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A new species of *Magelona* (Polychaeta: Magelonidae) from Chinese coastal waters

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A description of a new species of Magelona, M. parochilis *sp. nov. is presented, based on material collected from the Yellow Sea, China. The new species belongs to the '*Magelona mirabilis *group' of magelonids, possessing a rounded prostomium, lacking prostomial horns and specialized chaetae on chaetiger 9. Paired anteriorly open pouches are present between chaetigers 11–12 and 14–15 (occasionally between chaetigers 17–18).* Magelona parochilis *sp. nov. inhabits intertidal zones and shallow subtidal waters characterized by sandy mud.*

Keywords: *Magelona*, Yellow Sea, new species, tidal flat, specialized chaetae

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INTRODUCTION

The Magelonidae represents one of the most commonly encountered polychaete groups in Chinese coastal waters, and certain species obtain high densities. Until now, the species diversity of this family in China was poorly known. Previous taxonomic studies of Magelonidae in China were largely focused on species from Southern Chinese coastal waters (e.g. Wu & Sun, 1978; Wu *et al.*, 1980; Paxton & Chou, 2000; Al-Hakin & Glasby, 2004; Mortimer & Mackie, 2009). The composition of magelonid species in northern Chinese waters was virtually unknown. Only two species (i.e. *Magelona cincta* Ehlers, 1908 and *M. japonica* Okuda, 1937) have been recorded from this region in a compiled monograph on Chinese polychaete species by Yang & Sun (1988).

A total of five adult species have been recorded with sufficient taxonomic information in Chinese waters, they are *Magelona cincta* Ehlers, 1908 (*Magelona* cf. *cincta* in Hong Kong waters) (Yang & Sun, 1988; Mortimer & Mackie, 2009); *M. japonica* Okuda, 1937 (Yang & Sun, 1988), *M. cornuta* Wesenberg-Lund, 1949 (Mortimer & Mackie, 2009), *M. crenulifrons* Gallardo, 1968 (Mortimer & Mackie, 2009) and *M. gemmata* Mortimer & Mackie, 2003 (Al-Hakin & Glasby, 2004). Descriptions of new species and new records of *Magelona* species from other geographical regions in recent years (e.g. Fiege *et al.*, 2000; Mortimer & Mackie 2003; Mortimer *et al.*, 2012) reveal that regional studies often yield a high number of species. Given this fact, species diversity of magelonid species may be higher than has already been reported for this region with a potential for a number of new species and new recorded species within the fauna.

Recently, a project was initiated, aimed at searching for a more productive and environmentally-friendly way to breed molluscs on a tidal flat of the Yellow Sea, People's Republic of China. During this work, several macrobenthic samples within the study area were collected, including a number of magelonid specimens. Careful examination of this material indicated the possibility of a new *Magelona* species. Thereafter, three additional field collections were carried out around the original localities of this species, covering both intertidal and shallow subtidal zones. The results of these collections confirmed the presence of the new species, herein described.

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MATERIALS AND METHODS

Material examined within this study was collected on tidal flats and a shallow subtidal zone of the Yellow Sea, People's Republic of China (Jiangsu Province) (Figure 1). Sediment from the subtidal zone was obtained using a Van Veen grab with an area of 0.1 m^2, and those from the subtidal flat were obtained by hand using a quantitative frame (area of 0.0625 m^2 and depth of 30 cm) as a guide. The sediment obtained was then sieved using fine mesh sieves, the smallest mesh being 0.5 mm. All material was initially fixed in formalin/seawater, later washed with fresh water, and preserved in 75% alcohol.

Type and non-type material have been deposited at the East China Sea Fishery Research Institute (ECSFRI), Chinese Academy of Fishery Sciences and the National Museum Wales (NMW). Morphology was investigated using light and scanning electron microscopy (SEM). Drawings were made using a camera lucida attachment on a Leica MZ9.5 zoom microscope or Leica DM2000 compound microscope. Images of methyl green staining patterns were taken using a JVC KY-F7U3CCD camera on a Leica Z6 microscope. The resulting images were processed using syncroscopy, Automontage and Adobe Photoshop. Specimen descriptions are in the same format as those used in Mortimer (2010) and Mortimer *et al.* (2012). Specimens are herein recorded

