Skeena Independent Science Review Panel

Tradeoff Analysis

Prepared by

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for

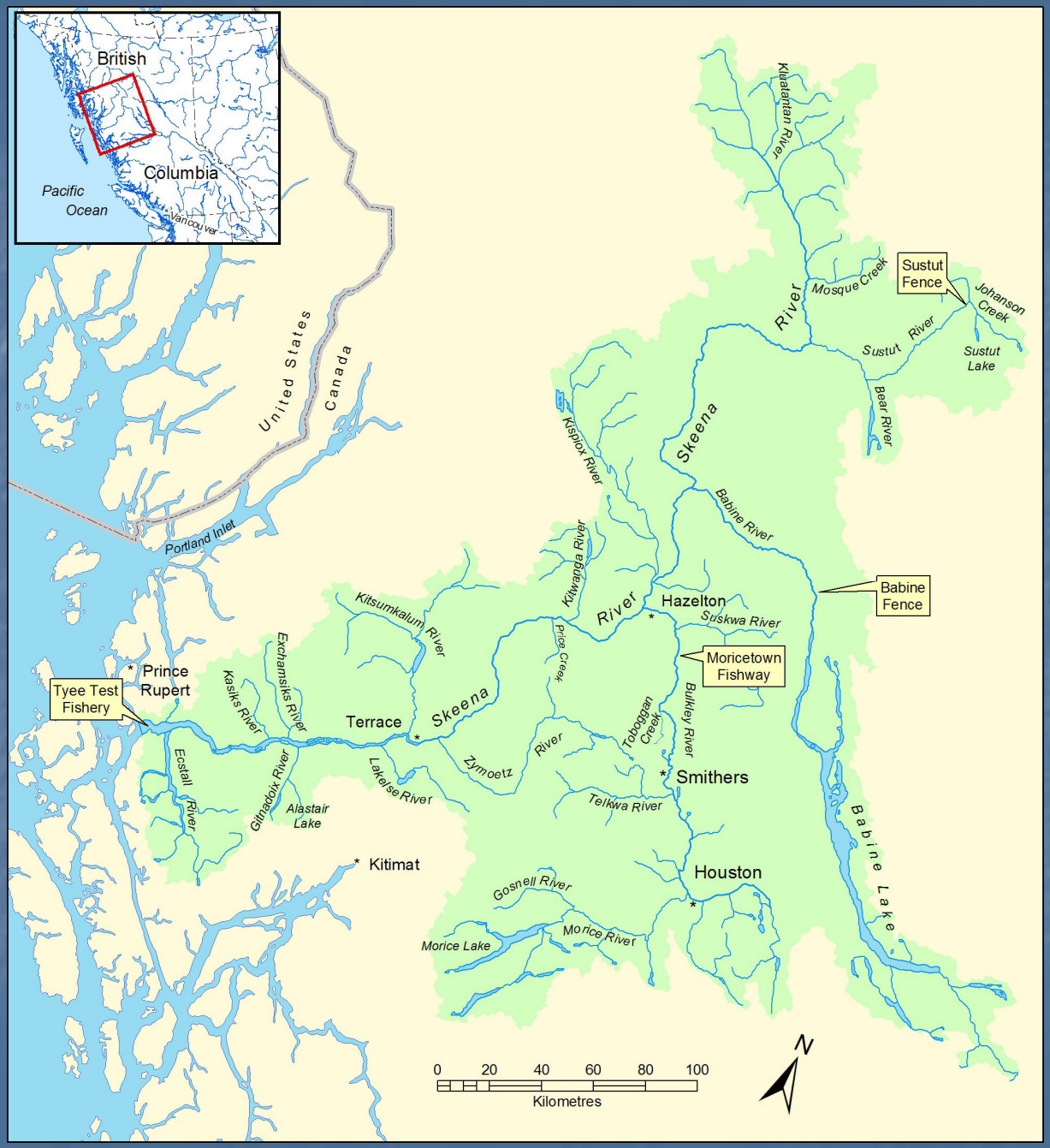
Conference on Ecological Interactions between
Wild and Hatchery Salmon
6 May 2010

Reasons for Tradeoff Analysis

- Productivity can vary substantially between stocks.
- Implementation of the Canada's Wild Salmon Policy requires estimates of sustainable harvest rates for stocks that are taken primarily in mixed-stock fisheries.
- Potential for SARA listing of overfished populations.

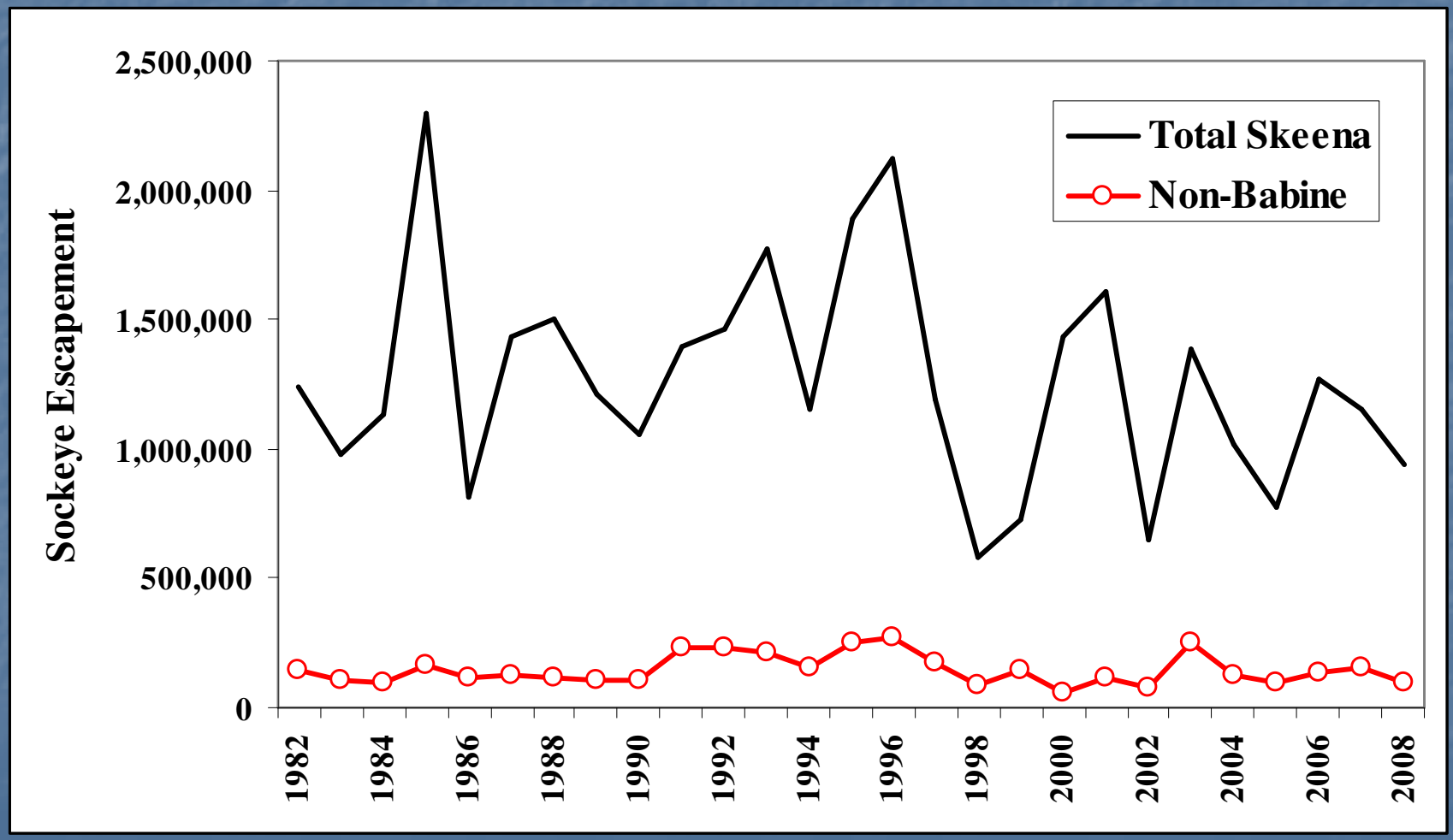
Skeena Watershed

- 54, 400 km^2
- CUs/stocks
  - 32 Sockeye
  - 8 Chinook
  - 5 pink
  - 4 chum
  - 4 coho
  - 2+ steelhead

