Rev. Mus. Argentino Cienc. Nat., n.s.
18(2): 237-241, 2016
ISSN 1514-5158 (impresa)
ISSN 1853-0400 (en línea)

The sea cucumber *Psolus patagonicus* (Echinodermata: Holothuroidea) from the southwestern Atlantic: Redescription of the holotype and a new synonym

Mariano I. MARTÍNEZ

Laboratorio de Ecosistemas Costeros, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (CONICET), Av. Ángel Gallardo 470, C1405DJR Buenos Aires, Argentina.
E-mail: mmartinez@macn.gov.ar

Abstract: *Psolus patagonicus* Ekman, 1925 is redescribed from material including the holotype, deposited in the Zoologisches Museum Hamburg (ZMH), and specimens of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-In). *Psolus marcusi* Tommasi, 1971 is stated as a junior synonym. Since also the specimens used by Ludwig in 1897 to report the brooding behavior of *Psolus antarcticus* (ZMH: E4168) are identifiable as *P. patagonicus,* the latter is the only South American psolid holothuroid known to be a brooder.

Key words: Dendrochirotida; Psolidae; type material; reproductive behavior

Resumen: Se redescribe *Psolus patagonicus* Ekman, 1925 a partir de material del Zoologisches Museum Hamburg (ZMH), que incluye al holotipo, y especímenes del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-In). *Psolus marcusi* Tommasi, 1971 se propone como un sinónimo más reciente. Puesto que los ejemplares usados por Ludwig en 1897 para informar sobre el comportamiento de incubación de *Psolus antarcticus* (ZMH E4168) son identificables como *P. patagonicus,* este es el único psólido sudamericano del que se sabe que es incubador.

Palabras clave: Dendrochirotida; Psolidae; material tipo; comportamiento reproductivo

INTRODUCTION

Six species of the family Psolidae Burmeister, 1837 live in the Argentine coast: *Psolus patagonicus* Ekman, 1925, *Psolus segregatus* Perrier, 1905, *Psolus antarcticus* (Philippi, 1857), *Psolus marcusi* Tommasi, 1971, *Psolidium dorsipes* Ludwig, 1887, and *Psolidium disciformis* (Théel, 1886) (Deichmann, 1947; Pawson, 1969a, 1969b; Hernández, 1981). Originally described from the "Patagoniske Bank" (46° S), *Psolus patagonicus* is the commonest one. While Deichmann (1947) and Pawson (1969a, 1969b) studied this species from Tierra del Fuego, Bernasconi (1941) and Hernández (1981) focused the study to northern waters (up to 38° S), extending the known distribution of this species to almost all the Argentine shelf. Tommasi (1971) described a new species, *P. marcusi*, from off Mar del Plata, Argentina (38° S). Although the description was adequate, no information about a holotype or type specimens was stated. The purpose of this work is to redescribe *Psolus patagonicus*, analyzing the holotype from the Zoologisches Museum Hamburg (ZMH) and specimens from the Collection of Invertebrates at the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-In), as a consequence of which *P. marcusi* is recognized as a junior synonym, and the identity of the material labeled as *P. antarcticus* by Ludwig (1897) is clarified.

RESULTS

Psolus patagonicus Ekman, 1925

Psolus patagonicus Ekman, 1925: 140; Bernasconi, 1941: 48, fig. VI; Deichmann, 1941: 145; Deichmann, 1947: 339; Pawson, 1964: 463; Pawson, 1969a: 129; Pawson, 1969b, Map 5; Hernández, 1981: 155; Tommasi *et al.*, 1988: 2; Larrain, 1995: 89; Lancellotti & Vasquez, 1999 (anexo), 2000; Ríos *et al.*, 2003, 2005: 231; Mutschke & Ríos 2006; Giménez & Penchaszadeh, 2010: 1; Martínez *et al.*, 2011: 1; Brogger *et al.*, 2013: 380; Solís-Marín *et al.*, 2013: 590.

