

# Two new species of *Metachromadora* (Nematoda: Desmodoridae) from Guanabara Bay, Rio de Janeiro, Brazil, and a revised dichotomous key to the genus

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*Two new species of Metachromadora are described from Bananal and Bica beaches in Guanabara Bay on the coast of Rio de Janeiro, Brazil. Both new species belong to the subgenus Bradylaimus, which is characterized by the absence of lateral alae. Metachromadora prepapillata sp. nov. is characterized by the presence of 8–9 precloacal papilliform supplements, while Metachromadora verae sp. nov. is characterized by the sexual dimorphism of the amphidial fovea, presence of 8–9 precloacal tubuliform supplements, and three postcloacal papillae. An updated dichotomous key to species of Metachromadora is proposed. Metachromadora asupplementa is reinstated as a valid species.*

**Keywords:** marine nematodes, Desmodorida, description, identification key

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## INTRODUCTION

The genus *Metachromadora*, which belongs to the subfamily Spiriniinae Gerlach & Murphy, 1965, is classified within the family Desmodoridae Filipjev, 1918, superfamily Desmodoroidea Filipjev, 1922. The superfamily Desmodoroidea is characterized by the apomorphy of a single anterior testis in the male and two antidromously reflexed ovaries in the female. However, no apomorphy is known for the family Desmodoridae (Lorenzen, 1994).

*Metachromadora* Filipjev, 1918 is a heterogeneous and poorly defined group (Vincx, 1987) that has been extensively studied since the early 20th Century (Filipjev, 1918; Cobb, 1933; Gerlach, 1951; Timm, 1961; Wieser & Hopper, 1967; Gerlach & Riemann, 1973/1974; Furstenberg & Vincx, 1988; Lorenzen, 1994; Verschelde *et al.*, 1995). It is characterized by a round head with unispiral amphidial fovea generally surrounded by cuticle striations; a narrow, slightly cuticularized buccal cavity bearing a large dorsal tooth; a short pharynx with a pronounced subdivided bulb and precloacal supplements of various forms.

This genus possesses five subgenera (Gerlach, 1951): *Bradylaimus* Stekhoven, 1931 (lateral wings absent and tubular supplements not easily detected); *Metachromadora* Filipjev, 1918 (longitudinal striations well pronounced on the head); *Metachromadoroides* Timm, 1961 (cuticle heavily striated without longitudinal striations on the head, lateral

ridges present, amphidial fovea on a plaque, tubular supplements present or absent); *Metonyx* Chitwood, 1936 (somatic setae arranged in 10 longitudinal rows); and *Neonyx* Cobb, 1933 (lateral wings present).

Two new species of the genus *Metachromadora*, subgenus *Bradylaimus*, were found during an ecological and taxonomic survey of marine nematodes from sandy beaches of Guanabara Bay (Maria *et al.*, 2013). Here we present a description of these species and propose a new dichotomous key for all valid species of *Metachromadora*.

## MATERIALS AND METHODS

Specimens were collected on the shore of Ilha do Governador, Rio de Janeiro, Praia do Bananal (Bananal Beach: 22°47'24.13"S 43°09'47.72"W) and Praia da Bica (Bica Beach: 22°49'37.9"S 43°11'15.9"W) during January and June 2000. Bananal Beach is characterized by medium and coarse sediment ranging from 400 to 940 µm median grain size; Bica Beach is characterized by coarse and very coarse sand with sediment ranging from 570 µm to 2800 µm. Sediment samples were taken using a corer of 10 cm<sup>2</sup> surface area in the upper and lower intertidal levels, and were fixed with 4% formaldehyde (Maria *et al.*, 2013).

In the laboratory, nematode specimens were processed according to the methodology described by Warwick *et al.* (1998). Measurements and drawings were done using an Olympus CX31 (Phillipines) microscope provided with a camera lucida. Photographs were taken with a digital camera connected to a Olympus BX50 (Phillipines) optical microscope.

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Type specimens of *Metachromadora prepapillata* sp. nov. and *Metachromadora verae* sp. nov. are deposited in the Museu Nacional do Rio de Janeiro (National Museum of Rio de Janeiro) under the identification numbers MNRJ369, MNRJ370, MNRJ371 and MNRJ372.

### Illustrated dichotomous identification key

The key is based on the list of valid species of *Metachromadora* provided by Gerlach & Riemann (1973/1974) and on species described subsequently.

#### Abbreviations used in the text

a:	total body length/maximum body diameter
abd:	anal body diameter
All:	allotype
amph:	amphidial fovea length
amph%:	diameter of the amphidial fovea as percentage of the corresponding body diameter
aw:	width of amphidial fovea
b:	total body length/pharynx length
bda:	body diameter at amphidial fovea level
bdp:	body diameter at widest pharyngeal bulb level
bl:	bulb length
bw:	bulb width
c:	total body length/tail length
c':	tail length/abd
ls:	length of outer labial sensilla
cs:	length of cephalic sensilla
gub:	length of gubernaculum
Hol:	holotype
L:	total body length
ols:	outer labial setae
ph:	pharynx length
Par:	paratype
spic:	length of spicules measured along the arc
sup:	number of supplements
t:	tail length
tna:	smooth tail portion
v:	distance from anterior end to vulva
V%:	position of the vulva as a percentage of the total body length from the anterior end.

