

# New Host and Geographical Records of *Ortholinea orientalis* (Schulman and Schulman-Albova, 1953) (Myxozoa, Myxosporea), a Parasite of Marine Fishes

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**Abstract:** *Ortholinea orientalis* (Schulman and Schulman-Albova, 1953) is reported from the urinary bladder of the fish hosts *Alosa tanaica* (Clupeidae) and *Mullus barbatus ponticus* (Mullidae) from the Black Sea. Infection prevalence is 33.3% and 2.5% in *M. barbatus ponticus* and *A. tanaica*, respectively. A morphometric description of the spores is provided. This paper provides the first records of *O. orientalis* in *Alosa tanaica* and *M. barbatus ponticus*, and the first detection of this parasite in the Black Sea. This is also the first record of *O. orientalis* from Turkey.

**Keywords:** *Ortholinea orientalis*, *Alosa tanaica*, *Mullus barbatus ponticus*, Black Sea

## Introduction

Myxozoans are among the most diverse groups of obligate parasites of freshwater and marine fishes. Members of the genus *Ortholinea* Schulman, 1962 occur exclusively in marine fish species. *Ortholinea orientalis* is a coelozoic species infecting mainly urinary bladder, ureter, kidney and, rarely, the gall bladder of diverse fish species in various geographical areas. It has been described from the Pacific herring *Clupea pallasii* Valenciennes, 1847 and the navaga *Eleginus navaga* (Walbaum, 1792) (SHULMAN, SHULMAN-ALBOVA 1953). Since then, it has been reported from *Clupea harengus* L., 1758, *C. pallasii*, *Eleginus navaga* and *E. gracilis* (Tilesius, 1810) in the White Sea and the northern part of the Pacific Ocean (SHULMAN 1966); from *C. harengus* in the North American Pacific waters (ARTHUR, ARAI 1980) and in the Northern North Sea (COSTA *et al.* 1991); from *Clupea pallasii*, *E. gracilis* and *Theragra chalcogramma* (Pallas, 1814) in the Sea of Okhotsk, Sea of Japan and the Bering Sea (ASEEVA 2000, 2002); and from *Clupea harengus* and *Sprattus sprattus*

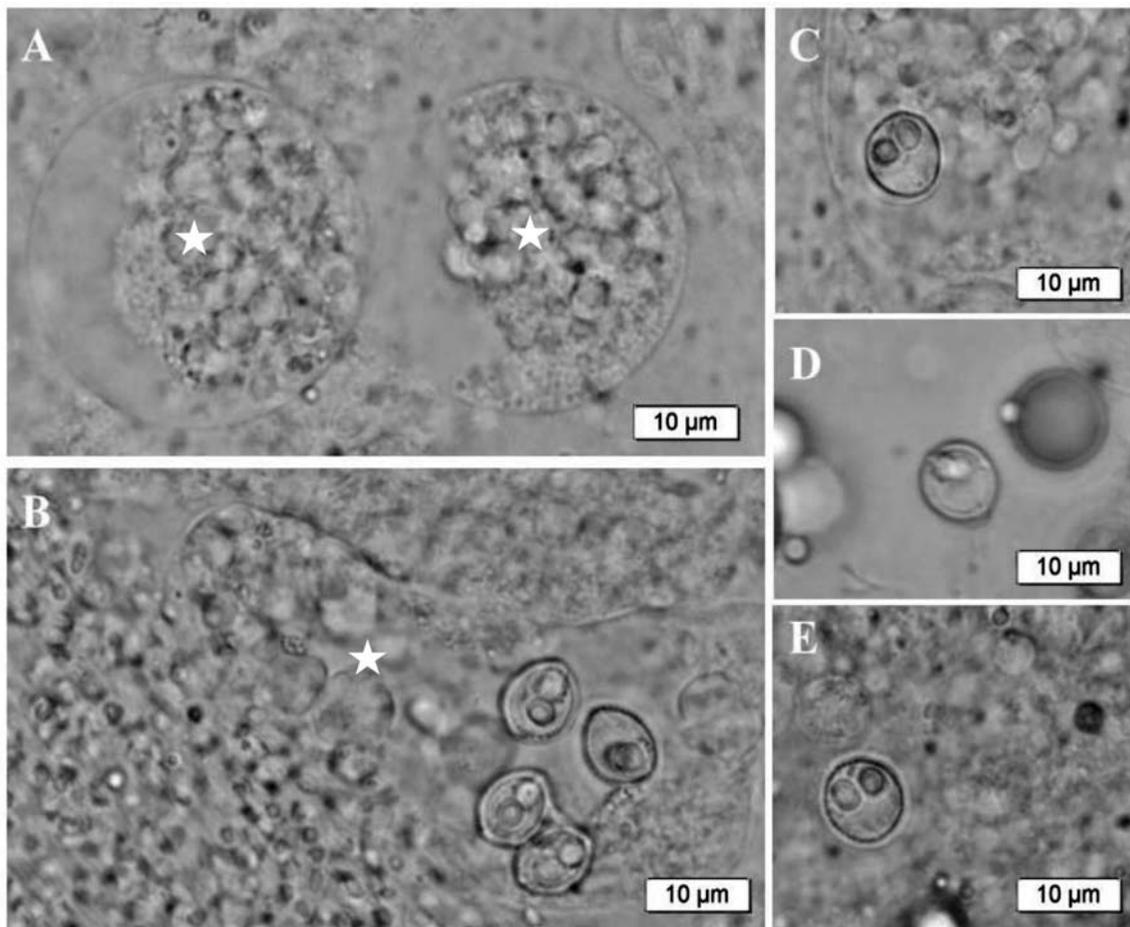
(Linneaus, 1758) in Øresund, Denmark (KARLSBAKK, KØIE 2011).

