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Nofima
Norwegian Institute of Food, Fisheries and Aquaculture Research

Millennial Salmon – Implementation of novel ingredients in feeds for a sustainable salmon

"Millennial Salmon", NFR project #319987, investigates new ingredients closest to commercialization (insects and microalgae) for use in salmon feed and how these can contribute to creating a more sustainable salmon industry

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Background

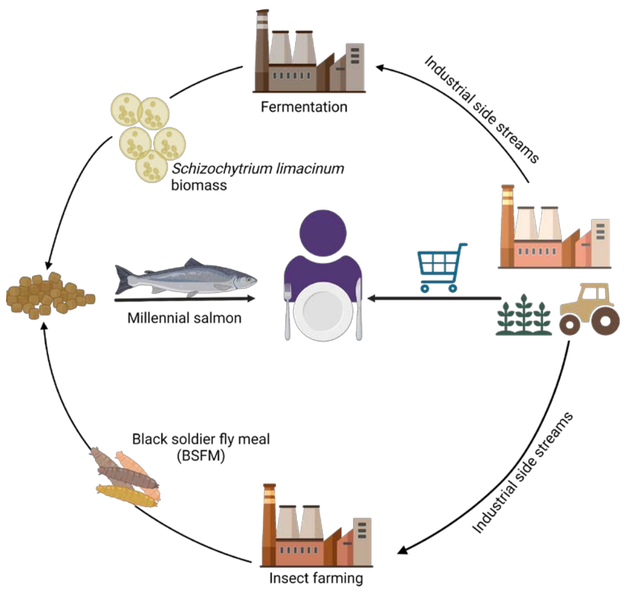
The aquafeed industry has the last decades shifted towards **alternative ingredients** to replace fishmeal and fish oil due to **resource concerns**. The aquaculture today is developing to be more **sustainable** through selection of circular and low trophic ingredients. The Millennial Salmon project, a collaboration among leading European organizations, focuses on utilizing **innovative**, novel sources like **DHA-rich microalgae** and **protein-rich insect meal**.

MILLENNIAL SALMON

"Aims to create a knowledge based sustainable product that answers to modern millennial principles of life, considering technoeconomic, animal welfare, environmental and societal aspects as a whole"

Project Implications:

- ✓ Provide downstream processing and extrusion technology solutions
- ✓ Establish effects of diets low in EPA on large salmon in the sea fed DHA-rich microalgae
- ✓ Identify potential functional effects of insect meal on fish growth, health and welfare
- ✓ Develop Life Cycle Assessment (LCA) and go-to-market strategy for the Millennial Salmon value chain



Focus group* survey for Millennial salmon

- ✓ Despite negative perceptions of salmon farming, **consumers** paradoxically continue to **consume farmed salmon**
- ✓ **Limited awareness** among respondents regarding **salmon production processes**, with an interest in learning more about feeding methods
- ✓ Consumers question the impact of **insect diets on fish** health and nutrients but are **open to accepting** them for a more **sustainable production cycle**
- ✓ **Consumers** had an overall **positive perception of algae** as a **sustainable** feed option

* Study conducted by Auchan in France (total of 24 participants)

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Innovafeed - Hilucia™ Protein for Salmonids


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- ✓ Downstream processing steps to improve the quality of black soldier fly larvae (BSFL) meal.
- ✓ **Nofima salmon parr trial** → Feeds with 3 different stickwater inclusion levels (water fraction during processing) were tested in salmon parr at 10% **BSFM** diet inclusion.
- ✓ **Nofima salmon post-smolt trial** → Dietary mixture design with **BSFM** meal (0-20%), fish meal and soy protein concentrate were tested in salmon post smolts.

Details are presented Aug 28, 10:15 at AUD15 – Black soldier fly larvae meal in feeds to Atlantic salmon (Salmo salar) in freshwater and seawater

Corbion Algaprime™ DHA LS (Microalgae)


© Corbion

Algaprime™ DHA LS microalgae oil suspension with plant oil (particle size <200 µm)

- ✓ **Feed technical study** → All trial feeds had a pore size distribution with a potential for high inclusion level of **Algaprime™ DHA LS**

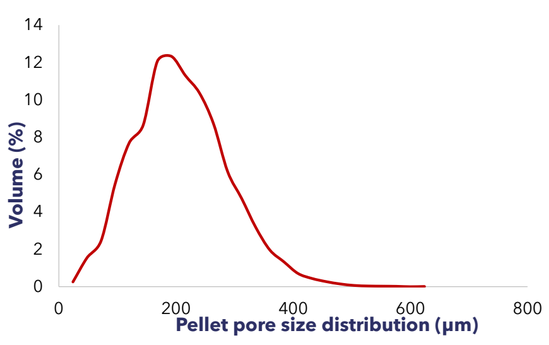

Fig1. The pellet pore sizes, measured with CT-scanning, is large enough to adsorb high amount of **AlgaPrime™ DHA LS** in the coating step.


Helge Skodvin © Nofima

Fig 2. Pellet hardness testing at Nofima's Aqua Feed Technology Centre performed by Tor Andreas Samuelsen

Mechanical treatment through extrusion have been reported essential for optimal *Schizochytrium* sp. digestibility in salmon feeds

- ✓ **Nofima salmon trials** → **Algaprime™ DHA LS** show similar digestibility either added prior to extrusion or oil coated
- ✓ **Mowi sea cage trial** → **Algaprime™ DHA LS** can substitute 100% of the fish oil in feeds to salmon (0.6-3.5 kg) without adverse negative effects on fish performance, feed intake, digestibility, health or filet quality
- ✓ End-product DHA content (sea cage trial) increased (**Labeyrie Fine Foods**), and lower intensity of fish flavour (**Nofima sensory panel)** with increasing **Algaprime™ DHA LS** use


© Labeyrie
Salmon Fillet: 100% Fish Oil


© Labeyrie
Salmon Fillet: 60% Fish Oil Replacement with Algaprime™ DHA LS


© Labeyrie
Salmon Fillet: 100% Fish Oil Replacement with Algaprime™ DHA LS

Funding industrial partners:
- MOWI
- Cargill
- Corbion
- Innovafeed
- Auchan
- Labeyrie Fine Foods

Research institutes:
- Nofima
- Sintef Ocean

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For more information about the project, visit: millennialsalmon.org