myfish
Maximising yield of fisheries while balancing ecosystem, economic and social concerns

SOCIOEC

SEVENTH FRAMEWORK PROGRAMME

DTU

Achieving MSY and minimising conflicts in mixed-fisheries management

Clara Ulrich, DTU Aqua, Denmark

Paul Dolder (UK), Ayoe Hoff (DK), Alexander Kempf (GE), Jan-Jaap Poos (NL), Anna Rindorf (DK), Youen Vermard (FR)

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

DTU Aqua
National Institute of Aquatic Resources

I. MSY: Do we have a problem?

The reasons for MSY mistrust 30 years ago still apply:

1. Mixed fisheries interactions make that not all stocks can reach MSY at the same pace

2. Multi-species interactions make that not all stocks can stay at MSY at the same time and for the same level of fishing effort

- *MSY is a positive concept but it may need to be interpreted as a desirable area rather than a point.*

- *Defining this desirable area and the path to get there is all about trade-offs!*

MSY in mixed-fisheries

- Single-species MSY target (or Long-Term Management Plan target) is supposed to be the optimal strategy for each stock
  - Maximum Yield
  - Sustainable biomass
  - Compromise between stability in annual yield and biomass recovery time

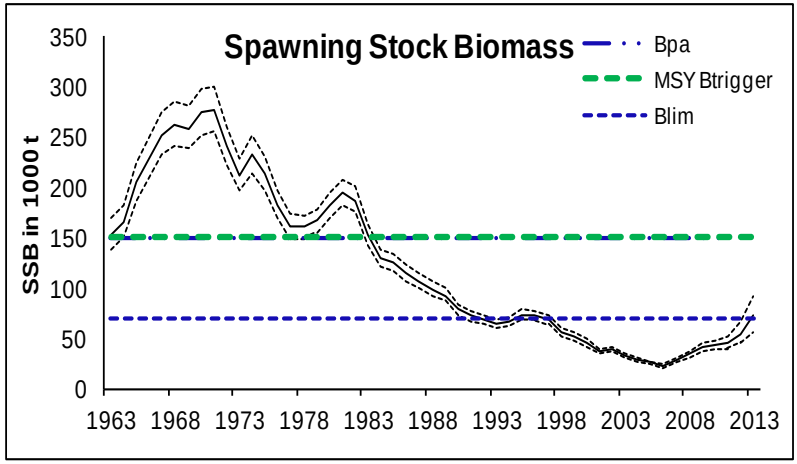
- Each stock has a different optimal strategy, causing mixed-fisheries issues

- Any deviation from a single stock strategy because of mixed-fisheries implies a sub-optimal management for that stock
  - Over exploitation and delayed recovery in some cases
  - Under exploitation of stock potential in other cases

- Increased need to address this question in the context of EU landing obligation

The example – North Sea cod advice 2014

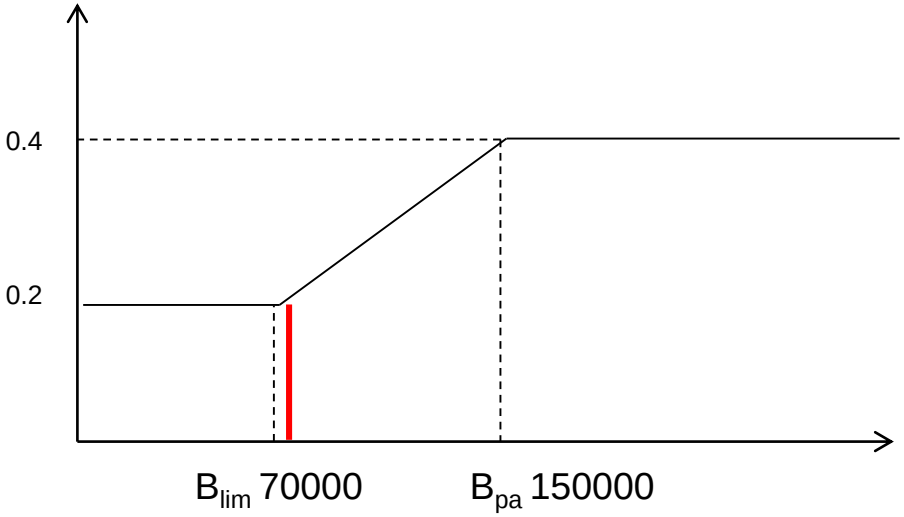
- Single stock LTMP :
  - Transition phase of annual F reduction
  - Target F=0.4
  - +/- 20% interannual variability
  - Sliding rule reducing F when SSB<Bpa
- Advice 2014:
  - SSB2013=71000t
  - TAC = - 9%
  - SSB~ + 45%



