

NOTES ON NEMATODES OF THE GENUS *CYRTOSOMUM* (ATRACTIDAE) PARASITIC IN CUBAN LIZARDS (SAURIA)

A. COY OTERO and V. BARUŠ

Zoological Institute, Cuban Academy of Sciences, Havana and Institute of Parasitology, Czechoslovak Academy of Sciences, Prague

Abstract. The authors studied the morphological and metrical variability of nematodes of the genus *Cyrtosomum* parasitic in Cuban reptiles. Two species, i.e., *C. scelopori* and *C. longicaudatum*, were identified in the material collected. The authors evaluated the range of the definitive hosts and the geographical distribution of these species.

Nematodes of the genus *Cyrtosomum* Gedoelst, 1919 have been recorded from the Nearctic and Neotropical zones. The definitive hosts are lizards of the family Iguanidae; hosts of the families Teiidae and Gekkonidae are rare in occurrence. At present, the genus has received 5 species, i.e., *C. scelopori* Gedoelst, 1919 (the typical species of the genus); *C. penneri* Gambino, 1957; *C. heynemani* Gambino, 1958; *C. readi* Gambino, 1958; *C. longicaudatum* Brennes et Bravo-Hollis, 1960.

Nematodes of this genus have been recorded from Cuba by Baruš and Coy Otero (1968, 1969) and Coy Otero (1970). A detailed investigation of the helminth fauna of Cuban lizards resulted in a considerably large collection of material. Difficulties in the differentiation of the individual species of the genus *Cyrtosomum* instigated a comprehensive evaluation of the morphology and biometry of the nematodes in our material. The results complete the present data on the variability of two species of this genus (*C. scelopori* and *C. longicaudatum*), and on the spectrum of definitive hosts and their distribution.

MATERIAL

During the years 1968—1972, a total of 299 hosts representing 35 species of the families Iguanidae, Gekkonidae, Teiidae, Xanthusiidae and Amphisbaenidae were examined in postmortem. Nematodes of the genus *Cyrtosomum* were recovered from hosts of the families Iguanidae and Gekkonidae. We examined 127 hosts of these families from 11 localities in various provinces of Cuba and Isla de Pinos. Nematodes were found in 19 hosts, (14.9 %). We measured the nematodes recovered and studied their morphology. The identification of the individual species was based on criteria suggested by Gambino and Heyneman (1960) as being important for the differentiation of species of this genus. A list of the definitive hosts, of the number of nematodes recovered, and of the localities is given in Table 1.

RESULTS

The morphological signs of nematodes in our material showed considerable stability; this was confirmed also by an analysis of the organophenotes in relation to hosts and localities.

Characteristics of the nematodes: Body small, yellowish, cuticle with fine, transverse striation; mouth terminal with 6 lips of similar size (2 subdorsal, 2 subventral, 2 lateral), each bearing one papilla. Cervical alae absent, cervical papillae not observed. Buccal cavity small. Oesophagus consisting of an anterior, enlarged, portion, an attenuated middle portion and a spherical bulb containing the valvular apparatus, at the end. Nerve ring surrounding the middle portion of the oesophagus, excretory pore generally at the level of the upper margin of the bulb. Intestine moderately enlarged in its anterior portion, terminating in the rectum which contains a group of rectal cells.

Table 1. Definitive hosts of nematodes of the genus *Cyrtosomum* in Cuba (after our material).

