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NATURAL RESOURCES INSTITUTE FINLAND

Health and welfare from underutilized fishes

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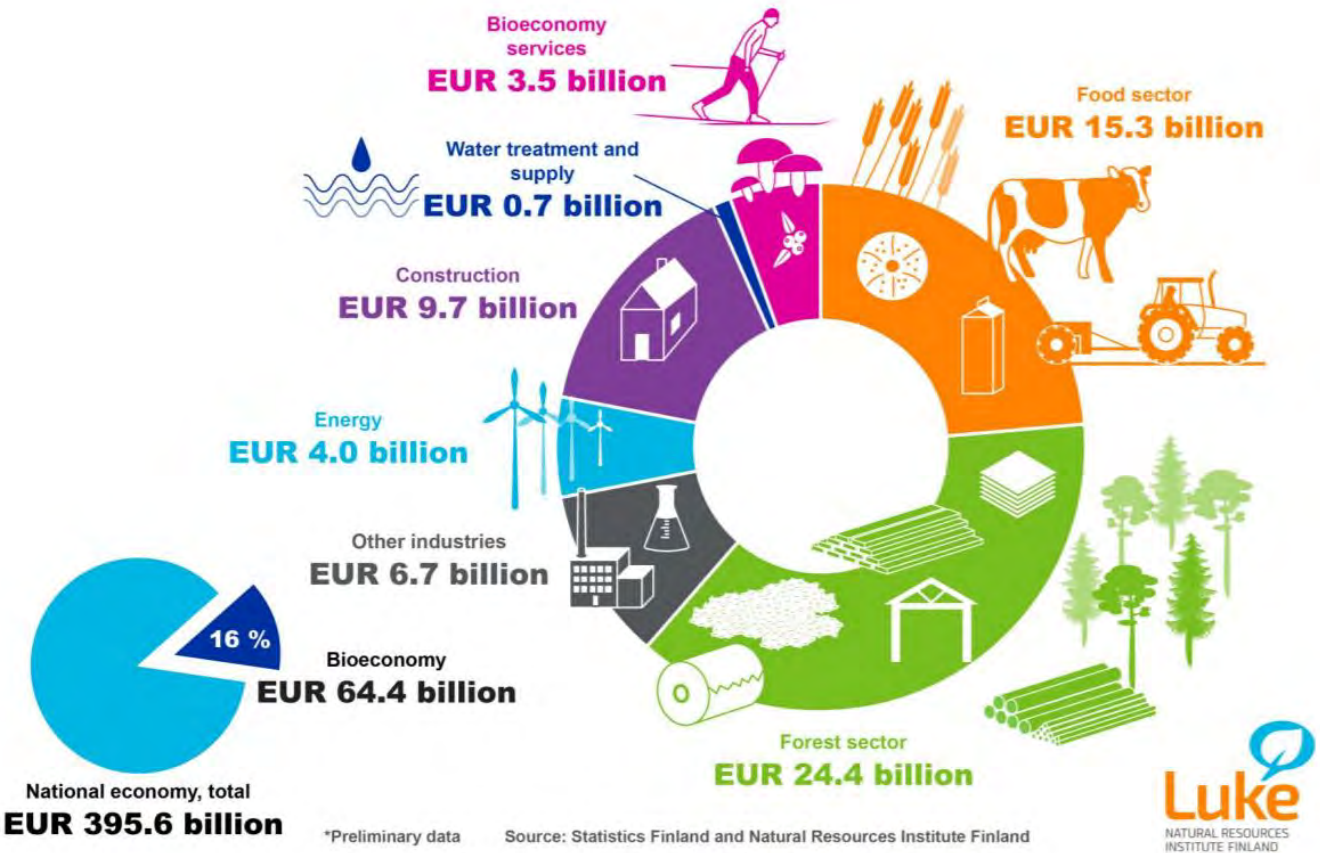
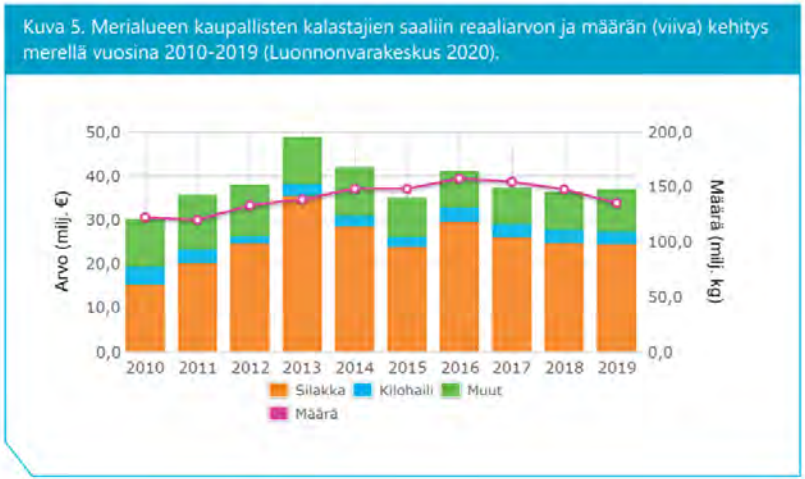
Blue Platform: Mapping perspectives of the blue bio-economy in the Baltic States
Online webinar 26.11.2020

