

Aquaculture - the Norwegian Experience

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Royal Norwegian Embassy
28. juni 2005



The pull from future demands from fish lovers can not be met by fishing more



The marmenill has already started to protect the fish stocks by removing the bait from the hooks.



Norway

- 4,5 millions inhabitants
- 324,220 sq km

(Italy is 301.230 sq km)

– Inland water: 16.360

– Arable land: 2,87%

- Coastal area: 90.126 km²

(to the coastal baseline)

- Coastline: 57.258 km

including fjord and islands

(equatorial line: 40.077)

- Natural resources: petroleum, natural gas, iron, copper, lead, zinc, titanium, pyrite, nickel, fish, timber, hydropower

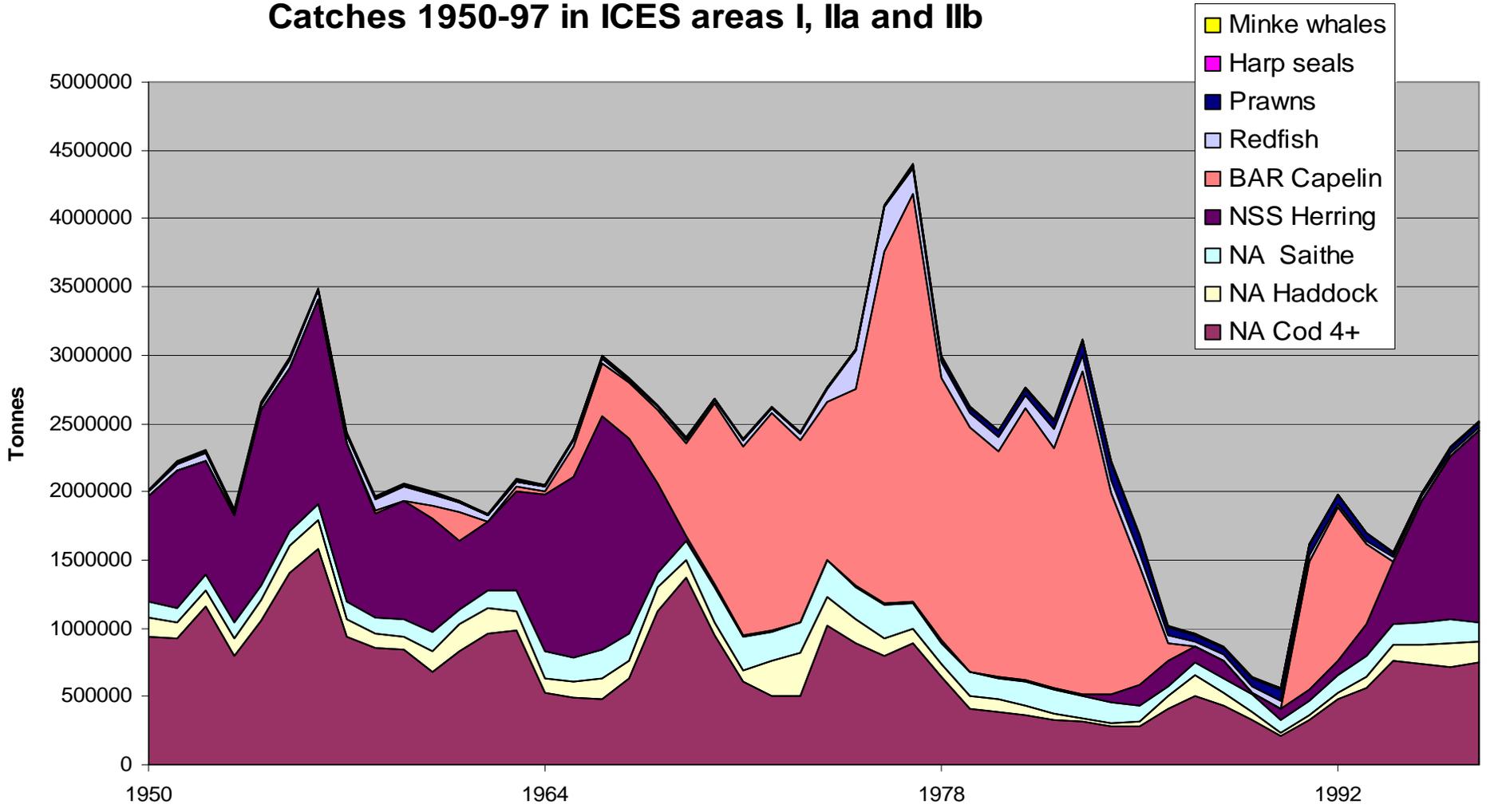


The tradition was fishing.....

