European anglers perspective on aquaculture
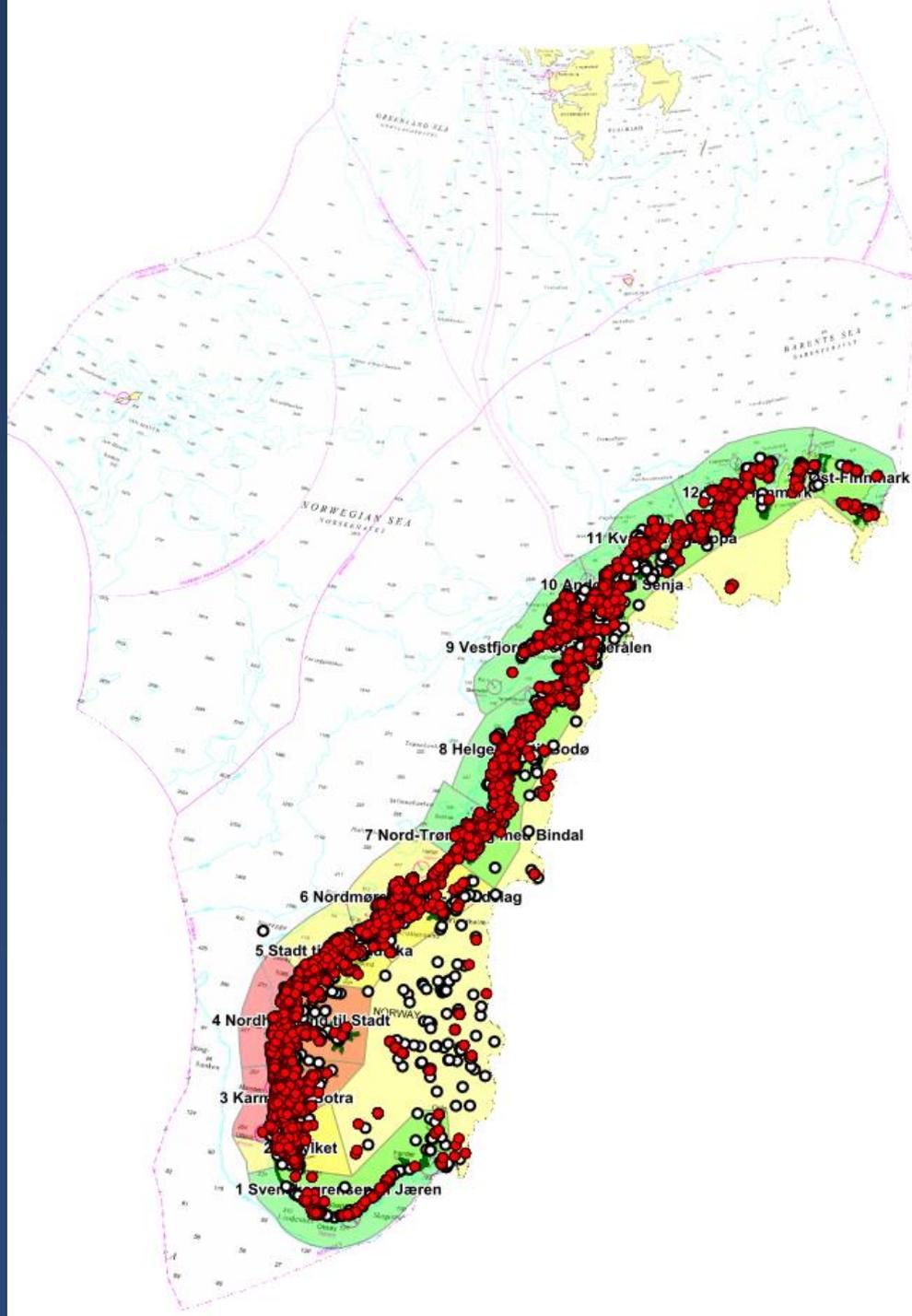