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«You have to understand lad, this is the beginning of something great»

(IntraFish)

Salmon farming in Norway

Edgar Brun
Dep Aquatic Animal Health and Welfare

1970-	2025

Arkiv/Kystmuseet i Sør-Trøndelag

The salmon farming has become a high technology driven industry

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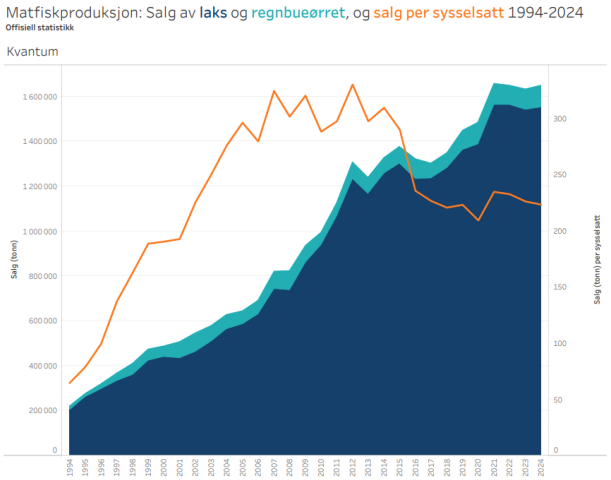
«Livestock salmon»

Atlantic salmon - *Salmon salar*

Rainbow trout - *Oncorhynchus mykiss*

Barentswatch



9200 employed directly in the salmonid production - 22 % women (Dir of Fisheries 2024)

Active sites	2020	2021	2022	2023	2024
Active salmon sites; on-growing sea sites	829	830	834	816	827
Active salmon sites; hatcheries	132	133	131	129	132
Active RB sites; on-growing sea sites	76	65	66	78	81
Active RB sites; hatcheries	25	22	22	19	18

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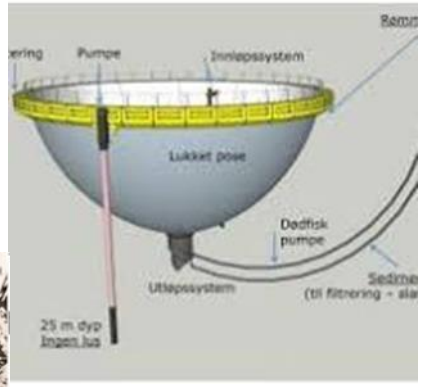
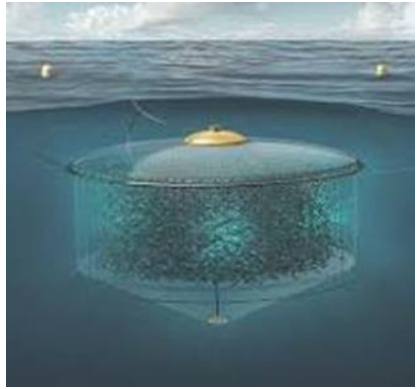
… in sea water

- <200 000 fish pr cage
- 50 m deep (20 – 80 m)
- 160 -200 m circumference





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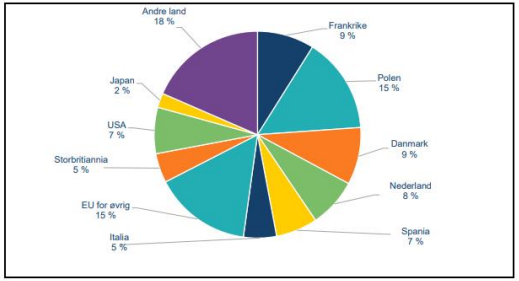
9.1. Eksport av laks

Figur 14. Hovedmarkedene for laks i 2023 (basert på salgsmengde)