Bioeconomy in Finland



More value for the fish catch by quality improvements and new products



Fisheries Sector Review 2020
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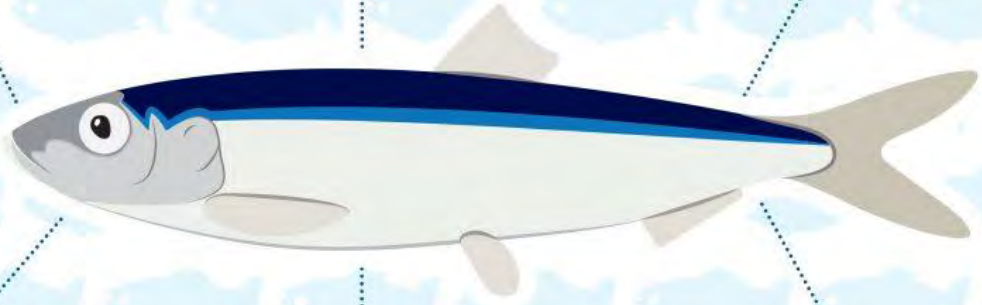
- Baltic herring comprises the major part of the value of commercial fish catch in Finland
  - Only few percentages are used for food
- In 2019, the price of food quality Baltic herring continued to rise:
  - 2019 price 0.32 € / kg
  - 2018 price 0.27 € / kg
- The price of industrial fish, which ends up as feed, decreased slightly from 2018
- By increasing the quality, a larger proportion of Baltic herring and sprat catch could be used as food
- Non-food quality fish catch could be refined also into high value special products

It's a fishy business!

SKIN
- cosmetics
- gummy bears
- leather products

SCALES
- help to prevent blood clots
- protection for plant seeds
- car paint coatings

FISH WASTE
- animal feed
- biodiesel or biogas



PROTEINS AND PEPTIDES
- protein supplements

OIL
- dietary supplements

BONES
- fertilisers

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Our aim is to increase the value of domestic fish, especially by developing new high value applications. Special focus is on *Baltic herring, sprat, roach and bream*. The aim is to transfer or develop technology and methods that are suitable for Finnish conditions to make full use of fish (food, nutraceuticals, food supplements and cosmetics).

Rest raw materials from Finnish fish industry (tons)

Setälä & Svanbäck 2018

Product/Species	RBT	S	BH	Other	Sum
Frozen file	3 300	1 315	596	238	5 449
Fresh file	8 297	15 795	2 874	1 508	28 474
Other fresh	4 993	4 888	60	954	10 895
Salted	558	252	27	45	882
Smoked	3 748	1 702	13	1 050	6 513
Cold smoked	1 699	439		5	2 143
Other	43	71	107	52	273
Sum	22 638	24 462	3 677	3 852	54 629
Side streams	8 675	7 032	2096	1965	19 768

