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Cymatocarpus solearis a brachycoeliid metacercaria parasitizing *Panulirus argus* (Crustacea : Decapoda) from the Mexican Caribbean Sea

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Resumen. Se examinaron 78 abdómenes de la langosta *Panulirus argus*, capturadas en el periodo comprendido de junio a noviembre de 2000 en una Cooperativa Pesquera de Punta Allen, en el Caribe Mexicano. En un total de 28 langostas parasitadas se registraron 720 metacercarias enquistadas de la familia Brachycoeliidae en el músculo abdominal. La prevalencia fue de 35.8% con una intensidad promedio de 26 metacercarias por hospedero parasitado. Los quistes pueden observarse sin ayuda de microscopio, son blanquecinos, redondeados y miden de 0.6 a 1.5 (1.07) mm. Las metacercarias desenquistadas midieron de 2.66 a 4.14 mm de largo por 0.840 a 1.480 mm de ancho, presentando la morfología característica de la especie *Cymatocarpus solearis* Braun 1899. Estas metacercarias se describen por vez primera como parásitas de *Panulirus argus* en el Caribe Mexicano.

Palabras clave: Trematoda, *Cymatocarpus solearis*, metacercaria, *Panulirus argus*, Mar Caribe, México.

Abstract. Seventy eight abdomens of the spiny lobster *Panulirus argus* were obtained from June to November 2000 from a commercial Fishery Cooperative at Punta Allen, in the Mexican Caribbean Sea. From a total of 28 parasitized lobsters, 720 encysted metacercariae of the family Brachycoeliidae were found in the abdominal muscle. Prevalence was 35.8% and the mean intensity was 26 per host. Cysts measured from 0.6 to 1.5 (1.07) mm, and can be observed with un-

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aided eye as small, opaque-whitish spheres. Excysted metacercariae measured 2.66 to 4.14 mm length, and 0.84 to 1.48 mm width having the typical morphology of *Cymatocarpus solearis* Braun 1899. This trematode is described for the first time parasitizing *P. argus* in the Mexican Caribbean Sea.

Key words: Trematoda, *Cymatocarpus solearis*, metacercaria, *Panulirus argus* Mexican Caribbean Sea.

Introduction

Members of the family Brachycoeliidae have been reported as parasites of chelonians in several coastal habitats including the Egyptian Mediterranean (Looss, 1899, 1902), Cheng & Provenza1960); Florida (Linton 1910, Pratt 1914, Luhman 1935), Japan (Oguro 1942), Atlantic (Threlfall 1979), Mexican Pacific (Caballero 1959), and Australian waters (Blair & Limpus 1982). Brachycoeliids have also been found in the pearl banks of the Persian Gulf in the hermit crab *Pagurus tinctor* (Forskal) (= *P. varipes* Heller) by Dollfus (1927) and in lobsters of the genus *Panulirus* (Linton 1910).

Although seven species of spiny lobsters have been reported in the littoral habitats of Mexico, (Gracia & Kensler 1980), only *Panulirus interruptus* Tandall 1846, on the west coast and *P. argus* (Latreille 1804) on the Atlantic-Caribbean coasts, contributed 85% of the annual capture during the period 1980-1988 (Secretaría de Pesca 1987). The fishery of *Panulirus argus* in the western coastal Atlantic is the largest in the world and one of the most important fishing resources in Mexico (Briones & Lozano 1980). According to Lipcius & Cobb (1994) *P. argus* contributed 42% (34 480 tons) during the period 1985-1988 of the worldwide lobster capture.

Lobsters, due to their abundance, particularly in shallow littoral habitats, appear to be important links in marine food webs and have been reported as predators of various species of snails, clams and urchins. Castañeda (1998) found for the juvenile lobsters of Puerto Morelos, Mexico, a total of 17 trophic items, although she also found that the main consumed groups were crustaceans (27.4 to 43.5%) and gastropods (11.9 to 24.2%). On the other hand, lobsters are prey of larger predators such as shark and fish. Thus, lobsters are not only important links in the food web, but also important in transmitting parasitic fauna to higher trophic levels.

In this work, the metacercaria of *Cymatocarpus solearis* (syn. *C. undulatus*) is redescribed, the spiny lobster *Panulirus argus* is reported as an intermediate host for the first time and the Mexican Caribbean Sea is reported as a new geographical distribution area.

