

Stock assessment issues in South Eastern Australia

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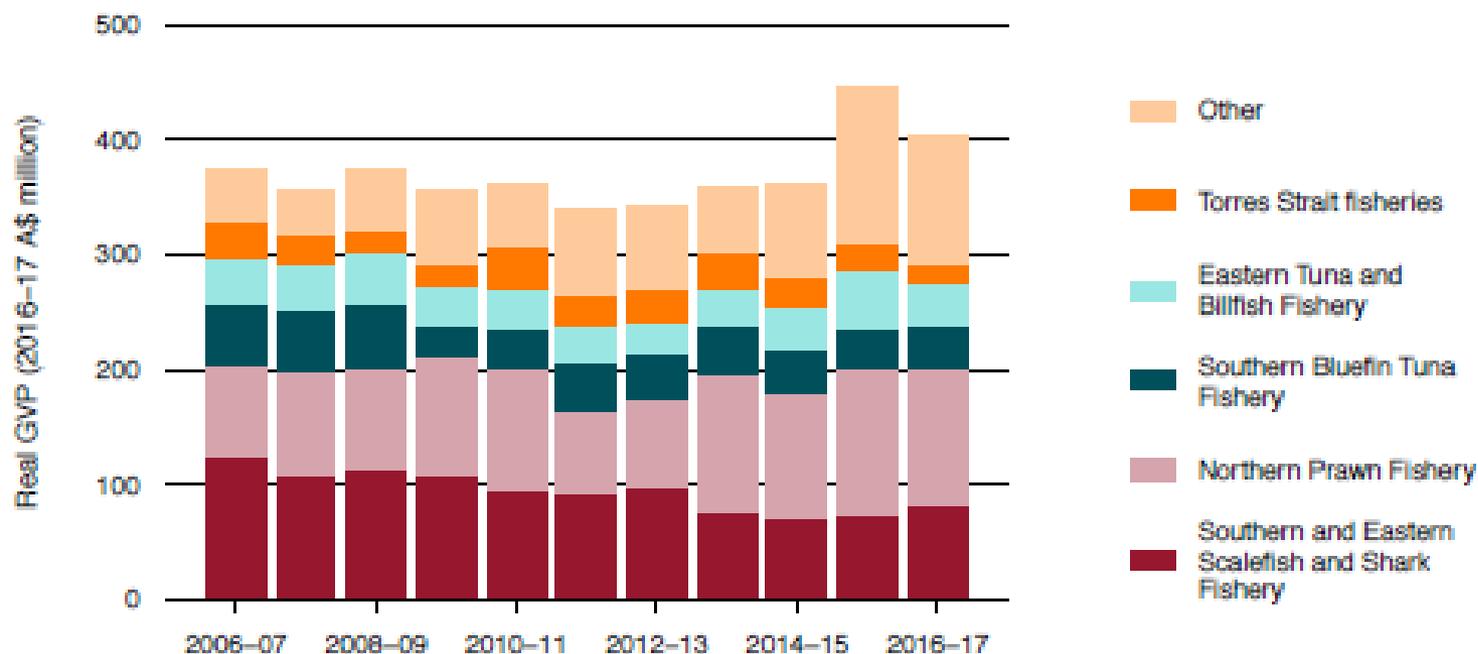
November 4, 2019

Fisheries in Australia

- International, Commonwealth (federal) and state managed fisheries in range of habitats and spatial zones
- Tunas and billfish
- Prawns
- Rock lobsters, scallops, abalone
- Small pelagics (sardines, jack mackerel)
- Aquaculture (Atlantic salmon)
- Sharks
- Scalefish (shelf, slope and deepwater)
- Sub-Antarctic fisheries Patagonian toothfish (Macquarie Island, Heard and McDonald Island)

Fisheries in Australia: Gross value

FIGURE 1.5 Gross value of production of fisheries managed solely or jointly by the Australian Government, 2006–07 to 2016–17



