará, Belém, Parque do Museu Goeldi, leg. H. Schubart, February 1964, MNRJ 3313).

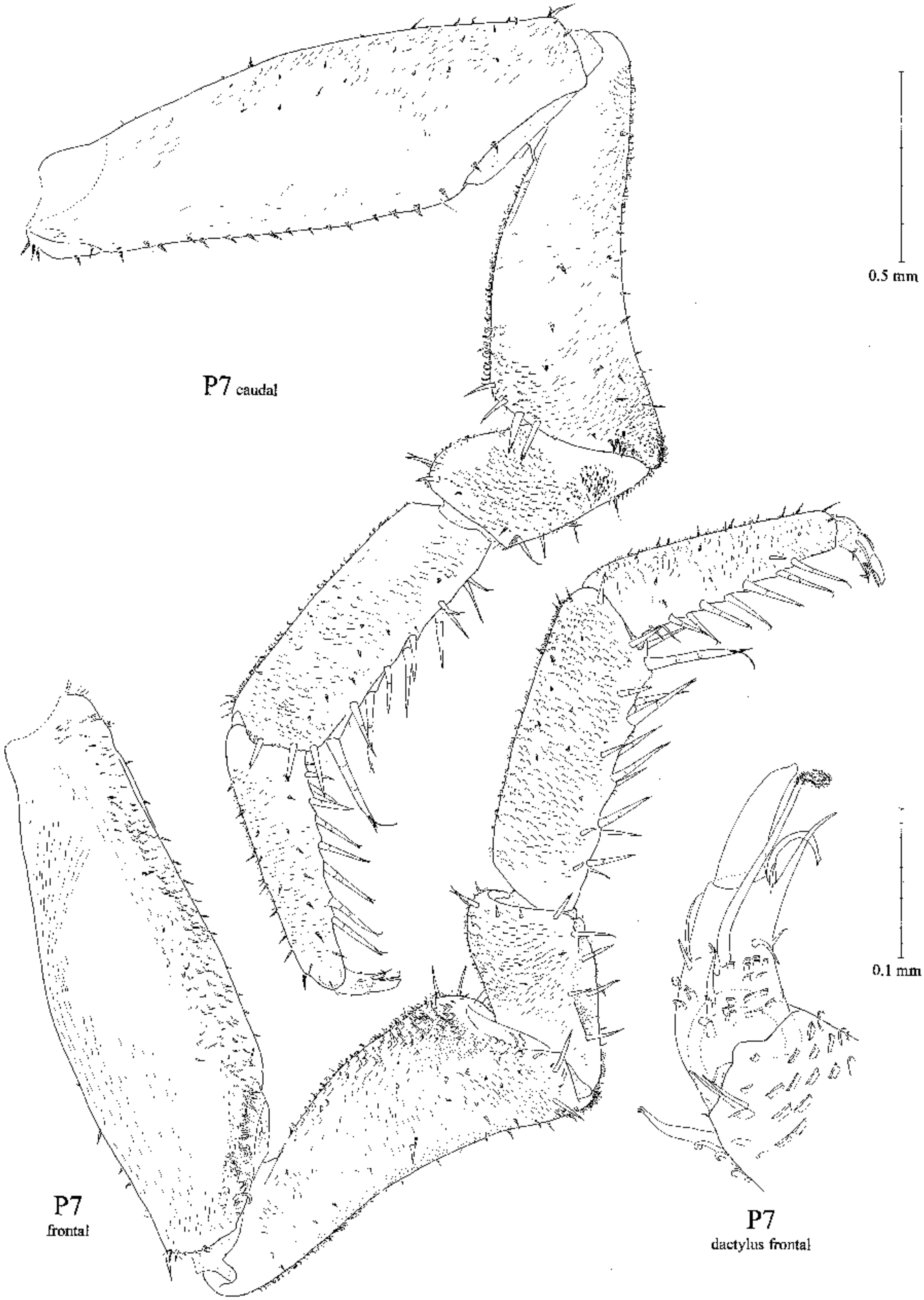

Figure 190. *Amazoniscus arlei* Lemos de Castro, 1967: paratype ♂, 10.1 × 4.1 mm, pereiopod 7 (Brazil, Pará, Belém, Parque do Museu Goeldi, leg. H. Schubart, February 1964, MNRJ 3313).

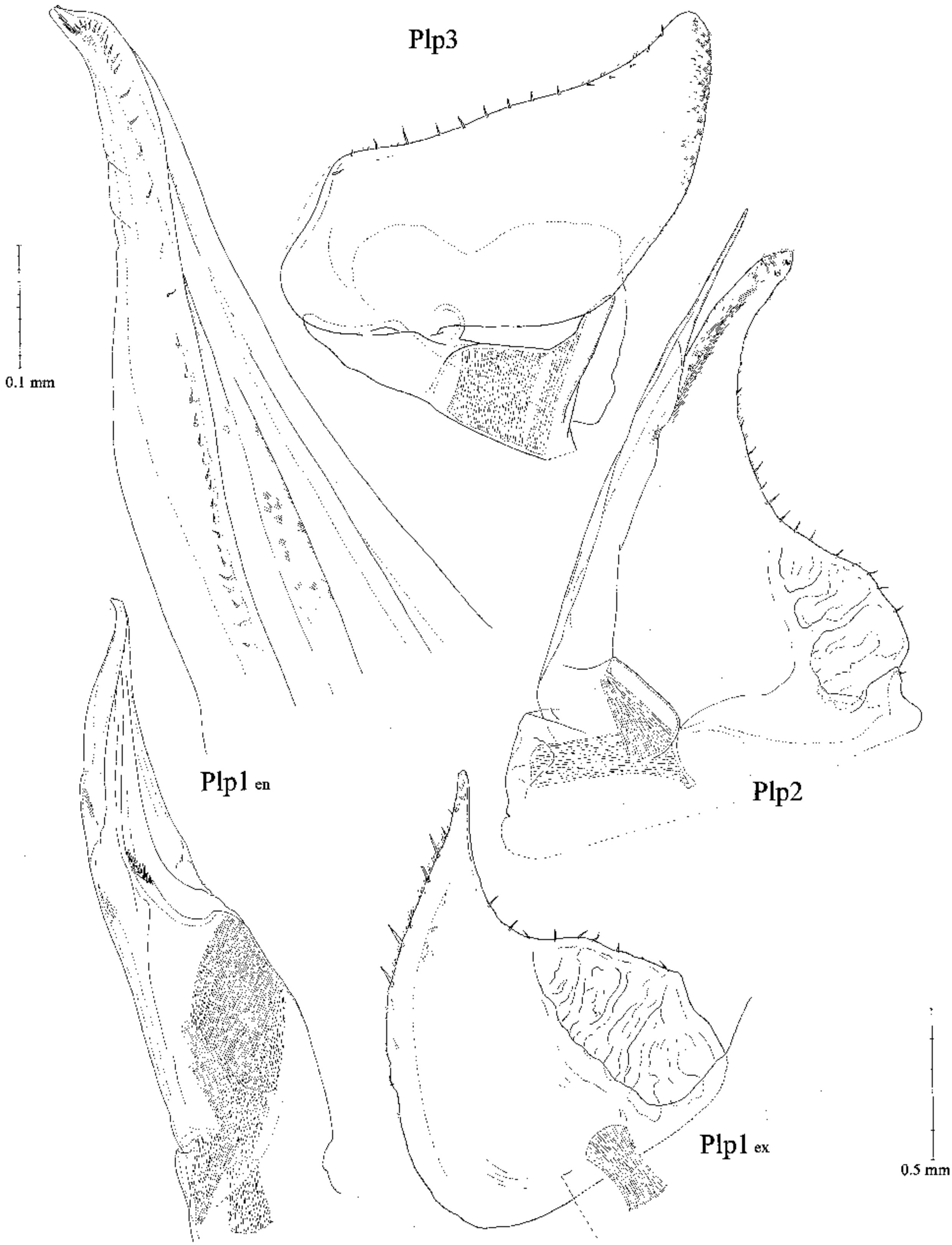

Figure 191. *Amazoniscus arlei* Lemos de Castro, 1967: paratype ♂, 10.1 × 4.1 mm, pleopods 1–3 (Brazil, Pará, Belém, Parque do Museu Goeldi, leg. H. Schubart, February 1964, MNRJ 3313).

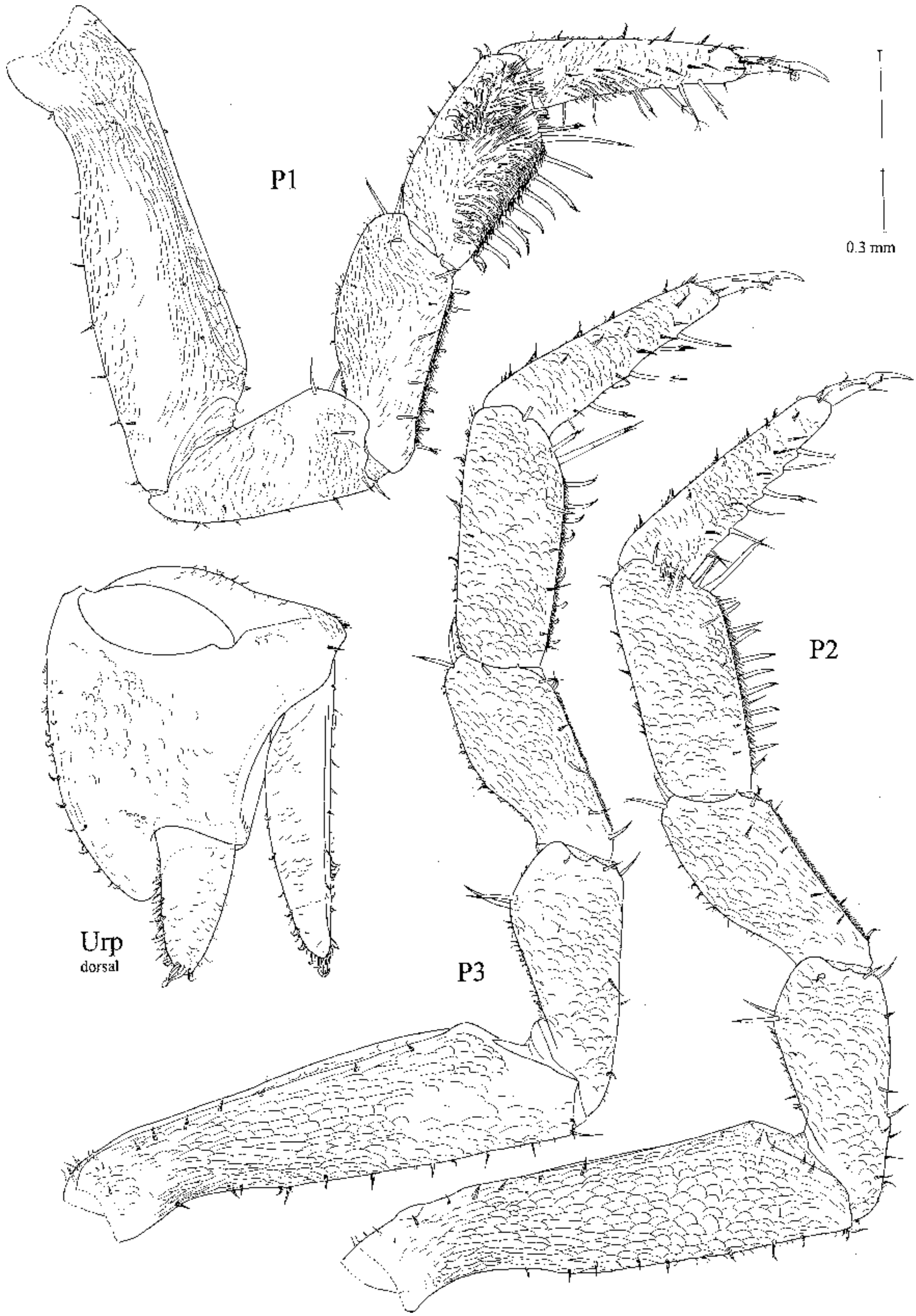

Figure 192. *Amazoniscus arlei* Lemos de Castro, 1967: ♂, 5.8 × 2.4 mm, cephalothorax 1.54 mm, pereiopods 1–3 frontal, uropod dorsal (Brazil, Minas Gerais, Leopoldina, 21°31′ S, 42°38′ W, leg. L. A. Souza, 10 July 1983, MNRJ 8198).

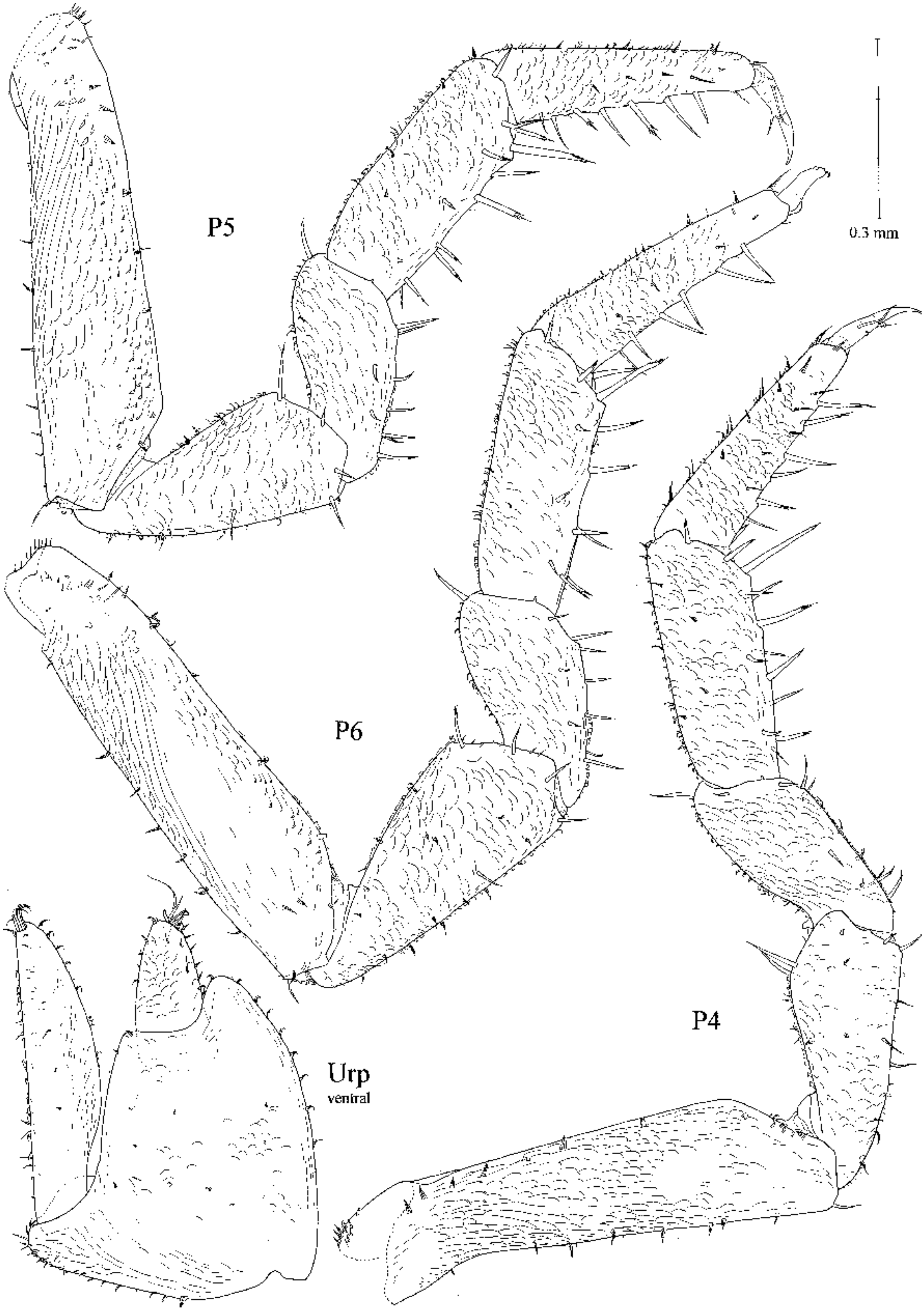

Figure 193. *Amazoniscus arlei* Lemos de Castro, 1967: ♂, 5.8 × 2.4 mm, cephalothorax 1.54 mm, pereiopods 4–6 frontal, uropod ventral (Brazil, Minas Gerais, Leopoldina, 21°31′ S, 42°38′ W, leg. L. A. Souza, 10 July 1983, MNRJ 8198).

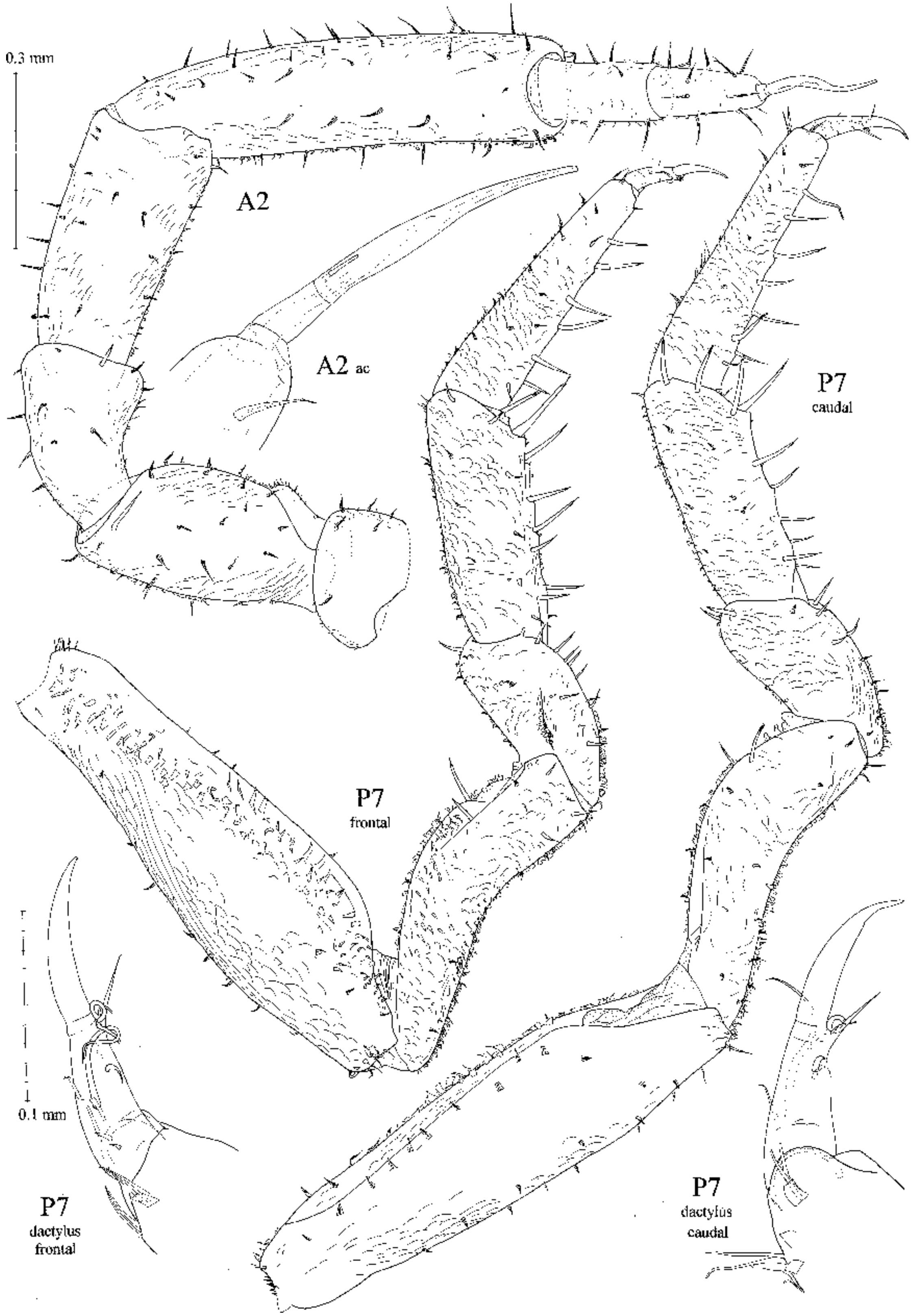

Figure 194. *Amazoniscus arlei* Lemos de Castro, 1967: ♂, 5.8 × 2.4 mm, cephalothorax 1.54 mm, pereiopod 7 frontal and caudal, pereiopod 7 dactylus, second antenna (Brazil, Minas Gerais, Leopoldina, 21°31′ S, 42°38′ W, leg. L. A. Souza, 10 July 1983, MNRJ 8198).

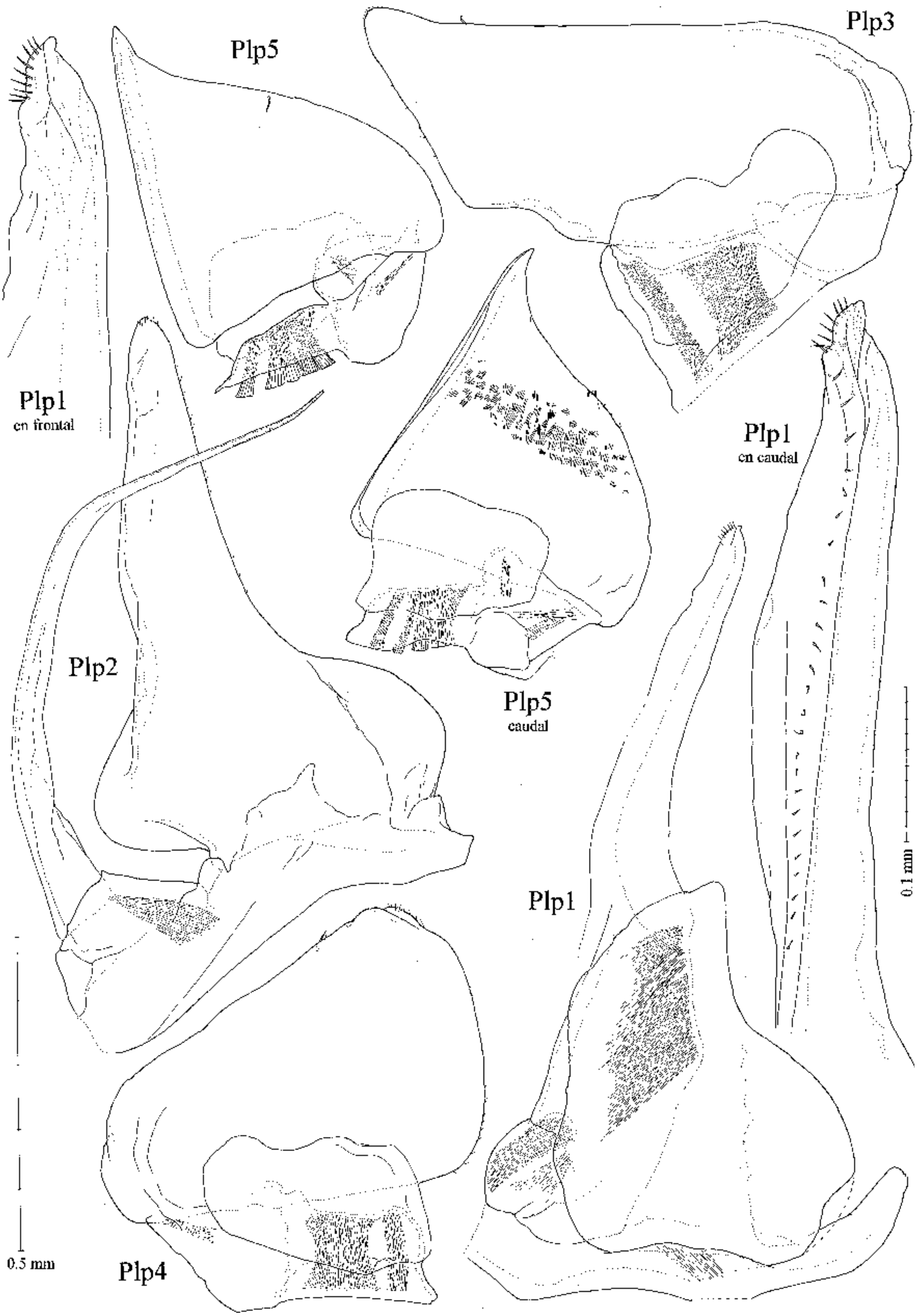

Figure 195. *Amazoniscus arlei* Lemos de Castro, 1967: ♂, 5.8 × 2.4 mm, cephalothorax 1.54 mm, pleopods 1–5 (Brazil, Minas Gerais, Leopoldina, 21°31′ S, 42°38′ W, leg. L. A. Souza, 10 July 1983, MNRJ 8198).

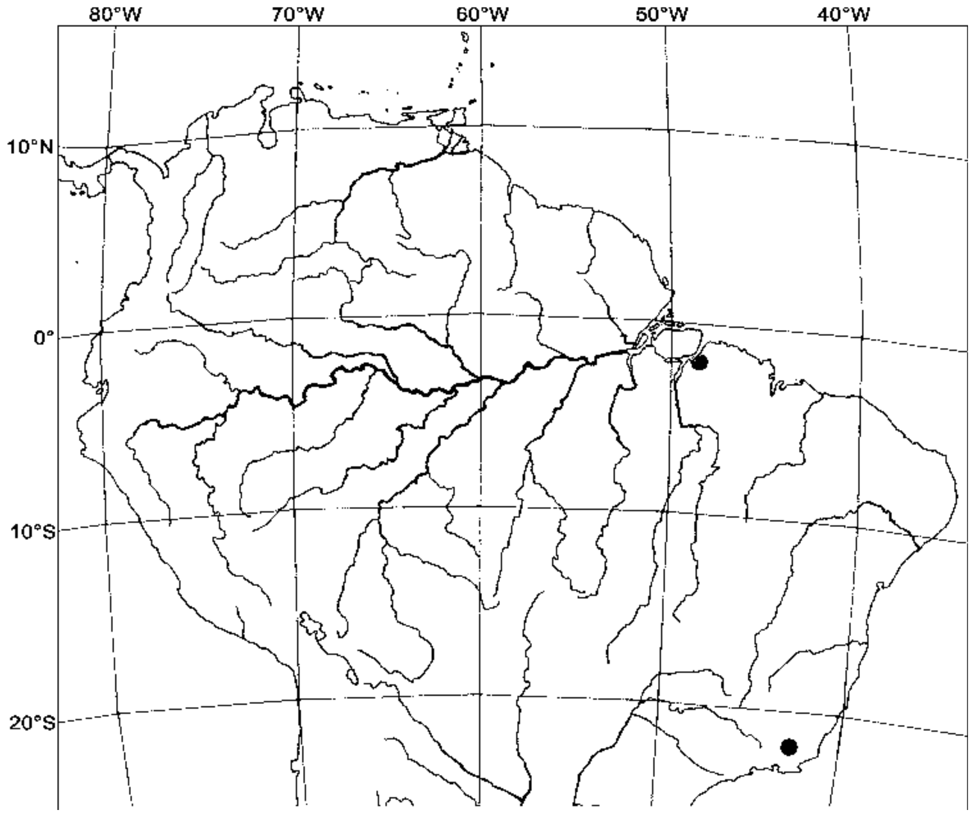

Figure 196. Geographical distribution of *Amazoniscus arlei*.

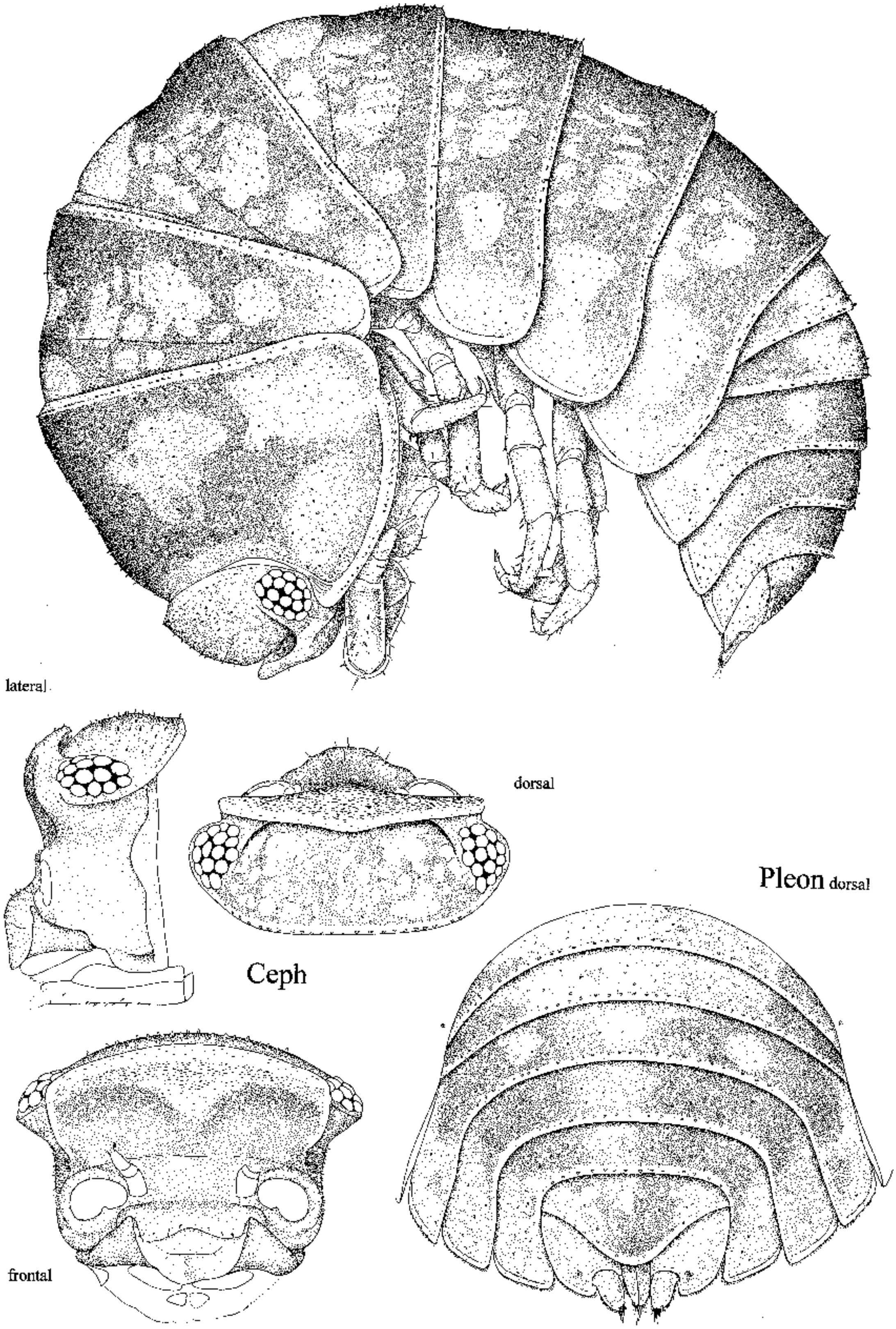

Figure 197. ***Circoniscus hirsutus*** **sp. nov.**: paratype ♀, 5.8 × 2.75 mm, cephalothorax 1.55 mm wide, habitus lateral, pleon dorsal; holotype ♂, 5.0 × 2.4 mm, cephalothorax 1.37 mm wide, cephalothorax lateral, frontal, dorsal (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b).

