Sole 27.4 - 2021 stock assessment

ICES WGNSSK. Web, 21-30 April 2021

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North sea sole (sol.27.4)

- Update of 2020 benchmark assessment (AAP)

Data overview

Catches

- Landings: 1957-2020
- Discards: 2002-2020

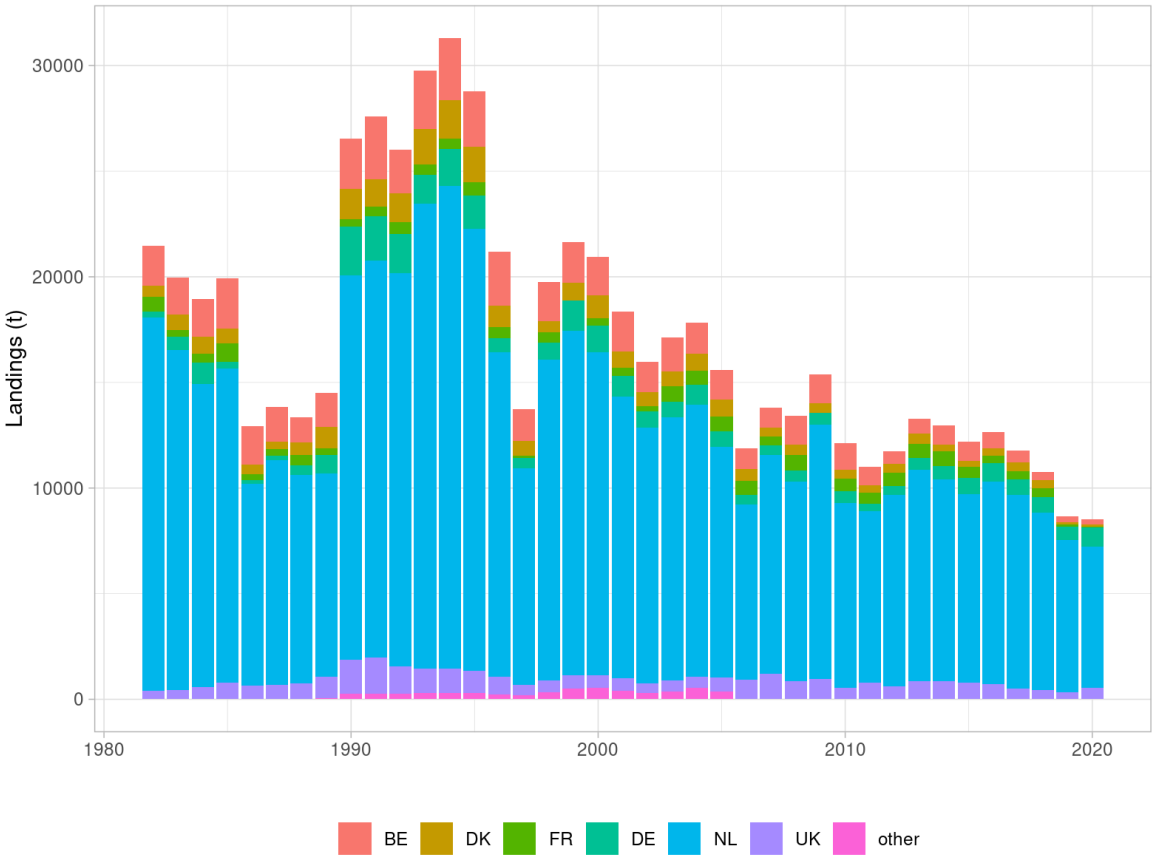
Indices of abundance

- BTS Q3 (NL + BE + DE) Delta-lognormal GAM: 1985-2020, ages 1-10
- SNS: 1970-2020, ages 1-6

Stock weight

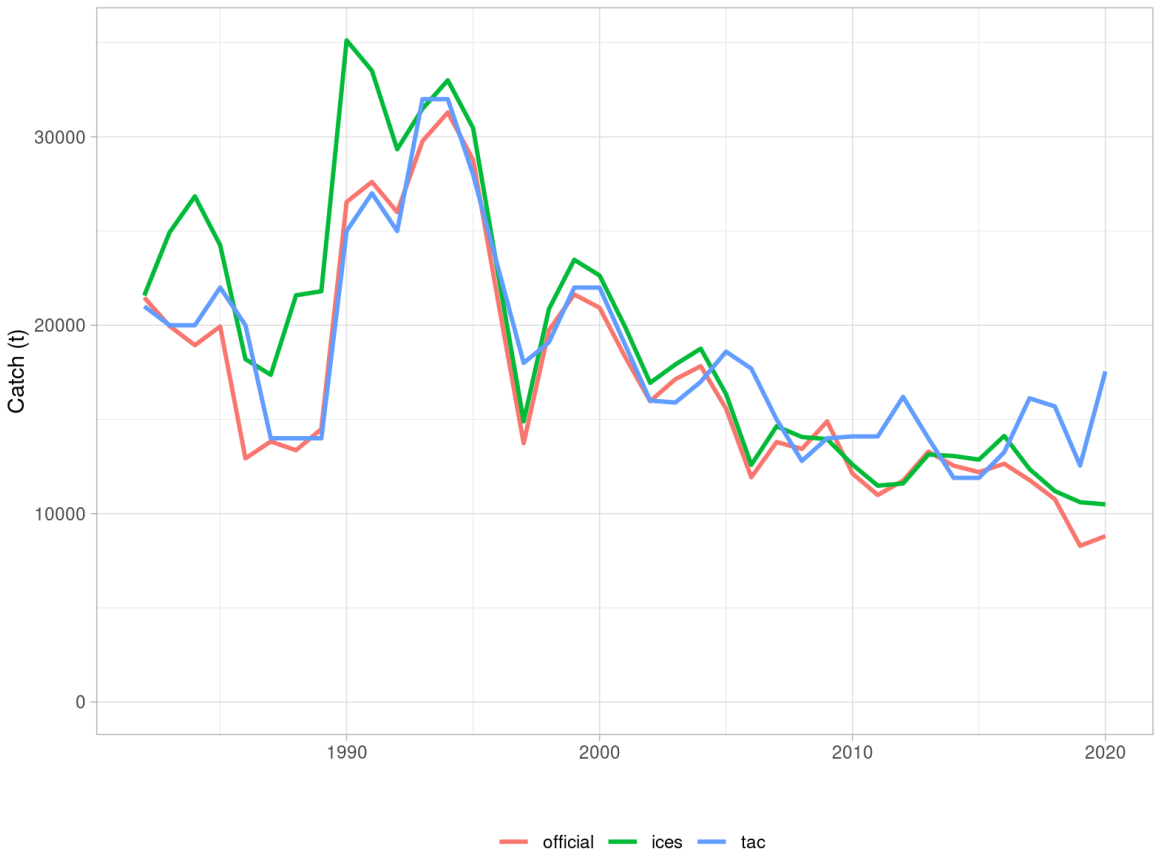
- Landings + discards quarter 2

Official catches



- Catch 2020 = 10,492 t
- TAC 2020 = 17,545 t

Catches and quota uptake



Intercatch

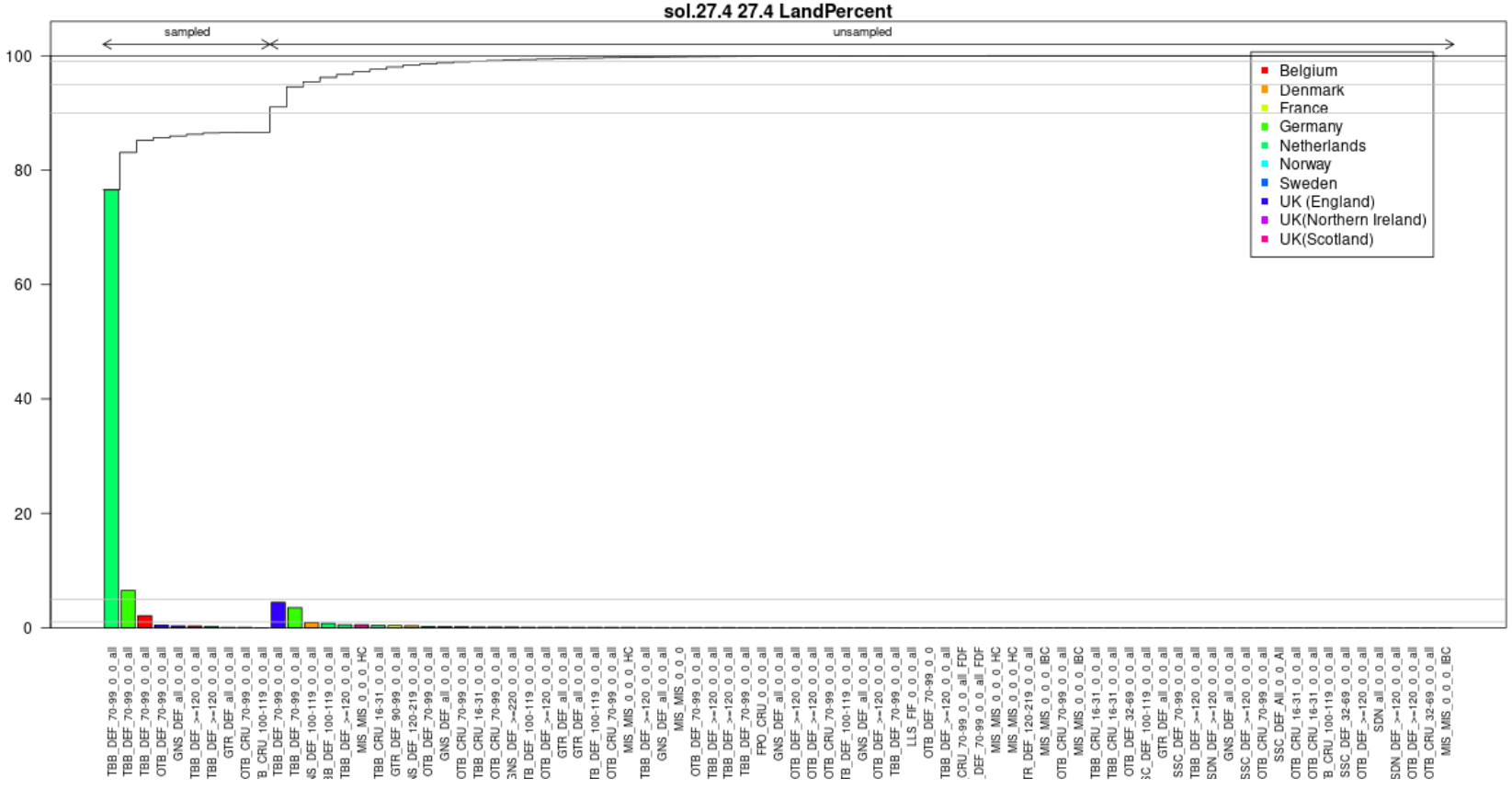
Coverage

- Main fleets (TBB 70-99) well sampled for landings and discards.
- More fleets with no samples, but low catches.

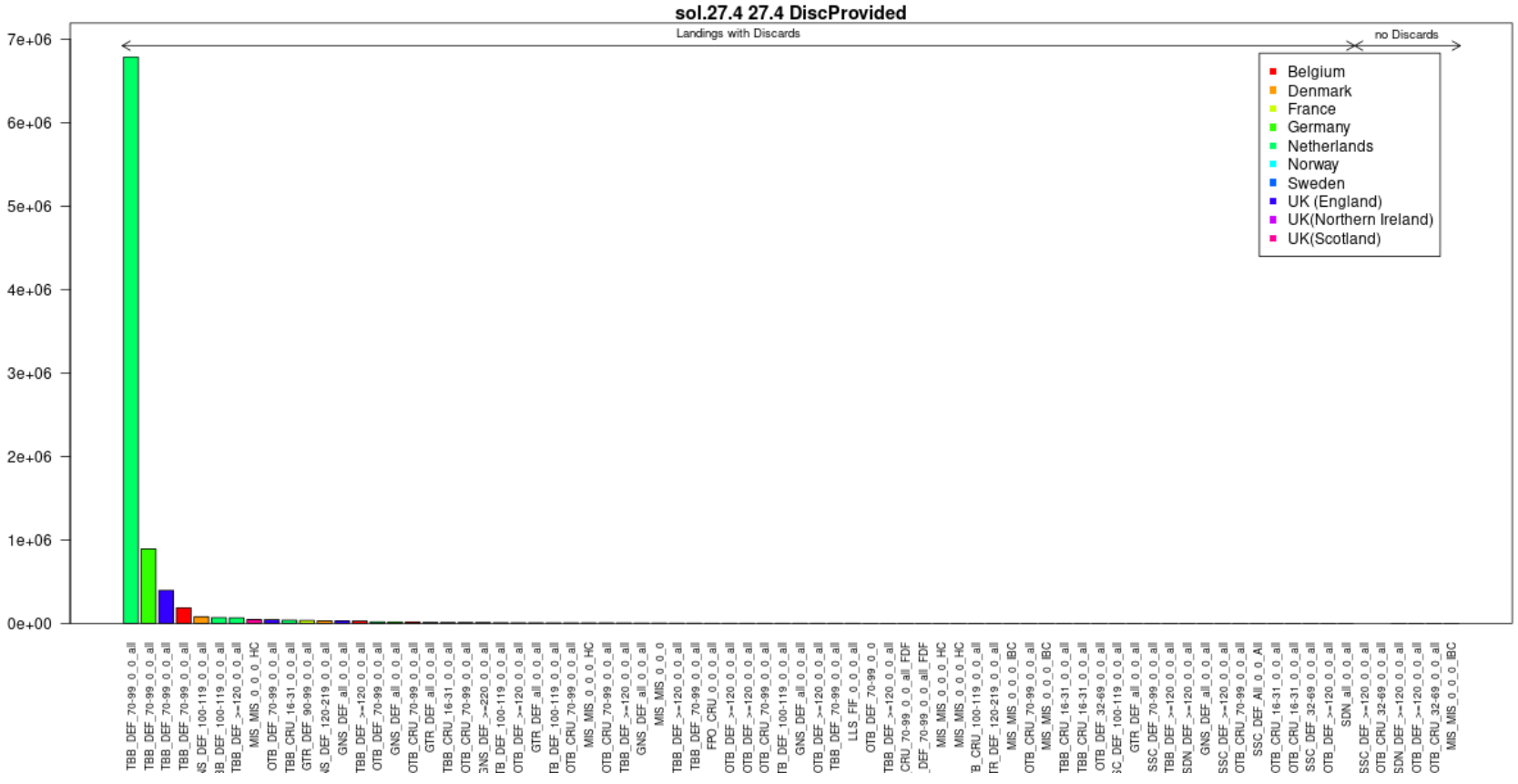
Raising

- Main fleets by quarter
- Group by metier/gear
- Separate at 100 mm mesh size
- Discards include BMS landings and logbook-recorded discards

