
Providing integrated total catch advice for the management of mixed fisheries with an ecoviability approach

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(submitted)

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Context

Management target for EU fisheries = stock-specific MSY

What is needed:

- ▶ Single-species approach → Mixed fisheries advice
 - ▶ Mismatch catch/quota → discard over-quota catches
 - ▶ Undermine the credibility of decision-makers
- ▶ Biological approach (MSY) → inclusion of socio-economic objectives
 - ▶ Economic and social consequences are considered anyway by decision-makers

Study-case: Bay of Biscay mixed demersal fishery

21 species ~ 80% of French landings in the Bay of Biscay

4 key species (hake, sole, Nephrops, anglerfish)
~ 25% landings in value

→ 710 French vessels

Specialized fleets (i.e. Sole gillnetters or Nephrops trawlers) and non-specialized fleets (i.e. mixed demersal trawlers)

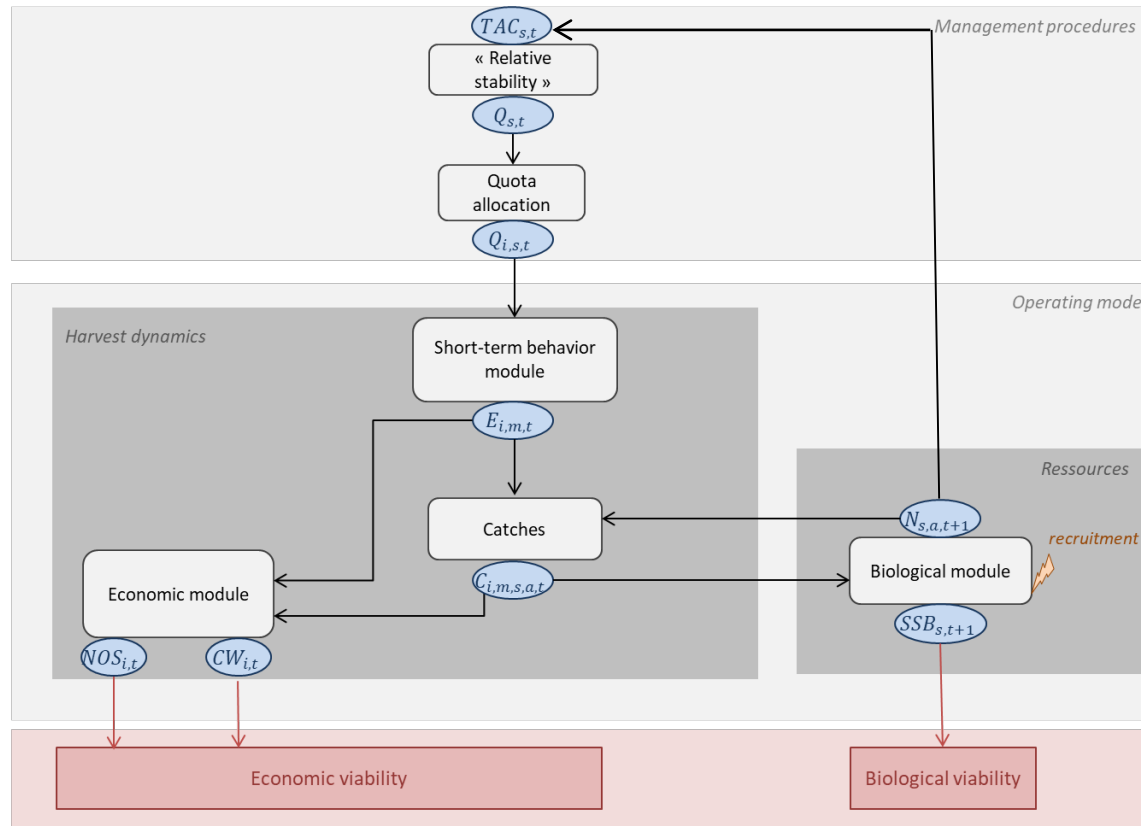
Activity described through métiers (combination of fishing gear and target species)



