Aquaculture, Fisheries and the Environment

Frank Asche

NAAFE, 2011

The Economics of Conflict and Co-existence in an Increasingly Crowded Ocean"

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We like to think of fishing as traditional and romantic,

..but there have always been conflicts…

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..even before the big guys showed up…

…and before one had to pay attention to these guys…

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...and these guys...

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..and these…

MARINE STEWARDSHIP COUNCIL®

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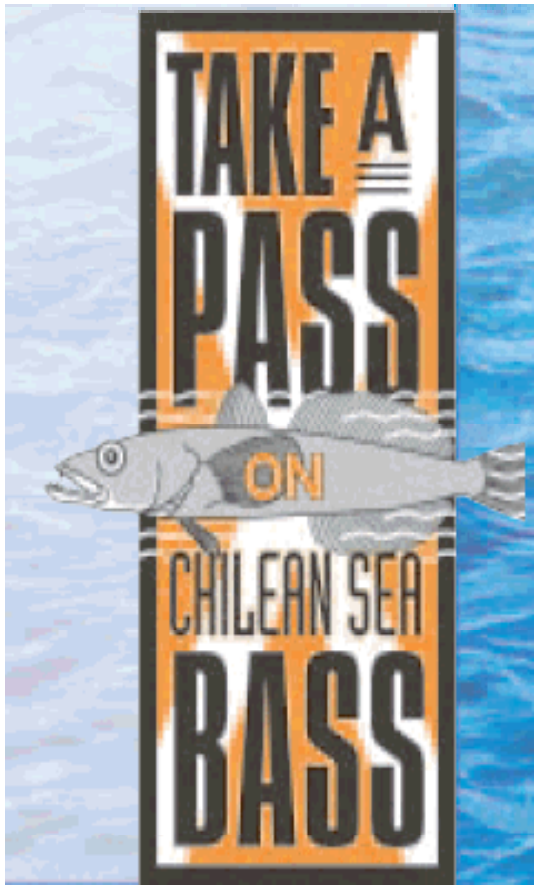
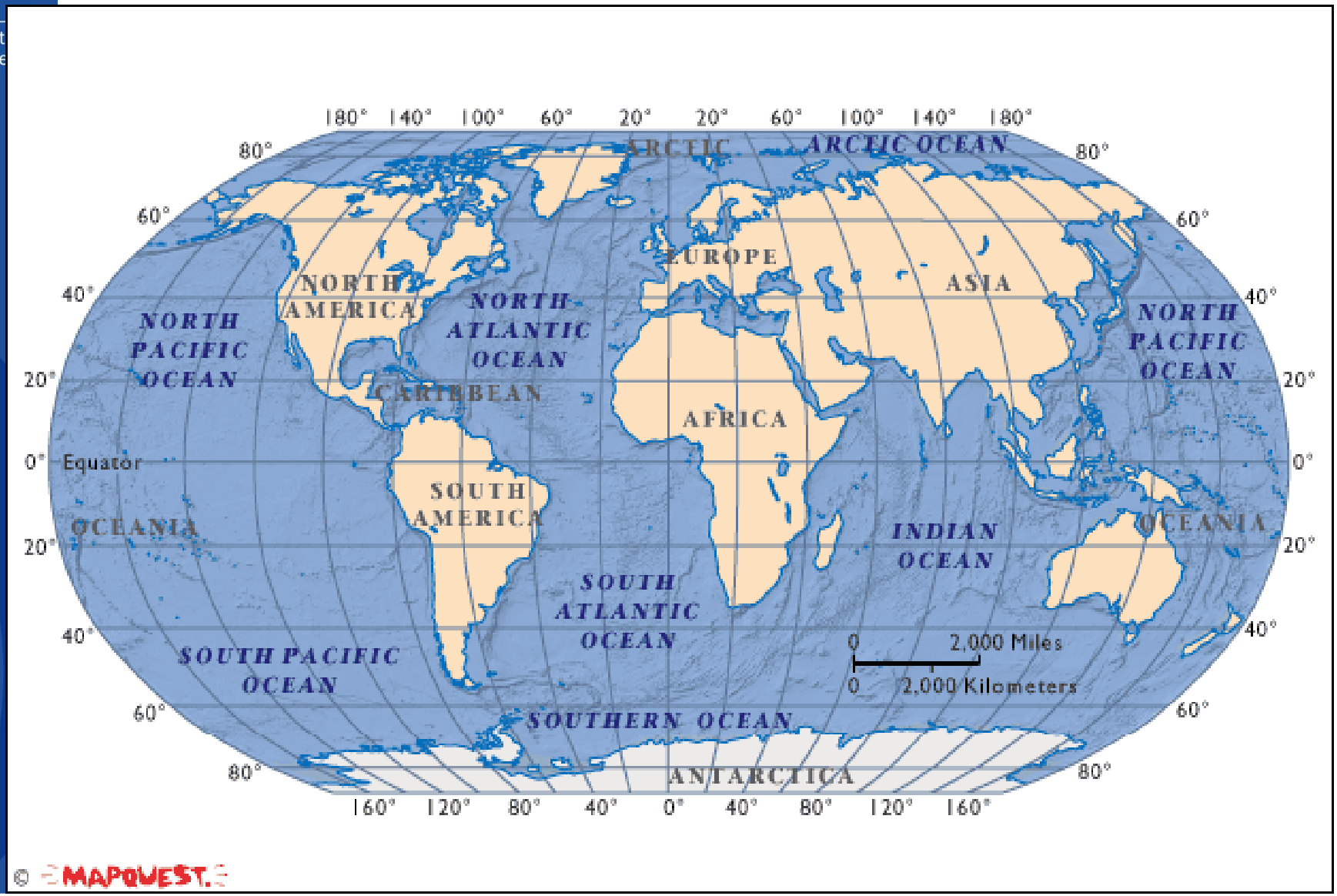


The world's oceans cover 2/3 of the planet…



.. and is an under-utilized resource

- But pressure is increasing
  1. Because an increasing and wealthier global population requires more resources
  2. Because more people and companies realize the opportunities in the ocean and innovate to exploit them
     - The power block, Offshore drilling, Aquaculture, Tourism
     - Globalization
  3. The competition creates use conflicts, and these are exacerbated by groups of people who think we should not utilize the oceans harder

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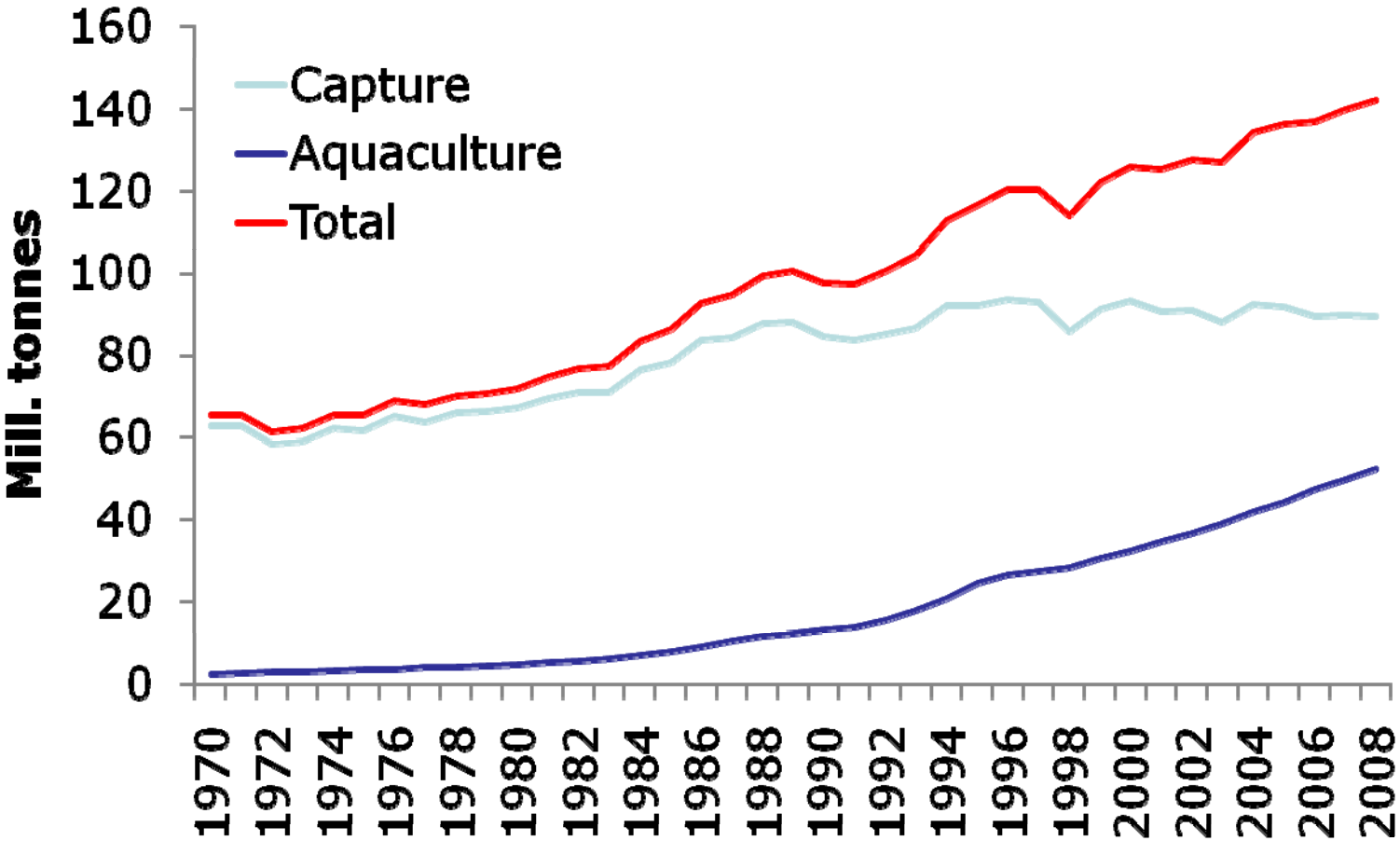
More people care!

Is the growth in aquaculture production good?



