

A partial review of the European Magelonidae (Annelida: Polychaeta): *Magelona mirabilis* redefined and *M. johnstoni* sp. nov. distinguished

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The identification of magelonids with mucronate chaetae on chaetiger 9 has long been confused. Until 1977 all corresponding European specimens were erroneously referred to *Magelona papillicornis*; a Brazilian species. Since then, but without any detailed study, the name *M. mirabilis* (originally given to a species from Scotland) has been widely employed. However, in recent years, it has become clear that two morphologically similar species coexist in European waters. *Magelona mirabilis* is redescribed and a neotype designated, and *M. johnstoni* sp. nov. is formally distinguished. Following re-examination of the other five species present in the region, a dichotomous key and a synoptic table of characters is provided for all seven European species.

INTRODUCTION

The Magelonidae is a relatively small family comprising the single genus *Magelona* F. Müller, 1858 with currently about 55 species described worldwide. They are common in sand and mud substrates of intertidal and continental shelf areas, though they also occur in abyssal depths to at least 5000 m (Hartman, 1971). Most species are assumed to live in poorly supported burrows (Fauchald & Jumars, 1979); a tube was reported for *Magelona variolamellata* Bolívar & Lana, 1986, while *Magelona alleni* Wilson, 1958 has a parchment-like tube (A.S.Y.M., personal observations). The body is long, slender and divided into an anterior (thoracic) and posterior (abdominal) region by a constriction at chaetiger 9. Magelonids are easily recognized by the presence of two long ventrolateral and papillated palps in combination with a flattened, shovel-shaped prostomium showing longitudinal muscle bands providing high mobility in all directions.

The main diagnostic characters for the distinction of *Magelona* spp. are: (1) presence/absence of prostomial horns; (2) length/width relation of the prostomium; (3) morphology of thoracic lateral lamellae; (4) presence/absence of specialized chaetae on chaetiger 9; (5) structure and arrangement of abdominal hooded hooks; (6) presence/absence of medial lobes; and (7) presence/absence of lateral pouches in anterior abdominal segments. Detailed accounts of the morphology, taxonomic history and biology of the Magelonidae are given in Fauchald & Jumars (1979); Uebelacker & Jones (1984); Blake (1996); and Fauchald & Rouse (1997).

For European waters (i.e. north-east Atlantic including North Sea, Baltic Sea, Irish Sea and Mediterranean Sea) the following species are described: *Magelona mirabilis* (Johnston, 1865); *M. alleni* Wilson, 1958; *M. filiformis* Wilson, 1959; *M. minuta* Eliason, 1962; *M. equilamellae*

Harmelin, 1964; and *M. wilsoni* Glémarec, 1966. From the Baltic Sea (Kiel Bay) only *M. mirabilis* has been recorded (Hartmann-Schröder, 1996). *Magelona equilamellae* is only known from the Mediterranean Sea.

Several additional species, originally described elsewhere, have been recorded from the region. *Magelona cincta* Ehlers, 1908 (South Africa), reported from Plymouth (Mare, 1942; Marine Biological Association, 1957) and west Scotland (Clark, 1952; Clark & Milne, 1955), was referred to *M. alleni* by Wilson (1958). *Magelona rosea* Moore, 1907 (Atlantic, USA), reported from west Ireland (Southern, 1914) and off west Sweden (Eliason, 1920), was later (Eliason, 1962) referred to *M. minuta*. *Magelona rosea* has also been recorded off east Scotland (McIntyre, 1958; Laverack & Blackler, 1974) and the Irish Sea (Bruce et al., 1963); the former were referred by Wilson (1959) to a dwarf variety of *M. filiformis*.

Another species, *M. papillicornis* Müller, 1858 (Brazil), has been widely reported from the North Sea (Hartmann-Schröder, 1971), Baltic Sea (Bick & Gosselck, 1985), Mediterranean Sea, UK and France (Fauvel, 1927; Marine Biological Association, 1957; Bruce et al., 1963; Cabioch et al., 1968). It has long been recognized as one of the most abundant faunal elements in the southern North Sea benthos (e.g. Davis, 1923; Stripp, 1969; Racher & Gerlach, 1978; Ziegelmeier, 1978; Salzwedel et al., 1985; Holtmann et al., 1998).

Moore (1907) and Day (1961) both doubted the presence of this Brazilian species in European waters, but this view was only confirmed by Jones (1977) following his redescription of *M. papillicornis* from topotype material. The European '*M. papillicornis*' was clearly a different species, for which Jones provisionally suggested the name *M. mirabilis* (Johnston, 1865). Unfortunately, "this purposeful taxonomic compromise" (Jones, 1977) was never resolved; his further investigations (into the early

1980s) remained unpublished as, from 1979 to his death in 1996 (Gardiner, 1997), he concentrated his scientific studies on the Vestimentifera (=polychaete family Siboglinidae; see Rouse & Fauchald, 1997). Several authors (e.g. Dauvin & Gentil, 1980; Garwood, 1982; Bhaud & Cazaux, 1987; Fiege & Ben-Eliahu, 1994; Böggemann, 1998) subsequently used the name *M. mirabilis* for European magelonids possessing special chaetae on chaetiger 9, which are in fact absent in the true *M. papillicornis*.

Mackie (in Oliver et al., 1986 and Howson et al., 1987) suggested (confirmed by M.L. Jones, personal communication, 1983) that there were actually two coexistent and morphologically similar species confused under the name *M. mirabilis*. The main distinguishing features between the two were included in a dichotomous key to the European Magelonidae made available at a polychaete taxonomy workshop held, under the auspices of the Estuarine and Coastal Sciences Association, in south-west Wales in April 1990. Later, the distinctions between *Magelona* sp. A and *Magelona* sp. B (for it was unclear which was actually *M. mirabilis*) were published in Mackie & Garwood (1995). The species were respectively distinguished by either a fimbriate or smooth upper margin to the notopodial lamellae of chaetigers 1–8, presence or absence of dorsal cirri in posterior thoracic chaetigers, and the presence or absence of lateral pouches between chaetigers 10 and 11. These results have been confirmed in the present study and leave most of the previous records of *M. mirabilis* doubtful as to the correctness of their designation.

Unfortunately, the type material of the species originally described (Johnston, 1865; ten years after his death) as *Maea mirabilis* was lost, and the accompanying illustration (cited 'plate XXII') was never published. We have been unable to locate the missing plate at either the Natural History Museum in London, or the Berwick-upon-Tweed Borough Museum and Art Gallery (initially established to house the Johnston Collection). Further, Johnston's description did not readily facilitate identification with either *Magelona* sp. A or *Magelona* sp. B *sensu* Mackie; both agreed in the salient features. However, detailed examination of material collected by McIntosh at St Andrews, Scotland, and comparison with Johnston's original description showed that patches of dark pigment were present between parapodia along the sides of the abdomen in a number of specimens. This pigmentation was subsequently noted by the two senior authors as a feature of Mackie's sp. B, indicating that it was *M. mirabilis* and that his *Magelona* sp. A was the undescribed species.

To settle the confusion about the proper identification of the European species of Magelonidae, we present a detailed redescription of *M. mirabilis* and describe *M. johnstoni* sp. nov. The morphological characteristics of all seven European magelonid species are compiled in a seven optic table and an identification key is provided.

MATERIALS AND METHODS

The specimens

The specimens used in this paper were obtained from the collections of the following institutions: The Natural History Museum, London (BMNH), Laboratoire Arago

Banyuls (LAB), Los Angeles County Museum—Allan Hancock Foundation, Los Angeles (LACM–AHF), Muséum National d'Histoire Naturelle, Paris (MNHN), Natural History Museum Göteborg (NHMG), National Museum of Wales, Cardiff (NMW), United States National Museum of Natural History, Smithsonian Institution, Washington (USNM), Phuket Marine Biological Center, Thailand (PMBC), Senckenberg Museum Frankfurt (SMF).

Full locality and sampling details for German Bight (FK 'Senckenberg' cruise DEB 1987) and Irish Sea (BIOMÔR 1989 & 1991) specimens are detailed in Fiege & Ben-Eliahu (1994) and Mackie et al. (1995) respectively. The sampling equipment used in the former has been abbreviated in the text as BC (box corer), VV (van Veen grab) and BT (beam trawl). Stations from the ongoing 'South West Irish Sea Survey', an Ireland–Wales project sponsored under the European Union INTERREG programme, are prefixed SWISS.

Specimens of all seven European species are detailed in the main text under their respective species names. The condition of the specimens has been given as: c, complete specimen, c-p, complete specimen, pygidium missing; pr, complete specimen, posterior regenerated; af, anterior fragment; pf, posterior fragment; and f, fragments. Where possible, the sex of reproductive specimens was also noted.

Material of several additional species from other regions was used for comparative purposes as follows:

Magelona longicornis Johnson, 1901. Canada, Vancouver Island, Barkley Sound, off Voss Point, 69 m, fine sandy silt, 29 specimens (4 c, 1 pr, 24 af, 6 f, 3 pf), coll. A.S.Y. Mackie & A. Woodham 14 August 1989 (NMW.Z.1989.115.1–2).

Magelona obockensis Gravier, 1905. Gulf of Aden/Gulf of Tadjourah, Obock, in *Balanoglossus* sand with *Cymodoce*, syntypes (MNHN A 172).

Magelona pectinata Nateewathana & Hylleberg, 1991. Thailand, west coast of Phuket, Kamala Bay (stn 8), 10 m, holotype, coll. 23 December 1981 (PMBC 3165).

Magelona pitelkai Hartman, 1944. USA, California, Marin County, Tomales Bay (Pitelka Station A-128), two specimens, coll. F.A. Pitelka, May–June 1941, det. O. Hartman (SMF 8866).

Magelona sacculata Hartman, 1961. USA, South California, off Point Hueneme Light (Velero IV stn 4843–57), 88 m, six specimens, coll. 6 February 1957, det. O. Hartman (SMF 8868). Canada, Vancouver Island, Barkley Sound, outside sill of Trevor Channel, 27 m, medium fine sand, two specimens (af), coll. A.S.Y. Mackie & A. Woodham 14 August 1989 (NMW.Z.1989.115.3).

Terminology

Parapodial lamellae

In his description of *Maea mirabilis*, Johnston (1865) simply referred to the projecting parapodial structures of the thorax as vesicular lobes at the base of the chaetae. This was presumably because the prechaetal and postchaetal parts encompassed the thoracic chaetae to some extent. The lobes of chaetiger 9 were described as larger, but those of the abdomen were considered absent or present 'only in minor form'. McIntosh (1878, 1911) used

the term 'lateral lamellae' for the same species (as *M. papillicornis*). Mesnil (1896) additionally noted a small dorsal cirrus on most thoracic notopodia, and minute dorsal and ventral cirri respectively on the abdominal noto- and neuropodia. McIntosh (1915) erroneously dismissed these observations because neither worker had realized that two species were involved. Other workers (e.g. Gravier, 1906; Moore, 1907; Okuda, 1937; Hartman, 1944) recognized the presence of both lamellae and cirri in descriptions of other species.

Jones (1963) employed the terms 'lateral lamellae' and 'medial lamellae' for the parapodial outgrowths; the former projecting from the sides of the body generally below the notochaetae and above the neurochaetae, the latter arising above the notochaetae or below the neurochaetae (i.e. the cirri of earlier accounts). Later, Jones (1971) limited the term 'lateral lamellae' to be used for the 'usually large, flattened structures in both anterior and posterior regions'. Considering the term 'medial lamellae' a misnomer (they are not always lamellar), he proposed 'dorsal medial lobes' (DML), 'ventral neuropodial lobes' (VNL) and 'ventral medial lobes' (VML) respectively for those of the notopodia, thoracic neuropodia and abdominal neuropodia. Low postchaetal structures behind the hooded hooks in the abdominal part of the body were termed 'interlamellae' (Jones, 1978; Uebelacker & Jones, 1984).

The terminology of Jones (1971, 1978) has largely been followed by other workers (Day, 1973; Uebelacker & Jones, 1984; Nateewathana & Hylleberg, 1991; Blake, 1996) and is used herein. The synopsis of characters for the European species (Table 1) is primarily derived from reassessments of type material.

Lateral pouches

Lateral pouches occur singly or in pairs (on either side) in the abdomen in a number of species. The first occurrence of lateral pouches is an important distinguishing character and is relatively easy to observe. We recognize two pouch morphologies: the first, aptly characterized by McIntosh (1878, 1911) as having convoluted or folded membranes, typically occur in pairs (on either side) between the parapodia of two anterior abdominal segments (chaetiger 10 & 11 or 11 & 12). These pouches are each bounded by two oval cuticular flaps, one dorsal and one ventral (Jones, 1968: 275, figure 3). An extensive, but delicate, membrane connects the anterior margins of each flap, the lateral body wall and the posterior of the segment, forming an anteriorly open pocket (in transverse section the whole structure would appear somewhat Σ shaped, the central '>' forming the pouch). When the lateral margins of the flaps are close together, or overlapping (Figure 5F), the connecting membrane is almost enclosed and appears as a complicated infolded or convoluted mass (sometimes reminiscent of folded or crumpled cellophane). Conversely, when the flaps are wider apart, the membrane is less convoluted and each pouch is more recognizable for what it is.

The second are simple sac-like pockets which, contrary to the convoluted ones, open rearward; all other sides are firmly connected to the lateral epidermis of the body (Figure 3D). In transverse section these would appear somewhat C shaped. The pouches consist of thin, opaque to translucent tissue and commonly form lateral bulges on

median and posterior abdominal segments (i.e. more posterior than the convoluted pouches). Further, as the parapodia in these regions are situated toward the rear of each segment, the pouches open just anterior to the parapodial lamellae of the segment which bears them (Figure 3D). Their size and degree of protrusion is variable and sometimes they can be inconspicuous. Simple posteriorly open pouches occur in pairs or are single, alternating from one side of the body to the other. Jones (1978; for *M. pitelkai*) and Uebelacker & Jones (1984) described the rearward opening and position of these pouches, but made no mention of any morphological differences from the convoluted type.

