Abalone Fisheries and Hyperstable CPUE

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and
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CPUE has a Bad Reputation

- **Many collapsed abalone fisheries (North America, etc.)**
- **Patchiness/Spatial Heterogeneity in biological properties and productivity means no dynamic pool: classical CPUE theory is invalid?**
- **Serial depletion (within stocks, between species)**
- **Hyperstability**
- **CPUE represents what was taken not what was left = relative abundance**

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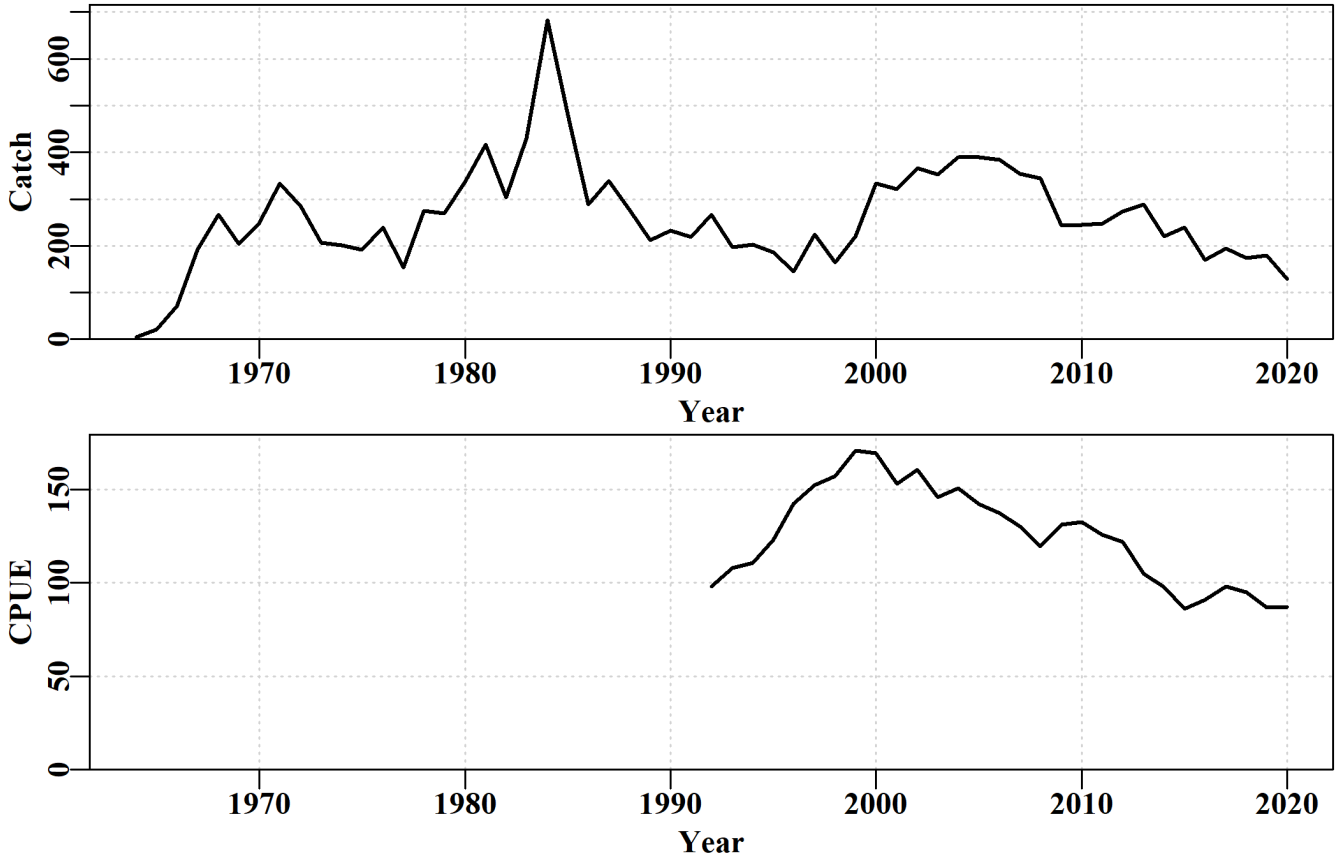
Australian Abalone Fisheries

