

4.11 - Implementing the Risk-Catch-Cost Framework for Data Poor Fisheries

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Acknowledgements:

The Nature Conservancy

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USAID

Stock Assessment – per Stock

Biology

Aging	3 yrs	\$90k
Tagging	3 yrs	\$150k
Size of Maturity	3 yrs	\$30k
Stock Structure	3 yrs	\$100k

Monitoring

Catch & Effort	10-20 yrs	\$300k
Biomass Surveys	10-20 yrs	\$1,000k

Biomass Modeling	3yrs	\$150k
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Total Cost / stock **\$500 – 1,000k**

Layers of Assessment

Quantitative Stock Assessment
Biomass Modeling

Data Requirements

Catch Rate or Survey Time Series
Data with:
SPR@ Size Curve curve estimated
& High Quality Size & Other Data

Risk Management

Quantitatively estimated
 B_{MSY} , $B_{opt.}$, $SPR_{opt.}$ targets
& risk

Risk Based Framework

Expert Based

High Risk Ranking
Requires higher
assessment

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Graduated Progression
Increasing Costs & Increasing Precision

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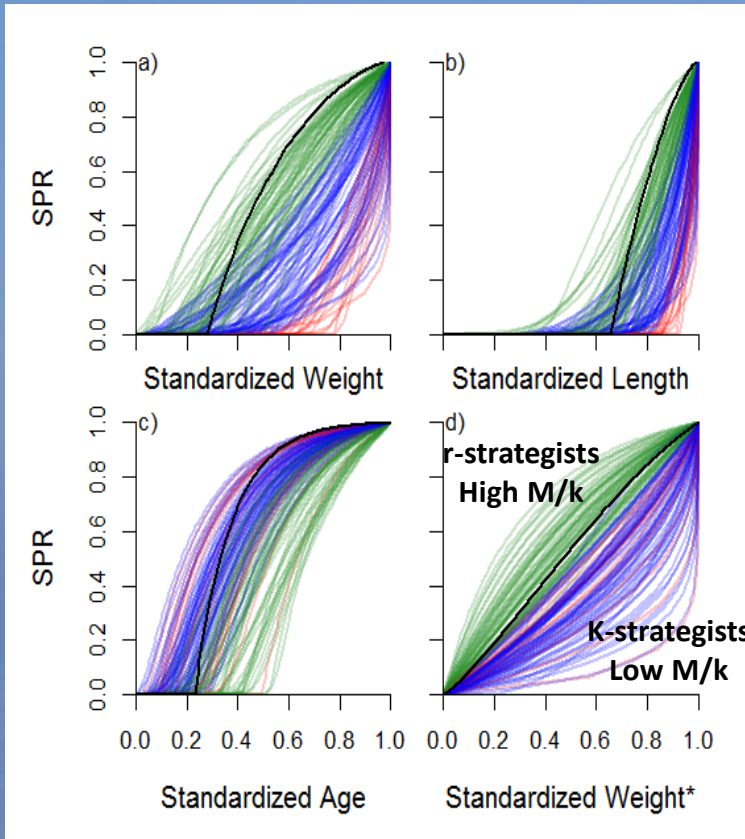
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The Risk – Catch – Cost Framework

