

"Recommended Improvements for the Next Pacific Salmon Treaty"

Randall M. Peterman

School of Resource and
Environmental Management

Simon Fraser University
Burnaby, British Columbia, Canada

Web site: <http://www.rem.sfu.ca/fishgrp/>


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Outline

1. Discuss 1999 Agreement on
Annex IV of the Pacific Salmon Treaty
2. Apply criteria to evaluate that Agreement
3. Make recommendations

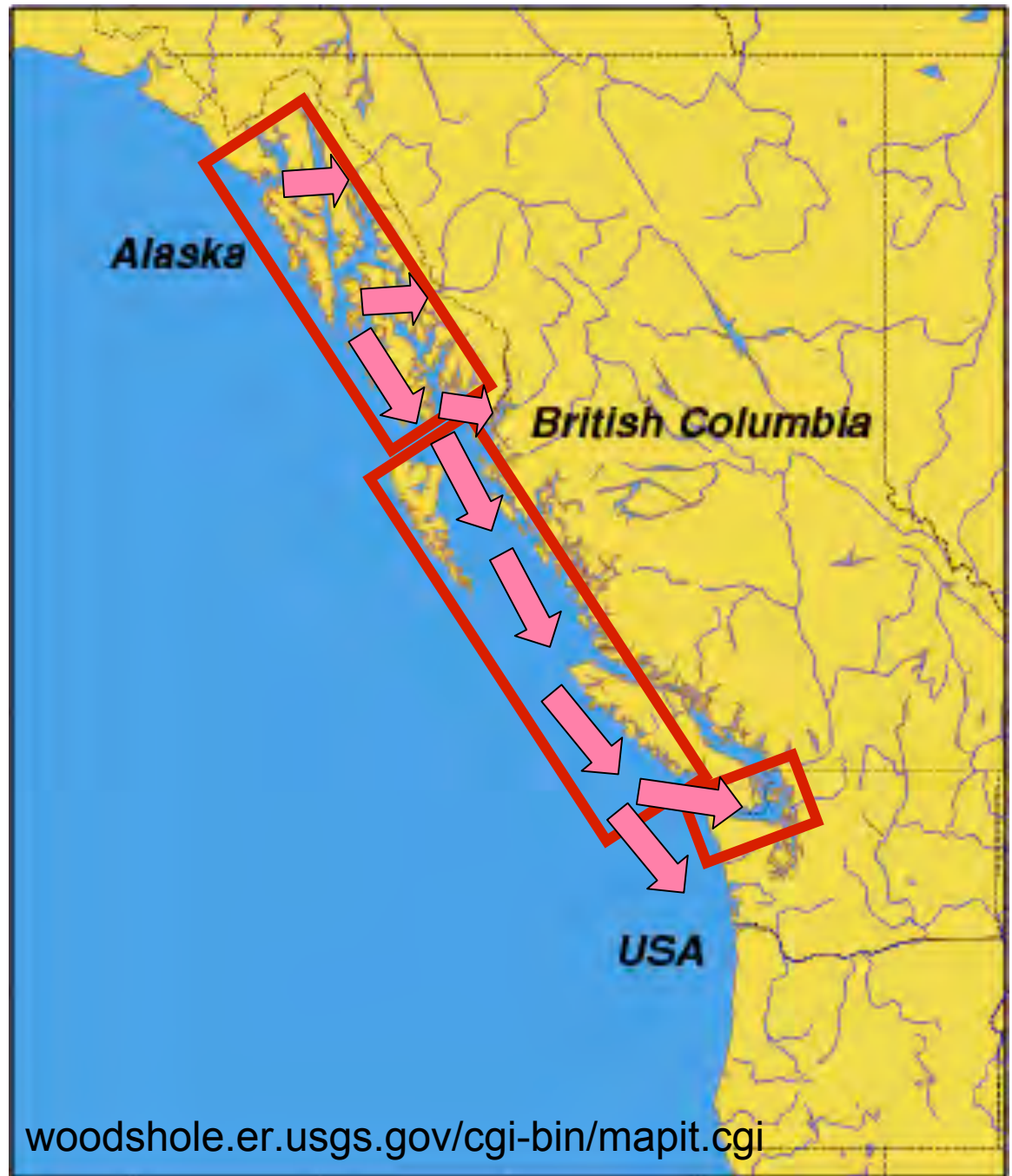
Pacific Salmon Treaty, 1985

- Articles
- Appendices
- Annexes



-- Annex IV amended in 1999
--- 51 pages of detailed fishing rules for each species and region ("The Agreement")

Main interception areas for salmon migrating to another country



Objectives stated in 1999 Agreement

- Achieve maximum sustainable yield (MSY)
- Rebuild naturally reproducing salmon stocks
- Halt the decline in spawner abundance in depressed stocks
- Maintain genetic and ecological diversity of Pacific salmon

Key features of 1999 Agreement

1. Rules for "Aggregate Abundance-Based Management" (AABM) for chinook

Apply to certain gear-type mixed-stock fisheries in:

- Southeast Alaska (intercept B.C.-bound salmon)
- British Columbia, including west coast of Vancouver Island (intercept U.S.-bound salmon)

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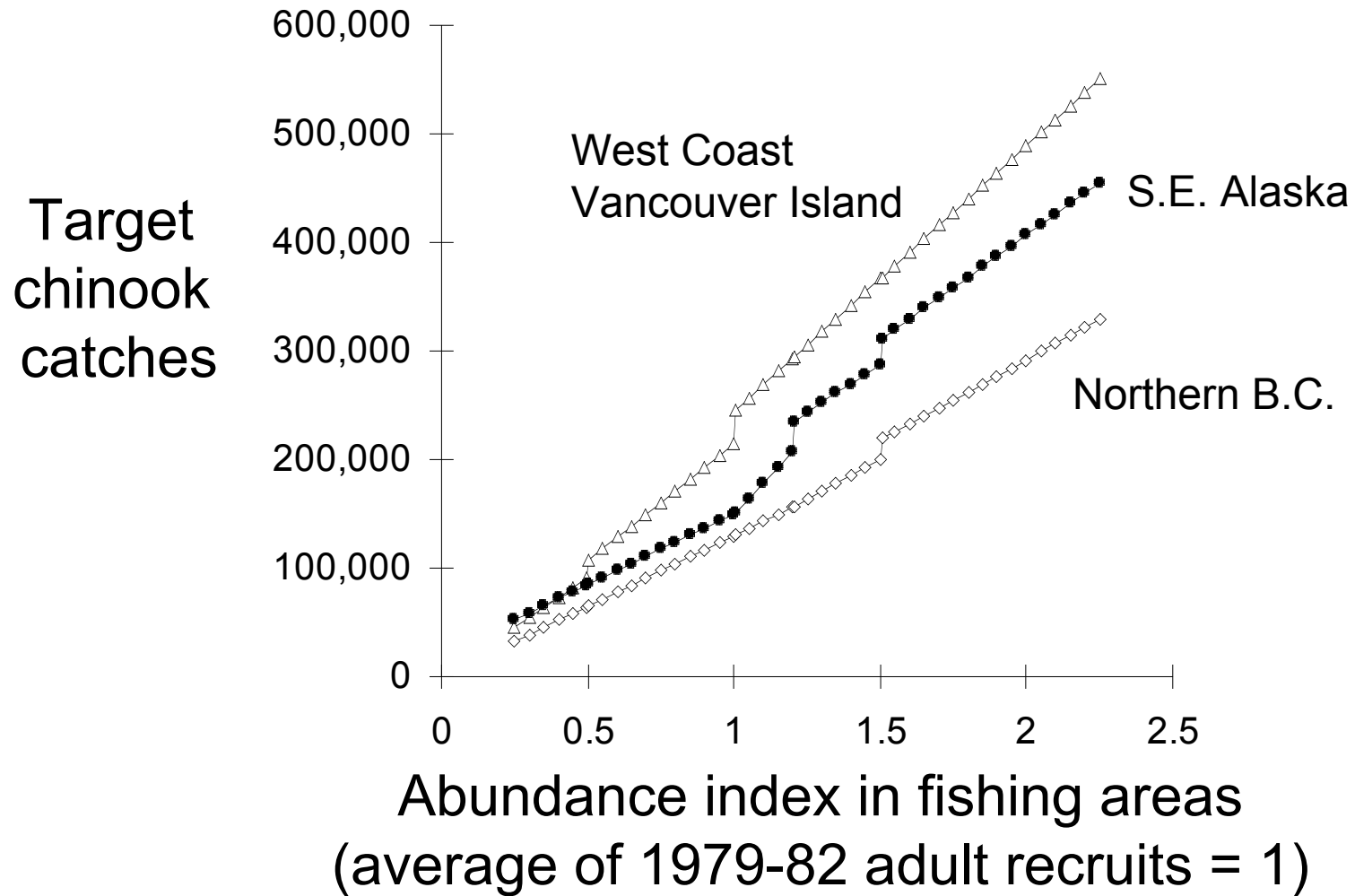
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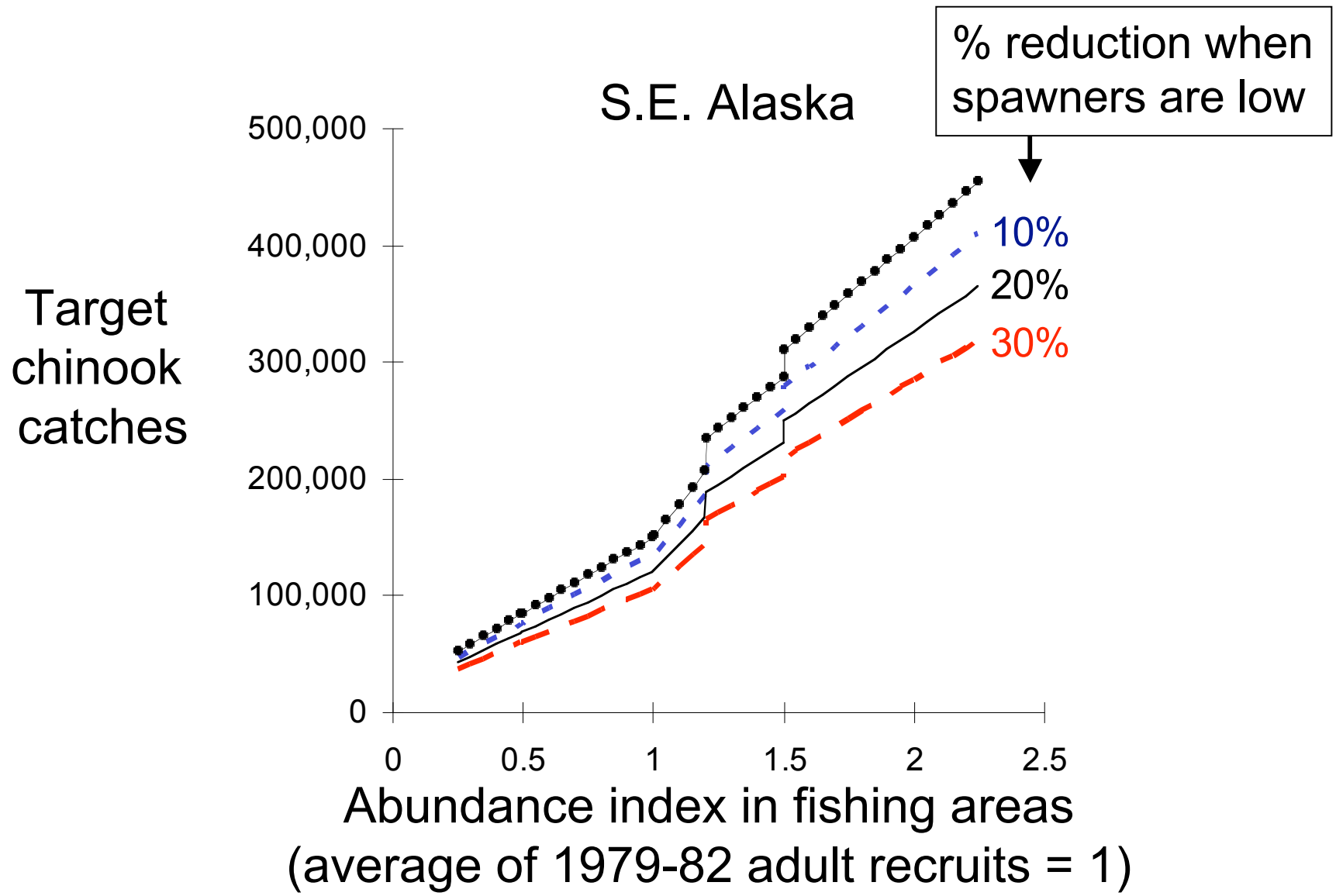
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AABM Rules