Convoluted anteriorly open pouches (Σ configuration) are here confirmed to occur in *M. johnstoni* sp. nov., *M. pectinata* and *M. sacculata*. For the last mentioned, Hartman (1961) reported pouches as 'first present behind the modified ninth segment' as well as between segments 10 and 11, though only the second were figured. Blake (1996) stated that they were present between chaetigers 9 and 10, sometimes 10 and 11, but Hobson & Banse (1981) only mentioned those between chaetigers 10 and 11. Our own observations of this species revealed convoluted pouches between chaetigers 10 and 11 only. However, they were sometimes so large (NMW.Z.1989.115.3) that they encompassed the parapodia of that chaetiger, apparently occurring between chaetiger 9 and chaetiger 10 (actually chaetiger 11). This may explain the discrepancy between accounts. We believe that the pouches reported between chaetiger 10 and 11 (*Magelona* sp. Jones, 1968; *M. riojai* Jones, 1963) or 11 and 12 (*Magelona* spp. A & B of Uebelacker & Jones, 1984; *M. obockensis*, *M. tiniae* Nateewathana & Hylleberg, 1991) will, on examination, prove to have the same convoluted morphology.

Simple posteriorly open pouches (C configuration) have been observed in a number of species (*Magelona* spp. A, B, & L of Uebelacker & Jones, 1984, *M. sacculata*, *M. obockensis*, *M. mirabilis* and *M. johnstoni* sp. nov.). Jones (1978) detailed their occurrence in his *M. hartmanae* and *M. dakini*, as well as in *M. pitelkai* Hartman, 1944 (pouches 'with a posterior opening'), and they are here newly recorded in *M. longicornis*.

The function of both pouch morphologies is unknown. McIntosh (1878, 1911) and Jones (1968) doubted any connection with reproduction, the latter noting that pouches occurred in males, females and juveniles. In addition, neither author could find any pore, duct or other communication between coelom and pouch. Observations on living specimens of *M. sacculata* by Leslie Harris (personal communication) showed that the lateral pouches contracted irregularly, first the dorsal then the ventral side. We have been unable to confirm this for the two species considered here. For *M. johnstoni* sp. nov. any contraction or expansion of the pouches on chaetiger 10 was associated with changes in the segment shape as the worm moved in the petri dish; no independent motion was seen. Further studies of living worms *in situ* within the sediment are necessary to elucidate the function of the pouches.

Internal arcuate setae

McIntosh (1878) and later Jones (1968) reported 'internal arcuate setae' (aciculae?) as supporting structures

Table 1. Characters of European *Magelona* species (based on type material; n.d., no data). Species grouped according to similarity of character sets as listed in first column to facilitate comparison.

Characters/ species	<i>M. filiformis</i> Wilson, 1959 Paratypes (6)	<i>M. wilsoni</i> Glémarec, 1966 Holotype	<i>M. minuta</i> Eliason, 1962 Holotype	<i>M. johnstoni</i> sp. nov. Holotype	<i>M. minabilis</i> (Johnston, 1865) Neotype	<i>M. alleni</i> Wilson, 1958 Holotype	<i>M. equilamelae</i> Harmelin, 1964 Syntypes (2)	<i>M. papillicornis</i> F. Müller, 1858 Neotype
Prostomium								
horns shape	present longer than wide	prominent wider than long, onion-shaped	absent longer than wide	absent longer than wide	absent longer than wide	absent wider than long, onion-shaped	absent slightly wider than long	absent wider than long, (sub)triangular
ratio length/width	1.25–1.74	0.78	1.38	2.13	2.28	0.6	0.67, 0.7	n.d.
Thorax								
length (mm)	3.84–6.24	5.5	1.92	5.8	9.0	4.4	6.12, 6.72	3.0
width excl. lateral lamellae (mm)	0.3–0.5	0.8	0.3–0.5	0.5	0.9	1–1.5	1.0, 1.1	~0.65
Chaetigers 1–8								
notopodia lateral lamellae	long, digitiform	large, leaf-like	digitiform to cone-shaped	elongate, leaf-like, upper edge crenulate (elkhorn-shaped)	elongate, leaf-like upper edge smooth	broad, digitiform	narrow, pointed on chaetigers 1–6; slightly larger, foliose on 7 and 8	leaf-like, subtriangular
neuropodia lateral lamellae	absent	leaf-like; smaller than notopodia	digitiform to cone-shaped	absent; chaetiger 8 with small post- chaetal lobe	absent; chaetiger 8 with small post- chaetal lobe	absent	absent	leaf-like, subtriangular
dorsal medial lobe (DML)	short, digitiform	small, leaf-like, postchaetal in chaetigers 1–6	absent	from chaetiger 4	absent	absent	absent	absent
ventral neuropodia lobe (VNL)	short, digitiform; ca. twice as long as DML	absent	absent	digitiform to leaf- like; almost as long as notopodia	small, digitiform to slightly foliose pre- to subchaetal	digitiform, flattened dorsoventrally; shorter than DML	narrow, subtriangular, pointed in chaetigers 1–4	absent
Chaetiger 9								
specialized chaetae	absent	absent	absent	mucronate	mucronate	absent	absent	absent
notopodia lateral lamellae	digitiform, moderate length	leaf-like, smaller than on chaetigers 1–8	digitiform to cone-shaped	low prechaetal; postchaetal ca. twice as high, laterally subtriangular, pointed	low prechaetal; postchaetal higher, laterally pointed	digitiform, as in chaetigers 1–8, short	leaf-like, subtriangular	leaf-like, subtriangular
neuropodia lateral lamellae	digitiform, ca. same size as notopodia	leaf-like, smaller than on chaetigers 1–8	digitiform to cone-shaped	similar, ca. same size as notopodia	similar, ca. same size as notopodia	absent	leaf-like, subtriangular; same size as notopodia	leaf-like, subtriangular
dorsal medial lobe (DML)	absent	? small	absent	absent	absent	absent	absent	absent
ventral neuropodia lobe (VNL)	short, digitiform	small	absent	absent	absent	very short, digitiform, as in chaetigers 1–8	absent	absent

Table 1. (*Continued*)

Abdomen													
notopodia lateral lamellae	leaf-like, stalked	leaf-like with narrowed base	leaf-like, stalked	leaf-like, slightly stalked, arched ventrally	leaf-like, broad, stalked, arched ventrally	large, leaf-like, tip pointing dorsally	leaf-like, pointed	subtriangular to ovate to sub-lanceolate, stalked					
neuropodia lateral lamellae	leaf-like, stalked; same size as notopodia short	leaf-like with narrowed base; same size as notopodia absent	leaf-like, stalked; same size as notopodia rudimentary ¹	same; same size as notopodia, arched dorsally small	same; same size as notopodia, arched dorsally very small	small, leaf-like; half the size of notopodia absent	leaf-like, pointed; same size as notopodia absent	subtriangular to ovate to sub-lanceolate, stalked					
dorsal medial lobe (DML)	short	absent	rudimentary ¹	small	very small	rudimentary	absent	very small					
ventral medial lobe (VML)	short	absent	rudimentary ¹	small	very small	rudimentary	absent	very small					
orientation of hooks; no. of teeth	one group in each ramus, all facing laterally; 3 absent	two groups in each ramus, facing vis-à-vis; 3 absent	two groups in each ramus, facing vis-à-vis 1; 2 absent	one group in each ramus, all facing laterally; 3	one group in each ramus, all facing laterally; 3 absent	two groups in each ramus, facing vis-à-vis; 3 ? 10/11, 14/15 left	two groups in each ramus, facing vis-à-vis; 3	two groups in each ramus, facing vis-à-vis; 2					
lateral pouches (Σ configuration)	absent	absent	n.d.	present in posterior chaetigers	present in posterior chaetigers	n.d.	absent	absent					
lateral pouches (C configuration)	absent	absent	n.d.	present in posterior chaetigers	present in posterior chaetigers	n.d.	absent	absent					
pygidium	two anal cirri	n.d.	n.d.	pointed, anal cirri lost	rounded, anal cirri lost	two short anal cirri	n.d.	n.d.					
Length (mm)	80–100	18	n.d.	up to 36	up to 105	40	12 and 7	7.5–20					
Chaetigers	142+	32	n.d.	81	~170	~70	14 and 19	46–106					
Colour	brown dorsal and ventral patches behind chaetal fascicles, largest on chaetigers 9 and 10	patches of whitish cells laterally in posterior chaetigers	grey-yellowish ‘glandular bands’ between a number of parapodia	uniformly cream coloured	dark patches between parapodia along sides of abdomen	reddish-brown pigment in chaetigers 4–6 (4–8)	carmin-coloured band dorsally and ventrally between chaetigers 5 and 8	absent					
Type locality	UK; intertidal, low water	Grande Vasière, South Brittany, France; 60–110 m	Øresund, Denmark; 16–18 m	St Andrews, Scotland, UK.	St Andrews, Scotland, UK.	Rame Head, Plymouth, UK; intertidal	Villefranche and Marseille, France; 13–18 m	Sta Catarina Island, South Atlantic, Brasil; intertidal					

¹, Jones (1977, p. 254 and figure 40)

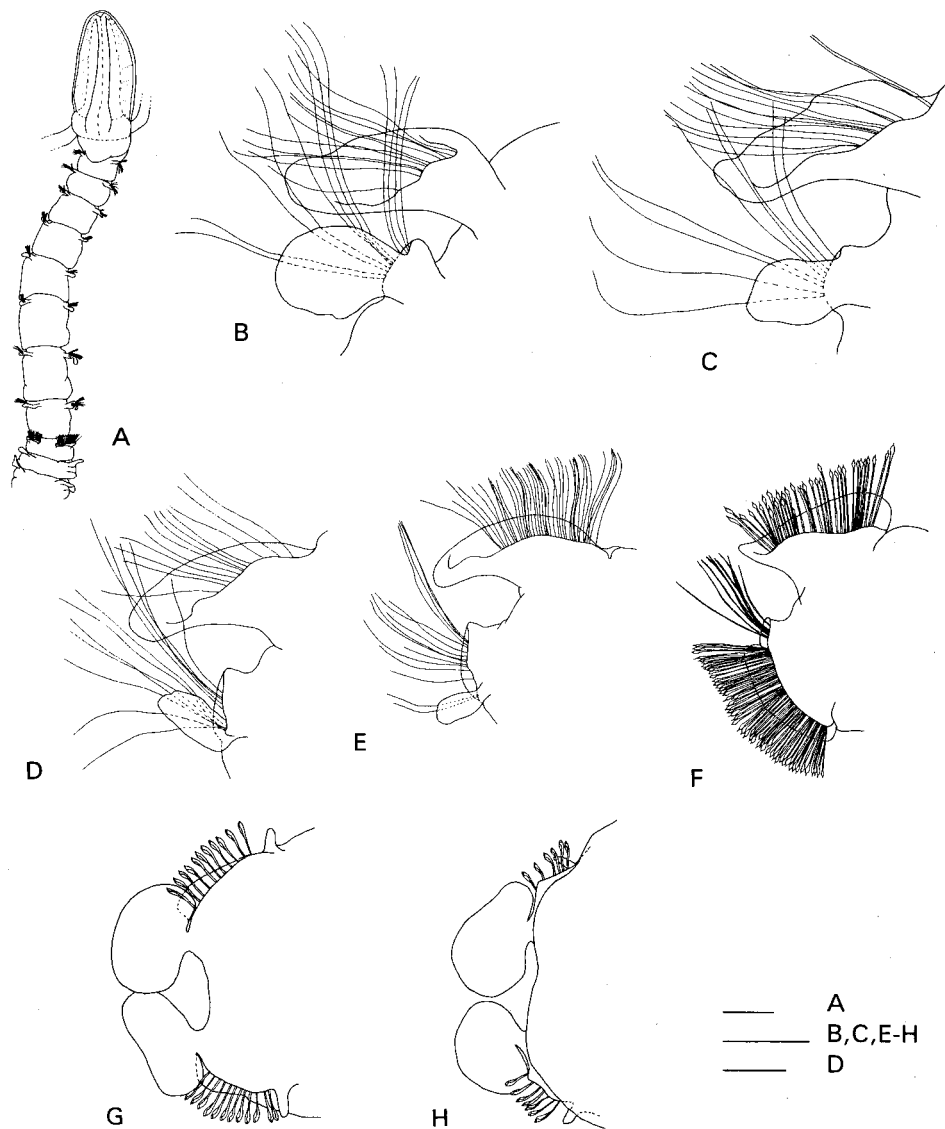


Figure 1. *Magelona mirabilis* (Johnston, 1865): (A) neotype; (B–H) sectioned specimen (BMNH 1921.5.1.3023–43). (A) Anterior part, dorsal view; (B) chaetiger 1, right, anterior view; (C) chaetiger 3, right, anterior view; (D) chaetiger 6, right, anterior view; (E) chaetiger 8, right, anterior view; (F) chaetiger 9, right, anterior view; (G) chaetiger 10, left, posterior view; (H) chaetiger 28, right, anterior view. Scale bars: A, 1 mm; B–E, 100 μ m; F–H, 250 μ m.

for abdominal lateral lamellae. Three to four of these structures (curved aciculae?) were noted connecting abdominal noto- and neuropodia in both species treated in this paper. They appear to be chaetal since bleaching with H_2O_2 or KOH leaves them intact together with the structurally similar abdominal hooks. However, histological investigations are needed to confirm the chaetal nature of these structures.

Measurements

The following measurements were made: thoracic width (maximum, excluding parapodia, over chaetigers 1–9), thoracic length (tip of prostomium to rear of chaetiger 9), prostomial width (maximum), prostomial length (prostomial tip to transverse groove dorsal to attachment of palps), abdominal width (maximum), total number of chaetigers, total length (prostomial tip to pygidium), length of palps (as measurement and as chaetiger reached posteriorly).

Epidermal glandular tissue

Epidermal glandular regions were highlighted on Berwick-upon-Tweed material and on *M. sacculata* (NMW.Z.1989.115.3) by methyl green staining as detailed in Mackie & Gobin (1993).

SYSTEMATICS

Family MAGELONIDAE Cunningham & Ramage, 1888

Genus *Magelona* F. Müller, 1858 emended

Type species

Magelona papillicornis F. Müller, 1858 by monotypy.
Gender: Feminine.