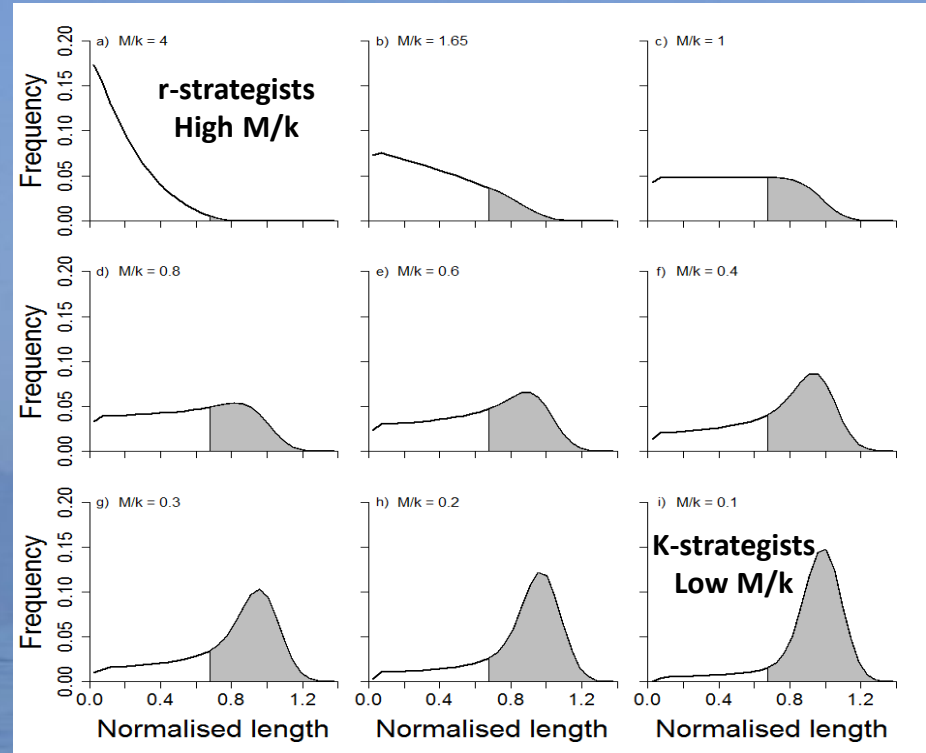
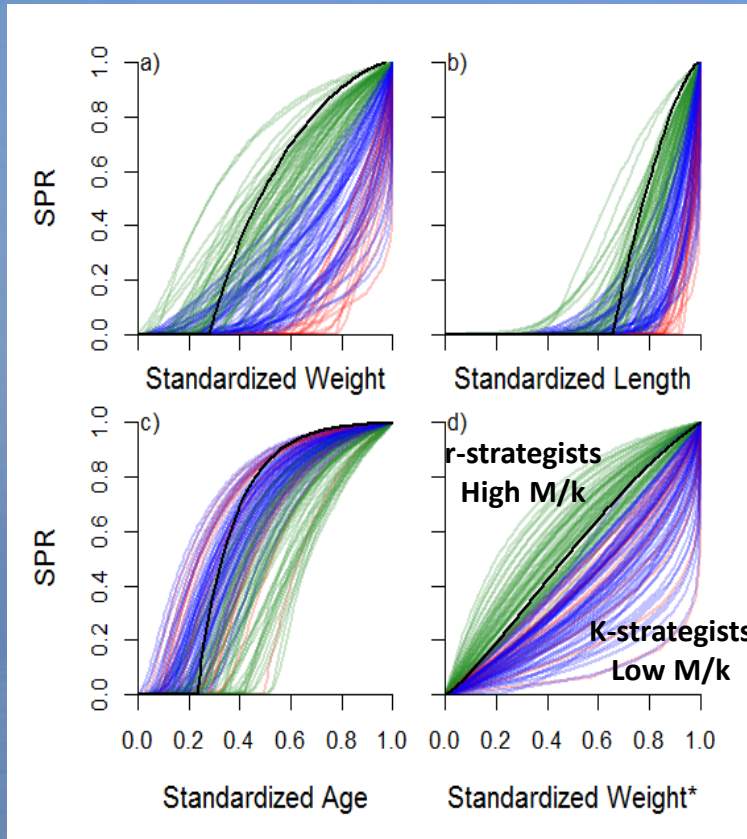
Meta-analysis



Spawning
Potential
Ratio
(SPR)

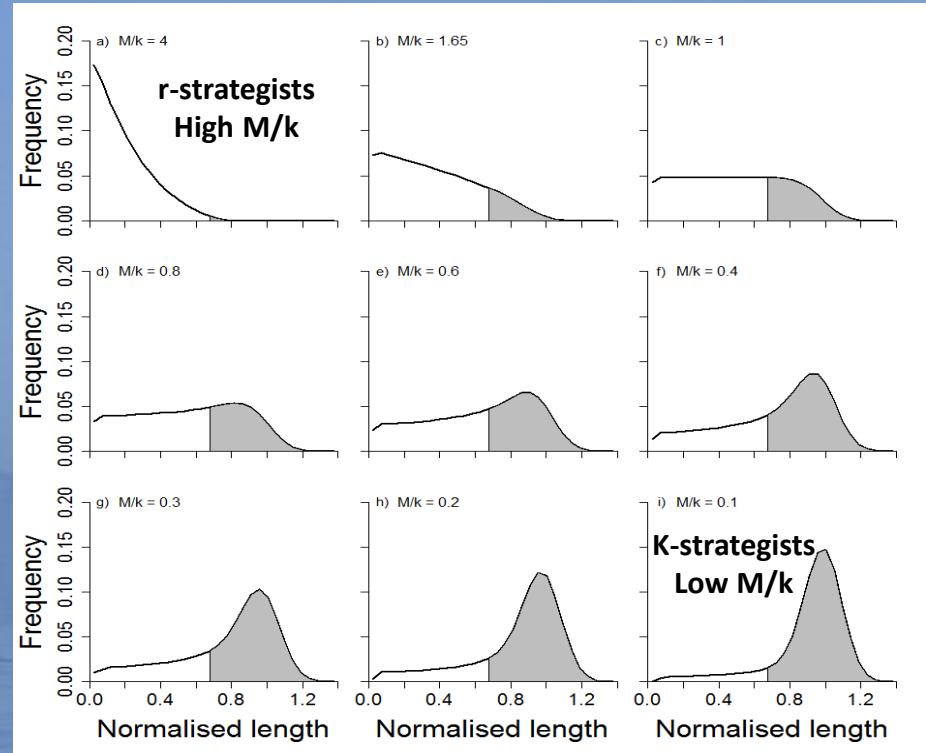
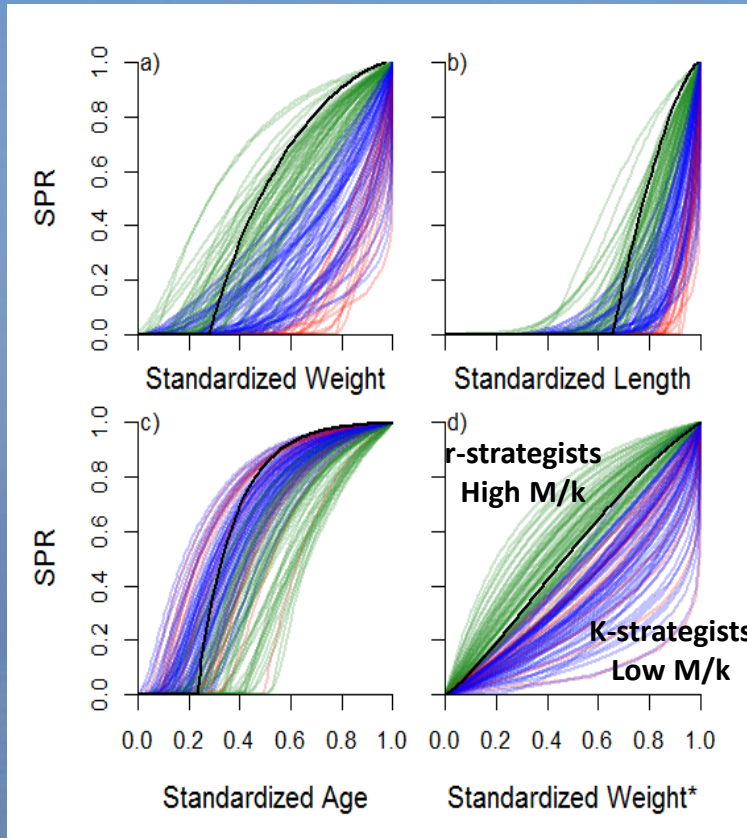
Meta-analysis

