



Research paper

First report of *Paelopatides* (Synallactida, Synallactidae) for the SW Atlantic, with description of a new species from the deep-sea off Argentina

Mariano I. Martínez ^{a, *}, Francisco A. Solís-Marín ^b, Pablo E. Penchaszadeh ^a

^a Laboratorio de Ecosistemas Costeros, Plataforma y Mar Profundo, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (CONICET), Av. Ángel Gallardo 470 (C1405DJR), Buenos Aires, Argentina

^b Colección Nacional de Equinodermos "Dra. M. Elena Caso M.", Laboratorio de Sistemática y Ecología de Equinodermos, Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, Mexico

ARTICLE INFO

Article history:

Received 22 March 2018
 Received in revised form
 18 September 2018
 Accepted 23 October 2018
 Available online 5 November 2018

Corresponding Editor: C. Lueter

Keywords:

Paelopatides shumel n. sp.
 Synallactids
 Southern hemisphere
 Diagnostic key
 Mar del Plata Submarine Canyon

ABSTRACT

The present study describes a new species, *Paelopatides shumel* n. sp., from Argentinian deep-sea waters. This is the first report of the order Synallactida for Argentina, the fifth for southern hemisphere and the deepest report for the Argentinian holothuroid fauna (almost 3000 m). The species has up to 330 mm length, light brown color and around 19 pairs of dorsal appendages. The ventral side has one ventral ambulacra, with two rows of tube feet. Ossicles are present in dorsal appendages, tube feet, tentacles and body wall near the anus, and are mainly crosses, tables and rods-shaped. The depth at which *P. shumel* n. sp. has been found is occupied by the North Atlantic Deep Water current. This association with North Atlantic waters could be related with the occurrence of members of *Paelopatides* in the North Atlantic.

© 2018 Elsevier GmbH. All rights reserved.

1. Introduction

The southwest Atlantic it is one of the most unknown areas of the world when talking about marine biodiversity. As an indication of this, redescrptions of seven species of holothuroids have been made and two new genera have been described since 2010 (Campos et al. 2010; Moura et al. 2010a; 2010b; Martínez & Brogger 2012; Martins et al. 2012a; 2012b; 2012c; Martínez et al. 2013, 2014; Prata et al. 2014; Martins & Souto 2015; Moura et al. 2015; Martins et al. 2016; Martínez & Penchaszadeh 2017). Particularly, for Argentina deep-sea waters (>1000 m), the last report was that from the HMS Challenger expedition by Théel (1882, 1886). Recently, the *Talud Continental* expedition (I, II and III) renewed interest in studying the deep-sea fauna for the area with several reports on different phyla (Cerino & Lauretta 2013; Martínez et al. 2014; Ocampo et al. 2014; Pastorino & Chiesa 2014; Farías et al. 2015; Signorelli & Pastorino

2015; Maggioni et al. 2016; Pastorino 2016; Pastorino & Sánchez 2016; Martínez & Penchaszadeh 2017; Pereira & Doti 2017).

The recently named order Synallactida Miller et al. 2017 includes the family Synallactidae Ludwig, 1894, which is one of the least studied groups of sea cucumbers (Gebruk et al. 2012). There are few reports of this family in the southwestern Atlantic, one from Campos Basin, off Brazil (1100–1700 m) (Moura et al. 2010a) and another off the Uruguay coast (4850 m) (O'Loughlin & Ahearn 2005). The oldest genus is *Paelopatides* Théel, 1886, described from specimens of the well-known deep-sea expedition of the HMS Challenger. Although the type species of the genus (*Paelopatides confundes* Théel, 1886) is the only subtropical one, described from specimens collected off Chile (Pacific Ocean; approximately 34°S, 74°W; 2502–4050 m), the genus is mainly present in northern hemisphere waters. For the northeastern Atlantic there are only few reports as well as for the Southeastern Atlantic off coast of the central region of Africa (Massin 1993).

The present study describes a new species of the genus *Paelopatides* Théel, 1886 from Argentinian deep-sea waters. This is the deepest report for the holothuroid fauna in the area. In addition, a key to the species of the genus from the southern hemisphere is

* Corresponding author.

E-mail addresses: mmartinez@macn.gov.ar (M.I. Martínez), fasolis@cmarl.unam.mx (F.A. Solís-Marín), pablopench@gmail.com (P.E. Penchaszadeh).

presented, and associations are established between this species and other members of the genera.

2. Material and methods

The holotype was collected by the B/O “Puerto Deseado” at the Mar del Plata Submarine Canyon area (2900 m) using a fishing net. Holotype and permanent ossicles slides are deposited in the Invertebrate Collections of the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (MACN-In), Buenos Aires, Argentina. Digital images of the specimen were taken using a digital reflex camera Nikon D800 with a macro lens. Digital images of ossicles were taken using Zeiss Axio Imager Z1 microscope with AxioCam HRc digital camera and Axiovision software. For scanning electron microscope (SEM) examinations of ossicles, small pieces of the body wall were dissolved in sodium hypochlorite solution, rinsed several times in distilled water, ethanol 96% and air-dried. Finally, ossicles were transferred to aluminum stubs, metal sputter coated and observed under SEM (Philips XL 30) at the MACN.