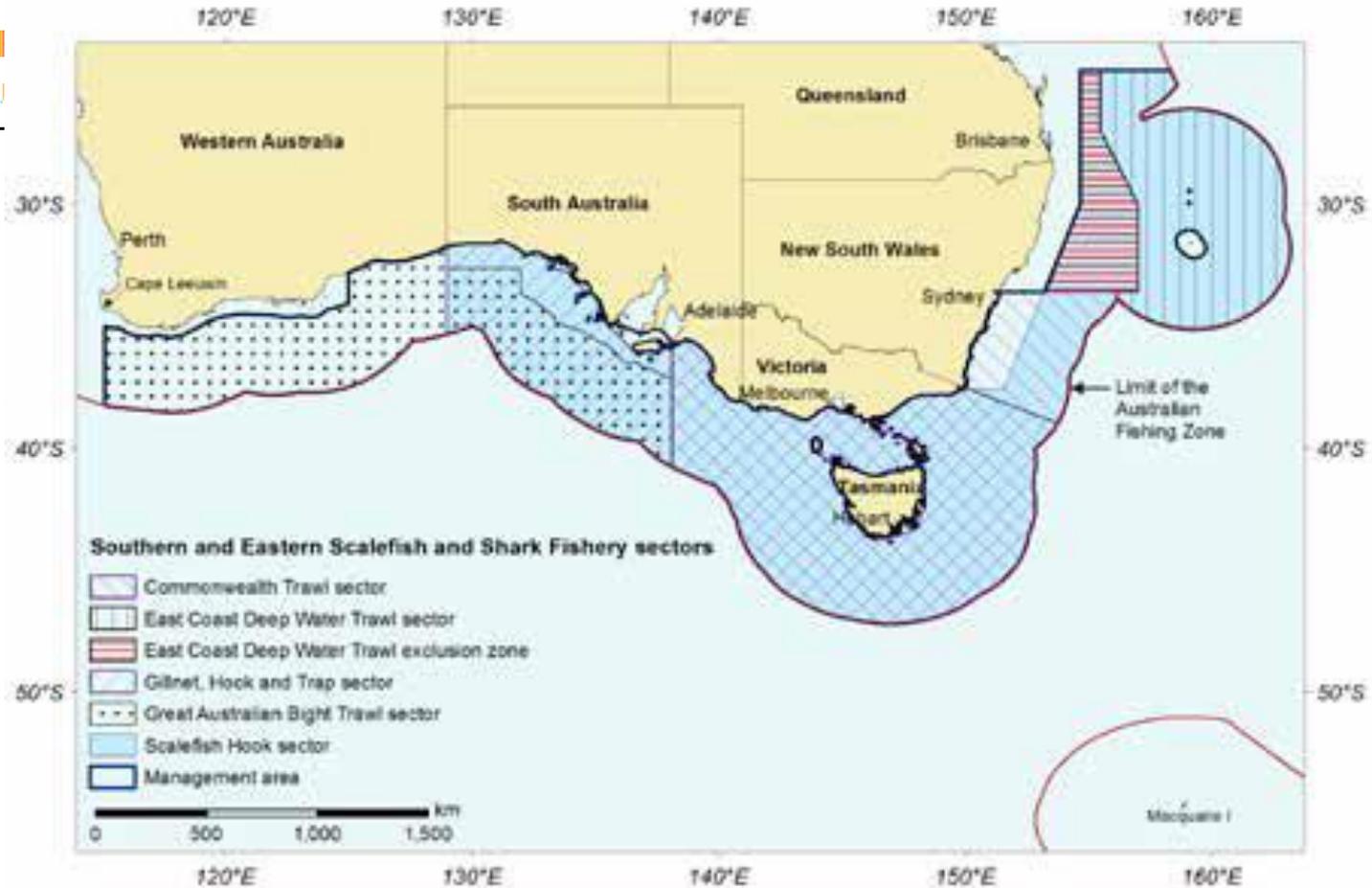
SESSF – Southern and Eastern Scalefish and Shark Fishery

- Multi-sector, multi-species fishery - covers **almost half of the Australian Fishing Zone**
- Operating since 1915
- Fishery managed by limiting catch (TAC), restricting number of boats and regulating gear
- Total fishery value: \$A 82.4 million in 2016-17 (\$US 57 million)
- **34 different species** managed under quota system (ITQ)
- About **13 Tier 1 species** (data rich)
- Rest are Tier 4 and 5 species (data poor)
- **Limited money** for management (cost recovery)

Fisheries in Australia: SESSF

FIGURE A

Real GVP (2016–17 A\$ million)



Stock assessment frameworks used

- Assessment platforms: C++, ADMB, TMB, Coleraine, **Stock Synthesis**, CASAL
- SESSF stock assessment group moved to Stock Synthesis in 2006
- New Harvest Policy implemented in 2007

- SS also being used in some Australian State Fisheries (sardines (SA), coral trout (QLD), saucer scallop (Wen-Hsi Yang, QLD))

SESSF – management of the fishery

- Harvest strategy used to determine the quotas for target species
- All harvest strategies developed in line with the Commonwealth Fisheries Harvest Strategy Policy and Guidelines – since 2007
- Before 2007? **Ad hoc rules** (and assessment platforms)
- Data collected from:
 - logbooks (1980s onwards - industry, catch and effort)
 - “independent” observers (lengths, ages)
 - limited survey data (Kapala, Fishery Independent Surveys)
- Quotas introduced in the early 1990s
- Data quality can be variable

