Digenea and Acanthocephala of Elasmobranch Fishes from the Southern Coast of Brazil

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New records for helminth species recovered from elasmobranch fishes in Brazil are established. Digenean and acanthocephalan parasites of elasmobranch fishes are reported from the southern coast of Brazil: Otodistomum veliporum *(Creplin, 1837) Stafford, 1904 (Digenea: Azygiidae) in the stomach and spiral valve of* Dipturus trachydermus *and in the spiral valve of* Squatina *sp. Cystacanths and juveniles of the acanthocephalans* Corynosoma australe *Johnston, 1937 and* Corynosoma *sp., in the spiral valve of* Squatina *sp.*, Galeorhinus galeus *and* Hexanchus griseus *and in the stomach of* Squalus megalops; *a juvenile of* Gorgorhynchus *sp., in the spiral valve of* Sphyrna zygaena. Dipturus trachydermus *and* Squatina sp. *are new host records for* O. veliporum. *Digeneans and acanthocephalans are reported for the first time parasitizing elasmobranch fishes in Brazil.*

Key words: Digenea - Acanthocephala - new records - elasmobranch fishes - Brazil

Helminths recovered from Brazilian elasmobranch fishes have been previously reported by Rego et al. (1974), Rego (1977), Vicente et al. (1985), São Clemente and Gomes (1989a, b, 1992), São Clemente et al. (1991), Vicente and Pinto (1999) and Knoff et al. (2001). The present study reports a digenetic trematode and three acanthocephalans parasitizing elasmobranchs, that are referred as new host records for the helminth species.

MATERIALS AND METHODS

A total of 307 elasmobranch fishes were examined. In November 1984, June 1985, and July 1986, 217 elasmobranch fishes: 6 *Notorynchus cepedianus* (Péron, 1807) (90-130 cm of total length-tl), 14 *Squalus megalops* (Macleay, 1881) (45-59 cm tl), 37 *Mustelus canis* (Mitchill, 1815) (70.5-113 cm tl), 35 *M. schmitti* Springer, 1939 (56-98 cm tl), 37 *Galeorhinus galeus* (Linnaeus, 1758) (86-146 cm tl), 7 *Carcharhinus brachyurus* (Günther, 1870) (80-108 cm tl), 16 *Sphyrna zygaena* (Linnaeus, 1758) (81-147 cm tl), 5 *S. lewini* (Linnaeus, 1758) (75-165 cm tl), 20 *Squatina guggenheim* Marini, 1936 (64-87 cm tl), 26 specimens of *Squatina* sp. (81-125 cm tl), 12 *Raja castelnaui* Miranda-Ribeiro, 1907 (70-103 cm tl), 1 *Dasyatis say* (Lesueur, 1817) (58 cm tl) and 1 *D. centroura* (Mitchill, 1815) (103 cm tl) were captured off the coast of State of Rio Grande do Sul (30°40'S-33°40'S and 50°40'W-53°20'W; 12-100 m depth) by professional fisherman of the oceanographic ship Atlântico Sul. In March 1998, 46 elasmobranch fishes: 1 *Hexanchus griseus* (Bonnaterre, 1788) (132 cm tl), 7 *Heptranchias perlo* (Bonnaterre,1788) (87-107.4 cm tl), 16 *Squalus* sp. (41-67 cm tl), 9 *Scyliorhinus haeckelii* (Miranda-Ribeiro, 1907) (41.5-54.5 cm tl), 5 *Carcharhinus signatus* (Poey, 1868) (120-150 cm tl) and 8 *Dipturus trachydermus* (Krefft & Stehmann, 1975) (133.5-176 cm tl) were captured at about 125 miles off the coast of State of Paraná (25°50'S-25°52'S and 45°23'W-45°25'W; 200-500 m depth) by professional fishermen of the Icanhema VI fish boat. In March 1999, more 44 elasmobranch fishes: 4 *Isurus oxyrhinchus* Rafinesque, 1810 (165-221cm tl), 30 *Prionace glauca* (Linnaeus, 1758) (206-287 cm tl), 2 *Carcharhinus signatus* (143-190 cm tl), 2 *C. longimanus* (Poey, 1861) (170-209 cm tl), 1 *C. obscurus* (Lesueur, 1818) (247 cm tl) and 5 *Sphyrna zygaena* (190-250 cm tl) were captured about 50 m depth, 190 miles off the coast of State of Santa Catarina (27°08'S-28°38'S and 45°30'W-46°53'W) by professional fishermen of the Kiyomã tuna fish boat. On board, their stomachs and spiral valves were collected, labelled and preserved in ice, be-