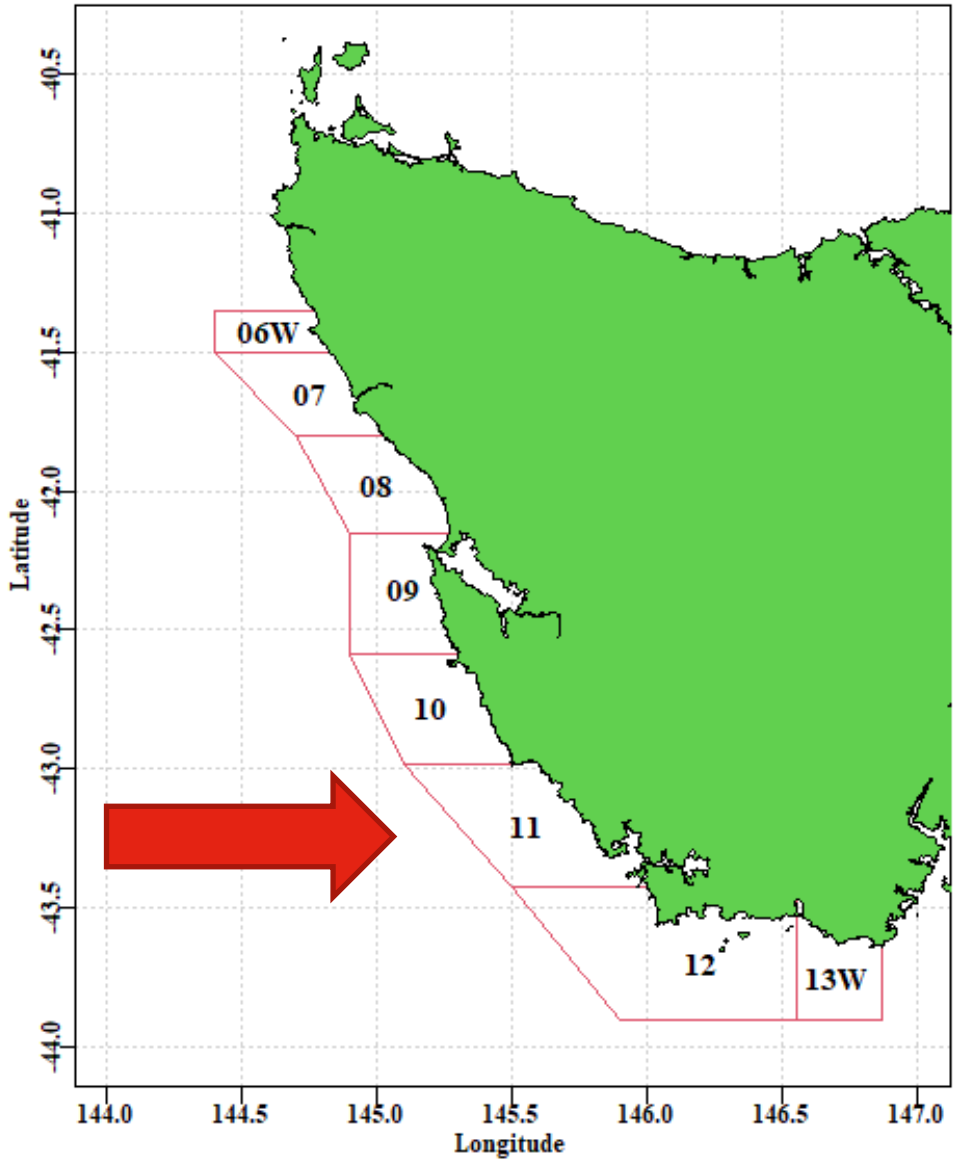
- **Each jurisdiction has different circumstances, many now introducing formal harvest strategies**
- **BUT: All formal harvest strategies in Australia use CPUE as an important measure of performance (also in NZ)**
- **All informal management processes also use CPUE (kg/hr)**
- **The Big Question:**
  - **<u>When, if ever, are CPUE data informative about stock dynamics?</u>**

Context of this Work

- Now have an MSE framework to test abalone harvest strategies
- Now have a formal size-based assessment model to condition each of multiple areas within each jurisdiction being tested (but best not use it for management advice)
- Needed to include Hyperstability of CPUE into both
- CPUE in some jurisdiction appeared more informative than in others

Example: Western Zone Tasmania





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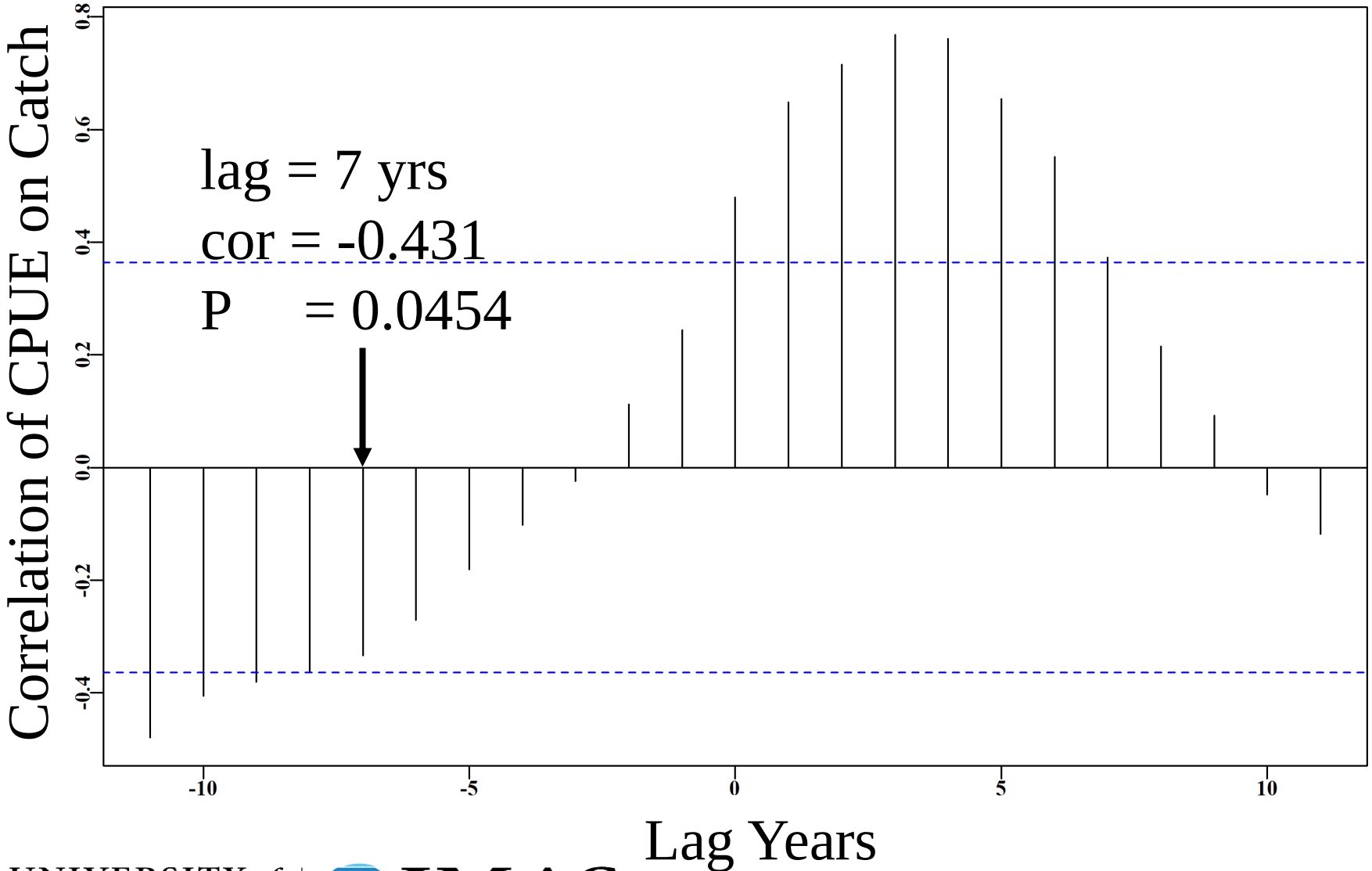
Proposed Diagnostic – Cross-Correlation



