

Chromadorida (Nematoda) from Guadeloupe and Polynesia with evidence of intersexuality

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Spirobolbolaimus boucherorum sp.n. (Microlaimidae) and *Sabatieria maboyae* sp.n. (Comesomatidae) are described, and *Dorylaimopsis pellucidum* (Cobb, 1920) is discussed. Intersex specimens have been found in all three species. *Spirobolbolaimus boucherorum* sp.n. is characterized by its multispiral amphidial fovea, number and localization of the cervical setae arranged in six rows posterior to the amphids, and large banana-shaped sperm. *Sabatieria maboyae* sp.n., a member of the *S. pulchra* group, possesses long posteriorly located cervical setae and long spicules.

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Introduction

The genus *Spirobolbolaimus* Soetaert & Vincx, 1988 was established for the Mediterranean species *S. bathyalis* Soetaert & Vincx, 1988. A second species of the genus has now been discovered in sublittoral tropical deposits of the Caribbean Sea, Guadeloupe, French West Indies. A new species of the large cosmopolitan genus *Sabatieria* Rouville, 1903 (cf. Platt 1985 for a revision) was found in the same geographical area. Both species are described in this paper.

Intersexuality was found among individuals of both species, a feature they share with the tropical Comesomatidae species from the Tuamotu Archipelago, *Dorylaimopsis pellucidum* (Cobb, 1920). Intersexuality is uncommon in marine nematodes so it is relevant to add some new records to the few literature data already known. Intersex specimens occur in low numbers (usually one) among nematode assemblages, and hitherto the reason for their occurrence cannot be demonstrated.

Material and methods

The *Spirobolbolaimus* specimens were collected, by diving (Dr G. Boucher), from the upper (0–8 cm) layer of sediment by hand corer, at a depth of 2 m off Grande Anse Deshaies (Basse-Terre) and Petite Rivière (Desirade Island) beaches. *Sabatieria maboyae* sp.n. were sampled directly in the muddy banks of Belle Plaine Bay and Canal (cf. Renaud-Mornant & Gourbault 1981; Gourbault *et al.* 1985). The Polynesian material was obtained by hand corer and scuba-diving (Dr L. Villiers) at a depth of 26–35 m in Fangataufa atoll, Tuamotu Archipelago (cf. Gourbault & Renaud-Mornant 1989).

The specimens were fixed with 7% neutralized formalin, extracted by centrifugation and mounted in anhydrous glycerine. Drawings were made with the aid of a drawing tube on a Nachtet 300 or Leitz Diaplan with interference contrast equipment. All measurements are in μm ; curved structures are measured along the arc.

The specimens have been deposited in the nematode collection of Muséum national d'Histoire naturelle, Paris (MNHN) and Instituut voor Dierkunde, Rijksuniversiteit, Gent (RUG).

Taxonomy

Family Microlaimidae Micoletzky, 1922

Genus *Spirobolbolaimus* Soetaert & Vincx, 1988

Spirobolbolaimus boucherorum sp.n. (Fig. 1)

Type material. Holotype male $\delta 1$, slide BN 25 (MNHN), paratype female $\delta 1$, slide BN 26; other paratypes BN 25–27 (MNHN) and slide Nos 78–79 (RUG).

Type locality. Guadeloupe, Basse-Terre, Deshaies, sample Nos 209–210 (April 1984), 6 males, 1 female, 5 juveniles.

Other locality. Desirade Island, Petite Rivière, sample No. 256 (May 1984), 1 intersex specimen.

Habitat. Marine, in sublittoral sediment near low water mark. Deshaies: loose shell gravel sand (sponge spicules, mollusc shells, echinoderm tests, . . .), $dm = 280 \mu\text{m}$, relatively well sorted, $So = 1.5$ with over 84% CaCO_3 . Desirade Island = calcareous (78% CaCO_3) fine sand, $dm = 175 \mu\text{m}$, $So = 1.3$.

Etymology. Named after Drs Guy and Renata Boucher (MNHN) who participated in one of our Lesser Antilles field-trips.

