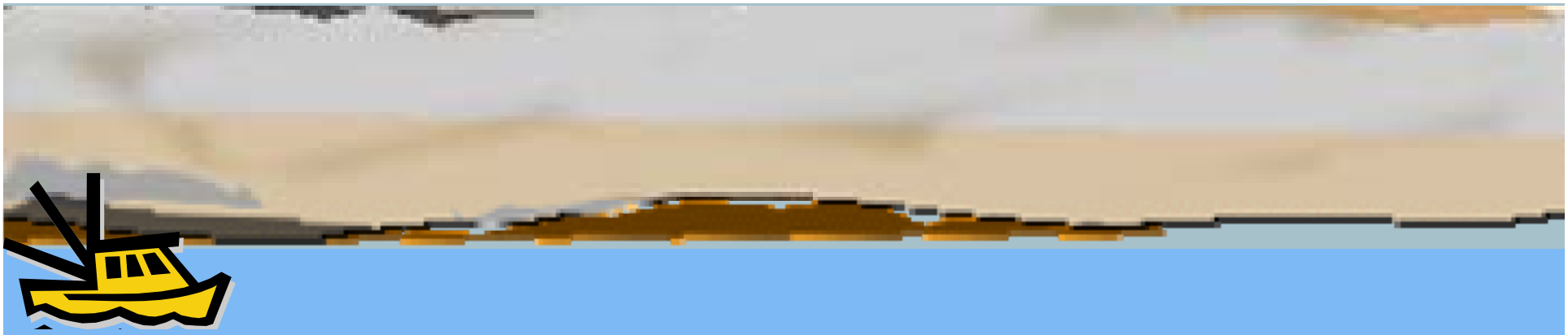


Anticipating fisher response to Management

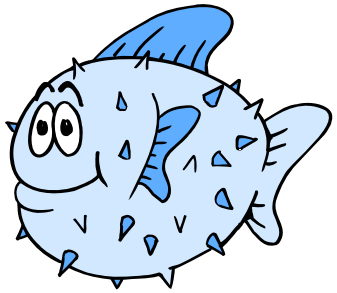
can economics help?

Sean Pascoe

CEMARE, University of Portsmouth

Outline

- What is economics?
- Profit maximisation – the basic economics assumption
- Models of fisher behaviour
  - Effort allocation and location choice
  - Entry and Exit
  - Compliance
- Including behaviour in fisheries models



What is economics?

