Technical Review of the CWT Program and its Use for coho and Chinook Management Part II

Annette Hoffmann
Marianna Alexandersdottir
Pam Goodman

Bias in CWT SER's

- There are several sources of bias and many specific cases.
- The challenge is to figure out where and how to focus our efforts
  - find a way to rank the different sources
  - identify those we can do something about

Bias in CWT SER's

- What is the viability of CWT system and how does bias affect concept?
- Current sources of bias
- Impact of current sources on viability of CWT system

Simple Exploitation Rate

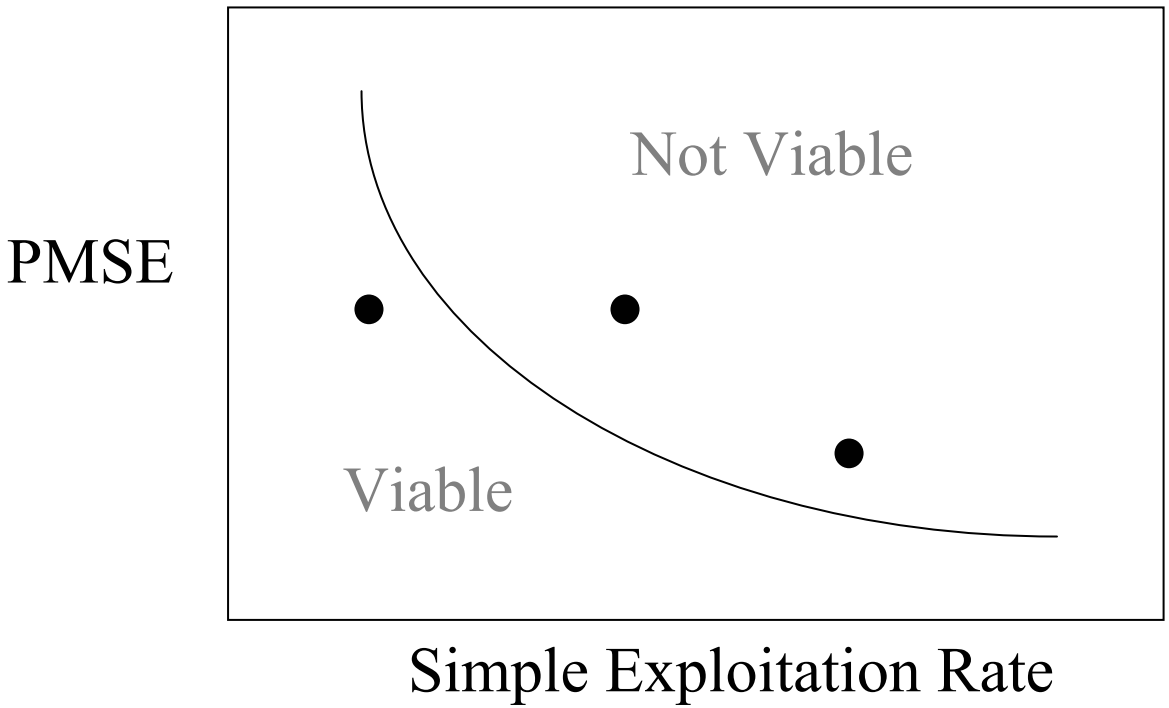
$$\frac{\text{Tags recovered in the fishery}}{\text{Tags in the fisheries + Tags in other fisheries + Tags in escapement}}$$

