Reconciling approaches to the assessment and management of data-poor species and fisheries with Australia's Harvest Strategy Policy

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Overview

- Australia's Harvest Strategy Policy
- Data-poor species – Southern and Eastern Scalefish and Shark Fishery (SESSF)
- Data-poor fishery – Western Deepwater Trawl Fishery (WDWTF)
- Enhancing stock assessment advice for data-poor species using intra- and inter-species knowledge
- General considerations

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Australia's Harvest Strategy Policy

- Introduced in 2007 – cease overfishing, rebuild overfished stocks
- Harvest Strategy – pre-specified monitoring, assessment and **control rule,** where the control rule explicitly links the management action to the biological and economic status of the fishery
- Core elements
  - maintain fish stocks at B_{MEY} (proxy = 1.2 X B_{MSY})
  - ensure fish stocks remain above B_{LIM} (proxy = 0.5 X B_{MSY})
  - ensure fish stocks stay above B_{LIM} at least 90% of the time
    - Proxy B_{MSY} = 40% of unfished levels (B_{40})
- Challenge is to reconcile the need for specific risk-related objectives given the reality of the available data/assessments for data-poor species/fisheries

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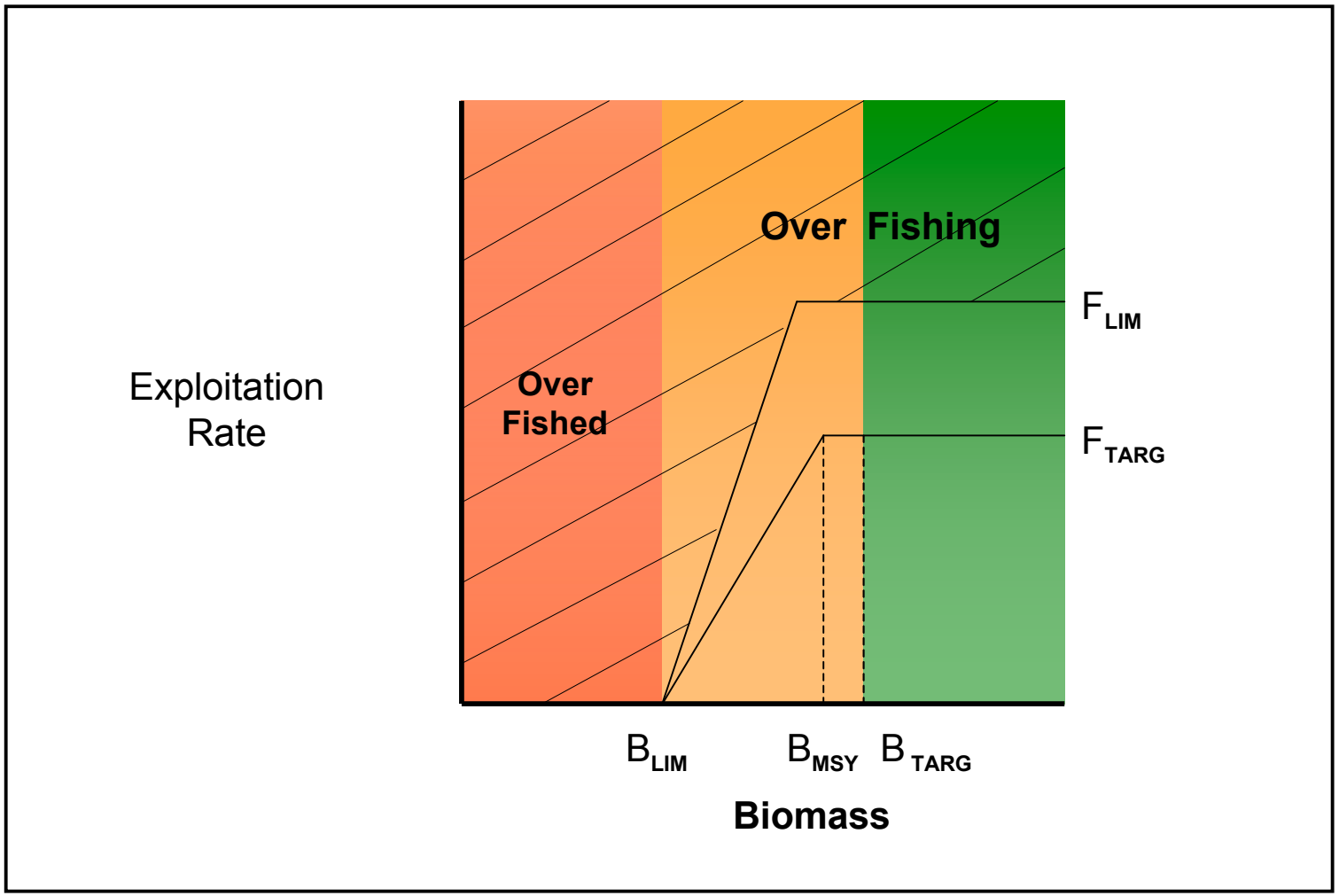
Australia's Harvest Strategy Policy