Methods

IAM bio-economic model

Projection period: 10 years



- Target F used to set annual TACs
- Individual quotas calculated on the basis of 2016 allocation

- Age-based model for sole, Nephrops, hake and seabass
- constant CPUE for other species

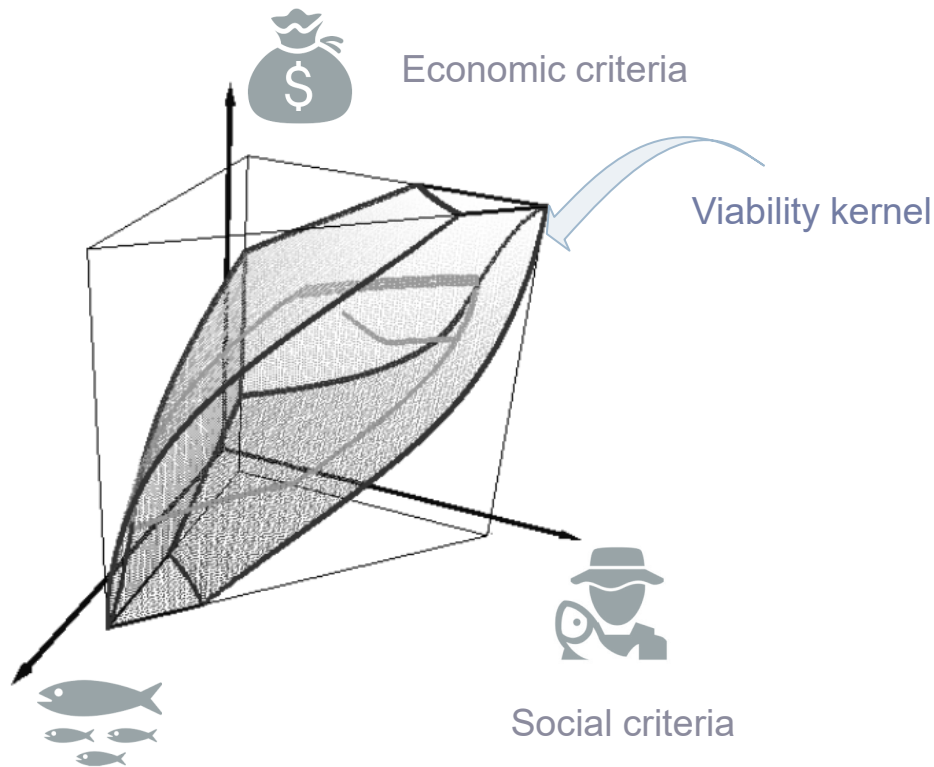
- Constant number of vessels
- Constant effort allocation among métiers
- Effort adjusted to the most constraining quota

 Stochastic processes

Methods

Ecoviability framework

Philosophy : Maintain a system within safe bounds rather than pursue a specific target (e.g. MSY, MEY)



From mathematical theory (*Aubin, 1991; Aubin et al. 2011*) ...

