UNIVERSITY OF COPENHAGEN

Warming, Hannesson and Fundamentals and Future Challenges in Fisheries Economics

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Outline

Introduction

- A story of the beginning of “my” story

Fundamentals in Fisheries Economics

- Warming, 1911 and 1931
- 1931 – 1953
- 1954 – Gordon, Scott, Christy, Crutchfield, Copes, Turvey, Munro, Clark, Anderson, Hannesson, Sutinen among others……

Hannesson, 1974 –

- The cornerstone in the Nordic countries

Future Challenges and research topics

Introduction

A graduate course in Monetary Policy 1975
- The Danish professor Gelting's habit

The Danish fishermen block a danish habour

Can economic theory help us to understand?

A "naive" part time fisherman gives an explanation – grade A

BUT…..

Next step - Warming 1911 and Hannesson 1974

A historical note on fisheries economics

The articles by Scott Gordon, 1954 and Scott, 1955, both published in *Journal Political Economy* are known as the classical references in fisheries economics.

As early as in 1911, a Danish economist derived results identical to those published in 1954 and 1955.

Professor Jens Warming's article, published in Danish in *The Danish Economic Journal* was almost unknown outside Scandinavia until Professor Jon Sutinen in 1981 convinced me to translate the article. It was published in *History of Political Economy* in 1983.

HOWEVER: Rögnvaldur Hannesson and Lee G. Andersen also translated the article, published in *Fisheries Economics Newsletter*, 1981.

Lesson: Publish in English and in cited journals

A historical note: Warming's main findings

Warming's main results based on a simple numerical model:

- Open access results in misallocation between fishing grounds (a simple spatial analysis)
- Biological overexploitation if cost of fishing effort is low
- Biological based regulations (closed seasons, gear restrictions etc.) may prevent biological overexploitation but not economic exploitation
- **M**aximum **S**ustainable **Y**ield (MSY) will not maximize total rent
- The economic optimum level of effort: MR=MC
- The optimal tax t= AR – MR at the optimal level of effort

A historical note: Warming and property rights

In a hot political debate in Denmark in 1930 about cancelling coast owners right to sell the fishing right to use eel weirs near their coast, Warming pointed out the loss of rent by extending common-property right. In his 1911 and in an article in 1931 he also touched on compliance and enforcement cost and aspects of the political economics of fisheries management. He concluded:

" No wonder fishermen find it difficult to understand this difference – that on the open sea they have full freedom when they do not bother other, but at the coast they have to ask a non-fisherman for permission and possible pay him for this. That the latter arrangement in principle is the right one…has not been explained to them" (Warming 1931)

Since Warming, fisheries economists have dealt with many theoretical topics and management issues. Hannesson has been one of the cornerstones. But still, important management issues need to be analyzed.

Math, economics and fisheries economics/bioeconomics

The gain of the interactions between math, general economics and resource economics have been significant:

Example:

1. Optimal control theory and capital theory enriched fisheries economics
   - Mathematical solutions were found to handle relatively simple management issues (well behaving stock dynamics, simple biological environment as single species biomass based models)
   - Discounting aspects
   - Optimal paths towards optimal stock level and optimal adjustments of taxes or ITQs
   - Non-malleability of fishing capacity and optimal path
   - Taxes and individual transferable quotas (ITQ)

   Since around 1975 fisheries economists have had a common math-capital theory based bioeconomic standard model as a base for advanced theoretical refinements and management analyses

Math, biology and fisheries economics

The gain of the interactions between math, biology and resource economics have been significant:

Example:

2. Integrating stochastic models, biology and fisheries economics have given important new insights
   - How does uncertainty change deterministic results
   - Effects of uncertain are often ambiguous as to optimal stock and effort level
   - Uncertainty and the choice of efficient management program
   - Uncertainty and the use of marine reserves
   - Uncertainty on economic parameters
   - Uncertain biomass shift and collapse
     - Exogenous caused collapse and overfishing caused collapse
   - Simulation experiments and empirical analyses
   - Ecosystem based fisheries management

Public economics - Integrating ideas from economics into fisheries economics

The idea of fisheries management as a public good or club good gives new perspectives:

Example:

3. The application of public choice theory and public finance has broadening the fisheries management research agenda

Research topics (in selection):

