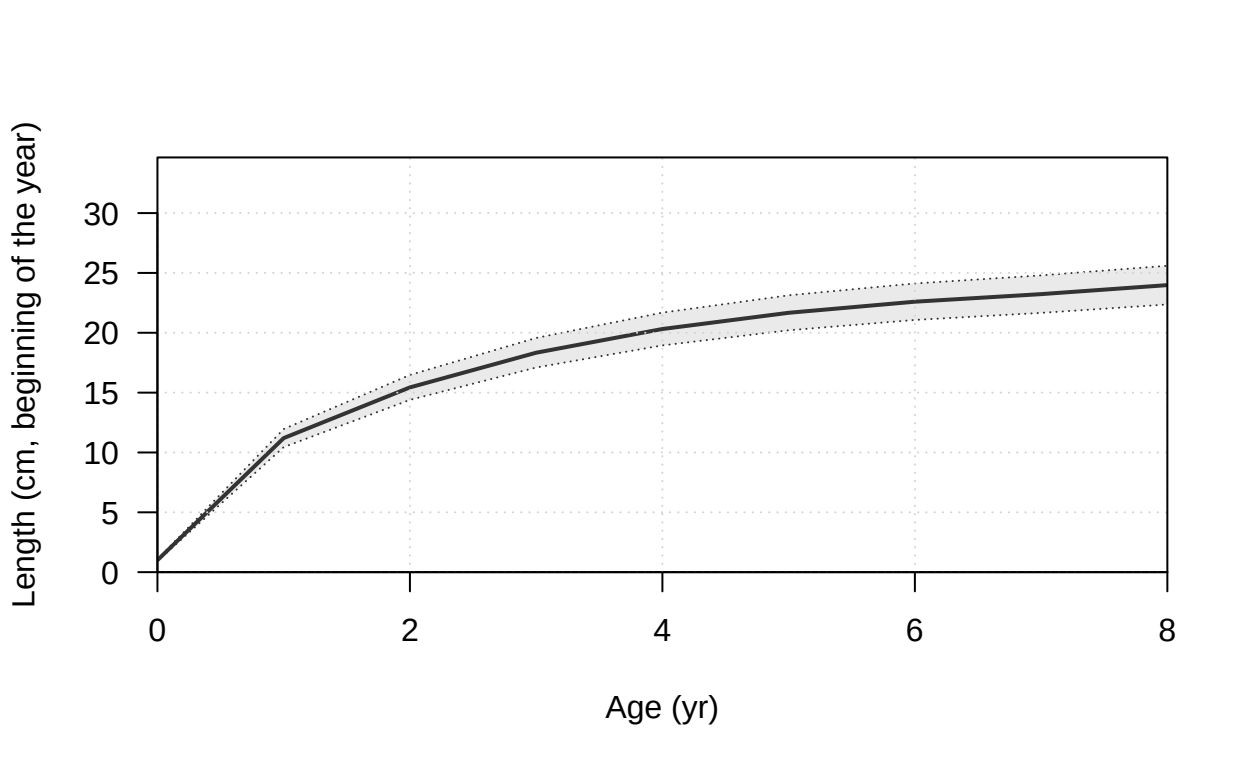
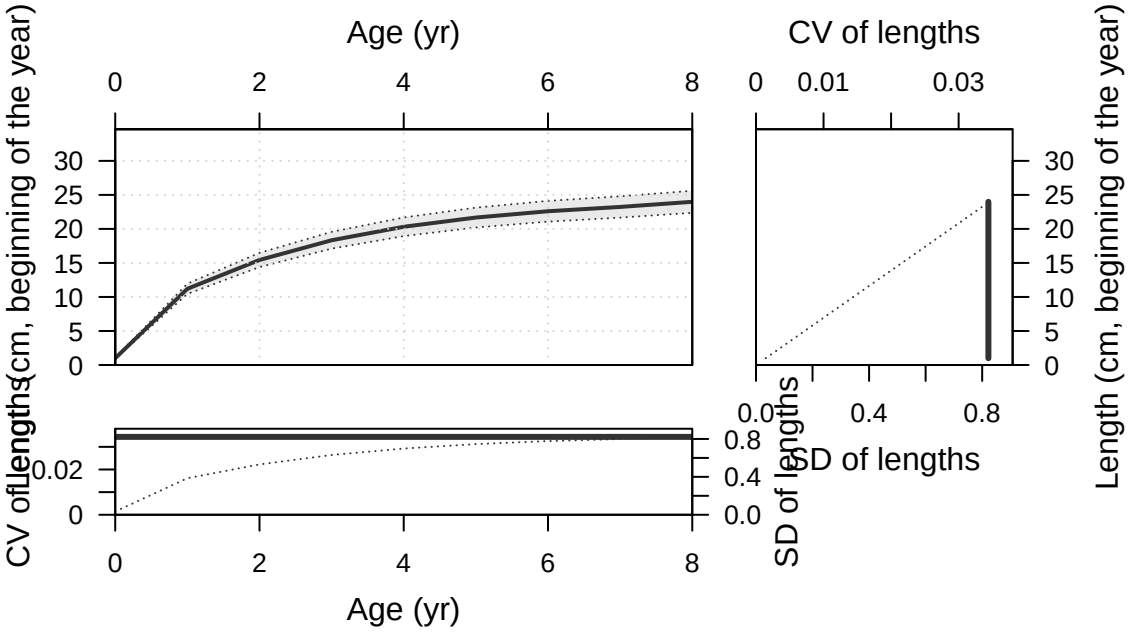
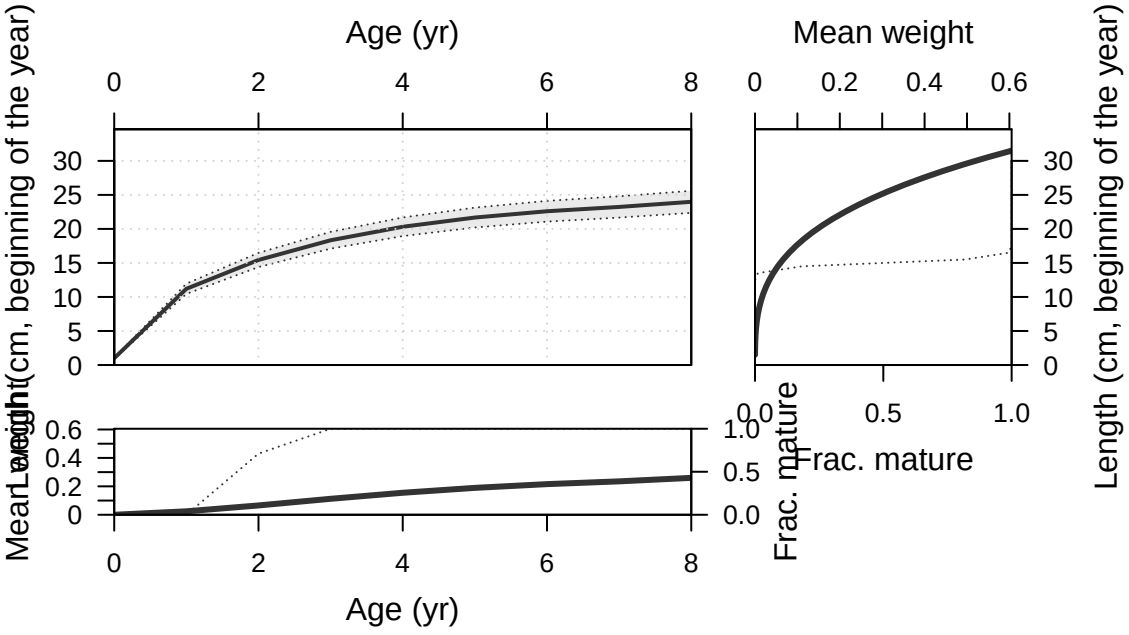
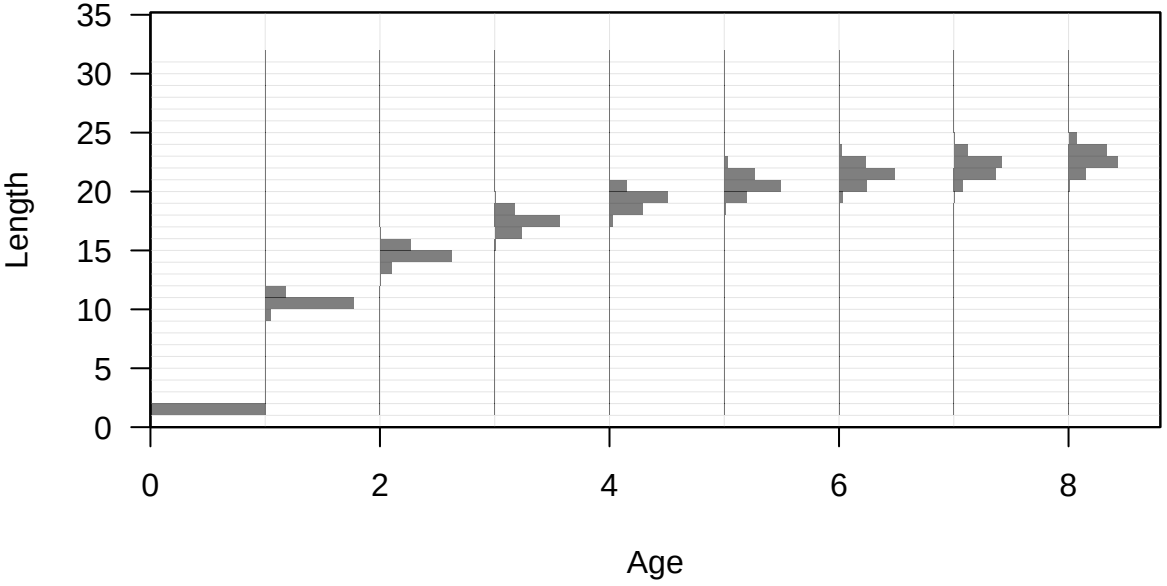
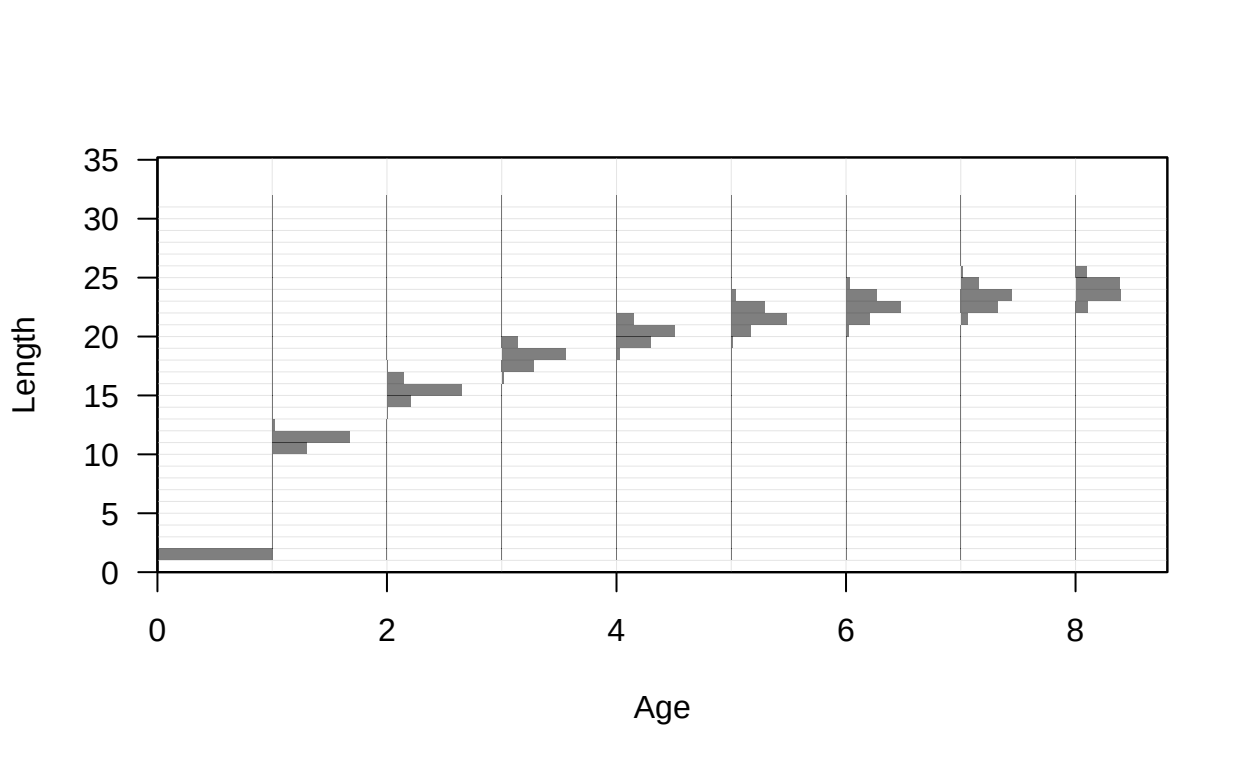
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Wed Sep 21 13:59:48 2022
Data_File: data.ss
Control_File: control.ss

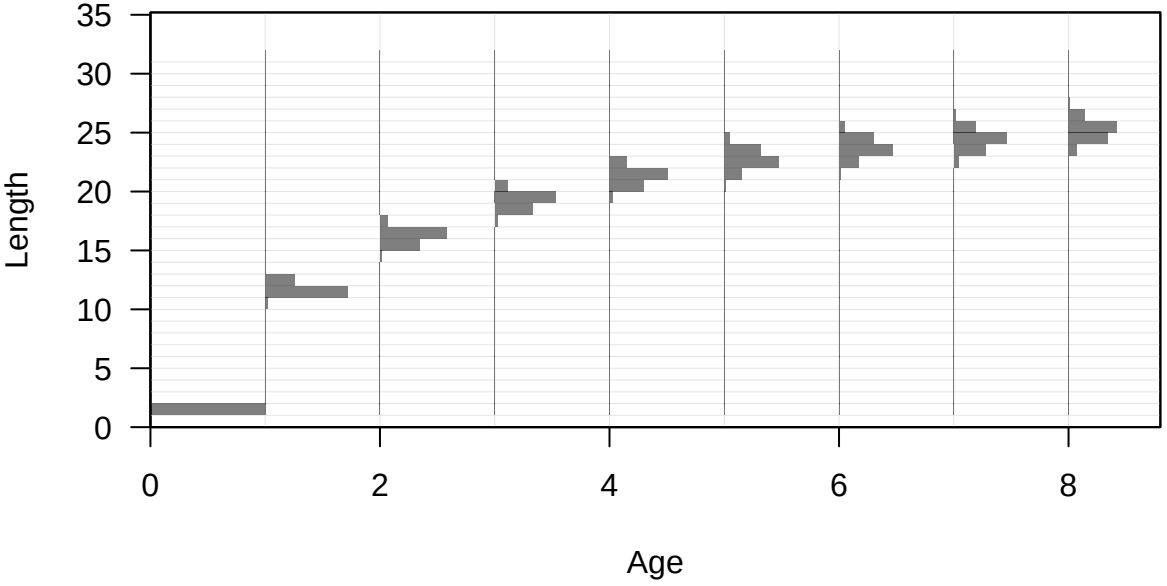

Length (cm, beginning of the year)
0
5
10
15
20
25
30
0
2
4
6
8
Age (yr)

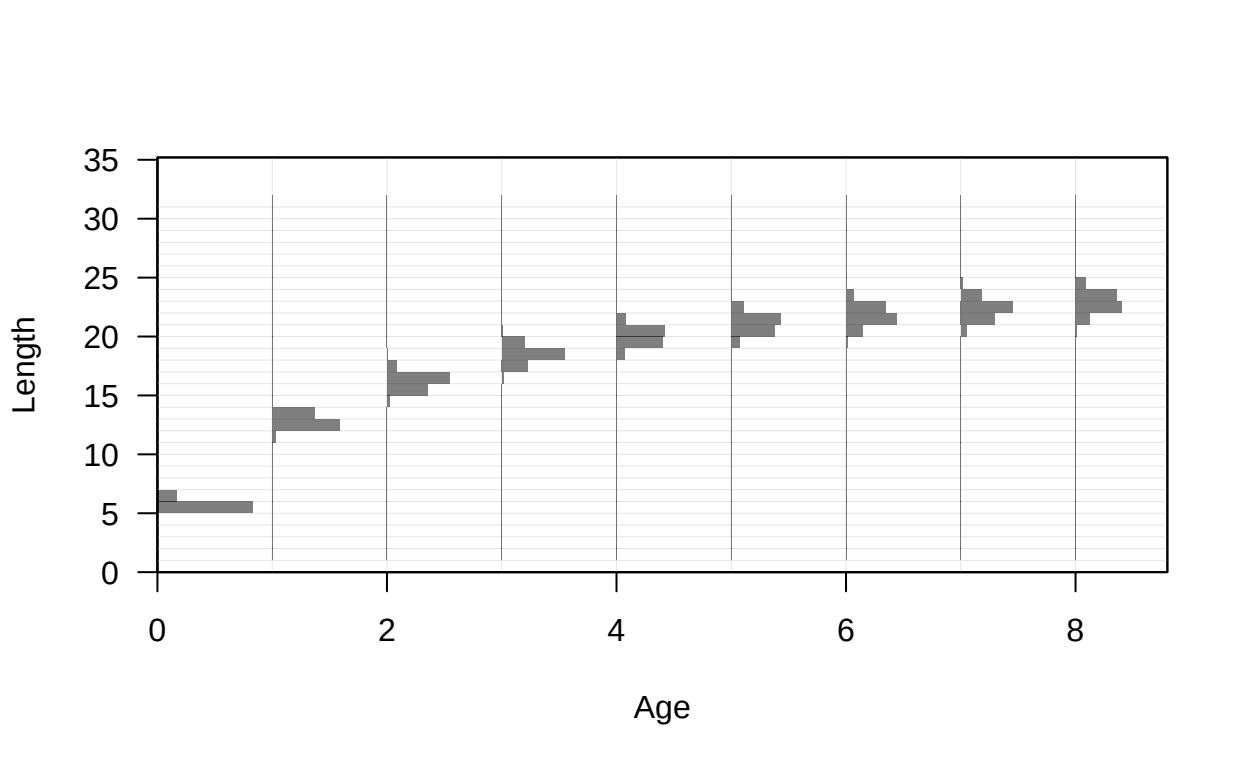

Age (yr)
0
2
4
6
8
CV of lengths
0
0.01
0.03
Length (cm, beginning of the year)
30
25
20
15
10
5
0
0.0
0.4
0.8
SD of lengths
CV of lengths
0.02
0
0.8
0.4
0.0
Age (yr)

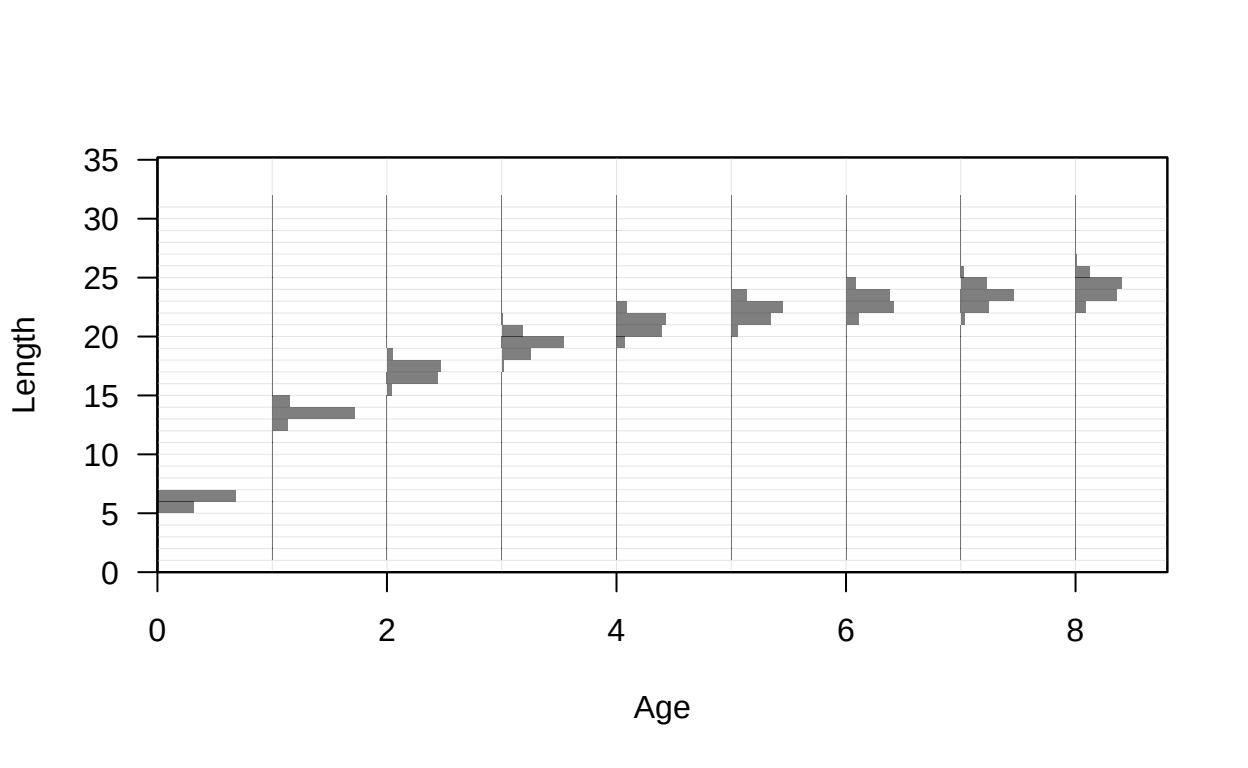

Age (yr)
0
2
4
6
8
Length (cm, beginning of the year)
0
5
10
15
20
25
30
Mean weight
0
0.2
0.4
0.6
Frac. mature
0.0
0.5
1.0
Age (yr)

