Zoosyst. Evol. 98 (2) 2022, 305–312 | DOI 10.3897/zse.98.83671

Pycnogonida (Arthropoda) from Museu de Ciências Naturais, Rio Grande do Sul, Brazil

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https://zoobank.org/10FA5741-370A-4ABF-A432-98A2DE65BCE3

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Academic editor: Pavel Stoev ♦ **Received** 12 March 2022 ♦ **Accepted** 5 July 2022 ♦ **Published** 20 July 2022

Abstract

Five species were identified in the studied collection: *Colossendeis megalonyx* Hoek, 1881, first record for Uruguay, *Ascorhynchus corderoi* du Bois-Reymond Marcus, 1952 and *Pallenopsis candidoi* Mello-Leitão, 1949, with extended ranges, *Pallenopsis patagonica* (Hoek, 1881), a species complex recently analysed with molecular data and *Ammothea tetrapoda*, recorded previously for Uruguayan waters. Our study clarifies records based on morphology, provides new data on distributions and species ranges and correlates species with ecological conditions.

Key Words

biological collections, marine invertebrates, Pantopoda, sea spiders, South America, Uruguay

Introduction

Zoological collections contain a practically inexhaustible amount of information. In Brazil, there are about 26 million deposited specimens (Zaher and Young 2003). A large portion of this database has never been studied taxonomically (Lewinsohn and Prado 2006), mainly due to the lack of specialists (Marques and Lamas 2006). A study of these collections permits a mapping of the composition, spatial and temporal distribution and a study of biodiversity as a whole (Magalhães et al. 2005; Egler et al. 2006; França and Callisto 2007; Winston 2007).

Class Pycnogonida represents an exclusively marine group of arthropods (du Bois-Reymond Marcus 1952; Arnaud and Bamber 1987), with circa 1365 valid species (Bamber et al. 2022). In general, pycnogonids incite little interest, mainly on account of their low abundance, cryptic habits, small size (notably in shallow waters) and lack of economic value (Arango 2003; Arango and Krapp 2007). Their study in Brazil is concentrated between the years of 1940 and 1970, based on small and punctual samples, like Marcus (1940), Mello-Leitão (1949) and du Bois-Reymond Marcus (1952). Through the decades of 1980 and 1990, the records were based on samples collected by large expeditions, for example Child (1982) and Stock (1986, 1992) (Lucena and Christoffersen 2018a). Recently, some important pycnogonid records to Brazil were made using, principally, material deposited in biological collections, like Lucena et al. (2015, 2017, 2019a). A detailed overview of the research with pycnogonids in Brazil can be found in Lucena and Christoffersen (2018a).

Nonetheless, most Brazilian collections remain little explored (Lucena and Christoffersen 2018b), from large collections, such as the Zoology Museum of University of São Paulo, to small collections, such as Museu de Ciências Naturais do Rio Grande do Sul. The pycnogonid collection of Museu de Ciências Naturais, is a small collection composed of just eight lots, 45 specimens and five species, collected in different regions of Brazil and South America. The present contribution aims to record all the species found in the collection of the Museu de Ciências Naturais (except *Ammothea tetrapoda* Gordon, 1932, previously recorded in Lucena et al. (2019b)), formerly known as Fundação Zoobotânica do Rio Grande do Sul (FZB-RS). Here, we extend the distribution of *Ascorhynchus corderoi* du Bois-Reymond Marcus, 1952, *Pallenopsis candidoi* Mello-Leitão, 1949 and *Pallenopsis patagonica* (Hoek, 1881) and record for the first time *Colossendeis megalonyx* Hoek, 1881 for Uruguay.

Materials and methods

The material is deposited in the Museum of Natural Science (Museu de Ciências Naturais do Rio Grande do Sul – FZB-RS) and encompasses specimens of Pycnogonida collected from 1961 to 1978 in south-eastern Brazil, Uruguay and Argentina (Fig. 1).

