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. Angel 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

---

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, 1941; 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 & Penchasadeh, 2010: 1; Martínez et al., 2011: 1; Brogger et al., 2013: 380; Solís-Marín et al., 2013: 590.
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.
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 Oceánográfico “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. Epheria, A. Pérez & A. Tablado. 2013. Echinoderms from Argentina: Biodiversity, distribution and current state of knowledge. Pp. 359-402 in: Alvarado, J.J. & FA. 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, Dendrochirotida. 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. & PE. 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 & PE. 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
Recibido: 17-XI-2016
Aceptado: 27-XII-2016