Zootaxa 3881 (1): 094–100
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3881.1.7
http://zoobank.org/urn:lsid:zoobank.org:pub:9C0FB9F8-C565-4627-87A2-D44FDFAB6781

Pseudoceros astrorum, a new species of Polycladida (Cotylea, Pseudocerotidae) from Northeastern Brazil

VERONICA N. BULNES[1] & YAN TORRES[2]

[1]*Zoología de Invertebrados I, Universidad Nacional del Sur. San Juan 670. 8000 Bahía Blanca, Argentina*
[2]*Departamento de Biologia, Centro de Ciências, Universidade Federal do Ceará, Ceará, Brasil*

Abstract

Pseudoceros astrorum **n. sp.** is characterized by a smooth dorsal surface with a brown ground colour, and with net-like pattern of small black granules, white spots of different sizes uniformly distributed, a thin black sub-marginal band, and a white marginal rim. The pseudotentacles are dark brown with white tips and the anterior margin and cerebral region is devoid of pigmentation. The male system is characterised by conspicuous spermiducal bulbs, a conical curved penis stylet, and the sucker lies more or less posterior. With this contribution, the number of known species from Brazil is now 72, and has created new interest in the lesser-known polyclad fauna from the northeast coast of Brazil.

Key words: biodiversity, morphology, Marine flatworms, Western Atlantic, Cotylea

Introduction

The Pseudocerotidae is one of the largest families within the Cotylea, with a large number of described species. The phylogeny as well as the monophyly of some genera are still unclear (Rawlinson & Litvaitis 2008). *Pseudoceros* is one of the most common tropical polyclad genera, and species of *Pseudoceros* are determined on the basis of their colour patterns (Newman & Cannon 1995), external morphological features, as well as the reproductive biology, and microanatomy (Hyman 1951; Prudhoe 1985; Faubel 1984; Bolaños *et al.* 2007).

The number of described polyclad species in Brazil is 71, most of them from the southern states, with only seven species described from the North-East of Brazil (Bahia *et al.*, 2012). Much of the Brazilian coast remains unexplored, and the low number of described species suggests that the biodiversity of polyclads in Brazil is currently underestimated. This contribution reports the presence of a new species of *Pseudoceros* inhabiting the waters of Ceará State, northeast Brazil.

Material and methods

The specimens were collected by hand from the rocky intertidal zone at Pacheco Beach, Ceará, Brazil. The animals were photographed and measured *in vivo*. The specimens were fixed in frozen formalin mixed with seawater, and preserved in ethanol 70% (Newman & Cannon, 1995). One specimen was embedded in paraffin and sagittally sectioned at 7 µm, and histological sections stained with hematoxylin-eosin method. The description is based on morphological characteristics, coloration pattern, arrangement of eyes, and reconstruction of the reproductive structures from serial histological sections; the determination and description were made following Faubel`s system (1984). All given measurements are from the holotype, unless stated otherwise. The material collected was deposited in the Museu de Zoologia da Universidade de São Paulo, Brazil (MZUSP).

 Accepted by W. Sterrer: 25 Sept. 2014; published: 3 Nov. 2014

Results

Systematics

Genus *Pseudoceros* Lang, 1884

***Pseudoceros astrorum* n.sp.**
(Figs 1–4)

Type material. Holotype: One mature specimen as serial sagittal sections of anterior part of body (106 slides), and the posterior part as serial transverse section (51 slides), MZUSP PL 1558. The specimen was collected on 7 October 2010 by F. Vasconcelos, from the intertidal zone.

Paratype: One mature specimen preserved in 70% ethanol, MZUSP PL 1559. The specimen was collected on 7 October 2010 by F. Vasconcelos, from the intertidal zone.

Etymology. The specific name *astrorum* is the Latin, genitive, plural form of *astrum* (star), which means "belong to the stars" and refers to the dorsal colour pattern resembling a constellation or group of stars.

Locality. Beach at Pacheco, São Gonçalo do Amarante, CE, Brazil (03° 41 'S, 38° 38' W).

