Freitasia teixeirai gen. n. et sp. n. and Other Nematodes Parasitizing Anolis equestris (Squamata: Iguanidae)

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Abstract. We found seven nematode species parasitizing the host Anolis equestris in Cuba. Of these, Oswaldocruzia anolisi sp. n. and Freitasia teixeirai gen. n. et sp. n. are taxons new for science. The other species — Cyrtosomum longicaudatum Brennes et Bravo-Hollis, 1960; Physaloptera squamatae Harwood, 1932; Porrocaecum sp. (larvae); Oswaldocruzia brevicaudata (Rodhain et Vuylsteke, 1937) and Piratuba sp. are first recordings from this host. Keys for determining the genera of the subfamily Rhabdocoelinae and for the species of the genus Cyrtosum are added.

Until now no detailed studies have been available on the helminth fauna of the host Anolis equestris Merrem, an endemic species of Cuba. The only information was given by Pérez VíGUERAS (1936), who recorded the findings of larval stages of a nematode in this host and designated them Anisakinae sp. (?).

In the years 1965—1966, we collected parasitic worms in post mortem examinations of 40 specimens of A. equestris.*) In this paper we present the results of a systematic elaboration of our material, which offers new knowledge on the helminth fauna of this host and on the geographical distribution of some species.

STRONGYLOIDES

Fam. Trichostrongylidae Leiper, 1912

1. Oswaldocruzia—anolisi sp. n. Fig. 1

Host: A. equestris Merrem.
Location: Stomach and intestine.
Locality: Sabanilla, La Florida and Cayo Güin-Baracoa (province Oriente), La Vega-Isla de Pinos.

*) Our thanks are due to Dr. ORLANDO GARRIDO, research officer of the Biological Institute of the Cuban Academy of Sciences, Havana, for providing us with the host material.
Fig. 1. *Oswaldocruzia anolisi* sp. n. A - anterior extremity (dorsal view); B - anterior extremity (lateral view); C, D - vulva region (detail); E - vulva region (general view); F - spicule; G - bursa copulatrix (ventral view); H - posterior extremity of female (lateral view); I - location and shape of cervical papillae in the species *Oswaldocruzia lenteixrai* Pérez Viguera, 1938.

Of a total of 40 *A. equestris* examined, this species was found in 9 hosts, intensity of invasion 1 - 2 nematodes in one host.

**Description:** Body whitish; on the anterior extremity of the body the cuticle forms a cephalic vesicle, the lower half of which bears distinct transverse striations. The
longitudinal cuticular cordon, numbering 38–45, are especially distinct in the posterior half of the body. Mouth terminal surrounded by 4 small papillae. Buccal cavity small. Oesophagus straight, slightly extended in its lower part. Large cuticular lateral alae are running from close under the cephalic vesicle along the anterior third of the body. Their maximum width is 0.023–0.030 mm. A pair of long pedunculate papillae rises from approximately one half of the oesophagus length.

**Male:** Length of body 8.01–8.68 mm, maximum width 0.18–0.19 mm. Width of anterior portion with cephalic vesicle 0.054 to 0.058 mm. Length of vesicle 0.076 to 0.081 mm. Nerve ring situated at a distance of 0.175–0.191 mm from the end of the anterior portion, excretory pore 0.195 mm and cervical papillae 0.269–0.284 mm from anterior end. Length of oesophagus 0.382–0.430 mm, maximum width 0.031–0.058 mm. Spicle of equal length and shape, well pseudo-chitinized. Their distal end consists of three separate extensions, each covered with a fine, cuticular membrane, into which the distal spicle ends extend like rays. Spicle length 0.183–0.206 mm, maximum width 0.023 to 0.031 mm. The posterior extremity terminates in a typical bursa copulatrix with a fine, dentate margin. The bursa consists of two wide lateral lobes and of one smaller, distinctly separated dorsal lobe. The rays are placed in a way, which is characteristic for the genus. Two long hook-like curved slender branches extend from the lower third of the stem of the dorsal ray. The central part of the stem of the dorsal ray is further extended and its distal part bifurcates. The genital cone is simple, conical, length 0.028–0.033 mm.

