UNIVERSITY OF GDAŃSK

aqua VIP

Interreg South Baltic

EUROPEAN UNION

European Regional Development Fund

State of play: innovative technologies in aquaculture in the Baltic Sea Region countries

Konrad Ocalewicz

Faculty of Oceanography and Geography,
Department of Marine Biology and Ecology, University of Gdańsk

Gdynia, 17th May

Aquaculture in EU – chalanges and innovations

1. Critisism of the sector.
2. It is better than you think – low carbon footprint.
3. Relatively slow development of aquaculture in EU.
4. New technologies in aquaculture.
5. Potential new species for aquaculture.
6. Covid-19 pandemic.

Criticism of the aquaculture sector

So bad, it’s good

Evil seems to be more attractive than goodness……

Criticism of the aquaculture sector

North America, Latin America and the Caribbean, East Asia, Europe, Middle East and North Africa, South Asia, Southeast Asia, Oceania, Sub-Saharan Africa

Environmental Problems of Aquaculture

- **pollution**
- **exploitation of the living resources**
- **quality of food from aquaculture**
- **wild stocks vs. farmed stocks**
- **fish welfare**

Aquaculture: are the criticisms justified? Feeding fish to fish

Summary

Aquaculture is a fast-growing sector of livestock production, but has attracted criticism owing to the practice of using marine ingredients as feed, usually in the form of fishmeal and fish oil. After placing so-called production of 'fed' aqua- culture within the global supply context of capture fisheries and aquaculture, the author lists the objections made against feeding fish to fish.

1317
Dr C J Shepherd
13th June 2013

Demand for farmed fish causing wild fish stocks to collapse

Shoppers buying farmed fish such as prawns and Scottish salmon labelled as sustainable in UK supermarkets may unwittingly be contributing to the collapse of fish stocks in Asia and Africa, a report has found.

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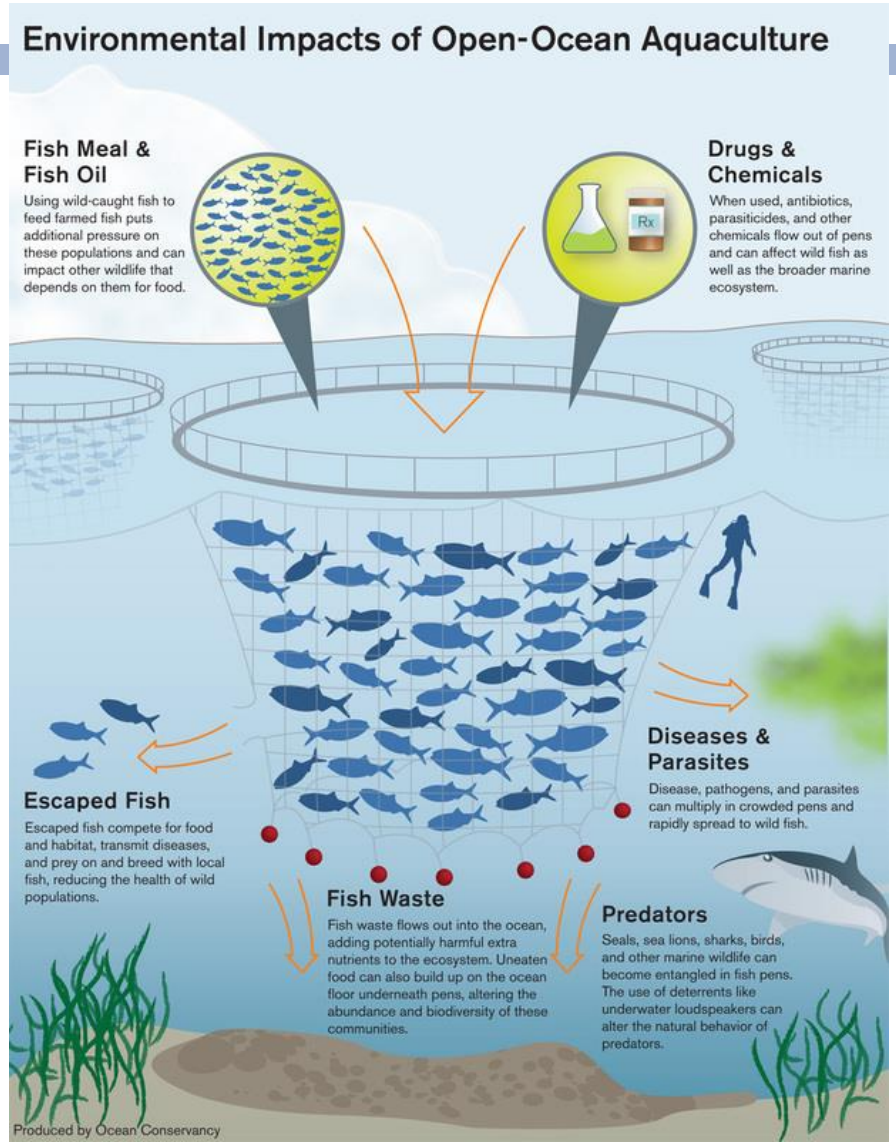
Criticism of the aquaculture sector

Environmental risk of aquaculture



https://feedingtheworldapes11.weebly.com/aquaculture.html

Any bright side of aquaculture? Still a lot!

Is Aquaculture the Answer to World Hunger?

By Emily Folk | April 13, 2020 - 7:37 am |

Feeding a growing world population could become problematic, but aquaculture might hold the key. If humans are anything, we are resourceful. We see a problem with the world, and we do what we can to fix it. When being nomadic and following food sources was no longer sustainable, we solved the problem by developing agriculture. Currently, as the population continues to grow and our taste for seafood increases, we're trying to find ways to meet demand and, at the same time, sustain wild populations of fishes.

So bad, it's good

Evil seems to be more attractive than goodness……

Criticism of the aquaculture sector

Fish welfare can be improved in some places with help of some organisations….

Home / Advice and welfare / Farm animals / Farmed fish / **What are we doing?**

Farmed fish - what are we doing?

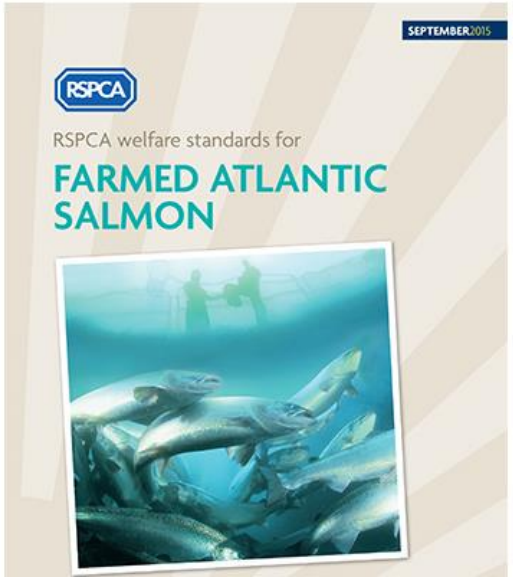
We're working in a number of ways to increase awareness of fish welfare issues and engage with the salmon and trout farming industries, governments and retailers to encourage improvements.

RSPCA welfare standards for farmed Atlantic salmon

We have developed a set of detailed **RSPCA welfare standards** for farmed Atlantic salmon. The standards cover all the key areas affecting fish welfare including water quality, stocking density, handling, health, slaughter and wider environmental impact.

We have also written and included what we believe to be the world's first welfare standards for well boats.

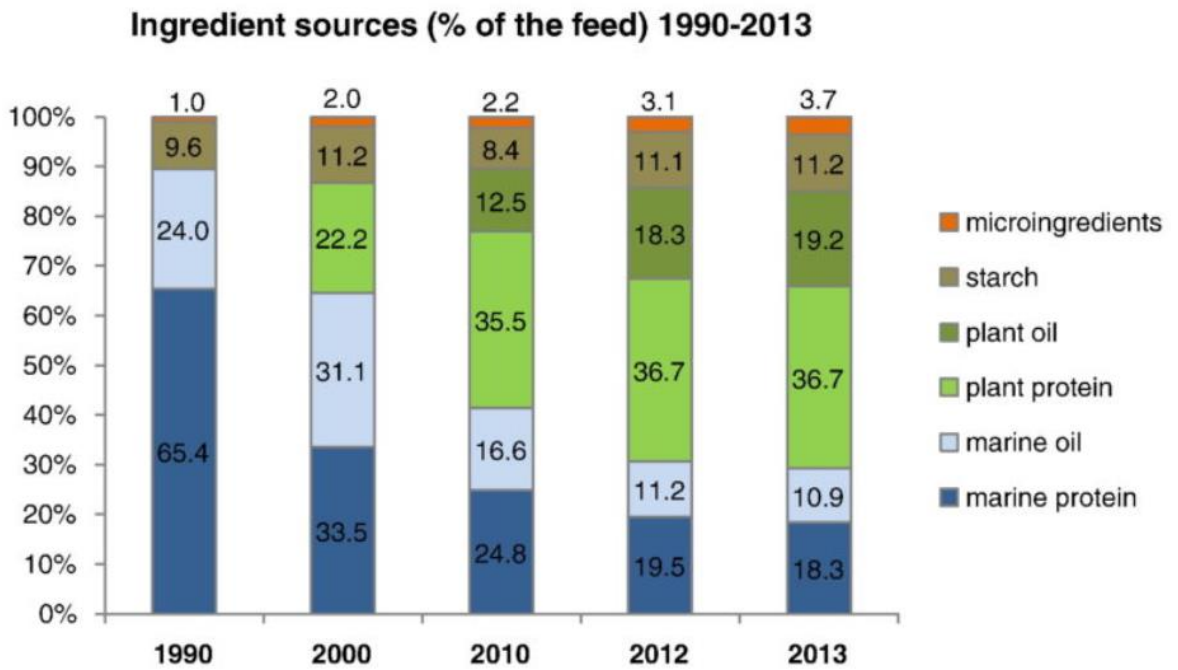
The standards are used by a significant proportion of the Scottish farmed salmon industry.