Description. External morphology: Dorsally the background colour is brown with numerous dark pigment granules creating a uniform pattern. Delicate black sub-marginal band and a white marginal rim (Figures 1A, C). Scattered white spots of different sizes (blotches, flecks and small spots) uniformly distributed on the dorsal surface. Pseudotentacles black, with small white spots and a single white blotch at the tip of each tentacle. The anterior-most marginal spot and the cerebral region are devoid of epidermal pigment (Figure 1B). Ventrally dark brown, fading to grey at the margins and with a white marginal rim (Figure 1E). Intestinal branches apparent (Figures 1D, E). Body of solid appearance, from oval to elongate, 30.4 mm long and 14.9 mm wide. Scattered tentacular eyes, only visible in serial sections, 63 cerebral eyes spots arranged in a single pear-shaped cluster (Figure 1B). Pharynx with numerous folds, arranged in anterior body half; the mouth opens anteriorly in the pharynx cavity. Gonopores separate, arranged distally in the anterior body half. Sucker well developed in the middle of the posterior body half (Figure 1D).

Body wall: Dorsal epidermis cells are ciliated. Epidermal cells cylindrical, 32 µm high, filled with dark granular pigmentation and scattered rhabdites. Basement membrane delicate (3 µm), circular muscle fibres in bundles, longitudinal muscle layer 10 µm high. Underneath the muscular layer, granular pigmentation is apparent as well as distinct eosinophilic glands (Figure 2A). Ventral body wall as thick as dorsal (50 µm), cellular, ciliated epidermis 30 µm high, the epidermal cells appear cuboidal, devoid of pigment granules and with scattered rhabdites. Basement membrane thinner than dorsally; circular muscle fibres arranged in a 5 µm deep distinct muscular layer; longitudinal muscle fibres less compact than dorsally, arranged in a 10 µm deep layer (Figure 2B). Rhabdites numerous only in anterior body margin (dorsal and ventral). Body wall relatively thin in comparison to the body height. Parenchymatous muscles apparent and numerous, giving the body its solid appearance (Figure 3D).

Reproductive anatomy: Spermiducal bulbs well developed (Figures 1D, 1E), joining anteriorly to form a muscular common *vas deferens* (Figure 3A). The *vas deferens* runs anteriorly and turns dorsal and posterior to enter the seminal vesicle on its anterior aspect. The cylindroid seminal vesicle is 1650 µm long and 750 µm high (Figure 3C). The vesicle´s muscular wall is slightly thicker anteriorly, thinning distally. The ejaculatory duct turns ventrally and posteriorly to join the prostatic duct at the tip of the penis papillae. A short prostatic duct leads to the small ovoid prostatic vesicle (460 µm x 360 µm) with an inner smooth glandular lining, arranged free (Figure 3B). The 300 µm curved stylet is supported by a short muscular papilla and housed in a muscular fold of the male atrium (penis sheath). The ciliated male atrium opens to a single male gonopore (Figure 3C, D).

The uteri run dorsal to the spermiducal bulbs; the distal tracts of the oviducts run anteriorly and join before entering the female canal. The vagina is ciliated, surrounded by the cement gland mass (Figure 4A). The vagina runs posteriorly, parallel to the body surface, then turns ventrally and opens to the small female atrium. The wall of the vagina is slightly muscular proximally, distally developing two glandular pouches (Figure 4B), before entering the small female atrium and the gonopore.