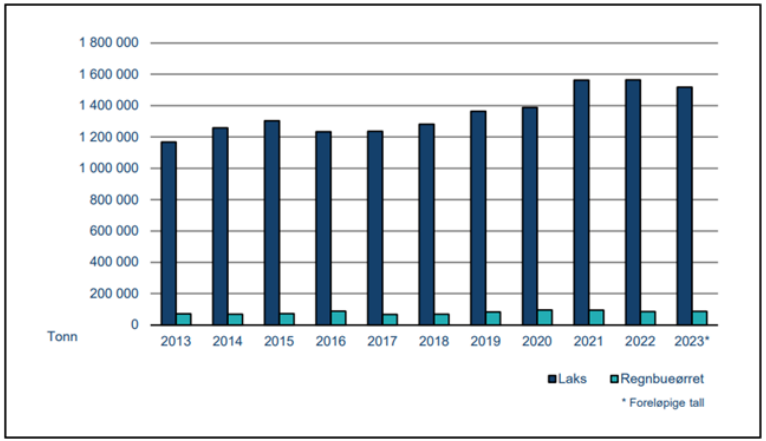


Tabell 33. Laks. Eksport fordelt på land. Mengde i tonn (rundvekt). Verdi i 1000 kroner. Kilde: Norges sjømatråd

	2022			2023			%-vis endring	
Laks	Mengde	Verdi	Pris/kg	Mengde	Verdi	Pris/ kg	Mengde	Verdi
Polen	213 868	13 547 022	63,34	216 296	16 413 229	75,88	1 %	21 %
Frankrike	140 887	9 865 779	70,03	128 988	10 897 716	84,49	-8 %	10 %
Danmark	126 255	8 536 136	67,61	129 458	10 045 766	77,60	3 %	18 %
Nederland	114 013	7 864 575	68,98	111 124	9 072 380	81,64	-3 %	15 %
Spania	97 095	6 667 928	68,67	94 186	7 931 776	84,21	-3 %	19 %
Øvrige EU	306 894	21 774 013	70,95	295 087	24 292 975	82,32	-4 %	12 %
EU totalt	999 013	68 255 453	68,32	975 139	78 653 841	80,66	-2 %	15 %
Storbritannia	73 635	4 965 125	67,43	66 542	5 596 491	84,11	-10 %	13 %
USA	99 033	8 892 073	89,79	104 317	10 737 322	102,93	5 %	21 %
Japan	41 024	2 673 042	65,16	32 663	2 947 361	90,24	-20 %	10 %
Sør-Korea	36 648	3 215 259	87,73	33 964	3 539 320	104,21	-7 %	10 %
Andre land	226 341	17 619 520	77,84	233 187	20 832 073	89,34	3 %	18 %
Totalt	1 475 694	105 620 472	71,57	1 445 812	122 306 408	84,59	-2 %	16 %

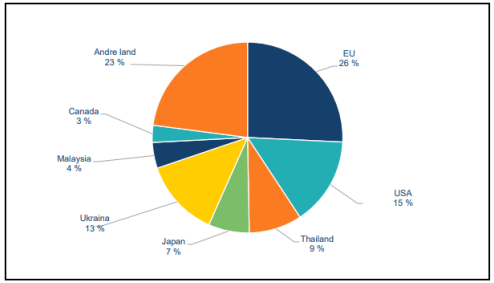
3

Figur 7. Solgt mengde av laks og regnbueørret (matfiskproduksjon) 2013-2023



9.2. Eksport av regnbueørret

Figur 15. Hovedmarkedene for regnbueørret i 2023 (basert på salgsmengde)



Tabell 35. Regnbueørret. Eksport fordelt på land. Mengde i tonn (rundvekt). Verdi i 1000 kroner. Kilde: Norges sjømatråd

