



***Archilina israelitica* n. sp.
(Platyhelminthes Proseriata)
from the eastern Mediterranean**

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INTRODUCTION

The genus *Archilina* Ax, 1959 (Proseriata, Monocelididae) has been the subject of recent publications: problems concerning its monophyly and relationships with the other genera of the *Archilina* genus complex *sensu* Karling (1966) have been discussed and several new species, from the Mediterranean, Red Sea and Caribbean have been described (Martens & Curini-Galletti, 1994, 1995; Curini-Galletti & Martens, 1995).

Eight of the 16 species known come from the Mediterranean. They all occur in low energy sublittoral or brackish environments. Research along the Mediterranean coast of Israel revealed an additional species, with derived morphological, karyological and ecological features for the genus. The present paper describes this new species and discusses its position in the *Archilina* genus complex.

MATERIALS AND METHODS

Extraction, preservation and histological techniques routinely adopted for Proseriata were used (see Martens *et al.*, 1989). Karyological techniques are described by Curini-Galletti *et al.*, 1989. Relative lengths (r.l. = length of chromosome $\times 100$ /total length of haploid genome) and centromeric indices (c.i. = length of short arm $\times 100$ /length of entire chromosome) were obtained from measurements of camera lucida drawings of five metaphase plates. The fundamental number is derived according to Matthey (1949) and the chromosome nomenclature follows Levan *et al.* (1964).

Abbreviations used in the figures

b, bursa; *ci*, cirrus; *co*, copulatory organ; *fd*, female duct; *fg*, female glands; *fp*, female pore; *gg*, «Kittdrüsen»; *mp*, male pore; *od*, oviduct; *ov*, ovary; *pg*, prostate glands; *ph*, pharynx; *sd*, seminal duct; *sta*, statocyst; *t*, testes; *v*, vagina; *vi*, vitellary; *vp*, vaginal pore; *sv*, seminal vesicle.

ABSTRACT

Archilina israelitica sp.n. (Platyhelminthes Proseriata) from the eastern Mediterranean is described. It differs from congeneric species for details of the genital organs. It is the only *Archilina* species known karyologically with $n = 4$ and the only *Archilina* from the Mediterranean occurring intertidally.

KEY WORDS: Platyhelminthes - Eastern Mediterranean - *Archilina*.

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SPECIES DESCRIPTION

Archilina israelitica n.sp.

Distribution and material

Atlit (Mediterranean coast of Israel), intertidal medium to coarse sand (type locality), April 1988, April 1992. Several animals studied alive; 5 specimens serially sectioned (one of them chosen as holotype) (ZC-LUC No 190); 2 whole mounts, 5 specimens used for karyology.

Etymology

The name refers to the type locality.

Description

The habitus of *Archilina israelitica* sp. n. is similar to that of the majority of the Monocelididae (Fig. 1A): slender and elongated, 1 to 2 mm long. They have neither