- does not include IM in other fisheries or NM

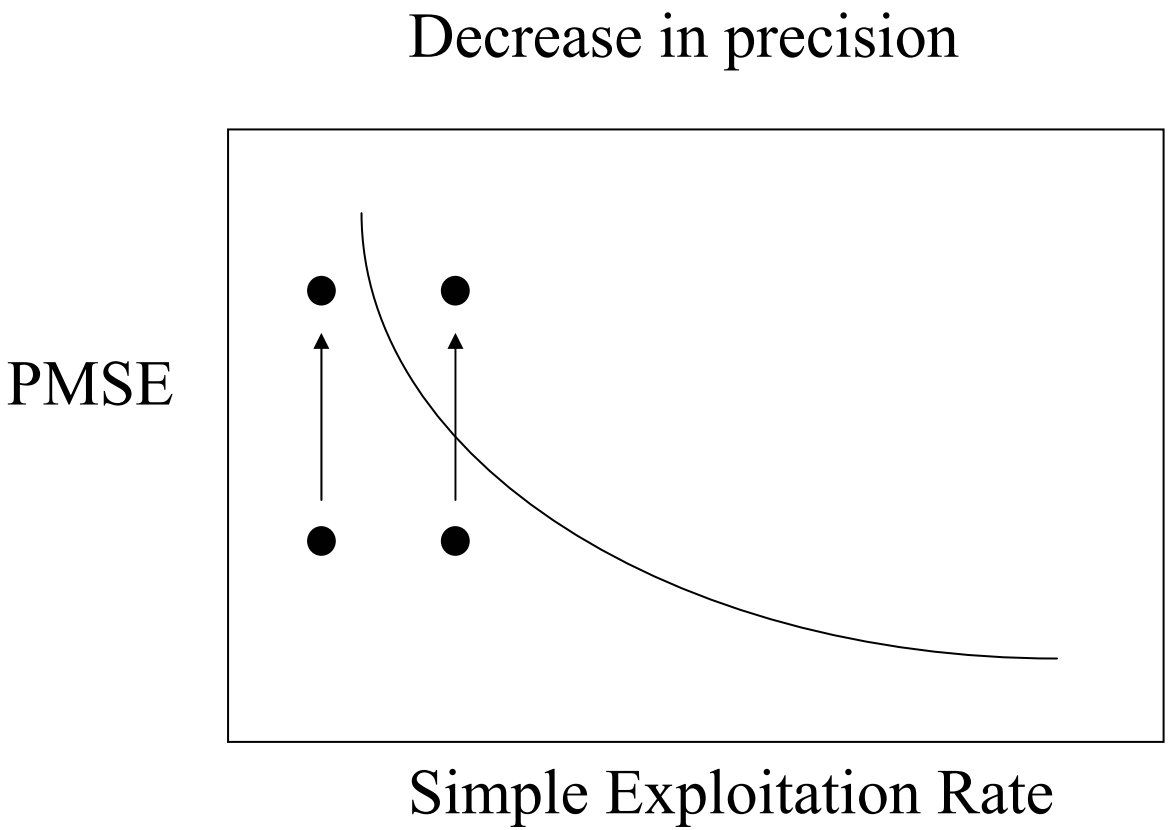
Total Error

$$\text{PMSE} = \frac{\sqrt{\text{Bias}^2 + \text{Variance}}}{\text{SER}}$$

