

REPORT AND REDESCRIPTION OF SOME SPECIES OF *COTYLOPHORON* (TREMATODA:PARAMPHISTOMIDAE) IN DOMESTIC RUMINANTS OF BRAZIL.

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SUMMARY: In this paper it is noticed the first occurrence in Brazil of three species of Trematoda, Family Paramphistomidae: *Cotylophoron panamensis*, *Cotylophoron jacksoni* and *Cotylophoron fülleborni*. They were collected from the rumen and mostly from the reticulum of the hosts. *C. panamensis* was collected in cattle (*Bos indicus*) from the state of Rondônia; *C. jacksoni* was collected in cattle (*Bos indicus*) and goat (*Capra hircus*) from the states of Pará, Roraima and Rondonia and *C. fülleborni* was found in cattle (*Bos indicus*) and goat (*Capra hircus*) from the states of Roraima, Pará and Maranhão. A new description of these three species and more *Cotylophoron bareilliensis* and *Cotylophoron travassosi* is made, including observations under SEM.

KEY WORDS: *Cotylophoron panamensis* - *Cotylophoron fülleborni* - *Cotylophoron jacksoni* - *Cotylophoron bareilliensis* - *Cotylophoron travassosi* - Trematoda - Paramphistomidae - Cattle - Goat - Sheep - Brazil.

INTRODUCTION

In his revision of the trematode family Paramphistomidae, NASMARK (1937) included four species in the genus *Cotylophoron* Stiles & Goldberger, 1910: *C. cotylophorum* (Fischöeder, 1901), *C. indicum* Stiles & Goldberger, 1910, *C. jacksoni* Nasmark, 1937 and *C. fülleborni* Nasmark, 1937. This last species was described from specimens collected from a number of hosts, including cattle (*Bos taurus*), African buffalo (*Syncerus caffer nanus*) and goats (*Capra* sp.) in the Cameroon (Africa), and *C. jacksoni* from specimens collected in rumen from *Alcephalus cokei* in East Africa.

PRICE & McINTOSH (1953) described two new species of the genus:

Cotylophoron noveboracensis and *Cotylophoron panamensis*. *C. panamensis* was found in the rumen of domestic sheep (*Ovis aries*) in Panama, Central America.

MUKHERJEE & CHAUHAM (1965) described *Cotylophoron bareilliensis* collected in rumen of goat from India.

EDUARDO (1985), in his revision of *Cotylophoron*, provided a new descriptions of *C. fülleborni*, *C. jacksoni*, *C. panamensis* and *C. bareilliensis*. In the study of *C. fülleborni*

he used specimens obtained from *Syncerus caffer nanus* in the Cameroon; he also examined specimens from bovines in Kenya, Mazabuka and Zambia, and from buffalos from Fort Jameson), Zambia and from indetermined origin. To describe *C. jacksoni* he used worms collected in *Alcelaphus buselaphus*, *Bos indicus*, cattle and *Hippotragus niger* from Africa. In the description of *C. bareilliensis* he used worms collected in *Bos indicus* from Sri Lanka and in *Bos taurus* and *Bubalus bubalis* from Philippines. In addition, his review provided a new description of *C. panamensis* from specimens obtained from the rumen of sheep in Panama, as well material taken from Carimagua, in the eastern llanos of Colombia, from Nagua and Sanchez in the Dominican Republic, and from Cuba and Trinidad.

SEY (1991) described *C. fülleborni* as a rumen parasite of a number of bovid hosts (*Aepicerus melampus*, *Bos primigenius* f. *taurus*, *Bubalus arnee* f. *bubalis*, *Boocercus eurycercus*, *Syncerus caffer*) in Africa; *C. jacksoni* as a rumen parasite of *Alcelaphus buselaphus*, *Bos primigenius* f. *taurus*, *Hippotragus niger* and *Tragelaphus strepsicercus* from Africa; *C. bareilliensis* as a rumen parasite of *Bos primigenius* f. *taurus*, *Bubalus arnee* f. *bubalis* and *Capra aegagrus* f. *hircus* from

Asia (India, Sri Lanka, Philippines), and *C. panamensis* as a parasite of both cattle and goats from the United States, Panama, the West Indies, Trinidad, the Dominican Republic, Cuba and Colombia.

Only two species of *Cotylophoron* have been reported from Brazil: *C. bareilliensis* Mukherjee & Chauhan, 1965 in sheep in the state of Pará (COSTA & GUIMARÃES, 1990) and *C. travassosi*, described by COSTA & GUIMARÃES (1992) in bovines from the state of Maranhão.

MATERIALS AND METHODS

The parasites were collected from: cattle of the states of the states of Roraima, Amazonas, Rondonia, Pará, Tocantins, Maranhão, Piauí and Ceará; goats from the states of Pará, Maranhão and Ceará; and sheep from the states of Pará and Ceará. Immediately on collection, the paramphistomids were washed in cold water, to remove extraneous detritus, and then killed in hot water (70-80°C) which also distended the specimens (following SEY, 1991). They were then transferred to labelled flasks and preserved in ethyl alcohol (70°). In the laboratory, the preservation fluid was replaced with AFA solution (8.96 ml formalin, 1.49 ml acetic acid, 29.85 ml 95% ethyl alcohol, and 59.7 ml distilled water). The paramphistomids in each flask were separated out according to their external features, and individuals of each group were prepared for examination under a scanning electron microscope (SEM). For this purpose, they were dehydrated in an ethanol series, and then placed in a Critical Point Drying Apparatus using liquid carbon dioxide. The dehydrated specimens were then mounted on appropriate substrates, sputtercoated with a film of gold and examined under a SEM. Subsequently, the specimens were removed from their substrates and treated with liquid mercury and agitated for a number of hours to remove the gold film. They were then rehydrated by exposing them to progressively lower concentrations of alcohol and eventually pure water. They were left in water for some days, and considered rehydrated when they fell to the bottom of the flask. They were then dehydrated in an ethanol series (up to 90%) in order to obtain the best consistency for manual sectioning using a barber's razor. Some specimens were used for frontal (lateral) sections, others for sagittal (dorso-ventral) sectioning. Following rehydration in an ethanol series alcohol to pure water, the sections of each specimen were stained with aceto-alumencarmine and mounted on glass-slides with Canada balsam for examination under a light microscope. After specific diagnose, specimens of the same group and not used in SEM were sectioned, stained and mounted. These slides were used for drawings and measurements. All measurements are given in mm, except when otherwise specified.

DESCRIPTIONS

Cotylophoron panamensis Price & McIntosh, 1953

(Figs 1 - 10)

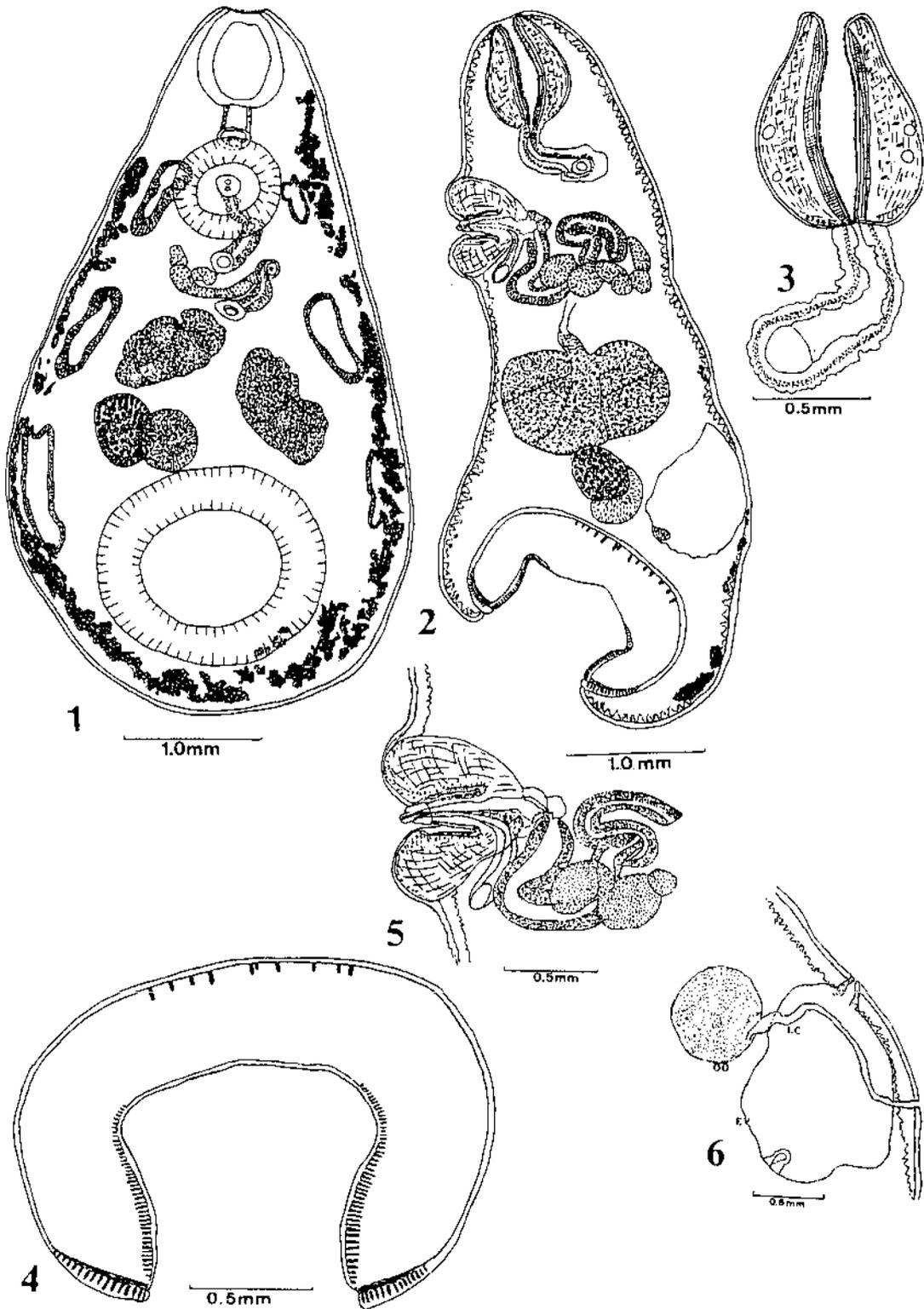
Host: Cattle (*Bos indicus*)

