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Northern Hake stock assessment hke.27.XXXX

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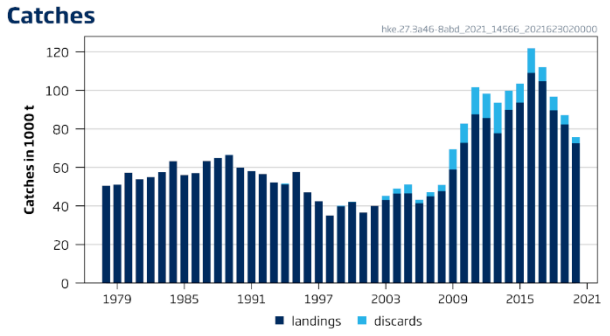
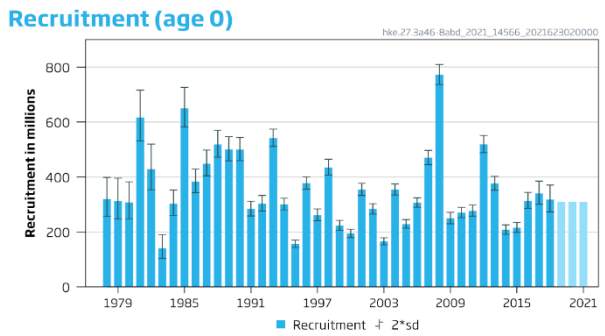
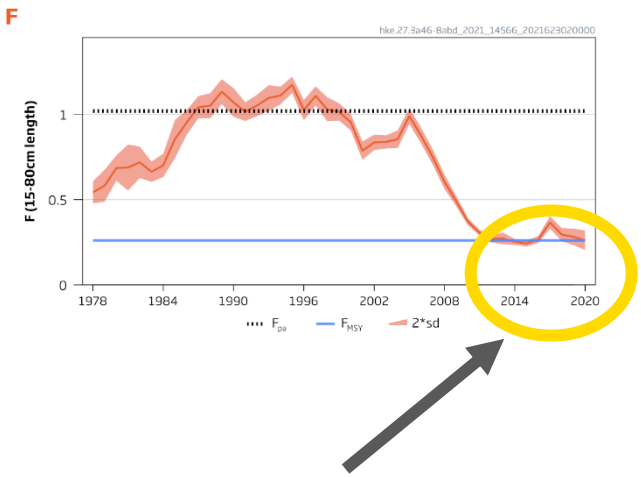
NWWAC (06/06/2023 – online)

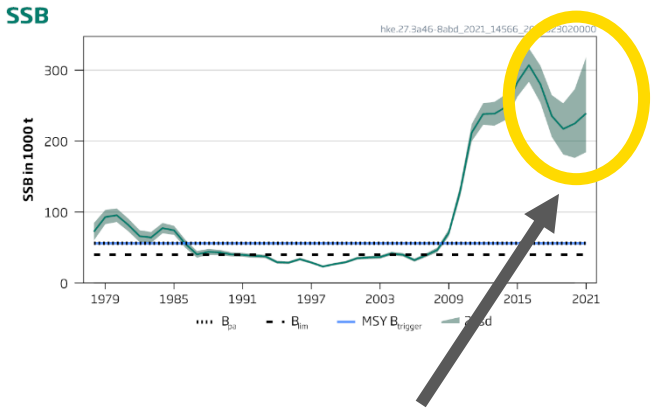
Summary assessment 2021

- 7 fleets
- 7 surveys (4 old and 3 contemporary)
  - FR-EVHOE
  - IR-IGFS
  - SP-PORCUPINE
- Length based data
- Natural mortality = 0.4
- Weight-at-length and maturity constant





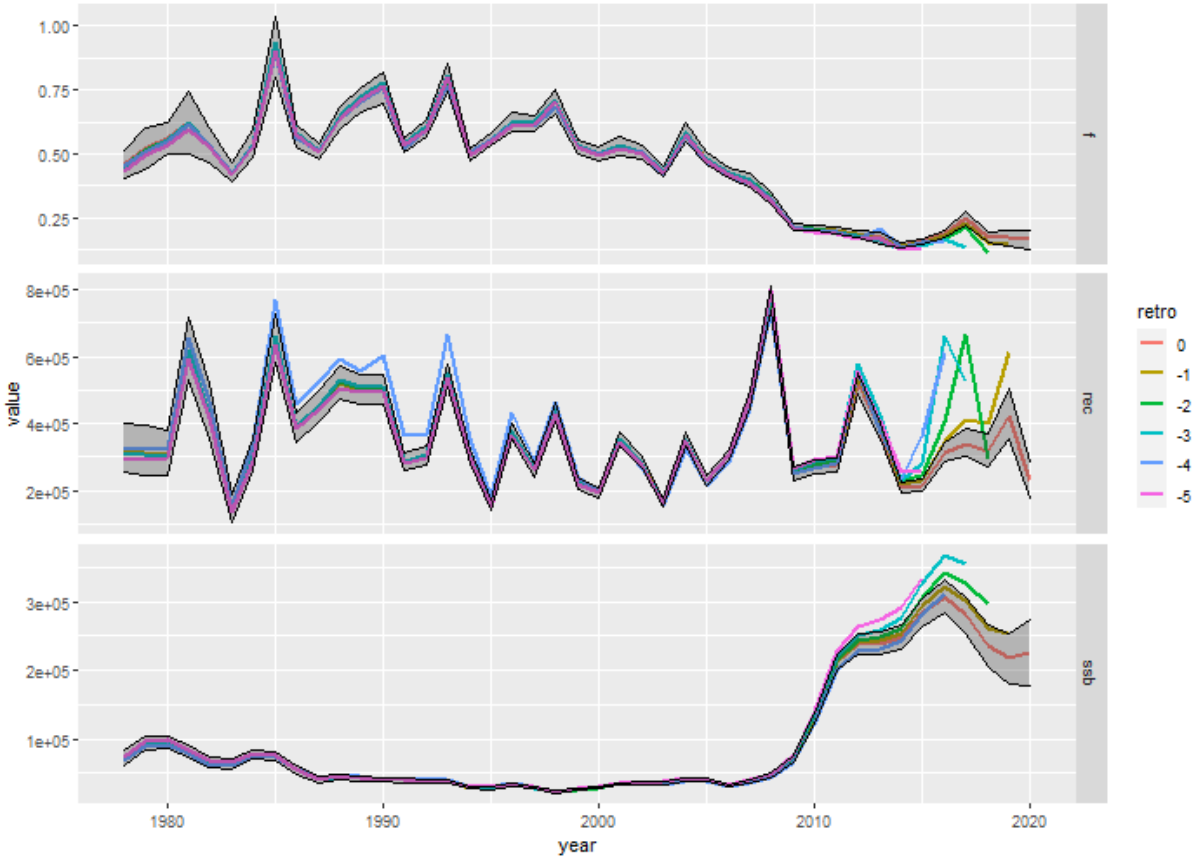




Desde 2012 explotación a niveles F_{msy}

Variabilidad esperada alrededor del RMS (MSY)

