Three new species of the genus *Belbolla* (Nematoda: Enoplida: Enchelidiidae) from the Yellow Sea, China

Y. HUANG1,2 & Z. N. ZHANG1

1College of Life Science and Technology, Ocean University of China, Qingdao, People’s Republic of China, and 2Agricultural College, Liaocheng University, Liaocheng, People’s Republic of China

(Accepted 11 November 2004)

Abstract
Three new species of free-living marine nematodes of the genus *Belbolla*: *Belbolla huanghaiensis* sp. nov., *Belbolla stenocephalum* sp. nov. and *Belbolla warwicki* sp. nov. from the Yellow Sea, China, are described and illustrated. *Belbolla huanghaiensis* can be separated from other species in the *Belbolla* genus by the number of oesophageal bulbs (nine), the length of the spicules and gubernacular apophysis, and the size of the two winged precloacal supplements. *Belbolla stenocephalum* can be separated from other species by the number of oesophageal bulbs (eight), the length of the spicules and the structure of gubernacular apophysis. *Belbolla warwicki* sp. nov. is characterized by the number of oesophageal bulbs (seven), reduced precloacal supplements and the structure of gubernacular apophysis. A key to the genus *Belbolla* is provided to facilitate species identification. Types are deposited in the College of Life Science and Technology, Ocean University of China.

Keywords: *Belbolla*, China, free-living marine Nematoda, new species, Yellow Sea

Introduction
In January 2003, sediment samples were taken at 23 stations in the Yellow Sea, China. Meiofaunal abundance varied from 553 to 1400 individuals per 10 cm$^2$ (average 847 ± 254), with 81–93% (average 86%) of the specimens being nematodes. Up to now, 29 species of marine nematodes have been recorded from the Yellow Sea (Zhang and Platt 1983; Zhang and Ji 1994; Zhang et al. 1994; Hope and Zhang 1995), but only one species of *Belbolla*, *B. zhangi* had been described from the Bohai Sea, China (Guo and Warwick 2001).

*Belbolla* is a genus of the family Enchelidiidae that belongs to the Enoplida. The name of the genus *Belbolla* was suggested by Andrássy (1973), instead of the previously used name *Bolbella* Cobb, 1920. It is probable that Andrássy’s paper was not available when Gerlach and Riemann (1973/74) wrote the monographs and proposed to change the previously used name *Bolbellia*. The name *Bolbellia* was thus a recent synonym of that proposed by Andrássy.

Correspondence: Z. N. Zhang, College of Life Science and Technology, Ocean University of China, 5, Yushan Road, Qingdao 266003, People’s Republic of China. Email: znzhang@ouc.edu.cn
The type species of this genus is *Belbolla tenuidens* (Cobb, 1920) (*Bolbella tenuidens* Cobb, 1920); *Bolbellia tenuidens* (Gerlach and Riemann, 1974). So far, nine species of this genus have been recorded (Platt and Warwick 1983; Guo and Warwick 2001). But, the species of this genus from the Yellow Sea, China have not been studied in the past. We found three species of this genus by investigation and study in the Yellow Sea, and all three species are new. In this paper we describe the three new species.

**Material and methods**

Undisturbed sediment samples were taken using a 0.1 m² improved Gray-O’Hara box corer, and meiofauna samples were taken using a sawn-off syringe tube with a 2.6 cm inner diameter, pushed into the sediment down to 8 cm depth whilst withdrawing the plunger to avoid core compression. Samples were stratified by 0–2, 2–5, 5–8 cm and each fixed with 5% formalin in seawater. In the laboratory, the samples were stained with rose Bengal for more than 24 h. Then all the samples were washed on a 50 μm sieve for the lower size limit and a 0.5 mm sieve for the upper size limit to remove the formalin. Ludox-TM was used to extract meiofauna from sediment by centrifugation. Each sample was washed into a lined Petri dish and the meiofauna was sorted under a stereoscopic microscope to higher taxonomic levels. Nematodes were transferred into 9:1 (v/v) solution of 50% alcohol–glycerol in an embryo dish to slowly evaporate to pure glycerol, then mounted on to a permanent slide. The descriptions have been made from glycerine mounts using interference contrast microscopy. Drawings were made with the aid of a camera lucida. Morphometric data are presented using the modification of Filipjev’s standard formula described by Platt (1973). The types are deposited in the College of Life Science and Technology, Ocean University of China. The descriptions of the new species are based on the examination of samples taken in January 2003. Measurements are in μm. Abbreviations are as follows: a, body length/max. body diameter; a.b.d., anal body diameter; b, body length/oesophagus length; c, body length/tail length; c.d., corresponding body diameter; h.d.: head diameter; L, body length; N%, nerve ring from anterior end of body/oesophagus length; Sc, spicule length as chord; V, vulva distance from the anterior end of body; V%, V/total body length.

