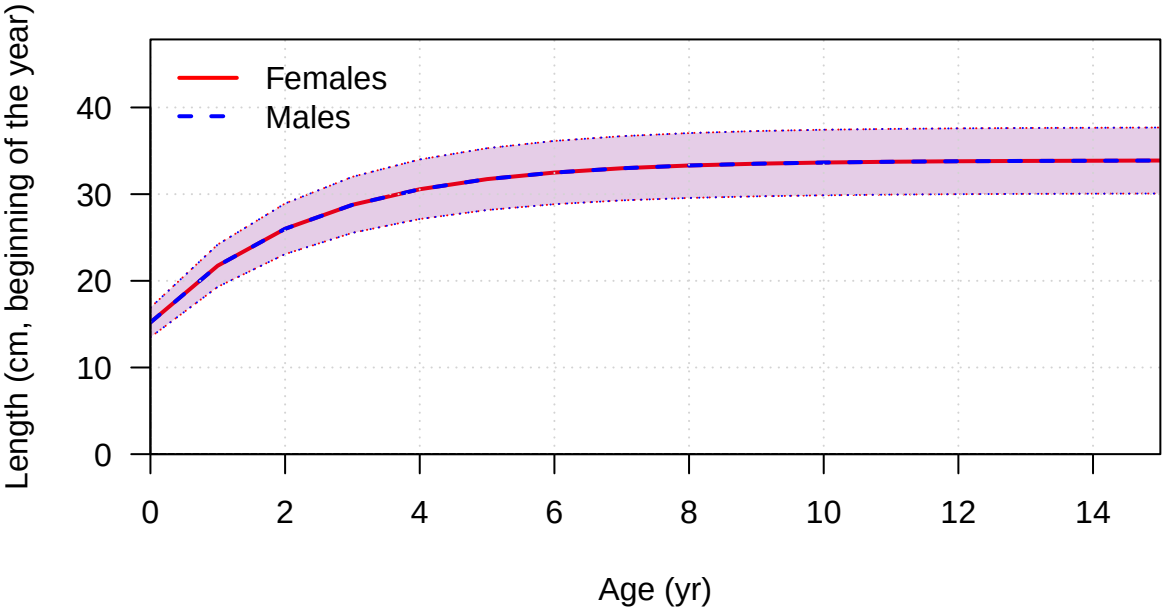
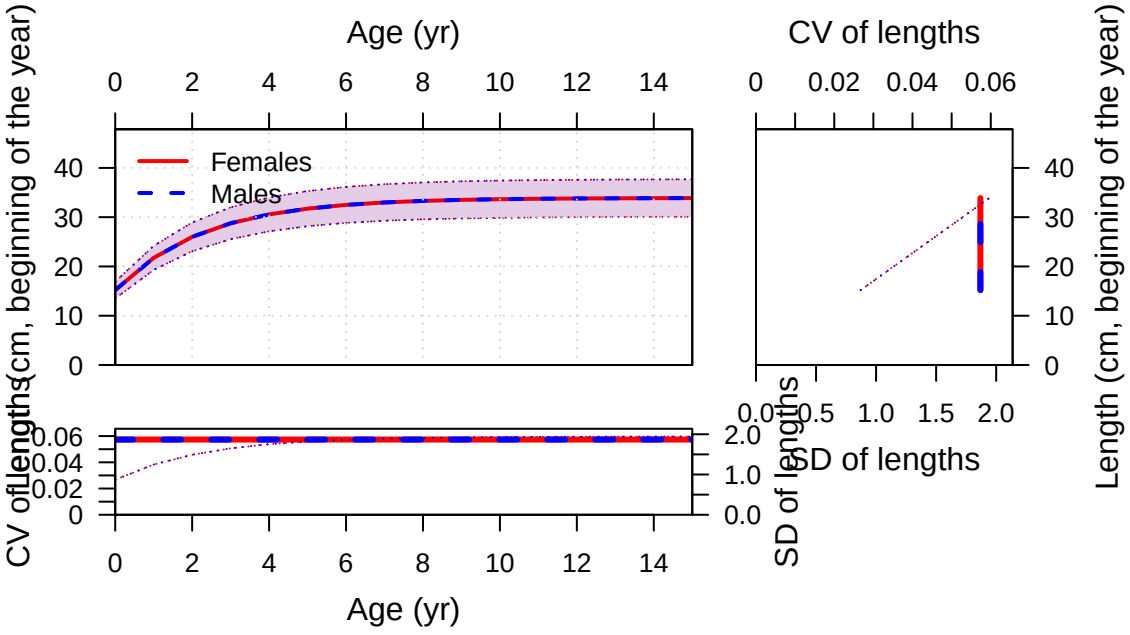
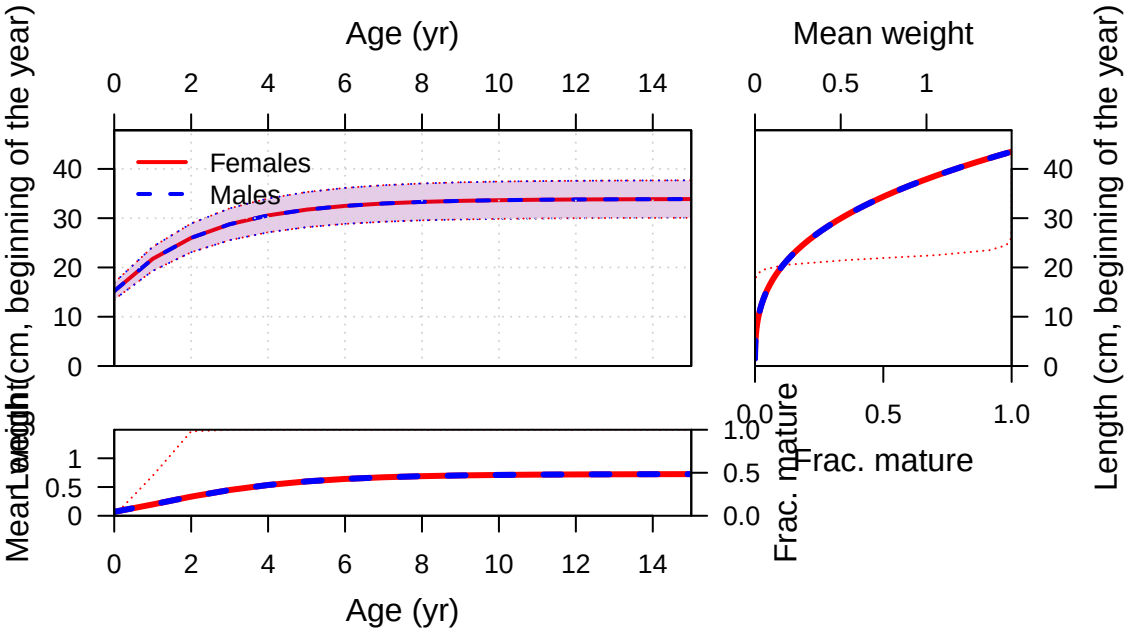
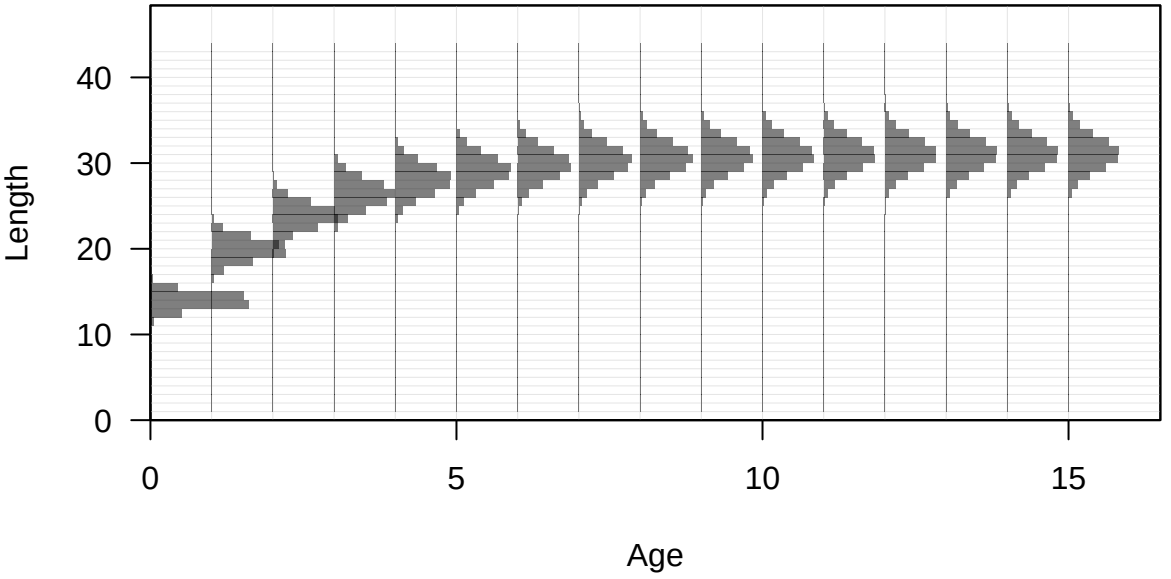
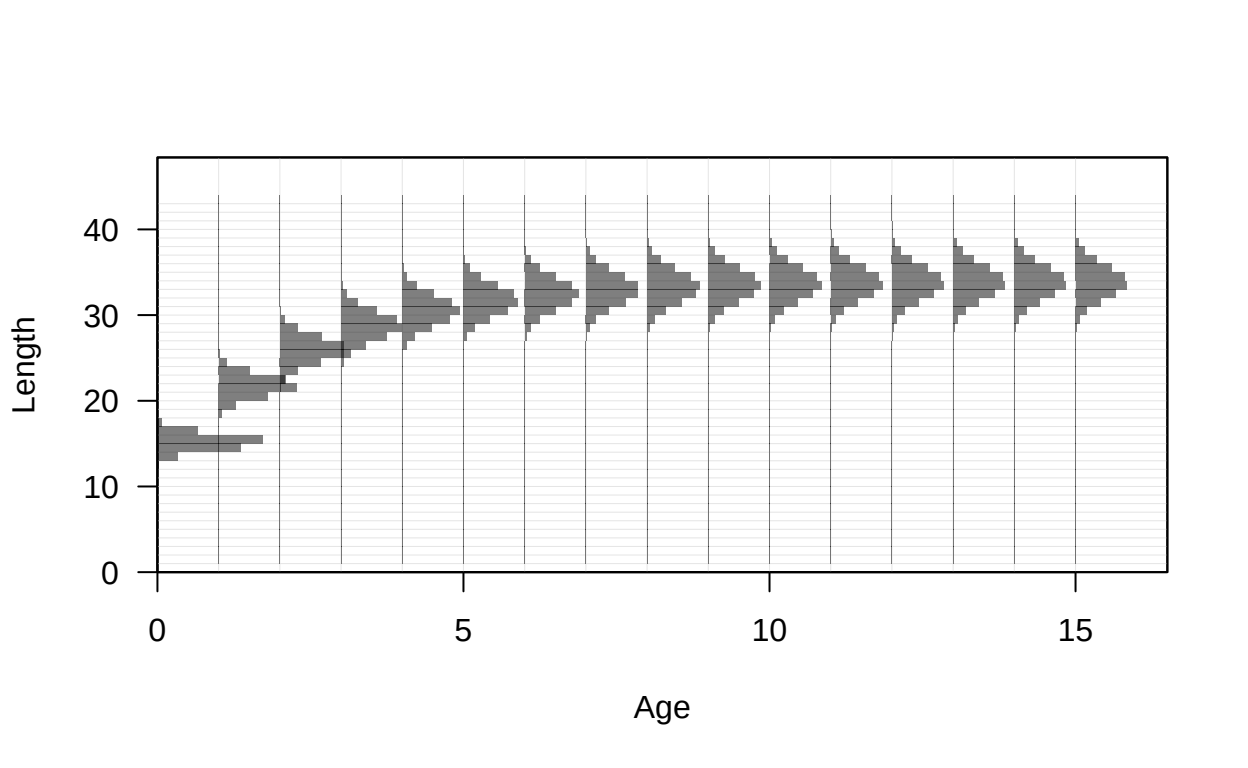
Plots created using the 'r4ss' package in R
Stock Synthesis version: 3.30.19.0
StartTime: Thu Oct 20 10:17:08 2022
Data_File: data.ss
Control_File: control.ss

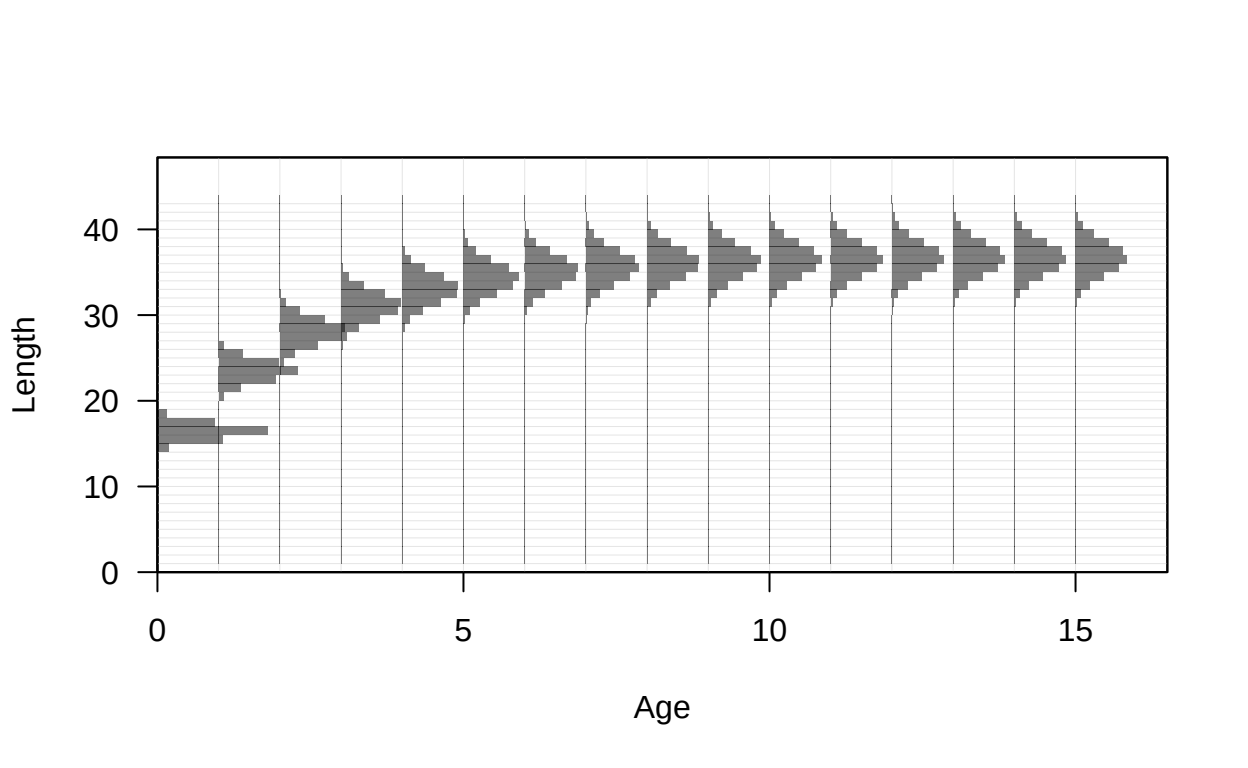

Females
Males
Length (cm, beginning of the year)
0
10
20
30
40
0
2
4
6
8
10
12
14
Age (yr)

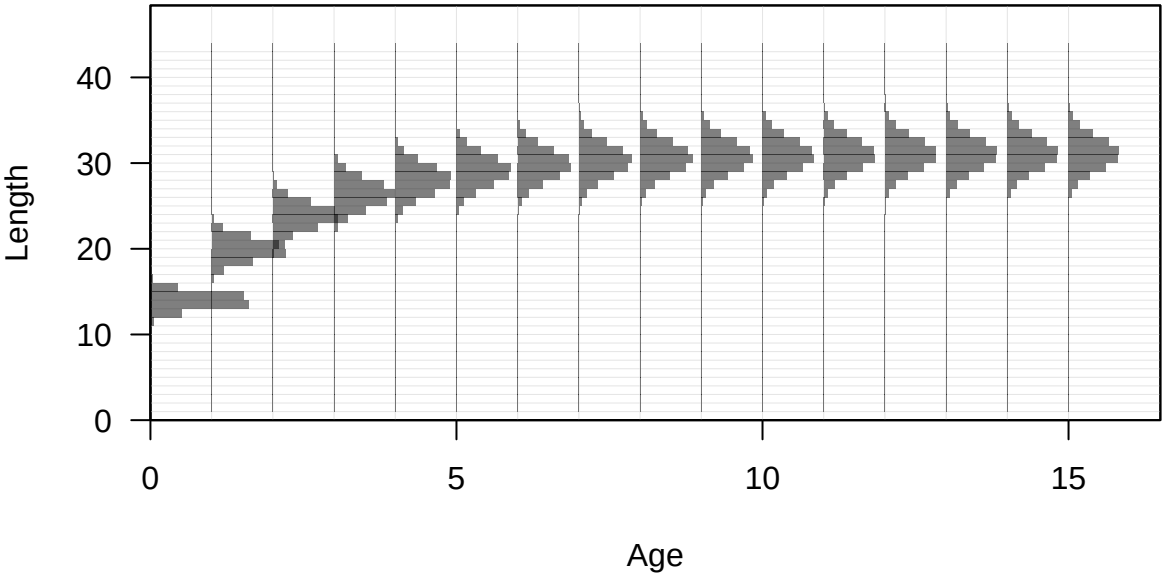

Age (yr)
0
2
4
6
8
10
12
14
Females
Males
Length (cm, beginning of the year)
0
10
20
30
40
CV of lengths
0.02
0.04
0.06
SD of lengths
0.0
0.5
1.0
1.5
2.0
Age (yr)

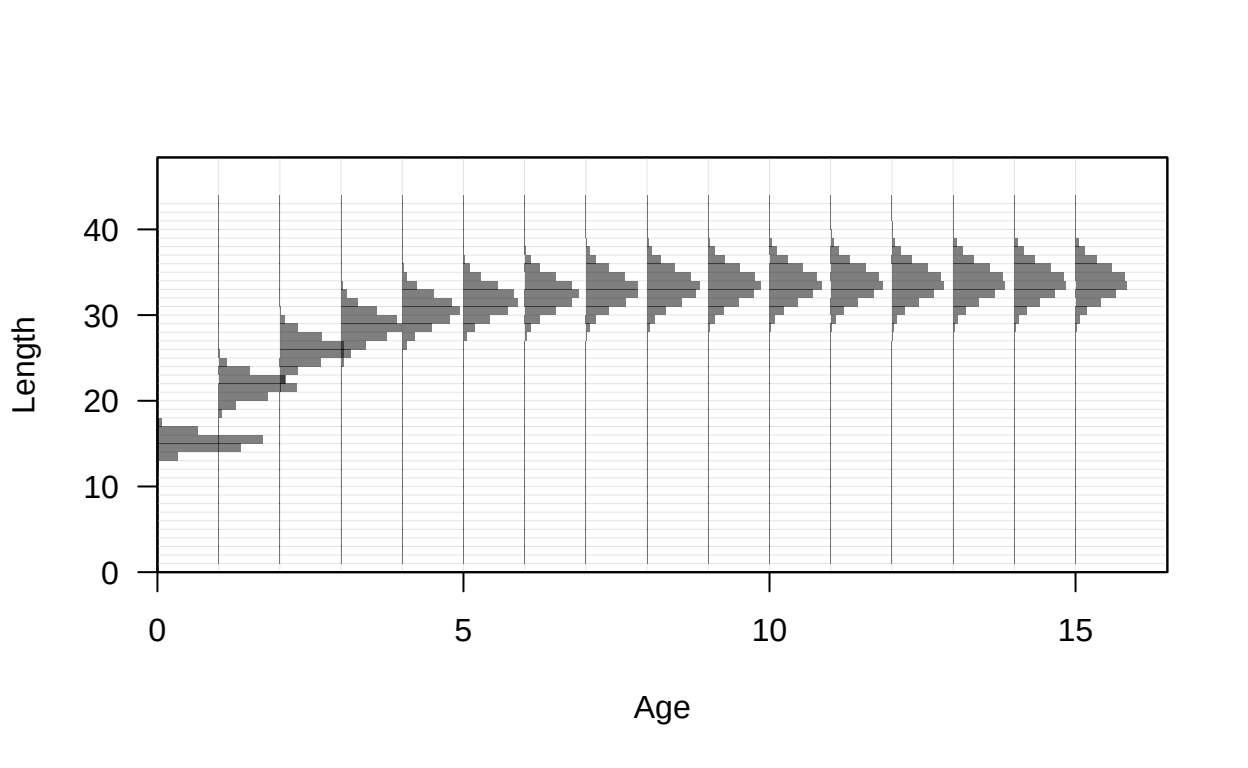

Age (yr)
Females
Males
Length (cm, beginning of the year)
Mean weight
Frac. mature
Age (yr)