Identification of the specimens followed Hoek (1881), Mello-Leitão (1949), du Bois-Reymond Marcus (1952) and Fry and Hedgpeth (1969). Specimens were analysed using the stereomicroscope Nikon SMZ800 and the microscope Olympus U-5RE-2. The pictures were made in the stereomicroscope Leica DFC450, utilising the software LAS V.4.5.

Results

Ascorhynchidae Hoek, 1881
***Ascorhynchus* Sars, 1877**

***Ascorhynchus corderoi* du Bois-Reymond Marcus, 1952**
Fig. 2

Material examined. (FZB.Pyc–001) 31 specimens, Fernando de Noronha, Pernambuco, Brazil, Dec 21, 1978; (FZB.Pyc–007) 5 specimens, Perequê, Nov 2, 1972.

Distribution. Brazil: São Paulo and Paraíba (Lucena and Christoffersen 2018a; Lucena et al. 2019a). Seychelles (Aldabra Atoll), Mauritius, Oman and Tonga (Child 1998a; Bamber 2004).

Depth. Shallow waters.

Remarks. The species is recorded herein for the first time for the Archipelago of Fernando de Noronha, expanding its known distribution in north-eastern Brazil. All 31 specimens obtained from Fernando de Noronha were found associated with the epibiont hydrozoan *Clytia*? Lamouroux, 1812 (FZB.Pyc–001).

The hydrozoans occurred on both the dorsal and ventral surfaces of the trunk (mainly near the dorsal tubercles and the lateral processes), on eggs and ovigers and more densely on the legs (Fig. 2). Besides occurring on the proximal

Figure 1. Map with the distribution of species present in the Museum of Natural Sciences of Rio Grande do Sul. Legend: black circle, *Ascorhynchus corderoi*; cross, *Colossendeis megalonyx*; diamond, *Pallenopsis candidoi*; triangle, *Pallenopsis patagonica*; white circle, *Ammothea tetrapoda*. Abbreviations: ARG, Argentina; BRA, Brazil; BOL, Bolivia; CHI, Chile; PAR, Paraguay; PER, Peru; URY, Uruguay; SC, Santa Catarina.

articles, as observed by Pipe (1982), we also found them mainly on the distal articles, such as the tibia 2 and even on the propodus. Visual differences in epibiont density were not noted amongst ovigerous and non-ovigerous individuals.

Colossendeidae Jarzynsky, 1870
***Colossendeis* Jarzynsky, 1870**

***Colossendeis megalonyx* Hoek, 1881**
Fig. 3

Colossendeis frigida Hodgson, 1902: 63.
Colossendeis rugosa Hodgson, 1907: 64, pl. IX, fig. 3, pl. X, figs 5, 6.
Colossendeis orcadense – Hodgson 1908: 184.
Colossendeis scoresbii Gordon, 1932: 18–21, figs 5c, 6b, c, 7a, b.

Material examined. (FZB.Pyc–002) 1 female, South Atlantic, July 8, 1964; (FZB.Pyc–004) 5 females, off Mar del Plata, Argentina (38°22'S, 55°37'W), May 1961, col. L.R. Pontes; (FZB.Pyc–005) 1 female, Uruguay, Mar1961.

Distribution. Circumpolar. Antarctic, Western South America and up to Buenos Aires (Argentina), South Africa, Madagascar, New Zealand, Eastern South America (Child 1995a; Munilla and Soler-Membrives 2009; Scarabino et al. 2019). This is the first record for Uruguayan waters.

Depth. 7 to 4900 m in depth.

Remarks. *Colossendeis megalonyx* is a very variable species (Fry and Hedgpeth 1969; Child 1998b) and may represent a group of cryptic species. Only the long proboscis, palp article 8 shorter than articles 9 and 10 and a tarsus longer than the propodus remain stable amongst all examined specimens (Child 1995a). Variable characters are the shape and size of the ocular tubercle (elevated or short, conical or rounded), the occurrence of eyes (similar in size or larger anteriorly, well pigmented, white or even absent), the size of the proboscis (equal to, or longer than the trunk) and the size of the legs (either the femur or the tibia represent the longest article) (Child 1995a, 1998b; Cano-Sanchez and López-González 2007).

