Zootaxa 1078: 33–40 (2005)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

1078

Myriotrochus (*Oligotrochus*) *meteorensis* spec. nov., a new myriotrochid holothurian from the deep-sea off NW Africa (Echinodermata: Holothuroidea: Myriotrochidae)

JENS MICHAEL BOHN
Zoologische Staatssammlung München, Münchhausenstraße 21, D–81247 Munich, Germany
E-mail: j.bohn@zsm.mwn.de

Abstract

A new myriotrochid holothurian, *Myriotrochus* (*Oligotrochus*) *meteorensis* spec. nov., has been discovered in a deep-sea sample taken during an expedition with FS 'Meteor' (M 36) off north-west Africa, together with specimens of *Molpadia musculus* Risso, 1826, *Hedingia albicans* (Théel, 1886) and *Protankyra* cf. *brychia* (Verrill, 1885). The new species is similar to *M*. (*O*.) *vitreus* (M. Sars, 1866) and *M*. (*O*.) *clarki* Gage and Billett, 1986; it is thoroughly described and detailed measurements of wheel parameters are presented. This is the first record of a myriotrochid holothurian for the NE Atlantic Ocean south of 40°N.

Key words: Holothuroidea; Myriotrochidae; *Myriotrochus*; *Oligotrochus*; *M*. (*O*.) *meteorensis* spec. nov.; taxonomy; systematics

Introduction

The benthos of the north-western Africa upwelling area from Cape Blanc to off northern Morocco has been sampled during four cruises (M 26, M 36, M 44 and M 53) with the German research vessel 'Meteor' (Thiel 1981) by the means of eight depth transects.

A hitherto unsorted holothurian sample from a deep station taken during cruise M 36 off Cape Blanc in 1975, held at the Zoologische Staatssammlung München (ZSM), contained in addition to *Molpadia musculus* Risso, 1826 (10 specimens, ZSM 20043111), *Hedingia albicans* (Théel, 1886) (3 specimens, ZSM 20043110) and *Protankyra* cf. *brychia* (Verrill, 1885) (35 fragments, ZSM 20043109) several fragments of a yet undescribed myriotrochid holothurian.

The Myriotrochidae Théel, 1877 are a family of apodous, usually infaunal holothurians that are worldwide distributed in the deep-sea, though few species are also known

Accepted by Alan Dartnall: 17 Oct. 2005; published: 7 Nov. 2005

from shallow waters. Albeit the bathyal and abyssal north Atlantic Ocean may be one of the best sampled deep-sea regions concerning myriotrochid holothurians (Belyaev & Mironov 1982, Gage & Billett 1986), knowledge of this family there is still scarce. The specimens collected during the cruise M 36 with FS 'Meteor' off Cape Blanc are the first record of a myriotrochid holothurian from the NE Atlantic Ocean south of 40°N.

Material and Methods

For examination of calcareous deposits small pieces of the body wall were macerated in a 12.5 % Natriumhypochlorite solution, then rinsed several times in distilled water and air-dried. The calcareous deposits were mounted on slides and analyzed with a Leitz microscope equipped with a video camera (380 USB 2.0 Spacec@m) and the software AxioVision LE. For SEM examinations the calcareous deposits were transferred to aluminum stubs, sputtered with gold and studied in a LEO 1430 VP Scanning Electron Microscope.

The wheel-like deposits in the body wall of the Myriotrochidae are an important diagnostic feature and a number of measurements and counts have been established to describe and characterize species (see Belyaev 1970, Belyaev & Mironov 1982, Gage & Billett 1986, Bohn 2005).

Taxonomy

Family Myriotrochidae Théel, 1877
Genus *Myriotrochus* Steenstrup, 1851
Subgenus *Oligotrochus* M. Sars, 1866

***Myriotrochus* (*Oligotrochus*) *meteorensis* spec. nov.**
(Figs 1A–M, 2)

Material. Holotype (♀ anterior fragment, ZSM 20043112), 8 paratypes (2 ♂ anterior fragments, 2 ♀ anterior fragments, 2 juv. [?] anterior fragments, 2 posterior fragments, ZSM 20043108), FS "Meteor", station M 36/99, Agassiz trawl 151, 21°36.2' N, 18°40.6' W, 2786–2843 m, 26.II.1975.

