

# NEW RECORDS AND EXPANDED DESCRIPTIONS OF *Tentacularia coryphaenae* AND *Hepatoxylon trichiuri* HOMEACANTH TRYPANORHYNCHS (EUCESTODA) FROM CARCHARHINID SHARKS FROM THE STATE OF SANTA CATARINA OFF-SHORE , BRAZIL

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**ABSTRACT:**- KNOFF, M.; SÃO CLEMENTE, S.C. DE.; PINTO, R.M.; LANFREDI, R.M.; GOMES, D.C. **New records and expanded descriptions of *Tentacularia coryphaenae* and *Hepatoxylon trichiuri* homeacanth trypanorhynchs (Eucestoda) from carcharhinid sharks from the State of Santa Catarina off-shore, Brazil.** [Novos registros e descrições expandidas de *Tentacularia coryphaenae* e *Hepatoxylon trichiuri* espécies de Trypanorhyncha Homeacanthoidea (Eucestoda) de tubarões Carcharhinidae da costa do Estado de Santa Catarina, Brasil.] *Revista Brasileira de Parasitologia Veterinária*, v. 13, n. 2, p. 73-80, 2004. Laboratório de Helmintos Parasitos de Vertebrados, Departamento de Helminologia, Instituto Oswaldo Cruz. Avenida Brasil 4365, Rio de Janeiro, RJ 21045-900, Brazil. E-mail: knoffm@ioc.fiocruz.br

Specimens of carcharhinid sharks, captured in 1999 in the State of Santa Catarina, Brazil, were parasitized with homeacanth trypanorhynchs: *Prionace glauca* (Linnaeus, 1758) with *Tentacularia coryphaenae* Bosc, 1802 and *Hepatoxylon trichiuri* (Holten, 1802) Bosc, 1811; *Carcharhinus longimanus* (Poey, 1861) and *C. obscurus* (Lesueur, 1818) with *T. coryphaenae*. Further details of internal morphology and/or of scolex and/or segment surface ultrastructure, that expand their descriptions, by using brightfield and scanning electronic microscopy, are provided.

**KEY-WORDS:** Eucestoda, Trypanorhyncha, Homeacanthoidea, Carcharhinidae, Brazil.

## RESUMO

Espécimes de tubarões Carcharhinidae, capturados em 1999 no Estado de Santa Catarina, Brasil, estavam parasitados com espécies de Trypanorhyncha Homeacanthoidea: *Prionace glauca* (Linnaeus, 1758) com *Tentacularia coryphaenae* Bosc, 1802 e *Hepatoxylon trichiuri* (Holten, 1802) Bosc, 1811; *Carcharhinus longimanus* (Poey, 1861) e *C. obscurus* (Lesueur, 1818) com *T. coryphaenae*. Detalhes adicionais da morfologia interna e/ou da ultraestrutura do escólex e/ou da proglótide, que melhoram suas descrições, usando microscópio de campo claro e eletrônico de varredura, são fornecidos.

**PALAVRAS-CHAVE:** Eucestoda, Trypanorhyncha, Homeacanthoidea, Carcharhinidae, Brasil.

## INTRODUCTION

Between March 1998 and March 1999, during a parasitological survey from 90 elasmobranch fishes of the Southern coast off Brazil, numerous specimens of parasites were collected. Several taxonomic and parasitological indexes of their parasites have been published: Knoff et al. (2001a) on nematodes, Knoff et al. (2001b) on digeneans and acanthocephalans, Knoff et al. (2002) on prevalences and intensities of infections of trypanorhynch cestodes, Knoff et al. (2004) on Obothrioidea trypanorhynch cestodes. The present paper continues the study of the taxonomic approaches related to Homeacanthoidea (Eucestoda, Trypanorhyncha) recovered from Carcharhinidae elasmobranchs.

*Tentacularia coryphaenae* Bosc, 1802 was found parasitizing in the spiral valve of *Prionace glauca* (Linnaeus, 1758), *Carcharhinus longimanus* (Poey, 1861) and *C. obscurus* (Lesueur, 1818). The species has a wide geographical distribution, occurring in teleost and elasmobranch fishes and cephalopods from several localities (DOLLFUS, 1942; LESTER et al., 1985; BATES, 1990; BEVERIDGE; CAMPBELL, 1996; PALM, 2000; COSTA et al., 2003).

