Journal of the Marine Biological Association of the United Kingdom, 2012, 92(5), 941–945.
doi:10.1017/S0025315411000476

Three new free-living marine nematode species of the genus *Micoletzkyia* (Phanodermatidae) from China Sea

YONG HUANG AND BO CHENG

College of Life Sciences, Liaocheng University, Liaocheng, 252059, People's Republic of China

Three new species of free-living marine nematodes Micoletzkyia longispicula *sp. nov.,* Micoletzkyia filicaudata *sp. nov. and* Micoletzkyia nanhaiensis *sp. nov. from the Yellow Sea and the South China Sea are described.* Micoletzkyia longispicula *sp. nov. is characterized by spicules elongated and straight, 7 a.b.d. long, pear-shaped proximally and pointed distally; gubernaculum conical, without apophysis, and tubular supplement headlike proximally.* Micoletzkyia filicaudata *sp. nov. is characterized by slender body with relatively long filiform tail (8.1 a.b.d.), spicules elongated and straight (4.4 a.b.d.), cephalate proximally and pointed distally, gubernaculum tubular, with dorsal apophysis.* Micoletzkyia nanhaiensis *sp. nov. is characterized by spicules slender and curved, 2.5 a.b.d. long, cephalous proximally and chapiter-shaped distally, and gubernaculum with relatively long dorsal apophysis. A key for all known species of* Micoletzkyia *is proposed.*

Keywords: *Micoletzkyia longispicula* sp. nov., *Micoletzkyia filicaudata* sp. nov., *Micoletzkyia nanhaiensis* sp. nov., free-living marine nematode, China Sea

Submitted 13 January 2011; accepted 1 March 2011; first published online 31 May 2011

INTRODUCTION

In order to study the biodiversity of free-living marine nematodes in the China Sea, sediment samples were collected in many sites from the intertidal to the sublittoral region of the Yellow Sea, the East China Sea and the South China Sea from January 2003 to October 2007. More than 240 species have been identified from these habitats (Huang *et al.*, 2006; Huang & Wu, 2010; Haung & Zhang, 2010a, b). The present paper describes three new species from this region which belong to the genus *Micoletzkyia* Ditlevsen, 1926.

MATERIALS AND METHODS

Undisturbed meiofauna samples were obtained using a syringe (2.6 cm diameter), and they were fixed with 5% formalin in filtered seawater. In the laboratory, samples were stained with 0.1% rose Bengal for 24 hours (Higgins & Thiel, 1988). All the samples were washed to remove the formalin and sieved over two mesh sizes (500 μm and 42 μm) in order to separate the macrofauna (500 μm) from the meiofauna (42 μm). Heavier sediment particles were removed using centrifugation in Ludox-^{TM} with a specific gravity adjusted to 1.15 (Jonge & Bouwman, 1977). Each sample was washed into a lined Petri dish and the meiofauna was sorted under a stereoscopic microscope up to higher taxonomic levels. Nematodes were transferred into a 9:1 (V:V) solution of 50% alcohol–glycerol in block cavity to slowly evaporate alcohol and then mounted in glycerol on permanent slides (McIntyre & Warwick, 1984). The descriptions were made from glycerin mounts using interference contrast microscopy. Drawings were made with a camera lucida. Type specimens have been deposited in the type collections of the museum of Qingdao Institute of Oceanology, Chinese Academy of Sciences.

Abbreviations are as follows: L, total body length; max. b.d., maximum body diameter (M); a, body length/maximum body diameter; a.b.d., anal body diameter; b, body length/pharynx length; c, body length/tail length; c′, tail length/a.b.d.; c.b.d., corresponding body diameter; Spic, spicule length along arc. The a, b, c ratios are from de Man (1888).

Corresponding author:
Y. Huang
Email: huangy@lcu.edu.cn

SYSTEMATICS

Order ENOPLIDA Filipjev, 1929
Family PHANODERMATIDAE Filipjev, 1927
Genus *Micoletzkyia* Ditlevsen,1926
Micoletzkyia longispicula sp. nov.
(Figures 1 & 2)

TYPE MATERIAL

Only one male was discovered and studied. Holotype: ♂1 on the slide 36005 (2–5) 091.

