

STRIANEMA VENEZUELENSIS GEN. ET SP. N.
(FILARIOIDEA: ONCHOCERCIDAE)
FROM VENEZUELAN ARMADILLOS (*DASYPUS* SPP.)

M. L. EBERHARD*, T. C. ORIHÉL**, I. CAMPO-AASEN***

SUMMARY

A new filaria, *Strianema venezuelensis* gen. et sp. n., is described from armadillos in Venezuela. The adults inhabit the subcutaneous tissues and the microfilariidae are found in the skin and occasionally the blood. The adults, which are of small size (males 9.6 to 13.8 mm in length by 57 to 63 μ m in diameter, females 18.3 to 26.3 mm in length by 95 to 120 μ m in diameter), have a distinctly striated cuticle. This filaria resembles most closely the genus *Cercopithifilaria*, from which it can be distinguished by the absence of a buccal capsule or pre-esophageal ring, and 11 to

13 pair of caudal papillae, three or four pair of which are separated as a group anterior to the cloaca. The species, *S. venezuelensis*, can be distinguished from the three other species of filariae described from armadillos by the undivided esophagus, number and distribution of caudal papillae in the male, size and shape of the spicules, and the distinctive microfilaria. The microfilaria, which averages 280 μ m in length, has a unique, slender, almost filamentous tail.

RÉSUMÉ : *Strianema venezuelensis* n.g. n. sp. (Filarioidea: Onchocercidae), parasite de Tatous (*Dasytus* spp.) au Venezuela.

Description de *Strianema venezuelensis* ng. n. sp., parasite de Tatou au Venezuela. Les adultes sont localisés dans les tissus sous-cutanés et les microfilaires dans la peau et accidentellement dans le sang. Adultes de petite taille, mâles 9,6 à 13,8 mm sur 57 à 63 μ m, femelles de 18,3 à 26,3 mm sur 96 à 120 μ m, avec cuticule distinctement striée. Cette filaire peut être distinguée de *Cercopithifilaria* le genre le plus proche, par l'absence de capsule buccale et d'anneau pré-œsophagien et par les 11 à 13 paires de papilles

caudales dont 3 ou 4 paires isolées en un groupe antérieur au cloaque. *S. venezuelensis* peut être distingué des trois autres espèces de filaires connues chez les Tatous par l'œsophage non divisé, le nombre et la disposition des papilles caudales du mâle, la taille et la forme des spicules et par la microfilaire particulière. Cette microfilaire, longue d'environ 280 μ m, a une queue très fine presque filamenteuse.

INTRODUCTION

During our studies of the filariae of armadillos in Venezuela, a new species of *Acanthocheilonema*, *A. sabanicolae*, was described (Eberhard and Campo-Aasen, 1985). A second, unidentified microfilaria was observed in skin snips from the savanna armadillo (*Dasytus sabanicola*) and the nine-banded armadillo (*Dasytus novemcinctus*). A number of adult worms, the parental form of this second microfilaria, subsequently were recovered at necropsy. These worms could not

be accommodated in any existing genera; therefore, a new genus is created for these specimens. This report also describes the specific morphological features of the parasite and provides a name, *Strianema venezuelensis* gen. et sp. n.

MATERIAL

Adult worms were recovered at necropsy by soaking the skin, carapace and carcass of infected armadillos in physiological saline for 1 to 2 hours and then examining the saline solution for worms by filtration through fine-mesh bolting cloth. Worms were examined alive, then fixed in glacial acetic acid for several minutes, transferred to 70 % ethanol containing 5 % glycerine, and subsequently cleared in pure glycerine by evaporation.

Microfilariidae were isolated from random skin snips taken from the ears and ventral surface of the animals. Skin snips were placed into vials containing 15 ml of tap water and allowed to soak for 1 hour. The solution was then centrifuged, the sediment fixed in 2 % formalin, spread on slides, dried and stained in hematoxylin following standard procedures. In several instances, instead of being fixed in 2 % formalin, sediment containing microfilariidae was spread

* Division of Parasitic Diseases, Centers for Disease Control and Prevention, Public Health Service, US Department of Health and Human Services, F13, CDC, 4770 Buforg Highway, NE Atlanta, GA 30341-3724.

