The nutritional needs of salmon and new feed resources
Defining the limits for what can be used as raw materials in salmon feed

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EWOS Innovation
Approach

• Inside EWOS salmon feed today.
• Focus on «marine Omega 3».
• Innovation in raw material testing.
• Summary.
Nutrient requirements of Atlantic salmon

- Proteins (amino acids)
- Fat (fatty acids)
- Energy
- Micronutrients (vitamins, minerals, pigments)
EWOS global feed sales and use of marine ingredients
Raw material basket?

TODAY

• fish meal
• fish oil
• soya protein conc.
• wheat gluten
• sunflower meal
• pea protein concentrate
• faba beans
• rapeseed oil

marine ingredients

plant ingredients
Marine Omega 3 value chain
EPA + DHA

Major source of Omega 3 today is fish oil.

Competition from nutraceutical industry means potential shortages in the future.

Biological requirement of Atlantic salmon is low at approx. 1% diet.

Omega 3 is important for human health.
2 servings of fish per week (American Heart Association)

250 mg EPA + DHA/day (EFSA)

Consumer

Marine Omega 3 EPA + DHA

Fish oil
- Responsibly sourced
- Sustainable
- Monitoring of undesirables

Salmon feed
- Nutrient Require ca. 1%/ diet
- Omega 3 =7.5%/ dietary fat
- 31% added oil/ feed
Salmon is a more efficient vector!

1 tonne fish oil containing 300kg EPA+DHA yields

2.8t salmon fillet containing 78kg EPA+DHA
and 1.85t salmon by-products containing 96kg EPA+DHA

0.05t refined oil containing 45kg EPA+DHA
and 0.95t waste oil for fuel or fertiliser

Marine Omega EPA + DHA
Adapted from Ytrestøyl et al. 2011.
Marine Omega 3 basket?

- Fish oil

FUTURE

- Better utilisation of discards & trimmings
- Unexploited marine resources
- Krill
- Algae
- GM plant oil
EWOS Innovation approach

1. Raw materials

2. Feed

3. Fish trials
Fish trials screening

- Start feeding fish
- Fast: 6 weeks
- Output: growth & survival.
- Performance is rated against a reference feed.
- Fish health & welfare
- Assessment of intestine structure.
Virtual fish research project

- Raw materials
- Small fish screening
- Data Modelling
- Commercial application

Tools & Checkers
Zero marine ingredients trial

![Graph showing weight gain (g) across different treatments: Ref-1, Exp-1, Ref-2, Exp-2. Treatments include Marine + Plant (Fish meal 30%), Plant, Marine, Plant, Animal By-product (Fish meal 20%), and Plant, Animal By-product.]
Summary

- Salmon feed today is using less marine ingredients.
- The challenge is the limited availability of fish oil (marine omega 3) going forward.
- EI has excellent know how – recently demonstrated in the Zero marine trial.

- Optimising nutrient use
- Wider raw material basket
Knowledge makes the difference

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