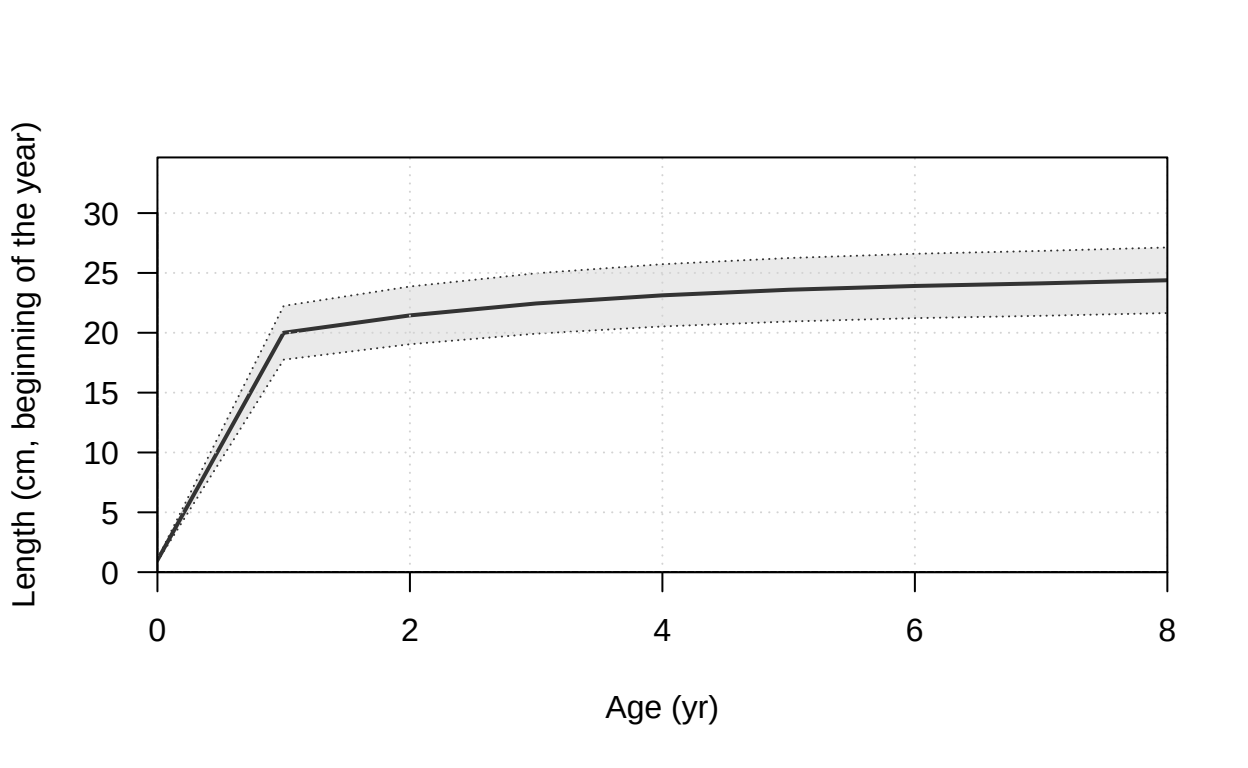
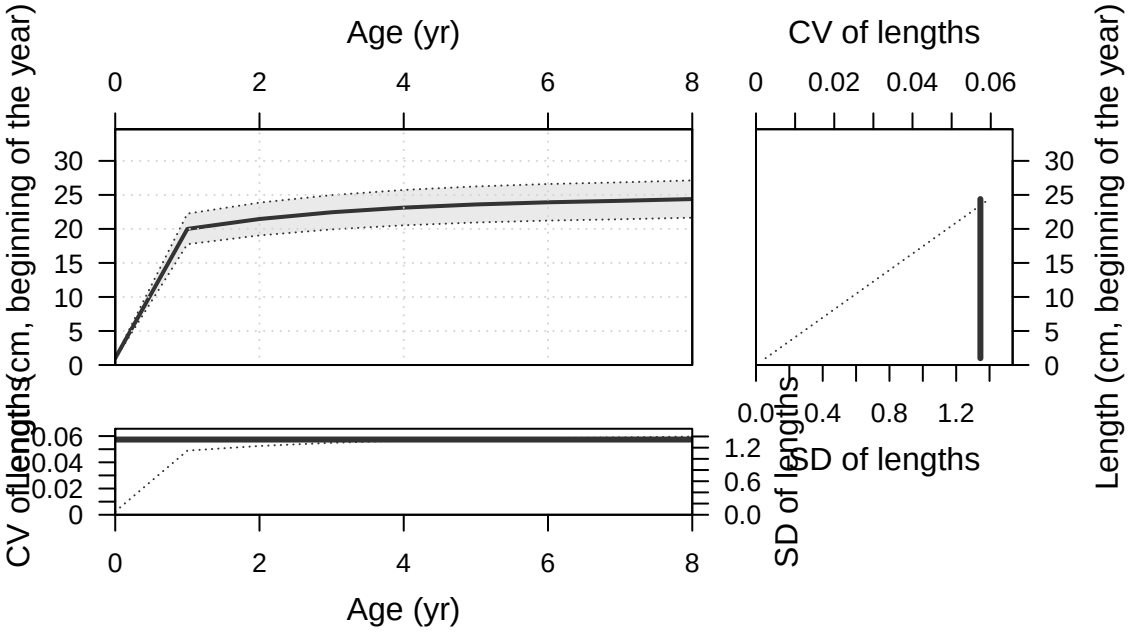
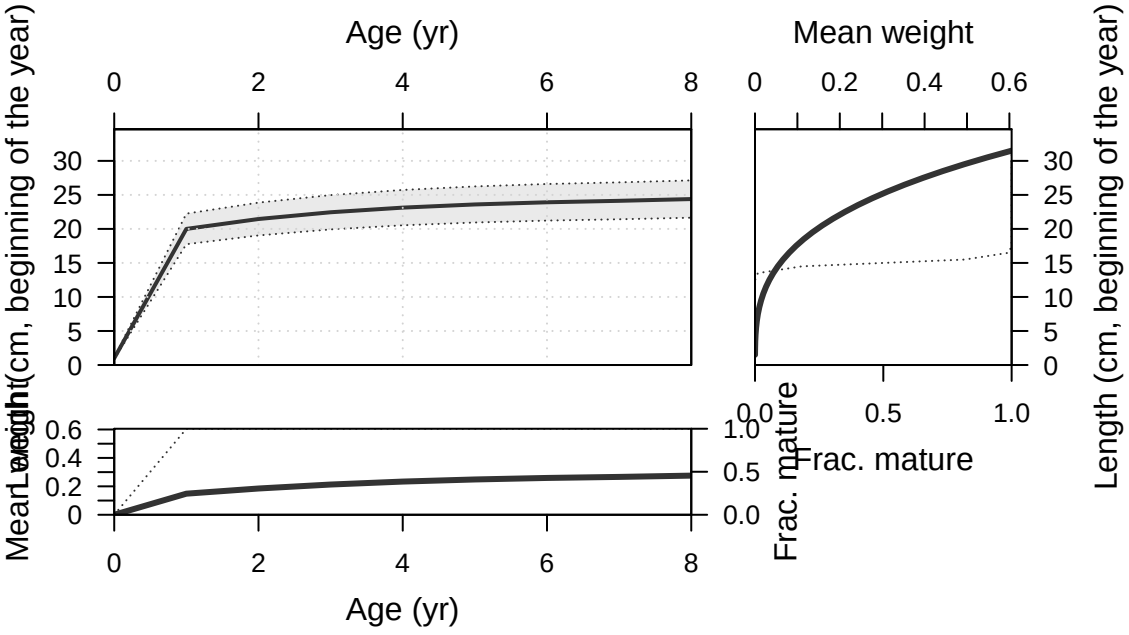
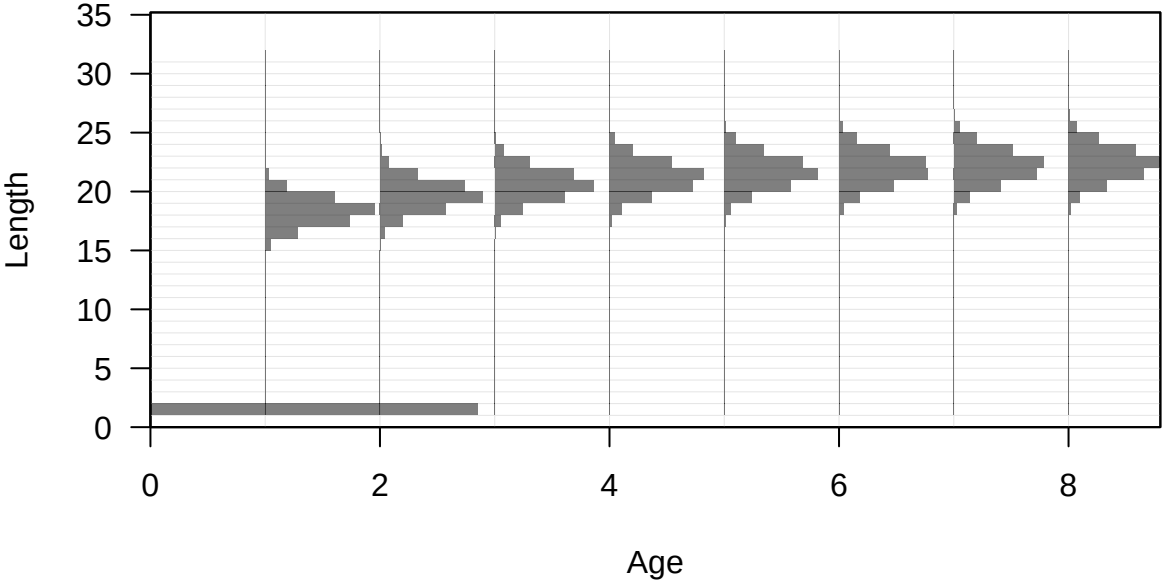
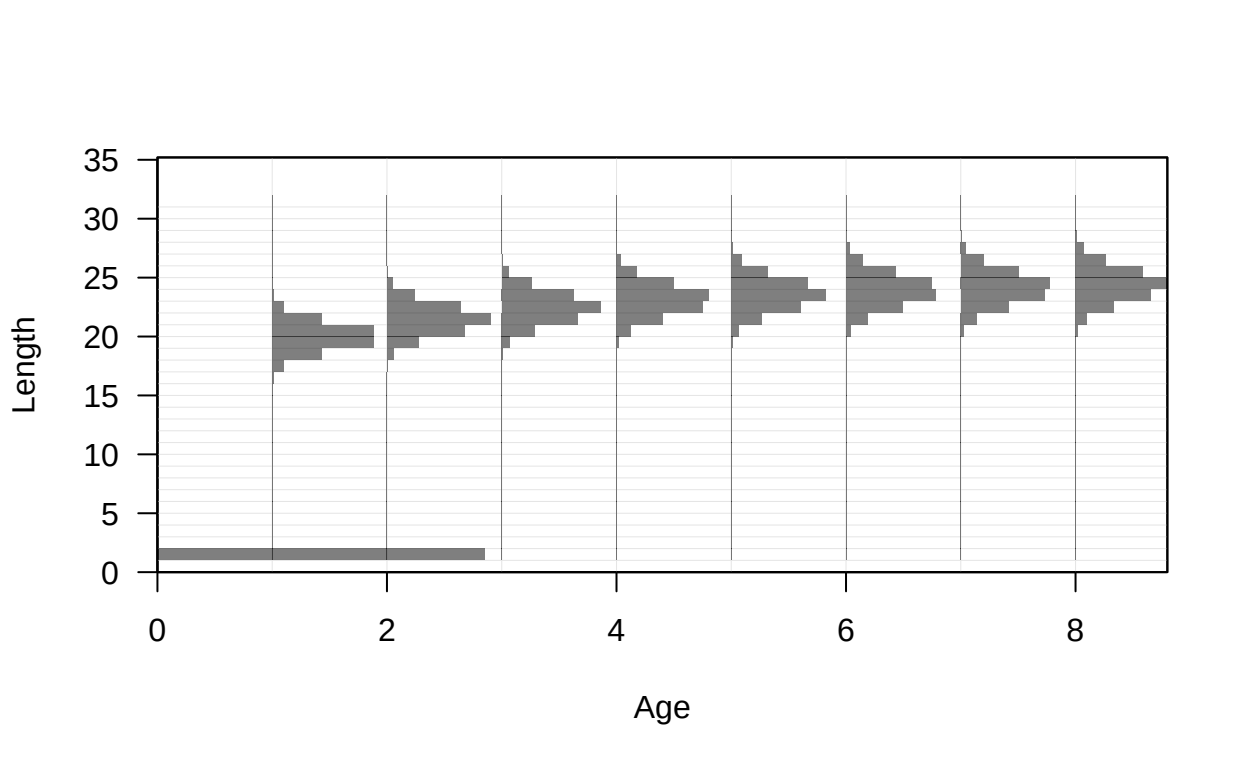
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Tue Aug 16 16:32:28 2022
Data_File: data.ss
Control_File: control.ss

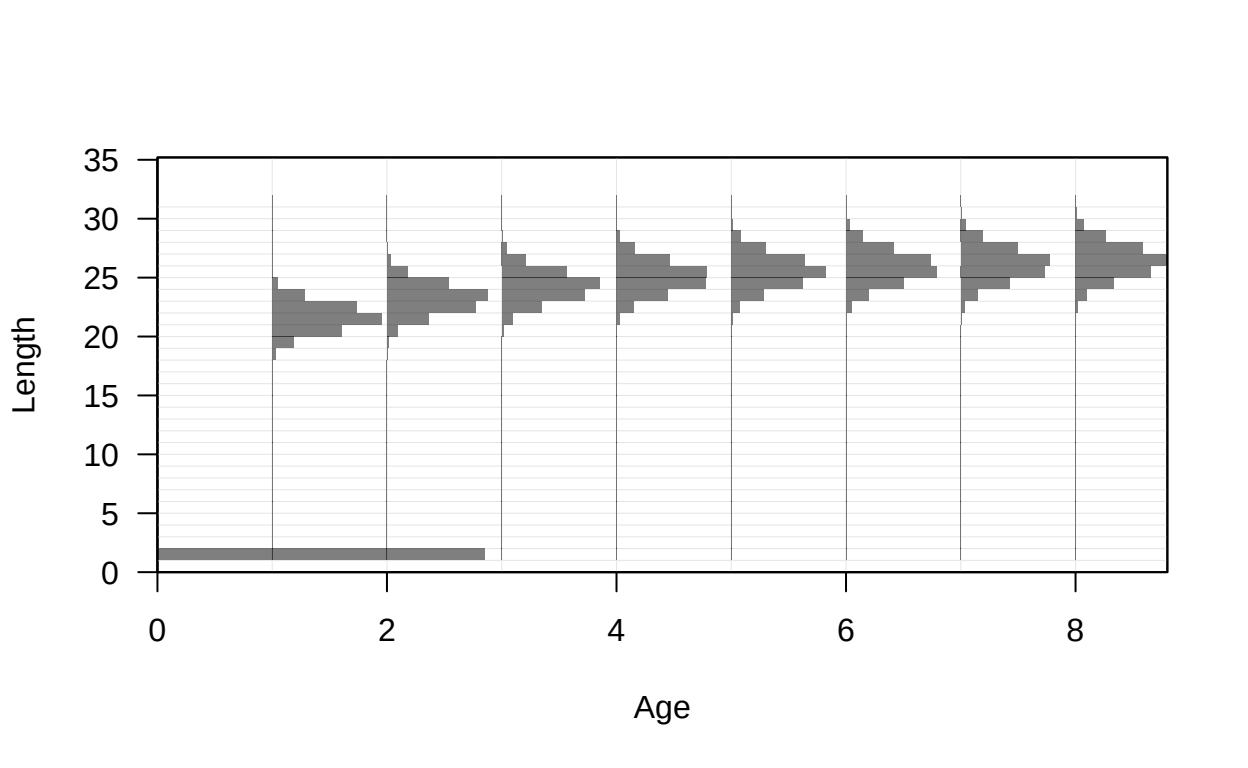

Length (cm, beginning of the year)
0
5
10
15
20
25
30
0
2
4
6
8
Age (yr)

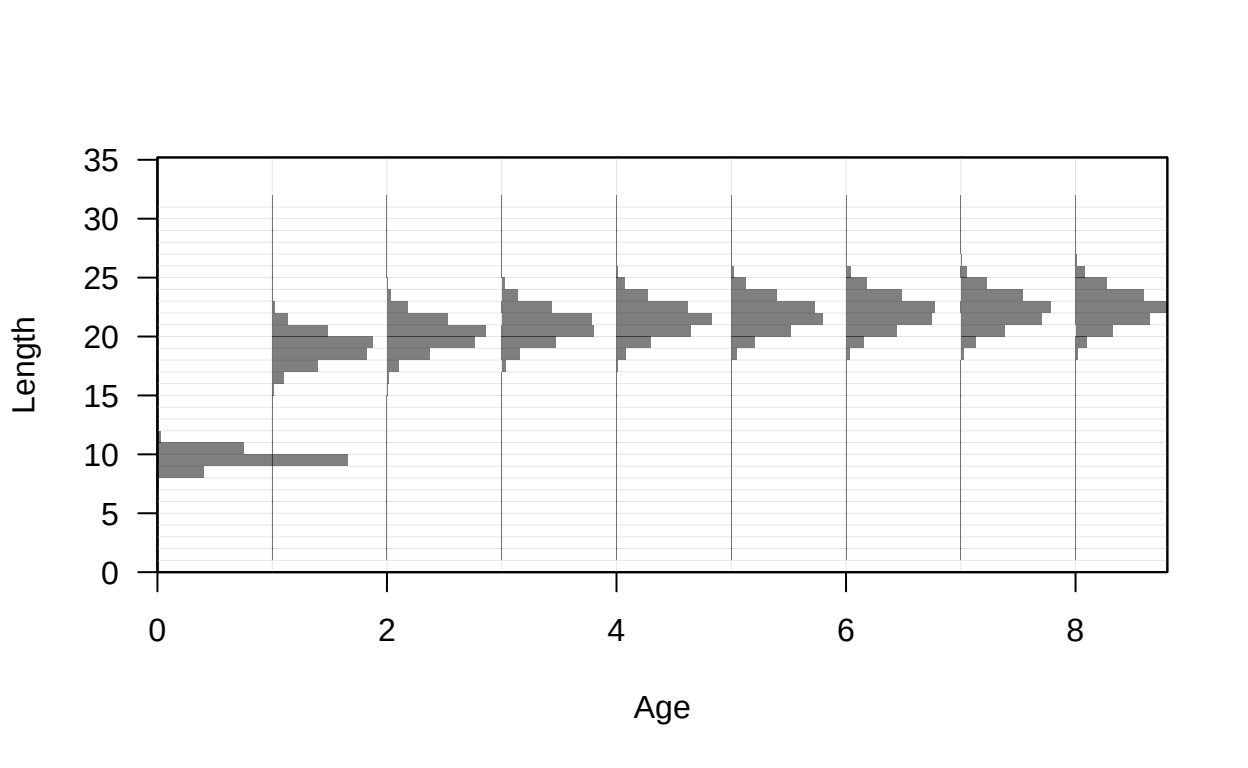

Age (yr)
0
2
4
6
8
Length (cm, beginning of the year)
0
5
10
15
20
25
30
CV of lengths
0
0.02
0.04
0.06
SD of lengths
0.0
0.4
0.8
1.2
0.6

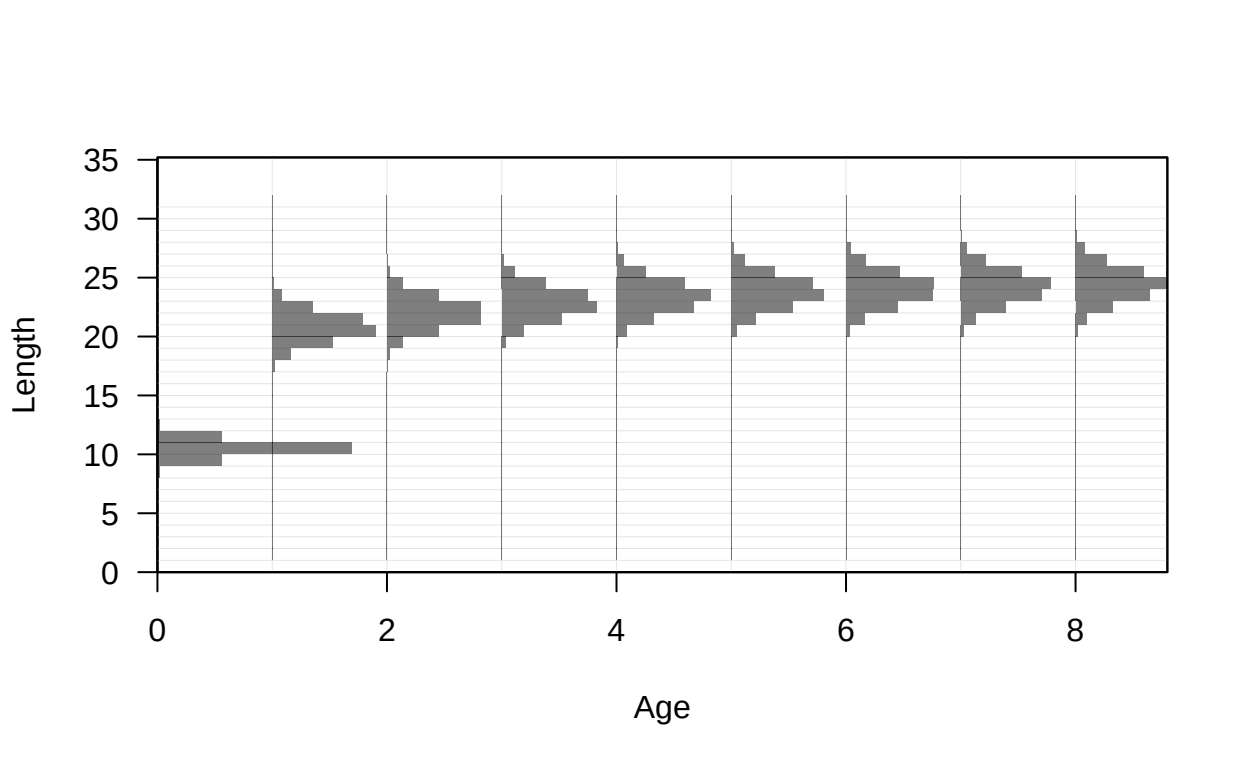

Age (yr)
Mean weight
Length (cm, beginning of the year)
Mean weight
Frac. mature
Age (yr)