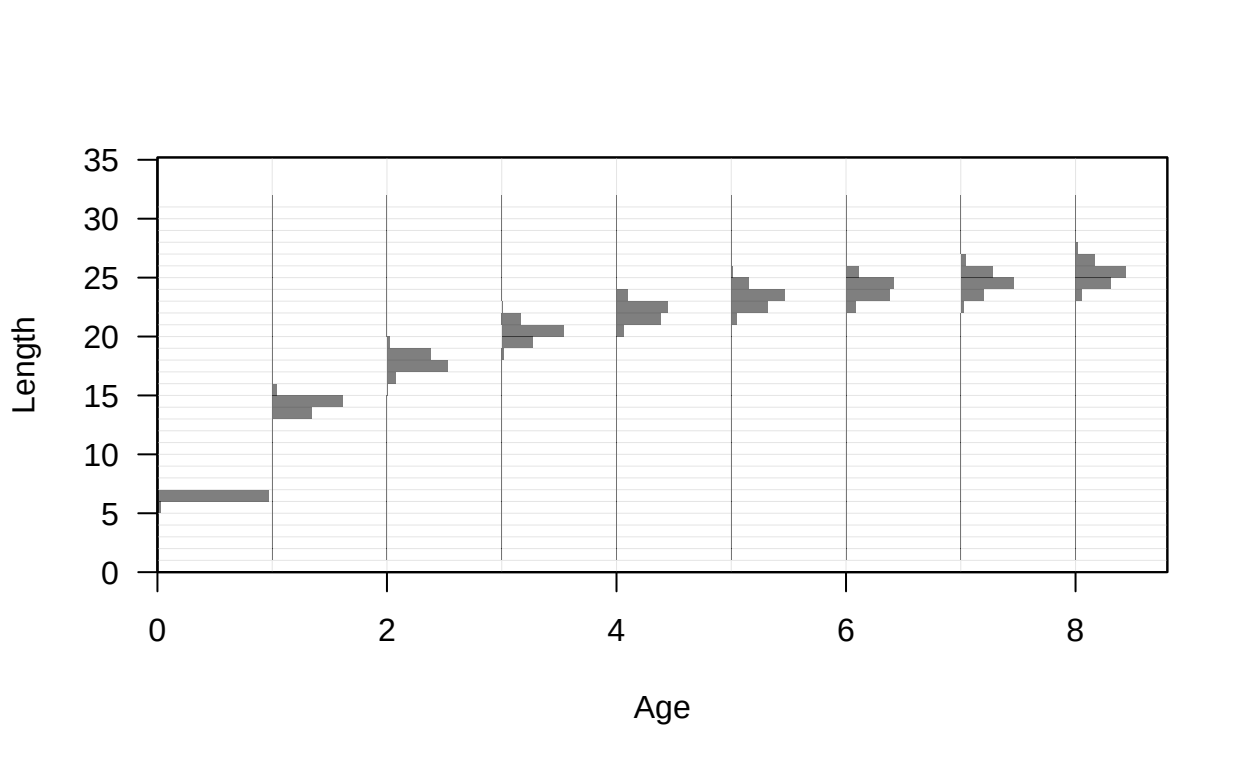

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

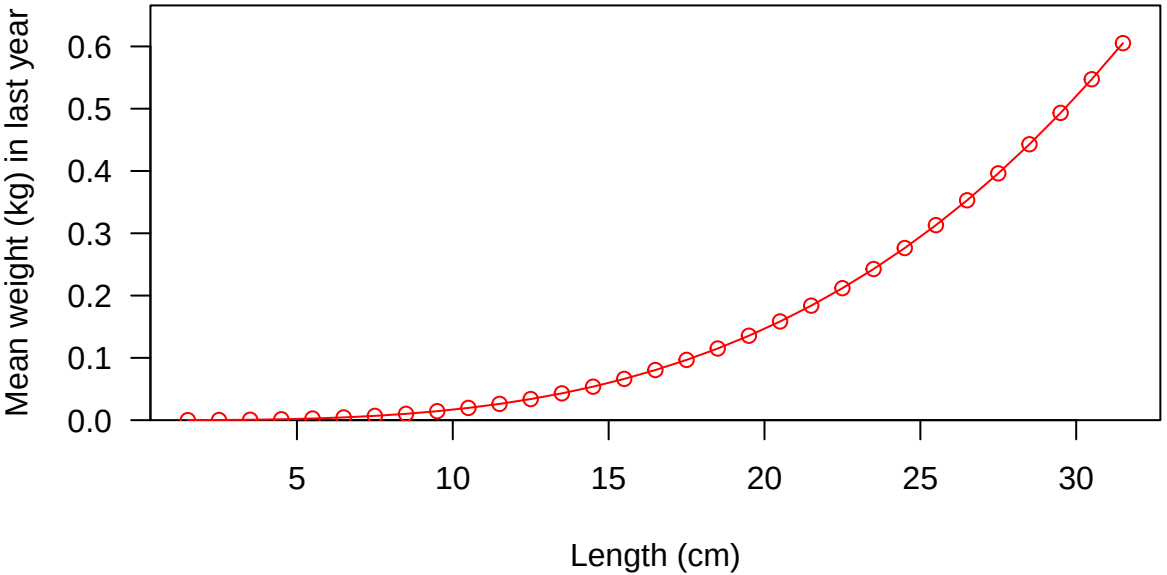

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

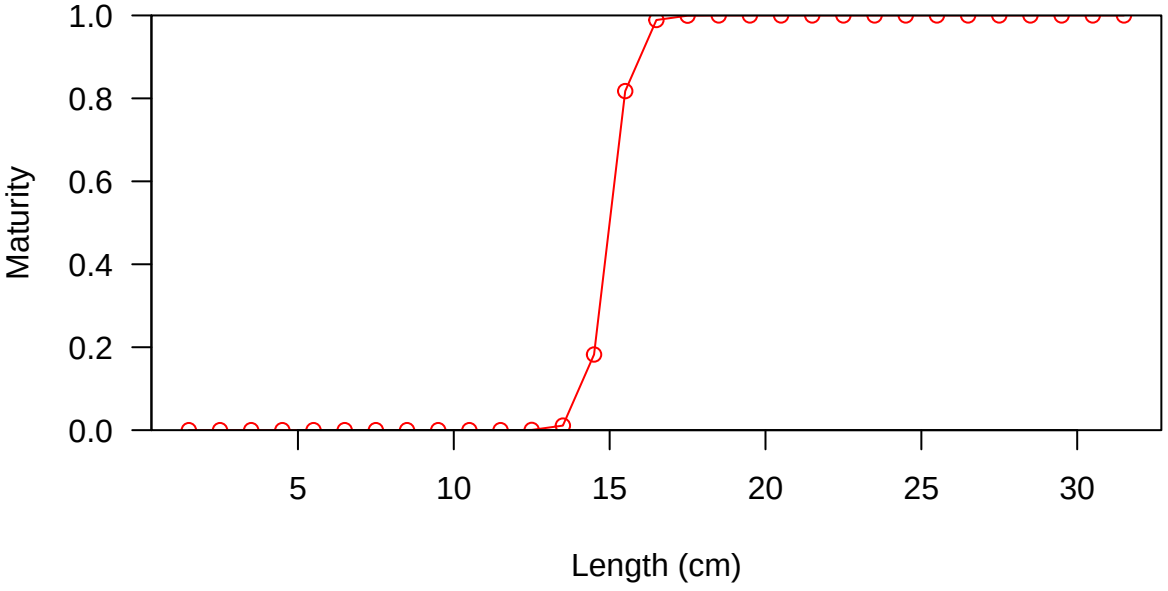

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

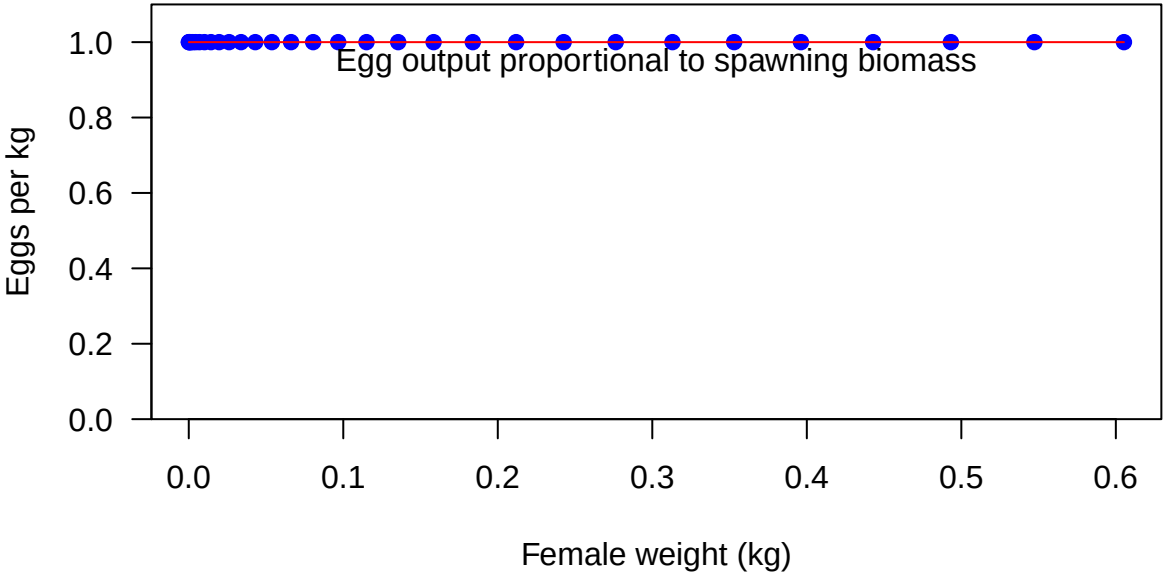

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

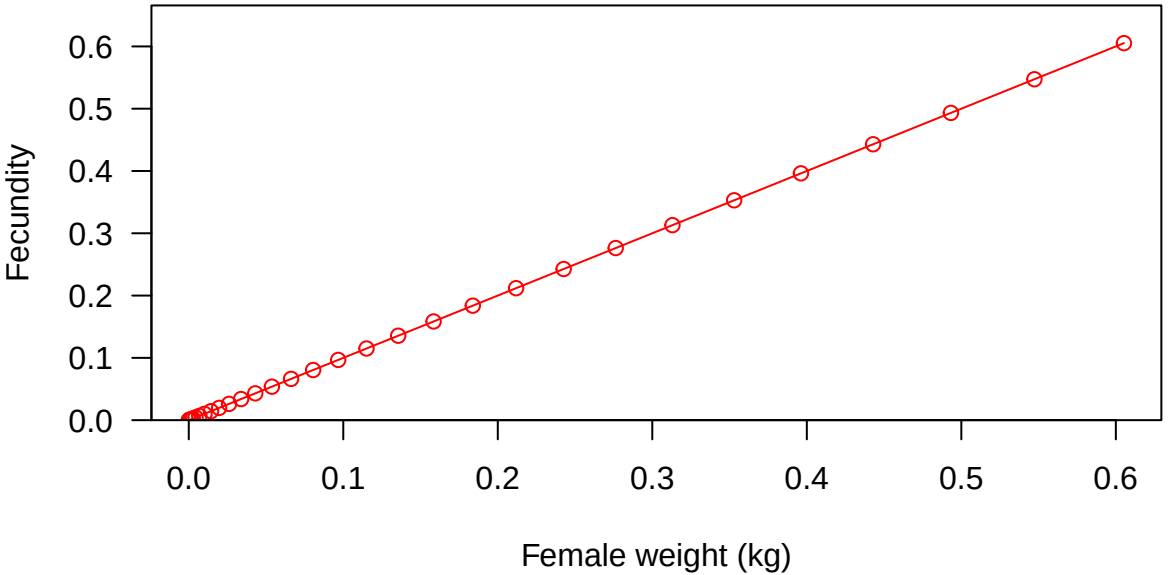

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

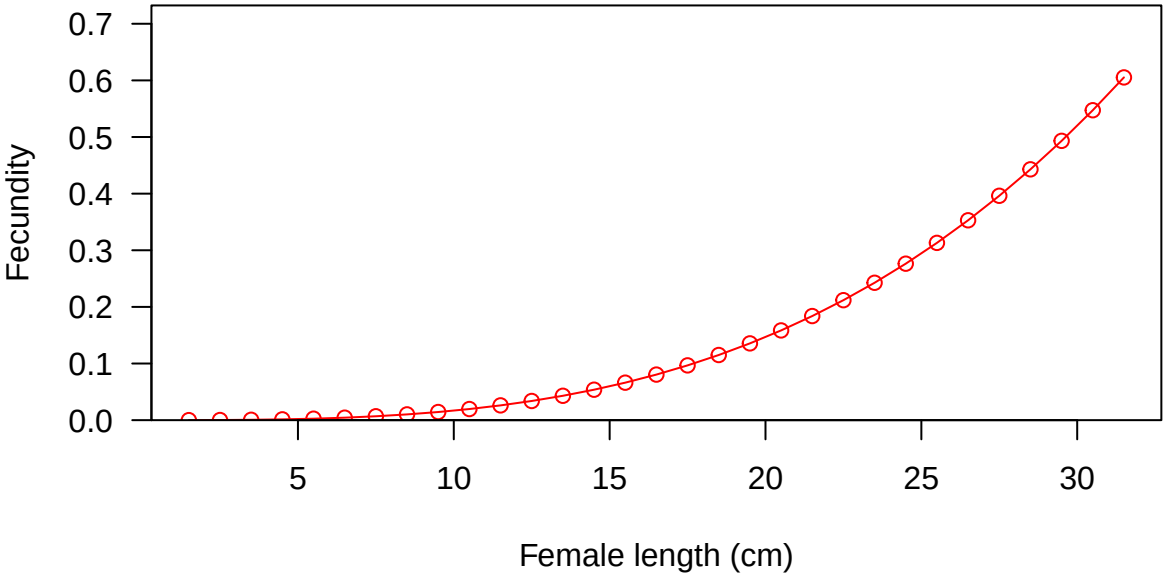

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

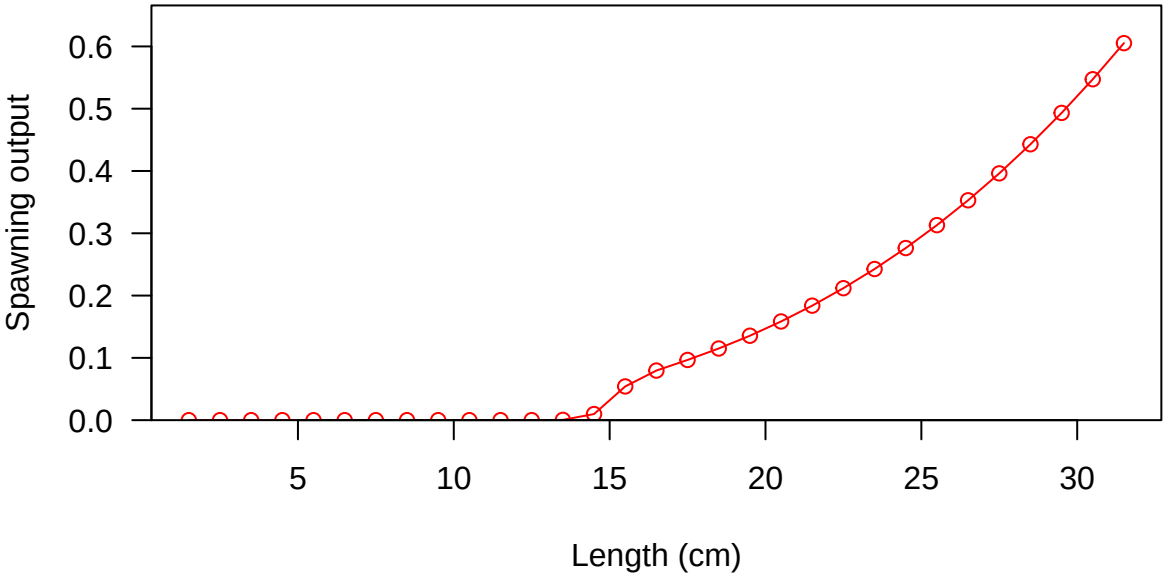

Mean weight (kg) in last year
0.0
0.1
0.2
0.3
0.4
0.5
0.6
5
10
15
20
25
30
Length (cm)

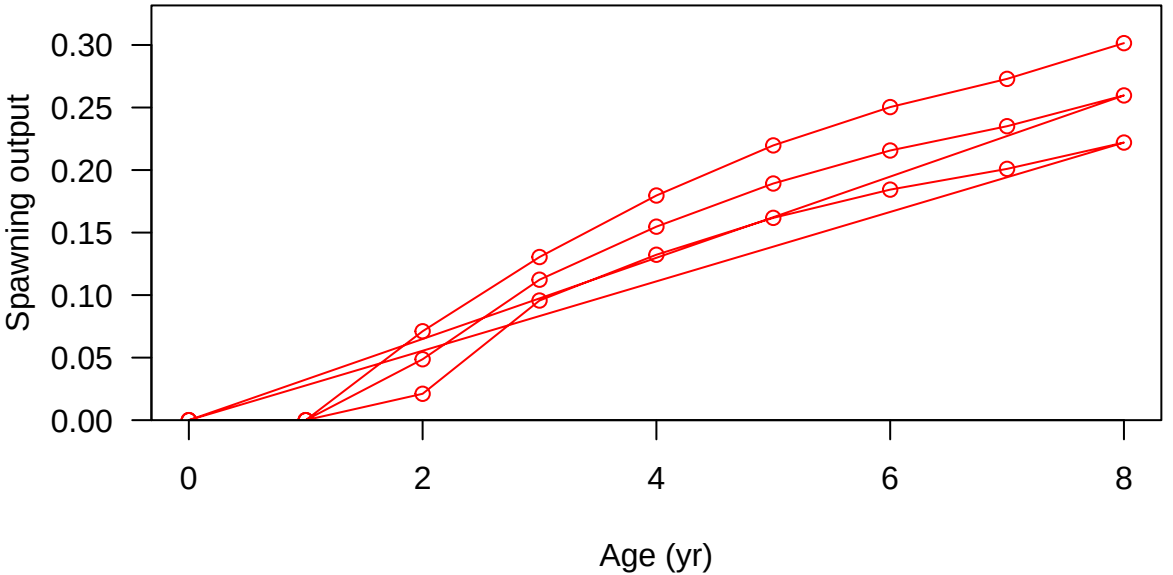

1.0
0.8
0.6
0.4
0.2
0.0
Maturity
5
10
15
20
25
30
Length (cm)

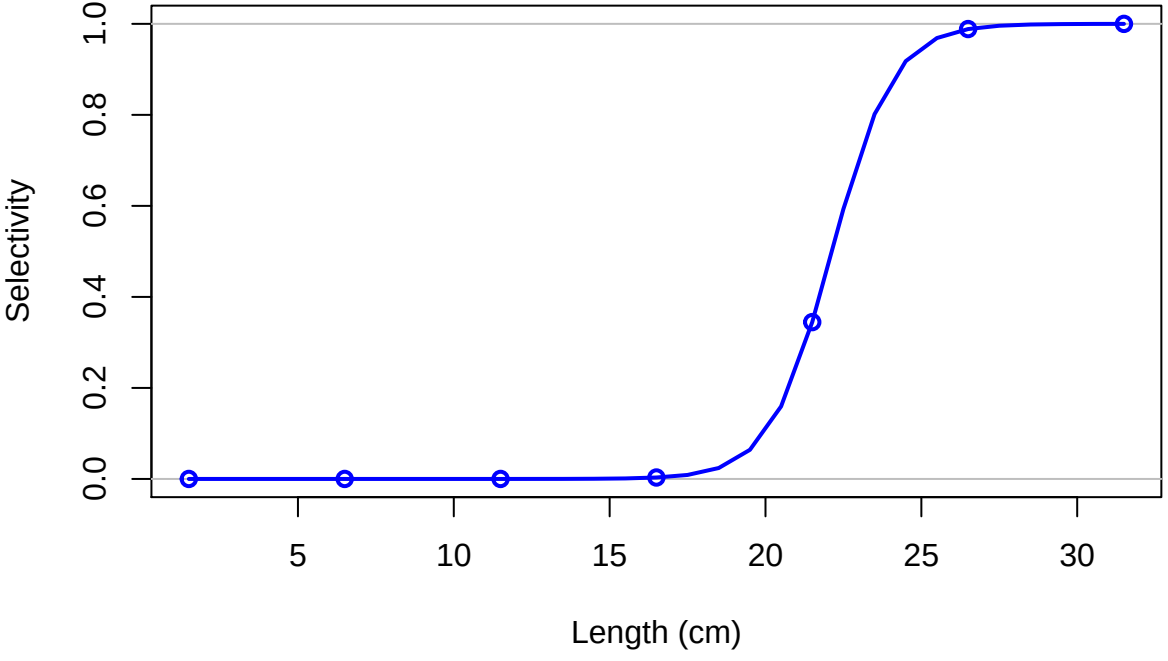

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Female weight (kg)

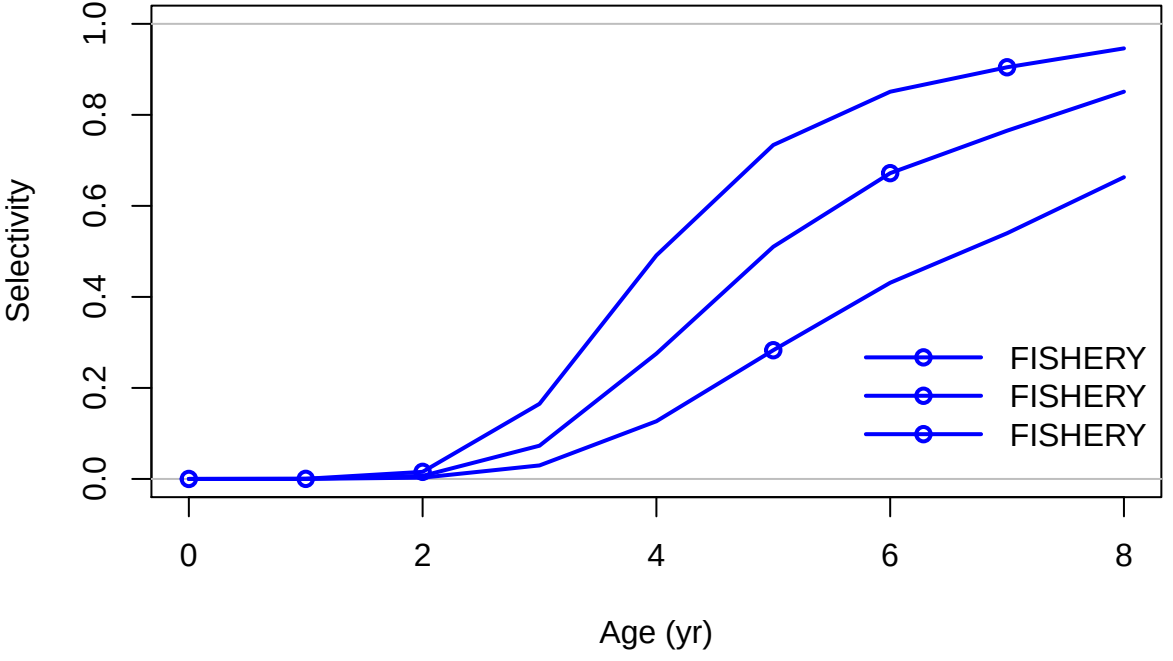

Fecundity
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Female weight (kg)

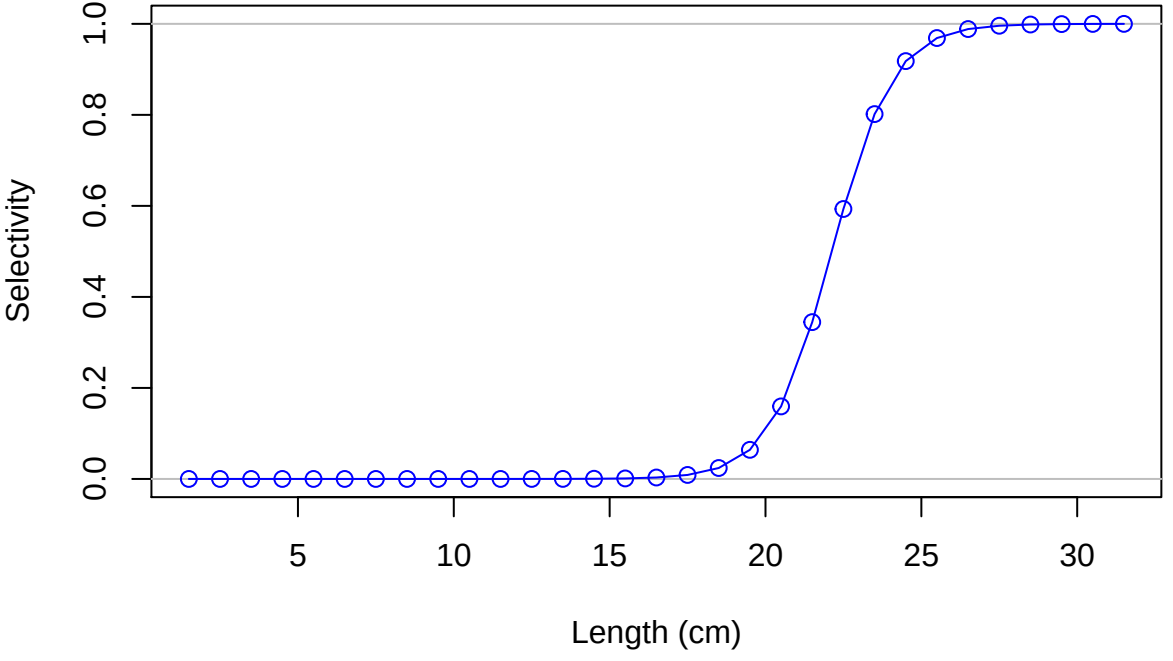

Fecundity
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
5
10
15
20
25
30
Female length (cm)

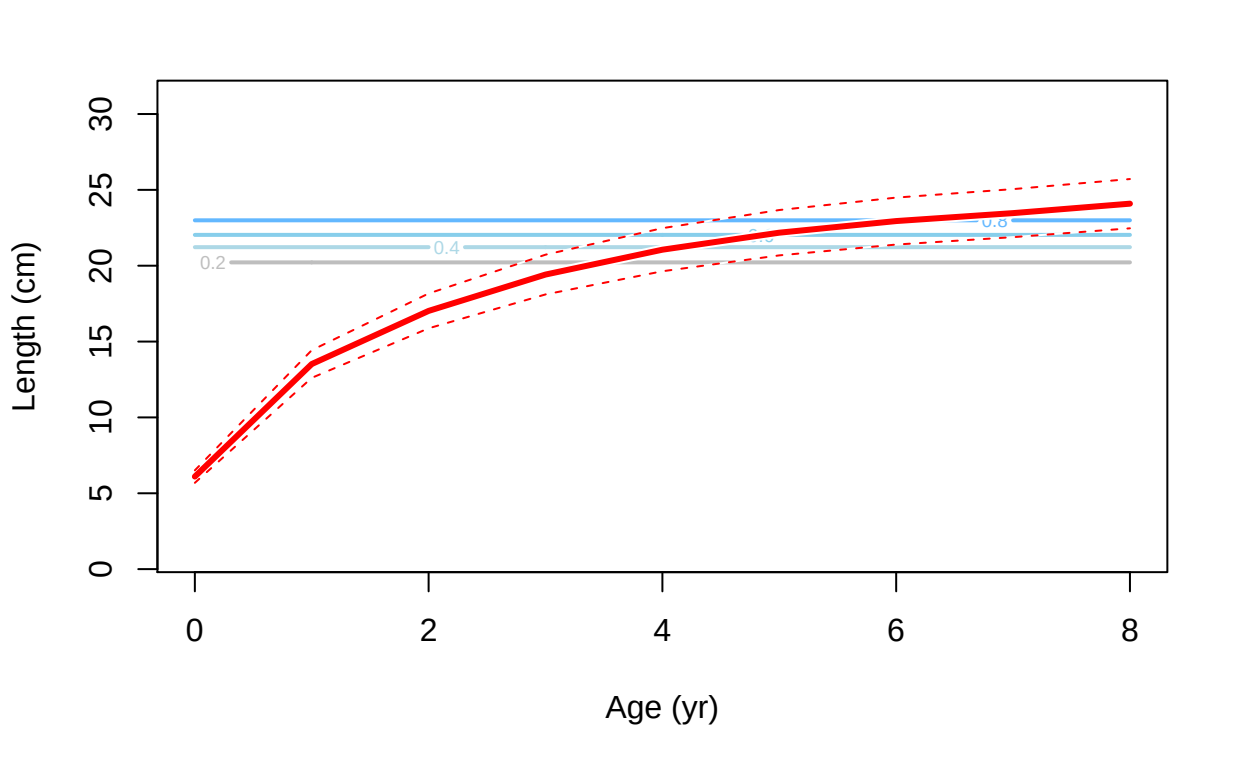

Spawning output
0.0
0.1
0.2
0.3
0.4
0.5
0.6
5
10
15
20
25
30
Length (cm)

