Speaking for the 7th Generation
Introducing intergenerational justice in bioeconomics

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What is this story about

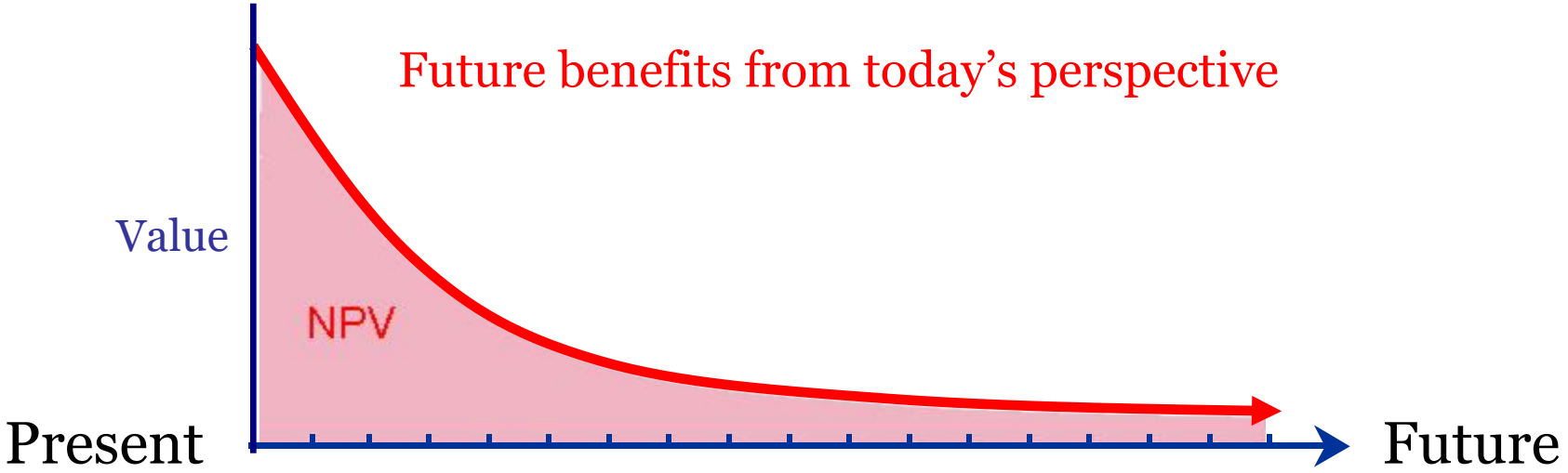
- It is about our interaction with the ocean;
- … property rights;
- It is an application of game theory;
- It is a story about values and valuation;
- It is a story about one of the things we need to change if we are to succeed in living in harmony with nature.

The basic interaction between people and the ocean

Interdisciplinarity; Partnership; Co-creation of knowledge

Interesting quote from a controversial person

"Egoism is the law of perspectives as it applies to feelings according to which what is ***closest*** to us appears to be ***large*** and ***weighty***, while size and weight ***decrease*** with our ***distance*** from things" (attributed to Nietzsche, 1844-1900).



Discounting in economics

The 7th Generation Principle

- The 7th Generation Principle (7^{th} GP) is based on an ancient Haudenosaunee philosophy that the decisions we make today should result in a sustainable world 7 generations into the future;
- The first recorded concepts of the 7th GP date back to anywhere from 1142 to 1500 AD;
- The Haudenosaunee philosophy is credited as being a contributing influence on the American Constitution (a la Benjamin Franklin).

Economic rent in a dynamic discrete model

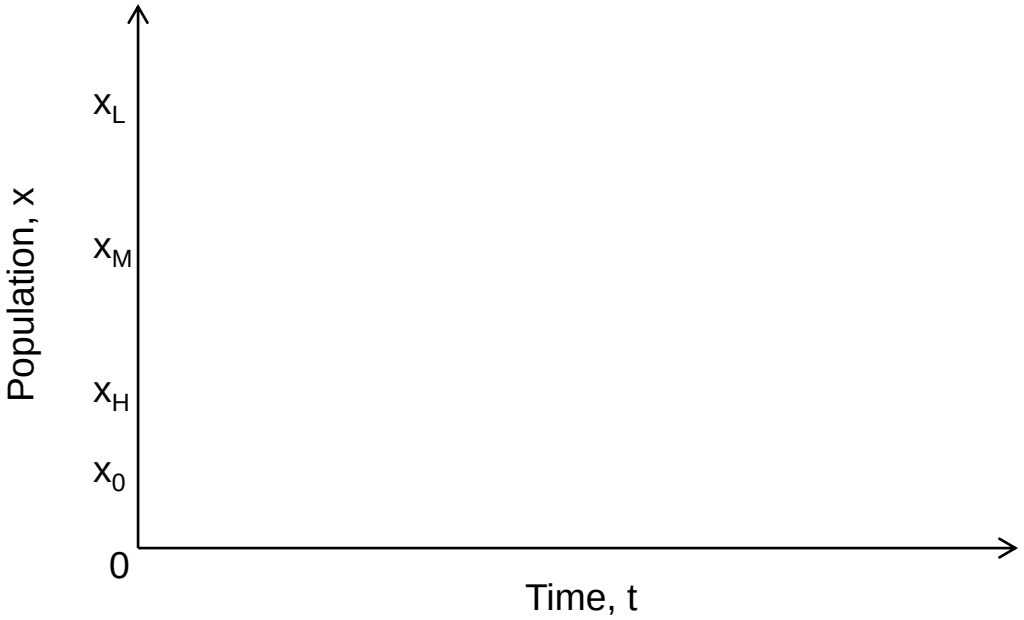
- Discounted economic rent (TR-TC) through time to obtain the discounted value of the economic benefits from the fishery.