Different perspectives on ocean use

- Conflict arises because there is no general agreement about how the ocean's resources should be used and to whose benefit

- More specifically, these conflicts are manifested through competing user interests, including no (new) use – i.e. conservationism

Kjell Bjordal's examples of different perspectives:

Hilborn:

- The state of the world's fish stocks is better than it has been for decades
- We do not know any fish species driven to extinction by human activity
- The situation in the Barent's Sea is better than for generations: International success story in fisheries management

->There is a tremendous potential for increased aquaculture production

Pauly:

- The world's fish stocks are overfished
- We started out by fishing out the large valuable species an will end up fishing jellyfish
- 80% of the Barent's Sea stocks have collapsed or a severely overfished
- In 2010 we drove 1000-2000 ocean species to extinction
- Trawling kills eco-systems and everything within them
- Aquaculture production should be significantly reduced

Different perspectives on ocean use

- There will always be a mechanism that balances the different interests
  - Different outcomes are possible depending on mechanism design, incentives and governance structure
    - The tragedy of the commons
    - Shrimp aquaculture and mangroves
- Economists can analyze the outcomes of different structures
  - National measures
  - International organizations

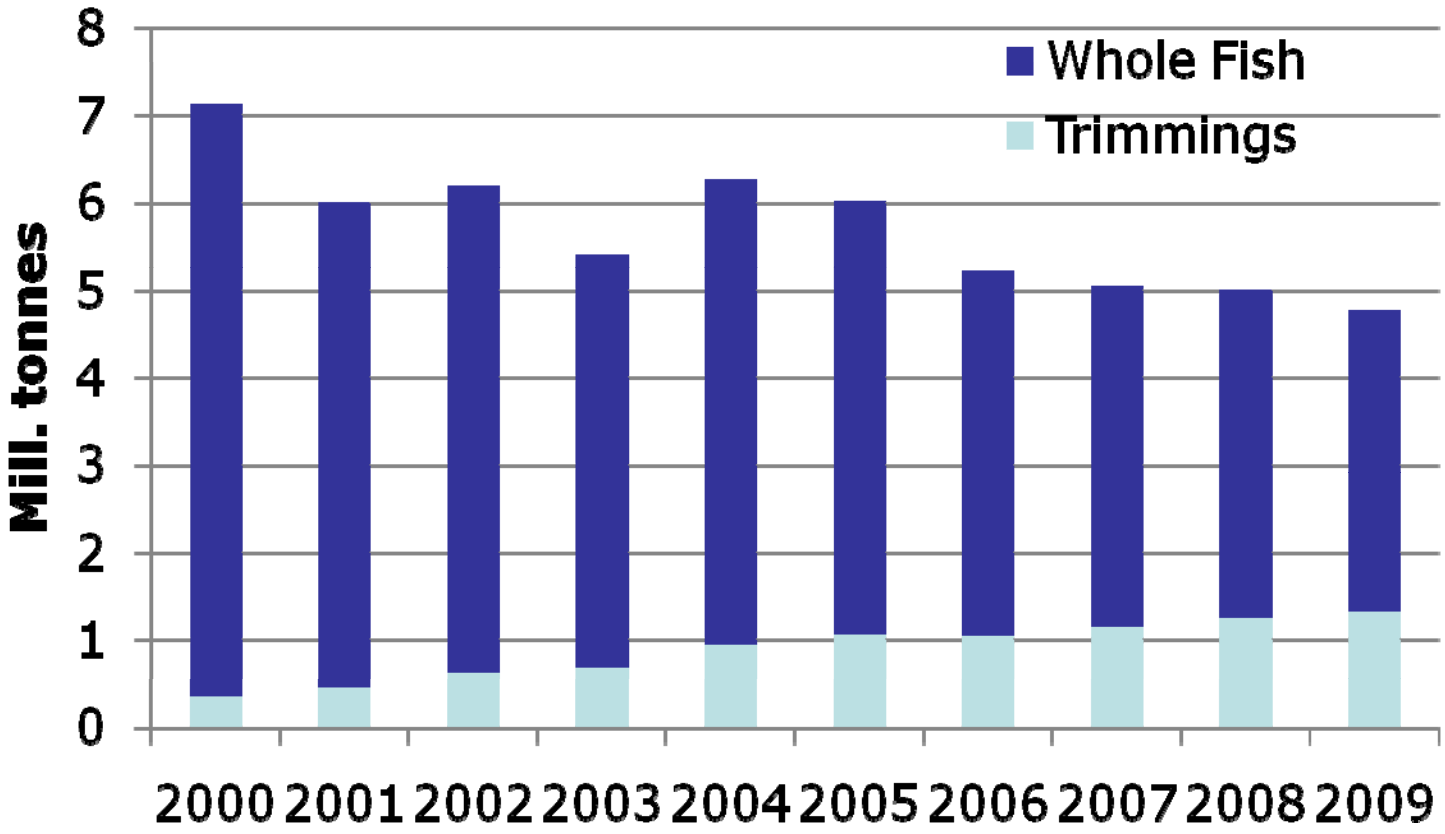
Small pelagics

- Are primarily reduced to fishmeal and oil, but are increasingly used for human consumption

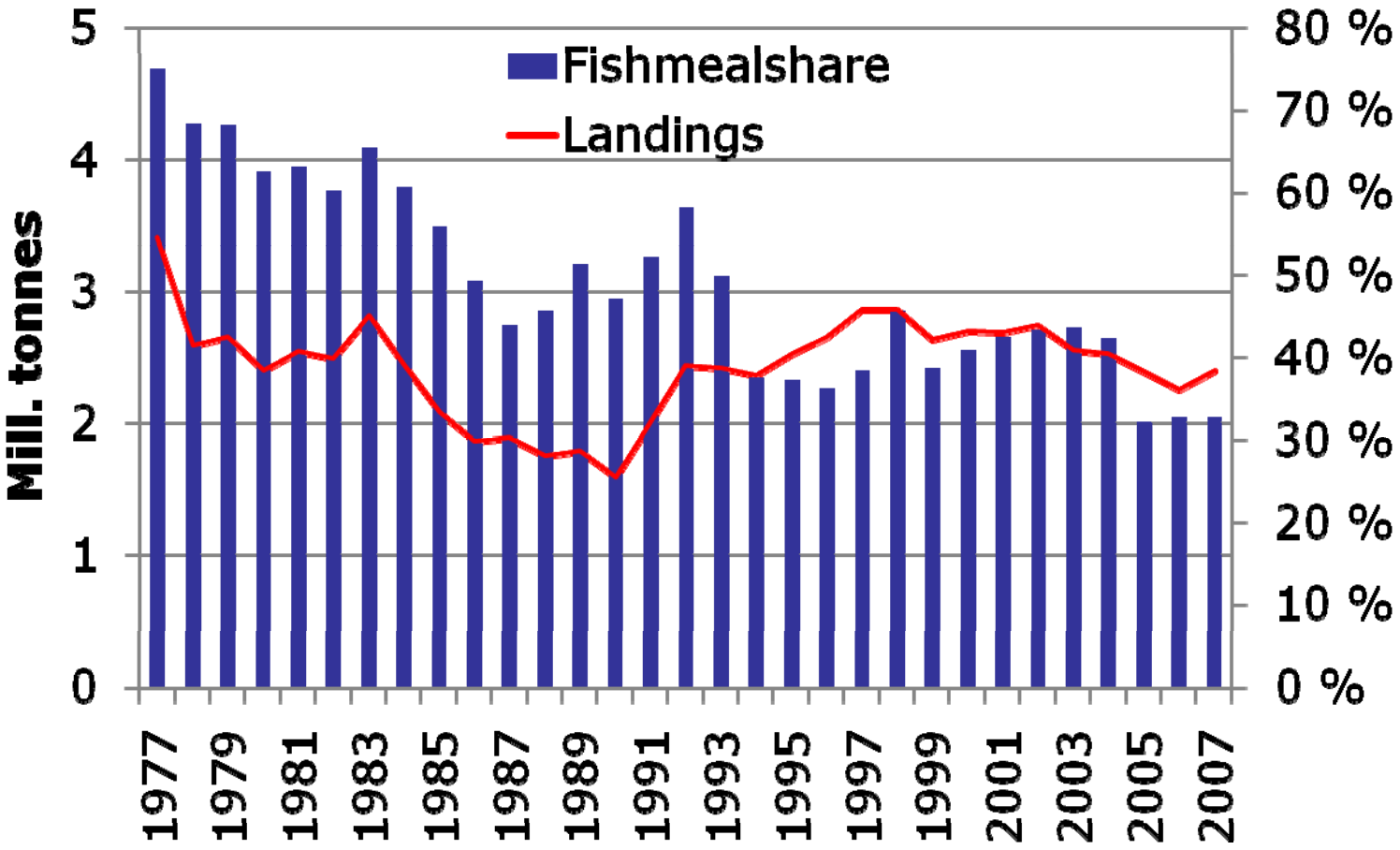
- The majority of fishmeal and oil is now used in aquafeeds

- Should their use be governed by management system, economics, or some ethical principles giving a different outcome?

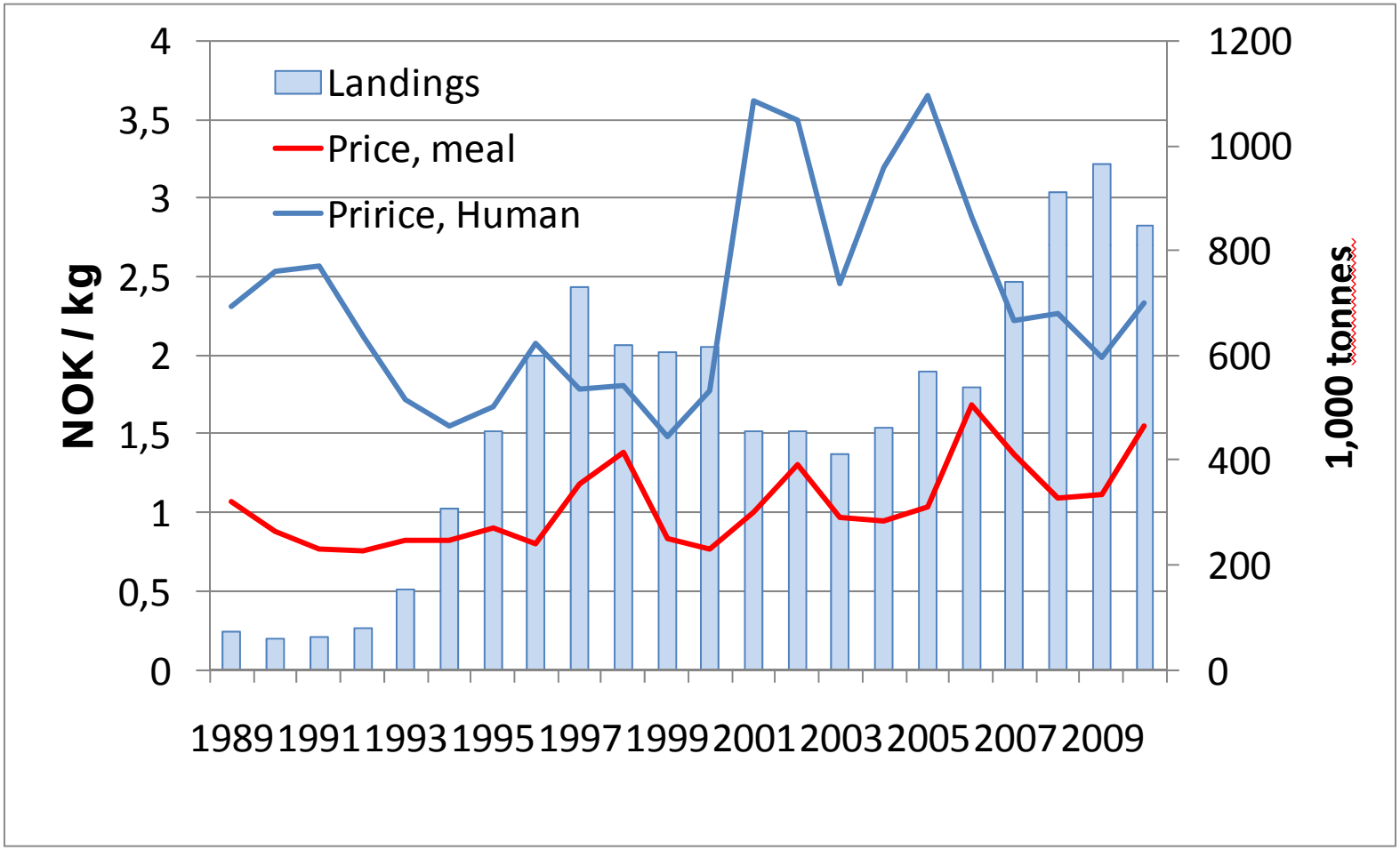
Global production by source for fishmeal