TYPE LOCALITY AND HABITAT

Subtidal muddy sediment in the Yellow Sea. Station 36005, located at 36°N 122°30′E, water depth 40 m, water temperature at the sediment–water interface 9.9°C, salinity 33.6.

ETYMOLOGY

This species is named after the long spicules.

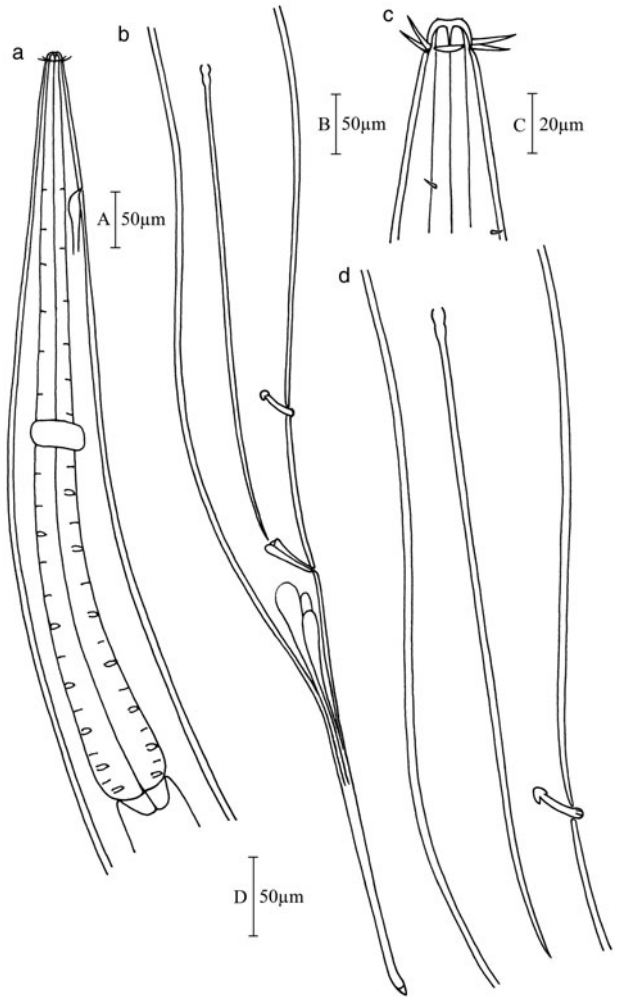

Fig. 1. *Micoletzkyia longispicula* sp. nov. (a) Lateral view of male pharynx region; (b) lateral view of male tail end, showing spicules, gubernaculum, precloacal supplement, caudal glands; (c) lateral view of male head end, showing cephalic setae, buccal cavity and amphideal fovea; (d) lateral view of male posterior part, showing spicule and precloacal supplement.

