



A new species of *Cottunculus* (Teleostei: Psychrolutidae) from the Mid Atlantic Ridge

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Abstract

Cottunculus tubulosus n.sp. is described from one specimen caught in the summer of 2004 in the Northeast Atlantic, at about 2000 m depth in the Mid Atlantic Ridge. The species is characterised by a slender body, a long head, large pointed cranial spines, large bony tubules along the lateral line, prominent dermal prickles along the back, dorsal and anal fins set far posterior, a short caudal peduncle, and no banded colour patterns. From morphological characters, the species seems closely related to the South African species *C. spinosus*.

Key words: Psychrolutidae, *Cottunculus*, Mid Atlantic Ridge, MAR-ECO

Introduction

Among the approximately 29 species of fathead sculpins (Psychrolutidae) eight species are considered by Eschmeyer (2007) to belong to the genus *Cottunculus* Collett, 1875 (subfamily Cottunculinae), yet from a morphological analysis Nelson (1982, 1989) concludes that one of these, *C. gyrioides* Weber, 1913, belongs to the subfamily Psychrolutinae (possibly genus *Ebinania*). The remaining seven species are all benthic and range in depth from shallow inshore waters to about 2200 m. They are distributed in the Pacific (*C. nudus* Nelson, 1989) and Atlantic oceans (*C. granulatus* Karrer, 1968; *C. spinosus* Gilchrist, 1906; *C. thomsonii* (Günther, 1882); *C. microps* Collett, 1875; *C. sadko* Essipov, 1937; *C. konstantinovi* Myagkov, 1991), *C. sadko* also in the Beaufort Sea (Nelson & Nakamura 1980, Nelson 1982, 1989, 2003, Fedorov & Nelson 1986, Myagkov 1991, Mecklenburg et al. 2002). While *C. nudus*, *C. granulatus* and *C. spinosus* are found in tropical waters or on the Southern Hemisphere, the other species range from tropical to northern temperate and arctic waters.

A specimen of Psychrolutidae was caught during the cruise of R/V “G.O. Sars” on the Mid Atlantic ridge in the summer of 2004 for the “MAR-ECO” project (<http://www.mar-eco.no/>). The specimen clearly belongs to the genus *Cottunculus*, as diagnosed by Nelson (1989), and bears similarities with *C. spinosus* Gilchrist, 1906 described from South African waters. However, it differs sufficiently from all known species of *Cottunculus* in proportions and in a number of meristic and other characters to be considered a new species. We here describe this new species of *Cottunculus*.

Material and methods

The specimen, was caught 17 July 2005 at N 51°45' – W 29° 33' with bottom trawl at a depth of almost 2000

m. On board the ship the specimen was labeled MAR-ECO 3421, stored deep frozen, and at the end of the cruise transferred to Bergen Museum, University of Bergen, where it was preserved in 70% ethanol and given the catalogue number ZMUB 16361.

Measurements and meristic characters recorded follow those of Nelson (1982) and are defined in Fig. 1. All measurements were taken using vernier callipers, and all except standard length were taken under a dissection microscope. The measurements are the shortest distance between the measuring points (shown as dots in Fig. 1), not the “projections” indicated by the arrows, the latter only used for convenient labelling of characters. To enable a vertebrae count and to facilitate the study of rays of dorsal and anal fins, the specimen was radiographed, using a Canon CXDI-31 digital radiograph unit with a resolution of 2256x2876 pixels. Caudal vertebrae were distinguished from precaudal vertebrae by the presence of a haemal spine in the former. All measurements were taken about 2 months after preservation of the specimen, except for weight, which was obtained on board from the newly caught specimen.