**Species descriptions**

*Order ENOPLIDA*

*Family ENCHELIDIIDAE*

*Genus Belbolla* Andrássy, 1973

*Belbolla huanghaiensis* sp. nov.

(Figures 1, 2)

**Type material**

Holotype: one male (♂ 1: ZB030101). Paratypes: three males (♂ 2: ZB 030102, ♂ 3: ZB030103, ♂ 4: ZB030104), two females (♀ 1: ZB030105, ♀ 2: ZB030106) and one juvenile (ZB030107).

**Type locality**

Sublittoral in the Yellow Sea: Station 8994: 35°59.95′N, 123°59.59′E, water depth >77 m, MDØ 8.26, organic matter 3.07%; Station 9594: 35°29.99′N, 122°29.47′E,
Three new species of Belbolla

Figure 1. Belbolla huanghaiensis sp. nov. (a) Lateral view of male head end (1000×); (b) lateral view of male head and cervical region (200×); (c) lateral view of male oesophageal region (200×); (d) lateral view of female tail (400×); (e) lateral view of male posterior body part (200×). Scale bars: 10 μm (a); 50 μm (b, c, e); 20 μm (d).

water depth 59 m, MDØ 8.53, organic matter 3.88%; Station 8194: 36°26.50′N, 123°29.93′E, water depth 77 m, MDØ 8.52, organic matter 3.68%; Station 12494: 33°59.76′N, 122°59.85′E, water depth 68 m, MDØ 7.59, organic matter 2.77%;
Station 13294: 33°30.27’N, 123°30.25’E, water depth 63 m, MDØ 7.07, organic matter 2.77%.

**Etymology**

This species is named after the Yellow Sea.

**Measurements**

Measurements are given in Table I.

|          | Value   | Value   | Value   | Value   | Value   |
|----------|---------|---------|---------|---------|---------|
| Holotype | 830     | M       | 3450    | 3700    | μm; a = 38.5, b = 4.5, c = 14.8, Sc = 81 |
|          | 13      | 90      | 96      | 66      |         |
| Paratype | 650     | V       | 2290    | 2458    | μm; a = 43.9, b = 3.8, c = 14.6, V = 59% |
|          | 9       | 52      | 57      | 39      |         |

**Description**

The body size of the species is relatively large for this genus. Furthermore, the male size is markedly larger than the female; they average 3382 μm long and 87 μm wide. The anterior end of the body tapers to a very small diameter. The buccal cavity has a large right ventro-lateral tooth and two less prominent teeth (dorsal and left ventro-lateral in position). The
The cuticular ring separating the two buccal chambers is smooth (i.e. with no denticles). The mouth is surrounded by six small papillae and there are 10 cephalic setae (10–13 μm long) arranged in one circle. There are dozens of cervical setae. The anterior 10 cervical setae (18–26 μm long) are in one circle (about 26 μm from head end), and the others are arranged irregularly. The oesophagus expands gradually and evenly and is modified into nine bulbs that are regarded as characteristic of the genus. Nerve ring at 41–46% oesophagus length. Spicules 106–137 μm (1.9–2.1 a.b.d.) as arc, 70–81 μm as long chord, curved with a tapered distal tip. Gubernaculum with long dorso-caudally directed apophysis, 45–60 μm long. Two winged precloacal supplements well developed. Tail 3.8–5.2 a.b.d., conico-cylindrical, tapering, with the distal third cylindrical and with a slightly swollen tip.