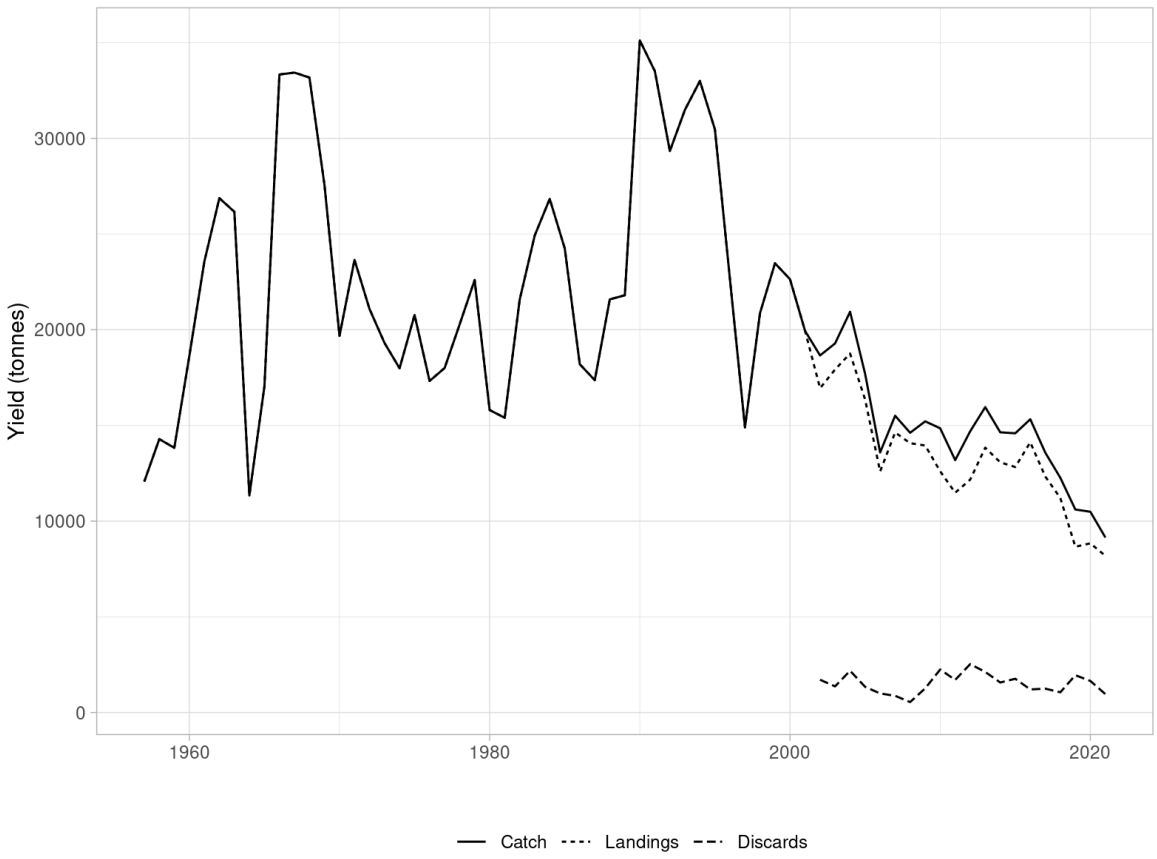
Intercatch - landings



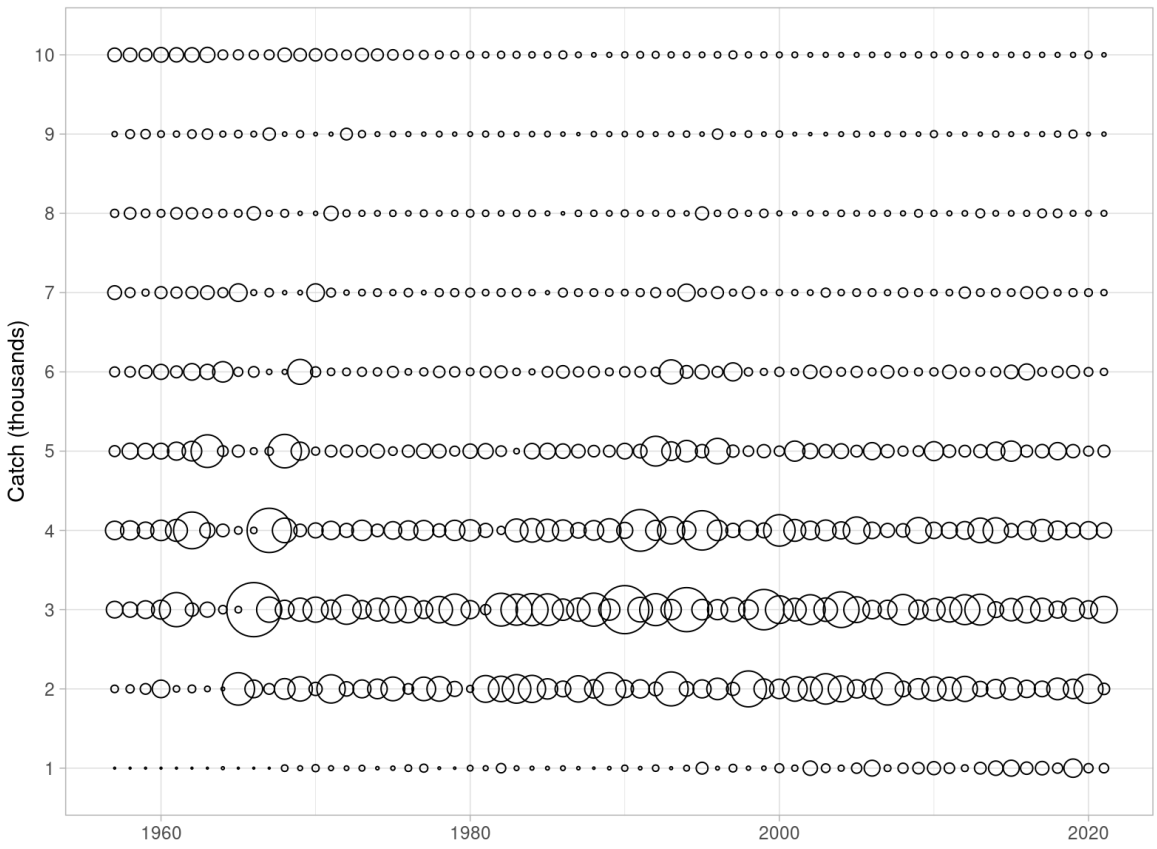
Intercatch - discards



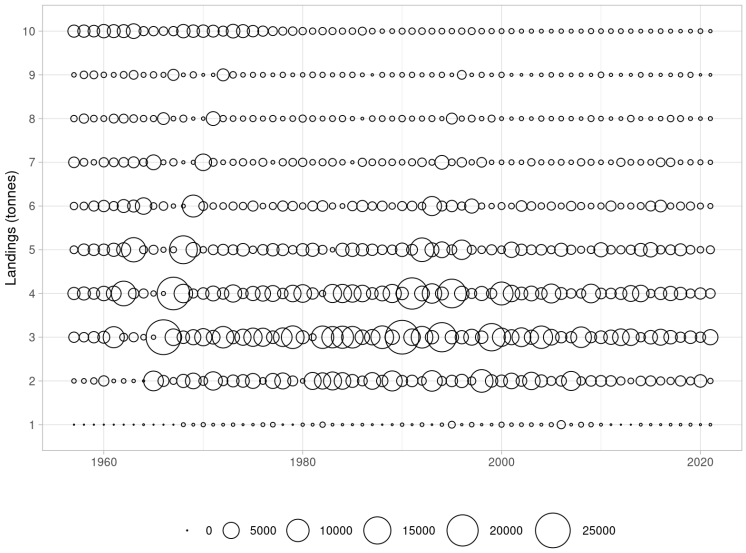
Catch, landings and discards

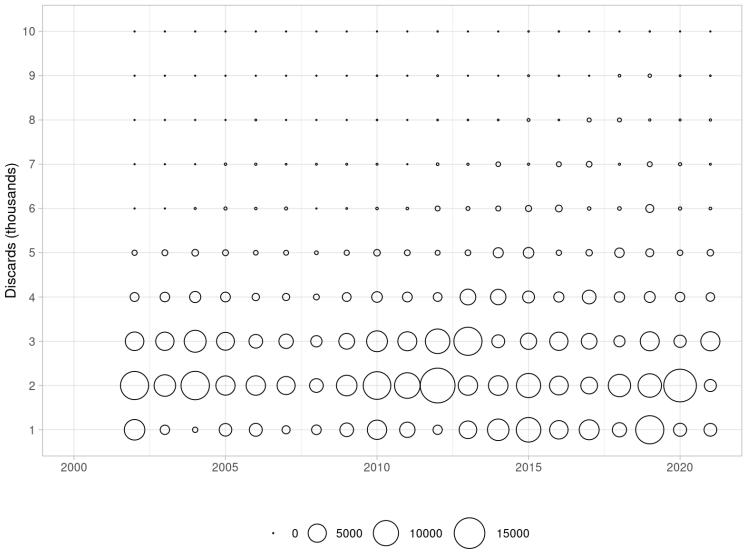


Catch at age

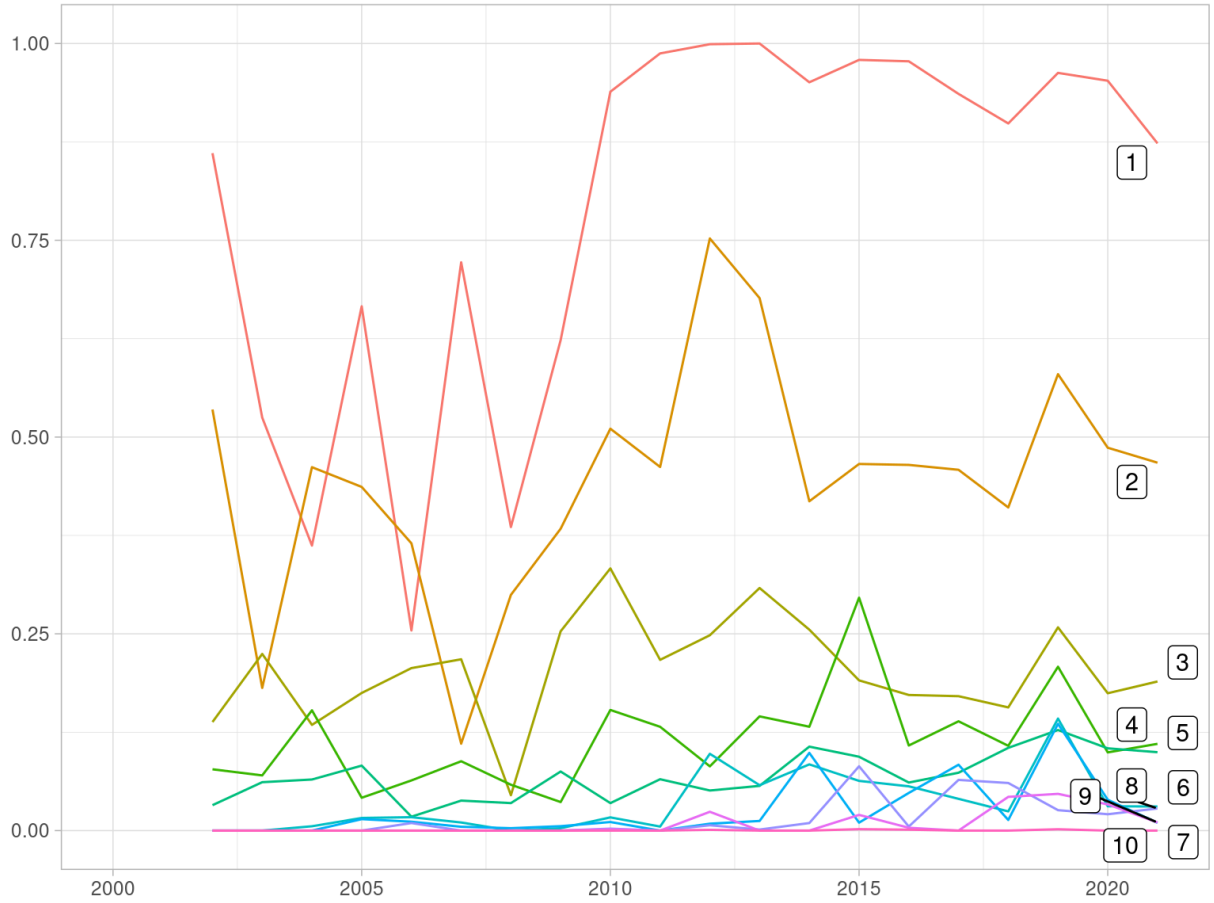


Landings and discards

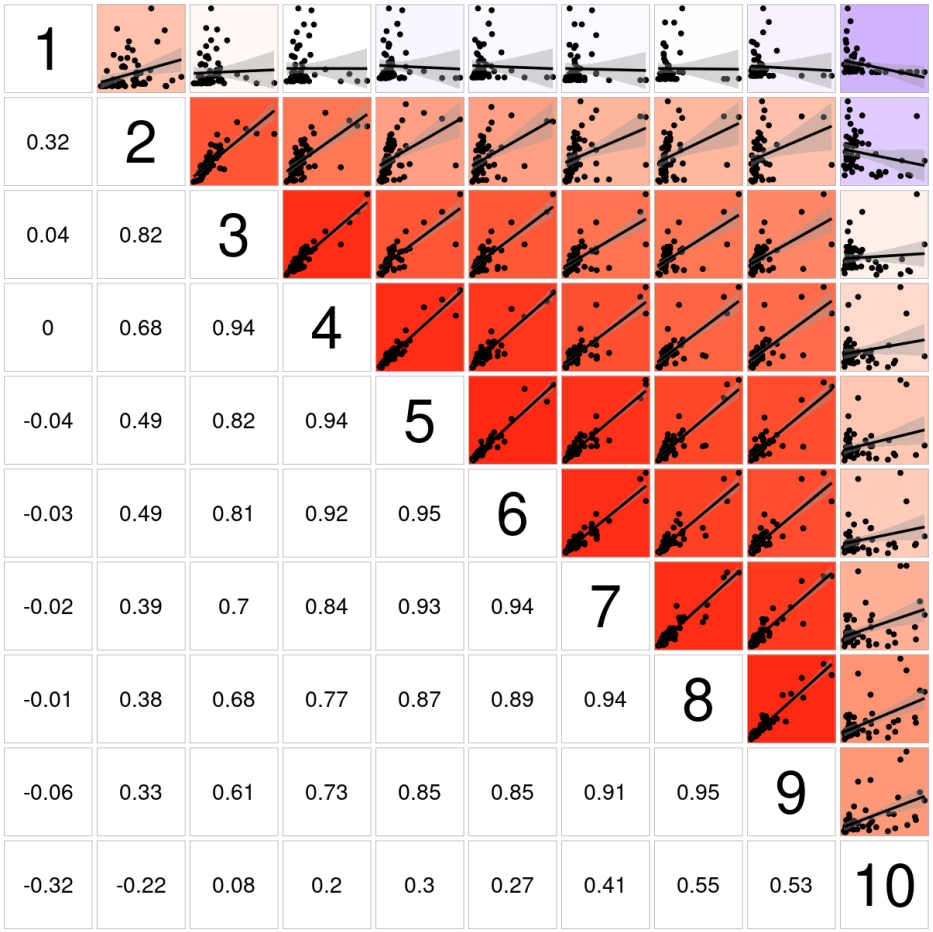




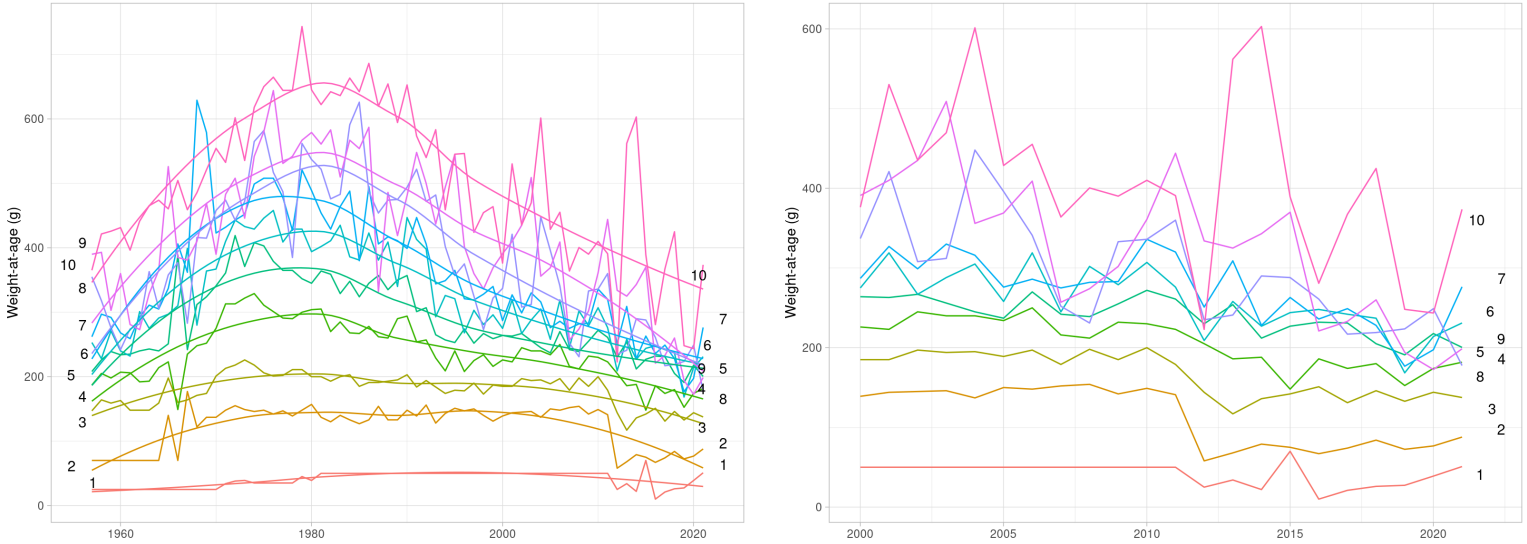
Discard ratio



Correlation in catch at age

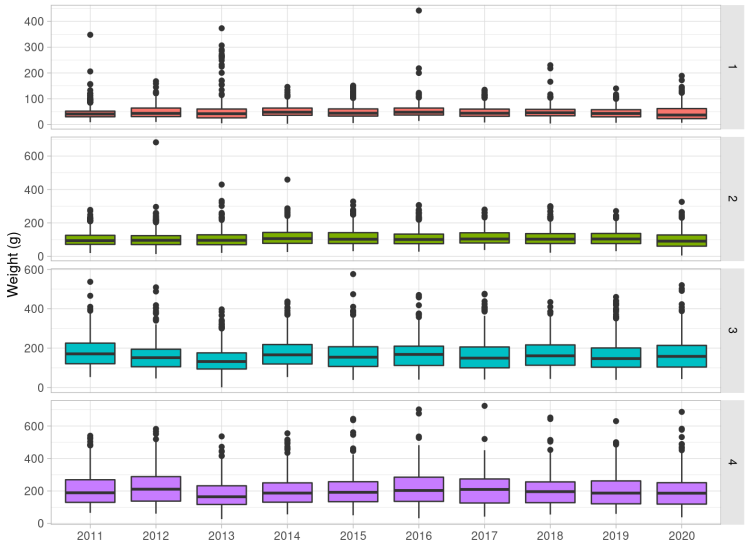


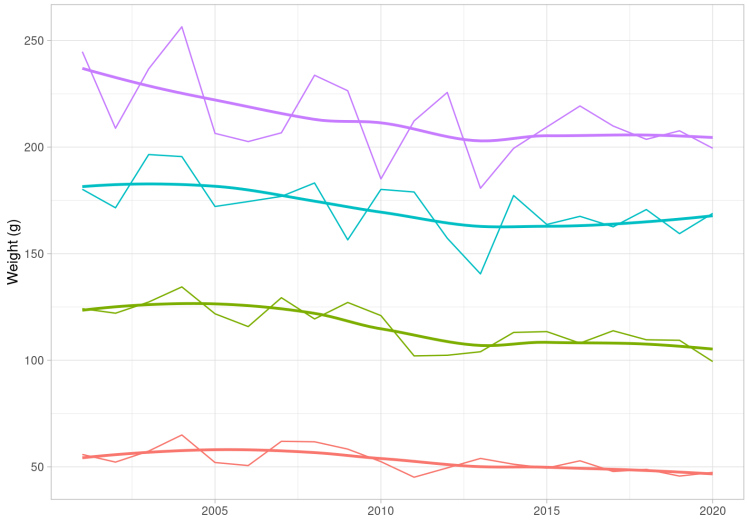
Stock weight at age



- Constructed from catch weight-at-age quarter 2.