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fore examination. Parasites were collected, fixed, stained and mounted according to the methods described in Amato et al. (1991). The systematic organization of the parasites was based on Yamaguti (1971) and Brooks et al. (1985a, b) (Digenea), and on Yamaguti (1963), Golvan (1959,1969), Petrochenko (1971a, b), and Amin (1985, 1987) (Acanthocephala). The prevalence, intensity and mean intensity of infection are indicated in accordance to Bush et al. (1997). The drawings were made with a camera lucida connected to an Olympus BH-2 microscope. All measurements are in millimeters unless otherwise indicated; ranges of measurements are followed by mean values (when indicated) within parentheses. Voucher specimens are deposited in the Coleção Helmintológica do Instituto Oswaldo Cruz (CHIOC), Fiocruz, Rio de Janeiro, RJ, Brazil. At least one specimen of each host species was deposited as voucher host, simbiotype *sensu* Brooks (1993), in the Coleção Ictiológica do Instituto de Pesca, Santos, SP, Brazil: *P. glauca* no. IP1967; *I. oxyrhinchus* no. IP 1968; *S. zygaena* no. IP 1969; *C. longimanus* no. 1970; *C. obscurus* no. IP 1971, are additional specimens to those listed elsewhere (Knoff et al. 2001).

RESULTS

Data are based on specimens recovered in the present investigation and are depicted in the Tables. Taking into account that the referred species are well known, morphometrics refer to the characters considered most important to its diagnosis.

DIGENEA
Hemiuriformes Travassos et al., 1969
Azygiidae Lühe, 1909
Otodistomum veliporum (Creplin, 1837) Stafford, 1904
(Figs 1-4, Table I)

Remarks - The systematics of the genus *Otodistomum* Stafford, 1904 has been of concern to different authors. Species of this taxon have been reported since the begining of the 19th century, from various marine species of rays and sharks collected from sub-tropical, temperate, sub-Artic and sub-Antartic regions (Manter 1926, Dollfus 1937, Miller 1941, Van Cleave & Vaughn 1941, Kay 1947, Skrjabin & Guschanskaya 1958, Caballero & Caballero 1969, Yamaguti 1971, Gibson 1976a, b, Threlfall & Carvajal 1986, Zdzitowiecki & Pisano 1996).

The systematics of these digeneans parasitizing elasmobranchs was discussed by Manter (1926), Dollfus (1937), Van Cleave & Vaughn (1941) and Gibson (1976a, b) based on differences related to body dimensions, extent and form of uterine branches, extent of vitellaria, ratio between oral and ventral suckers, length and thickness of the egg. The three later authors considered two distinct species of the genus *Otodistomum* from elasmobranch hosts: *O. veliporum* (Creplin, 1937) Stafford, 1904 mainly from sharks and *O. cestoides* (Van Beneden, 1871) Stafford, 1904 mainly from rays, based on differences in the egg. Dawes (1947), Rees (1953), Skrjabin and Guschanskaya (1958) and

TABLE I
Data on *Otodistomum veliporum* collected from elasmobranch fishes (present study)