Diagnosis

Body long, slender, tapering posteriorly; divided into thorax with reduced peristomium, i.e. achaetous first segment, and chaetigers 1–9, and abdomen with numerous chaetigers. Prostomium large, dorsoventrally

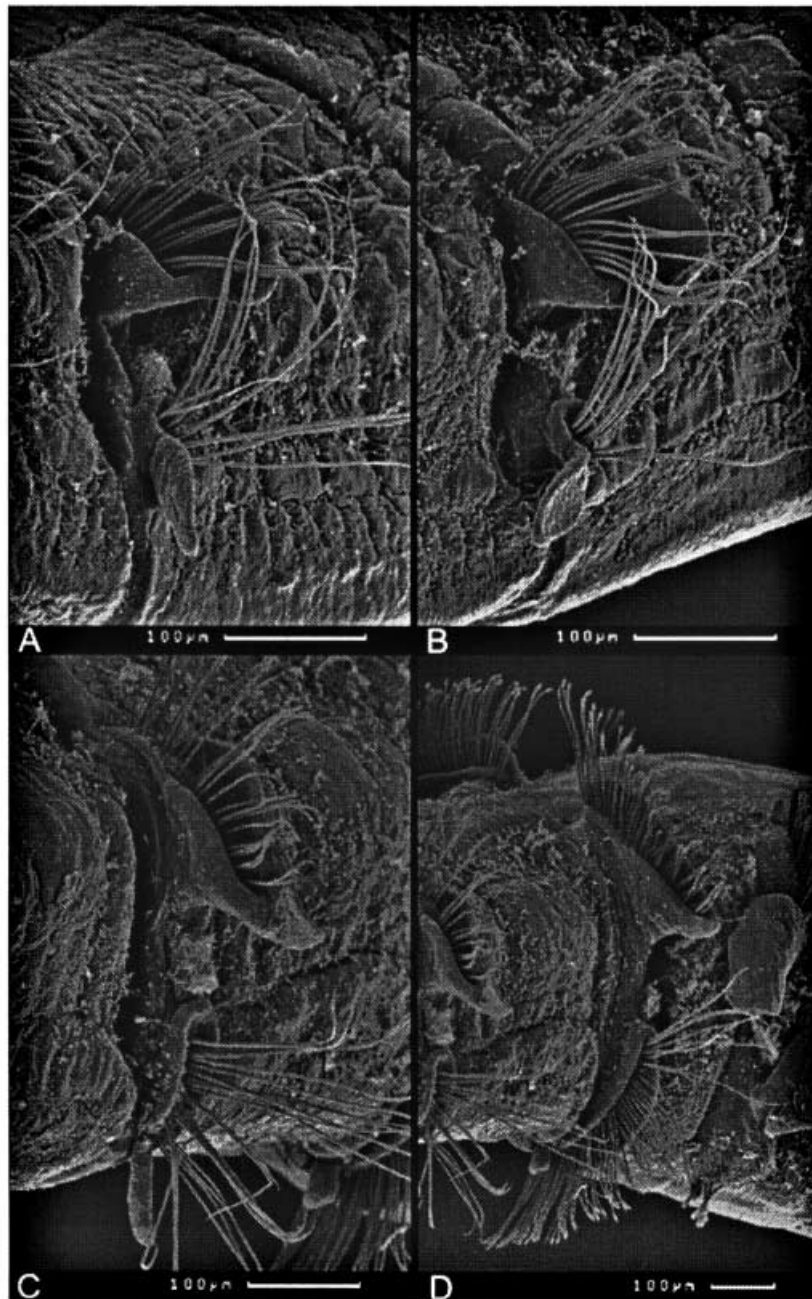


Figure 2. *Magelona mirabilis* (Johnston, 1865), scanning electron microscope micrographs: (A–D) specimen from St Andrews (BMNH 1921.5.1.3023-43). (A) Chaetiger 2, left, anterior view; (B) chaetiger 4, left, anterior view; (C) chaetiger 8, left, anterior view; (D) chaetiger 9, left, anterior view.

flattened, with longitudinal muscular ridges; anterior margin smooth or crenulate, rounded or with lateral horns. Pair of long, papillose palps inserted ventrolaterally at posterior margin of prostomium. Parapodia biramous, bearing various combinations of medial and lateral lobes or lamellae. Branchiae absent. Thoracic chaetigers with only limbate capillaries; those of chaetiger 9 may be modified. Abdominal chaetae uni-, bi-, tri-, or polydentate hooded hooks. Two kinds of lateral pouches present or absent between abdominal chaetigers. Pygidium with 0, 2 or 3 anal cirri.

Remarks

The diagnosis has been emended from previous accounts (most recently, Fauchald & Rouse, 1997) to

incorporate our new observations concerning the lateral pouches. When reported, most species possess a pair of small anal cirri, however, *M. longicornis*; (NMW.Z. 1989.115.1-2; seven observations) lacks anal cirri and Uebelacker & Jones (1984) cited three anal cirri for their *Magelona* sp. B.

Magelona mirabilis (Johnston, 1865)

Figures 1–3; Table 1; Appendix 1

Maea mirabilis Johnston, 1865: 278–279 [plate XXII not published]. Carrington, 1865:185.

Rhynophylla bitentaculata Carrington, 1865: 185–186.

Magelona papillicornis—McIntosh, 1878 (in part): plate XXIX figure 10; plate XXXV figures 1 & 2. McIntosh,

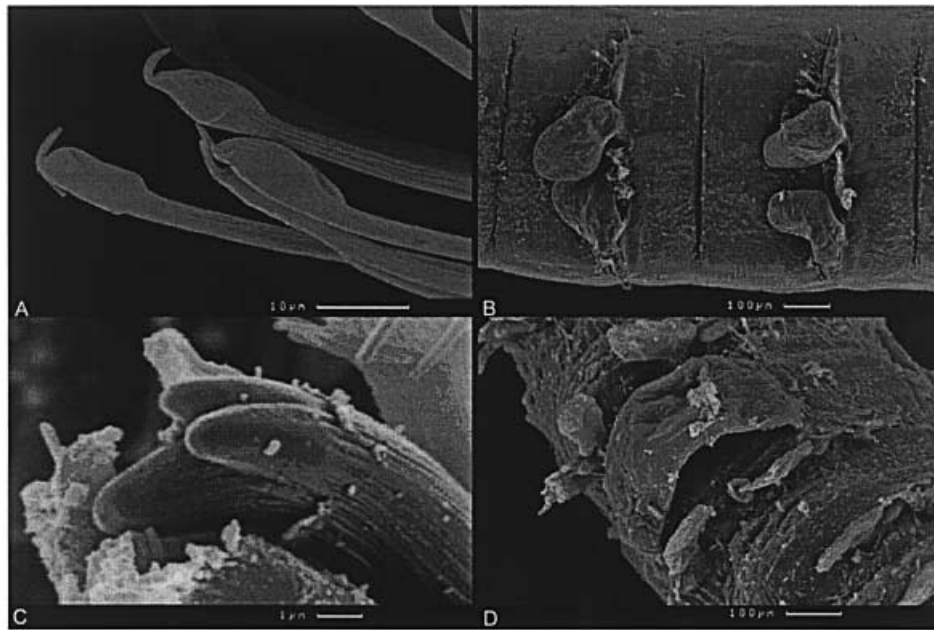


Figure 3. *Magelona mirabilis* (Johnston, 1865), scanning electron microscope micrographs: (A–C) specimen from St Andrews, (BMNH 1921.5.1.3023–43); (D) specimen from Roscoff (SMF 4626). (A) Chaetiger 9, mucronate chaetae; (B) abdominal chaetiger; lateral view; (C) tip of abdominal hook; (D) lateral pouch (C configuration), posterior view.

1911 (in part): 417–457. McIntosh, 1915: 223–227; McIntosh, 1916: plate XC, figure 6; plate CI, figure 2. Fauvel, 1927 (in part): 64–65. [Not F. Müller, 1858.] *Magelona* sp. B—Mackie & Garwood, 1995: 42. *Magelona mirabilis*—Hartmann-Schröder, 1996: figure 166a,e.

Neotype designation

In accordance with Article 75 of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature, 1985), we redescribe here *Maea mirabilis* as belonging to the genus *Magelona*, family Magelonidae, and provide a differential diagnosis to distinguish it from all closely related species in order to settle the confusion about the true identity of *Magelona papillicornis* and *M. mirabilis*. The type material of *Maea mirabilis* Johnston, 1865 is lost (A. Muir & M. Lowe, personal communication). As Johnston's description of *Maea mirabilis* is not very detailed, evidence that the description of *Magelona mirabilis* presented here is consistent with that of Johnston's species, was initially based on the presence of dark patches along the sides of abdominal chaetigers on some preserved specimens. Besides this admittedly rather weak argument, our selected species agrees well with the extensive description presented by McIntosh (1915). Apart from the parapodial structures, the mention of dark pigment bars on palps and a maximum size of 6–7" (15.0–17.5 cm) for up to 145 segments correspond with our findings. Johnston reported his specimen to be 4" (10 cm) long. The only other European species confusable with *M. mirabilis* lacks pigmented bands on the palps, is smaller (up to 5.6 cm recorded) and has less chaetigers (up to 89 recorded). This second species is described herein as *M. johnstoni* sp. nov.

Another clue for the correct identification of *M. mirabilis* can be found in some of the material in the Natural

History Museum (BMNH), which had also been studied and sorted to groups by M.L. Jones in 1975. The grouping and labelling applied by Jones (e.g. BMNH 1921.5.1.4700.1 and other subsamples of BMNH 1921.5.1.3023–43 labelled as '*Maea mirabilis*' and '*Maea* sp. (non *M. mirabilis*)' respectively), show that he obviously reached the same conclusion regarding the identity of *Magelona mirabilis*. Unfortunately, Jones never published any reasons for his separation of the two species and, ultimately, we rely on the principle of the first revisor (Article 24 of the International Code of Zoological Nomenclature, 1985).

As type-locality we have selected St Andrews, Scotland, since it is close to Edinburgh, the home of Robert Kaye Greville (1794–1866), the botanist who collected and donated the specimen described by Johnston (1865) as *Maea mirabilis*. Carrington (1865), describing a magelonid from Southport, stated that 'Dr Baird informs me there is one specimen in the British Museum from the coast of Fife'. Assuming that he was referring to Johnston's specimen, St Andrews appears to be a reasonable choice for the type locality. Many of Johnston's letters were compiled and published by his daughter Jane (Barwell Carter, 1892), but there are regrettably no additional clues as to the original locality, however, Greville was known to collect at St Andrews. Indeed, in a letter to Mrs Alfred Gatty (dated 18 July 1854), Johnston mentioned that he was soon to visit St Andrews with Greville. In another letter (1853?) to the same correspondent Johnston mentioned his contract to produce a 'Manual of worms' and wrote intriguingly 'I have partially examined today a very curious undescribed worm, that would make Mr Gatty wonder if he saw the wonderful and beautiful mechanism of the structure it has received, to fit it for its station.' Perhaps that worm was *Maea mirabilis* (*Maea*, a classical city in Çanakkale Bogazi, Turkey; *mirabilis*, latin for wonderful, extraordinary)?

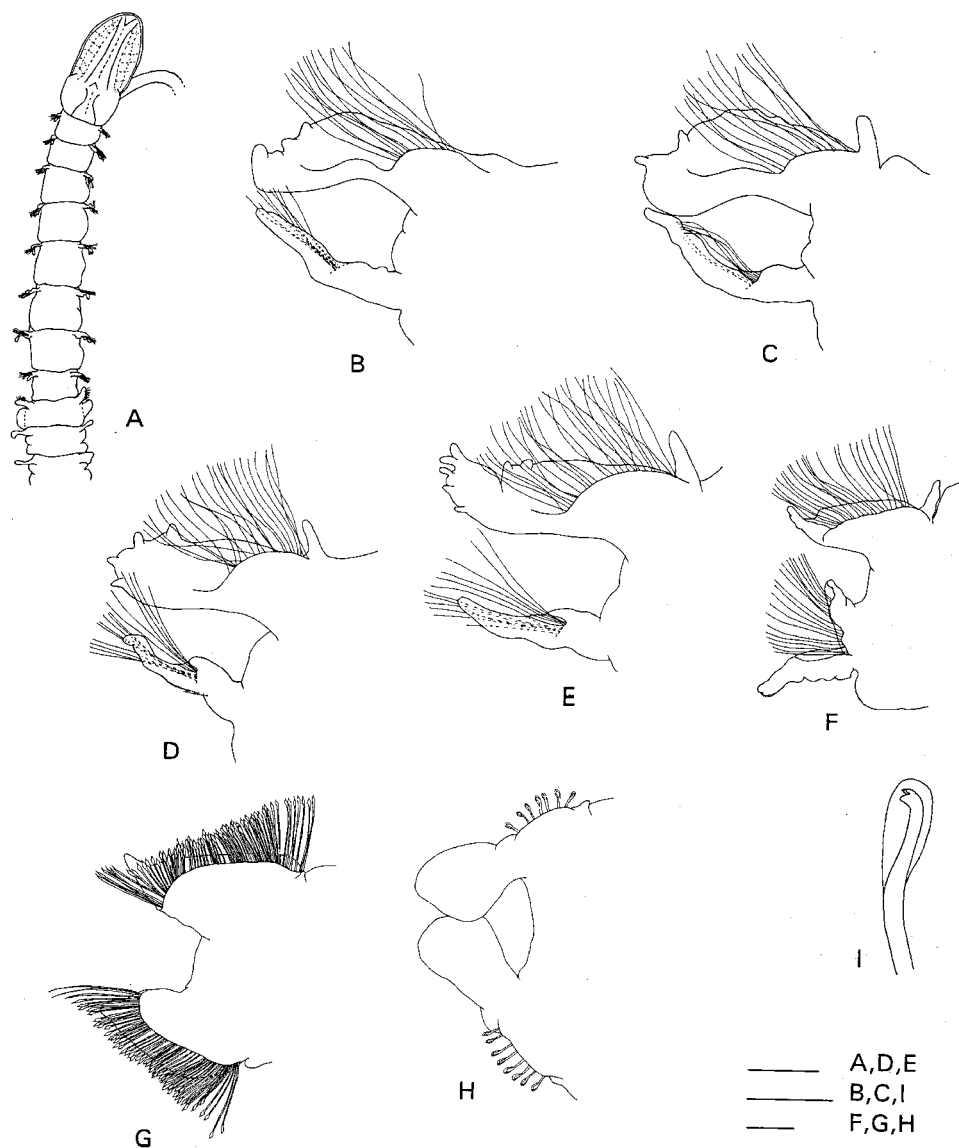


Figure 4. *Magelona johnstoni* sp. nov.: (A) holotype; (B–H) sectioned specimen (BMNH 1921.5.1.3064–76). (A) Anterior part, dorsal view; (B) chaetiger 2, right, anterior view; (C) chaetiger 4, right, anterior view; (D) chaetiger 6, right, anterior view; (E) chaetiger 7, right, anterior view; (F) chaetiger 8, right, anterior view; (G) chaetiger 9, right, anterior view; (H) chaetiger 15, right, anterior view; (I) abdominal hooded hook, lateral view. Scale bars: A, 1 mm; B–H, 100 μ m; I, 25 μ m.