$$NPV = \sum_{t=0}^{T} d^t (TR_t - TC_t)$$

$$where \;\; d = \frac{1}{(1+\delta)}$$

$$\delta = discount\ rate$$

Discount rate impacts on fish populations



The optimal population trajectory x = x(t) and optimal population for different discount rates

Adapted from a model developed by Clark and Munro (1975)

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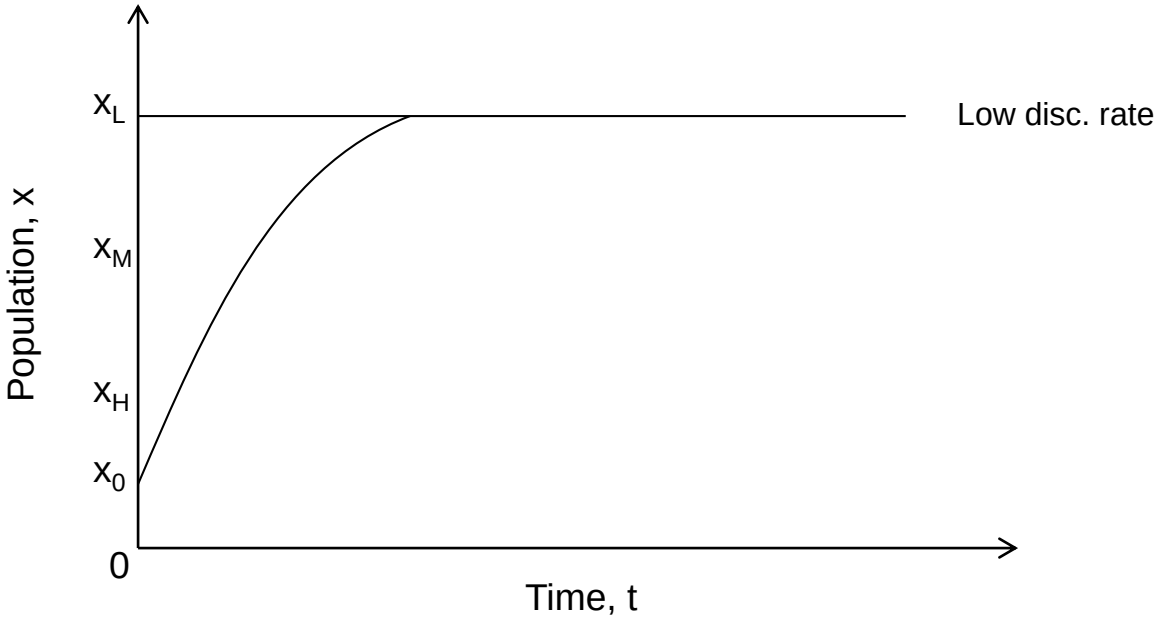

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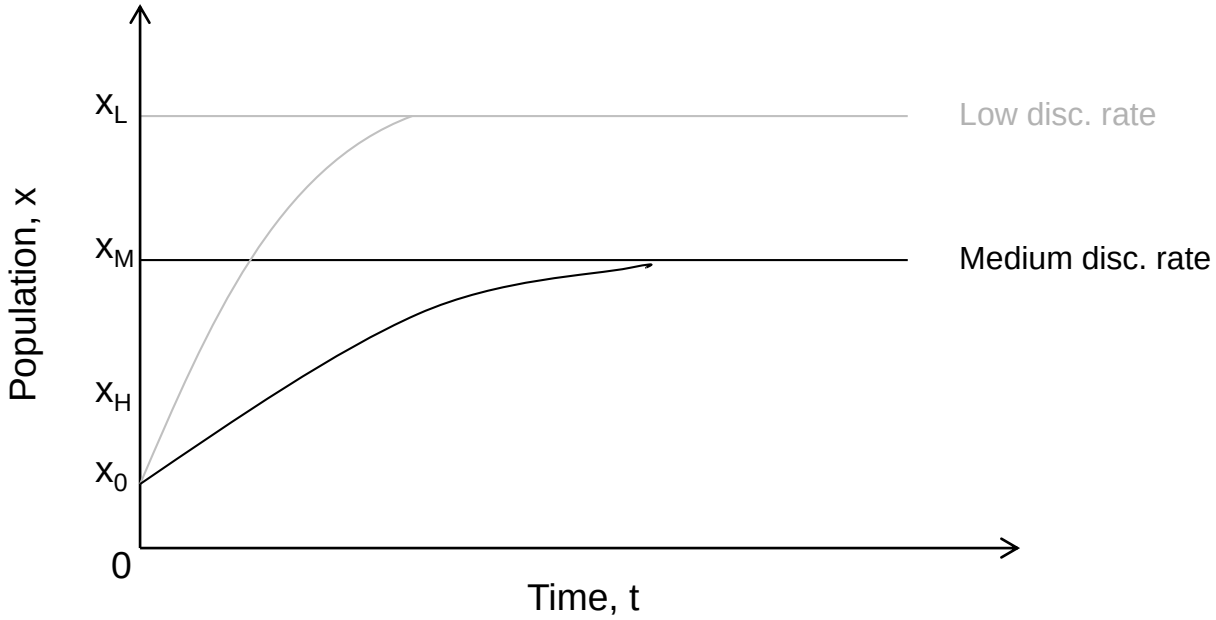