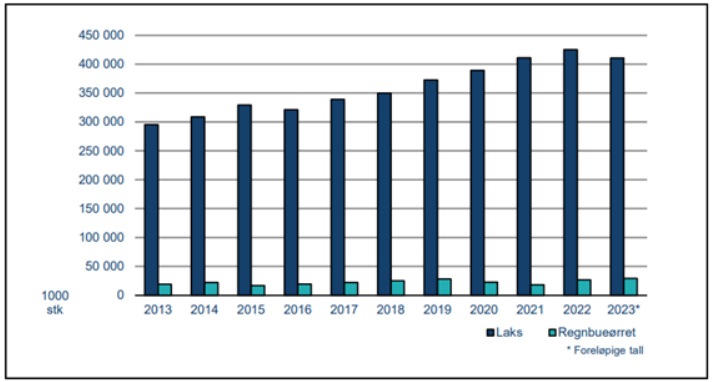
	2022			2023			%-vis endring	
Regnbueørret	Mengde	Verdi	Pris/kg	Mengde	Verdi	Pris/kg	Mengde	Verdi
EU	17 170	1 161 104	67,62	18 124	1 270 205	70,08	6 %	9 %
USA	12 108	905 061	74,75	10 532	955 678	90,74	-13 %	6 %
Thailand	9 313	706 818	75,90	6 344	529 460	83,45	-32 %	-25 %
Japan	5 366	352 082	65,61	4 877	384 577	78,85	-9 %	9 %
Ukraina	5 329	307 798	57,76	9 260	590 918	63,81	74 %	92 %
Malaysia	3 143	238 522	75,88	3 080	246 806	80,14	-2 %	3 %
Canada	2 373	194 922	82,13	2 045	248 767	121,65	-14 %	28 %
Andre land	13 570	1 138 091	83,87	16 138	1 258 860	83,87	19 %	11 %
Totalt	68 373	5 004 398	73,19	70 401	5 485 272	77,91	3 %	10 %

- 2.5 % of global finfish production
- 35 % of global salmon production
- 45 % of Europe's production of farmed aquatic animals

Hatcheries

UiN

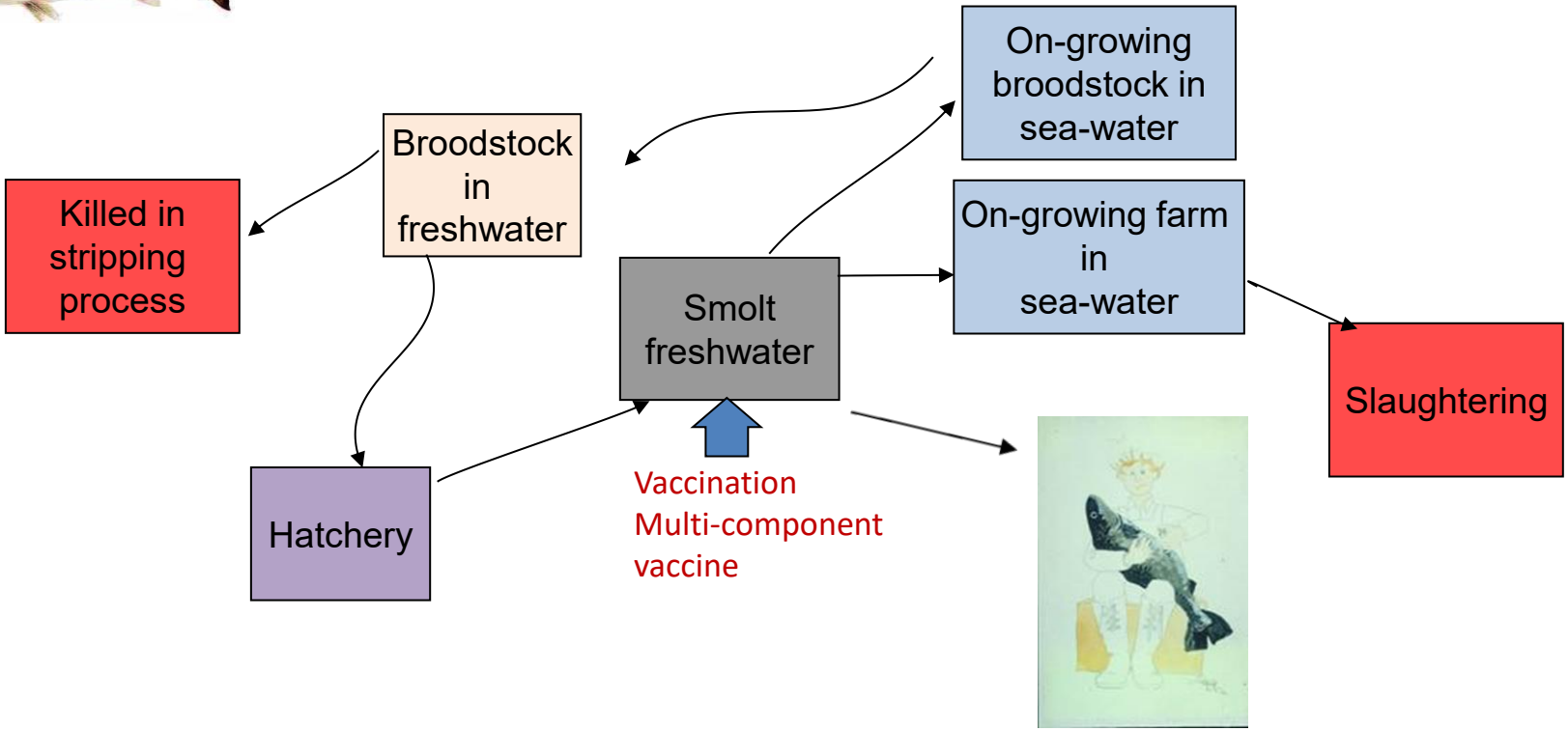
Figur 8. Salg av smolt/settefisk for utsett i sjø (settefiskproduksjon) 2013-2023