Reports of *T. coryphaenae* in Brazil refer to the species in teleost hosts. According to Dollfus (1942), Rudolphi (1819)

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recovered encapsulated and free specimens of *T. coryphaenae* from the body cavity of *Coryphaena equisilis* Linnaeus, 1758; Amato et al. (1990) registered the presence of plerocercoids in *Katsuwonus pelamis* (Linnaeus, 1758); Silva and São Clemente (2001) found this species in the musculature of *C. hippurus* Linnaeus, 1758.

*Hepatoxylon trichiuri* (Holten, 1802) Bosc, 1811, recovered from the liver of *Prionace glauca* (Linnaeus, 1758), the most prevailing host among several elasmobranchs, is widely distributed and was also found in a cephalopod species (DOLLFUS, 1942; BATES, 1990; SIN et al., 1992; BEVERIDGE; CAMPBELL, 1996; CAMPBELL; CALLAHAN, 1998). The few reports of *H. trichiuri* in Brazil mostly refer to the occurrence of the species in the liver, stomach and intestine of the teleost *C. hippurus* (RUDOLPHI, 1819; PINTNER, 1930; SÃO CLEMENTE et al., 2001) except for the record of the parasite in the liver of *P. glauca* (SÃO CLEMENTE et al., 2001).

### MATERIALS AND METHODS

In March 1999, 33 elasmobranchs, 30 specimens (12 males, 18 females) of *P. glauca*, 206-287 cm of total length-tl, 2 specimens (1 male, 1 female) of *C. longimanus*, 170-209 cm tl and one male specimen of *C. obscurus*, 247 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), 25m in depth, by professional fishermen of the Kiyomã tuna fishing vessel. On board, stomachs, spiral valves and samples of livers (with plerocercoids) were collected, labelled and preserved on ice before examination. Cestodes were recovered, fixed, stained and mounted in accordance with the technique of Amato et al. (1991). Taxonomic classification follows Campbell and Beveridge (1994). Full synonymies for the species are given in Dollfus (1942). Measurements and terminology follow Dollfus (1942) and Campbell and Beveridge (1994). Measurements are in millimeters (mm) unless otherwise indicated; means are followed by the variation range in parenthesis. In the taxonomic summaries, the total number of parasitized specimens and the infrapopulation of each host was indicated. Drawings were made with the aid of a drawing tube connected to a brightfield Olympus BH-2 microscope. Some specimens were observed under a Variable Pressure Scanning Electron Microscope (VPSEM) – LEO 435; other samples were routinely prepared and were analyzed under a Scanning Electron Microscope (SEM) – JEOL. Voucher specimens were deposited in the Coleção Helminológica do Instituto Oswaldo Cruz, Rio de Janeiro, Brazil (CHIOC); voucher specimens for comparison were also obtained from the CHIOC and from the Collection d'Helminthes, Muséum National d'Histoire Naturelle, Paris, France (MNHN). At least one host specimen of each investigated fish species was deposited as symbiotypes *sensu* Brooks (1993), in the collection of the Instituto de Pesca, Santos, SP, Brazil and listed by Knoff et al. (2001 b).