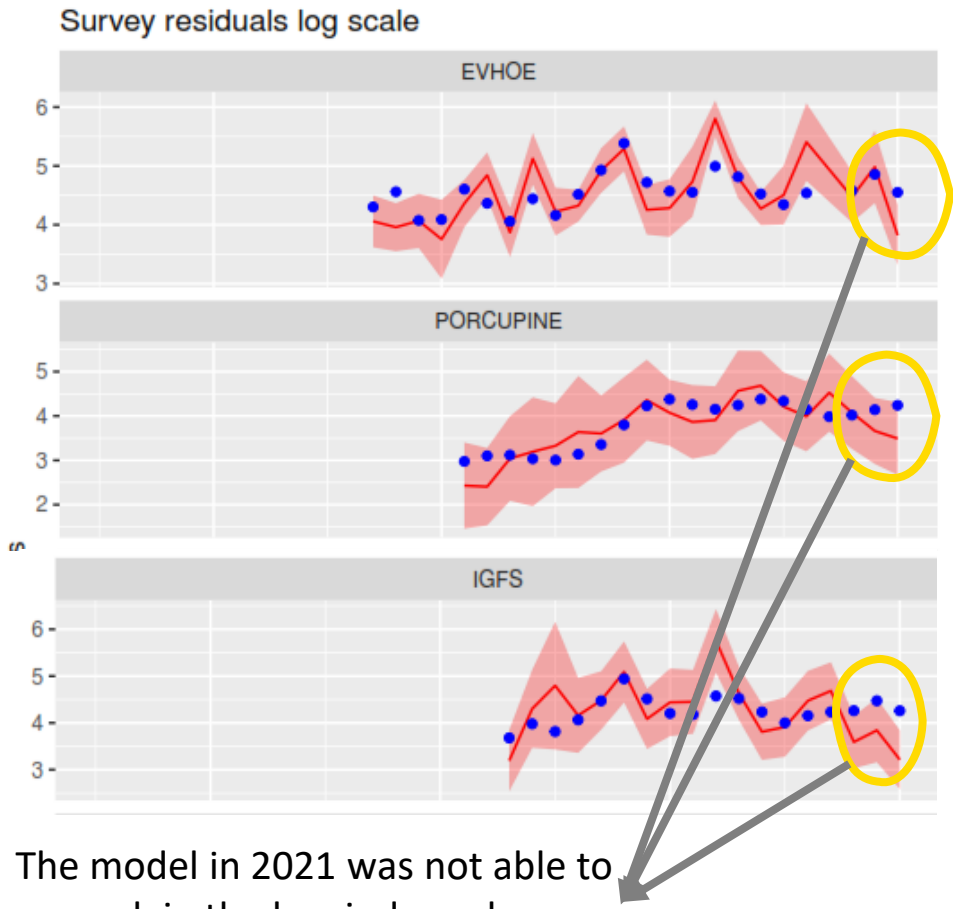
Retrospective pattern 2021 assessment



F = -0.28

SSB = 0.18

EVHOE & IGFS historical low levels



The model in 2021 was not able to explain the low index values

Justification of the 2021-2022 benchmark

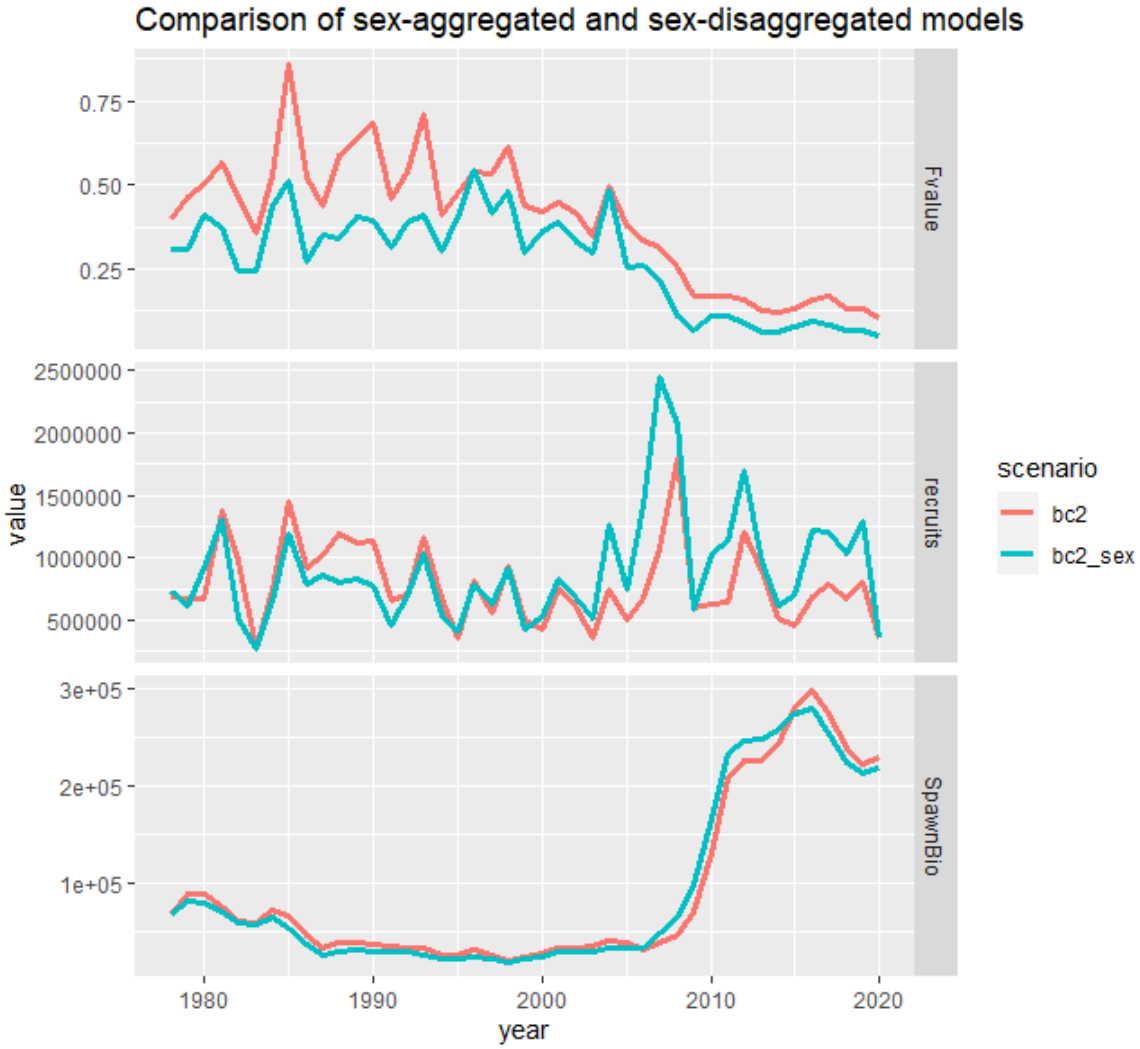
1. Need of a benchmark for southern hake.
2. Time since last benchmark (2014). IBP (2019)
3. Problems in the assessment:
    a) Retrospective pattern.
    b) Growth based on estimated values in 2012.
    c) Natural mortality value.
    d) Convergence problems.
    e) Selectivity parameter ranges too narrow.
    f) Relative weight of different data sources.

2022 Benchmark 2022: Principal changes

- Sex disagregated model (growth dimorphism by sex, M~80cm, F~120cm).
- Steepness (stock productivity at low biomasses) estimated by the model.
- Variable selectivity since 1998 in all fleets (previous 'blocks' removed).
- Down-weighting of length composition data.
- Inclusion of Irish IAMS survey.
- OTHER fleet (catch outside areas 7 and 8) disaggregated into trawl and 'non-trawl' since 2013.
- Externally extrapolated discards since 2014.

Sex disaggregated model

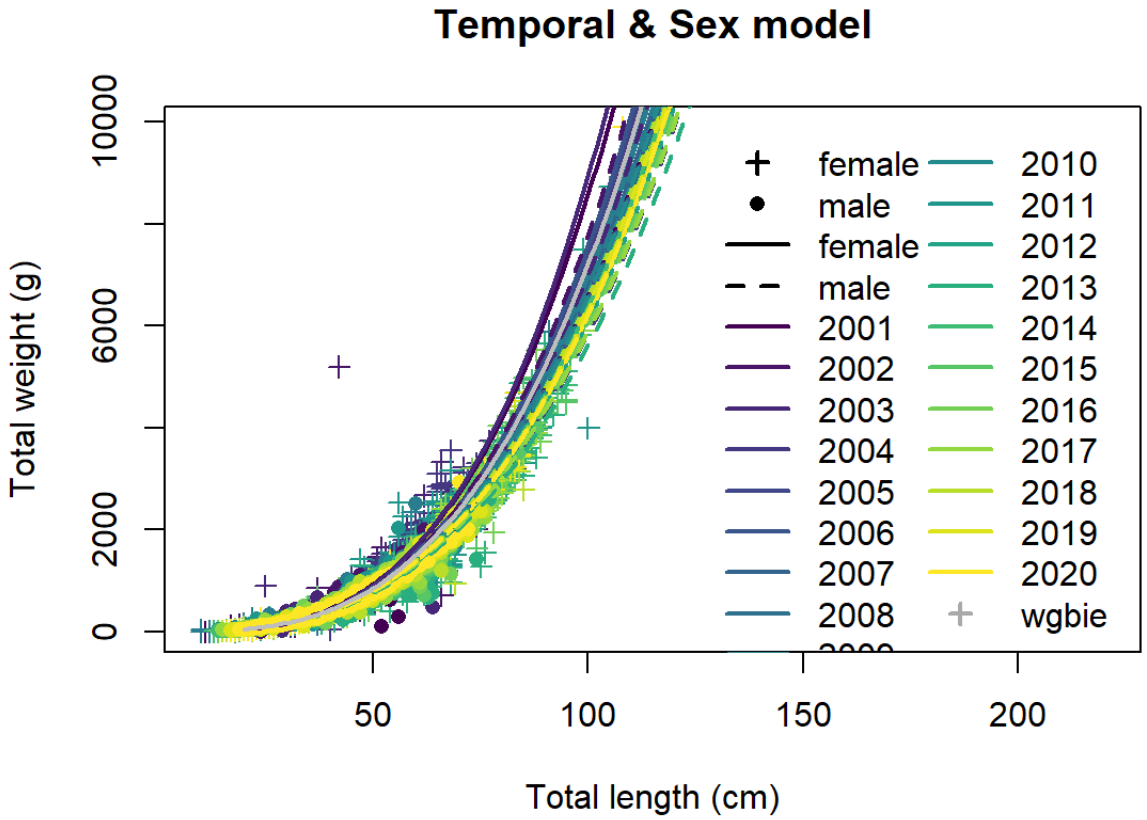
- Sex-ratio data from the PORCUPINE and IAMS surveys.
- Biological sex-ratio data 'borrowed' from Mediterranean hake stocks!!!
- Need to fix the biological component!
- Diagnostics improve somewhat with this model.
- Similar biomass, but in blue only females!!!



