RESEARCHES REGARDING THE ARGULOSIS TREATMENT TO *HUSO HUSO* JUVENILES WITH NaCl

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Abstract

Fish pathologies caused by parasitic crustaceans lead to mass mortality in affected populations. Called popular, fish lice, these crustaceans have body adapted to parasitic life. Among others, the most common parasitosis in cultured fish is argulosis, ergasilosis, lerneosis and sinergasilosis. Argulosis, is the most common crustacean parasitosis, widespread in the world, common to many species of freshwater fish, marine and brackish water. All fish development stages are receptive to argulosis. Sodium chloride is widely used to control pests during the growth stage of fish, from alleviants to the adult fish. The difference in terms of lethal concentration of sodium chloride for the fish and for the parasites is not very large and for this reason it is necessary that, during the treatment, all general principles of therapy to be respected, particularly those relating to tolerance tests. This work has as main goal the establishment of optimal concentration of sodium chloride to treat argulosis in the case of beluga juveniles.

Key words: argulosis, sodium chloride, beluga juveniles

INTRODUCTION

Argulosis is caused by species belonging to crustaceans, the Branchiura subclass, genus Argulus, with *Argulus foliaceus* as the most common specie in European waters.

This specie is parasitic on the skin, fins, gills of different fish species, in different stages of development from juveniles to adult.

Sources of parasites in argulosis are infested fish, as carriers may be older cultured fish or wild fish. Technological water is also a source of parasite eggs and larvae. For juveniles, distributed live food can be a source of parasites.

Once attached, the parasite pierces the flesh using stinger mouthparts and will suck the blood of the fish. *Argulus* inject a toxin that will kill smaller fish and leaves reddened, inflamed lesions on larger fish. At bites, inflammatory processes occur characterized by abundant secretion of mucus and haemorrhages, causing necrosis of the injured areas. Injuries and small ulcers are forming entry gates for infectious agents which invade the whole fish body.

Mechanical and toxically action induced by crustacean parasites is particularly felt by the early stages on which, due to thin tegument, parasite bites can damage muscle layers beneath the skin. Likewise, in juveniles, the nervous system is more vulnerable to inoculated toxins. Intensive parasitized fish (especially juveniles) are agitated, sometimes to exhaustion; they rub the hard bodies from the water, manifests anoxia and, in severe cases, become anaemic, emaciated, and cachexic and eventually die [3].

Argulosis prognosis is unfavourable for highly parasitized fish fry. The literature mentions frequent epizootics in cultures of juvenile carp, rainbow trout, eel, and also for larger fish (2-3 years) and breeders, which led to mass mortality [4].

To combat argulosis the literature recommends as treatments Trichlorfon with potassium permanganate solution, lindane or Bromex-50, sodium chloride in different doses and exposure times, depending on the stage of development and fish species.

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MATERIAL AND METHODS

Biological material for the present study consisted in beluga alleviants originating from the artificial reproduction conducted at Isaccea station. Before transportation, larvae were adapted to artificial feeding at Horia sturgeon farm, Tulcea County. Sturgeon alleviants were transferred to the laboratory "Recirculating Aquaculture Systems Engineering" from "Dunarea de Jos" University of Galati.

After transportation, alleviants were populated (whit the purpose of studying different technological aspects) in a semi-closed intensive rearing system consisting in:

- Two fibreglass rearing tanks, Ewos type, with a size of 1.40 x 1.40 x 0.40 (m), provided with an inlet pipe which assured a flow rate of 1700 litters / h while evacuation was accomplished through the central drain. To ensure optimal life conditions, the water depth was maintained to a minimum of 0.30 m, in this case the total volume of the tank was 580 l (Fig. 1).

Fig.1 Rearing units of the semi-closed experimental system

- Two water conditioning units, Eheim professional 2080, equipped with filter materials (mechanical, biological and chemical) (produced by Eheim, Germany) were used to control both, water flow and hydrological parameters.

