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Elinai dos Santos Silva

TAXONOMY AND GEOGRAPHIC DISTRIBUTION OF THE ISCHNOMESIDAE FAMILY (CRUSTACEA, ISOPODA) FROM BRAZILIAN DEEP SEA

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BY

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"Quem caminha sozinho pode até chegar mais rápido, mas aquele que vai acompanhado, com certeza vai mais longe."

Clarice Lispector

Abstract

The family Ischnomesidae belongs to the order Isopoda; they are marine benthic animals, essentially from the deep sea, and distributed all around the world. They are included in the suborder Asellota, and presents distinctive features diagnostic such as pereonite V elongated in relation to the others and the completely immobile head, fused to the pereonite I. The main objective of this study was to make a taxonomic and geographic distribution of the family Ischnomesidae from the Brazilian deep sea, through the identification and description of the species found in this region. The material examined was collected during oceanographic campaigns coordinated by Petrobrás in three Brazilian's sedimentary Basins: Alagoas-Sergipe Basin, Espírito Santo and Campos Basin. The specimens are deposited in the crustacean collections of the "Universidade Federal de Pernambuco" (UFPE), "Universidade Federal de Sergipe" (UFS) and "Museu Nacional do Rio de Janeiro" (MNRJ). The specimens were dissected and drawn using a microscope with a slide. The specimens were stained in Clorazol Black and their parts were mounted on semi-permanent slides with gelatin-glycerinated. The digital drawings were made in CorelDRAW® X7 graphics program. As result, five new species were found for science and a new genus: *Ischnomesus* sp. nov. 1, *Ischnomesus* sp. nov. 2, *Ischnomesus* sp. nov. 3, *Gracilimesus* sp. nov. and Ischnomesidae gen. nov. et sp. nov. In addition, the discovery of these species permitted to register new occurences for the genera: *Ischnomesus* and *Gracilimesus* for South Atlentic. The discovery of the new genus brought a new diagnosis to the family, with the addition of biramaous uropods, never before described for the group. The new genus also presents the body surface covered with small setae; antennula with 6 articles; pereonites V-VII, pleonite 1 and pleotelson freely articulated. The species with the widest geographic distribution was *Gracilimesus* sp. nov. found in all Basins studied. The species with restrict geographic distribution were *Ischnomesus* sp. nov. 1 (Espírito Santo Basin and Campos) and *Ischnomesus* sp. nov. 2 (Espírito Santo Basin and Alagoas-Sergipe).

Keywords: New genus. New species. *Haplomesus*. *Gracilimesus*. Marine benthos fauna.

Resumo

A família Ischnomesidae faz parte da ordem Isopoda; são animais bentônicos marinhos, essencialmente habitantes de mares profundos, encontrados no mundo todo. Pertencem a subordem Asellota e apresentam como principais características diagnósticas o pereonito V alongado em relação aos demais e a cabeça completamente imóvel, fundida ao pereonito I. O presente trabalho teve como objetivo estudar a taxonomia e distribuição geográfica da família Ischnomesidae na região de mar profundo brasileiro, através da identificação e descrição das espécies encontradas nesta região. O material examinado foi coletado através de campanhas oceanográficas realizadas pela Petrobrás em três bacias sedimentares brasileiras: Bacia Alagoas-Sergipe, Espírito Santo e Campos. Os espécimes foram dissecados e desenhados com auxílio de um microscópio com câmara clara acoplada, as peças dissecadas foram montadas em lâminas semi-permanentes com gelatina glicerinada. Os desenhos vetorizados foram confeccionados no programa gráfico CorelDRAW® X7. Este é o primeiro estudo com a família Ischnomesidae no Brasil, trazendo a descrição de cinco espécies novas para a ciência e um novo gênero: *Ischnomesus* sp. nov. 1, *Ischnomesus* sp. nov. 2, *Ischnomesus* sp. nov. 3, *Gracilimesus* sp. nov. e Ischnomesidae gen. nov. et sp. nov. Com a descoberta dessas espécies houve também o aumento da distribuição dos gêneros *Ischnomesus* e *Gracilimesus* para o Atlântico Sul. A descoberta do novo gênero ampliou a diagnose da família, com o acréscimo de urópodos birremes, nunca antes descritos para o grupo. O novo gênero também apresenta o corpo coberto com pequenas cerdas; antênula com 6 artículos; divisão entre todos os segmentos posteriores, assim como visto no gênero *Ischnomesus*. A espécie com maior distribuição geográfica foi a *Gracilimesus* sp. nov., encontrada em todas as bacias sedimentares estudadas. As espécies com menor distribuição geográfica foram: *Ischnomesus* sp. nov. 1 (Bacia do Espírito Santo e Campos) e *Ischnomesus* sp. nov. 2 (Bacia do Espírito Santo e Alagoas-Sergipe). Quanto a distribuição batimétrica a espécie com maior variação foi a *Gracilimesus* sp. nov. (400 – 1900 m) e a espécie com menor variação foi *Ischnomesus* sp. nov. 1 (750 – 1050 m).

Palavras chaves: Novo gênero. Nova espécie. *Haplomesus*. *Gracilimesus*. Fauna bentônica.

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Summary

1. Introduction

The order Isopoda is one of the most diverse group of crustaceans, in terms of morphology and in numbers of described species. With more than 10,300 species, this group is found in all ecosystems from the deepest oceans to the montane terrestrial habitats (Wilson, 2008; Poore and Bruce, 2012). They belong to the superorder Peracarida, which is characterized by the presence of a marsupial pouch located in the ventral region of the organism, where the eggs are hatched (Kavanagh, 2009).

This is the most recent and accepted classification for Isopoda was performed by Brandt and Poore (2003), based on cladistics analyses, showed that Isopoda is subdivided into 12 suborders, the result of its great morphological and adaptive diversity. The suborders are: Anthuridea Leach, 1914; Asellota Latreille, 1803; Calabozoidea Van Lieshout, 1983; Cymothoida Waegele, 1989; Limnoriidea Brandt and Poore, 2002; Microcerberidea Lang, 1960; Oniscidea Latreille, 1802; Phreatoicidea Stebbing, 1893; Phoratopidea Brandt and Poore, 2003; Sphaeromatidea Waegele, 1989; Tainisopidea Brandt and Poore, 2003; Valvifera Sars, 1882.

Isopoda constitutes an important component in the deep sea macrofaunal communities (Gage and Tyler, 1991). Most species belong to the suborder Asellota (Hessler *et al*., 1979; Wilson and Hessler, 1987), which is the most diversified group among the Isopoda, both at the family and species level, with more than 2,914 species being registered worldwide (Wilson, 1989). The Asellota present peculiar characteristics, such as: pleopod I absent in females; pleopod 2 fused in females forming an operculum; pleon rarely with two free pleonites plus pleotelson; uropods usually peduncular but may be reduced, birramous and unirramous, terminal or subterminal (Kensley and Schotte, 1989). Numerically, they dominate the fauna of deep sea crustaceans, being one of the most successful and diverse group in this ecosystem (Wilson, 1989). It currently comprises 23 accepted families (Schotte *et al.*, 2013; Riehl, 2014) plus seven genera with uncertain affinities (Wilson, 2013).

The deep sea is the largest ecosystem on the Earth and is largely unexplored (Llodra and Billett, 2006). Consequently, very little is still known regarding the basic ecology information for most species, such as: life style, reproduction strategies, feeding habits, life cycle, etc. Deep sea Isopoda have common behavior like grooming, especially keeping the flagellum of antennae clean, respiratory movement, ability to burrow and

general mobility (Hessler and Strömberg, 1989). About the Asellota's feeding, Menzies (1962) observed that the most species are deposit feeder, and among them, was possible to note that some seemed to accumulate small particles of nearly uniform size. These were called “Particle Size Selective Deposit Feeders”; whereas, others had particles of considerable size range in their digestive tracts suggesting indiscriminate particle size feeding (Menzies, 1962).

The family Ischnomesidae Hansen, 1916 typically marine benthic environmental, they are mostly found in the deep sea, between 274 – 9,043 m depth (Menzies, 1962; Kavanagh and Wilson, 2007). Althout this family has been found mostly in the deep sea, Brandt *et al.* (2015) have reported the occurrence of the species *Ischnomesus bispinosus* (Sars, 1866) in shallow water, 10 m, at Christiania Fjord (Oslo, Norway). As a result, there was an increase in the vertical distribution for the family of 10 – 9,043 m.

The Ischnomesidae species are considered excellent walkers, the length and orientation of their pereopods (II–VI) permit to move rapidly on jumbled surfaces, as well as across smooth seabed, and they also can use the anterior pereopods (PI) to make permanent burrows (Hessler and Strömberg 1989). Thistle and Wilson (1987) classified Ischnnomesidae as infaunal, but the mobility of these isopods also enable to explore a variety of epibenthic habitats. For example, the species *Heteromesus frigidus* Hansen, 1916 lives on the sediment or may even clings on to larger animals, such as sponges or agglutinating Foraminifera. The species *H. oryktus* Cunha and Wilson, 2006 was found on the Foraminifera *Bathysiphon rusticus* Folin, 1886 (Gooday 1984; Hessler and Strömberg 1989), that commonly inhabitat the bottom at bathyal and abyssal depths.

Concerning the Ischnomesidae feeding behavior, few direct observations are available. Sokolova (1958) was the first to examine the gut content of a few unidentified ischnomesid specimens and classified them as true selective deposit feeders. Menzies (1962) examined the hindgut content of four abyssal *Ischnomesus* Richardson, 1908 species (*I. decemspinosus* Menzies 1962, *I. elegans* Menzies 1962, *I. simplissimus* Menzies 1962, *I. wolffi* Menzies 1962) and classified the species as deposit feeders, more or less selective. Hessler and Strömberg (1989) attempted unsuccessfully to feed specimens of *I. bispinosus* (Sars, 1866) with mussel meat, they were attracted but did not eat. Mahaut (1991) classified 16 bathyal ischnomesid species from the Meriadzek Terrace as deposit feeders (including *I. caribbicus* Menzies 1962, *I. profundus* Hansen, 1916 and *I. roseus* Wolff, 1962). Kavanagh *et al.* (2015) also suggest that *I. harrietae* is a deposit

feeder, due to its morphology, habitat and hindgut content, probably collecting organic particles sedimented on the bottom with its pereopods I and also consuming adsorbed organic matter and bacterial populations associated with the ingested bottom sediment particles.

The family Ischnomesidae was erected by Hansen (1916), as the group Ischnomesini, and later became the family Ischnomesidae (Gurjanova, 1932). The first genus described was the genus *Ischnosoma* Sars, 1866 through the type species *Ischnosoma bisphiosum*. It was described before the family Ischnomesidae, since it belonged to the family Desmosomidae Sars 1866, later accepted as Desmosomatidae Sars, 1897. Richardson (1908), replaced this name to *Ischnomesus*, because *Ischnosoma* was preoccupied, having been used for a genus of fishes in 1829, and in 1832 for Coleoptera (Richardson, 1908).

After the genus *Ischnomesus,* Richardson, 1908, described other three genera: *Haplomesus*, *Heteromesus* and *Rhabdomesus*. In 1956, Wolff described the genus *Stylomesus* and in 1962, described the genus *Bactromesus*, *Gomphomesus*, *Helomesus* and *Mixomesus*. After the description of these genera, only in 2007, Kavanagh and Wilson described the genera *Contrarimesus*, *Cornuamesus*, *Fortimesus* and *Gracilimesus*.

Wolff (1962) described the genera *Gomphomesus* and *Helomesus*, which were synonimized as *Stylomesus,* by Birstein, 1960 and Kussakin, 1988, respectively. Another modification realized was with the genus *Rhabdomesus* described by Richardson, 1908 and synonymised by Wolff (1956) as *Stylomesus*.

Kavanagh and Wilson (2007) reviewed the genus *Haplomesus* with the purpose of organizing the information that were not properly employed by previous authors; mainly due the poor condition of the type material and even the lack of knowledge regarding the main characteristics of the group. This review resulted in four new genera: *Contrarimesus, Cornuamesus, Fortimesus* and *Gracilimesus*, showing that several characters were not considered. Besides the changes related with the genus *Haplomesus*, some species were also synonymized and demoted: *Ischnomesus curtispinis* Brandt, 1992 transferred to *Contrarimesus curtispinis* (Brandt, 1992); *Ischnomesus gracilis* Chardy, 1974 demoted to *Ischnomesus chardyi* Kussakin, 1988; *Ischnomesus hessleri* Kussakin, 1988 demoted to *Ischnomesus norvegicus* Svavarsson, 1984; *Heteromesus thomsoni* (Beddard, 1886) transferred to *Fortimesus thomsoni* (Beddard, 1886).

Nowadays there are nine genera and 106 species belonging to the family Ischnomesidae: *Contrarimesus* Kavanagh and Wilson, 2007; *Cornuamesus* Kavanagh and Wilson, 2007; *Fortimesus* Kavanagh and Wilson, 2007; *Gracilimesus* Kavanagh and Wilson, 2007; *Haplomesus* Richardson, 1908; *Heteromesus* Richardson, 1908; *Ischnomesus* Richardson, 1908; *Mixomesus* Wolff, 1962; *Stylomesus* Wolff, 1956 (Schotte *et al.*, 2007).

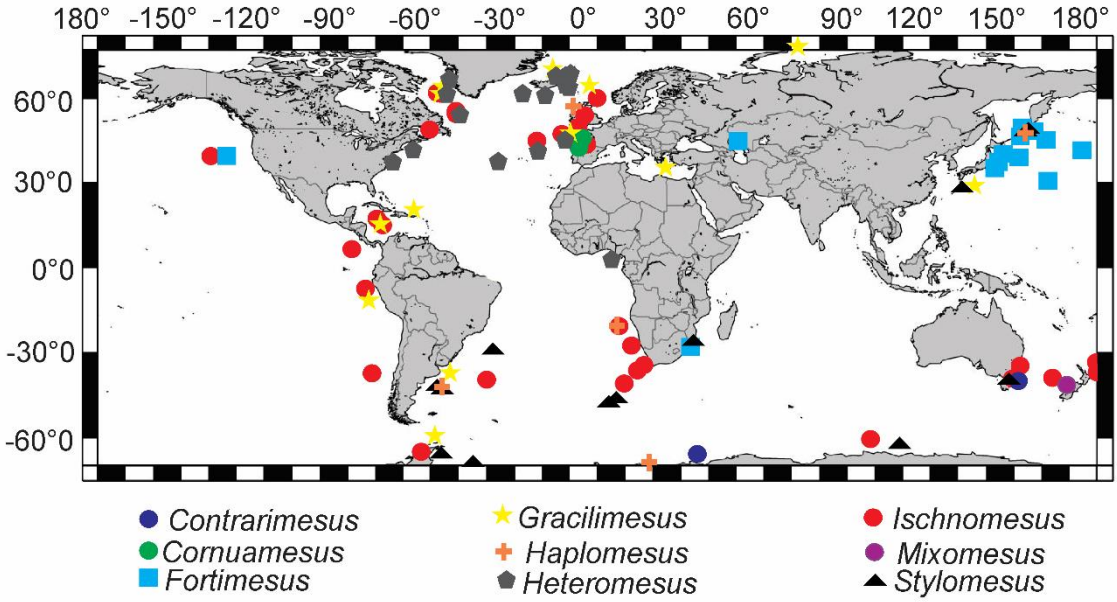
The family Ischnomesidae forms a very peculiar group within the suborder Asellota (Wolff, 1962). One of the most distinctive features of Ischnomesidae is the elongate pereonite V and is the unique family in the suborder with the head completely immobile fused to pereonite I (Hansen, 1916; Merrin and Poore, 2003). In addition, this family has absent eyes, uropods with styled shape, except for *Mixomesus*, which not have this structure (Wolf, 1962; Brandt et al., 2015), pleopods, 3 and 4 form gills and are covered by two opercular pleopods, being this characteristic common among Asellota (Kensley and Schotte, 1989).

According to Kavanagh and Wilson (2007) the degree of fusion in the posterior pereonites, pleonites and pleotelson is the most important feature to define genera in Ischnomesidae. In the genus *Ischnomesus* all the pereonites are freely articulated and the pleonite 1 also freely articulated with the pleotelson. The opposed situation occurs with the genera: *Haplomesus*, *Cornuamesus*, *Contrarimesus*, *Fortimesus* and *Gracilimesus* where posterior pereonites, pleonite 1 and pleotelson are fused. *Stylomesus* and *Heteromesus*, pereonite V is freely articulating with pereonite VI. The genus *Stylomesus* has an intermediate degree of fusion with pereonite VII, the pleonites and the pleotelson are fused together, whereas *Heteromesus* have free articulation just pereonite V and VI, pereonite VII, pleonite and pleotelson are fused (Wolff, 1962; Kavanagh and Wilson, 2007). As for the genus *Mixomesus* Wolff (1962) explains that the degree of fusion in the posterior segments is not clear, due to poor condition of the material. Still according to this author, this genus probably has freely articulation between all segments, like *Ischnomesus*. However, new specimens and species are needed to confirm the status of genus (Kavanagh and Wilson, 2007).

The main contributions to the studies regarding Ischnomesidae family were performed by Sars (1866), Hansen (1916), Wolff (1956, 1962), Brandt (1992, 2015), Cunha and Wilson (2006), Kavanagh (2009), Kavanagh and Sorbe (2006), Kavanagh and Wilson (2007), Kavanagh *et al.* (2015), among others, who dedicate themselves to

studying not only the family, but also a large number of marine Isopoda around the world. The following map shows a more illustrative way the geographic distribution of the genera of the family Ischnomesidae in the world (fig.1).

Figure 1. Geographic distribution of the family Ischnomesidae in the world. Map produced through Geomar online.



Fonte: A autora.

The genus *Mixomesus* is a monotypic genus and after the original description no register in other localities than the type locality (Tasmania Sea) were reported. The genus *Contrarimesus* is known only in Polar waters and South Pacific. It has a restricted distribution, like the genus *Cornuamesus*, which is just known in Bay of Biscay and North Atlantic. Both genera have only two species described. The genus *Haplomesus* has five species and it can be found in Atlantic, North Pacific and Antarctica Oceans. The genus *Fortimesus* is composed by 10 species and is distributed in North Pacific, Indian and Carpian Sea. *Gracilimesus*, composed by 11 species, is found in Atlantic, Pacific and Polar waters. The genus *Heteromesus* is composed by 16 species, it can be found only in North Atlantic and East South Atlantic Oceans. *Stylomesus* is composed by 20 species distributed in South Atlantic, North Pacific, Antarctic Oceans and Tasmania sea. The genus *Ischnomesus* it is the genus with the highest number of species described, 38 in

total, and it is a genus widely distributed found in Atlantic Ocean, Pacific and in Polar waters.

Up to date, there are no studies for the family in Brazilian waters, and in fact, few studies are focused on marine deep sea isopods in the country. Although Brazil has a great diversity, little is still known about its fauna of deep sea crustaceans. This will change with the training of professionals who dedicate themselves to the study of these organisms, together with the increase of collection effort. Thus, the present study aimed to study the taxonomy and geographic distribution of the family Ischnomesidae, through the material of different environmental monitoring and characterization campaigns realized by Petrobrás, in different years, in three Brazilian sedimentary Basins.

The results present of the dissertation is divided in two chapters and each chapter is referent to a paper. The chapter I have been already submitted to Zootaxa journal (ISSN 1175-5326) and the chapter II will be submitted to Crustaceana Journal. The first chapter with the description of three new species of the genus *Ischnomesus* from Brazilian deep waters. The second chapter is related to the description of two new species and a new genus of the family Ischnomesidae from Brazilian deep sea.

2. Objectives

2.1. General

To study the taxonomy and geographic distribution of the family Ischnomesidae in Brazilian deep sea, collected by Petrobrás through of different environmental monitoring and characterization campaigns in three Brazilian sedimentary Basins: Alagoas-Sergipe, Espírito Santo and Campos.

2.2. Specifics

a) To analyze species of the family Ischnomesidae from Brazil.
b) To describe possible new species for science.
c) To illustrate the species
d) To report possible new occurrences
e) To analyze the geographic distribution of the family Ischnomesidae in Brazilian waters
f) To confection maps of geographic distribution of the species

3. Material and Methods

Study area

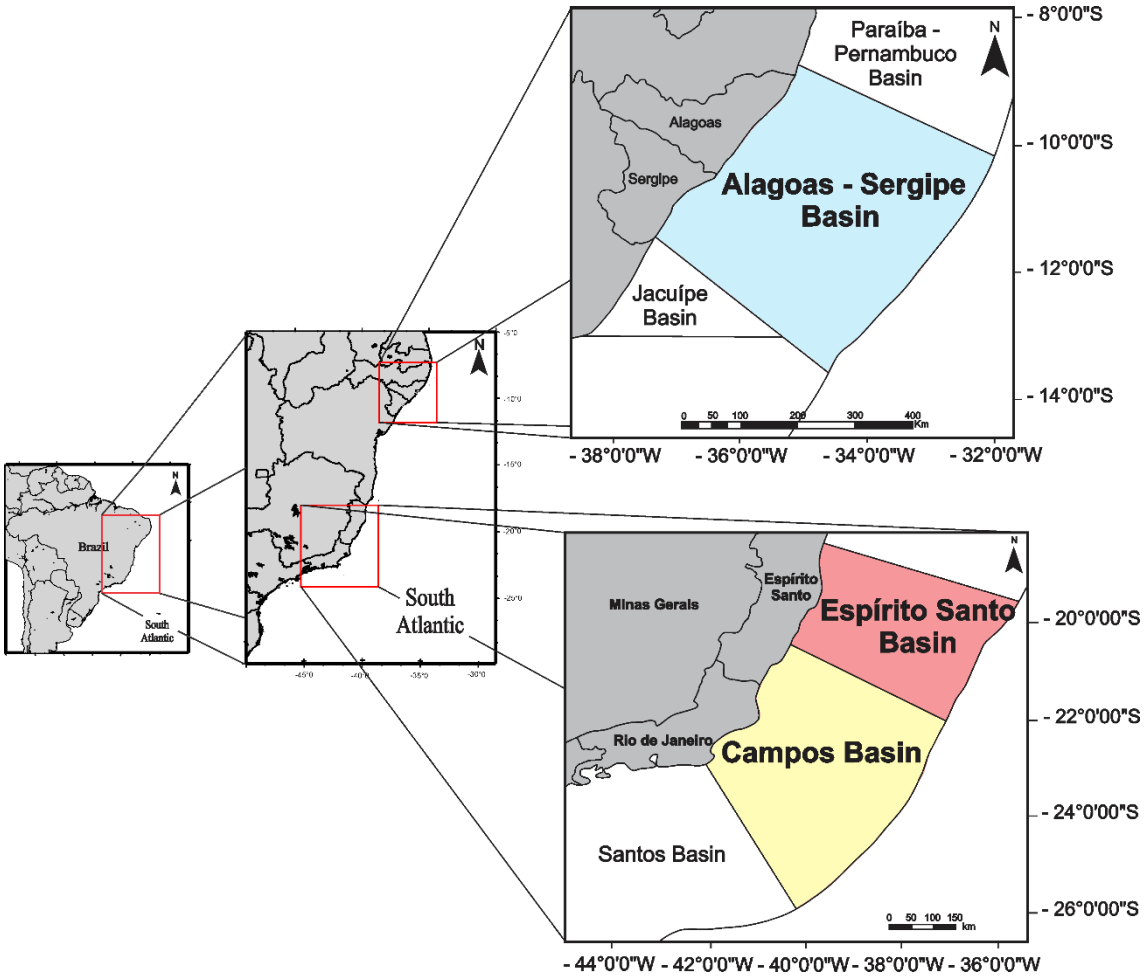
The specimens were collected from three Brazilian sedimentary Basins: Alagoas-Sergipe, Espírito Santo and Campos. All of these are areas of gas and oil exploration, including periodic reports of environmental monitoring and characterization realized by Petrobrás.

The Alagoas-Sergipe Basin is situated on the continental margin of northeastern Brazil, located in the states of Alagoas and Sergipe. It has a total area of 44,370 km², wich 31,750 km² corresponds to the bathymetric quota of 3,000 m depth. The north is limited to of Pernambuco-Paraíba Basin by the Alto de Maragogi, and to the south by Jacuípe Basin (Haeser, 2015) (fig.2).

The Espírito Santo Basin is located in the state of Espírito Santo, delimited to the south by the Campos Basin through the Alto de Vitória, and to the north by the Mucuri Basin. It has an exploitable area of approximately 41,500 km^2, which 3,000 km^2 refers to the terrestrial Basin, considering the eastern border coinciding with the continental/oceanic crust limit (France, 2007) (fig.2).

The Campos Basin is situated in the state of Rio de Janeiro, covering about 100,000 km^2, which only 500 km^2 is in emerged area. To the north, this Basin is partially isolated from the Espírito Santo Basin in the shallow water region by Alto de Vitória, a high basement block that coincides with the western termination of the Vitória-Trindade Chain. In deep waters, there is no effective separation between the Campos and Espírito Santo Basins (Milani *et al.*, 2000) (fig.2).

Figure 2. Map showing the Brazilian's sedimentary Basins of Alagoas-Sergipe, Espírito Santo and Campos. Map produced through Geomar online.



Fonte: A autora.

Collecting

The material was collected with box corer (50 x 50 x 50 cm) and 12 cores (10 x 10 x 10 cm) were placed in the central region for benthic macrofauna analyses. The sub-samples were stratified (layers 0-2, 2-5, 5-10 cm). Each one was placed in a plastic pot and fixed with 4% buffered formaldehyde solution. Afterwards, the pots were placed in thermal boxes, separately per station. After this, the material was sent to specialized laboratories, to sort and identification of the material. The laboratories of carcinology of the Universidade Federal de Pernambuco (UFPE), Sergipe (UFS) and Rio de Janeiro (UFRJ), received the material from the campaigns: Atex (UFPE), Astro Garoupa -

Campos Basin (UFRJ), Ext3Lead2 (UFPE), Lead Teg (UFPE), Marseal (UFS) and Seillean (UFPE).

Campaigns

The Marseal campaign was realized in Alagoas-Sergipe Basin, in 2013, on board of the R / V Seward Johnson. The Atex, Ext3Lead 2, Lead Teg and Seillean campaigns were realized in Espírito Santo Basin, between 2006-2008, on board of R/V Gyre, Company American Bureau of Shipping (ABS). The campaign realized in Campos Basin, in 2002/2003, on board of N/RB Astro Garoupa.

Laboratory Methodology

In the laboratories the material was sorted, identified and preserved in 75% etanol. Material was identified under stereomicroscope and optical microscope, using the specialized bibliography (e.g.: Wolff, 1956; 1962; Menzies, 1962; Kavanagh *et al.* 2006; Kavanagh *et al.* 2015). The drawings were made under a microscope with *camera lucida*, than vectorized in the graphic program CorelDRAW® X7, using digital table, according to adapted Coleman's techniques (2003).