- … up to 20 mill at a site
- Sea transfer at +/- 100 g
- > 20 % more than 250 g

Million smolts transferred to on-growing sea sites	2020	2021	2022	2023	2024
Atlantic Salmon	289,0	304,4	341,0	410,8	387,4
Rainbow trout	17,5	13,0	18,0	25,5	27,0

Production cycle



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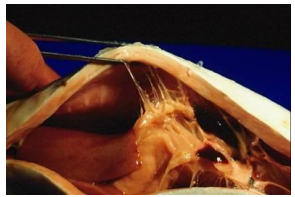
Vaccine Delivery Systems

- Immersion



- Injection (i.p., i.m.)
- Oral

- https://youtu.be/VQYxjjpkueU
- https://youtu.be/ecw5rxxiNc4

Aeromonas salmonicida (furunculosis), *Vibrio salmonicida* (cold water vibriosis), *Listonella anguillarum serotype* O1 og O2a (vibriosis), *Moritella viscosa* (winter wounds), IPNV (infectious pancreatic necrosis) * QTL

ISAV (infectious salmon anemia).
Pancreas Disease – separate injection

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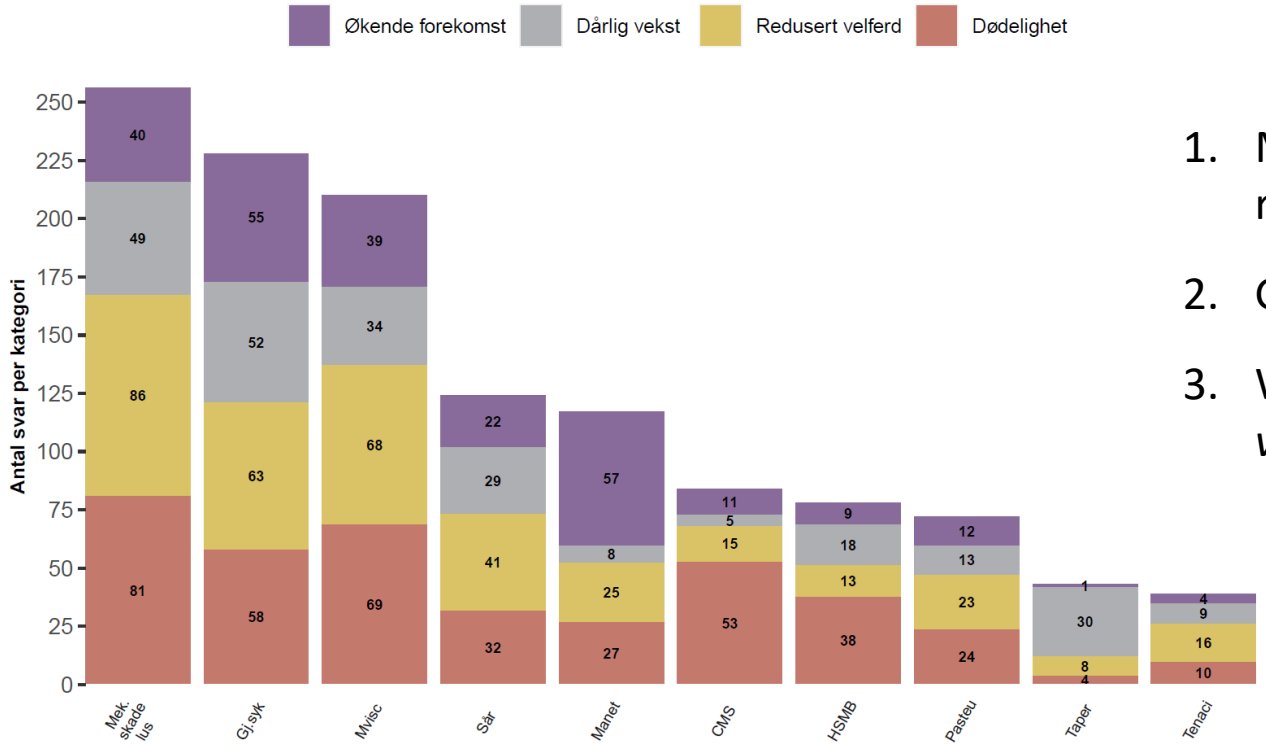
Top 10 problems for on growin sea sites