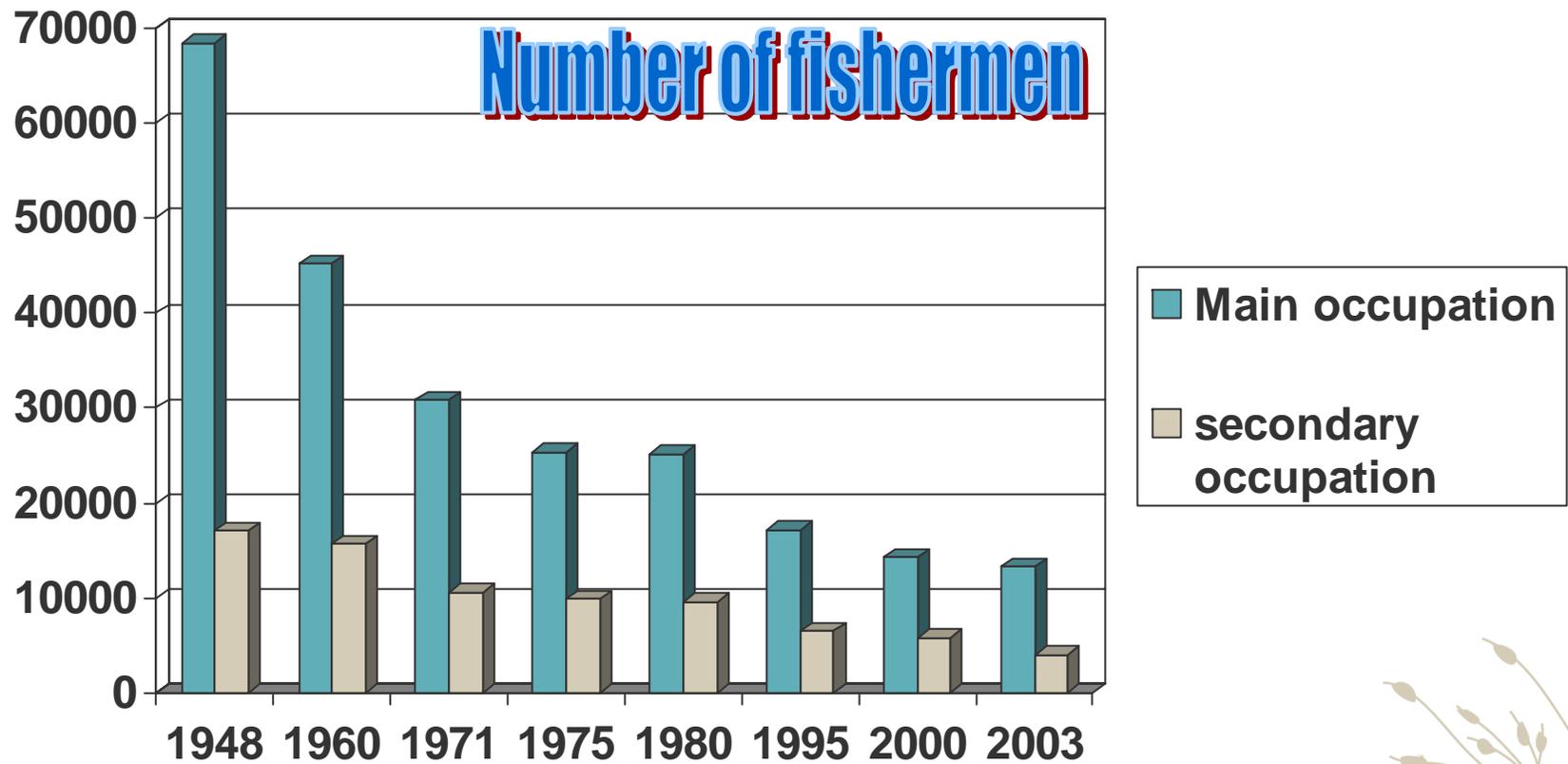
- Seasonal variations
- Seasonal employment
- Subsistence culture
- Technology drive in the fishing fleet
- Then came the resource management efforts and it was evident that better management means lower quotas



Catches 1950-97 in ICES areas I, IIa and IIb



There was work in new industries.....



The importance of the fishing industry

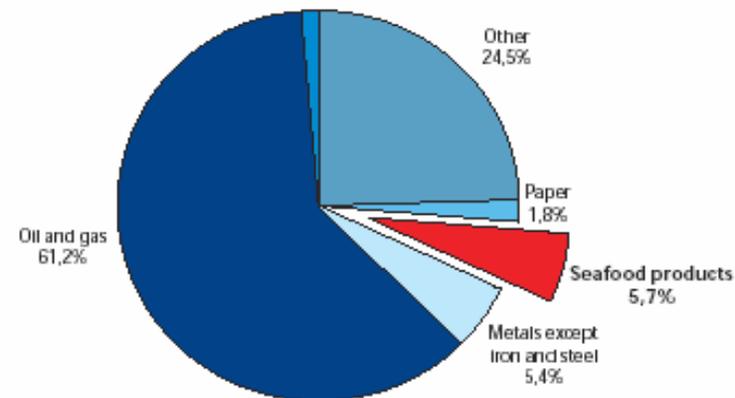
Norway as an export nation:

- ✓ 95% are exported to 150 countries
- ✓ 3rd largest exporter of seafood in the world

2004:

- ✓ Total export NOK 28.2 billion
- ✓ Salmon and trout: NOK 11.4 / USD 1.8 billion

