A new *Orygmatobothrium* Diesing, 1863 (Eucestoda, Tetraphyllidea) parasite of *Mustelus schmitti* Springer, 1939 (Carcharhiniformes, Triakidae) from the southwestern Atlantic Ocean

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ABSTRACT
Orygmatobothrium schmittii n. sp. collected from the spiral valve of *Mustelus schmitti* in the southwestern Atlantic Ocean at the Mar del Plata coastal region, Argentina, is described. The new species differs from *O. musteli* (Van Beneden, 1850) as described by Euzet (1959) in the size of body, scolex, gravid proglottis, cirrus sac and eggs; in the structure of eggs; in neck and cirrus length; in cirrus shape and by testes number. The cestode described here is different from *O. zschokkei* Woodland, 1927, and *O. plicatum* Yamaguti, 1934, in the location of the genital pore and in having bothridia with smooth margins respectively. Anatomical differences with the cestode described by Yoshida (1917) as *O. velamentum* are listed. The cestode parasitic of the same host in the same region and mentioned as *O. velamentum* by Ostrowski de Nuñez (1973) is probably cospecific with *O. schmittii* n. sp.

KEY WORDS
Plathelminthes,
Cestoda,
Eucestoda,
Tetraphyllidea,
Phyllobothriidae,
Orygmatobothrium,
Pisces,
Triakidae,
Mustelus,
Argentine,
Atlantic coast,
parasitology,
new species.

RÉSUMÉ
Un nouveau Orygmatobothrium *Diesing, 1863 (Eucestoda, Tetraphyllidea) parasite de* Mustelus schmitti *Springer, 1939 (Carcharhiniformes, Triakidae) du Sud Ouest de l'Atlantique.*
Orygmatobothrium schmittii n. sp. parasite de *Mustelus schmitti* de l'océan Atlantique, région côtière de Mar del Plata, Argentine, est décrit. Cette espèce est anatomiquement différente d'*O. musteli* (Van Beneden, 1850) décrite par Euzet (1959) par la taille du corps, du scolex, des proglottides gravides, de la poche du cirre et des œufs, par la longueur du cou et du cirre, par la forme du cirre et par le nombre de testicules. *O. schmitti* n. sp. se distingue d'*O. zschokkei* Woodland, 1927 et d'*O. plicatum* Yamaguti, 1934 par la position du pore génital et la présence des bords des bothridias non plissés. Les différences anatomiques avec le cestode décrit par Yoshida (1917) et nommé *O. velamentum* sont indiquées. Le cestode parasite du même hôte dans la même région et désigné comme *O. velamentum* par Ostrowski de Nuñez (1973) appartient probablement à l'espèce *O. schmittii* n. sp.

MOTS CLÉS
Plathelminthes,
Cestoda,
Eucestoda,
Tetraphyllidea,
Phyllobothriidae,
Orygmatobothrium,
Pisces,
Triakidae,
Mustelus,
côte atlantique,
Argentine,
parasitologie,
nouvelle espèce.

INTRODUCTION

Records of tetraphyllidean cestodes in the South American Pacific coasts are restricted to the studies of the southwestern and northwestern Pacific Ocean carried out by Euzet & Carvajal Garay (1973), Carvajal Garay (1974), Carvajal Garay & Dailey (1975), Campbell & Carvajal Garay (1979) and Escalante & Carvajal Garay (1981). So far, tetraphyllidean cestodes of the southwestern Atlantic Ocean have been reported by Rego & Mayer (1976), Rego (1977) and Brooks *et al.* (1980). Ostrowski de Nuñez (1971, 1973) and Ivanov & Campbell (1998) have reported on cestodes parasitic of sharks and rays from the Argentine sea coastal region. Recently, a Phyllobothriidae cestode with anatomical characteristics consistent with those of the genus *Orygmatobothrium* was collected from *Mustelus schmitti* Springer, 1939 of the Argentine sea coast. It is regarded as a new species within this genus, for which the name *Orygmatobothrium schmittii* n. sp. is proposed. The specific systematic position of the species of *Orygmatobothrium* is very confused. Therefore, the aim of this paper is to describe in a precise way the new species and to compare it with those cited previously by other authors.

MATERIALS AND METHODS

Seven specimens of *Mustelus schmitti* were collected in the coastal region of Mar del Plata (38°35'S, 57°33'W) by the port fishing fleets of the city. Fish (0.50-0.70 m long) were dissected and examined for parasites in the laboratory immediately after captured. Twenty cestode specimens belonging to the genus *Orygmatobothrium* were collected from the sharks'spiral valve. Live parasites were placed into a Petri dish containing mentholated physiological solution to relax and stretch them. The cestodes were then fixed in AFA, stained with carmine chlorine and mounted in Canada balsam. Histological sections (7 µm thick) were stained with hematoxylin-eosine. The cestodes anatomy was studied using a Wild M20 microscope. Three proglottid "types" were considered: immature proglottids, mature proglottids and gravid proglottids. Drawings were made with the aid of a camera lucida. Measurements are given in micrometers, followed by ranges in parenthesis, unless otherwise stated. Cestodes taxonomy follows Euzet (1994) and host classification follows Compagno (1984).

