Evaulation of the Efficacy of a Radial Flow Settler for Aquaculture Wastewater Treatment

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**Keywords.** Aquaculture, wastewater treatment, radial flow settler, land-based aquaculture

**Abstract.** Wastewater from land-based aquaculture (e.g. recirculating aquaculture systems, RASs) contains large amounts of solids, in particular uneaten feed, feces and other particles (e.g., algae and biofouling). These particulate matters need to be removed as earlier as possible to avoid water quality depletion. The aim of this study was to evaluate the efficacy of a customized device layout of the radial flow settler (RFS).

The prototype was designed according to the existent literature and commercial products. The technical parameters of the RFS were: 1) fiberglass cylindrical tank 1500 mm diameter and 2020 mm height with a conical bottom of 60°; 2) V-notch weir diameter of 1350 mm with V-notch height of 20 mm; 3) diameter and height of stilling cylinder of 400 and 500 mm, respectively; 4) surface-loading rate of 2.1 Ls-1m-2; 5) inlet and outlet pipes diameter of 50 mm. The experimental phase lasted four months starting from June 2020 and was conducted in a land-based aquaculture farm in the Central Italy (Orbetello, Grosseto, Italy). The RFS received a part of the outlet flow from one of the rearing ponds of the farm. The inlet flow was set at 2 Ls-1 (66 % of the maximum allowed by this device and approximatively 14 % of the total outlet flow from the pond). Samples of inlet and outlet water and sediments were collected on a monthly basis to evaluate the solids content through gravimetric and filtration methods and the concentration of phosphorous, nitrogen, ammonium, nitrite, and nitrate. The solids (SS) removal efficiency (%) was calculated according to the following equation: (SSinlet-SSoutlet)/(SSinlet)\*100.

The results suggest that the designed device complied with the intended use. Moreover, the functioning of the RFS required a modest hydraulic load (15-20 cm) and therefore low energy requirement. However, it is necessary to install a cover on the device to avoid algal blooming. The gravimetric methods used did not allow a correct evaluation of the amount of sediments as a difference between inlet and outlet, since the error of the method exceeded the difference between the SS content in the inlet and outlet water. However, a sedimentation efficiency of 15-30% was observed through the filtration of the sedimented material, together with a reduction of the P and N contents.