Finally, we have informed other polychaete specialists of our intended action and have received their endorsement of our designation of a neotype.

Neotype complete, in two pieces with anterior part forming a knot behind chaetiger 28, thoracic width 0.9 mm, length about 105 mm (thorax 9.0 mm) for about 170 chaetigers; specimen examined by M.L. Jones (26 April 1974) and marked 'NDC, VD' (BMNH 1999.2400, separated from McIntosh collection BMNH 1921.5.1.3023–43).

Other material

North Sea, Scotland: unknown locality, indeterminate posterior fragments, labelled (in unknown handwriting) *M. papillicornis*, possible type of *Maea mirabilis* Johnston, 1865 (BMNH unregistered; examined by M.L. Jones in May 1975). Fife, St Andrews, five specimens (including one male) labelled *Maea mirabilis* 273800, sectioned by M.L. Jones (McIntosh coll.,

BMNH 1921.5.1.3023–43); 12 specimens (incl. one male) labelled *M. papillicornis* Müller, 1858, identified as *Maea mirabilis* Johnston by M.L. Jones, 8 May 1975 (McIntosh coll., BMNH 1921.5.1.3023–43); five specimens, examined by M.L. Jones 26 April 1974 and separated as 'NDC hooks?' (McIntosh coll., BMNH 1921.5.1.3023–43); one specimen, examined by M.L. Jones 26 April 1974, separated as 'NDC VV' (McIntosh coll., BMNH 1921.5.1.3023–43); 72 specimens (incl. eight male), separated by M.L. Jones, as 'NDC, VD' (McIntosh coll., BMNH 1921.5.1.3023–43; SEM stubs 565–568; one specimen labelled *M. papillicornis* F. Müller, 1858, from the 'young worm area', det. N. Tebble (BMNH ZK 1951.5.2.50); 21 specimens (incl. 14 male), labelled *Magelona* sp. (McIntosh coll. BMNH 1921.5.1.3064–76); 36 specimens (incl. 19 male, four female), labelled *Magelona papillicornis* Fritz Müller (McIntosh coll. BMNH 1921.5.1.3045–55); off St Andrews Cathedral, stn 1–2, fine sand, 2–3 m, two specimens (af), dredge, labelled

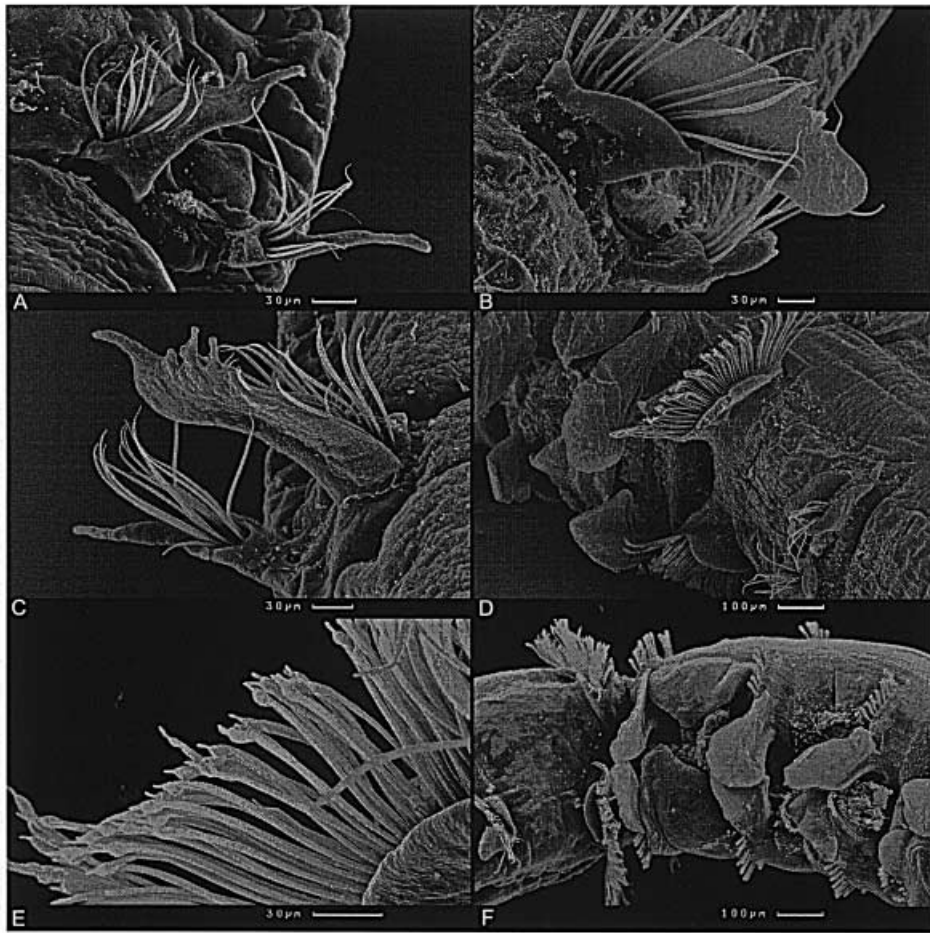


Figure 5. *Magelona johnstoni* sp. nov., scanning electron microscope micrographs: (A,C) specimen from German Bight (SMF 4978); (B,D) specimen from St Andrews (BMNH 1921.5.1.3023–43); (E,F) specimen from North Sea (SMF 9186, SEM stub 316). (A) Chaetiger 1, left, anterior view; (B) chaetiger 4, left, anterior view; (C) chaetiger 5, left, posterior view; (D) chaetiger 9, left, anterior view; (E) chaetiger 9, mucronate chaetae; (F) lateral pouch (Σ configuration) between chaetigers 10 and 11, lateral view.

Magelona 'mirabilis', coll. NMW 16 July 1990 (NMW.Z.1990.050.0006); East Sands, fine silty sand, shore (LW), one specimen (c, male), coll. NMW 21 March 1999 (NMW.Z.1999.027.0001); off Kinkell Ness, stn 10 (56°19.9'N 02°44.4'W), fine sand, 3–5 m, one specimen (af), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0007); Firth of Tay, Tayport, Lucky Scalp (56°26.9'N 02°51.2'W), silty sand, shore (LW), one specimen (af), labelled *Magelona 'mirabilis'*, coll. NMW 23 July 1990 (NMW.Z.1990.050.0008).—Firth of Clyde, Scotland: one specimen, labelled *M. papillicornis*, coll. Mr D. Robertson (BMNH 1864.6.30.7).

North Sea, England: Northumberland, Berwick-upon-Tweed (55°46'N 01°59'W), Meadow Haven, just north of pier, stn 10, sand beside rocks, shore (LW), seven specimens (af), coll. NMW 31 March 1998 (NMW.Z.1998.014.0001), ten specimens (3c, 6af, laf, female), coll. NMW 20 March 1999 (NMW.Z.1999.021.0007–0008); stn 4, silty sand with stones and *Lanice*, shore (LW), three specimens (1c, 2af), coll. NMW 18 March 1999 (NMW.Z.1999.021.0001), five specimens (1c, 4af), coll. NMW 19 March 1999 (NMW.Z.1999.021.0002–0003), ten specimens (af), coll. NMW 20 March 1999 (NMW.Z.1999.021.0004–0005); stn 7, sand, mid to low

shore, two specimens (af), coll. NMW 19 March 1999 (NMW.Z.1999.021.0006).

North Sea, German Bight: FK 'Senckenberg' cruise DEB 1987, stn 10 VV, 16 m, one specimen (af), coll. M. Türkay 24 May 1987, det. D. Fiege (SMF 4965 separated from SMF 4985).

Atlantic Ocean, Ireland: Mayo, Blacksod Bay, Carrigeenmore (54°6.6'N 10°3.2'W), fine sand, shore (LW), one specimen (af), labelled *Magelona 'mirabilis'*, coll. NMW 20 March 1988 (NMW.Z.1988.069.0087).

Irish Sea, England: Merseyside, Southport, sand and mud, shore (LW), holotype *Rhynophylla bitentaculata* Carrington, 1865, coll. B. Carrington (BMNH 1967.3.1); Birkdale, sand, shore (LW), one specimen (af, pf, male), labelled *Magelona mirabilis* form B, coll. NMW, 26 June 1988 (NMW.Z.1988.124.0018); fine sand, shore (LW), three specimens (1c, 2af), labelled *Magelona mirabilis* form B, coll. NMW 28 August 1988 (NMW.Z.1988.124.0020).

Irish Sea, Wales: Gwynedd, Anglesey, Menai Straits, Black Rock (see Oliver et al., 1986); as *Magelona* sp. A, mid-shore, two specimens (2af, 1f), coll. NMW, 5 May 1985 (NMW.Z.1985.038.0578); Tremadog Bay, BIOMÖR stn 25, sand, 25 m, one specimen (af), labelled *Magelona* sp. B', coll. NMW, 13 July 1989 (NMW.Z.1989.104.1129).

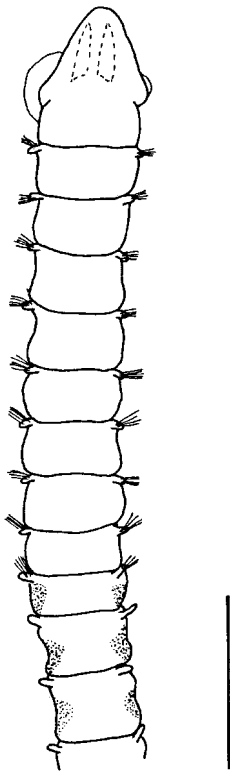


Figure 6. *Magelona minuta* Eliason, 1962: paratype (USNM 52510), anterior part, dorsal view. Scale bar: 500 μm .

Bristol Channel, Wales: West Glamorgan, Rhossili Bay, sand, shore (LW), one specimen (af, male), labelled *Magelona mirabilis* type B, coll. A.S.Y. Mackie & A. Trew, 21 April 1988 (NMW.Z.1988.081.0010); Swansea Bay, Mumbles, silty sand, shore (near LW), two specimens (af), labelled *Magelona mirabilis* B, coll. A.S.Y. Mackie & P.G. Oliver, 22 November 1987 (NMW.Z.1987.138.0008).

Celtic Sea, Ireland: south-west of the Saltee Islands, SWISS stn 108 (52°5.00'N 06°45.00'W), very fine sand, 32 m, one specimen (af), coll. 8 July 1997 (NMW.Z.1997.050.0015).

English Channel, France: Bretagne, Côtes du Nord, Lancieux (48°36.7'N 02°9.3'W), silty sand with some *Lanice*, mid-shore, one specimen (af, f, female), coll. A.S.Y. Mackie 24 May 1989 (NMW.Z.1991.067.0003); Finistère, St Michel-en-Grève, three specimens, coll. D. Fiege, March 1994 (SMF 4625 & 4627); Finistère, St Efflam, three specimens, coll. D. Fiege, March 1994, (SMF 4626 and SEM stubs 322 & 323).

Atlantic Ocean, France: Bretagne, Finistère, Morgat (48°13.6'N 04°30.2'W), silty sand with much *Zostera* detritus, shore, seven specimens (lpr, 6af, 2f), coll. NMW 21 October 1987 (NMW.Z.1987.084.0020–0021); sand, shore (near LW), one specimen (af), coll. NMW 21 October 1987 (NMW.Z.1987.084.0022); sand, shore (LW), three specimens (lc, 2af), coll. NMW 21 October 1987 (NMW.Z.1987.084.0023); two specimens (2af, lf), coll. A.S.Y. Mackie 2 August 1992 (NMW.Z.1992.040.0001). Gironde, Bassin d'Arcachon, Cap Ferret (44°39.0'N 01°14.5'W), sand, mid-shore, one specimen (laf, lf), coll. NMW 29 October 1987 (NMW.Z.1987.084.0024).

Mediterranean Sea, France: Pyrénées-Orientales, Banyuls-sur-Mer, south of Cap de l'Abeille, Db 57, near-shore, two specimens, coll. Guille no. 474 (LAB).

Diagnosis

Prostomium longer than wide, rounded, without prostomial horns. Notopodia of chaetigers 1–8 with elongate, leaf-like postchaetal lateral lamellae with smooth upper edge. Dorsal medial lobes absent on chaetigers 1–9. Neuropodial postchaetal lamellae absent on chaetigers 1–7; low, scarcely projecting on chaetiger 8. Chaetiger 9 with mucronate chaetae. Abdominal hooded hooks tridentate, all hooks of each fascicle pointing laterally. Lateral pouches all simple (C configuration), in posterior chaetigers.

Description

Prostomium longer than wide, anterior margin rounded; prostomial horns absent (Figure 1A). Proboscis globular; superior part smooth, larger inferior part longitudinally ridged. Palps long, reaching chaetigers 16–18 (up to chaetiger 37, usually to chaetigers 26–32, for NMW MgCl₂ relaxed material); except for unadorned most proximal part, each palp densely papillated basally. More distally papillae arranged in a gradually decreasing number of rows set apart by a median, more or less conspicuous non-papillated groove.

Notopodial lateral lamellae of chaetigers 1–8 with small pre- and larger, elongate, leaf-like postchaetal lamellae with smooth upper edge; increasing slightly in size from chaetigers 1–8. Neuropodial lateral lamellae absent in chaetigers 1–7. Chaetiger 8 with very low postchaetal lobe; usually with straight margin, occasionally rounded and slightly more projecting. Dorsal medial lobes (DML) absent, ventral neuropodial lobes (VNL) small, slightly foliose, more or less prechaetal in chaetigers 1–5 and small, digitiform, subchaetal in chaetigers 6–8 (Figures 1B–E & 2A–C). Chaetiger 9 with notopodial lateral lamellae consisting of low prechaetal and higher, laterally pointed postchaetal lamellae. Neuropodial lateral lamellae similar and about same size as notopodial, but postchaetal lamellae rounded or only slightly pointing laterally. Dorsal medial lobe and ventral neuropodial lobe absent on chaetiger 9 (Figures 1F & 2D).