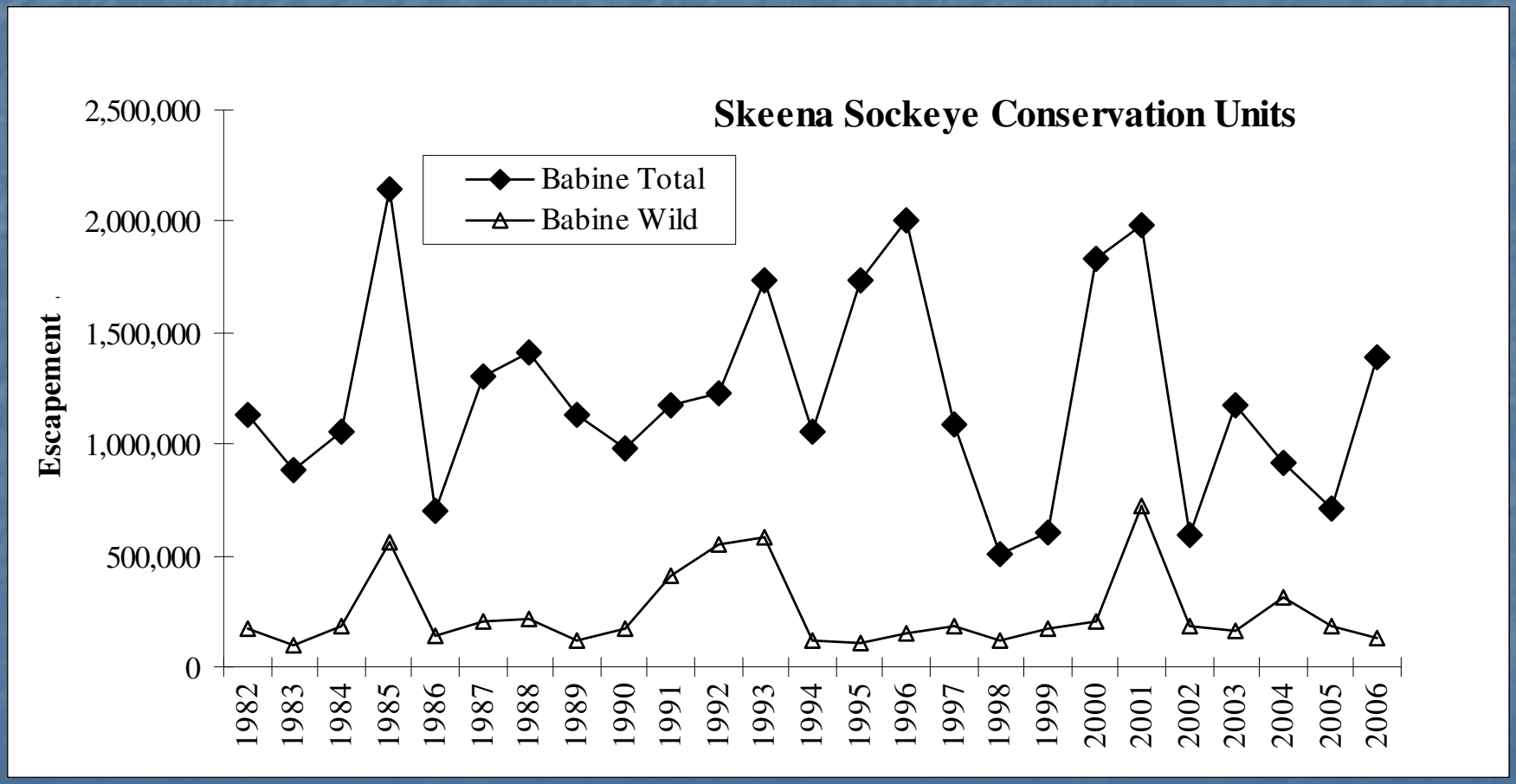


Skeena Chinook

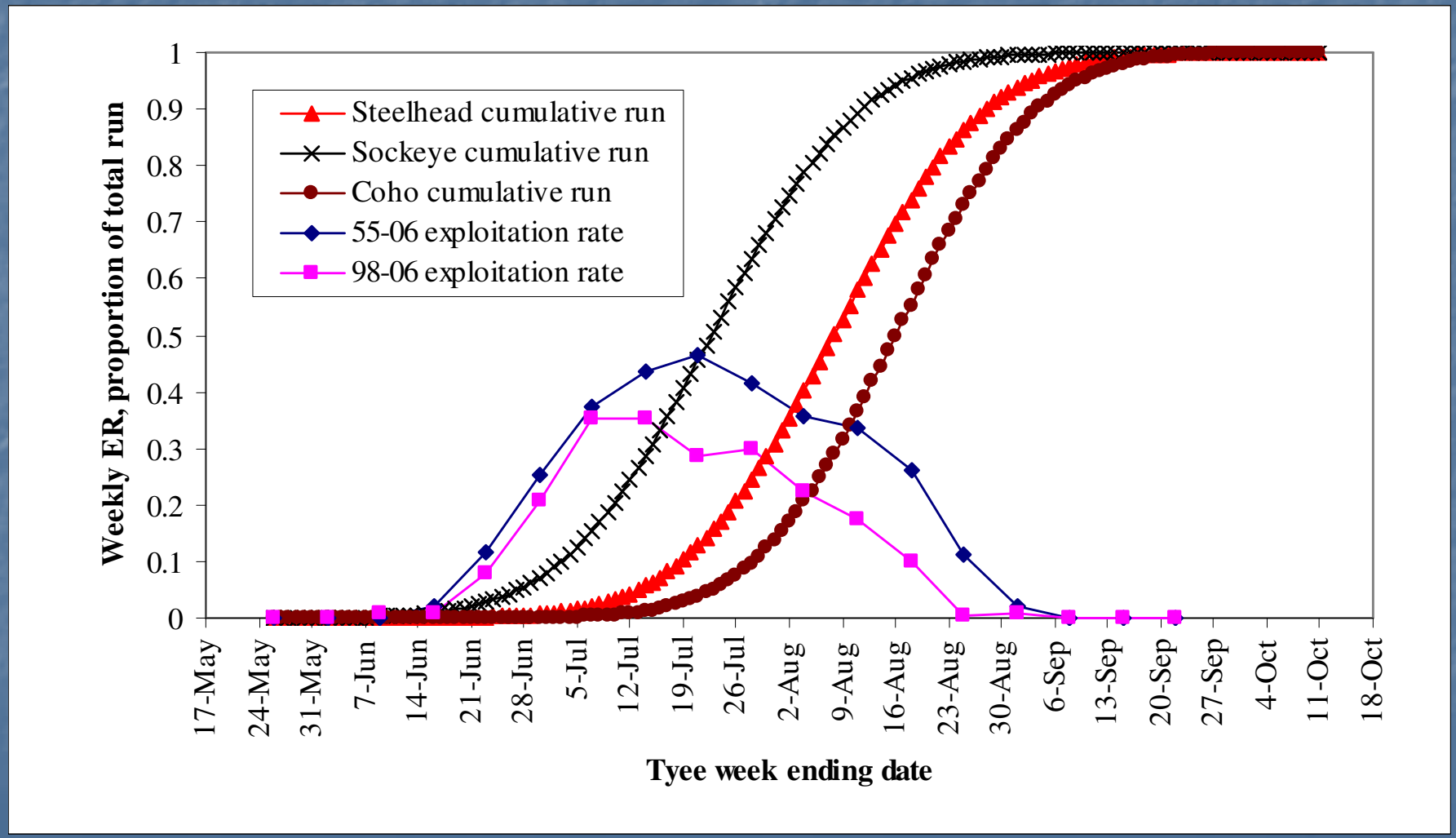
Babine Sockeye = 90-98% of Skeena Sockeye