Engaging with decision makers

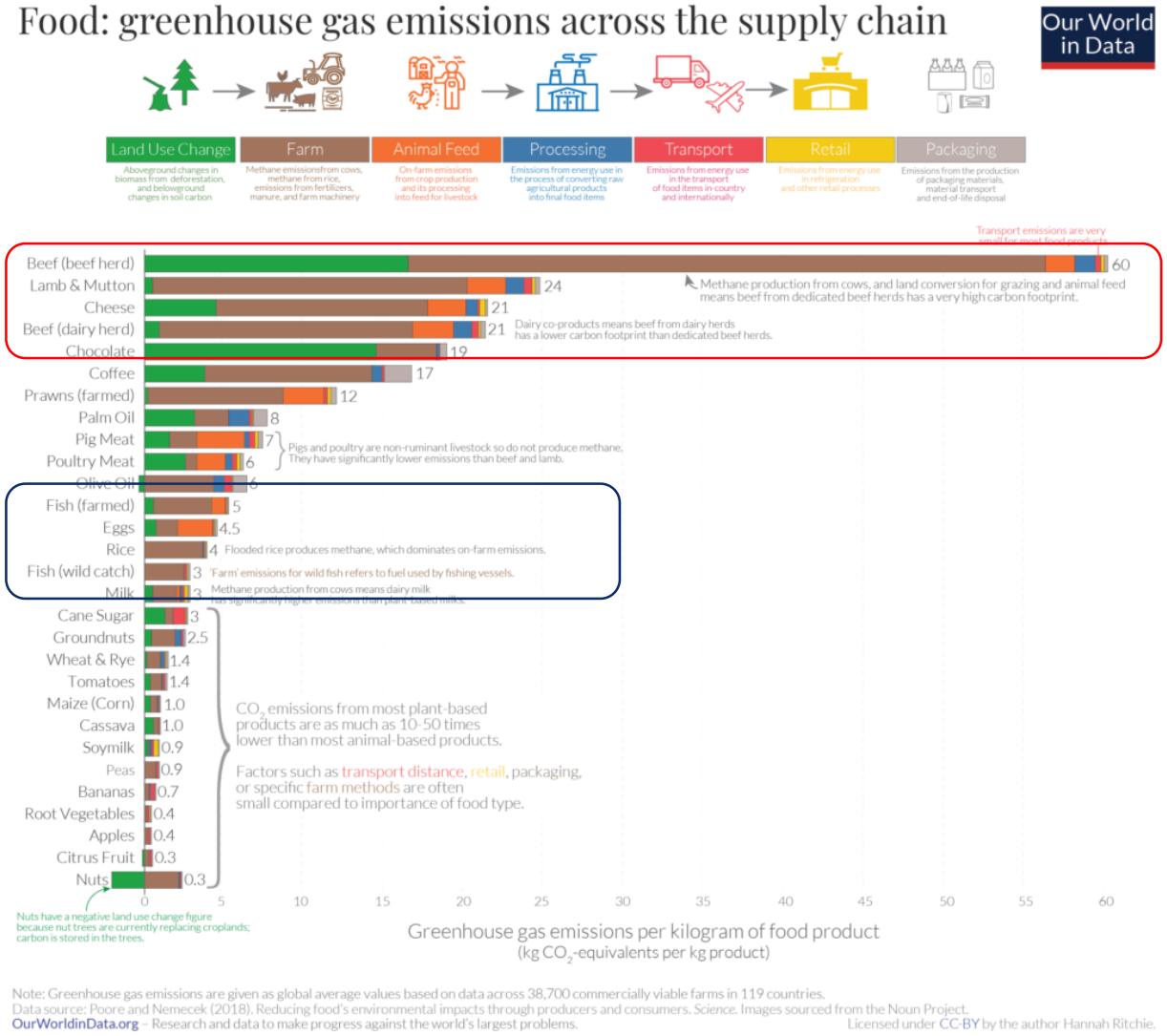
RSPCA – Royal Society for the Prevention of Cruelty to Animals

The evolution of fish feed ingredients: The transition to plant-based raw materials in fish feeds



https://www.luke.fi/aquaimpact/2019/12/20/the-evolution-of-fish-feed-ingredients-the-transition-to-plant-based-raw-materials-in-fish-feeds/

Greenhouse gas emission from aquaculture



Aquaculture production is safe for the planet, more than other animal production sectors!!!!

Why it is developing so slowly….

Table 1. Rankings by aquaculture production quantity, excluding aquatic plants, in 1970 and 2016.

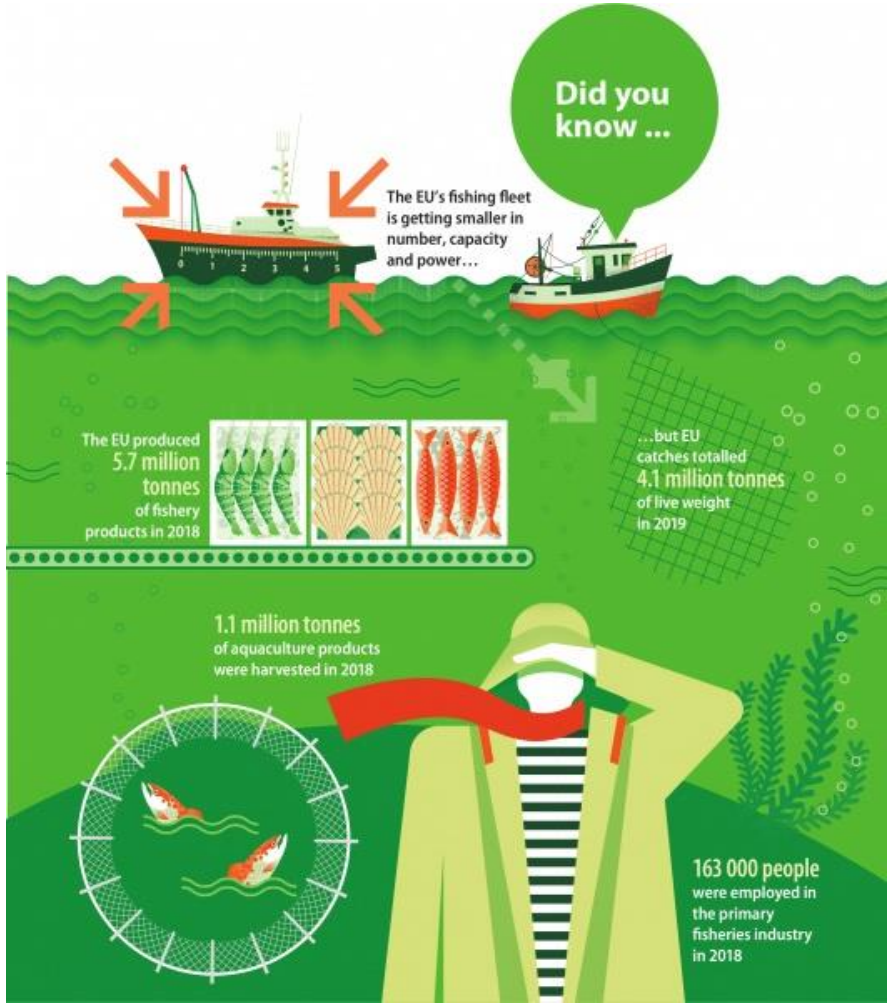
1970	2016
1. China	1. China
2. Japan[a]	2. India
3. United States[a]	3. Indonesia
4. Spain[a]	4. Vietnam
5. India	5. Bangladesh
6. Indonesia	6. Egypt
7. France[a]	7. Norway[a]
8. Philippines	8. Chile
9. Netherlands[a]	9. Myanmar
10. Thailand	10. Thailand
11. South Korea	11. Philippines
12. Soviet Union[a]	12. Japan[a]
13. Taiwan	13. Brazil
14. Vietnam	14. South Korea
15. Bangladesh	15. Ecuador
16. Malaysia	16. United States[a]
17. Italy[a]	17. Iran
18. Germany[a]	18. Nigeria
19. Hungary[a]	19. Spain[a]
20. Romania[a]	20. Taiwan
Share in developed countries:	
41.2%	5.6%

[a]Indicates an economically developed country (Data from FAO 2018a).

Two thirds of the fish consumed in Europe is imported

Garlock et al. 2020 in Reviews in Fisheries Science & Aquaculture

Why it is developing so slowly….