- In comparison: TAC+20% gives SSB~ + 34%

Large differences for small effects?

-> Poor governance at annual TAC decisions



II. Modelling Mixed-Fisheries for quantifying trade-offs

- Low cod TAC, taken with low effort / high haddock TAC, taken with a higher level of effort
- Fleets dilemna:
    - stop fishing when cod TAC caught and underutilise haddock TAC (”min effort” scenario)
    - go on fishing until haddock TAC caught and get overquota catches of cod (”max effort” scenario)
    - Something else?
- What are the long-term effects of such scenarios?

The North Sea Mixed-Fisheries Advice
(Fcube, Ulrich et al., 2011 / ICES WGMIXFISH)

- 9 demersal stocks, 8 *Nephrops* stocks, 4 management plans

FHCR /F2013	COD-NS	HAD	PLE-NS	PLE-EC	POK	SOL-NS	TUR	SOL-EC
2014	1	1.03	1	0.85	1.10	1	1	0.91
2015	0.54	1.91	1.38	0.63	0.92	0.95	0.66	0.57

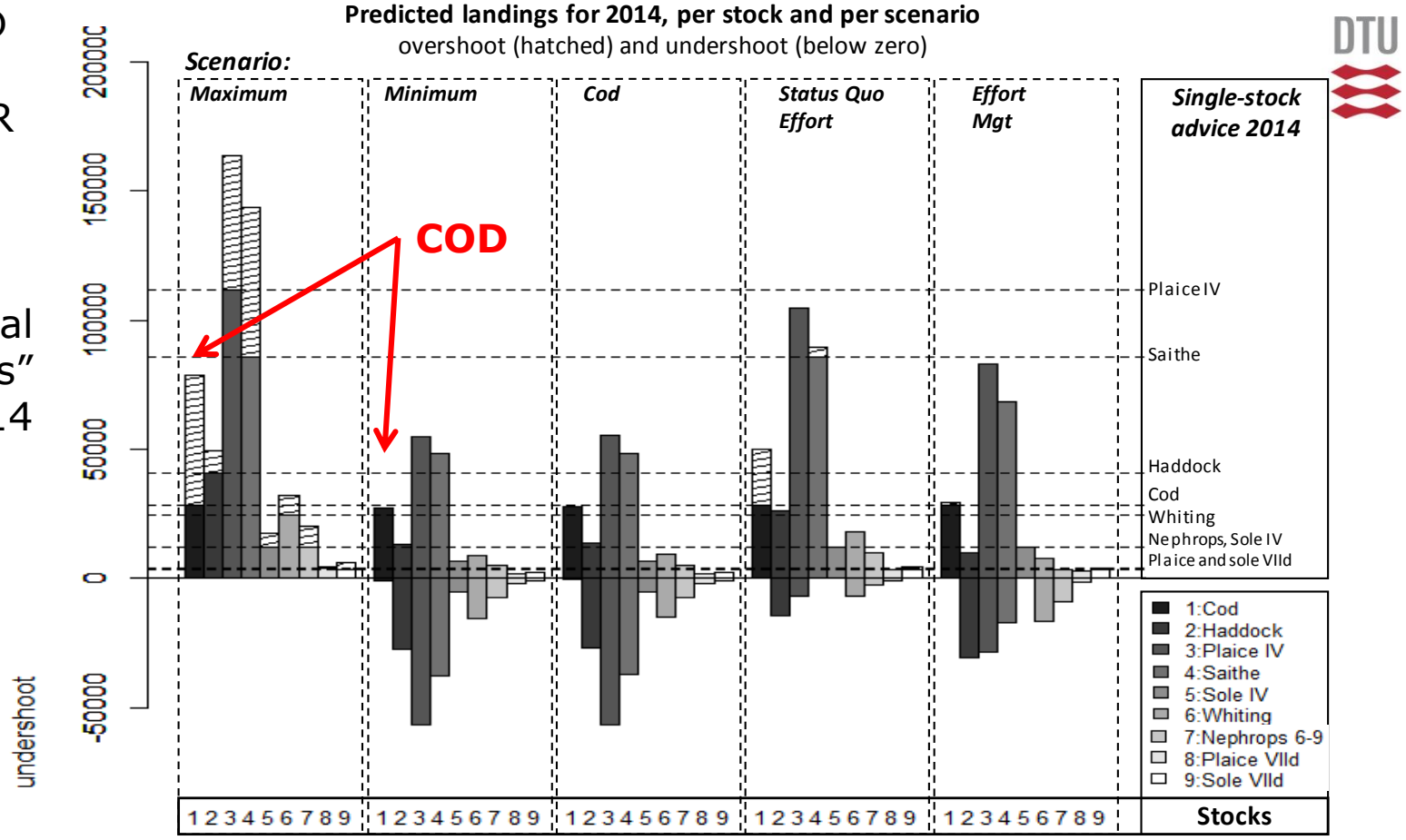
- 9 countries, 3 areas, 37 fleets, 19 métiers, 97 combinations fleets*métiers