- Aeration / oxygenation unit represented by a compressor RESUN AIR-PUMP, MODEL: LP-100 which distributed the air in each rearing unit at the level required by fish biomass. The air flow of the compressor was 8400 L/h, 2220 GPH, pressure - 0.042 Mpa and maximum water depth is up to 4.0m.

RESULTS AND DISCUSSIONS

The transport of alleviants (4000 exemplars) from fish farm to the laboratory was done in polyethylene bags, in a density of 200 individuals / bag. The alleviants were distributed evenly on the two rearing units in a density of 2000 individuals/tank. From the moment of packaging to population and accommodation of the last exemplars elapsed approximately 6 hours.

The rearing units were disinfected, allowed a time to dry and then, the system worked for two weeks, before populating.

Numerical losses during transportation counted 30 individuals; the average weight of the fry populating the tanks was 0.7 g/ex.

The initial objective of the experiment was to quantify the technological performances through growth indicators (W- biomass gain, FCR- feed conversion rate, SGR- specific growth rate, PER-protein efficiency ratio) of the beluga alleviants in a semi-closed rearing system with artificial feeding, in the context of monitoring and control of physic-chemical water parameters.

The main water quality parameters (dissolved oxygen, temperature, and pH) were monitored. Parameter differences between the two units were not significant; the ranges during experiments were as follows:

-Oxygen: 4,2 – 6,6 mg/l
-Temperature: 18,7 – 22,9 ^{o}C
-pH: 7,50 – 7,92

Feeding ration of 5% was set and distributed in 8 meals / day. The administered fodder, Aller 0_{GR} Futura, contained 64% crude protein and ranged in size from 0.2 to 0.6 mm. In short time after first feeding mortalities were observed.

On closer analysis of alleviants and fry behaviour, some exemplars were observed to be agitated, manifesting chaotically swim and lack of appetite. Careful analysis of these samples has led to the detection of parasite *Argulus foliaceus*, mechanical action of this parasite being confirmed also on dead specimens. Dead exemplars removed from the system were analyzed in order to identify parasite action which proved to be difficult since the crustacean's bite was located near the heart, where the skin is very thin compared to the rest of the body surface and the area is also highly vascularised, small haemorrhages caused by the parasite being hardly detected. Another constraint that led to the late detection of the crustacean was the lack of parasite on dead specimens.

Once parasite was detected on the fry beluga's skin, the main objective became disinfestations. The origin of fish lice parasite was Horia sturgeon farm which is located downstream of the lake with the same name, from where water is supplied directly, without any previous treatment before filling rearing facilities. In the Horia pond, the mud accumulation and, therefore, continuous decaying of organic substances and the presence of large number of fish species of various stages of development favoured the development and growth of this crustacean parasite.

Within two days from stocking beluga alleviants, in the two tanks significant losses of 250 individuals were counted. For disinfestations was followed a classical protocol consisting in the treatment with iodine free sodium chloride at a concentration of 10 g NaCl/L water, bathing of short duration, maximum 30 minutes with strong aeration [3]. This concentration of sodium chloride had no effect on the parasite. Therefore the concentration of sodium chloride NaCl has been increased up to 15g/L, in this case being observed a partially effect, some parasites still remaining attached to the fish body. In order to have better results, a new trial, consisting in a treatment with higher salinity (the salt concentration was 20 g NaCl/L) for an exposure time of 15 minutes, was started. This concentration gave better results, easily visible as the parasites leave the fish body, remaining near the walls and the bottom of bathing tank. Without the possibility of separating biological filter from system's configuration, bathing treatment was done outside the system.

Overall, treatment lasted long enough because bathing was done in much smaller tanks which allowed bathing of small batches (100 alleviants for 40 minutes).

However, numerical losses after treatment counted 98 exemplars. Post treatment, numerical losses decreased daily as shown in Figure 2.

From the figure above, it can be seen that numerical losses of young sturgeons decreased after treatment. The main explanation for the post treatment mortalities consists in poor physiological condition of the highly infested fish which didn't recovered after osmotic shock.