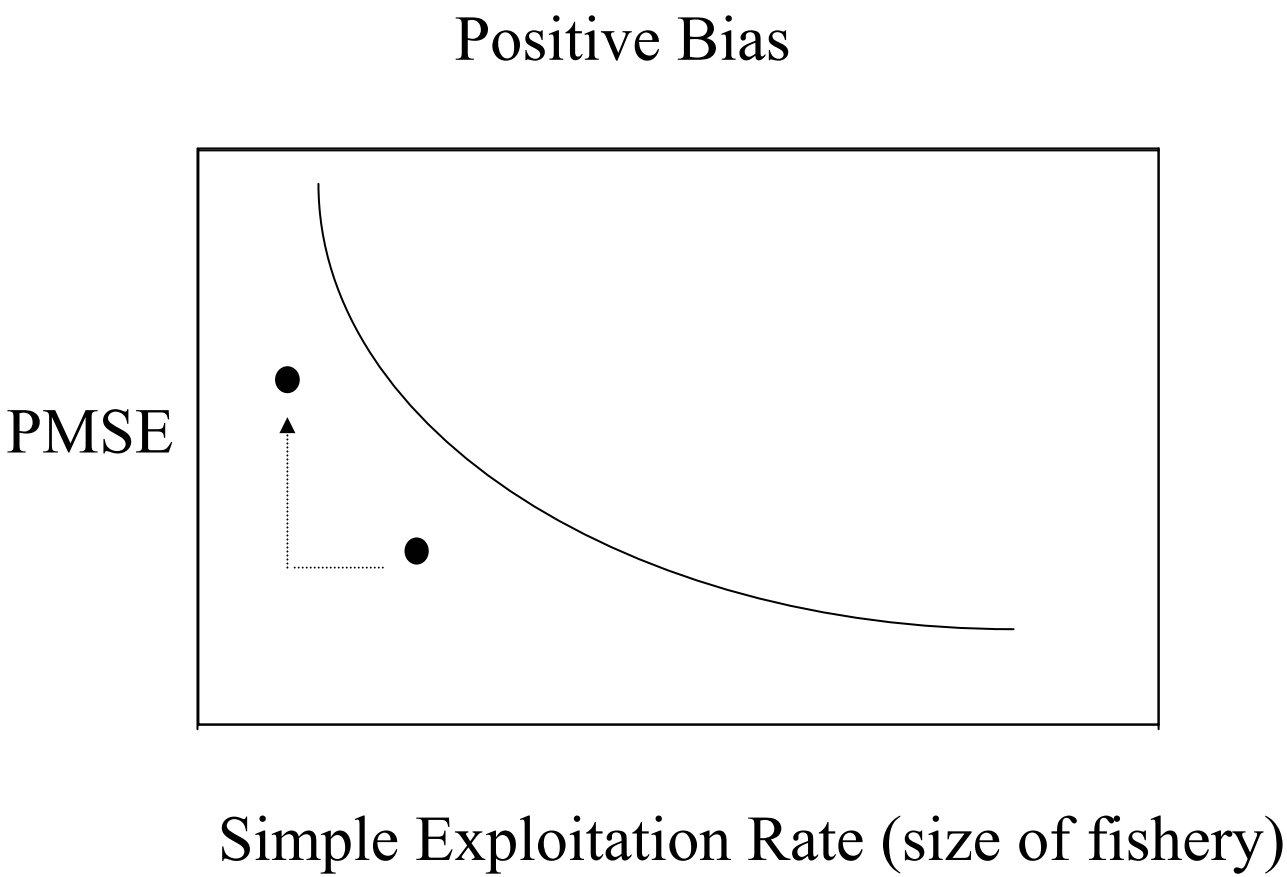
Viability of CWT System



Viability of CWT System



Viability of CWT System



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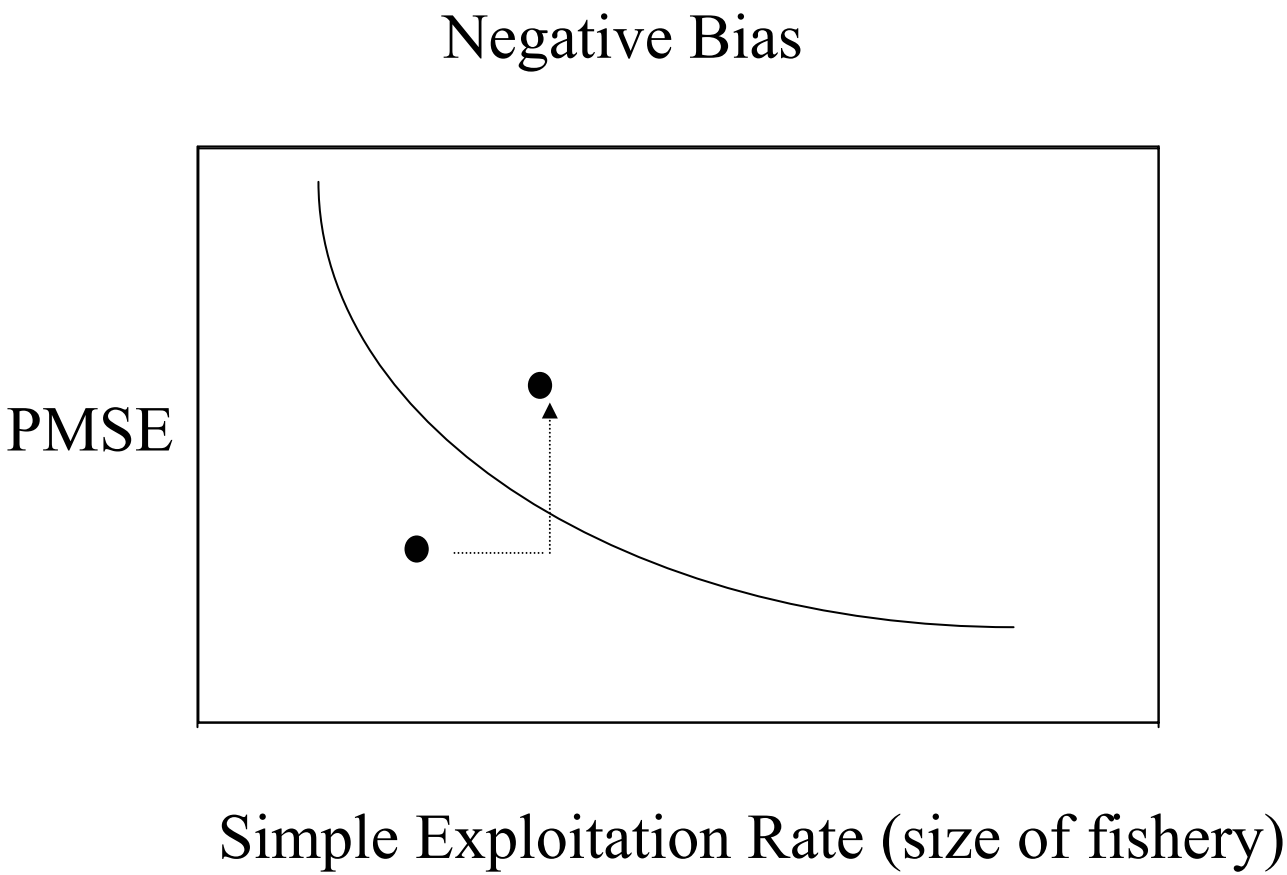