Genus *Paelopatides* Théel, 1886

Paelopatides Théel, 1886: 154; Fisher, 1907: 693; Mortensen, 1927: 388; Deichmann, 1930: 104.

Benthodytes Walsh 1891: 200.

Paelopatides Ludwig, 1891: 332.

Perizona Koehler & Vaney, 1905: 51 [new synonymy].

Bathyzona Koehler & Vaney, 1905: 53 [new synonymy].

Pelopatides, Perrier, 1902: 359–361; Koehler & Vaney, 1905: 29–30.

Diagnosis. Body more or less distinctly depressed, with a rather considerable rim surrounding the sides and the extremities. Tentacles 15–20, peltate, or subdigitate on margin of the crown. Mouth ventral. Anus dorsal or subdorsal. The tube feet form a double row along the odd ambulacrum, except on the anterior part where they are absent. The papillae form a simple row around the margin of the rim, and are scattered along each of the two dorsal ambulacra as well. Interambulacra naked. Gonads on both sides of the dorsal mesentery. A rete mirabile is sometimes present. One or two Polian vesicles. Stone canals apparently lacking. No calcareous ring. Ossicles. Simple tri-radiate or quadri-radiate rods either smooth or spinous; with slightly branched tips; exceptionally deposits often entirely wanting.

Type species. *Paelopatides confundens* Théel, 1886 by monotypy.

Remarks. Perrier (1902) noted that Théel (1886) spelled the genus name as *Pælopatides*. Subsequent authors have hesitated



Fig. 1. Holotype MACN-In 42221 (A) dorsal and (B) ventral view. Scale bar = 10 cm.

between using *Pælopatides* or *Pelopatides* (see Deichmann, 1930: 104, Mortensen 1927: 388). If we follow the etymology ($\pi\eta\lambda\acute{o}\varsigma$ = loam or mud, $\pi\alpha\tau\acute{\epsilon}\omega$ = to press) “*Pelopatides*” is the proper spelling (see Koehler & Vaney 1905, 1910). Although Ludwig (1891) acted as the first reviewer of the genus after this, according to the code, the correct name of the genus is *Paelopatides* (Théel, 1886).

The genus *Bathyzona* Koehler & Vaney, 1905 was erected using a single, small (75 mm long), eviscerated, and not well-preserved specimen. Even though its external appearance and form of ossicles resembles the genus *Paelopatides*, its authors decided to create a new genus. The genus contains only the type species, *Bathyzona incerta*. No respiratory trees were found in the type material. Its position and validity as a member of Synallactidae needs further analysis. After the revision of the type material of the genus, here we propose its synonymy with *Paelopatides*. As for the genus

Perizona, Koehler & Vaney (1905), using a single specimen, differentiated *Perizona* from *Paelopatides* after the presence in the first one of only two morphological differences 1) The development of a lateral fringe, 2) A row of pedicels along the whole length of the ventro-lateral radii. These variable characteristics have been questioned by different authors such as Deichmann (1930) and Hansen (1975), following the previous suggestions, here we propose the synonymy of *Perizona* with *Paelopatides*.

Paelopatides shumel n. sp.

Diagnosis. Live specimen body sub-cylindrical. Fixed material flattened, color light brown. Dorsal appendages present, almost invisible in the dorsal middle area, around 19 pairs. Mouth ventral and anus subdorsal. One ventral ambulacrum with two rows of