Hosts	Examined	Positive	Number of nematodes	Males	Females	Localities
<i>Anolis sagrei</i>	19	4	17	11	6	Marianao (Prov. Habana); Santiago de Cuba (Prov. Oriente)
<i>A. mestrei</i>	20	1	8	5	3	Soroa (Prov. Pinar del Río)
<i>A. bartschi</i>	5	1	9	1	8	Valle San Vicente (Prov. Pinar del Río)
<i>A. alloqus</i>	3	1	4	1	3	Sierra del Rosario (Prov. P. del Río)
<i>A. vermiculatus</i>	13	2	12	2	10	Sierra del Rosario (Prov. P. del Río)
<i>A. quadriocellifer</i>	9	1	4	1	3	El Veral Guanahacabibes. (P. del Río)
<i>A. allisoni</i>	10	1	3	0	3	Laguna del Tesoro (Prov. Matanzas)
<i>A. bremeri</i>	9	2	10	4	6	Siguanea (Isla de Pinos)
<i>A. argillaceus</i>	15	1	2	0	2	Cupeyal (Prov. Oriente)
<i>A. equestris</i>	12	2	9	3	6	Ciénaga de Zapata (Prov. Matanzas); Santa Cruz del Norte (Prov. Habana)
<i>Chamaeleolis chamaeleonides</i>	3	2	31	11	20	Ciénaga de Zapata (Prov. Matanzas)
<i>Hemidactylus brooki</i>	9	1	1	0	1	Santiago de Cuba (Prov. Oriente)
Total	127	19	110	39	71	11 localities

Posterior end of male spherical, ending in a tail with a sharp point. Caudal papillae present (8 pairs; of these 3 pairs praecloacal, or two praecloacal and one pair paraclacal; 5 pairs postcloacal). Lay-out of the postcloacal papillae: the first pair close to the posterior lip of the cloaca (subventral), the second pair below it (more laterally). The third and fourth pair approximately at half the length of the tail, the fifth pair close to the foregoing pair (subdorsal). Upper and bottom lips of the cloaca rounded, sometimes moderately elevated. Spicules (2) of different length. The longer spicule always more sclerotized than the shorter spicule; also its transverse structure is more distinct. The proximal spicule end obtuse, the distal end pointed. Gubernaculum absent. Vas deferens

directed anteriorly and dorsally from cloaca, then joins seminal vesicle which extends anteriorly in dorsal region of body. Seminal vesicle joins testis shortly before latter flexes. Extremity of testis directed posteriorly.

Posterior end of female's body attenuated, ending in a tail with a sharp point. Caudal papillae absent. Vulva in posterior half of body, anus close below. Vagina directed



Fig. 1. *Cyrtosomum scelopori* (Gedocist, 1919) — A—G; *C. longicaudatum* Brennes et Bravo-Hollis, 1960 — H—J. A, E — from *Anolis bremeri*; B — from *A. vermiculatus*; C — from *A. sagrei*; D — from *A. mestrei*; F — from *A. allogus*; G — from *A. quadriocellifer*; H; J — from *Chamaeleolis chamaeleonides*; I — from *Anolis equestris*. Orig.

Table 2. Body measurements of male nematodes of the species *Cyrtosomum scelopori* Geddes from different hosts

