

Challenges to estimating the benefits of marine protected areas

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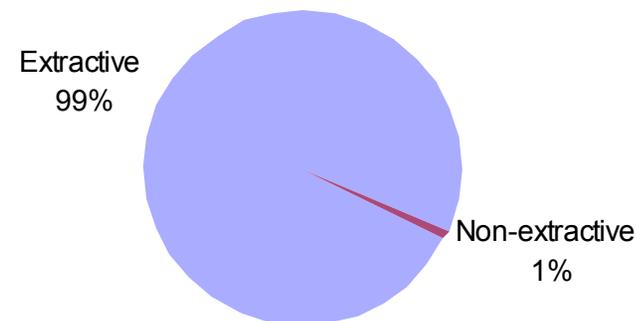
Economic theory of valuation of environmental goods and services

- The economic theory of valuation calls for the computation of total economic values made up of both use and non-use (market & non-market; extractive & non-extractive) values:
 - Direct use value;
 - Indirect use value;
 - Option value;
 - Existence value;
 - Bequest value.
- Starting point for valuation is people's preferences

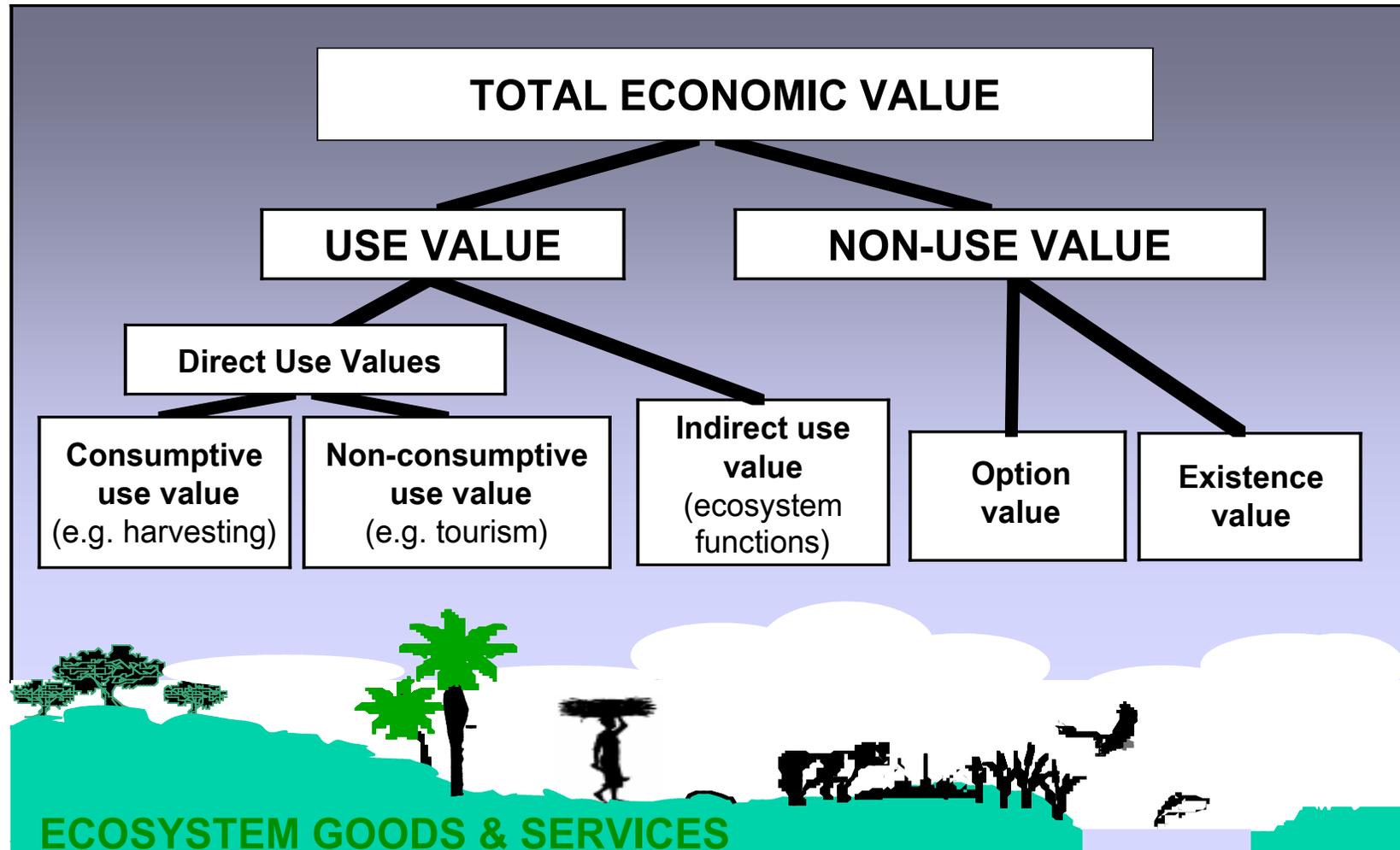
The practice of valuation

Survey of 9 leading Environmental & Resource economics journals:

- the # of articles published: 1994-2003: 4705
- articles that contain the words ‘non market’ or ‘existence value’ or ‘option value’ or ‘bequest value’ during the full period from 1994 to 2003: 43

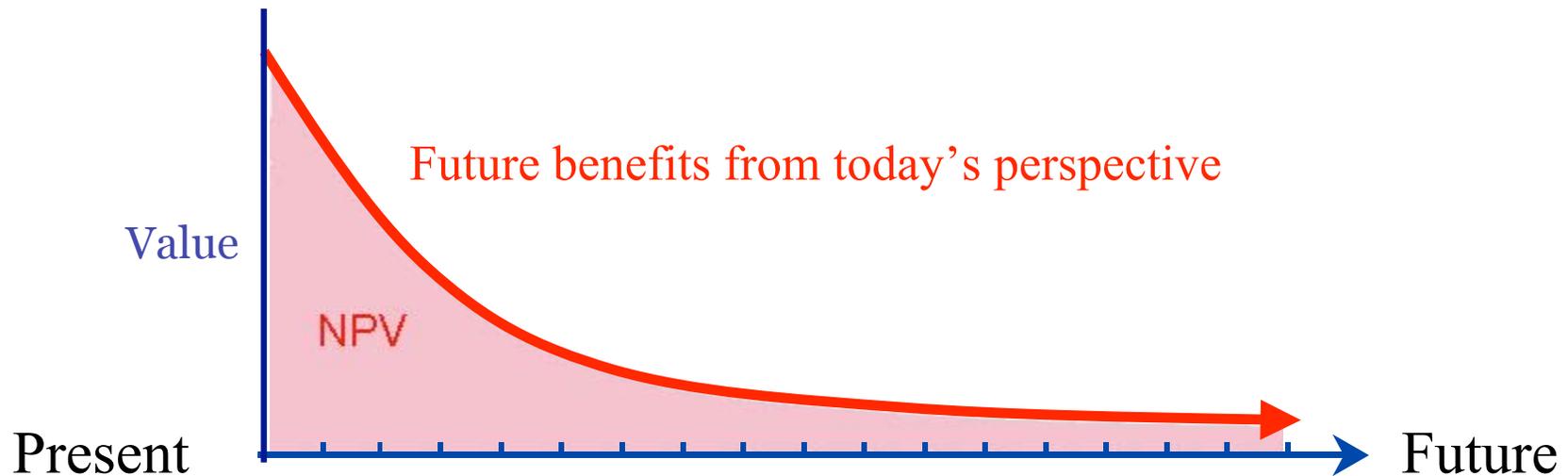


The challenge: Capturing total economic value of PAs



Shortsightedness in valuation

“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*” (Nietzsche, 1844-1900).