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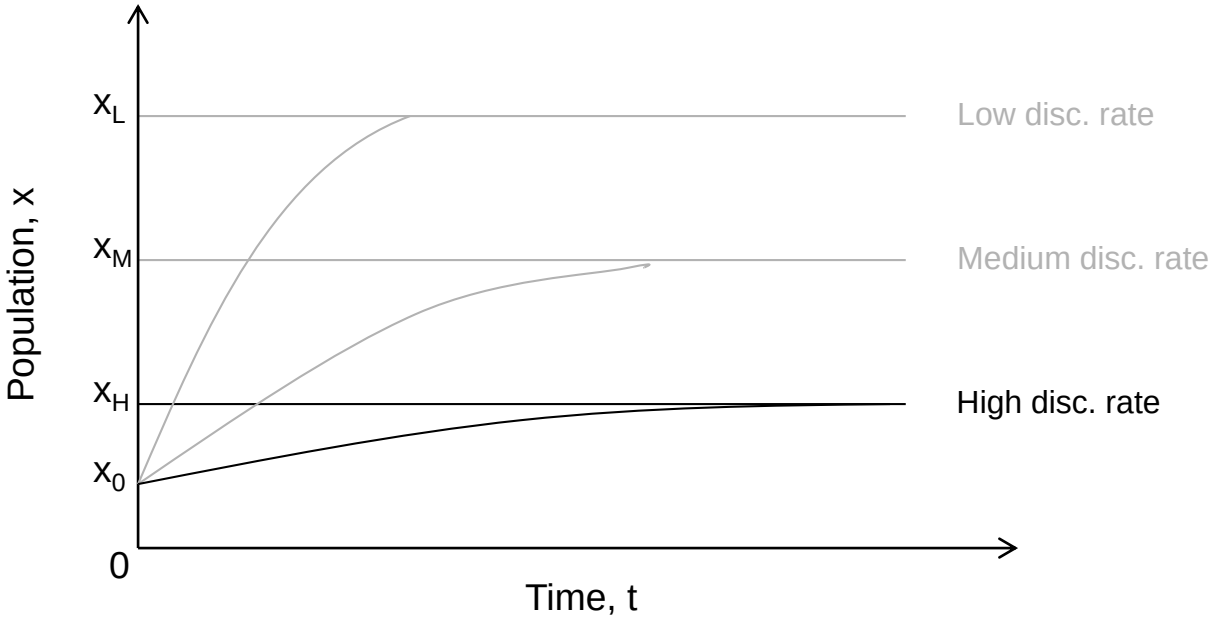
Application of Clark and Munro (1975) model