## RESULTS

### SYSTEMATICS

- Order DESMODORIDA De Coninck, 1965
- Suborder DESMODORINA De Coninck, 1965
- Superfamily DESMODOROIDEA Filipjev, 1922
- Family DESMODORIDAE Filipjev, 1922
- Subfamily SPIRINIINAE Gerlach & Murpy, 1965
- Genus *Metachromadora* Filipjev 1918

#### EMENDED DIAGNOSIS FROM ORIGINAL

#### DESCRIPTION OF THE GENUS *METACHROMADORA* FILIPJEV, 1918

Desmodoridae. Spiriniinae. Cuticle finely or coarsely striated, extreme anterior end of the head unstriated, but not forming a cephalic capsule, cryptospiral amphidial fovea partly surrounded by cuticle striations, or not surrounded by striations; outer labial sensilla usually setiform, buccal cavity with large

dorsal tooth and two smaller subventral teeth in most of the species (exceptions: several subventral teeth in *M. zaixsi* and presence of denticles in *M. setosa*); pharynx with well-developed posterior bulb with a thick cuticular lining and partitioned into two or three sections; male with one testis at left of the intestine; spicules with well developed velum and capitulum; preloacal supplements of various forms; tail conical.

#### RELATIONSHIPS

*Metachromadora* resembles *Chromaspirina* by the shape of the amphidial fovea and tail shape, but differs from it by the well-developed and subdivided pharyngeal bulb with a distinct cuticular lining of the lumen of the pharynx. This genus is also similar to *Sigmophoranema* in the shape of the dorsal tooth and the subdivided pharyngeal bulb; however, it differs from the latter genus by the small size of the spicules and the absence of S-shaped preloacal supplements.

#### LIST OF VALID SPECIES (25)

- Metachromadora (Neonyx) alata* (Cobb, 1933) Gerlach, 1951  
Syn. *Neonyx alatus* Cobb, 1933?
- Metachromadora (Bradylaimus) asupplementa* (Crites, 1961) Gerlach, 1951  
Syn. *Neonyx asupplementa* Crites, 1961
- Metachromadora (Neonyx) campycoma* (Cobb, 1933) Gerlach, 1951  
Syn. *Neonyx campycoma* Cobb, 1933
- Metachromadora (Neonyx) cancellata* (Cobb, 1933) Gerlach, 1951  
Syn. *Neonyx cancellata* Cobb, 1933
- Metachromadora (Metachromadora) chandleri* (Chitwood, 1951) Gerlach, 1955  
Syn. *Ichtyodesmodora chandleri* Chitwood, 1951
- Metachromadora parasitifera* Timm, 1952
- Metachromadora (Metachromadoroides) complexa* Timm, 1961
- Metachromadora (Bradylaimus) gerlachi* Wieser & Hopper, 1967
- Metachromadora (Metonyx) horrida* Chitwood, 1936
- Metachromadora (Metachromadora) itoi* Kito, 1978
- Metachromadora (Metachromadora) macroteura* Filipjev, 1918
- Metachromadora (Metachromadoroides) minor* Gagarin & Nguyen Vu Thanh, 2010
- Metachromadora (Neonyx) meridiana* Wieser & Hopper, 1967
- Metachromadora (Bradylaimus) nyalli* Verschelde & Vincx, 1996
- Metachromadora (Neonyx) obesa* Chitwood, 1936
- Metachromadora (Bradylaimus) onyxoides* Chitwood, 1936
- Metachromadora (Bradylaimus) pneumatica* Gerlach, 1954
- Metachromadora (Neonyx) pseudocampycoma* Hopper, 1961
- Metachromadora (Metachromadoroides) pulvinata* Wieser & Hopper, 1967
- Metachromadora (Metachromadoroides) remanei* (Gerlach, 1951) Timm, 1961  
Syn. *Metachromadora (Metachromadora) remanei* Gerlach, 1951
- Metachromadora (Bradylaimus) scotlandica* Warwick & Platt, 1973
- Metachromadora (Bradylaimus) setosa* Hopper, 1961
- Metachromadora (Bradylaimus) spectans* Gerlach, 1957
- Metachromadora (Bradylaimus) suecica* (Allgén, 1929) Gerlach, 1955

Syn. *Oistolaimus suecicus* Allgén, 1929

*Metachromadora* (*Metachromadoroides*) *vulgaris* Timm, 1961  
*Metachromadora* (*Metachromadoroides*) *zaixsi* Pastor de  
 Ward, 2004

#### LIST OF INVALID SPECIES

*Metachromadora benepapillata* Timm, 1961 transferred to  
*Pseudochromadora* by Gerlach (1963)  
*Metachromadora clavata* Gerlach, 1957 transferred to  
*Papillonema* by Verschelde *et al.* (1995)  
*Metachromadora cystoseriae* Filipjev, 1918 based upon only  
 one female  
*Metachromadora longilaima* Schuurmans-Stekhoven, 1950  
 transferred to *Pseudometachromadora* by Timm (1952)  
*Metachromadora pacifica* Murphy, 1966 transferred to  
*Chromadoropsis* by Furstenberg & Vincx (1988)  
*Metachromadora papillata* Schuurmans-Stekhoven, 1950  
 transferred to *Pseudometachromadora* by Wieser (1954)  
*Metachromadora quadribulba* Gerlach, 1956 re-established as  
*Chromadoropsis* by Furstenberg & Vincx (1988)  
*Metachromadora serrata* Gerlach, 1963 *incertae sedis*  
*Metachromadora spiralis* Gerlach, 1955 *incertae sedis*  
*Metachromadora vivipara* (De Man, 1907) re-established as  
*Chromadoropsis* by Furstenberg & Vincx (1988).

*Metachromadora prepapillata* sp. nov.  
 (Figures 1 & 2)

#### TYPE MATERIAL

Holotype and allotype deposited in the Museu Nacional do Rio de Janeiro (National Museum of Rio de Janeiro – MNRJ) and paratypes in the Laboratório Meiofauna do Departamento de Zoologia da UFPE (NM-LMZOO UFPE). Holotype male (MNRJ369), seven paratype males (361 NM-LMZOO UFPE), allotype female (MNRJ370), six paratype females (362 NM-LMZOO UFPE).

#### TYPE LOCALITY

Bananal Beach (22°49'37.9"S 43°11'15.9"W), Guanabara Bay, Rio de Janeiro, Brazil.