**Female:** Length of body 7.83–15.30 mm, maximum width 0.23–0.28 mm. Length of cephalic vesicle 0.085 to 0.136 mm, maximum width 0.058–0.105 mm. Length of oesophagus 0.436–0.507 mm, maximum width 0.054–0.070 mm. Nerve ring situated at a distance of 0.152–0.261 mm, the excretory pore at 0.175–0.335 mm from anterior end of body. Eggs with thin walls, their internal content cleaved into numerous blastomeres. Size of eggs 0.068–0.074 mm by 0.035–0.042 mm. Vulva, situated at a distance of 2.30–5.28 mm from posterior end of body, forms a transverse slit; it is bordered by a typically elongated anterior lip and a smaller posterior vulval lip. Length of ovjector 0.78–1.01 mm. Posterior extremity conically attenuated, ending in a spine of 0.019 mm in length. Anus placed at a distance of 0.296 to 0.351 mm from posterior extremity.

**Discussion.** In the light of information obtained from monographs by Skrjabin, Shikhobalova, Shults (1954), Yamaguti (1961) and from papers by Gupta (1960), Chabaud and Brygo (1962) and Hörchner (1963) the genus Oswaldocruzi Travassos, 1917 comprises a total of 34 nematode species, parasitizing mainly hosts of the order Amphibia and less frequently hosts of the order Reptilia. The new nematode species of this genus - *O. anolisi* n. sp. described in this paper belongs to the morphological group of species with cuticular cervical alae. To this group belong the species: *O. bialata* (Molin, 1861); *O. lopesi* Freitas et Lent, 1938; *O. picipiens* Walton, 1929; *O. problematica* Iwanitzky, 1940; *O. skrjabini* Travassos, 1937; *O. socialis* Morishita, 1926 and *O. yezonensis* Morishita, 1926.
The species *O. anolisi* n. sp. differs from the European and Asiatic species of this morphological group (*O. bialata, O. problematica, O. skrjabini, O. socialis* and *O. yezonensis*) principally in the shape of the spicules (from *O. problematica, O. socialis* and *O. yezonensis* also significantly in the spicule length). Another differentiating feature is the shape of the dorsal ray and the vulva (with the exception of the species *O. socialis*). From the South-American species *O. lopesi, O. anolisi* n. sp. differs in the shape of the dorsal ray, the vulva and in the majority of body sizes, especially the length of the spicules. From the North-American species *O. pipiens, O. anolisi* n. sp. differs in the shape of the dorsal ray, in the form of the vulva and in the length of the cervical papillae.

By the shape of the spicules, the dorsal rib and the vulva, the species *O. anolisi* n. sp. resembles the species *O. lenteixeirai* Pérez Vigueras, 1938, redescribed in detail by Baruš and Moravec (1967) from material of the typical host *Hyla insulsa* — *H. septentrionalis*. However, no cervical alae are developed in the species *O. lenteixeirai* and also the shape of the cervical papillae and their location are different.

The species name of the nematode *O. anolisi* sp. n. has been deduced from the generic name of its definitive host.

The type, allotype and part of the paratypes are deposited in the collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague. The remaining paratypes (2 male and 2 female worms) are in the collection of the Zoological Museum of the Humboldt University in Berlin and in the Central collection of the Biological Institute of the Cuban Academy of Sciences in Havana (2 male and 3 female worms).

**OXYURATA**

Fam. Atractidae Travassos, 1919

2. *Cyrtosomum longicaudatum* Brennes et Bravo - Hollis, 1960

**Host**: *A. equestris* — a new host.
**Location**: large intestine.
**Locality**: La Florida and Sabanilla, Baracoa (province Oriente); Cueva de Paredones and Cayo Cantillas (province La Habana).

This nematode species was found in 8 *A. equestris*. Intensity of invasion 3—175 nematodes in one host.