Molecular studies confirm that a complex of species exists under the name *C. megalonyx*. Five species and another seven cryptic species were indicated (Krabbe et al. 2010; Dietz et al. 2015; Dömel et al. 2020). These papers suggest the use of the name *C. megalonyx* for specimens from South America and the Subantarctic Region, the type locality (Krabbe et al. 2010; Dietz et al. 2015, 2019). Although morphology was not used for the delimitation of these species, subspecies were previously proposed by Fry and Hedgpeth (1969). This indicates that morphology can be used successfully for the delimitation of species (Cano-Sanchez and López-González 2007).

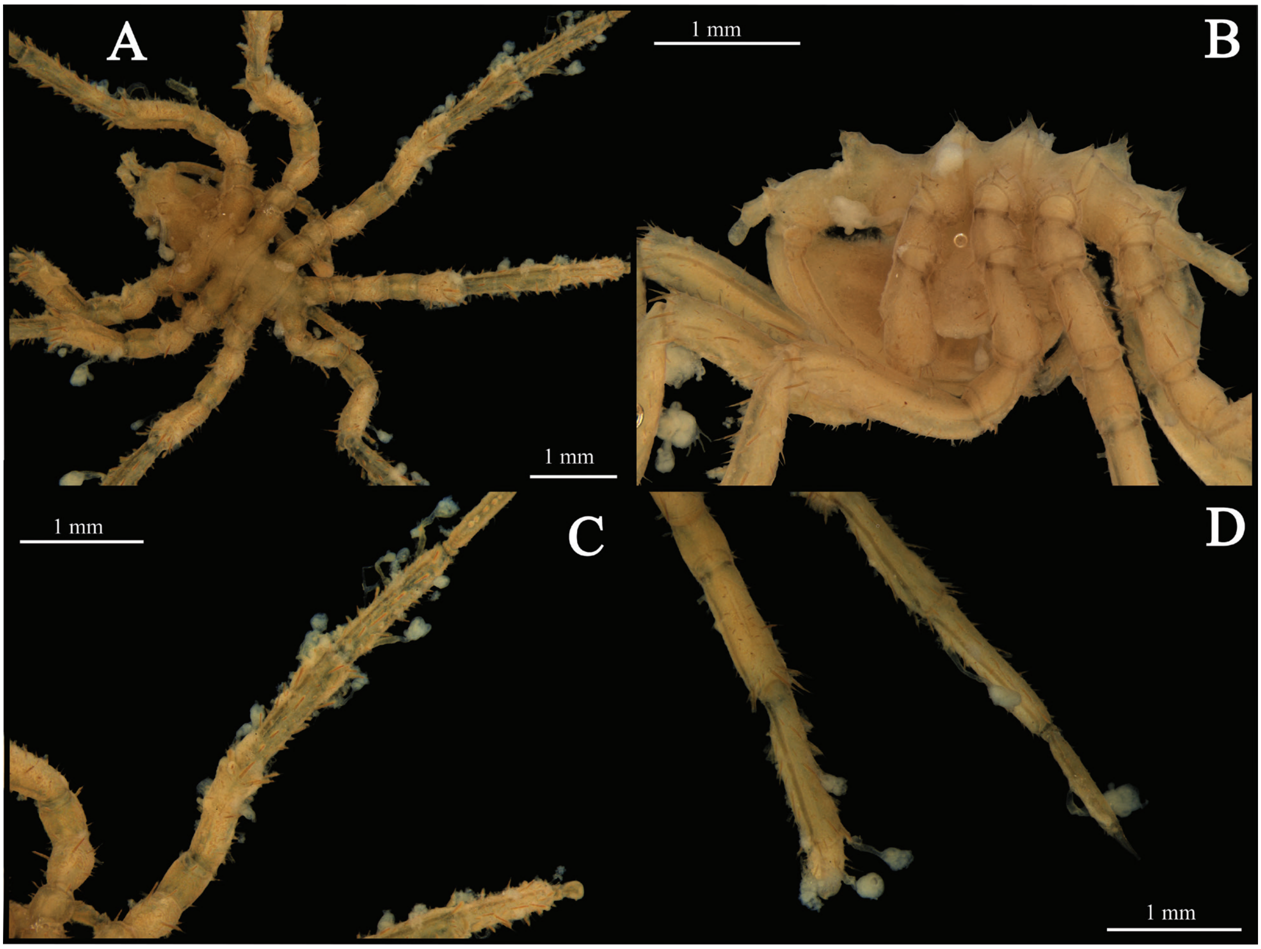

Figure 2. *Ascorhynchus corderoi* (FZB.Pyc–001). **A.** Dorsal view; **B.** Lateral view; **C.** Distal articles of 3rd leg; **D.** Tibia 2, tarsus and propodus.

