

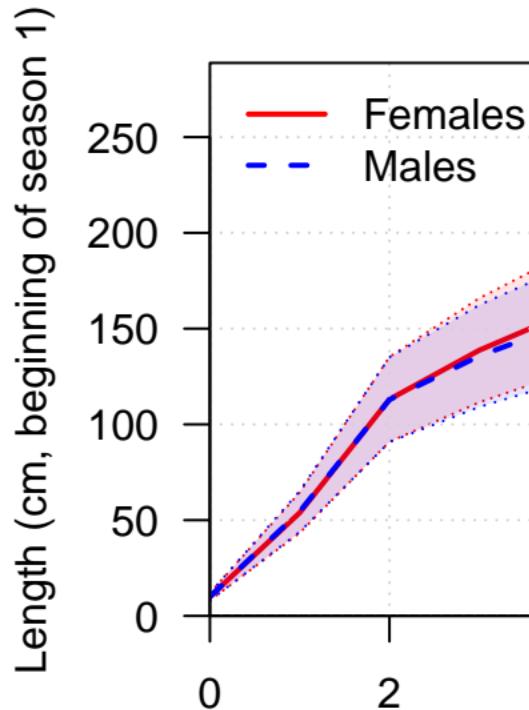
Plots created using the 'r4ss' package in R

Stock Synthesis version: 3.30.20.0

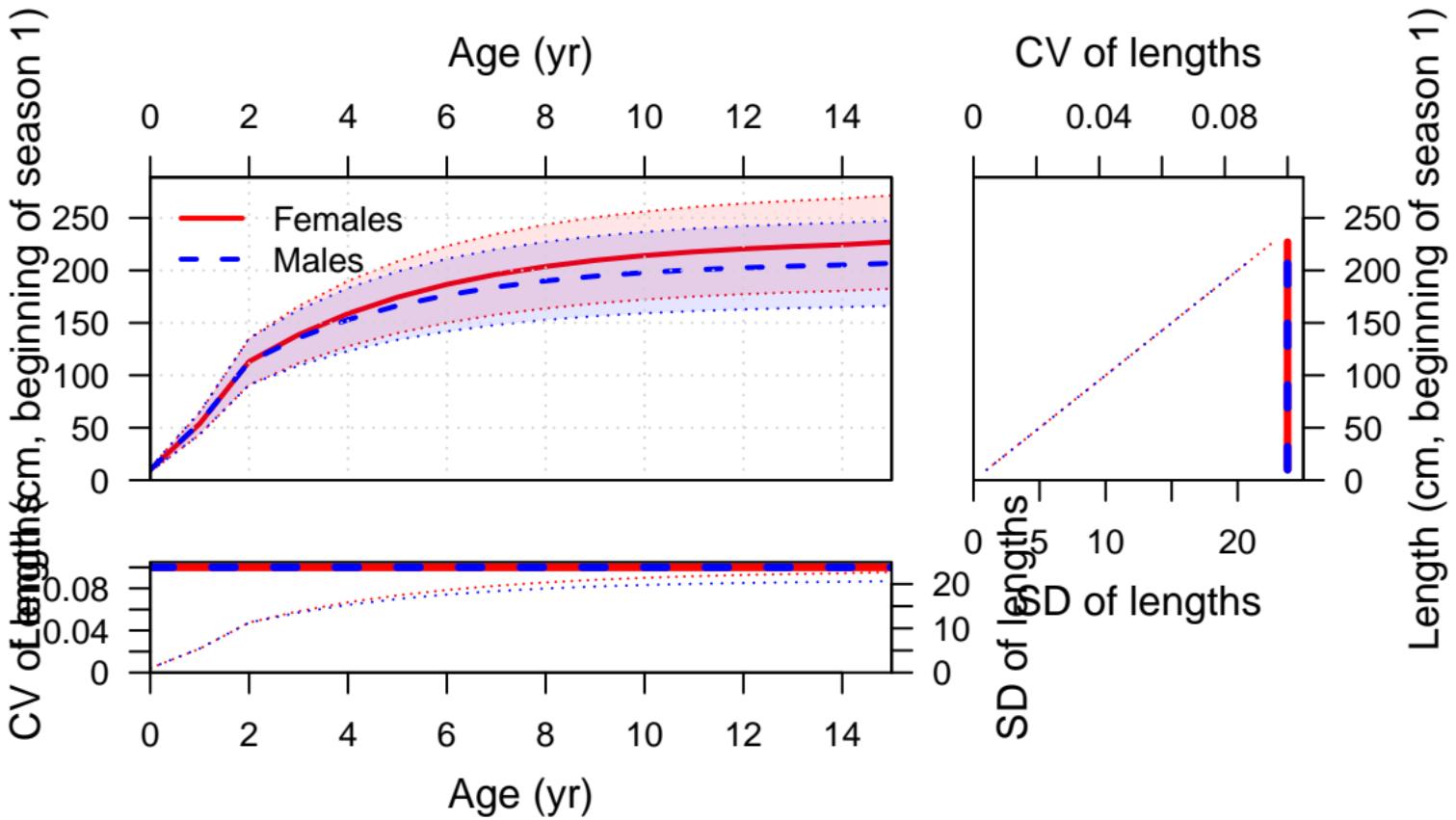
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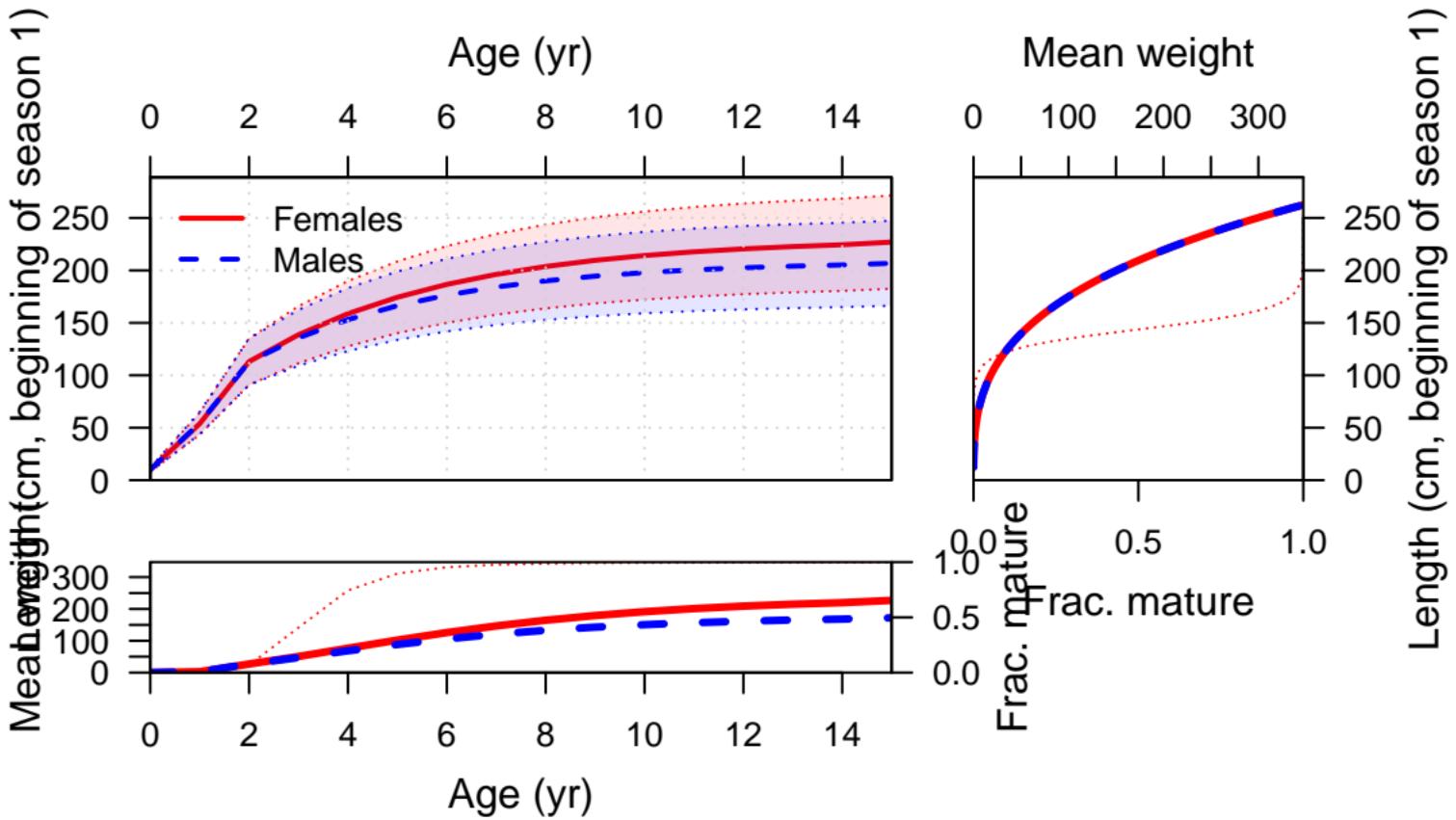
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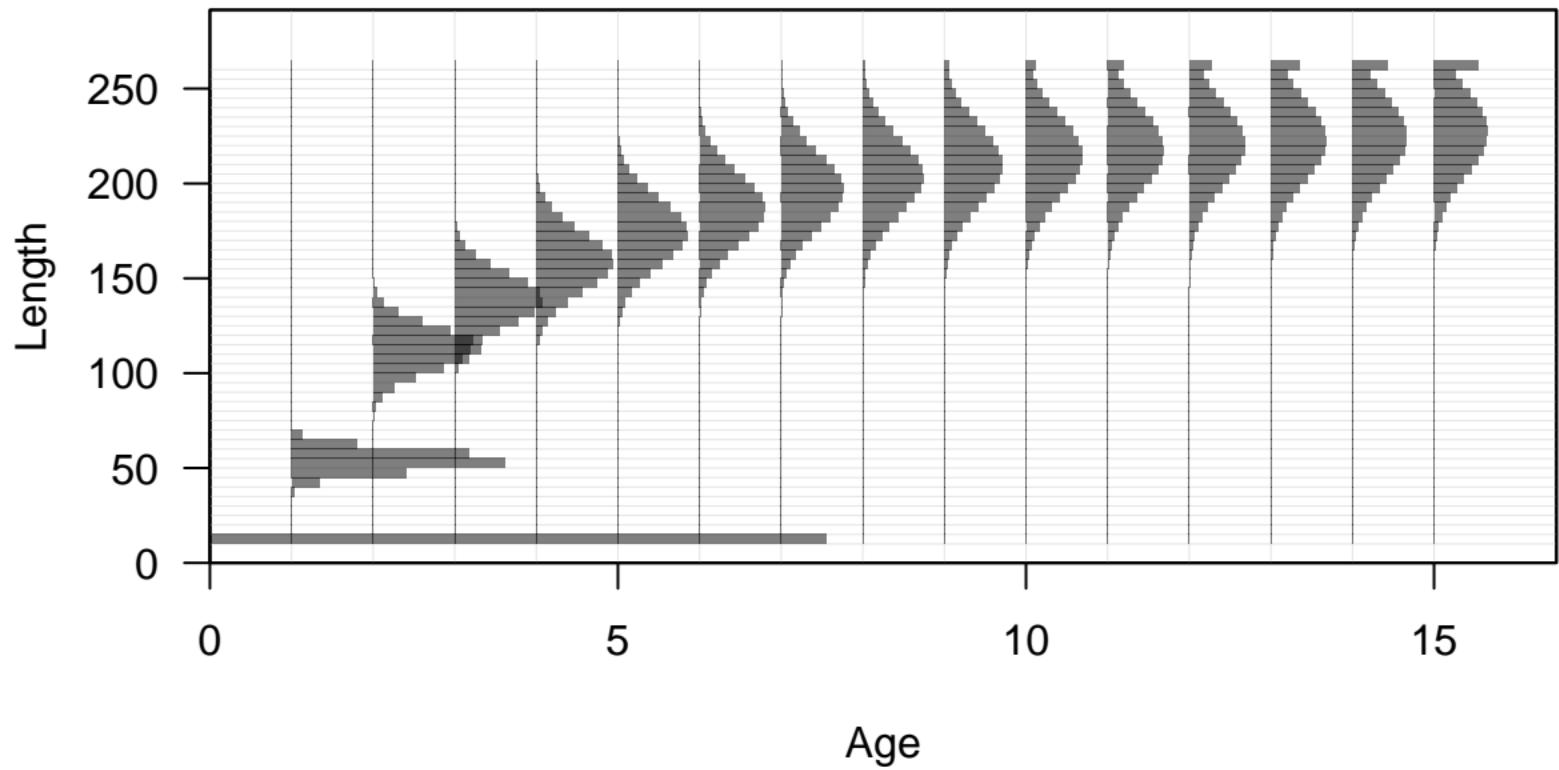
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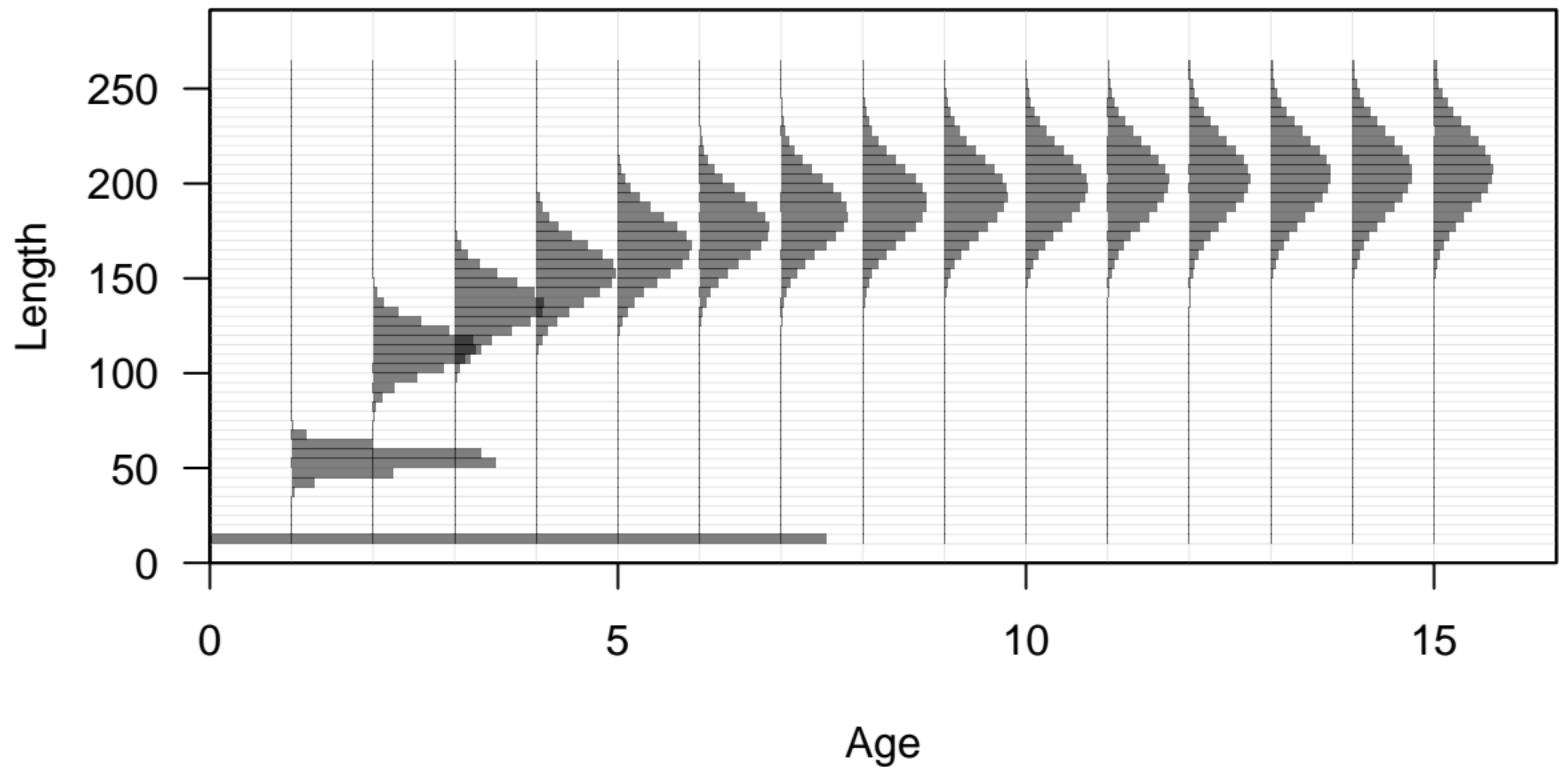