**Remark**: The original description was given by Brennes and Bravo-Hollis (1960) from material obtained from the host *Ctenosaura similis similis* (Gray) from the localities Liberia (province Guanacaste) and Mata Limón (province Puntarenas) in Costa Rica. Our nematode material of this species is in full morphological agreement with the original description. The sizes of the nematodes in our collection extent greatly the present knowledge on the metric variability of this species (Tab. 1). From all up to date known species of the genus *Cyrtosomum* (*C. scelopori*,

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C. penneri, C. reedi and C. heynemanii), also distributed in North- and Central America, the species C. longicaudatum differs principally in the length of the tail (in males and females) and in the number of the caudal papillae. A key to the species of the genus Cyrtosomum Gedoelst, 1919 has been added:

1. Caudal papillae 6 pairs (2–3 pairs precloacal, 3–4 pairs postcloacal) . . . . 2
   - Caudal papillae 7 and more pairs (3–4 pairs precloacal, 4–5 pairs postcloacal) 3
2. Precloacal papillae 3 pairs, postcloacal papillae 3 pairs; length of long spicule 0.140 mm, of short spicule 0.120 mm . . . . . C. sclopori Gedoelst, 1919
   - Precloacal papillae 2 pairs, postcloacal papillae 4 pairs; length of long spicule 0.110–0.138 mm, short spicule 0.088–0.116 mm . . C. penneri Gambino, 1957
<table>
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<th>Authors</th>
<th>Our data</th>
<th>After Brennes and Bravo-Hollis (1960)</th>
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<tr>
<td></td>
<td>Male</td>
<td>Female</td>
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<td><strong>Measurements</strong></td>
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<tr>
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<td>1.98 - 2.34</td>
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<td>Body width</td>
<td>0.109 - 0.163</td>
<td>0.167 - 0.331</td>
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<tr>
<td>Length of muscular oesophagus</td>
<td>0.261 - 0.351</td>
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<td>Length of glandular oesophagus</td>
<td>0.109 - 0.132</td>
<td>0.078 - 0.132</td>
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<tr>
<td>Length of bulb</td>
<td>0.066 - 0.081</td>
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<tr>
<td>Width of bulb</td>
<td>0.058 - 0.089</td>
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<td>Distance of nerve ganglion</td>
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<td>Distance of excretory pore</td>
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<td>3 - 4</td>
<td>—</td>
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<tr>
<td>Number of postcloacal papillae</td>
<td>4 - 5</td>
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<td>Length of bigger spicule</td>
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<td>Width of spicule</td>
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<td>Length of shorter spicule</td>
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<tr>
<td>Width of spicule</td>
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<tr>
<td>Distance of cloaca from end of tail</td>
<td>0.273 - 0.378</td>
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<td>Distance of vulva from end of tail</td>
<td>—</td>
<td>0.635 - 0.717</td>
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<td>Distance of anus from end of tail</td>
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<td>0.546 - 0.624</td>
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3. Number of caudal papillae 8 pairs (3—4 pairs precloacal, 4—5 pairs postcloacal). Distance of cloaca of males from end of tail 0.225—0.378 mm, distance of anus from end of tail in females 0.546—0.624 mm. 

C. longicaudatum Brennes et Bravo-Hollis, 1960

Number of caudal papillae 7 pairs (3 pairs precloacal, 4 pairs postcloacal); distance of male cloaca from end of tail less than 0.200, distance of female anus less than 0.300 mm. 

4. Distance of cloaca of males from end of tail 0.080 to 0.096 mm, distance of female anus 0.096—0.104 mm. 

C. heynermani Gambino, 1958

Distance of male cloaca from end of tail 0.128—0.160 mm, distance of female anus 0.144—0.240 mm. Length of long spicule 0.192—0.204 mm, of short spicule 0.088—0.096 mm. 

C. readi Gambino, 1968

ASCARIDATA

Fam. Stomachidae (Johnston et Mawson, 1945) Hartwich, 1957

3. Porrocaecum sp. (larvae)

Host: A. equestris.
Location: pulmonary and abdominal cavity (unattached).
Locality: Sabanilla, La Florida, Cayo Guín, Cabo Cruz,

Fig. 3. Porrocaecum sp. (larvae). A — anterior extremity (apical view); B — anterior extremity detail; C, D — anterior extremity (general view); E, F, G — posterior extremity (lateral view).
Mandinga-Baracoa (province Oriente) and Geiba del Agua (province La Habana).

