DESCRIPTION OF *ALAEURIS STEHLINI* N. SP. AND *ALAEURIS NUMIDICA CANARIENSIS* N. SSP. (NEMATODA, PHARYNGODONIDAE), PARASITE OF *GALLOTIA STEHLINI*, LACERTID OF GRAND CANARY ISLAND (SPAIN)

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Summary :

Pharyngodonid nematodes (Oxyuroidea) belonging to the genus *Alaeuris* Thapar, 1925, were collected from the posterior gut of *Gallotia stehlini* (Lacertidae) from Grand Canary Island. Two species *Alaeuris stehlini* n. sp. and *Alaeuris numidica canariensis* n. ssp. were identified. The new species is described in which the long thin males are characterized by: narrow caudal alae, a rounded first pair of adanal papillae non pedunculate, the second pair attached and elongate, the three pair teated; a short narrow V plate and a relatively long caudal appendage. The females are also long and thin with a slightly salient vulva, a conical pointed caudal appendage, oesophageal length approximately one third of body, excretory pore below the oesophageal bulb. The new subspecies most closely resembles *Alaeuris numidica numidica* (Seurat, 1918) Petter, 1966 and *Alaeuris numidica madagascariensis* Petter, 1966.

KEY WORDS : *Alaeuris, A. stehlini* n. sp., *A. numidica canariensis* n. ssp., Nematoda, Pharyngodonidae, *Gallotia stehlini*, Grand Canary Island.

Résumé : DESCRIPTION D'*ALAEURIS STEHLINI* N. SP. ET D'*ALAEURIS NUMIDICA CANARIENSIS* N. SSP. (NEMATODA, PHARYNGODONIDAE), PARASITES DE *GALLOTIA STEHLINI* (LACERTIDAE) DE L'ILE DE GRANDE CANARIE

Des nématodes Pharyngodonidae (Oxyuroidea), appartenant au genre Alaeuris *Thapar, 1925, ont été recueillis dans l'intestin postérieur d'un* Gallotia stehlini *(Lacertidae) de l'île de Grande Canarie (Espagne). Deux espèces,* Alaeuris stehlini *n. sp. et* Alaeuris numidica canariensis *n. ssp. ont été identifiées. Les mâles de la nouvelle espèce, longs et minces, sont caractérisés par d'étroites ailes caudales, la première paire de papilles arrondie, non pédonculée, la deuxième paire allongée, la troisième paire en forme de tétine, une pièce en V courte et étroite, et un appendice caudal relativement long. Les femelles sont également longues et minces avec une vulve légèrement saillante, une queue conique et pointue, un œsophage mesurant environ le tiers de la longueur du corps et un pore excréteur postérieur au bulbe œsophagien. La nouvelle sous-espèce est très voisine de* Alaeuris numidica numidica *(Seurat, 1918) Petter, 1966 et d'*Alaeuris numidica madagascariensis *Petter, 1966.*

MOTS CLÉS : Alaeuris, A. stehlini *n. sp.*, A. numidica canariensis *n. ssp., Nematoda, Pharyngodonidae,* Gallotia stehlini, *Île de Grande Canarie.*

INTRODUCTION

The fauna of the Canary Archipelago includes a large number of endemic species one of which is *Gallotia stehlini*, an inhabitant of Grand Canary Island.

The first study on the parasite fauna of *G. stehlini* was carried out by López Orge in his Doctoral Thesis (1981), in which he reported the presence of the genus *Alaeuris* among the nematodes present in the posterior gut of this lacertid.

The genus *Alaeuris* Thapar, 1925 is characterized by the presence in male of a rather robust caudal appendage with prominent caudal alae and by the ventral position of the last pair of caudal papillae. The tail sometimes terminated by long tapering point or short and rounded (Petter & Quentin, 1976). This group includes parasites of the terrestrial tortoises, New World lizards (Iguanidae & Xantusidae) and Agamidae, represented in Palaearctic, Oriental, Ethiopian, Madagascar, Nearctic and Neotropical regions.

The helminthological study of this lacertid is of interest to us in that it contributes to knowledge of the distribution of the genus *Alaeuris* in Spain. To date, the only species reported in our country is *A. numidica* (Seurat, 1918), found in *Testudo graeca* Linnaeus, 1758 (Reptilia: Testudinidae) in Doñana National Park (Roca, 1988).