** Department of Tropical Medicine, Tulane Medical Center, New Orleans, Louisiana.

*** Instituto Nacional de Biomedicina, Facultad de Medicina, Universidad Central, Apartado Postal No. 4043, Caracas, Venezuela.

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on slides, dried, fixed in methanol and stained in Giemsa. *Ex utero* microfilariae were collected from a broken female worm and fixed in 2 % formalin. Examination of these microfilariae confirmed that the adults were the parental forms of the microfilariae observed in skin snips.

An adult female worm was placed into a liver tissue preparation and fixed in 10 % formalin for sectioning and staining. This preparation was used for description of the adult worm microanatomy.

Measurements, the range followed by the mean in parentheses, are in micrometers unless otherwise indicated. Structures and anatomical landmarks in the microfilariae are expressed as distance from the anterior end. Illustrations were made with the aid of a drawing tube.

kedly drawn out along lateral or median axis. Prominent cuticular striations, 3 to 4 micrometers apart, present on body beginning anterior to nerve ring and continuing onto tail (*Fig. 8*). Buccal cavity and preesophageal cuticular ring absent. Esophagus not distinctly divided, muscular throughout. Vulva located in esophageal region. Caudal alae well developed. Caudal papillae prominent, typically pedunculated, including three to four precloacal pairs well anterior to the cloaca. Gubernaculum absent. Microfilaria lacks sheath.

DESCRIPTION

Strianema gen. n. (*Figs. 1-10*)

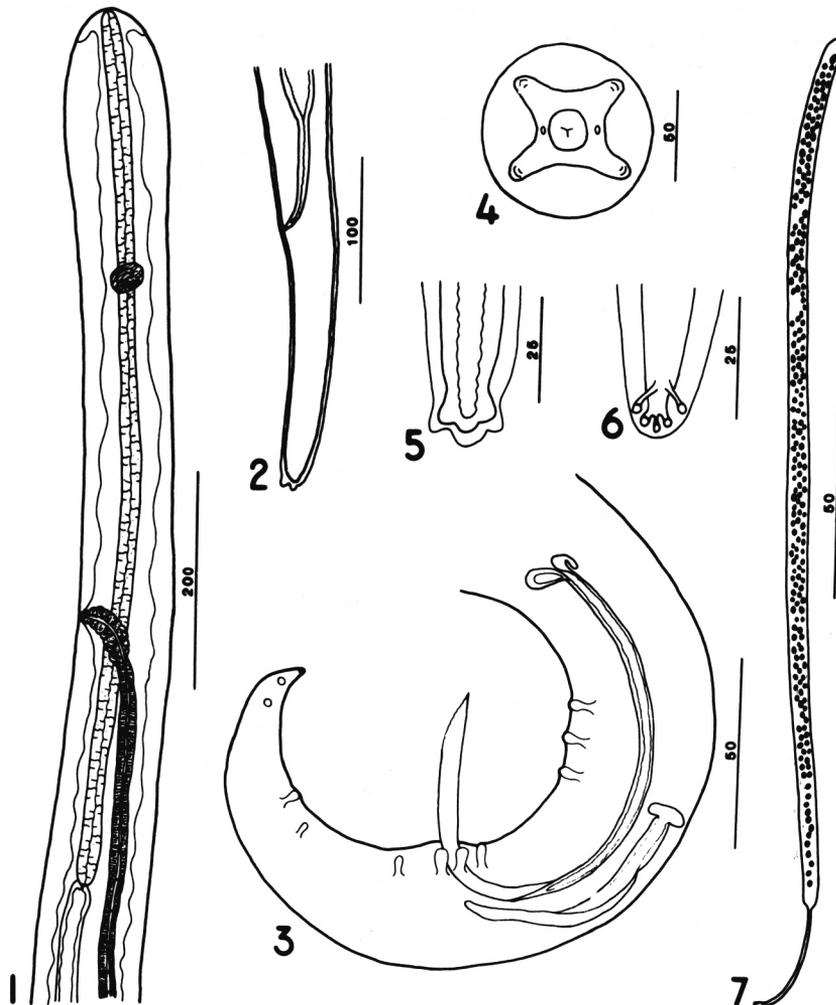
DEFINITION

Onchocercidae (Leiper, 1911) Chabaud and Anderson, 1959; Onchocercinae Leiper, 1911. Cephalic plate not mar-

Strianema venezuelensis sp. n. (*Figs. 1-10*)

DEFINITION

General: Onchocercidae (Leiper, 1911) Chabaud and Anderson, 1959; Onchocercinae Leiper, 1911; *Strianema*.



