



Sustainability through Innovation: an Aquafeed Industry Perspective

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September 2017

Skretting - a global aquafeed company



2,900 employees

> 2 million tonnes of feed

Production in 18 countries



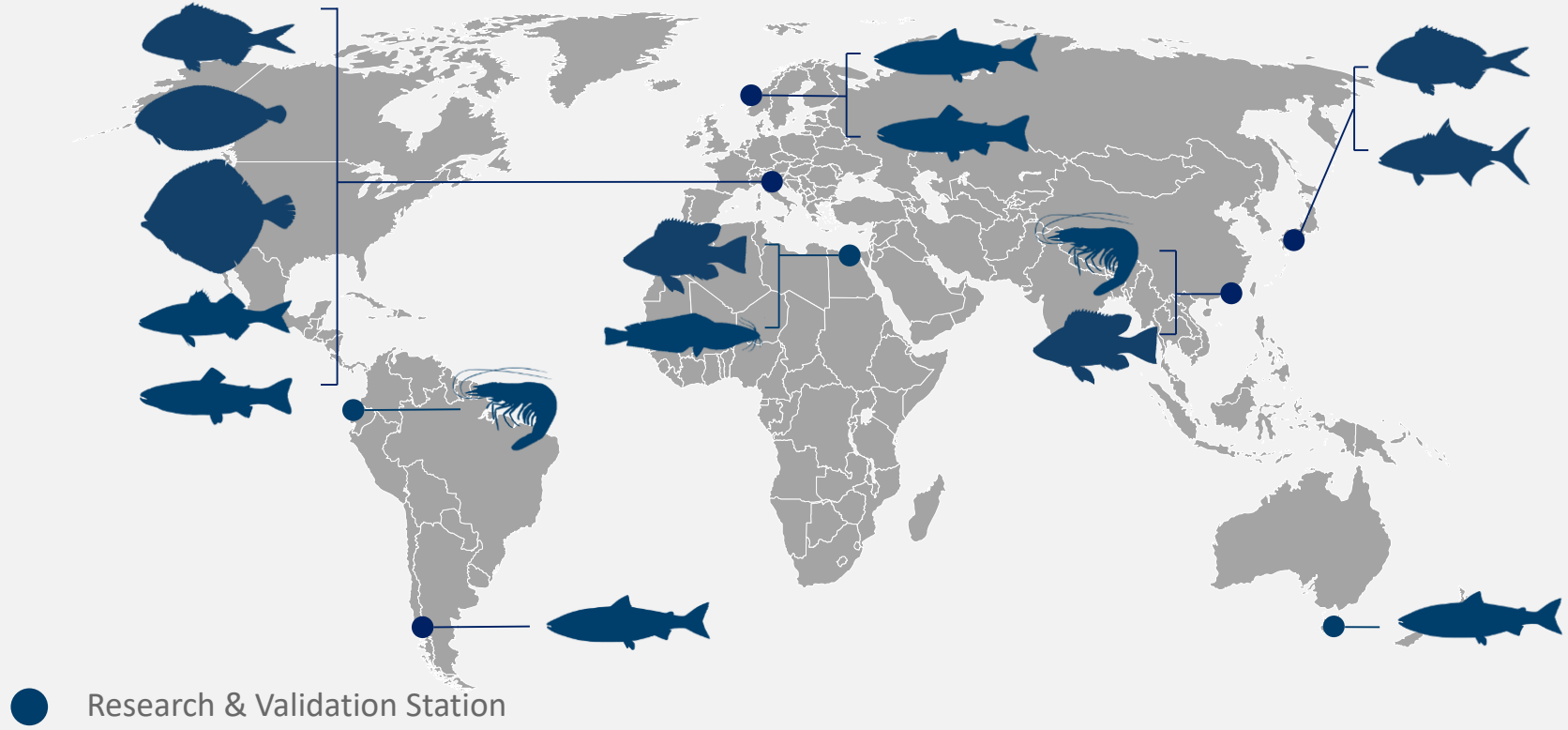
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SKRETTING