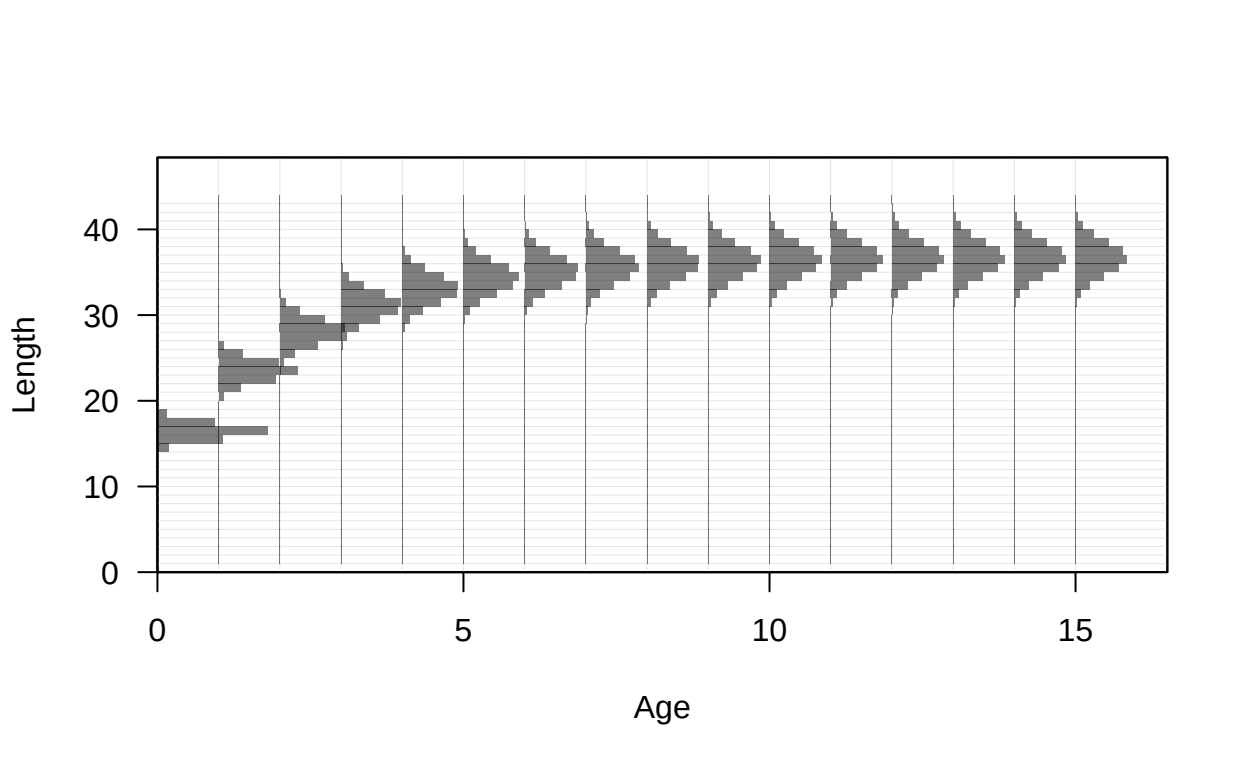

Length
0
10
20
30
40
0
5
10
15
Age

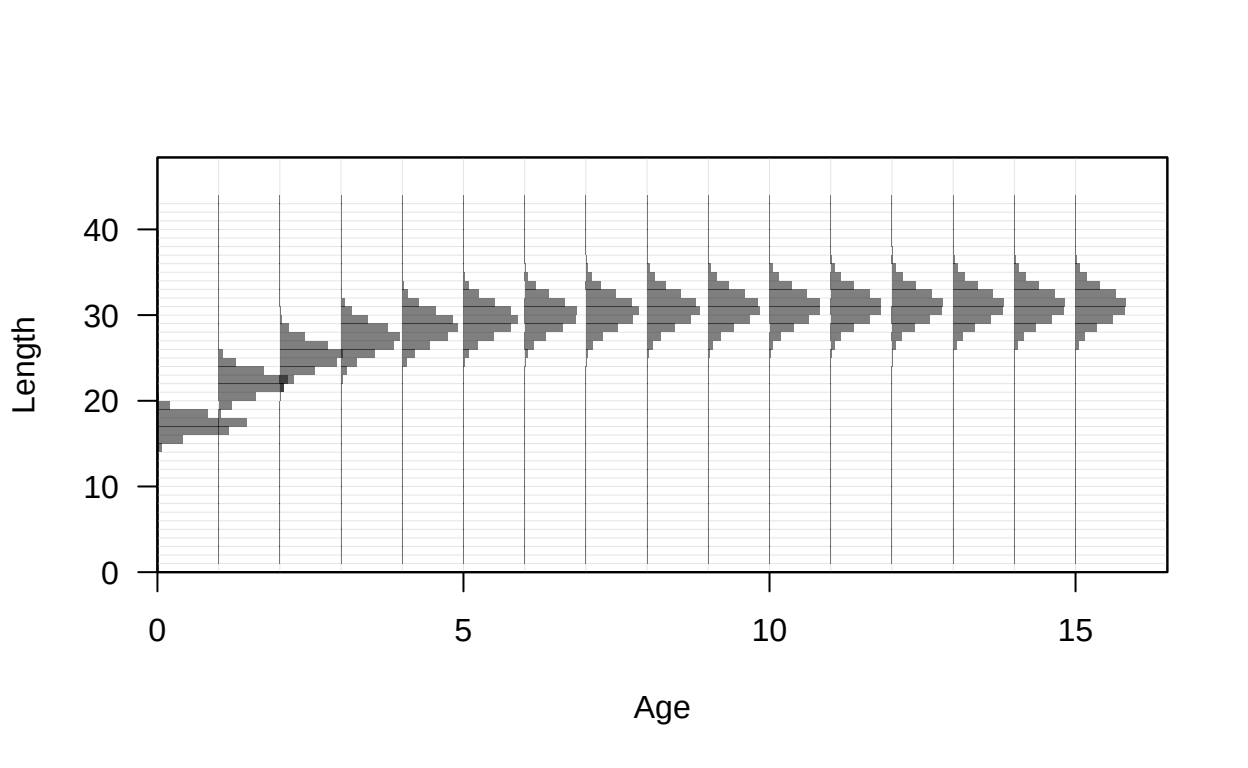

Length
0
10
20
30
40
0
5
10
15
Age

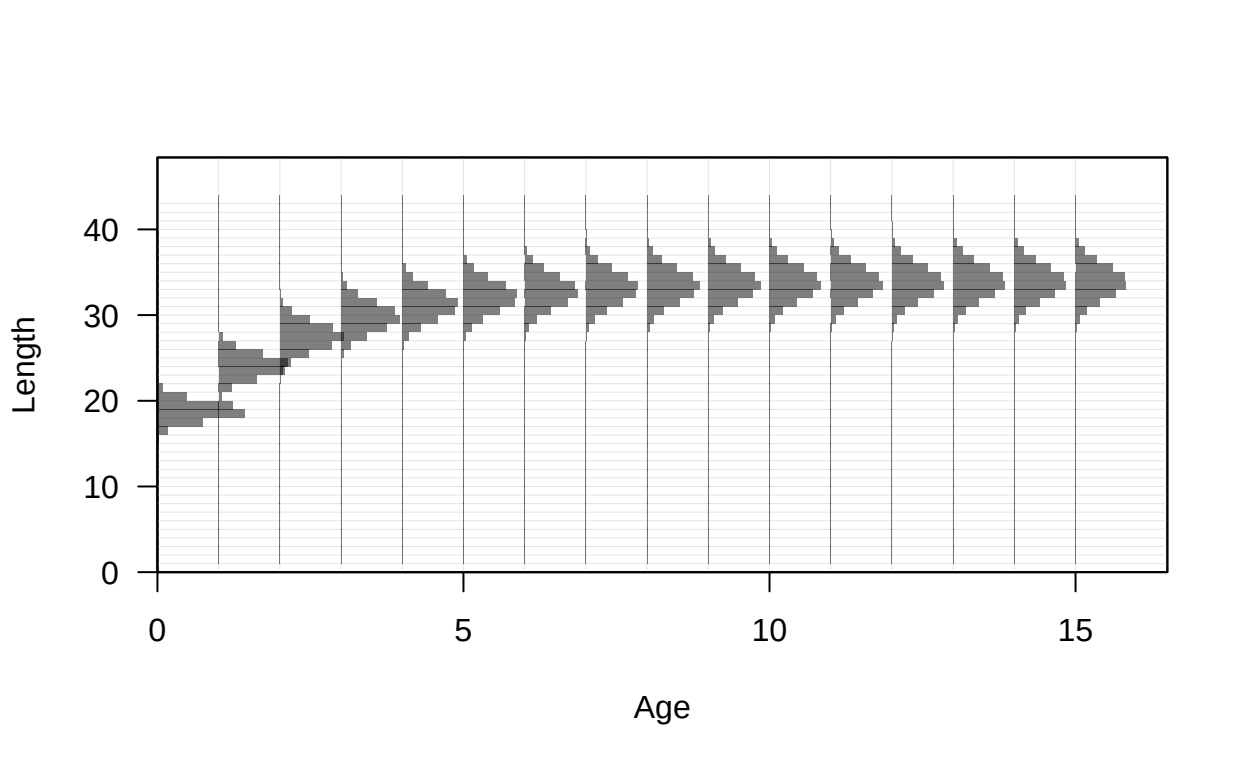

Length
0
10
20
30
40
0
5
10
15
Age

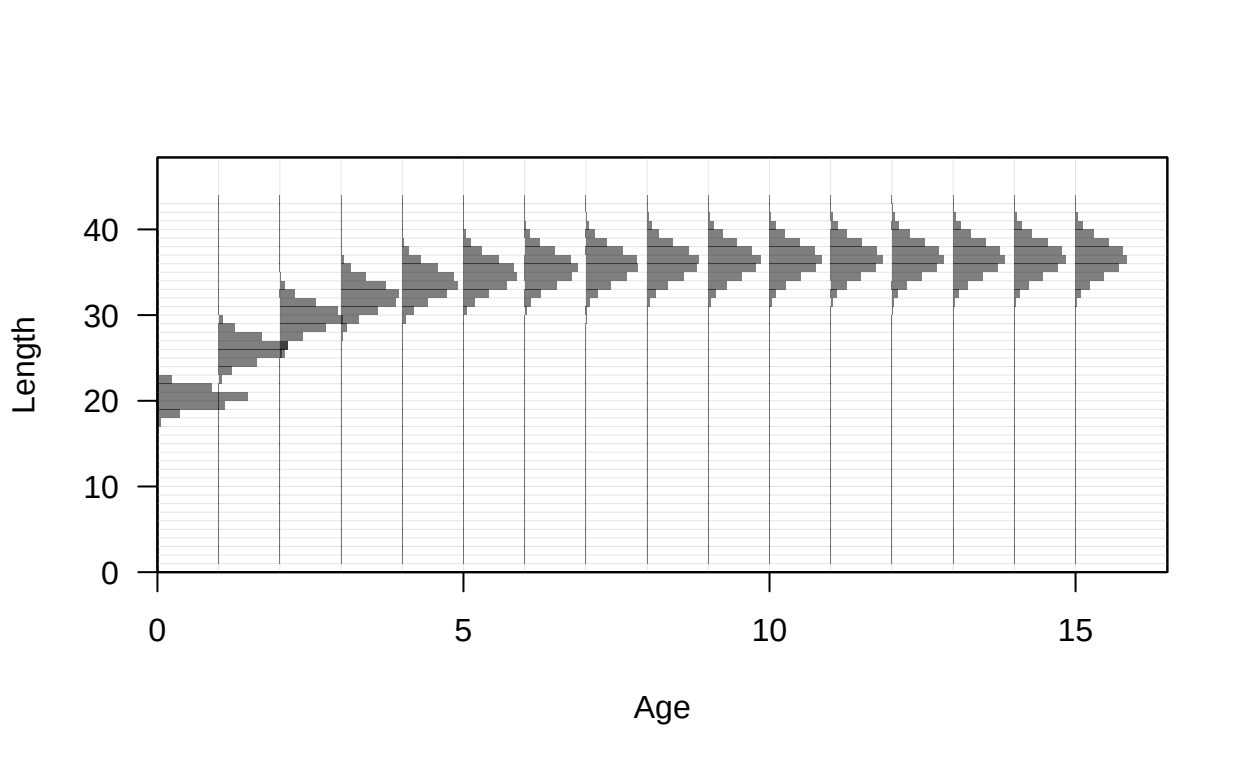

Length
0
10
20
30
40
0
5
10
15
Age

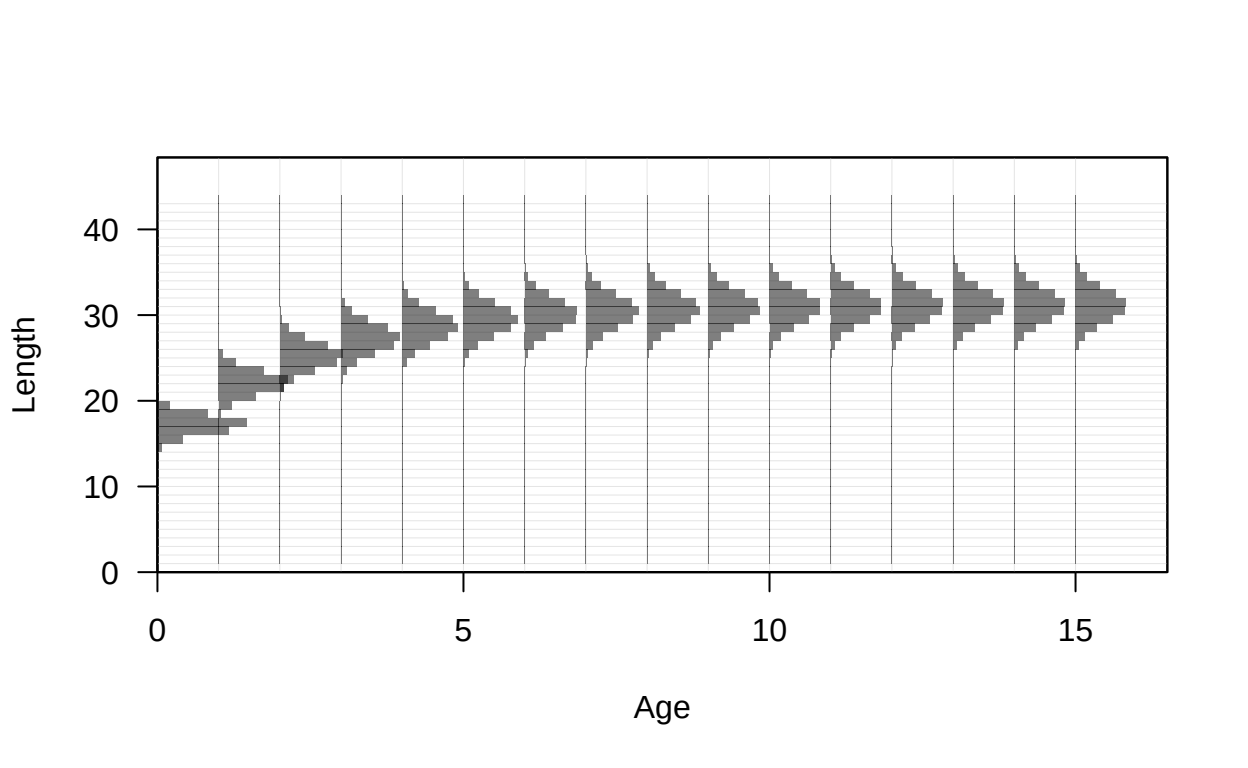

Length
0
10
20
30
40
0
5
10
15
Age

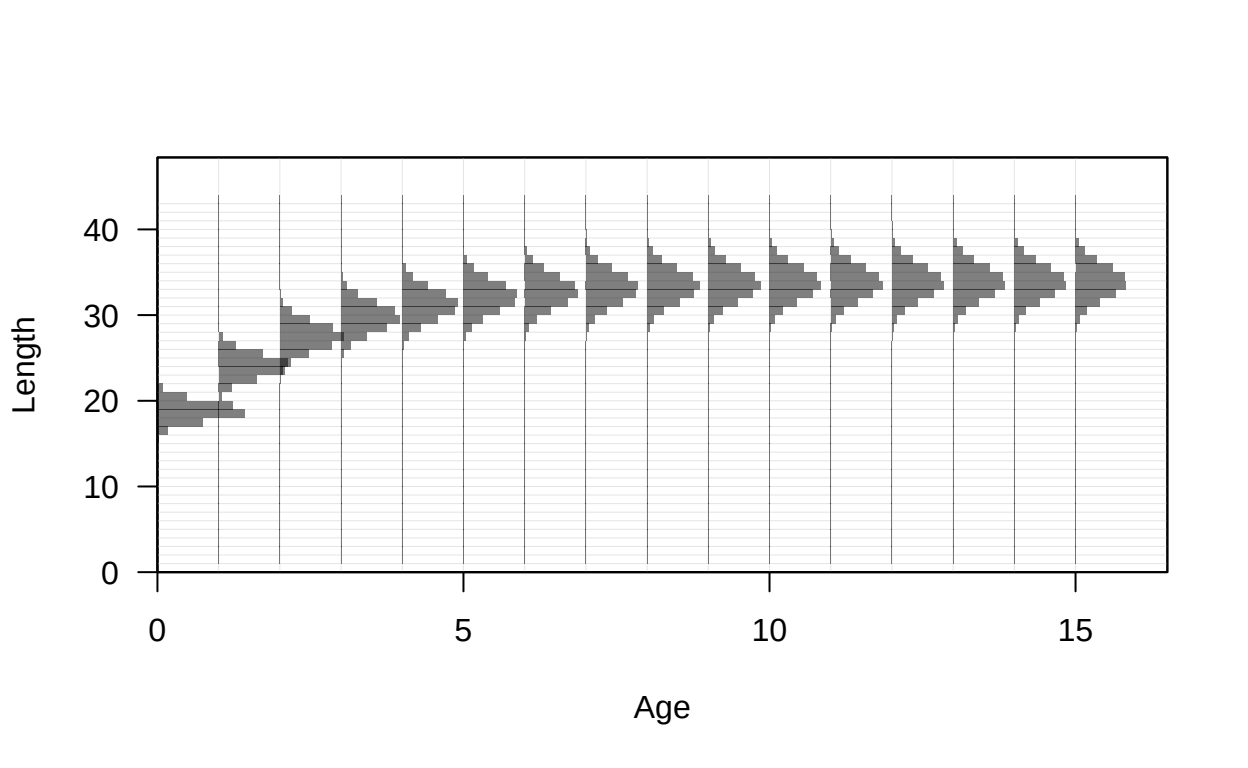

Length
0
10
20
30
40
0
5
10
15
Age

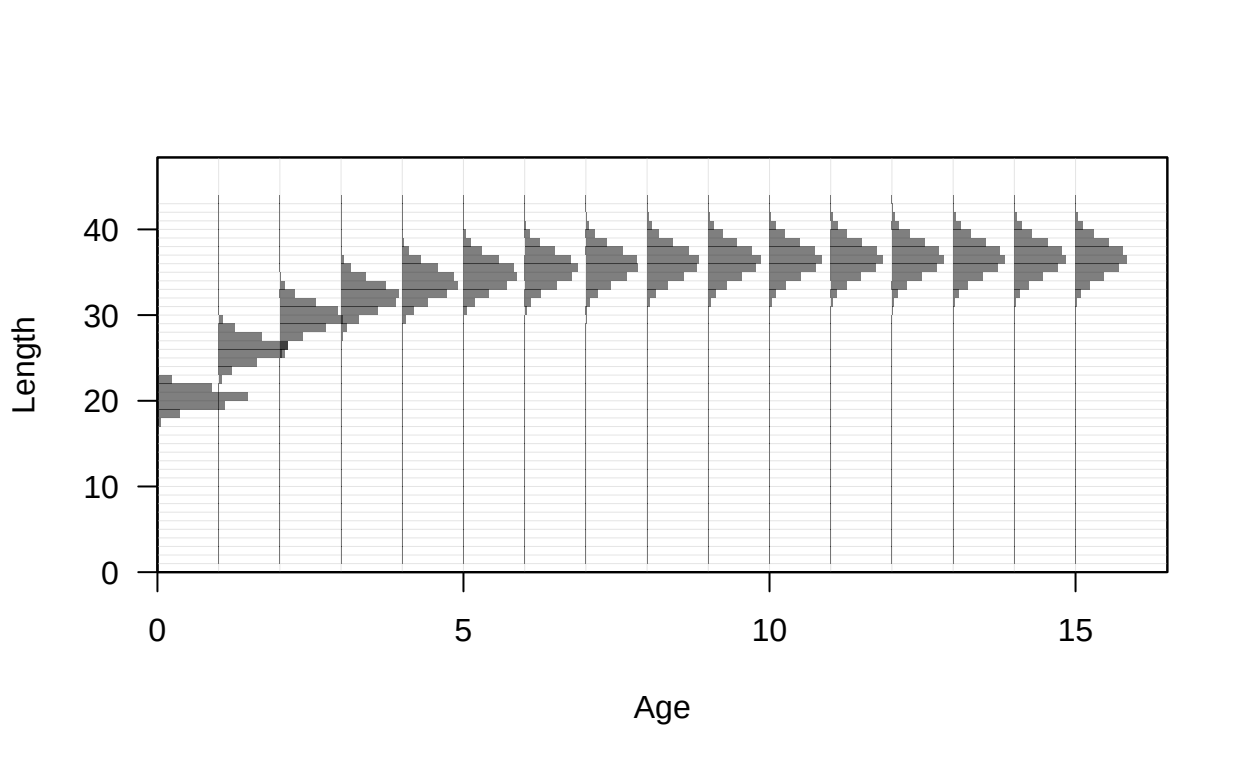

Length
0
10
20
30
40
0
5
10
15
Age

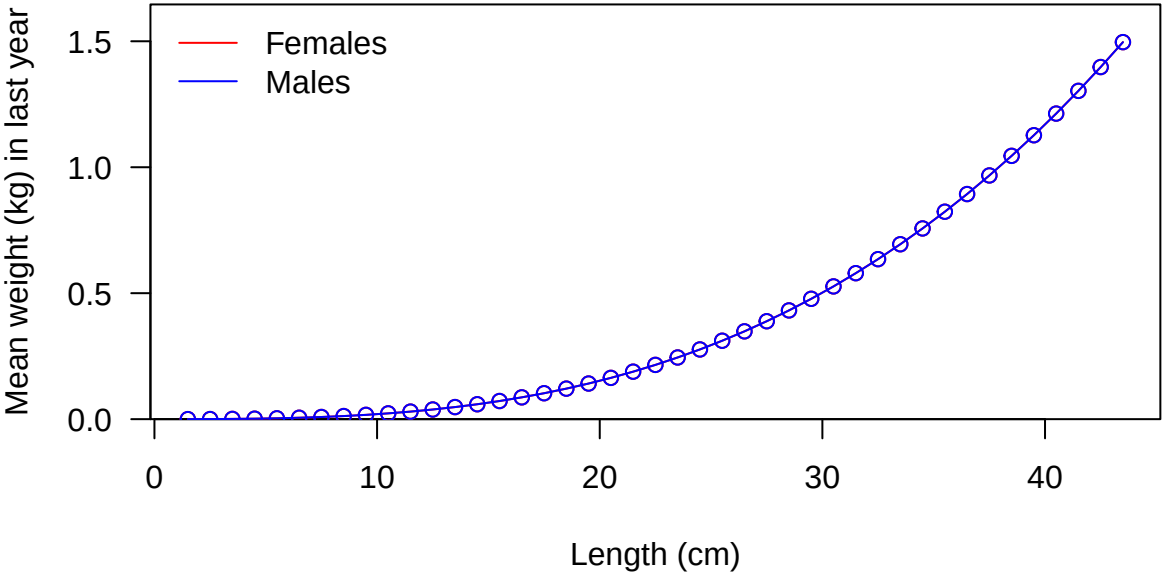

Length
0
10
20
30
40
0
5
10
15
Age

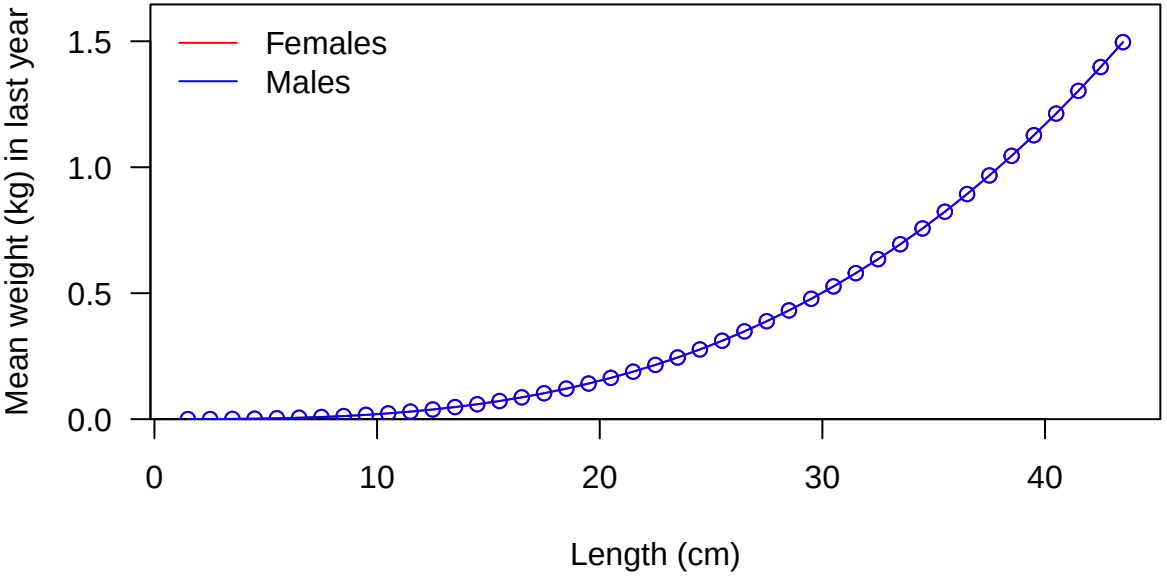

Length
0
10
20
30
40
0
5
10
15
Age

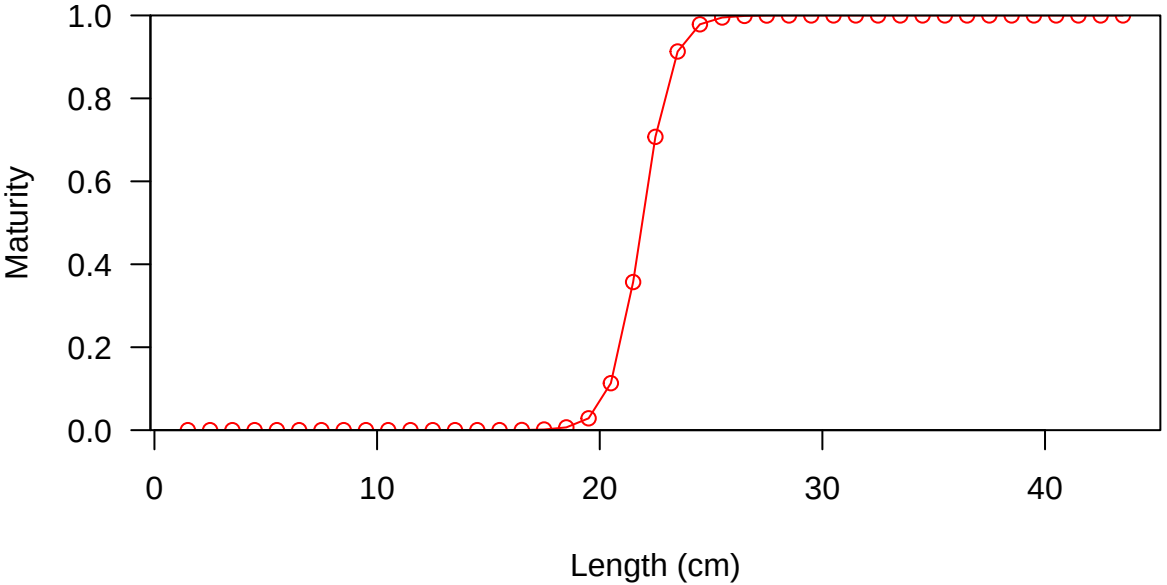

Length
0
10
20
30
40
0
5
10
15
Age

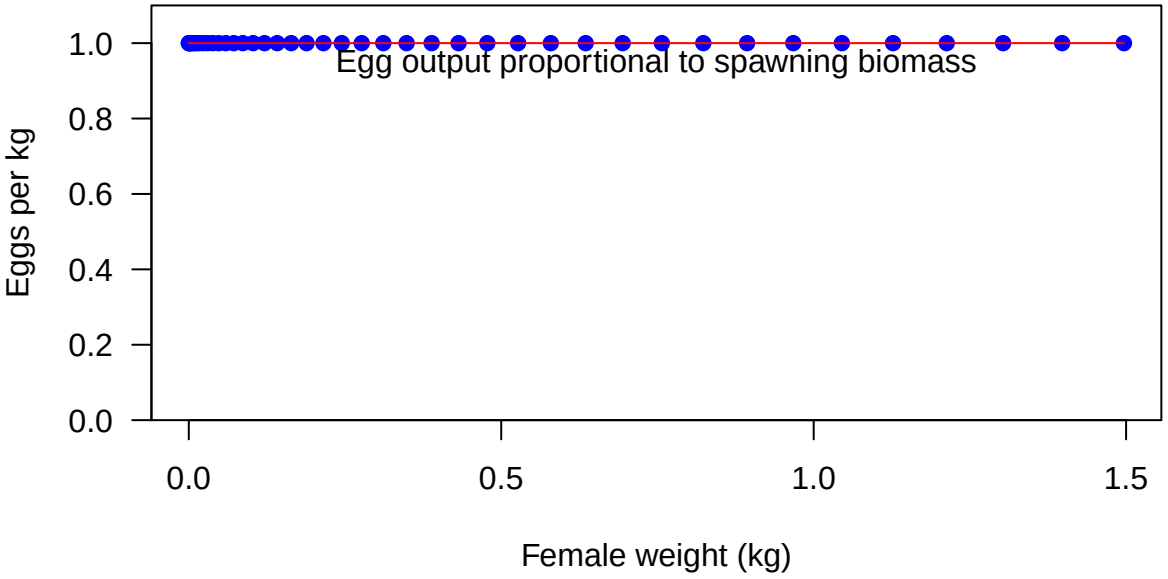

Length
0
10
20
30
40
0
5
10
15
Age

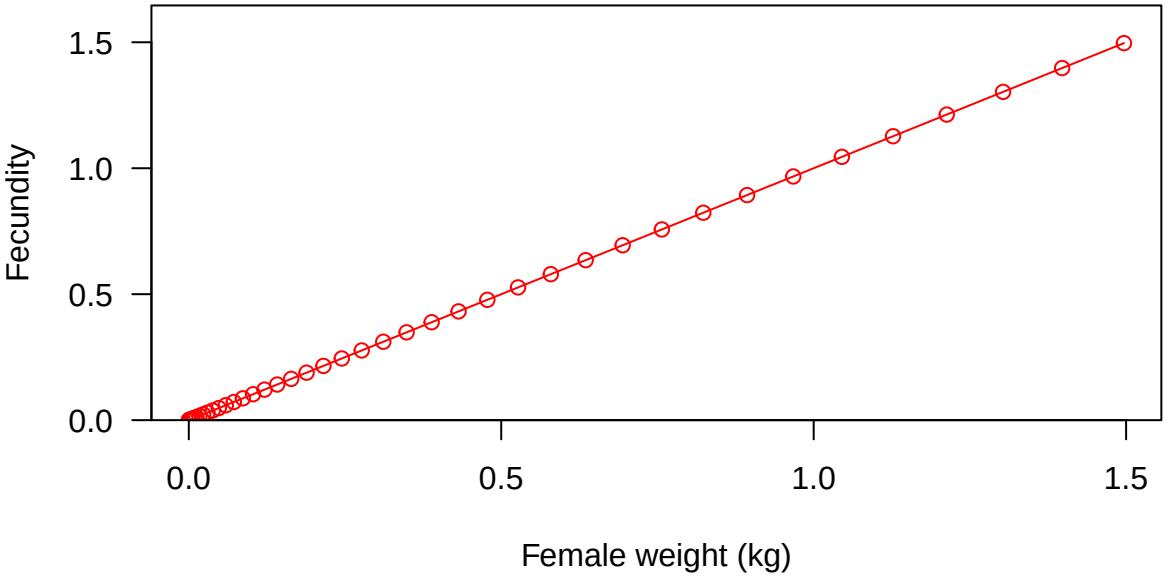

Length
0
10
20
30
40
0
5
10
15
Age

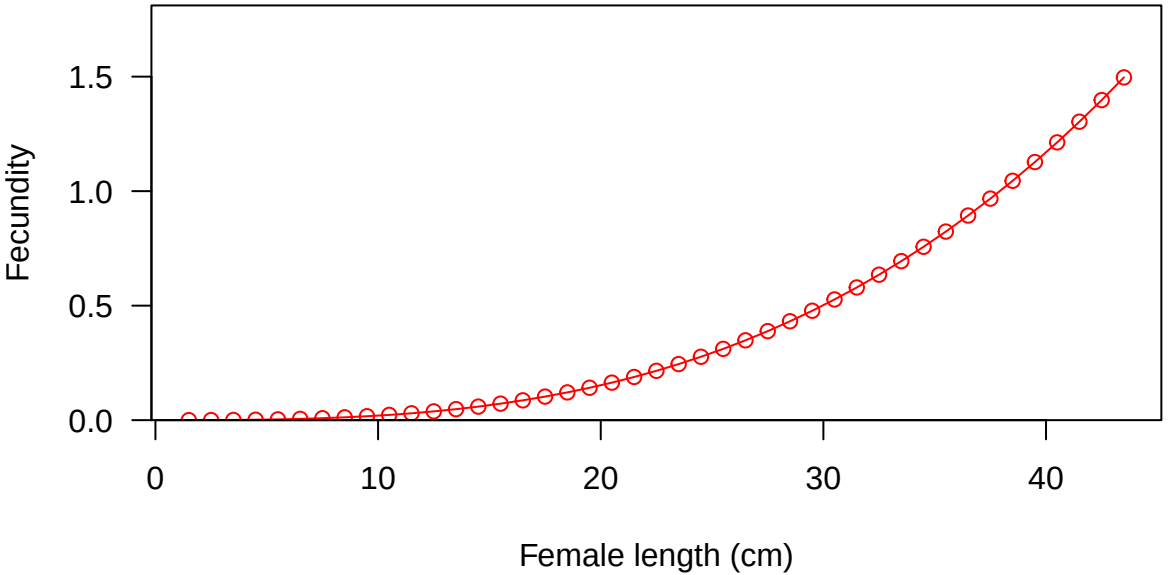

Females
Males
1.5
1.0
0.5
0.0
Mean weight (kg) in last year
0
10
20
30
40
Length (cm)

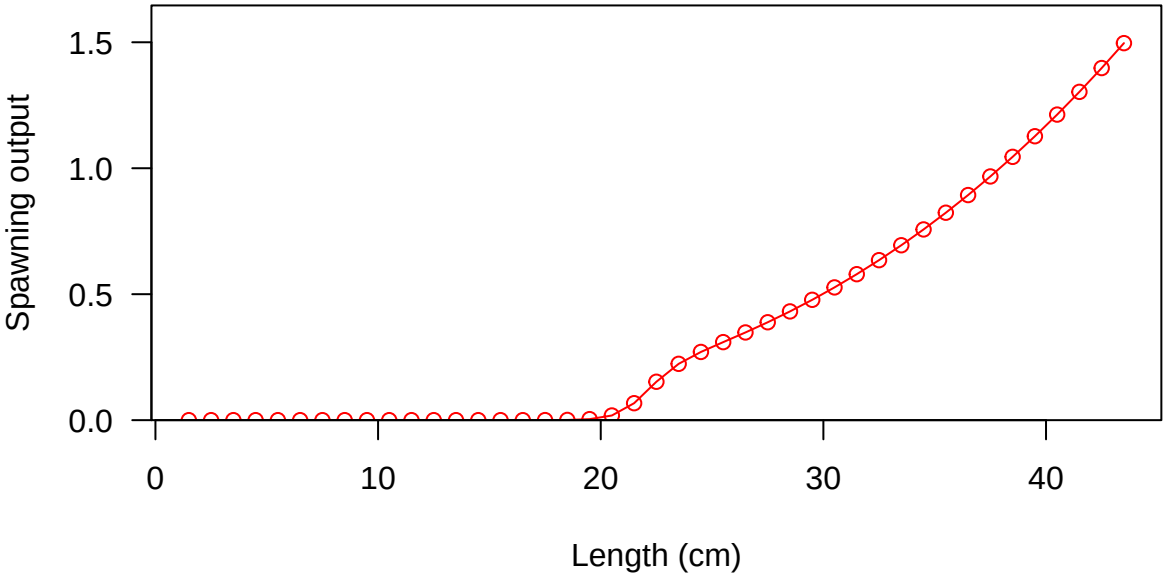

Females
Males
1.5
1.0
0.5
0.0
Mean weight (kg) in last year
0
10
20
30
40
Length (cm)

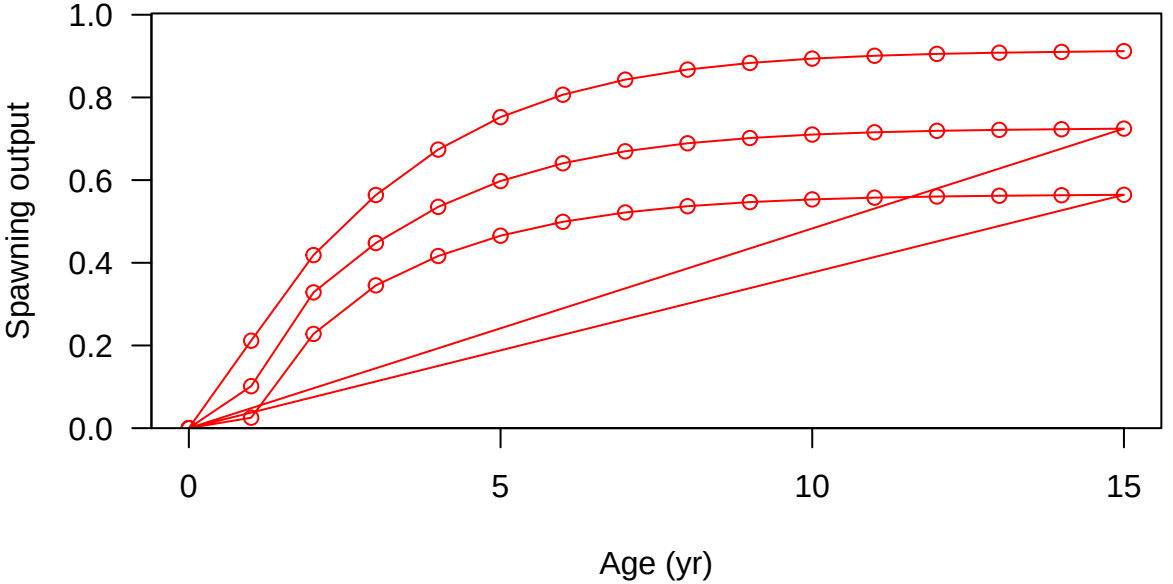

1.0
0.8
0.6
0.4
0.2
0.0
Maturity
0
10
20
30
40
Length (cm)

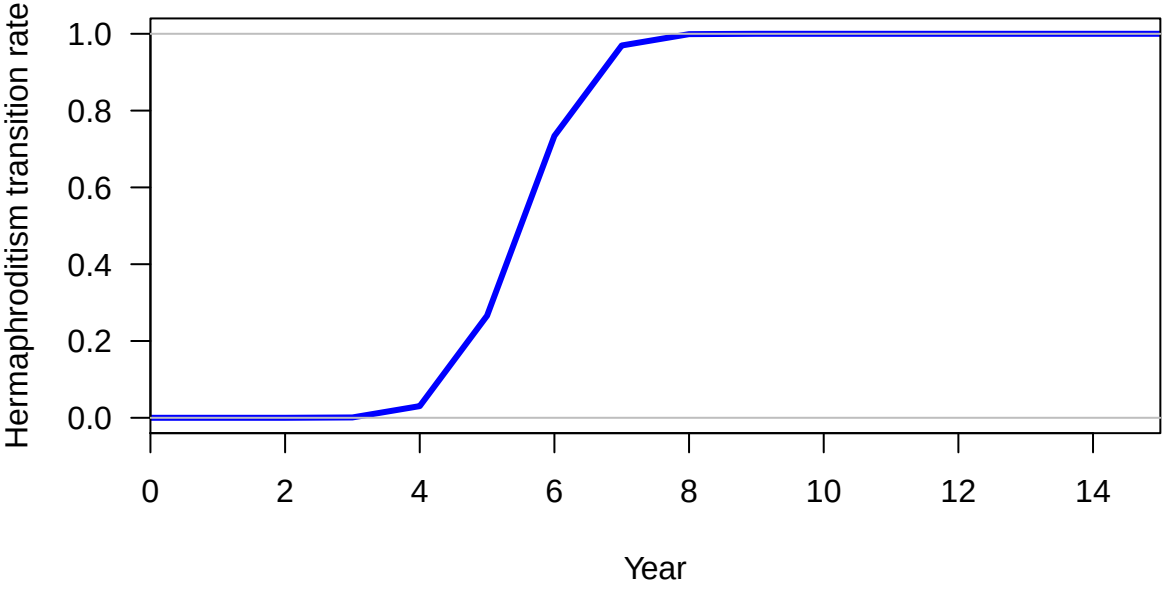

Egg output proportional to spawning biomass
Eggs per kg
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
Female weight (kg)

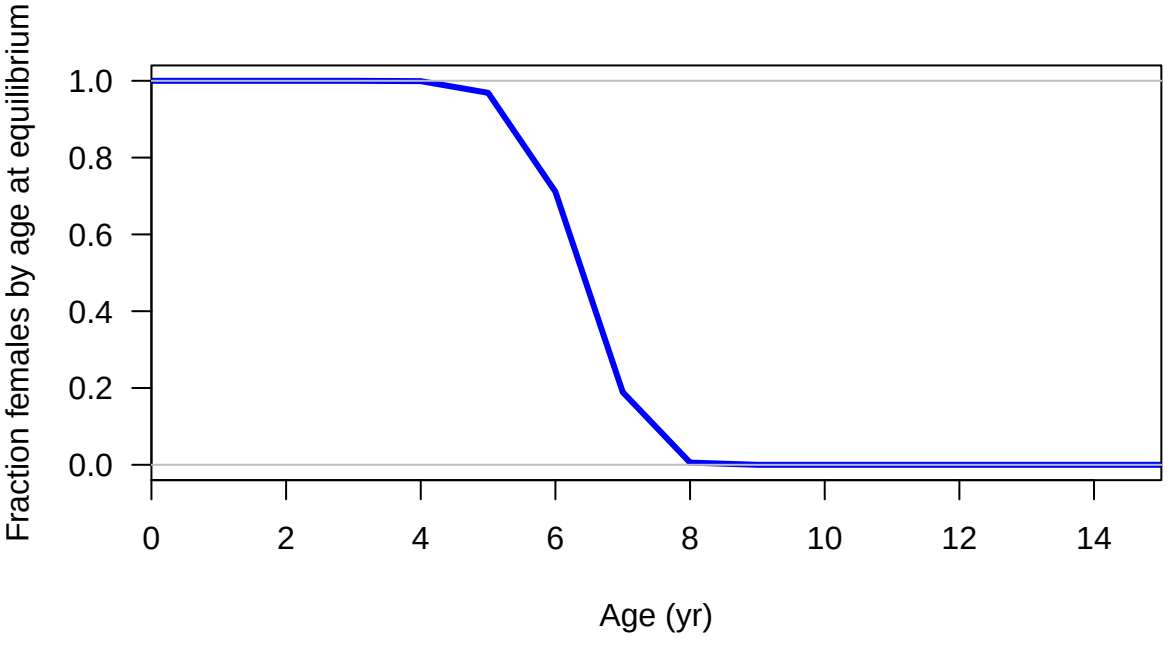

Fecundity
0.0
0.5
1.0
1.5
0.0
0.5
1.0
1.5
Female weight (kg)