SYSTEMATICS

Family PHYLLOBOTHRIIDAE Braun, 1900
Genus *Orygmatobothrium* Diesing, 1863

Orygmatobothrium schmittii n. sp.
(Fig. 1)

TYPE MATERIAL. — Holotype (Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Helminthological Collection 382/1-2); paratype (MNHN 20HG, 2 slides 158 CIX-159 CIX).

TYPE HOST. — *Mustelus schmitti* Springer, 1939 (spiral valve)

TYPE LOCALITY. — Coastal region of Mar del Plata (38°35'S, 57°33'W), Province of Buenos Aires, Argentina.

ETYMOLOGY. — The specific name *schmittii* refers to specific name of the host.

LOCATION IN THE HOST. — Spiral valve.

MATERIAL EXAMINED. — 10 specimens *in toto* (measurements based on 10 specimens); two specimens in serial transverse sections.

DESCRIPTION

With the characters of the genus *Orygmatobothrium* as defined by Euzet (1994).

Body 17.49 (14.20-21.94) mm long by 250 (210-300) wide. Scolex 410 (350-500) in diameter possessing four circular bothridia with a muscular edge suspended by a very short peduncle. Bothridia 240 (220-290) in diameter; each bothridia with a central glandular organ (27-30 in diameter) and an accessory sucker 50 (45-70) in diameter. Two pairs of osmoregulatory ducts. Neck 620 (540-710) long and 100 (80-150) wide, provided with microtriches 6-8 long.