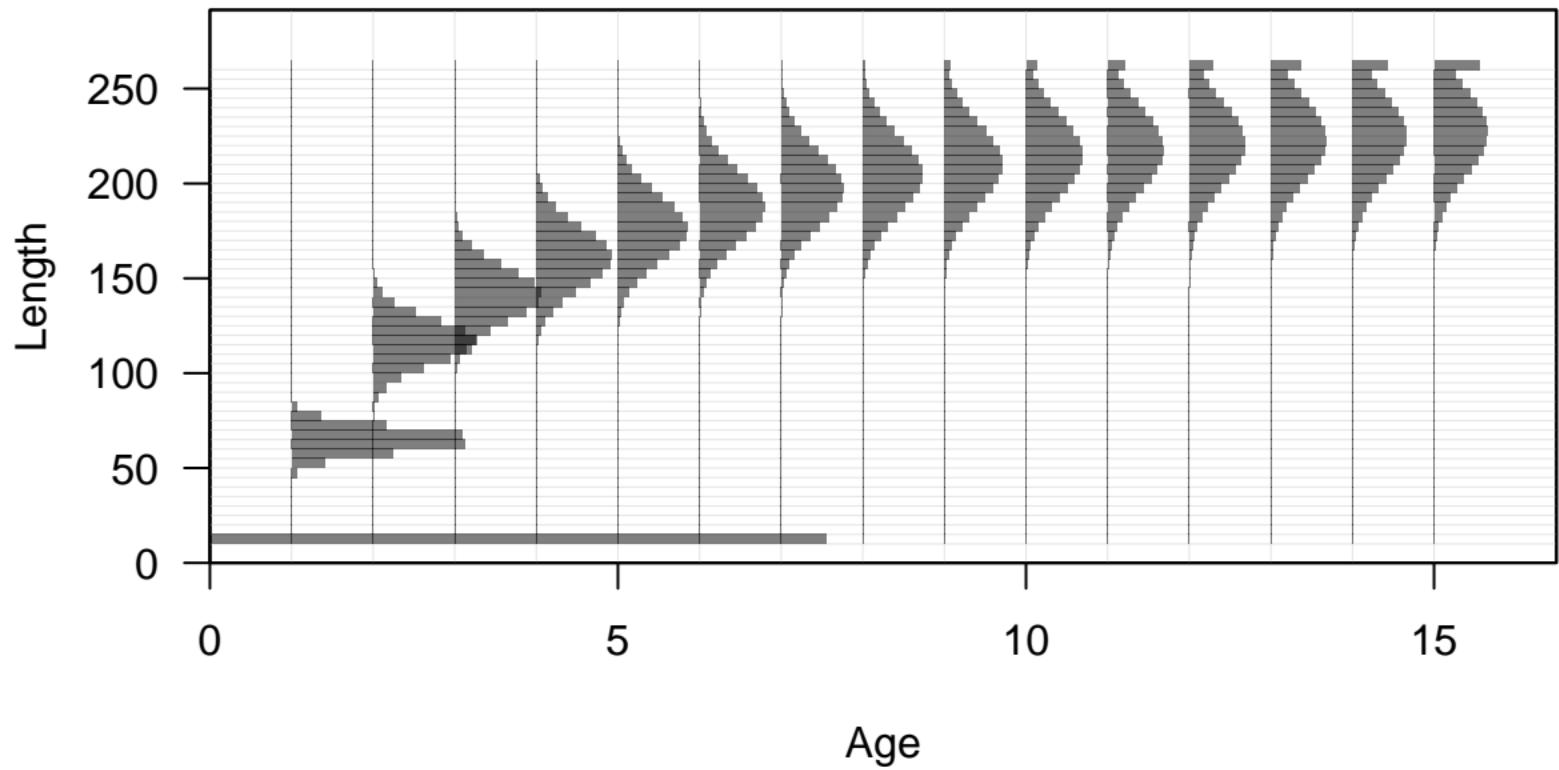
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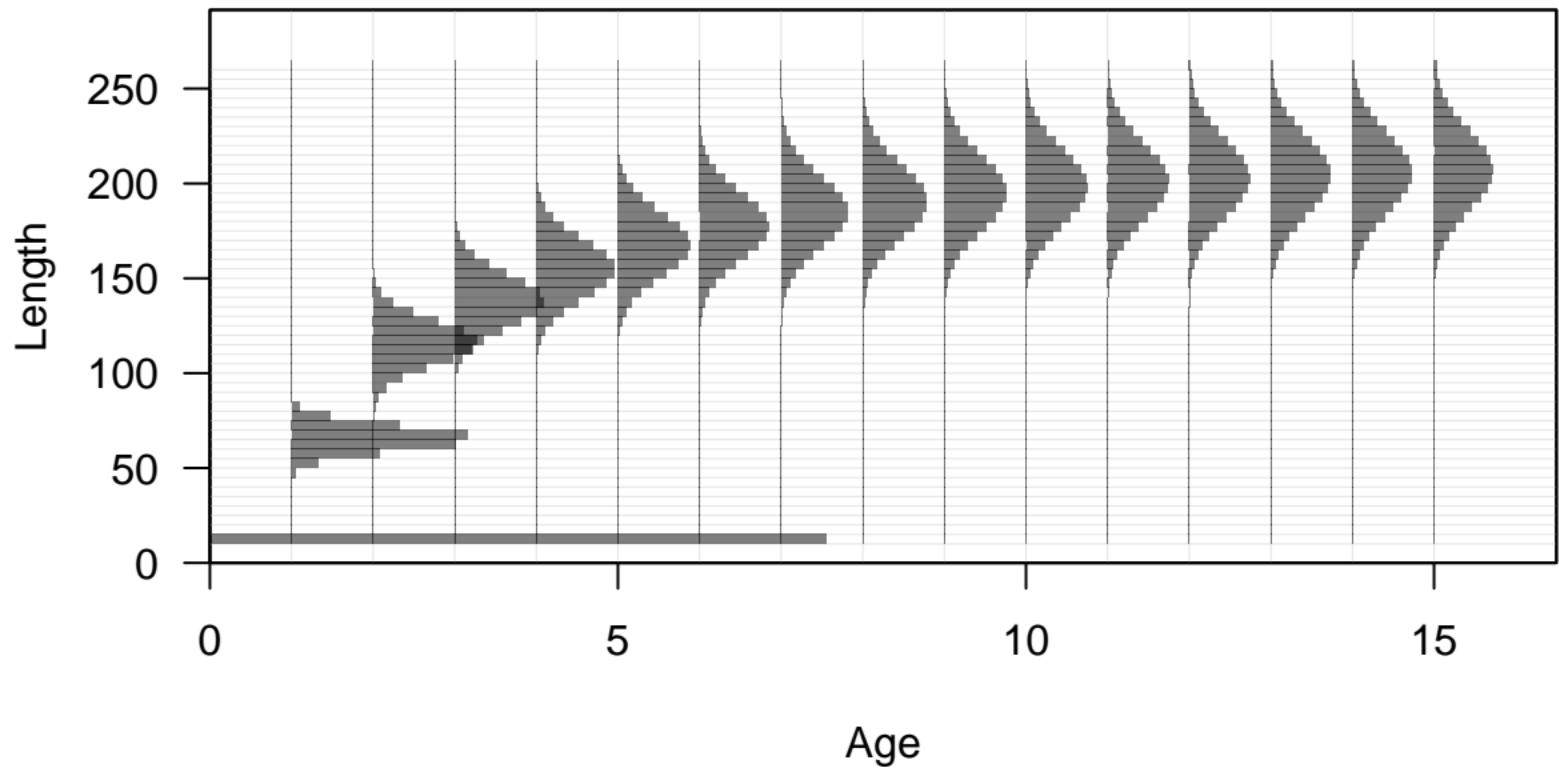