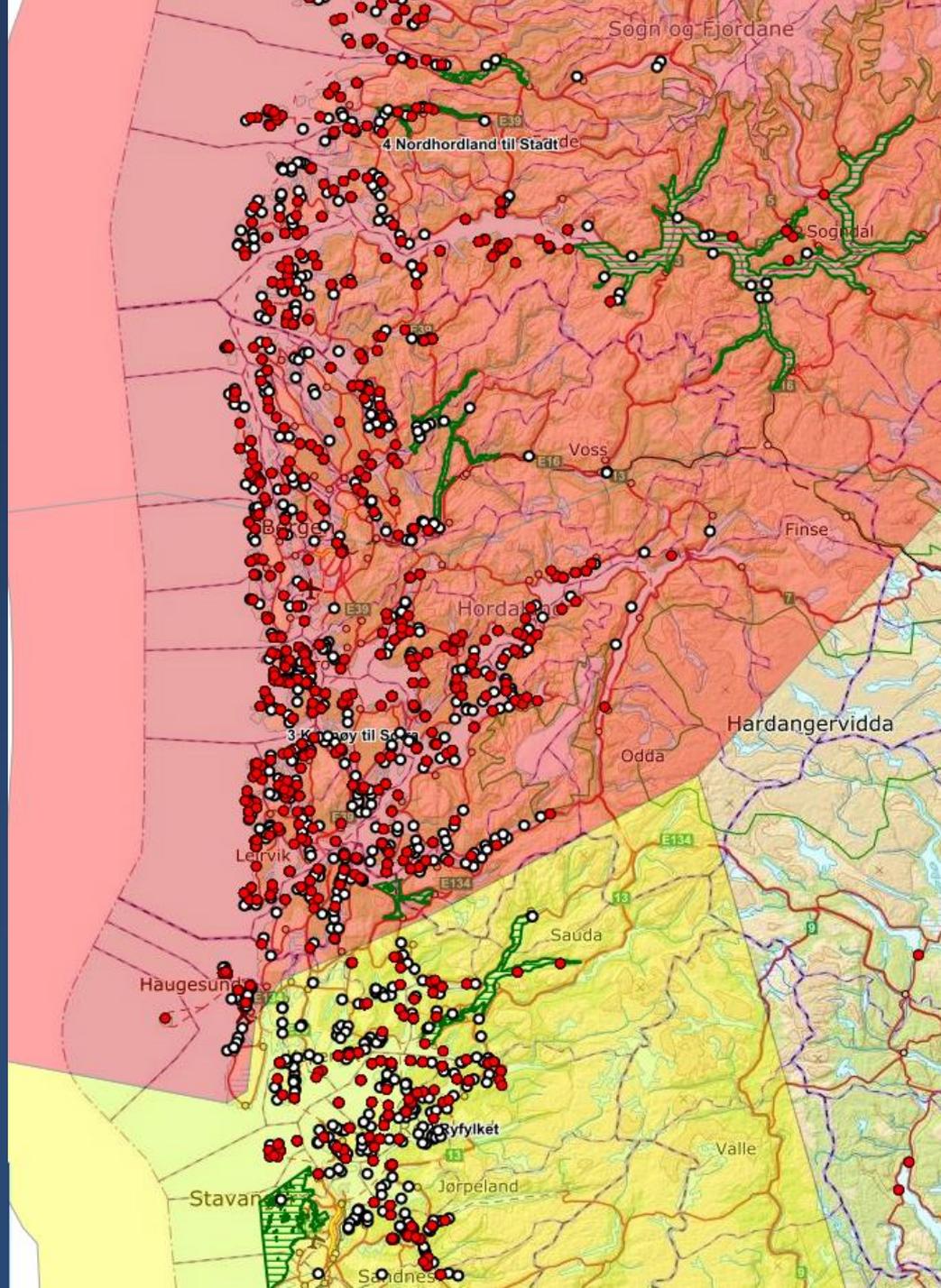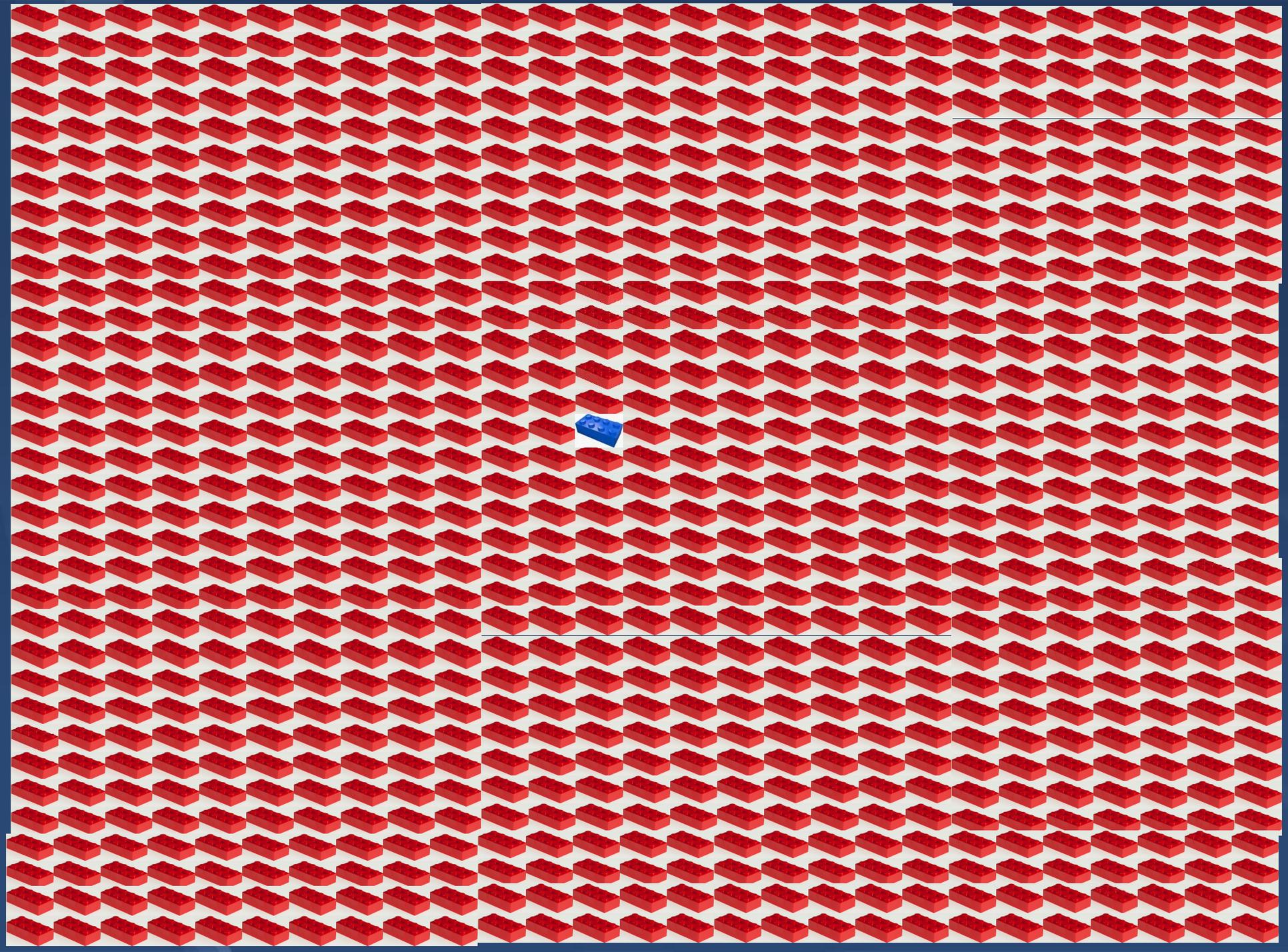