- Estimation of effort corresponding to single-species TAC advice for each fleet

- Scenarios :
  - Baseline : ICES Single-stock advice
  - Fcube scenarios : Max, Min, Sq_E, Cod-ns, Ef_Mgt

ICES MIXED FISHERIES ADVICE FOR THE NORTH SEA, 2014

"Potential Landings" 2014

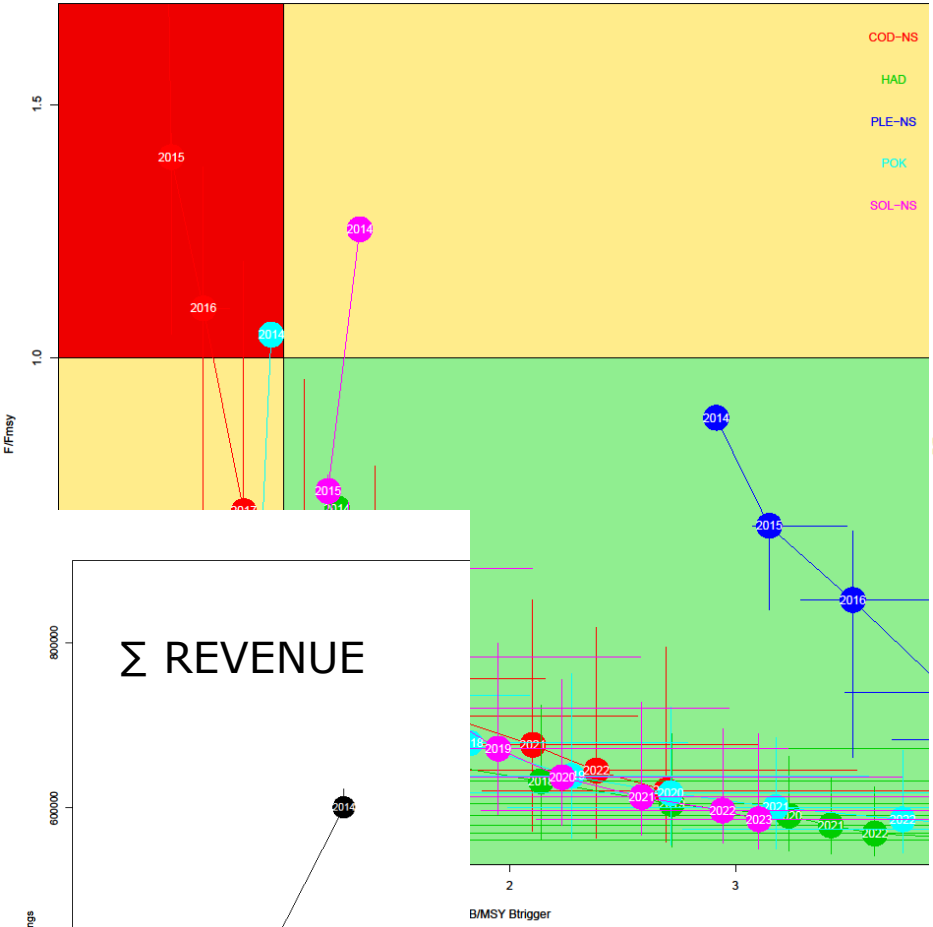


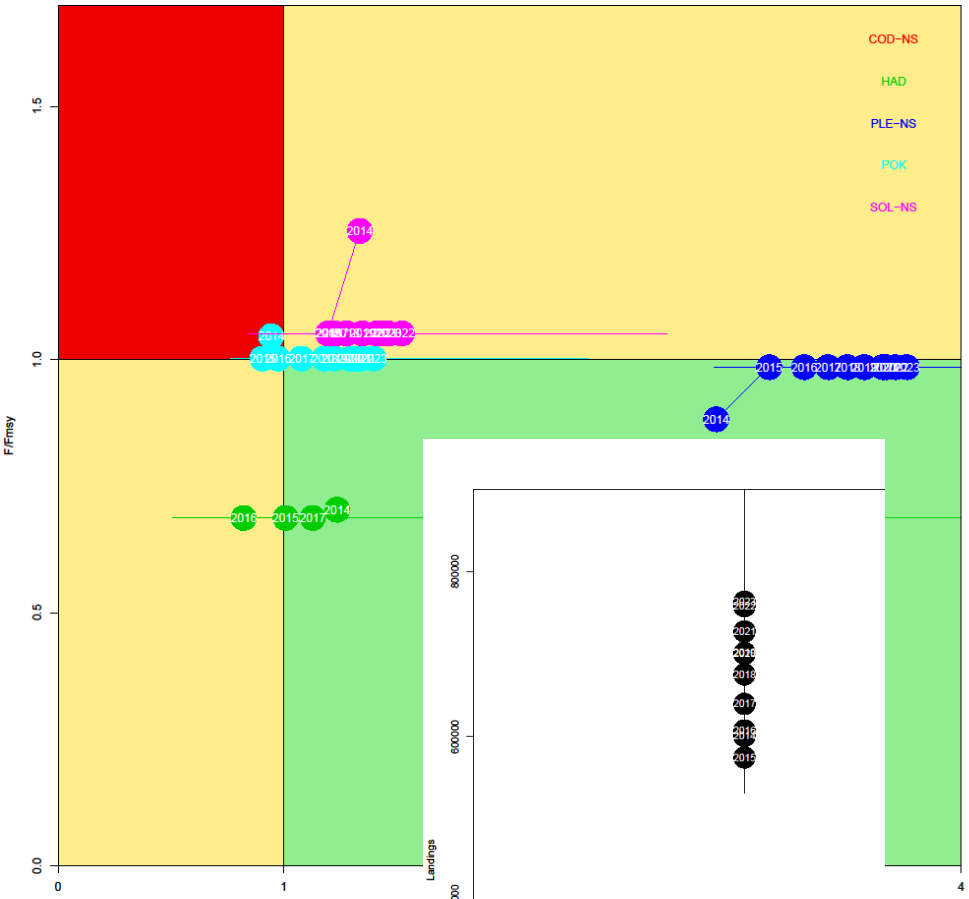
47% reduction in revenue between Sq_E and min

