

# Preaching water while drinking wine? Time preferences of fishery advisors and implications for management

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# Motivation

- Fishermen are often advised to be more patient and limit catches now in order to increase stock size and catches in the future.
- Such scientific advice is usually based on the maximum sustainable yield (MSY) objective.
- This biological criterion is generally consistent with economic interests/rationales at low discount rates.

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- 2 How would their time preferences affect management targets?

# Online field experiment with 442 members of the ICES community

Please consider the following scenario:

The environment has been shown to have many positive impacts on work.

The European Union has therefore decided to increase its spending on nature conservation programs.

They can either spend 1,000 EUR in 4 weeks or another certain amount in 56 weeks.

You are now asked for your recommendation on when to spend the money. Please choose between each of the following options (i.e. make 8 marks):

**In 4 weeks**

**in 56 weeks**

1000 Euro  or 990 Euro

1000 Euro  or 1000 Euro

1000 Euro  or 1010 Euro

1000 Euro  or 1020 Euro

1000 Euro  or 1050 Euro

1000 Euro  or 1100 Euro

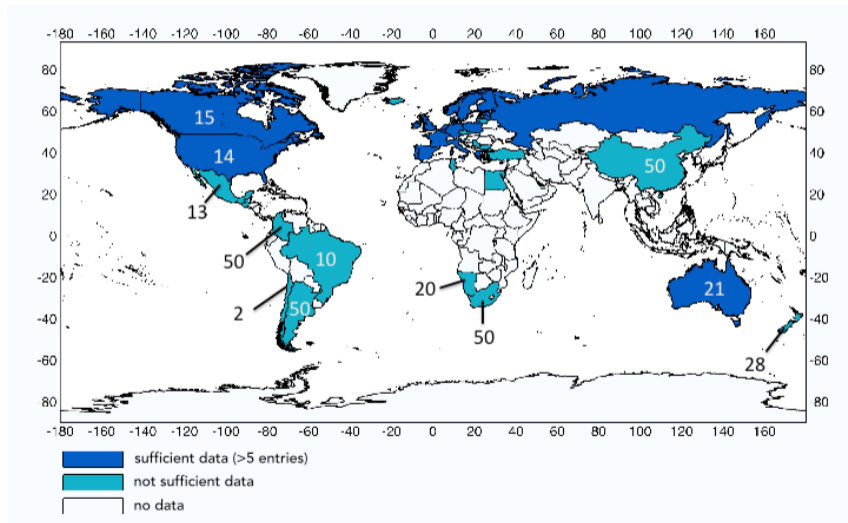
1000 Euro  or 1200 Euro

1000 Euro  or 1500 Euro

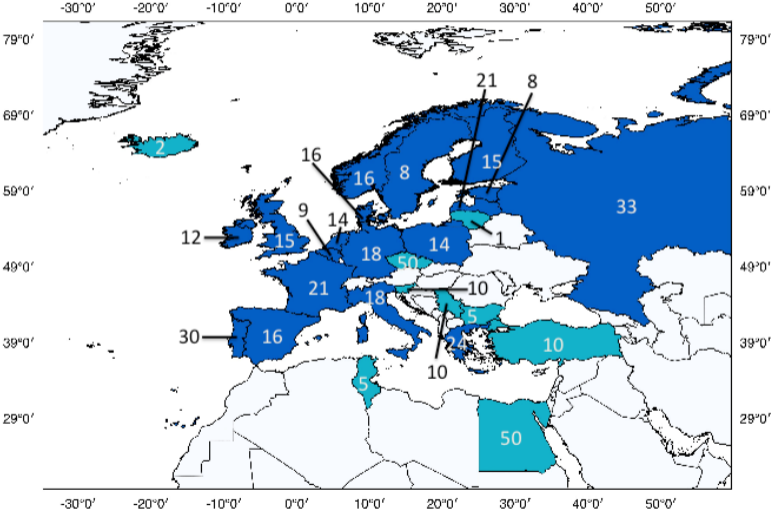
# Conversion to impatience indicator and discount rates

Impatience indicator	Choice	Minimum positive discount rate (in % p.a.)
0	990 Euro & 1000 Euro in one year; otherwise 1000 Euro now	-
1	Always invest in the future	-
2	Switch at 1000 Euro to future	-
3	Switch at 1010 Euro to future	-
4	Switch at 1020 Euro to future	$> 0$
5	Switch at 1050 Euro to future	$> 2$
6	Switch at 1100 Euro to future	$> 5$
7	Switch at 1200 Euro to future	$> 10$
8	Switch at 1500 Euro to future	$> 20$
9	Always invest now	$> 50$

# Mean discount rates per nationality of participant



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# Ecological-economic modeling and consequences for management

Eastern Baltic Cod Trawl fishery with 8 age classes (Tahvonen et al. 2017, Voss et al. 2017):

$$x_{1,t+1} = \frac{1.94 \sum_{s=1}^8 \gamma_s w_s x_{st}}{1 + 0.00352 \sum_{s=1}^8 \gamma_s w_s x_{st}} \quad (1)$$

$$x_{s+1,t+1} = \alpha_s \left( 1 - q_s \frac{H_t}{B_t} \right) x_{st} \quad s = 1, \dots, 6 \quad (2)$$

$$x_{8,t+1} = \alpha_7 \left( 1 - q_7 \frac{H_t}{B_t} \right) x_{7t} + \alpha_8 \left( 1 - q_8 \frac{H_t}{B_t} \right) x_{8t} \quad (3)$$

$$B_t = \sum_{s=1}^8 w_s q_s x_{st} \quad (4)$$

Based on most commonly used fishing gear in the fishery (EC 2010, Madsen 2007), using the latest stock conditions as input (ICES 2014).