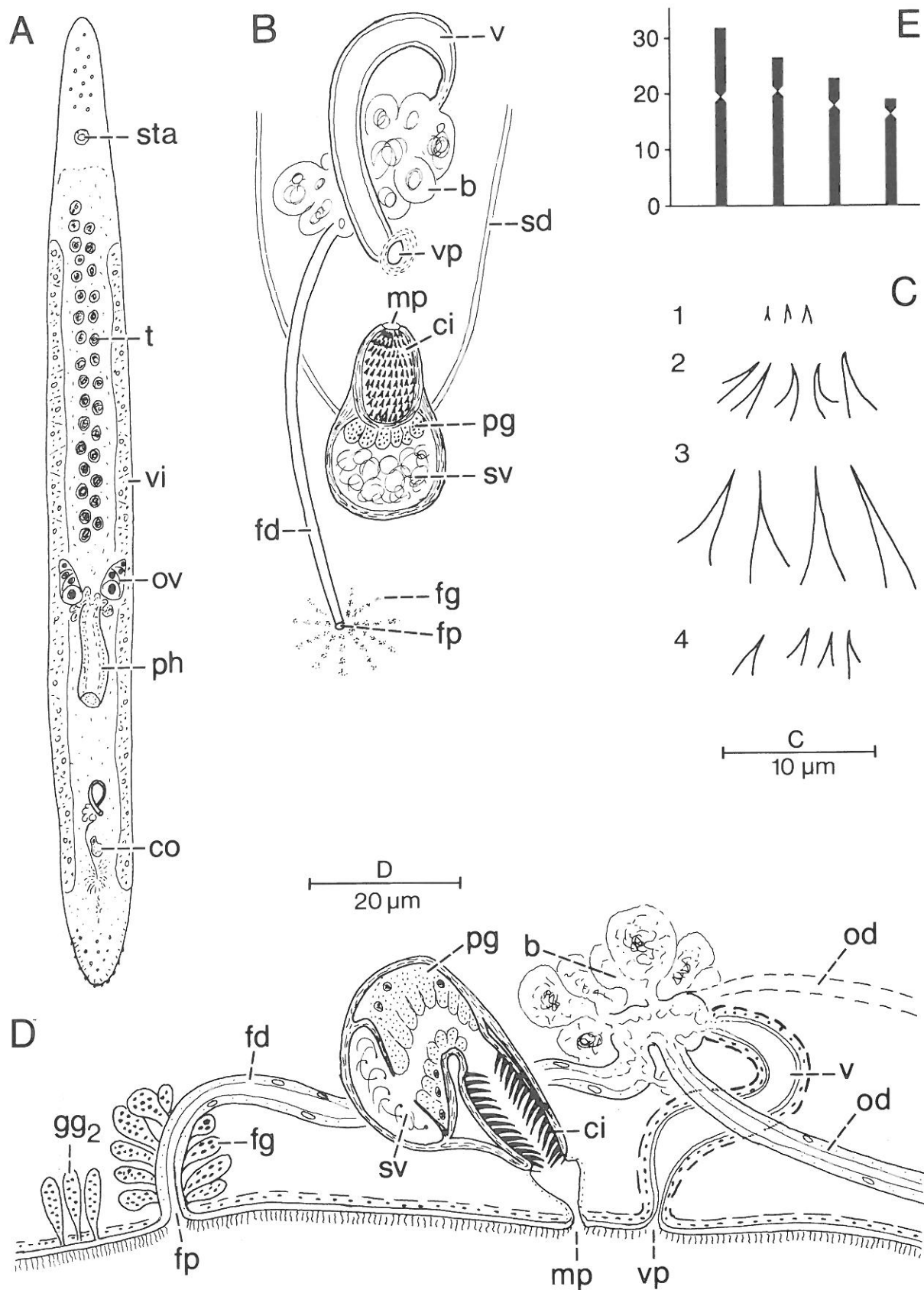


Fig. 1. - *Archilina israelitica* n. sp.: A, general organisation of a living animal; B, general organisation of the copulatory organs from living animals; C, cirrus spines (see text for description); D, reconstruction of the copulatory organs from serial sagittal sections; E, idiogram.

pigmented eye-spots nor pigment in other parts of the body. The anterior tip is rounded, with a few very small 'oily droplets' in front of the statocyst. The posterior end is rounded and provided with some small adhesive papillae. The epidermis is of the insunk type, ciliated all over the body, except for the caudal tip. Cilia are about 3 μm long. No rhabdite-like structures were observed within the epidermis. In sectioned material, numerous small elongate sac-like glands, opening through the epidermis, were observed all over the body, clearly more abundant in the posterior part of the body. The pharynx is in the second half of the body, about 150 μm long. External and internal epithelium have insunk nuclei and are ciliated except at the distal tip of the pharynx, where pharyngeal glands discharge. The longitudinal muscles lie at the epithelial side, the circular muscles at the parenchymal side. The cell bodies of the pharyngeal glands lie ventrally in front of the pharynx, and extend under the ovaries.