Babine Enhanced = 56-92% of Babine sockeye

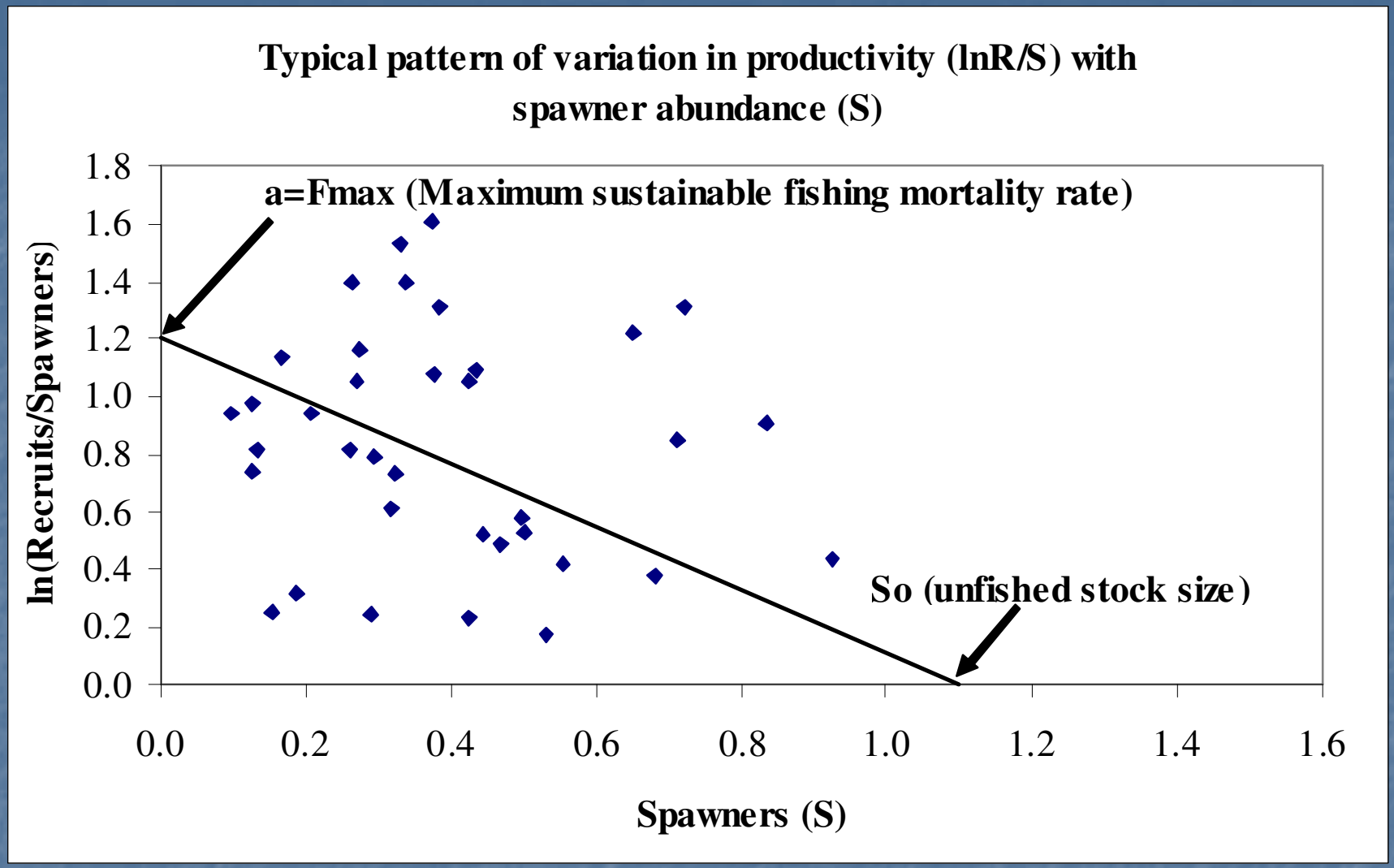


Average Run Timing & Exploitation Rates



ISRP Tradeoff Analysis

- Goal – Provide quantitatively estimated tradeoff curves to illustrate the type of information needed for well-informed decision making.
- Data needs – escapement and exploitation rate time series
- Analysis challenge – address known bias in stock-recruitment parameters

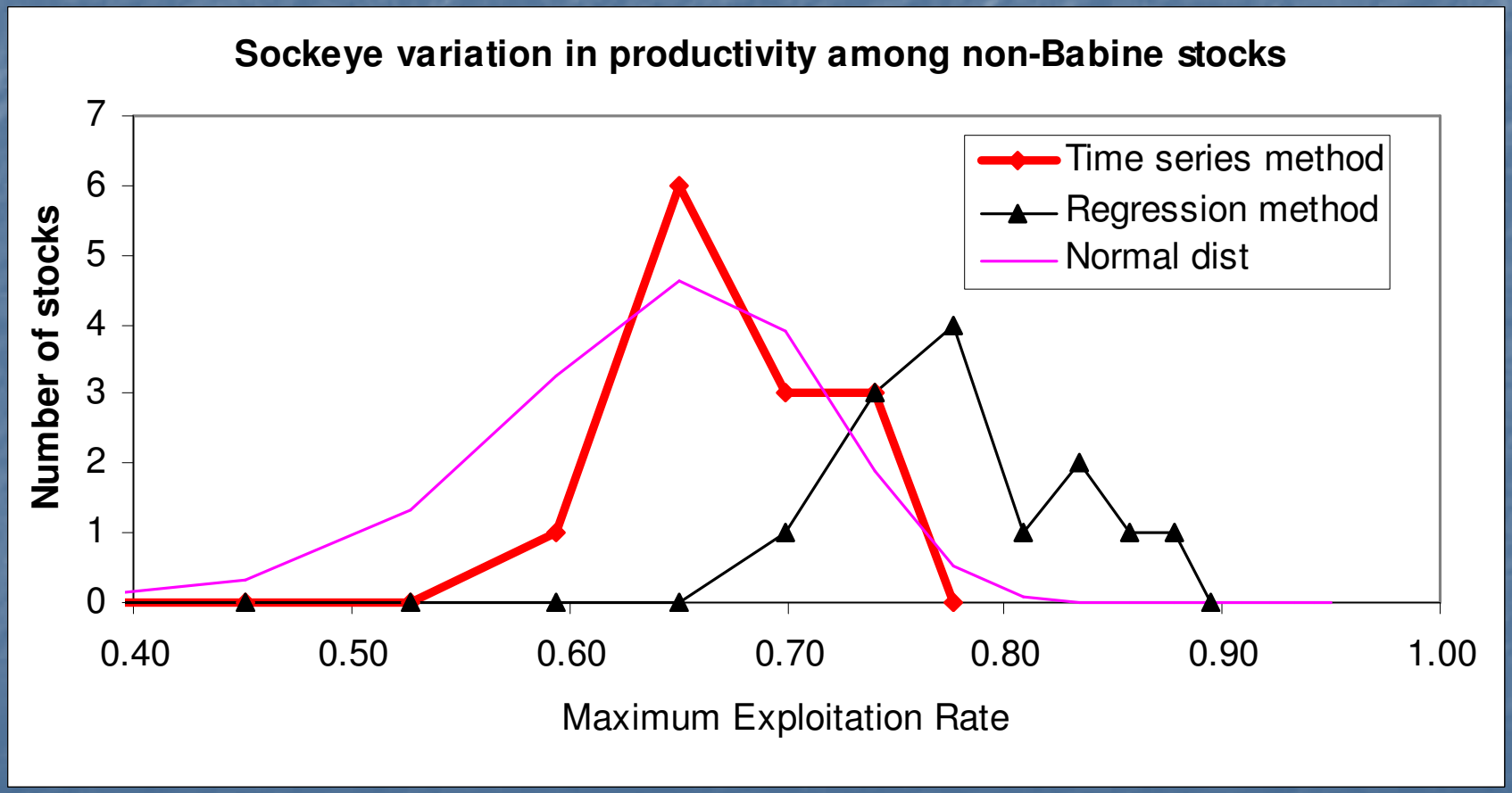


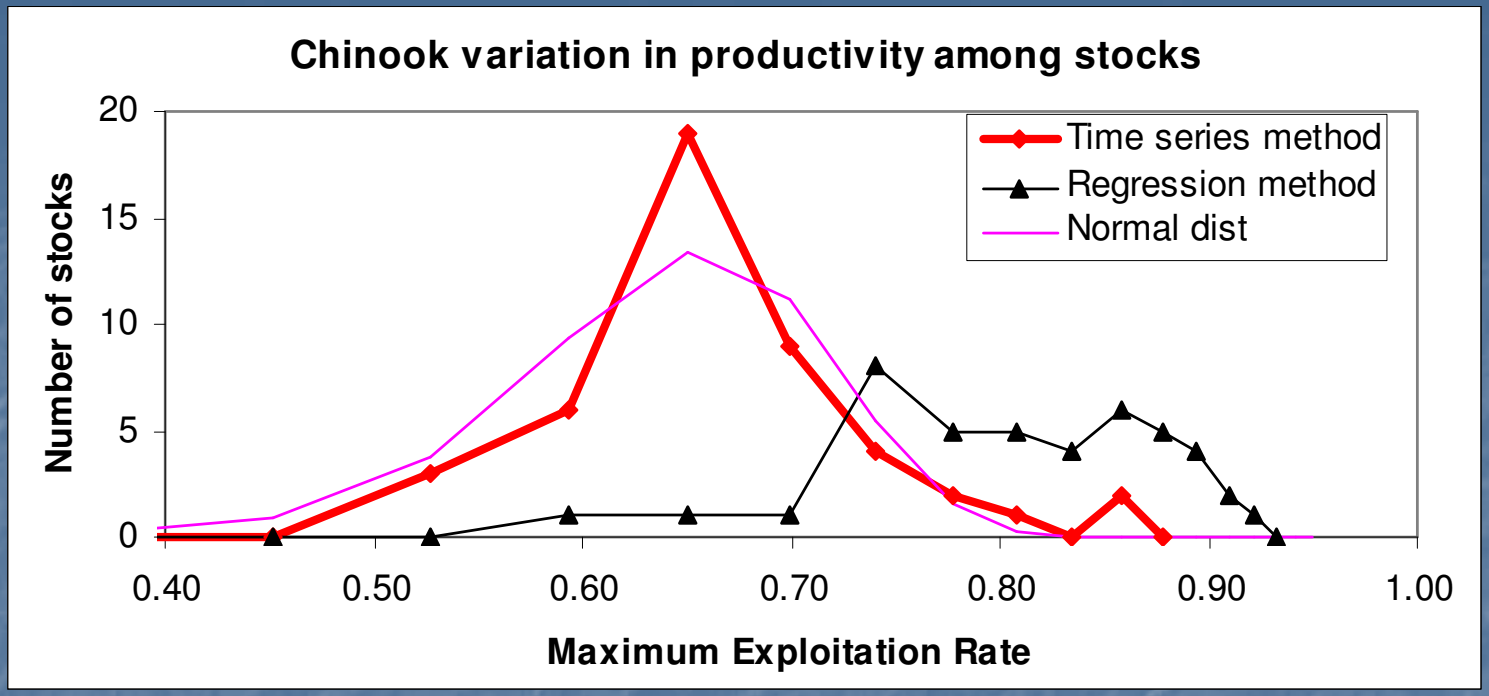
Linear regression fits – typically overestimate 'a' (Fmax) and underestimates So because of error-in-variables and time-series effects (Walters and Martell 2004)