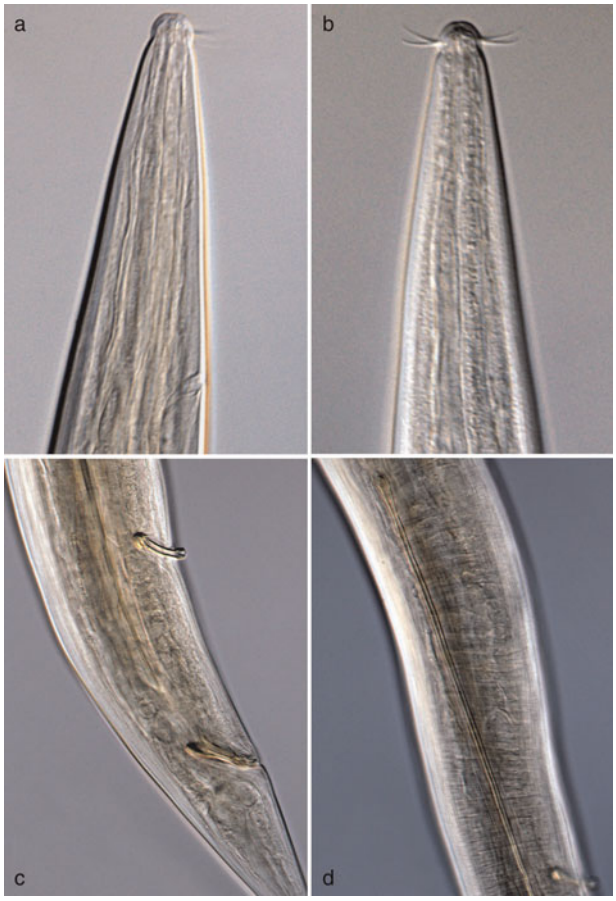

Fig. 2. *Micoletzkyia longispicula* sp. nov. (a) Lateral view of male head end, showing cephalic capsule and excretory pore; (b) lateral view of juvenile head end, showing cephalic setae; (c) lateral view of male cloacal region, showing gubernaculum and precloacal supplement; (d) lateral view of male posterior part, showing spicule anterior portion.

MEASUREMENTS

Holotype ♂1: $\frac{—}{15}\ \frac{690}{122}\ \frac{M}{128}\ \frac{5649}{66}$ 6075 μm;

a = 47.5, b = 8.8, c = 14.2, c′ = 6.5, Spic = 460 μm

DESCRIPTION

Body long spindle-shaped, gradually tapering towards both extremities, more pronounced in anterior region. Cuticle smooth. Head set off, globular, with weak cephalic capsule.

Six lips, each with a tiny inner labial papilla. Outer labial and cephalic sensilla arranged in one circle of ten setae, about 15 μm long. Buccal cavity small and simple, unarmed. Pharynx cylindrical, with wide basal part. Amphideal fovea pocket-shaped with elliptical opening, 10 μm wide (0.7 c.b.d.) in males. Secretory–excretory pore situated 130 μm from anterior end, or 19% of pharynx length from head end. Nerve ring about mid-way pharynx. Tail conico-cylindrical with relatively long distal filiform part, 428 μm or 6.5 a.b.d. long. No terminal setae. Three caudal glands confined to tail region.

Spicules elongated and straight, 461 μm or 7 a.b.d. long, pear-shaped proximally and pointed distally. Gubernaculum conical, 51 μm long, without apophysis. Single tubular supplement 37 μm long, headlike proximally, 153 μm (2.5 a.b.d.) in front of cloacal opening, and about one-third of spicule from cloacal opening. Reproductive system diorchic with two outstretched testes.

Differential diagnosis

Micoletzkyia longispicula sp. nov. is characterized by amphideal fovea pocket-shaped with elliptical opening; spicules elongated and straight, 7 a.b.d. long, pear-shaped proximally and pointed distally; gubernaculum conical, without apophysis, a single tubular precloacal supplement, cephalated proximally.

The new species is close to *M. magna* Vitiello, 1970. *Micoletzkyia magna* Vitiello, however, is much longer in body length (8073 μm versus 6075 μm); the spicules are longer too (545 μm versus 461 μm) and not pear-shaped proximally; and supplement is not headlike proximally. *Micoletzkyia longispicula* sp. nov. is similar to *M. elegans* Ditlevsen, 1926, but the spicules of *M. elegans* are relatively shorter (318 μm or 4.42 a.b.d.); and the position of supplement is equal level with the proximal end of retracted spicules. This new species differs from the other two new species by relatively longer spicules with pear-shaped

https://doi.org/10.1017/S0025315411000476 Published online by Cambridge University Press

