ACTA ICHTHYOLOGICA ET PISCATORIA (2008) 38 (2): 143–147 DOI: 10.3750/AIP2008.38.2.10

PARASITES OF A SAITHE, *POLLACHIUS VIRENS* (L.) CAPTURED IN THE BALTIC SEA

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Rolbiecki L., Rokicki J., Skóra K. 2008. Parasites of a saithe, *Pollachius virens* (L.) captured in the Baltic Sea. Acta Ichthyol. Piscat. 38 (2): 143–147.

Background. A female saithe, *Pollachius virens* (L.), caught in the Baltic Sea, off Polish coast, was infected with microsporidian *Glugea* sp., nematodes *Anisakis simplex* (L3), *Contracaecum osculatum* (L3), *Hysterothylacium aduncum aduncum*, *H. aduncum gadi*, and acanthocephalan *Echinorhynchus gadi*; each of which constitutes a new geographic locality record for these species in the Baltic Sea. *H. aduncum aduncum* and *H. aduncum gadi* are described, illustrated, and their detailed measurements are provided.

Keywords: parasites, fish, saithe, *Pollachius virens*, Baltic Sea, Poland, new host records

The saithe, *Pollachius virens* (L.) is a marine fish, representing the family Gadidae. It naturally occurs in the North Atlantic Ocean and it has been rarely reported from the Baltic Sea (Froese and Pauly 2008). The hitherto conducted parasitic surveys of this fish focused on the Atlantic, particularly the Sea of Norway and the Barents Sea (e.g., Rokicki and Strömberg 1991, Karasev et al. 1996, Strømnes and Andersen 1998, Lom 2002).

The Baltic Sea is a brackish inland body of water with salinities ranging from 3.7 PSU (Bothnian Bay) to 8 PSU (Pomeranian Bay) (Łomniewski et al. 1975). Its animal- and plant species diversity is much lower than that of full-salinity seas. It is particularly evident in the composition of its fish fauna and invertebrate fauna. The low species diversity of potential definitive, intermediate, or paratenic hosts may also theoretically affect the species richness of fish parasites (Rhode 2002, Zander and Reimer 2002). Therefore it would be interesting to compare the parasite faunas of saithe from the Baltic Sea and Atlantic Ocean. The results of the presently reported study comprise the first published parasite records of saithe from the Baltic Sea off Polish coast.

In March 2007, a single, semi-ripe female saithe, *Pollachius virens* (99 cm TL, 9.2 kg), was caught in the Gulf of Gdańsk. The fish was promptly subjected to a standard parasitological necropsy. The microsporidians found were smeared on a microscopic slide and mounted in glycerolgelatine. The nematodes and acanthocephalans were fixed in a mixture of acetic acid and formalin. Selected nematodes were cleared in lactophenol and mounted in glycerolgelatine. The acanthocephalans were stained in Gowers carmine, dehydrated in glacial acetic acid, and cleared in benzyl alcohol.

The following parasites were recovered from the fish examined

MICROSPORA

***Glugea* sp.**: 3 spherical cysts, infecting intestine, 0.8 mm in diameter; spore 5.7–5.9 μm (5.7 μm) × 1.5–2.1 μm (1.8 μm).

NEMATODA

Anisakis simplex (Rudolphi, 1809) L3: 474 specimens, including 1 nematode on the spleen, 17 on the intestine, 32 on the stomach (including 3 penetrating the stomach wall), 65 on the pyloric caecae, and 359 on the liver (134 on the one lobe and 225 on the other).

Contracaecum osculatum (Rudolphi, 1802): L3: 1 specimen on the liver.

Hysterothylacium aduncum aduncum (Rudolphi, 1802): 1 adult female (with eggs visible in her uterus) in the intestine (Fig. 1, Table 1)

Hysterothylacium aduncum gadi (Müller, 1776): 3 specimens in the intestine (2 females, including a mature one; 1 male) (Fig. 2, Table 1).

ACANTHOCEPHALA

Echinorhynchus gadi Müller, 1776: 3 specimens in the intestine (2 females, 1 male).

The presently reported study constitutes the first report on saithe parasites from the Baltic Sea. However, the helmints found have already been recorded from this fos outside the Baltic Sea. In addition, the genus *Glugea* was represented by *Glugea punctifera* Thélohan, 1895, infecting the connective tissue of the

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Table 1

Measurements (in mm) of *Hysterothylacium aduncum aduncum* and *H. aduncum gadi* from *Pollachius virens* from the Baltic Sea (mean values in brackets)