Fig. 1. *Psolus patagonicus* Ekman, 1925. Holotype: ZMH E4173, dorsal view. Scale bar: 1 cm.

Psolus marcusi Tommasi, 1971: 4.
Psolus antarcticus: Ludwig, 1897 (non Philippi, 1857).

Description: Psolid shape, up to 23.26 mm long, color in life light orange to white; in alcohol, white. Mouth and anus dorsal, covered by five valves and five interradial teeth between the valves. Valves and interradial teeth in anus about half size of mouth pieces (Fig. 1). Tentacles 10, white with brown dots, eight dendritic and the last two (most ventral) reduced, bifid-ended (ratio 1:3). Tube feet up to 0.35 mm in diameter, only on ventral side; trivium with central ambulacra naked, and both lateral ambulacra with one zig-zag and two rows of podia. Calcareous ring simple, with five radial and five interradial pieces fused at the base. Radial piece with an anterior notch and anteriorly wider than the interradial piece, which has not notch. One Polian vesicle in the left ventral side, one stone canal and a two-kidney shaped madreporite, attached to the base of the middorsal interradial piece. Gonad on the dorsal side, below the calcareous ring, composed by multiple tubes, well developed during reproductive season. Respiratory trees well extended up to the anterior part of the body, right trunk longer than the left one.

Ossicles from the ventral wall are plates with four holes (70–170 μm), slightly curved and plates with multiple perforations with lobed ends (Fig. 2a, 3a). Tentacles and podia with curved bars (70–200 μm), end plate up to 400 μm (Fig. 2b, 3b, 3c).

Distribution: Southwest Atlantic Ocean, from Mar del Plata (38° S) to Tierra del Fuego (54° S) and Cape Horn. In the Pacific Ocean, known from the vicinity of Magellan Strait (48° S) (Hernández, 1981).

Examined material: Holotype "Patagonische Bank 46° S. B. 60 fad. Kpt. H. Nissen 15.VI.1906" (ZMH E4173); ZMH: E4172, E4171, E4168, E4167; MACN-In: 12661, 16264, 23362, 25125, 34776, 34777, 37574.

Habitat: Rocks, shells, *Macrocystis* fronds and holdfast (Pawson, 1969a; Giménez & Penchaszadeh 2010, and this paper).

Depth: Intertidal to about 308 m (Hernández, 1981, and this paper).

Remarks: In some specimens with retracted tentacles, the oral and anal valves may cover the oral and anal interradial teeths, which could not be seen. According to Pawson (1964) teeths could be absent in small specimens.