Male genital organs. There are about 25 to 35 testes in two irregular medioventral rows. The copulatory organ is an ovoid bulb, about 100 to 120 μm long in squeezed animals, with a well developed muscular wall. It contains a straight cirrus, the seminal vesicle and the prostatic vesicle. The prostatic vesicle is lined by a nucleated secretory epithelium with very small eosinophilous granules. The seminal vesicle is well separated from the prostatic vesicle by a muscular diaphragm. The copulatory organ opens into the male atrium, which is provided with a non-ciliated epithelium.

The straight cirrus, about 50 to 60 μm long and 25 μm broad in squeezed condition, is barrel-shaped in living animals. In whole mounts different kinds of spines can be distinguished (Figs 1C, 2B). There are 25 to 32 rows

with 15 to 18 spines per row, except at the basis of the cirrus where there are only 5 to 6 spines per row. These proximal spines are short, about 3 to 4 μm (nr. 4 in Fig. 1C). More distally, the spines range between 8 and 10 μm in length and are straight or very slightly curved (nr. 3 in Fig. 1C). Near the tip of the cirrus, the spines become smaller (3 to 5 μm), and are mostly curved more strongly (nr. 2 in Fig. 1C). At the extreme tip of the cirrus some very small spines, 1-2 μm long can be seen (nr. 1 in Fig. 1C). In the living animals those different kinds of spines are easily overlooked and the non-everted cirrus seems to be densely packed with spines (Fig. 1B).

Female genital organs. The ovaries are ventro-lateral in front of the pharynx, the vitellaries are dorso-lateral and extend from behind the first testes till behind the copulatory organ. The oviducts, lined with a non-ciliated epithelium, run to the pre-penial bursa of the resorbiens type, situated just in front of the copulatory organ. This bursa consists of some large spherical bulges with sperm, and continues posteriorly into the female duct, which is lined with a nucleated epithelium (Fig. 1D). A long and coiled muscular vagina starts from the anterior part of the bursa and opens to the outside 20 to 50 μm in front of the male pore in living animals. This vagina is lined with a (probably) non-secretory epithelium with insunk nuclei and is surrounded with a well developed inner circular and outer longitudinal muscle layer; no glands were observed around the pore. The female duct opens behind the male pore. The last portion of the female duct is surrounded by numerous female glands with large eosinophilous granules. Numerous glands («Kittdrüsen») (gg₂ in Fig. 1D) are present behind the female pore.

Karyotype. The haploid chromosome set is made up of 4 chromosomes, distinctly differing in size. The total