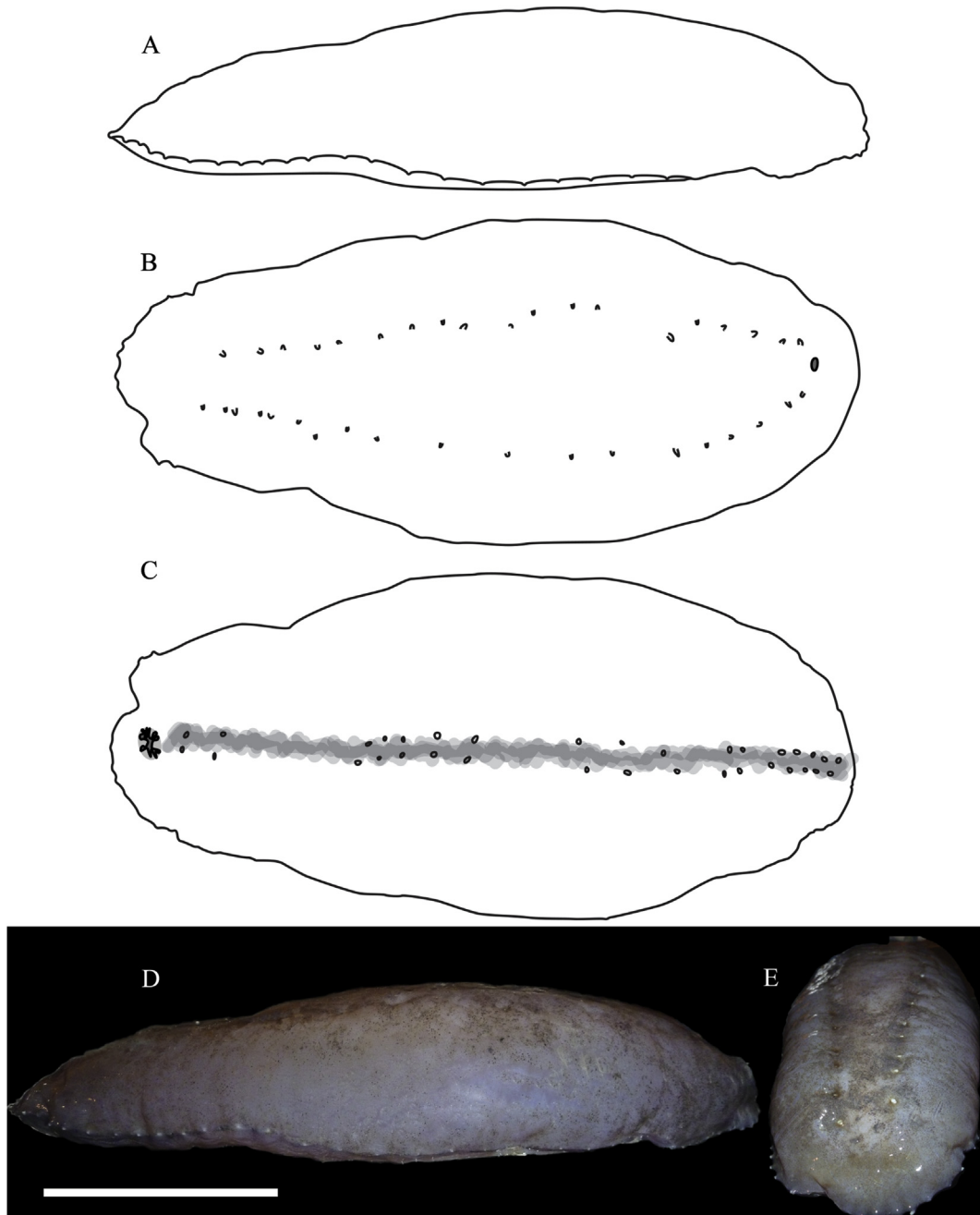


Fig. 2. Drawing from (A) lateral, (B) dorsal and (C) ventral view; and photographs from (D) lateral and (E) frontal view. Scale bar = 10 cm.

tube feet. Festooned edges in dorsal–ventral interface forming a rim. Ossicles, from dorsal appendages and body wall near anus, crosses with bipartite spire, tables with crown, bipartite or one axis spire and three arms crosses with spire. Podia with three arms crosses, tables with simple spire and rods, the last one also present in tentacles.

Description. Body, when alive sub-cylindrical, flattened in fixed material. Size up to 330 mm, color alive and fixed light brown (Figs. 1 and 2). Mouth ventral, anus completely dorsal. Tentacles 20, retracted, shield shaped, each tentacle cover by a thin sac-like structure. Dorsal appendages up to 3.15 mm in length, visible along the body in living animal, around 19 pairs slightly asymmetrical in the 1/5 anterior part (Figs. 1a and 2b). Festooned edges of the rim at the dorsal ventral interface, very visible in anterior and posterior part of the body (Fig. 1). Ventral side like sole, with two

rows of podia in zig-zag, not visible in the middle section of the body (Figs. 1b and 2c). Body wall thin, ossicles restricted to dorsal appendages, near the anus, podia and tentacles. A very strong muscular pharynx, two Polian vesicles, 37.3 and 60 mm in length. Gonad, multiple empty tubules. Respiratory trees from posterior to anterior part of the body right, left half size.

Ossicles, from dorsal appendages, body-wall near the anus and podia, rods with or without central apophysis and crosses with three or four arms. From body wall near the anus three arms (one arm size: 111–153 μm), four arms (one arm size: 71–118 μm). Dorsal appendages bars with or without central apophysis (half 81–115 μm) and crosses with three arms (one arm size: 78–131 μm). Podia bars with or without central apophysis (size from center to extreme 104–184 μm), three arms (one arm size: 42–114 μm), four arms (one arm size: 63–69 μm) (Fig. 3a and b, d, f,