Total Norwegian landings and share used for reduction to fishmeal/oil



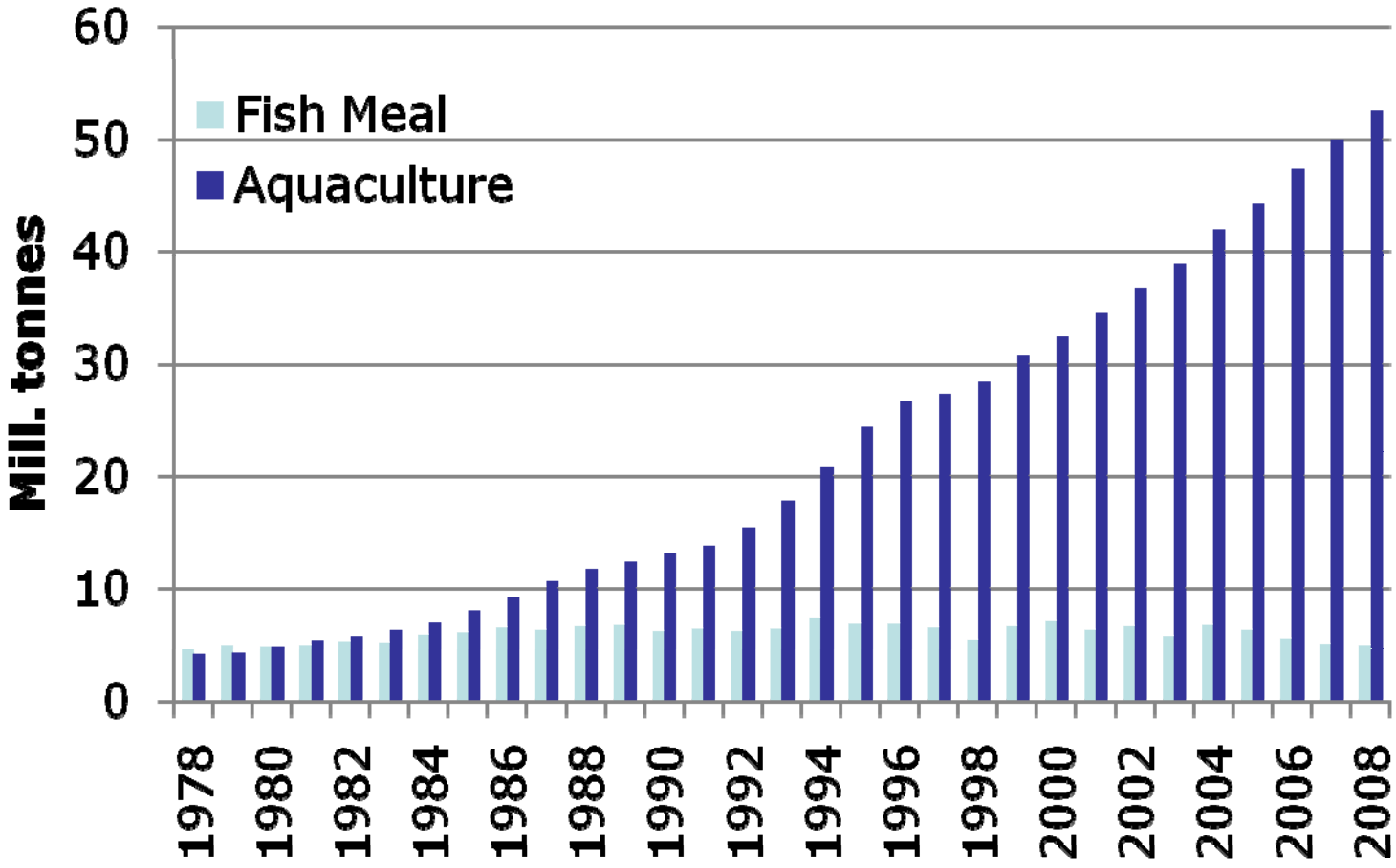
Norwegian landings and prices by use for spring spawning herring



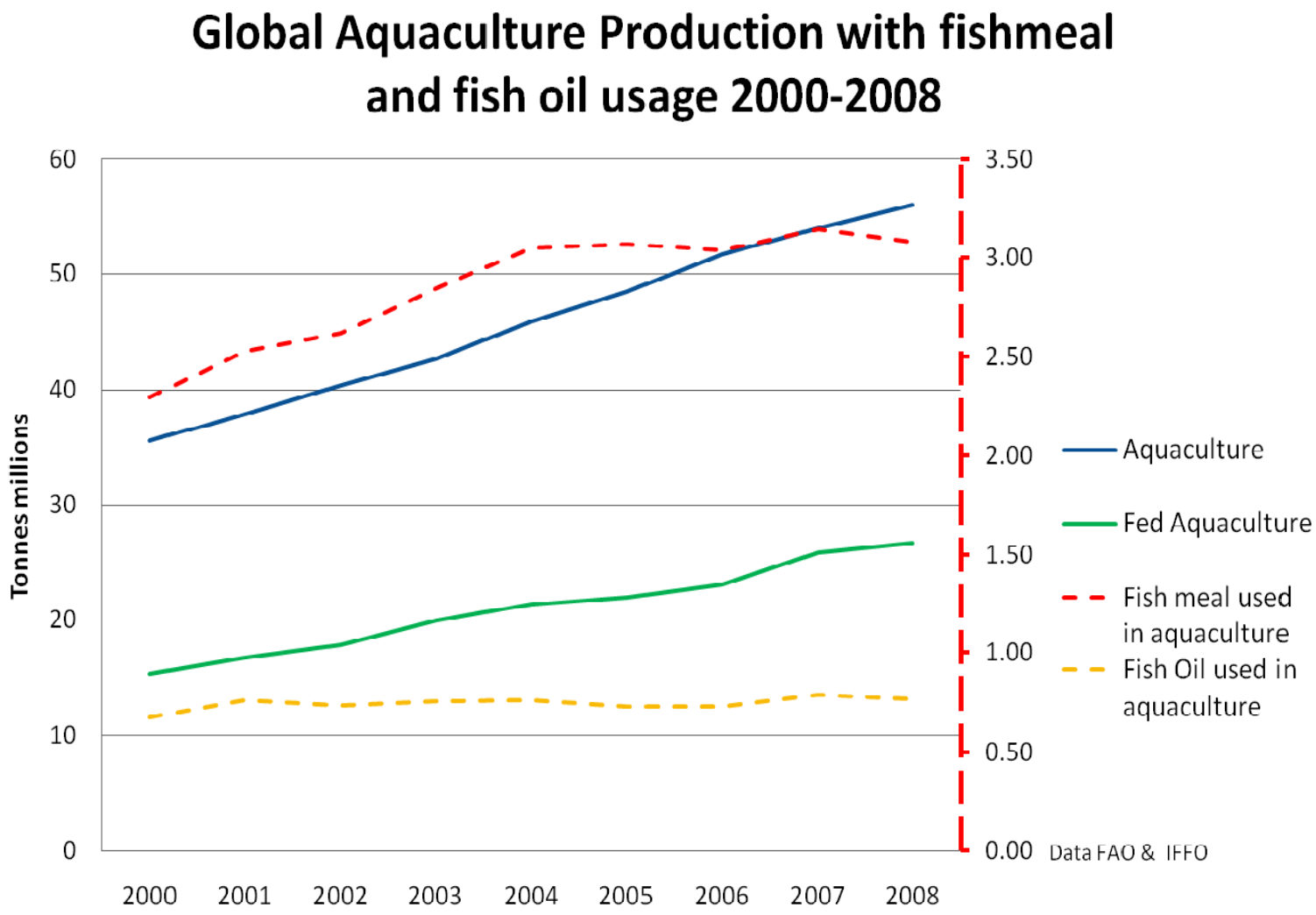
The fishmeal trap hypothesis (Wijkstrøm, Naylor et al)

- Growth in aquaculture production increase demand for forage fish to produce feed
  1. This makes aquaculture inherently unsustainable and environmentally degrading
     - Requires that forage fisheries are poorly managed, that forage fish has no substitutes, and that cost is not important for aquaculture production
  2. This will eventually also put a limit on aquaculture production
     - Requires that aquaculture feed must contain marine ingredients

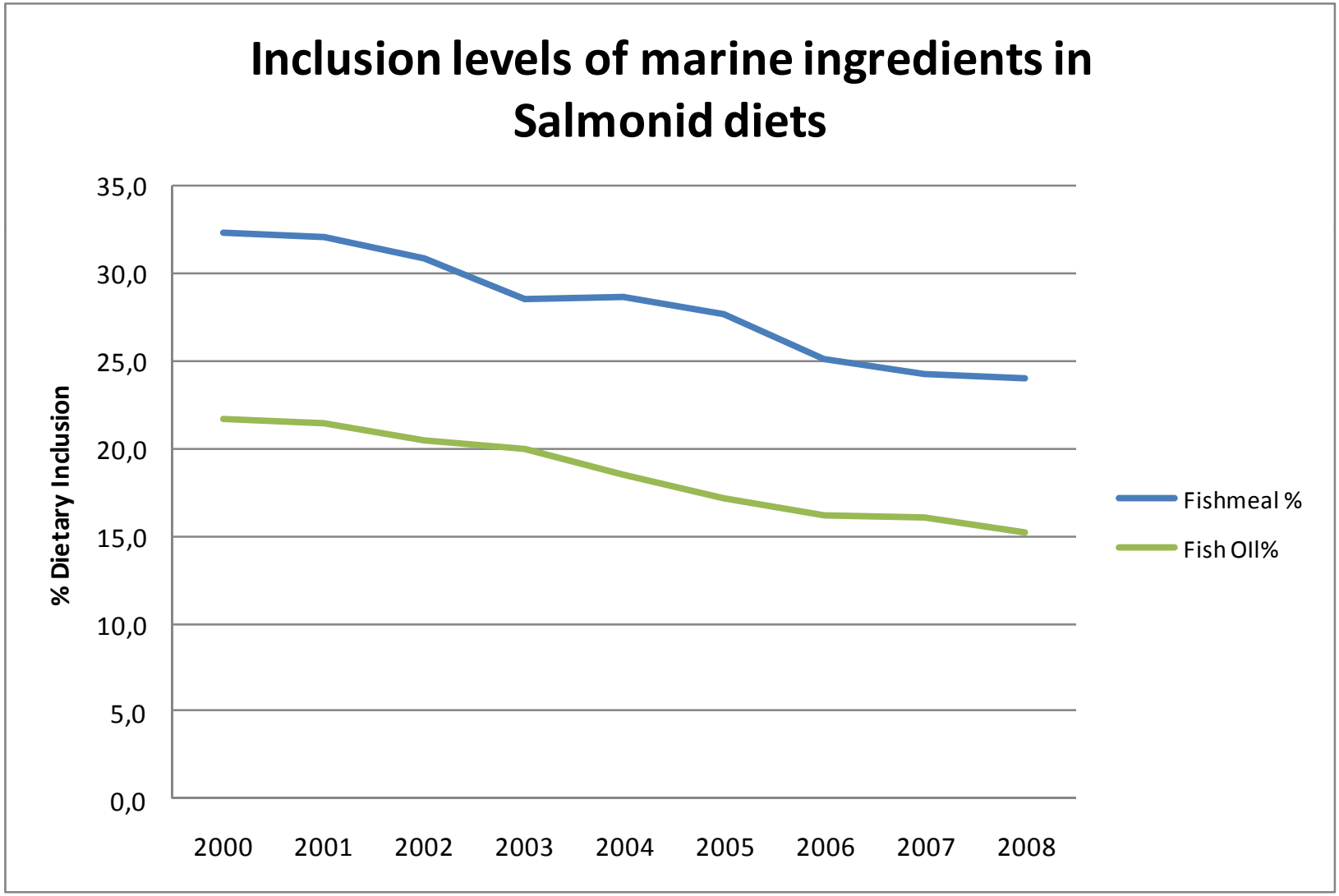
Global aquaculture and fishmeal production



