

## Taxonomic Reports of Obothrioidea (Eucestoda, Trypanorhyncha) from Elasmobranch Fishes of the Southern Coast Off Brazil

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*Specimens of elasmobranch fishes, captured in the states of Paraná and Santa Catarina, of the southern coast off Brazil, represented by three families, four genera, and four species, were parasitized with obothrioid trypanorhynch cestodes: Heptranchias perlo (Bonnaterre, 1788), Squalus sp. and Carcharhinus signatus (Poey, 1868) were parasitized with Progrillotia dollfusi Carvajal & Rego, 1987; Prionace glauca (Linnaeus, 1758) with Molicola horridus (Goodsir, 1841) Dollfus, 1942. Details of internal morphology and/or scolex and/or proglottids surface ultrastructure, that expanded the description of M. horridus, through observations with lightfield, and/or scanning electronic microscopy, are provided. The known geographical distribution for the species M. horridus is enlarged. P. dollfusi is reported for the first time in elasmobranchs.*

Key words: Trypanorhyncha/Obothrioidea - taxonomic reports - elasmobranchs - Brazil

This investigation reports a taxonomic study of obothrioid trypanorhynch cestodes parasitizing elasmobranchs, with discussion of the species, based on metacestodes (plerocerci) and adults, collected during two trips to the coast of the states of Paraná and Santa Catarina, South of Brazil.

During the three last decades in Brazil, most reports of specimens of this superfamily have been in teleost fishes (Carvajal & Rego 1983, São Clemente 1986a,b, 1987, Rego 1987, São Clemente et al. 1991, 1993, 1995, 1997, Pereira Jr 1993, 1998, Palm 1997, Alves & Luque 1999, 2000, 2001a,b) with only one report from elasmobranchs (Rego et al. 1974).

*Progrillotia dollfusi* Carvajal & Rego, 1987 was found parasitizing *Heptranchias perlo* (Bonnaterre, 1788), *Squalus* sp. and *Carcharhinus signatus* (Poey, 1868) off the coast of states of Paraná and Santa Catarina. It was described from *Cynoscion striatus* (Cuvier, 1829) in the state of Rio de Janeiro and also was reported in other sciaenids from the state of Rio Grande do Sul (Rego 1987, Pereira Jr 1998).

*Molicola horridus* (Goodsir, 1841) Dollfus, 1935, collected from the spiral valve of *Prionace glauca* (Linnaeus, 1758) from the state of Santa Catarina, had already been reported from teleosts, mainly in the liver and muscles of *Mola mola* (Linnaeus, 1758), in France, the Mediterra-

nean region, Canada, Japan, New Zealand, and India and also from the musculature of *Thyrssites* sp. from Holland (Dollfus 1942, Bates 1990). In elasmobranchs, this species was reported from the spiral valve of *Isurus oxyrinchus* Rafinesque, 1810 in Japan and south California, US (Iwata 1939, Heinz & Dailey 1974).

### MATERIALS AND METHODS

In March 1998, 30 elasmobranchs, 7 specimens (6 females and 1 male) of *Heptranchias perlo*, 87-107.4 cm in total length (tl), 16 specimens (10 females and 6 males) of *Squalus* sp., 41-67 cm (tl) and 7 specimens (1 female and 6 males) of *Carcharhinus signatus*, 120-150 cm (tl) were captured about 125 miles off the coast of the state of Paraná (25°50'S-25°52'S, 45°23'W-45°25'W; 200-500 m in depth), by professional fishermen of the Icanhema VI fish boat, and in March 1999, more 30 elasmobranchs, 18 females, and 12 males, of *Prionace glauca*, 206-287 cm (tl), were captured about 190 miles off the coast of the state of Santa Catarina (27°08'S-28°38'S, 45°30'W-46°53'W; ~25-50 m) by professional fishermen of the Kiyomã tuna fish boat. On board, stomachs and spiral valves, were collected, labelled and cooled on ice prior to examination. Cestodes were recovered, fixed, stained and mounted according to the technique of Amato et al. (1991). Taxonomic classification is in accordance with Campbell and Beveridge (1994). Measurements and terminology follow Dollfus (1942) and Campbell and Beveridge (1994). Measurements are in millimeters (mm) unless otherwise indicated. In the taxonomic summaries, the total number of parasitized specimens and the infrapopulation of each host are indicated. NH refers to new host and NGD to new geographical distribution; drawings were made with the aid of a drawing tube connected to a lightfield Olympus BH-2 microscope (LM). One specimen of *M. horridus* was observed under