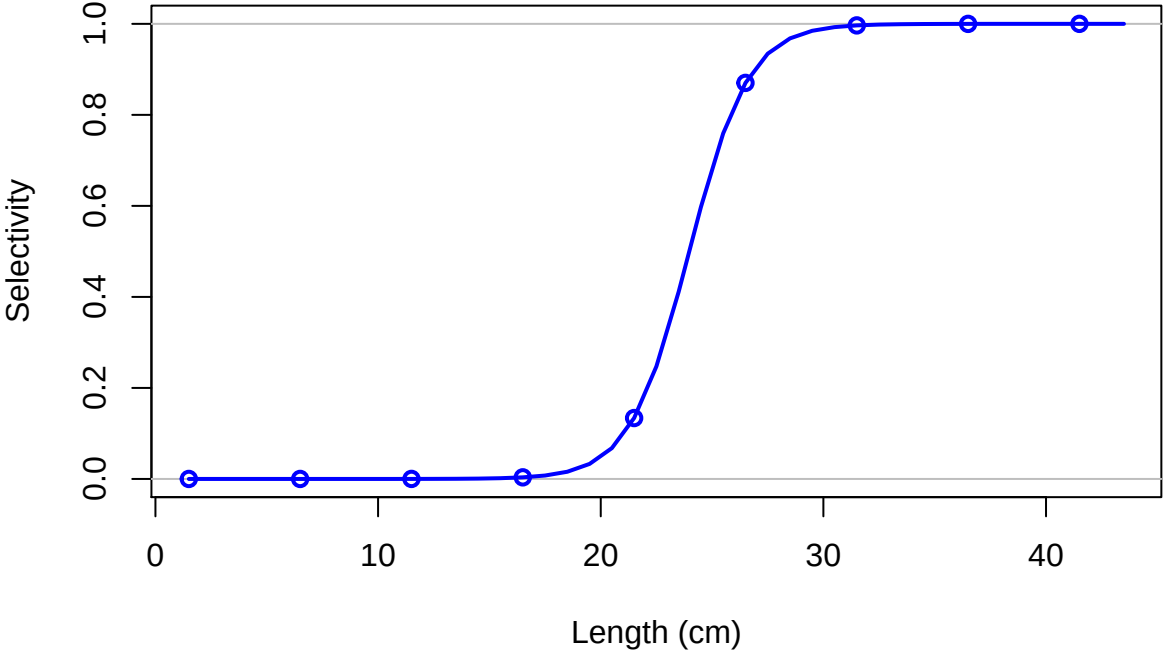

Fecundity
0.0
0.5
1.0
1.5
0
10
20
30
40
Female length (cm)

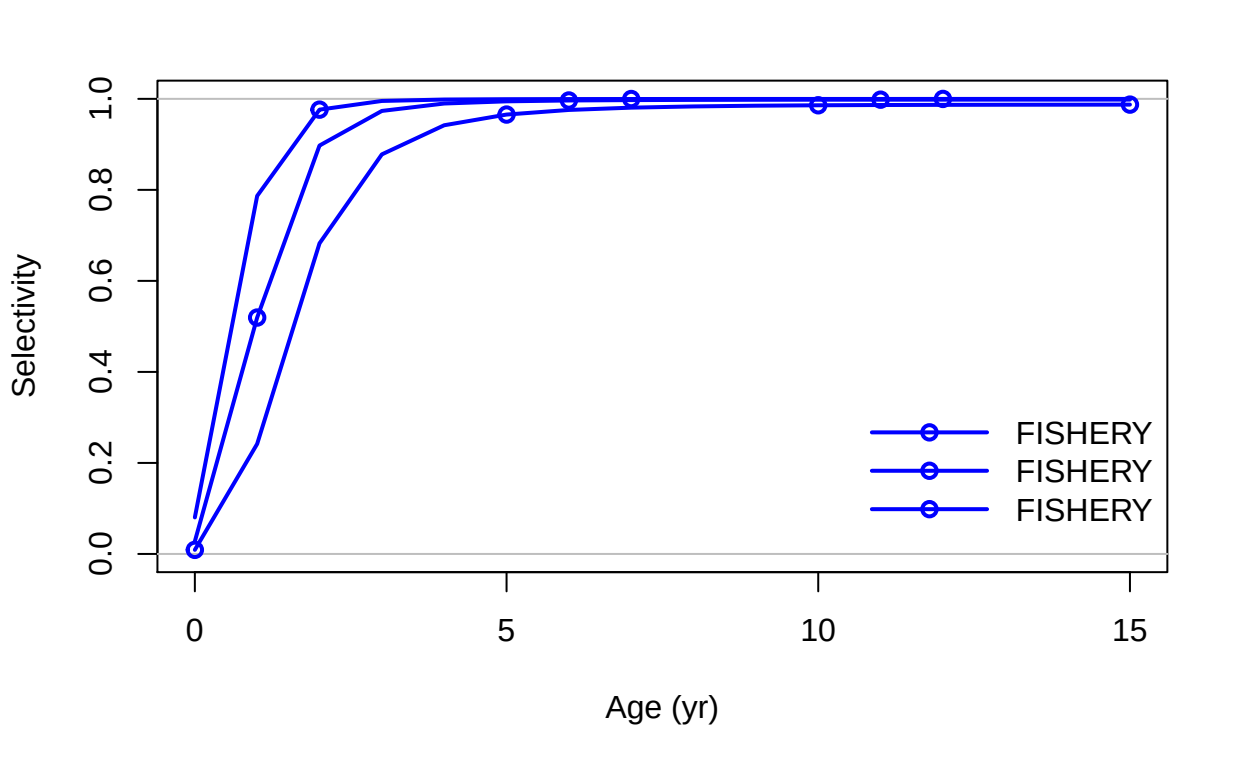

Spawning output
1.5
1.0
0.5
0.0
0
10
20
30
40
Length (cm)

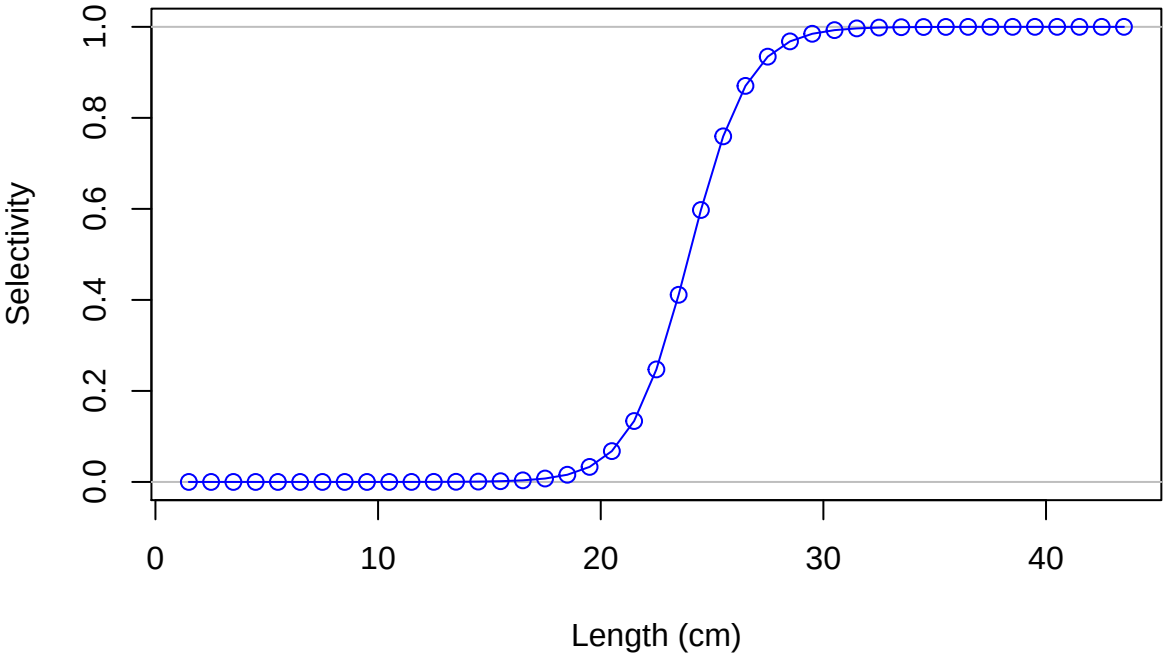

1.0
0.8
0.6
0.4
0.2
0.0
Spawning output
0
5
10
15
Age (yr)

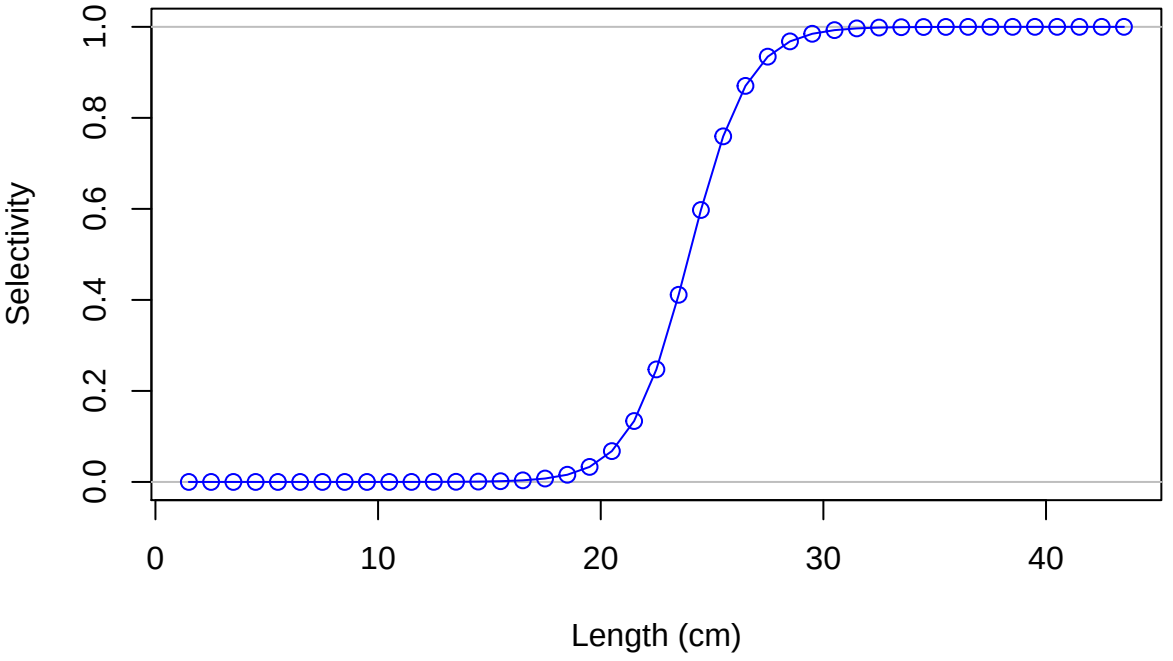

Hermaphroditism transition rate
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
14
Year

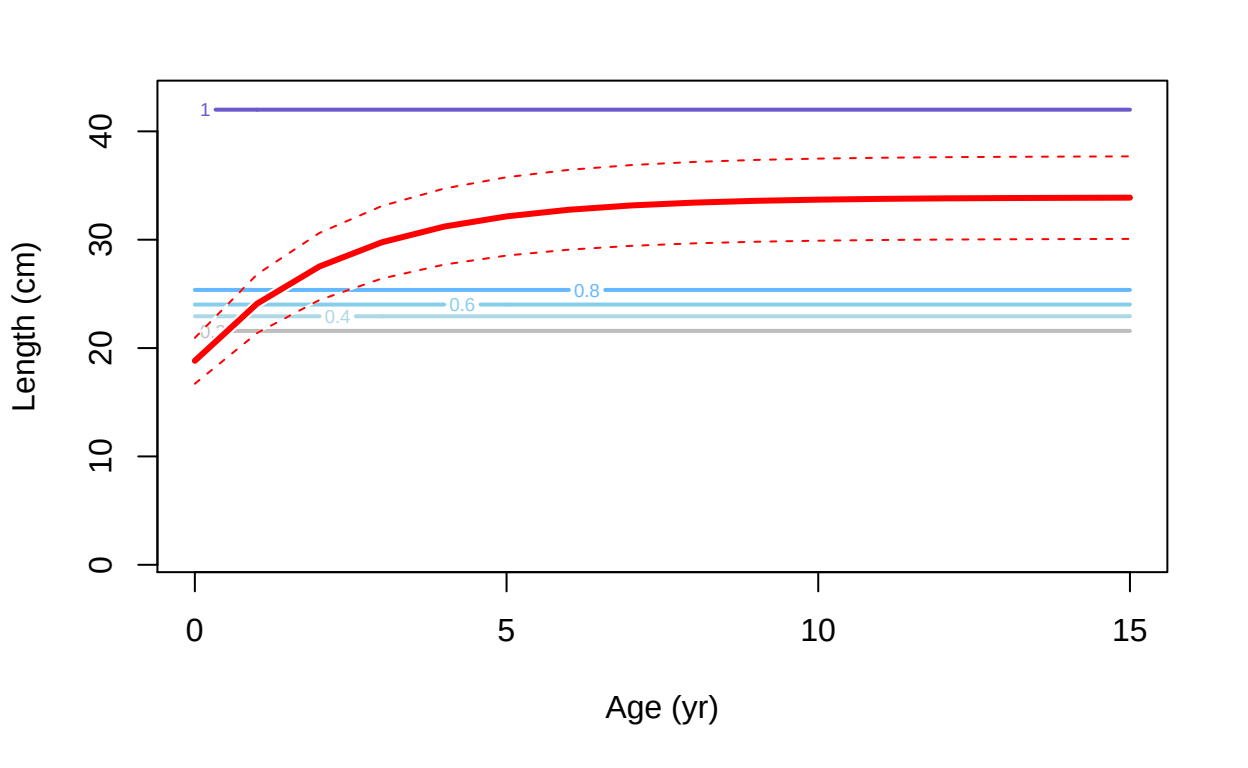

Fraction females by age at equilibrium
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8
10
12
14
Age (yr)

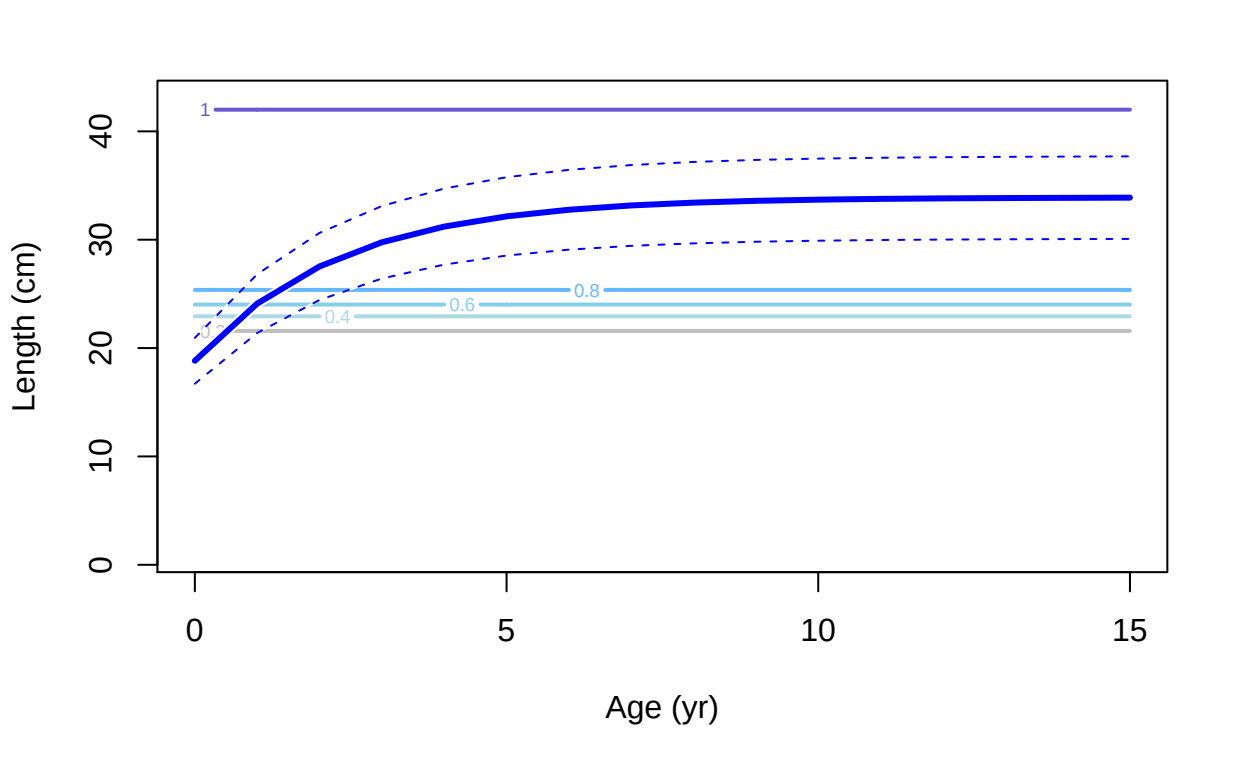

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
Length (cm)

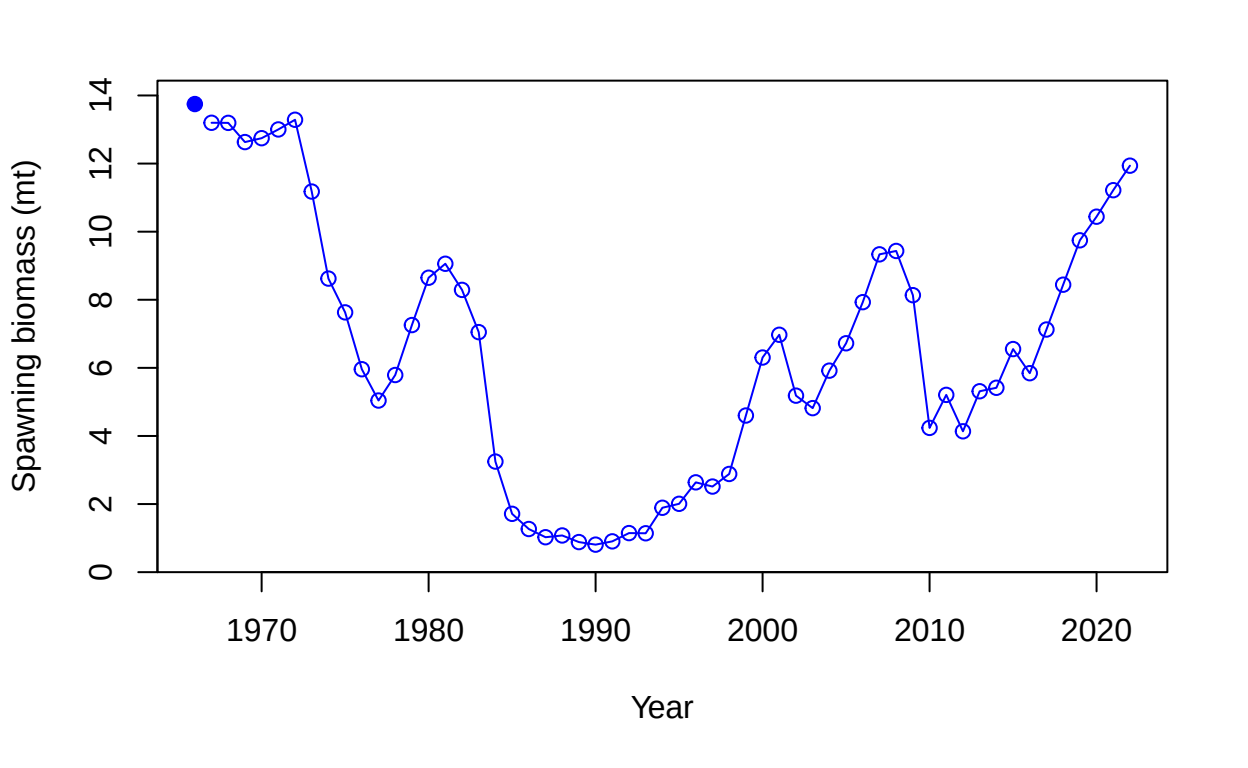

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
Age (yr)
FISHERY
FISHERY
FISHERY

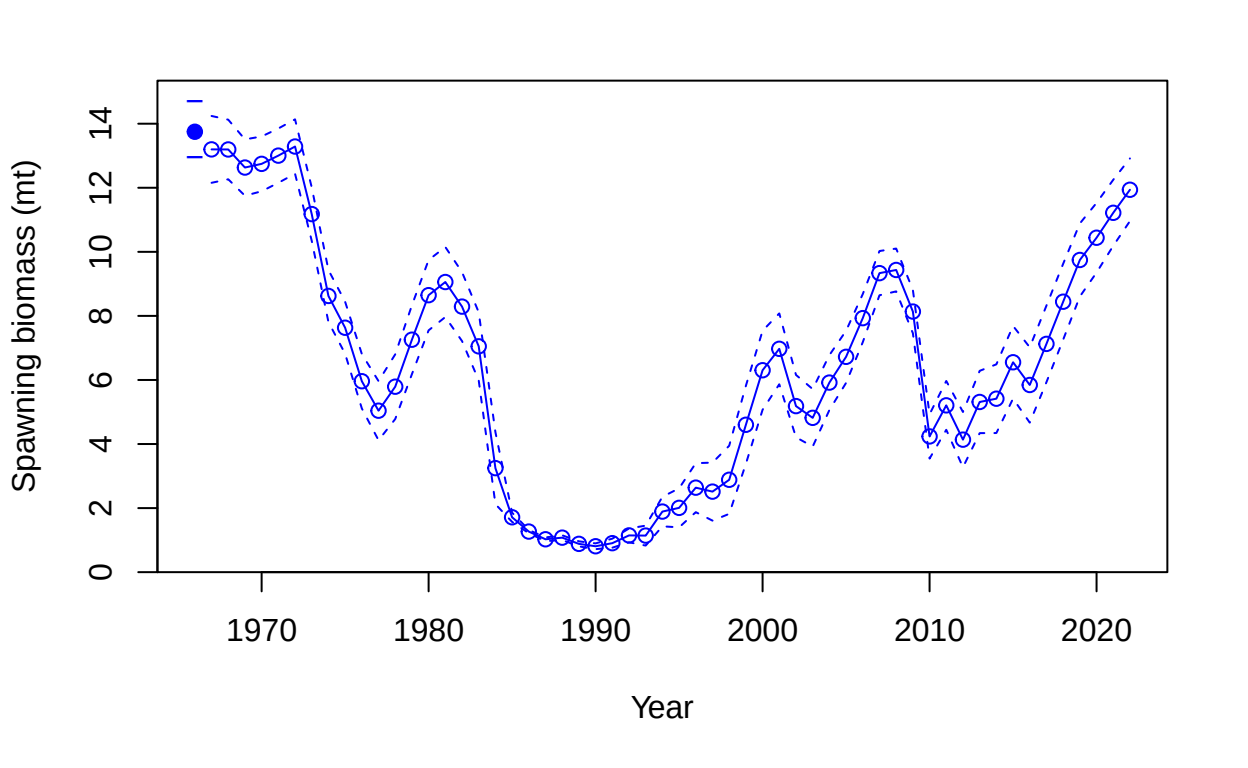

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
Length (cm)

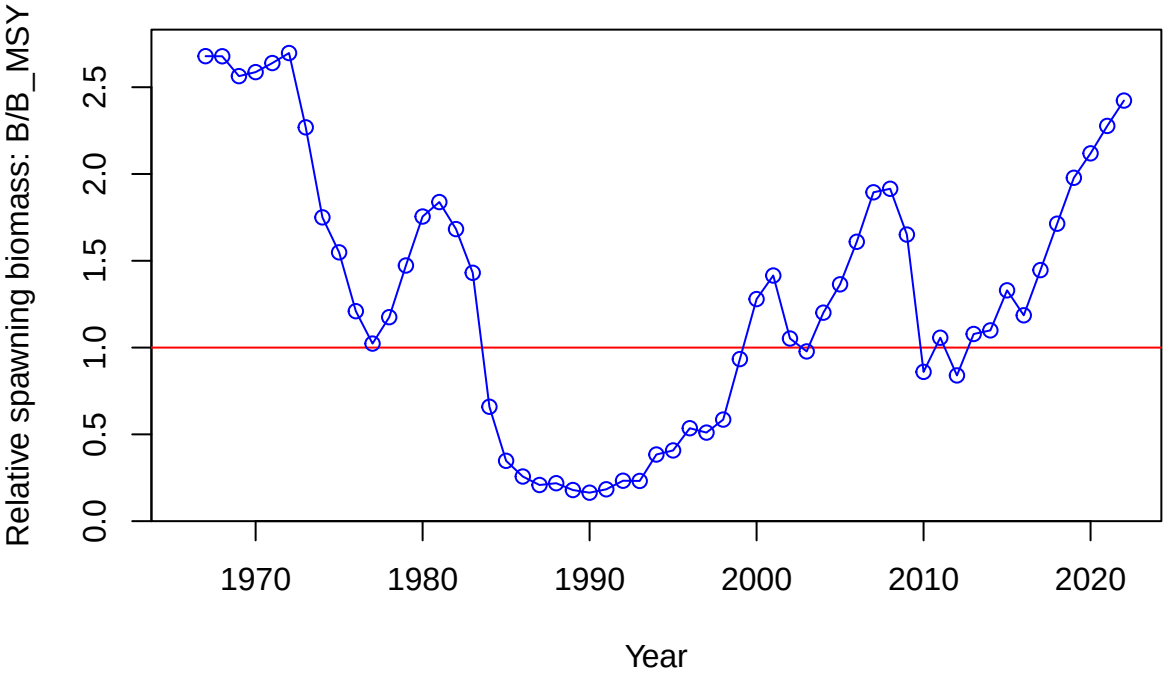

Selectivity
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
Length (cm)

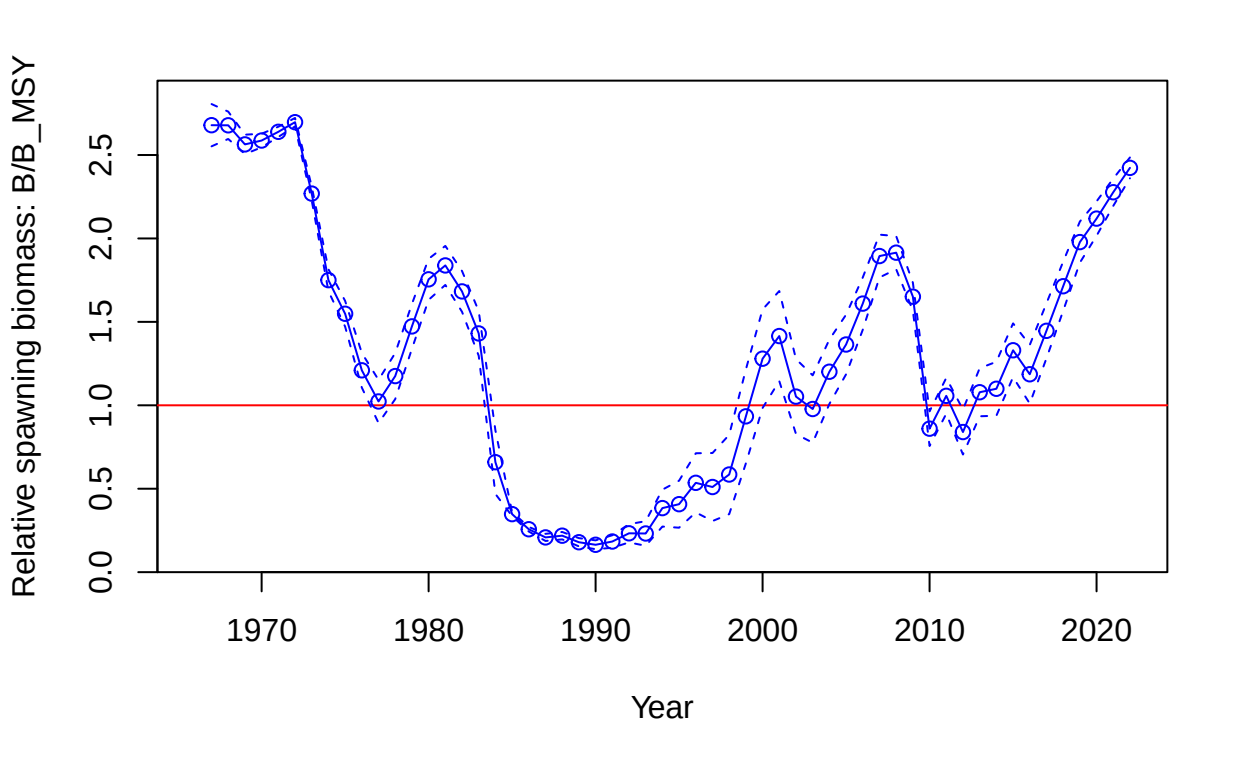

Length (cm)
0
10
20
30
40
1
0.8
0.6
0.4
0
5
10
15
Age (yr)

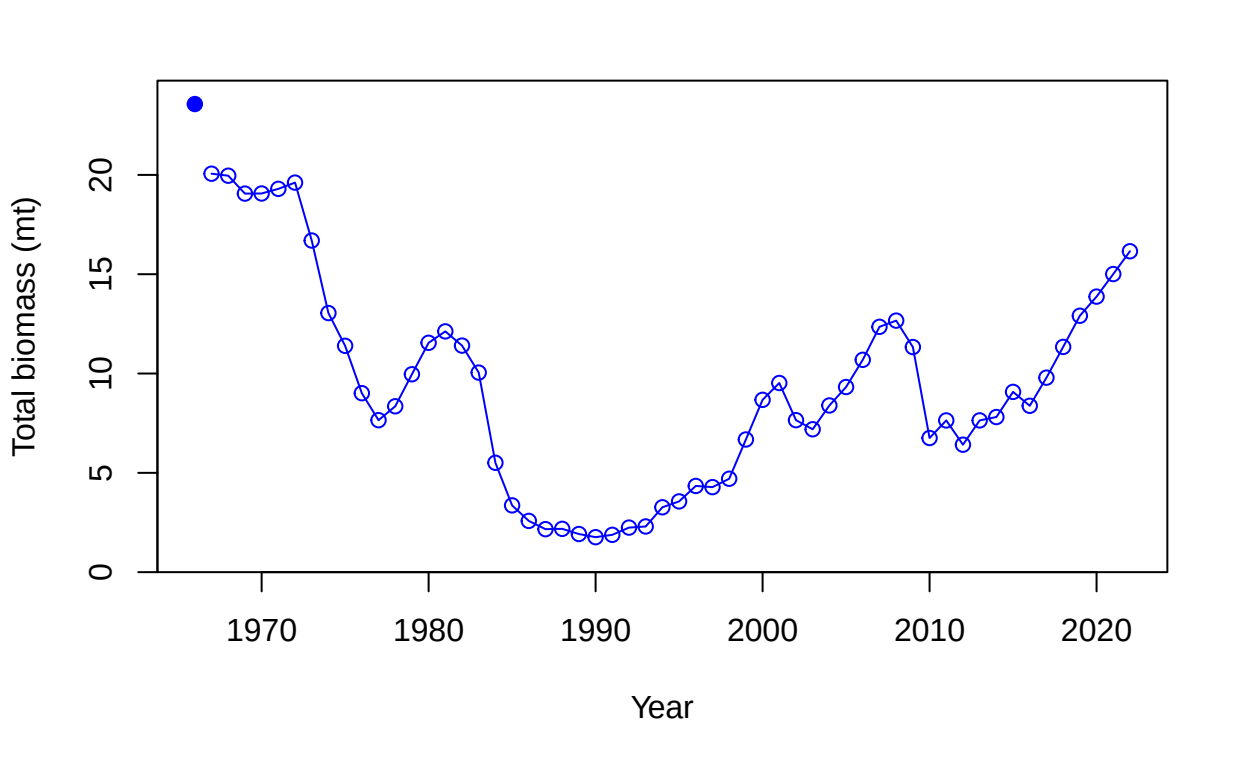

Length (cm)
0
10
20
30
40
1
0.8
0.6
0.4
0.2
0
5
10
15
Age (yr)