Chaetigers 1–8 with fascicles of winged capillaries in both rami; notopodial ones basally surrounded by lateral lamellae. Chaetiger 9 with mucronate chaetae (Figures 1F & 3A) and a few longer, winged capillaries in lateralmost position of noto- and neuropodial fascicles; chaetae originating from trough between pre- and postchaetal lamellae in both rami.

Chaetigers 9 and 10 constricted, abdomen wider than thorax. Abdominal lateral lamellae in both rami broad, leaf-like, stalked, about same size dorsally and ventrally. Dorsal and ventral medial lobes small (Figures 1G,H & 3B).

Abdominal hooded hooks all of same size with two small teeth above main fang (Figure 3C). Each chaetiger with one group of hooks dorsally and ventrally, all with main fangs facing in same lateral direction. Anterior lateral pouches (Σ configuration) absent, simple (C configuration) pouches present in posterior chaetigers (Figure 3D); for neotype in pairs on chaetigers 4, 8, 11,

14, 18, 22, 26, 29, 32, 35, 38, 41, 45, 50, 55, 58, 61, 64, 68, 72, 76, 80, 84, 88 and 92 (as counted from posterior end).

Pygidium rounded with two small, lateral anal cirri (missing in neotype).

Measurements

Morphometric data from all specimens measured is presented in Appendix 1. The neotype is the largest specimen examined; 105 mm for about 170 chaetigers.

Colour

Living animals from St Andrews and Berwick-upon-Tweed (NMW material) with pale pinkish grey thorax. Some reddish brown pigmentation present in patches (variable) on achaetous segment 1 (peristomium) and thoracic chaetigers; posterior half of chaetiger 4 usually with light reddish speckles laterally. Palps pale, distal halves to two-thirds with dark brown bands dorsally; additional brown pigment around bases of papillae. Palp pigmentation less, only around papillae, or lacking on smaller animals (thoracic width <0.50–0.55 mm). Abdomen yellowish green with darker olive green granules lateral to gut. In alcohol, specimens usually cream-white, often with dark patches along sides of abdomen and/or dark transverse bands dorsally on thorax just behind segmental borders. Some specimens uniformly darker, brownish. Brown banding still visible on palps of material placed in alcohol 10–12 years previously (NMW material).

Methyl green staining

Prostomium lightly speckled, particularly in mid-dorsal and mid-ventral regions. Basal regions of palp papillae deeply stained. Thorax covered with dark staining speckles, most persistent around chaetigers 4 and 5. In abdomen staining most dense laterally, as interrupted mid-dorsal line, and as two continuous mid-ventral longitudinal lines. Lateral staining continued across dorsum somewhat, in median chaetigers more or less forming bands behind notopodia; lateral lamellae unstained.

Reproduction

Reproductive data scarce. Males with sperm masses laterally (chaetiger 34–153) in specimen from St Andrews (March 1999). Females recorded (NMW material) at Berwick-upon-Tweed (March) and Lancieux (May); eggs (up to 125 µm diameter).

Remarks

Magelona mirabilis is clearly distinguished from all but one *Magelona* species (i.e. *M. johnstoni* sp. nov.) occurring in European waters by the presence of specialized chaetae in chaetiger 9 (Table 1). It occurs together with *M. johnstoni* sp. nov. in the same habitat in intertidal and shallow waters (to 25 m). Many earlier authors confused the two species, often referring to them collectively under the name *M. papillicornis*. Important characters differing in the two species include (Table 1): dorsal medial lobes on chaetigers 4–8, thoracic notopodial lateral lamellae with crenulate upper edges, prominent postchaetal neuropodial lamellae on chaetiger 8, basally constricted (stalked) anterior abdominal lateral lamellae, and lateral pouches (Σ configuration) between chaetigers 10 and 11. All of

these features are present in *M. johnstoni* sp. nov. and absent in *M. mirabilis*. The two species also differ in their pigmentation, most notably in the brown banded palps and fine reddish speckling on chaetiger 4 of *M. mirabilis*. Further, *M. mirabilis* attains a much greater size with about twice the number of segments as *M. johnstoni* sp. nov.

Besides *M. mirabilis* and *M. johnstoni* sp. nov. the following nine *Magelona* species are characterized by the presence of specialized chaetae on chaetiger 9, absence of prostomial horns and presence of tridentate abdominal hooks: *M. obockensis* Gravier, 1905; *M. pitelkai* Hartman, 1944; *M. sacculata* Hartman, 1961; *M. riojai* Jones, 1963; *M. heteropoda* Mohammad, 1973; *Magelona* sp. B Uebelacker & Jones, 1984; *M. crenulata* Bolívar & Lana, 1986; *M. pectinata* Nateewathana & Hylleberg, 1991 and *M. tinae* Nateewathana & Hylleberg, 1991. *Magelona mirabilis* differs from all these species in lacking both lateral pouches between chaetigers 10 and 11 and dorsal medial lobes on chaetigers 1–8.

The holotype of *Rhynophylla bitentaculata* Carrington, 1865 shows exactly the same characters as described above for *M. mirabilis*. Thus, in accordance with Carrington (1865), who only provisionally used the name *R. bitentaculata* for his species, we consider it synonymous with *M. mirabilis*.

It is ironic that Johnston did not himself collect *M. mirabilis* from Berwick-upon-Tweed. Whether this was due to its absence during his time, a difference in sediment type or due to an oversight cannot now be determined. It may be noted, however, that we (NMW) have also collected *M. johnstoni* and *M. filiformis* from the intertidal sand there. Most of the polychaete species described by Johnston from this locality (e.g. *Psamathe fusca*, *Harmothoe impar*, *Pholoe inornata*, *Sthenelais boa*, *Polydora ciliata*) can still be found in the nearby rockier parts of Berwick Bay and it may be that Johnston simply preferred to hand collect in that habitat, rather than dig in the sands.

Habitat

Sandy sediments, intertidal (mid to lower shore) to 32 m.

Distribution

North Sea, Baltic Sea (Hartmann-Schröder, 1996: Kiel Bay), Irish Sea, Celtic Sea, English Channel, Atlantic Ocean (Ireland, France), Mediterranean Sea (France).

Magelona johnstoni sp. nov.

Figures 4 & 5, Table 1, Appendix 2

Magelona papillicornis—McIntosh, 1878 (in part): 460, plate XXX, figure 7; 1911 (in part): 454–455. Mesnil, 1896: 257–259, plate XIV, figures 27–32. Fauvel, 1927 (in part): 64–65, figure 22h, i. [Not F. Müller, 1858.]

Magelona mirabilis—Fiege & Ben-Eliahu, 1994: 417. Böggemann, 1998: 141, figure 101a–h. [Not Johnston, 1865.]

Magelona sp. A.—Mackie & Garwood, 1995: 42.

Type material

Scotland, Fife, St Andrews, holotype (?male) (BMNH 1999.2401), six paratypes: three (1cs, male; 2af) (BMNH

1999.2402–2404), one paratype (af) (SMF 9242), one paratype (af) (USNM 186519), one paratype (af) (NMW.Z.1999.107.0001). All separated from McIntosh collection BMNH 1921.5.1.3023–43; examined by M.L. Jones 26 April 1974, and marked 'DC 4–8, fimbriate, 10/11'.

Other material

North Sea, Scotland: Fife, St Andrews, ten specimens (incl. four male, one female) labelled *Magelona* sp. (McIntosh coll., BMNH 1921.5.1.3064–76 and SEM stubs 553 & 562–564); eight specimens (incl. two male, three female) labelled *Magelona papillicornis* Fritz Müller (McIntosh coll., BMNH 1921.5.1.3045–55); seven specimens, examined by M.L. Jones 26 April 1974, separated as 'smooth, DC 3–8, 10/11' (McIntosh coll., BMNH 1921.5.1.3023–43); 42 specimens (incl. 14 male, one female), examined by M.L. Jones 26 April 1974, separated as 'DC 4–8, smooth 10/11 and DC 4–8, fimbriate, 10/11' (McIntosh coll., BMNH 1921.5.1.3023–43 and SEM stubs 560 & 561, 558 & 559); two specimens (McIntosh coll., BMNH 1921.5.1.4700–1), separated as '*Maea* sp. (non *M. mirabilis*)' from BMNH 1921.5.1.3023–43 by M.L. Jones, May 1975; off St Andrews Cathedral, stn 1–2, fine sand, 2–3 m, four specimens (af), dredge, labelled *Magelona 'mirabilis'*, coll. NMW 16 July 1990 (NMW.Z.1990.050.0009); off Tentsmuir Forest, stn 4 (56°24.5'N 02°45.8'W), fine sand with *Lanice*, 6 m, one specimen (af), dredge, coll. NMW 16 July 1990 (NMW.Z.1990.050.0010); off Firth of Tay, stn 5 (56°26.9'N 02°37.5'W), fine and coarse sand, 18 m, one specimen (af), labelled *Magelona 'mirabilis'*, dredge, coll. NMW 16 July 1990 (NMW.Z.1990.050.0011); off Kinkell Ness, stn 10 (56°19.9'N 02°44.4'W), fine sand, 3–5 m, four specimens (af), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0012); off Buddo Ness, stn 12 (56°20.0'N 02°42.2'W), silty fine sand, 11 m, 12 specimens (af, two female), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0013); Boarhills, off Craig Hartle, stn 13 (56°19.7'N 2°40.4'W), mud and fine sand, 10 m, ten specimens (1pr, male, 9af), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0014); off Babbet Ness, stn 15 (56°19.8'N 02°38.5'W), silty fine sand, 14 m, five specimens (af), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0015); St Andrews Bay, stn 16 (56°20.9'N 02°38.7'W), silty fine sand, 13 m, two specimens (af), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0016); stn 17 (56°21.4'N 02°42.5'W), silty fine sand, 13 m, three specimens (af), dredge, coll. NMW 18 July 1990 (NMW.Z.1990.050.0017); off St Andrews Bay, stn 23, silty fine sand with shell, 23 m, one specimen (af), dredge, coll. NMW 20 July 1990 (NMW.Z.1990.050.0018); stn 24, silty fine sand with some shell, 25 m, one specimen (c), dredge, coll. NMW 20 July 1990 (NMW.Z.1990.050.0019). Shetland Islands, Sullom Voe, between Calback Ness and Little Roe (60°29.6'N 01°16'W), medium to coarse sand, 17 m, two specimens (2af, 5f, 1pf), coll. Institute of Offshore Engineering, April 1989 (NMW.Z.1997.078.0208).

North Sea, England: Northumberland, Berwick-upon-Tweed (55°46'N 01°59'W), Meadow Haven, just north of pier, stn 10, sand, shore (LW), 16 specimens (6c, 1pr, 9af; four female, five male), coll. NMW 31 March 1998 (NMW.Z.1998.014.0002), 38 specimens (10c, 28af; 17

female, seven male), coll. NMW 20 March 1999 (NMW.Z.1999.021.0018–0021); stn 4, silty sand with stones and *Lanice*, shore (LW), two specimens, (2c female), coll. NMW 18 March 1999 (NMW.Z.1999.021.0009), 11 specimens (5c, 1pr, 5af; three female, six male), coll. NMW 19 March 1999 (NMW.Z.1999.021.0010–0012), 54 specimens (11c, 3pr, 40af; 16 female, 13 male), coll. NMW 20 March 1999 (NMW.Z.1999.021.0013–0016); stn 7, sand, mid to low shore, three specimens (2c, 1af; two female), coll. NMW 19 March 1999 (NMW.Z.1999.021.0017); stn 8, silty sand, mid shore, four specimens (3c, 1af; three female, one male), coll. NMW 19 March 1999 (NMW.Z.1999.021.0022).

North Sea, German Bight: FK 'Senckenberg' cruise DEB 1987 (see Fiege & Ben-Eliahu, 1994), coll. M. Türkyay, det. D. Fiege: stn 3 VV, 46 m, one specimen (af), 24 May 1987 (SMF 4986); stn 4 VV, 43 m, two specimens (af), 24 May 1987 (SMF 4980); stn 5 VV, 44 m, one specimen (af), 24 May 1987 (SMF 4983); stn 6 VV, 46 m, one specimen (af, 1f), 24 May 1987 (SMF 4981); stn 8 VV, 31 m, 15 specimens (1c, 14af), 24 May 1987 (SMF 4982); stn 10 VV, 16 m, two specimens (af), 24 May 1987 (SMF 4985); stn 18 VV, 29 m, 32 specimens (af), 25 May 1987 (SMF 4978 and SEM stubs 554–557); stn 19 VV, 25 m, five specimens (af), 25 May 1987 (SMF 4972); stn 19 BT, 25 m, one specimen (c-p), 25 May 1987 (SMF 4984); stn 20 VV, 18 m, five specimens (af), 26 May 1987 (SMF 4973); stn 21 VV, 30 m, four specimens (4af, 2f), 26 May 1987 (SMF 4974); stn 22 VV, 36 m, two specimens (af), 26 May 1987 (SMF 4977); stn 23 VV, 43 m, 21 specimens (21af, 1pf), 26 May 1987 (SMF 4975); stn 25 VV, 19 m, 33 specimens (33 af, f), 26 May 1987 (SMF 4976).

North Sea, unknown location: six specimens (af), coll. J. Dörjes (SMF 9186, SEM stubs 314–319).

Atlantic Ocean, Ireland: Galway, Connemara, Ballynakill Harbour, off Coastguard Bay, fine sand, 7 m, four specimens (4af, 1f), dredge, coll. NMW 21 March 1988 (NMW.Z.1988.069.0088).

Irish Sea, England: Merseyside, Birkdale, fine sand, shore (LW), 13 specimens (6c, 7af; three female, two male) labelled *Magelona mirabilis* Form A, coll. NMW 28 August 1988 (NMW.Z.1988.124.0019).