Habitat: rumen and reticulum

Locality: State of Rondônia - Brazil

Specimens: Deposited in the Helminthological Collection of the Institute Oswaldo Cruz, Rio de Janeiro, Brazil, n° 33783 a d

Body conical, recurved in lateral view, very wide laterally and very narrow dorso-ventrally. Measurements: 5.87 (5.58 - 6.29) in length by 3.02 (2.81 - 3.22) in width (lateral section), and 5.85 (5.62 - 6.16) in length by 2.40 (2.13 - 2.49) in width (dorso-ventral section) (Figs.1-2). Pharynx of the *Calicophoron* type (Fig. 3), measuring 0.83 (0.65 - 1.0) in length by 0.77 (0.69 - 0.87) in width (frontal section), and 0.85 (0.79 - 0.90) in length by 0.64 (0.59 - 0.68) in width (sagittal section). Oesophagus 0.43 (0.34 - 0.52) in length by 0.23 (0.21 - 0.26) in width, with uniformly developed muscular layer not forming a bulb (Fig. 3). Acetabulum sub-terminal of the *Cotylophoron* type, measuring 1.84 (1.41 - 2.13) in length by 1.64 (1.09 - 2.15) in width (lateral section), and 0.82 (0.53 - 1.25) in length by 1.44 (0.70 - 1.80) in width (dorso-ventral section), with acetabulum / body length ratios of 1: 3.6 (lateral) and 1: 4.0 (dorso-ventral); and muscle layers (Fig. 4) with the following muscle units: 10 to 14 in the dorsal external circular (DEC), 44 - 52 in the dorsal internal circular (DIC), 14 -19 in the ventral external circular (VEC), 42 - 58 in the ventral internal circular (VIC), and 7 - 10 in the medial external circular (MEC). Terminal genitalium of the *Cotylophoron* type (Fig. 5), with strong genital sucker, measuring 0.75 (0.64 - 0.95) in length by 0.88 (0.83 - 0.98) in width (frontal section), with a well-developed genital papilla, measuring 0.39 (0.27 - 0.50) in length (dorso-ventral section) and presenting at the extreme of the free end a papilliform projection in which the male genital pore opens. The female genital pore opens separately, more close to where papilliform projection is inserted in the extremity of the papilla. Pars muscosa well developed and folded; pars prostatica small and weakly developed. Well-developed testes, lobed, located almost side-by-side (one slightly anterior to other) close to ovary; most anteriorly-placed measures 0.74 (0.66 - 0.90) in length by 0.84 (0.58 - 1.02) in width (frontal section), and 0.79 (0.58 - 1.17) in length by 1.09 (0.70 - 1.34) in width (dorso-ventral section); the other measures 0.64 (0.54 - 0.71) in length by 0.77 (0.60 - 1.02) in width (lateral section), and 0.68 (0.59 - 0.79) in length by 1.03 (0.89 - 1.23) in width (dorso-ventral section). Ovary measures 0.52 (0.43 - 0.60) in length by 0.52 (0.33 - 0.61) in width (frontal section) and 0.54 (0.42 - 0.67) in length by 0.54 (0.46 - 0.61) in width (dorso-ventral section). Oötype measures 0.45 (0.35 - 0.50) in length by 0.50 (0.41 - 0.65) in width (lateral section), and 0.48



Cotylophoron panamensis Price & McIntosh, 1953. Fig. 1 - 2: Lateral and dorso-ventral sections; Fig. 3: *Calicophoron* type pharynx and esophagus without bulb; Fig. 4: *Cotylophoron* type acetabulum; Fig. 5: *Cotylophoron* type terminal genitalium; Fig. 6: Ootype and Laurer's canal crossing the excretory vesicle (OO – ootype, EV – excretory vesicle, LC – Laurer's canal).

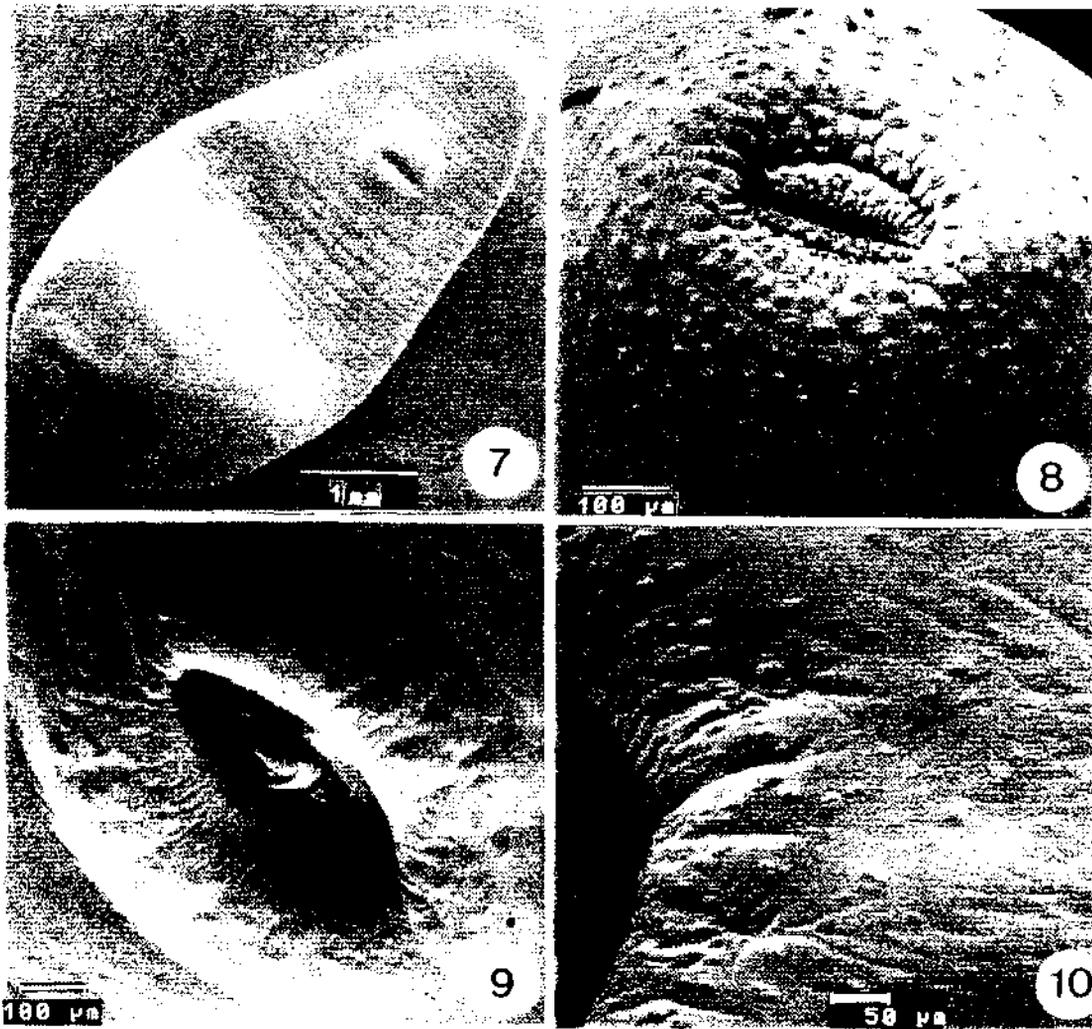
(0.39 - 0.59) in length by 0.46 (0.34 - 0.56) in width (dorso-ventral section). Vitelline follicles fill lateral fields from pharynx to posterior region of the parasite (Fig.1). Eggs operculated, 0.126 (0.120 - 0.131) by 0.063 (0.060 - 0.065). Excretory vesicle very well-developed (Fig. 6), with excretory pore at level of oötype; Laurer's canal traverses excretory vesicle and opens well posterior excretory pore.

In the Fig. 7 we have the whole parasite. Examination under the SEM revealed small, regularly-spaced, circular papillae around the oral aperture (Fig. 8). Discrete, rather irregularly-arranged papillae occur around the genital opening (Fig. 9). Small, irregularly-disposed papilla can also be seen in the region of the acetabulum (Fig. 10).