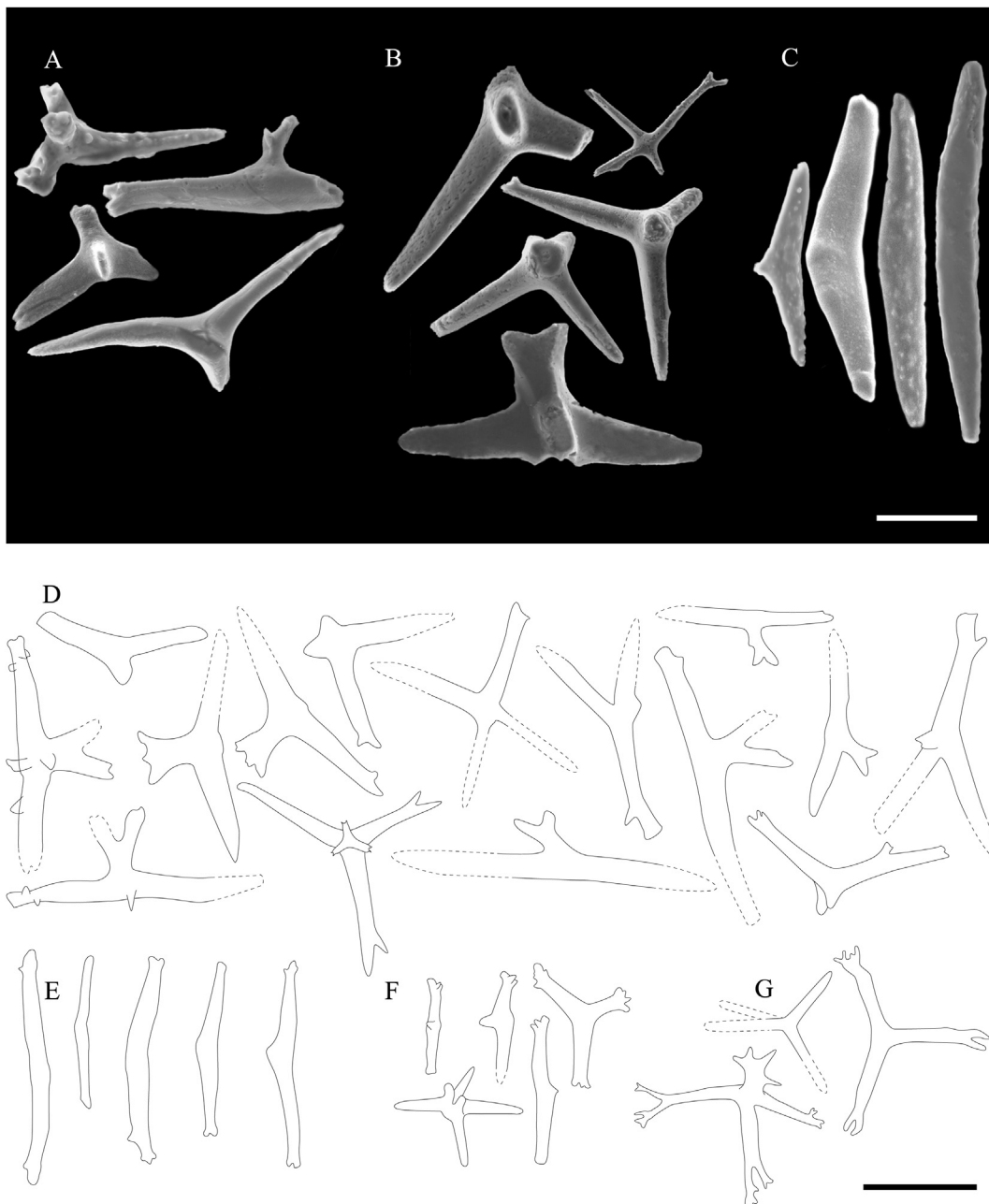


Fig. 3. Ossicles of *Paelopatides shumel* n. sp. MACN-In 42221, A–C = SEM images from (A) dorsal appendages, (B) body-wall near anus, (C) tentacles; D–G = drawings from (D) dorsal appendages, (E) tentacles, (F) podia and (G) body-wall near the anus. Scale bars A, B, C = 50 μm ; D, E, F, G = 100 μm .

g). Tentacles: bars with or without central apophysis (half 104–201 μm) (Fig. 3 c, e).

Etymology. From “shumel” = shoe in the language of Tehuelches, the earlier inhabitants of northern Patagonia. The species named after it resembles the shape of a shoe. The specific name is a noun in apposition.

Material examined. Holotype, MACN-In 42221, ossicles of holotype specimen mounted on four SEM stubs.

Type locality: Mar del Plata submarine canyon (38°2’S–53°39’W), 2934 m, 5-Sep-2013.

Distribution: Only known from the type locality.

Depth: 2934 m.