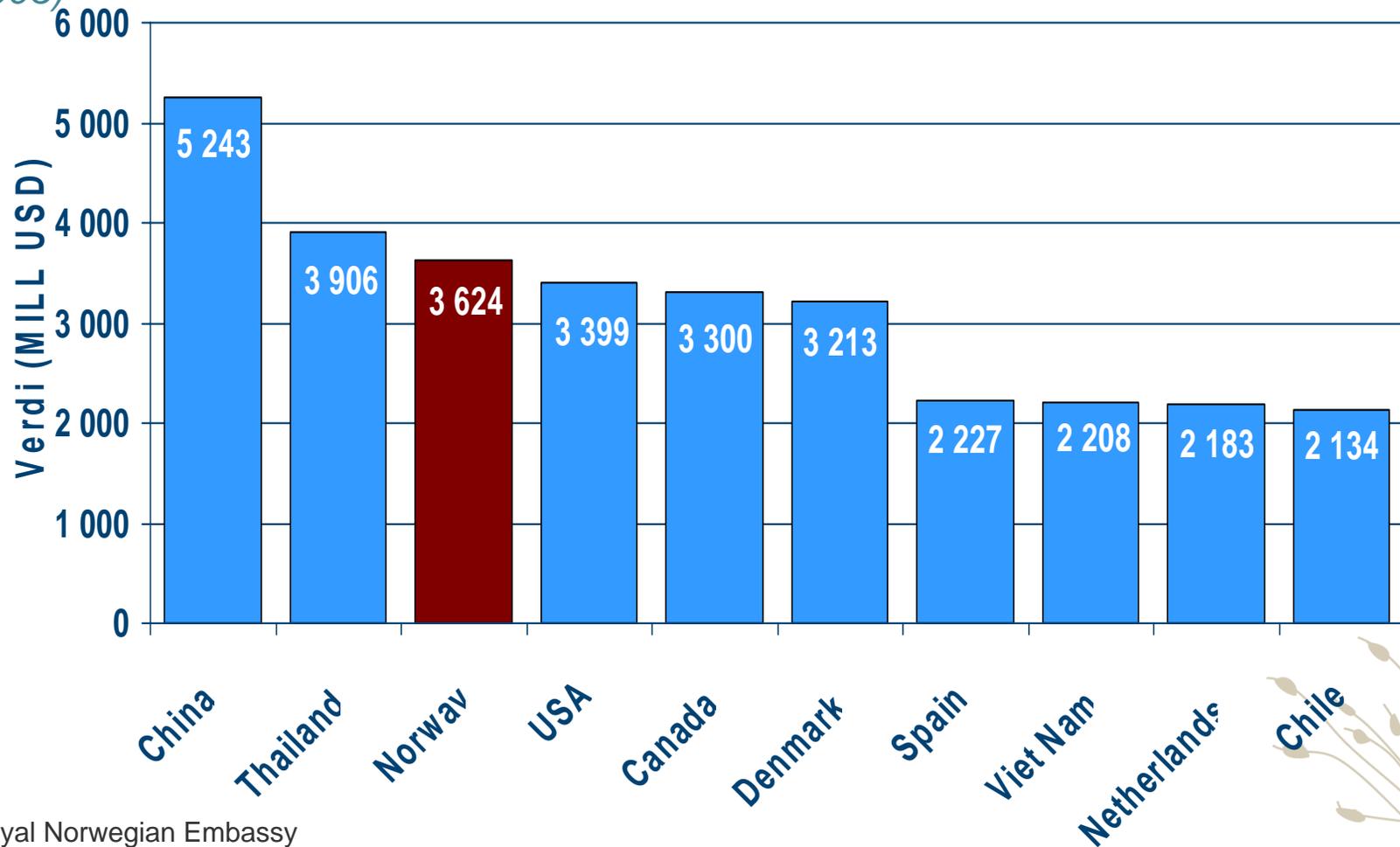
Fisheries and aquacultures share of Norwegian export 2002



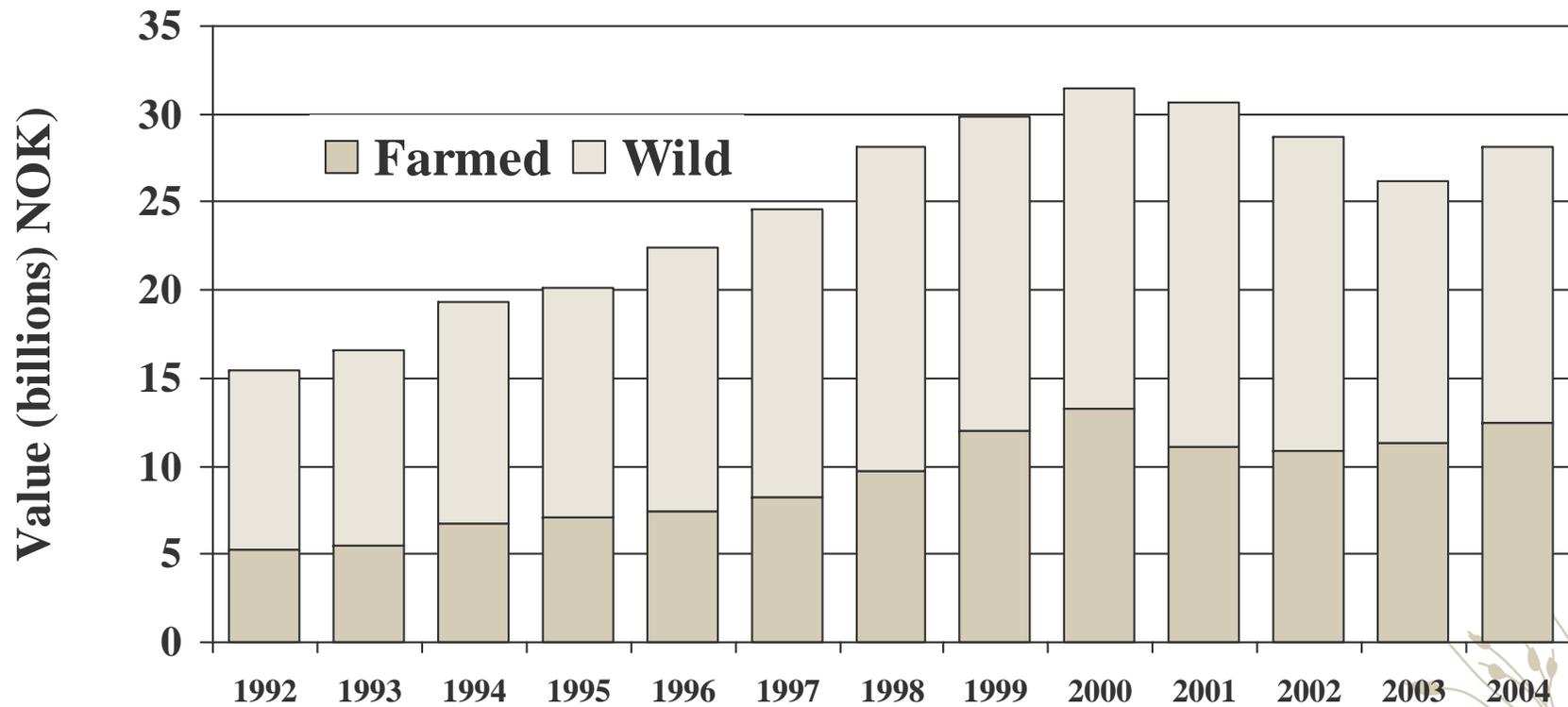
Source: Statistics Norway, The Norwegian Seafood Export Council