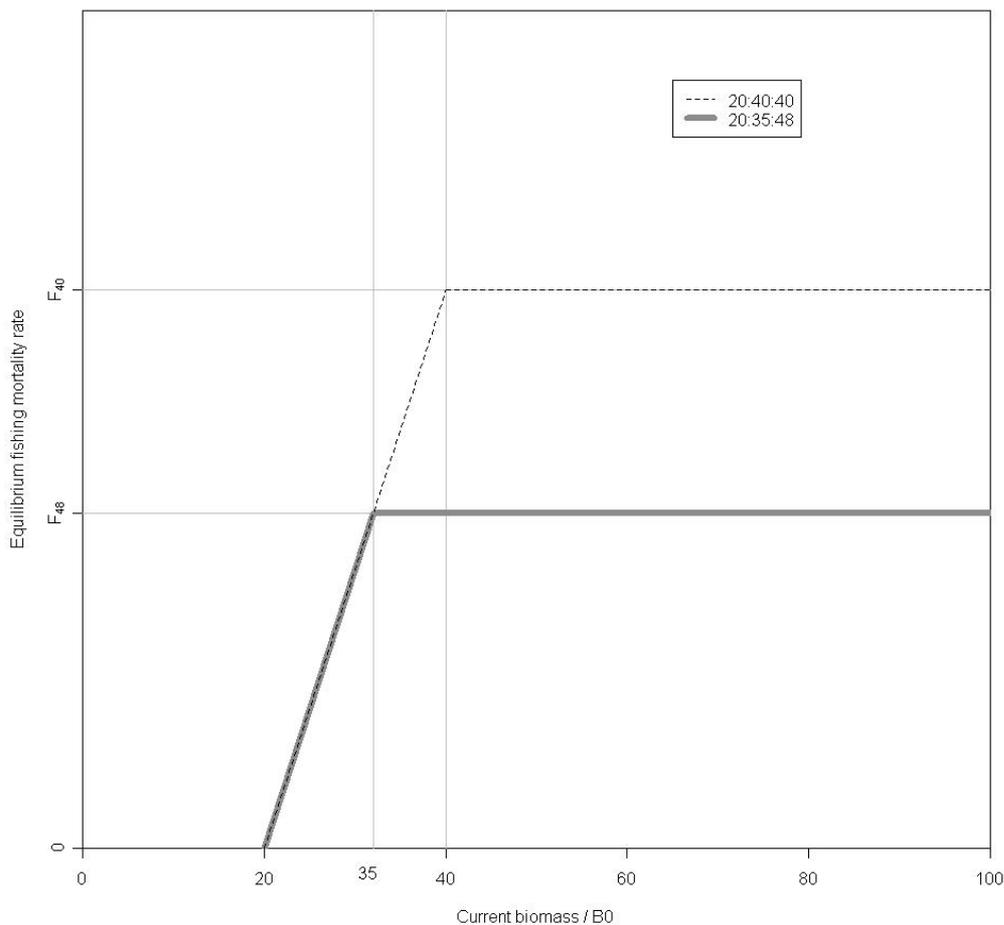
SESSF – Tier based Harvest Control Rules

- RBCs calculated using a tiered system of Harvest Control Rules (HCR)
- Tier 1: Robust quantitative assessment
- Tier 2: Less robust quantitative assessment
- Tier 3: Length or age data + catch curves
- Tier 4: Catch and CPUE only – uses a reference period
- Tier 5: Catch only methods (method of last resort)

MSE testing of Tiers 1-4

- Synthesis like MSE developed (Gavin Fay, Sally Wayte, Neil Klaer, Geoff Tuck, Rich Little) in C++ and all harvest control rules were tested using Stock Synthesis as the assessment model
- Did they approach target (time frame loosely specified)
- Probability of going below limit biomass (B_{20}) < 10%?
- Examined catch variability, depletion in final year, average catches
- **Requires incorporation of Harvest Control rules in assessment software**

Harvest Control rule (Tier 1: F based)



Range of species assessed

- Short-lived species (**school whiting**)
- Sporadic recruitment (**blue grenadier**) - cohort dependent growth
- East west splits (**pink ling, silver warehou, jackass morwong**)
- Old fisheries (**tiger flathead, jackass morwong**) – back to 1915
- Data issues (**bight redfish, deepwater flathead, orange roughy, eastern gemfish, redfish, western gemfish**)
- Long-lived species (**orange roughy, Patagonian toothfish, bight redfish**)
- Spatial with tagging (Patagonian toothfish, **big eye, yellowfin tuna** (Dale Kolody))
- Non-recovering species (eastern gemfish, blue warehou, silver warehou, jackass morwong, redfish) and productivity shifts

Features required

- Stock Synthesis currently satisfies many (most) requirements for SESSF species
- Harvest control rule integrated in assessment software
- Cohort dependent growth
- Productivity shifts
- Low recruitment projections
- Standardised diagnostics (r4ss plots)
- Data weighting functionality
- Support and community (Rick Methot, Andre Punt, Ian Stewart, Ian Taylor, Chantel Wetzel, Gavin Fay, ...)

Features desired (CSIRO perspective)

- Multi-species assessment with technical and trophic interactions (Rich Little)
- Tagging: incorporate tagging with unknown age of release (tag cohorts in SS and move from SS to TMB model for Patagonian toothfish – Rich Hillary)
- Tagging: Indian Ocean tuna would like to be able to assign tag ages for seasonal models with multiple cohorts per year (Dale Kolody)
- Addition of index area-weighting factor parameters (Dale Kolody)
- Projection capacity for use in Management Procedure evaluation, i.e. ability to project forward the full range of uncertainties with process and observation error (Dale Kolody)
- Ability to easily incorporate harvest control rules (SESSF, Chile, Qld)
- Incorporate close kin (Robin Thomson, Rich Hillary)

Thank you

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