Measurements

Holotype ($\delta 1$)

| | | | | | |
|----|-----|-----|----|------|--------------------|
| 17 | 100 | 185 | M | 1640 | 1740 μm |
| 32 | 36 | 38 | 40 | 34 | |

$a = 43.5$ $b = 9.4$ $c = 17.4$ $c' = 2.9$

Paratype ($\delta 1$)

| | | | | | |
|----|-----|-----|-----|------|--------------------|
| 16 | 105 | 200 | 790 | 1340 | 1460 μm |
| 32 | 34 | 37 | 38 | 34 | |

$a = 38.4$ $b = 7.3$ $c = 12.2$ $c' = 3.6$ $V = 54.1$

Other paratypes

| | | |
|----|-----------------------------|------------------|
| | $\delta \delta$ ($n = 3$) | juv. 1, 2, 3 |
| L: | 1700–1870 | 405; 670; 1280 |
| a: | 42.7–50.0 | 17.8; 24.8; 36.8 |
| b: | 7.8–9.8 | 4.1; 4.5; 7.1 |
| c: | 13.3–13.6 | 7.0; 8.2; 9.6 |

Description

Body cylindrical, with a rectangular anterior end, tapering posteriorly. Cuticle faintly striated with annules 1.5 μm wide, except on head. Somatic sensilla setiform, in four rows. A ventral row of setae (3 μm) also present on the tail.

Blunt apical region, head wider than long. Three distinct crowns of anterior sensilla; six stout internal labial papilla, six thick external labial setae, 8 μm long, located 6–7 μm behind apex; four smaller (6 μm), half as wide cephalic setae (Fig. 1F). Amphid fovea heavily sclerotized, multispiral, ventrally coiled comprising 2 $\frac{3}{4}$ turns; 10–12 μm wide (29–35% of the corresponding body diameter), partly surrounded by cuticular striations; anterior border 8–10 μm from anterior. Eight rows of 5–8 cervical setae, 9 μm long, starting 15 μm behind amphids (Fig. 1B), they are more numerous in ♀1, up to 11 (Fig. 1F). Large buccal cavity with a strong dorsal tooth and one pair of ventrosublateral teeth located at the same level (Figs 1A, F, G). Pharynx with globular buccal cavity, its cylindrical part enlarged posteriorly in an elongated bulb with a weakly sclerotized lumen wall. Cardia 7–10 μm long. Intestine with large globular cells. Nerve ring at 55–58% of pharyngeal length. Ventral gland at anterior part of the intestine; pore behind the nerve ring.

Male diorchic, testes opposed and outstretched. Reproductive system filling up much of the body length, anterior testis reaching 275–340 μm behind the pharyngeal bulb; both testes to left of intestine in most specimens; however both to right in ♂5. Anterior testis longer than posterior testis due to greater development of its seminal vesicle. Sperm large, banana- or shuttle-shaped, 33 μm long \times 4 μm diameter (Fig. 1C). Vas deferens very long, displaying differently sized and structured granular cells together with clear patches.

Two equal spicules, heavily sclerotized with a small capitulum longer in ♂3 (61 μm) than in all the others (55–59 μm). Gubernaculum 23–30 μm . Seven tiny preloacal supplements present.

Female didelphic, amphidelphic; reproductive system occupying one-third of body length. Anterior ovary outstretched, to right of intestine; posterior ovary outstretched to left of intestine. Large spermatheca between ovaries and uteri filled with sperm. Eggs large, 85–120 μm long, one in uterus. Two granular vaginal glands.

Tail conical, gradually tapering, slightly longer in ♀1 (120 μm).

Juveniles similar to adults in habitus.

Differential diagnosis. The new species differs from the type species *Spirobolbolaimus bathyalis* Soetaert & Vincx, 1988 in the posterior location of the cervical setae, its smaller amphid with only 2 $\frac{3}{4}$ turns, its elongated body, large buccal cavity, and by the shape of spicules and gubernaculum. In *S. boucherorum* the cephalic sensilla are setose and not papillate, a feature typical of the Microloaimidae.

Remarks. This species displays all the discriminative characters of the Microloaimidae genus *Spirobolbolaimus* and thus reinforces its validity.

Family Comesomatidae Filipjev, 1918

Genus *Sabatieria* Rouville, 1903

Sabatieria maboyae sp.n. (Fig. 2)

Type material. Holotype male ♂1 and paratype female ♀1, slide BN 29 (MNHN); other paratypes BN 30 and slide No. 80 (RUG).

Type locality. Guadeloupe, Marine mangrove, Grand Cul-de-Sac Marin, Canal Belle Plaine opening, station 25, sample No. 8 (April 1979), 2 males, 2 females, 9 juv., 1 intersex.

