How can Fisheries Management Solve the Problem of Biological Sustainability?

Workshop in Akureyri Iceland

11.-12. October 2007

Niels Vestergaard

Department of Environmental and Business Economics

Centre for Fisheries & Aquaculture Management & Economics (FAME)

Observations, outline and conclusion

- The Marine Resources are limited and it looks like that we are affecting the functions and the interaction of the marine environment in such a way that the production of services from the marine areas is changing.
- It is discussed whether possible economic institutions and politics can be designed for managing the impact from fishery on the marine environment. Our current (economic) institutions (i.e. regulation) do very often disregard them.
- The importance of economic incentives as a necessary condition for sustainable development will be emphasized.
- Hence, restoring a profitable fishing sector is central in order to secure long term decisions and investments.

The value of the nature

- Ecosystems are capital goods.
- If they are managed well they can provide a stream of vital services:
  - Production of goods (fish, tree)
  - Life supporting functions (drinking water)
  - Processes like the decomposition of wastes
  - Satisfaction of life (recreation)
- Has also an option value (bio-diversity for future use)
- Looking at ecosystems producing services for human welfare gives a useful link between ecology and economy.
- We take many of these services for granted, for free!

The value of the nature #2

- It is changing, it looks like. The marine resources are limited and we impact the functions and interactions in the oceans in such a way that the production of the services is affected negatively.
- It is therefore necessary to assess how and how much we shall conserve the marine environment? These questions, economists has a meaning about.

What is the situation?

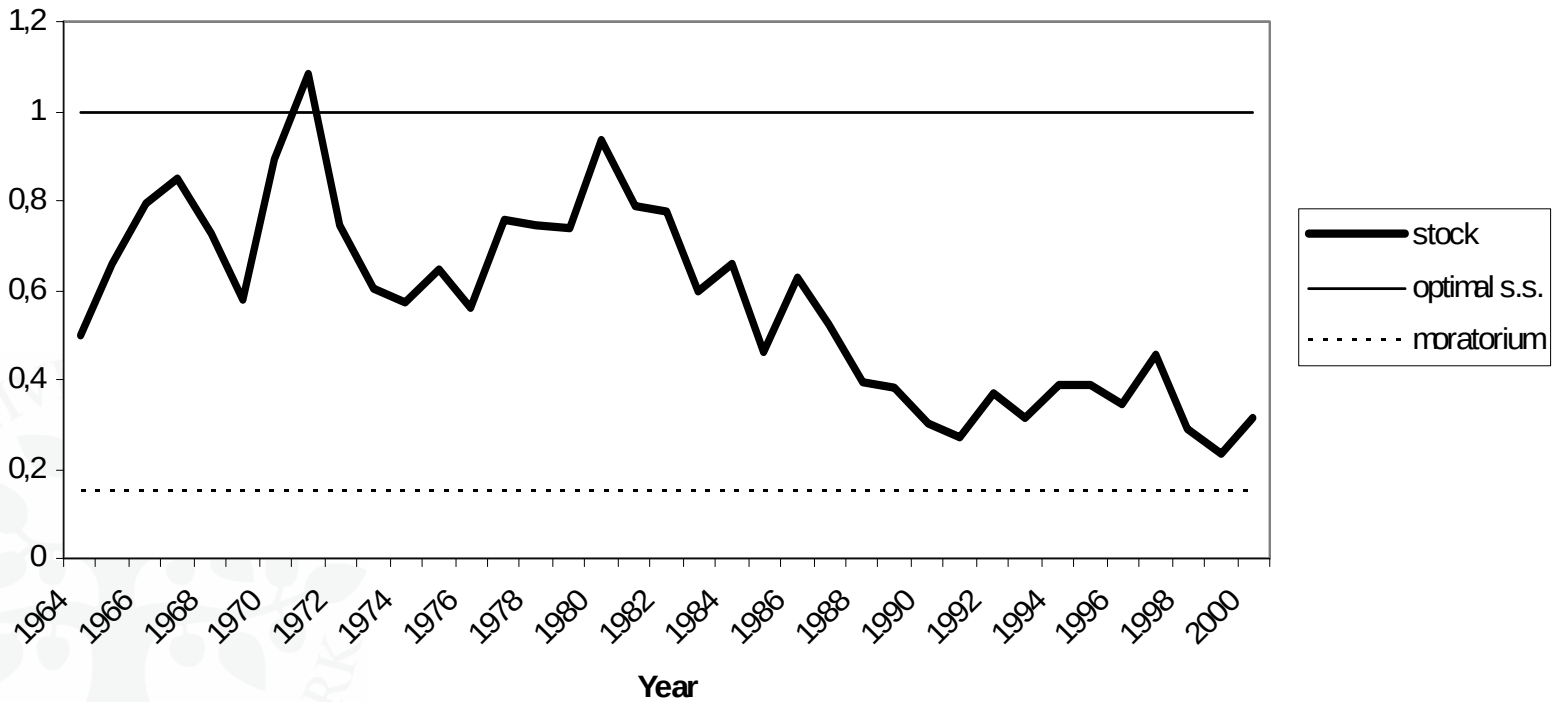
Bergen conference 1997 (stocks North Sea**):**