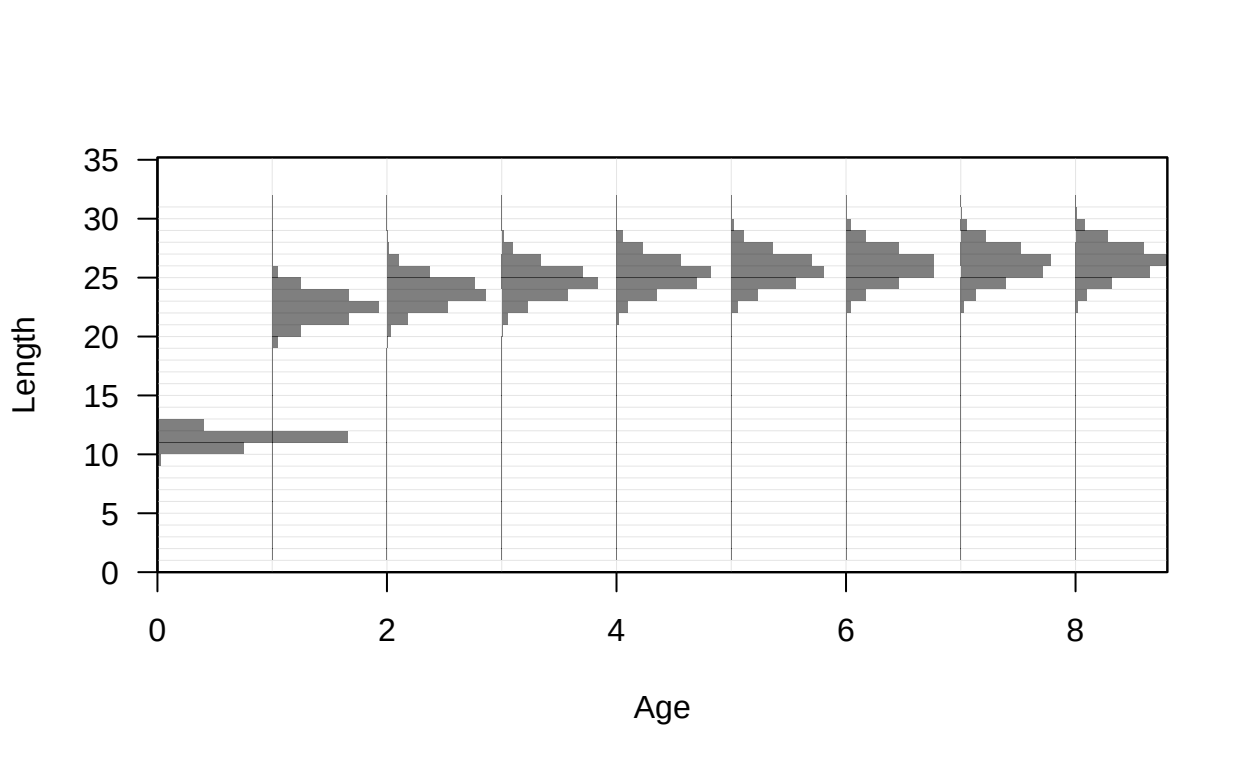

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

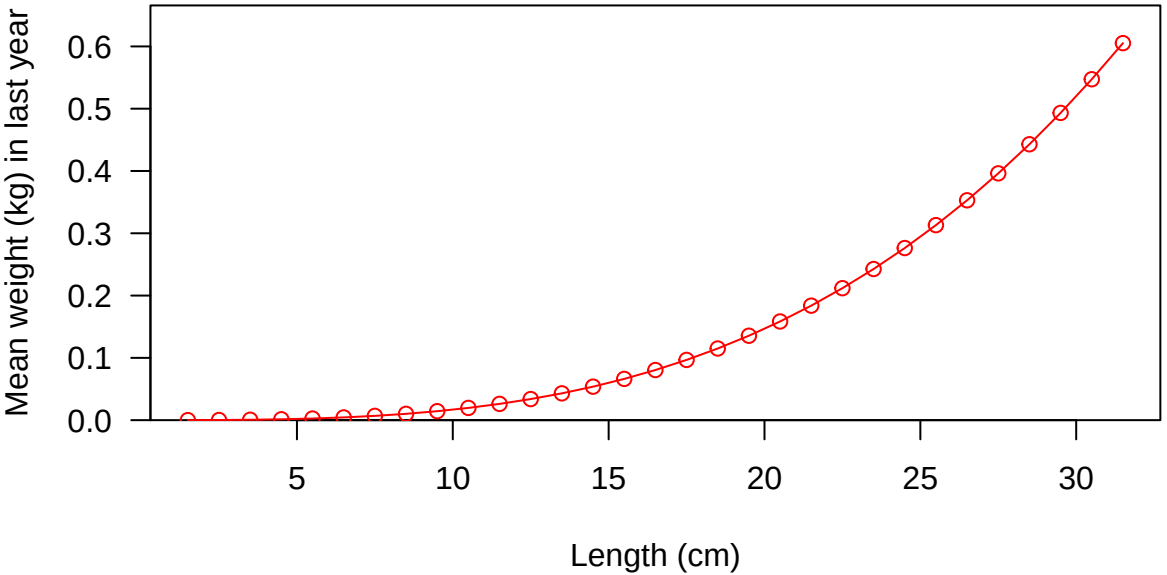

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

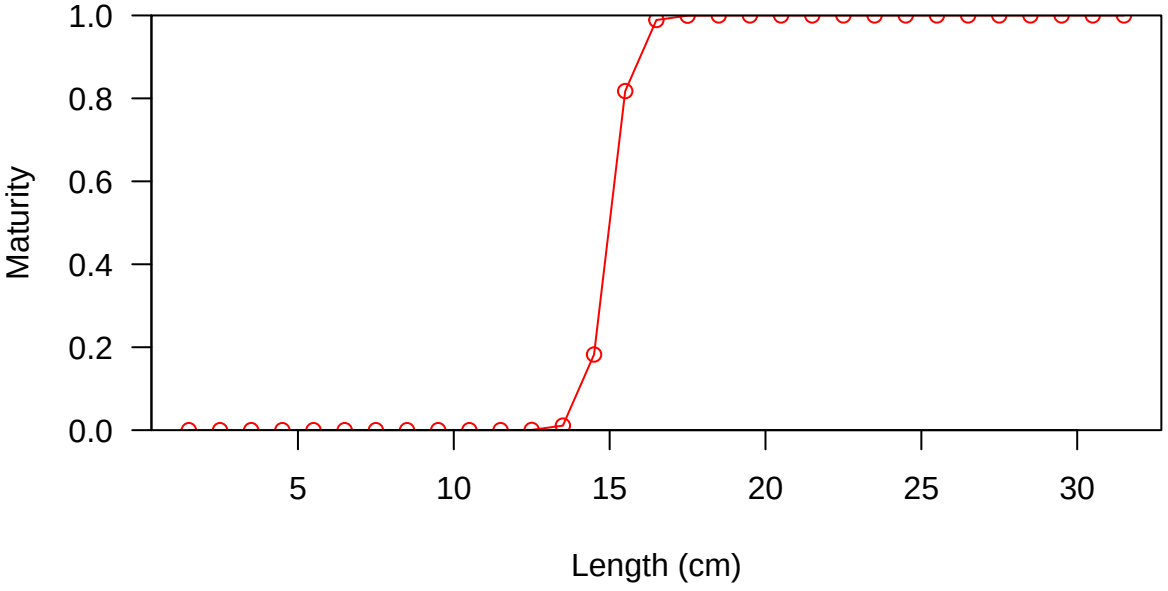

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

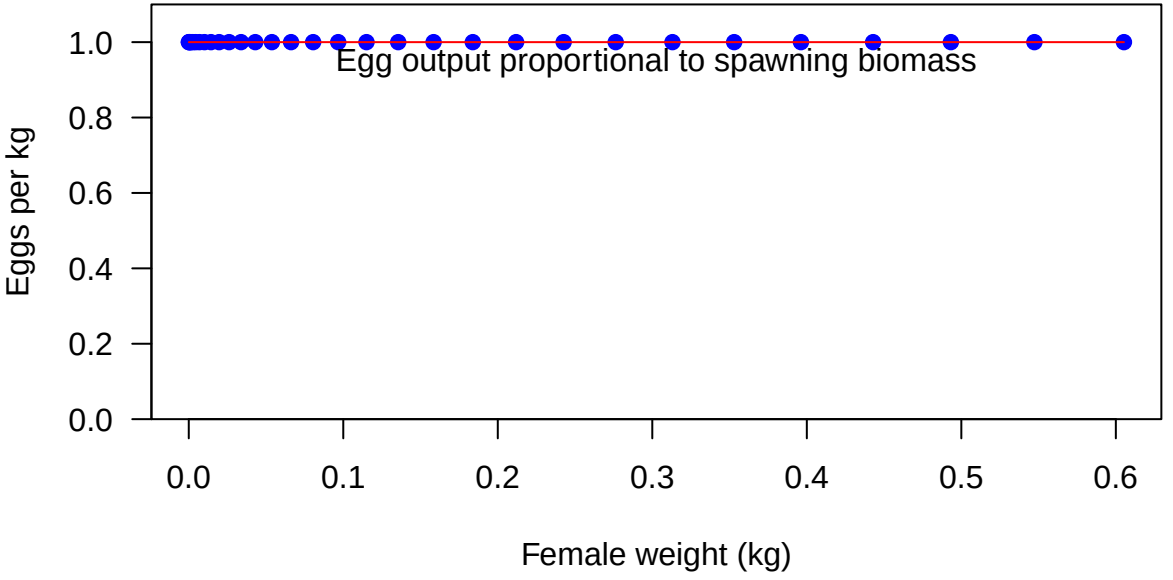

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

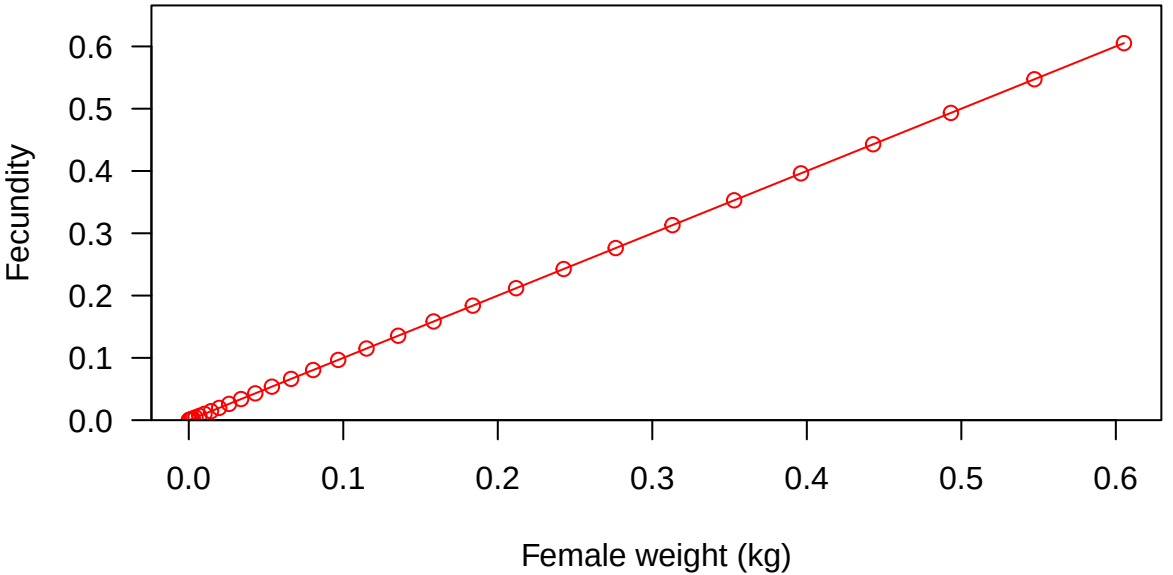

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

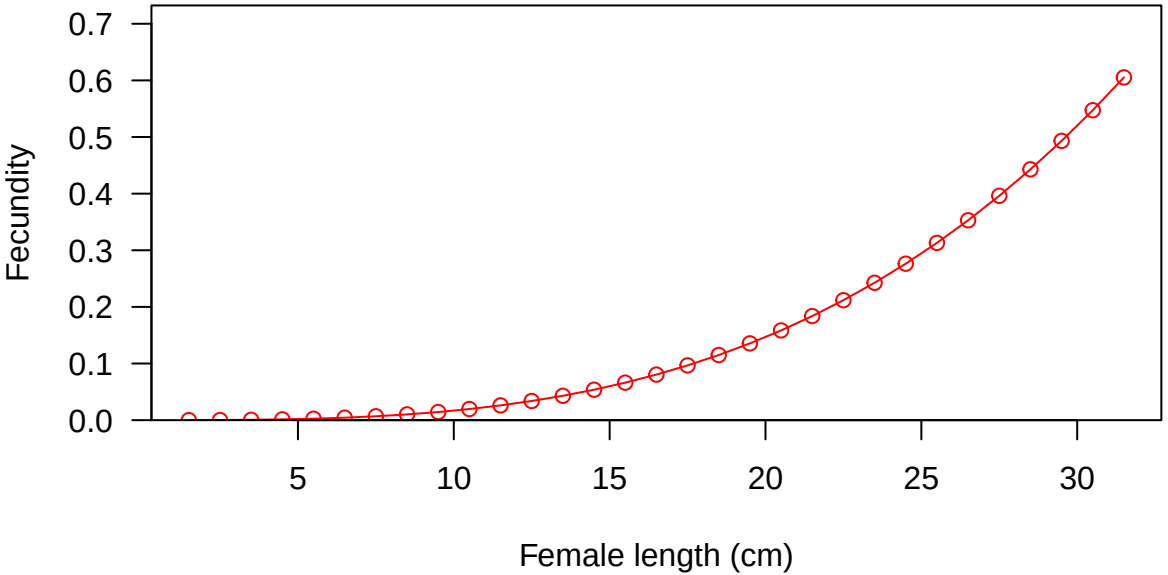

35
30
25
20
15
10
5
0
Length
0
2
4
6
8
Age

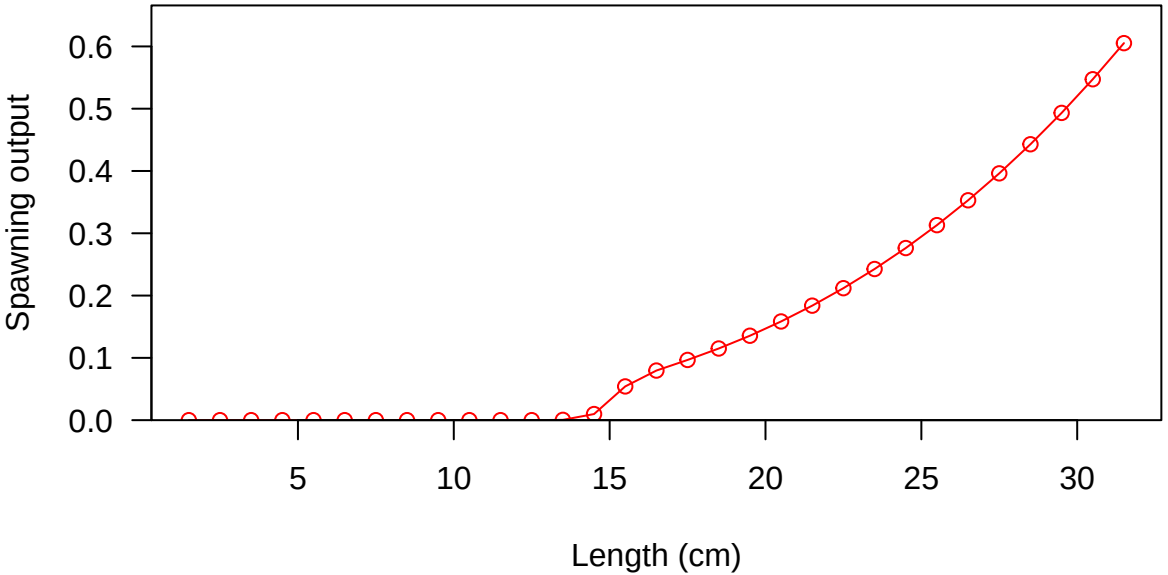

Mean weight (kg) in last year
0.0
0.1
0.2
0.3
0.4
0.5
0.6
5
10
15
20
25
30
Length (cm)

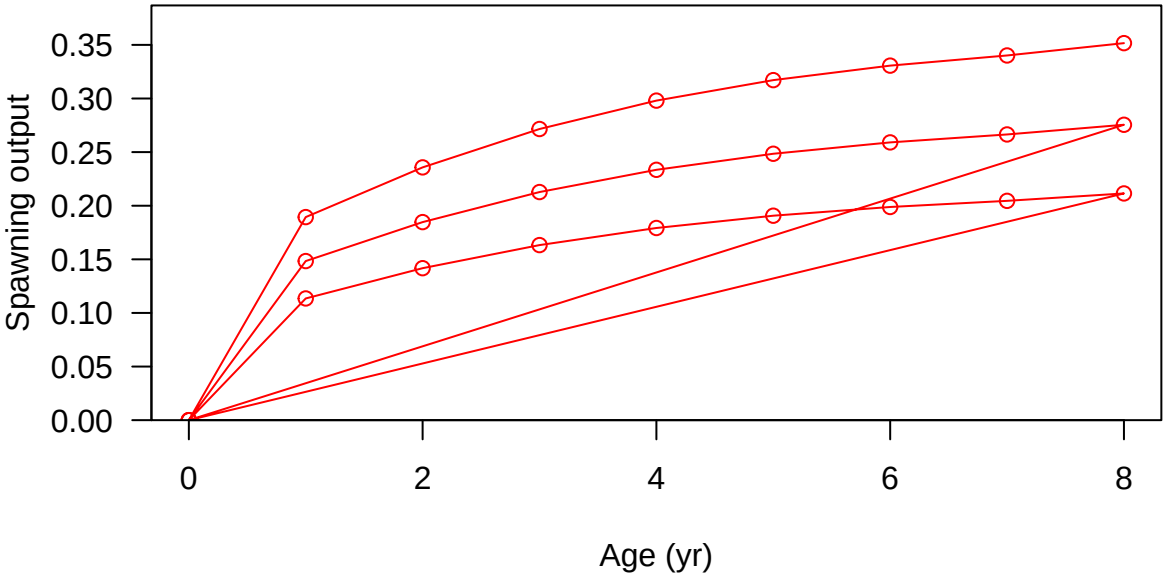

1.0
0.8
0.6
0.4
0.2
0.0
Maturity
5
10
15
20
25
30
Length (cm)

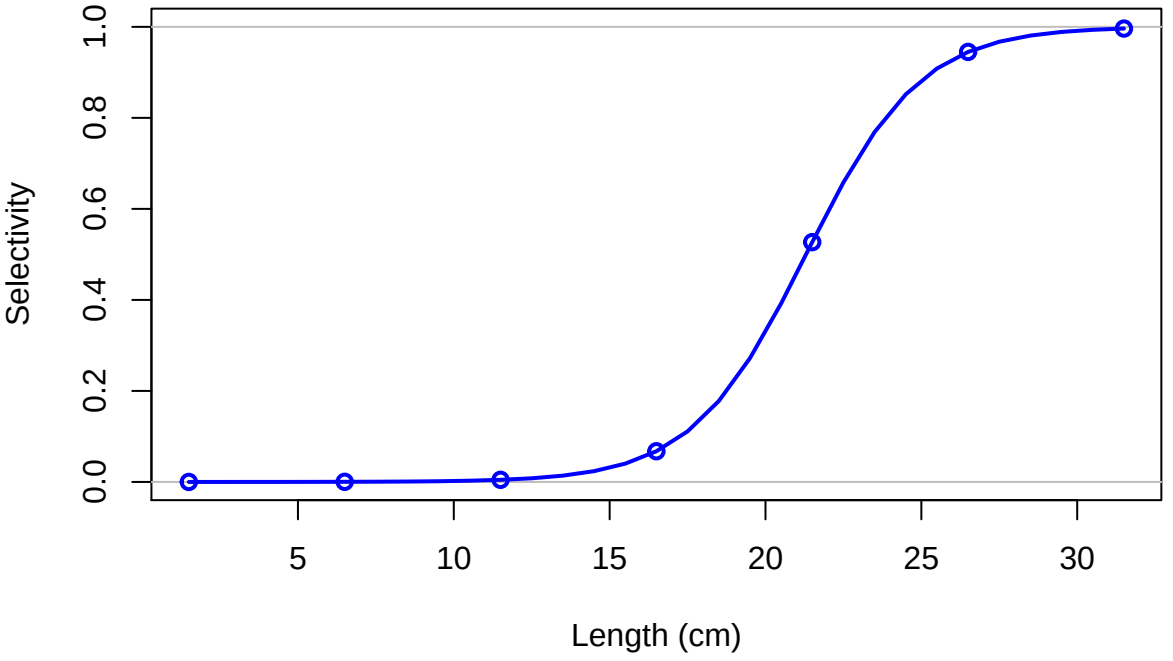

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Female weight (kg)

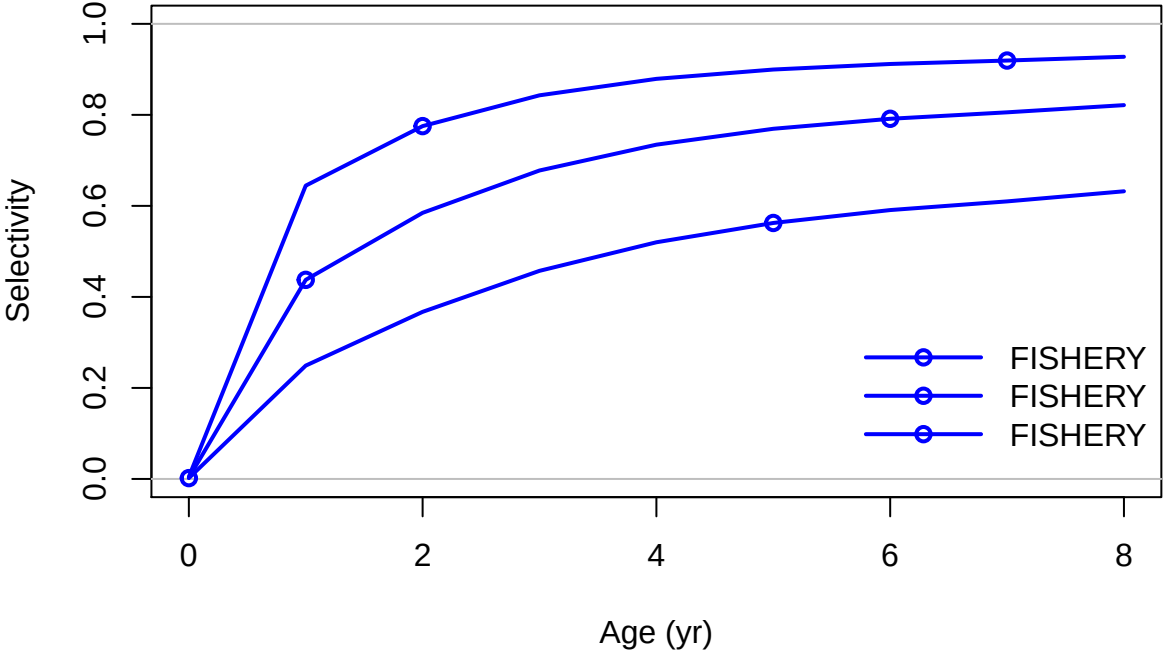

Fecundity
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Female weight (kg)

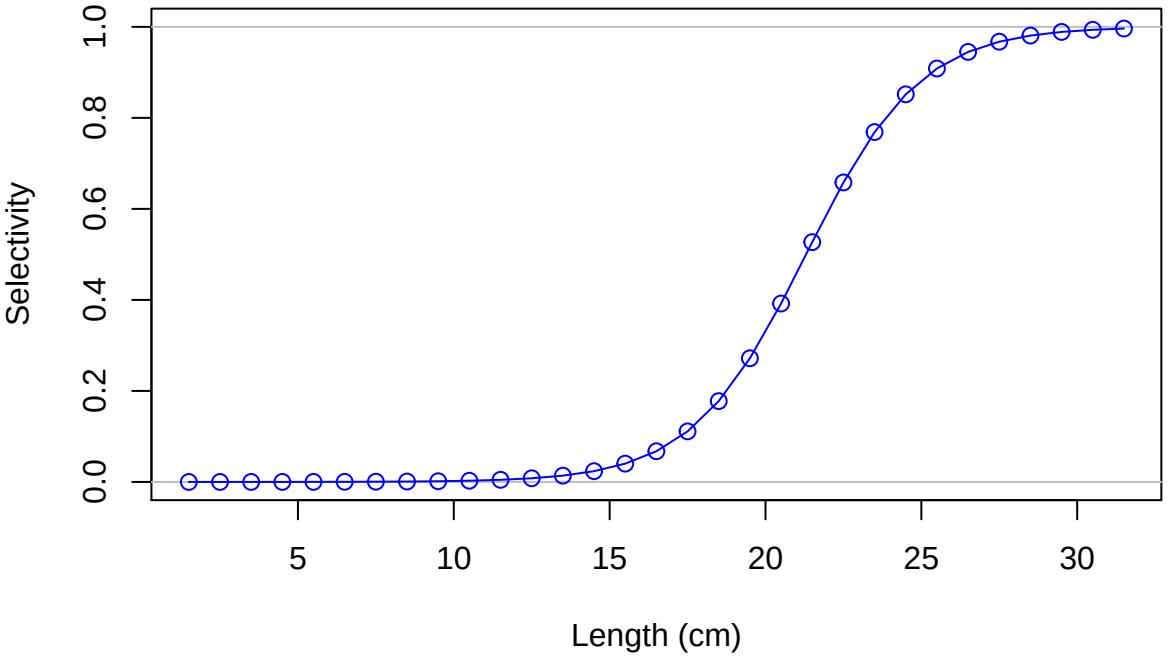

Fecundity
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
5
10
15
20
25
30
Female length (cm)

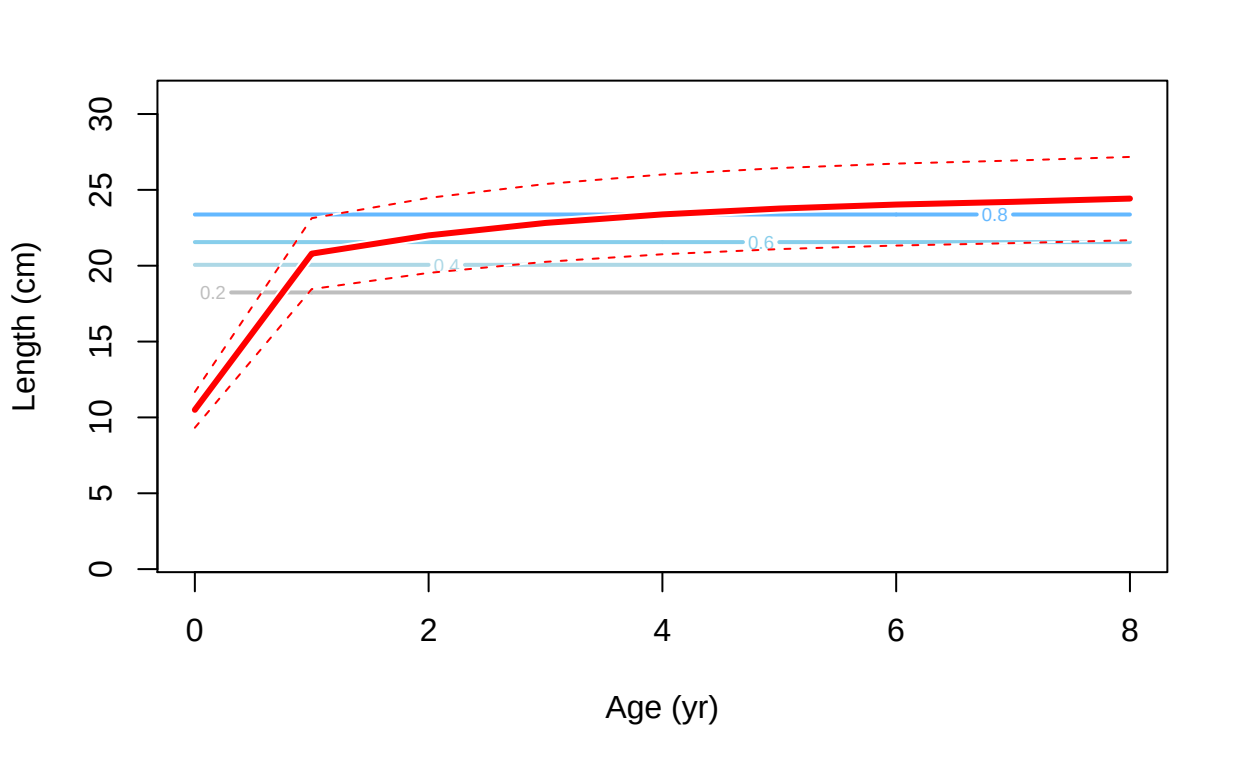

Spawning output
0.0
0.1
0.2
0.3
0.4
0.5
0.6
5
10
15
20
25
30
Length (cm)

