

Fisheries Biology, Assessment & Management

Lecture 4

The Bioeconomics of Fisheries

A vicious interaction ?

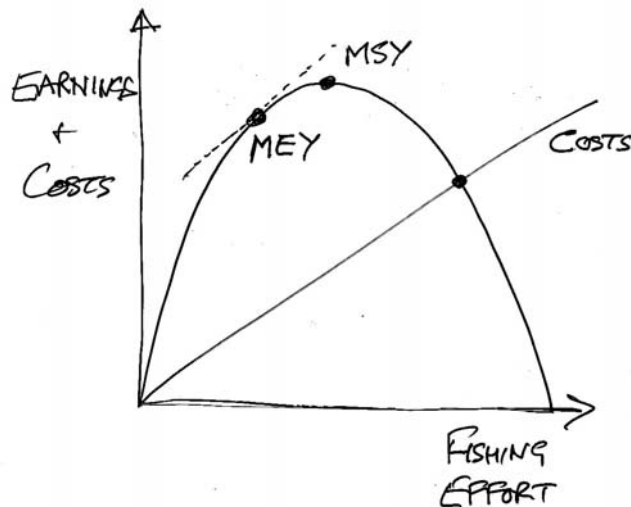
Real Management Problems

- **Not** poor scientific advice
- **Not** the Common Fisheries Policy
- Interaction of Biology & **Economics**
- Need for economic intervention

Bio-economics

- Natural tendency to over-exploitation
- MEY is less than MSY
 - and occurs at a lower level of F
- All conservation requires
 - short-term losses (of catch & earnings)
 - to secure long-term gains
- The natural (unregulated) bio-economic system may be unstable (vicious circle)

Costs, Earnings, and Effort



Fishing : the facts of life

- Fishing kills fish
- Effective conservation means :-
 - killing fewer fish
 - especially small & immature fish
 - reduced catch & effort, larger mesh sizes, closed areas, etc.
 - **short-term loss of earnings**
 - long-term gains when stocks recover
- Need for transitional aid

Short-term losses vs. Long-term gains (1)

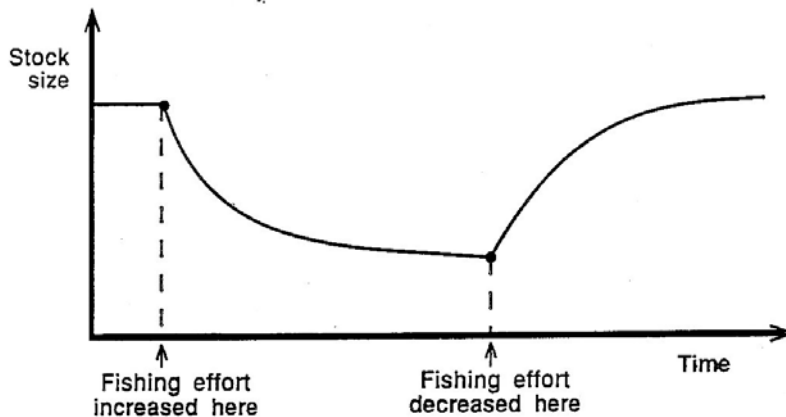


Figure 3. The response of a fish stock to changes of fishing effort.

Short-term losses vs. Long-term gains (2)

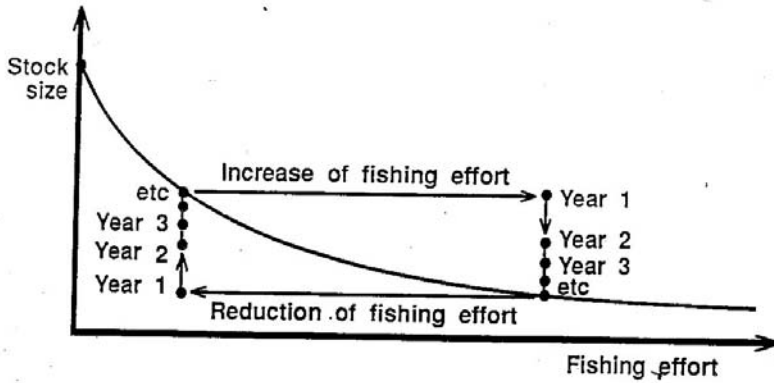


Figure 4. The same thing drawn in a different way.