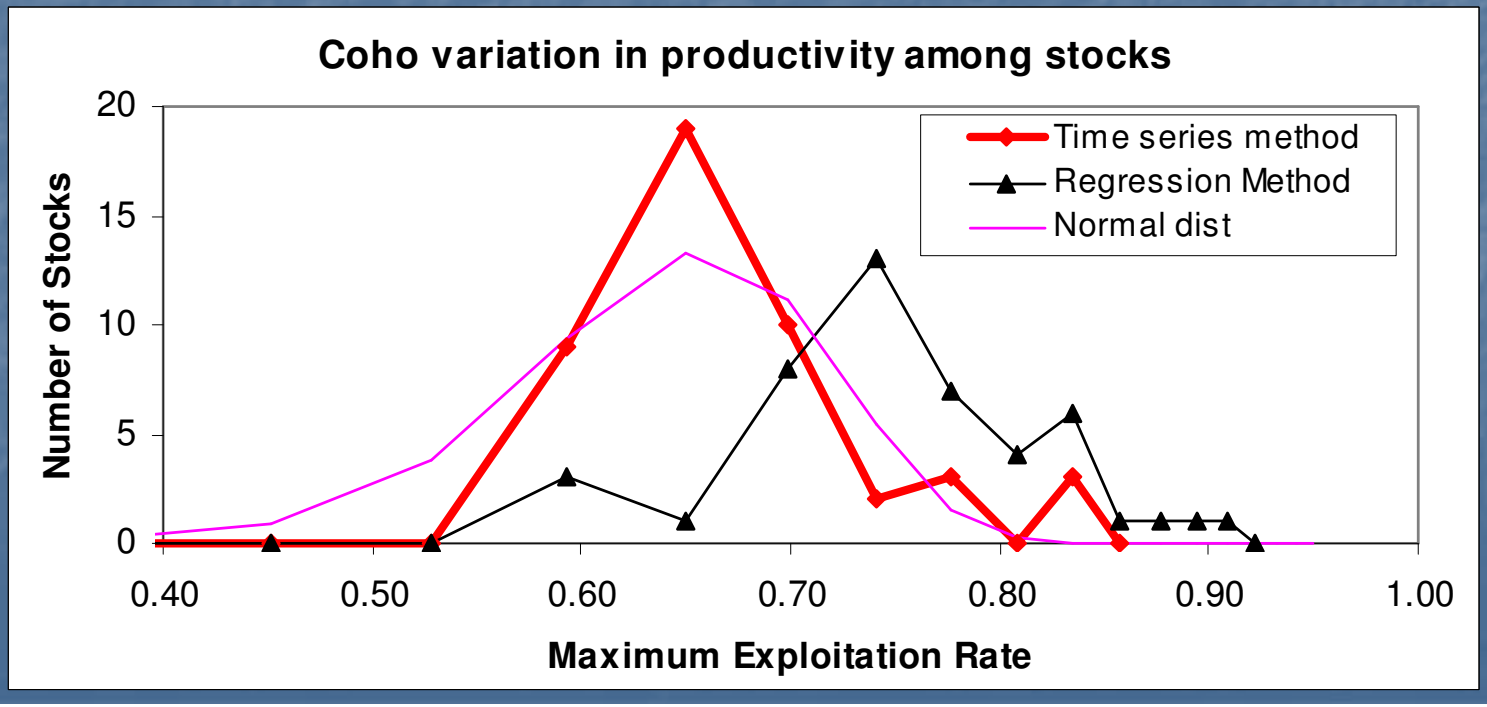
Skeena Analysis

- As part of the ISRP process, Carl Walters recommended a time series method for estimating the maximum exploitation rate (F_{max}) using escapement trend data for stocks that share variation in survival (i.e. exposed to similar fisheries, environmental conditions and estimation error).

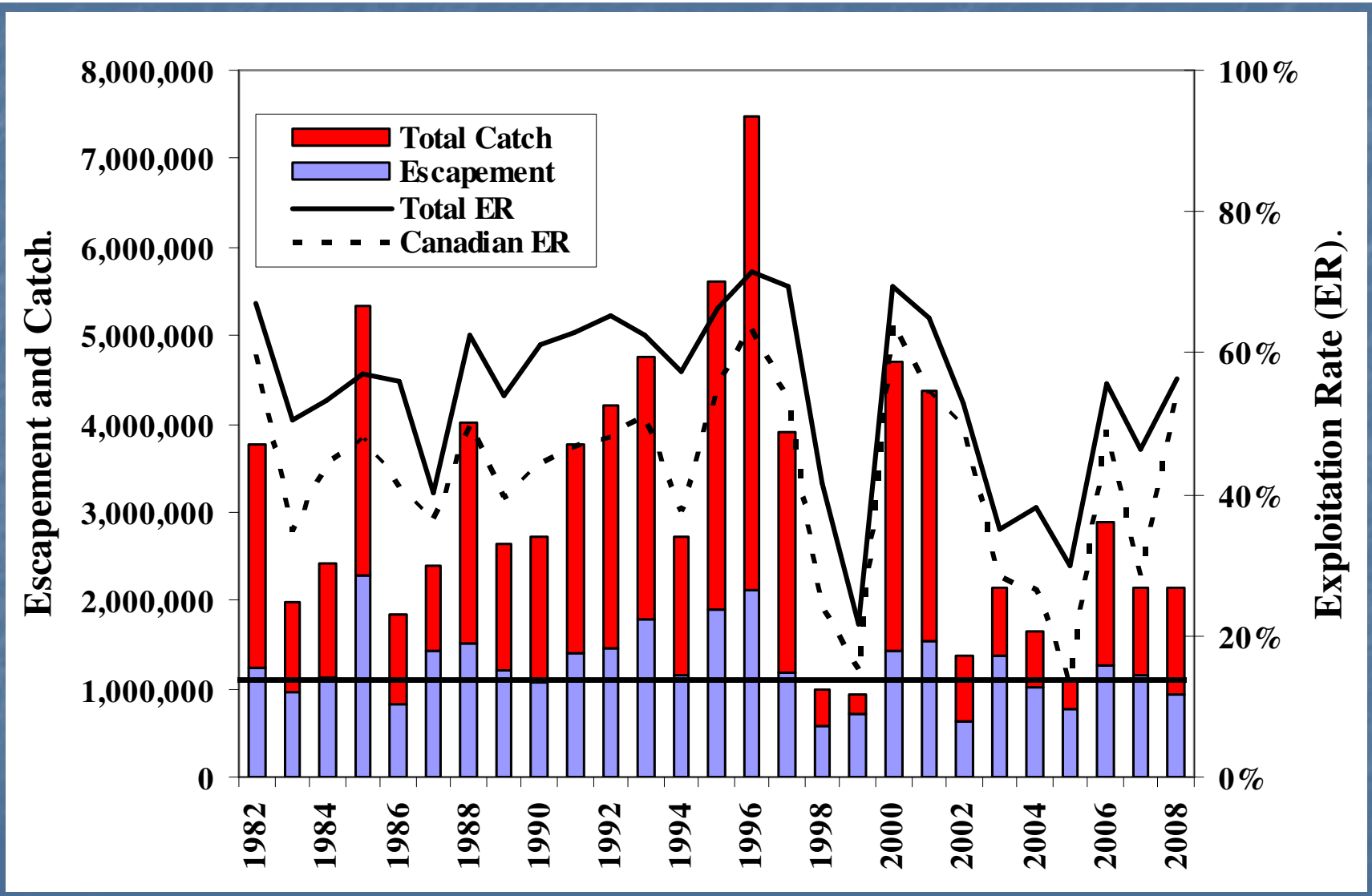
Estimation methods and variation in productivity between stocks