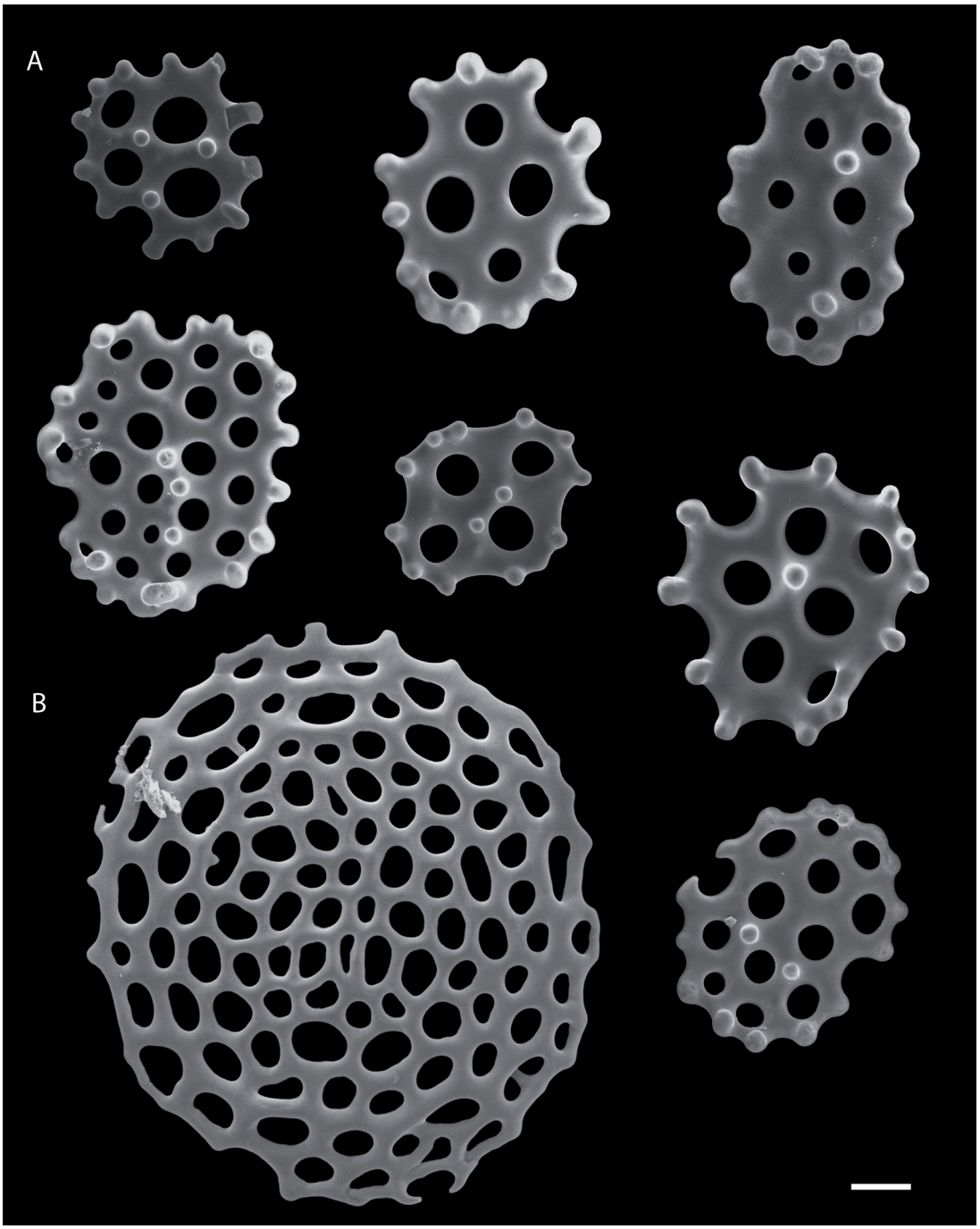

Fig. 2. *Psolus patagonicus* Ekman, 1925. Ossicles: A. plates from the sole, B. end plate. Scale bar: 50 μm.

DISCUSSION

The original description of *Psolus marcusi* Tommasi, 1971, based on a single specimen 11 mm long, noted the absence of oral teeth as the only difference to *P. patagonicus* (Fig. 1, 4) with no comparison to the sympatric psolid, *Psolus patagonicus*. The specimen described by Tommasi was deposited at the Museu de Zoologia da Universidade de São Paulo (Tommasi, personal

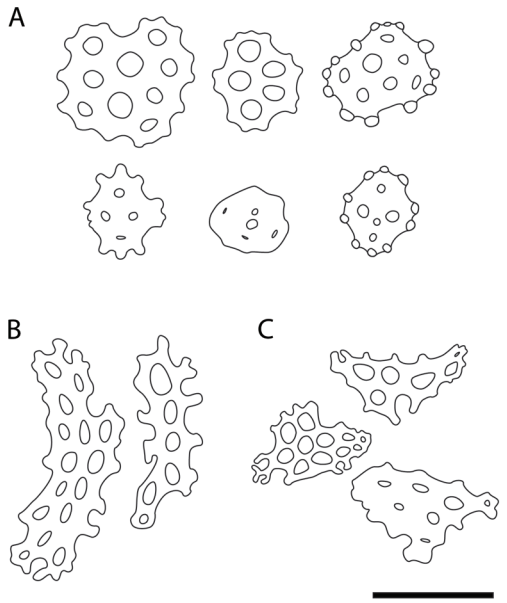

Fig. 3. *Psolus patagonicus* Ekman, 1925. Ossicles: A. Plates from the ventral side, B. Curved plates from podia, C. Curved plates from tentacles. Scale bar: 100 μm.

