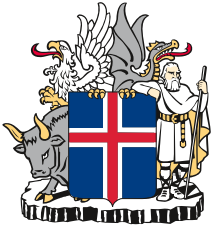


12 November 2019



# Recent changes in the **Aquaculture Act in Iceland** and the issuance of **licenses**

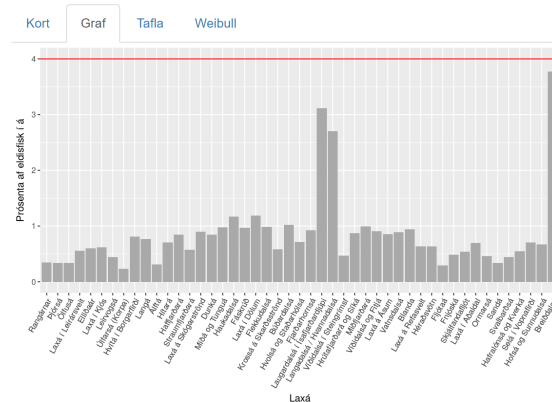
Dr. Jón Þrándur Stefánsson

**Government of Iceland**  
Ministry of Industries and Innovation

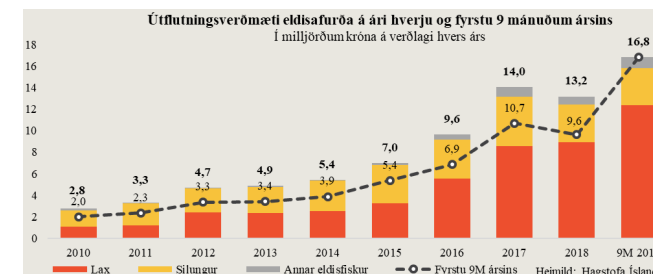
## The background and history



## The regulatory framework



## The outlook for aquaculture





# The background and the history



## The beginnings

- The seafood sector in Iceland dates back centuries.
- Aquaculture in Iceland however was initially based on the on-rearing of salmonids for release into rivers. The first efforts to that effect were in the period 1884-1885.
- Aquaculture efforts in Iceland gradually developed into larger-scale rearing of fish for the consumer market.
- While the history of fish farming in Iceland stretches back more than a century, the industry has until recently been struggling in finding its way forward.

*From the 14th century manuscript of Jónsbók /  
Árni Magnússon Institute for Icelandic Studies*

# The early stages

The first aquaculture experiments in Iceland began in the 1950s in small ponds and land based tanks as well as experiments with ocean ranching of Atlantic salmon

Early on aquaculture prospects in Iceland were linked with the use of geothermal water to create optimal growth conditions.

In hatcheries for Atlantic salmon geothermal water is used to reach optimal water temperature and thereby shorten the process from egg to smolt to one year. Land based tanks with pumped seawater were first used in 1978.

In this way optimal temperature and salinity conditions were indeed created. With a high market price for salmon at the time a number of such land based salmon farms were built in the late 1980s.





„Aquaculture

More profits  
than from cod“

Early on there  
were high  
expectations  
that where not  
realized

25. apríl  
1985  
fimmtu-  
dagur

93. tölublað 50. árgangur

# ÞJÓÐVILJINN

HEIMURINN  
LANDIÐ

*Fiskeldi*

## Meiri gróði en af þorski

*Möguleiki á 40 til 60 þúsund tonna framleiðslu af eldislaxi á ári. Ellefu miljarðar miðað við verðlag í dag.*

*Meiri en útflutningstekjur af þorski. Skiptiældi – íslenska leiðin*

**M**ed réttu skipulagi gætu Íslendingar á næstu áratugum fimmhundruðfaldað árlega framleiðslu á eldislaxi og búið til 40 til 60 þúsund tonn á ári. Miðað við núverandi verðlag, 190-200 krónur á kíló, jafngildir þetta útflutningsverðmæti alls þorskaflla Íslendinga á síðasta ári og gott betur eða 11 miljörðum. En til að unnt sé að gera þetta verður að lækka seiðaverð allmikið með uppsetningu stórra, mjög hagkvæmra seiðafframleiðslustöðva sem búa að ódýrri orku og setja á laggir stórar fæðufframleiðslu-

stöðvar sem framleiða úr íslensku hráefni miklu ódýrara fæður en fæst í dag. Á vegum innlendra aðila er nú verið að huga að skipulagsmálum greinarinnar einmitt í þessa veru.

Sérfræðingar telja að fiskeldi muni fyrst og fremst byggjast á tveimur aðferðum í framtíðinni. Hafbeit, sem í dag er lítt eða ekki arðbær sökum hás verðs á sleppiseiðum, og svo skiptiældi, sem stundum er nefnt íslenska leiðin og sú sem vænlegust er talin í upphafi. Hún byggist á því að

seiði eru alin á 12-15 mánuðum í heitu vatni upp í 400 til 600 gramma stærð. Að því loknu er þessum stórseiðum sleppt í sjávarkvíar við suðurströndina, þar sem náttúrulegur sjávarhiti er nægur til að þau ná sláturstærð frá miðjum maí til ársloka. Með því er eldisferillinn styttr um ár eða meir miðað við erlendar fiskeldistöðvar, sem kynni í framtíðinni að gera mögulegt fyrir Íslendinga að bjóða vöruna til sölu fyrir lægra verð en Norðmönnum og öðrum verður kleift.

Til að hægt sé að nota skiptiældi

með góðum árangri verður að vera vól á mjög ódýrri orku og líta menn í því skyni til staða eins- og Litluár í Axarfirði, þar sem 15 gráðu heitt ferskvatn streymir upp í verulegum mæli. Slíkar aðstæður er víðar að finna hérlandis.

Hafbeit borgar sig vart í dag, en með því að byggja stórar seiðafframleiðslustöðvar við slíkar aðstæður, þar sem orkan er nær ókeypis, er jafnframt talið, að kleift verði að framleiða svo ódýr seiði að hafbeit muni borga

síð. Jafnframt er nú talið að hafbeit á öðrum tegundum en laxi kunni að vera fýsileg, til dæmis á stálhöfða, sem er sjógenga afbrigðið af regnbogasilungnum og endurheimtist í miklu ríkari mæli en laxinn, samkvæmt erlendum heimildum allt upp í 35 prósentum.