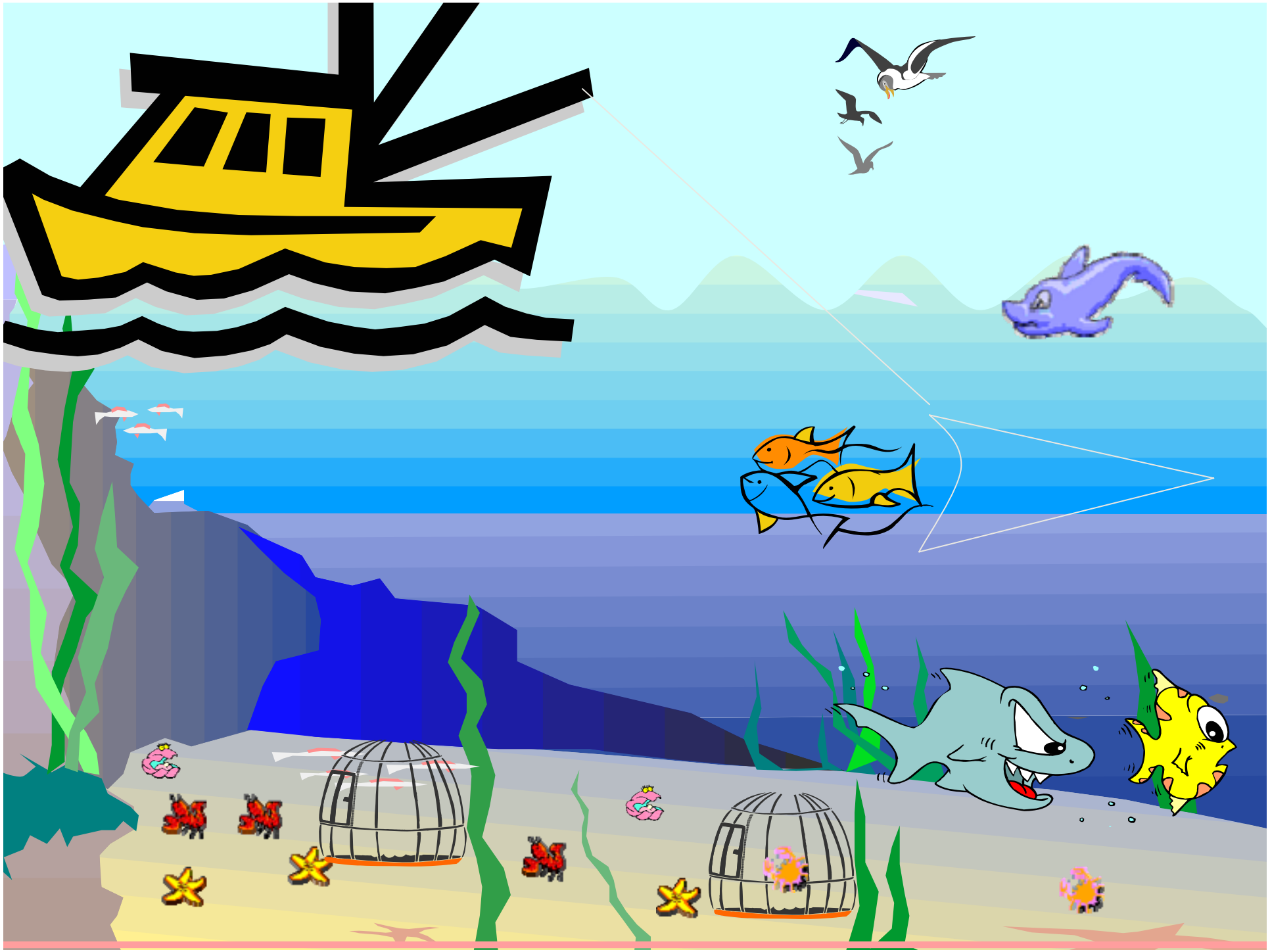
- Most people assume that economics is about

- But economics is really about allocating resources in order to produce the greatest *utility* to the individual or society
- Money is just a useful way to keep score