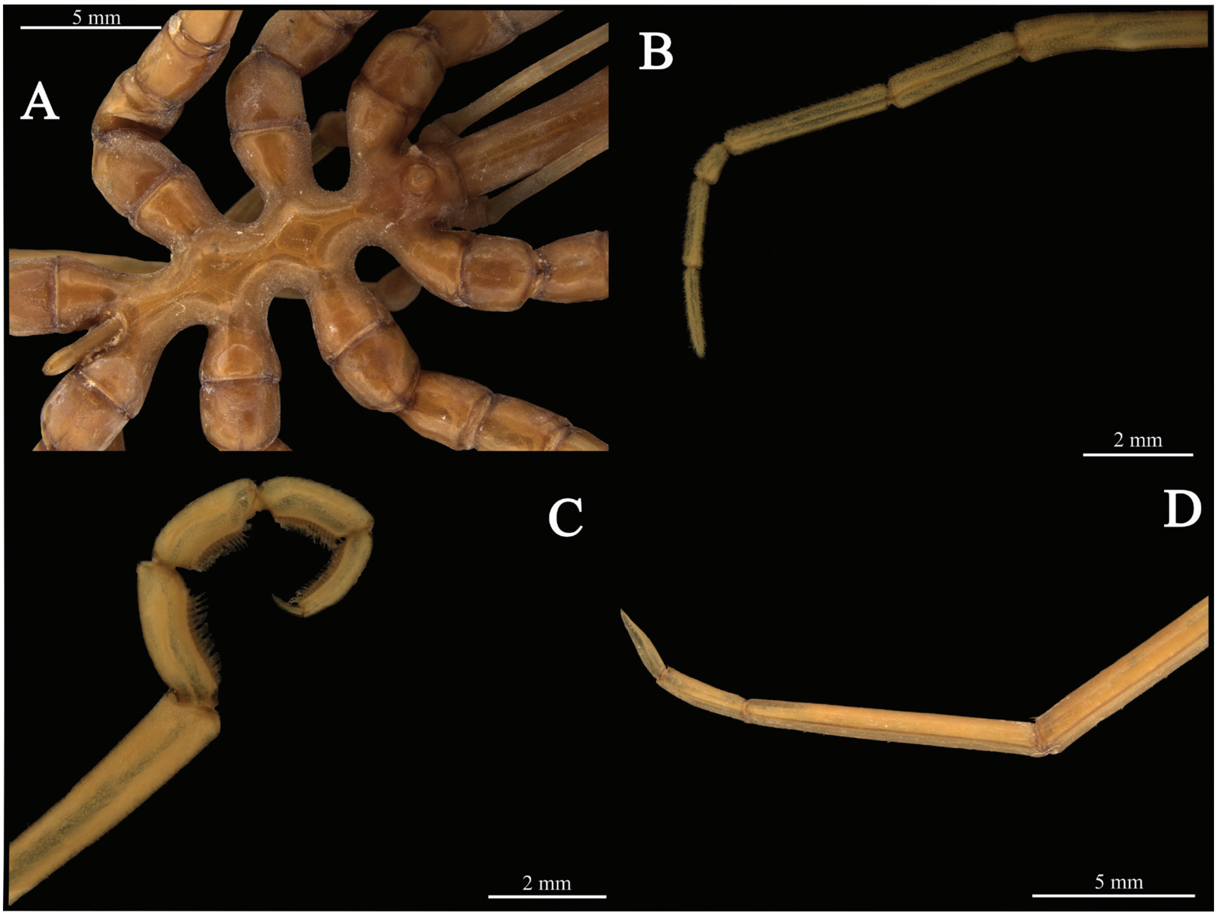

Figure 3. *Colossendeis megalonyx* (FZB.Pyc–002), female. **A.** Dorsal view; **B.** Distal articles of palp; **C.** Distal articles of oviger; **D.** Tarsus and propodus.

Specimens analysed thus should belong to *C. megalonyx*, as they were collected in Uruguay (the northernmost record for the species, a full two degrees of latitude north of the record provided by Child (1995a)). Further, they conform to the description of Hoek (1881). Yet, variations in the shape of the ocular tubercle were observed, in some specimens this structure being conical and in others, rounded. All specimens had a proboscis 1.5 times as long as the trunk, on average, the same proportion observed by Stock (1963) for individuals identified as *C. orcadensis*. Although molecular analyses are an important new source of evidence, their results need to be correlated with detailed morphological analyses, in order to corroborate or refute the recent results with the older morphological work available in literature.

Pallenopsidae Fry, 1978
Pallenopsis Wilson, 1881

Pallenopsis candidoi Mello-Leitão, 1949
Fig. 4

Melloleitanianus candidoi Mello-Leitão, 1955: 122–128, figs 1–4.
Pallenopsis (*Pallenopsis*) *candidoi* – Stock 1974a: 1018 [key], 1030.

