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Karyological study of three *Monocelis*-species, and description of a new species from the Mediterranean, *Monocelis longistyla* sp. n. (Monocelididae, Plathelminthes)

Paul M. Martens and Marco C. Curini-Galletti

Contents

Abstract

Monocelis longistyla sp. n. from litoral sandy habitats of the Mediterranean is described. The karyotypes of *Monocelis fusca, Monocelis lineata* and *Monocelis longistyla* sp. n. were analysed.

A basic karyotype for the genus *Monocelis* is postulated and its probable evolution from the basic karyotype of the family Monocelididae and within the genus is discussed. The karyotype of *M. longistyla* seems to have evolved from the basic *Monocelis* karyotype by pericentric inversions.

However from the analysis of the karyotype in different populations of *M. lineata* the species appeared not to be homogeneous (European populations versus the Canadian population).

A. Introduction

Our knowledge of the karyology within the genus *Monocelis* is limited: RUEBUSH (1938) reported the chromosome number n = 3; 2 n = 6 for *M. fusca* (without any description of the karyotype) and CURINI-GALLETTI et al. (1984) presented a description of the karyotype of *M. lineata* and of the new species which is described further on.

With the more extensive data which have now become available, some conclusions can be drawn on the possible karyological evolution within the genus and within the family.

B. Methods

The animals were extracted from algae, mussels or sediment with $MgCl_2$ (see MARTENS 1984).

Identification of the animals was performed on living material and the description of the new species is based on sectioned material as well. Animals were fixed in Bouin's fluid and serially sectioned (5 µm). Sections were stained with Heidenhain's iron hematoxylin. The relative pore distance is given according KARLING (1966).

Karyological analysis was carried out according to the method described in CURINI-GALLETTI et al. 1985. The idiograms are based on the mean values reported in tab. 1, 2 and 3. The chromosome nomenclature employed is that of LEVAN et al. 1964.

C. Description of the new species

Monocelis longistyla sp. n.

(Fig. 1)

Localities: Bay of Calvi (Corsica, France), medium sand with gravel, litoral, April 1984 (type locality); Bay of Portoferraio (Elba, Italy), sand with gravel, litoral, Oct. 1983; Punta Marina (Ravenna, Italy), fine sand, litoral, Nov. 1985.

Material: Several animals studied alive, 3 sectioned specimens, one of them designed as holotype (sectioned sagittally) and 3 whole mounts.

Description: The living animals are about 3 mm long, without pigment or eyes (Fig. 1 A). The anterior end is rounded and provided with well developed glands in front of the brain. The caudal end, very variable in appearance (Fig. 1 B) bears

