

"The need for international cooperation to reduce competition among salmon for a common pool of prey resources in the North Pacific Ocean"

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- Please be patient!
- NPAFC has opportunity to recommend action before a serious crisis occurs

Outline

- A. Density-dependent interactions among salmon in the ocean
- B. Implications
- C. Need for international cooperative action

Problem

1. Density-dependent interactions

- Within a species from populations within a nation
- Within a species from populations among nations
- Between species (within and among nations)

Reduce economic and social benefits due to:

- Smaller adult body mass
- Lower productivity (returns per spawner)

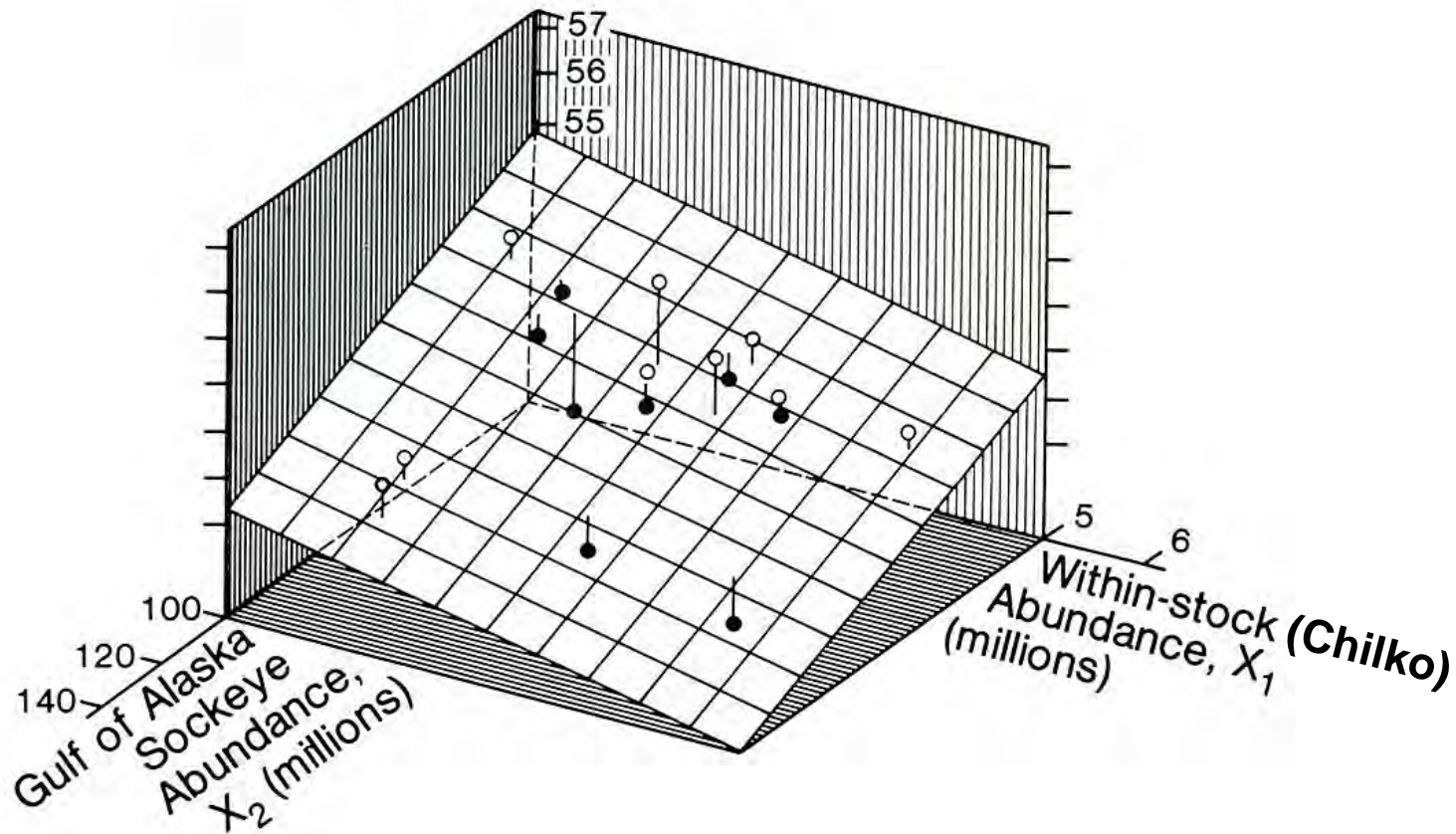
Within a species from populations among nations:

- B.C. sockeye smaller with more sockeye competitors



Chilko Lake Sockeye, Fraser River, B.C.