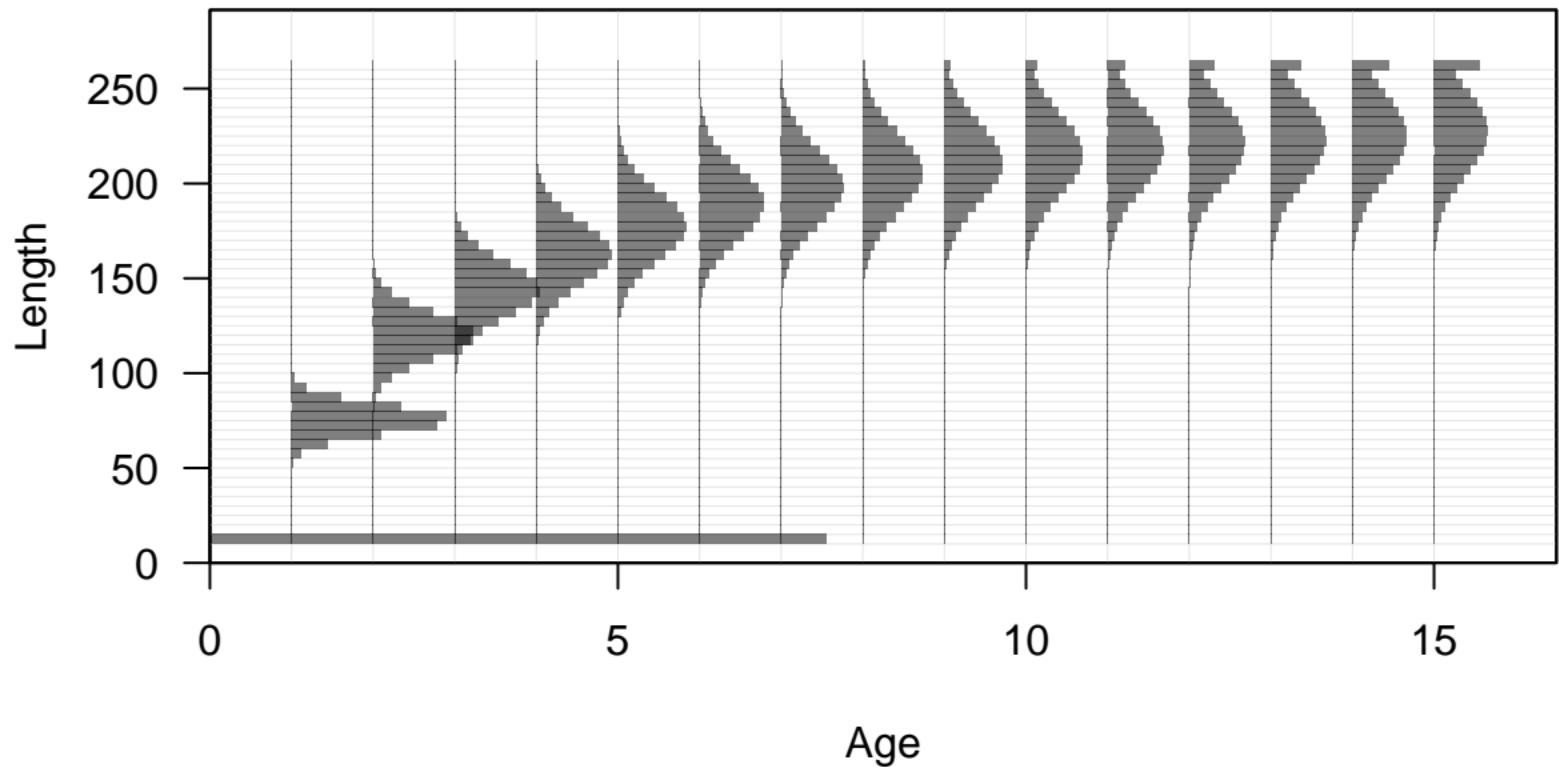


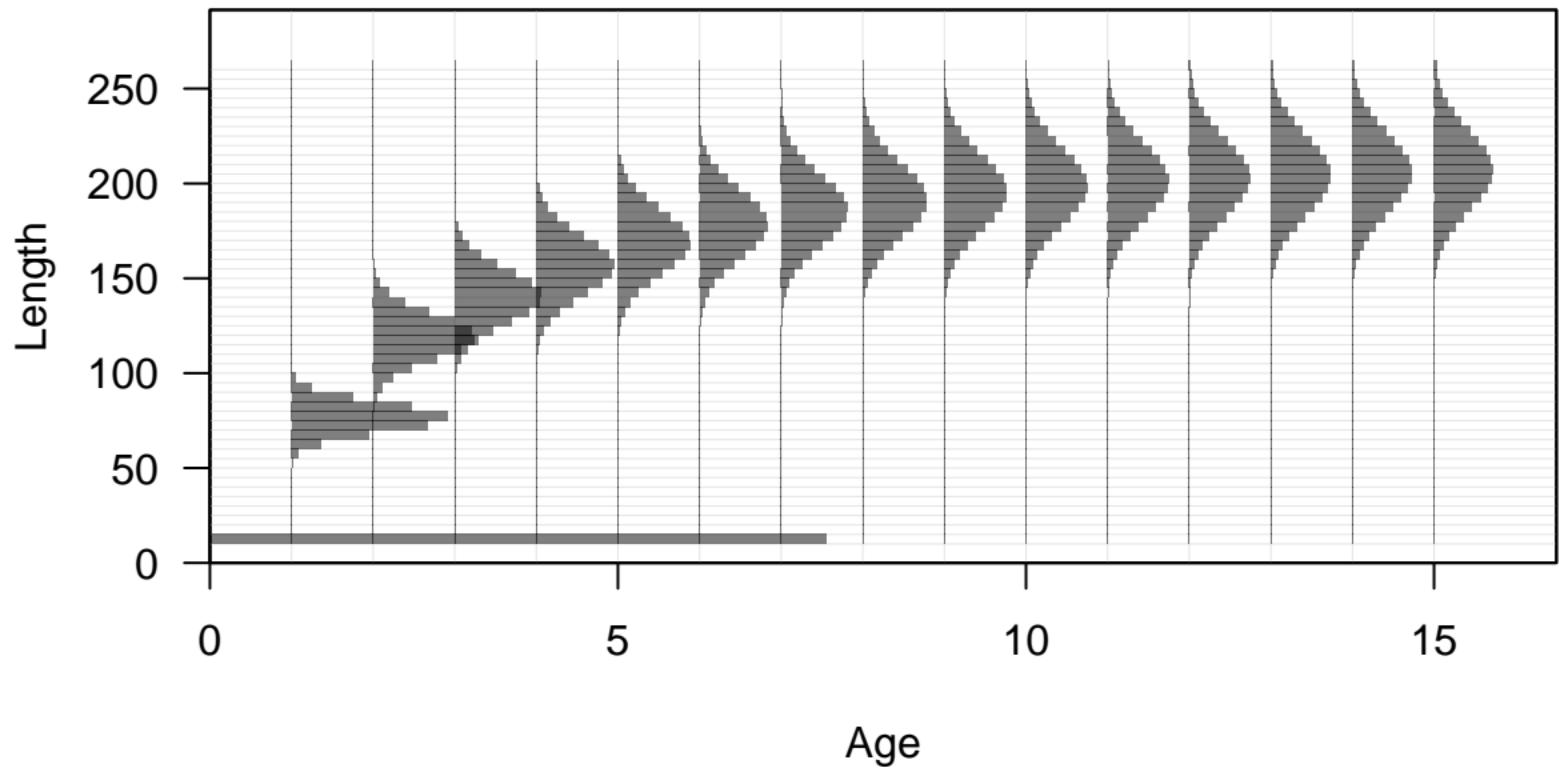


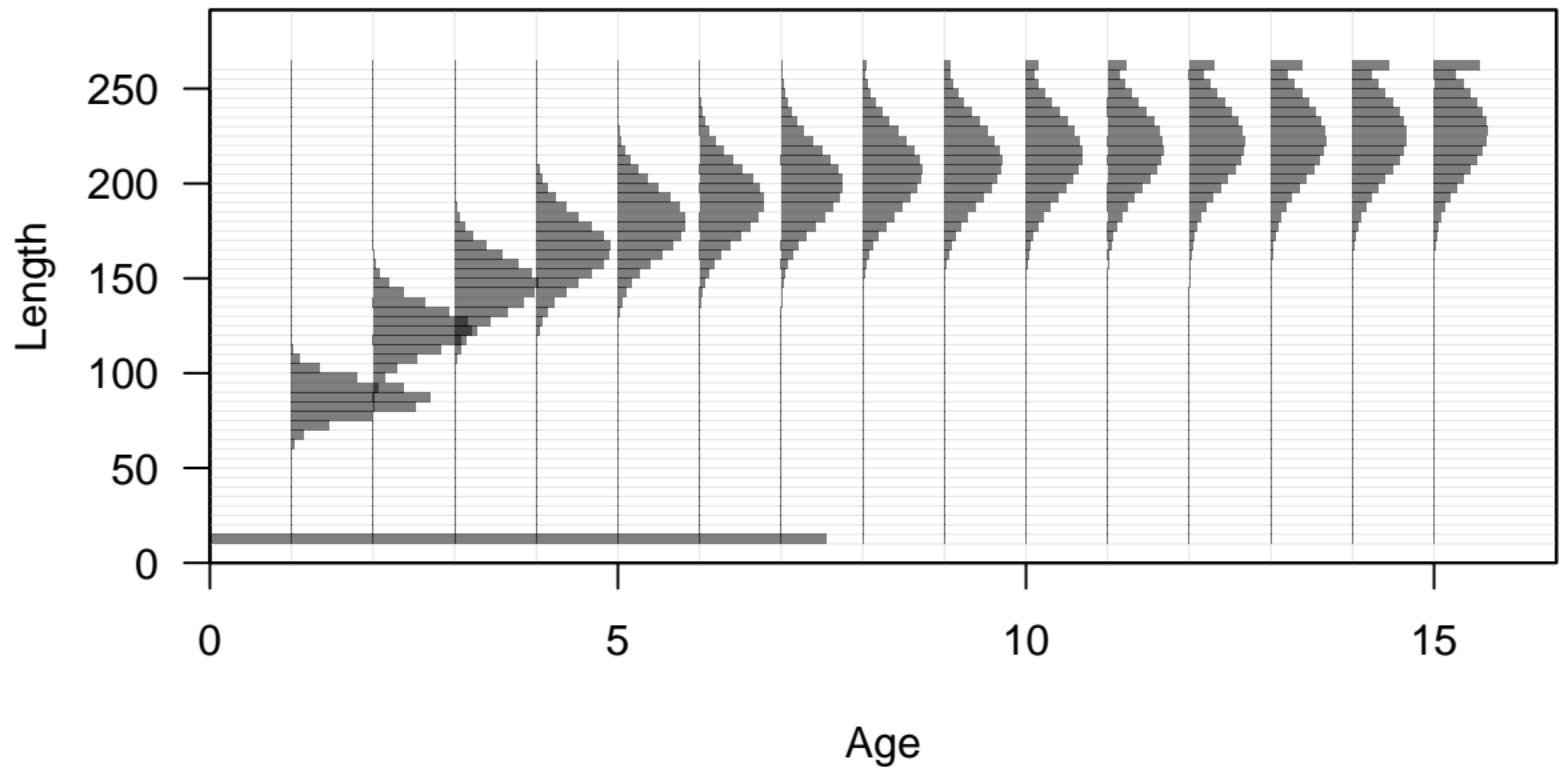