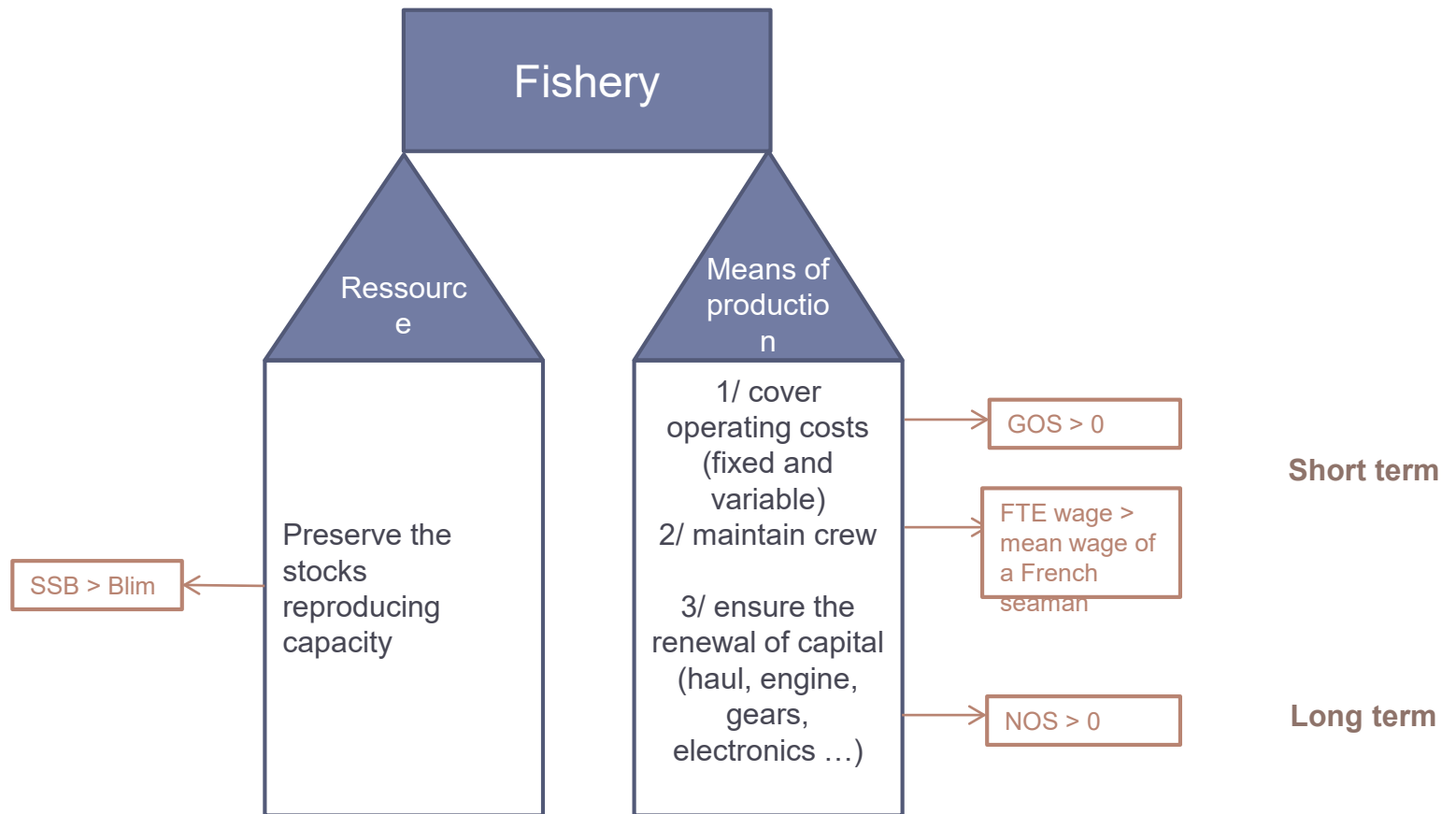
to fisheries' case studies (*Béné and Doyen, 2008; De Lara and Martinet, 2009; Péreau et al. 2012; Gourguet et al., 2013; Cissé et al., 2013, 2015; Maynou, 2014 ...*)