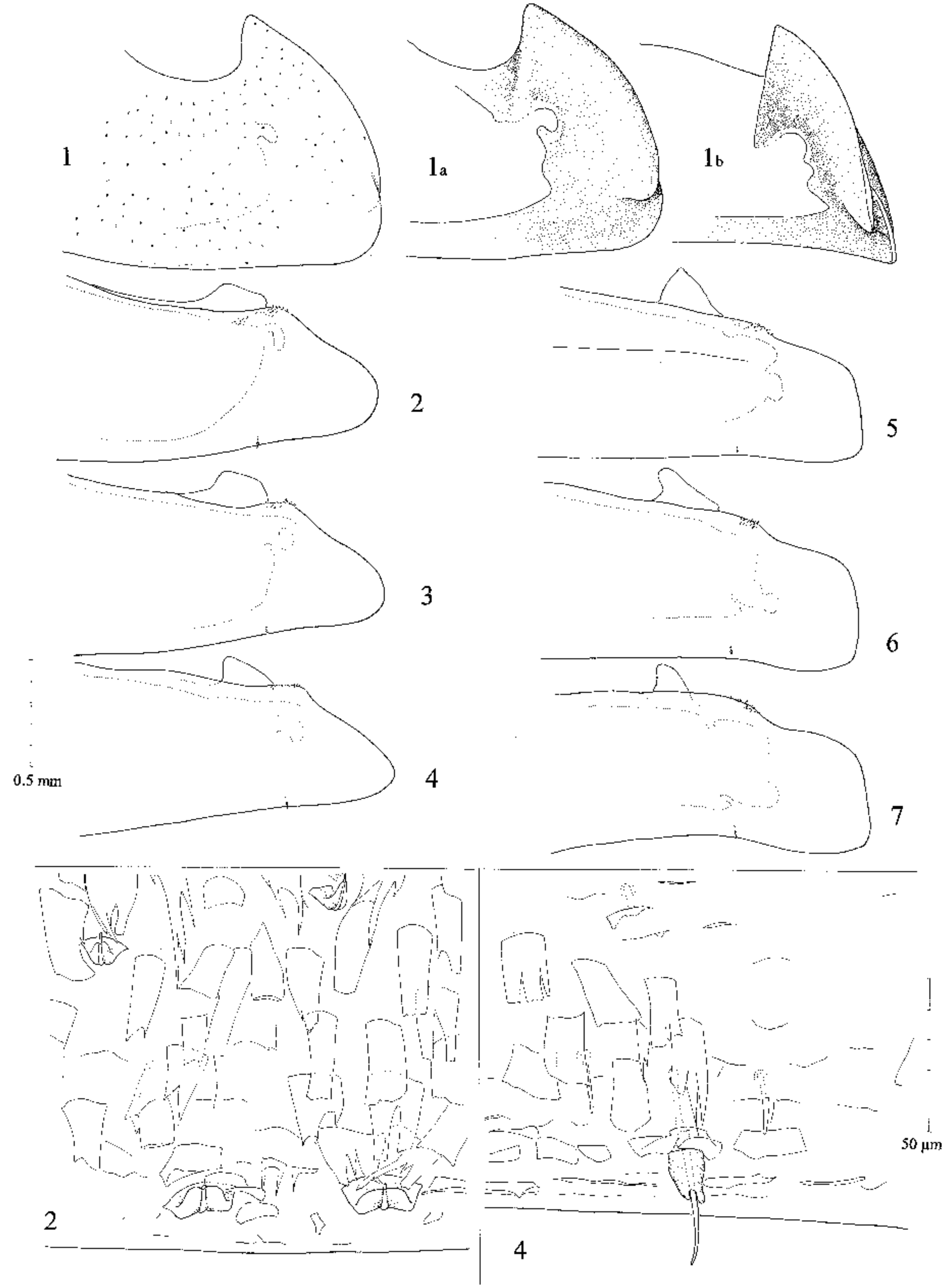

Figure 198. ***Circoniscus hirsutus*** **sp. nov.**: holotype ♂, 5.0 × 2.4 mm, cephalothorax 1.37 mm wide, tergites, detail of tergite 2 showing scale setae, detail of tergite 4 showing nodulus lateralis (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b).

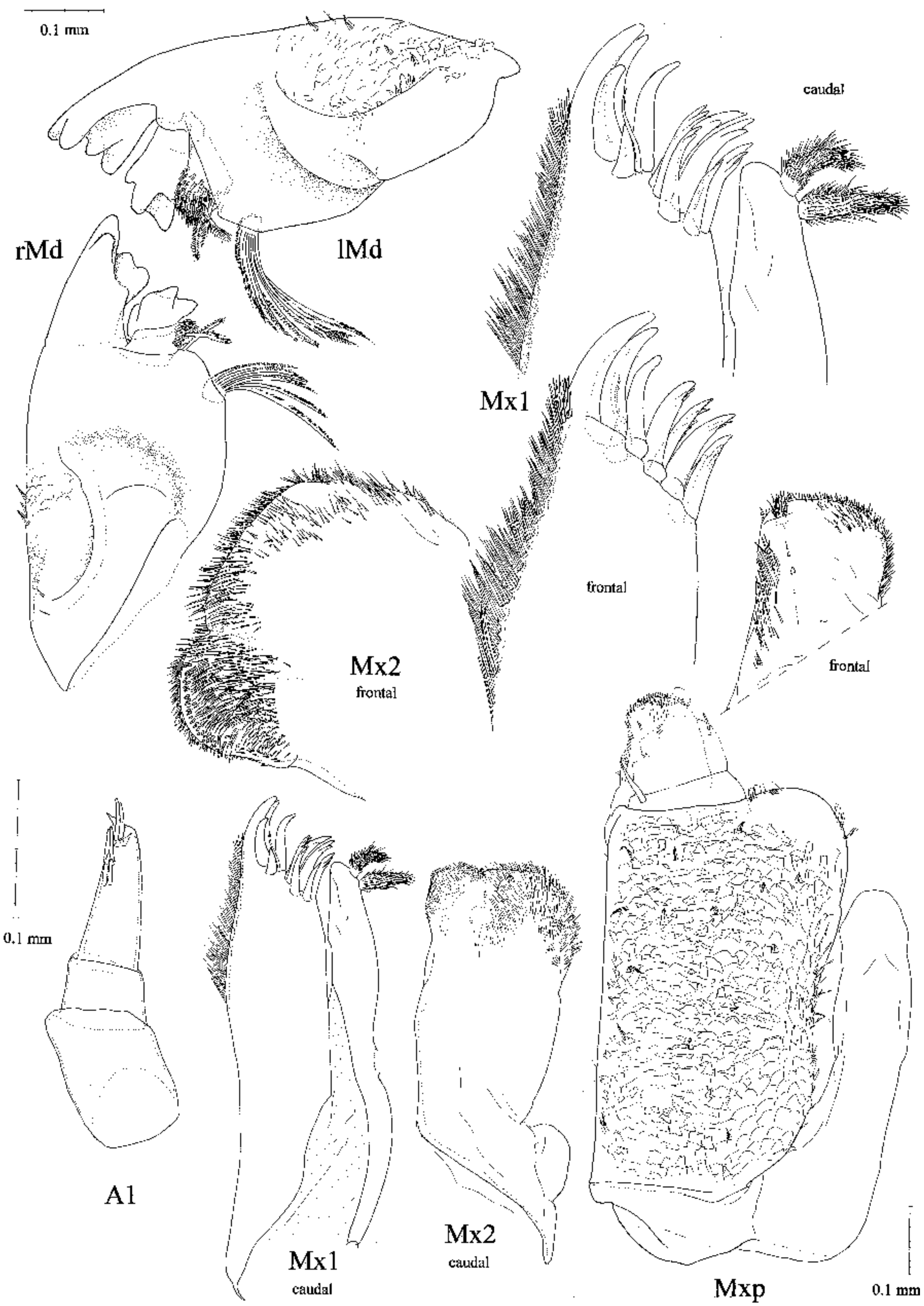

Figure 199. ***Circoniscus hirsutus* sp. nov.**: paratype ♀, 3.1 mm wide, cephalothorax 1.75 mm wide, mouthparts and first antenna (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b).

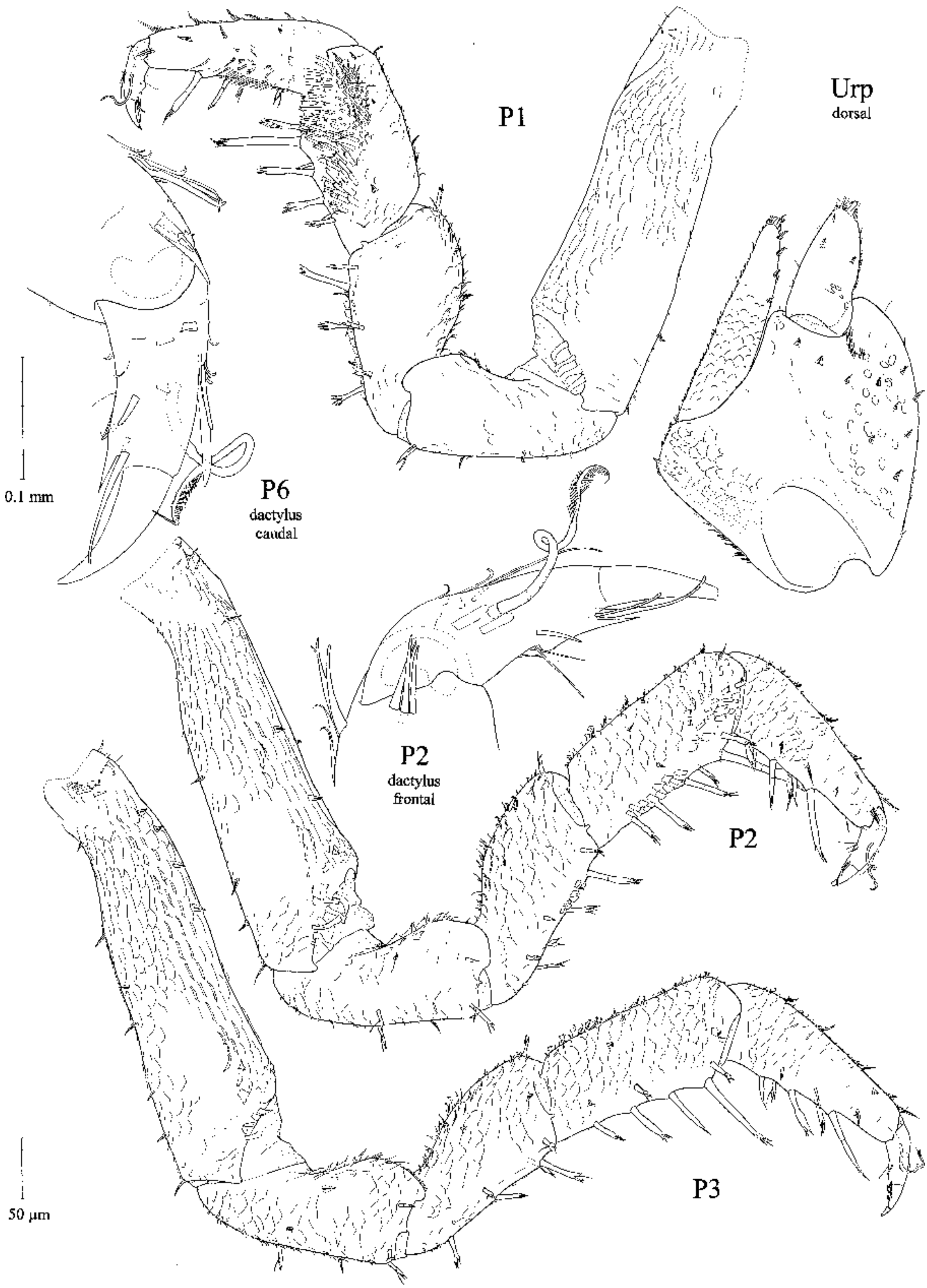

Figure 200. ***Circoniscus hirsutus* sp. nov.**: holotype ♂, 5.0 × 2.4 mm, cephalothorax 1.37 mm wide, pereiopods 1–3 frontal, uropod dorsal, dactyli (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b).

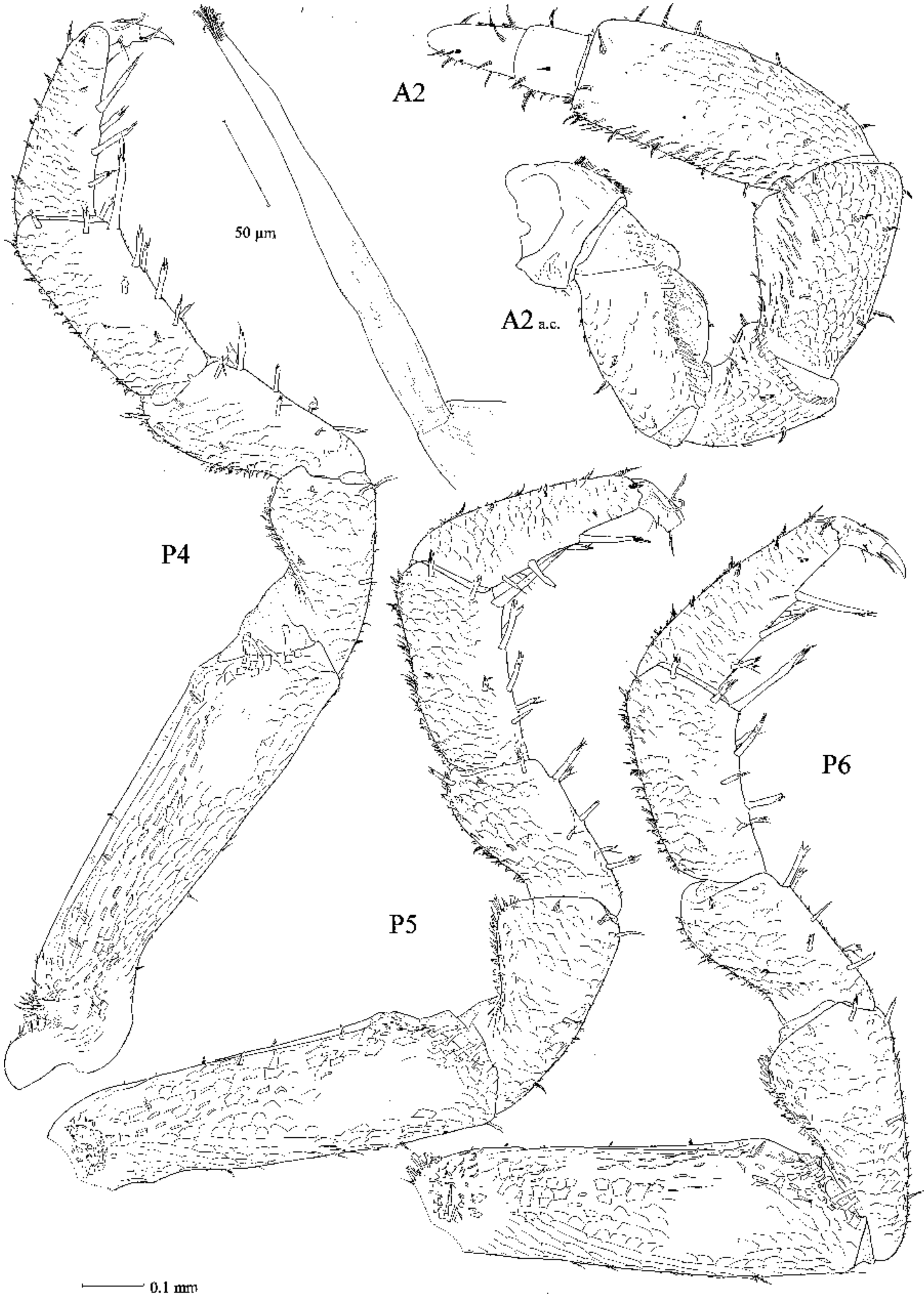

Figure 201. ***Circoniscus hirsutus* sp. nov.**: holotype ♂, 5.0 × 2.4 mm, cephalothorax 1.37 mm wide, pereiopods 4–6 frontal; paratype ♀, 6.4 × 2.8 mm, cephalothorax 1.55 mm wide, second antenna, dorsal (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b).

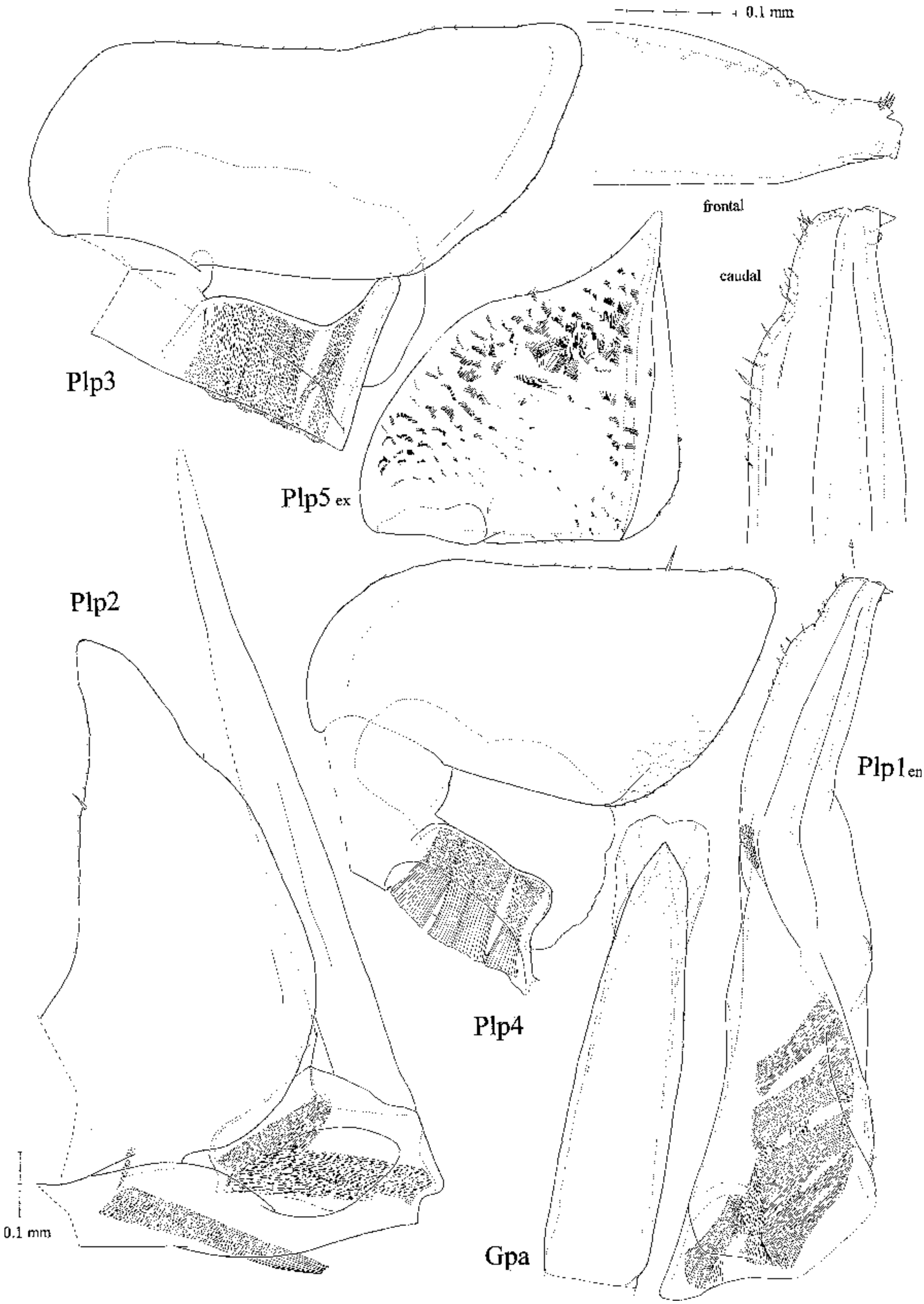

Figure 202. ***Circoniscus hirsutus* sp. nov.**: holotype ♂, 5.0 × 2.4 mm, cephalothorax 1.37 mm wide, pleopods 1–5 (Brazil, near Manaus, Lago Janauri, leg. Irmler, 17 May to 7 June 1972, SMNS 10064b).

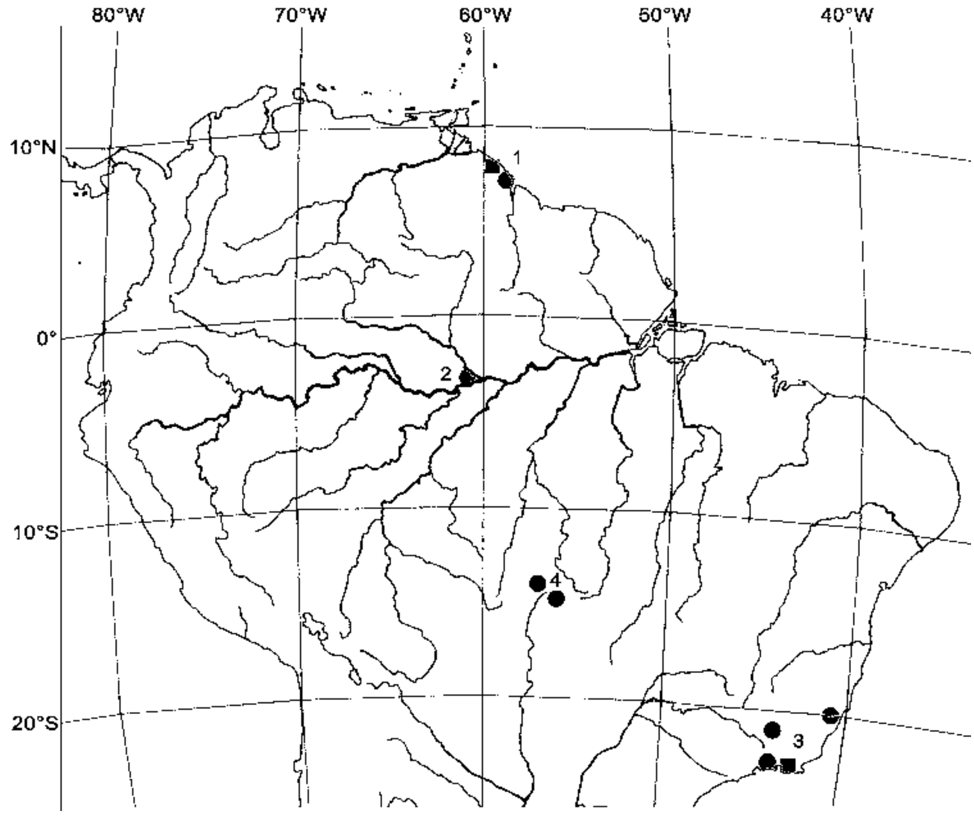

Figure 203. Geographical distribution of *Circoniscus gaigei* (1), *Ci. hirsutus* (2), *Ci. incisus* (3), and *Ci. intermedius* (4).

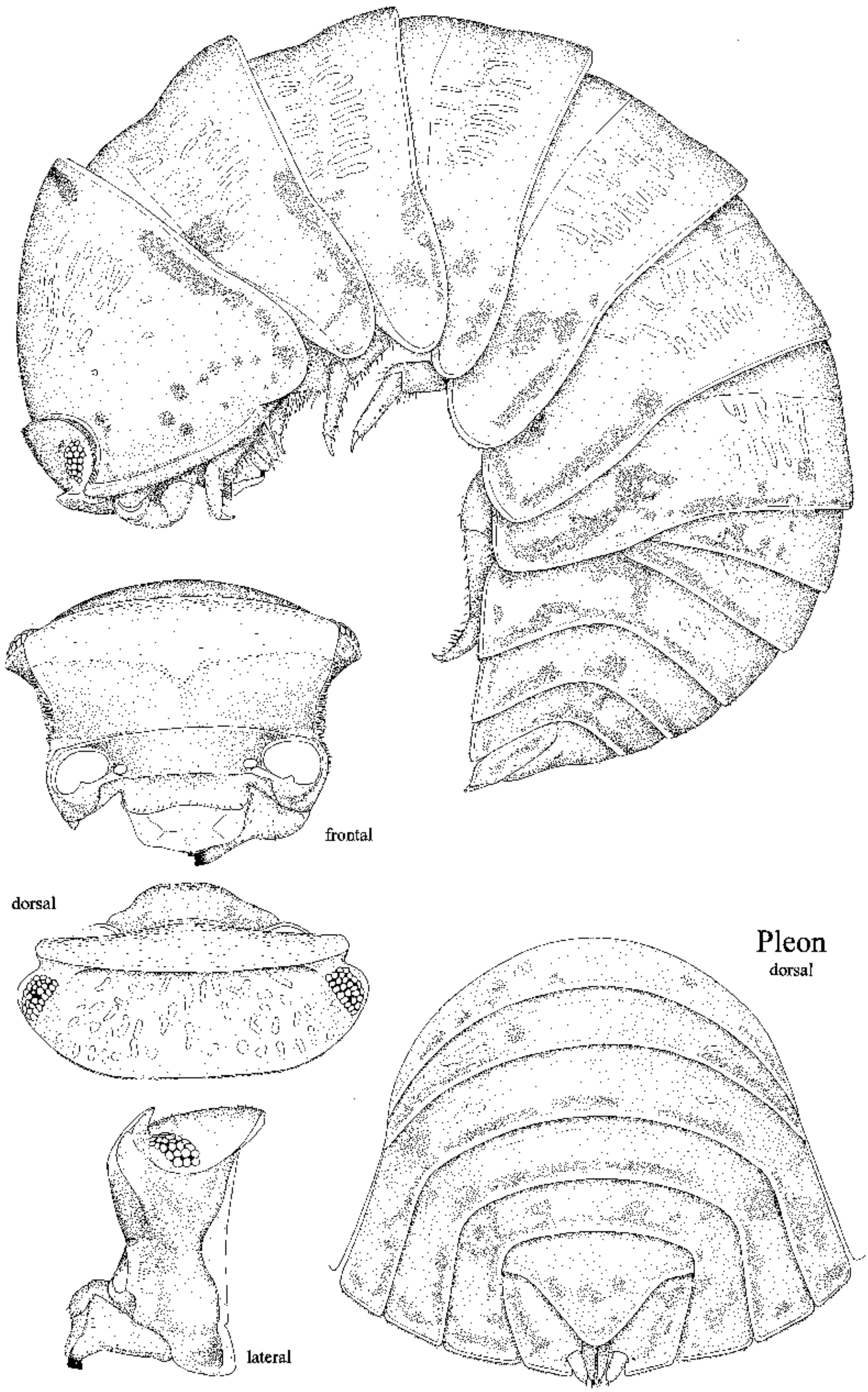

Figure 204. *Circoniscus gaigei* Pearse, 1917: ♀, 7.5 mm wide, habitus lateral and pleon dorsal; ♂, 7.3 mm wide, cephalothorax (syntypes, Guyana, Dunoon, leg. F. M. Gaige, 17 July 1914, USNM 98371).

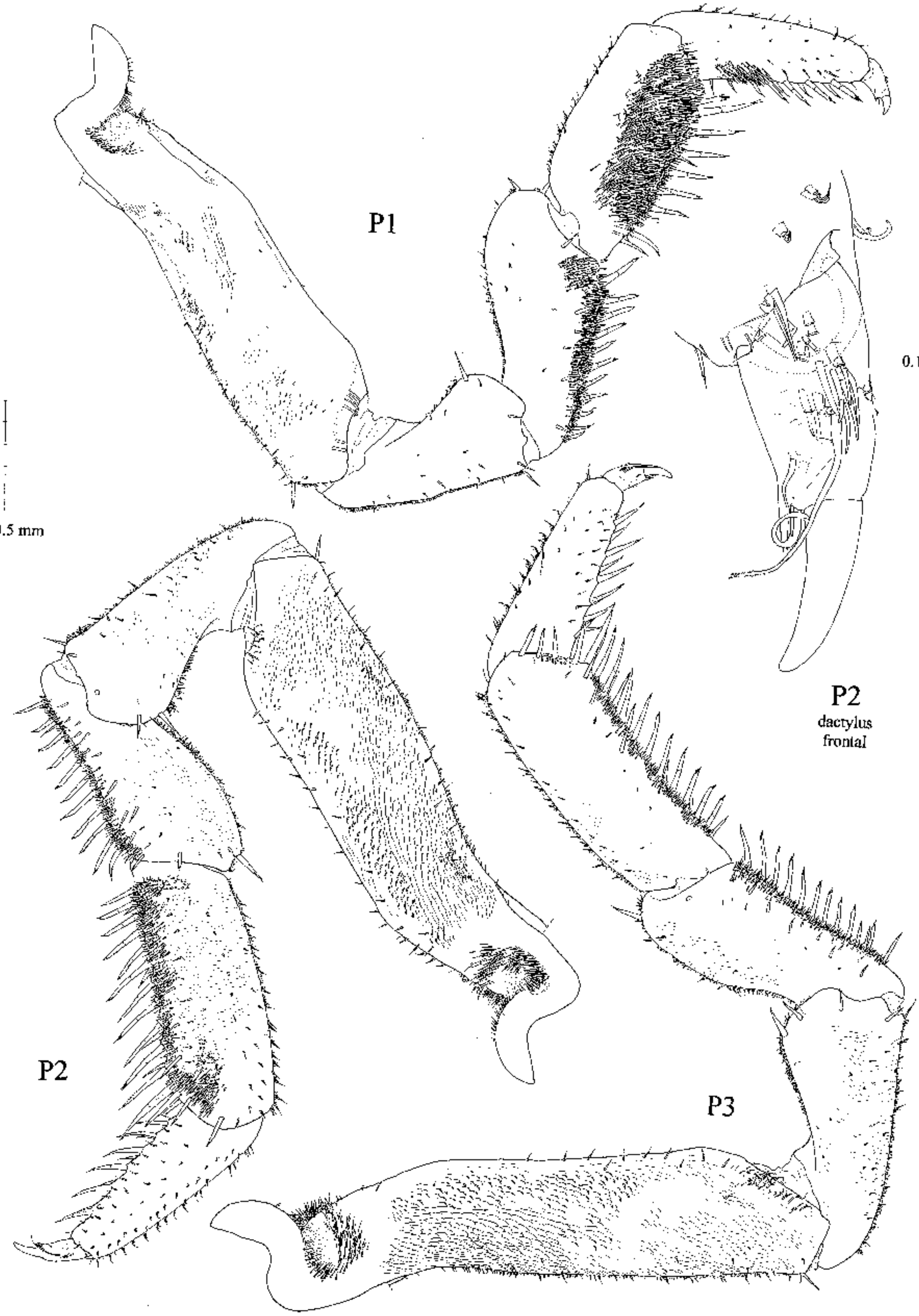

Figure 205. *Circoniscus gaigei* Pearse, 1917: ♂, 7.3 mm wide, pereiopods 1–3 (syntype, Guyana, Dunoon, leg. F. M. Gaige, 17 July 1914, USNM 98371).

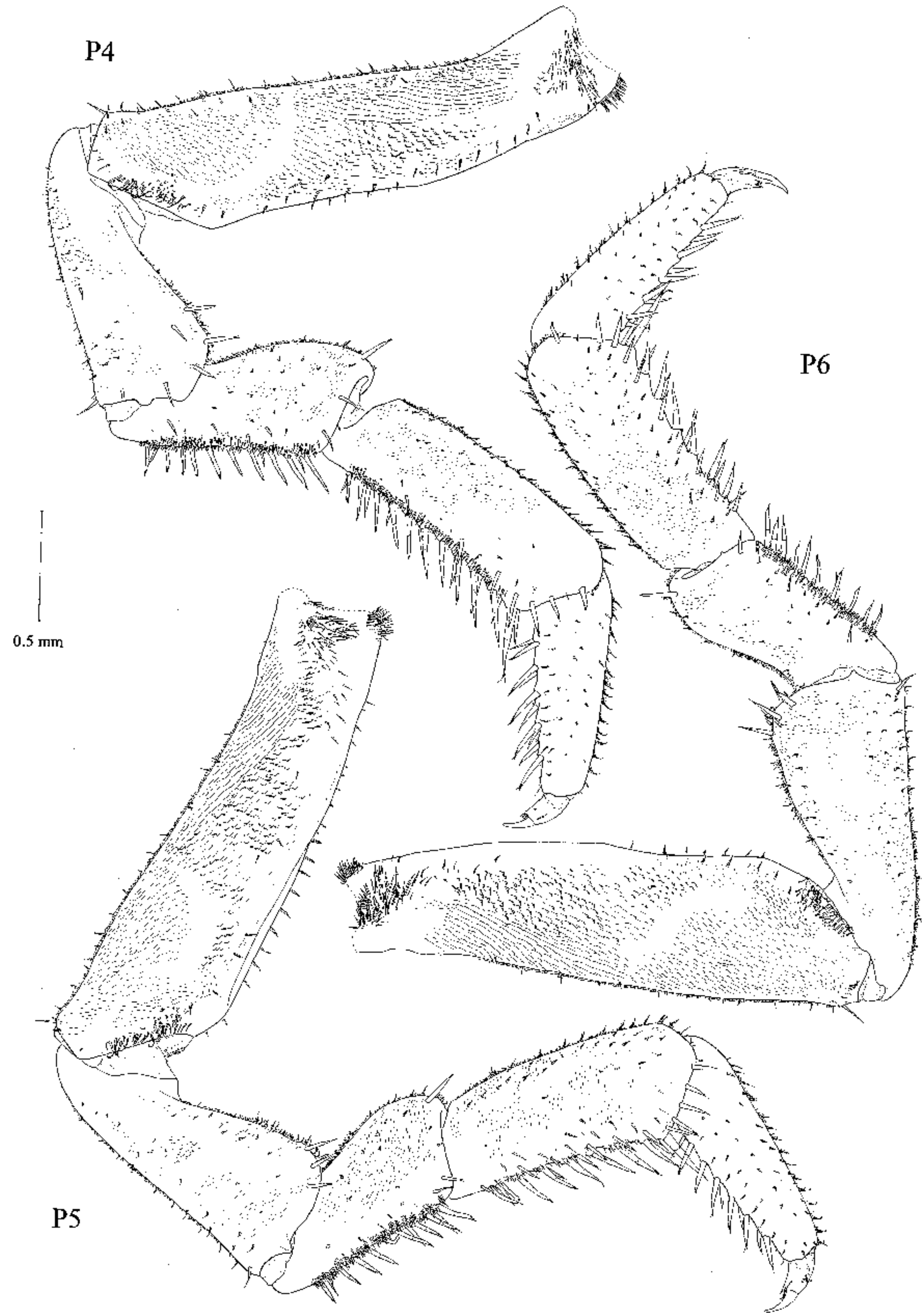

Figure 206. *Circoniscus gaigei* Pearse, 1917: ♂, 7.3 mm wide, pereiopods 4–6 (syntype, Guyana, Dunoon, leg. F. M. Gaige, 17 July 1914, USNM 98371).

