



Nofima

Norwegian Institute of Food, Fisheries
and Aquaculture Research

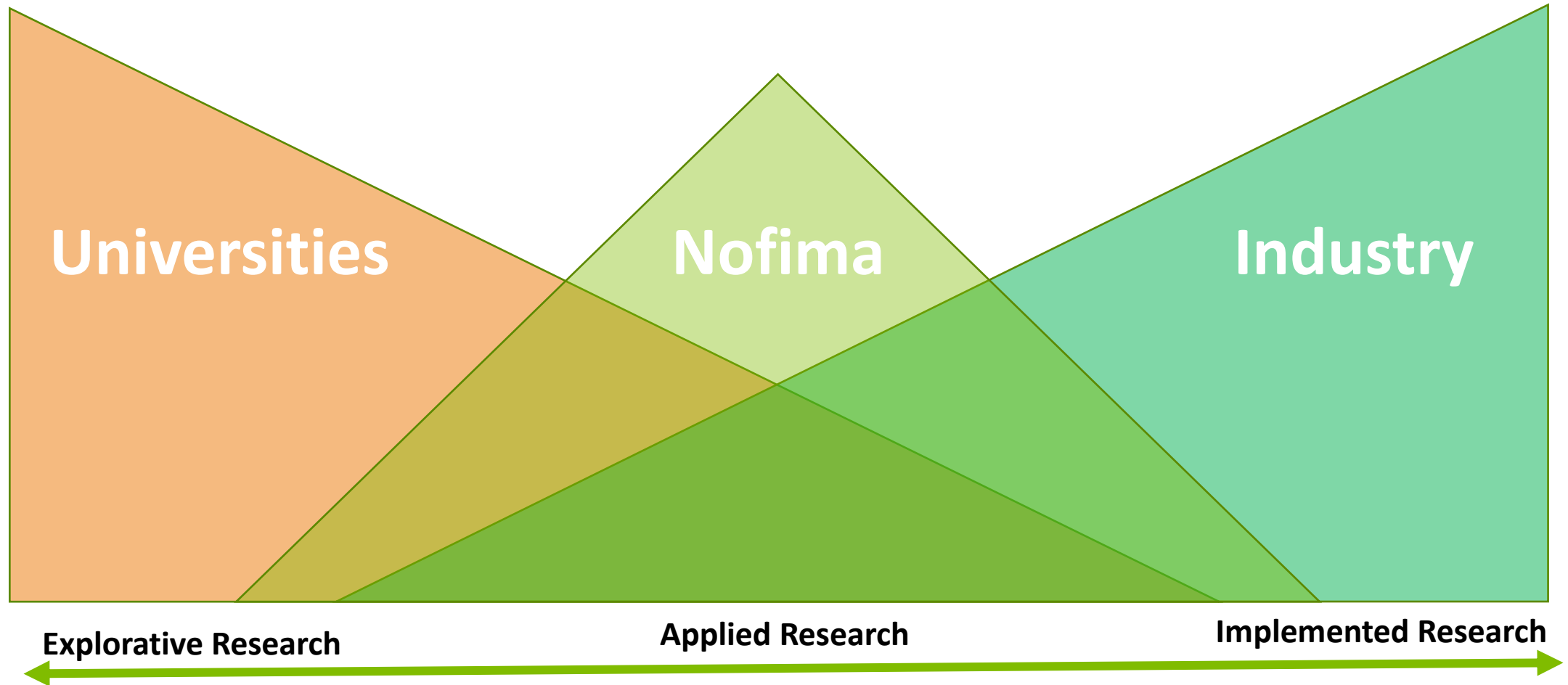
Salmon blood – a diamond in the rough

12/10/23 AG fish workshop



Runar Gjerp Solstad
scientist

A good innovation system



Facts about Nofima



602

projects in which
Nofima is
engaged
in 2022



32

customers
from different
countries



397

employees
60 % women and
40 % men
165 have a PhD.