Peterman and Pyper (2000)



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- Allow recovery of depleted populations?
- Meet commitment to biodiversity?

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- Maintain productive wild salmon populations?
- Allow recovery of depleted populations?
- Meet commitment to biodiversity?

- Respect the best of intentions of past negotiators,
but much has changed in 8 years

Criteria for Evaluation of Agreement

1. Well-defined objectives for harvest and conservation?
2. Effective indicators of abundance and productivity?
3. Pre-specified and adequate reductions to harvest to:
 - Reduce frequency of conservation concerns?
 - Ensure prompt response to such concerns?
4. Effective control of exploitation rates?
5. Account for uncertainty and variability?

Peterman and Pyper (2000)

Criterion 1. Well-defined objectives?

Compare with objectives from other fisheries worldwide (salmon and non-salmon):

Example of an ideal recovery objective

Pr(Spawners > 20,000 within 20 years) \geq 0.8

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- Time frame ...

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- **Indicator variable**
- **Target condition**
- **Time frame ...**
- **Recognition of uncertainty**

Same structure for a long-term persistence objective
i.e., to avoid quasi-extinction

$$\Pr(\text{Spawners} < 1,000 \text{ over next 50 years}) \leq 0.1$$

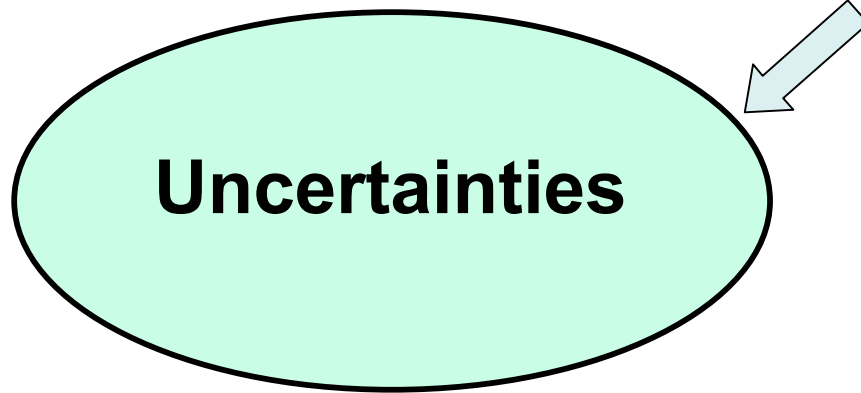
Example components of an ideal recovery objective