Growth in global aquaculture production does not lead to increased use of marine ingredients



Inclusion levels of fish meal and oil in salmon feed



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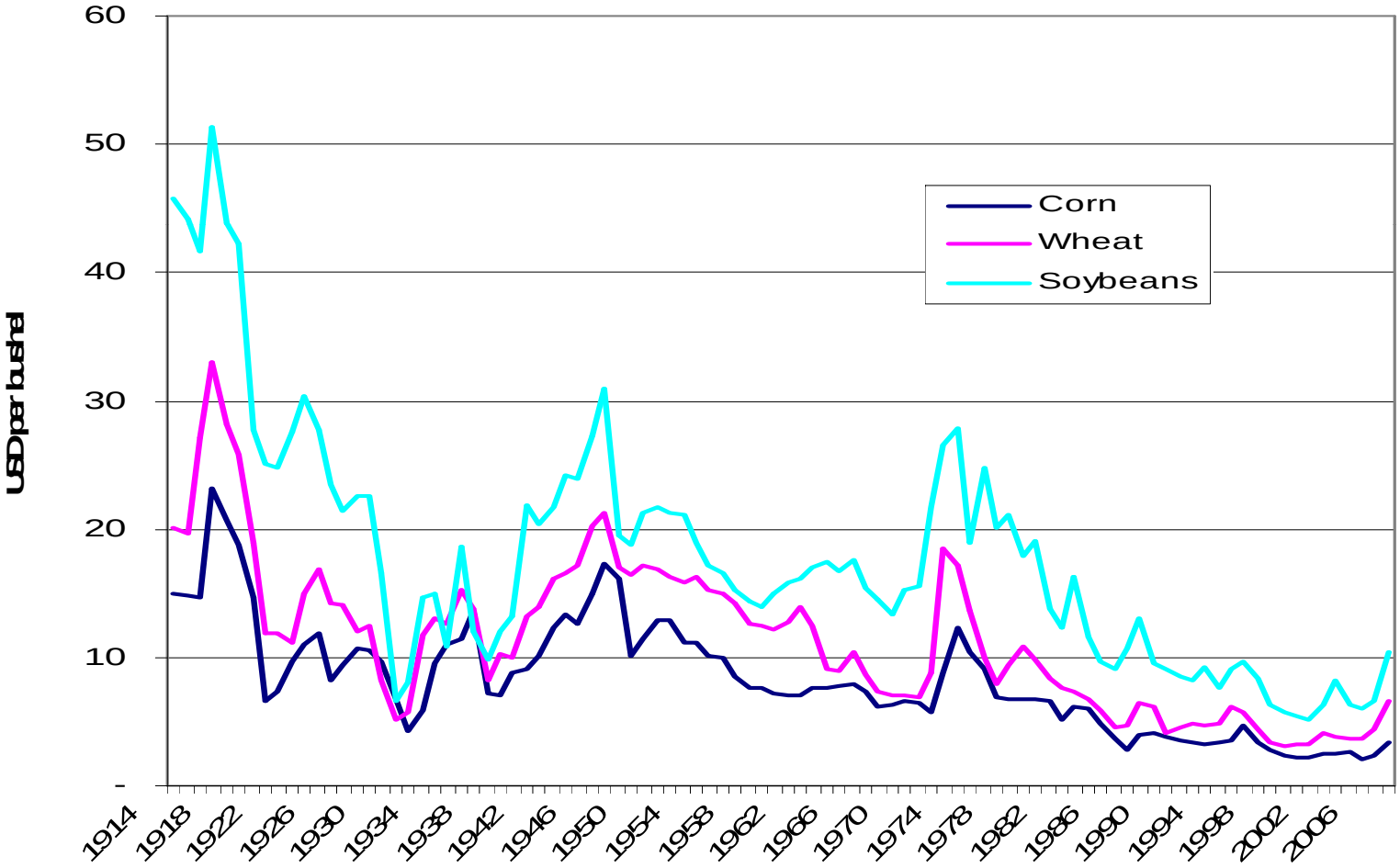
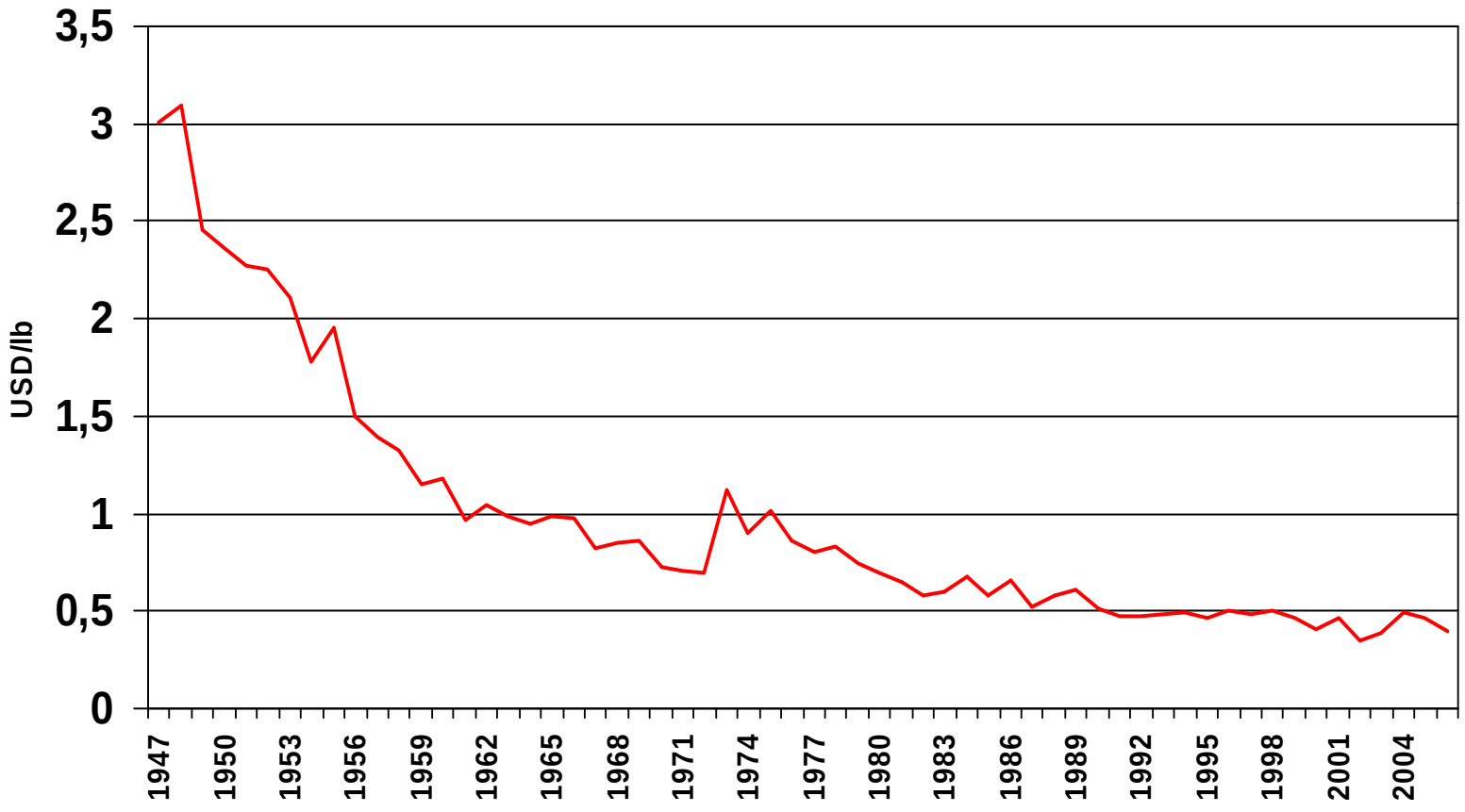
The fishmeal trap is a good story, but does not hold up against the data

Innovation is driving the food market and enables us to feed more humans: The long run real price trends

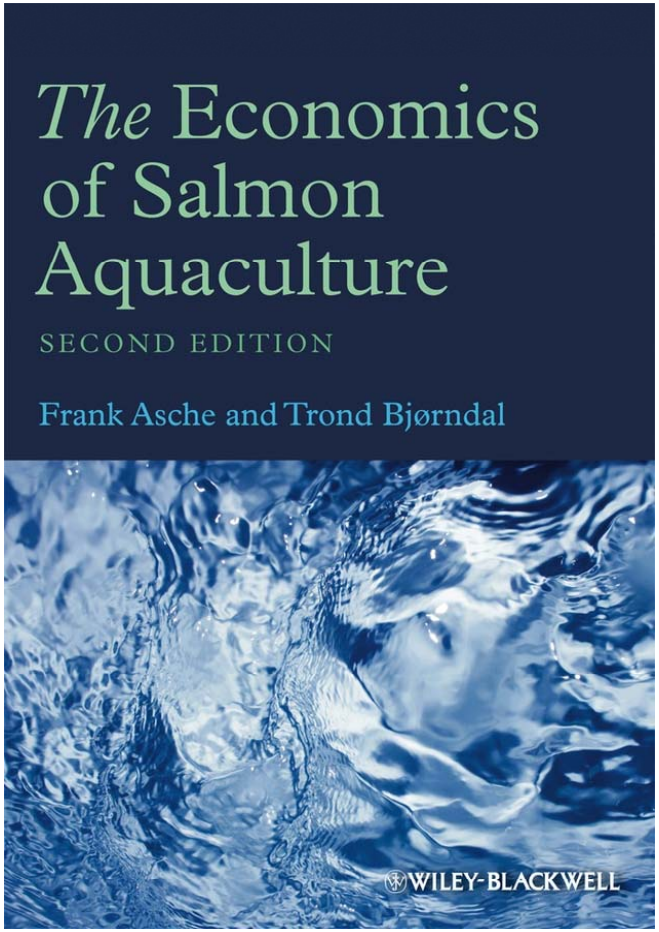


Real U.S. broiler prices



Aquaculture

- Aquaculture is the result of systematic R&D and innovation in water based food production systems
- Expansion of aquaculture production is profitable because of lower production cost due to technical innovation
  - Productivity growth
- This is a necessary development if the world's oceans and waterways are to be significant sources of food