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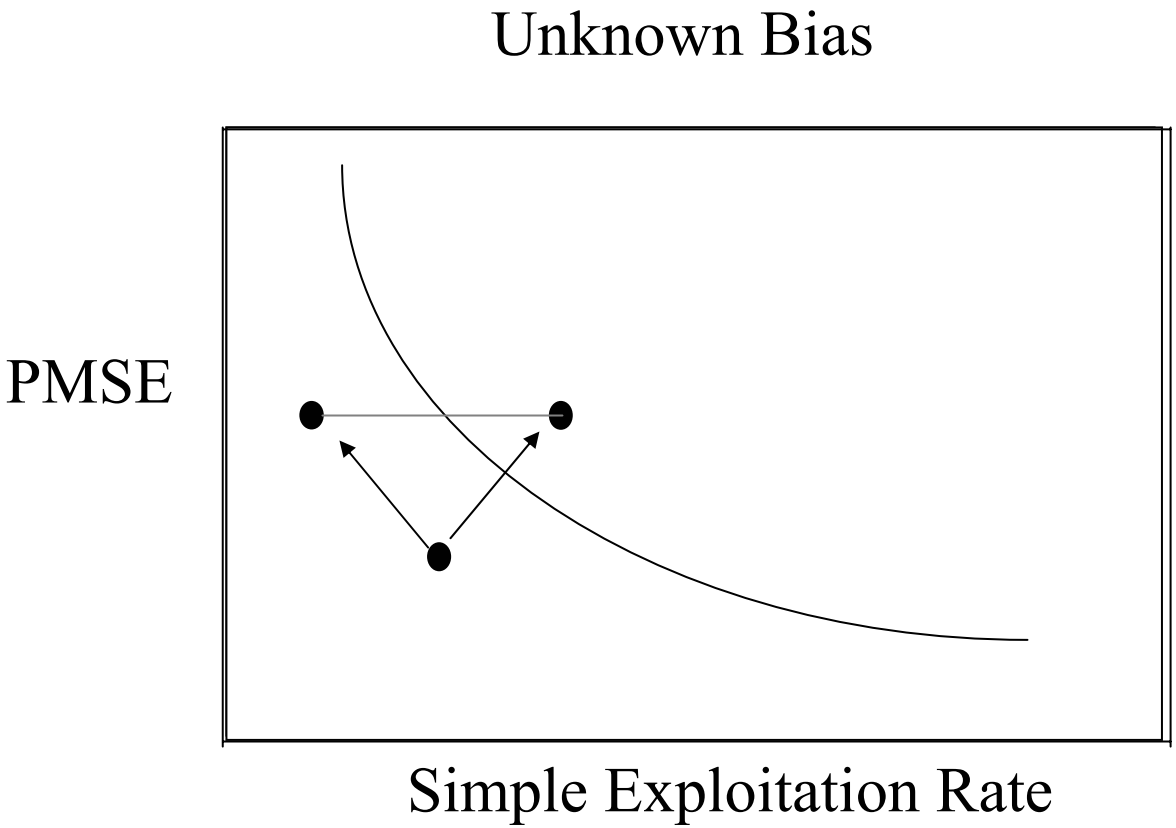


Bias in CWT SER's

- Incomplete coverage of catch
  - Unsampled freshwater sport fisheries
  - Unreported commercial catch
- Incomplete accounting of escapement