Escapees, sea lice, and other challenges
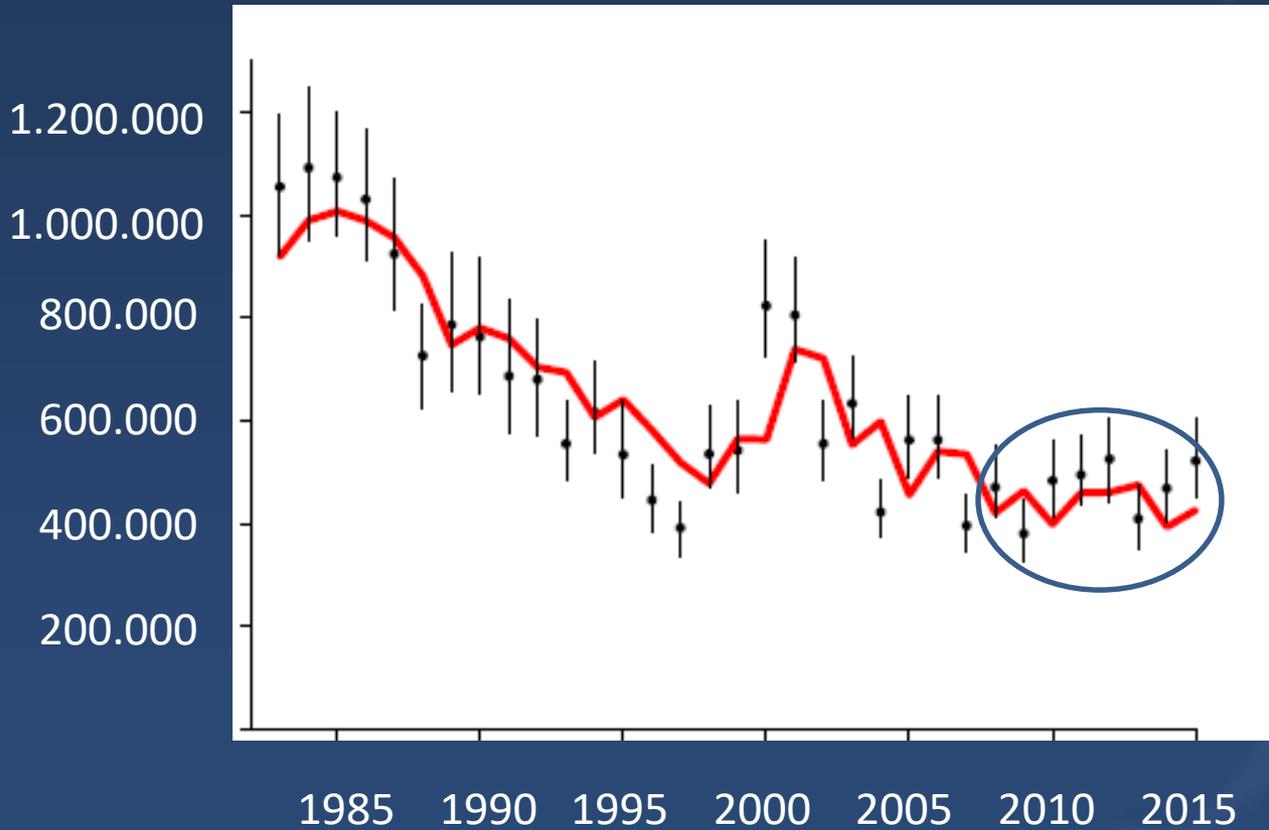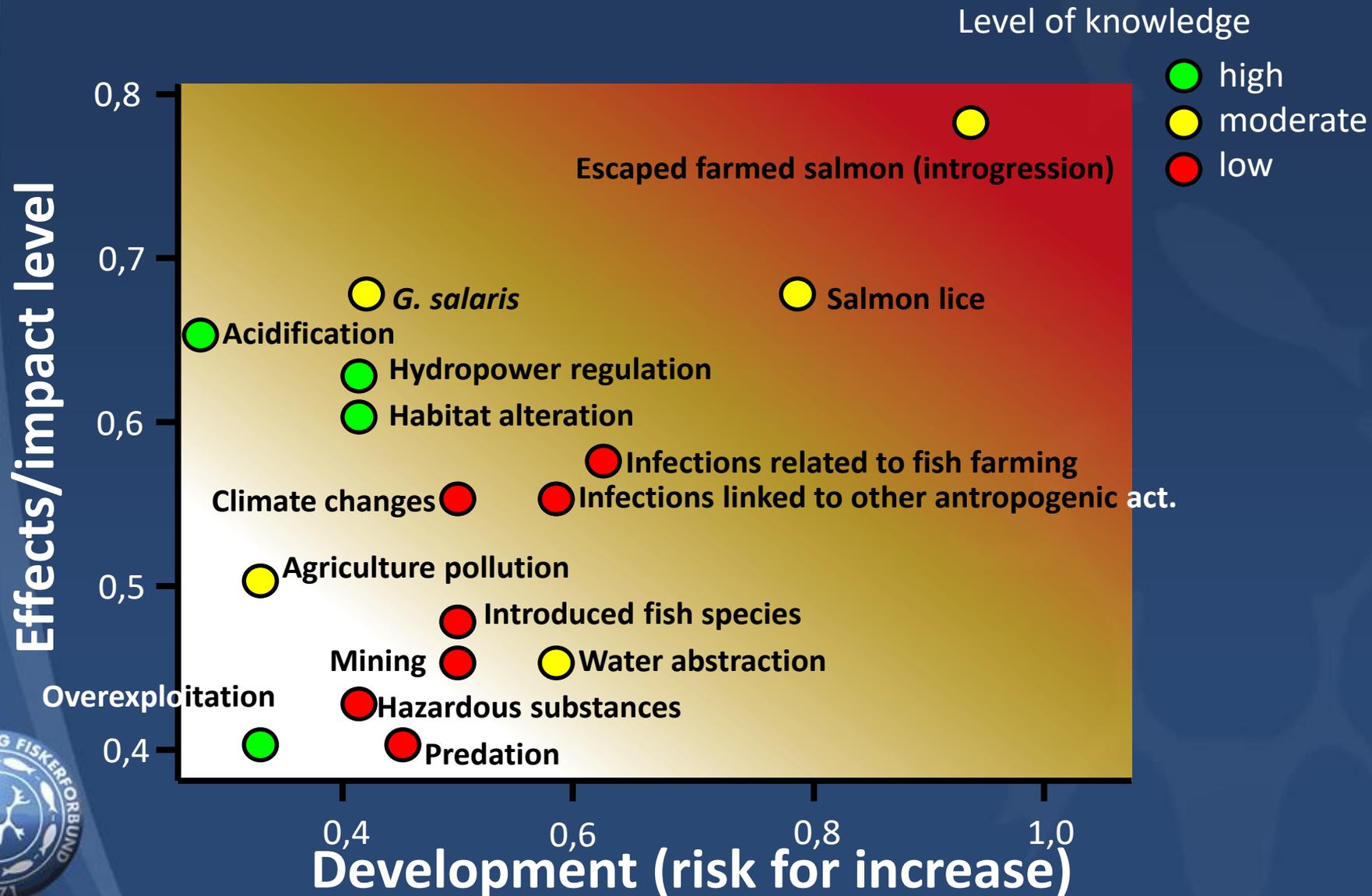
Our worry