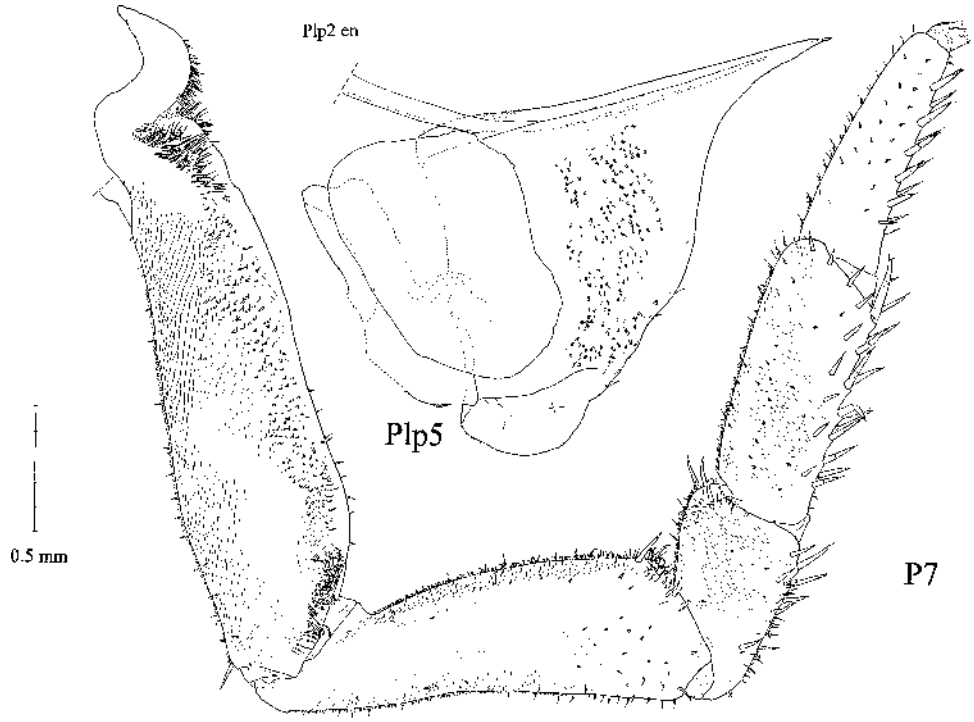

Figure 207. *Circoniscus gaigei* Pearse, 1917: ♂, 7.3 mm wide, pereiopod 7, pleopod 5 (syntype, Guyana, Dunoon, leg. F. M. Gaige, 17 July 1914, USNM 98371).

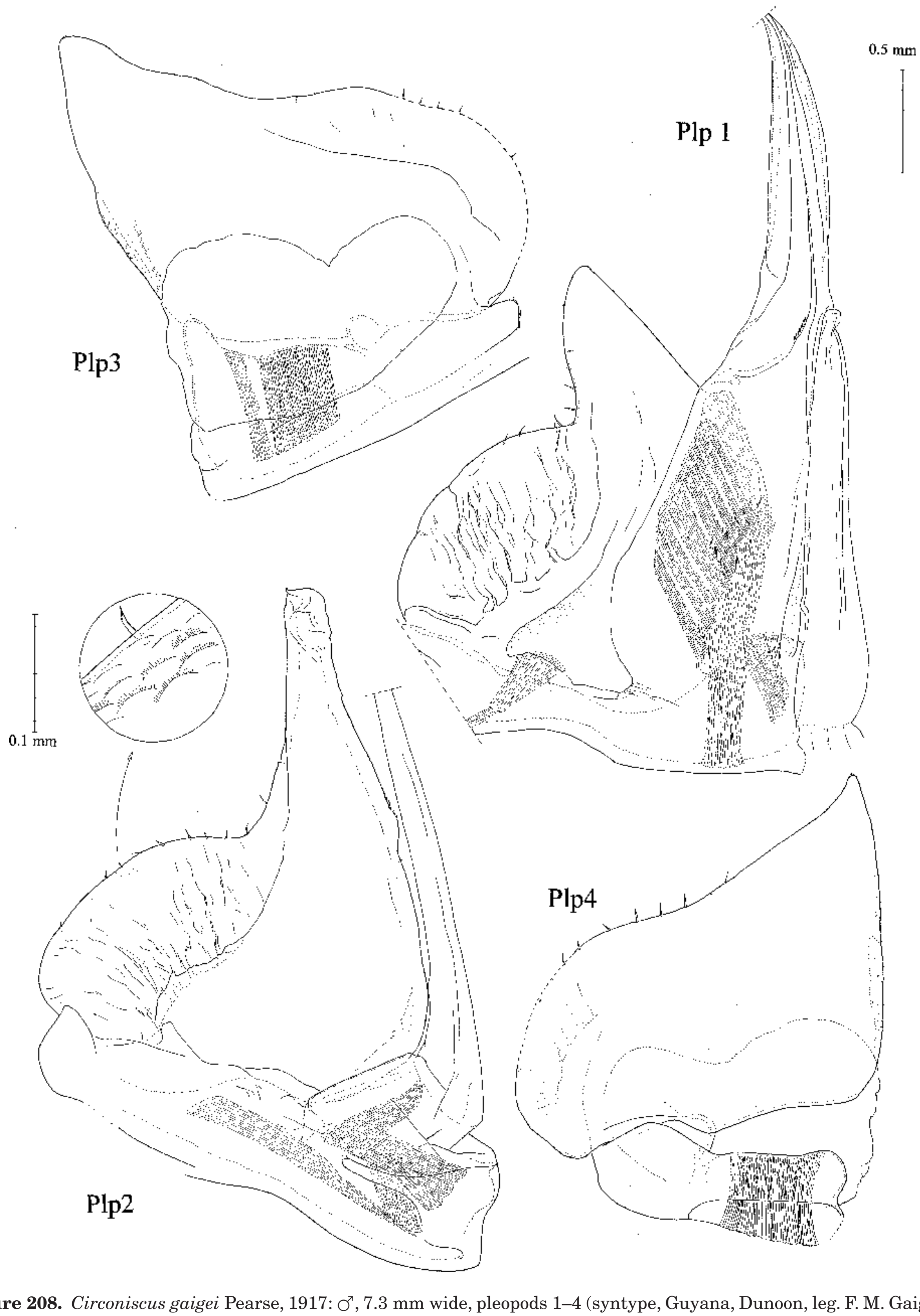

Figure 208. *Circoniscus gaigei* Pearse, 1917: ♂, 7.3 mm wide, pleopods 1–4 (syntype, Guyana, Dunoon, leg. F. M. Gaige, 17 July 1914, USNM 98371).

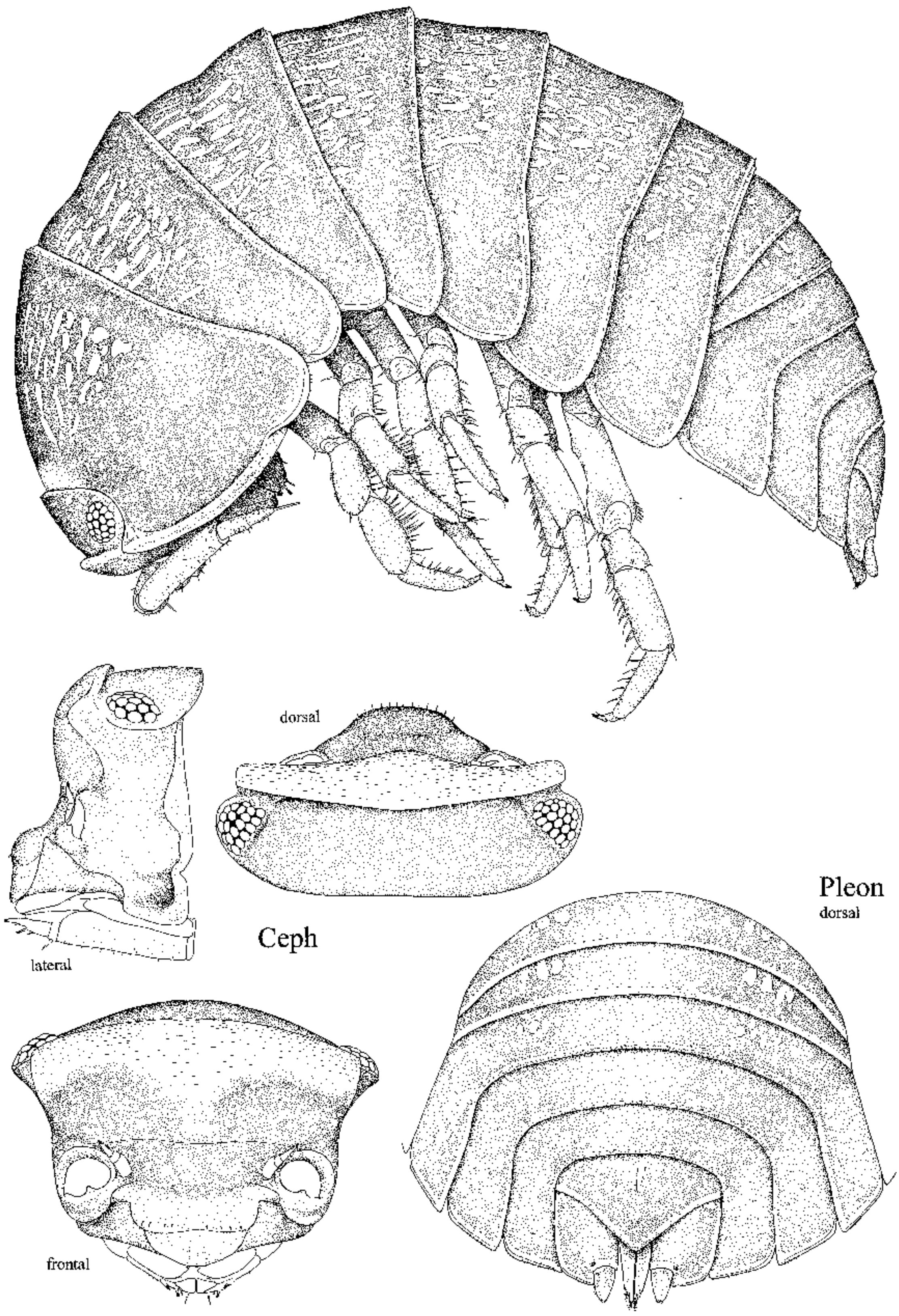

Figure 209. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 10.6 × 5.0 mm, cephalothorax 2.57 mm wide, habitus lateral, pleon dorsal; ♀, with marsupium 9.6 × 5.0 mm, cephalothorax 2.66 mm wide, cephalothorax lateral, dorsal, frontal, pigment omitted (Peru, Panguana, 'Caña brava', leg. Hanagarth, 2 July 1975, SMNS).

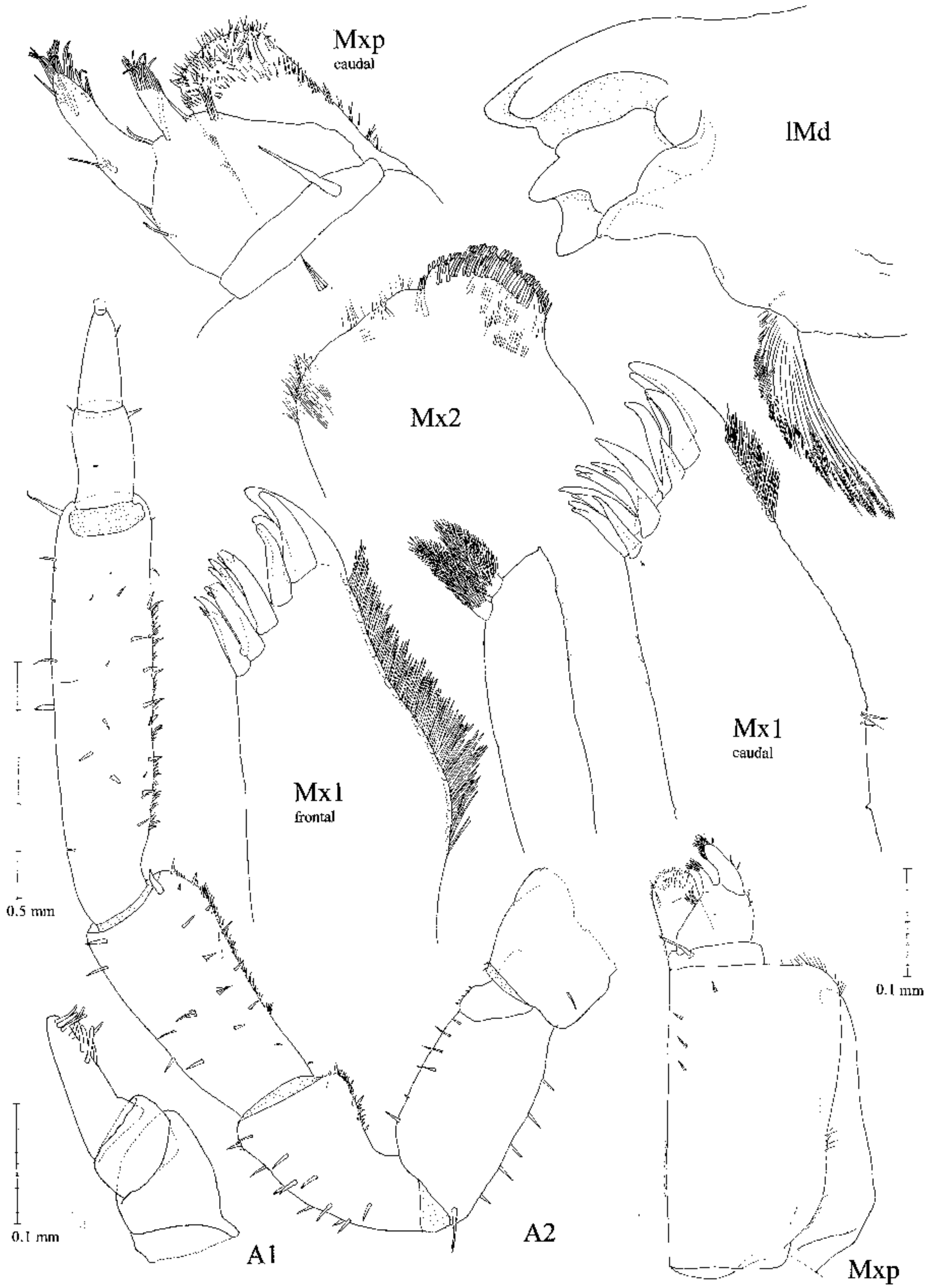

Figure 210. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 3.8 mm wide, mouthparts, first antenna, second antenna (Peru, Department Huanuco, Rio Yuyapichis, 9°37′ S, 74°56′ W, altitude 260 m, September 1981, cCS 137).

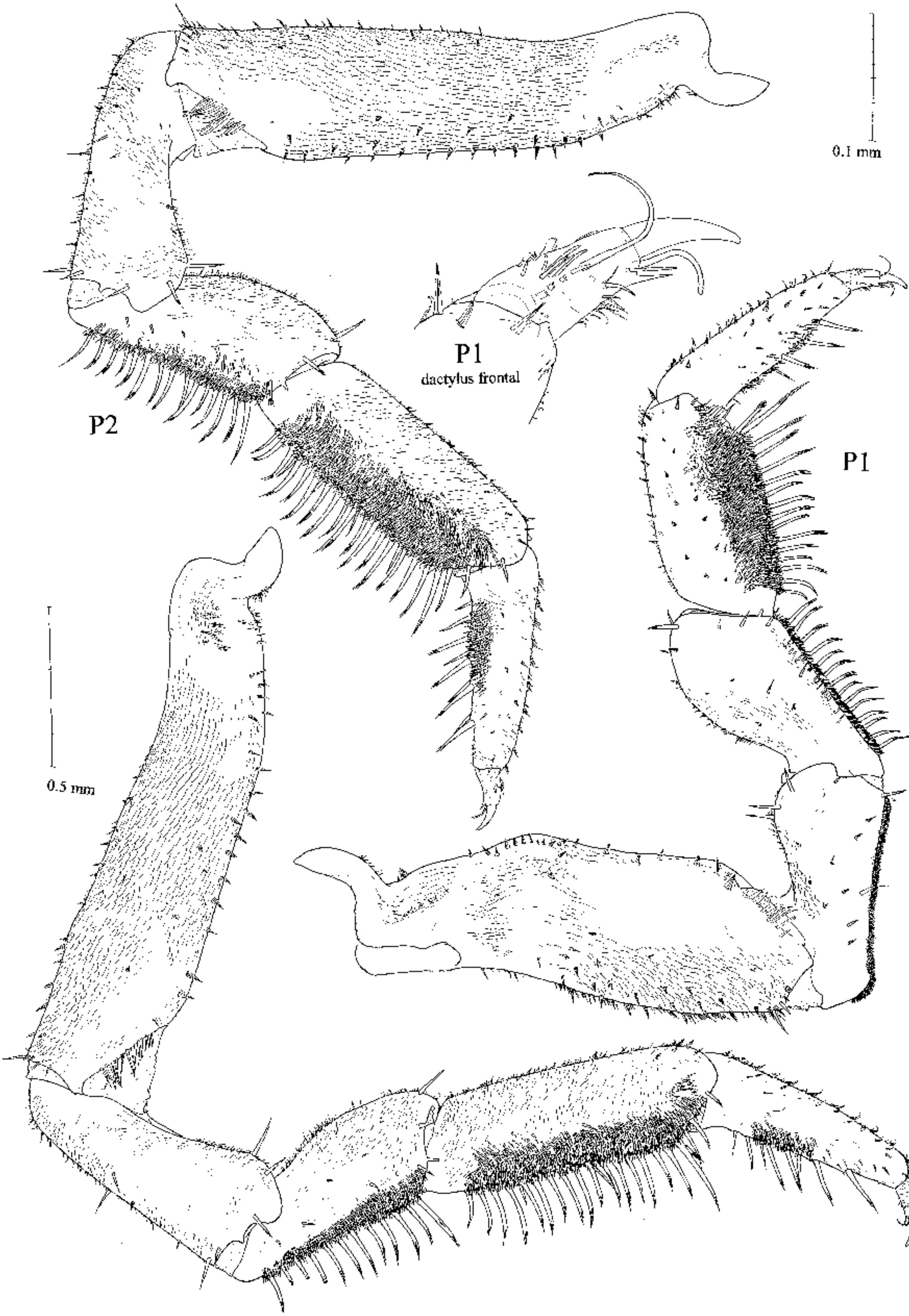

Figure 211. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 11 × 5.0 mm, cephalothorax 2.71 mm wide, pereiopods 1–3 (Peru, Panguana, leg. Hanagarth, '87.88 A 3.4. 16.11.75 Yar', cCS 412).

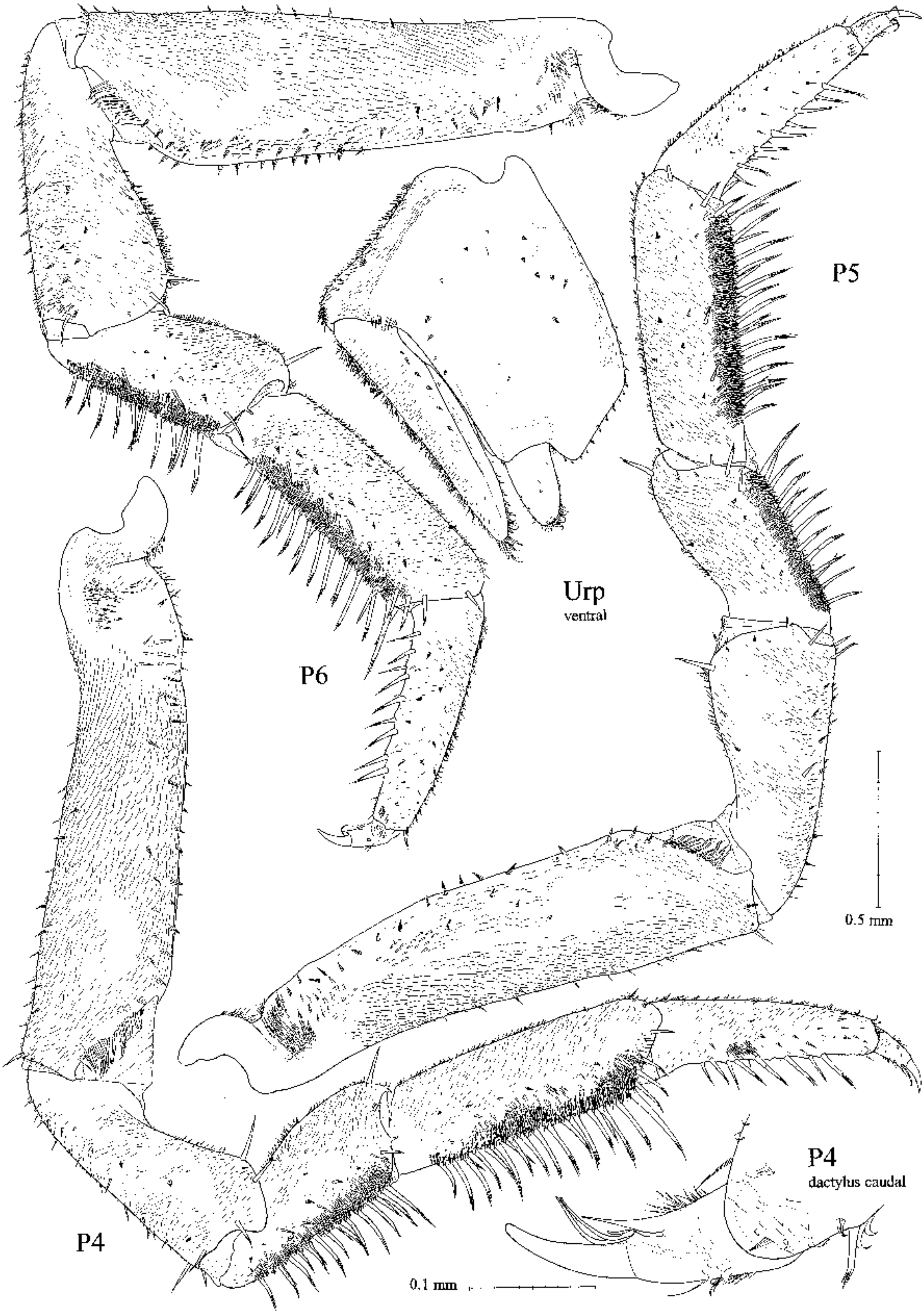

Figure 212. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 11 × 5.0 mm, cephalothorax 2.71 mm wide, pereiopods 4–6, pereiopod 4 dactylus caudal, uropod ventral (Peru, Panguana, leg. Hanagarth, '87.88 A 3.4. 16.11.75 Yar', cCS 412).

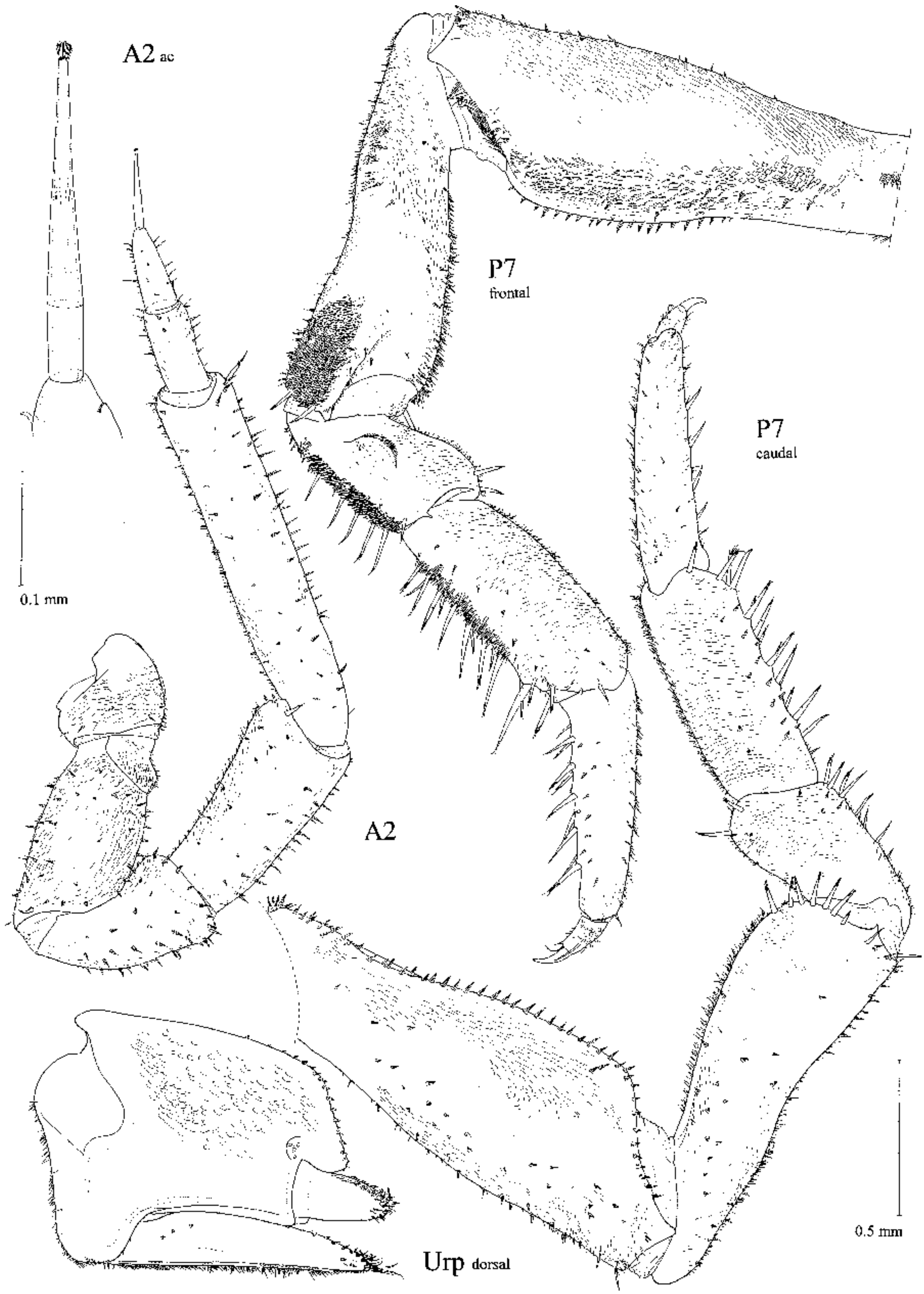

Figure 213. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 11 × 5.0 mm, cephalothorax 2.71 mm wide, pereiopod 7 frontal and caudal, second antenna, uropod dorsal (Peru, Panguana, leg. Hanagarth, '87.88 A 3.4. 16.11.75 Yar', cCS 412).

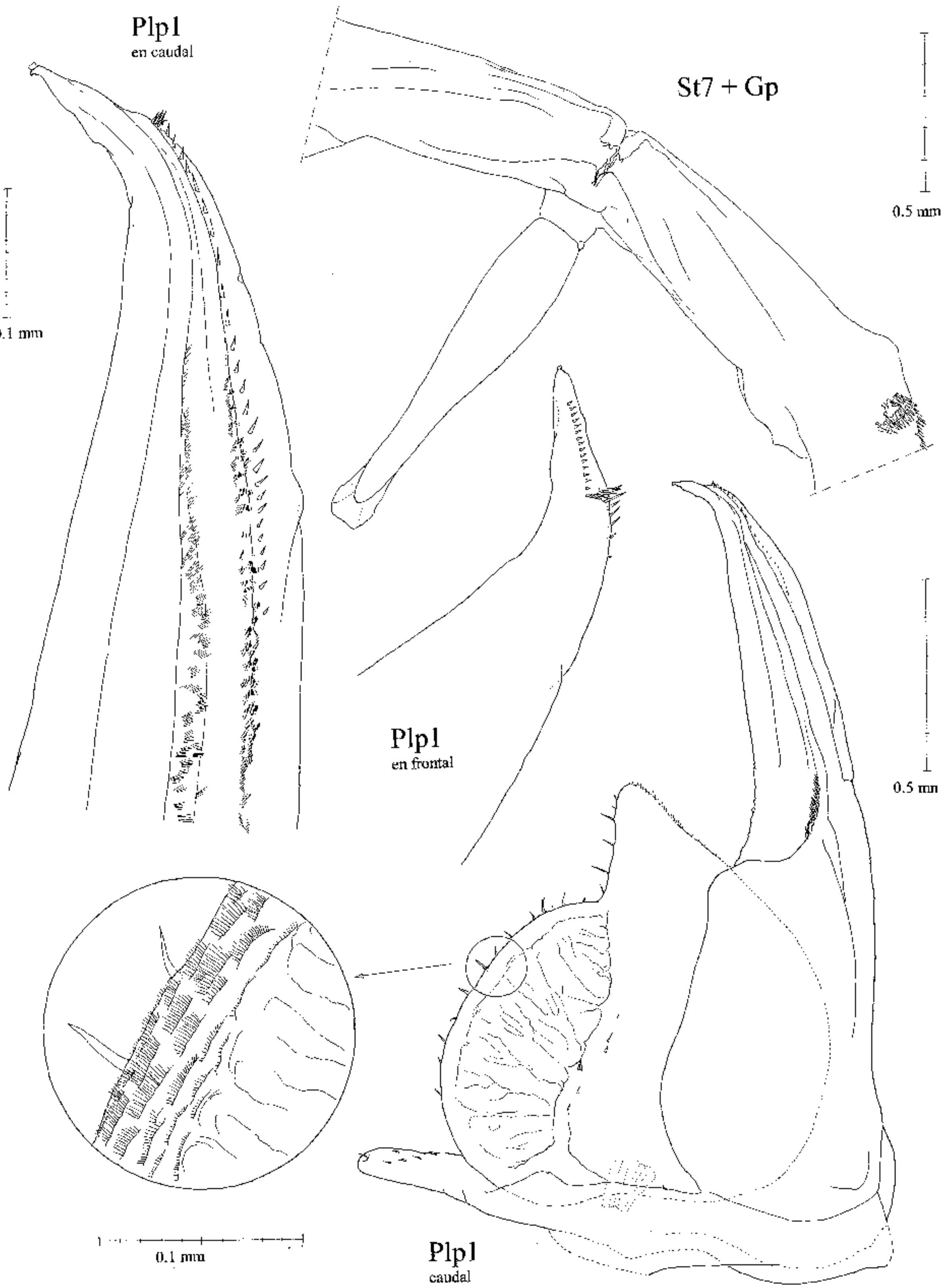

Figure 214. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 3.8 mm, sternite 7, pleopod 1 (Peru, Department Huanuco, Rio Yuyapichis, 9°37′ S, 74°56′ W, altitude 260 m, September 1981, cCS 137).

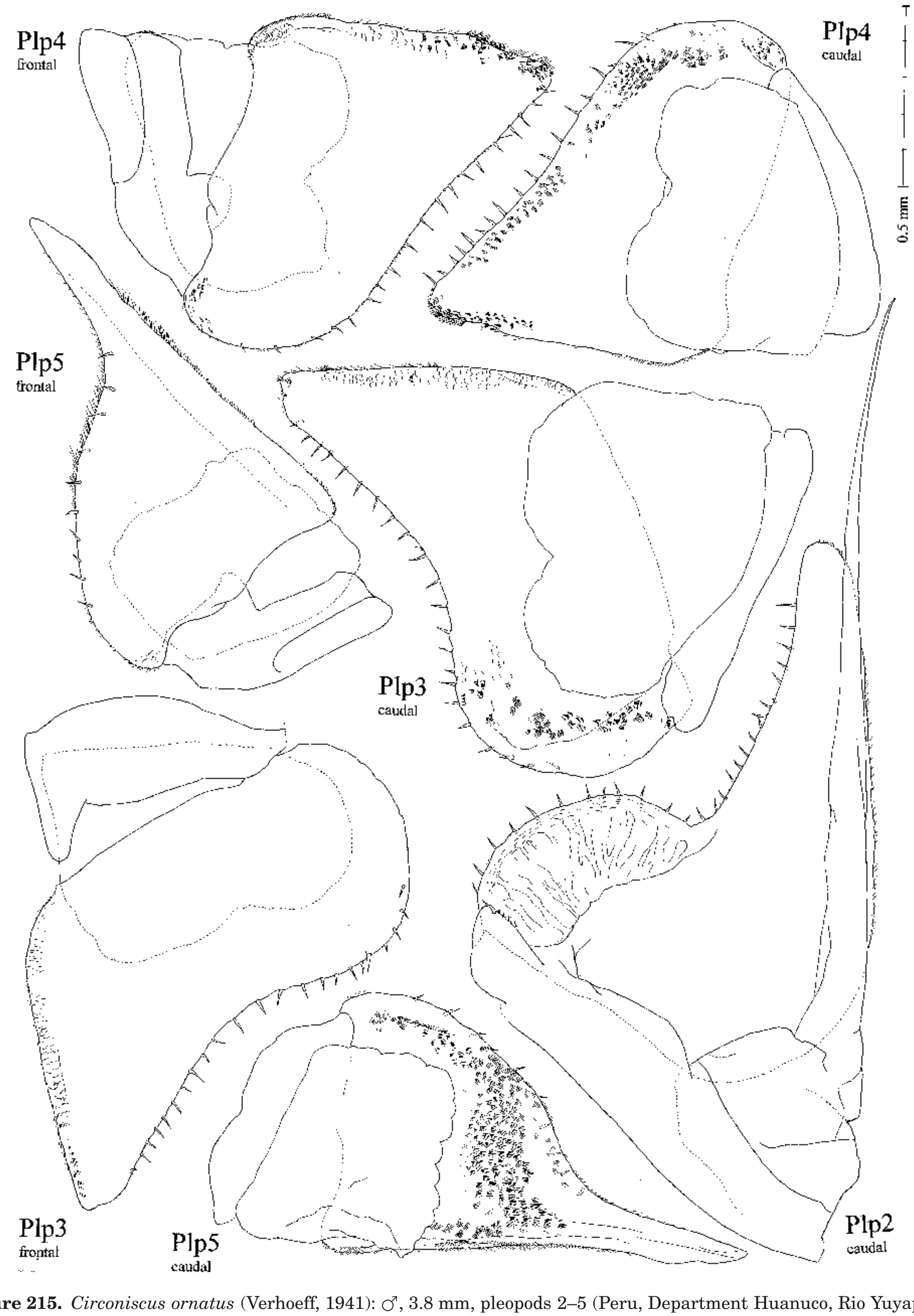

Figure 215. *Circoniscus ornatus* (Verhoeff, 1941): ♂, 3.8 mm, pleopods 2–5 (Peru, Department Huanuco, Rio Yuyapichis, 9°37′ S, 74°56′ W, altitude 260 m, September 1981, cCS 137).