Irish Sea, Wales: Gwynedd, Anglesey, Moelfre Bay, SWISS stn 74 (53°21.18'N 04°13.87'W), muddy sand, 7 m, 38 specimens, coll. 30 June 1997 (NMW.Z.1997.050.0001–0002); Llanddwyn Bay (see Oliver et al., 1986; as *M. mirabilis*), stn 1, sand, shore (LW), one specimen (af, female), coll. NMW 3 May 1985 (NMW.Z.1985.038.0576); stn 4, sand, shore (LW), one specimen (af, male), coll. NMW 3 May 1985 (NMW.Z.1985.038.0577); Caernarfon Bay, BIOMÖR (see Mackie et al., 1995, as *Magelona* sp. A) stn 32, fine sand, 20 m, four specimens (2c, 2af, 3f, 1pf), coll. NMW 14 July 1989 (NMW.Z.1989.104.1128); Cardigan Bay, Tremadog Bay, BIOMÖR stn 25, sand, 25 m, one specimen (af), coll. NMW 13 July 1989 (NMW.Z.1989.104.1125); BIOMÖR stn 28, sand, 18 m, 59 specimens (20c, 39af, 16f, 7pf), coll. NMW 13 July 1989 (NMW.Z.1989.104.1126); BIOMÖR stn 29, sandy mud, 18 m, two specimens (1c, 1af), coll. NMW 13 July 1989 (NMW.Z.1989.104.1127); off Sarn-y-Bwch, BIOMÖR stn 42, sand,

16 m, four specimens (4c), coll. NMW, 30 July 1991 (NMW.Z.1991.075.1594); off Aberdyfi, BIOMÖR stn 43, sand, 16 m, five specimens (2c, 3af, f), coll. NMW 30 July 1991 (NMW.Z.1991.075.1595); SWISS stn 126 (52°31.27'N 04°13.14'W), fine sand, 16 m, 17 specimens (6c, 1laf), coll. 10 July 1997 (NMW.Z. 1997.050.0013); BIOMÖR stn 50, sand, 49 m, one specimen (c), coll. NMW 1 August 1991 (NMW.Z. 1991.075.1596); Dyfed, Cardigan Bay, west of Aberystwyth, BIOMÖR stn 45, sand, 17 m, 22 specimens (9c, 13af, 4f, 1pf), coll. NMW 31 July 1991 (NMW.Z. 1991.075.1597); south-west of Aberystwyth, BIOMÖR stn 21, sand, 20 m, nine specimens (3c, 6af), coll. NMW 12 July 1989 (NMW.Z.1989.104.1124).

Irish Sea, Ireland: Dublin, north of Howth, SWISS stn 75 (53°26.29'N 06°3.94'W), very fine sand, 15 m, 13 specimens, coll. 2 July 1997 (NMW.Z.1997.050.0003); Dublin Bay, SWISS stn 88 (53°19.12'N 06°4.88'W), very fine sand, 17 m, 35 specimens, coll. 2 July 1997 (NMW.Z. 1997.050.0004–0008); Wexford, north-east of Roney Point, SWISS stn 116 (52°38.58'N 06°8.81'W) very fine sand, 9 m, one specimen (laf, 3f, 1pf), coll. 9 July 1997 (NMW.Z.1997.050.0012).

Celtic Sea, Wales: Dyfed, St Bride's Bay, SWISS stn 129 (51°50.19'N 05°13.02'W), muddy sand, 21 m, 13 specimens (3c, 10af, 5pf), coll. 11 July 1997 (NMW.Z.1997.050.0014); south-west of Milford Haven, BIOMÖR stn 12, sand, 88 m, 39 specimens (29c, 10af), coll. NMW 12 July 1989 (NMW.Z.1989.104.1122).

Celtic Sea, Ireland: north-east of the Saltee Islands, SWISS stn 111 (52°9.45'N 06°29.30'W), coarse sand and pebbles with a little mud, 28 m, one specimen (af), coll. 8 July 1997 (NMW.Z.1997.050.0011); south-west of the Saltee Islands, SWISS stn 108 (52°5.00'N 06°45.00'W), very fine sand, 32 m, eight specimens (2c, 6af), coll. 8 July 1997 (NMW.Z.1997.050.0010); south-west of Coningbeg Light, SWISS stn 107 (51°59.03'N 6°44.94'W), muddy fine sand, 55 m, four specimens (1c, 3af, 1pf), coll. 8 July 1997 (NMW.Z.1997.050.0009).

Bristol Channel, Wales: BIOMÖR stn 13, sand, 88 m, ten specimens (c), coll. NMW 11 July 1989 (NMW.Z.1989.104.1123); Dyfed, Carmarthen Bay, Pendine Sands, fine sand, shore (ELWS), three specimens (1c, 1pr, 1af, female) labelled *Magelona mirabilis*, coll. J.P. Hartley 26 March 1982 (NMW.Z.1982.067.0010); West Glamorgan, Swansea Bay, Mumbles, silty sand, shore (LW), ten specimens (7c, 3af), labelled *Magelona mirabilis* A, coll. A.S.Y. Mackie & P.G. Oliver 22 November 1987 (NMW.Z.1987.138.0009).

Atlantic Ocean, France: Bretagne, Finistère, Morgat (48°13.6'N 04°30.2'W), sand, shore (LW), two specimens (1c, 1af), labelled *Magelona* cf. *mirabilis*, coll. NMW 21 October 1987 (NMW.Z.1987.084.0025).

Mediterranean Sea, France: Pyrénées-Orientales, Banyuls-sur-Mer, south of Cap de l'Abeille, nearshore, three specimens (one male, two female), Db 57, coll. Guille no. 474 (LAB, one female SMF 9803).

Diagnosis

Prostomium longer than wide, without prostomial horns. Notopodia of chaetigers 1–8 with elongate, leaf-like, postchaetal lateral lamellae; upper edges usually crenulate to fimbriate. Neuropodial lateral lamellae absent on chaetigers 1–7; prominent, asymmetrically

subtriangular or rounded on chaetiger 8. Dorsal medial lobes from chaetigers 4(3)–8, digitiform. Chaetiger 9 with mucronate chaetae. Abdominal hooded hooks tridentate, all facing in same lateral direction. Lateral pouches (Σ configuration) between chaetigers 10 and 11; additional pouches (C configuration) in posterior chaetigers.

Description

Prostomium longer than wide, anterior margin rounded; prostomial horns absent (Figure 4A). Proboscis globular, superior part smooth, inferior part longitudinally ridged. Palps long, reaching up to chaetiger 22 (to chaetiger 25 in NMW MgCl₂ relaxed specimens); except for unadorned proximal part, each palp densely papillated basally. More distally, papillae arranged in a gradually decreasing number of rows set apart by a median, more or less conspicuous non-papillated groove.

Notopodial lateral lamellae of chaetigers 1–8 with small pre- and larger, elongate leaf-like, postchaetal lamellae with crenulate upper edge; crenulations variable, sometimes long and narrow with lamellae appearing elkhorn-shaped, sometimes low and broadly undulating. Lamellae increase in size from chaetigers 1 through 8. Neuropodial lateral lamellae absent on chaetigers 1–7. Chaetiger 8 with small rounded to asymmetrically subtriangular postchaetal lobe; reaching greatest width near superior margin. Dorsal medial lobes digitiform, present on chaetigers 4 (holotype: 4; 3 on some specimens) to 8 (holotype: missing on chaetiger 8, left side). Ventral neuropodial lobes digitiform to leaf-like, almost as long as notopodial lateral lamellae, basally surrounding chaetal fascicles (Figures 4B–F & 5A–C). Notopodial lateral lamellae of chaetiger 9 with low prechaetal lobes, slightly higher laterally; postchaetal lobes about twice as high, laterally subtriangular with free tip pointing outward. Neuropodial lateral lamellae similar and about same size as notopodial. Dorsal medial lobes and ventral neuropodial lobes absent (Figures 4G & 5D).

Chaetigers 1–8 with fascicles of winged capillaries in both rami; notopodial ones basally surrounded by lateral lamellae. Chaetiger 9 with mucronate chaetae (Figure 5E) and a few longer, winged capillaries in lateralmost positions of noto- and neuropodial fascicles; chaetae originating from trough between pre- and postchaetal lamellae in both rami (Figures 4G & 5D).

Chaetigers 9 and 10 constricted, abdomen generally wider than thorax. Abdominal lateral lamellae in both rami broad, leaf-like, with slight basal constriction (often barely noticeable; when present constriction smooth, not abrupt), about same size dorsally and ventrally. Dorsal and ventral medial lobes small (Figures 4H & 5F). Abdominal hooded hooks of same size, with two small teeth above main fang (Figure 4I). Each chaetiger with one group of hooks each dorsally and ventrally, all with main fangs pointing laterally.

Anteriorly open lateral pouches (Σ configuration) between chaetigers 10 and 11 (Figure 5F); on holotype also between 13/14 left side and 14/15 right side; some paratypes with additional unpaired pouches between chaetigers 13/14, 14/15, 15/16, 16/17, 17/18, or 18/19. Some other specimens (NMW material) with additional pouches between either (or both) chaetigers 11 and 12 or 13 and 14, unpaired

or paired. One specimen (NMW.Z.1999.021.0021) with a single extra pouch on right side between chaetigers 9 and 10. Simple (C configuration) pouches present on posterior chaetigers; in holotype on chaetigers 3, 5, 7, 9, 11, 14, 16, 18, 20, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 53, and 57 (as counted from posterior end). Simple lateral pouches on all paratypes and in all three specimens from Banyuls in a large number of posterior segments starting around chaetiger 20.

Pygidium pointed with two small, lateral anal cirri (missing on holotype).

Measurements

Morphometric data from all specimens measured are presented in Appendix 2. The longest was a relaxed (MgCl_2) specimen of 56 mm for 78 chaetigers. The maximum number of chaetigers recorded was 89.

Colour

Living animals from Berwick-upon-Tweed (NMW material) similar to *M. mirabilis*, but generally paler; no reddish speckled pigmentation on thorax. Palps pale, sometimes with brown pigmentation distally at bases of papillae; no dark brown bands. In alcohol, specimens usually uniformly cream; some darker.

Methyl green staining

Anterior staining generally similar to that of *M. mirabilis*. Thorax most densely speckled ventrally and dorsolaterally. In abdomen staining most dense laterally and as two continuous mid-ventral longitudinal lines, but lateral staining usually continued across dorsum as distinct bands from chaetiger 10. Additional staining as short longitudinal lines across bases of oval cuticular flaps associated with lateral pouches between chaetigers 10 and 11. Lateral lamellae of anteriormost abdominal chaetigers usually with densely stained speckles.

Reproduction

Males and females recorded (NMW material) at Berwick-upon-Tweed and south-west Wales (March), Anglesey (May), St Andrews (July) and Birkdale (August). Eggs (up to 125 μm diameter) and sperm masses respectively occur laterally from about chaetigers 16–18 onwards.

Remarks

The presence of specialized chaetae in chaetiger 9 clearly distinguishes *Magelona johnstoni* sp. nov. from all European species except *M. mirabilis* (Table 1). The two species can, however, be readily separated by a suite of characters (see *M. mirabilis* Remarks).

Magelona johnstoni sp. nov. is similar to a number of other *Magelona* species with mucronate chaetae in chaetiger 9, lateral pouches between anterior abdominal chaetigers, absence of prostomial horns, and tridentate abdominal hooks: e.g. *M. obockensis* Gravier, 1905; *M. sacculata* Hartman, 1961; *M. riojai* Jones, 1963; *M. heteropoda* Mohammad, 1973; *Magelona* sp. B of Uebelacker & Jones, 1984; *M. crenulata* Bolivar & Lana, 1986; *M. pectinata* Nateewathana & Hylleberg, 1991 and *M. tinae* Nateewathana & Hylleberg, 1991. However, *M. obockensis*, *M. heteropoda*, *Magelona* sp. B, *M. crenulata* and *M. tinae* have lateral pouches first appearing between

chaetigers 11 and 12 and not between chaetigers 10 and 11. *Magelona heteropoda*, *Magelona* sp. B, *M. crenulata* and *M. tinae* have abdominal hooded hooks in two groups, facing each other (i.e. main fangs vis-à-vis in both rami). *Magelona crenulata* also differs significantly in the shape of the lateral lamellae of chaetigers 1–9; having cirriform prechaetal and triangular postchaetal lamellae on chaetigers 1–8, and triangular crenulate lateral lamellae on chaetiger 9.

Magelona sacculata, *M. riojai*, and *M. pectinata* approach *M. johnstoni* sp. nov. in the location and type of the anterior lateral pouches. In *M. riojai*, however, the anterior margin of the prostomium is truncated instead of rounded. In *M. pectinata* the notopodial prechaetal lateral lamella of chaetiger 8 is longer than the postchaetal, a ventral neuropodial lobe is present (although very small) on chaetiger 9, and the abdominal lateral lamellae are not stalked. The north-east Pacific *M. sacculata* shares most of the characters of *M. johnstoni* sp. nov., except that the thoracic notopodial lateral lamellae always have smooth edges, the postchaetal lamellae on chaetiger 8 are more symmetrically subtriangular and the anterior abdominal lateral lamellae exhibit more abrupt (albeit slight also) basal constrictions. The two species also differ in their methyl green staining patterns. In *M. sacculata* dense staining was only found in the palp papillae and, on one of the two specimens examined, as a speckled band laterally and dorsally across chaetiger 4. Blake (1996) noted no staining pattern for Californian specimens.

Habitat

Sandy sediments, intertidal (mid to lower shore) to 88 m.

Distribution

North Sea, Irish Sea, Celtic Sea, English Channel, Atlantic Ocean (Ireland, France; and south Portugal, J. Gil, personal communication), Mediterranean Sea (France).

Etymology

The new species is named in honour of Dr George Johnston.

Magelona allenii Wilson, 1958

Table 1

Type material

English Channel, England: Devon, Plymouth, Rame Head (Rame Mud), holotype (BMNH 1958.5.2.1).

Other material

North Sea, German Bight: FK 'Senckenberg' cruise DEB 1987, stn 15 VV, 41 m, one specimen (af), coll. M. Türkay 25 May 1987, det. F. Licher & D. Fiege 1992 (SMF 4994). FK 'Senckenberg' cruise D 1990, coll. M. Türkay, det. M. Böggemann (see Böggemann, 1998), Station 25 VV, 41 m, two specimens (af), 12 August 1990 (SMF 5383); stn 13 VV, 47 m, one specimen (af), 11 August 1990 (SMF 7707); stn 17 VV, 43 m, one specimen (af), 11 August 1990 (SMF 7708).