Spawners returning to the rivers

Anthropogenic factors aff. wild salmon

Level of knowledge
- **high**
- **moderate**
- **low**

Effects/impact level

Development (risk for increase)

- Escaped farmed salmon (introgression)
- *G. salaris*
- Salmon lice
- Acidification
- Hydropower regulation
- Habitat alteration
- Infections related to fish farming
- Climate changes
- Infections linked to other antropogenic act.
- Agriculture pollution
- Introduced fish species
- Mining
- Water abstraction
- Overexploitation
- Hazardous substances
- Predation

0,8 0,7 0,6 0,5 0,4

0,4 0,6 0,8 1,0

The challenges as the scientists see it

Legend:
- Salmon lice
- Esc. salmon
- Hydropower
- Habitat destruction
- Acidification
- Agriculture
- Diverse use of water
- Drainage
- Pollutants
- G. salaris
- Roads etc

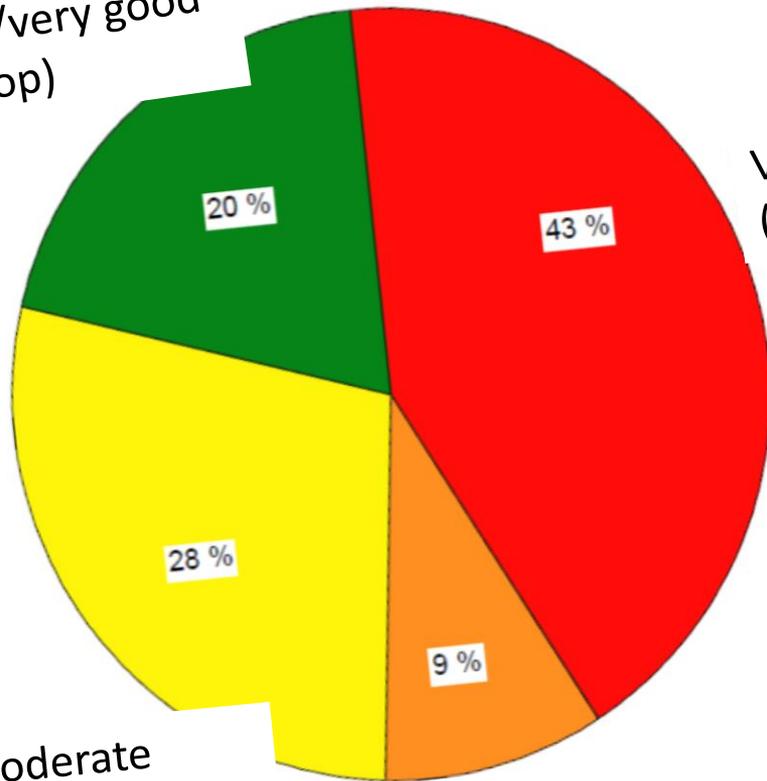Pie chart values: 38,7 — 24,7 — 17,0 — 5,1 — 3,6 — 2,4 — 1,9 — 1,4 — 1,4 — 1,4 — 0,8
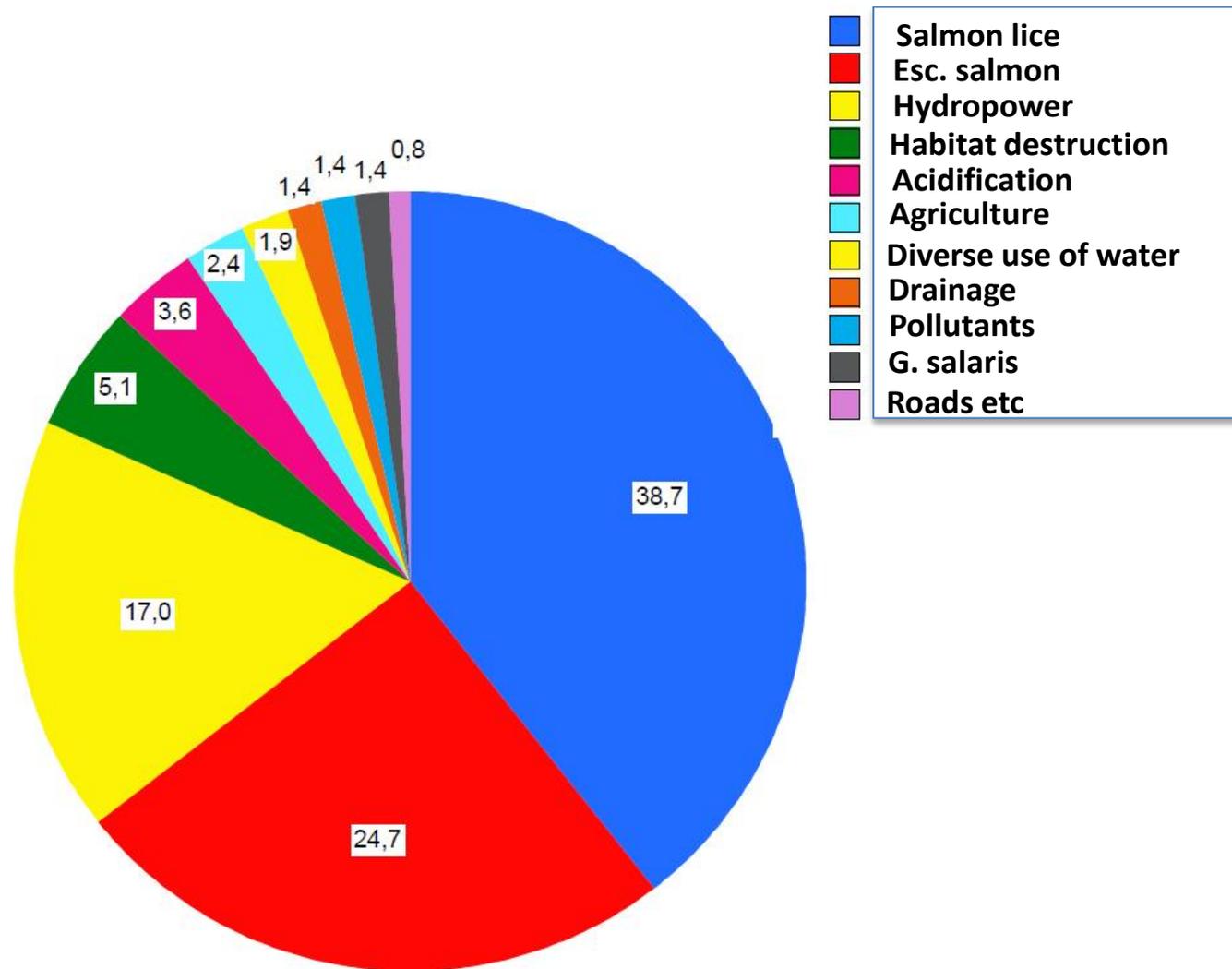
Figur 3.4. *Effekt av ulike påvirkningsfaktorer på redusert bestandsstørrelse hos norsk laks, beregnet etter prosentandel hver enkelt påvirkning utgjør av totalsummen, for perioden 2010-2014. Totalt ble 448 bestander vurdert. Tallene i figuren angir prosentandeler.*