**Males.** Tail relatively stout over most of its length, narrowing rather sharply in the posterior one-third. The spicules are equal in length and identical in structure with round, blunt proximal ends, and a tapered distal tip. The gubernaculum has a pair of 45–60 μm apophyses, longer than half the length of spicule. The two pre-cloacal supplements

| Characters | 31 | 32 | 33 | 34 | 37.5 | 38 | 39 |
|------------|----|----|----|----|------|----|----|
| Total body length | 3700 | 3150 | 3037 | 3642 | 2458 | 2808 | 2506 |
| Head diameter | 13 | 12 | 11 | 12 | 9.5 | 11 | 10 |
| Buccal cavity length | 17 | 16 | 17 | 16 | 13 | 14 | 13.5 |
| Buccal cavity width | 11 | 10 | 10 | 11 | 8 | 8 | 9 |
| Cephalic setae | 13 | 12 | 11.5 | 12 | 11 | 10.5 | 10 |
| Length of cervical setae | 26 | 25 | 22 | 27 | 18 | 26 | 21 |
| Nerve ring from the anterior end of body | 360 | 356 | 340 | 350 | 298 | 320 | 310 |
| Nerve ring c.d. | 68 | 58 | 61 | 65 | 43 | 51 | 47 |
| Oesophagus length | 830 | 790 | 777 | 850 | 650 | 730 | 700 |
| Oesophagus c.d. | 90 | 73 | 78 | 85 | 52 | 72 | 58 |
| Length of bulbed part of oesophagus | 410 | 380 | 390 | 393 | 322 | 330 | 330 |
| Maximum body diameter | 96 | 76 | 88 | 87 | 59 | 79 | 62 |
| Spicule length as chord | 81 | 73 | 70 | 78 | – | – | – |
| Spicule length as arc | 137 | 118 | 106 | 130 | – | – | – |
| Length of gubernacular apophysis | 56 | 50 | 45 | 60 | – | – | – |
| Anal diameter | 66 | 59 | 57 | 61 | 39 | 49 | 40 |
| Tail length | 250 | 230 | 238 | 252 | 168 | 215 | 206 |
| Tail length/a.b.d. | 3.8 | 3.9 | 4.2 | 4.1 | 4.3 | 4.4 | 5.2 |
| Vulva from anterior | – | – | – | – | 1445 | 1360 | – |
| Vulva c.d. | – | – | – | – | 57 | 78 | – |
| V% | – | – | – | – | 59% | 48% | – |
| Length of the wing of the posterior supplement | 20 | 17 | 17 | 12 | – | – | – |
| Length of middle part of the posterior supplement | 14 | 13 | 11 | 13 | – | – | – |
| Total length of the posterior supplement | 46 | 38 | 40 | 36 | – | – | – |
| Length of the wing of the anterior supplement | 18 | 16 | 17 | 18 | – | – | – |
| Length of middle part of the anterior supplement | 16 | 15 | 15 | 15 | – | – | – |
| Total length of the anterior supplement | 45 | 42 | 41 | 43 | – | – | – |
| Distance of the posterior pro-cloacal supplement from cloacal opening | 255 | 240 | 210 | 240 | – | – | – |
| Distance between supplements | 140 | 115 | 120 | 115 | – | – | – |
| a | 38.5 | 41.5 | 34.5 | 41.9 | 43.9 | 35.5 | 40.4 |
| b | 4.5 | 4.0 | 3.9 | 4.3 | 3.8 | 3.8 | 3.6 |
| c | 14.8 | 13.7 | 12.8 | 14.5 | 14.6 | 13.1 | 12.2 |
characteristic of the genus are well developed and lie close together relatively far from the cloacal opening. Anterior one 0.7 a.b.d. Posterior one 0.6–0.7 a.b.d. Tail with four terminal setae.

**Females.** Body size shorter than male, ovaries paired, equal, opposed, reflexed. Vulva at 48–59% of body length, tail with two terminal setae.

**Differential diagnosis**

*Belbolla huanghaiensis* sp. nov. is characterized by the numbers of oesophageal bulbs, the length of the spicules and gubernacular apophyses, and the size of the two winged precloacal supplements. It is close to *B. californica* Allgen, 1951, but differs by the length of spicules and gubernacular apophyses, and the distance of the posterior supplement from the proximal ends of the spicules. In species of *B. huanghaiensis*, both males and females have nine oesophageal bulbs, while for *B. californica*, females have 10 oesophageal bulbs. In the former, the spicule length as arc is longer than 100 μm; gubernacular apophysis is longer than 42 μm. The posterior supplements are distant from the proximal end of the spicule by more than one spicule length. In the latter, the length of the spicule is 68 μm; gubernacular apophysis is 21 μm. The posterior supplements are distant from the proximal end of the spicule by less than one spicule length. This species is close to *B. zhangi* Guo, 2001, but differs by the number of oesophageal bulbs and the size of the male body. In this species, the numbers of oesophageal bulbs of male, female and juvenile are all nine. The body size is relatively larger, and the male body (3037–3700 μm long, CV% 9.9) is markedly longer than that of the female. While in *B. zhangi*, the numbers of oesophageal bulbs vary between eight and nine. The body size is smaller, and the body lengths of males and females are nearly equal (2230–2750 μm long, CV% 9.0).

