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Defining MEY in bioeconomic analysis

Experiences from the northern prawn fishery

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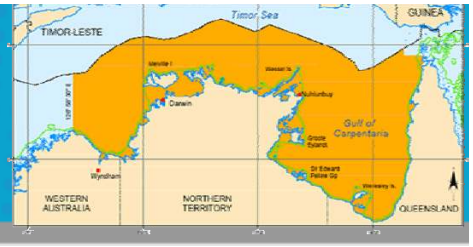
Outline

- Northern prawn fishery
  - First fishery to have MEY as explicit management goal
  - Bioeconomic model used to set effort targets and to be used to set TACs
- MEY in theory
  - What we were all told at Uni (and what we were not)
- MEY in practice
  - Does MEY have any real meaning in a non-equilibrium environment?
  - What can really be estimated
  - Data issues – some basic concepts re-examined

Northern prawn fishery



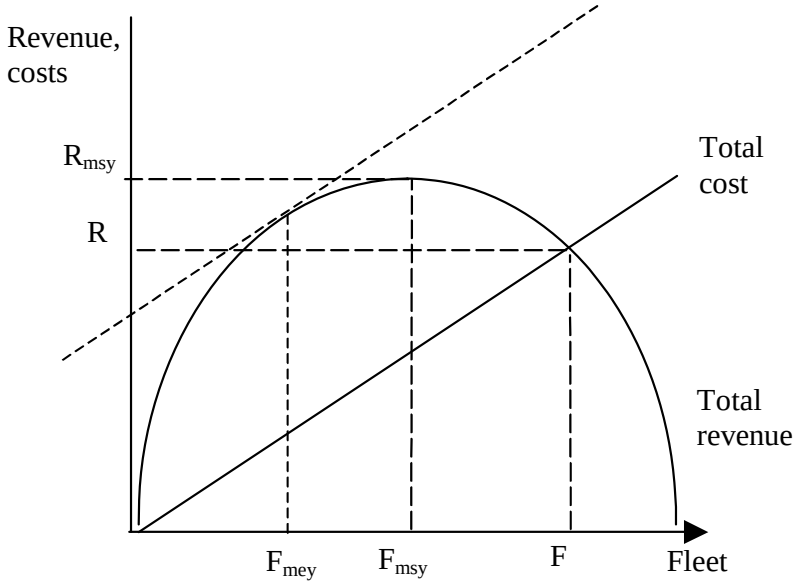
- Australia's most valuableCommonwealth managed fishery
  - $64m-$150m value of landings
- Currently around 51 boats
  - Peak of >300 vessels in early 80s
- Three main species (groups)
  - Banana prawns; tiger prawns; endeavour prawns
  - Plus king and other prawns
- Managed through seasonal closures and restrictions on headrope length
- Proposed to go to ITQs in 2010
  - Which species still to be decided
- Management has an explicit objective of maximum economic yield

Bioeconomic model overview

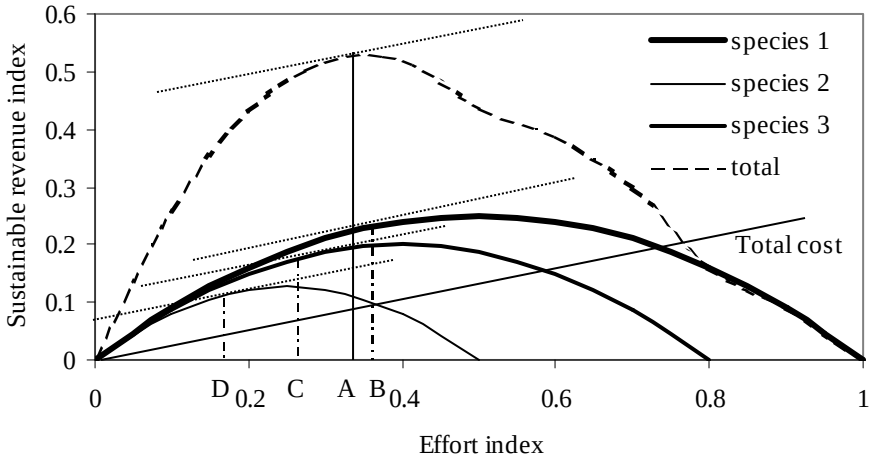
- Used to set effort levels andbeing modified to look at TACs
- Dynamic with an 8 year time frame
  - 2007-2014 based on management object to achieve MEY by 2014
- Limited to tiger prawn fishery only (but includes endeavours as bycatch)
- Stock recruitment relationship for the two main tiger prawn species
- Assumes each species is targetable and effort can be diverted from one species to the other
  - More recent work suggests that some targeting is possible but the fishery is mostly characterised by joint production
- Single price
- All vessels assumed homogeneous (so costs based on a single average cost per unit of effort)