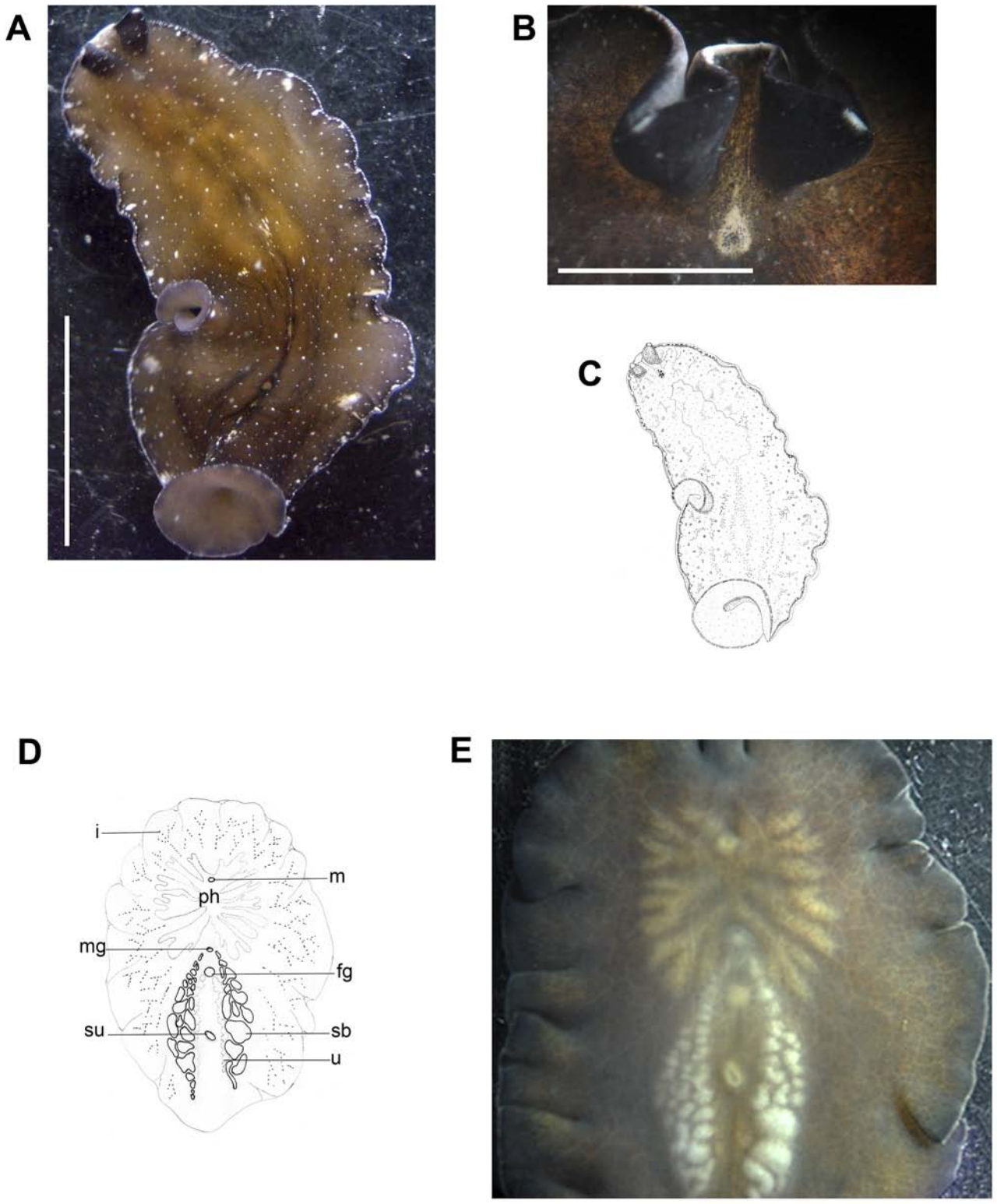

FIGURE 1. *Pseudoceros astrorum* **n. sp.** A, dorsal view of type specimen; B, detail of dorsal anterior margin; C, diagram of colour pattern; D, diagram of ventral view; E, ventral view of fixed specimen. Abbreviations to the figures: fg, female gonopore; i, intestine; m, mouth; mg, male gonopore; ph, pharynx; sb, spermiducal bulbs; su, sucker; u, uterus. Scale bars: A, 10 mm; B, 3 mm.