Description. The seven anterior fragments are only few millimeters long and 6.0–9.2 mm wide (close to the calcareous ring). The larger of the two posterior fragments is about 25 mm long. The anterior fragments are circular to slightly oval in cross-section, the posterior fragments have a slightly tapering posterior end.

There are 12 conical tentacles with 4–5 pairs of lateral digits. Both, the left and right lateral interradius have three tentacles, while all other interradii only have two. The tentacles lack calcareous deposits.

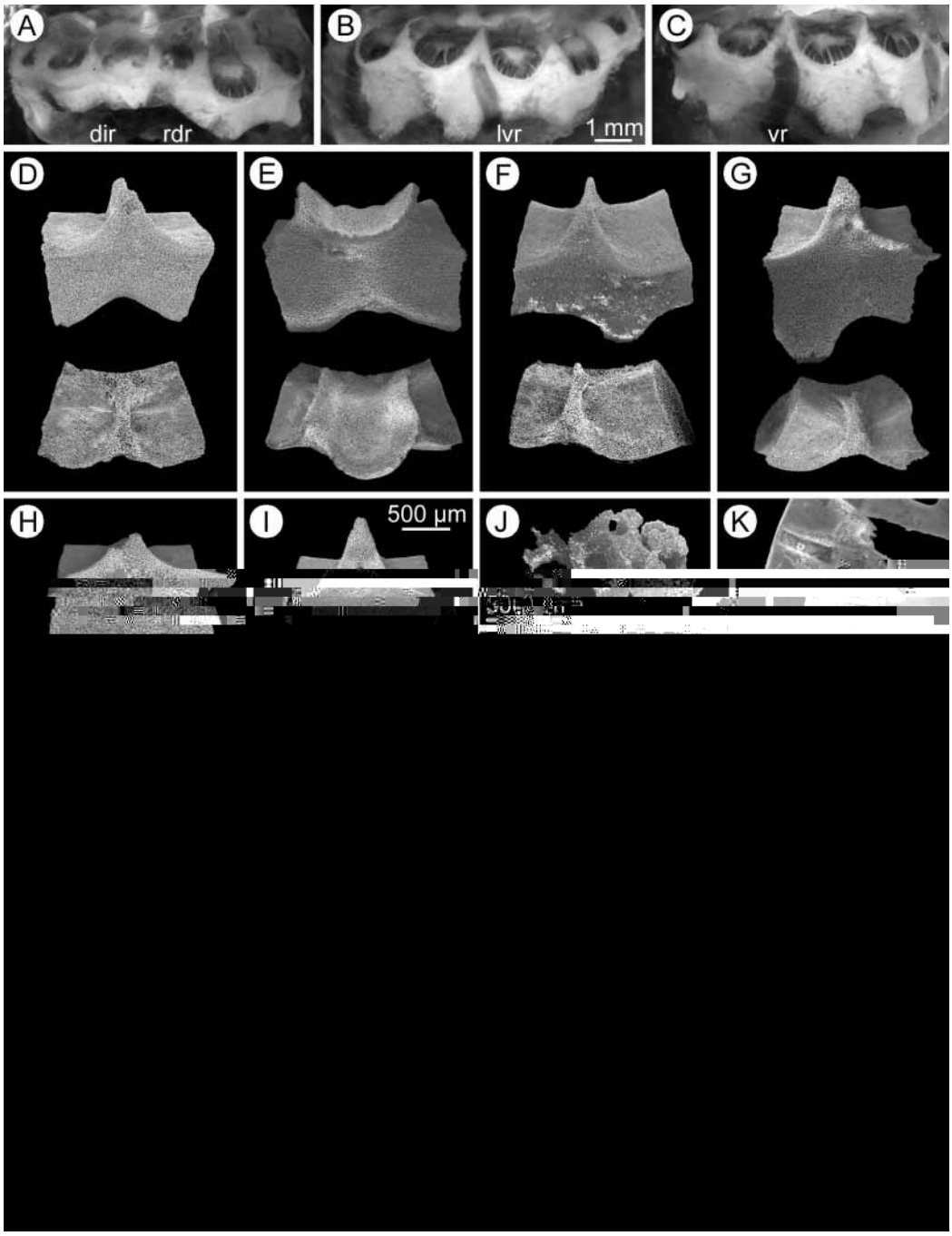

FIGURE 1. *Myriotrochus* (*Oligotrochus*) *meteorensis* spec. nov. **(A–C)** Calcareous ring of holotype (all to the same scale). **(A)** Dorsal view (dir: dorsal interradial plate, rdr: right dorso-lateral radial plate). **(B)** Left lateral view (lvr: left ventro-lateral radial plate). **(C)** Ventral view (vr: ventral radial plate). **(D–I)** Individual plates of calcareous ring of a paratype, outer (top) and anterior (bottom) view (all to the same scale). **(D)** Dorsal interradial plate. **(E)** Right dorso-lateral radial plate. **(F)** Right lateral interradial plate. **(G)** Left ventro-lateral radial plate. **(H)** Right ventral interradial plate (anterior process damaged). **(I)** Ventral radial plate. **(J)** Madreporite body (small basal piece broken off). **(K–M)** Wheel deposits of body wall from paratypes. **(K)** Detail of a wheel, rim with bifid teeth. **(L)** Small wheel lacking branched spokes. **(M)** Common large wheels with branched spokes.

According to Smirnov (1999), the last-mentioned three species have wheel deposits with a hub perforated by a more or less complete circle of holes and a calcareous ring where the ventral pieces are less than two times as high as the dorsal pieces (not known in *M*. (*O*.) *rotulus*). In contrast, *M*. (*O*.) *meteorensis*, *M*. (*O*.) *vitreus* and *M*. (*O*.) *clarki* have wheels without perforations on the hub and the ventral pieces of the calcareous ring are about two times higher than the dorsal pieces (see Heding 1935, Gage & Billett 1986, Smirnov 1999). Though quite similar, the new species also differs in several characters from *M*. (*O*.) *vitreus* and *M*. (*O*.) *clarki*.

