77° CONVEGNO SISVET

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SKELETAL DEVELOPMENT OF RAINBOW TROUT FRY (Oncorhynchus mykiss) REARED IN A RECIRCULATING AQUACULTURE SYSTEM WITH A TiO2-BASED PHOTO-ELECTROCATALYSIS FILTERING TECHNIQUE – PRELIMINARY RESULTS

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In recirculating aquaculture systems (RAS) fish can be subjected to increased levels of ammonia, nitrates, and nitrites, which can cause toxic effects and impaired health and growth [1]. Skeletal anomalies are frequent in farmed fish, and their occurrence depends on the species, developmental stage, and rearing method [2]. In salmonids, these have been described as associated with fast-growing rearing conditions [3], causing a change in swimming and feeding performance, with negative consequences on the growth rate, economic value, and welfare status. This study is part of a major project, the Fish-PhotoCAT (PRIMA2019), and aimed at evaluating the impact of a PEC system on the growth and skeletal development of rainbow trout fry.
Five grams fry were reared at 5 kg/m3, for 21 days in 500 L tanks. All the tanks were equipped with the standard water filtration set-up: in three tanks this constituted the only filtration system (CTR) and in the other three tanks, a PEC system was installed (T). Water parameters were monitored and at the end of the trial, fish were weighed, measured for total length, scored for dorsal and caudal fins, and sampled for skeletal analyses with alcian blue-alizarin whole-mount double staining. Skeletal structures were studied to assess the osteogenesis in the vertebral column and fins. Authorization code: OPBA_20_2020.
No significant differences were found regarding NH3 and nitrite concentrations between the experimental groups. The mean concentration of nitrates, however, was significantly higher in the CTR (122.211 mg/L vs. 108.510 mg/L; $p<0.001$), likely due to the parallel ammonia oxidation to molecular nitrogen performed by the PEC. All groups exhibited similar weight, length, and fin lengths. Classification of skeletal structures as dermal or endochondral bone was based upon their affinity for the histological stains revealing that the origin of the skeletal elements studied did not differ from that seen in other teleosts. The fry double staining revealed that individuals from both groups were similarly ossified revealing that no vertebral abnormalities were detected nor spine deformities. No differences were found in the head length versus in the groups. Analysis of the number of vertebrae revealed that the number varied between 59 and 64 and the mean was not significantly modified by the PEC. Caudal and dorsal fin scores showed no differences between treatments. No difference was found between the experimental groups regarding the other fins organization.The results of this study indicate that both experimental groups presented a similar skeletal development, but further studies are necessary to deepen the different aspects of the use of the PEC.

[1] McKenzie et al., Sublethal Concentrations of Ammonia Impair Performance of the Teleost Fast-Start Escape Response, Physiol. Biochem. Zool., 82, 2009
[2] Boglione et al., Skeletal anomalies in reared European fish larvae and juveniles. Part 1: normal and anomalous skeletogenic processes, Rev. Aquac., 5-s1, 2013
[3]Boglione et al., Skeletal Anomaly Monitoring in Rainbow Trout (Oncorhynchus mykiss, Walbaum 1792) Reared under Different Conditions, PLOS ONE, 9-5, 2014