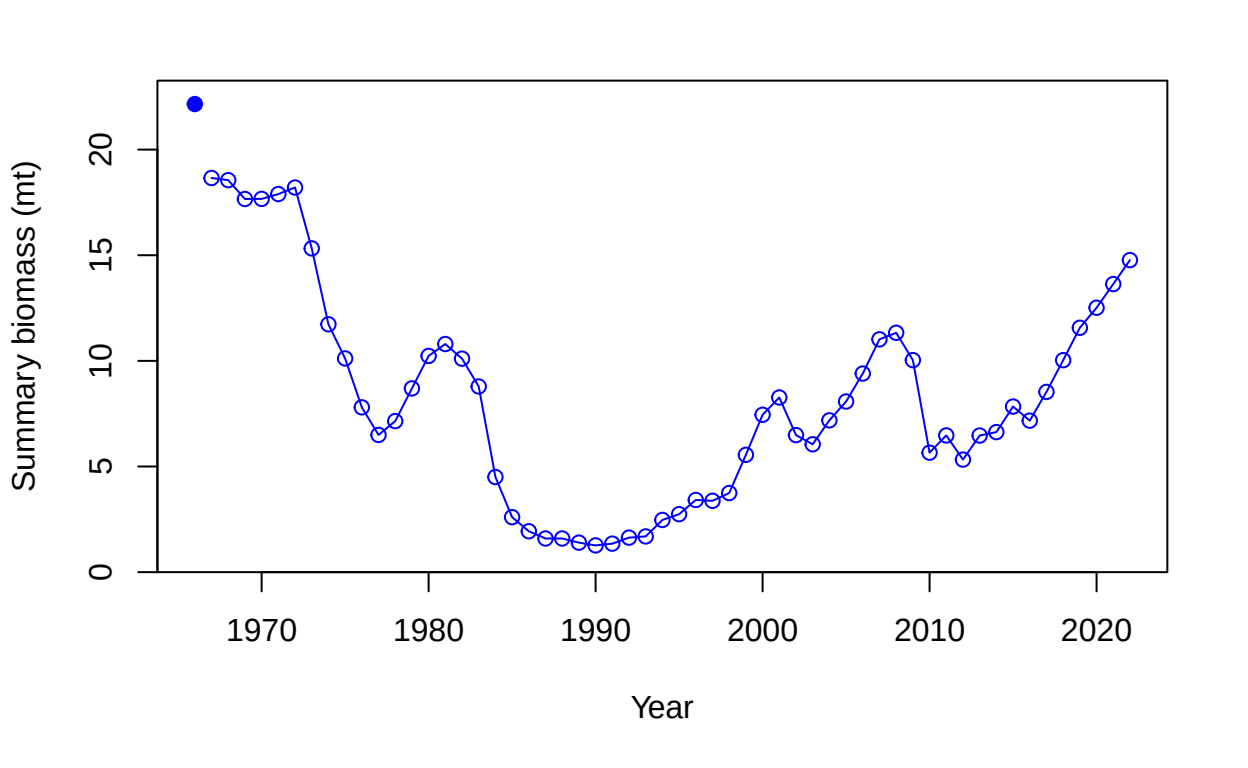

Spawning biomass (mt)
0
2
4
6
8
10
12
14
1970
1980
1990
2000
2010
2020
Year

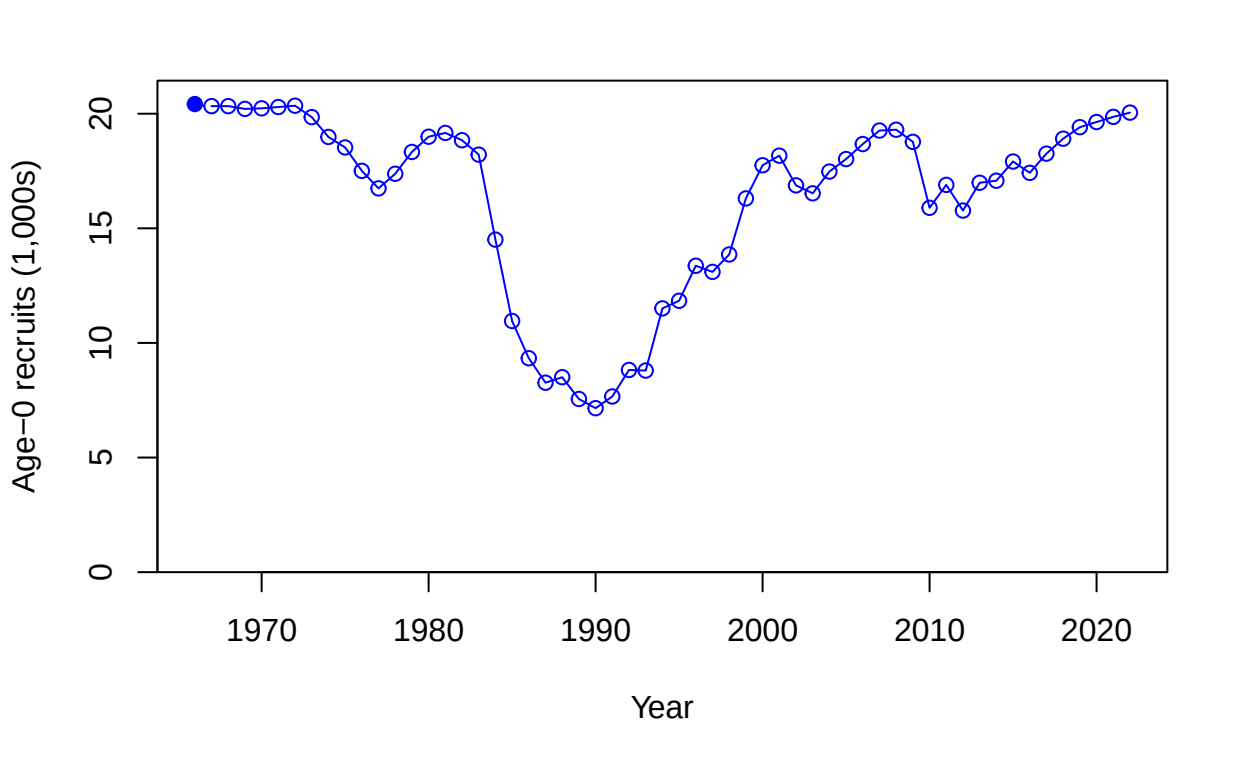

Spawning biomass (mt)
0
2
4
6
8
10
12
14
1970
1980
1990
2000
2010
2020
Year

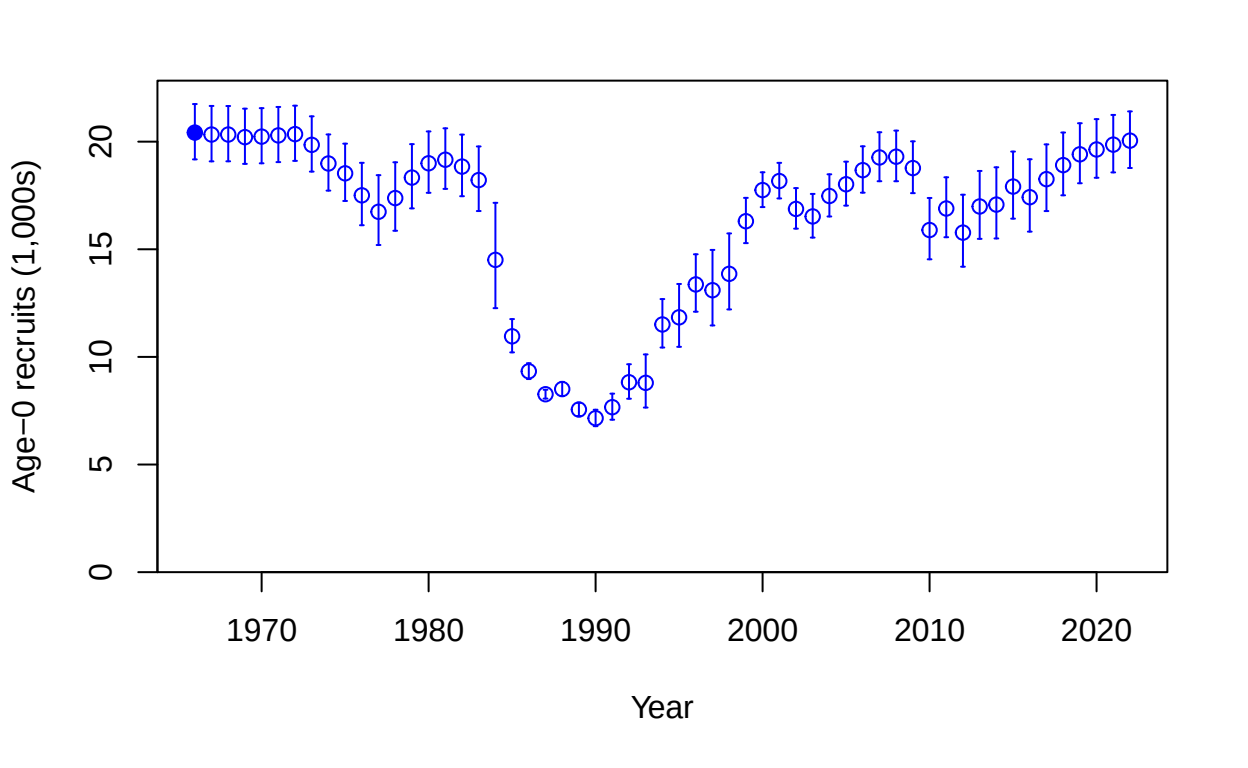

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
1970
1980
1990
2000
2010
2020
Year

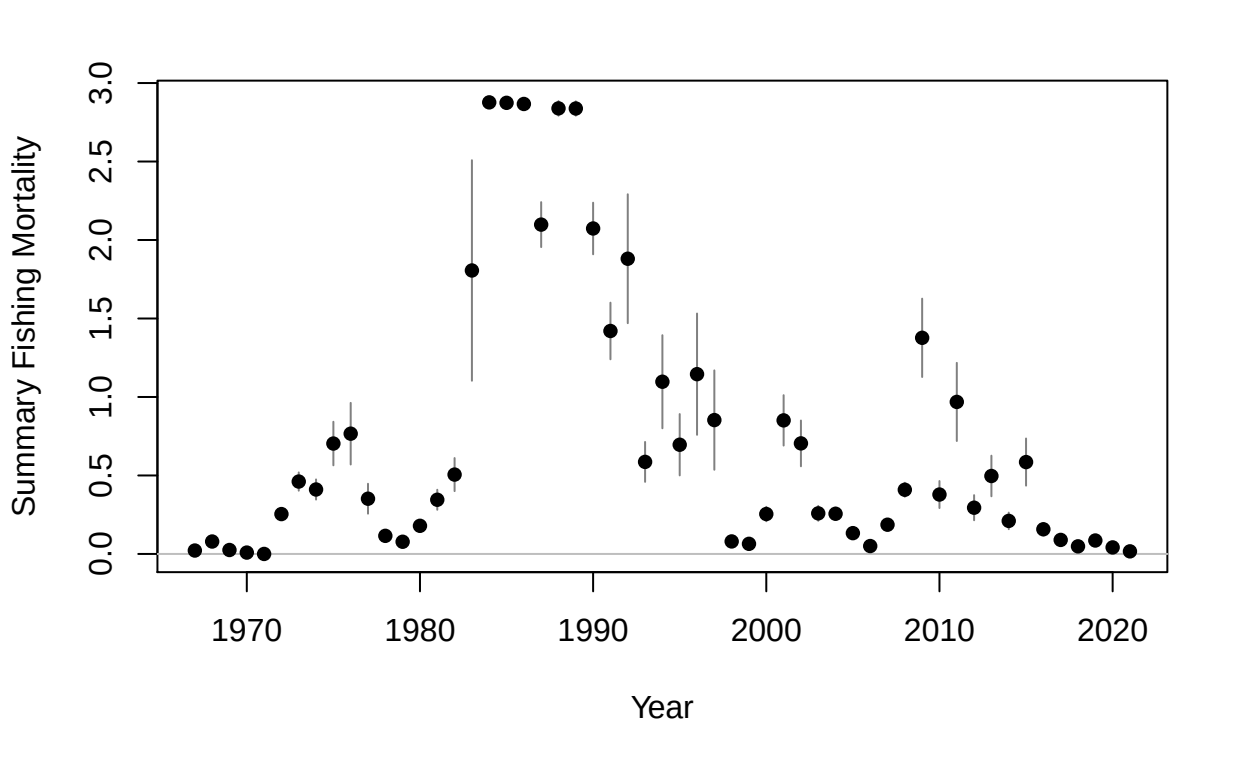

Relative spawning biomass: B/B_MSY
0.0
0.5
1.0
1.5
2.0
2.5
1970
1980
1990
2000
2010
2020
Year

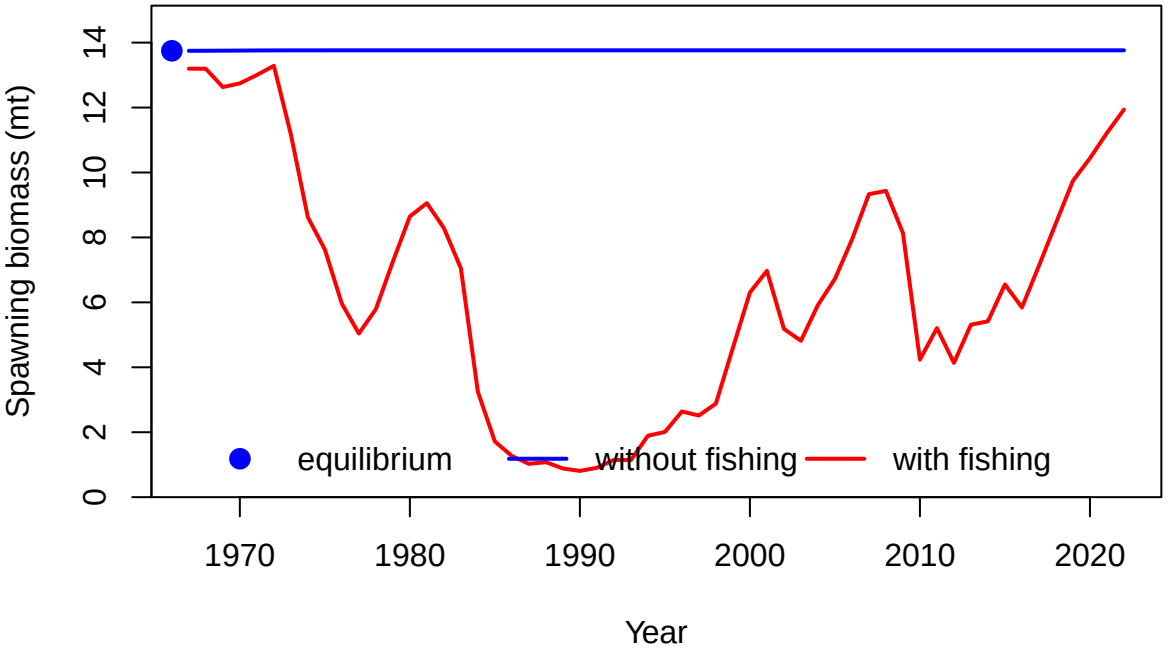

Total biomass (mt)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year

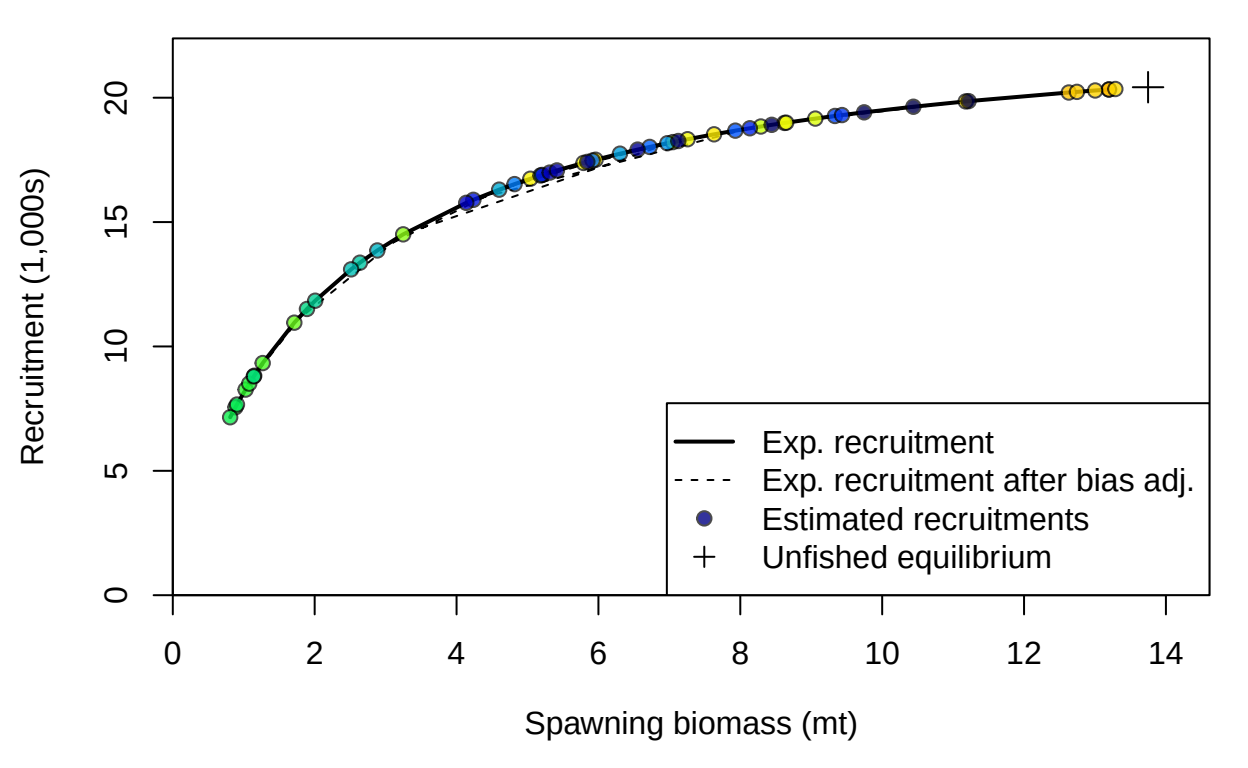

Summary biomass (mt)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year

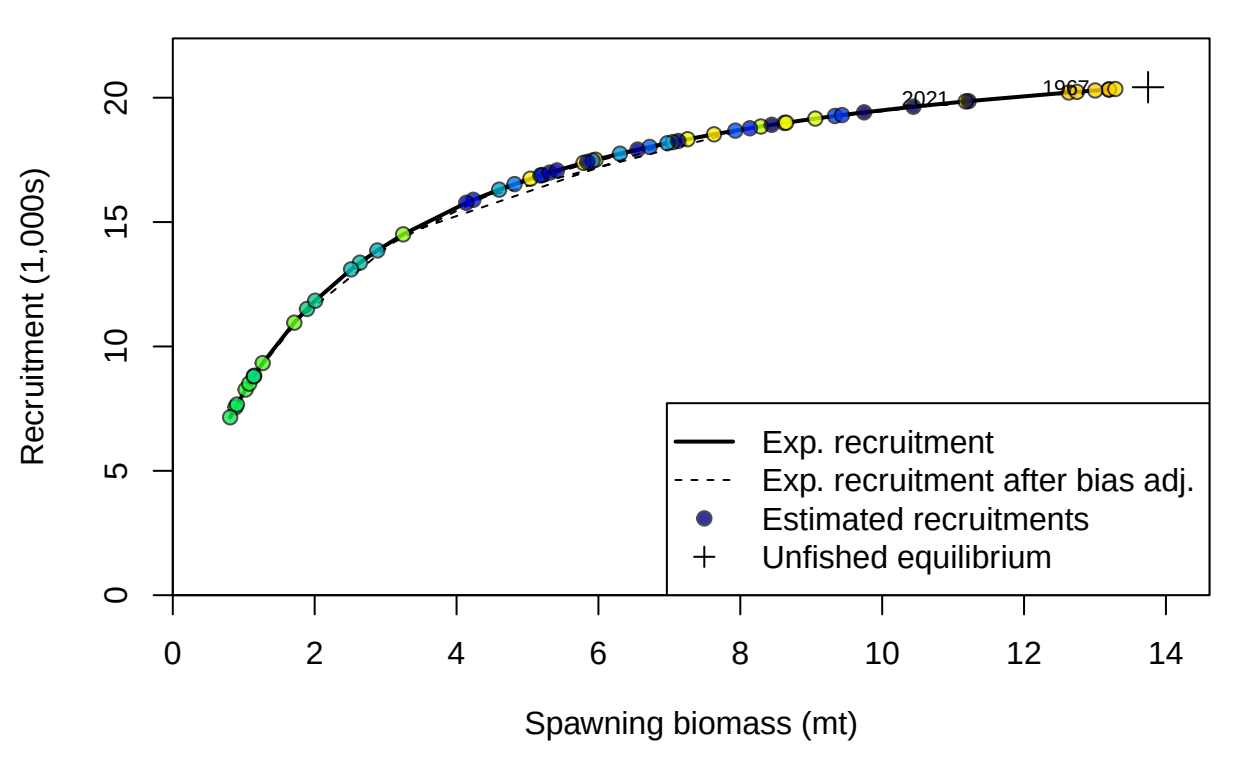

Age−0 recruits (1,000s)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year

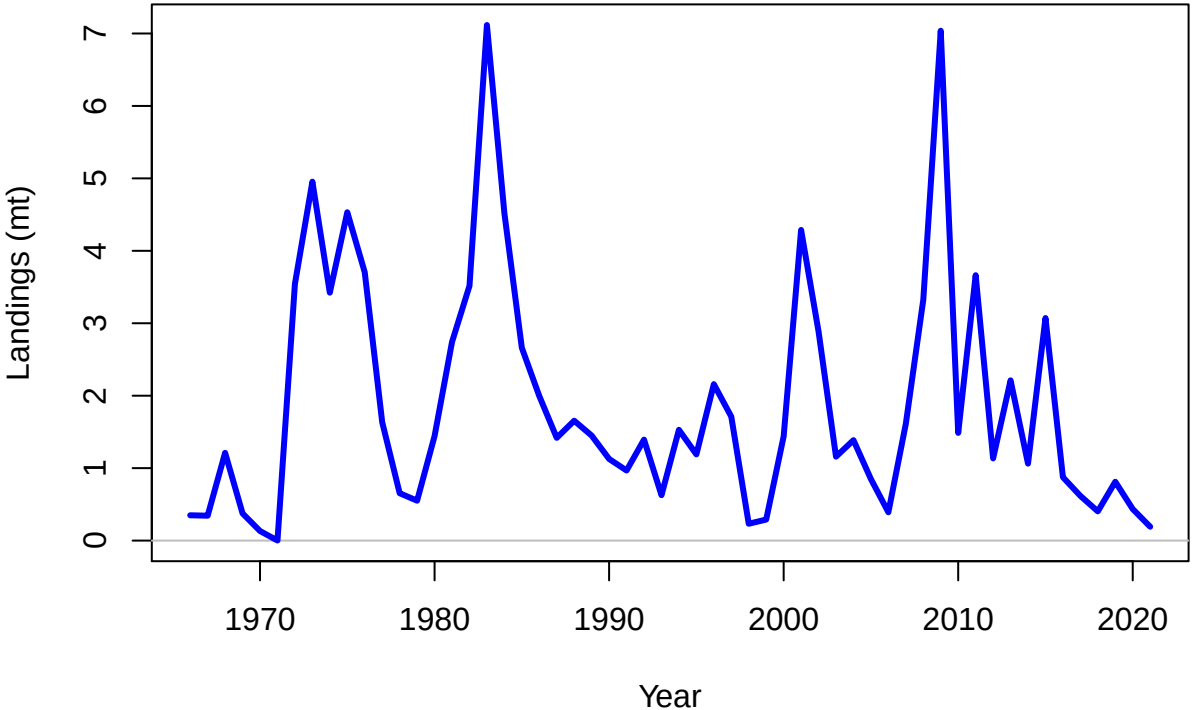

Age−0 recruits (1,000s)
0
5
10
15
20
1970
1980
1990
2000
2010
2020
Year

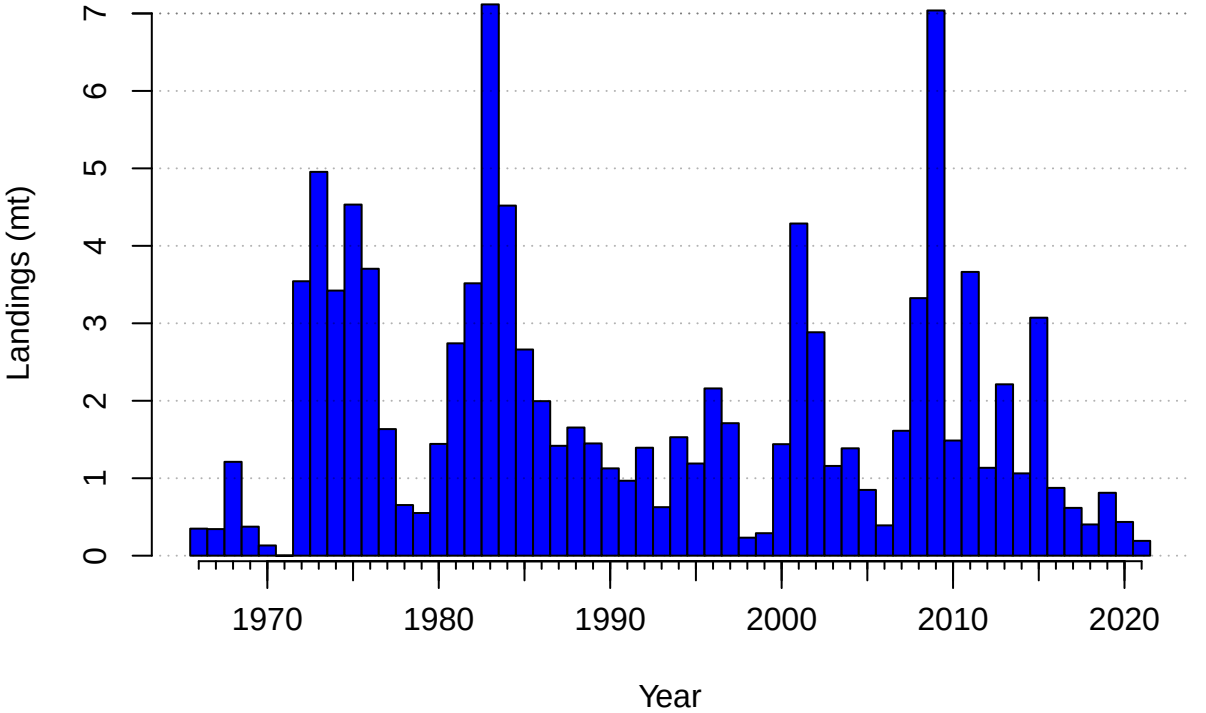

Summary Fishing Mortality
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

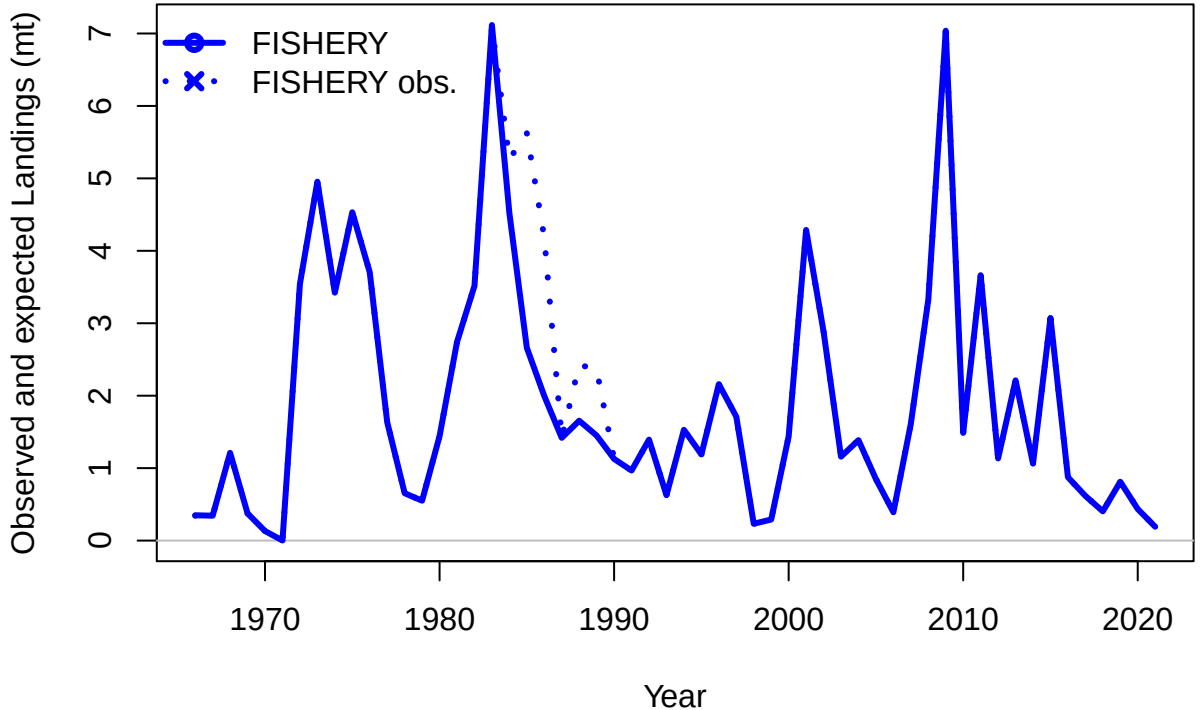

Spawning biomass (mt)
0
2
4
6
8
10
12
14
1970
1980
1990
2000
2010
2020
Year
equilibrium
without fishing
with fishing

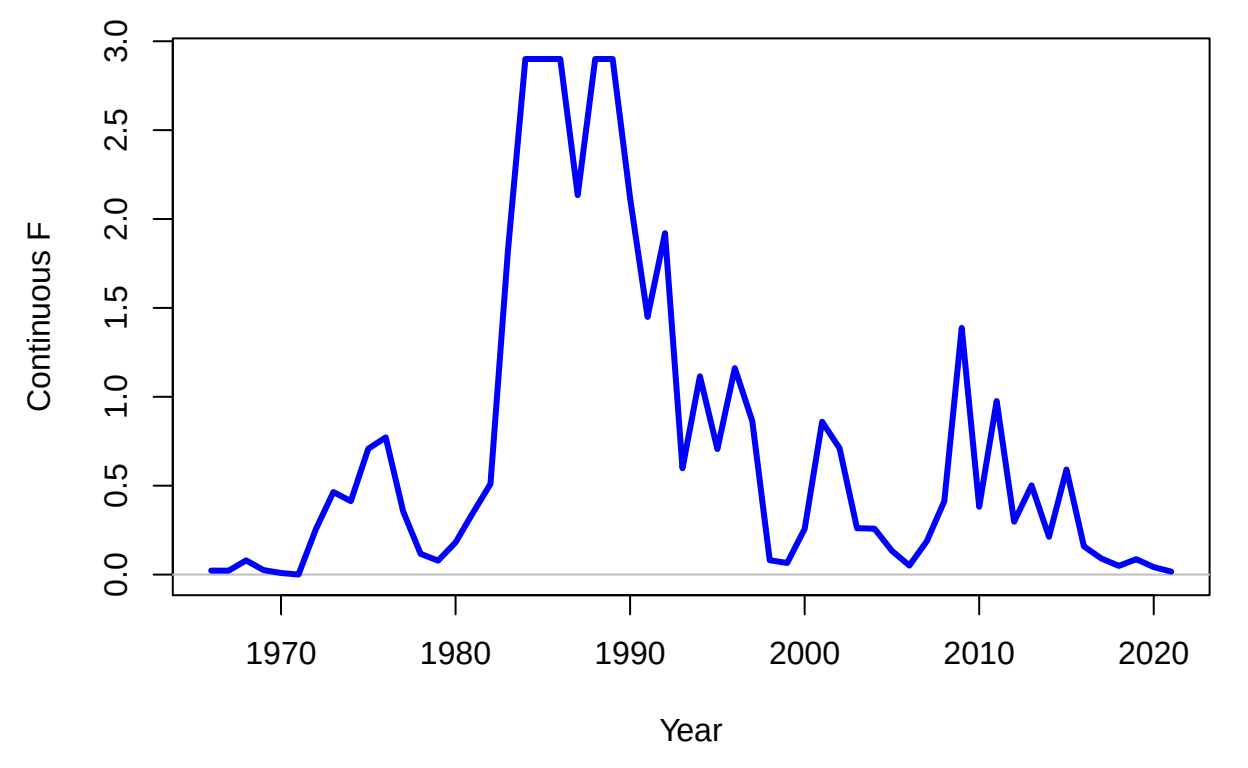

Recruitment (1,000s)
0
5
10
15
20
0
2
4
6
8
10
12
14
Spawning biomass (mt)
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