FIGS. 1-7. — *Strianema venezuelensis* gen. and sp. n.

1. Female anterior end, lateral view; 2. Female posterior end, lateral view; 3. Male posterior end, lateral view; 4. *En face*; 5. Female tail, ventral view; 6. Male tail, ventral view; 7. Microfilaria, 2 % formalin-fixed and stained with hematoxylin.

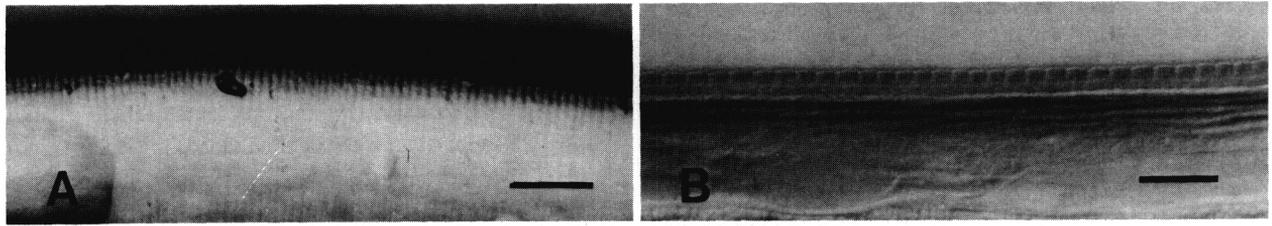


FIG. 8. — *Strianema venezuelensis* gen. and sp. n. cleared in glycerine.

A. Female worm, midbody, surface view without coverslip to show striations in cuticle, bar = 25 µm.
 B. Female worm, midbody, showing striations in cuticle, bar = 10 µm.

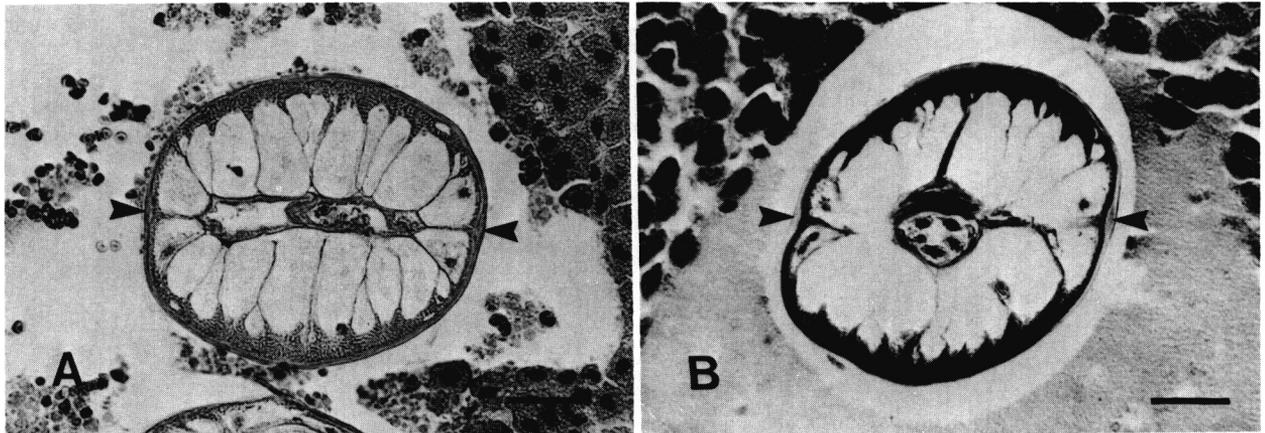


FIG. 9 A and B. — *Strianema venezuelensis* gen. and sp. n. in stained cross section (A = H&E, B = trichrome) showing the microanatomy of the worm, including lateral internal thickening of the cuticle (arrowheads), lateral chords, number and arrangement of the muscle cells, and the reproductive and digestive tubes, bar = 25 µm.