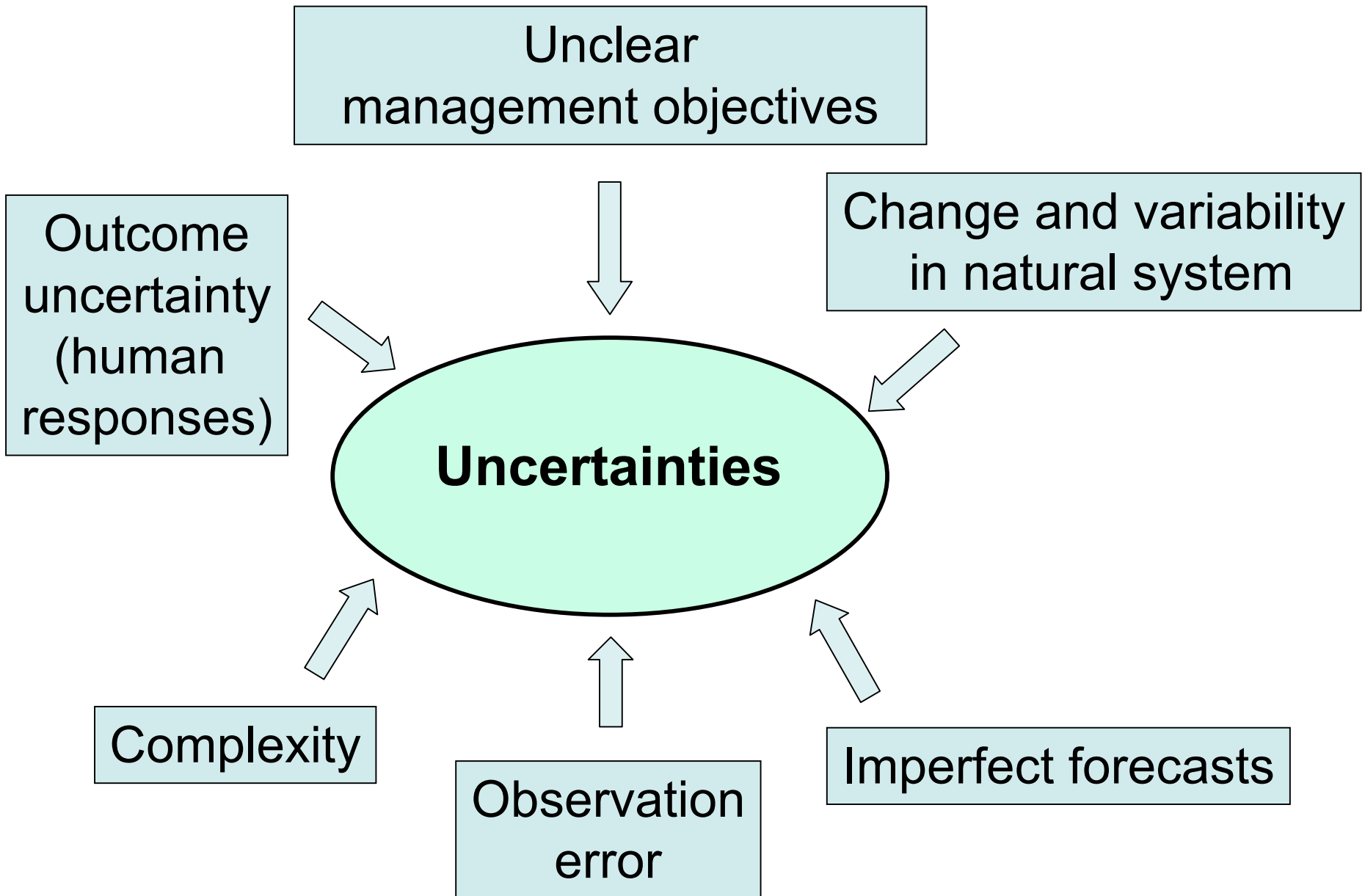
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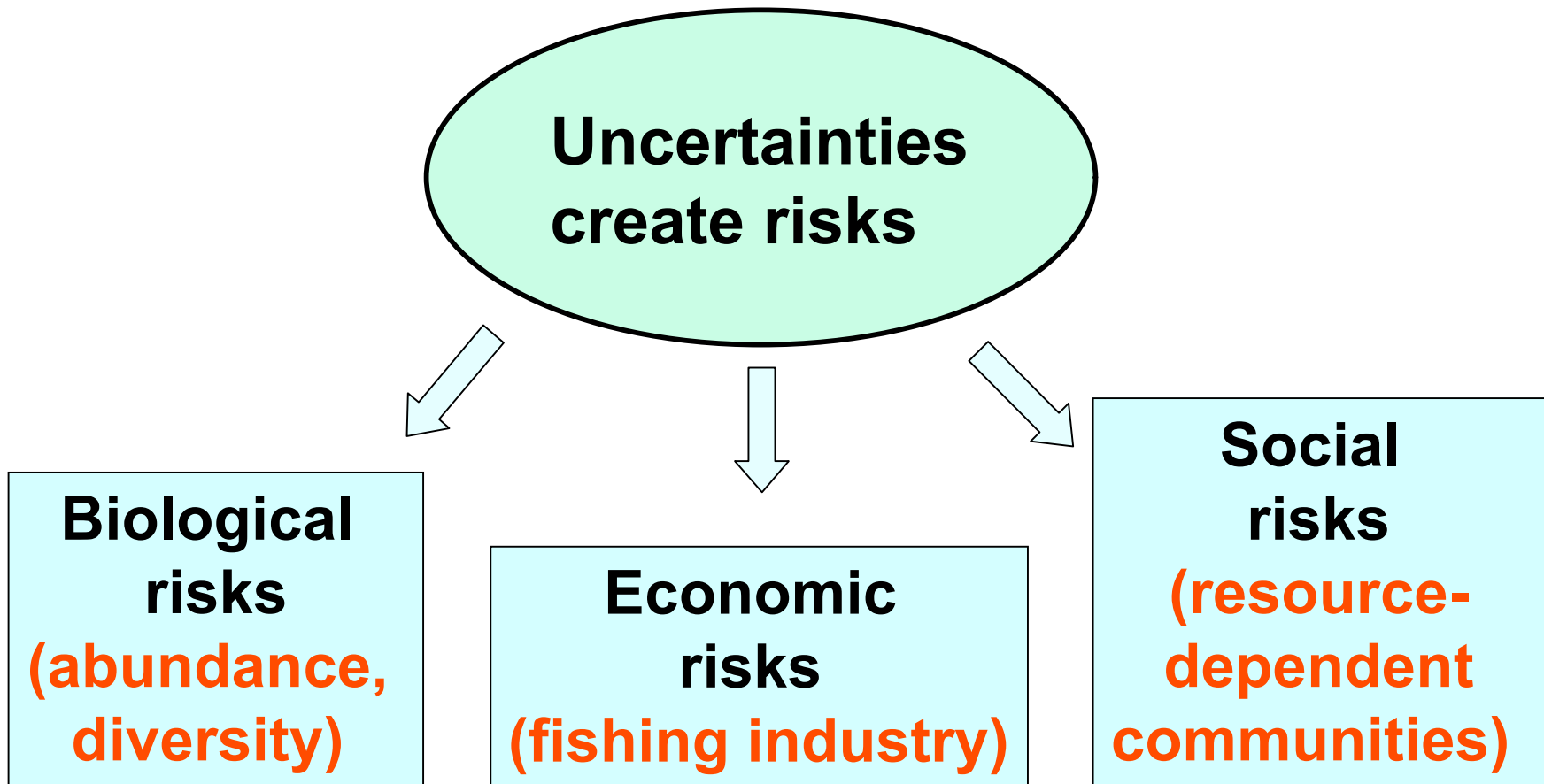
- **Indicator variable**
- **Target condition**
- **Time frame ...**
- **Recognition of uncertainty**