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Including Hyperstability of CPUE

$$CE = qB^{\lambda}$$

CE = Catch per Unit Effort

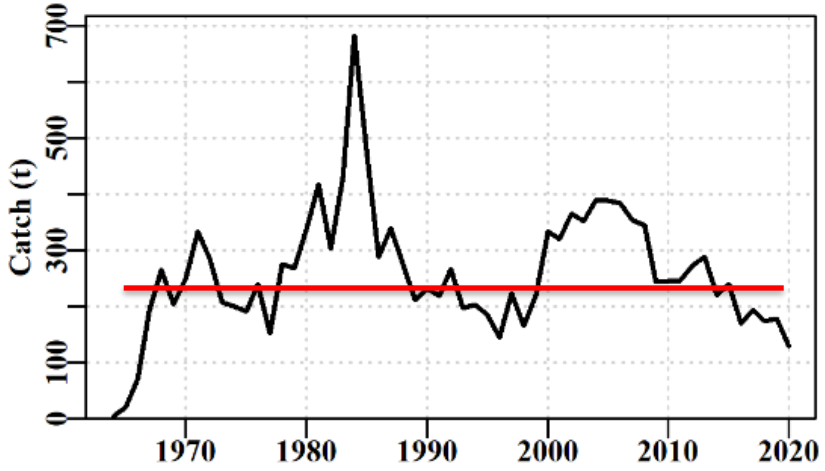
q = catchability

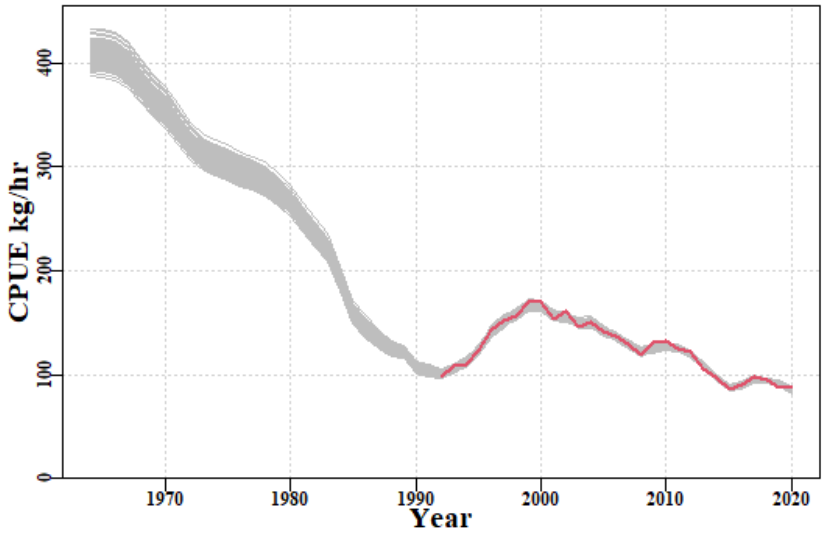
B = exploitable biomass

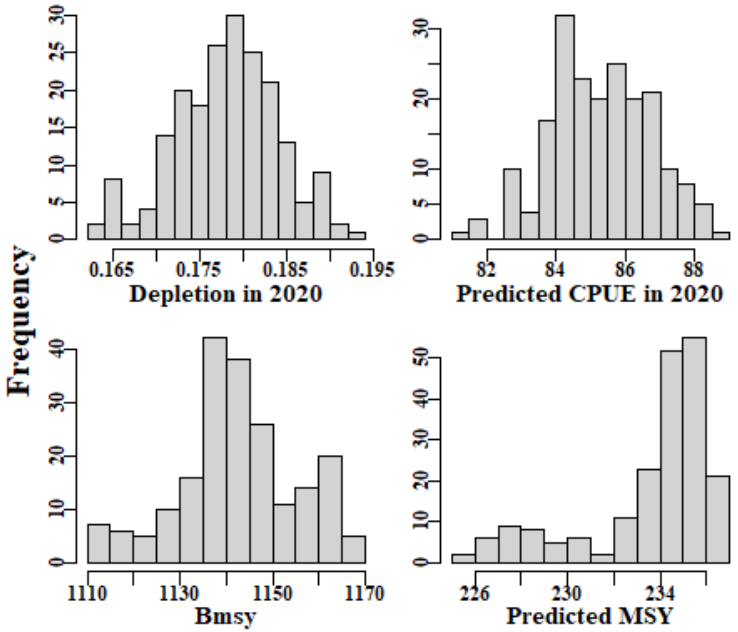
λ *= hyperstability parameter*

So-called ‘Power-Law’