Comments: The illustrations and figures presented by PRICE & MCINTOSH (1953), EDUARDO (1985) and SEY

(1990) suggest that they were working with contracted specimens, which may be the cause of differences in the measurements which we obtained. For example, we recorded specimens of 5.62 - 6.16 in length, whereas those measured by PRICE & MCINTOSH (1953) were 3.6. EDUARDO (1985) and SEY (1990) recorded lengths of 3.6 to 5.9. Differences such as those of the pharynx / body length and acetabulum body length ratios and the position of the testes in relation to the ovary are probably also a result of contraction.

In the material we examined, the testes were slightly smaller and were not in the previously described arrangement (side-by-side). The ovary, likewise, was lightly larger. Differences were also noted with regard to the genital papilla, and the separate opening of the genital pores. EDUARDO (1985) by contrast, noted the genital pore to be post-bifurcal.



Cotylophoron panamensis Price & McIntosh, 1953 (Observations under SEM). Fig. 7: The whole parasite (ventral view); Fig. 8: Oral opening and circumoral papillae (SEM); Fig. 9: Genital opening with small and irregularly disposed papillae; Fig. 10: Small and irregularly disposed papillae in the acetabular region.

***Cotylophoron fülleborni* Nasmark, 1937**

(Figs. 11 - 20)

Host: Cattle (*Bos indicus*) and goat (*Capra hircus*)

Habitat: rumen and reticulum

Localities: States of Roraima, Pará and Maranhão - Brazil

Specimens: Deposited in Helminthological Collection of the Institute Oswaldo Cruz, Rio de Janeiro, Brazil, nº 33781 a d

Body conical, recurved dorso-ventrally, with the ventral surface slightly arched in profile. Measurements: 5.69 (5.10 - 6.22) in length by 2.24 (1.90 - 2.43) in width (frontal section), and 4.69 (3.77 - 5.45) in length by 1.92 (1.43 - 2.39) in width (sagittal section) (Figs. 11 - 12). Pharynx of the *Calicophoron* type, measuring 0.58 (0.49 - 0.69) in length by 0.64 (0.61 - 0.69) in width (frontal section), and 0.64 (0.54 - 0.74) in length by 0.63 (0.49 - 0.73) in width (sagittal section) (Fig. 13). The ratio of pharynx length to body length is 1:7.4. Oesophagus 0.56 (0.47 - 0.66) in length by 0.21 (0.18 - 0.23) in width (frontal section), and 0.55 (0.40 - 0.77) in length by 0.25 (0.17 - 0.31) in width (sagittal section), with fine uniformly developed muscular layer, not forming bulb. Caeca with undulations terminating at the acetabulum. Acetabulum well developed, sub-ventral (Figs 11 - 12); measuring 1.31 (1.18 - 1.36) in length by 1.28 (1.16 - 1.33) in width (frontal section), and 1.07 (0.87 - 1.19) in length by 1.29 (1.13 - 1.48) in depth (dorso-ventral section); with following muscle units: MEC = 11 - 13, DEC = 17 - 19, DIC = 38 - 40, VEC = 15 - 17, VIC = 37 - 39 (Fig. 14). Acetabulum / body length ratio 1: 4.4 and pharynx length / acetabulum width ratio 1: 2. Genital sucker measures 0.57 (0.46 - 0.69) in length by 0.55 (0.49 - 0.62) in width (frontal section), and 0.48 (0.39 - 0.58) in length by 0.46 (0.39 - 0.56) in depth (dorso-ventral section). Ratio between genital sucker and acetabulum 1: 2.3. Terminal genitalia of the *Cotylophoron* type; genital papilla well developed 0.24 (0.20 - 0.32) in length, with genital pore post-bifurcal (Fig 15). Lobed testes, directly in tandem; anterior testis 0.71 (0.64 - 0.77) in length by 0.72 (0.61 - 0.84) in width (frontal section), and 0.56 (0.41 - 0.72) in length by 0.82 (0.59 - 1.06) in width (dorso-ventral section); posterior testis 0.65 (0.53 - 0.81) in length by 0.73 (0.56 - 0.87) in width (frontal section), and 0.57 (0.50 - 0.66) in length by 0.81 (0.66 - 1.09) in width (dorso-ventral section). Ovary is immediately posterior to testis and measures 0.41 (0.33 - 0.47) in length by 0.44 (0.36 - 0.52) in width (frontal section) and 0.39 (0.33 - 0.56) in length by 0.46 (0.35 - 0.68) in width (dorso-ventral section). Ovary / testis ratio is 1:2 (anterior) and 1:2 (posterior) in the dorso-ventral section and 1: 7 (anterior) and 1: 7 (posterior) in the frontal-section. Mehlis' gland (oötype) 0.31 (0.19 - 0.47) in length by 0.34 (0.23 - 0.52) in width (dorso-ventral section) and 0.34 (0.27 - 0.46) in length by 0.34 (0.26 - 0.41) in width (frontal section). Laurer's canal traverses excretory vesicle (Fig. 16). Eggs

operculated 0.130 - 0.150 by 0.060 - 0.070.

Examination under the SEM revealed circles of small papillae around the buccal aperture (Figs 17 - 18) and small papillae in the acetabular region (Fig. 19). No papillae were found around the genital aperture (Fig 20).

Comments : The description here is highly consistent with those of NASMARK (1937), EDUARDO (1985) and SEY (1990), not only in the morphology but also in the measurements and numbers of muscle units of the acetabulum. Of note, however, is the size of the ovary, which in our material is near twice as large as previously recorded. The oötype is also larger than those described by EDUARDO (1985) and SEY (1990).

This parasite was known only in Africa.

***Cotylophoron bareilliensis* Mukherjee & Chauhan, 1965**
(Figs. 21-31)Hosts: Cattle (*Bos indicus*), goat (*Capra hircus*), sheep (*Ovis aries*).

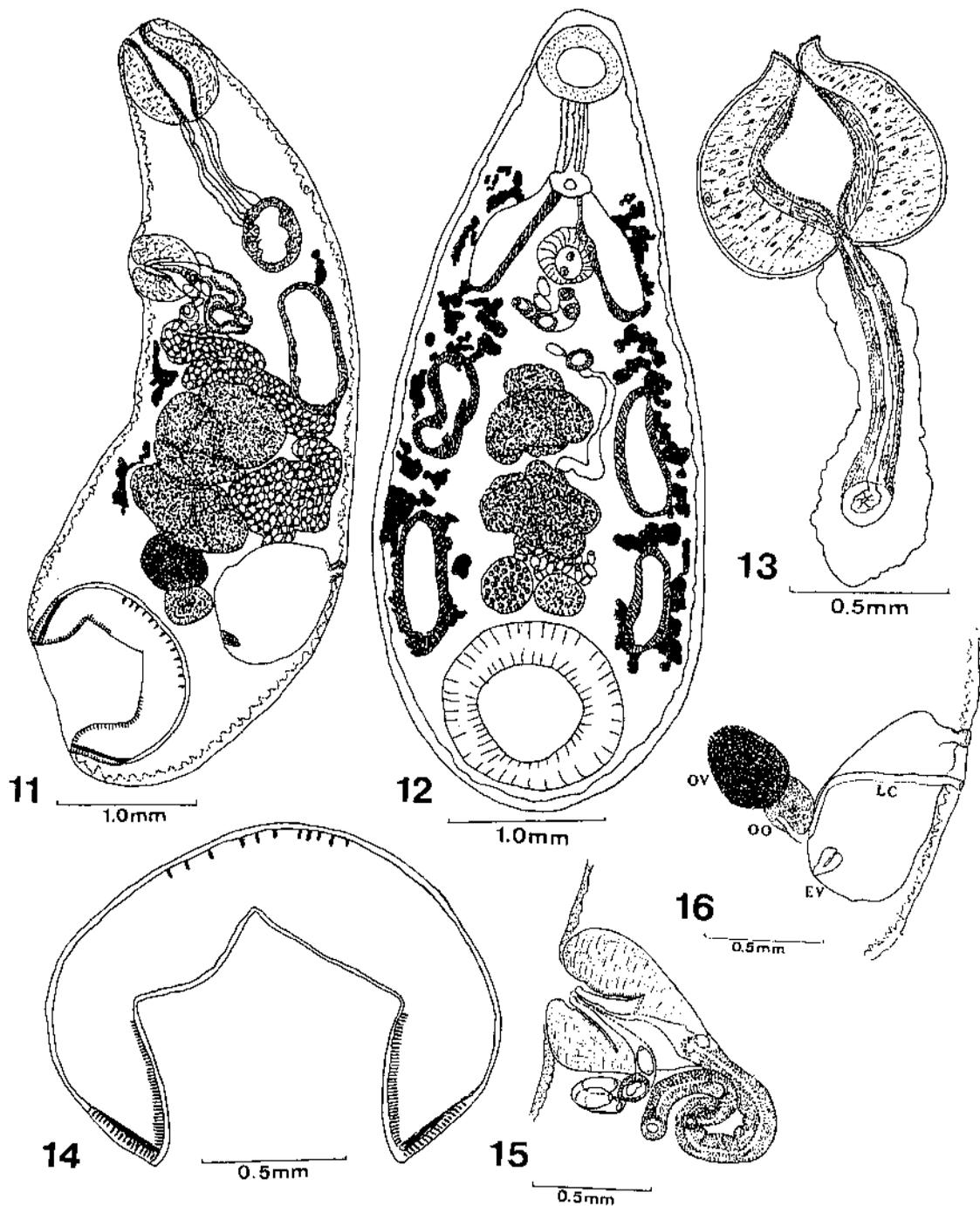
Habitat: rumen and reticulum.