Why?

Change and variability
in natural system







Two objectives of 1999 Agreement

	1. Rebuilding
Indicator variable and target?	Spawners needed for MSY
Clear, biologically-based spatial units?	Stock groups -- represented by "indicator" stocks
Time frame?	Rarely stated
Recognition of uncertainty?	Little

Two objectives of 1999 Agreement

	1. Rebuilding	2. Biodiversity
Indicator variable and target?	Spawners needed for MSY	None
Clear, biologically-based spatial units?	Stock groups -- represented by "indicator" stocks	Management stock groups, <u>not</u> ESUs or CUs
Time frame?	Rarely stated	None
Recognition of uncertainty?	Little	None

Recommendations for Criterion 1 (objectives)

Clearer biological conservation goals

- Measurable indicators for biodiversity
- Ecologically relevant spatial units
- Time frame for reaching goals
- Explicit recognition of uncertainty

Criterion 2. Effective indicators that reflect objectives?

Indicator stocks of spatial units?	<ul style="list-style-type: none">- Most are abundant or easily observed stocks- Not necessarily stocks that are most at risk
Target reference points? (e.g., maintain X% of low-productivity stocks)	None stated except MSY
Limit reference points? (conditions to be avoided)	None stated; only stated low abundance that triggers more action
Account for uncertainties?	None

Recommendations for Criterion 2 (indicators)

- Ensure that indicator stocks reflect changes in abundance of stocks at risk
- Set target and limit reference points to adequately reflect uncertainties
- If not feasible, then make harvest rules more cautious

Criterion 3.