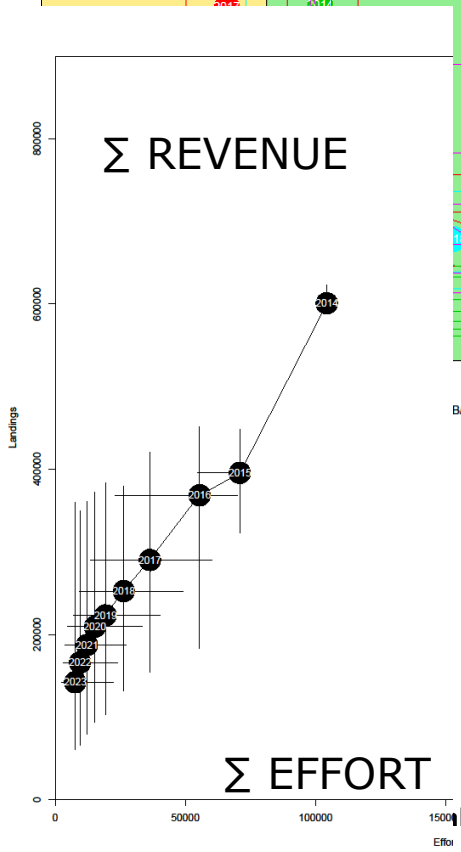
Differences in scenarios imply:

- A mismatch between fishing opportunities
- A situation forcing changes in fishing patterns to occur

But these changes cannot be predicted







Medium term trade-offs

MIN (~ landings obligation)

Constant 2013 effort

III. Mixed-Fisheries management plans: Exploring mechanisms to achieve MSY

- PURPOSE : DECREASE THE SITUATION OF TAC MISMATCH TO IMPROVE ANNUAL TAC DECISION

MSY range values

	min	max
COD-NS	0.16	0.42
HAD	0.27	0.33
PLE-NS	0.2	0.3
POK	0.27	0.33
SOL-NS	0.2	0.25
TUR	0.3	0.36
WHG-NS	0.135	0.165

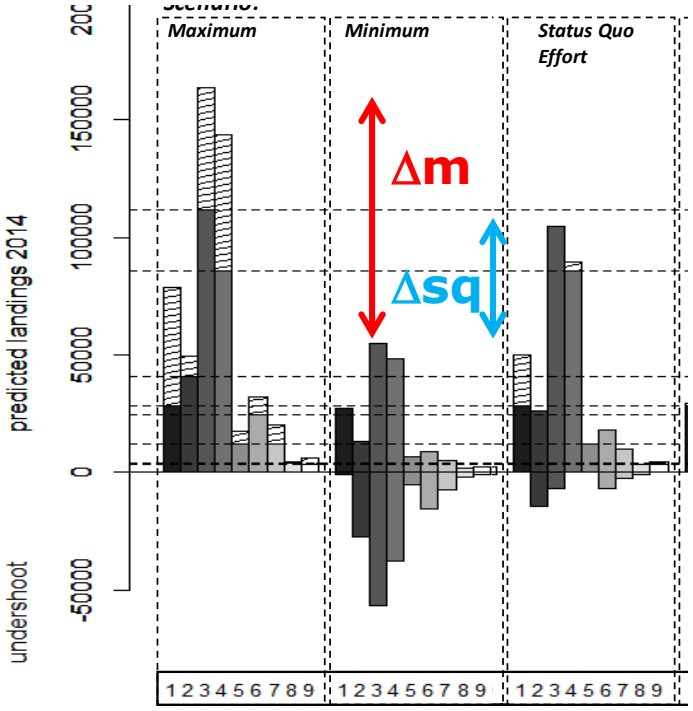
- For each stock :
  - define the single-species MSY target
  - Acceptable range
    - Fmsy Confidence Interval?
    - Pretty Good Yield? (95% MSY?)
    - Other?
  - Acceptable time frame
    - 2015?
    - 2020?
- Multidimensional window of opportunity (”the potatoe of opportunity”)