Mikil bjartsýni ríkir nú innan fiskeldisgeirans og í bígerð er að hefja nýtingu á ýmiss konar erlendri tækni sem gæti flýtt fyrir þróuninni.

– ÖS.





„Serious investments in salmon farming are land based and make use of water circulation systems“

Quote from Frjáls Verslun, 1 August 1989

„Þær fjárfestingar í laxeldi sem hægt er að taka alvarlega á Íslandi byggjast á eldi í landi og notkun dæluvatns.“



However, as the price of salmon went down, this production method proved too expensive due to the high construction costs and the high energy cost for pumping large amounts of water into the tanks.



# Different species tried including

- Atlantic salmon
- Atlantic cod
- Arctic charr
- Atlantic halibut
- Rainbow trout
- Turbot
- Blue mussel
- River eel
- Spotted catfish
- Abalone,
- Tilapia
- Haddock

# Promising species

- One of the more promising of these new species is the rearing of Senegal sole that began in 2013 and saw the first commercial production in early 2015.
- Hatching of lumpfish eggs was started in early 2014 with juveniles being exported to The Faroe Islands and Scotland as an innovative approach to “delouse” farmed salmon in floating cages as the lumpfish pluck the salmon lice off the skin of the salmon.

## The current main species



**Atlantic salmon  
(Sea-cage operations)**



**Arctic char  
(Land-based operations)**





# Farmed strain of Atlantic salmon in Iceland

- In the 1990s **Stofnfiskur hf.** selective breeding started. It was decided to import eyed ova from Norway to Iceland.
- The „Saga-strain“ farmed in Iceland is a descendant of three Norwegian strains of Atlantic salmon that showed good growth potential and low grilse rate.



# The regulatory framework

# The Aquaculture controversy

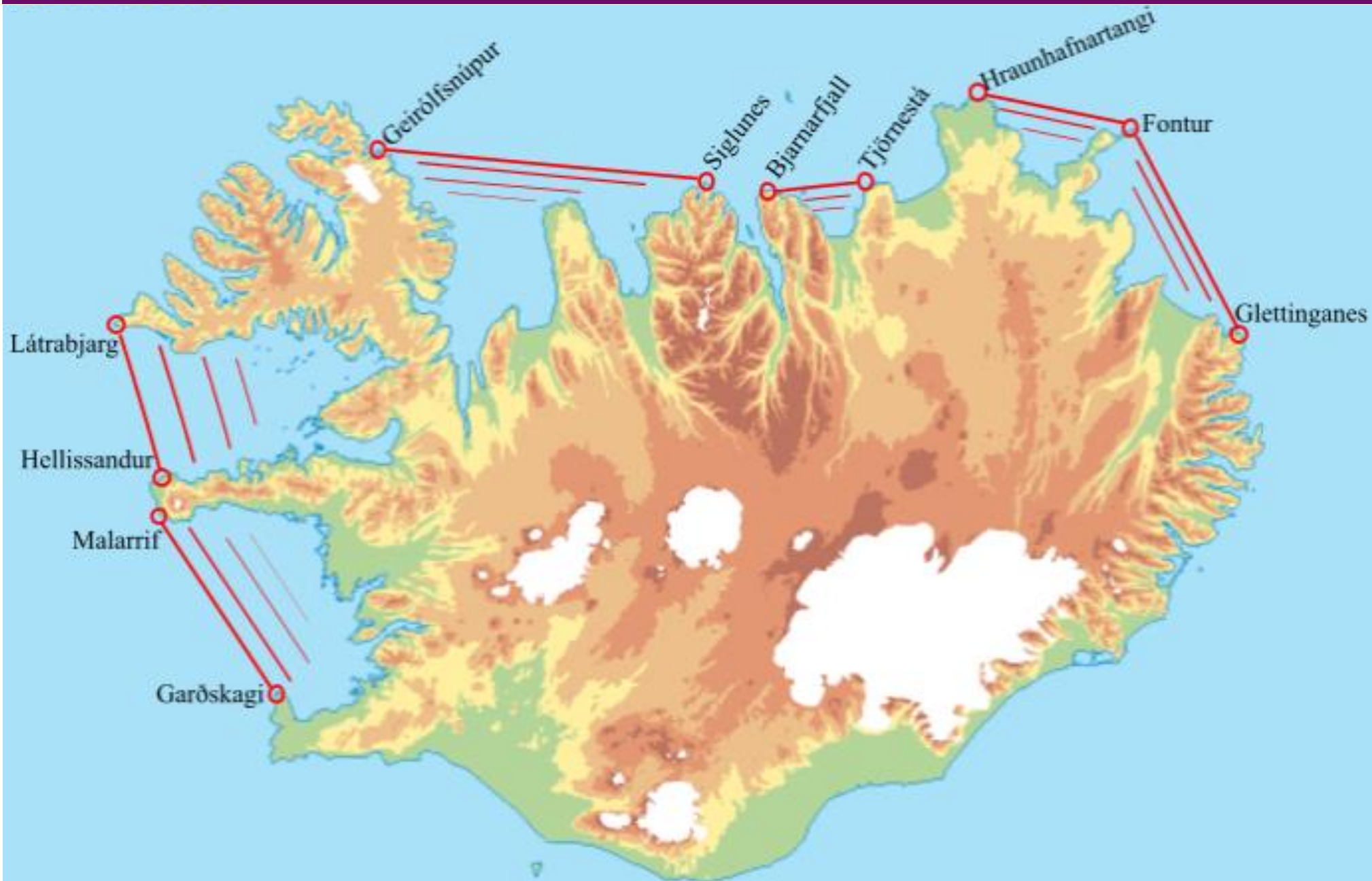
- Much controversy exists about the ecological and health impacts of intensive salmonids aquaculture on the environment, including on the impacts on wild salmon stocks.
- In Iceland only certain specified coastal areas are therefore open for salmonid aquaculture, mainly in the Westfjords and Eastfjords.