1. Mechanical – often related to delousing
2. Gill problems
3. Winter ulcer (*M. viscosa*)

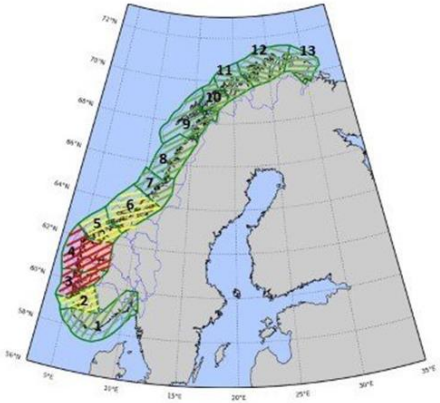
Salmon lice

Traffic light system

- Weekly lice counts at site level reported to a national salmon lice database
- Published on www.barentswatch.no
- Treatment initiated at defined levels set by NFSA

- Estimation of lice burden on wild outbound migratory salmon smolt
- Every 2nd year the burden is transferred to light coulor that decides next period production level

Norway divided into 13 production areas



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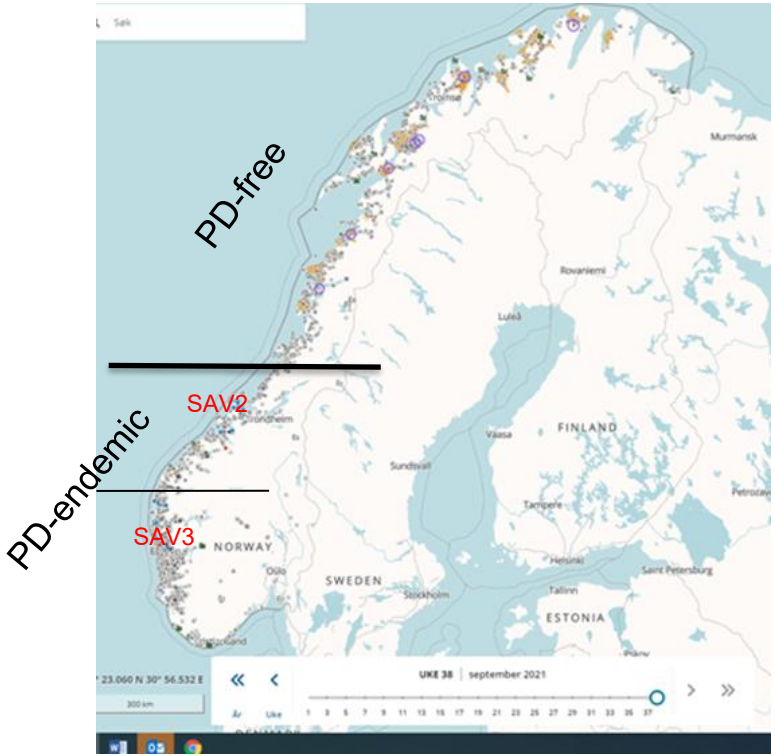
Pancreas disease