Jari Setälä/Luke

Under-utilized fish species

e.g. Baltic herring, sprat, roach, bream

Process development towards new products

Fish side streams

Hot water extraction and separation

Gelatin/collagen hydrolysate

70-93 €/kg

https://www.fitnessfirst.fi

Enzymatic hydrolysis and separation

Oil

40-90€/1000 ml

https://www.tujoma.fi/tujoma-tuotteet/

Protein hydrolysate

Bioactive peptides for nutraceuticals
604-730 €/kg

Protein hydrolysates for food

Minerals

Calcium supplements for humans and pets
260-320 €/kg

https://biomer.com/ossomer-calcium-supplement

From fish skins:
gelatin yield 9-14%
hydrolysate yield 12-20%

Pilot testing (Meatco + Bodec, The Netherlands)
Baltic herring scales

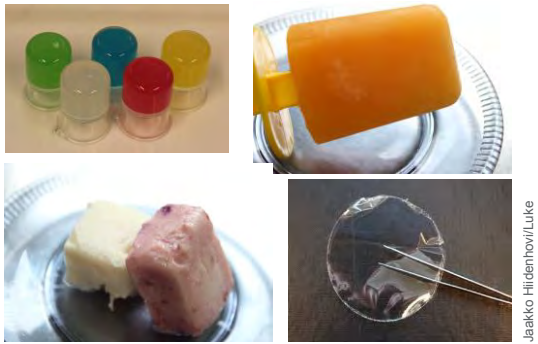




Gelatin | Protein hydrolysate | Minerals

Use of fish gelatin/collagen hydrolysates

- Interest in fish-based gelatin has increased
  - No religious restrictions on use
  - Suitable for fish-vegetable diet
- Fish gelatin can be utilized, for example
  - In biodegradable films
  - Fortifying food and modifying its structure
  - As food supplements in powders, protein bars and beverages
  - As ingredients in cosmetics, for example in skin creams



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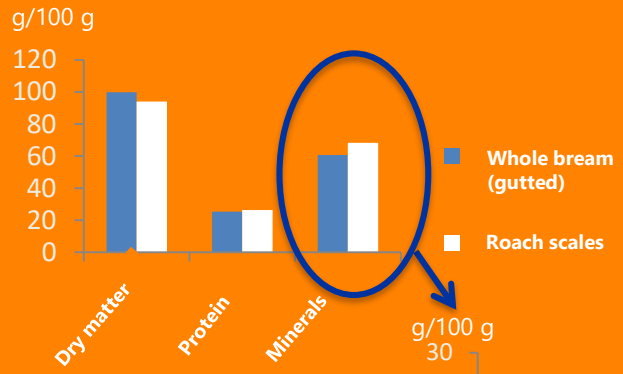
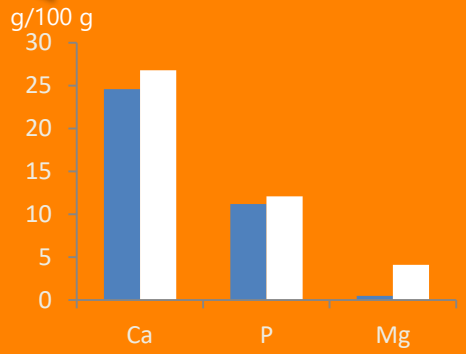
Finnish fish gelatins have **low**
gelation temperature (7-15°C)
melting temperature (13-21°C)

Commercial gelatin (Dr Oetker, pig skin):
gelation temperature 24.0°C,
melting temperature 29.9 °C

Fish bones and scales as a source of calcium

Composition of mineral fractions isolated from whole bream (gutted) and roach scales





Calcium is present as hydroxyapatite

$Ca_{10}(PO_4)_6 \cdot (OH)_2$

Fish side streams provide highly absorbable calcium, which can be utilized in

- food supplements
  - pets
  - humans
- bone and tooth transplants
- fertilizers
- feeds

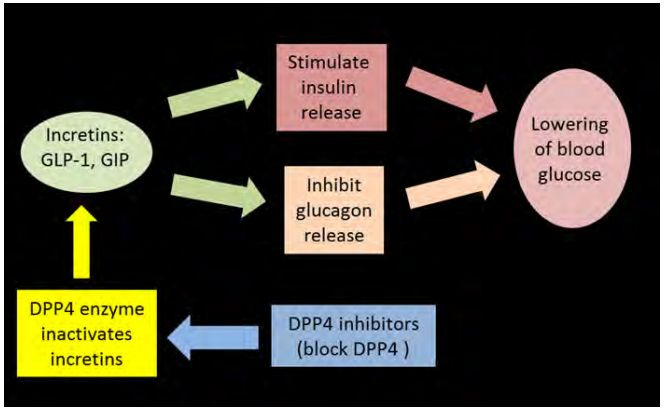
http://www.thewormfarm.net/store/product/81761/Fish-Bone-Meal-3-18-0

http://www.kalsytech.com

Bioactive properties of the peptide fractions

Glucose tolerance enhancing peptides

- In recent years, several DPP4 inhibitors, such as sitagliptin, vildagliptin and linagliptin, have been approved as antidiabetic agents in the EU, USA and Japan
- The hydrolysates produced from the Baltic herring rest raw materials (frames, skins and intestines) effectively inhibited the DPP4 enzyme activity in laboratory experiments
- Natural DPP4 inhibitors could be used as nutraceuticals to promote the blood glucose balance and to support medication
- Further research is needed; animal tests and clinical intervention tests
- Challenges / constraints to commercialization in Europe (e.g. Finnish Food Authority, EFSA)