Weigth at age from BTS Q3

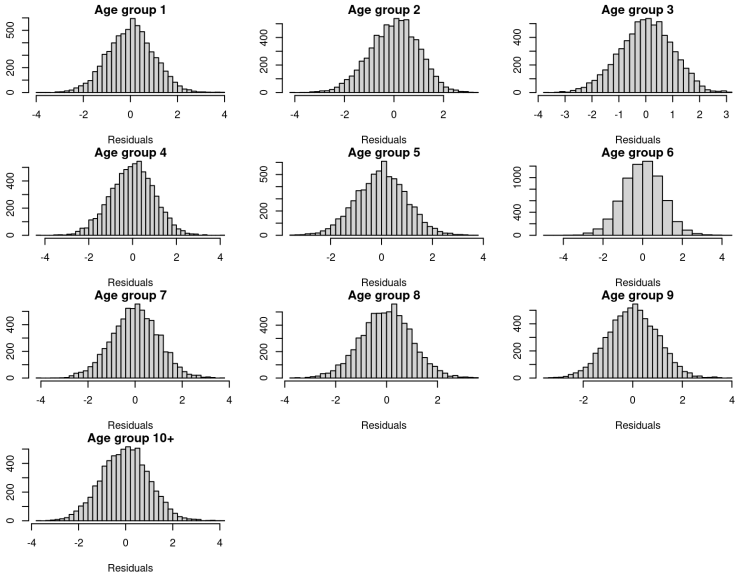


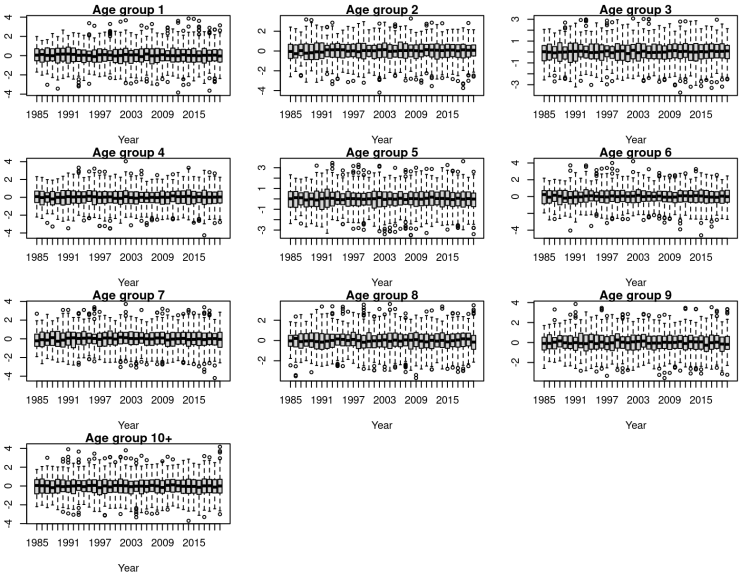


BTS GAM, NL+BE+DE Q3

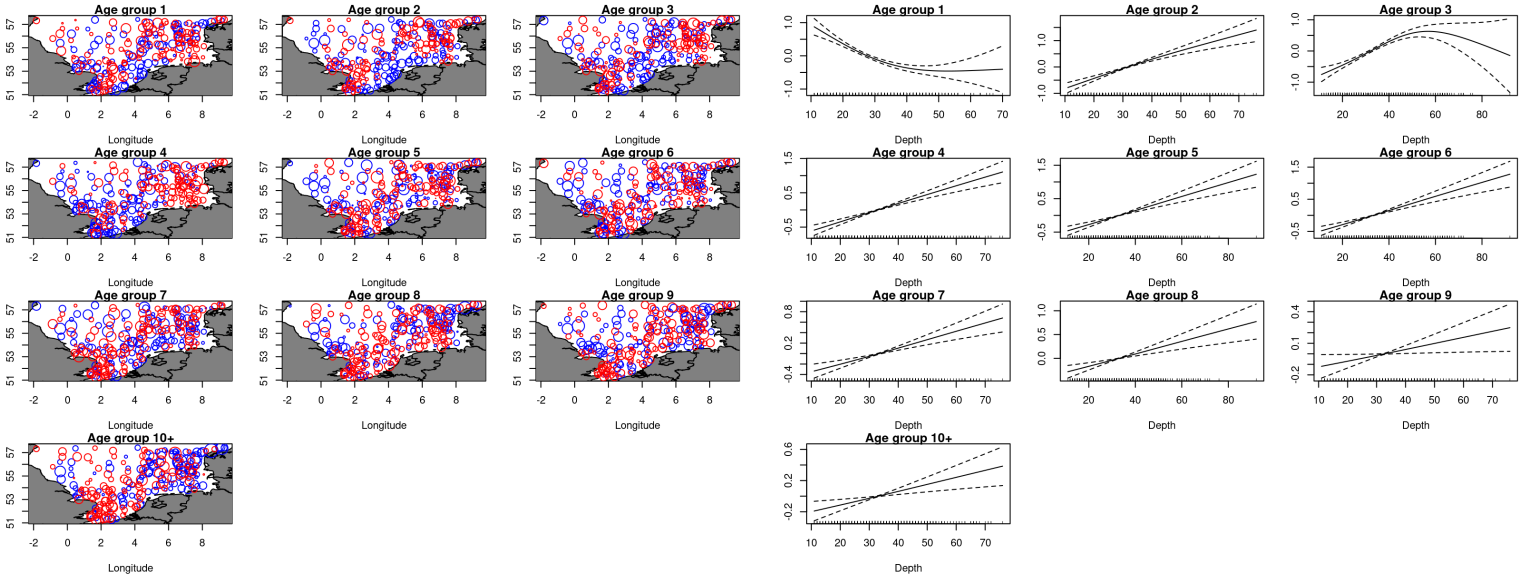
- Delta-lognormal GAM
- Ages 1-10+
- Time invariant spatial effect
- Year and gear factors
- Depth covariate
- Fitted using `surveyIndex` (Berg et al, 2014)
- https://github.com/ices-taf/2021_sol.27.4_survey