+ Theoretical Development



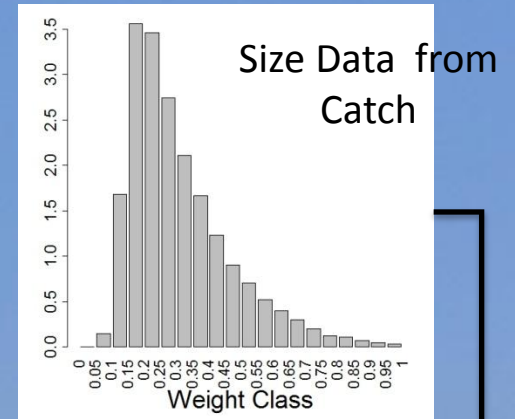
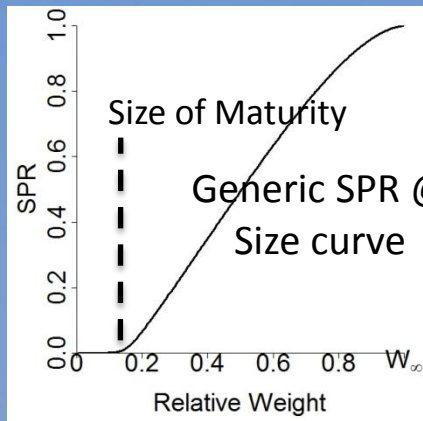
Meta-analysis

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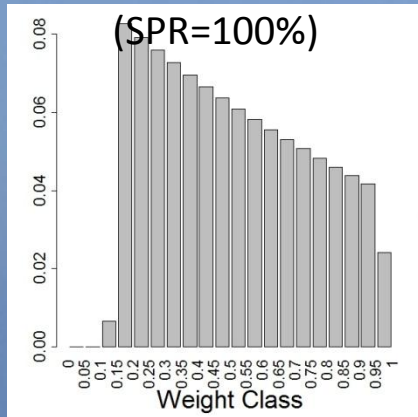


Generic Knowledge from well Studied Species Predicts Size Composition in Unstudied Stocks