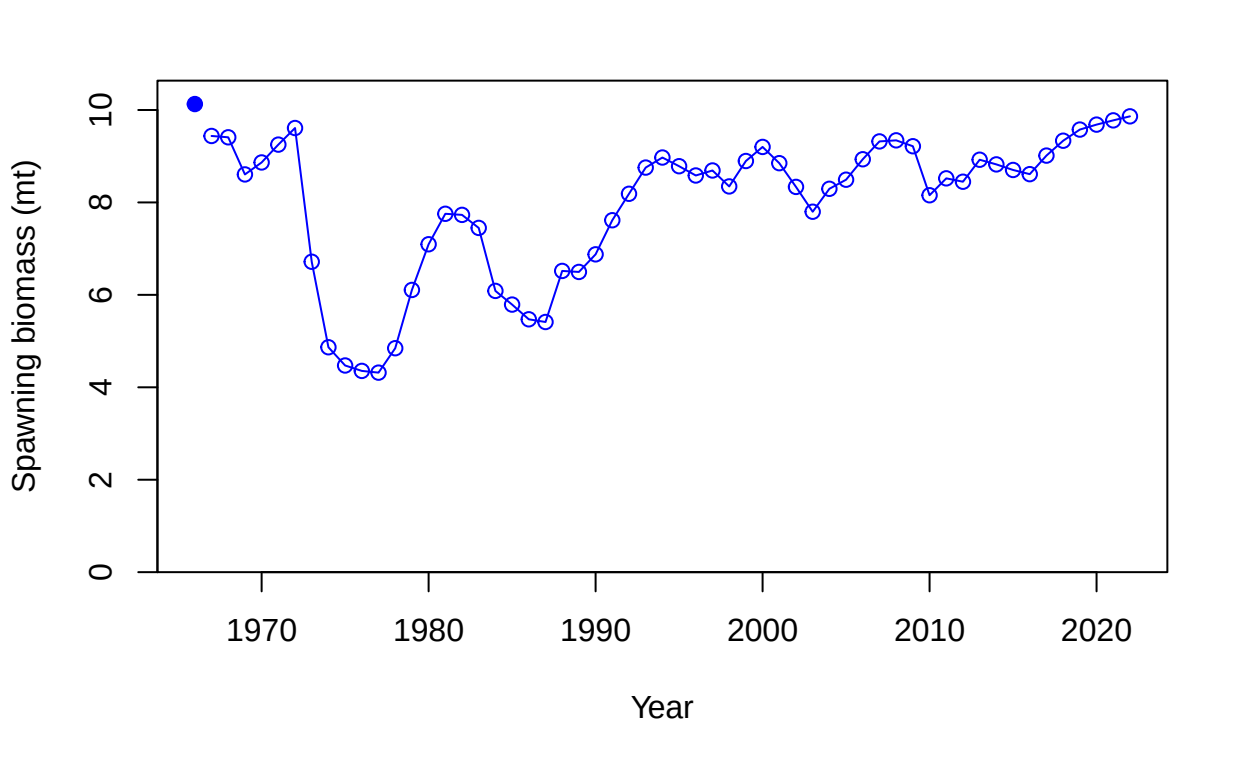

Spawning output
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0
2
4
6
8
Age (yr)

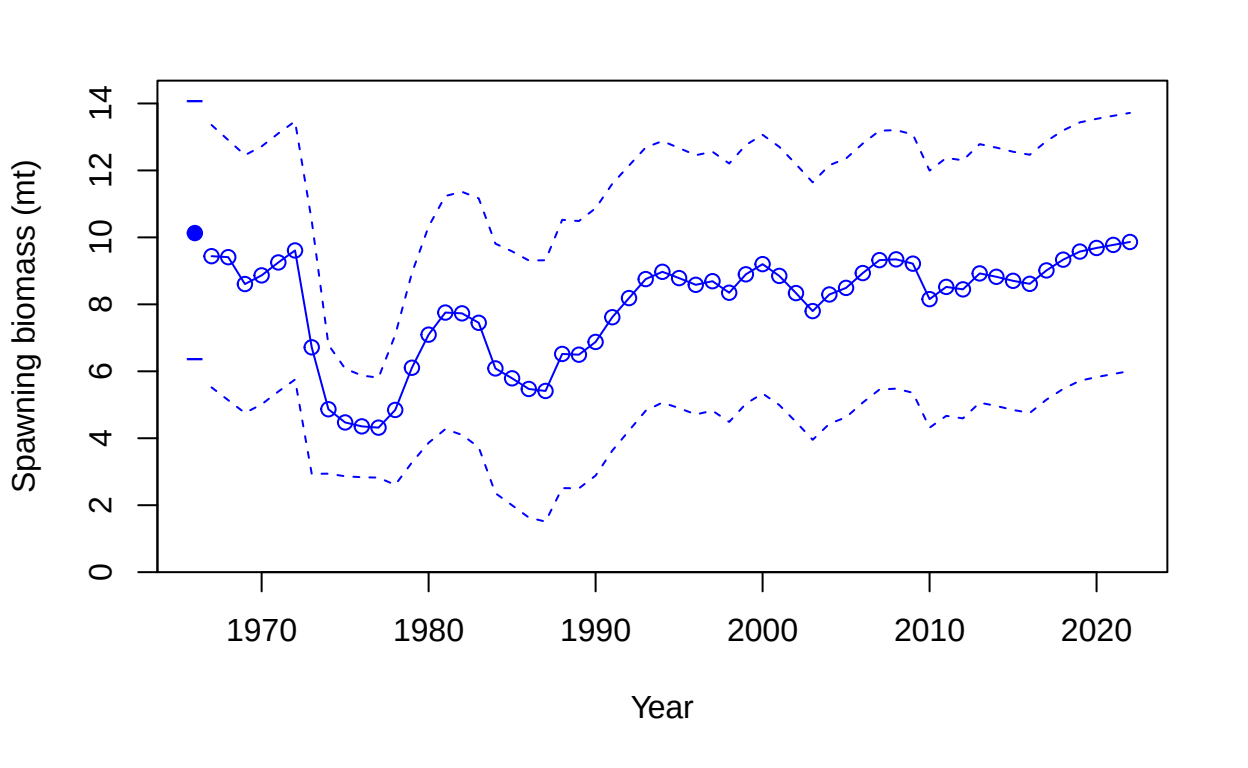

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20
25
30
Length (cm)

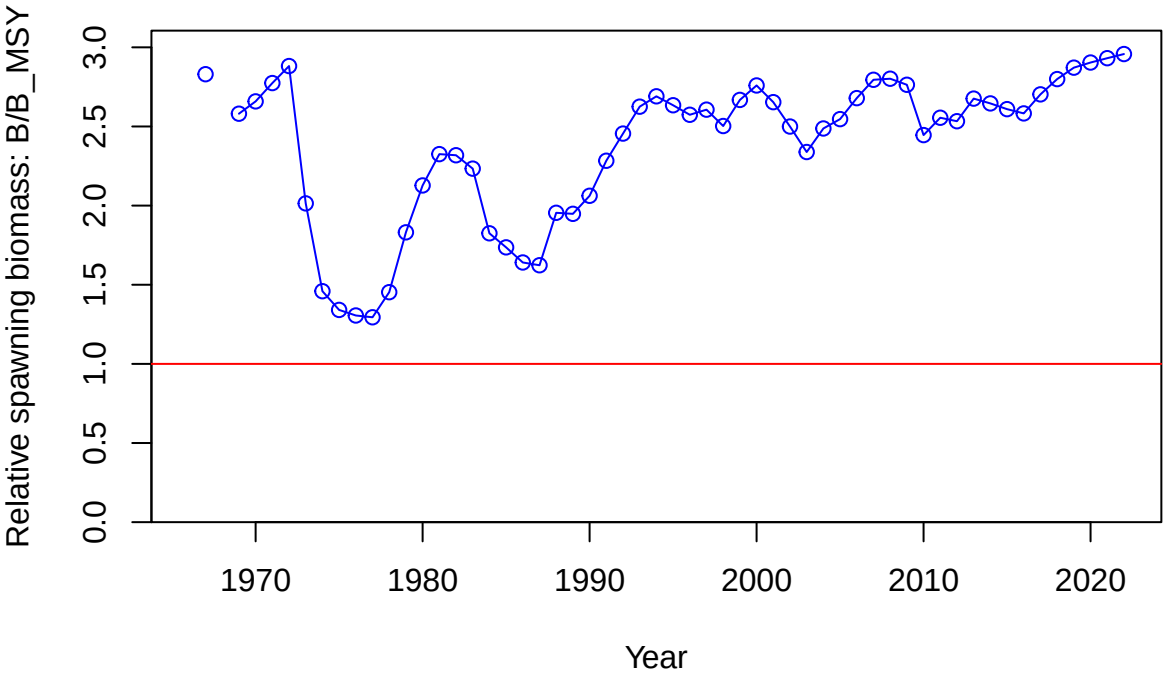

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
Age (yr)
FISHERY
FISHERY
FISHERY

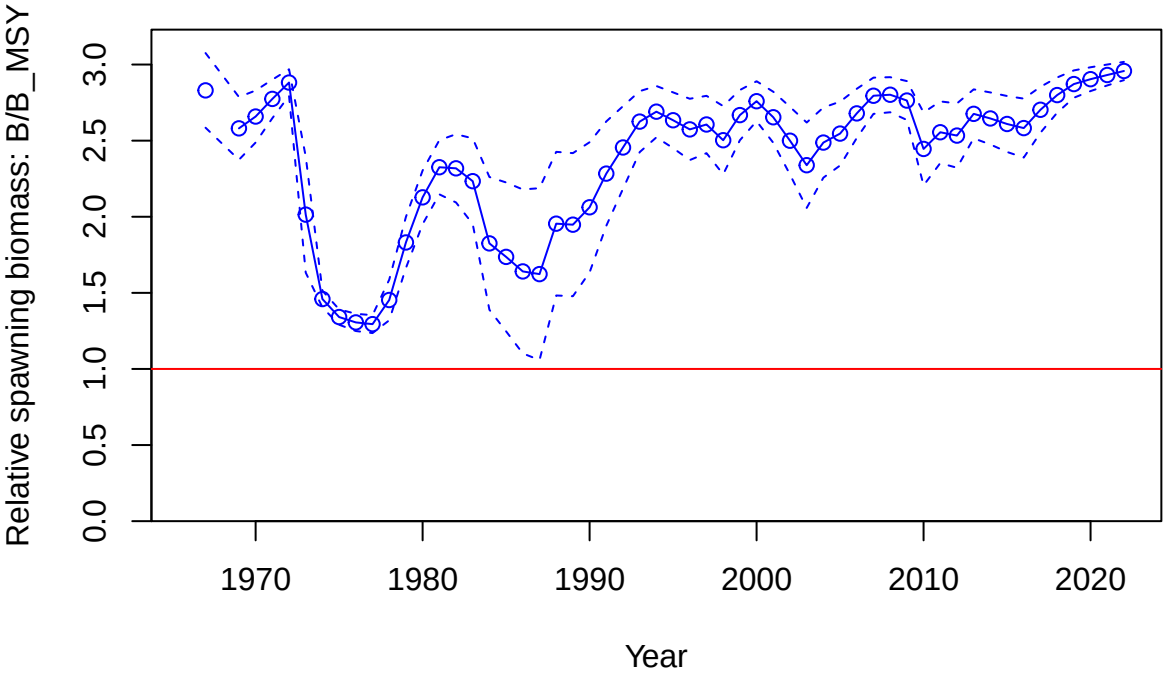

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20
25
30
Length (cm)