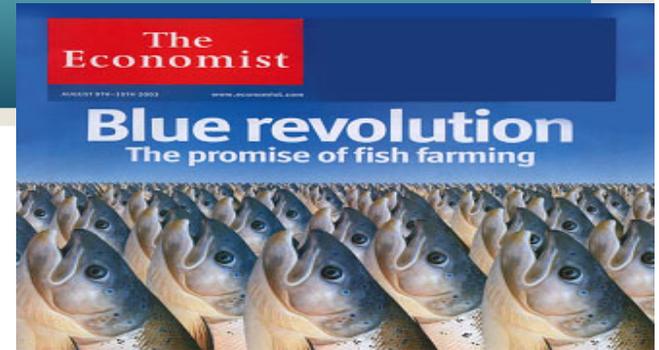


Norway's position in production and export (FAO 2003)

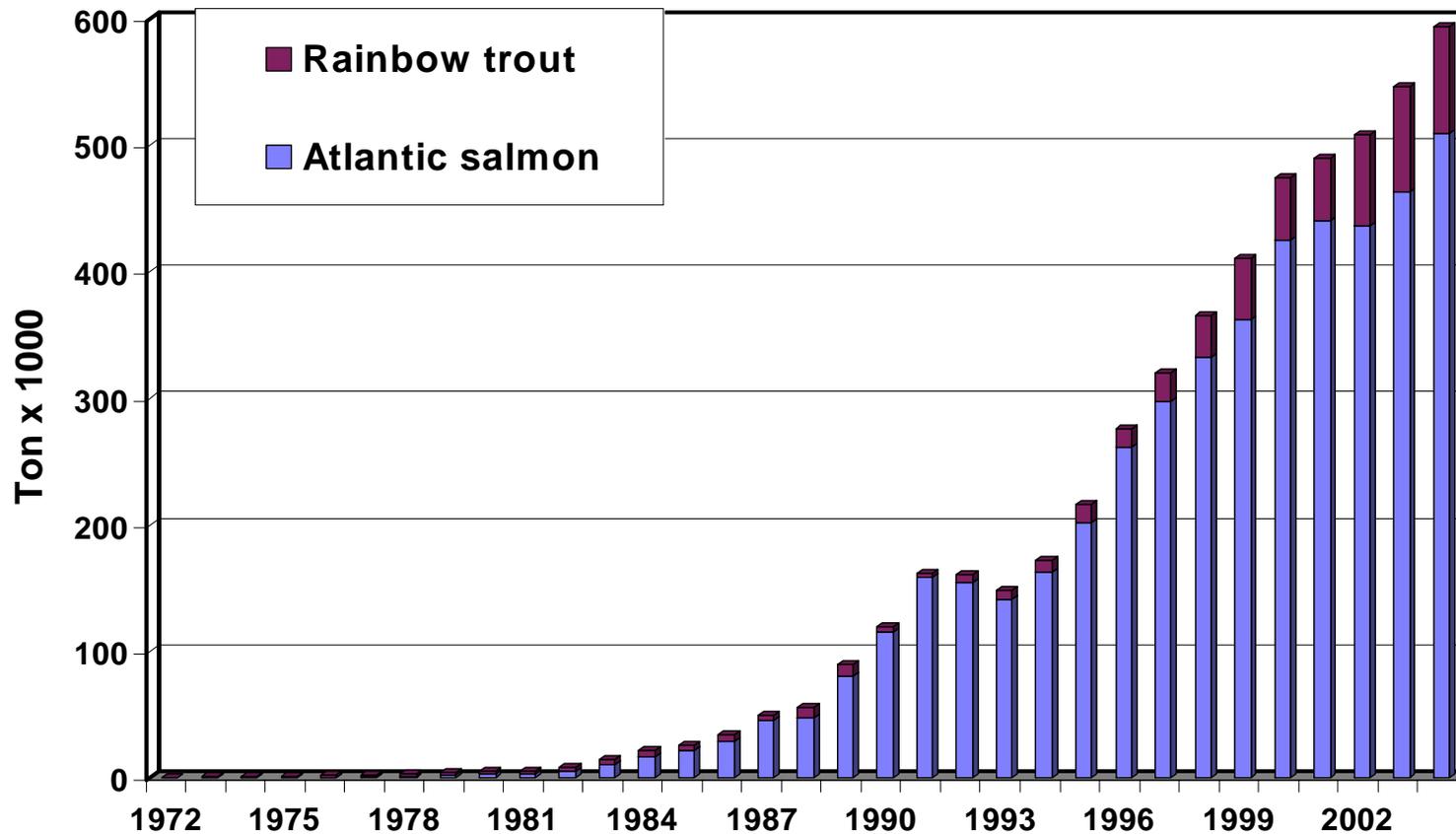


Norwegian fish exports.....