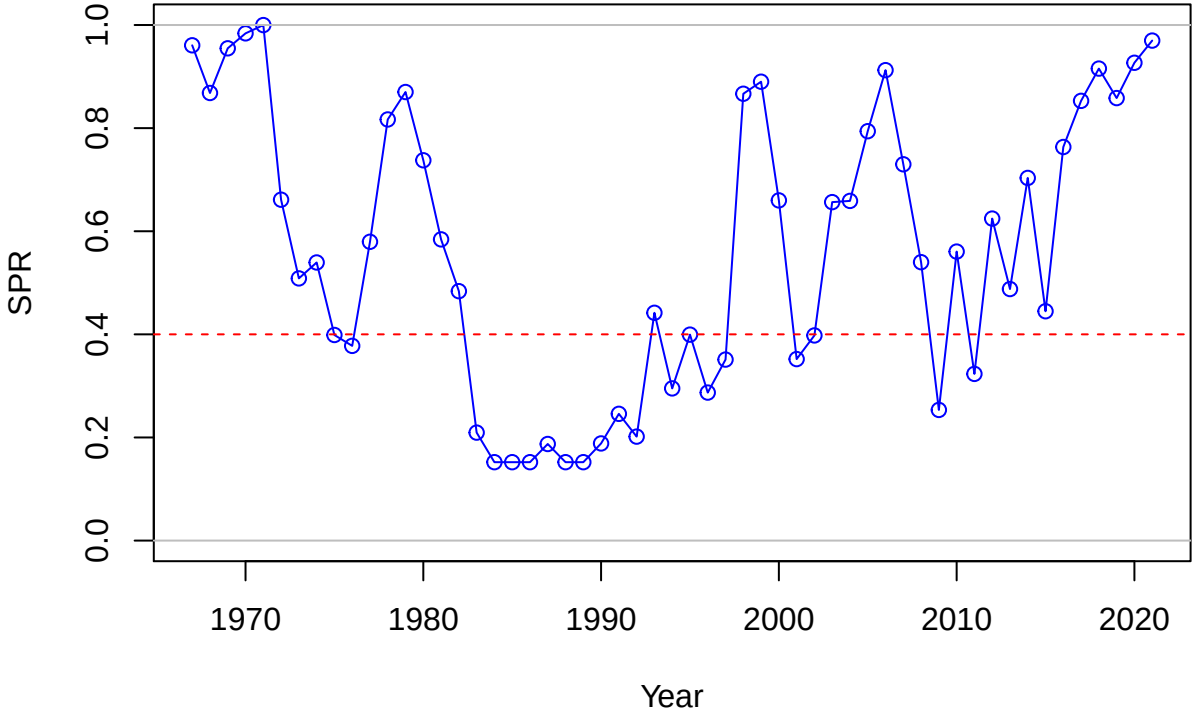

Recruitment (1,000s)
0
5
10
15
20
0
2
4
6
8
10
12
14
Spawning biomass (mt)
2021
1967
Exp. recruitment
Exp. recruitment after bias adj.
Estimated recruitments
Unfished equilibrium

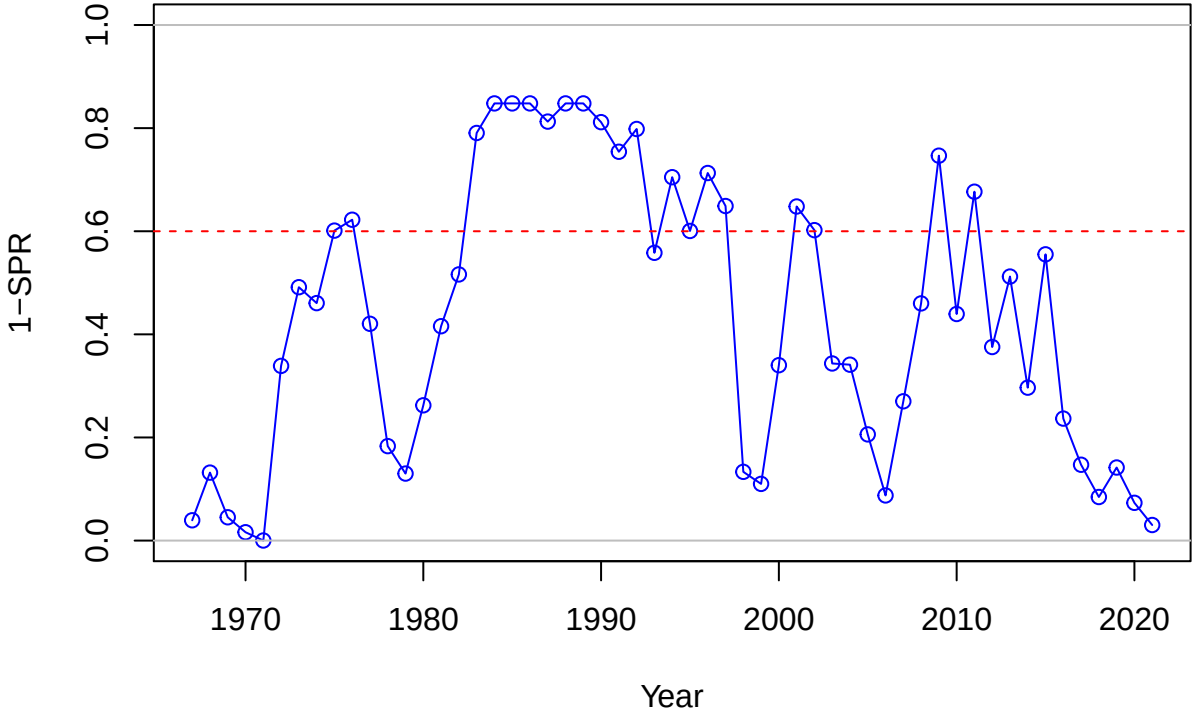

Landings (mt)
0
1
2
3
4
5
6
7
1970
1980
1990
2000
2010
2020
Year

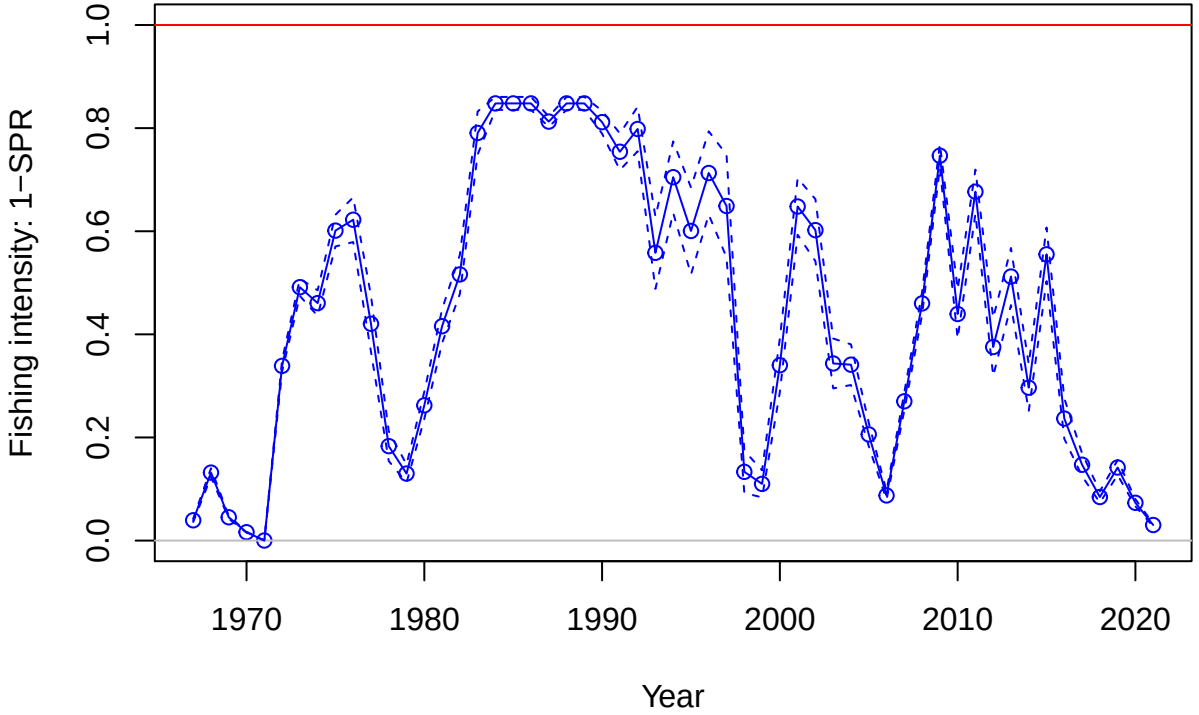

Landings (mt)
0
1
2
3
4
5
6
7
1970
1980
1990
2000
2010
2020
Year

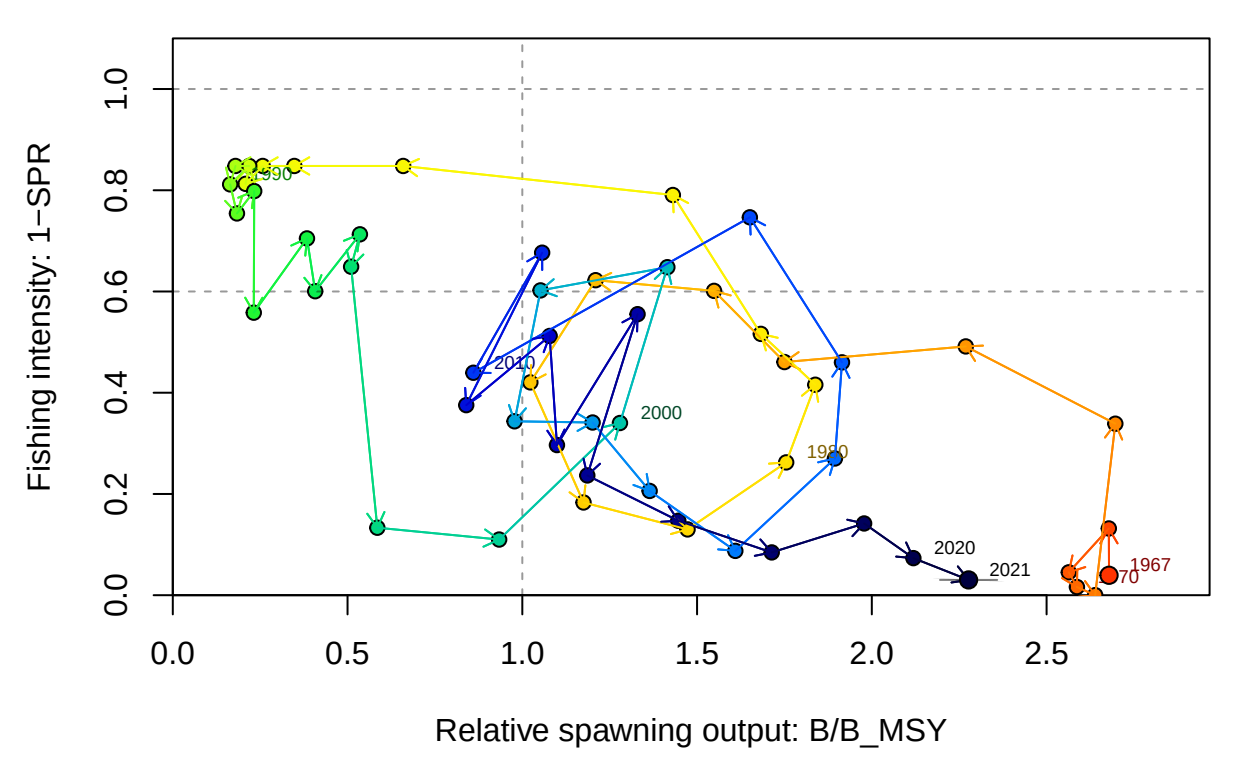

FISHERY
FISHERY obs.
Observed and expected Landings (mt)
0
1
2
3
4
5
6
7
1970
1980
1990
2000
2010
2020
Year

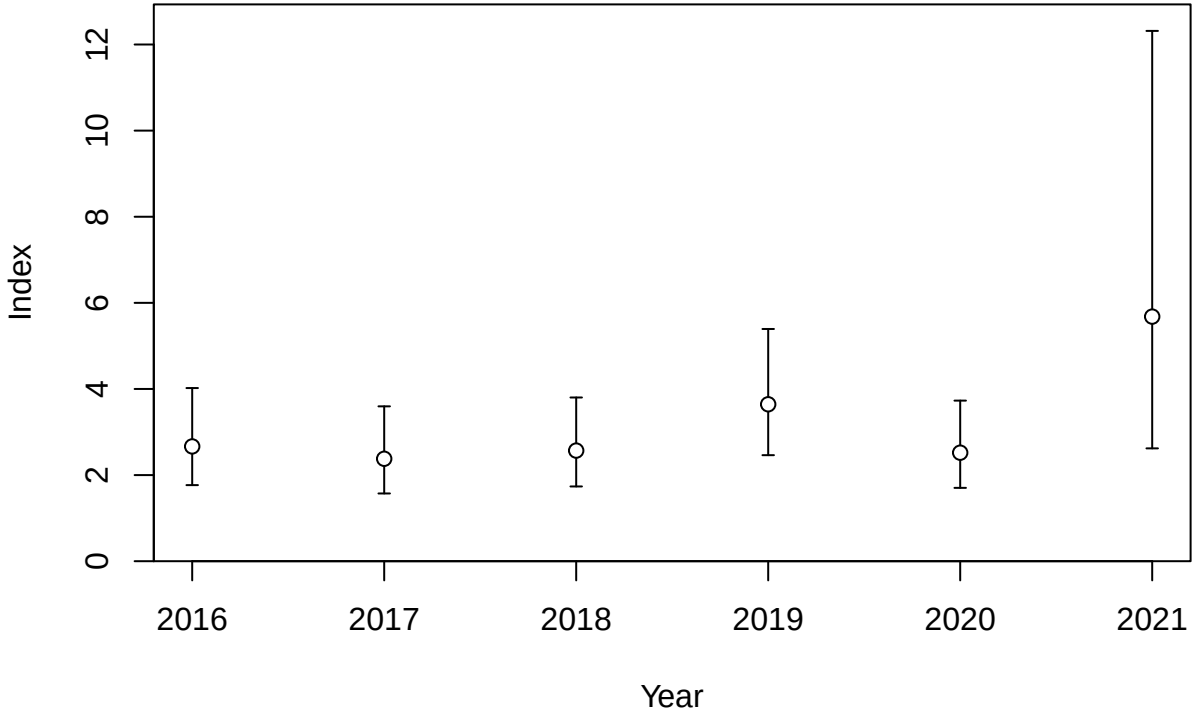

Continuous F
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1970
1980
1990
2000
2010
2020
Year

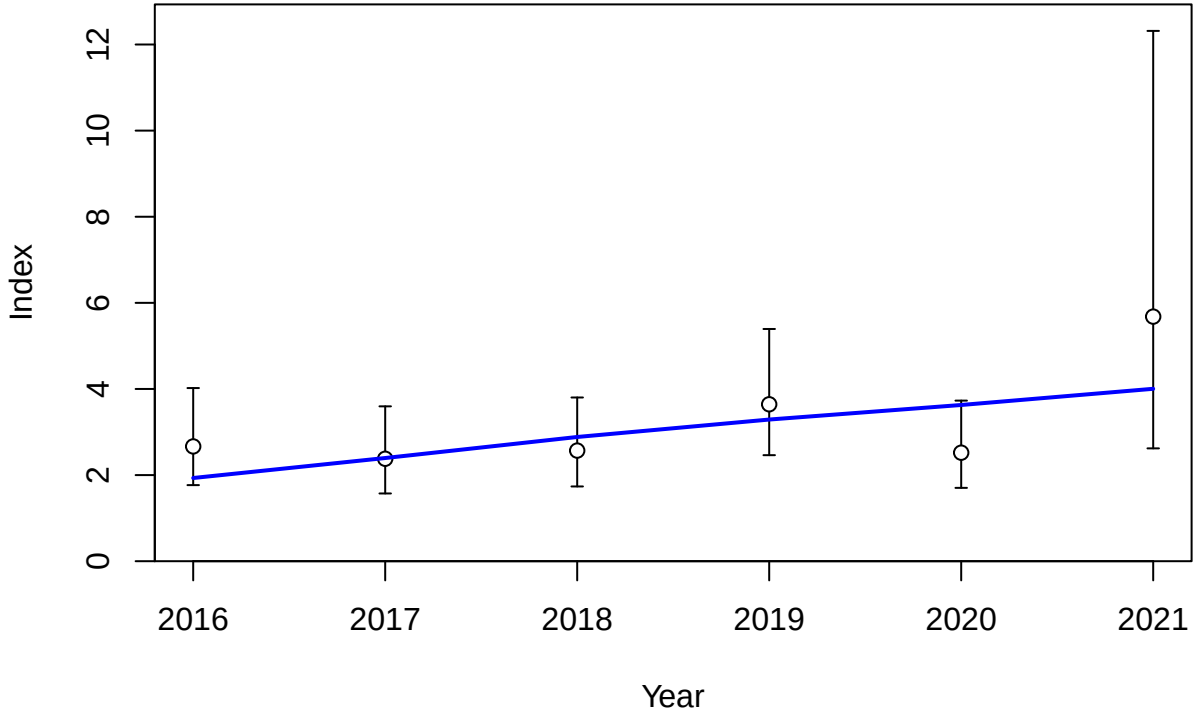

SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

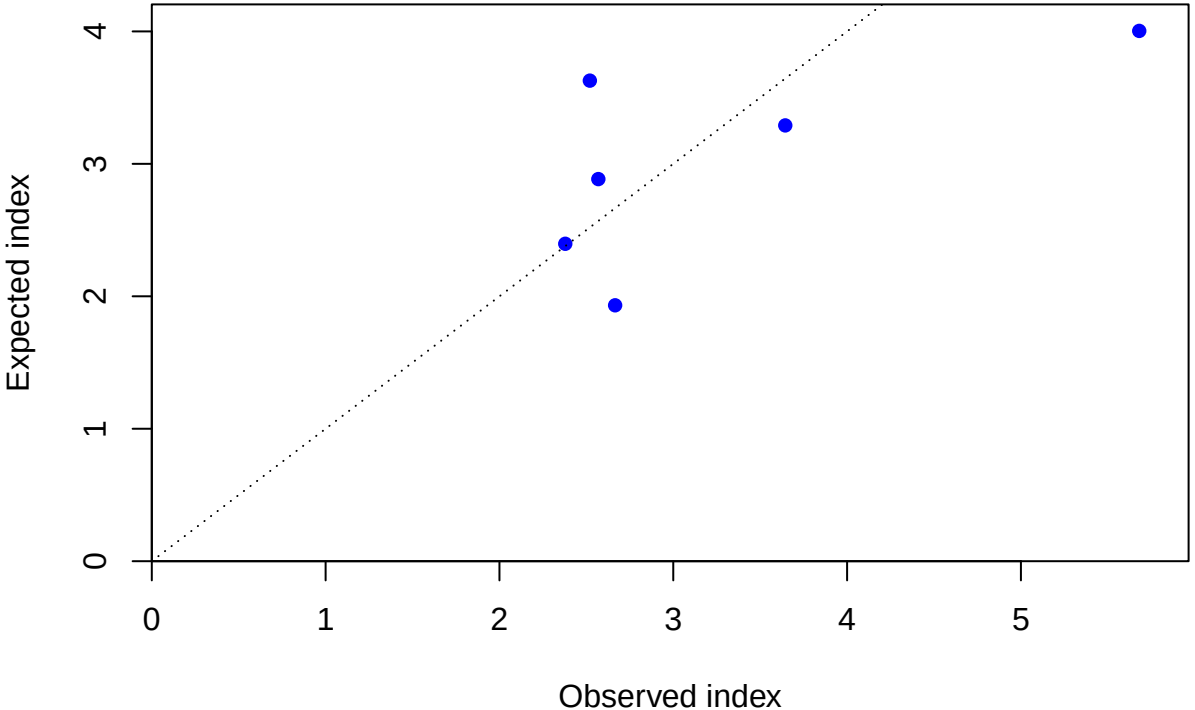

1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

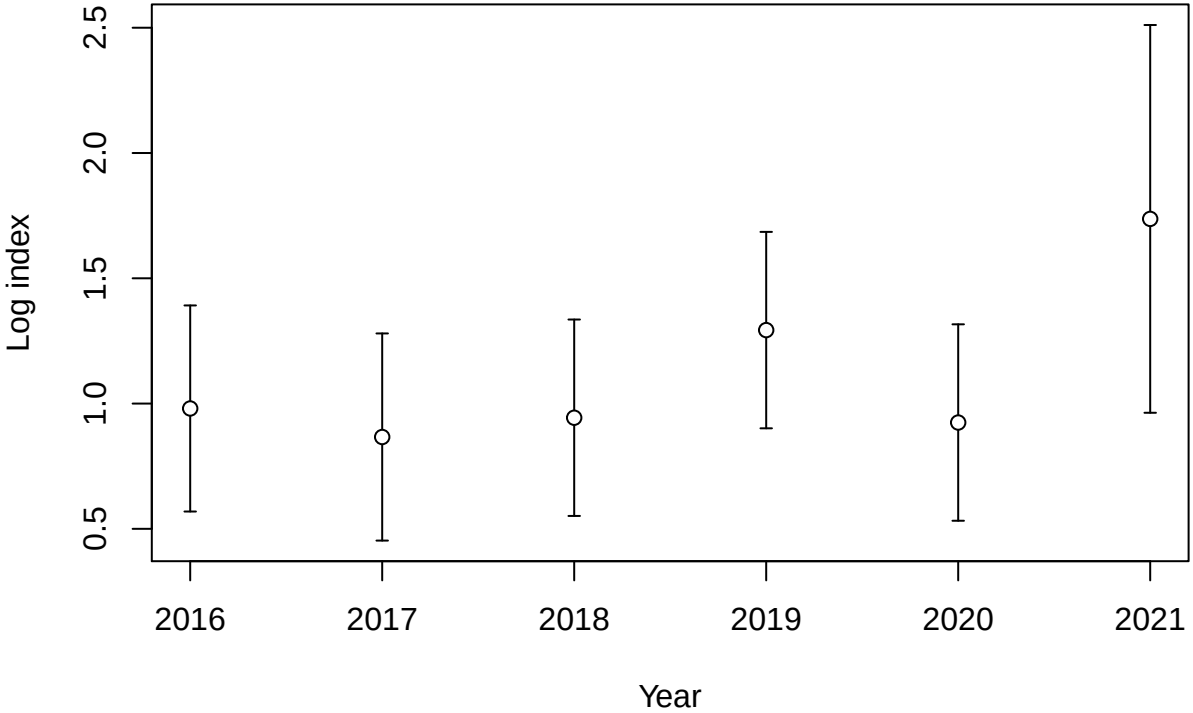

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
1970
1980
1990
2000
2010
2020
Year

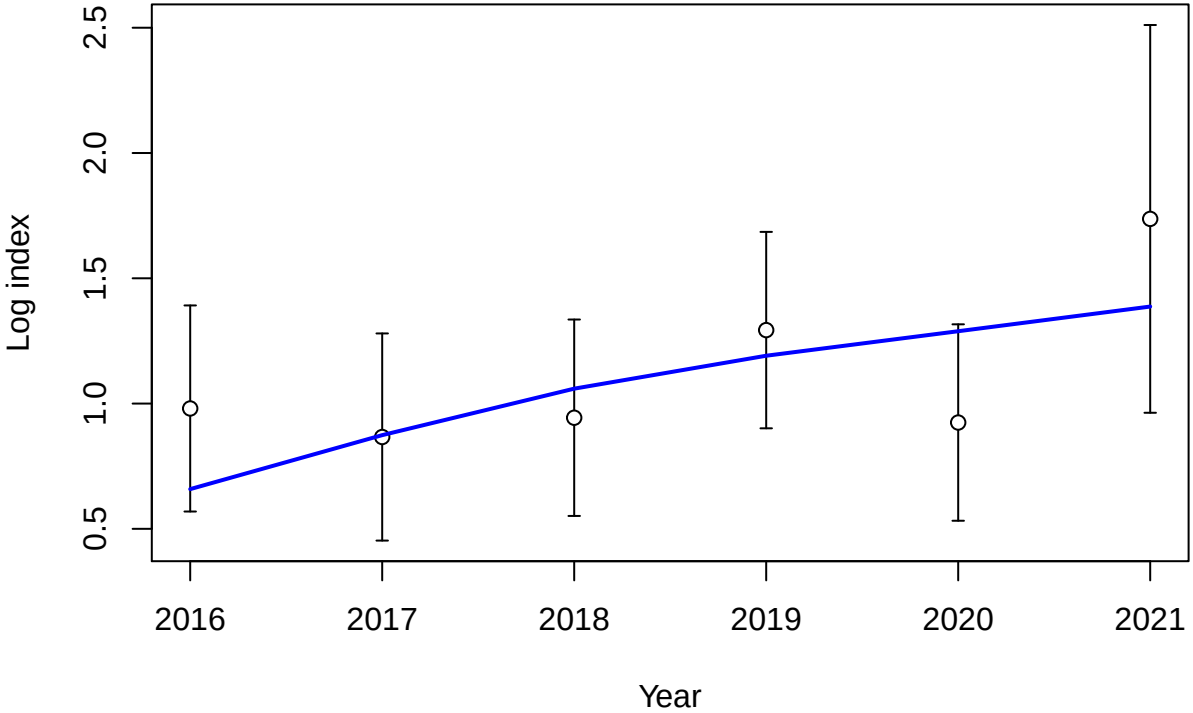

Fishing intensity: 1−SPR
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
Relative spawning output: B/B_MSY
1990
2010
2000
1980
2020
2021
1967
70