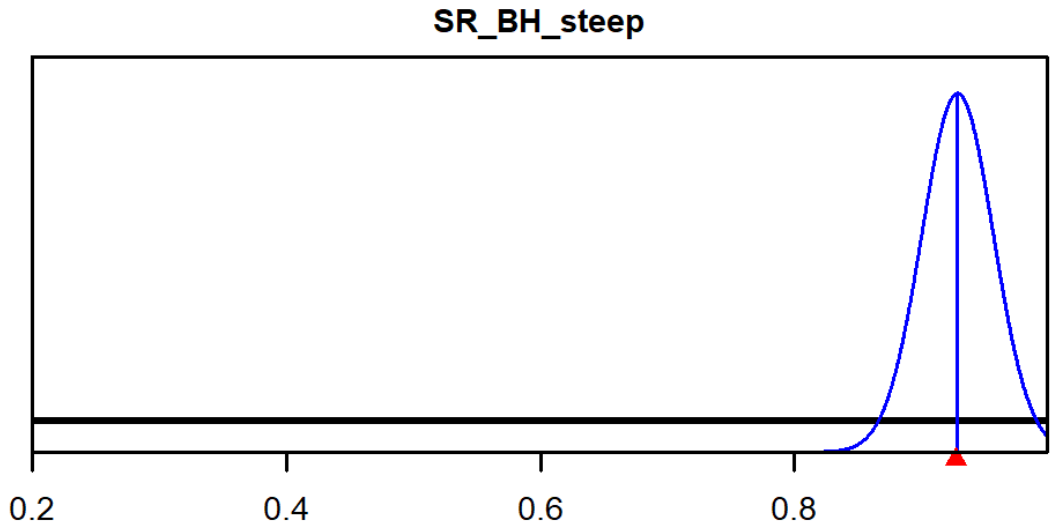
Mean weights

- A drop in average weights has been observed.
- Not included due to lack of time and data.
- Only information available from AZTI.

  Reason: hake arrive at port gutted.



Steepness estimated



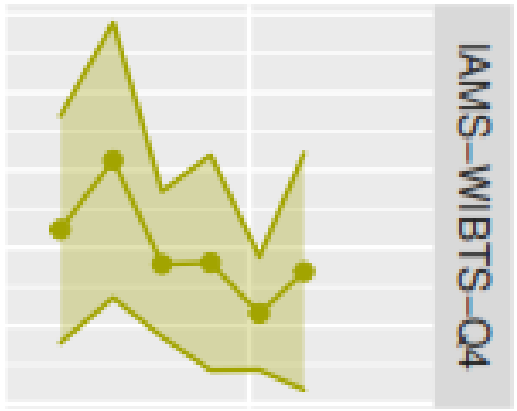
- Steepness = 0.93,
- If Steep = 1, recruitment independent of biomass

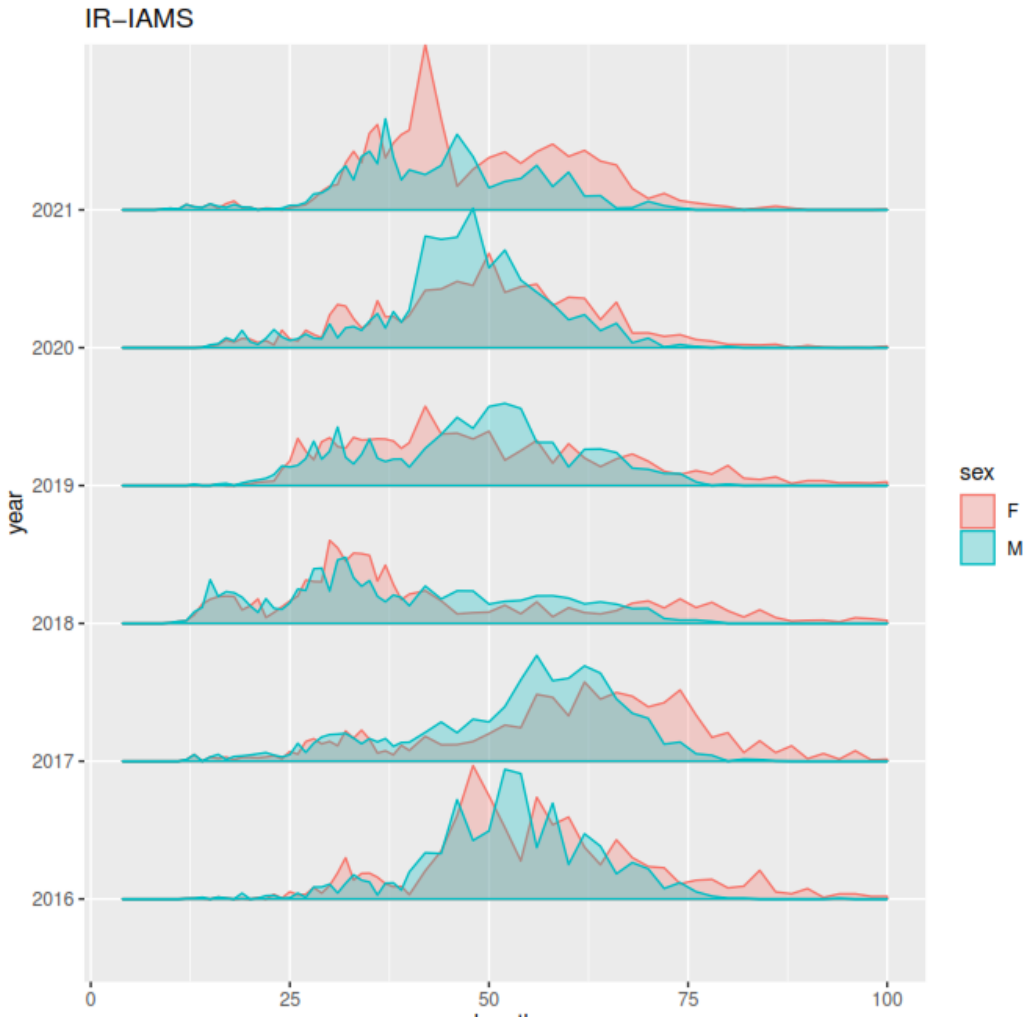
The model is able to estimate a drop in recruitment at low biomasses.

Variable selectivity and down-weighting of sizes

- Variable selectivities since 1998 to improve model fit and diagnostics.
- Down-weighting of lengths in the fit to give more weight to abundance indices.