MATERIAL AND METHODS

Thirty-two lizards of the species *Gallotia stehlini* were collected from Tafira, Barranco Hondo, La Melonera and Puerto Rico in Grand Canary with the permission of the Island Government Environmental Committee. The animals were taken to the laboratory where they were fed on a varied, mainly vegetarian, diet until sacrifice.

After necropsy, nematodes collected from the posterior gut were fixed in 70 % alcohol at 70 °C then rinsed

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and mounted in Amman lactophenol or 50 % glycerine-alcohol. After mounting, taxonomic and biometric studies were carried out.

RESULTS

Two species of nematodes of the genus *Alaeuris* were collected: *Alaeuris stehlini* n. sp. and *Alaeuris numidica canariensis* n. ssp. described in the following section.

The number of nematodes present in the lizards was extremely high, between 500 and 1,500 per individual, which made their counting very laborious. In spite of this, full parasite counts were done in each individual. Table I compiles the distribution per host locality, the prevalence and the intensity of parasitization of both parasite species.

ALAEURIS STEHLINI N. SP.

DESCRIPTION OF MALE

A straight body with a thick cuticle, striated from the anterior extremity to the anal region. Three lipped mouth with three small internal laminae. Cephalic sense organs consisting of two amphids; papillae not observed. Projections at anterior end of oesophagus tooth-like in side view. Long oesophagus, occupying almost 1/3 of the total length, oxyuriform and terminating in a bulb with a triradiate valvular apparatus characteristic of the order. Straight intestine widening at the anterior extremity. Rounded excretory pore surrounded by a poorly defined elliptical sclerotized plate situated well behind the oesophageal bulb. Posterior extremity with narrow caudal alae beginning in front of the anus and terminating near the last pair of caudal papillae. Caudal appendage with a terminal spine. Two pairs of large papillae in the anal region: non pedunculate preanal ones and long pedunculate postanal ones. Two membranous lobes between the two pairs (interpreted by some authors as a third pair of adanal papillae) corresponding to the double lobe of the anal lip. The third pair of papillae isolated, teated with rosette, in ventral position on the caudal appendage. The anterior anal lip surrounds the second pair of papillae. The posterior lip forms a prominent robust genital cone, strengthened by a narrow V-shaped sclerotized piece. The long spicule has reinforced edges and is sharply pointed.

The measurements are recorded in table II and the illustrations in figure 1.

Holotype: Total length 2,600 µm. Width at oesophageal bulb 140 µm. Length of oesophagus and bulb 780 µm. Diameter of bulb 84 µm. Diameter of oesophagus 28 µm. Distance from cephalic extremity to excretory pore 1,010 µm. Tail length 93 µm. Terminal spine length 23 µm. Diameter of excretory pore 8 µm. Length of spicule 94 µm.

DESCRIPTION OF FEMALE

Female larger than male, with a straight body narrowing at the extremities, a small conical tail. Thick cuticle striated along the whole body length. Three lipped mouth with three small internal laminae.

Localities	Tafira	B. Hondo	Melonera	P. Rico
Total host	11	6	11	4
Host with *Alaeuris*	11	6	11	4
Prevalence in %	100	100	100	100
Collected nematodes	784	152	814	284
Parasitation intensity	71.27	25.33	74.00	71
Host with *A. numidica*	11	4	11	4
Prevalence in %	100	66,67	100	100
Collected nematodes	524	152	760	284
Parasitation intensity	47.64	38	69.09	71
Host with *A. stehlini*	8	0	5	0
Prevalence in %	72.73	0	45.45	0
Collected nematodes	260	0	54	0
Parasitation intensity	32.50	0	10.80	0

Table I. – Distribution of species of Genus *Alaeuris*.

Parameters	Mean (µm)
Body length	2,854 (2,976-2,732)
Body width	156 (166-146)
Oesophagus + bulb length	788 (838-738)
Bulb width	111 (120-102)
Oesophagus width	36 (40-32)
Excretory pore from anterior end	1,078 (1,120-1,036)
Tail	92 (97-87)
Terminal spine length	22 (25-19)
Excretory pore diameter	7 (8-6)
Spicule length	100 (103-97)

n = 20 males.

Table II. – Measurement of males of *A. stehlini*.

Parameters	Mean (µm)
Body length	3,596 (3,753-3,439)
Body width	245 (261-229)
Oesophagus + bulb length	1,132 (1,206-1,058)
Bulb width	152 (163-141)
Oesophagus width	41 (43-39)
Vulva from anterior end	2,342 (2,463-2,221)
Excretory pore from anterior end	1,222 (1,307-1,137)
Tail	121 (127-115)
Eggs length	110 (113-107)
Eggs width	72 (76-68)
Excretory pore diameter	8 (10-6)

n = 20 females.