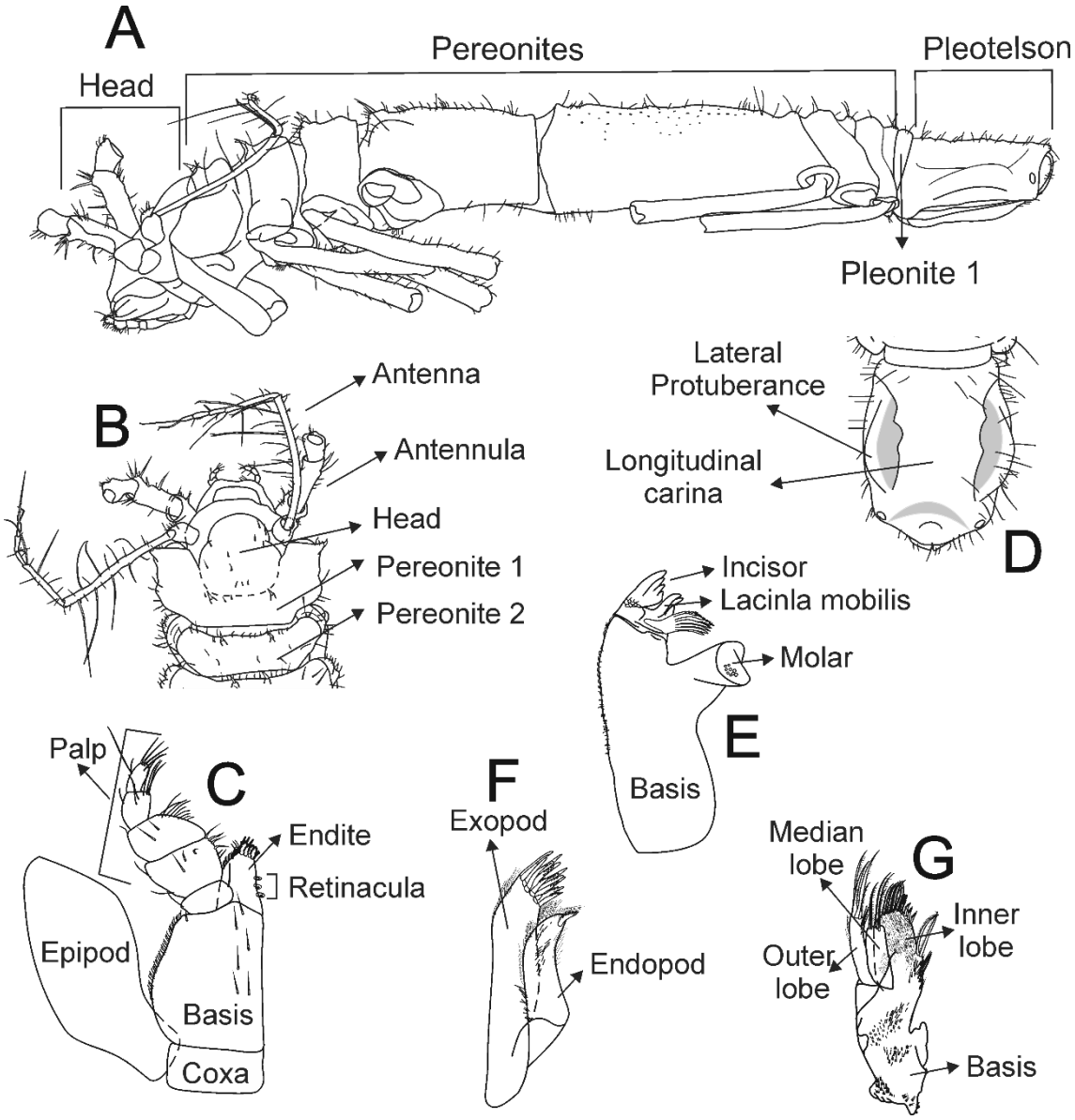
The most conserved specimens were drawn, dissected and mounted in glycerine gel slides. Each specimen was placed in a solution with 75% EtOH - 10% glycerine on a slide. Cover slides to draw the habitus (dorsal, lateral and ventral). After this step, the appendices were dissected and mounted on gelatin-glycerinated slide.

Species with male and female specimens were both drawn. When present, the pereopods were illustrated. When possible, the mancas were illustrated and the characters that different from the adults were also described. The nomenclature adopted for the description (morphological terminology) was based on: Kavanagh and Wilson (2007); Kavanagh *et al.* (2015) and the nomenclature adopted for mouthparts follows Brökeland and Brandt (2004) (figs. 3 and 4).

Maps

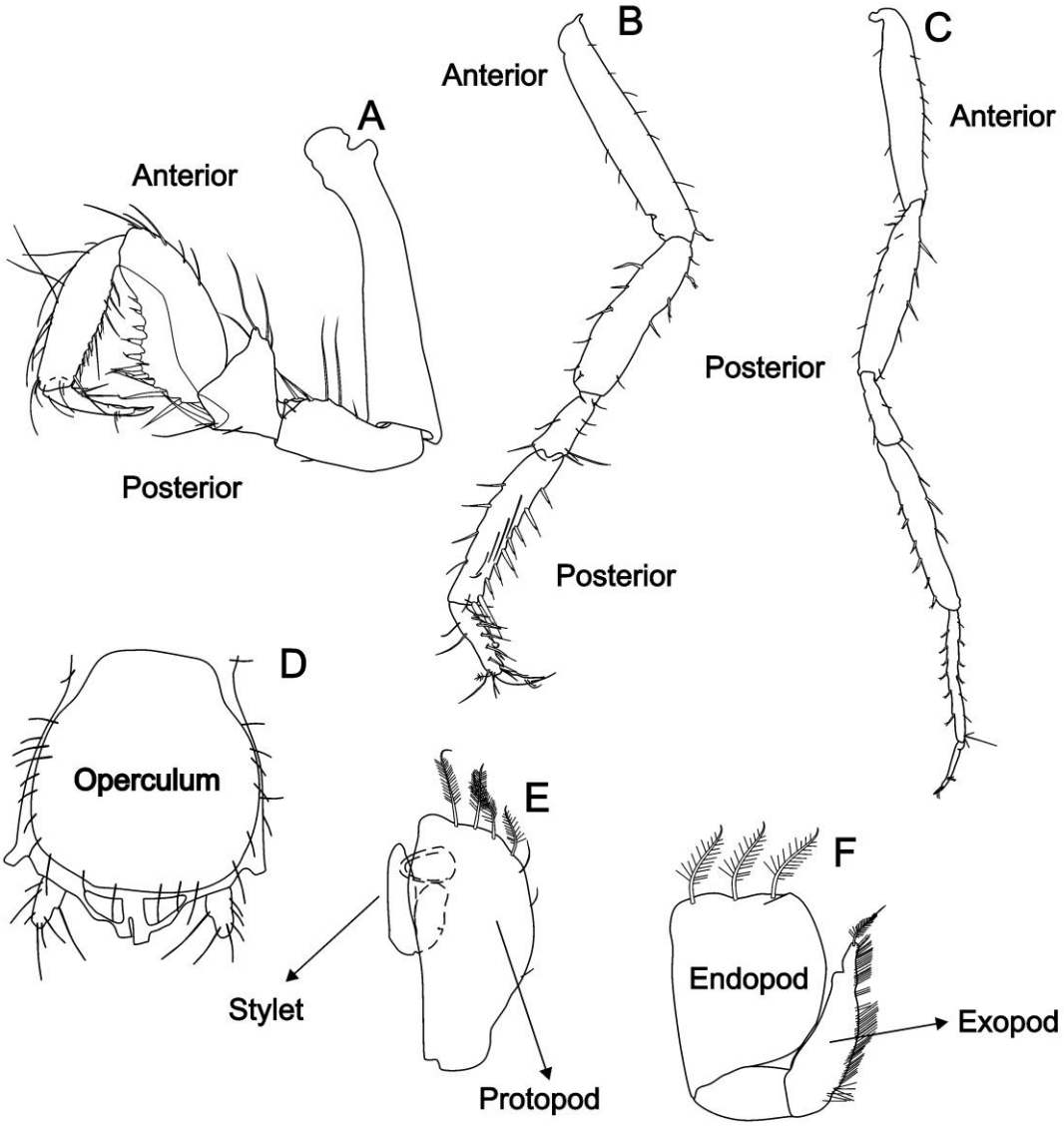
All the maps were confectioned through the website: GMT Maps - GEOMAR and after edited in the graphic program CorelDRAW® X7.

Figure 3. Illustration showing parts of the animal according with the nomenclature adopted by Kavanagh and Wilson (2007); Brökeland and Brandt (2004). A = lateral view of the body, B = head, C = right maxilliped, D = pleotelson, E = right mandible, F = right maxillula and G = right maxilla.



Fonte: A autora.

Figure 4. Illustration showing parts of the animal according with the nomenclature adopted by Kavanagh and Wilson (2007); Brökeland and Brandt (2004). A=pereopod 1, B= pereopod 2, C= pereopod 5, D= ventral view of the pleotelson, E= male pleopod 2 and F= pleopod 3.



Fonte: A autora.

4. Chapter I – New record for the family Ischnomesidae from Brazilian deep sea with description of three new species for the genus *Ischnomesus* (Isopoda: Asellota)

Abstract

Three new species of genus *Ischnomesus* are described from three Brazilians sedimentary Basins: Alagoas-Sergipe, Espírito Santo and Campos, collected through environmental monitoring and characterization monitoring campaigns realized by Petrobrás. This is the being the first record to the family Ischnomesidae in Brazilian waters. The species *Ischnomesus* sp. nov. 1 was found between 750 and 830 m depth in Espírito Santo Basin and Campos Basin. This species has the body all ornamented. Pereonite I with 1 pair of antero and posterolateral spines. Pereonites I–III with 1 pair of dorsal spines. Pereonites I–III with 1 lateral spine. Pereonite IV with 3 pairs of dorsal spines, 1 anterolateral spine in each side and 3 lateral long spines. Pereonite V with 4 pairs of dorsal spines and 5 lateral long spines. Pereonite VI with 1 pair of lateral spines. Pereonites VI-VII with 1 pair of dorsal and dorsolateral spines. The *Ischnomesus* sp. nov. 2 was found between 1,445 m and 3,000 m depth in Alagoas-Sergipe Basin and Espírito Santo Basin. This species has pereonite I with 1 pair of anterolateral small spines. Pereonites I-IV with a pair of anterodorsal spines. Pereonites VI-VII with carina in the middle of the pereonite and 1 posterior protuberance longitudinal. Pleotelson with pronounced lateral protuberance. *Ischnomesus* sp. nov. 3 was found between 200 - 820 m depth in Alagoas-Sergipe Basin and Espírito Santo Basin. This species has the pereonites without spines, but covered with long simple setae. Pleotelson with vertical carina and 5 lateral simple setae, without spines or tubercles. An identification key to South Atlantic species of *Ischnomesus* is provided.

Key words: Asellota, Taxomomy, Marine benthos, New species, South Atlantic

Introduction

The genus *Ischnomesus* Richardson, 1908 is one of the nine genera belonging to the family Ischnomesidae Hansen, 1916. They are marine isopods distributed from continental slopes, bathyal, abyssal and hadal depths, between 10 and 9,043 m depth

(Merrin *et al.*, 2003; Kavanagh *et al.*, 2015; Kavanagh and Wilson, 2007, Brandt *et al.*, 2015; Wolff 1956, 1962). Although they are essentially from deep sea the species *Ischnomesus bispinosus* (Sars, 1868) in Christiania Fjord (Oslo, Norway) is found at 10 m depth (Brandt *et al.*, 2015).

The genus *Ischnomesus* is the most speciose genus within the family. To date, 38 species were described for the Atlantic Ocean (excluding the new species described herein), Pacific and Southern Oceans, as well as from Northern Polar and Caribbean Seas (Kavanagh *et al.* 2015). In South Atlantic, the six known species was described from East South Atlantic, Basin Cape, Africa: *Ischnomesus bidens* Menzies 1962, *I. decemspinosus* Menzies 1962, *I. elegans* Menzies 1962, *I. paucispinis* Menzies 1962, *I. simplissimus* Menzies 1962 and *I. wolffi* Menzies 1962 (Tab.1).

Table 1. Species of the genus Ischnomesus described from South Atlantic.

South Atlantic species				
Species	**Geographic distribution**	**Latitude**	**Longitude**	**Depth**
***Ischnomesus bidens* Menzies 1962**	South East Atlantic, Basin Argentine, L.G.O. Biotrawl No. 12	38°58.5'S	41°45'W	5041 m
***I. decemspinosus* Menzies 1962**	South East Atlantic, Basin Cape, L.G.O. Biotrawl No. 14.	30°14.9'S	13°03'E	3045 m
***I. elegans* Menzies 1962**	South East Atlantic, L.G.O. Biotrawl No. 214.	-	-	2783-5293 m
***I. paucispinis* Menzies 1962**	South East Atlantic, Basin Argentine, L.G.O. Biotrawl No. 12	38°58.5'S	41°45'W	5024 m
***I. simplissimus* Menzies 1962**	South East Atlantic, Basin Cape, L.G.O. Biotrawl No. 52	41°03'S	7°49'E	4885-5960 m
***I. wolffi* Menzies 1962**	South East Atlantic, Basin Cape, L.G.O. Biotrawl No. 52	41°03'S	7°49'E	4047-4961 m

This paper aims to describe three new species of the genus *Ischnomesus* found in three sedimentary Basins of Brazil: Alagoas-Sergipe, Espírito Santo and Campos. This is the first record for the family Ischnomesidae for Brazilian waters.

Material and Methods

Sampling procedures

The specimens examined in the present paper were collected with box corer (50 x 50 x 50 cm), during environmental monitoring and characterization program of Petrobrás (Tab.2), realized in deep waters of Alagoas-Sergipe Basin, Espírito Santo Basin and Campos Basin. In Alagoas-Sergipe Basin, the collections were carried out in 2013 on board of the R/V Seward Johnson. In Espírito Santo Basin, the collections were realized between 2006-2008 on board of the R/V Gyre, Company American Bureau of Shipping (ABS). In Campos Basin, the collections were realized in 2002 and 2003, on board of N/RB Astro Garoupa (Fig.5).

Table 2. Environmental monitoring and characterization campaigns realized by Petrobrás in Brazil.

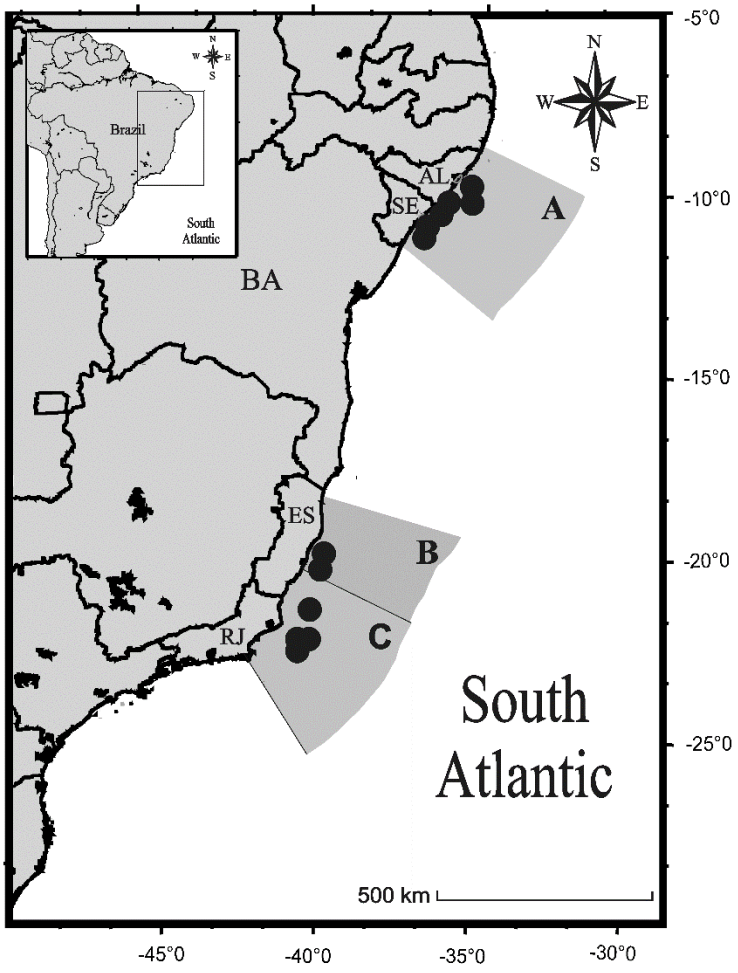
Campaigns	Locality	Date
Marseal	Alagoas-Sergipe Basin	2013
Ext3 Lead2	Espírito Santo Basin	2006/2007
Lead Teg	Espírito Santo Basin	2008
Atex	Espírito Santo Basin	2007
Campos	Campos Basin	2002/2003

Taxonomic techniques

The specimens were identified under a stereoscopic microscope with *camera lucida* and the drawn specimens were dissected and mounted in glycerine gel slides, after staining with Clorazol black. The illustrations were made in a graphic program, with support of the digital table, according to Coleman's techniques (2003). All the maps were confectioned through the website: GMT Maps - GEOMAR and after edited in the graphic program CorelDRAW® X7. The type material is deposited in the Crustacea collections

of “Museu de Oceanografia Prof. Petrônio Alves Coelho da Universidade Federal de Pernambuco” (MOUFPE), “Universidade Federal de Sergipe” (UFS_CRU) and “Museu Nacional do Rio de Janeiro” (MNRJ) and preserved in 75% Etanol.

Figure 5. Map showing the study area where the samples were collected in Brazillian waters. A= Alagoas-Sergipe Basin, B=Espírito Santo Basin and C= Campos Basin. Map produced through Geomar online.



Fonte: A autora.

The species with male and female specimens, both were drawn. Pereopods and manca specimens were illustrated where possible. The nomenclature adopted for description (morphologic terminology) was based in Kavanagh and Wilson (2007); Kavanagh *et al.* (2015), and nomenclature adopted to mouthparts was Brökeland and Brandt (2004). Roman numerals and Arabic numerals were used for pereopods and body parts, respectively.

Taxonomy

Order Isopoda Latreille, 1817

Suborder Asellota Latreille, 1802

Superfamily Janiroidea Sars, 1897

Family Ischnomesidae Hansen, 1916

Genus *Ischnomesus* Richardson, 1908

Ischnosoma Sars, 1866: 84.

Ischnomesus Richardson, 1908: 81; –Hansen, 1916: 56; –Gurjanova, 1932: 40l; –Wolff, 1956: 88; –Menzies, 1962: 111; –Wolff, 1962: 73; –Menzies and George, 1972: 971; –Kussakin, 1988: 419; –Merrin and Poore, 2003: 290; –Kavanagh *et al.*, 2015: 203.

Rhabdomesus Richardson, 1908: 81.

Bactromesus Wolff, 1962: 83.

Type species: *Ischnosoma bispinosum* Sars, 1866 (by monotypy).

Diagnosis. See Kavanagh *et al.* (2015).

Species included: *Ischnomesus anacanthus* Wolff, 1962; *I. andriashevi* Birstein, 1960; *I. antarcticus* Schultz, 1979; *I. armatus* Hansen, 1916; *I. bacilloides* (Beddard, 1886); *I. bacillopsis* (Barnard, 1920); *I. bacillus* (Beddard, 1886); *I. bidens* Menzies, 1962; *I. birsteini* Wolff, 1962; *I. bispinosus* (Sars, 1868); *I. bruuni* Wolff, 1956; *I. calcificus* Menzies and George, 1972; *I. caribbicus* Menzies, 1962; *I. carolinae* Chardy, 1974; *I. chardyi* Kussakin, 1988; *I. decemspinosus* Menzies, 1962; *I. elegans* Menzies, 1962; *I. elongatus* Birstein, 1963; *I. fragilis* Birstein, 1971; *I. glabra* Kensley, 1984; *I. gracilis* (Birstein, 1960); *I. harrietae* Kavanagh, Frutos and Sorbe, 2015; *I. justi* Merrin and Poore, 2003; *I. latimanus* Birstein, 1971; *I. magnificus* Menzies, 1962; *I. multispinis* Menzies, 1962; *I. norvegicus* Svavarsson, 1984; *I. paucispinis* Menzies, 1962; *I. planus* Wolff, 1962; *I. profundus* Hansen, 1916; *I. roseus* Wolff, 1962; *I. simplex* Menzies and

George, 1972; *I. simplissimus* Menzies, 1962; *I. spaercki* Wolff, 1956; *I. tasmanensis* Merrin and Poore, 2003; *I. vinogradovi* Birstein, 1963 and *I. wolffi* Menzies, 1962.

Remarks. According to Kavanagh *et al.* (2015), the freely articulation on the posterior pereonites, pleonite 1 and pleotelson observed in *Ischnomesus* is a condition presumed to be plesiomorphic, with other genera showing various degrees of fusion of the pereonites (e.g. pereonites 5–7, pleonite and pleotelson fused together in genus *Haplomesus*, Kavanagh and Wilson 2007). Merrin and Poore (2003) have described Uniarticulate uropods for *Ischnomesus justi*, so the biarticulate uropods may not be a diagnostic character for the genus, although all other species described with this structure have biarticulate uropods.

The genus was divided herein in three groups: ***Group a*** with ornamentation throughout all pereonites or on more than one pereonite, ***Group b*** ornamentation only on the first pereonite and ***Group c*** pereonites smooth (tab. 3 and 4). For this classification it was considered only spines, tubercles or pedestal setae ornamentations. Simple setae or long simple setae were excluded.

Table 3. Grouping of species of *Ischnomesus* based on the ornamentation of pereonites of group a.

Species	Ornamentation	Geographic distribution	Depth range
***Group a* - Ornamentation throughout all pereonites or more than one pereonite**			
Ischnomesus antarcticus	all pereonites	W Antarctic Peninsula	~ 274 m
Ischnomesus armatus	Pereonites I-VI	Mar do Labrador	2702 - 5497 m
Ischnomesus bacilloides	Pereonites IV-VI*	North Pacific	2652 m
Ischnomesus bacillopsis	all pereonites	South Africa	1280-1400 m
Ischnomesus bacillus	Pereonites IV and V*	South Pacific	3292 m
Ischnomesus birsteini	all pereonites	Kermadec Trench	4410 m
Ischnomesus bruuni	Pereonites I-VI	Kermadec Trench	6960-7000 m
Ischnomesus chardyi	Pereonites I-VI	North Atlantic Ocean	3178 m
Ischnomesus decemspinosus	Pereonites II- V	South Atlantic, L.G.O. Biotrawl Xo. 14.	3045 m

Species	Ornamentation	Geographic distribution	Depth range
Ischnomesus elegans	Pereonites II- V*	South Atlantic, L.G.O. Biotrawl No. 214	2783-5293 m
Ischnomesus fragilis	Pereonites I-III	North West Pacific	5005-5045 m
Ischnomesus harrietae	Ornamentation throughout all pereonites	Bay of Biscay	619-1099 m
Ischnomesus latimanus	Pereonites I and II	North West Pacific	5005-5045 m
Ischnomesus magnificus	Pereonites V*	South Atlantic, L.G.O. Biotrawl No. 12.	5041 m
Ischnomesus multispinis	Ornamentation throughout all pereonites	Caribbean	975 m
Ischnomesus spaercki	Ornamentation throughout all pereonites	Kermadec Trench	6660-7000 m
Ischnomesus tasmanensis	Ornamentation throughout all pereonites	E Bass Strait	1750-1840 m
Ischnomesus wolffi	Pereonites V and VI*	South Atlantic, L.G.O.	4961 m

* Other anterior pereonites missing

Table 4. Grouping of species of *Ischnomesus* based on the ornamentation of pereonites of group b and c.

Group b - Ornamentation only on the pereonite 1		
Species	**Distribution**	**Depth range**
Ischnomesus andriashevi	North West Pacific	5005- 5045 m
Ischnomesus bispinosum	Christiania Fjord, Norway	90 to 1100m
Ischnomesus calcificus	Peru-Chile Trench	4526-4609 m
Ischnomesus caribbicus	Panamanian part of the Caribbean Sea	1714 m
Ischnomesus carolinae	South Atlantic	4180 m
Ischnomesus gracilis	North West Pacific	5680-5690 m
Ischnomesus justi	Tasman Sea	990-996 m
Ischnomesus norvegicus	Norwegian Sea	794-860 m
Ischnomesus paucispinis	South Atlantic, L.G.O. Biotrawl No. 12	~ 4983 m
Ischnomesus profundus	Davis Strait	3521 m
Ischnomesus simplex	Peru-Chile Trench	4526-4609 m
Group c - Pereonites smooth		
Species	**Distribution**	**Depth range**
Ischnomesus anacanthus	Tasman Sea	3710 m
Ischnomesus bidens	South Atlantic, L.G.O. Biotrawl No. 12	~ 4983 m
Ischnomesus elongates	Bougainville Trench	8980-9043 m
Ischnomesus glabra	South Africa	1800-1950 m
Ischnomesus kussakini	South Shetland Islands	550- 560 m
Ischnomesus planus	Costa Rican part of the North Pacific Ocean	3570 m
Ischnomesus roseus	Costa Rican part of the North Pacific Ocean	3270- 3670 m
Ischnomesus simplissimus	South East Atlantic	4885- 5960 m
Ischnomesus vinogradovi	North West Pacific	3860 m

***Ischnomesus* sp. nov. 1**

(Figures 6-9)

Material examined. *Holotype*: 1 adult female, 15 mm, (MOUFPE 15.535), station Ext3 Lead2 #1, R1, 2-5, campaign EXT3 LEAD2, Espírito Santo Basin, 19º54'31.1"S, 39º36'56.8"W, 750 m depth, September 2007.

Paratypes: 1 adult female, (MOUFPE 15.536), station Atex #7, R3, 2-5, campaign ATEX, Espírito Santo Basin, 19º54'41.8''S, 39º 36'75.62''W, 830 m depth, 18 October 2006. 1 manca female, (MOUFPE 15.540), station Ext 3 Lead 2 #3, 2-5, campaign EXT3 LEAD2, Espírito Santo Basin, 19º54'36.98"S, 39º36'54.8"W, 750 m depth, September 2007. 1 adult female, (MOUFPE 15.541), station Ext 3 Lead 2 #4, R2, 0-2, campaign EXT3 LEAD2, Espírito Santo Basin, 19º54'36.6"S, 39º36'59.3''W, 750 m depth, September 2007. 1 manca female, (MNRJ 20854), station OP I#50A, 2-5, Campos Basin, 22°03'69.4"S, 39°52'40.2"W, 1050 m depth, 20 November 2002. (MNRJ 20856) 1 manca female, station OP I #79, 2-5, Campos Basin, 22°20'67.1"S, 40°00'58.5"W, 775 m depth, 20 November 2002.

Diagnosis. Head, dorsal surface with 2 small horizontal spines. Maxilliped epipod with numerous simple setae on the external border. Pereonite I with 1 pair of antero and posterolateral spines. Pereonites I–III with 1 pair of dorsal spines. Pereonites I–III with 1 lateral spine, the last with spine 3.0 times longer than pereonite II. Pereonite IV with 3 pairs of dorsal spines, 1 anterolateral spine in each side and 3 lateral long spines. Pereonite V length 3.0 width, with 4 pairs of dorsal spines; 5 lateral long spines. Pereonite VI with 1 pair of lateral spines. Pereonites VI-VII with 1 pair of dorsal and dorsolateral spines. Pleotelson with a median longitudinal carina with 1 pair of anterolateral spine and 2 pairs of dorsal spines on carina; lateral protuberance with 2 pairs of spines, two pairs of lateral spines, 1 pair of posterolateral spines and 1 pairs of posterior spines; one pair of tubercles in the posterodorsal margin.

Description (based on adult female holotype, MOUFPE 15.535). Dorsal cuticle covered with coarse projections. Head length 0.9 width, dorsal surface with 2 small spines horizontals. Delicate suture visible between the head and first pereonite.

Antennula (fig.7C) with 6 articles. Article 1 squat and globular, with 4 lateral simple setae. Article 2 longer than others, length 4 article 1 length, with 6 lateral simple setae

and 5 ventromedial simple setae. Article 3 elongate and tubular, 1.2 longer than 4-6 together, with 4 dorso and ventromedial simple setae; 4 distal simple setae. Article 4 with 4 distal setae. Article 5 with 1 distal seta. Article 6 with 3 distal setae.

Antenna (fig.7B) with peduncle present: article 1 with 4 distal robust setae, 5 distal simple setae and 1lateral. Article 2 with 3 almost lateral setae, 3 distal robust setae and 7 distal simple setae. Article 3 with 11 simple setae. Flagellum missing.

Maxilliped (fig.8A) basis broader than palp, with 13 longs simple setae along the basis; endite shorter than palp. Palp positioned in distal second of basis, articles 4-5 narrower than articles 1-3, all of them with numerous long simple setae, except article 1, just has 2 longs simple setae in the distal angles. Endite with 4 retinacula, 4 distal fan setae, 3 plumose setae and 7 simple setae; in the distal angle there is a robust sinuous (right side) seta with accessory seta and next its there is a long sinuous seta with longs projections. Epipod with numerous simple setae on the external border and 3 more central.

Maxilulla (fig.8B) exopod with 10 large serrated spine-like apical setae; lateral margin with several fine setae; distal margin of endopod with 1 stout serrated seta distomedially, 2 lateral setae, 1 each of side, 1 short robust (next to stout serrated seta) and the other long; lateral and distal margin with numerous fine setae.

Maxilla (fig.8C) basis with rows of short setae, outer lobe with 4 apical setulated spine-like setae, 4 simple setae and 1 setulated; lateral margin with several fine setae; median lobe with 3 apical setulated spine-like setae and some fine setae; inner lobe almost more than twice as broad as median or outer lobes, with 12 apical setulated setae, distal margin bearing 4 stout serrated setae distomedially, lateral margin with 2 setulated prominent setae, several fine setae and surface of with some rows of short setae.