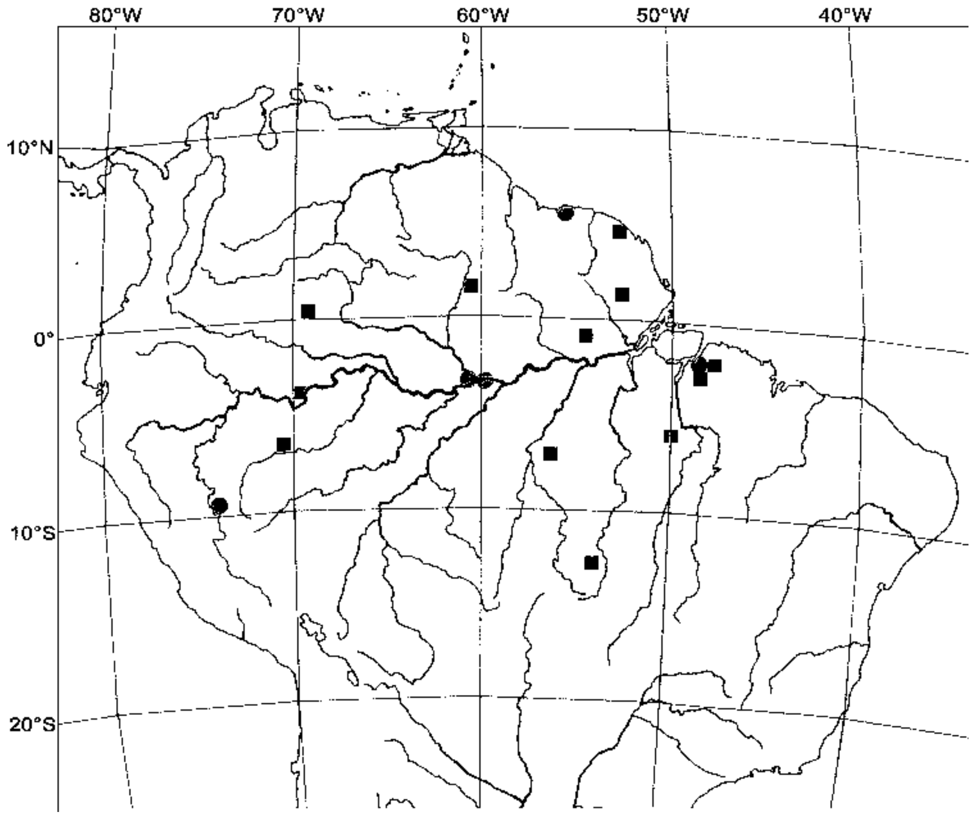

Figure 216. Geographical distribution of *Circoniscus ornatus*; circles, material examined; squares, literature data (under the name *C. gaigei*).

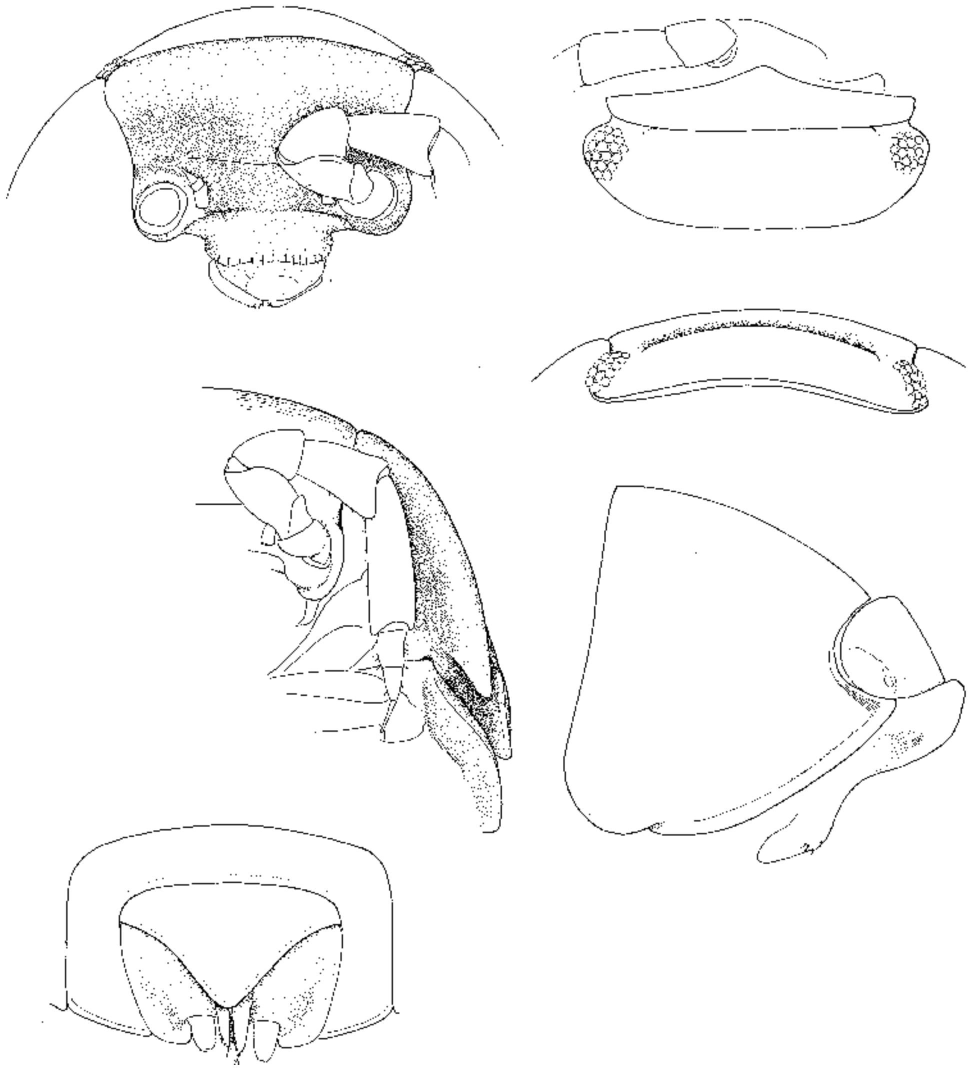

Figure 217. *Circoniscus intermedius* Souza & Lemos de Castro, 1991: holotype ♂, 4.6 mm wide, cephalothorax 2.15 mm wide, cephalothorax in frontal, dorsal and oblique posterodorsal view, coxal plate 1 in ventral and lateral view, pleotelson and uropods (Brazil, Mato Grosso, Fazenda São João Diamantino, leg. H. N. Cunha, October 1979, MNRJ 3171).

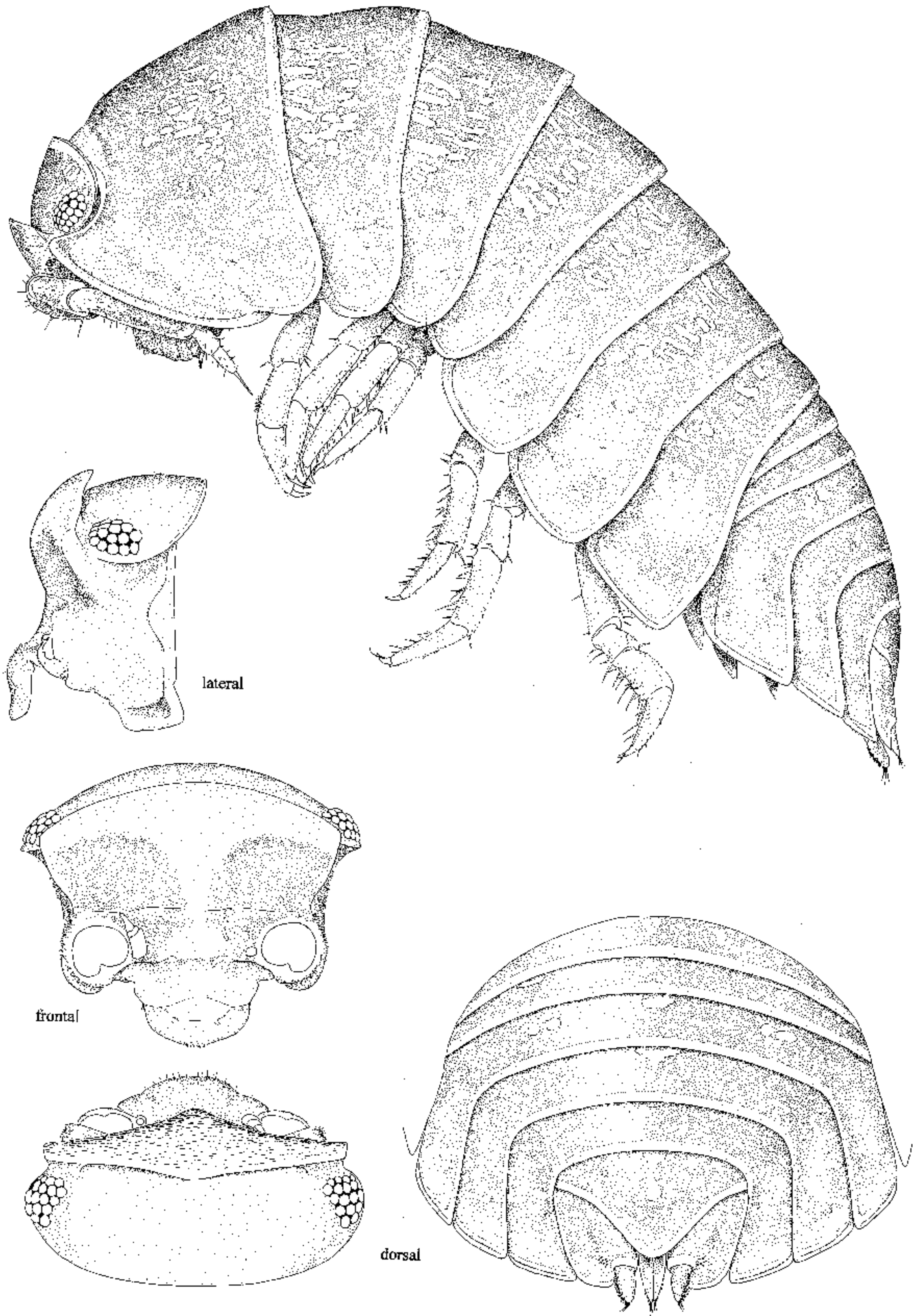

Figure 218. *Circoniscus incisus* Souza & Lemos de Castro, 1991: ♀m, 10×4.8 mm, habitus, pleon; ♂, 7.6×3.5 mm, cephalothorax (Brazil, Minas Gerais, between Ouro Preto and Ouro Branco, cCS 214a).

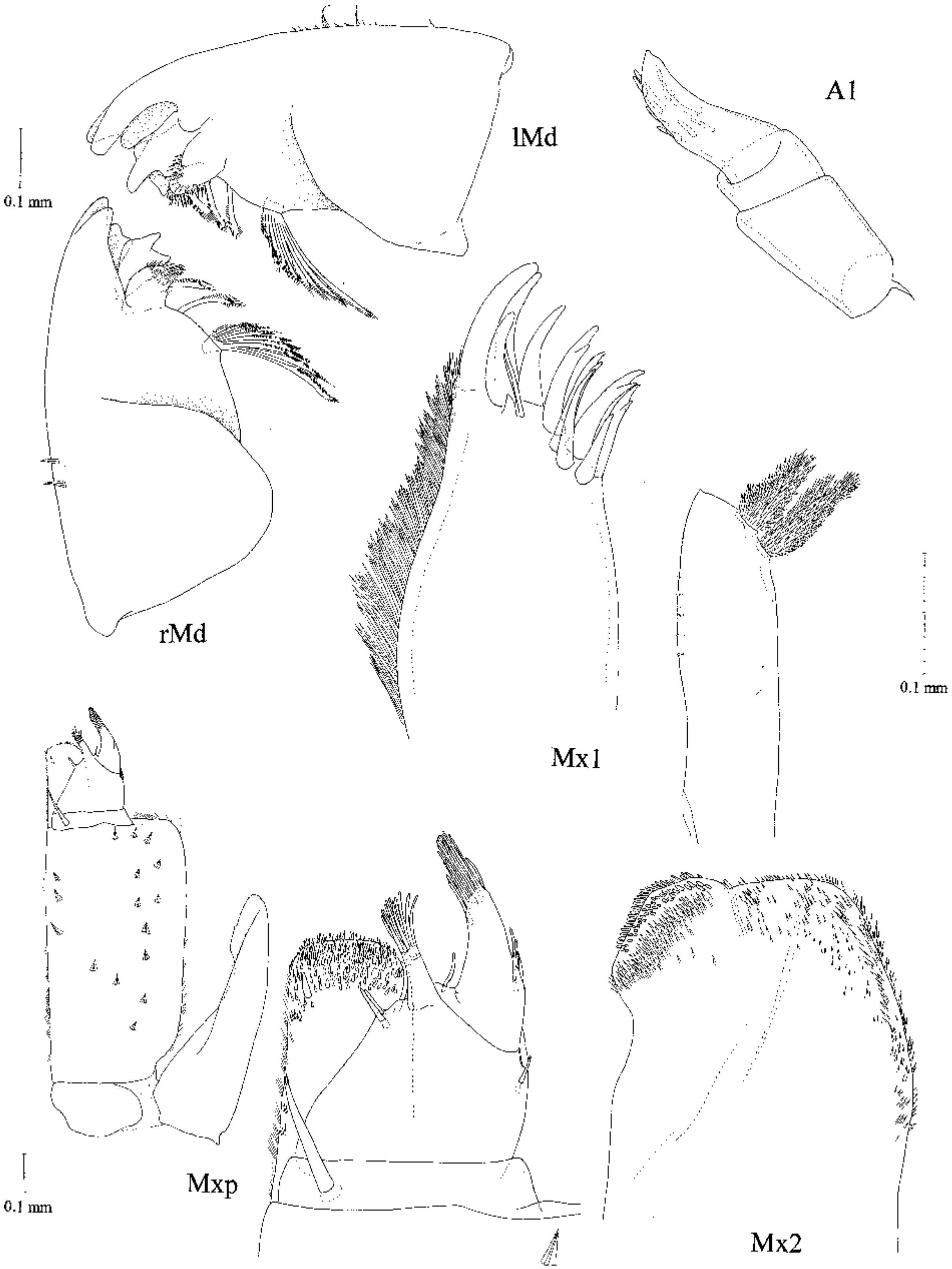

Figure 219. *Circoniscus incisus* Souza & Lemos de Castro, 1991: ♂, 7.6 × 3.5 mm, mouthparts, first antenna (Brazil, Minas Gerais, between Ouro Preto and Ouro Branco, cCS 214a).

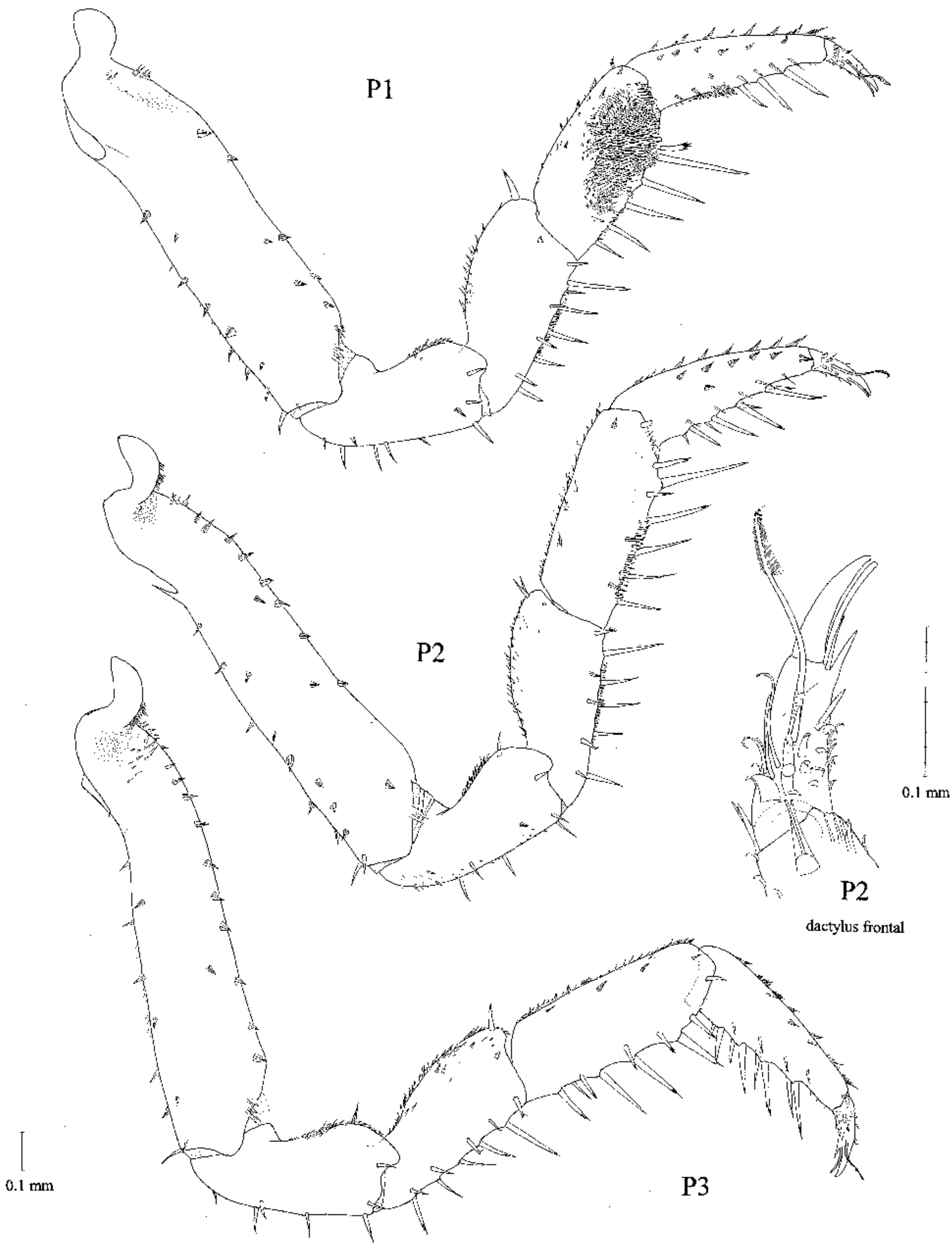

Figure 220. *Circoniscus incisus* Souza & Lemos de Castro, 1991: ♂, 7.6 × 3.5 mm, pereiopods 1–3 (Brazil, Minas Gerais, between Ouro Preto and Ouro Branco, cCS 214a).

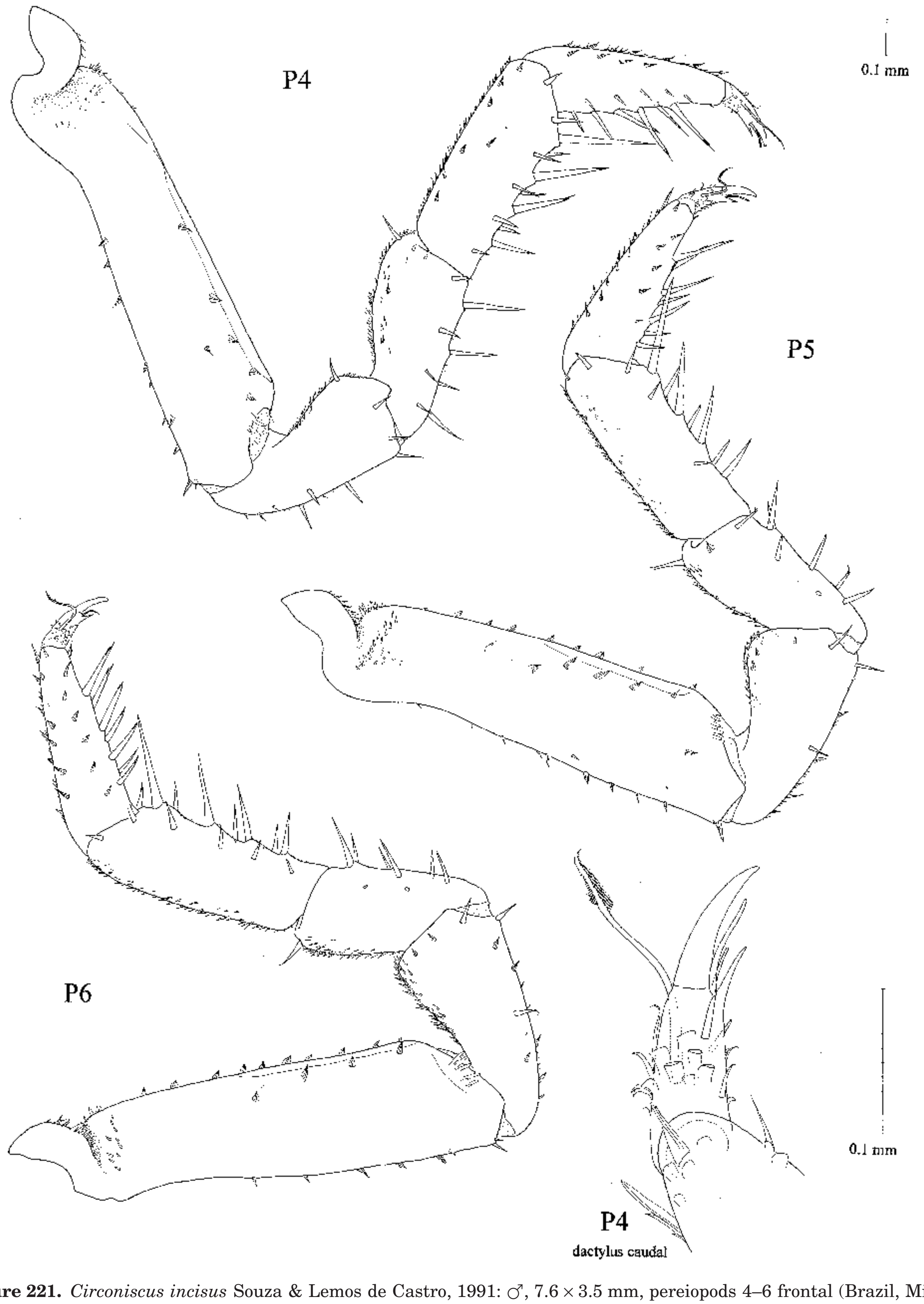

Figure 221. *Circoniscus incisus* Souza & Lemos de Castro, 1991: ♂, 7.6 × 3.5 mm, pereiopods 4–6 frontal (Brazil, Minas Gerais, between Ouro Preto and Ouro Branco, cCS 214a).

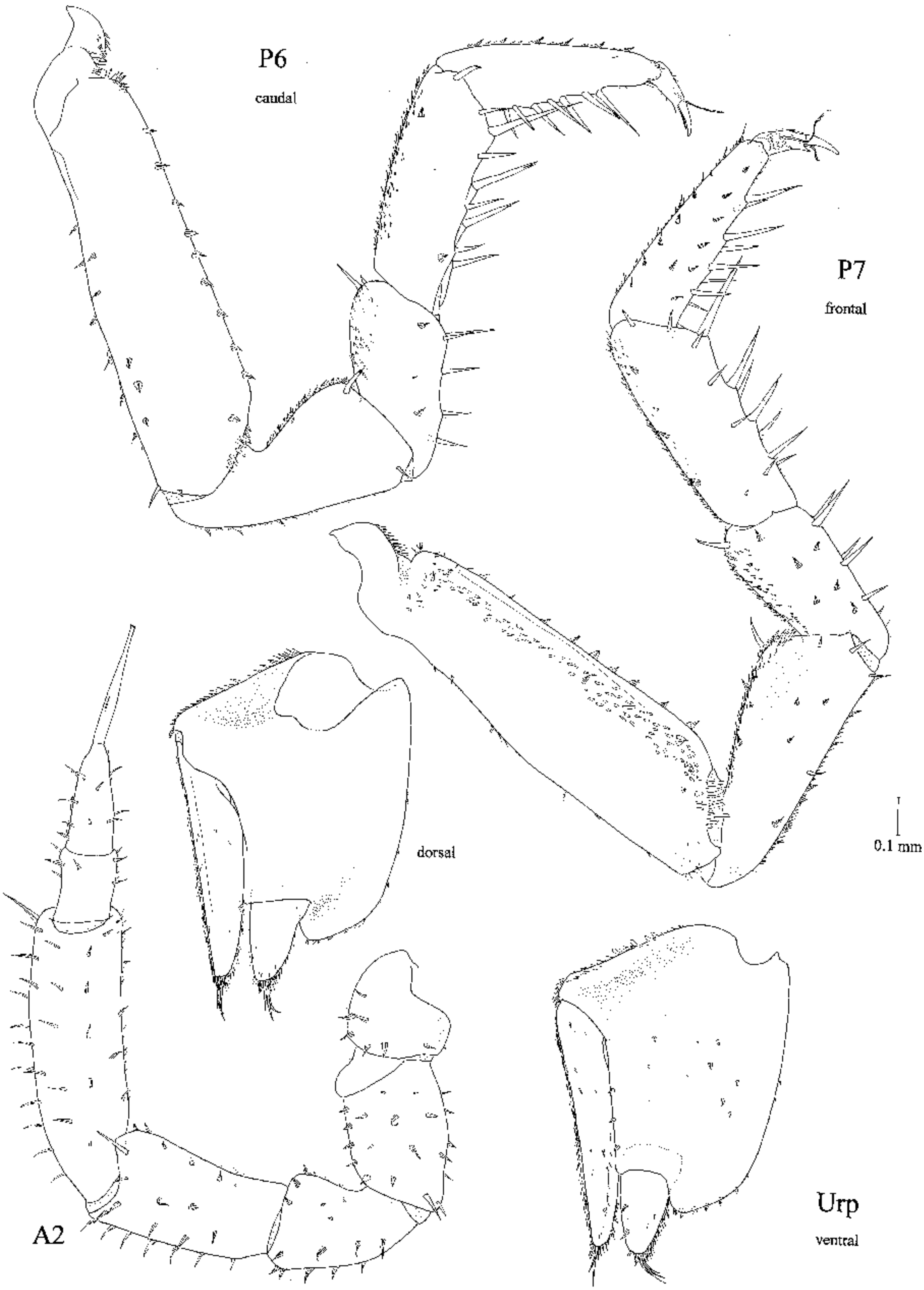

Figure 222. *Circoniscus incisus* Souza & Lemos de Castro, 1991: ♂, 7.6 × 3.5 mm, pereiopods 6 and 7, uropods, second antenna (Brazil, Minas Gerais, between Ouro Preto and Ouro Branco, cCS 214a).

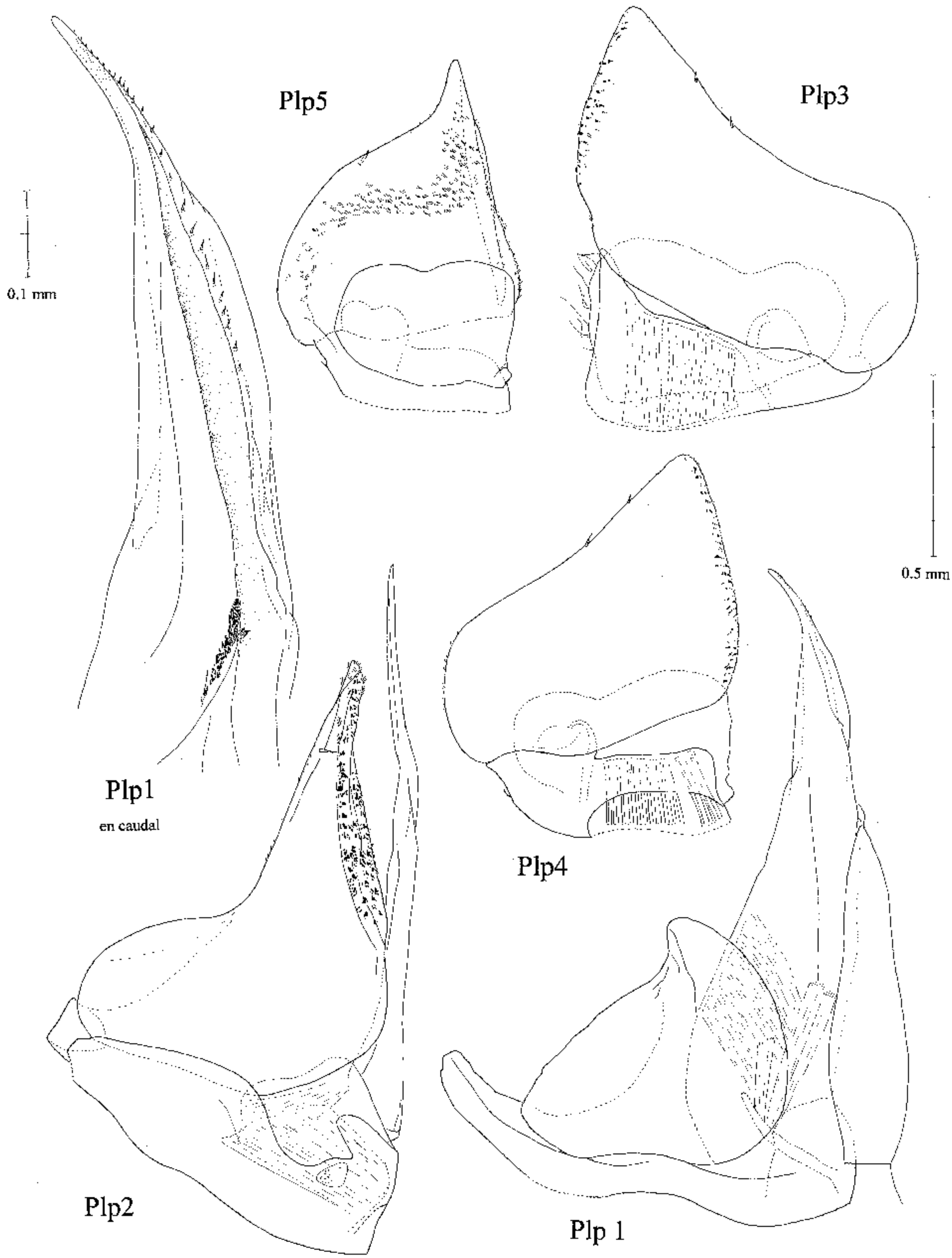

Figure 223. *Circoniscus incisus* Souza & Lemos de Castro, 1991: ♂, 7.6 × 3.5 mm, pleopods 1–5 (Brazil, Minas Gerais, between Ouro Preto and Ouro Branco, cCS 214a).