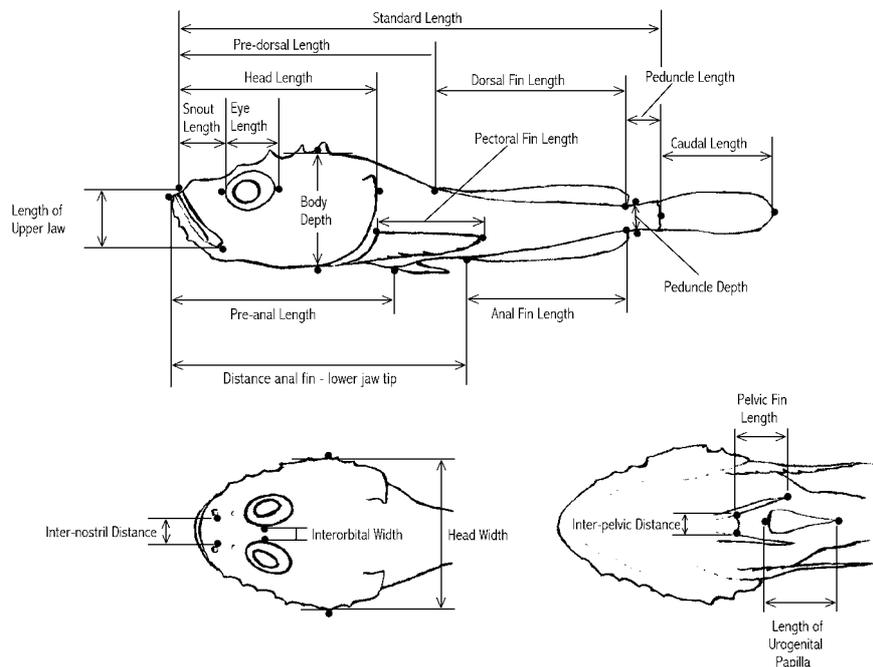


FIGURE 1. Measuring points for morphometric characters.

Comparisons with other species of *Cottunculus* are mainly based on Gilchrist (1906: *C. spinosus*), Nelson (1982: craniology of *C. microps*, *C. sadko*, *C. granulatus*, *C. thomsonii*, measurements and meristic characters of 3 species of *Ebinania*, key to psychrolutid species; 1989: description of *C. nudus*, measurements and meristic characters of *C. thomsonii*), and Nelson & Nakamura (1980: measurements and meristic characters of *C. granulatus*). Specimens of *C. thomsonii* (ZMUB 1806 and 3166), *C. microps* (ZMUB 6396, 10763 (2 individuals), 10506, 11213 (2 individuals), 15606, 15613, 15615 (2 individuals)), *C. sadko* (ZMUB 11264), and *C. konstantinovi* (Holotype at ZMMGU, R-16261) were also examined.

The new species appears to most closely resemble *C. spinosus*. Unfortunately, all museum material of *C. spinosus*, including the holotype, has been lost (Nelson 1989, 2003). We therefore relied on the original description of Gilchrist (1906) for comparison. Gilchrist's (1906) text contains few measurements, but accurate-looking drawings (plate 38) show the lateral and dorsal aspects, from which we made as many of the relevant measurements as possible. We are fully aware of the shortcomings of these measurements, but they may give an indication of the body proportions of *C. spinosus*.

Results

Cottunculus tubulosus sp.n.

(Figs. 2–3)

Holotype. male, NORTH ATLANTIC, 51°45'N – 29°33'E, 17 July 2004, 1950–1872 m depth, soft bottom, R/V G.O.Sars, super station 56, local station 378, bottom trawl. ZMUB 16361.

Diagnosis. The species differs from other species of *Cottunculus* by having very prominent tubes externally visible along all of the lateral line, and dense single and double prickles, readily apparent to the unaided eye, covering the body. The head is fairly slender and head tubercles are well developed, as are the infraorbital (non-paired) and preopercular spines. The peduncle is short and relatively deep.

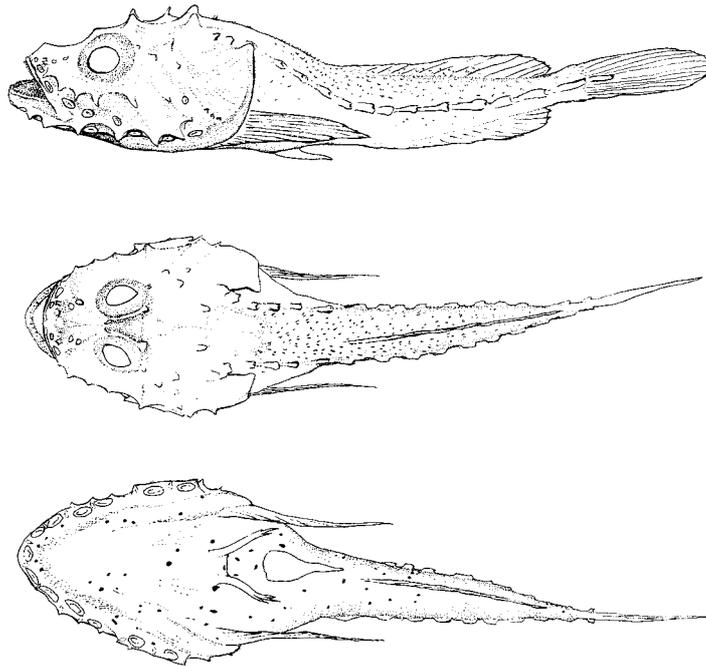


FIGURE 2. Drawing of *Cottunculus tubulosus*, holotype ZMUB 16361.