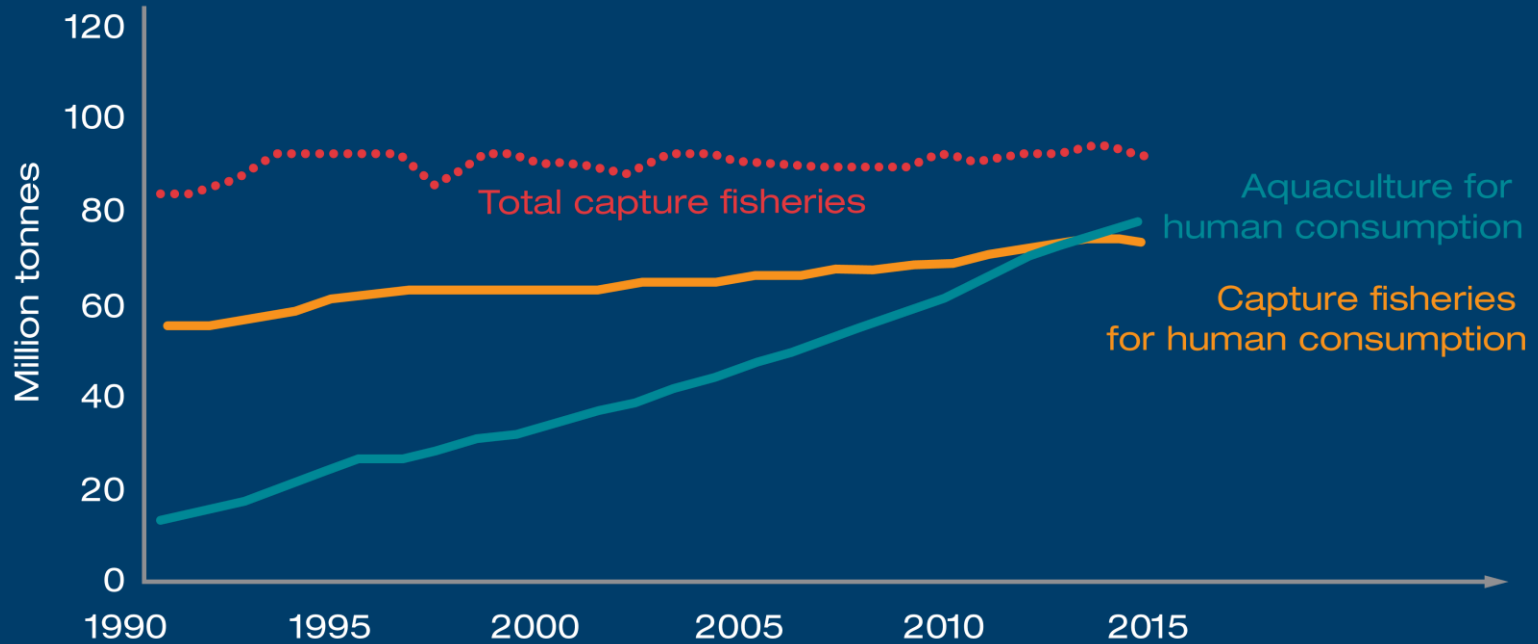
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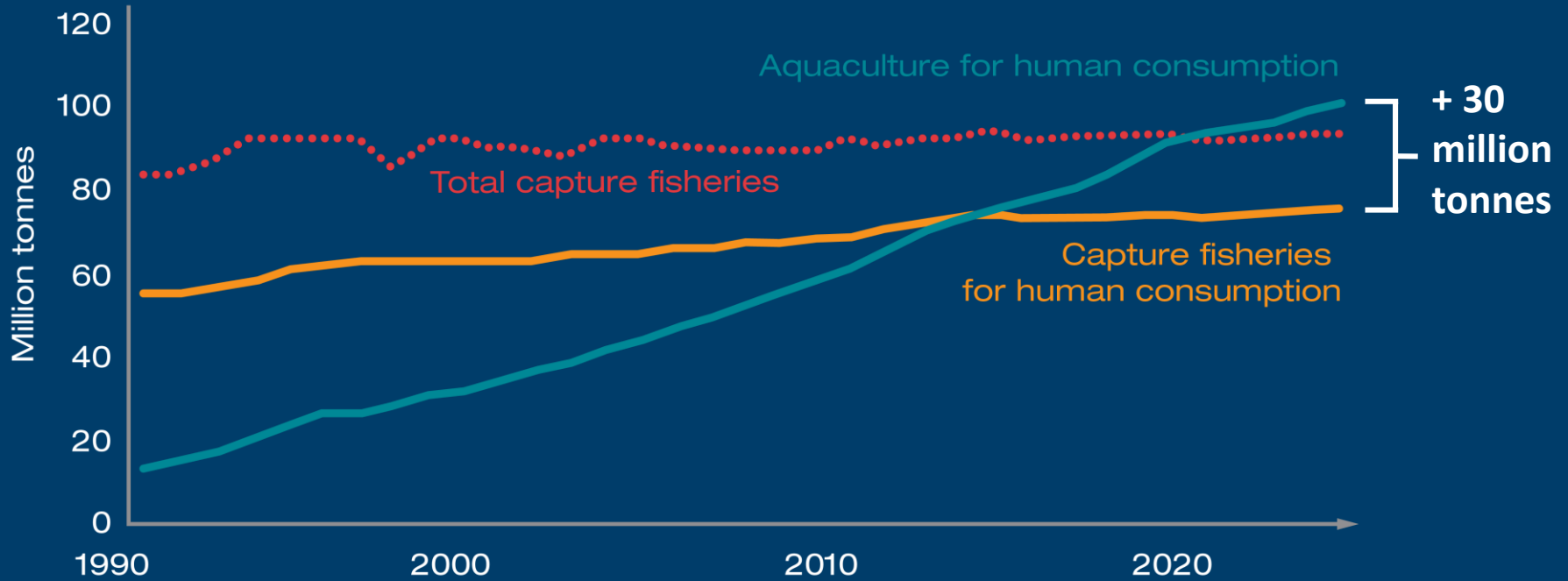
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Aquaculture: a success story







As an industry, we are facing some challenges...