Adapted from: https://en.wikipedia.org/wiki/Dipeptidyl_peptidase-4_inhibitor

DPP4 = Dipeptidyl peptidase-4
GLP-1 = Glucagon like peptide-1
GIP = Gastric inhibitory polypeptide a.k.a. glucose-dependent insulinotropic peptide

Fish oil for people and pets

- Fish oil is an important source of n-3 unsaturated fatty acids such as eicosapentaenoic acid (EPA, C20: 5) and docosahexaenoic acid (DHA, C22: 6)
- EFSA has approved several health claims for EPA and DHA (Commission Regulation (EU) 1924/2006 and 432/2012)
- 2-3% EPA and 3-5% DHA of salmon /rainbow trout fatty acids
- EPA and DHA concentrations in Baltic herring oil are approx. 3 x higher
- Used as a dietary supplement

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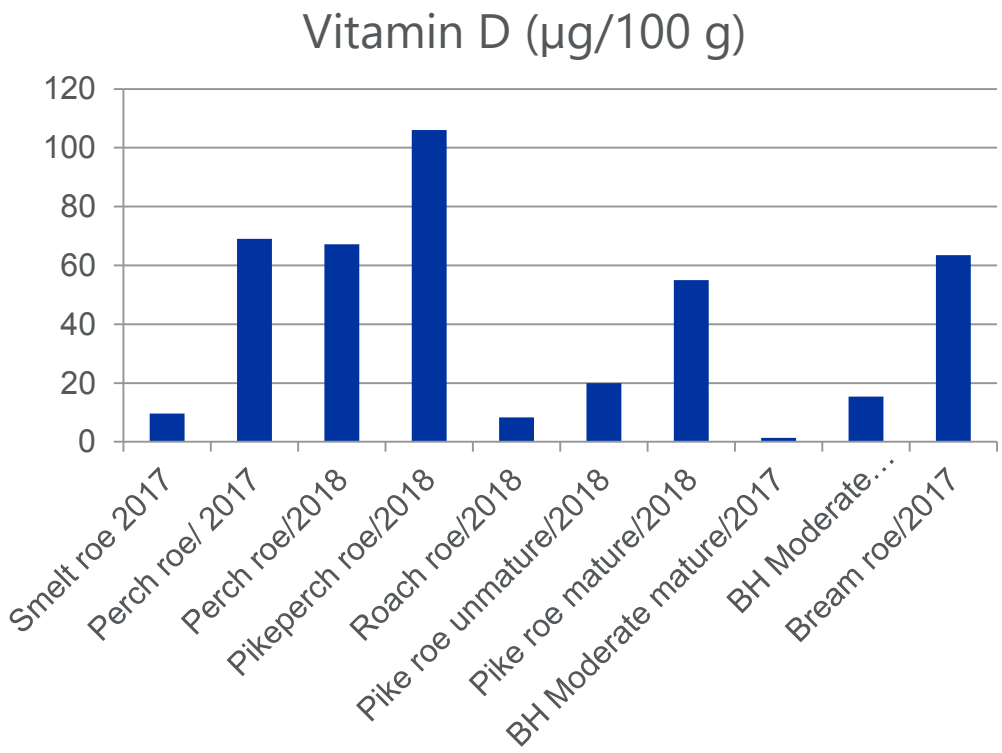
Rainbow trout oil

https://www.tujoma.fi/tujoma-tuotteet/

Underutilized roes as natural vitamin D supplement?



Perch

Pike

Bream

Pikeperch

Photos: ©Pro Kala

Next steps…

- Process development and optimization
- R&D for new products
- Quality improvements in fish catches
- New food applications for small fishes
- Further *in vivo* studies on the potential anti-diabetic effects

EUROPEAN MARITIME AND FISHERIES FUND
OPERATIONAL PROGRAMME
FOR FINLAND
2014-2020

European Union

Thank you!

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