Australia's Harvest Strategy Policy

Implications for data-poor species and fisheries:

- The HSP does not explicitly deal with data-poor species, provided in the Guidelines
- Recognises that information about many stocks limited and may not be possible to make direct use of the target and limit reference points
- Need scientifically defensible proxies for reference points and corresponding control rules need to be specified to meet intent of HSP
- Acknowledges that obtaining the data required for quantitative stock assessment may not be possible
- Advocates a risk management approach whereby exploitation levels reduce as uncertainty around stock status increase

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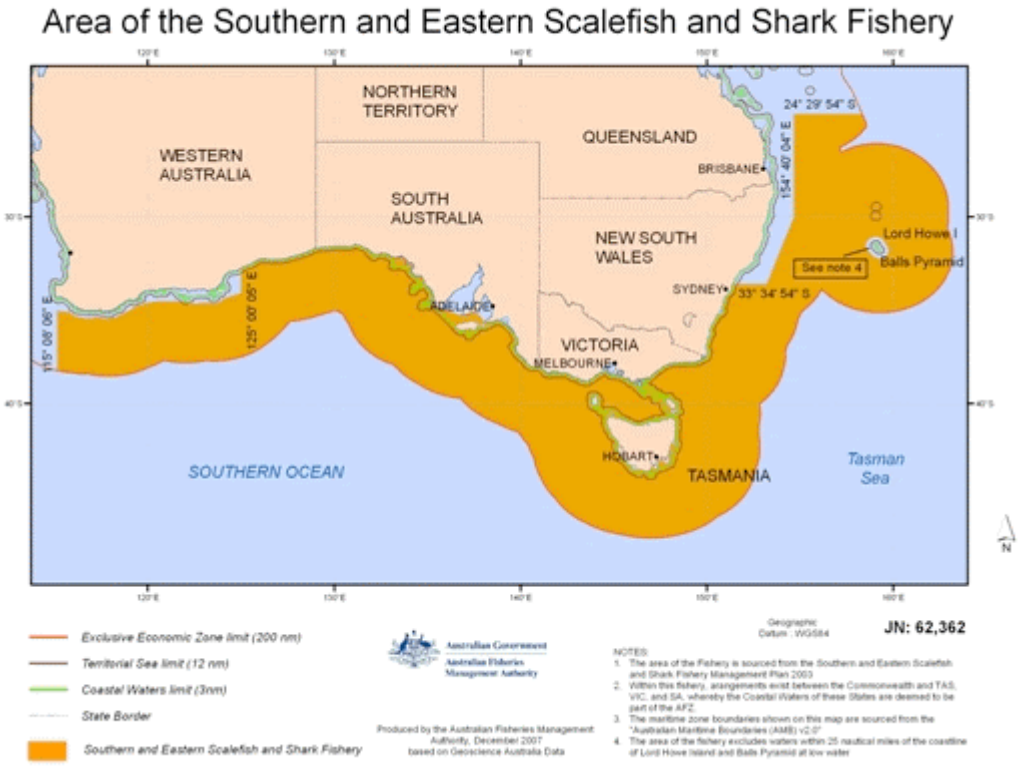
Data-poor species: the SESSF – a complex multispecies fishery

- Australia's oldest demersal fishery
- Sub-tropical to sub-Antarctic, coastal to >1200m
- Trawl, gillnet, longline, Danish seine, trap



Management and assessment in the SESSF

- Over 80 species routinely landed
- Under ITQ management since 1992, Currently 34 species and stocks in the quota management system
- Variable data quality by species
  - Logbooks (catch and effort) for all species and gears
  - Fishery independent survey data for a few species
  - Some at sea observer data (discards and length frequencies)
  - Port measurements (age and length)
  - Catch by sector (plus other jurisdictions)
- Formal harvest strategies introduced in 2005
  - Four Tier system (based on data availability and quality)
  - Formal harvest control rules at each Tier
  - Focus here mainly on lower Tiers 3 and 4