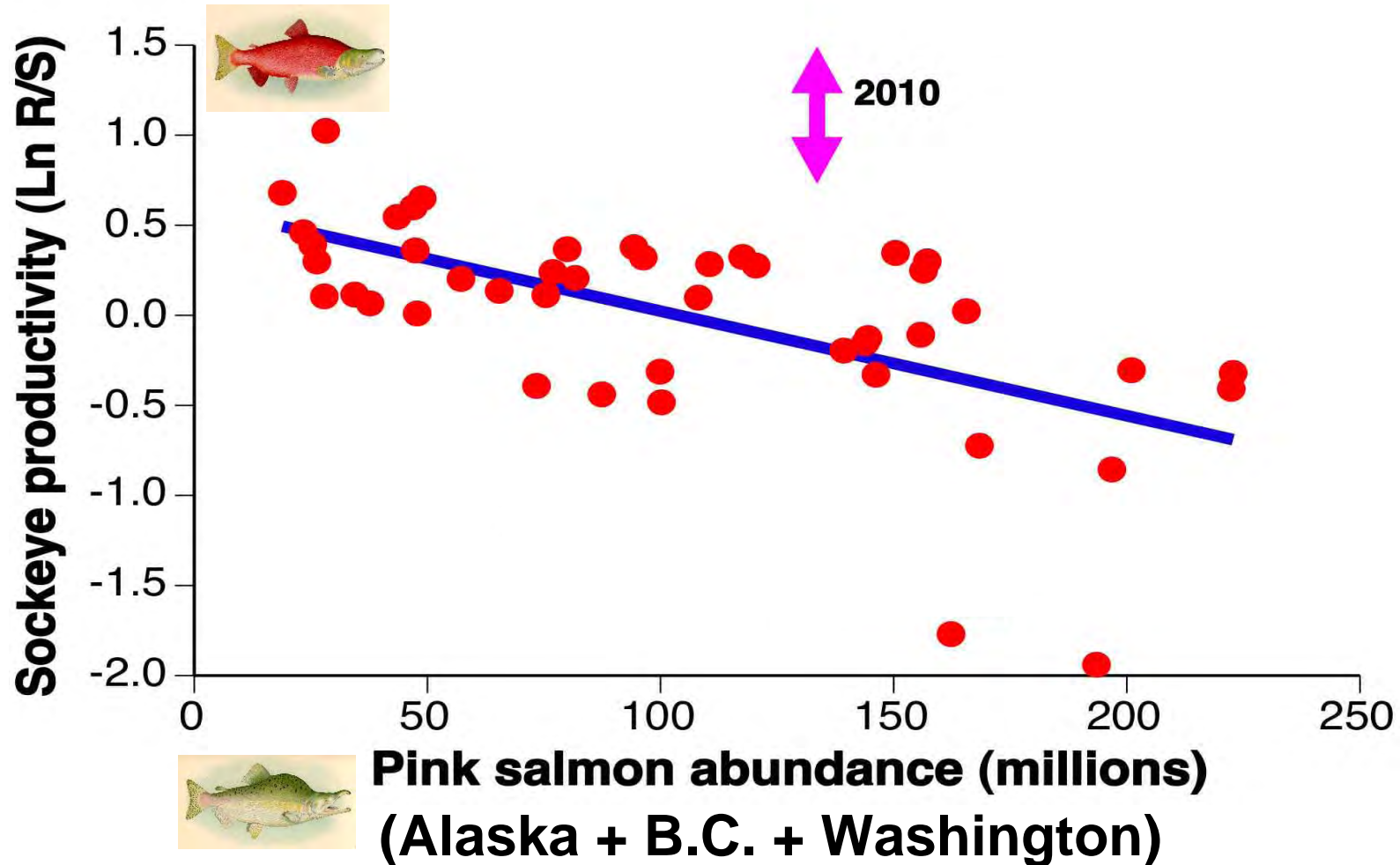
Age 4₂ ♀ Length (cm)



Peterman 1984
CJFAS

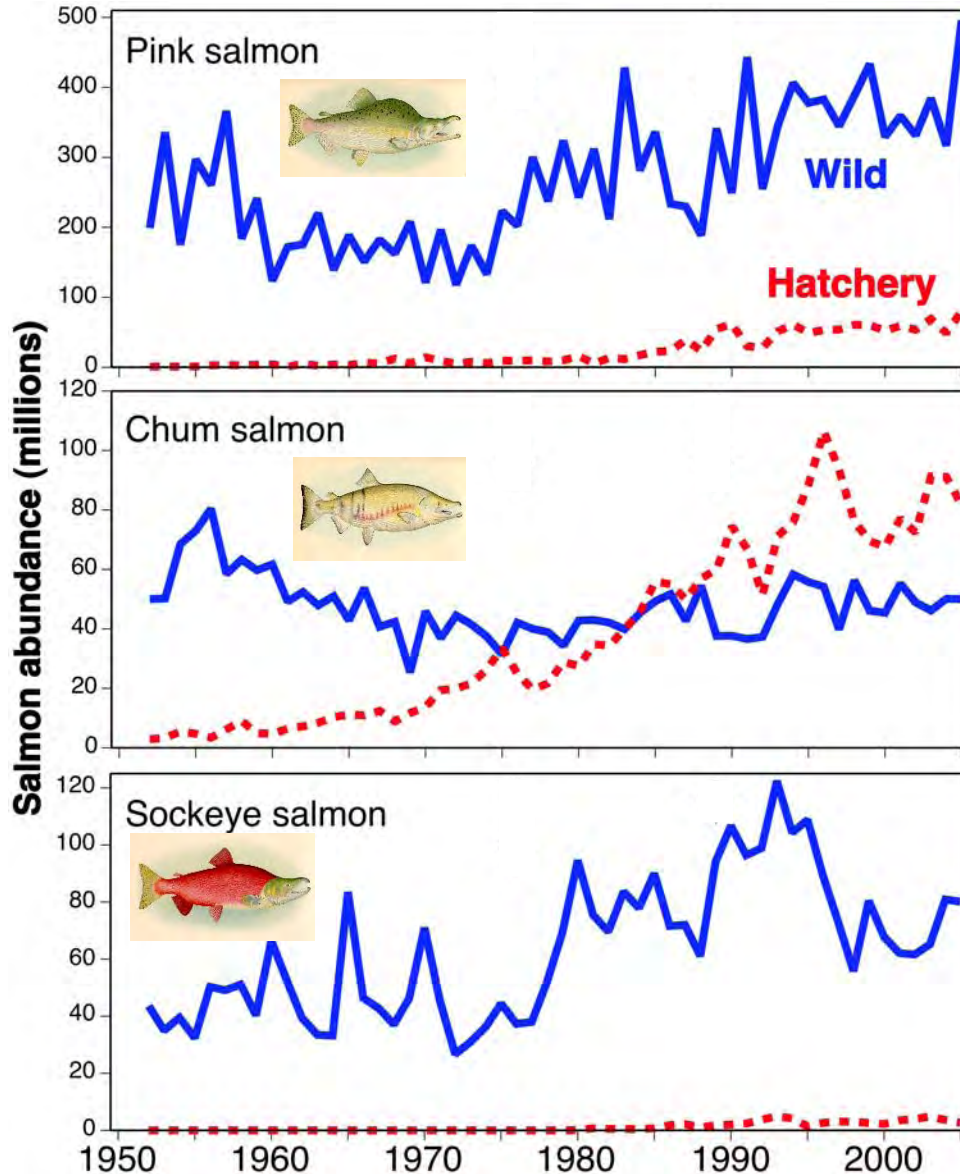
Interactions between species among nations:

- Fraser River sockeye productivity, $\log_e(\text{recruits/spawner})$



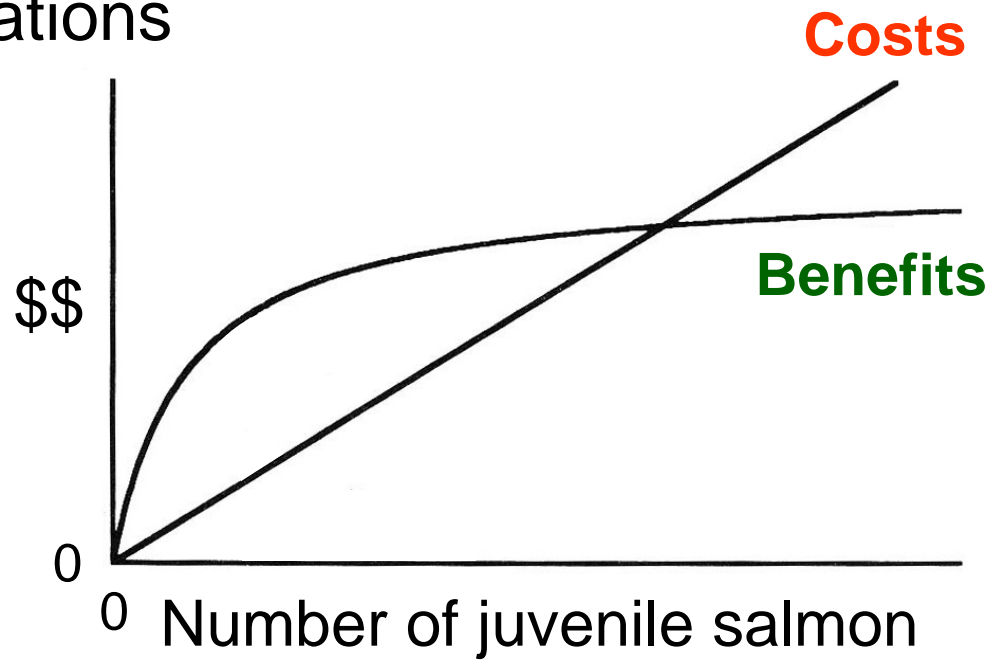
Problem

2. Trends in abundance of competitors

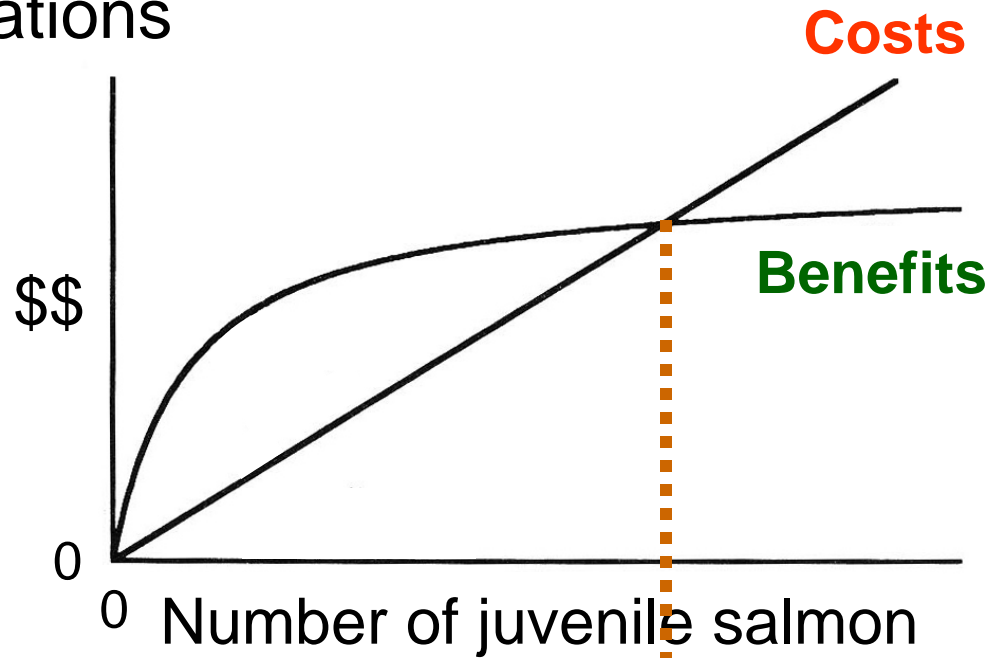


- Increase in wild pink and sockeye salmon
- Increase in hatchery pink and chum salmon
- **Plans for future hatcheries**