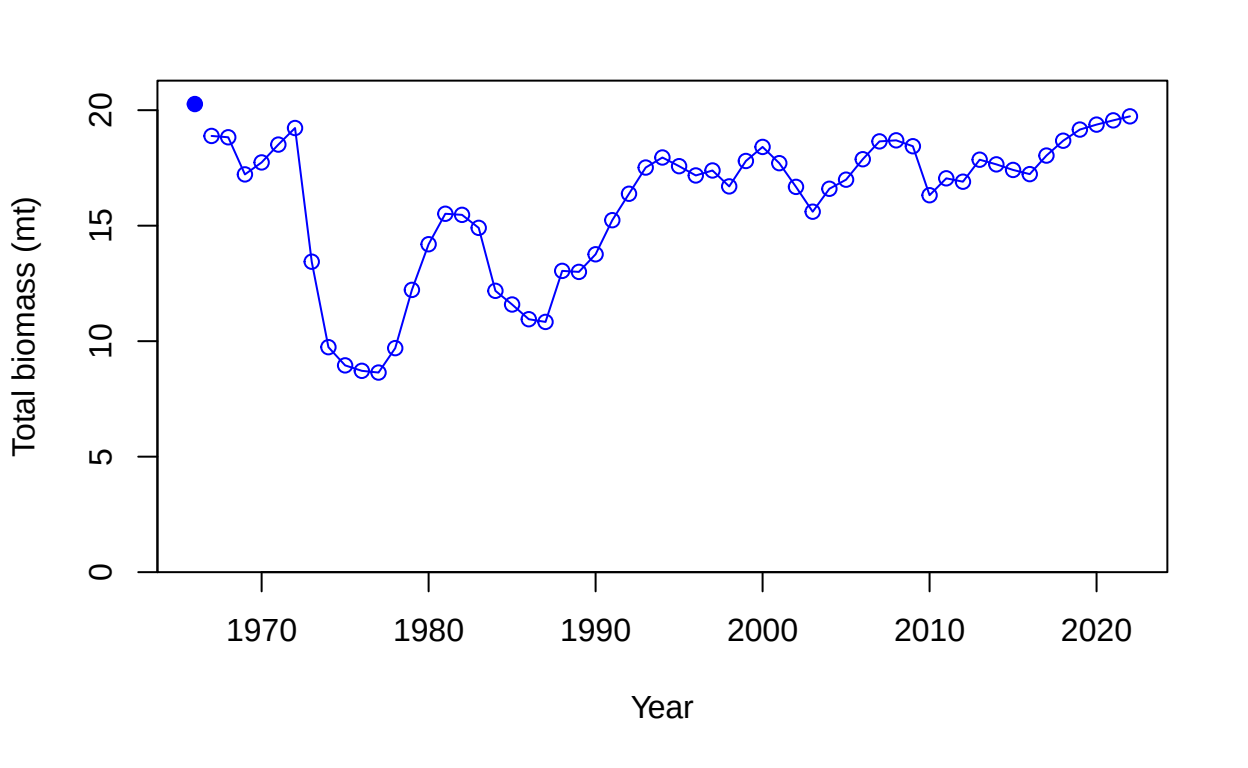

Length (cm)
0
5
10
15
20
25
30
0
2
4
6
8
Age (yr)
0.8
0.6
0.4
0.2

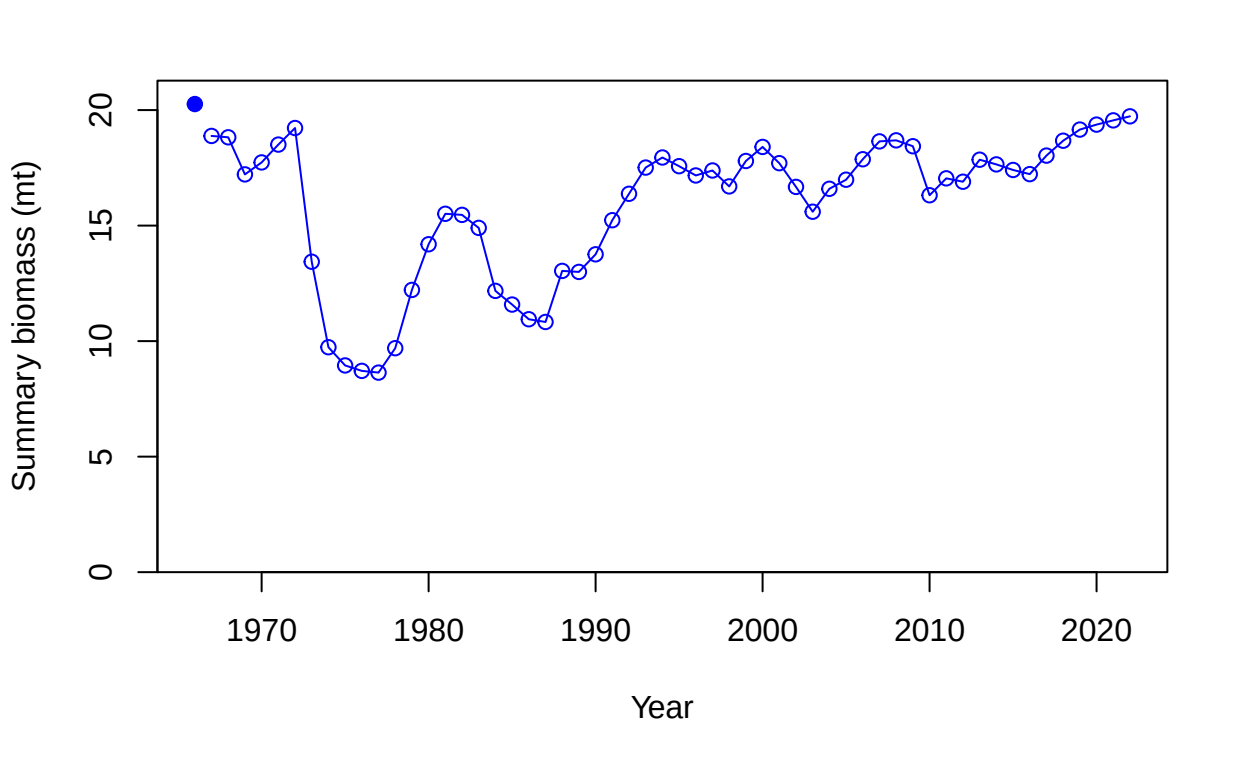

Spawning biomass (mt)
0
2
4
6
8
10
1970
1980
1990
2000
2010
2020
Year

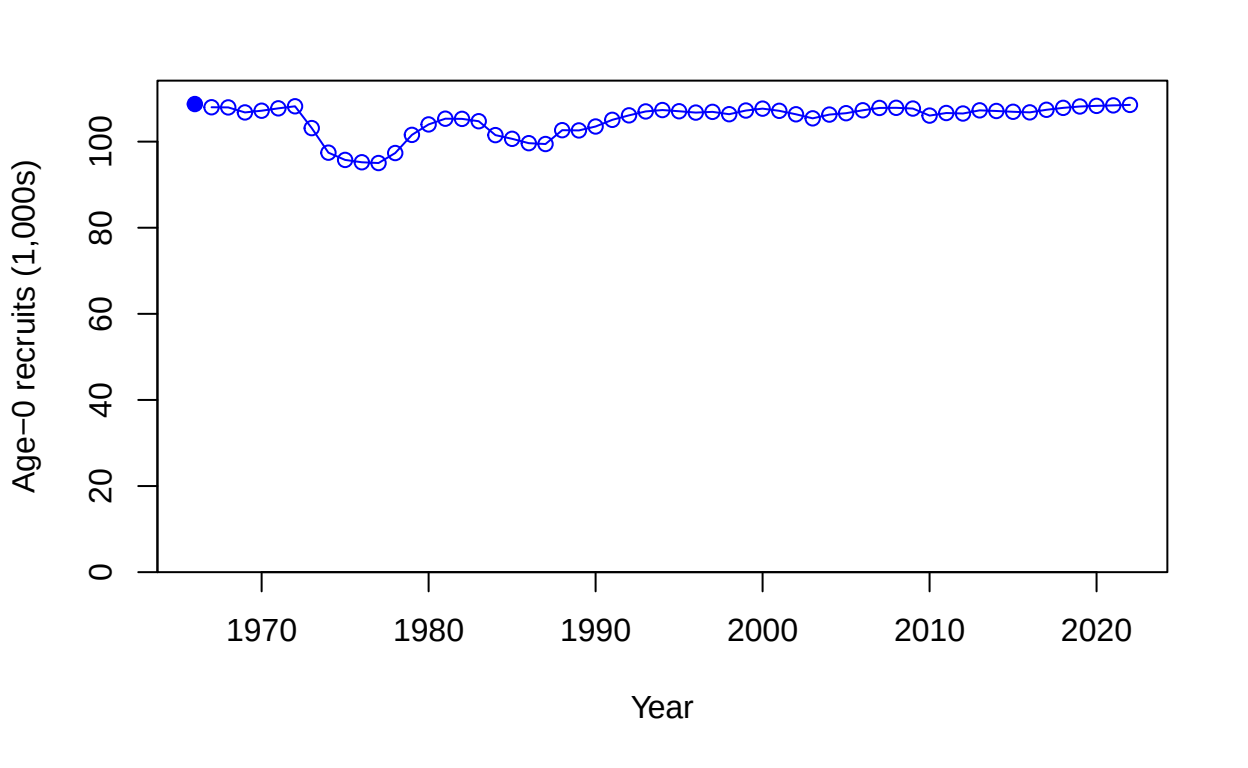

Spawning biomass (mt)
0
2
4
6
8
10
12
14
1970
1980
1990
2000
2010
2020
Year

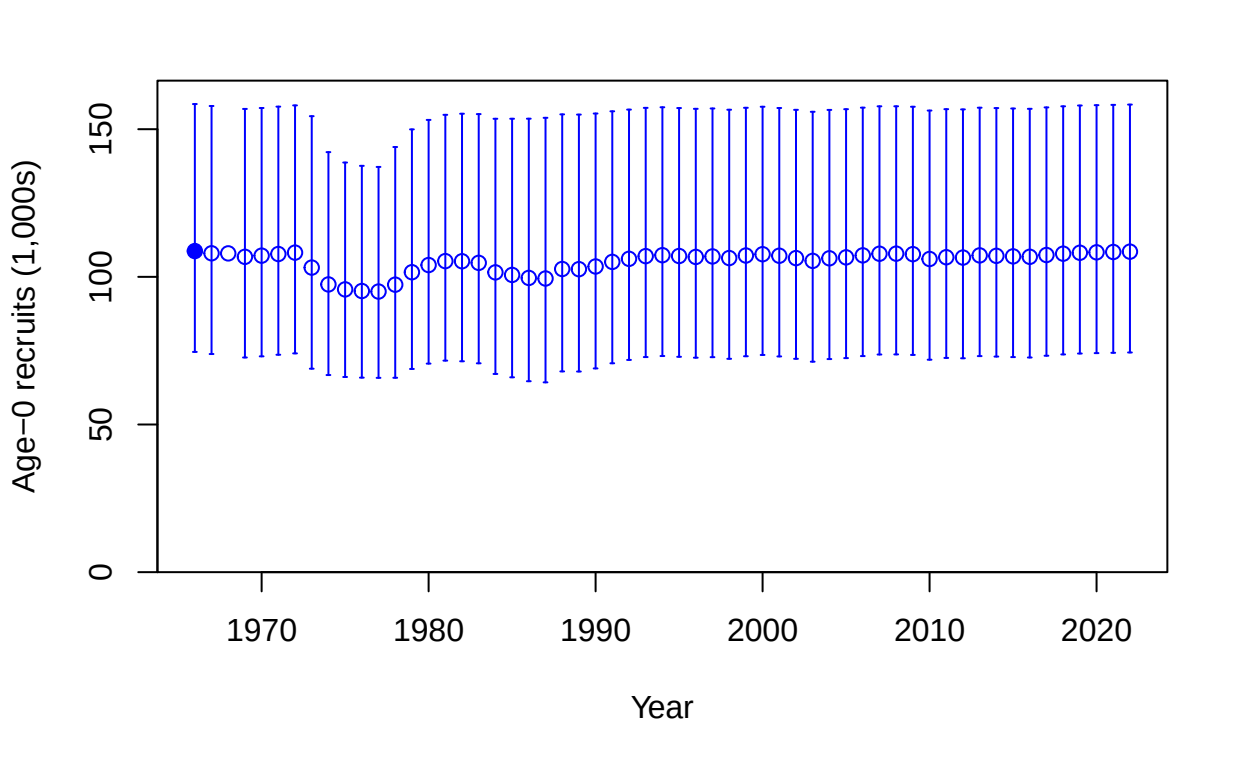

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

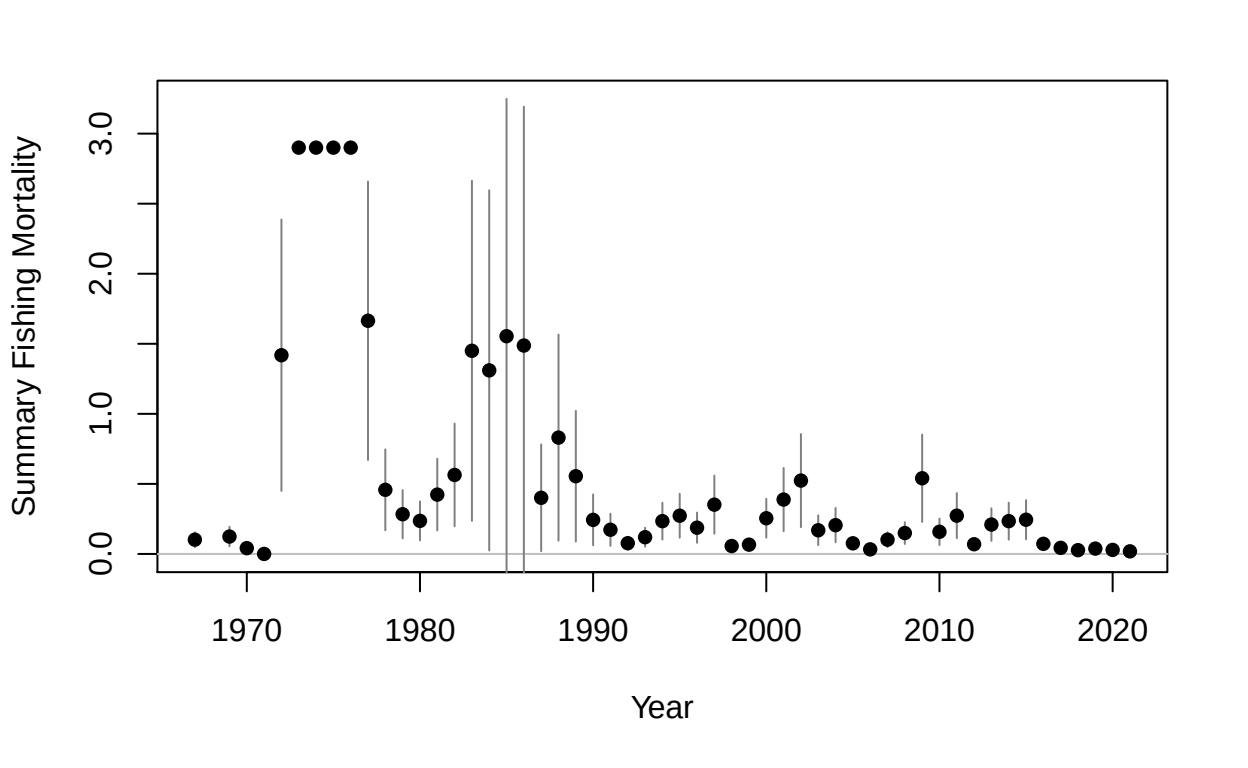

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

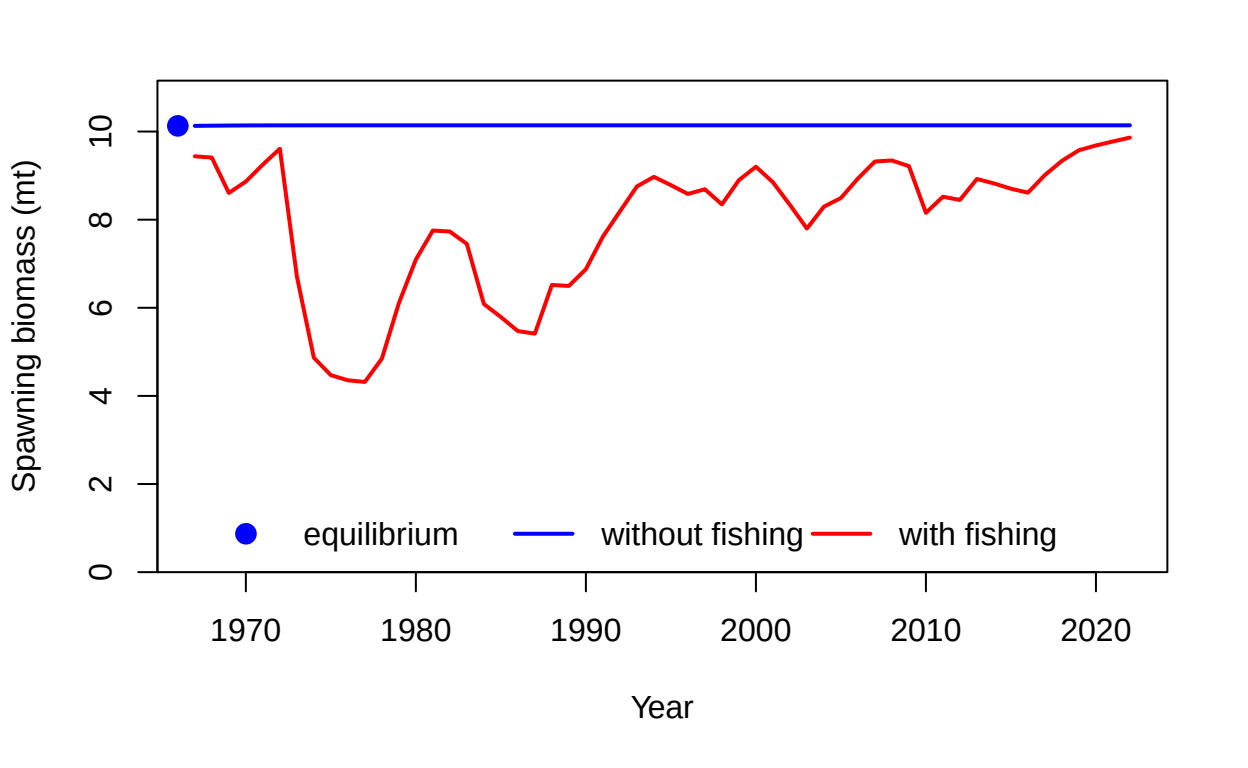

Total biomass (mt)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year

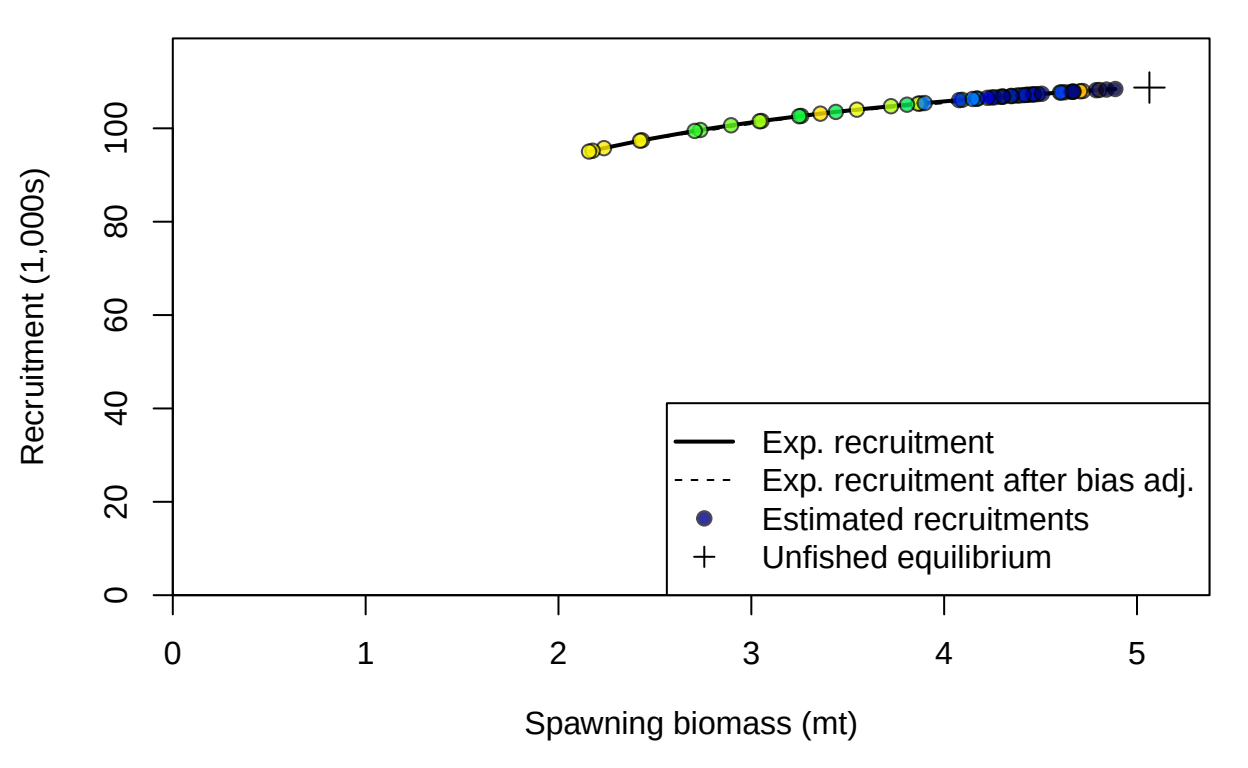

Summary biomass (mt)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year

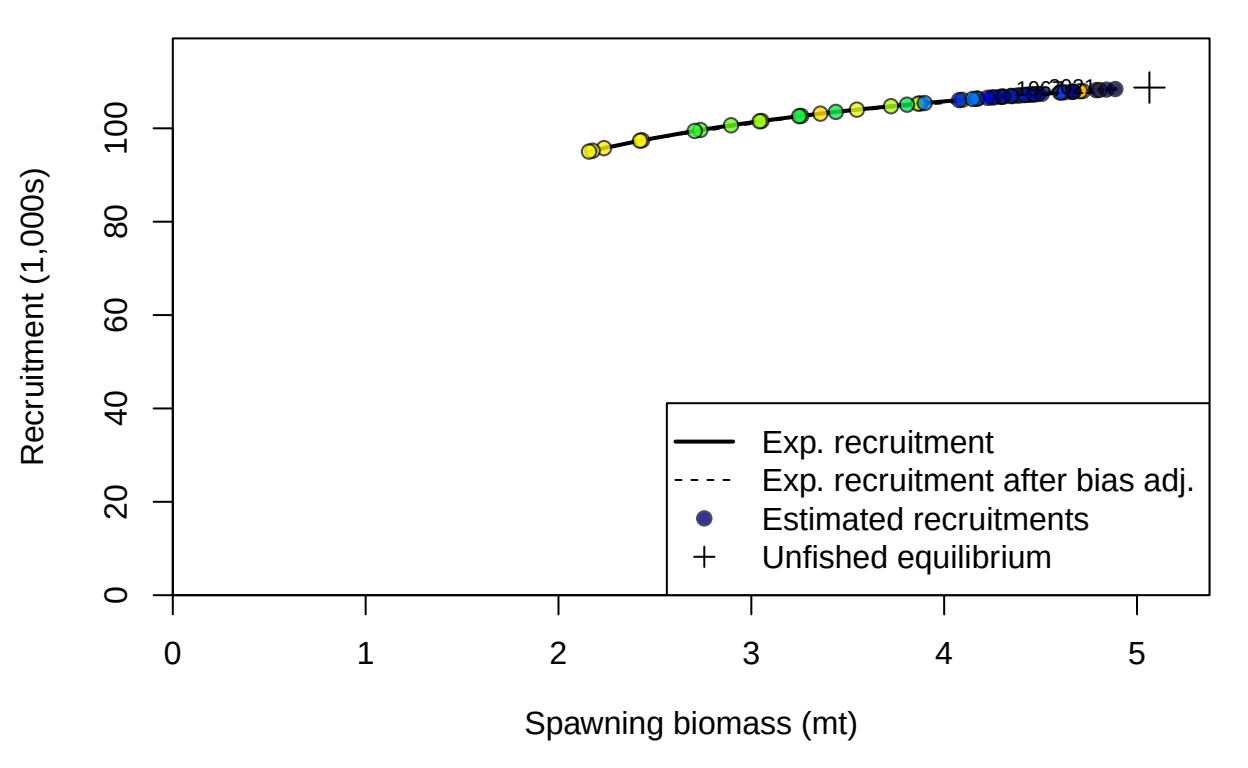

Age−0 recruits (1,000s)
0
20
40
60
80
100
1970
1980
1990
2000
2010
2020
Year

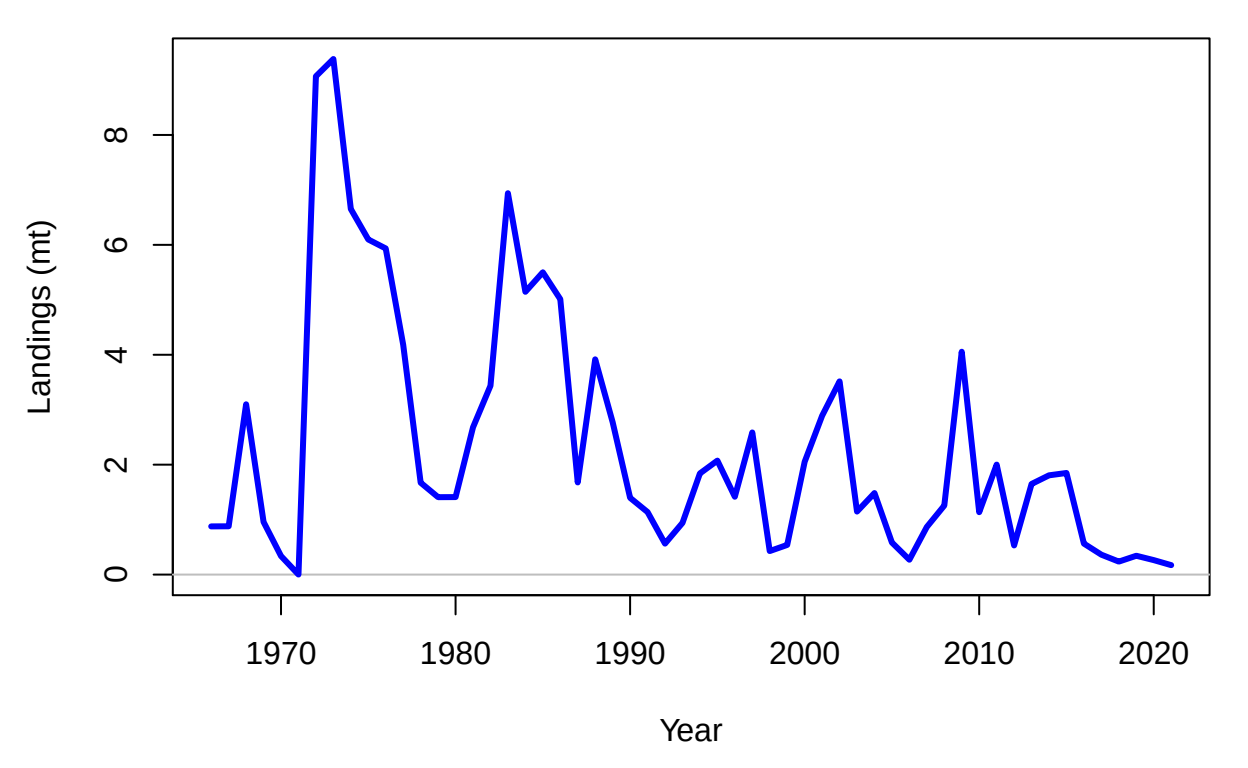

Age−0 recruits (1,000s)
0
50
100
150
1970
1980
1990
2000
2010
2020
Year

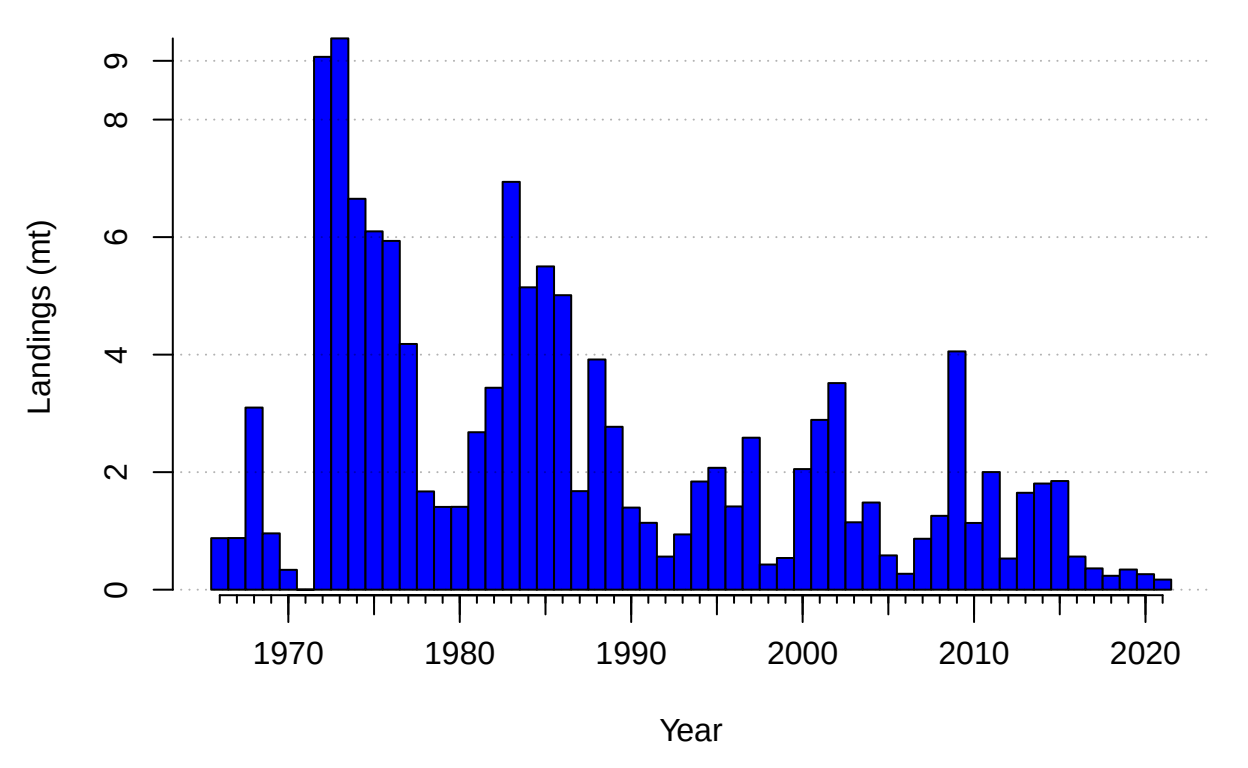

Summary Fishing Mortality
0.0
1.0
2.0
3.0
1970
1980
1990
2000
2010
2020
Year

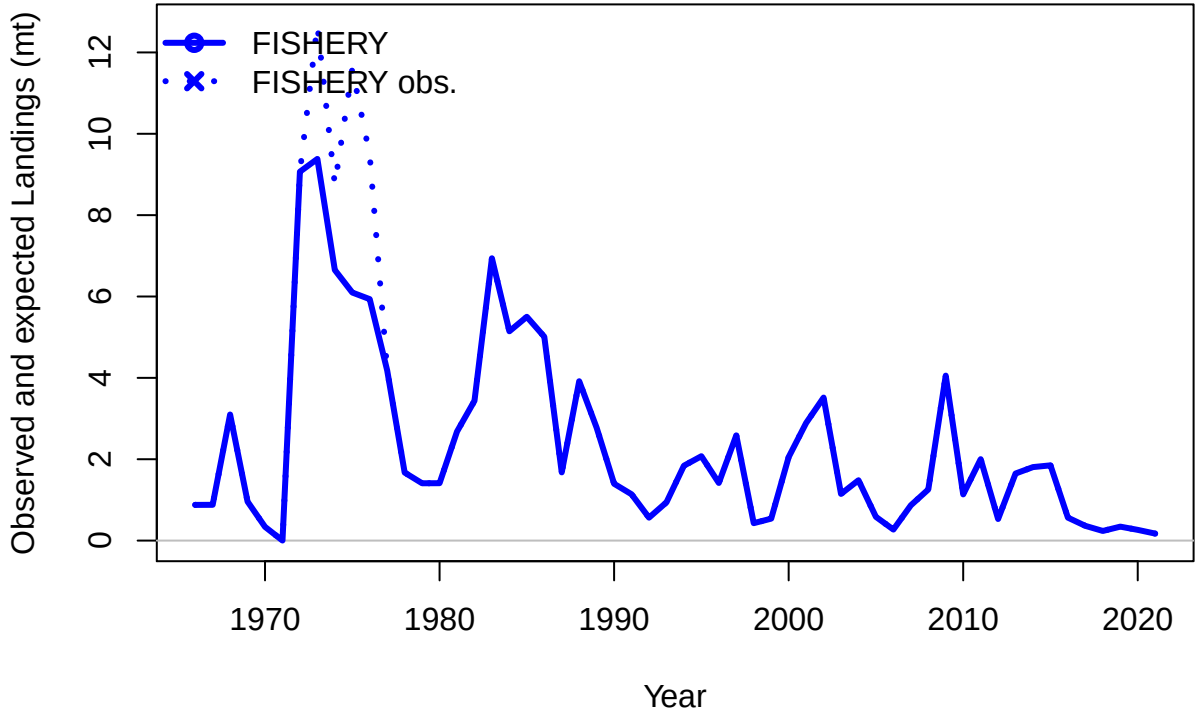

Spawning biomass (mt)
0
2
4
6
8
10
1970
1980
1990
2000
2010
2020
Year
equilibrium
without fishing
with fishing

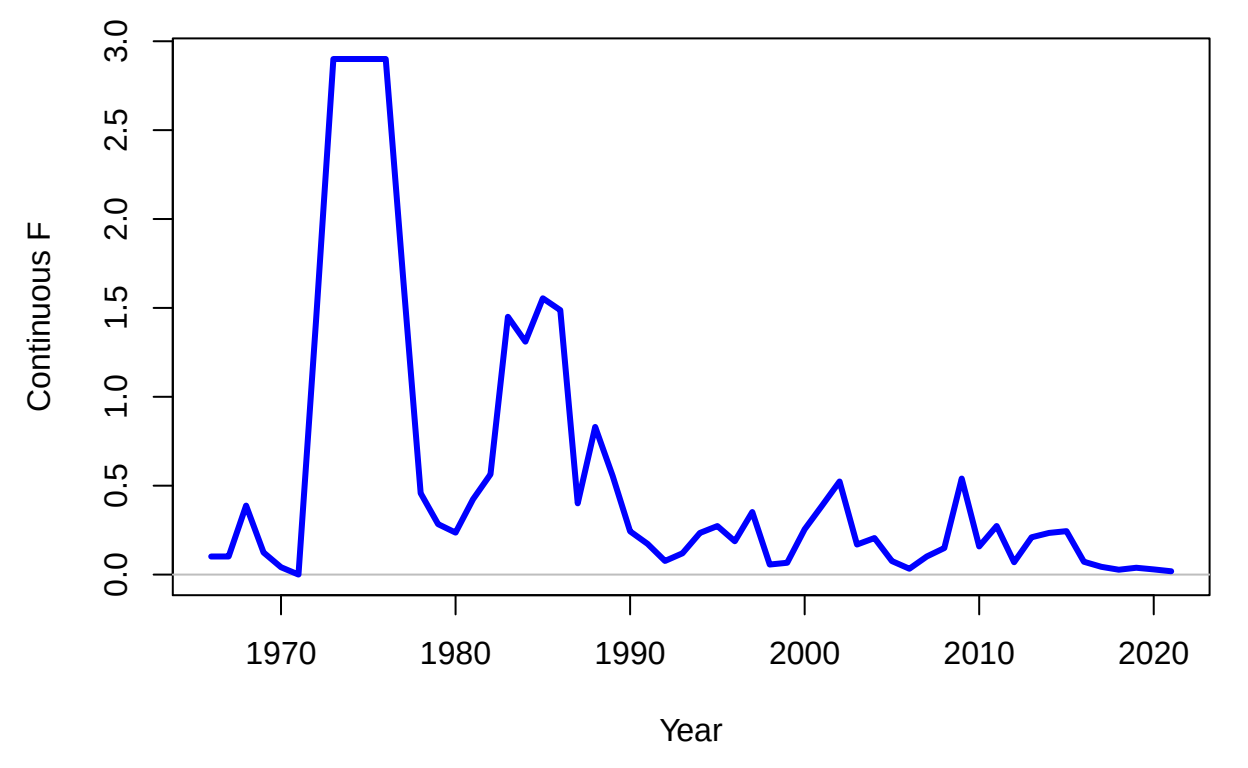

Recruitment (1,000s)
0
20
40
60
80
100
0
1
2
3
4
5
Spawning biomass (mt)
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

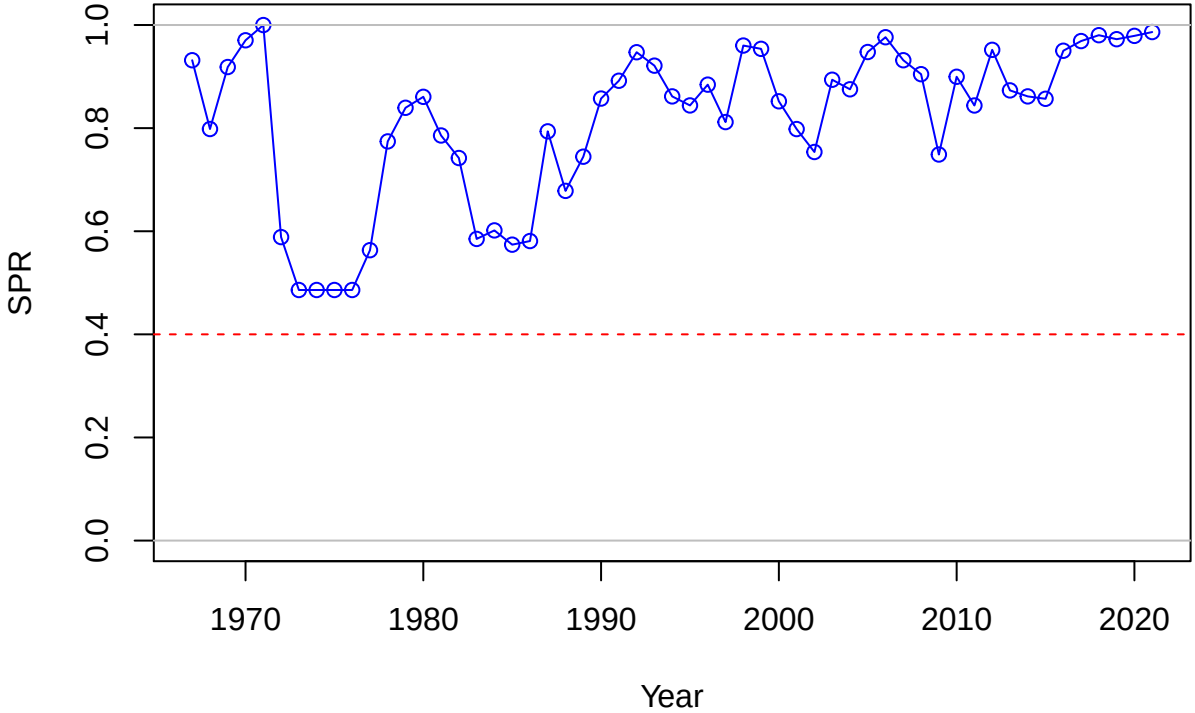

Recruitment (1,000s)
0
20
40
60
80
100
0
1
2
3
4
5
Spawning biomass (mt)
1962
2021
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