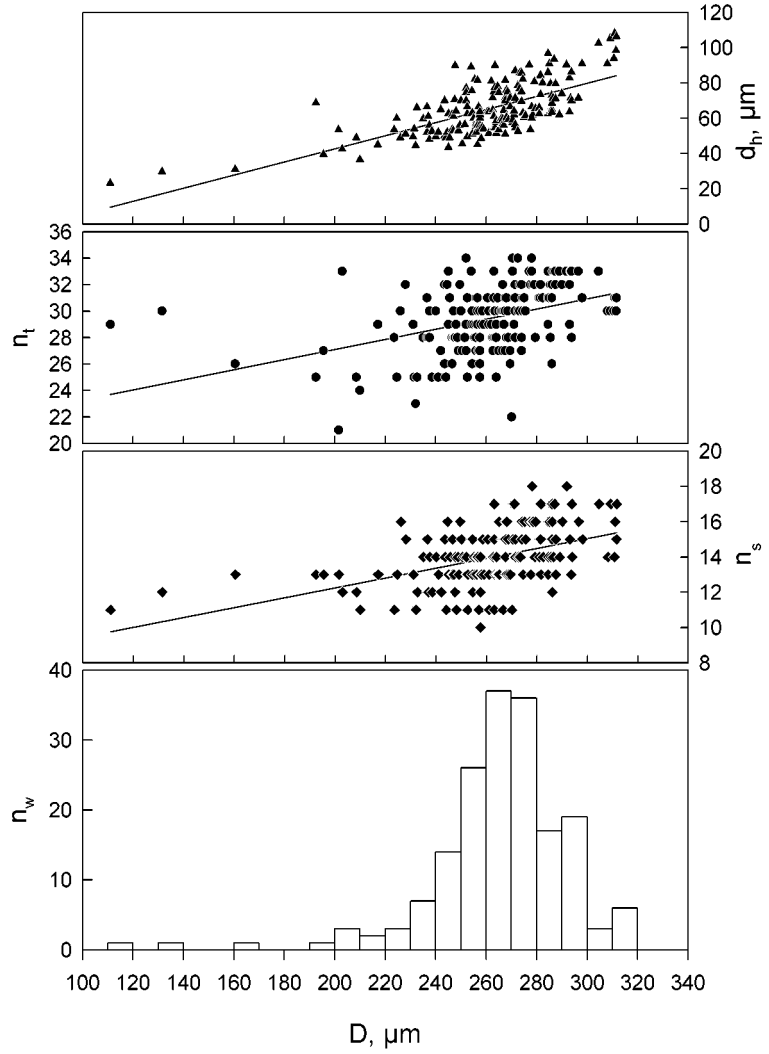

FIGURE 2. *Myriotrochus* (*Oligotrochus*) *meteorensis* spec. nov. Wheel parameters and size distribution of wheel diameters (D, µm; n_w: number of wheels), with plots of the number of spokes (n_s: rhombus), number of teeth (n_t: circle), and the diameter of the hub (d_h, µm: triangle) in relation to the wheel diameter. Linear regression of n_s, n_t and d_h, µm on D, µm are shown, where n_s = 6.65 + (0.03 x D, µm), r^2 = 0.22, $p < 0.0001$; n_t = 19.44 + (0.04 x D, µm), r^2 = 0.17, $p < 0.0001$; d_h, µm = -31.81 + (0.37 x D, µm), r^2 = 0.47, $p < 0.0001$. (Wheel diameter size classes: 10 µm.)

TABLE 1. *Myriotrochus* (*Oligotrochus*) *meteorensis* spec. nov. Means, standard deviations (in parentheses) and range of wheel parameters for seven specimens. D, µm: diameter of wheel, d_h, %: diameter of hub expressed as a percentage of total wheel diameter, n_s: number of spokes, n_{sb}/n_s, %: ratio of branched spokes to spokes, n_t: number of teeth, lt, %: length of teeth expressed as a percentage of total wheel diameter, s/t, %: ratio of spokes to teeth.

Parameter	Specimen						
	ZSM 20043112	ZSM 20043108					