It is a matter of

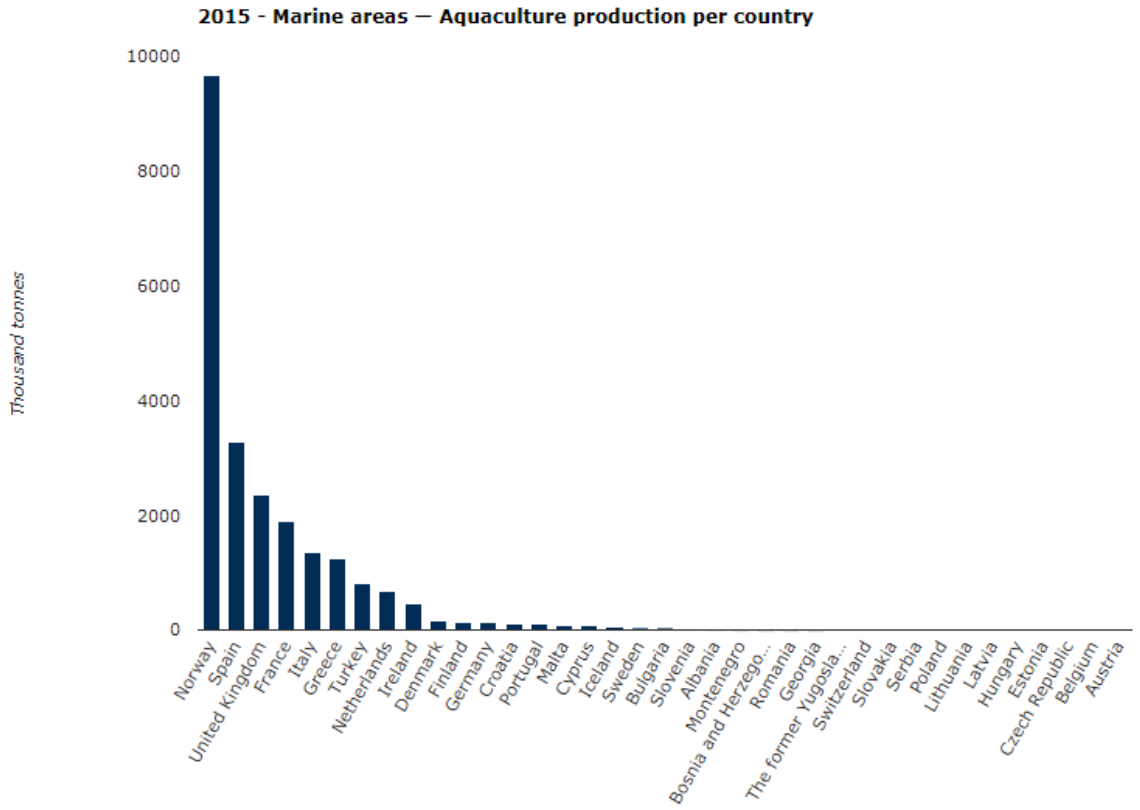
- **money (profitability),**
- **resources (short of water),**
- **climate and environmental conditions,**
- **fish import….**

But demand is still reasonable:

Fish and seafood consumption in EU ranges from c. 5 kg (Hungary) to almost 60 kg (Portugal).

https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Fishery_statistics

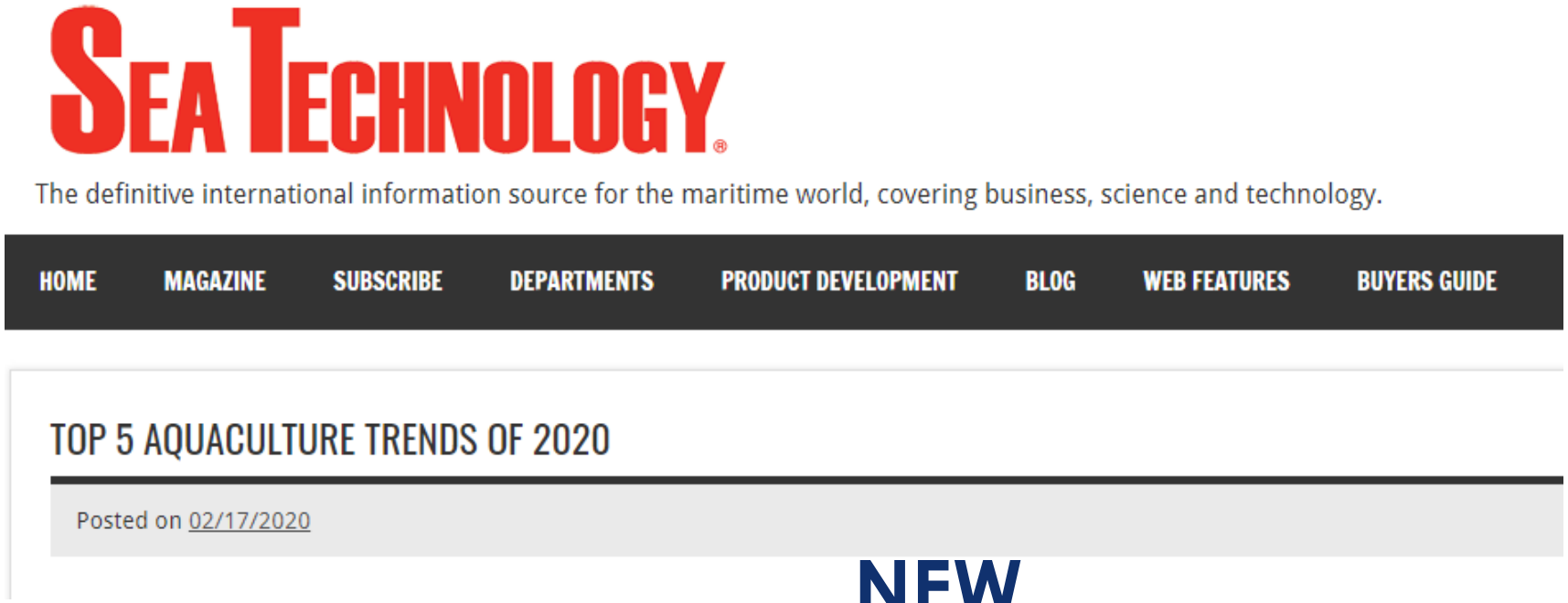
Why it is developing so slowly….



Baltic Sea is not the perfect place for aquaculture

https://www.eea.europa.eu/data-and-maps/indicators/aquaculture-production-4/assessment

What innovations we need?



1. **Climate Change-Resistant Mussels**
2. **Shift Toward Microalgae Oil**
3. **Kelp Farming**
4. **Increased Sea Urchin Production**
5. **Open-Ocean Aquaculture**

NEW TECHNOLOGIES

NEW SPECIES

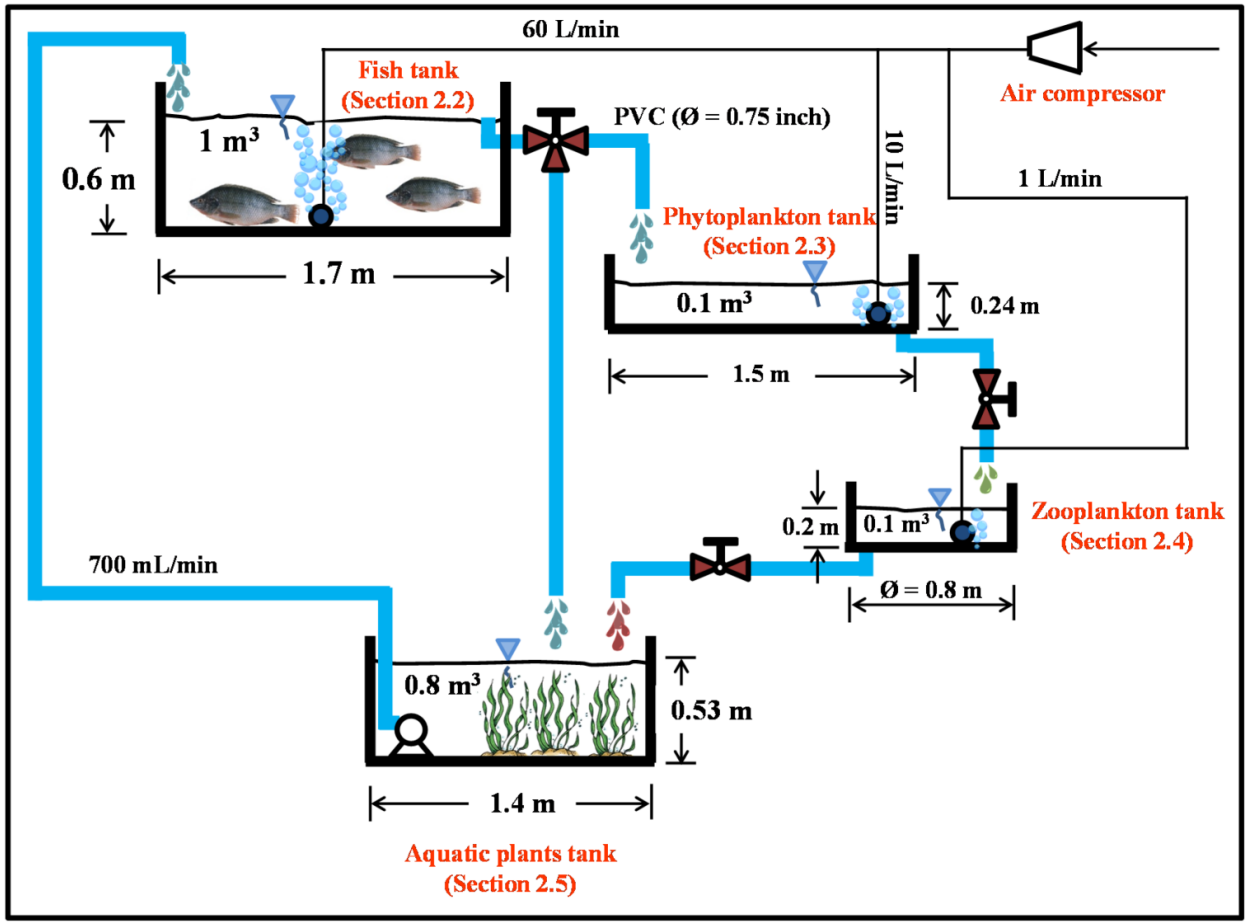
What innovations we need? Floating cages

https://www.stylus.com/fzjkkk, https://www.nola.com/news/environment/article_f2dd0cea-01b3-11eb-a7bb-ff7f70acd02d.html

What innovations we need? I am sceptical concerning Baltic Sea….

https://www.stylus.com/fzjkkk, https://www.nola.com/news/environment/article_f2dd0cea-01b3-11eb-a7bb-ff7f70acd02d.html

What innovations we need? RAS – yes!



