Fisheries Management:
objectives and strategies

- Purpose
- Objectives and strategies
- Goals
- Regulatory tactics
  - Catch (output) controls
  - Effort (input) controls

Fisheries Management:
Do we need it?

"I believe then that the cod fishery, the herring fishery, the pilchard fishery,the mackerel fishery, and probably all the great sea fisheries are inexhaustible: that is to say that nothing we do seriously affects the numbers of fish. And any attempt to regulate these fisheries seems consequently from the nature of the case to be useless."

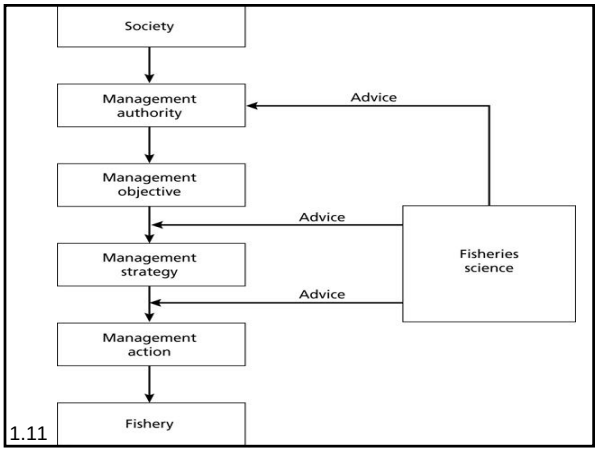
T.H. Huxley, speech, London 1883

Fisheries Management:
Purpose

- Consequences of unregulated fisheries are undesirable
- Self-interest is the rule in most societies
- Governments intervene to ensure sustainability
- Regulatory actions promote economic and social well-being of fish and industry
- Managers must design, justify (politically), and administer (enforce) set of actions

Fisheries Management:
Stock assessment vs. management

- Not synonymous terms
- Biologists assess stocks, provide advice (alternatives), but choice remains
- Ultimately, managers trade-off between average yield and variability of yield
- Stock assessment should provide quantitative advice on possible outcomes, but choice has to be made on social and economic grounds



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Fisheries Management:
Objectives

- Depend on specific fishery and political agenda
- Can be biological, social, economic, and almost always political

Example: For an export fishery, maximizing profit is most important; a small number of efficient fishing units is best……..

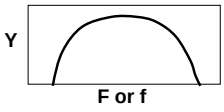
but, for an artisanal fishery, ensuring broad participation is more important; perhaps smaller and less efficient units

Fisheries Management:
Objectives

- Types of user groups and stock distribution and mobility create most management difficulties
- Traditional conflicts arise when the same stock is exploited by different user groups
  - e.g. inshore recreational fishery for juveniles vs. offshore commercial fishery for adults
- Allocation among user groups?

Fisheries Management:
Fundamental tenets

- Repeatable relationship between fishing effort and average catch
- Yield increases as fishing effort increases up to some point, at which point yield begins to decline with further increases in fishing effort
  - ➢max average yield between low and high effort



Fisheries Management:
2 important questions

What is the optimum effort?

What is the maximum sustainable yield?

- Monitor fishing effort as it increases to detect MSY
- ➢Unfortunately, must go beyond MSY to know you've found it

Fisheries Management:
Maximizing sustainable catches

- Goal is to produce constant yield long-term
- Scientists and Managers soon realized MSY was simple-minded and often unachievable

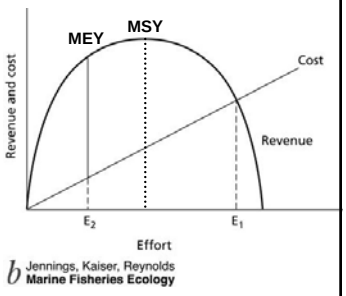
MSY
1930's-1970's

Here lies the concept, MSY
It advocated yields to high
And didn't spell out how to slice the pie.
We bury it with the best of wishes,
Especially on behalf of fishes.
We don't know yet what will take its place,
But hope it's as good for the human race
R.I.P.

from Larkin, P. 1977, An epitaph for the concept of maximum sustained yield. TAFS 106:1-11

Fisheries Management:
Maximizing economic yield

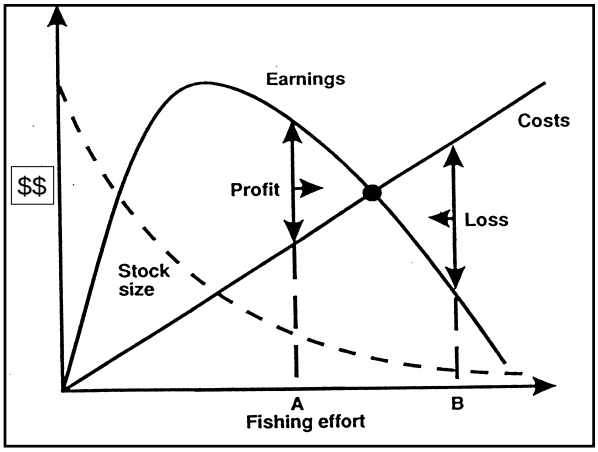
- MSY plus cost curve
- Increased effort = increased costs
- When is MEY?
- Usually at a lower effort than MSY



b Jennings, Kaiser, Reynolds
Marine Fisheries Ecology

Fisheries Management:
Maximizing economic yield

- **However, effort sometimes moves beyond MEY and well beyond the break-even point**
- **But, if effort is high and costs exceed revenues, effort will be reduced**
- **Fishing effort should stabilize at the intersection of cost and benefits**
- **Known as "bio-economic equilibrium"**
- **But, the stock has been reduced to a low level and there is no profit**