Block 11 West Coast Tasmania - *sizemod*





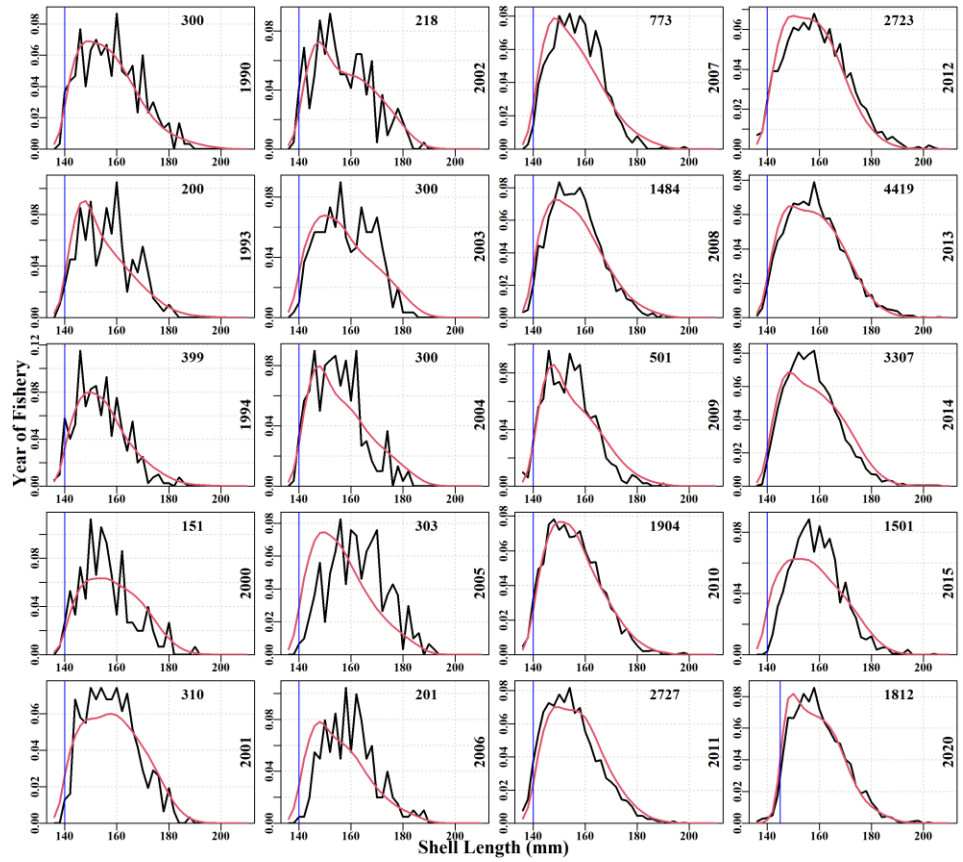


MSY ~233t?

(using M=0.15, h=0.75, λ = 0.75)

Current B^E ~14%

Current B^M ~19%



Uses Francis' (2011) weighting on cpue, iterative reweighting for composition data (McAllister & Ianelli, 1997), and bias-ramp adjustment to recruitment residuals (Methot & Taylor, 2011)

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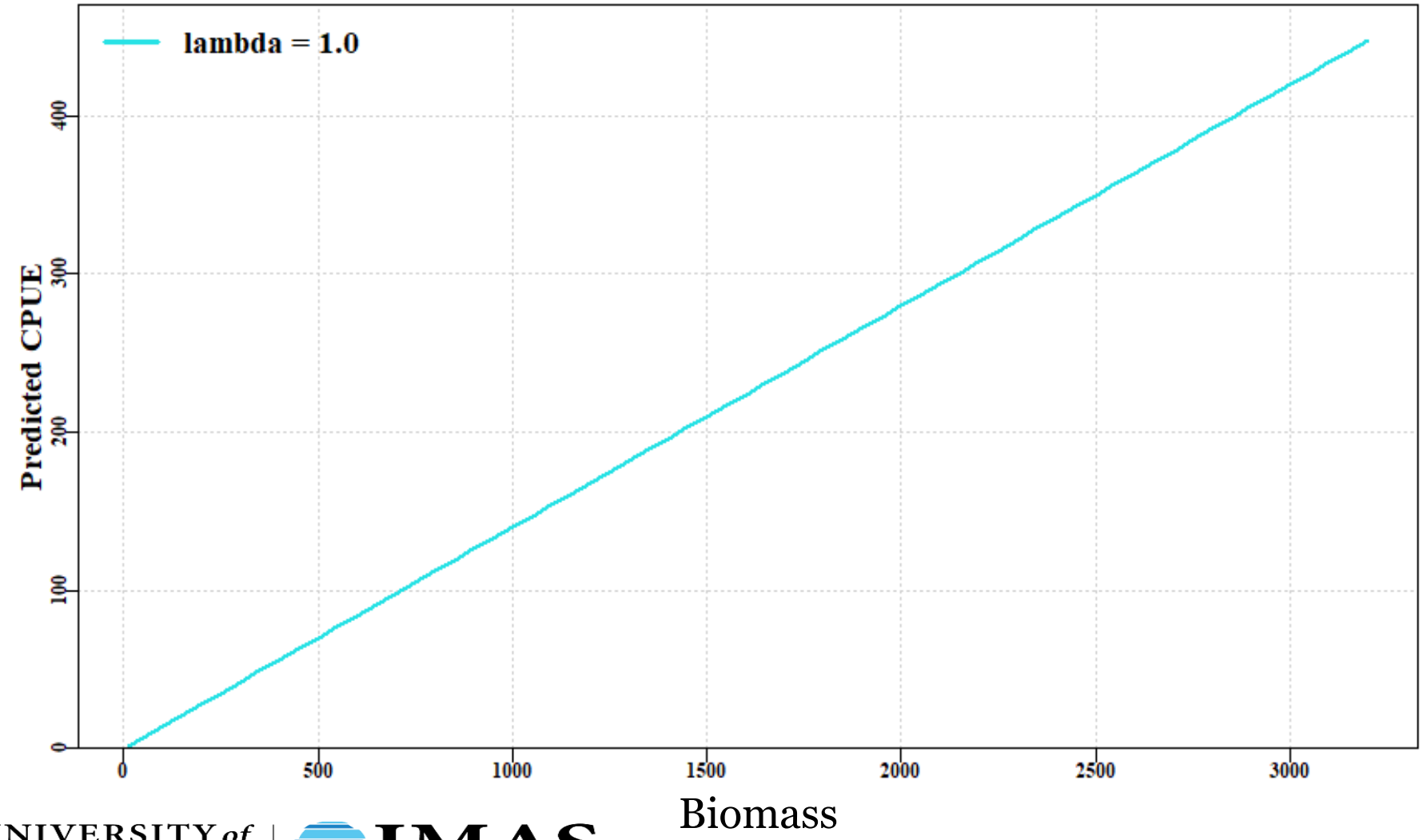
Effect of Lambda on Predicted CPUE