Integrated Multi-Trophic **Recirculating Aquaculture Systems?** Like this one designed for Nile tilapia?

Definitely, but it must be profitable!

Puchong Sri-uam et al. 2016 in Sustainability

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Why it is developing so slowly….

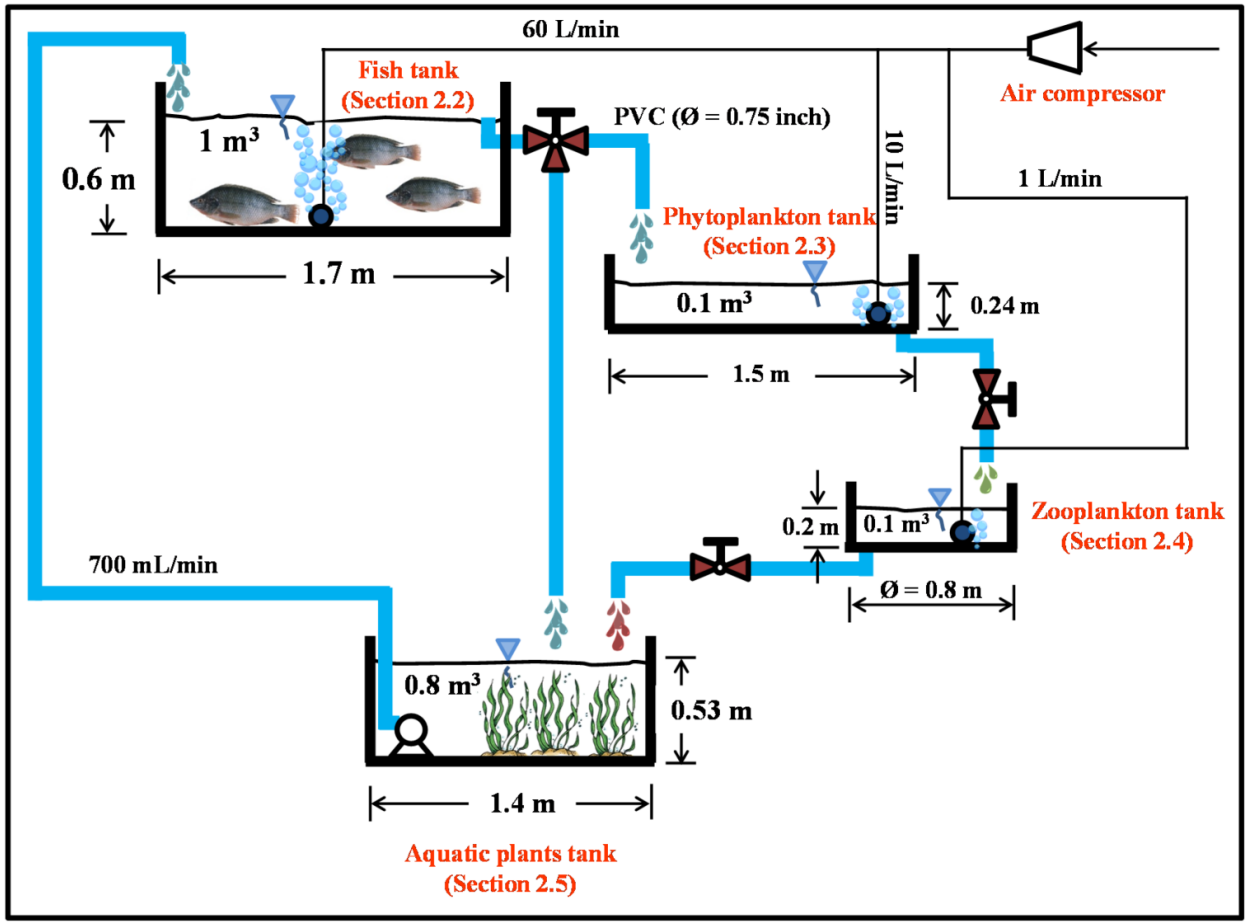
What is not produced on the large scale?

https://caughtonline.co.za/product/wild-caught-argentinian-prawns/

Crustaceans

Crustaceans comprises 24% of Europe's total imports from developing countries. Crustaceans exported to Europe from developing countries include a variety of frozen products. The most important of which are **warm water shrimp (95%),** rock lobsters (2.5%) and crab (1%).

What innovations we need? RAS – yes!



Think about rearing **crustaceans** in RAS !

Definitely, but it must be profitable!

Puchong Sri-uam et al. 2016 in Sustainability

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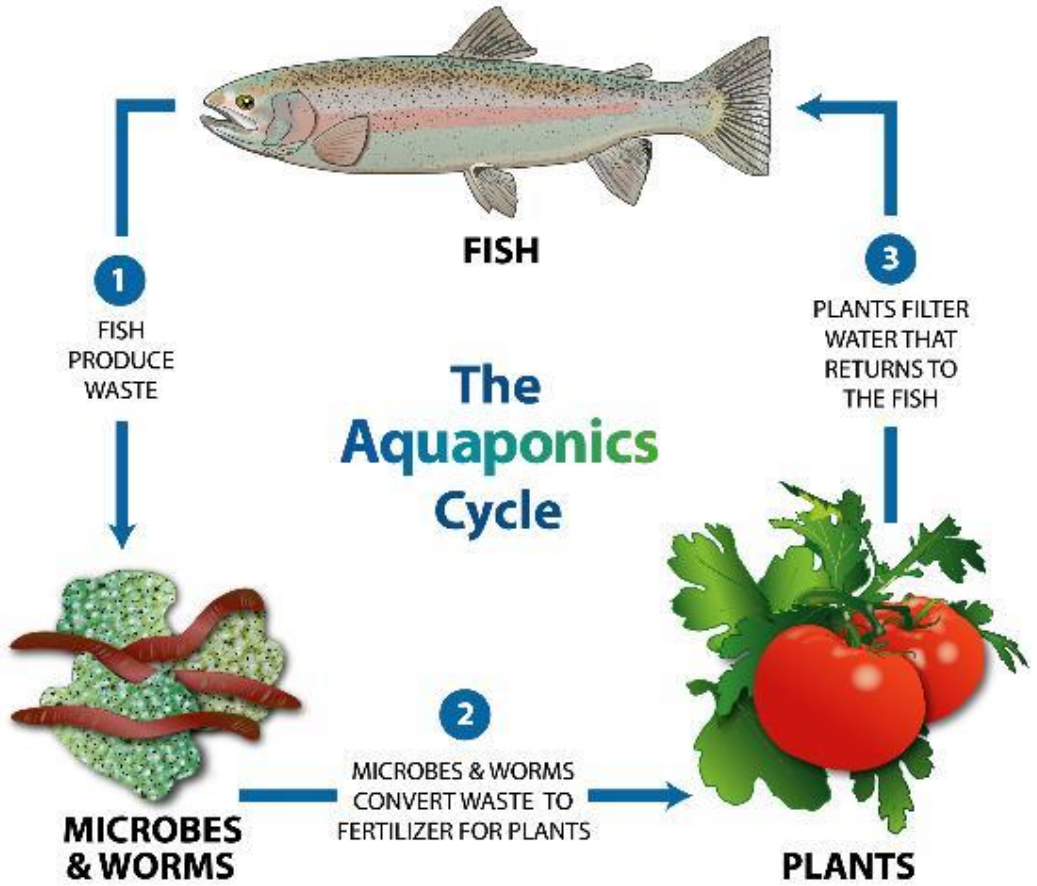
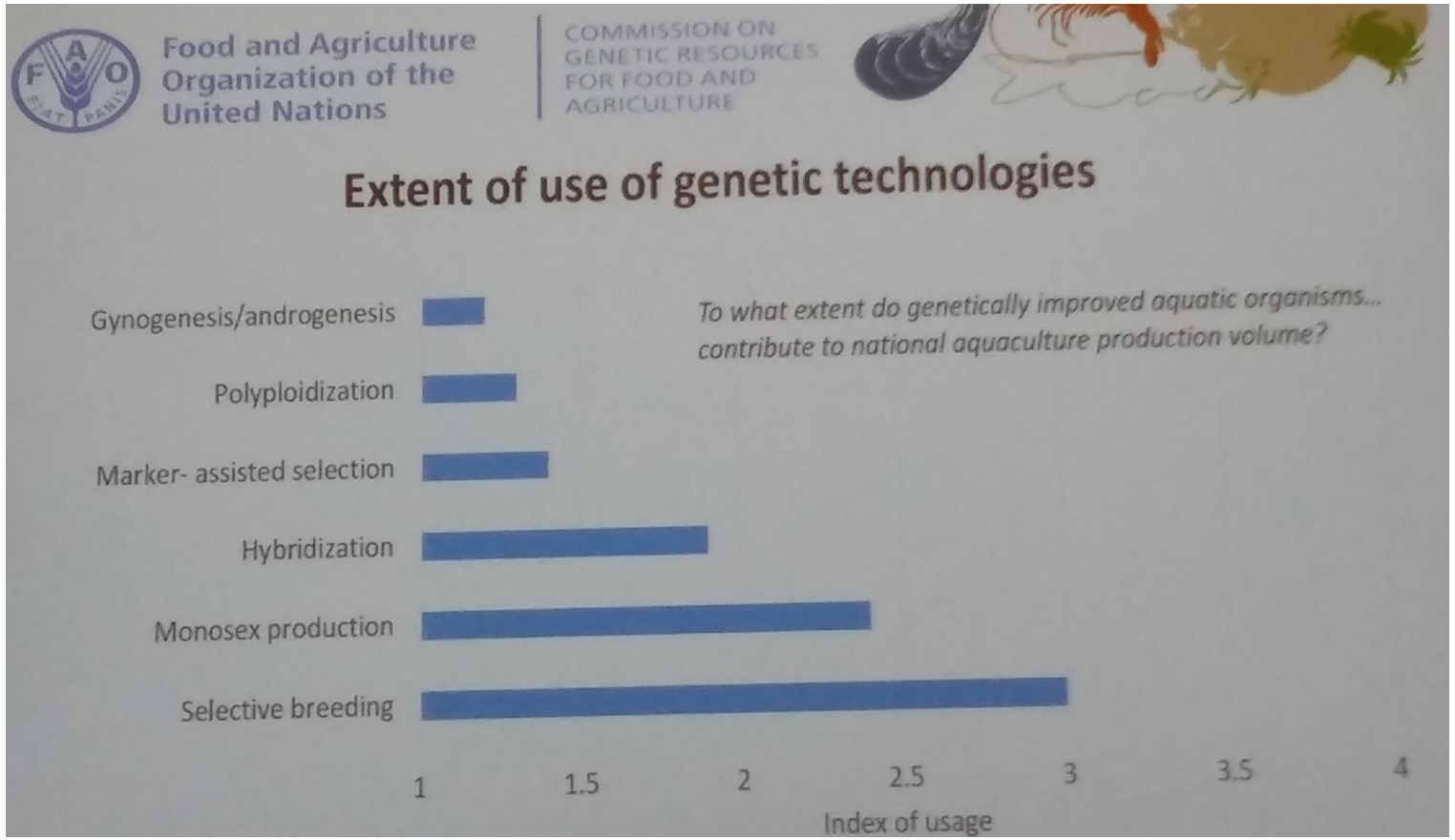
What innovations we need? RAS – yes!