With characters of the genus. Adult worms small in size, slender, inhabiting subcutaneous connective tissues. Body widest in the anterior end, tapers gradually toward posterior end. Cephalic plate moderately developed, bearing eight circumoral papillae arranged in the form of a square (Fig. 4). Amphids minute, located near margin of cephalic plate close to mouth. Buccal cavity and preesophageal cuticular ring absent. Esophagus relatively short, muscular throughout. Tail of both sexes long, tapered but bluntly rounded at tip. Microfilaria lacks sheath; typically observed in skin snips, occasionally present in blood.

Male (9 complete specimens; 2 posterior ends): Body 9.6-13.8 (11.6) mm long, maximum width 57-63 (61). Nerve ring 171-205 (192) from anterior end. Esophagus 580-655 (604) long. Tail 95-120 (109) long. Caudal papillae well developed, often asymmetrical in distribution, numbering 11 to 13 per side, including: three to four pair precloacal which are grouped a short distance anterior to the cloaca; three to four pair pericloacal; and five pair postcloacal, three pair of which are more or less evenly spaced along tail, and two subterminal pair (Fig. 3). Small, button-like

knob present on tip of tail. Tip of tail in ventral view with candelabra appearance due to arrangement of papillae and terminal knob (Fig. 6). Spicules unequal, dissimilar (Fig. 3). Left spicule 158-180 (168) long, tubular, heavily cuticularized throughout; proximal end with large fluted knob, twisted mid-section and sharply beveled distal end. Right spicule 59-67 (63) long, tubular, simple and heavily cuticularized throughout; ring-like knob proximally, bluntly rounded tip distally. Spicule ratio 2.7:1. Gubernaculum absent. *Area rugosa* absent.

Female (18 complete specimens): Body 18.3-26.3 (22.5) mm long, maximum width 95-120 (105). Distance from anterior end to nerve ring 210-250 (225), vulva 475-650 (540), base of esophagus 620-840 (750) (Fig. 1). Ovejector long, tubular, lumen not convoluted or twisted. Tail 140-210 (175) long; tip bearing three equal sized lobes, two sub-ventral, subterminal and one terminal (Figs. 2, 5).

In stained cross section (Fig. 9), cuticle 3 to 4 µm in thickness over most of body, thickening internally over lateral chords. Lateral chords tall and extend well into body cavity. Muscle cells, which number only 8 to 10 per hemi-

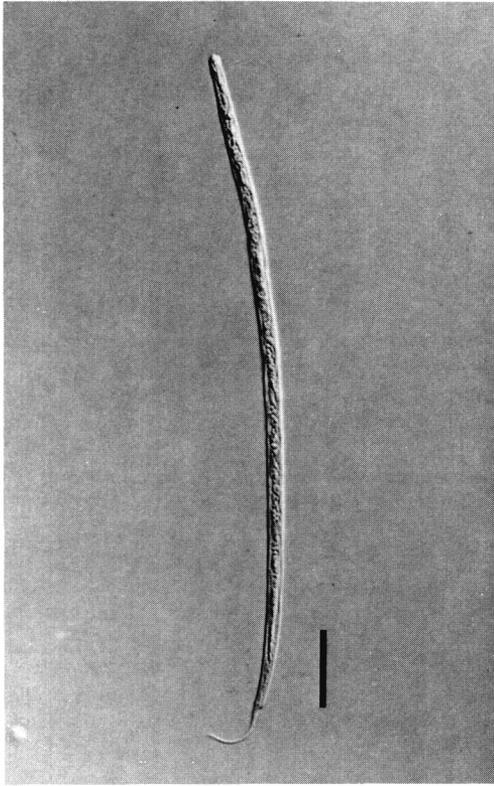


FIG. 10. — *Strianema venezuelensis* gen. and sp. n. microfilaria, unstained, wet mount showing the terminal filamentous tip of tail, bar = 25 μ m.

sphere, have low contractile portions and large cytoplasmic portions. Gut small, about one-tenth diameter of uterine tubes, the latter fill body cavity.

Microfilaria (30 specimens): Preserved in 2% formalin, body long, straight, of about uniform — width throughout, with exception of posterior end which abruptly narrows to a thin, filamentous portion (Fig. 10). Microfilariae stained with hematoxylin measure 255-305 (280) long by 3-5 wide (Fig. 7). Cephalic space 5-8 (6), nerve ring 49-57 (53), excretory pore 74-87 (80), anal pore 175-219 (197), last nucleus 221-259 (239). Caudal nuclei reduced to a single row of 8-12 nuclei, not extending into the terminal, nuclei-free filamentous portion of tail.