Fishing is an economic activity

Fish produce benefits to society (utility) through their consumption

and costs through their capture

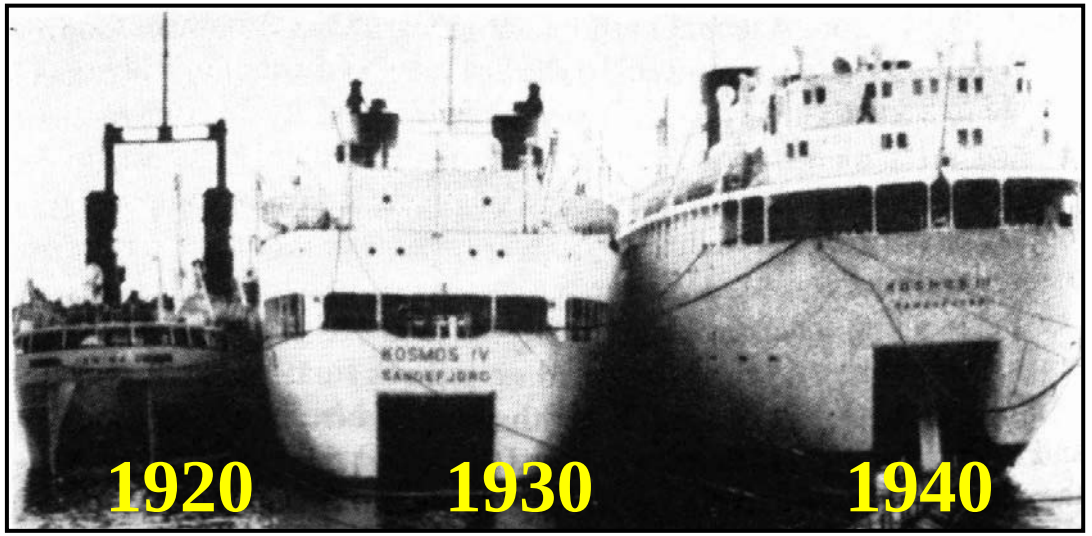


Economics and fisheries

- Optimal allocation of fishery resources
  - Catch and effort level that produces the greatest welfare to society over time
  - Usually represented as catch and effort that maximises the (sustainable) flow of economic profits (or resource rent generation)
    - Multiple objectives may also include employment considerations, conflict minimisation, environmental damage minimisation and other factors that affect the utility derived from fishing

Market failure and the need for management

- An “optimal” fishery will not arise naturally as not all costs are incurred by the individual fishers, nor do benefits of conservation accrue to the fishers
- Problem of imperfect property rights and externalities
- The resultant set of economic incentives favour overexploitation rather than conservation and optimal harvesting

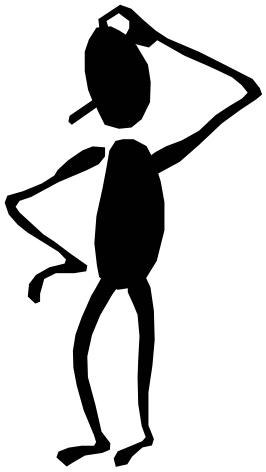


Management and incentives

- Management is introduced to counter the economic incentives to overexploit fisheries

… but creates a new set of incentives that affect the way that fishers behave

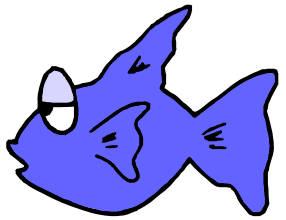
So how can economics help explain how fishers will respond to management??



Economics and fisher behaviour

- Economics is about allocation of scarce resources in order to achieve the greatest utility
- For the individual fisher, the scarce resource is their physical (vessel and gear) and human (skill) capital
- The individual fisher will allocate his/her time and effort to activities that are likely to provide the greatest benefits to themselves
- This can be simplified in a modelling context to *profit maximising behaviour*

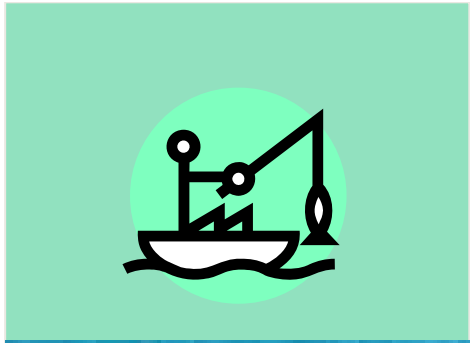
What does profit maximising behaviour mean?



- It doesn't mean fishing 24 hours a day (or "flat out")
  - Leisure time has an *opportunity cost* that will differ from one individual to the next
- Two key principles
  - Fishers will operate as long as the additional benefit (i.e. revenue) from fishing exceeds the additional cost (including opportunity costs)
  - Fishers will allocate their effort to the activities that will provide the greatest return
  - … subject to any constraints placed on this activity in both cases

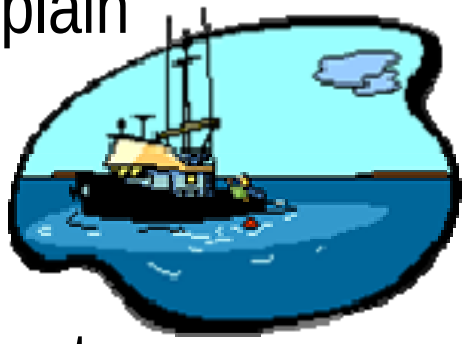
So …

- If fishers all maximise profits, why do some fish more than others?
  - Different capital base
    - human (skill) as well as physical (vessel)
  - Different constraints (including social constraints) and opportunity costs
  - Differences in “luck”
- Despite these differences, economic theory can provide a reasonable explanation for fisher behaviour
  - And can be used to estimate the likely outcome of a management change