Material examined. (FZB.Pyc–003) 2 females, Garopaba, Santa Catarina, Brazil, 24 June 1975.

Distribution. Scotia Sea, King George Island, Brazil: Santa Catarina, Rio de Janeiro and Espírito Santo. Brazil to USA (Georgia); Panama (Pacific) (Lucena and Christoffersen 2018a).

Depth. Up to 430 m.

Remarks. *P. candidoi* and *P. fluminensis* (Krøyer, 1844) are sympatric species, very frequent in depths between 10 and 100 m. These are the commonest species of *Pallenopsis* along the Brazilian coast. The two species are very similar, varying mainly in the number of setae on the legs (larger and more numerous in *P. candidoi*) and in the number of articles in the female oviger, in which article 6 is smaller than article 5 and 8 and is less than half as long as article 7 in *P. candidoi* (article 6 is the same size as article 5 and article 8 is almost the same size as article 7 in *P. fluminensis*) (Marcus 1940; Mello-Leitão 1949; Stock 1974; Lucena et al. 2017).

Pallenopsis patagonica (Hoek, 1881)
Fig. 5

Phoxichilidium patagonicum Hoek, 1881: 84–86, pl. XII, figs 6–9.
Pallenopsis glabra Möbius, 1902: 184–185, taf. XXVII, fig. 1–6.
Pallenopsis hiemalis Hodgson, 1907: 17–20, pl. I, fig. 4, pl. II, fig. 3.
Pallenopsis meridionalis Hodgson, 1914: 158–165.
Pallenopsis moebiusi Pushkin, 1975: 80–83, fig. 4 a–m.

