



Pikeperch (*Sander lucioperca*) used in growth trial with black soldier fly (*Hermetia illucens*) meal inclusion in experimental recirculating system © Vlastimil Stejskal

## SUMMARY

This output concerns the effect of fish meal replacement by black soldier fly (*Hermetia illucens*) in the diet of pikeperch (*Sander lucioperca*). Results indicated that a 50 % substitution of partially defatted black soldier fly meal can be used in pikeperch diets without negative effects on growth rate, feed conversion ratio and fillet yield. These results will be of particular interest to pikeperch farmers who wish to use insect-based meals as an alternative food source for their stock.

## KNOWLEDGE NEED

One of the major challenges that the aquaculture industry faces today is the availability of fishmeal and fish oil, which have fluctuating (high) costs and sustainability issues. There is a substantial need for alternative fish feed ingredients that do not deplete marine resources, and which produce healthy fish. Another related challenge is the limited knowledge of the nutritional requirements of most cultured fish species. Alternative ingredients in the fish's diet can lead to adverse effects, such as decreased digestion efficiency and increased susceptibility to diseases and stress. Much work is needed to ensure that aquafeeds utilising alternative ingredients can supply the same benefits as fish meal and fish oil, while maintaining high biological value and low competitiveness with human food. Optimum substitution levels for each fish species must also be established. One such alternative is insect-based meals, such as inclusion of black soldier fly (*Hermetia illucens*), for which the safe substitution level must be established for pikeperch.



Experimental recirculating system © Vlastimil Stejskal



## POTENTIAL IMPACT

- Partly substituting pikeperch diets with insect meal reduces the need for fish meal and oil, which are costly, volatile and unsustainable sources. This could lead to a more sustainable and competitive aquaculture sector.
- The findings contribute towards improving ecological and social sustainability of fish feeds, especially if applied to multiple species.

**EATiP - Strategic Research and Innovation Agenda (SRIA)** Thematic Area 4 - Sustainable Feed Production; Goal 1. To see the full list and descriptions of the thematic areas and goals, please visit: [eatip.eu/?page\\_id=46](http://eatip.eu/?page_id=46)

## UNDERLYING SCIENCE

Insects are a natural food source for many fish species. Farmed fish fed with insect-based meals often perform well, depending on the level of substitution. In this study, four levels of fish meal substitution by black soldier fly meal were applied to pikeperch diets: 0 % (control group), 25 %, 50 % and 100 %. The experimental trial lasted 84 days, and three replicates were performed per diet, each containing 50 fish.

The following performance and functions were monitored: growth rate, feed conversion ratio and fillet yield. The Shannon index in gut microbiota was also calculated. The Shannon diversity index (H) is used to characterise species diversity in a community. It accounts for both abundance and evenness of the species present.

## RESULTS

- Results indicated that a partially defatted black soldier fly meal can be used for up to 50 % of fish meal substitution in pikeperch diets without negative effect on growth rate, feed conversion ratio and fillet yield.
- 100 % fish meal substitution negatively affected pikeperch performance, feed conversion ratio and fillet yield.
- The use of *Hermetia illucens* meal induces microbiota changes enhancing microbial biodiversity indices in pikeperch intestines. An increase of Short Chain Fatty Acid (SCFA) producing bacteria was reported in fish fed *Hermetia illucens* diets.

## END-USERS & POTENTIAL APPLICATIONS

### END-USER 1: Pikeperch fish feed producers

**APPLICATION:** Developing and producing novel feed formulations based on alternative, safe and sustainable feed sources (insect meal) with high biological value and low competitiveness with human nutrition.

### END-USER 2: Pikeperch farmers

**APPLICATION:** Feeding of aquaculture fish stocks with more sustainable (and potentially cheaper) fish feeds while maintaining good production levels, leading to higher profits and reduced environmental impact.

### END-USER 3: Aquaculture marketing and lobby groups

**APPLICATION:** Supporting a sustainable, dynamic image of the aquaculture sector, working towards improving global food security while decreasing environmental impact.

### END-USER 4: Aquaculture research community

**APPLICATION:** Furthering knowledge relating to fish meal replacement and its effect on many aspects, such as growth, health, and taste of the final product, in pikeperch

and other fish species. This will support development of the aquaculture sector and contribute to increased levels of Technology Readiness, and aid progression towards commercialisation.

## STATUS

**Technology Readiness Level (TRL) 4 – the knowledge has been validated in a laboratory environment.**

**Further research is needed to:**

- Establish the precise, optimal *Hermetia illucens* substitution rate in pikeperch diets.
- Investigate further effects of the *Hermetia illucens* diet substitution on other crucial elements such as digestive organs and their tissues and microbiota composition.
- Understand changes in susceptibility to stressors under different diet compositions.
- Examine potential effects on the fish product, e.g. on texture, odour and taste.
- Perform feeding trials on a commercial scale (i.e. validated and demonstrated in an industrially relevant environment).

## AT A GLANCE

**TITLE:** Effect of black soldier fly meal inclusion on pikeperch

**KNOWLEDGE TYPE:** Scientific publication

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**STATUS:** Draft

**TNA FACILITY USED:** University of South Bohemia, Faculty of Fisheries and Protection of Waters, Institute of Aquaculture and Protection of Waters, Czech Republic

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**PATENTS OR OTHER IPR EXPLOITATIONS:** No