Modelling fisher behaviour

- Empirical models have been developed to explain
  - Fisher location choice
  - Entry/exit behaviour
  - Compliance



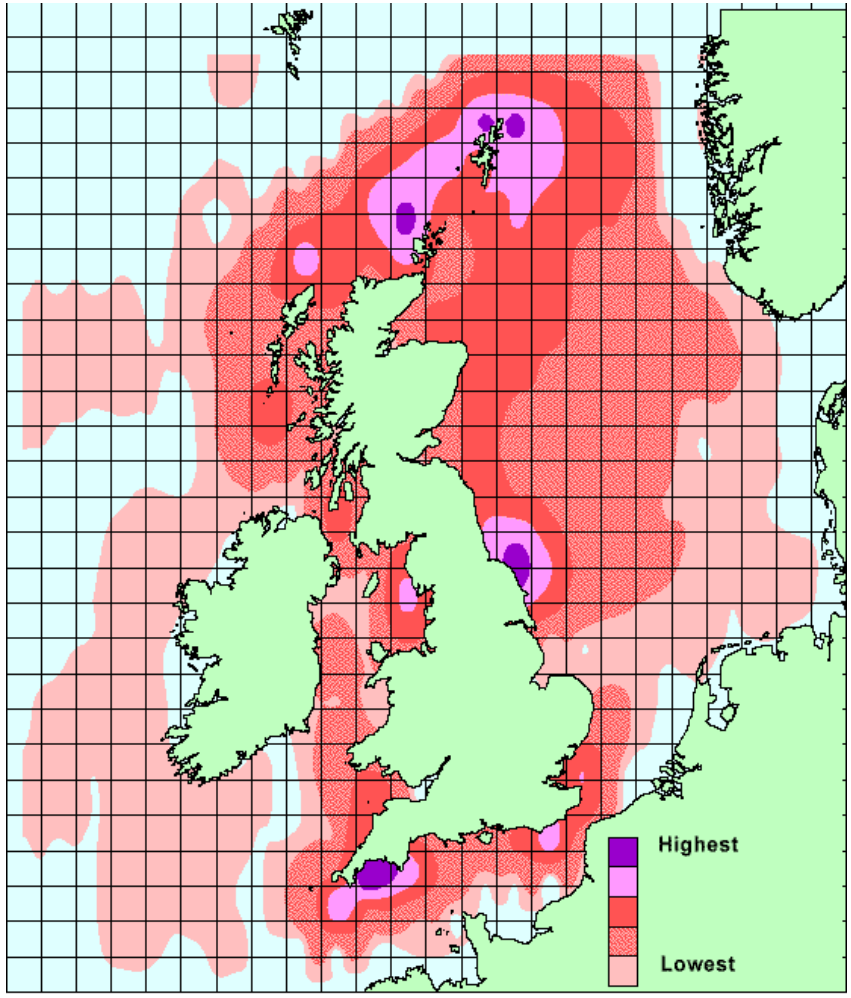
- Most recent empirical analyses based on discrete choice modelling approach
  - Random utility model
- Models based on economic theory, but often economic data not available in “ideal” form so proxy measures used
  - e.g. revenue rather than profit, effort or distance assumed to reflect costs etc

Discrete choice modelling

- Models of discrete decisions based on observed decisions
  - “Revealed preference”
- Assumes decisions are based on utility maximisation
  - Utility assumed to relate to profitability or related measures (e.g. revenue and cost measures)
  - Heterogeneity in decisions captured through vessel characteristics
  - Probabilistic based models