Mandible (fig.8D and E) with outer anterior margin setulated. Incisor with 5 blunt teeth. Spine row of 4 serrated spine-like setae and 7 simple; *lacinia mobilis* of left mandible with 4 blunt teeth and incisor with 5 blunt teeth. Spine row of 8 serrated spine-like setae. Molar with smooth grinding surface.

Pereon (fig.6A) very ornamented. Pereonite I with 1 pair of large antero and posterolateral spines with the same length, 2.5 times longer than wide; in the middle of the pereonite, 1 pair of dorsal spines and 2 tubercles in the middle of this spines. Pereonite II with one pair of lateral spines; 1 pair of spines in the middle of pereonite; one pair of

small tubercles on the posterior margin. Pereonite III with one pair of lateral spines; 1 pair of spine in the middle of pereonite. Pereonite IV with 4 dorsal pairs of spines, the second pair is dorsolateral; 3 longs lateral spines on all the length. Pereonite V with 4 pairs of dorsal spines, plus only one, close to the posterior margin and 1 pair of dorso-posterolateral; with 5 longs lateral spine on all the length. Pereonite VI with 1 pair of lateral spines. Pereonites VI-VII with 1 pair of dorsal and dorsolateral spines. Pereonite VII with an intumescence with 2 small tubercles in the middle.

Pereopods just the pereopods I and V is present. Pereopod I (fig. 7A) basis 4 times as long as broad. Ischium 2.4 times as long as broad, 8 dorsal simple setae and 1 ventral. Merus 1.18 times as broader as long, with 4 dorsodistal long setae, 1 ventral, 2 ventrodistal simple setae and 2 large simple spine-like seta. Carpus about 2.0 times as long as broad, slightly tapering distally, ventral margin with 8 spine-like robust setae with accessory seta and 3 long simple spine-like seta, 6 dorsal simple setae with different size. Propodus about 3.2 times as long as broad with 6 ventral simple setae, 6 spine-like robust setae with accessory seta, 1 long simple seta, 2 laterodistal and 12 dorsal simple setae with different size. Dactylus with 1 dorsal and 7 lateral simple setae.

Pereopod V (left) basis 7.2 times as long as broad with 3 dorsal simple setae. Ischium 8.6 times as long as broad with 2 setae, 1 medial and the other distal. Merus 3.6 times as long as broad with 1 distal robust seta with accessory seta. Carpus 14 times as long as broad with 3 dorsal simple setae and 2 ventral. Propodus 8.7 times as long as broad with 2 dorsal and 3 ventral. Dactylus 6.6 times as long as broad, smooth.

Pleonite 1 with 1 pair of small dorsal tubercles.

Pleotelson with a median longitudinal carina with 1 pair of anterolateral pedestal seta and 2 pairs of dorsal pedestal setae. Protuberance with 2 pairs of pedestal setae. Two pairs of lateral pedestal setae and 2 pairs of spines in the superior margin. One pair of tubercles in the posterodorsal margin.

Uropods missing.

Mancas features (fig.6)

In the present material, it was observed two mancas females in different stages of development. Illustrates the manca in stage 2 (fig. 9A and B) (3.9 mm, MOUFPE 15.540), the last leg is absent, and C in stage 3 (fig. 9C and D) (5.2 mm, MNRJ 20856), pereopod

VII is present but is rudimentary (see about manca stages in Kavanagh *et al.* 2006) The second pair of dorsolateral pedestal setae on pereonite V is absent. Because the specimen illustrated in fig.6A is in poor condition, the variation in the pleotelson ornamentation was not possible to verify.

The mancas have not presented the pair of dorsolateral spines on pereonite IV. The spines are not calcified like in adult and they are longer in pereonites IV-VI and on pleotelson. The pattern of ornamentation is the same.

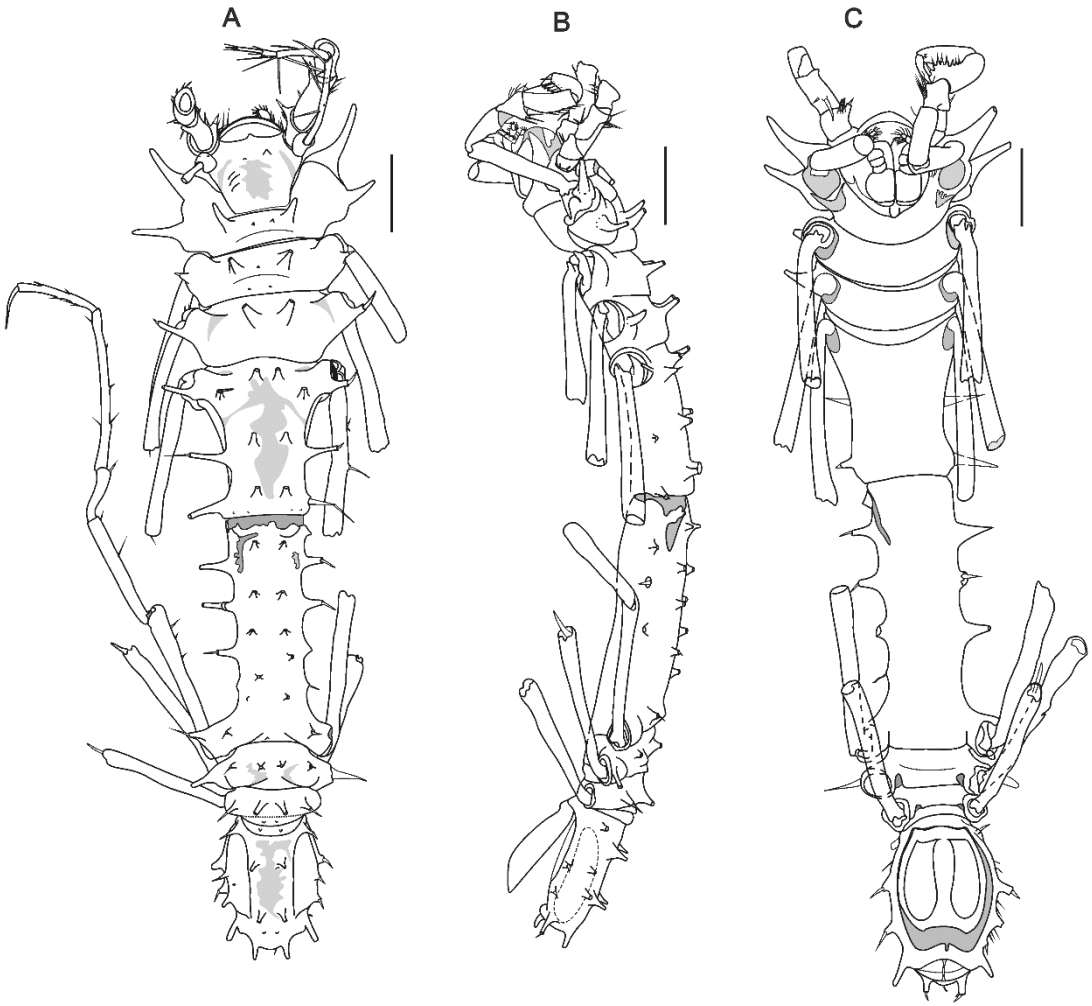
The uropods were presents in mancas. Uropods uniramous and biarticulate.

Remarks. This species belongs to the group *a* (table 3), but it is different from all species included in this group due to the amount and distribution of the body ornamentation. Especially within this group, three species bear several projections on their body surface, in a pattern more or less similar to those observed in *Ischnomesus* sp. nov. 1: *I. antarcticus* Schultz, 1979; *I. spaercki* Wolff, 1956 and *I. tasmanensis* Merrin and Poore, 2003. It is closely related to *I. antarcticus* Schultz, 1979, due to antero and posterolateral spines on the pereonite I, in the same position, but they are more robust in *I. antarcticus*. The pair of spines in the middle of pereonites I-III is similar to the *I. tasmanensis* Merrin and Poore, 2003. In addition, the two species cited above have the lateral spines in pereonites II-VII. The three species differ from each other by the distributional pattern and number of spines in the pereonites IV and V. The species *Ischnomesus* sp. nov. 1 has 3 long lateral spines in pereonite IV and 5 long lateral spines in pereonite V. However, *I. tasmanensis* has just 1 pair of anterolateral spine in pereonite IV and 1 pair of posterolateral spine in pereonite V as well as *I. antarcticus,* but it has long seta over the pereonites cited above and *I. antarcticus* has a lot of short spines over the pereonites. The 3 species differ also by the presence in pleotelson a pattern of ornamentation and a format very different among them. The *Ischnomesus* sp. nov. 1 has more spines than *I. tasmanensis,* but less than *I. antarcticus.* Finally, from all related species the pleotelson is longer than wide, but this proportion is more visible in *Ischnomesus* sp. nov. 1 and *I. antarcticus.*

Bathymetric range: 750 - 1050 m depth.

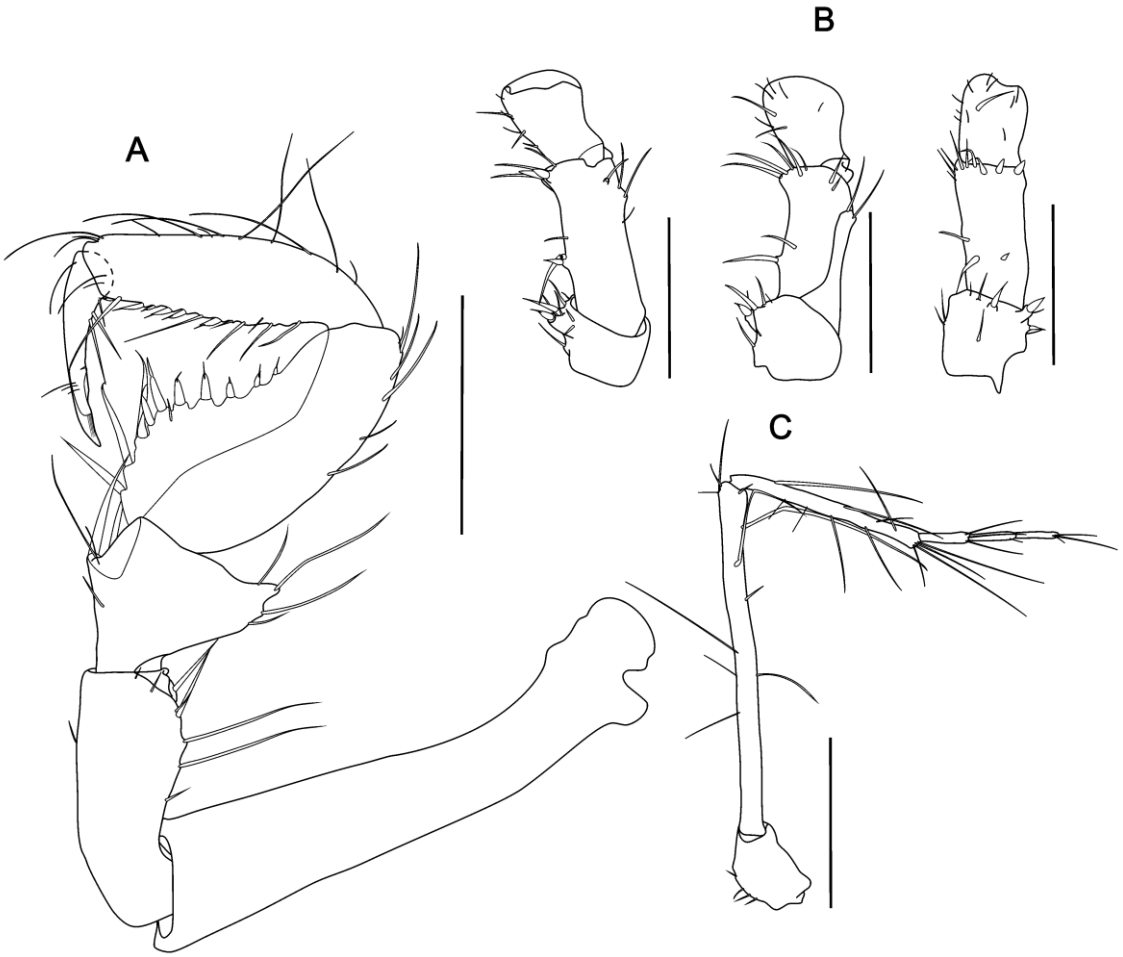
Geographic distribution: Espírito Santo Basin and Campos Basin.

Figure 6. *Ischnomesus* sp. nov. 1 holotype female, 15 mm, EXT3 LEAD2, (MOUFPE 15.535). A= habitus, B= lateral view, C= ventral view. Scale= 1 mm.



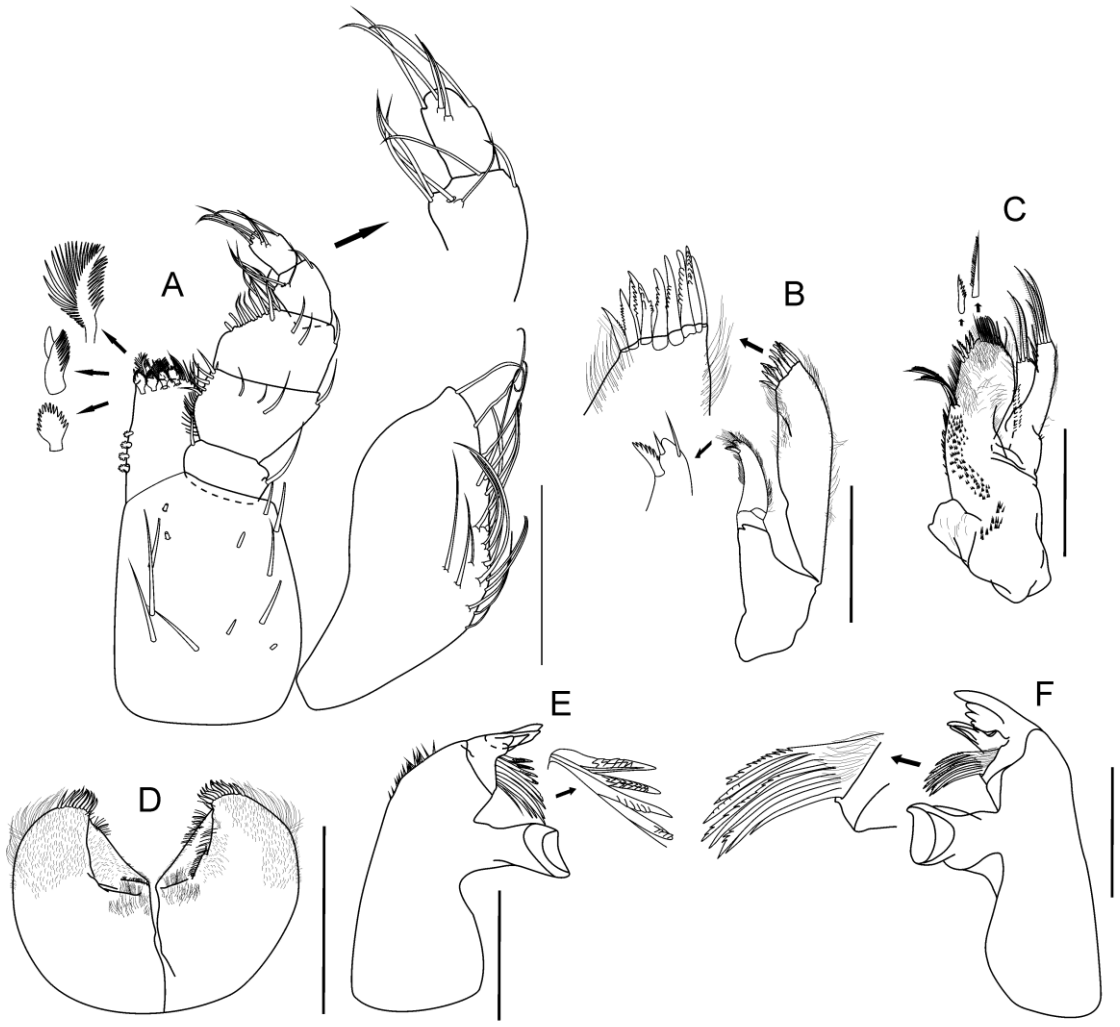
Fonte: A autora.

Figure 7. *Ischnomesus* sp. nov. 1 holotype female, 15 mm, EXT3 LEAD2, (MOUFPE 15.535). A= pereopod 1, B= antenna in different views and C= antennula. Scale= 0.1 mm.



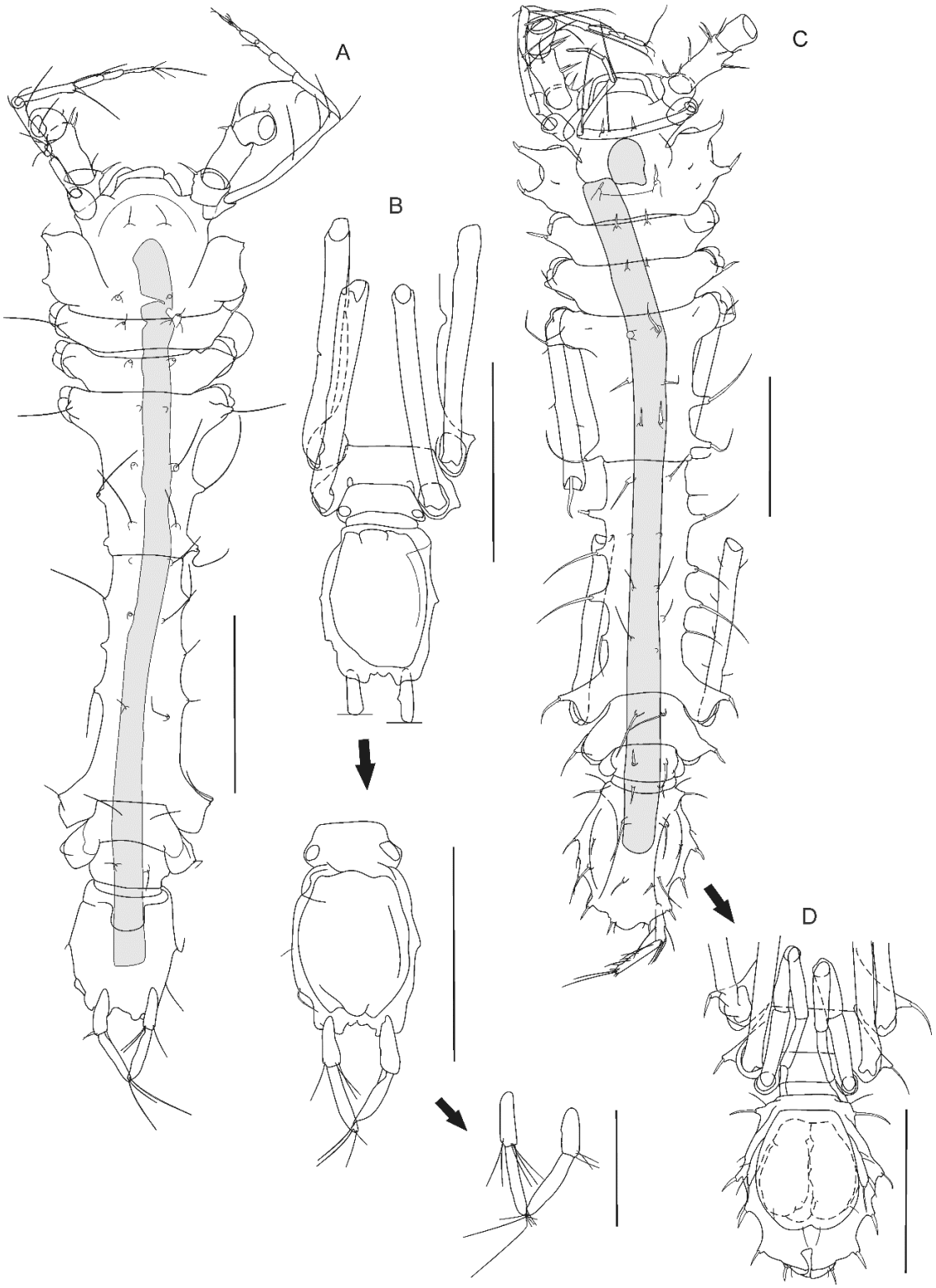
Fonte: A autora.

Figure 8. *Ischnomesus* sp. nov. 1 holotype female, 15 mm, EXT3 LEAD2, (MOUFPE 15.535). A= maxilliped, B= maxillula, C= maxilla, D= paragnaths, E= right mandible and F= left mandible. Scale= 0.1 mm.



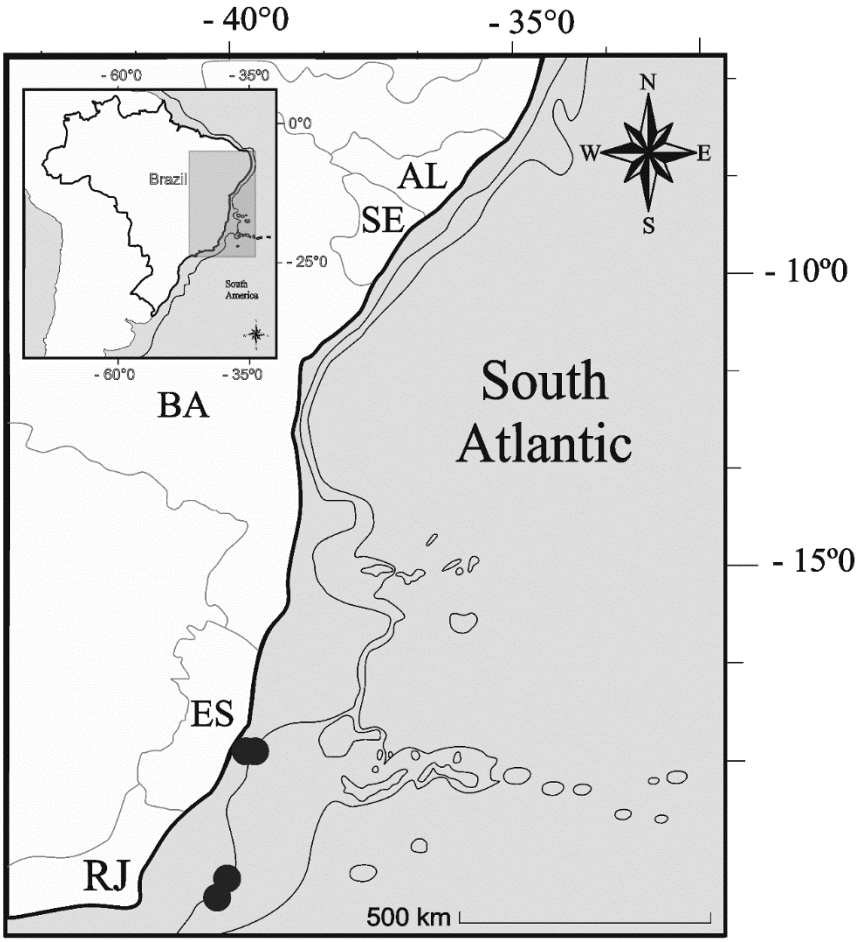
Fonte: A autora.

Figure 9. *Ischnomesus* sp. nov. 1, paratypes. Two mancas, A= manca female stage 2 female, B= ventral view, EXT3 LEAD2, (MOUFPE 15.540). C= manca female, stage 3, D= ventral view, Campos Basin, (MNRJ 20856).



Fonte: A autora.

Figure 10. Geographic distribution of *Ischnomesus* sp. nov. 1 in Brazillian waters. Samples collected in Espírito Santo Basin and Campos Basin. Map produced through Geomar online.



Fonte: A autora.

***Ischnomesus* sp. nov. 2**

(Figures 11-13)

Material examined. *Holotype*: 1 adult female, 11 mm, (MOUFPE 15.542), station SLN #2 R3, 0-2, campaign Seillean, Espírito Santo Basin, 20°03'37.8"S, 39°30'12.3"W, 1450 m depth, November 2006.

Paratypes: 1 adult female, (MOUFPE 15.543), station SLN #8 R3, 2-5, campaign Seillean, Espírito Santo Basin, 20°03'55"S, 39°60.8"W, 1445 m depth, November 2006. 1 adult female, (UFS_CRU_ 0216), station FN6R2, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°15'27.3"S, 36°52"13.2"W, 2-5, 1000 m depth, March 2013. 1 adult

female, (UFS_CRU_0217), station CN9R1, 5-10, campaign Marseal, Alagoas-Sergipe Basin, 11°05’14.3”S, 35°53’53.6”W, 5-10, 3000 m depth, March 2013.

Diagnosis. Head dorsal surface with small setae. Maxilliped epipodite smooth. Pereonite I with 1 pair of anterolateral small spines. Pereonites I-IV with a pair of anterodorsal spines. Pereonite V length 2.5 width, without spines, but covered with setae. Pereonites VI-VII with carina in the middle of the pereonite and 1 posterior protuberance longitudinal. Pleotelson without spines, but covered with simple short setae. Pronounced lateral protuberance. In the end of the pleotelson has a tubercle on the middle. Uropods missing.

***Description (based on adult female holotype, MOUFPE* 15.542).** Dorsal cuticle covered with some simple setae. Head length 1.3 width, dorsal surface with small setae. Delicate suture visible between the head and pereonite I.

Antennula (fig. 11D) with 6 articles. Article 1 squat and globular, with 7 small setae on anterior margin. Article 2 biggest, length 3.9 article 1 length, covered with 9 ventromedial setae and 10 lateral setae. Article 3 elongate and tubular, 1.3 longer than 4-6 together, with 4 lateral and 5 ventromedial simple setae, 1 distal long simple seta. Article 4 with 1 ventro medial seta and 4 distal. Article 5 with 1 distal seta. Article 6 with 3 distal setae. All the others articles have setae longs and smalls.

Antenna (fig. 11E) with only peduncle present, 3 articles: article 1 with 1 robust seta with accessory seta and 2 simple setae, article 2 longest, with 5 robust setae, 3 distal and 2 lateral and 8 simple setae, 4 ventromedial, 2 distal and 2 lateral. Article 3 with 5 distal setae. Flagellum missing.

Maxilliped (fig. 12A) basis broader than palp, with 6 simple setae along it and 1 short lateral seta (the side of the epipod); endite shorter than palp. Articles 4-5 narrower than articles 1-3, except the 1 that has just 1 simple seta; articles 2-4 with medial simple setae; the inner side with some simple setae in all articles and distal margin with 5 simple setae. Endite with 3 retinacula, 4 fan setae and 3 distal plumose setae and several simple setae. Epipod smooth.

Maxilulla (fig.12B) exopod with 12 large serrated spine-like apical setae; lateral margin with several fine setae; distal margin of endopod with 1 stout serrated seta distomedially and lateral margin with numerous fine setae.

Maxilla (fig.12C) basis with some rows of short setae, outer lobe with 4 apical setulated spine-like setae, inner lateral margin with 4 simple setae and outer lateral margin with some fine setae; median lobe with 5 apical setulated spine-like setae; inner lobe almost more than twice as broad as median or outer lobes, with 10 apical setulated setae, distal margin bearing 3 stout serrated setae distomedially, lateral margin with 2 setulated prominent setae, surface with several fine setae.

Mandible (fig.12E and F) with outer margin smooth; incisor with 4 blunt teeth. Spine row of 5 serrated spine-like setae and 7 simple; molar setulated with outer margin "saw form". Left mandible with outer anterior margin setulated. *Lacinia mobilis* with 3 blunt teeth and incisor with 4 spine-like setae blunt teeth. Spine row of 4 serrated spine-like setae and 3 simple. Molar with smooth grinding surface.

All the pereonites are coated of the simple setae, being the lateral longer than the dorsal, mainly in pereonites IV and V. Pereonite I with one pair of anterolateral spines. Pereonites I-IV with a pair of anterior dorsal spines. Pereonite V length 2.5 width, without spines, but covered with setae. Pereonites VI-VII with a dorsal carina in the middline and 1 posterior protuberance longitudinal. Pleonite 1 smooth and slim. Pleonite smooth wider than long.

Pleotelson posterior and laterally setose, with few setae in the middle witha large vertical carina in the middle, length 1.4 width. Pronounced lateral protuberance. Posterior higher region with a small protuberance.

Uropods missing.