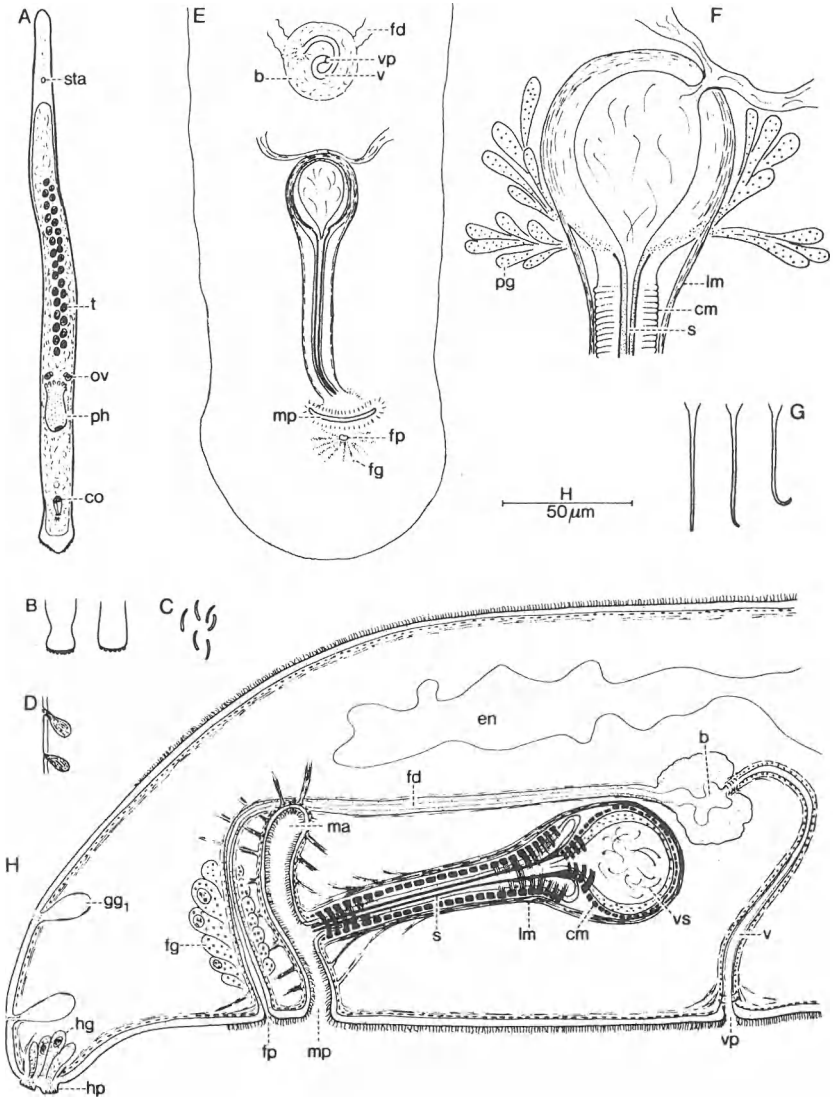

Fig. 1. *Monocelis longistyla* sp. n. A. Habitus. B. Shapes of tail. C. Rhabdites. D. Eosinophilous glands. E. Copulatory organs. F. Copulatory bulb. G. Differences in stylet shape. H. Reconstruction of the genital organs, from serial sections (seen from the right).

ventral and lateral adhesive papillae, and forms an adhesive disk. The epidermis, with depressed nuclei, is ciliated except in the caudal end and contains banana-shaped rhabdites over the whole body (Fig. 1 C). Small eosinophilous epidermal glands are present (Fig. 1 D). Some larger glands (gg_1) are present in the caudal tip (Fig. 1 H). The pharynx is situated in the last third of the body. The ovaria lie in front of the pharynx, and vitellaria run from the level of the first pair of testes till just in front of the copulatory organ. About 30 testes lie medially in two non-symmetrical rows anteriorly to the pharynx. The copulatory organ (Fig. 1 E and H) consists of a globular seminal vesicle in which prostatic glands discharge distally. The vesicle is surrounded by strong inner circular and outer longitudinal muscles which continue around the stylet sheat. The backwards orientated stylet in the three populations is 100 – 110 µm long. The distal end of the stylet is variable, due to the flexibility of the material (Fig. 1 F). The male atrium is large, with a ciliated epithelium surrounded by muscles, and communicates with the exterior via a wide pore. Several muscles insert on the wall of the atrium and run to the body wall or to the stylet sheat. These muscles make the atrium, the pore and even the whole posterior body part variable in aspect. In front of the copulatory bulb the common oviduct is differentiated into a large bursa of the resorbiens type with a long and slender vagina with muscular wall. In the living animal the vagina is spirally convoluted (Fig. 1 G). Behind the bursa, the female duct has a thin non-ciliated epithelium with a few muscles; it runs above the copulatory bulb and opens through the female pore which is surrounded by numerous erythrophilic glands.

Diagnosis: *Monocelis* species (3 mm long) without eyes or pigment. Copulatory bulb with a backwards orientated stylet of 100 – 110 µm. Large male atrium. Long muscular vaginal duct. Vaginal pore, male pore and female pore separated from each other. Pore relation a:b:c:d = 7:11:2:5.

D. Karyological data

1. *Monocelis fusca*

(Fig. 2, Table 1)

Material studied: List (Sylt, West-Germany), fine sand with mud, litoral, Sept. 1985, 6 specimens; Passamaquoddy bay (St. Andrews, East-Canada), on mussels, litoral, Aug. 1984, 3 specimens.

The populations from the North Sea (Sylt) and from the Canadian coast (Passamaquoddy bay) are not appreciably different in their karyotype. The complement is composed of three pairs of homologous chromosomes, the smallest pair being a little over 2/3 of the length of the largest pair.