Discount rate impacts on fish populations



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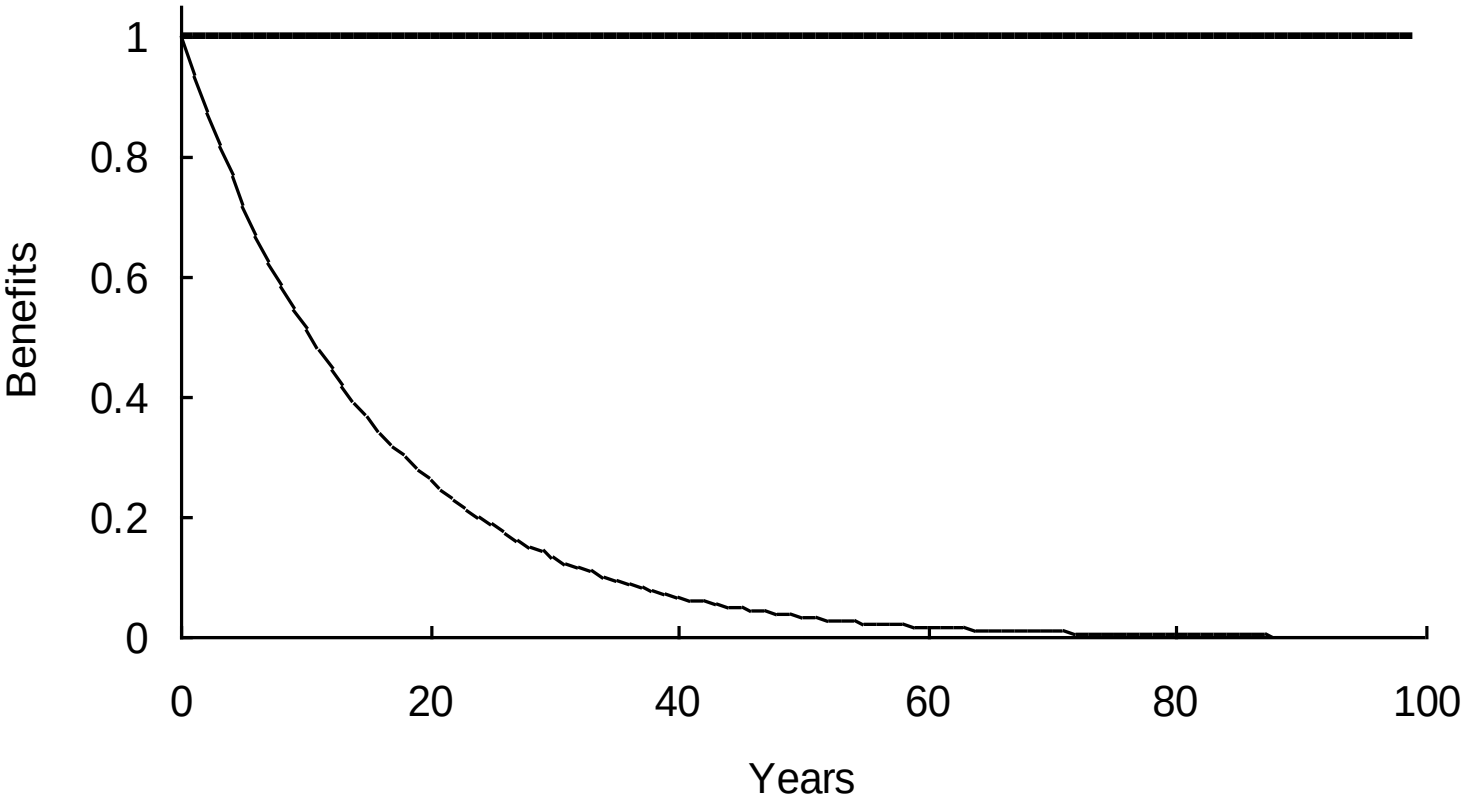
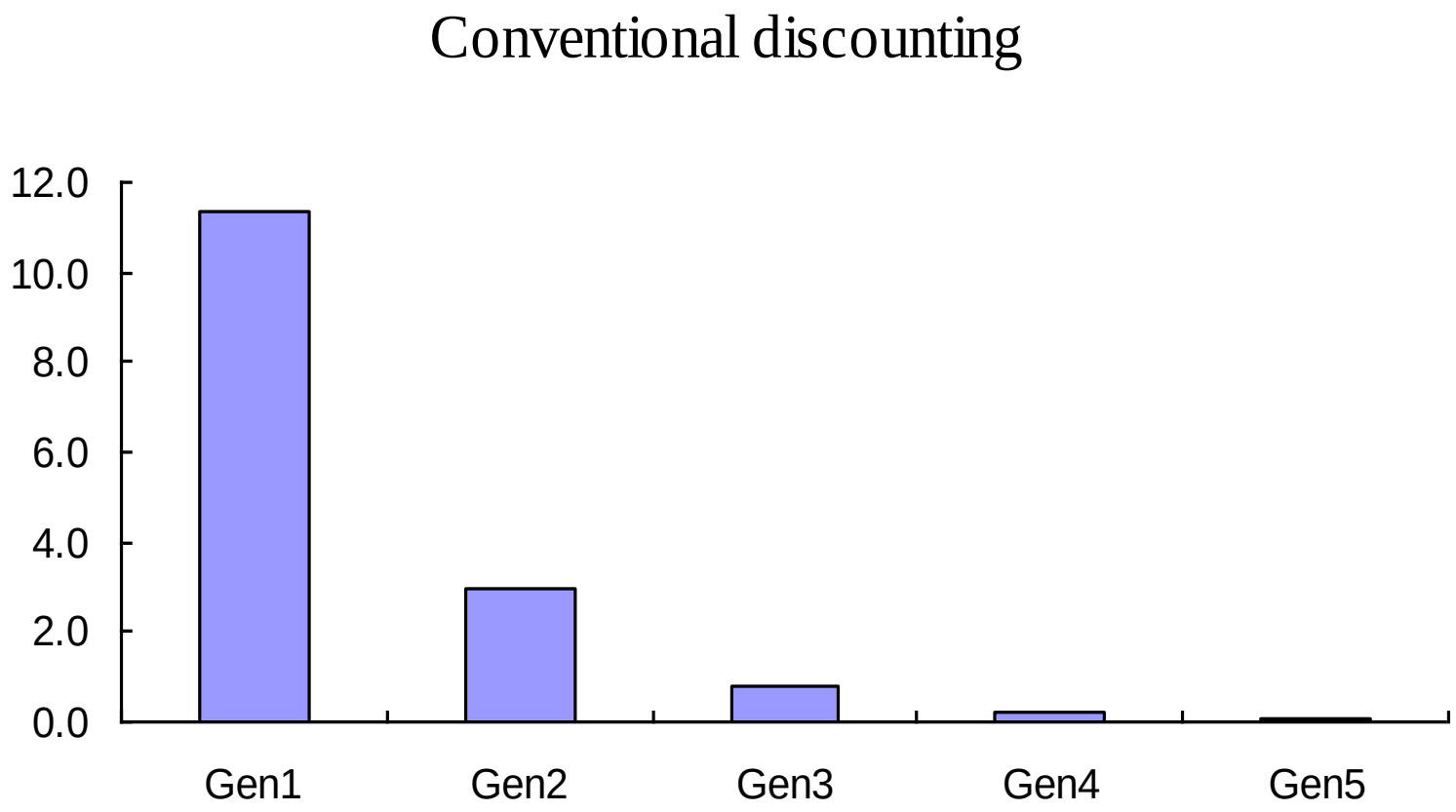
Flow of 1 unit of benefit in current and discounted value