BTS GAM - residuals

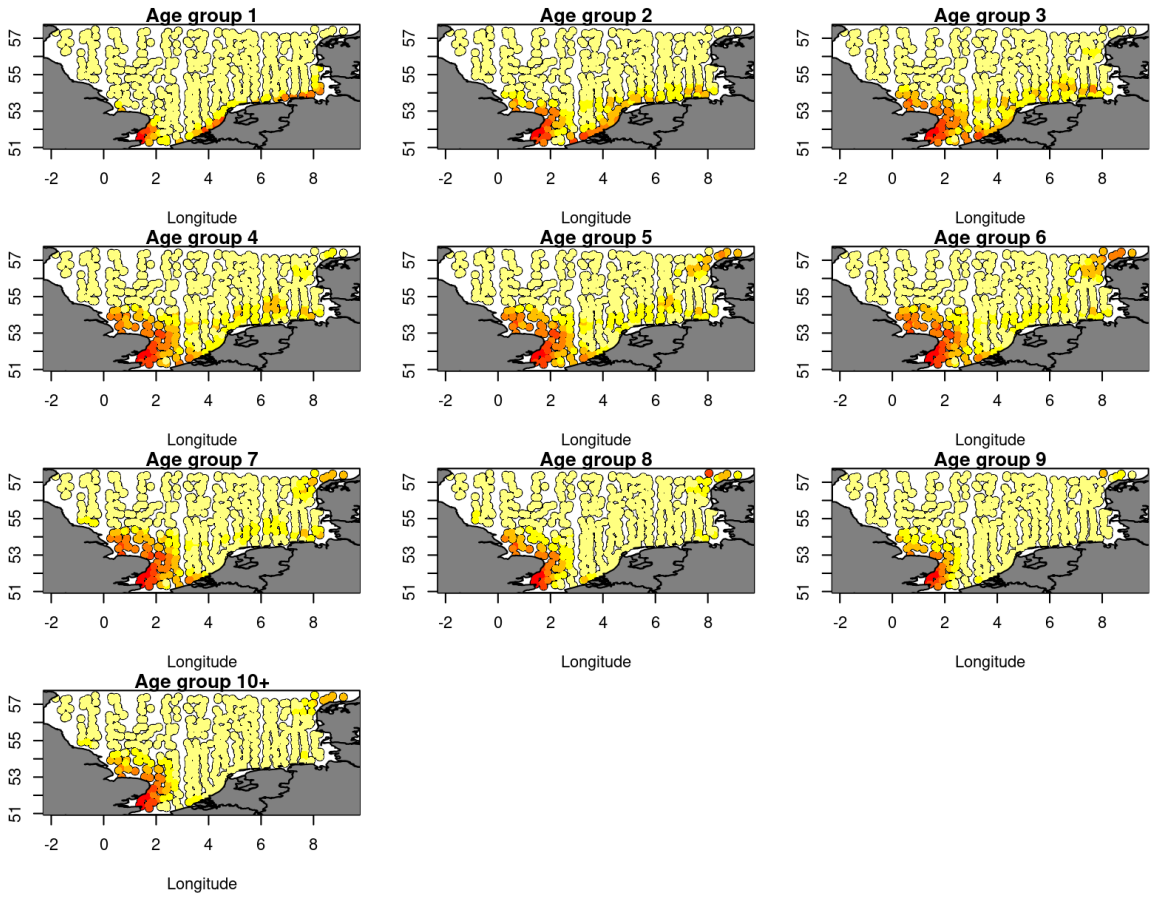




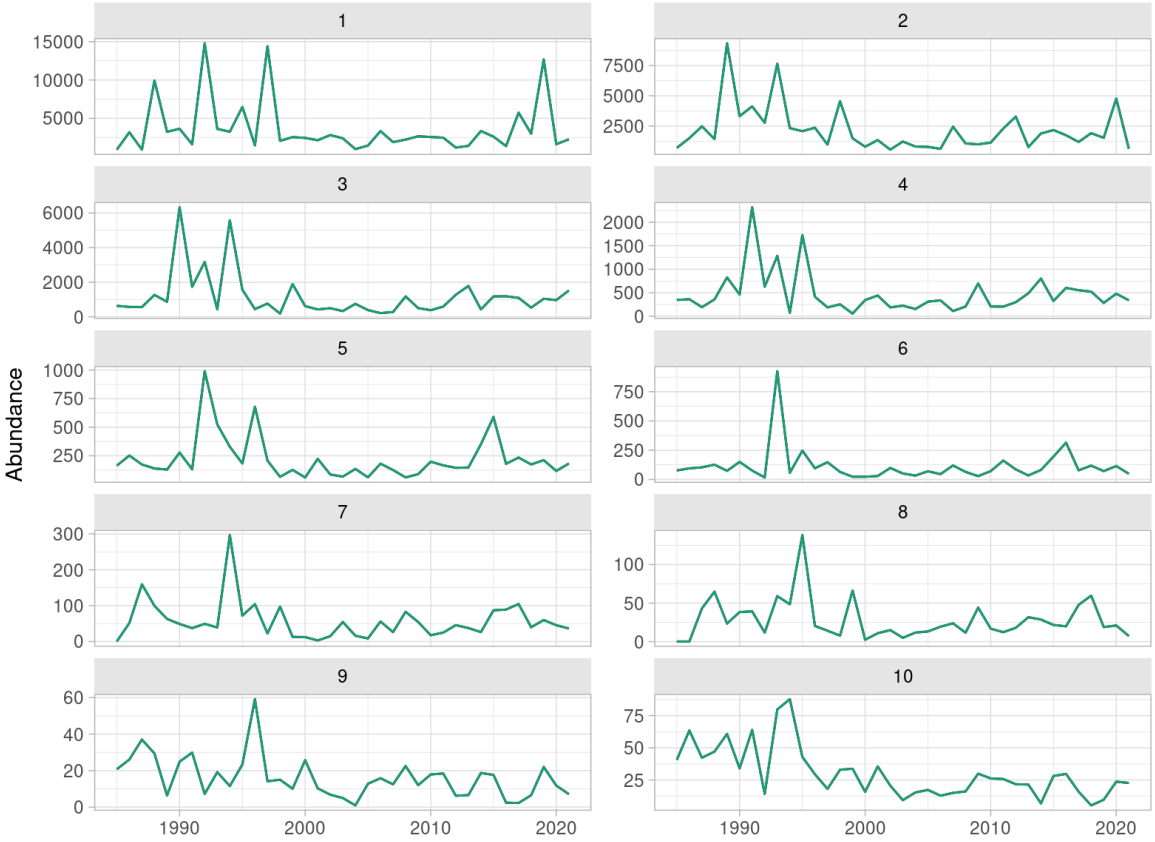
BTS GAM - residuals



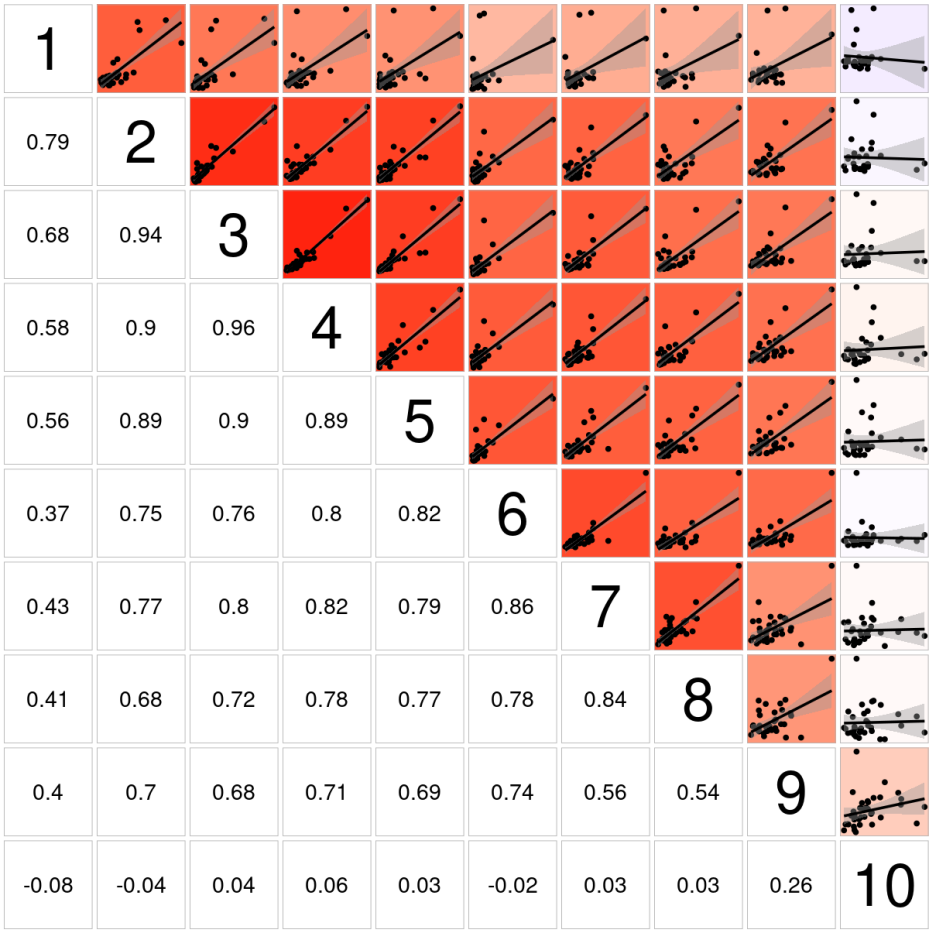
BTS GAM - 2020 estimates



BTS GAM, NL+BE+DE Q3

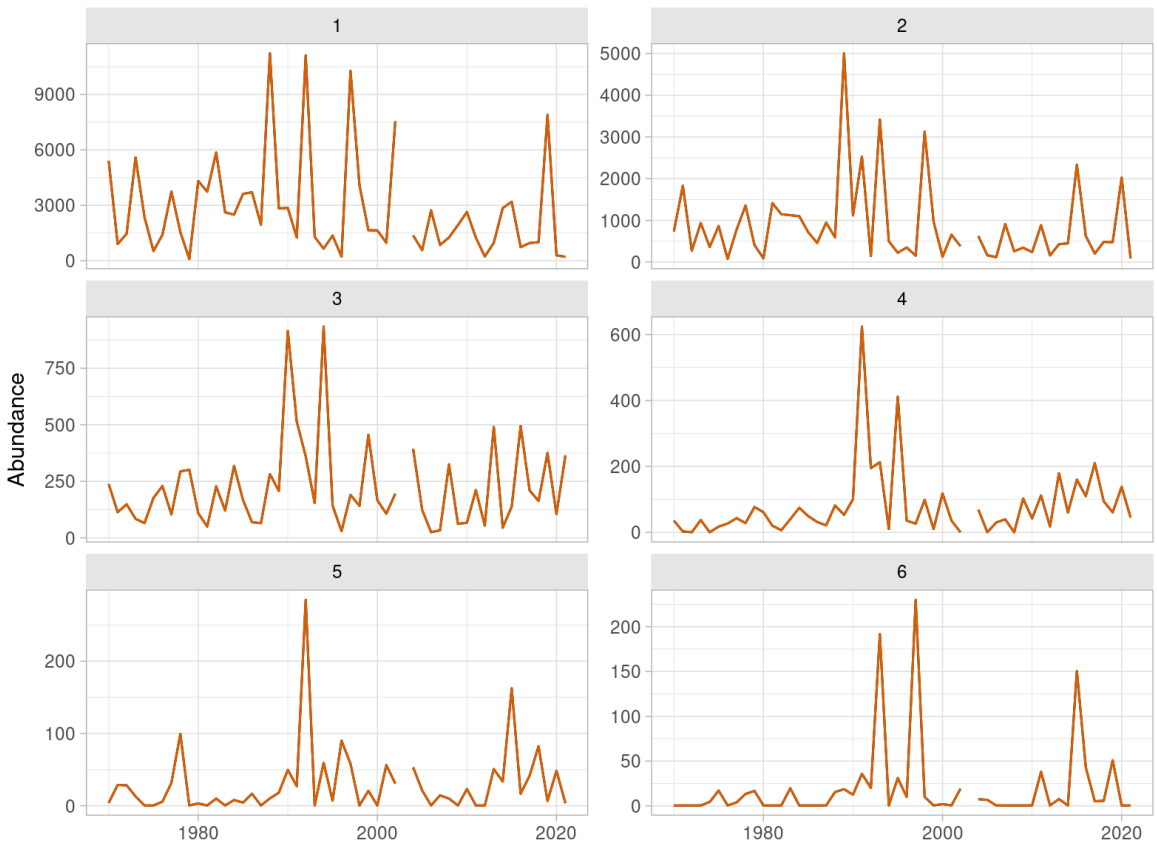


Internal consistency

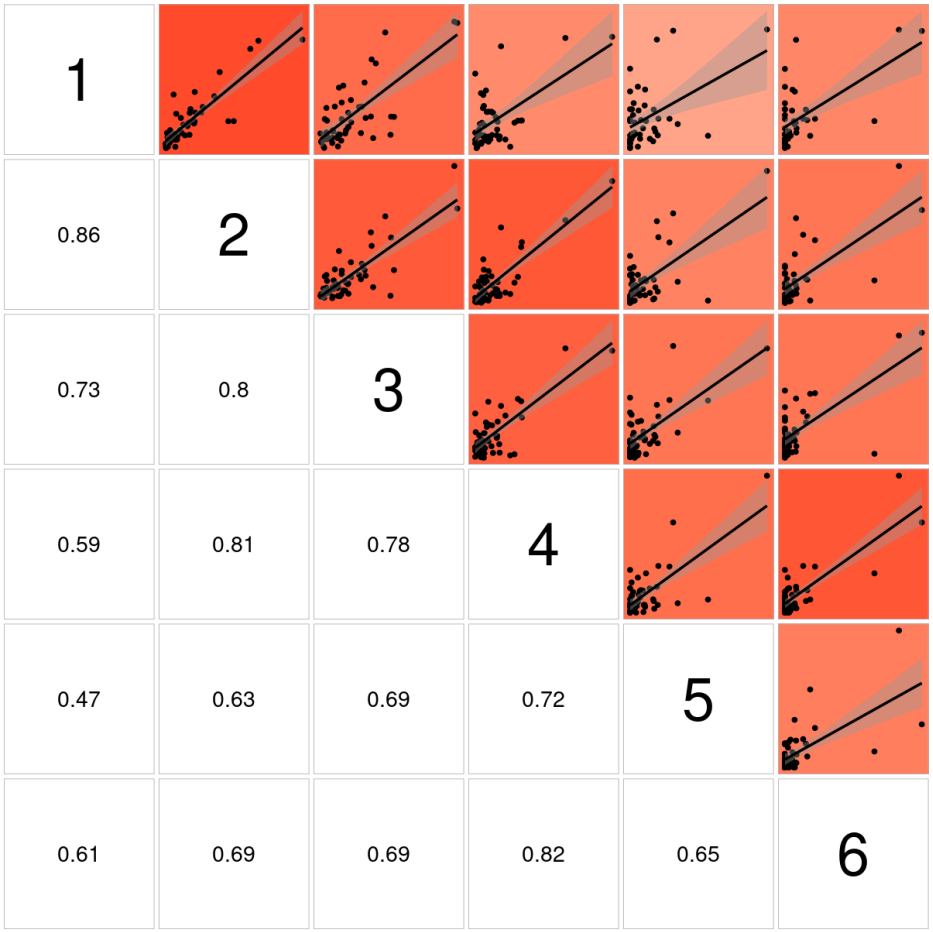


BTS consistency

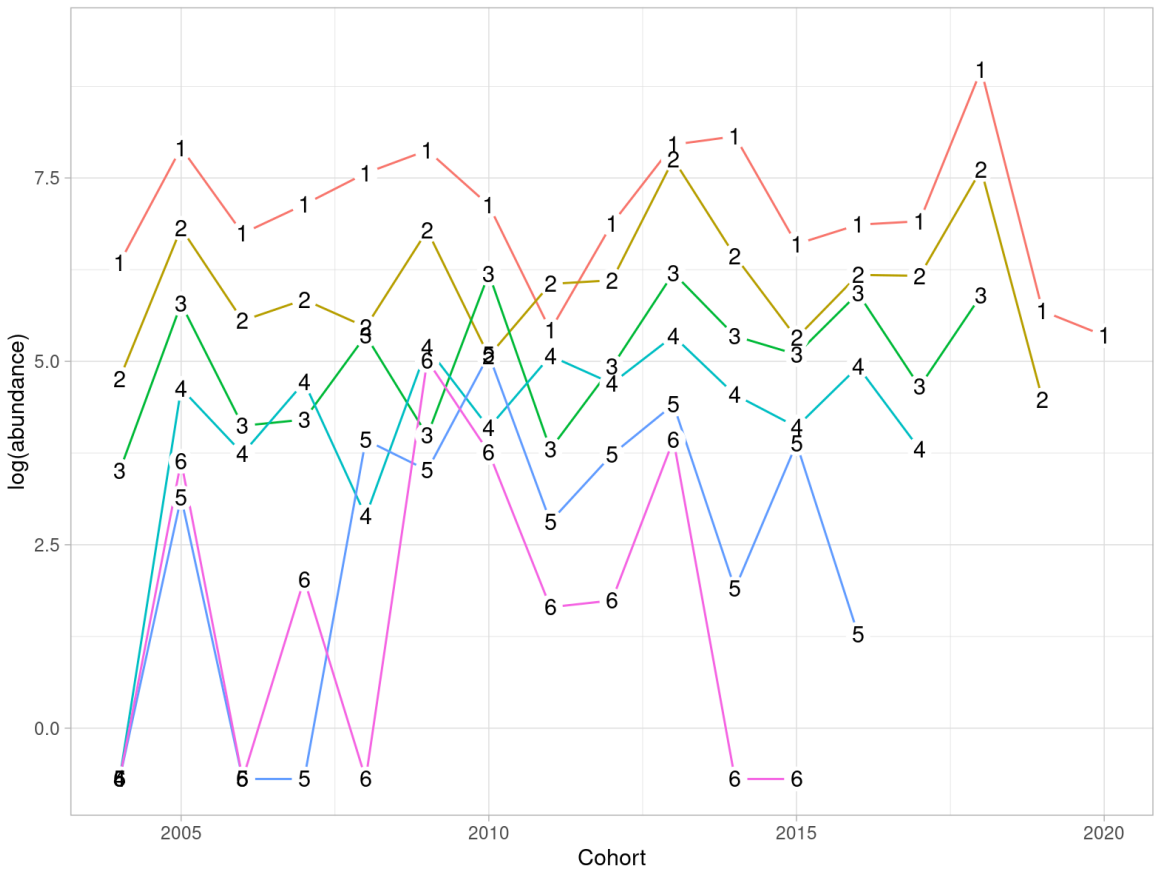
SNS


1
2
3
4
5
6
Abundance
9000
6000
3000
0
5000
4000
3000
2000
1000
0
750
500
250
0
600
400
200
0
200
100
0
200
150
100
50
0
1980
2000
2020