- OIE listed disease
- Monthly sampling of each site for SAV/PD
- Monthly reporting to NFSA

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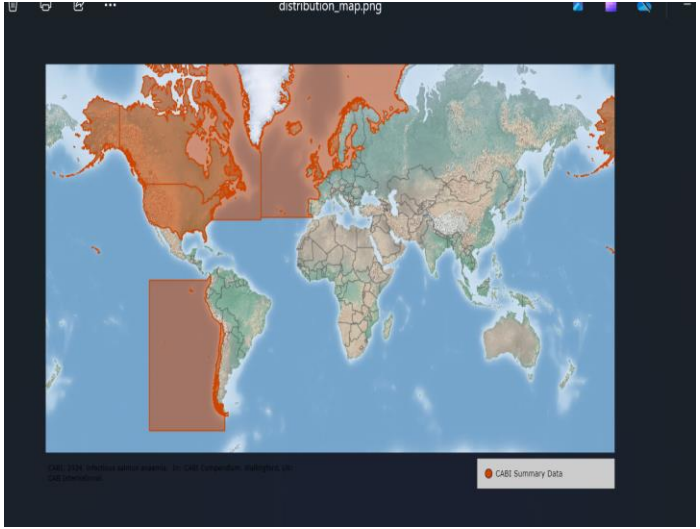
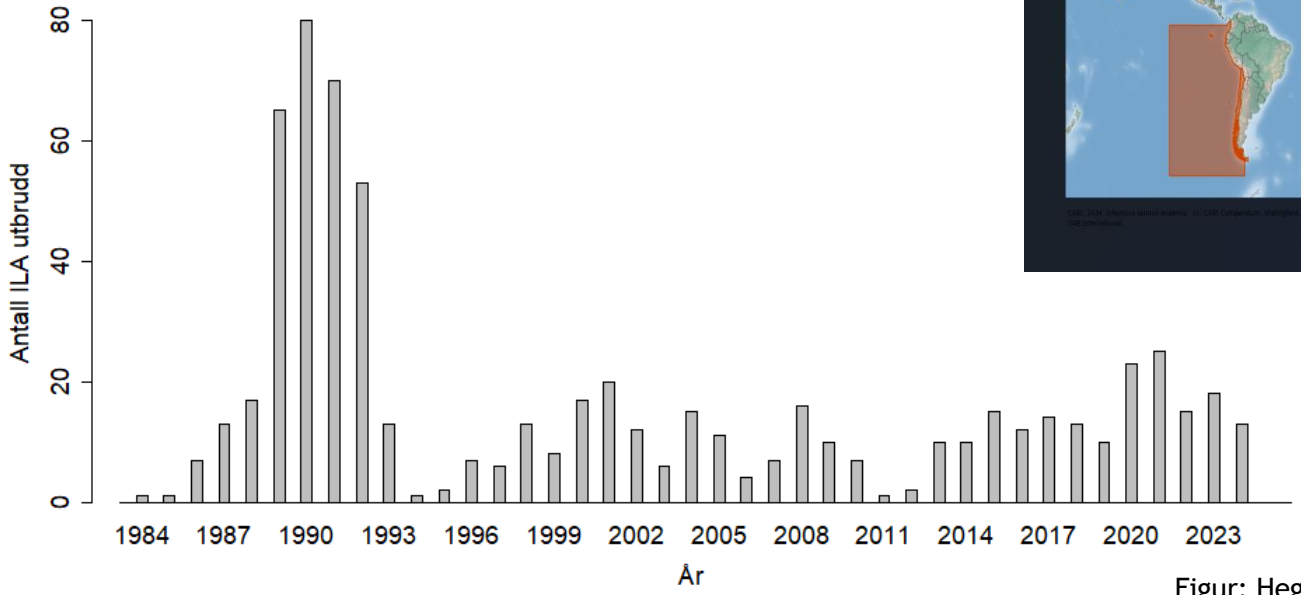
ISA outbreaks