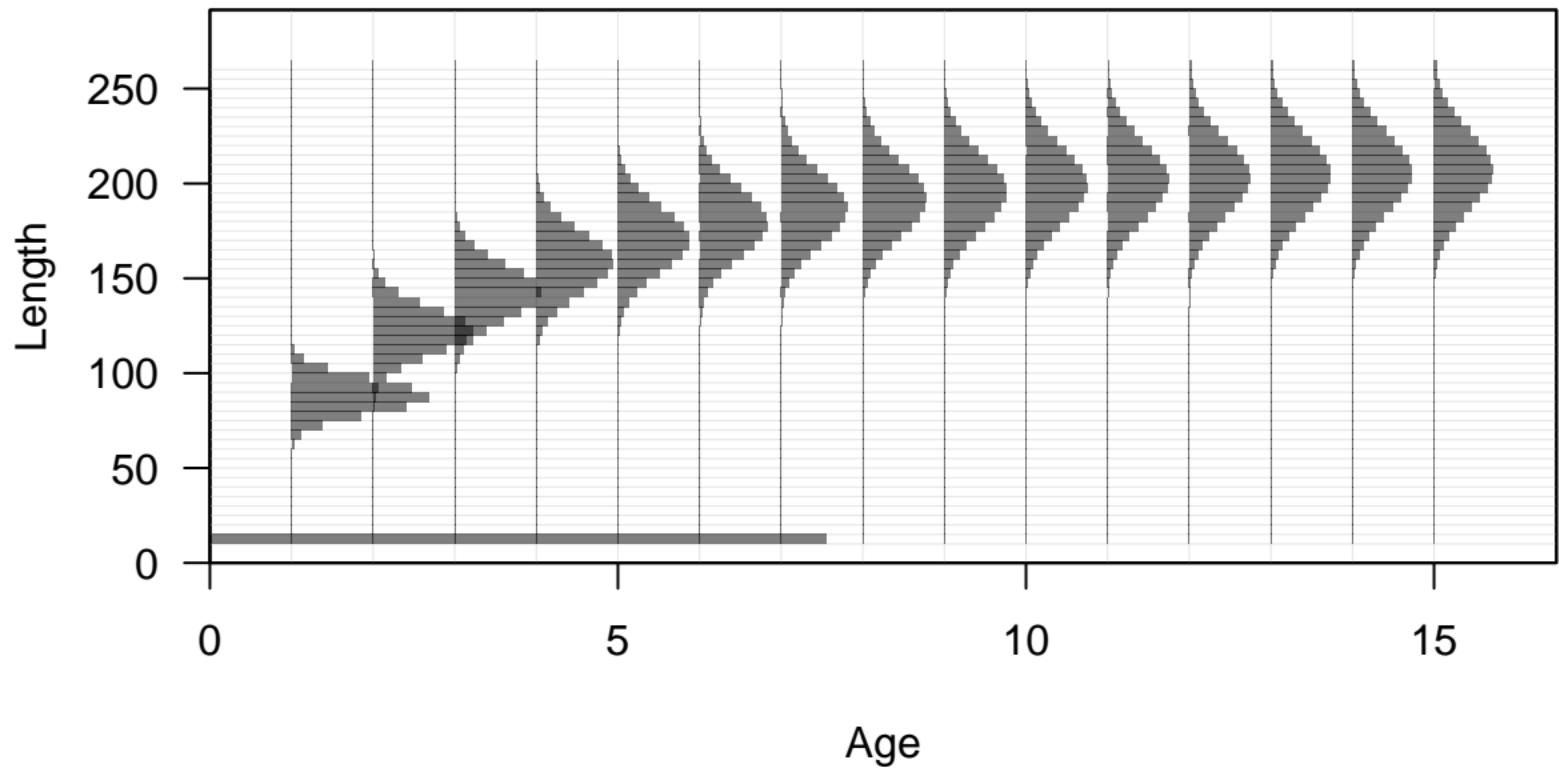


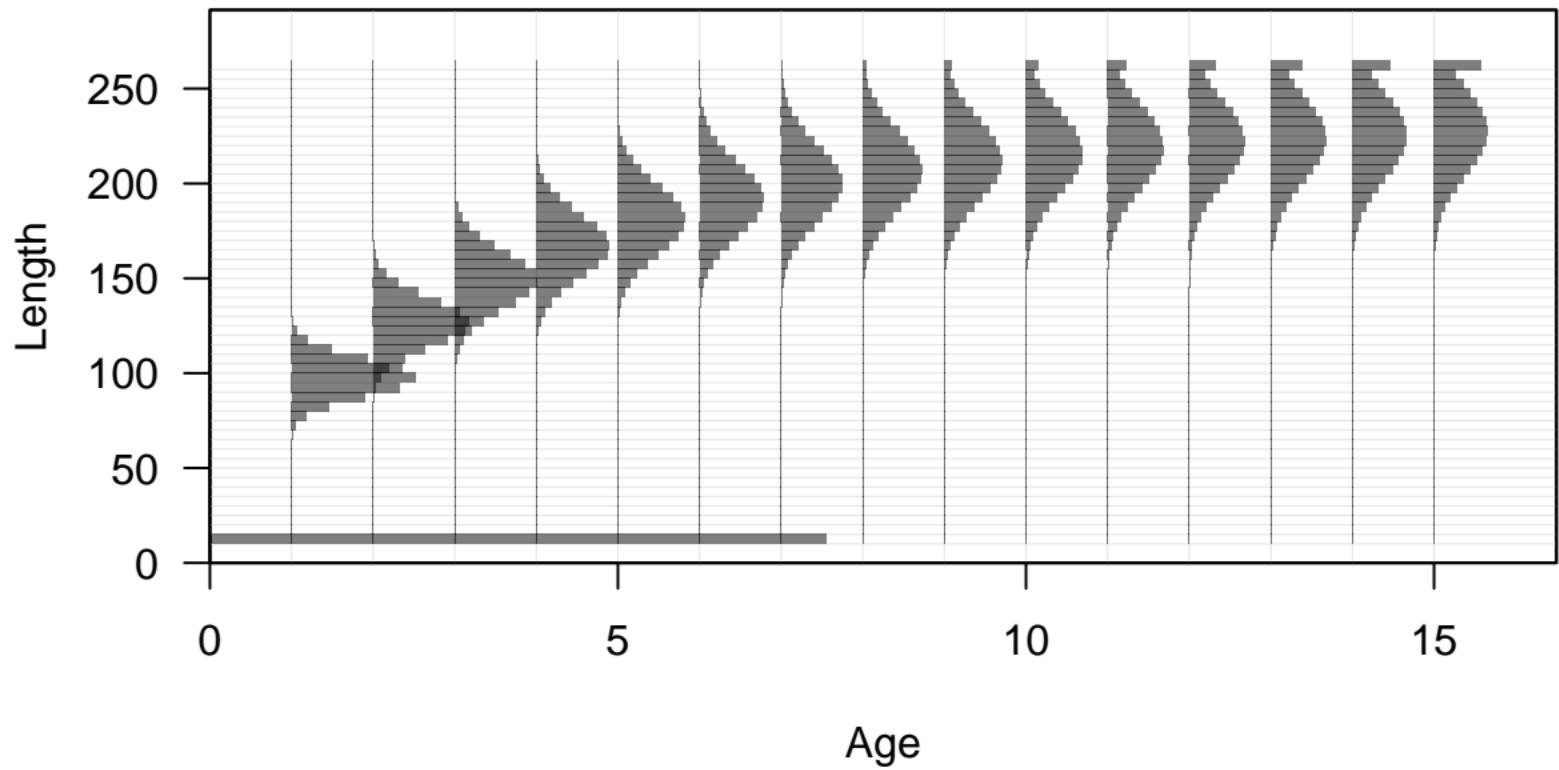


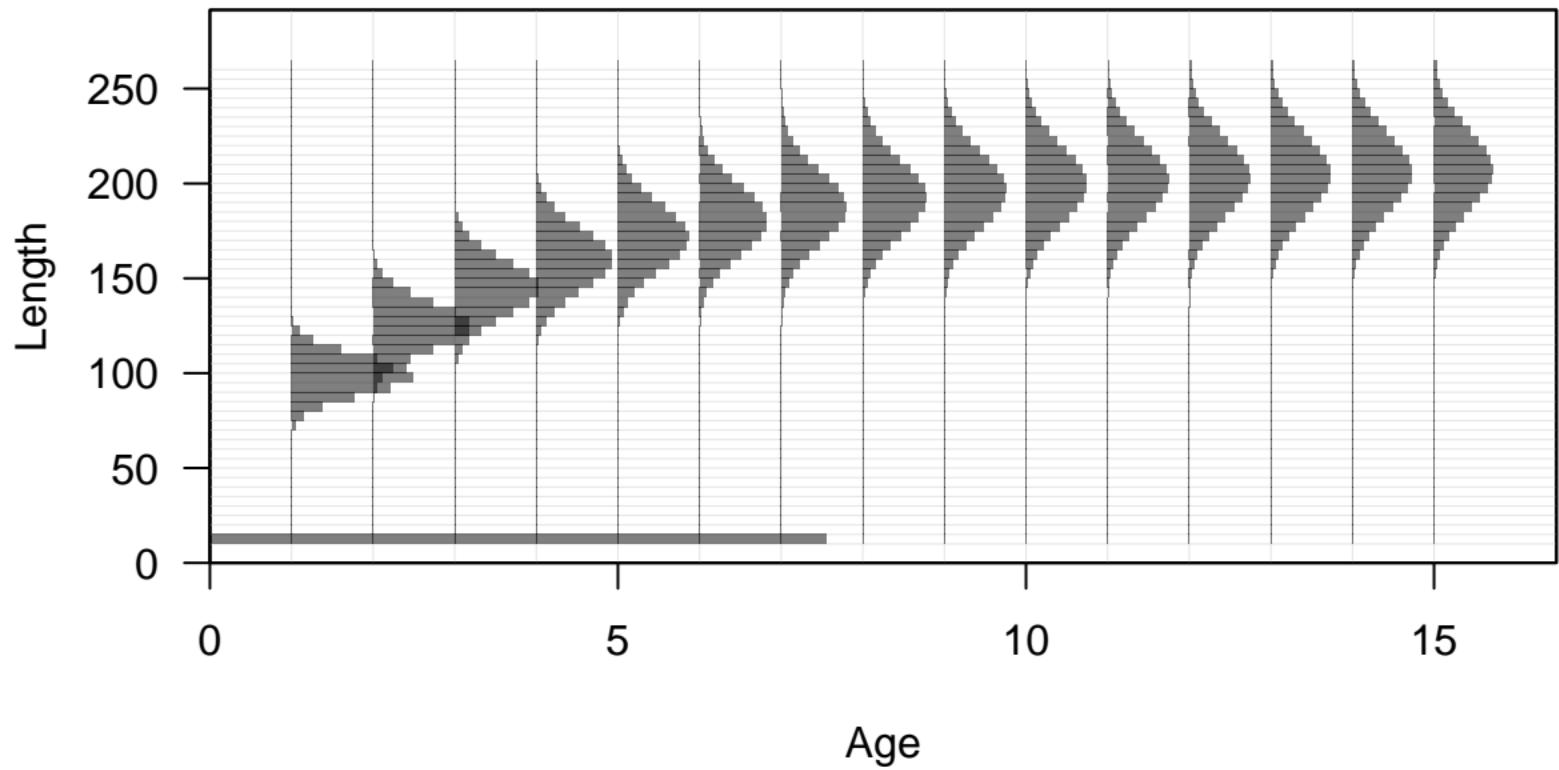