▶

Methods

Ecoviability framework

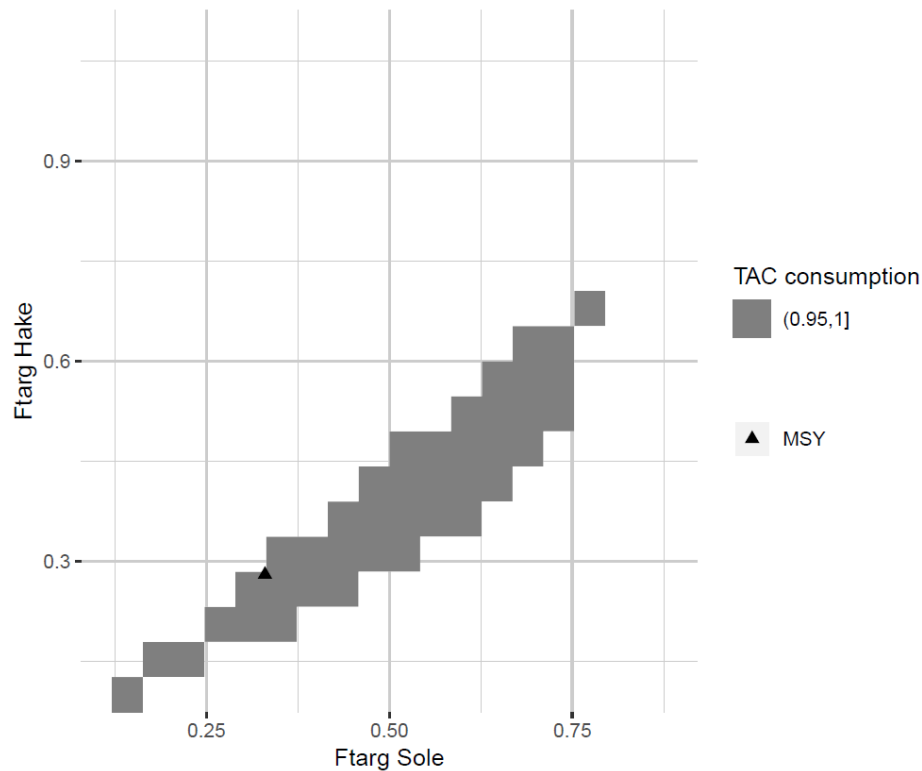
GOS = Gross Operating Surplus = Revenues – Crew costs – Fixed and variable costs
NOS = Net Operating surplus = GOS - depreciation



Results

« Operating domain »

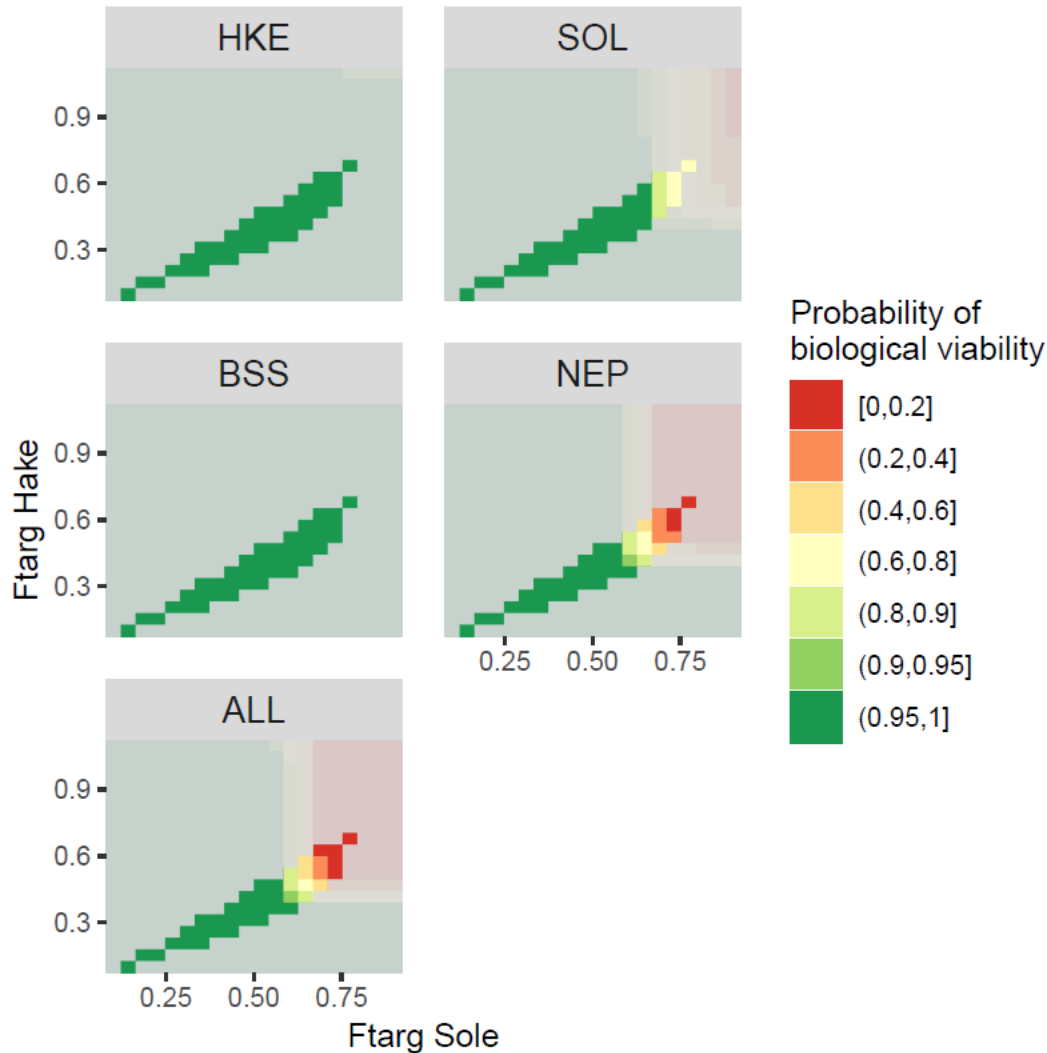
Operating domain = domain of target F ensuring that 95% of all quotas are caught