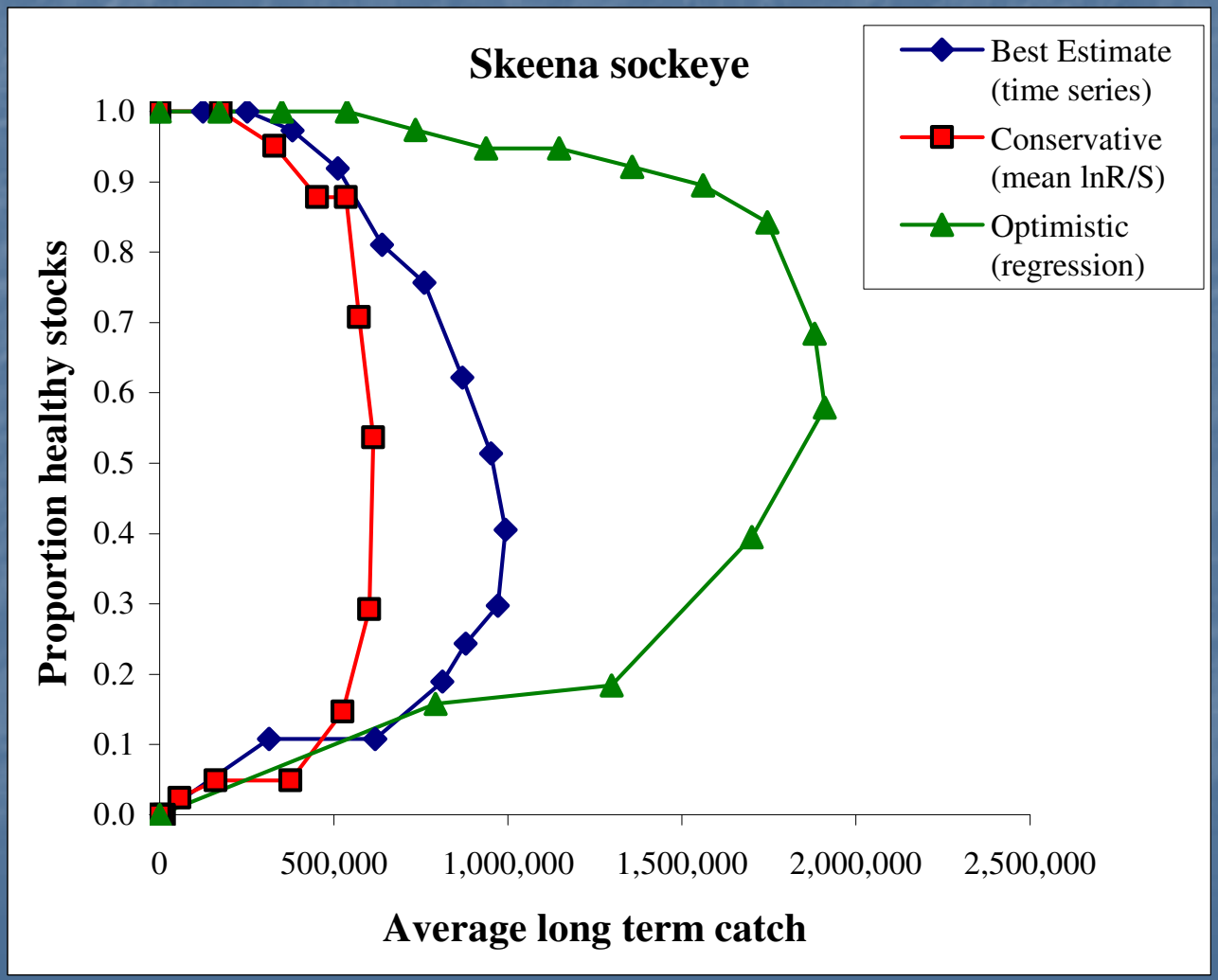

Chinook variation in productivity among stocks
Number of stocks
20
15
10
5
0
0.40
0.50
0.60
0.70
0.80
0.90
1.00
Maximum Exploitation Rate
Time series method
Regression method
Normal dist


Coho variation in productivity among stocks
Number of Stocks
20
15
10
5
0
0.40
0.50
0.60
0.70
0.80
0.90
1.00
Maximum Exploitation Rate
Time series method
Regression Method
Normal dist