In methanol fixed, Giemsa stained preparations, body (10 specimens) measures 218-257 (240) long by 5-6 wide, cephalic space 4-6, nerve ring 40-52 (47), excretory pore 63-73 (68) anal pore 150-200 (172), last nucleus 180-227 (204). Random attitudes assumed by microfilariae in methanol fixed preparations.

Specimens deposited: holotype (male) MNHN Paris, Coll. No. 232HF (a); allotype (female) MNHN Paris, Coll. No. 232HF (b); paratypes MNHN Paris, Coll. No. 232HF (c); microfilariae MNHN Paris, Coll. No. 232HF (d).

Hosts: *Dasypus sabanicola* Mondolphi, 1967; savanna armadillo (type host); *Dasypus novemcinctus* Linnaeus, 1758; nine-banded armadillo.

Type locality: Venezuela, Apure State.

Other localities: Venezuela, Guarico and Aragua States.

Site of infection: Adults in subcutaneous tissues; microfilariae commonly in skin occasionally in blood.

Etymology: Genus name derived from « stria » meaning furrowed, referring to the striated cuticle; species name derived from the geographical name of the type country.

DISCUSSION

The genus *Dipetalonema*, once exceptionally large and heterogeneous, has undergone considerable change within the last 15 years. In 1976, Chabaud and Bain created six subgenera within the genus *Dipetalonema*, including *D. (Dipetalonema)*, *D. (Orihelia)*, *D. (Loxodontofilaria)*, *D. (Molinema)*, *D. (Acanthocheilonema)* and *D. (Chenofilaria)*. Two additional subgenera were described shortly thereafter, *D. (Cercopithifilaria)* and *D. (Dasypafilaria)* (Eberhard, 1980, 1982). Seven of these eight subgenera were raised by Bain *et al.* (1982) to the generic level. The subgenus *D. (Chenofilaria)* was synonymized and the species contained therein placed among the other seven genera.

In describing *Strianema*, it was the above mentioned seven genera to which it was compared most closely. *Strianema* is most similar, morphologically, to *Cercopithifilaria*. When Bain *et al.* (1982) elevated *Cercopithifilaria* to the generic level, they placed 12 species in it, and at least 5 additional species have been added since then. However, almost half of these species do not share common morphological features which were proposed originally for that group by Eberhard (1980), including an undivided esophagus, small buccal capsule or preesophageal cuticular ring, and caudal papillae reduced in number and clumped around the cloaca. The host range for this group is also diverse, and includes marsupials, rodents, ungulates, carnivores, and primates. The diversity in morphological features and exceptionally large host range and geographical distribution has made it difficult to characterize this group and to make comparisons with new species. However, the genus *Strianema* can be distinguished readily from *Cercopithifilaria* based on the unique combination of its morphological features, specifically the striated cuticle, the absence of a buccal cavity and preesophageal cuticular ring, an undivided esophagus, a vulva located in the esophageal region, three or four pair of precloacal caudal papillae well anterior to the cloaca and several pair of papillae spaced along the tail, no guber-

naculum, and an unsheathed microfilaria. Since the number and variety of zoonotic filarial infections encountered in humans increases steadily, it is important to provide some information on the general morphological features of this species as it appears in tissue sections. This is not to suggest that *Strianema venezuelensis* has any perceived or real zoonotic potential, but the information expands our current knowledge of the variation in morphological features seen among species of filariae.

Strianema venezuelensis is the fourth species and the third monotypic genus of filaria to be described from armadillos and it can be distinguished readily from the other genera of filaria parasitic in armadillos, namely *Orihelia*, *Dasypafilaria* and *Acanthocheilonema*. All three of these genera have distinct preesophageal cuticular rings and an esophagus divided distinctly into muscular and glandular portions. In addition, in *Orihelia* and *Dasypafilaria*, the microfilariae are sheathed and the adults reside in the peritoneal cavity; in *Orihelia* a gubernaculum is present, and in *Dasypafilaria* the caudal papillae are reduced in number and clumped around the cloaca. Based on size, the morphological features cited above for generic differentiation, and the distinctive microfilaria, *Strianema venezuelensis* can be distinguished morphologically from all other filariae.

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