**Order ENOPLIDA**

**Family ENCHELIDIIDAE**

**Genus Belbolla** Andrássy, 1973

*Belbolla stenocephalum* sp. nov. (Figures 3, 4)

**Type material**

Holotype: one male (♂ 1: ZB030108). Paratypes: three males (♀ 2: ZB 030109, ♂ 3: ZB030110, ♂ 4: ZB030111), two females (♀ 1: ZB030112, ♀ 2: ZB 030113).

**Type locality**

Sublittoral in the Yellow Sea: Station 15094: 32°29.36'N, 124°00.51'E, water depth 41 m, MDθ 2.89, organic matter 0.76%; Station 14194: 32°59.58'N, 123°35.38'E, water depth 40 m, MDθ 7.64, organic matter 3.84%; Station 13994: 33°01.62'N, 122°32.27'E, water depth 28 m, MDθ 6.93, organic matter 2.84%.

**Etymology**

This species is named after the feature of its body.
Figure 3. *Belbolla stenocephalum* sp. nov. (a) Lateral view of male head end (1000 ×); (b) lateral view of male anterior part (200 ×); (c) lateral view of male posterior body part (200 ×); (d) lateral view of female tail (400 ×). Scale bars: 10 μm (a); 50 μm (b, c); 20 μm (d).
Measurements

Measurements are given in Table II.

Holotype male 1: \[
\begin{array}{ccc}
650 & M & 2200 \\
66 & 66 & 53
\end{array}
\]

\begin{align*}
2394 \mu m; & \quad a = 36.3, \\
b = 3.7, & \quad c = 12.3, \\
Sc = 82
\end{align*}

Paratype female 1: \[
\begin{array}{ccc}
700 & V & 2480 \\
72 & 73 & 47
\end{array}
\]

\begin{align*}
2669 \mu m; & \quad a = 36.6, \\
b = 3.8, & \quad c = 14.1, \\
V = 50\%
\end{align*}

Description

The anterior end of the body tapers to a very small diameter. The buccal cavity has a large right ventro-lateral tooth and two less prominent teeth (dorsal and left ventro-lateral in position), and is separated into two chambers by a smooth cuticular ring. The mouth is surrounded by six small papillae and there are 10 cephalic setae (9–12 µm long) arranged in one circle. There are dozens of cervical setae. The anterior 10 cervical setae (17–26 µm long) are in one circle (about 23 µm from head end), and the others are arranged irregularly. The oesophagus expands gradually and evenly and is modified into eight bulbs that are regarded as characteristic of the genus. Nerve ring at 42–47% oesophagus length. Spicules 80–100 µm as arc, 64–82 µm (1.2–1.5 a.b.d.) as chord, curved with a swollen distal tip. Gubernaculum with long dorso-caudally directed apophyses, 34–36 µm long. Two winged precloacal supplements well developed. Tail 172–210 µm (3.5–4.1 a.b.d.) long, conico-cylindrical, tapering, with the distal third cylindrical, and with two terminal setae.

Figure 4. Belbolla stenocephalum sp. nov. (a) Lateral view of male posterior body part (200 ×); (b) lateral view of male oesophageal region (200 ×).
Males. Tail relatively stout over most of its length narrowing rather sharply in the posterior one-third. The spicules are equal in length and identical in structure, with swollen distal ends. The gubernaculum has a pair of 34–36 μm apophyses, shorter than half the length of a spicule. The two pre-cloacal supplements characteristic of the genus are well developed and lie close together relatively far from the cloacal opening. Anterior one 0.7–0.9 a.b.d. Posterior one 0.6–0.7 a.b.d.

Females. Body size longer in female than male, ovaries paired, equal, opposed, reflexed. Vulva at 48–50% of body length.