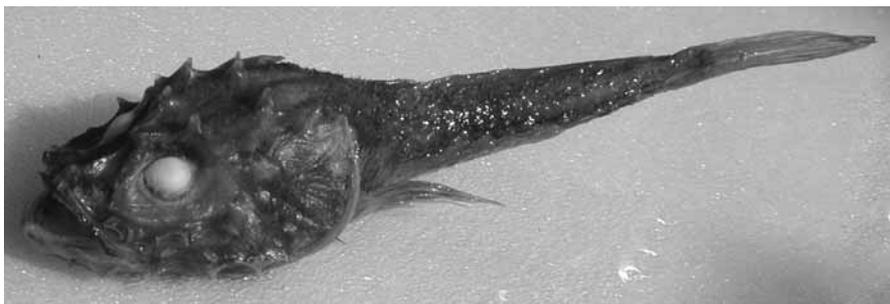


FIGURE 3. *Cottunculus tubulosus*, holotype ZMUB 16361, photographed c. 2 months after preservation.

Description. SL 47, 0 mm, fresh weight 3.7g. Other measurements are given in Table 1 and meristic characters in Table 2. General shape fairly slender and elongated for a *Cottunculus*, with a marked convex nuchal area and a short caudal peduncle no longer than its depth (Fig. 2 and 3). From above the snout has a convex outline, and regularly sectioned bony tubes stand out clearly all along the lateral line, extending on to the caudal fin. Snout and interorbital areas concave, the latter displaying prominent orbital rims.

Cranial spines well developed. Following the numbering of Nelson & Nakamura (1980), and Nelson

(1982), spine 1 not apparent, while the most prominent spines are 6>3>5>4>2. Spines of pair number 2 (inter-orbital spines) are least spaced, followed by 3<6<4<5. There are two distinct tabular spines. Opercular with 5–6 fan-spread ridges, lowermost of which ending in 3 minor spines. Suborbital, mandibular and preopercular pores large and separated by single (non-paired) bony spines which point obliquely outwards-downwards. A single large median chin pore present. A pore present midlaterally on the operculum posterior to a single spine. Nasal spines present but small. Anterior pair of nostrils with long tubular openings, posterior pair without tubular openings. Lateral line pores situated on the posterior end of the lateral line bony tubes, but with no tubular opening.

TABLE 1. Measurements of the holotype of *Cottunculus tubulosus* (ZMUB 16361) and *C. spinosus*, the latter measured from plate 38 in Gilchrist (1906)

Character	ZMUB 16361 measurements (mm)	ZMUB 16361 % of SL	<i>C. spinosus</i> % of SL	<i>C. spinosus</i> Aspect of illustration measured
Standard length	47.0			dorsal
Length upper jaw	7.4	15.7	10.6	dorsal
Snout length	4.6	9.8	12.0	dorsal
Eye length	4.9	10.4	9.8	lateral
Head length	19.5	41.5	39.4	dorsal
Inter-nostril distance	3.7	7.9	4.8	dorsal
Interorbital width (bony)	1.4	3.0	3.6	dorsal
Head width (without spines)	14.8	31.5	36.8	dorsal
Body depth (without spines)	9.9	21.1	23.0	lateral
Pre-dorsal length	25.8	54.9	56.1	lateral
Pectoral fin length	11.2	23.8	25.6	lateral
Dorsal fin length	17.9	38.1	34.0	lateral
Anal fin length	19.0	40.4	33.2	lateral
Caudal fin length	13.3	28.3	17.0	dorsal
Caudal peduncle length	2.3	4.9	13.6	lateral
Caudal peduncle depth	2.3	4.9	4.7	lateral
Distance anal fin – lower jaw tip	26.8	57.0	55.5	lateral
Pre-anal distance	20.8	44.3		
Urogenital papilla	6.8	14.5		

Lower jaw protrudes clearly beyond upper jaw. Dentary and vomerine teeth small and numerous in dense irregular rows. Small, yet clearly visible, single and double spinules cover the body from posterior part of nape and backwards, extending on to about basal one third of the dorsal fin. Smaller and more scattered spinules on head; nuchal region bald.

Dorsal fin originates well posterior to the nuchal region. Anal fin originates slightly posterior to the perpendicular from the dorsal fin origin. About 1/3 of the free part of pelvic fins pass beyond anus. Three pelvic fin soft rays present, the first ray shortest and the second ray longest. Number of vertebrae 28, anterior eight precaudal. The first dorsal fin ray above vertebra # 12. Urogenital papilla well developed, but not reaching anal fin origin.