How bad is it?

Classification of 148 salmon populations (85 % of total) after Norwegian minimum quality requirements regarding genetic integrity and harvestable surplus

Good/very good (29 pop)

20 %

Very poor (63 pop)

43 %

28 %

9 %

Moderate (42 pop)

Poor (14 pop)

Figur 1. Prosentvis og antallsmessig fordeling av kvalitet for 148 laksebestander klassifisert etter kvalitetsnorm for villaks, fra svært dårlig til god/ svært god (slått sammen). Normens mål er at bestandene skal ha god eller svært god kvalitet (tilsvarende grønn sektor).
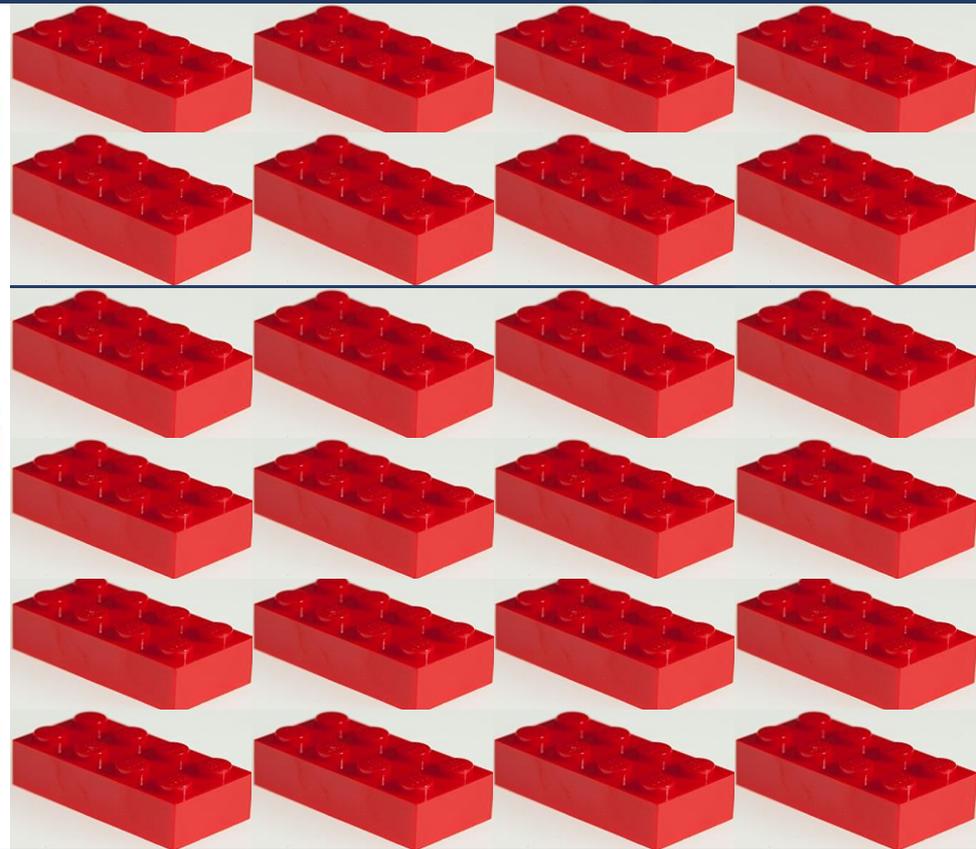
- Antall rømte laks – matfisk og settefisk