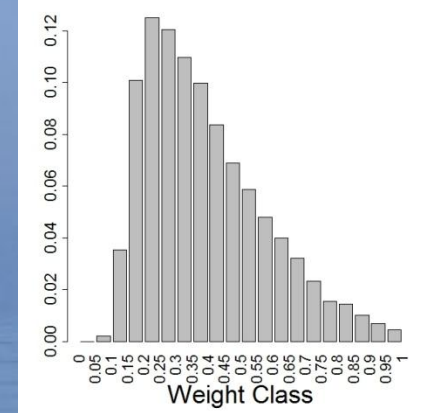
SPR@Size Assessment



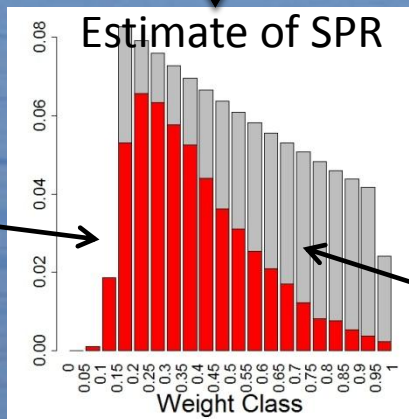
SPR in Unfished Stock



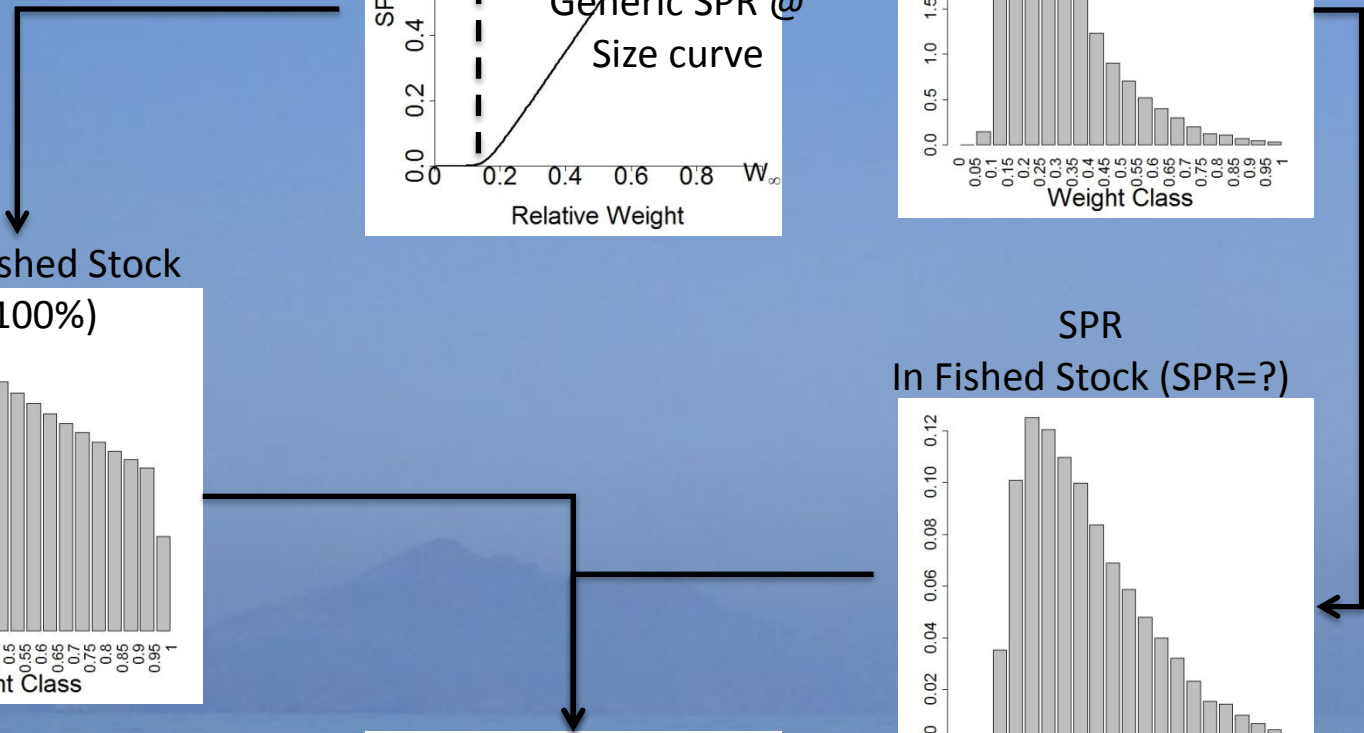
SPR In Fished Stock (SPR=?)