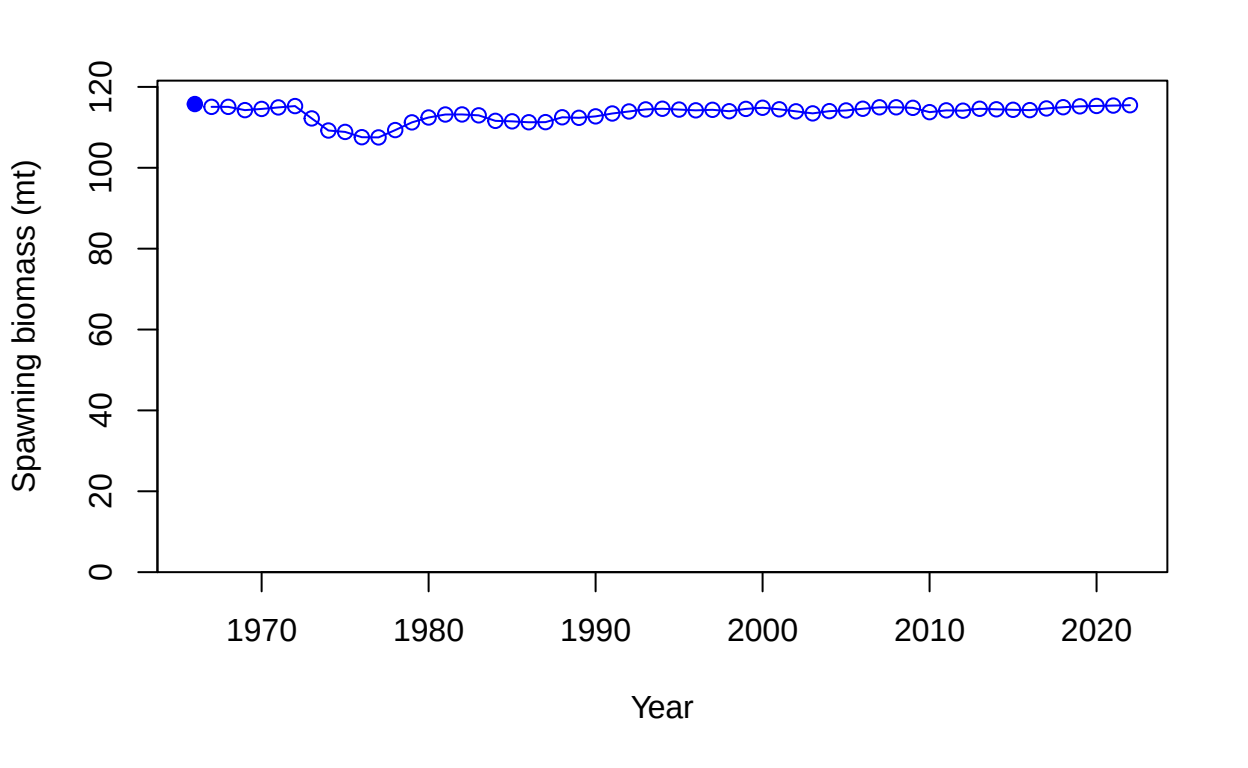

Spawning output
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0
2
4
6
8
Age (yr)

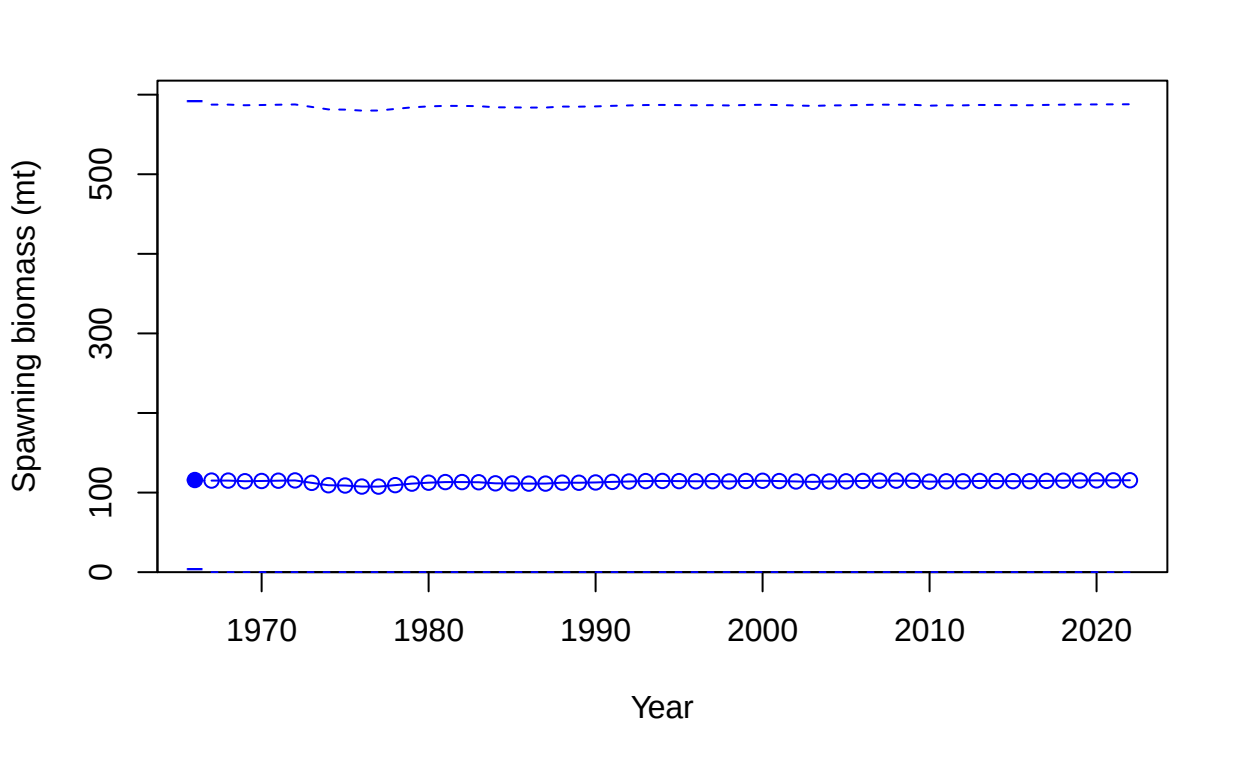

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20
25
30
Length (cm)

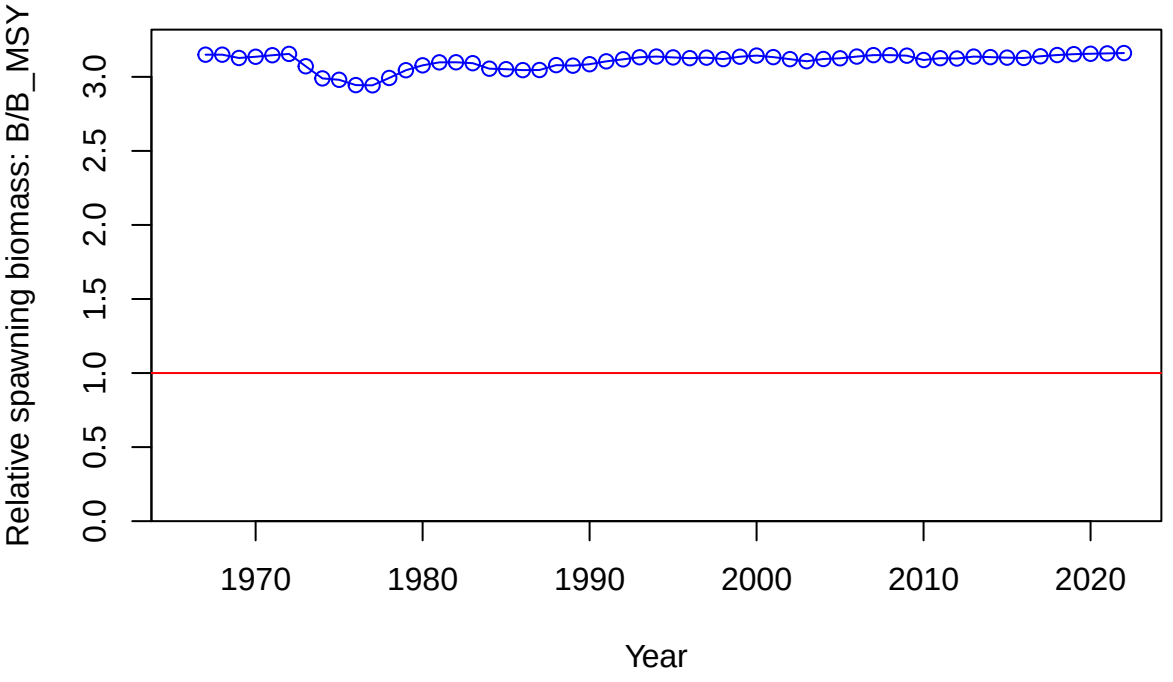

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
Age (yr)
FISHERY
FISHERY
FISHERY

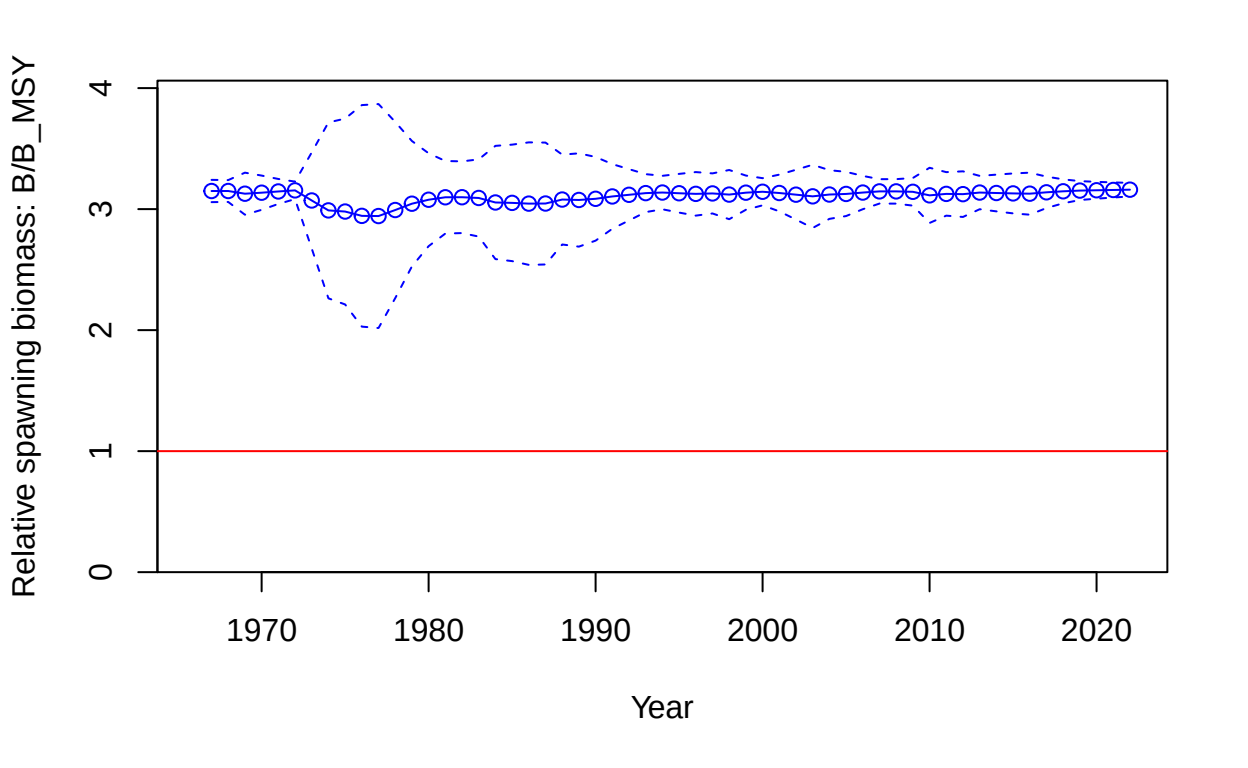

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20
25
30
Length (cm)