NPV accruing to each of 5 generations within 100 yrs.



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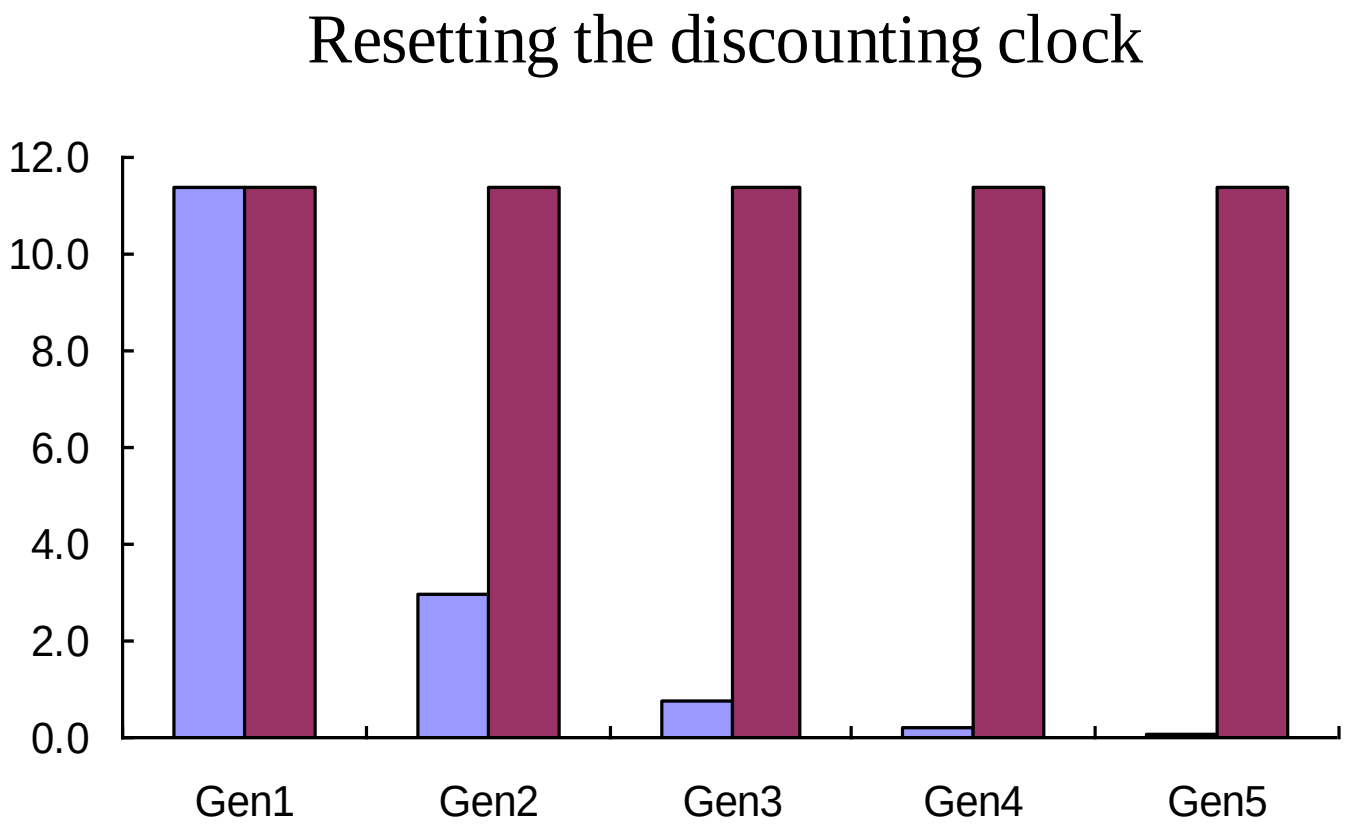


