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Environmental Impacts and Sustainability of Low-Value Roach Fish When Used as Food

Cleaner

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# 1 ENVIRONMENTAL IMPACTS AND SUSTAINABILITY OF LOW-VALUE

### 2 ROACH FISH WHEN USED AS FOOD

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#### Abstract

14 One of the major global environmental challenges is the overuse of nutrients and related 15 eutrophication problems. Specifically in Finland, the roach fish population is rapidly increasing in eutrophic water systems. Currently roach fish does not have economic value, and it is mainly 16 17 composted despite the fact that it could provide a direct protein source for human needs. This paper 18 assumes that new business could be established by removing roach fish from eutrophic water systems 19 and using them as a protein source for human consumption. Removing roach fish directly removes 20 nutrients and indirectly impacts the vicious cycle of eutrophication. This paper assesses different 21 environmental sustainability perspectives of roach fish removal and utilization. It also aims to present 22 different environmental impacts on the planetary boundary framework. The research is carried out 23 using life cycle assessment methodology.

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- Based on the results, the use of roach fish as a protein source would help in returning to a safe operational zone in biochemical flows. Phosphorous removal with roach fish is 5.8 (1.9-10.3) g kg<sup>-1</sup> while nitrogen removal is 28.4 (26.4-30.4) g kg<sup>-1</sup>. However, the production has also climate change impacts which are 2.9-5.2 kgCO<sub>2eq</sub> kg<sup>-1</sup> roach protein. Nevertheless, the climate change impacts are
- 29 12-57 times lower than positive impacts on eutrophication.
- 30 Different environmental impacts are assessed regarding whether or not they help to avoid crossing
- 31 planetary boundaries. Roach fish should be marketed especially for green consumers, and creating
- 32 new markets for roach fish could also help in eutrophic lake restoration projects. Additionally, new
- business could be created from nutrient offsetting by roach fish removal.
- Roach removal from eutrophic water systems and use as food helps in returning to a safe operational
- 35 zone in biochemical flows and the positive impacts are far greater than the negative impacts on
- 36 climate change from fishing and fish processing.
- 37 Key words: fish, life cycle assessment, carbon footprint, environmental impact, nutrient offsetting,
- 38 eutrophication

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