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Data and assessment used at each Tier

- Tier 1: all available data used in an integrated assessment (e.g. Stock Synthesis – SS2 – see Methot 1f2)
- Tier 3: catch at age data used in “catch curve” analysis to determine current fishing mortality rate F
- Tier 4: catch per unit effort CPUE used directly in HCR; no formal assessment

Used to calculate recommended biological catch (RBC)

TAC = RBC – discards – state catches

RBC discounted relative to Tier 1

- Tier 3, 5%; Tier 4, 15%
- Explicit catch risk cost trade-off

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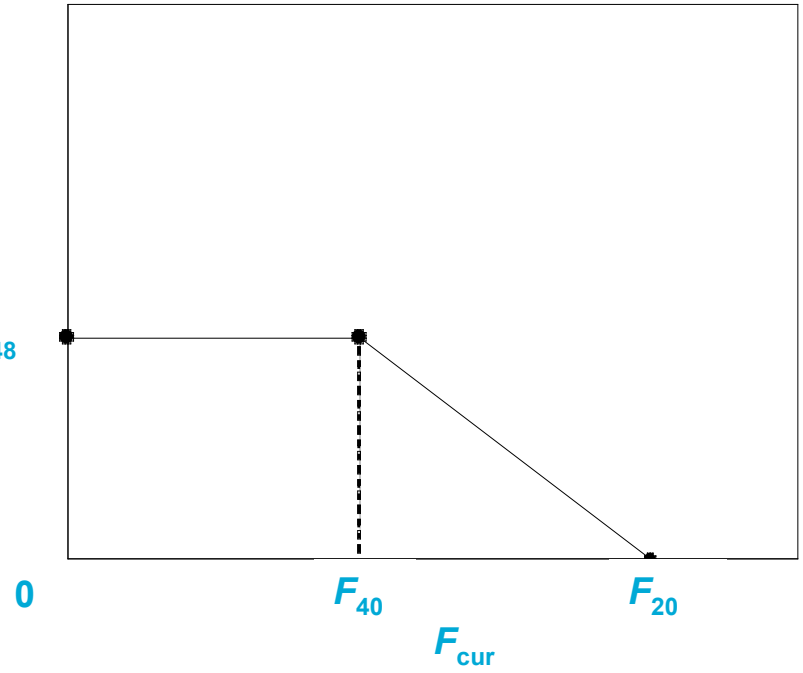
Tier 3

- Simulation tested using MSE methods
- Summary: generally works "pretty well" – not useful for long lived species
- Meets the intent of the Harvest Strategy Policy
- Ongoing work to improve ways of estimating F (e.g. non-equilibrium methods)

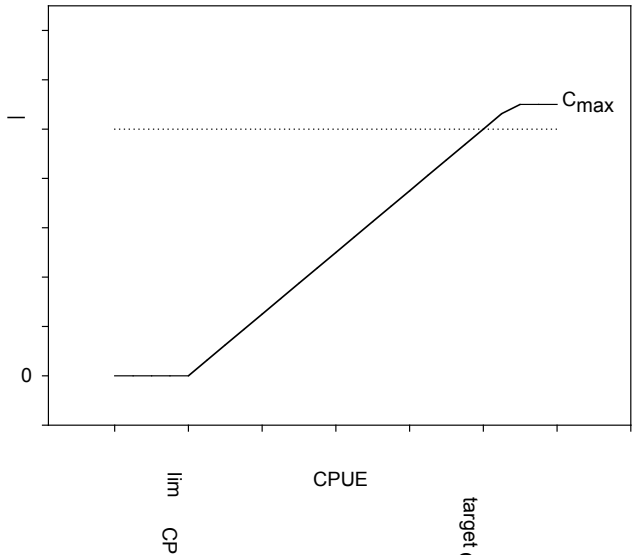


Tier 4

- No age data or too long lived
- What can be done with CPUE?

$$RBC = \min\left[C_{\max}, C^{*} \max\left(0, \frac{\overline{CPUE} - CPUE_{\lim}}{CPUE_{\text{targ}} - CPUE_{\lim}}\right)\right]$$