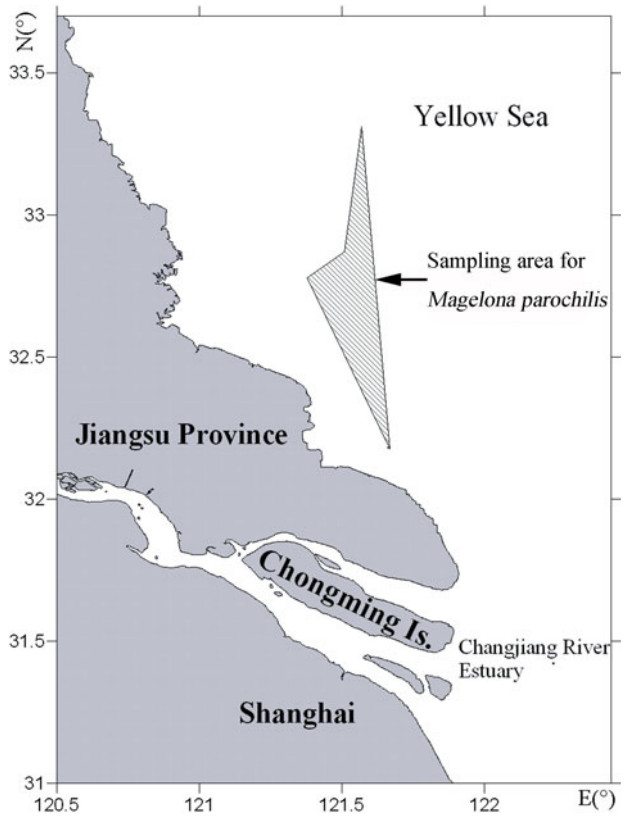

Fig. 1. Sampling area where specimens of *Magelona parochilis* were collected.

as complete (c), anterior fragments (af), posterior fragments (pf) or fragments (f). Measurements were taken as detailed in Fiege *et al.* (2000). Staining patterns were observed using methyl green, as detailed by Nateewathana & Hylleberg (1991) (although Nateewathana & Hylleberg used methyl blue) and Mackie & Gobin (1993).

SYSTEMATICS

Order: Spionida
Suborder: SPIONIFORMIA
Family MAGELONIDAE Cunningham & Ramage, 1888
Genus *Magelona* F. Müller, 1858
Magelona parochilis sp. nov.
(Figures 2–5)

TYPE MATERIAL

Holotype: YELLOW SEA, CHINA–ECSFRI100532 (1c), 32°10.87′N 121°39.58′E, sandy mud, 23 August 2011, coll. Mei Jiang & Lei Li.

Paratypes: ECSFRI100533 (1c+ 2af), 32°10.98′N 121°39.93′E, sandy mud, 23 August 2011, coll. Mei Jiang & Lei Li; ECSFRI100534 (1c + 3af), 32°10.71′N 121°39.93′E, sandy mud, 23 August 2011, coll. Mei Jiang & Lei Li; ECSFRI100535 (4af), 32°10.63′N 121°40.00′E, sandy mud, 23 August 2011, coll. Mei Jiang & Lei Li; ECSFRI100589/NMW.Z.2012.033.0001 (1af) 32°10′.42′N 121°39′56′E, sandy mud, 5 May 2012.

OTHER MATERIAL EXAMINED

YELLOW SEA, CHINA–ECSFRI100901 (3c + 8af), 32°10.89′N 121°39.93′E, sandy mud, 16 November 2011, coll. Mei Jiang & Lei Li; ECSFRI100902 (2af), 32°10.71′N 121°39.93′E, sandy mud, 16 November 2011, coll. Mei Jiang & Lei Li; ECSFRI100909 (2af), 32°10.63′N 121°40.00′E, sandy mud, 16 November 2011, coll. Mei Jiang & Lei Li; ECSFRI100914 (1af + 2pf), 32°10.87′N 121°39.58′E, sandy mud, 16 November 2011, coll. Mei Jiang & Lei Li; ECSFRI100916 (1c + 2af + 3pf), 32°10.71′N 121°39.93′E, sandy mud, 16 November 2011, coll. Mei Jiang & Lei Li; ECSFRI100922 (1c + 4af), 32°10.71′N 121°39.93′E, sandy mud, 5 May 2012, coll. Mei Jiang & Lei Li; ECSFRI100923 (1c + 1af), 32°10.63′N 121°40.00′E, sandy mud, 5 May 2012, coll. Mei Jiang & Lei Li; ECSFRI100930 (1c), 33°18.59′N 121°34.11′E, 7.4 m, sandy mud, 18 May 2012, coll. Jin Zhou; ECSFRI100931 (1af), 32°46.75′N 121°22.72′E, 3.9 m, sandy mud, 20 May 2012, coll. Jin Zhou; ECSFRI100932 (1af), 32°52.26′N 121°30.58′E, 2.9 m sandy mud, 17 May 2012, coll. Jin Zhou; ECSFR1100542/NMW.Z.2012.033.0002 (2af) 32°39.93′N 121°10.97′E, sandy mud, 5 May 2012, coll. Mei Jiang & Lei Li; ECSFR1102541 (1c), 33°11.03′N 121°16.59′E, 11.0 m, sandy mud, 22 September 2012, coll. Jin Zhou; ECSFR1102542 (2c + 4af), 32°40.32′N 121°19.67′E, 7.8 m, sandy mud, 23 September 2012, coll. Jin Zhou; ECSFR1102543 (1af), 33°26.45′N 121°03.01′E, 5.0 m, sandy mud, 22 September 2012, coll. Jin Zhou; ECSFR1102544 (2c + 12af), 33°24.69′N 121°14.46′E, 8.6 m, sandy mud, 22 September 2012, coll. Jin Zhou.

