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## Environmental Sustainability of Cyprinid Rheophilic Fish Conservative Aquaculture

Jan Mazurkiewicz<sup>1, 2\*</sup>, Klaudia Łyczkowska<sup>2</sup>, Mateusz Rawski<sup>1, 2</sup>, Krzysztof Florczyk<sup>1, 2</sup>, Jan Banaszak<sup>1</sup>, Paula Skrzypczak<sup>2</sup>, Marcin Wiśniewski<sup>3</sup>

<sup>1</sup>Poznań University of Life Sciences, Experimental Station of Feed Production  
Technology

and Aquaculture in Muchocin, Muchocin 20, 64-400 Międzychód

<sup>2</sup>Poznań University of Life Sciences, Laboratory of Inland Fisheries and Aquaculture,  
Department of Zoology, Wojska Polskiego 71c, 60-625 Poznań

<sup>3</sup>Polish Angling Association, District in Poznań, Znanieckiego 9, 60-682 Poznań

\* Correspondence address: e-mail: jan.mazurkiewicz@up.poznan.pl

The environmental sustainability of aquaculture is the basis of most current research on aquatic nutrition, and its primary goal is to reduce the use of fish meal and oil. However, in most scientific works, this term remains in the sphere of discussion without its measurable assessment based on empirical results (Rawski et al. 2021; Stejskal et al. 2020). Therefore, in the presented work, an attempt was made to fill this gap by calculating parameters, taking into account the composition of the diet and the degree of its use. The studies were conducted with juveniles of three species of cyprinid rheophilic fish: chub, vimba and barbel, with an average initial body weight of  $9.6 \pm 0.1$  g,  $10.5 \pm 0.4$  g and  $7.9 \pm 0.3$  g, respectively. Each species was maintained in an experimental recirculating aquaculture system in 21 growth tanks with a net capacity of 400 dm<sup>3</sup> each. Fish meal and fish oil substitutes in feed were meals and fats obtained from the biomass of larvae of three insect species: *Hermetia illucens* (HI), *Tenebrio molitor* (TM) and *Zophobas morio* (ZM).

The environmental sustainability indicators of fish farming were calculated:

- relative consumption of fish meal, from the formula: FMU (g kg<sup>-1</sup> of fish mass) = share of fish meal in feed (g kg<sup>-1</sup>) x feed conversion factor (g/g)

- relative consumption of fish oil, from the formula: FOU (g kg<sup>-1</sup> of fish mass) = share of fish oil in feed (g kg<sup>-1</sup>) x feed conversion factor (g g<sup>-1</sup>)

- Fish in - Fish out Ratio, from the formula: FIFO = [(share of fish meal in feed (g kg<sup>-1</sup>) + share of fish oil in feed (g kg<sup>-1</sup>)) / (average weight of fish meal from catches (g kg<sup>-1</sup>) + average weight of fish oil from catches (g kg<sup>-1</sup>))] x (feed intake (g) / body weight gain (g)).

In the case of chub, 1 kg of feed resulted in an increase of 430 to 760 grams of fish biomass, with the level not worsening about fish meal remaining in the groups using insect meals, except for one – fed with a diet containing 150 g/kg of TM meal. On the other hand, using HI meals resulted in a statistically unchanged level of feed productivity, which increased with TM. In the case of vimba, the use of HI and TM meals and a lower share of ZM also proved to be a beneficial variant from the point of

view of feed efficiency. The only one that led to a deterioration of FCE was the variant containing 150 g kg<sup>-1</sup> of TM meal. The study conducted on barbel indicated an equal growth potential of the experimental feeds, except for the diet containing 150 g/kg of ZM meal, where it deteriorated. The obtained results open new perspectives on using insect larvae biomass meals in conservative aquaculture of cyprinid rheophilic fish.

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