### RESULTS

Tentaculariidae Poche, 1926

*Tentacularia* Bosc, 1797

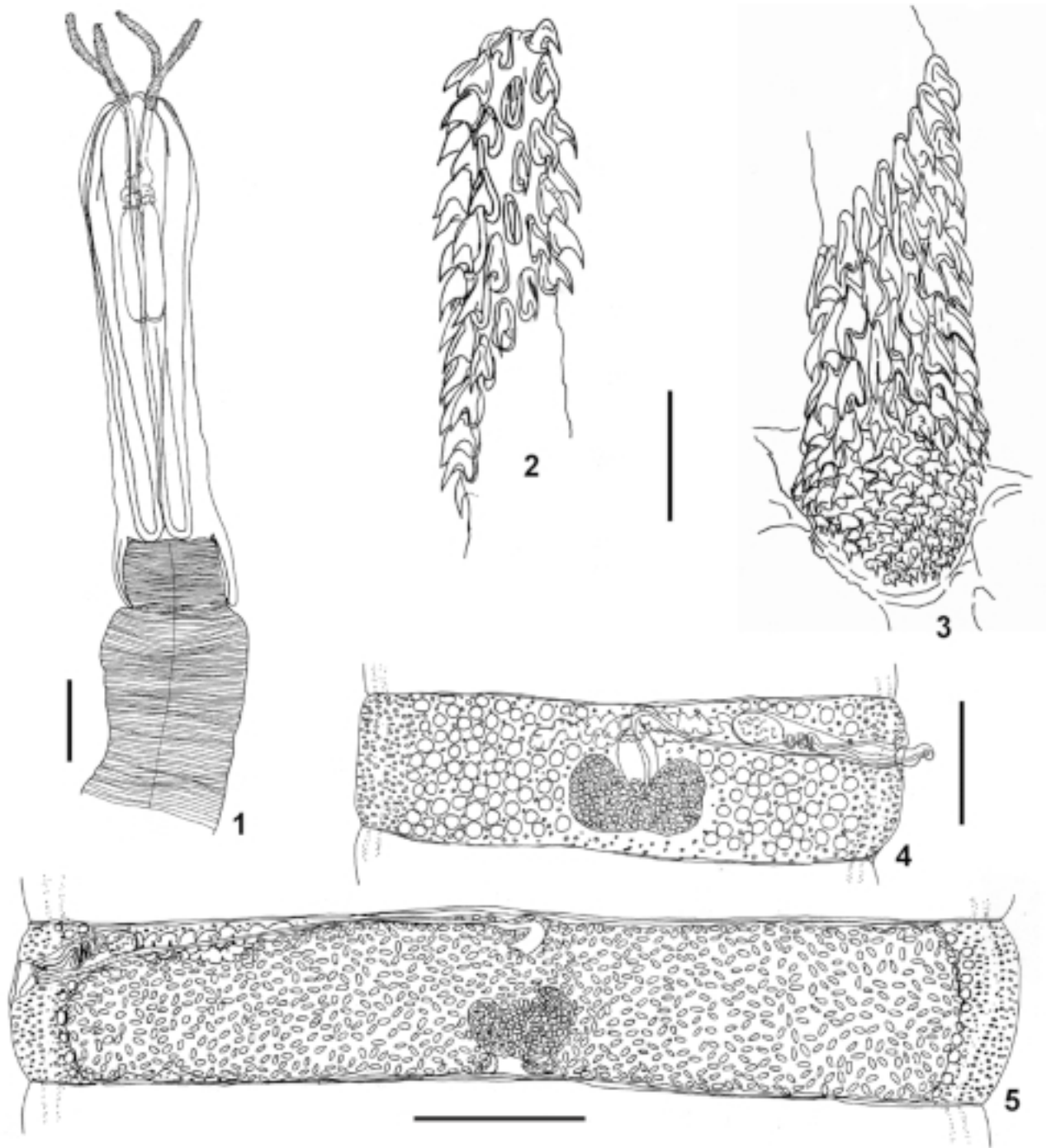
*Tentacularia coryphaenae* Bosc, 1802

(Figs. 1-9)

Description based on 22 adults, 10 mounted and measured (5 from *P. glauca*, 5 from *C. obscurus*), 6 observed under SEM (2 from *P. glauca*, 2 from *C. obscurus*, 2 from *C. longimanus*), 6 observed under VPSEM (2 from *P. glauca*, 3 from *C. obscurus*, 1 from *C. longimanus*), uncompressed. Specimens from *P. glauca*: Scolex 5.17 (4.16-6.00) long, including velum, 1.02 (0.80-1.20) wide. Pars bothridialis 4.36 (3.41-4.86) long, 0.85 (0.70-1.00) wide. Pars vaginalis 0.86 long. Pars bulbosa 1.08 long, 0.40 wide. Individual bulbs 1.025 (1.00-1.04) long, 0.165 (0.16-0.18) wide. Pars postbulbosa and velum well developed. Velum 0.84 (0.66-1.06) long. Width of tentacles, without hooks: basal region, 0.069 (0.060-0.076); metabasal region, 0.044 (0.036-0.056). Tentacular armature at basal region with pattern of bilateral symmetry, with ascending rows of hooks, where identical bothridial and antbothridial surfaces present V pattern; external and internal surfaces also identical with pattern of inverted unarmed V. Hooks at basal region trident-like, 0.012 (0.008-0.014) long, base 0.010 (0.006-0.012) wide. Metabasal armature, with rotational symmetry and quincunxial arrangement. Metabasal hooks uncinatae 0.032 (0.028-0.034) long, base 0.024 (0.020-0.028) wide. Nine to ten hooks/row; hooks with same shape on both surfaces of tentacles. Strobila: anapolytic, maximum length 23, with segments wider than longer. Mature segments acraspedote, 0.109 (0.080-0.136) long, 1.408 (1.144-1.936) wide. Genital pores irregularly alternate, pre-equatorial, laterally located. Cirrus pouch 0.180 (0.160-0.216) long, 0.061 (0.054-0.072) wide. Internal seminal vesicle 0.062 (0.048-0.080) long, 0.042 (0.032-0.056) wide. Testes numerous, rounded; in mature segments testes are 0.044 (0.036-0.052) in diameter. Ovary 0.048 (0.040-0.056) long, 0.116 (0.112-0.120) wide, located in posterior portion of segment. Uterus egg-shaped, reaching anterior extremity of segment. Eggs 0.025 (0.021-0.029) long, 0.020 (0.017-0.021).