Parameter	*H. aduncum aduncum*, female	*H. aduncum gadi*, female	*H aduncum gadi*, female	*H. aduncum gadi*, male
Length of body	61.0	31.5	22.0	27.0
Maximum width	0.574	0.695	0.347	0.574
Length of dorsal lip	0.196	0.181	0.196	0.146
Width of dorsal lip	0.211	0.195	0.213	0.154
Length of ventrolateral lip	0.211 and 0.21	0.166 and 0.167	0.161 and 0.161	0.141 and 0.141
Width of ventrolateral lip	0.218 and 0.216	0.192 and 0.191	0.155 and 0.154	0.149 and 0.148
Length of interlabium	0.091–0.098 (0.096)	0.075–0.077 (0.076)	0.044–0.047 (0.045)	0.075–0.077 (0.075)
Width of interlabium	0.098–0.121 (0.106)	0.087–0.113 (0.102)	0.088	0.101–0.110 (0.105)
Maximum width of lateral alae	0.053	0.151	0.051	0.158
Length of oesophagus	4.983	3.473	2.688	3.171
Maximum width of oesophagus	0.226	0.249	0.196	0.242
Length of ventriculus	0.377	0.242	0.075	0.181
Width of ventriculus	0.196	0.166	0.061	0.226
Length of ventricular appendix	1.057	0.936	0.679	1.178
Length of intestinal caecum	1.268	1.027	0.876	0.966
Nerve ring to anterior end	0.876	0.74	0.511	0.815
Excretory pore to anterior end	0.921	0.778	0.606	0.906
Length of tail	0.453	0.438	0.264	0.131
Vulva to anterior end	19.0	11.0	not visible	—
Eggs (n = 20)	0.044–0.051 × 0.036–0.058 (0.046 × 0.047)	0.036–0.044 × 0.044–0.058 (0.042 × 0.052)	absent	—
Length of spicules	—	—	—	2.975 and 2.959
No. of preanal papillae	—	—	—	30 pairs
No. of adanal papillae	—	—	—	1 pair
No. of postanal papillae	—	—	—	4 pairs
Oesophagus length/maximal width of lateral alae	94.0	23.0	52.7	20.07
Ventricular appendix length /maximal width of lateral alae	19.9	6.2	13.31	7.56