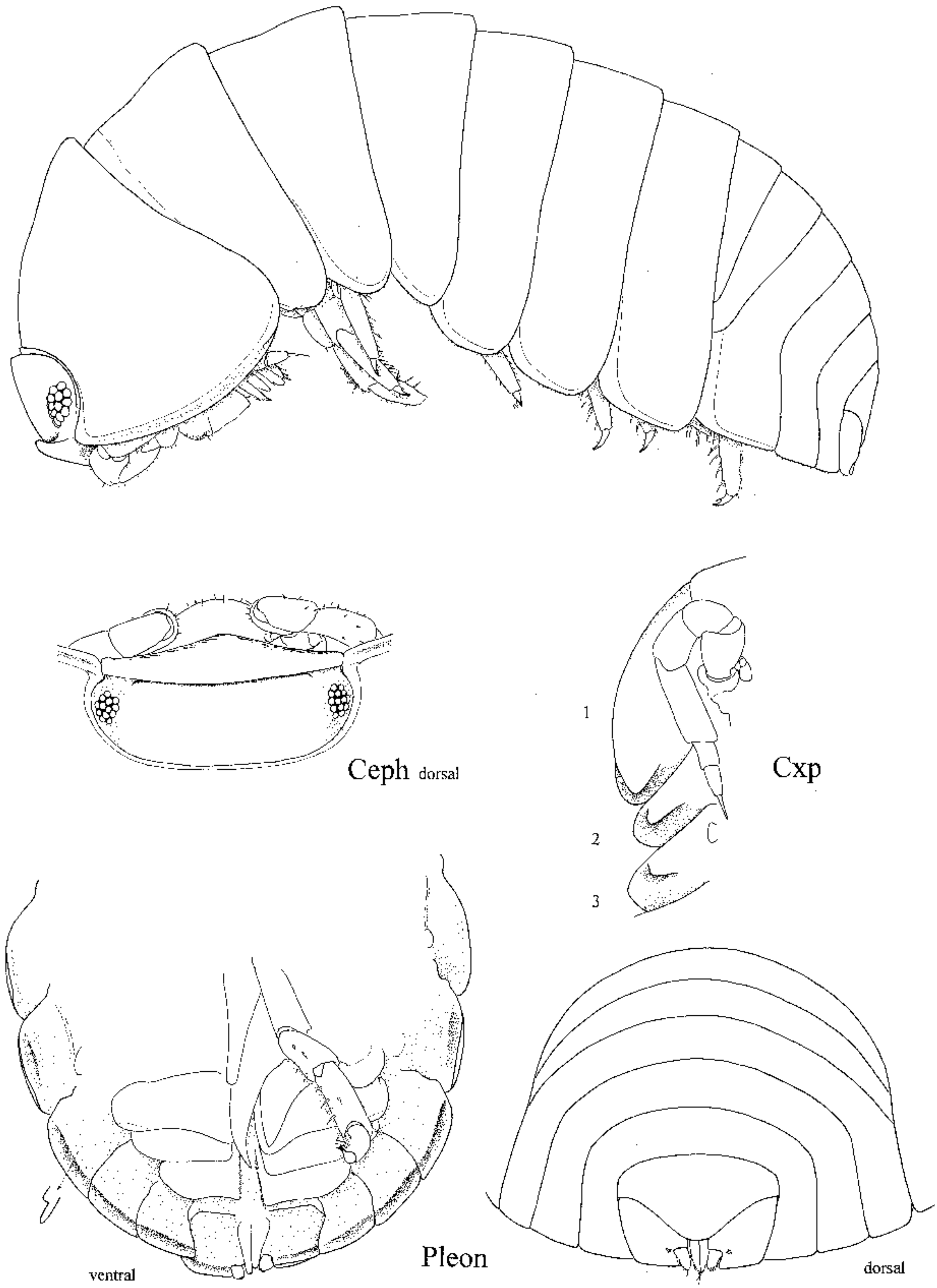

Figure 224. *Circoniscus bezzii* Arcangeli, 1931: ♂, 9.0 × 4.7 mm, habitus lateral, cephalothorax dorsal, coxal plates 1–3 from below, pleon ventral and dorsal (Brazil, SP, Nova Europa, Fazenda Itaquerê, leg. K. Lenko, 1 May 1960, MNRJ 3169).

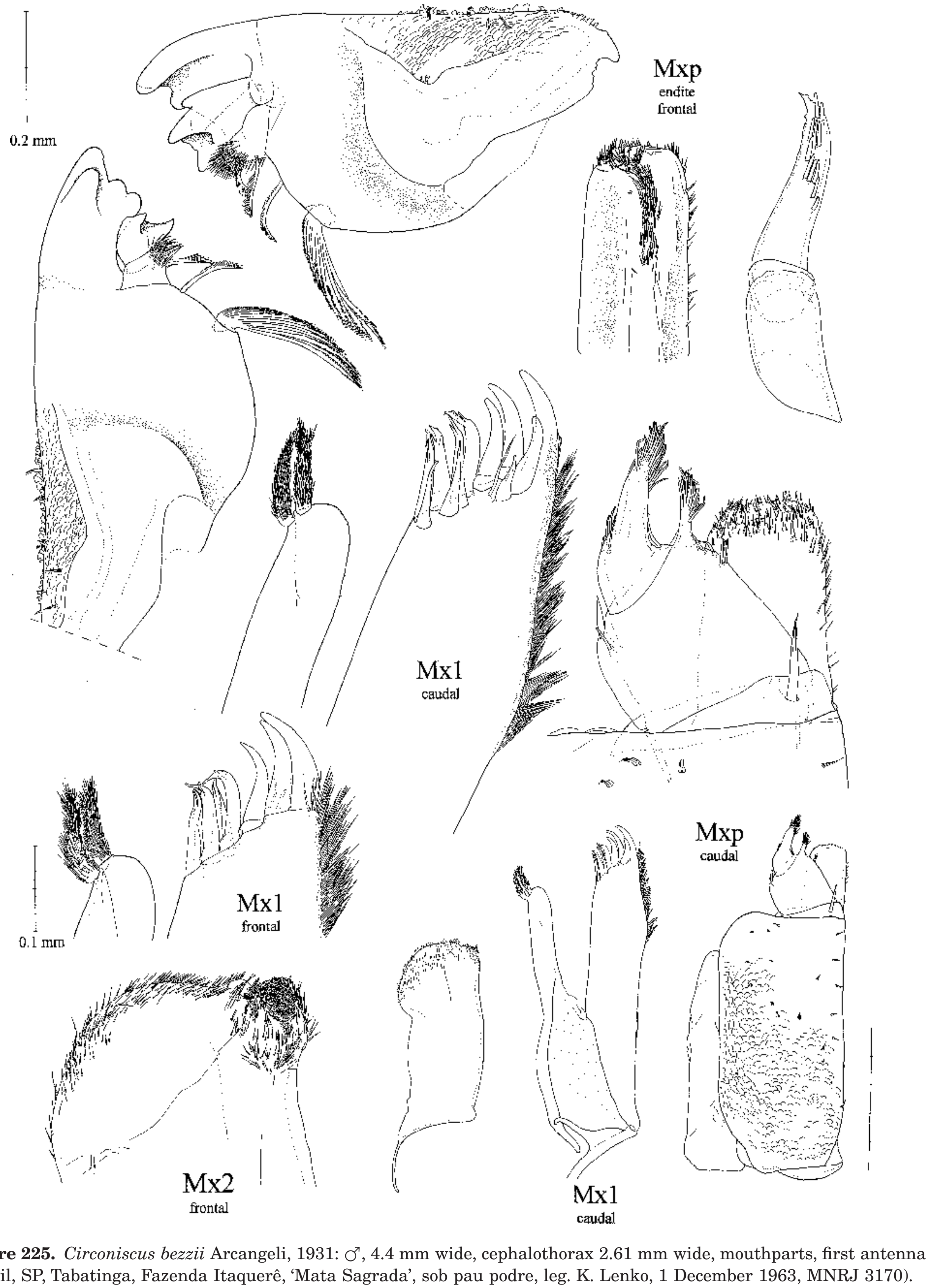

Figure 225. *Circoniscus bezzii* Arcangeli, 1931: ♂, 4.4 mm wide, cephalothorax 2.61 mm wide, mouthparts, first antenna (Brazil, SP, Tabatinga, Fazenda Itaquerê, 'Mata Sagrada', sob pau podre, leg. K. Lenko, 1 December 1963, MNRJ 3170).

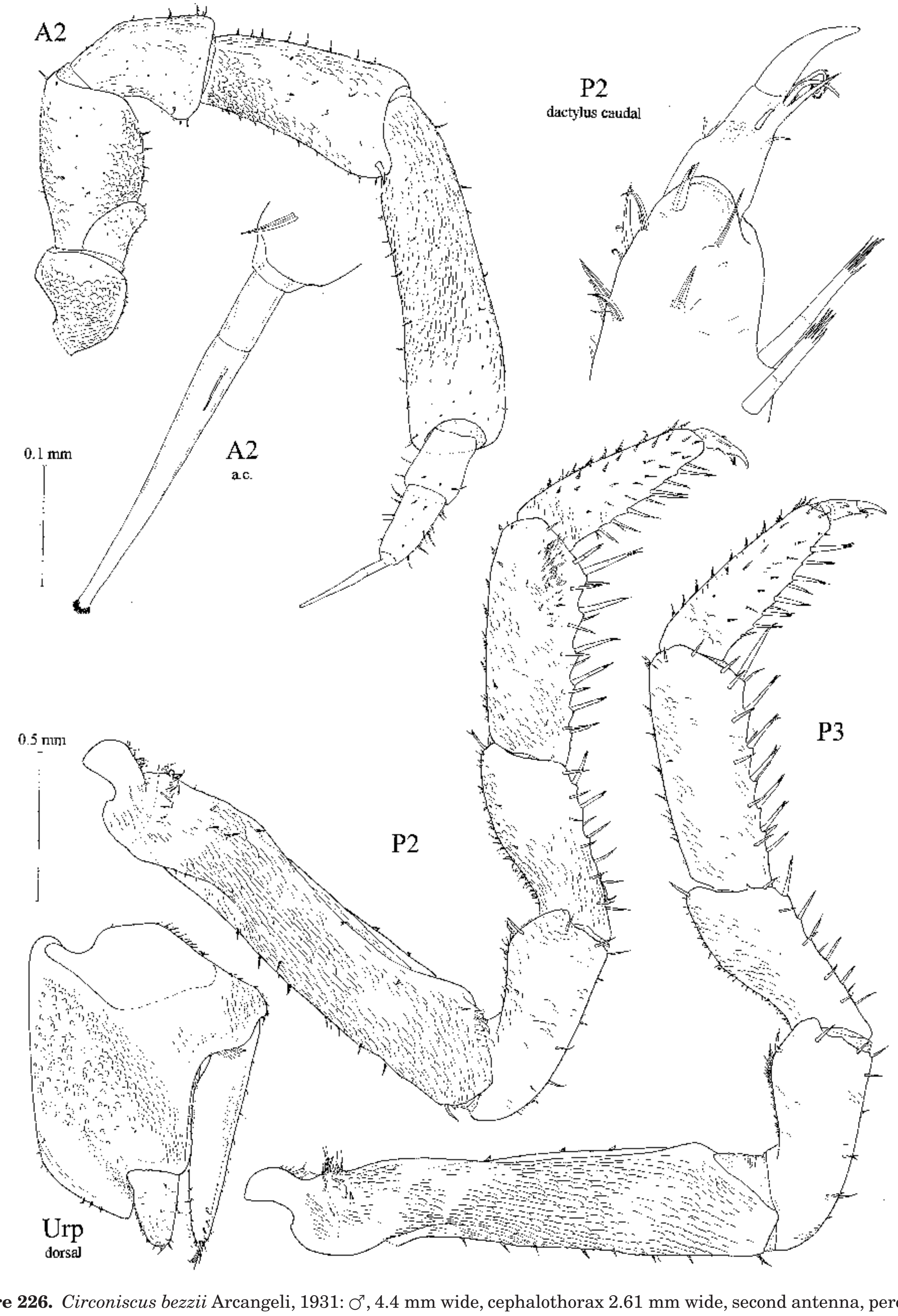

Figure 226. *Circoniscus bezzii* Arcangeli, 1931: ♂, 4.4 mm wide, cephalothorax 2.61 mm wide, second antenna, pereiopods 2 and 3, uropod (Brazil, SP, Tabatinga, Fazenda Itaquerê, 'Mata Sagrada', sob pau podre, leg. K. Lenko, 1 December 1963, MNRJ 3170).

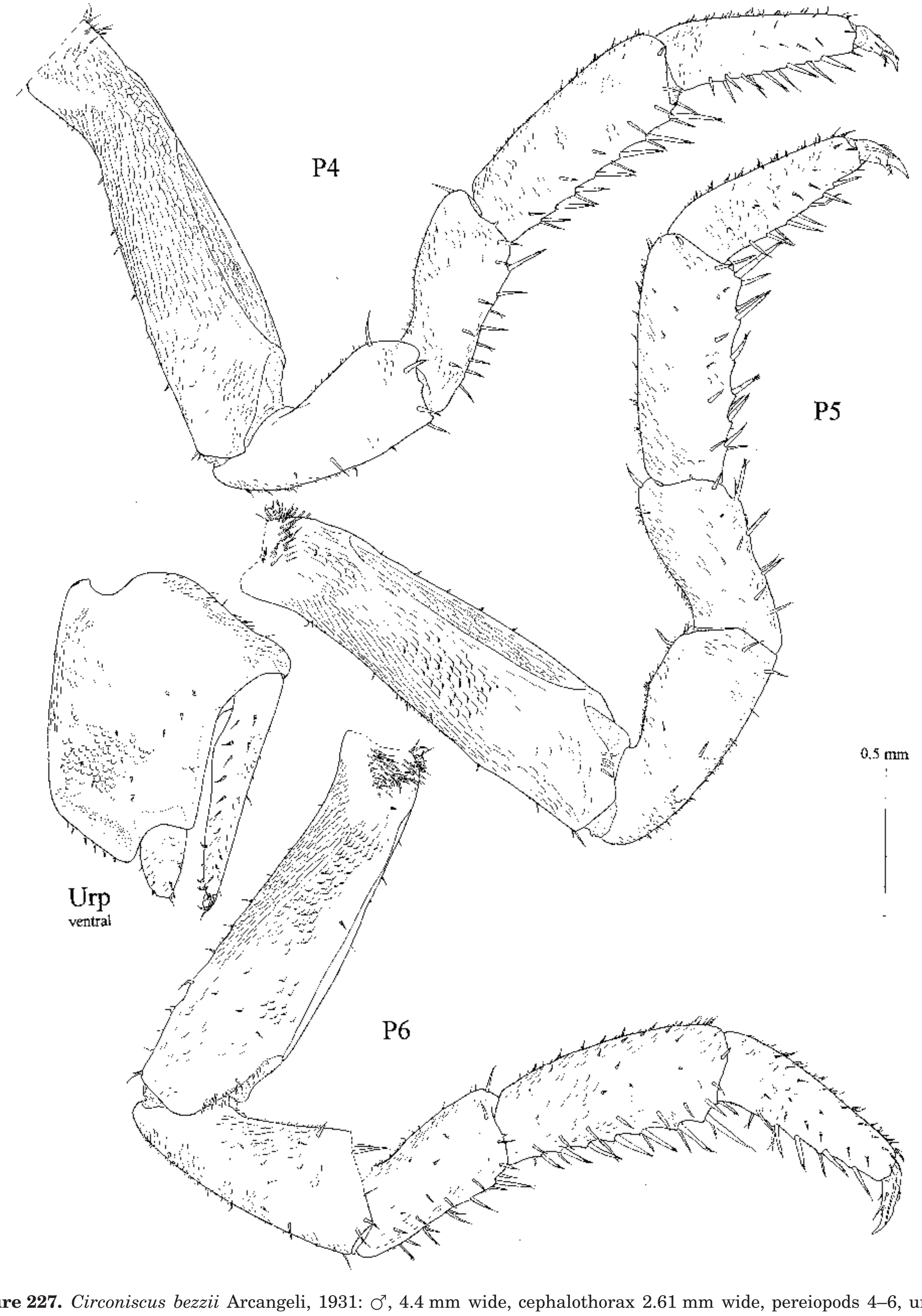

Figure 227. *Circoniscus bezzii* Arcangeli, 1931: ♂, 4.4 mm wide, cephalothorax 2.61 mm wide, pereiopods 4–6, uropod (Brazil, SP, Tabatinga, Fazenda Itaquerê, 'Mata Sagrada', sob pau podre, leg. K. Lenko, 1 December 1963, MNRJ 3170).

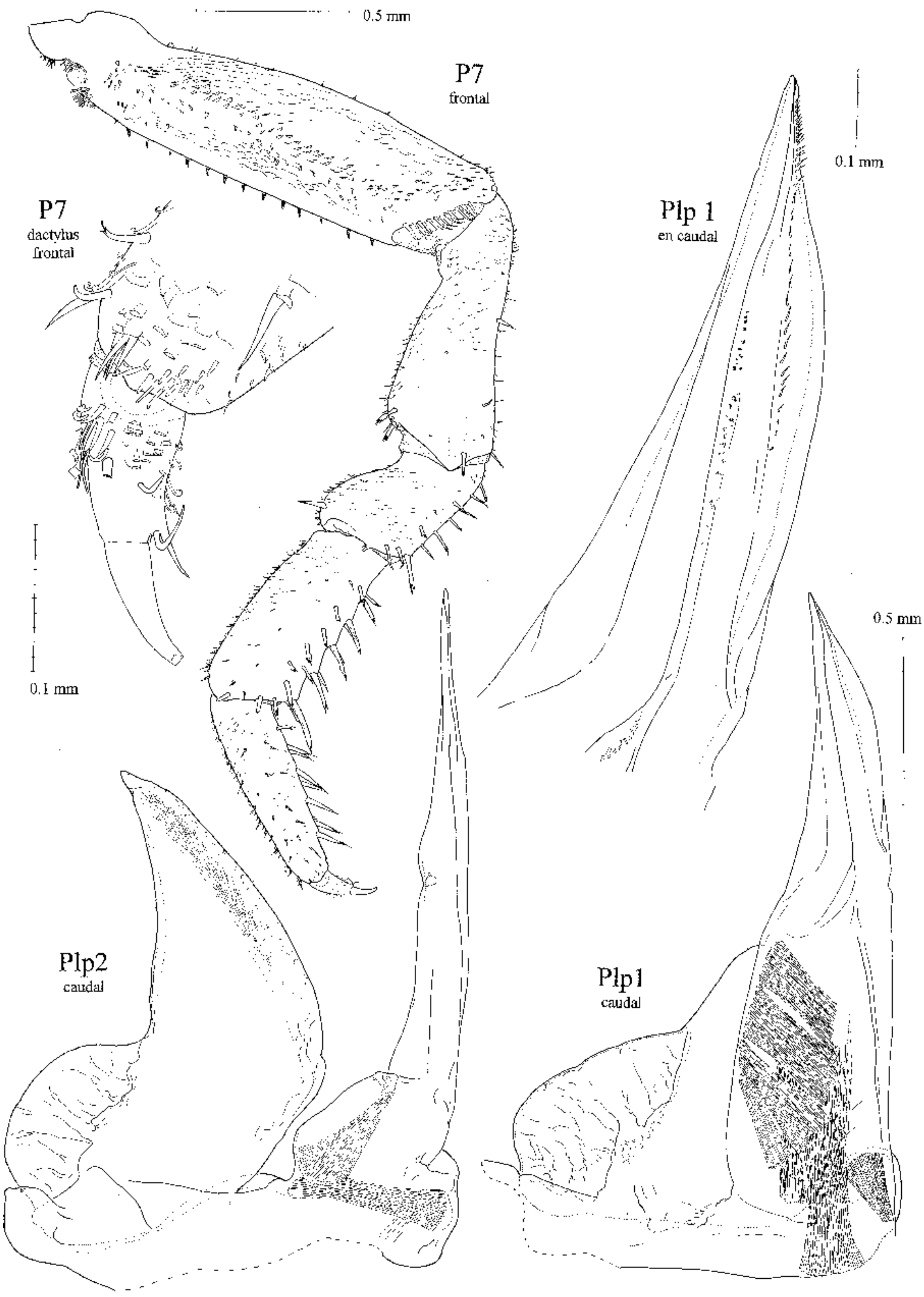

Figure 228. *Circoniscus bezzii* Arcangeli, 1931: ♂, 9.0 × 4.7 mm, pereiopod 7 frontal, dactylus enlarged, pleopods 1 and 2 caudal (Brazil, SP, Nova Europa, Fazenda Itaquerê, leg. K. Lenko, 1 May 1960, MNRJ 3169).

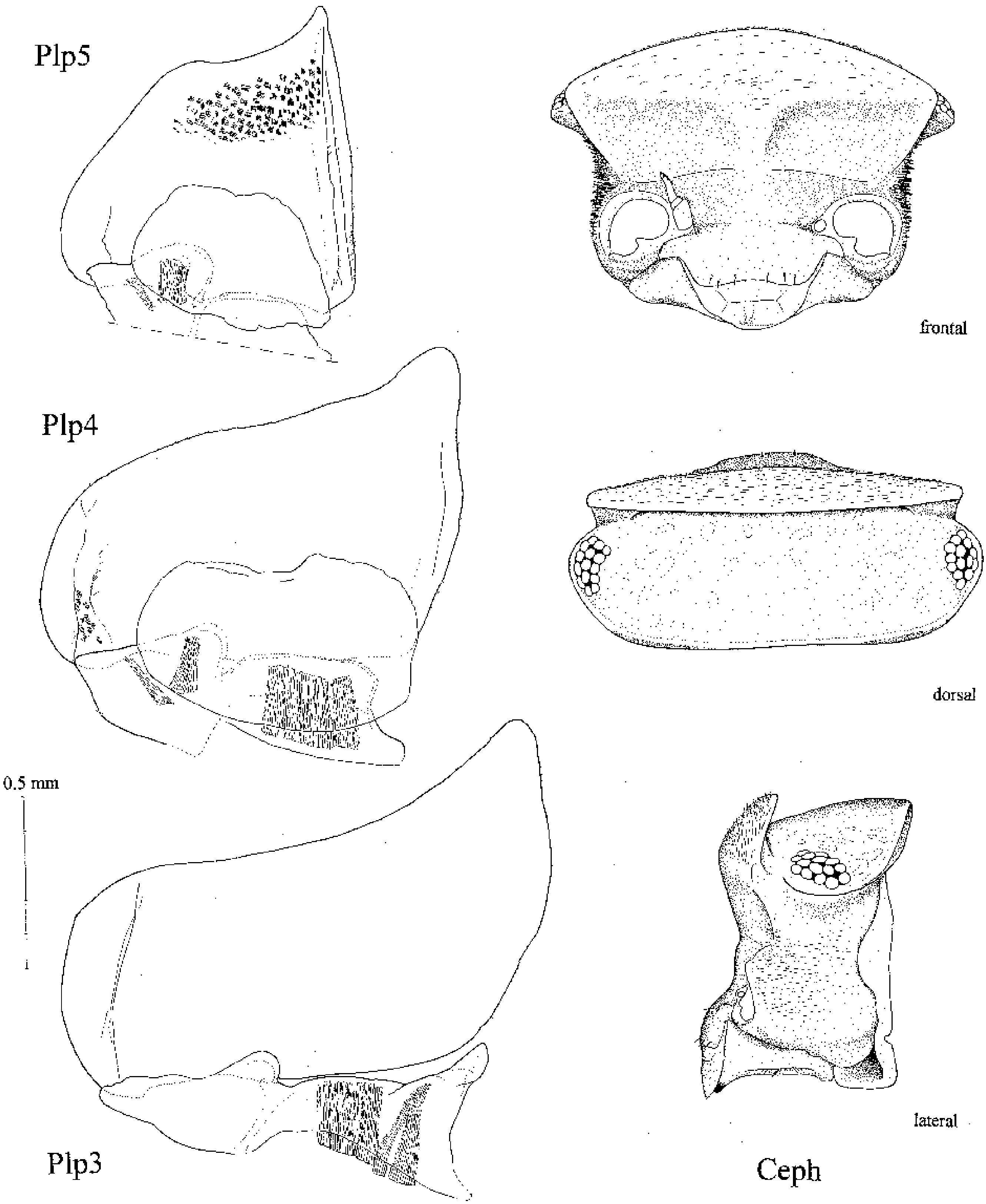

Figure 229. *Circoniscus bezzii* Arcangeli, 1931: ♂, 4.4 mm wide, cephalothorax 2.61 mm wide, cephalothorax, pleopods 3–5 (Brazil, SP, Tabatinga, Fazenda Itaquerê, 'Mata Sagrada', sob pau podre, leg. K. Lenko, 1 December 1963, MNRJ 3170).

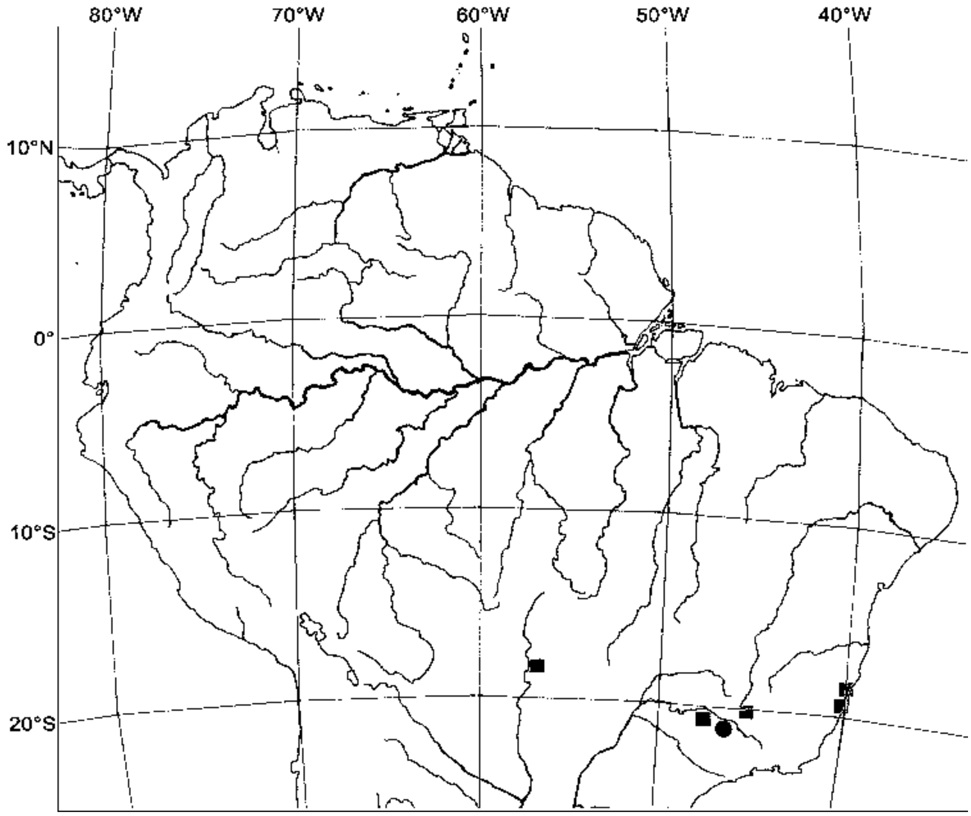

Figure 230. Geographical distribution of *Circoniscus bezzii*; circles, material examined; squares, literature data.

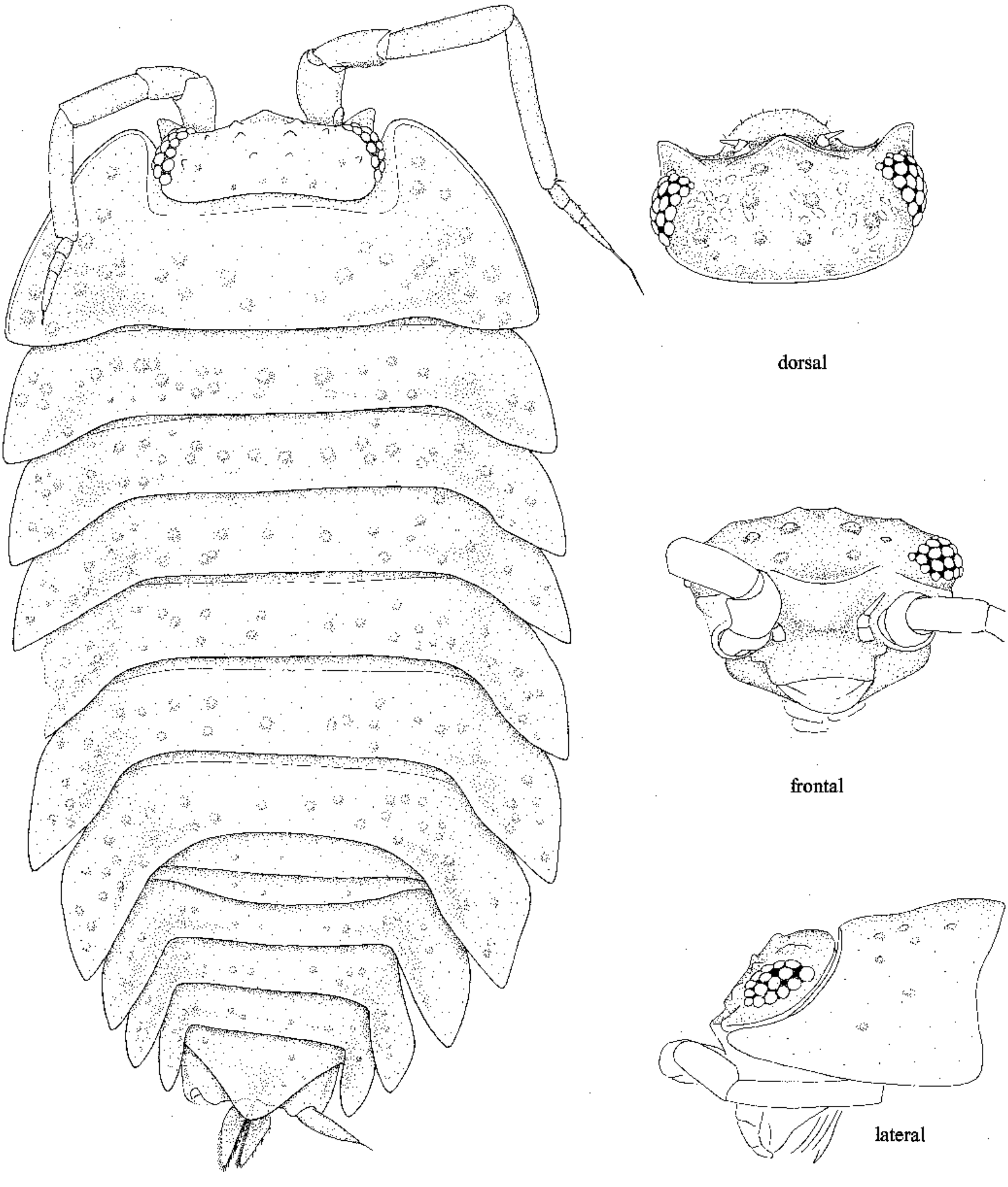

Figure 231. *Synuropus granulatus* Richardson, 1901: holotype ♀, 6.3 × 3.35 mm (Puerto Rico, El Yunque, altitude 850 m, leg. L. Stejnegen, USNM 23912).