www.motherearthnews.com/organic-gardening/aquaponic-gardening-growing-fish-vegetables-together

New breeding techniques

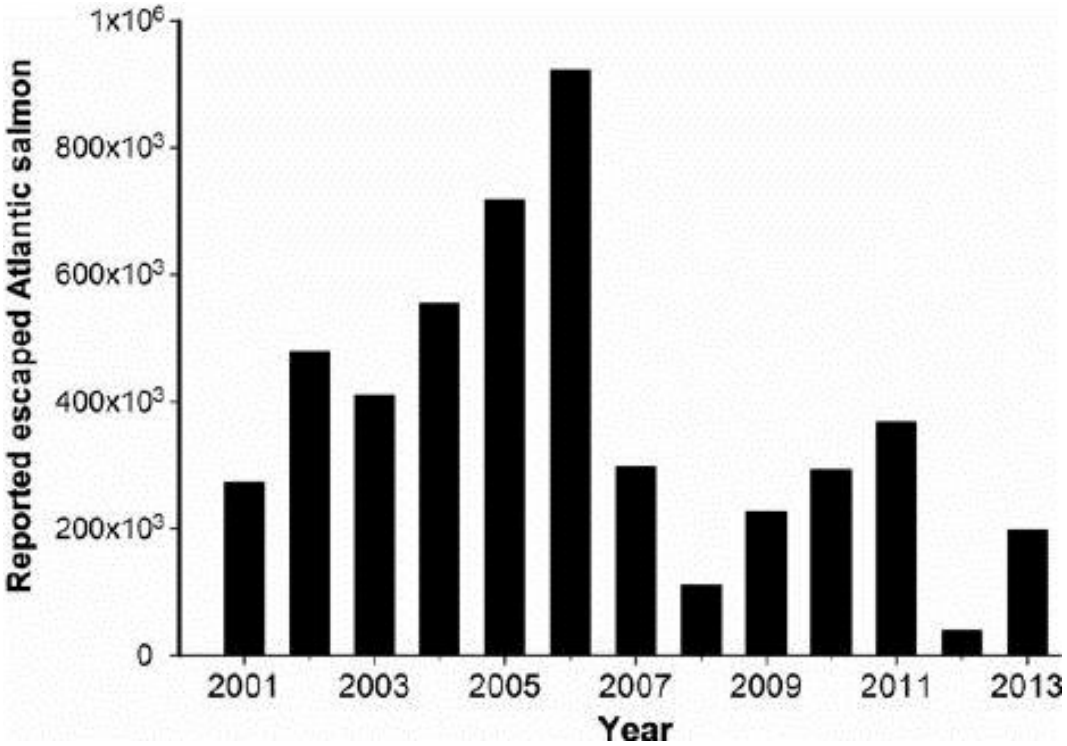


Global trends in aquaculture - FISH GENETICS AND REPRODUCTION

International Symposium of Genetics in Aquaculture, Cairns (ISGA 2018)

New breeding techniques – sterile fish even if escaped are not the problem…

Fish escapes from the farms - Fish sterilisation due to triploidization



The number of farmed salmon escapes reported to the Norwegian Directorate of Fisheries by fish farmers for the period 2001 –2013. Data were taken from the Norwegian Directorate of Fisheries http: // www.fiskeridir.no / .

New trends in our aquaculture – any space for **new species**?

from algea to fish

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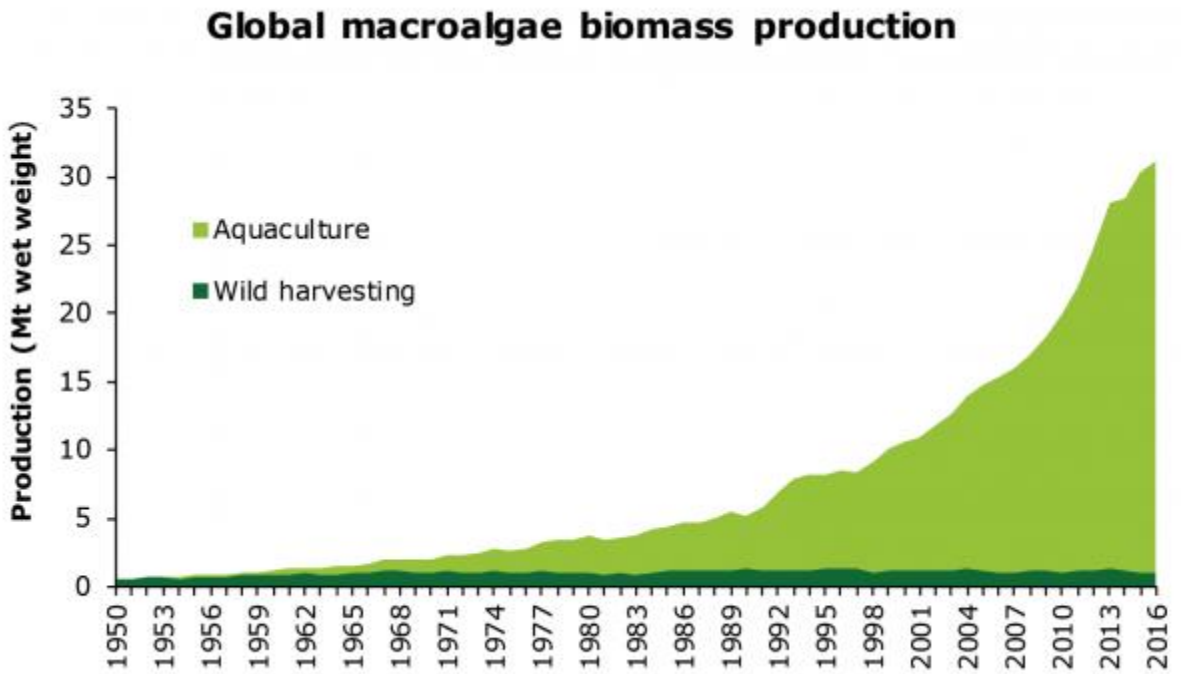

https://ec.europa.eu/jrc/en/science-update/algae-biomass-production-bioeconomy

New trends in our aquaculture – any space for **new species**?