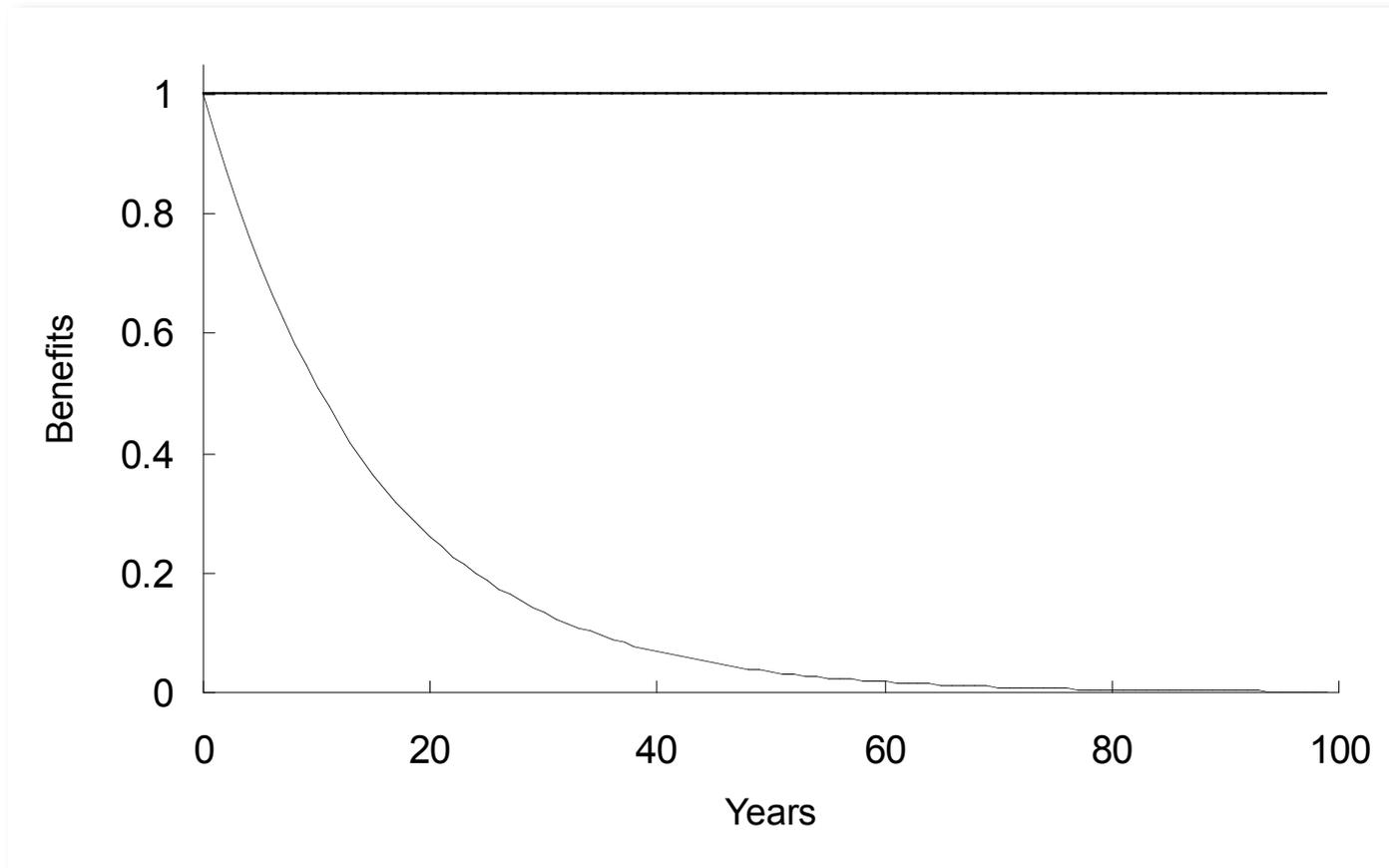
Discounting in economics

Dealing with challenge

- Capture all values
 - Papers to come later will describe how economists are tackling this
 - Find ways to get people to take non-market values seriously:
 - Ethics;
 - Education;
 - Communication;
 - Policy instruments.
 - Need special treatment of bequest value: use intergenerational discounting.