	Imature specimen	Adult specimens
Body	9.54 x 1.48	12.3 - 28.1 (17.6) x 1.8 - 3.7 (2.5)
Oral sucker	0.50 x 0.56	0.54 - 1.20 (0.79) x 0.72 - 1.20 (0.91)
Acetabulum	0.84 x 0.86	0.84 - 1.84 (1.19) x 1.14 - 1.90 (1.41)
Pharynx	0.28 x 0.30	0.24 - 0.56 (0.38) x 0.34 - 0.56 (0.42)
Testes anterior	0.23 x 0.18	0.58 - 1.10 (0.81) x 0.72 - 1.18 (0.89)
posterior	0.26 x 0.20	0.66 - 1.20 (0.85) x 0.66 - 0.98 (0.81)
Cirrus pouch	0.37 x 0.20	0.50 - 1.54 (0.79) - 0.34 - 0.58 (0.43)
Seminal vesicle	0.62 x 0.08	0.92 - 2.24 (1.41) x 0.20 - 0.34 (0.25)
Ovary	0.12 x 0.12	0.32 - 0.64 (0.42) x 0.40 - 0.84 (0.55)
Eggs	-	0.072 - 0.096 (0.084) x 0.048 - 0.060 (0.052)
Egg-shell wall	-	0.002 - 0.006
Hosts	*Squatina* sp.	*Dipturus trachydermus*
Site of infection	Spiral valve	Stomach and spiral valve
Locality	RS	PR
Prevalence (%)	3.8	12.5
Intensity of infection	1	4
Voucher CHIOC no.	34262	33980 a-d

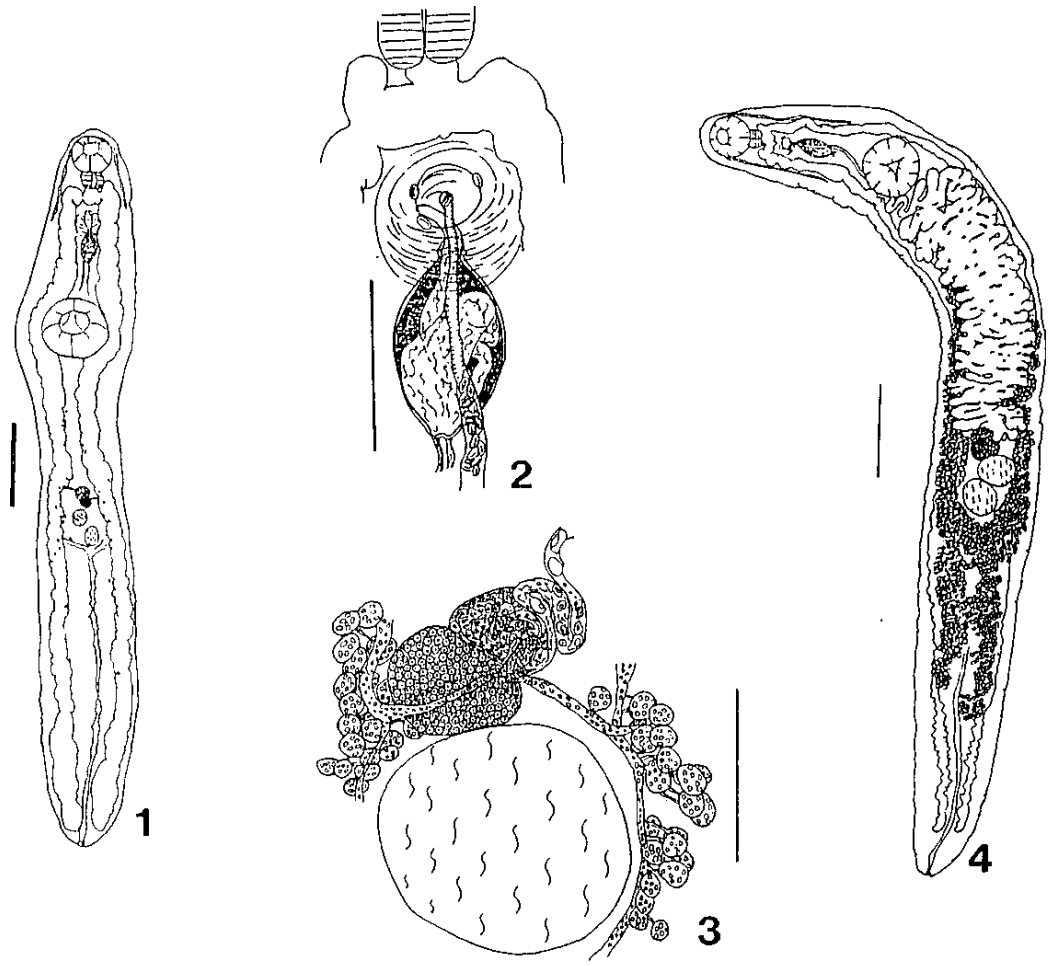
RS: Coast of the State of Rio Grande do Sul; PR: Coast of the State of Paraná; CHIOC: Coleção Helmintológica do Instituto Oswaldo Cruz; measurements in mm

