Joint stakeholder satisfaction in fisheries management

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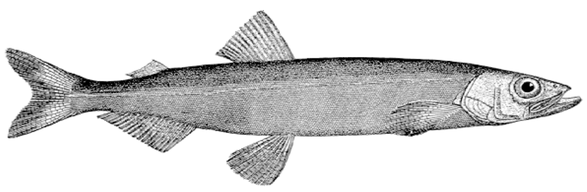
Issue

Marine fisheries have biological, social, & economic components, & stakeholders have different preferences for different parts of this system.



Problem

Most of the world's major fish stocks are managed based on biological assessments only. These assessments are unable to tackle social and economic components of the fishery.

So What?

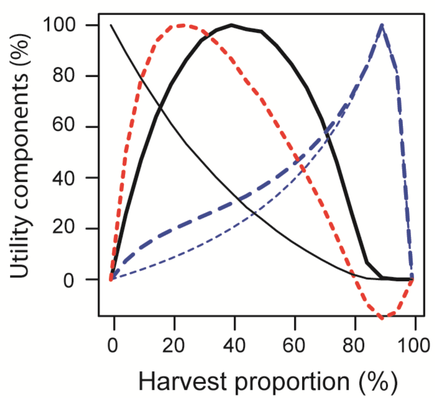
Management failures could come from over-emphasizing biological assessments at the expense of social and economic assessments.

Decision-makers lacking quantitative tools to understand the trade-offs among stakeholder preferences may misinterpret what the fishery system can provide for stakeholders.

Our solution

Our framework, calibrated for **capelin** (results illustrated) and **cod** in the Barents Sea integrates the stakeholder eyes' view by quantifying the joint stakeholder satisfaction (JSS) profile by calculating the generalized mean.

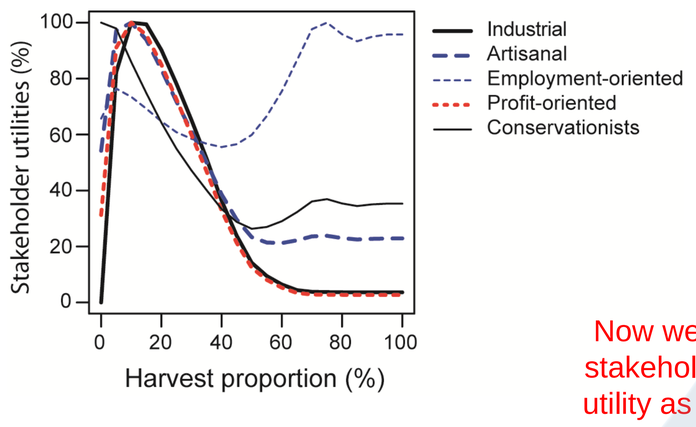
The framework starts by assuming the utility per component as a function of harvest proportion.



Utility component values are multiplied by stakeholder group preferences to produce stakeholder-specific utility

Table of stakeholder group preferences for each utility component	YIELD	EMPLOY-MENT	PROFIT	STOCK LEVEL (spawning stock biomass)
FISHERMEN "industrial"	0.3	0	0.7	0
"artisanal"	0.5	0.1	0.1	0.3
SOCIETY "employment-oriented"	0.2	0.5	0	0.3
"profit-oriented"	0.2	0	0.6	0.2
CONSERVATIONISTS	0.1	0.2	0.2	0.5

Stakeholder- specific total utility



Now we know each stakeholder groups's utility as a function of harvest level. How to quantify the potential for a consensus decision on harvest level?

Assessment of joint stakeholder satisfaction (JSS)