Localities: States of Pará, Rondonia, Roraima, Maranhão, Piauí and Ceará - Brazil

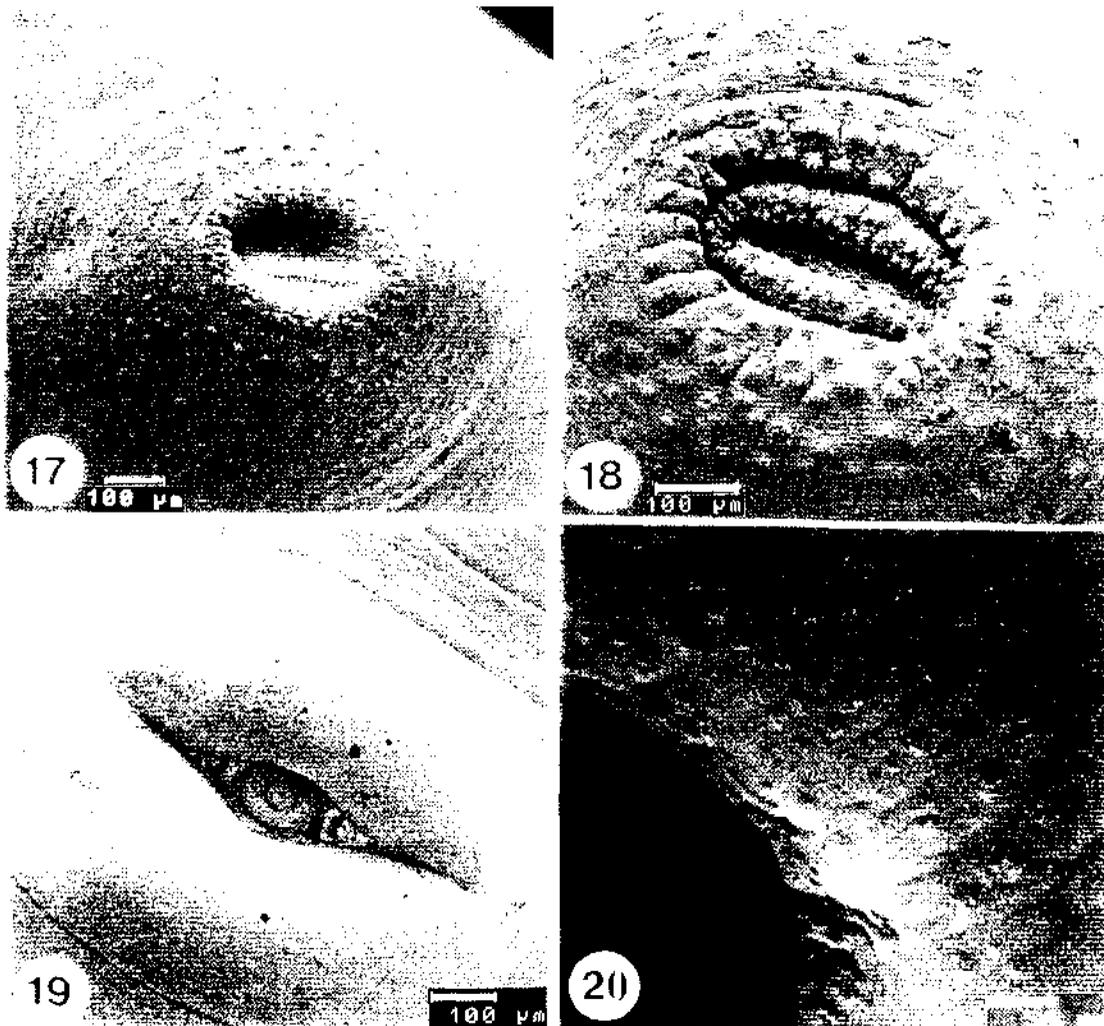
Specimens: Deposited in the Helminthological Collection of The Institute Oswaldo Cruz, Rio de Janeiro, Brazil, nº 33784 a d

Body conical, slightly recurved dorso-ventrally (Fig. 27). Measurements: 6.62 (5.26 - 7.38) in length by 2.24 (1.90 - 2.43) in width (frontal section) (Figs. 21 - 22).

Pharynx of the *Calicophoron* type, measuring 0.80 (0.64 - 1.02) in length by 0.78 (0.63 - 0.91) in width (frontal section), and 0.81 (0.71 - 0.93) in length by 0.63 (0.52 - 0.76) in width (sagittal section) (Fig. 23). The ratio pharynx length to body length is 1:32.32. Esophagus 0.73 (0.68 - 0.78) in length by 0.27 (0.25 - 0.30) in width (frontal section), and 0.55 (0.40 - 0.77) in length by 0.25 (0.17 - 0.31) in width (sagittal section), with fine uniformly developed muscular layer, not forming bulb. Caeca with undulations, terminating at the level of anterior margin of the acetabulum. Acetabulum well developed, sub-ventral, of the *Cotylophoron* type (Figs. 21 - 22), measuring 1.56 (1.39 - 1.84) in length by 1.61 (1.42 - 1.93) in width (frontal section), and 1.56 (1.17 - 1.85) in length by 1.46 (1.10 - 1.77) in depth (dorso-ventral section); with the following muscular units (Fig. 24): MEC = 10 (7 - 12), DEC = 17 (14 - 20), DIC = 53 (45 - 57), VEC = 14 (11 - 15) and VIC = 55 (43 - 60). The ratio acetabulum / body length is 1 : 4.24 and the ratio pharynx length / acetabulum width is 1: 2.0. Genital sucker measures 0.69 (0.59 - 0.78) in length by 0.79 (0.61 - 0.92) in width (frontal section), and 0.78 (0.65 - 0.93) in length by 0.75 (0.68 - 0.88) in depth (sagittal section). The ratio genital sucker length to body length is 1: 4.17 and the ratio genital sucker / acetabulum length is 1 : 2.26. Terminal genitalia of the *Cotylophoron* type, with



Cotylophoron fülleborni Nasmark, 1937. Figs. 11 – 12: Dorso-ventral and lateral sections; Fig. 13: *Calicophoron* type pharynx and esophagus without bulb; Fig. 14: *Cotylophoron* type acetabulum; Fig. 15: *Cotylophoron* type terminal genitalium; Fig. 16: Ovary, oötype and Laurer's canal crossing the excretory vesicle (OV = ovary, OO = oötype, EV = excretory vesicle, LC = Laurer's canal).



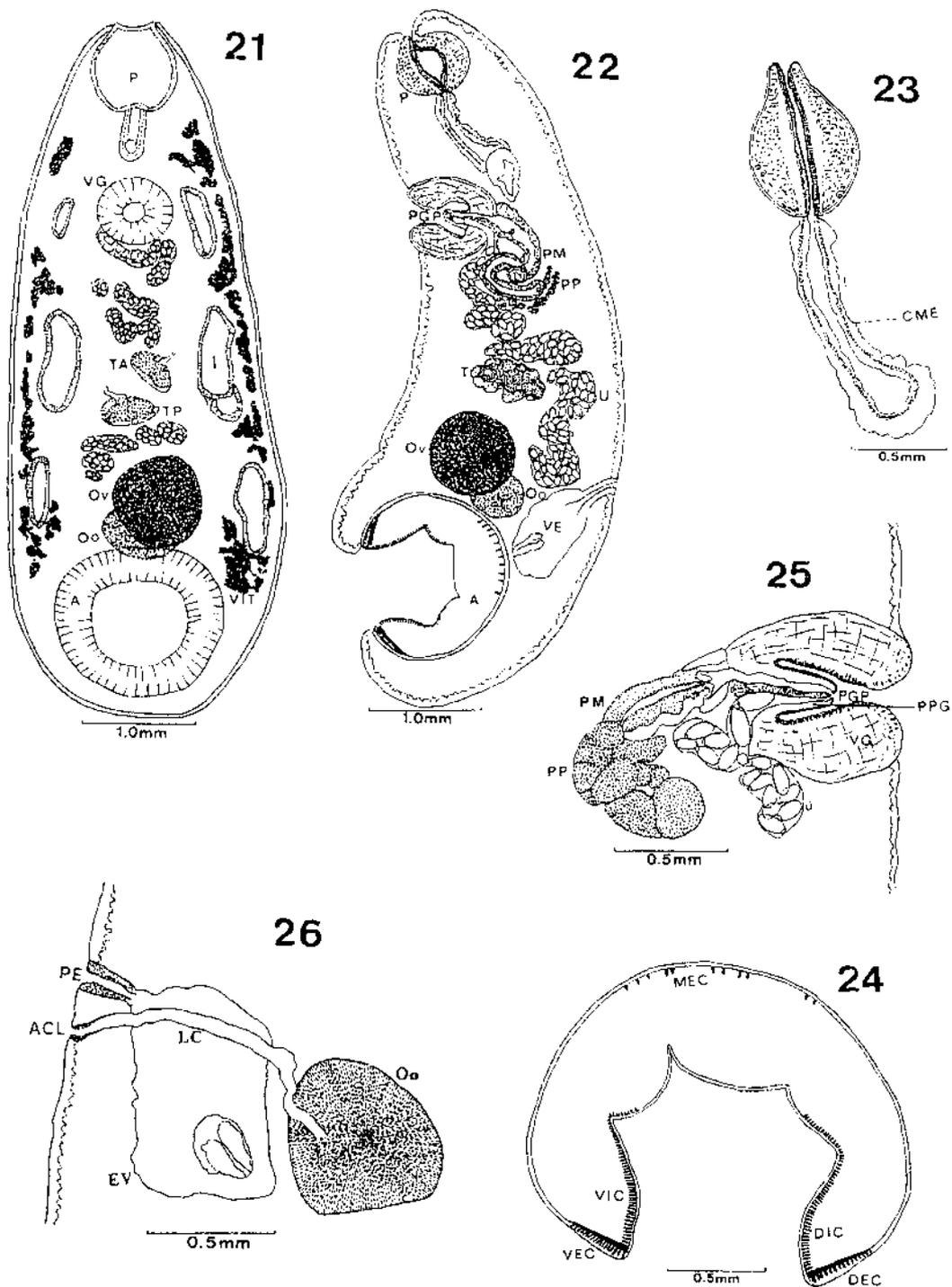
Cotylophoron fülleborni Nasmark, 1937 (Observations under SEM). Figs. 17 - 18: Circles of small papillae around the oral opening; Fig. 19: Genital opening without papillae; Fig. 20: Small papillae irregularly distributed in the acetabular region.