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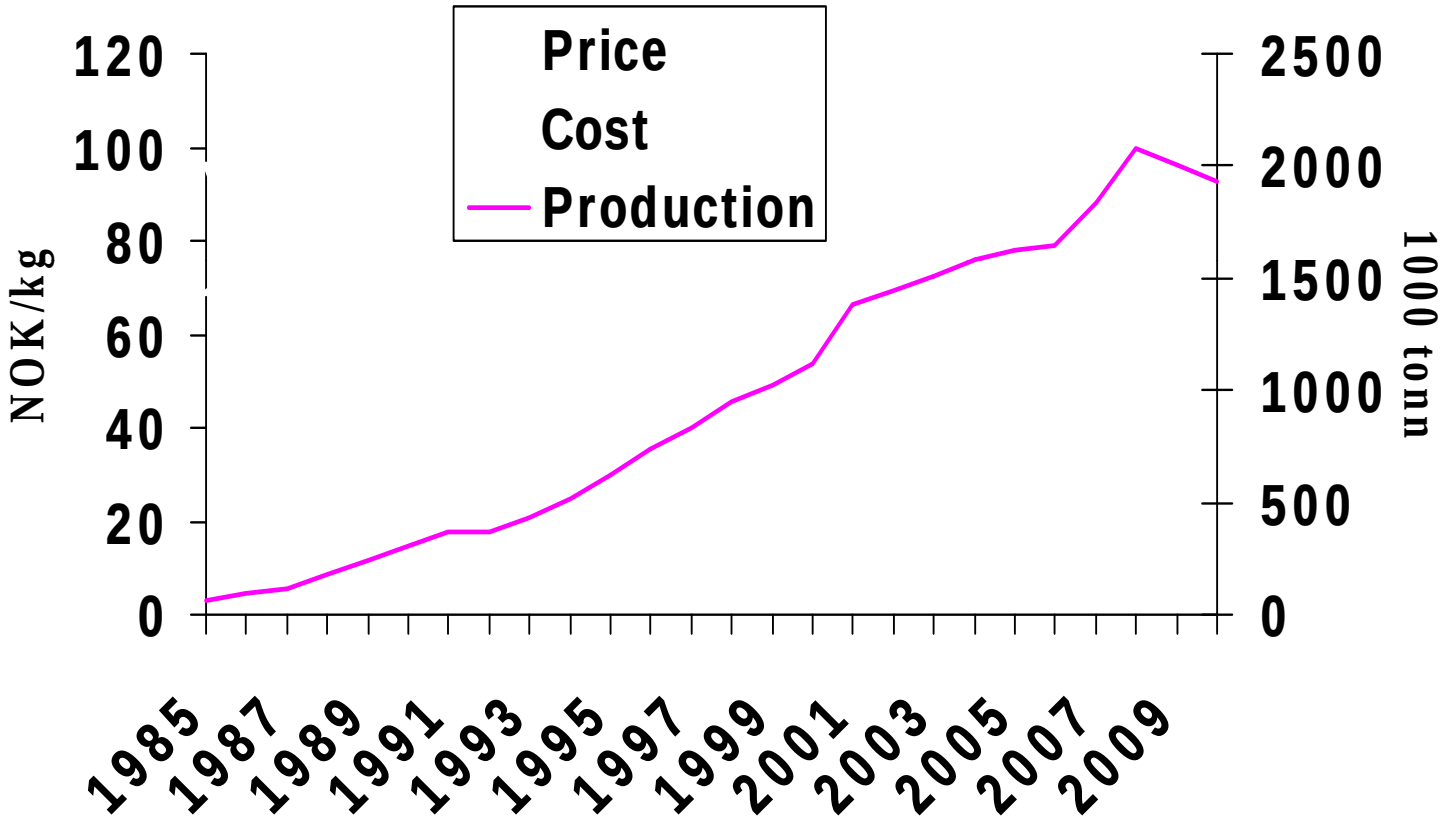
Norwegian export price and production cost for salmon 1985-2010 (2010=1)



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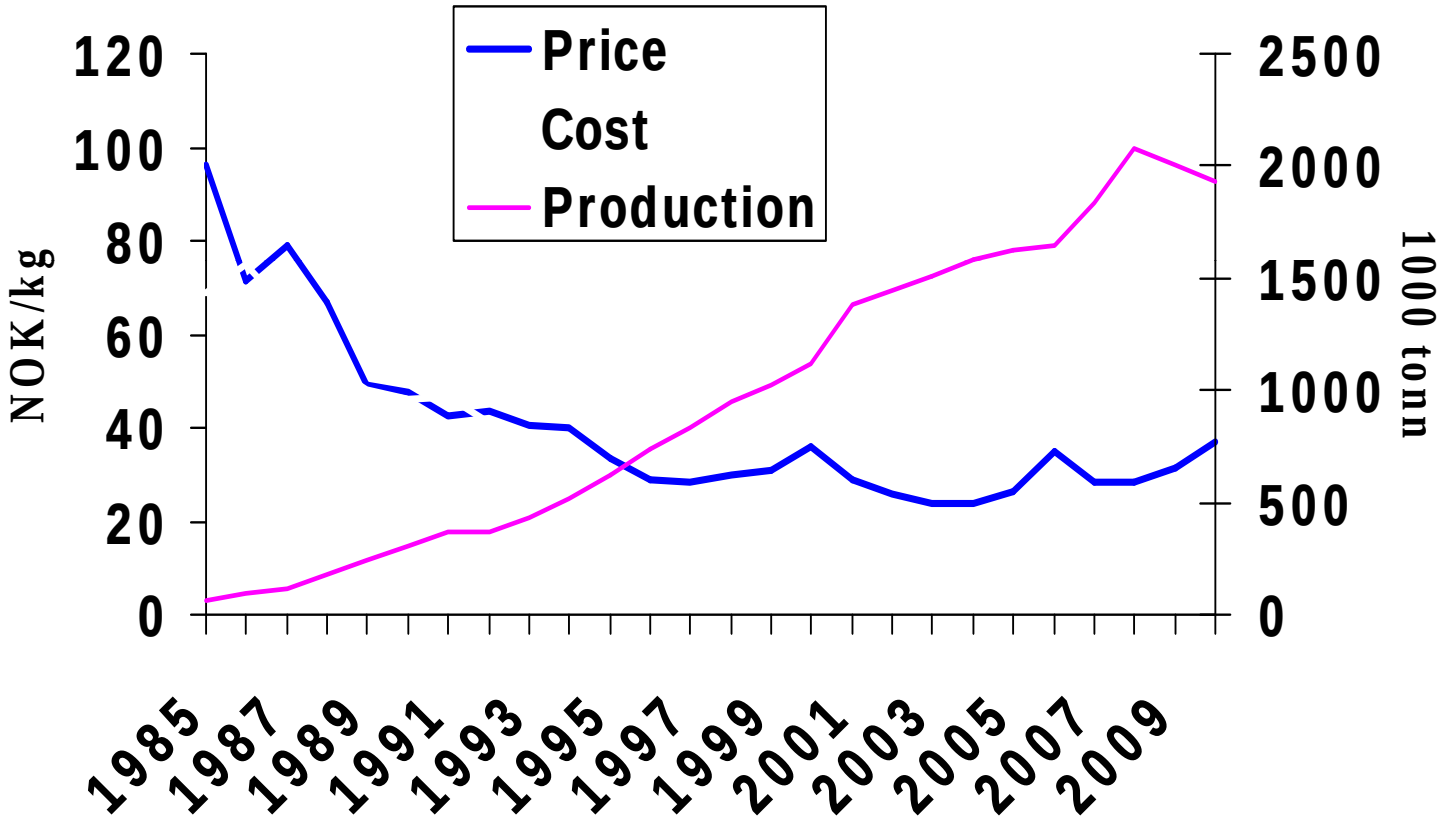