Mediterranean Sea, France: Pyrénées-Orientales, Banyuls-sur-Mer, off Cap de l'Abeille, Db 63, two specimens labelled *M. equilamellae*, coll. Guille no. 415

(LAB); south of Cap Bear, Db 32, 12 specimens, coll. Guille no. 418 (LAB, two specimens SMF 9802); Banyuls-sur-Mer, one specimen, coll. D. Fiege & R. Barnich 24 March 1997 (SMF 9177).

Remarks

The species can be readily distinguished from all other European magelonids by the presence of large abdominal notopodial lamellae (Table 1).

Magelona filiformis Wilson, 1959

Table 1

Type material

Magelona filiformis Wilson, 1959: English Channel, England: Devon, Salcombe, Mill Bay, six paratypes (BMNH 1959.4.2.6-10).

Other material

North Sea, German Bight: FK 'Senckenberg' cruise DEB 1987, coll. M. Türkay, stn 2 VV, 44 m, one specimen (af), 24 May 1987 (SMF 4993); stn 4 VV, 43 m, two specimens (af), 24 May 1987, det. F. Licher (SMF 4991); stn 12 VV, 25 m, one specimen (af), 25 May 1987, det. D. Fiege (SMF 4979); stn 13 VV, 40 m, one specimen (c-p in two pieces), 25 May 1987, det. F. Licher (SMF 4988); stn 15 VV, 41 m, one specimen (af), 25 May 1987, det. F. Licher (SMF 4990); stn 22 VV, 36 m, one specimen (af), 25 May 1987, det. F. Licher (SMF 4989); stn 23 VV, 43 m, one specimen (af), 26 May 1987, det. F. Licher (SMF 4992); stn 25 VV, 19 m, one specimen (af), 26 May 1987, det. F. Licher (SMF 4987).

Remarks

The species can be distinguished from all other European magelonids by the presence of lateral horns on an anterior truncate prostomium that is longer than wide. (Table 1).

Magelona minuta Eliason, 1962

Figure 6; Table 1

Type material

Sweden, Øresund stn 06869, mud, a little sand, shells, 16 m, holotype (NHMG Polych. 11491); north-west part of Sound (Øresund), Hornbaek Bay, sandy bottom, 18 m, paratype, coll. K. Muus, det. A. Eliason (USNM 52510).

Other material

Mediterranean Sea, RV 'Meteor' cruise 25, leg one, coll. D. Fiege: Gulf of Taranto, stn 10 BC (40°08.23'N 17°01.86'E), 1000 m, one specimen (af), 17 May 1993 (SMF 9169); off Israel, stn 27 BC (33°00.05'N 34°59.69'E), 53 m, four specimens (af), 2 June 1993 (SMF 9170); stn 30 BC (33°01.22'N 34°55.51'E), 229 m, one specimen (af), 2 June 1993 (SMF 9171).

Remarks

The species can be readily distinguished from all other European magelonids by the presence of a single large secondary tooth above the main fang of the abdominal hooks (Table 1).

In the original description of *M. minuta*, only a thoracic and an abdominal parapodium together with an abdominal hook was figured by Eliason (1962). For general appearance he referred to figures of *M. californica* Hartman, 1944 (see Hartman, 1944, plate 28, figure 10).

Therefore, we provide herein for the first time a figure of the anterior part of *M. minuta* (Figure 6).

Magelona equilamellae Harmelin, 1964

Table 1

Type material

Mediterranean Sea, France: Rade de Villefranche, herbier, 13 m and Golfe de Marseille, 18 m, two syntypes, HP6-MM7, coll. J.G. Harmelin 1963 (SMF 4675).

Remarks

The species can be distinguished from all other European magelonids by a prostomium that is wider than long in combination with abdominal noto- and neuropodial lateral lamellae of equal size (Table 1).

Magelona wilsoni Glémarec, 1966

Table 1

Type material

Atlantic Ocean, France: south Brittany, Grande Vasière, 60–110 m, three specimens, one labelled as holotype and two as paratypes (MNHN A771).

Other material

Mediterranean Sea, France: Pyrénées-Orientales, Banyuls-sur-Mer, off Cap Bear, Db 93, 15 specimens, coll. Guille no. 417 (LAB, two specimens SMF 9804).

Remarks

The species can be distinguished from all other European magelonids by a prostomium that is wider than long and the presence of prominent prostomial horns (Table 1).

Key to adult *Magelona* species in European waters

1. Chaetiger 9 with specialized chaetae (mucronate, i.e. subdistally expanded) 2
- Chaetiger 9 without specialized chaetae 3
2. Notopodial lateral lamellae of chaetigers 1–8 with crenulate upper edge (often elkhorn-shaped); dorsal medial lobe present on chaetigers (3)4–8. Lateral pouches present between chaetigers 10 and 11. *M. johnstoni* sp. nov.
- Thoracic notopodial lateral lamellae with smooth upper edge; no dorsal medial lobes on thoracic chaetigers. No lateral pouches between chaetigers 10 and 11. *M. mirabilis*
3. Abdominal hooks bidentate (one long tooth above main fang) *M. minuta*
- Abdominal hooks tridentate (two small teeth above main fang) 4
4. Prostomium with frontal horns 5
- Prostomium without frontal horns, wider than long 6
5. Prostomium wider than long, compressed; thoracic notopodial lateral lamellae leaf-like *M. wilsoni*
- Prostomium longer than wide; thoracic notopodial lateral lamellae digitiform *M. filiformis*
6. Abdominal notopodial lateral lamellae much larger than neuropodial *M. alleni*
- Abdominal notopodial and neuropodial lateral lamellae of equal size *M. equilamellae*

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REFERENCES

- Barwell-Carter, J., 1892. *Selections from the correspondence of Dr George Johnston* (ed. J. Hardy). Edinburgh: David Douglas.
- Bhaud, M. & Cazaux, C., 1987. Description and identification of polychaete larvae; their implications in current biological problems. *Oceanis*, **13**, 596–753.
- Bick, A. & Gosselck, F., 1985. Arbeitsschlüssel zur Bestimmung der Polychaeten der Ostsee. *Mitteilungen aus dem Zoologischen Museum in Berlin*, **61**, 171–272.
- Blake, J.A., 1996. Family Magelonidae Cunningham and Ramage. In *Taxonomic atlas of the benthic fauna of the Santa Maria Basin and the Western Santa Barbara Channel*. Vol. 6. *The Annelida*. Part 3. *Polychaeta: Orbiniidae to Cossuridae* (ed. J.A. Blake et al.), pp. 253–261. Santa Barbara: Santa Barbara Museum of Natural History.
- Böttgermann, M., 1998. Polychaeten aus der Deutschen Bucht. *Courier Forschungsinstitut Senckenberg*, **202**, 1–315. [Imprinted publication date 1997]
- Bolívar, G.A. & Lana, P.C., 1986. Magelonidae (Annelida: Polychaeta) do litoral sudeste do Brasil. *Nerítica*, **1**, 131–147.
- Bruce, J.R., Colman, J.S. & Jones, N.S., 1963. *Marine fauna of the Isle of Man*, 2nd ed. Liverpool: Liverpool University Press.
- Cabioch, L., L'Hardy, J.P. & Rullier, F., 1968. Inventaire de la Faune Marine de Roscoff. Annelides. *Travaux de la Station Biologique de Roscoff (N.S.)*, **17**, 1–95.
- Carrington, B., 1865. On the chaetopod annelids of Southport Sands. *Proceedings of the Literary and Philosophical Society of Manchester*, **4**, 176–188.
- Clark, R.B., 1952. New records of sub-littoral polychaetes from the Clyde Sea area, with a description of a new species. *Proceedings of the Royal Society of Edinburgh B*, **45**, 1–26.
- Clark, R.B. & Milne, A., 1955. The sublittoral fauna of two sandy bays on the Isle of Cumbrac, Firth of Clyde. *Journal of the Marine Biological Association of the United Kingdom*, **34**, 161–180.
- Cunningham, J.T. & Ramage, G.A., 1888. The Polychaeta Sederaria of the Firth of Forth. *Transactions of the Royal Society of Edinburgh*, **33**, 635–684.
- Dauvin, J.-C. & Gentil, F., 1980. Nouvelles espèces pour l'inventaire de la Faune Marine de la Région de Roscoff: Annelides Polychètes et Crustacés Amphipodes. *Travaux de la Station Biologique de Roscoff (N.S.)*, **26**, 5–10.
- Davis, F.M., 1923. Quantitative studies on the fauna of the sea bottom. No. 1. Preliminary investigation of the Dogger Bank. *Fishery Investigations, Series 2. MAFF London*, **6**, 1–54.
- Day, J.H., 1961. The polychaete fauna of South Africa. Part 6. Sedentary species dredged off Cape coasts with a few new records from the shore. *Journal of the Linnean Society of London (Zoology)*, **44**, 463–560.
- Day, J.H., 1973. New Polychaeta from Beaufort, with a key to all species recorded from North Carolina. *NOAA Technical Report NMFS CIRC*, **375**, 1–140.
- Ehlers, E., 1908. Die bodensässigen Anneliden aus dem Sammlungen der deutschen Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898–1899*, **16**, 1–167, plates 1–23.
- Eliason, A., 1920. Biologisch-faunistische Untersuchungen aus dem Öresund. V. Polychaeta. *Acta Universitatis Lundensis, Avd. 2*, **16**, 1–103.
- Eliason, A., 1962. Undersökningar över Öresund. XXXXI. Weitere Untersuchungen über die Polychaetenfauna des Öresunds. *Lunds Universitets Årsskrift, N.F. Avd. 2*, **58**, 1–98.
- Fauchald, K. & Jumars, P.A., 1979. The diet of worms: a study of polychaete feeding guilds. *Oceanography and Marine Biology. Annual Review*, **17**, 193–284.
- Fauchald, K. & Rouse, G.W., 1997. Polychaete systematics: past and present. *Zoologica Scripta*, **26**, 71–138.
- Fauvel, P., 1927. Polychètes sédentaires. *Faune de France*, **16**, 1–494.
- Fiege, D. & Ben-Eliahu, M.N., 1994. Polychaeta of the German Bight from the 1987 cruise of the R/V "Senckenberg". In *Actes de la 4ème Conférence Internationale des Polychètes* (ed. J.-C. Dauvin et al.). *Mémoires du Muséum National d'Histoire Naturelle, Paris*, **162**, 413–423.
- Gardiner, S.L., 1997. Obituary: Meredith L. Jones, 1926–1996. *Bulletin of Marine Science*, **60**, 221–223.
- Garwood, P.R., 1982. Polychaeta. Sedentaria incl. Archiannelida. The marine fauna of the Cullercoats District no. 10. *Report. Dove Marine Laboratory, Series 3*, **23**, 1–270.
- Glémarec, M., 1966. Les Magelonidae des côtes de Bretagne. Description de *Magelona wilsoni* n. sp. *Vie et Milieu*, **17**, 1077–1085.
- Gravier, C., 1905. Sur les annélides polychètes de la Mer Rouge (Cirratulien, Spionidiens, Ariciens). *Bulletin du Muséum d'Histoire Naturelle, Paris*, **11**, 42–46.
- Gravier, C., 1906. Contribution à l'étude des annélides polychètes de la Mer Rouge. *Nouvelles Archives du Muséum d'Histoire Naturelle, Paris, Série 4*, **8**, 124–236.
- Harmelin, J.G., 1964. Étude de l'endofaune des "mattes" d'herbiers de *Posidonia oceanica* Delile. *Recueil des Travaux de la Station Marine d'Endoume*, **35**, 43–105.
- Hartman, O., 1944. Polychaetous annelids. Part VI. Paraonidae, Magelonidae, Longosomidae, Ctenodrilidae, and Sabellariidae. *Allan Hancock Pacific Expeditions*, **10**, 311–389.
- Hartman, O., 1961. Polychaetous annelids from California. *Allan Hancock Pacific Expeditions*, **25**, 1–226.
- Hartman, O., 1971. Abyssal polychaetous annelids from the Mozambique Basin off southeast Africa, with a compendium of abyssal polychaetous annelids from world-wide areas. *Journal of the Fisheries Research Board of Canada*, **28**, 1407–1428.