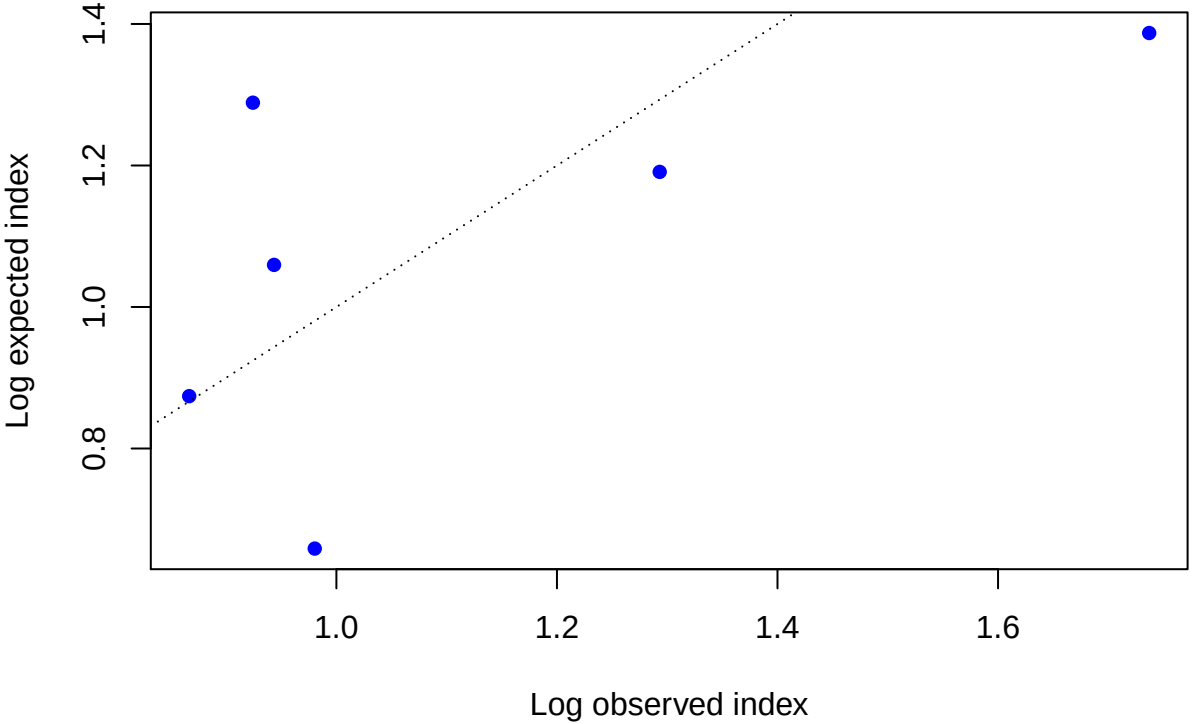

Index
0
2
4
6
8
10
12
2016
2017
2018
2019
2020
2021
Year

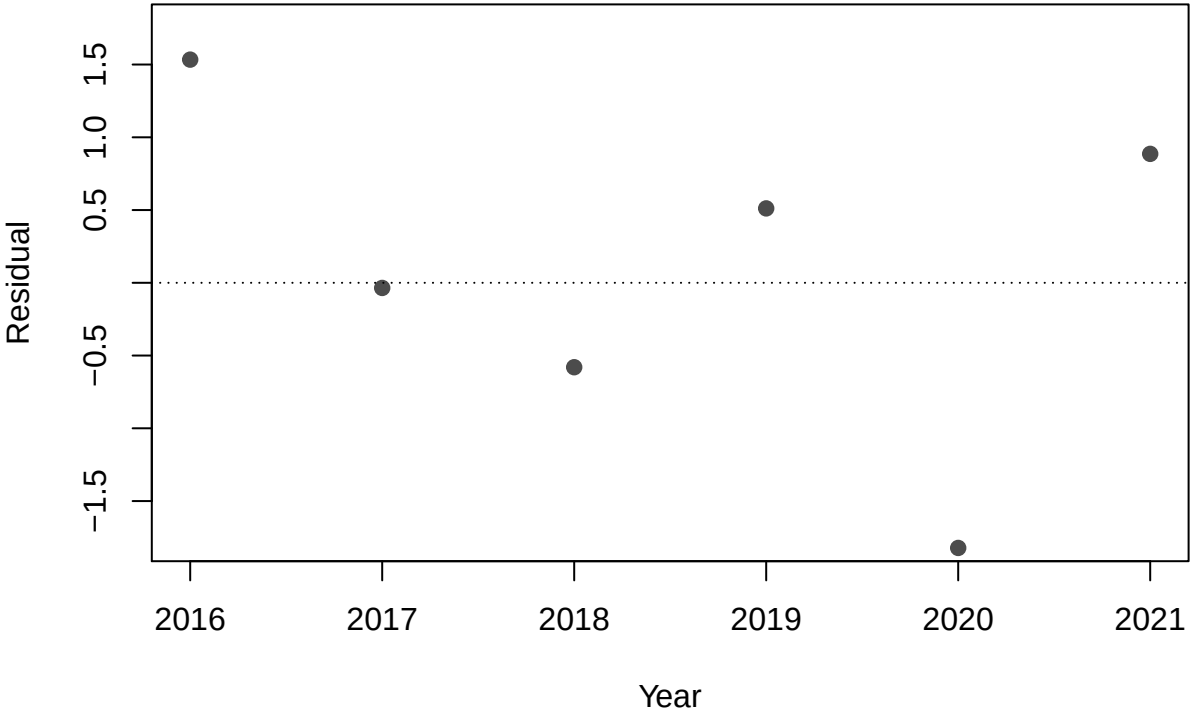

Index
0
2
4
6
8
10
12
2016
2017
2018
2019
2020
2021
Year

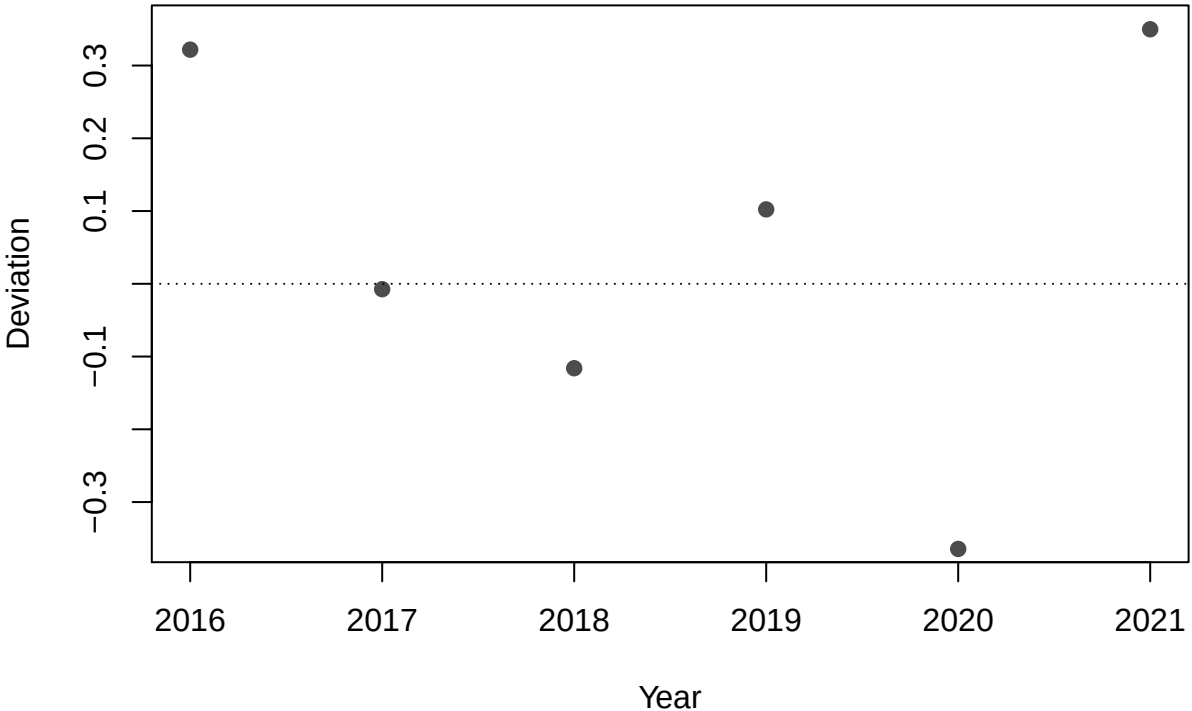

Expected index
Observed index
0
1
2
3
4
5

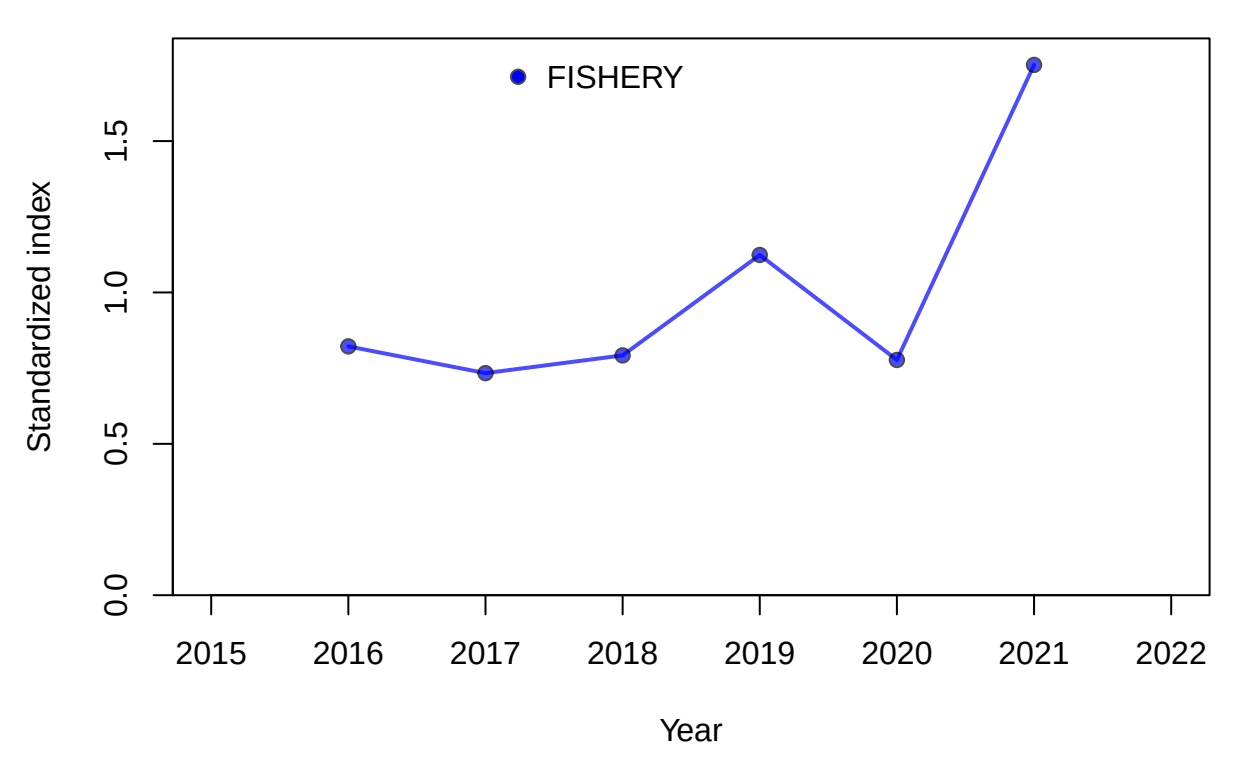

Log index
0.5
1.0
1.5
2.0
2.5
2016
2017
2018
2019
2020
2021
Year

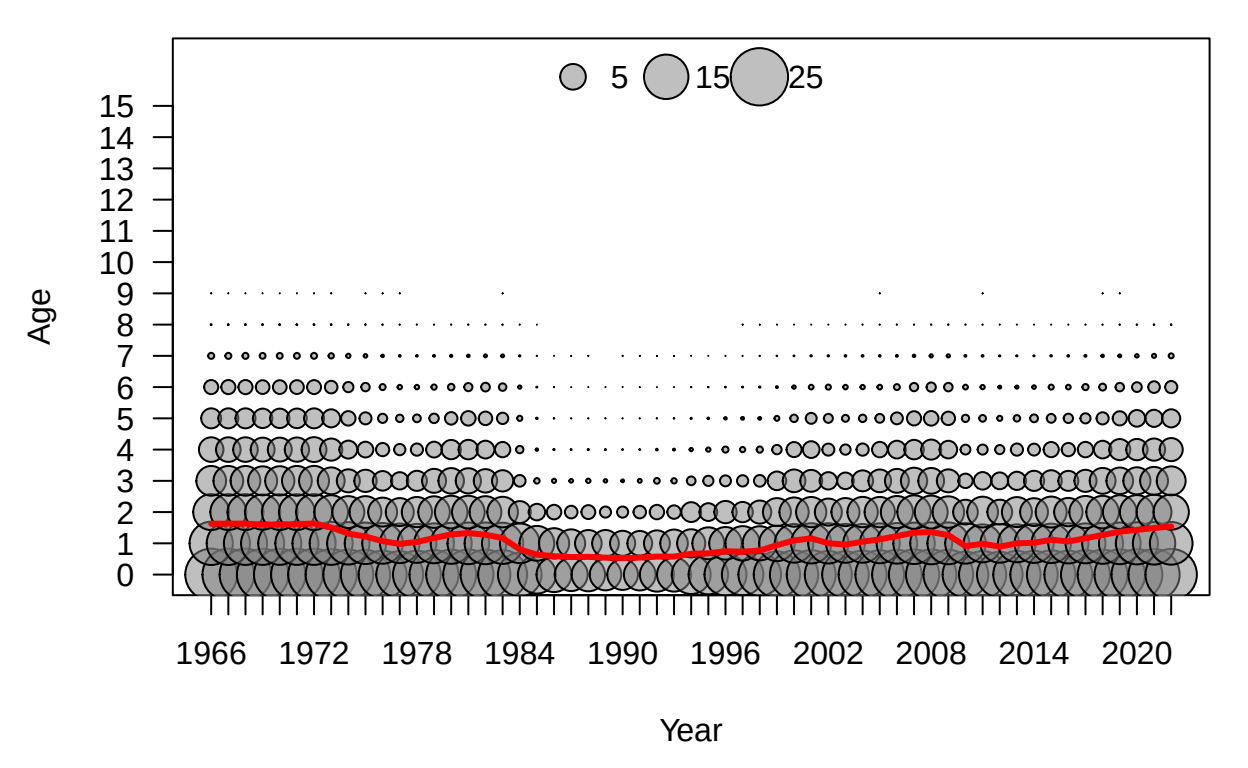

Log index
0.5
1.0
1.5
2.0
2.5
2016
2017
2018
2019
2020
2021
Year

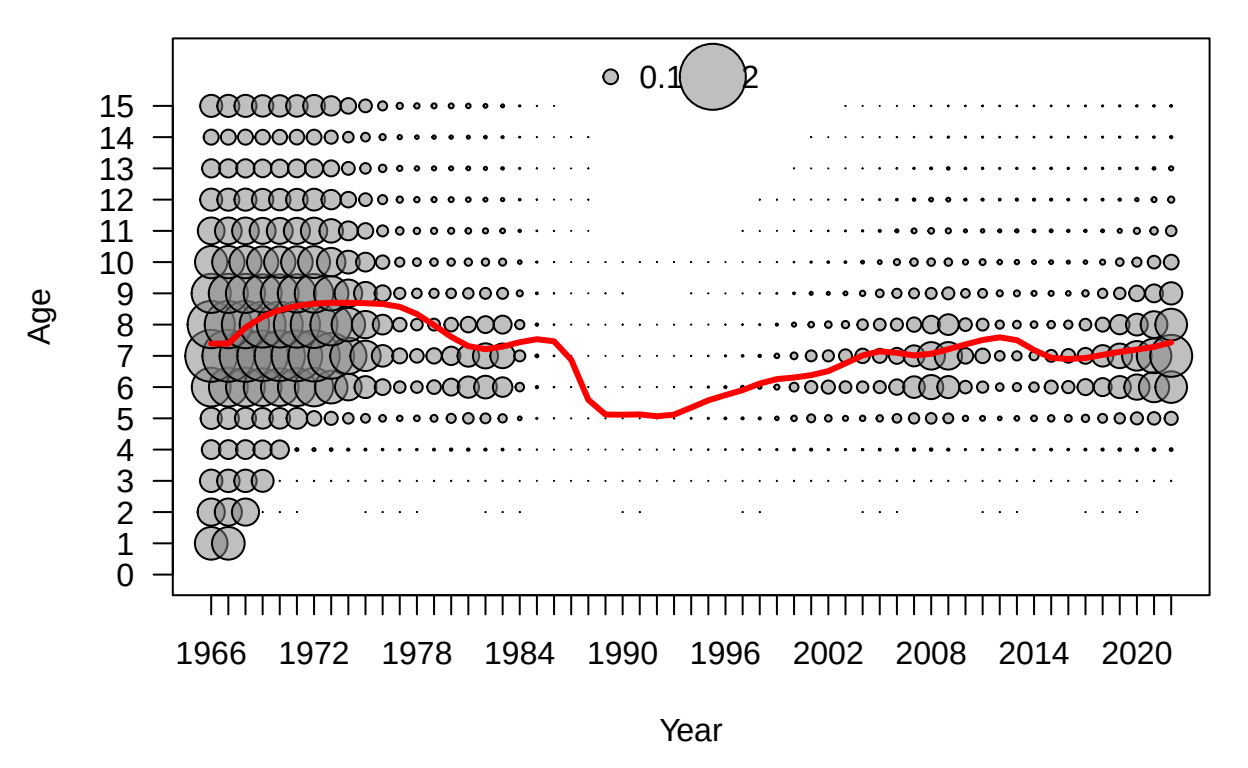

Log expected index
0.8
1.0
1.2
1.4
1.0
1.2
1.4
1.6
Log observed index

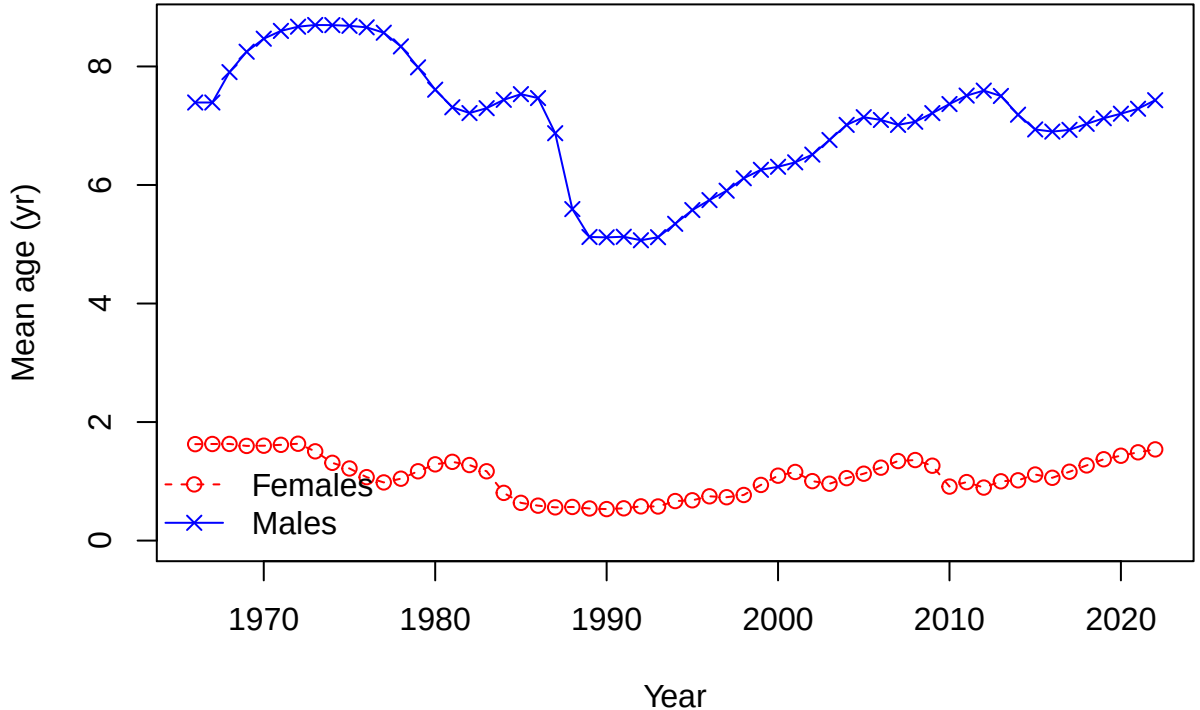

Residual
1.5
1.0
0.5
−0.5
−1.5
2016
2017
2018
2019
2020
2021
Year

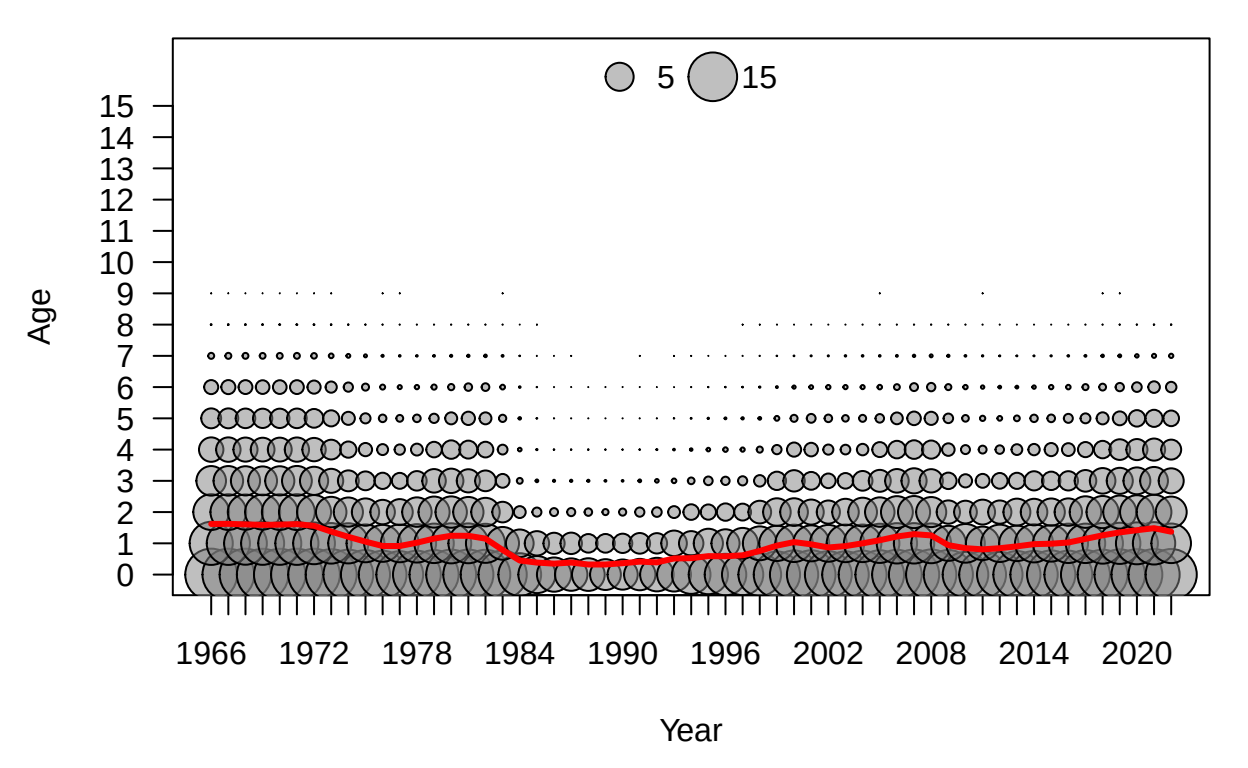

Deviation
0.3
0.2
0.1
−0.1
−0.3
2016
2017
2018
2019
2020
2021
Year

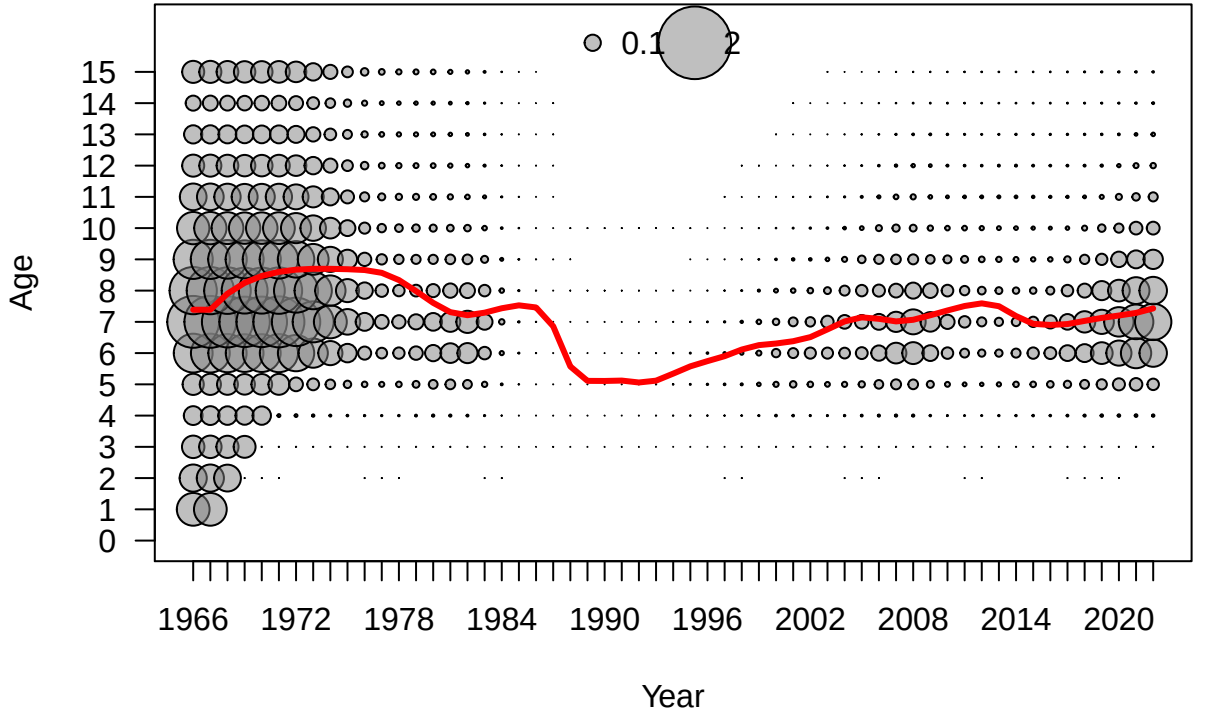

FISHERY
Standardized index
0.0
0.5
1.0
1.5
2015
2016
2017
2018
2019
2020
2021
2022
Year

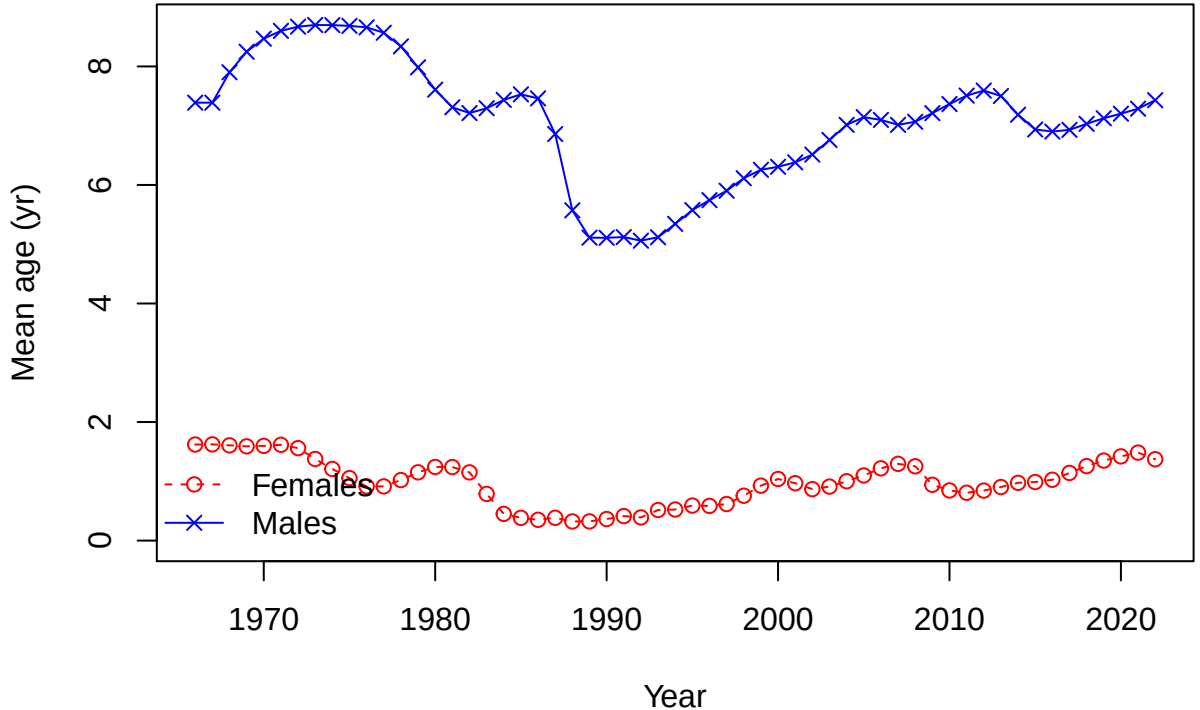

5
15
25
Age
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

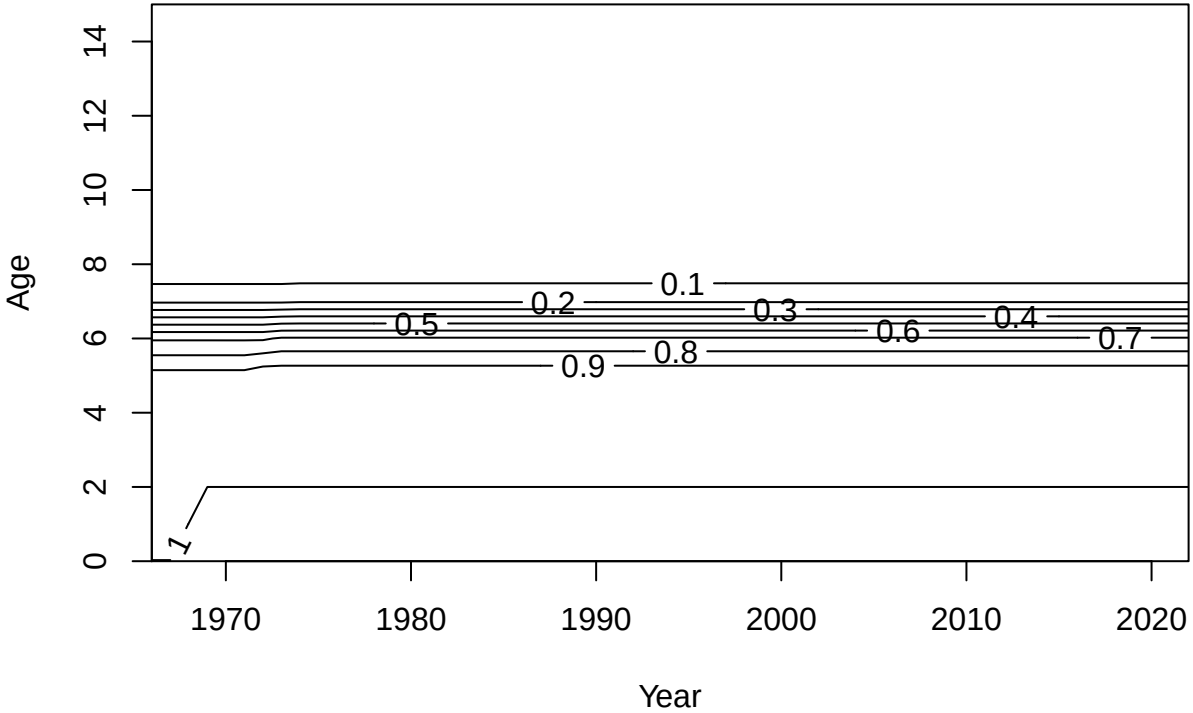

0.1
2
Age
Year
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020

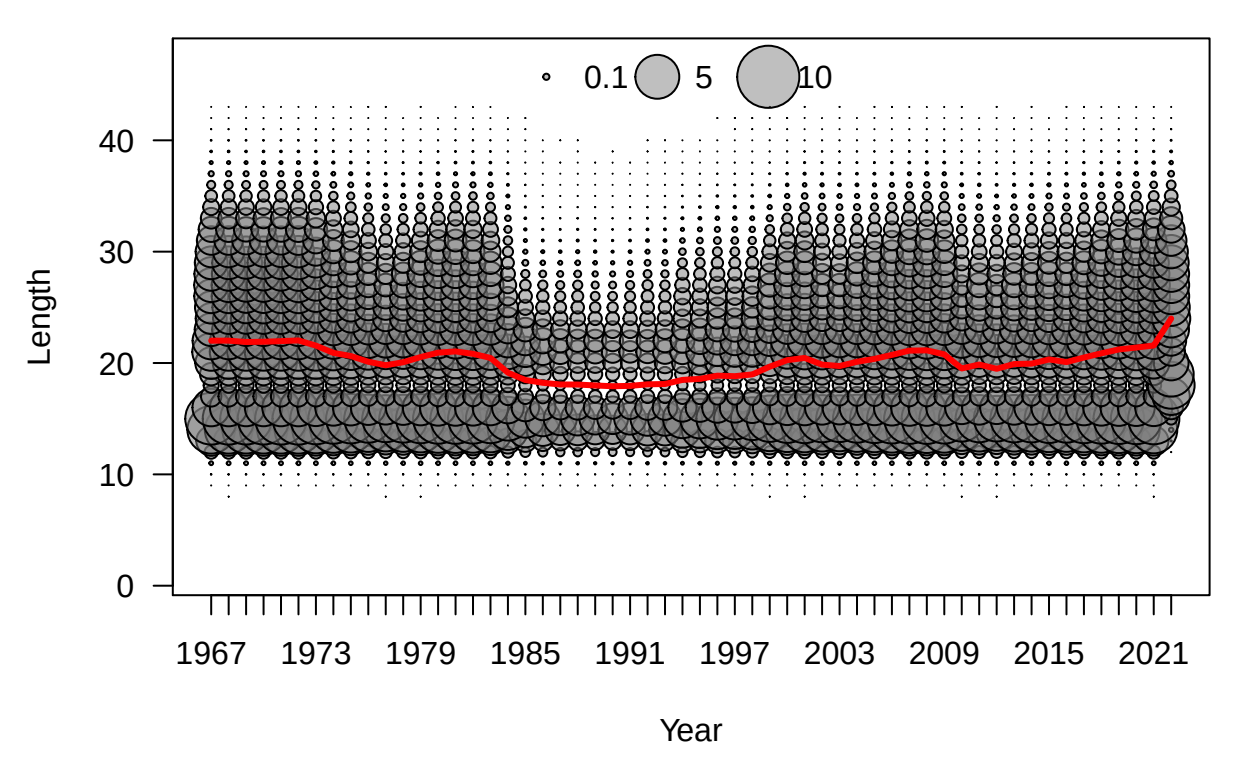

Mean age (yr)
0
2
4
6
8
1970
1980
1990
2000
2010
2020
Year
Females
Males

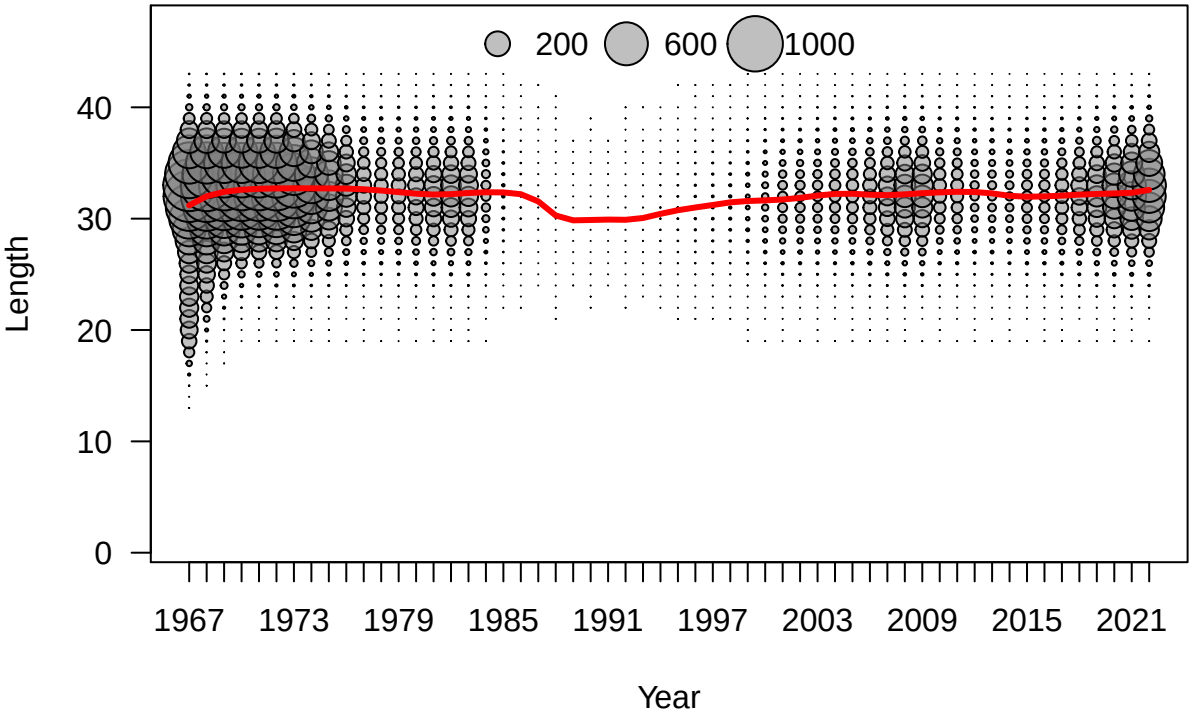

5
15
Age
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

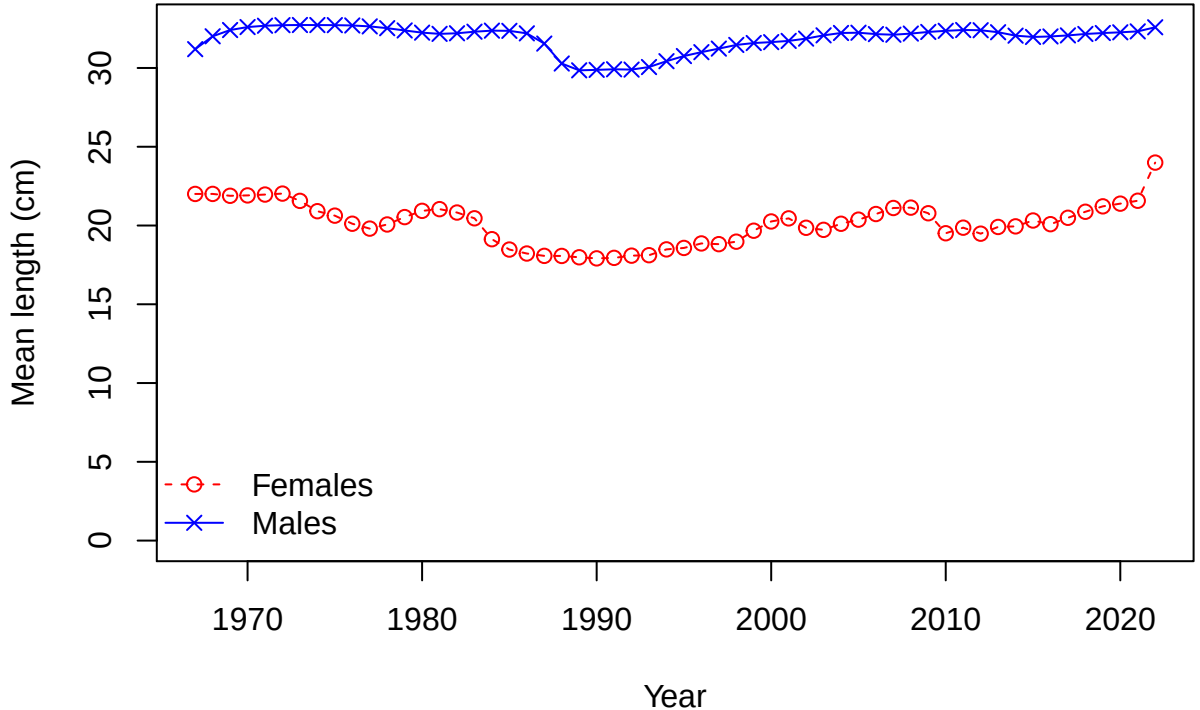

0.1
2
Age
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1966
1972
1978
1984
1990
1996
2002
2008
2014
2020
Year