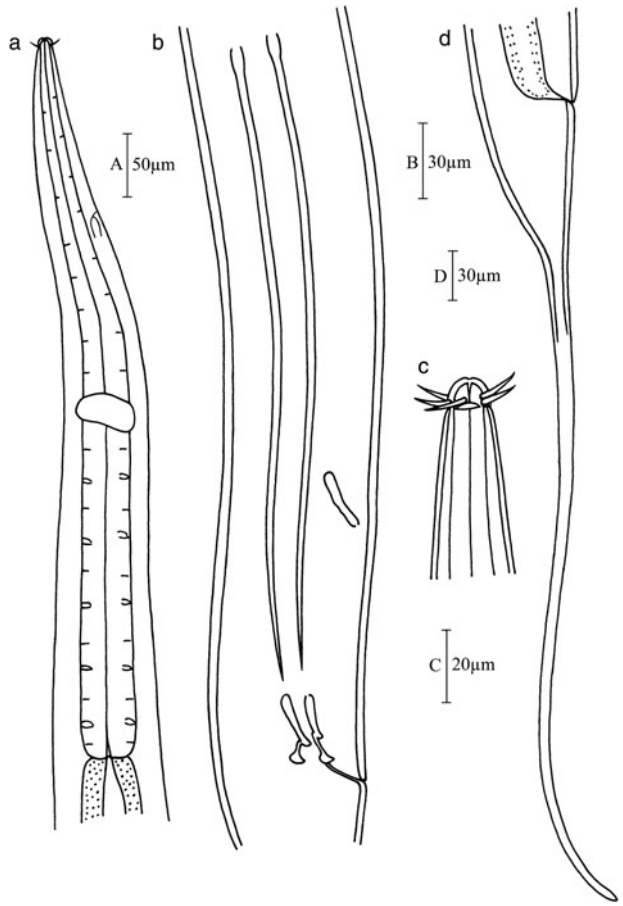

Fig. 3. *Micoletzkyia filicaudata* sp. nov. (a) Lateral view of male pharynx region, showing head, nerve ring, excretory pore; (b) oblique view of male cloacal region, showing spicules, gubernaculum and precloacal supplement; (c) lateral view of male head end, showing cephalic seta, buccal cavity and amphideal fovea; (d) lateral view of male tail end, showing anus and tail filiform part.

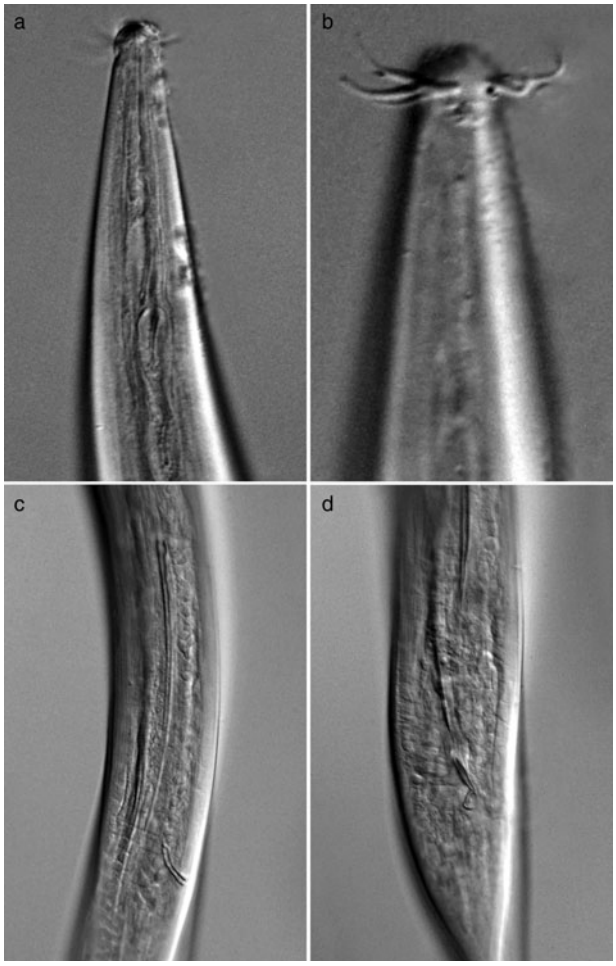

Fig. 4. *Micoletzkyia filicaudata* sp. nov. (a) Lateral view of male head end, showing cephalic capsule; (b) lateral view of male head end, showing cephalic setae; (c) ventral sublateral view of male posterior part, showing spicule and precloacal supplement; (d) ventral sublateral view of male cloaca region, showing spicules and gubernaculum.

proximal end, gubernaculum without apophysis, and precloacal supplement cephalated proximally.