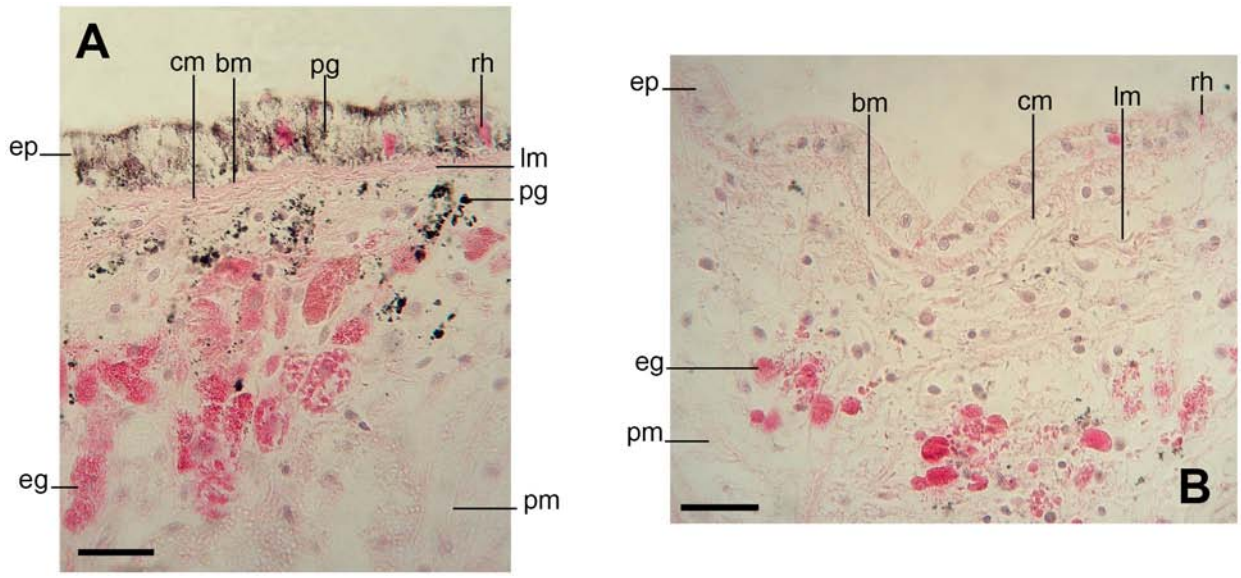

FIGURE 2. *Pseudoceros astrorum* **n. sp.**, sagittal section. A, dorsal body wall; B, ventral body wall. Abbreviations to the figures: bm, basement membrane; cm, circular muscle; eg, eosinophilic glands; ep, epidermis; lm, longitudinal muscles; pg, pigment granules; pm, parenchymatous muscles; rh, rhabdites. Scale bars: A, 10 µm; B, 10 µm.

Discussion

The genus *Pseudoceros* is the largest within the Pseudocerotidae. The homogeneity of the inner anatomy is high and the specific determinations are usually based on coloration and color patterns (Hyman 1954, 1955a, b, 1959a, b; Prudhoe 1989; Newman & Cannon 1994, 1996, 1997, 1998).

The smooth dorsal surface, presence of tentacular and cerebral eyes, single male copulatory apparatus, with a seminal vesicle and an armed penis papilla places this new species within the family Pseudocerotidae and in the genus *Pseudoceros*.

Pseudoceros heronensis Newman & Cannon, 1994 and *P. lindae* Newman & Cannon, 1994 exhibit similar colour patterns, with a brownish background colour, dorsally with blotches of different sizes and marginal bands.

Pseudoceros heronensis was originally described from Australian waters and is characterized by a mottled dark and light brown dorsal surface, with two brown marginal bands and a translucent margin. The white spots are randomly distributed on the surface and in a band along the mid-dorsal line, with dark brown tentacle´s tips and a white frontal marginal band. *Pseudoceros astrorum* differs from *P. heronensis* because of its brown background colour and mesh-like black pattern, with white spots of different sizes uniformly distributed and a thin black marginal band and white marginal rim.

Pseudoceros lindae described from Australia, Indonesia and South Kenya, is characterized by a dark brown ground colour, submarginal greyish band and a marginal white rim, and large elongated yellow to reddish spots distributed on the dorsal surface, larger marginally. *Pseudoceros astrorum* differs from *P. lindae* because the spots are white and of different sizes, randomly distributed on the dorsal surface.

Pseudoceros astrorum is characterized by the smooth dorsal surface of a brown ground colour, with a net-like pattern of small black granules, white spots of different sizes uniformly distributed, a thin black submarginal band, a white marginal rim, pseudotentacles dark brown with distal white blotches, anterior margin and cerebral region devoid of pigment; conspicuous spermiducal bulbs, conical curved penis papillae and sucker located more or less posterior. Based on these characters *Pseudoceros astrorum* is considered a new species belonging to the genus *Pseudoceros*.

