New species of nematodes (Nematoda: Rhigonematida) associated with *Rhinocricus parcus* (Diplopoda), from Puerto Rico

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ABSTRACT. Two new species of the genera *Ichthyocephalus* and *Rhigonema* (Nematoda, Rhigonematida) are described. The specimens were found in *Rhinocricus parcus*, from Puerto Rico. These are the first records of Rhigonematida from the island. *R. perezassoi* sp. nov. belongs to Adamson's group I. *Ichthyocephalus victori* sp. nov. is one of the largest species of the genus.

Key words: Nematoda, Rhigonematida, *Ichthyocephalus*, *Rhigonema*, new species, *Rhinocricus* host.

INTRODUCTION

Studies of nematodes associated with arthropods is an uncommon issue in Caribbean biodiversity researching (García *et al.*, 2001; García *et al.*, 2002). Brooks (2001) have emphasized the importance of this sort of "hidden biodiversity", because of the sheer number of potential unknown species and for the relevance of parasites as a force of evolution and balance of ecosystems. Among the Greater Antilles, Cuba has the prominent place on this studies. García *et al.* (2002) recorded 62 species of nematodes (Oxyurida and Rhigonematida), found in 26 species of arthropods (Diplopoda, Dyctioptera, Coleoptera, Orthoptera). About 23 species of rhigonematid nematodes have been found in Cuban *Rhinocricus*. *Rhinocricus* is an endemic genus of big diplopods from Cuba and Puerto Rico. There are three species in Cuba, *R. duvernoyi* Karsch, *R. maximus* Loomis and *R. suprenans* Chamberlain. The Puerto Rican species, *R. parcus*, is the smallest in size. This study describes two new species of nematodes belonging to the genera *Rhigonema* Cobb and *Ichthyocephalus* Artigas, respectively. *Rhigonema* is a widespread genus distributed by the Southern hemisphere. *Ichthyocephalus* is restricted to the mainland Neotropic and the West Indies.

No previous records about rhigonematids associated with Puerto Rican diplopods are known, according to the available information (Adamson y Waerebeke, 1985; Hunt 1996; Hunt and Moore, 1998; 1999; García *et al.* 2002, and references therein). Type material is available in the Zoological Collection (CZACC), at the Institute of Ecology and Systematic (IES). Measurements are given in millimeters.

SYSTEMATICS

Family Rhigonematidae

Rhigonema Cobb

Rhigonema perezassoi sp. nov.

(Fig. 1)

Diagnosis. Nematodes belonging to Adamson's group I. They differ from the other species in this group in the smaller size, naked cuticle, shortest tail and curvest spicules.

Description. Small size (females slighter bigger). Cuticle naked. Tail long and subulate. Pharynx wide and muscular. Bulb rounded. Intestine more or less rectilineal. Vagina short

and muscular, located toward the posterior end of the body. Eggs very numerous, thin walled, shell smooth. Spicules very curve and pointed, big and equal in size (about one third of body length).

Types. Holotype (male), CZACC 11.4389, PUERTO RICO, Cambalache, viii.2000, col. J. L. Fontenla. Paratypes (two males and two females): CZACC 11.4390 and 11.4393., same data as holotype.

Holotype measurements, (male paratypes between parentheses): Total length: 3.90 (3.48-3.58). Maximum width: 0.32 (0.23-0.26). Pharynx: 0.29 (0.28-0.29). Bulb diameter: 0.10 (0.08-0.10). Distance from the anus to tail terminus: 1.36 (1.00-1.26). Spicules length: 1.60 (1.17-1.30). **Paratypes measurements** (females): Total length: 3.43-4.41. Maximum width 0.23-0.26. Pharynx: 0.30-0.32. Bulb diameter: 0.08-0.10. Distance from the vulva and the anus to tail terminus: 1.80- 1.95 y 1.28-1.31, respectively. Eggs: 0.05-0.07 X 0.06-0.08.

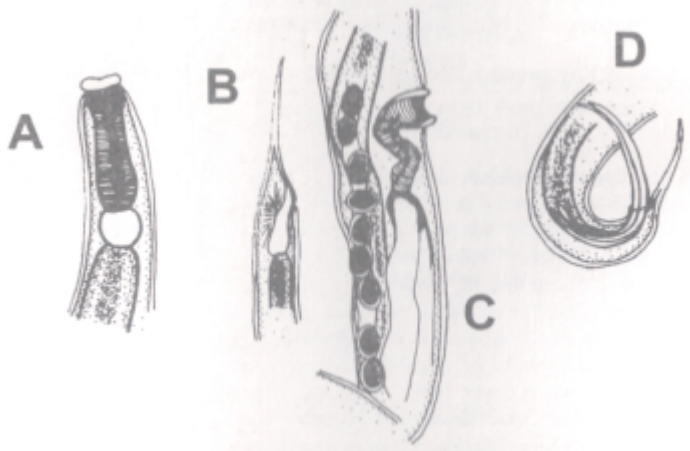

Fig. 1. *Rhigonema perezassoi* sp. nov. A. Cephalic region (female). B. Caudal region (female). C. Vulva and eggs. D. Caudal region of male.

Host: *Rhinocricus parcus* (Diplopoda:Rhinocricidae). Localization: Guts. Intensity and prevalence: eight specimens in the examined host (100%).