Bias in CWT SER's

Incomplete Coverage in a Fishery

$$\frac{\text{Tags recovered in the fishery}}{\text{Tags in the fisheries} + \text{Tags in other fisheries} + \text{Tags in escapement}}$$

Exploitation rate in fishery with unrecovered tags is too small

Bias in CWT SER's

Incomplete Coverage in a Fishery

$$\frac{\text{Tags recovered in other fisheries}}{\text{Tags in the fisheries} + \text{Tags in other fisheries} + \text{Tags in escapement}}$$

Exploitation rate other fisheries is too large

Bias in CWT SER's

Incomplete Coverage in Escapement

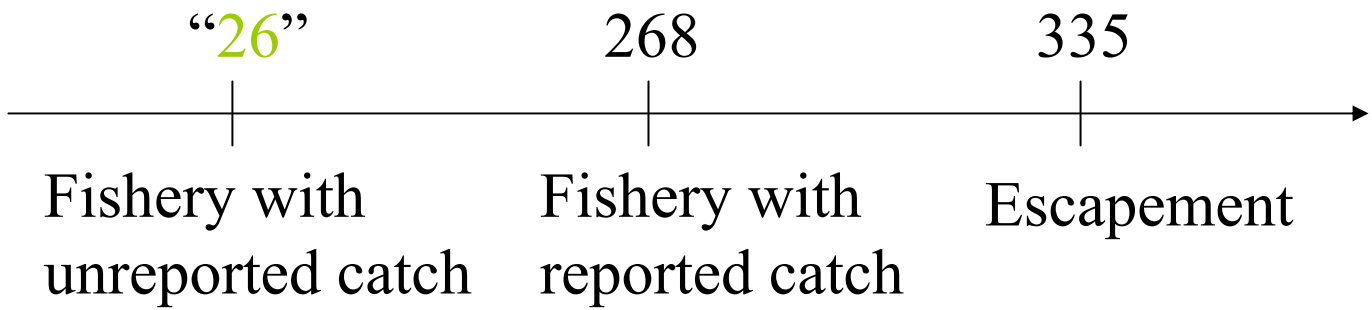
$$\frac{\text{Tags recovered in a fishery}}{\text{Tags in the fisheries} + \text{Tags in other fisheries} + \text{Tags in escapement}}$$

Exploitation rates in all fisheries are too large

Examples of Undercoverage Bias

- Skagit River Coho Sport Fishery – one of the larger coho sport fisheries not currently sampled for tags.
- Hood Canal Coho Commercial Fishery – a fishery with potentially substantial unreported catch.

Skagit River Coho Sport Fishery



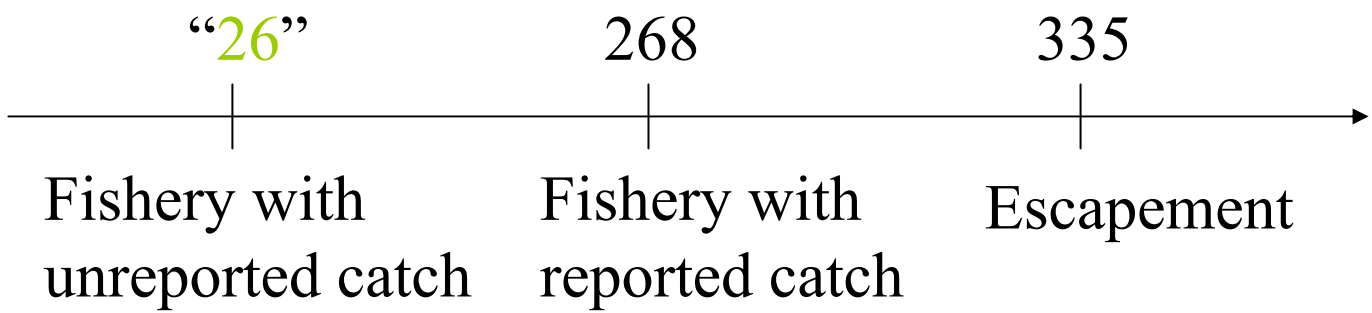
FW sport fishery = 1225 (marked and unmarked)

Hatchery released 210,588 marked smolts
Unmarked production was estimated at 1,808,109
Production mark rate = 210,588/(210,588+1,808,109) = 0.10