Differential diagnosis

Belbolla stenocephalum sp. nov. is characterized by the numbers of oesophageal bulbs, the structure of the spicules and and the length of the gubernacular apophyses. It is close to B. zhangi Guo, 2001, but differs by the structure of spicules and the length of the gubernacular apophyses. In this species, the numbers of oesophageal bulbs are eight in each
individual, the spicule has a swollen distal tip. Length of the gubernacular apophysis is 34–36 μm, shorter than half the length of a spicule. In B. zhangi, the number of oesophageal bulbs is eight or nine, and the spicule has a tapered distal tip. Length of the gubernacular apophysis is 40–45 μm, longer than half the length of a spicule.

Order ENOPLIDA
Family ENCHELIDIIDAE
Genus Belbolla Andrassy, 1973
Belbolla warwicki sp. nov. (Figures 5, 6)

Type material
Holotype: one male (♂1: ZB030114). Paratypes: three males (♂2: ZB030115, ♂3: ZB030116) and two females (♀1: ZB030117, ♀2: ZB030118).

Type locality
Sublittoral in the Yellow Sea: Station 15094: 32°29.36′N, 124°00.51′E, water depth 41 m, MDØ 2.89, organic matter 0.76%; Station 13994: 33°01.62′N, 122°32.27′E, water depth 29 m, MDØ 6.93, organic matter 2.84%; Station 14194: 32°59.58′N, 123°35.38′E, water depth 40 m, MDØ 7.64, organic matter 3.84%.

Etymology
This species is named in honour of Professor R. M. Warwick.

Measurements
Measurements are given in Table III.

|                   | M (µm) | Sc (µm) | Total (µm) | a | b | c | V (% of male) |
|-------------------|--------|---------|------------|---|---|---|-------------|
| Holotype male 1   | 430    | 1354    | 1470       | 40.8 | 3.4 | 12.7 | 30          |
| Paratype female 1 | 424    | 1272    | 1390       | 39.7 | 3.3 | 12.9 | 59%         |

Description
The body size of this species is relatively small compared to the other species of the genus, 1230–1690 μm long. The anterior end of the body tapers to a very small diameter. The buccal cavity has a large right ventro-lateral tooth and is separated into two chambers by a cuticular ring. There are 10 cephalic setae (5–6 μm long) arranged in one circle. There are dozens of cervical setae. The anterior 10 cervical setae (10–15 μm long) are in one circle (about 12 μm from head end), and the others are arranged irregularly. The oesophagus expands gradually and evenly and is modified into seven bulbs (first bulb sometimes not very clear in the males), which is regarded as characteristic of the genus. Oesophageal part is relatively short. Nerve ring 51–56% oesophageal length. Spicules 33–37 μm (1.3–2.5
Figure 5. Belbolla warwicki sp. nov. (a) Lateral view of male head, cervical and oesophageal region (400×); (b) lateral view of male head end (1000×); (c) lateral view of male posterior body part (400×); (d) lateral view of female tail (400×). Scale bars: 20 μm (a, c, d); 10 μm (b).
a.b.d.) as arc, 30–31 μm as long chord, broad with rounded proximal ends, distally tapering. Gubernaculum with small dorsal apophysis. Tail 4.8–5.6 a.b.d., gradually tapering with short cylindrical part, and with a slightly swollen tip.

**Males.** Tail relatively stout over most of its length and gradually narrowing and cylindrical in the posterior quarter. The spicules are equal in length and identical in structure with rounded, blunt proximal ends. The gubernaculum has a pair of 7.5–8.0 μm apophyses. The two pre-cloacal supplements are reduced, in long pocket-shaped structure, not winged shape, which is regarded as characteristic of the genus. Tail with three terminal setae.

**Females.** Ovaries paired, equal, opposed, reflexed. Vulva at 55–59% of body length. Tail without terminal setae.

**Differential diagnosis**

*B. warwicki* sp. nov. is characterized by the number of oesophageal bulbs, the shape of the spicule, gubernacular apophysis and precloacal supplements. It is close to *B. asupplementata* Juario, 1974. They all have seven bulbs, but the principal difference between the species is the presence or absence of precloacal supplements and the shape, the size of spicules and gubernacular apophyses. In *B. warwicki*, precloacal supplements are present, whilst in *B. asupplementata*, precloacal supplements are absent. The body size and the shape of spicule and gubernacular are very different.