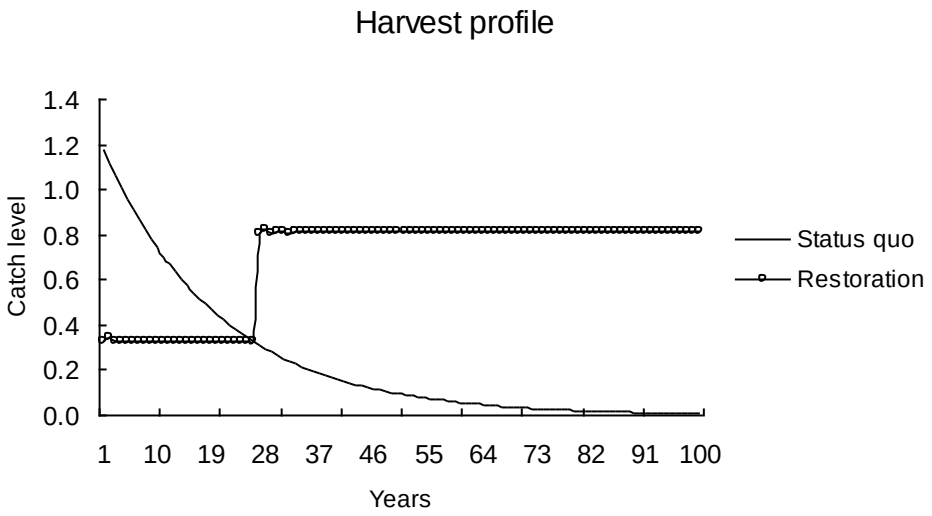
IG Discounting: Discrete model

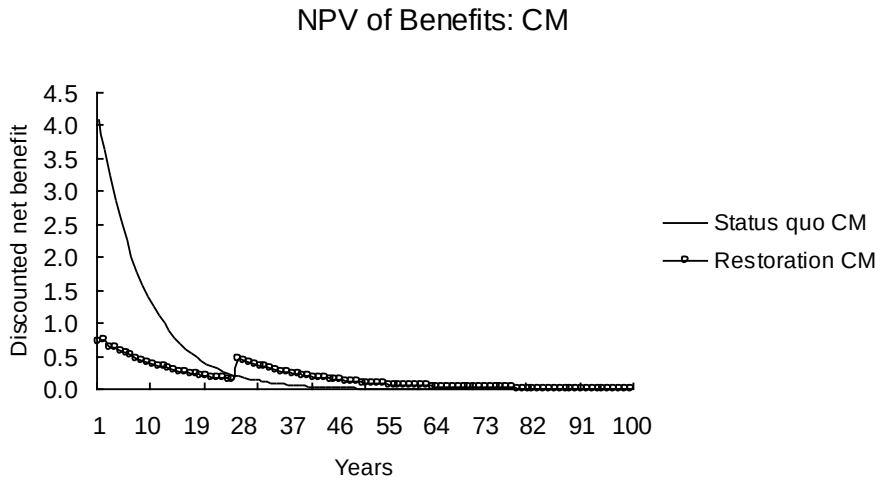
$$NPV = NPV_1 + NPV_2$$

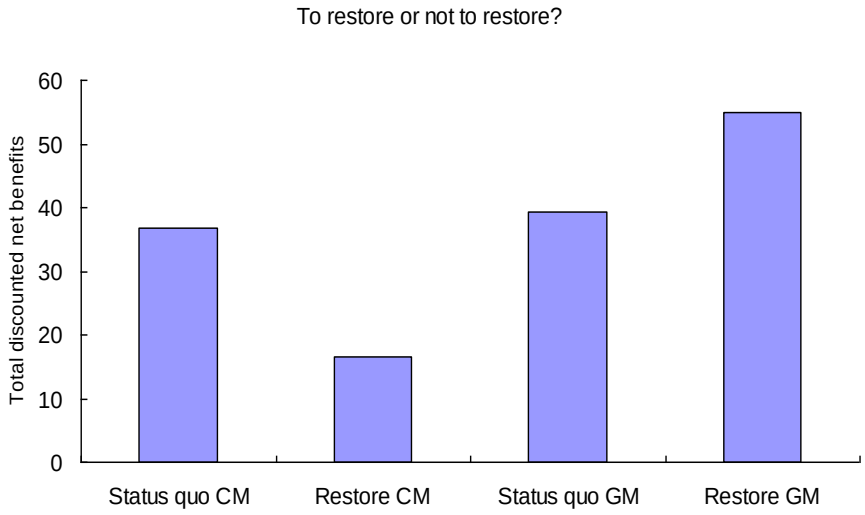
$$= \sum_{t=1}^{t_1} \frac{V_t - C_t}{(1+\delta)^t} + \sum_{t=t_{1+1}}^{t_2} \frac{V_t - C_t}{(1+\delta)^{t-t_1}}$$