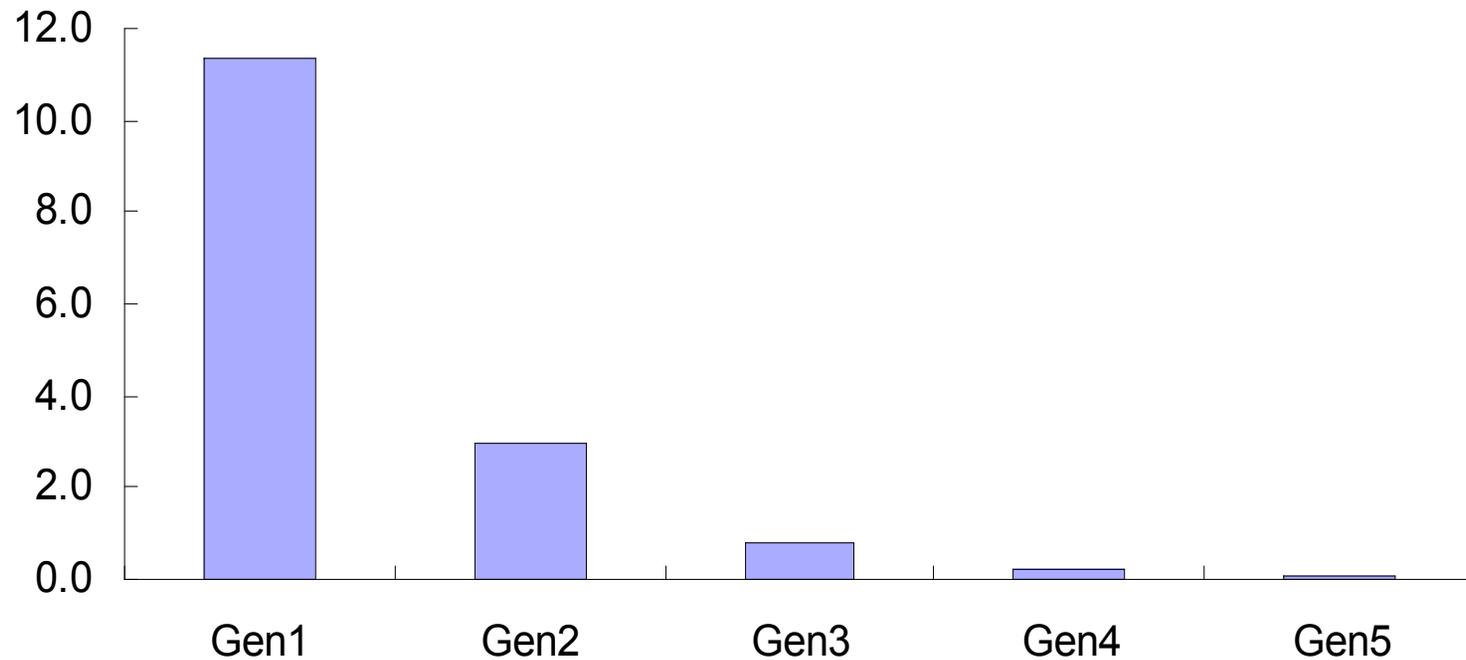
Intergenerational discounting

Flow of 1 unit of value in current and discounted value (7% d.r.)