Measurements	Hosts							Min.-Max.	
	<i>A. sagrei</i>	<i>A. mestrei</i>	<i>A. bartschi</i>	<i>A. allogus</i>	<i>A. vermiculatus</i>	<i>A. bremeri</i>	<i>A. quadricellifer</i>		
Body length	1.05-2.42	1.40-1.95	2.15	-	1.37-1.65	1.79-2.13	1.64	1.95-2.07	1.05-2.44
Body width	0.090-0.217	0.112-0.140	0.154	-	0.112-0.133	0.112-0.133	0.189	0.217-0.245	0.090-0.245
Total oesophagus length	0.259-0.483	0.301-0.406	0.413	-	0.238-0.322	0.364-0.399	0.266	0.294-0.350	0.238-0.483
Muscular oesophagus	0.173-0.371	0.210-0.224	0.287	-	0.196-0.245	0.259-0.287	0.210	0.168-0.210	0.173-0.371
Nerve ring	0.173-0.385	0.224-0.287	0.301	-	0.203-0.259	0.266-0.294	0.224	0.182-0.224	0.173-0.385
Excretory pore	0.238-0.476	0.308-0.336	0.392	-	0.238-0.276	0.336-0.392	0.322	0.231-0.294	0.231-0.476
Cloaca from tail	0.102-0.224	0.084-0.132	0.129	0.117	0.162-0.177	0.123-0.183	0.196	0.234-0.248	0.084-0.248
Length of bigger spicule	0.100-0.174	0.106-0.132	0.108	0.156	0.135-0.153	0.111-0.132	0.130	0.144-0.153	0.100-0.174
Width of spicule	0.006-0.009	0.006-0.009	0.006	0.006	0.006	0.008-0.009	0.008	0.006-0.008	0.006-0.009
Length of shorter spicule	0.051-0.153	0.060-0.070	0.071	0.084	0.078-0.081	0.051-0.075	0.080	0.108-0.129	0.047-0.153
Width of spicule	0.003-0.006	0.004-0.006	0.004	0.004	0.004	0.004-0.006	0.006	0.006	0.004-0.006
Spicule ratio	0.47-0.87	0.52-0.56	0.68	0.54	0.52-0.57	0.38-0.59	0.61	0.76-0.85	0.31-0.87
Bigger spicule length/body length	0.06-0.15	0.05-0.09	0.05	-	0.08-0.11	0.06-0.07	0.08	0.06-0.07	0.05-0.15
Shorter spicule length/body length	0.02-0.14	0.03-0.04	0.03	-	0.04-0.05	0.02-0.03	0.04	0.05-0.06	0.02-0.14
Number of specimens	11	5	1	1	2	4	1	2	27

Table 3. Body measurements of female nematodes of the species *Cyrtosomum scelopori* Gedoelst, 1919 from different hosts

Measurements	Hosts					
	<i>A. sagrei</i>	<i>A. mestrei</i>	<i>A. bartschi</i>	<i>A. alloqus</i>	<i>A. vermiculatus</i>	<i>A. bremeri</i>
Body length	1.12-1.64	1.16-1.79	1.71-2.49	1.23-1.68	1.68-2.23	1.43-2.06
Body width	0.119-0.210	0.119-0.175	0.140-0.154	0.119-0.203	0.140-0.168	0.091-0.189
Total oesophagus length	0.259-0.406	0.294-0.322	0.343-0.455	0.280-0.350	0.357-0.434	0.322-0.392
Muscular oesophagus	0.168-0.245	0.203-0.217	0.238-0.301	0.175-0.227	0.252-0.322	0.231-0.280
Glandular oesophagus	0.063-0.161	0.084-0.105	0.105-0.175	0.105-0.126	0.084-0.133	0.091-0.126
Length of bulb	0.063-0.084	0.070-0.077	0.070-0.091	0.070-0.077	0.070-0.084	0.070-0.084
Width of bulb	0.070-0.077	0.070-0.084	0.070-0.098	0.077-0.084	0.077-0.091	0.070-0.091
Nerve ring	0.182-0.259	0.217-0.224	0.238-0.308	0.189-0.239	0.259-0.336	0.245-0.295
Excretory pore	0.273-0.399	0.294-0.322	0.336-0.455	0.252-0.329	0.399-0.455	0.287-0.385
Vulva from end of tail	0.201-0.258	0.324	0.343-0.523	0.264-0.287	0.378-0.469	0.245-0.378
Anus from end of tail	0.135-0.168	0.168-0.282	0.249-0.385	0.171-0.196	0.287-0.364	0.175-0.259
Number of specimens	6	3	8	3	10	6