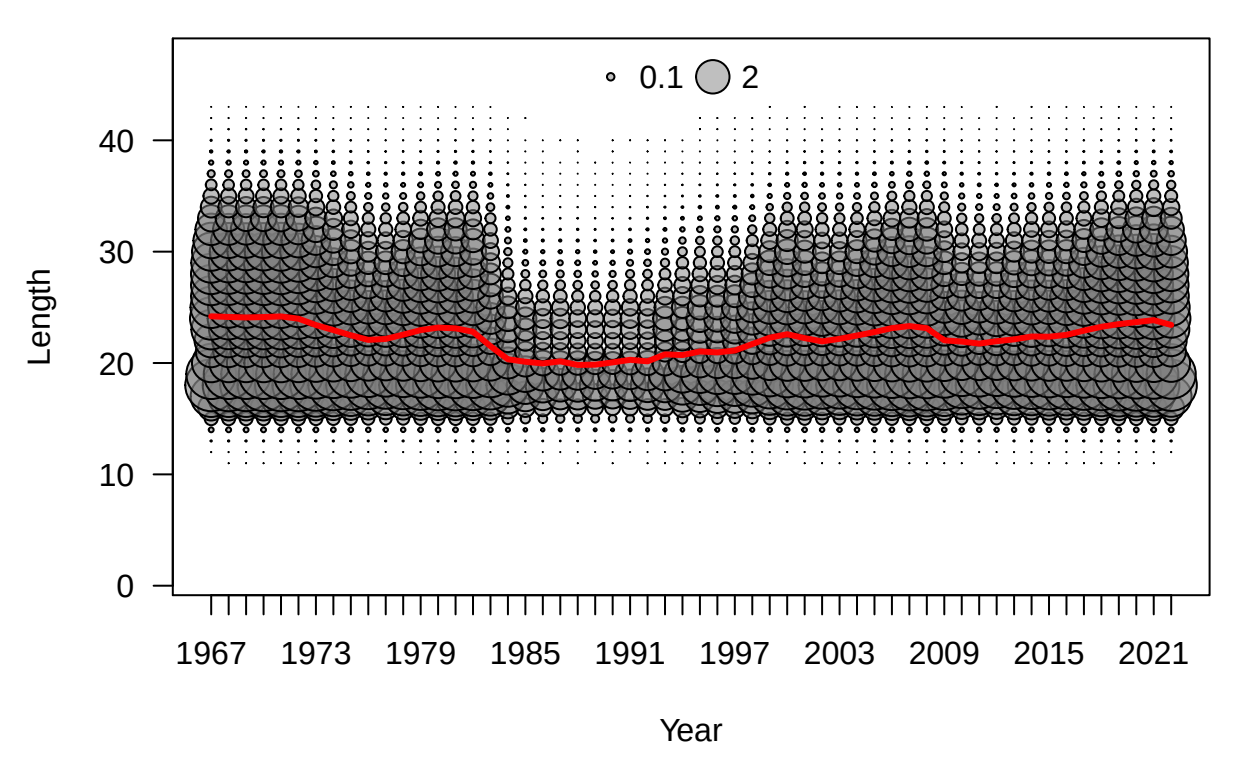

Mean age (yr)
0
2
4
6
8
1970
1980
1990
2000
2010
2020
Year
Females
Males

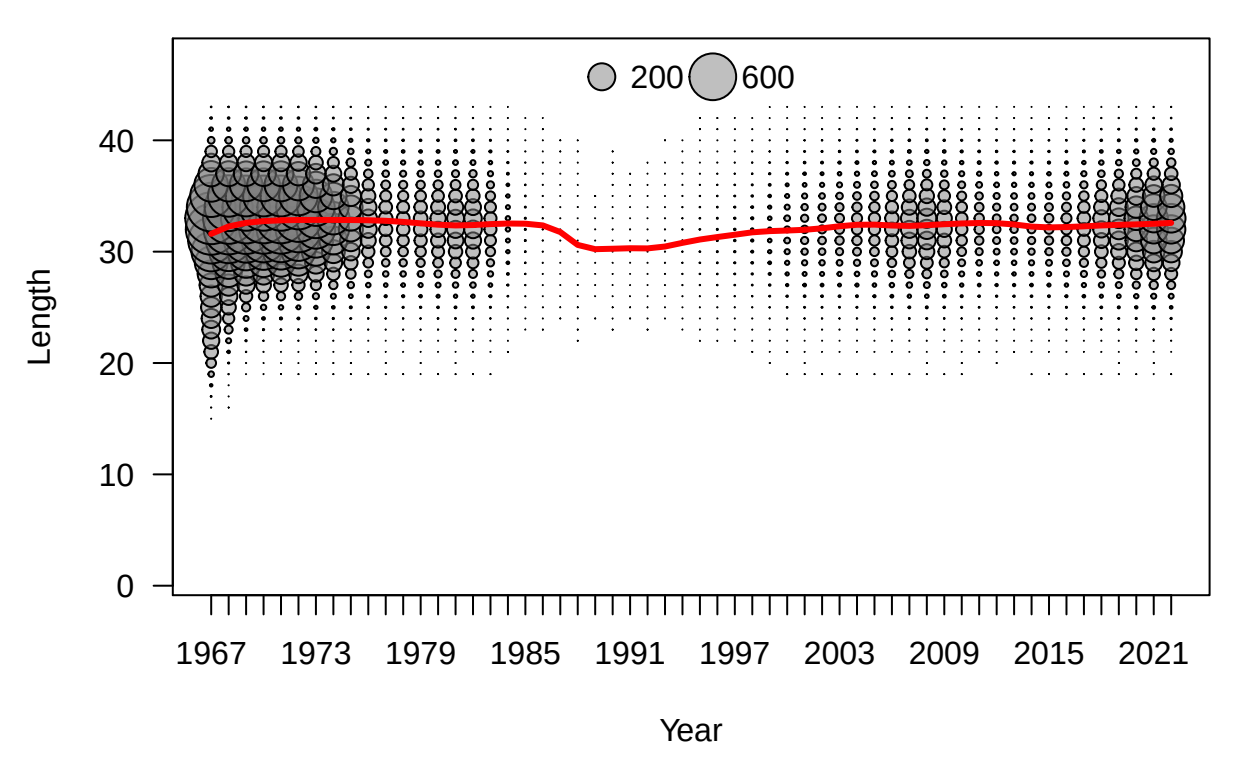

Age
0
2
4
6
8
10
12
14
1970
1980
1990
2000
2010
2020
Year
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

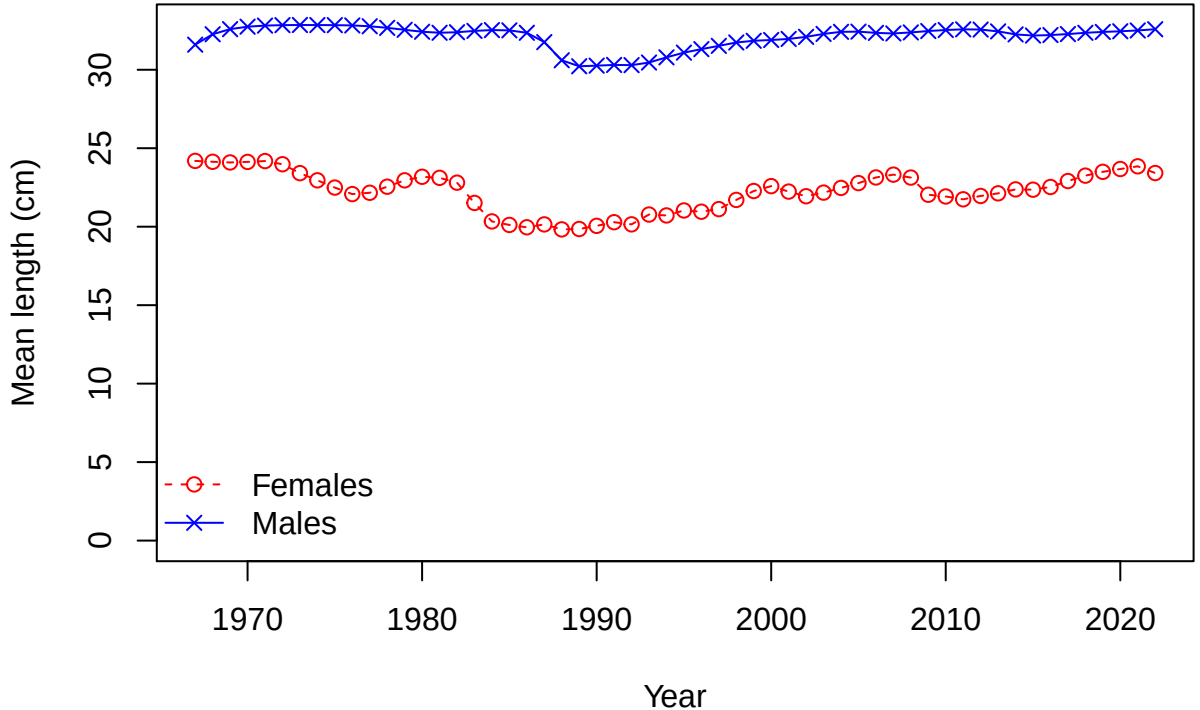

0.1
5
10
Length
0
10
20
30
40
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

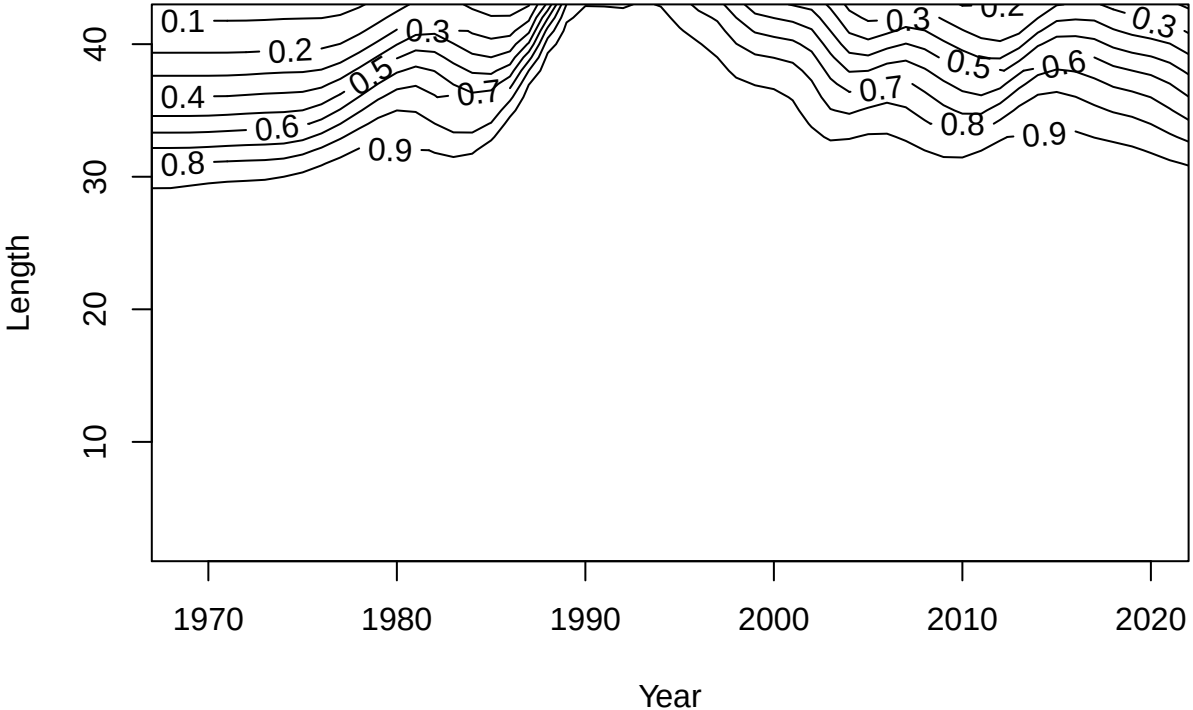

200
600
1000
Length
0
10
20
30
40
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

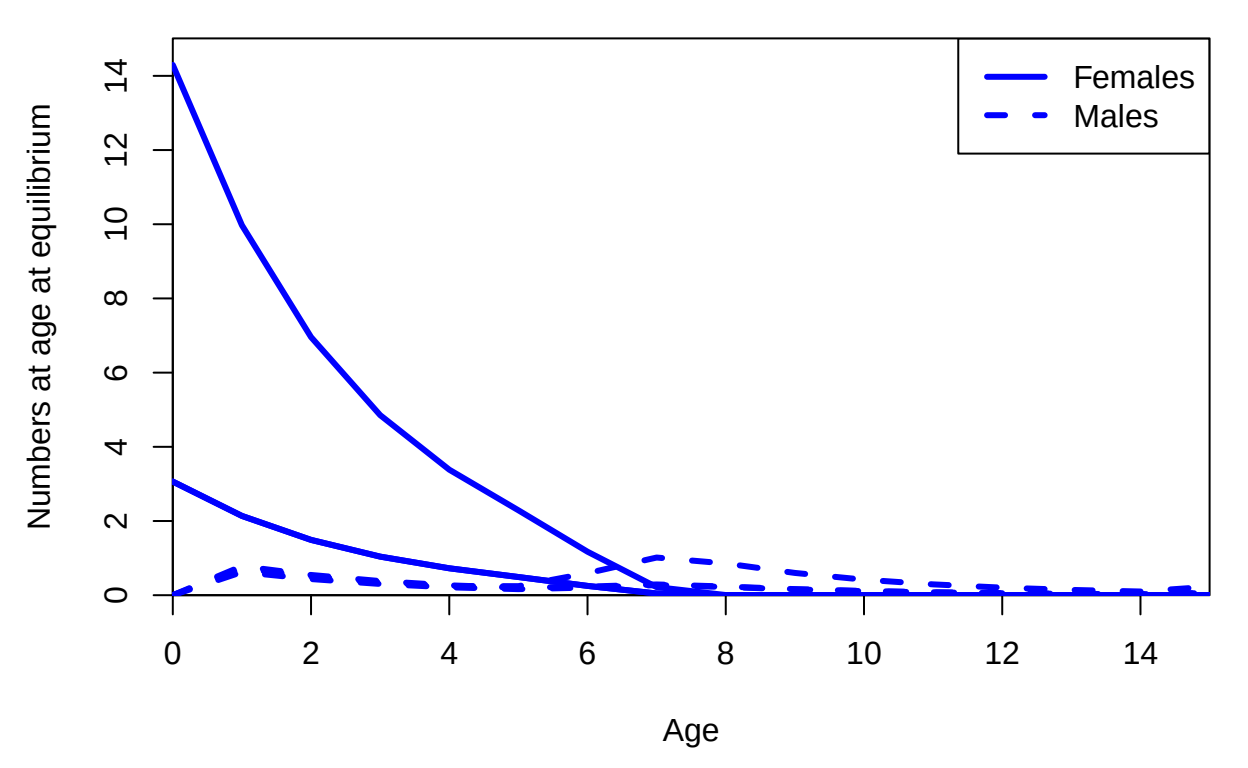

Mean length (cm)
0
5
10
15
20
25
30
1970
1980
1990
2000
2010
2020
Year
Females
Males

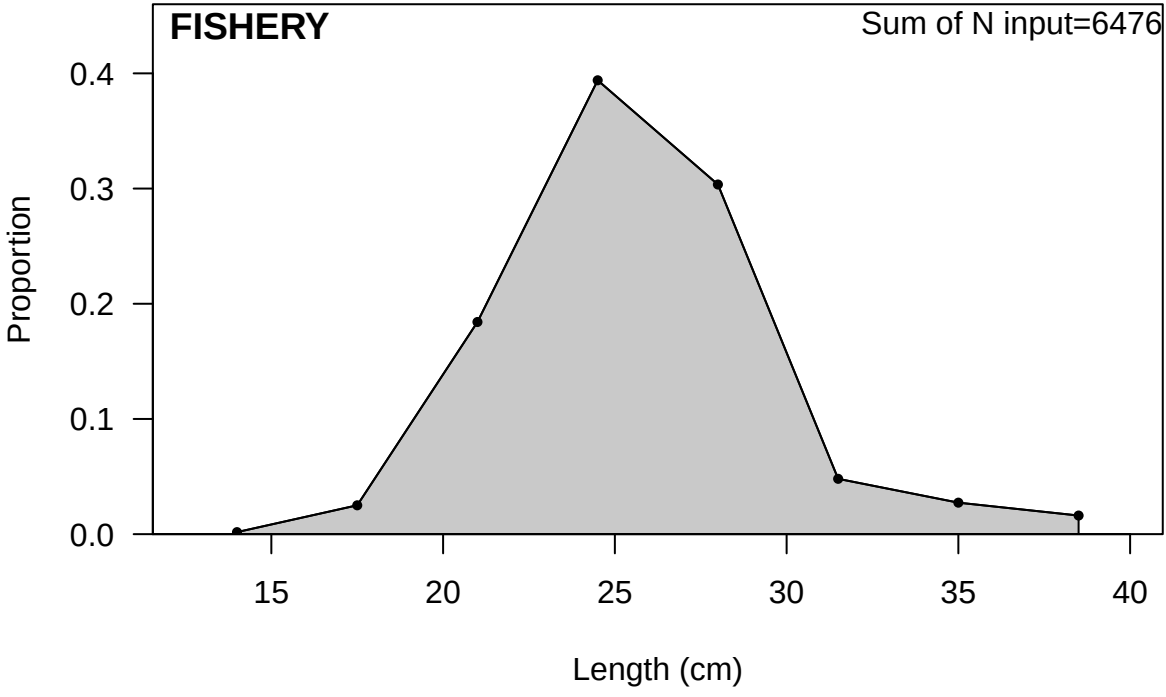

0.1
2
Length
0
10
20
30
40
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

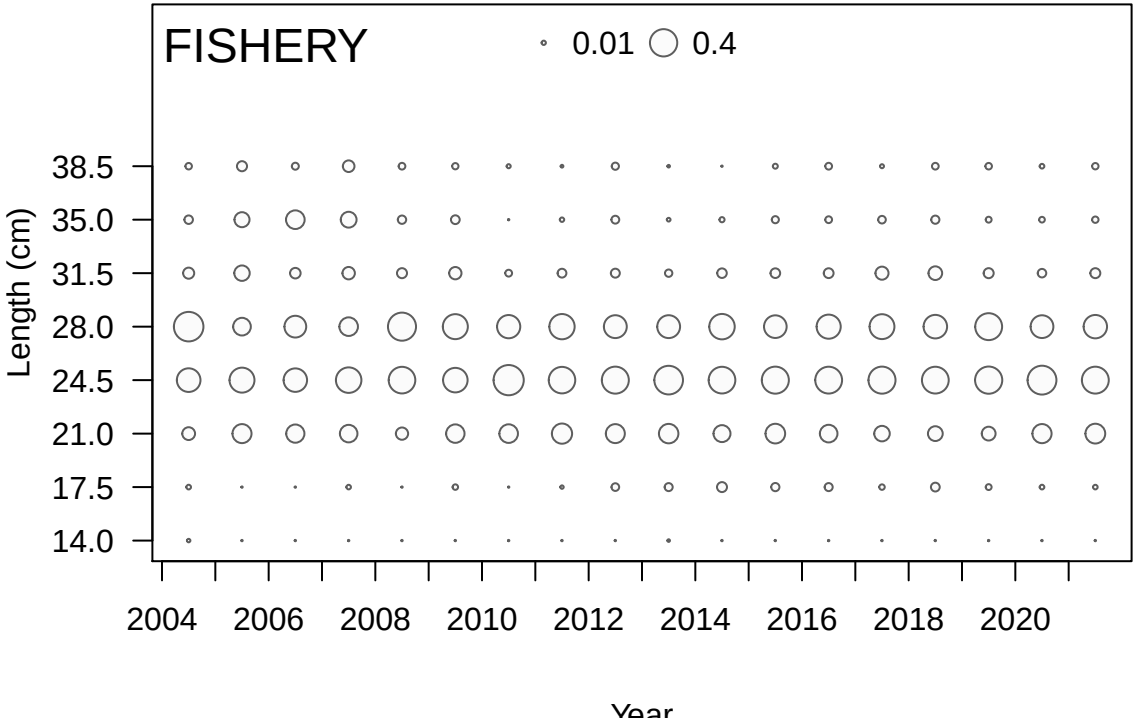

200
600
40
30
20
10
0
Length
1967
1973
1979
1985
1991
1997
2003
2009
2015
2021
Year

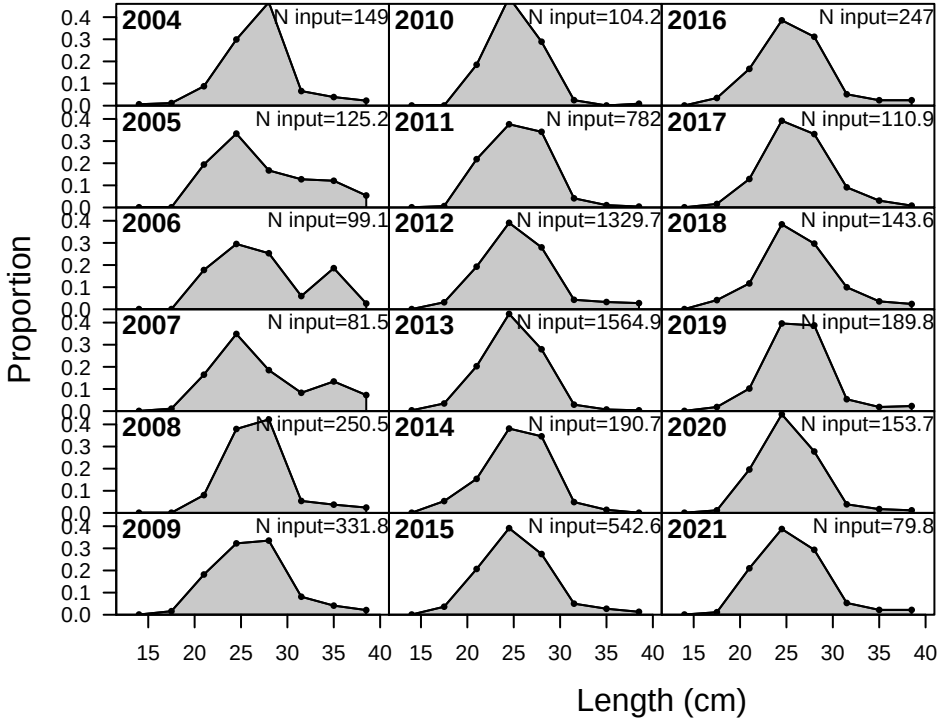

Mean length (cm)
0
5
10
15
20
25
30
1970
1980
1990
2000
2010
2020
Year
Females
Males

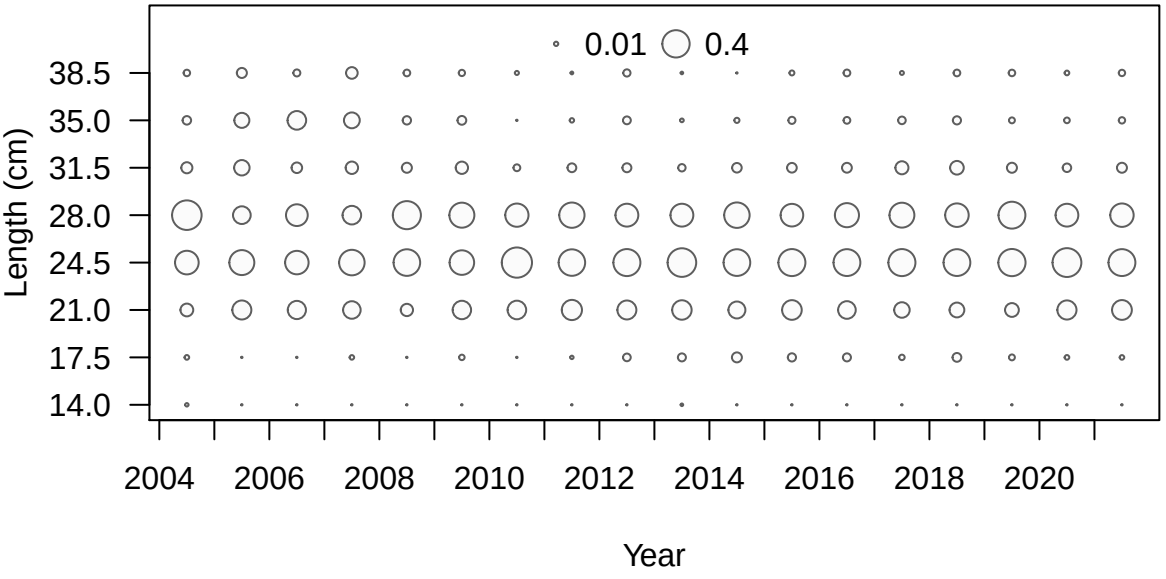

0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Length
10
20
30
40
1970
1980
1990
2000
2010
2020
Year

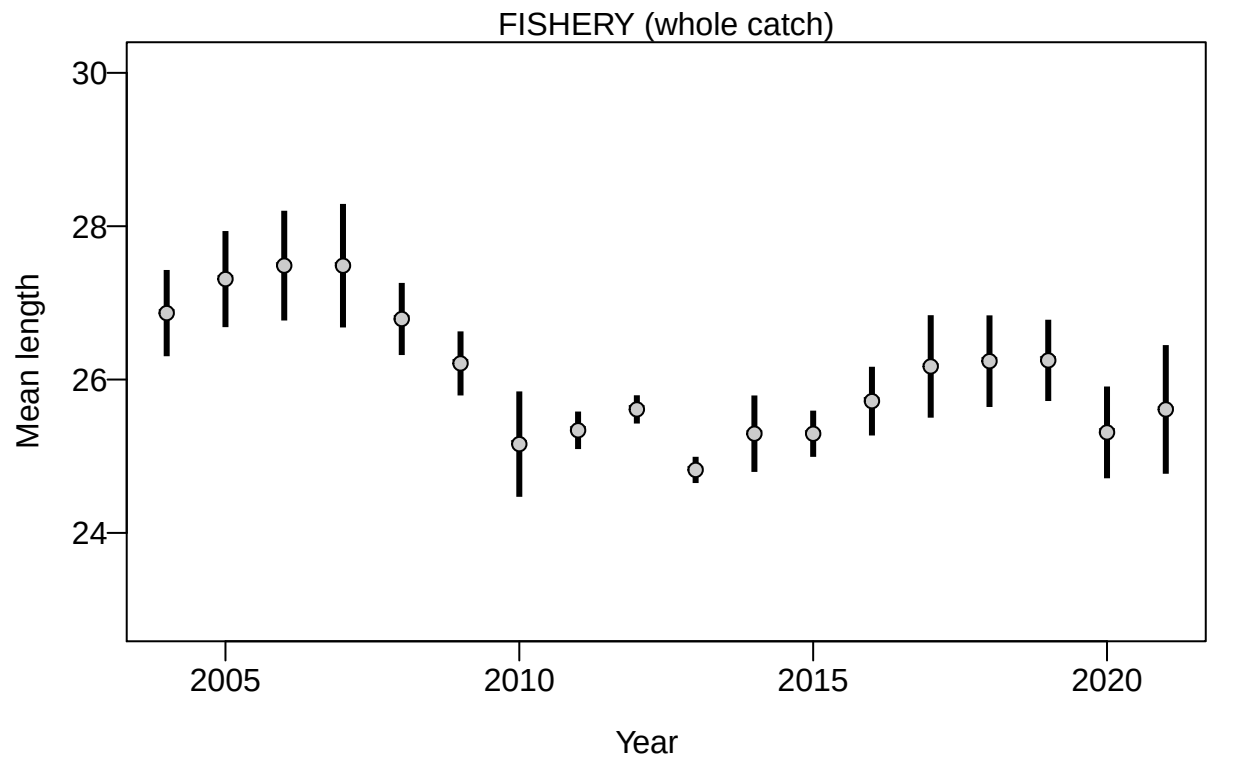

Numbers at age at equilibrium
0
2
4
6
8
10
12
14
Age
Females
Males

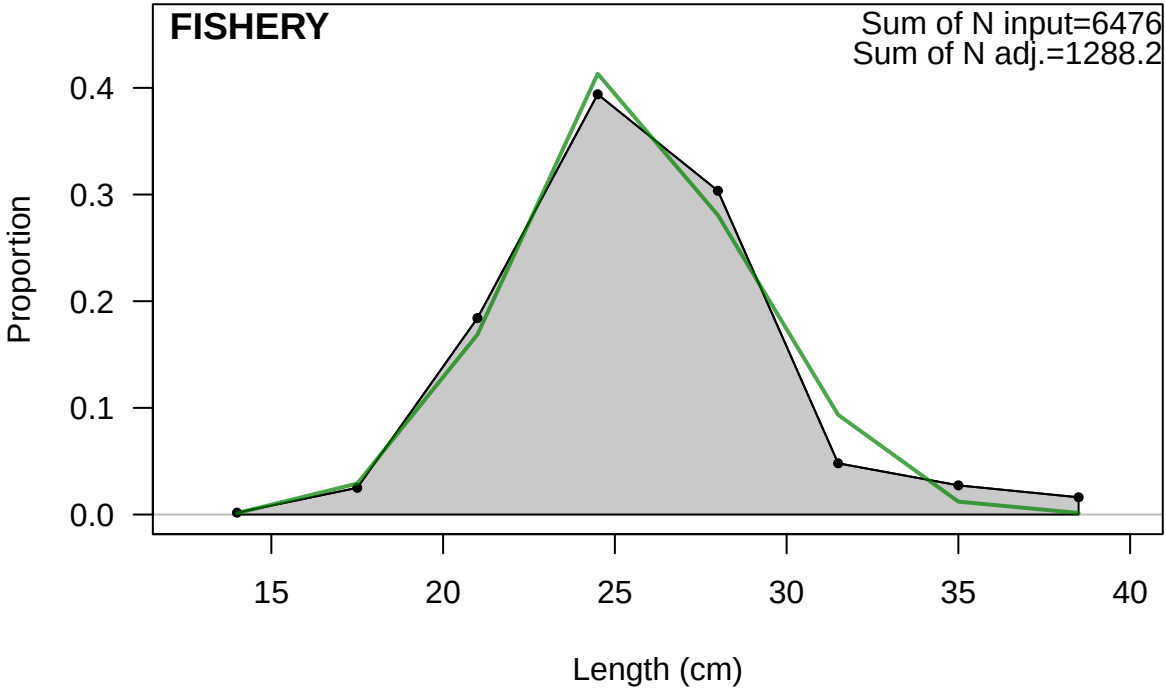

FISHERY
Sum of N input=6476
Proportion
0.0
0.1
0.2
0.3
0.4
15
20
25
30
35
40
Length (cm)