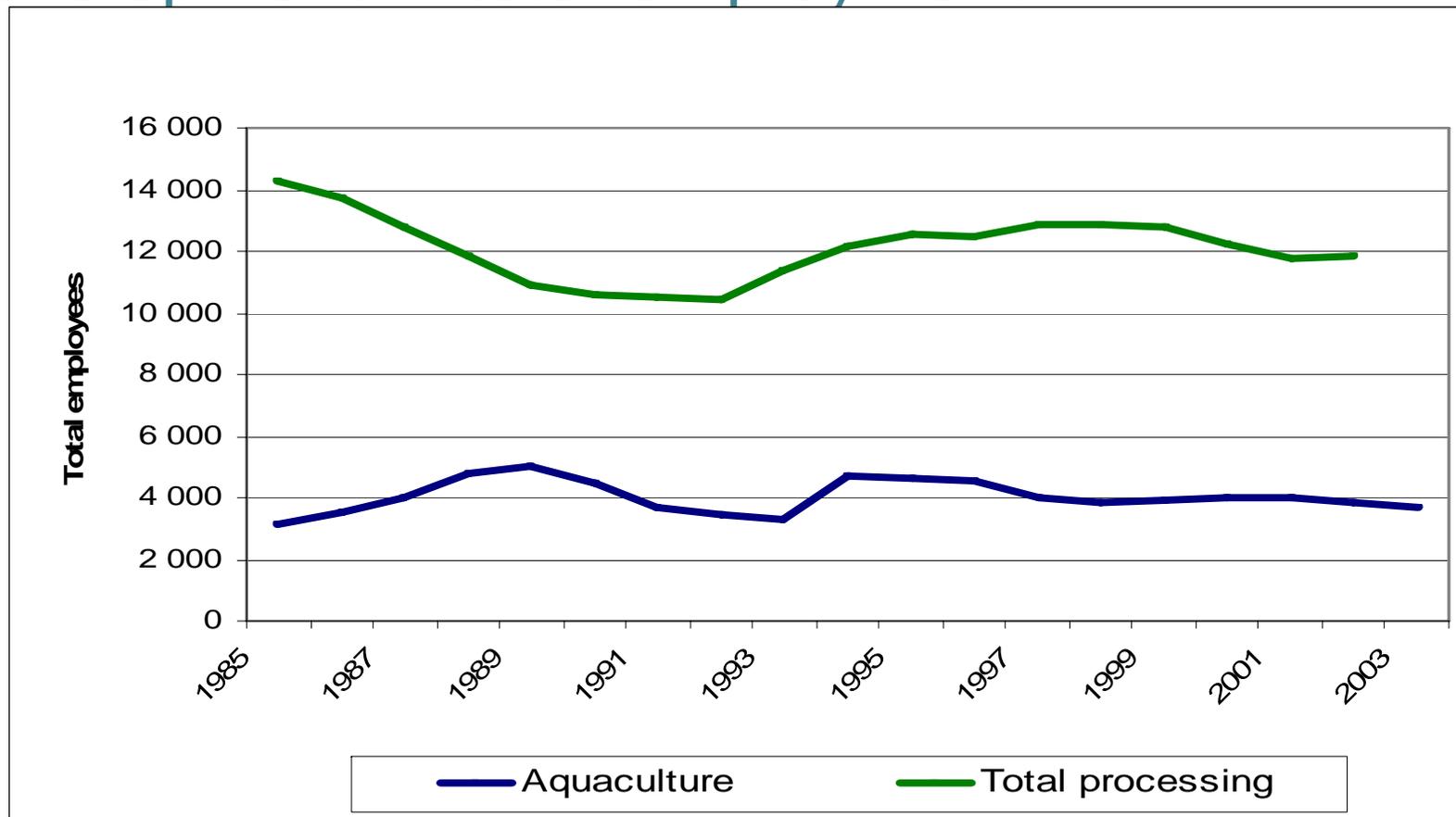




Production growth in fish farming.