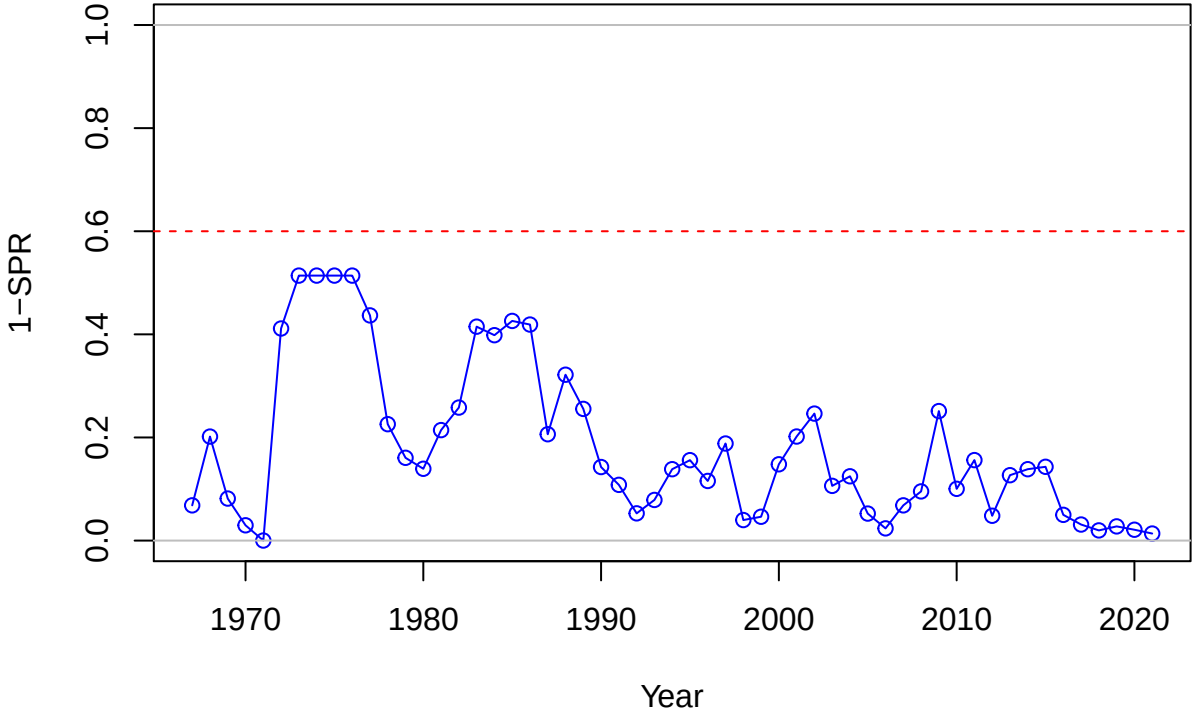

Landings (mt)
0
2
4
6
8
1970
1980
1990
2000
2010
2020
Year

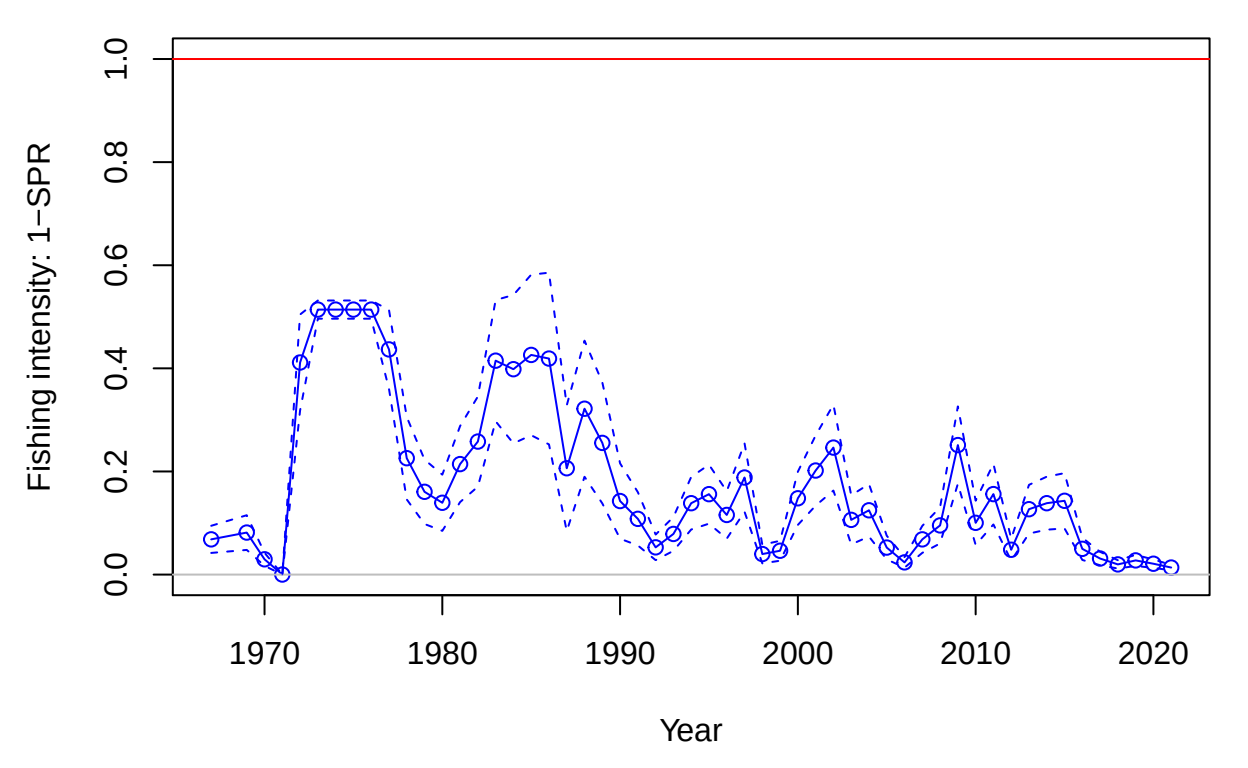

Landings (mt)
0
2
4
6
8
9
1970
1980
1990
2000
2010
2020
Year

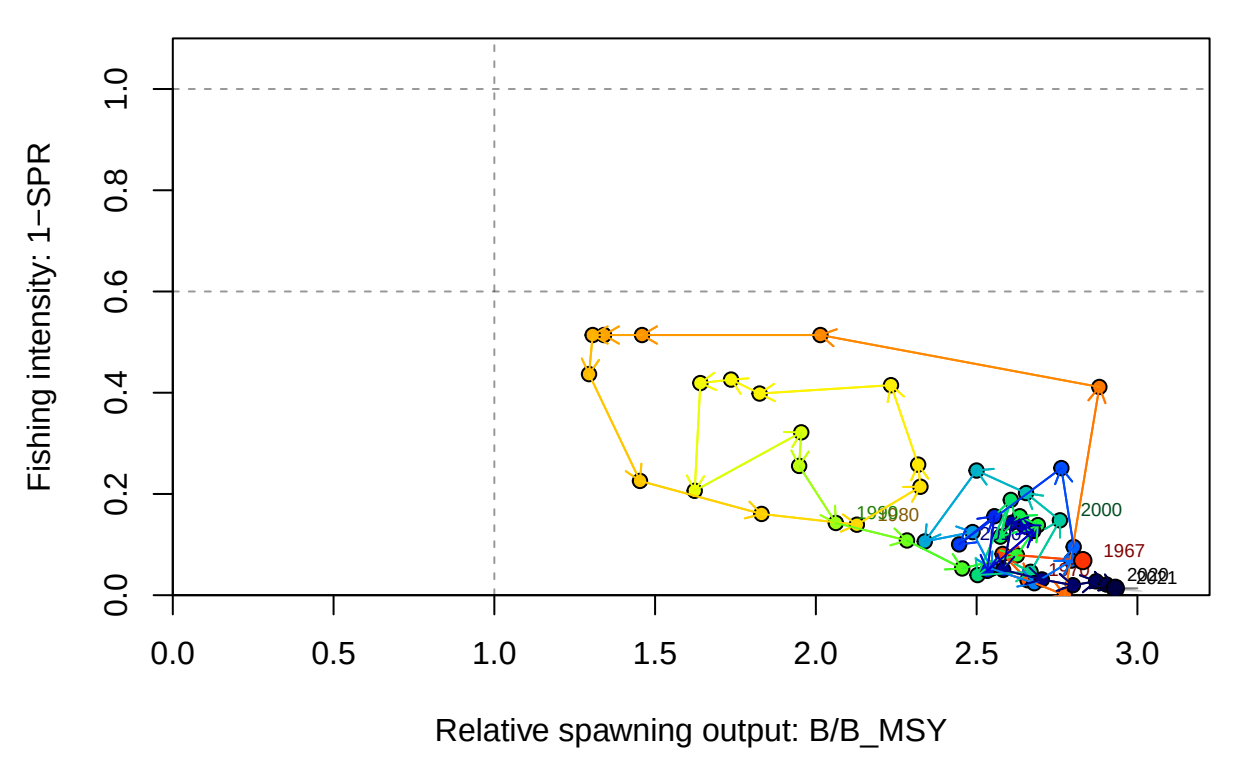

FISHERY
FISHERY obs.
Observed and expected Landings (mt)
0
2
4
6
8
10
12
1970
1980
1990
2000
2010
2020
Year

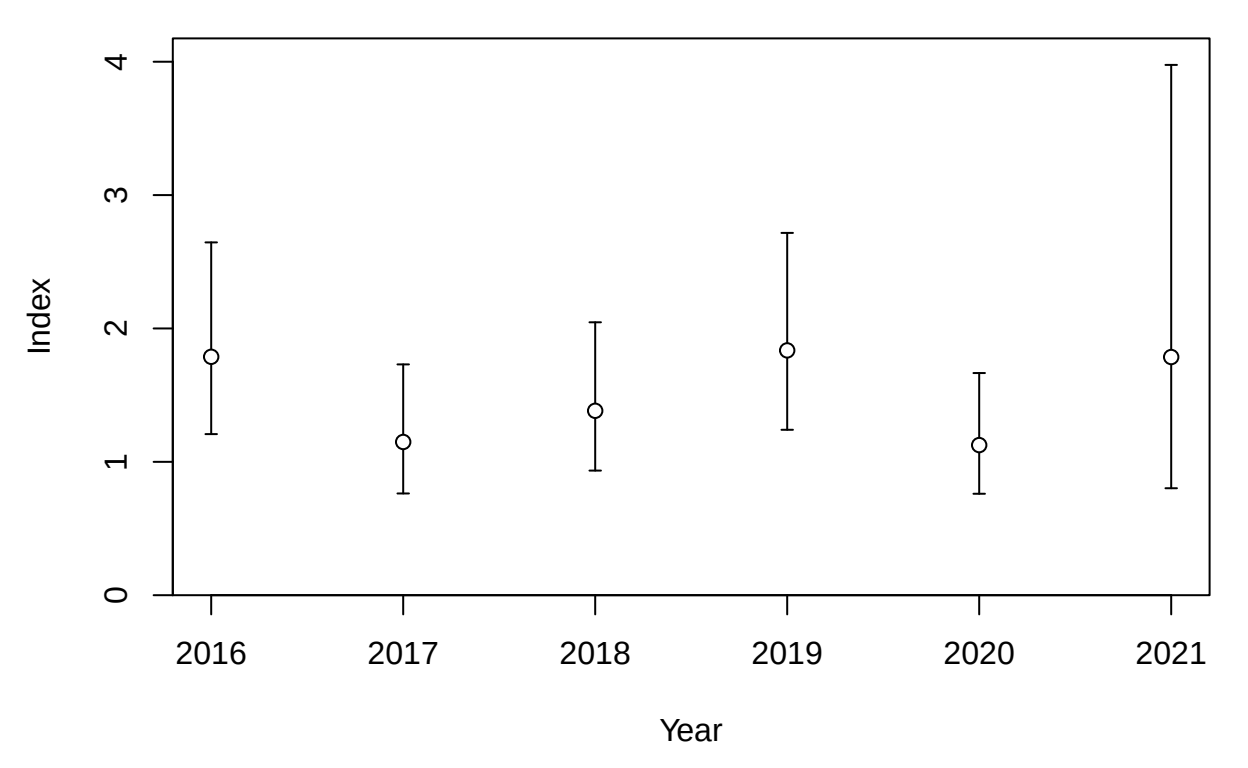

Continuous F
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

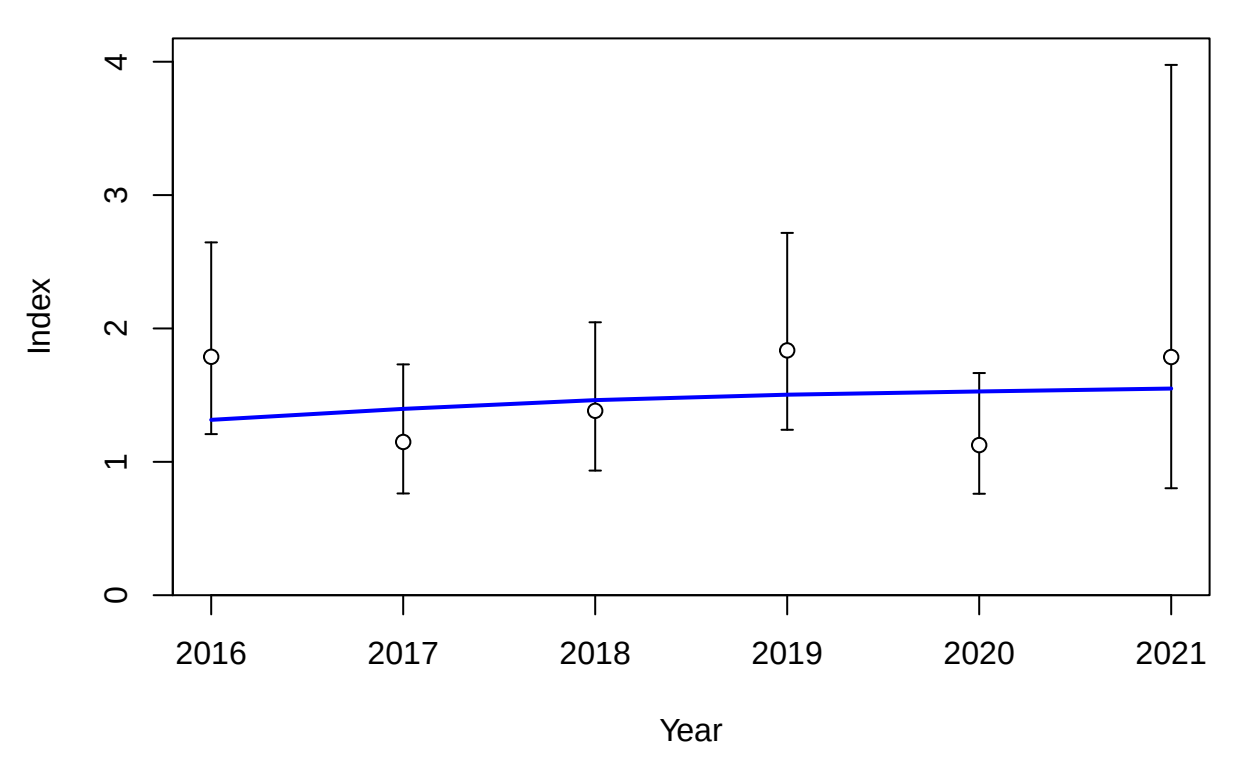

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

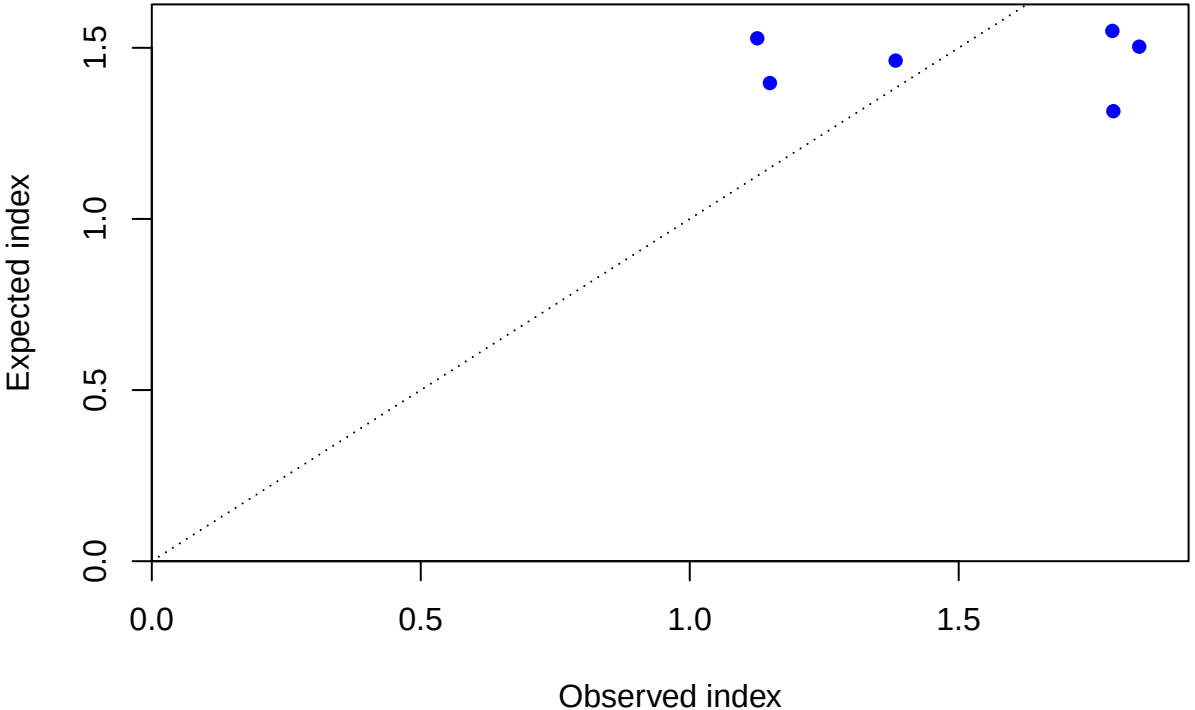

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

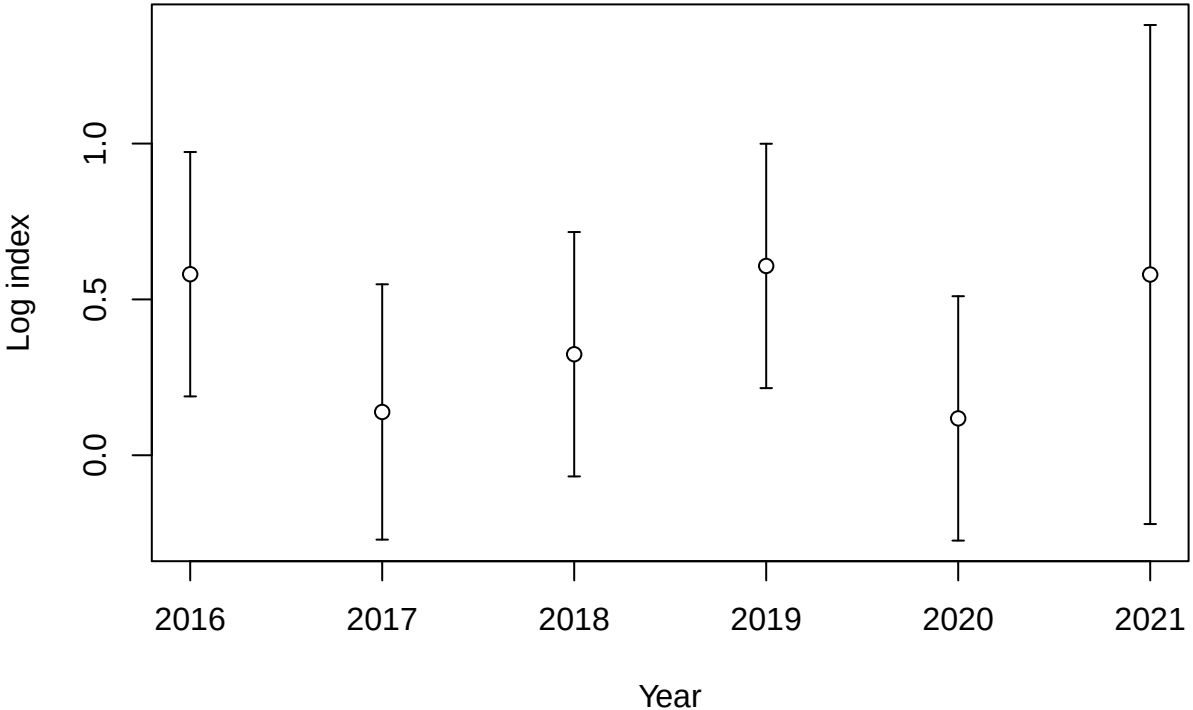

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

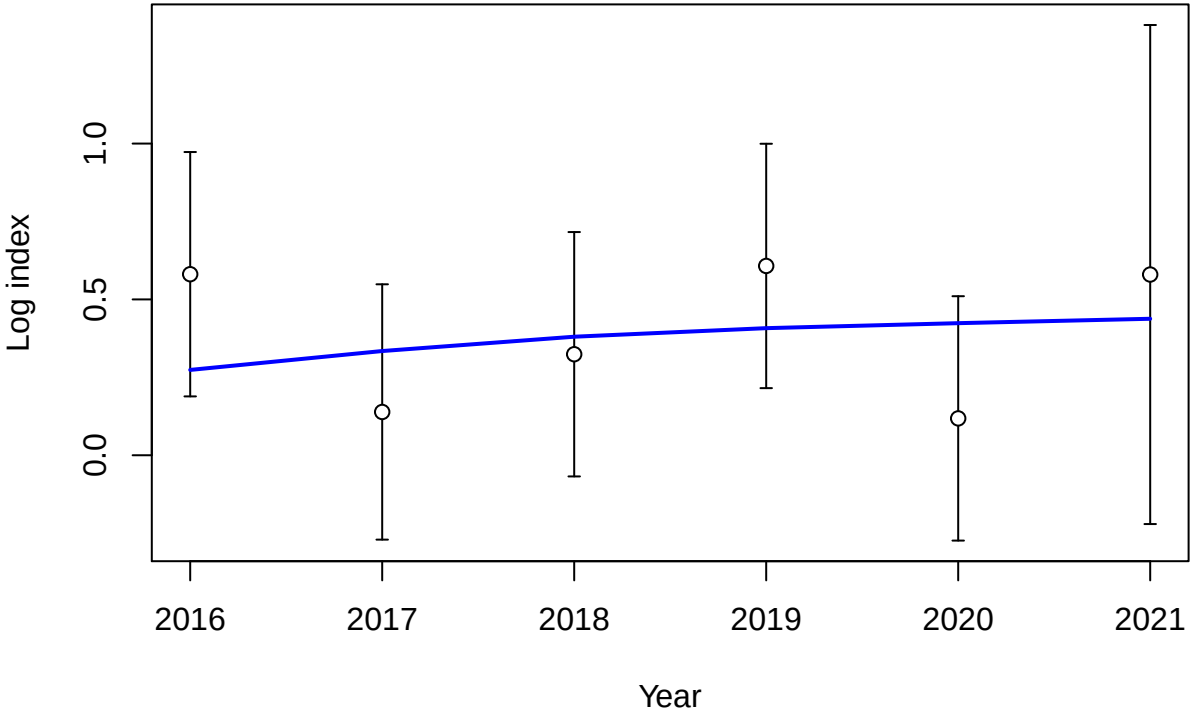

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Relative spawning output: B/B_MSY
1967
2000
2021