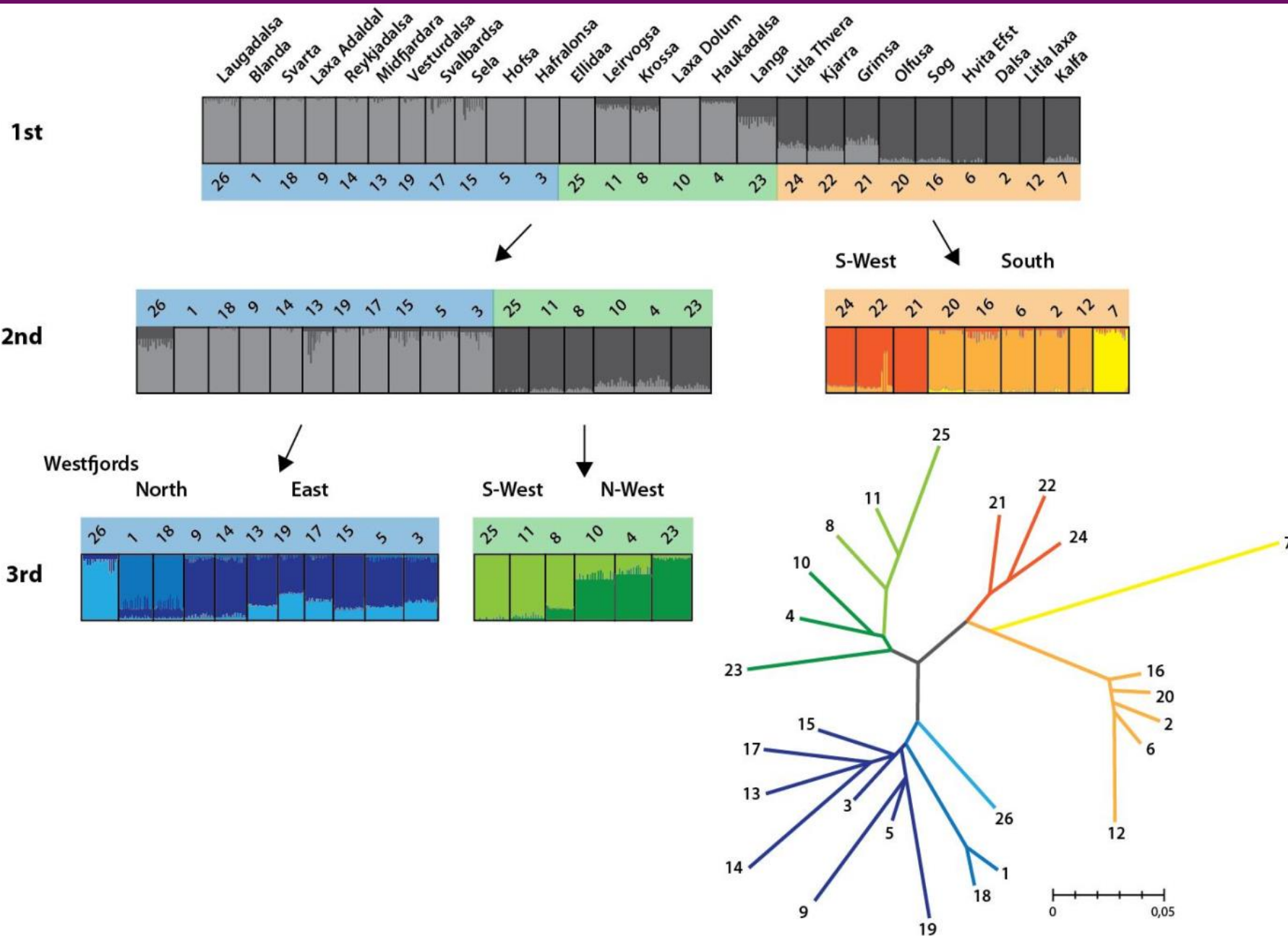
## Announcement (No. 460/2004)

On protection areas where the farming of salmon (fam. salmonidae) in sea cages is prohibited.





# Mapping the Icelandic wild salmon



# Aquaculture license structure



- The Icelandic Environmental Agency (**UST**) is the state authority for the issuance of **environmental licenses** and is under the Ministry for the Environment.
- The environmental license contains specific criteria regarding pollution, harmful chemicals, distribution of suspended solids and other local environmental issues.
- The Icelandic Food and Veterinary Authority (**MAST**) is the state agency for the issuance of **operating licenses** and is under the Ministry of Industries and Innovation.
- The operating license also contains specifications concerning the species being reared, total biomass allowed, monitoring and other conditions.