Short-term losses vs. Long-term gains (3)

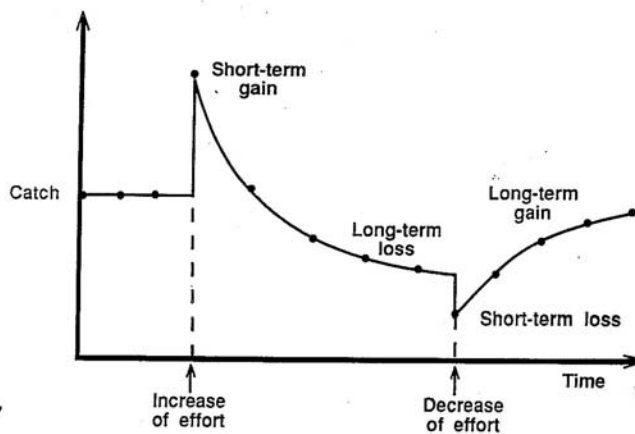


Figure 5. The same thing drawn in a different way.

**RESPONSE OF YIELD TO
CHANGES OF FISHING EFFORT**

Short-term losses vs. Long-term gains (4)

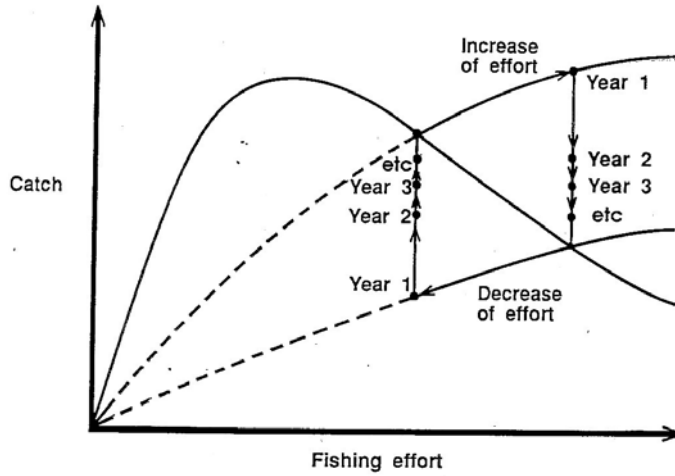
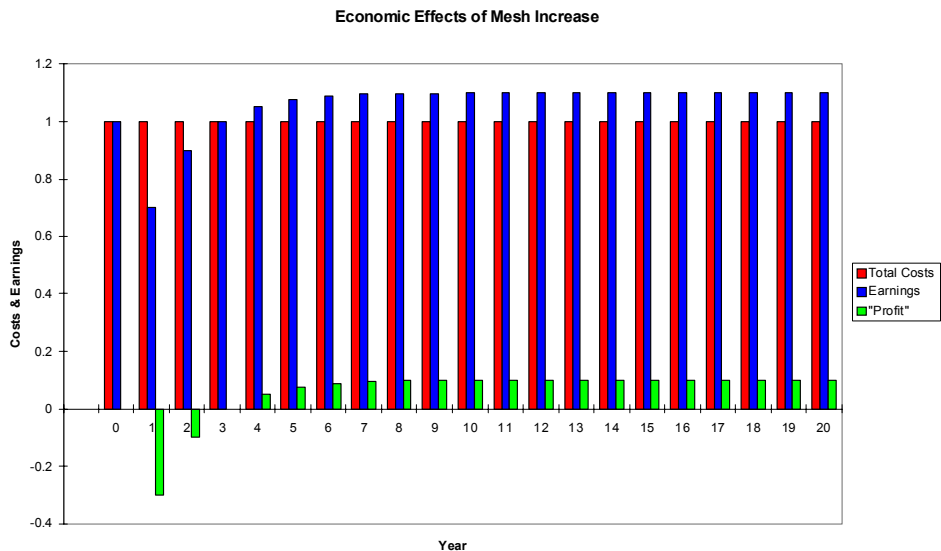