- Works well if target CPUE and catch are well estimated (and CPUE is a reasonable measure of relative abundance)!
- Tracks to whatever target is selected – can result in "sustainable overfishing" – or underfishing
- Have developed various rules for assigning targets – need further empirical and simulation testing



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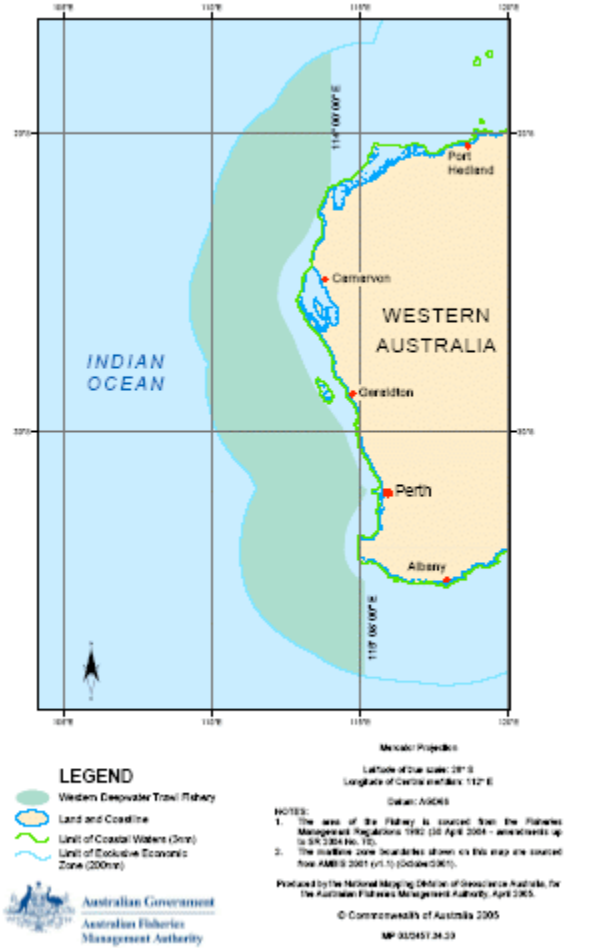
Data-poor fishery: the Western Deepwater Trawl Fishery

- Commenced 1987
- Multi-species (>50) finfish fishery now targeting bugs (*Ibacus* spp)
- Fishery is developmental, opportunistic & species comp temporally variable
- No formal Management plan
  - Input controls – 11 permits
  - No output controls
- Low GVP
- Limited information can't use Tiers 3 or 4
- Develop HS that doesn't stop controlled development

Area of the Western Deepwater Trawl Fishery



WDWTF harvest strategy - issues and principals

- Dowling et al (2008) identified 4 principles for fishery of this type:
  - Trigger levels as reference point proxies
  - Identifying data gathering protocols and simple analyses to assess fishery
  - Archiving biological data for possible future analysis
  - Spatial management

WDWTF harvest strategy

- Pre-agreed triggers for key commercial and species identified as high risk by ERA (Smith et al 2007) and monitoring species composition
- Fishery monitoring protocols
  - Detailed logbooks
  - Observer coverage extended to include baseline biological data (length, sex, otoliths) on key species – only analysed if particular trigger reached.
- Catch Triggers
  1. Catch exceeds 0.5 highest recorded catch – exploratory analysis of catch and effort data
  2. Catch exceeds highest recorded catch – assessment (Tier 3/4) based on archived biological data and standardised catch rates
  3. Catch exceeds double highest catch – limit reference point. Targeted fishing fishing ceases until assessment demonstrates any increase in catch sustainable
- Implement strict catch controls for high risk species
- Spatial management
  - Divide fishery into smaller units because of spatial extent
  - Implement fishery closures to protect high risk species and benthic habitat

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Enhancing stock assessment advice for data-poor species using intra- and inter-species knowledge

- Intra-species
  - Application of parameters from data-rich stocks to those for data-poor for a multiple stock species
  - Example gummy shark *Mustelus antarcticus* of southern Australia – 3 stocks Bass Strait, Tasmania and South Australia
  - Recent assessments have assessed all stocks simultaneously and shared parameters and uncertainty re parameters in all stocks
- Inter-species
  - Bayesian approaches where posterior distributions are developed for key parameters such as steepness based on meta-analyses of similar species

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Enhancing stock assessment advice for data-poor species using intra- and inter-species knowledge