1980
2000
2020

SNS


1
0.86
2
0.73
0.8
3
0.59
0.81
0.78
4
0.47
0.63
0.69
0.72
5
0.61
0.69
0.69
0.82
0.65
6

SNS



BTS & SNS

1
2
3
4
5
6
7
8
9
10
Standardized relative abundance
0
2
4
1970
1980
1990
2000
2010
2020
BTS
SNS

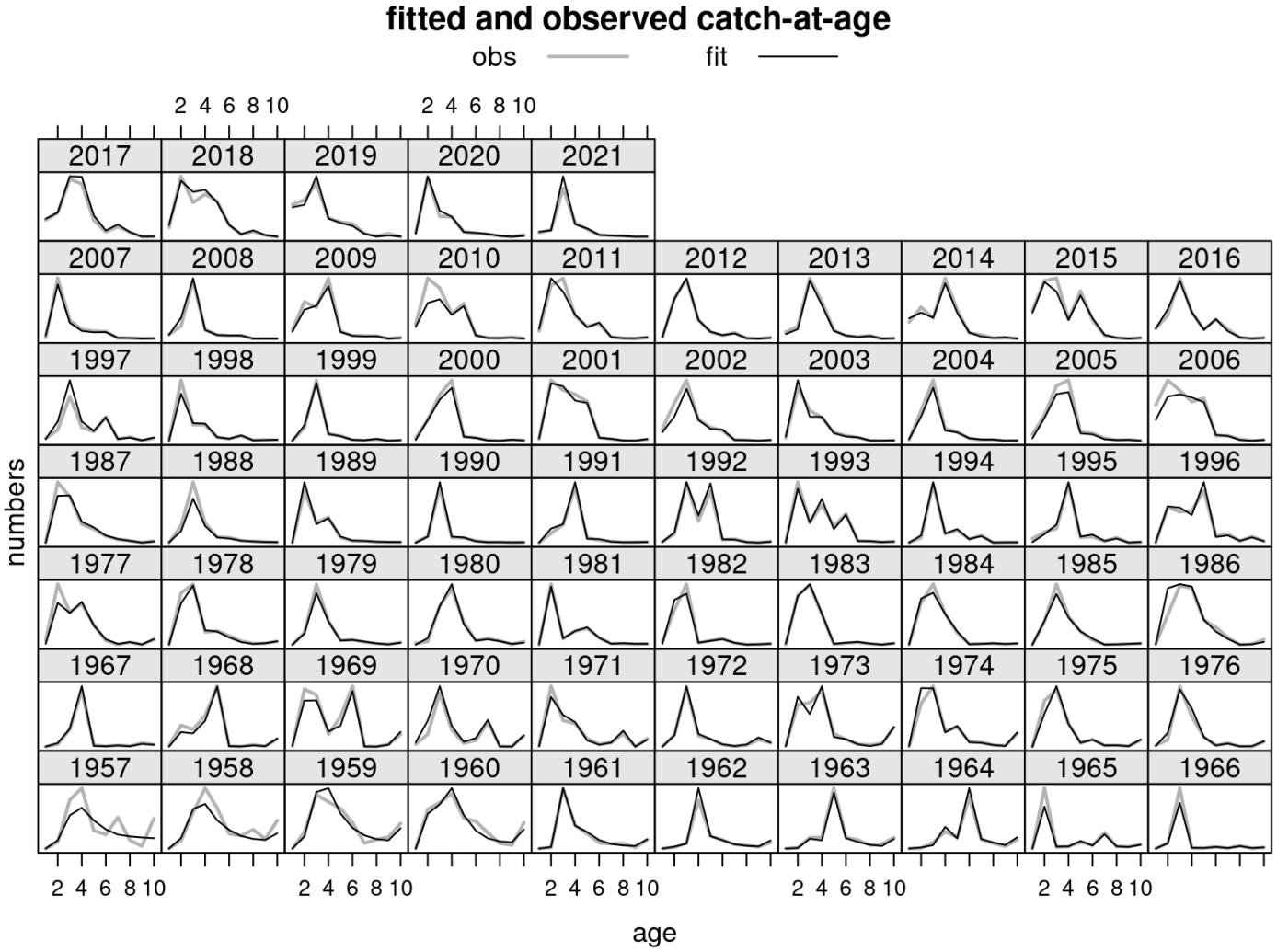
AAP Model setup

Setting	Value
Plus group	10
First tuning year	1970
Catchability catches constant for age >=	8
Catchability surveys constant for ages >=	8
Spline for selectivity-at-age survey	6
Tensor spline for F-at-age, ages	8
Tensor spline for F-at-age, years	28