Other locality. Lagune Belle Plaine station 24, sample No. 6 (April 1979), 1 male, 5 juv.

Habitat. Marine in fine mud with 4.3–0.7% CaCO₃ and phytal detritus.

Etymology. From *Maboya*, an Indian Arawaks goddess.

Measurements

Holotype (♂1)

$$\frac{5 \quad 120 \quad 185 \quad M \quad 1413}{14 \quad 32 \quad 37 \quad 40 \quad 31} \quad 1570 \mu\text{m}$$

$$a = 39.2 \quad b = 8.5 \quad c = 10.0 \quad c' = 5.1$$

Paratype (♀1)

$$\frac{6 \quad 115 \quad 196 \quad 785 \quad 1510}{14 \quad 34 \quad 38 \quad 48 \quad 27} \quad 1680 \mu\text{m}$$

$$a = 35.0 \quad b = 8.8 \quad c = 9.9 \quad c' = 6.3 \quad V = 46.7$$

Other types

| | ♂♂ (n = 2) | ♀2 |
|-----|------------|------|
| L: | 1410; 1700 | 1645 |
| a: | 35.0; 40.0 | 33.0 |
| b: | 7.7; 7.8 | 8.2 |
| c: | 9.0; 9.2 | 8.9 |
| c': | 4.6; 5.6 | 6.6 |
| V: | | 43.7 |