Measurements	Hosts				
	<i>A. quadriocellifer</i>	<i>A. equestris</i>	<i>A. allisoni</i>	<i>A. argillaceus</i>	Min.—Max.
Body length	1.26-2.59	1.15-1.85	1.19-1.40	0.98-1.61	0.62-2.59
Body width	0.140-0.168	0.189-0.308	0.077-0.168	0.112-0.182	0.077-0.308
Total oesophagus length	0.245-0.371	0.280-0.315	0.171-0.195	0.259-0.315	0.171-0.455
Muscular oesophagus	0.183-0.280	0.210-0.224	0.093	0.196-0.231	0.093-0.322
Glandular oesophagus	0.062-0.091	0.056-0.091	0.078	0.063-0.084	0.056-0.175
Length of bulb	0.066-0.084	0.063-0.077	0.039	0.056-0.077	0.039-0.091
Width of bulb	0.072-0.077	0.070-0.077	0.036	0.063-0.070	0.036-0.098
Nerve ring	0.189-0.285	0.224-0.238	0.099	0.209-0.245	0.099-0.336
Excretory pore	0.237-0.364	0.252-0.308	0.165	0.280-0.315	0.165-0.455
Vulva from end of tail	0.144-0.444	0.280-0.287	0.210	0.250	0.144-0.523
Anus from end of tail	0.162-0.375	0.182-0.196	0.126-0.168	0.150-0.175	0.126-0.385
Number of specimens	3	5	3	2	49

Table 4. Body measurements of male and female nematodes of the species *Cyrtosomum longicaudatum* Brønnes et Bravo Hollis, 1960 from different hosts

Hosts	<i>Anolis equestris</i>		<i>Chamaeleolis chamaeleonides</i>		<i>Hemidactylus brooki</i>
	Male	Female	Male	Female	Female
Body length	2.74	2.94	1.53-2.60	1.68-2.83	2.73
Body width	0.224	0.308	0.119-0.168	0.077-0.217	0.182
Total oesophagus length	0.406	0.399	0.357-0.427	0.329-0.420	0.371
Muscular oesophagus	0.224	0.224	0.266-0.329	0.231-0.280	0.259
Nerve ring	0.231	0.239	0.280-0.343	0.238-0.319	0.273
Excretory pore	0.350	0.364	0.350-0.420	0.292-0.378	0.357
Vulva from end of tail	—	0.567	—	0.472-0.767	0.784
Anus from end of tail	0.315	0.462	0.308-0.480	0.420-0.672	0.700
Length of bigger spicule	0.144	—	0.102-0.153	—	—
Width of spicule	0.008	—	0.006-0.009	—	—
Length of shorter spicule	0.092	—	0.075-0.087	—	—
Width of spicule	0.006	—	0.004-0.006	—	—
Spicule ratio	0.64	—	0.49-0.85	—	—
Bigger spicule length/body length	0.05	—	0.05-0.09	—	—
Shorter spicule length/body length	0.03	—	0.02-0.05	—	—
Number of specimens	1	1	6	20	1

antero-dorsally from vulva. Proximal portion of vagina with strong muscles. Single uterus forms a large, sac-like structure which, in the adult worm, contains developing embryos or larvae. Short muscular oviduct connects uterus with ovary. Ovary flexed, its tip directed posteriad.

Of the biometric signs we evaluated the body length, maximum width, overall oesophagus length, the length of its anterior and middle portion (each separately), length and width of the bulb, the distance of the nerve ring and the excretory pore from the anterior end of the body, the distance of the anus and vulva from the posterior body end, the distance anus-vulva, length and width of spicules, distance of cloaca from posterior body end, and number of caudal papillae. In addition, we evaluated the ratio of long spicule to body length; short spicule to body length; the ratio of short

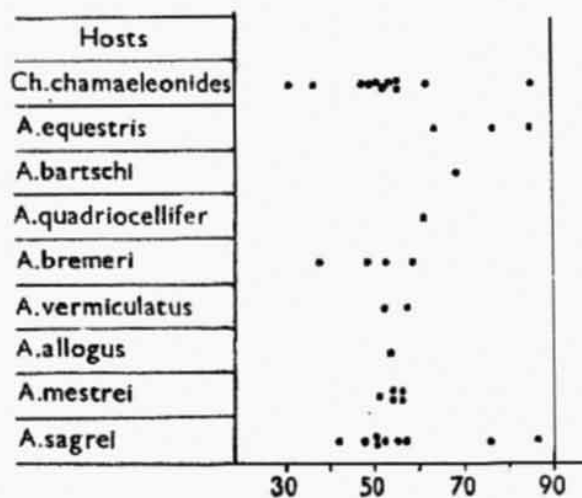


Fig. 2. Ratio of right to left spicule length in Cuban species of the genus *Cyrtosomum* (longitudinal axis = assessed values; each specimen represented by a black point).

to long spicule, the latter values being of utmost importance as emphasized by Gambino and Heyneman (1960).