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a variable pressure scanning electron microscope (VPSEM) – LEO 435; following this procedure, the same sample was routinely prepared and examined under a scanning electron microscope (SEM) – JEOL. Representative specimens were deposited in the Coleção Helminológica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil; samples for comparison were also obtained from the CHIOC and from the Musée National d’Histoire Naturelle, Paris (MNHN). At least one host specimen of each investigated fish species was deposited as syntypes *sensu* Brooks (1993) in the collection of the Instituto de Pesca, Santos, SP, Brazil and listed by Knoff et al. (2001a,b).

## RESULTS

Otobothrioidea Dollfus, 1942

Grillotiidae Pintner, 1969

*Progrillotia* Dollfus, 1946

*Progrillotia dollfusi* Carvajal & Rego, 1983

*Hosts/site of infection:* four specimens from the stomach of one male of *Carcharhinus signatus* (NH), one specimen from the spiral valve of one female of *Heptranchias perlo* (NH) and one specimen from the spiral valve of one female of *Squalus* sp. (NH).

*Locality:* coast of the state of Paraná.

*Specimens deposited:* CHIOC 34505 a-b and 34506-7.

*Material examined:* *P. dollfusi*. Plerocerci from *Cynoscion striatus* (Cuvier, 1829), Rio de Janeiro, Brazil [CHIOC 32018 a (type) – d] and from *C. guatucupa* (Cuvier, 1830), *C. jamaicensis* (Vaillant & Bocourt, 1883), *Macrodon ancylodon* (Bloch & Schneider, 1801), *Ctenosciaena gracilicirrus* (Metzelaar, 1919), *Umbrina canosai* Berg, 1895, *Menticirrus americanus* (Linnaeus, 1758), *M. littoralis* (Holbrook, 1855), *Paralanchurus brasiliensis* (Steindachner, 1875), *Micropogonias furnieri* (Desmarest, 1823), Rio Grande do Sul, Brazil (CHIOC 33725-33735). *Trypanorhyncha* sp. (= *P. dollfusi*). Plerocerci from *C. striatus*, Rio de Janeiro, Brazil (CHIOC 29116 and 31044 (alcohol)).

*Remarks:* the six metacestodes studied agreed with the description of *P. dollfusi* (Carvajal & Rego 1983) and the redescription of Pereira Jr (1998), when this species was reported parasitizing sciaenid hosts in the littoral of the states of Rio de Janeiro and Rio Grande do Sul, respectively.

The presence of this cestode species in *C. signatus*, *H. perlo*, and *Squalus* sp. represents new host records and the first reference in elasmobranchs.

Molicolidae Beveridge & Campbell, 1989

*Molicola* Dollfus, 1935

*Molicola horridus* (Goodsir, 1841) Dollfus, 1942

(Figs 1-12)