Micoletzkyia filicaudata sp. nov.
(Figures 3 & 4)

TYPE MATERIAL

Only one male was discovered and studied. Holotype: ♂1 on the slide NH130-138(2-5)1.

TYPE LOCALITY AND HABITAT

Subtidal muddy sediment in the South China Sea. Station D13-4, located at 20°59′N 110°46′E, water depth 45 m, water temperature at the sediment–water interface 27.5°C, salinity 33.7.

ETYMOLOGY

This species is named after the long filiform tail.

MEASUREMENTS

Holotype ♂1: $\frac{-\quad 506 \quad M \quad 3946}{12 \quad 80 \quad 81 \quad 60}$ 4430 μm;

a = 54.7, b = 8.8, c = 9.1, c′ = 8.1, Spic = 262 μm

DESCRIPTION

Body is finely spindle-shaped, gradually tapering towards both extremities. Cuticle is smooth. Head is globular, constricted a short distance behind cephalic setae, with weak cephalic capsule.

Six lips, each with a tiny inner labial papilla. Outer labial and cephalic sensilla arranged in one circle of ten setae, 16 μm long. Buccal cavity is small and simple. Pharynx cylindrical, basal part not broadened. Amphideal fovea pocket-shaped with elliptical opening, 6 μm wide (0.5 c.b.d.), 8 μm from anterior border of fovea to anterior end of body. Secretory–excretory pore situated 120 μm from head end, or midway between anterior end of body and nerve ring. Nerve ring about half-way down pharyngeal length, or 51% of pharynx length from anterior end.

Tail is conico-cylindrical with five sixths of distal filiform. 486 μm or 8.1 a.b.d. long. No terminal seta. Three caudal glands confined to tail region.

Spicules elongated and straight, 262 μm or 4.4 a.b.d. long, cephalate proximally and pointed distally. Gubernaculum is tubular, with dorso-caudal apophysis. Single tubular precloacal supplement 24 μm long, 104 μm (1.7 a.b.d.) in front of cloacal opening. Reproductive system is diorchic with two outstretched testes.

https://doi.org/10.1017/S0025315411000476 Published online by Cambridge University Press

Differential diagnosis

Micoletzkyia filicaudata sp. nov. is characterized by slender body with relatively long filiform tail, spicules elongated and straight (4.4 a.b.d.), cephalate proximally and pointed distally. Gubernaculum is tubular, with dorsal apophysis.

The new species is close to *M. magna* Vitiello, 1970. *Micoletzkyia magna* Vitiello, however, is much bigger in body size (L: 8073 μm, a: 71.4 versus 4430 μm, 54.7); the spicules are longer too (545 μm versus 262 μm) and gubernaculum without dorsal apophysis. *Micoletzkyia filicaudata* sp. nov. is similar to *Micoletzkyia longispicula* sp. nov. in some respects. But in the latter, spicules are relatively longer and tail is shorter, spicules with pear-shaped proximal end, gubernaculum without apophysis, and precloacal supplement head-like proximally. The new species differs from *Micoletzkyia nanhaiensis* sp. nov. by longer tail (8.1 a.b.d. versus 4.7 a.b.d.), longer spicules (4.4 a.b.d. versus 2.5 a.b.d.) with pointed distal end, and precloacal supplement distant from cloacal opening (1.7 a.b.d. versus 0.4 a.b.d.).

Micoletzkyia nanhaiensis sp. nov.
(Figures 5 & 6)

TYPE MATERIAL

Only one male was discovered and studied. Holotype: ♂1 on the slide NH28-36(5-8)1.

TYPE LOCALITY AND HABITAT

Subtidal muddy sediment in the South China Sea. Station D20-1, located at 18°35′N 110°17′E, water depth 30 m, water temperature at the sediment–water interface 26.7°C, salinity 33.5.