Diagnostic key for *Paelopatides* species from southern hemisphere:

Diagnostic Key for *Paelopatides* species from southern hemisphere:

1. Ventral podia, only present in the rear third part of the body.....*Paelopatides illicitus*
 - Ventral podia present in more than the rear third part of the body.....2
2. Rod-like ossicles absent.....*Paelopatides confundens*
 - Rod-like ossicles present.....3
3. Rod-like ossicles only present in tentacles.....*Paelopatides grisea*
 - Rod-like ossicles present in tentacles and dorsal appendages.....4
4. Two respiratory trees equally well-developed.....*Paelopatides ovalis*
 - Left respiratory tree half size than the right one.....*Paelopatides shumel n. sp.*

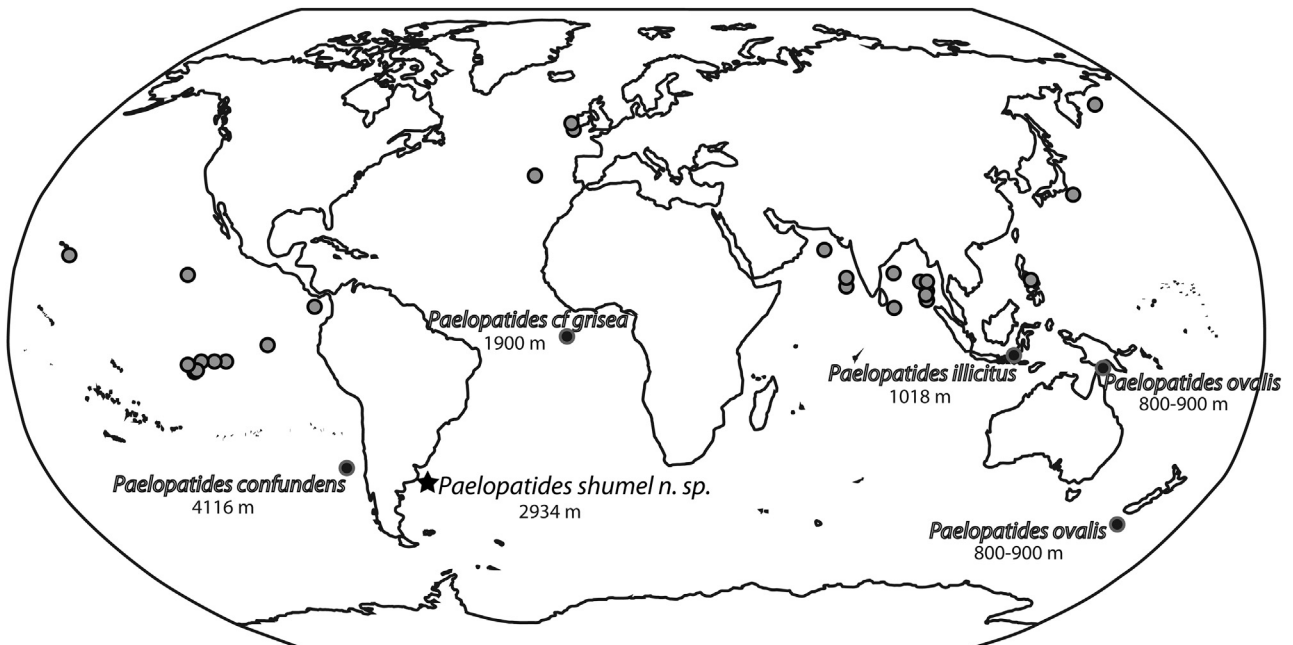


Fig. 4. Map showing *Paelopatides shumel n. sp.* (line black-center grey) distribution and previous reports on *Paelopatides* (grey), with the other southern hemisphere species (black) *Paelopatides confundens*, *Paelopatides cf. grisea*, *Paelopatides illicitus* and *Paelopatides ovalis*.

3. Discussion

The genus *Paelopatides* is composed of 19 species distributed in deep-sea waters around the world. The species *Paelopatides confundens* Théel, 1886, is the type species of the genus. The nearest record of the genus to *P. shumel n. sp.* reported is from the Pacific (Fig. 4). The distinct characters of this species are the number of dorsal appendages and the shape of the ossicles. In addition, *P. shumel n. sp.* has ossicles in podia, and body-wall near the anus. No ossicles was observed for these areas of the body in *P. confundens*. For the other southern hemisphere member of the genus, *Paelopatides cf. grisea* (Perrier, 1898), Massin (1993) did not find a dorsal papillae, probably after the material suffers some damage during the trawling. Furthermore, no similar

characteristics have been found with other northern hemisphere species of the genus.

This is the first report of the order Synallactida for the Argentine deep-sea. In particular, the family Synallactidae, is a well-known family from Antarctica and southwestern Atlantic (Moura et al. 2010a; O'Loughlin & Ahearn 2005). The species *Molpadiodemas violaceus*, from the order Persiculida, with a South Atlantic distribution has a previous report from HMS Challenger Expedition, although station 325 it is not from Argentine waters and corresponds to the fauna from off Uruguay.