FCUBE MIXED FISHERIES INDICATOR

As MAX and MIN represent the range of effort levels between differences in single-species fishing opportunities, we assume that the lowest the difference between the two, the least unbalance between TACs

$\Delta m = \Delta\sum max - \sum min$ can be computed for total fishery or by fleet/stock, in effort or in catches

$\Delta sq = \Delta\sum sq - \sum min$ is a proxy for potential choke effects



Several options being explored (preliminary results only…)

- **Exploration 1** : HCR at average across stock targets. Increasing ”Min” and decreasing ”Max” by setting HCR for all stocks at the average between highest and lowest steps from Fcurrent to Fmsy. Ex:
  - Cod : From F2013=0.4 to Fmax=0.19 = -0.21
  - Haddock : From F2013=0.18 to Fmax=0.35 = +0.17
  - HCR for all stocks next year exploited at -0.02 F

- **Exploration 2** : Finding F by stock within MSY range that minimise the differences Δm and Δsq

- **Exploration 3** : Using mixed-fisheries MEY from FishRent

- **Exploration 4** : How much avoidance of choke-species would be needed to avoid mismatches?

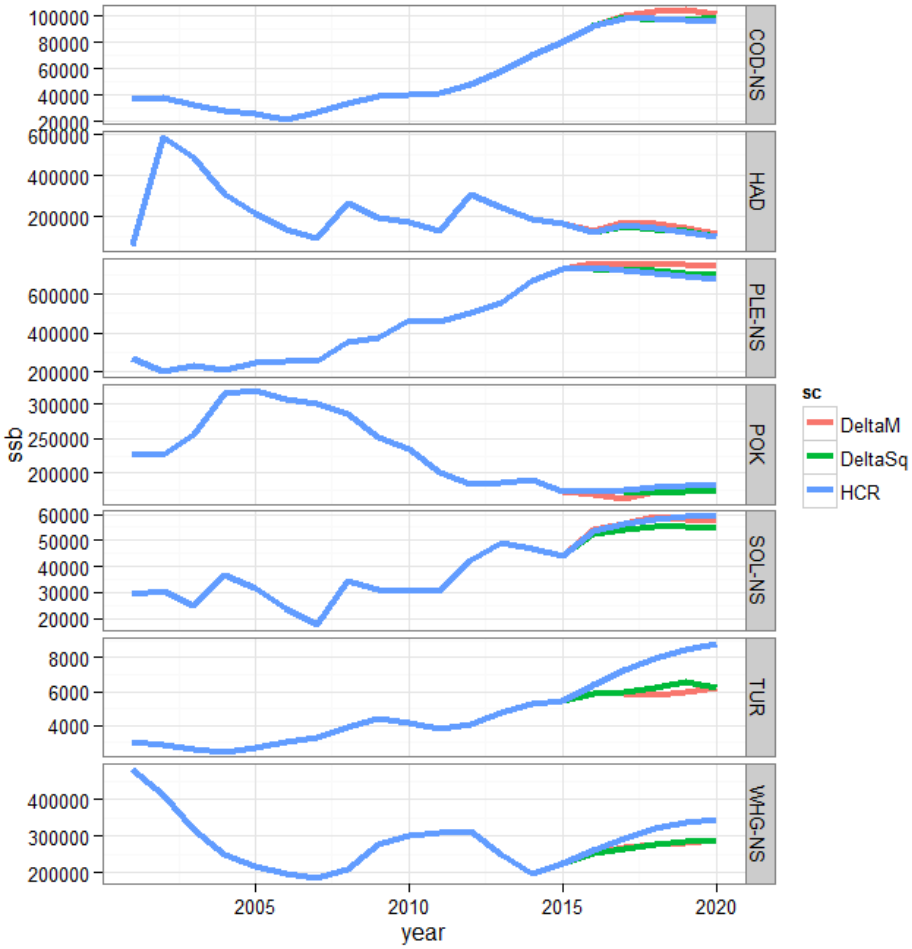
Exploration 2 : Finding Fs that minimise the differences