Uniform brownish grey colour with no indication of banded pattern, becoming slightly paler on the under-side of the head, along the subopercular rim, along the lower part of the pectoral fins, and ventrally from the

urogenital papilla, the latter being whitish. Small black dots scattered over the ventral area. Colours still intact after several months in preservation fluid.

Etymology. The specific epithet *tubulosus* (from the Latin *tubus*, meaning “pipe”) refers to the prominent bony tubes of the lateral line.

TABLE 2. Meristic characters of *Cottunculus tubulosus* from holotype ZMUB 16361, and *C. spinosus* from Gilchrist (1906)

Characters	<i>C. tubulosus</i>	<i>C. spinosus</i>
Dorsal fin rays	15	14
Anal fin rays	14	10
Pectoral fin rays	14	16
Pelvic fin rays	3	3
Caudal fin rays	20	
Lateral pores	14	>>14 (24?)*
Vomerine teeth	yes	no
Branchiostegal rays	5	

*) From plate 38 in Gilchrist (1906)

Discussion

According to Nelson (1989) the genus *Cottunculus* is diagnostisized by the following combination of characters: spines present on at least some of the cranial archs, teeth present on head of vomer, cirri absent or weak, a rigid interorbital area, and parietal spines fixed to the cranium. These characters are found in *C. tubulosus*.

Cottunculus tubulosus differs from all congeners except *C. spinosus* in the following characters: prominent spines present between dentary pores; lateral line tubes prominent and clearly visible; low number of dorsal fin-rays; low number of pectoral fin rays; a relatively long predorsal length; and a relatively shallow caudal peduncle. It differs from that species in having clearly visible dense dermal prickles; lateral line tubes not gradually smaller toward the tail; clearly fewer lateral line pores; and in the relative size of cranial spines. While the exact number of lateral line pores in *C. spinosus* is not known, the number judged from Gilchrist’s (1906) illustration obviously far exceeds 14, possibly reaching as high as 24.

The new species can be separated from the other known congeners by the arrangement of cranial spines alone. *C. tubulosus* differ from *C. konstantinovi*, *C. microps*, and *C. sadko* (Nelson 1982, personal observation *contra* Myagkov 1991) by the presence of a well-developed spine on arch 5, and from *C. granulosus*, *C. spinosus*, *C. thomsonii*, and *C. nudus* (Gilchrist 1906, Nelson & Nakamura 1980, Nelson 1989) by a small knob instead of spine on arch 4. The ridge on cranial arch 2 in *C. tubulosus* is also different from the prominent spine of *C. spinosus* in this head region. The new species differs from *C. granulosus*, *C. thomsonii* and *C. nudus* in having single, not double, suborbital spines, and from *C. microps*, *C. sadko*, and *C. konstantinovi* in having prominent preopercular spines (Nelson & Nakamura 1980, Nelson 1989).

Among the Atlantic species of *Cottunculus*, *C. thomsonii* is found from temperate to tropical waters, whereas the others are either Southern Hemisphere species (*C. spinosus*, *C. granulosus*) or belong to boreal and arctic waters (*C. microps*, *C. sadko*, *C. konstantinovi*; Fedorov & Nelson 1986, Scott & Scott 1988, Nielsen & Bertelsen 1992). Thus, *C. thomsonii* is the species of *Cottunculus* whose range gets closest to the locality of *C. tubulosus*, but *C. thomsonii* is found on the continental shelves and slopes, and on the Faroe-Iceland ridge, not on the Mid Atlantic Ridge. Also the South Atlantic *C. granulosus* and *C. spinosus* are found

on the shelves. Thus, *C. tubulosus* is the only species of *Cottunculus* reported from the Mid Atlantic Ridge. Although *C. thomsonii* has been found at almost 1500 m depth (Scott & Scott (1988), only *C. spinosus* has been reported from a depth similar to *C. tubulosus* (1460–2180 m, Nelson 2003), the other species primarily found between 200 and 1000 m deep (Nelson & Nakamura 1980, Fedorov & Nelson 1986, Nelson 1989, Nielsen & Bertelsen 1992).

The station at which the specimen was caught had a soft bottom, a usual bottom habitat of psychrolutids (Fedorov & Nelson 1986). From the bottom trawl catch the demersal and benthopelagic fish fauna at the station consisted of at least 43 species representing 23 families of which Gonostomatidae (2 species), Moridae (1 species), Macrouridae (5 species), Alepocephalidae (6 species), Halosauridae (1 species), Melamphaidae (3 species), and Bathylagidae (1 species) made up 80% of the individuals.

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