- Governmental failures in fishery management
- Potential efficiency gains by applying a cost recovery program
- Assessing benefits of fisheries management and the distribution of these benefits (taxpayer, industry, fishermen or the internationally community)

Government failure in fisheries management - Integrating ideas from economics

Areas of interest or concern:

- Conservation policy
  - Many stocks are overexploited or highly overexploited
- Fleet capacity development
  - Too much harvesting capacity in too many fleets
- Expenditures on fisheries management
  - Count for a very high proportion of landed value in most countries
- Patterns of decision-making
  - The degree of use of scientific advice
  - The lag in decisions-making
  - The lag in the implementation of regulation
  - The softness of regulation measures
    - Just the direction is right

Government failure II - Integrating ideas from economics

Potential risks:

- Strong focus on short-term group interests
  - Fishermen, industry, regions (or even countries)
- The balance between “economic (private) uncertainties” versus (longer run) “resource uncertainties”
- The balance between well-defined interests and “public interests”
- The social discount rate is an unsolved problem

No efficient mechanism exists to avoid governmental inefficiencies in fisheries management

- Important to look at ways to provide management services through “self-governance”

Management as a club good - Government failure
II- Integrating ideas from economics

Fisheries management services as a club good

Or why treat fisheries management services as fitness club services

- The services is non-rival for club members and excludable
- If management services are club goods “optimal” rules for “membership” can be developed

Fisheries management services require (among other things):

- Research (stock assessment)
- Decision making (management measures, allocation of fishing rights (ITQ’s, days at sea, etc.))
- Enforcement
    - Surveillance, prosecution and sanctions etc.

Research, decision-making and enforcement form a club good as the services can be exclusive to a well-defined group.

Cost recovery aspects - Government failure II- Integrating ideas from economics

Alternatives to government provided fisheries management services?

- Scientific advice (non-governmental research centers)
- Decision making (co-management)
- Enforcement (private agency)

Incentives to reduce or eliminate inefficiencies

If costs and benefits of various management services are linked to the same group efficiency gains might be harvested

Principles for user charges and cost recovery

- More focus on efficiency, relevance and level of services
- Problem: If the club good is more than a club good

Conclusion: Who pays and how they pay for management services are important for the performance of a fishery and for the nature and the extent of management expenditures

Important research topics related to cost of fisheries management:

- The nature and the economic implication of government failures in fisheries management
- Management cost influences on management regimes and visa versa
- Double dividend aspects of cost recovery programs

Fisheries management – theory versus reality

Economic theory and design of incentives have over time been more and more integrated in models of fisheries regulation.

But lack of knowledge related to:

- The complexity of fish biology
- Interaction between environment and stock dynamics
- Uncertainties
- Imperfect empirical foundation
- Human behavior in various social and political contexts
- Government failures among others

The distance between theory and practical fisheries management is often significant but - in my view - reduced over the last 10-20 years

The balance between theory and policy application

There is a clear link between economic theory and fisheries management.

But did fisheries economists up to recently spend too much time on technical theoretical refinements compared to time spent on serious management problems?

Jim Wilen concludes in his 2000 – JEEM paper: “My assessment is that the profession has probably been too preoccupied with abstract, conceptual, and normative analysis”

It is difficult and perhaps some did not find the right balance.

Rögnvaldur Hannesson has contributed to the development of the theoretical framework, made theory applicable, shown the link between theory and management issues, and argued – and still does - strongly for the relevance of fisheries economics related to fisheries management.

Challenges and future research

Management of complex fisheries

- Theory
- Simulation models

Ecosystem based fisheries management

- Theory
- Applicable models, data and challenges

European-EU fisheries policy – the new CFP

- Main challenges: Discard ban and MSY vs. MEY vs. Green fishery

The New Nordic Fish War

A complicated game or ? How do we solve the game?