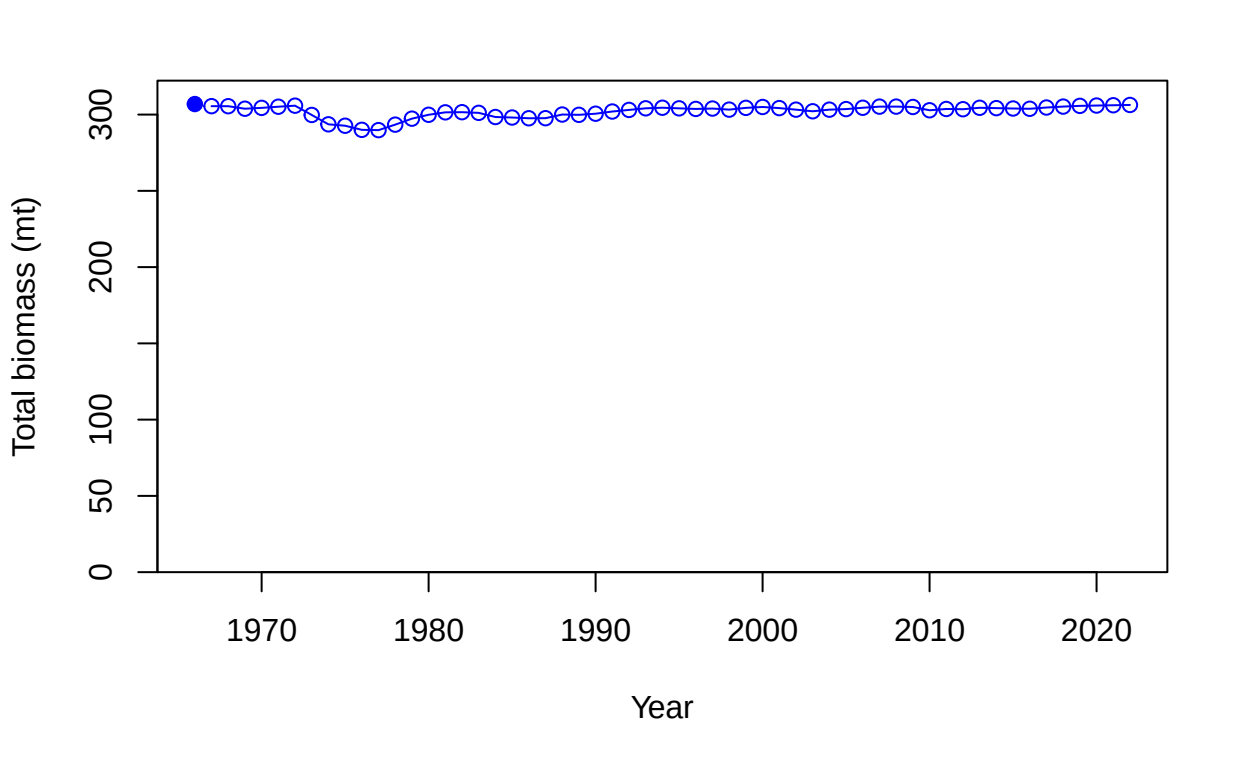

Length (cm)
0
5
10
15
20
25
30
0
2
4
6
8
Age (yr)
0.8
0.4
0.2

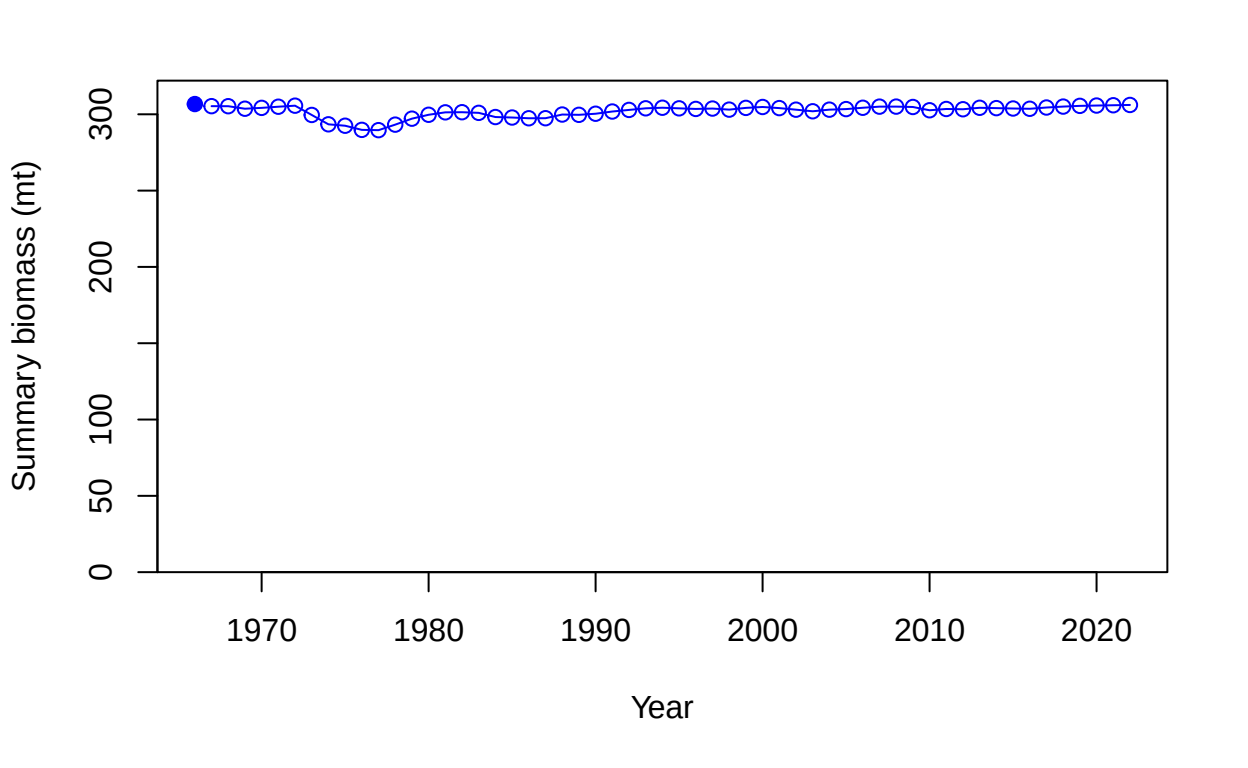

Spawning biomass (mt)
0
20
40
60
80
100
120
1970
1980
1990
2000
2010
2020
Year

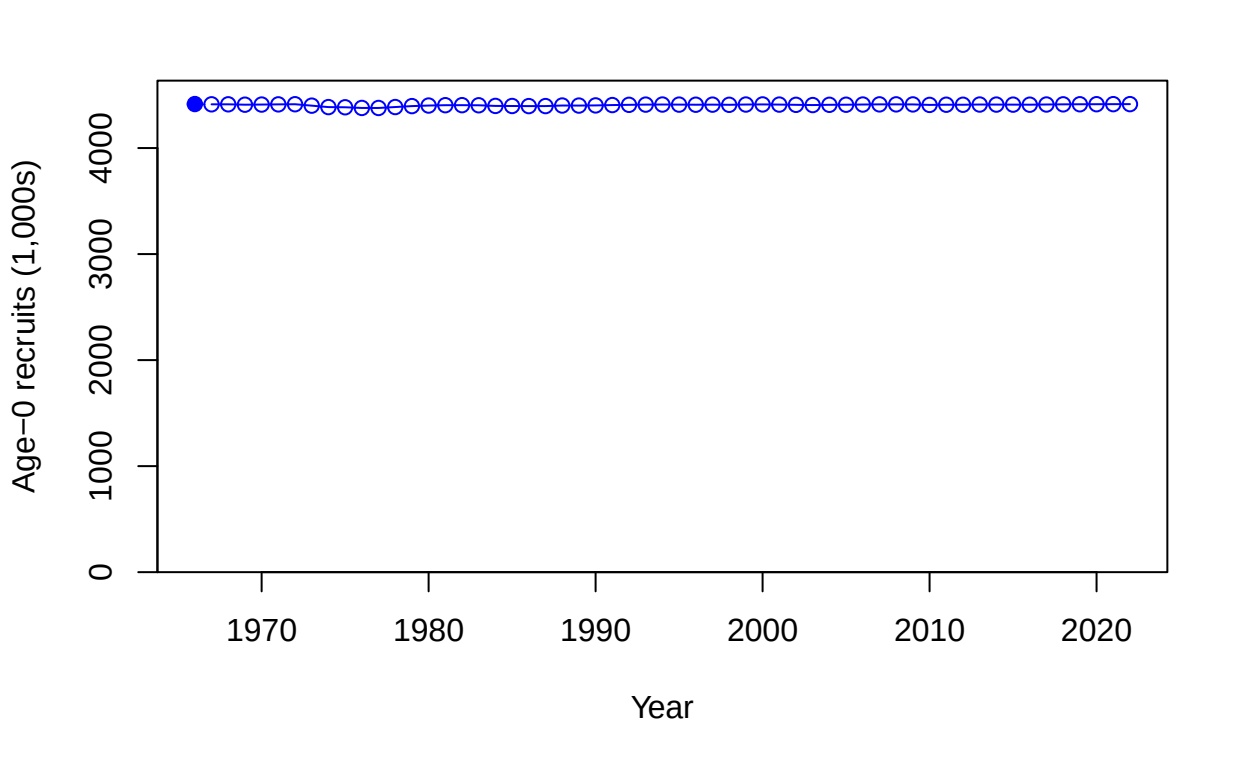

Spawning biomass (mt)
0
100
300
500
1970
1980
1990
2000
2010
2020
Year

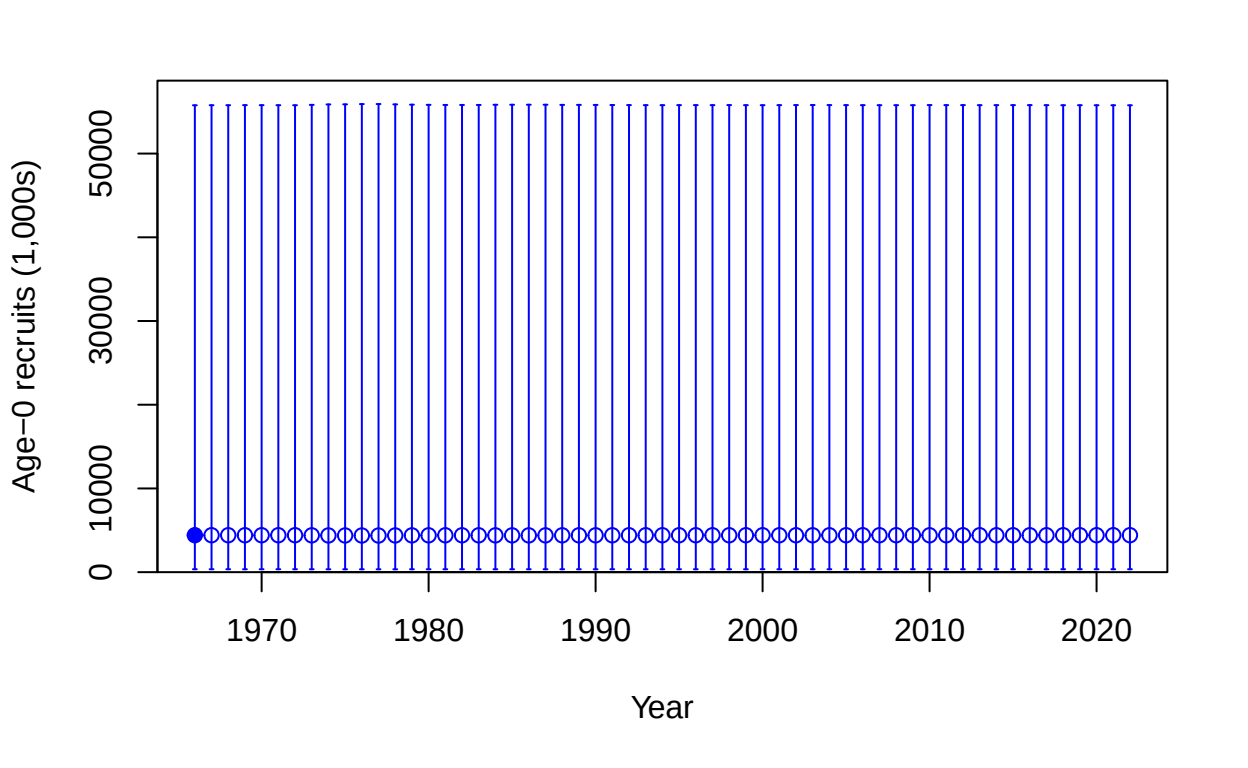

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

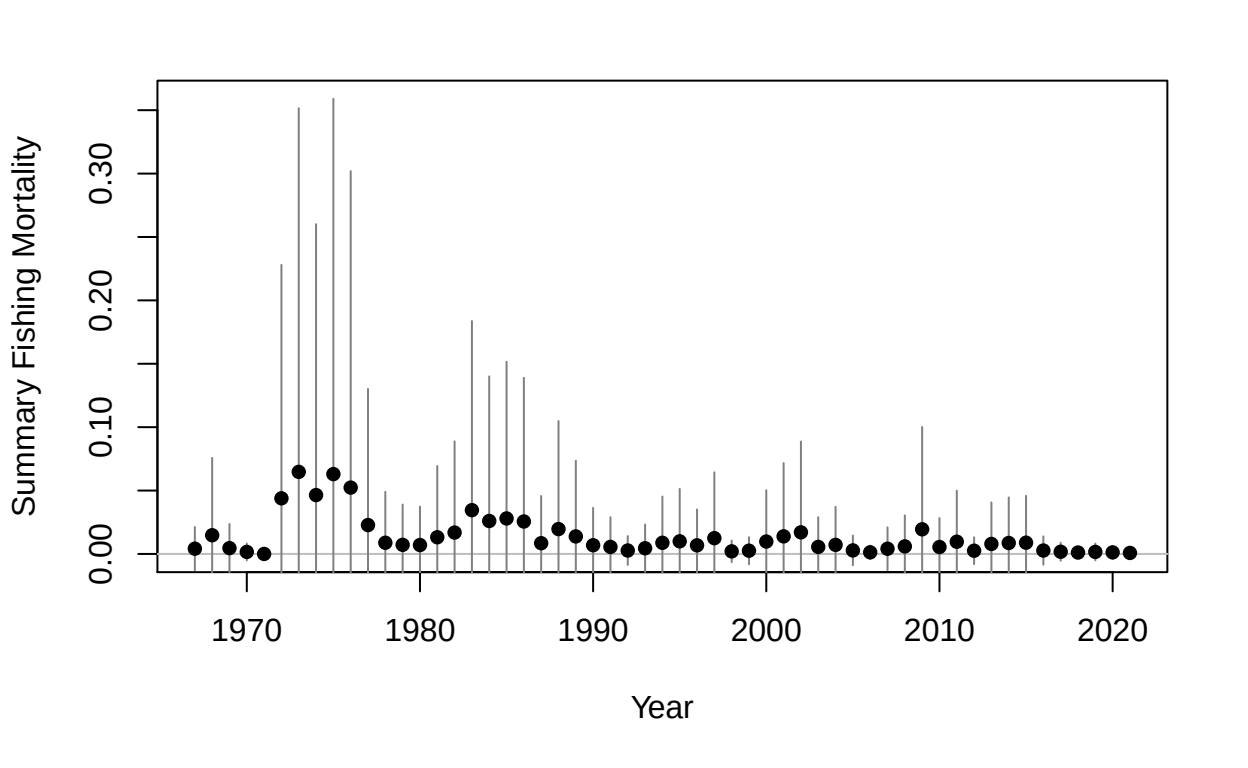

Relative spawning biomass: B/B_MSY
0
1
2
3
4
1970
1980
1990
2000
2010
2020
Year

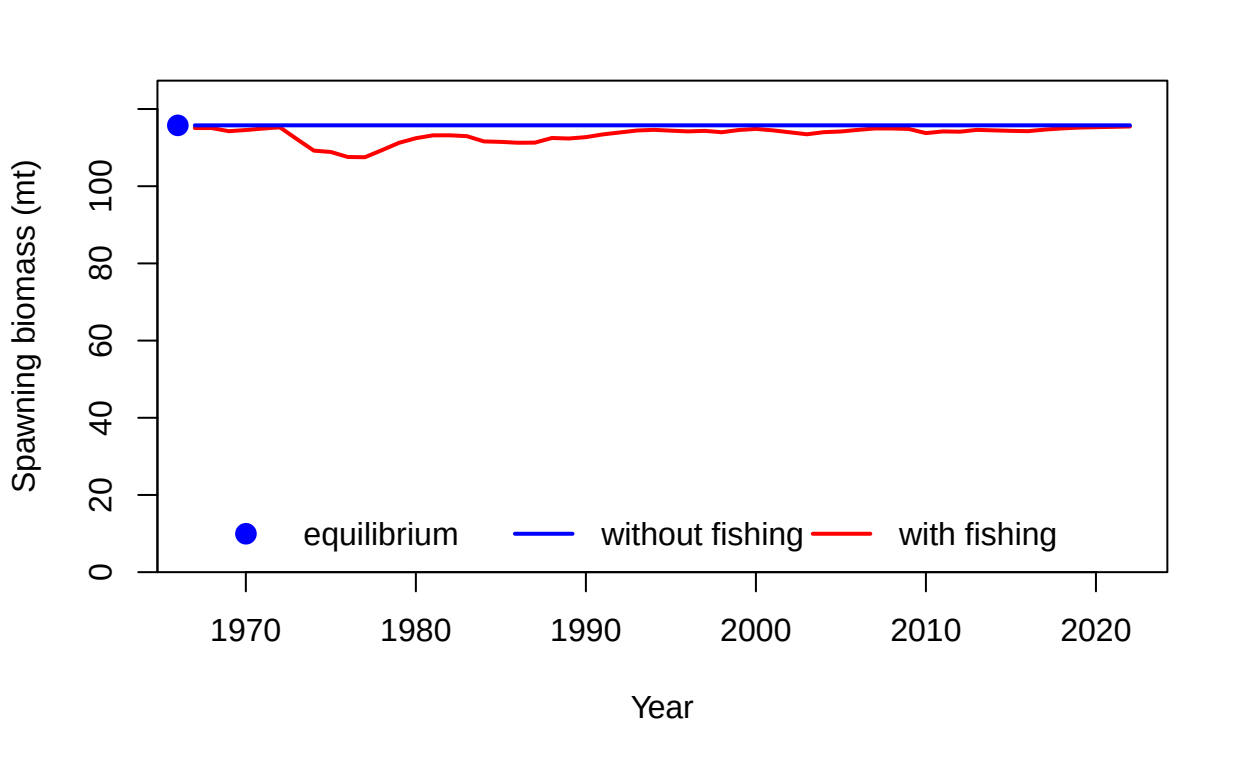

Total biomass (mt)
0
50
100
200
300
1970
1980
1990
2000
2010
2020
Year

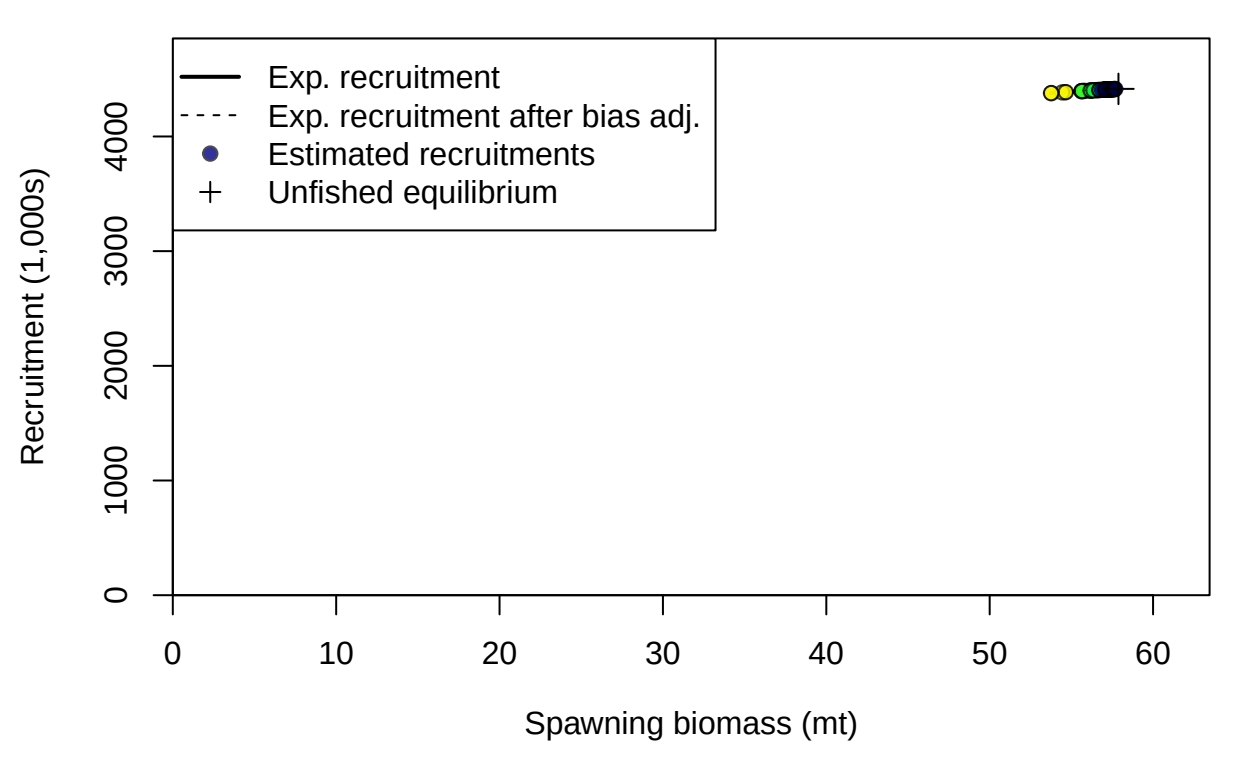

Summary biomass (mt)
0
50
100
200
300
1970
1980
1990
2000
2010
2020
Year

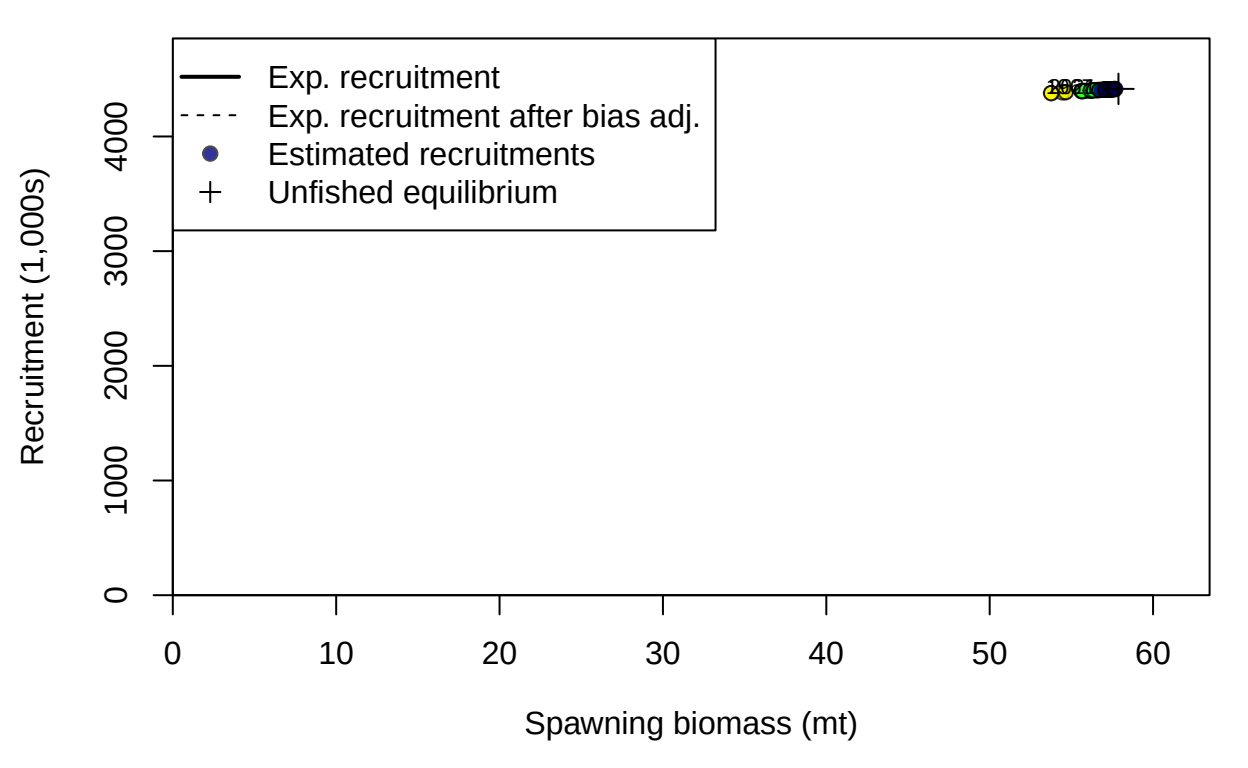

Age−0 recruits (1,000s)
0
1000
2000
3000
4000
1970
1980
1990
2000
2010
2020
Year

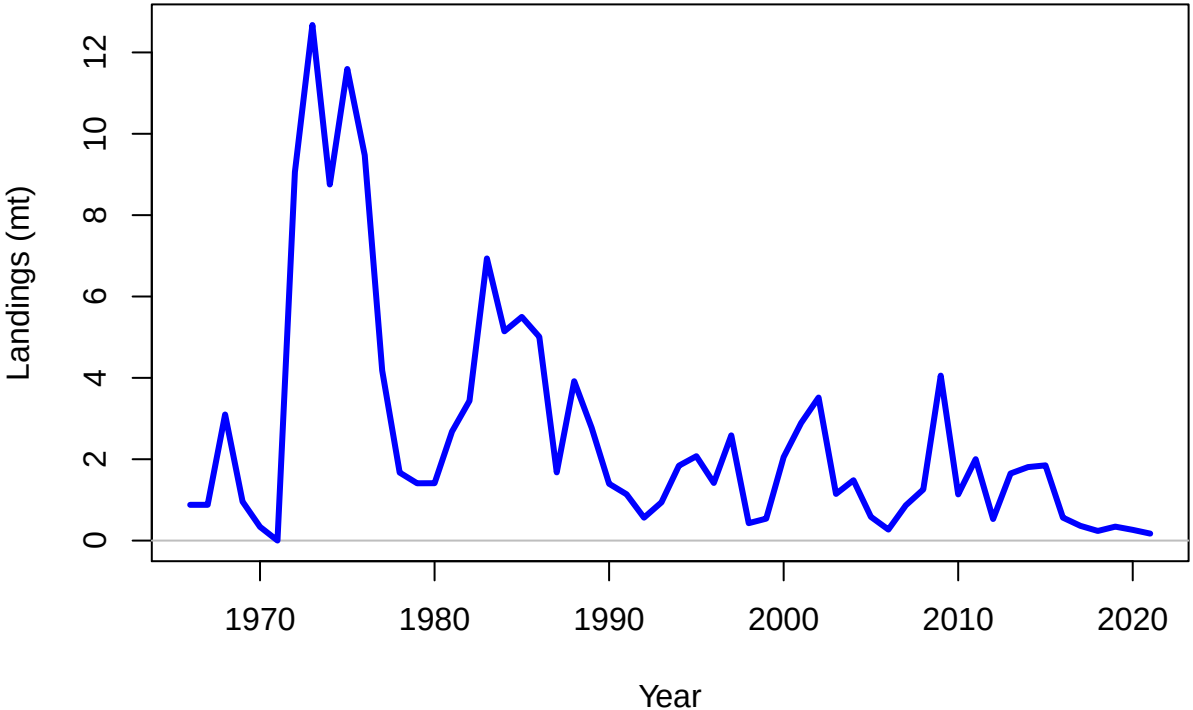

Age−0 recruits (1,000s)
0
10000
30000
50000
1970
1980
1990
2000
2010
2020
Year

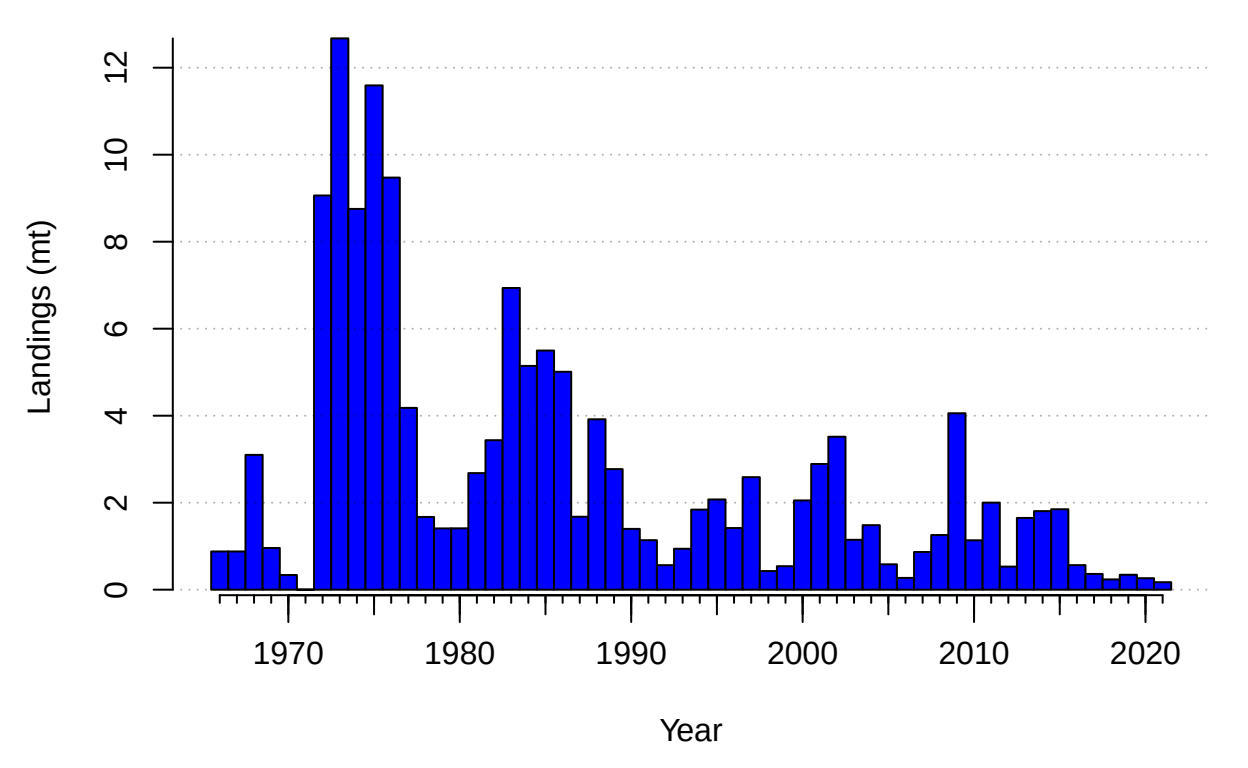

Summary Fishing Mortality
0.00
0.10
0.20
0.30
1970
1980
1990
2000
2010
2020
Year

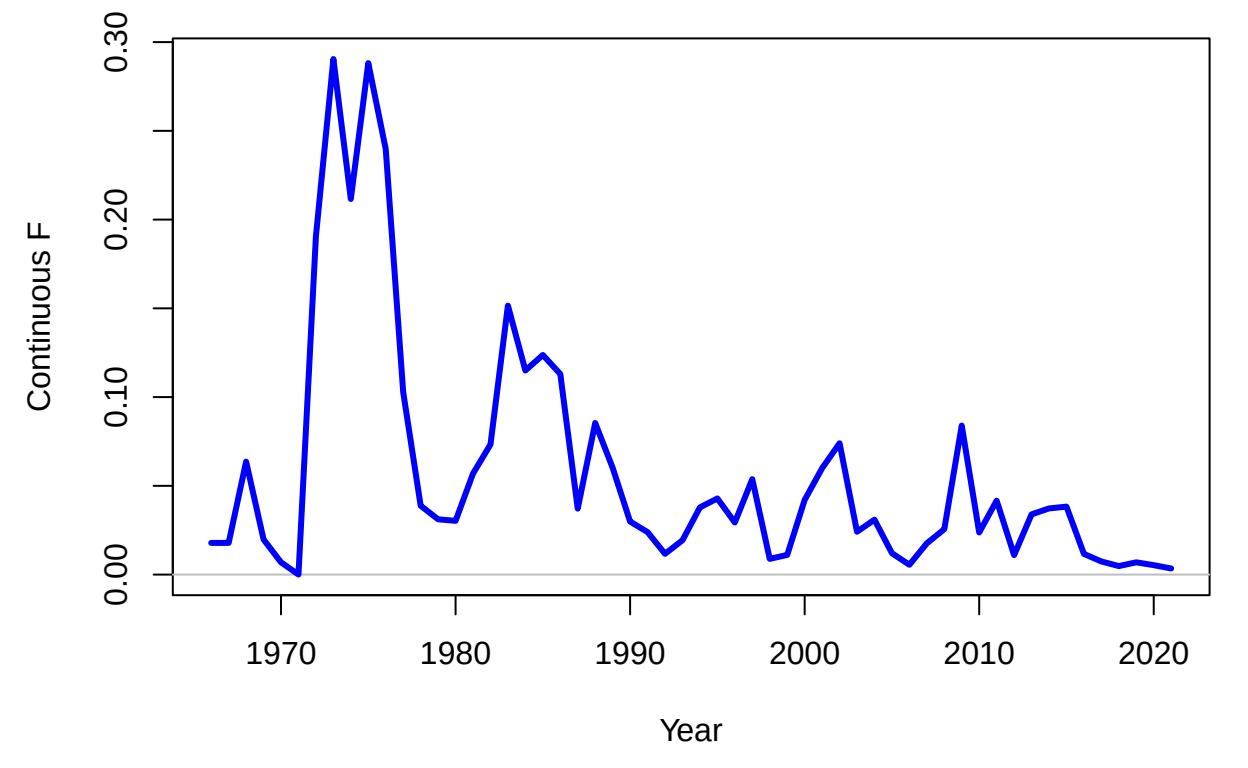

Spawning biomass (mt)
0
20
40
60
80
100
1970
1980
1990
2000
2010
2020
Year
equilibrium
without fishing
with fishing