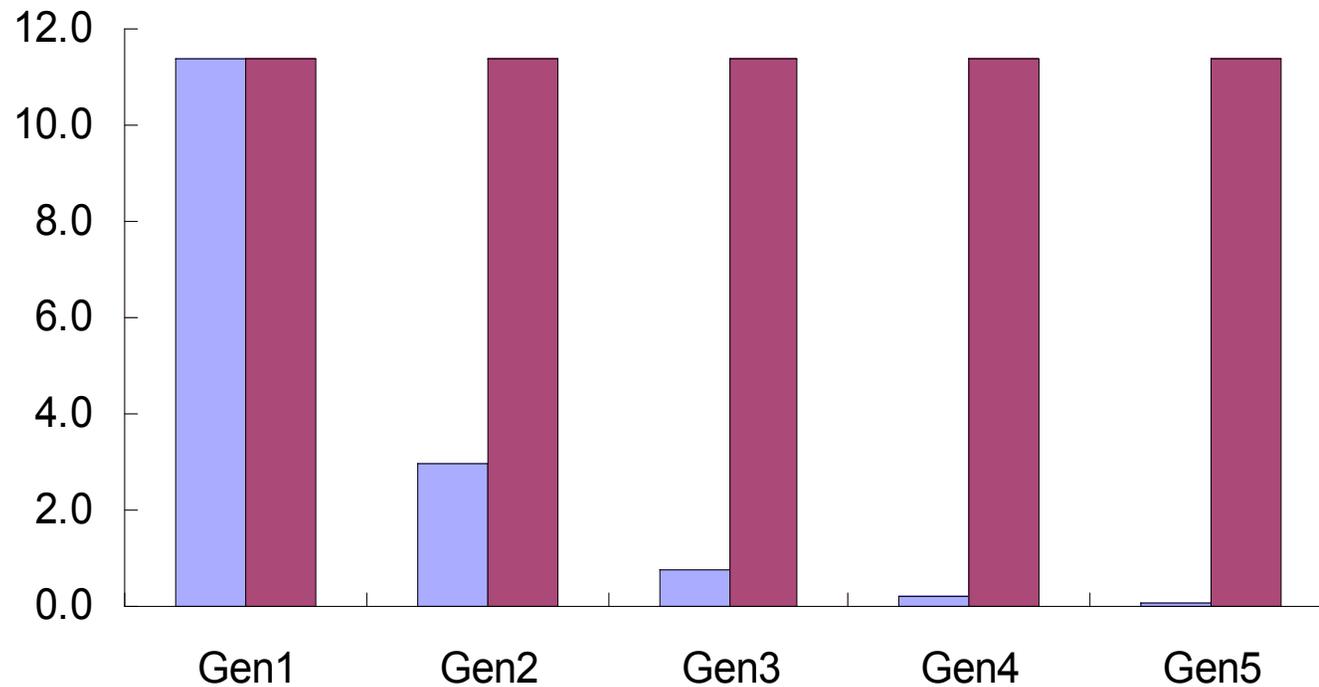
NPV accruing to each of 5 generations within 100 yrs

Conventional discounting



NPV accruing to each of 5 generations within 100 yrs

Resetting the discounting clock



Inter-generational discounting (Sumaila and Walters, 2005)

- 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’ rate at the time they enter the population.

<i>Year(t)</i>	Present	Join yr 1	Join yr 2	...	Join year t
0	1				
1	d	$\frac{d_{fg}}{G}$			
2	d ²	$\frac{dd_{fg}}{G}$	$\frac{d_{fg}^2}{G}$		
.					
.					
.					
t	d ^t	$\frac{d^{t-1}d_{fg}}{G}$	$\frac{d^{t-2}d_{fg}^2}{G}$...	$\frac{d_{fg}^t}{G}$

The inter-generational factor

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

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

A hypothetical example

Total value calculations

- Total values from an MPA
 - Sum of landed, recreational, indirect, option, and existence values is:
 - Consumptive value = \$1.5 m.
 - Non-consumptive value = \$0.5 m.
 - Indirect values = \$1.5 m.
 - Option values = \$1.0 m.
 - Existence values = \$2.5 m.
 - Total value less bequest is \$7.0 million per annum.