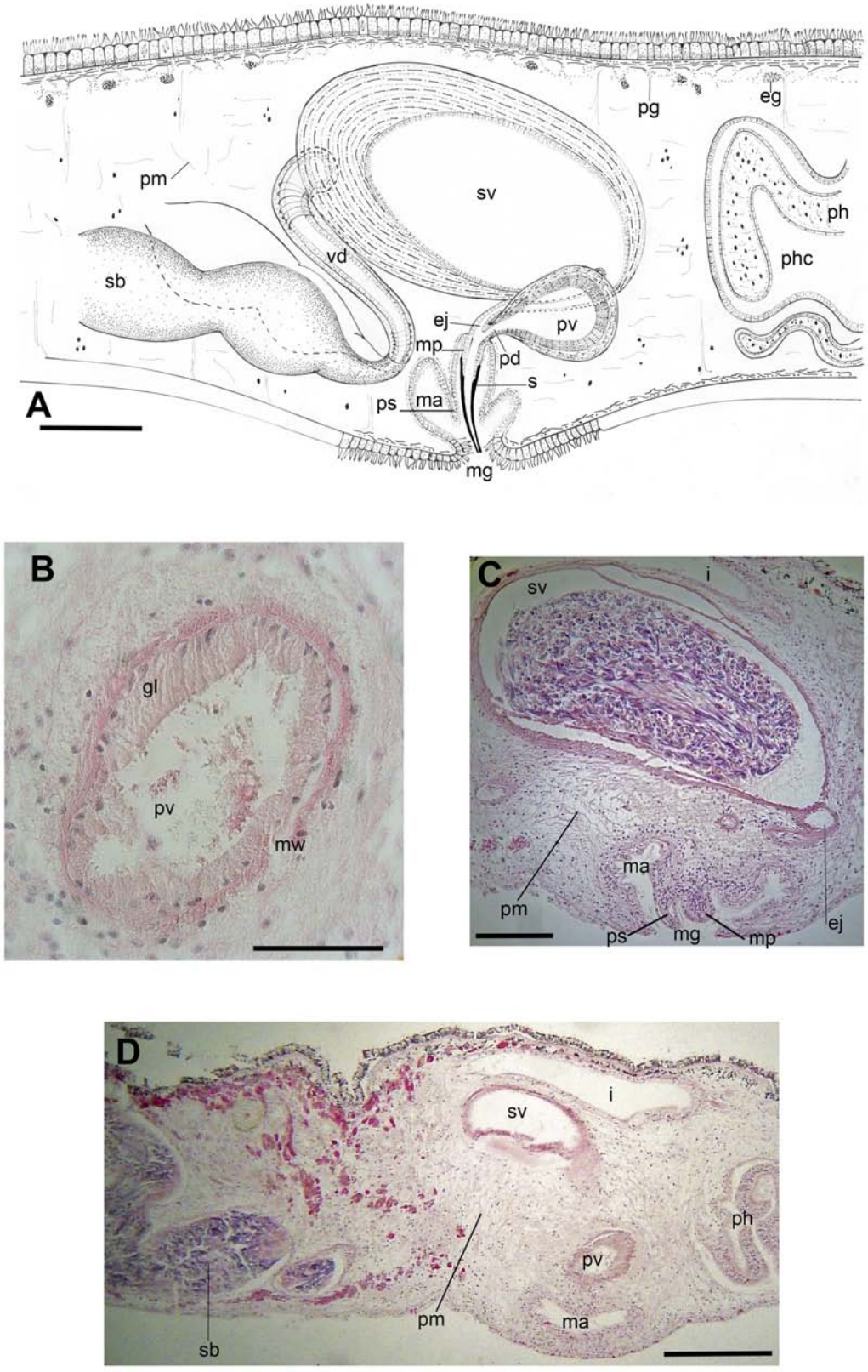

FIGURE 3. *Pseudoceros astrorum* **n. sp.**, sagittal sections, right is anterior. A, reconstruction of male copulatory organs; B, detail of seminal vesicle and vas deferens; C, detail of seminal vesicle and ejaculatory duct; D, detail of spermiducal bulbs. Abbreviations to the figures: eg, eosinophilic glands; ej, ejaculatory duct; gl, glandular lining; i, intestine; ma, male atrium; mg, male gonopore; mp, muscular papillae; mw, muscular wall; pd, prostatic duct; pg, pigment granules; ph, pharynx; phc, pharynx cavity; pm, parenchymatous muscle fibres; ps, penis sheath; pv, prostatic vesicle; s, stylet; sb, spermiducal bulbs; sv, seminal vesicle; vd, *vas deferens*. Scale bars: A, 300µm; B, 300µm; C, 300µm; D, 500µm.