Managing complex fisheries – simulation model

- Investigate magnitude of resource rent given different management scenarios
- Investigate adaptation by fishermen (investment behavior)

6 factors:

1) Fish stock-recruitment
2) Technology
3) Financial bookkeeping
4) Fishermen behavior/responses
5) Management
6) Prices (although deactivated here = price is constant)

The management regime directly influences the fishermen's choice-set in regards to effort and may lead to non-compliance

8 different management scenarios run in the model

Managing complex fisheries – simulation model

The model

$$\Pi = \int \pi(e,x,z) \cdot \exp(-r,t)dt$$

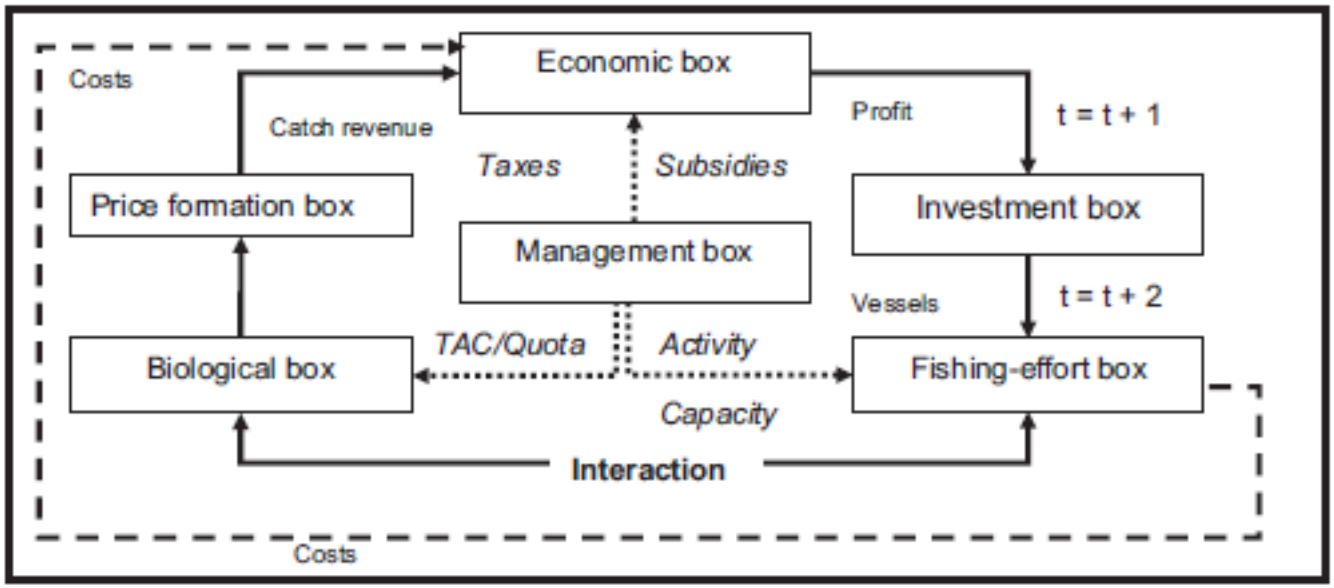
$$\pi(e,x,z) = p \cdot Y(e,x,z) - C(e,x,z)$$

$$\dot{x} = G(x) - Y(e,x,z)$$

e: economic inputs
x: fish stock size
z: exogenous variable mainly in terms of management measures
p: price of fish
Y: catches
C: costs
Π and $\prod$: fleet and NPV of the fleet profit
G: stock growth function

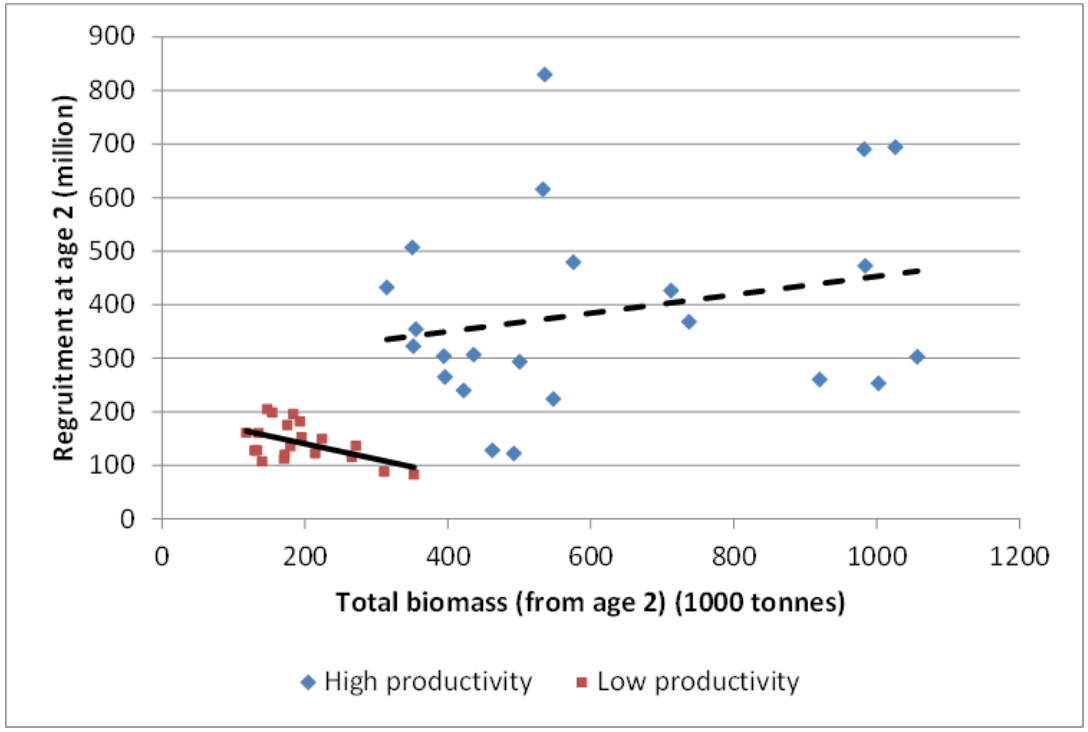
Managing complex fisheries, cont.