3. Implications

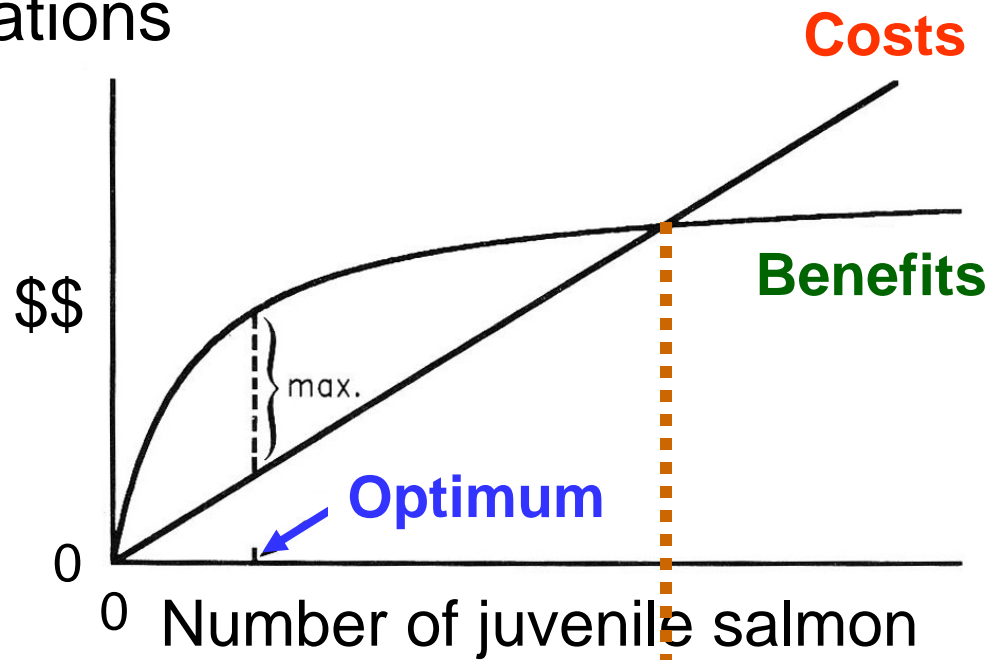


3. Implications



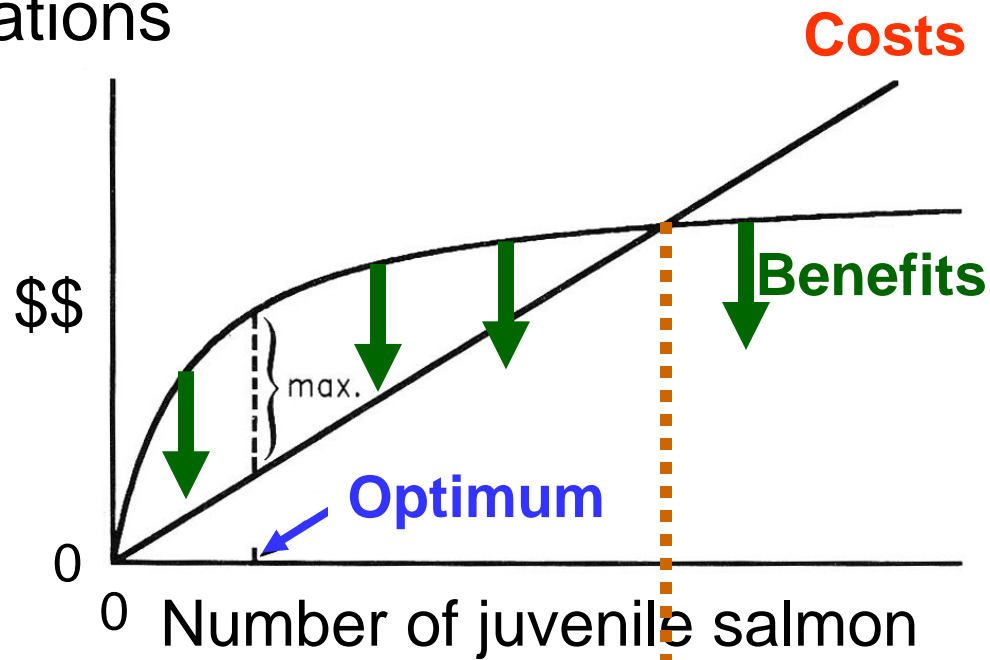
Expected tendency in the absence of cooperative restrictions