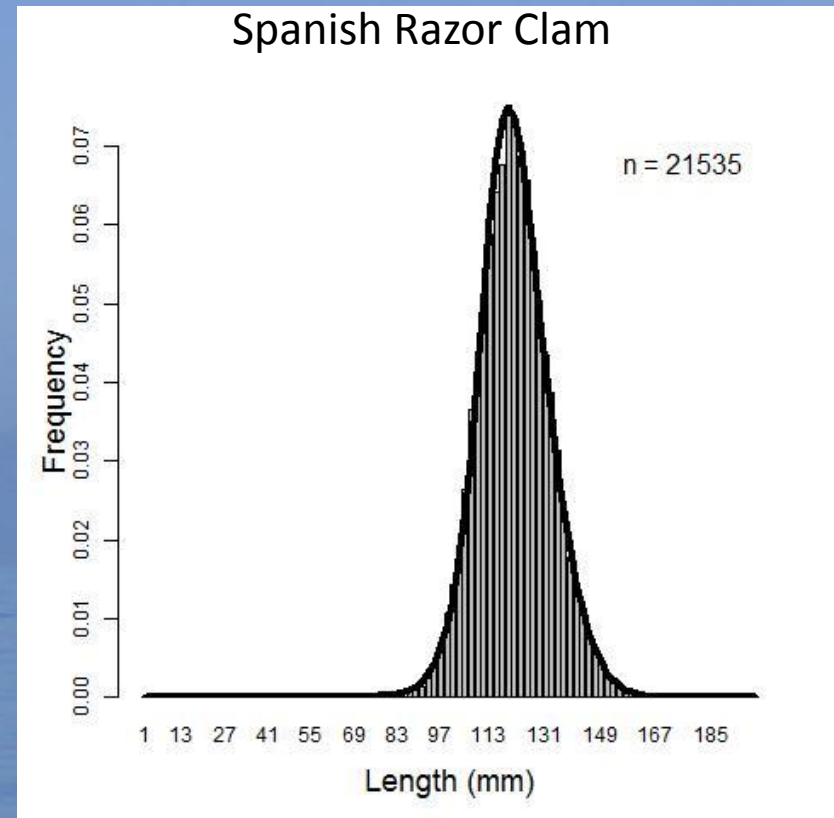
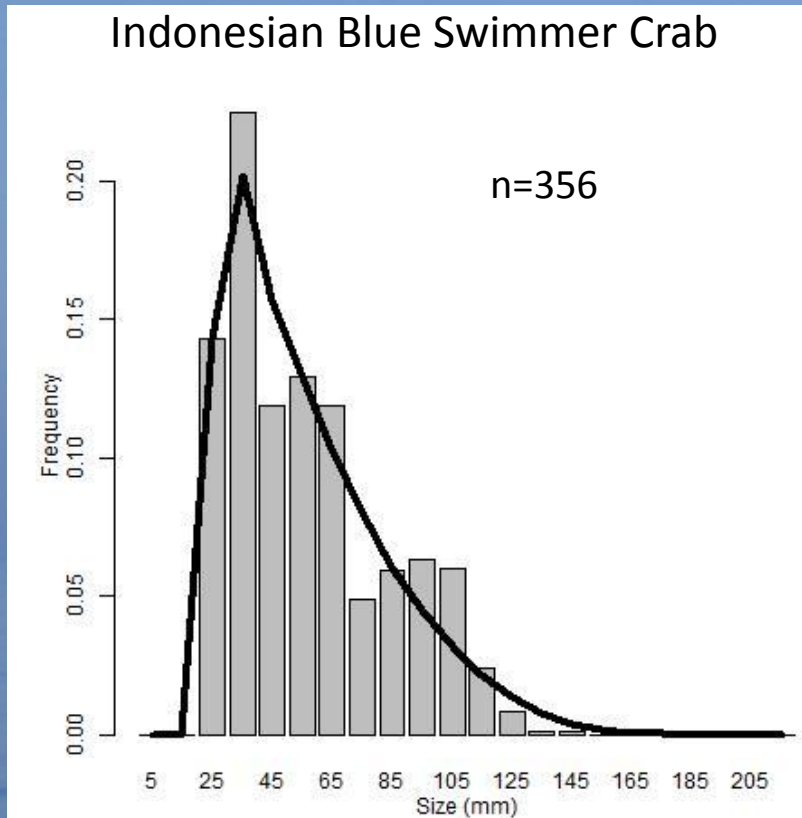
Current SPR



Depletion (F/M)