Variation observed in one female (UFS_CRU_0216). It was observed a variation in pereonites IV (fig.13A), V (fig.13B) and pleotelson (fig.13C) in one specimen found at 3000 m depth. It has 1 more pair of spines in these parts of the body, pereonite IV with 1 pair of anterolateral spines, pereonite V and pleotelson with 1 pair of posterolateral spines. According to Wilson and Ahyong (2015), the higher depths could explain these additional spines, where several species often present the body more ornate; this could help to reduce predation, among other reasons.

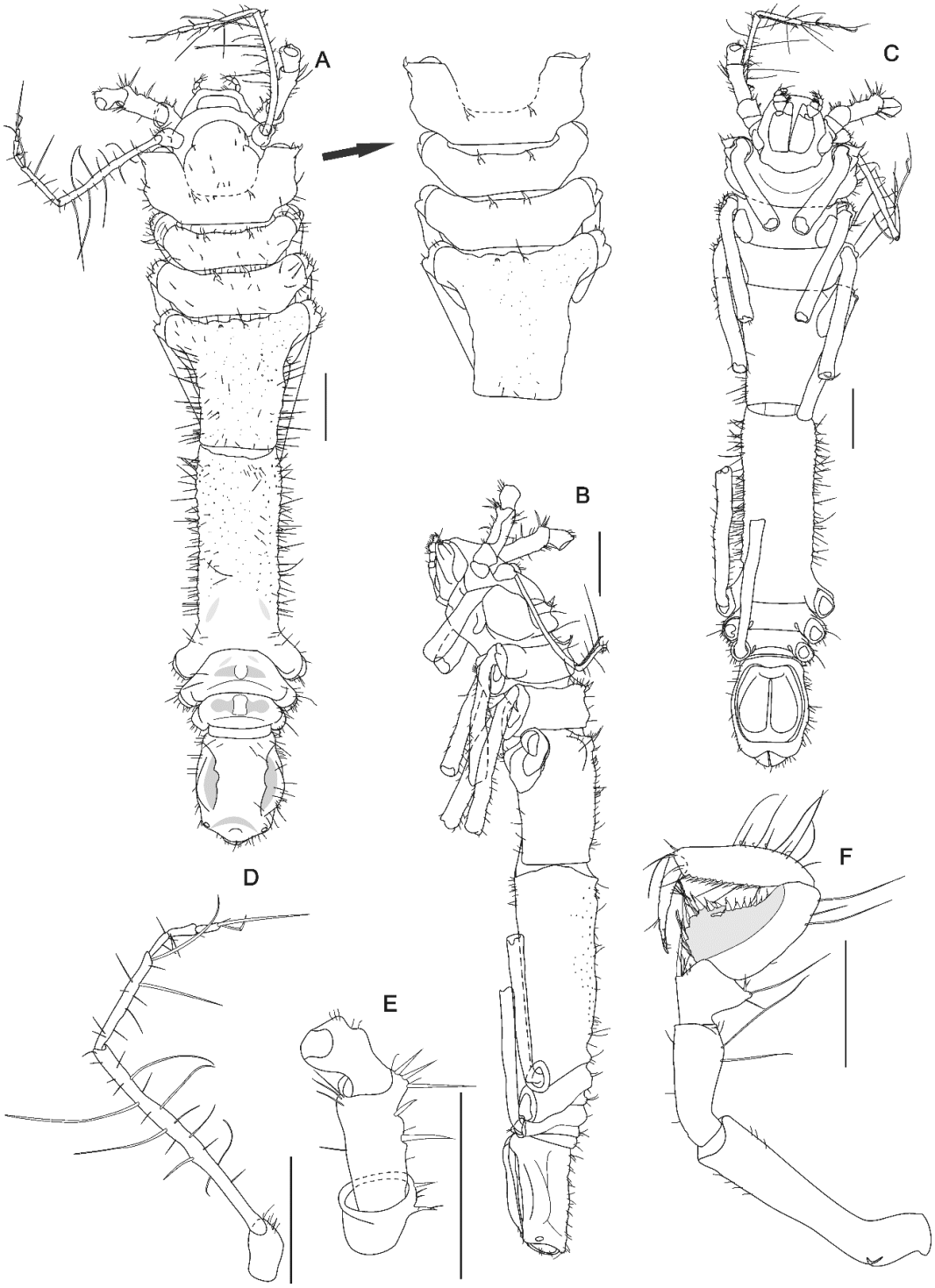
Remarks. Ischnomesus sp. nov. 2 belongs to the group *a* (tab.3), but it is different from all species included in this group due to the amount and distribution of the body ornamentation. *Ischnomesus* sp. nov. 2 has a pattern of ornamentation more or less similar

to those observed in *I. tasmanensis* Merrin and Poore, 2003 and *I. harrietae* Kavanagh, Frutos and Sorbe, 2015. It is similar to *I. tasmanensis*, because both have 1 pair of dorsal median spines on pereonite I-IV, and in the same, on pereonite I-IV, the *Ischnomesus* sp. nov. 2 has pedestal setae. It resembles with *I. harrietae*, both lack spines on pleotelson, just setae, and body robust covered by setae, pedestal setae in *I. harrietae* and simple setae in the new species. However, differ from these by type of setae through the body, beyond the ornamentation and format of pleotelson. *Ischnomesus* sp. nov. 2 has a pronounced lateral protuberance in pleotelson. It is common the presence of the dorsal carina in pleotelson among the genus, but the lateral protuberance, observed in this species, is an exception until now.

Bathymetric range: 1000 - 3000 m depth.

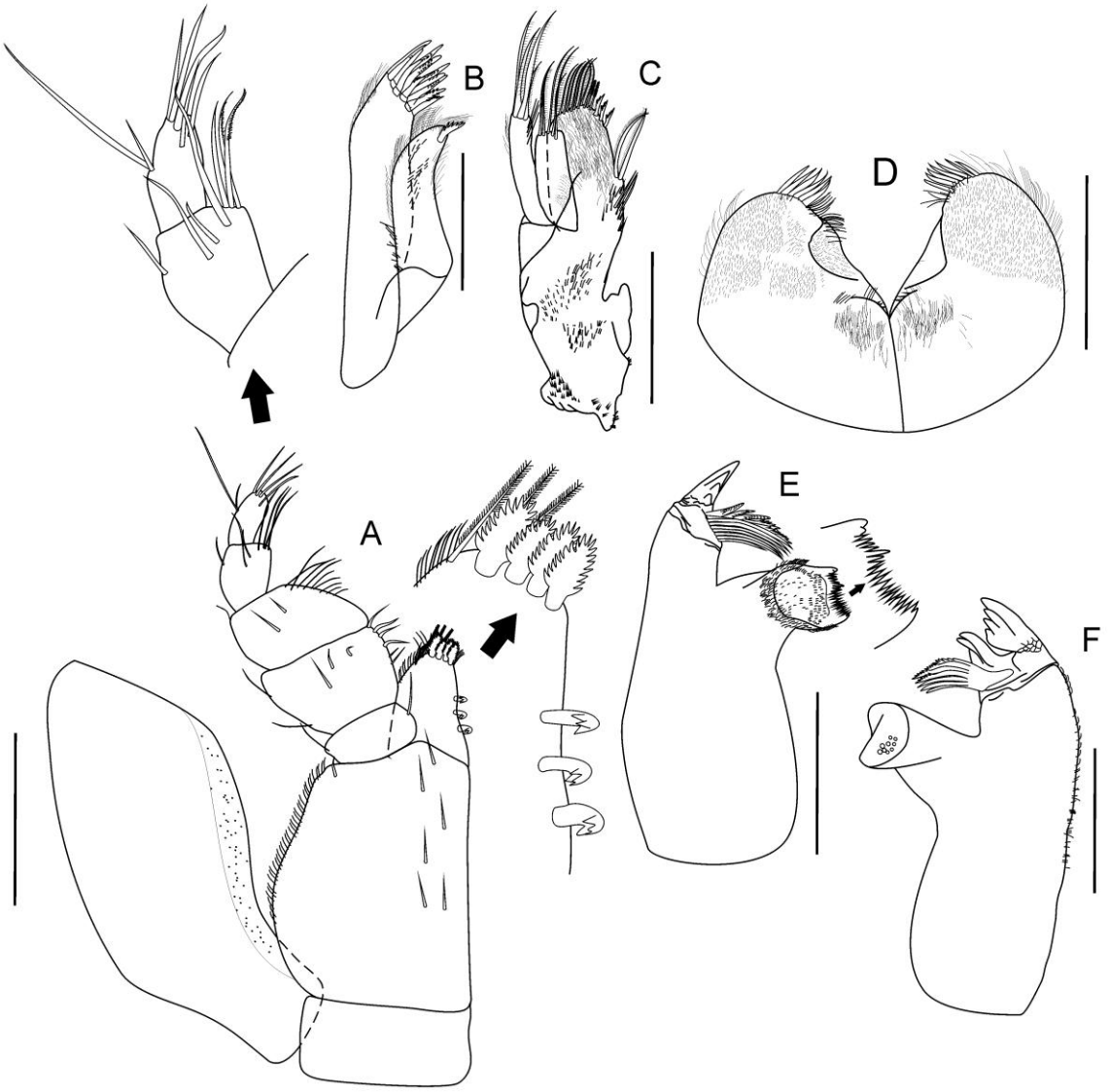
Geographic distribution: Alagoas-Sergipe Basin and Espírito Santo Basin.

Figure 11. *Ischnomesus* sp. nov. 2, holotype adult female, 11 mm, SLN, (MOUFPE 15.542). A= habitus, B= lateral view, C= ventral view, D= antennula, E= antenna and F= pereopod 1. Scale= 1mm (habitus, lateral view and ventral view); scale= 0.1 mm (antennula, antenna and pereopod 1).



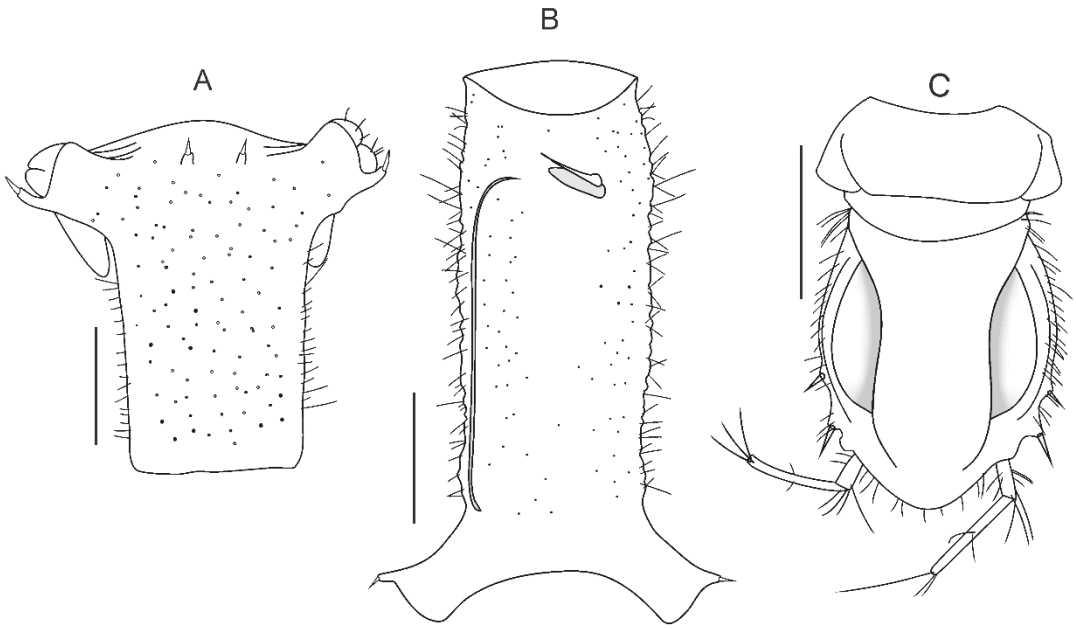
Fonte: A autora.

Figure 12. *Ischnomesus* sp. nov. 2, paratype adult female, 11 mm, SLN, (MOUFPE 15.543). A= maxilliped, B= maxillula, C= maxilla, D= paragnaths, E= right mandible and F= left mandible. Scale= 0.1 mm.



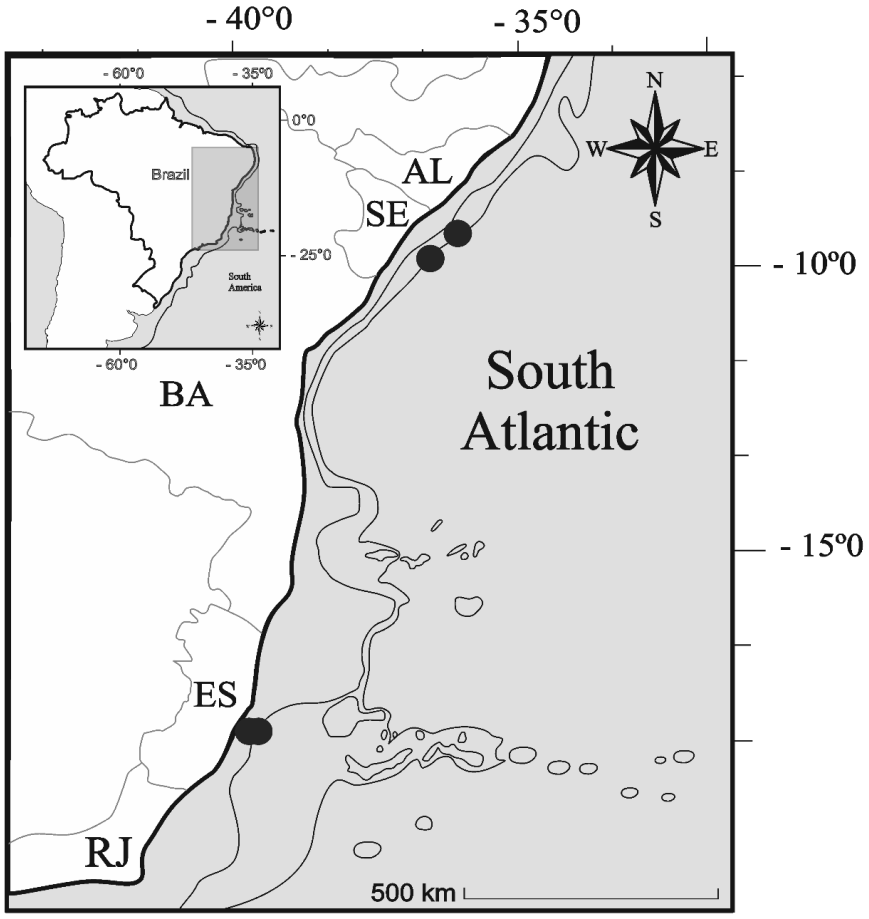
Fonte: A autora.

Figure 13. *Ischnomesus* sp. nov. 2, specimen with variation observed. Female adult, Marseal, (UFS_CRU_0216). A= pereonite IV, B= pereonite V and C= pleotelson. Scale= 1 mm.



Fonte: A autora.

Figure 14. Geographic distribution of *Ischnomesus* sp. nov. 2 in Brazil. Samples collected in Alagoas-Sergipe Basin and Espírito Santo Basin. Map produced through Geomar online.



Fonte: A autora.

***Ischnomesus* sp. nov. 3**

(Figures 15-17)

Material examined. *Holotype:* 1 adult female (2.5 mm), (MOUFPE 15.568), station Atex #3, R3, 0-2cm, campaign ATEX, Espírito Santo basin, 19°54.5’00”S, 39°36.9’00”W, 800 m depth, October 2006.

Alotype: 1 adult male, 3 mm, (MOUFPE 15.569), station Atex#11, R1, 0-2cm, campaign ATEX, Espírito Santo basin 19°53,7’00”S, 39°36,2’00”W, 798 m depth, October 2006.

Paratypes: 2 adults females, (UFS_ CRU_ 0176), station BN4R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°32'07.1"S 36°05'11.5"W, 400 m, March 2013. 2 adults females, (UFS_ CRU_ 0177), station FN4R2, 0-2, campaign Marseal, Alagoas-

Sergipe Basin, 11°11'20.4"S 36°52'16.8"W, 400 m, October 2013. 1 adult female, (UFS_ CRU_ 0178), station HN4R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°37'31.2"S, 37°13'16.7"W, 400 m, October 2013. 1 adult female, (UFS_ CRU_ 0181), station BN4R2, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°32'06.9"S 36°05'11.7"W, 400 m, March 2013. 1 adult female, (UFS_ CRU_ 0182), station FN4R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°11'20.6"S, 36°52'16.4"W, 400 m, October 2013. 1 adult female, (UFS_ CRU_ 0183), station BN4R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°32'05.8"S 36°05'10.4"W, 400 m, October 2013. 1 adult female, (MOUFPE 15.570), station Ext 3 EAD2 #4, R2, 2-5, campaign EXT3 LEAD2, Espírito Santo Basin, 19°54'29.28"S, 39°37'13.18"W, 750 m depth, September 2007. 1 adult female, (MOUFPE 15.571) station Atex #12, R1, 0-2cm, campaign ATEX, Espírito Santo Basin, 19°53'00"S, 39°35'00"W, 793 m depth, October 2006. 1 adult male, (MOUFPE 15.572) station Ext3, lead2 #2, R2, campaign EXT3 LEAD2, Espírito Santo Basin, 19°54'36.64"S, 39°36'59.28"W, 750 m depth, September 2007. 1 adult female, (MOUFPE 15.573) station FPSO P-34 #12, R2, 0-2, campaign FPSO P-34, Espírito Santo Basin, 21°10'12.4"S, 40°01'13"W, 200 m depth, August 2007. 1 adult female, (MOUFPE 15.655) station 3 loc Bia #3, R2, 0-2, campaign 3 Loc Bia, 19°53'25.6"S, 39°36'44"W, 650 m depth, July 2007. 1 female, (MOUFPE 15.656) station LEAD TEG #4, R2, 0-2, campaign LEAD TEG, Espírito Santo Basin, 19°48'26"S, 39°30'38"W, September 2008. 1 adult female, (MOUFPE 15.657) station ATEX #10, R1, 0-2, campaign ATEX, Espírito Santo Basin, 19°54,4'00"S, 39°37'00"W, 820 m depth, October 2006.

Diagnosis. Head dorsal surface with some simple setae. Pereonites without spines, but covered with several long simple setae. Pereonite IV-V with several lateral long simple setae. Pereonite V length 2.7 width. Pleotelson with vertical carina and 5 lateral simple setae, without spines or tubercles. Uropods uniramous, biarticulate.

***Description (based on adult female holotype, MOUFPE* 15.568).** Body more or less flattened and elongated, dorsal cuticle covered with long setae. Head 1.2 times wider than long, dorsal surface without spines, but with some simple setae.

Antennule (fig.17B) with 6 articles. Article 1 squat and globular, with 1 seta on anterior margin. Article 2 length 4.6 article 1 length, 2 ventromedial long setae and 2 distal. Article 3 length 1.6 article 4 length, 1 lateral seta, 1 ventromedial and 1 distal. Article 4 with 1

distal seta. Articles 5 and 6 subequal and shorter than others. Articles 5 smooth. Article 6 with 3 terminal setae.

Antenna (fig.17A) article 2 with 2 setae; article 3 length 2 width, with 4 setae (this amount can to vary); article 4 small with 2 setae. Flagellum missing.

Maxilliped (fig.18A) palp consisting of 5 articles, decreasing in length and width distally; The basis is broader than palp, with 2 simple setae. Article 1 of the palp with 2 laterodistal simple setae, one of each side, being the outer about 3x longer than the internal. Article 2 with 1 laterodistal simple seta, bigger than others of this articles, 1 medial distal and 2 laterodistal inner, with some simple setae extremely thin. Article 3 with 1 laterodistal simple seta, 2 medial distal simple setae and 2 laterodistal inner simple setae. Article 4 with 3 laterodistal inner simple setae, one medial. Article 5 with 3 distal simple setae.

Maxilulla (fig.18E) exopod with 10 large spine-like apical setae; lateral margin with several fine setae; distal margin of endopod with 4 large setae, being the last largest, lateral margin with some fine setae.

Maxilla (fig.18D) basis with a row of short setae, outer lobe with 3 apical spine-like setae and some fine setae and rows of short setae on lateral margin; median lobe with 4 apical spine-like setae; inner lobe twice as broad as median or outer lobes, with 6 simple apical setae, distal margin bearing 2 stout serrated setae distomedially; 2 setulated prominent setae; some fine setae and surface with rows of short setae.

Mandibles (fig.18B) with smooth outer margin. Incisor with 4 blunt teeth. Spine row of 4 serrated spine-like setae; *lacinia mobilis* of left mandible with 4 blunt teeth. Molar with smooth grinding surface.

All pereopods broken.

Pleotelson with vertical carina and 5 lateral simple setae, without spines or tubercles.

Uropods uniramous, biarticulate.

Description (based on adult male Alotype, 3 mm, ATEX, MOUFPE 15.569) Body elongated; dorsal cuticle covered with several long setae. Head 0.8 times wider than long. Pereonite V length 4.0 width, 3.4 total body length.

Pleopods. Pleopod I (fig.19A) not fused. Length 10 times as long as wide and distal margin with 1 simple setae.

Pleopod II (fig.19B) stylet not extending to distal margin of protopod. Protopod distal margin 8 simple seta.

Pleopod III (fig.19C) exopod length almost than endopod length, apex with 1 long plumose seta, that arrives the distal margin of the endopod. Lateral margin fringed with fine setae.

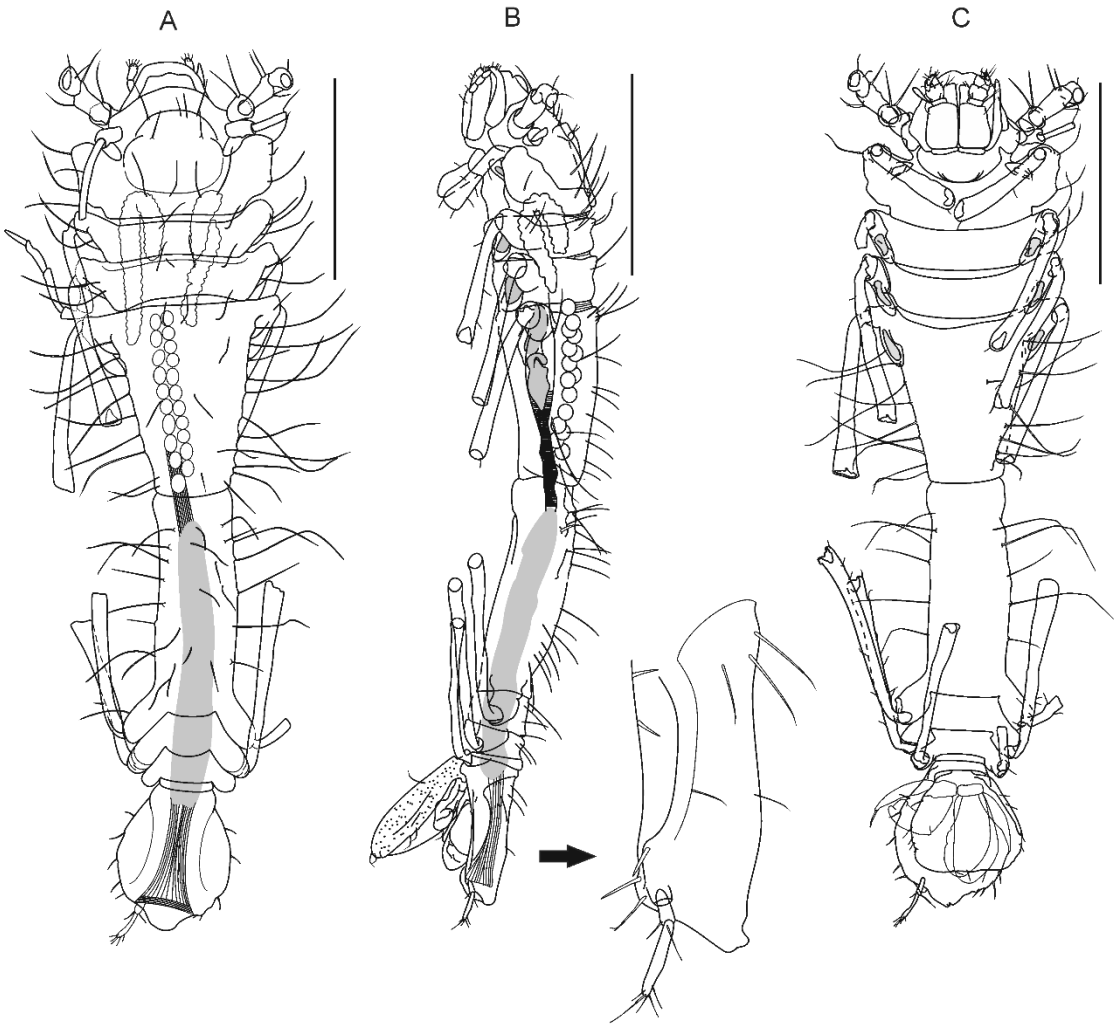
Pleopod IV (fig.19D) setae absent.

Remarks. *Ischnomesus* sp. nov. 3 can be easily distinguished from the other species of *Ischnomesus* due the format of the body, several long simple setae covering the body and pleotelson format. It is part of the group c (tab.4) with no spines, tubercles or pedestal setae along the body, like *I. simplissimus* Menzies, 1962 and *I. vinogradovi* Birstein, 1963. The species *Ischnomesus* sp. nov. 3 resembles *I. vinogradovi* by have pereonites, pleonite and pleotelson smooth, and pleotelson almost rounded, but differ because the species *Ischnomesus* sp. nov. 3 have the pereonites I-IV broader than *I. vinogradovi*. Although the new species belong to the genus *Ischnomesus*, it has similarities with *Mixomesus pellucidus* Wolff, 1962. The species *Ischnomesus* sp. nov. 3 differ from the *Mixomesus pellucidus*, because according to Wolff (1962), this species does not have uropods, while the Brazilian species has. Moreover, Wolff (1962) describes the pereonites V-VII "probably" free, being this feature very clear in the Brazilian species. In addition, to these morphological points, the possibility to be the same species was discarded, because geographically these species has no relation. *Mixomesus pellucidus* was found in Tasman Sea, South Pacific, while *Ischnomesus* sp. nov. 3 in South Atlantic.

Bathymetric range: 200 - 820 m depth.

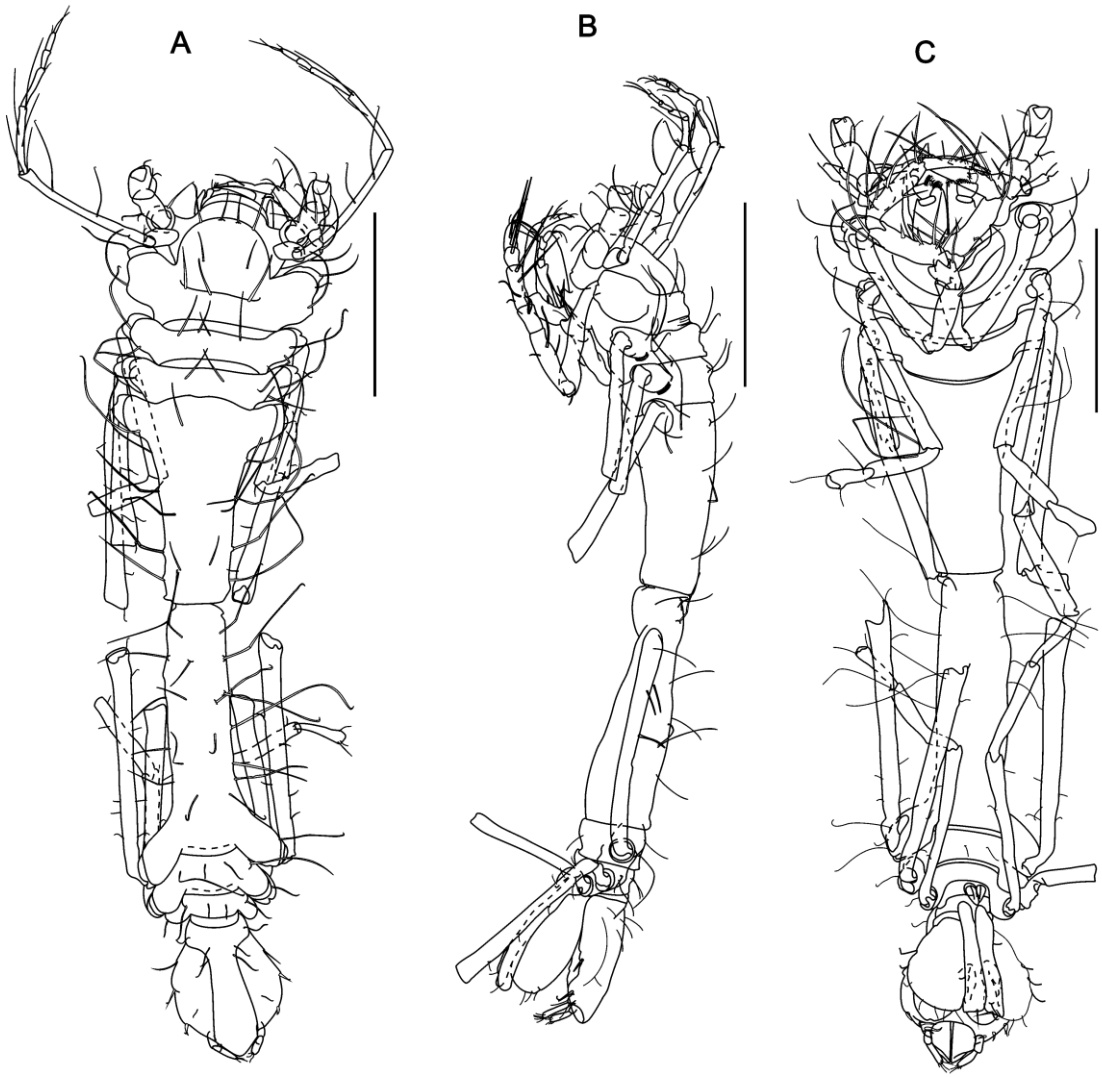
Geographic distribution: Alagoas-Sergipe Basin and Espírito Santo Basin.