Development in total employment



THE VALUE CHAIN

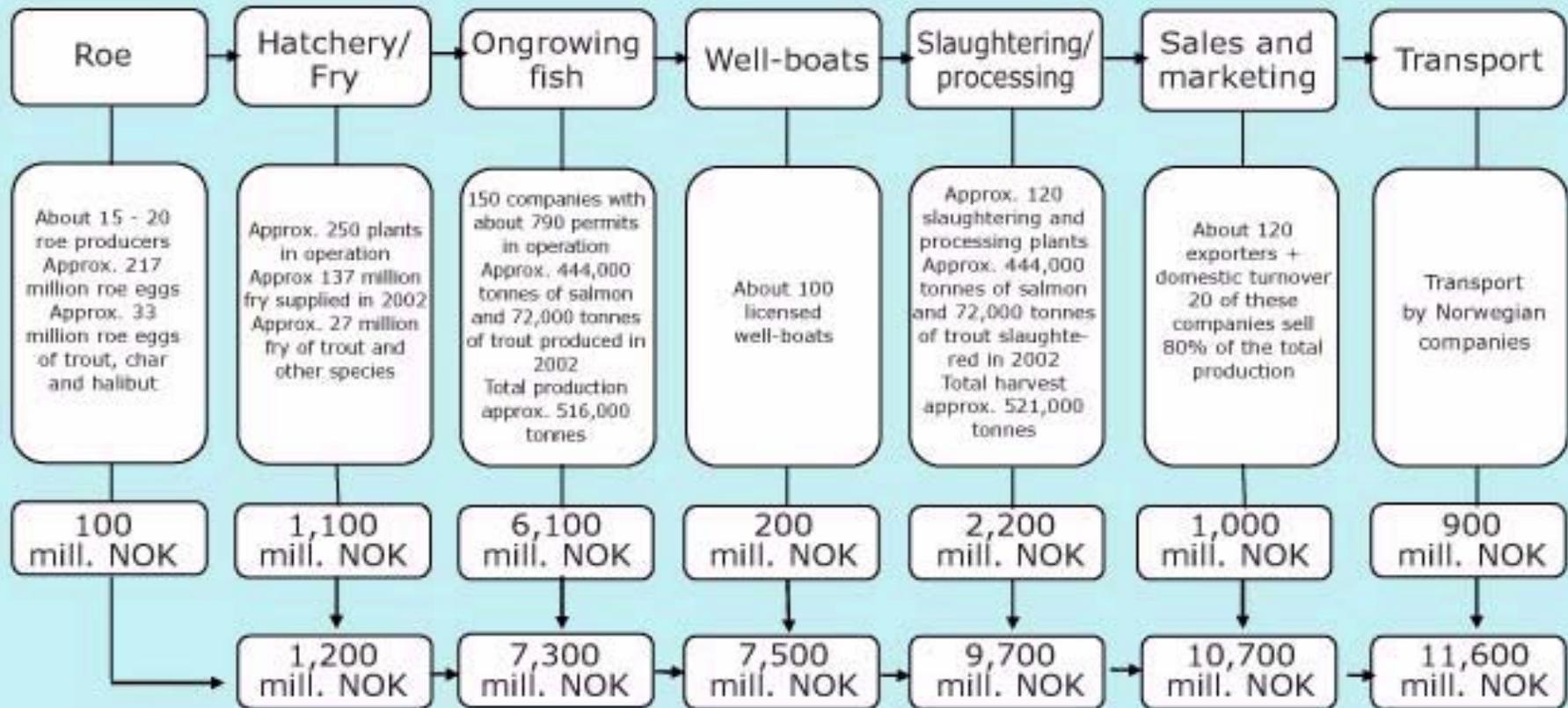


Figure: Estimated creation of value in the Norwegian aquaculture industry in 2002. Source: Kontali Analyse AS

- 1970:
 - Rainbow trout
 - Production: 640 tons
 - Inland market
 - 55 fish farms
- 2004
 - Atlantic salmon + rainbow trout
 - Production 600.000 tons
 - World market (>100 countries)
 - 800 on growing farms



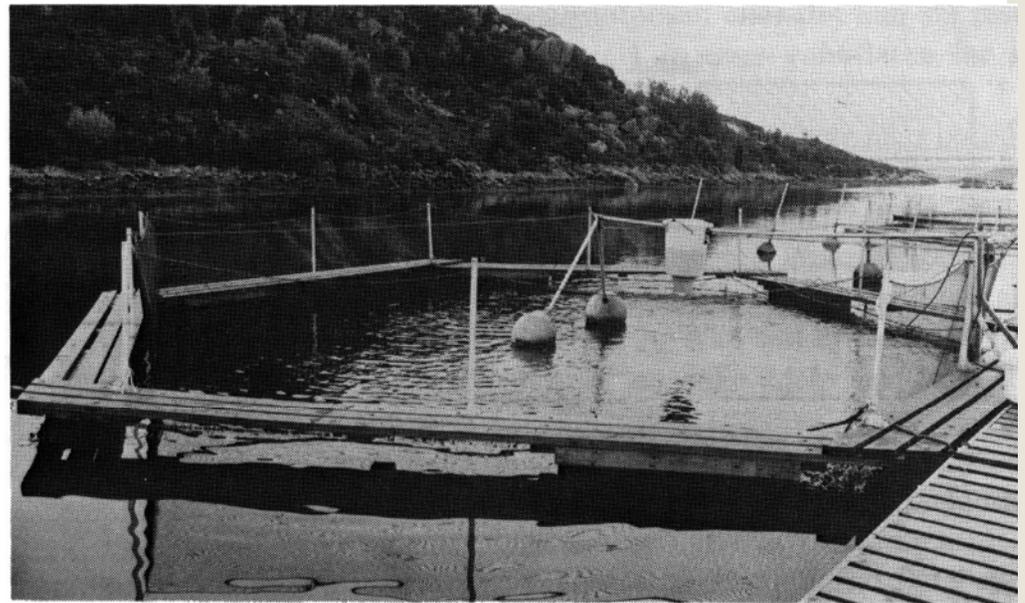
Natural advantages

- Wild salmon population
 - Knowledge about hatching
 - Clean water
 - Long coast, potential localities
 - Temperatures fit for culturing salmon and trout
 - Well-built infrastructure
 - Coastal pioneers, coastal culture
 - Access to raw materials, especially feed
- ✓ Strong focus on research



The cage technology

- Focus on
 - minimizing risk of injuries
 - inspection
 - fish handling



Source: SINTEF Fisheries and Aquaculture



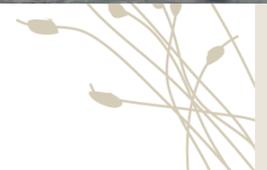
Plastic ring cages



Source: SINTEF Fisheries and Aquaculture

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Ridgid and hinged steel cages



Source: SINTEF Fisheries and Aquaculture

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The choice of sites.