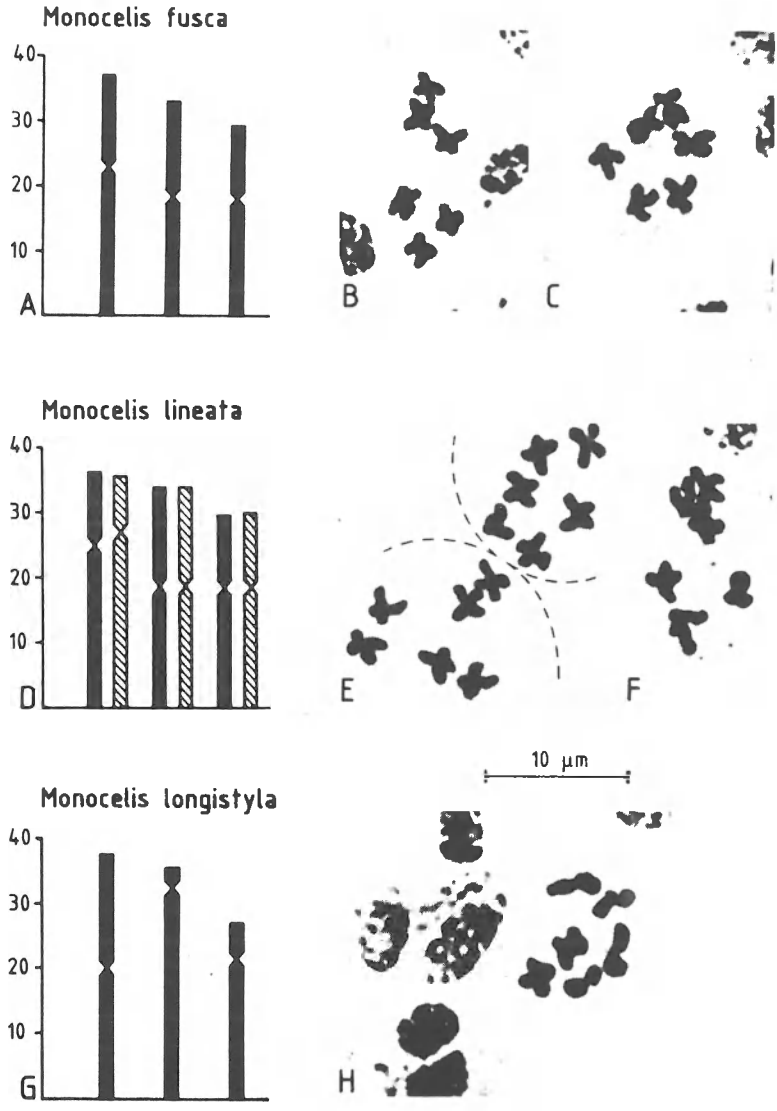

Fig. 2. Idiograms and plates from spermatogonial mitosis. *Monocelis fusca*. A. Idiogram. B. Plate from the Canadian population. C. Plate from the List population. *Monocelis lineata*. D. Idiogram of the European (black) and the Canadian (lined) populations. E. Two plates from the Calvi population. F. Plate from the Canadian population. *Monocelis longistyla*. G. Idiogram. H. Plate from the Portoferraio population.

Table 1: Karyometric data for the three chromosomes of the haploid set of *Monocelis fusca*. In parenthesis the number of metaphasic plates measured.

Population		Chromosome 1	Chromosome 2	Chromosome 3	Haploid genome size (µm)
Monocelis fusca					
List (16)	r. l.:	37.20 ± 1.31	33.30 ± 1.07	29.50 ± 1.28	
	c. i.:	39.11 ± 1.70	43.29 ± 2.21	38.61 ± 2.61	5.60 ± 0.55
	size (µm):	2.09 ± 0.22	1.86 ± 0.18	1.65 ± 0.20	
	nomencl.:	m	m	m	
Passamaquoddy	r. l.:	37.15 ± 1.29	33.05 ± 1.25	29.79 ± 1.72	
bay (13)	c. i.:	36.24 ± 2.10	44.74 ± 2.07	37.99 ± 3.71	7.15 ± 0.60
	size (µm):	2.66 ± 0.25	2.36 ± 0.20	2.13 ± 0.22	
	nomencl.:	sm	m	m	
means	r. l.:	37.18 ± 1.28	33.19 ± 1.14	29.63 ± 1.47	
	c. i.:	37.73 ± 2.38	43.99 ± 2.23	38.32 ± 3.14	6.30 ± 0.97
	size (µm):	2.34 ± 0.37	2.09 ± 0.31	1.87 ± 0.31	
	nomencl.:	m	m	m	

All chromosomes are metacentric, but chromosomes 1 and 3 are nearly submetacentric according to LEVAN et al. 1964 (c. i.: 37.73 and 38.32). The haploid genome has a mean absolute length of 6.30 µm.