Structure of Fishrent



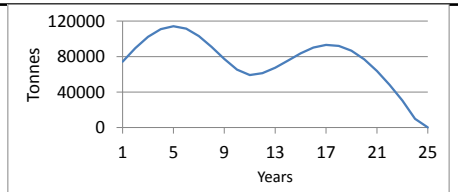
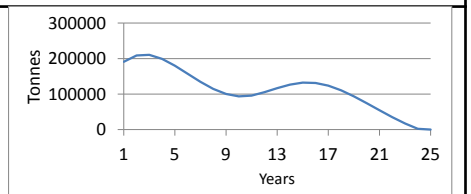
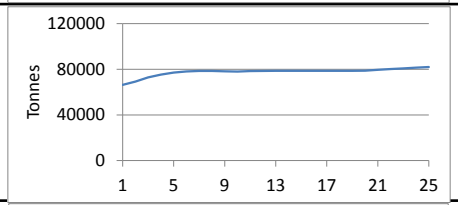
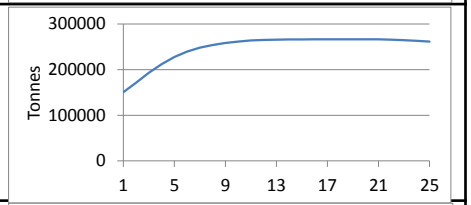
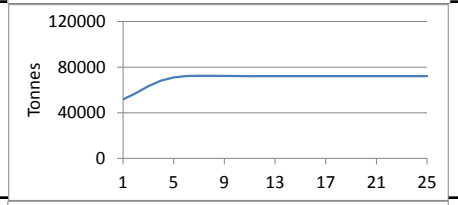
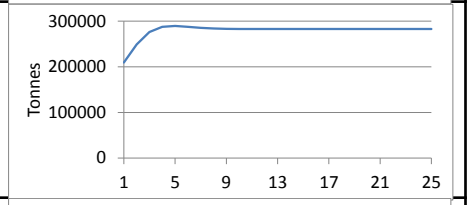
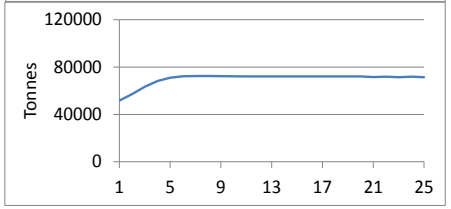
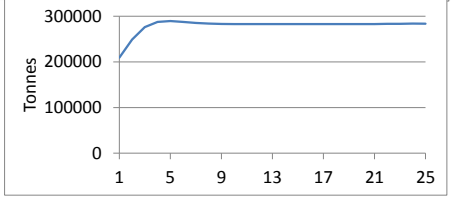
Managing complex fisheries, cont.