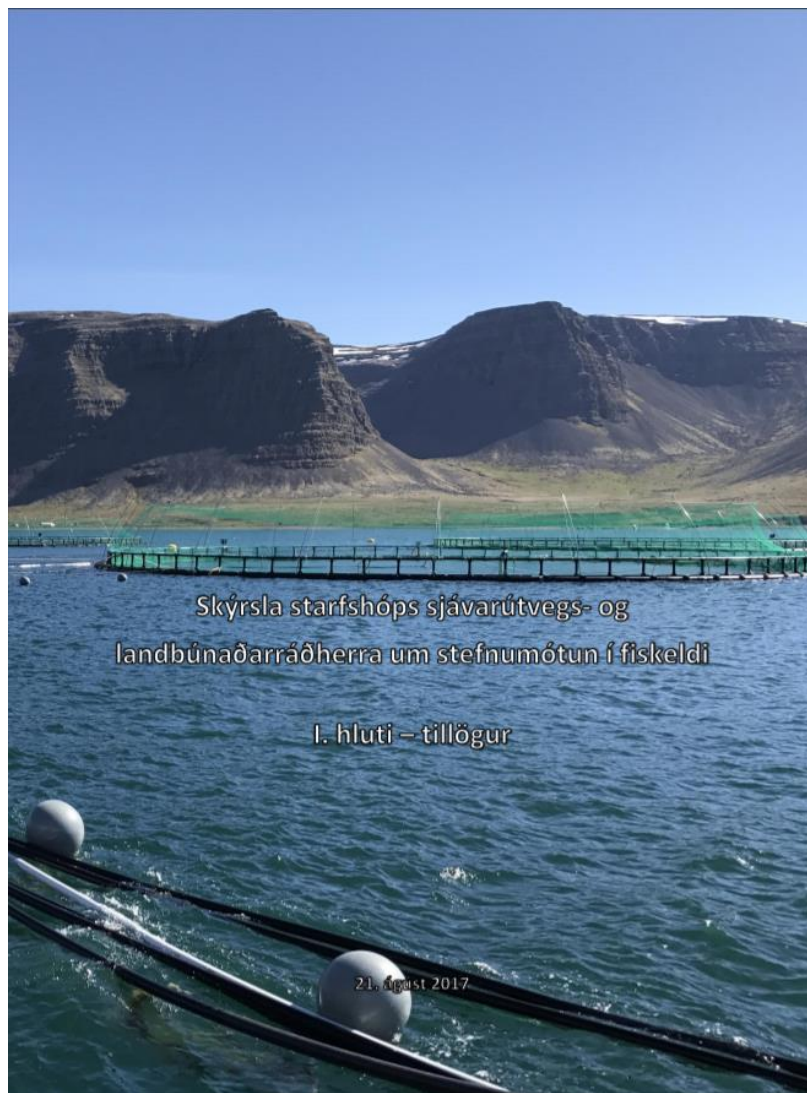
# Aquaculture quality control



- Official quality control is the responsibility of the Icelandic Food and Veterinary Authority (MAST) under the Ministry of Industries and Innovation.
- A government-appointed Fish Disease Committee advises MAST on all fish disease issues. The Fish Disease Laboratory is a National Reference Laboratory that offers applied veterinary research, health control and diagnostic services for aquatic animals.

# The Aquaculture Act No. 71/2008

- The same act for land-based aquaculture and sea-cage based aquaculture.
- Still there are additional requirements concerning sea-cage based aquaculture.
- Revision of the Aquaculture Act in 2014 introduced additional requirements based on the „**NS 9415:2009** (Flytende oppdrettsanlegg - Krav til lokalitetsundersøkelse, risikoanalyse, utforming, dimensjonering, utførelse, montering og drift) “ standard.



# Strategy for aquaculture

Report submitted in August  
2017





# Technology and knowledge transfers

Primarily from Norway

All four main salmon farmers are majority foreign owned

Salmar, Norway Royal Salmon, Bremesco, Måsøval Fiskeoppdrett AS, Midt-Norsk Havbruk

# Some of the **recent amendments to the Aquaculture Act**

- **Risk assessment** to evaluate how much salmon farming could be operated in Iceland without taking too high risk of genetic deterioration of the wild salmon populations.
- **Offshore area allocation.**
- Application procedures for licenses.
- License allocation (**16 years**).
- Information disclosures concerning licenses and operations.
- Internal control.
- Monitoring procedures (incl. salmon lice).
- Temporary research licenses for the MFRI.
- Administrative fines.

A photograph showing a large sea cage in the ocean. The cage is made of a dark net and is filled with water. In the background, there are steep, brown mountains under a clear sky. The water is dark blue with some white foam from the cage's movement.

The focus is on farming in sea cages

# License requirements and conditions

## Carrying capacity

Survey conducted by the MFRI at the request of the Minister.

## Site allocation

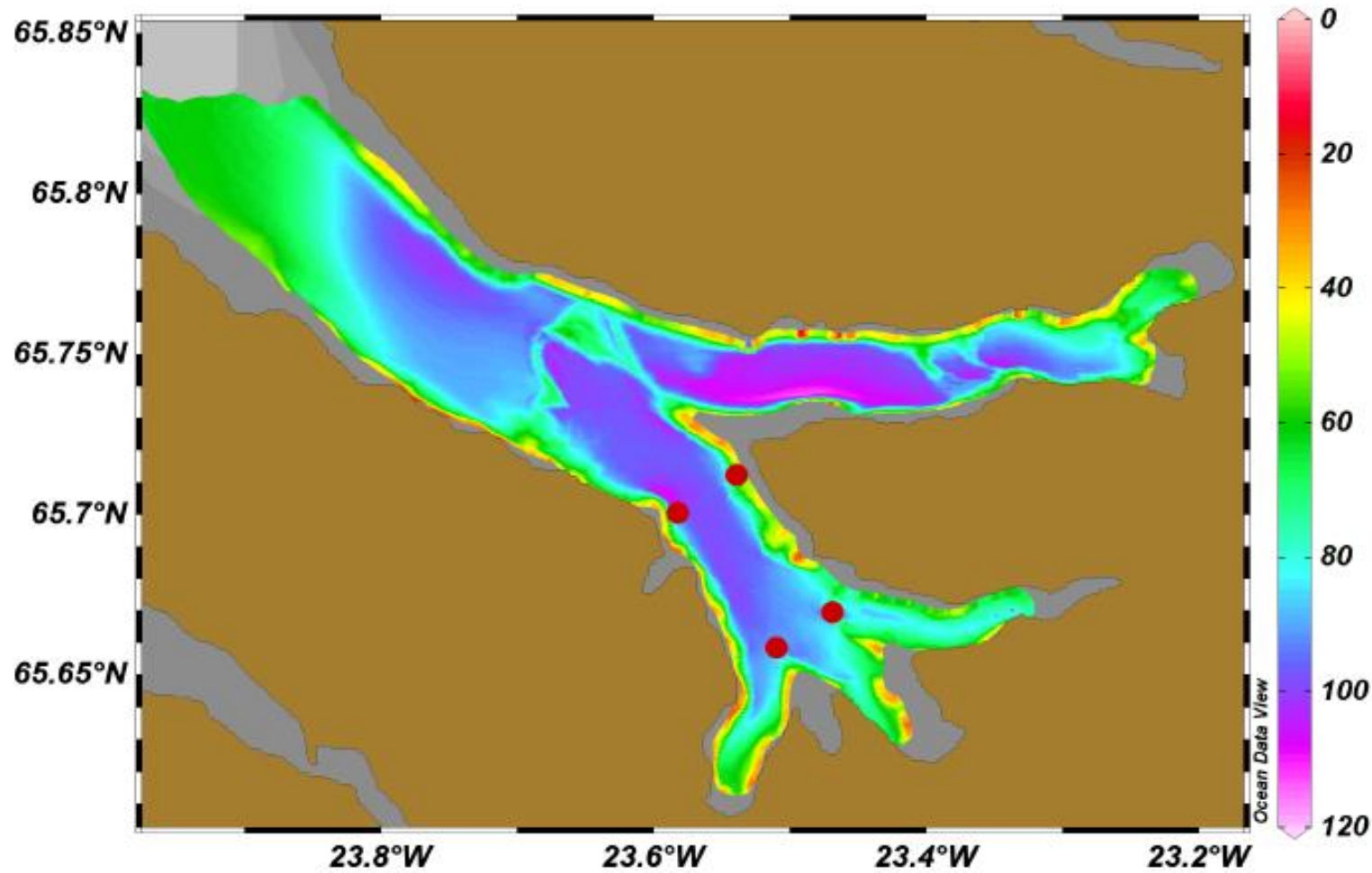
Survey conducted by the MFRI at the request of the Minister.