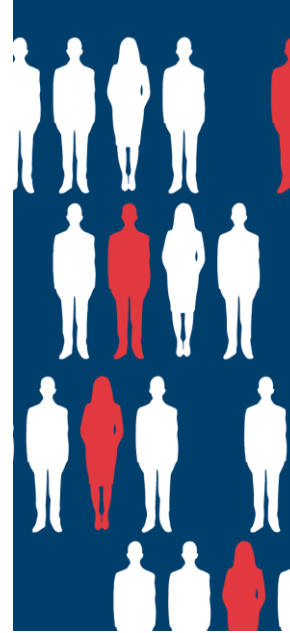
Pollution from farms



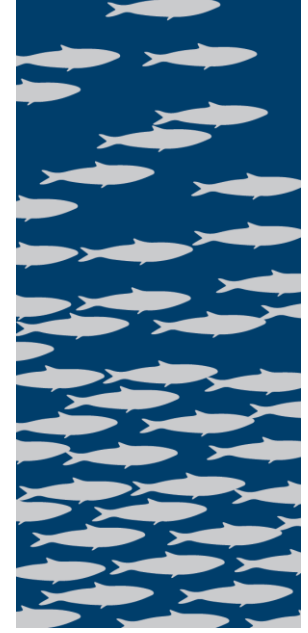
Destruction of Habitat



Antibiotic use



Consumer health



Pressure on wild fisheries

KFC Criticized Over Suppliers in China



The Wall Street Journal, 2013

Bloomberg Sign In

Costco Sued Over Claims Shrimp Harvested With Slave Labor

Bloomberg, 2015

REUTERS

Reuters, 2016

Life | Wed Jun 1, 2016 2:08pm EDT Related: HEALTH, ENVIRONMENT

Chile court orders salmon farms antibiotic use be disclosed

SANTIAGO | BY ANTHONY ESPOSITO

Fast food companies facing fight to win trust of millennials

Those born between 1980 and 2000 are big spenders, but McDonalds and others will fail to win their custom if things don't change



The Guardian, 2015

NIKKEI ASIAN REVIEW Sort by Region

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April 22, 2016 12:00 am JST

Thai seafood industry face EU ban as talks fail

Reuters, 2016



Why do we need to be independent from marine raw materials?

They are finite.