Maximum economic yield

- Theoretically a simple concept
- Expounded by economists worldwide as THE objective of management
- Theoretical models based on a single species fishery, but some work also on multispecies fisheries



Single species model



Multispecies model

What they didn't tell you at Uni

- In most multispecies fisheries, there is neither pure joint production nor perfect targeting
  - There is some ability to alter the species composition in favour of one species or another
    - So neither simple theoretical models are valid
- The path to "MEY" is as important as the destination
  - There are substantially different implications from a slow recovery path to a fast path, with different end points also
- We are stuck – at least in the short term – with the fleet we have
  - This affects both the path and the endpoint
- MEY depends on future prices and cost structures
  - We need to forecast prices as well as estimate how the cost structures may change if there is fleet adjustment
- What costs do we use anyway?
  - Problem of quasi-variable costs in particular (repairs and maintenance, gear replacement costs).

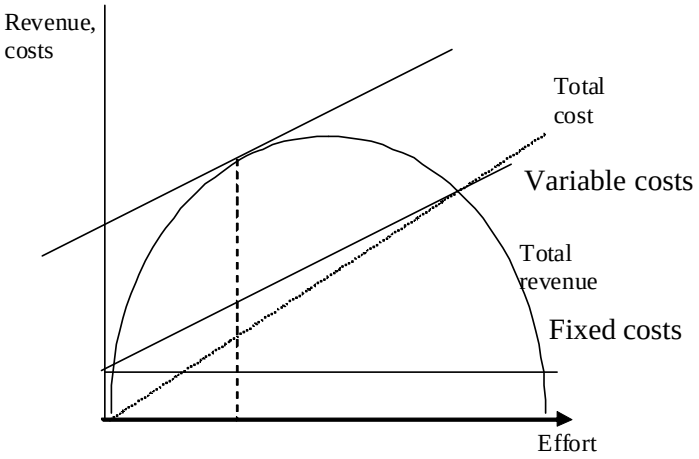
“MEY” in practice

- We need to think not in termsof MEY, but maximising net present value of the flow of benefits
  - Dynamic MEY does this for the single species fishery but runs into the same problems for multispecies fisheries
  - From a modelling perspective this is not an issue, but from a management perspective there is not a single point to aim for.
    - By pushing “MEY” as a target we have created a rod for our own backs!
- Most dynamic models with a relatively low discount rate are more than happy to close the fishery in the short term to achieve higher long term objectives
  - This is not very practical when there are 51 boats that still have fixed costs to meet – they might be better off in the long run but might not survive to see the long run!