2. *Monocelis lineata*

(Fig. 2, Table 2)

Material studied: Giglio Island (Tuscany, Italy), coarse sand, litoral, Dec. 1985, 4 specimens; Capraia Island (Tuscany, Italy), medium sand, litoral, May 1985, 5 specimens; S. Rossore (Tuscany, Italy), on mussels and algae, April 1984, 4 specimens; Bay of Calvi (Corsica, France), on coralline algae, litoral, April 1985, 4 specimens; Punta Marina (Ravenna, Italy), fine sand, litoral, Nov. 1985, 6 specimens; Cefalonia (Greece), coarse sand, Aug. 1981, 8 specimens; List (Sylt, West-Germany), fine sand with mud, Sep. 1985. 6 specimens; Passamaquoddy bay (St. Andrews, East-Canada), on mussels, litoral, Aug. 1984, 4 specimens.

The karyotypes in the seven European populations are highly similar and confirm the data of CURINI-GALLETTI et al. (1984) and of GALLENI & PUCCINELLI (1984). Relative and absolute lengths of the chromosomes are similar to those in *M. fusca*. Chromosomes 1 and 3 are, however, slightly more heterobrachial and submetacentric according to the classification of LEVAN et al. 1964 (c. i.: 31.37 and 36.79 resp.). In the Canadian population of *M. lineata*, however, chromosome 1 is subtelocentric with a c. i. = 23.49, which is significantly different from that in the European populations ($t = 7.9546$; $p \ll 0.01$). Canadian and European

Table 2: Karyometric data for the three chromosomes of the haploid set of *Monocelis lineata*. In parenthesis the number of metaphasic plates measured. * Recalculated from the data used by CURINI-GALLETTI et al. (1984) ** from GALLENI & PUCCINELLI (1984).

Population		Chromosome 1	2	3	Haploid genome size (μm)
Monocelis lineata					
Giglio Is. (14)	r. l.:	35.68 ± 1.10	34.12 ± 1.73	30.19 ± 1.56	
	c. i.:	32.68 ± 3.02	46.33 ± 2.26	36.72 ± 2.19	5.81 ± 0.58
	size (μm):	2.07 ± 0.23	1.97 ± 0.20	1.75 ± 0.22	
	nomencl.:	sm	m	sm	
Capraia Is. (11)	r. l.:	36.09 ± 1.03	33.95 ± 2.01	30.30 ± 1.44	
	c. i.:	31.40 ± 2.66	45.12 ± 1.87	35.76 ± 2.56	5.69 ± 0.37
	size (μm):	2.07 ± 0.18	1.91 ± 0.15	1.72 ± 0.13	
	nomencl.:	sm	m	sm	
S. Rossore (9)	r. l.:	36.01 ± 1.92	34.11 ± 0.83	29.88 ± 2.27	
	c. i.:	29.54 ± 1.42	45.98 ± 1.99	36.36 ± 3.04	6.34 ± 0.79
	size (μm):	2.28 ± 0.28	2.16 ± 0.21	1.89 ± 0.38	
	nomencl.:	sm	m	sm	
Bay of Calvi (14)	r. l.:	35.91 ± 2.07	34.49 ± 2.62	29.59 ± 2.05	
	c. i.:	31.52 ± 3.20	44.71 ± 2.29	38.49 ± 4.32	5.95 ± 0.44
	size (μm):	2.14 ± 0.22	2.05 ± 0.19	1.76 ± 0.19	
	nomencl.:	sm	m	m	
Punta Marina (9)	r. l.:	36.52 ± 0.99	34.54 ± 1.76	29.21 ± 1.43	
	c. i.:	31.65 ± 2.62	44.76 ± 2.02	37.31 ± 2.18	6.30 ± 1.16
	size (μm):	2.30 ± 0.43	2.17 ± 0.38	1.83 ± 0.38	
	nomencl.:	sm	m	sm	
Cefalonia * (10)	r. l.:	37.46 ± 1.47	33.61 ± 1.07	29.74 ± 1.51	
	c. i.:	31.06 ± 2.62	44.66 ± 2.49	35.07 ± 2.61	5.33 ± 0.65
	size (μm):	2.00 ± 0.28	1.79 ± 0.26	1.58 ± 0.19	
	nomencl.:	sm	m	sm	
List (9)	r. l.:	37.00 ± 1.52	33.83 ± 1.54	29.15 ± 2.30	
	c. i.:	31.48 ± 2.02	42.61 ± 2.46	36.74 ± 3.92	6.50 ± 1.12
	size (μm):	2.41 ± 0.45	2.19 ± 0.35	1.89 ± 0.37	
	nomencl.:	sm	m	sm	
Means of European	r. l.:	36.34 ± 1.51	34.11 ± 1.82	29.73 ± 1.80	
populations	c. i.:	31.37 ± 2.65	44.99 ± 2.40	36.79 ± 3.16	6.05 ± 0.83
	size (μm):	2.22 ± 0.33	2.08 ± 0.28	1.81 ± 0.28	
	nomencl.:	sm	m	sm	
Øresund **	r. l.:	35.12 ± 1.20	34.55 ± 3.49	30.35 ± 2.74	
	c. i.:	33.53 ± 4.70	45.01 ± 1.99	32.09 ± 5.29	
	nomencl.:	sm	m	sm	
Passamaquoddy	r. l.:	35.71 ± 1.95	34.10 ± 1.41	30.18 ± 1.63	
bay (11)	c. i.:	23.94 ± 3.09	45.85 ± 1.76	38.46 ± 2.95	7.25 ± 1.09
	size (μm):	2.57 ± 0.31	2.48 ± 0.44	2.19 ± 0.37	
	nomencl.:	st	m	m	