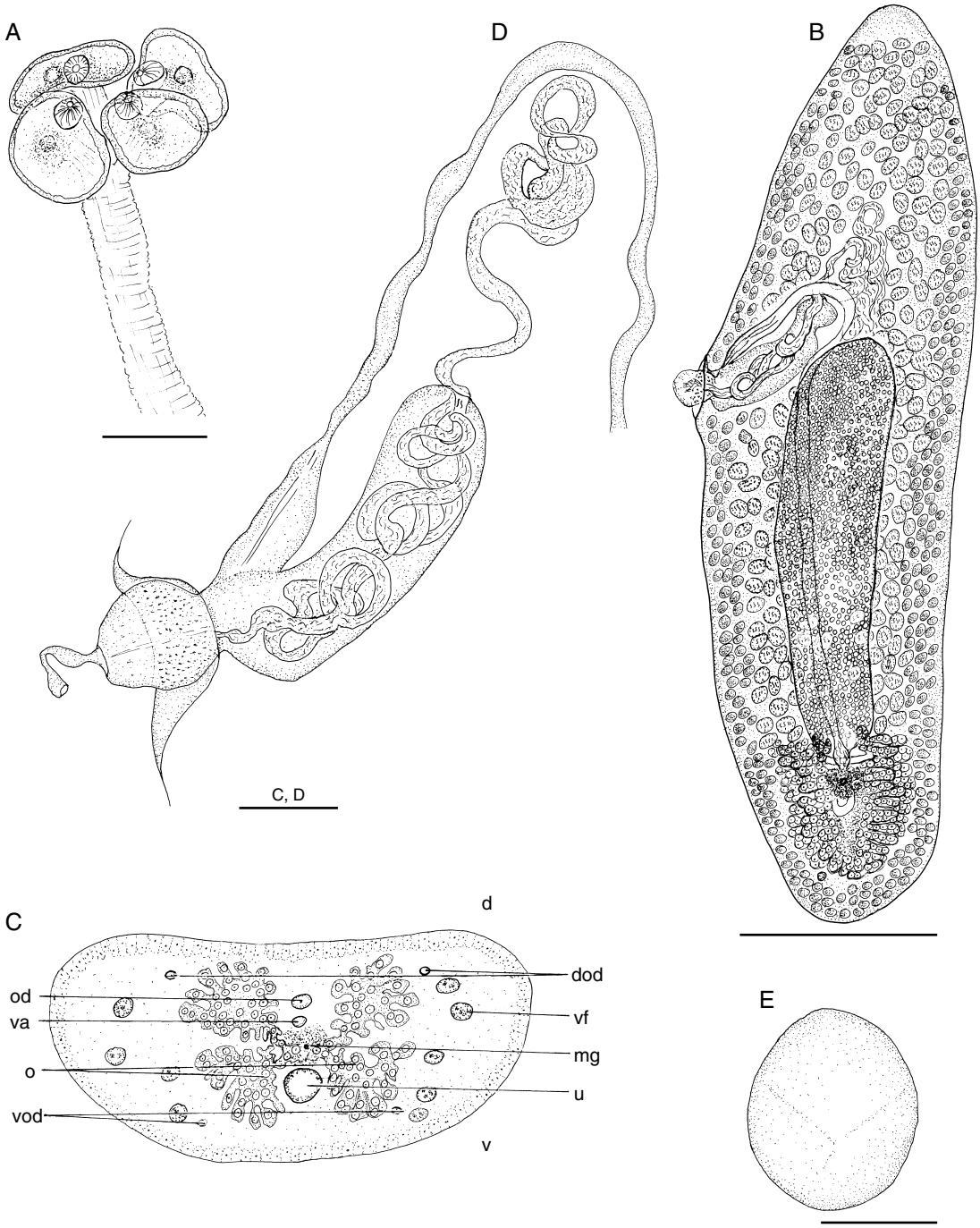

FIG. 1. — *Orygmatobothrium schmittii* n. sp.; **A**, scolex; **B**, gravid proglottid (ventral view); **C**, cross section throught proglottid at level of ovary; **D**, detail of terminal genitalia with everted cirrus (lateral view); **E**, egg. Abbreviations: **d**, dorsal; **v**, ventral; **o**, ovary; **od**, oviduct; **dod**, dorsal osmorregulatory duct; **vod**, ventral osmoregulatory duct; **mg**, mehlis glands; **va**, vagin; **vf**, vitelline follicles; **u**, uterus. Scale bars: A-C, 0.2 mm; B, 1 mm; D, 0.05 mm; E, 0.01 mm.

Immature proglottids 20 (20-50) long by 80 (80-100) wide; mature proglottids 480 (350-500) long by 290 (250-320) wide; gravid proglottids 5590 (4470-7250) long by 123 (100-148) wide.
Segments with 193 (168-207) testes, subspherical 90 (60-120) long by 40 (60-80) wide. Testes are located in the medullary region, extending from the anterior part of the ovary to the anterior part of the proglottid. Vas deferens median, anterior and ventral; highly coiled before opening into cirrus sac. Cirrus sac thin-walled 480 (370-580) long by 150 (120-180) wide located ventrally in the lateral second third of the proglottid containg the ejaculatory duct and cirrus. Cirrus 220 (170-250) long (partially invaginated) and 400-700 when fully protruded, with basal (proximal) bulbous shape, armed with microtriches about 10 long and a distal cylindrical end. Genital atrium ventro lateral and irregularly alternating 170-300 in diameter.
Ovary 940 (770-1140) in major diameter by 690 (560-790) in minor diameter located in posterior third of the proglottid, X shape in cross sections. Vagina opening anterior to cirrus sac in the genital atrium. Vaginal canal crossing the vas deferens ventrally, then, descending median and ventrally expanding into a seminal receptacle. Vagina, dorsal to the uterus. Oviduct receiving ducts of the seminal receptacle and median vitelline duct, continuing with the ootype surrounded by the Mehli's glands. Uterus sac shape reaching the level of the cirrus sac opening to the exterior through the rupture of the ventral wall of the proglottid. Vitelline follicles extending from the posterior to the anterior part of the proglottid. Eggs 14-16 in diameter.