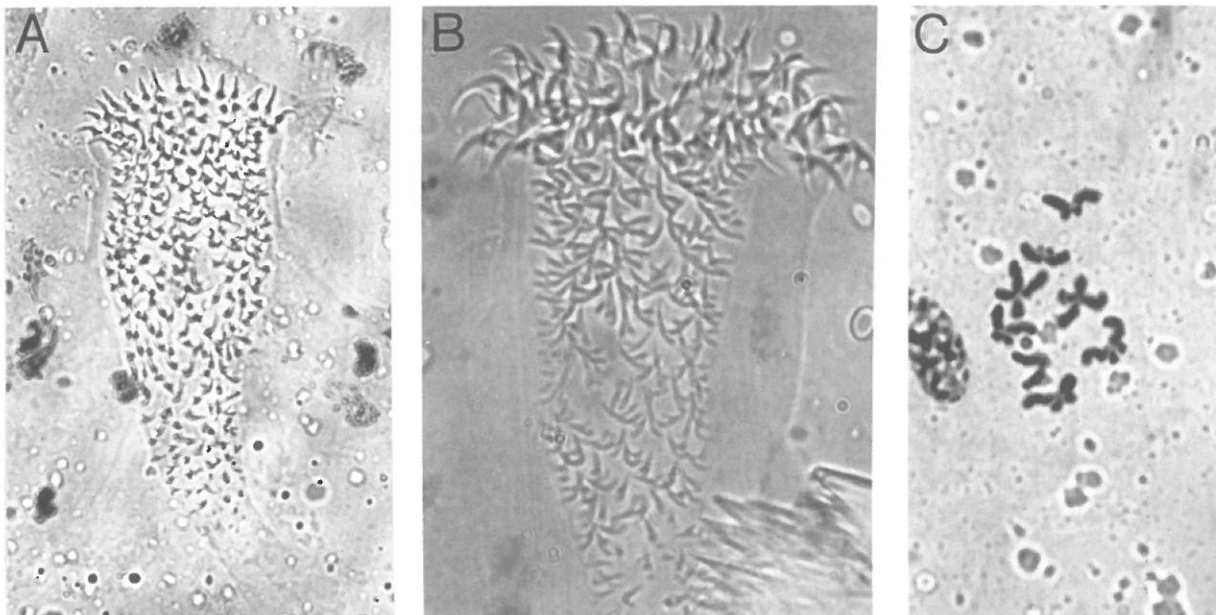


Fig. 2 - *Archilina israelitica* n. sp.: A - B, cirrus from moderately (A) and strongly (B) squeezed karyological slides; C, spermatogonial mitosis.

haploid length is $12.3 \pm 1.6 \mu\text{m}$, the fundamental number is 5. The first chromosome is metacentric (r.l. = 31.8; c.i. = 38.8), the others are subtelocentric (Chrom. 2: r.l. = 26.5; c.i. = 22.6; Chrom. 3: r.l. = 22.7; c.i. = 21.2; Chrom. 4: r.l. = 18.9; c.i. = 13.9). The idiogram (Fig. 1E) is based on these karyometrical data.

DISCUSSION

Archilina israelitica n. sp. clearly belongs to the *Archilina* genus-complex. Based on the combination of its morphology and karyology, it is not possible to place the new species in one of the more derived genera of the complex, viz. *Archilina* de Beauchamp, 1910, *Archilopsis* Meixner, 1938, *Mesoda* Marcus, 1949, *Monocelopsis* Ax, 1951, *Tajikina* Martens & Curini-Galletti, 1994, *Inaloea* Martens & Curini-Galletti, 1994. According to the presence of insunk epithelial nuclei, simple prepenial bursa with external vagina, simple copulatory bulb and absence of postpenial bursa, we assign it to the genus *Archilina* Ax, 1959, which contains species with mostly plesiomorphic characters (for the discussion about this group, see Martens & Curini-Galletti, 1994, 1995).

The main characters differentiating *A. israelitica* from the other species of the genus are the shape of the cirrus, vagina, karyotype and habitat.

In living animals of the new species the inverted cirrus is barrel-shaped, nearly half as broad as long, with numerous rows of spines, seemingly identical, unless in strongly squashed mounts. The only known species which has a cirrus with the same length to breadth ratio is *A. palestinica* Martens & Curini-Galletti, 1994. In this species, however, the cirrus is provided with fewer spines with distinctly marked size differences (ranging 3-22 μm), easily appreciable in living specimens.

According to Martens & Curini-Galletti (1994), the plesiomorphic condition for the genus *Archilina* is a rather short vagina opening into the prepenial bursa. In most of the species, the bursa is of the resorbiens type. This morphology can be modified, as in the new species, whose vagina is long, very muscular and coiled. The only species with a vagina comparable with that of the new species is *A. endostyla* Ax, 1959. In this species, however, the vagina is not coiled. Furthermore, in *A. israelitica* the oviducts enter the bursa separately, while in *A. endostyla* the oviducts fuse before entering the bursa.

A long muscular external vagina which can be coiled is also found in the genus *Inaloea* Martens & Curini-Galletti, 1994. In the two described species [*I. scalopura* (Marcus, 1949) and *I. cirrifera* (Meixner, 1943)] the common femal duct, which runs to the female pore, starts from the muscular vagina (see Fig. 1 in Martens & Curini-Galletti, 1994), while in the new species the common female duct starts from the bursa. Furthermore, the genus *Inaloea* presents other characters which are missing in the new species: 1) extremely long cirrus and 2) the copulatory bulb not filled up by the seminal and prostatic vesicles,

which are more or less isolated from the bulb wall. Both *Inaloea* species live in brackish water.