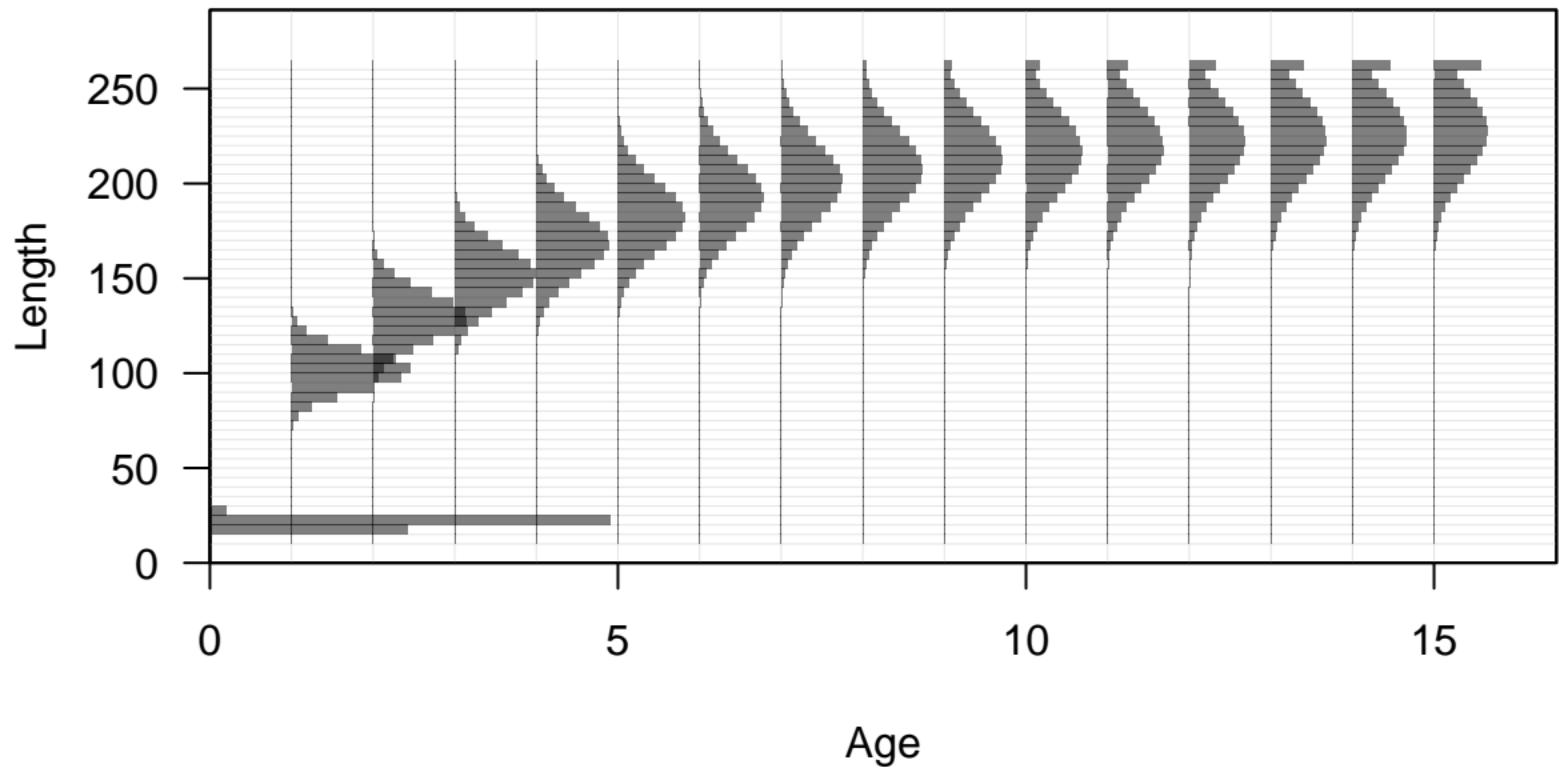


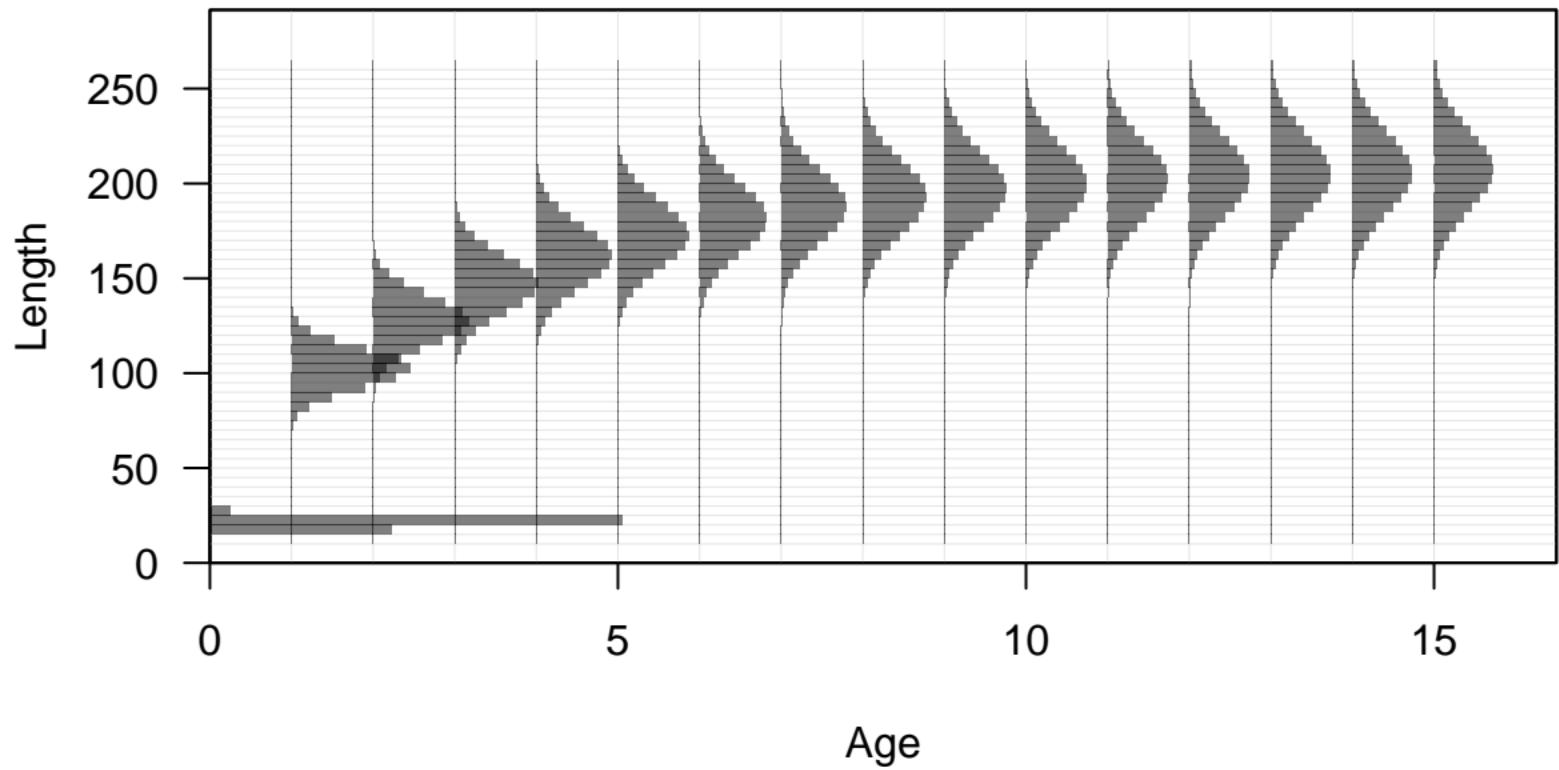


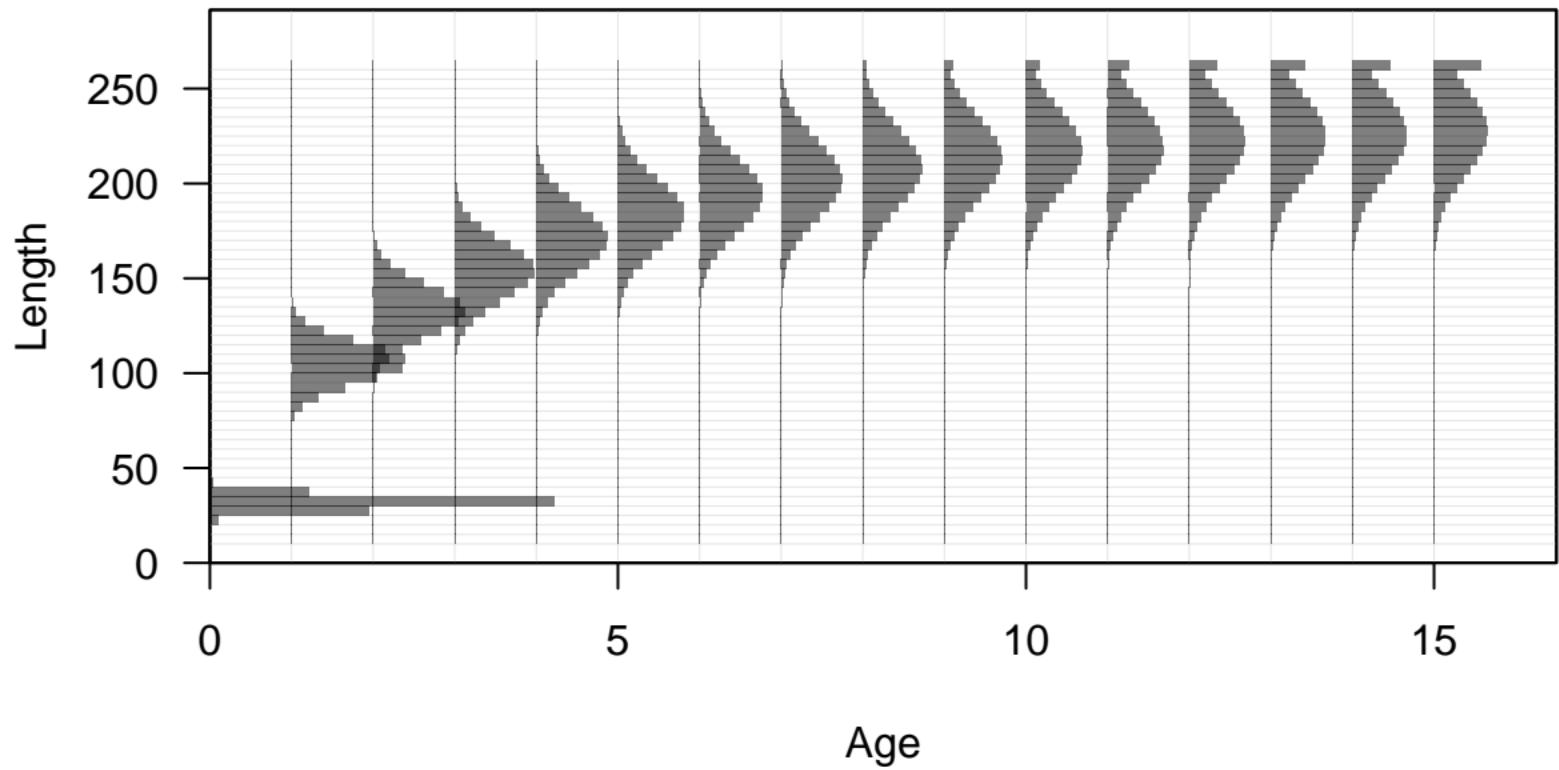