1. Annual discards of commercial species in the North Sea fisheries is at least 1/3 of the catches
2. Herring, mackerel and cod stocks are depleted
3. Sole, plaice, haddock and saithe stocks are close to their lowest recorded levels
4. The present control system has limited effect and does not prevent misreporting

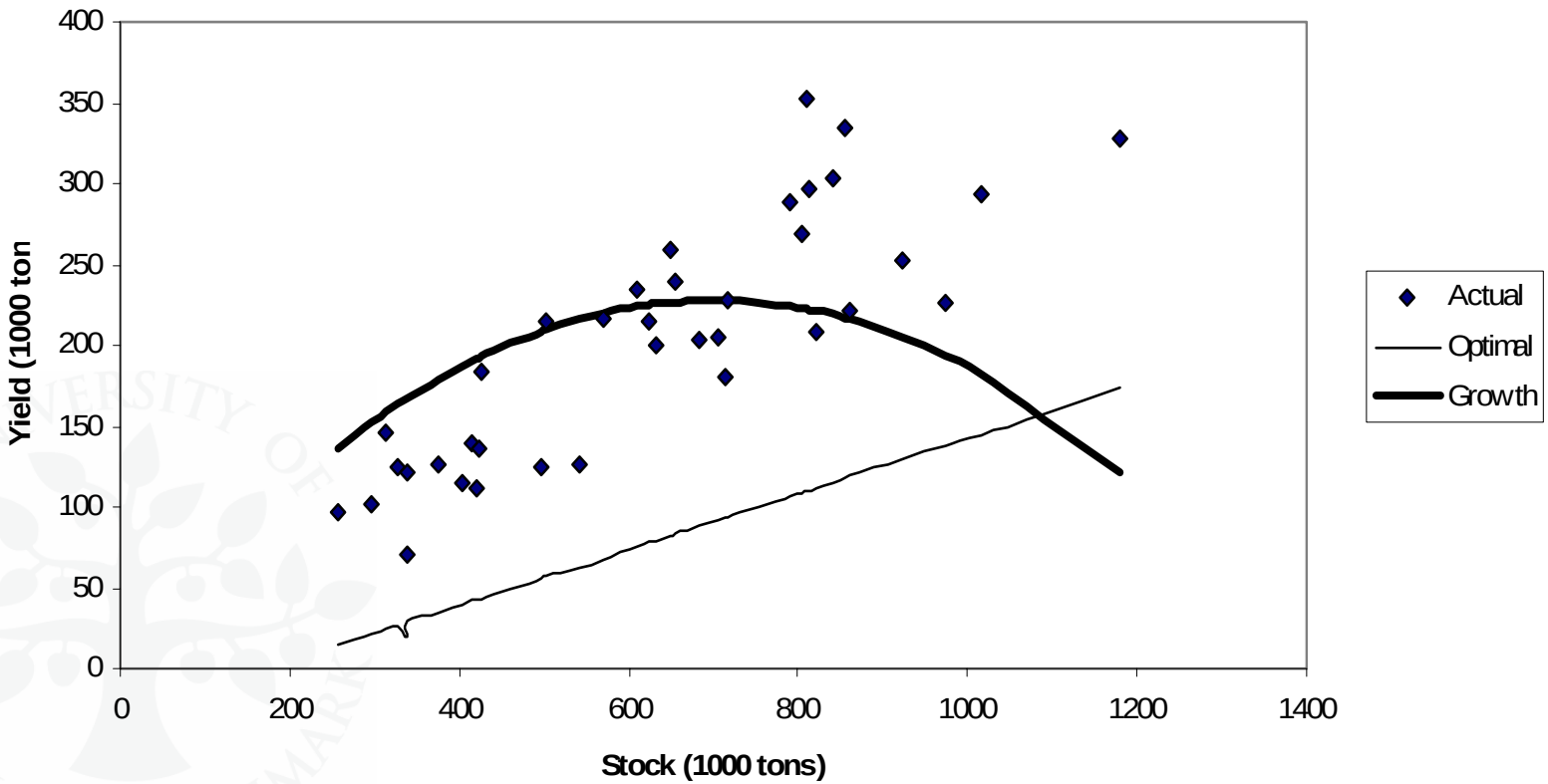
Basic concerns:

- Biological overfishing
- Incidental harvest of undersized, non-target and protected species
- Fish habitat

Denmark: Cod stock in the North Sea relative to optimal steady state



Cod in North Sea: Growth function and actual and optimal harvest against stock



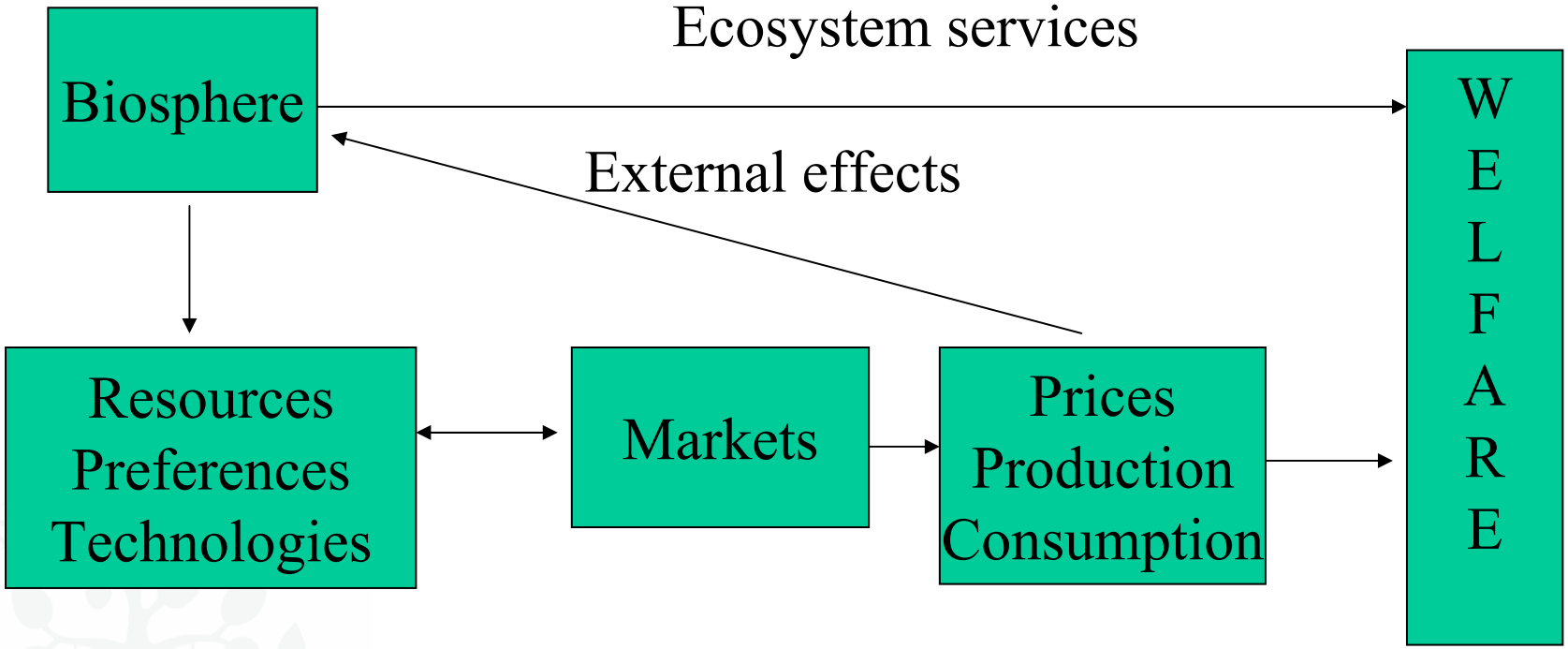
Cod biomass relative to the optimal

	Common data period 1964 - 2000	Period with TAC-regulation 1978 – 2000
Denmark	0.57	0.49
Iceland	0.68	0.60
Norway	0.77	0.61

What do we deal with?