Material and methods

Abdomens ("tails") of *Panulirus argus* (n = 78) were analyzed from the fishing Cooperativa de Pescadores de Vigia el Chico, at Punta Allen in the Mexican state of Quintana Roo (Fig. 1). Lobsters at that place are captured at *ca.* 3 to 5 m depth (5 to 10 km offshore), and each fisherman has a parcel where the fishing method of "casitas" is applied. Abdomens of adults are the only parts to be reported because is the only one landed, the other parts of the lobster, including the cephalotorax ("heads") are usually discarded at sea during capture. Tails were examined whole, by cutting the muscle in thin, small parts, searching for cysts of metacercariae. Metacercariae were excysted from its wall and transferred to saline solution (*ca.* 17 UPS). Some excysted metacercariae were fixed in AFA (a mixture of 85 ml of ethanol, 25 ml of formaldehyde and 5 ml of acetic acid), and stained with Acetic Carmine. Larvae were made transparent with clove oil and mounted on permanent slides in Balsam of Canada. Other excysted metacercariae were fixed with Glutaraldehyde, dehydrated in ethanol series, changed to acetone, criti-

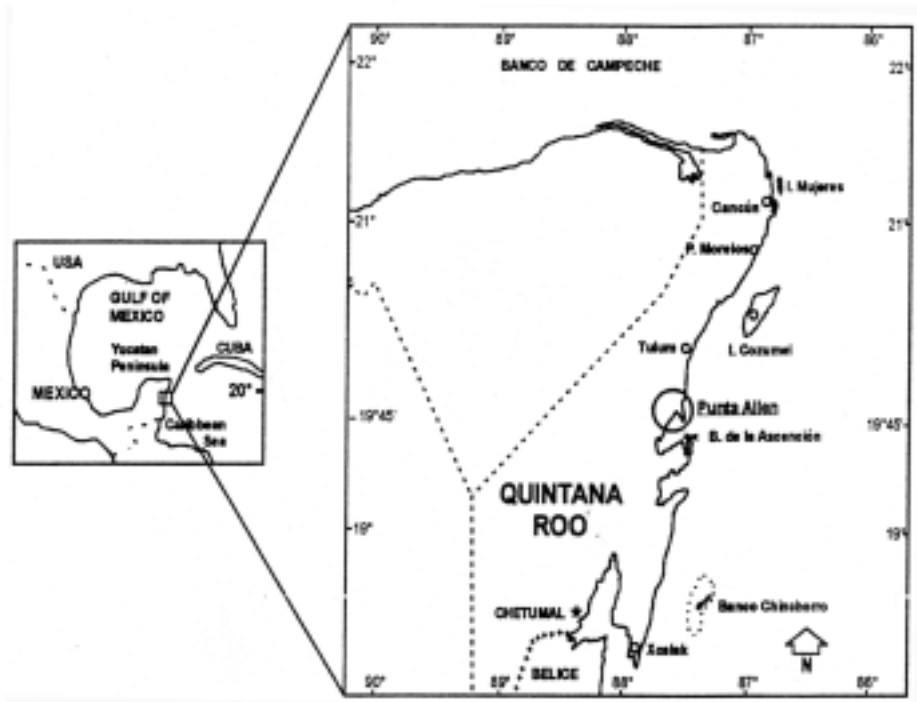

Fig. 1. Study area, showing Punta Allen, in the Mexican Caribbean Sea.

cally dried, gold covered and observed in a Jeol JSM-35 scanning electronic microscope. Measurements of parasites are given in mm (mean in parentheses). Prevalence and intensity of parasitism were calculated according to Margolis *et al.* (1982). Description of the internal anatomy (permanent slides) is based on 20 excysted individuals, size measurements on ten individuals, and the external ultra structure is based on five SEM micrographs, but only two are included in this work.

Results

A total of 720 encysted trematode metacercariae were obtained from the abdomen musculature of 28 *Panulirus argus* examined (n = 78, prevalence 35.8%, mean intensity 26). Cysts measured from 0.6 to 1.5 (1.07) and can be observed with unaided eye as small, opaque-whitish spheres.

Parasites are elongated with both ends rounded with the anterior part slightly wider. The tegument is covered with small spines (not observable with a light microscope (Fig.2.) Total length varies from 2.66 to 4.14 (3.18) and 0.84 to 1.48 (1.14) wide. The oral sucker is terminal and measures 0.16 to 0.24 (0.19) in length and 0.16 to 0.26 (0.21) wide. The acetabulum is sligthly pre-equatorial and almost the same size as the oral sucker, measuring 0.14 a 0.22 (0.18) in length and 0.15 a 0.25 (0.24) wide. Length ratio between suckers was 1:0.9.