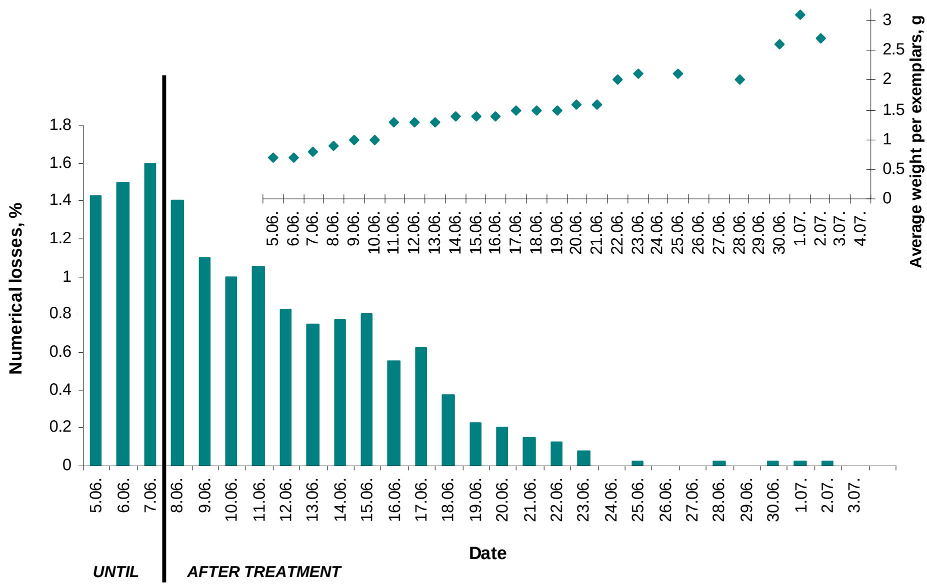

Fig. 2. Numerical losses until and after its treatment

By the end of the experiment, which lasted 45 days, survival was only 37.5% for beluga with an average weight of 4.4 g/exemplar. For this stage of development, the crustacean parasite can affect fry beluga population significantly, in special in a closed rearing system. Usually, biological material introduced in a closed recirculating system is subjected to tremendous stress and, in the case of additional pathogens outbreak, strong imbalances can occur at physiological level, which may result in total loss of the fish stock.

The possibility of pathogens penetration inside the closed system should be excluded entirely by compulsory measures of prevention for infectious and parasitic diseases and throughout hygienic measures during technical and technological management protocols. But if these pathogens have entered the system, effective and energetic treatments must be made in order to remove them before occurring irreversible damages [1].

Another requirement to ensure proper sanitary conditions of biological material consists in its acquisition from specialized units recognized in terms of absence or very low incidence of disease [2].

In our country, there are not many farms dealing with reproduction and sturgeon's production and, therefore, the interest for research studies on technological performance of these valuable species reared in controlled systems is high. Providing the biological material for populating a recirculating system may be difficult, in many cases health aspects of the biological material and the quality of the environment in which it is developed being neglected. The quality of biological material is primordial since a poor quality or unhealthy population, in the context of any stress factors, can lead to significant partial or total loss or, in case of higher survival rate, to lower quality final products.

CONCLUSIONS

Biological material allocated to an intensive rearing system must meet health conditions and be free of infectious or parasitic diseases. If health status is inappropriate, is highly recommended to avoid that biological material populate these production systems.

In order to avoid introducing pathogens in recirculating systems, biological material will be subject to a period of quarantine in specially designed tanks completely isolated from the rearing system.

In the case of treatments of the biological material in a closed system, it must be applied correctly, both in terms of duration and concentration of drugs and flow intensification or renewal rate. The treatments will be done in such way that bio-filter bacterial population not to be affected. When these conditions cannot be satisfied simultaneously, biomass culture will be treated outside the rearing system.

In the case of infested fry sturgeons with parasitic crustacean *Argulus foliaceus*, best results were obtained by bath treatments with 20gNaCl/l sodium chloride was and 15 minutes exposure time.

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