707

turnover
Million NOK
in 2022

Division Aquaculture

- Breeding and genetics
- Fish health
- Nutrition and feed technology
- Production biology





Division Food Science

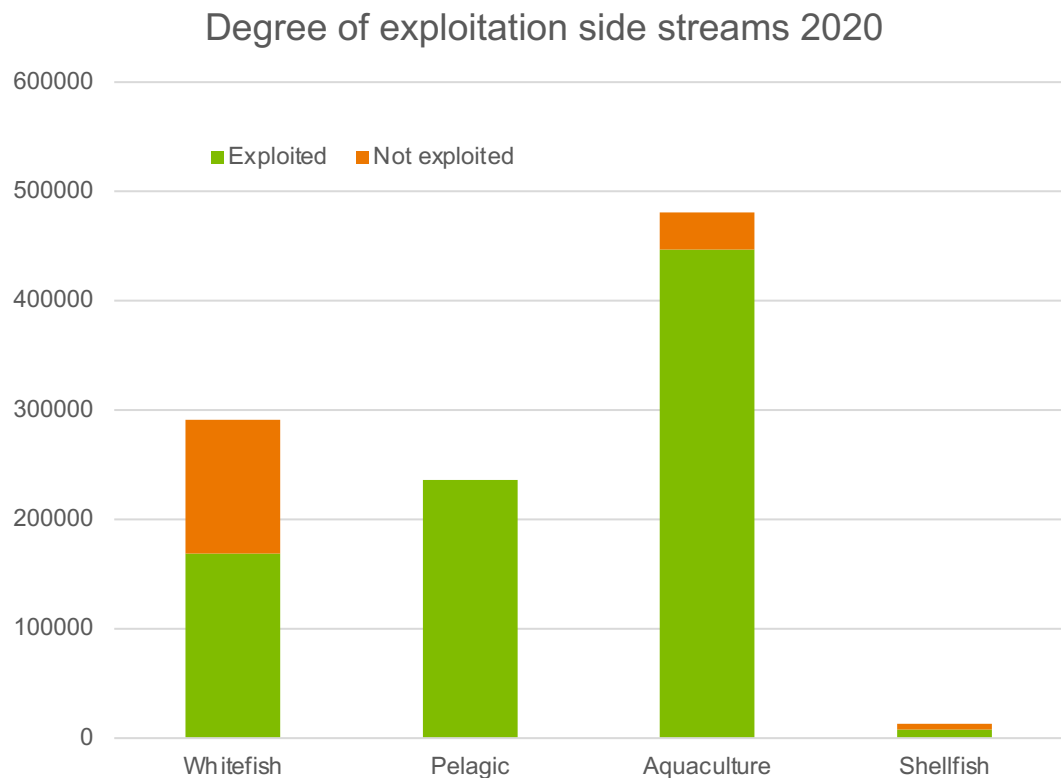
- Innovation, consumer and sensory sciences
- Food and health
- Food safety and quality
- Raw materials and process optimization