Table III. – Measurement of females of *A. stehlini*.

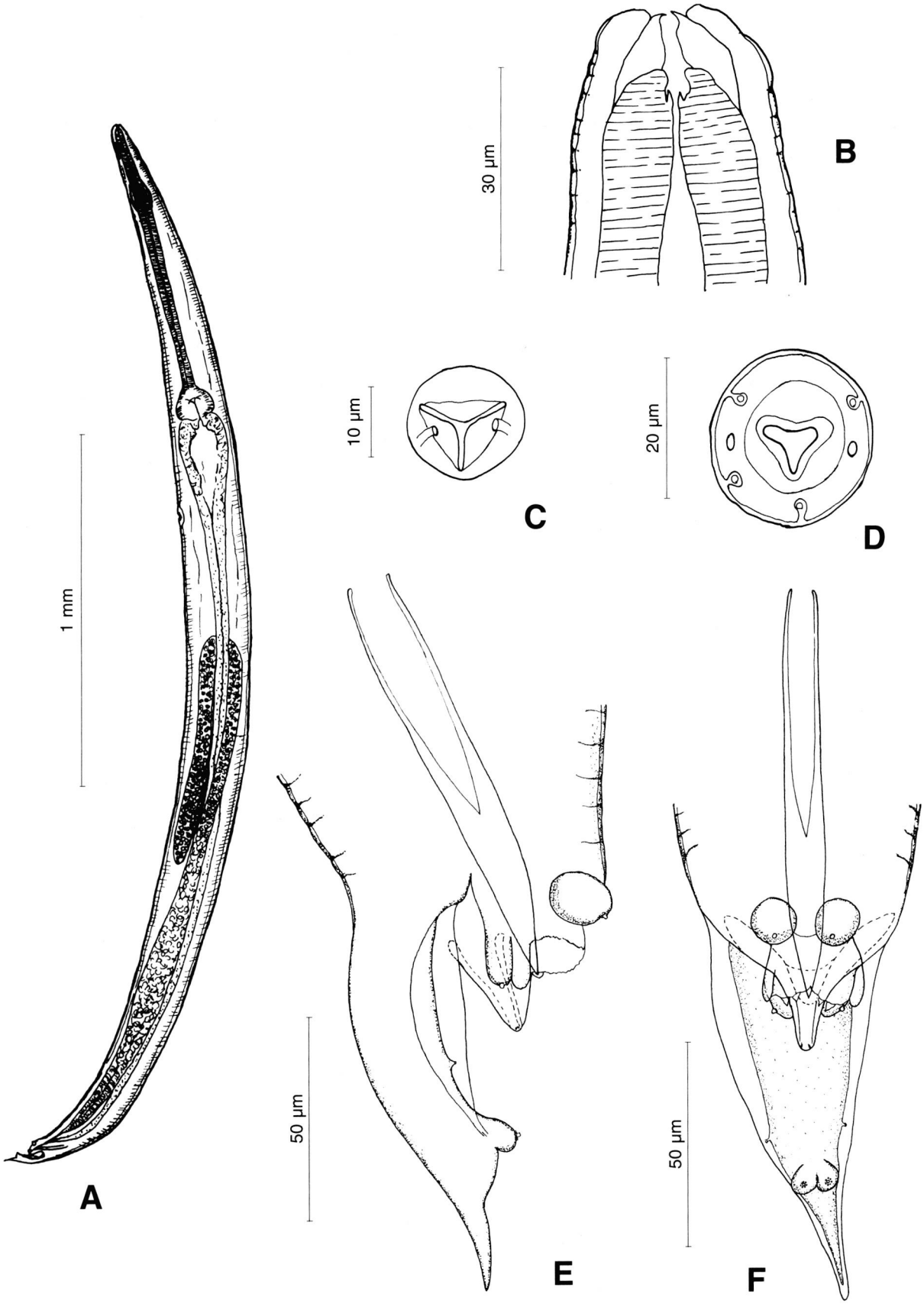

Fig. 1. – *Alaeuris steblini* n. sp., male. A: entire worm, lateral view. B: cephalic extremity, lateral view. C: superficial apical view. D: optical section through buccal cavity, apical view. E: caudal extremity in lateral view. F: caudal extremity in ventral view.