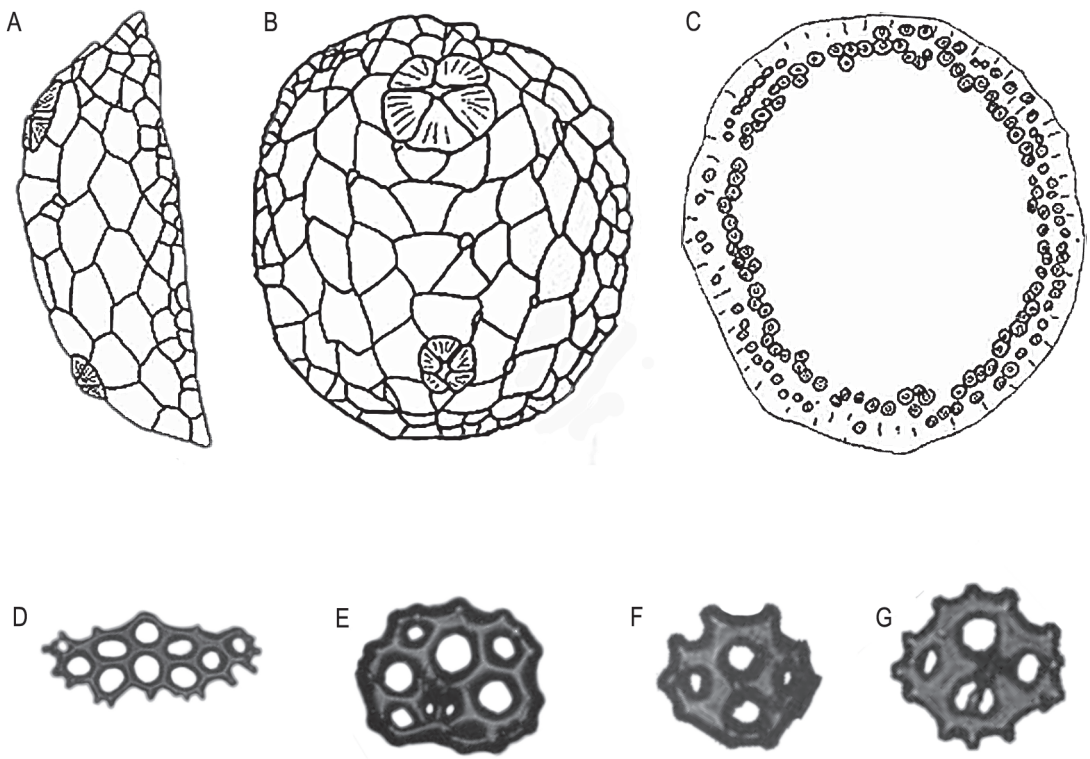

Fig. 4. *Psolus marcusi* Tommasi, 1971. Drawings from Fig. 9 and 10 of Tommasi (1971). A. lateral, B. dorsal, C. ventral view, D-E. plates, F-G. curved plates with multiple perforations.

communication), but no such material could be traced in that collection, so I conclude that the holotype of *Psolus marcusi* is lost.

Since the oral and anal teeth of *Psolus patagonicus* may be easily overlooked when they are covered by the oral and anal valves, and Pawson (1964) pointed out that oral teeth could be absent in small specimens (up to 11 mm, i.e. the size of the holotype of *P. marcusi*), there is no evidence of any meaningful difference between these two sympatric taxa. So I conclude that *P. marcusi* Tommasi, 1971 is a junior synonym of *P. patagonicus* Ekman, 1925.

Psolus patagonicus was reported as a brooder by Bernasconi (1941), Hernández (1981) and Giménez & Penchaszadeh (2010). Martínez *et al.* (2011) studied the reproductive cycle and found a spawning event during February, which is followed by a brooding period from February to September (Giménez & Penchaszadeh 2010).

