

New records of deep-sea sea spiders (Chelicerata: Pycnogonida) in the southeastern Pacific

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Abstract New records of the very large sea spiders *Colossendeis colossea*, *Colossendeis macerrima*, and *Colossendeis minor* are presented based on specimens collected as bycatch from the deep water fisheries of the Patagonian toothfish during January–March 2015 off the port of Caldera (27° S), Región de Atacama, northern Chile. The specimens examined represent the deepest bathymetric record for *C. colossea* in the country, the northernmost record of *C. macerrima* for Chile, extending its previous record by about 2170 km, and the first record of *C. minor* in Chilean waters, which is also the southernmost record of *C. minor* for the Pacific Ocean. The presence of these species in northern Chile may give hints of a continuous distribution of this genus along the Chilean coasts, representing part of a hidden biodiversity of invertebrates thriving in deep waters in the southeastern Pacific.

Keywords Chile · *Colossendeis colossea* · *Colossendeis macerrima* · *Colossendeis minor* · Southeastern Pacific · Range extension

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Introduction

The pycnogonid fauna of Chile has been sparsely studied. The first record of a pycnogonid in Chilean waters was by Nicolet (1849), who recorded the shallow-water species *Pycnogonum littorale* [possibly=*P. panamum* Hilton, 1942 (Child (1992))]. Further studies derived from collections made by several expeditions (Vettor Pisani, Discovery, Challenger, Agassiz) in the nineteenth century were later reviewed by Hoek (1881), Loman (1923), and Gordon (1932), describing several species. The most comprehensive review to date is by Hedgpeth (1961), based on material collected by the Lund University Chile Expedition, which described a new species and two new subspecies. More recent papers dealing with the Chilean fauna only include the work by González and Edding (1990), which recorded the northernmost Chilean record of *Achelia assimilis* (Haswell, 1884); Child (1992), who published the Pycnogonida of the Southeast Pacific Biological Oceanographic Project; Melzer et al. (2006) and Weis and Melzer (2012a, b), who reviewed the fauna and distribution of the pycnogonids in the fjord region of southern Chile; Försterra et al. (2013), recording *Colossendeis macerrima* Hoek, 1881 in shallow waters in the Chilean fjords; and Weis et al. (2014) reviewing the *Pallenopsis patagonica* (Hoek, 1881) complex and describing a new species from southern Chile. In this work, as part of ongoing studies documenting the invertebrates from the bycatch of commercial fisheries, I provide the deepest bathymetric record of *Colossendeis colossea* Wilson, 1881 for Chile, the northernmost records for *Colossendeis macerrima* Wilson, 1881 for Chile, and the southernmost Pacific Ocean record of *Colossendeis minor* Schimkewitsch, 1893, which is also the first record of this species for Chilean waters.

Materials and methods

The specimens studied here were entangled in long-line gear set for the Patagonian toothfish *Dissostichus eleginoides* Smith, 1898 off the coast of Caldera, northern Chile. The specimens were identified according to their original descriptions (Wilson 1881; Schimkewitsch 1893) and subsequent works (Stock 1984; Bamber 2002; Staples 2007; Vinu et al. 2015), and they were deposited in the collections of the Museo Paleontológico de Caldera, Caldera, Chile (MPCCL) and in the collection of the Zoologische Staatssammlung München (ZSMA) in München, Germany.

Results

Systematics

Subphylum Chelicerata Heymons, 1901

Class Pycnogonida Latreille, 1810

Order Pantopoda Gerstaecker, 1863

Superfamily Colossendeidoidea Hoek, 1881

Family Colossendeidae Hoek, 1881

Genus *Colossendeis* Jarzynsky, 1870

Type species *Colossendeis borealis* Jarzynsky, 1870.