Table 1: Karyometric data for the three chromosomes of the haploid set of *Monocelis fusca*. In parenthesis the number of metaphasic plates measured.

Population		Chromosome 1	2	3	Haploid genome size (µm)
Monocelis fusca					
List (16)	r. l.:	37.20 ± 1.31	33.30 ± 1.07	29.50 ± 1.28	
	c. i.:	39.11 ± 1.70	43.29 ± 2.21	38.61 ± 2.61	5.60 ± 0.55
	size (µm):	2.09 ± 0.22	1.86 ± 0.18	1.65 ± 0.20	
	nomencl.:	m	m	m	
Passamaquoddy	r. l.:	37.15 ± 1.29	33.05 ± 1.25	29.79 ± 1.72	
bay (13)	c. i.:	36.24 ± 2.10	44.74 ± 2.07	37.99 ± 3.71	7.15 ± 0.60
	size (µm):	2.66 ± 0.25	2.36 ± 0.20	2.13 ± 0.22	
	nomencl.:	sm	m	m	
means	r. l.:	37.18 ± 1.28	33.19 ± 1.14	29.63 ± 1.47	
	c. i.:	37.73 ± 2.38	43.99 ± 2.23	38.32 ± 3.14	6.30 ± 0.97
	size (µm):	2.34 ± 0.37	2.09 ± 0.31	1.87 ± 0.31	
	nomencl.:	m	m	m	

All chromosomes are metacentric, but chromosomes 1 and 3 are nearly submetacentric according to LEVAN et al. 1964 (c. i.: 37.73 and 38.32). The haploid genome has a mean absolute length of 6.30 µm.

2. *Monocelis lineata*

(Fig. 2, Table 2)

Material studied: Giglio Island (Tuscany, Italy), coarse sand, litoral, Dec. 1985, 4 specimens; Capraia Island (Tuscany, Italy), medium sand, litoral, May 1985, 5 specimens; S. Rossore (Tuscany, Italy), on mussels and algae, April 1984, 4 specimens; Bay of Calvi (Corsica, France), on coralline algae, litoral, April 1985, 4 specimens; Punta Marina (Ravenna, Italy), fine sand, litoral, Nov. 1985, 6 specimens; Cefalonia (Greece), coarse sand, Aug. 1981, 8 specimens; List (Sylt, West-Germany), fine sand with mud, Sep. 1985. 6 specimens; Passamaquoddy bay (St. Andrews, East-Canada), on mussels, litoral, Aug. 1984, 4 specimens.