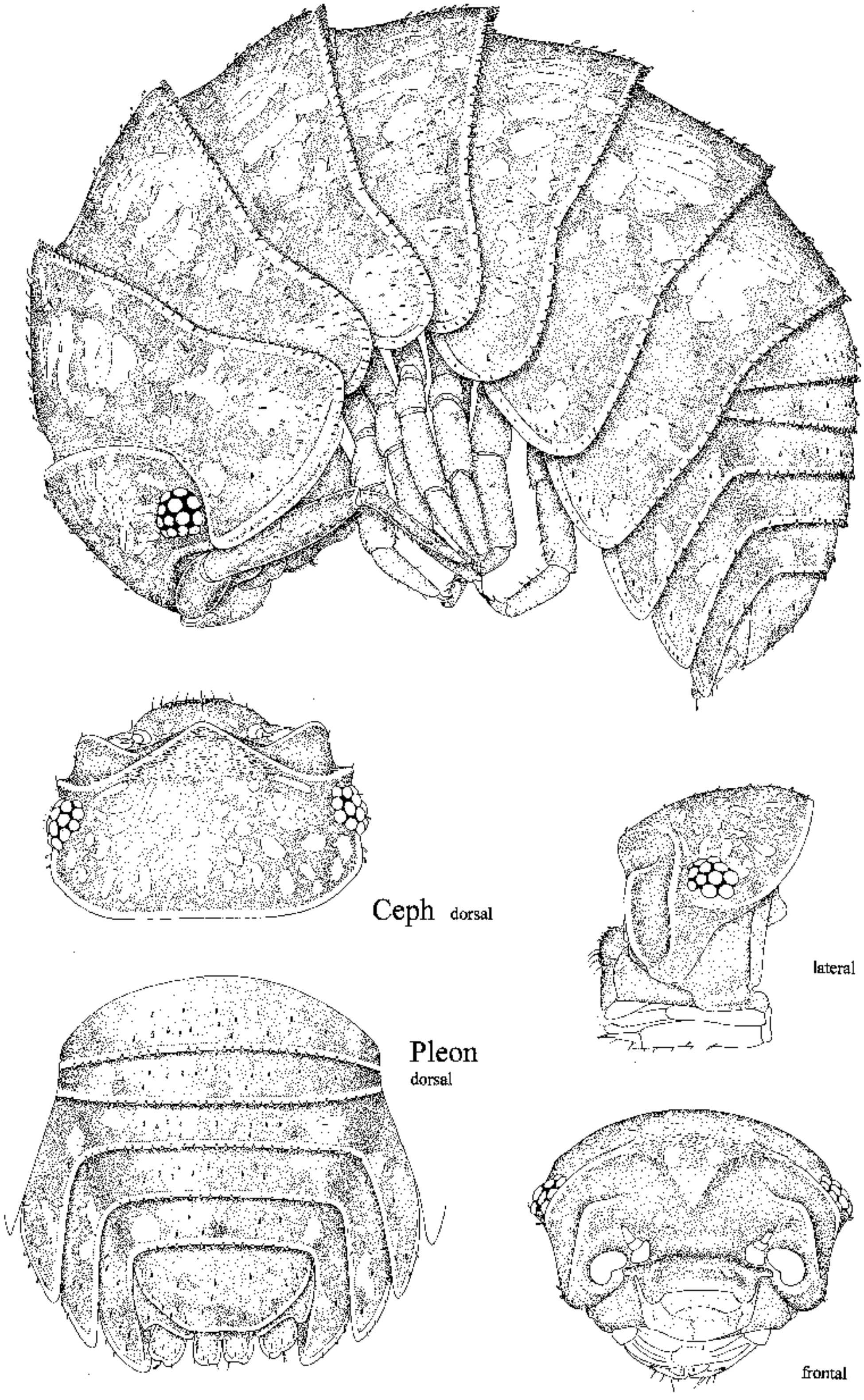

Figure 232. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: paratype ♂, 4.8 × 1.95 mm, cephalothorax 1.15 mm wide, habitus lateral, pleon dorsal (Chile, Coquimbo, Nague, leg. Peña, 26 September 1980, SMNS T205); ♂, 4.3 × 1.8 mm, cephalothorax 1.1 mm wide, cephalothorax frontal, dorsal, lateral (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

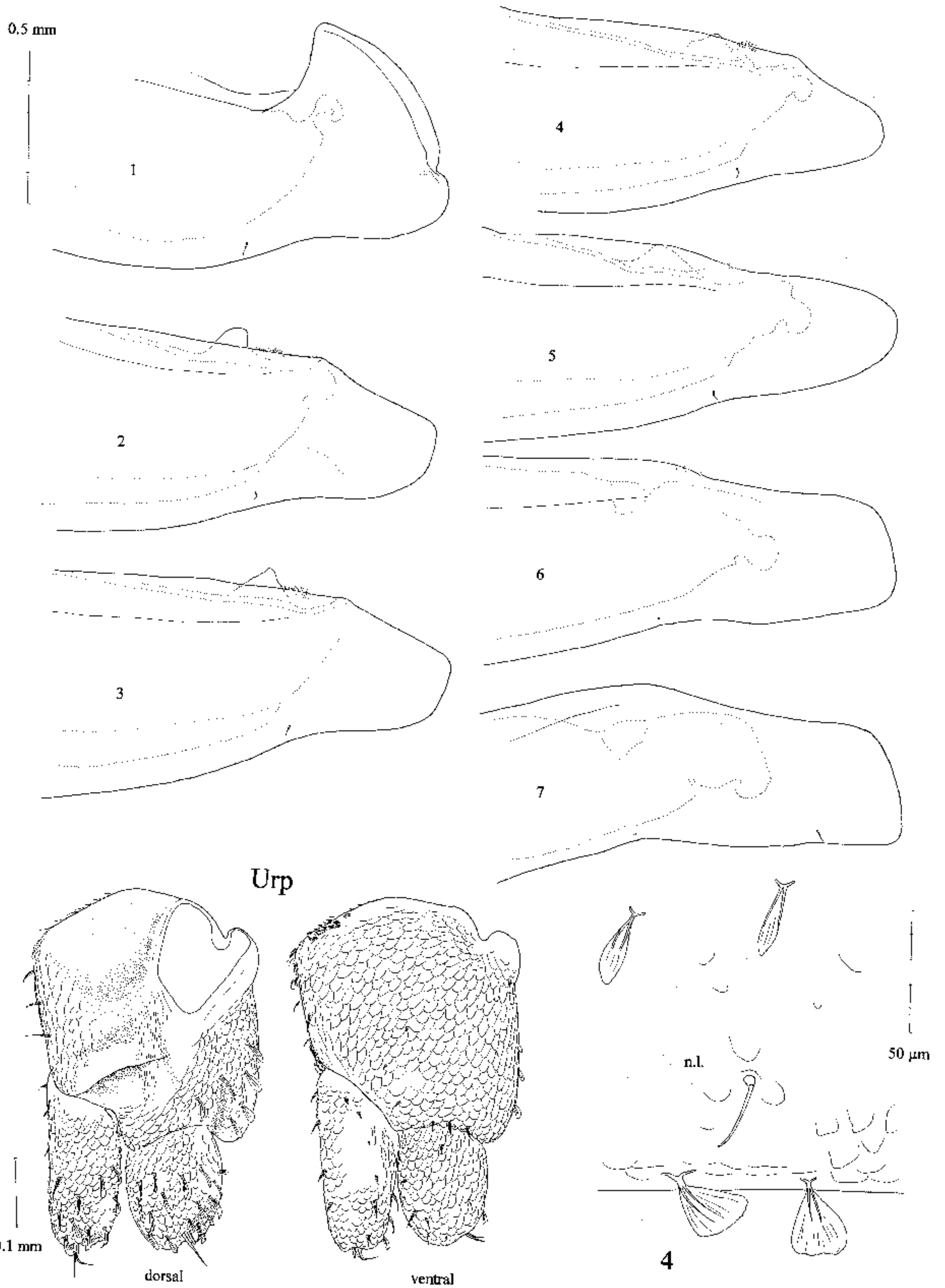

Figure 233. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: ♂, 4.3 × 1.8 mm, cephalothorax 1.1 mm wide, coxal plates and uropods, nodulus lateralis and some scale setae of tergite 4 more enlarged (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

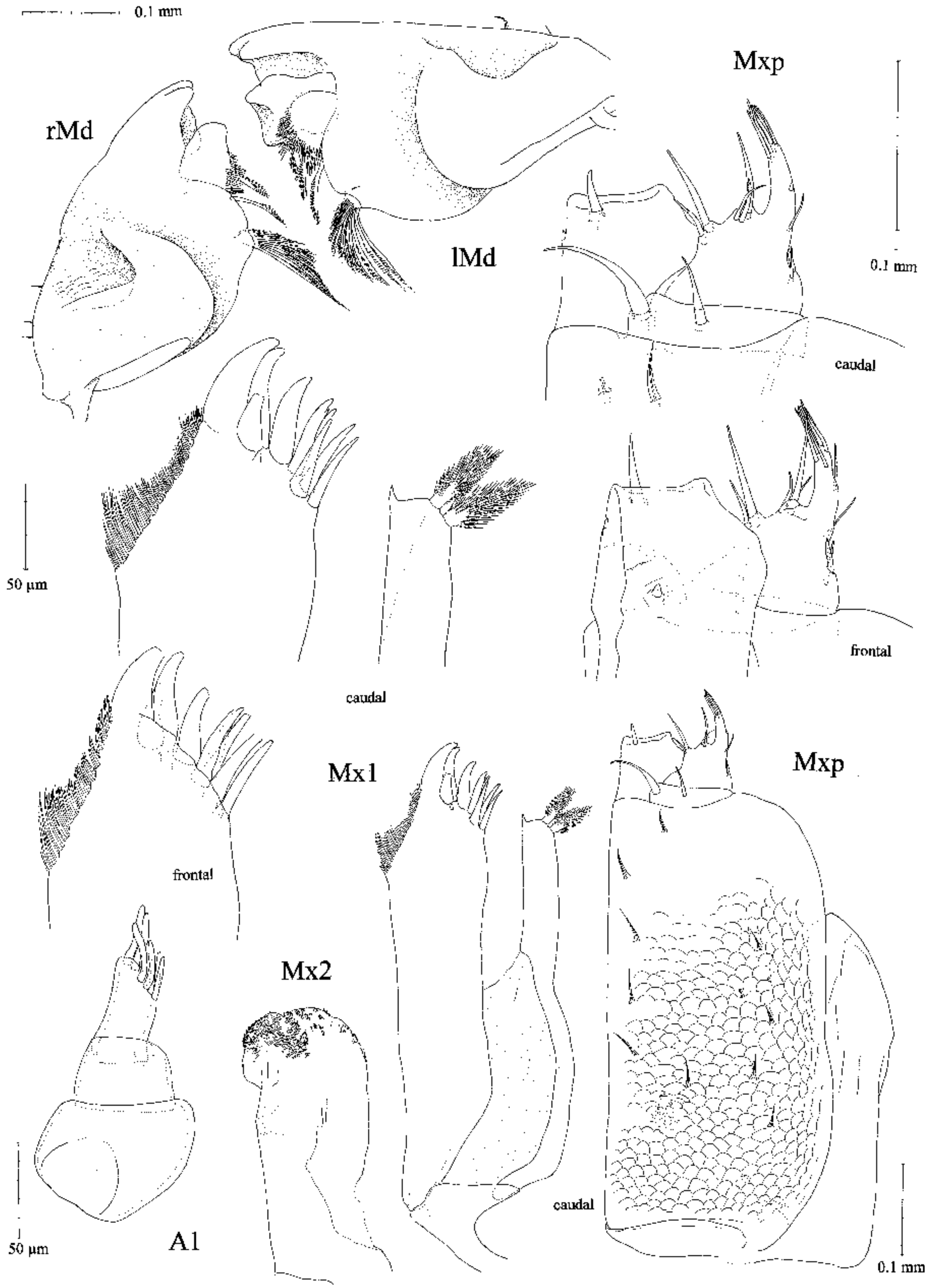

Figure 234. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: ♂, 4.3 × 1.8 mm, cephalothorax 1.1 mm wide, mouthparts and first antenna (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

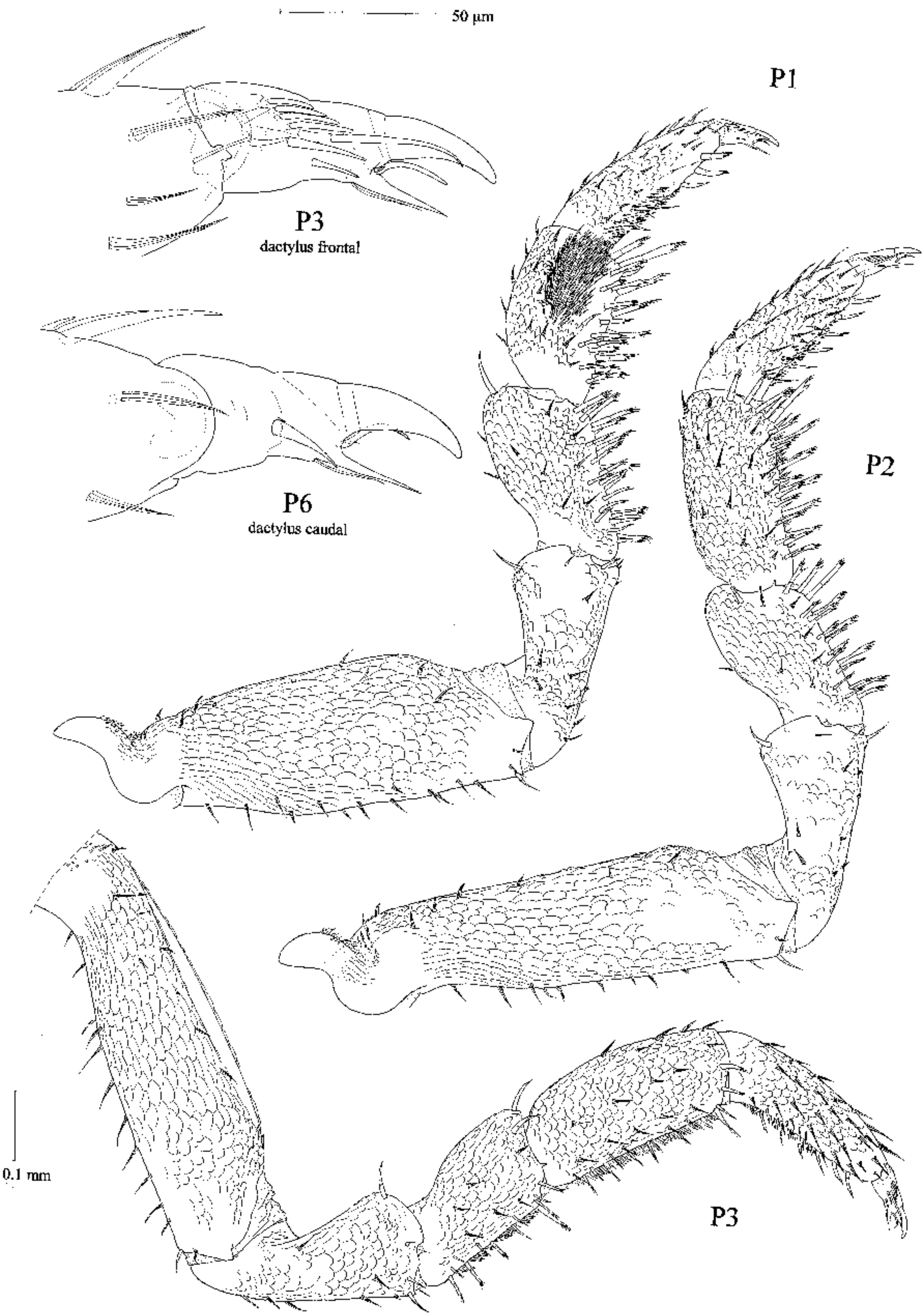

Figure 235. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: ♂, 4.3 × 1.8–mm, cephalothorax 1.1 mm wide, pereiopods 1–3, pereiopod 3 dactylus frontal, pereiopod 6 dactylus caudal (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

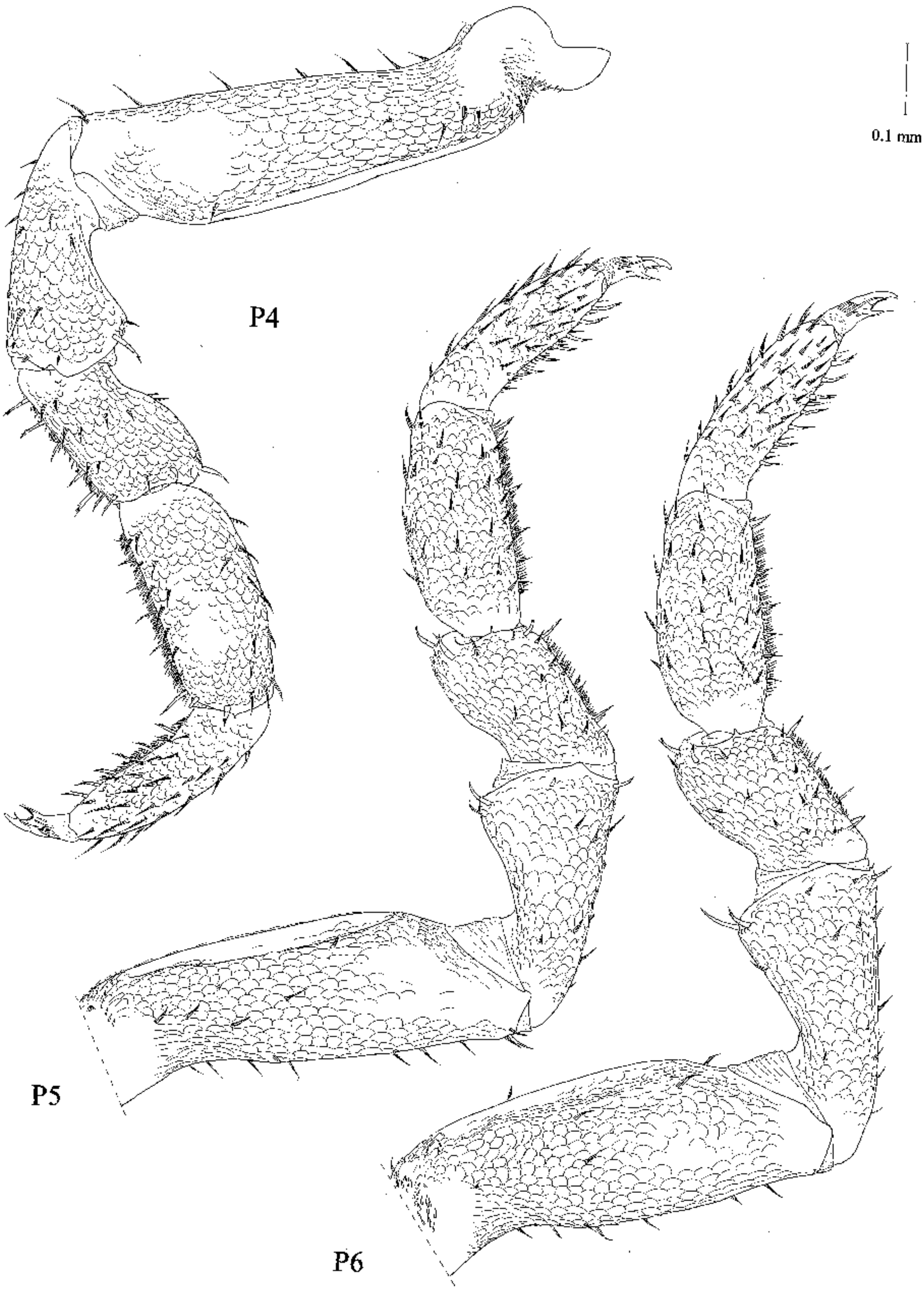

Figure 236. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: ♂, 4.3 × 1.8 mm, cephalothorax 1.1 mm wide, pereiopods 4–6 frontal (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

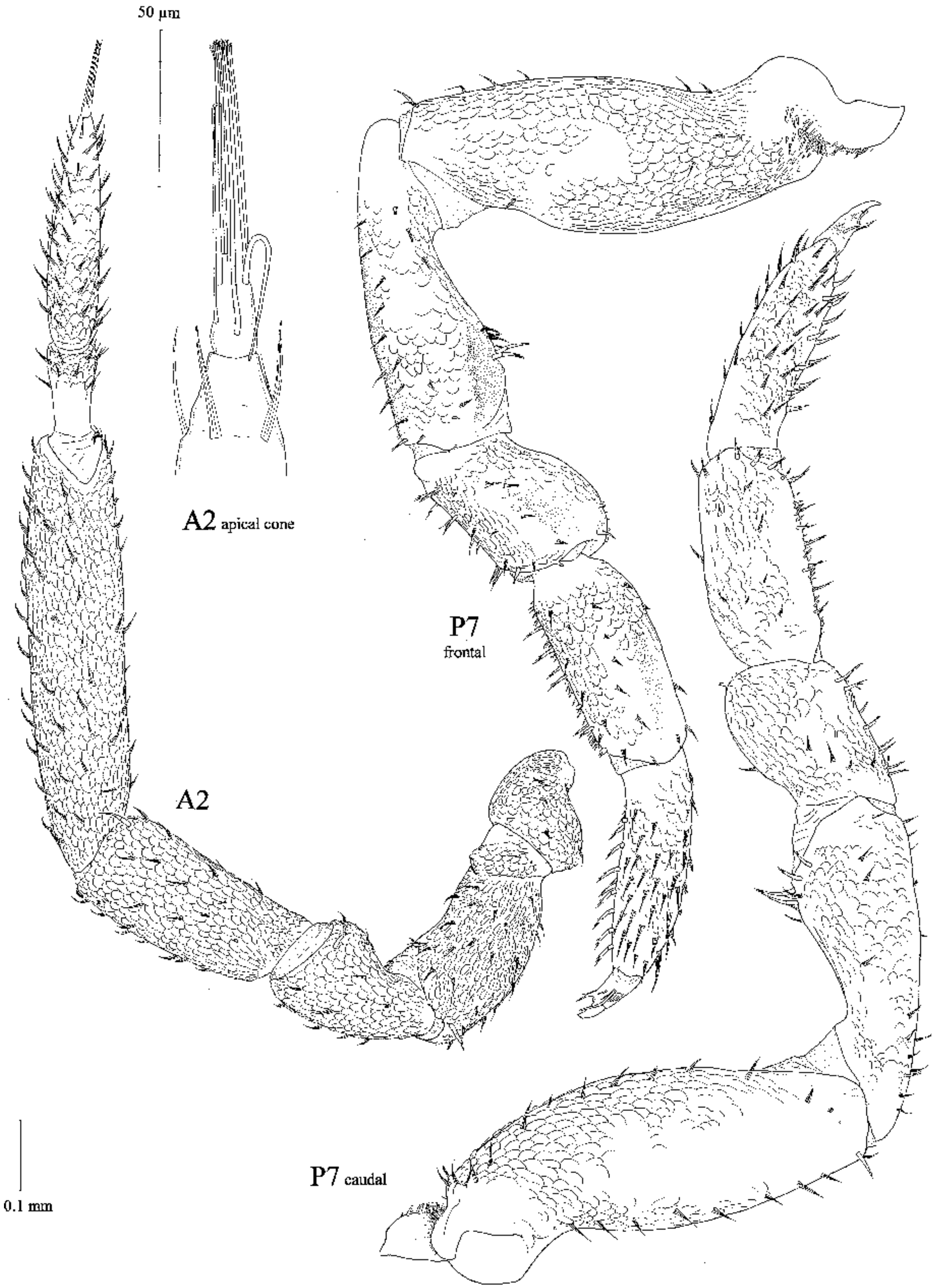

Figure 237. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: ♂, 4.3 × 1.8 mm, cephaothorax 1.1 mm wide, pereiopod 7 frontal and caudal, second antenna (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

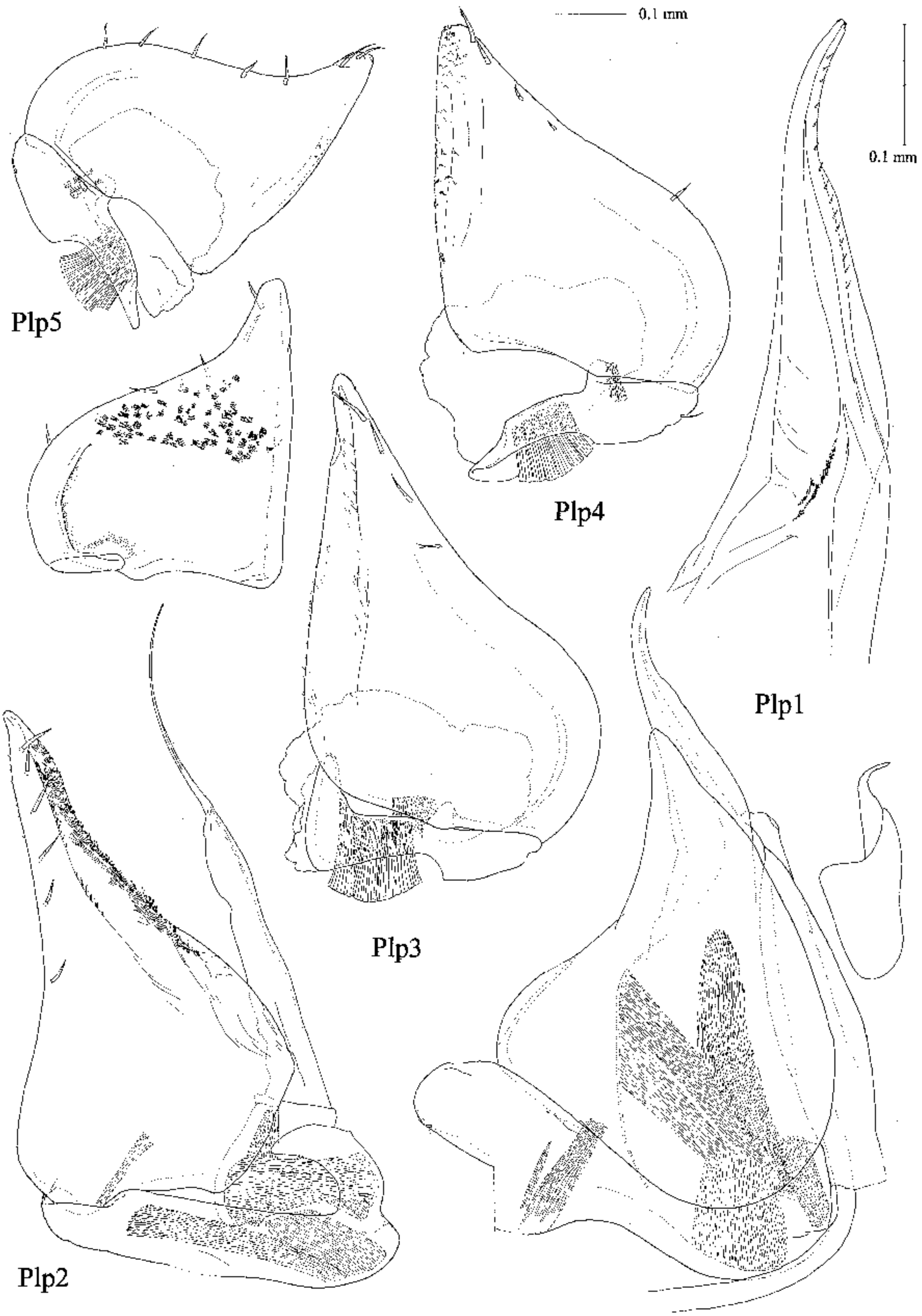

Figure 238. *Chileoniscus marmoratus* Taiti, Ferrara & Schmalfuss, 1986: ♂, 4.3 × 1.8 mm, cephalothorax 1.1 mm wide, pleopods 1–5 frontal, endopodite 1 and exopodite 5 caudal (Chile, IV Reg. Prov. Limari, PN Fray Jorge, altitude 550 m, Alto de Talinay, leg. Agosti and Burckhardt, 6–7 December 1990, #1a, MZUF).

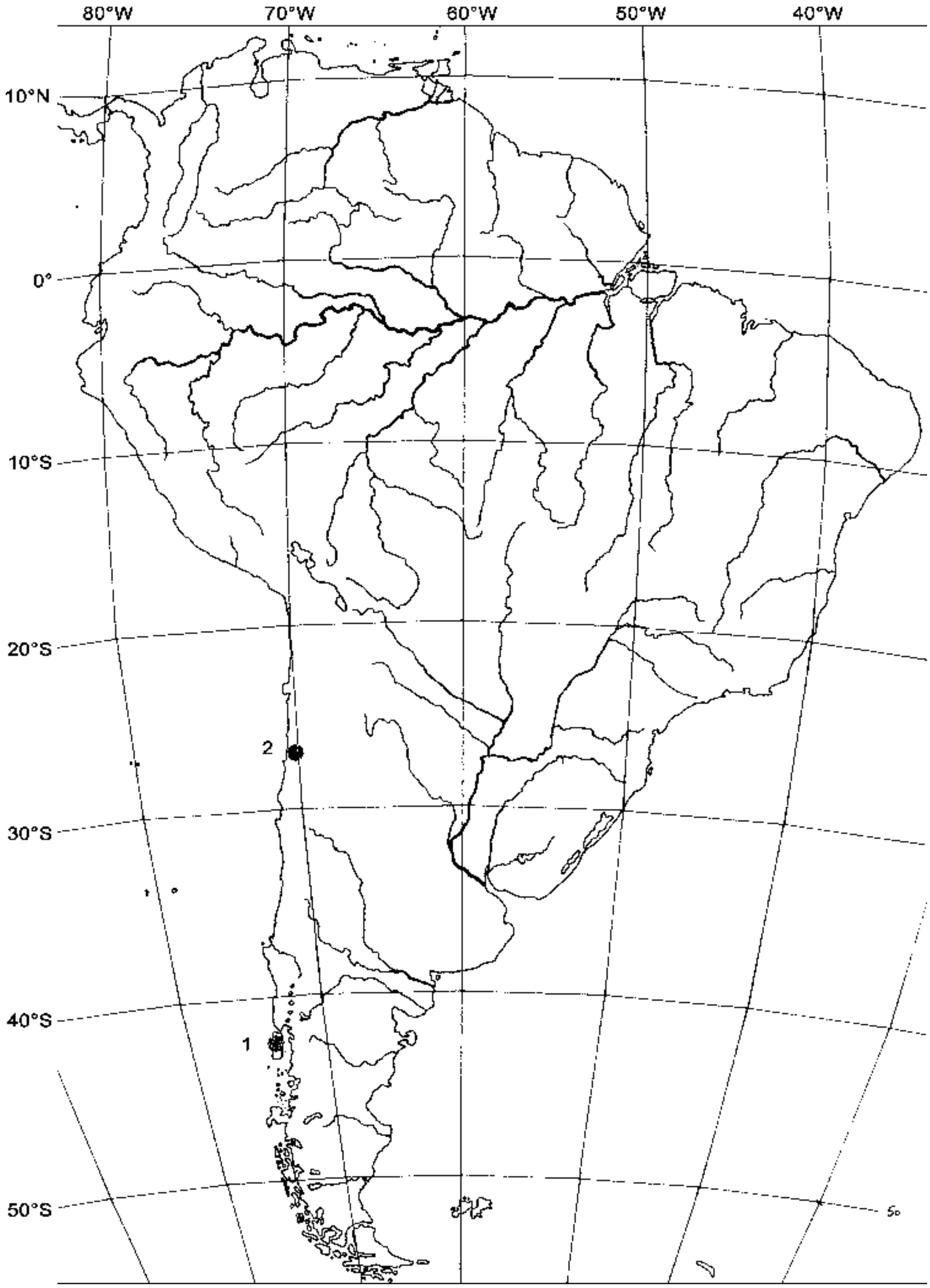

Figure 239. Geographical distribution of *Chileoniscus armadillidioides* (1) and *Ch. marmoratus* (2).