Of a total of 40 *A. equestris* examined, larvae of this species were found in 15 hosts, intensity of invasion 1–10 larvae in one host.

**Description:** Small to medium size nematodes of yellowish colour. Cuticle with distinct transverse striation. Length of body 5.51—21.36 mm, maximum width 0.39—0.54 mm. Width of anterior extremity at the level of the lip anlage 0.10 to 0.14 mm. Mouth bearing three small lips and one larval tooth of 0.007—0.011 mm in length. Length of pharynx 0.071—0.160 mm. Length of oesophagus 0.765 to 1.424 mm. Length of ventriculus 0.195—0.391 mm, maximum width 0.124 to 0.142 mm. Length of forward directed intestinal appendix 0.284—0.605 mm. Nerve ring situated at a distance of 0.320—0.356 mm, excretory pore at 0.551—0.670 mm from anterior end of body. Posterior end conical. Anus placed at a distance of 0.142—0.178 mm from the end of the tail.

**Remark:** The larval stages of these nematodes, designated *Anisakidae* sp. larvae and recorded by Pérez Viguera (1936) seem to be identical with our findings. We assume that these larvae belong to the imaginal forms of nematodes, parasitizing birds of the order Falconiformes and Strigiformes. *A. equestris* is probably the reservoir host of our larvae named *Porrocaecum* sp., in which a form of growth called reservoir habituationism (Ryšavý, Baruš 1965) takes place.

SPIRURATA

Fam. Physalopteridae Leiper, 1932

4. **Physaloptera squamatae** Harwood, 1932

Fig. 4

**Host:** *A. equestris* — a new host.

**Location:** stomach.

**Locality:** Sabanilla-Baracoa (province Oriente).

Of a total of 40 *A. equestris* examined, this nematode species was found only in a single host (1 male worm).

**Description:** Nematodes of medium size, white colour, the cuticle with fine, transverse striation, prominently elevated at the anterior portion forming the cephalic collar. Two oval lips present, each bearing an external tooth and a small triple internal tooth. Length of body 9.43 mm, maximum width 0.42 mm. Width of anterior extremity with cephalic collar 0.13 mm. Oesophagus composed of two parts, length of anterior part 0.23 mm, of posterior part 1.87 mm. Nerve ring situated at a distance of 0.21 mm from anterior end of body, excretory pore at 0.32 mm. Lips 0.015 mm high, 0.054 mm wide. Posterior end of body straight, conical, surrounded by a caudal vesicle with a characteristic cuticular structure on the ventral side. Length of vesicle 0.78 mm, width 0.47 mm in dorsoventral position. Vesicle supported by 4 pairs of long pedunculate papillae situated laterally.
On the anterior lip of the cloaca there are three papillae, on the posterior lip two pairs of papillae. Four more pairs of papillae are situated on the tail between the cloaca and the end of the body. The two spicules are of moderately different length and of very different shape. Length of right spicule 0.187 mm, its proximal end is 0.019 mm wide, maximum width of the distal extended part is 0.030 mm. Length of left spicule 0.202 mm, its proximal end is 0.015 mm wide. Cloaca situated at a distance of 0.26 mm from the posterior end.

Fig. 4. Physaloptera squamatae Harwood, 1932. A — anterior extremity (lateral view); B — spicule and location round cloacal papillae; C — posterior extremity of male (ventral view).

Remark: Morgan (1943) assumes that the species Ph. squamatae Harwood, 1932 is in synonymy with the species Ph. obtusissima Molin, 1860. In our opinion the original description by Molin (1860) is not complete. Ortlepp’s redescription (1922) of the species Ph. obtusissima is very detailed, but clearly different from the original description of the species Ph. squamatae Harwood, 1932 especially in the sizes. Therefore, we consider Ph. squamatae a valid taxon. Our material is both metrically and morphologically in agreement with the original description of the species Ph. squamatae Harwood, 1932. There are slight differences in the length of the spicules (after Harwood 0.155—0.175 mm) and in the number of the postcloacal papillae on the tail (Harwood found only three pairs).