Description based on two adults, one whole mounted and measured and one observed under VPSEM and SEM. Scolex elongate, cylindrical, acraspedote, 4.38 long, 0.70 wide. Maximum width 0.70 either at the bothridial portion or at the pars bulbosa. Pars bothridialis with four auriculate elongate bothridia, curved and inclined apically, rims thickened, with rounded edges, in two separate pairs on

opposite faces of the scolex, each pair united by velum, posterior and lateral edges free, merged with scolex anteriorly, with their concave faces side by side, 1.4 long by 0.70 wide. Pars vaginalis 2.88 long. Pars bulbosa 1.11 long, 0.44 wide, retractor muscles originating in the anterior half of bulb. Bulbs longer than wider, 1.04 long, 0.22-0.24 wide. Prebulbar organs absent. Pars postbulbosa 0.70 long. Tentacular orifices on the anterior surface of the bothridial rims. Tentacles partially extroverted up to 3.70 including a proximal unarmed region. Proximal region cylindrical, with a plicate appearance, unarmed, 0.60-1.10 long, 0.12 wide. Distinctive basal armature 0.16-0.18 wide, with a corona of long falciform hooks with rounded extremities. The corona of the long falciform hooks around the base of the tentacles has a pattern of distribution in a glide reflection symmetry consisting in half-spiral rows of hooks, ascending from the internal to the external face. Hooks of the corona are hollow (LM) and porous (SEM). Tentacles one and two have one great central hook (1C) and six hooks in each half-spiral row: 2(2'), 3(3'), 4(4'), 5(5'), 6(6') and 7(7'). Tentacles three and four, have 7 hooks in each half-spiral row: 1(1'), 2(2'), 3(3'), 4(4'), 5(5'), 6(6') and 7(7'). The hooks 1C / 1(1'), 2(2'), 3(3'), 4(4'), are large and the hook 2(2') is the largest; 5(5') is median; 6(6') and 7(7') are the smallest. The hooks 1C (central, on the tentacles 1 and 2) and 1(1') (on the tentacles three and four) 0.100 x 0.032 to 0.120 x 0.040 (length x base), 2(2') 0.140 x 0.048 to 0.160 x 0.056, 3(3') 0.088 x 0.036 to 0.108 x 0.040, 4(4') 0.108 x 0.040 to 0.128 x 0.052, 5(5') 0.068 x 0.020 to 0.084 x 0.028, 6(6') 0.020 x 0.004 to 0.028 x 0.006, 7(7') 0.016 x 0.002 to 0.020 x 0.004. Metabasal armature heteromorphous, hooks hollow, consisting in half-spiral rows of hooks, ascending, from the internal to the external face, longest hooks at the middle of the row, with 10 hooks each, separated by a band of small hooks on the middle of the external face. Hooks 1(1') robust, unciform, with wide bases, internal face, 0.024-0.080 by 0.012-0.064 (length x base), hooks 2(2') with narrower bases, 0.028-0.084 x 0.016-0.048, hooks 3(3'), falciform, 0.032-0.092 l x 0.024-0.032, hooks 4(4') 0.028-0.100 x 0.016-0.040, hooks 5(5') 0.032-0.100 x 0.016-0.028, hooks 6(6') 0.036-0.088 x 0.012-0.028. From this region distally, the hooks become straighter, spiniform, diminishing in length; hooks 7(7') are 0.032-0.068 x 0.012-0.024, hooks 8(8') 0.032-0.056 x 0.008-0.016, hooks 9(9') 0.028-0.040 x 0.008-0.016, hooks 10(10') 0.028-0.032 x 0.008-0.012. There is a band of small spiniform hooks in the middle of the external face, disposed obliquely, in sets of three rows of four elements each, one behind the other, with an inclination of about 45°, opposite, alternate, forming continuous longitudinal bands from the basal portion of the tentacle to the tip. Initially, these hooks are smaller and gradually increase in length towards the tip and are 0.018-0.020 long and 0.004-0.006 wide. The first elements of the band of small hooks, aligned to the 1st and the 2nd principal rows of hooks, almost merging with the principal rows, are 0.012-0.040 x 0.004-0.012. Strobila, hyperapolytic, about 6 cm long. Proglottids acraspedote, initially wider than longer. Genital pores, pre-equatorial, marginal and irregularly alternate, surrounded by papillae. Mature proglottids wider than longer, 1.48-1.84 long, 2.74-2.90 wide. Gravid proglottids 1.24-2.56 long, 2.50-3.14 wide. Internal struc-