Knowledge is the key

Modern nutrition is about **digestible nutrients**,
not specific raw materials



Fish meal

High protein

**Balanced amino
acid profile**

High fat

Good fatty acid profile



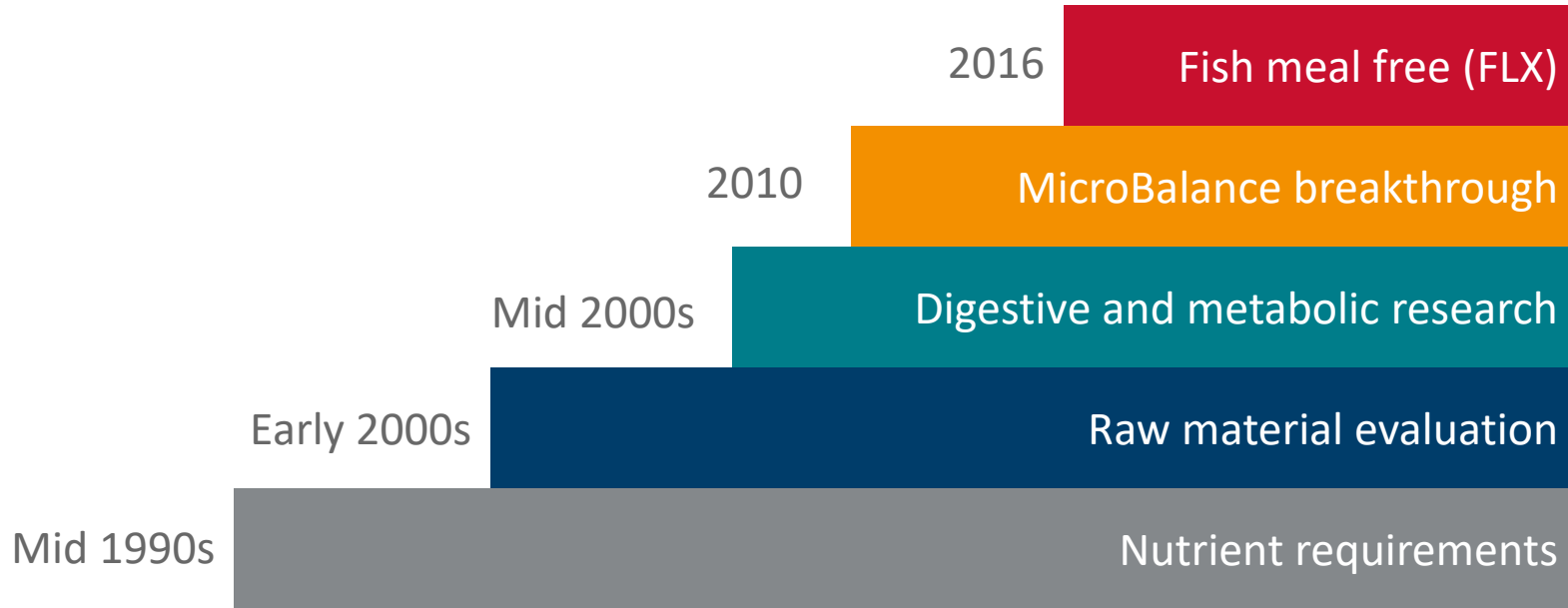
No antinutritional factors

Functional nutrients

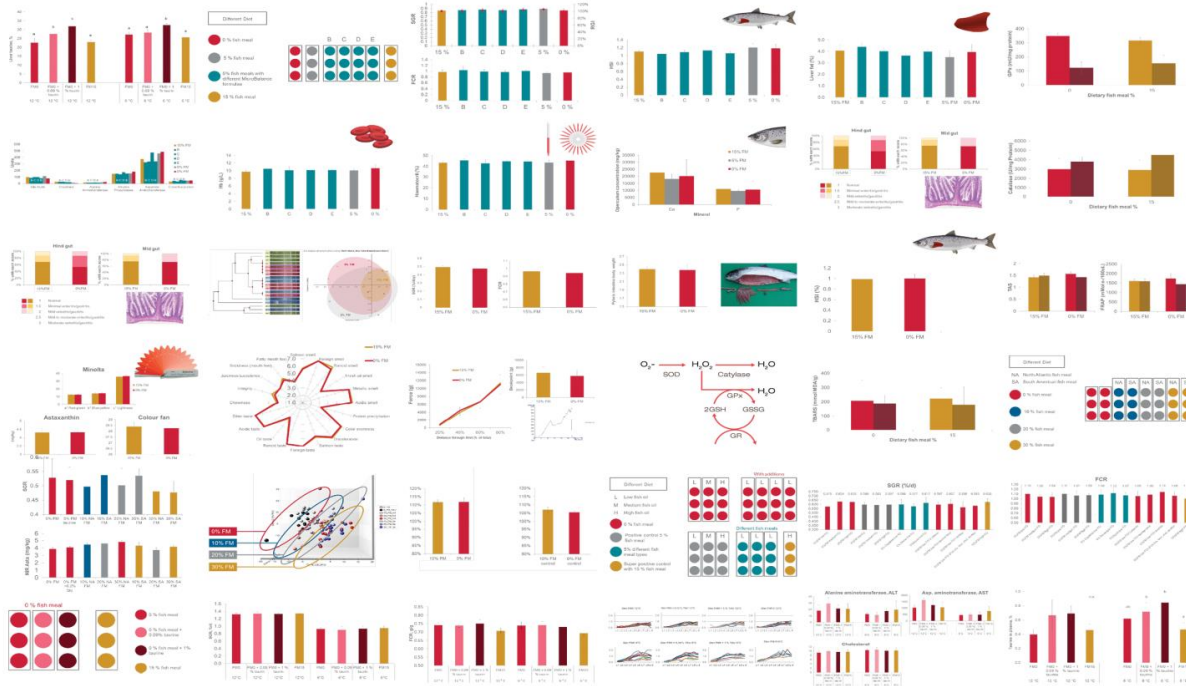
**Contains phosphorus and
other minerals**