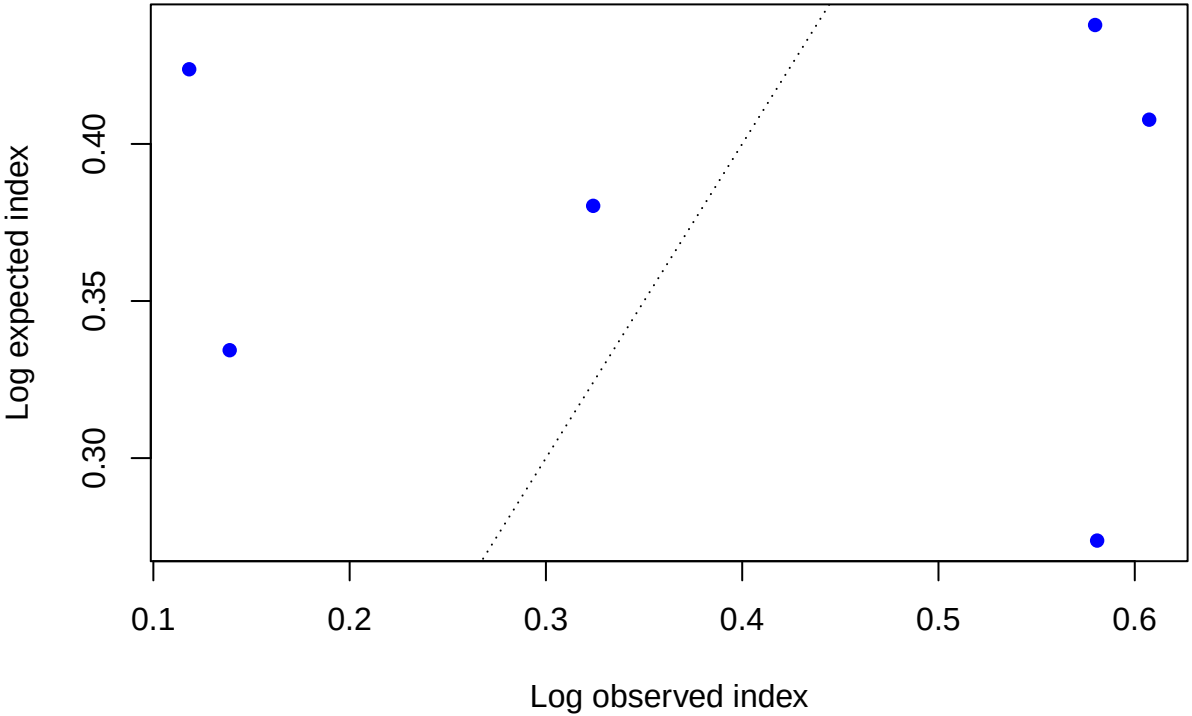

Index
0
1
2
3
4
2016
2017
2018
2019
2020
2021
Year

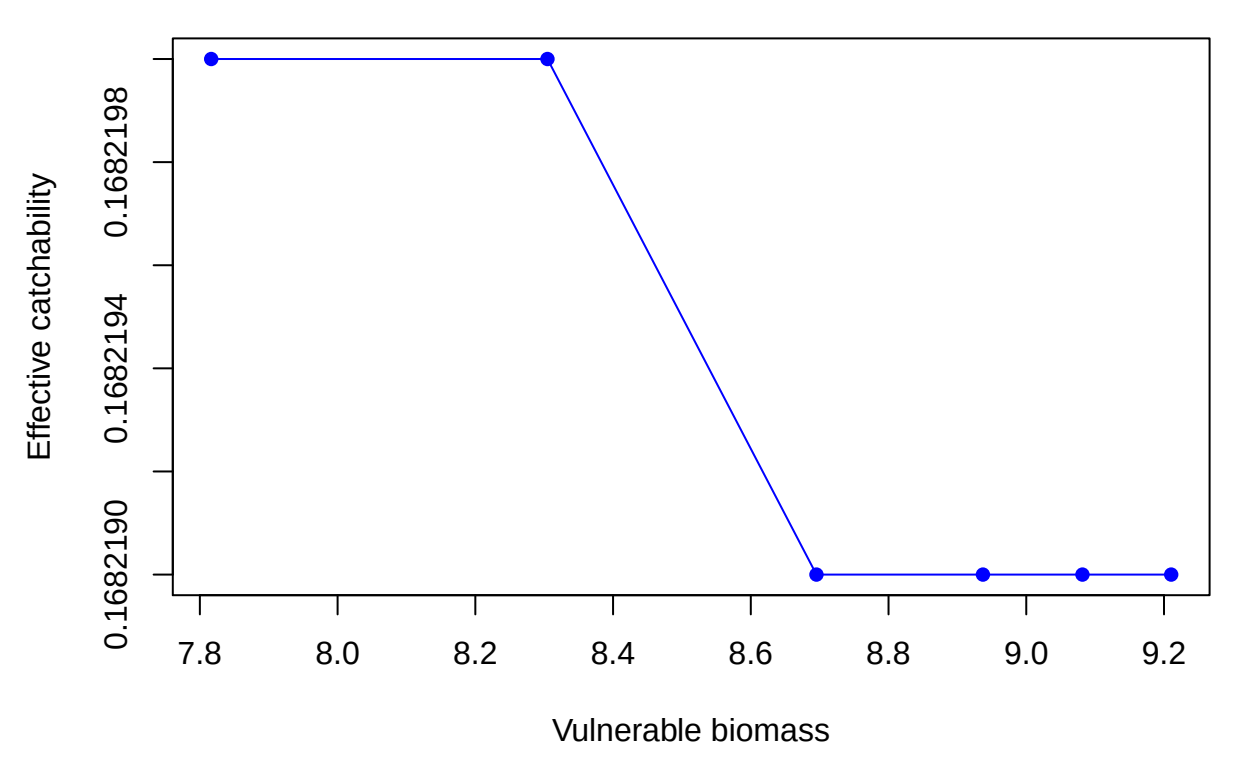

Index
0
1
2
3
4
2016
2017
2018
2019
2020
2021
Year

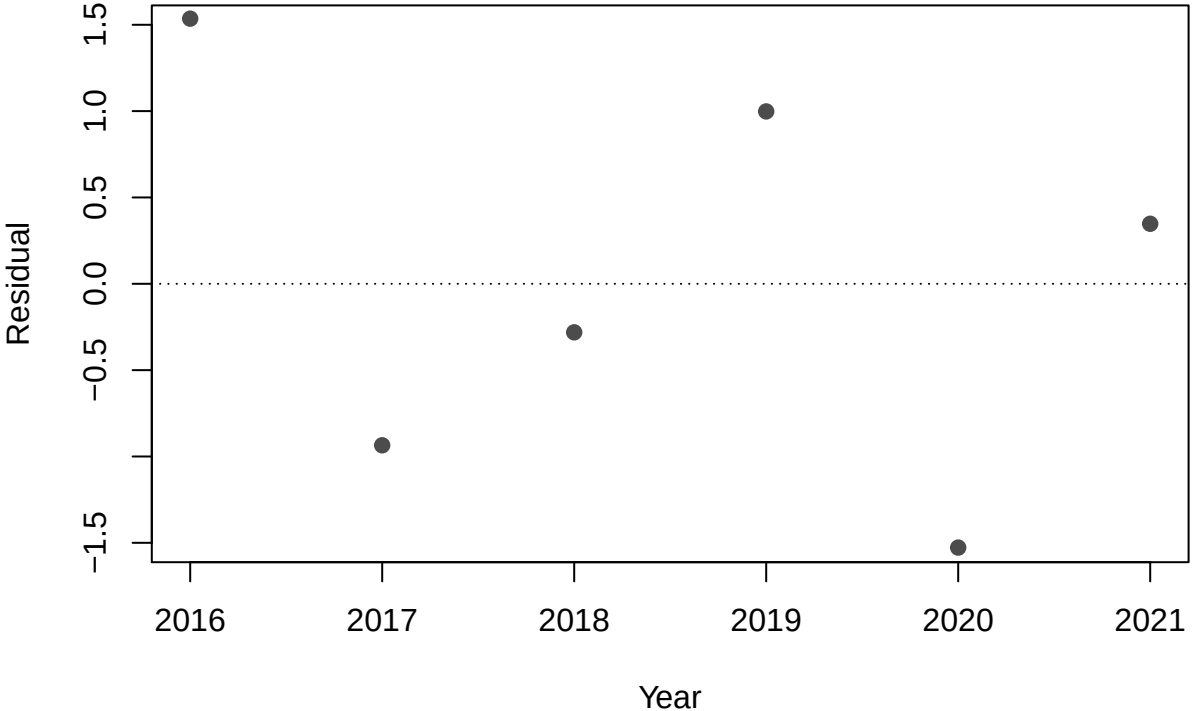

Expected index
0.0
0.5
1.0
1.5
0.0
0.5
1.0
1.5
Observed index

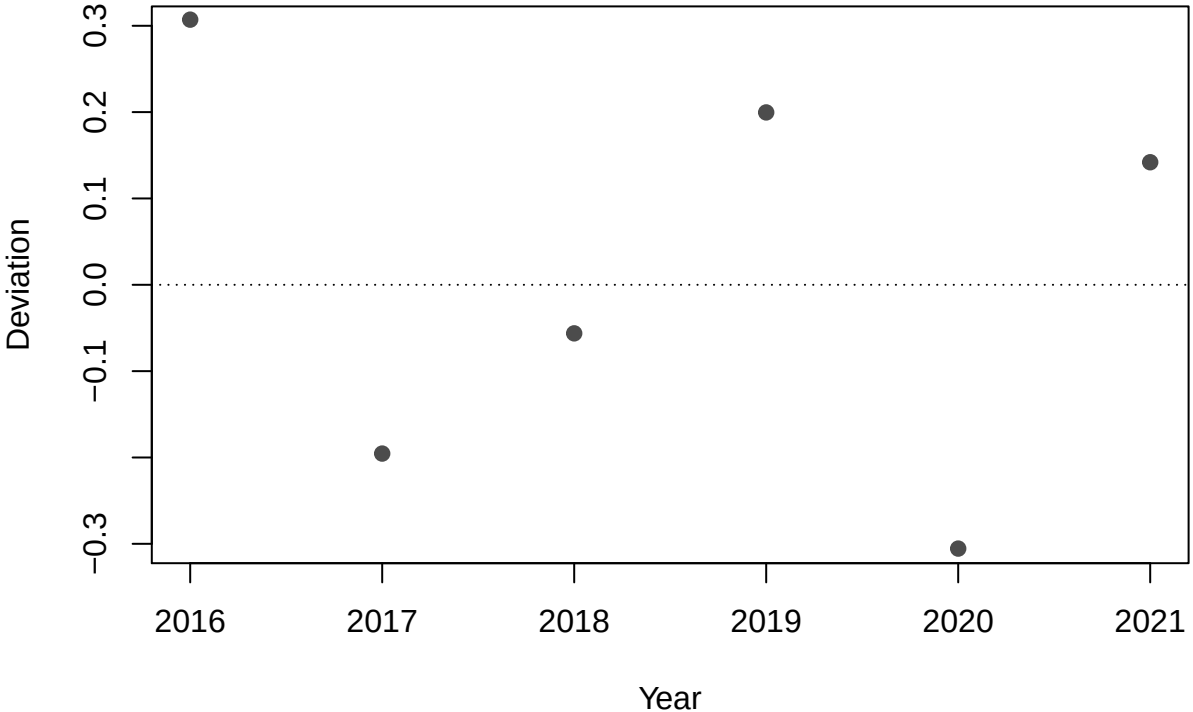

Log index
0.0
0.5
1.0
2016
2017
2018
2019
2020
2021
Year

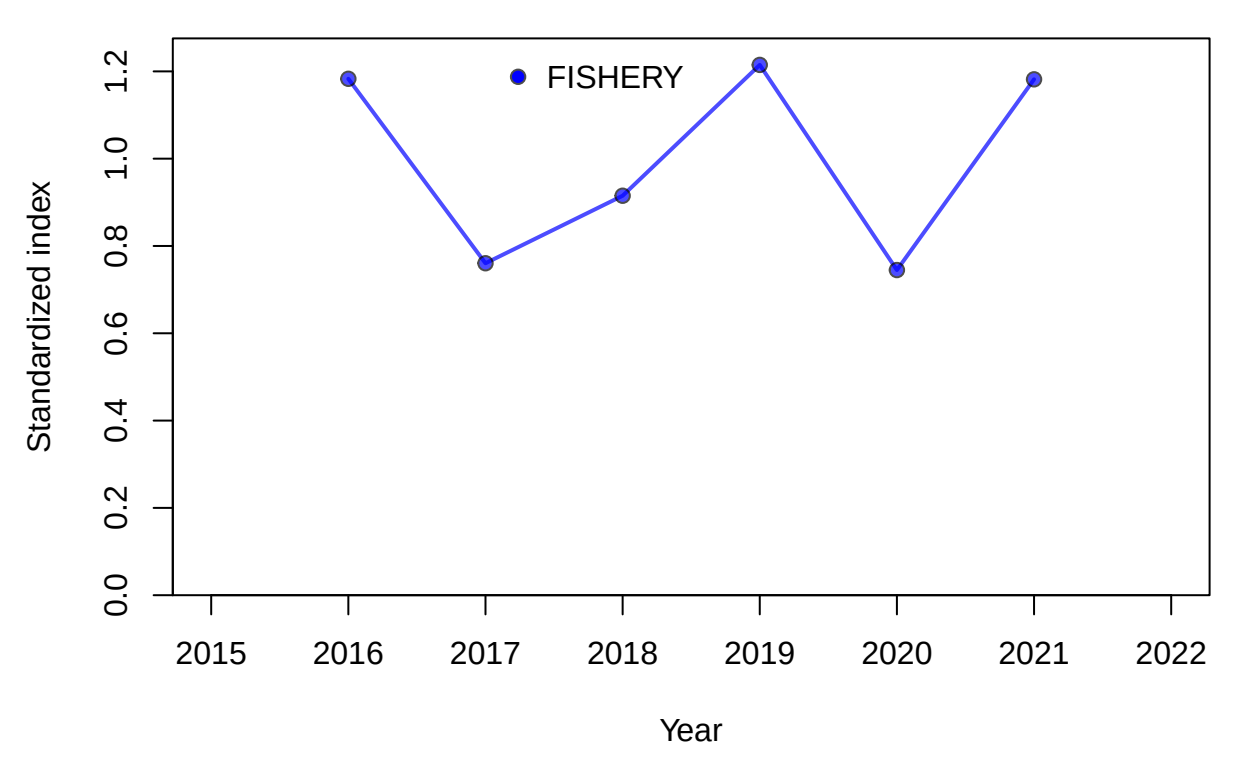

Log index
0.0
0.5
1.0
2016
2017
2018
2019
2020
2021
Year

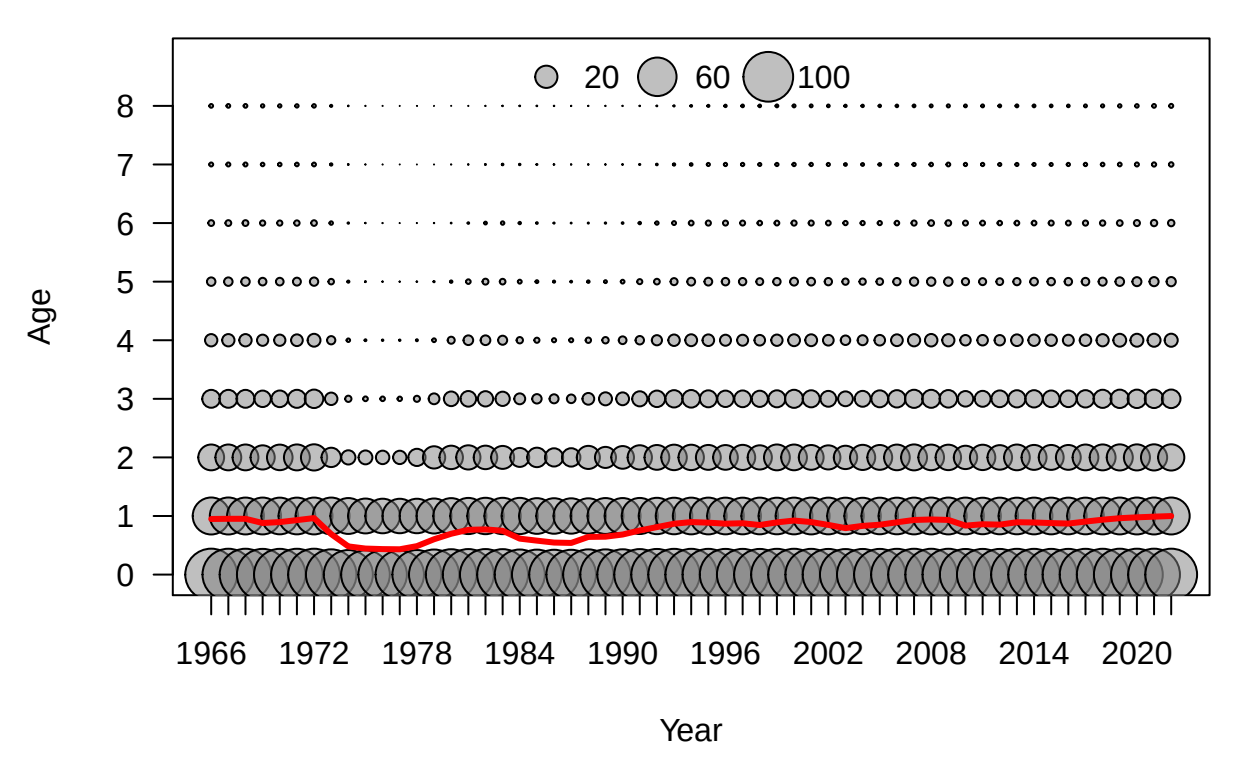

Log expected index
0.30
0.35
0.40
0.1
0.2
0.3
0.4
0.5
0.6
Log observed index

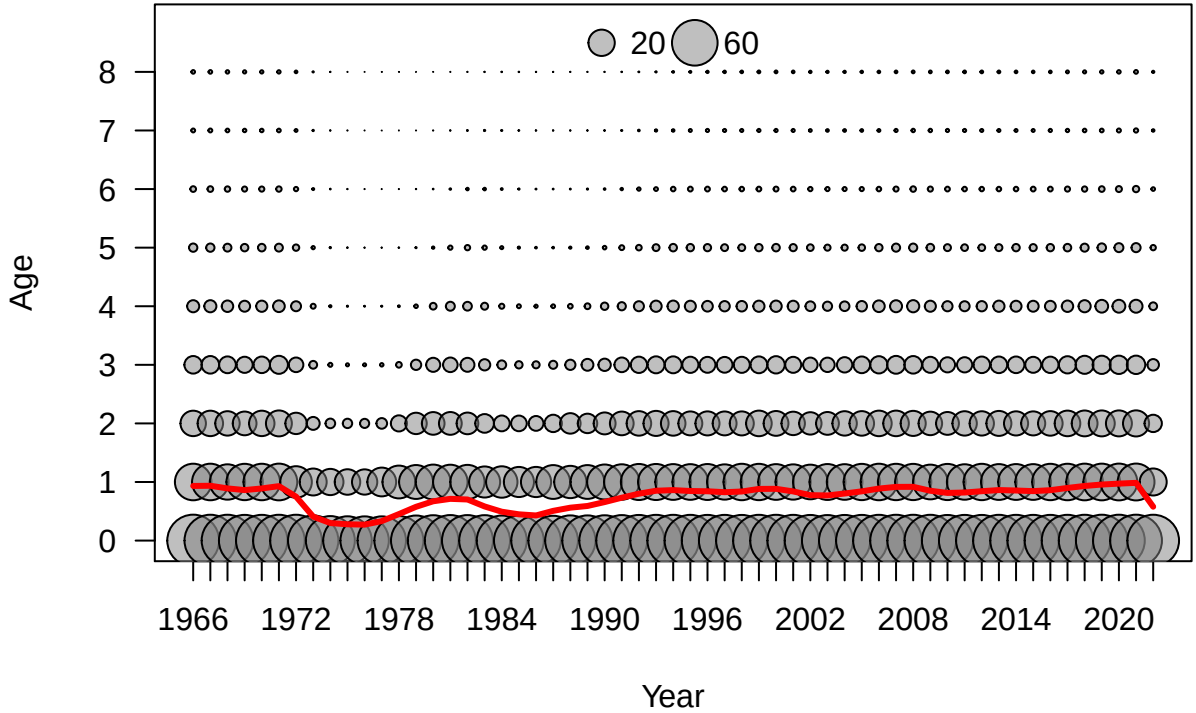

Effective catchability
0.1682198
0.1682194
0.1682190
7.8
8.0
8.2
8.4
8.6
8.8
9.0
9.2
Vulnerable biomass

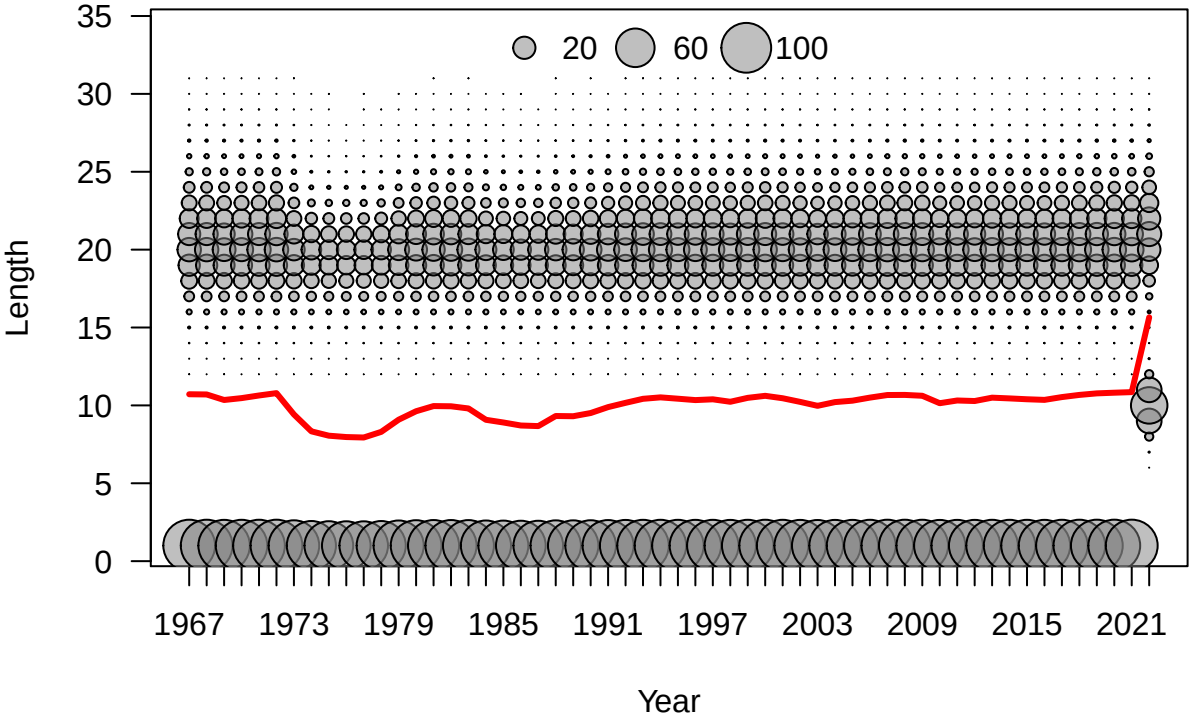

Residual
1.5
1.0
0.5
0.0
−0.5
−1.5
2016
2017
2018
2019
2020
2021
Year

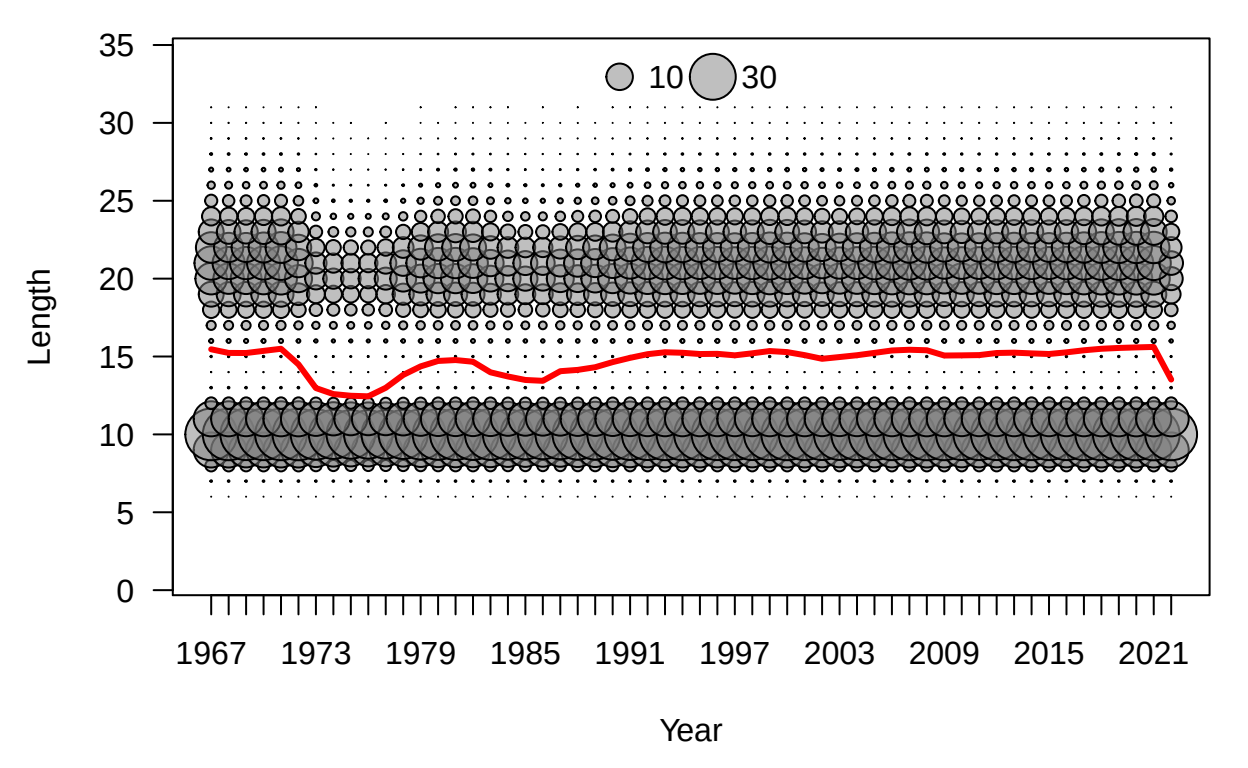

Deviation
0.3
0.2
0.1
0.0
−0.1
−0.3
2016
2017
2018
2019
2020
2021
Year

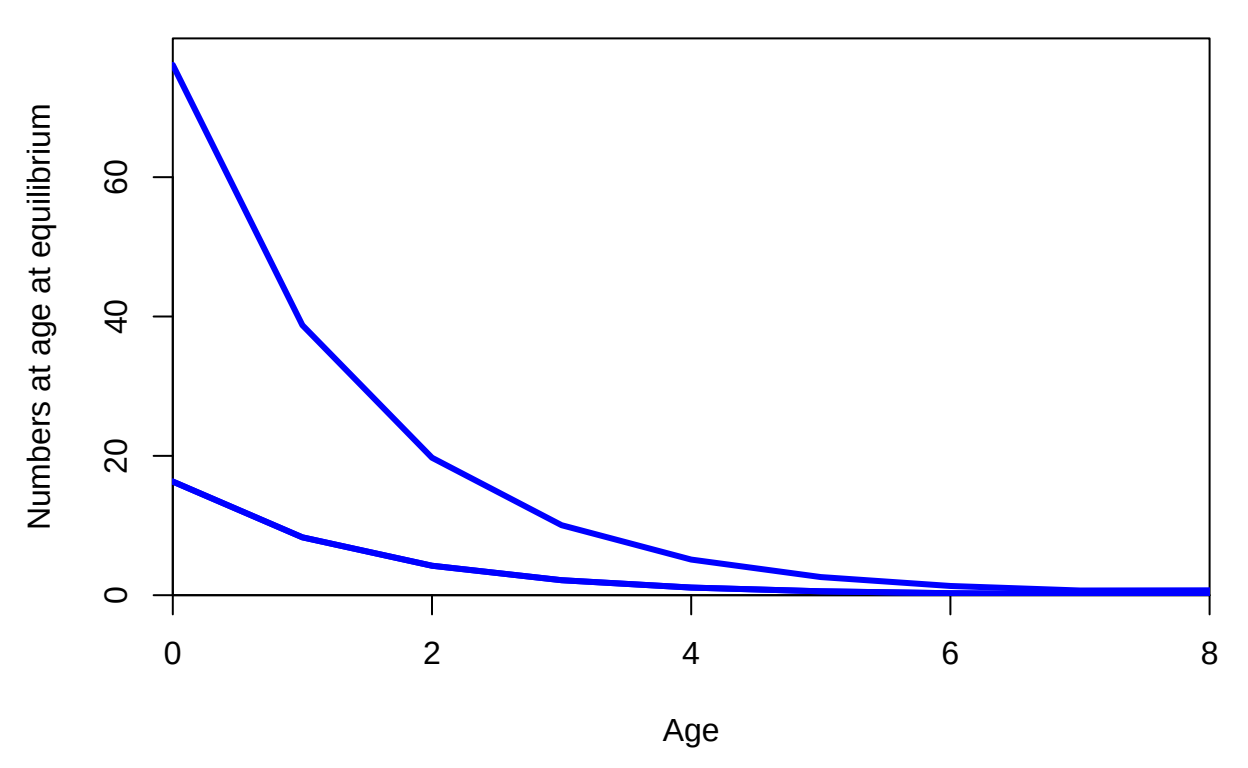

FISHERY
Standardized index
0.0
0.2
0.4
0.6
0.8
1.0
1.2
2015
2016
2017
2018
2019
2020
2021
2022
Year