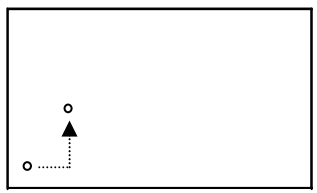
Marked fish in FW sport fishery = 1225*0.10 = 123

With a hatchery tagging rate of 20.5% => 26 tagged fish

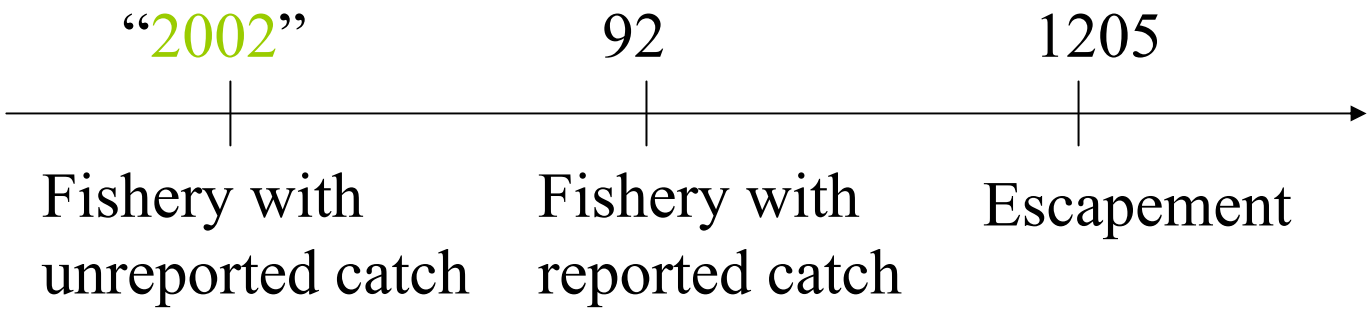
Skagit River Coho Sport Fishery



	True SER	Apparent SER
Fishery with unreported catch	$\frac{26}{629} = 0.041$	0.0
Fishery with reported catch	$\frac{268}{629} = 0.426$	$\frac{268}{603} = 0.444$

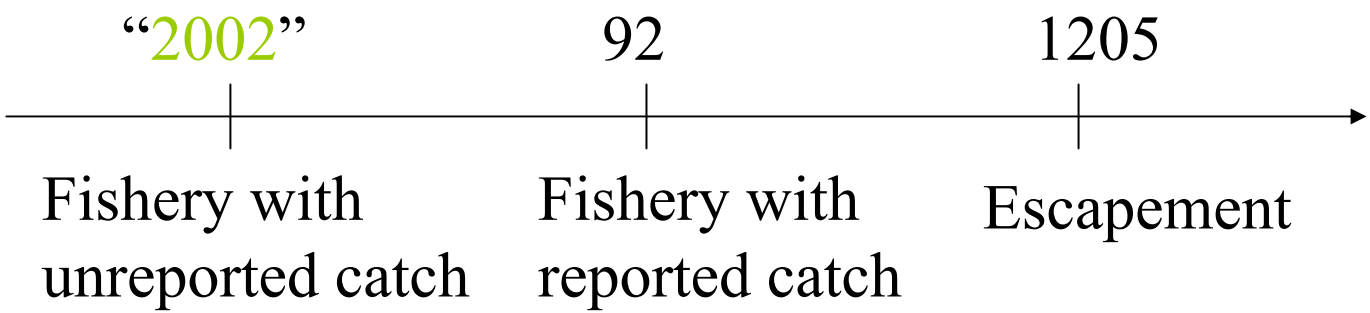


HC Commercial Coho Fishery

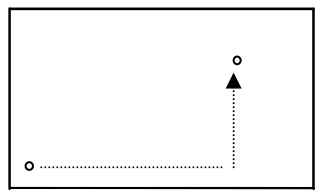


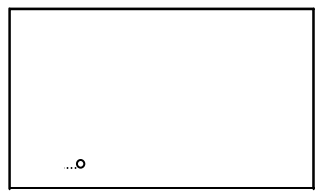
Special sampling effort recovered 803 CWT's that were expanded to 2002 estimated tags