Specimens from *C. obscurus*: Scolex 5.76 (3.56-7.12) long, larger width 0.92 (0.84-1.10). Pars bothridialis 4.96 (3.14-6.24) long, 0.76 (0.60-0.92) wide. Pars vaginalis 0.76 (0.74-0.80) long. Pars bulbosa 0.94 (0.84-1.00) long, 0.32 (0.28-0.32) wide. Individual bulbs 0.87 (0.80-0.96) long, 0.14 (0.10-0.20) wide. Pars postbulbosa well developed. Velum 0.76 (0.47-0.92) long. Width of tentacles, without hooks: basal region 0.073 (0.064-0.092); metabasal region, 0.047 (0.040-0.056). Hooks of basal region 0.013 (0.004-0.016) long, base 0.006 (0.002-0.010) wide. Metabasal region 0.029 (0.020-0.034) long, base 0.022 (0.014-0.028) wide. Nine to ten hooks/row. Strobila: maximum length 14. Testes in mature segments, 0.038 (0.028-0.048) in diameter.

The surface ultrastructure of *T. coryphaenae* revealed tegumentary structures such as porosities and filiform microtriches on the scolex, the latter refringent under VPSEM.



Figuras 1-5. *Tentacularia coryphaenae* from *Prionace glauca*. 1 Scolex. 2 Tentacle, metabasal region, bothridial surface. 3 Tentacle, basal region, bothridial surface. 4 Mature segment, ventral view. 5 Gravid segment, ventral view. Bars of **figs.** 1 = 0.5 mm; 2 and 3 = 0.05 mm; 4 and 5 = 0.25 mm

Hook-like microtriches were also found along the bothridiae margins. These microtriches were more conspicuous in the distal portion, mainly in relaxed specimens.