Single-species Fmsy
reference points are
(in this case!)
reachable targets

Results

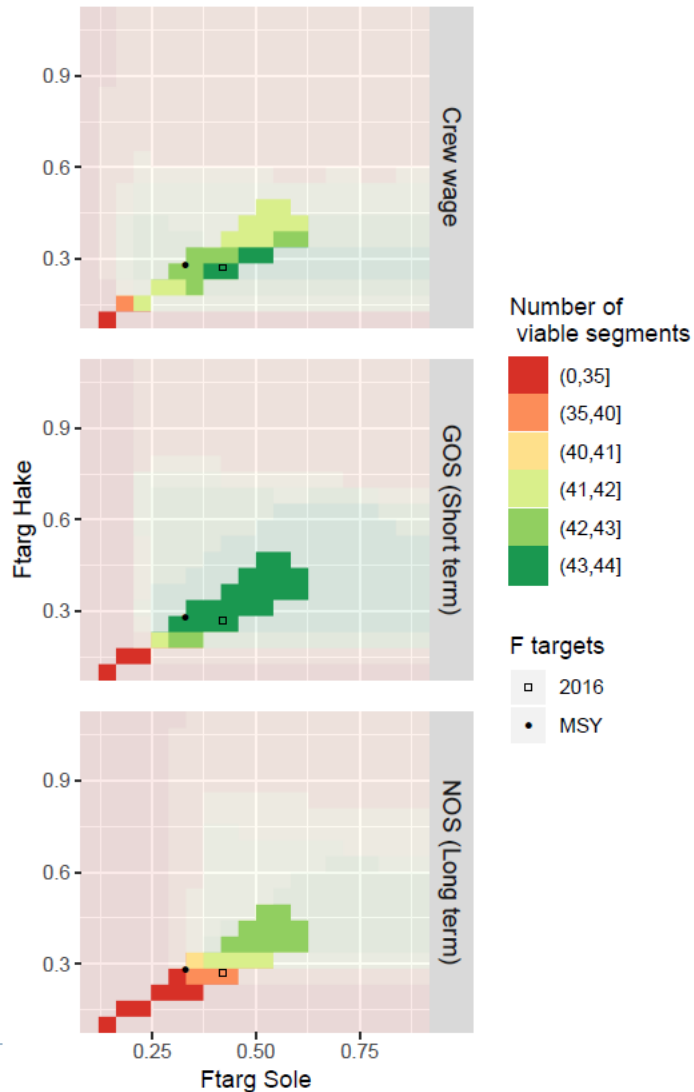
Biological viability



Biologically viable domain = domain of F targets with a probability of biological viability for all species > 95%