- At each year, minimising ∆m and ∆sq with F within Fmsy range by stock (genetic algorithm)

-> No combination of Fs can solve the issue

-> only limited gains in difference over the first years

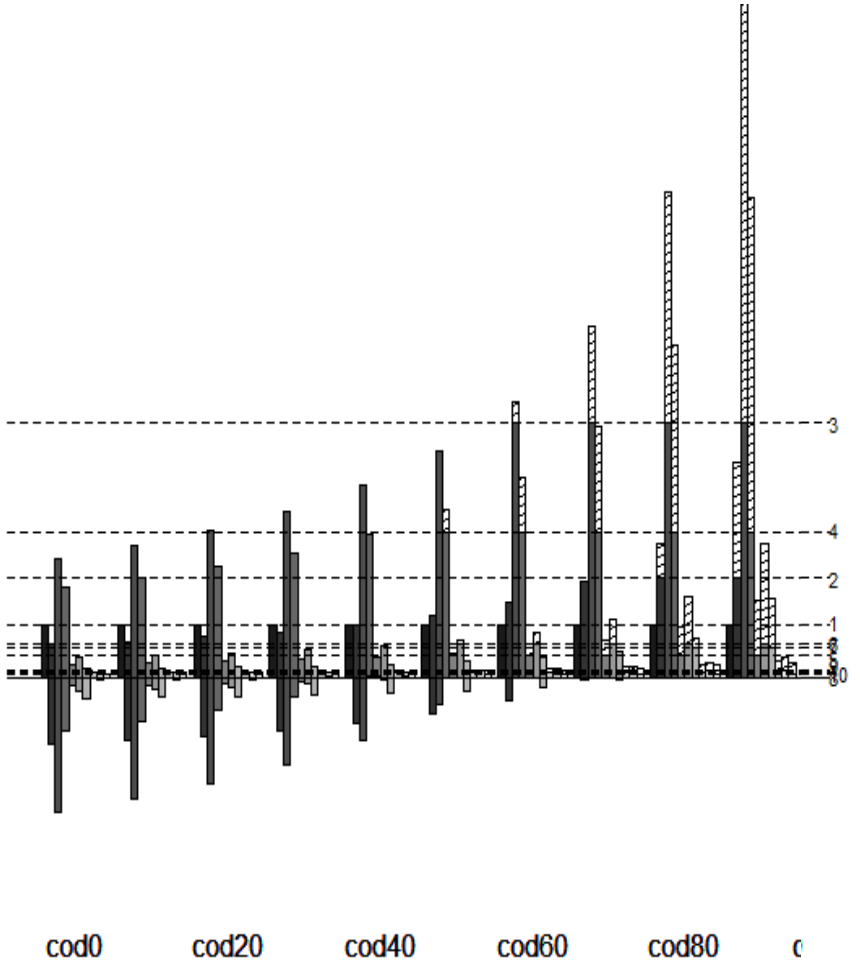
-> improvements mainly gained by increasing F for limited stocks



Exploration 4 : How much avoidance would be needed to avoid mismatches

- Reducing catchability of all cod métiers by 10 to 90%

-> 50% more avoidance of cod would be needed to avoid mismaatches with other TACs…



Conclusions

- The challenges in achieving MSY in mixed-fisheries must be acknowledged and addressed upfront to improve annual governance
- Only a ”MIN” scenario would be fully compatible with current single-stock MSY definition. Any deviation from this implies a consensus on some flexibility around MSY concept.
- ”MIN” in North Sea can only be achieved by halfing effort or cod catchability or changing balance between metiers. The consequences for the fisheries worsen with the landings obligation
- The mixed-fisheries explorations would help in the short-medium term but would implies some delayed recovery for some stocks (cod). They would work well when all stocks are recovered.
- Mixed-fisheries mechanisms could be a top-down contribution to help bottom-up implementation of landings obligation
- Some fleets win and some lose, depending on their dependency on choke species

Thank you for your attention!