

THE OCCURRENCE OF THE NEMATODES *ANISAKIS SIMPLEX*
PATHOGENIC TO MAN IN PIKE-PERCH FROM THE VISTULA
LAGOON, POLAND

LESZEK ROLBIECKI, JERZY ROKICKI

Department of Invertebrate Zoology, University of Gdańsk
81-378 Gdynia, Poland, Al. Piłsudskiego 46

Abstract. Of the 400 pike-perches examined, 12% were infected with L₃ *Anisakis simplex*. The infected fish were over 45 cm long. The hypothesis submitted was that the pike-perches may constitute the source of infection in accidental hosts, i.e. in man.

INTRODUCTION

Anisakis simplex is a cosmopolitan species of nematodes occurring mainly in the waters of the northern hemisphere. The final hosts of this nematode are marine mammals of the orders of cetaceans and pinnipeds (THIEL 1967, KAGEI et al. 1967, DAVEY 1971). They are infested by parasites through intermediate (paratenic ?) hosts of planctonophagous fish – mainly herrings. The fish, in turn, become infested through crustaceans (Euphasiacea), which become infested by *A. simplex*, through feeding on free-living larvae of the second stage (GRABDA 1973, SMITH 1983, NAGASAVA 1990). III-stage larvae may also exist in predatory fishes, which ingest *A. simplex* when catching planctonophagous fishes containing larvae of the parasite. In this case, the predator becomes a paratenic host.

The first mention of the appearance of *Anisakis simplex* III-stage larvae in the Baltic, was at the turn of the sixties and seventies (LUBIENIECKI 1972, ROKICKI 1972 and 1973). Since then, this nematode has been the subject of interest of numerous researchers.

MATERIAL AND METHODS

From December 1994 to March 1997 and in April 2000, 400 pike-perches (6.5–72 cm, 15–4500 g, 221 females and 179 males) were studied. The fish were taken in catches by fishermen from the port of Tolkmicko near Elbląg, using pike-perch/bream gill-nets and fyke-nets.

To determine the dependence between the length of the pike-perch and infestation, they were divided into 5 length classes: below 15 cm (79 fish); 15–30 cm (79 fish); 30.1–45 (76 fish) cm; 45.1–60 cm (86 fish) and above 60 cm (80 fish). The division was made by taking into account the growth rate of the fish and the number of individuals examined.

The nematodes were fixed in a mixture of glacial acetic-acid and formalin (95:5) then cleared in lactophenol and mounted in glycerogelatine.

RESULTS

III-st stage *Anisakis simplex* larvae were found in 12% of the pike-perches. The mean intensity of infestation was 2.6 ind. and range of intensity from 1 to 6 nematodes.

Of 123 larvae, 38 were noted during penetration of the stomach wall, 37 on the stomach, 24 on the intestine, 23 on the pyloric caeca and 1 on the gonads of a pike-perch.

The observed dependence between level of infestation and fish length – *A. simplex* occurred only in pike-perches of over 45 centimetres in length (Fig. 1).

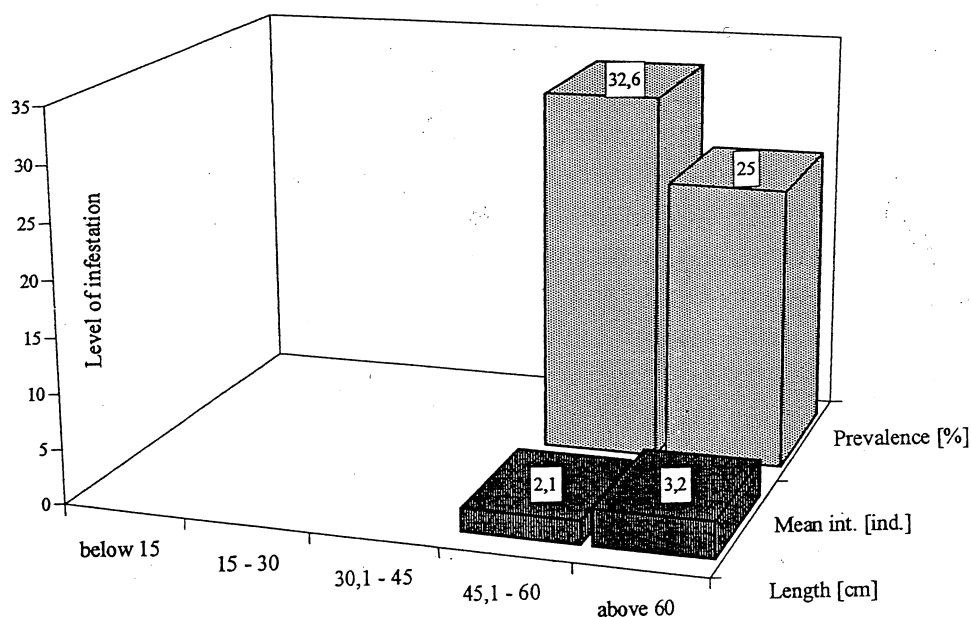


Fig. 1. Dependence between the occurrence of *L₃ Anisakis simplex* and length of pike-perches from the Vistula Lagoon

Higher indices of infestation were noted in the female pike-perch (prev. 15.4% and mean. int. 2.7 ind.) than in the males (7.8% and 2.3 ind.).

Intensity of nematodes varied depending upon the time of year and study seasons (tab.). No correlation was noted between the occurrence of the parasite and season.