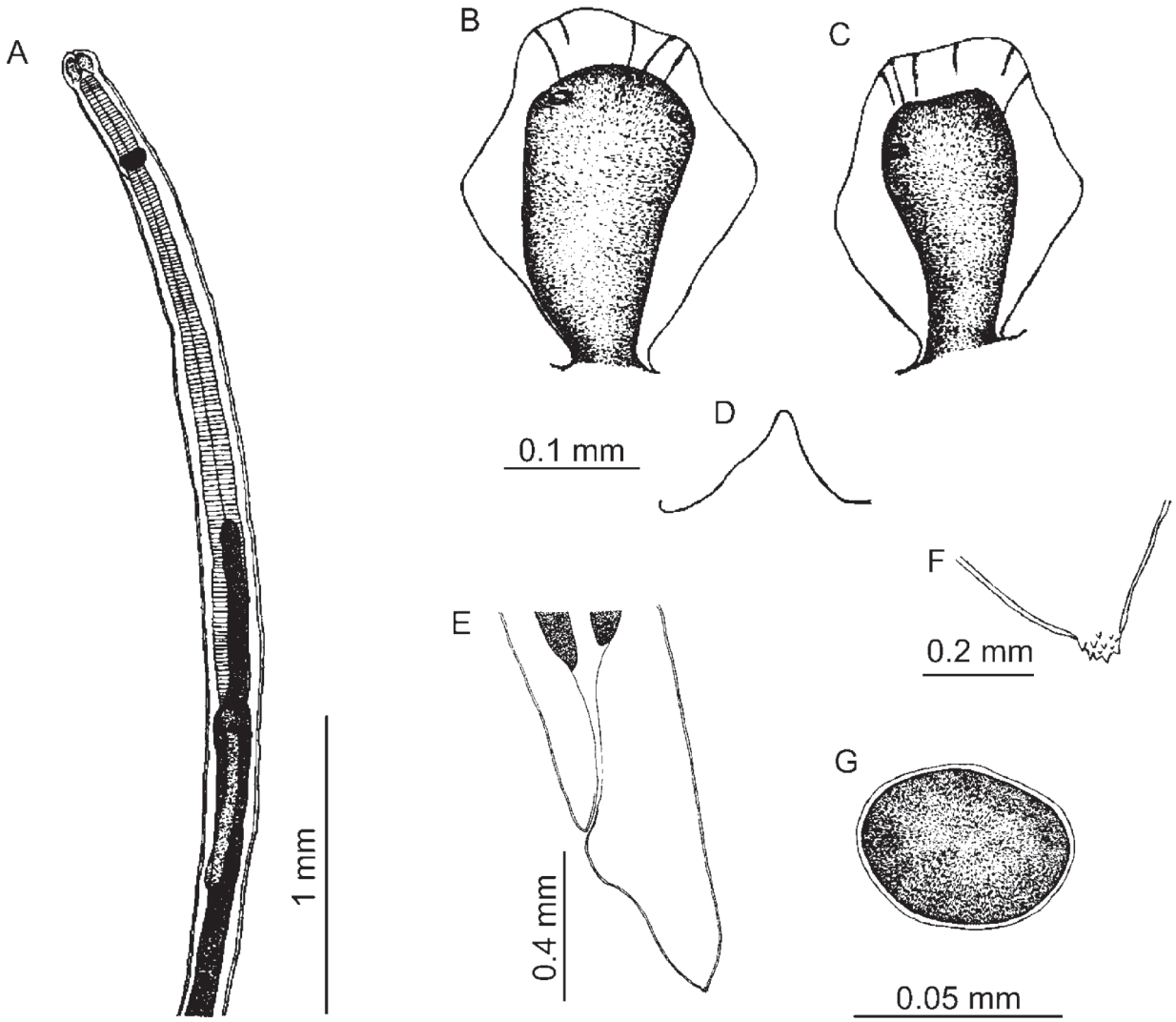

Fig. 1. *Hysterothylacium aduncum aduncum*, female, from *Pollachius virens* from the Baltic Sea; A = head end, B = dorsal lip, C = ventrolateral lip, D = interlabium, E = posterior end, F = caudal process, G = egg

eye (Lom 2002). Other records of this genus in Polish fishes include:
Glugea anomala (Moniez, 1887) infecting three-spined stickleback, *Gasterosteus aculeatus* L., nine-spined stickleback, *Pungitius pungitius* (L.) (cf. Morozińska-Gogol 2006), and flounder, *Platichthys flesus* (L.) (cf. Chibani and Rokicki 2004). Because the latter finding has not been confirmed by morphological examination it most probably represented *Glugea stephani* Hagenmüller, 1899, a parasite specific to flounder. Also the other species: *Glugea acerinae* Jirovec, 1930 was recorded in ruffe, *Gymnocephalus cernuus* (L.) (cf. Rolbiecki 2003).

The nematodes *Anisakis simplex*, *Hysterothylacium aduncum* (Rudolphi, 1802), and *Contracaecum osculatum*, as well as the acanthocephalan, *Echinorhynchus gadi* have frequently been encountered in fishes of the southern Baltic Sea (e.g., Rokicki 1975, 1995, Rokicki et al. 1993, Køie 1999, Rolbiecki and Rokicki 2000).

Hysterothylacium aduncum is among the most commonly reported species of its genus in Baltic Sea fishes. Hartwich (1975) listed the sympatric congeners—*H. aduncum*—infecting chiefly clupeids, *H. auctum* (Rudolphi, 1802)—infecting viviparous blenny, *Zoarces viviparus* (L.), and flatfishes, and *H. gadi* (Müller, 1776)—infecting gadids in the Baltic Sea. Punt (1941) stated that *H. aduncum* and *H. auctum* were conspecific, based on morphological features of the lobes, while Petter and Cabaret (1995) delineated the subspecies *H. aduncum aduncum* and *H. aduncum gadi* based on cluster analysis of morphological parameters (i.e., ventricular caecum length, intestinal caecum length, oesophagus length, body length, and length of spicules /width of cervical alae). We ascribe to the sub-species classification established by Petter and Cabaret (1995). Balbuena et al. (1998) also agreed and noted the likely presence of a species complex associated with *H. aduncum*. We based our identification of *Hysterothylacium aduncum gadi* on the presence of prominent, wing-like alae—contributing to a characteristic bending in the anterior part of parasites (both males and females) (Fig. 2). Those alae are not observed in