Sumaila (2004): *Fish and Fisheries*

IG Discounting: Discrete model application

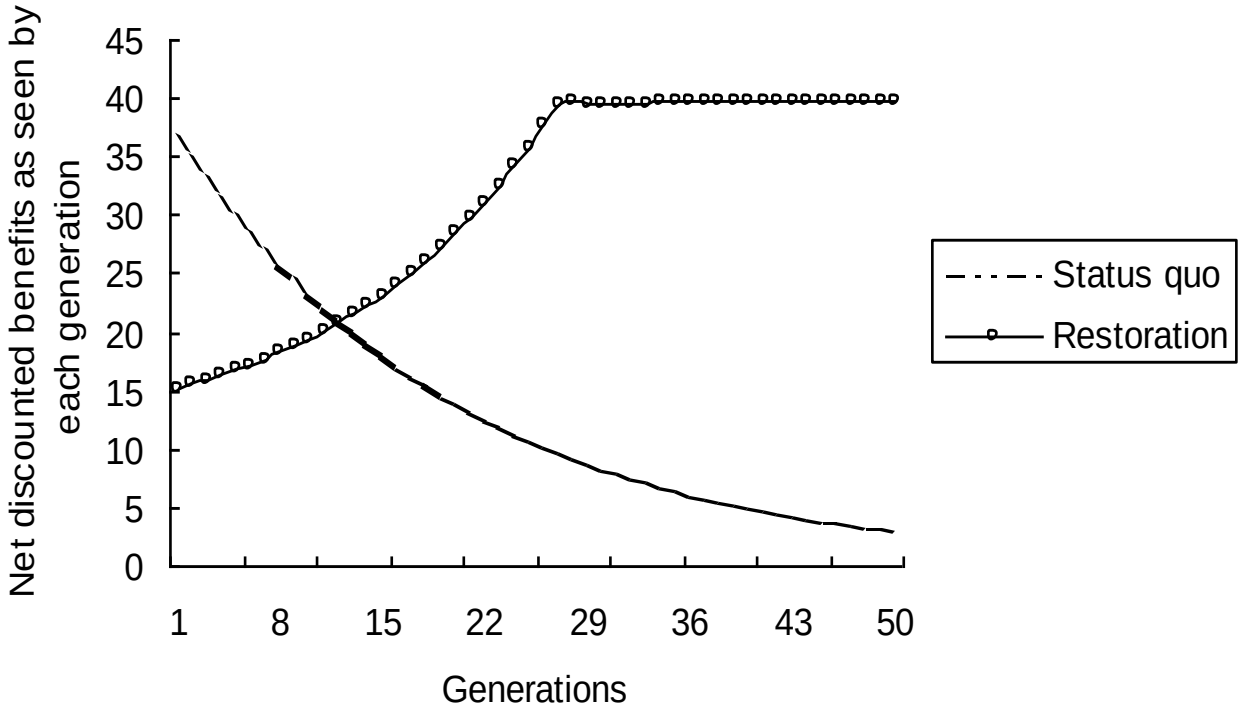






naila (2004): *Fish and Fisheries*

Benefits of rebuilding to different generations of 50 years each



Sumaila (2004): *Fish and Fisheries*

IG discounting: Continuous time

- Assumptions:
  - Present generation discount flows of benefits at standard rate;
  - New generation of size 1/G enters population each year: they discount at standard rate every year after entry;
  - Current generation as decision makers discount the interest of future generations at a ‘future generation’ discount rate at the time they enter the population.

Sumaila & Walters (2005): *Ecological Economics*

Year(t)	Present	Join yr 1	Join yr 2	...	Join year t
o	1				
1	d	$\frac{d_{fg}}{G}$			
2	d^2	$\frac{dd_{fg}}{G}$	$\frac{d_{fg}^{\ 2}}{G}$		
.					
.					
.					
t	d^t	$\frac{d^{t-1}d_{fg}}{G}$	$\frac{d^{t-2}d_{fg}^{\ 2}}{G}$	...	$\frac{d_{fg}^{\ t}}{G}$

Sumaila & Walters (2005): *Ecological Economics*

The inter-generational CBA model

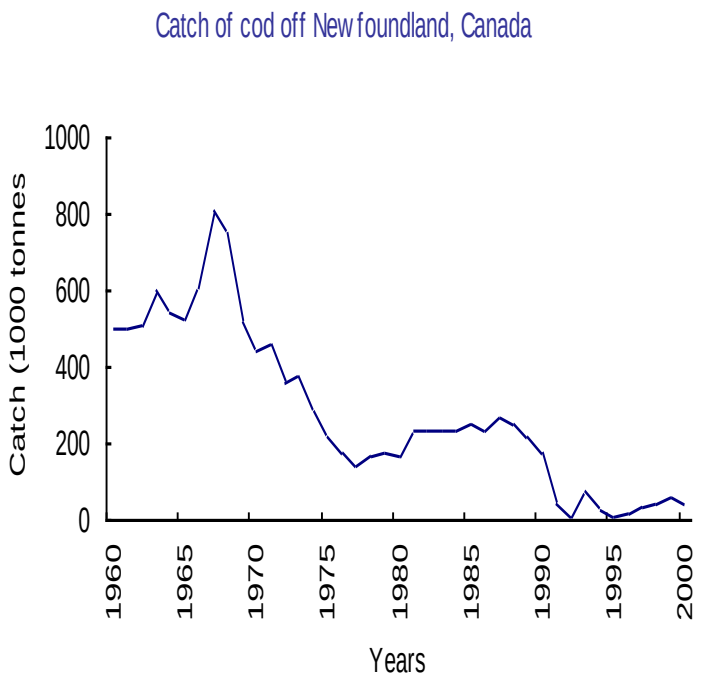
$$NPV = \sum_{t=0}^{T} W^t (V_t - C_t), \quad t = 0,1,2,..,T$$