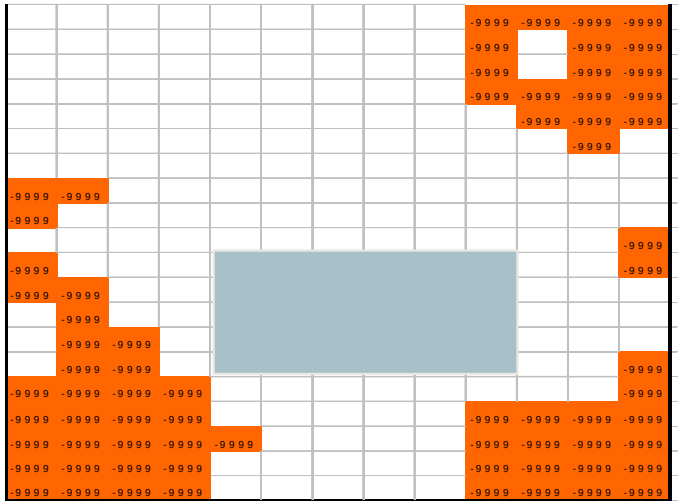
Fisher location choice

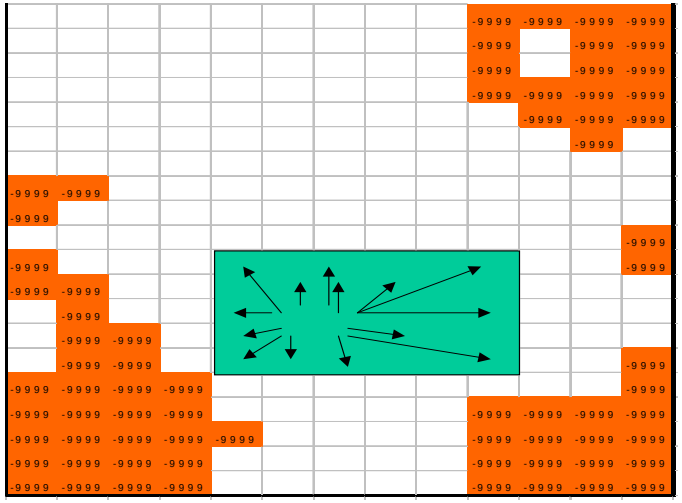
- Model spatial allocation of fishing effort
- Assumption is that fishers operate in areas that produce the greatest profits
  - Subject to constraints
- Profits depend on catch rates, prices, cost of getting to area
  - Differ by boat characteristic, home port, skipper attributes (usually assumed part of the random component)



Application: area closures

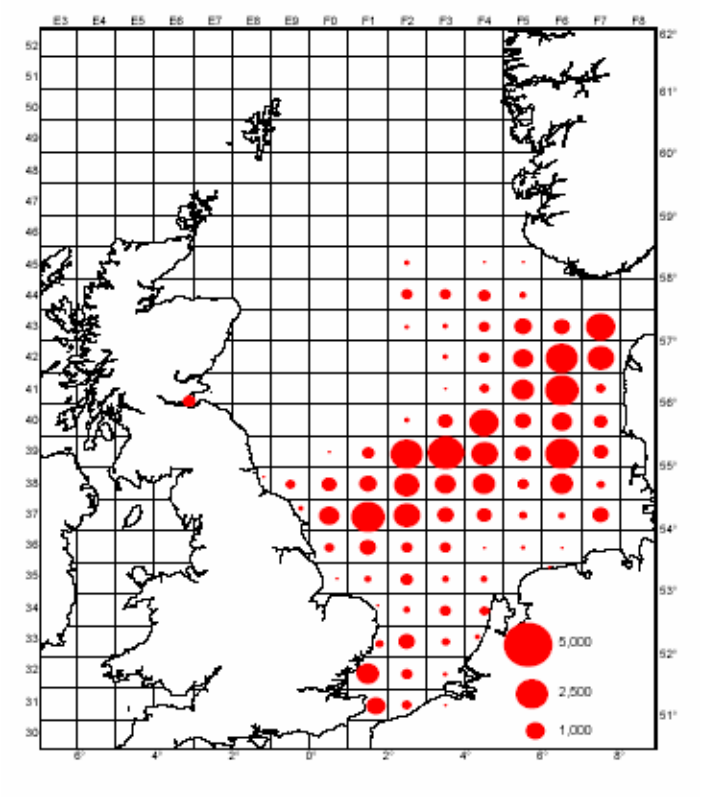
- Expected effort allocation built up based on probability of each individual operating in each area
- Data intensive approach
- Few ex post attempts have been made to validate results following closure
  - Made more complex as conditions change also