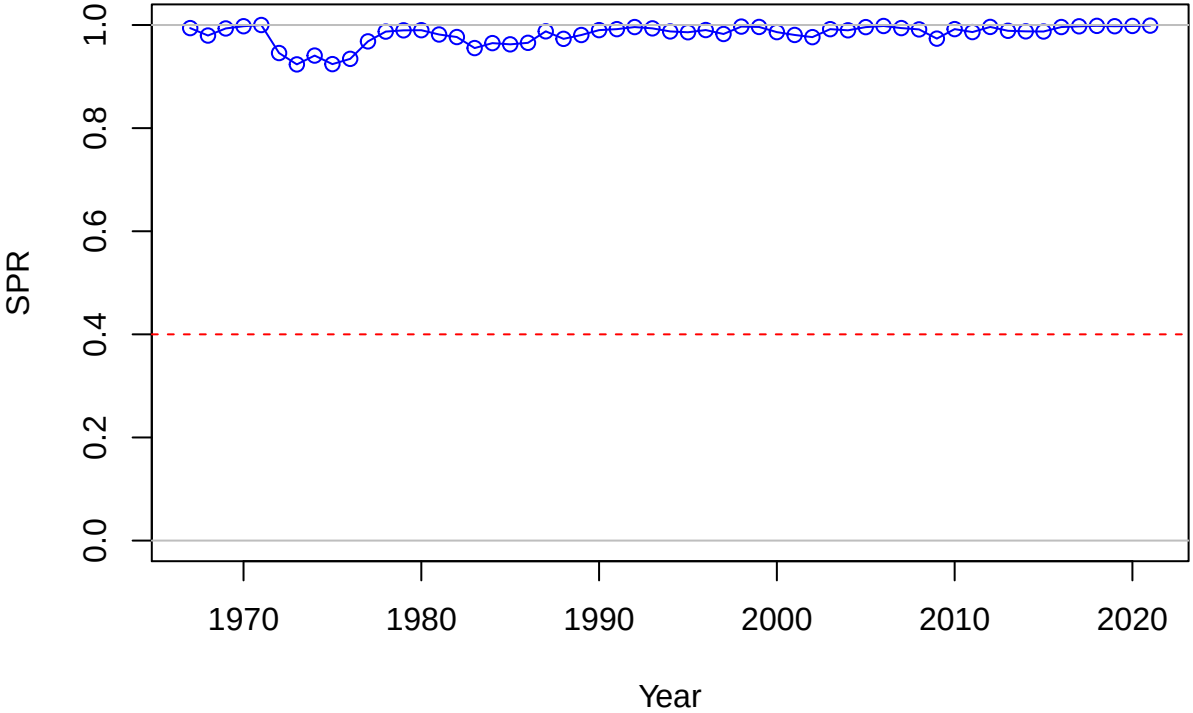

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
Recruitment (1,000s)
0
1000
2000
3000
4000
0
10
20
30
40
50
60
Spawning biomass (mt)

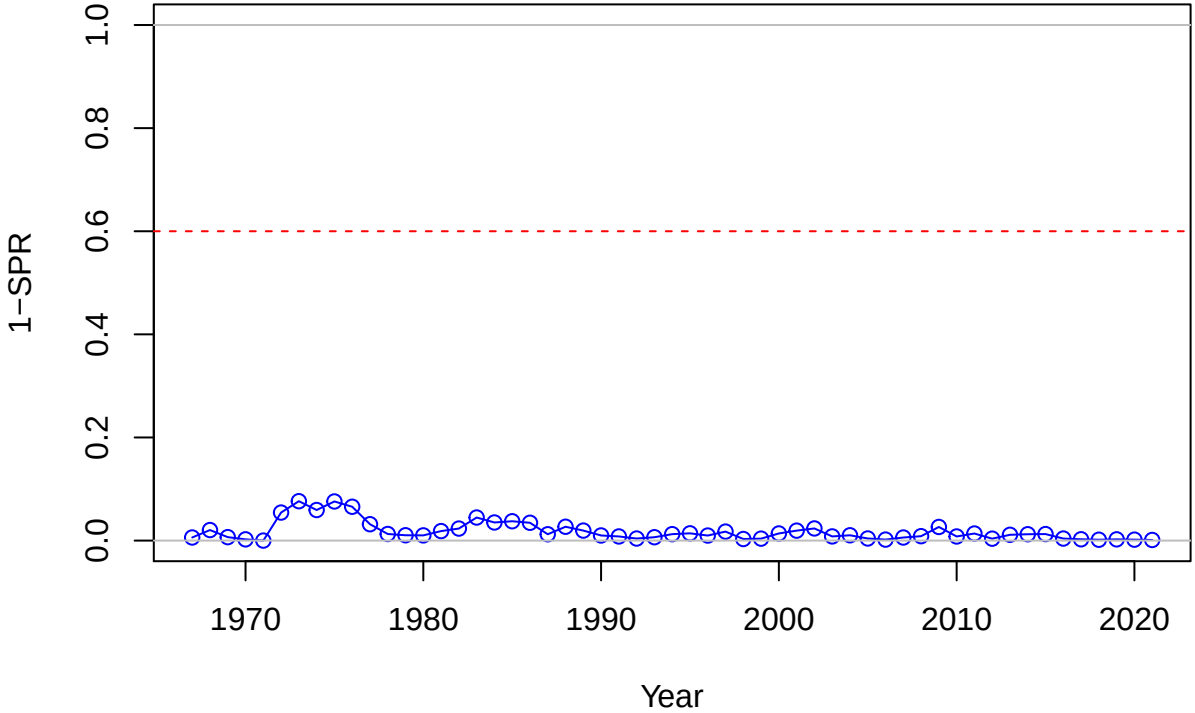

Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium
Recruitment (1,000s)
0
1000
2000
3000
4000
0
10
20
30
40
50
60
Spawning biomass (mt)

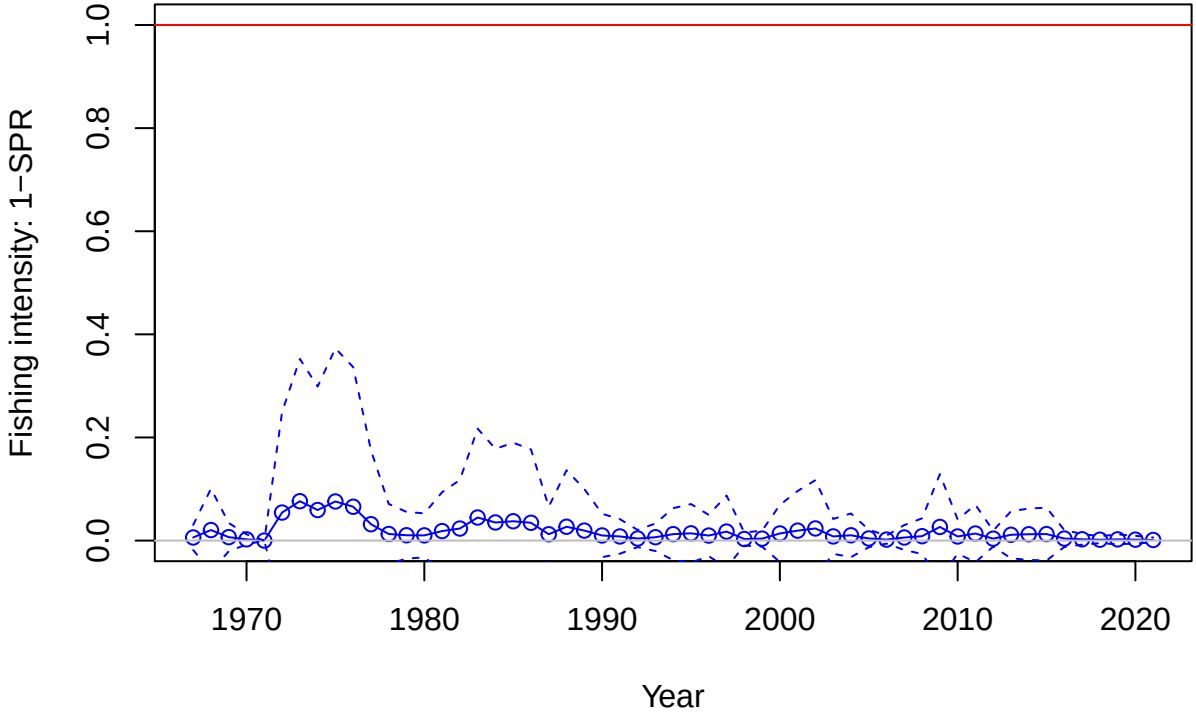

Landings (mt)
0
2
4
6
8
10
12
1970
1980
1990
2000
2010
2020
Year

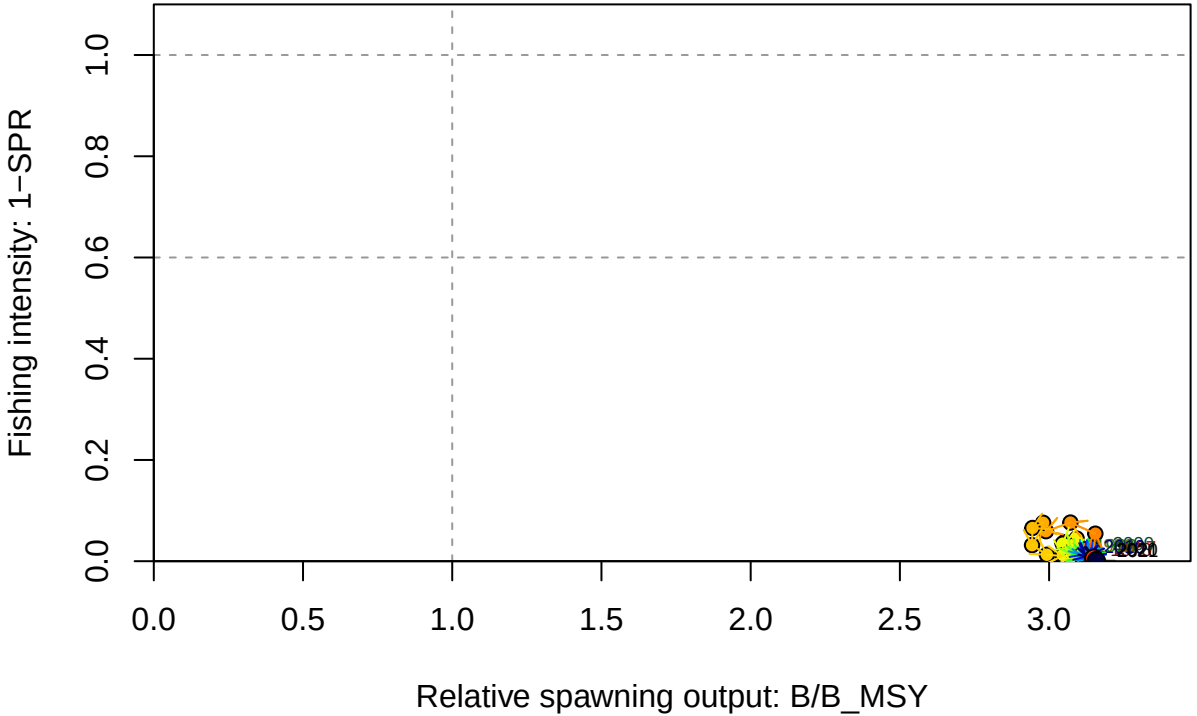

Landings (mt)
0
2
4
6
8
10
12
1970
1980
1990
2000
2010
2020
Year

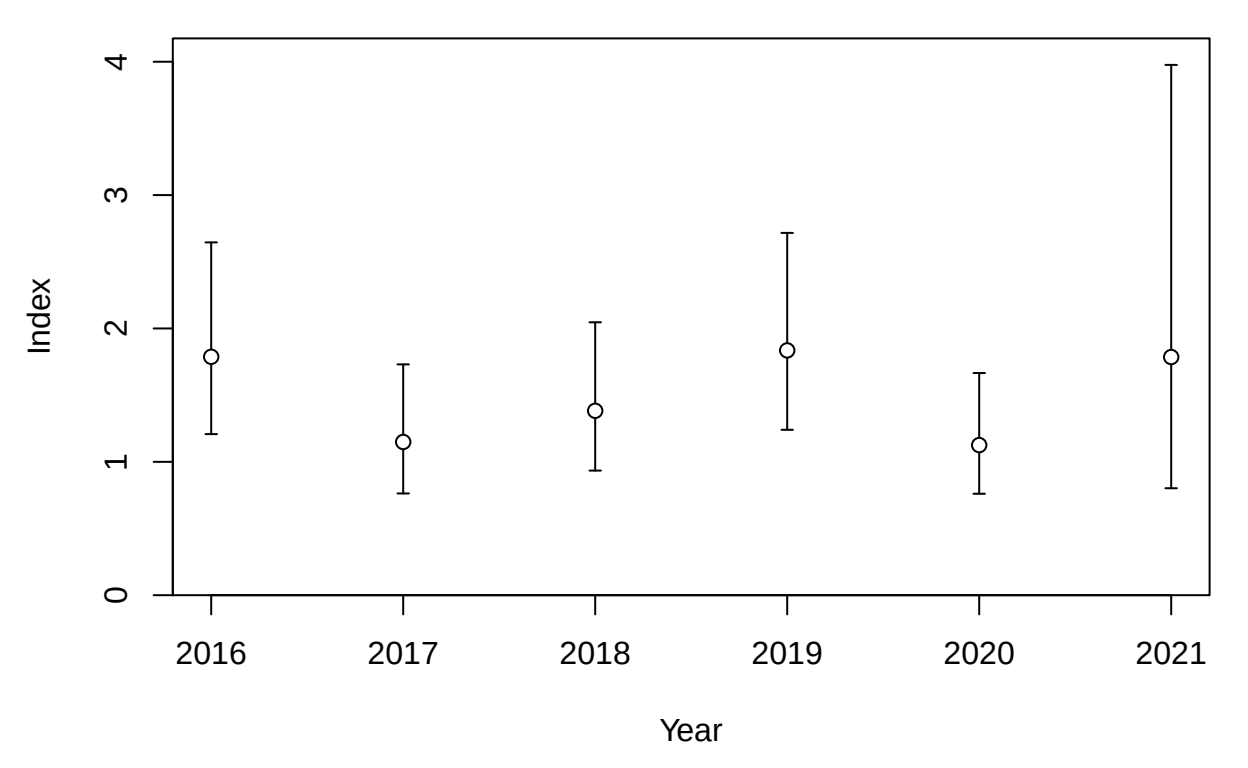

Continuous F
0.00
0.10
0.20
0.30
1970
1980
1990
2000
2010
2020
Year

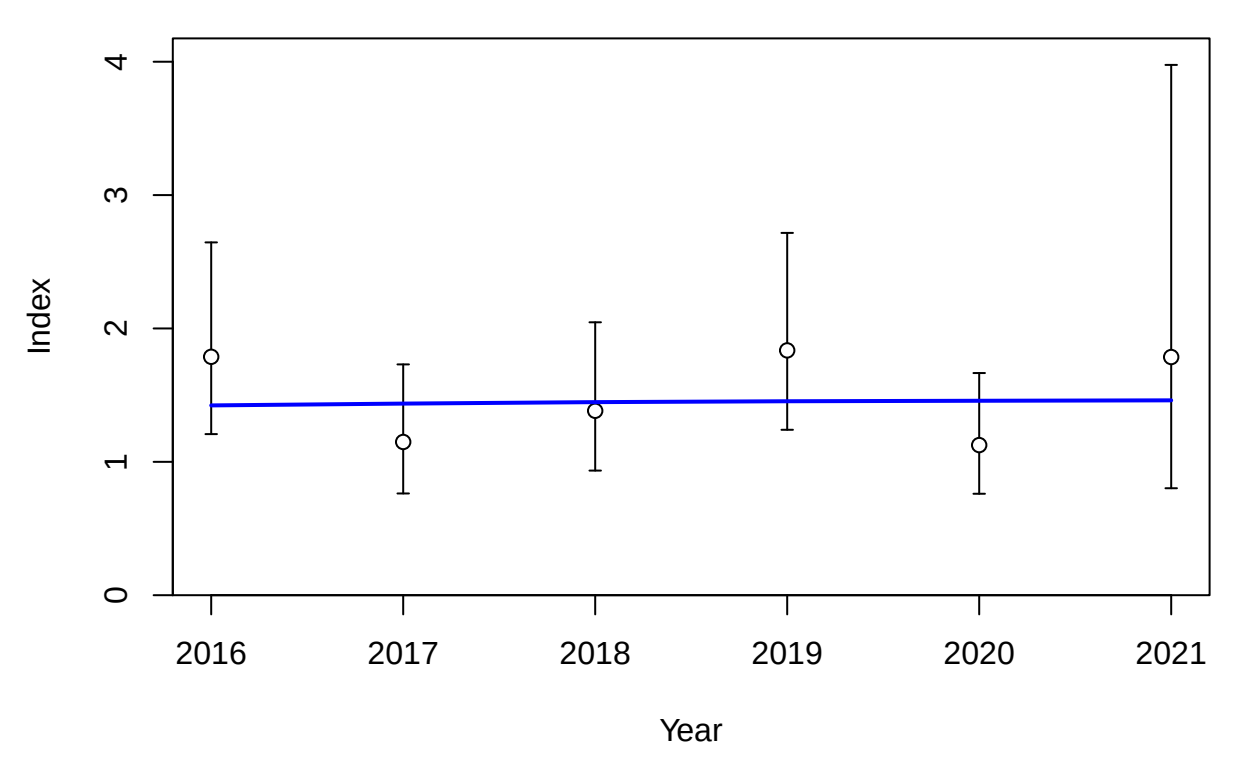

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

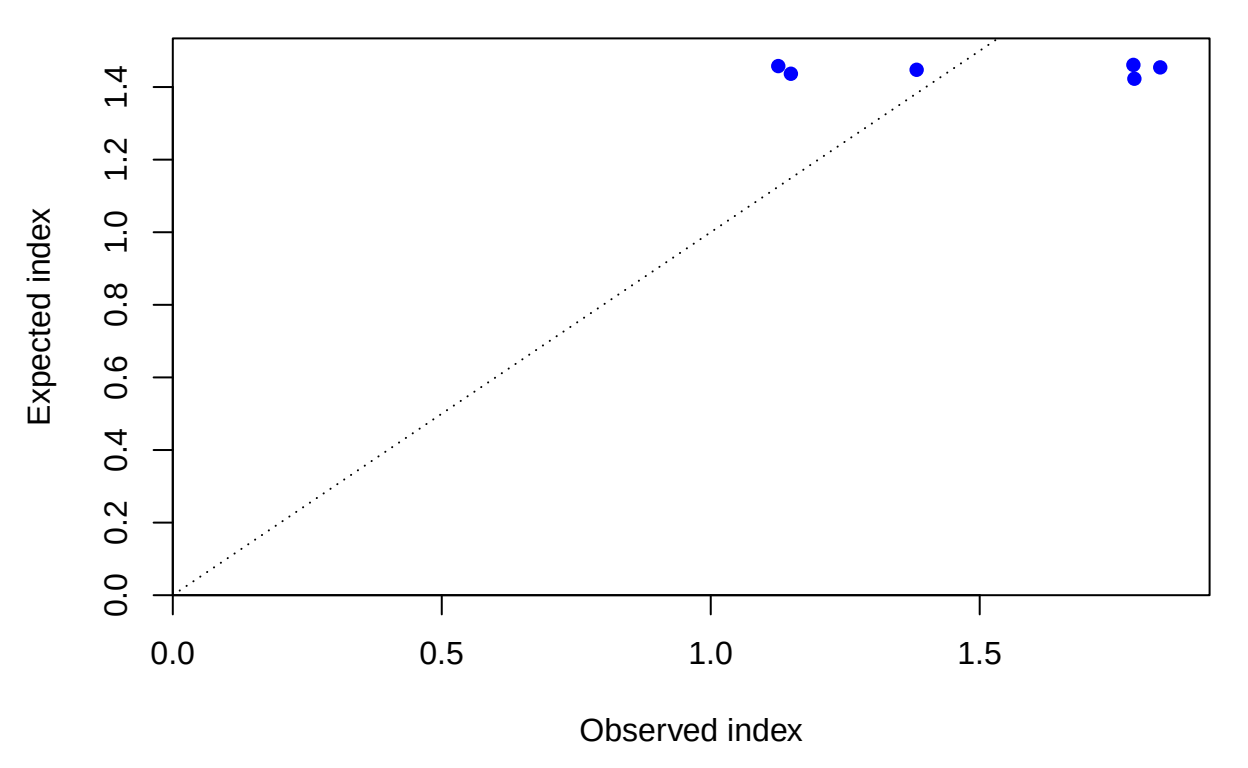

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

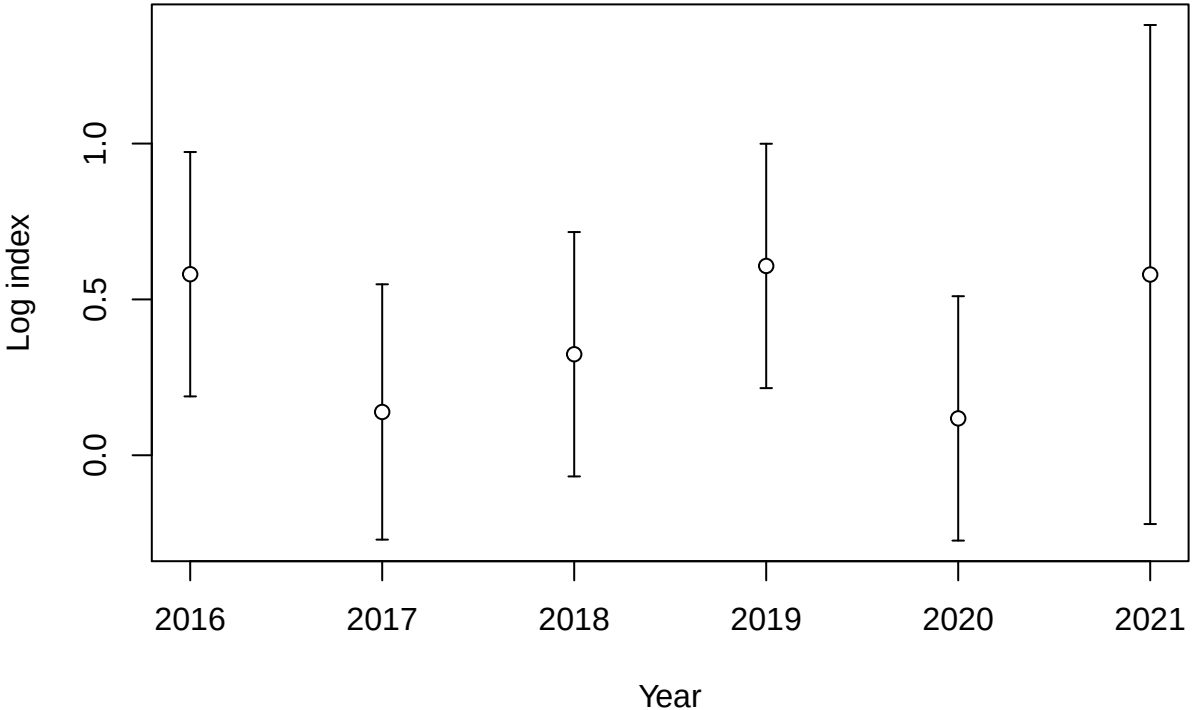

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

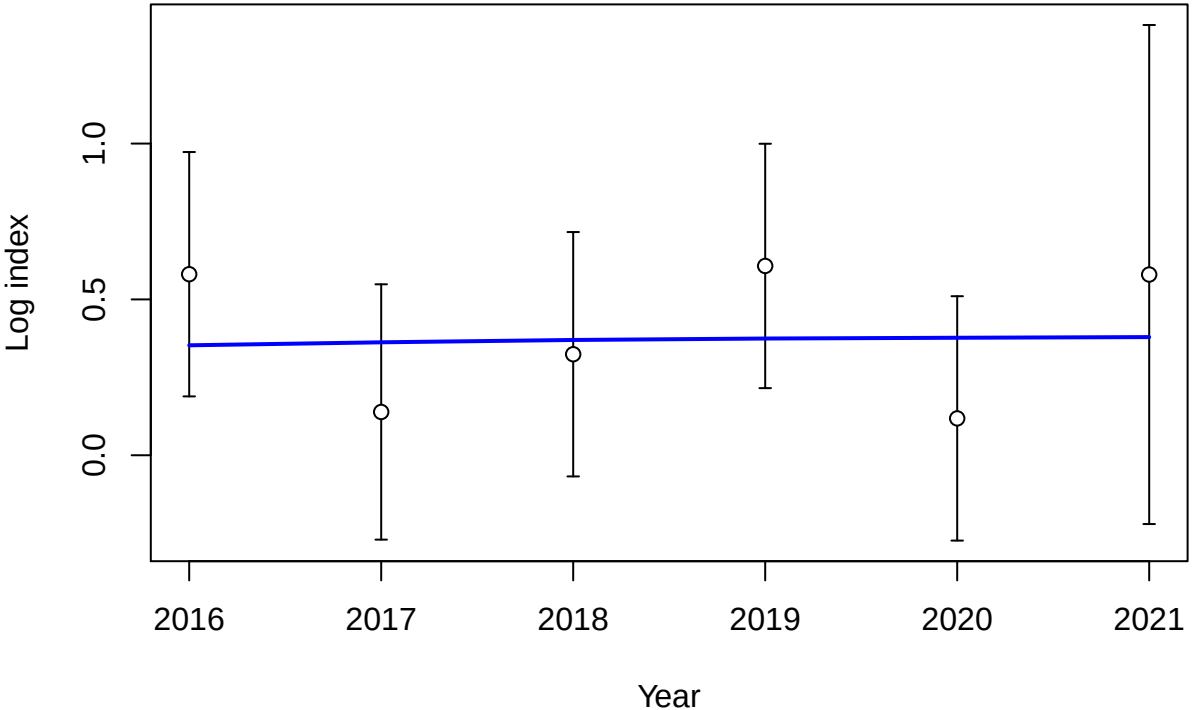

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Relative spawning output: B/B_MSY