3. Implications



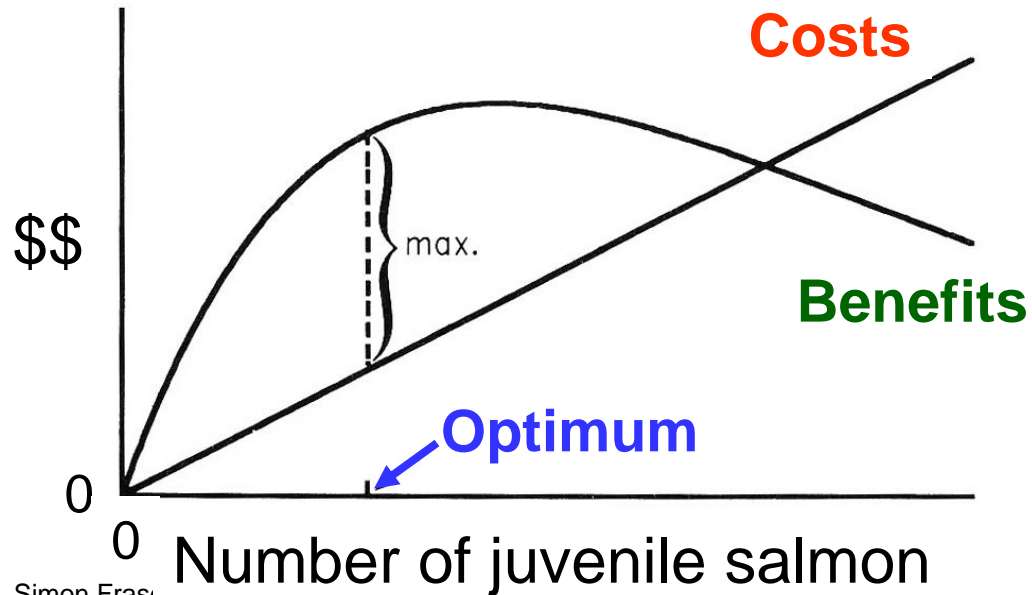
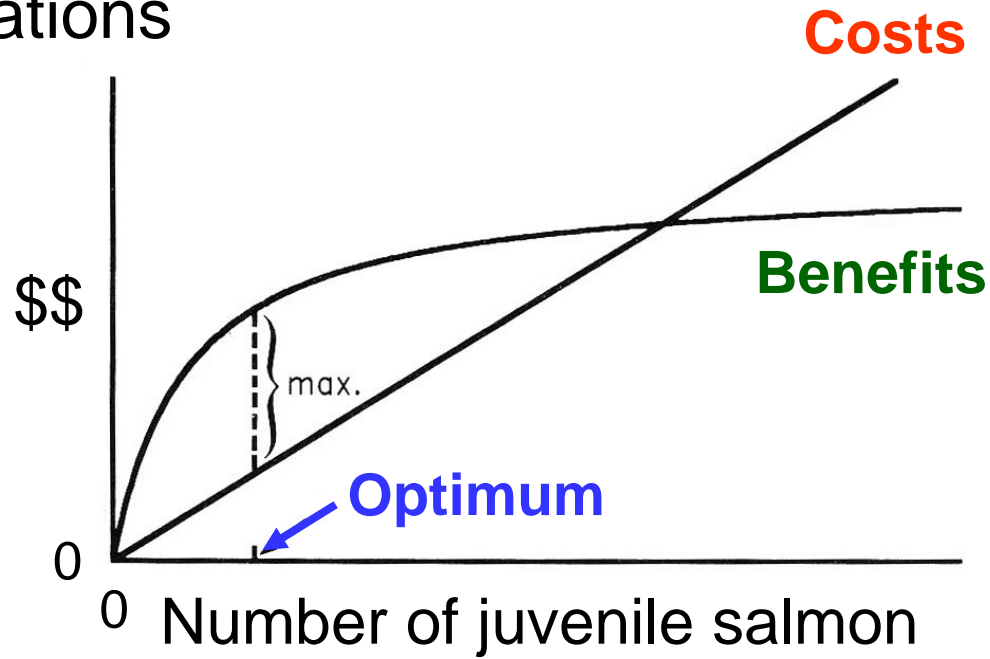
Expected tendency in the absence of cooperative restrictions

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Expected tendency in the absence of cooperative restrictions