Recruitment against catchable biomass



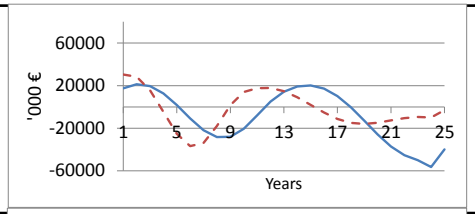
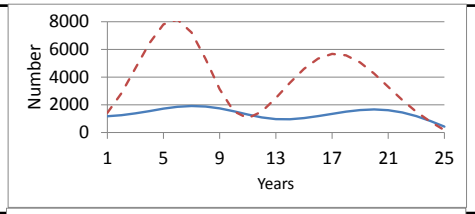
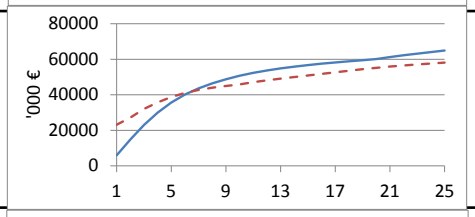
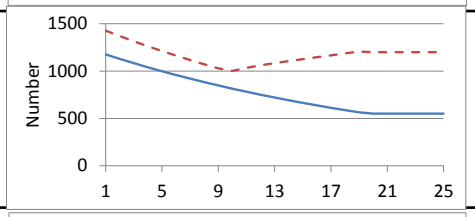
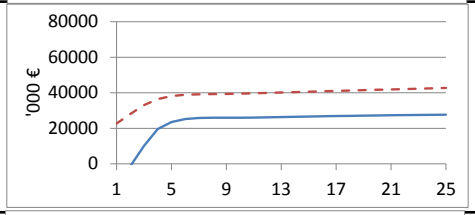
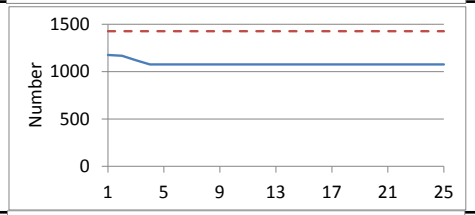
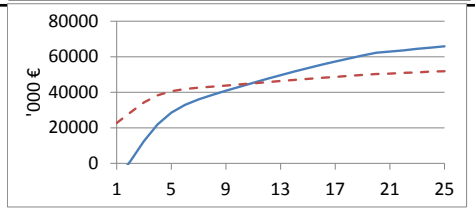
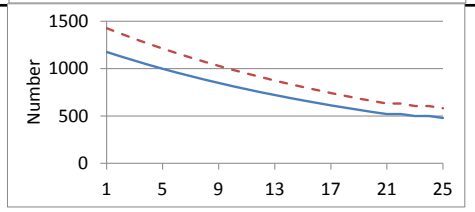
Managing complex fisheries, cont.

Results of simulation

	Landings of cod	Catchable biomass (age 2+) of cod
Scenario 1. Open access NPV = -0.12 billion €		
Scenario 2. FRO (Ideal ITQ) NPV = 1.48 billion €		
Scenario 4. Cod management plan with days at sea ceiling and full compliance NPV = 0.98 billion €		
Scenario 6. Cod management plan with days at sea ceiling, full compliance and cooperative behaviour NPV = 1.36 billion €		

Managing complex fisheries, cont.

Results of simulation

	Profit	Number of vessels
Scenario 1. Open access NPV = -0.12 billion €		
Scenario 2. FRO (Ideal ITQ) NPV = 1.48 billion €		
Scenario 4. Cod management plan with days at sea ceiling and full compliance NPV = 0.98 billion €		
Scenario 6. Cod management plan with days at sea ceiling, full compliance and cooperative behaviour NPV = 1.36 billion €		

Managing complex fisheries, conclusions

- The cost of management must be taken into account

- Impact on resource rent indicates effectiveness of second best solution compared to the first best

- Compliance with a TAC management system is more likely when:

1. TAC is set in full correspondence with the yield of stock,
2. The total level of effort is known,
3. The behavior of the fishermen is known and controlled

  - If the moral obligations and social influences are in place, it is doubtful if any gains in resource can be achieved be deterrence, enforcement, and penalties

- Cooperation is encouraged by ITQs but also by allowing cooperatives to develop

➢ Necessary to consider management “packages” with different measures – could in practice perform better than ITQs

Conclusions

Rögnvaldur has contributed to almost all areas in fisheries economics

He has inspired the next generations of fisheries economists

He was the first after Warming to put the Nordic Countries on the Fisheries Economists' map

THANKS RÖGNVALDUR

And do not retire from fisheries economics

And solve the Nordic Fish War