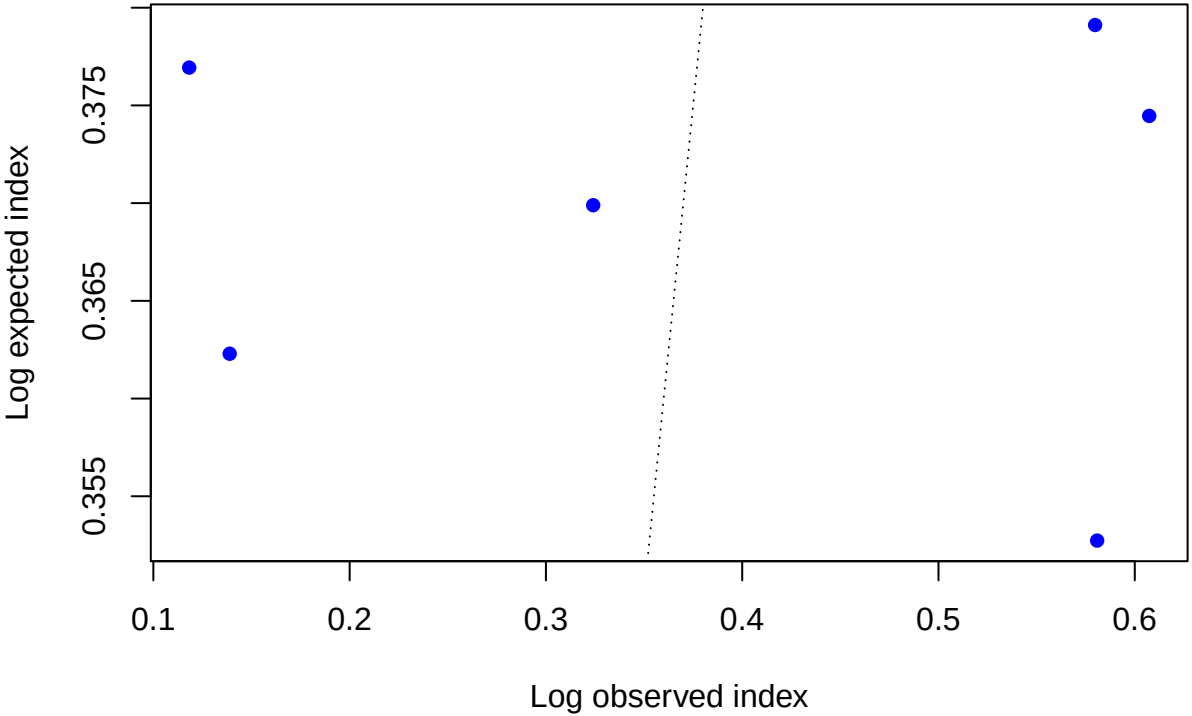

Index
0
1
2
3
4
2016
2017
2018
2019
2020
2021
Year

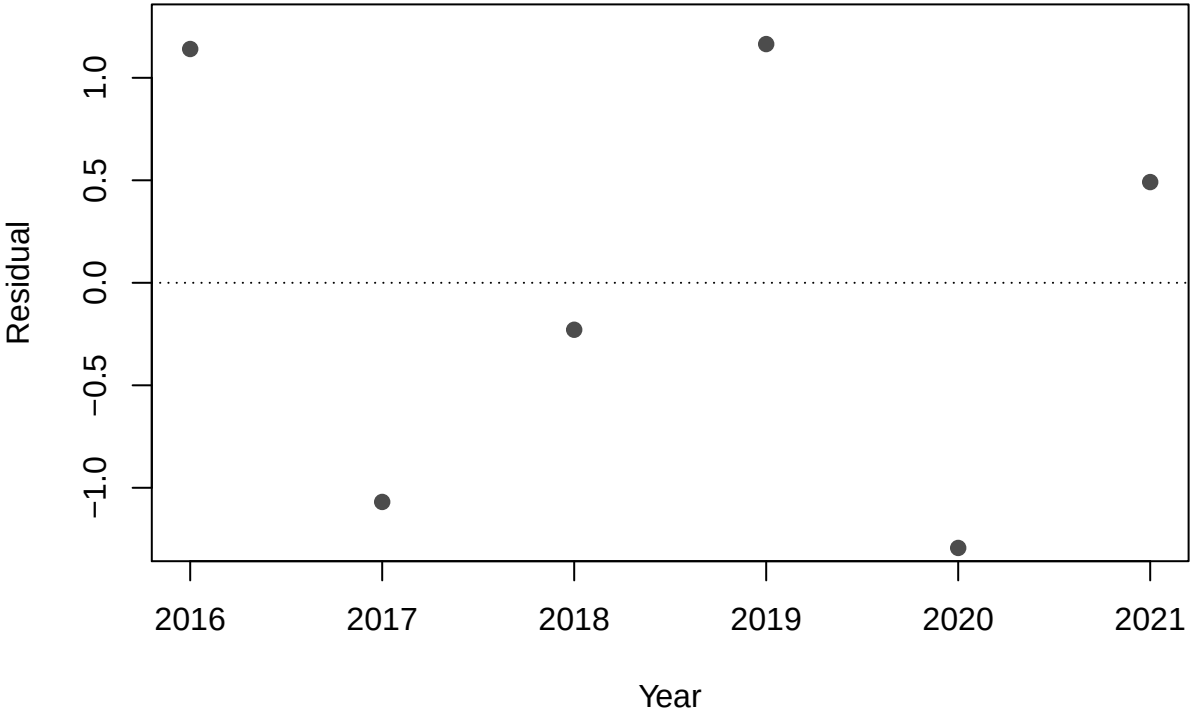

Index
0
1
2
3
4
2016
2017
2018
2019
2020
2021
Year

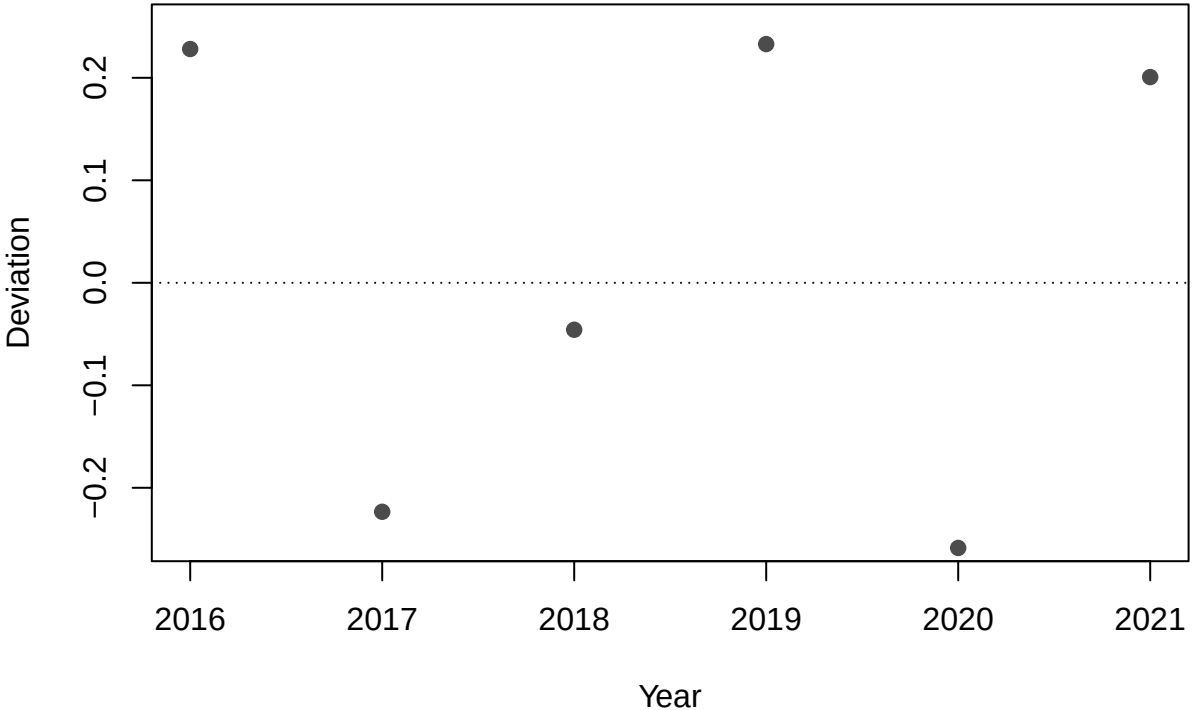

Expected index
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0.0
0.5
1.0
1.5
Observed index

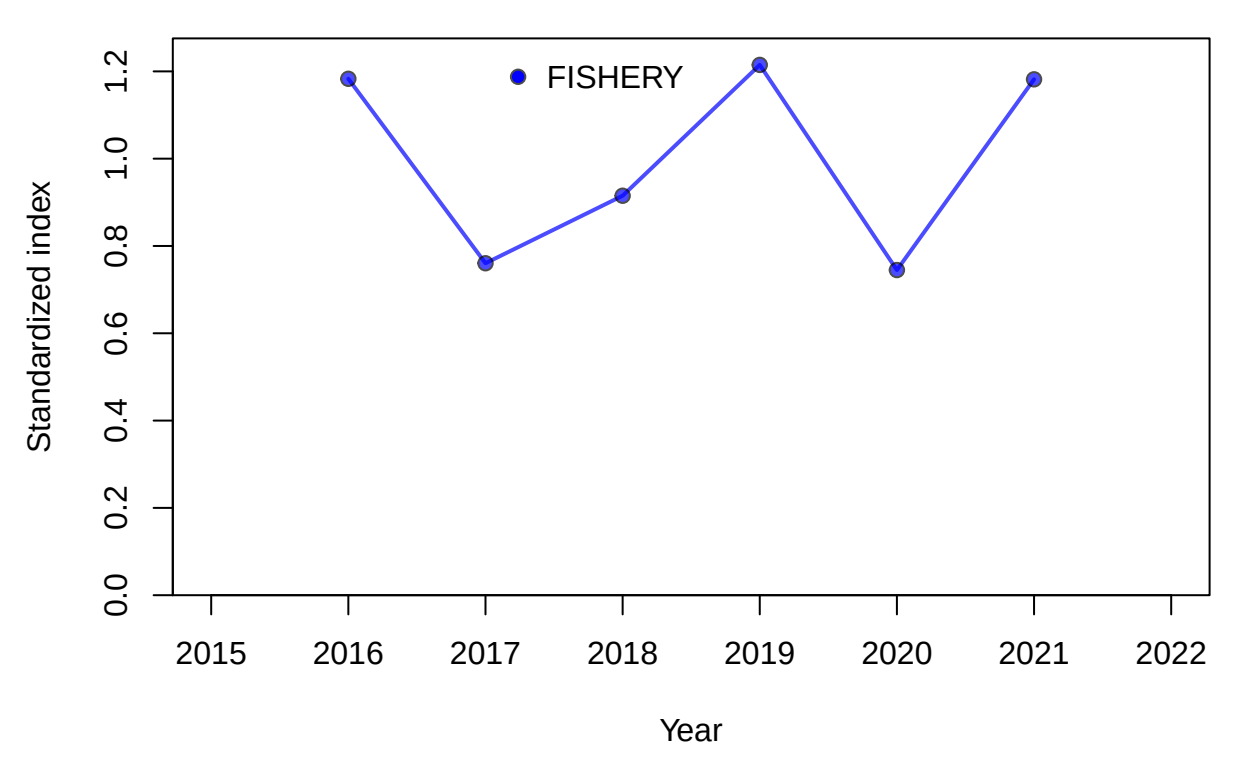

Log index
0.0
0.5
1.0
2016
2017
2018
2019
2020
2021
Year

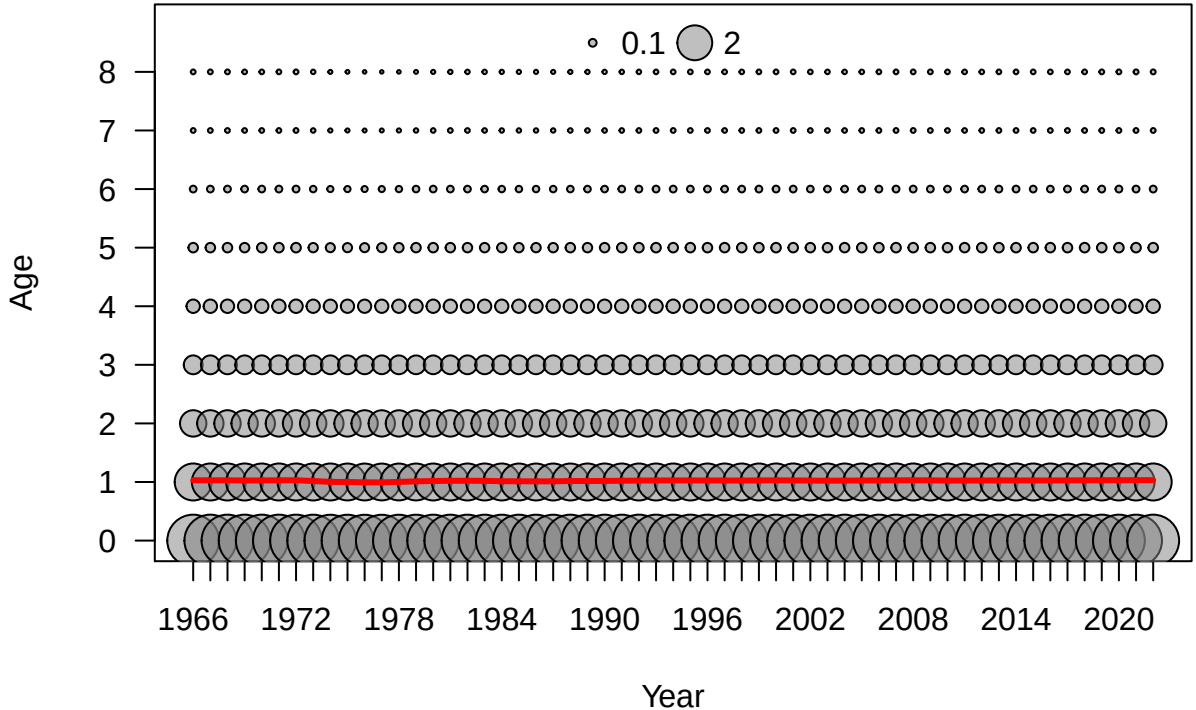

Log index
0.0
0.5
1.0
2016
2017
2018
2019
2020
2021
Year

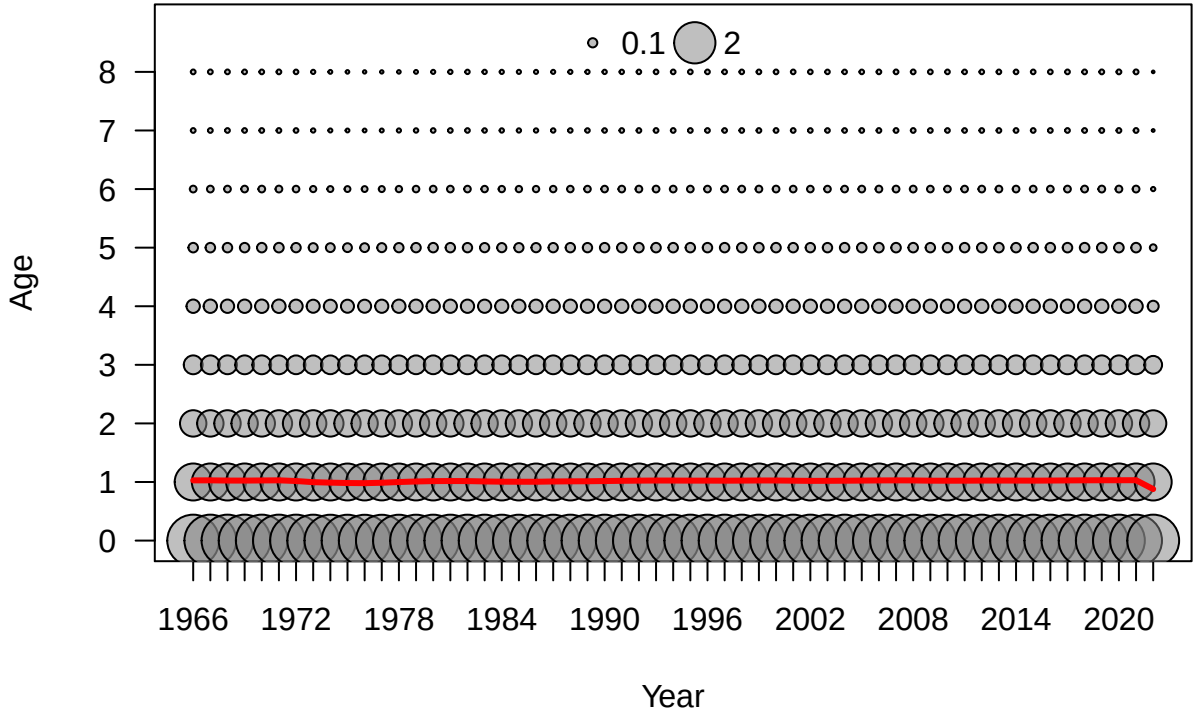

Log expected index
0.355
0.365
0.375
0.1
0.2
0.3
0.4
0.5
0.6
Log observed index

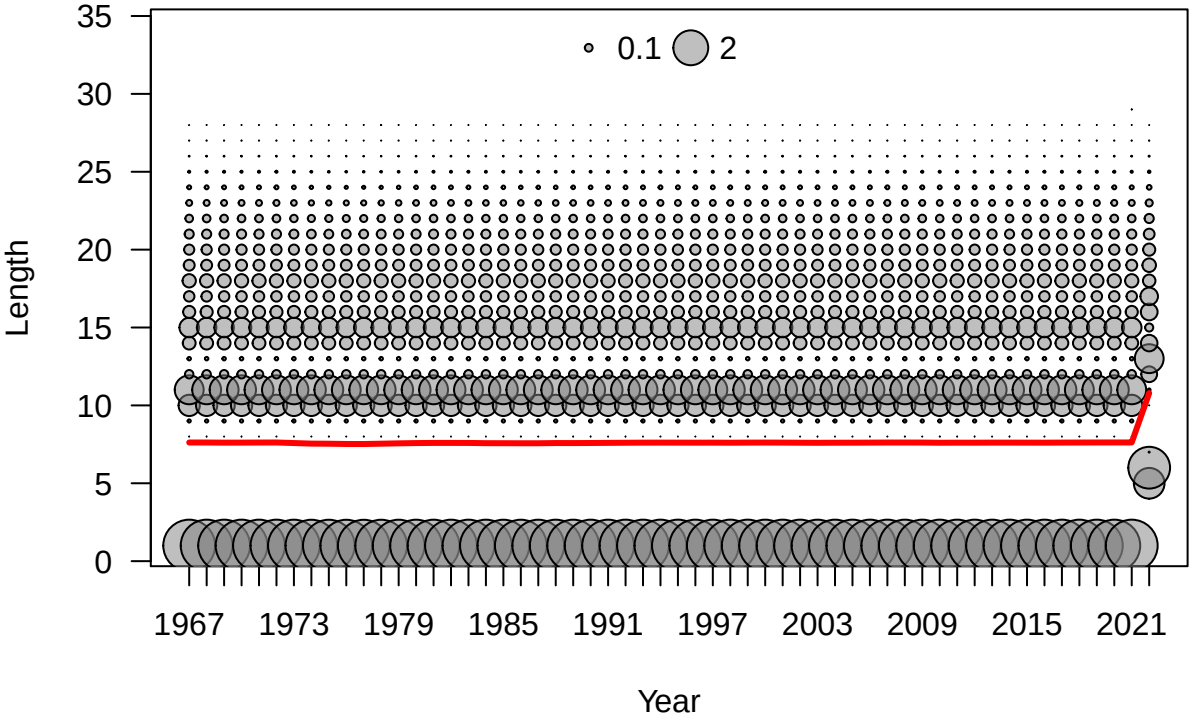

Residual
1.0
0.5
0.0
−0.5
−1.0
2016
2017
2018
2019
2020
2021
Year

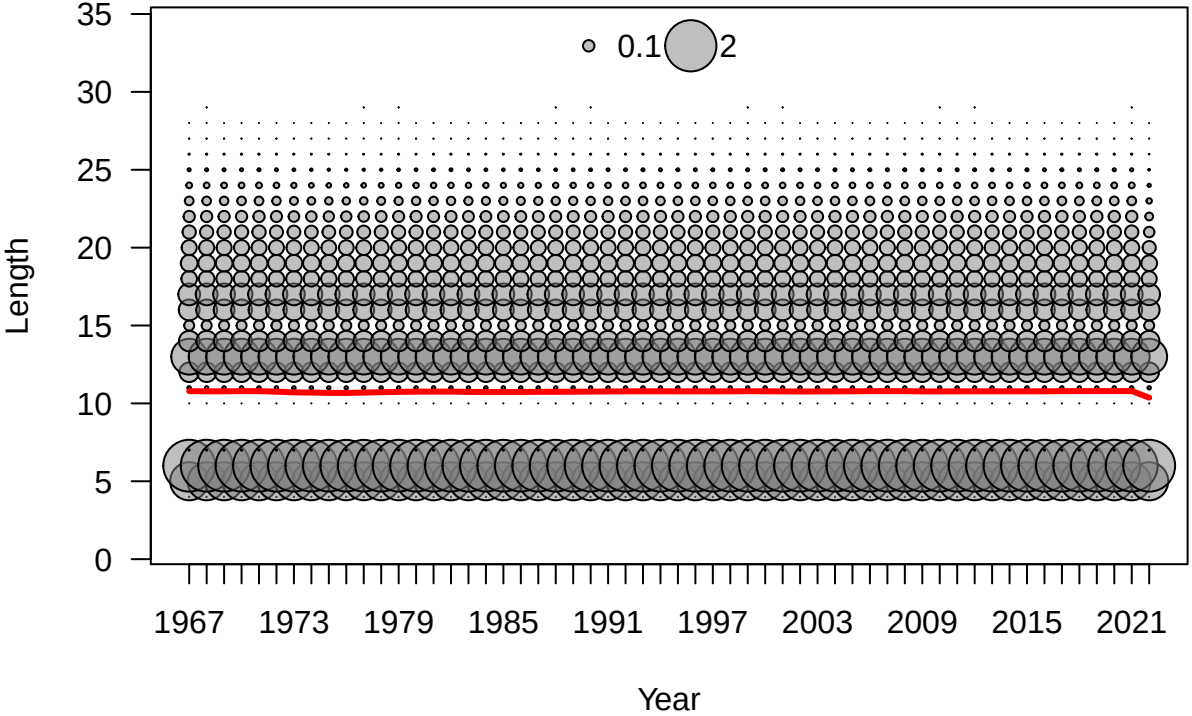

Deviation
0.2
0.1
0.0
−0.1
−0.2
2016
2017
2018
2019
2020
2021
Year

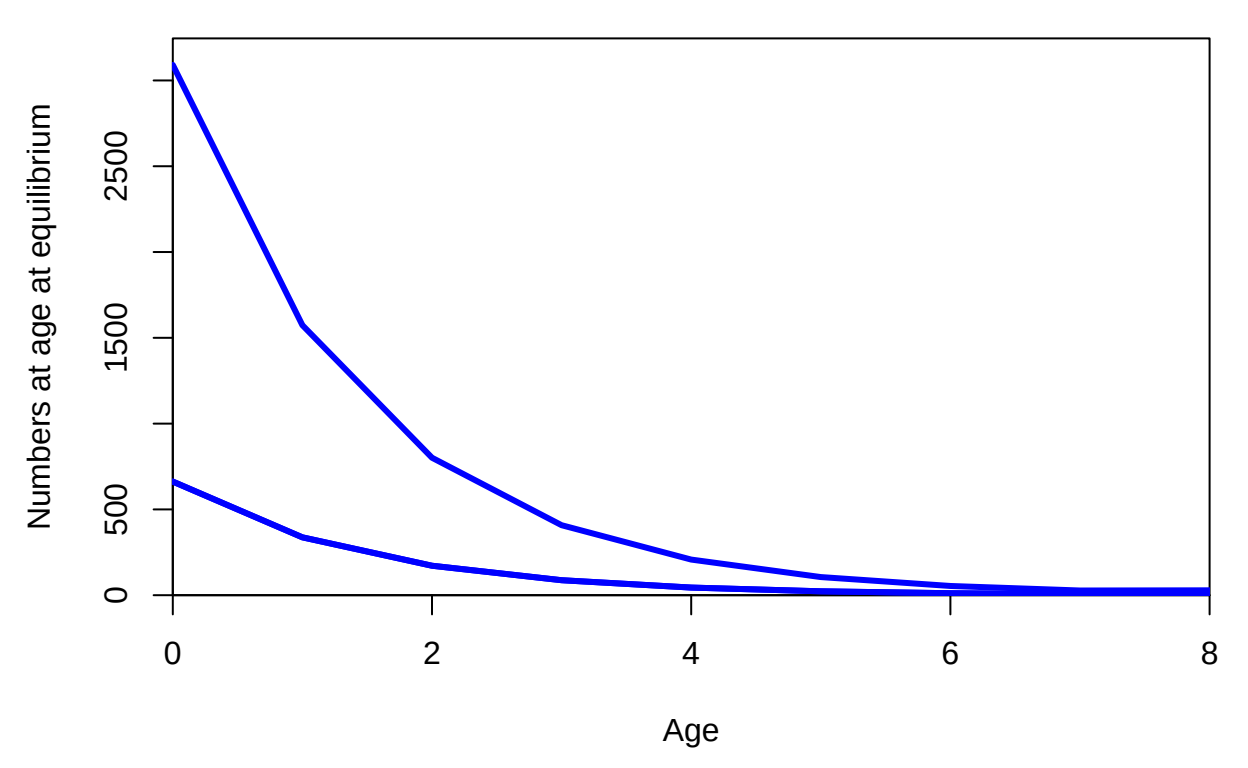

FISHERY
Standardized index
0.0
0.2
0.4
0.6
0.8
1.0
1.2
2015
2016
2017
2018
2019
2020
2021
2022
Year