Moreover, for Brazilian deep-sea waters, Moura et al. (2010a) redescribed several species of this family, without any reports on *Paelopatides*. The latest described species of this genus, *Paelopatides solea* Baranova, 1955, was erected more than 60 years ago, indicating how unknown are synallactids, and *Paelopatides* in particular. In addition, the present study has material properly preserved for molecular analysis for future comparisons with other specimens off Argentina and worldwide. This genus is sometimes difficult to distinguish owing to 1) the damage that the gelatinous body sustains during collection and preservation, 2) the absence of both ossicles and a calcareous ring, and 3) the difficulty of preserving specimens in anything like their original shape. Although this species has been compared with all the species of *Paelopatides*, we do not find any close morphological relation with other species around the world.

Species of the genus *Paelopatides* are almost neutrally buoyant and have been observed from submersibles to swim by undulating their bodies (Pawson 1978). A bottom photograph, taken using a combined trawl and forward-looking deep-sea camera system, clearly shows a large *Paelopatides*, >40 cm long. From 1942 to 1949 m depth off the NW African coast (Rice et al. 1979). It is interesting that the authors note that this specimen was the only one recovered in the trawl catch because these holothuroids have a rather patchy distribution (Gage et al. 1985; Pawson 1982; Sibuet 1977).

The Mar del Plata Canyon, has unique characteristics and it is near a great energetic zone. The Brazil–Malvinas Confluence is the encounter of two currents, one southward (Brazil current) and another northward (Malvinas current) (see Piola & Matano 2001). In particular the canyon has many layers, including Antarctic waters. The 2000–3000 m depth layer, at which *P. shumel* has been found, is dominated by the North Atlantic Deep Water current, which is rich in oxygen and has high salinity (see Preu et al. 2013). The connection with North Atlantic waters could be related to the presence of some species of *Paelopatides* in the North Atlantic. Although the distance is a huge barrier (more than 10,000 km apart), proper studies on this matter could help in the analysis on the cosmopolitan status of this genus.

Acknowledgments

We thank Alejandro Tablado, curator of the Invertebrate Collection of the Museo Argentino de Ciencias Naturales, to CONICET (Argentina), colleagues and crew from the B/O “Puerto Deseado” during the Talud Continental III (2013) expedition. In particular to Guido Pastorino, Martin Brogger, Carlos Sánchez-Antelo, Pamela Rivadeneira, Juan José Berecoechea and Jonathan Flores. Also would like to thanks Martin Brogger, John Lawrence and Mike Reich for valuable suggestions and comments that improved this manuscript. This work has been partially funded by grants BID PICT 2013–2504, BID PICT 2015–0428 and PICT 2016–0271 from the Agencia Nacional de Promoción Científica y Tecnológica (Argentina) and by grant 11220170100643CO from the Consejo Nacional de Investigaciones Científicas y Técnicas (Argentina).