Figure 15. *Ischnomesus* sp. nov. 3, holotype adult female, 2.5 mm, ATEX, (MOUFPE 15.568). A= Habitus, B= lateral view, C= Ventral view. Scale= 1 mm.



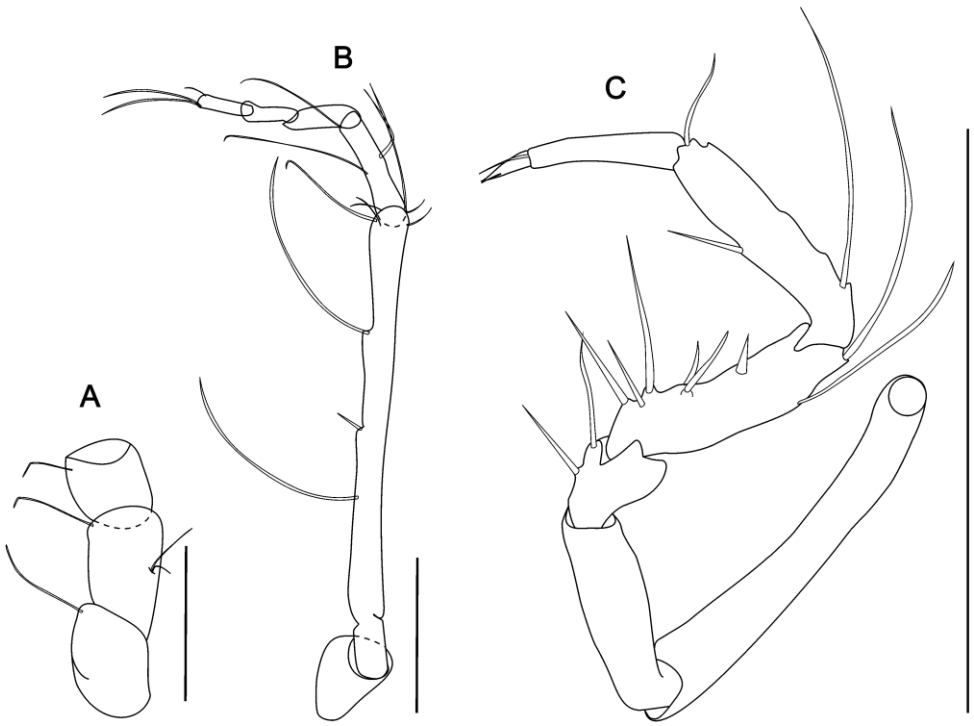
Fonte: A autora.

Figure 16. *Ischnomesus* sp. nov. 3, alotype adult male, 3 mm, ATEX, (MOUFPE 15.569). A= Habitus, B= lateral view, C= Ventral view. Scale= 1 mm.



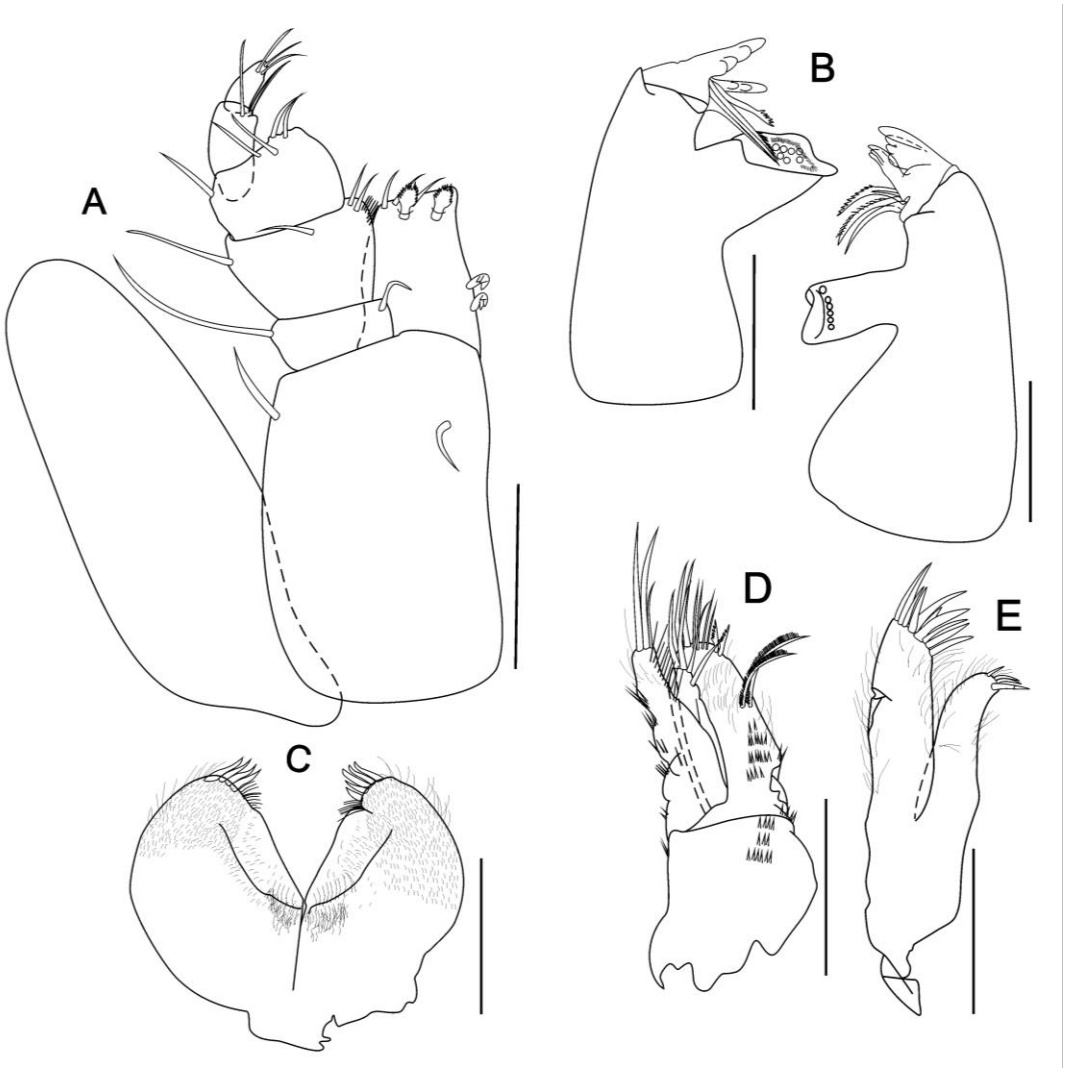
Fonte: A autora.

Figure 17. *Ischnomesus* sp. nov. 3, alotype adult male, 3 mm, ATEX, (MOUFPE 15.569). A= antenna, B= antennula, C= pereopodo 1. Scale A and B= 0,1mm; scale C= 1 mm.



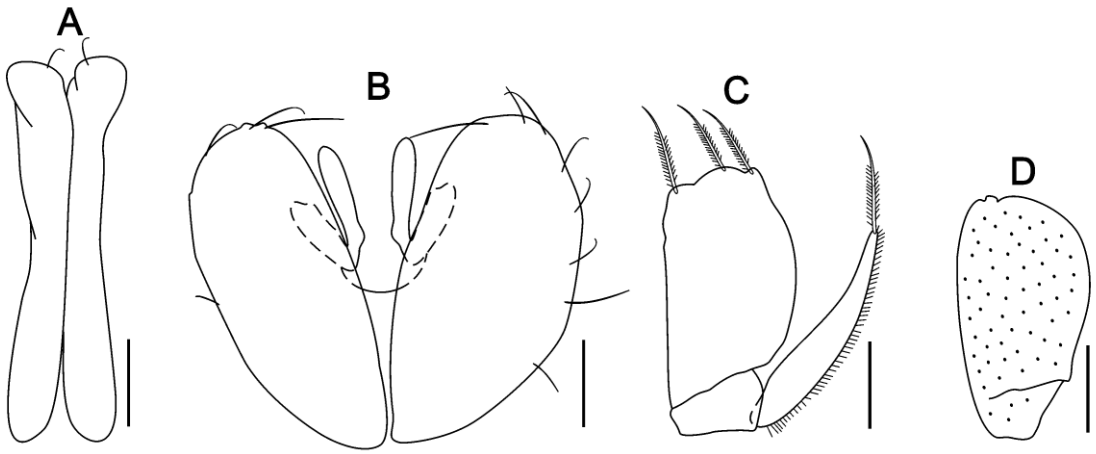
Fonte: A autora.

Figure 18. *Ischnomesus* sp. nov. 3, paratype adult female, LEAD TEG, (MOUFPE 15.656). A= maxilliped, B= mandibles, C= paragnaths, D= maxilla, E= maxillula. Scale= 0.1 mm.



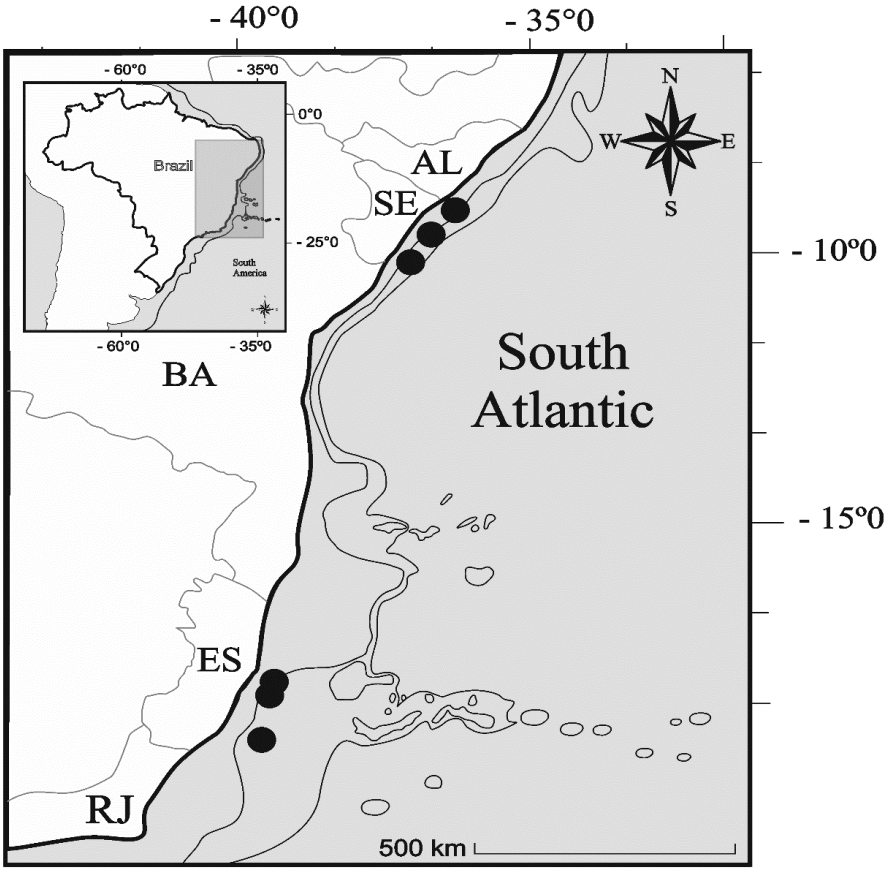
Fonte: A autora.

Figure 19. *Ischnomesus* sp. nov. 3, alotype adult male, 3 mm, ATEX, (MOUFPE 15.569). A= pleopodo 1, B= pleopodo 2, C= pleopodo 3 and D= pleopodo 4. Scale = 0,1mm.



Fonte: A autora.

Figure 20. Geographic distribution of *Ischnomesus* sp. nov. 3 in Brazilian waters. Samples collected in Alagoas-Sergipe Basin and Espírito Santo Basin. Map produced through Geomar online.



Fonte: A autora.

Identification key to *Ischnomesus* species (adult specimens) from South Atlantic.

1 Ornamentation on more than one pereonite ……..... 2

- Pereonites smooth 3

2 Ornamentation on all pereonites…….....……. 4

- Ornamentation only on pereonite on pereonite I ……..……. *I.paucispinis*

3 Pleotelson with spines ……..... *I. bidens*

- Pleotelson without spines ……..... 5

4 Pleotelson with spines ……..…….. *Ischnomesus* sp. nov. 1

- Pleotelson without spines…….....…….. 6

5 Pleotelson with some setae ……..……. *Ischnomesus* sp. nov. 3

- Pleotelson without setae ..……..…….. *I. simplissimus*

6 Pereonite VI with posterolateral spines ……..……... *I. wolffi*

- Pereonite VI without posterolateral spines …….…..…….. 7

7 Pereonite I with anterolateral spines …….....8

- Pereonite I without anterolateral spines ……..*I. decemspinosus*

8 Without dorsal spines ..... *I. elegans*

- With dorsal spines on pereonites I until 4..... *Ischnomesus sp.nov.2*

General Comments

This is the first record of the family Ischnomesidae for Brazilian waters. It were found three species of the genus *Ischnomesus,* having its higher diversity and records in the Atlantic Ocean. The table 3 showed three type of ornamentation found in this group and where their geographic and bathymetrical distribution for each species. *Ischnomesus* sp. nov. 1 is closer to *I. antarcticus* and *I. spaercki*, presenting ornamentation in all the body.

Was not observed any ornamentation pattern relationed with bathymetric distribution. *Ischnomesus spaercki* was found in deeper depths, 6660-7000 m, but the most ornamented species is *I. antarcticus.* Although *I. antarcticus* was found in the shallower depth, 274 m, approximately, in relation to the three species mentioned, it was certainly found in colder waters, due to its location, polar waters (Schultz, 1979). The second most ornamented was *I. spaercki* found at the temperature of 1.3ºC (Wolff, 1956) and the Brazilian species *Ischnomesus* sp. nov.1, found in 750-1050 m, with less ornamentation in the body, found at a temperature of approximately 4ºC. Through this analysis, ornamentation seems to be more related to temperature than depth, however if we observed the table 1, for example, *I. simplissimus* that was found between 4885-5960 m depth and temperature of approximately 2.5ºC (Menzies, 1962), does not present ornamentation. With this, we also conclude that temperature does not influence the ornamentation of individuals. Further studies are necessary to understand if there is a relationship between the ornamentation and the environment, if it serves to protect against predators, or helps in the reproduction process, among other reasons.

The species *Ischnomesus* sp. nov. 2 and *Ischnomesus* sp. nov. 3 are not so ornamented like the *Ischnomesus* sp. nov. 1, but they have their bodies covered with setae. Brazilian species are more setose of the others around the world. The species *Ischnomesus* sp. nov. 2 presents several simple setae covered on its body and the *Ischnomesus* sp. nov. 3 has long setae, not observed in any other species. The species *I. tasmanensis* and *I. harrietae* also present their setose bodies, they were found in Australia and France, respectively. The function of the setae in the animal is not known, but Kavanagh et al. (2006) said that *I. harrietae* use carposubchelate pereopods I to feed it, but also consume adsorbed organic matter, the setae may help in this last process feed.

The species found at higher depth was *Ischnomesus* sp. nov. 2 and the shallower was *Ischnomesus* sp. nov. 3, the last has the wider geographic distribution along the Brazilian deep sea. All the specimens were collected in three sedimentary Basin, Alagoas-Sergipe Basin, Espírito Santo Basin and Campos Basin. The predominant sediment found in high depth is sandy muddy.

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5. Chapter II - Two new species of the family Ischnomesidae Hansen, 1916 (Isopoda, Asellota) from Brazilian deep sea, with description of a new genus

Abstract

Two new species and a new genus of family Ischnomesidae are described from Brazilian deep sea. All material examined herein were collected in environmental monitoring and characterization campaigns realized by Petrobrás in three sedimentary Basins: Alagoas-Sergipe, Espírito Santo and Campos. The new genus is characterized by presenting uropods biramous and the male pleopod 2 fused. The new species *Gracilimesus* sp. nov. share characters with *G. celticensis*, but differs from it due the presence of two long setae on the article 2 of antennula, the size of the spines on the pereonite I, pleopods 1 fused, except for a small region near the distal margin and the mouthparts less setose than in *G. celticensis*. The bathymetric range of the new genus is 750 - 1900 m depth and the bathymetric range of the *Gracilimesus* sp. nov. is 400 - 1900 m depth. This paper increases the diagnosis for the family Ischnomesidae, with biramous uropods and key to all genera for the family is provided.

Key words: Peracarida, Taxonomy, Marine benthic, *Gracilimesus*, South Atlantic

Introduction

The family Ischnomesidae Hansen, 1916 is represented by nine genera and 106 species: *Contrarimesus* Kavanagh and Wilson, 2007; *Cornuamesus* Kavanagh and Wilson, 2007; *Fortimesus* Kavanagh and Wilson, 2007; *Gracilimesus* Kavanagh and Wilson, 2007; *Haplomesus* Richardson, 1908; *Heteromesus* Richardson, 1908; *Ischnomesus* Richardson, 1908; *Mixomesus* Wolff, 1962; *Stylomesus* Wolff, 1956 (Wilson and Schotte, 2008). It is a very peculiar group among the Asellota and can be readily identified by the pereonite V longest in relation of the others pereonites (Wolff, 1962). Also, it is the only family among the Asellota that has the head completely fused with the pereonite I (Hansen, 1916; Merrin and Poore, 2003).

The degree of fusion on the posterior pereonites, the pleonites and pleotelson is an important character for defining genera in Ischnomesidae. For example, in the genus

Ischnomesus, all pereonites are freely articulated and pleonite I also articulates freely with the pleotelson. On the other hand, the genus *Contrarimesus*, *Cornuamesus*, *Fortimesus*, *Gracilimesus* and *Haplomesus* present, posterior pereonites, pleonite I and the pleotelson fused together (Kavanagh and Wilson, 2007).

Analyzing the material collected by Petrobrás in the projects of Marseal (Alagoas-Sergipe Basin), Atex, Ext3Lead2, Seillean (Espírito Santo Basin) and Campos Basin (Rio de Janeiro) a new genus and species were found, also a new specie of the genus *Gracilimesus* is described herein.

Material and Methods

Sampling procedures

The specimens examined in the present paper were collected with box core (50 x 50 x 50 cm), during environmental monitoring and characterization programmes of Petrobrás realized in deep waters of Alagoas-Sergipe Basin, Espírito Santo Basin and Campos Basin. In Alagoas-Sergipe Basin, the campaign were carried in 2013 on board of the R/V Seward Johnson. In Espírito Santo Basin, the campaign were realized in 2006-2008 on board of R/V Gyre, Company American Bureau of Shipping (ABS), trough the campaigns Ext3 Lead 2 (2006/2007), ATEX (2007) and Seillean (2006). In Campos Basin, the campaign were realized in 2002 and 2003, on board of N/RB Astro Garoupa.

Taxonomic techniques

The specimens were identified under a stereoscopic microscope and microscopy with *camera lucida* and the drawn specimens were dissected and mounted in glycerine gel slides. The illustrations were made in graphics program Corel Draw X7, with support of the digital table, according to adapted Coleman's techniques (2003). The type material is deposited in the Crustacea collection of "Museu de Oceanografia Prof. Petrônio Alves Coelho da Universidade Federal de Pernambuco" (MOUFPE), "Universidade Federal de Sergipe" (UFS_CRU) and "Museu Nacional do Rio de Janeiro" (MNRJ), preserved in 75% etanol.

Illustrations of manca were made and characters that differ from adults were also described. The nomenclature adopted for description (morphologic terminology) was based in Kavanagh and Wilson (2007); Kavanagh *et al*. (2015); nomenclature adopted for

mouthparts was Brökeland and Brandt (2004). We use Roman numerals for pereopods descriptions and Arabic numerals for other body parts.

Taxonomy

Order Isopoda Latreille, 1817

Suborder Asellota Latreille, 1802

Superfamily Janiroidea Sars, 1897

Family Ischnomesidae Hansen, 1916

Diagnosis (modificated from Merrin and Poore, 2003). Body elongate, subcylindrical and narrow. Pereonites IV–V elongate, pereonite V longest, at least twice as long as wide, pereonite IV widest anteriorly, 5 widest posteriorly. Head fused to and embedded in pereonite I. Pereonites I (posterior margin) to IV free and articulating. Pleon with maximum of 2 free pleonites plus pleotelson. Anus separated from branchial chamber. Eyes absent. Antenna 1 terminating with simple setae, article 1 squat and globular, article 2 elongate, at least twice as long as article 1. Antenna 2 length more than half body length, without squama. Maxilla 2 inferior margin with 2 medial pectinate setae. Pereopod 1 robust, strongly subchelate and haptorial; pereopods 2–7 ambulatory; dactylus with single unguis and 2 simple setae. Pleopod 3 endopod with 3 distal plumose setae, exopod tapering, shorter than endopod, with long distal plumose seta. Pleopod 4 unadorned, simple lobe, exopod absent; pleopod 5 absent. Uropod uniramous **or biramous, uniarticulated or biarticulated**, terminal. In females, operculum wider at midpoint than proximally.

Ischnomesidae gen. nov.

Diagnosis. Body surface with lateral and dorsal small setae. Pereonites V–VII, pleonite 1 and pleotelson freely articulated. Antennula with 6 articles, distal flagellar articles much longer than wide. Pleotelson dorsal surface axial ridge weakly vaulted, separated from lateral fields only by shallow elongate concavities. Uropods birramous.

Remarks. Ischnomesidae gen. nov. is closely related to the genus *Ischnomesus*, which has all pereonites, pleonites and pleotelson freely articulated. However, the new genus differs from the later, and from all other genera included in the family Ischnomesidae, by the presence of biramous uropods.

Ischnomesidae gen. nov. et sp. nov.

(Figures 19-24)

Material examined: *Holotype*: 1 adult female, 7 mm, (UFS_ CRU_ 0186), station FN6R3, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°15'30.1"S, 36°52'15.0"W, 1000 m depth, March 2013.

Alotype: 1 adult male, 5 mm, (UFS_ CRU_ 0207*)*, station GN8R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°32'02.8"S, 36°56'09.6"W, 1900 m depth, March 2013.

Paratypes: 2 adults females, (UFS_ CRU_ 0339), station FN6R3, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°15'30.1"S, 36°52'15.0"W, 1000 m depth, March 2013. 2 adult females, (UFS_ CRU_ 0187), station BN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°35'03.7"S, 36°01'33.2"W, 1000 m depth, October 2013. 2 adult females, (UFS_ CRU_ 0189), station BN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'07.8"S, 36°01'37.5"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0190), station AN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°21'21.9"S, 35°53'36.1"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0191), station BN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°35'03.7"S, 36°01'33.2"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0192), station BN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'08.9"S, 36°01'35.4"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0193), station BN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'07.8"S, 36°01'37.5"W, 1000 m depth, March 2013. 1 adult female e 1 fragment, (UFS_ CRU_ 0194), station BN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'07.8"S, 36°01'30.1"W, 1000 m depth, October 2013. 1 adult female e 1 fragment, (UFS_ CRU_ 0195), station AN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°21'23.9"S, 35°53'37.6"W, 1000 m depth, October 2013. 2 adults females, (UFS_ CRU_ 0196), station BN6R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'03.7"S, 36°01'33.2"W, 1000 m depth, October 2013. 2

adults females, (UFS_ CRU_ 0201), station AN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°21'24.0"S, 35°53'37.7"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0202), station DN6R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°21'24.0"S, 35°53'37.7"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0204), station AN6R2, 2-5,campaign Marseal, Alagoas-Sergipe Basin, 10°21'25.9"S, 35°53'40.3"W, 1000 m depth, March 2013. 1 adult male (UFS_ CRU_ 0206), station BN8R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°39'59.2"S 35°55'58.0"W, 1900 m depth, March 2013. 2 adults females, (UFS_ CRU_ 0211), station DN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°56'19.6"S, 36°28'47.1"W, 1000 m depth, October 2013. 3 fragments, (UFS_ CRU_ 0212), staion DN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°56'19.6"S, 36°28'47.1"W, 1000 m depth, October 2013. 1 adult female (UFS_ CRU_ 0213), station EN8R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°00'41.8"S, 36°45'43.5"W, 1900 m depth, October 2013. 1 fragment, (UFS_ CRU_ 0205), station EN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°00'41.8"S, 36°45'43.5"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0208), station GN6R3, 0-2 campaign Marseal, Alagoas-Sergipe Basin, 11°26'41.9"S 37°02'24.7"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0209), station FN8R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°26'41.9"S, 37°02'24.7"W, 1900 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0210), station FN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°15'27.3"S, 36°52'13.2"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0188), station FN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°15'28.1"S, 36°52'16.0"W, 1000 m depth, October 2013. 2 adults females, (UFS_ CRU_ 0203), station FN6R3, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°15'30.1"S, 36°52'15.0"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0184), station HN8R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°32'04.3"S, 36°56'10.5"W, 1900 m, October 2013. 1 fragment, (UFS_ CRU_ 0185), station FN6R2, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°15'27.3"S, 36°52'13.2"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0198), station GN8R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°32'03.9"S, 36°56'09.6"W, 1900 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0199), station GN8R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°32'04.3"S, 36°56'10.5"W, 1900 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0200), station AN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°32'04.3"S, 36°56'10.5"W, 1000 m depth, March 2013. 1 adult female, (MOUFPE 15.665), station Ext3 Lead2 #4, R2, 0-2, campaign

EXT3 LEAD2, Espírito Santo Basin, 19º54’36.6”S, 39º36’59.3’’W, 750 m depth, September 2007.

Diagnosis. Body surface with lateral and dorsal small setae. Pereonites V–VII, pleonite 1 and pleotelson freely articulated. Antennula with 6 articles, distal flagellar articles much longer than wide. Pleotelson dorsal surface axial ridge weakly vaulted, separated from lateral fields only by shallow elongate concavities. Uropods birramous. Males with pleopod 2 fused.

Description (based on adult female holotype 7 mm, UFS_ CRU_ 0186). Dorsal cuticle covered with small simple setae. Head length 0.9 width, dorsal surface without tubercles or spines. Delicate suture visible between the head and pereonite I. Pereonites I-III with anterolateral small spines.

Antennula (fig. 21A) with 6 articles. Article 1 squat and globular, with 1 lateral plumose seta. Article 2 longer than others, 1.6 times as long as article 1, with 3 lateral long simple setae and 5 ventromedial setae, one of them with accessory seta, 4 ventrolateral, one of them plumose. Article 3 elongate and tubular, 1.3 times as long as articles 4 and 5 together, with 2 lateral and ventromedial simple setae. Article 4 very short, with 2 simple setae. Article 5 with 1 ventromedial seta and 1 distal. Article 6 with 4 distal setae.

Antenna (fig. 21B) with peduncle present: article 1 with 8 simple setae. Article 2 with 13 simple setae, 3 are distal. Article 3 with 3 distal simple setae. Flagellum missing.