DIAGNOSIS

Prostomium anteriorly rounded without prostomial horns. Thoracic notopodial lamellae smooth edged. Notopodia of chaetigers 1–8 with slender cirriform dorsal processes. Neuropodia of same chaetigers with ventral, slender triangular lamellae. Chaetigers 1–8 with capillary chaetae, chaetiger 9 with mucronate chaetae. Hooded hooks tridentate, unidirectional. Anteriorly and posteriorly open pouches present.

DESCRIPTION

Holotype (Figure 3), a moderate, complete specimen, abdomen thicker than thorax. Prostomium 0.68 mm long, 0.42 mm wide; thorax (including prostomium) 2.94 mm long, 0.44 mm wide at widest point; abdomen 11.62 mm long, 0.60 mm wide; total length 15.24 mm for 67 chaetigers. Dimensions of broadest specimen (ECSFRI100909): prostomium 0.84 mm long, 0.59 mm wide; thorax (including prostomium) 7.05 mm long, 0.63 mm wide; abdomen 0.73 mm wide; total length 19.86 mm for 39 chaetigers. Longest specimen (ECSFRI100533), 22.1 mm for 73 chaetigers. Other paratypes 11.4 mm–17.2 mm with 61–69 chaetigers.

Prostomium elongate, longer than wide (L:W 1.53–2.52), slender triangular, without prostomial horns, anterior margin smooth, rounded, eyes absent (Figures 2A, 3A, 5A). Two pairs of prominent longitudinal dorsal muscular ridges, outer pair (slightly shorter) abutting inners for entire length, inner pair almost reaching distal tip of prostomium, where they diverge only very slightly. Indistinct quadrangular areas present on either side of muscular ridges. Proboscis not everted on holotype but everted in five specimens, heart-shaped when fully everted, oval when partially everted (Figures 2B, 4A). Proboscis longitudinal ridged, ridging of upper surface much lighter, appearing smooth. Palps arising ventrolaterally from base of prostomium, robust, tapering to fine translucent tips, reaching chaetiger 10 on holotype but chaetigers 9–16 in other specimens, non-papillated region