Colossendeis colossea Wilson, 1881

(Figure 1a, d)

Colossendeis colossea Wilson, 1881: 224, pl. 1, fig. 1, pl. 3, figs. 5–7; Schimkewitsch, 1893: 29. Stock, 1975: 987; Stock, 1978: 402; Stock, 1990: 219; Nakamura & Child, 1991: 62; Bamber & Thurston, 1993: 859; Child, 1994: 10; Bamber & Thurston, 1995: 147; Child, 1995: 76; Raiskii &

Turpaeva, 2006: 58; Bamber, 2007: 257; Staples, 2007: 87, figs. 2A–J, 7A, Table 1; Munilla & Soler Membrives, 2008: 5; Vinu et al., 2015: 2, figs. 1a, b. An extensive chresonymy can be found in Müller (1993: 142).

Description Wilson (1881), Staples (2007), Vinu et al. (2015).

Material examined One specimen, entangled in long-lines, off Caldera (26°42'00" S; 71°08'00" W), Región de Atacama, Chile, at about 1600–2000 m depth (MPCCL 23102015A).

Geographical distribution This is a semi-cosmopolitan species, found in almost all oceans in bathyal and abyssal depths, from 350 to 5219 m (Staples 2007; Turpaeva and Raiskii 2014; Vinu et al. 2015). In Chile, this species has been recorded only at Stations 146, 147, and 300 of the HMS Challenger Expedition, between Juan Fernández Archipelago and Valparaíso, at a depth of 1375 to 1600 fathoms (= 2515 to 2926 m) (Hoek 1881), off the port of San Antonio (33°39' S; 72°10' W) at 1170–1480 m depth, and SW of Roca del Rincón (25°00'S; 70°40' W) at 950 m deep (Child 1992). The present record is, thus, the deepest bathymetric record of this species in Chile, and it fills a gap in its distribution in the southeastern Pacific.

Remarks This is a very large species; the specimen examined is very large, with a leg span of about 34 cm and an overall length (from tip of proboscis to fourth lateral processes) of about 5 cm. This species can be confused with the very similar species *Colossendeis tasmanica* Staples, 2007; however, the proportion of the palp segments of the examined specimen (Fig. 1d) and fusion of the oviger claw to segment 10 confirm its specific allocation as *C. colossea*.

Fig. 1 *Colossendeis* species found off northern Chile. **a** *Colossendeis colossea*, detail of trunk in dorsal view (MPCCL 23102015A). **b** *Colossendeis macerrima*, detail of trunk in dorsal view (ZSMA20160003). **c** *Colossendeis minor*, detail of trunk in dorsal view (MPCCL 23102015B). **d** *Colossendeis colossea*, detail of distal end of palps. **e** *Colossendeis macerrima*, detail of oviger. **f** *Colossendeis minor*, detail of distal palp segments