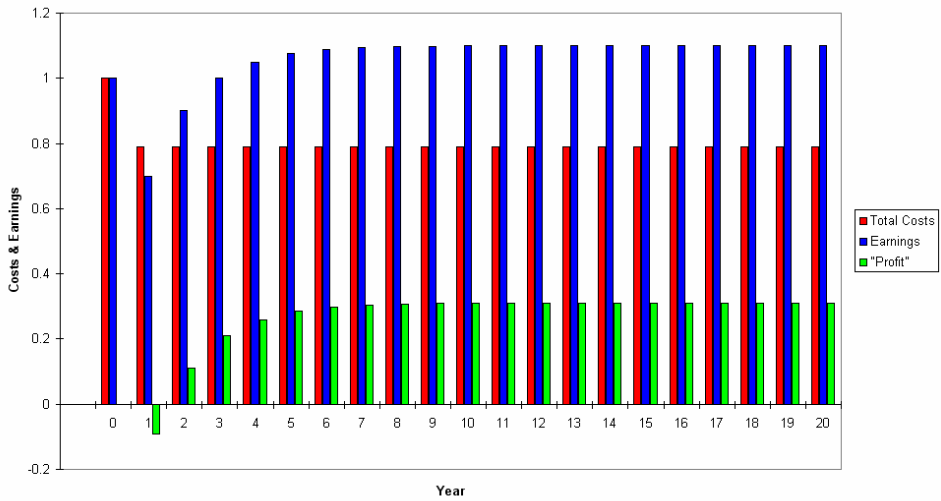
Figure 7. Short and long-term effects of fishing effort on catch.

Economic effects of various management measures



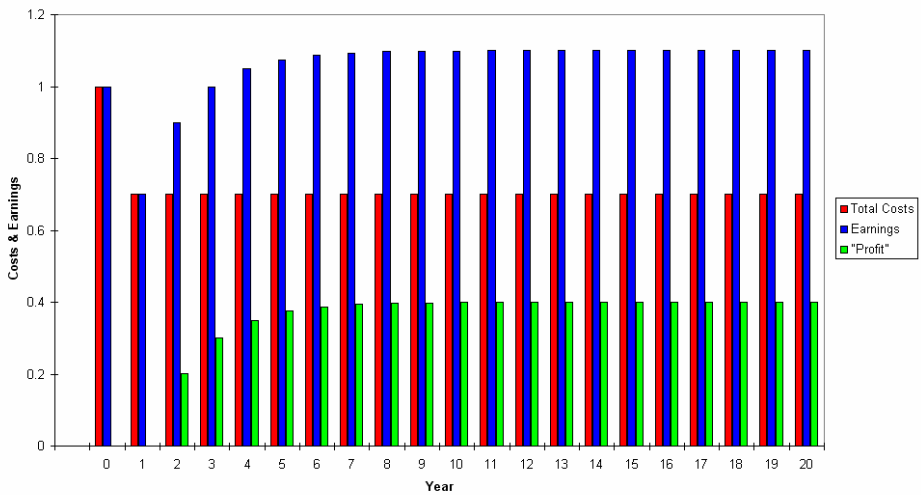
Economic effects of various management measures

Economic Effects of Effort Control



Economic effects of various management measures

Economic Effects of Decommissioning



Economic intervention

- Control & monitoring of fishing effort
- Tradeable rights in fishing effort
 - vessel capacity x days-at-sea
 - by sea areas, gear types, etc
- Transitional aid : initial buy-back scheme
- Resource rental charges (per day-at-sea)
 - to reduce pressure for re-expansion
 - to finance decommissioning, retirements, etc

Quota-hopping mad

Present arguments about quota hopping obscure the problem of dwindling fish stocks. John Shepherd presents his plan of action to save Europe's fisheries.

reasons for this are economic in origin, and easy to understand. I suggest that these economic processes need to be allowed for, and indeed harnessed by deliberate manipulation of the market forces which affect fisheries.

Economics

Fishing kills fish, and thus reduces stock sizes. The size (and age) of the fish caught also matters, and may be adjusted by so-called 'technical conservation measures'. At present, however, there is no way to enhance stocks directly, and the only way to conserve fish is to kill fewer of them (especially the small ones). Whether this is achieved by catch limits, effort control, closed areas or limits on mesh size is of secondary importance. These conservation measures can only be effective if they lead fishermen to catch and kill fewer fish.

Unfortunately, smaller catches means reduced earnings, at least in the short-term until the stocks have recovered. It is for this simple and entirely understandable reason that fishermen find it so difficult to accept almost all proposals for effective conservation. In the long-term, of course, maintaining larger stocks is in their own interest, as it should lead to higher catch-rates, greater profitability, more stability, less risk of stock collapse, and (in some

It makes no difference to the fish whether they end up as paella or on a plate with chips: in both cases they are dead.

THE PROBLEMS OF SUSTAINABLE AND rational markets for fisheries are complex and intractable. They derive, due to the imperfections of the Common Fisheries Policy, that may not be as overwhelming success, but the present arguments about 'quota-hoppers' are about who is allowed to catch what. It makes no difference to the fish whether they end up as paella or on a plate with chips: in both cases they are dead.