Biology

- Natural mortality constant at 0.1 (but 0.9 in 1963)
- Maturity assumed time-invariant and knife-edge at age 3

AAP 2020 run


fitted and observed catch-at-age
obs
fit
numbers
age
2017
2018
2019
2020
2021
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
1997
1998
1999
2000
2001
2002
2003
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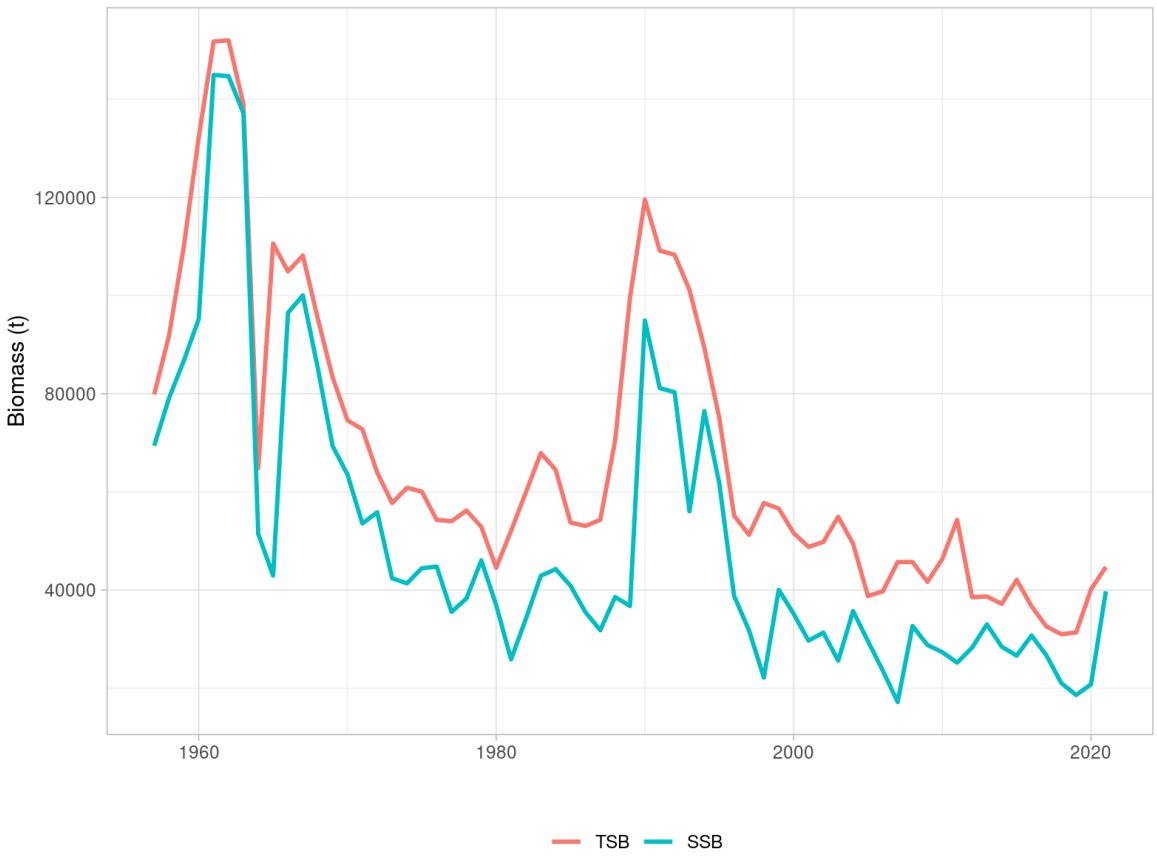
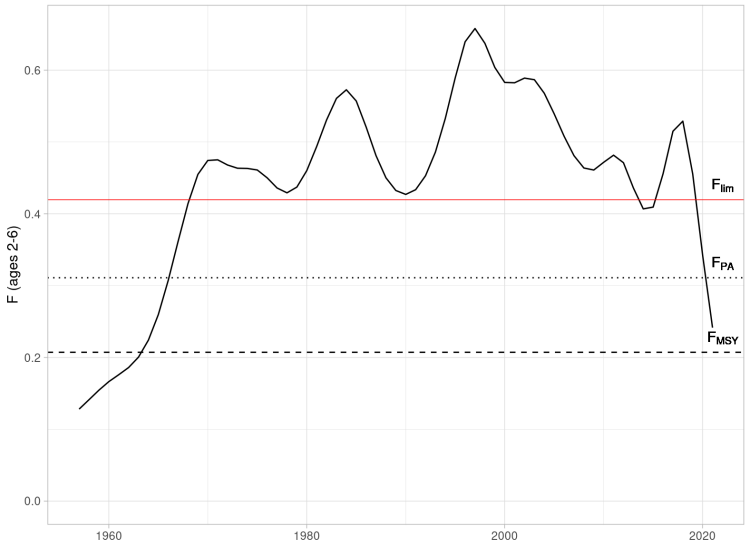
1963
1964
1965
1966
2 4 6 8 10

TSB and SSB



Refpts

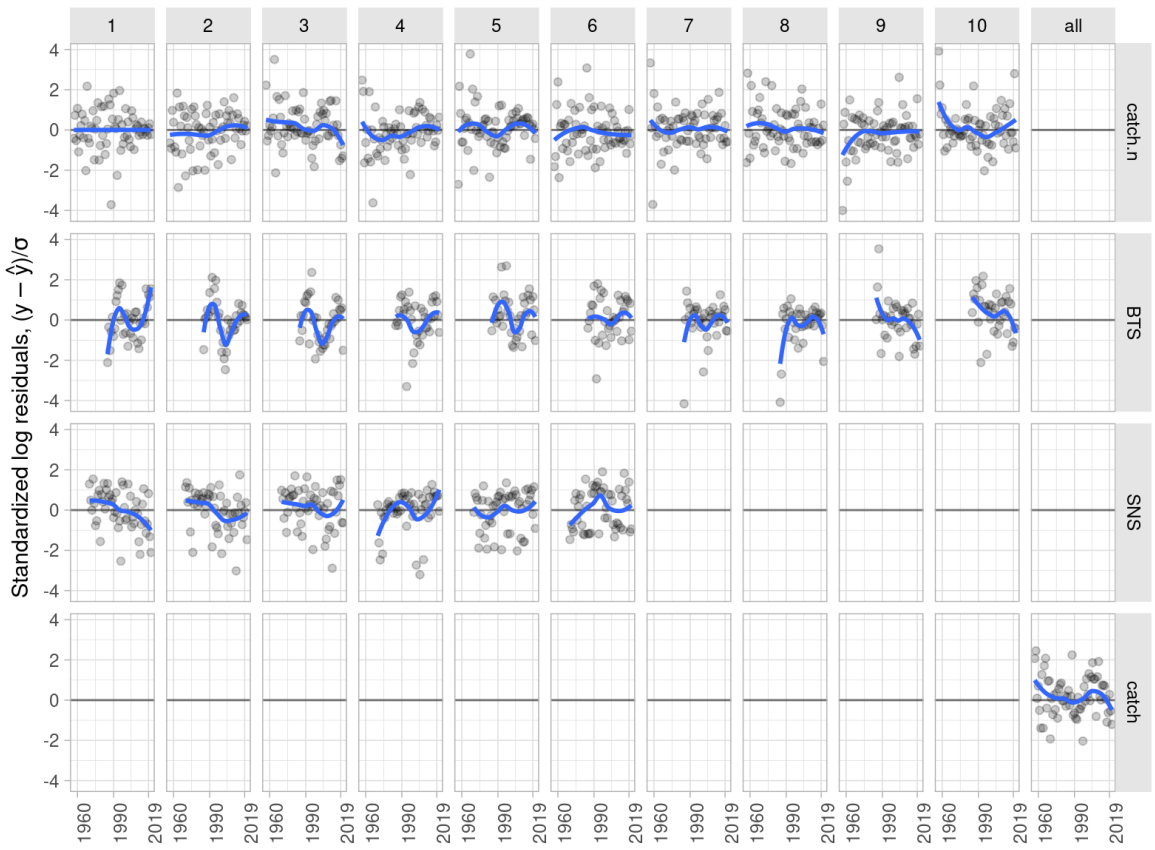

F (ages 2-6)
0.0
0.2
0.4
0.6
1960
1980
2000
2020
F_{lim}
F_{PA}
F_{MSY}

SSB (tonnes)
0
50000
100000
150000
1960
1980
2000
2020
$MSYB_{trigger}$
B_{PA}
B_{lim}

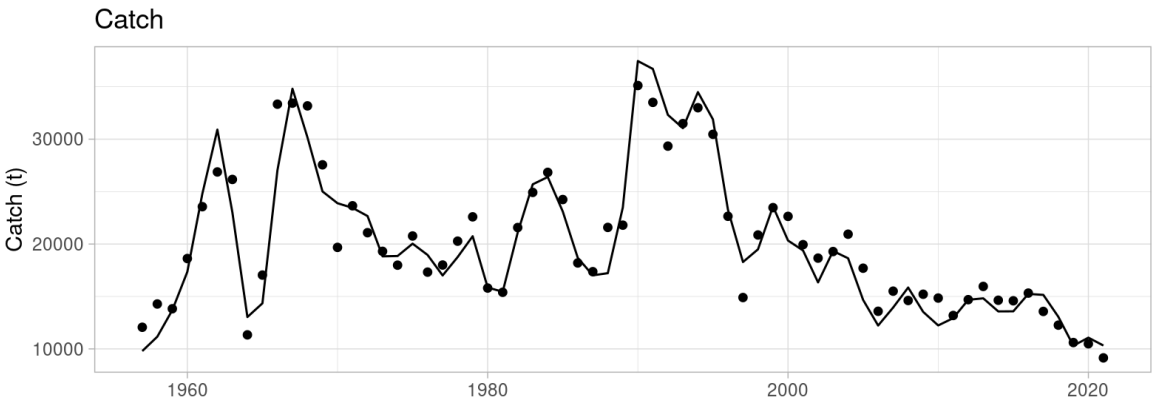
Residuals

catch.n
BTS
SNS
catch
Standardized log residuals, (y − ŷ)/σ
all
10
9
8
7
6
5
4
3
2
1
1960
1980
2000
2020
1
2
3
4
<0
>0

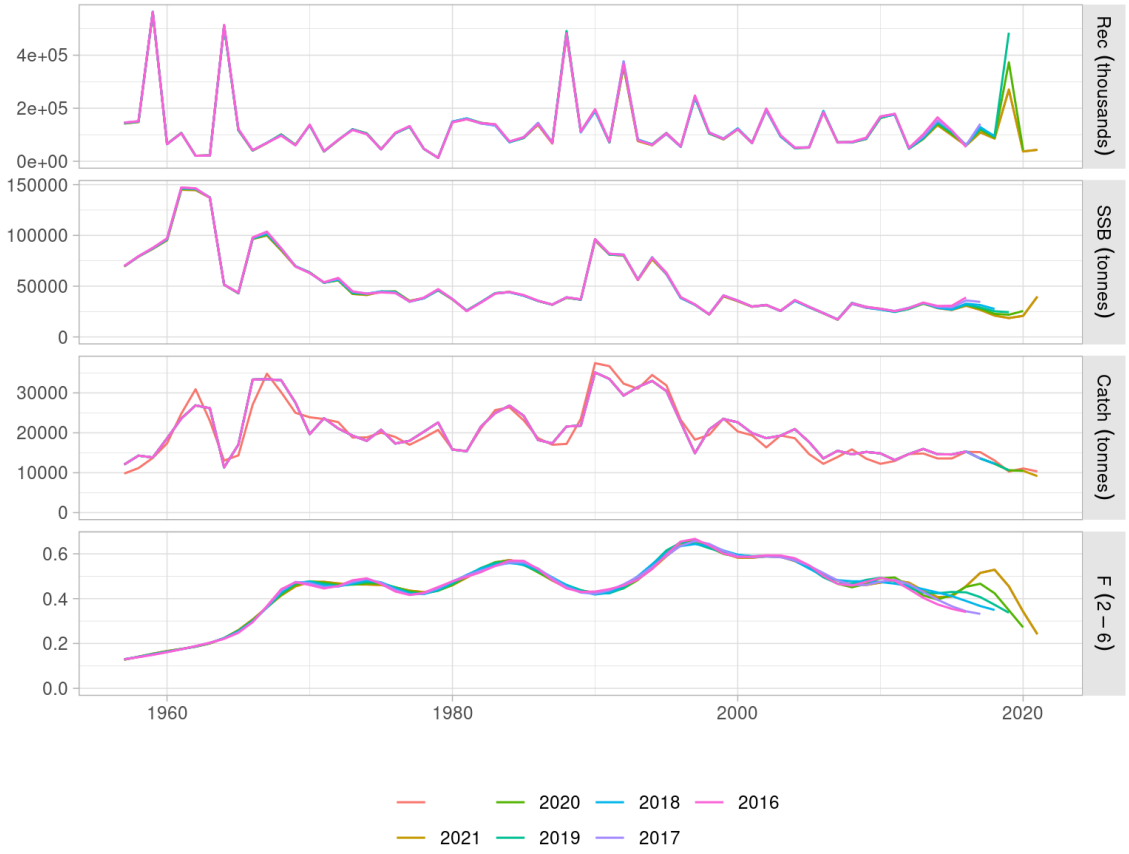
Residuals


1
2
3
4
5
6
7
8
9
10
all
catch.n
BTS
SNS
catch
Standardized log residuals, (y − ŷ)/σ
4
2
0
-2
-4
1960
1990
2019