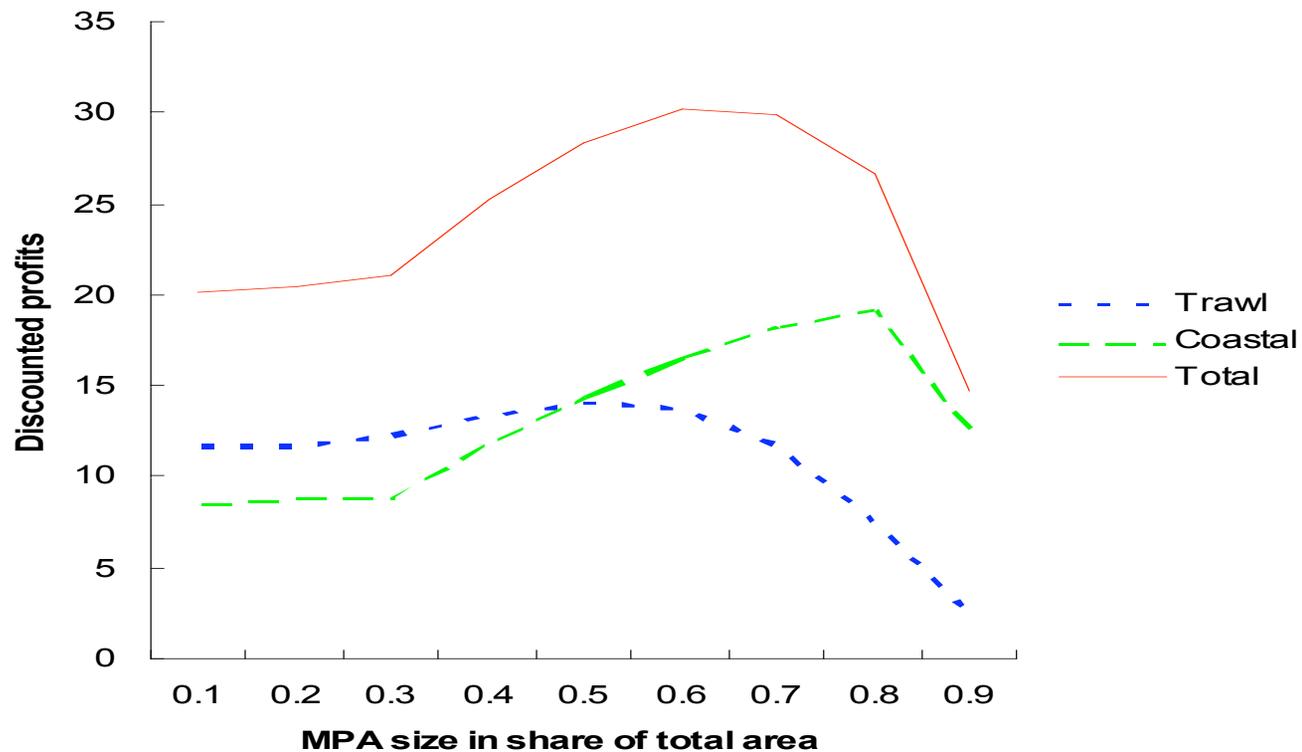
Incorporating bequest into total value

- Present value of a flow of \$7.0 million in perpetuity discounted conventionally at 7% = $14.29 \times 7 = \$100$ million.
- Present value of a flow of \$7.0 million in perpetuity discounted intergenerationally at $85 \times 7 = \$595$ million.

Winners & losers with MPA creation

- Usually even though a group as a whole will benefit from the creation of an MPA, some in the group will gain and some will loss
- This usually presents a big social challenge.
- To deal with problem create a compensation program for losers

Present value profits to trawlers and coastal vessels for different MPA sizes



Armstrong and Sumaila (under review)

Finally: A new global MPA database

- www.seaaroundus.org
- Contact: I.wood@fisheries.ubc.ca
- Take and give approach:
 - Mexico: 49 MPA sites; 1st recorded site in 1979
 - Canada: 244 MPA sites; 1st recorded site in 1911
 - USA: 487 MPA sites; 1st recorded site in 1904

*Thanks for your
attention*