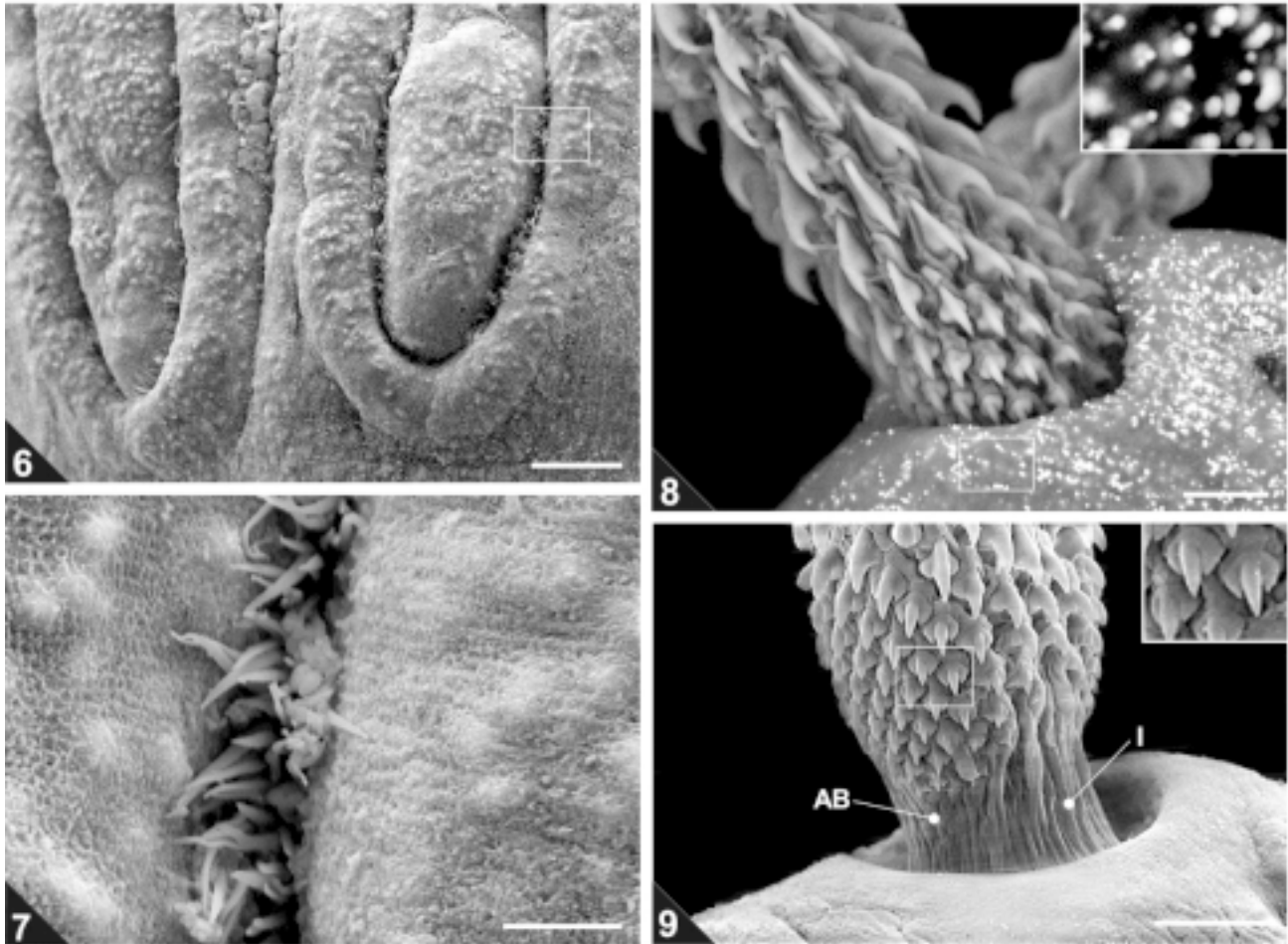
Host/site of infection: 26 specimens from the spiral valve: 8 (2; 2; 1; 3) from 4 males and 1 from one female of *P. glauca*, 5 specimens from one female of *C. longimanus* and 12 specimens from one female of *C. obscurus*.

Locality: littoral of the State of Santa Catarina, Brazil.

Specimens deposited: CHIOC no. 34393 a-c, 34394, 34395 and 34396.

Material examined: Adults, from *C. longimanus*, Recife, Pernambuco, Brazil (CHIOC no. 31431 a-c); plerocercoid, from *Polydactylus opercularis* (Gill, 1863), Panama Bay, Panama (MNHN no. BD19 bis).

Remarks: The present results are in accordance with the description of Dollfus (1930; 1942), Bilqeas and Khurshid (1988)



Figuras 6-9. *Tentacularia coryphaenae* from *Prionace glauca*, SEM\* and VPSEM. **6** Bothridial region distal, showing hook-like microtriches along the bothridial margins. Rectangle indicates region from which **fig. 7** was obtained. **7** Hook-like microtriches along the bothridial margins. **8** Scolex surface region near the tentacle, with filiform microtriches, rectangle indicates in detail the region. **9\*** Tentacle, basal region, internal surface (I) showing unarmed L-shaped area at base, and antiothridial surface (AB) showing ascending rows of hooks V-shaped area at base, rectangle indicates in detail the trident-like hooks. Bars of **figs. 6** and **8** = 60  $\mu$ m; **7** = 9  $\mu$ m; **9** = 90  $\mu$ m.

and Palm (1995; 2000); it is well known that specimens of *T. coryphaenae* present a remarkable variation in size, either those recovered from different hosts or those from a population in the same host species. The symmetry pattern of hooks of basal (bilateral) and metabasal (rotational in quincunx) regions of the tentacle is in agreement with the patterns established by Beveridge and Campbell (1996); also, the trident-like morphology of basal hooks is in accordance with that observed by Dollfus (1930) and by Palm (2000). This is the first record of adults of *T. coryphaenae* occurring in *C. obscurus* in Brazil.