	JMB–01314 (n=31)	JMB-01317 (n=31)	JMB-01319 (n=31)	JMB-01309 (n=11)	JMB-01313 (n=30)	JMB-01318 (n=21)	JMB-01316 (n=22)
D, µm	253.9 (±27.9) 157–299	272.6 (±38.5) 111–315	262.0 (±28.0) 131–298	244.5 (±21.1) 201–275	256.8 (±16.4) 208–293	256.1 (±17.5) 222–294	269.0 (±24.0) 182–316
dh, %	21.8 (±1.4) 19.3–25.0	24.8 (±4.6) 19.3–34.8	22.0 (±2.0) 17.5–26.1	20.5 (±2.6) 17.4–26.6	25.3 (±2.2) 20.2–28.7	28.9 (±2.4) 23.9–35.0	31.1 (±2.7) 25.4–36.3
n_s	14.6 (±1.2) 13–17	14.6 (±1.6) 11–18	13.7 (±1.5) 11–17	12.1 (±1.3) 10–14	13.3 (±1.8) 11–17	13.5 (±1.3) 11–16	14.6 (±1.4) 13–18
n_{sb}/n_s, %	91.5 (±18.4) 0.0–100	95.2 (±17.6) 0.0–100	95.0 (±17.8) 0.0–100	92.4 (±22.0) 23.1-100	100	94.2 (±11.5) 61.5-100	75.8 (±31.6) 0.0-100
n_t	30.6 (±2.0) 26–34	30.2 (±1.9) 25–34	29.1 (±2.3) 25–33	25.2 (±2.4) 21–29	28.2 (±2.1) 25–33	30.0 (±2.2) 25–34	30.4 (±2.1) 25–33
lt, %	10.4 (±0.7) 9.1–12.1	11.7 (±0.8) 9.8–13.1	13.1 (±0.8) 11.5–15.2	11.3 (±1.4) 9.5–14.3	12.4 (±0.6) 11.4–13.5	11.3 (±0.7) 9.5–12.4	9.3 (±0.6) 8.3–10.3
s/t, %	47.8 (±3.3) 39.4–53.3	48.4 (±4.4) 36.4-56.7	47.3 (±4.9) 34.4–57.1	48.3 (±5.5) 38.5–61.9	47.2 (±4.8) 35.5–53.8	45.2 (±3.6) 39.3–52.0	48.5 (±3.4) 41.9–54.8