The karyotypes in the seven European populations are highly similar and confirm the data of CURINI-GALLETTI et al. (1984) and of GALLENI & PUCCINELLI (1984). Relative and absolute lengths of the chromosomes are similar to those in *M. fusca*. Chromosomes 1 and 3 are, however, slightly more heterobrachial and submetacentric according to the classification of LEVAN et al. 1964 (c. i.: 31.37 and 36.79 resp.). In the Canadian population of *M. lineata*, however, chromosome 1 is subtelocentric with a c. i. = 23.49, which is significantly different from that in the European populations ($t = 7.9546$; $p \ll 0.01$). Canadian and European

Table 2: Karyometric data for the three chromosomes of the haploid set of *Monocelis lineata*. In parenthesis the number of metaphasic plates measured. * Recalculated from the data used by CURINI-GALLETTI et al. (1984) ** from GALLENI & PUCCINELLI (1984).

Population		Chromosome 1	2	3	Haploid genome size (µm)
Monocelis lineata					
Giglio Is. (14)	r. l.:	35.68 ± 1.10	34.12 ± 1.73	30.19 ± 1.56	
	c. i.:	32.68 ± 3.02	46.33 ± 2.26	36.72 ± 2.19	5.81 ± 0.58
	size (µm):	2.07 ± 0.23	1.97 ± 0.20	1.75 ± 0.22	
	nomencl.:	sm	m	sm	
Capraia Is. (11)	r. l.:	36.09 ± 1.03	33.95 ± 2.01	30.30 ± 1.44	
	c. i.:	31.40 ± 2.66	45.12 ± 1.87	35.76 ± 2.56	5.69 ± 0.37
	size (µm):	2.07 ± 0.18	1.91 ± 0.15	1.72 ± 0.13	
	nomencl.:	sm	m	sm	
S. Rossore (9)	r. l.:	36.01 ± 1.92	34.11 ± 0.83	29.88 ± 2.27	
	c. i.:	29.54 ± 1.42	45.98 ± 1.99	36.36 ± 3.04	6.34 ± 0.79
	size (µm):	2.28 ± 0.28	2.16 ± 0.21	1.89 ± 0.38	
	nomencl.:	sm	m	sm	
Bay of Calvi (14)	r. l.:	35.91 ± 2.07	34.49 ± 2.62	29.59 ± 2.05	
	c. i.:	31.52 ± 3.20	44.71 ± 2.29	38.49 ± 4.32	5.95 ± 0.44
	size (µm):	2.14 ± 0.22	2.05 ± 0.19	1.76 ± 0.19	
	nomencl.:	sm	m	m	
Punta Marina (9)	r. l.:	36.52 ± 0.99	34.54 ± 1.76	29.21 ± 1.43	
	c. i.:	31.65 ± 2.62	44.76 ± 2.02	37.31 ± 2.18	6.30 ± 1.16
	size (µm):	2.30 ± 0.43	2.17 ± 0.38	1.83 ± 0.38	
	nomencl.:	sm	m	sm	
Cefalonia * (10)	r. l.:	37.46 ± 1.47	33.61 ± 1.07	29.74 ± 1.51	
	c. i.:	31.06 ± 2.62	44.66 ± 2.49	35.07 ± 2.61	5.33 ± 0.65
	size (µm):	2.00 ± 0.28	1.79 ± 0.26	1.58 ± 0.19	
	nomencl.:	sm	m	sm	
List (9)	r. l.:	37.00 ± 1.52	33.83 ± 1.54	29.15 ± 2.30	
	c. i.:	31.48 ± 2.02	42.61 ± 2.46	36.74 ± 3.92	6.50 ± 1.12
	size (µm):	2.41 ± 0.45	2.19 ± 0.35	1.89 ± 0.37	
	nomencl.:	sm	m	sm	
Means of European	r. l.:	36.34 ± 1.51	34.11 ± 1.82	29.73 ± 1.80	
populations	c. i.:	31.37 ± 2.65	44.99 ± 2.40	36.79 ± 3.16	6.05 ± 0.83
	size (µm):	2.22 ± 0.33	2.08 ± 0.28	1.81 ± 0.28	
	nomencl.:	sm	m	sm	
Øresund **	r. l.:	35.12 ± 1.20	34.55 ± 3.49	30.35 ± 2.74	
	c. i.:	33.53 ± 4.70	45.01 ± 1.99	32.09 ± 5.29	
	nomencl.:	sm	m	sm	
Passamaquoddy	r. l.:	35.71 ± 1.95	34.10 ± 1.41	30.18 ± 1.63	
bay (11)	c. i.:	23.94 ± 3.09	45.85 ± 1.76	38.46 ± 2.95	7.25 ± 1.09
	size (µm):	2.57 ± 0.31	2.48 ± 0.44	2.19 ± 0.37	
	nomencl.:	st	m	m	

populations are similar as far as the relative lengths of all chromosomes and the morphology of chromosomes 2 and 3 are concerned.