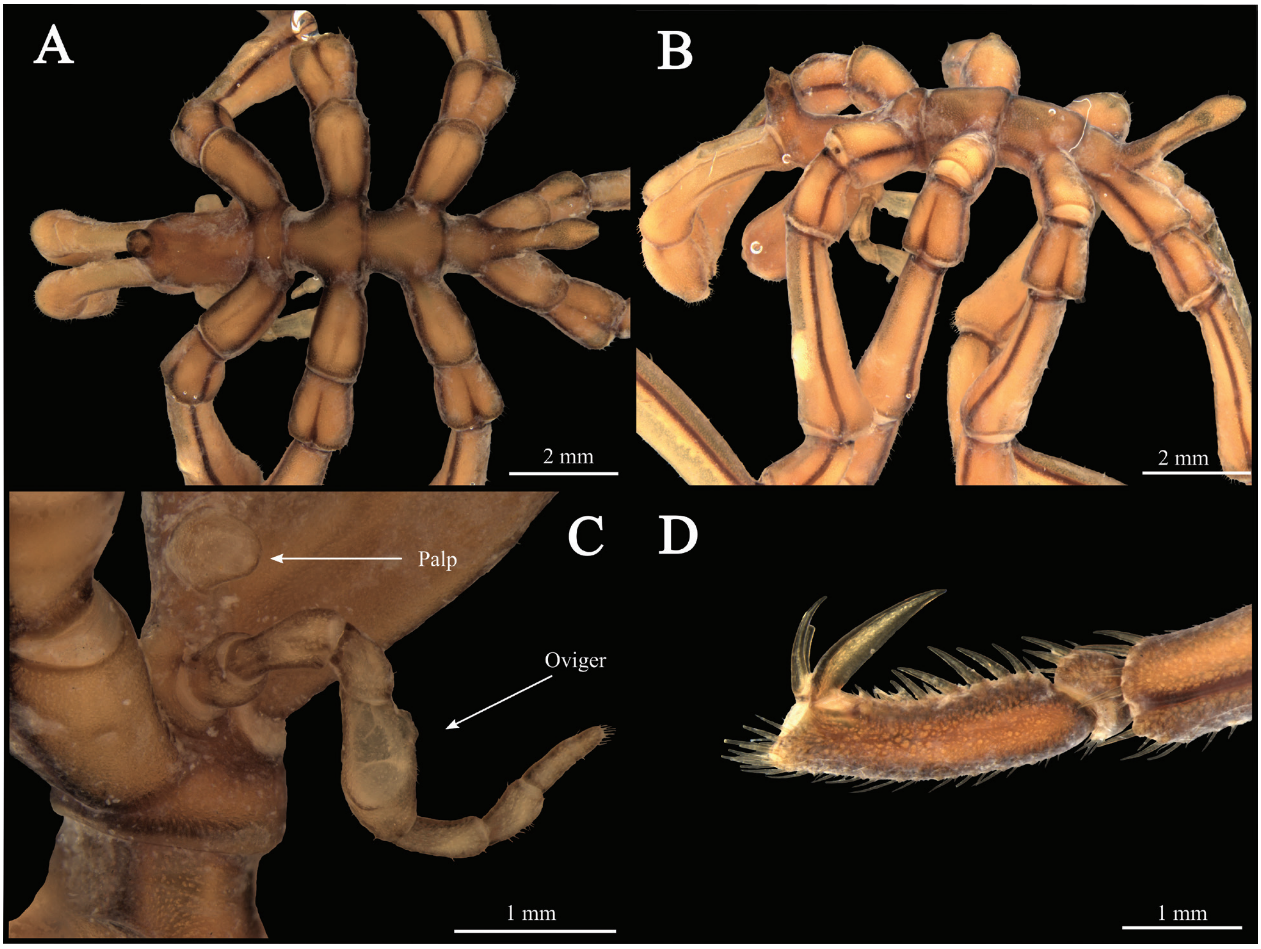

Figure 4. *Pallenopsis candidoi* (FZB.Pyc–003), female. **A.** dorsal view; **B.** lateral view; **C.** oviger; **D.** propodus.

Material examined. (FZB.Pyc–008) 1 female, St. 4512, 37°38'S, 56°56'W, Argentina, 25 Aug 1977.

Distribution. Antarctic (Ross Sea, Weddell Sea) to southern Argentina (up to approximately 37°15'S), south-east Pacific (Strait of Magellan up to 33°S) (Weis et al. 2014; Scarabino et al. 2019).

Depth. 15–720 m (Child 1995b).