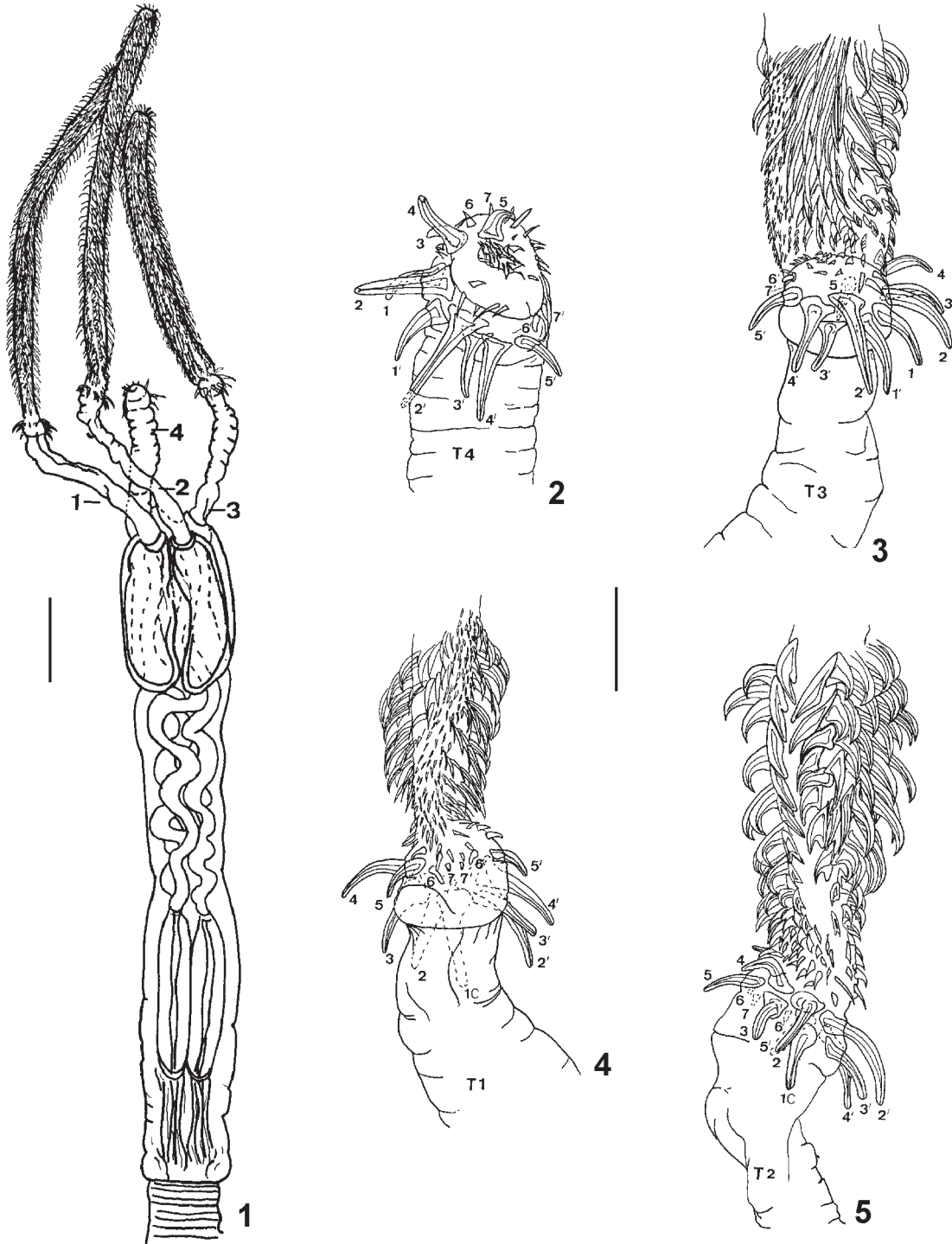
tures inconspicuous. By SEM, papillae around the genital pore were observed. Eggs not collapsed 0.040-0.056 long, 0.028-0.036 wide.