Maxilliped (fig. 22A) basis broader than palp, covered with rows of short setae; endite shorter than palp. Palp with articles 4-5 narrower than articles 1-3, all of them covered with rows of short setae, except the article 5, and lateral simple setae, except the article 1, that just has 1 long simple seta in the distal angle. Endite with 3 retinacula, 4 fan setae and some distal and lateral simple setae. Epipod with 4 almost lateral simple setae.

Maxilulla (fig. 22C) exopod with 8 large serrated spine-like apical setae and 2 simple; lateral margin and dorsally with some fine setae; distal margin of endopod with 1 stout serrated seta lateral 2 distomedially simple, lateral and distal margin with few fine setae. Basis, dorsal margin (considering the region not divided), with rows of short setae.

Maxilla (fig. 22B) basis with rows of short setae, outer lobe with 3 apical spine-like setae, 4 rows of short setae, inner side with some simple setae; median lobe with 3 apical spine-like setae; inner lobe almost more than twice as broad as median or outer lobes, with 10

plumose setae, 2 plumose robust setae and distal margin bearing 1 stout serrated seta, 2 long simple setae, lateral margin with 2 setulated prominent setae, several fine setae, few simple setae and surface of with some rows of short setae.

Mandible (fig.22D e F) with outer margin setulated, with some rows of short setae and 1 long simple seta. Incisor with 5 blunt teeth. Spine row of 7 serrated spine-like setae; *lacinia mobilis* with 5 blunt teeth and incisor with 5 blunt teeth. Molar with smooth grinding surface.

Pereon poor ornamented. Pereonite I-III with 1 pair of small anterolateral spines. Pereonite IV-VII just covered with simple setae, but without spines, tubercles or pedestal setae. Pereonite IV and V are the longest. Pereonite V length 1.1 pereonite IV length. Pereonite VI length 1.1 pereonite VII.

Pereopod I (fig. 23P1) weakly subchelate. Basis with 5 anterior and 9 posterior simple setae. Ischium with 4 anterior, 2 posterior and 2 mesial simple setae. Merus with 2 anterior, 3 posterior, 4 mesial simple setae and 3 anteromesial robust setae with accessory setae. Carpus with 7 anterior long simple setae, with 20 short sensillate robust setae and 4 long simple setae and 2 long robust proximally. Propodus with 11 anterior simple setae and 5 posterior simple setae and 2 short robust setae. Dactylus with 4 anterior simple setae, 1 posterior simple seta and 1 mesial simple seta.

Pereopod II (fig. 23P2) basis 5.4 times as long as broad with 3 anterior and 8 posterior setae Ischium 4 times as long as broad with 6 anterior and 5 posterior setae. Merus 2.2 times as long as broad with 1 anterior seta, 3 posterior and 4 distal setae. Carpus 3.2 times as long as broad with 4 anterior and 7 posterior robust setae with accessory setae, 2 long robust setae with accessory setae and 5 lateral setae. Propodus 3.5 times as long as broad with 6 anterior, with a plumose seta, 5 lateral, 4 posterior and 2 distal setae, 1 simple seta and 1 robust setae with accessory seta. Dactylus 5.5 times as long as broad with 3 lateral setae.

Pereopod III (fig. 23P3) basis 6.8 times as long as broad with 2 anterior and 10 posterior setae. Ischium 5 times as long as broad with 5 anterior and 5 posterior setae. Merus 2.9 times as long as broad with 1 anterior seta, 2 posterior setae and 1 distal seta. Carpus 7.9 times as long as broad with 6 anterior, 6 posterior robust setae with accessory setae, 4 lateral setae and 1 distal robust seta with accessory setae. Propodus 7.1 times as long as

broad with 10 anterior, 9 posterior robust setae with accessory setae, 1 distal and 3 lateral setae. Dactylus 4.3 times as long as broad with 2 lateral setae and 1 anterior seta.

Pereopod V (fig. 23P5) basis 5.4 times as long as broad with 6 anterior and 3 posterior setae. Ischium 5.2 times as long as broad with 5 anterior, 2 lateral and 8 posterior setae. Merus 3.1 times as long as broad with 1 anterior, 1 posterior and 2 distal setae. Carpus 6.4 times as long as broad with 3 anterior and 6 posterior. Propodus 11 times as long as broad with 6 anterior, 6 posterior and 3 distal. Dactylus 8.3 times as long as broad with 3 mesial setae and 2 anterior setae.

Pereopod VI (fig. 23P6) basis 7.1 times as long as broad with 6 anterior, 6 posterior and 2 distal setae. Ischium 3.9 times as long as broad with 2 anterior and 1 posterior seta. Merus 3 times as long as broad with 2 distal setae. Carpus 8 times as long as broad with 2 anterior and 4 posterior setae. Propodus with 1 anterior, 3 posterior setae and 4 distal setae. Dactylus 8 times as long as broad with 3 lateral setae.

Pereopods IV and *VII* broken.

Pleonite 1 with small ventral and lateral simple setae.

Pleotelson with a median longitudinal carina without tubercles, spines or pedestal setae, but covered with simple setae.

Uropods biarticulate, birramous (fig.24A). Peduncle with 6 simple setae, length 2.3 width. The ramus are about 2 times longer than the peduncle; inner ramus length 1.06 outer ramus, with several simple setae and 1 plumose distal.

Description (based on male Alotype,* 5 mm, *UFS_ CRU_ 0207). Males present same ornamentation as females. The pereonite V 1.06 is longer in males than in females. Pereonite V length 1.4 pereonite IV length.

Pleopods. Pleopod I ((fig. 24Pl1) twice as long as wide, distal and ventral margins with 1 simple seta.

Pleopod II (fig. 24Pl2) fusioned. Stylet with tapered tip and 6 long simple setae. Protopod tapering toward distal margin with some simple setae on lateral margin

Pleopod III (fig. 24Pl3) exopod less than half of endopod length, apex with 1 long simple seta which arrives almost the distal margin of the endopod. Lateral margin fringed with fine setae. Endopod with 2 plumose setae on distal margin.

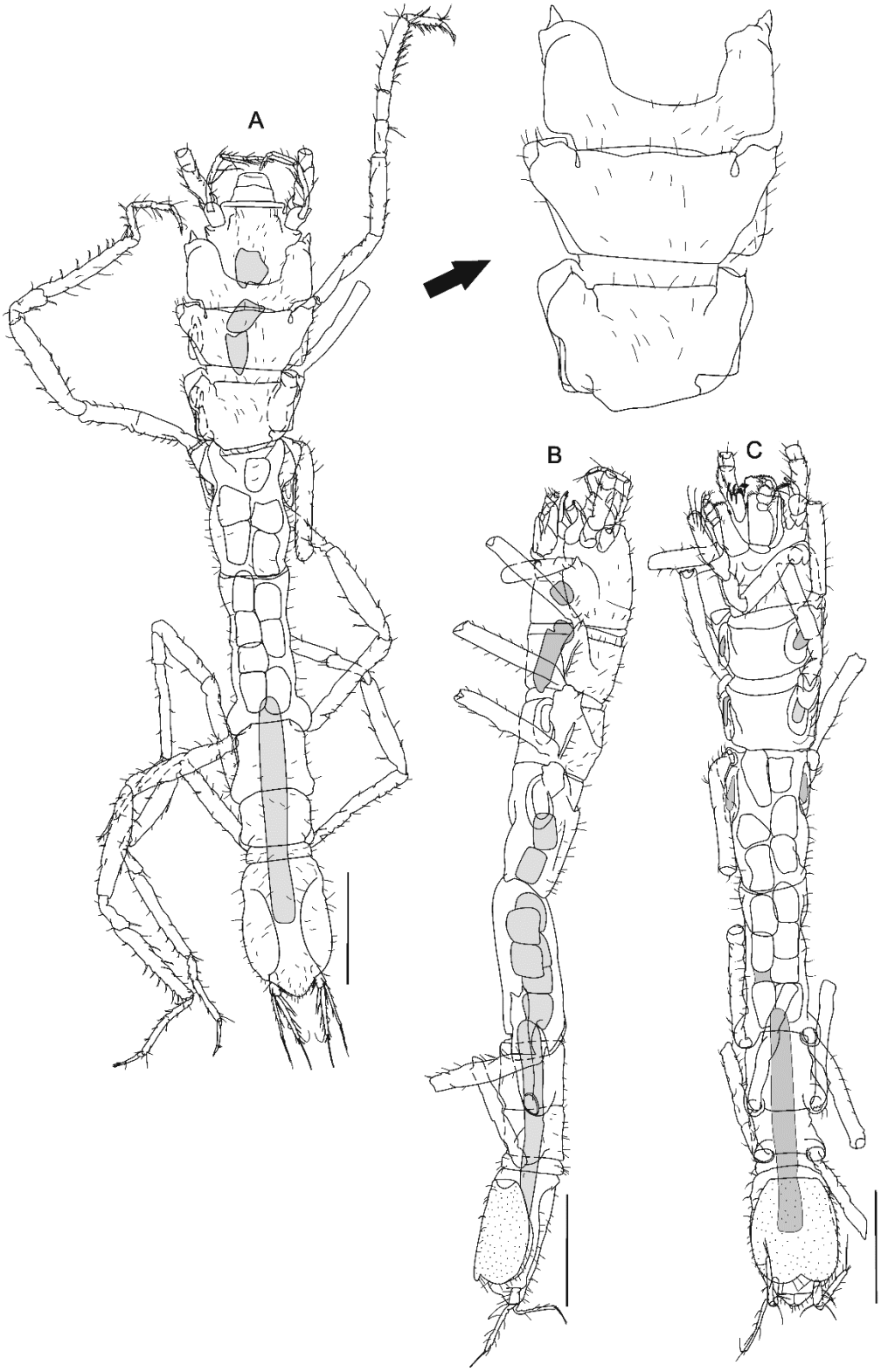
Pleopod IV (fig. 24Pl4) without setae on margins.

Remarks. The new genus found in Brazilian deep sea reveals a new type of uropod, expanding the diagnosis of the family. All other genera of the family have uropods uniramous, which could biarticulated (e.g. *Ischnomesus*) or uniarticulate (all other genera) (Richardson, 1908; Wolff, 1962; Kavanagh *et al.* 2006). According Kavanagh and Wilson, 2007, the genera that belongs to Asellota that presents uropods biramous are basally derived from genera *Stenetrium* (Stenetriidae), *Janira* (Janiridae) and *Asellus* (Asellidae), but the new genus of Ischnomesidae also presents this characteristic, uropods biramous. In examined material was observed just one specimen male and the pleopod 2 was fused. The male pleopod 2 is separated in all the genera already described to family Ischnomesidae. No suture was visualized between the pleopods 2 of this specimen and the stylet is positioned almost at the distal margin of the pleopod. It is necessary to analyze more individuals to confirm if this character is common among males within this species.

Bathymetric range: 750 - 1900 m depth.

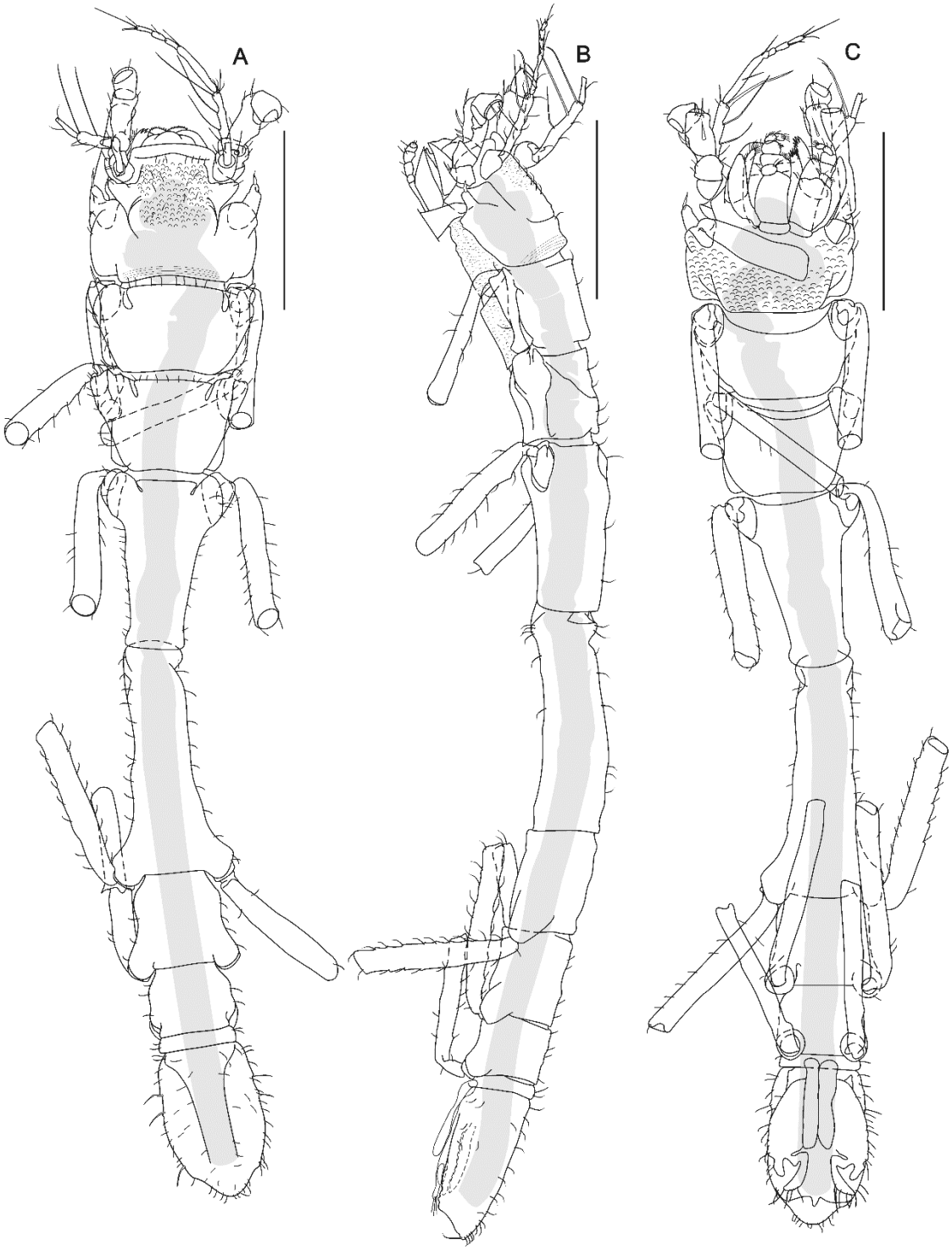
Geographic distribution: Alagoas-Sergipe Basin and Espírito Santo Basin.

Figure 21. Ischnomesidae gen. nov. et sp. nov., holotype adult female, 7 mm, Marseal, (UFS_ CRU_ 0186). A= habitus, B= lateral view, C= ventral view. Scale= 1 mm.



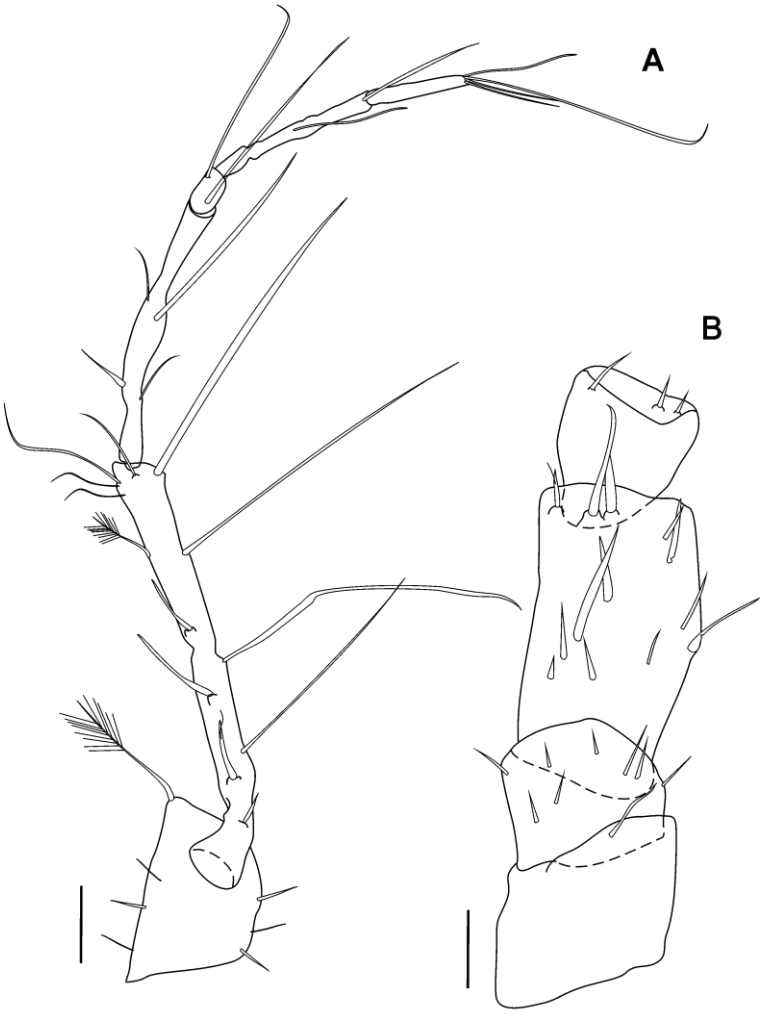
Fonte: A autora.

Figure 22. Ischnomesidae gen. nov. et sp. nov., alotype adult male, 5 mm, Marseal, (UFS_ CRU_ 0207). A= habitus, B= lateral view, C= ventral view. Scale= 0.1 mm.



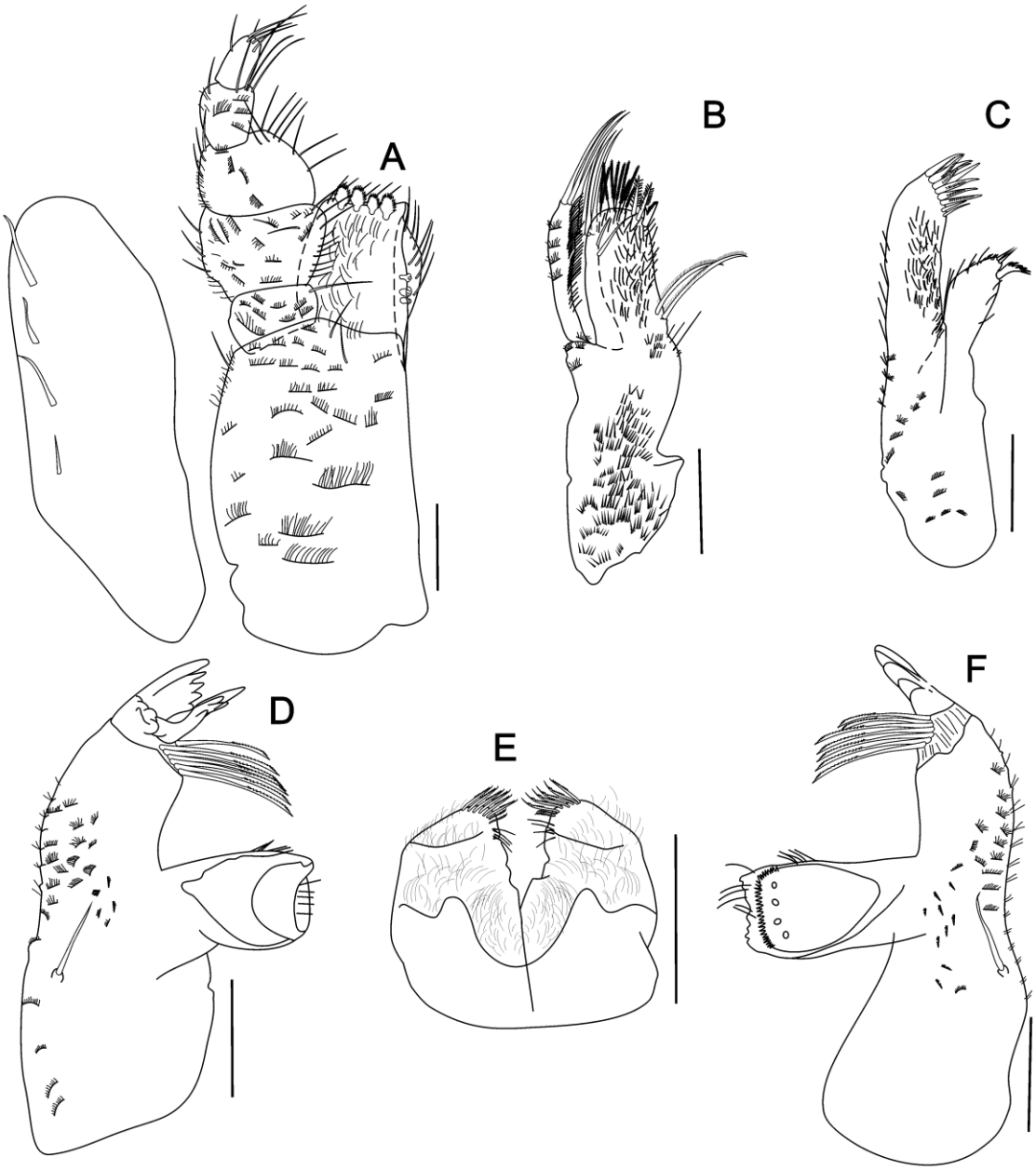
Fonte: A autora.

Figure 23. Ischnomesidae gen. nov. et sp. nov., paratype adult female, Marseal, (UFS_ CRU_ 0339). A= antennula, B= antenna. Scale= 0.1 mm.



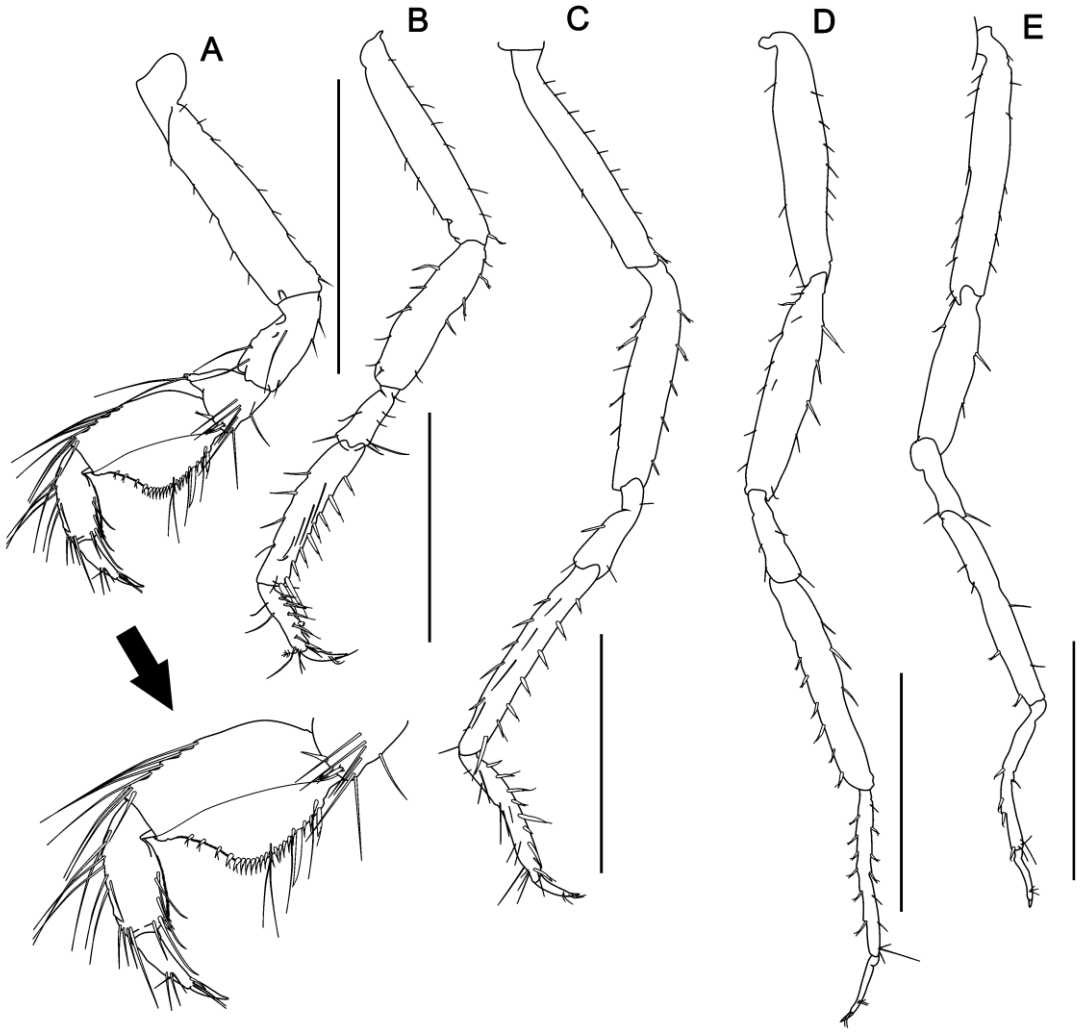
Fonte: A autora.

Figure 24. Ischnomesidae gen. nov. et sp. nov., paratype adult female, 7 mm, Marseal, (UFS_CRU__0339). A= maxilliped, B= maxilla, C= maxillula, D= right mandible, E= paragnaths and F= left mandible. Scale= 0.1 mm.



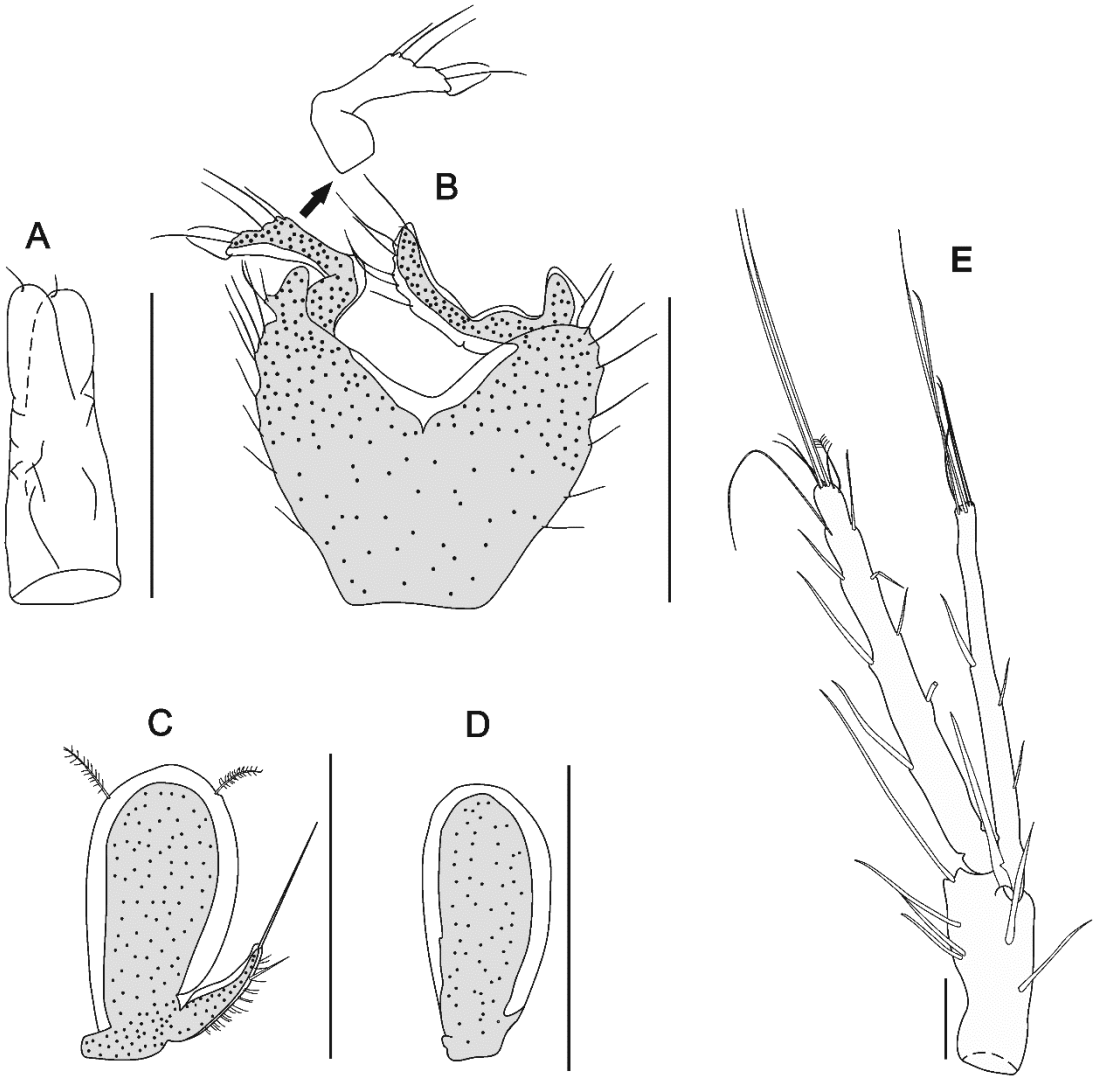
Fonte: A autora.