TABLE
Prevalence and mean intensity of infection of pike-perch in different seasons and years

Season / Year	Number of examined fish	Prevalence [%]	Mean intensity [ind.]
Winter 1994/95	33	-	-
Spring 1995	59	10,2	2.5
Summer 1995	53	13.2	3.6
Autumn 1995	31	9,7	1.7
Winter 1995/96	-	-	-
Spring 1996	51	11.8	3.3
Summer 1996	76	7.9	2
Autumn 1996	56	9	2
Winter 1996/97	31	25.8	3
Spring (April) 2000	10	70	1.7

DISCUSSION

The pike-perch is a predacious fish found in fresh water, although it has also been noted in brackish lagoons and marine bays. Zooplankton prevails in the feed of the pike-perch fry. In time, feeding on fish becomes the norm.

An interesting phenomenon is the infiltrating of the marine nematode *A. simplex* into both fresh and saline waters, this being the consequence of joint inhabitation by pike-perch and herring. Infested herrings have been observed in the waters of the Southern Baltic – including the Vistula Lagoon – during spring spawning and also in the autumn (GRABDA 1974). It is during this period that the predatory fishes become infested (FEILER and WINKLER 1981). As given by FILUK (1962) herrings constitute about 15% of the food consumed by pike-perch in the Vistula Lagoon.

Previously, in the Vistula Lagoon, *A. simplex* was only noted in the herring (MYJAK et al. 1995, 1996; ROKICKI et al. 1997; RODJUK and SHUKHGALTER 1998). It is now the first time it has been noted in the pike-perch in this basin. *A. simplex* has been noted in these fish in the waters of the western Baltic (FEILER and WINKLER 1981; PIASECKI and SOBECKA 1987; WALTER 1988). FEILER, WINKLER (1981) and WALTER (1988), however, give only the generic name. It was most probably *A. simplex*.

The extent of infestation noted at present is lower (12%) than that observed in the western Baltic Bay of Graifswald (about 30%). On the other hand, only single cases of infested pike-perch were noted in the less saline Sallers Bay (FEILER and WINKLER 1981, WALTER 1988). This was considered to be due to the lack of migration of pike-perch to the Baltic waters, where infested herring were noted. Authors, however, are not explicit about herrings spawning-ground. It is considered that no infested herring is to be found in Sallers Bay. Another surprising factor is the lack of nematodes in the German area of Szczecin Lagoon – the Small Lagoon (WALTER 1988), but there are some in the Polish zone

(PIASECKI and SOBECKA 1987). One would expect the index of infected fish (pike-perch) to be higher in the western Baltic, as a greater number of infested herrings are noted there (LANG et al. 1990).

It would appear from present investigations that only pike-perches with lengths of over 45 cm (Fig. 1) are infested by larvae. FEILER and WINKLER (1981) noted nematodes only in pike-perches of over 60 cm in length. With the exception of one 49.5 cm fish, Feiler and Winkler's observation was confirmed. When studying the pike-perches in the Odra estuary, PIASECKI and SOBECKA (1987) connected the occurrence of *A. simplex* larvae in fish with their migration in search of food to waters containing infested herrings. These authors, however, fail to give the size of pike-perches infested. It is most probable that they were larger individuals, as it is such that migrate in search of food to saline waters. When interpreting the dependence of the level of infestation on the length of the fish, the main emphasis should be placed on the size of the fish and only in second place their migration, when the pike-perches become infested. In the Vistula Lagoon, to which infested herrings make their way for spawning, theoretically, pike-perches of various length classes can become infested, however it is only the large fish boasting relatively large mouth openings and oesophagus than can eat the herrings. Mention should also be made of the fact that infested herrings are larger than those not infected (POTAJALLO et al. 1992, PODOLSKA 1996).

The larger percentage of infested pike-perch females (15.4%) than males (7.8%) observed, most probably arises from the fact that their intake of food is less or non-existent in the post-spawning period – spring, when they guard the nest and the eggs laid there (BRYLIŃSKA 1991). It is during the herring spawning period in spring (to a lesser extent in autumn), how mentioned above, that the pike-perch become infested with the larvae of *A. simplex*.

Studies did not produce confirmation of seasonal occurrence of nematodes in pike-perch. The low level of infestation of pike-perch in the Vistula Lagoon may be due to the fact that seasonal dynamics were unnoticed there. Other researchers, however (FEILER and WINKLER, 1981), noted infested fish mainly during the spring and autumn.

The finding of L₃ *A. simplex* in pike-perch is important from the epidemiological point of view. The reason for this is that nematodes infecting the pike-perch may constitute a source of infection for man, who may constitute an accidental host. In the stomach or intestines of man, the larvae do not undergo sexual maturity, only consecutive change into stage IV, then after about three months die and undergo calcification. Despite this, it gives rise to serious changes in the host organism. For technical reasons, the muscles of the fish were not studied in the present experiments, but as presented by numerous authors (these including BRATTEY, BISHOP 1992, GRABDA 1976, SMITH, WOOTTEN 1975 and 1978) a certain number of *A. simplex* larvae – particularly after the death of the fish – pass into the muscles and gonads. Cases of anisakidosis in man are ma-

inly noted in countries in which fish is eaten semi- or completely raw, e.g. in Japan or Holland. By the 1997, over 35 000 cases of this disorders caused by Anisakidae nematods were reported in the world (ISHIKURA et al. 1998). So far, in Poland, several cases have been noted, but it is not known whether it was caused by *A. simplex* or some other representative of Anisakidae (ISHIKURA et al. 1992). Symptoms of *A. simplex* occurrence in humans are not very specific (stomach pains, vomiting, nausea), hence it can be supposed that the number of persons who actually fell ill is higher. For this reason, the consumption of raw, or only half-cooked dishes from pike-perch infected with IIIrd stage larvae of *A. simplex*, may constitute a threat to the patient's life.

This work was conducted during the tenure of Grant No. 6P04B02616 from the State Committee for Scientific Research.

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