The wheels of *M*. (*O*.) *vitreus* are considerably smaller, with a diameter ranging from 55 to 95 µm (Østergren 1902, Heding 1935) compared to those found in *M*. (*O*.) *meteorensis* which have a mean diameter of 260.6 µm (range: 111–316 µm, see Tab. 2). Other wheel parameter separating both species are the number of teeth, which usually is lower in *M*. (*O*.) *vitreus* and the ratio of spokes to teeth, which is considerably higher in *M*. (*O*.) *vitreus* (see Tab. 2). A character, both species have in common are their tentacles with four to five pairs of lateral digits.

Myriotrochus (*O*.) *clarki* differs by several wheel parameters from the new species (see Tab. 2). Most obvious is the smaller size of the wheel deposits, which have a mean diameter of 121.7 µm and range from 56 to 244 µm (Gage & Billett 1986) compared to those found in *M*. (*O*.) *meteorensis* (mean: 260.6 µm, range: 111–316 µm). Also the mean number of spokes and teeth per wheel are lower in *M*. (*O*.) *clarki* (see Tab. 2). The size differences observed in the wheels of both species cannot be ascribed to size differences of the investigated material, because the current specimens (calcareous ring diameter: 6.0–9.2 mm) are within the range of the specimens described by Gage & Billett (calcareous

ring diameter: 1.6–9.2 mm). Furthermore, both species differ in their tentacle morphology: *Myriotrochus* (*O.*) *clarki* has two pairs of lateral digits per tentacle (Gage & Billett 1986), while the new species has four to five pairs.

TABLE 2. *Myriotrochus* (*Oligotrochus*) *meteorensis* spec. nov. Means, standard deviations (in parentheses) and range of wheel parameters of the new species compared to the wheel parameters of *M.* (*O.*) *clarki* (data from Gage & Billett 1986) and *M.* (*O.*) *vitreus* (data from Østergren 1902). D, µm: diameter of wheel, d_h, %: diameter of hub expressed as a percentage of total wheel diameter, n_s: number of spokes, n_{sb}/n_s, %: ratio of branched spokes to spokes, n_t: number of teeth, lt, %: length of teeth expressed as a percentage of total wheel diameter, s/t, %: ratio of spokes to teeth.

Parameter	Species		
	M. (*O.*) *meteorensis* (n=177)	*M.* (*O.*) *clarki*	*M.* (*O.*) *vitreus*
D, µm	260.6 (±27.9) 111–316	121.7 56–244	70-80 55–95
d_h, %	24.9 (±4.3) 17.4–36.3		
n_s	13.9 (±1.6) 10–18	12.8 10–18	11–16
n_{sb}/n_s, %	92.8 (±19.5) 0.0–100		
n_t	29.4 (±2.5) 21–34	27.4 21–34	17–26
lt, %	11.5 (±1.4) 8.3–15.2		
s/t, %	47.5 (±4.4) 34.4–61.9	49.4 37.9–75.0	55–60