Calculate the generalized mean, *M*, with a parameter, *p*

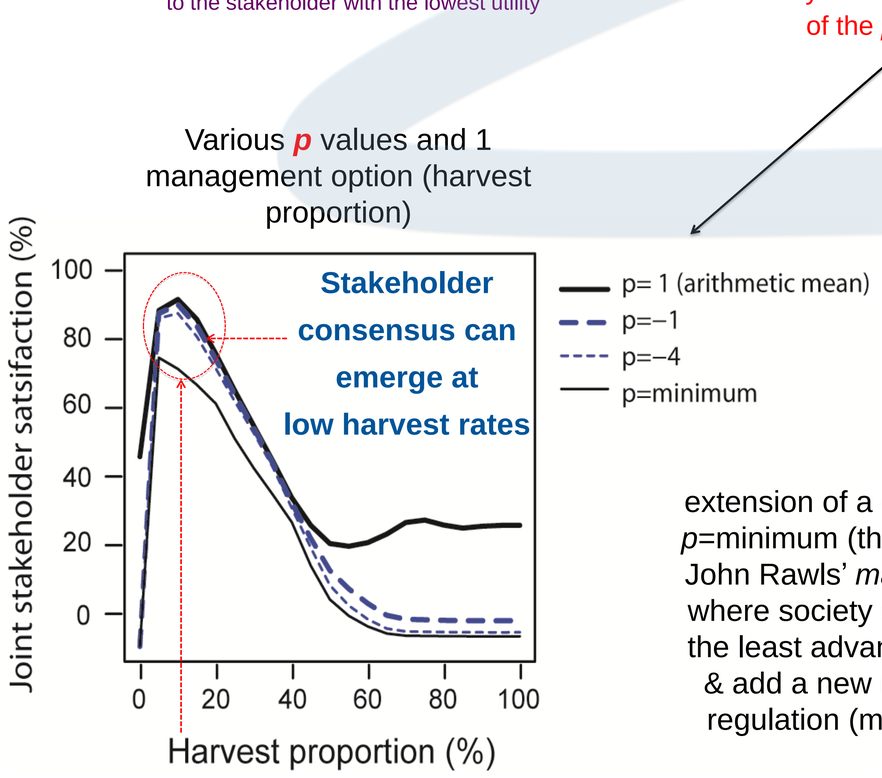
$$M_p(x_1,\ldots,x_n) = \left(\frac{1}{n}\cdot\sum_{i=1}^{n} x_i^{p}\right)^{1/p}$$

Why use the generalized mean? To connect our quantitative assessment to humanistic ideas of democracy à la John Rawls' idea of maximum utility to the least advantaged

the harmonic mean (*p*=-1)leads to intermediate weight being given to the stakeholder with the lowest utility

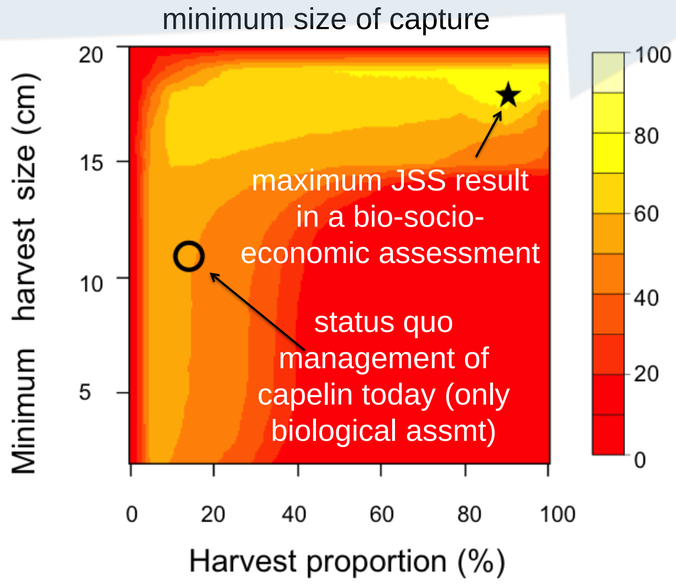
This function allows covering the full ground between the minimum and the arithmetic mean by changing the values of the *p* value.

Various ***p*** values and 1 management option (harvest proportion)



extension of a case using the *p*=minimum (the equivalent of John Rawls' *maximin* criteria, where society cares most for the least advantaged citizen) & add a new management regulation (minimum size)

The *p*= minimum with 2 management types, harvest level & minimum size of capture

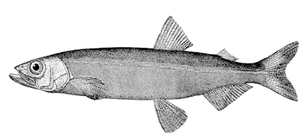


Maximum JSS (76%) means the least happy stakeholder group gets 76% of their maximum utility. This is greater than the JSS result at the staus quo regime (55%).

Benefits of quantifying the joint stakeholder satisfaction (JSS)

Stakeholder conflicts may not be so conflicting as thought! Quantification of stakeholder preferences leads to clarification of management consequences and room for an "integrated solution." Follett, MP. 1955. *Dynamic Administration: the collected papers of Mary Parker Follett* (Harper & Row Publishers, New York).

Integrating biological & socio-economic assessments sheds light on utilities that matter to society.



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