Remarks. Literature records large morphological variations for this species (Hoek 1881; Hodgson 1907; Loman 1923; Gordon 1944; Child 1995b; Weis et al. 2014). These variations encompass mainly the proportion of the articles of the legs, the shape of the trunk, the structure of the propodus, the size and inclination of the abdomen and the size of the cement gland (Stock 1957; Pushkin 1993; Child 1995b; Cano-Sanchez and López-González 2019; Scarabino et al. 2019).

Recent studies, based mainly on molecular data, have indicated the existence of cryptic species under the name *P. patagonica*, mainly from the Antarctic Region (Weis et al. 2014; Harder et al. 2015; Dömel et al. 2017, 2019). These species form the *P. patagonica sensu lato* complex. Although no consensus exists concerning the number of possible new species (up to 19 clades have been proposed) and no morphological characterisation has been provided for the identified clades, specimens collected in the Falkland Islands and the Patagonian Region appear to belong to *P. patagonica sensu stricto* (Weis et al. 2014; Harder et al. 2015; Dömel et al. 2017, 2019), the type locality of the species.

The specimen analysed herein comes from northern Argentina, close to the northern range of the species (Child 1995b). This female individual has all the characters described by Hoek (1881), such as the indicated number of articles and the proportion established amongst the last articles of the ovigers, the same proportion amongst the articles of the legs and a similar body structure, with lateral processes separated by about less than half their own diameter and a cylindrical proboscis. In relation to subsequent descriptions, the present specimen is similar to *P. meridionalis* (today a synonym of *P. patagonica*), particularly in the shape of the ocular tubercle, structure of the propodus and ornamentation of the lateral processes (Pushkin 1993). However, the closest proximity is with *P. yepayekae* Weis et al. 2014, from which it may be distinguished by the number of articles on the oviger and in the number of setae on the abdomen (2 in the description, 4 in the individual at hand), including a cylindrical proboscis. However, we observed an undescribed character for *P. patagoica*, but reported for *P. yepayekae* and indicated as distinguishing the two species: the presence of brush-like setae in the ventral region of coxae 2 and 3. Hoek (1881) described the presence of setae in coxae 2 and