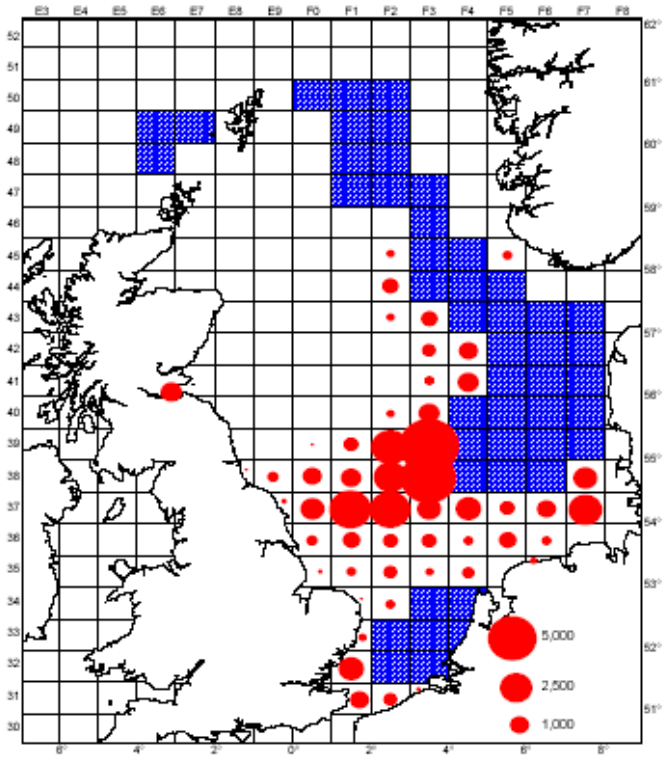




Example

2003 UK beam trawl effort





UK beam trawl effort following proposed area closure

Source: Hutton (2005)

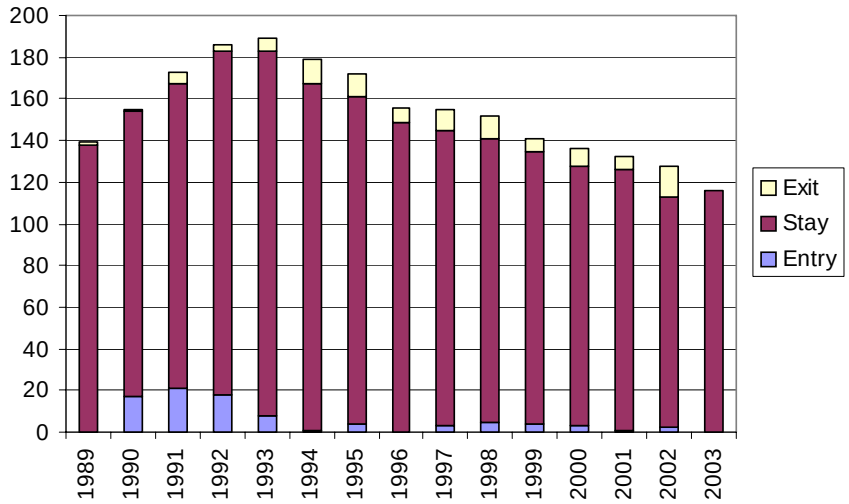
Other approaches

- Optimal foraging theory
  - Implicitly based on profit maximising assumption
    - Boats initially move to areas where revenue is maximised given the costs of fishing there
    - Boats move areas when returns are less than the “opportunity cost”
  - Captures less heterogeneity that RUM
- “Next best alternative” assumption
  - Again based on profit maximisation assumption
  - Vessels assumed to move to areas with the “next best” profitability following closure