3. Implications

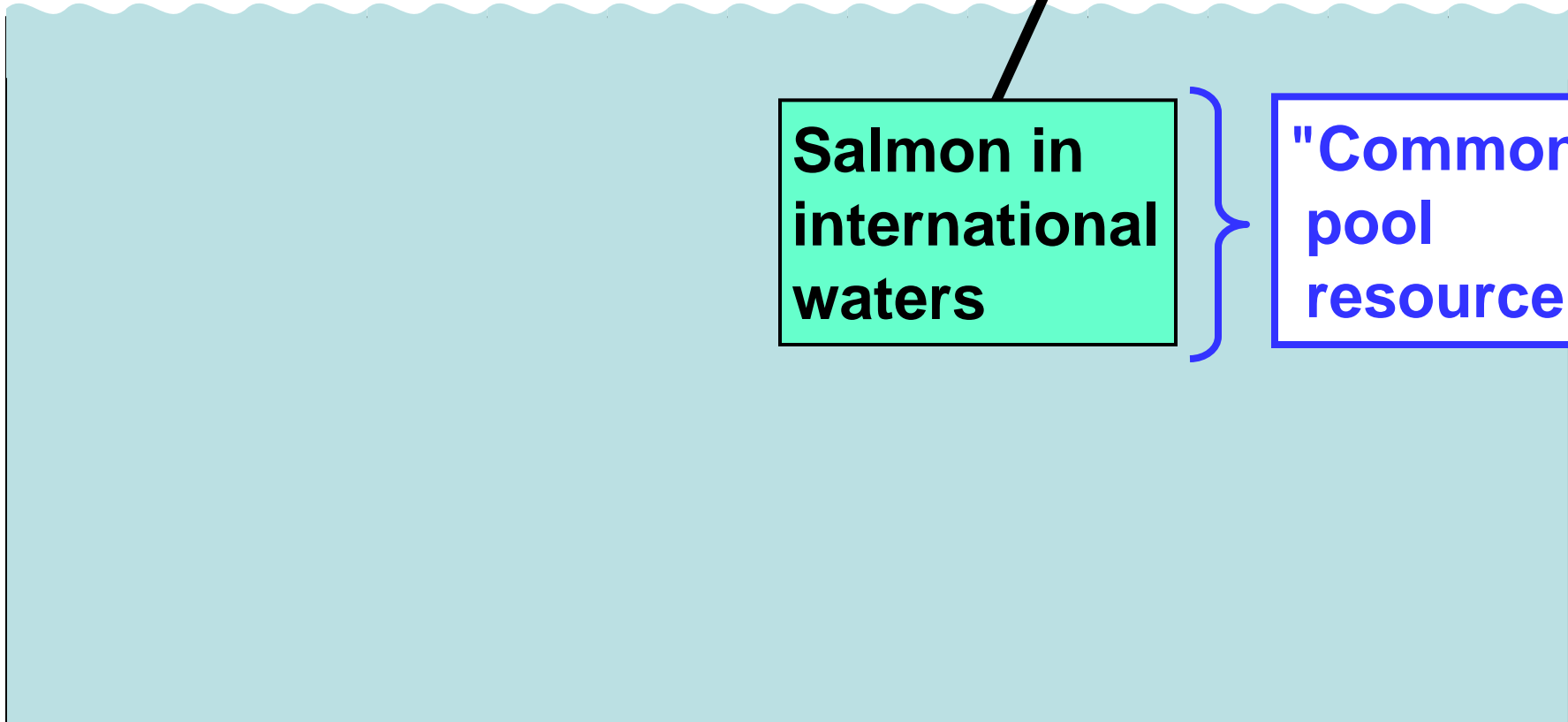


Before 1992

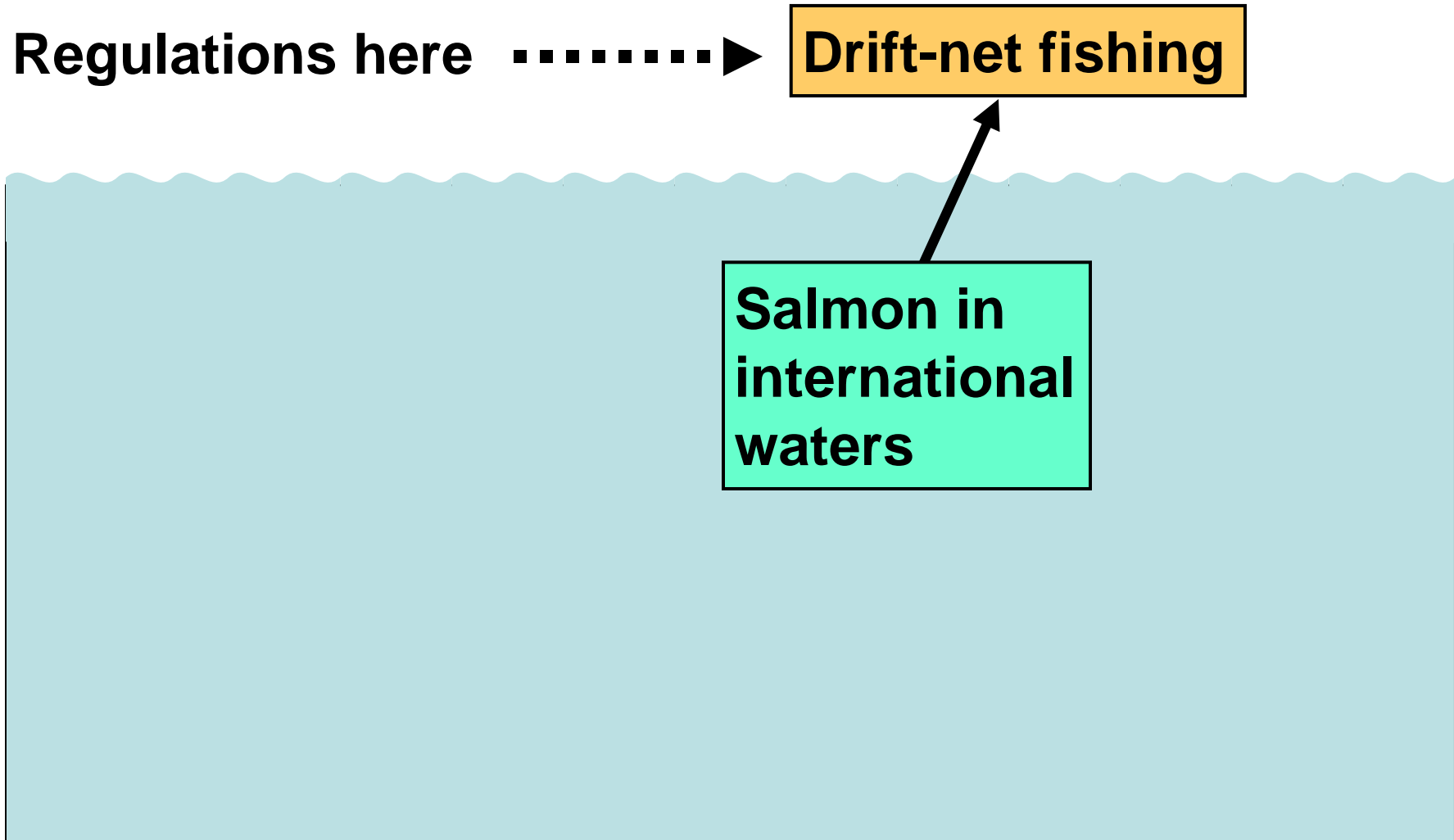