$$CE = qB^{\lambda}$$



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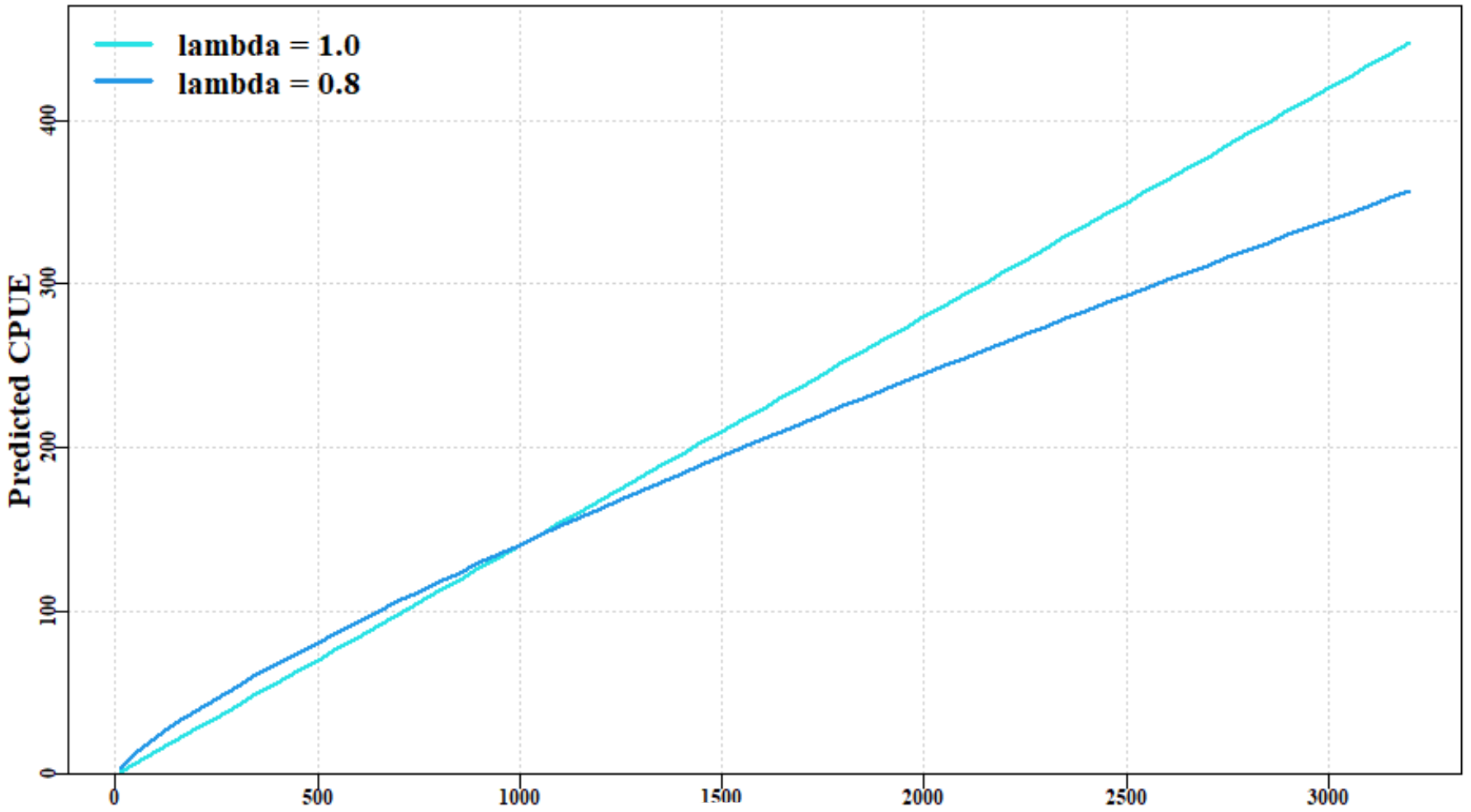