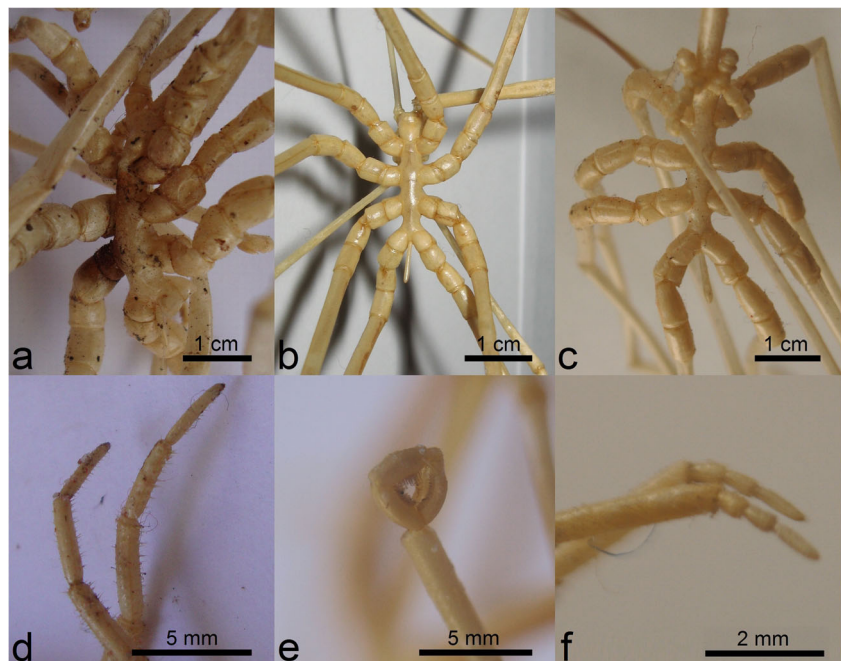


Table 1 Species of genus *Colossendeis* Jarzynsky, 1870 present along the Chilean coasts

Species	Distribution	Bathymetry	References
<i>Colossendeis angusta</i> Sars, 1877	From Punta Molles (32°17'S; 71°40'W) to Bahía Las Cañas (35°27'S; 72°53'W)	580–750	Child, 1992
<i>Colossendeis arcuata</i> Milne-Edwards, 1885	Off Punta Topocalma (34°07'S; 72°19'W)	730–750	Child, 1992
<i>Colossendeis colosseae</i> Wilson, 1881	From SW of Roca del Rincón (25°00'S; 70°40' W) to San Antonio (33°39'S; 72°10'W)	950–2000	Child, 1992 and this work
<i>Colossendeis leptorhynchus</i> Hoek, 1881	SW of Roca del Rincón (25°00'S; 70°40'W)	950 m	Child, 1992
<i>Colossendeis macerrima</i> Wilson, 1881	From Caldera (26°44'00" S; 71°07'00" W) to Canal Farquhar (48.52 S; 74.24 W)	18.3–1800 m	Child, 1992 and this work
<i>Colossendeis megalonyx</i> Hoek, 1881	From Concepción (36°24.010' S; 73°43.074' W) to the Falkland Islands (51°05'08" S; 61°44'00" W)	174–69 m	Weis & Melzer, 2012
<i>Colossendeis minor</i> Schimkewitsch, 1893	Off Caldera (26°44'00" S; 71°07'00" W)	1800–2000	This work

***Colossendeis macerrima* Wilson, 1881**

(Figure 1b, e)

Colossendeis macerrima Wilson, 1881: 246, pl. 1, fig. 2, pl. 3, figs. 9–12, pl. 5, fig. 32; Hoek, 1881: 64, pl. 8, figs. 3–7 (as *C. leptorhynchus*); Stock, 1975: 985, figs. 11a–b; Stock, 1978: 400, figs. 2, m; Stock, 1990: 220; Nakamura & Child, 1991: 62; Bamber & Thurston, 1993: 858; Child, 1994: 13; Bamber & Thurston, 1995: 148; Bamber, 2002: 723; Raiskii & Turpaeva, 2006: 58; Bamber, 2007: 257; Turpaeva, 2007: 128, pl. XXIII, figs. 1–3; Munilla & Soler Membrives, 2008: 5. An extensive chresonymy can be found in Müller (1993: 146).

Description Wilson (1881), Stock (1974), Bamber (2002).

Material examined One specimen, entangled in long-lines, off Caldera (26°44'00" S; 71°07'00" W), Región de Atacama, Chile, at about 1500–1800 m depth (ZSMA20160003).

Geographical distribution *Colossendeis macerrima* is a cosmopolitan deep sea species, found in a depth range of 121 to 4000 m (Müller 1993). In Chile, this species has been found from about 510 m in the Chilean fjord region (45°54.471 S; 75°36.021 W) to 18.3 m on a rocky slope at Canal Farquhar (48.52 S; 74.24 W), in southern Chile (Försterra et al. 2013). The present record is the deepest bathymetric record for Chile and the northernmost record for this species in the country, extending the previous distribution by about 2170 km.

