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Contribution to the knowledge of Spanish Lumbricidae

II. *Dendrobaena alvaradoi* n. sp.

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ABSTRACT

A new species is recorded, *Dendrobaena alvaradoi*, from Galapagar (Madrid, Spain). Its morphology is described and the soil examined in which it was found. Similarities and differences with related species are discussed.

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INTRODUCTION

In the Genus *Dendrobaena* Eisen, 1874 (Pop, 1941 em.), one of the most debated of the Family Lumbricidae owing to the difficulty in differentiating its numerous species, are included species generally epigean with red pigment, of small or medium size, with separated setae, *tubercula pubertatis* usually as continuous lines, two to four pairs of seminal vesicles and spermathecae simple.

This genus, established by Eisen (1874), has been modified by several authors. Pop (1941) gave a new definition, later accepted by Omodeo (1956), who, in turn, divided the genus into 2 subgenera *Dendrobaena s.s.* and *Dendrodrilus*, differentiated by Morren's glands and by the position of the spermathecal pores.

Bouché (1972) in accepting Omodeo's division pointed out that in *Dendrobaena* several ecologically convergent lines could be included. Gates (1975, 1979a) raised Omodeo's two subgenera to genera because of Morren's glands and the shape of the nephridial bladders.

While studying the earthworm fauna of the "Sierra de Guadarrama" we found four specimens of a lumbricid that represents, we believe, a new species of the genus *Dendrobaena* as defined by Pop and Omodeo.

MATERIAL AND METHODS

The specimens were collected at a height of 880 m in the "Urbanización El Congosto", Galapagar, Madrid (UTM, 30TVK142938) on 30 January 1980 (two specimens) and 28 February 1980 (two specimens). The holotype and two paratypes (dissected) are in the collection of the Cátedra de Zoologia de Invertebrados no Artrópodos of the Universidad Complutense de Madrid; the third paratype is in Prof. Omodeo's collection.

The extraction was made in the first case by the formalin method and in the second by digging the leaf litter surface in a sparse holm-oak grove with natural turf. The specimens were fixed in alcohol-formalin and preserved in 10% formalin.

In the first sampling, soil samples were taken to study humidity, porosity, aeration, pH, carbon, organic matter, nitrogen, carbon-nitrogen relation and texture. We used our techniques (Diaz Cosin & Moreno, 1979; Diaz Cosin *et al.*, 1980.

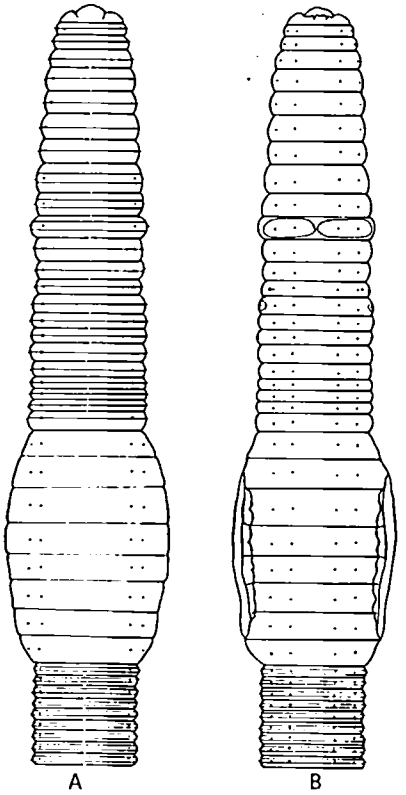

Fig. 1. — *Dendrobaena alvaradoi*: (a) dorsal, (b) ventral view.

RESULTS

External morphology (Fig. 1)

In vivo red pigment with fore-hind gradient; after preservation in formalin it becomes violet. Only one specimen is complete: 75 mm long, maximum width 4 mm, number of segments 116, and weight (after draining for a minute on filter paper) 275 mg.

Prostomium small proepilobous. A transverse groove in every preclitellar segment and 2 in the postclitellar. Setae very widely separated with the following relative distances:

	aa	*ab*	*bc*	*cd*	*dd*
Segment 9	22	12	18	8.5	48
Segment 40	22	10	18.5	8	45

Papillae much marked in segment 11 which includes setae *ab*.

First dorsal pore resembling a just visible dot in 5/6, clearly visible from 9/10 on. Nephridial pores little visible in line *b*. Male pores in 15 with little developed glandular edge, between *b* and *c*. Female pores in 14 a little over line *b*. Spermathecal pores in 9/10 and 10/11 between *c* and *d*, closer to *d*.

Clear colour, saddle-shaped clitellum in 24-31, dorsally and laterally developed up to half of *bc*. Its limits are generally well defined, the intersegmentary grooves and the setae are visible and there is a glandular ventral field.

Tubercula pubertatis 26-30 with both ends tapering.

Internal anatomy (Fig. 2)

Pectinate type musculature.

First septum in 4/5 very little broadened and displaced from 5/6 to 7/8. Lateral hearts from 7 to 11, those of 7 much smaller.