There can be little doubt, that both species are closely related. Some presumable synapomorphic features are their unique wheel deposits. (1) Spokes are fused in their proximal part with their neighbors, thus enlarging the hub. (2) Close to the rim spokes branche into two. (3) The teeth projecting from the rim of the wheel often are bifid. According to Gage & Billett (1986) these characters are only present in the larger wheels of *M.* (*O.*) *clarki*, while they are found in nearly all wheels of *M.* (*O.*) *meteorensis* with a diameter larger than 210 µm. Out of 177 wheels measured, there were only 4 wheels which had no branched spokes, and each one, with only 1, 2 or 3 branched spokes. Five of these seven wheels have a diameter of less than 210 µm. Similar to small wheels in *M.* (*O.*) *clarki*, small wheels in *M.* (*O*). *meteorensis* may lack this character, though all of them have bifid teeth projecting from the rim.

Myriotrochus (*O*.) *clarki* has been found off NW Ireland and off NW United Kingdom at depths between 1040 and 2907 m (Gage & Billett 1986, Harvey *et al*. 1988). Recently, it also has been described from off NW Spain, at a depth of 480–520 m (Smirnov 1999).

In conclusion, *M*. (*O*.) *meteorensis* may be distinguished from the closely related *M*. (*O*.) *clarki* by its tentacles, which bear four to five pairs of lateral digits, instead of only two in the latter species, and by its considerably larger wheels.

Distribution. Only known from the type locality, off NW Africa, NE Atlantic Ocean, 2786–2843 m.

Etymology. The name, *meteorensis*, refers to the German research vessel FS "Meteor" the service of which contributed much to our current knowledge on marine biodiversity.

Acknowledgements

For providing material, I am indepted to Dr. Bernhard Ruthensteiner from the Bavarian State Collection of Zoology. I am also very grateful to Dr. Michael Schrödl and Horst Bohn for valuable comments on the manuscript.

References

Belyaev, G.M. (1970) Ultra-abyssal holothurians of the genus *Myriotrochus* (order Apoda, fam. Myriotrochidae). *Trudy Instituta Okeanologii N.M. P.P. Shirshova*, 86, 458–488. [In Russian.]

Belyaev, G.M. & Mironov, A.N. (1982) The holothurians of the family Myriotrochidae (Apoda): composition, distribution and origin. *Trudy Institute Okeanologii N.M. P.P. Shirshova*, 117, 81–120. [In Russian, English summary.]

Bohn, J.M. (2005) On two rare abyssal Myriotrochidae (Echinodermata: Holothuroidea: Apodida) new to the South Atlantic: *Siniotrochus myriodontus* Gage and Billett, 1986 and *Neolepidotrochus parvidiscus angolensis* subsp. nov. *Organisms, Diversity and Evolution*, 5, 231–238.

Gage, J.D. & Billett, D.S.M. (1986) The family Myriotrochidae Théel (Echinodermata: Holothuroidea) in the deep northeast Atlantic Ocean. *Zoological Journal of the Linnean society*, 88, 229–276.

Harvey, R., Gage, J.D., Billett, D.S.M., Clark, A.M. & Paterson, G.L.J. (1988) Echinoderms of the Rockall Trough and adjacent areas. 3. Additional records. *Bulletin of the British Museum (Natural History), Zoology*, 54, 153–198.

Heding, S.G. (1935) Holothurioidea. Part 1. Apoda.—Molpadioidea.—Gephyrothurioidea. *The Danish Ingolf-Expedition*, 4, 1–84.

Østergren, H. (1902) The Holothurioidea of northern Norway. *Bergens Museums Aarbog*, 9, 1–34.

Smirnov, A.V. (1999) Some remarks on the subgenus *Oligotrochus* M. Sars, 1866 sensu Heding, 1935 (genus *Myriotrochus*, Myriotrochidae, Holothurioidea) with description of two new species. *Zoosystema*, 21, 13–27.

Thiel, H. (1981) Benthic investigations in the Northwest African upwelling area. Report on the cruises 26, 36, 44 and 53 of R.V. "Meteor". *Meteor Forschungsergebnisse Reihe D*, 33, 1–15.