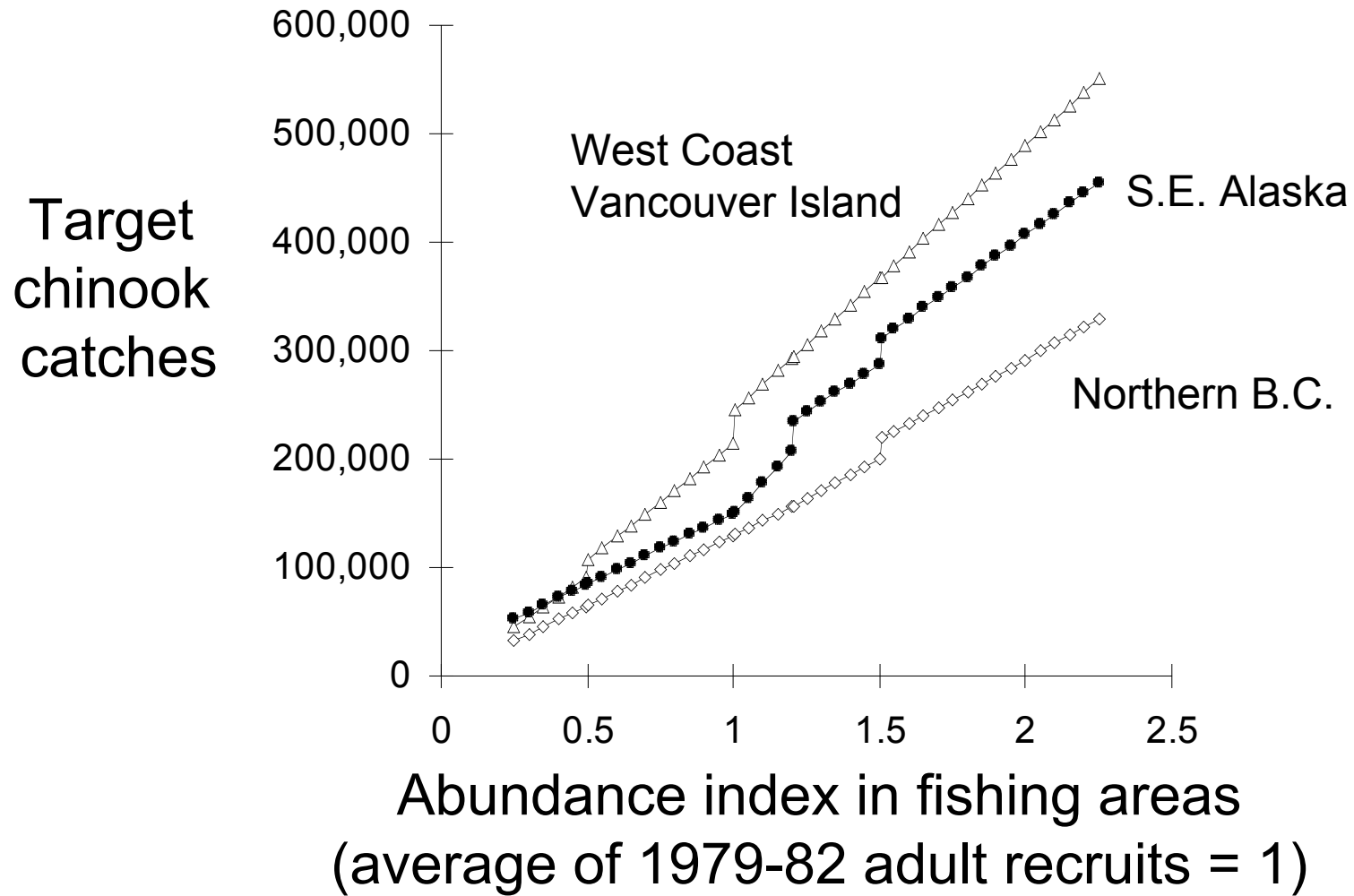
Pre-specified and adequate reductions to harvest?

- We simulated AABM rules for chinook fisheries
 - North/Central BC
 - Upper Georgia Strait
 - West Coast Vancouver Island