Remarks Müller (1993) documented specimens as being associated with muddy substrates rich in foraminifera, pteropods, and shells. In Chile, this is the only *Colossendeis* species with records from the upper infralittoral and euphotic zone. *Colossendeis macerrima* has a complex taxonomy, being similar to the congeneric *C. gardineri* Carpenter, 1907, *C. leptorhynchus* Hoek, 1881, and *C. minor*. The differences among these species were reviewed by Stock (1984) and later by Bamber (2002).

***Colossendeis minor* Schimkewitsch, 1893**

(Figure 1c, f)

Colossendeis macerrima minor Schimkewitsch, 1893: 30, pl. I, figs. 7–10, pl. II, figs. 14–15. *Colossendeis macerrima* Stock, 1975: 985. *Colossendeis minor* Stock, 1984: 702, figs. 1–6; Bamber & Thurston, 1993: 148, fig. 9C; Raiskii & Turpaeva, 2006: 58; Bamber, 2007: 257. An extensive chresonymy can be found in Müller (1993: 149).

Description Schimkewitsch (1893), Stock (1984).

Material examined One specimen, entangled in long-lines, off Caldera (26°43'00" S; 71°07'00" W), Región de Atacama, Chile, at about 1800–2000 m depth (MPCCL 23102015B).

Distribution This species has been recorded from the northwestern part of the Pacific Ocean, western part of the Indian Ocean, and northeastern part of the Atlantic Ocean in 800–4850 m depths (Turpaeva and Raiskiy 2014), in the eastern tropical Pacific off Central and South America (Colombia and Ecuador), and in the Mid-Indian basin and south-eastern Madagascar (Stock 1984; Müller 1993). The present record is the southernmost in the Pacific Ocean and the first record of this species for Chile.

Remarks This is a species with a complex history and taxonomy; originally described as a subspecies of *Colossendeis macerrima*, it was later elevated to species status by Stock (1984). An extensive study of this species (and of *C. macerrima*) can be found in Stock (1984) and in Bamber (2002: 720). According to these authors, the distally narrowed (by about half the proximal part) and upcurved proboscis separates this species—along with *C. gardineri*—from *C. macerrima* and *C. leptorhynchus*. The principal characters used to distinguish *C. minor* and *C. gardineri* from each other are the spination of the propodal sole and the proportions of the distal palp segments; in *C. gardineri*, the sole spines are distinct and up to half the propodal diameter; in *C. minor*, the sole is lined with fine setae; finally, in *C. minor*, the palp segment 10 is longer than segment 9 (see Fig. 1f), while in *C. gardineri*, these segments are subequal.

Discussion

Seven *Colossendeis* species have been recorded from Chilean waters, all of them with discontinuous records found only in deep waters, with the single exception of *C. macerrima*, which has also been recorded from about 18 m in the fjords of southern Chile (Table 1). In regard to the species reviewed in this work, even when they have almost cosmopolitan distributions, the record of their presence in the bycatch of deep water fisheries—in particular from those operating offshore northern Chile, which have not been reviewed until now—is important considering the lack of biodiversity studies in the area and the scarce research on the Chilean Pycnogonida. The presence of several species of macroinvertebrates, such as anthozoans (mostly scleractinians and octocorallians), together with antipatharians, poriferans (Reiswig and Araya 2014), mollusks (Araya 2013), and several deep water barnacle species in the same hauls as the examined *Colossendeis* species, confirms the presence of a very rich bathyal invertebrate fauna thriving in the area. A thorough study of this fauna, in particular by examining, for example, the incidental catch of the deep water fisheries of the Patagonian toothfish *Dissostichus eleginoides* is, thus, of utmost importance. In conclusion, the new records extend the known geographical range of *Colossendeis colossea*, *Colossendeis macerrima*, and *Colossendeis minor* in the southeastern Pacific, and they add the latter species to the Chilean biodiversity. The presence of these species in northern Chile may give hints of a continuous distribution of this genus along the continental shelf of the Chilean or South American coasts, representing part of a hidden biodiversity thriving in deep waters in the southeastern Pacific.

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