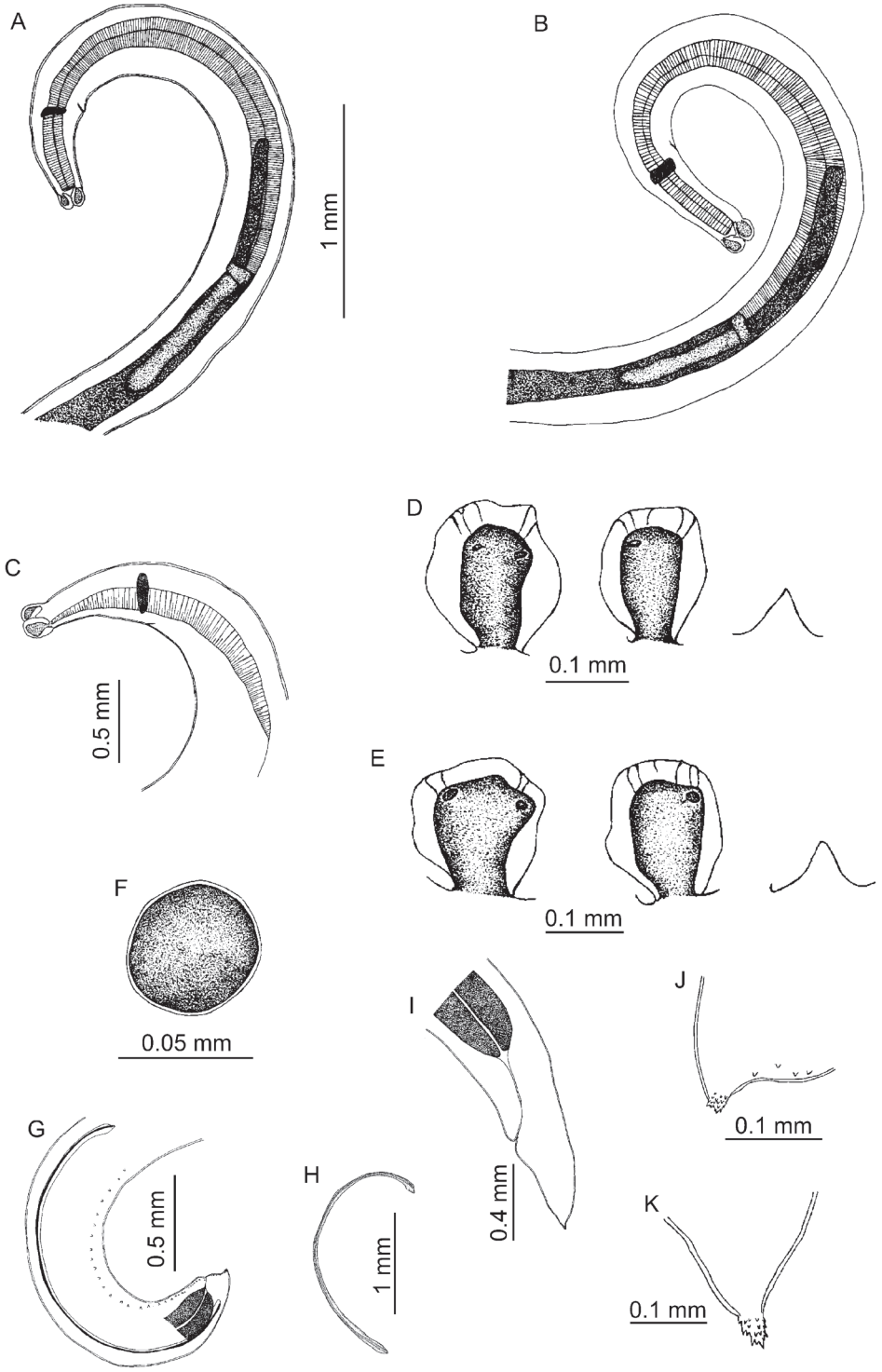

Fig. 2. *Hysterothylacium aduncum gadi* from *Pollachius virens* from Baltic Sea; A = head end of female, B = head end of male, C = head end with lateral alae of male, D = dorsal lip, ventrolateral lip and interlabium of female, E = dorsal lip, ventrolateral lip and interlabium of male, F = egg, G = posterior end of male, H = spicule, I = posterior end of female, J = caudal process of male, K = caudal process of female

H. aduncum aduncum. The alae were 0.051 mm wide (in a young female) and 0.151 and 0.158 mm wide (in adult nematodes). It is worthwhile emphasizing that the nematode with wider alae had the more bent anterior part of body. The ratio (oesophagus length : alae width) differentiates the subspecies: in *H. aduncum gadi* it is <54 whereas in *H. aduncum aduncum* it is >54. Moreover, the ratio (ventricular caecum length : alae width) differs among specimens of these subspecies, i.e., <15 and >15 in *H. aduncum gadi* and *H. aduncum aduncum*, respectively (Petter and Cabaret 1995). Our specimens fit those measurements for *H. aduncum gadi* but had only 4 pairs of

post-anal papillae rather than the 5 pairs reported by Petter and Cabaret (1995). We suspect that specimens of *H. aduncum* may have previously been misidentified as *H. gadi*. For example, the figures of Berland (1961, 1991) labelled as *H. aduncum* may represent *H. aduncum gadi*, which is strongly suggested by the characteristic bending caused by large alae. Unfortunately latter author failed to estimate the ratio of oesophagus and ventricular caecum length to alae width. Specimens of *H. aduncum* in our collection from cod and flounder in the Gulf of Gdańsk lack such alae. In view of the above, the records of *Hysterothylacium* spp. from the North Atlantic need re-confirmation.

ACKNOWLEDGEMENTS

This study was supported by the Ministry of Science and Higher Education, Grant No. 0420/PO4/2005/28.

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Received: 2 June 2008
Accepted: 21 October 2008
Published electronically: 15 December 2008