Figure 25. Ischnomesidae gen. nov. et sp. nov., paratype adult female, 7 mm, Marseal, (UFS_ CRU_ 0186). A= pereopod 1, B = pereopod 2, C = pereopod 3, D = pereopod 5, E = pereopod 6. Scale = 1 mm.



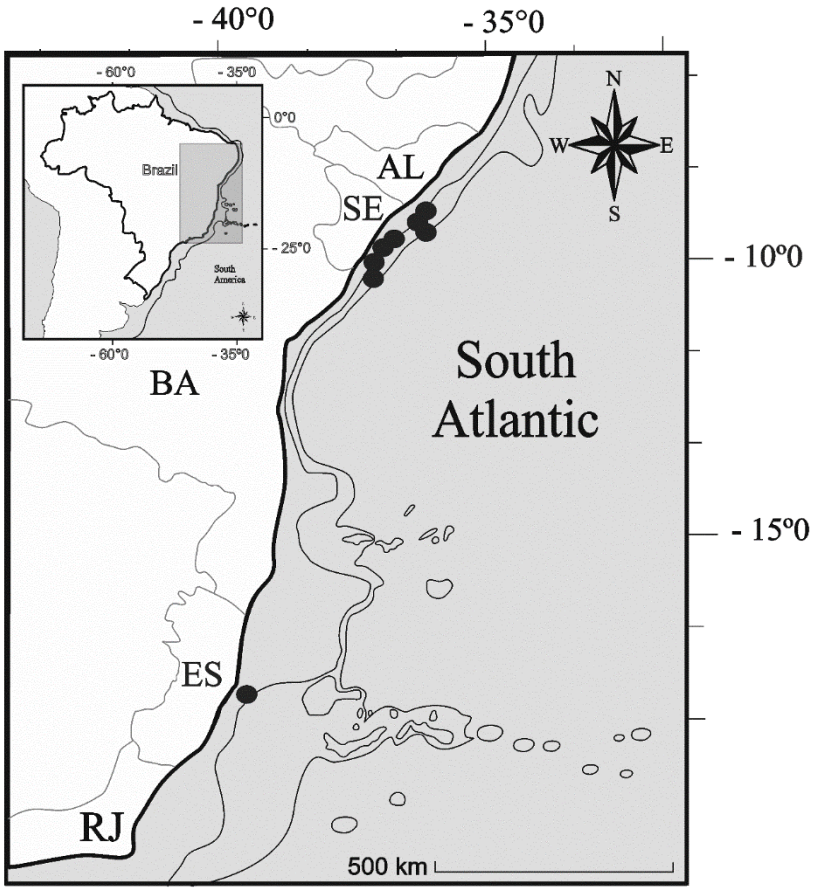
Fonte: A autora.

Figure 26. Ischnomesidae gen. nov. et sp. nov., alotype male, 5 mm, Marseal, (UFS_ CRU_ 0207), A = pleopod 1, B= pleopod 2 (The detail shows the original position of the stylet, modified during the preparation of the lamina), C = pleopod, D = pleopod. Paratype female, 7 mm, Marseal, (UFS_ CRU_ 0186), E= uropod. Scale= 0.1 mm.



Fonte: A autora.

Figure 27. Geographic distribution of Ischnomesidae gen. nov. et sp. nov. in Brazilian waters. Samples collected in Alagoas-Sergipe Basin and Espírito Santo Basin. Map produced through Geomar online.



Fonte: A autora.

***Gracilimesus* sp. nov.**

(Figures 27-31)

Material examined: *Holotype*: 1 adult female, 3.3 mm, (MNRJ 20945), station OP II#45, campaign Campos Basin, 22°11.811'S 39°52.324'W, 1050 m depth, 12 October 2002.

Alotype: 1 adult male, 3 mm, (MNRJ 20960), station OPII #84, campaign Campos Basin, 22º26'28.8"S, 39°58'53.3"W, 1050 m depth, 20 June 2003.

Paratypes: 1 adult female, (UFS_ CRU_ 0129), station CN7R3, 5-10, campaign Marseal, Alagoas-Sergipe Basin, 10°43'45.8"S, 36°11'45.3"W, 1300 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0130), station BN6R1, 2-5, campaign Marseal, Alagoas-

Sergipe Basin, 10°35'05.5"S, 36°01'32.8"W, 1000 m depth, March 2013. 1 adult female and 1 fragment, (UFS_ CRU_ 0131), station BN6R1, 5-10, campaign Marseal, Alagoas-Sergipe Basin, 10°35'05.5"S, 36°01'32.8"W, 1000 m depth, March 2013. 1 adult female, 1 juvenile and 1 fragment, (UFS_ CRU_ 0132), station CN7R2, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°43'45.8"S 36°11'45.0"W, 1300 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0133), station AN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°21'24.0"S, 35°53'37.7"W, 1000 m depth, March 2013. 3 adults females, (UFS_ CRU_ 0134), station CN7R3, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°43'45.8"S, 36°11'45.3"W, 1300 m depth, October 2013. 2 adults females,1 juvenile and 1 adult male, (UFS_ CRU_ 0135), station FN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°15'30.1"S, 36°52'15.0"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0136), station FN6R1, 2-5 campaign Marseal, Alagoas-Sergipe Basin, 11°15'26.9"S, 36°52'15.1"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0137), station CN7R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'43.2"S, 36°11'47.3"W, 1300 m depth, October 2013. 2 adults females and 1 juvenile, (UFS_ CRU_ 0138), station CN7R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'42.4"S, 36°11'45.3"W, 1300 m depth, October 2013. 2 adults females and 2 fragments, (UFS_ CRU_ 0139), station CN7R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'45.8"S 36°11'45.0"W, 1300 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0140), station AN6R3, 0-2 campaign Marseal, Alagoas-Sergipe Basin, 10°21'28.5"S, 35°53'43.7"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0141), station HN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°39'03.4"S, 37°11'42.6"W, 1000 m depth, March 2013. 8 adults females, (UFS_ CRU_ 0142), station CN7R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'45.8"S, 36°11'45.3"W, 1300 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0143), station GN6R3, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°26'40.5"S, 37°02'20.6"W, 1000 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0144), station DN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°56'19.0"S, 36°28'46.1"W, 1000 m depth, March 2013. 1 adult male, (UFS_ CRU_ 0145), station HN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°39'03.6"S, 37°11'42.3"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0146), station HN8R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°42'50.5"S, 37°07'07.5"W, 1900 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0147), station FN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 11°15'26.9"S, 36°52'15.1"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_

0148), station FN4R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 11°11'20.4"S, 36°52'16.8"W, 400 m depth, October 2013. 3 adults females, (UFS_ CRU_ 0149), station BN6R1, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'05.5"S, 36°01'32.8"W, 1000 m depth, March 2013. 1 adult female and 1 adult male, (UFS_ CRU_ 0150), station BN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'07.8"S, 36°01'37.5"W, 1000 m depth, March 2013 . 1 adult female, (UFS_ CRU_ 0151), station BN6R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°35'05.5"S, 36°01'32.8"W, 1000 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0152), station BN6R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°35'07.8"S, 36°01'37.5"W, 1000 m depth, March 2013. 10 adults females, 2 adults males and 3 fragments, (UFS_ CRU_ 0153), station CN7R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'41.2"S 36°11'44.5"W, 1300 m depth, March 2013. 5 adults females, (UFS_ CRU_ 0154), station CN7R3, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°43'41.2"S, 36°11'44.5"W, 1300 m depth, March 2013. 5 adults females, 1 adult male and 3 fragments, (UFS_ CRU_ 0155), station CN7R3, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'45.8"S, 36°11'45.3"W, 1300 m depth, October 2013. 1 adult female, (UFS_ CRU_ 0156), station CN7R3, 5-10, campaign Marseal, Alagoas-Sergipe Basin, 10°43'41.2"S, 36°11'44.5"W, 1300 m depth, March 2013. 2 adults females, (UFS_ CRU_ 0157), station CN7R1, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°43'42.4"S, 36°11'45.3"W, 1300 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0158), station CN7R1, 5-10, campaign Marseal, Alagoas-Sergipe Basin, 10°43'42.4"S, 36°11'45.3"W, 1300 m depth, March 2013. 1 adult male, (UFS_ CRU_ 0159), station CN7R2, 2-5, campaign Marseal, Alagoas-Sergipe Basin, 10°43'42.5"S, 36°11'45.4"W, 1300 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0160), station CN7R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°43'42.5"S, 36°11'45.4"W, 1300 m depth, March 2013. 1 adult female, (UFS_ CRU_ 0161), station AN6R2, 0-2, campaign Marseal, Alagoas-Sergipe Basin, 10°21'23.9"S, 35°53'37.6"W, 1000 m depth, October 2013. 1 adult female, (MOUFPE 16.073), station SLN, #7, R3, 2-5, campaign Seillean, Espírito Santo Basin, 19°32'38.7"S 39°22'03.4"W, 837.60 m depth, 25 October 2006. 1 adult female, (MOUFPE 16.074), station ATEX, #10, R2, 0-2, campaign ATEX, Espírito Santo Basin, 19°32'38.6"S 39°22'22.6"W, 803.60 m depth, 17 October 2006. 1 adult female, (MOUFPE 16.075), station ATEX, #7, R2, 0-2, campaign ATEX, Espírito Santo Basin, 19°32'38.9"S 39°22'02.8"W, 837 m depth, October 2006. 1 adult male, (MOUFPE 16.076), station ATEX, #2, R2, 0-5, campaign ATEX, Espírito Santo Basin, 19°32'41.1"S 39°22'10.9"W, 793.40 m depth, 17 October

2006 . 1 fragment, (MOUFPE 16.077), station EXT 3, LEAD 2, #2, R2, campaign ATEX, Espírito Santo Basin, 19°54'31"S, 39°36'56.8"W, 793.40 m depth, 1 September 2007. 2 mancas and 2 adults females, (MNRJ 18727), station OP II #61, campaign Campos Basin, 21°53'00"S, 39°48'00"W, 1350 m depth, 12 December 2002. 1 manca, (MNRJ 20955), station OPII #62, campaign Campos Basin, 21°53'39"S, 39°46'29"W, 1650 m depth, 13 June 2007. 1 adult male, (MNRJ 20953), station OP II #57, campaign Campos Basin, 21°57'00"S, 39°47'00"W, 1650 m depth, 13 June 2007. 1 adult female, (MNRJ 20959), station OP II #83, campaign Campos Basin, 22°31'16"S, 39°51'07"W, 1950 m depth, 13 June 2007. 1 adult female, (MNRJ 20956), station OP II #69, campaign Campos Basin, 22°31'00"S, 40°15'00"W, 750 m depth, 13 June 2007. 1 adult female, (MNRJ 20947), station OP II #50, campaign Campos Basin, 22°04'33"S 39°52'05"W, 1050 m depth, 13 June 2007. 1 adult female, (MNRJ 20949), station OP II #50A, campaign Campos Basin, 22°03'00"S, 39°52'00"W, 1050 m depth, 13 June 2007. 1 adult female, (MNRJ 20944), station OP II#45, campaign Campos Basin, 22°11'00"S, 39°52'00"W, 1050 m depth, 13 June 2007. 1 adult female, (MNRJ 20958), station OP #73, campaign Campos Basin, 22°42'00"S, 40°00'00"W, 1950 m depth, 13 June 2007. 1 manca, (MNRJ 20950), station OP II #50A, campaign Campos Basin, 22°03'00"S, 39°52'00"W, 1050 m depth, 13 June 2007. 1 adult male, 1 adult female, 1 manca, (MNRJ 20954), station OP II #61, campaign Campos Basin, 21°53'00"S, 39°48'00"W, 1350 m depth, 13 June 2007. 1 adult female, (MNRJ 20952), station OP II #56, campaign Campos Basin, 21°57'00"S, 39°49'00"W, 1350 m depth, 13 June 2007. 1 adult female, (MNRJ 20961), station OP II #87, campaign Campos Basin, 22°33'00"S, 39°54'00"W, 1950 m depth. 1 adult female, (MNRJ 20951), station OP II #51, campaign Campos Basin, 22°05'00"S, 39°49'00"W, 1350 m depth, 13 June 2007. 1 adult female, (MNRJ 18697), station OP II #78, campaign Campos Basin, 22°37'02"S, 39°56'20"W, 1950 m depth, 05 July 2006. 1 adult female, (MNRJ 20943), station OP II#45, campaign Campos Basin, 22°11'00"S, 39°52'00"W, 1050 m depth, 13 June 2007. 2 mancas, (MNRJ 20946), station OP II #46, campaign Campos Basin, 22°11'00"S, 39°48'00"W, 1350 m depth, 13 June 2007. 1 adult male and 1 manca, (MNRJ 20957), station OP II#70, campaign Campos Basin, 22°35'00"S, 40°08'00"W, 1050 m depth, 13 June 2007. 1 adult female, (MNRJ 18956), station OP II#48, campaign Campos Basin, 22°11'00"S, 39°43'00"W, 1950 m depth, 07 July 2006. 1 manca, (MNRJ 18961), station OP II #81, campaign Campos Basin, 22°27'00"S, 39°54'00"W, 1350 m depth, 07 July 2006. 1 manca, (MNRJ 18722), station OP II #50, campaign Campos Basin, 22°04’33,99”S, 39°52’04,97”W, 1050 m depth, 05 July 2006.

Diagnosis. Male with anterolateral spines on pereonites I and IV. Female with anterolateral spines on pereonite I only, shorter than spines observed on pereonite I of males. Pleotelson posterolateral margin anterior to uropods with pedestal spines: length approximately half uropod length, in female and male. Pleopod I fused, except for a small region near the distal margin and with 3 distal setae. Antennula with 5 articles. Article 2 with 2 long simple dorsomedial setae and 1 simple lateral seta.

Description (based on adult female holotype, 3.3 mm, MNRJ 20945). Dorsal margin with few simple setae. Head length 0.7 width. Suture absent between the head and pereonite I.

Antennula (fig.28A) with 5 articles. Article 1 squat and globular with 1 distal plumose seta; article 2 longer than others, length 2.7 article 1 length with 2 long simple dorsomedial setae and 1 simple lateral seta; article 3 length 0.5 article 4 length and smooth; article 4 length 0.8 article 5 length with 1 distal simple seta; article 5 smooth.

Antenna (fig.28B) with peduncle present: article 1 smooth. Article 2 with 2 dorsomedial simple setae. Article 3 with 1 lateral simple seta. Flagellum missing.

Maxilliped (fig.29A) basis broader than palp, with lateral simple setae; endite shorter than palp. Palp with articles 4–5 narrower than articles 1–3, all of them covered with few short simple setae, except the article 4 and 5, and lateral simple setae in of all. Endite with 3 retinacula, 3 fan setae and few distal simple setae. Epipod smooth.

Maxillula (fig. 29B) exopod with 9 large serrated spine-like apical setae; lateral margin and dorsally with some fine setae; distal margin of endopod with 1 stout serrated seta lateral 1 distomedially simple, lateral and distal margin with few fine setae.

Maxilla (fig. 29C) basis with rows of short setae, outer lobe with 3 apical spine-like setae and some lateral rows of short setae; median lobe with 3 apical spine-like setae; inner lobe almost more than twice as broad as median or outer lobes, with 7 simple setae, 4 robust, lateral margin with 2 setulated prominent setae, several fine setae.

Mandible (fig. 29D and E) Incisor with 5 blunt teeth. Spine row of 6 serrated spine-like setae; *lacinia mobilis* with 2 blunt teeth. Molar with smooth grinding surface.

Pereon poor ornamented. Pereonite I with short anterolateral simple spines. Pereonites II- VII without spines, tubercles or pedestal setae.

Pereopod I (fig.28C) weakly subchelate. Basis smooth. Ischium with 1 anterior and posterior simple seta. Merus with 2 anterior simple setae, 1 long and 1 short, and 2 posterior simple setae, 1 very long 14.4 longer than broad and 1 short. Carpus with 1 anterior distal simple seta, with 2 posterior short sensillate robust setae and 2 simple setae, 1 very long and 1 short proximally; posterior margin serrated. Propodus with 2 very long anterior simple setae and 1 mesial and posterior short sensillate robust setae and 2 simple setae, 1 long and 1 short. Dactylus with 4 lateral simple setae, 3 posterior simple setae.

Pereopod II (fig. 30P2) basis 8.8 times as long as broad, smooth. Ischium 5.5 times as long as broad with 2 anterior and 1 posterior setae. Merus 2.8 times as long as broad with 2 anterior setae, 1 posterior seta. Carpus 5.4 times as long as broad with 1 anterior robust seta with accessory seta and 1 simple seta 1 posterior, anterior margin with distal serrated region. Propodus 5.5 times as long as broad with 2 anterior robust setae with accessory seta and 1 distal simple seta, 1 posterior distal simple seta. Dactylus 11 times as long as broad with 3 lateral setae.

Pereopod III (fig. 30P3) basis 8.5 times as long as broad with 6 anterior and 5 posterior setae. Ischium 4.6 times as long as broad with 1 anterior and 1 posterior seta. Merus 1.7 times as long as broad with 2 anterodistal setae, 1 posterodistal and 1 posterior seta. Carpus 9.6 times as long as broad with 2 anterior setae, 1 posterodistal and 1 posterior seta. Propodus 5.8 times as long as broad with 1 anterior seta, 4 posterior robust setae with accessory setae and 1 distal seta. Dactylus 7 times as long as broad with 3 anterior setae and 1 posterior seta.

Pereopod IV (fig. 30P4) basis 8.8 times as long as broad with 7 anterior simple setae, 2 of them are long and together highlighting in relation of the others, and 5 posterior setae. Ischium 5.6 times as long as broad with 2 anterior and 3 posterior simple setae. Merus 2.5 times as long as broad with 2 anterior and 2 posterior simple setae. Carpus 8.9 times as long as broad with 2 anterior and 3 posterior simple setae. Propodus 6.3 times as long as broad with 3 anterior simple setae, 4 posterior robust setae with accessory setae and 1 distal seta, posterior margin serrated. Dactylus 8.6 times as long as broad with 2 anterior simple setae and 2 posterior setae.

Pereopod V (fig. 30P5) basis 12.4 times as long as broad with 11 anterior and 7 posterior setae. Ischium 6.8 times as long as broad with 3 anterior and 3 posterior setae. Merus 2.5 times as long as broad with 1 anterior, 1 anterodistal and 2 posterodistal setae. Carpus 13.8 times as long as broad with 3 anterior and 4 posterior robust setae with accessory setae. Propodus 11.3 times as long as broad with 1 anterior, 3 anterodistal, 5 posterior robust setae with accessory setae and 1 distal. Dactylus 11.2 times as long as broad with 5 lateral setae.

Pereopod VI (fig. 30P6) basis 11.8 times as long as broad with 9 anterior and 7 posterior setae. Ischium 6.3 times as long as broad with 3 anterior and 2 posterior setae. Merus 2.7 times as long as broad with 1 anterior and 1 posterior seta. Carpus 17.1 times as long as broad with 4 anterior robust setae with accessory setae and 6 posterior setae, short distal region in anterior margin serrated. Propodus 14 times as long as broad with 3 anterior robust setae with accessory setae and 2 distal, 1 simple and 1 long with accessory setae, 3 posterior setae. Dactylus 13 times as long as broad with 5 lateral setae and 1 posterior.

Pleotelson length 0.9 width; dorsal surface axial delicate ridge weakly vaulted and almost sooth, just with few setae, separated from lateral fields only by shallow elongate concavities; posterolateral margin adjacent to uropods convex.

Uropods uniramous, uniarticulate.

Description (based on male Alotype, 3 mm, MNRJ 20960) Head 0.9 times as long as broad width. Pereonite I with 1 pair of anterolateral spines, elongate, with the length 0.4 width of pereonite I. Pereonite 4 with 1 pair of anterolateral spines, short, spines of pereonite I 5 times longest than spine of pereonite IV. Pereonite V length 6.9 width, 2.5 total body length.

Pleopods. Pleopod I (fig. 31Pl1) fused, except for a small region near the distal margin. Length more than three proximal width, distal margin with 3 setae, 2 plumose and 1 simple, with different sizes, decrescent the middle to the sides.

Pleopod II (fig. 31Pl2) stylet not extending to distal margin of protopod. Protopod distal margin with 4 plumose setae and 3 simple setae in lateral external margin.

Pleopod III (fig. 31Pl3) exopod length almost than endopod length, apex with 1 long plumose seta, which arrives the distal margin of the endopod. Lateral margin fringed with fine setae. Endopod with 3 plumose setae on distal margin.

Pleopod IV (fig. 31Pl4) setae absent.

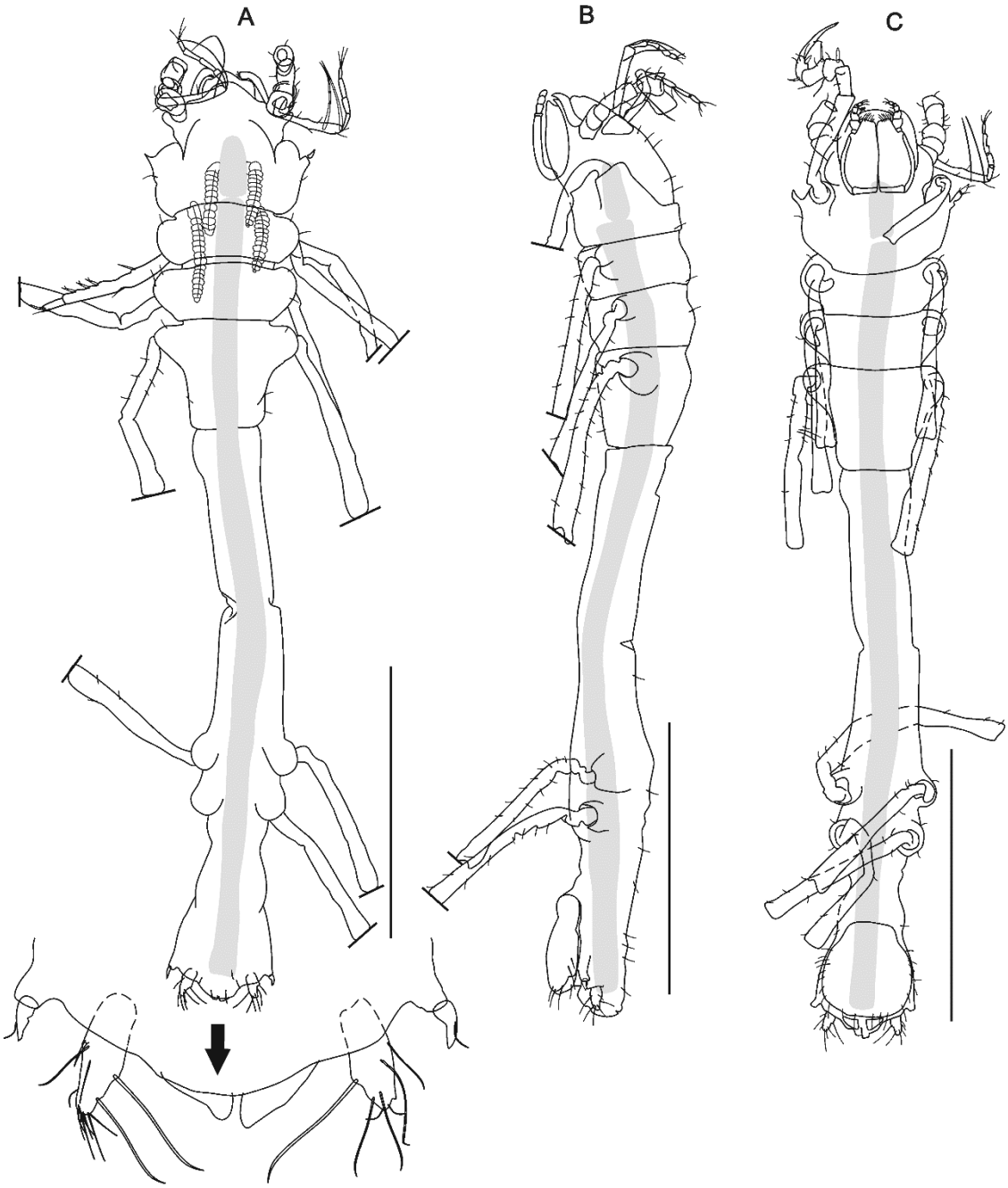
Manca, 2.8 mm, MNRJ 1822 Head length 0.8 width. Pereonite V length 4.2 width, 2.7 total body length. Pereonite I with 1 pair of anterolateral spines. Antenna with flagellum complete, with 13 articles, some segments expanded, longer than broad.

Remarks. *Gracilimesus* sp. nov. belongs to the group within the genus *Gracilimesus* without pereopod VII (Kavanagh *et al.*, 2006). This new species share characters to *G. celticensis* (Kavanagh, Wilson and Power, 2006), originally described from Celtic Sea, off West coast of Ireland, between 1491-1500 m depth. The similarities include the ornamentation of the body, positioning of the spines in the pereonites, pleotelson format, number of articles in the antennula. However, it differs from *G. celticensis* by the variation in the size of the spines on the pereonites, some individuals have longer and more curved spines than others independent of the animal size, characteristic not observed by Kavanagh *et al.* (2006) and two long setae observed in article 2 of the antennula, longer than those observed in *G. celticensis*. The male pleopods are also different between the species, *Gracilimesus* sp. nov. presents pleopods 1 fused, except for a small region near the distal margin; the mouthparts are less setose in *Gracilimesus* sp. nov. than in *G. celticensis*.

Bathymetric range: 400 – 1900 m depth.

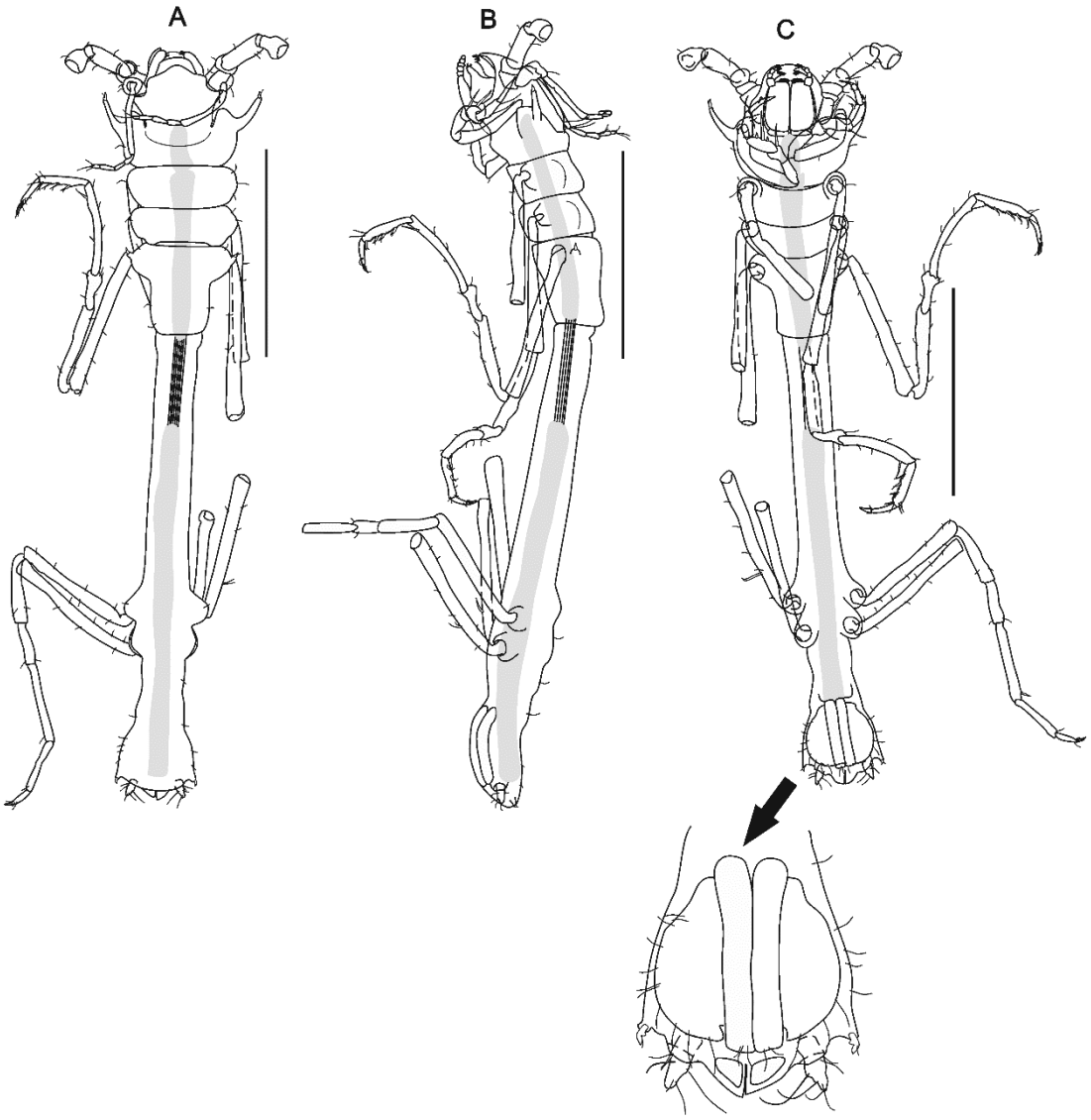
Geographic distribution: Alagoas-Sergipe Basin, Espírito Santo Basin and Campos Basin.