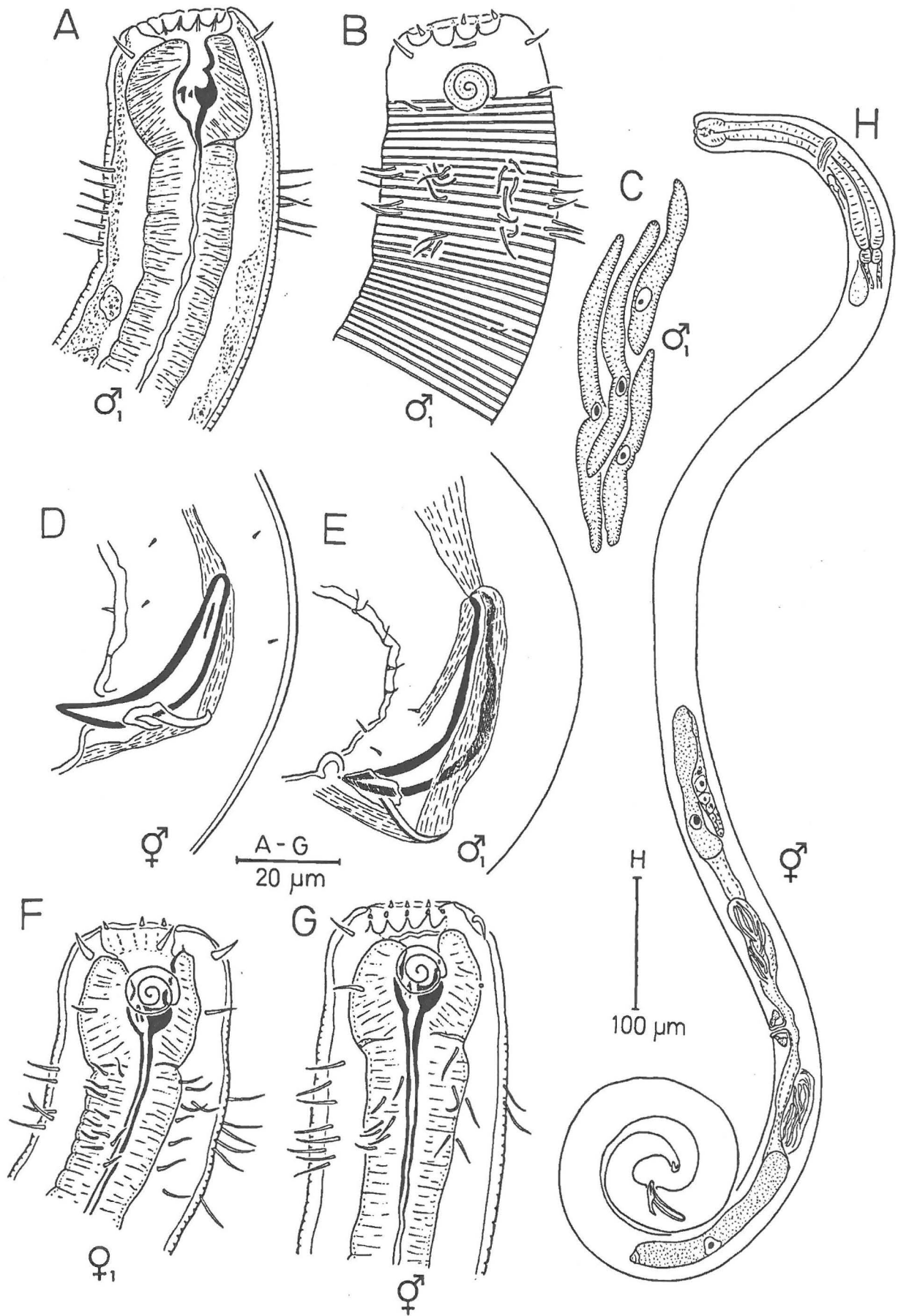
Description

Body cylindrical, round head and cylindroconical tail with swollen tip. Cuticle uniformly punctate but with some coarser irregular lateral punctations from mid-pharyngeal region to tail end. Thin somatic setae arranged in four sublateral rows; setae shorter and in eight rows on posterior part. Sublateral cervical setae (three ventral opposed to a dorsal one) 5 μm long and quite clearly posterior to the amphids. Six internal and six external labial sensilla, very small. Four cephalic setae 8 μm long. Amphid fovea spiral, ventrally wound, with 2–2 $\frac{1}{2}$ turns, 7–8 μm diameter (48–55% of corresponding cephalic diameter). Nerve ring at 58% and ventral pore at 71% of pharyngeal length; ventral gland posterior to cardia (Fig. 2I).

Buccal cavity typical for the genus (cf. Platt 1985); pharynx with pyriform terminal bulb, 22% of pharyngeal length.

Male diorchic with opposed testes, T1 left, T2 right of

Fig. 1.—A–H. *Spirobolbolaimus boucherorum* sp.n.—A. Head of holotype, ♂1, internal view.—B. Surface view.—C. Sperm cells ♂1.—D. Copulatory apparatus ♀.—E. Copulatory apparatus ♂1.—F. Head ♀1.—G. Head ♀.—H. Habitus ♀.