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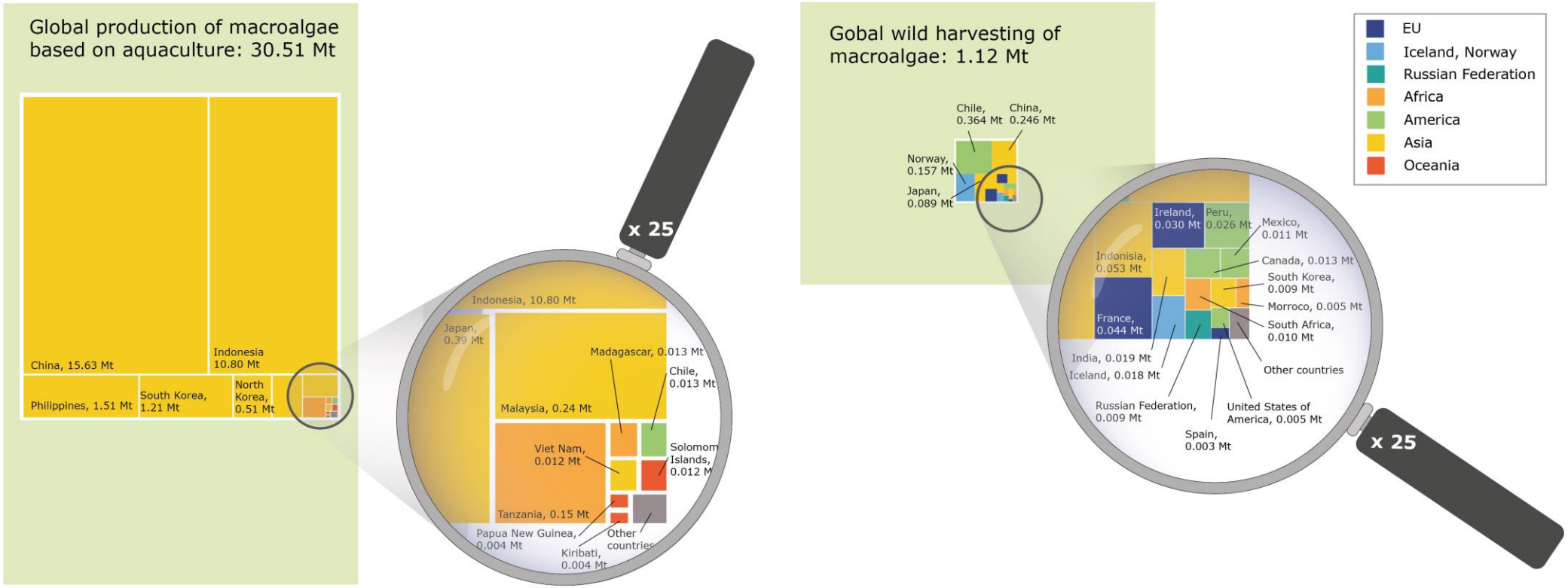

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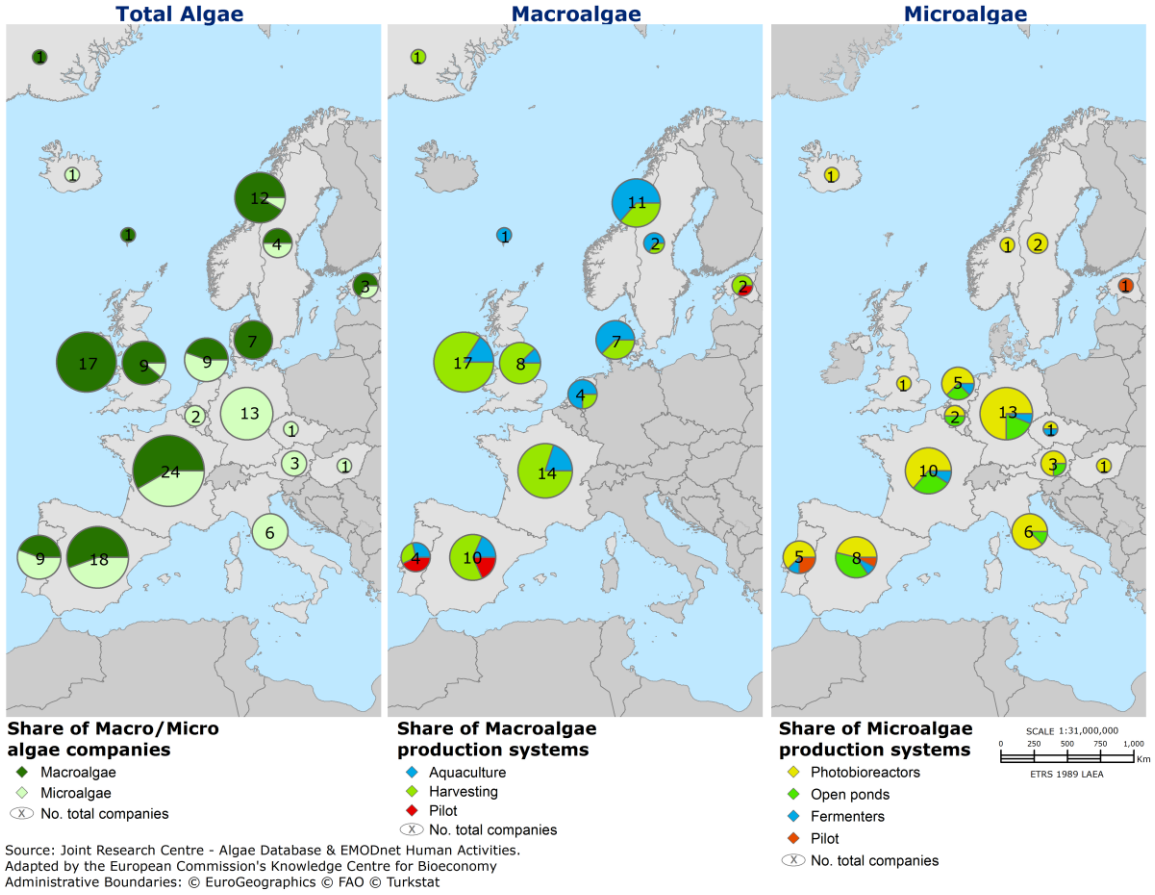

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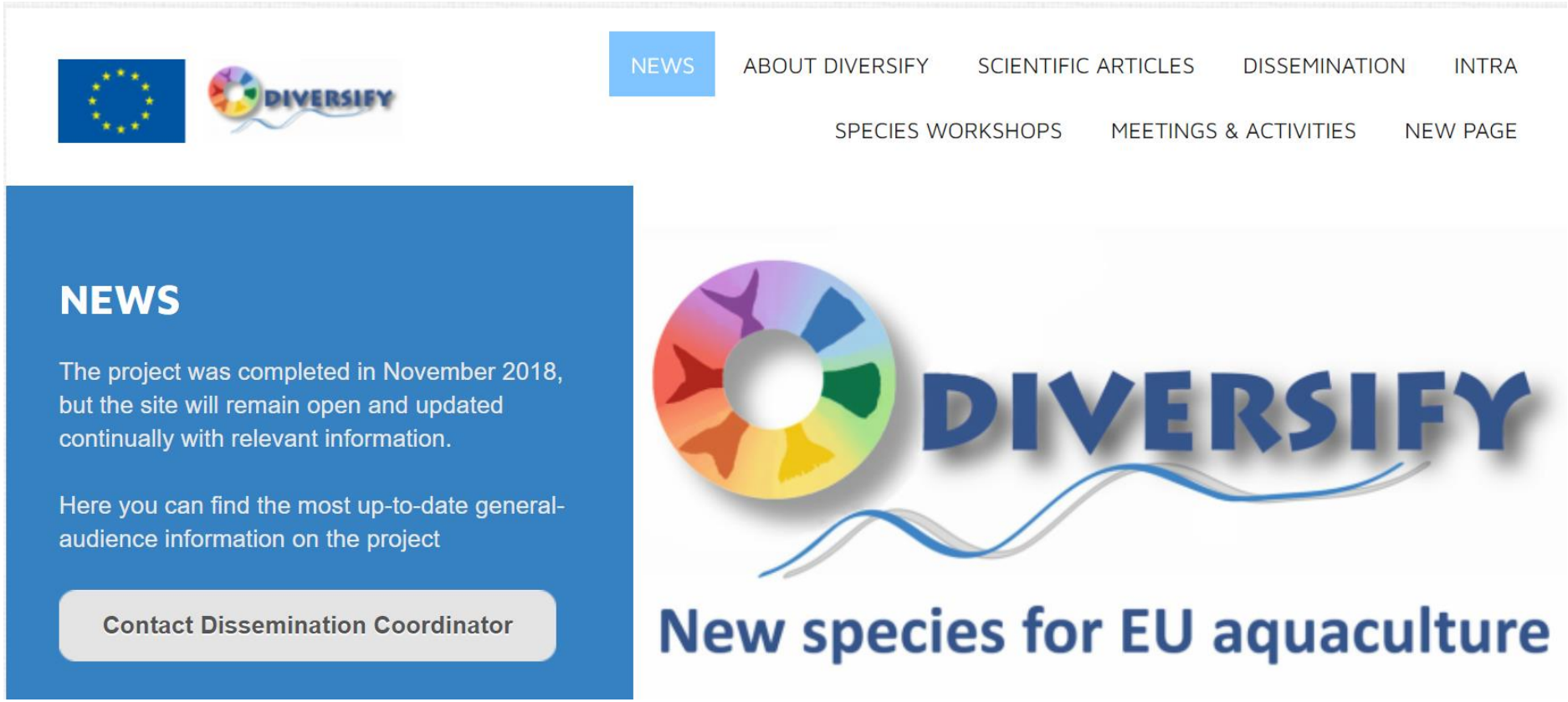
New trends in our aquaculture – any space for new fish species?



Mostly marine aquaculture species, but….

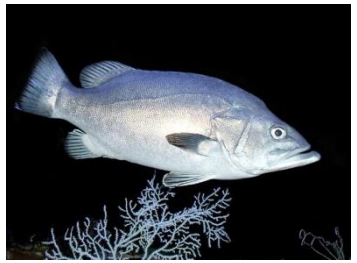
MEAGRE (ARGYROSOMUS REGIUS)

GREATER AMBERJACK (*SERIOLA DUMERILI*)

PIKEPERCH (*SANDER LUCIOPERCA*)

ATLANTIC HALIBUT (*HIPPOGLOSSUS HIPPOGOLSSUS*)

WRECKFISH (*POLYPRION AMERICANUS*)



GREY MULLET (*MUGIL CEPHALUS*)

Mostly marine aquaculture species, but….