Mean absolute lengths of the haploid genome are 6.05 μm for the European population and 7.25 μm for the Canadian population.

3. *Monocelis longistyla*

(Fig. 2, Table 3)

Material studied: Bay of Calvi (Corsica, France), medium sand with gravel, litoral, April 1984, 4 specimens (type locality); Bay of Portoferraio (Elba, Italy), sand with gravel, litoral, Oct. 1983, 3 specimens; Punta Marina (Ravenna, Italy), fine sand, litoral, Nov. 1985, 1 specimen.

The karyotype of the population from Portoferraio as presented by CURINI-GALLETTI et al. 1984, and that found in the Calvi population and in the individual from the Adriatic are the same. The relative lengths of the chromosomes are similar to that in *M. fusca* and *M. lineata*. As centromeric indices are concerned, chrom. 1 is metacentric, while the remaining two pairs are markedly heterobrachial: chrom. 2 is acrocentric and chrom. 3 subtelocentric (c. i. = 9.03 and 20.23 resp.).

Table 3: Karyometric data for the three chromosomes of the haploid set of *Monocelis longistyla*. In parenthesis the number of metaphasic plates measured. * Recalculated from the data used by CURINI-GALLETTI et al. (1984).

Population		Chromosome 1	2	3	Haploid genome size (μm)
Monocelis longistyla					
Bay of Calvi (8)	r. l.:	37.26 ± 2.07	36.01 ± 1.62	26.73 ± 1.43	
	c. i.:	45.42 ± 2.06	8.30 ± 2.29	22.45 ± 2.94	7.15 ± 1.22
	size (μm):	2.65 ± 0.38	2.58 ± 0.50	1.79 ± 0.52	
	nomencl.:	m	t	st	
Portoferraio *(5)	r. l.:	37.85 ± 2.91	35.03 ± 2.57	27.12 ± 1.03	
	c. i.:	48.05 ± 1.93	11.78 ± 4.97	18.70 ± 4.21	5.30 ± 0.75
	size (μm):	2.02 ± 0.35	1.84 ± 0.28	1.44 ± 0.17	
	nomencl.:	m	t	st	
Punta Marina (1)	r. l.:	38.52	34.97	26.50	
	c. i.:	46.10	6.25	14.43	5.38
	size (μm):	2.07	1.88	1.43	
	nomencl.:	m	t	st	
means	r. l.:	37.66 ± 2.37	35.45 ± 2.02	26.89 ± 1.25	
	c. i.:	46.63 ± 2.31	9.03 ± 3.27	20.23 ± 4.81	6.44 ± 1.39
	size (μm):	2.38 ± 0.46	2.26 ± 0.55	1.71 ± 0.38	
	nomencl.:	m	t	st	

E. Discussion

Within the genus *Monocelis* a close relationship may be supposed between *M. fusca* Örsted, 1843, *M. nitida* Riedl, 1959 and *M. longistyla* sp. n. based on the presence of a stylet. In *M. nitida* the stylet is orientated backwards, as in *M. longistyla,* but it is rather short and enclosed by a cuticular funnel (sheat) at its basis (RIEDL 1959).

For *M. fusca* a wide range in the length of the stylet is known (GRAFF 1913 reported lengths of 50 – 130 µm; DEN HARTOG 1964 mentioned two forms: one with a small stylet of less than 25 µm and the other one with a stylet varying between 70 – 85 µm). Any confusion between *M. fusca* and the new species is excluded by the absence of pigment, of an eyespot, by the number of testis, the long muscular vagina, the habitat, the karyotype . . . It cannot be excluded that *M. longistyla* has in some instances been confused with *M. fusca.* It is also possible that *M. fusca* is a species-group as suggested by DEN HARTOG (1964).

In all the specimens we studied and in many specimens we observed in the North of France on other occasions the stylet was never longer than 40 µm. The karyotype in both populations of *M. fusca* also indicates that one single species is involved.