Auctioning of new sites.

## Risk assessment

MFRI to evaluate how much salmon farming could be operated in Iceland without taking too high risk of genetic deterioration of the wild salmon populations.





## Carrying capacity

Assessment of how much biomass can be allowed in certain areas.





## Current carrying capacity

| Year of publication/Area |   | Tons    |
|--------------------------|---|---------|
| 2015                     | Arnarfjörður  | 20.000  |
| 2015                     | Dýrafjörður   | 10.000  |
| 2015                     | Patreksfjörður, Tálknafjörður og Patreksfjarðarflói | 20.000  |
| 2016                     | Berufjörður   | 10.000  |
| 2016                     | Fáskrúðsfjörður                                     | 15.000  |
| 2016                     | Reyðarfjörður                                       | 20.000  |
| 2017                     | Ísafjarðardjúp                                      | 30.000  |
| 2017                     | Stöðvarfjörður                                      | 7.000   |
| 2018                     | Seyðisfjörður                                       | 10.000  |
| 2018                     | Önundarfjörður                                      | 2.500   |
| Total                    |   | 144.500 |

# Risk assessment variables

The size of the farming and the distance to rivers are the key variables in the model that was used to determine the quantity allowed to be farmed of fertile salmon.

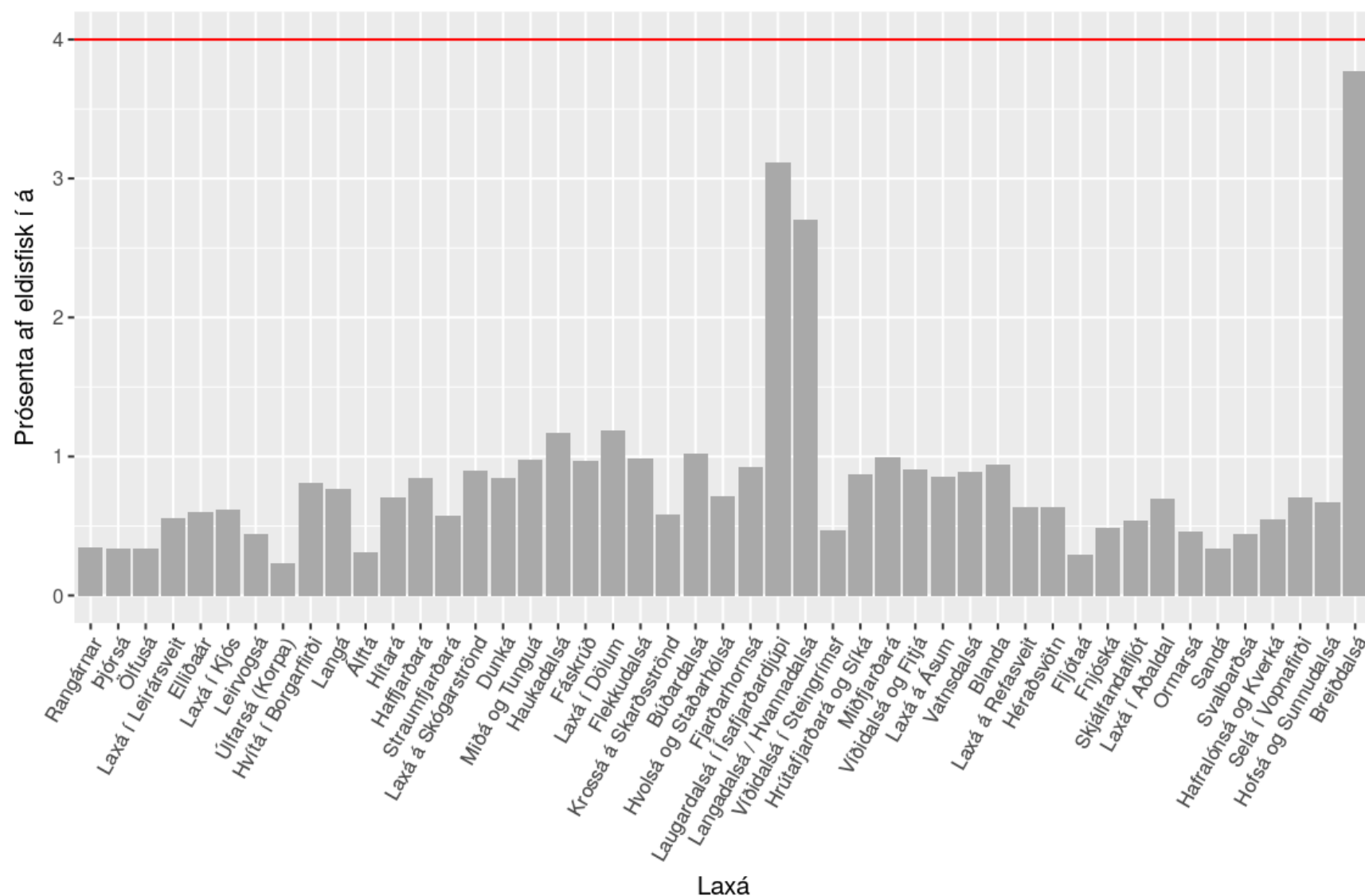
Based on the principle to protect the wild populations it is suggested that not more than 71.000 tonnes of fertile salmon can be farmed in Iceland, thereof 50.000 tonnes in Westfjords and 21.000 in the Eastfjords.