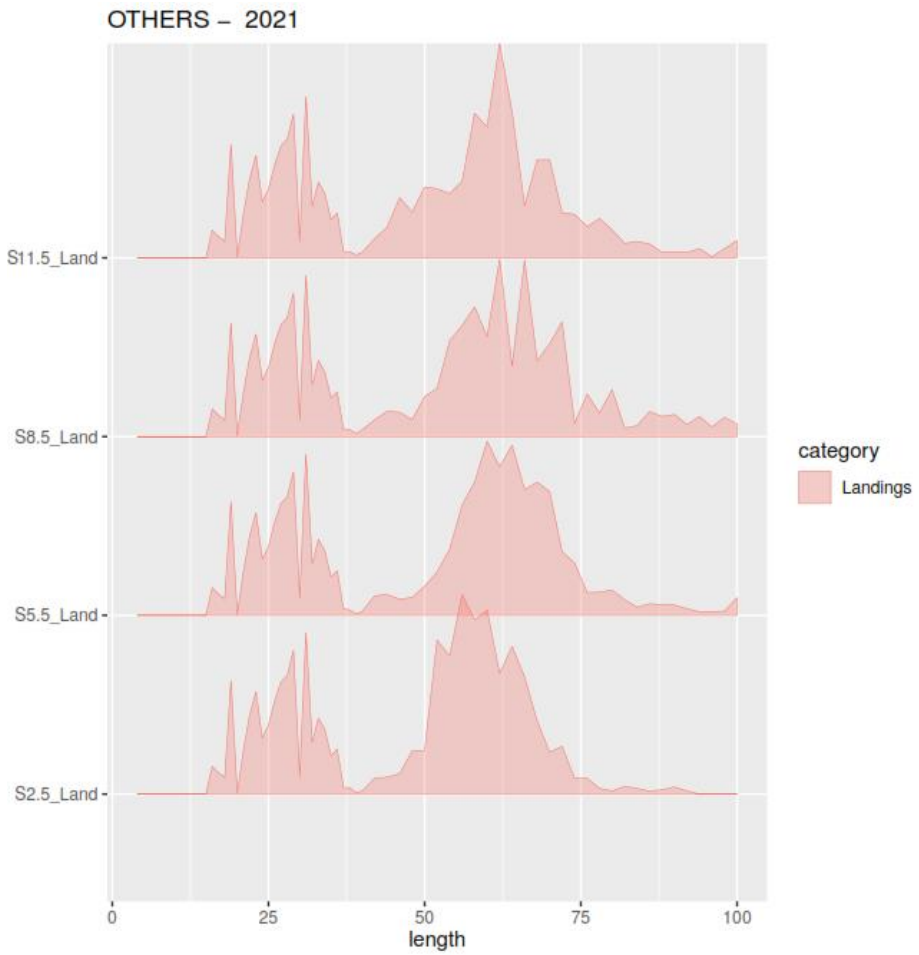
Irish IAMS survey

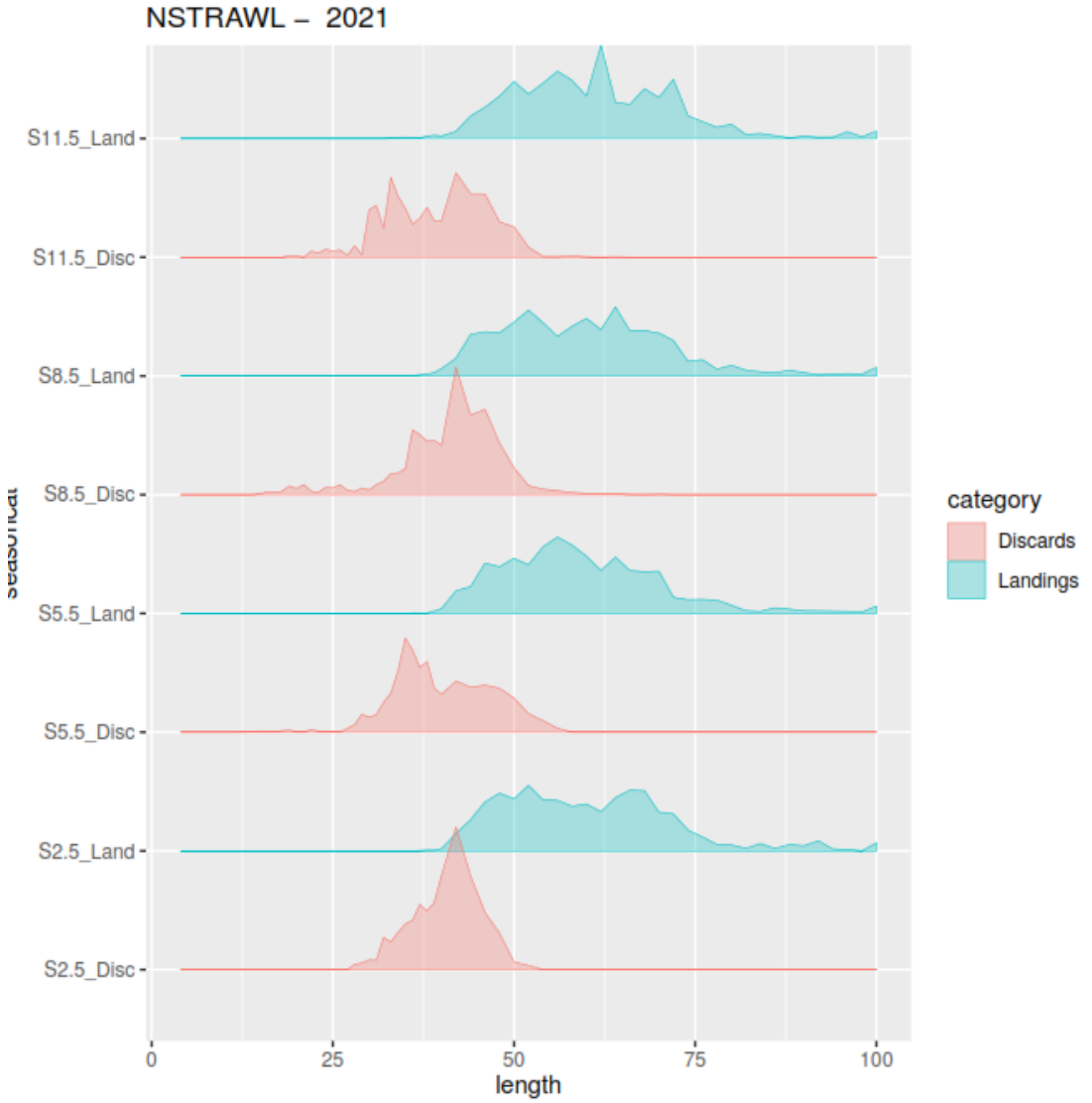




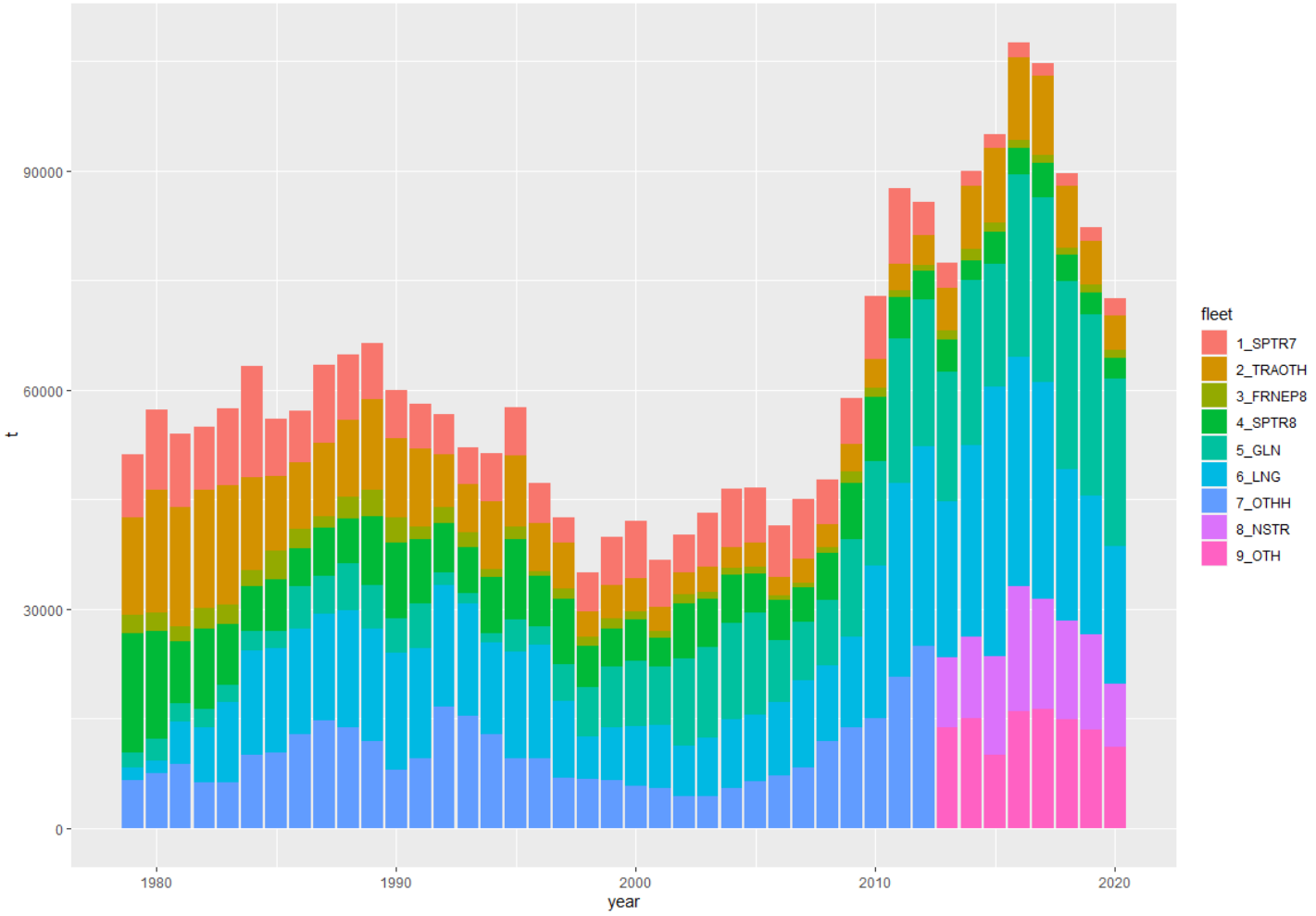
- Larger spatial coverage.
- Larger individuals than EVHOE and IR-IGFS.