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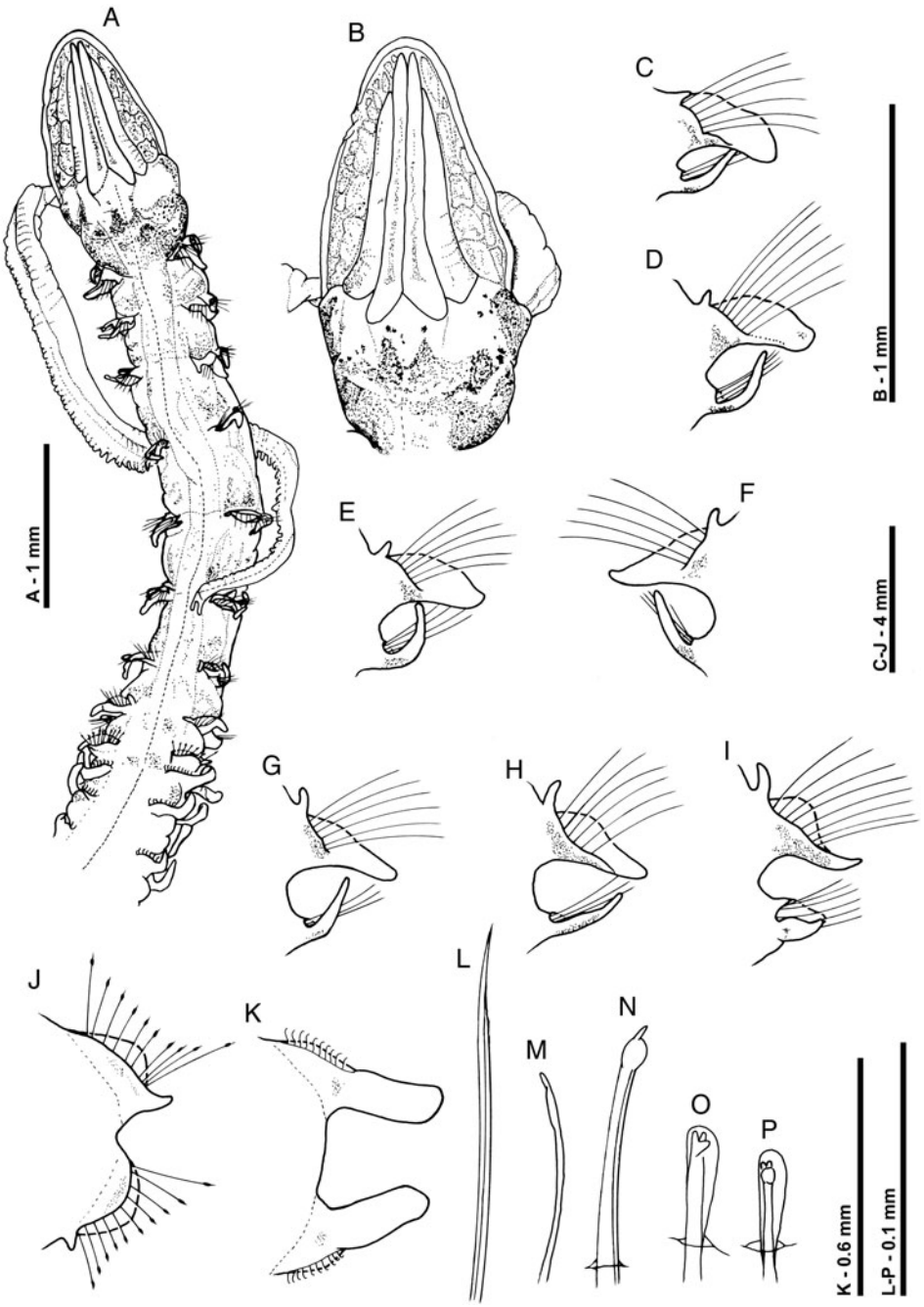

Fig. 2. *Magelona parochilis* sp. nov. (paratype, NMW.Z.2012.033.0001): (A) anterior region, dorsal view; (B) prostomium, dorsal view (showing partially everted proboscis to the right-hand side); (C–K) chaetigers 1, 2, 3, 5, 6, 7, 8, 9 and 10 (anterior views); (L) capillary chaeta, lateral view, from the notopodia of chaetiger 8; (M–N) specialized chaetae from the notopodia of chaetiger 9, lateral views (M, outermost lateral chaeta); (O–P) tridentate abdominal hooded hooks, oblique frontal and frontal views from chaetigers 10 and 11, respectively.

reaching chaetigers 1–2. Papillae very short proximally, increasing gradually in size, papillae long at distal tip. Initially 3–4 rows of papillae on either side of inconspicuous ventral groove, medially 2 rows, and distally 1–2 rows.

Achaetous region behind prostomium, about one and half times the size of chaetiger 1 (Figures 2A, 3A). Chaetigers 1–7 similar; parapodia biramous (Figure 2C–H). Notopodia prechaetal lamellae low triangular, increasing in size and becoming well-developed by chaetiger 5, confluent with larger spatulate postchaetal lamellae. Point of connection between pre- and postchaetal lamellae becoming closer to distal lamellar tips towards the posterior thorax. Postchaetal lamellae becoming marginally longer and thinner along thorax, somewhat triangular by chaetiger 5. Upper edges of notopodial postchaetal lamellae relatively smooth. Slender, tapering cirriform prechaetal superior processes (DML) present on all thoracic chaetigers (except chaetiger 9), increasing in size along thorax. Those of chaetiger 1 relatively small. Neuropodia of chaetigers 1–7 with slender triangular lamellae directly underneath chaetae (VNL), becoming slightly prechaetal in position by chaetiger 6. pre- and postchaetal lamellae not developed.