Fam. Rhabdochonidae Skrjabin, 1946

Genus: Freitasia gen. n.

Generic diagnosis: Rhabdochoninae. Body thin in its first third, gradually widening in backward direction. Mouth simple, without lips and papillae. Vestibulum tubiform, walls well pseudochitinized, of extreme length (much longer than the muscular

5. *Freitasia teixeirai* gen. n. et sp. n.  

**Host:** *A. aequus.*  
**Location:** small intestine.  
**Locality:** La Florida-Baracoa (province Oriente).  

Of a total of 40 *A. aequus* examined this species was found in a single host (two male worms).

**Description:** Small nematodes, colour of body whitish, cuticle with distinct transverse striation. Mouth simple without lips and papillae. Length of body 10.04 to 10.52 mm, maximum width 0.23—0.27 mm, width at cloaca level 0.11—0.12 mm. Vestibulum tubiform, well pseudochitinized, of fine transverse structure. Length of vestibulum 0.62—0.78 mm, width of anterior end 0.008, width of posterior end 0.012 mm. Oesophagus divided into two portions. Length of anterior muscular portion 0.21—0.23 mm, maximum width 0.028—0.031 mm. Length of posterior glandular portion 1.05 mm, maximum width 0.058 mm. Nerve ring placed at a distance of 0.68—0.78 mm, excretory pore of 0.86 mm from anterior end of body. Spicules distinctly different in length and shape. The longer spicule, bearing small cuticular alae in its central third, is 0.47—0.51 mm long, its proximal end is 0.011 mm wide. Shorter spicule measures 0.097 mm in length, width of its proximal end 0.027 mm. Cloaca situated at a distance of 0.22—0.23 mm from end of tail. Longitudinal cuticular bands extending along the ventral side of the posterior extremity. A small number of caudal papillae present (one precloacal and three postcloacal pairs).

**Discussion:** We have listed the species *Freitasia teixeirai* gen. n. et sp. n. on the grounds of its morphology to the family Rhabdochonidae Skrabin, 1964, subfamily *Rhabdochoninae* Travassos, Artigas et Pereira, 1928. After Yamaguti (1961) and Rasheed (1965), the subfamily Rhabdochoninae comprises the following genera: *Rhabdochona* Railliet, 1916; *Cystidicola* Fischer, 1798; *Ichthyophronema* Gnedina et Savina, 1930; *Johnstonmaeovia* Campana—Rouget, 1955; *Cephalophora* Layman, 1933; *Hepatinema* Rasheed, 1964; *Heptochona* Rasheed, 1965 and *Sterliadochona* Skrabin, 1946. In agreement with the findings of Moravec (1967) we consider the genus *Sterliadochona* in synonymy with the name *Cystidicoloides* Skinker, 1931. We have also listed the genus *Filochaeta* (Saidov, 1954) = syn. *Rhabdochonoides* Janiszewska, 1956 to the subfamily Rhabdochoninae. After Yamaguti (1961) this is the only typical genus of the subfamily Filochaetinae Yamaguti, 1961) = syn. *Rhabdochonoidinae* Janiszewska, 1956. In our opinion, the signs originally con-
Fig. 5. Freitasia teixeirai gen. n. et sp. n. A — anterior extremity of male (general view); B — proximal termination of long spicule; C — short spicule and distal termination of long spicule; D — anterior extremity (detail); E — posterior extremity of male (lateral view).

sidered by SAVDOV (1954) as taxons determining the subgenus (Filochona as subgenus of the genus Rhabdochona), are only of generic value and not suitable for the erection of an independent subfamily. Neither are the characteristic signs of JANISZEWSKA (1956) convenient for the determination of the subfamily.