Disaggregation of the OTHER fleet





Disaggregation of the OTHER fleet



Reference points

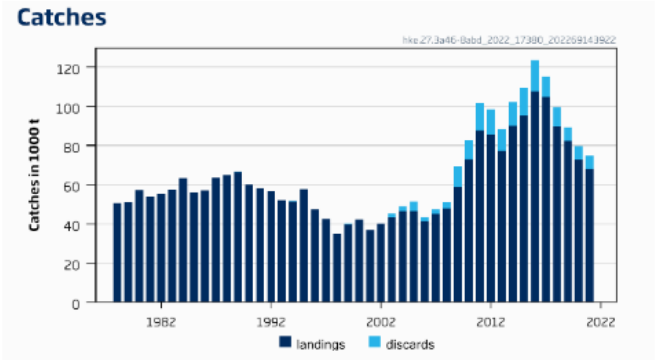
Framework	Reference point	Value	Technical basis
MSY approach	MSY $B_{trigger}$	56 000	B_{pa}
	F_{MSY}	0.26	Stochastic simulations on a segmented regression stock–recruitment relationship
Precautionary approach	B_{lim}	40 000	The breakpoint of the segmented regression stock–recruitment relationship
	B_{pa}	56 000	1.4 × B_{lim}
	F_{lim}	Not defined	
	F_{pa}	1.02	$F_{p0.5}$; the F that leads to SSB ≥ B_{lim} with 95% probability (with Btrigger)
Management plan	F_{MGT}	Not defined	
	SSB_{MGT}	Not defined	
	MAP MSY $B_{trigger}$	56 000	MSY $B_{trigger}$
	MAP B_{lim}	40 000	B_{lim}
	MAP F_{MSY}	0.26	F_{MSY}
	MAP range F_{lower}	0.180	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2019b)
	MAP range F_{upper}	0.40	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2019b)

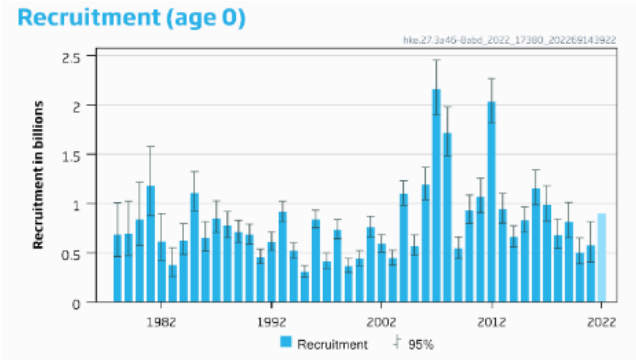
Framework	Reference point	Value	Technical basis
MSY approach	MSY $B_{trigger}$	78 405 t	B_{pa}
	F_{MSY}	0.243	SS simulations
Precautionary approach	B_{lim}	61 563 t	The median of the segmented regression stock–recruitment relationship breakpoint (Type 2 stock recruitment)
	B_{pa}	78 405 t	exp(1.654 × σ) × Blim, σ = 0.147.
	F_{lim}	0.734	The F that provides a 50% probability for SSB to be above B_{lim}.
	F_{pa}	0.537	Fp.05 with ICES MSY AR: The F that provides a 95% probability for SSB to be above B_{lim}.
Management plan	F_{MGT}	Not defined	
	SSB_{MGT}	Not defined	
	MAP MSY $B_{trigger}$	78 405 t	MSY $B_{trigger}$
	MAP B_{lim}	61 563 t	B_{lim}
	MAP F_{MSY}	0.243	F_{MSY}
	MAP range F_{lower}	0.147	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2019b).
	MAP range F_{upper}	0.37	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2019b).

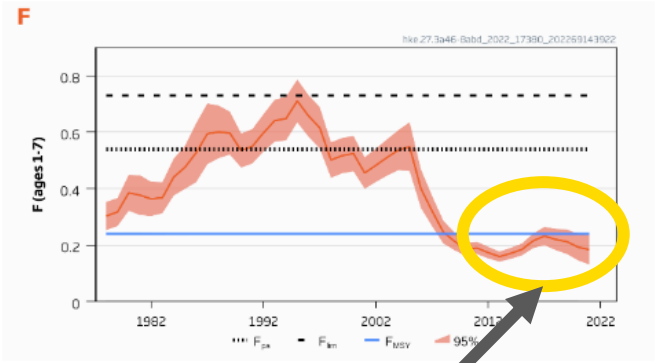
Summary of the 2022 assessment

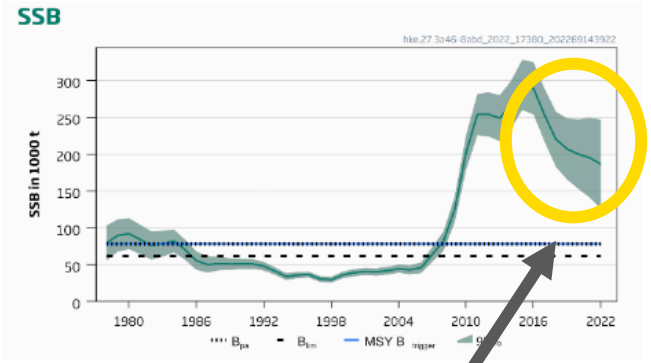
- 9 fleets
- 8 surveys (4 old and 4 contemporary)
  - FR-EVHOE
  - IR-IGFS
  - SP-PORCUPINE
  - IR-IAMS
- Length data
- Weight-at-length and maturity constant
- Age dependent natural mortality -
- Sex disagregated.
- SSB females only