The karyotype is an additional derived feature of *A. israelitica*. The new species, in fact, has a karyotype with 4 chromosomes in its haploid set, distinctly differing in size. The longest one is metacentric; while the others are subtelocentric. This karyotype is the result of a Robertsonian process of fission of Chrom. 1 of the basic set for the Monocelididae with $n = 3$. All the other karyologically known species included in the genus *Archilina* have $n = 3$ (Martens & Curini-Galletti, 1994; Curini-Galletti & Martens, 1995). Haploid sets with four chromosomes are also present in the genera *Inaloea* and *Archiloea* de Beauchamp, 1910. The karyotype of *A. israelitica* is nearly identical to that found in the karyologically known *Inaloea* species (a new species and *I. cirrifera* (see *Archiloea cirrifera* in Curini-Galletti *et al.*, 1989). It is questionable whether this identity implies a relationship among the new species and *Inaloea* or represents a homoplasious feature. Based on the data reported above, we favour the latter hypothesis, since the new species does not present the characteristic morphology of the copulatory organ of the genus *Inaloea*. Furthermore, fission of Chrom. 1 of the basic set of the Monocelididae is known to have happened independently in other genera of the family (*Promonotus* Beklemishev, 1927; *Boreocelis* Westblad, 1952; *Duplominona* Karling, 1966) (Curini-Galletti *et al.*, 1989 and unpubl. data) always resulting in very similar karyotypes with $n = 4$.

The aberrant karyotype of *A. israelitica* within the genus *Archilina* is possibly linked with its unusual habitat. Curini-Galletti & Martens (1990) showed a significative correlation, within the Monocelididae, between colonization of stressed environments and karyological evolution from the basic set, basically through Robertsonian mechanisms. *A. israelitica* occurs intertidally in medium to coarse sand, a habitat which experiences high energy stress due to wave action, as well as salinity and temperature extremes. On the contrary, all the other Mediterranean *Archilina* species are found in lower energy habitats (subtidal or brackish, in protected conditions) and have basic karyotypes. This was also evident in the locality where we found the new species, where two other *Archilina* species, with $n = 3$ and basic set, were present subtidally in the same transect: *A. palestinica* occurring at a depth of about 30 cm and *A. endostyla* at a depth of about 60 cm.

REFERENCES

- Curini-Galletti M. C., Martens P. M., 1990 - Karyological and ecological evolution of the Monocelididae (Platyhelminthes, Proseriata). P.S.Z.N.I.: Mar. Ecol., 11: 255-261.
- Curini-Galletti M. C., Martens P. M., 1995 - New *Archilina* species (Platyhelminthes, Proseriata) from the Red Sea and the Caribbean. Tropical Zool., in press.
- Curini-Galletti M. C., Puccinelli I., Martens P. M., 1989 - Karyometrical analysis of ten species of the subfamily Monocelidinae (Proseriata, Platyhelminthes) with remarks on the

- karyological evolution of the Monocelididae. *Genetica*, 78: 169-178.
- Karling T. G., 1966 - Marine Turbellaria from the Pacific Coast of North America IV. Coelogynoporidae and Monocelididae. *Ark. Zool.*, 18: 493-528.
- Levan A., Fredga K., Sandberg A. A., 1964 - Nomenclature for centromeric position on chromosomes. *Hereditas*, 52: 201-220.
- Martens P. M., Curini-Galletti M. C., Puccinelli I., 1989 - On the morphology and karyology of the genus *Archilopsis* (Meixner) (Platyhelminthes, Proseriata). *Hydrobiologia*, 175: 237-256.
- Martens P. M., Curini-Galletti M. C., 1994 - Revision of the *Archiloa* genus complex with description of seven new *Archilina* species (Platyhelminthes, Proseriata) from the Mediterranean. *Bijdr. Dierkd.*, 64: 129-150.
- Martens P. M., Curini-Galletti M. C., 1995 - Phylogenetical relationships within the *Archiloa* genus complex. *Hydrobiologia* (in press).
- Matthey R., 1949 - Les chromosomes des Vertébrés. Rouge, Lausanne, 344 pp.