Brinkmann Jr (1975) suggested that *O. cestoides* should be considered a synonym of *O. veliporum*. According to Brinkman Jr (1988) life-cycles of the parasites should be investigated to support this proposition. Nevertheless, we consider our specimens to be *O. veliporum* based on the fact that the differences now observed in both species may be related to the size of body, compressing conditions, different hosts, and egg thickness that is 2-6 µm in our specimens, compared to 6-10 µm previously reported for *O. veliporum* (Dollfus 1937, Rees 1953, Skrjabin & Guschanskaya 1958, Caballero & Caballero 1969, Yamaguti 1971); and 3-5.3 µm for *O. cestoides* (Manter 1926, Dollfus 1937, Miller 1941, Van Cleave & Vaughn 1941, Skrjabin & Guschanskaya 1958, Yamaguti 1971, Gibson 1976a, Threlfall & Carvajal 1986).

This species was reported as *O. cestoides* from *Raja* spp., *R. flavirostris* (= *Dipturus flavirostris*) and *Psammobatis scobina* in South America (Falkland Islands and Chilean Coast) by Dollfus (1937), Gibson (1976a) and Threlfall and Carvajal (1986) and from *Bathyraja eatonii* and *B. murrayi* in the Indian Ocean by Zdzitowiecki and Pisano (1996).

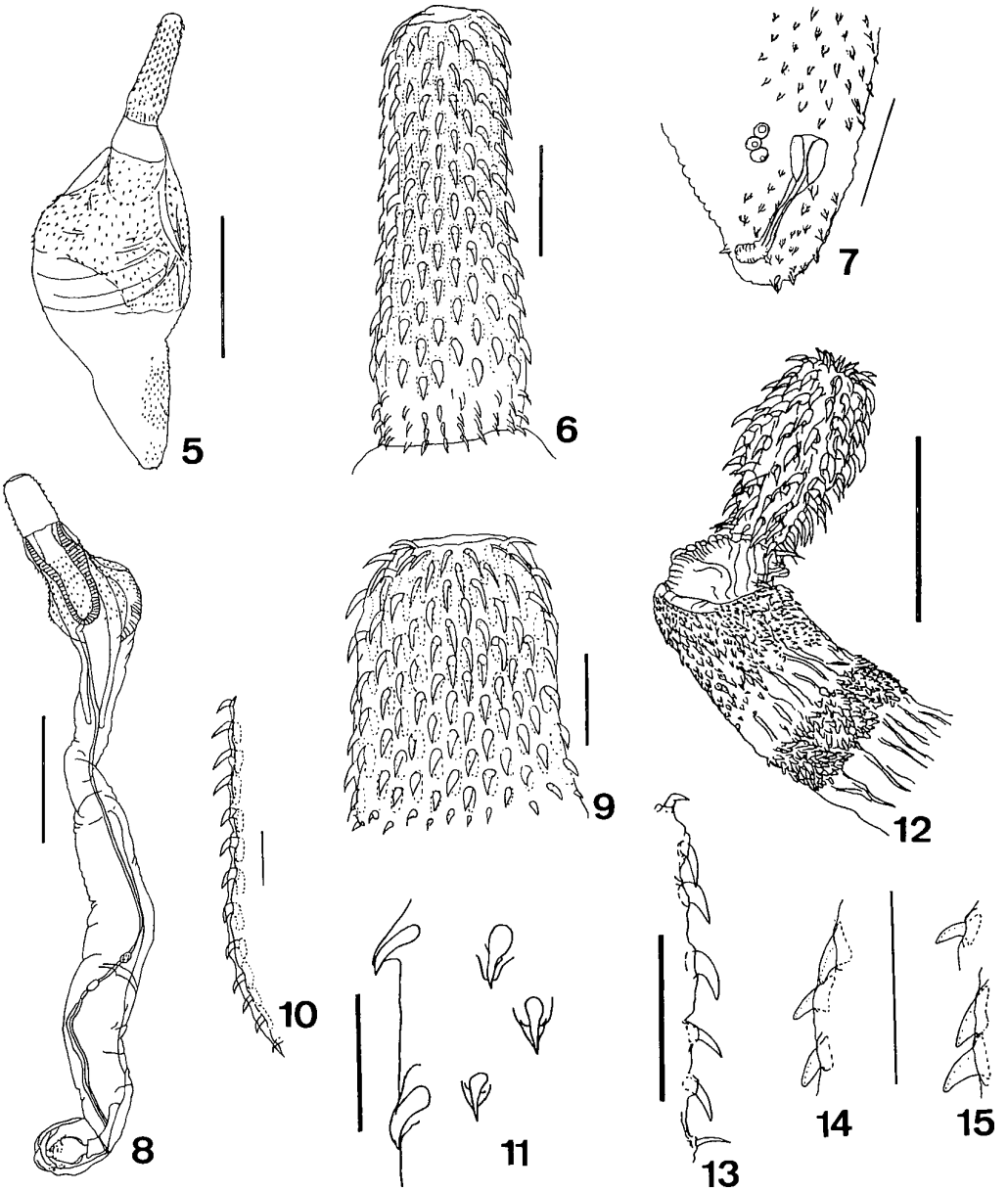
Dipturus trachydermus and *Squatina* sp. are two new hosts records for the *O. veliporum.* This is the first report of a digenetic trematode in elasmobranch fishes in Brazil.