#### TYPE HABITAT

Intertidal zone of Bananal Beach.

#### ETYMOLOGY

The species name *prepapillata* sp. nov. refers to the presence of papilliform precloacal supplements.

#### MEASUREMENTS

See Table 1.

*Males.* Body long, cylindrical and relatively slender with blunt rounded head and conical tail. Cuticle golden, with very fine transverse striations starting after posterior edge of amphidial fovea and without ornamentations. Minute somatic setae arranged in eight longitudinal rows (four sub-lateral, two sub-dorsal and two sub-ventral) extending to tail region. These setae are connected to prominent oval epidermal gland cells, called porids.

Non-annulated head region with three separate circles of anterior sensilla: six inner minute conical labial papillae, six outer labial setae 3 µm long, and four cephalic setae

4–5 µm long, located immediately in front of amphidial fovea and eight subcephalic setae (four sub-lateral, two sub-dorsal and two sub-ventral) immediately after posterior edge of amphidial fovea. Amphidial fovea ventrally wound, unispiral, not surrounded by striations, its diameter 41–51% of corresponding body diameter. Buccal cavity cyathiform with cheilorhabdia, with one large dorsal tooth and two small ventrosulateral teeth. Pharynx largely cylindrical, posterior widened and forming small bulb less than 2/5 of pharyngeal length; bulb subdivided into two well-demarcated regions through constrictions of lumen of entire pharynx, which is covered by thick sclerotization. Nerve ring and cardia not observed.

Tail conical and twice anal body diameter; three caudal glands restricted to tail and opening through a spinneret. Terminal part of tail smooth, 10 µm long, 11–14% of total tail length.

Reproductive system monorchic, with outstretched testis lying on left side of intestine. Testis characterized by short germinal zone followed by opaque cells packed with dark granules leading to lighter cells and narrow ejaculatory duct. Two equal spicules, slender, ventrally curved with thick sclerotized lamina and well-cephalated capitulum with internal shaft. Gubernaculum canoe-shaped, oriented parallel to spicula, without apophyses. Eight to nine delicate conoid pre-cloacal papillae protruding from cuticle at regular intervals, first supplement 91 µm from cloaca.

*Females.* Similar to male in most respects, except for: triangular cardia evident, shorter outer labial setae (2 µm long) and large non-annulated tail region, 10 µm long. Reproductive system didelphic–amphidelphic with short reflexed ovaries; both branches lying to left of intestine; spacious uterus. Vulva a transverse slit, situated at 54–60% from anterior end, vagina with evident muscular sphincter and well-sclerotized *vagina vera* and *vagina uterina* tubular.