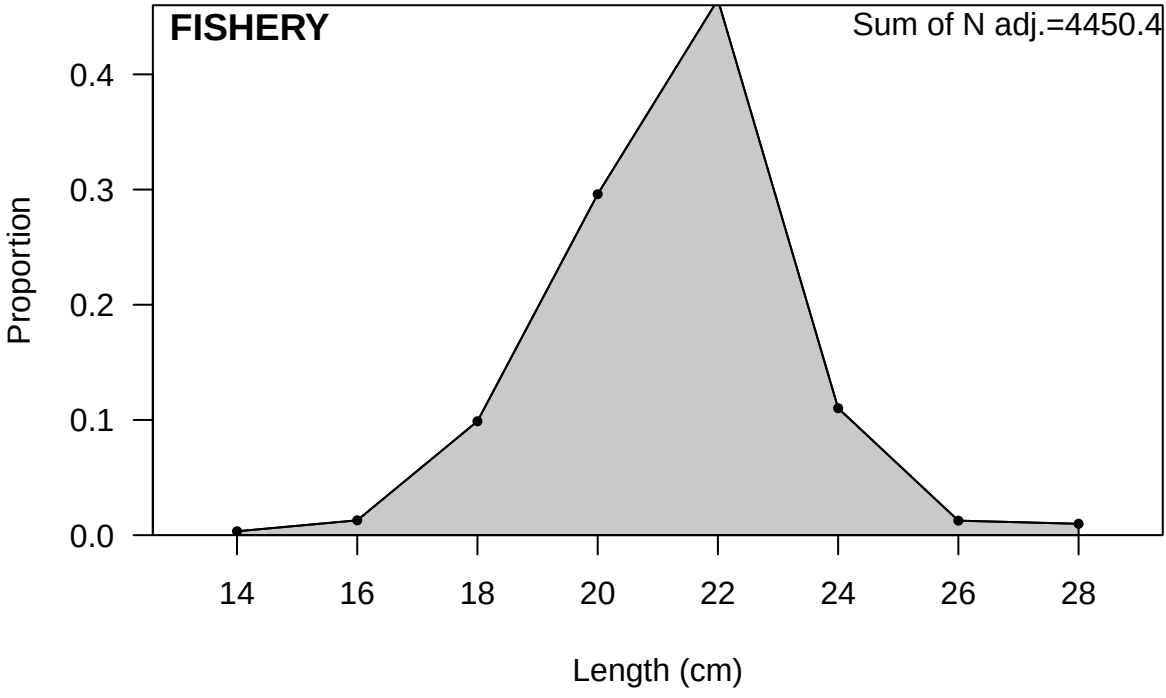

20
60
100
Age
0
1
2
3
4
5
6
7
8
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

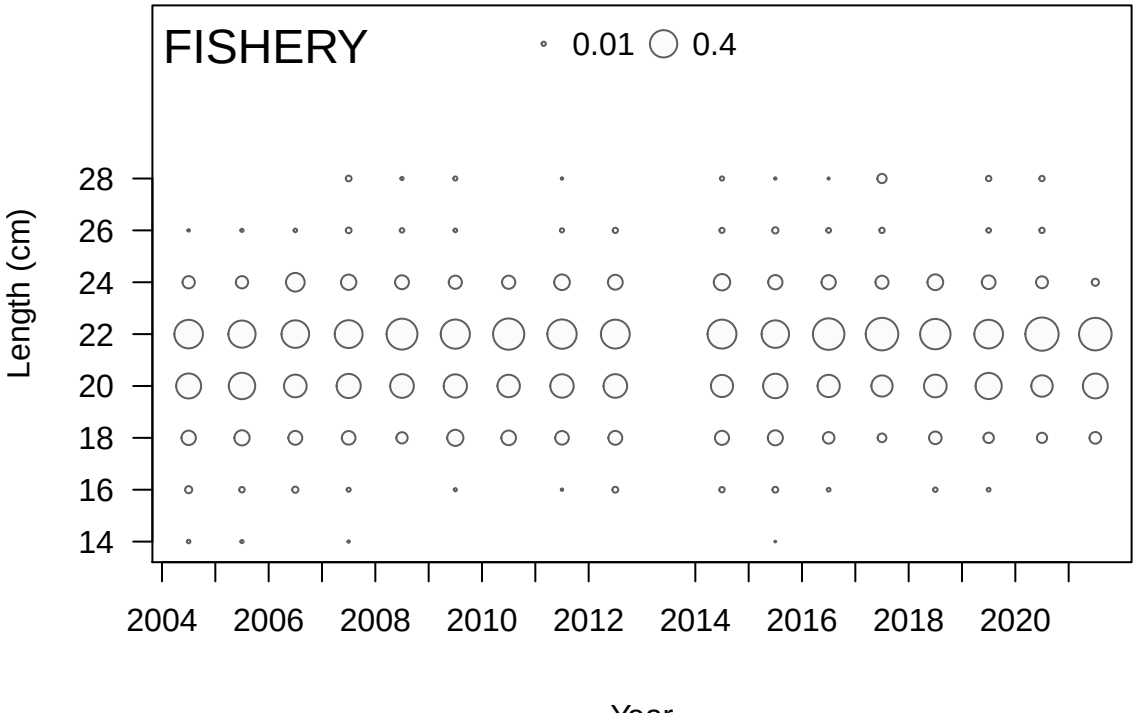

20
60
Age
0
1
2
3
4
5
6
7
8
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

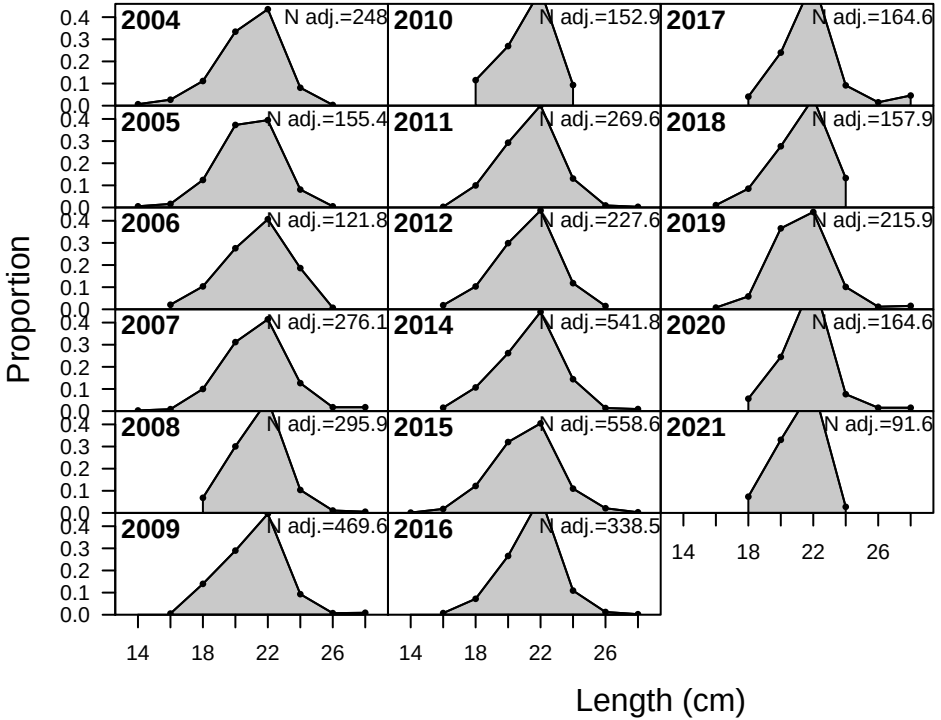

20
60
100
Length
0
5
10
15
20
25
30
35
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

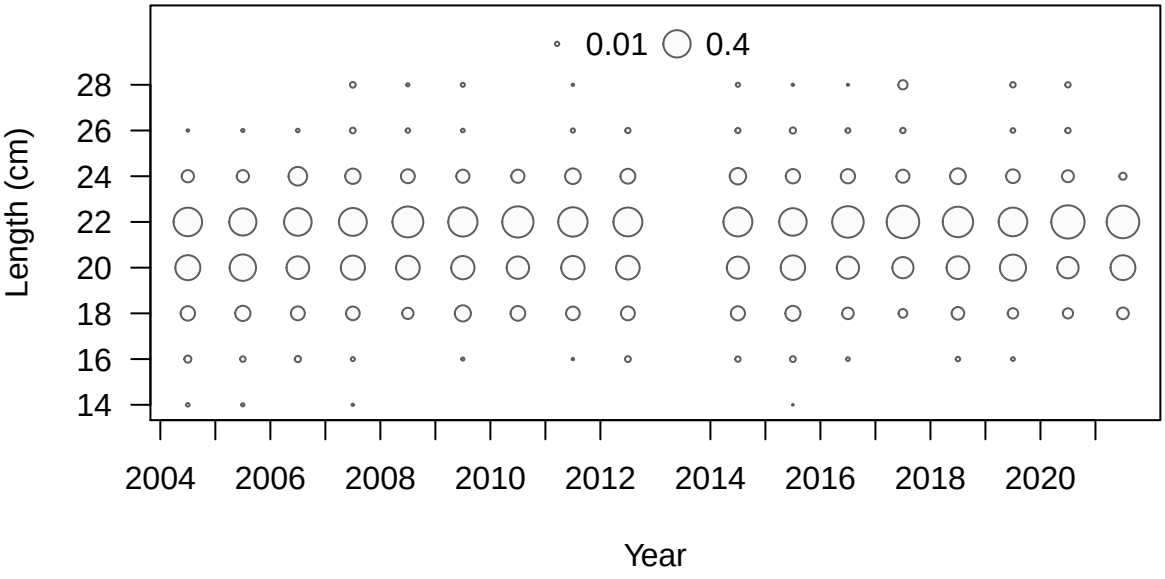

10
30
Length
Year
0
5
10
15
20
25
30
35
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021

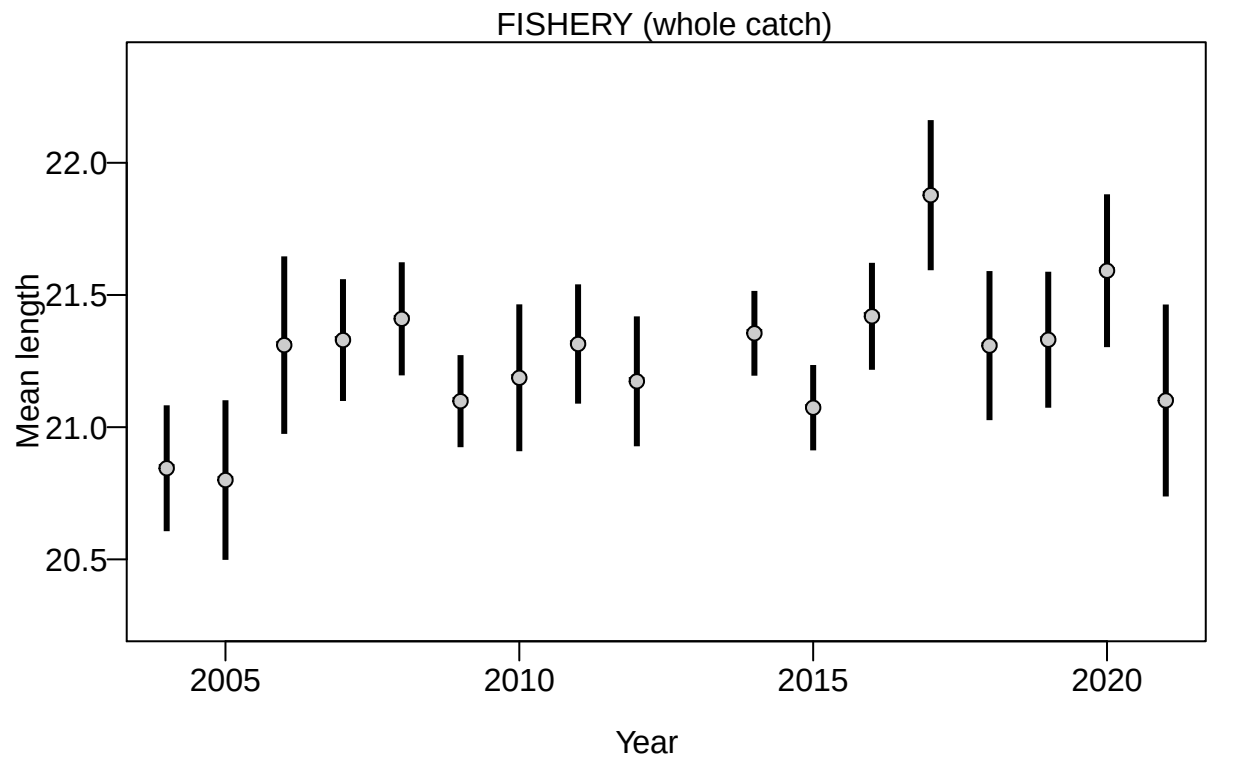

Numbers at age at equilibrium
0
20
40
60
0
2
4
6
8
Age

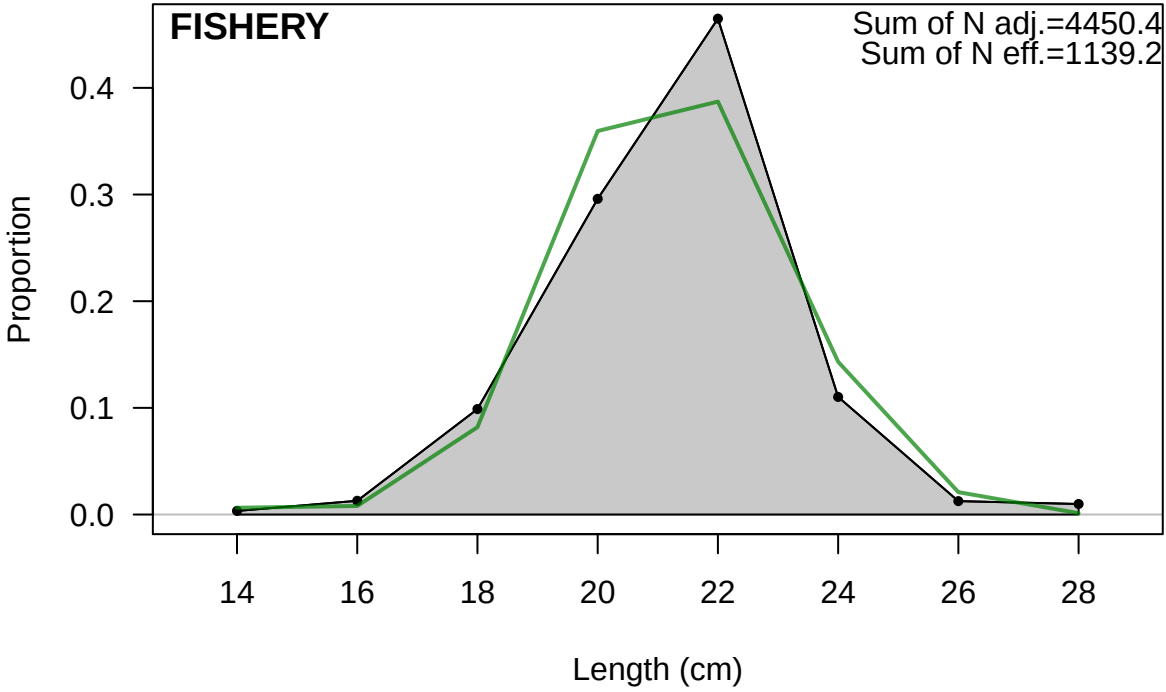

FISHERY
Sum of N adj.=4450.4
Proportion
0.0
0.1
0.2
0.3
0.4
14
16
18
20
22
24
26
28
Length (cm)

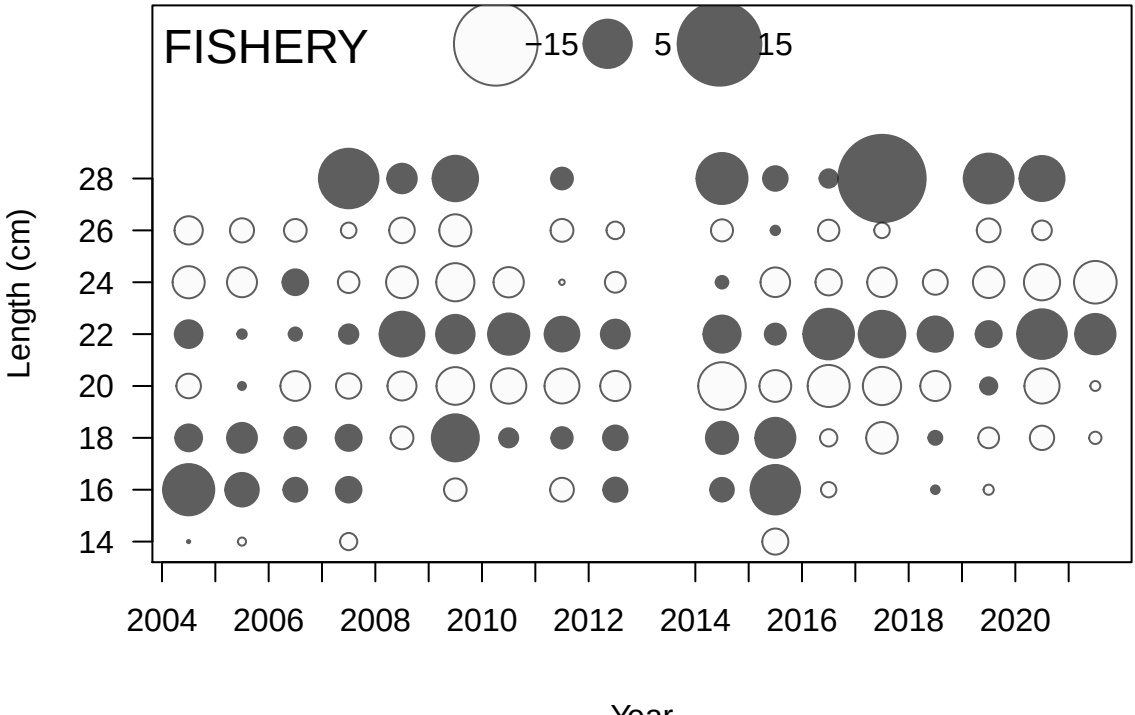

FISHERY
0.01
0.4
Length (cm)
28
26
24
22
20
18
16
14
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

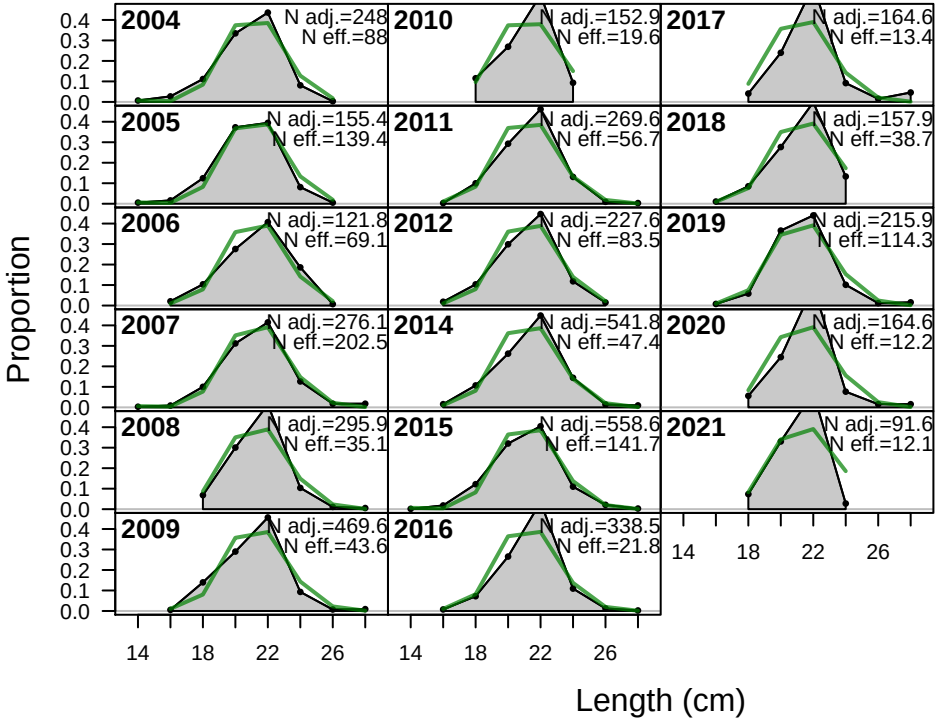

2004
N adj.=248
2010
N adj.=152.9
2017
N adj.=164.6
2005
N adj.=155.4
2011
N adj.=269.6
2018
N adj.=157.9
2006
N adj.=121.8
2012
N adj.=227.6
2019
N adj.=215.9
2007
N adj.=276.1
2014
N adj.=541.8
2020
N adj.=164.6
2008
N adj.=295.9
2015
N adj.=558.6
2021
N adj.=91.6
2009
N adj.=469.6
2016
N adj.=338.5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

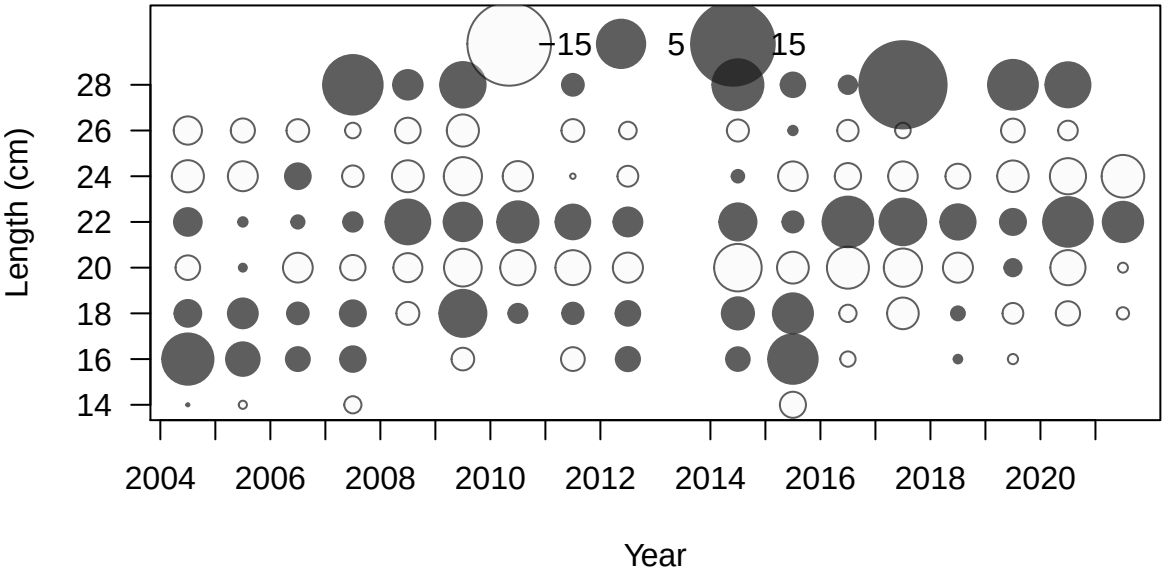

0.01
0.4
Length (cm)
28
26
24
22
20
18
16
14
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