Figure 28. *Gracilimesus* sp. nov., holotype adult female, 3.3 mm, Campos Basin, (MNRJ 20945). A= habitus, B= lateral view, C= ventral view. Scale= 1 mm.



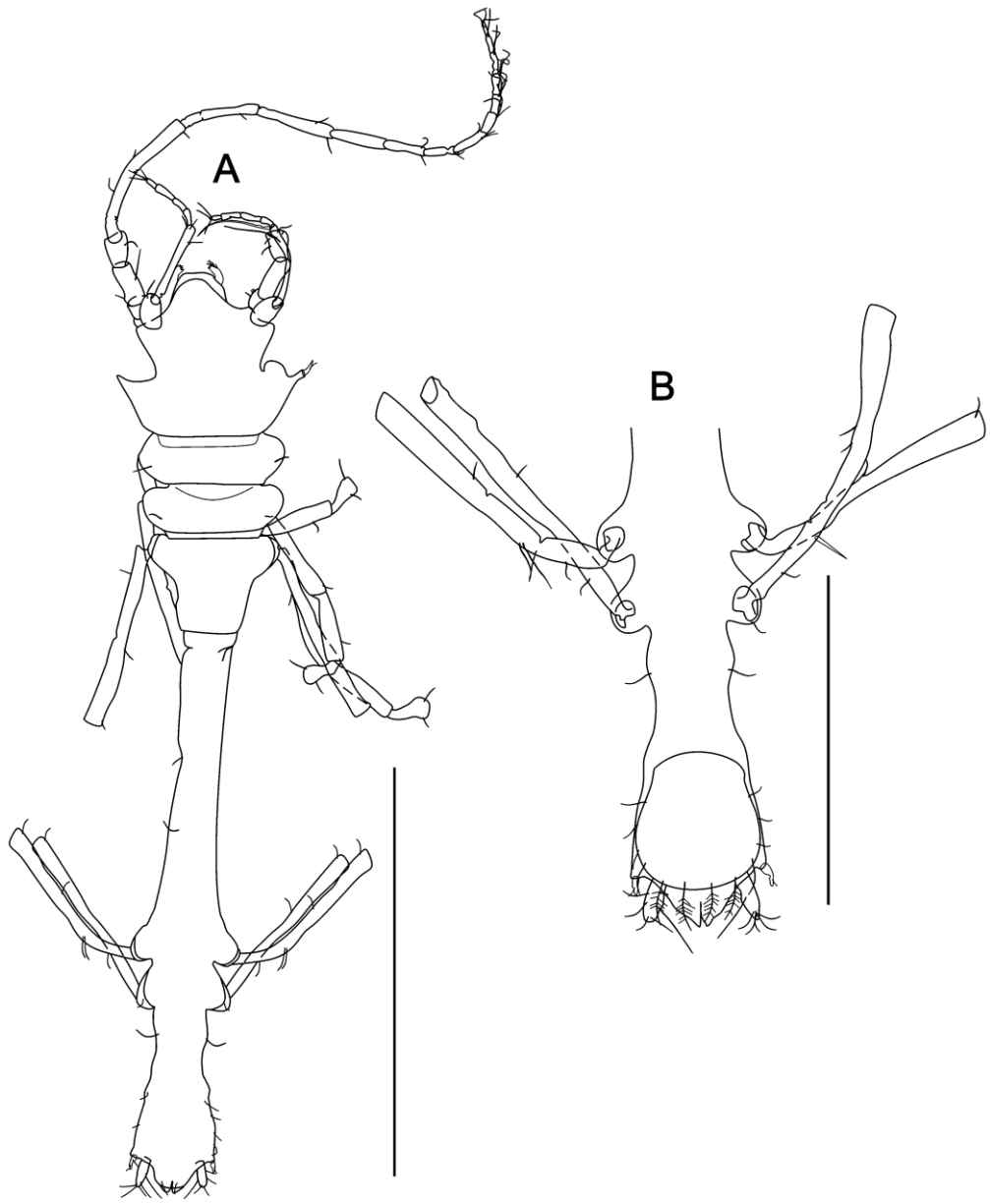
Fonte: A autora.

Figure 29. *Gracilimesus* sp. nov., alotype male, 3 mm, Campos Basin, (MNRJ 20960); manca, 2.8 mm, Campos Basin, A= Habitus, B= lateral view, C= Ventral view, D = manca dorsal view and E = manca ventral view. Scale= 1 mm. Scale= 1 mm and 0.5 mm (manca ventral view).



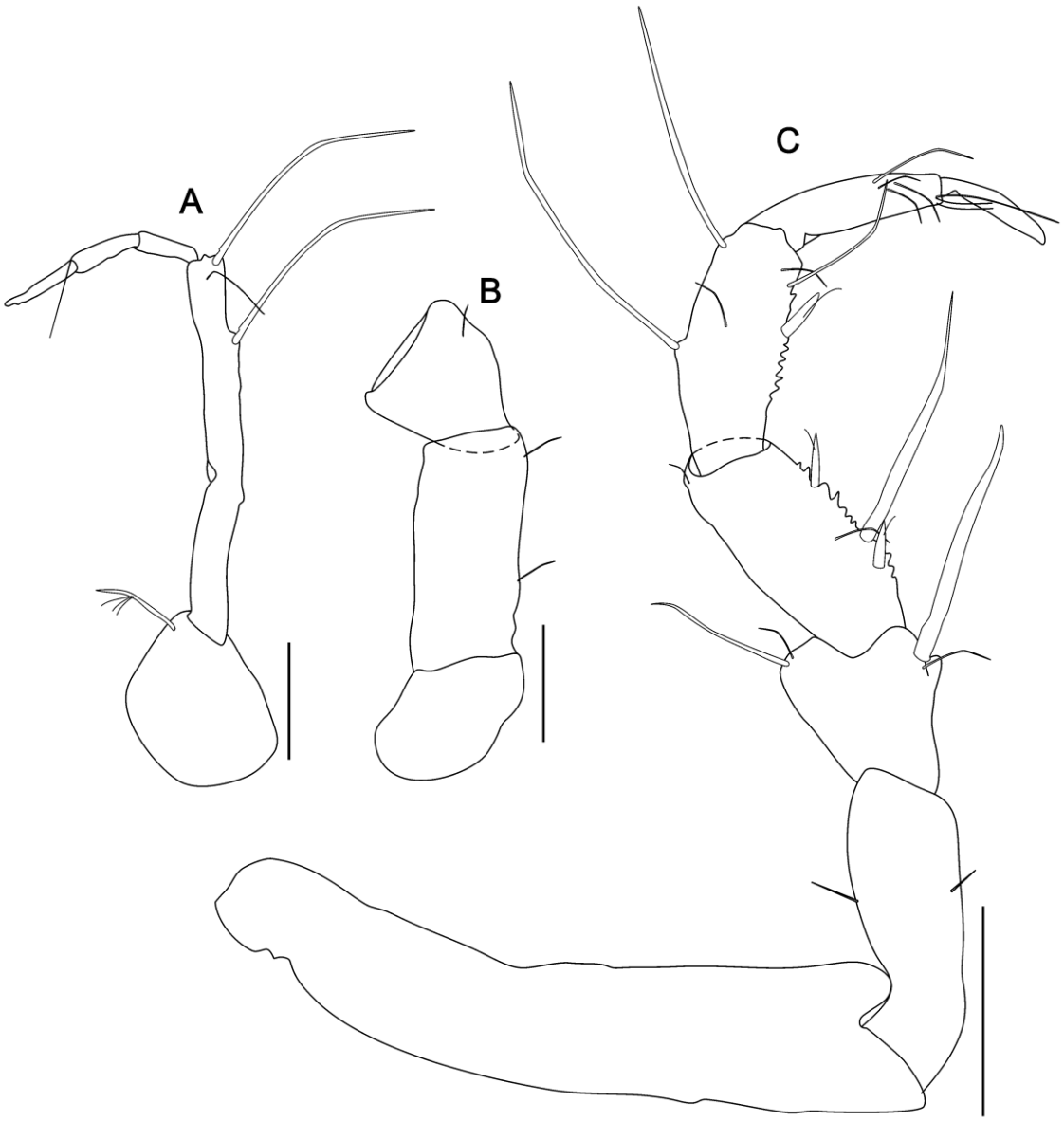
Fonte: A autora.

Figure 30. *Gracilimesus* sp. nov., manca, 2.8 mm, Campos Basin, (MNRJ 18.722). A = manca dorsal view and B = manca ventral view. Scale= 1 mm and 0.5 mm (manca ventral view).



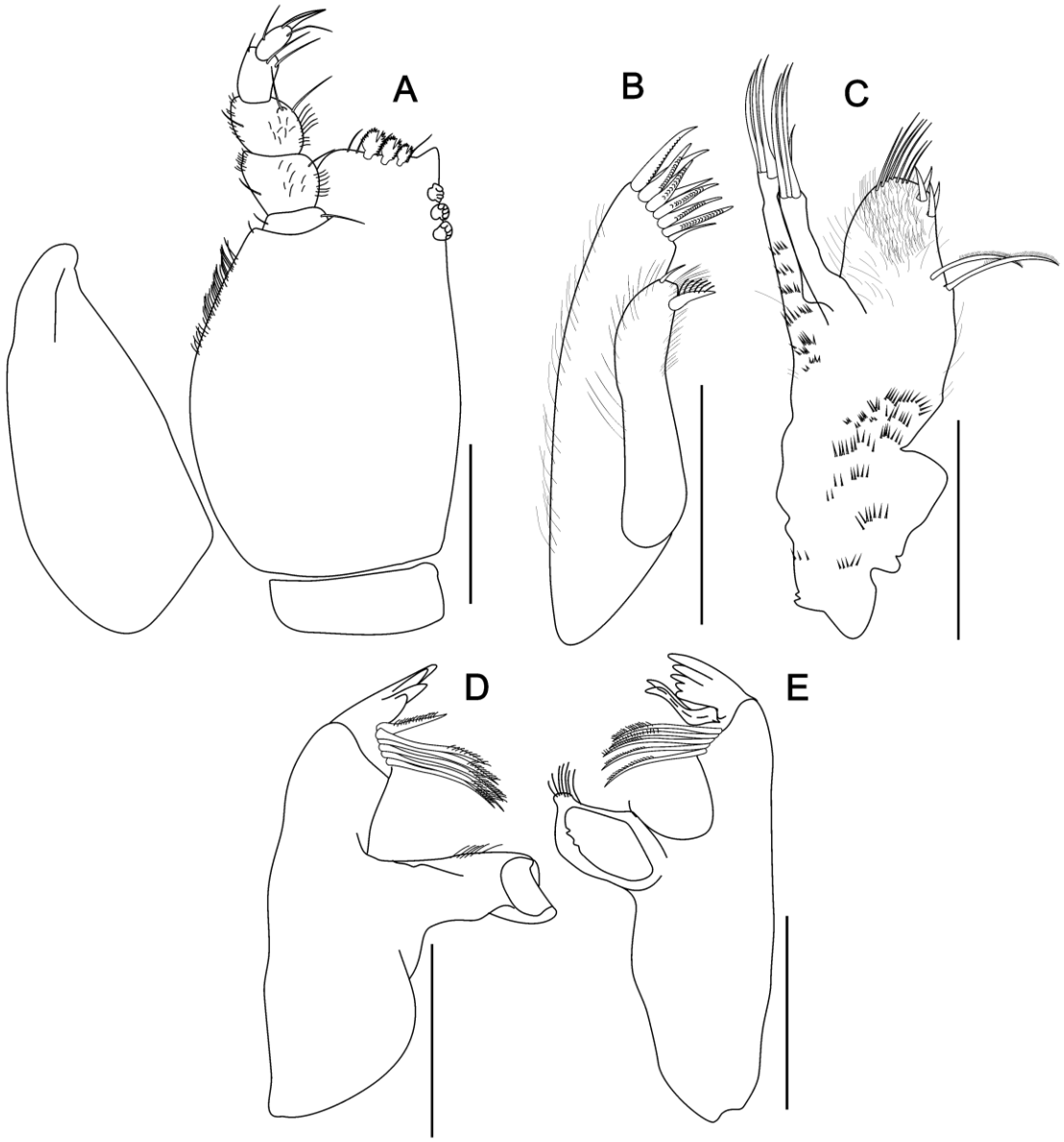
Fonte: A autora.

Figure 31. *Gracilimesus* sp. nov., paratype, 1 male, ATEX, (MOUFPE 16076). A= antennula, B= antenna, C= pereopod 1. Scale= 0.1 mm.



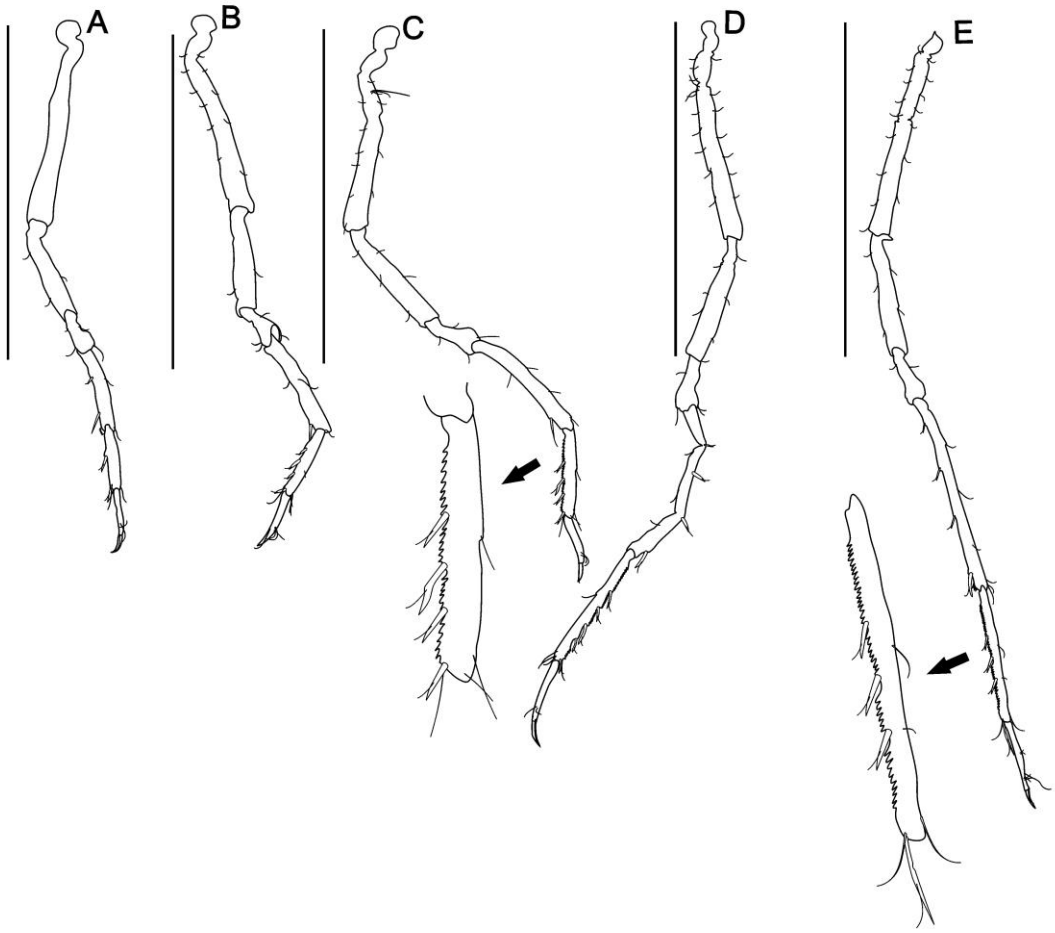
Fonte: A autora.

Figure 32. *Gracilimesus* sp. nov., paratype, 1 male, ATEX, (MOUFPE 16076). A= maxilliped, B= maxillula, C= maxilla, D= right mandible and E= left mandible. Scale= 0.1 mm.



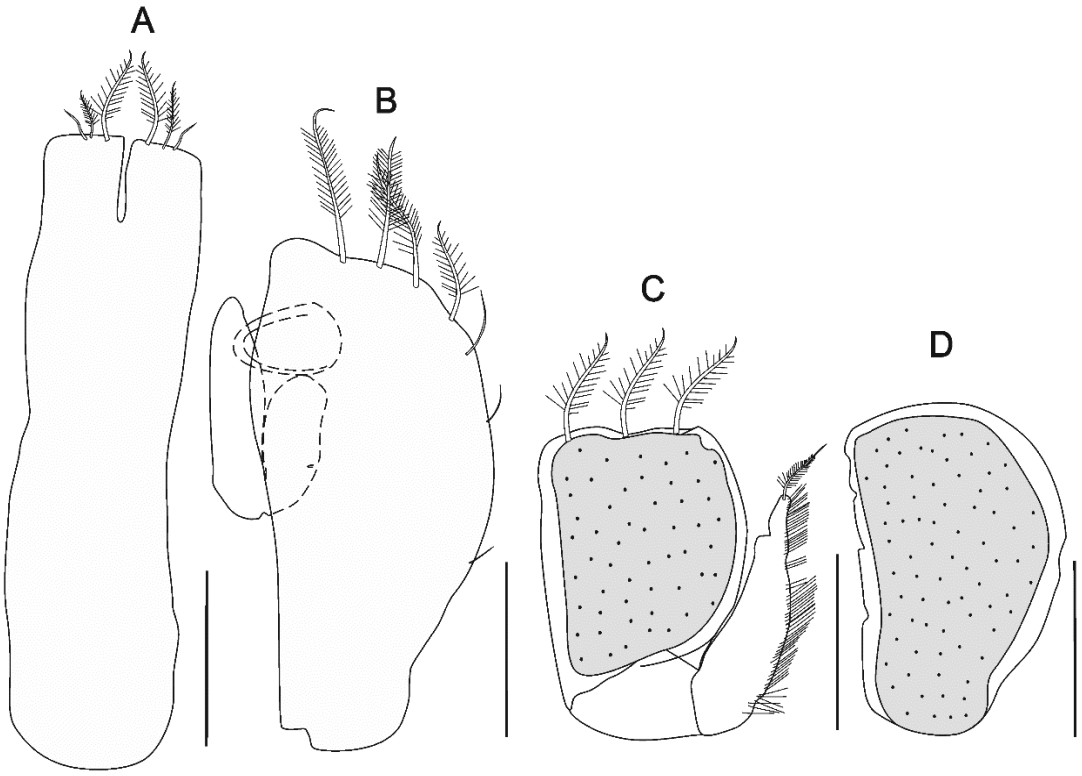
Fonte: A autora.

Figure 33. *Gracilimesus* sp. nov., alotype male, 3 mm, Campos Basin, (MNRJ 20.960). A pereopod 2, B= pereopod 3, C= pereopod 4, D= pereopods 5 and E= pereopod 6. Scale= 1 mm.



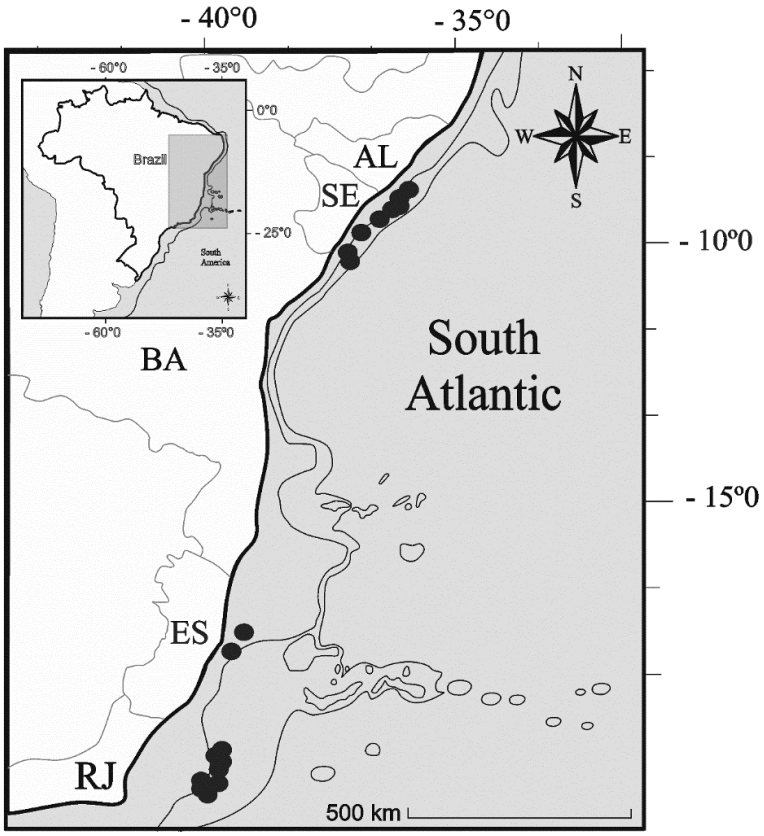
Fonte: A autora.

Figure 34. *Gracilimesus* sp. nov., alotype male, 3 mm, Campos Basin, (MNRJ 20960). A = pleopod 1, B= pleopod 2, C= pleopod 3 and D= pelopodo 4. Scale= 0.1 mm.



Fonte: A autora.

Figure 35. Geographic distribution of *Gracilimesus* sp. nov., in Brazilian waters. Samples collected in Alagoas-Sergipe Basin and Espírito Santo Basin. Map produced through Geomar online.



Fonte: A autora.

General Comments

The large majority of the Asellota species presents styloform uropods, with elongate protopods and rami (Erhard, 2001). They can be divided in two groups, considering the uropods: uniramous (Merrin and Poore, 2003) and biramous (Erhard, 2001).

One of the most important character to define genera within the family Ischnomesidae is the division of the posterior segments of the pereon. Apart from this character, the uropods also are an important diagnostic character, being the first character in the keys of identification of the family (Richardson, 1908; Wolff, 1962; Brandt et al., 2015).

The uropods of the new genus are biramous, differing from the diagnosis of the family Ischnomesidae. They emerge from a ring of cuticle and are inserted (sub-) terminally at the pleotelson separed each other only the short telsonic shield is projected slightly over the bases of the uropod protopodites. Between the uropod protopodite and the exopodite and endopodite articulations are developed, allowing the mobility of the uropod rami, which are movable in dorsal and ventral directions.

In the basally-derived genera *Stenetrium* (Stenetriidae), *Janira* (Janiridae) and *Asellus* (Asellidae) uropods are biramous, as the new genus described. Their uropods are inserted posteroventrally on either side of the anus. Although how the uropods insert has changed, their position in the Ischnomesidae has not diverged significantly from the primitive position observed in the Stenetriidae (Kavanagh and Wilson, 2007).

Although the uropodos show great importance in the separation of genera and even families within the suborder Asellota, it is necessary observe others diagnostics features. After observe these catacters: head completely fused to pereonite I, body elongated and subcylindrical, absent eyes, pereonites IV and V longer than others, especially pereonite V, we classify the new species as a new genus, because we believe that it has a large number of characters that classify it as of the family Ischnomesidae, and that only one character, uropods, is not enough to separate it. Therefore, in this study is proposed a emended diagnosis for family Ischnomesidae, to include the new genus with a biramous uropodus.

The genus *Gracilimesus* sp. nov. is registered for the first time in Brazilian waters. For south Atlantic, the genus was found only in the division between Uruguay and north of Argentina, with the species *Gracilimesus hanseni* (Kavanagh, Wilson and Power, 2006), and in the south of south America, very close to Malvinas islands and Antarctica, with *Gracilimesus corniculatus* (Brökeland and Brandt, 2004)

Key to the genera of Ischnomesidae

(Adapted from Brandt *et. al.*, 2015 and Kavanagh and Wilson (2007)

1 Uropods absent…..……..……..……..... *Mixomesus* Wolff, 1962

- Uropods developed……2

2 Uropods biramous ……...…..…..…… Ischnomesidae gen. nov.

- Uropods uniramous ……...…….…….….3

3 Uropods uniramous, biarticulated …… *Ischnomesus* Richardson, 1908

- Uropods uniramous, uniarticulated …….……...…. 4

4 Pereonites 7, pleonites and pleotelson completely fused with each other……. *Stylomesus* Wolff, 1956

- Pereonites 5, 6, 7 and pleonites fused with faint suture lines, pleonite and pleotelson completely fused……..... *Contrarimesus* Kavanagh and Wilson, 2007

5 Pereonites 5 freely articulating with pereonite 6……...*Heteromesus* Richardson, 1908

- Pereonites 5 not freely articulating with pereonite 6.……...……..……...6

6 Pleotelson with distinct posterolateral spines……...…...……7

- Pleotelson without distinct posterolateral spines…… 8

7 Pereonite 4 at least 1.5x as long as wide; head with long, thin anterolateral projections supporting antennae……*Cornuamesus* Kavanagh and Wilson, 2007

- Pereonite 4 as long as wide, head without anterolateral projections supporting antennae …… *Gracilimesus* Kavanagh and Wilson, 2007

8 Pleotelson dorsal surface axial ridge weakly vaulted, separated from lateral fields only by shallow elongate concavities; pleotelson without posterolateral spines.…… *Fortimesus* Kavanagh and Wilson, 2007

- Pleotelson dorsal surface axial ridge strongly vaulted, separated from lateral fields by distinct indented lines….…..……...… *Haplomesus* Richardson, 1908

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6. Final Considerations

Five new species of the family Ischnomesidae were described for the Brazilian deep-sea trough this research: *Ischnomesus* sp. nov.1, *Ischnomesus* sp. nov. 2, *Ischnomesus* sp. nov. 3, *Gracilimesus* sp. nov. and Ischnomesidae gen. nov. et sp. nov.

The genera *Ischnomesus* and *Gracilimesus*, which were already described for the South Atlantic, had their distribution expanded, through the discovery of the new species. A new genus has been found, Ischnomesidae gen. nov. including new characters to the diagnose of the family, which are uropods biramous, never seen before in this group.

The species with the largest geographic distribution was the *Gracilimesus* sp. nov. found in the entire study area: south of Alagoas, Sergipe, north of Bahia, Espírito Santo and Rio de Janeiro. The species with the lowest geographic distribution were Ischnomesidae gen. nov. et. sp. nov., *Ischnomesus* sp. nov.1 and *Ischnomesus* sp. nov.2, which also had the lowest number of individuals observed, only four.

As for the bathymetric distribution, the species with the largest range of bathymetric distribution was *Gracilimesus* sp. nov. and the species with the smallest amplitude was *I. wilsoni* sp. nov. The species found in deepest water was *Ischnomesus* sp. nov.2, 3.000 m depth and the species found in shallowest water was *I. longiseta* sp. nov, 200 m depth.

When comparing the species found in Brazil with those described in other localities, it was observed that the Brazilian ones are more setose, however this characteristic may be a differential of the Brazilian species or only an omission by the authors at the time of their description.

This was the first record with the family Ischnomesidae in Brazil, bringing the description of five new species and a new genus, showing its importance for science. It is hoped that this research will influence new researches with deep sea crustacean and help future studies about the family ecology to understand the importance of this group in these regions.

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