År	Antall
2017	8
2016	126 000
2015	170 000
2014	287 000
2013	198 000
2012	38 000
2011	368 000
2010	291 000
2009	225 000
2008	111 000
2007	298 000
2006	921 000
2005	717 000
2004	553 000
2003	409 000
2002	477 000
2001	272 000

Genetic introgression

The genetic problem

- Escapes salmon has already affected the genetics in 66% of 175 surveyed salmon stocks (Norway)

- Genbank a necessity

- Hard fight for the understanding of reality
    - *In Norway the Department of Environment leads the front by listening to the scientists. The Fisheries department lags behind*

    - *Policy must be based on good science*

The genetic solution

- ZERO escapees – the best
- Sterile salmon – the next best
- Removal of escaped farmed salmon – crisis solution
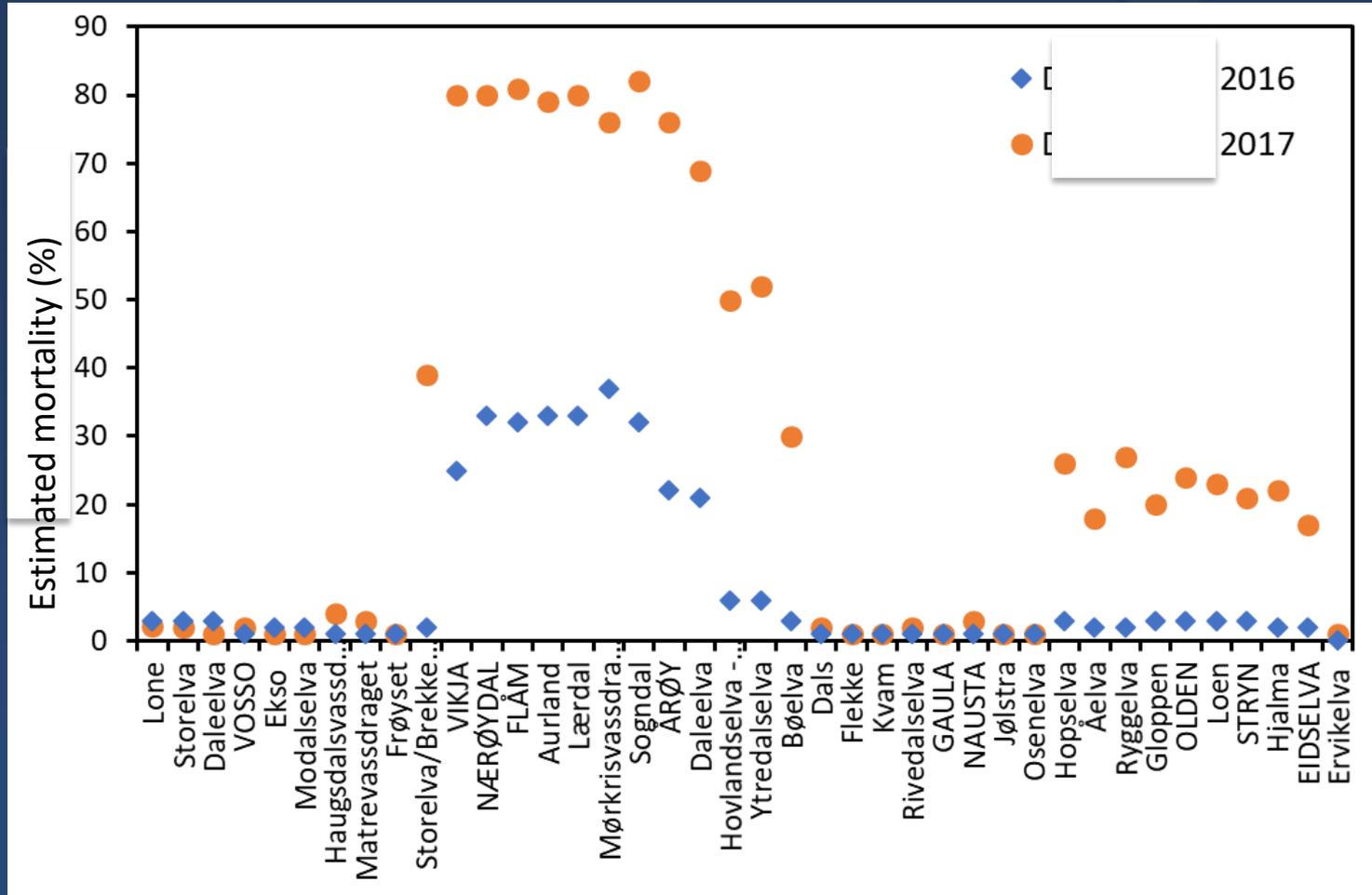- Tagging