- Used 1985-96 data

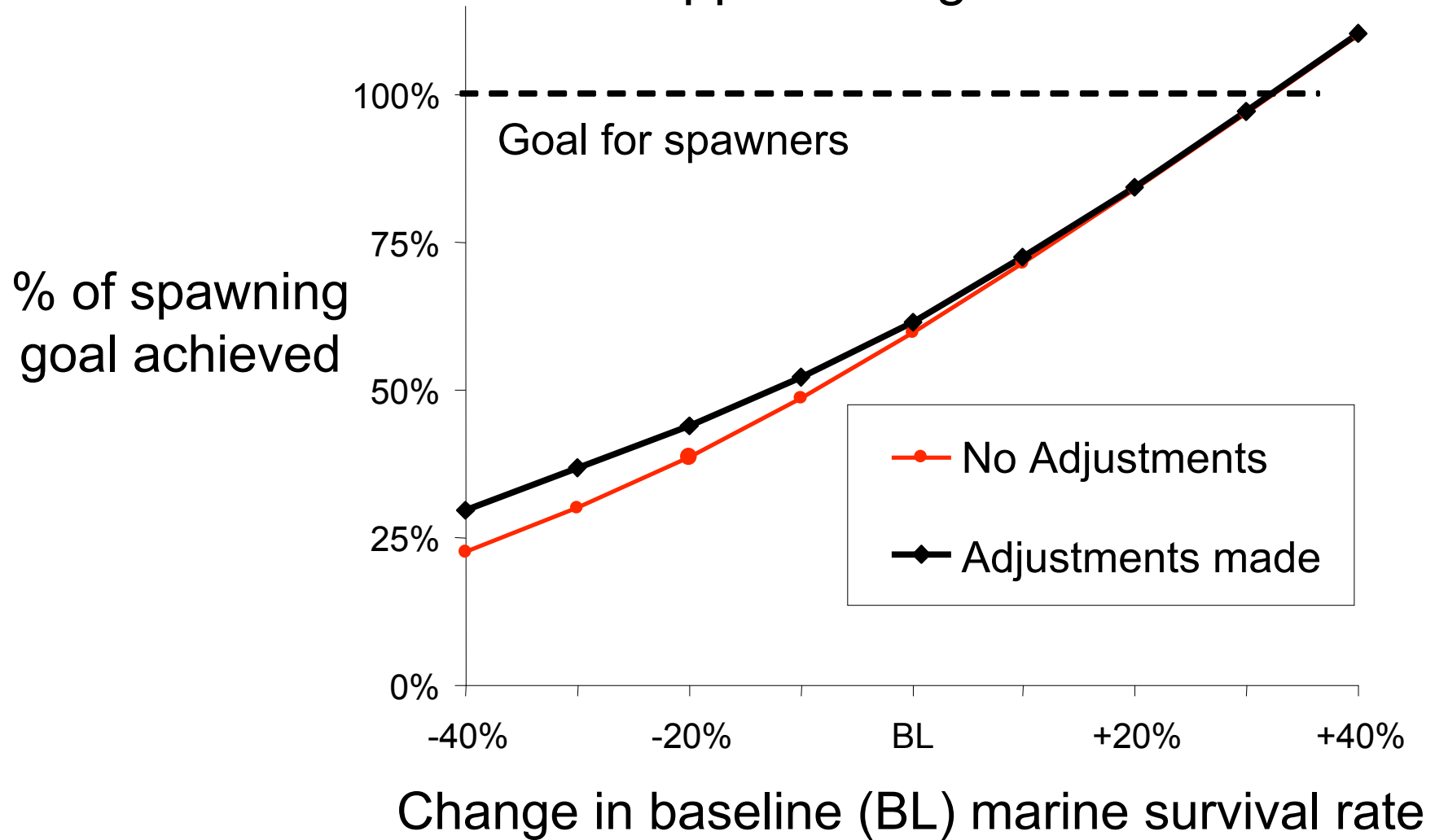
- 15-year simulations

AABM Rules



Peterman and Pyper (2000)

Upper Georgia Strait



Peterman and Pyper (2000)

Recommendations for Criterion 3 (reducing harvests)

- Use extensive simulation analyses to:
 - Find more effective reactive rules to reduce catches
 - Identify target catches that are more proactive than MSY, i.e., that minimize chance of crossing below some abundance
 - Develop limit reference points (i.e., conditions to be avoided)