- Fish stocks – renewable – common property.
- The nature is complex and dynamic – also the oceans around Europe.
- In practice, we have (very) limited operational knowledge about the ecological relationships in the oceans (Example: Climate contra fishery).
- Political complicated because several countries are participating – e.g. EU.
- Fishery resources are stocks and part of the marine ecosystem, i.e. they are multi-attribute resources and several externalities are involved.

Ecosystem services are not traded on the markets.
And some market activities impact the nature.



Why regulate the fisheries?

- What is good for the individual fisherman is not (necessary) good for society. The fisherman has the incentives to invest more in a fishing capacity than wanted from the social point of view.
- This will lead to smaller stocks, lower catches, higher costs and hence poor economic results and in the end a bad fishery for all.
- The result for the society (fishermen, consumer, NGO's etc.) is a low return from the fish stocks.
- And higher pressure on the ecosystems

Regulation is needed, BUT

- Traditional regulation (season and gear limits etc.) drives up the cost, but the pressure on the fish stocks is not decreased.
- Result: poor economic results, unexpected adjustments (e.g. upgrading of the catch) and stressed stocks, which lead to new regulations, i.e. a treadmill between the fisher's and the authorities.
- An almost chaotic situation where one can not rely on the imposed regulations to have the desired effect they were meant to. One could be tempted to implement an even more detailed restrictive control for the fishing industry. But that would, of course, only make matters worse.
- Traditional regulations do not handle the fundamental problem: What is individual rational is collective stupid!

Inefficient regulation: Dynamic effects

- Including technical progress and technical inefficiency in a standard bio-economic model, (Gordon-Schafer model) to show some of the dynamics between fishermen and regulator. Technical progress λ represent the ability of the fisher to improve their fishing operations while the technical inefficiency term -μ captures traditional regulation which works by limiting the ability of effort to produce outputs. These two terms are added to the production function:

$$Y_t = qS_tE_te^{\lambda t-\mu(t,z)}$$

Inefficient regulation: Dynamic effects #2

Solving the open access equilibrium stock level:

$$S(openaccess) = \frac{c}{pqe^{\lambda t - \mu(t,z)}}$$

- This implies that with continuous technical progress will the open access equilibrium stock constantly decline. The reaction from the regulator could be to implement "open-access regulation" which works by increasing the technical inefficiency and hence the equilibrium stock level.

Flexibility

- A system, that is more constrained than another one, can not adjust as easy than the less constrained system, when it is impacted by changes in the market conditions or in the resource situation: Le Chatelier effect.
- This means that micro based regulation can lead to a series of unintended derived effects, such as discard, illegal landings, low use of vessel and crew and poor quality of landings.
- Poor economic performance and lack of sustainable ability of adjustment keep the sector in a trap, where short run decisions are taken by both fishermen and the authorities.
- There is a need for a system where long term investments can be made both in nature capital and man-made capital.

Illustration

Average rate of return for all fishing firms in Denmark:

1996	1997	1998	1999	2000	2001	2002
-0,4%	6,9%	8,6%	0,9%	-3,1%	2,3%	7,0%

Illustration - continued

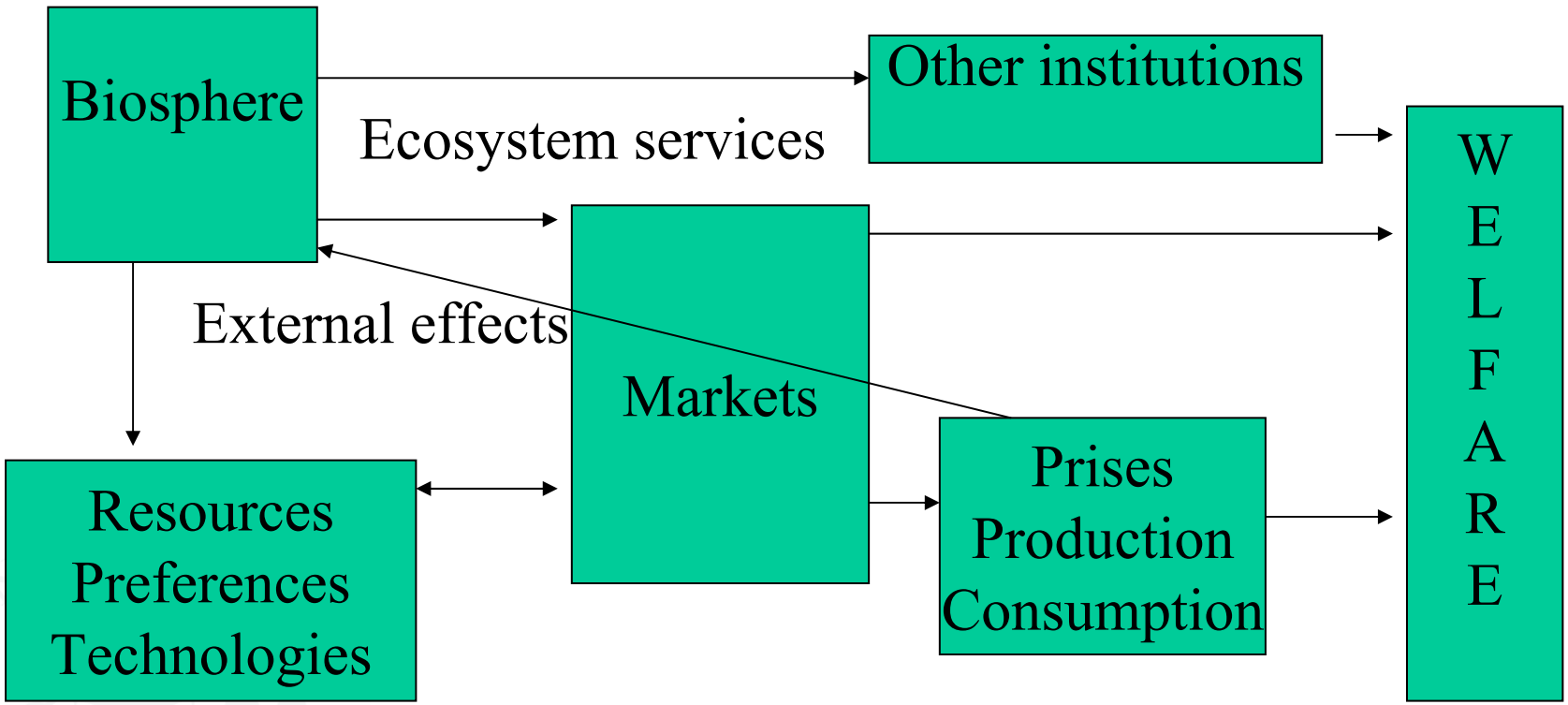
From ACFM report on cod in Kattegat (2004):

- The TAC is implemented by period rations for individual vessels. Ration sizes have been low in recent years and may have created incentives to discard (high-grade). As ration size has been higher in the Western Baltic there have been incentives for writing Kattegat catches into the Western Baltic. The recovery plan, agreed in 2004, stipulates strict rules for carrying and landing cod in Kattegat.
- Discards are not included in the assessments, and their magnitude is unknown. Essential assessment data (70% of landings) are only available from Denmark for 2003.

What does this mean?

- A system focusing at the framework instead of focusing on micro regulations.
- A system which handles the fundamental regulation problem (which micro regulation don't): Stock externality <=> market based solution.
- The fishermen decide themselves – within the framework – their production machinery and the use of it.
- Other supplementary regulations ought to be targeted towards the problem that it is going to solve. (E.g. protection of spawning ground).

Institutions to arrange the interaction between humans and nature



Conclusions

- Paradox: Markets are seen as the course for the overexploitation of the nature, but market based solutions (mixed economy) can play a role as institution between nature and economic activity.
- Economic incentives are important for conservation of nature – secure a balanced and more sustainable use. If we wish that the owners shall conserve the nature the owners shall have the incentives to do it.
- By that the social economic value of the ecosystem services is transformed to income for the owners as payment for their conservation.

Closing remark

"Getting the economics of fisheries right" is one of the preconditions for achieving the objectives of the Common Fisheries Policy, namely, the effective conservation of the resources and a sustained employment and a decent standard of living for those who work in the sector. To put it more bluntly, we won't be helping those who work in this industry if we continue to ignore economics, as the Ugly Sisters ignored Cinderella.

Steffen Smidt 2000 Former Director in DGFish in EU