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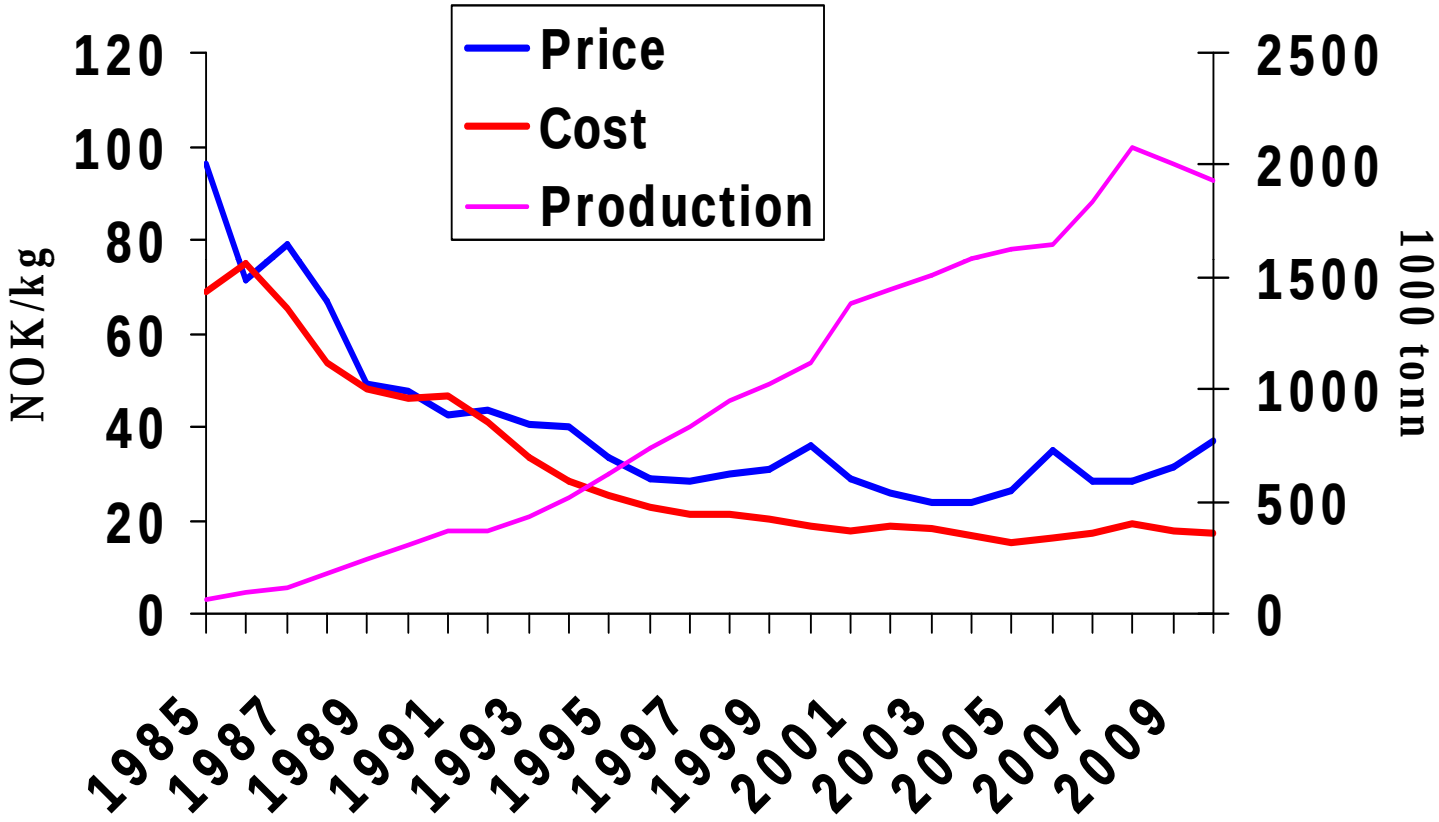
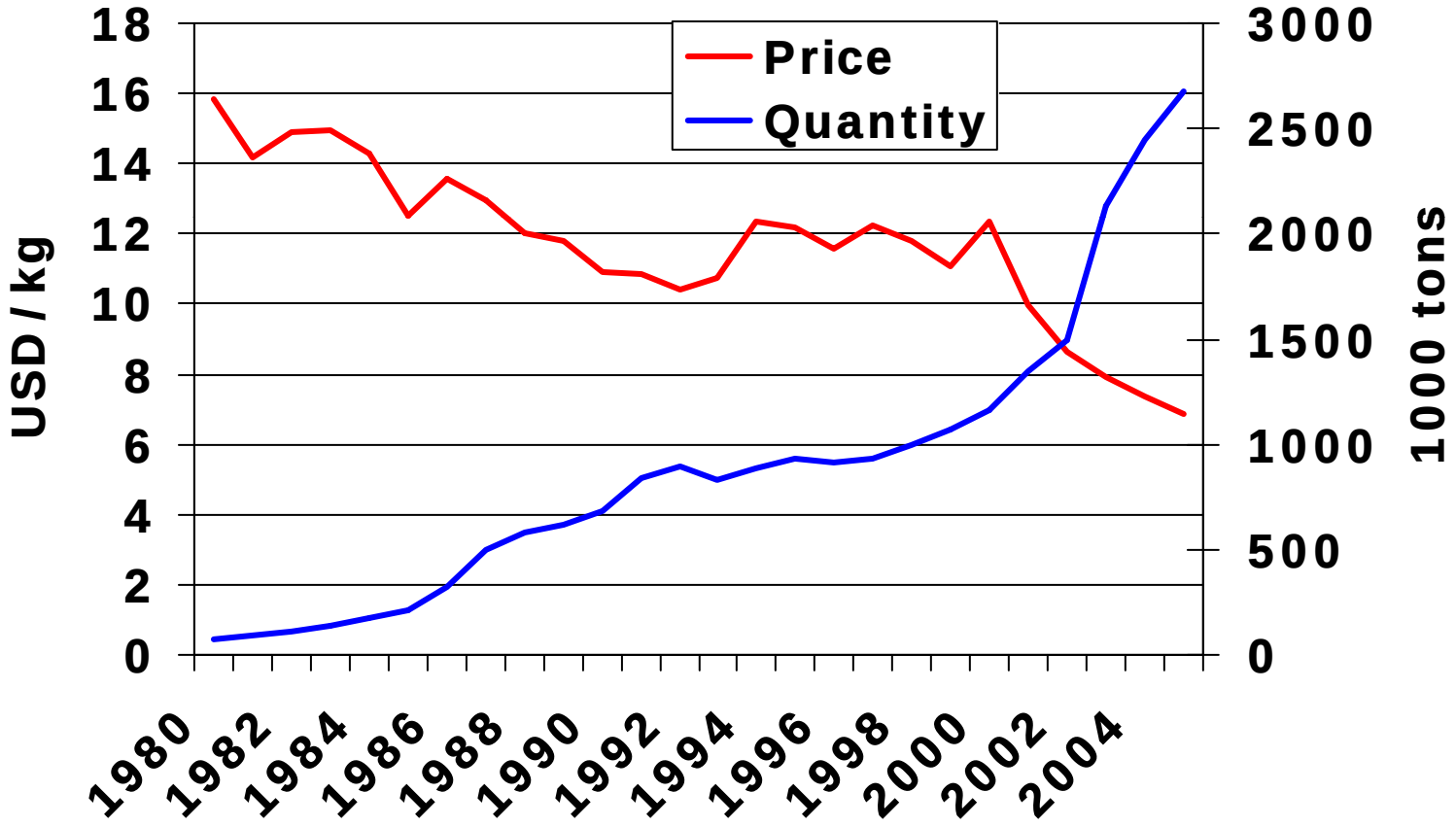
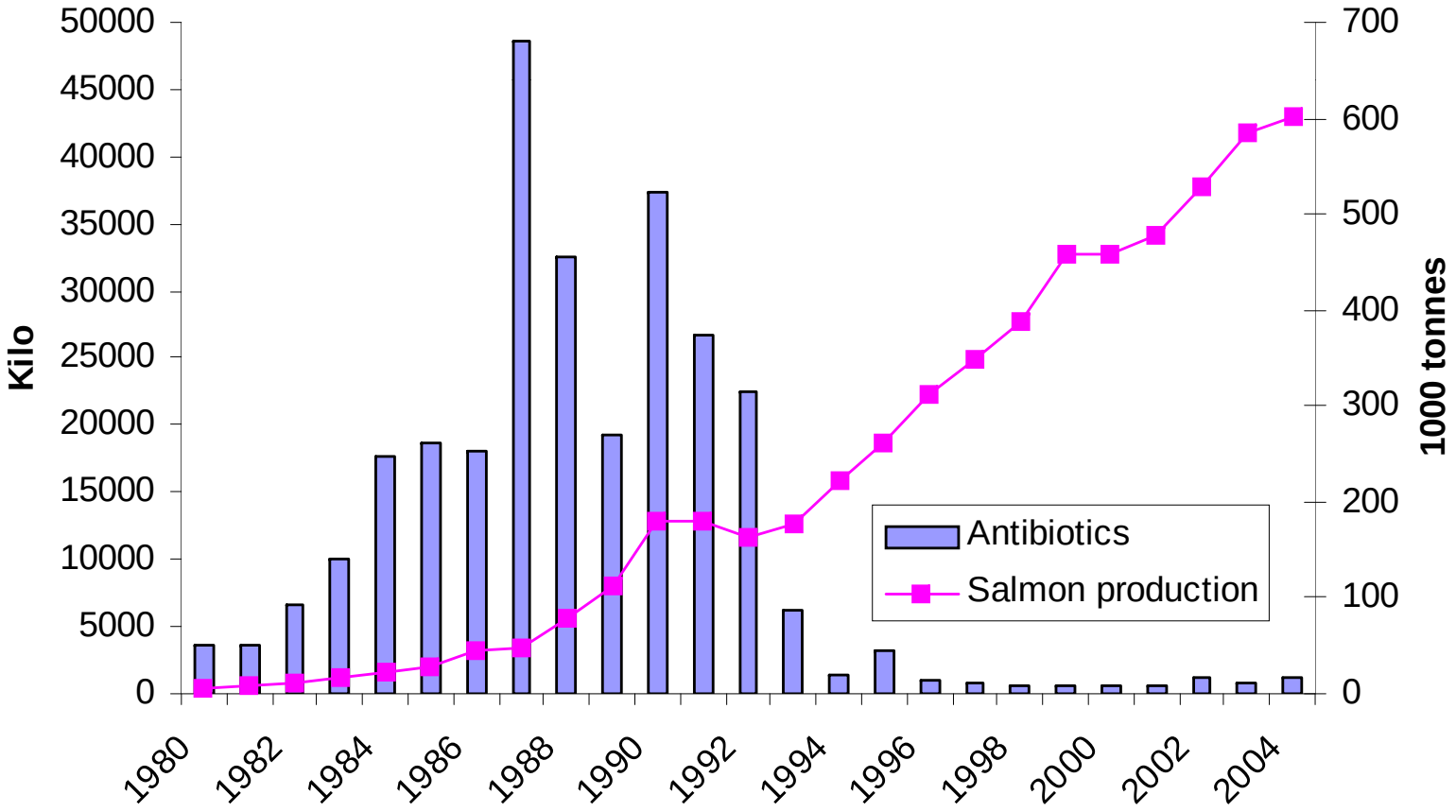


Shrimp production and real US import price (2005=1)



There will be environmental challenges, but these can be solved:

Use of antibiotics in the Norwegian salmon farming industry



Seafood is ecosystem friendly

Species	Carbon footprint (kg CO2e/kg edible part at slaughter)	Reference
Beef, Sweden	30	Cederberg et al (2009)
Pork, Sweden	5.9	Cederberg et al (2009)
Chicken, Sweden	2.7	Cederberg et al (2009)
Salmon, Norway	2.9	Winther et al (2009)
Cod, Norway	2.9	Winther et al (2009)
Haddock, Norway	3.3	Winther et al (2009)
Mackerel, Norway	0.5	Winther et al (2009)
Herring, Norway	0.5	Winther et al (2009)

- But even improved resource use is not necessarily regarded as positive:
- Canadian Atlantic salmon farms increase emissions ".. largely due to greater use of poultry products" (Pelletier et al., 2009) and in the UK a marked improvement in environmental performance could be achieved through replacing "mixed whitefish trimmings meal/oils"