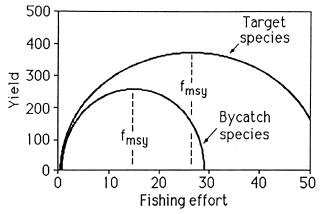
Fisheries Management:
Maximizing socially optimum yield

- MSY plus a social costs curve
- Defined as "a deliberate melding of biological, social, and political values designed to produce the maximum benefit to society from a given stock of fish" by Roedel (1977)

➢ Not a well defined objective

Fisheries Management:
Ecosystem goals

- Ecologically sustainable development
  - protect ecosystem supporting fisheries
  - account for species interactions
  - minimize damage to habitat
  - bycatch



Fisheries Management:
Quantitative strategies

- Maintain minimum stock size
- Maintain size of spawning stock (often relative to unfished stock)
- Both attempts to ensure adequate recruitment and provide stable catches
- Limit fishing mortality rate (F) to specific level
- Biological reference points
- Periodic harvest or selective (size or sex) harvest

Management actions

Mechanisms to implement the strategy:

1. Catch (output) controls
   - Restricts total catch
2. Effort (input) controls
   - Controls effective fishing effort
3. Technical measures
   - Controls size or sex caught, or area and time when fishing occurs

Catch (output) controls

Catch quotas

- Total Allowable Catch (TAC)
  - Creates race for fish
- Individual Transferable Quotas (ITQ)
  - guaranteed a share of TAC, allocated among all fishers
  - Potential PROBLEMS:
    - estimation of TAC
    - Privatizing public resource
    - Reduces number of users
    - Enforcement
- Bag limits (individual quota in recreational fisheries)
  - allow a limited resource to be shared by many

Effort (input) controls

1. Restrict the size and efficiency of gear and vessels

- limit gear number or size
  - restricted to a certain number of hooks per line
  - restrict gill nets in length
- limit vessel size
- produce inefficiency and raise cost of fishing
- allow resource sharing by larger number of fishers (good for artisanal fishery)

Effort (input) controls

2. Limiting the number of fishing units

- license limitations (vs. open access)
- vessel replacement restrictions
- Goal is to limit fishing mortality rate

Problems

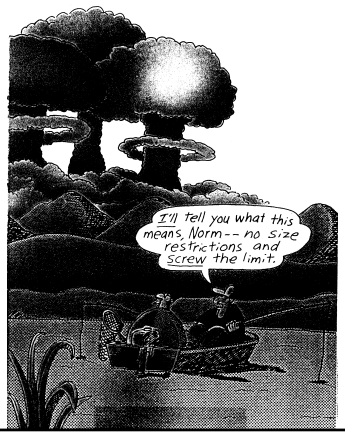
- fair methods of selecting holders (allocation)
- licensees fish harder (may not achieve drop in total effort)

Technical measures

1. Closures
   - temporal
     - close during short, well-defined recruitment periods
     - reopen fishery when fish reach an optimum size
   - spatial
     - protection of juveniles and/or spawning stocks
     - nursery or spawning areas such as mangroves, estuaries, sea grass meadows, and reefs
     - ecosystem approach: Marine Protected Areas (MPAs)
2. Minimum mesh sizes
   - allow escapement of juveniles for growth to marketable size OR to reproductive size

Technical measures

3. Size limits (minimum legal lengths)
   - oldest regulation applied to fisheries
   - very applicable to recreational fisheries (slot limits)
   - not feasible in commercial fisheries - use mesh size restrictions instead
   - PROBLEM: low survival after capture?
   - PROBLEM: sequential hermaphrodites or sexually dimorphic species
4. Rejection of females or spawning females
   - possible if distinguishable and handling doesn't harm



Fisheries Management:
Other strategies

Adaptive Management Strategies

- belief that single management strategy is too limited
- apply alternative strategies to different stocks
- manage like an experiment
- PROBLEM: relies on government reducing fishing effort when required

Evolution of Fisheries Management

- Initially to optimize product on annual basis
- During last thirty years, focus has been on rebuilding overfished stocks
- Present and future concerns about maintaining ecosystem structure and conserving biodiversity

Current approaches

- Vary widely based primarily on available data
- Many fishery management plans utilize 'reference points' that are mainly related to fishing mortality
- The precautionary approach attempts to maintain balance between high yields and low risks of depletion in the face of substantial uncertainty

Promising possibilities

- Cooperative management leading to more conservative decisions (i.e., precautionary)
- Although allocation issues are complex, individual-rights fisheries have proven successful
- Marine reserves (no-take zones) maintain a fraction of population and allow experimentation
- Beginning to define management goals in an ecosystem context

The influence of socioeconomics

- Rapid overcapitalization: reducing fishing effort is the hardest thing to do in a fishery, often because catches are already declining
- Lack of clear objectives from the outset
- Precautionary scientific advice often debated or ignored delaying its application until too late

Gulland may have said it best "…..fishery management is interminable debate about the condition of fish until all doubt is removed"

How do we right the ship?

- The precautionary approach is changing the burden of proof → embrace uncertainty
- Stakeholders directly involved in the management process → building trust
- Management actions pre-negotiated and effected on schedule → reduce political influence
- Realize dynamic interactions between fishery and ecosystem → towards a holistic approach

Fisheries Science

What do we know and what do we still need to figure out?

"So little done, so much to do"

- (Cecil Rhodes' last words,1902)

"This is not the end. It is not even the beginning of the end. But it is perhaps the end of the beginning."

- (Winston Churchill, Nov 10, 1942)