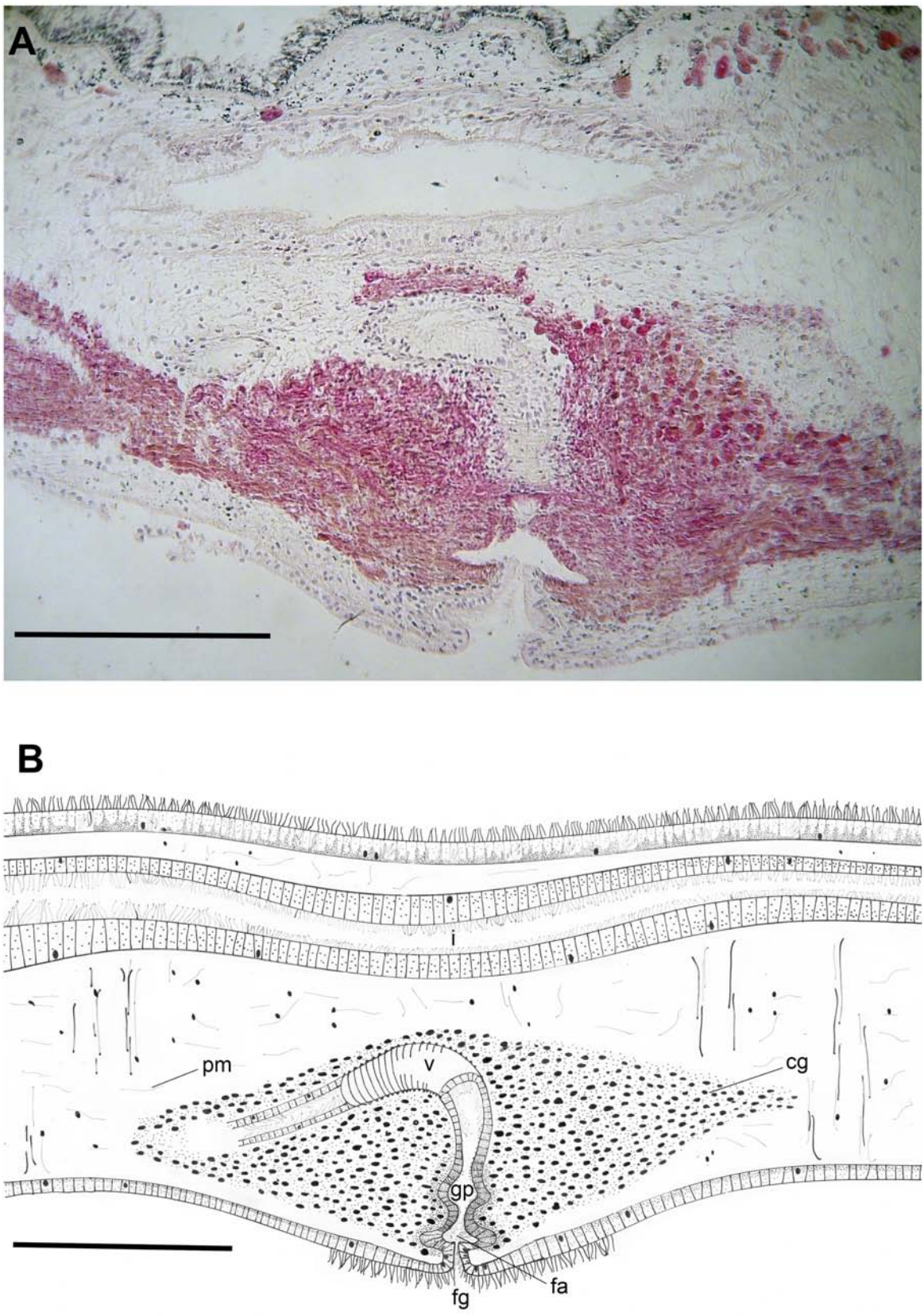

FIGURE 4. *Pseudoceros astrorum* **n. sp.**, sagittal section, right is anterior. A, view of female system; B, reconstruction of female system. Abbreviations to the figures: cg, cement glands; fg, female gonopore; gp, glandular pouch; i, intestine; pm, parenchymatous muscle fibers; v, vagina. Scale bars: A, 800µm; B, 800µm.

Acknowledgements

Verónica N. Bulnes is a staff researcher of the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina. This contribution was partially granted by the CONICET, and the Universidad Nacional del Sur through allowances, supporting the activity of their fellows and researchers.