- Hartmann-Schröder, G., 1971. Annelida, Borstenwürmer, Polychaeta. *Die Tierwelt Deutschlands und der angrenzenden Meeressteile*, **58**, 1–594.
- Hartmann-Schröder, G., 1996. Annelida, Borstenwürmer, Polychaeta, 2nd ed. *Die Tierwelt Deutschlands und der angrenzenden Meeressteile*, **58**, 1–645.
- Hobson, K.D. & Banse, K., 1981. Sedentariate and archiannelid polychaetes of British Columbia and Washington. *Canadian Bulletin of Fisheries and Aquatic Sciences*, **209**, 1–144.
- Holtmann, S.E., Duineveld, G.C.A., Mulder, M. & Wilde, P.A.W.J., de, 1998. The macrobenthic fauna in the Dutch sector of the North Sea in 1997 and a comparison with previous data. *Netherlands Institute for Sea Research, Texel, NIOZ-Rapport*, 1998–5, 103 pp.
- Howson, C.M., Hartley, J.P., Mackie, A.S.Y. & O'Connor, B., 1987. Annelida. In *Directory of the British marine fauna and flora. A coded checklist of the marine fauna and flora of the British Isles and its surrounding seas* (ed. C.M. Howson), pp. 76–123. Ross-on-Wye: Marine Conservation Society.
- International Commission on Zoological Nomenclature, 1985. *International code of zoological nomenclature*, 3rd ed. London: International Trust for Zoological Nomenclature.
- Johnson, H.P., 1901. The Polychaeta of the Puget Sound region. *Proceedings of the Boston Society of Natural History*, **29**, 381–437.
- Johnston, G., 1865. *A catalogue of the British non-parasitical worms in the collection of the British Museum*. London: Trustees of the British Museum.
- Jones, M.L., 1963. Four new species of *Magelona* (Annelida, Polychaeta) and a redescription of *Magelona longicornis* Johnson. *American Museum Novitates*, **2164**, 1–31.
- Jones, M.L., 1968. On the morphology, feeding, and behavior of *Magelona* sp. *Biological Bulletin. Marine Biological Laboratory, Woods Hole*, **134**, 272–297.
- Jones, M.L., 1971. *Magelona berkeleyi* n. sp. from Puget Sound (Annelida: Polychaeta), with a further redescription of *Magelona longicornis* Johnson and a consideration of recently described species of *Magelona*. *Journal of the Fisheries Research Board of Canada*, **28**, 1445–1454.
- Jones, M.L., 1977. A redescription of *Magelona papillicornis* F. Müller. In *Essays on polychaetous annelids in memory of Dr Olga Hartman* (ed. D.J. Reish and K. Fauchald), pp. 247–266. Los Angeles: Allan Hancock Foundation.
- Jones, M.L., 1978. Three new species of *Magelona* (Annelida, Polychaeta) and a redescription of *Magelona pitelkai* Hartman. *Proceedings of the Biological Society of Washington*, **91**, 336–363.
- Laverack, M.S. & Blackler, M., 1974. *Fauna and flora of St Andrews Bay*. Edinburgh: Scottish Academic Press.
- Mackie, A.S.Y. & Garwood, P., 1995. Annelida. In *Benthic biodiversity in the southern Irish Sea. Studies in Marine Biodiversity and Systematics from the National Museum of Wales. BIOMÓR Reports*, vol. 1 (ed. A.S.Y. Mackie et al.), pp. 37–50. Cardiff: National Museums and Galleries of Wales.
- Mackie, A.S.Y. & Gobin, J., 1993. A review of the genus *Johnstonia* Quatrefages, 1866 (Polychaeta, Maldanidae), with a description of a new species from Trinidad, West Indies. *Zoologica Scripta*, **22**, 229–241.
- Mackie, A.S.Y., Oliver, P.G. & Rees, E.I.S., ed., 1995. Benthic biodiversity in the southern Irish Sea. *Studies in Marine Biodiversity and Systematics from the National Museum of Wales. BIOMÓR Reports*, **1**, 263 pp.
- Mare, M.F., 1942. A study of a marine benthic community with special reference to the micro-organisms. *Journal of the Marine Biological Association of the United Kingdom*, **25**, 517–554.
- Marine Biological Association, 1957. *Plymouth marine fauna*, 3rd ed. Plymouth: Marine Biological Association of the United Kingdom.
- McIntosh, W.C., 1878. Beiträge zur Anatomie von *Magelona*. *Zeitschrift für Wissenschaftliche Zoologie*, **31**, 401–472.
- McIntosh, W.C., 1911. On the structure of *Magelona*. *Annals and Magazine of Natural History, Series 8*, **7**, 417–457. [Translation of McIntosh, 1878.]
- McIntosh, W.C., 1915. *A monograph of the British marine annelids*. Vol. III. Part I—Text. *Polychaeta. Opheliidae to Ammocharidae*. London: The Ray Society.
- McIntosh, W.C., 1916. *A monograph of the British marine annelids*. Vol. III. Part II—Plates. *Polychaeta. Opheliidae to Ammocharidae*. London: The Ray Society.
- McIntyre, A.D., 1958. The ecology of Scottish inshore fishing grounds. 1. The bottom fauna of east coast grounds. *Marine Research*, **1**, 1–24.
- Mesnil, F., 1896. Études de morphologie externe chez les annélides. I. Les spionidiens des côtes de la Manche. *Bulletin Scientifique de la France et de la Belgique*, **29**, 110–287.
- Mohammad, M.B.-M., 1973. New species and records of polychaete annelids from Kuwait, Arabian Gulf. *Zoological Journal of the Linnean Society of London*, **52**, 23–44.
- Moore, J.P., 1907. Description of new species of spioniform annelids. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **59**, 195–207.
- Müller, F., 1858. Einiges über die Annelidenfauna der Insel Santa Catharina an der brasilianischen Küste. *Archiv für Naturgeschichte*, **24**, 211–220.
- Nateewathana, A. & Hylleberg, J., 1991. Magelonid polychaetes from Thailand, the Andaman Sea, with descriptions of eight new species. In *Systematics, biology and morphology of world Polychaeta. Proceedings of the Second International Polychaete Conference, Copenhagen, 1986* (ed. M.E. Petersen and J.B. Kirkegaard), pp. 169–184. Helsingør: Ophelia Publishers [Ophelia, supplement no. 5]
- Okuda, S., 1937. Spioniform polychaetes from Japan. *Journal of the Faculty of Science, Hokkaido University, Series 6 (Zoology)*, **5**, 217–254.
- Oliver, P.G., Mackie, A.S.Y. & Trew, A., 1986. Report on the molluscan and polychaete faunas of selected sites within the Menai Bridge Conservation Area. *National Museum of Wales, Department of Zoology: Report to the Nature Conservancy Council*, 52 pp.
- Rachor, E. & Gerlach, S.A., 1978. Changes of macrobenthos in a sublittoral sand area of the German Bight, 1967 to 1975. *Rapport et Procès-verbaux des Réunions du Conseil Permanent International pour l'Exploration de la Mer*, **172**, 418–431.
- Rouse, G.W. & Fauchald, K., 1997. Cladistics and polychaetes. *Zoologica Scripta*, **26**, 139–204.
- Salzwedel, H., Rachor, E. & Gerdes, D., 1985. Benthic macrofauna communities in the German Bight. *Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven*, **20**, 199–267.
- Southern, R., 1914. Clare Island Survey. Archiannelida and Polychaeta. *Proceedings of the Royal Irish Academy*, **36**, 1–160.
- Stripp, K., 1969. Die Assoziationen des Benthos in der Helgoländer Bucht. *Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven*, **12**, 95–141.
- Uebelacker, J.M. & Jones, M.L., 1984. Family Magelonidae. Cunningham and Ramage, 1888. In *Taxonomic guide to the polychaetes of the northern Gulf of Mexico*, vol. II (ed. J.M. Uebelacker and P.G. Johnson), pp. 7.1–7.29. Mobile: Barry A. Vittor & Associates.
- Wilson, D.P., 1958. The polychaete *Magelona alleni* sp. nov. and a re-assessment of *Magelona cincta* Ehlers. *Journal of the Marine Biological Association of the United Kingdom*, **37**, 617–626.
- Wilson, D.P., 1959. The polychaete *Magelona filiformis* n. sp. and notes on other species of *Magelona*. *Journal of the Marine Biological Association of the United Kingdom*, **38**, 547–556.
- Ziegelmeier, E., 1978. Macrobenthos investigations in the eastern part of the German Bight from 1950 to 1974. *Rapport et Procès-verbaux des Réunions du Conseil Permanent International pour l'Exploration de la Mer*, **172**, 432–444.

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Appendix 1. *Morphometric data for Magelona mirabilis (Johnston, 1865).*

Thorax			Prostomium		Palp		Abdomen		Total		Specimen	
Width (mm)	Length (mm)	Width (mm)	Length (mm)	Ratio (L:W)	Length (mm)	Length (mm)	Width (mm)	Chaetigers	Length (mm)	Status	Relaxed	Reference
0.9	9.0	1.1	2.5	2.28	9.7, 10.5	1.20	~170	105.0	complete	?	Neotype: BMNH 1999.2400	
1.0	8.2	0.9	2.1	2.34	—	1.1	31	20.0	incomplete	?	BMNH 1864.6.30.7	
1.0	8.0	1.0	1.5	1.5	10.0	0.8	45	26.0	incomplete	?	BMNH ZK 1951.5.2.50	
0.8–1.1 (0.97)	6.5–10.0 (8.84)	1.0–1.8 (1.3)	1.5–2.5 (1.96)	1.07–2.5 (1.54)	6.0–11.0 (7.86 [†])	0.8–1.6 (1.18)	≤82	≤62.0	19 [16 [†]] incomplete	?	BMNH 1921.5.1.3064–76	
~0.7	~6.0	0.7	1.1	1.84	—	—	—	—	incomplete	?	Holotype: <i>Rhyngophylla bidentaculata</i> BMNH 1967.3.1	
0.5–0.8 (0.6)	6.0–8.0 (6.9)	0.5–0.9 (0.74)	1.0–1.4 (1.18)	1.11–2.4 (1.68)	8.5–15.0 (11.9)	0.5, 0.7 [†] (0.6)	≤120	≤76.0	5 [2 [†]] incom- plete	yes	SMF 4626	
0.5	5.5	0.6–0.8 (0.7)	1.0–1.5 (1.25)	1.67–1.88 (1.77)	—	—	—	—	incomplete	?	LAB (coll. Guille no. 474)	
1.20	10.10	1.70	2.15	1.26	19.0	1.70	165	102.0	entire	yes	NMW.Z.1999.027.0001	
0.80	7.90	1.15	1.90	1.65	23.0	1.00	121	76.0	entire	yes	NMW.Z.1999.021.0002	
0.60	6.00	0.75	1.35	1.80	20.0	0.60	99	65.0	entire	yes	NMW.Z.1999.021.0001	
0.50	4.10	0.60	1.10	1.85	12.5	0.55	72	20.0	entire	yes	NMW.Z.1999.021.0008	
0.48	4.85	0.65	1.10	1.69	10.0	0.55	68	23.0	entire	yes	NMW.Z.1999.021.0008	
0.40	4.00	0.55	0.90	1.64	—	0.50	52	13.5	entire	yes	NMW.Z.1999.021.0008	

Appendix 2. *Morphometric data for Magelona johnstoni sp. nov.*

Thorax			Prostomium		Palp	Abdomen	Total		Specimen	
Width (mm)	Length (mm)	Width (mm)	Length (mm)	Ratio (L:W)	Length (mm)	Width (mm)	Chaetigers	Length (mm)	Relaxed	Reference
0.5	5.8	0.8	1.7	2.13	6.0	0.7	~81	36.0	?	Holotype: BMNH 1999.2401
0.6	7.9	0.9	1.8	2.0	8.0, 8.5	1.0	89	35.0	?	Paratype: BMNH 1999.2402-4
0.7	7.2	0.9	1.5	1.67	7.0	0.9	31	19.4	?	Paratype: BMNH 1999.2402-4
0.6	5.5	0.9	1.2	1.34	3.0, 6.0	0.7	42	20.5	?	Paratype: SMF 9242
0.7	6.8	0.9	1.5	1.67	-	1.0	78	40.0	?	Paratype: USNM 186519
0.7	6.0	0.8	1.1	1.38	-	0.7	36	17	?	Paratype: BMNH 1999.2402-4
0.7	5.7	0.8	1.2	1.5	5, 5.5	0.8	63	27.7	?	Paratype: NMW.Z. 1999.107.0001
0.5-0.7	5.0-7.0	0.7-1.0	1.1-1.7	1.10-1.88	5.0-11.0	0.7-1.0	≤75	≤44.5	?	BMNH 1921.5.1.3064-76
(0.61) [†]	(5.79)	(0.89)	(1.27)	(1.44)	(7.9)*	(0.81) [#]				
0.7-1.0	6.2-7.5	1.0-1.1	1.2-2.0	1.00-2.00	10.0 [†]	0.9-1.4 (1.1)	≤75	≤44.5	?	BMNH 1921.5.1.3045-55
(0.89)	(6.74)	(1.01)	(1.46)	(1.37)	-	-	≤66	≤31.0	yes	SMF 4976 (coll. Dörjes)
0.53-0.96	2.4-7.2	0.36-0.84	0.4-1.3	1.00-1.65	-	-				
(0.74)	(4.10)	(0.59)	(0.79)	(1.27)	~7.0-8.0 [†]	0.6-0.8	≤65	≤36.5	yes	LAB (coll. Guille no. 474)
0.6-0.7	4.0-6.0	0.6-0.8	0.8-1.1	1.28-1.57						
(0.64)	(5.16)	(0.7)	(1.0)	(1.34)		(0.74)				
0.70	6.20	0.90	1.60	1.78	-	1.00	74	50.0	yes	NMW.Z. 1999.021.0011
0.70	6.30	0.90	1.55	1.72	-	0.95	78	47.0	yes	NMW.Z. 1999.021.0011
0.70	5.80	0.85	1.55	1.82	13.0	0.88	85	47.0	yes	NMW.Z. 1999.021.0014
0.60	6.30	0.80	1.35	1.69	15.0	0.60	78	56.0	yes	NMW.Z. 1999.021.0009
0.60	5.10	0.75	1.30	1.73	-	0.70	71	40.5	yes	NMW.Z. 1999.021.0011
0.60	5.80	0.75	1.30	1.73	14.0	0.75	65	37.5	yes	NMW.Z. 1999.021.0012
0.48	4.40	0.60	1.00	1.67	10.5	0.45	61	31.5	yes	NMW.Z. 1999.021.0010
0.48	3.90	0.55	0.95	1.73	-	0.60	58	16.5	yes	NMW.Z. 1999.021.0014
0.45	4.40	0.58	1.00	1.72	10.0	0.60	65	26.5	yes	NMW.Z. 1999.021.0014
0.45	4.20	0.58	1.00	1.72	-	0.55	61	23.0	yes	NMW.Z. 1999.021.0009
0.45	3.90	0.55	0.90	1.64	-	0.55	62	20.0	yes	NMW.Z. 1999.021.0014
0.80	5.60	0.9	1.3	1.44	8.4	0.90	87	43.0	yes	NMW.Z. 1999.021.0014
0.65	4.40	0.70	1.0	1.43	-	0.80	73	22.5	no	NMW.Z. 1989.104.1122
0.55	4.00	0.65	1.0	1.54	8.0	0.75	69	23.0	no	NMW.Z. 1989.104.1122
0.50	2.85	0.55	0.75	1.36	-	0.45	58	17.0	no	NMW.Z. 1989.104.1126
0.48	3.00	0.50	0.70	1.40	-	0.40	53	13.5	no	NMW.Z. 1989.104.1126
0.45	3.00	0.45	0.70	1.56	-	0.40	50	13.0	no	NMW.Z. 1989.104.1126
0.38	2.15	0.40	0.50	1.25	-	0.35	41	8.0	no	NMW.Z. 1989.104.1122
0.35	2.30	0.40	0.55	1.38	-	0.35	42	8.0	no	NMW.Z. 1989.104.1122
0.35	2.00	0.40	0.45	1.13	-	0.38	43	8.0	no	NMW.Z. 1989.104.1122
0.30	1.75	0.35	0.50	1.43	1.7	0.30	45	7.5	no	NMW.Z. 1982.067.0010
0.30	1.60	0.33	0.45	1.36	-	0.25	34	5.5	no	NMW.Z. 1989.104.1122