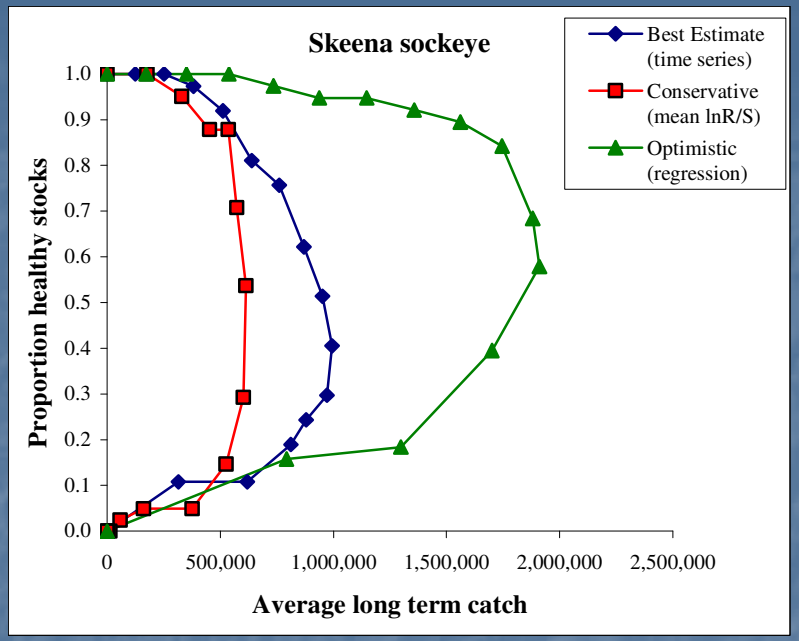
Skeena Sockeye Abundance and ERs

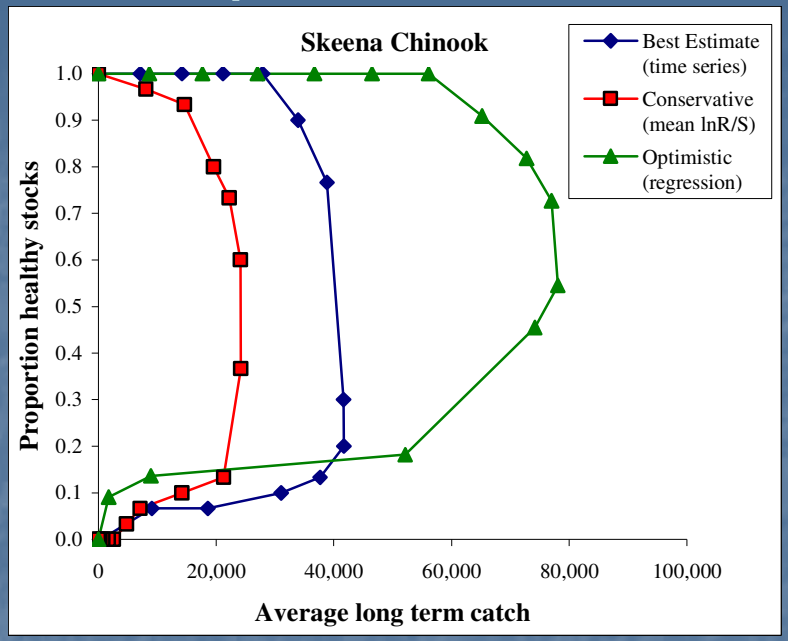


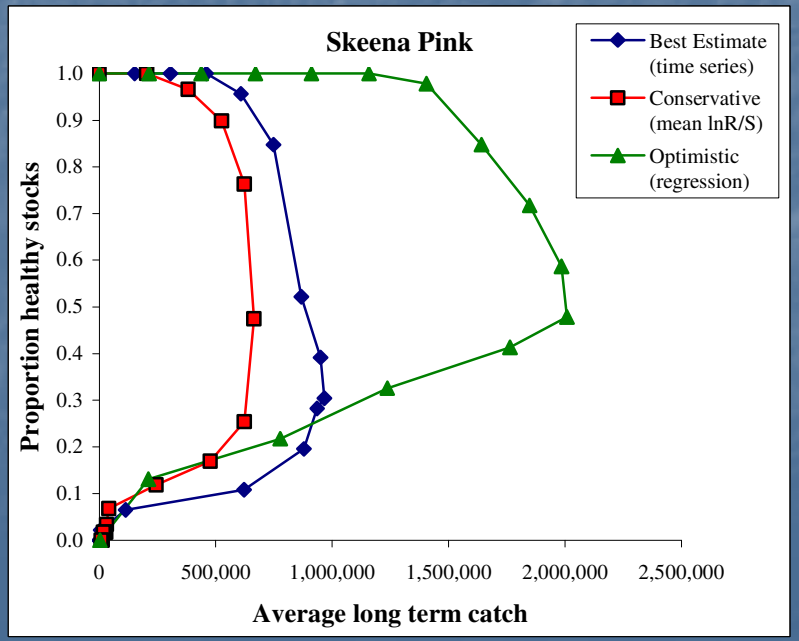
Tradeoff curves for Skeena sockeye

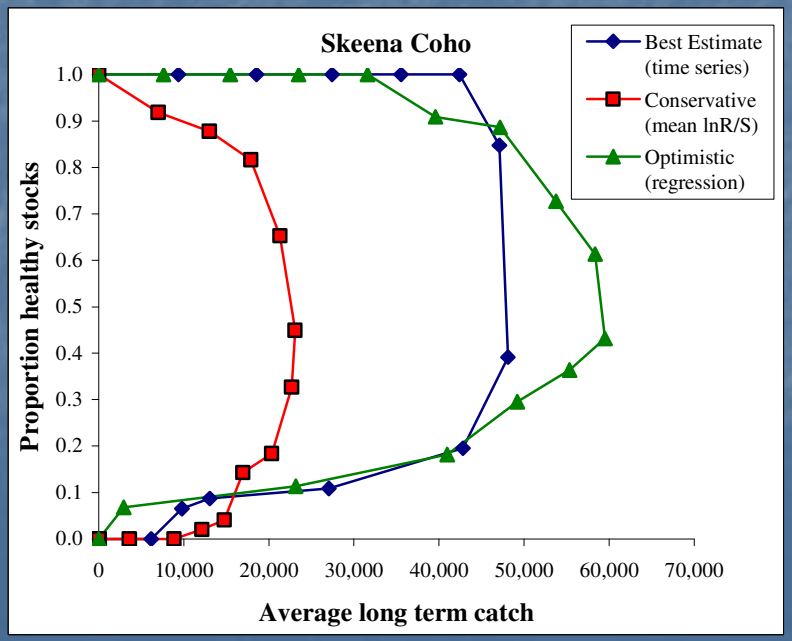


Other Skeena salmon species

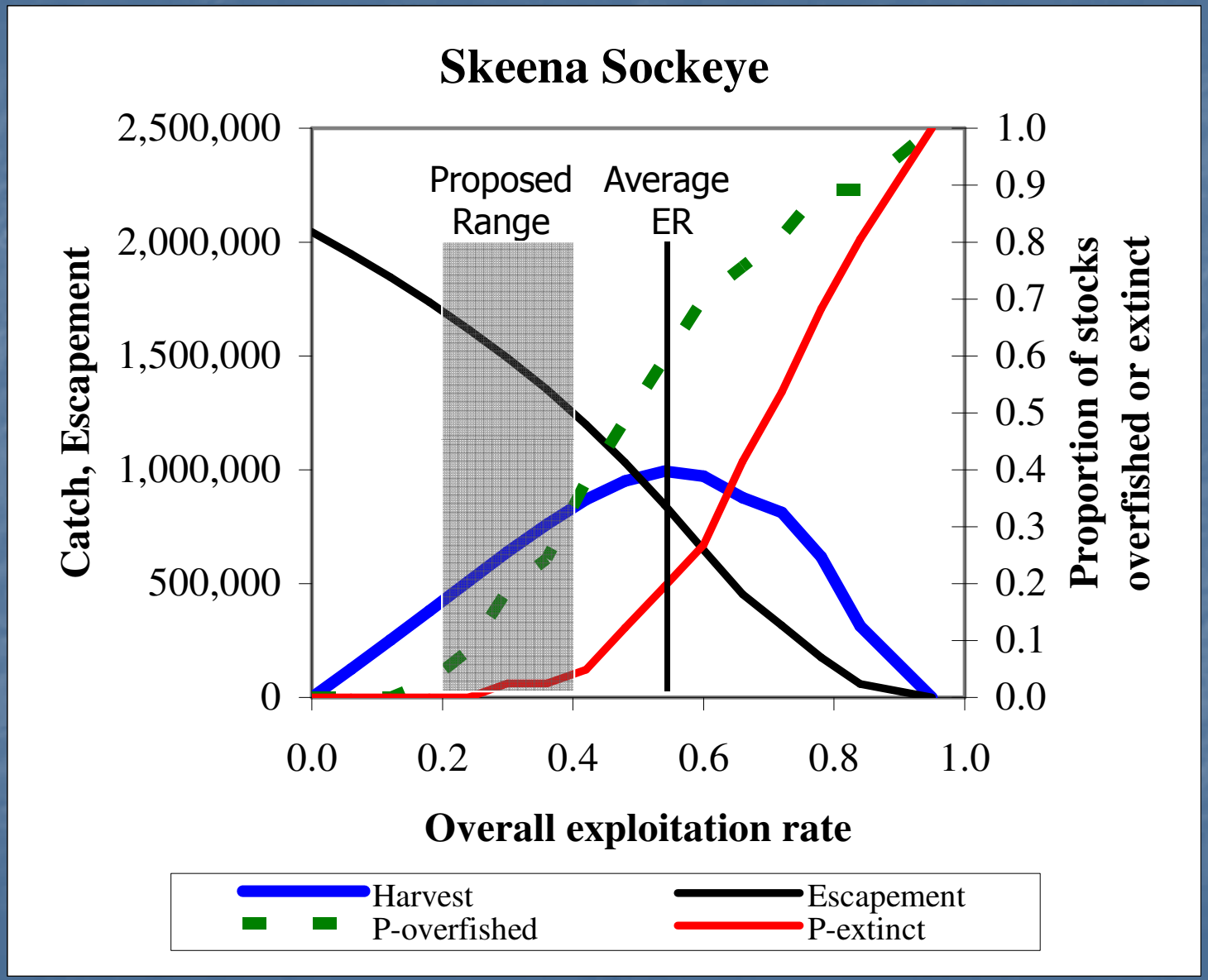




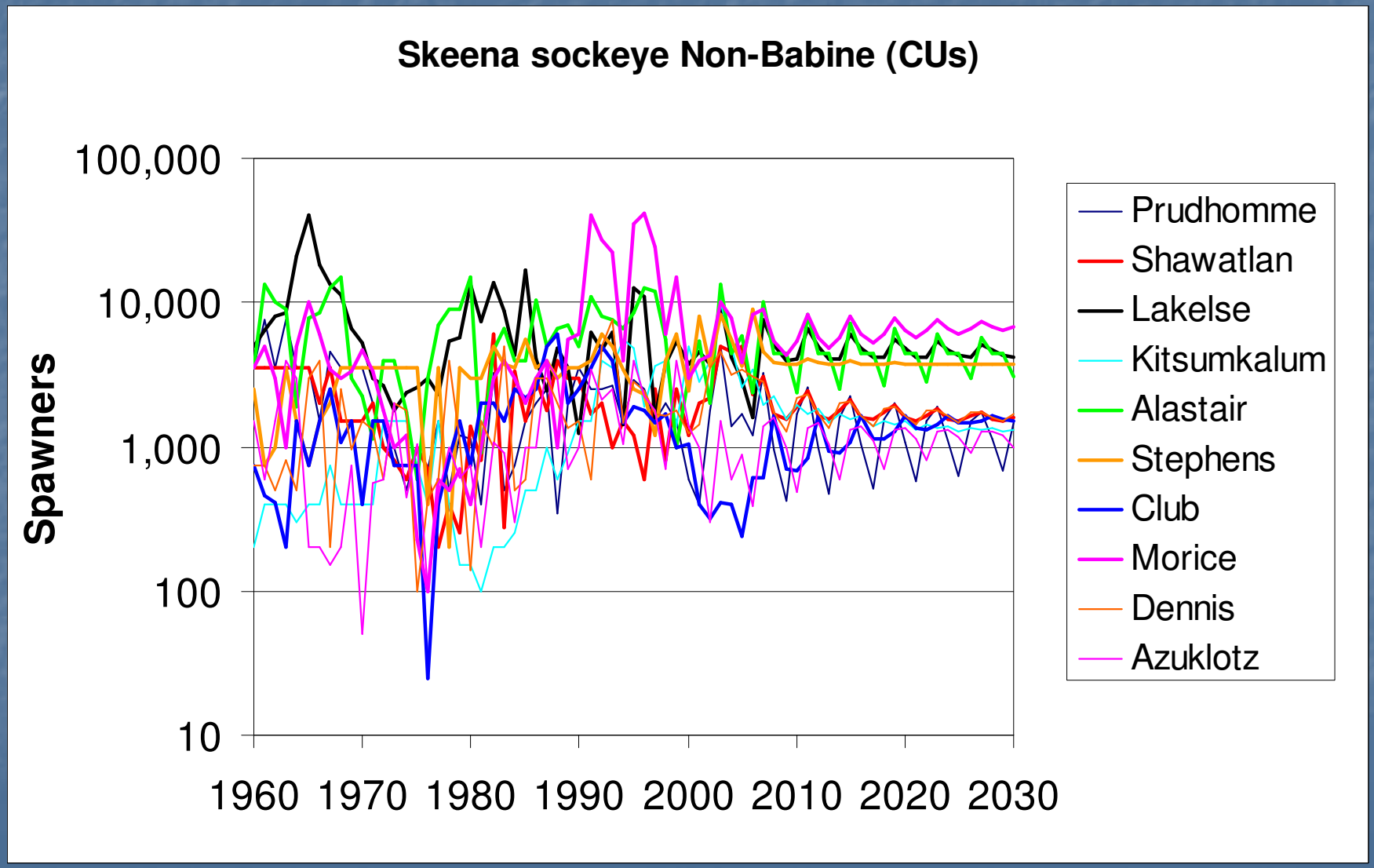




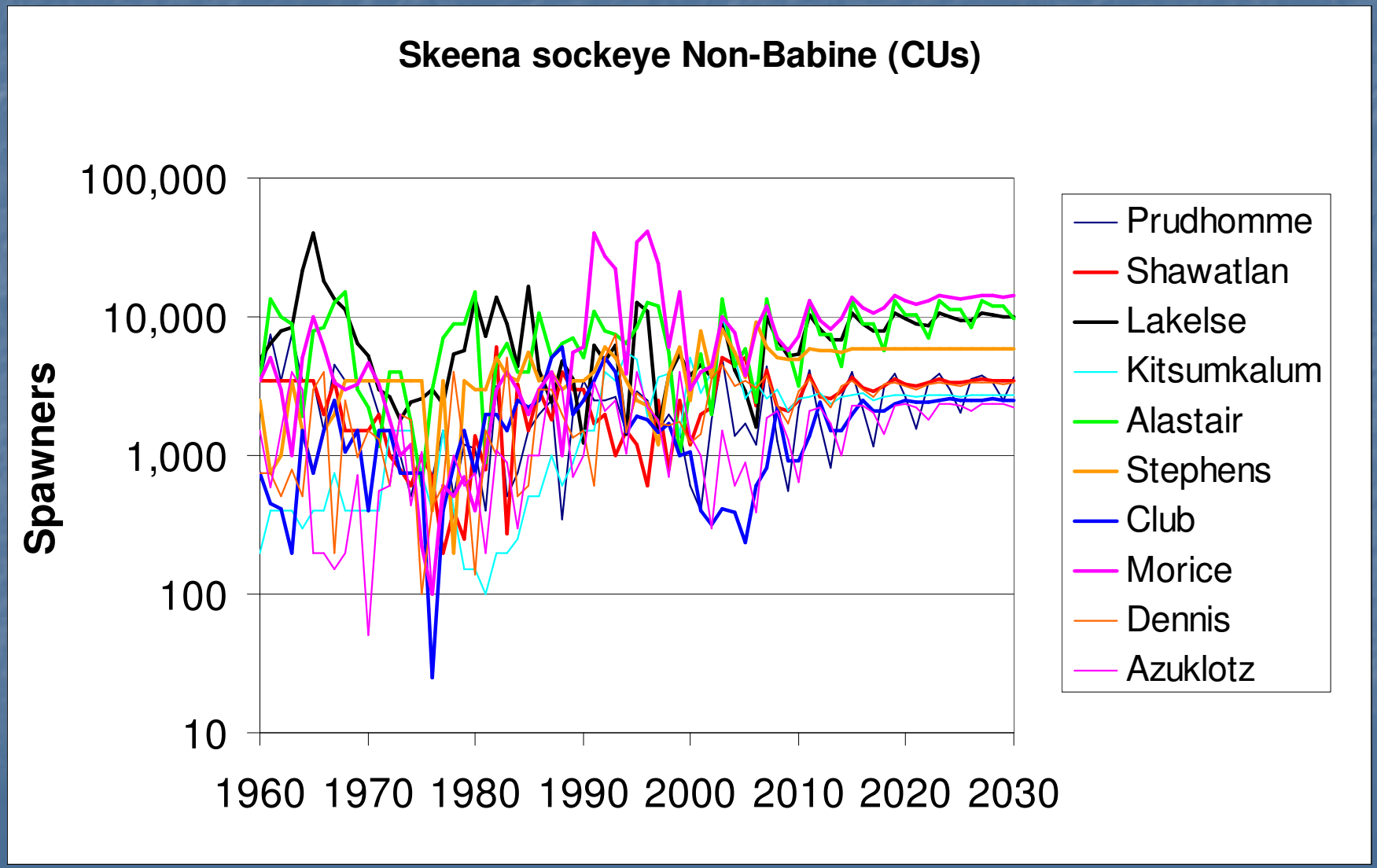
Sockeye Tradeoff Analysis



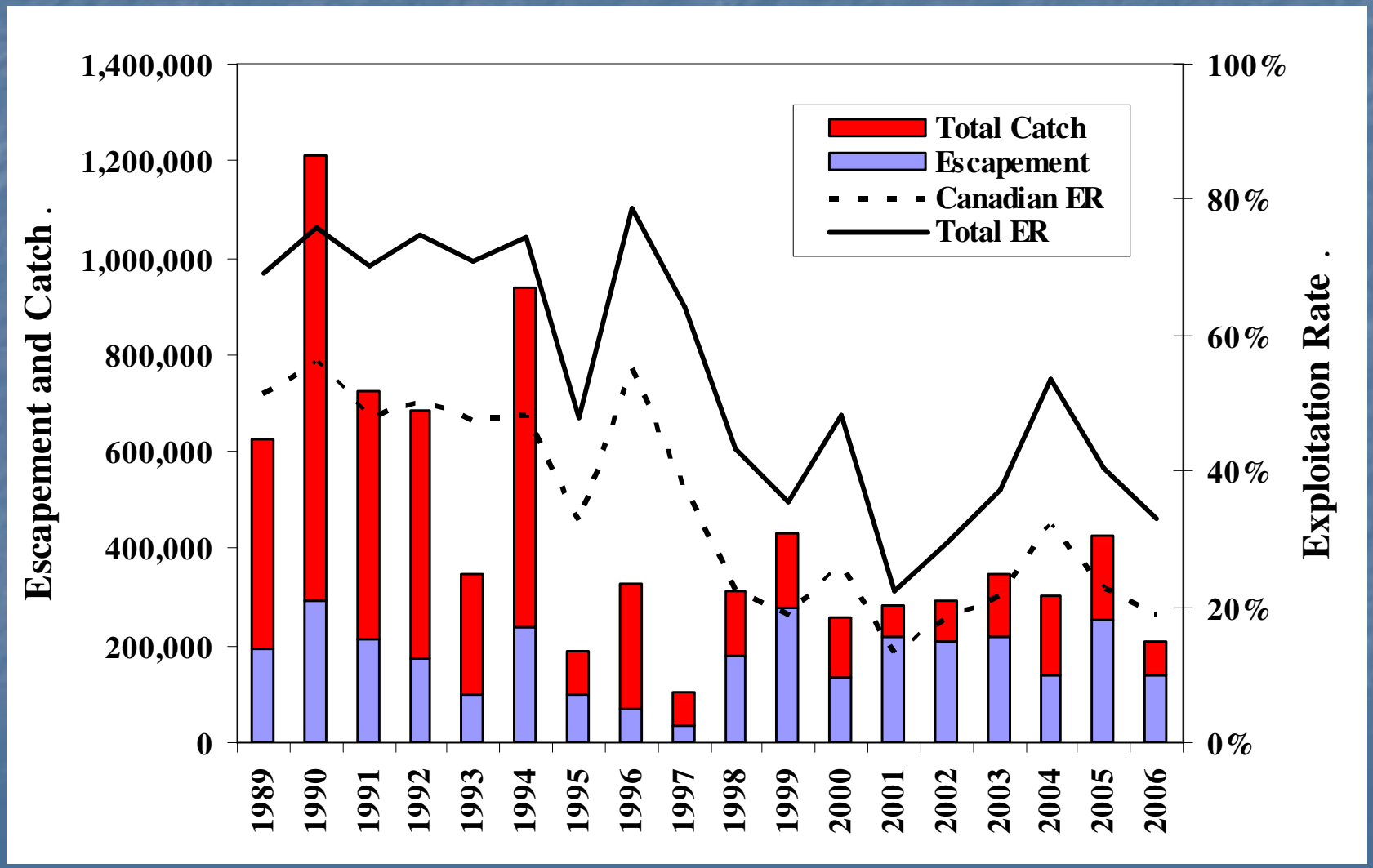
Average Mixed-stock HR = 55%