Entry and exit

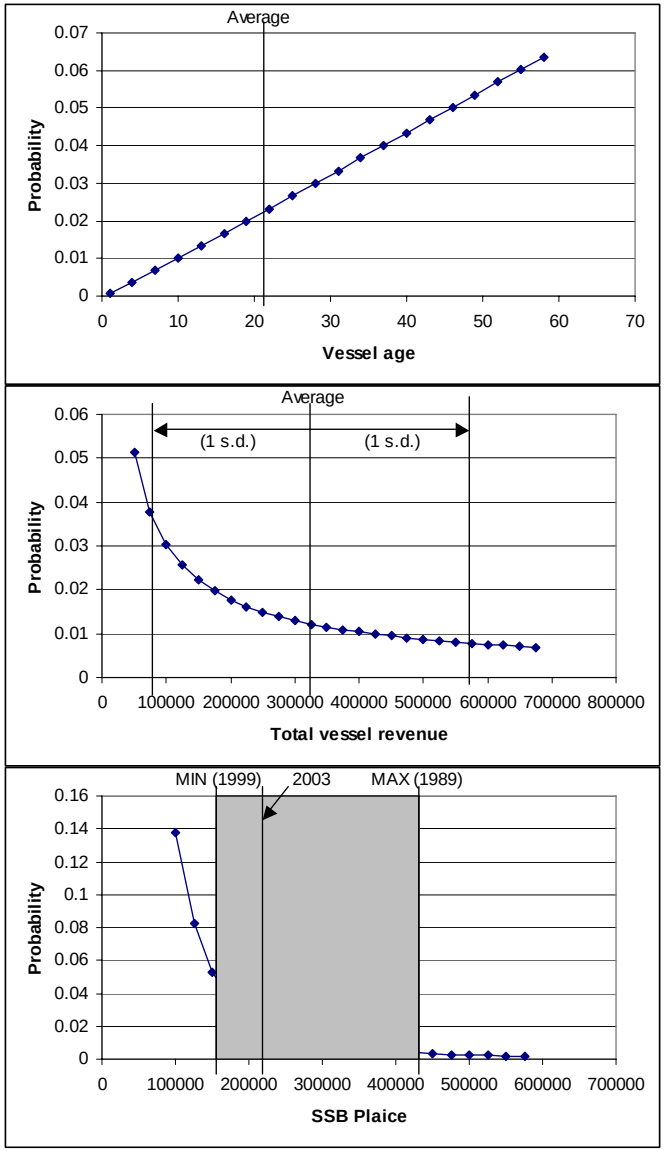
- Early models assumed entry and exit was relatively easy
  - Boats entered if profitability in the fishery greater than alternative activity (i.e. the opportunity cost)
  - Boats exited if profitability less than the opportunity cost
- But entry and exit usually not that easy
  - Non-malleability of capital
  - Limited access and other restrictions

- Theoretical models have been developed but difficult to parameterise
  - Small sample size problem in terms of entrants, most exits driven by decommissioning schemes