Kort Graf Tafla Weibull

# Risk assessment model

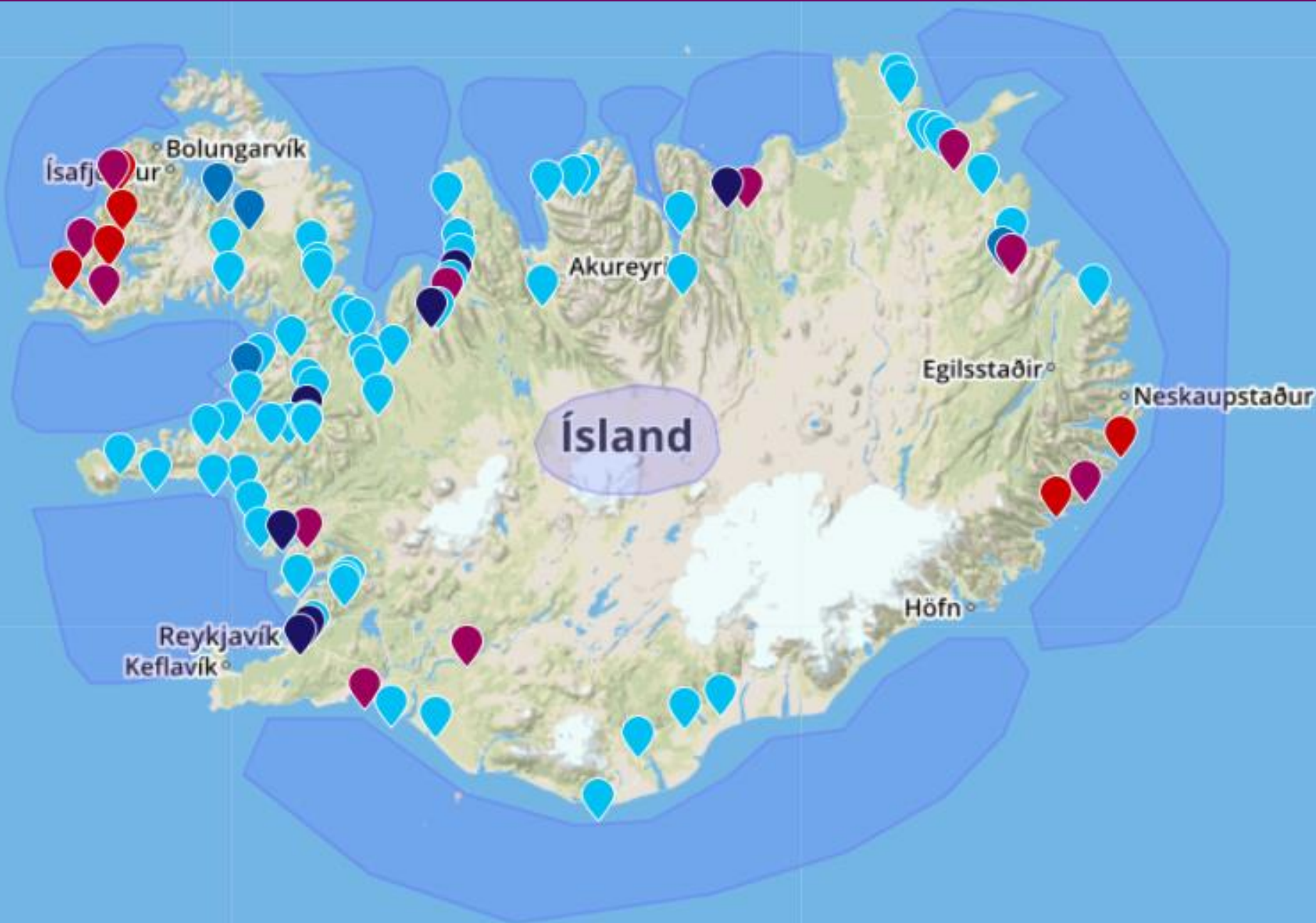
The percentage of farmed salmon in respective rivers





## Ongoing monitoring programs by the MFRI

Mapping to sites and escapees.