genital papilla well developed, measuring 0.28(0.24 - 0.38) in length; genital pore post-bifurcal (Fig. 25). Lobed and small testes obliquely tandem; anterior testis 0.43(0.32 - 0.53) in length by 0.56(0.45 - 0.71) in width (frontal section) and 0.44(0.34 - 0.71) in length by 0.41(0.33 - 0.51) in width (dorso-ventral section); posterior testis 0.41(0.33 - 0.53) in length by 0.63(0.51 - 0.76) in width (frontal section), and 0.37(0.23 - 0.51) in length by 0.63(0.52 - 0.76) in width (sagittal section). Pars musculosa well developed; pars prostatica weakly developed. Ovary posterior to testes and measures 0.76(0.61 - 0.86) in length by 0.66(0.49 - 0.88) in width (frontal section), and 0.71(0.52 - 0.81) in length by 0.76(0.63 - 0.71) in width (dorso-ventral section). The ratio ovary / anterior testis length is 1 : 1.77 and ovary / posterior testis is 1 : 1.85 in frontal section, and 1 : 1.61 (anterior) and 1 : 1.92 (posterior) in sagittal section. Uterus with ascendant

loops. Mehlis' gland (oötype) 0.49(0.44 - 0.58) in length by 0.54(0.47 - 0.72) in width (frontal section), and 0.52(0.45 - 0.58) in length by 0.56(0.52 - 0.64) in width (sagittal section). Laurer's canal traverses excretory vesicle (Fig. 26). Viteline follicles in the lateral fields, sometimes coming on the intra-caecal field. Eggs operculated 0.14(0.13 - 0.16) in length by 0.07(0.06 - 0.08) in width.

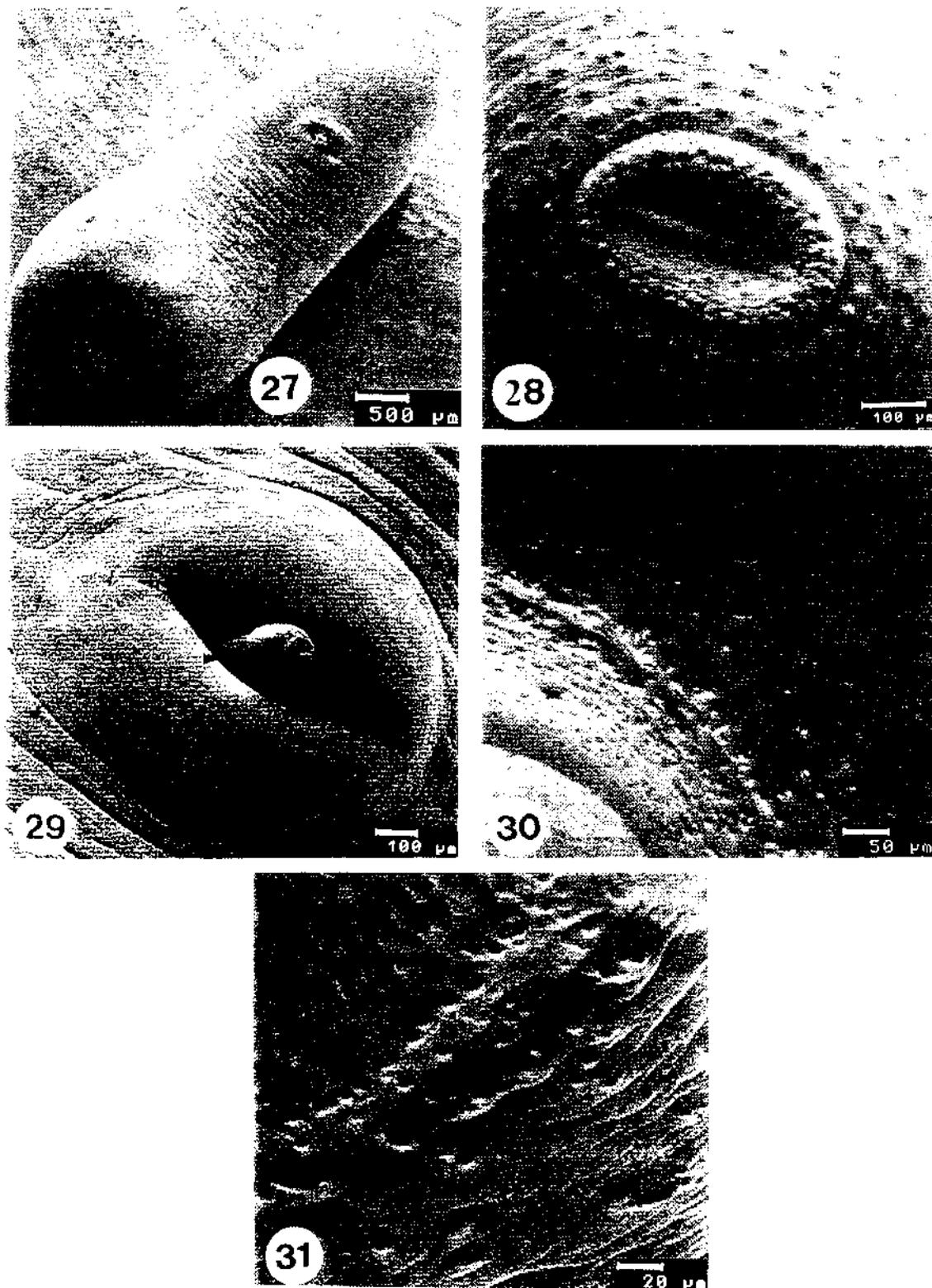
Examination under the SEM revealed circles of small papillae around the buccal aperture (Fig. 28) and small papillae irregularly disposed in the acetabulum region (Figs. 30 - 31). No papillae were found around the genital aperture (Fig. 29).

Comments: In MUKHERJEE & CHAUHAN (1965) the testes were not lobed, but in our material they look as lobed testes. Despite of some variations, the description is highly consistent to those of MUKHERJEE & CHAUHAN (1965), EDUARDO (1985) and SEY (1991).



Cotylophoron bareilliensis Mukherjee and Chauhan, 1965. Figs. 21 - 22: Lateral and dorso-ventral sections; Fig. 23: *Calicophoron* type pharynx and esophagus without bulb; Fig. 24: *Cotylophoron* type acetabulum; Fig. 25: *Cotylophoron* type terminal genitalium; Fig. 26: Laurer's canal crossing excretory vesicle.

(A = acetabulum, ACL - opening of the Laurer's canal, CME = musculature uniformly thickened in the esophagus), DEC = dorsal exterior circular muscle units, DIC = dorsal interior circular muscle units, I = cacca, LC = Laurer's canal, MEC = Median circular muscle units, OO = ootype, OV = ovary, P = pharynx, PE - Excretory pore, PGP = genital papilla, PM = pars musculosa, PP = pars prostatica, PPG = genital pore, T - testicle, U - uterus, TA - anterior testicle, TP = posterior testicle, VE = excretory vesicle, VEC - ventral exterior circular muscle units, VG - genital sucker, VIC = ventral interior circular muscle series).



Cotylophoron bareilliensis Mukherjee and Chauhan, 1965 (Observations under SEM). Fig. 27: The whole parasite; Fig. 28: Small papillae around the buccal opening; Fig. 29: Genital aperture ; Figs. 30 - 31: Small papillae in the acetabular region.