---

Figure 6. *Belbolla warwicki* sp. nov. (a) Lateral view of male cervical and oesophageal region (200×); (b) lateral view of male posterior body part, showing spicules (400×); (c) lateral view of male posterior body part, showing pre-cloacal supplements (400×).
The genus *Belbolla* is characterized by multiple oesophageal bulbs, and the number of bulbs is an important feature in classification (Belogurov and Belogurova 1980). So, we use this characteristic as the principal basis of identification. In the three new species, the numbers of oesophageal bulbs are invariable in every species. Most characters of the three new species show marked interspecific variation, and little intraspecific variation. So, we think *B. huanghaiensis*, *B. stenocephalum* and *B. warwick* should be new species.

A key is given for the determination of the 12 species of the genus *Belbolla*, which are described so far. The number of bulbs is an important feature in keys to the genus presented by Belogurov and Belogurova (1980).

**Key for the determination of 12 species of the genus *Belbolla***

1. **Precloacal supplements absent**  
   - Precloacal supplements present  
2. Seven oesophageal bulbs  
   - Eight, nine or 10 oesophageal bulbs  
3. Precloacal supplements well developed, appearing winged; apophysis of gubernaculums absent  
   - Precloacal supplements absent

*Three new species of Belbolla*  

1701
Precloacal supplements reduced, in long pocked-shaped structure; apophysis of gubernaculums present. 

4 Eight oesophageal bulbs. 

5 Length of the apophysis longer than half spicule length. 

6 Supplements long (1.4–1.5 a.b.d.). 

7 Spicule with swollen distal tip. 

8 Posterior supplement distant from the proximal ends of the spicule by less than one length of spicule; the apophysis about one-third of the spicule length. 

9 Length of the supplement wing almost equal to the diameter of its central part. 

10 Spicule with a hook at the distal end. 

Acknowledgements

We are very grateful to Professor R. M. Warwick, Dr M. C. Austin and Dr D. J. Somerfield (Plymouth Marine Laboratory, UK) for initiating the study on the biodiversity of free-living marine nematodes in the Bohai Sea and the Yellow Sea, and Professor Guy Boucher (Natural History Museum, Paris, France) for comments and suggestions on the draft. The present work is jointly funded by National Key Basic Research Program from The Ministry of Science and Technology, P. R. China (G19990437 and 2002CB412400), and the National Science Foundation of China (Project no. 40176033). We thank also two anonymous referees for their revision and comments.

References

Andrássy I. 1973. Über vier homonym Nematodengattungen. Nematologica 19:403–404.

Belogurov OI, Belogurova LS. 1980. Morphology of Belbolla intarma sp. n., diagnosis and a table for the species of the genus Belbolla. Biologiya Morya 4:74–77. (Translated from Russian, 1981).

Gerlach SA, Riemann F. 1973/74. The Bremerhaven checklist of aquatic nematodes. Veröff. Inst. Meeresforschung in Bremerhaven (Suppl 4):1–736. (Part 1, 1973; Part 2, 1974).

Guo YQ, Warwick RM. 2001. Three new species of free-living nematodes from the Bohai Sea, China. Journal of Natural History 35:1575–1586.
Hope WD, Zhang ZN. 1995. New nematodes from the Yellow Sea, *Hopperia hexdentata* sp. n. and *Cervonema deltensis* sp. n. (Chromadorida: Comesomatidae), with observations on morphology and systematic. Invertebrate Biology 114(2):119–138.

Platt HM. 1973. Free-living marine nematodes from Strangford Lough, Northern Ireland. Cahiers de Biologie Marine 14:295–321.

Platt HM, Warwick RM. 1983. Free-living marine nematodes. Cambridge: Cambridge University Press. 248p. (Synopses of the British fauna; 28, part I: British Enoplids).

Zhang ZN, Ji RB. 1994. The first record of *Terschellingia longicaudata* de Man, 1907. Journal of the Ocean University of Qingdao (Suppl):215–219.

Zhang ZN, Lin X, Yu ZS. 1994. Preliminary study on the phytal meiofauna from the rocky beach at Shicao Dalian, China. Journal of the Ocean University of Qingdao 24(3):373–383.

Zhang ZN, Platt HM. 1983. New species of marine nematodes from Qingdao, China. Bulletin of the British Museum of Natural History 45(5):253–261.