Hepatoxylidae Dollfus, 1940

Hepatoxylon *Bosc, 1811*

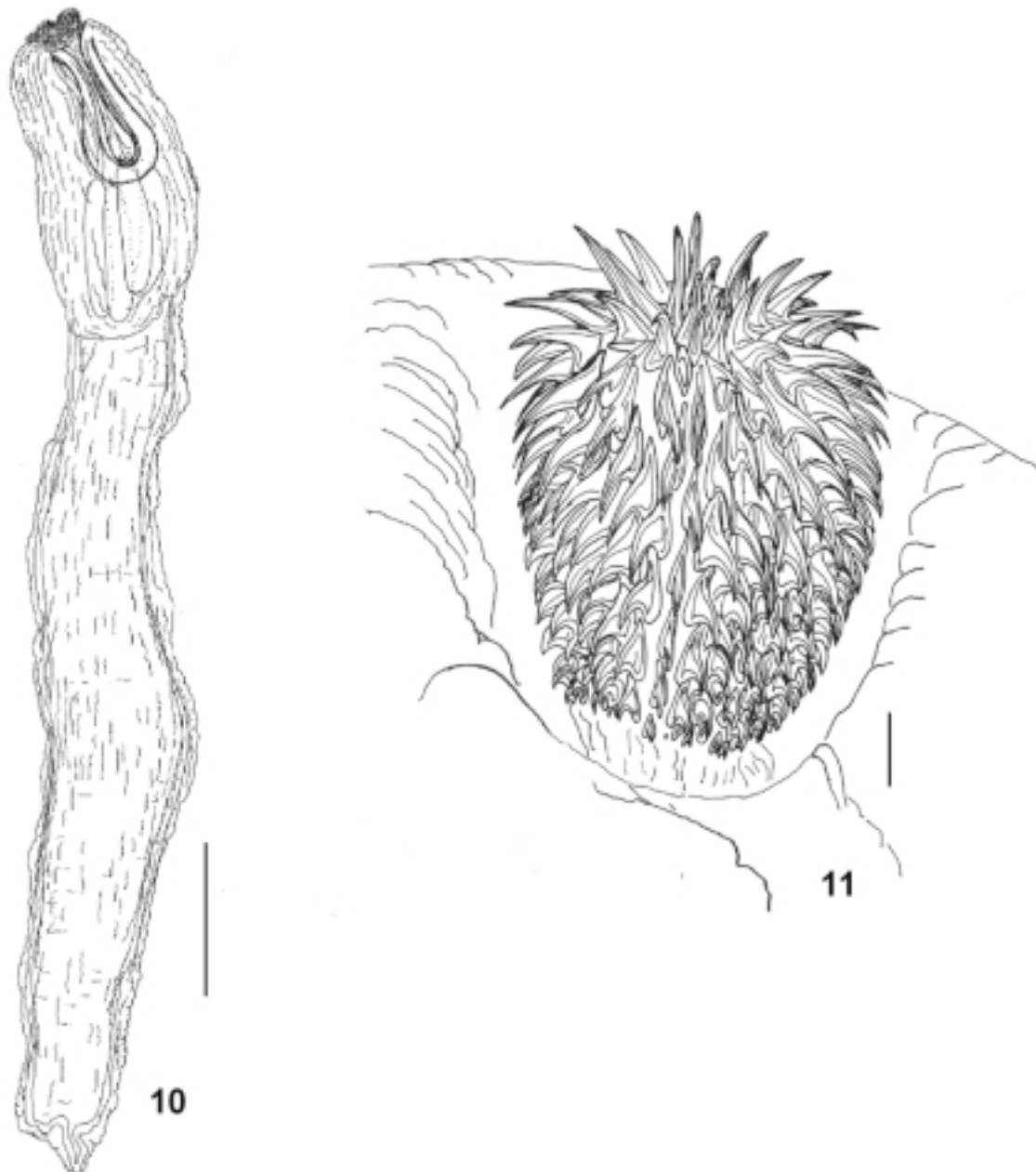
*Hepatoxylon trichiuri* (Holten, 1802) Dollfus, 1942

(Figs. 10-16)