- Past: sheltered sites
 - + Close to the land base
 - + Sheltered from wind and waves
 - + More convenient for the employees
- low water current

- Present: more exposed sites
 - + better environment
 - + better economy
 - Need for better technological solutions



Breeding programs

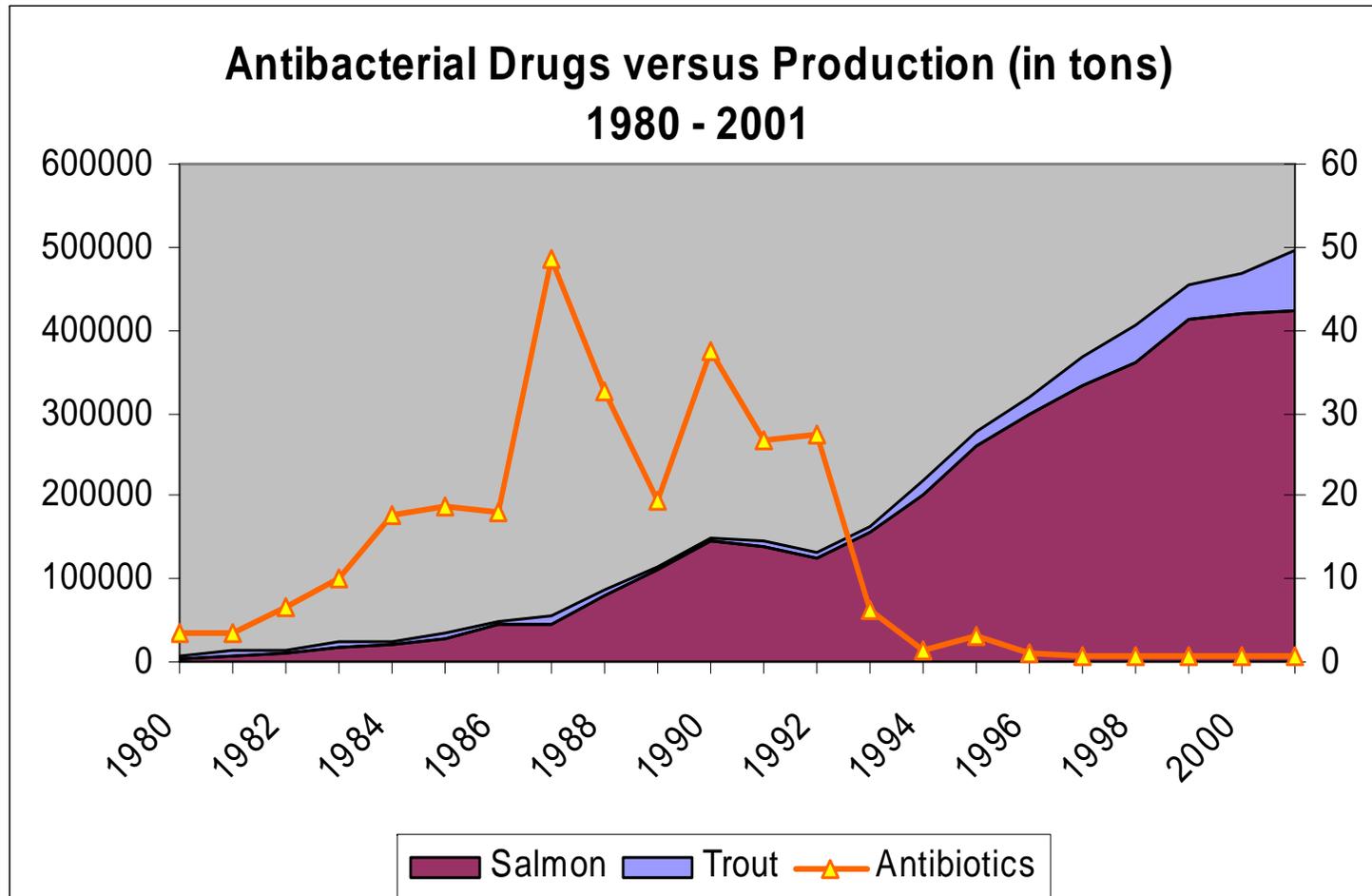


Photo: Salmobreed AS

- National breeding program
 - Fast growth
 - Late maturation
 - Color and fat content
 - Disease resistant
- No GMO fish!
- No hormone manipulation accepted in Norway



Disease prevention



Why this reduction?

- **Good sites**
- **Only one generation per site (site rotation)**
- **Good management – fish welfare**
- **Good vaccines**
- **Strict veterinary control of all farms**
- **Avoidance of resistance to medicines**
- **Strict rules for movement of live fish**
- **All medicines approved according to environmental effects**

The Norwegian aquaculture management system

A licensing system

- development from one license pr person to many but limited.