Results

Fleets' viability



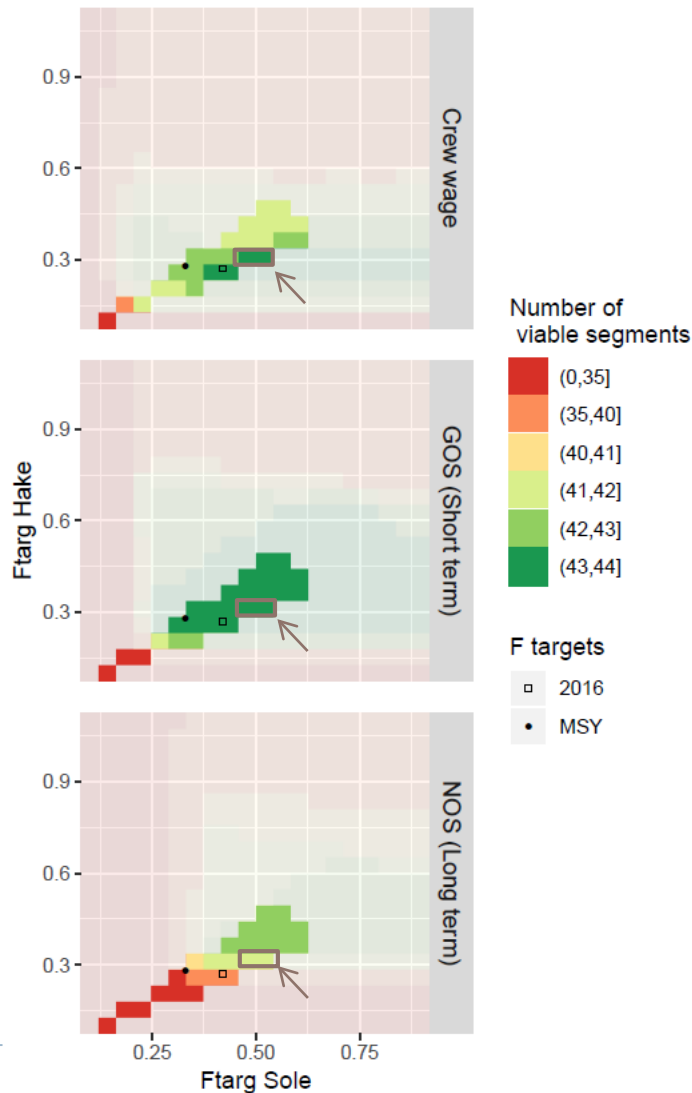
Fishing segment viable when meeting the constraint with 80% probability

- No strategy allowing for all segments to meet all viability constraints

Results

Fleets' viability

In
reference
year



Fishing segment viable when meeting the constraint with 80% probability

- No strategy allowing for all segments to meet all viability constraints

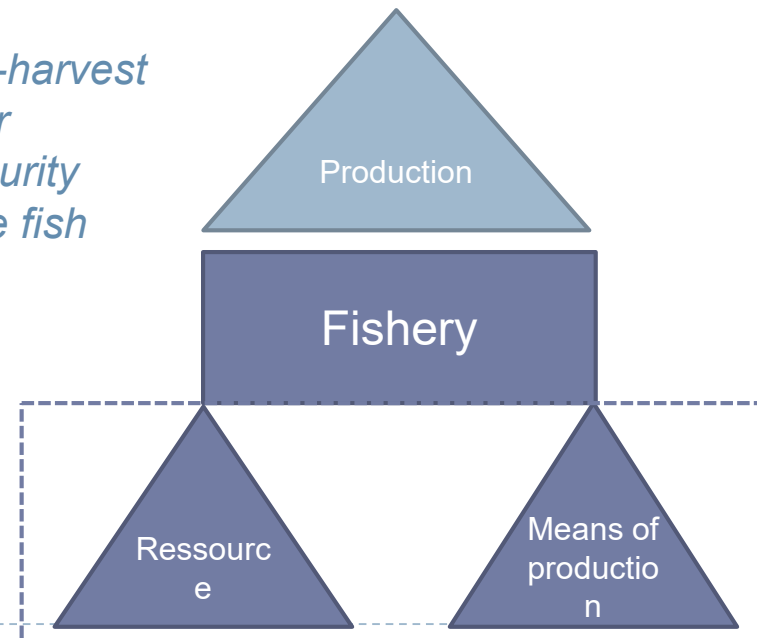
... but possible to increase the number of viable segments compared to the reference year (2016)

In the next season...