Ludwig (1897) reported a brooding behavior for *Psolus antarcticus* (Philippi, 1857). This report did not include any collection number. However, the specimens E4168 from the ZMH collection, which are coincident in locality, collector and date with the material mentioned by Ludwig as *P. antarcticus*, were labeled as *P. patagonicus* by Power in 1965, and this identification is confirmed herein. Therefore, Ludwig's (1897) report on brooding actually referred to *P. patagonicus* before its original recognition as a different species by Ekman (1925). Since there are no other reports on *P. antarcticus* brooding behavior after Ludwig's observations, and the identification of his specimens was rectified, the only brooder psolid up to now properly described for South America is *P. patagonicus*.

ACKNOWLEDGMENTS

I would like to thanks Daniel M. Lauretta, Julio Arriaga-Ochoa, two anonymous reviewers and the editor, Néstor Cazzaniga, for valuable suggestions and commentaries that improved this manuscript. Also to Alejandro Tablado (MACN), Andreas Smith-Rhaesa (ZMH), Helma Roggenbuck (ZMH) and Aline Staskowian Benetti (MZUSP) for facilitating the search of specimens in each collection. This work was partially founded by PICT 2015-0428, PICT 2012-0561, PICT 2013-2504 from the *Agencia Nacional de Promoción Científica y Tecnológica* (Argentina), PIP 0253 from *Consejo Nacional de Investigaciones Científicas y Técnicas* (Argentina), PADI Foundation (USA), and DAAD (Germany).

BIBLIOGRAPHY

Bernasconi, I. 1941. Los equinodermos de la expedición del Buque Oceanográfico "Comodoro Rivadavia" A.R.A. *Physis* 19: 37-49.

Brogger, M.I., D. Gil, T. Rubilar, M. Martínez, E. Díaz de Vivar, M. Escolar, L. Epherra, A. Pérez & A. Tablado. 2013. Echinoderms from Argentina: Biodiversity, distribution and current state of knowledge. Pp. 359-402 in: Alvarado, J.J. & F.A. Solís-Marín (eds.) *Echinoderm Research and Diversity in Latin America*. Berlin: Springer. 658 pp.

Burmeister, H. 1837. *Handbuch der Naturgeschichte. Zum Gebrauch bei Vorlesungen. Zweite Abtheilung. Zoologie,* p. 471. Berlin: Enslin. xii + pp. 369–858.

Deichmann, E. 1941. The Holothuroidea collected by the Velero III during the years 1932 to 1948. Part I, Dendrochirota. *Allan Hancock Pacific Expeditions* 8: 61-196. Los Angeles: The University of Southern California Press.

Deichmann, E. 1947. Shallow water holothurians from Cabo de Hornos and adjacent waters. *Anales del Museo Argentino de Ciencias Naturales* 8: 325-351.

Ekman, S. 1925. Holothurien. *Further Zoological Results of the Sweden Antarctic Expedition* 1: 1-194. Stockholm: Norstedt.

Giménez, J. & P.E. Penchaszadeh. 2010. Brooding in *Psolus patagonicus* (Echinodermata: Holothuroidea) from Argentina, SW Atlantic Ocean. *Helgoland Marine Research* 64(1): 21-26.

Hernández, D.A. 1981. Holothuroidea de Puerto Deseado (Santa Cruz, Argentina). *Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"* 4: 151-168.

Larrain, A.P. 1995. Biodiversidad de equinodermos chilenos: Estado actual del conocimiento y sinopsis biosistemática. *Gayana, Zoología* 59: 73-96.

Lancellotti, D.A. & J.A. Vásquez. 1999. Biogeographical patterns of benthic macroinvertebrates in the Southeastern Pacific littoral. *Journal of Biogeography* 26(5): 1001-1006.