Figur: Hege Løkslett

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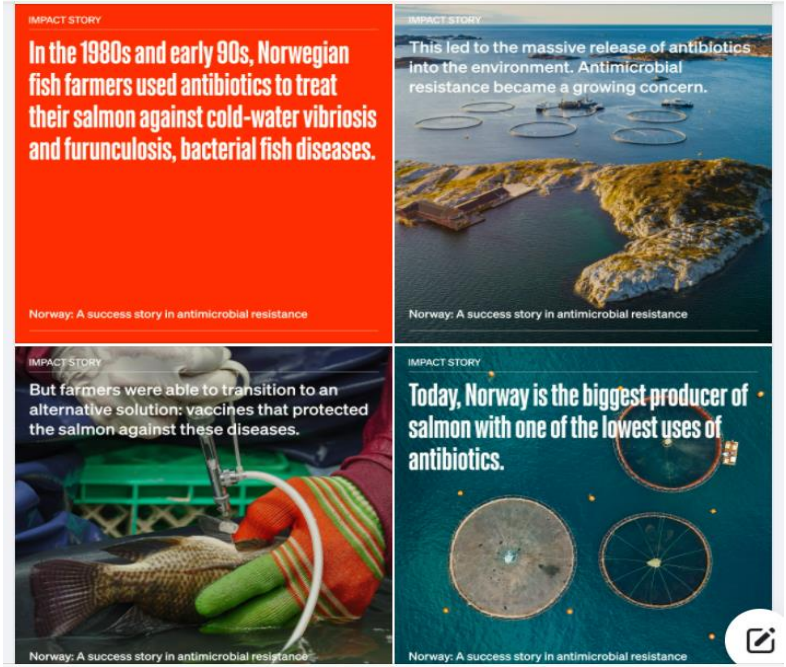
Categorizing losses

- Long time reporting of mortalities and escapees to a national database
- Trying out a new hierarchical and harmonized system for registration of causes of death

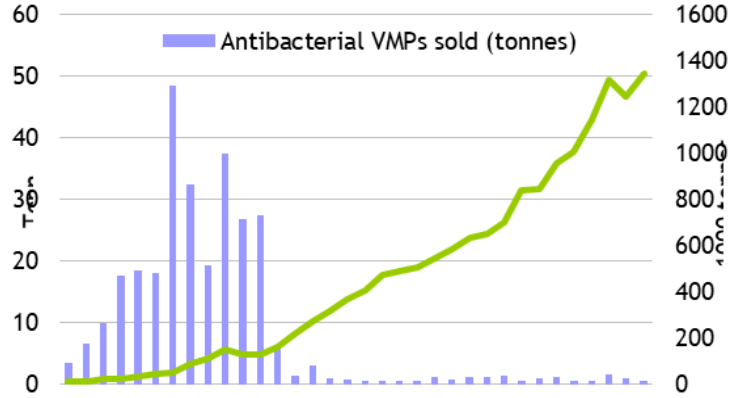
- Understand death profiles at national and farm level important for intervention
- Resource allocation
- Cost effective intervention

Categories;
- Infectious diseases
- Environmental causes
- Injuries (handling)
- Physiological causes
- Others
- Unknown

Collaboration –Regulations –Biosecurity



World Organisation Animal Health



Antibiotic substances (in kg)	2015	2016	2017	2018	2019	2020	2021	2022
Total antibiotics	273	201	612	931	222	220	593	425

~ 0.3 mg/kg

Fish Health Report, 2022 (VetReg)