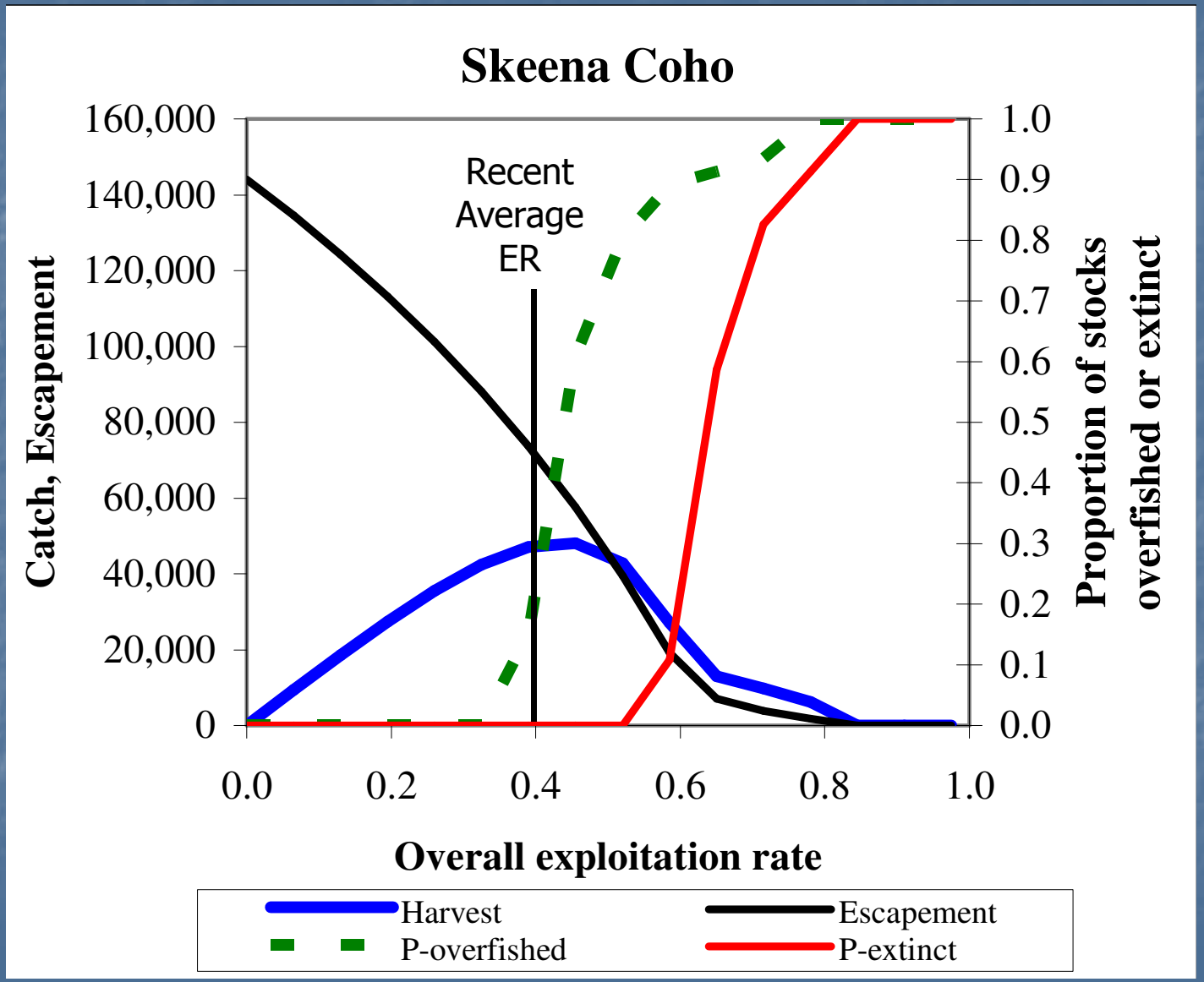
Average Mixed-stock HR = 40%



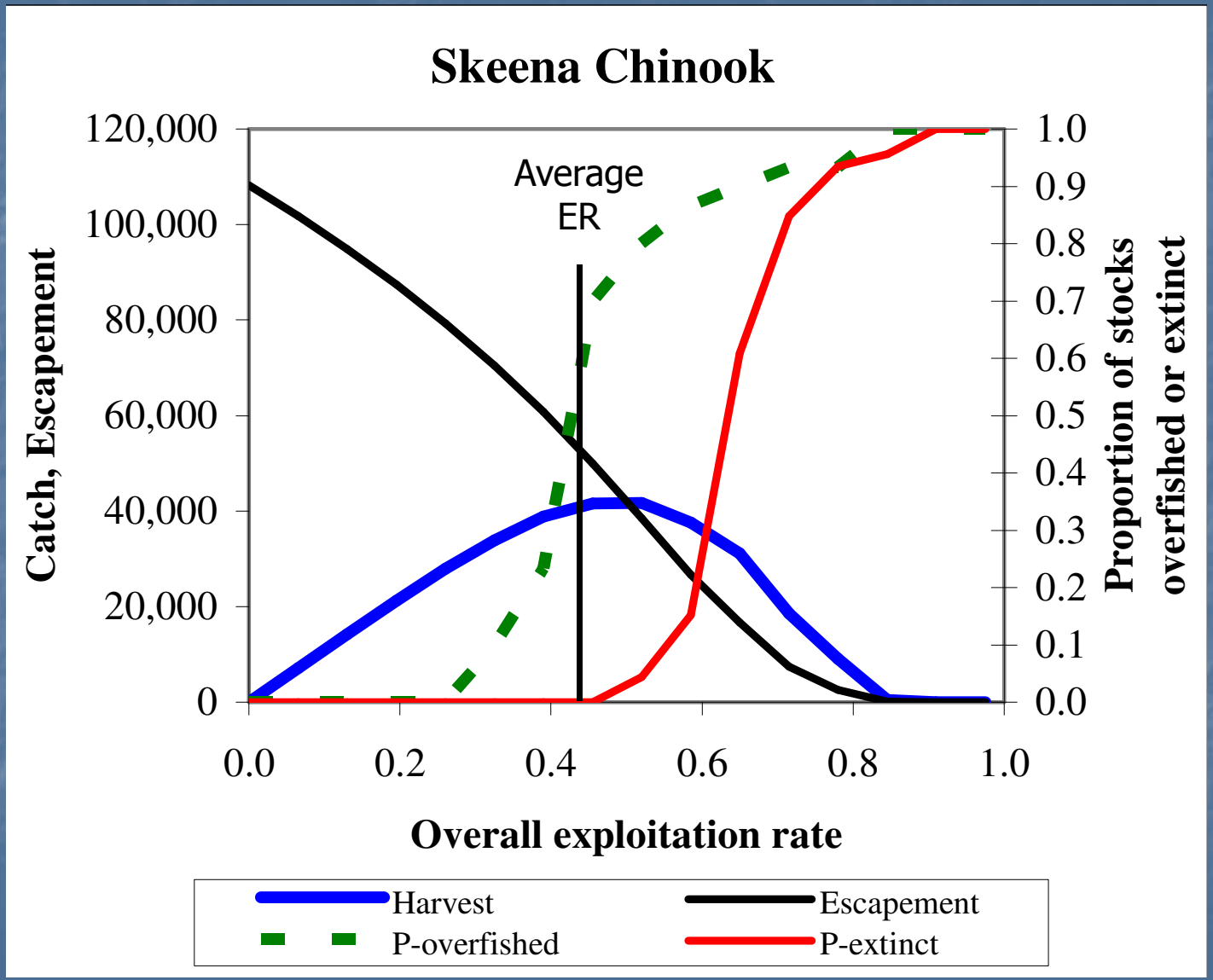
Skeena Coho Abundance and ERs



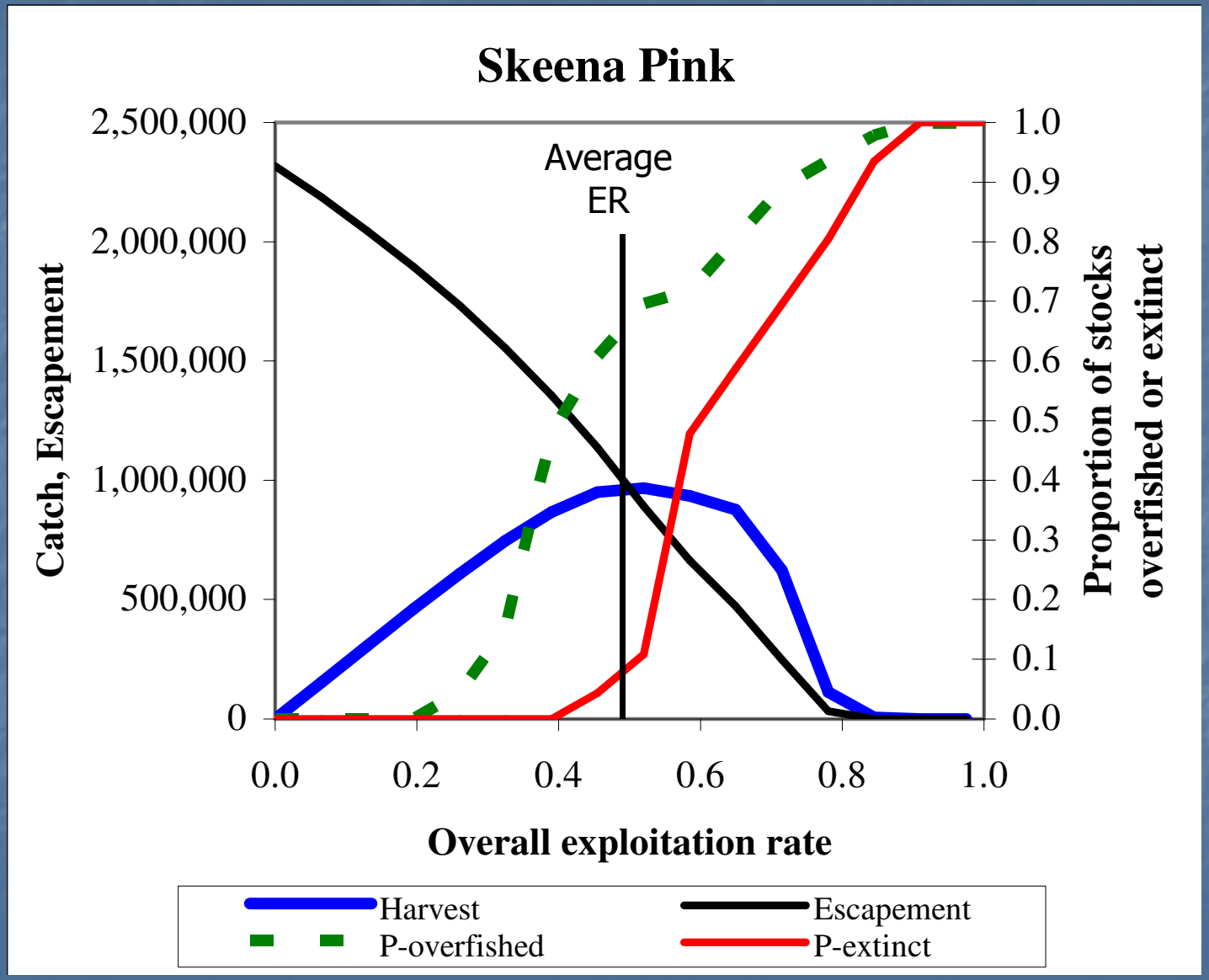
Coho Tradeoff Analysis



Chinook Tradeoff Analysis



Pink Salmon Tradeoff Analysis



Summary

- These analyses indicated that:
  - the proportion of stocks overfished is quite sensitive to small changes in catch and exploitation rate; and
  - it is not possible to achieve a high proportion of the maximum average yield in mixed stock fisheries without overfishing at least 10-20% of the coho and Chinook stocks and at least 30-50% of the sockeye and pink stocks.

Recommendation 1

- ISRP called for explicit public decision about the loss of biodiversity that is deemed acceptable and changes required to fisheries in order to achieve particular harvest objectives.

Need for find the balance between ocean mixed-stock fisheries and terminal in-river fisheries.

Fishwheel on the Babine River