$$where \quad W = d + \frac{d_{fg} d^{t-1}}{G} \left[\frac{1 - \Delta^t}{1 - \Delta} \right]$$

$$and \quad \Delta = \frac{d_{fg}}{d}; \quad G = generation\ time$$

Sumaila & Walters (2005): *Ecological Economics*

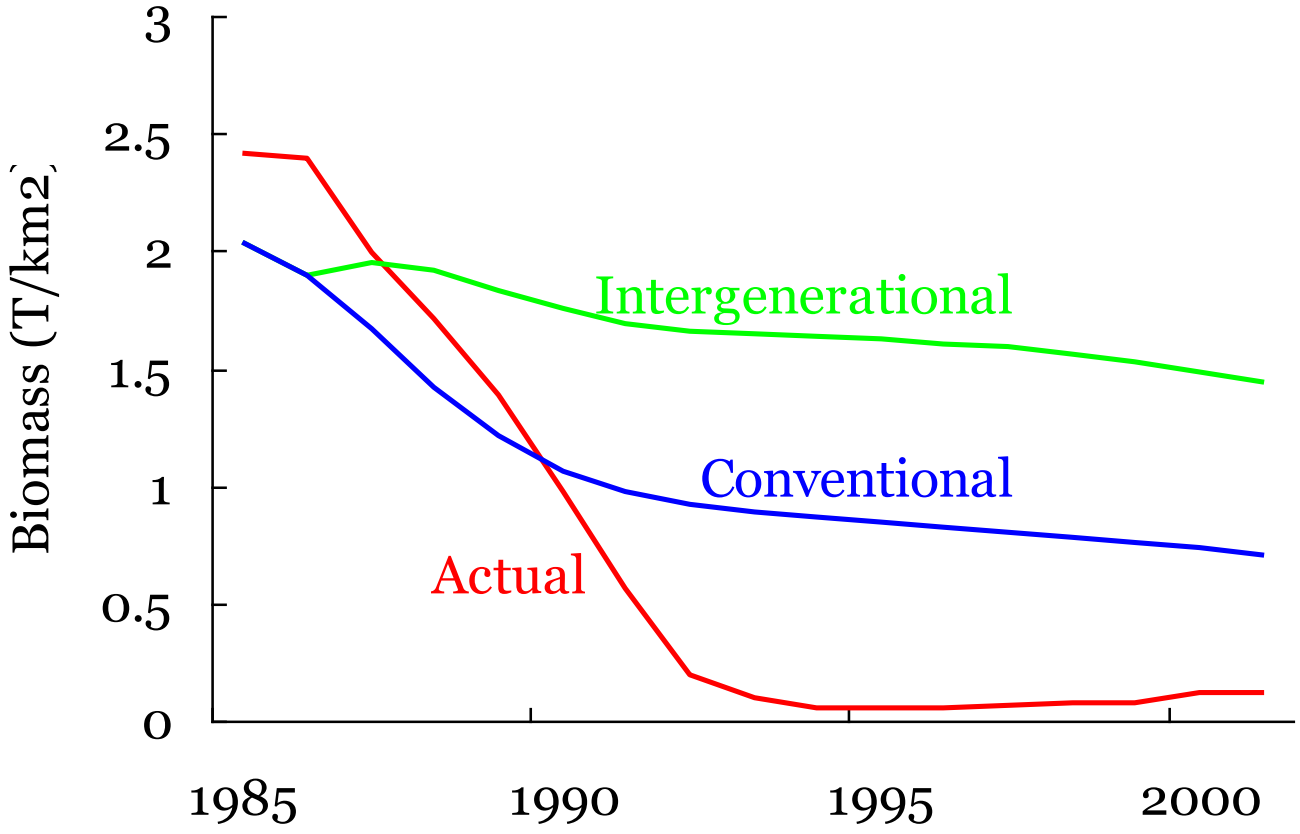
Ken Arrow - An Application: cod off Newfoundland?



- Two broad reasons:
  - Open access, ineffective management, uncertainty, etc.;
  - The way we value benefits from our marine resources.
- Question:
  - What portion of the collapse can be attributed to each of the above?

Ainsworth & Sumaila (2005). Canadian J. of Fisheries and Aquatic Sciences

Causes of cod collapse



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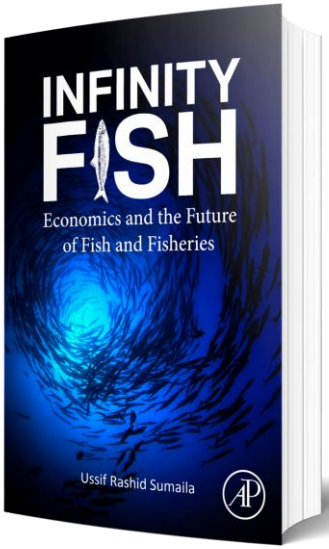
THE CONCEPT OF INFINITY FISH

"Fish is more valuable than diamond !!"



- ***Infinity Fish***: Fish is forever – if managed wisely;
- Fish is valuable to many

To achieve ***Infinity Fish***: Pass on a healthy ocean to our children and grandchildren so they too can have the option to do the same.