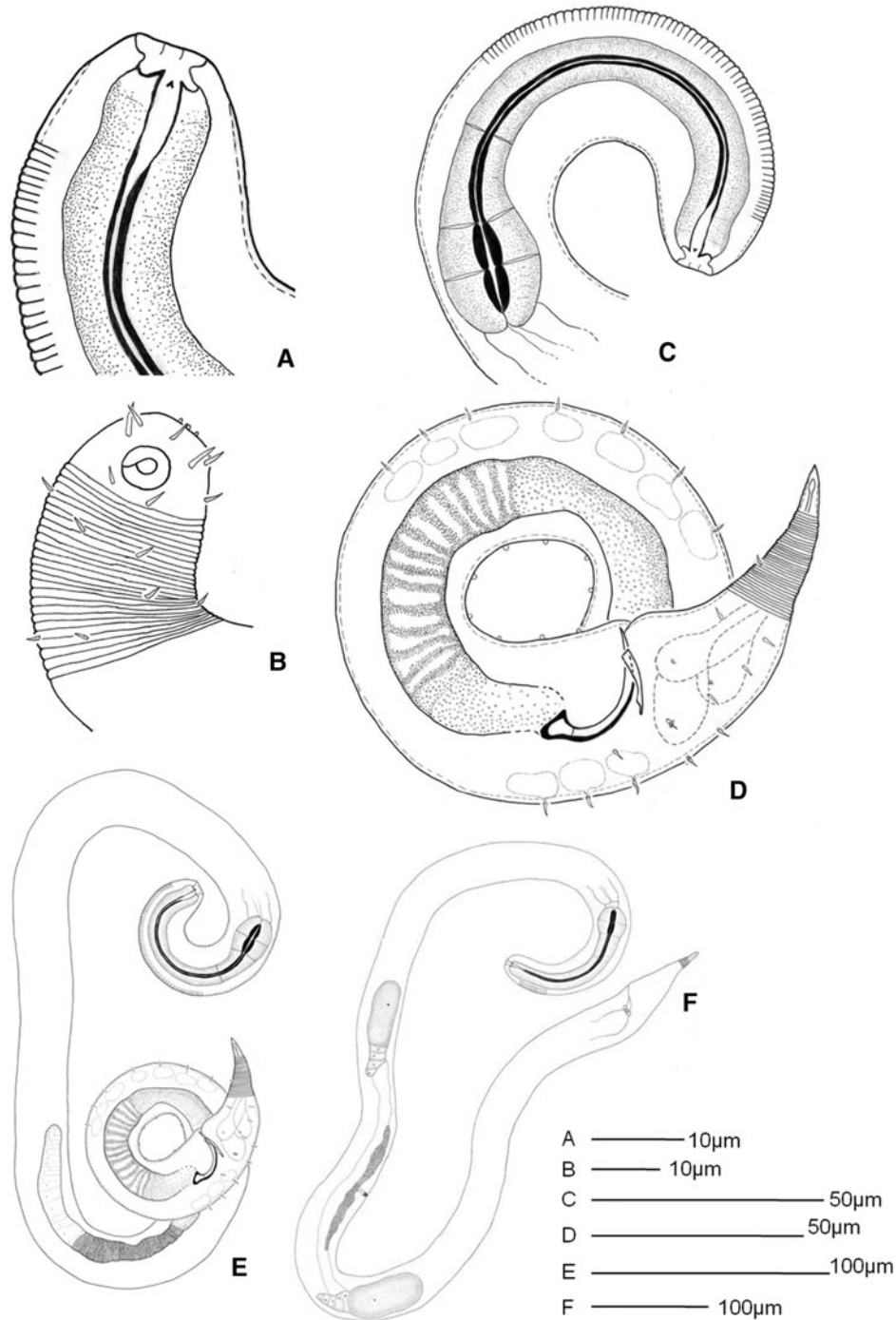
#### DIAGNOSIS

*Metachromadora prepapillata* sp. nov. is characterized by pharynx with sclerotized lumen, small bipartite bulb, eight longitudinal rows of somatic setae, and conical tail corresponding to twice abd in both sexes. Males characterized by spicule shape with sclerotized capitulum and lamina, and presence of eight or nine pre-cloacal papillar supplements. Females characterized by both ovaries situated to left of intestine.

#### DIFFERENTIAL DIAGNOSIS

*Metachromadora prepapillata* sp. nov. most closely resembles *M. pneumatica* in the pharynx design, bulb dimensions and spicule shape, but differs from it in the design of the cuticle, in which the ornamentation of small dots between the striae is absent in *M. prepapillata*; in tail length, which is four times the anal body diameter in the latter species; and in the presence of pre-cloacal supplements, which are not clearly described in *M. pneumatica*. In the latter species, the author suggests that the supplements are present in the form of very small inconspicuous pores.

*Metachromadora verae* sp. nov.  
 Figures 3 & 4



**Fig. 1.** *Metachromadora prepapillata* sp. nov.: (A–E) holotype male. (A) head region at midbody level; (B) head region, surface view; (C) pharynx region; (D) tail region and copulatory apparatus, (E) habitus. (F) Allotype female, habitus.

#### TYPE MATERIAL

Holotype and allotype deposited in the Museu Nacional do Rio de Janeiro (National Museum of Rio de Janeiro—MNRJ) and paratypes in the Laboratório Meiofauna do Departamento de Zoologia da UFPE (NM-LMZOO UFPE). Holotype male (MNRJ 371), four paratype males (NM-LMZOO UFPE), allotype female (MNRJ 372).

#### TYPE LOCALITY

Bica Beach (22°49'37.9"S and 43°11'15.9"W), Guanabara Bay, Rio de Janeiro, Brazil.

#### TYPE HABITAT

Intertidal zone of Bica Beach.

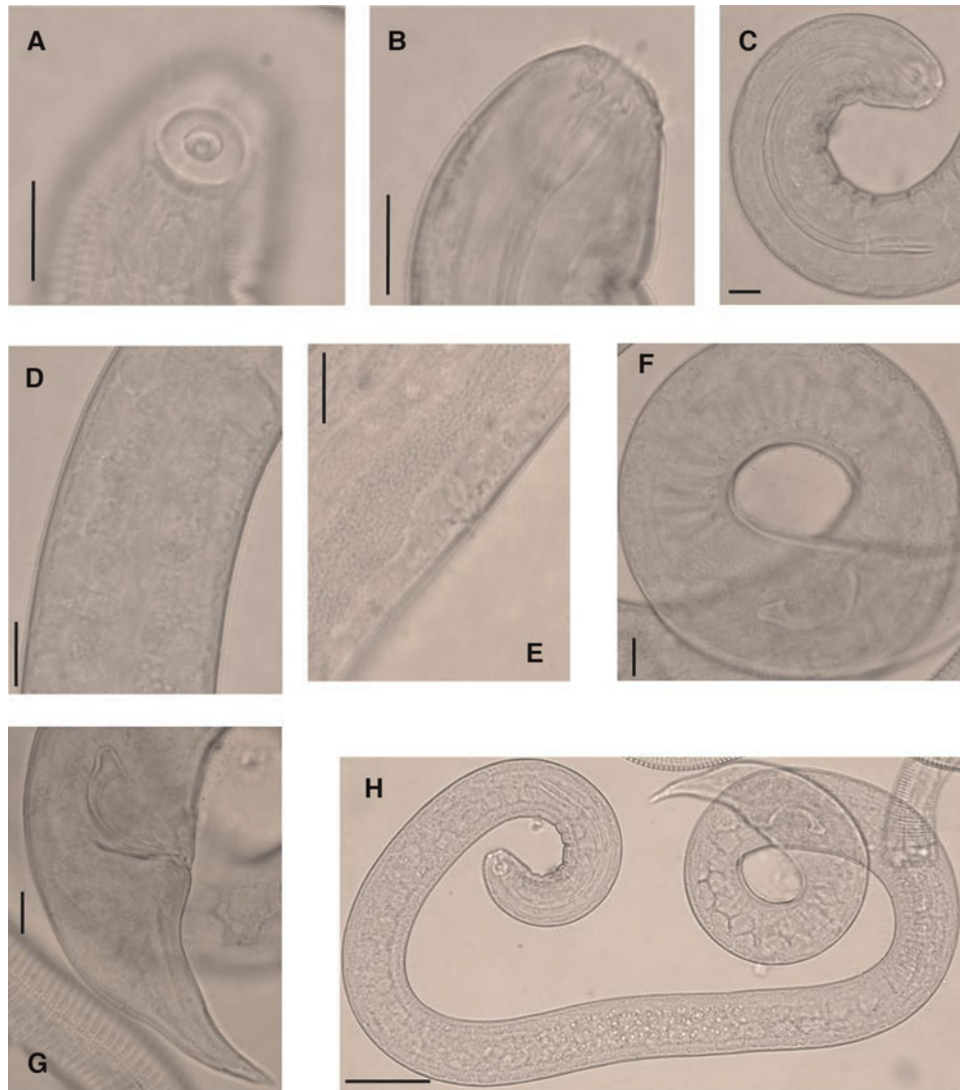
#### ETYMOLOGY

The species name *verae* honours Professor Vera Abud, who introduced meiofauna studies in Rio de Janeiro State, Brazil.