In the present study, two economically important fish species, *Alosa tanaica* (Grimm, 1901) and *Mullus barbatus ponticus* Essipov, 1927, were collected from the Black Sea off Sinop (Turkey) and examined for myxosporean parasites for the first time. We report here the first records of the myxosporean parasite *Ortholinea orientalis* from these two host species as well as from the Black Sea.

## Materials and Methods

Totally, 32 Black Sea shads *Alosa tanaica* and 24 red mullets *Mullus barbatus ponticus* were collected from closely located sampling areas at Sinop coast of the Black Sea in Turkey (N 42°05'68" E 35°10'55") in March and April 2014. Gills, kidney, intestine, liver, brain, gall bladder and urinary bladder of fishes were investigated for myxosporean parasites using conventional methods (LOM, DYKOVA

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**Fig. 1.** Plasmodia and spores of *Ortholinea orientalis*. **A.** Developing plasmodia (\*), **B.** Polysporic plasmodium (\*), **C.** Frontal view, **D.** Sutural view, **E.** External ridges on the surface of spore

1992; LOM, ARTHUR 2006). Fresh spores obtained from tissue scrapings or squash preparations were examined using oil immersion and Olympus BX51 microscope equipped with phase-contrast optics and photographed by DP-25 digital camera using data-processing software DP2-BSW. Measurements (in micrometers) were taken from fresh smears and are based upon of not less than 30 spores obtained from several infected fish. Morphological terminology used in the descriptions follow the definitions of LOM, DYKOVA (1992). Infection prevalence was determined according to BUSH *et al.* (1997).

## Results

A myxosporean parasite was encountered in the urinary bladder of both fish species. Numerous unsporulated plasmodia and polysporic plasmodia with immature spores were observed (Fig. 1A,B). Plasmodia (n=20) either round, 30.0 µm in diameter, or elongate, 50 µm (40–60) long and 30 µm (25–35) wide. Mature free spores in urinary bladder subspherical to slightly triangular, with rounded an-

terior pole and pointed posterior end in frontal view (Fig. 1C). Spores oviform, with more or less pointed posterior end in sutural view (Fig. 1D). Valves with external ridges on surface of spores (Fig. 1E). Two spherical polar capsules opening anteriorly in sutural plane, with approaching distal ends. For spore and polar capsule dimensions, see Table 1.

Infection prevalence was 33.3% and 2.5% in *M. barbatus ponticus* and *A. tanaica*, respectively.