Chaetiger 8 parapodia (Figures 2I, 4B): Notopodial prechaetal lamellae well-developed, confluent with slightly larger, rounded triangular postchaetal lamellae. Point of connection between

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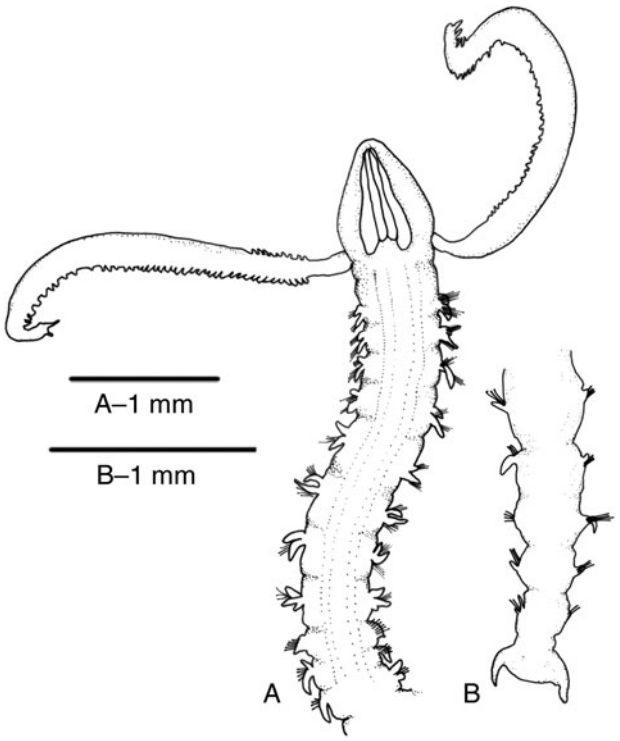

Fig. 3. *Magelona parochilis* sp. nov. (holotype ECSFRI100532): (A) anterior, dorsal view; (B) posterior, dorsal view.

these lamellae, near distal tips, thus appearing as though lamellae are sub-chaetal. When viewed laterally, lamellae form a U-shaped structure around chaetae. Prechaetal superior processes long, digitiform (DML). Neuropodial prechaetal lamellae low, confluent with triangular postchaetal lamellae, additional digitiform prechaetal processes present. Chaetae of chaetigers 1–8 simple winged capillaries (Figures 2L, 4C).

Chaetiger 9 (Figure 2A): shorter and narrower than preceding chaetigers. Notopodial prechaetal lamellae rounded, smooth, confluent with higher rounded triangular postchaetal lamellae (Figure 2J). Dorsal superior processes (DML) absent. Neuropodia similar to notopodia, however, prechaetal lamellae inferiorly developed as small triangular processes. Chaetae mucronate (Figures 2M–N, 4D), arranged in arcs; chaetae longer but with narrower distal tips towards margins of each fan.

Abdominal chaetigers (Figure 2K) with spatulate lateral lamellae, of about equal size in both rami, bluntly rounded. Lateral lamellae not overlapping. Lamellar shape shows some variation; from rounded, subrectangular to slightly reniform. Postchaetal extension of lateral lamellae, not well-developed, apparent only in anterior abdomen. Dorsal and ventral processes (DML & VML) at inner margins of chaetal rows absent.

Abdominal chaetae (Figures 2O–P, 4E) tridentate hooded hooks of similar size, superior two fangs parallel, above main fang. Hooks in each ramus unidirectional, main fangs pointing laterally. A few hooks closest to the lamellae slightly twisted in some parapodia. Initially around 10–14 hooks per rami, decreasing to approximately 8–10 hooks per rami on posterior fragment.

Paired anteriorly open pouches present between chaetigers 11–12 and 14–15 ($\sum$ configuration pouches of Fiege *et al.*, 2000: well-developed, large membrane, often extruded, bounded between two cuticular flaps) (Figures 4F–G, 5D). In some specimens, this type of lateral pouch is also present between chaetigers 17–18. Unpaired posteriorly open pouches present in middle and posterior abdomen, on alternate chaetigers (C configuration pouches of Fiege *et al.*, 2000: often quite large, more expanded both dorsally and ventrally, often convoluted) (Figure 4H). Pouches observed on holotype on 21L, 23R, 25L, 27R, 29L, 31R, 33L, 35R, 37L, 39R, 41L, 43R, 45L, 47R, 49L, 51R, 53L and 55R.

Two short anal cirri present (Figure 2B).

COLOUR

Specimen cream–white in alcohol. Staining with methyl green diffuse, however when much of the stain has dissipated (MBA as defined by Nateewathana & Hylleberg, 1991) a distinct pattern on the prostomium and thorax noticeable, particularly in the anterior thorax. Light, speckled longitudinal staining of the dorsal prostomial ridges present as well as heavy dense staining of the areas either side (Figure 5A). Staining darkest on achaetous region, generally comprising large speckles. Thorax stained weakly all over (Figures 5B–C), however dorsally, areas surrounding parapodia and on mid-dorsal region in anterior thorax showing less stain. Ventral thoracic staining similar to dorsal, staining strongest on prostomial edges and in the anterior thorax. Thoracic lamellae and those of the anterior abdomen possessing stain near to the lamellar bases (Figure 5D). Interparadodial staining in mid and posterior abdomen. Staining pattern weaker on some specimens. Two green parallel lines between notopodial and neuropodial lobes on abdominal chaetigers present. However, these lines are absent on thoracic chaetigers.