Observed and estimated catches

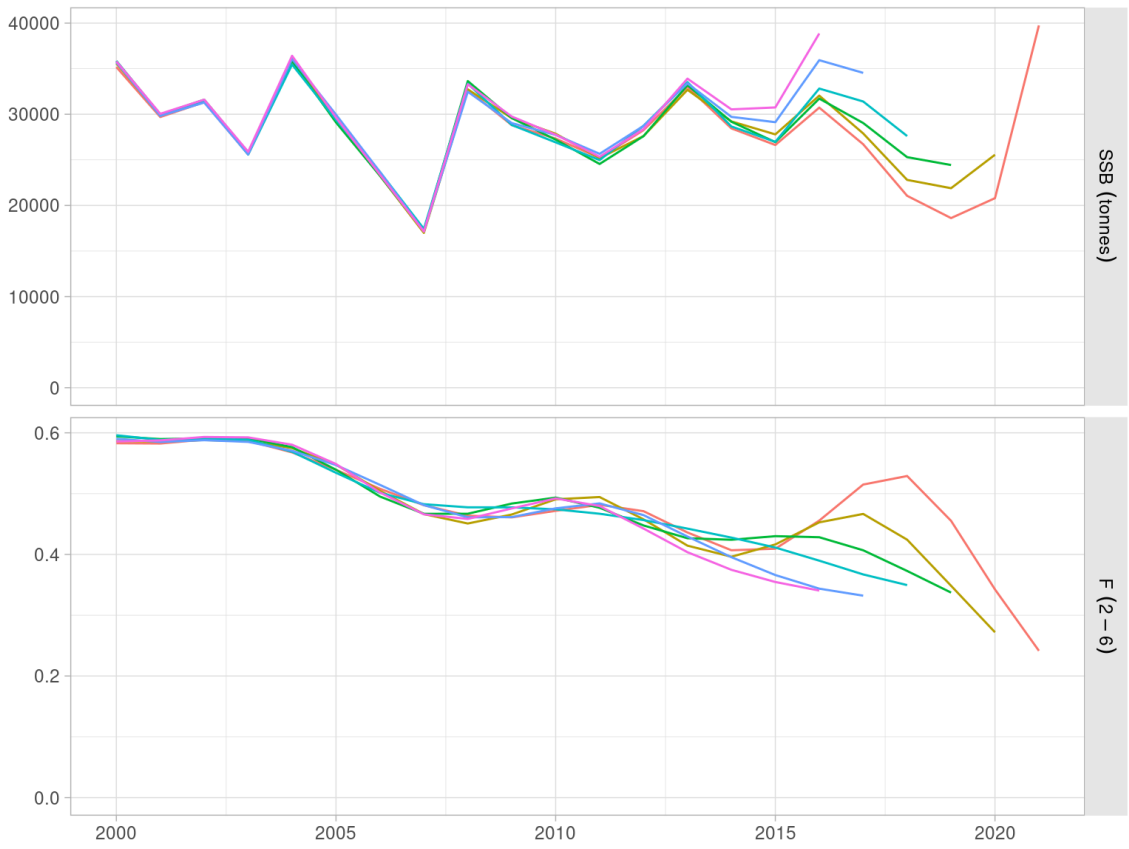


Retrospective patterns

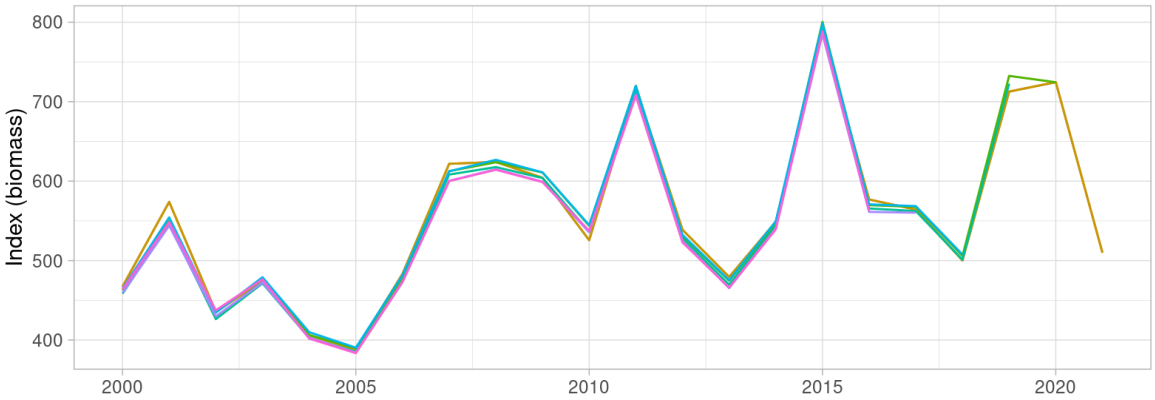


- 3-year Mohn's rho: SSB = 0.26, F = -0.28

Retrospective patterns



GAM BTS retrospective

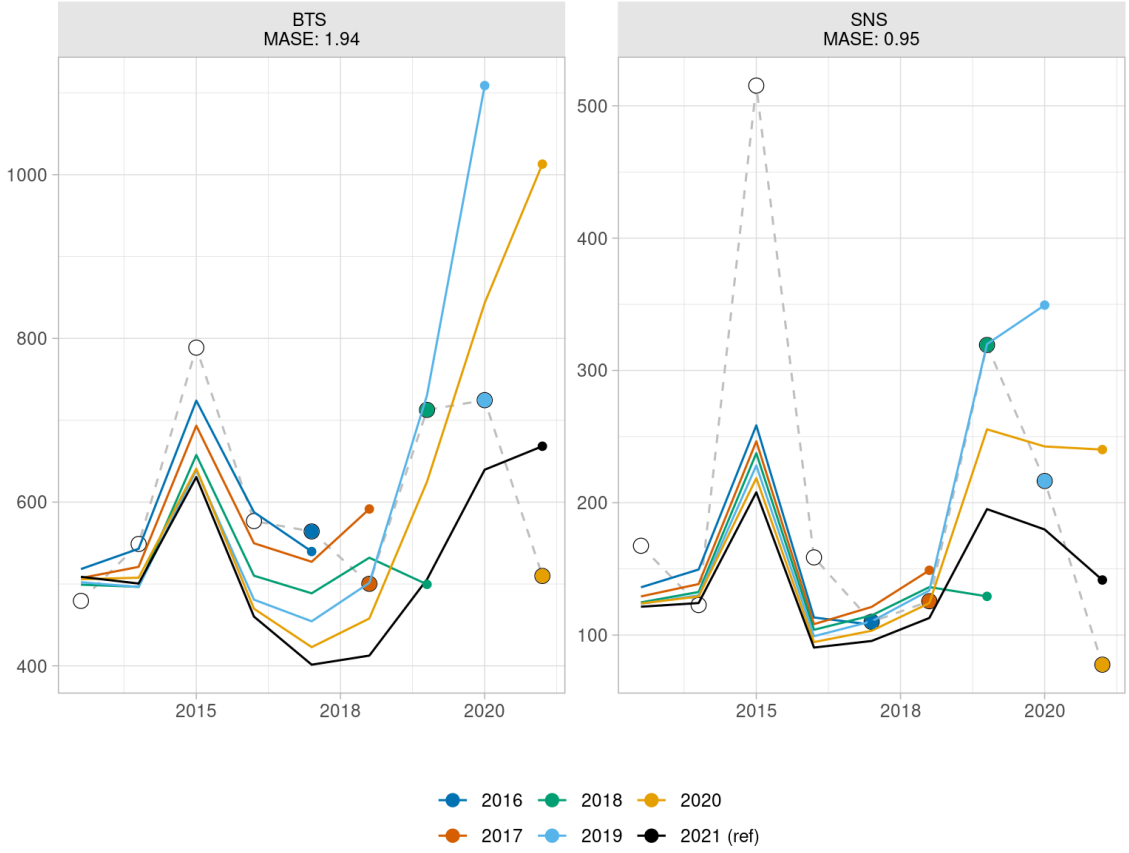


- No effect in SSB or F Mohn's rho.

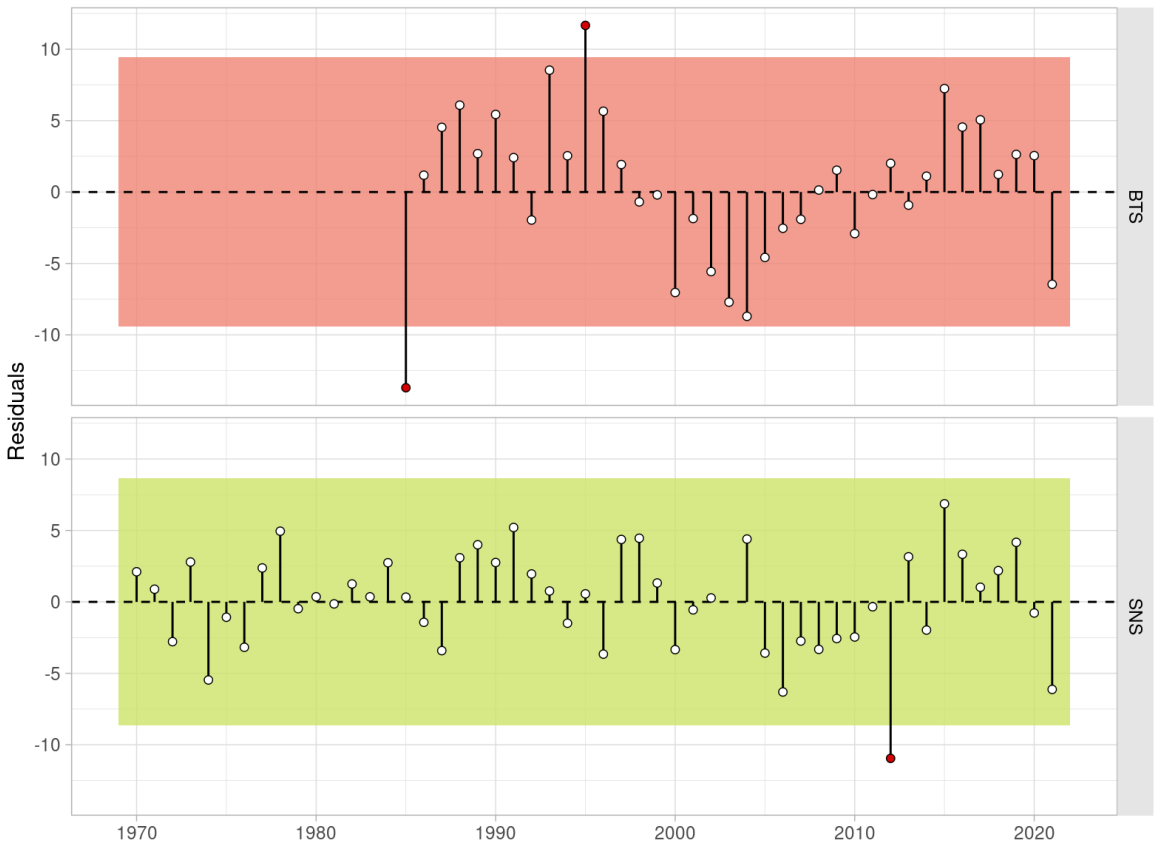
What might be behind retrospective pattern?