Description based on 14 plerocercoids, 10 mounted and measured, two examined under VPSEM and two under SEM, uncompressed. Body 6.0 cm long, 0.7 cm wide, including the

appendix. Scolex 11.18 (8.56-12.40) long, 4.61 (3.62-4.94) wide, not including the appendix. Two bothridia, transversal to scolex, with long lateral borders. Pars bothridialis (pbo) 4.69 (2.70-5.82) long, 2.71 (2.30-2.90) wide, overlapping or not the pars bulbosa. Deep bothridial cavity is longitudinally divided by a median fold that in its anterior portion forms two branches, further joining at tentacular aperture. Pars vaginalis (pv) 4.24 (3.30-5.20) long. Scolex proportion pbo < pv, pbo = pv and pbo > pv. Pars bulbosa 4.96 (3.88-5.44) long, 2.51 (2.10-2.88) wide; individual bulbs 4.40 (3.62-5.20) long, 0.79 (0.74-0.84) wide. Pars postbulbosa 1.25 (0.54-1.78) long. Appendix 29.36 (21.70-42.22) long, 4.74 (3.62-5.36) wide. Excretory pore terminal. Tentacles short, stout subglobular, 0.96 (0.77-1.11) long, 0.53 (0.50-0.57) in maximum diameter. Short naked constriction 0.133 (0.096-0.84) long, 0.358 (0.312-0.432) wide, before first rows. Tentacle of basal region, with ascending hooks arranged in bilateral symmetry, identical bothridial and antiothridial surfaces, with V pattern and internal and external surfaces also identical, with inverted V pattern, unarmed. Two types of hooks: the shorter, with basis





Figuras 10-11. *Hepatoxylon trichiuri*. **10** Scolex. **11** Tentacle, basal and metabasal regions, bothridial face. Bars of **figs. 10** = 1.0 mm; **11** = 0.125 mm.

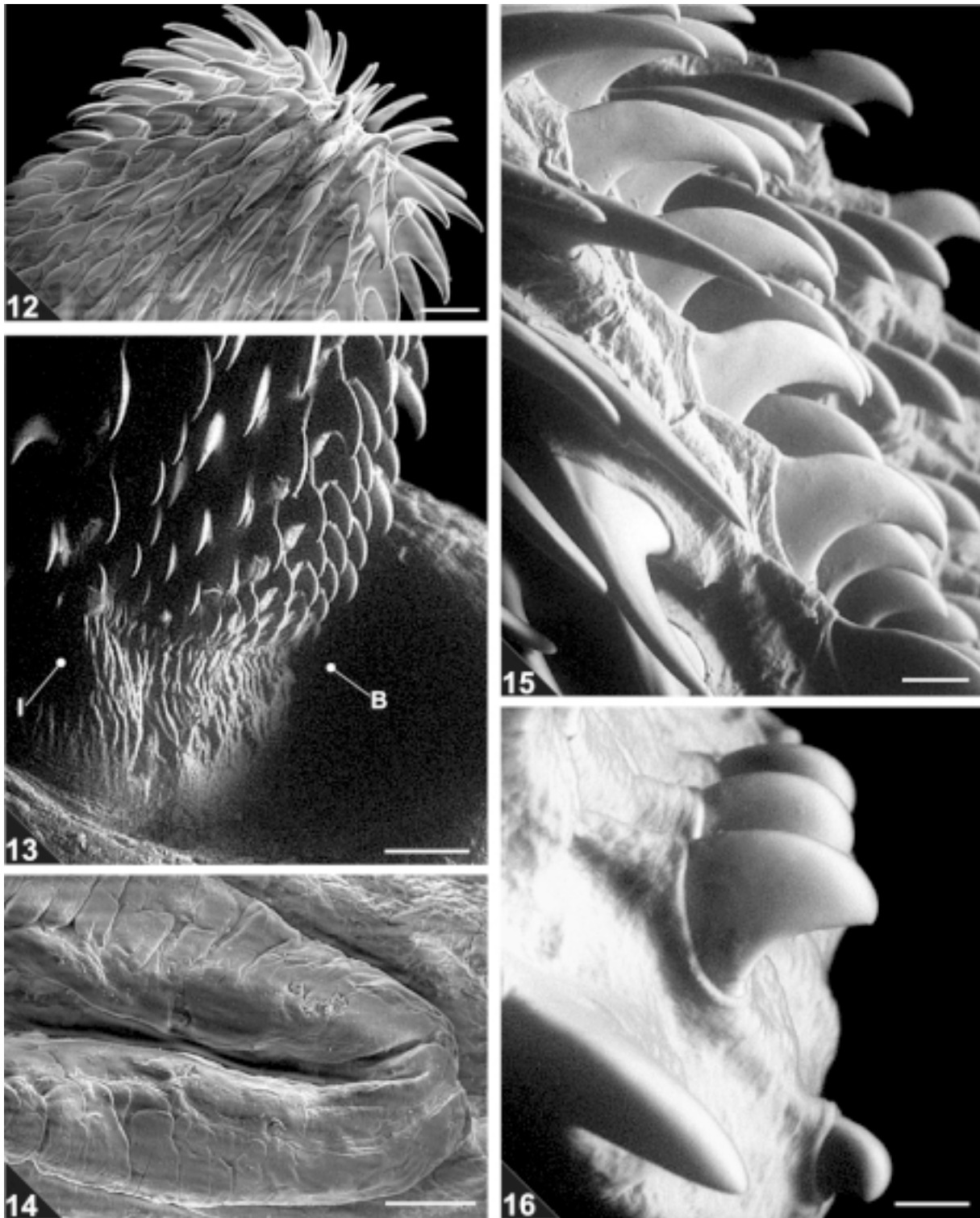
equal or larger than length, uncinuate, located in basal region, and more slender and longer hooks, with base narrower than their length, appear falciform, in metabasal region. Both types present prominent expansions of anterior and posterior base. First row the basal hooks, two types: rudimentary with blunt ends 0.032 (0.024-0.040) long, 0.035 (0.016-0.048) wide and the uncinuate, with sharp ends 0.049 (0.040-0.064) long, 0.054 (0.048-0.068) wide. Basal hooks of second and third rows increase in size 0.110 (0.080-0.0148) long, 0.116 (0.096-0.144) wide. Metabasal hooks inserted in longitudinal rows in quincunxes in 26-32 oblique rows with rotational symmetry, gradually increasing in size, 0.200-0.280 long, 0.120-0.224 wide, with longer hooks located distally. Number of hooks/row 22-24.