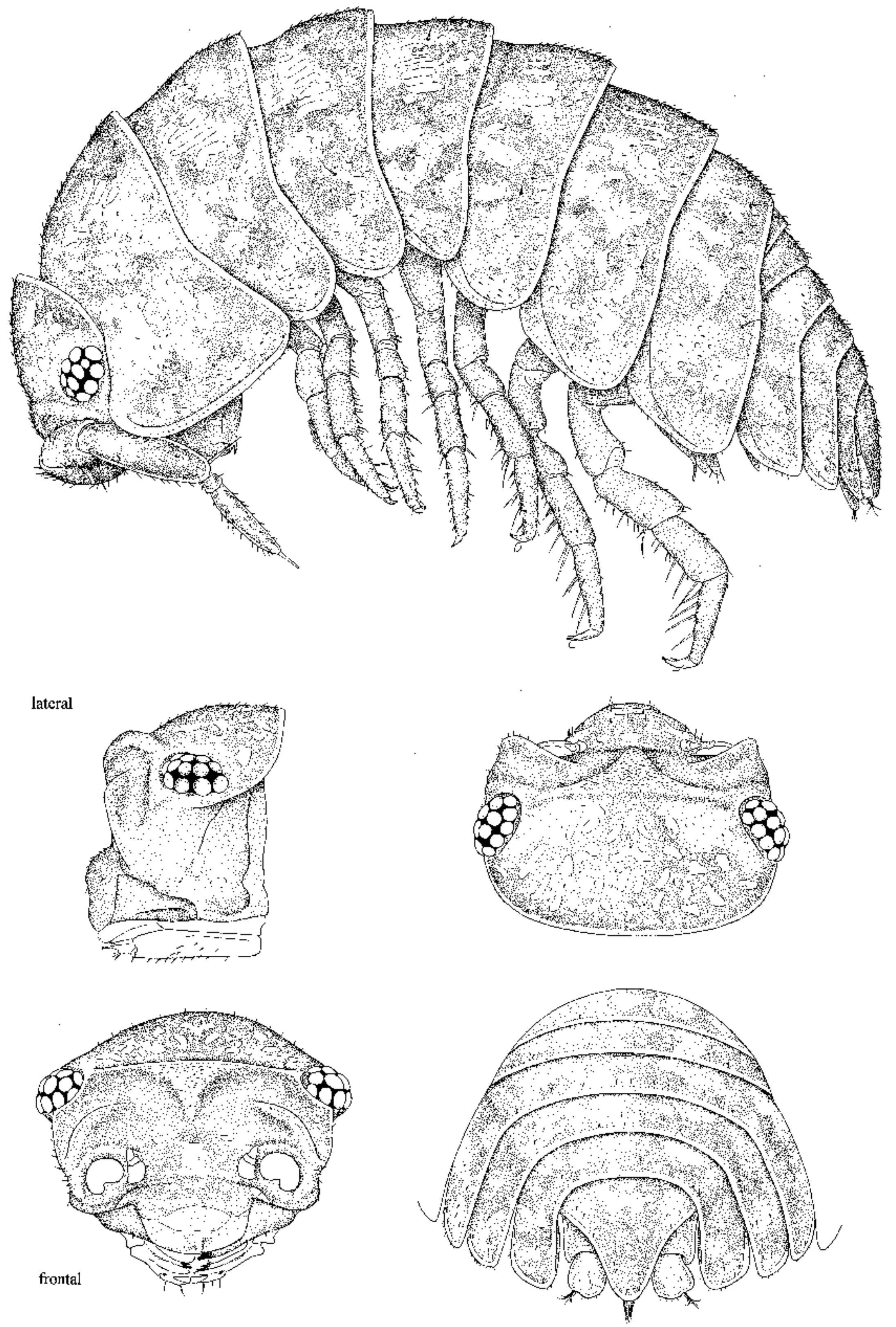

Figure 240. ***Chileoniscus armadillidioides* sp. nov.**: paratype ♂, 4.1 × 1.8 mm, habitus lateral, pleon dorsal; holotype ♂, 4.5 × 1.95 mm, cephalothorax, more enlarged (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

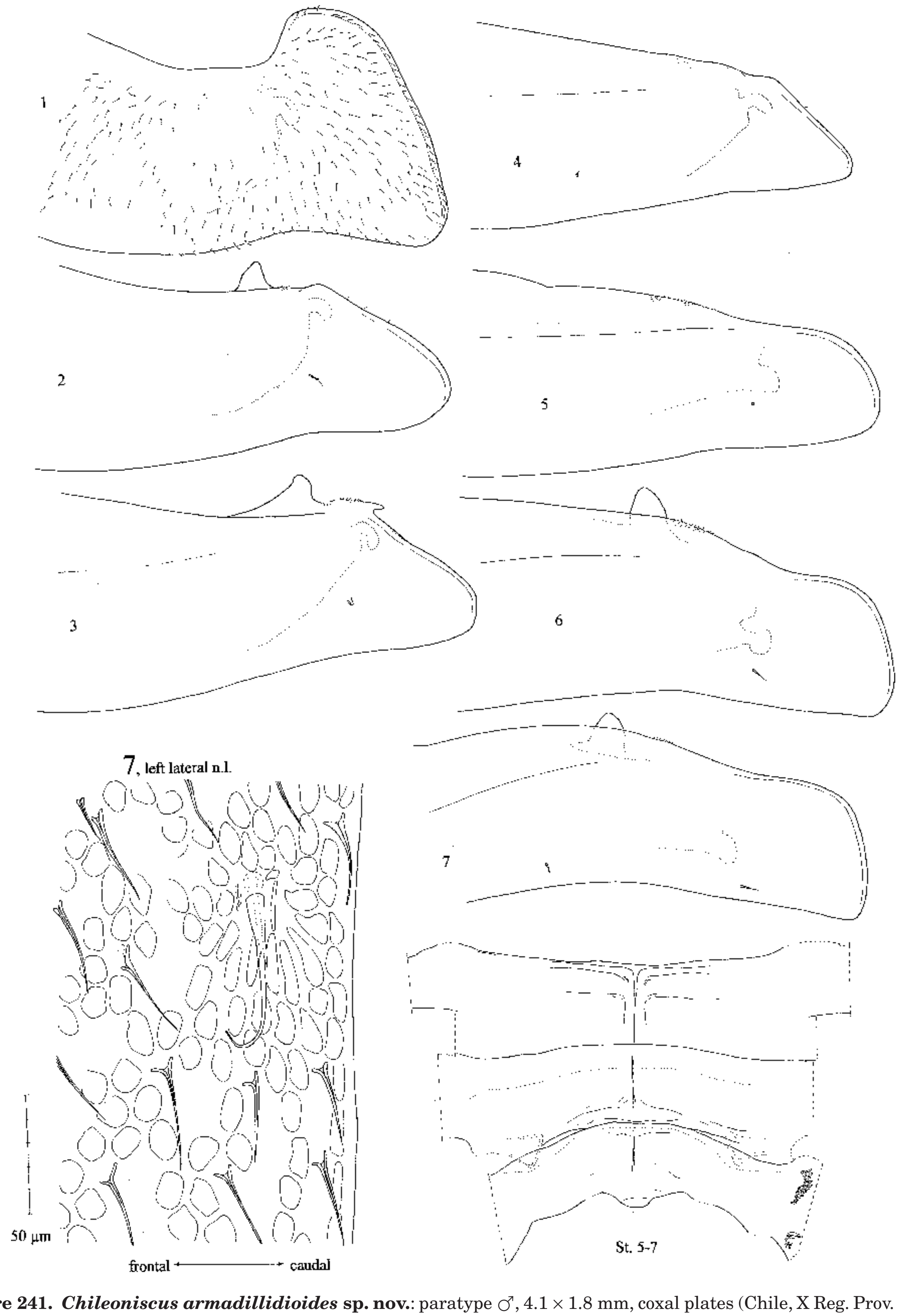

Figure 241. ***Chileoniscus armadillidioides*** **sp. nov.**: paratype ♂, 4.1 × 1.8 mm, coxal plates (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

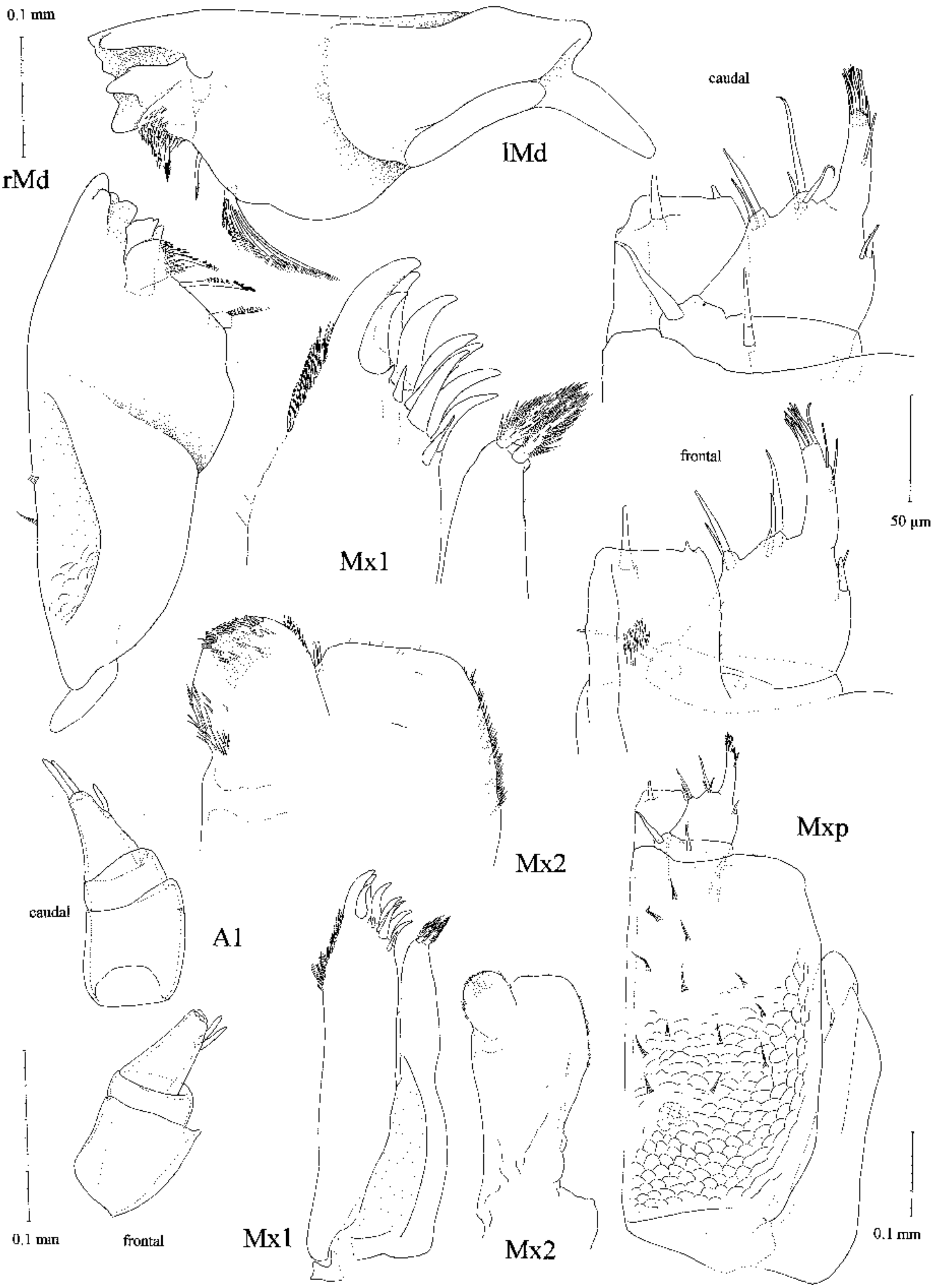

Figure 242. ***Chileoniscus armadillidioides*** **sp. nov.**: paratype ♂, 4.1 × 1.8 mm, mouthparts, first antenna (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

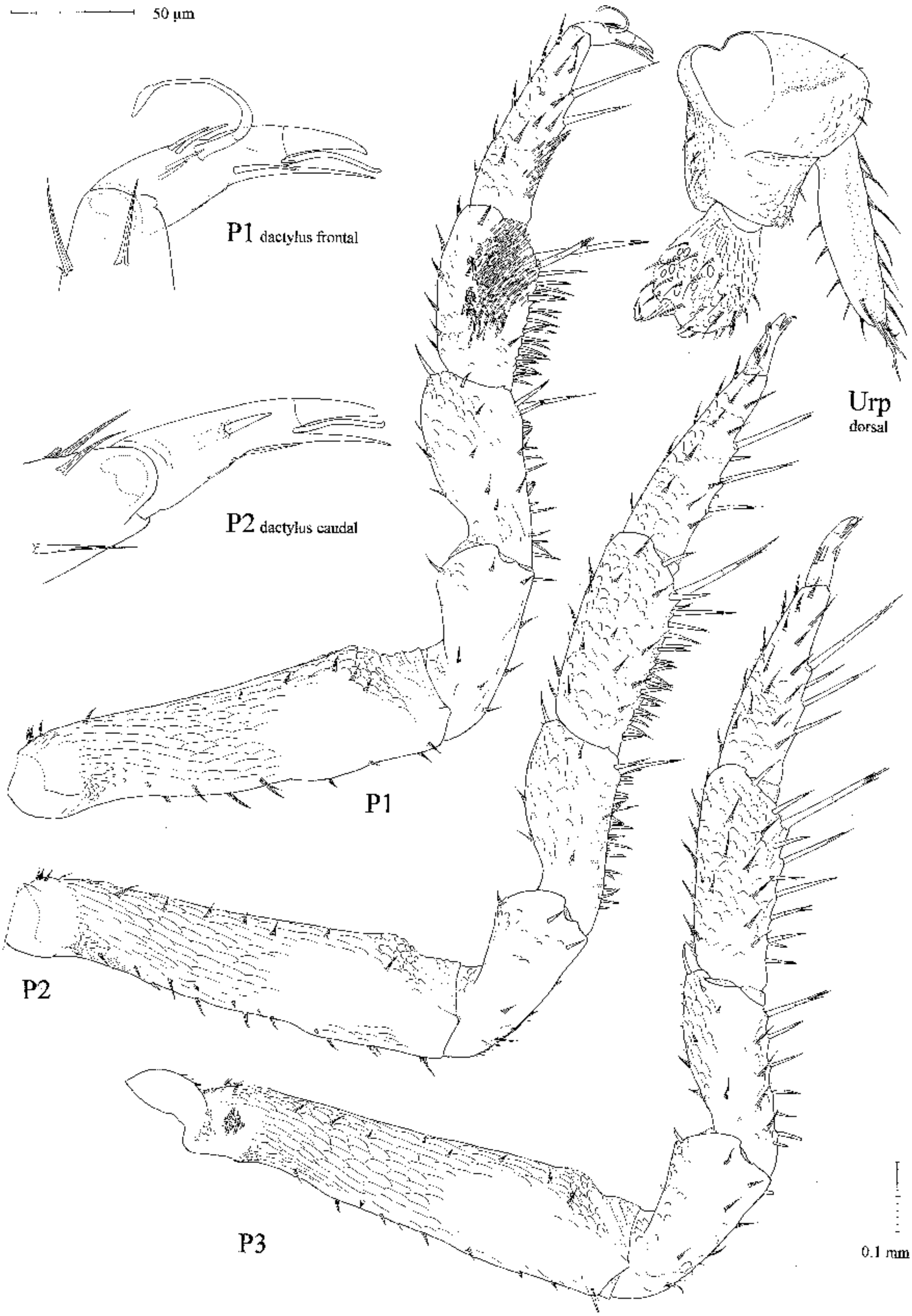

Figure 243. ***Chileoniscus armadillidioides*** **sp. nov.**: paratype ♂, 4.1 × 1.8 mm, pereiopods 1–3 frontal, uropod (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

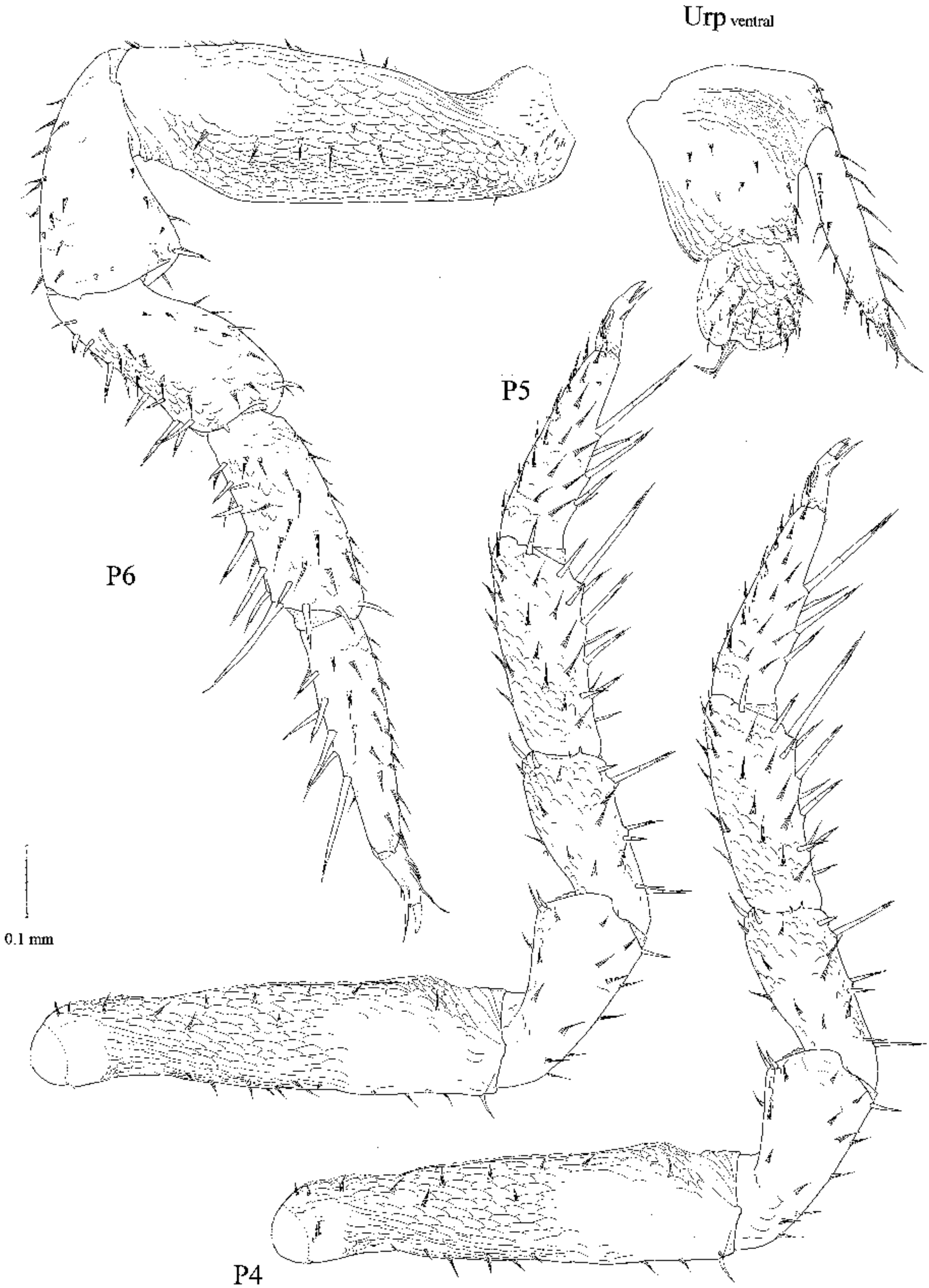

Figure 244. ***Chileoniscus armadillidioides* sp. nov.**: paratype ♂, 4.1 × 1.8 mm, pereiopods 4–6, uropod (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

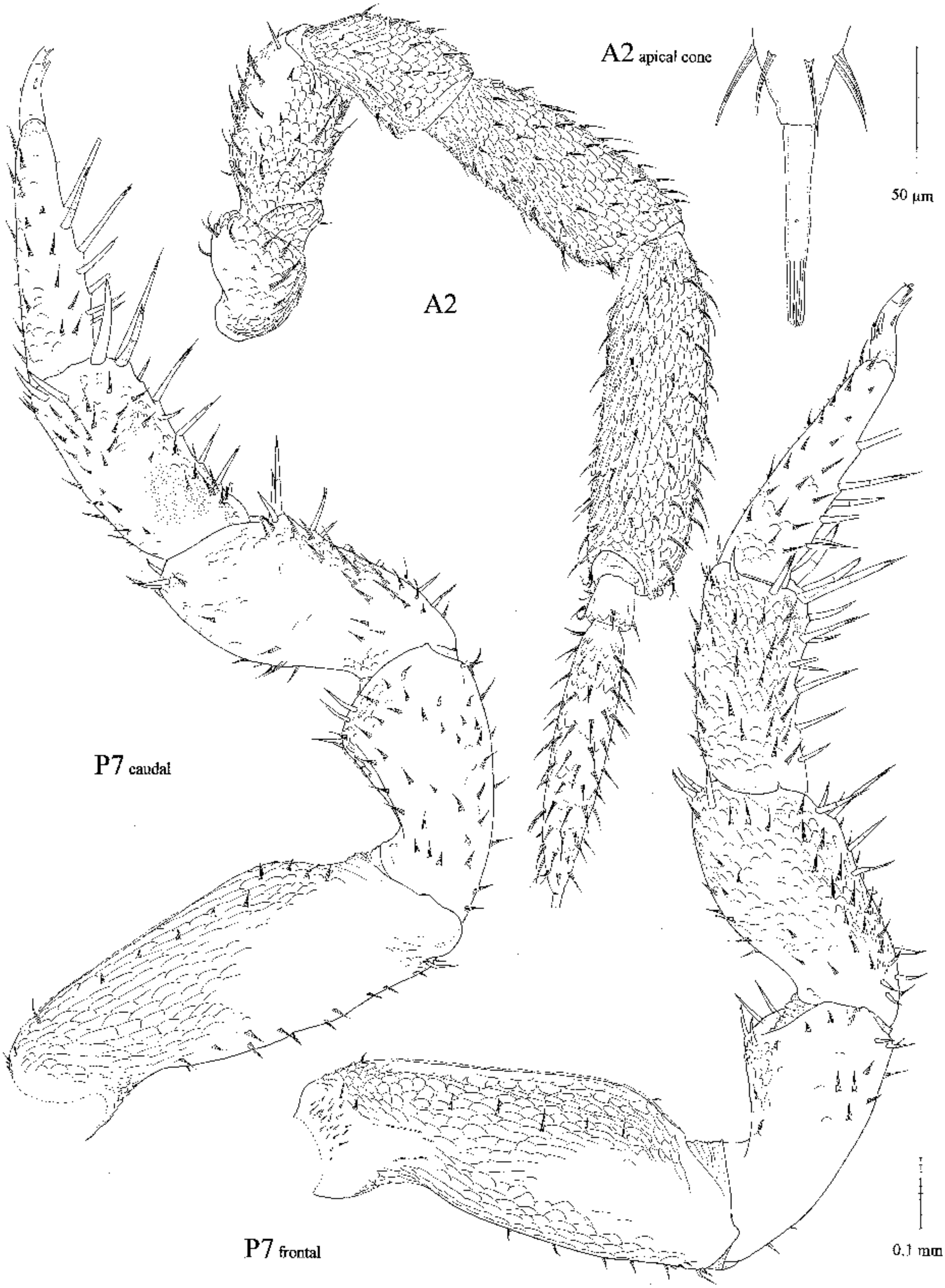

Figure 245. ***Chileoniscus armadillidioides*** **sp. nov.**: paratype ♂, 4.1 × 1.8 mm, pereiopod 7 frontal and caudal, second antenna (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

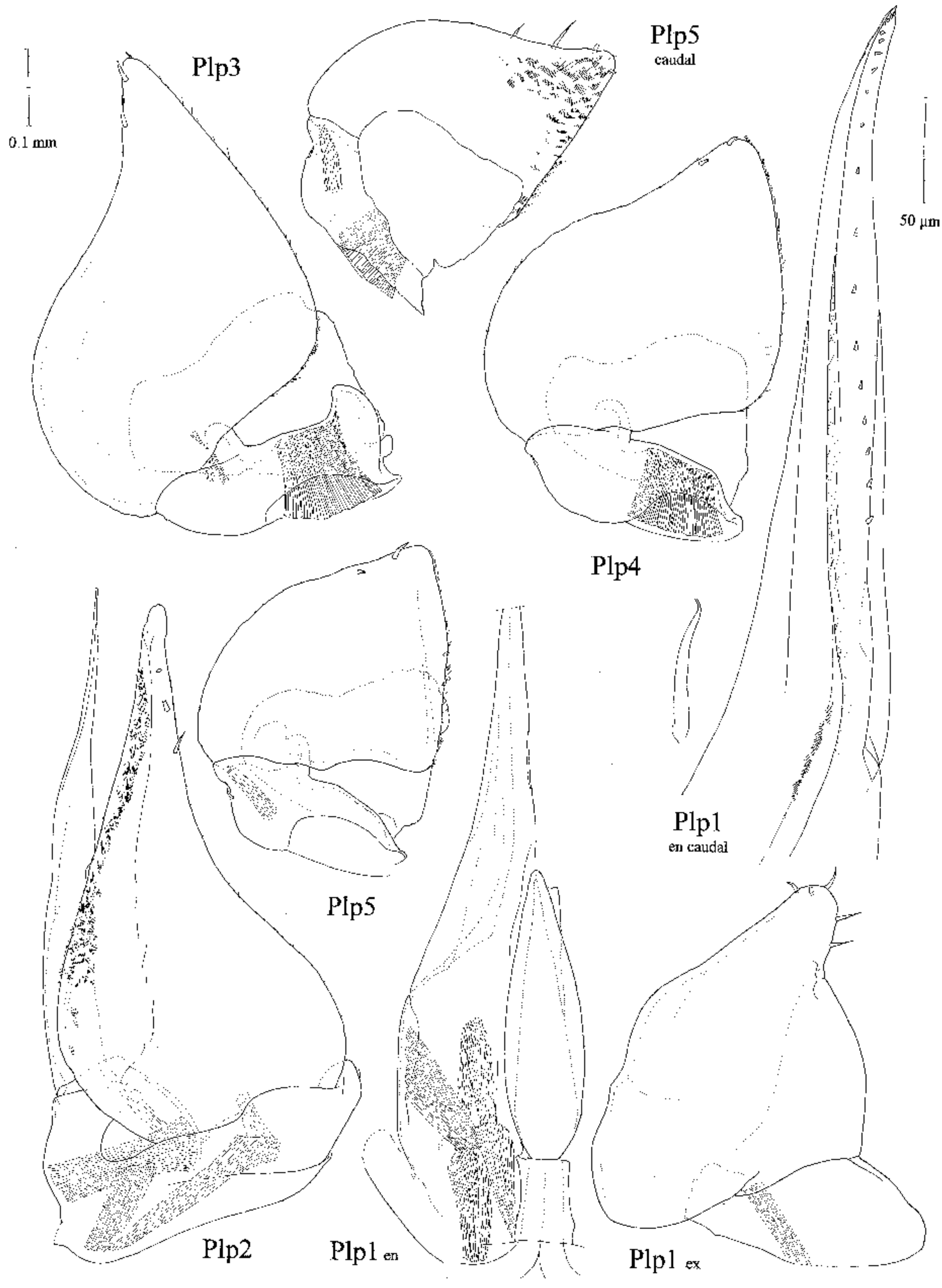

Figure 246. ***Chileoniscus armadillidioides*** **sp. nov.**: paratype ♂, 4.1 × 1.8 mm, pleopods 1–5; paratype ♂, 4.0 × 1.7 mm, cephalothorax 1.02 mm (Chile, X Reg. Prov. Chiloé, Cucao, 30 km south-west of Castro, altitude 30 m, temperate rainforest, leg. Agosti and Burckhardt, 4–6 January 1991, #29a, MZUF).

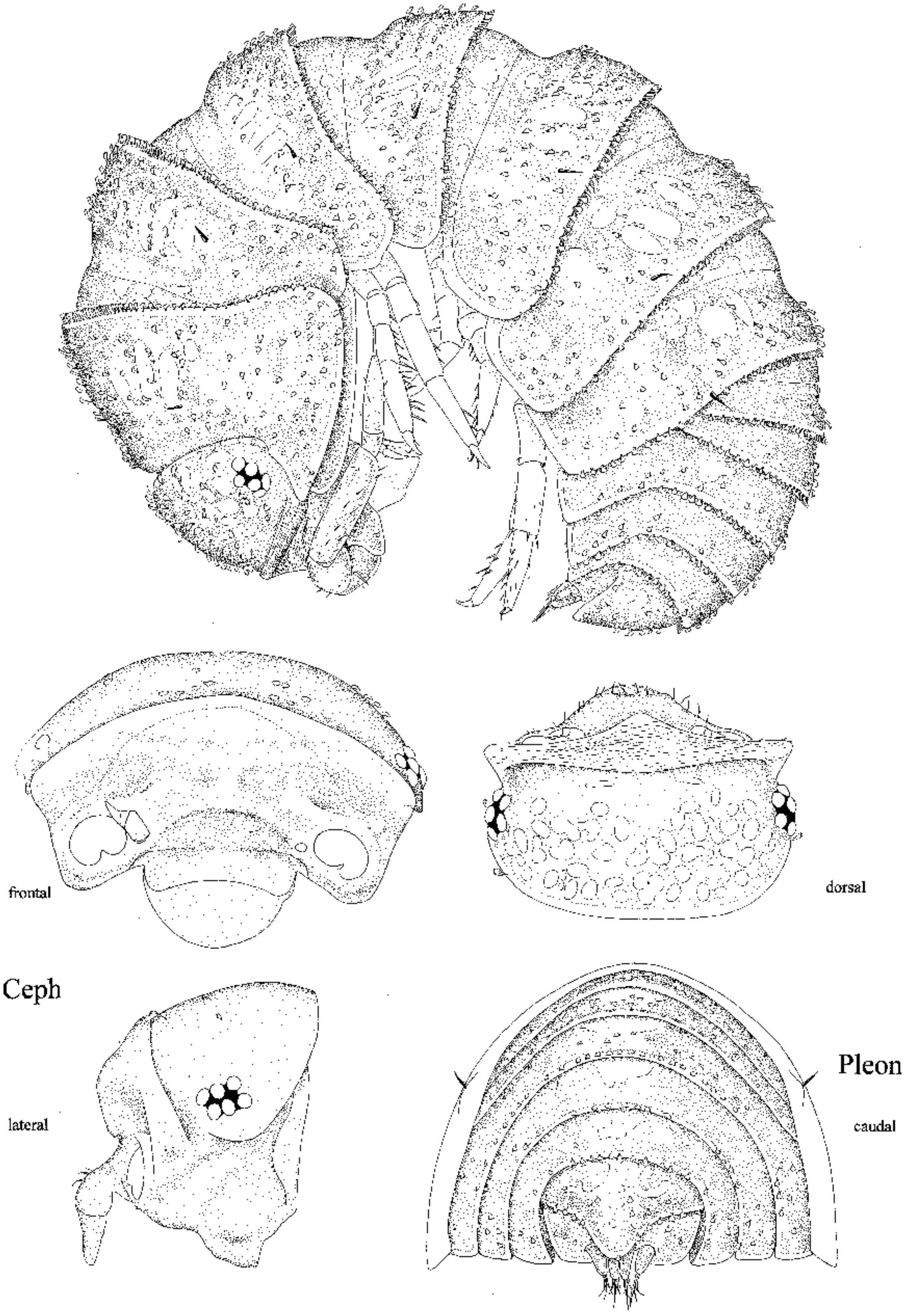

Figure 247. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♀, 2.4 × 1.0 mm, habitus lateral, pleon caudal/dorsal; ♀, 2.8 × 1.25 mm, cephalothorax frontal and lateral; ♂, 2.1 × 0.75 mm, cephalothorax dorsal (France, St Béat, leg. Ribaut, April 1939, MNHN) (the pleon is drawn in such a position that the pleotelson is seen in strictly dorsal view).

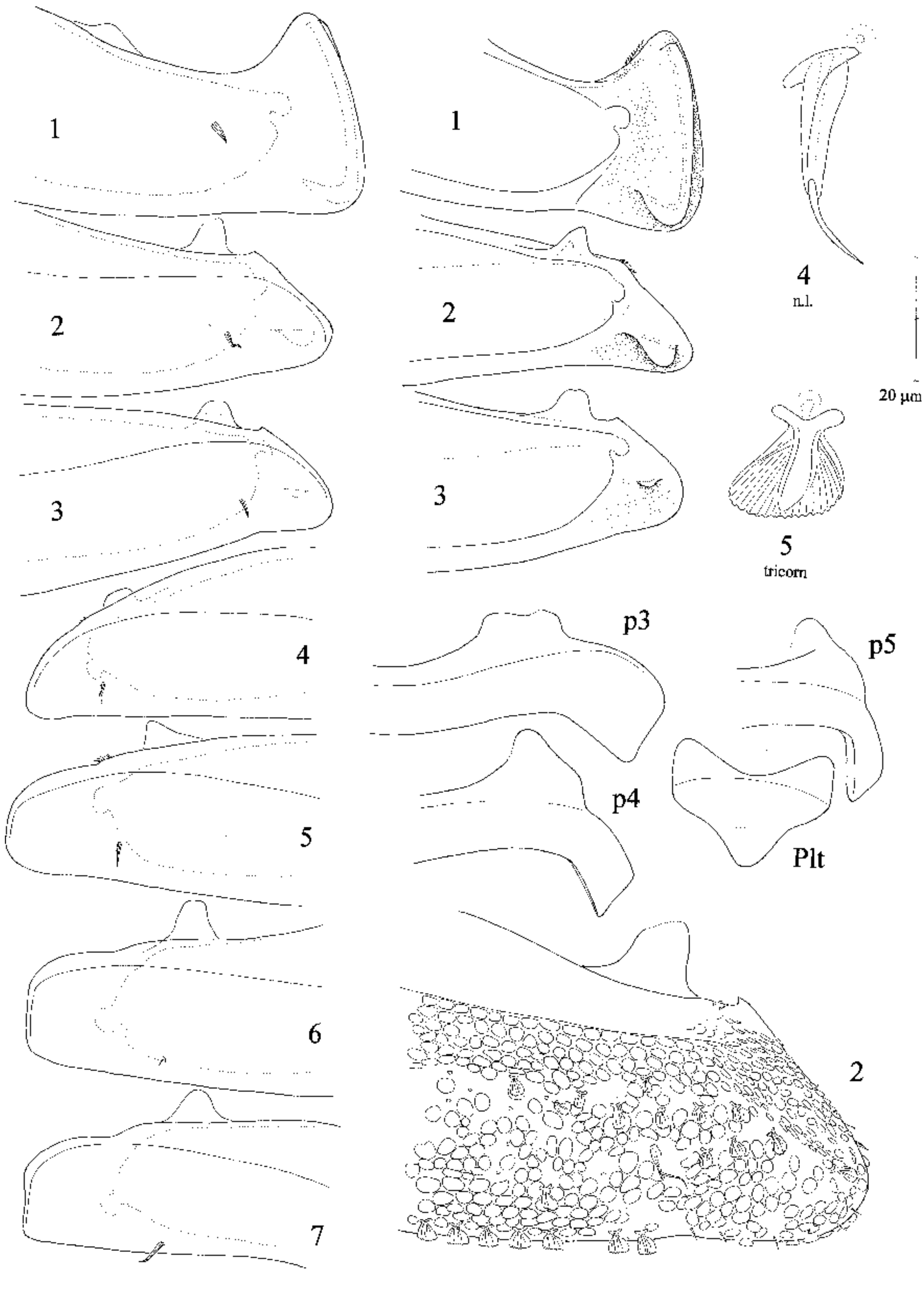

Figure 248. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, 2.1 × 0.75 mm, tergites (France, St Béat, leg. Ribaut, April 1939, MNHN).