#### MEASUREMENTS

See Table 2.





**Fig. 2.** Photomicrographs of the holotype and allotype of *Metachromadora prepapillata* sp. nov. (A) surface view of head region, showing outer labial setae and unispiral amphidial fovea; (B) head region, showing buccal cavity; (C) pharyngeal region; (D) porids; (E) germinal zone of testis showing granular cells; (F) vas deferens showing lighter cells; (G) copulatory apparatus and tail; (H) habitus. Scale bars: A–G, 10  $\mu\text{m}$ ; H, 100  $\mu\text{m}$ .

**Males.** Body long and relatively slender, with blunt rounded head and conical tail. Cuticle golden, with very fine transverse striations starting in middle of amphidial fovea and without ornamentations. Few and scattered minute somatic setae along body, more evident in pharynx region, without a pattern of organization.

Non-annulated head region with anterior sensilla in three circles: inner labial sensilla not visible, six outer labial setae 2  $\mu\text{m}$  long and four cephalic setae 4–5  $\mu\text{m}$  long, located immediately in front of amphidial fovea. Amphidial fovea oval, ventrally wound and unispiral partly surrounded by striations, its diameter 59–62% of corresponding body diameter. Buccal cavity cyathiform with cheilorhabdia, rather large dorsal tooth, and two small ventrosublateral teeth. Pharynx largely cylindrical, posteriorly widened forming small bulb, less than  $2/5$  of pharyngeal length; bulb subdivided into two well-demarcated regions, lumen of pharyngeal bulb covered by thick rod-shaped sclerotization, lumen of rest of pharynx less sclerotized. Cardia not evident. Nerve ring not observed.

Tail conical and more than three times anal body diameter; caudal glands not visible, but spinneret evident at tail tip.

Terminal part of tail smooth, corresponding to 9–10% of total tail length.

Reproductive system monorchic with outstretched testis lying on left side of intestine. Testis characterized by short germinal zone followed by large region of lighter cells leading to opaque cells packed with dark granules and a narrow ejaculatory duct. Two equal spicules, slender, ventrally curved with a relatively thin lamina and well-cephalated capitulum. Gubernaculum canoe-shaped, oriented parallel to spicula, without apophyses. Eight to nine delicate tubular pre-cloacal supplements protruding from cuticle at regular intervals and covered by ventral alae, first supplement 160  $\mu\text{m}$  distant from the cloaca; three postcloacal elevations.

**Females.** Similar to male in most respects, except for rounded amphidial fovea occupying 29% of head diameter. Reproductive system didelphic–amphidelphic with short reflexed ovaries, both branches lying to left of intestine. Vulva a transverse slit situated at 75% from anterior end, *vagina vera* and *vagina uterina* tubular evident, but not very sclerotized.

**Table 1.** Measurements of *Metachromadora prepapillata* sp. nov.

	Holotype	Allotype	Paratype ♂ N = 7		Paratype ♀ N = 6	
			Min	Max	Min	Max
L	990	1188	1023	1164	912	1068
width	32	37	32	39	34	3
ols	3	2	–	–	–	–
cs	4	4	–	–	4	5
amph	9	11	10	11	7	9
aw	8	11	8	11	7	9
bda	16	23	20	22	17	21
amph %	52	49	44	53	34	44
ph	134	134	128	139	118	133
bdp	30	33	28	39	28	37
bl	24	26	23	26	23	28
bw	21	23	19	29	22	26
bulb %	18	20	18	19	17	20
t	73	66	78	82	58	66
tna	10	10	8	11	11	12
tna %	14	15	10	15	17	21
abd	36	30	28	35	26	30
spic	40	–	32	40	–	–
gub	14	–	13	17	–	–
sup	9	–	8	9	–	–
v	–	648	–	–	510	597
V%	–	55	–	–	54	61
a	30.6	31.9	28.7	35.1	21.4	31.7
b	7.4	8.8	8.1	8.6	6.9	8.6
c	13.5	18.0	13.3	15.6	15.1	17.8
c'	2.0	2.0	2.5	3.0	2.0	2.4

–, not applicable.

#### DIAGNOSIS

*Metachromadora verae* sp. nov. is characterized by the sexual dimorphism of the amphidial fovea, pharynx with bipartite terminal bulb and strong sclerotization restricted to the elongated bulb, somatic setae with no pattern of organization, conical tail shape corresponding to more than three times abd in males. Males characterized by presence of eight to nine preloacal tubular supplements and three postloacal papilliform supplements.

#### DIFFERENTIAL DIAGNOSIS

*Metachromadora verae* sp. nov. most closely resembles *M. suecica* in the pharynx design, spicule shape, and tail length, but differs from it by the sexual dimorphism of the amphidial fovea, the number of preloacal supplements, and the presence of postloacal papilliform supplements.