Literature cited

Bahia, J., Padula, V. & Delgado, M. (2012) Five new records and morphological data of polyclad species (Platyhelminthes: Turbellaria) from Rio Grande do Norte, Northeastern Brazil. *Zootaxa*, 3170, 31−44.

Bolaños, D.M., Quiroga, S.Y. & Litvaitis, M.K. (2007) Five new species of cotylean flatworms (Platyhelminthes: Polycladida) from the wider Caribbean. *Zootaxa*, 1650, 1–23.

Faubel, A. (1984) The Polycladida, Turbellaria. Proposal and establishment of a new system. Part II. The Cotylea. *Mitteilungen Hamburgisches Zoologisches Museum und Institut*, 81, 189–259.

Hyman, L.H. (1951) *The Invertebrates: Platyhelminthes and Rhynchocoela.* The acoelomate Bilateria. Vol. II. McGraw-Hill, New York, 51 pp.

Hyman, L.H. (1954) The polyclad genus *Pseudoceros*, with special reference to the Indo-Pacific region. *Pacific Science*, 8, 331–336.

Hyman, L.H. (1955a) Some Polyclad flatworms from the West Indies and Florida. *Proceedings of the United States National Museum*, 104 (3341), 115−150.
http://dx.doi.org/10.5479/si.00963801.104-3341.115

Hyman, L.H. (1955b) Some polyclad flatworms from Polynesia and Micronesia. *Proceedings of the United States Natural Museum*, 105, 65–82.
http://dx.doi.org/10.5479/si.00963801.105-3352.65

Hyman, L.H. (1959a) A further study of Micronesian polyclad flatworms. *Proceedings of the United States Natural Museum,* 108, 543–597.
http://dx.doi.org/10.5479/si.00963801.108-3410.543

Hyman, L.H. (1959b) Some Australian polyclads. *Records of the Australian Museum*, 25, 1–17.
http://dx.doi.org/10.3853/j.0067-1975.25.1959.653

Lang, A. (1884) *Die Polycladen (Seeplanarien) des Golfes von Neapel und der angrenzenden Meeresabschnitte*. Leipzig, Verlag von W. Engelman, 688 pp. [*Fauna und Flora des Golfes von Neapel, Monograph 11*]

Newman, L.J. & Cannon, L.R.G. (1994) *Pseudoceros* and *Pseudobiceros* (Platyhelminthes, Polycladida, Pseudocerotidae) from eastern Australia and Papua New Guinea. *Memoirs of the Queensland Museum*, 37, 205–266.

Newman, L.J. & Cannon, L.R.G. (1995) The importance of the fixation of colour, pattern and form in tropical Pseudocerotidae (Platyhelminthes, Polycladida). *Developments in Hydrobiology*, 108, 141–143.
http://dx.doi.org/10.1007/BF00036376

Newman, L.J. & Cannon, L.R.G. (1996) New genera of pseudocerotid flatworms (Platyhelminthes; Polycladida) from Australian and Papua New Guinean coral reefs. *Journal of Natural History*, 30 (10), 1425−1441.
http://dx.doi.org/10.1080/00222939600770811

Newman, L.J. & Cannon, L.R.G. (1997) Nine new species of *Pseudobiceros* (Platyhelminthes: Polycladida) from the Indo-Pacific. *The Raffles Bulletin of Zoology*, 45 (2), 341−368.

Newman, L.J. & Cannon, L.R.G. (1998) *Pseudoceros* (Platyhelminthes: Polycladida) from the Indo-Pacific with twelve new species from the Australia and Papua New Guinea. *The Raffles Bulletin of Zoology*, 46 (2), 293−323.

Prudhoe, S. (1985) *A Monograph on Polyclad Turbellaria*. London/Oxford: British Museum of Natural History and Oxford University Press, 259 pp.

Prudhoe, S. (1989) Polyclad turbellarians recorded from African waters. *Bulletin of the British Museum of Natural History (Zool.)*, 55, 47–96.

Rawlinson, K.A. & Litvaitis, M.K. (2008) Cotylea (Polycladida): a cladistic analysis of morphology. *Invertebrate Biology*, 127 (2), 121−138.
http://dx.doi.org/10.1111/j.1744-7410.2007.00119.x