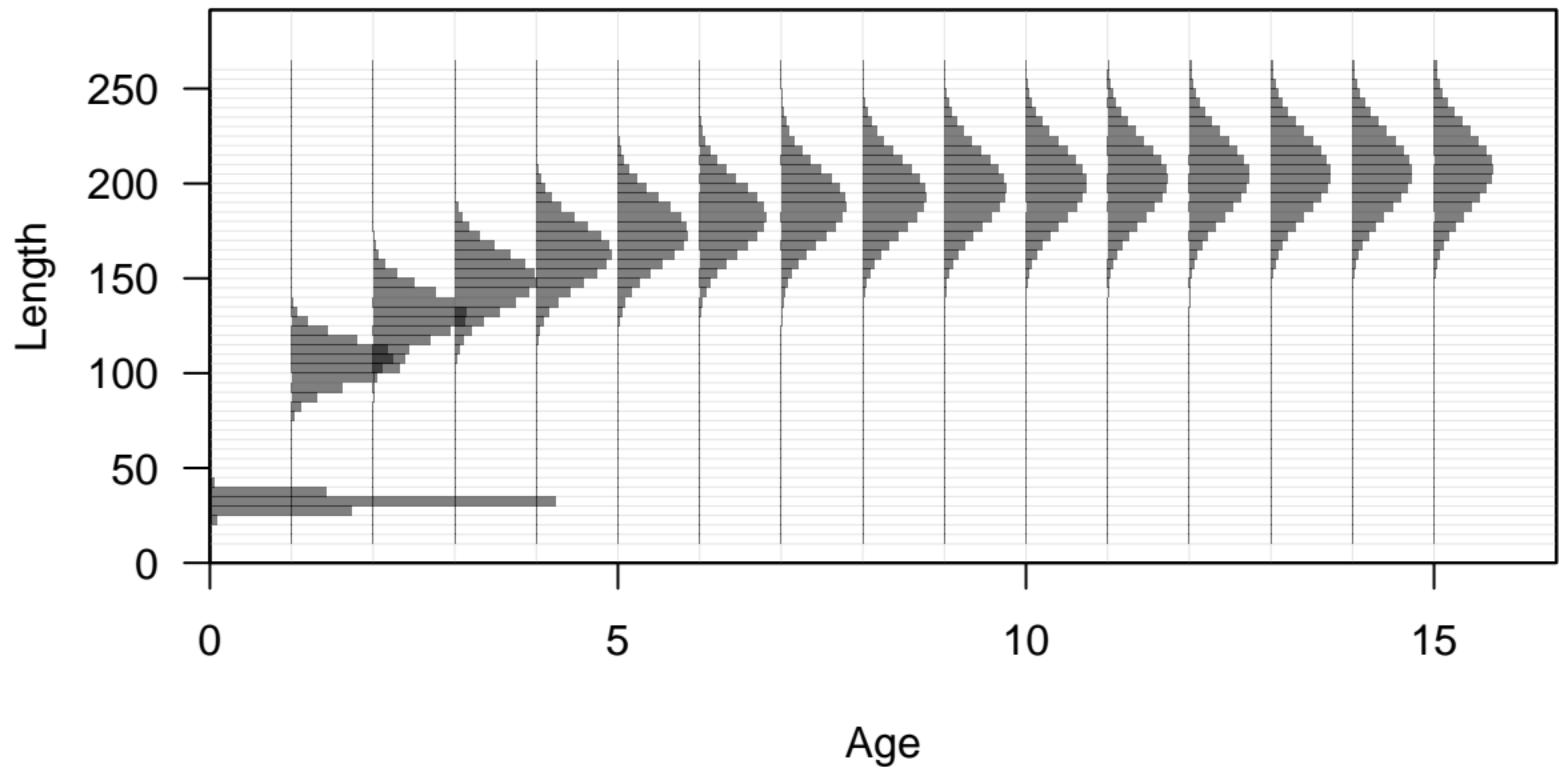


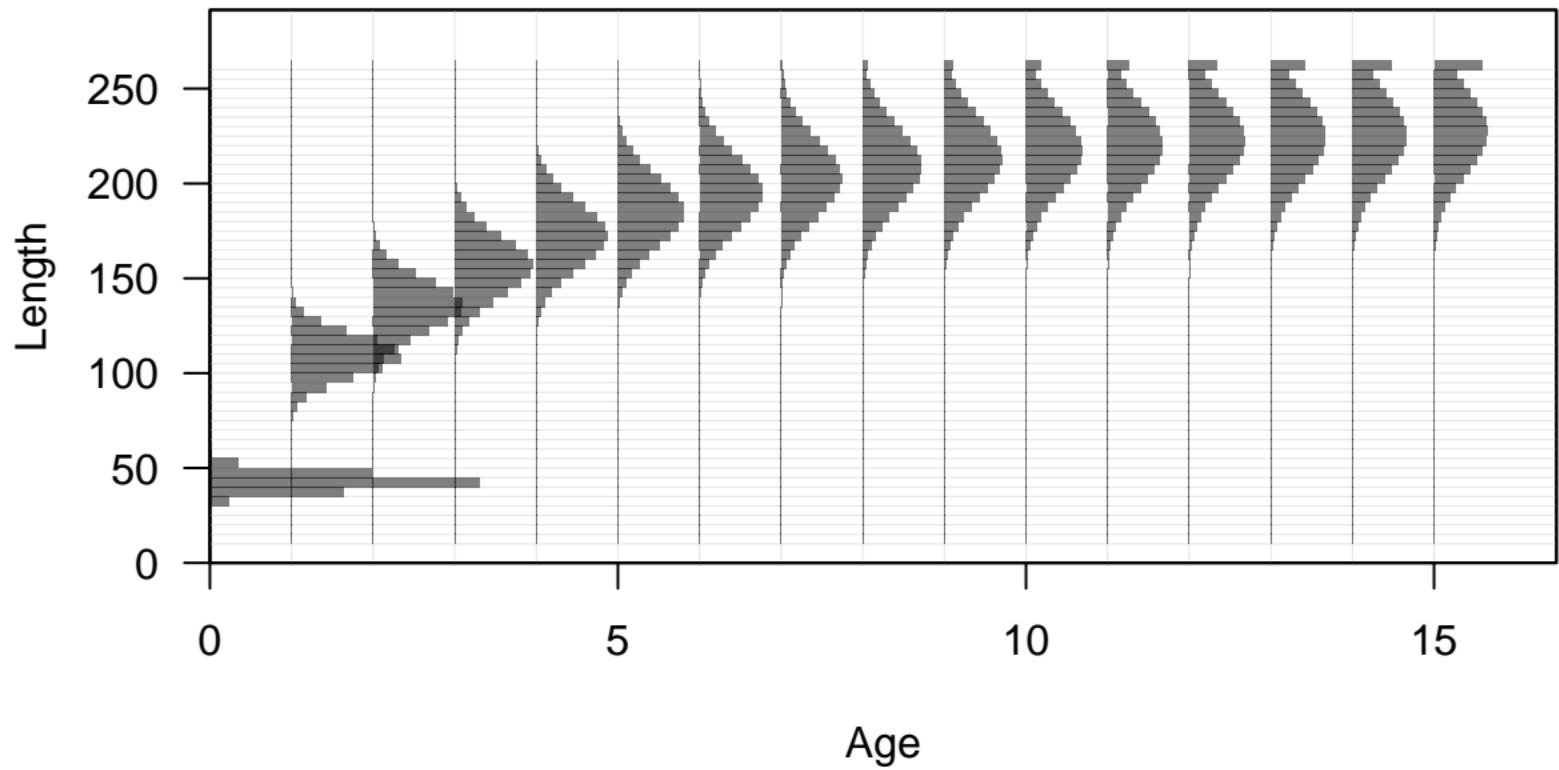