*Host/site of infection*: two specimens from spiral valve of one female of *Prionace glauca* (NH; NGD).

*Locality*: coast of the state of Santa Catarina.

*Specimens deposited*: CHIOC 34508 a-b.

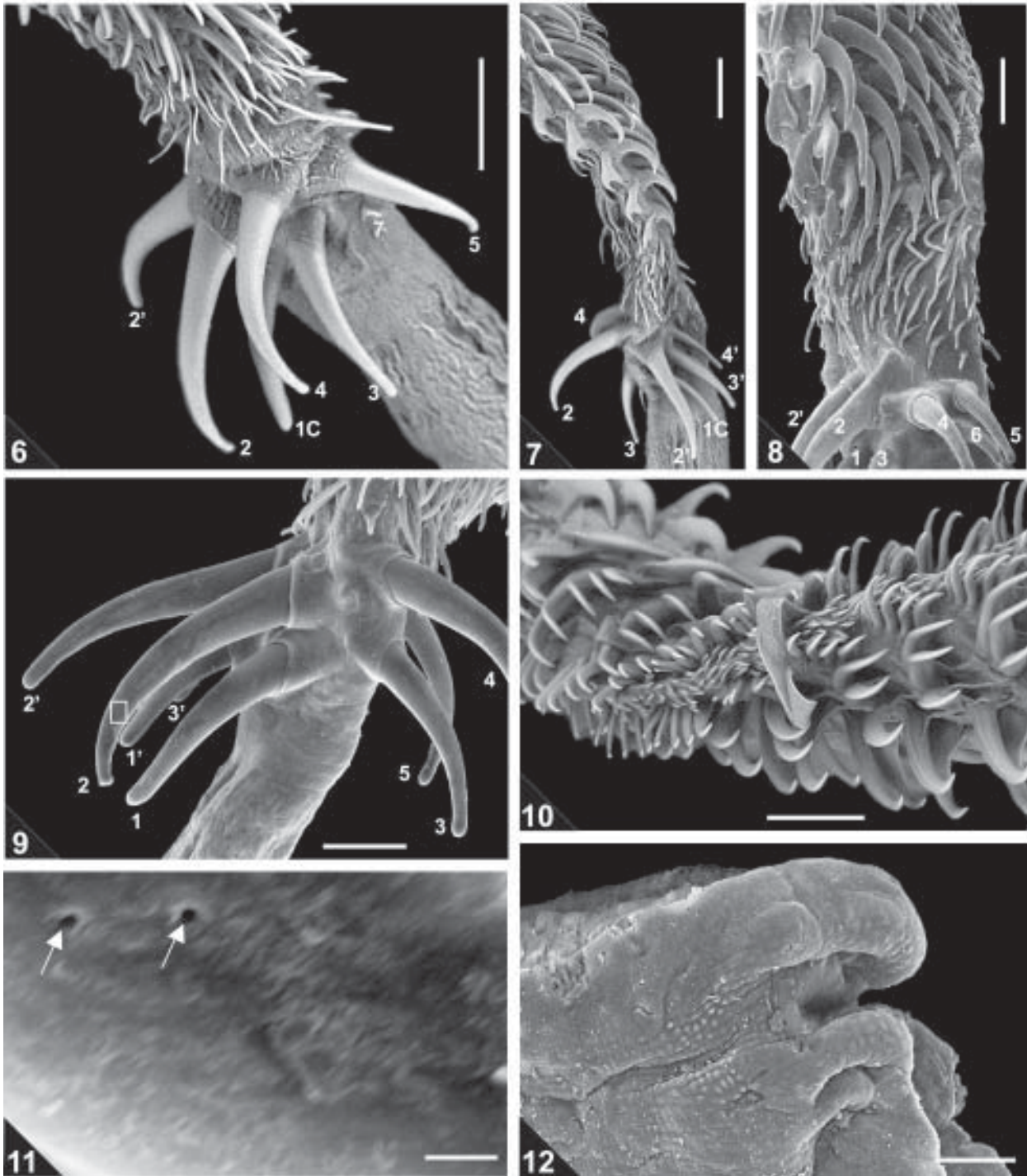
*Material examined*: plerocerci. From *Orthogoriscus mola* (Linnaeus, 1758) (= *Mola mola*), Concarneau, France (MNHN bocal C85).



