Losses caused by the snail commensalist
*Chaetogaster limnaei* Baer, 1827 among sterlet larvae
(*Acipenser ruthenus* L.)

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(Received 30 October, 1992)

Abstract: In 1991, substantial mortality was observed among sterlet fry cultured in the hatchery of TEHAG. The mortality was caused by the oligochaete *Chaetogaster limnaei* known as a commensalist of snails. *Physa acuta*, a snail infected by this worm was found in a great number in water-conduits. The commensalist sparsely-bristled worms actively moving in the gill and oral cavities and on the body surface prevented the first breath-taking and food intake of immature larvae. As a result, occasionally the entire culture died out. Medication attempts with different doses of formaldehyde, trichlorphon and mebendazole were also made to control the problem.

Keywords: Sterlet larvae, Oligochaeta, *Chaetogaster limnaei*, pathogenic commensalist, treatment

INTRODUCTION

Studies on the parasite fauna of acipenserids have a history of at least two hundred years. Helminths have been demonstrated from these fishes since the end of the 18th century. Investigations into the protozoan fauna of acipenserids and the description of new species were made possible by technical progress at the beginning of the 20th century.

Despite the fact that the work has been lasting for a long time, new species descriptions are still being published. These works report on coccidian and myxosporan infections of the sterlet, a topic little studied so far (Molnár 1986, Baska 1990). The largest body of data on parasitoses of acipenserids living in the waters of Eurasia was supplied by Russian and Soviet researchers. Bychowsky (1962) fully reviewed the parasite fauna of the 10 acipenserid species native in the Soviet Union, including the
4 protozoan and 26 metazoan parasites of the sterlet (*Acipenser ruthenus* L.) described until then. Skrjabina (1974) wrote a review article on helminths described from acipenserids.

Numerous data are available in the literature on the parasite fauna and diseases of acipenserid mother fish caught for artificial propagation, as well as of the acipenserid fry obtained from that propagation (Shestakovskaya 1981). While in the mother fish mainly the helminth infections acquired in natural waters present an animal health problem, the diseases of fry often supervene on indicator diseases, e.g. the excessive multiplication of ectoparasites on the body surface and gills.

The present paper reports on cases in which a snail commensalist oligochaete caused total mortality of artificially propagated sterlet larvae.

**MATERIALS AND METHODS**

The studies were performed in the fish hatchery of TEHAG (Százhalombatta) on sterlet larvae kept in appr. 100-litre tanks with throughflow water, in the years 1991 and 1992. Water throughflow was ensured by a water-pipe system (Fig. 1) according to the technology applied on the farm. Water temperature was between 16 and 18 °C. Feeding of the larvae with tubifex crushing and starter feed was commenced after their first breath-taking.

Larvae were regularly transported to the laboratory and examined for the presence of ectoparasites under stereomicroscope. Impression smears made from the body surface and from the surface of organs after opening the body cavity were fixed in methanol, stained with a tenfold dilution of Giemsa solution, then examined in a light microscope.

The oligochaetes collected from the body surface and gill cavity of the larvae were immobilized with 5% MgCl₂ and identified by microscopy after adding a drop of Amman-lactophenol (Ferencz 1979). To obtain permanent preparations, the helminths were fixed in 70% ethanol.

*Physa acuta* snails occurring in the water-conduits and tanks in large numbers were also sampled and examined for the presence of *Chaetogaster limnaei*.

From the active ingredients (formaldehyde, mebendazole and trichlorphon) used for the medication trials, stock solutions were prepared and added to the water. The treatments were carried out in the form of 30- and 60-minute exposures.

**RESULTS**

In 1991, appr. ten thousand larvae died before or immediately after taking the first breath, when starting to feed. If the infestation was less severe, the larvae were seen restlessly swimming close to the surface, their swimbladder did not contain visible air-bubbles, and gas bubbles were often present in their primitive oral cavity instead. Severely affected, exhausted larvae were lying on the bottom of the tank, swam less
Fig. 1. Intensive fish hatchery and pre-rearing room of TEHAG (Százhalombatta). Sterlet fry pre-reared in tanks with throughflow water are well visible. On the top of the photograph, note water-conduits which are inhabited by large populations of *Physa acuta* snails.

Fig. 2. Microphotograph made at low magnification of the head of a sterlet larva infected by *Chaetogaster limnaei*. The helminth (indicated by the point of the arrow) is located in the nasal part of the cranium, before the eyeballs (E).

Magnification = x25

Fig. 3. Low-magnification microphotograph of the oligochaete *Chaetogaster limnaei*. The arrow-heads point to bristles. Magnification = x50
than normal, from time to time they tried to emerge to the surface but the first breath-taking did not take place. The few larvae that succeeded in taking a breath could not start feeding. In tanks in which the disease occurred usually all larvae died of the signs described above. Several hundred Physa acuta snails were consistently seen on the brim of the tanks, close the water surface. According to data obtained from the farm’s staff, large numbers of this snail inhabit the water-conduits as well (Fig. 1).