ETYMOLOGY

From the Latin meaning 'limited area', referring to the species habitat being somewhat restricted during these present investigations (see Remarks section below).

REMARKS

During the current investigations *Magelona parochilis* sp. nov. appeared to be restricted to one particular region of the tidal flat (32°10.63′N–33°26.45′N) of the Yellow Sea, China. No other records of species matching this description have been found for tidal flat or subtidal zones in other Chinese coastal waters, even those directly adjacent to the type locality. Additional material from other studies has been systematically examined (extending from the Bohai Sea to the South China Sea, covering both northern and southern Chinese coastal waters). The results revealed that *Magelona cincta* was the most frequently encountered magelonid species. Other magelonid specimens in Chinese coastal waters were commonly identified as *Magelona crenuliforms* or *Magelona cornuta.* Futhermore, no other specimens of *M. parochilis* were found in this additional material.

Magelona parochilis sp. nov. belongs to a '*Magelona mirabilis* group' of species, which are characterized by possessing a rounded prostomium lacking frontal horns, and mucronate chaetae on chaetiger 9. There are 14 members of this group, including: *M. mirabilis* (Johnston, 1865), *Magelona johnstoni* Fiege, Licher & Mackie, 2000, *Magelona crenulata* Bolívar & Lana, 1986, *Magelona pitelkai* Hartman, 1944, *Magelona sacculata* Hartman, 1961, *Magelona riojai* Jones, 1963, *Magelona conversa* Mortimer & Mackie, 2003, *Magelona pectinata* Nateewathana & Hylleberg, 1991, *Magelona sachalinensis* Buzhinskaja, 1985, *Magelona tinae* Nateewathana &

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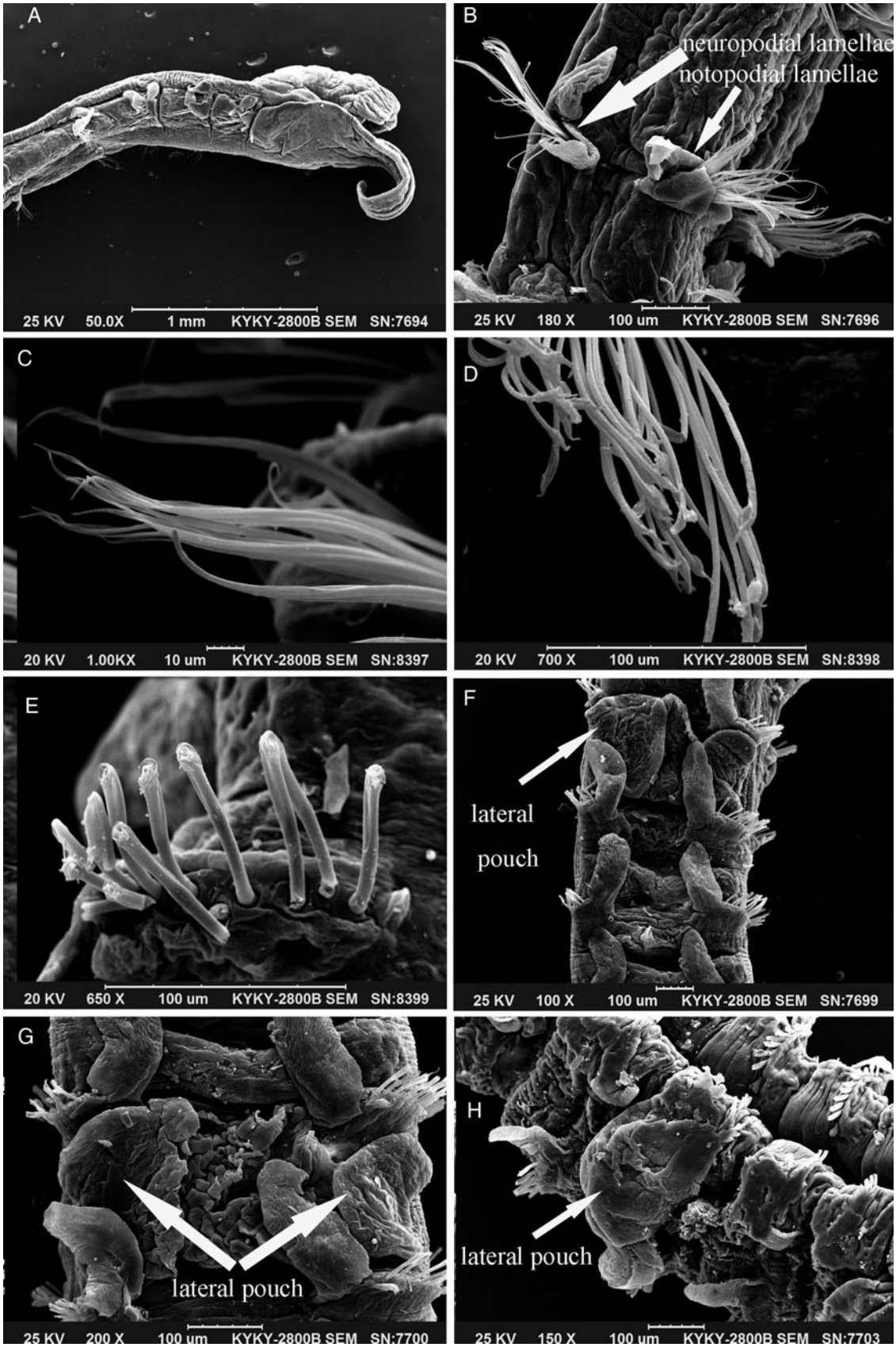