The karyotypes of the three *Monocelis* species are highly similar with respect to the absolute total genome length (*M. fusca:* 6.30 µm; *M. lineata:* 6.05 in the European populations and 7.25 in the Canadian population; *M. longistyla:* 6.44 µm), and they consist of a set of three chromosomes slightly differing in size, with the smallest about 2/3 the length of the largest one.

The karyotype of *M. fusca* and of the European *M. lineata* are strikingly similar. The corresponding chromosomes have the same relative length and the median ones even have the same centromeric index. The first and the third chromosomes in *M. lineata* are to be classified as "submetacentric" and those in *M. fusca* as "metacentric", according to LEVAN et al. 1964, but the centromeric index of these chromosomes are close to each other.

In the Canadian population of *M. lineata* the first chromosome is subtelocentric with a centromeric index of 23.94, which is obviously different from the centromeric index of 31.48 found in the European populations (see further below).

When the karyotype of *M. longistyla* is compared with that of the other two species it is clear that small chromosome rearrangements must have taken place, such as pericentric inversions, known to have occurred during speciation in many turbellarian groups (see BENAZZI 1976, 1982; GALLENI & PUCCINELLI 1981, 1986). More sophisticated karyological analysis as e. g. chromosome banding are necessary to be affirmative on exactly what processes are involved.

In order to establish which of both karyotypes (*M. lineata* - *M. fusca* or *M. longistyla*) is the basic one, related genera of the Monocelididae must be taken into consideration. From our data on species in at least six different genera (CURINI-GALLETTI et al. 1985, 1987 in press; MARTENS et al. 1987 in press) we can hypothesize a basic karyotype for the Monocelididae (plesiomorphic within the family, perhaps an autapomorphy for the family). This basic karyotype consists of one large metacentric chromosome, a medium sized metacentric chromosome and a subtelo- to acrocentric small chromosome (Fig. 3 A). A translocation from the large to the small chromosome would result in a karyotype (Fig. 3 B) in which the relative length of the three chromosomes is as found in the genus *Monocelis:* a first metacentric to submetacentric chromosome, a second metacentric chromosome (unchanged) and a third metacentric (submetacentric) chromosome. This is the karyotype as it is found in *M. fusca* and in *M. lineata* and it can be considered as "basic" for the genus *Monocelis* (i. e. an autapomorphy for this genus). Further minor rearrangements may consecutively produce karyotypes like the one found in *M. longistyla* which then must be considered as derived. The karyotype as found in the Canadian population of *M. lineata* may be derived from the basic type by a minor pericentric inversion that occurred in the first chromosome. This suggests that the worldwide *"M. lineata"* might consist of a complex of different species or subspecies. Further studies are necessary to establish the status of the Canadian (and other) populations.

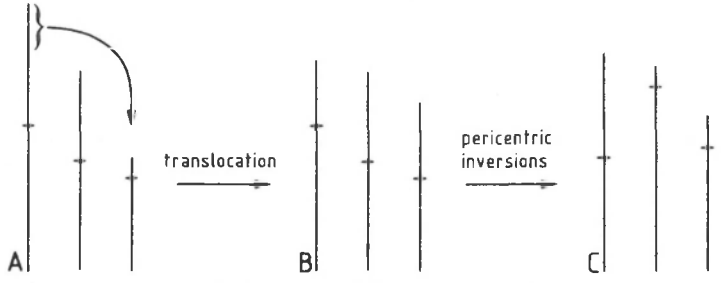

Fig. 3. Hypothetized karyological evolution of the genus *Monocelis*. A. Basic karyotype for the family Monocelididae. B. Basic karyotype of the genus *Monocelis*. C. Karyotype of *Monocelis longistyla*.

Abbreviations in the Figures

b	bursa	fd	female duct
cm	circular muscles	fg	female glands
co	copulatory organ	fp	female pore
en	intestine	gg	glands

hg	adhesive glands
hp	adhesive papillae
lm	longitudinal muscles
ma	male atrium
mp	male pore
ov	ovaria
pg	prostate glands
ph	pharynx
s	stylet
sta	statocyst
v	vagina
vg	prostate vesicle
vp	vaginal pore

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Paul M. Martens
Department SBM, Limburgs Universitair Centrum,
B-3610 Diepenbeek, Belgium.
Marco C. Curini-Galletti
Dipartimento di Scienze dell'Ambiente e del Territorio, via Volta 6,
I-56100 Pisa, Italy.