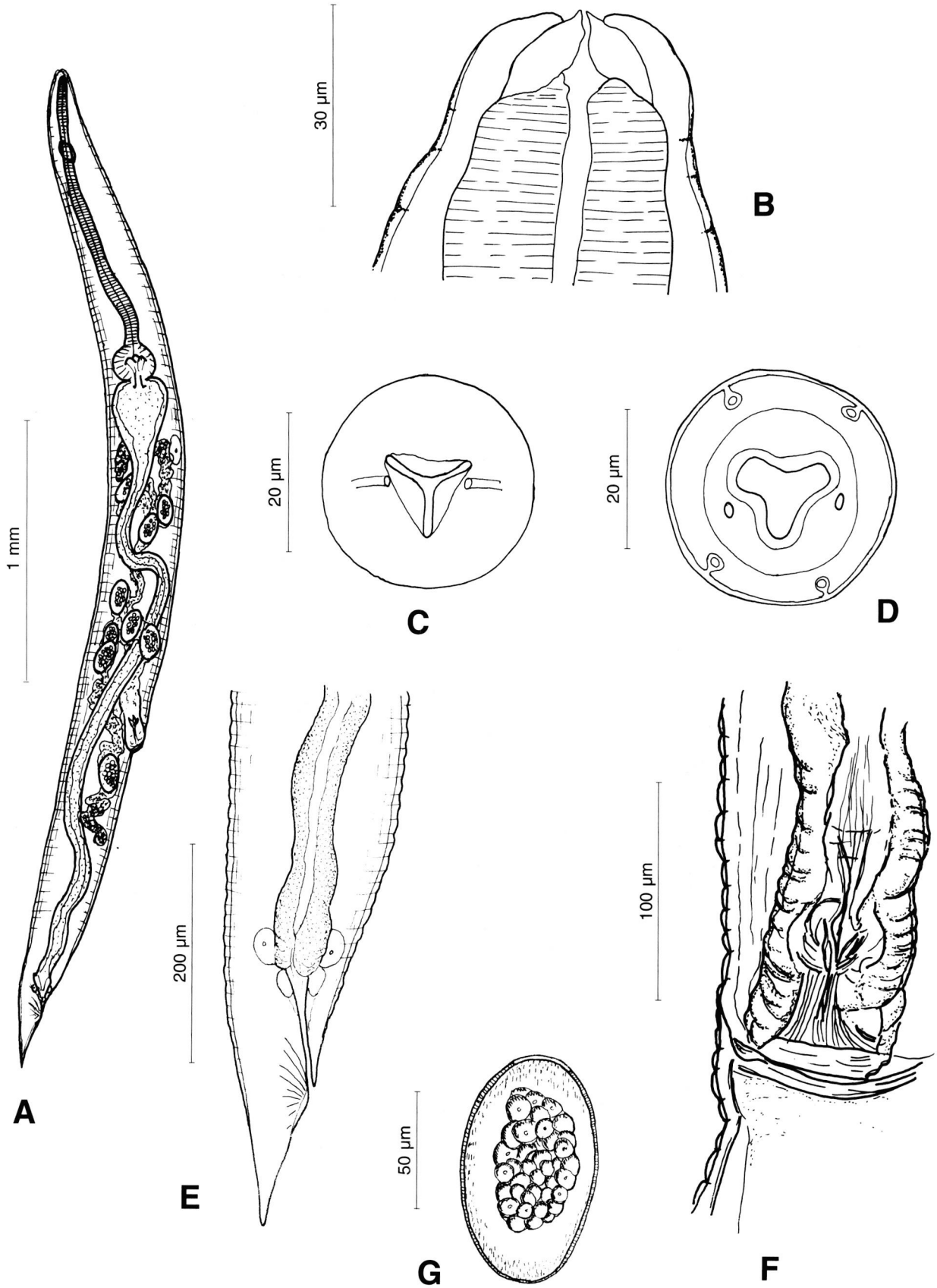

Fig. 2. – *Alaeuris steblini* n. sp., female. A: entire worm, lateral view. B: cephalic extremity, lateral view. C: superficial apical view. D: optical section through buccal cavity, apical view. E: caudal extremity in lateral view. F: vulva and ovejector. G: egg.

Cephalic sense organs consisting of two amphids; papillae not observed. Projections at anterior end of oesophagus tooth-like in side view. A straight oxyuriform oesophagus less than a third of body length, oesophageal bulb with triradiate valvular structure slightly sunken into the intestine. The intestine initially strongly dilated becoming narrower and progressing, in a straight manner, to the end. Ventral anal lip in the posterior extremity. The excretory pore is rounded, positioned behind the bulb and is surrounded by an elliptical sclerotized plate. Amphidelphic, one of the ovi-uterine ducts originates in the anterior and the other in the posterior region; both lead to the posterior body section into which the vulva opens. Prominent vulva covered by a vulvar flap. Oval operculate eggs with thin shell.