Size-based Stock Assessment

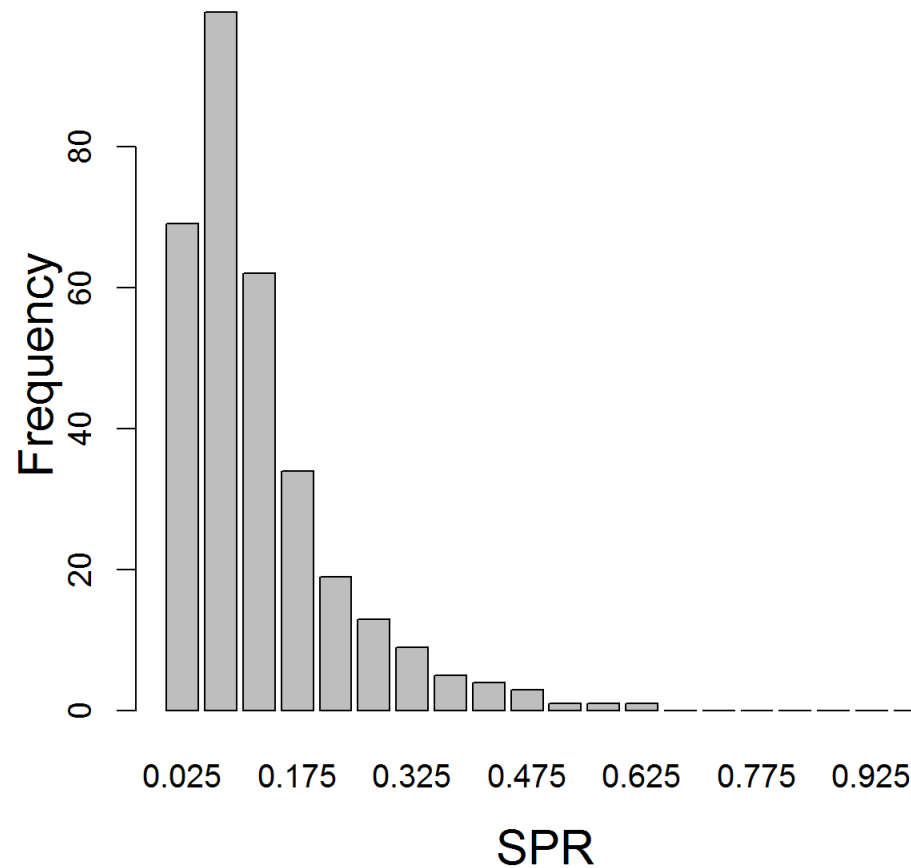


SPR = 4.6% F/M = 1.96

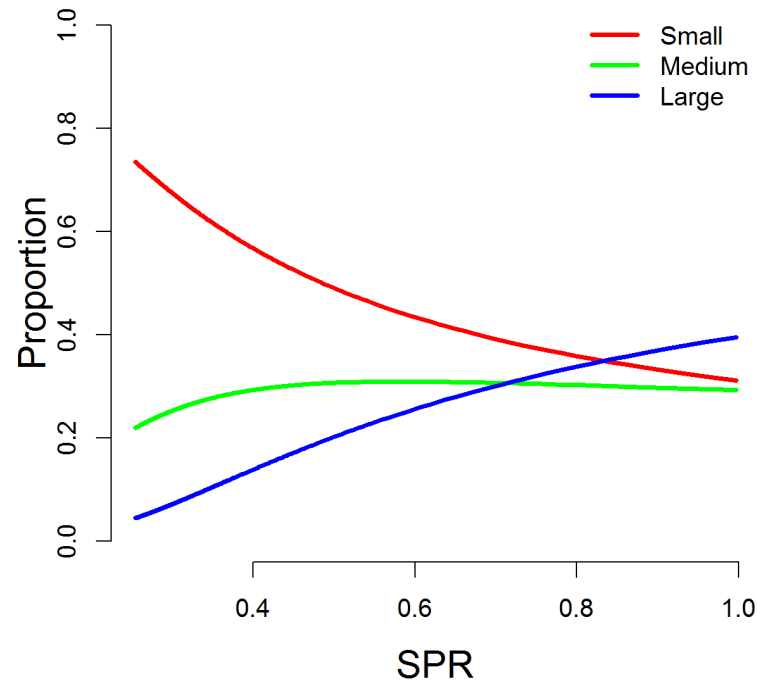
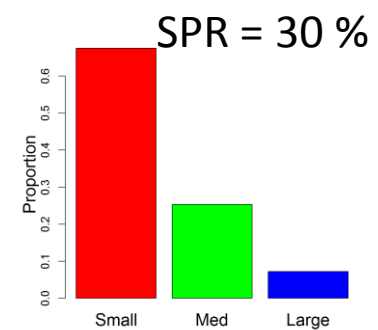
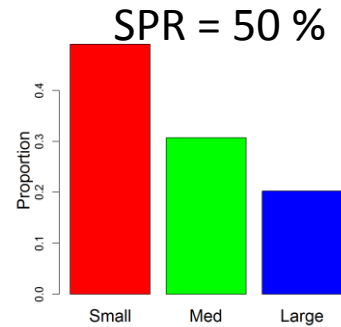
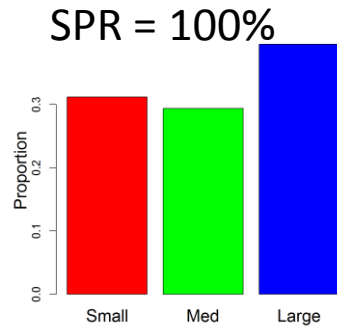
SPR = 45% F/M = 1.58

Port Fairy blacklip

Distribution of estimated SPR



Proportions of By-catch Species in size classes



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SPR @ Size Analysis –Triage
Equilibrium Assessment

Generic SPR@ Size Curve &
Categoric analysis of rudimentary
size data

$<SPR_{70\%}$ Requires higher
assessment
 $>SPR_{70\%}$ No action
Required

Risk Based Framework

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Graduated Progression
Increasing Costs & Increasing Precision

The Risk – Catch – Cost Framework

Harvest Control Rule

Recommend Biological Catch (RBC)