ETYMOLOGY

This species is named after the sea area where the specimens were collected, South China Sea.

MEASUREMENTS

Holotype ♂1: $\frac{-\quad 690 \quad M \quad 4695}{13 \quad 66 \quad 72 \quad 62}$ 4985 μm;

a = 69.2, b = 7.2, c = 17.2, c′ = 4.7, Spic = 152 μm

DESCRIPTION

Body is finely spindle-shaped, gradually tapering towards both ends. Cuticle is smooth. Head set off, globular, with weak cephalic capsule.

Four cephalic setae and 6 outer labial setae arranged in one circle, about 10 μm long. Buccal cavity is small and simple. Pharynx is cylindrical, broadened gradually towards the base, no terminal bulb. Amphideal fovea not observed. Secretory–excretory pore situated 150 μm from anterior end of body, or 22% pharynx length from head end. Nerve ring situated 268 μm from anterior end, or 39% of pharyngeal length.

Tail is conico-cylindrical with relatively long distal filiform. 290 μm or 4.7 a.b.d. long. No terminal seta.

Spicules are slender and curved, 152 μm or 2.5 a.b.d. long, cephalate proximally and chapiter-shaped distally. Gubernaculum with dorsal apophysis, 22 μm long. Single tubular precloacal supplement 22 μm long, 26 μm in front of cloacal opening. Reproductive system is diorchic with two outstretched testes.

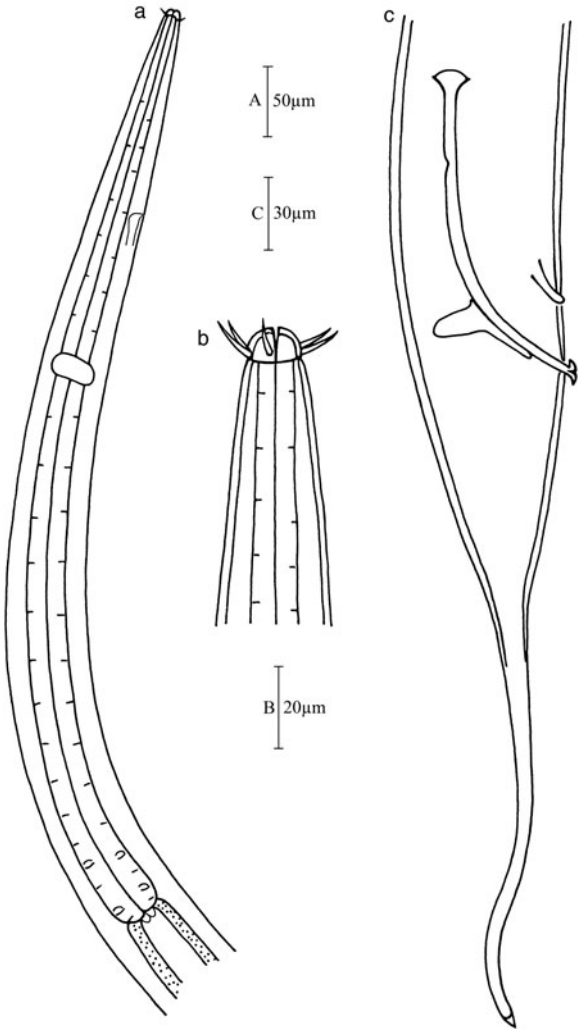

Fig. 5. *Micoletzkyia nanhaiensis* sp. nov. (a) Lateral view of male pharynx region, showing head, nerve ring, excretory pore and pharynx; (b) lateral view of male head end, showing cephalic seta and buccal cavity; (c) lateral view of male posterior end, showing spicules, gubernaculum, precloacal supplement and tail.