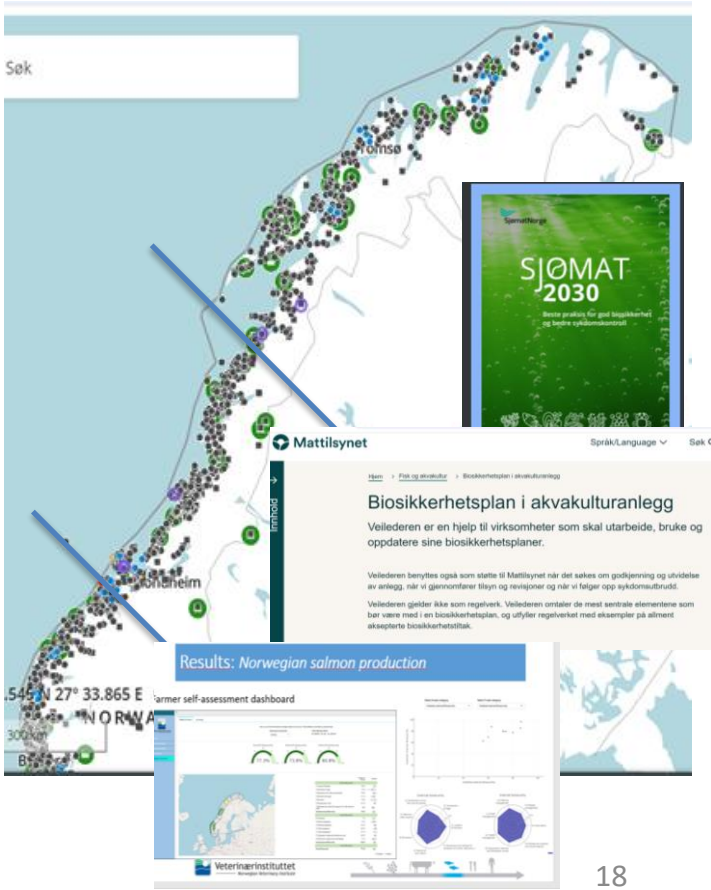
Biosecurity

- Spredning av BKD i PO 5 og 6

- PD utbrudd i PO 8
  - kostnaden av et PD utbrudd på anleggsnivå estimert til 55,4 millioner NOK (2013). (74,9 millioner i 2023-kroner)
  - 2014-2020; 10-12 milliarder for næringen

- Smittespredning skjer
  - **aktivt med fisk, båter og utstyr**
  - passivt i vann (horisontalt)

- Biosikkerhet er samarbeid vs egne særinteresser



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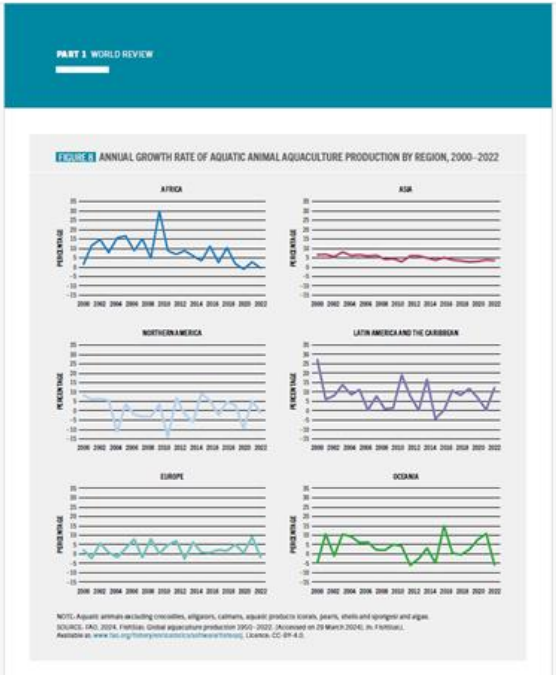
SOFIA report 2024

TABLE 5 WORLD PRODUCTION OF MAJOR AQUACULTURE SPECIES AND MAIN SPECIES GROUPS

Species or species group	2018	2019	2020	2021	2022	Share of species in species group, 2022 (%)
	(thousand tonnes, live weight equivalent)					
Finfish	**54 564**	**56 354**	**57 681**	**59 602**	**61 567**	**100**
Carps	29 015	29 426	30 208	30 901	31 788	51.6
Catfishes	5 782	6 286	6 092	6 199	6 628	10.8
Cichlids	6 043	6 407	6 066	6 293	6 549	10.6
Salmonids	3 517	3 812	3 996	4 205	4 243	6.9
Milkfish	1 327	1 297	1 284	1 278	1 196	1.9
Largemouth black bass	434	480	621	704	804	1.3
Snakeheads	554	583	649	687	690	1.1
Sea breams and porgies	391	436	485	533	564	0.9
Other finfish	7 500	7 628	8 280	8 803	9 105	14.8
Crustacean	**9 501**	**10 422**	**11 108**	**11 948**	**12 751**	**100**



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Norwegian salmon «The world's most popular fish»

- Governmental money
- Flexible …
- Sushi