Discussion. *Rhigonema perezassoi* sp. nov. belongs to Adamson's group I (Adamson, 1987) of the genus *Rhigonema*. These species exhibit a short, thick-walled muscular portion, the vagina vera, near to the vulva and a thinner-walled region between the vagina and the uteri. All of the Cuban *Rhigonema* species belong to this group. The naked cuticle differentiates this species from other with spinous surface, like *R. prolifica* Bowie, *R. alpinensis* Bowie, *R. kaorinus* Bowie, *R. hirsutus* Bowie, *R. cubana* (Barus) and *R. piedralavela* (García, Coy and Ventosa). The spineless species known so far are the following: *R. chanaae* (Travassos and Kloss), *R. longeacauda* Travassos and Kloss, *R. ruthi* (Travassos and Kloss) y *R. falcatum* (Artigas). The new species is smaller than the first three already mentioned, but bigger than *R. longicauda*. It also differs from those three species in morphometric values. In addition, *R. perezassoi* sp. nov. has the shortest tail and the curvest spicules (like a letter C) of all the

known species in the group I of *Rhigonema*.

Etimology. Named after Antonio Pérez-Asso, a diplopod specialist, who has been very helpful in the field work and has encouraged the quest of nematodes associated with Puerto Rican diplopods.

Familia Ichthyocephalidae
Ichthyocephalus Artigas
Ichthyocephalus victori sp. nov.
(Fig. 2)

Diagnosis. Robust, with short cuticular spines covering the body surface not beyond the middle region of the body, spicules unequal.

Description. Nematodes medium size. Cuticle finely striated from the cephalic region to the base of the caudal terminus. Short spines covering the body surface not beyond the middle region of the body. Cephalic region typical of the genus. Esophagus plump, width and muscled. Isthmus short. Esophageal cells rounded, with dark brown color. Bulb rounded, lightly flatted. Spicules very big, the biggest is very curved, C-shaped; the lesser spicule is narrow, straight toward its terminus, where is curved. Spicular ratio: 1:2.5. Tail not very long and conical.

Types. Holotype male: CZACC 11.4394, PUERTO RICO, Cambalache, viii.2000, coll. J. L. Fontenla. Paratypes (two males): same data as holotype, CZACC 11.4395 and 11.4396

Holotype measurements (males paratypes between parentheses): Total length. 11. 934 (9.776-9.984). Maximum width 0.441 (0.388-0.420). Pharynx 0.315 (0.252-0.262). Isthmus: 0.052 (0.042-0.052). Bulb diameter. 0.147 (0.118-0.136). Distance from the vulva and the anus to tail terminus: 0.600 (0.472-0.588). Spicules length: 0.304 (0.241-0.273) y 0.829 (0.682-0.735).

Host: *Rhinocricus parcus* (Diplopoda:Rhinocricidae). Localization: Guts. Intensity and prevalence: 10 specimens in the examined host (100%).

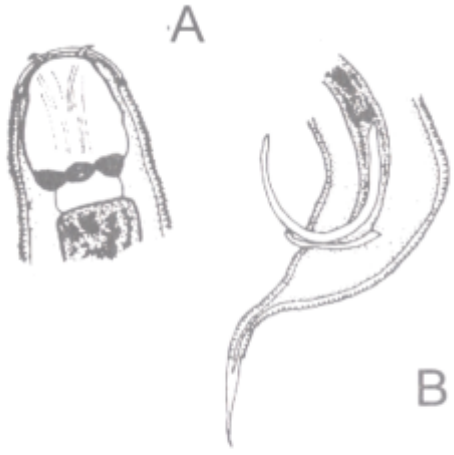

Fig. 2. *Ichthyocephalus victori*, sp. nov. Male. A. Cephalic region. B. Caudal region.

Discussion. *Ichthyocephalus victori* sp. nov. is one of the largest species of the genus. It also differs from other smaller species like *I. egleri* Travassos and Kloss, *I. hoffmani* Sánchez-Velázquez, *I. ichthyocephalus* Artigas, *I. antenori* Travassos and Kloss, and *I. seymouri* Adamson, in the shape and size of the spicules, subequals in the last three species. The spicules of the new species are unequal, like all of the Cuban species. It differs from large species like *I. spinosus* García and Coy, 1995 and *I. alayoi* García, Coy and Ventosa in the distribution of cuticular spines, restricted to the anterior region in the new species, while they cover the whole body surface in the species mentioned. *I. anafe* García and Coy is larger than *I. victori* sp. nov., but this last species is more robust, the tail is shorter and the spicules are unequal and smaller. It also differs in spicular proportion and general morphometry. *I. victori* sp. nov. is similar, in general aspect, to *I. guaniguanico* Coy and García, and *I. cubensis* Spiridonov, but differs from them in the body surface, covered by spines, as well as in the shape of the spines, shorter in the new species, whose tail is also shorter and the bulb is smaller. The spicules are quite similar in relative size among these three species, but the new species has more curved the longest of its spicules.

The females found in the examined host specimens were not included in the description, because they were not well preserved. However, it was possible to observe in all of them a vaginal diverticulum. This structure has been observed in *I. anadenoboli* Waerebeke, Adamson and Kermarrec., a continental species, and in all known Cuban species of the genus. The rest of the continental species do not exhibit this structure (Waerebeke *et al.*, 1984; Hunt, 1994). This diverticulum has been also found in the genus *Ichthyocephaloides* Hunt *et* Sutherland.

Etimology: Named after Victor González, from Puerto Rico, who offered financial support and all kind of facilities to make possible this research.

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