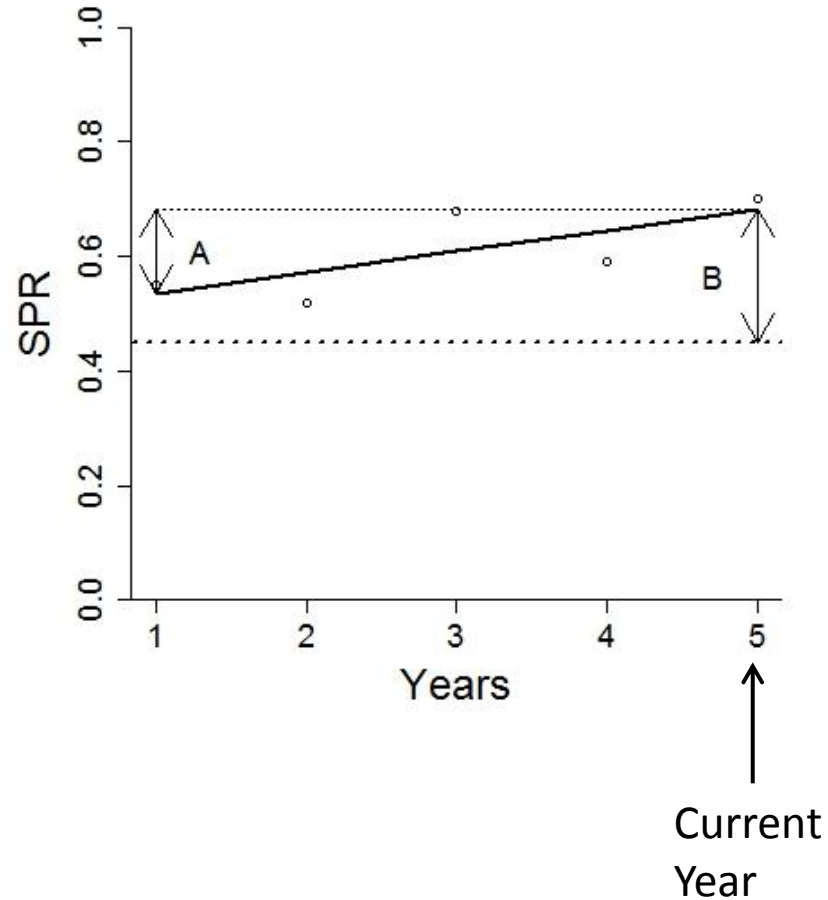
$$NewRBC = pastRBC * (1+V)$$

$$V = k1.A + k2.B$$

$$A = SPR_{CUR} - SPR_{CUR-5}$$

$$B = SPR_{CUR} - SPR_{TARG}$$

$k1$ & $k2$ responsiveness parameters



Iterative Catch Adjustments Preliminarily MSEs

30 Iterations

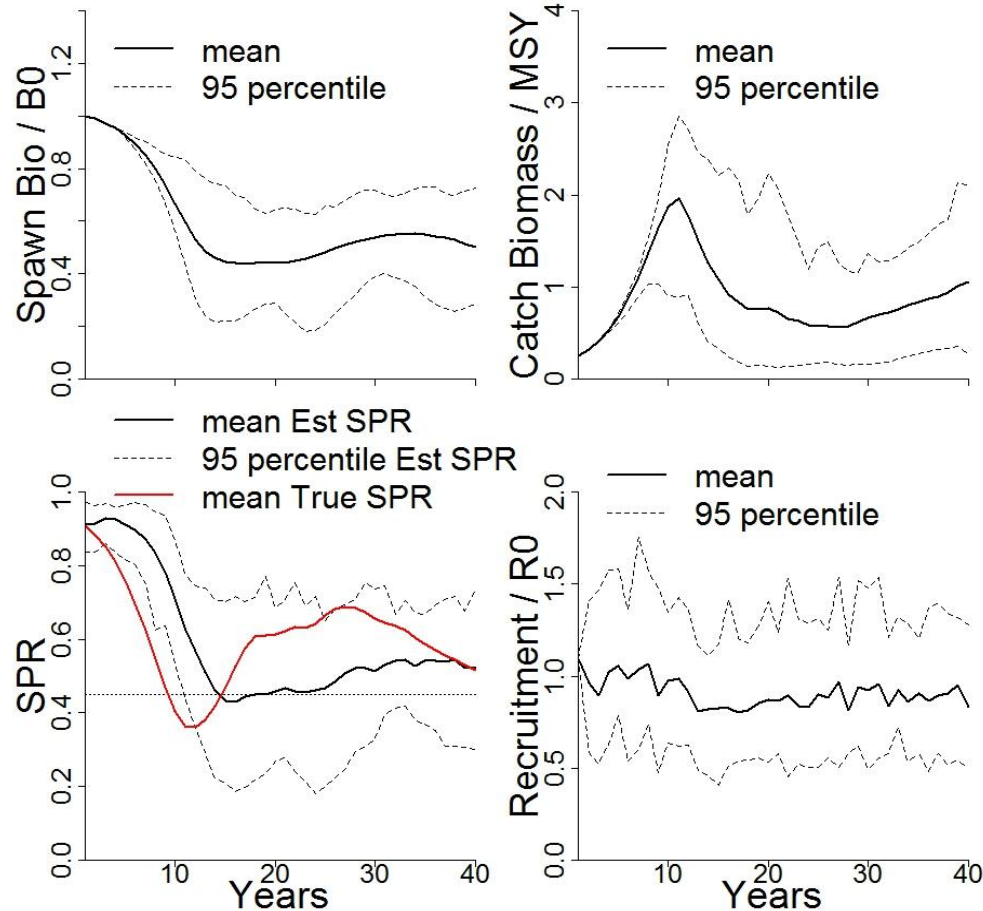
40 years

Low initial F

High initial SPR

$k1 = 0.8$

$k2 = 0.7$



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Equilibrium Assessment

SPR@ Size Curve curve estimated
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Incremental catch
adjustment around $SPR_{50\%}$
Size Target.