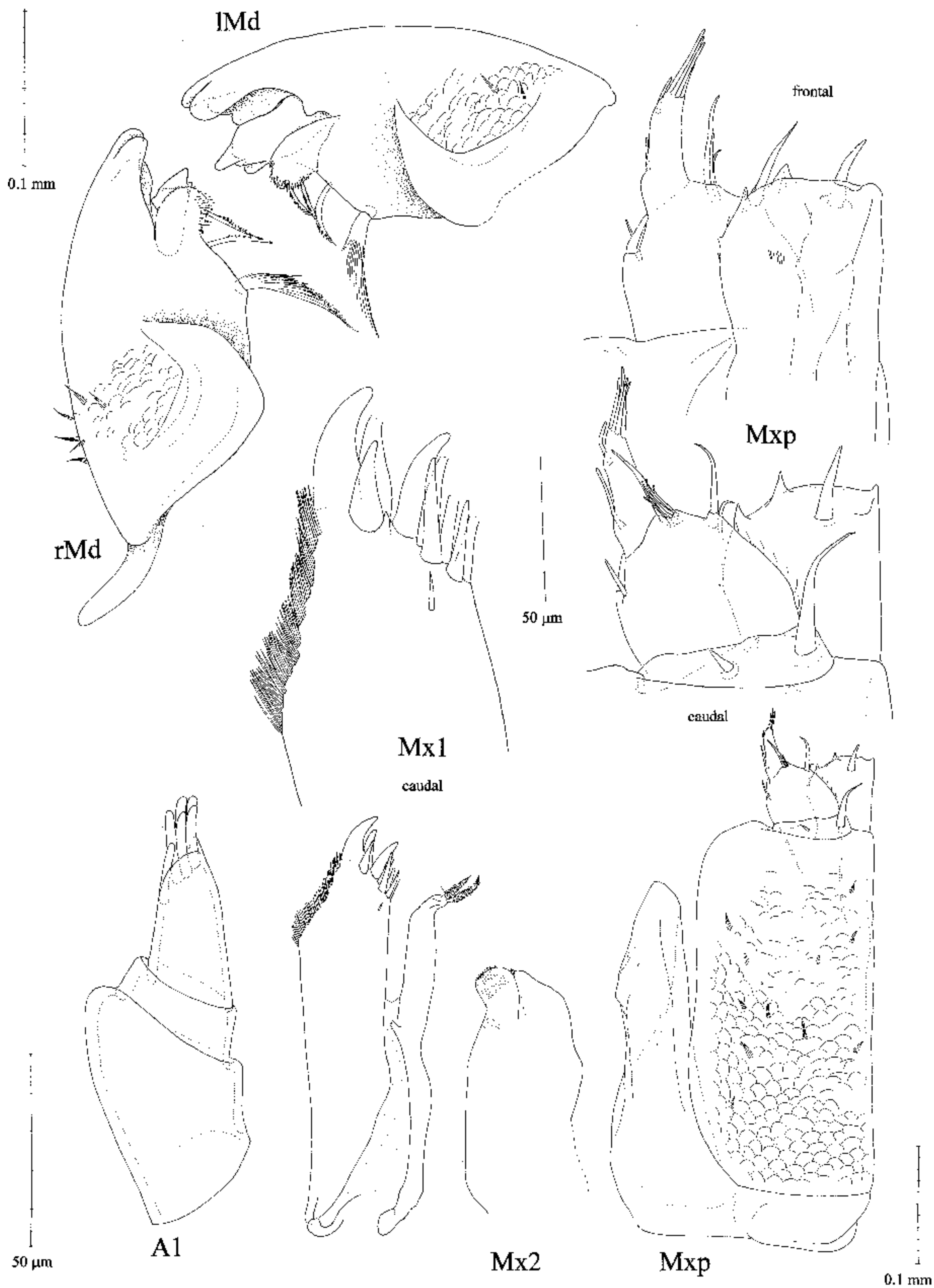

Figure 249. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, 2.1 × 0.75 mm, first antenna and mouthparts (France, St Béat, leg. Ribaut, April 1939, MNHN).

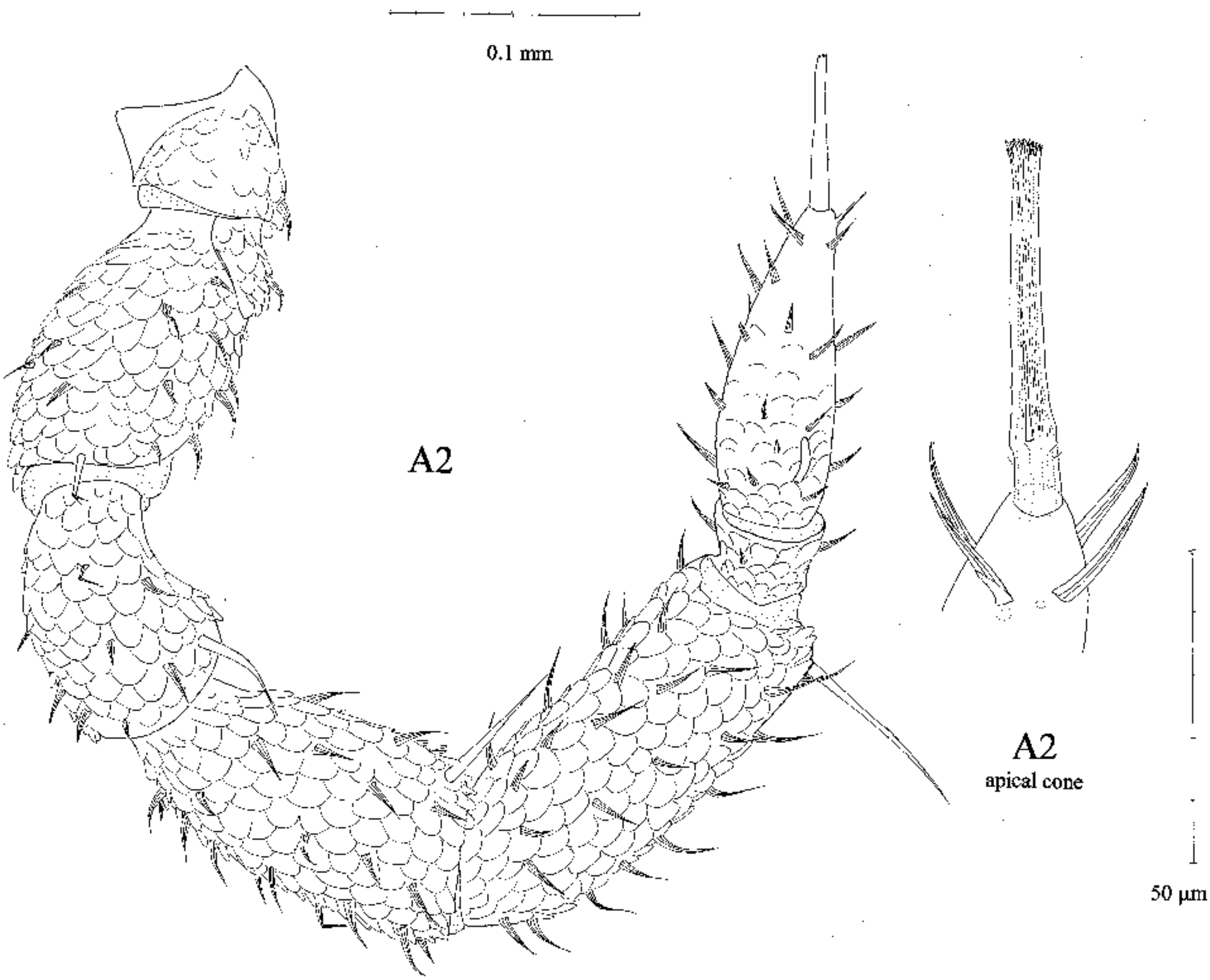

Figure 250. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, 2.1 × 0.75 mm, second antenna (France, St Béat, leg. Ribaut, April 1939, MNHN).

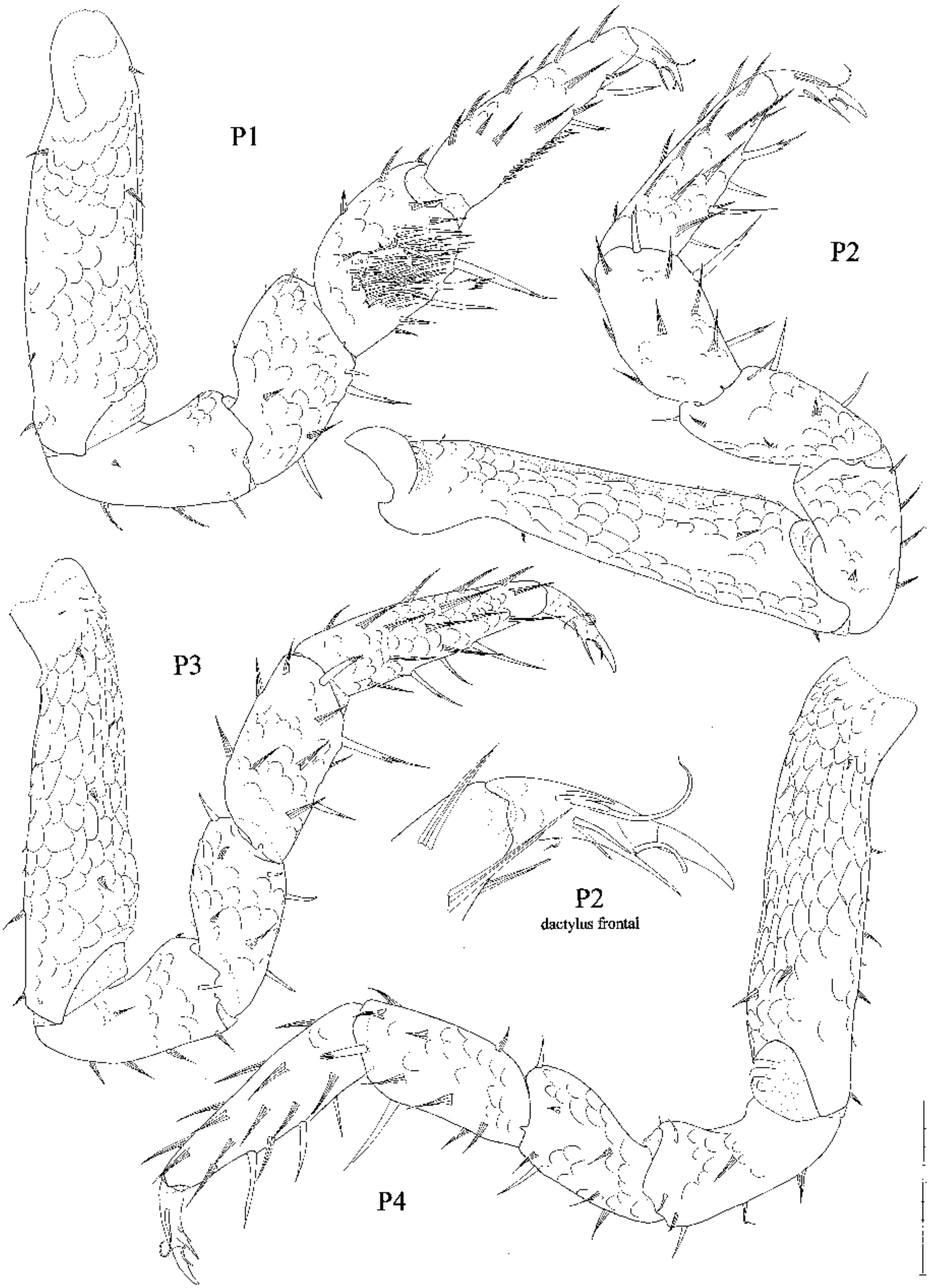

Figure 251. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, 2.1 × 0.75 mm, pereiopods 1–4, frontal view (France, St Béat, leg. Ribaut, April 1939, MNHN).

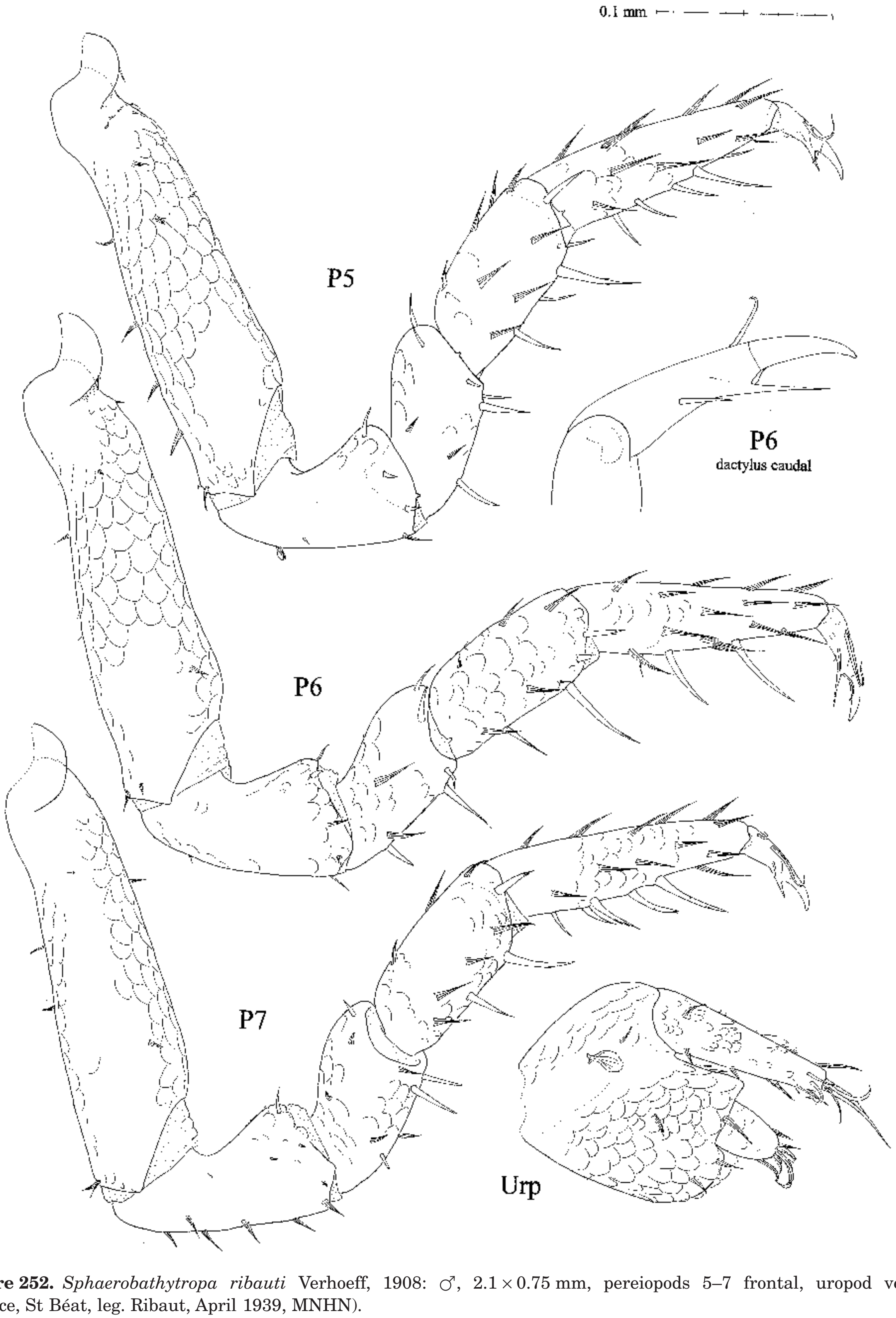

Figure 252. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, 2.1 × 0.75 mm, pereiopods 5–7 frontal, uropod ventral (France, St Béat, leg. Ribaut, April 1939, MNHN).

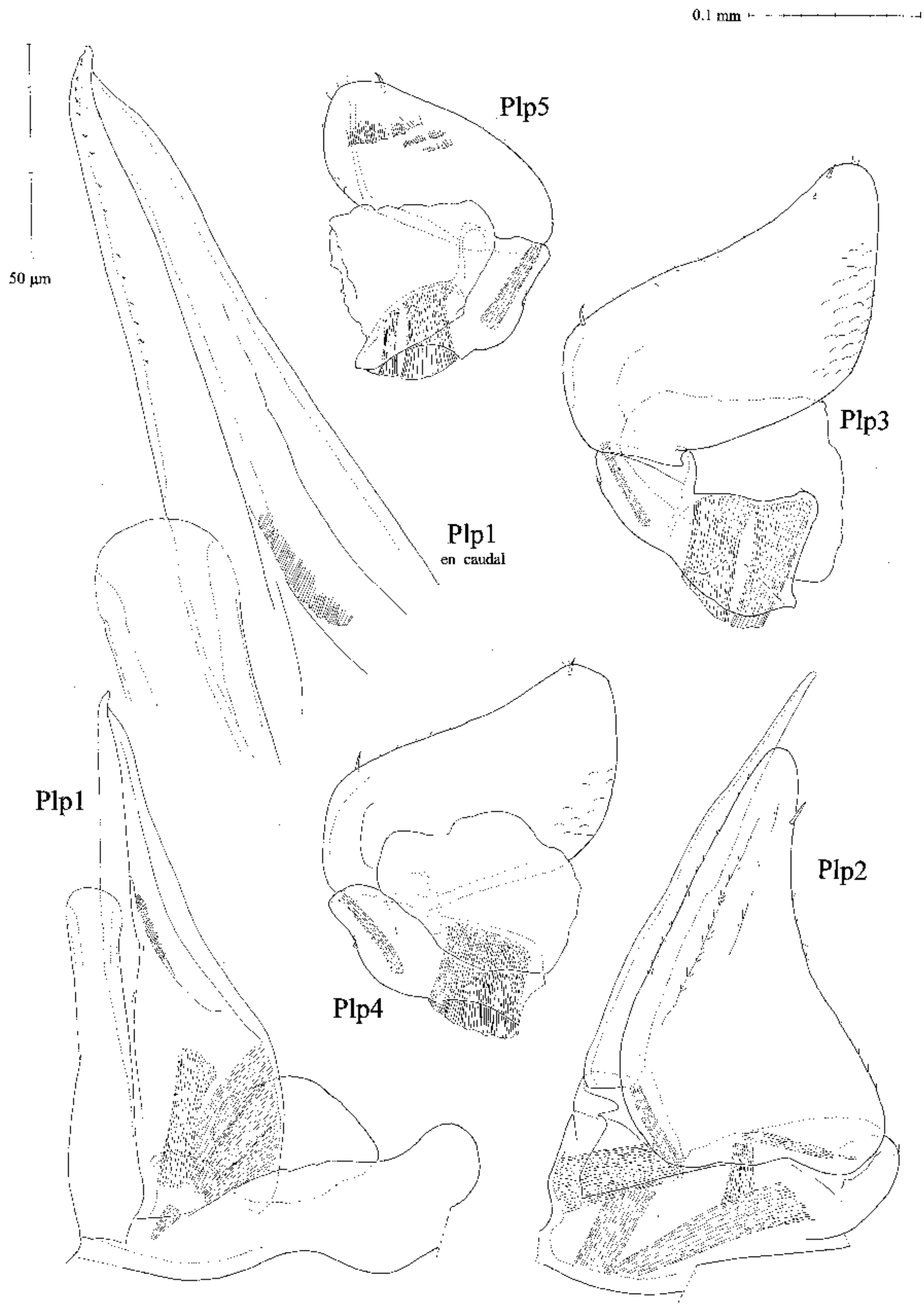

Figure 253. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, 2.1 × 0.75 mm, pleopods 1, 4 and 5 caudal, pleopods 3 and 4 frontal (France, St Béat, leg. Ribaut, April 1939, MNHN).

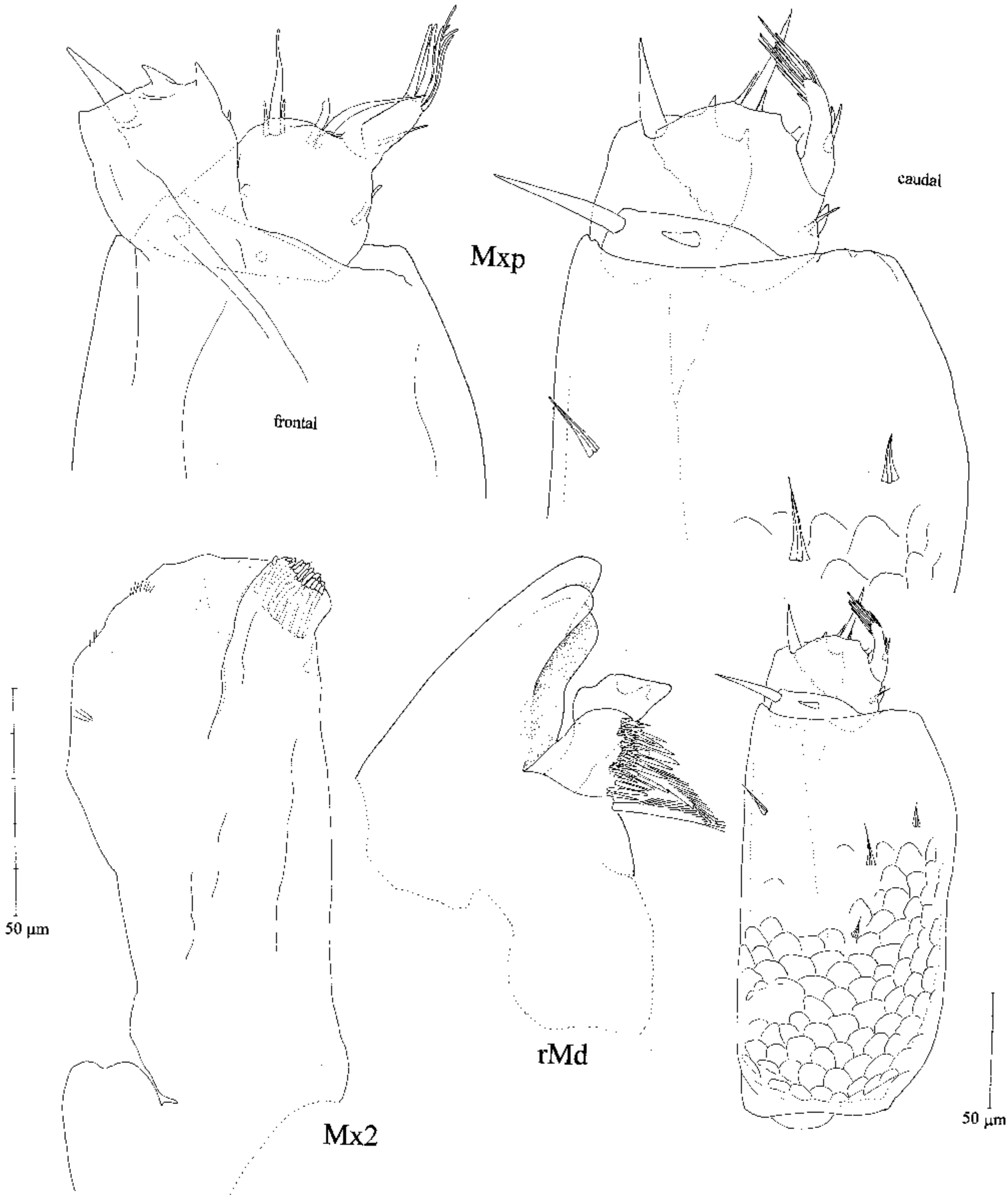

Figure 254. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, holotype of *Sphaerobathytropa antarctica* Vandel, 1963, distal part of right mandible, maxilliped and second maxilla.

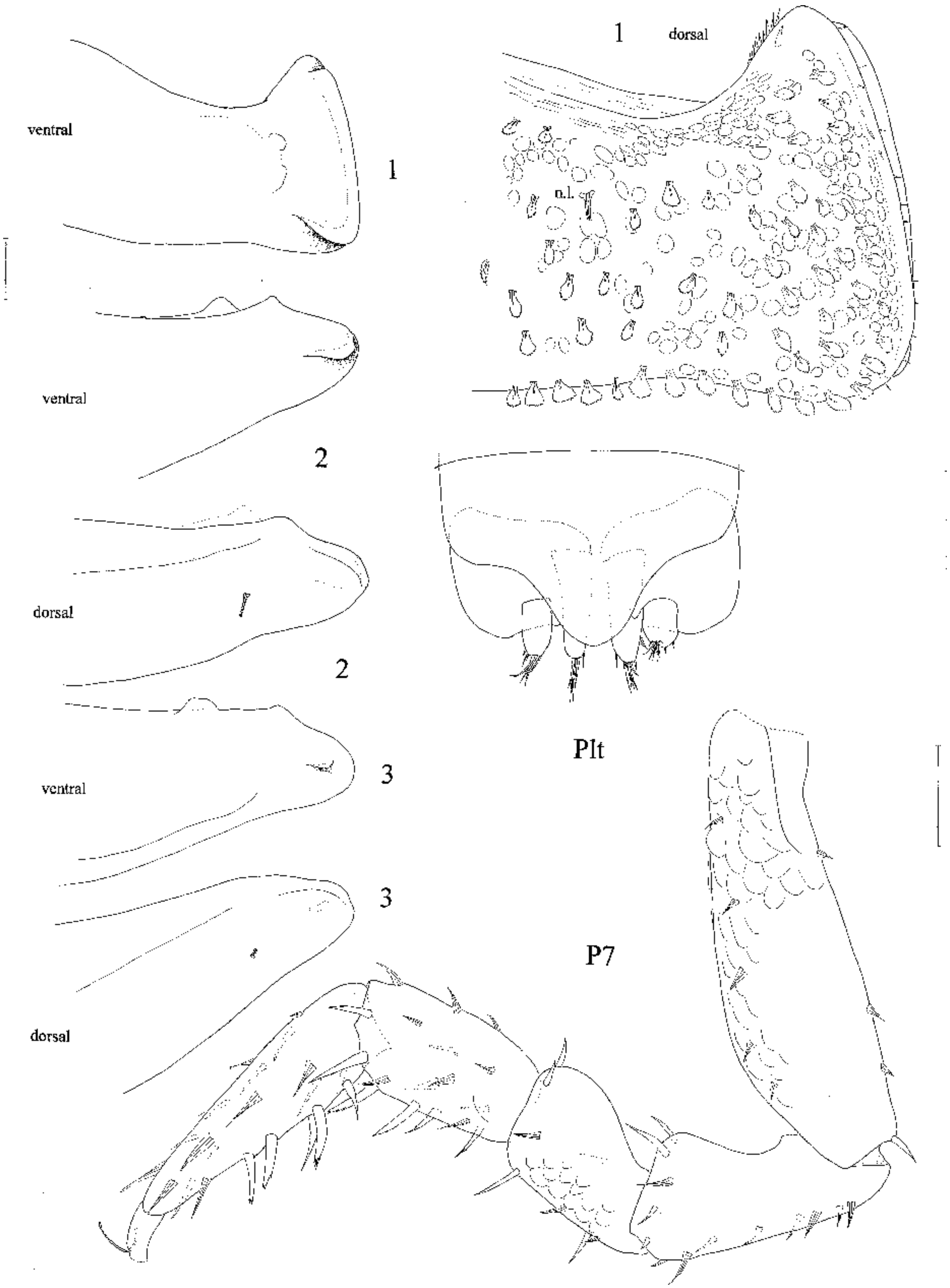

Figure 255. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, holotype of *Sphaerobathytropa antarctica* Vandel, 1963, coxal plates 1–3, pleotelson and uropods, pereiopod 7.

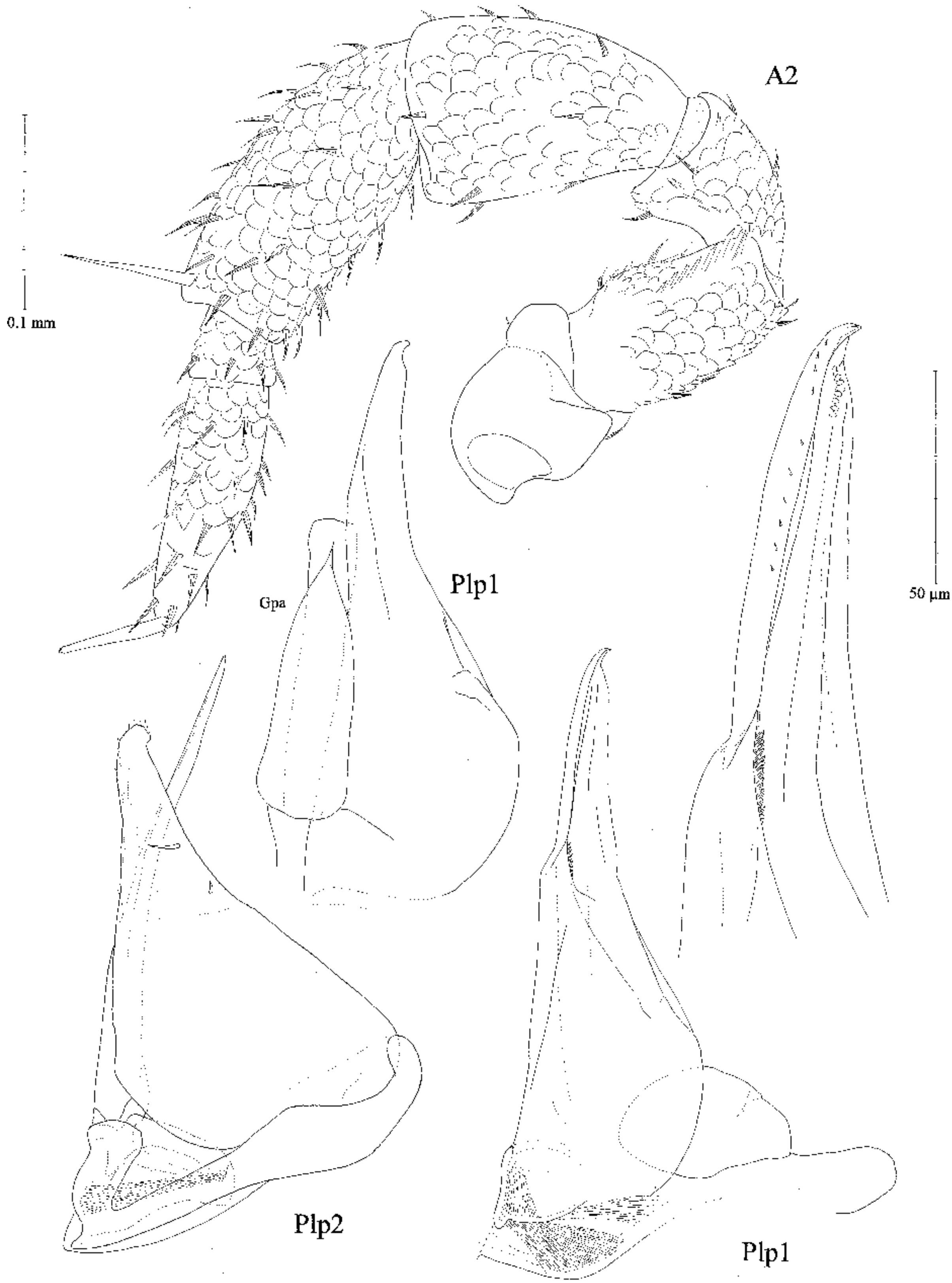

Figure 256. *Sphaerobathytropa ribauti* Verhoeff, 1908: ♂, holotype of *Sphaerobathytropa antarctica* Vandel, 1963, pleopods 1 and 2, second antenna.

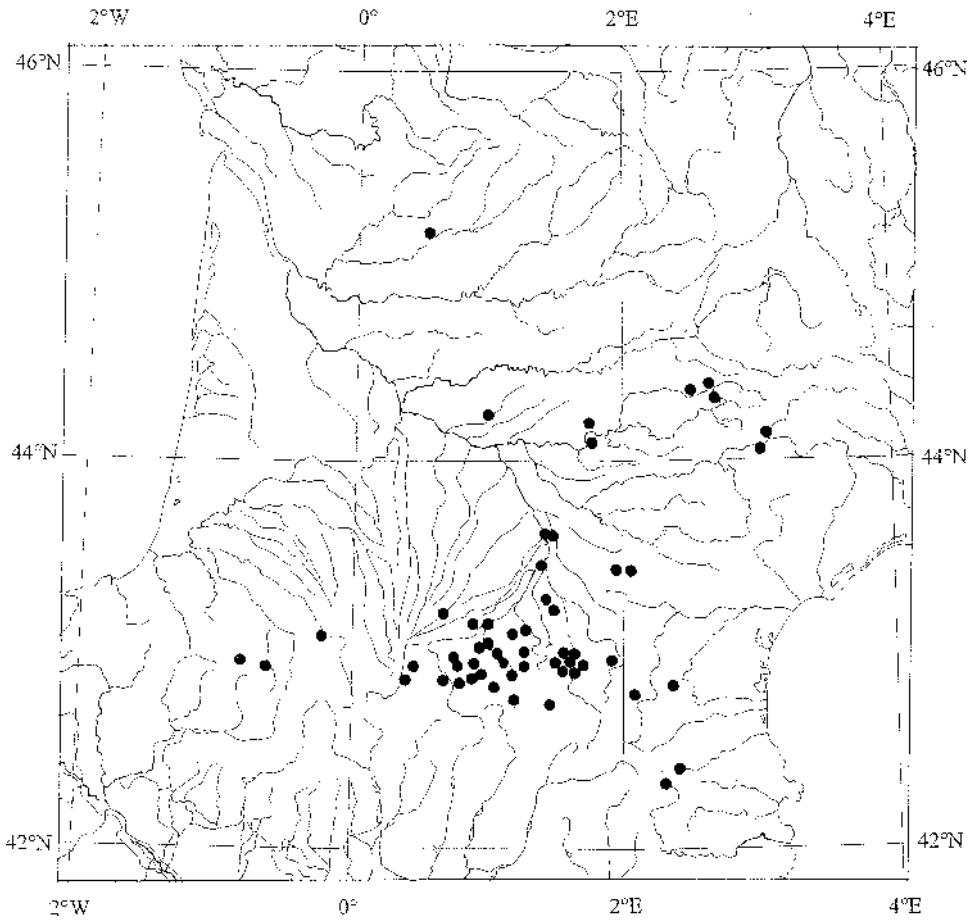

Figure 257. Geographical distribution of *Sphaerobathytropa ribauti*, according to the literature [based on the map given by Vandel (1962a)]; specimens from only three or four locations had been examined.