#### KEY TO VALID SPECIES OF THE GENUS

##### METACHROMADORA FILIPJEV, 1918

##### Key to subgenera

- Somatic setae arranged in 10 longitudinal rows .....subgenus *Metonyx*  
— Somatic setae not arranged in 10 longitudinal rows.....2
- Head with pronounced longitudinal striation .....subgenus *Metachromadora*  
— Head without pronounced longitudinal striation .....3

- Cephalic setae absent or short and stout; amphidial fovea (at least in males) on thick cuticularized plate .....subgenus *Metachromadoroides*  
— Cephalic setae slender; amphidial fovea not on thick cuticularized plate.....4

- Lateral alae (wings) present .....subgenus *Neonyx*  
— Lateral alae (wings) absent .....subgenus *Bradyaimus*

##### Subgenus *Metonyx*

Only species: *M. horrida*

##### Key to subgenus *Metachromadora*

- Amphidial fovea equal in both sexes.....*M. macroteura*  
— Sexual dimorphism in shape of amphidial fovea .....2

- Males with 12–14 preloacal supplements ....*M. chandleri*  
— Males with 21–25 preloacal supplements..... *M. itoi*

##### Key to subgenus *Metachromadoroides*

- Bulb bipartite..... *M. remanei*  
— Bulb tripartite .....2

- Preloacal supplements absent .....3  
— Preloacal supplements present.....4

- Anterior non-striated part equal to two amphidial fovea lengths ..... *M. vulgaris*  
— Anterior non-striated part equal to one amphidial fovea length..... *M. zaisxi*

- Cephalic setae absent.....*M. complexa*  
— Cephalic setae present .....5

- Body length less than 1 mm long, spicules 35 µm long and 12–14 preloacal supplements ..... *M. minor*  
— Body length more than 1 mm long, spicules 55 µm long and 23 preloacal supplements..... *M. pulvinata*

##### Key to subgenus *Neonyx*

- Subcephalic setae at same level of cephalic setae .....2  
— Subcephalic setae and cephalic setae in different crown.....3

- Buccal cavity with denticles .....*M. cancelata*  
— Buccal cavity without denticles .....*M. meridiana*

- Subcephalic and cervical setae longer than cephalic setae .....4  
— Subcephalic and cervical setae shorter than cephalic setae .....5

- Males with 10 preloacal supplements ..... *M. alata*  
— Males with 12 preloacal supplements .....*M. campycoma*

- Obese nematode (a: 16–24 in ♂; a: 9–20 in ♀), 8 preloacal supplements.....*M. obesa*  
— Thin nematode (a: 45 in ♂; a: 35 in ♀), 12 preloacal supplements .....*M. pseudocampycoma*

##### Key to subgenus *Bradyaimus*

- Bulb tripartite.....2  
— Bulb bipartite .....3

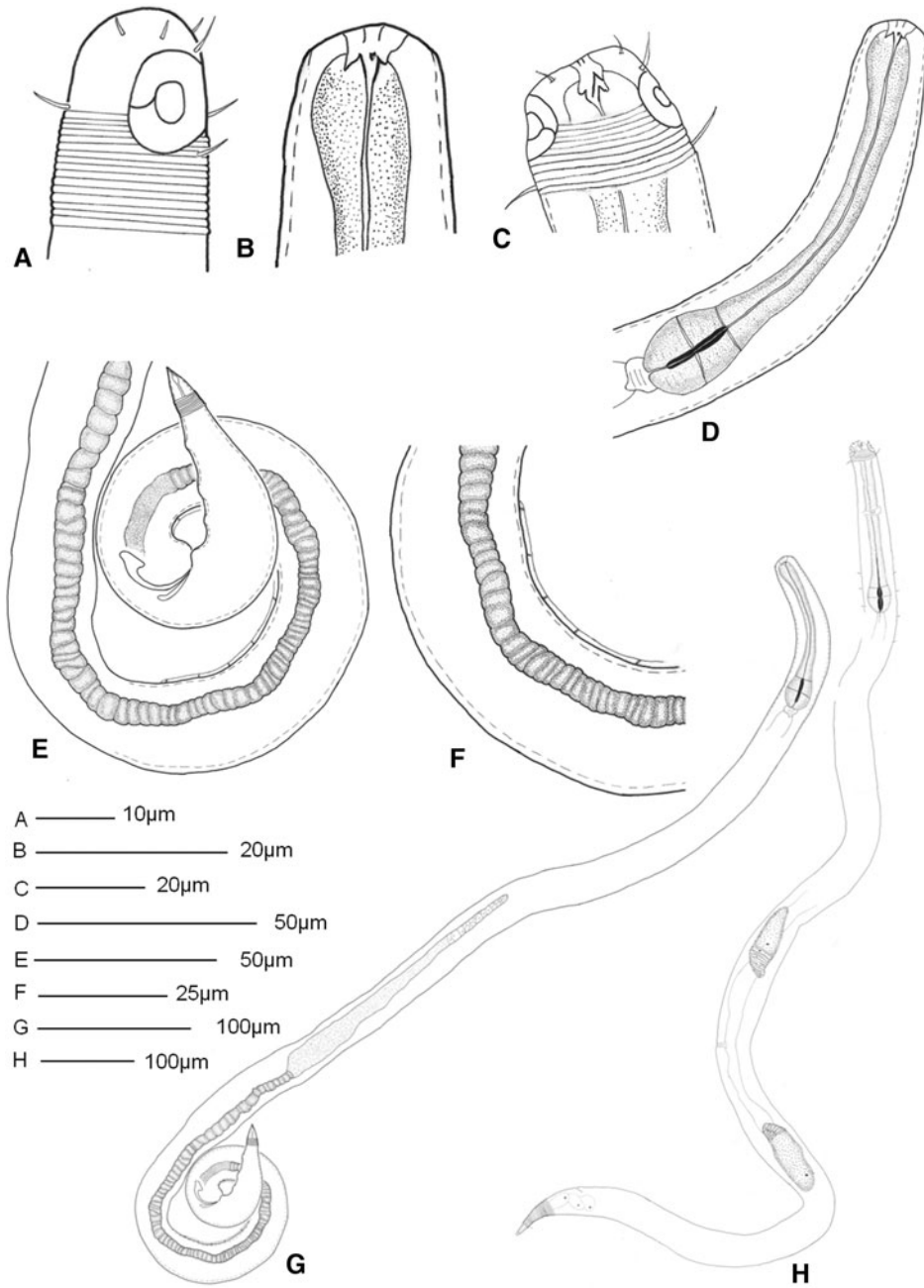
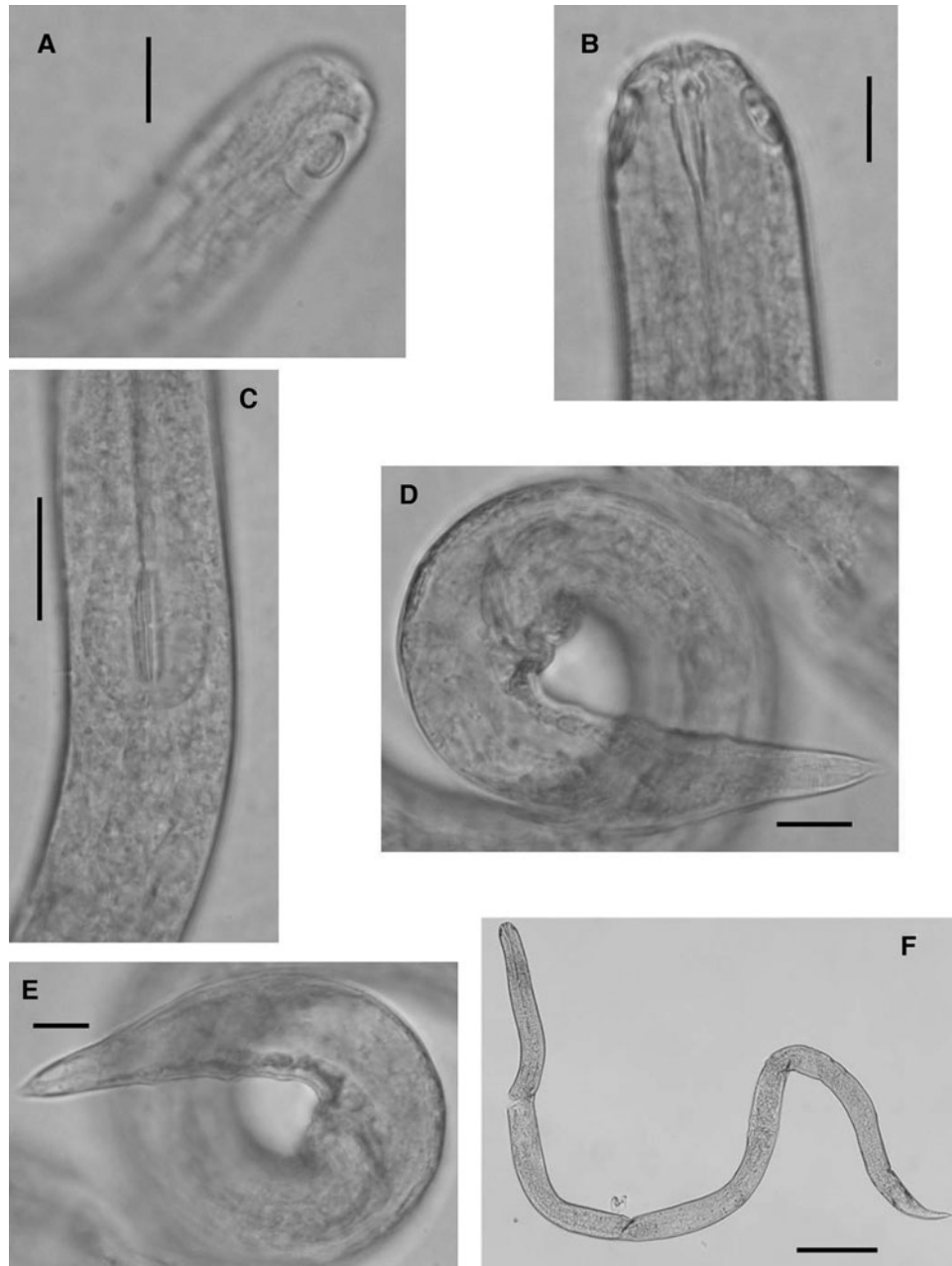