***Cotylophoron travassosi* Costa & Guimarães, 1992**

(Figs. 32 - 41)

Host: Cattle (*Bos indicus*), goat (*Capra hircus*) and sheep (*Ovis aries*)

Habitat: rumen and reticulum

Localities: States of Pará, Amazonas, Rondonia, Tocantins, Maranhão, Piauí and Ceará - Brazil

Specimens: Deposited in the Helminthological Collection of the Institute Oswaldo Cruz, Rio de Janeiro, n° 33782 a d

Body smooth, conical, slightly incurved over the ventral face, measuring 5.08(4.70 - 5.51) in length by 3.10 (2.67 - 3.30) in width (sagittal section) and 5.06(4.70 - 5.59) in length by 3.39(2.99 - 3.56) in width at the acetabulum level ((frontal section) (Figs. 32 - 33). Pharynx of the *Calicophoron* type, 0.66(0.57 - 0.74) in length by 0.79(0.77 - 0.88) in width (frontal section) (Fig. 34). Ratio pharynx length to body length is 1 : 7.55 (frontal section). Esophagus 0.55(0.40 - 0.72) in length by 0.30(0.27 - 0.36) in width (sagittal section) with uniformly developed muscular layer, not forming bulb (Fig. 34). Acetabulum well developed, of the *Cotylophoron* type, sub-ventral (Figs. 32 - 33) measuring 1.42(1.29 - 1.53) in length by 1.82(1.70 - 1.90) in depth (dorso-ventral section) and 1.73(1.68 - 1.85) in length by 1.77(1.66 - 1.92) in frontal section, with the following muscular units (Fig. 35) : MEC = 19(18 - 20), DEC = 18(16 - 20), DIC = 41(37 - 48), VEC = 15(12 - 19) and VIC = 39(36 - 48). Ratio acetabulum / body length is 1 : 2.92 (frontal section) and ratio pharynx length / acetabulum width is 1 : 2.64. Genital sucker 0.83(0.60 - 0.93) in depth by 0.84(0.75 - .92) in width (sagittal section), and 0.80(0.66-0.90) in length by 0.93(0.74-1.01) in width (frontal section). Ratio genital sucker / acetabulum lengths is 1 : 2.16. Terminal genitalium of the *Cotylophoron* type; genital papilla well developed, 0.30(0.24 - 0.36) in length, with genital pore post-bifurcal (Fig. 36). Lobed testes disposed diagonally, just above the ovary; anterior testis 0.48(0.40 - 0.59) in length by 0.83(0.64 - 1.05) in width (dorso- ventral section), and 0.46(0.40 - 0.52) in length by 0.65(0.51 - 0.78) in width (frontal section); posterior testis 0.48(0.35 - 0.63) in length by 0.82(0.73 - 0.94) in width (sagittal section) and 0.41(0.35 - 0.52) in length by 0.64(0.54 - 0.70) in width (frontal section). Pars muscosa and pars prostatica well developed. Ovary just after the testes, 0.87(0.73 - 1.05) in length by 1.05(0.88 - 1.14) in width (dorso-ventral section) and 0.75(0.58 - 0.89) in length by 0.88(0.60 - 1.04) in width (frontal section). Ratios among ovary length to testes length are 1 : 1.63 (anterior) and 1 : 1.83 (posterior) in frontal section and 1 : 1.81 (anterior and posterior) in dorso-ventral section. Ootype (Mehlis' gland) 0.56(0.40 - 0.64) in length by 0.65(0.51 - 0.76) in width (sagittal section) and 0.49(0.34 - 0.61) in length by 0.73(0.53 - 0.87) in width (frontal section). Uterus with ascendent loops.

Laurer's canal traverses excretory vesicle (Fig. 37). Viteline follicles in the lateral fields from the posterior margin of pharynx to the lateral of acetabulum. Eggs operculated 0.14(0.12 - 0.15) in length by 0.07(0.06 - 0.08) in width.

Examination under SEM revealed circles of papillae around the buccal aperture (Figs. 38-39) a few larger than those observed in *C. panamensis*, *C. fülleborni* and *C. barelliensis*. Around the genital aperture (Fig. 40) there are observed papillae. Small and irregularly disposed papillae are observed in acetabulum region (Fig. 41).

Comments: COSTA & GUIMARÃES (1992) described esophagus with bulb, we are not in accordance, because in the esophagus it is clearly seen a fine uniformly developed muscular layer, not forming bulb. Besides this, the description is highly consistent to that of COSTA & GUIMARÃES (1992).

***Cotylophoron jacksoni* Nasmark, 1937**

(Figs. 42 - 52)

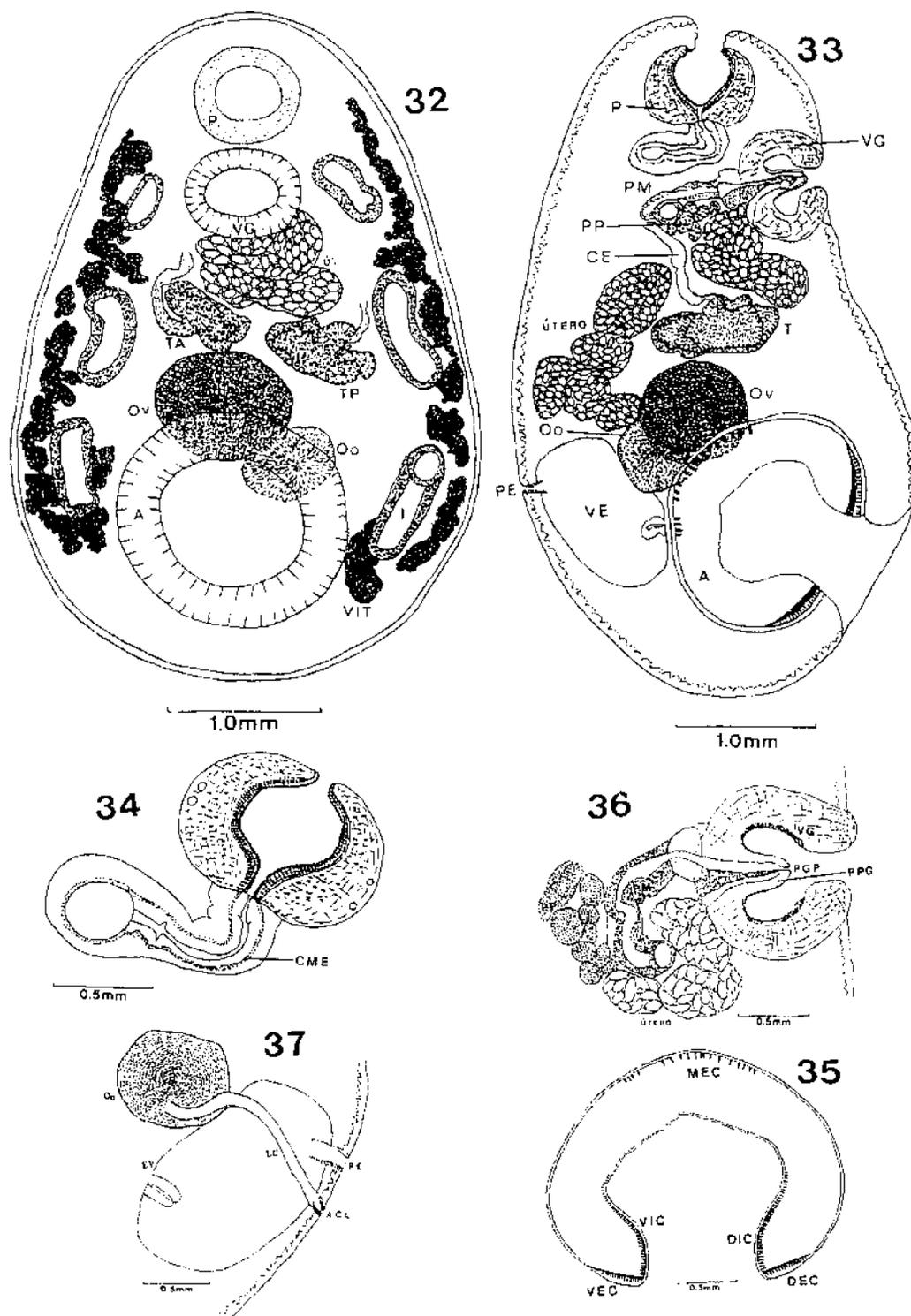
Host: Cattle (*Bos indicus*) and goat (*Capra hircus*)