The measurements are recorded in table III and the illustrations in figure 2.

Allotype: Total length 3,600 µm. Width at oesophageal bulb 226 µm. Length of oesophagus and bulb 1,040 µm. Diameter of bulb 121 µm. Diameter of oesophagus 32 µm. Distance from cephalic extremity to vulva 2,460 µm. Distance from cephalic extremity to excretory pore 1,280 µm. Egg length 108 µm. Egg width 68 µm. Caudal appendage length 120 µm. Diameter of excretory pore 6 µm.

Host: *Gallotia stehlini.*

Habitat: Posterior gut.

Type locality: Tafira, Grand Canary Island.

Other localities: See table I.

Deposition of types: Department of Parasitology, Faculty of Pharmacy, UCM. Spain. (holotype n° 1023, allotype n° 1024 y paratypes).

Etymology: The specific name of this species derived from the name of the host.

ALAEURIS NUMIDICA CANARIENSIS N. SSP.

DESCRIPTION OF MALE

Large body. Cuticle with transverse striations. Cephalic extremity with rounded end. Three lipped mouth with three internal laminae. Cephalic sense organs consisting of two amphids; papillae not observed. Projections at anterior end of oesophagus tooth-like in side view. A long, thin oesophagus ending in a bulb with a triradiate valvular apparatus. Intestine straight and dilated anteriorly. Rounded excretory pore, surrounded by small plate, situated at bulb level. Absence of lateral alae. Semicircular caudal alae, wich are not supported by the anal papillae. Anterior anal lip formed by a double flap, one part of which is shorter with fluted edges, and the other consisting of a plate with a lobed border, joined at the two finger-like lateral lobes. Posterior anal lip supported by a V-shaped piece, at the end of which are two nerve endings. Three pairs of papillae: two surrounding the anus and another on the caudal appendage. Globular, kidney-shaped preanal papillae and ending in a rosette. Large adanal papillae with a short stem on the posterior end. Caudal papillae joined at the base and ending in a rosette. Long spicule, well cuticularized. The caudal appendage is short, ending in a point behind the pair of caudal papillae. The measurements are recorded in table IV and the illustrations in figure 3.

Parameters	Mean (µm)
Body length	2,756 (2,853-2,659)
Body width	258 (269-247)
Oesophagus + bulb length	1,158 (1,213-1,103)
Bulb width	179 (186-172)
Oesophagus width	49 (52-46)
Excretory pore from anterior end	1,239 (1,283-1,195)
Tail	75 (81-69)
Terminal spine length	15 (17-13)
Excretory pore diameter	6 (7-5)
Spicule length	100 (104-96)

n = 20 males.

Table IV. – Measurement of males of *A. numidica canariensis.*

Holotype: Total length 2,400 µm. Width at oesophageal bulb 252 µm. Length of oesophagus and bulb 969 µm. Diameter of bulb 151 µm. Diameter of oesophagus 40 µm. Distance from cephalic extremity to excretory pore 1,039 µm. Tail length 75 µm. Terminal spine length 15 µm. Diameter of excretory pore 6 µm. Length of spicule 87 µm.

DESCRIPTION OF FEMALE

Large body. Cuticle with fine striations beginning just behind cephalic extremity and continuing to anal region. Three lipped mouth with three internal laminae. Cephalic sense organs consisting of two amphids; papillae not observed. Projections at anterior end of oesophagus tooth-like in side view. Long, straight

Parameters	Mean (µm)
Body length	3,588 (3,791-3,385)
Body width	375 (416-434)
Oesophagus + bulb length	1,610 (1,685-1,535)
Bulb width	215 (230-200)
Oesophagus width	59 (64-54)
Vulva from anterior end	2,546 (2,734-2,358)
Excretory pore from anterior end	1,602 (1,686-1,518)
Tail	88 (94-82)
Eggs length	109 (115-103)
Eggs width	68 (73-63)
Excretory pore diameter	7 (8-6)

n = 20 females.