Although some question our whole food production system

Toxic salmon

Museum of zoology – mutants' room

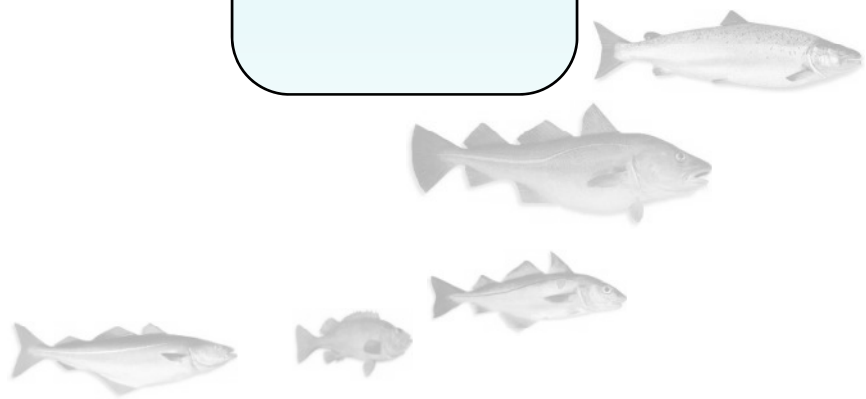
Bird flu

Stinky pig

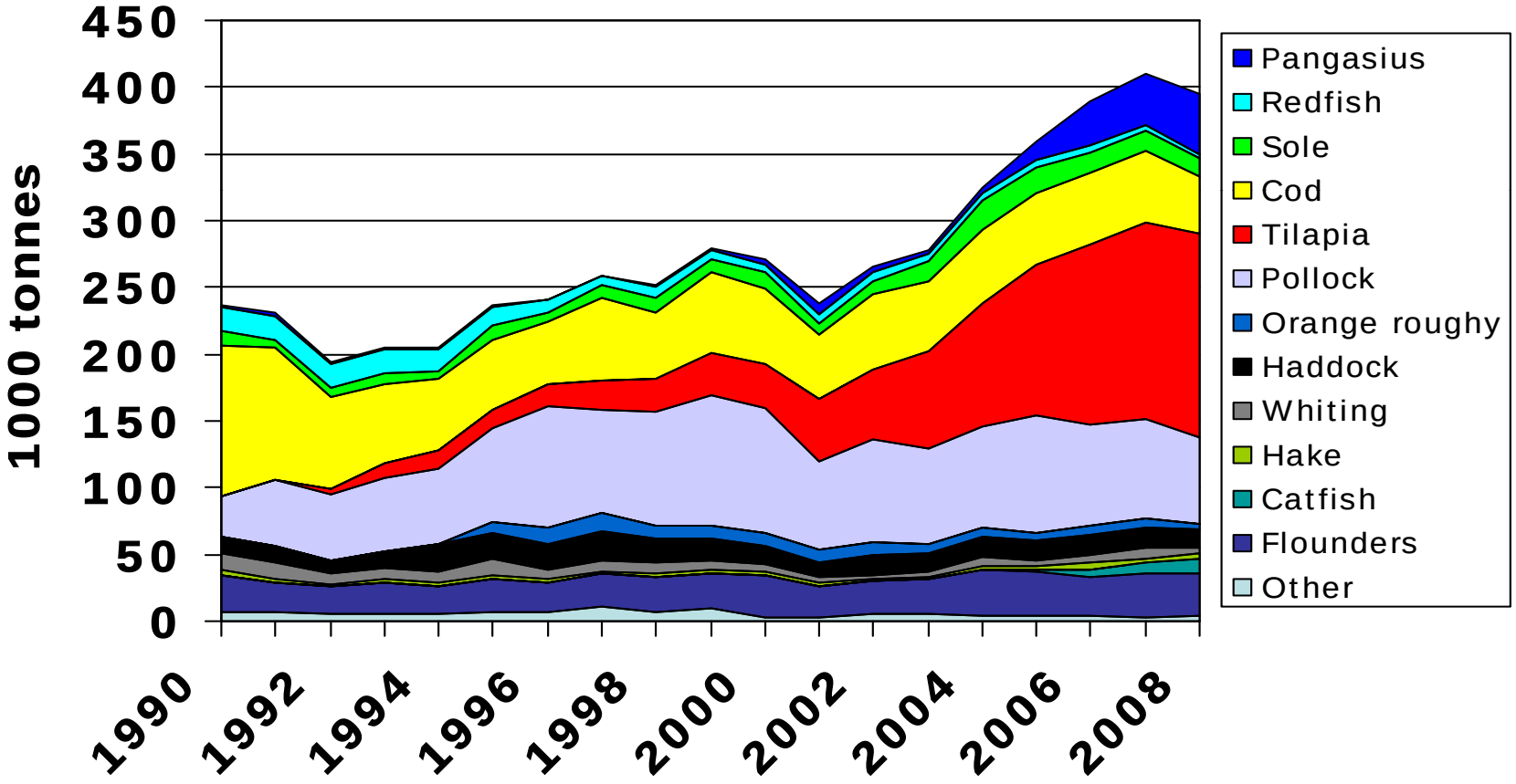
Mad cow

Trade and aquaculture change the market: New species in the whitefish market

ca 1900 - 1985	ca 1990	ca 1995	ca 2000	ca 2005
Until 1985 Cod, haddock, saithe, etc.	1990: Alaska Pollock Catfish	1995: Hake Hoki	2000: New warm water species as tilapia and Nile Perch	2005: Pangasius

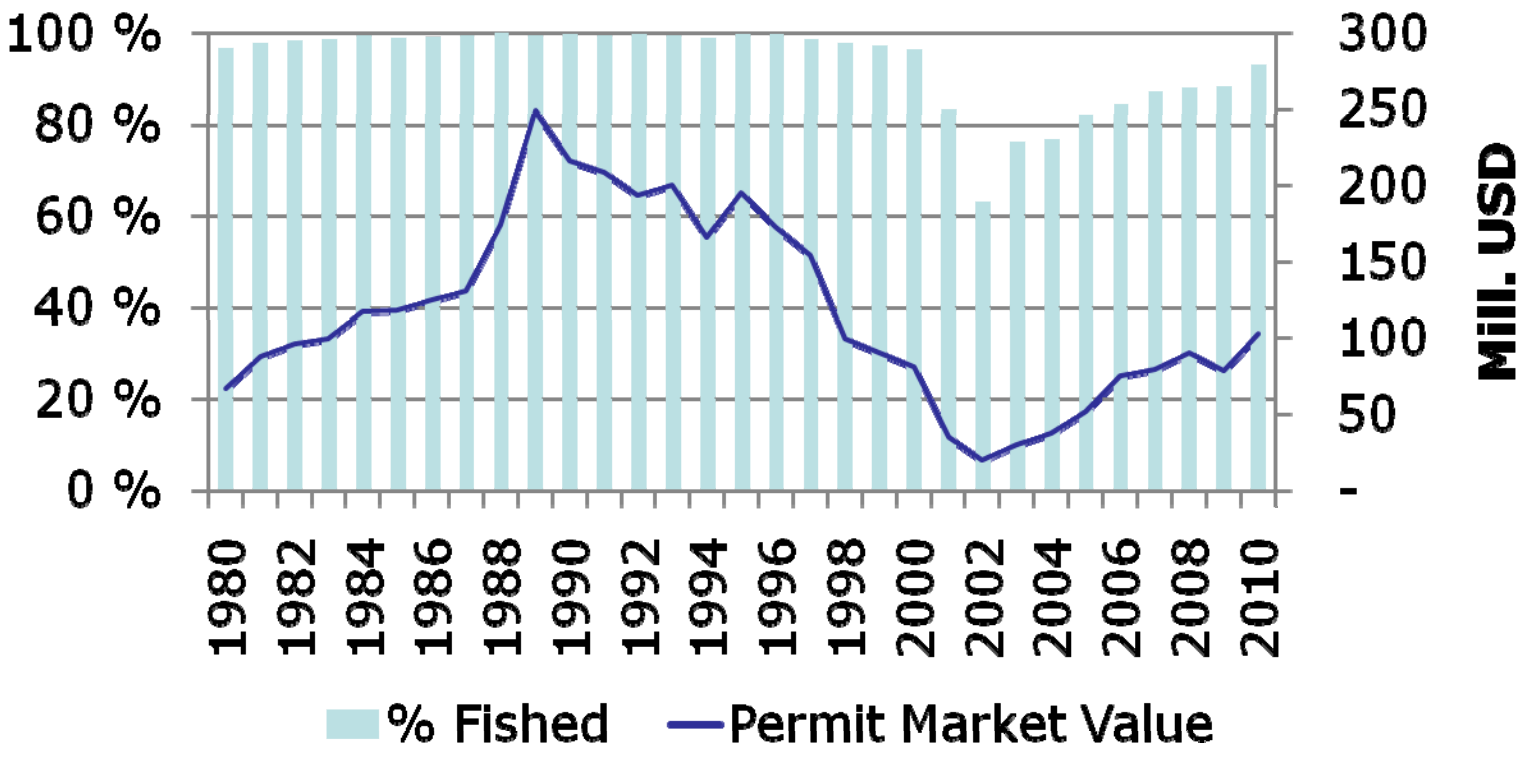


US imports of frozen whitefish, 1990-2008(tonnes product weight)



Competition from new species influence asset values and participation as well as prices

Bristol Bay sockeye (drift gillnet) from Valderrama and Anderson



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The values of attributes and information are increasingly important (Roheim)

The product is not only the physical seafood product…

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...but also a set of services related to:

- Volume
- Timing and frequency
- Flexibility
- Cost efficiency in distribution
- Food safety
- Harvesting technology
- Ecolabel
- etc.

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...but also a set of services related to:

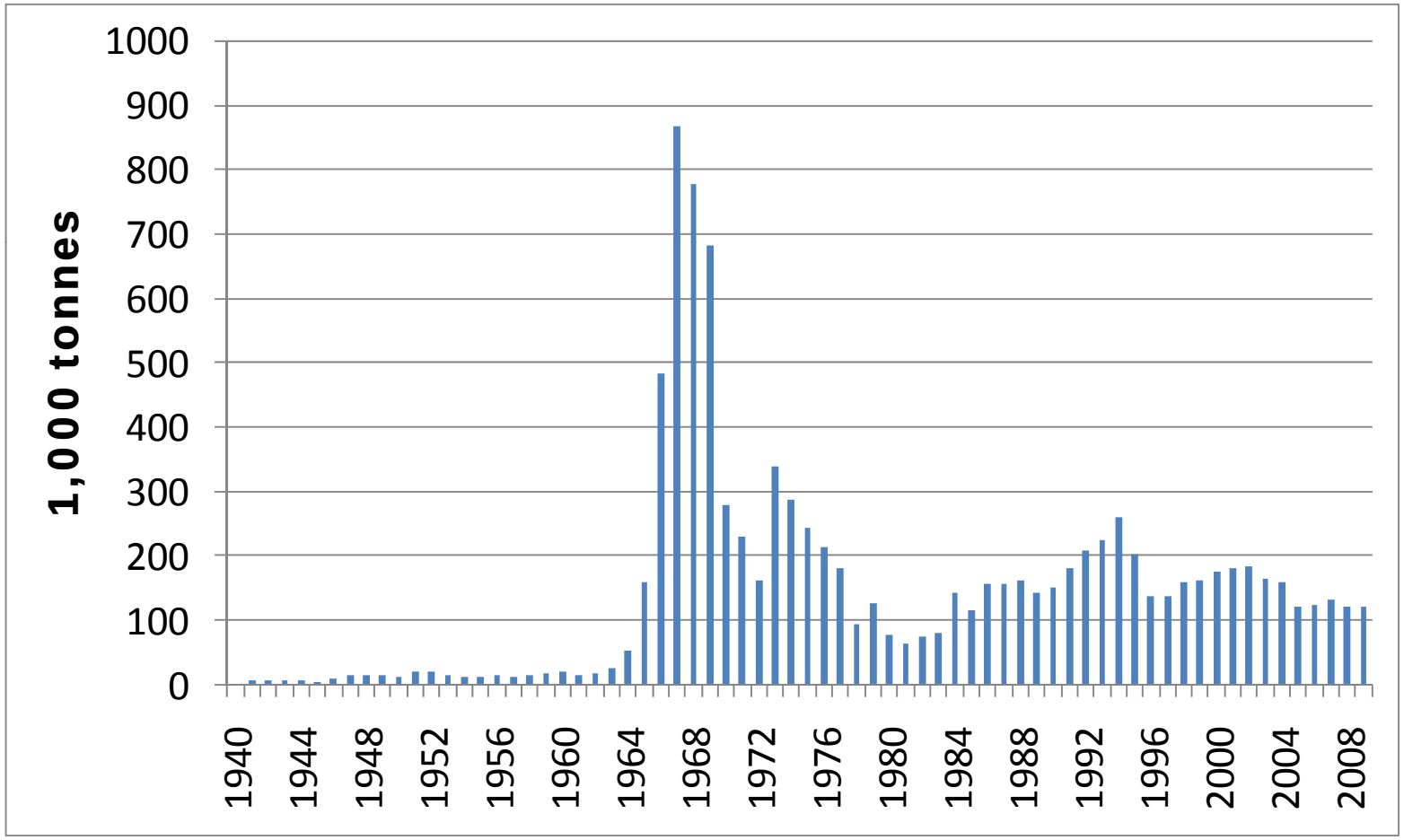
- Volume
- Timing and frequency
- Flexibility
- Cost efficiency in distribution
- Food safety
- Harvesting technology
- Ecolabel
- etc.