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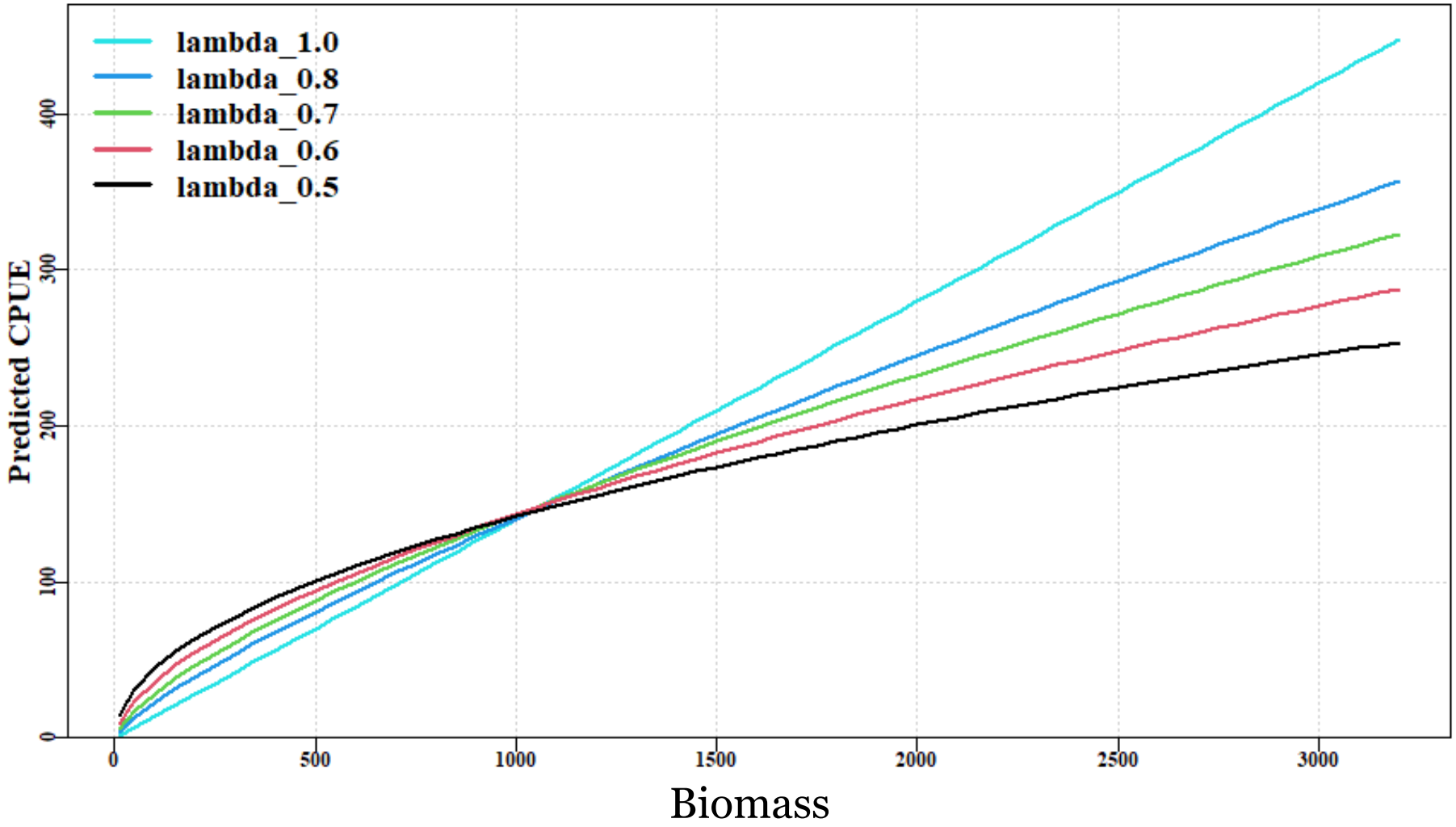

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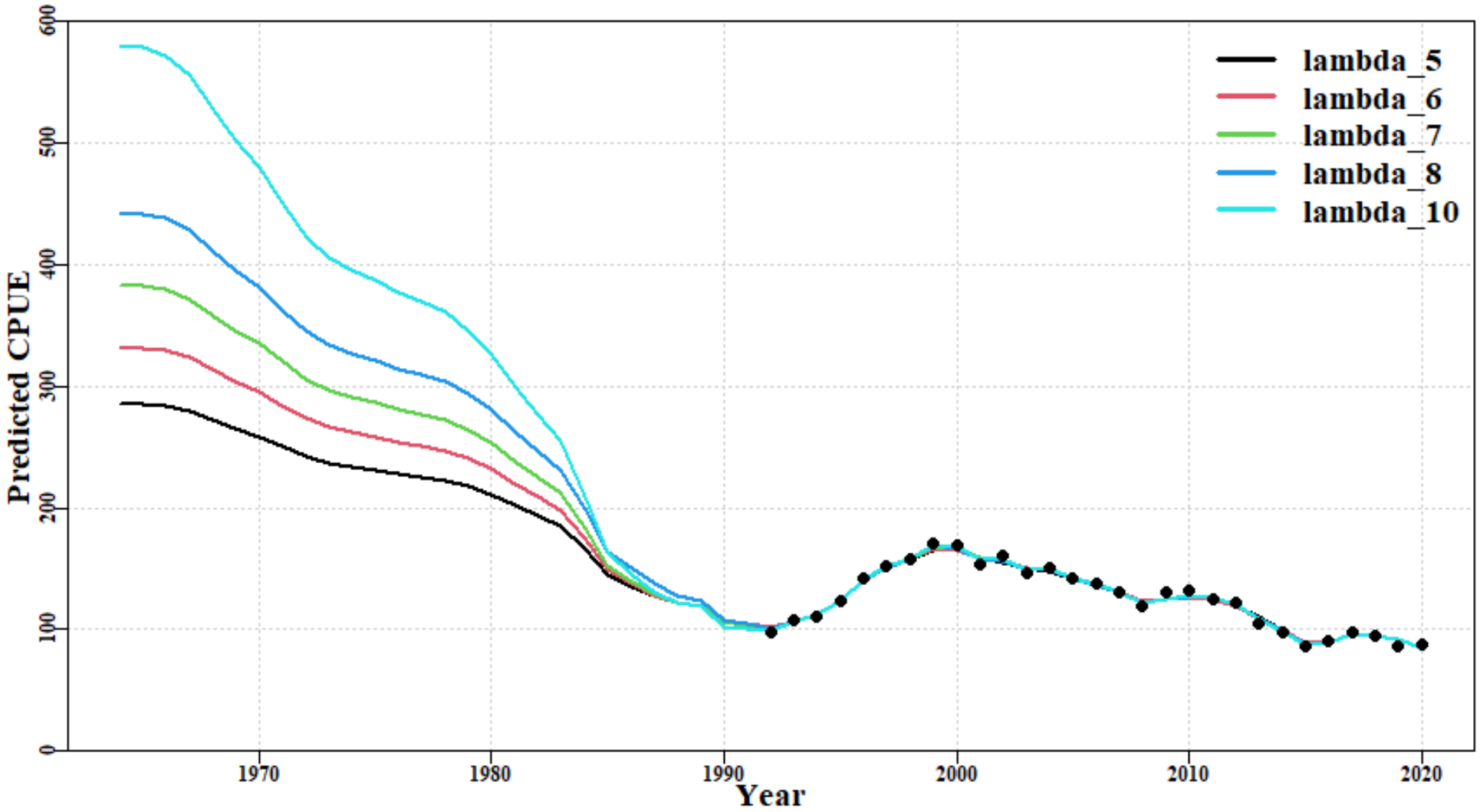
Effect of Lambda on Fit to CPUE