* Información reclutamiento





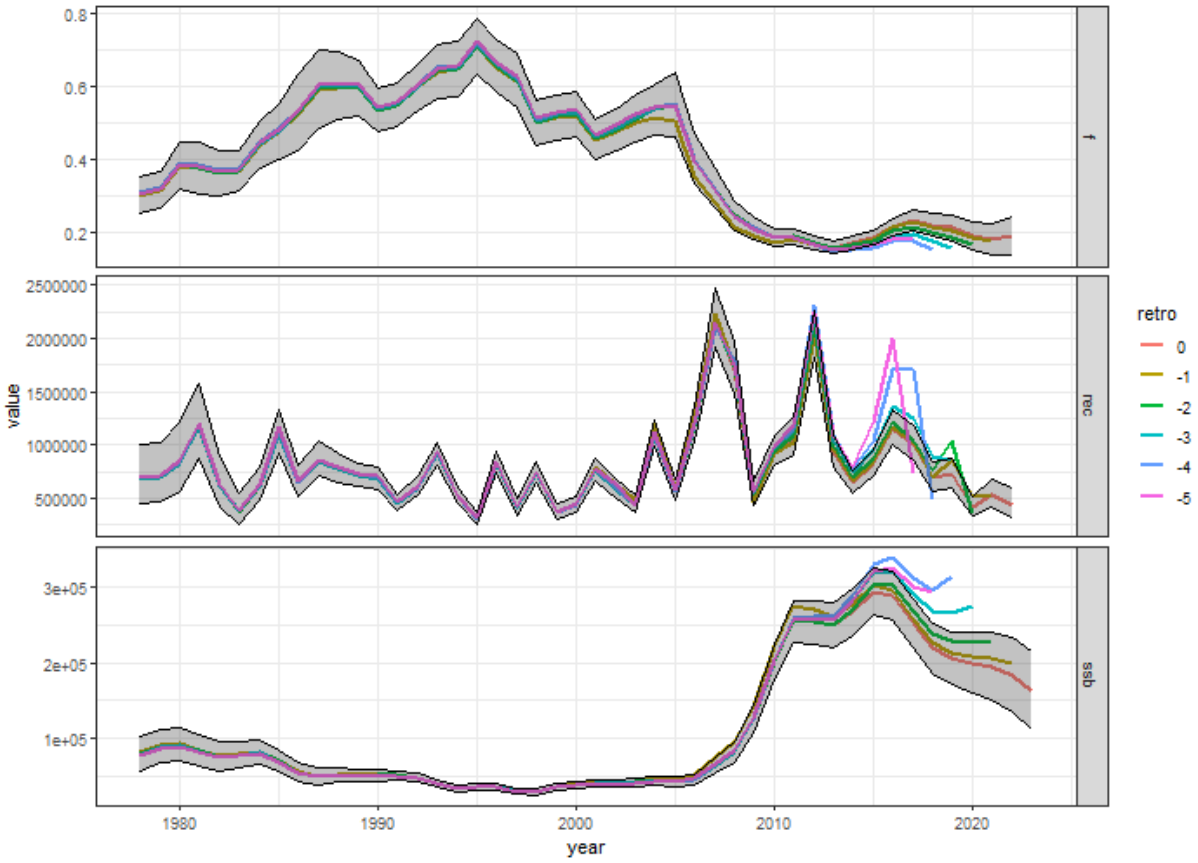




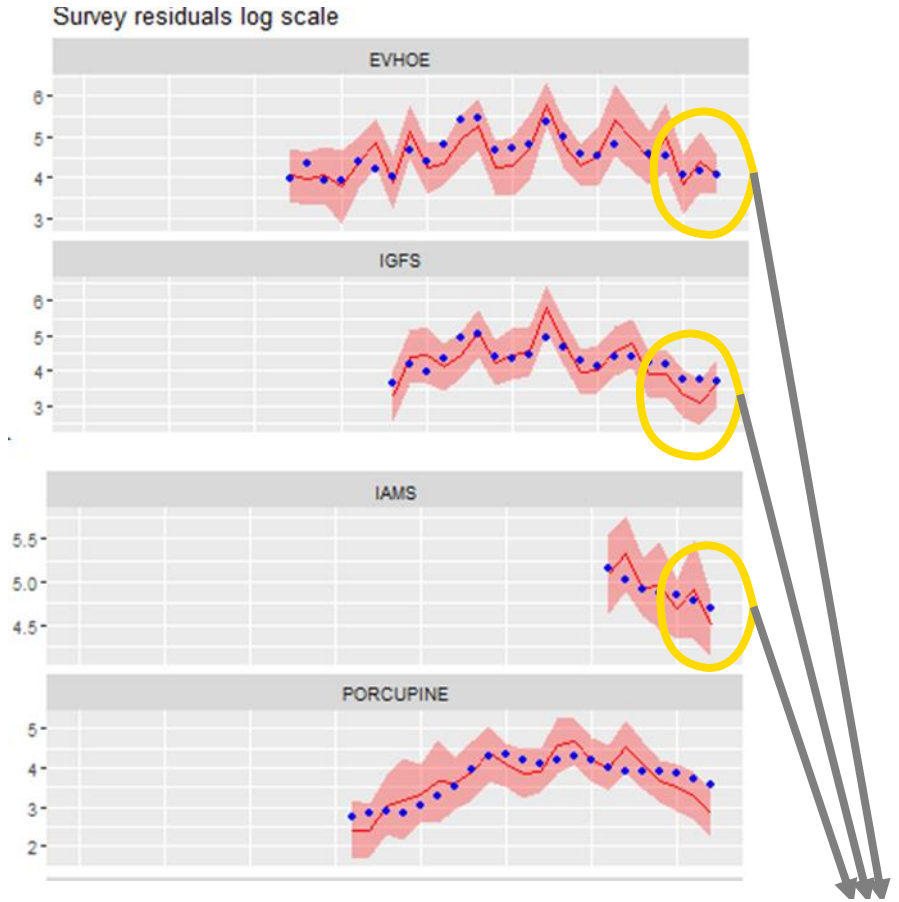
Since 2012 explotation levels around F_{msy}