References

- Baranova, Z.I., 1955. New species and subspecies of echinoderms from the Bering Sea. Tr. Zool. Inst. Akad. Nauk SSSR 18, 334–342.
- Campos, L.S., Veríssimo, I., Curbelo-Fernandez, M.P., Cavalcanti, G.H., Brasil, A.C.S., 2010. ROV imaging of deep-sea echinoderms from the Brazilian continental margin, Southwest Atlantic. In: Harris, L.G., Böttger, S.A., Walker, C.W., Lesser, M.P. (Eds.), *Echinoderms* Durham. Taylor & Francis Group, London, pp. 147–152.
- Cerino, N., Lauretta, D.M., 2013. *Armadiillogorgia albertoi* sp. nov.: a new primnoid from the Argentinean deep sea. Zootaxa 3741 (3), 369–376.
- O'Loughlin, P.M., Ahearn, C.G., 2005. A review of pygal-furrowed Synallactidae (Echinodermata: Holothuroidea), with new species from the Antarctic, Atlantic and Pacific oceans. Mem. Mus. Vic. 62 (2), 147–179.
- Deichmann, E., 1930. The holothurians of the western part of the Atlantic Ocean. Mem. Mus. Comp. Zool. Harv. 71, 41–226.
- Fariás, N.E., Ocampo, E.H., Luppi, T.A., 2015. On the presence of the deep-sea blind lobster *Stereomastis shumel* (Decapoda: Polychelidae) in Southwestern Atlantic waters and its circum-Antarctic distribution. N. Z. J. Zool. 42 (2), 119–125.
- Fisher, W.K., 1907. The holothurians of the Hawaiian Islands. Proc. U. S. N. M. 32, 637–744.
- Gage, J.D., Billett, D.S.M., Jensen, M., Tyler, P.A., 1985. Echinoderms of rockall trough and adjacent areas. 2. Echinoidea and Holothuroidea. Bull. Br. Mus. Nat. Hist. Zool. 48, 173–213.
- Gebruk, A., Solis-Marín, F.A., Billet, D.S.M., Rogacheva, A., Tyler, P.A., 2012. Review of the genus *Zygothuria* Perrier, 1898 and the Atlantic group of species of the genus *Mesothuria* Ludwig, 1894 (Synallactidae: Holothuroidea) with description of the new species *Mesothuria milleri* sp. nov. J. Nat. Hist. 46 (5–6), 265–348.
- Hansen, B., 1975. Scientific results of the Danish deep-sea expedition round the world 1950–52. Systematics and biology of the deep-sea holothurians. Galathea Rep. 13, 1–262.
- Koehler, R., Vaney, C., 1905. An Account of the Deep-sea Holothuroidea Collected by the Royal Indian Marine Survey Ship Investigator. Indian Mus., Calcutta, India.
- Koehler, R., Vaney, C., 1910. Description d'holothuries nouvelles appartenant au musée indien. Rec. Indian Mus. 5 (7–8), 89–103. Part. 2.
- Ludwig, H., 1891. Die Seewalzen. In: Bronn, H.G. (Ed.), Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild. Zweiter Band. Dritte Abtheilung: Echinodermen (Stachelhäuter): I. Buch. Leipzig. C.F. Winter'sche Verlagshandlung, p. 460 vi +.
- Ludwig, H.L., 1894. The Holothuroidea. In: Reports on an Exploration off the West Coast of Mexico, Central and South America, and off the Galapagos Islands, in Charge of Alexander Agassiz by the U.S. Fish Commission Steamer “Albatross” during 1891. Lieut. Commander, Z.L. Tanner, U.S.N., Commanding, vol. XII. Mem. Mus. Comp. Zool. Harv. Coll. 17, 3, 183 pp., 19 pls.
- Maggioni, T.A., Taverna, A., Tatián, M., 2016. Redescription of the deep-sea colonial ascidian *Synoicum molle* (Herdman, 1886): first record since its original finding during the Challenger Expedition. Zoosyst. Evol. 92 (2), 181–185.
- Martínez, M.I., Brogger, M.I., 2012. *Thandarum hernandezii*, a new genus and new species of sea cucumber family Sclerodactylidae (Echinodermata: Holothuroidea: Dendrochirotida) from the Southwestern Atlantic Ocean. Zootaxa 3304, 63–68.
- Martínez, M.I., Penchaszadeh, P.E., 2017. A new species of brooding Psolidae (Echinodermata: Holothuroidea) from deep-sea off Argentina, southwestern Atlantic ocean. Deep Sea Res. Part II 146, 13–17.
- Martínez, M.I., Thandar, A.S., Penchaszadeh, P.E., 2013. A new species of *Havelockia* Pearson, 1903 from the Argentine sea (Holothuroidea: Dendrochirotida: Sclerodactylidae). Zootaxa 3609, 583–588.
- Martínez, M.I., Solis-Marín, F.A., Penchaszadeh, P.E., 2014. *Benthodytes violela*, a new species of a deep-sea holothuroid (Elasipodidae: Psychropotidae) from Mar del Plata Canyon (south-western Atlantic Ocean). Zootaxa 3760, 89–95.
- Martins, L., Souto, C., 2015. Taxonomic review of four western Atlantic dendrochirotid (Holothuroidea) with the description of a new Brazilian cucumariid species and designation of neotypes. Zootaxa 3919 (2), 362–374.
- Martins, L., Souto, C., Magalhães, W.F., de Souza Alves, O.F., Rosa, I.L., Santos Sampaio, C.L., 2012a. Echinoderm harvesting in Todos-os-Santos Bay, Bahia state, Brazil: the aquarium trade. SCB 12 (1), 1–7.
- Martins, L., Souto, C., Menegola, C., 2012b. First record of *Holothuria* (*Theelothuria*) *princeps* and *Thyone pawsoni* (Echinodermata: Holothuroidea) in the south Atlantic ocean. Mar. Biodivers. Rec. 5, 1–6.
- Martins, L., Souto, C., Menegola, C., 2012c. A new genus and new species of Sclerodactylidae (Holothuroidea: Dendrochirotida) from the south-western Atlantic coast. Zootaxa 3506, 54–62.
- Martins, L., Souto, C., Braga, J., Tavares, M., 2016. Echinoidea and Holothuroidea (Echinodermata) of the Trindade and Martin Vaz Archipelago, off Brazil, with new records and remarks on taxonomy and species composition. J. Mar. Biol. Assoc. U. K. 1, 1–35. <https://doi.org/10.1017/S0025315416001569>.
- Massin, C., 1993. The Holothuroidea (Echinodermata) collected during the Tyro Mauritania-II expedition 1988. Zool. Med. 67 (29), 397–429.
- Miller, A.K., Kerr, A.M., Paulay, G., Reich, M., Wilson, N.G., Carvajal, J.I., Rouse, G.W., 2017. Molecular phylogeny of extant Holothuroidea (Echinodermata). Mol. Phylogenet. Evol. 111, 110–131.
- Mortensen, T., 1927. Handbook of the Echinoderms of the British Isles. Humphrey Milford-Oxford Univ. Press, London, etc.
- Moura, R.B., Campos, L.S., Curbelo-Fernández, M.P., Cavalcanti, G.H., 2010a. Synallactidae (Echinodermata: Holothuroidea) from Campos Basin, southwest