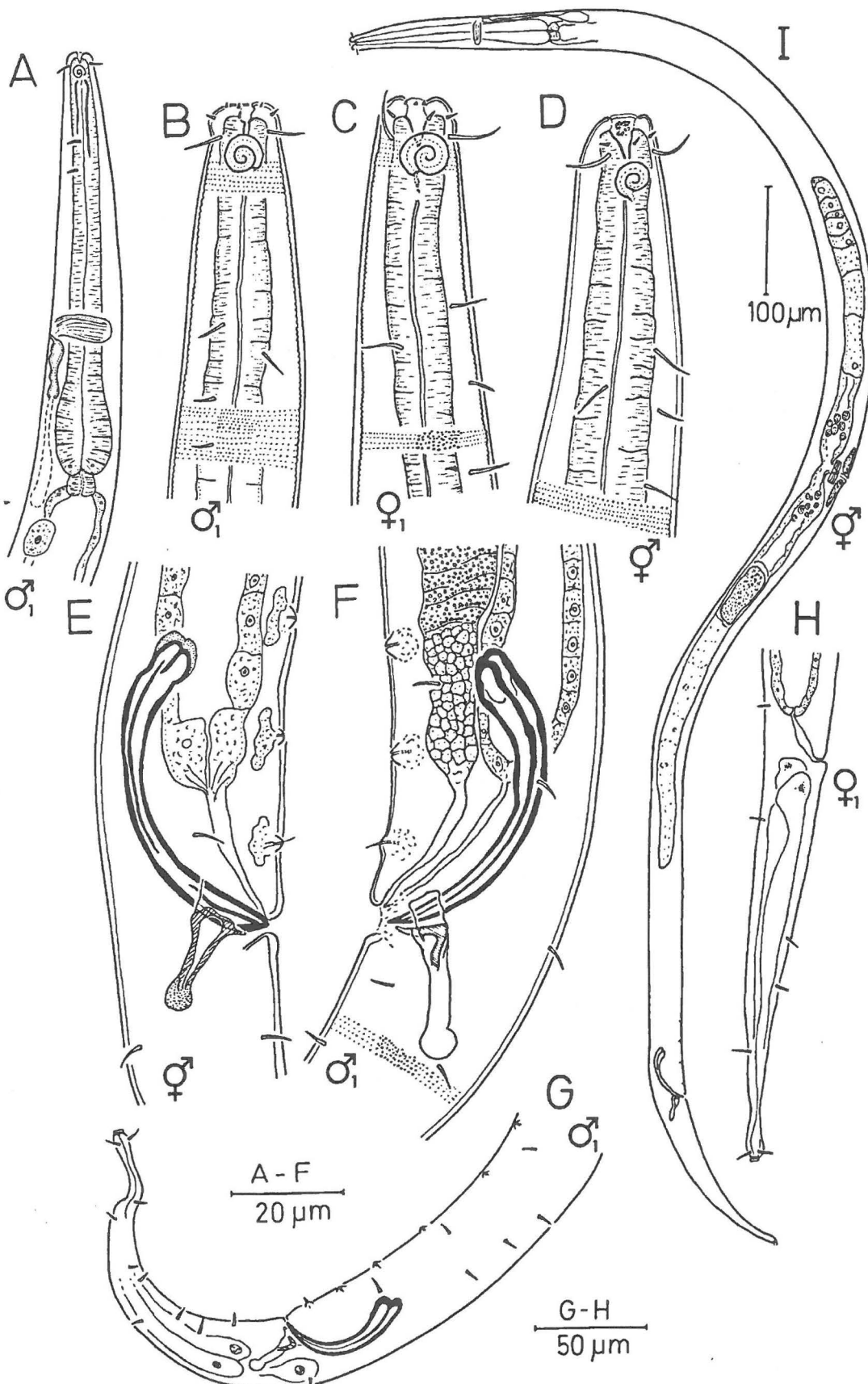


Fig. 2.—A–I. *Sabatieria maboyae* sp.n.—A. Pharyngeal region of holotype, ♂1.—B. Head ♂1.—C. Head ♀1.—D. Head ♀.—E. Copulatory apparatus ♀.—F. Copulatory apparatus ♂1.—G. Tail region ♂1.—H. Tail region ♀1.—I. Habitus ♀.

intestine. Paired spicules 65–67 μm long (2.1 relative anal body diameter), arcuate and proximally enlarged but without distinct capitulum; median cuticularized lamella present; gubernaculum with dorso-caudal apophyses (24 μm long), cuneus with a caudally directed bar. One preanal seta and two tiny preanal supplements close to anus, an additional two or three more anteriorly located.

Tail tip slightly swollen, somatic setae more numerous on subventral zone of tail. One of the three caudal glands reaches distal part of the spicules.

Females. Similar to male, differ by longer (10 μm) cephalic and somatic (7 μm) setae. Didelphic, amphidelphic; outstretched ovaries, anterior left, posterior right of intestine. Two well-developed granular vaginal glands.

Differential diagnosis. *Sabatieria maboyae* sp.n. belongs to the *pulchra* group as defined by Platt (1985) mainly because of the low number of supplements and the shape of the gubernaculum. It differs from all hitherto recognized species (Platt 1985; Vincx 1986) in the length of spicules relative to the anal diameter (2.1 instead of 0.9–1.4) and in the presence of three long ventrosublateral plus one dorsosublateral cervical setae located quite posteriorly.

Genus *Dorylaimopsis* Ditlevsen, 1918

Dorylaimopsis pellucidum (Cobb, 1920) (Fig. 3)

Pepsonema pellucidum Cobb, 1920: 295–296, fig. 77.
Mesonchium pellucidum (Cobb, 1920) Cobb 1935: 466; Wieser & Hopper 1967: 288, fig. 57 a–d; Boucher 1973: 208–209, fig. 11.

Material examined. 2 males, 2 females, 1 intersex, and 5 juveniles, from Tuamoto Archipelago Fangataufa atoll (February 1987) in fine calcareous deposits from the deeper part (26–35 m) of the lagoon, 135 < Md < 237, 21 < % silt < 37.