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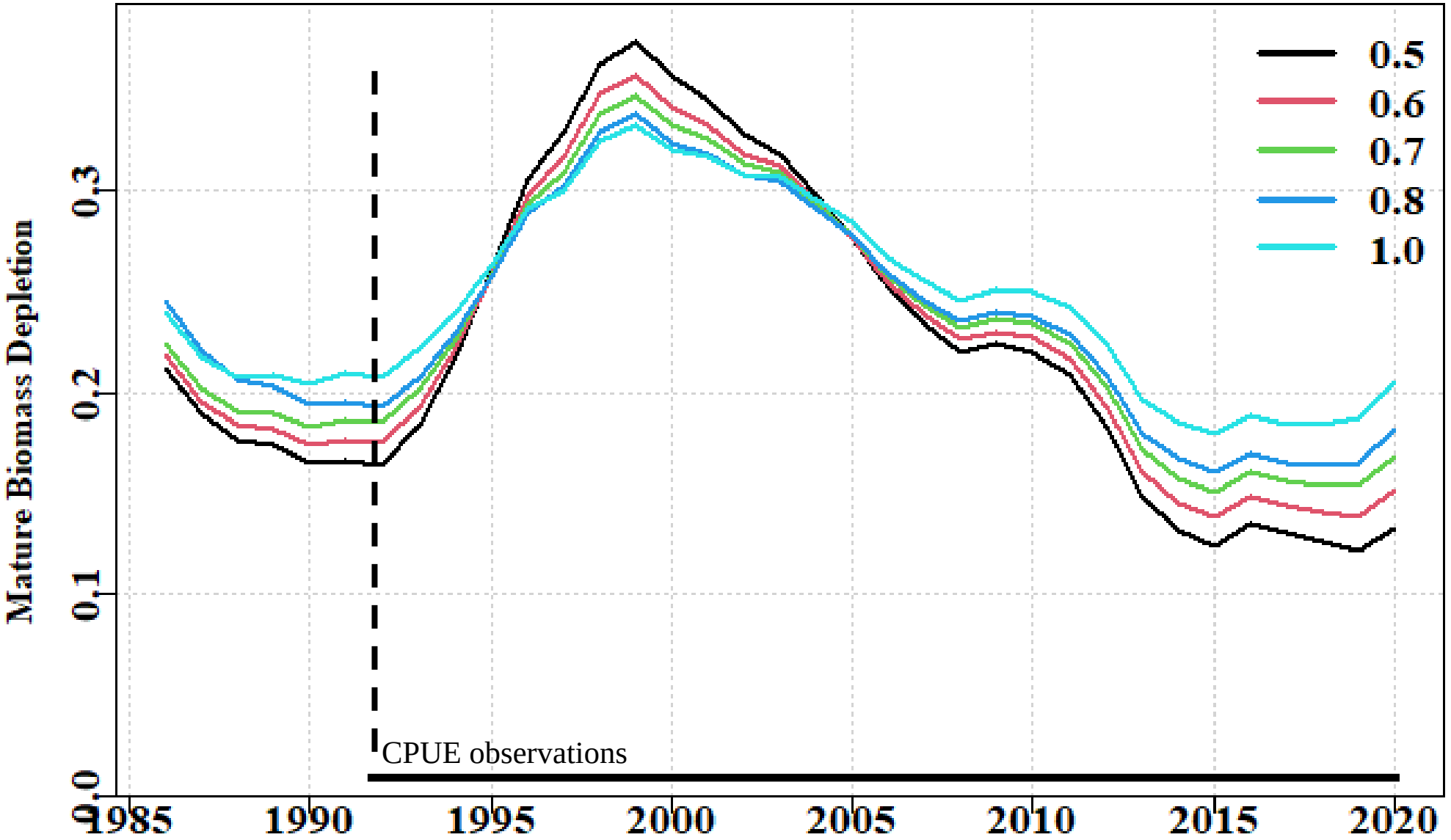
Hyperstability of CPUE on Depletion



Suggestions:

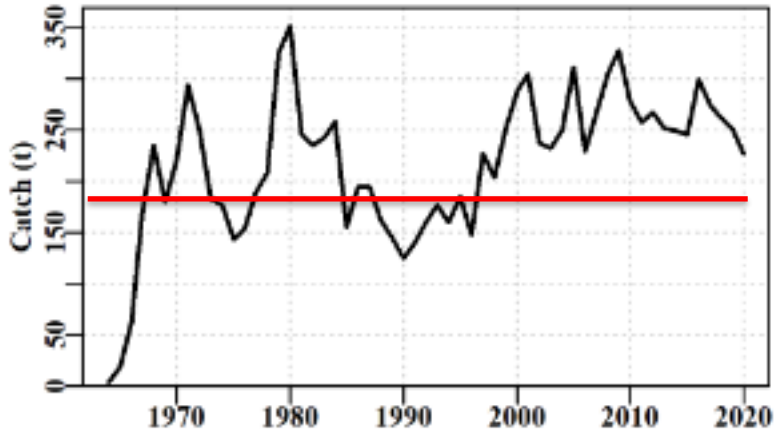
- If proposed diagnostic of informative CPUE indicates weak or no signal, then more than CPUE may be needed to manage fishery
- Hyperstability introduces major biases, naïve CPUE provides an overly confident outlook; <u>hyperstability needs attention!</u>
- NOT recommending using size-based model to assess abalone: there are too many known unknown uncertainties
- BUT, would recommend using such formal models to explore those uncertainties and suggest more appropriate levels of caution in management recommendations