Not are the problems of the management of the scientific advice. The present system of management by Total Allowable Catches and national quotas imposes immense demands on the management process, which are certainly undesirable and probably intolerable. However,

Bio-economic dynamics The vicious circle

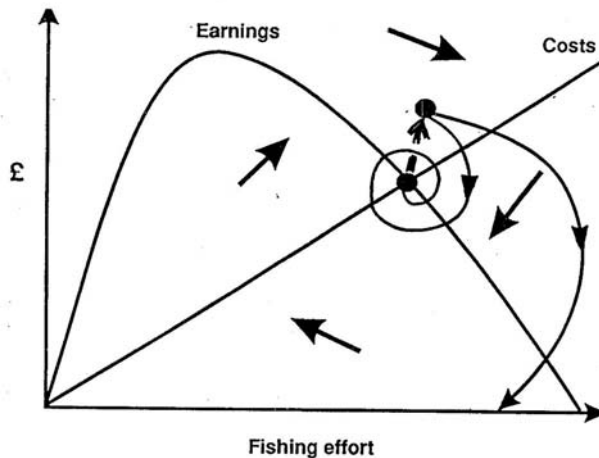


Figure 2. Dynamic response of catches and fishing effort (broken arrow indicates a perturbation due to good recruitment)

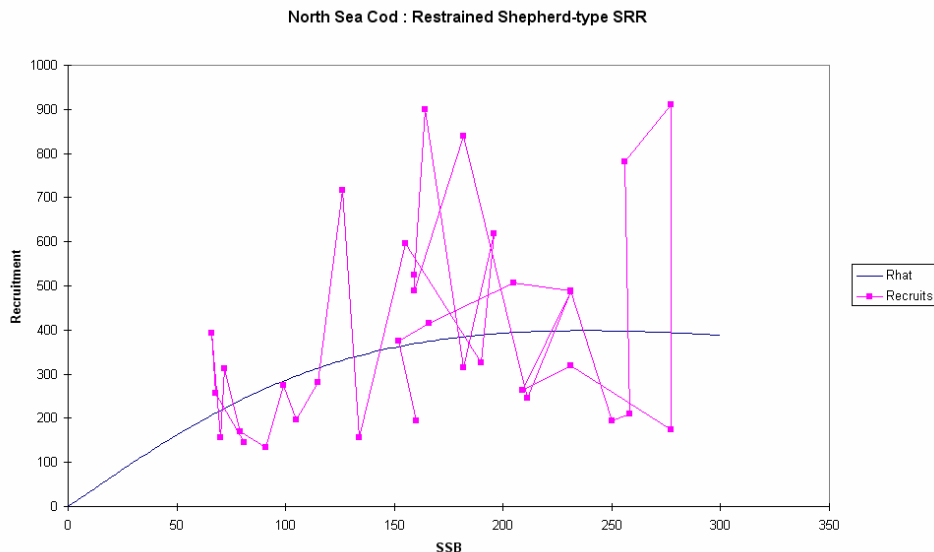
The International Dimension

- Effective conservation is **only** possible by international co-operative action
 - fish migrate between national zones
 - stocks are fished by several nations
- National management of the UK EEZ is not practicable
- If the CFP did not exist, we would have to invent it !

Real Scientific Problems (research opportunities)

- What Determines Recruitment ?
 - Fluctuations (weather, etc ?)
 - Stock size : the SRR (possible collapse)
- Multi-species interactions
 - Predators and prey (who eats who ?)
 - competition (limited resources) ???
- Basic biology, including ... stock identity, distribution, migration, growth, maturation, natural mortality, etc, etc ...

The Stock & Recruitment problem



Conclusions

- Most fish stocks are over-exploited
- We know why (bioeconomics)
- We know what to do about it (well enough)
- The problems are
 - **political** : social & international factors
 - **economic** : transitional (short-term) losses
 - **practical** : effective enforcement
 - **scientific** : uncertainties in assessments
- Sustainable Development & Management ...
 - **is easy to say : but not easy to do.**

Is Sustainable Exploitation Possible ?

- Maybe, if...
 - Enforcement is effective
 - International co-operation is good
 - Fishing effort & mortality can be kept low
 - about half F_{collapse} : ie $F \sim 0.5$ for N.Sea cod
 - Spawning stocks are not severely depleted
 - Recruitment failure can be avoided
 - Economic forces can be moderated
 - The environment does not change ...