Drift-net fishing

Salmon in international waters

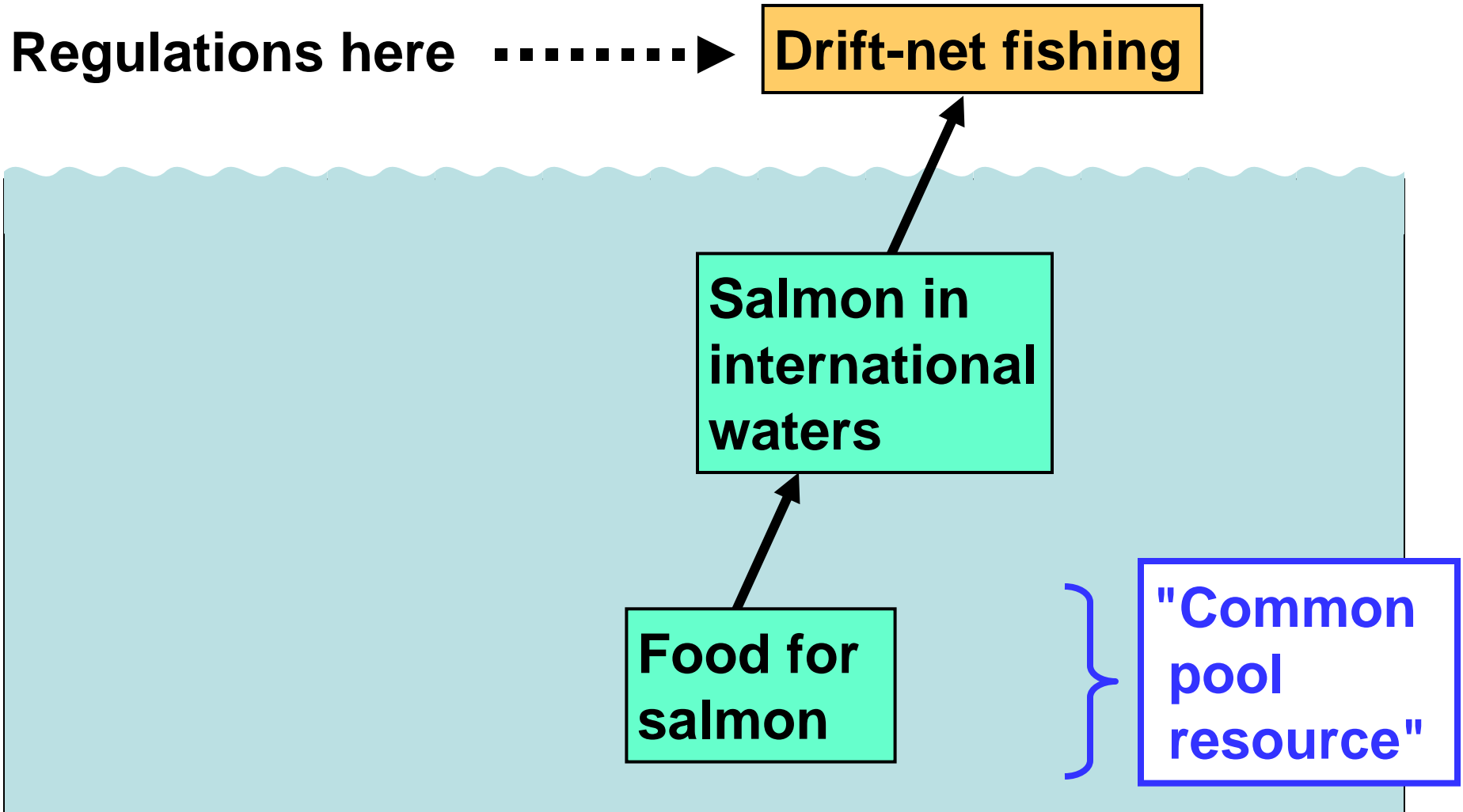
"Common pool resource"