Table V. – Measurement of females of *A. numidica canariensis.*

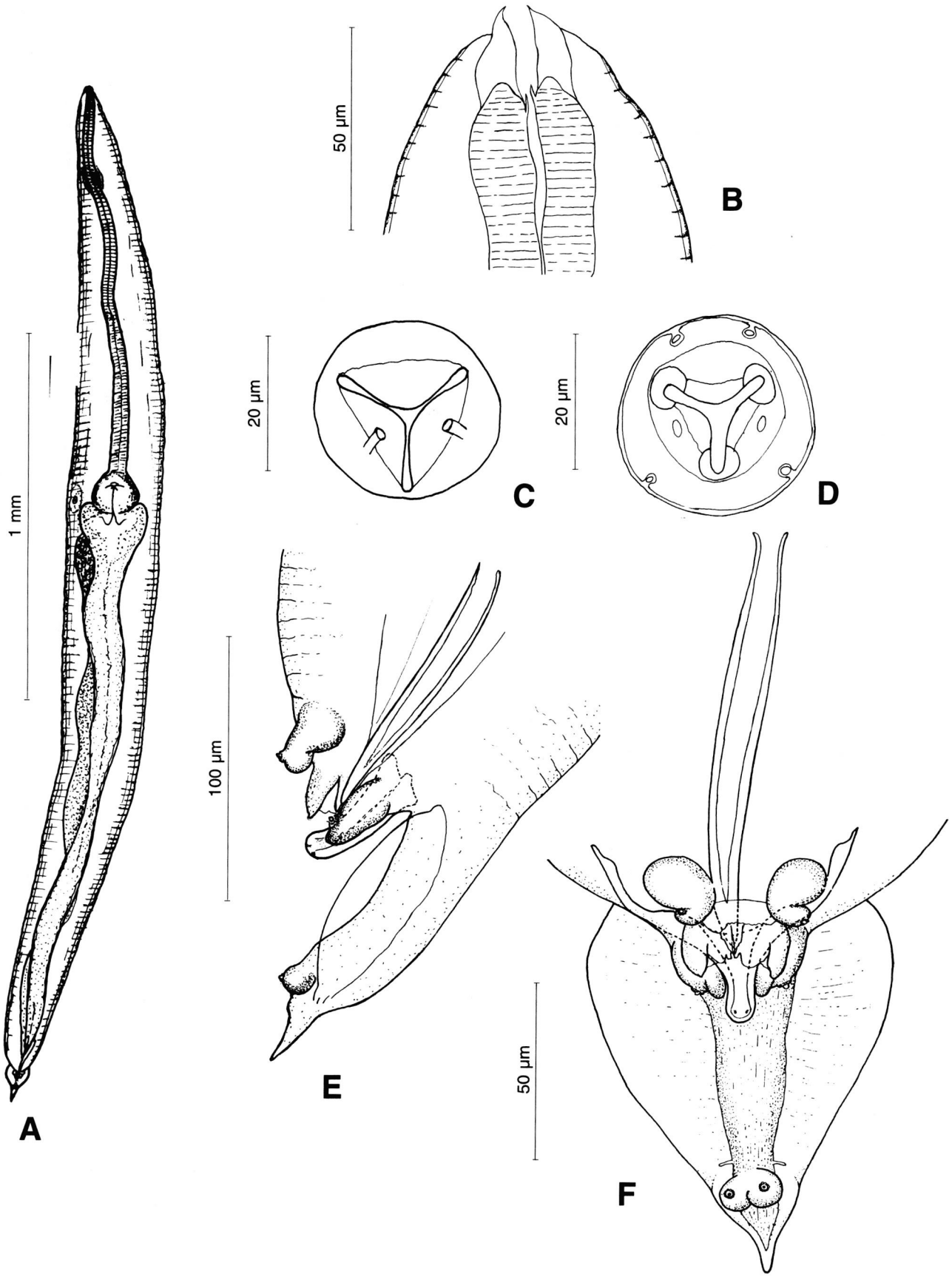

Fig. 3. – *Alaeuris numidica canariensis* n. ssp., male. A: entire worm, ventral view. B: cephalic extremity, lateral view. C: superficial apical view. D: optical section through buccal cavity, apical view. E: caudal extremity in lateral view. F: caudal extremity in ventral view.