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Generic SPR @ Curve assumes worst-
case productivity for species

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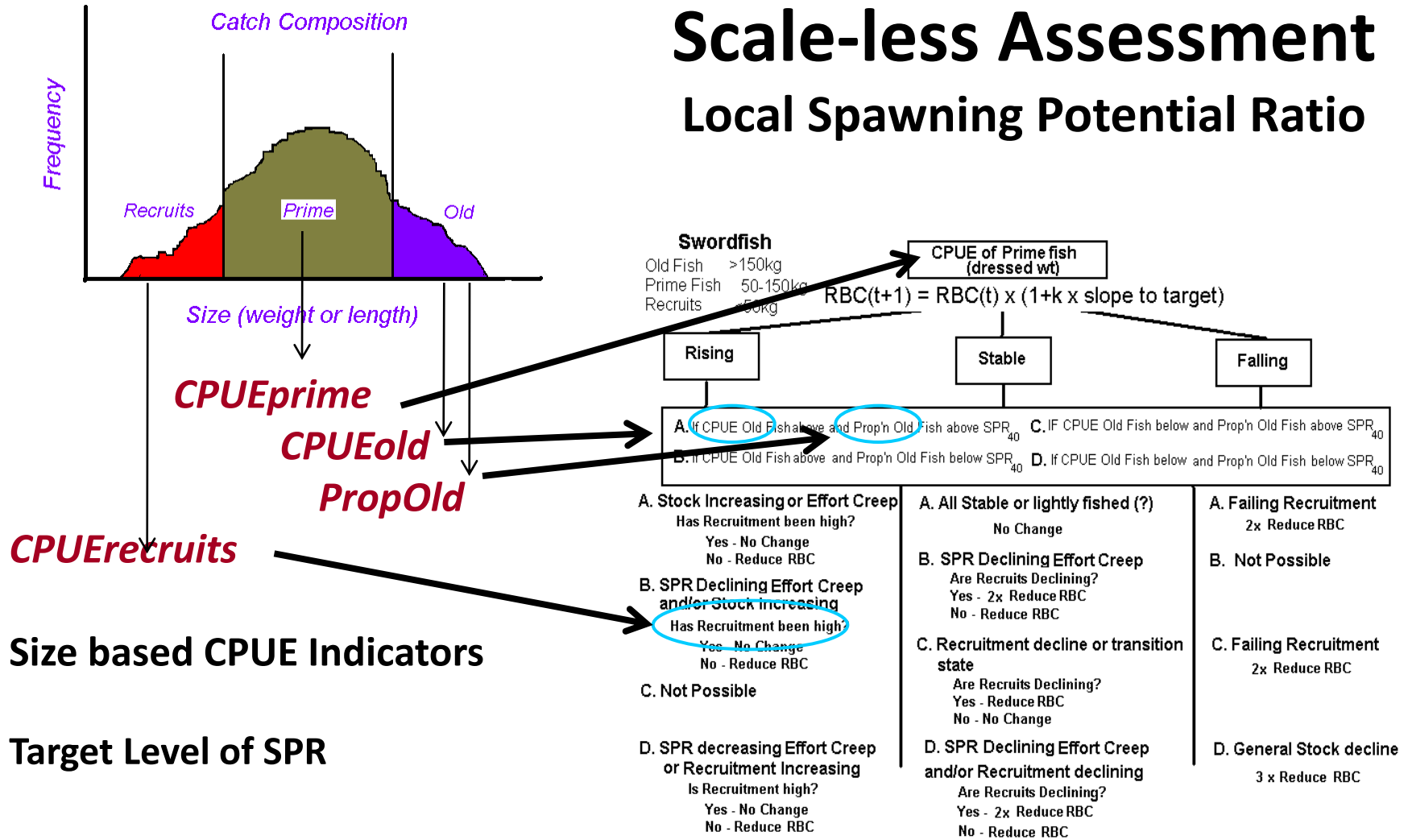
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The Risk – Catch – Cost Framework

Scale-less Assessment

Local Spawning Potential Ratio



Iteratively establish local catch levels

Froese, R. (2004). Keep it simple: three indicators to deal with overfishing. *Fish Fish*. 5, 86-89.

Prince, J. D. et al. (2011). A simple cost-effective and scale-less empirical approach to harvest strategies. *ICES J. Mar. Sci.* 68: 947-960.

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SPR @ Size Decision Tree
Dynamic Pool Assessment

Catch Rate Data with:
SPR@ Size Curve curve estimated
& High Quality Size Data

Incremental catch
adjustment around $SPR_{50\%}$
Size & CPUE Targets

SPR @ Size Analysis – advanced
Equilibrium Assessment

SPR@ Size Curve curve estimated
& High Quality Size Data

Dynamic assessment more accurate,
less precautionary more catch

SPR @ Size Analysis- basic
Equilibrium Assessment

Generic SPR@ Size Curve &
Better Quality Size Data

Incremental catch
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