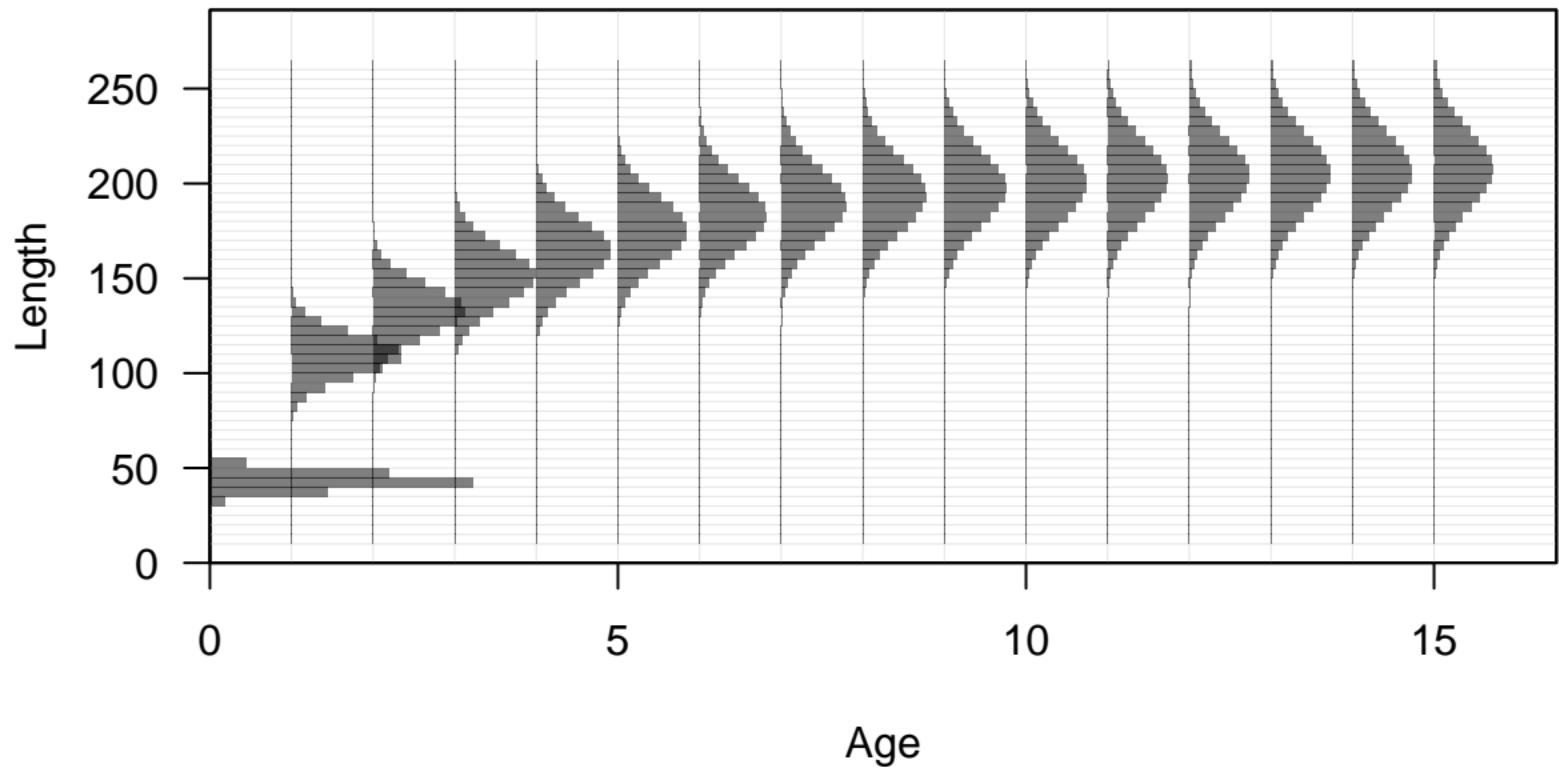


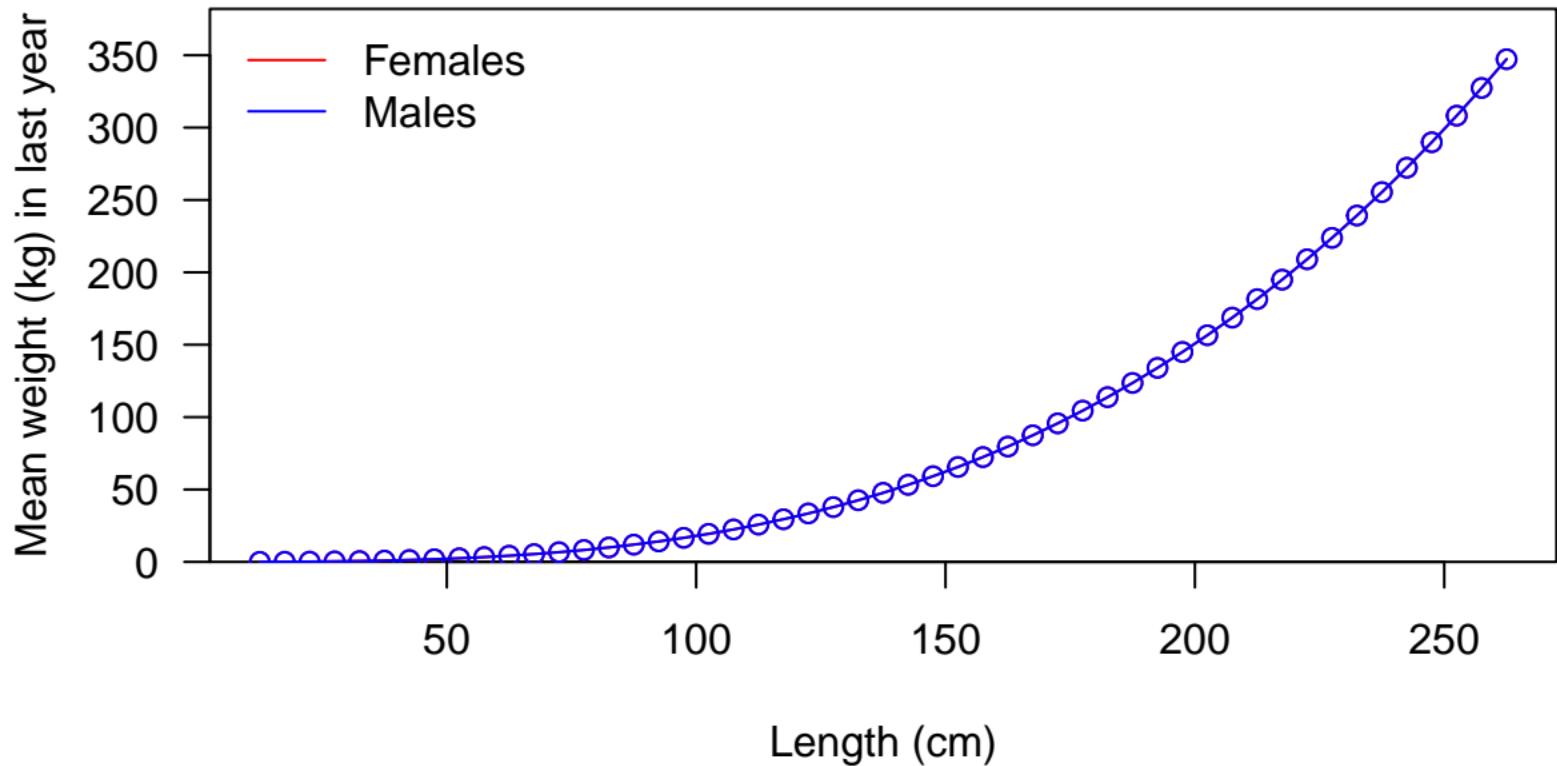


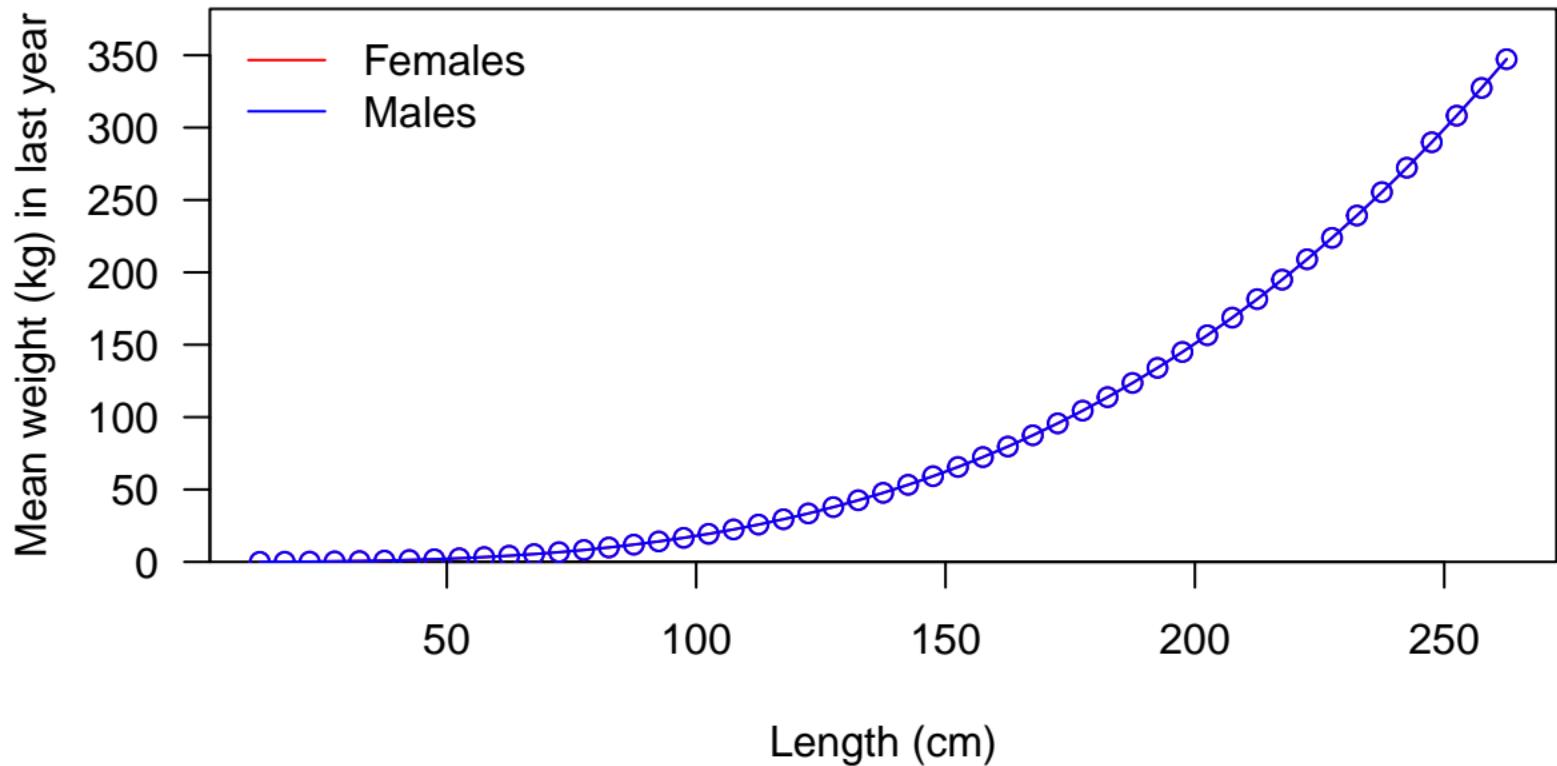