- And each attribute creates a new potential line of conflict at the market place, in the supply chain and in the production or harvesting process

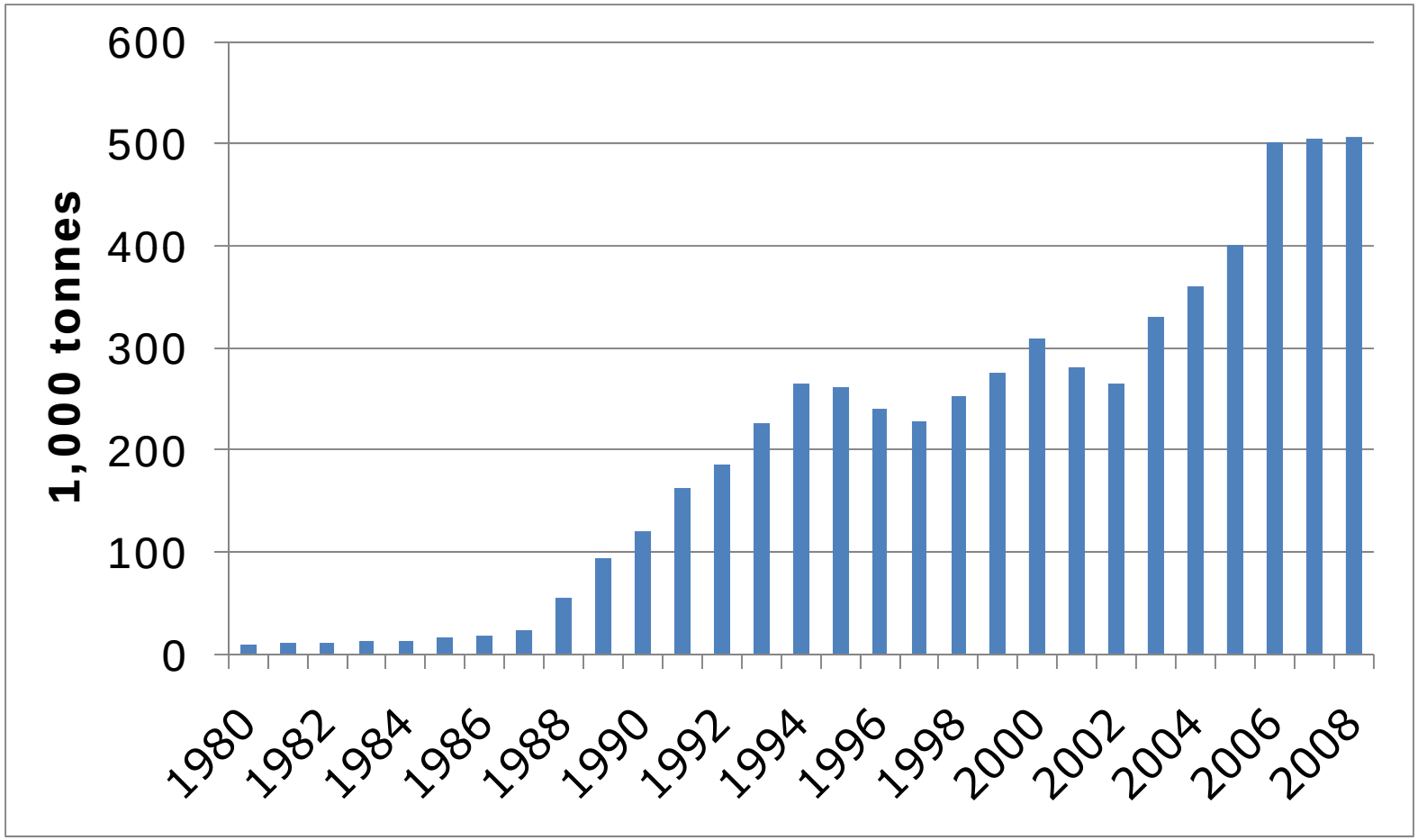
Governance (Smith et al, 2010)

- Not only the government, but also the industry itself is responsible for good governance
- The influence of other stakeholders on governance has increased over time
  - Competing economic interests, environmental concerns, food safety concerns
- In a successful industry, governance cannot be too light, not too heavy handed
- Governance should recognize structural changes in the industry
  - And not prevent innovations and sustainable technological developments

It can take time to find a good governance system: Norwegian landings of mackerel

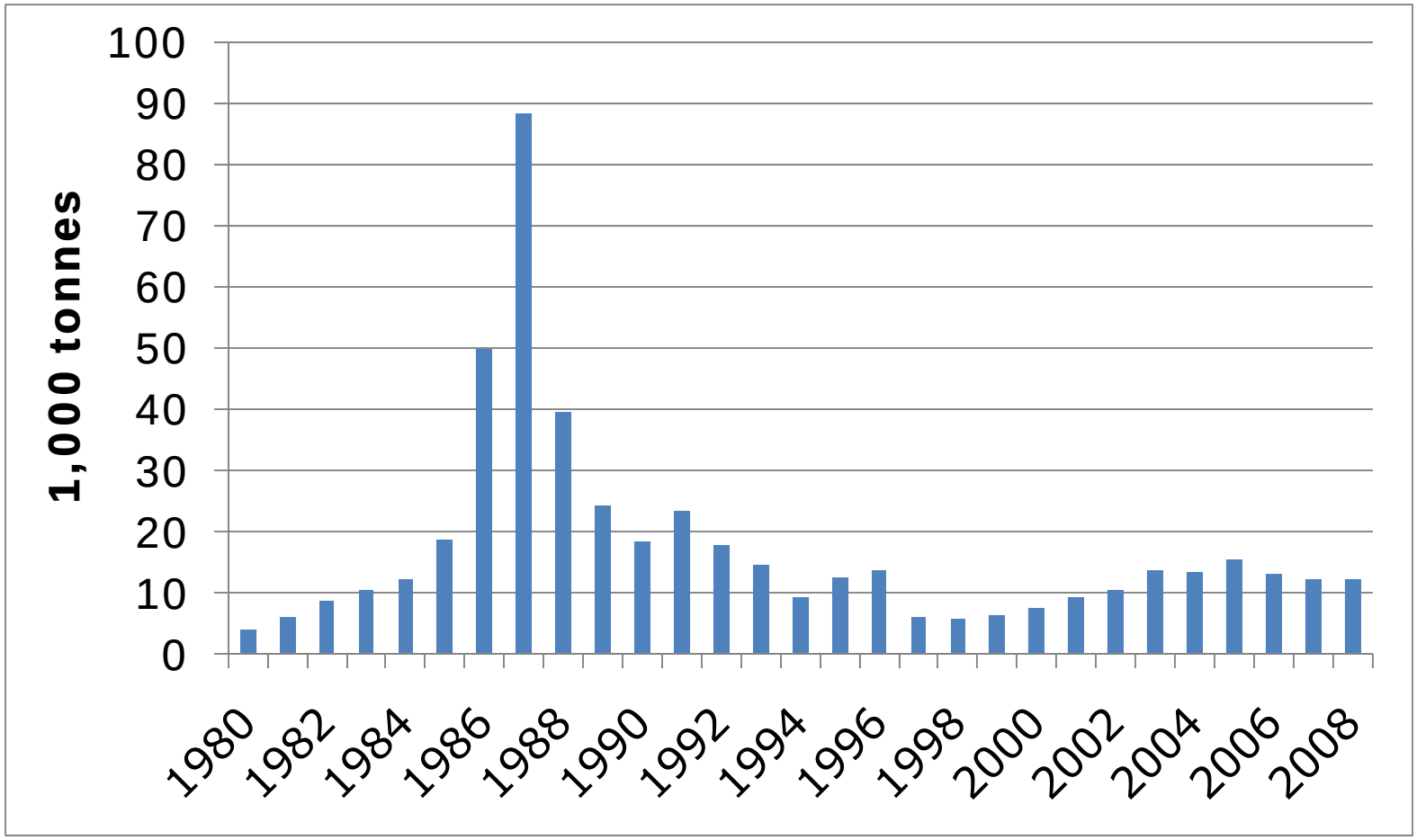


It can take time to find a good governance system: Shrimp production, Thailand

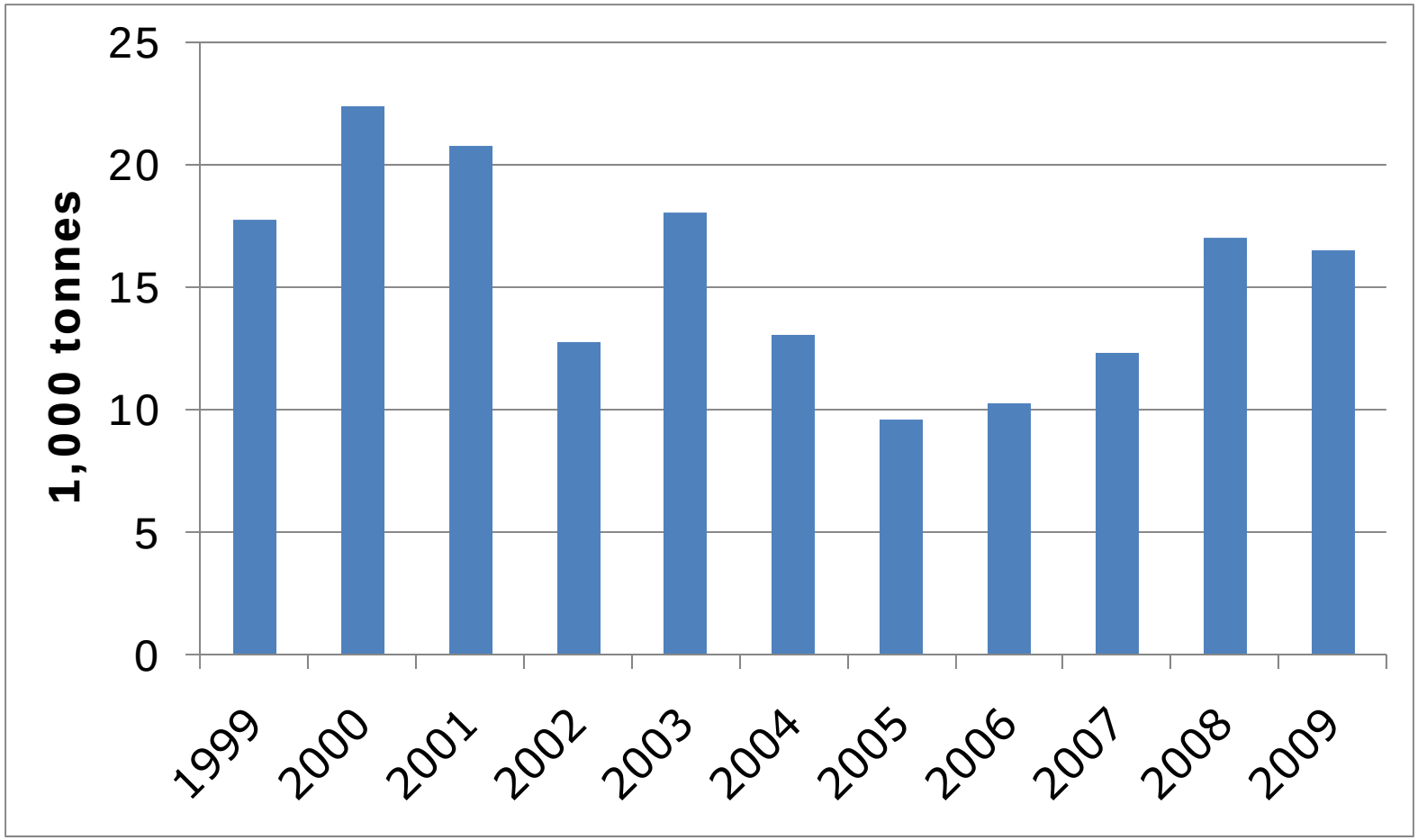


Source: FAO

One may never get there because governance is lax: Shrimp production, Taiwan



Or because governance prevents innovation and new technologies: Salmon production, USA



Conclusions

- Conflicts in relation to the use of oceans are likely to continue and increase, because there are so many visions with respect to sustainable use
  - The importance of the oceans is likely to increase as pressure on marginal lands continue to increase
  - No governance is likely to lead to the worst outcome, e.g. open access
- A fundamental question is whether innovation and human ingenuity are to be allowed to play their part
- Better and sustainable outcomes require analyses and trade-offs

Conclusions

- Analyzing trade-offs is what economists do best
- There is a huge role for economic research in analyzing the effects of different governance systems - including no governance - and how these are linked to different supply chains and market systems
  - Markets always play a role, but which?
  - And other disciplines provide valuable insights

Marine Resource Economics:

- MRE: The only journal specifically addressing economic issues in relation to marine resources
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- Published in association with IIFET and NAAFE
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