Lancellotti, D.A. & J.A. Vásquez. 2000. Zoogeografía de macroinvertebrados bentónicos de la costa de Chile: contribución para la conservación marina. *Revista Chilena de Historia Natural* 73(1): 99-129.

Ludwig, H. 1887. Die von G. Chierchia auf der Fahrt der Kgl. Ital. Corvette Vittor Pisani gesammelten Holothurien. *Zoologische Jahrbücher* 2: 1-36.

Ludwig, H. 1897. Brutpflege bei *Psolus antarcticus*. *Zoologischer Anzeiger* 20: 237–239.

Martínez, M.I., J. Giménez & P.E. Penchaszadeh. 2011. Reproductive cycle of the sea cucumber *Psolus patagonicus* Ekman 1925, off Mar del Plata, Buenos Aires, Argentina. *Invertebrate Reproduction & Development* 55(2): 124-130.

McEuen, F.S. & F.S. Chia. 1991 Development and metamorphosis of two psolid sea cucumbers, *Psolus chitonoides* and *Psolidium bullatum*, with a review of reproductive patterns in the family Psolidae (Holothuroidea: Echinodermata). *Marine Biology*

109(2): 267-279.

Mutschke, E. & C. Ríos. 2006. Distribución espacial y abundancia relativa de equinodermos en el Estrecho de Magallanes, Chile. *Ciencia y Tecnología del Mar* 29(1): 91-102.

Pawson, D.L. 1964. The Holothuroidea collected by the Royal Society Expedition to Southern Chile, 1958-1959. *Pacific Science* 18: 453-470.

Pawson, D.L. 1969a. Holothuroidea from Chile report no. 46 of the Lund University Chile expedition 1948-1949. *Sarsia* 38(1): 121-146.

Pawson, D.L. 1969b. Holothuroidea. In: Bushnell, V.C. & J.W. Hedgpeth (eds.). *Antarctic Map Folio Series*, 11: 38-41. New York: American Geographical Society.

Perrier, R. 1905. Holothuries antarctiques du Muséum d'Histoire naturelle de Paris. *Annales de Sciences Naturelles, Zoologie* 9(1): 104-146.

Philippi, R.A. 1857. Vier neue Echinodermen des Chilensischen Meeres. *Archiv für Naturgeschichte* 23: 130-134.

Rios, C., E. Mutschke, A. Montiel, D. Gerdes & W.E. Arntz. 2005. Soft-bottom macrobenthic faunal associations in the southern Chilean glacial fjord complex. *Scientia Marina* 69(Suppl. 2): 225-236.

Ríos C., E. Mutschke & E. Morrison. 2003. Biodiversidad bentónica sublitoral en el estrecho de Magallanes, Chile. *Revista de Biología Marina y Oceanografía* 38(1): 1-12.

Solís-Marín, F.A. *et al.* (69 authors). 2013. Appendix. Pp. 543-654 in: Alvarado, J.J. & F.A. Solís-Marín (eds.) *Echinoderm Research and Diversity in Latin America*. Berlin: Springer. 658 pp.

Théel, H. 1886. Report on the Holothurioidea dredged by H.M.S. Challenger during the years 1873-76. Part II. In: Thompson, C. W. & J. Murray (dirs.) *Report of the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873-76 under the command of Captain George S. Nares, R.N. F.R.S. and the late Captain Frank Tourle Thomson, R.N.* 14, Zoology 39, 290 pp.

Tommasi, L.R. 1971. Equinodermes do Brasil I. Sôbre algumas espécies novas e outras pouco conhecidas, para o Brasil. *Boletim do Instituto Oceanográfico* 20(1): 1-22.

Tommasi, L.R., M.C.W. Cernea & M.C.G. Condeixa. 1988. Equinodermes coletados pelo N/Oc. "Almirante Saldanha", entre 26°59´S e 38°39´S. *Relatório Interno do Instituto Oceanográfico, Universidade de São Paulo* 22: 1-11.

Doi: 10.22179/REVMACN.18.474

Recibido: 17-XI-2016
Aceptado: 27-XII-2016