Fig. 4. *Magelona parochilis* sp. nov. (paratype, ECSFRI 100535): (A) anterior region, lateral view; (B) chaetiger 8, lateral view (specimen orientated so that the prostomium is towards the top of the picture); (C) capillary chaetae from chaetiger 6; (D) modified chaetae from chaetiger 9, postchaetal view (notopodia); (E) tridentate hooded hooks from chaetiger 42, anterior view; (F) anteriorly open lateral pouch between chaetigers 11 and 12, lateral view; (G) anteriorly open lateral pouch between chaetigers 14 and 15, lateral view; (H) posteriorly open lateral pouch between chaetigers 52 and 53, lateral view.

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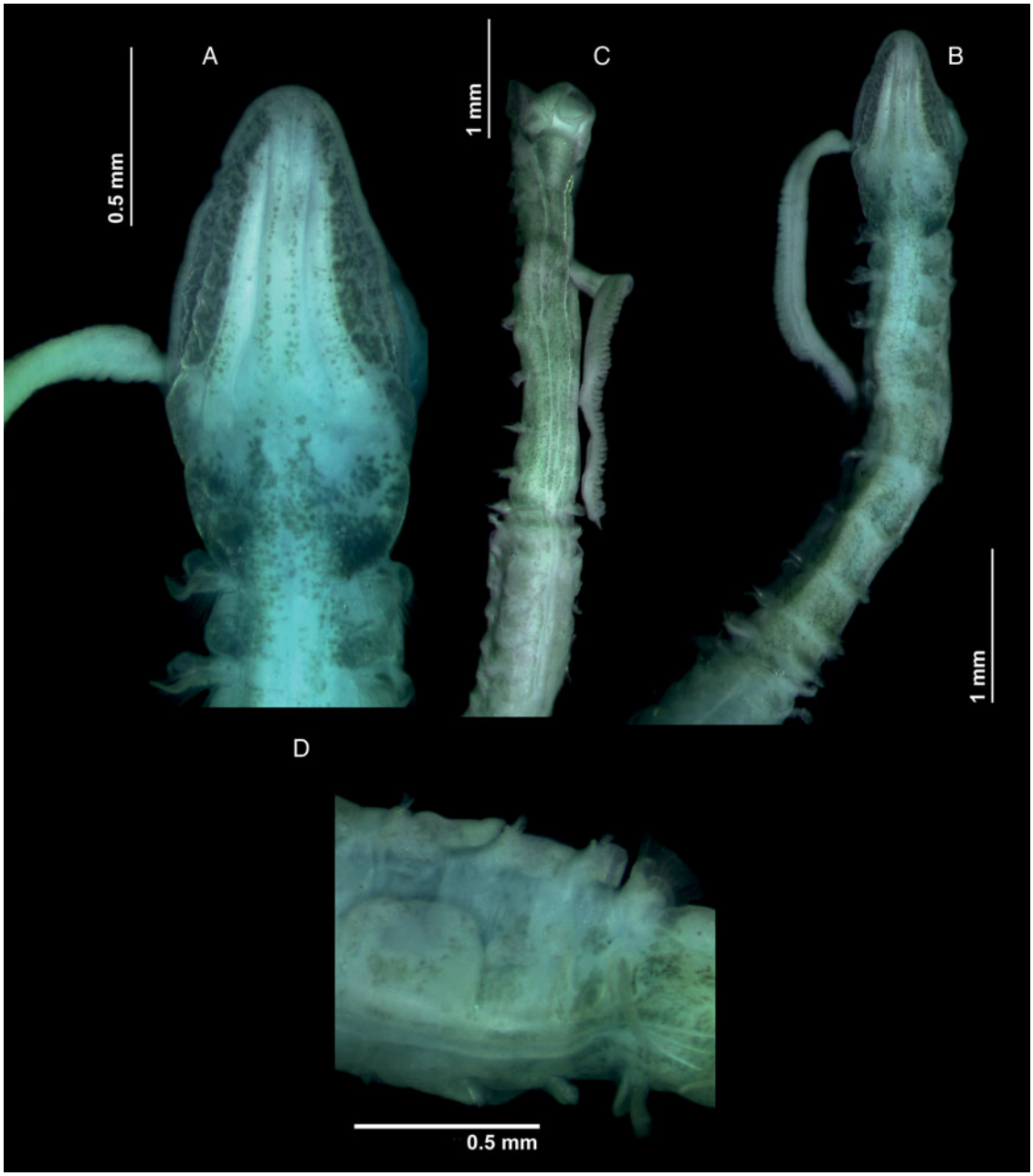