Choice based exit/entry models

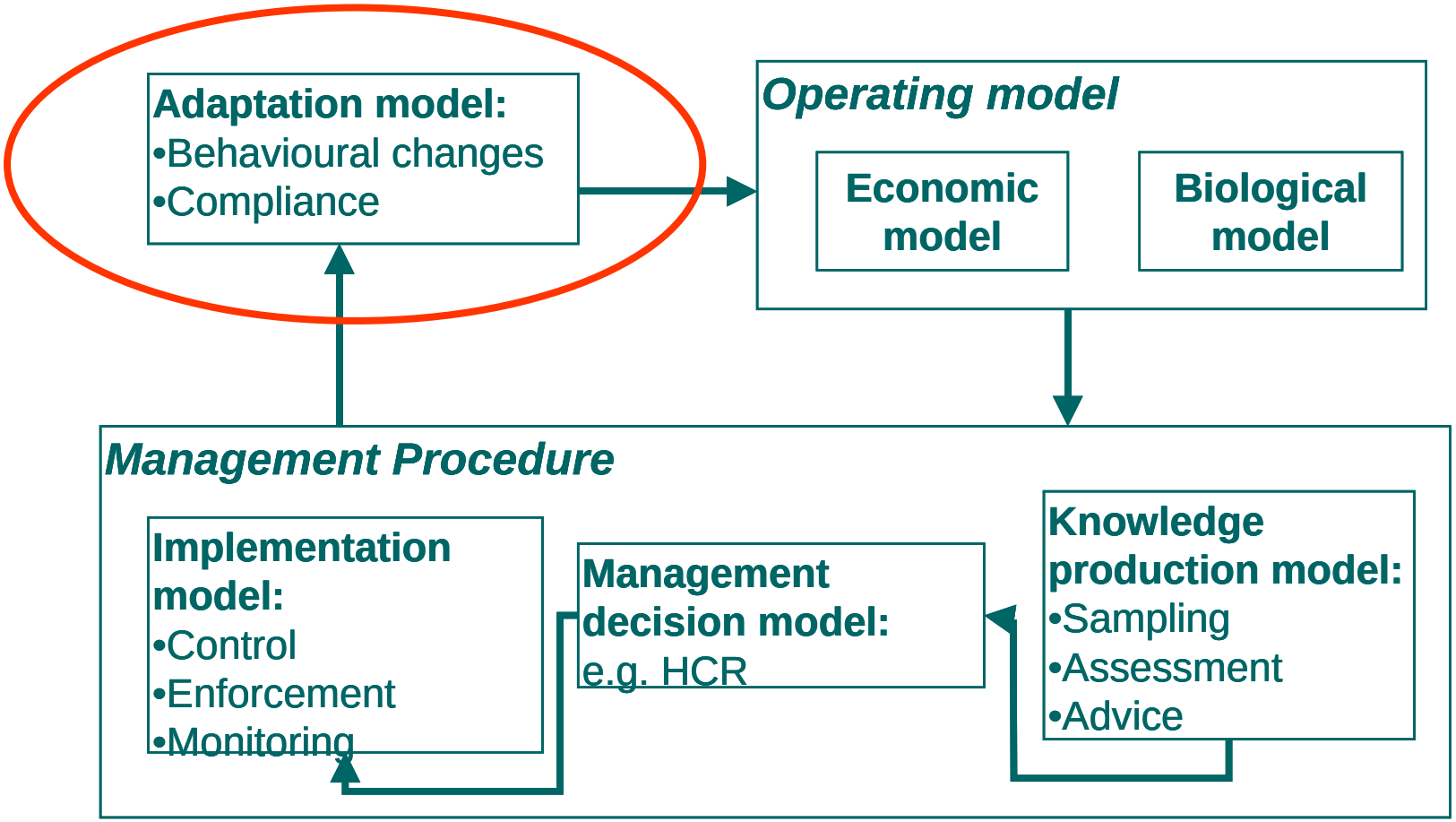
- Several attempts made to model the decision to enter or exit a fishery using choice based models based on factors including:
  - Vessel characteristics
  - Revenue
  - Stock size



Compliance

- On going debate about the relative importance of economics vs social factors affecting compliance
- Economic
  - Revenue from non-compliance
  - Cost of non-compliance
    - Penalty and risk of being caught
- Social
  - Social norms
  - Perceived legitimacy of regulation
- Empirical choice based models support both concepts

Incorporating behaviour into fisheries models



Incorporating behaviour into fisheries models

- Some work already underway on incorporating location choice and entry/exit decisions into bioeconomic models
  - Complex as behavioural models based on individual choices while most fisheries models work at the fleet (or higher) level
- Compliance more complex
  - Difficult to model “legitimacy” and social norms except through scenario analysis
  - These are also likely to vary with the type of management being introduced

Conclusions

- Fishing is an economic activity, and the behaviour of fishers is motivated by the benefits and costs (including the opportunity costs) of fishing
- Economic theory provides a robust qualitative framework to explain fisher behaviour
- Development of quantitative models has proven more difficult, but some successes have been made in certain areas
- Integrating these behavioural models into management evaluation frameworks is the next challenge