# Ecological-economic modeling and consequences for management

The objective is to maximize the present value of economic surplus from the fishery

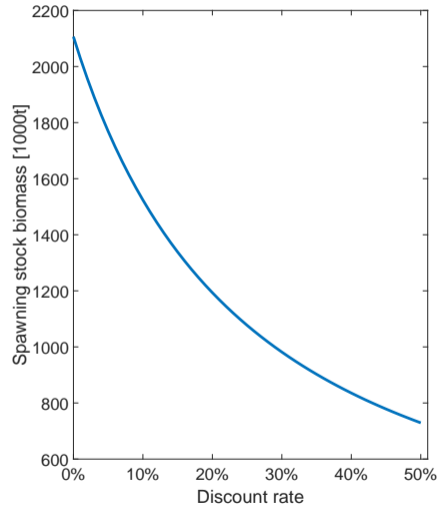
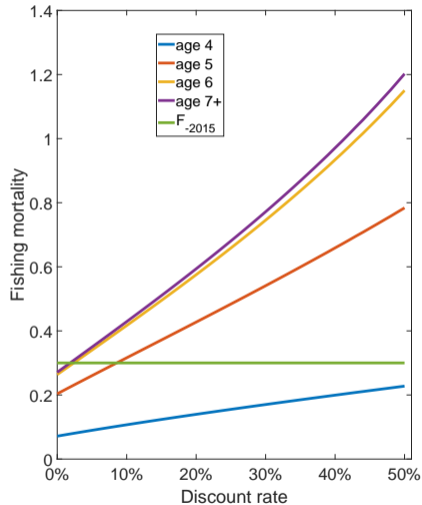
$$\max_{\{H_t\}} \sum_{t=1}^T \left( \frac{1}{1+\rho} \right)^{t-1} \left( \sum_{s=1}^n p_s w_s q_s \frac{H_t}{B_t} x_{st} - c_0 \frac{H_t}{B_t^{\chi}} \right)^y, \quad (5)$$

where  $0 < y < 1$  is a scaling factor that prevents pulse fishing solutions and  $\rho$  is the discount rate. The objective is maximized subject to the fishery dynamics (1)-(4).

Transformation to age-specific fishing mortalities :

$$F_{st} = -\ln \left( 1 - q_s \frac{H_t}{B_t} \right). \quad (6)$$

# Desired management targets as a function of the discount rate



# Discussion

- 61% of all scientists displayed discount rates of  $> 5\%$  , and to a large extent (45%) even discount rates of  $> 10\%$  .
- Fishermen's discount rates in an ITQ system between 11-25% (Asche 2001).  
Mean individual discount rate of Danish fishermen 28% (Harrison et al. 2002)
- These high discount rates of fishermen and fishery scientists are in line with the MSY objective only if counterbalanced by strongly stock-dependent harvesting costs.

# References

- Asche, F. (2001). Fishermen's discount rates in ITQ systems. Environmental and resource economics, **19**(4): 403–410.
- EC (2010). Commission Regulation (EU) No 686/2010 of 28 July 2010 amending Council Regulation (EC) No 2187/2005 as regards specifications of Bacoma window and T90 trawl in fisheries carried out in the Baltic Sea, the Belts and the Sound.
- Harrison, G. W., M. I. Lau, and M. B. Williams (2002). Estimating individual discount rates in Denmark: A field experiment. American economic review, **92**(5): 1606–1617.
- ICES (ed.) (2014). Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 3-10 April 2014, ICES HQ, Copenhagen, Denmark., ICES CM 2014/ACOM:10. 919 pp.
- Madsen, N. (2007). Selectivity of fishing gears used in the Baltic Sea cod fishery. Reviews in Fish Biology and Fisheries, **17**(4): 517–544. ISSN 0960-3166.
- Tahvonen, O., M. F. Quaas, and R. Voss (2017). Harvesting selectivity and stochastic recruitment in economic models of age-structured fisheries. Journal of Environmental Economics and Management. ISSN 00950696.
- Voss, R., M. F. Quaas, M. T. Stoeven, J. O. Schmidt, M. T. Tomczak, and C. Mllmann (2017). Ecological-Economic Fisheries Management AdviceffQuantification of Potential Benefits for the Case of the Eastern Baltic COD Fishery. Frontiers in Marine Science, **4**: 209. ISSN 2296-7745.  
URL <https://www.frontiersin.org/article/10.3389/fmars.2017.00209>