The mouth, inside the oral sucker, is followed by a relatively short muscular pre-pharynx. The pharynx is 0.06 to 0.11 (0.07) in length, and 0.06 to 0.10 (0.07) wide. The esophagus measures from 0.52 to 0.96 (0.71) length and 0.04 to 0.10 (0.07) wide. The cecal bifurcation is found in the first ¼ of the body, the right branch measuring from 0.32 to 0.56 (0.43) in length, and 0.10 to 0.34 (0.16) wide and the left from 0.30 to 0.58 (0.41) length, and 0.15 a 0.25 (0.18) wide. The intestinal ceca are wide and short, not reaching the acetabulum nor the middle region of the trematode. Two round to slightly ovoid testicles are located slightly oblique or nearly opposite, the right one (slightly more anterior than the left one), is placed in post-equatorial position, measuring 0.10 to 0.36 (0.22) in length, and 0.14 a 0.32 (0.23) wide. The left is also post-equatorial, postovarian, measuring 0.12 to 0.40 (0.24) in length, and 0.16 to 0.32 (0.25) wide. From each testicle a thin efferent conduct is produced and joins at the base of the cirrus sac. Cirrus sac is pre-equatorial, almost cylindrical, curved, spineless, extending backward the acetabulum in its anterior part and measures from 0.34 to 0.54 (0.46) in length and 0.10 to 0.26 (0.18) wide. The seminal vesicle is internal, bipartite, located at the base of the cirrus sac, and measures from 0.10 to 0.34 (0.13) length and 0.08 to 0.22 (0.10) wide. Some prostatic cells are present along the walls of the cirrus sac. The cirrus is long, sinuous, non-ornamented and opens in the genital pore. The genital pore is pre-acetabular and slightly skewed on the right side of the body.

The ovary measures 0.10 to 0.20 (0.15) in length, and 0.10 to 0.20 (0.14) wide, it is post-acetabular, rounded, placed on the left side of the body and slightly ob-

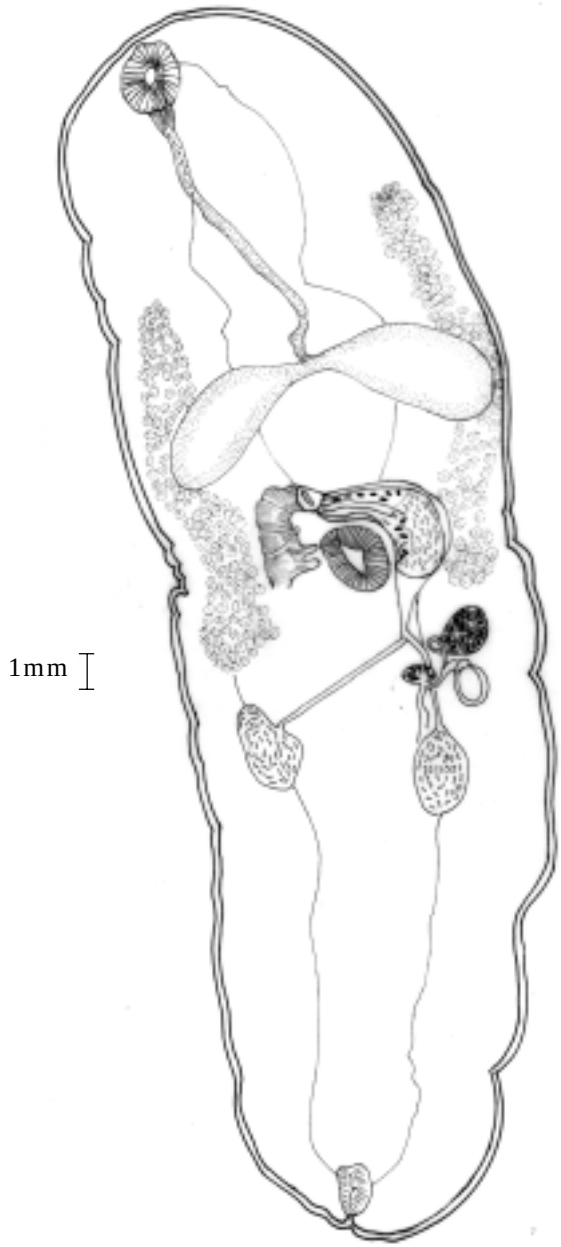

Fig. 2. *Cymatocarpus solearis* Braun 1899**.** Ventral view. Scale = 0.1 mm.

lique in relation to the rigth testicle (a little more anteriorly). The oviduct is short and it is directed to the middle of the body. Ootype and Mehlis gland, however, not well defined, are situated between the posterior testicle and the ovary. A seminal receptacle is observed behind the ovary as a small structure. An "U" shaped and highly sinuous uterus is directed to the posterior part of the body, ending in the genital pore. The metraterm is wide and conspicuous.