These simulations should

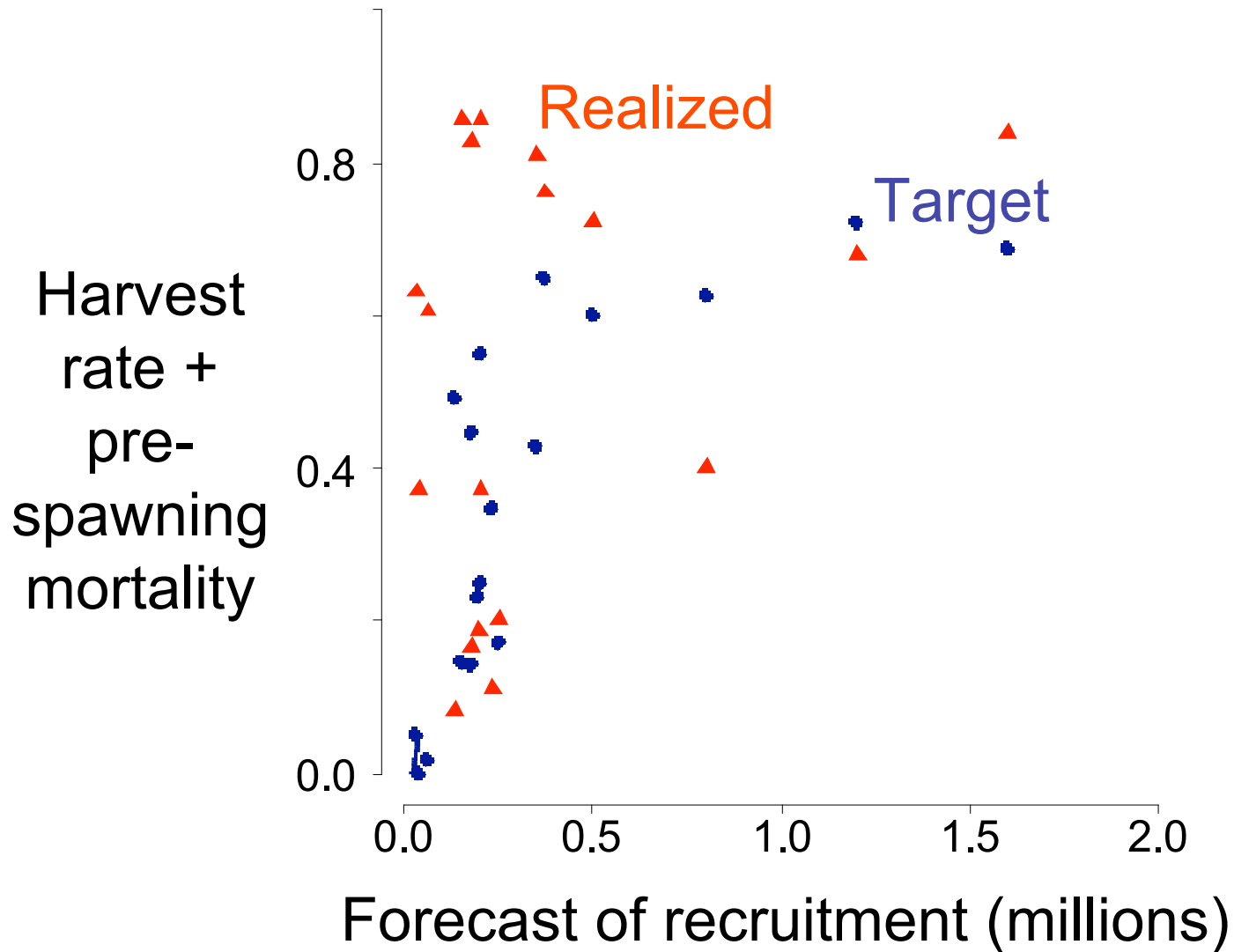
- Assume a range of plausible future survival rates
- Take other uncertainties into account
- Consider tradeoffs between biological and economic risks

Criterion 4. Effective control of exploitation rates?

- No mention of "outcome uncertainty" in AABM fisheries

"Outcome uncertainty"

Early Stuart sockeye salmon, B.C. (1986-2003)



Holt and Peterman (2006)

Recommendations for Criterion 4 **(control of exploitation rates)**

- Include "outcome uncertainty" in analyses
- Encourage more selective-fishing procedures
in mixed-stock fisheries

Criterion 5. Account for uncertainty and variability?

- Very little mention of these topics!

Recommendations for Criterion 5 (uncertainties)

- Make the Agreement more consistent with:
 - FAO "Code of Conduct for Responsible Fisheries" (1995)
 - FAO "Precautionary Approach to Capture Fisheries" (1995)
 - United Nations "Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks" (1995)

Revised Annex IV should emphasize a precautionary approach:

- Allow recovery before increasing harvests
- Adopt objectives other than MSY
- Respond promptly and adequately to decreasing productivity or abundance
- Explicitly consider risks and uncertainties
 - Greater uncertainties --> lower harvests to reduce risks

Summary

<u>Evaluation Criteria</u>	
1. Well-defined objectives?	No.
2. Effective indicators?	Indicator stocks not necessarily representative
3. Pre-specified and adequate adjustments to harvest?	Pre-specified, but not adequate
4. Effective control of exploitation rates?	Not in AABM fisheries
5. Account for uncertainty and variability?	Little

Summary of recommendations for the next Agreement

1. State more specific biological conservation goals.
 - Use measurable and ecologically relevant indicators.
 - Specify time frame for achieving goals.
2. Use indicator stocks that reflect "stocks at risk".
3. Quantitatively evaluate performance of harvest rules.
 - Explicitly take into account sources of uncertainty, especially "outcome uncertainty".
 - Ensure that rules are adequate (prompt and sufficient)

Summary of recommendations for the next Agreement

4. Make Agreement more consistent with others that apply the "precautionary approach".

- Management objective to achieve certain harvests should only apply after conservation objectives have been met
- Allow recovery of populations to rebuild spawning populations before increasing harvesting

References

Holt, C.A. and R.M. Peterman. 2006. Missing the target: uncertainties in achieving management goals in fisheries on Fraser River, British Columbia, sockeye salmon. Canadian Journal of Fisheries and Aquatic Sciences 63:2722-2733.

Peterman, R.M. and B.J. Pyper. 2000. Review of the coho and chinook salmon sections of the "Agreement Under the Pacific Salmon Treaty" between Canada and the United States, dated 30 June 1999. Pacific Fisheries Resource Conservation Council, Vancouver, B.C., Canada, Background Paper No. 2000/2, pp. 1-35.

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United Nations' Food and Agriculture Organization (FAO). 1995. Precautionary approach to capture fisheries. Part 1. FAO Fisheries Tech. Paper No. 350/1, FAO, Rome, 52 pp. (www.fao.org/docrep/003/v8045e/v8045e00.htm)