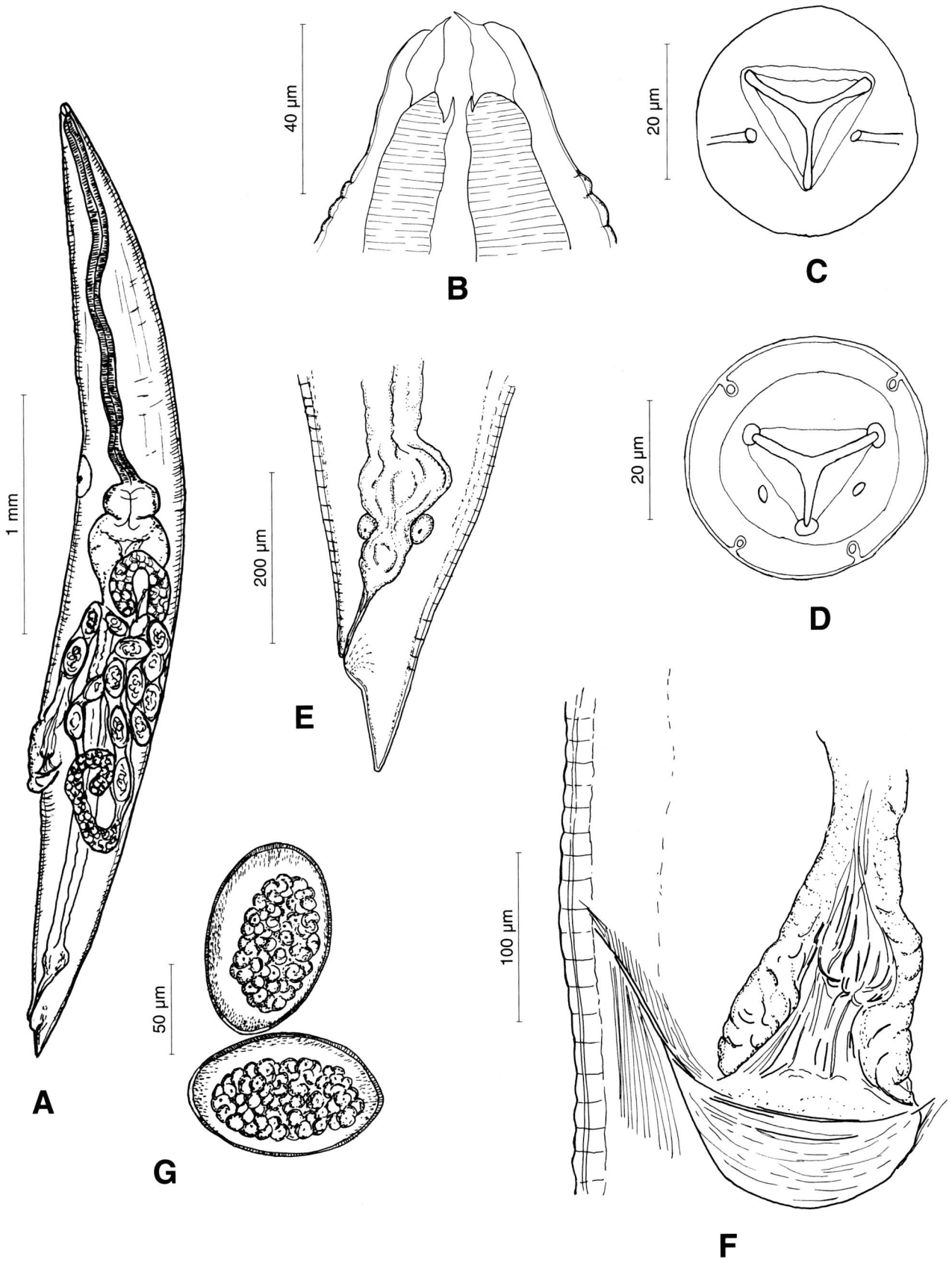

Fig. 4. – *Alaeuris numidica canariensis* n. ssp., female. A: entire worm, lateral view. B: cephalic extremity, lateral view. C: superficial apical view. D: optical section through buccal cavity, apical view. E: caudal extremity in lateral view. F: vulva and ovejector. G: eggs.

oesophagus; the length of the oesophagus and bulb represent almost 1/2 of the total length. Bulb with triradiate valvular system. Straight intestine with a pear-shaped dilation in anterior edge. Excretory pore just before level of bulb, surrounded by a sclerotized oval plate. The vulva is protuberant, situated in the bottom half of the body and covered by a vulvar flap. Amphidelphic. The tail is very short and conical. Eggs with terminal operculum, oval, with a thin shell.

The measurements are recorded in table V and the illustrations in figure 4.