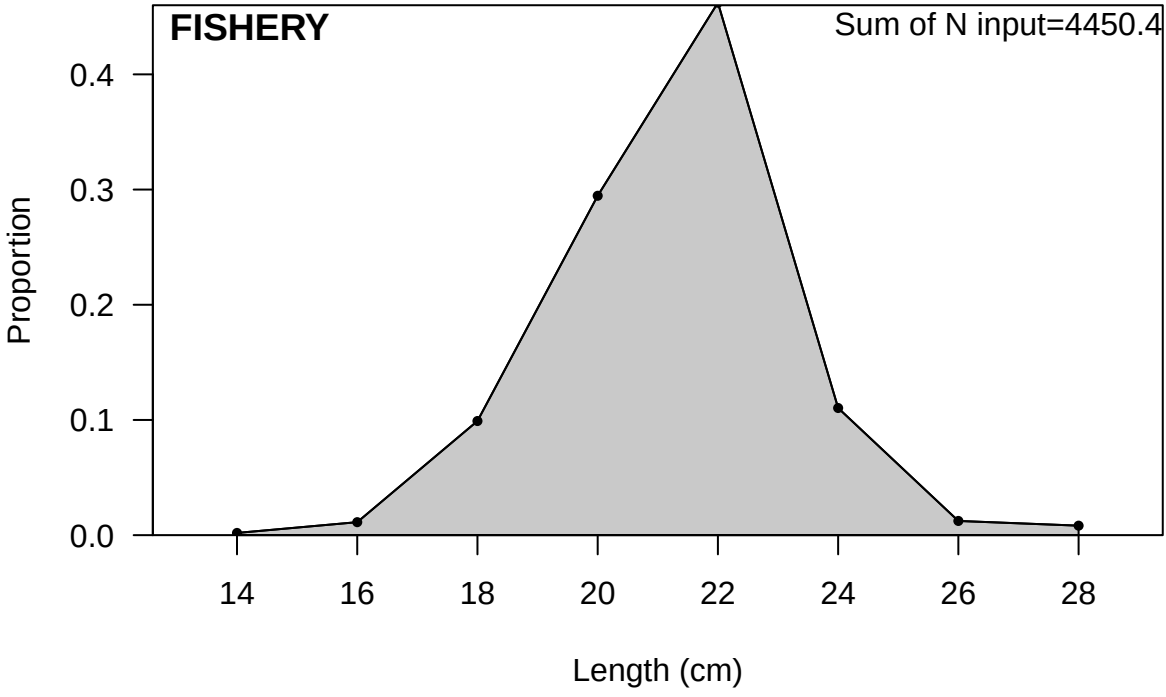

0.1
2
Age
8
7
6
5
4
3
2
1
0
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

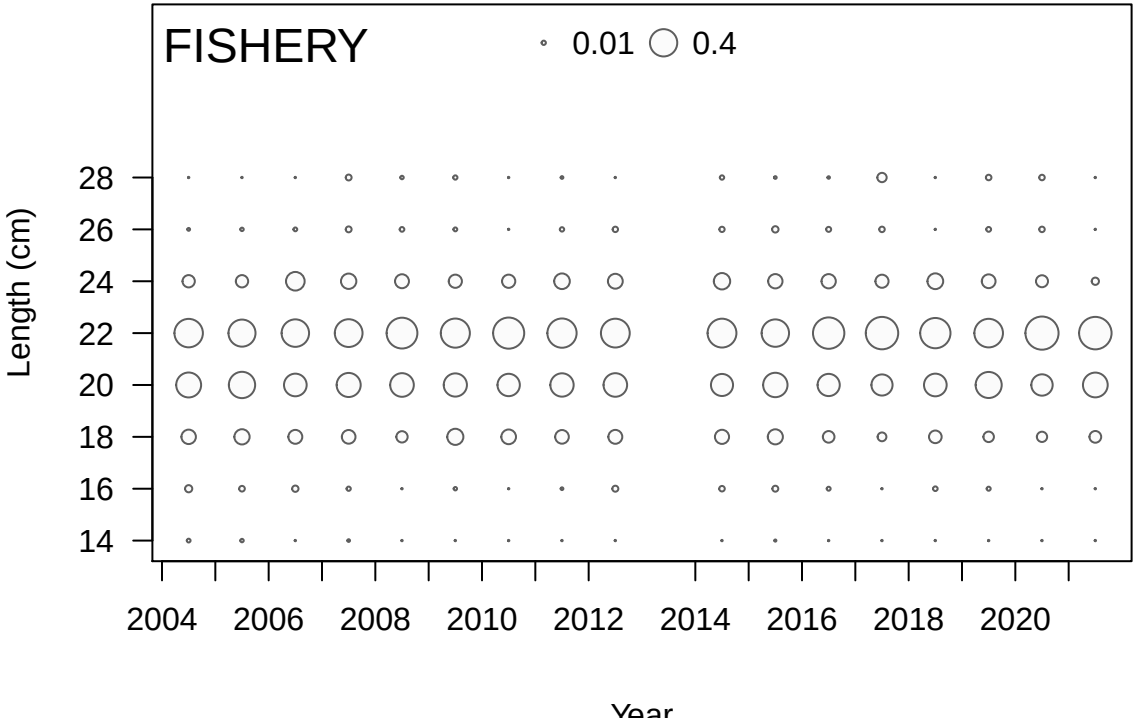

0.1
2
Age
8
7
6
5
4
3
2
1
0
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

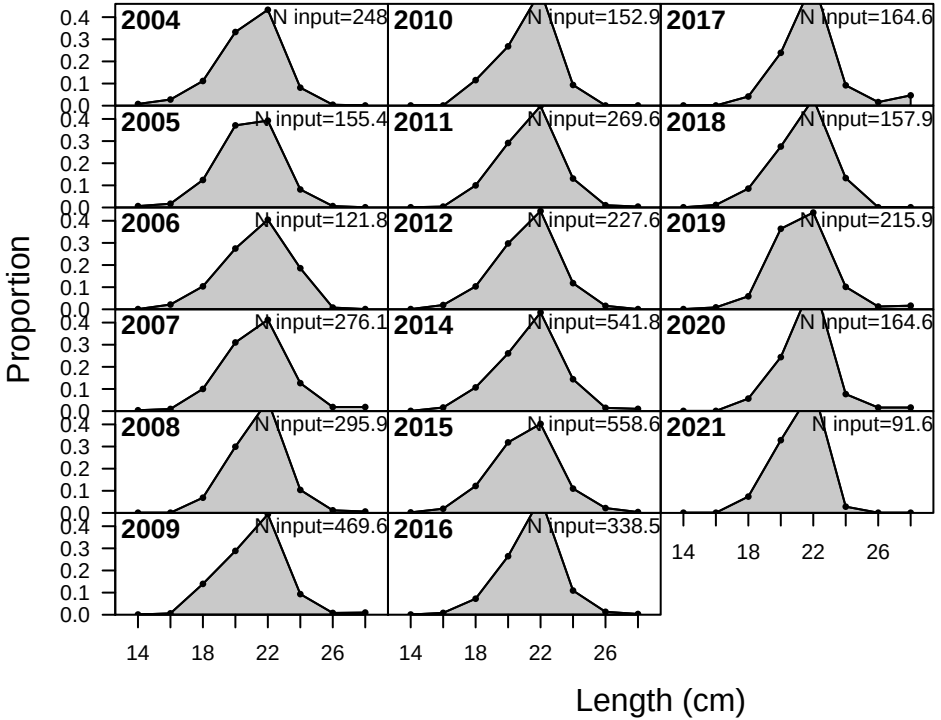

0.1
2
Length
Year
0
5
10
15
20
25
30
35
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021

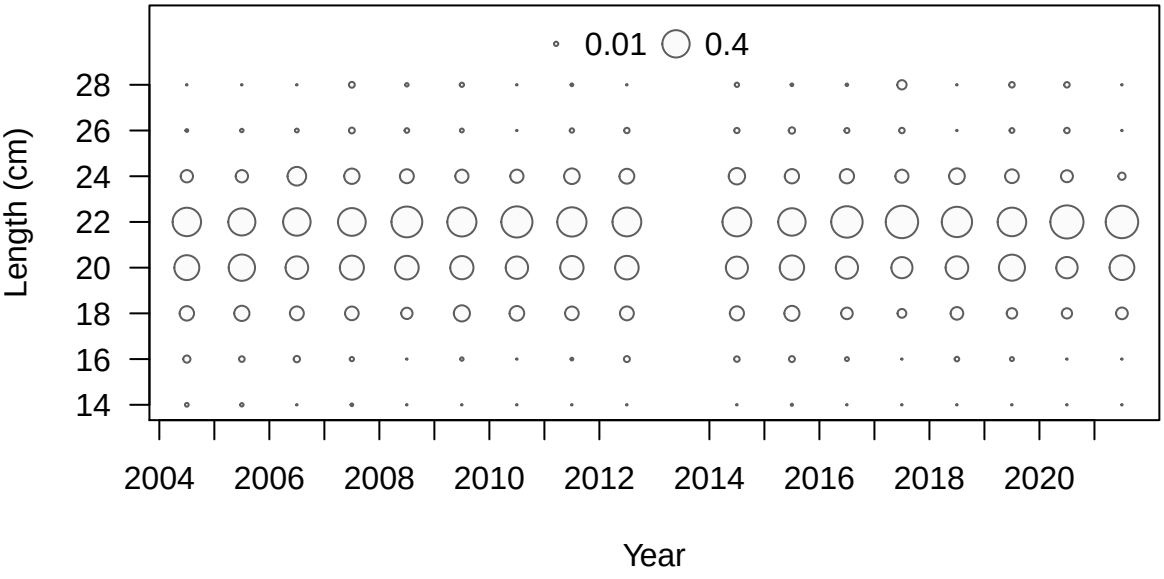

0.1
2
35
30
25
20
15
10
5
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

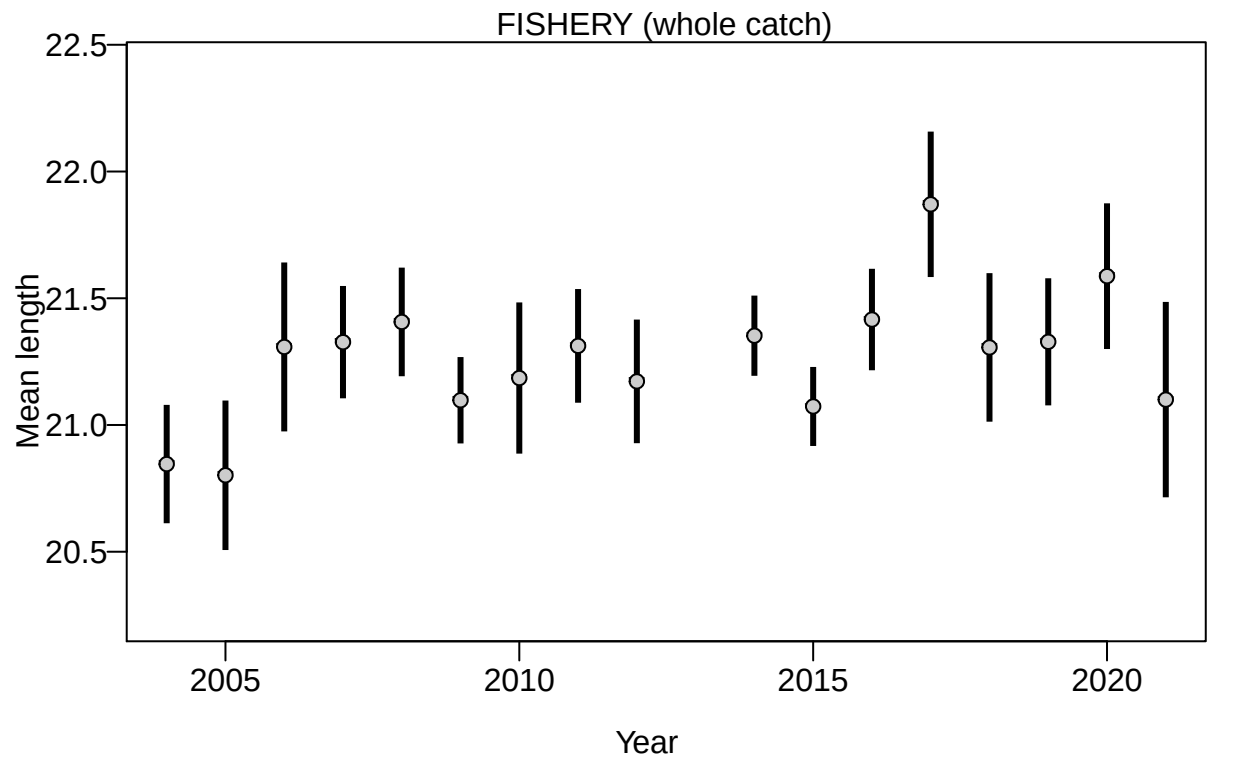

Numbers at age at equilibrium
0
500
1500
2500
0
2
4
6
8
Age

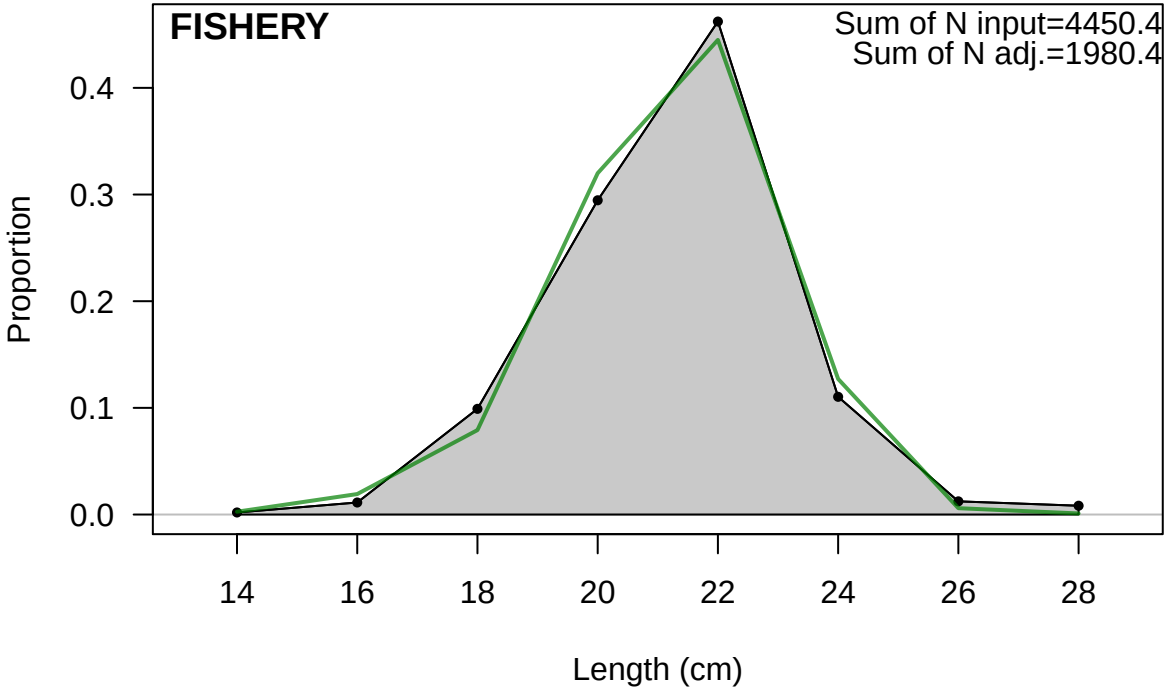

FISHERY
Sum of N input=4450.4
Proportion
0.0
0.1
0.2
0.3
0.4
14
16
18
20
22
24
26
28
Length (cm)

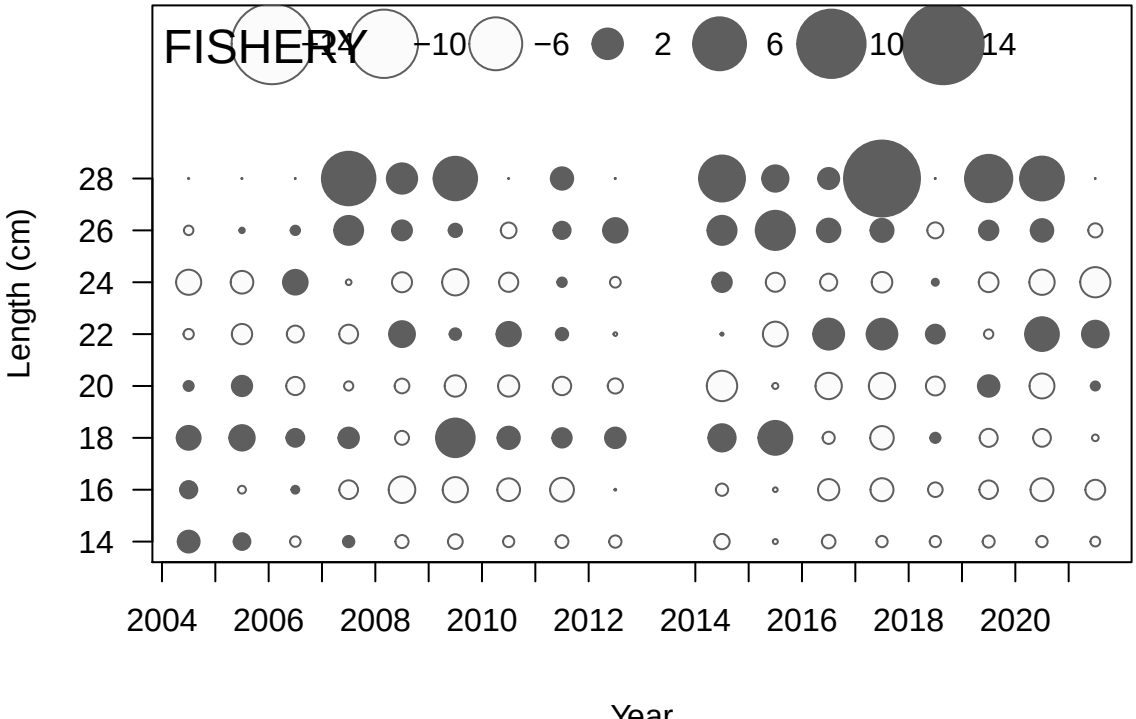

FISHERY
0.01
0.4
Length (cm)
28
26
24
22
20
18
16
14
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

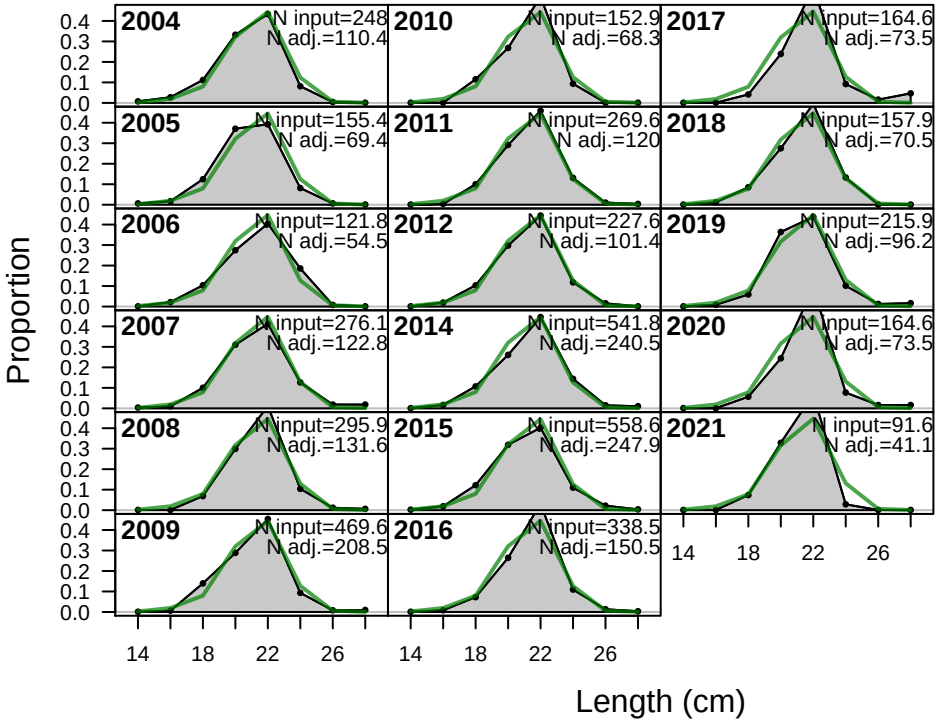

2004
N input=248
2010
N input=152.9
2017
N input=164.6
2005
N input=155.4
2011
N input=269.6
2018
N input=157.9
2006
N input=121.8
2012
N input=227.6
2019
N input=215.9
2007
N input=276.1
2014
N input=541.8
2020
N input=164.6
2008
N input=295.9
2015
N input=558.6
2021
N input=91.6
2009
N input=469.6
2016
N input=338.5
Proportion
0.0
0.1
0.2
0.3
0.4
14
18
22
26
Length (cm)

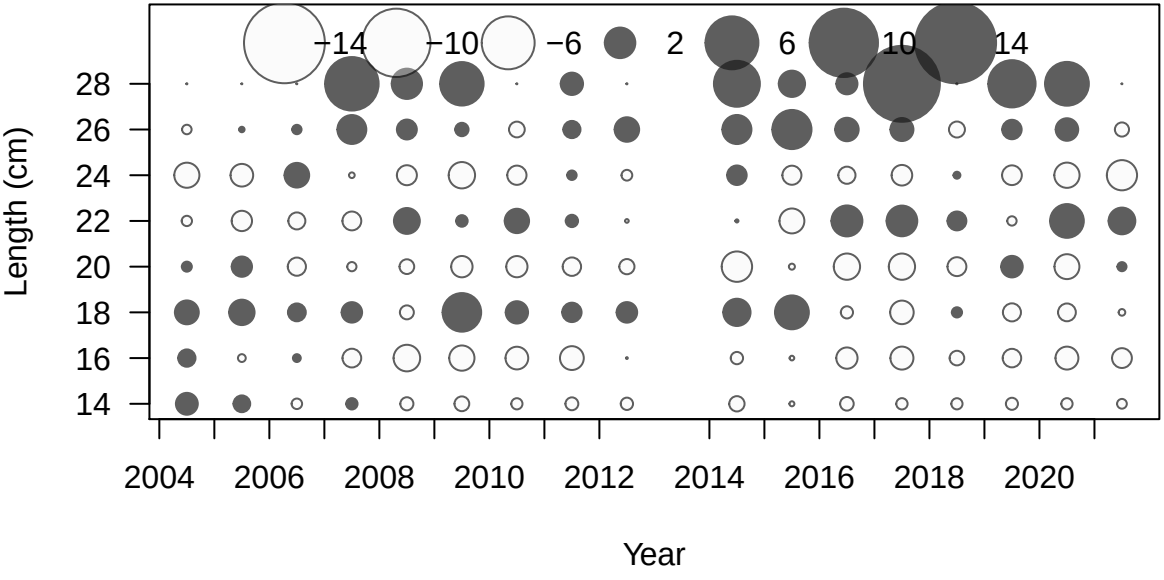

0.01
0.4
Length (cm)
28
26
24
22
20
18
16
14
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