MEAGRE (ARGYROSOMUS REGIUS)

GREATER AMBERJACK (*SERIOLA DUMERILI*)

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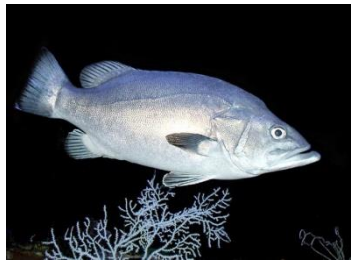
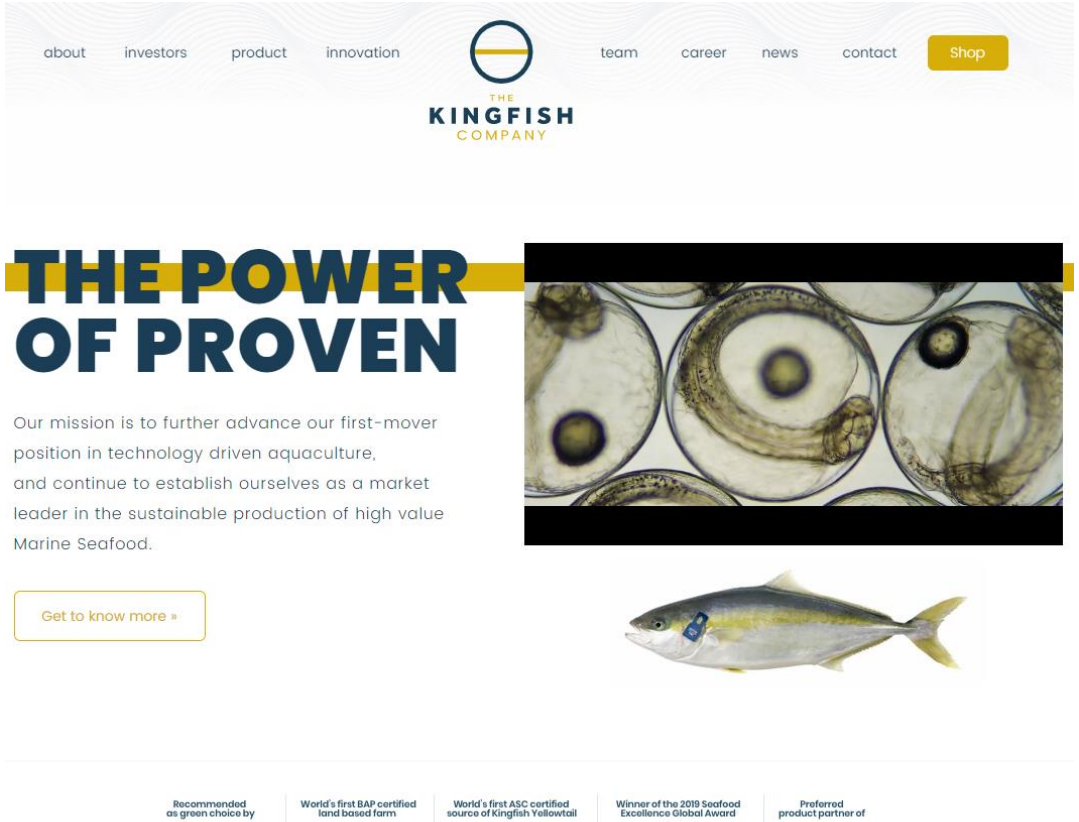


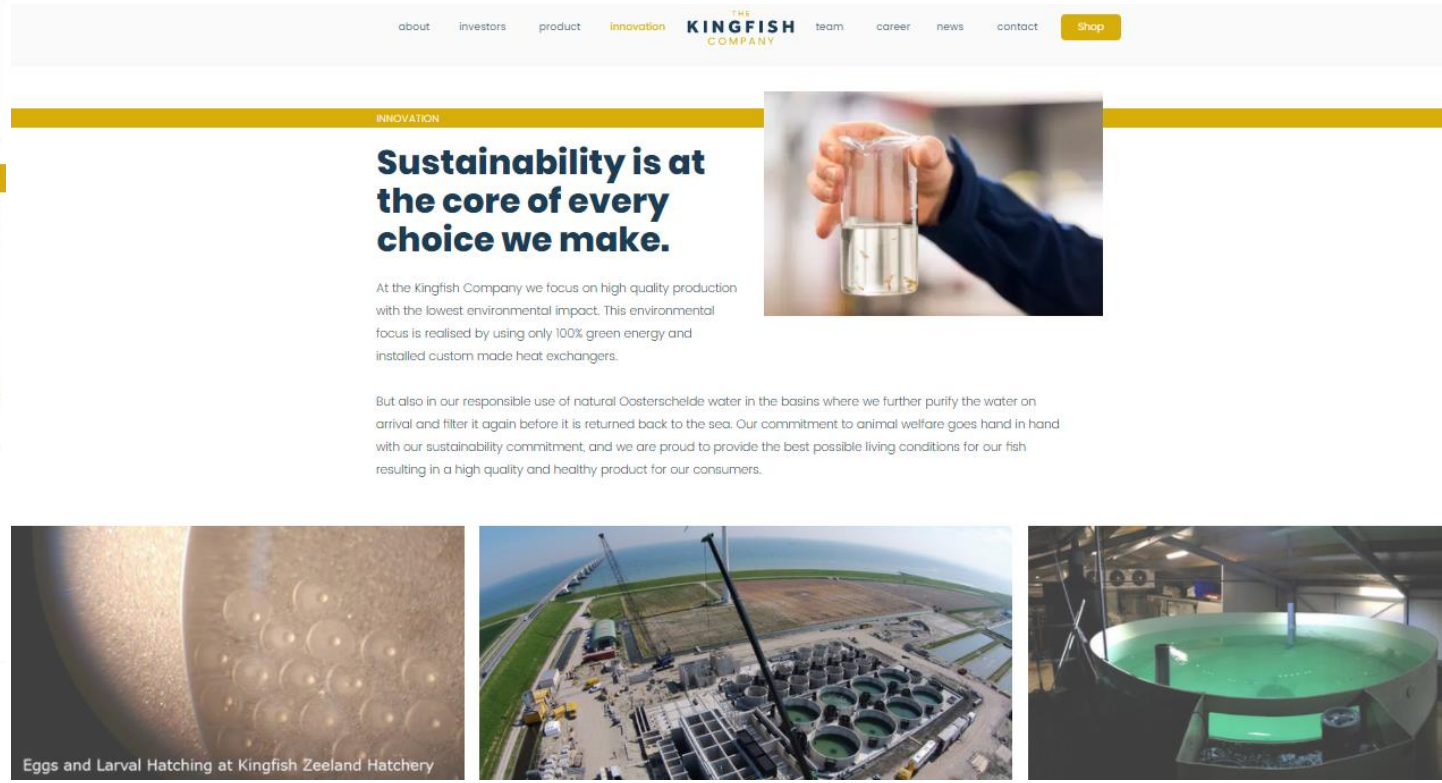
WRECKFISH (*POLYPRION AMERICANUS*)

GREY MULLET (*MUGIL CEPHALUS*)

New trends in our aquaculture – any space for new fish species?

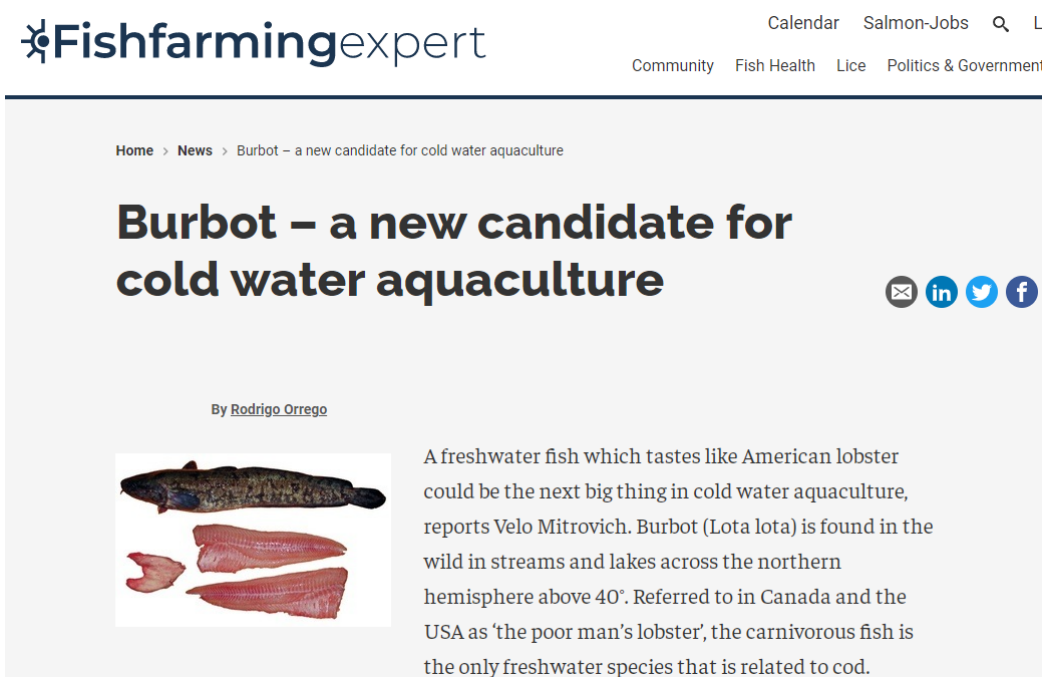
Land-based aquaculture of Yellowtail kingfish (*Seriola lalandi*) by the Dutch company





New trends in our aquaculture – any space for new fish species?

from time to time we have „a new candidate for coldwater aquaculture”….