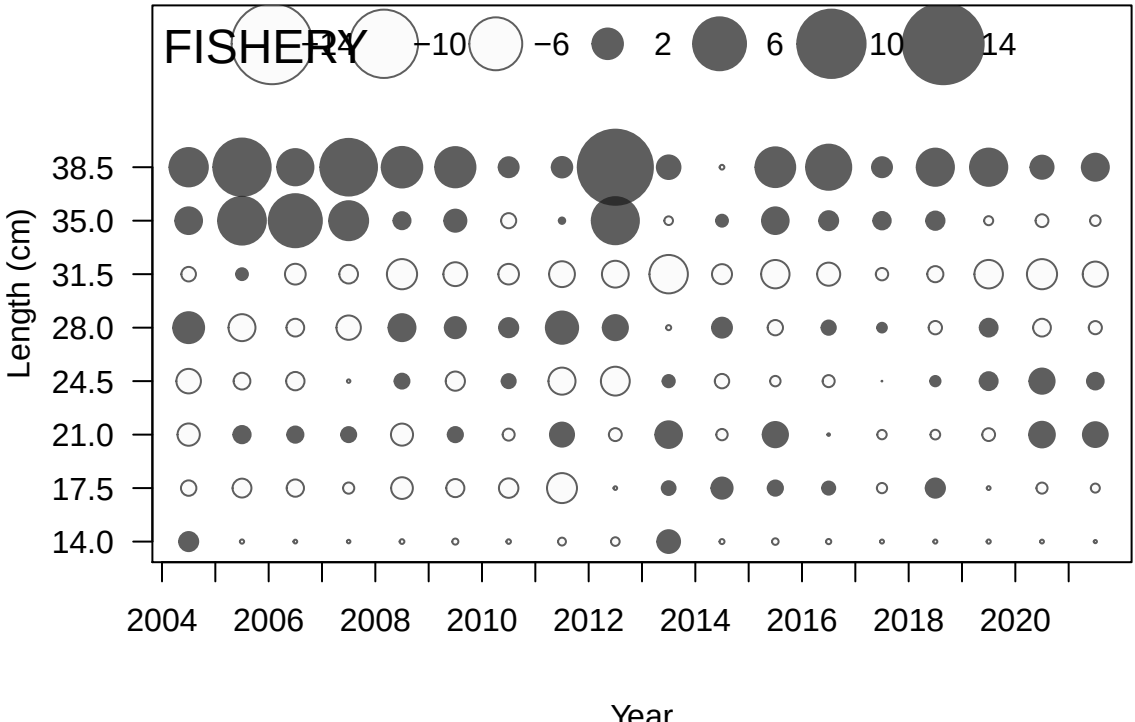

FISHERY
0.01
0.4
Length (cm)
38.5
35.0
31.5
28.0
24.5
21.0
17.5
14.0
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

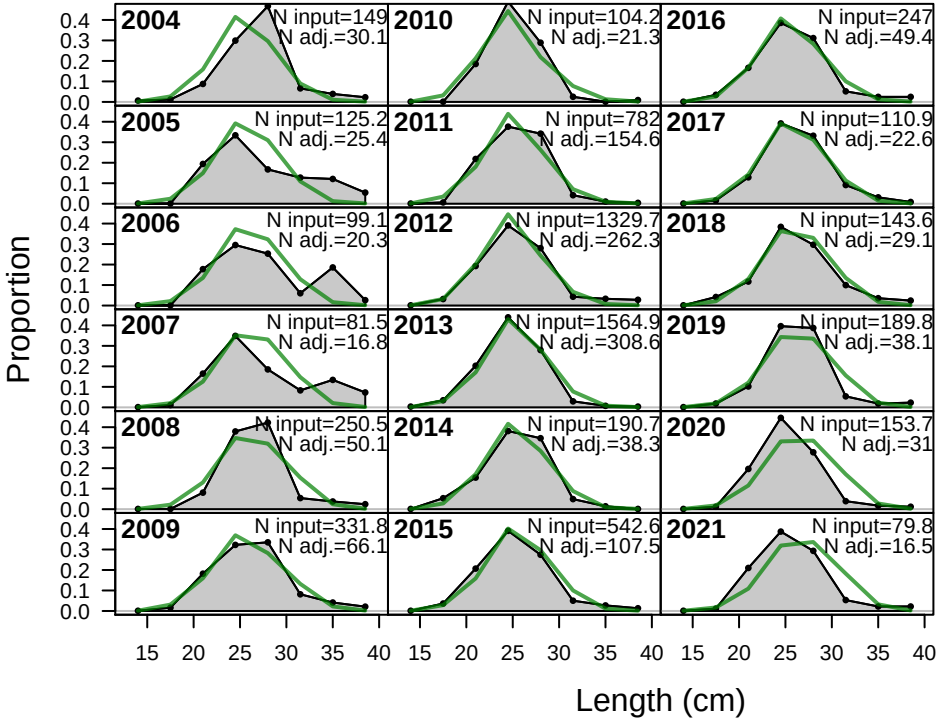

2004
N input=149
2010
N input=104.2
2016
N input=247
2005
N input=125.2
2011
N input=782
2017
N input=110.9
2006
N input=99.1
2012
N input=1329.7
2018
N input=143.6
2007
N input=81.5
2013
N input=1564.9
2019
N input=189.8
2008
N input=250.5
2014
N input=190.7
2020
N input=153.7
2009
N input=331.8
2015
N input=542.6
2021
N input=79.8
Proportion
0.0
0.1
0.2
0.3
0.4
15
20
25
30
35
40
Length (cm)

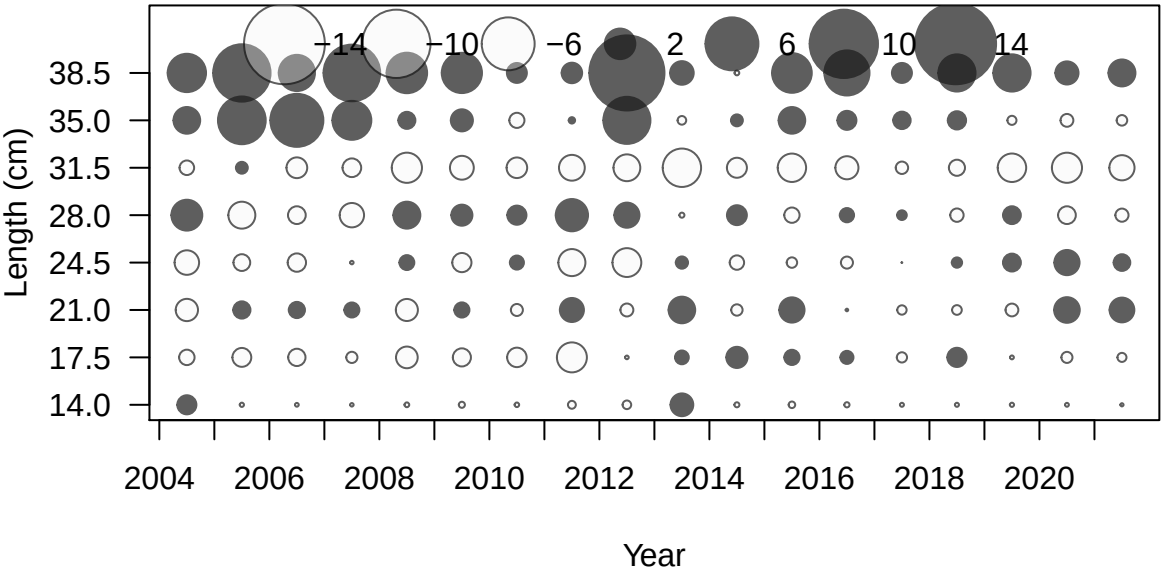

0.01
0.4
38.5
35.0
31.5
28.0
24.5
21.0
17.5
14.0
Length (cm)
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

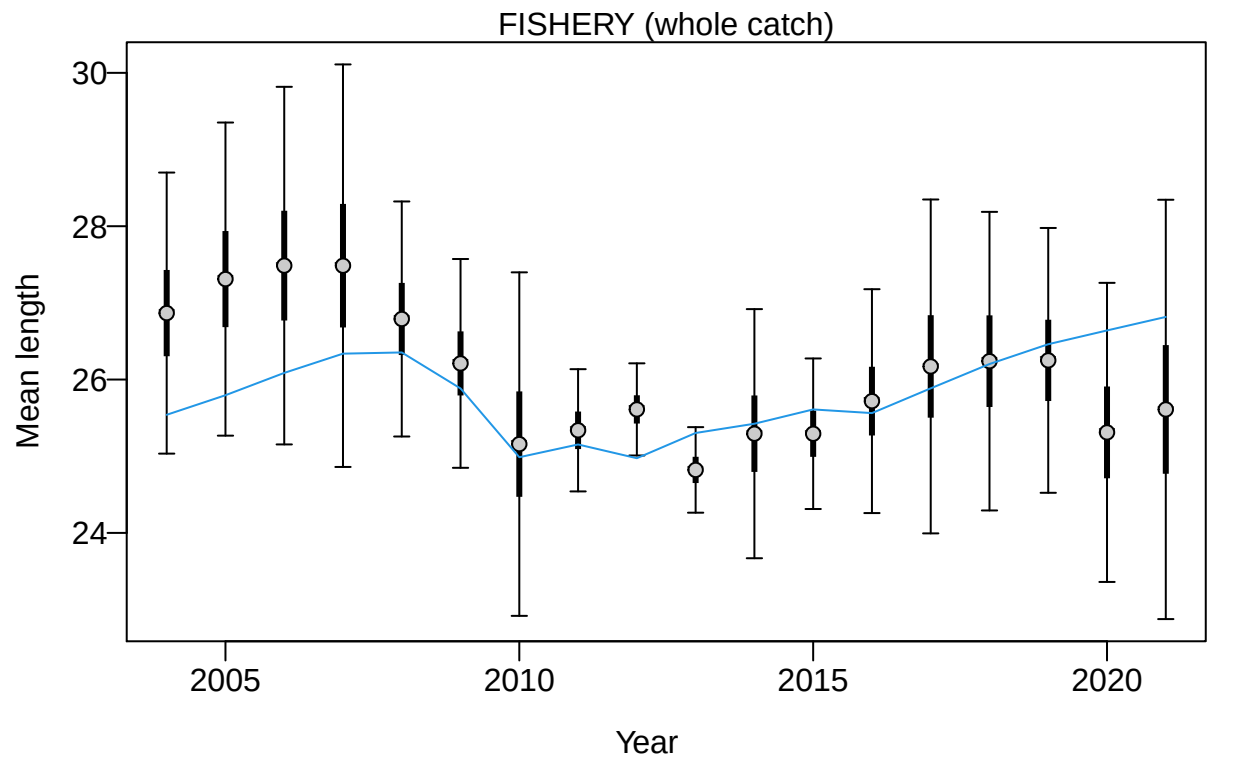

FISHERY (whole catch)
30
28
26
24
Mean length
2005
2010
2015
2020
Year

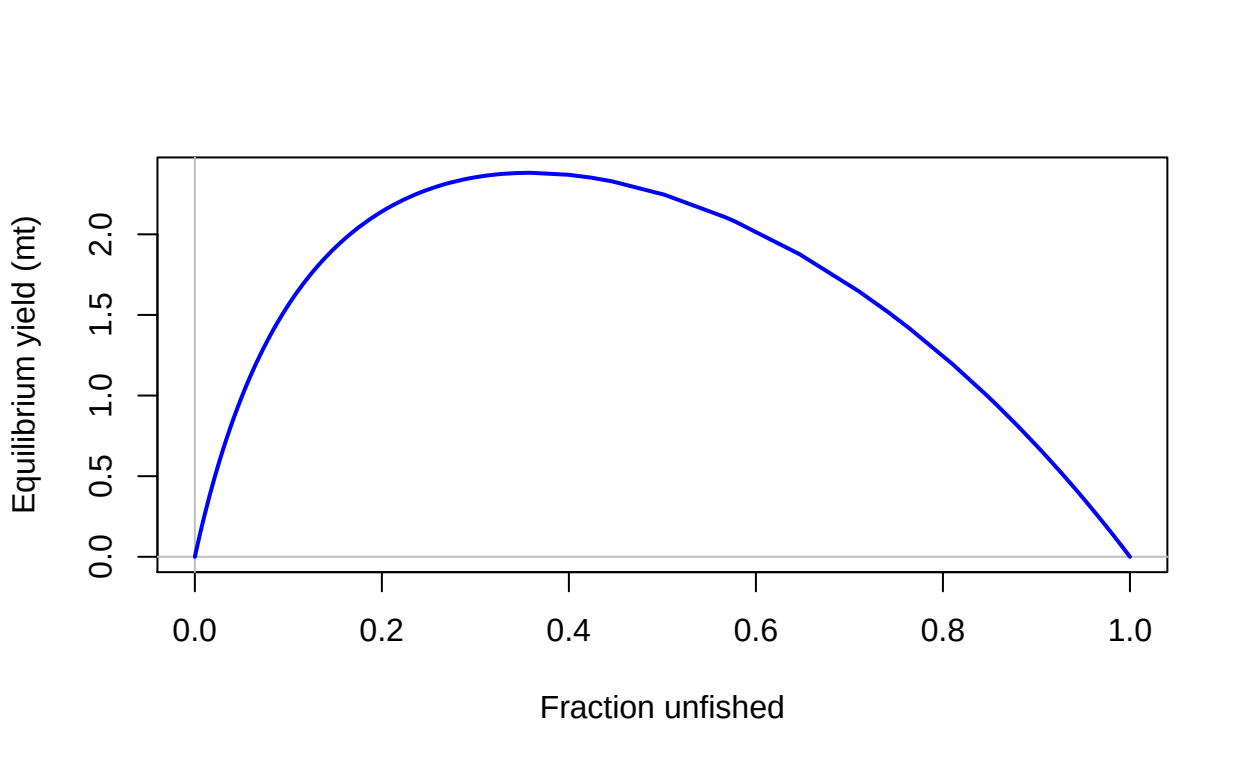

FISHERY
Sum of N input=6476
Sum of N adj.=1288.2
Proportion
0.0
0.1
0.2
0.3
0.4
15
20
25
30
35
40
Length (cm)

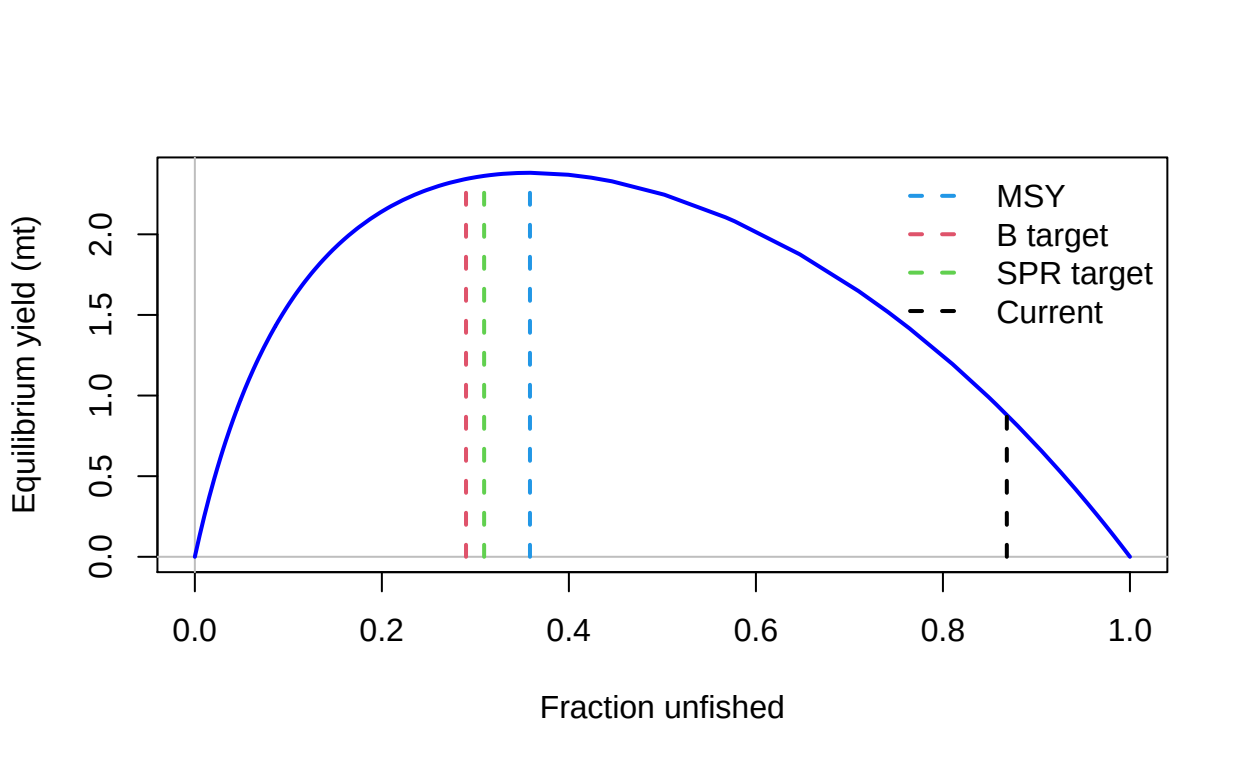

FISHERY
−14
−10
−6
2
6
10
14
38.5
35.0
31.5
28.0
24.5
21.0
17.5
14.0
Length (cm)
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

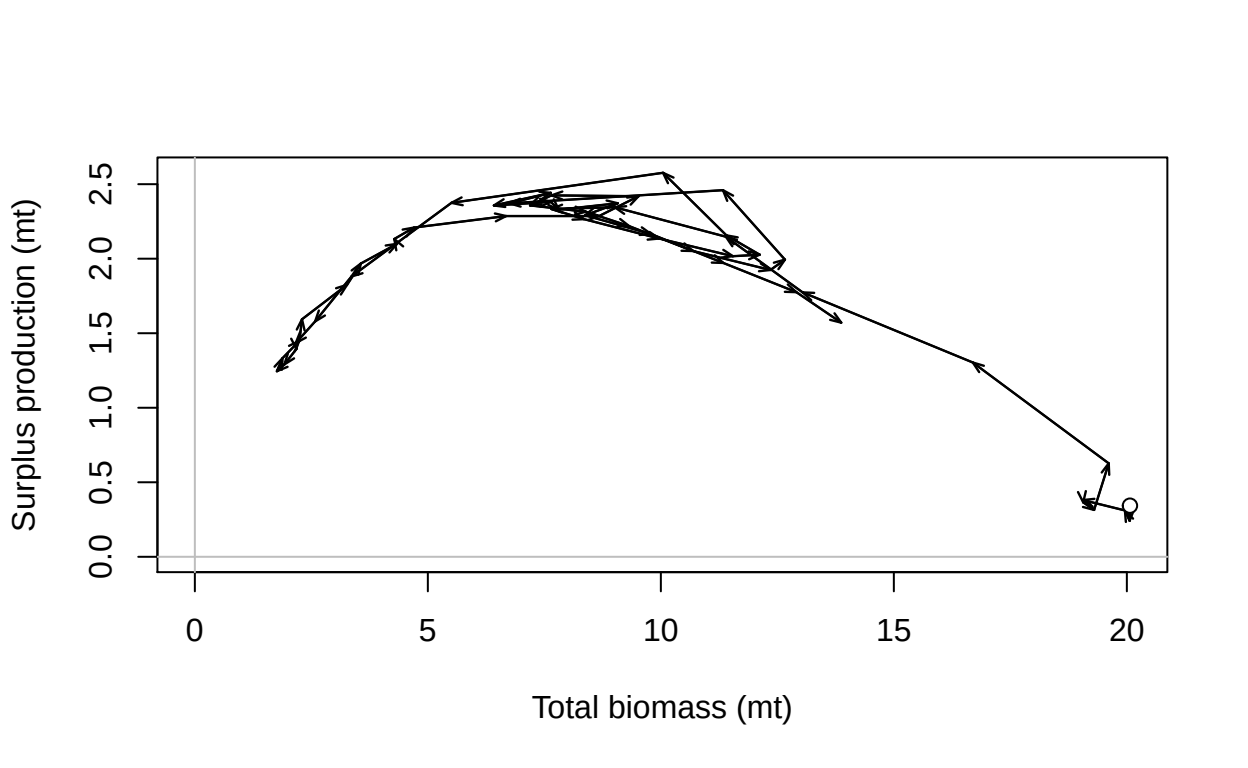

2004
N input=149
N adj.=30.1
2010
N input=104.2
N adj.=21.3
2016
N input=247
N adj.=49.4
2005
N input=125.2
N adj.=25.4
2011
N input=782
N adj.=154.6
2017
N input=110.9
N adj.=22.6
2006
N input=99.1
N adj.=20.3
2012
N input=1329.7
N adj.=262.3
2018
N input=143.6
N adj.=29.1
2007
N input=81.5
N adj.=16.8
2013
N input=1564.9
N adj.=308.6
2019
N input=189.8
N adj.=38.1
2008
N input=250.5
N adj.=50.1
2014
N input=190.7
N adj.=38.3
2020
N input=153.7
N adj.=31
2009
N input=331.8
N adj.=66.1
2015
N input=542.6
N adj.=107.5
2021
N input=79.8
N adj.=16.5
Proportion
0.0
0.1
0.2
0.3
0.4
15
20
25
30
35
40
Length (cm)

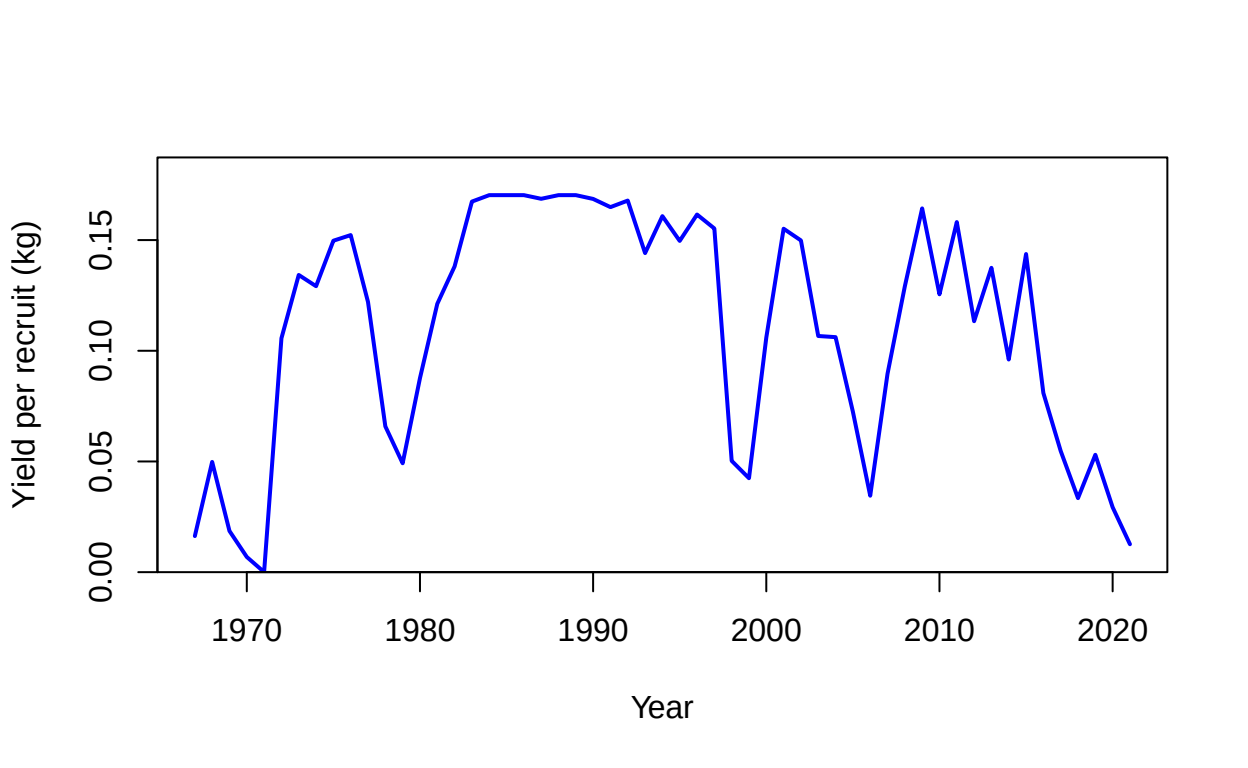

−14
−10
−6
2
6
10
14
38.5
35.0
31.5
28.0
24.5
21.0
17.5
14.0
Length (cm)
2004
2006
2008
2010
2012
2014
2016
2018
2020
Year

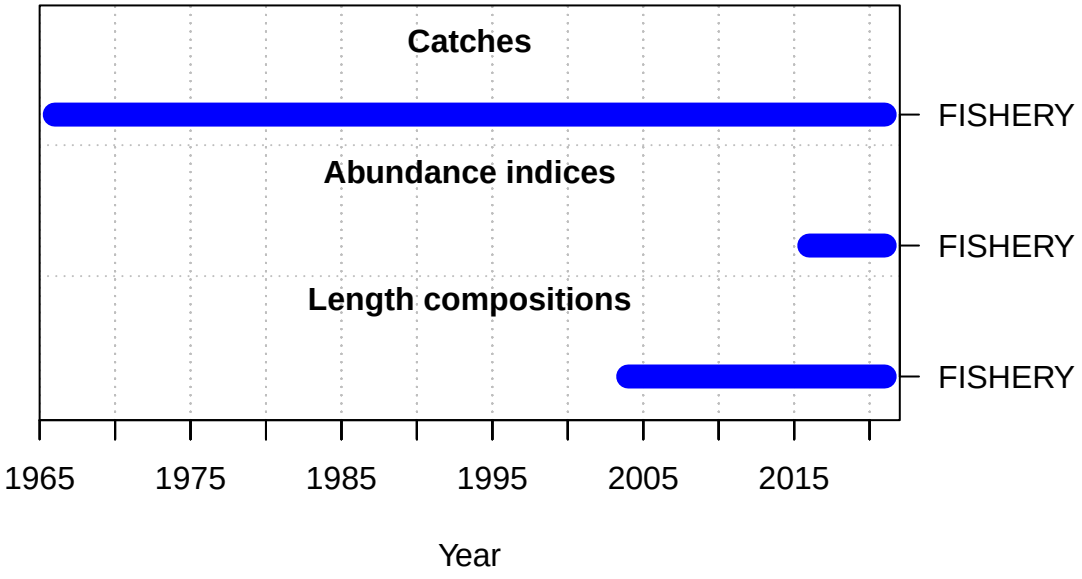

FISHERY (whole catch)
30
28
26
24
Mean length
2005
2010
2015
2020
Year

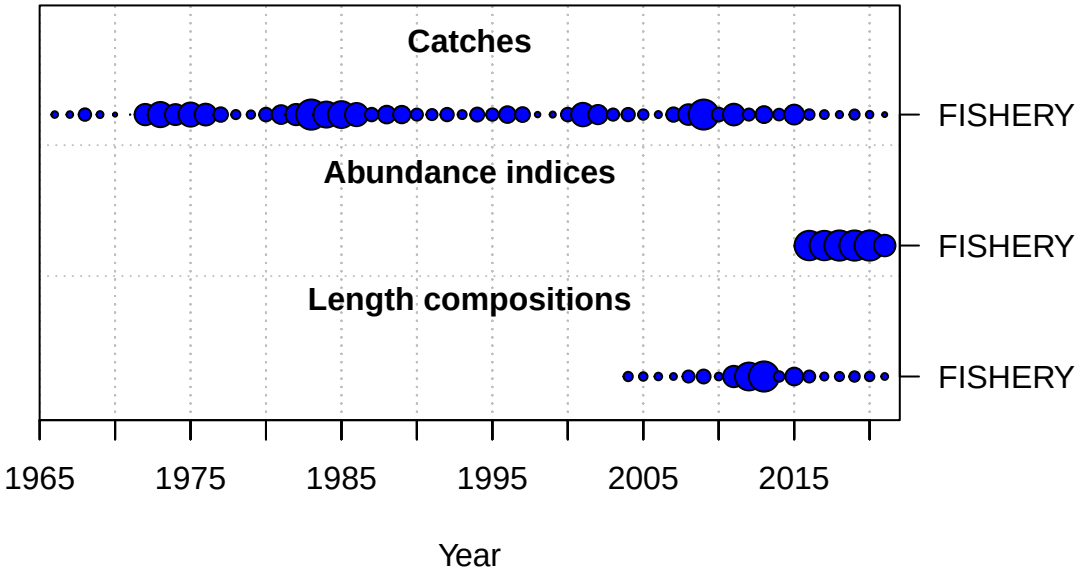

Equilibrium yield (mt)
0.0
0.5
1.0
1.5
2.0
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished

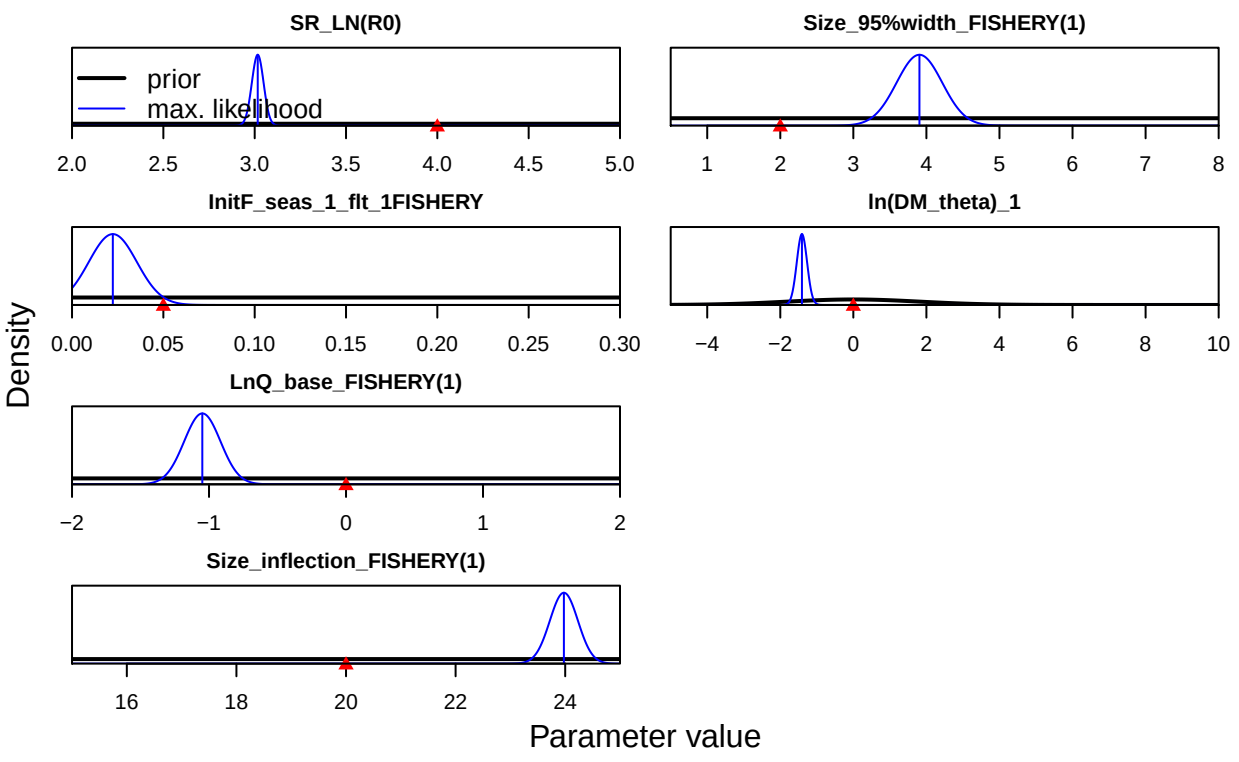

Equilibrium yield (mt)
0.0
0.5
1.0
1.5
2.0
0.0
0.2
0.4
0.6
0.8
1.0
Fraction unfished
MSY
B target
SPR target
Current


Surplus production (mt)
0.0
0.5
1.0
1.5
2.0
2.5
0
5
10
15
20
Total biomass (mt)


Yield per recruit (kg)
0.00
0.05
0.10
0.15
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
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Size_95%width_FISHERY(1)
1
2
3
4
5
6
7
8
InitF_seas_1_flt_1FISHERY
0.00
0.05
0.10
0.15
0.20
0.25
0.30
ln(DM_theta)_1
−4
−2
0
2
4
6
8
10
LnQ_base_FISHERY(1)
−2
−1
0
1
2
Size_inflection_FISHERY(1)
16
18
20
22
24
Density
Parameter value