Good palatability

Research on fish meal



MicroBalance® FLX



Fish oil

**Natural source of
omega-3 fatty acids
EPA and DHA**

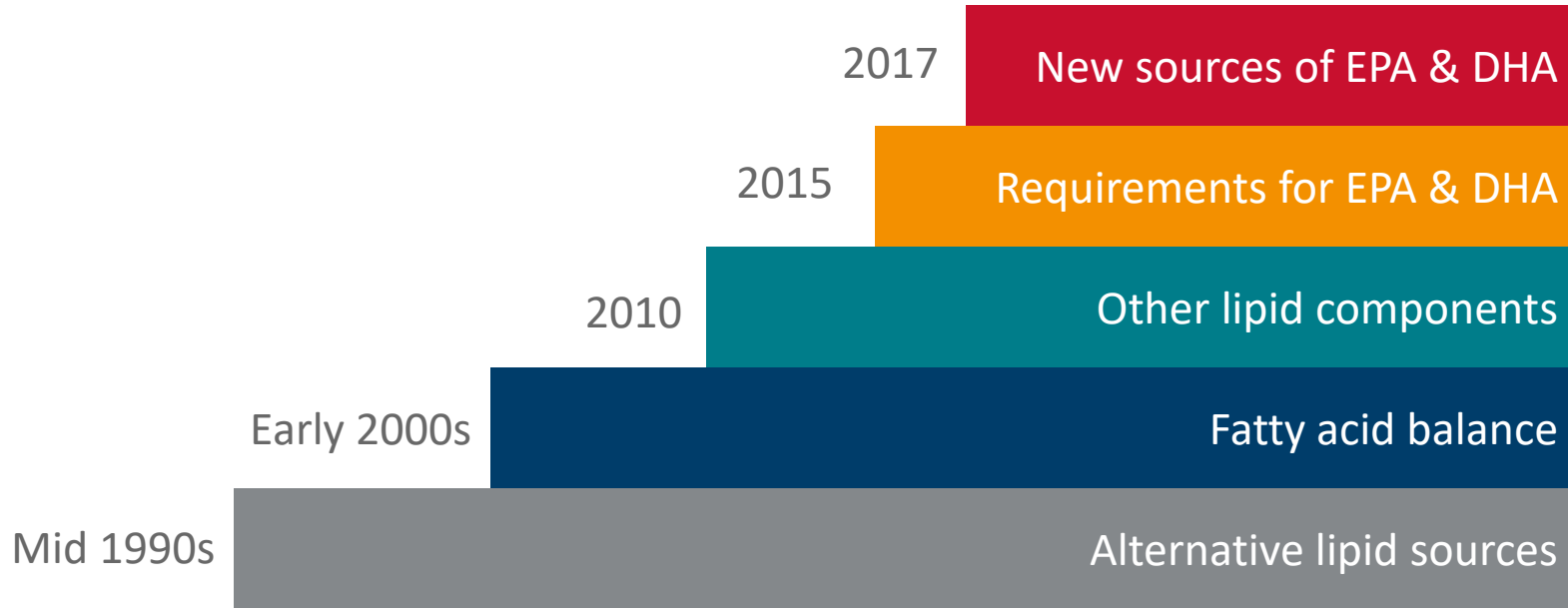
Good digestibility



**Good energy to support
growth**

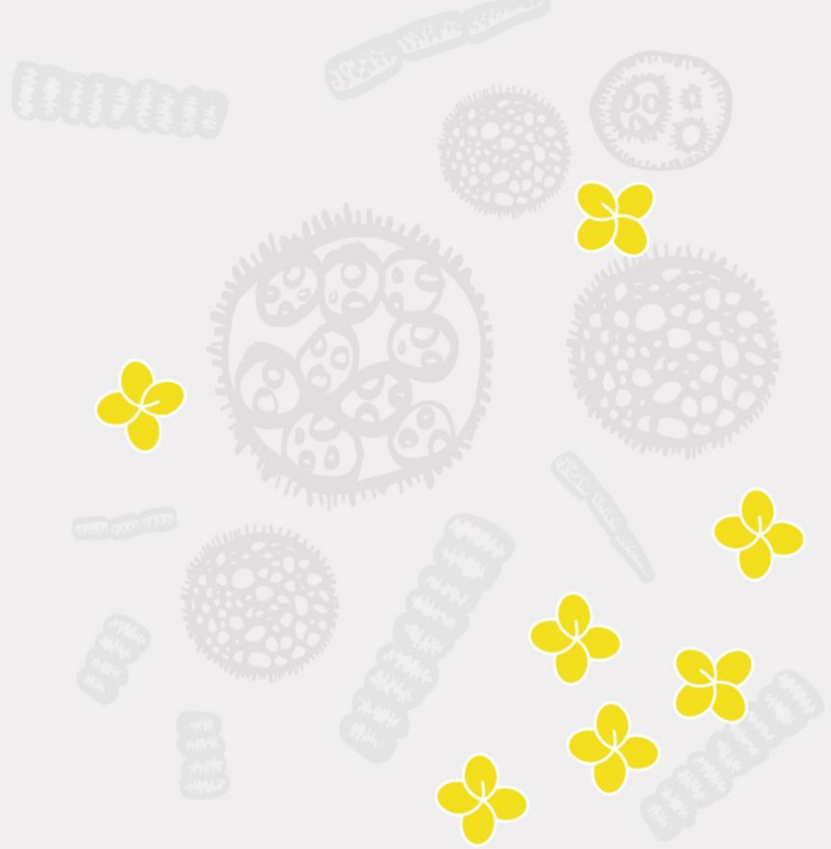
Good palatability

Research on fish oil



Fish oil replacement

- **New EPA & DHA sources - today**
 - Algae meal (only DHA)
 - Algae oil (EPA & DHA)
- **New EPA & DHA sources - tomorrow**
 - GM vegetable oils



Fatty acid model

Diet nutrition

Protein
Fat
Energy
AA-profile
FA-profile ...