Nephridial bladders of cucumber shape.

Septal glands up to segment 7. Morren's glands in 10 to 13, in 10 with 2 lateral evaginations with lamellae only in the hind part, in 11, 12 and 13 well developed lamellae. Instestinal valve in 14. Crop in 15 and 16, gizzard in 17 and 18. Typhlosole beginning at segment (21) 22, in simple form and very small, ending in region of (95) 97.

Testes and testicular funnels in 10 and

11; the funnels are big and iridescent. Broad, clearly visible deferent ducts, without epididymes, which apparently join in segment 13. Four pairs of seminal vescicles in 9, 10, 11 and 12; those in 9 and 10 small and lateral, those in 11 and 12 bigger but all of them empty of male gametes in development. The spermathecae are 2 pairs in 10 and 11, big and spheroidal, but without spermatozoa.

Ovaries and ovarian funnels well visible in 13; ovisacs in 14 small and little visible; oviducts in 14 well visible.

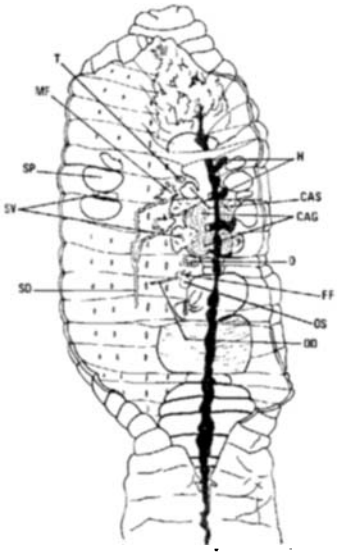

Fig. 2. — *Dendrobaena alvaradoi*. Internal anatomy. CAG, Morren's glands; CAS, evaginations of Morren's glands; FF, ovarian funnels; H, lateral hearts; MF, testicular funnels; O, ovaries; OD, oviducts; OS, ovisacs; SD, deferent ducts; SP, spermathecae; SV, seminal vesicles; T, testes.

Habitat

This species clearly looks epigean, being found between the leaf litter layer and the soil.

The characteristics of the station soil in which it was found were: temperature, 9°C; carbon, 3.21%; organic matter, 5.53%; nitrogen, 0.186%; carbon-nitrogen relation, 17.26; porosity, 43.11%; humidity, 9.15%; ventilation, 33.96%; pH, 6.2; particles over 2 mm diameter, 31.70%; sand, 80.31%; lime, 10.75% and clay, 8.94%.

Derivatio nominis

This species is dedicated to Professor Dr. R. Alvarado.

Companion species

Dendrobaena alvaradoi has been found with *A. caliginosa* and *O. cyaneum*.

DISCUSSION

Dendrobaena alvaradoi is distinguished from *D. byblica*, *D. annectens* and *D. lacustris* by the clitellum and *tubercula pubertatis* position and the relative distances between setae.

From *D.* (= *Orodrilus*) *doderoi*, the new species is distinguished because the former is hemiandric. It can be distinguished from *D. platyura* by the clitellum position, the distances between setae and, above all, by the great size of this species.

It is distinguished from *D. fedtschenkoi* by the distance between setae, the clitellum and the spermathecal pores position. The main difference with *D. oliveirae*, which Omodeo (1956) includes in the genus *Eiseniona*, is that this species presents the setae closely paired.

The four *D. alvaradoi* specimens have empty spermathecae and the seminal vesicles without spermatozoa, so that they are presumably male-sterile and parthenogenetic, the same as *D. byblica*, a parthenogenetic and polymorphous species.

To establish a new species on parthenogenetic specimens is difficult because parthenogenesis generates a reproductive isolation which soon makes populations different. For this reason, Gates (1979b) suggests that the parthenogenetic forms

be referred, whenever possible, to the original amphimictic forms. Unfortunately in this case such a reference is not possible, but some characteristics, such as the setal ratio, Morren's glands, the position of clitellum, tubercles and spermathecal pores, seem enough to justify the establishing of a new species.

Anyway, the study of "Sierra de Guadarrama" earthworms goes on. It is a zone rich in endemic forms suggestive that the future may produce the original amphimictis form.

Of the two subgenera of *Dendrobaena*, *Dendrobaena s.s.* and *Dendrodrilus*, Omodeo (1956) considers as differential characters the presence of Morren's glands, evaginations in segment 10 and the spermathecal pores position in line *c* in *Dendrodrilus*, while in *Dendrobaena s.s.*, Morren's glands, lack of evaginations or only a rudimentary uneven one present, and the spermathecal pores are positioned in line *d* or more dorsally.

The designation of *D. alvaradoi* for some of the two subgenera, *Dendrobaena s.s.* or *Dendrodrilus* is problematic as it presents evaginations of Morren's glands in segment 10, a *Dendrodrilus* character; the spermathecal pores are between *c* and *d*, intermediate position, and the nephridial pores form a single line on each side of the body, *Dendrobaena s.s.* characters.

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