Habitat: Rumen and reticulum

Localities: States of Pará, Rondônia and Roraima - Brazil

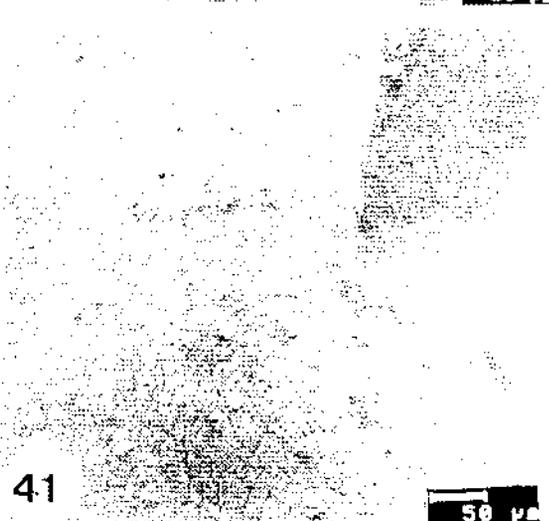
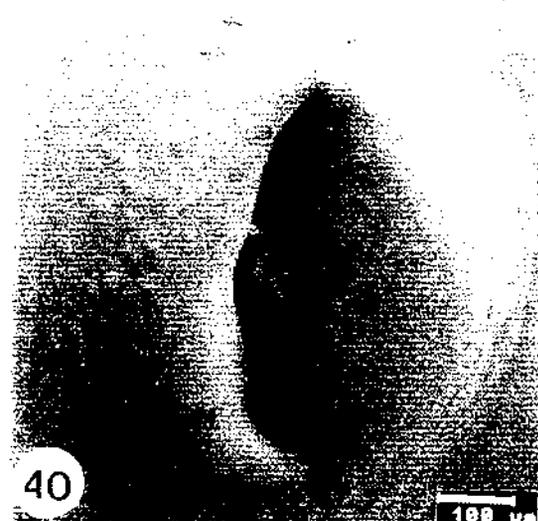
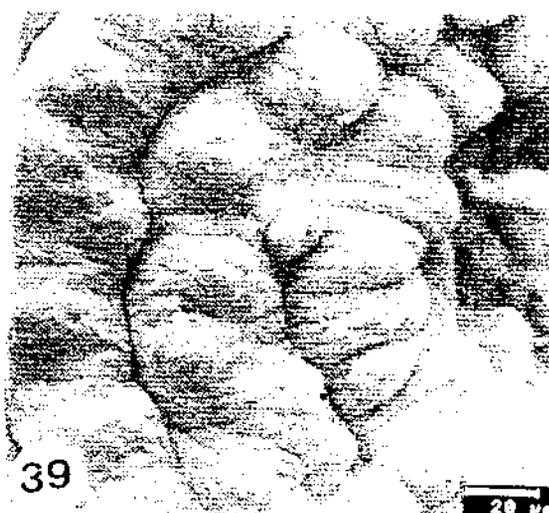
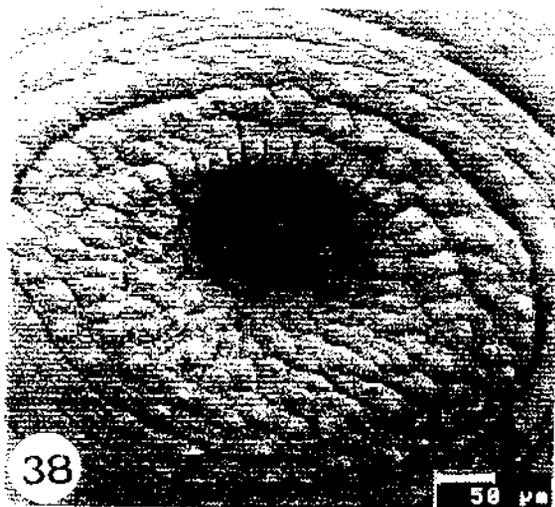
Specimens: Deposited in the Helminthological Collection of the Institute Oswaldo Cruz, Rio de Janeiro, Brazil, n° 33785 a d

Body conical, dorsal surface slightly recurved and ventral surface almost straight, 7.15(6.22 - 8.06) in length by 2.80(1.98 - 3.76) in width (lateral section), and 6.68(6.04 - 7.50) in length by 2.68(2.13 - 3.14) in width (dorso-ventral section) (Figs. 42 - 43). Pharynx of the *Calicophoron* type, 0.99(0.76 - 1.56) in length by 0.86(0.76 - 0.96) in width (frontal section) and 0.97(0.94 - 1.02) in length by 0.57(0.51 - 0.64) in width (sagittal section) (Fig. 44). Esophagus 0.56(0.40 - 0.70) in length by 0.29(0.24 - 0.34) in width (dorso-ventral section) with uniformly developed muscular layer, not forming bulb, but slight increase of volume may be seen near caeca origin. Caeca with undulations terminating near the lateral of acetabulum. Acetabulum well developed, sub-ventral, of the *Cotylophoron* type (Figs. 42 - 43), 1.61(1.39 - 1.90) in length by 1.58(1.17 - 1.88) in width (frontal section), with the following muscular units (Fig. 45): DEC = 15 (13 - 17), DIC = 39 (37 - 45), VEC = 15 (12 - 17), VIC = 37 (31 - 42) and MEC = 9 (8 - 9). Ratio acetabulum / body length of 1 : 4.47. Genital sucker 0.67(0.65 - 0.81) in length by 0.92(0.75 - 1.06) in width (lateral section); ratio genital sucker / acetabulum length of 1 : 2.0. Terminal genitalia of the *Cotylophoron* type (Fig. 46); genital papilla well developed, 0.34(0.27 - 0.39) in length, presenting near the extreme of the free end a ring followed by a papilliform projection in which the male genital pore opens, while the female genital pore opens separately, more where the papilliform is inserted. Testes lobed, located almost straightly tandem, the anterior measuring



Cotylophoron travassosi Costa & Guimarães, 1992. Figs. 32 - 33: Lateral and dorso-ventral sections; Fig. 34: *Calicophoron* type pharynx and esophagus without bulb; Fig. 35: *Cotylophoron* type acetabulum; Fig. 36: *Cotylophoron* type terminal genitalium; Fig. 37: Laurer's canal crossing excretory vesicle.

(A = acetabulum, CE = efferent canal, CME = musculature uniformly thickened in the esophagus, DEC = dorsal external circular muscle units, DIC = dorsal internal circular muscle units, I = caeca, MEC = medial external circular muscle units, OO = oötype, OV = ovary, P = pharynx, PE = excretory pore, PGP = genital pore, PM = pars musculosa, PP = pars prostatica, PPG = genital papilla, TA = anterior testicle, TP = posterior testicle, U = uterus, VE = Excretory vesicle, VEC = ventral external circular muscle units, VG = genital sucker, VIC = ventral internal circular muscle units, VIT = vitelline follicle).



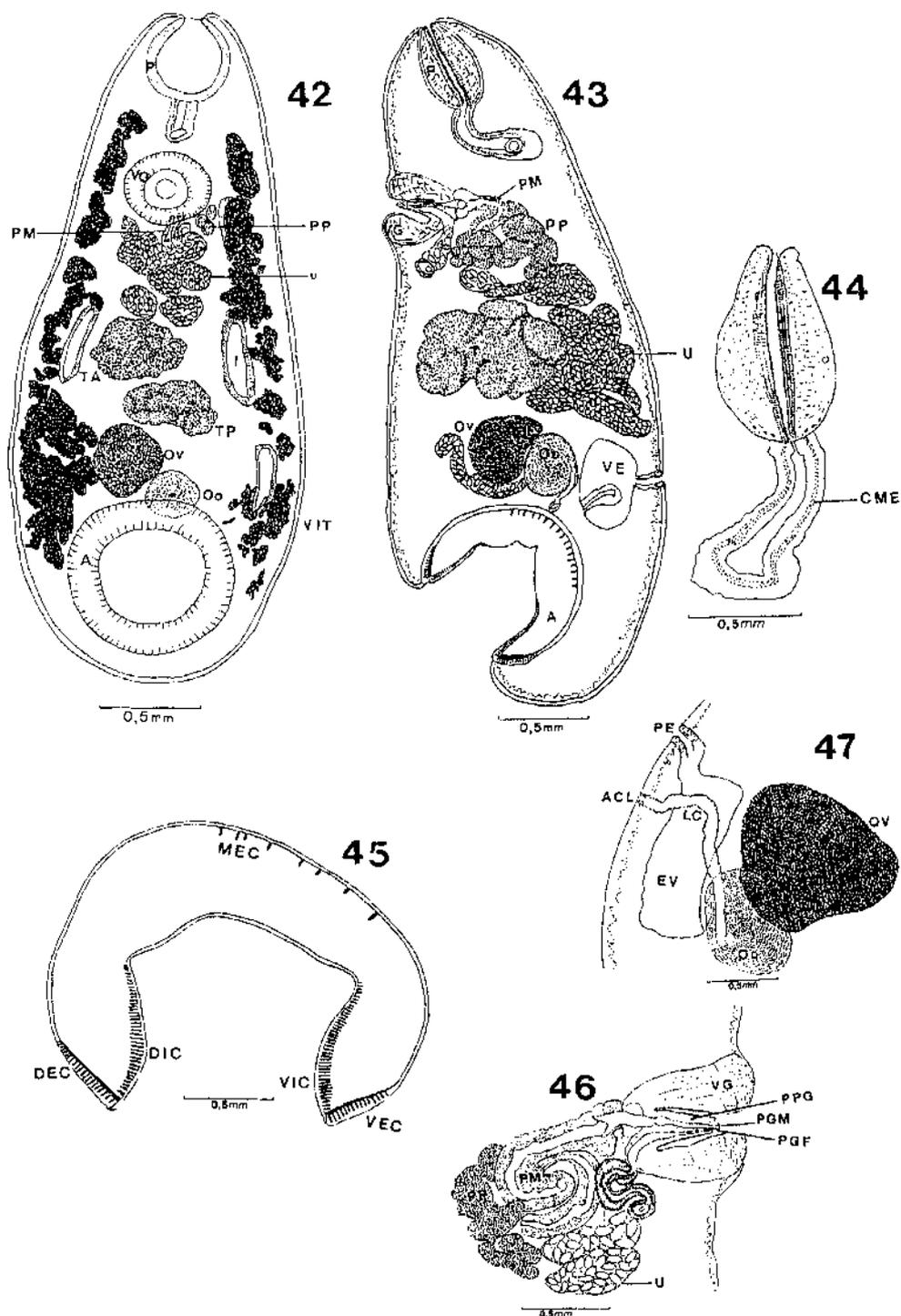
Cotylophoron travassosi Costa & Guimarães, 1992 (Observations under SEM). Figs. 38 - 39: Circles of papillae around the buccal opening; Fig. 40: Genital aperture with papillae; Fig. 41: Small papillae in the acetabular region.