## Discussion

Based on the overall morphology and spore dimensions, the parasite was identified as *Ortholinea orientalis* (Schulman and Schulman-Albova, 1953). *Ortholinea orientalis* is a parasite of the urinary system of several fish species, mainly clupeids (KARLSBAKK, KØIE 2011). Our study also confirmed its occurrence in a part of the urinary system, the urinary bladder. Our results expand its host ranges to a further clupeid fish, *Alosa tanaica*, as well as the mullid *Mullus barbatus ponticus*. This is also the first report of this parasite for the Black Sea. It must be noted

**Table 1.** Dimensions ( $\mu\text{m}$ ) of *Ortholinea orientalis* spores from different hosts. Average values are given with range values in parentheses

Fish species	Spore			Polar capsule		Reference
	Length	Width	Thickness	Length	Width	
<i>Clupea harengus</i>	7.5-8.5	7.5-7.6	5.0	2.2-3.0	2.2-3.0	Shulman and Shulman-Albova (1953)
<i>Eleginus navaga</i>	8.5-11.5	6.8-9.8	6.5 - 8.0	3.0-4.2	3.0-4.2	Shulman and Shulman-Albova (1953)
<i>Clupea harengus</i>	9.0 (8.5-9.2)	7.9 (7.7-8.0)	5.6 (4.9-5.8)	2.7 (2.3-2.9)	2.7 (2.3-2.9)	Karlsbakk and Køie (2011)
<i>Sprattus sprattus</i>	9.0 (8.5-9.2)	7.9 (7.7-8.0)	5.6 (4.9-5.8)	2.7 (2.3-2.9)	2.7 (2.3-2.9)	Karlsbakk and Køie (2011)
<i>Clupea pallasii</i>	7.3-9.0	6.3-7.2	-	2.8-3.2	1.8-2.0	Aseeva (2000)
<i>Eleginus gracilis</i>	9.3-10.3	8.6-9.3	-	3.5-4.0	2.7-3.5	Aseeva (2002)
<i>Theragra chalcogramma</i>	7.6-8.3	6.6-8.0	-	3.0-3.7	3.0-3.7	Aseeva (2002)
<i>Mullus barbatus ponticus</i>	7.3 (7.1 - 7.5)	7.0 (6.9 - 7.2)	6.2 (6.0-6.4)	2.7 (2.6 - 2.9)	2.2 (2.1 - 2.3)	Present study
<i>Alosa tanaica</i>	7.4 (7.2 - 7.6)	7.2 (7.0 - 7.4)	6.2 (6.1-6.4)	2.8 (2.7 - 3.0)	1.9 (1.8 - 2.0)	Present study

that MOSHU, TROMBITSKY (2006) previously reported the new myxosporean *Ortholinea antipae* from one of the studied hosts, *Alosa tanaica*, collected from a lake and a reservoir in the lower reaches of the Danube River in Ukraine and Moldova. The dimensions provided for *O. antipae* differed slightly from *O. orientalis* (KARLSBAKK, KØIE 2011) by the spore shape and thickness, as well as by the presence of valvular striations. MOSHU, TROMBITSKY (2006) emphasised that both species could be geographical variations of the same species and, considering *O. orientalis* as non-genus specific to hosts. KARLSBAKK, KØIE (2011) CONSIDERED *O. antipae* as a synonym of *O. orientalis*.

KARLSBAKK, KØIE (2011) reported infection prevalence 20% and 11% in *Clupea harengus* and

*Sprattus sprattus*, respectively. COSTA *et al.* (1991) also reported prevalence 20% in juvenile *C. harengus* in Scottish waters from the North-eastern North Sea. We detected low infection prevalence in the clupeid *A. tanaica* (2.5%), which is lower than those reported above for other clupeids; however, the prevalence in *M. barbatus ponticus* (33.3%) is the highest reported so far. The spore and polar capsule dimensions of *O. orientalis* measured in the present study conform well (Table 1).

In conclusion, we report the presence of an emerging parasite *O. orientalis* in a new geographical locality, the Black Sea, and from the two new fish hosts, *A. tanaica* and *M. barbatus ponticus*. This parasite is also a new record for the Turkish fauna.

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