*Molicola horridus*. Fig. 1: scolex. Fig. 2: tentacle 4, basal, corona of long hooks, with hooks 1 and 1', internal face on the left. Fig. 3: tentacle 3, basal, corona of long hooks, with hooks 1 and 1'. Metabasal, half-spiral of principal rows, internal face on the right, and band of small hooks, external face. Fig. 4: tentacle 1, basal, corona of long hooks, with hook 1 central (1C). Metabasal, band of small hooks, external face. Fig. 5: tentacle 2, basal, corona of long hooks, with central hook 1 (1C). Metabasal, half-spiral of principal rows, internal face. Bars - Fig. 1 = 0.5 mm; Figs 2-5 = 0.125 mm

*Remarks:* the two specimens studied accord with the description and drawings of *Gymnorhynchus (Molicola) horridus* (Goodsir, 1841) Dollfus, 1935 (= *Molicola horridus*), found parasitizing *M. mola* from several

Mediterranean regions, European, and African Atlantic coasts (Dollfus 1942). The observation of the basal armature, the corona of the long falciform hooks with rounded extremities, posterior to the unarmed basis under LM,



*Molicola horridus*, SEM\* and Variable Pressure SEM. Fig. 6: tentacle 1, basal, corona of long hooks, with central hook 1(1C), antitrochanteral face. Fig. 7: tentacle 2, basal, corona of long hooks, with central hook 1(1C). Metabasal, half-spiral of principal rows, bothridial face. Fig. 8\*: tentacle 4, basal, corona of long hooks, with hooks 1 and 1', internal face upper portion. Metabasal, half-spiral of principal rows, internal face upper portion. Fig. 9\*: tentacle 3, basal, corona of long hooks, with hooks 1 and 1', internal face on the left. Rectangle indicates the portion of Fig. 11. Fig. 10: metabasal, band of small hooks on the external face. Fig. 11\*: detail of pores from one hook of the corona (arrows). Fig. 12\*: detail of papillae around the genital pore, latero-ventral view. Bars - Figs 6,7-10 = 80 µm; Figs 8-9 = 50 µm; Fig. 11 = 2 µm; Fig. 12 = 100 µm

VPSEM, and SEM, permitted the establishment of the distribution pattern of these hooks around the tentacle. On the basis of the illustrations of this species after Dollfus (1942) only the basal corona of one of the tentacles can be observed, with hook one central, four long hooks and two smaller in a half-turn, what is equivalent to the pattern of the tentacles one and two observed in the Brazilian specimens. The description of these long basal hooks by Dollfus (1942) is general: "...vient ensuite une région portant de très longs crochets, beaucoup plus longs que ceux implantés antérieurement. Ces longs crochets, généralement au nombre de 9, ne sont pas tous de même longueur et sont accompagnés de quelques-uns (2 ou 3) beaucoup plus petits. Ces longs crochets ont une forme peu arquée et leur pointe n'est pas aiguë; ils s'insèrent sur les faces bothridiale et antibothridiale et sur le côté interne de la trompe (fig. 291); il n'y en a pas du côté externe (fig. 292)..."; at the bottom of the page the author comments about the difference in the number of these hooks after previous data.

Under VPSEM and SEM the pattern of distribution of the hooks in the basal corona, the presence of pores in these hooks and papillae around the genital pore are added to the original description.

The finding of the species in *P. glauca* represents a new host record and its first occurrence in Brazil.

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