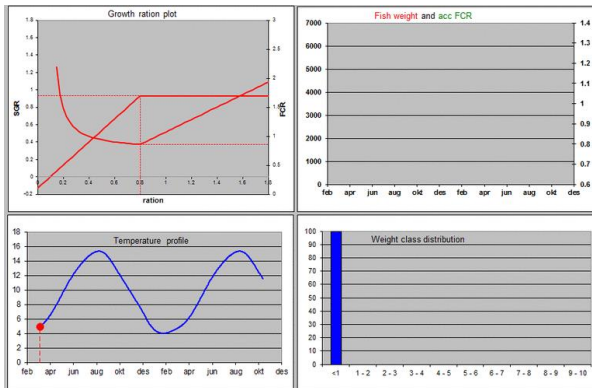
Fish farming

Stocking
Feeding
Handling
Harvesting ...

Environment

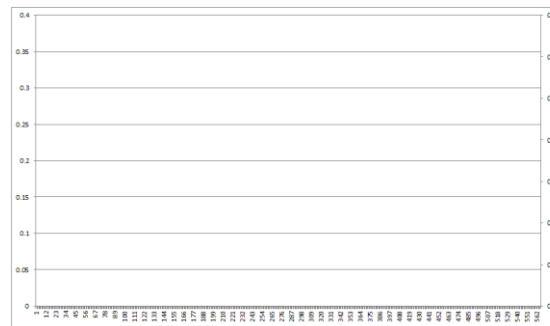
Temperature
Oxygen
Season
Latitude ...

Mathematical models for:
Growth, Feed Conversion, Feeding,
Mortality, Feed volumes, Size distribution



Fatty Acid Pathways

Elongation, Saturation, Retention, Consumption



FA profile in fish

C14:0
C16:0
C16:1n-7
C16:2n-6
C18:0
C18:1n-9
C18:1n-7
C18:2n-6
C18:3n-3
C18:4n-3
C20:1
C20:4n-6
C20:4n-3
C20:5n-3
C22:1
C22:5n-3
C22:6n-3
C24:1n-9

...

We are not alone - an industry effort

- Many projects with leading institutions
- EU Projects:
 - RAFOA – €4m
 - AquaMax – €16m
 - ARRAINA – €8m
- Support from National Research Councils: NFR; FHF; BBSRC; NERC; CNRC; CORFO; Innova Chile

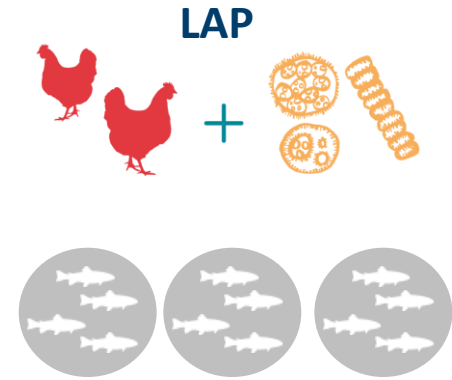
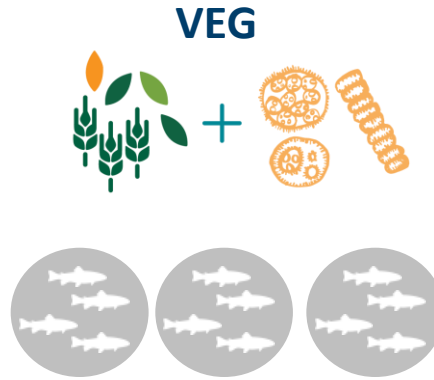
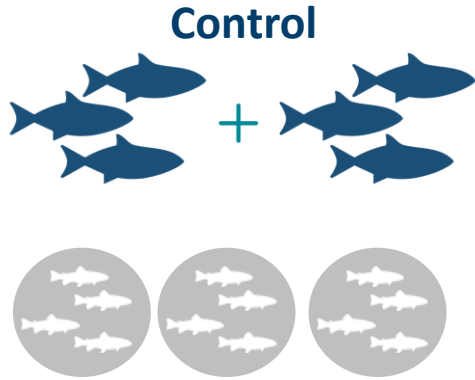