Values above Btrigger.
With a downward trend

Retrospective pattern



EVHOE, IGFS e IAMS en mínimos históricos



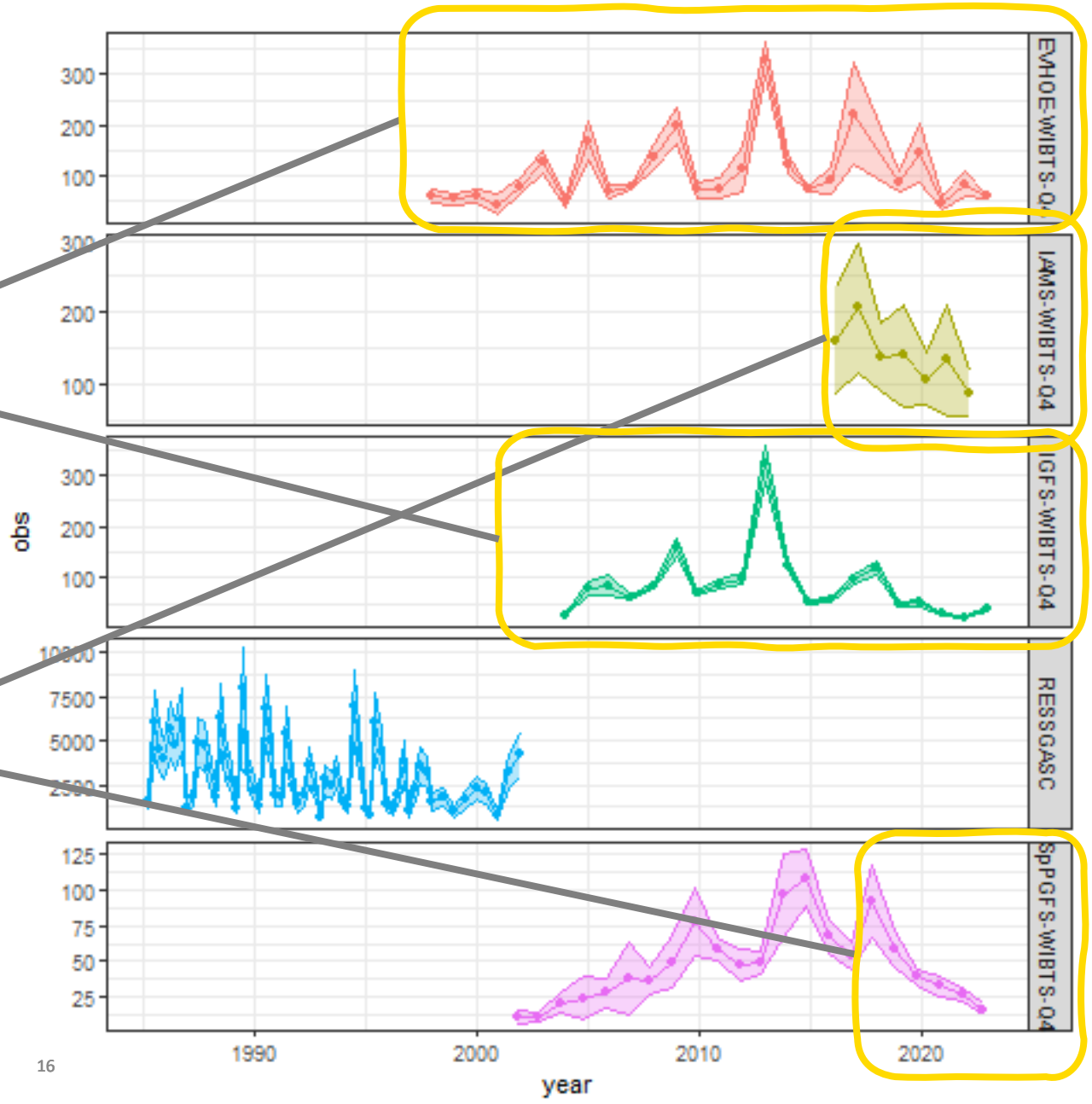
F = -0.19
SSB = 0.30

The model follows better the índices now

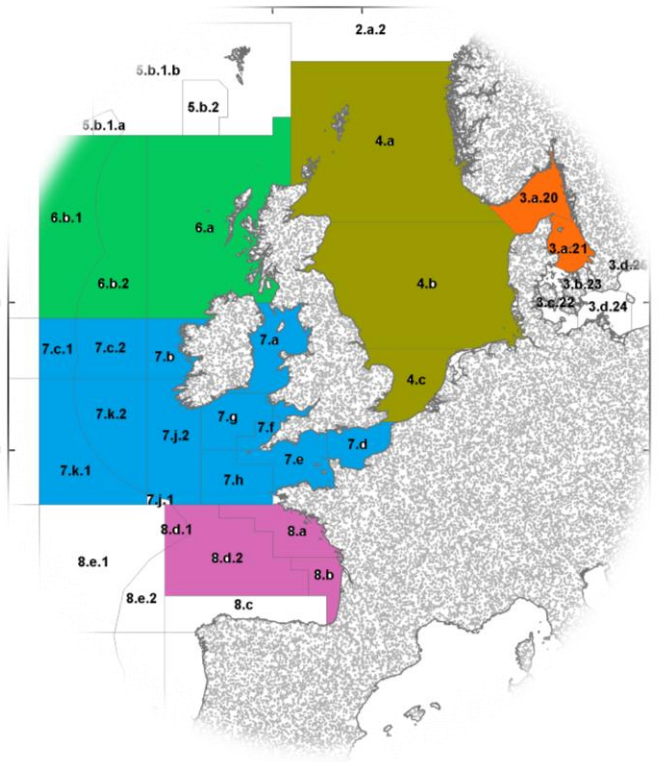
Surveys

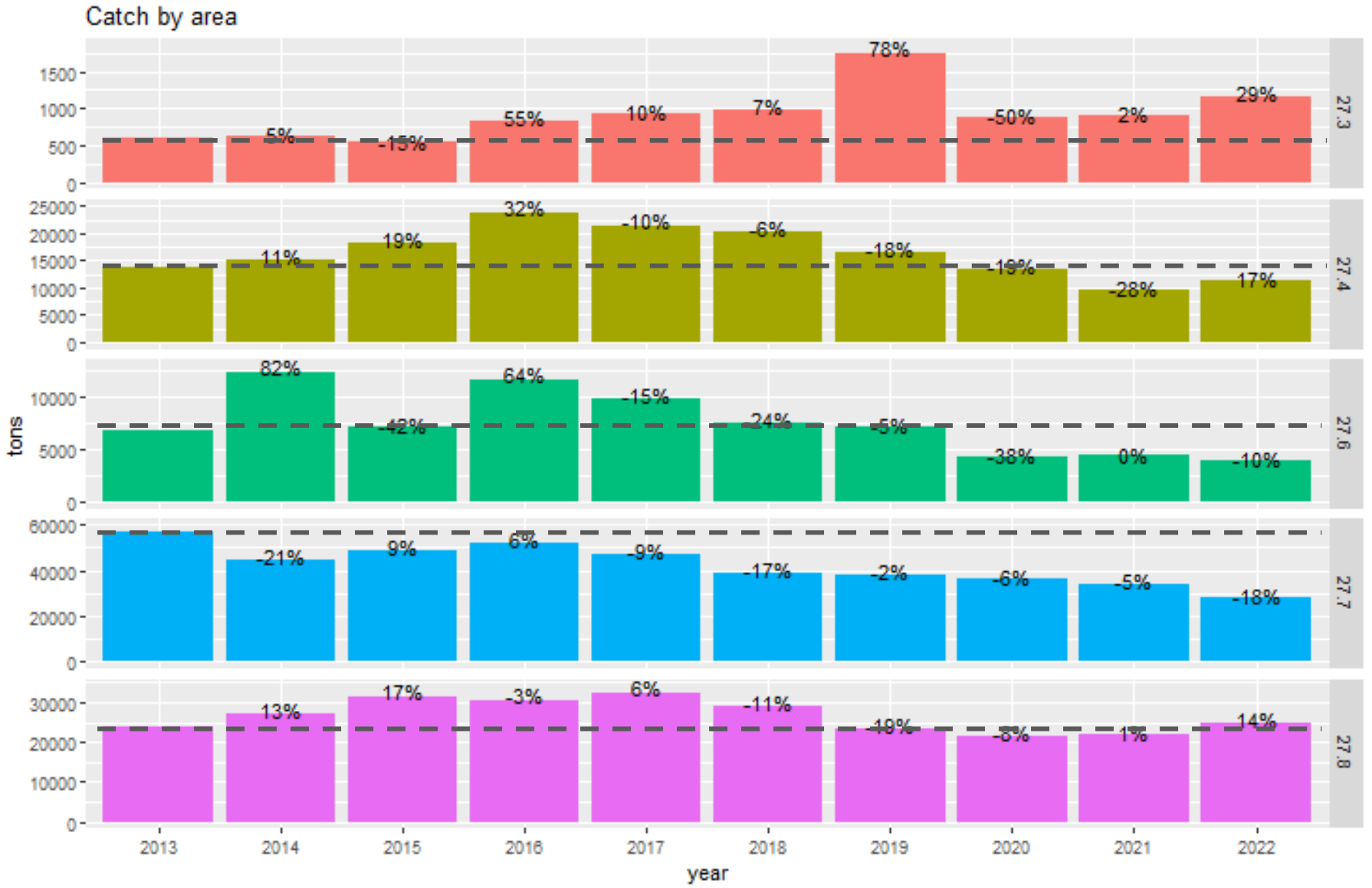
Recruitment indices in historical minimum

Other indices decreasing treng



Catch by area





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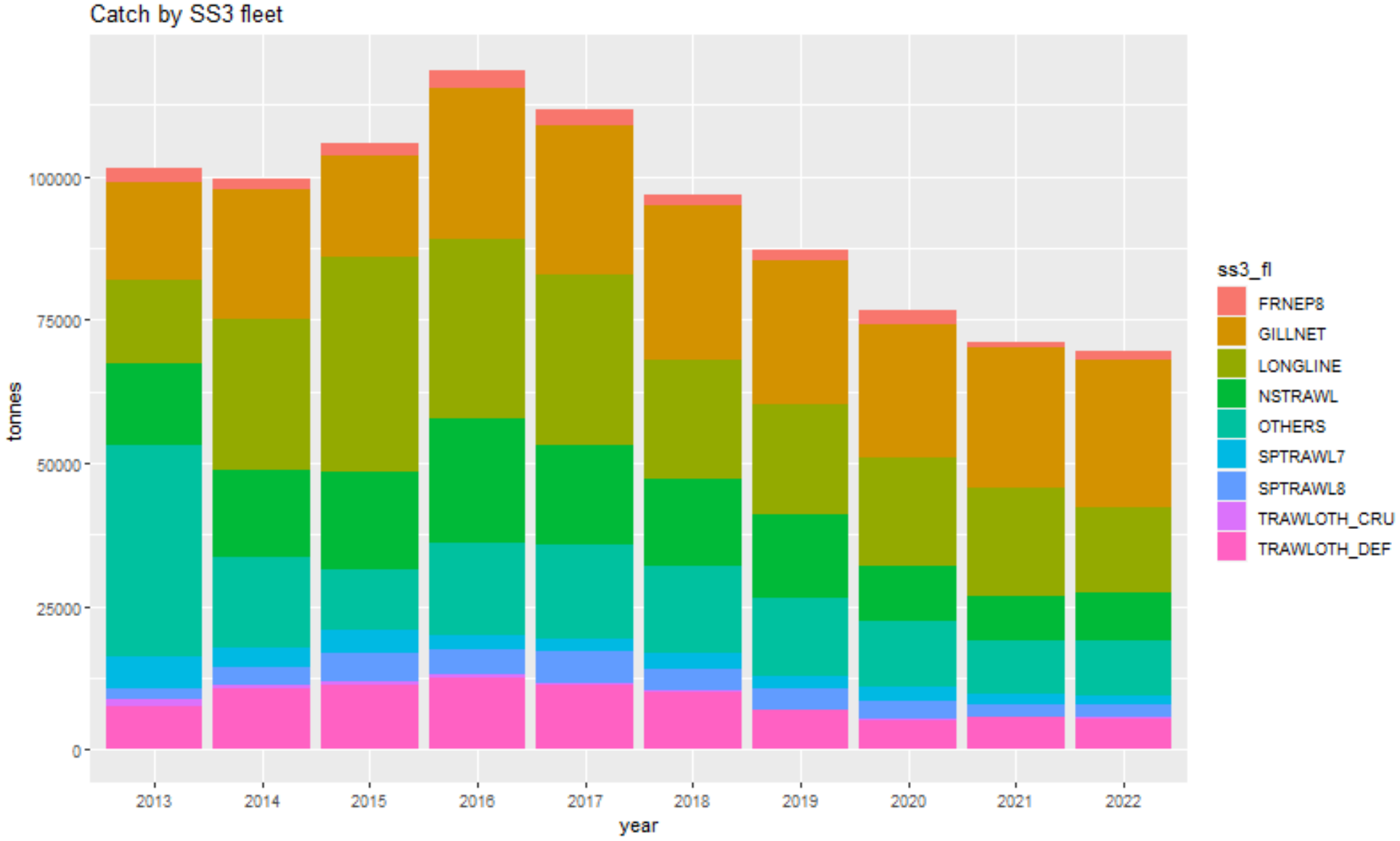
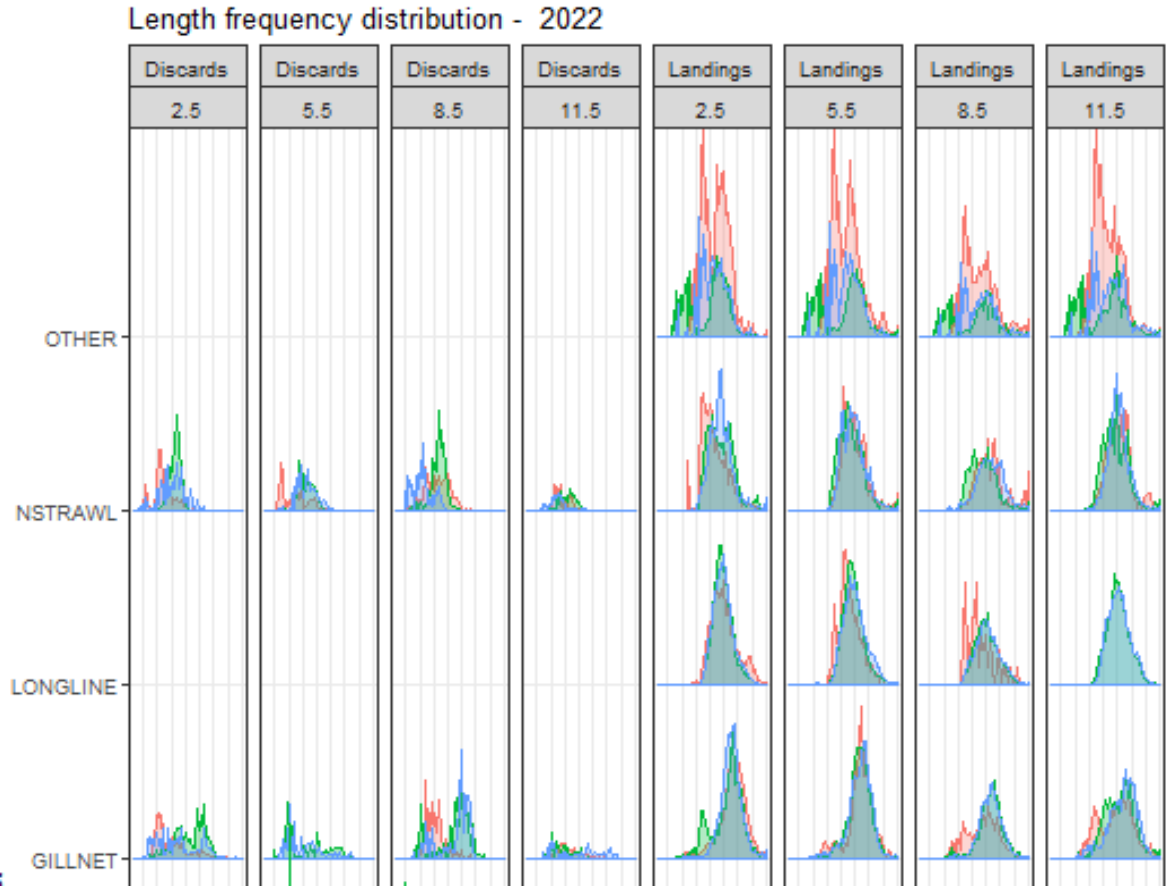
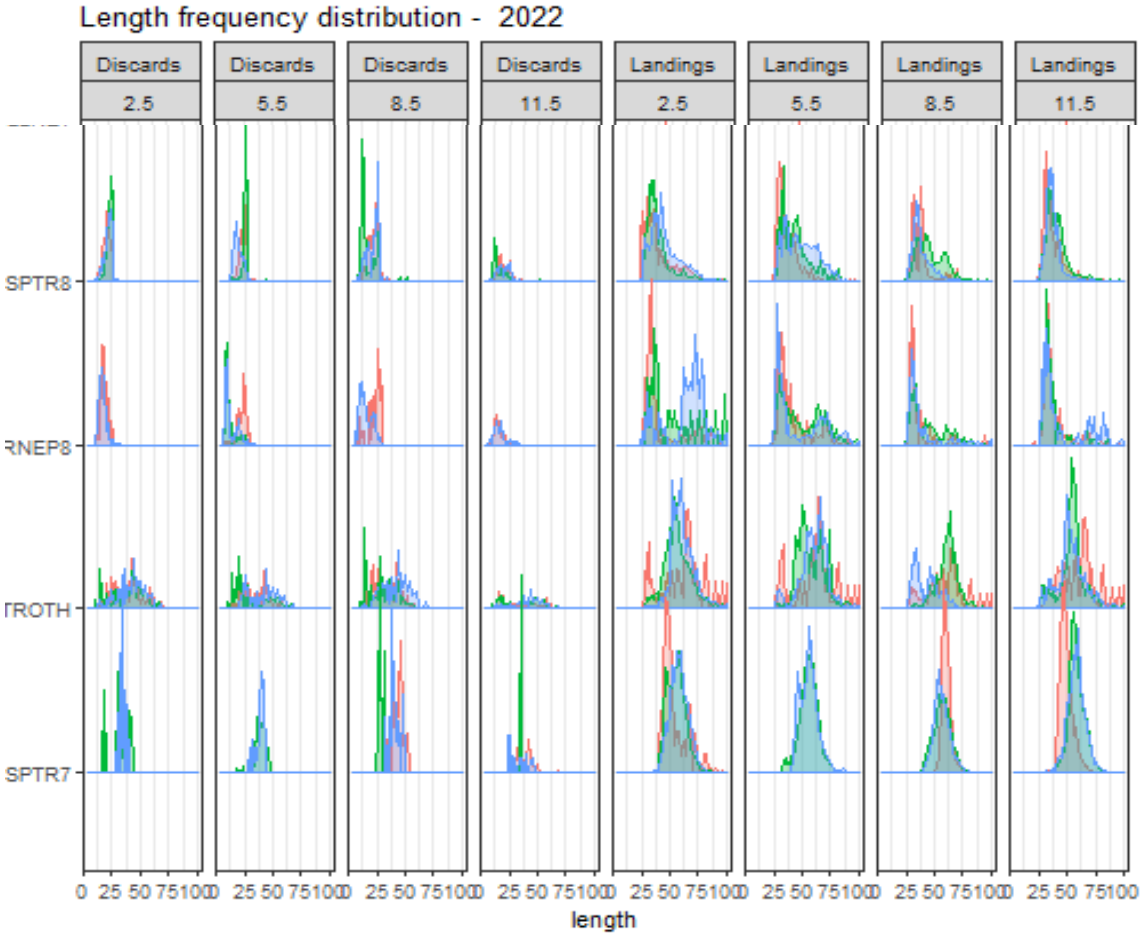
Total catches by fleet in the assessment model