- ▶ Generally more than 2 species to manage in multispecies fisheries → curse of dimensionality :
 - ▶ Exhaustive screening of all possible targets not numerically tractable → optimized search of satisfying solutions
 - ▶ Results harder to display
- ▶ Other management objectives:

*Bio-economic viability
of the fishery*

*Viability post-harvest
sector
Food security
Affordable fish*

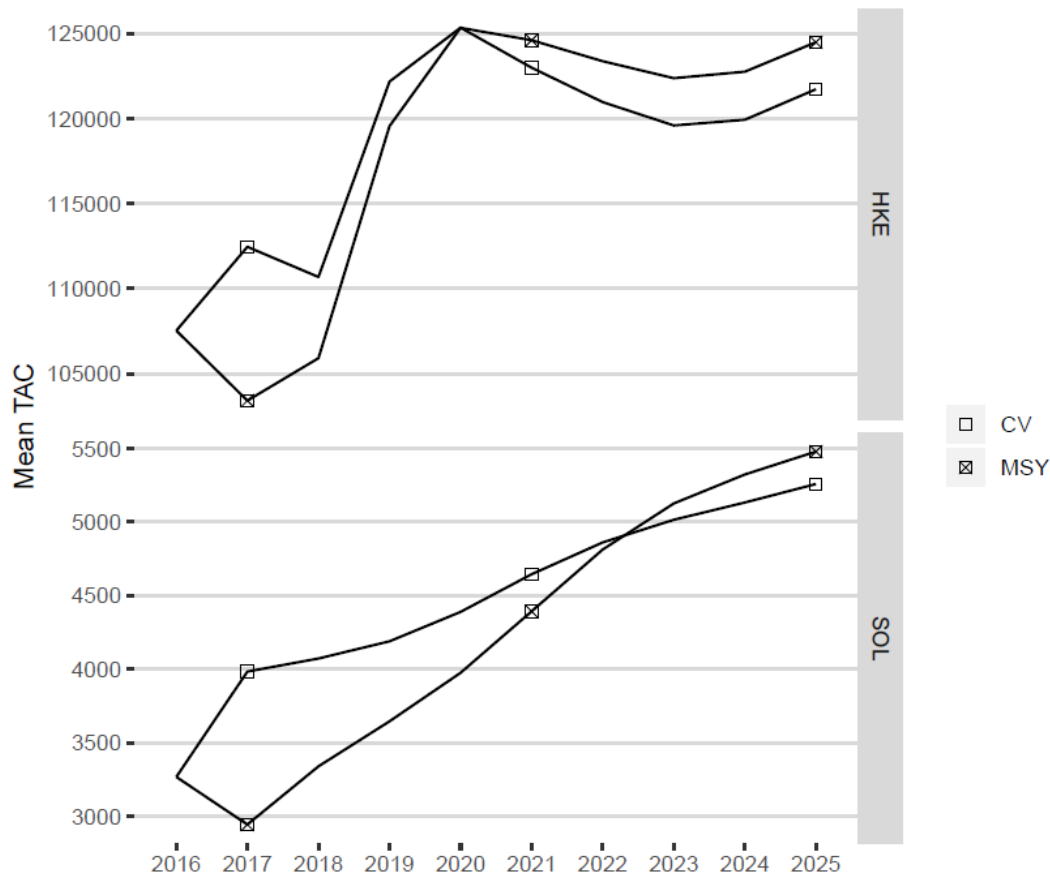




Thank you !

Results

From F target to TAC advice



Co-viability strategy = trade-off between benefiting from abundant stocks on the long term and maintaining fleets viable on the short term