The genus Freitasia n. gen. differs distinctly from all other genera of the subfamily Rhabdochoninae known up to date, especially in its extremely long vestibulum. The sign, differentiating it from the genera Rhabdochona, Filochona, Cystidicotoïdes, Comophoronema and Johnstonmaconsonia, is the anterior portion of the vestibulum of Freitasia n. gen., which is not funnel- or cup-like extended. (All other differentiating signs are given in the key.) All up to date known nematode species of the subfamily Rhabdochoninae parasitize only definitive hosts of the class Pisces. The species Freitasia teixeirai n. gen. et n. sp. is the only representative of this subfamily parasitic in reptiles. The genus and species have been named in honour of Prof. Dr. J. F. Teixeira de Freitas, Rio de Janeiro, Brasil.
The type is deposited in the collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, the paratype in the collection of the Zoological Museum of the Humboldt University in Berlin.

KEY TO THE GENERA OF THE SUBFAMILY RHABDOCHONINAE
TRAVASSOS, ARTIGAS ET PEREIRA, 1928

1. Vestibulum in the anterior portion funnel- or cup-like extended ........................................ 2
   - Vestibulum cylindrical or tubiform ......................................................... 6

2. Vestibulum unarmed (without teeth or tooth-like formations in its anterior portion) ........... 3
   - Vestibulum armed (with teeth or tooth-like formations in the anterior portion) 5

3. Mouth simple without lips; gubernaculum present. Parasites of marine fishes .................. Johnstonmausonia Campana—Rouget, 1955
   - Mouth with lips; gubernaculum absent. Parasites of freshwater fishes ..................... 4

4. Mouth with four lips (2 prominent lateral lips, 2 rudimentary median lips). Eggs with polar filaments ......................................................... Comephoronema Layman, 1933
   - Mouth with 2 indistinct lateral lips. Eggs without polar filaments .............................. Cystidicoloides Skinker, 1931

5. Eggs with polar filaments .............................................................................. Filochon a (Saidov, 1954)
   - Eggs without polar filaments. ............................................................................. Rhabdochona Railliet, 1916

6. Vestibulum armed (with a circle of forwardly directed teeth) ......................................... 7
   - Vestibulum unarmed ......................................................................................... 8

7. Gubernaculum present; 11 pairs of caudal papillae (5 precloacal, 6 postcloacal) .................... Ichthyobronema Gnedina et Savina, 1930
   - Gubernaculum absent; 5 pairs of caudal papillae (1 pair precloacal, 1 double pair paracloacal, 3 pairs postcloacal) .................................................... Heptochona Rasheed, 1965

8. Vestibulum distinctly shorter than length of muscular oesophagus; parasites of fishes .......... 9
   - Vestibulum 3-times longer than muscular oesophagus; parasites of reptiles ................. Freitasia n. gen.

9. Body cuticle with prominent “pedunculate” papillae all over it, posterior end conical ending in a sharp point. Parasites of marine fishes ........................................ Hepatinema Rasheed, 1964
   - Body cuticle without “pedunculate” papillae all over, posterior end rounded. Parasites of freshwater fishes ................................................................. Cystidicola Fischer, 1798

FILARIATA

Fam. Oswaldofilariae Sonin, 1966

6. Oswaldofilaria brevicaudata (Rodhain et Vuylsteke, 1937)

Host: A. aequitrus — a new host.
Location: body cavity.
Locality: Sabanilla and Mandinga-Baracoa (province Oriente).

This nematode species was found in 5 out of a total of 10 *A. equestris* examined. Intensity of invasion 1—7 nematodes in one host. For data on the morphology and a detailed systematic evaluation of this species see SONIN and BARUŞ (1967).

**Fam. Splendidofilariidæ Sonin, 1962**

7. *Piratuba* sp.

Host: *A. equestris* — a new host.

Locality: body cavity.

Locality: Sabanilla-Baracoa (province Oriente).

In one of the 10 *A. equestris* examined a fragment of the posterior extremity of a male worm was found. In view of the characteristic morphological signs it could be listed to the genus *Piratuba* Lent et Freitas, 1941.

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