Measurements

| | $\delta\delta$ ($n=3$) | ♀♀ ($n=2$) |
|-------|--------------------------|-----------------------|
| L: | 2150; 2170 | 1900; 2275 |
| a: | 21.1; 28.8 | 26.0; 30.3 |
| b: | 7.2; 7.7 | 7.0; 7.3 |
| c: | 11.4; 11.8 | 9.7; 9.9 |
| sp/V: | 100; 105 | 45.8; 49.6 |

Remarks. One female has two different amphids; the left one is loop-shaped with circular outline and dorsally wound (Fig. 3E).

New cases of intersexuality in marine nematodes

Nigon (1965: 329) recorded all of the known cases of intersexuality in a synthesis on development and reproduction in nematodes. Recently, Zell (1988) reported a new case in soil nematodes. Most examples occur in females with a functional reproductive system.

Intersexuality was reported by de Bovée (1975) in *Dorylaimopsis mediterranea* Grimaldi de Zio, 1968 (Comesomatidae). The additional cases we report here

were also found in the genus *Dorylaimopsis*, as well as in *Sabatieria* (both in the family Comesomatidae), and *Spirobolbolaimus* (Microlaimidae), the two latter genera including the new species described above.

Description of intersex specimens

(1) *Spirobolbolaimus boucherorum* sp.n. (Figs 1D, G, H).

$$\begin{array}{cccccc} 17 & 115 & 200 & 915 & 1575 & 1700 \\ \hline 33 & 38 & 40 & 42 & 33 & \\ \hline a = 40.5 & b = 8.3 & c = 13.6 & c' = 3.7 & V = 53.8 \end{array}$$

This specimen is as long as the male and longer than the only female observed. It is similar in all respects to the type specimen except that it possesses a female reproductive system with male copulatory apparatus (Fig. 1H).

The female reproductive system occupies about one-third of the body, the vulva is located as in paratype ♀ 1; anterior ovary reflexed left of intestine, posterior right of intestine and outstretched; eggs large (155 × 20 μm). Spermatheca with the characteristic sperm cells.

Spicules thinner than in males, narrow capitulum, but similar gubernaculum (Fig. 1D).

(2) *Sabatieria maboyae* sp.n. (Figs 2D, E, I).

One intersex specimen on slide BN 29 (MNHN).

$$\begin{array}{cccccc} 5 & 122 & 185 & 765 & 1380 & 1550 \\ \hline 15 & 27 & 37 & 44 & 30 & \\ \hline a = 35.2 & b = 8.4 & c = 9.1 & c' = 5.7 & V = 49.3 \end{array}$$

Habitus as for a female but with copulatory apparatus. Spicules quite similar to those of the typical male, 67 μm long but with a shorter gubernaculum (18 μm); preanal supplements also present.

(3) *Dorylaimopsis pellucidum* (Cobb, 1920) (Figs 3C, F, G).

One intersex specimen on slide BN 31 (MNHN).

$$\begin{array}{cccccc} 8 & 145 & 290 & 1040 & 1960 & 2170 \\ \hline 19 & 50 & 64 & 75 & 45 & \\ \hline a = 28.9 & b = 7.5 & c = 10.3 & c' = 4.7 & V = 47.9 \end{array}$$

There is no sexual dimorphism in *Dorylaimopsis pellucidum*; the intersex displays the typical habitus of the species (Fig. 3).

The female reproductive system is similar to the one observed in the female specimens, i.e. two opposed and outstretched ovaries not reflexed as noticed by Cobb (1920) in the same species. Anterior ovary left and posterior right of intestine. Two spermatheca are present, packed with large spermatozoa. These thick sausage-shaped sperm (up to 60 × 12 μm) are similar to those observed in males, with T1 left and T2 right of intestine.

The copulatory apparatus occurring in the intersex specimen is different from that of the male (Fig. 3D). The spicules are half as long and possess a well-developed capitulum (Fig. 3F); the gubernaculum lacks a caudal apophysis and supplements are absent.