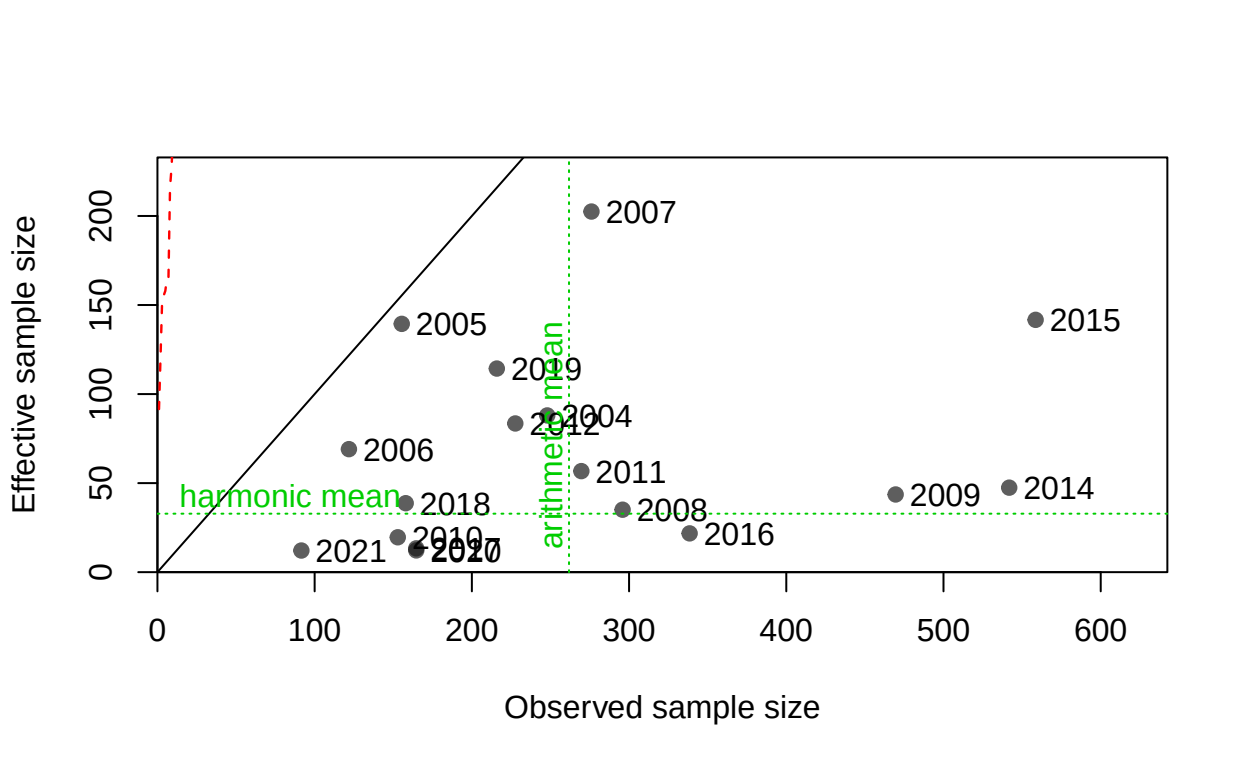

FISHERY (whole catch)
Mean length
22.0
21.5
21.0
20.5
2005
2010
2015
2020
Year

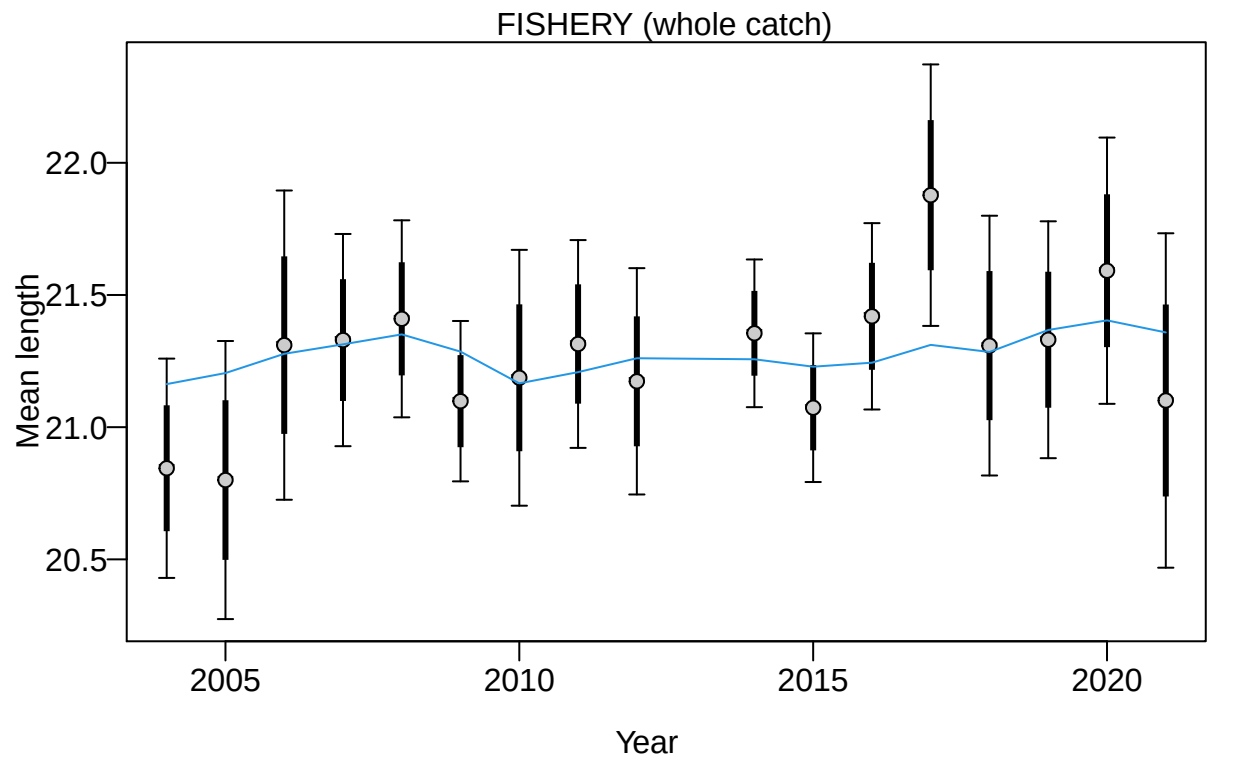

FISHERY
Sum of N adj.=4450.4
Sum of N eff.=1139.2
Proportion
0.0
0.1
0.2
0.3
0.4
14
16
18
20
22
24
26
28
Length (cm)

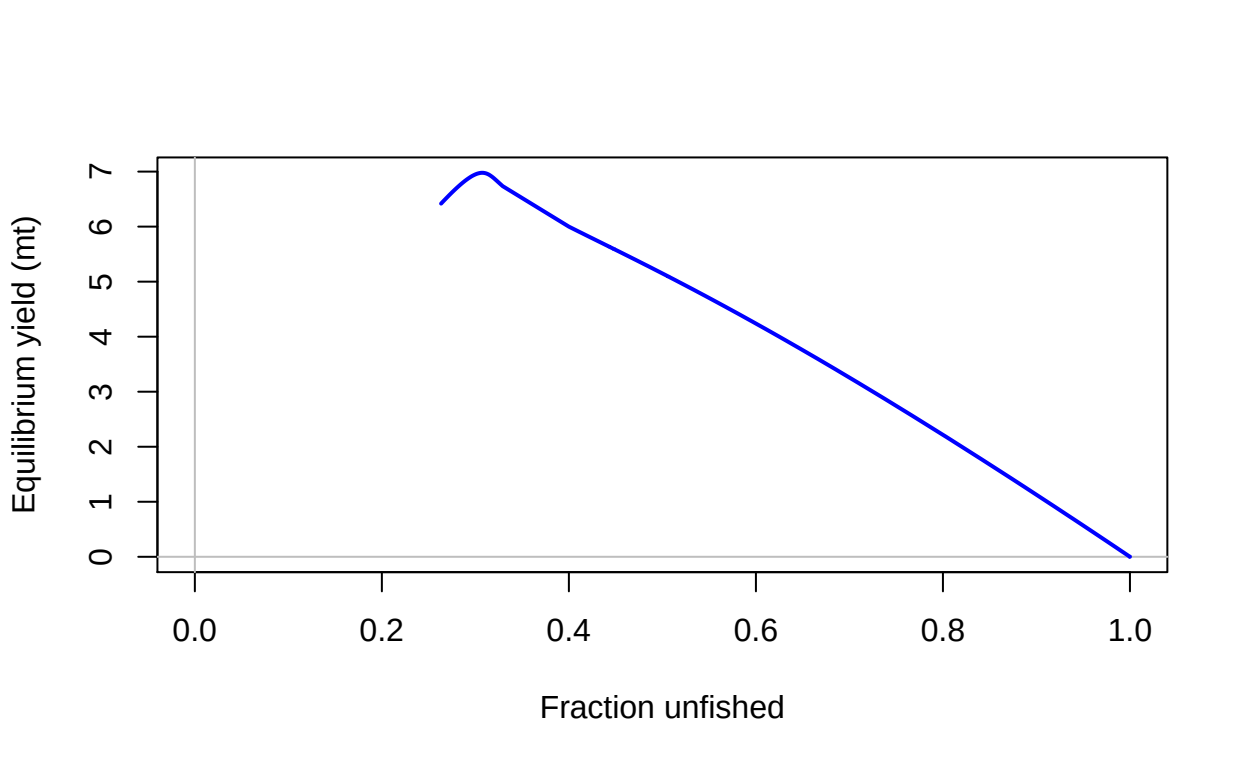

FISHERY
−15
5
15
Length (cm)
28
26
24
22
20
18
16
14
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

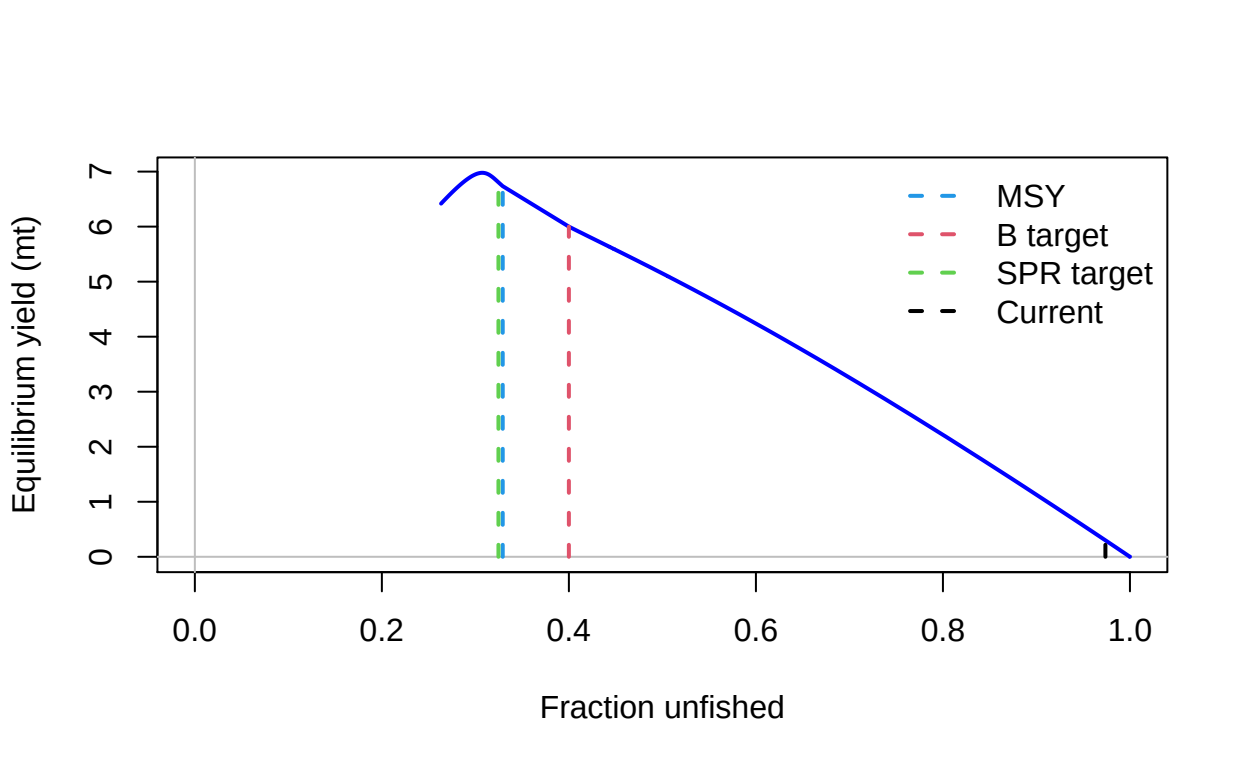

2004
N adj.=248
N eff.=88
2010
N adj.=152.9
N eff.=19.6
2017
N adj.=164.6
N eff.=13.4
2005
N adj.=155.4
N eff.=139.4
2011
N adj.=269.6
N eff.=56.7
2018
N adj.=157.9
N eff.=38.7
2006
N adj.=121.8
N eff.=69.1
2012
N adj.=227.6
N eff.=83.5
2019
N adj.=215.9
N eff.=114.3
2007
N adj.=276.1
N eff.=202.5
2014
N adj.=541.8
N eff.=47.4
2020
N adj.=164.6
N eff.=12.2
2008
N adj.=295.9
N eff.=35.1
2015
N adj.=558.6
N eff.=141.7
2021
N adj.=91.6
N eff.=12.1
2009
N adj.=469.6
N eff.=43.6
2016
N adj.=338.5
N eff.=21.8
Proportion
0.0
0.1
0.2
0.3
0.4
14
18
22
26
Length (cm)

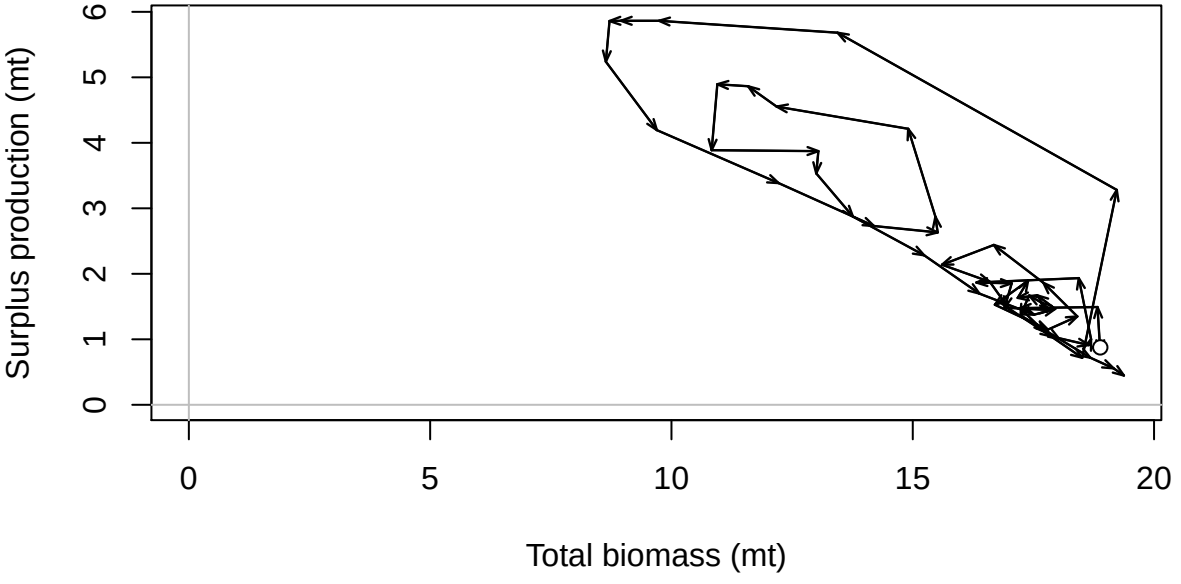

15
5
15
28
26
24
22
20
18
16
14
Length (cm)
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

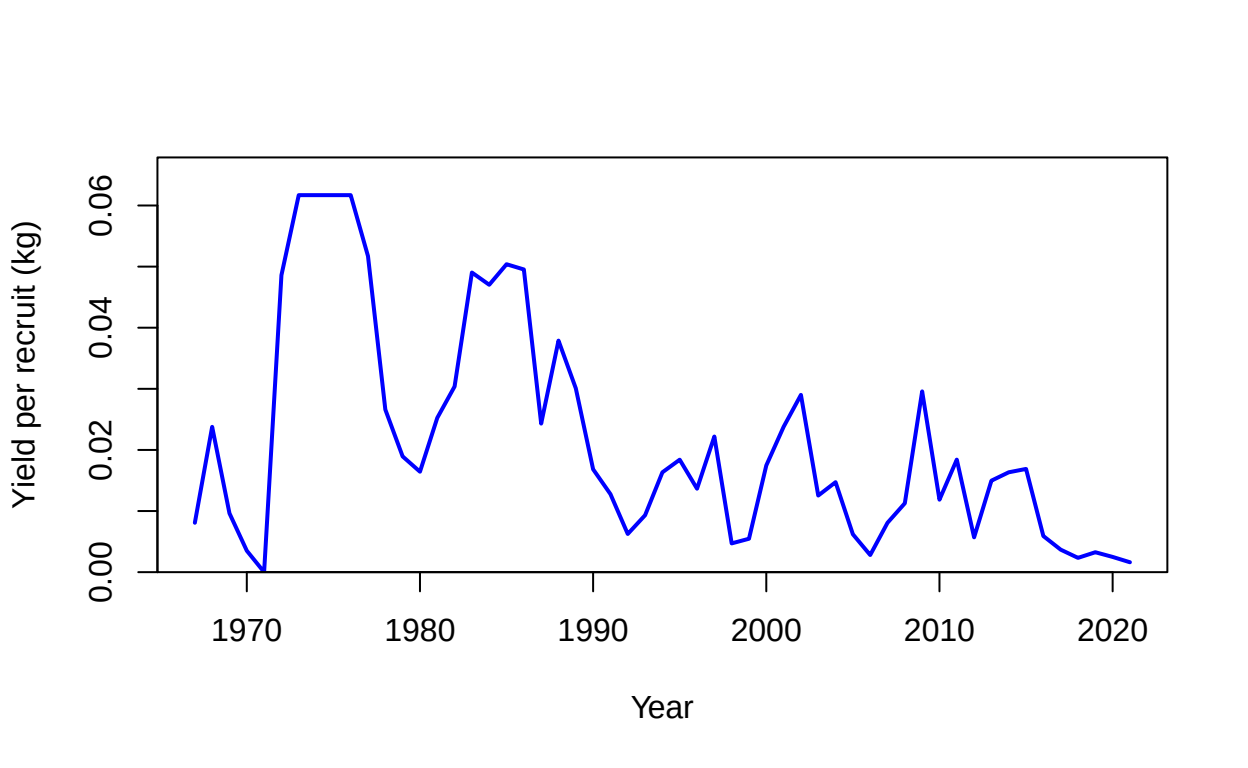

Effective sample size
0
50
100
150
200
0
100
200
300
400
500
600
Observed sample size
2007
2005
2015
2019
2004
2012
2006
2011
harmonic mean
2018
2009
2014
2008
2010
2016
2021
2017
2020
arithmetic mean

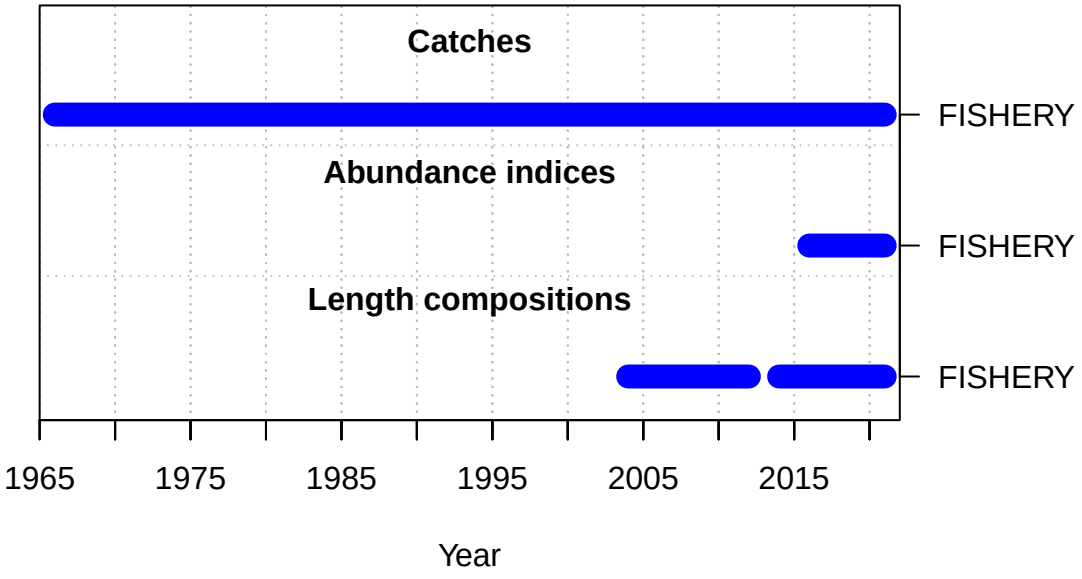

FISHERY (whole catch)
Mean length
22.0
21.5
21.0
20.5
2005
2010
2015
2020
Year

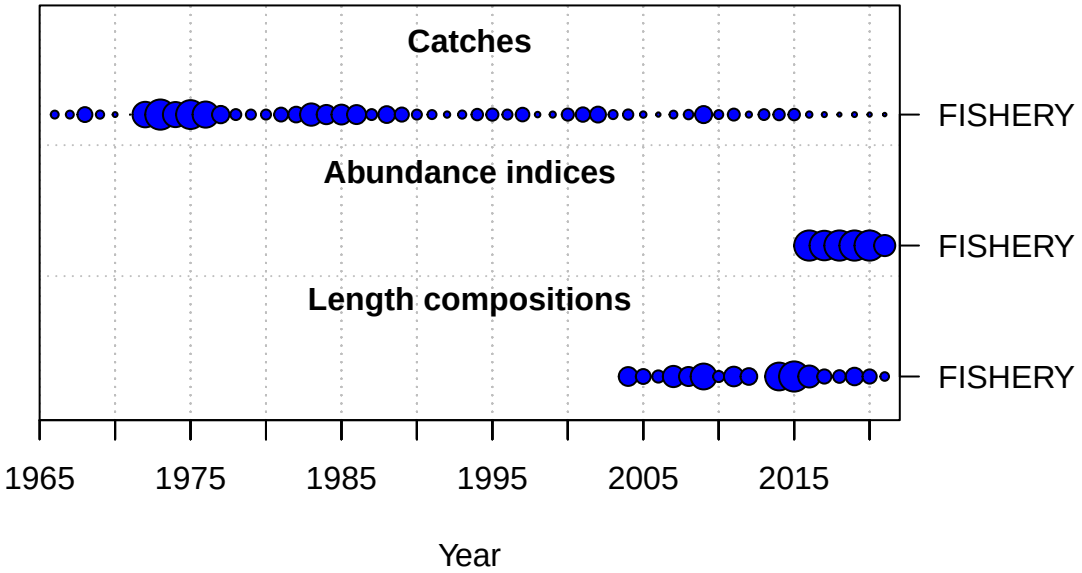

Equilibrium yield (mt)
0
1
2
3
4
5
6
7
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

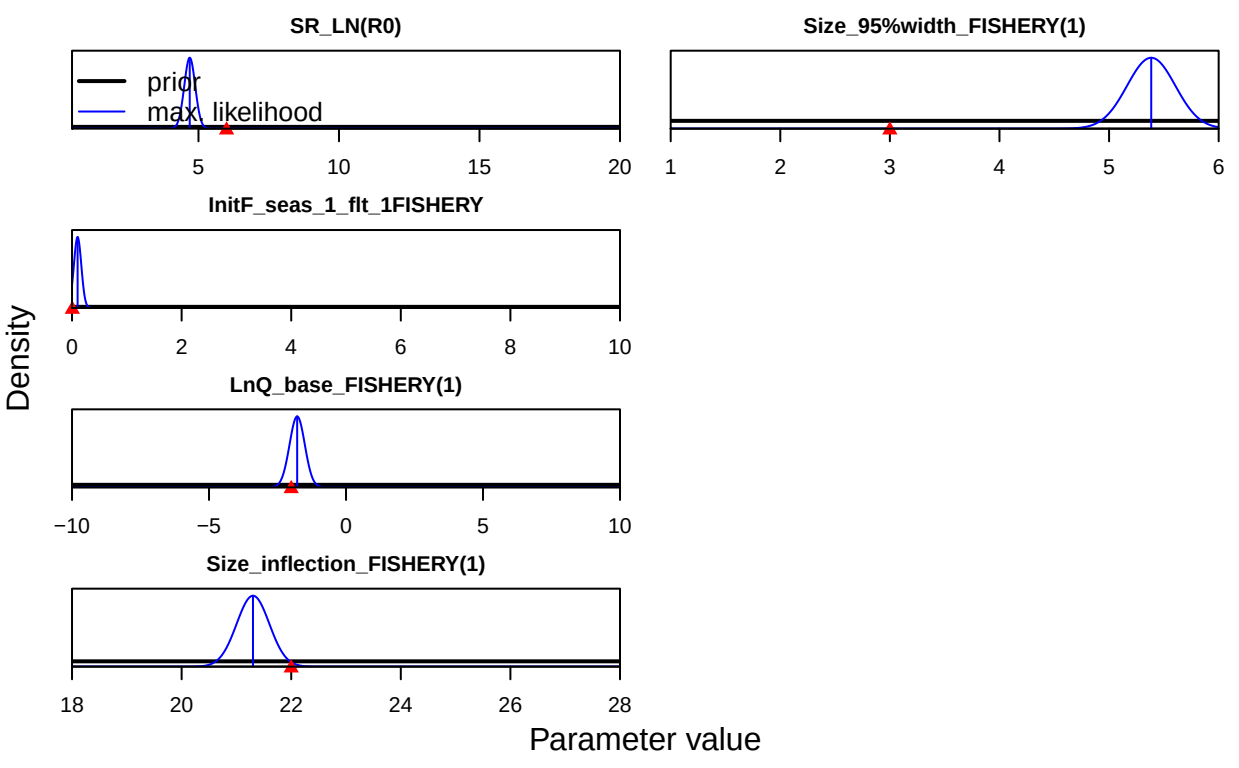

Equilibrium yield (mt)
0
1
2
3
4
5
6
7
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
0
1
2
3
4
5
6
0
5
10
15
20
Total biomass (mt)


Yield per recruit (kg)
0.00
0.02
0.04
0.06
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
LnQ_base_FISHERY(1)
−10
−5
0
5
10
Size_inflection_FISHERY(1)
18
20
22
24
26
28
Density
Parameter value