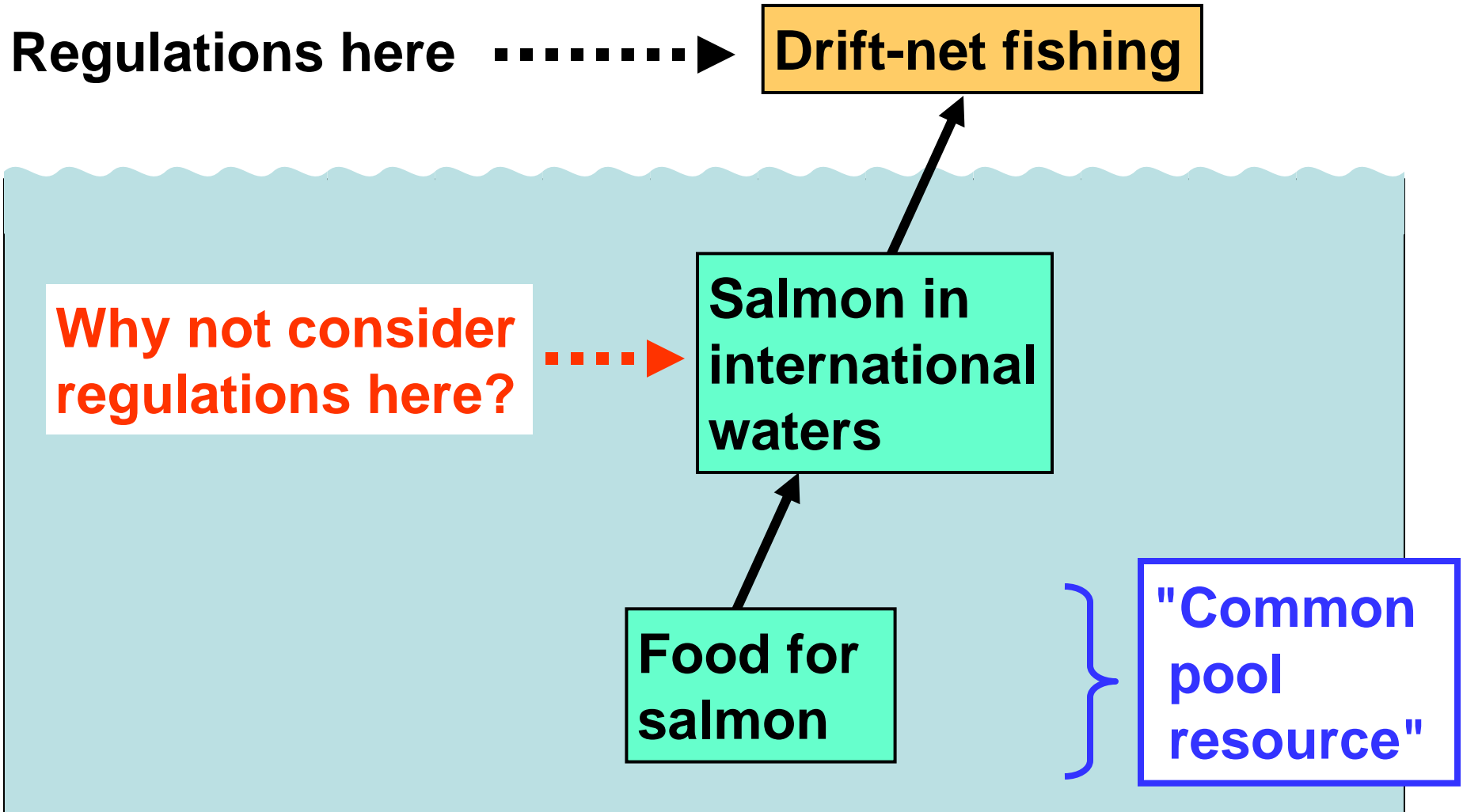
Example of cooperation: 1992 elimination of high-seas drift-net fishing



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Precedents

Cooperative approaches to "common-pool" resources

- Physical (oil pools, aquifers that cross boundaries)
- Terrestrial (parks)
- Aquatic (Great Lakes in North America)

Over 900 environmental treaties since 1970!

Principles

To succeed, cooperative arrangements must:

- Respect sovereignty
- Be fair and equitable
- Provide benefits to each party above and beyond the benefits expected without cooperation ("win-win")
- Consider using "side-payments" such as mutual access arrangements, linkage with non-fisheries issues, ...
- Lead to action plans

(Scott Barrett 2003; "Rio+20" 2011;
Cairncross 2004 Conserv. in Practice)

Lessons from previous international agreements

Must have:


1. Clear objectives, e.g., maintain productive food base for salmon and increase benefits for nations
2. Flexibility to deal with changing conditions (e.g., changes in ocean productivity)
3. Robust implementation and enforcement

(Scott Barrett 2003; "Rio+20" 2011)

Example: North Pacific Fur Seal Treaty of 1911

	Breeding grounds	Harvest location
Russia	Yes	Breeding + pelagic
U.S.A.	Yes	Breeding + pelagic
Japan	Small	Pelagic
Canada	-	Pelagic

Example: North Pacific Fur Seal Treaty of 1911

	Breeding grounds	Harvest location	Gains from Treaty
Russia	Yes	Breeding + pelagic	Mgmt. rights
U.S.A.	Yes	Breeding + pelagic	"
Japan	Small	Pelagic	Side payments
Canada	-	Pelagic	"

Recommendations

1. NPAFC uniquely positioned to lead

- Solid foundation of collaboration among nations
- Strong record in data compilation, monitoring, and enforcement

2. Start discussions now, before:

- Productive capacity of ocean decreases to ...?
- Benefits decrease

3. Result in benefits for all member nations

Reference

Holt, C.A., M.B. Rutherford, and R.M. Peterman. 2008. International cooperation among nation-states of the North Pacific Ocean... *Marine Policy* 32:607-617.