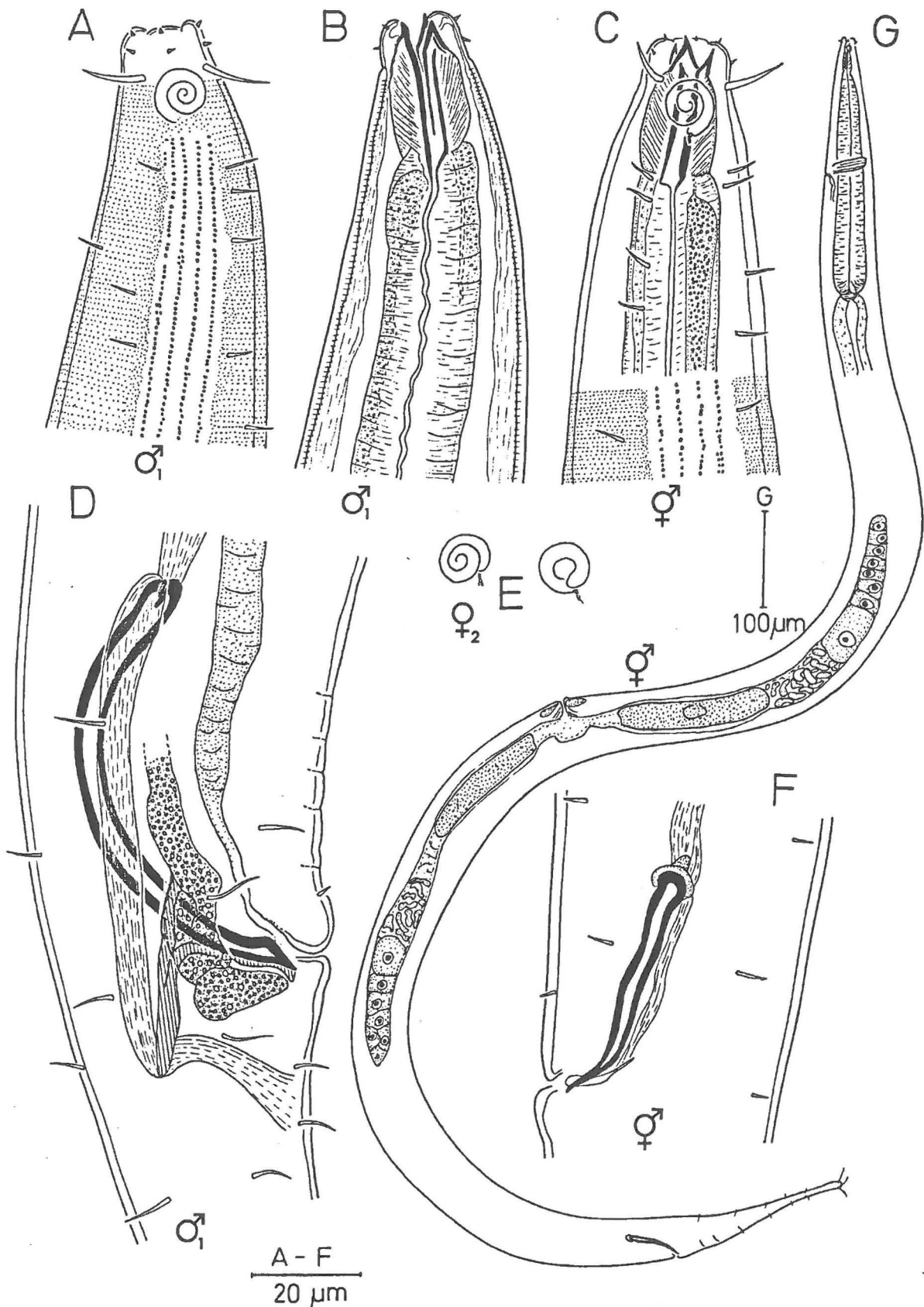


Fig. 3.—A–G. *Dorylaimopsis pellucidum* (Cobb, 1920).—A. Head of male, ♂1 in surface view.—B. Internal view.—C. Head ♀.—D. Copulatory apparatus ♂1.—E. Left and right amphidical fovea ♀2, dorsal body side right.—F. Copulatory apparatus ♀.—G. Habitus ♀.

Discussion

In the three new cases studied, intersex specimens are considered to be females, with functional reproductive systems. As far as the copulatory apparatus is concerned, clear differences are evident: spicules may or may not be similar to those of the typical male. They are similar in *Sabatieria maboyae*, thinner in *Spirobolbolaimus boucherorum*, but smaller and quite different in *Dorylaimopsis pellucidum*.

These morphological variations have been observed by previous authors (e.g. de Bovée 1975). They occur even in a single species: as noticed by de Man (1904: 24) in *Enoplus michaelsonii* Linstow, 1896, each of three intersex females displayed spicules of different shape.

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