0.74(0.46 - 1.00) in length by 1.04(0.7 - 1.08) in width (frontal section), and 0.81(0.65 - 0.99) in length by 1.30(1.13 - 1.48) in width (sagittal section); the posterior 0.77(0.48 - 1.18) in length by 0.96(0.54 - 1.22) in width (frontal section), and 0.88(0.60 - 1.04) in length by 1.33(0.79 - 1.67) in width (sagittal section). Pars musculosa and pars prostatica well developed. Ovary 0.83(0.70 - 0.93) in length by 0.70(0.56 - 0.79) in width (frontal section) and 0.79(0.58 - 0.89) in length by 0.85(0.64 - 1.06) in width (sagittal section). Ratios ovary / testes length of 1: 1.17 and 1: 1.28 (anterior) respectively frontal and sagittal sections and to the posterior 1: 1.15 (frontal section), and 1: 1.35 (sagittal section). Oötype (Mehlis' gland) 0.56(0.44 - 0.64) in length by 0.56(0.40 - 0.78) in width (frontal section), and 0.64(0.50 - 0.72) in length by 0.59(0.48

- 0.71) in width (sagittal section). Uterus with ascendent loops. Laurer's canal traverses excretory vesicle and opens near excretory pore (Fig. 47). Vitelline follicles fill lateral fields from near pharynx to lateral of the acetabulum. Eggs operculated 0.130(0.120 - 0.140) in length by) 0.074 (0.070 - 0.080) in width.

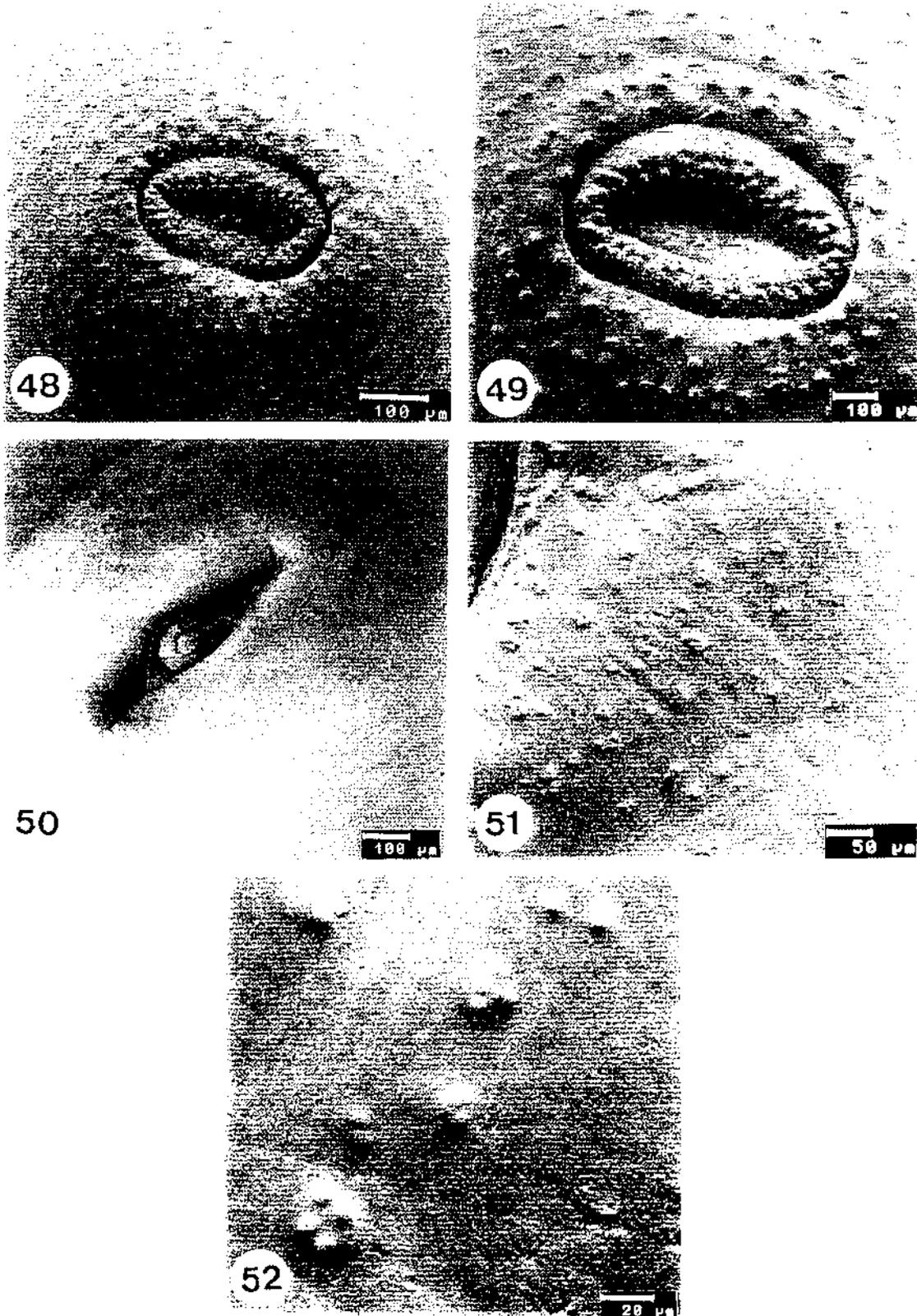
Examination under SEM revealed circles of small papillae regularly or not spaced around the oral aperture (Figs. 48 - 49); very discrete papillae around the genital opening (Fig. 50), sometimes looking as surface almost smooth. Small, irregularly disposed papillae are seen in the region of the acetabulum (Fig. 51 - 52).

Comments: The worms we examined present the feature as described by NASMARK (1937). Some differences in



Cotylophoron jacksoni Nasmark, 1937. Figs. 42 - 43: Lateral and dorso-ventral sections; Fig. 44: *Calicophoron* type pharynx and esophagus without bulb; Fig. 45: *Cotylophoron* type acetabulum; Fig. 46: *Cotylophoron* type terminal genitalium; Fig. 47: Laurer's canal crossing excretory vesicle.

(A- acetabulum, CL - Laurer's canal pore, CME = musculature uniformly thickened in the esophagus, DEC = dorsal circular external muscle units, DIC = dorsal circular internal muscle units, I = caeca, LC - Laurer's canal, MEC = Medial circular external muscle units, OO - oötype, OV = ovary, P - pharynx, PE = excretory vesicle pore, PGI = female genital pore, PGM = male genital pore, PM - pars muscosa, PP = pars prostatica, PPG - genital papilla, T = testicle, TA - anterior testicle, TP = posterior testicle, U = uterus, VE and EV = excretory vesicle, VEC = ventral circular external muscle units, VG = genital sucker, VIC = ventral circular internal muscle units, VIT = vitelline follicle).



Cotylophoron jacksoni Nasmark, 1937 (Observations under SEM). Fig. 48 - 49: Circles of small papillae around the buccal opening; Fig. 50: Genital opening; Figs. 51 - 52: Small papillae in the acetabular region.

measures were noted when compared with EDUARDO (1985) and SEY (1991). To EDUARDO (1985) the genital pore is post-bifurcal, while to us the male and female genital pores open separately (not post-bifurcal). In this aspect it remember *C. panamensis*.

This parasite was known only in Africa.

SUMÁRIO

Foram estudados trematódeos paramfistomídeos parasitos de ruminantes domésticos de Estados das regiões Nordeste e Norte do Brasil. Estão sendo notificadas, pela primeira vez no Brasil, três espécies da família Paramphistomatidae: *Cotylophoron panamensis*, *Cotylophoron jacksoni* e *Cotylophoron fülleborni*, todos colhidos do rumen e do retículo (principalmente) de seus hospedeiros. *C. panamensis* foi colhido de bovinos (*Bos indicus*) do Estado de Rondônia; *C. jacksoni* foi encontrado nos Estados de Roraima, Rondônia e do Pará e seus hospedeiros eram bovinos (*Bos indicus*) e caprinos (*Capra hircus*); e *C. fülleborni* foi encontrado parasitando bovinos (*Bos indicus*) e caprinos (*Capra hircus*) nos Estados de Roraima, Pará e Maranhão. É feita nova descrição destas espécies e, também, de *Cotylophoron bareilliensis* e de *Cotylophoron travassosi*, incluindo observações ao microscópio eletrônico de varredura (MEV).

PALAVRAS-CHAVE: *Cotylophoron panamensis* - *Cotylophoron fülleborni* - *Cotylophoron jacksoni* - *Cotylophoron bareilliensis* - *Cotylophoron travassosi* - Trematoda - Paramphistomidae - Bovino - Caprino - Ovino - Brasil.

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