Fig. 5. *Magelona parochilis* sp. nov. (paratype, NMW.Z.2012.033.0001 methyl green staining patterns;): (A) prostomium, dorsal view; (B) anterior, dorsal view; (C) anterior, ventral view; (D) lateral abdominal pouch between chaetigers 11–12.

Hylleberg, 1991, *Magelona debeerei* Clarke, Paterson, Florence & Gibbons, 2010, *Magelona obockensis* Gravier, 1905 and two unnamed species (*Magelona* sp. A and *Magelona* sp. B) from the Gulf of Mexico (Uebelacker & Jones, 1984).

Magelona debeerei and *M. johnstoni* differ from the new species by the absence of dorsal superior processes in the anterior thorax, in *M. parochilis* sp. nov. they are present from chaetigers 1–8. Dorsal superior thoracic processes are absent in *M. mirabilis*. Three species (*M. conversa, Magelona* sp. A and *M. sachalinensis*) differ from the new species by possessing bidentate instead of tridentate abdominal hooded hooks. *Magelona crenulata* and *Magelona* sp. B differ from *M. parochilis* sp. nov. by possessing crenulate lamellae of chaetiger 9. In possessing smooth edged thoracic notopodial lamellae, *M. parochilis* sp. nov. differs from *M. obockensis, M. tinae* and *M. pectinata* in which they are minutely crenulate and bilobed on several chaetigers in the two first species and pectinate in the latter species. *Magelona pitelkai* differs from the new species in not possessing lateral abdominal pouches in the anterior abdomen, possessing posteriorly open pouches only. It is reported for *M. sacculata* that 'conspicuous pouched membranes, first present behind the modified ninth segment, occur also between segments 10 and 11'. In *M. parochilis* sp. nov. the abdominal lateral pouches first appear between chaetigers 11–12. *Magelona riojai* differs from the new species by possessing a squared prostomial anterior margin, whilst in *M. parochilis* sp. nov. it is rounded, and not possessing neuropodial processes on chaetiger 9. *Magelona parochilis* sp. nov. differs from all of the above species, except *M. debeerei* by not possessing small triangular

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processes (DML & VML) present at inner margins of chaetal rows in the abdomen.

Of all these species, *M. conversa, M. mirabilis, M. johnstoni, M. sacculata, M. riojai* and *M. debeerei* have unidirectional facing abdominal hooded hooks as in the new species (orientation for *M. sachalinensis* and *M. pectinata* unknown, however, for the latter species, in figure 7L of the original description they are shown as unidirectional).

The shape of the thoracic notopodial lamellae of chaetigers 7 and 8 in *M. parochilis* sp. nov, where the pre-chaetal and post-chaetal lamellae meet to form U-shaped structures around the chaetae is a character which was described for *M. riojai*. Jones (1963) when describing this species stated 'Dorsal lateral lamellae are U-shaped in cross section, and presetal and postsetal portions meet ventrally'. This is a character which the new species seems also to share with the following members of this group: *M. mirabilis, M. pitelkai, Magelona* sp. A, *Magelona* sp. B and *M. obockensis*.

The new species can be readily distinguished from other known Chinese magelonid species in having a rounded anterior prostomial margin without horns.

DISTRIBUTION

The species is currently known only from tidal flats and shallow subtidal waters of Yellow sea, China.

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