- Inter-species
  - Using assessments of data-rich to inform assessments of data-poor, or
  - Stealing from the data-rich to give to the data-poor, the **"Robin Hood"** approach
  - Assumes similar trends in fishing mortality for each species caught at the same time by a particular fleet
  - Imposes prior (penalty within a maximum likelihood estimation) on relative trend in F
  - Can also apply penalties to length-at-50%-selectivity and recruitment deviations

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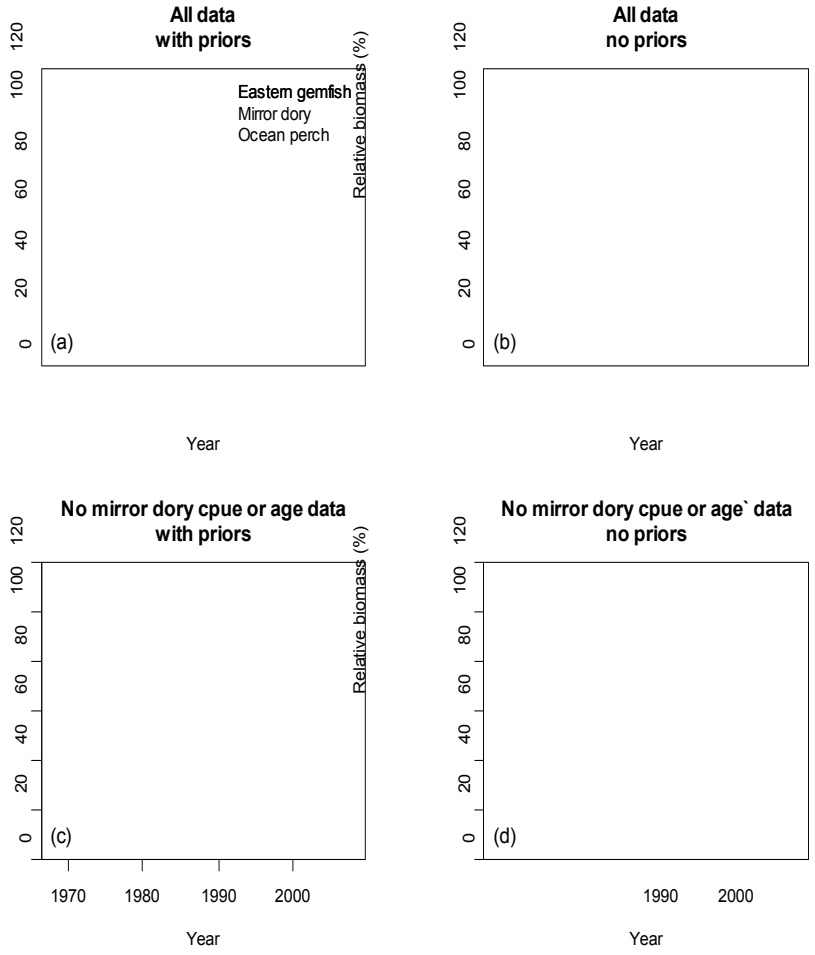
Enhancing stock assessment advice for data-poor species using inter-species knowledge – “Robin Hood”

- Applied to SESSF species
  - Example here three species
  - F constrained only
  - Data-rich species - eastern gemfish (*Rexea solandri*)
  - Data-poor species - ocean perch (*Helicolenus barathri)*, and mirror dory, (*Zenopsis nebulosus)*
  - Has significant effect on ocean perch assessment showing a stock recovering rather than declining
  - Little impact on gemfish assessment
  - Mirror dory assessment insensitive to whether include mirror dory CPUE or age data – reason unclear



General considerations

- In Australia, the HSP has provided impetus to consider data-poor species and fisheries more explicitly
- The lack of data on which to base quantitative stock assessments does not preclude the development of objective harvest control rules.
- Evaluation of harvest control rules using, for example, the MSE approach is ideal, but in some cases, implementation before testing is a necessary reality.
- Information for data-rich species can be used to inform ‘assessments’ for data-poor species, eg Robin Hood

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General considerations

- Stakeholder buy-in and knowledge is essential when species are data-poor.

- Control rules for data-poor species should recognize that sufficient data may never be available for some species to enable quantitative assessments to be conducted. In these cases, there is a trade-off between the cost of data collection and the value of the fishery; adopting a sufficiently precautionary approach may be the only realistic way to manage low-value data-poor species.

Thank you

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