The oligochaete Chaetogaster limnaei (Fig. 3) was present in all larvae and snails examined. These 1.3-4.8 mm long helminths occurred on the larvae in numbers ranging from 1 to 14 (!), the majority being present and moving actively in the primitive gill cavity and in the cephalic region (Fig. 2). Live helminth specimens were often found in the intestinal tract of the moribund larvae. Soon after the larva’s death, all helminths migrated to the body surface. They left the decomposing larvae covered by water-moulds by active movement. The helminths caused no visible changes in the snails. Their number ranged between 1 and 17 per snail.

No other pathogen was found to be present by parasitological dissection.

Three different active ingredients were tested for efficacy against the helminths. Of them, formaldehyde failed to kill the worms even at doses toxic to the larvae. At the same time, a one-hour exposure to a mebendazole (Vermox$^R$) solution of 10 mg/l concentration and a 30-min exposure to a trichlorphon (Flibol) solution of 4 mg/l concentration effectively killed the helminths. On the day following the treatment, the larvae - if they had not become utterly exhausted - were swimming normally, in a way typical of the species, were breathing and took up the feed. Often the dewormed fish consumed from the bottom of the tank the helminths killed by the treatment, as indicated by the presence of numerous bristles in their intestinal content.

Intensive infection occurred also in 1992; however, by treating every tank twice with Flibol (which had been found easier to use and cheaper than the other effective drug, Vermox) the disease signs could be prevented and no mortality occurred.

**DISCUSSION**

This is the first report in the literature on severe, epizootic-like mortality of fish fry caused by a snail commensalist helminth. Only few papers deal with the role played by Chaetogaster limnaei in the life of water snails. Far-Eastern authors (Dimatulac and Pinto 1983) reported a negative correlation between Chaetogaster infection of the snail Lymnaea philippinensis and the presence of trematode developmental stages in the snail. They established that the presence of minimum 4 Chaetogaster helminths protected the snail against invasion by the developmental stages of Fasciola and Plagiorchis species. Thus, instead of causing damage to the host, the commensalist Chaetogaster limnaei even provided it with indirect protection against the infective stages of trematodes.

In contrast, the present studies have revealed that the snail commensalist oligochaete may be obligately pathogenic to intensively cultured sterlet fry, as it caused substantial mortality on stock level even in the absence of other factors predisposing
to disease. The oligochaete exerted its pathogenic activity by disturbing the development of larvae, by mechanically inhibiting their first breath-taking, swimming movements and feed intake. By actively moving on the body surface, chiefly in the first third of the body, the helminth gives rise to epithelial lesions which make the fish vulnerable to secondary infection by water-moulds.

We made efforts to eliminate the problem by medication and by developing preventive methods. The only feasible solution was medication by exposure to solutions containing active ingredients effective against the pathogen. Only the short exposure could be used, as at the density typical of the technology (3000-5000 larvae/tank) the sterlet larvae would not have tolerated without an injury to health the interruption of water throughflow for more than 1-2 hours, which is absolutely necessary for exposing the fish to a precisely adjusted dose. The usual solutions of formaldehyde not yet toxic to the larvae (40 mg/l) proved ineffective against the helminths. At the same time, two other compounds, mebendazole and trichlorphon, were found to be effective.

The use of mebendazole alone in the form of exposure was first reported by Székely and Molnár (1987) who found that modern anthelmintic, applied at a dose of 10 mg/l as an one-hour exposure, effective against Pseudodactylogyrus gill parasites which endangered the profitability of intensive eel culture. Choosing a similar dose and mode of application, we successfully treated sterlet fry infected by Chaetogaster limnaei. One day after the treatment, the larvae resumed normal swimming activity, started to breathe and took up the feed. Having got rid of helminths, the larvae were actively looking for food on the bottom of the tanks and took up also the oligochaetes that had fallen off as a result of medication. Following the treatment, the commensalists disappeared from the snails as well.

Exposure to trichlorphon-containing solutions has long-standing traditions in pisciculture. It is used for selective plankton control when preparing ponds for fish culture, and it is also applied for treating fish against various ectoparasites. Its applicability was proved also in the present case: when used at a dose of 4 mg/l as a 30-min exposure, it eliminated the helminths from the larvae. A contraindication may be that the use of this active ingredient in the form of Flibol is not permitted; at the same time, its inexpensiveness, water-solubility and easy applicability are arguments that support its use. The preparations Masothen and Neguvon are more indicated for veterinary use. These preparations also contain trichlorphon as active ingredient; however, in chemically purer form than does Flibol.

The best solution to problems like this is still the preventive approach. It is absolutely necessary to eradicate snails from intensive acipenserid cultures; namely, snails can carry the oligochaete Chaetogaster limnaei which can excessively multiply when water temperature rises in the spring. The risk of infection of fish larvae by any pathogen can be reduced further if the fish farms base the reproductive and fry-rearing phases of fish culture on well-water which is surely free from fish-pathogenic organisms.
Baska F. és Puppánne Bóna F.: Chaetogaster limnaei Baer,1827 csigakommentalista kártelele a kecsegelárvák (Acipenser ruthenus L.) felnevelésekor


REFERENCES