RAFOA



Zero-zero

Experimental design



1021 g

3326 g

5862 g

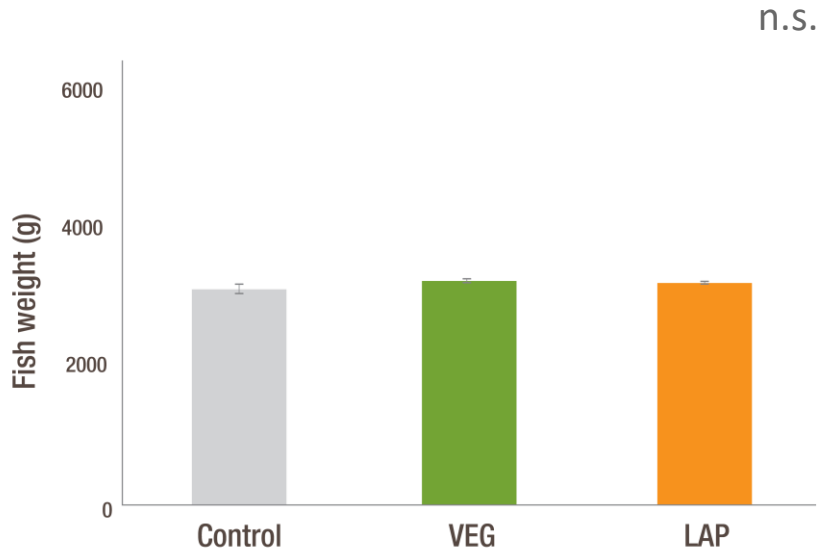
▲
Sampling 20 weeks

▲
Final sampling 38 weeks

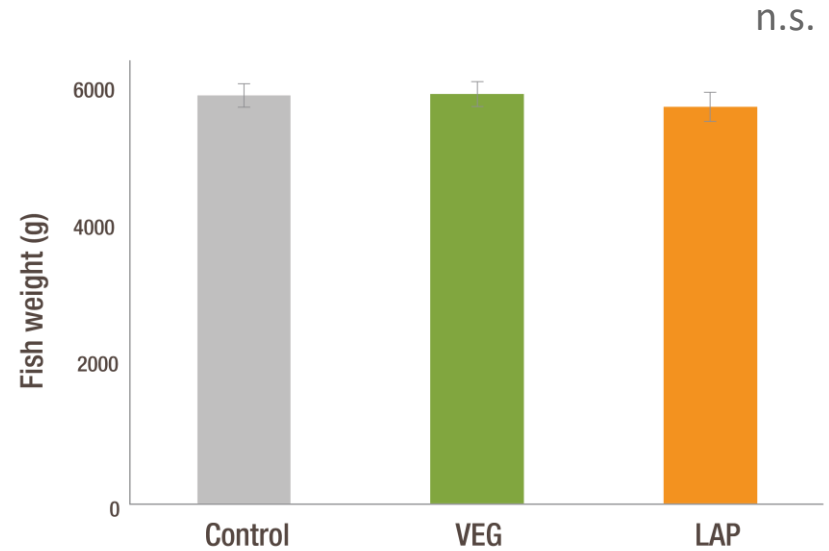
VEG = Vegetable protein
LAP = Land animal protein

No differences in performance (growth, feed intake, FCR)

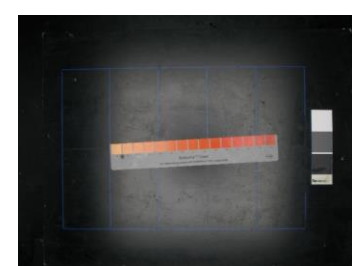
Intermediate weighing (20 weeks)



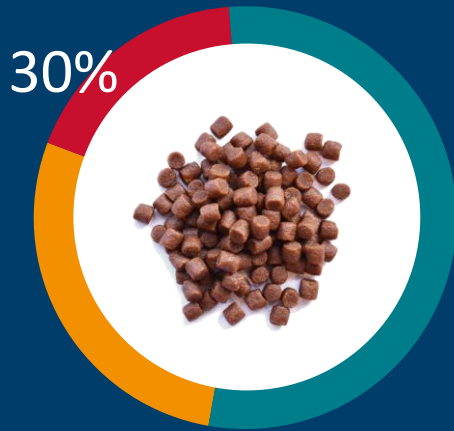
Final weighing (38 weeks)



Sensory evaluation



20 years ago...



Yesterday...



Today...