DISCUSSION

The anatomical characters of the previously described cestode coincide with those of the genus *Orygmatobothrium* Diesing, 1863 as defined by Euzet (1994). The type species of the genus is *O. musteli* (Van Beneden, 1850). Van Beneden (1850) described the species *Anthobothrium musteli* parasite from the spiral valve of *Mustelus mustelus*. Zschokke (1889) accomodated *A. musteli* in the genus *Orygmatobothrium* with *O. musteli* as type species. Yoshida (1917) described *O. velamentum* from *Cynias manazo* (Blecker, 1854) (= *Mustelus manazo*) collected from Hiroshima (Pacific Ocean). Woodland (1927) considered *O. velamentum* to be synonymous with *O. musteli*. Woodland added to the genus *Orygmatobothrium* a new species which named *O. zschokkei.* Woodland concluded that the genus *Orygmatobothrium* includes *O. musteli* and *O. zschokkei* Woodland, 1927. Yamaguti (1934) described the species *O. plicatum* parasite of an unidentified skate from the Pacific Ocean. Yamaguti (1952) considered *O. musteli* as described by Woodland (1927) synonymous with *O. versatile* Diesing, 1854 and *O. velamentum* synonymous with *O. musteli*. Euzet (1959) redescribed the type species of the genus *Orygmatobothrium*: *O. musteli* collected from *Mustelus mustelus* (Linnaeus, 1758) from the Mediterranean Sea (Sète coast). Euzet then, considered *O. versatile* synonymous with *O. musteli.* Ostrowski de Nuñez (1973) described a cestode parasite of *Mustelus schmitti* from the coastal region of Mar del plata (southwestern Atlantic Ocean). She suggested that *O. velamentum* could be a valid species. Ostrowski de Nuñez named then *O. velamentum* the cestode parasite of *Mustelus schmitti* studied by her. Barker *et al.* (1984) considered *O. musteli* the only representative of the genus *Orygmatobothrium*.
The cestode described in this paper differs from the type species of the genus, *O. musteli,* as described by Euzet (1959), in the cirrus shape and length, in body, scolex, gravid proglottis, cirrus sac and egg size (Table 1). The location of the cirrus sac (at the beginning of the second third of the body) separates *O. schmittii* n. sp. from *O. zschokkei*. The unfolded edge of the bothridia and the location of the vitelline folicles separate *O. schmittii* n. sp. from *O. plicatum. Orygmatobothrium schmittii* n. sp. differs from *O. velamentum* in body, bothridia and testes size. Yoshida (1917) never described the cirrus sac or its size but, he stated that the length of the aforementioned organ surpasses the medullar region toward the

TABLE 1. — Comparative measurements (in µm) of *Orygmatobothrium* spp. described and redescribed by different authors. *, measurements in millimeters.

Species	*O. musteli*	*O. musteli*	*O. velamentum*	*O. schmittii* n. sp.
Author	(Van Beneden, 1850)	(Van Beneden, 1850)	Yoshida, 1917	Present study
Redescription	Yoshida 1917	Euzet 1959	O. Nuñez 1973	
Host	*Mustelus manazo*	*Mustelus mustelus*	*Mustelus schmitti*	*Mustelus schmitti*
Body length	30-40*	60*	–	17.49 (14.20-21.94)*
Body width	–	1.520-2000	–	250 (210-300)
Scolex Diameter	1000-6000	600-800	–	410 (350-500)
Bothridia diameter	500-600	–	400 (220-440)	240 (220-290)
Accessory sucker	–	50-60	44-74	50 (45-70)
Glandular Organ	–	100-120	59 (52-81)	27-30
Neck length	–	2.000-2.500	110-180	620 (540-710)
Neck width	700-860	200-800	–	100 (80-150)
Neck microtriches	–	–	–	6-8
Immature proglottids length	–	–	–	20 (20-50)
Inmature proglottid width	–	–	–	80 (80-100)
Mature proglottids length	1500-2.500	–	–	480 (350-500)
Mature proglottids width	–	–	–	290 (250-320)
Gravid proglotitids length	–	10.000	9.000	5.590 (4.470-7.250)
Gravid proglottids width	–	400	–	1.230 (1.000-1.480)
Testes #	–	380-440	200-280	193 (168-207)
Evaginated cirrus length		5.000	–	400-700
Cirrus spines	–	–	–	10
Cirrus sac length	–	1.000	580-750	480 (370-580)
Cirrus sac width		500	180-240	150 (120-180)
Eggs	–	23-26	19-22	14-16

non polar side of the proglottid. That is not the case for *O. schmittii* n. sp. Yoshida (1917) did not report on egg size and testes number of *O. velamentum*. Yamaguti (1934) studied the material described by Yoshida (1917) and added to the description of the cestode. According to Yamaguti's redescription, there are other anatomical differences concerning number of testes, cirrus sac, egg size and cirrus length between *O. velamentum* species and *O. schmittii* n. sp. (Table 1).

Anatomical differences of species included within the genus *Orygmatobothrium* are not very significative. Nevertheless, body length, glandular organ diameter, testes number and eggs size allow us to distinguish three species that show certain specificity: *O. musteli* (Van Beneden, 1850) *O. velamentum* Yoshida, 1917 and *O. schmittii* n. sp. respectively. *O. plicatum* parasite of an unidentified species of ray from the Pacific ocean should be considered as *species inquirenda*. It is interesting to note that the cestode belonging to the genus *Orygmatobothrium* described by Ostrowski de Nuñez (1973) was collected from the spiral valve of specimens of *Mustelus schmitti* from the Mar del Plata region. This worms could be cospecific with *O. schmittii* n. sp. The lack of information makes impossible the comparison between the Ostrowski de Nuñez's description and that presented here and, therefore, supports the working hypothesis that in the Mar del Plata coastal region (Argentine sea) the genus *Orygmatobothrium* is represented up to now only by *O. schmittii* n. sp., parasite of *Mustelus schmitti*.

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