Allotype: Total length 3,575 µm. Width at oesophageal bulb 404 µm. Length of oesophagus and bulb 1,375 µm. Diameter of bulb 181 µm. Diameter of oesophagus 50 µm. Distance from cephalic extremity to vulva 2,500 µm. Distance from cephalic extremity to excretory pore 1,450 µm. Egg length 125 µm. Egg width 65 µm. Caudal appendage length 88 µm. Diameter of excretory pore 7 µm.

Host: *Gallotia stehlini.*

Habitat: Posterior gut.

Type locality: Tafira, Grand Canary Island.

Other localities: See table I

Deposition of types: Department of Parasitology, Faculty of Pharmacy, UCM. Spain. (holotype n° 1025, allotype n° 1026 y paratypes).

Etymology: The subspecific name of this subspecies derived from the name of the island.

DISCUSSION

The new species and the new subspecies are included in the Order Oxyurida, Skrjabin, 1923, Superfamily Oxyuroidea, Railliet, 1916, Family Pharyngodonidae, Travassos, 1919 (Petter & Quentin, 1976) and within the genus *Alaeuris* Thapar, 1925 for the following characteristics: caudal alae independent from the papillae that leave the terminal spine free, a pair of ventral papillae on caudal appendage (Petter & Quentin, 1976).

In the comparative study of our new species, we note that it is most similar to *Alaeuris dupuisi* Petter, 1966 described in Madagascar tortoises. Howewer, the new species has longer and narrower caudal alae, non fused caudal papillae and a shorter caudal appendage; males and females with three lips. *A. dupuisi* is smaller in all the parameters measured, except in the body width.

Moreover, this species most closely resembles the subspecies of *Alaeuris numidica*: *A. numidica numidica* (Seurat, 1918) Petter, 1966 from *Testudo graeca* in North Africa; *A. numidica madagascariensis* Petter, 1966 from *Testudo radiata* and *Pyxis arachnoides* from Madagascar, *A. numidica canariensis*, described in this article from *Gallotia stehlinii* in Grand Canary Island. The new species is easily distinguishable by the shape of the caudal alae, by the length of caudal appendage and by the presence of pedunculate and elongate papillae (second pair). Moreover, the present species differs from *A. numidica canariensis* in possessing shorter and narrower V-shaped piece.

With respect to the form and disposition of the male papillae, it also closely resembles *Alaeuris gopheri pudica* Petter & Douglass, 1976, that parasitizes North American tortoises. However, they differ in that the latter species has large auriculate caudal alae, a very long terminal spine, compared to the very short one in our species, fused caudal papillae and a longer tail in the female.

Another similar species, as regards the disposition of the male papillae, is *Alaeuris caballeroi* Petter & Douglass, 1976, with the main difference being in its longer terminal spine compared to our species. Also, if we compare it with the measurements given by Petter & Douglass, 1976, *A. stehlini* n. sp. is smaller in all the parameters measured. There are two main differences between the females of both species: the excretory pore in *A. stehlini* is postbulbar whereas in the species description by Petter *et al.* it is above the oesophageal bulb; the vulva, prominent in our species is non salient in *A. caballeroi.*

The new subspecies resembles *Alaeuris numidica numidica* (Seurat, 1918) Petter, 1966 cited in *Testudo graeca* from North Africa and *Alaeuris numidica madagascariensis* Petter, 1966 described in Madagascar tortoises. The difference lies in the mouth which in our species is triangular in both males and females, while in Petter's subspecies, the mouth is hexagonal in males and triangular in females. Furthermore, Petter describes in her species a third pair of adanal papillae on the caudal extremity of the male, which we believe are two membranous lobes of the anal flap. Finally, the biometric parameters are smaller, with the exception of spicule length wich is halfway between that of the two cited subspecies.

The genus *Alaeuris* is represented almost worldwide and parasitizes tortoises and iguanids. Our specimens are noteworthy in that they were found in lacertids on Grand Canary Island thus represent a new host family for this genus.

It is also interesting to note the high number of nematodes (hundreds or thousands) present in the posterior gut of lizards from Grand Canary Island, mainly belonging to the genus *Alaeuris*. This does not occur in the other members of the Lacertidae family on Canary Archipelago, and is more characteristic in tortoises. At present, there are no testudinids in the Canary Islands but they have been found in fossils which, given the great age of *Gallotia sthelini* recently

demonstrated by DNA tests (Thorpe *et al.*, 1993), seems to indicate that the nematofauna of this lacertid mainly originate from the tortoises that inhabited the island many years previously, whereas the rest of the Canary lacertids have been more influenced by African continental reptiles.

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