HC Commercial Coho Fishery

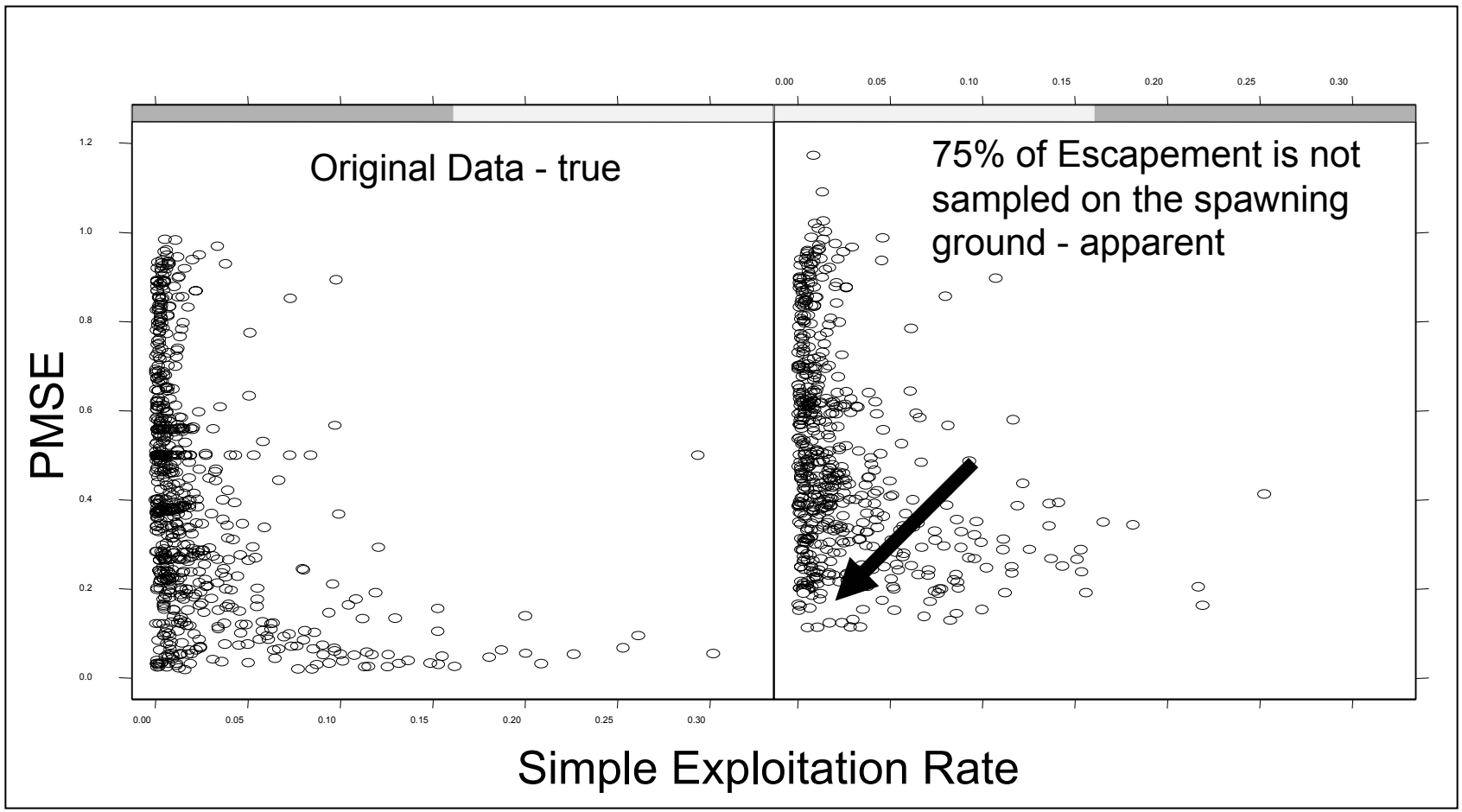


	True SER	Apparent SER
Fishery with unreported catch	$\frac{2002}{3299} = 0.607$	0.0
Fishery with reported catch	$\frac{92}{3299} = 0.028$	$\frac{92}{1297} = 0.071$