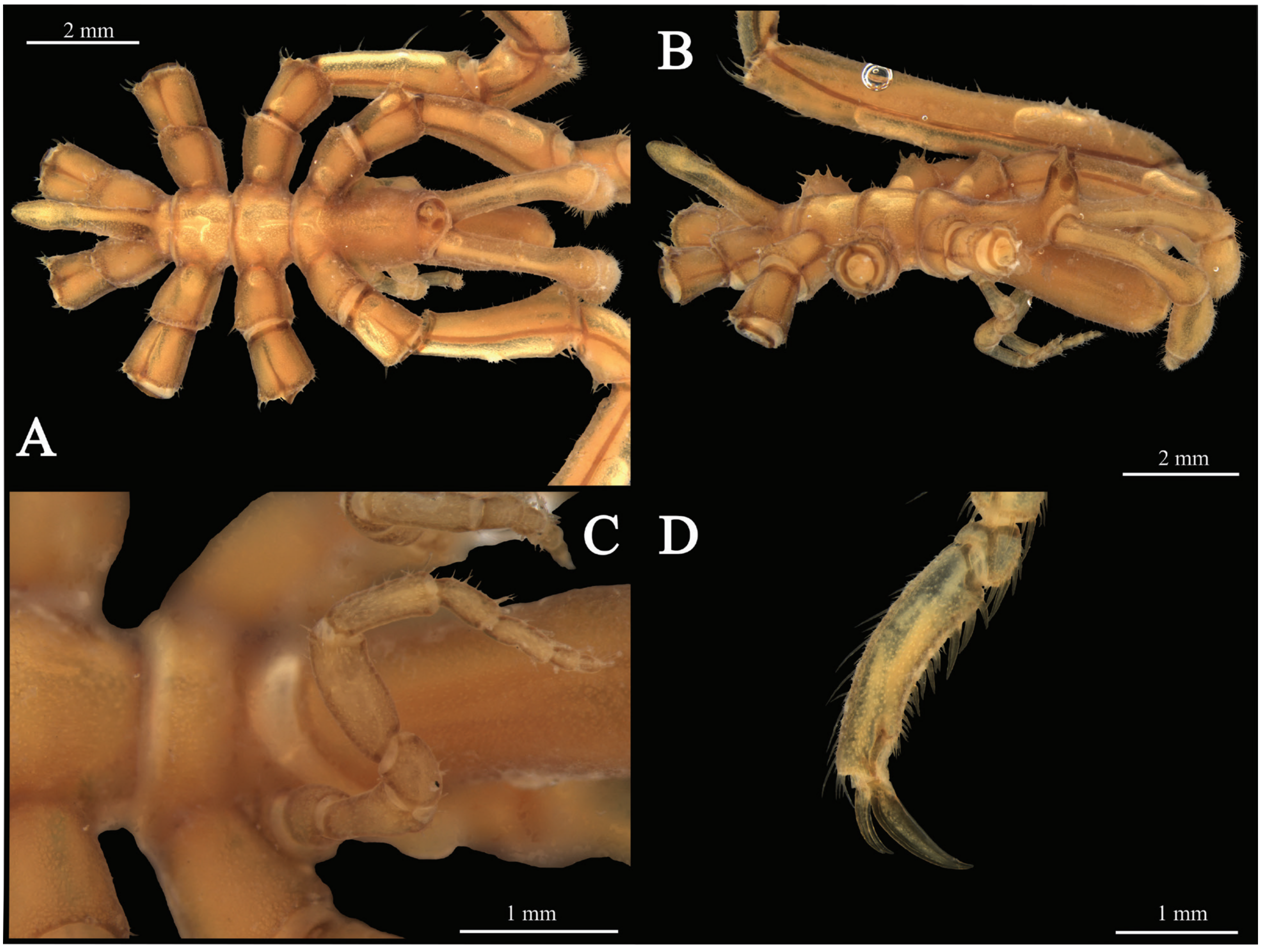

Figure 5. *Pallenopsis patagônica* (FZB.Pyc–008), female. **A.** Dorsal view; **B.** Lateral view; **C.** Oviger; **D.** Propodus.

3, but did not illustrate them. In the cited material, such setae appear to be smaller and in lower number in the material analysed herein than in *P. yepayekae*.

Great morphological variation has been reported for several species from polar, temperate and tropical regions, where the genus is quite diverse (Stock 1974). Our data are insufficient for advancing previous taxonomic conclusions. It becomes necessary to conduct more in-depth morphological analysis and to extend the investigation to include samples from wider geographical locations. Species-group and genus-level revisions are necessary to distinguish diagnostic species characters from intrapopulational variations (Hennig 1950, 1968).

Discussion

The studied collection further includes one specimen of *Ammothea tetrapoda*, recorded previously for Uruguayan waters (Lucena et al. 2019b). Notwithstanding the low quantity of individuals (44) and species (4), we have herein provided the first record of *Colossendeis megalonyx* for Uruguay and extended considerably the known ranges of *Ascorhynchus corderoi* and *Pallenopsis candidoi*. Furthermore, we recorded the occurrence of an epibiont hydrozoan (*Clytia*?) on *Ascorhynchus corderoi*. Taxonomic studies such as the present one clarify records, provide new data on distributions and species ranges, correlate species with ecological conditions and provide information on species interactions.

A survey of Pycnogonida is needed for southern Brazil. Although the studied collection represents one of the largest for the region, only two specimens of *Pallenopsis candidoi* from Santa Catarina were identified. The eight known species indicate a biodiversity below that encountered in similar studies for other regions (see Lucena and Christoffersen 2018c).

Acknowledgements

We would like to thank Dr. Ricardo Ott, coordinator of the Arachnid section of the Museum of Natural Science, for providing the material in the collection for study. We are also grateful to Prof. Dr. Miodeli Nogueira Junior for the identification of hydrozoans and to the anonymous referees for their critical reviews, corrections and suggestions regarding the manuscript.

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