- Retrospective by age group
  - Ages 1, 2 = 0.31
  - Ages 3-6 = 0.29
  - Ages 7-10 = 0.12
- Retrospective using 2021 SSB
  - 5 peel = 0.24
  - 3 peel = 0.15
- Run for BTS ages 1:8 only
  - SSB = 0.20
  - F = -0.23
- Run with BTS-NL
  - SSB = 0.16
  - F = -0.14
- Retro using 2021 SSB
  - SSB = 0.23

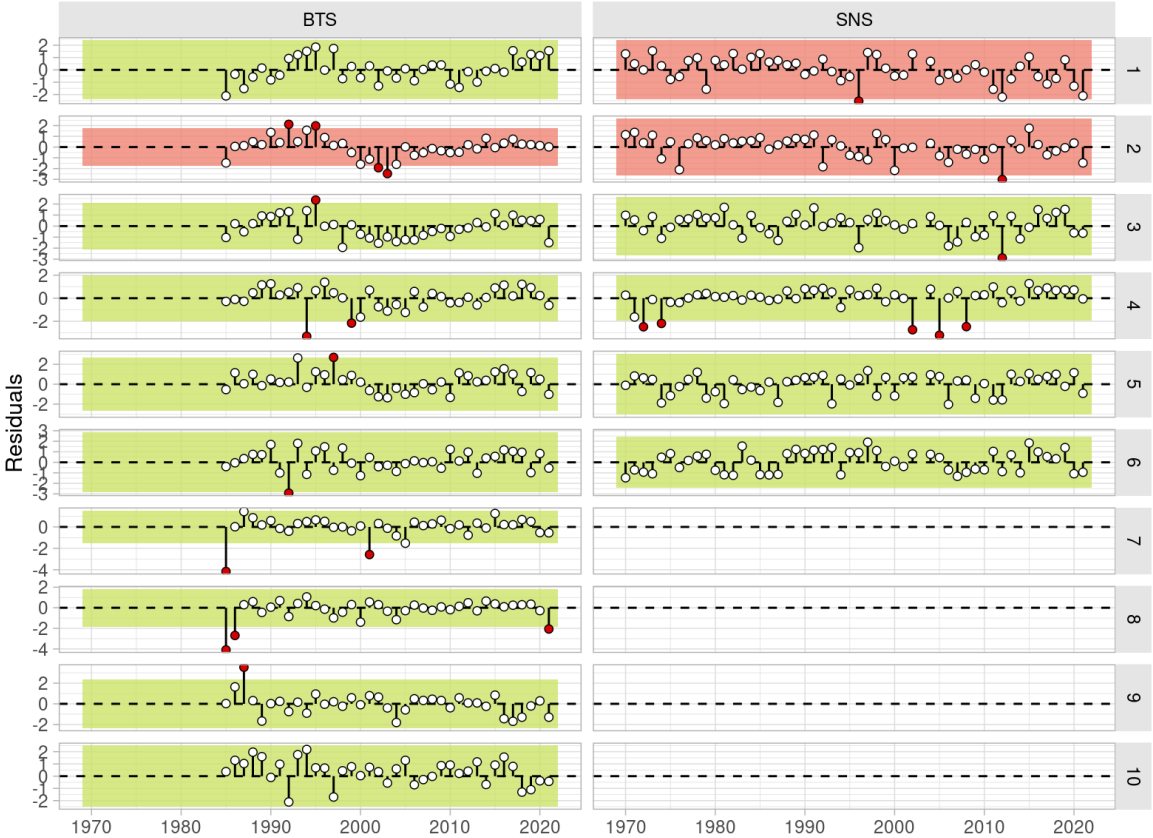
Hindcasting cross-validation surveys



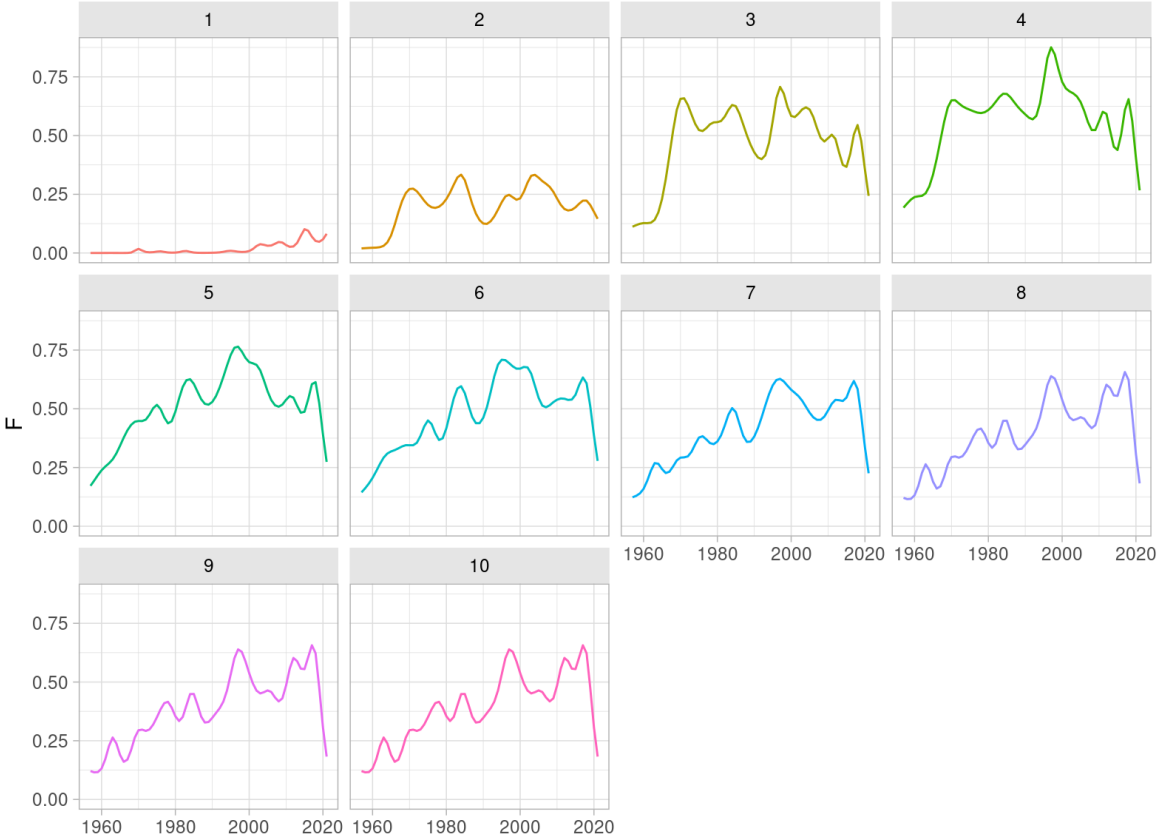
Indices runs test



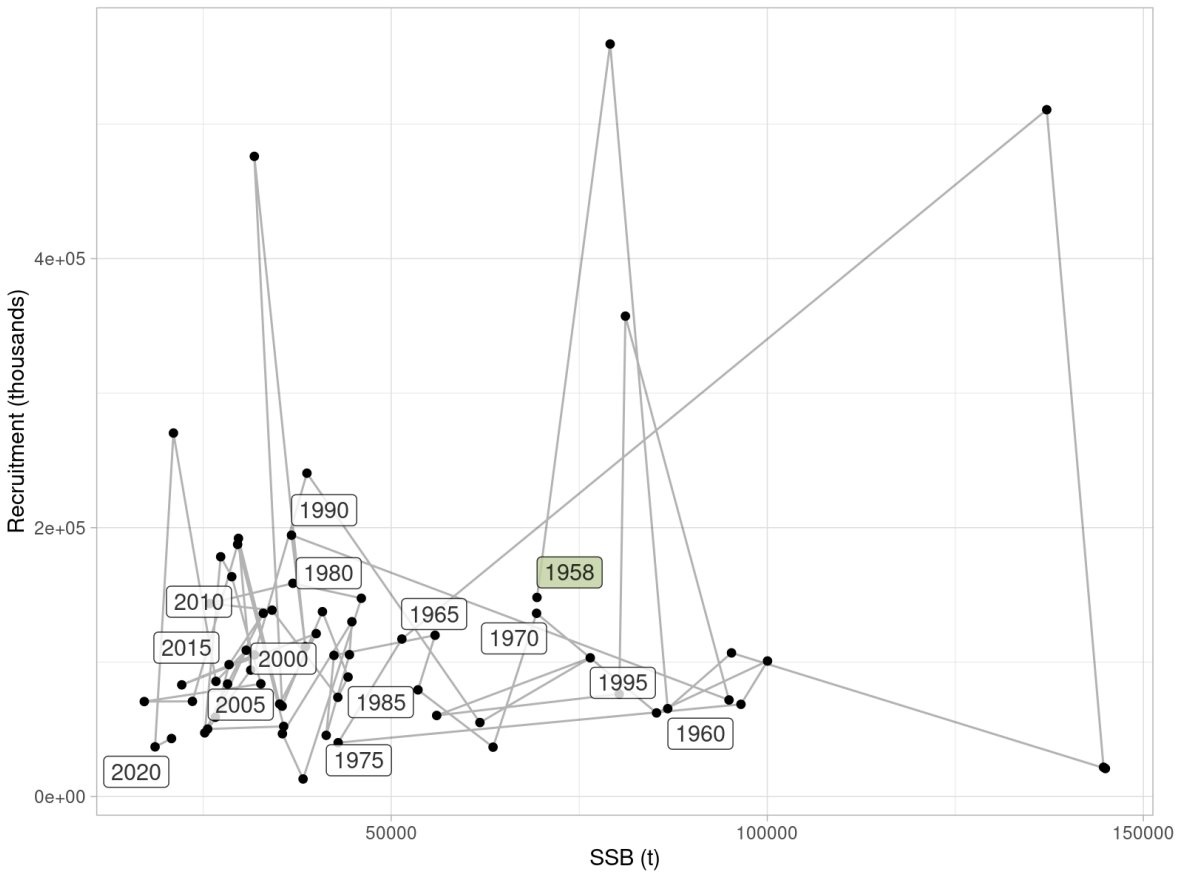
Indices runs test



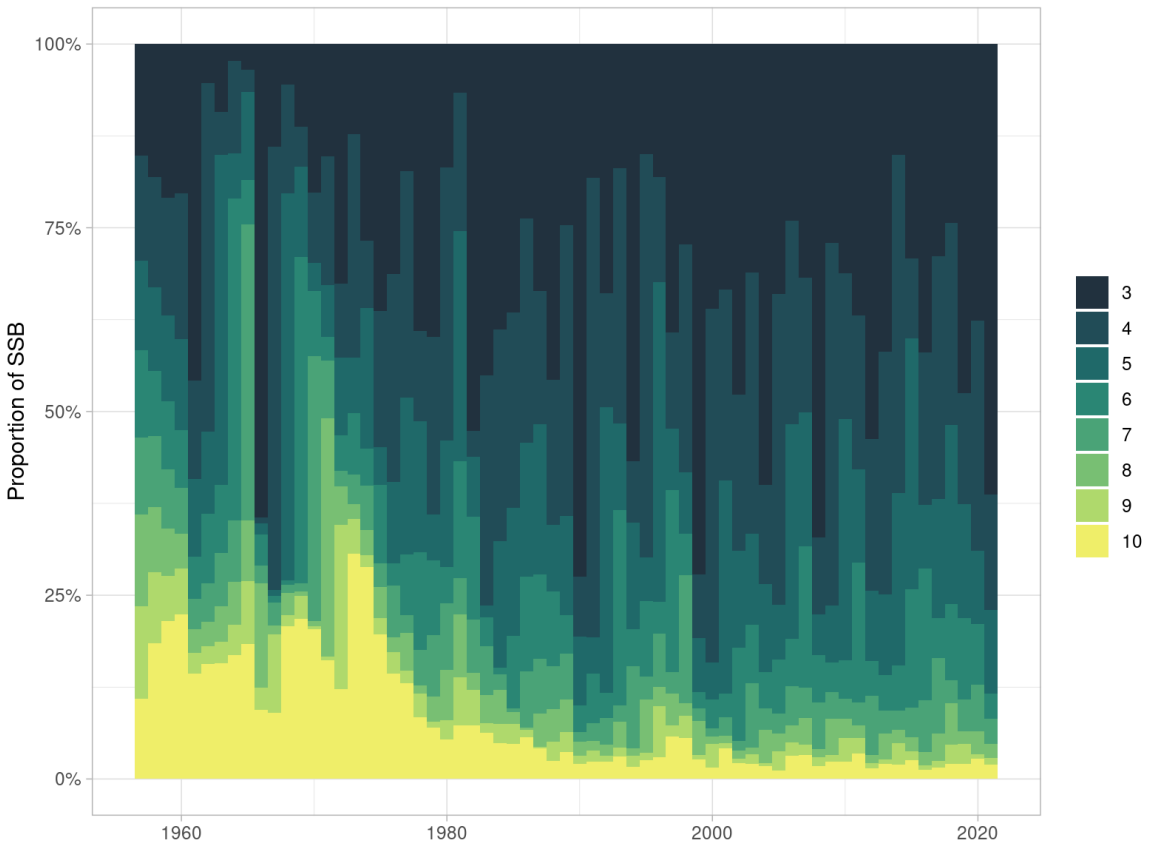
F-at-age



Estimated recruitment



Proportion SSB at age



Issues

- Retrospective pattern needs to be addressed.
  - BTS selectivity.
  - Fishery selectivity in recent years.
- Residuals patterns
  - Recent age 1 landings and discards.
  - Estimated total landings and catches
- Trends in weights at age, effects on maturity or M.
- Maturity knife-edge and not time-varying.