Differential diagnosis

Micoletzkyia nanhaiensis sp. nov. is characterized by curved spicules, cephaloid proximally and chapiter-shaped distally; gubernaculum with relatively large dorsal apophysis; precloacal supplement near to cloacal opening. The new species is close to *M. mucronata* Vitiello, 1970. *Micoletzkyia mucronata* Vitiello, however, with short tail (2.3 a.b.d. versus 4.7 a.b.d), and very short posterior cylindrical portion; spicules are longer than 400 μm and pointed distally, not chapiter-shaped. *Micoletzkyia nanhaiensis* sp. nov. differs from the other two new species by short spicules with chapiter-shaped distal end, gubernaculum with large dorsal apophysis and precloacal supplement very near to cloacal opening (not enough 0.5 a.b.d.).

DISCUSSION

Micoletzkyia was established in the family Phanodermatidae by Ditlevsen in 1926 based on the following features: body length 3–9 mm; head attenuated and set-off; cephalic capsule weak; tubular supplement present. Up to now, nine species of *Micoletzkyia* have been recorded: *M. anomala* Wieser, 1953

https://doi.org/10.1017/S0025315411000476 Published online by Cambridge University Press

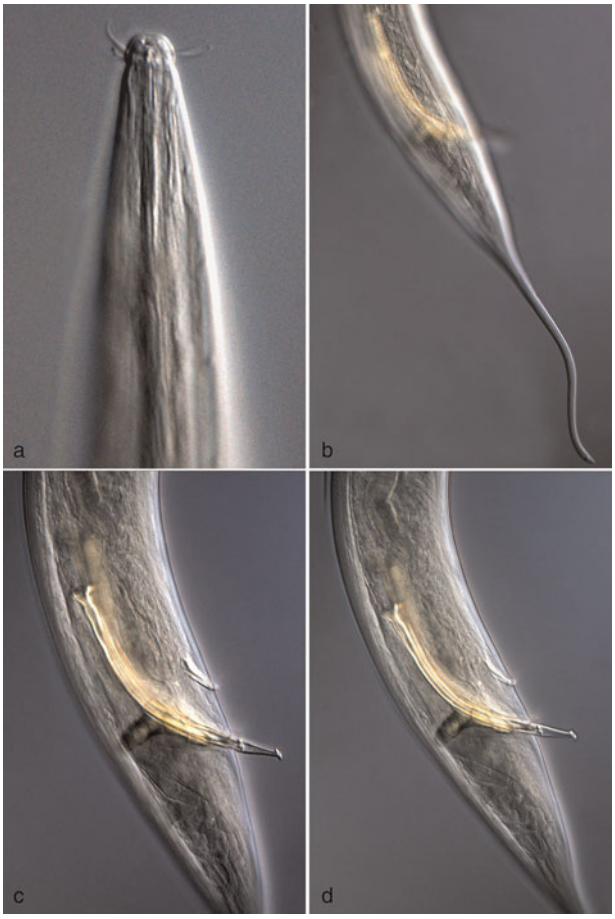

Fig. 6. *Micoletzkyia nanhaiensis* sp. nov. (a) Lateral view of male head end, showing cephalic capsule and cephalic setae; (b) lateral view of male tail end, showing tail and filiform part; (c) lateral view of male cloaca region, showing spicules, gubernaculums and precloacal supplement; (d) lateral view of male cloacal region, showing gubernaculums.

(2 female type specimens, 1 female in Mawson), *M. austrogeorgiae* Allgen, 1954 (1 female types, 1 female in Mawson), *M. elegans* Ditlevsen, 1926 (1 male), *M. falklandiae* Allgen, 1954 (1 juvenile female), *M. magna* Vitiello, 1970 (1 male), *M. mucronata* Vitiello, 1970 (1 male, 2 juveniles), *M. nudicapitata* Allgen, 1959 (1 male), *M. parelegans* Allgen, 1954 (1 male, 1 juvenile), *M. sedata* Gagarin, 2010 (1 male, 9 females). Of them, *M. anomala* Wieser, 1953 and *M. austrogeorgiae* Allgen were known only from the female. *Micoletzkyia falklandiae* was known from a single juvenile only by Allgen in 1954. So, we consider them as invalid species. A key to all valid species of *Micoletzkyia* is given.