The range of values obtained from the individual measurements was considerably wide; this applied also to organophenotes from a single definitive host species. Tables 2 and 3 surveying the minimum and maximum extent of values for the individual signs provided clear evidence of the fact that the only reliable diagnostic signs were the values given for the distance of the cloaca from the end of the tail in the males, and the distance of the anus from the end of the tail in the females, and, also, the distance of the vulva from the body end of the female. The exact assessment of these values enabled the differentiation of our nematode material into two groups. The remaining metric signs (measured on material from different hosts) either merged or overlapped and, hence, yielded insignificant taxonomic values.

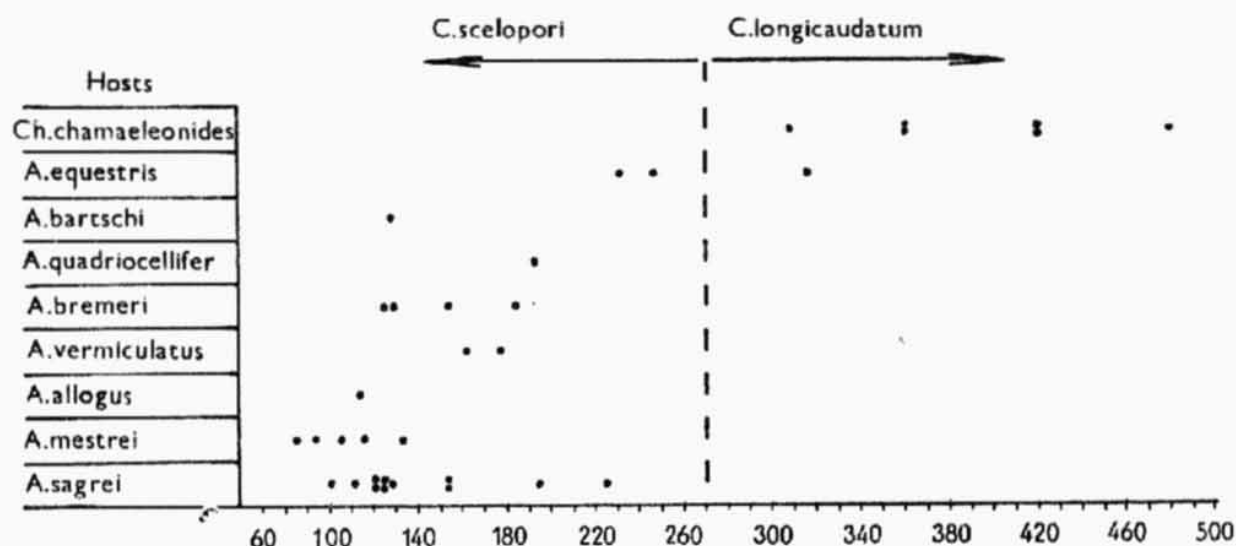


Fig. 3. Length of the tail (distance: cloaca-posterior end of body) in males of the species *Cyrtosomum scelopori* Gedoelst, 1919 and *C. longicaudatum* Brennes et Bravo-Hollis, 1960 (longitudinal axis = range of assessed values; black point = the specimen measured).