Applies only to  
fertile salmon  
in sea cages

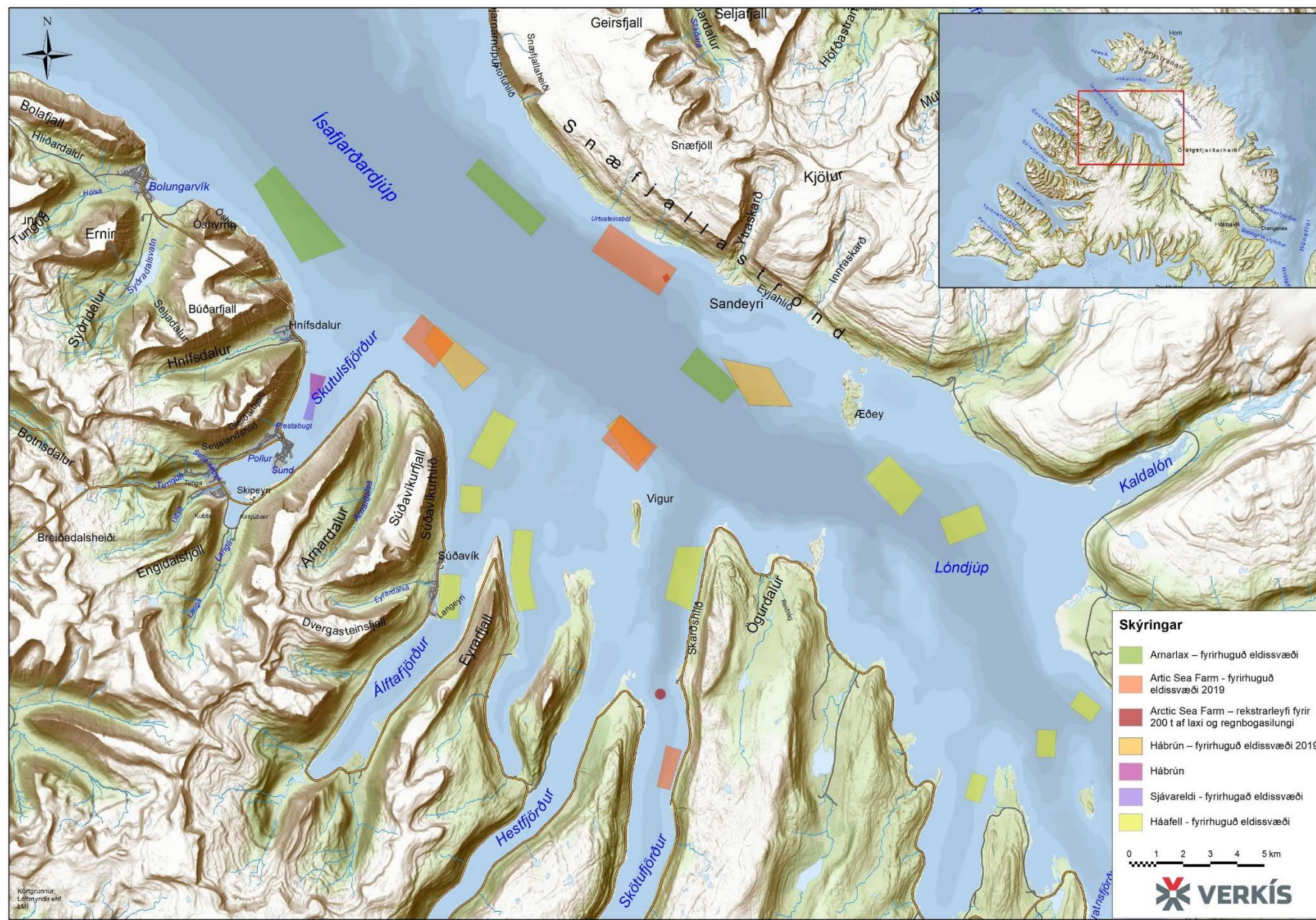
## Current risk assessment

| Area  | Tons          |
|---|---------------|
| <b>Westfjords</b>                                   |               |
| Arnarfjörður  | 20.000        |
| Dýrafjörður   | 10.000        |
| Patreksfjörður, Tálknafjörður og Patreksfjarðarflói | 20.000        |
| <b>Ísafjarðardjúp</b>                               | <b>0</b>      |
| <b>Westfjords total:</b>                            | <b>50.000</b> |
| <b>Eastfjords</b>                                   |               |
| <b>Berufjörður</b>                                  | <b>6.000</b>  |
| <b>Fáskrúðsfjörður</b>                              | <b>6.000</b>  |
| <b>Reyðarfjörður</b>                                | <b>9.000</b>  |
| <b>Stöðvarfjörður</b>                               | <b>0</b>      |
| <b>Eastfjords total:</b>                            | <b>21.000</b> |