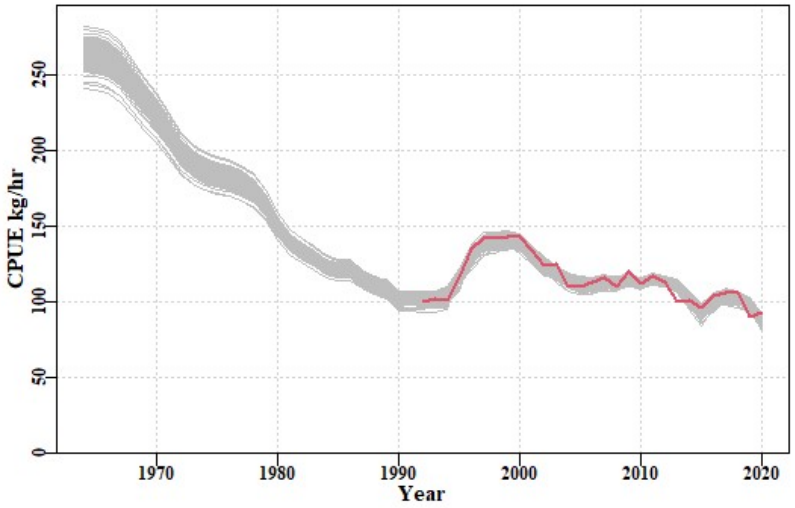
Question

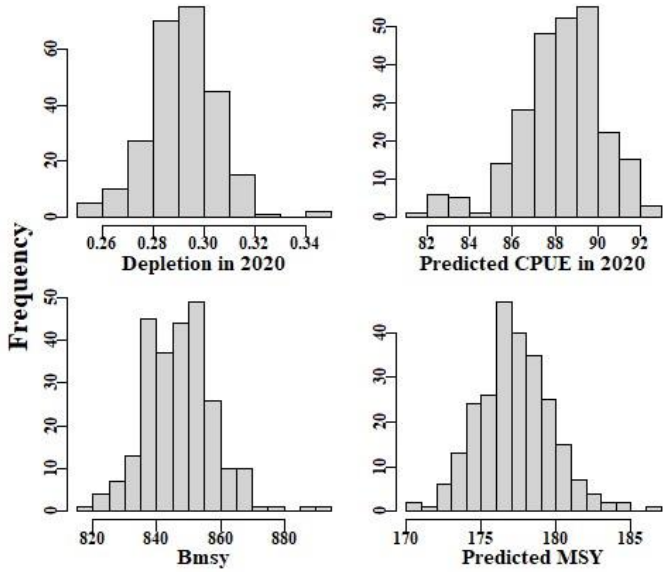
- **Acknowledgements**

- **Fisheries Research and Development Corporation**
- **University of Tasmania**
- **IMAS Taroona Abalone team (Jaime McAllister, Luisa Forbes)**
- **Other colleagues on FRDC MSE project: Cathy Dichmont, Stephen Mayfield, Owen Burnell**

Block 12 West Coast Tasmania - *sizemod*



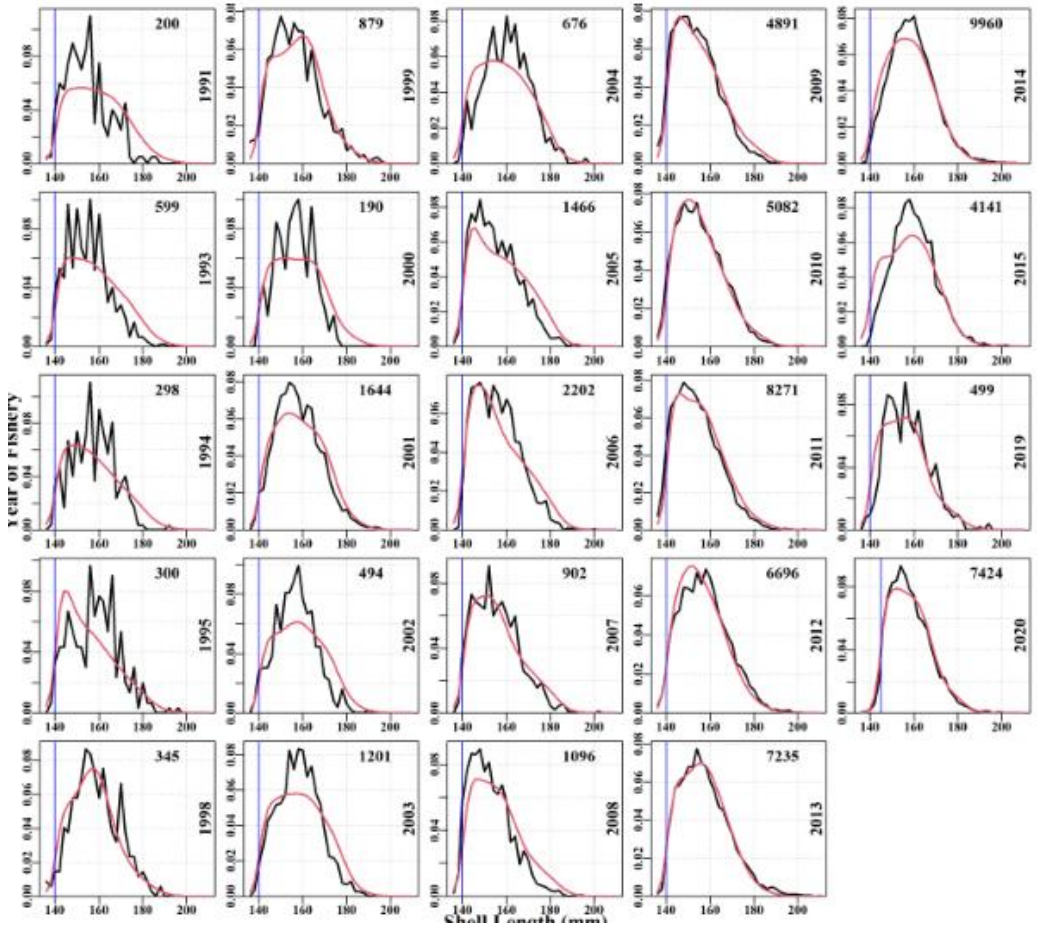




MSY ~177t?

(using M=0.15, h=0.75, λ = 0.75)

Current exploitable biomass depletion ~23%



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