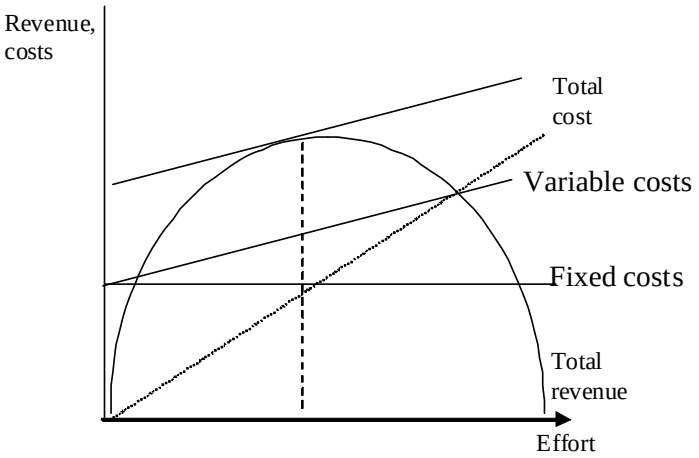
“MEY” in the medium term

- MEY is a long run concept
  - All costs variable (including capital costs)
- In the medium term – the time horizon on most management – have a mix of variable and fixed costs as well as quasi-variable costs
  - Variable – fuel, crew, packaging, freight
  - Fixed – depreciation, admin, management costs, harbour dues etc
  - Quasi-variable – repairs and maintenance, gear costs
- How do we treat the quasi-variable costs?
  - If treat them as fully fixed then will overestimate “MEY”
  - If treat them as fully variable will underestimate “MEY”
  - Need to separate out the fixed and variable components
    - Usually ignored by economists butpotentially an important issue for determining profit maximising harvest strategies

Examples (with some mixed time concepts)



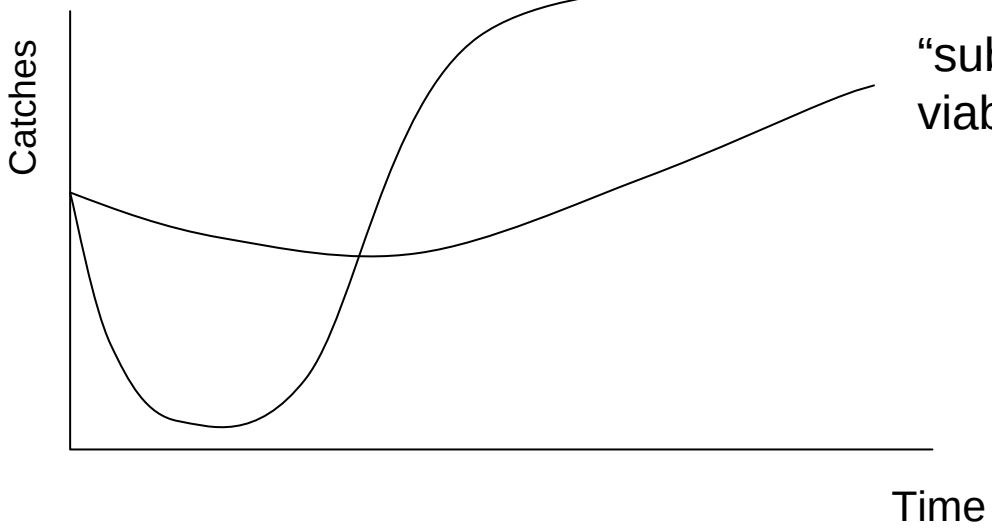
Lower fixed costs, higher cost per unit of effort
e.g. treat repairs etc as variable



Higher fixed costs, lower cost per unit of effort
e.g. treat repairs etc as fixed

Maintaining short term viability of the fleet

- Capital is largely non-malleable
- While the short run viability condition is that revenue exceeds the variable costs, having a whole fishing fleet making losses is undesirable in the short term
  - Particularly if the losses are expected to accrue for several years



"optimal" path

"sub-optimal" but viable path

- Impose minimum effort level each year (ad hoc)
- Impose condition that average profits>0 each year

Other considerations

- Providing the right environment toachieve “MEY” may result in a fleet with a different cost structure to that which was started with
  - As a result the estimated optimal path is no longer the true optimal
- The path will need to be re-estimated each year taking into account any revisions of costs
  - and also forecasts of prices

Summary

- MEY is a theoretical conceptthat may not really exist
  - It is a moving target thatwill depend on prices and costs
  - In multispecies fisheries it is probably impossible to define
- Maximising the expected net present value of economic profits a more realistic management objective
  - This may need to be constrained by conditions to ensure viability of the fleet in the short term
  - Ideally, models of how the fleet might adjust (if at all) would be included as this also affects the optimal path
- A look at the basic componentsof costs is essential but has been ignored by economists (not sexy)
  - How we treat costs will affect our end point, but no systematic approach has been developed