Host/site of infection: 17 plerocercoids in the outer surface of the liver, with tentacles penetrating the parenchyma, in *P. glauca*, 1 male with 11 parasites and 3 females with 1, 2, 3 parasites, respectively.

Locality: littoral of the State of Santa Catarina, Brazil  
Specimens deposited: CHIOC no. 34504 a-e.

Material examined: Plerocercoids from *Architeutis dux* Steenstrup, 1857, White Bay, Newfoundland, Canada (MNHN no. BD 19), from *P. glauca*, Rio Grande do Sul, Brazil (CHIOC no. 34517) and from *C. hippurus*, Rio de Janeiro, Brazil (CHIOC no. 34514).

Remarks: The data on plerocercoids collected from the liver of *P. glauca* from the littoral of Santa Catarina are in



Figuras 12-16. *Hepatoxylon trichiuri*, SEM\* and VPSEM. **12\*** Tentacle, metabasal and apical regions, quincunxial hook arrangement, bothridial surface. **13** Tentacle, basal region, bothridial surface (B) showing ascending rows of hooks V-shaped area at base, and internal face (I) showing unarmed L-shaped area at base. **14\*** Bothridial surface is smooth. **15** Detail of hooks from the beginning of metabasal armature, changing from unciform to falciform hooks, bothridial surface. **16** Detail of hooks from the beginning of basal armature, changing from rudimentary to uncinata hooks, bothridial surface. Bars of **figs. 12** = 100  $\mu$ m; **13** and **14** = 300  $\mu$ m; **16** = 40  $\mu$ m; **15** = 30  $\mu$ m.

accordance with the description of Dollfus (1942). Observation of the scolex under SEM confirms the reports by Sin et al. (1992), Campbell and Callahan (1998). SEM and VPSEM images of the pattern of the hooks in this species have been provided; the pattern is analogous to that observed for *T. coryphaenae* by Beveridge and Campbell (1996) and Dollfus (1930). This is the second record of *H. trichiuri* occurring in *P. glauca* in Brazil (SÃO CLEMENTE et al., 2001).

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