Vitelline glands are folicular, forming a longitudinal strand at each side of the body, and distributed from the posterior region of the esophagus to the ovary or reaching the anterior part of the right testicle. The vitelline receptacle was not observed. The excretory vesicle is l-shaped, goes along the middle of the body up to the pharynx. The excretory pore is terminal and carries a small muscular sphincter.

The SEM photographs made possible to observe the presence of spines all over the body, denser anteriorly. The oral sucker showed spines and numerous tegumentary papillae with apparently no arrangement on the anterior lip; papillae were also present on the posterior lip, but less numerous (Fig.3). Sensorial

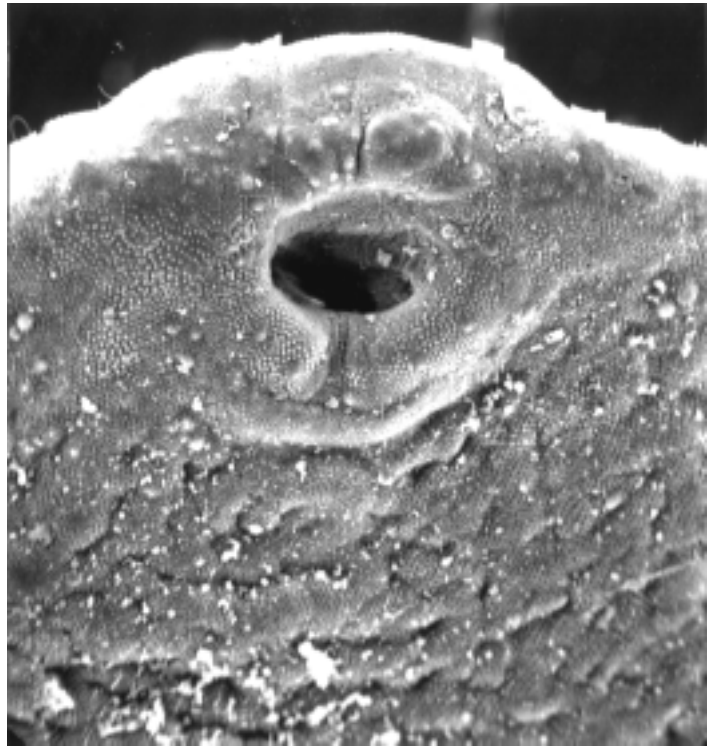

Fig. 3. Oral sucker of *Cymatocarpus solearis* showing the tegumentary papillae. 320X (SEM).

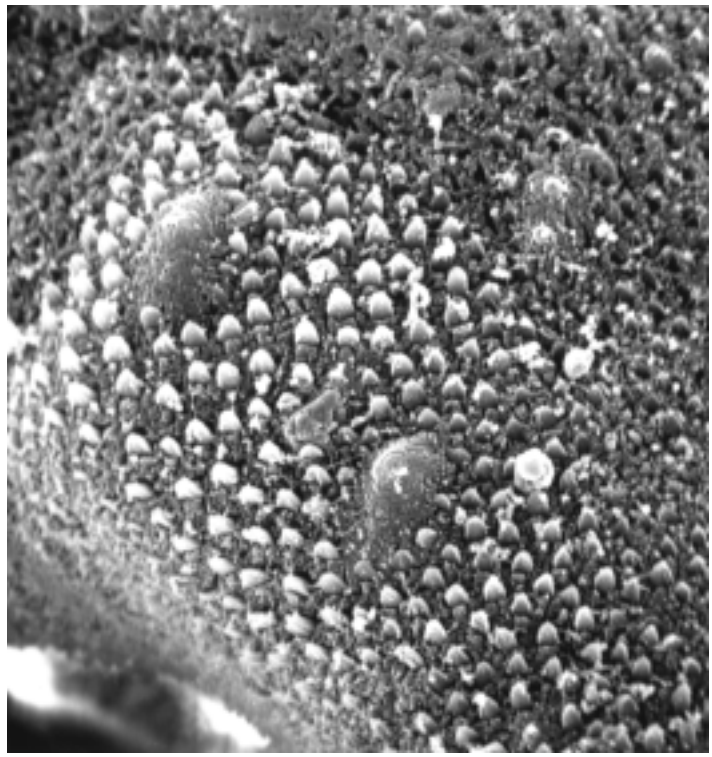

Fig. 4. Oral sucker of *Cymatocarpus solearis* showing sensorial papillae. 2000X (SEM).

papillae, besides the tegumentary ones, were also observed in the surrounding area of the oral sucker (Fig. 4).