KEY FOR NINE VALID SPECIES OF *MICOLETZKYIA* DITLEVSEN, 1926

1. Body length shorter than 4 mm, precloacal supplement absence ..... *M. nudicapitata* Allgen
— Body length close to or longer than 4.5 mm, precloacal supplement presence 2
2. Gubernaculum with dorsal apophysis 3
— Gubernaculum without dorsal apophysis 5
3. Tail longer than 8 a.b.d., with long posterior filiform; spicule longer than 260 μm ..... *M. filicaudata* sp. nov
— Tail shorter than 5 a.b.d. long 4
4. Tail 2.3 a.b.d. long, with short posterior cylindrical portion; spicule longer than 400 μm ..... *M. mucronata* Vitiello
— Tail 4.7 a.b.d. long, with long posterior filiform; spicule shorter than 160 μm ..... *M. nanhaiensis* sp. nov.
5. Tail with short posterior thinned portion, no filiform ..... *M. parelegans* Allgen
— Tail with long posterior filiform 6
6. Cephalic setae shorter than 1 h.d. 7
— Cephalic setae longer than 1 h.d. 8
7. Cephalic setae 0.4 h.d., spicule 7.8 a.b.d. ..... *M. magna* Vitiello
— Cephalic setae 0.8 h.d., spicule 4.4 a.b.d. ..... *M. elegans* Ditlevsen
8. Spicule 6.8 a.b.d., gubernaculum 51 μm ..... *M. longispicula* sp. nov.
— Spicule 5 a.b.d., gubernaculum 23 μm ..... *M. sedata* Gagarin

ACKNOWLEDGEMENTS

This work was supported by the National Natural Science Foundation of China (No. 30770250), the Knowledge Innovation Program of the Chinese Academy of Sciences (No. KZCX2-YW-417) to K. Xu, and the Open Research Cruise offshore China by RV 'KE XUE SAN HAO', Institute of Oceanology, Chinese Academy of Sciences (IOCAS) in July 2008. The authors are very grateful to Dr Kuidong Xu for supplying specimens and Ms Zhongying Shan for her slide making. Two anonymous referees are thanked for their valuable comments and revision of the paper.

REFERENCES

Higgins R.P and Thiel H. (1988) *Introduction to the study of meiofauna*. Washington, DC: Smithsonian Institution Press, 488 pp.

Huang Y., Zhang Z.N. and Liu X.S. (2006) Studies on the species composition and biodiversity of free-living marine nematode in the Southern Yellow Sea, China. *Acta Oceanologica Sinica* 25, 87–98.

Huang Y. and Zhang Z.N. (2010a) Three new species of *Dichromadora* (Nematoda) from the Yellow Sea, China. *Journal of Natural History* 44, 545–558.

Huang Y. and Zhang Z.N. (2010b) Two new species of Xyalidae (Nematoda) from the Yellow Sea, China. *Journal of the Marine Biological Association of the United Kingdom* 90, 391–397.

Huang Y. and Wu X.Q. (2010) Two new free-living marine nematode species of the genus *Vasostoma* (Comesomatidae) from the Yellow Sea, China. *Cahiers de Biologie Marine* 51, 19–27.

Jonge V.N. and Bouwman L.A. (1977) A simple density separation technique for quantitative isolation of meiobenthos using the colloidal silica Ludox-^{TM}. *Marine Biology* 42, 143–148.

McIntyre A.D. and Warwick R.M. (1984) Meiofauna techniques In Holme N.A. and McIntyre A.D. (eds) *Methods for the study of marine benthos*. Oxford: Blackwell Scientific Publications, pp. 217–244.

and

Vitiello P. (1970) Nematodes libres marins des vases profondes du Golfe du Lion. 1. Enoplida. *Téthys* 12, 139–210.

Correspondence should be addressed to:
Y. Huang
College of Life Sciences, Liaocheng University
Liaocheng, 252059, People's Republic of China
email: huangy@lcu.edu.cn

https://doi.org/10.1017/S0025315411000476 Published online by Cambridge University Press