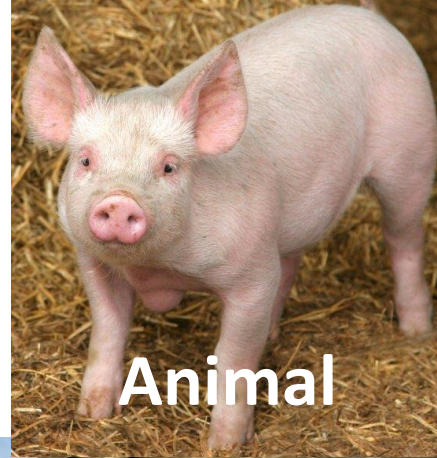
 Fish meal

 Fish oil

 Alternatives



Vegetable



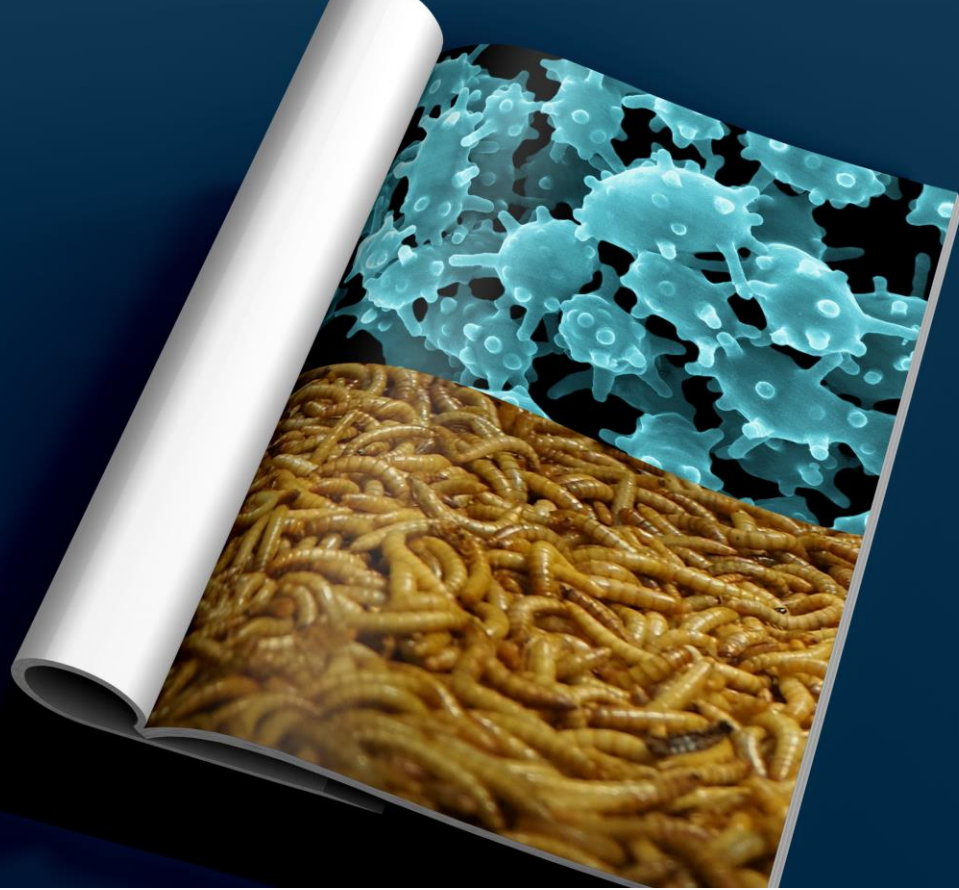
Animal

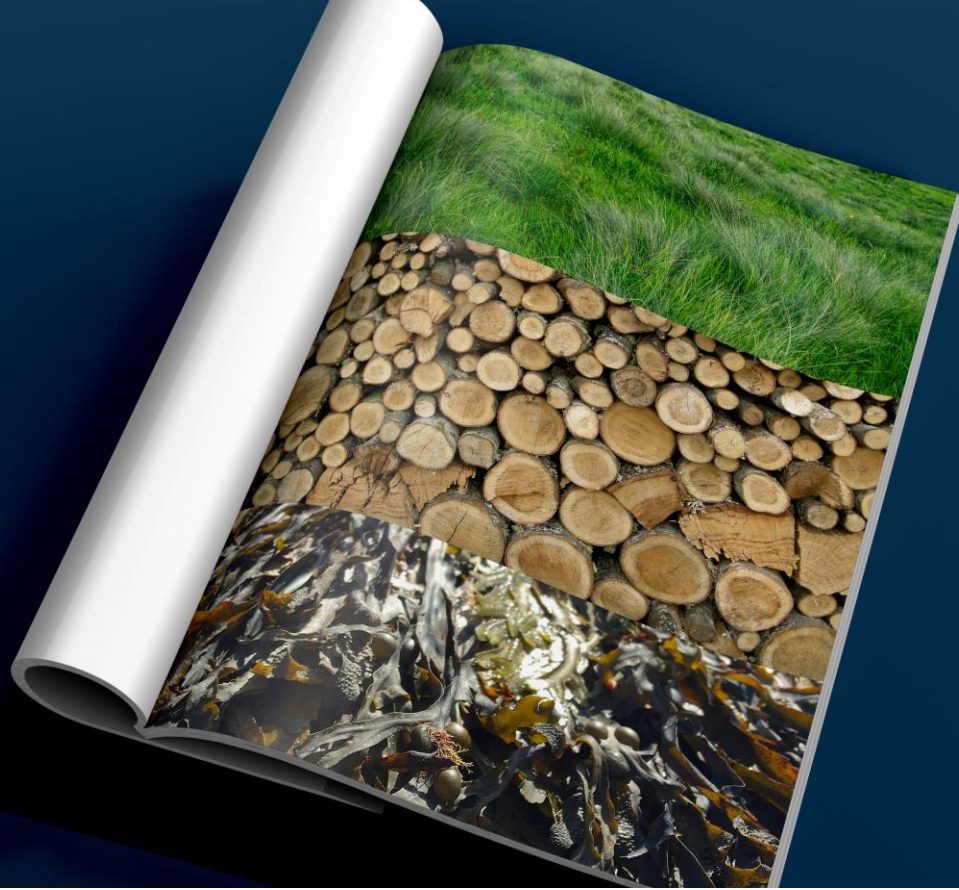


Today's raw materials

The future?











**CURIOSITY IS
OUR PASSION**