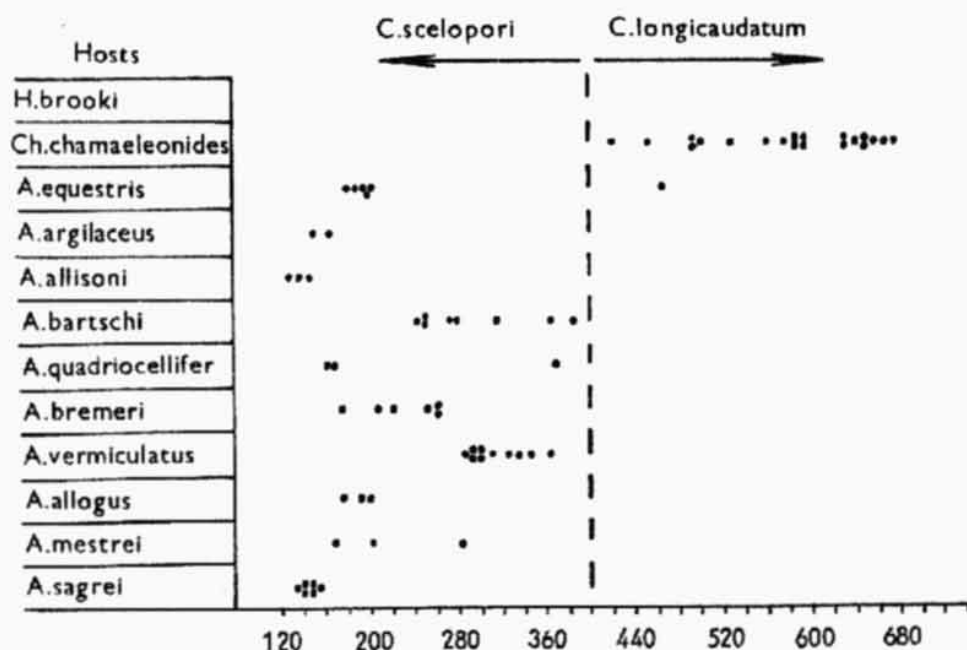


Fig. 4. Length of tail (distance: anus-posterior end of body) in females of the species *Cyrtosomum scelopori* Gedoelst, 1919 and *C. longicaudatum* Brennes et Bravo-Hollis, 1960. (Longitudinal axis = range of assessed values; black point = the specimen measured).

The distribution and number of caudal papillae were similar and constant in both morphological groups of nematodes of the genus *Cyrtosomum* from our material. Therefore, it could not be used for differentiation. A comparison of our results with data on the morphology of the species described by Gambino (1957, 1958) suggested that both our forms differed from *C. heynemani*, *C. readi* and *C. penneri*.

The importance of ratios suitable for a differentiation was insignificant in our material. The same had been inferred earlier by Gambino and Heyneman (1960) for the ratio of spicule length to body length, or oesophagus length to body length. It should be emphasized that also the ratio of spicule lengths utilized successfully by Gambino and Heyneman (1960) for distinguishing North-American species of the genus *Cyrtosomum*, did not prove satisfactory with our material. The fluctuation of our values was high (Fig. 2) and no unanimous interpretation could be obtained.

We concluded, therefore, that detailed studies on the morphology and biometry of nematodes of the genus *Cyrtosomum* from Cuban lizards made it possible to distinguish two distinct groups characterized by the length of the tail (distance of the anus or cloaca) from the end of the tail (Figs. 3, 4). The first group consisted of nematodes, in which the distance of the cloaca from the end of the tail ranged from 0.084—0.248 mm; in females the distance of the anus from the end of the tail ranged from 0.167—0.375 mm. This group received the species *Cyrtosomum scelopori* Geddoelst, 1919, in our material represented by 32 males and 49 females. In the second group, the value of this sign in the males was 0.308—0.480 mm, in the females 0.420—0.700; it received the species *C. longicaudatum* Brennes et Brano-Hollis, 1960, and in our material, was represented by 7 males and 22 females.