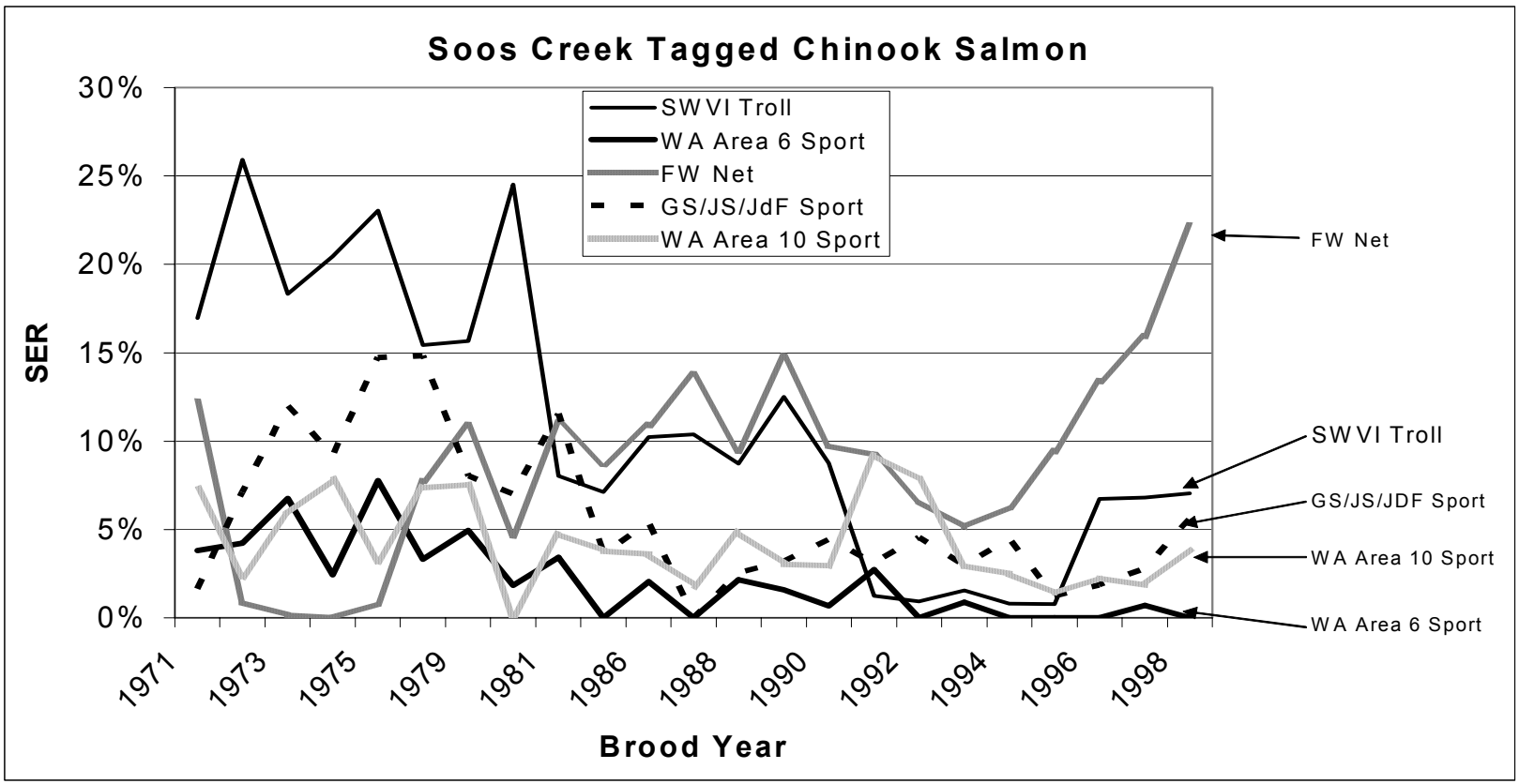
Escapement Sampling Bias



Conclusions

- Most fisheries have small SER's (< 5%) with PSE's in the 47-64% range.
- Few fisheries, generally terminal, have larger SER's (> 5%) with PSE's 25-37%.
- Precision needs will depend on objective, i.e. less relative precision may still be useful in detecting trends over time.

Conclusions (con't)



Conclusions (con't)

- Sources of imprecision and bias in the absence of mass marking and mark-selective fisheries impact the viability of the CWT system.
  - Non representative sampling
  - Unreported harvest
  - Unsampled harvest or escapement

Conclusions (con’t)

- Tagging and sampling rate increases could reduce the imprecision.
- Bias due to under coverages described here can only be corrected with indirect estimation methods or additional sampling resources.


CWT TUNE-UP

Suggestions for the Expert Panel to Consider

- Provide recommendations on
  - defining viability and/or viability reference curves
  - how to organize all the different factors (and all the different levels of impacts within them) affecting the viability of the CWT system
  - how to prioritize those factors (and levels)