ACANTHOCEPHALA
Palaeacanthocephala Meyer, 1931
Polymorphida Petrochenko, 1956
Polymorphidae Meyer, 1931
Corynosoma australe Johnston, 1937
(Figs 5-7, Table II)
Corynosoma sp.
(Figs 8-11, Table II)



Otodistomum veliporum - Fig. 1: immature specimen in *Squatina* sp., total, ventral view (Bar = 1 mm). Fig. 2: terminal genitalia (adult *in Dipturus trachydermus*), ventral view (Bar = 1 mm). Fig. 3: ovarian complex (adult), ventral view (Bar = 0.5 mm). Fig. 4: total (adult), ventral view (Bar = 3 mm)

Remarks - The species of *Corynosoma* reported here are probably accidental parasites of elasmobranch fishes, since they are known to use mammals and birds as definitive hosts (Schmidt 1985). The identification of *C. australe* was obtained on the basis of morphometrics data related mainly to the number of hooks and number of rows of the proboscis (see Petrochenko 1971b). *C. australe* was originally described parasitizing *Neophoca cinerea* and was also reported from other marine mammals from Australia (Golvan 1959, Yamaguti 1963, Petrochenko 1971b, Smales 1986). In South America, *C. australe* had been reported in teleost fishes from Pacific (Peru) to Atlantic waters (Uruguay) (Vergara & George-Nascimento 1982, Zdzitowiecki 1989, Cremonte & Sardella 1997,



Corynosoma australe - Fig. 5: female cystacanth in *Squatina* sp., total, lateral view (Bar = 1 mm). Fig. 6: proboscis, ventral view (Bar = 0.2 mm). Fig. 7: female cystacanth, posterior portion, lateral view (Bar = 0.2 mm). *Corynosoma* sp. - Fig. 8: juvenile male, total, ventral view (Bar = 1.5 mm). Fig. 9: proboscis, ventral view (Bar = 0.2 mm). Fig. 10: hooks of proboscis, lateral view (Bar = 0.2 mm). Fig. 11: trunk spines (Bar = 0.1 mm). *Gorgorhynchus* sp. - Fig. 12: portion of trunk and proboscis, lateral view (Bar = 0.5 mm). Fig. 13: hooks of proboscis, lateral view (Bar = 0.25 mm). Fig. 14: trunk spines, first area, lateral view (Bar = 0.1 mm). Fig. 15: trunk spines, second area, lateral view (Bar = 0.1 mm)

Tanzola et al. 1997, Oliva 1999). In Brazil these acanthocephalans occurred in teleost fishes: *Corynosoma* sp. in *Pomatomus saltator* from the coast of the State of Rio de Janeiro and *C. australe* in *Micropogonias furnieri* from the coast of the State of Rio Grande do Sul (Rego et al. 1983, Pereira Jr & Neves 1993). The morphology of the other *Corynosoma* sp. (juvenile form), considered here is similar to *C. reductum* (Linstow, 1905) Raillet & Henry, 1907 but the evagination of the proboscis did not permit the proper species determination. This is the first occurrence of specimens of *Corynosoma* in elasmobranch fishes.