Host: *Panulirus argus* (Latreille 1804).
Habitat: Abdominal muscle.
Locality: Punta Allen, Bahía de la Ascensión, Quintana Roo, Mexico (19° 45': 87° 30' W).
Specimens**:** Colección Parasitológica del Museo de Historia Natural de la Universidad Autónoma de Baja California Sur, catalog number 221 and Colección Nacional de Helmintos (CNHE), Instituto de Biología, Universidad Nacional Autónoma de México, catalog number 4332.

Discussion

The metacercariae reported here were identified following Blair & Limpus (1982) as *Cymatocarpus solearis* (synonym *C. undulatus*,) by taking into account the follow-

ing morphological features: vitelogen glands distribution, shape and position of the male and female gonads, form and disposition of the cirrus pouch, the seminal vesicle bipartite, and of the metraterm, as well as the shape of the excretory vesicle. These structures are similar to those described by Braun 1899, Looss (1899), Linton (1910), Caballero (1959), Caballero (1960), and Blair & Limpus (1982) for the adults. However, the spines in the base of the cirrus reported by Blair & Limpus (1982) were not observed. The advanced development of the metacercariae reported here, with the female and male gonads of the larvae almost mature but with no eggs present, are similar to those described by Dollfus (1927).

Trematod adults of the genus *Cymatocarpus* have been reported as specific parasites of several species of turtles such as *Caretta caretta* (Linnaeus 1758) (Linton 1910; Blair & Limpus 1982), *Chelonia mydas* (Linnaeus 1758) (Caballero 1959, Caballero 1960 and Cheng & Provenza, 1960), *Thalassochelys corticata* (Rondelet) = *Caretta caretta* (Pratt 1914, Cheng & Provenza, 1960), *Dermochelys coriacea* (Linnaeus 1766) (Threlfall 1979) and *Lepidochelys olivacea* (Eschscholtz 1829) (Blair & Limpus 1982).

Linton (1910) in Dry Tortugas, Florida, U.S.A., recovered more than 3000 adults of *Cymatocarpus undulatus* together with fragments of carapaces of lobsters of the genus *Panulirus* from the intestine of one *Caretta caretta* and suggested that lobsters are important intermediate hosts. The hermit crab, *Pagurus tinctor* = (*P. varipes*), was reported by Dollfus (1927) as harboring encysted metacercariae of *C. undulatus* in the abdominal musculature, but it was not clear if the crab was the only host or one of them. According to Cheng & Provenza (1960), "…. from the few life cycles known of the Brachycoeliidae, all the genera from this family utilize only one intermediate host". Thus, in this work *Panulirus argus* is reported as the only known, intermediate host of *Cymatocarpus solearis* and more work will have to be done to clarify if other invertebrates (molluscs or crustaceans) could also serve as hosts.

The high prevalence and parasitism intensity found in the Mexican Caribbean Sea, compared with the parasitism intensity observed by Dollfus (1927), shows a relatively higher level of infestation. Besides, the high infestation registered by Linton (1910) in *Caretta caretta* suggests that the intermediate and final hosts are massively parasitized by *Cymatocarpus* species. Pratt (1914) reported that *Cymatocarpus undulatus* is frequently found in turtles from the Gulf of Mexico.

This is the first report of parasitism by *Cymatocarpus solearis* having spiny lobsters as the only known intermediate host. The first record for the adult of this parasite (recorded as *C. undulatus*) was Acapulco, in the Mexican state of Guerrero (Pacific Ocean) (Caballero 1959). Thus, Punta Allen, in the coast of the Mexican Caribbean Sea (Quintana Roo), is a new geographical area for the brachycoeliid parasite and for the spiny lobster *Panulirus argus*.

Lack of knowledge of other possible intermediate hosts, particularly first intermediate host, and the completion of the life cycle of this parasite warrant further investigation.

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