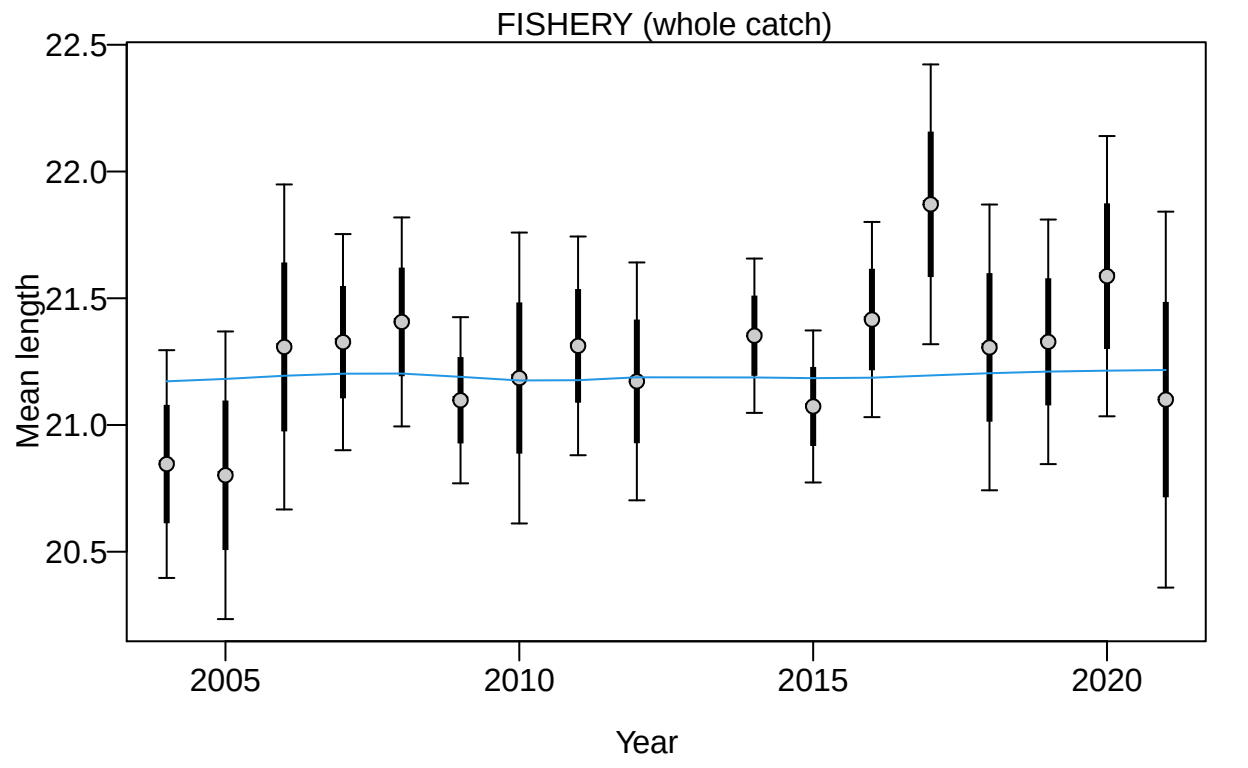

FISHERY (whole catch)
22.5
22.0
21.5
21.0
20.5
Mean length
2005
2010
2015
2020
Year

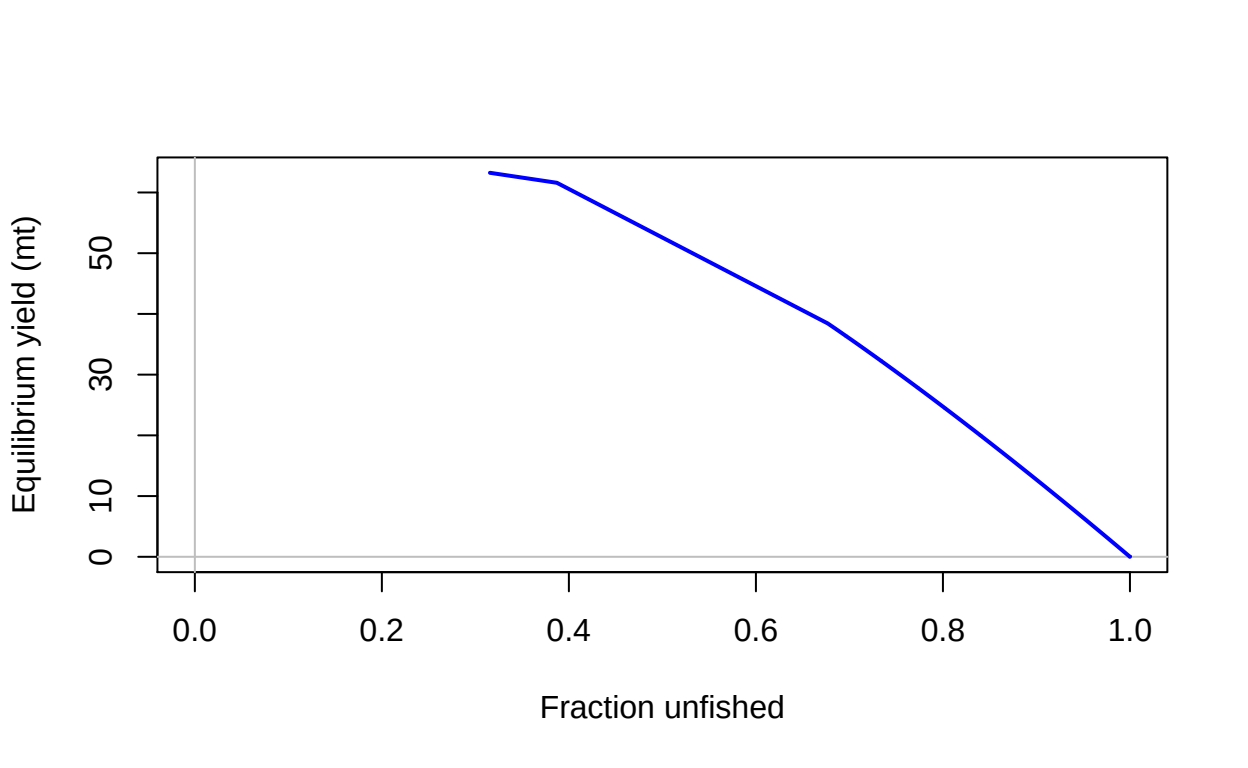

FISHERY
Sum of N input=4450.4
Sum of N adj.=1980.4
Proportion
0.0
0.1
0.2
0.3
0.4
14
16
18
20
22
24
26
28
Length (cm)

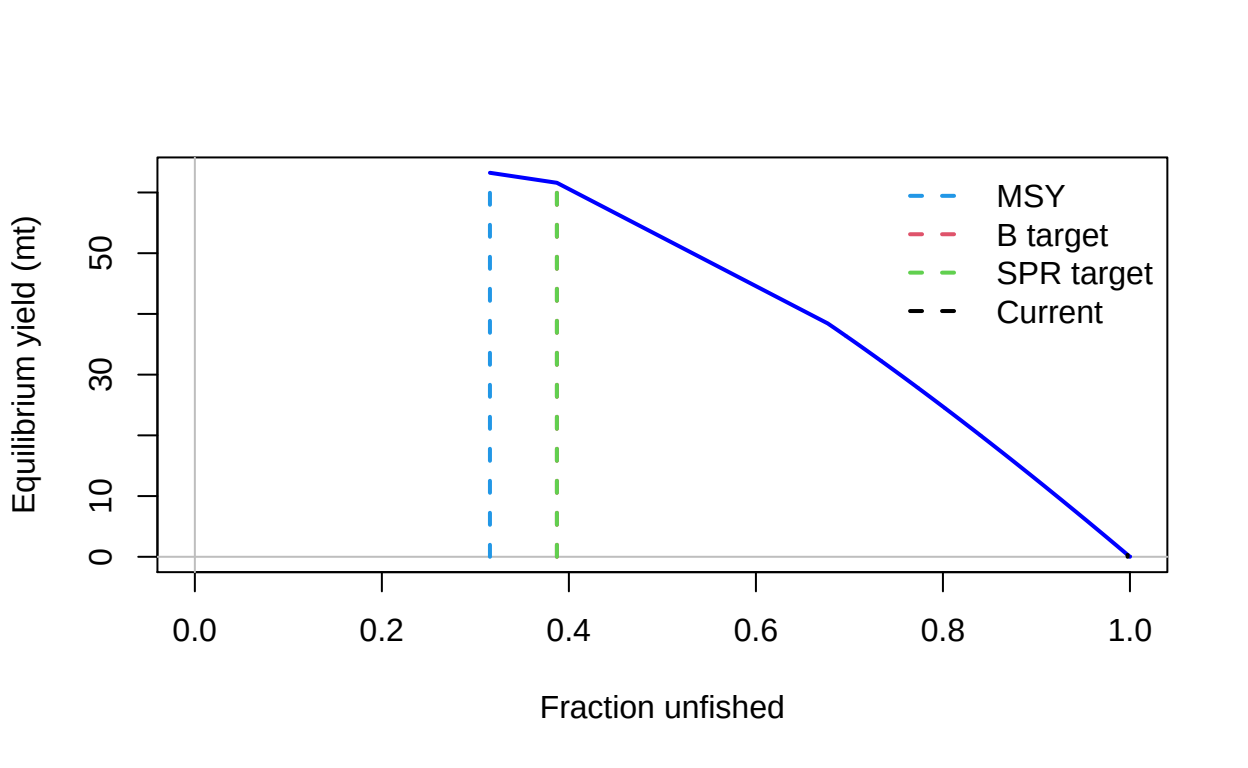

FISHERY
−14
−10
−6
2
6
10
14
Length (cm)
28
26
24
22
20
18
16
14
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

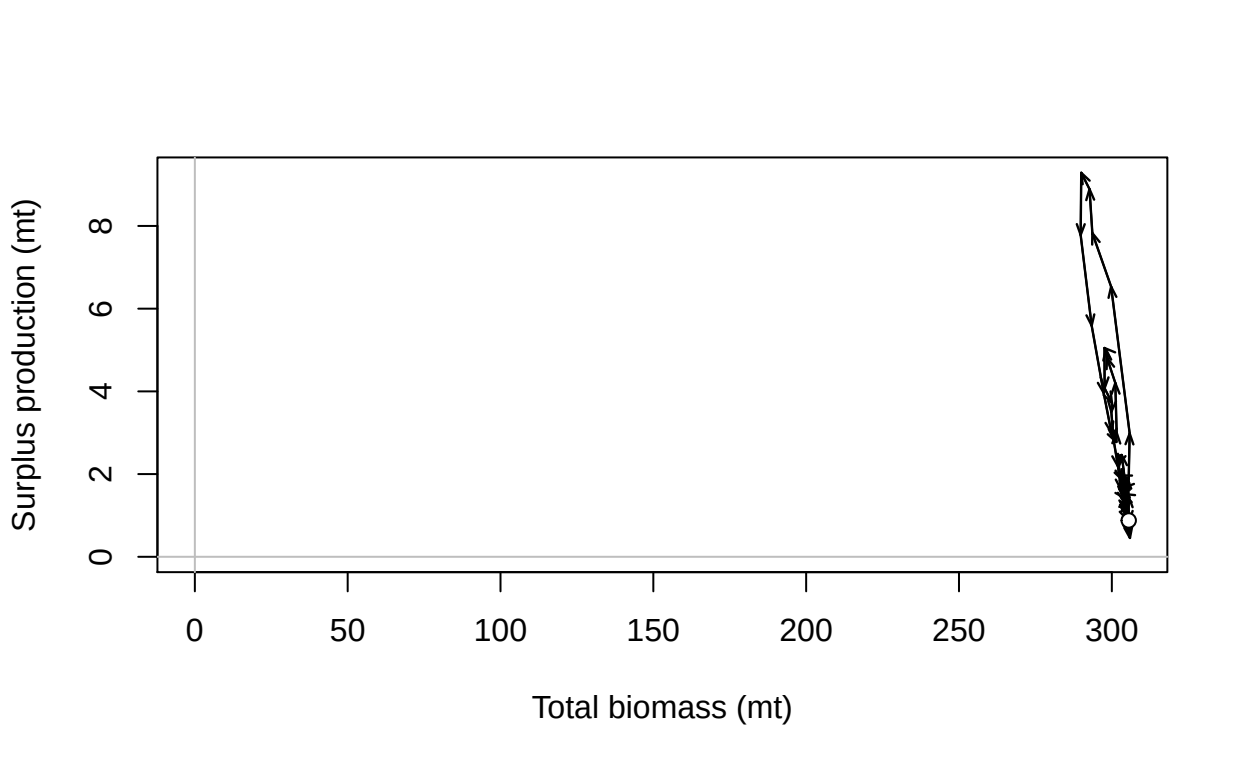

2004
N input=248
N adj.=110.4
2010
N input=152.9
N adj.=68.3
2017
N input=164.6
N adj.=73.5
2005
N input=155.4
N adj.=69.4
2011
N input=269.6
N adj.=120
2018
N input=157.9
N adj.=70.5
2006
N input=121.8
N adj.=54.5
2012
N input=227.6
N adj.=101.4
2019
N input=215.9
N adj.=96.2
2007
N input=276.1
N adj.=122.8
2014
N input=541.8
N adj.=240.5
2020
N input=164.6
N adj.=73.5
2008
N input=295.9
N adj.=131.6
2015
N input=558.6
N adj.=247.9
2021
N input=91.6
N adj.=41.1
2009
N input=469.6
N adj.=208.5
2016
N input=338.5
N adj.=150.5
Proportion
0.0
0.1
0.2
0.3
0.4
14
18
22
26
Length (cm)

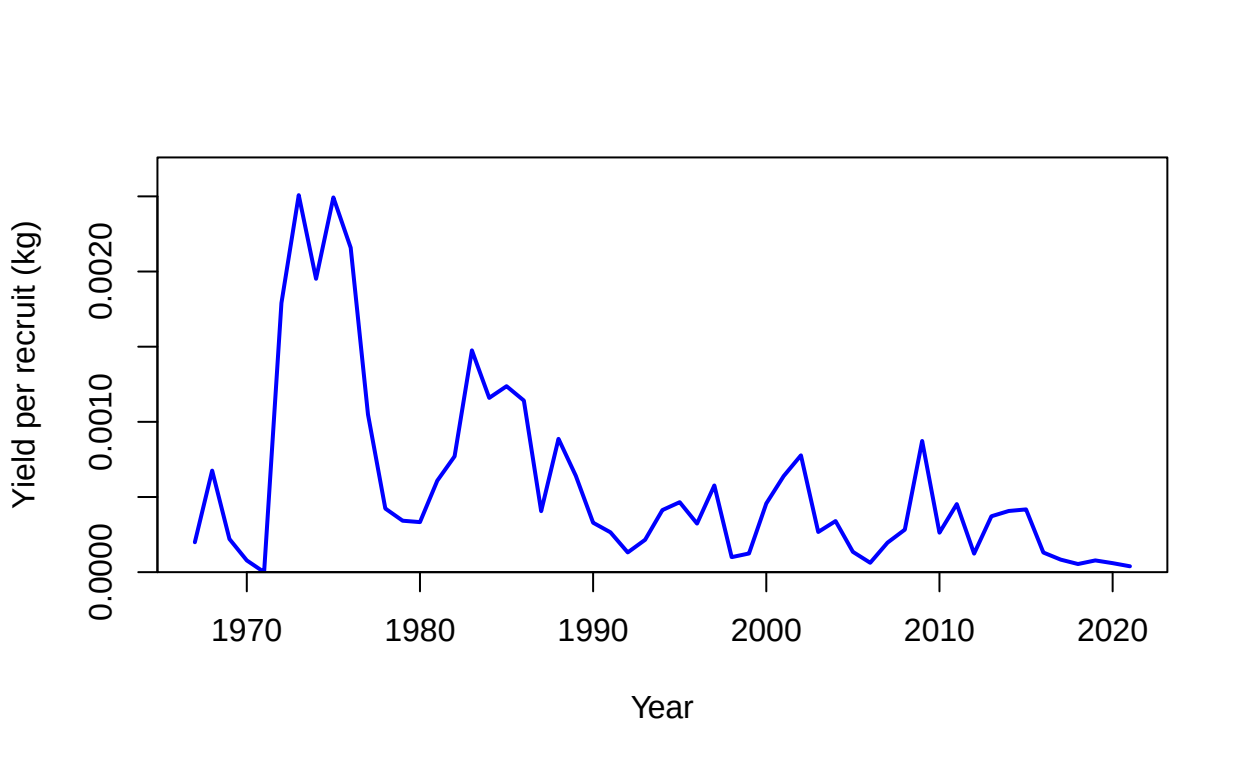

−14
−10
−6
2
6
10
14
28
26
24
22
20
18
16
14
Length (cm)
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

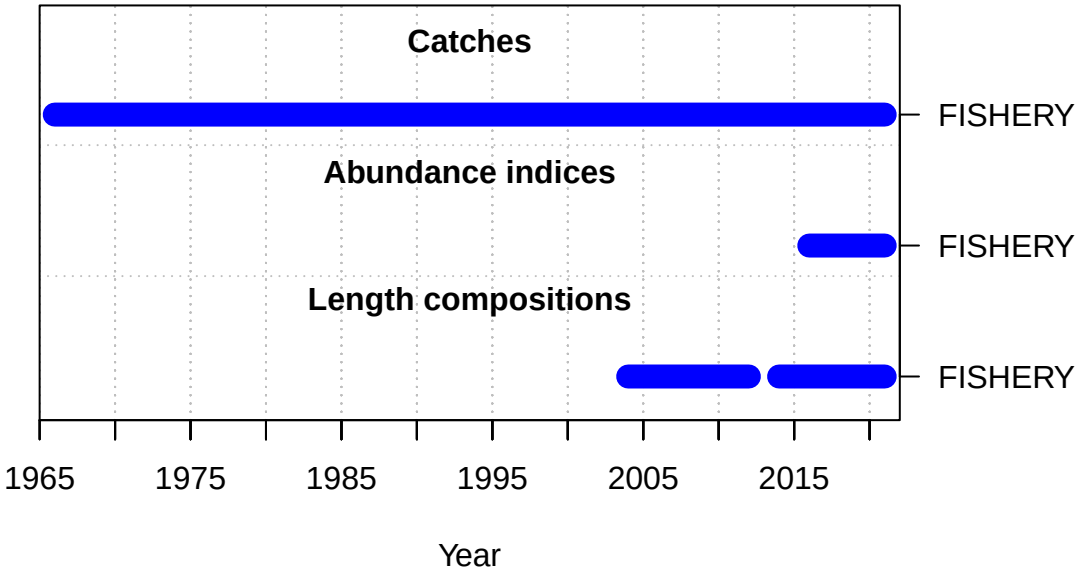

FISHERY (whole catch)
22.5
22.0
21.5
21.0
20.5
Mean length
2005
2010
2015
2020
Year

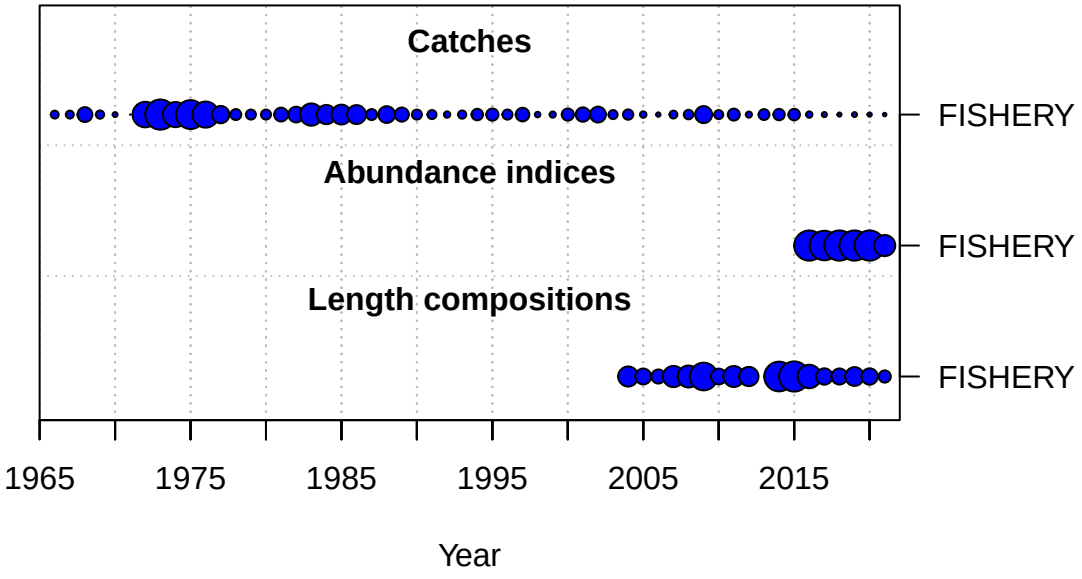

Equilibrium yield (mt)
0
10
30
50
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

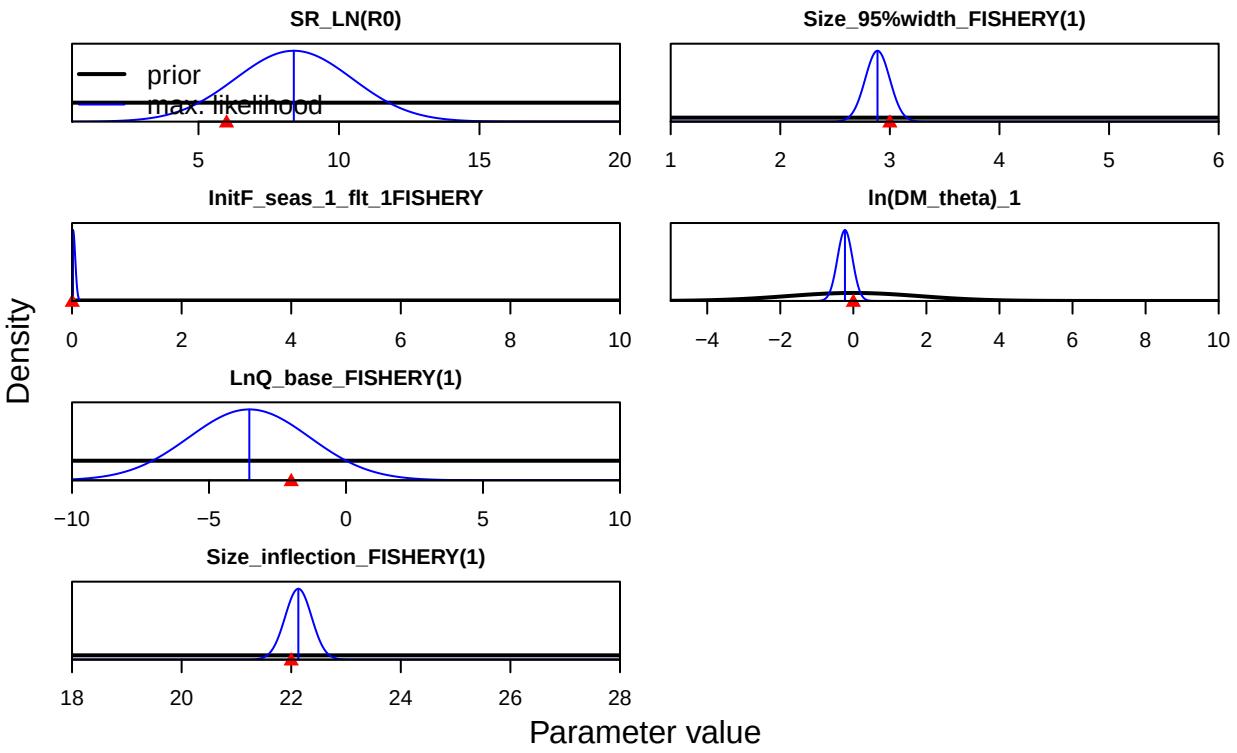

Equilibrium yield (mt)
0
10
30
50
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
0
2
4
6
8
0
50
100
150
200
250
300
Total biomass (mt)


Yield per recruit (kg)
0.0000
0.0010
0.0020
1970
1980
1990
2000
2010
2020
Year


Catches
FISHERY
Abundance indices
FISHERY
Length compositions
FISHERY
1965
1975
1985
1995
2005
2015
Year


Catches
FISHERY
Abundance indices
FISHERY
Length compositions
FISHERY
1965
1975
1985
1995
2005
2015
Year


SR_LN(R0)
prior
max. likelihood
5
10
15
20
Size_95%width_FISHERY(1)
1
2
3
4
5
6
InitF_seas_1_flt_1FISHERY
0
2
4
6
8
10
ln(DM_theta)_1
−4
−2
0
2
4
6
8
10
LnQ_base_FISHERY(1)
−10
−5
0
5
10
Size_inflection_FISHERY(1)
18
20
22
24
26
28
Density
Parameter value