Fig. 3. *Metachromadora verae* sp. nov.: (A, B, D–F) holotype male. (A) head region in surface view; (B) buccal cavity; (C) head region of allotype female; (D) pharynx region; (E) tail and copulatory apparatus; (F) ventral alae in the region of the precloacal supplements; (G) male habitus; (H) allotype female, habitus.

- |   |   |   |  |
|---|---|---|--|
| 2 | Buccal cavity with denticles..... <i>M. setosa</i>                            | 6 | Head capsule present.....8   |
| — | Buccal cavity without denticles.....4   | — | Head capsule absent.....9  |
| 3 | Terminal bulb elongate, its length more than twice width.....5                | 7 | Cephalic setae 14 µm long..... <i>M. scotlandica</i>                                       |
| — | Terminal bulb oval, its length less than twice width.....6                    | — | Cephalic setae longer than 15 µm..... <i>M. gerlachi</i>                                   |
| 4 | Male without supplements..... <i>M. asupplementa</i>                          | 8 | Tail long, four times abd; precloacal supplements absent..... <i>M. pneumatica</i>         |
| — | Male with 9–12 precloacal supplements..... <i>M. onyxoides</i>                | — | Tail short, twice abd; precloacal supplements present..... <i>M. prepapillata</i> sp. nov. |
| 5 | Amphideal fovea small (7.5–9 µm wide), less than or equal to 1/3 cbd.....7    | 9 | Cuticle without any special ornamentation..... <i>M. verae</i> sp. nov.                    |
| — | Amphideal fovea large (15 µm wide), more than 2/3 cbd..... <i>M. spectans</i> | — | Annuli with ornamentations of dots or vacuoles.....10                                      |



**Fig. 4.** Photomicrographs of the holotype and allotype of *Metachromadora verae* sp. nov. (A) Surface view of head region showing outer unispiral amphidial fovea of male; (B) head region, showing buccal cavity of female; (C) pharyngeal region; (D) copulatory apparatus and tail; (E) tail showing postcloacal elevations; (F) habitus of female. Scale bars: A–E, 10 µm; F, 100 µm.