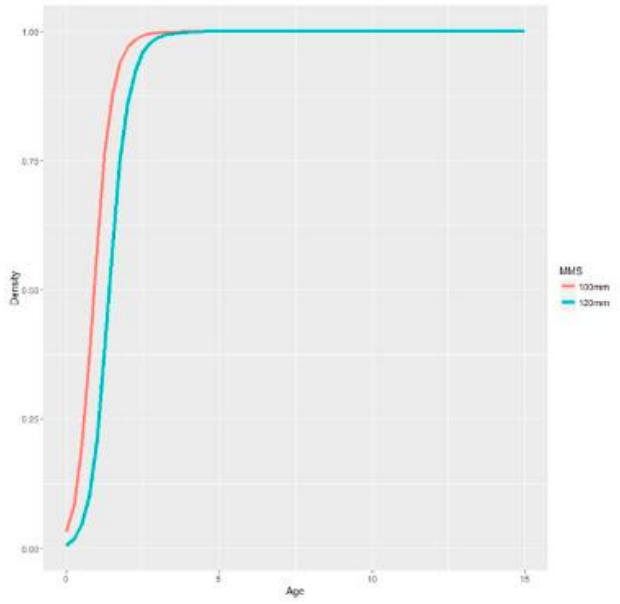


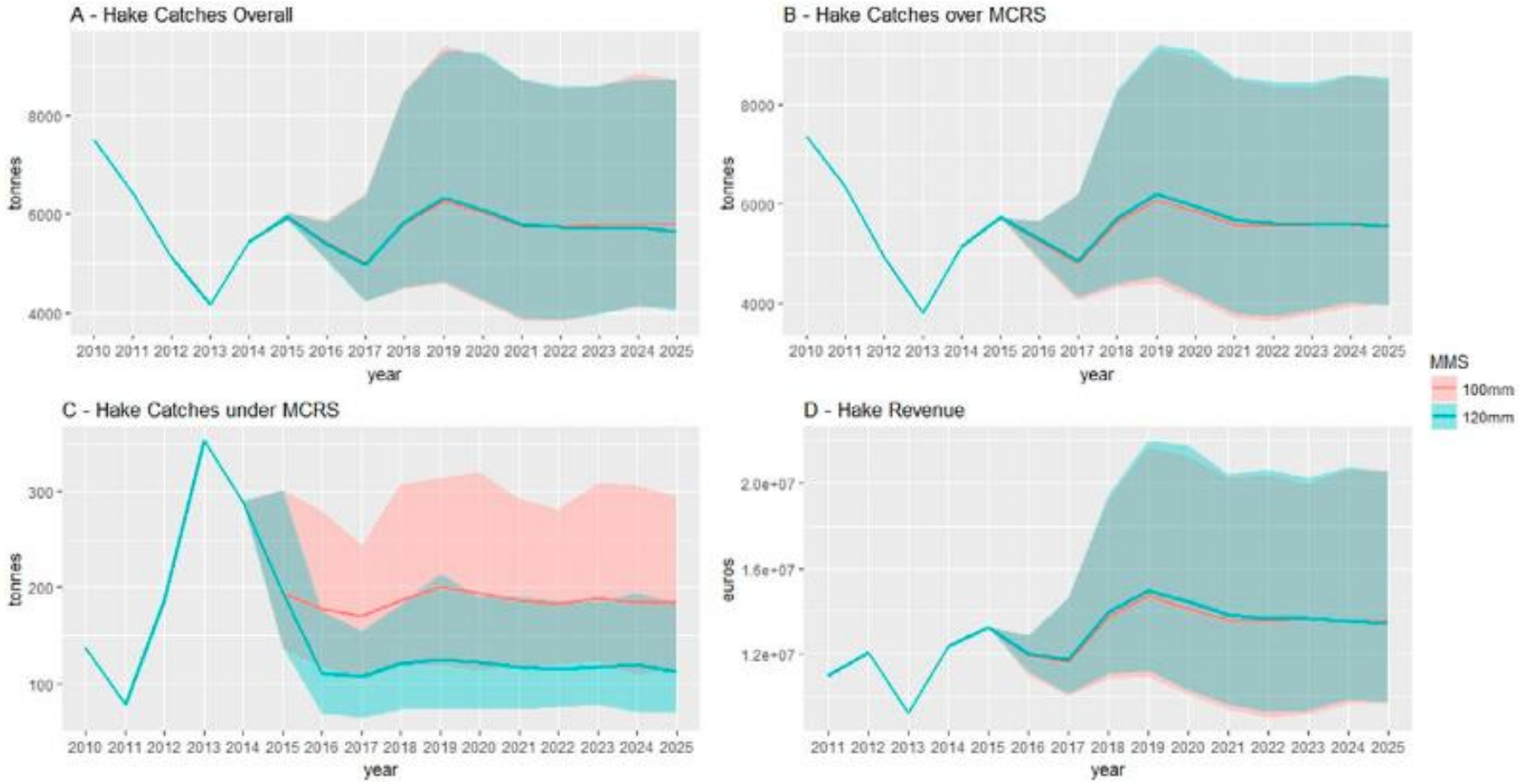
Length frequency distributions





Simulation study of increasing mesh size in 8abd pair trawlers





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