Sea lice - *Lepeophtheirus salmonis*

- Natural parasite
- Deadly in large numbers
- Young (small) fish most vulnerable
- Salmon <u>and</u> Sea Trout affected

Estimated mortality (smolt) caused by salmon lice - Norway

Treatment

- **Use of chemicals**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
azametifos	66	1884	3346	2437	4059	3037	4630	3904	1269	204
cypermetrin	32	88	107	48	232	211	162	85	48	8
deltametrin	39	62	61	54	121	136	158	115	43	14
diflubenzuron	-	1413	1839	704	1611	3264	5016	5896	4824	1803
emamektin	81	41	22	105	36	51	172	259	232	128
teflubenzuron	-	2028	1080	26	751	1704	2 674	2509	4 209	293
hydrogen-peroksid (100%) (tonn)		308	3071	3144	2538	8262	31577	43246	26597	9277

Cleaner fish?

- 20-30.000.000 wild wrasses fished e.y. in Norway
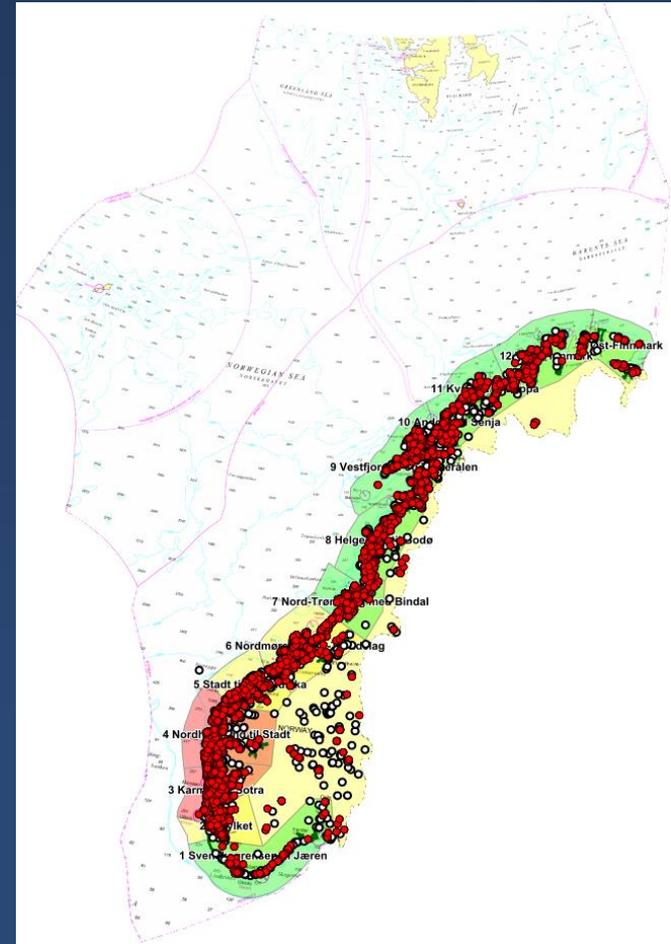- All dies!
- Animal welfare?

Mortality – in farms

- 53+ million farmed salmon dies e.y.
- 3+ million rainbow trout

Mortality (wild salmon) caused by salmon lice

- 15% on average for Salmon
- 20-30% for Sea Trout

Pollution

- Faeces
- Particles N & P
- Rescourses are lost

Our wishes

- A gradual transition to closed facilities - at sea/on land

- No or greatly reduced genetic impact from escaped salmon - escape prevention and more effective removal in rivers

- Sterile fish – if justifiable (animal welfare)

- Reduced mortality from salmon lice on wild fish

- Transition towards recirculating aquaculture systems (RAS)

- Politicians and industry must make the right decisions in the future, and chose the best solutions - both for the environment and for the long-term success of the industry!

Foto: Kjell Erik Kleveland.

So far the salmon lice and genetic problem is in fact unsolved...

- Lot of projects are looking at and testing closed systems (development licenses)

- Lot of work concerning treatment against salmon lice
  - High mortality (farmed fish)

- New technology is taken into use as it is developed – if beneficial economically!
  - Someone must lead the industry into the next phase
    - No lice
    - No escapements
    - No resources lost