- Atlantic. In: Harris, L.G., Böttger, S.A., Walker, C.W., Lesser, M.P. (Eds.), Echinoderms Durham. Taylor & Francis Group, London, pp. 245–249.
- Moura, R.B., Rodrigues, D.S., Carvalho, A.L.P.S., Campos, L.S., 2010b. On the Holothuroidea from the collection of Echinodermata, Institute of biology, federal university of rio de Janeiro, Brazil. In: Harris, L.G., Böttger, S.A., Walker, C.W., Lesser, M.P. (Eds.), Echinoderms Durham. Taylor & Francis Group, London, pp. 251–254.
- Moura, R.B., Campos, L.S., Esteves, A.M., 2015. Hooked from the deep: a rare new species of *Taeniogyrus* (Holothuroidea, Chiridotidae) from the continental slope of Brazil, southwestern Atlantic. *Zootaxa* 3972 (4), 535–548.
- Ocampo, E.H., Fariás, N.E., Luppi, T.A., 2014. New record of the deep-sea crab *Ethusina abyssicola* from the Mar del Plata Canyon, Argentina. *N. Z. J. Zool.* 41 (3), 218–221.
- Pastorino, G., 2016. First report of the family Laubierinidae Warén & Bouchet, 1990 (Gastropoda: Tonnoidea) in the southwestern Atlantic. *Molluscan Res.* 36 (2), 108–111.
- Pastorino, G., Chiesa, I.L., 2014. The family Caecidae (Gastropoda: Caenogastropoda) in Argentine waters. *Nautilus* 128 (2), 40–50.
- Pastorino, G., Sánchez, N., 2016. Southwestern Atlantic species of conoidean gastropods of the genus *Aforia* Dall, 1889. *Zootaxa* 4109 (4), 458–470.
- Pawson, D.L., 1978. Some aspects of the Biology of deep-sea echinoderms. *Thalassia Jugosl.* 12, 287–293.
- Pawson, D.L., 1982. Papers from the Echinoderm Conference. 8. Deep-sea echinoderms in the Tongue of the ocean, Bahama Islands: a survey, using the research submersible *Alvin*. *Australian Mus. Mem.* 16, 129–145.
- Pereira, E., Doti, B., 2017. *Edotia abyssalis* n. sp. from the Southwest Atlantic Ocean, first record of the genus (Isopoda, Valvifera, Idoteidae) in the deep sea. *Zool. Anz.* 268, 19–31.
- Perrier, R., 1898. Sur les Holothuries recueillies par le Travailleur et le Talisman. *C. R. Acad. Sci.* 126, 1664–1666.
- Perrier, R., 1902. Holothuries. In: Perrier, E. (Ed.), Expéditions scientifiques du “Travailleur” et du “Talisman” pendant les années 1880, 1881, 1882, 1883. Masson et Cie, Paris, pp. 299–554.
- Piola, A.R., Matano, R.P., 2001. Brazil and Falklands (Malvinas) Currents. Academic Press, London.
- Prata, J., Pereira Das, T.L., Christoffersen, M.L., 2014. Occurrence of *Holothuria* (*Holothuria*) *dakarensis* (Holothuroidea: Echinodermata) in the south-western Atlantic, with notes on distribution and ecology. *Mar. Biodivers. Rec.* 7, 1–6.
- Preu, B., Hernández-Molina, F.J., Violante, R., Piola, A.R., Paterlini, C.M., Schwenk, T., Voigt, I., Krastel, S., Spiess, V., 2013. Morphosedimentary and hydrographic features of the northern Argentine margin: the interplay between erosive, depositional and gravitational processes and its conceptual implications. *Deep Sea Res. Part I* 75, 157–174.
- Rice, A.L., Aldred, R.G., Billett, D.S.M., Thurson, M.H., 1979. The combined use of an epibenthic sledge and a deep-sea camera to give quantitative relevance to macro-benthos samples. *Ambio Spec. Rep.* 6, 59–72.
- Sibuet, M., 1977. Répartition et diversité des Echinoderms (Holothurides-Asterides) en zone profonde dans le Golfe de Gascogne. *Deep Sea Res.* 24, 594–563.
- Signorelli, J., Pastorino, G., 2015. A new species of *Laubiericoncha* (Bivalvia: Vesicomidae) from deep waters off Argentina. *Malacologia* 58 (2), 349–360.
- Théel, H., 1882. Report on the Holothuroidea, dredge by H.M.S. ‘Challenger’ during the years 1873–76. Part I. *Challenger Rep. Zool.* 13, 1–176.
- Théel, H., 1886. Report on the Holothuroidea dredged by H.M.S. ‘Challenger’ during the years 1873–76. Part II. *Challenger Rep. Zool.* 39, 1–290.