Our determination was supported by the topography and the number of caudal papillae in the males, which was consistent with data by Brennes and Bravo-Hollis (1960) for both the species *C. scelopori* and *C. longicaudatum*. Also Gambino and Heyneman (1960) postulated that the number of caudal papillae (7—10 pairs as compared with 8 pairs in our material) was typical of *C. scelopori*. By comparing the ratio of spicule lengths (1 : 0.31—0.87) with that assessed by Gambino and Heyneman (1960) for lizards from North-America (1 : 0.73—1.00), our values were well below the bottom limits. The difference in the ratio of spicule lengths may be due to the adaptation of the species *C. scelopori* to hosts of the genus *Anolis* from the Antilles subregion; therefore, we considered its taxonomic position to be of subspecific value. For *C. longicaudatum*, we found a difference in the length of the tail of the male worm (our material: 0.308—0.480 mm; the original description: 0.225—0.262 mm); this difference was not observed in the females.

The definitive hosts of *C. scelopori* from Cuba are, according to our present and earlier findings (Baruš and Coy Otero 1968, 1969; Coy Otero 1970), mainly hosts of the family Iguanidae (genera *Anolis*, *Chamaeleolis* and *Leiocephalus*). Baruš and Coy Otero (1969) recovered this species also from one host of the family Teiidae. It is evident that in Cuba the range of definitive hosts of this species is very wide. It consists of 13 lizard species, i.e., *A. allogus*, *A. argilaceus*, *A. bartschi*, *A. bremeri*, *A. equestris*, *A. mestrei*, *A. sagrei*, *A. vermiculatus*, *A. quadriocellifer*, *Chamaeleolis porcus*, *Ch. chamaeleonides*, *Leiocephalus cubensis* and *Ameiva auberi*. Also the geographical distribution of this species is wider than that of the remaining species of this genus. According to Geddoelst (1919), Bravo-Hollis (1942) and Gambino and Heyneman (1960), the species was found also in the U. S. A., Mexico, Nicaragua and Panama (only in hosts of the family Iguanidae, genera *Basiliscus*, *Ctenosaura*, *Dipsosaurus*, *Sauromalus* and *Enyadliosaurus*).

The species *C. longicaudatum* was recorded from Cuba and Costa Rica. In Cuba, it was found in hosts of the family Iguanidae (*A. equestris*, *Ch. chamaeleonides*, *Ch. porcus*,

L. carinatus), and in hosts of the family Gekkonidae (*Hemidactylus brooki*). In Costa Rica, Brennes and Bravo-Hollis (1960) recovered this species from the host *Ctenosaura similis* (Iguanidae).

A comparison of the definitive hosts of *C. scelopori* and *C. longicaudatum* from Cuba shows a specific association of *C. scelopori* with hosts of the genus *Anolis* (preferably smaller species of this genus), except for the species *Anolis equestris* in which infection with both species was concomitant. *C. longicaudatum* was never found in small species of the genus *Anolis*. In Cuba, this species appeared to be a typical parasite of larger iguanid species (genus *Chamaeleolis*, apparently also *Leiocephalus*). Sometimes, also *C. scelopori* was found in hosts of these genera. The presence of *C. scelopori* in *A. auberi*, and *C. longicaudatum* in *H. brooki* demonstrated that these helminths are capable of infecting uncommon hosts. These findings, however, were rare in occurrence.

ПРИМЕЧАНИЯ К НЕМАТОДАМ РОДА *CYRTOSOMUM* (ATRACTIDAE), ПАРАЗИТИРУЮЩИМ У ЯЩЕРИЦ (SAURIA) КУБЫ

А. Кой Отэро и В. Баруш

Резюме. Авторами изучена морфологическая и метрическая изменчивость нематод рода *Cyrtosomum*, паразитирующих у пресмыкающихся Кубы. В собранном материале определены два вида, а именно *C. scelopori* и *C. longicaudatum*. Авторами также рассмотрен круг окончательных хозяев и географическое распространение этих видов.

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Received 22 December 1972.

A. C. O., Zoological Institute, Cuban Academy of Sciences, Havana, Cuba