Division Seafood

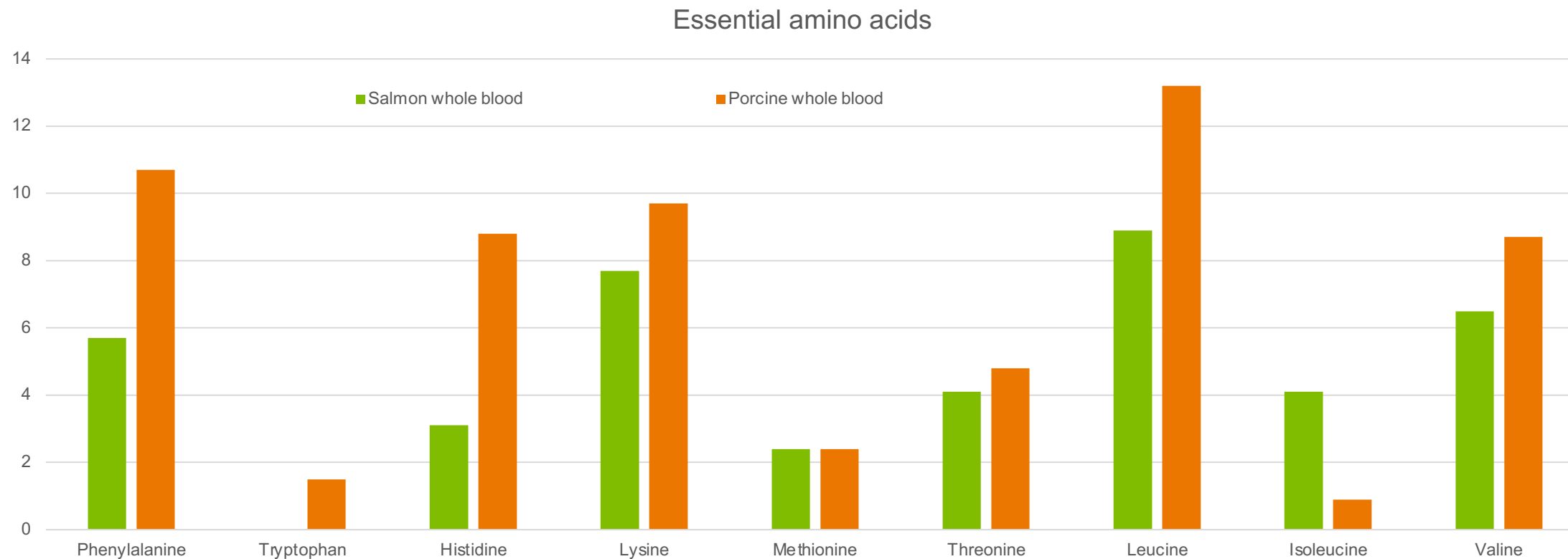
- Seafood industry
- Marine biotechnology
- Processing technology
- Industrial economics
- Marketing research

Salmon blood - availability



- Only resource unexploited
- 450,000 metric tonnes side stream
- 50,000 metric tonnes blood
- silage

Salmon blood – amino acids



Salmon blood – Vitamins

Beta-carotene	mg/kg	<0.15
Beta-carotene as retinol equivalents	mg/kg	<0.03
Biotin	mg/kg	<0.02
Vit. A (Retinol)	iu/g	<5.00
Vit. B1 (Thiamine)	mg/kg	0,98
Vit. B2 (Riboflavin)	mg/kg	1,14
Total Vit. B3	mg/kg	13,3
Vit. B5 (Pantothenic acid)	mg/100g	1,7
Vit. B6 (Pyridoxine)	mg/kg	1,01
Vit. B9 (Folic acid)	mg/kg	<0.20
Vit. B12 (Cobalamin)	mg/kg	0,079
Vit. C	mg/kg	<10.0
Vit. D3 (Cholecalciferol)	iu/g	2,31
Vit. E	mg/kg	<5.00
Vit. K1	µg/100g	3,8
Vit. K3	µg/100g	<0.010

- Vit. B's, D3, K1

Iron



Lessons learned

- Control the supply chain
- Purification
- Water removal



So you've come this far...

Scaleup process

- Biotech process facility
- Operation 24/7/5
- Set rate + variables
- Mitigate risk



Some Q's for us to A

- What do you think are the upcoming and most developed ingredients from sidestreams?
 - Proteins and lipids always
- What is the current use of sidestreams from aquaculture in your company / country / ?
 - Primarily silage for animal feed. Blood is only sidestream not utilised
- Which knowledge gaps do exist for sidestream utilisation including e.g., logistics, storage, current laws and rules?
 - Novel food legislation and safety assessment is perhaps main obstacle
 - Early fractionation
- is there a current market for sidestreams? And if yes, what and where
 - Unsure (not my area) but hopeful
- how can new ingredients from sidestreams best be fast-tracked to market?
 - Mainly legislative hurdles



Thank you for your
attention

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