# Offshore area allocation

The challenges how to map the area

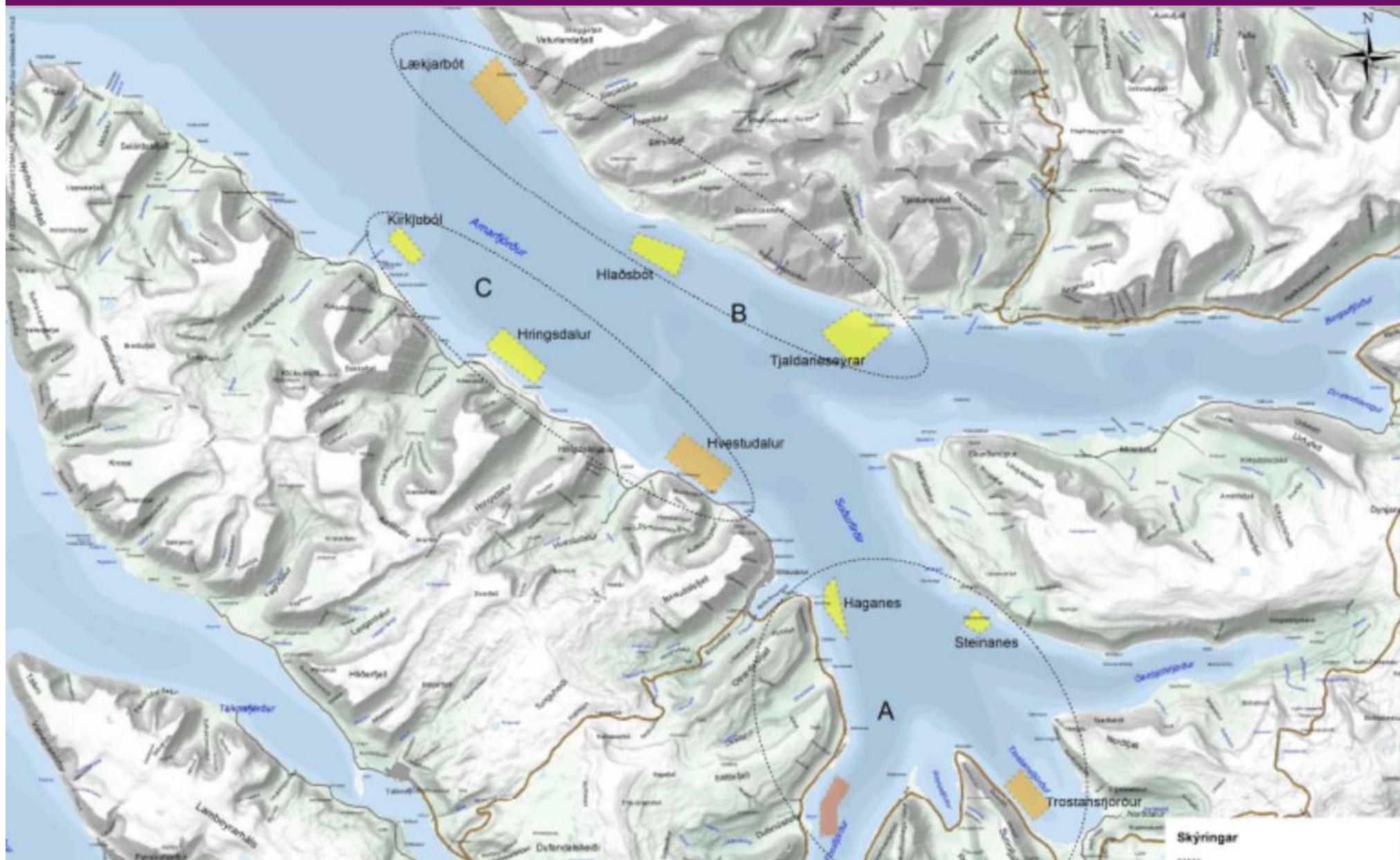






# Offshore area allocation

The challenges how to map the area





# **Regulatory challenges on how to balance the new and the old system**



# The outlook for aquaculture



|  |        |        |
|--|--------|--------|
| Production                                     | 10.000 | 40.000 |
| Direct employment                              | 130    | 520    |
| Indirect employment                            | 104    | 416    |
| Population with aquaculture related livelihood | 562    | 2.246  |
| Salaries in ISK millions                       |        |        |
| Direct employment                              | 780    | 3.120  |
| Indirect employment                            | 624    | 2.496  |
| Taxes in ISK millions                          |        |        |
| Direct employment                              | 106    | 426    |
| Indirect employment                            | 85     | 341    |
| Export revenues in ISK billions                |        |        |
| Prices @ 4,50 €/kg                             | 5,4    | 21,7   |
| Prices @ 6,00 €/kg                             | 7,2    | 29,0   |
| Prices @ 7,00 €/kg                             | 8,5    | 33,8   |
| Prices @ 8,00 €/kg                             | 9,7    | 38,7   |

# Icelandic Regional Development Institute

BYGGÐASTOFNUN

Byggðaleg áhrif fiskeldis

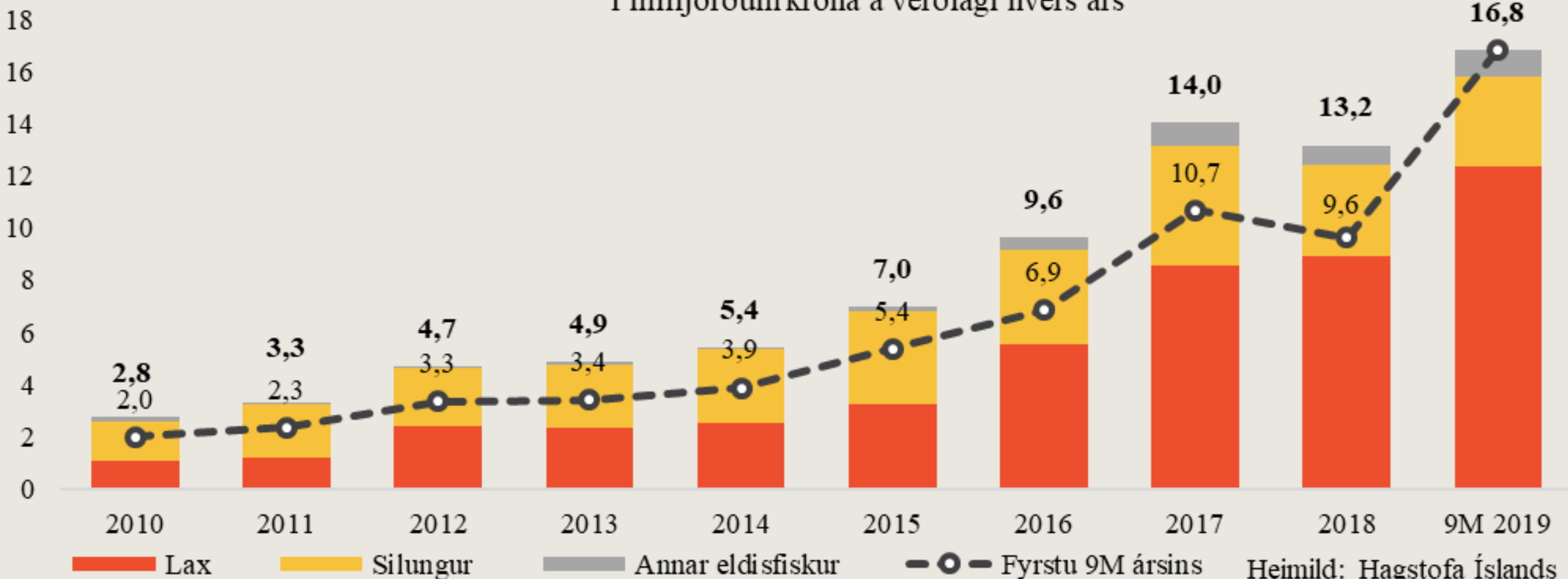
Assessment of  
possible impact





# Aquaculture export revenues 2010-2019

Útflutningsverðmæti eldisafurða á ári hverju og fyrstu 9 mánuðum ársins  
Í milljörðum króna á verðlagi hvers árs



# The industry is still in its infancy

Even though the current wave of aquaculture in Iceland is the 4th wave for this industry – the industry is still in early stages and there are still many challenges to be addressed – both from regulatory and operational point of view.

Finding the right balance between aquaculture and other operations is an ongoing task.

Even though the debate surrounding the industry has been heated at times the outlook for continued growth looks promising.



# Q&A