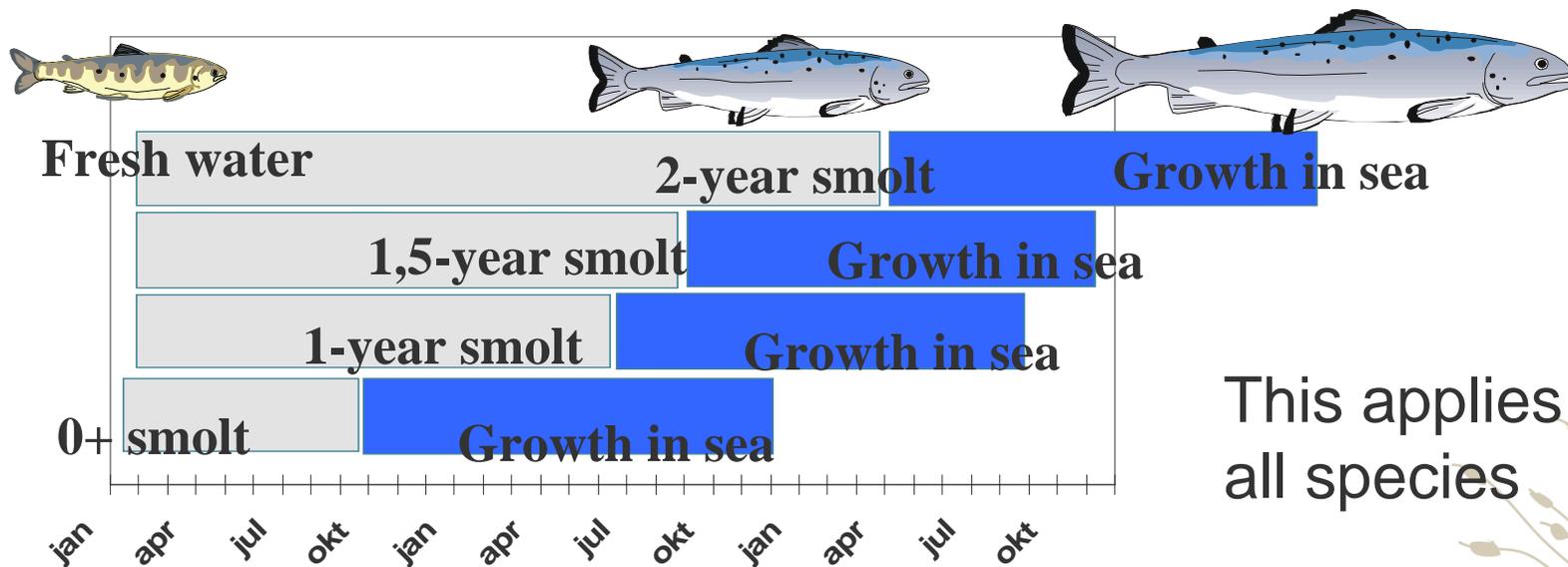
A permit regulating the influence on the environment and a monitoring of the impact.

A licensing procedure including all stakeholders both private and public.



Production time

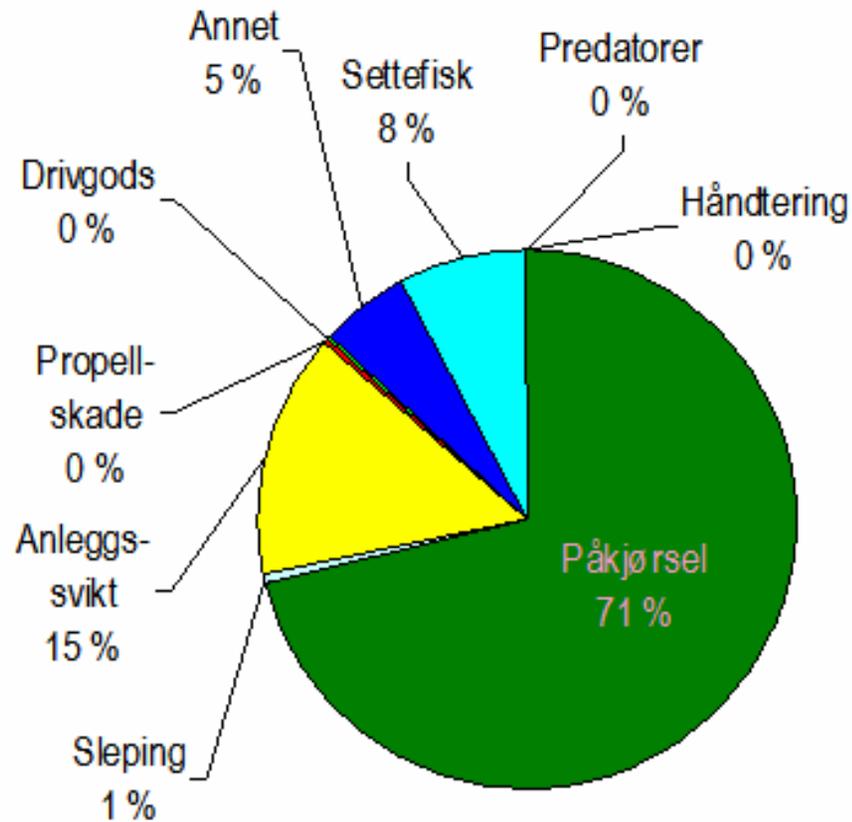
- Key words:
- improved smolt production methods
 - better feed sites / farm management
 - improved disease prevention
 - selection breeding programmes



This applies to all species

Escapees

- ✓ Technical regulations introduced to prevent
- ✓ High priority from authorities and industry



Sea lice



Fish feed a challenge for the future.

- 800.000 tons herring => 400.000 tons fillet
 - 400.000 tons "waste"
 - 40.000 tons protein
 - Can feed 100.000 tons farmed fish



And more fish feed

	Salmon	Poultry	Pigs
Energy utilization	24 %	12 %	14 %
Protein utilization	25 %	20 %	14 %
Feed factor (live weigh)	1,16	1,94	3

Source: Kontali Analyse AS 1997





R&D will be the most important tool to develop the aquaculture industry further



Summing up

- Some lessons from Norway may have common interest
- Increased demand in general - fueled by growth in population and health awareness.
- There is a strong need to focus on sustainability when choosing technology, species and growth rates.
- Challenge the scientific community.