Fishfarmingexpert

Calendar Salmon-Jobs L

Community Fish Health Lice Politics & Government

Home › News › Burbot – a new candidate for cold water aquaculture

Burbot – a new candidate for cold water aquaculture

By Rodrigo Orrego

A freshwater fish which tastes like American lobster could be the next big thing in cold water aquaculture, reports Velo Mitrovich. Burbot (Lota lota) is found in the wild in streams and lakes across the northern hemisphere above 40°. Referred to in Canada and the USA as 'the poor man's lobster', the carnivorous fish is the only freshwater species that is related to cod.

Sometimes it works…sometimes it does not….

https://www.fishfarmingexpert.com/article/burbot-ndash-a-new-candidate-for-cold-water-aquaculture/

New trends in our aquaculture – any space for new fish species?

Renaisance of some old species

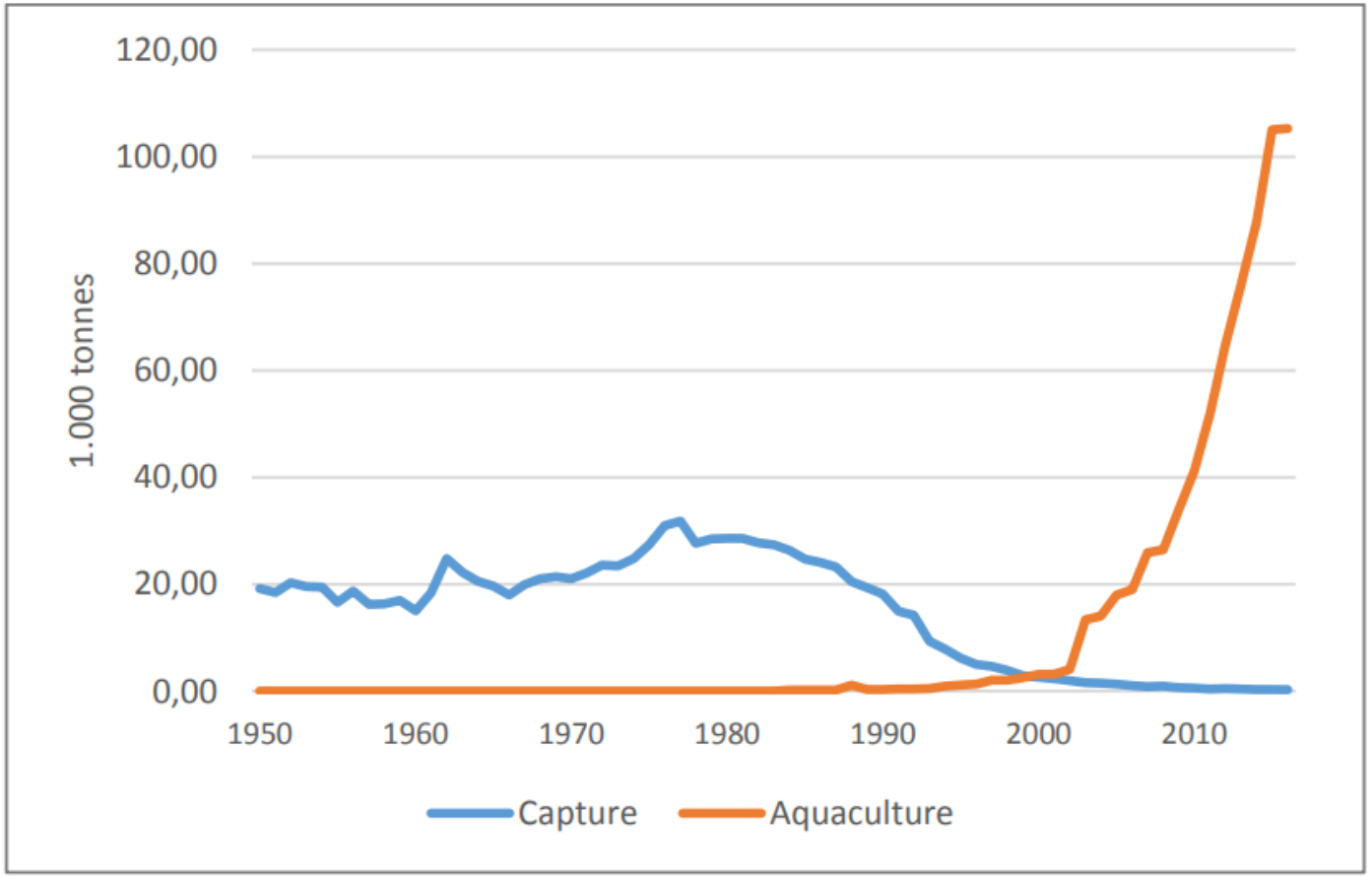
STURGEONS

a boutique production of caviar

Global trends in aquaculture – FISH PROCESSING INDUSTRY

Caviar production and sturgeon aquaculture

Chart 2: Capture and aquaculture of sturgeons. 1950-2016 (FAO)



Source: FAO

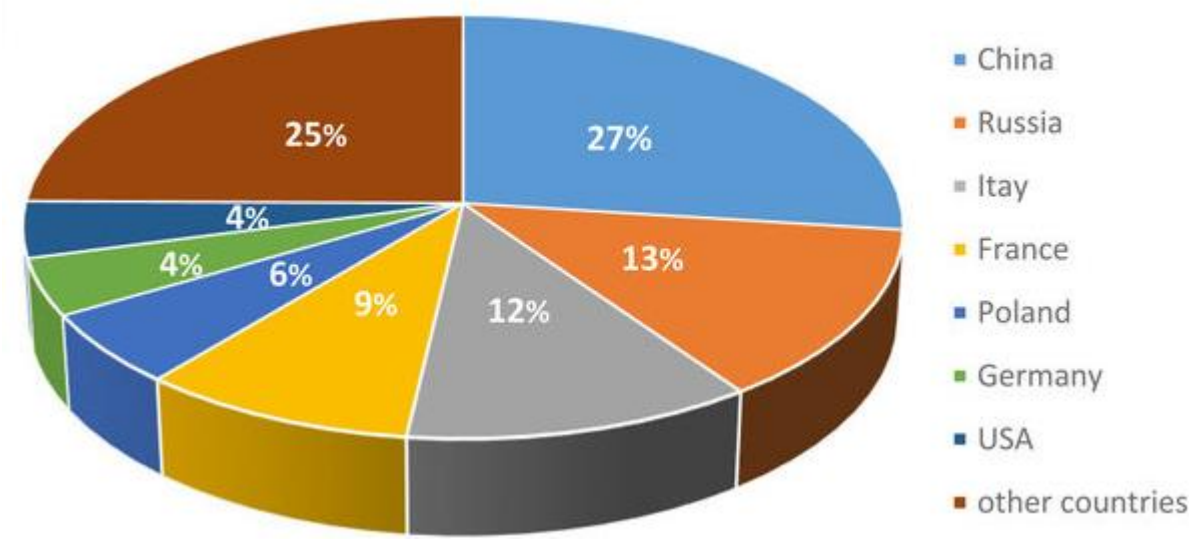
Global trends in aquaculture – OLD BUT NEW - STURGEONS

THE CAVIAR MARKET

Production, trade and consumption in and outside the EU

New trends in our aquaculture – any space for new fish species?

a boutique production of caviar



Reviews in Fisheries Science & Aquaculture

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/brfs21

Sturgeon, Caviar, and Caviar Substitutes: From Production, Gastronomy, Nutrition, and Quality Change to Trade and Commercial Mimicry

Samad Tavakoli, Yongkang Luo, Joe M. Regenstein, Ehsan Daneshvar, Amit Bhatnagar, Yuqing Tan & Hui Hong

Share of the major countries in caviar production

New trends in our aquaculture – any space for new fish species?

AKTUALNOŚCI WIADOMOŚCI

Kawior made in Poland

12 lipca 2020

Products that can be made from cod can be also made from other fish species!!!!

https://www.worldfishing.net/news101/icelandic-fisheries-exhibition/icefish-conference-fish-waste-for-profit

COVID-19 pandemic situation…..

1. Many major seafood-consuming European countries (Southern Europe) have been hit by COVID-19.
2. **Importing countries** and companies are suffering a lot from COVID as many businesses have closed down - **Transportation was limited as many borders were closed.**
3. The seafood processing sector has been also affected, as **factories reduced their working capacity due to social distancing measures**. This has an effect on the imports of raw material from exporting nations.

BUT:

1. In France, for example, the sale of fresh fish has declined, but **purchases of ready-to-use and packaged fish have increased**.
2. In Italy, **consumption of fish products is increasing as people have more time to cook at home during the quarantine**.

UNIVERSITY OF GDAŃSK

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Interreg South Baltic

EUROPEAN UNION

European Regional Development Fund

State of play: innovative technologies in aquaculture in the Baltic Sea Region countries

Konrad Ocalewicz

Faculty of Oceanography and Geography,
Department of Marine Biology and Ecology, University of Gdańsk

Gdynia, 17th May