Echinorhynchida Southwell & MacFie, 1925
Rhadinorhynchidae Travassos, 1923
Gorgorhynchus sp.
(Figs 12-15, Table II)

Remarks - The juvenile of *Gorgorhynchus* sp. presents the typical generic characteristics related to the form of the body and the proboscis, the distribution of trunk spines and length of proboscis sheat. Nevertheless, our specimens could neither be identified as *Gorgorhynchus trachinotus* Noronha et al.,1986, the only Brazilian species of the genus parasitizing the intestine of a teleost fish *Trachinotus goodei* Jordan and Evermann, 1896

TABLE II

Data on Acanthocephala species collected from elasmobranch fishes (present study)

	Corynosoma australe	*Corynosoma* sp.	*Gorgorhynchus* sp. (juvenile form)
Body	2.97 x 1.05	8.92 x 1.05	7.174 x 0.408
Proboscis (long)	0.73	0.64	0.560
anterior region (wide)	0.15	0.36	0.182
median region (wide)	0.18	0.40	0.238
basal region (wide)	0.21	0.43	0.140
Hooks	18 rows of 12-14 hooks each	12 partially extroverted rows of 12-14 hooks each	9 partially extroverted rows of 13-14 hooks each
Basal	0.014-0.018 x 0.003-0.007	0.018-0.032 x 0.003-0.007	0.0540-0.0612 x 0.0108-0.0180
Root	0.007-0.014 x 0.003	0.014-0.018 x 0.003-0.007	0.0144-0.0180 x 0.0144-0.0216
Midle and anterior	0.032-0.043 x 0.007-0.018	0.046-0.072 x 0.010-0.014	0.0720-0.0936 x 0.0216-0.0396
Root	0.018-0.032 x 0.032-0.010	0.032-0.054 x 0.010-0.014	0.0108 x 0.0216-0.0468
Trunk spines	0.018-0.025 x 0.003-0.007	0.014 - 0.021 x 0.010	0.0288-0.0396 x 0.0180-0.0288 1st area: 20 rows of 20-22 spines each 2nd area: 12 rows of 18-20 spines each
Genital spines	0.018-0.007	-	-
Ovijector and bell	0.23	-	-
Hosts	*Squatina* sp.; *Squalus megalops*; *Galeorhinus galeus*; *Hexanchus griseus*	*Squatina* sp.; *Squalus megalops*; *Galeorhinus galeus*	*Sphyrna zygaena*
Site of infection	Spiral valve; stomach; spiral valve; spiral valve	Spiral valve; stomach; spiral valve	Spiral valve
Locality	RS; RS; RS; PR	RS; RS; RS	SC
Prevalence (%)	3.8; 7.1; 2.7; 100	3.8; 7.1; 5.4	20
Intensity or mean intensity*	2; 1; 3*; 4	1; 1; 1.5*	1
Voucher CHIOC no.	34283 a-b; 34284 b; 34286; 34280 a-d	34282; 34284 a; 34285, 34287 a-b	34281

RS: Coast of the State of Rio Grande do Sul; PR: Coast of the State of Paraná; SC: Coast of the State of Santa Catarina; CHIOC: Coleção Helmintológica do Instituto Oswaldo Cruz; *morphometric data of *C. australe* and *Corynosoma* sp. were obtained from a female cystacanth and a juvenile male, respectively, both from *Squatina* sp. of RS; measurements in mm

(Noronha et al. 1986) nor as any other described species (Golvan 1969, Petrochenko 1971a). This is the first record of a species of *Gorgorhynchus* in an elasmobranch host.

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