- 10 Tail short, less than three times abd.....*M. suecica*  
 — Tail long, more than three times abd..... *M. nyali*

## DISCUSSION

*Metachromadora* is a very complicated genus which has undergone several taxonomic rearrangements since its description. It was first divided into five subgenera: *Bradylaimus*, *Chromadoropsis*, *Metonyx*, *Metachromadora*, and *Neonyx* by Gerlach (1951) based on the presence, type and distribution of somatic setae over the body, presence of precloacal supplements, presence of lateral fields called wings (alae), presence and shape of precloacal supplements. All these subgenera,

except the type subgenus, were eventually established as genera and subsequently relegated to subgeneric status. Subsequently, a sixth subgenus, *Metachromadoroides*, was erected by Timm (1961), who distinguished it from the previous subgenera by the amphidial fovea placed on a thick cuticular plate. Timm (1961) also suggested that all subgenera would be regarded as distinct genera in any other family of nematodes, because of the dissimilarity of most of them.

In order to reduce this ambiguity, the subgenus *Chromadoropsis* was reinstated to the category of genus (Furstenberg & Vincx, 1988) and a new genus *Papillonema* was established by Verschelde *et al.* (1995). However, *Metachromadora* is still a large genus in terms of species; at present, 27 species are considered valid (including the two



Table 2. Measurements of *Metachromadora verae* sp. nov.

	Holotype	Allotype	Paratype N = 4	
			Min	Max
L	996	1092	900	1017
width	25	47	22	24
ols	2	3	–	–
cs	4	7	4	5
amp L	13	9	12	13
amp w	10	7	10	11
amph cbd	17	24	15	17
amph %	59	29	61	62
phar	106	161	96	108
phar cbd	23	36	22	23
bulb L	22	31	20	23
bulb w	17	26	15	16
bulb/phar	20	19	20	24
t	74	85	78	84
tna	9	15	10	11
abd	23	30	22	24
spic	23	–	23	25
gub	13	–	13	14
sup	9	–	8	9
v	–	826	–	–
V%	–	76	–	–
a	39.5	23.3	37.5	43.4
b	9.4	6.8	8.9	10.2
c	13.4	12.8	11.3	12.3
c'	3.3	2.8	3.2	3.7

–, not applicable.

new species), as listed here. The subgeneric division is adopted following the criteria of Wieser & Hopper (1967). We agree with Timm (1961) that the subdivision must stand until enough material becomes available for an appropriate revision of the genus.

In this paper, two species are described. They are assigned to the subgenus *Bradylaimus* because both of them lack lateral alae, which is the distinctive feature of this subgenus according to Gerlach (1951). An updated and emended key to the species of *Metachromadora* is also proposed. In this key, two species (*M. serrata* and *M. spiralis*) are not included in any of the five subgenera that are presently considered valid. In the key provided by Wieser & Hopper (1967), these two species together with *M. clavata* were not grouped in any of the six adopted subgenera at that time, and the authors stated that these three species belong to a doubtful genus. Later, the three species were included in the subgenus *Metachromadora* by Gerlach & Riemann (1973/1974). Subsequently, Furstenberg & Vincx (1988) transferred *M. clavata* to the genus *Chromadoropsis*. However, when Verschelde *et al.* (1995) erected the genus *Papillonema*, which is characterized by prominent papilliform labial sensilla, an elongate muscular terminal bulb partitioned into three regions, and the presence of three papilliform precloacal supplements, *M. clavata* was transferred to it because of the possession of all these three features. Concerning the other two species (*M. serrata* and *M. spiralis*), we do not agree that they belong to the subgenus *Metachromadora* since they lack its most distinct feature, the longitudinal striations of the head. In fact, these two species possess a smooth cuticle, which makes them too different from the other 27 species. Therefore, we consider these two species as *incertae sedis*.

Even though Wieser & Hopper (1967) regarded *M. alata* as a species *inquirendae* based on the study by Chitwood (1936), who stated that its original description is insufficient, we fully support the opinion that the original description gives enough information to place this species in the subgenus *Neonyx*. It is clearly mentioned in the original description that the lateral alae (wings) start at the cardia level, and also the presence of ten precloacal supplements. This latter feature distinguishes *M. alata* from *M. campycoma*.

Wieser & Hopper (1967) suggested that *M. asupplementa* is a possible synonym of *M. onyxoides*; however, there is a step in their key that makes a distinction between the two species. Therefore, we are not fully convinced of the synonymy, since the two species differ from each other in the presence versus absence of precloacal supplements.

The two new species are placed in *Bradylaimus* mainly because of the absence of lateral alae. *Metachromadora verae* sp. nov. is a typical species of this subgenus, since all the characters entirely agree with the distinct features of *Bradylaimus* (in addition to the cuticle, tubular precloacal supplements occur in this subgenus); while *M. prepapillata* sp. nov. diverges only in the presence of papilliform precloacal supplements. These papilliform supplements place *M. prepapillata* sp. nov. close to *Papillonema*; nevertheless, this species should not be placed in *Papillonema* due to the shape of the outer labial sensilla, which are papilliform in all of the described species; the relative length of terminal bulb (more than 47% in *Papillonema* spp. versus less than 20% in *M. prepapillata* sp. nov.); and the number of precloacal supplements (3–4 in *Papillonema* spp. and –9 in *M. prepapillata* sp. nov.). The kind of supplement present in both *M. prepapillata* sp. nov. and *Papillonema* spp. may suggest a possible phylogenetic relationship between the two genera.

The two newly described species can be distinguished from each other by the following set of characteristics: (1) presence of three postcloacal papillae in the male of *M. verae*; (2) sexual dimorphism of the amphidial fovea in *M. verae*; and (3) presence of well-sclerotized structures of the vagina in *M. prepapillata*.

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