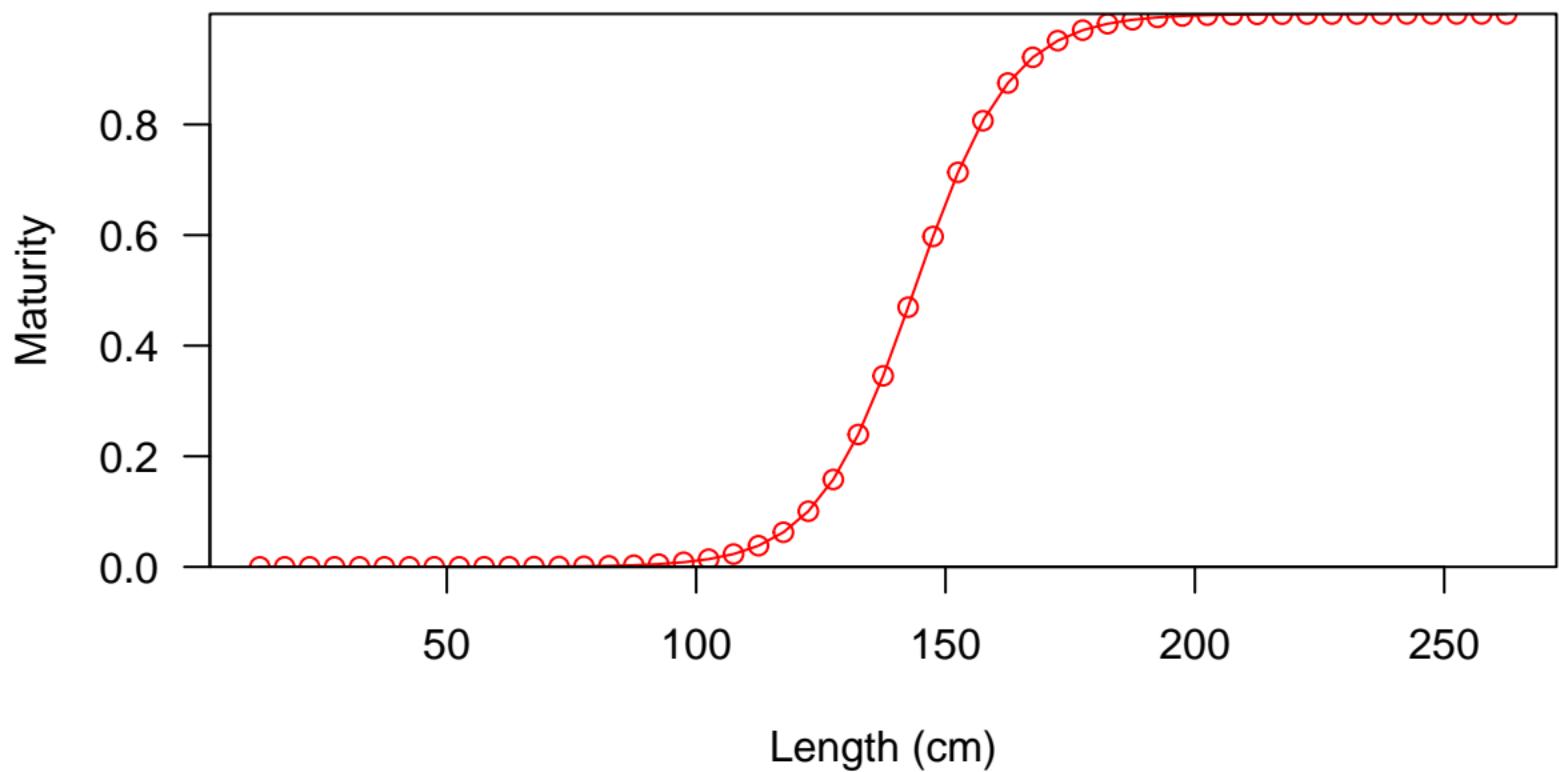


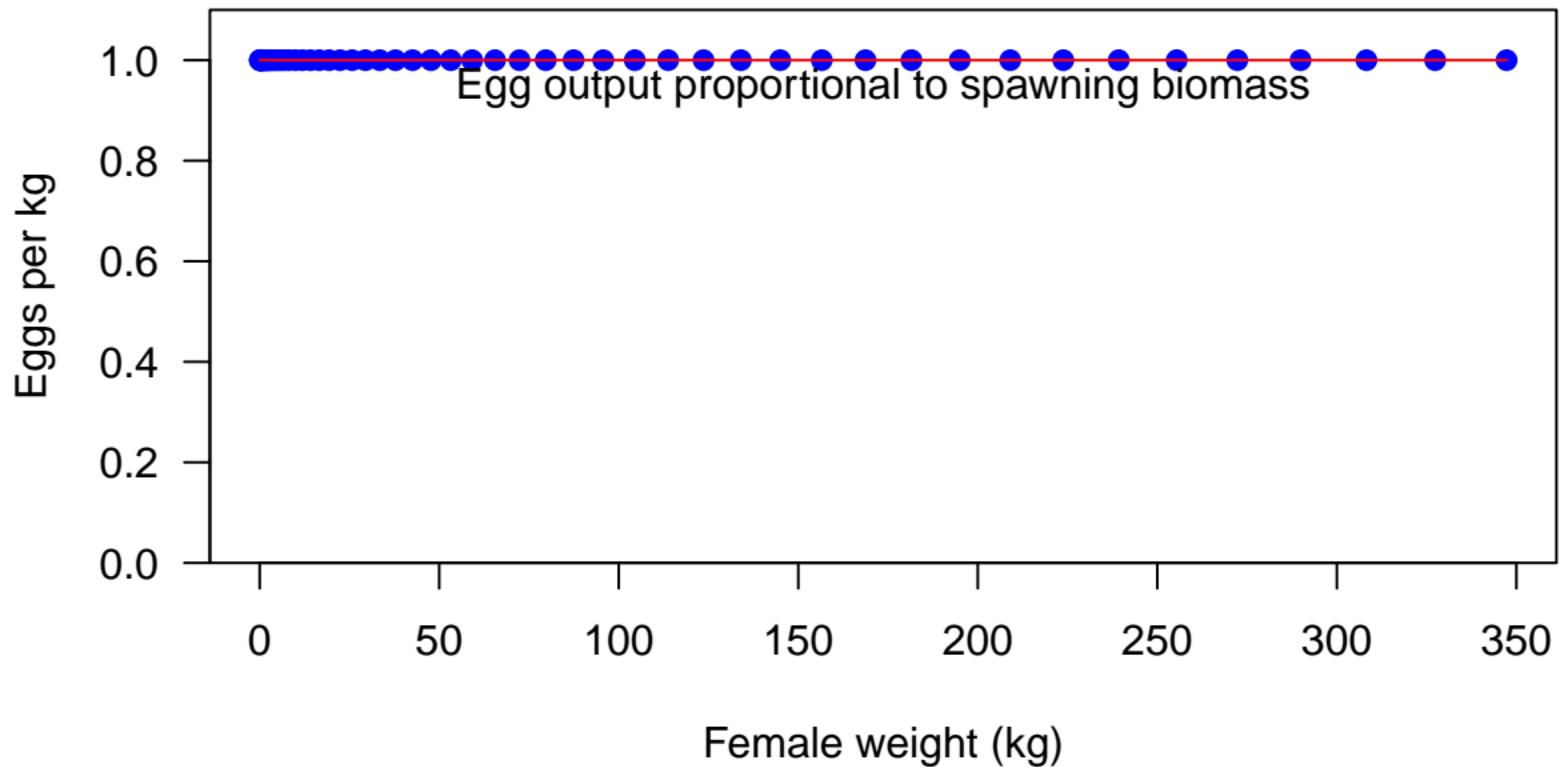


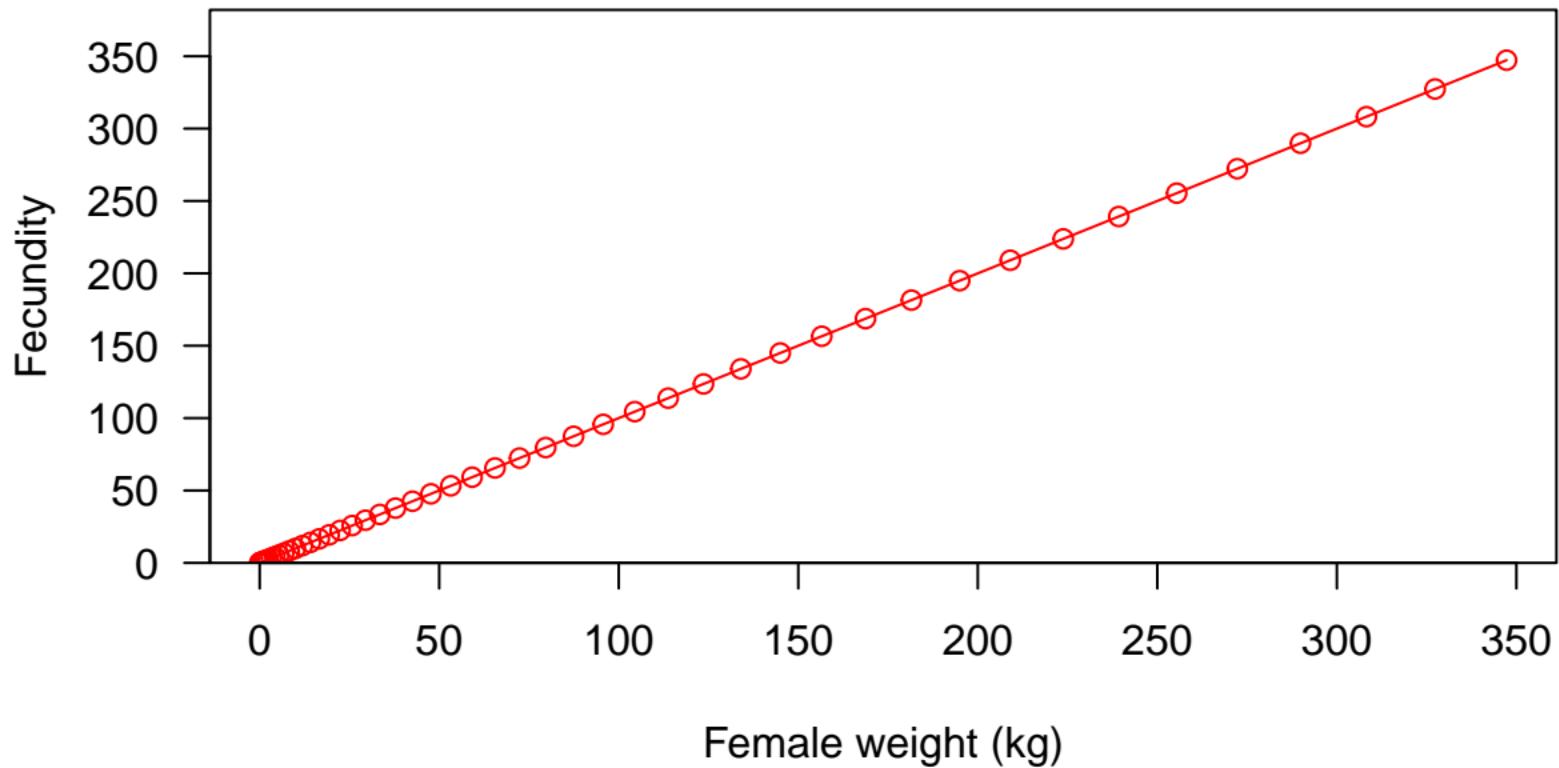


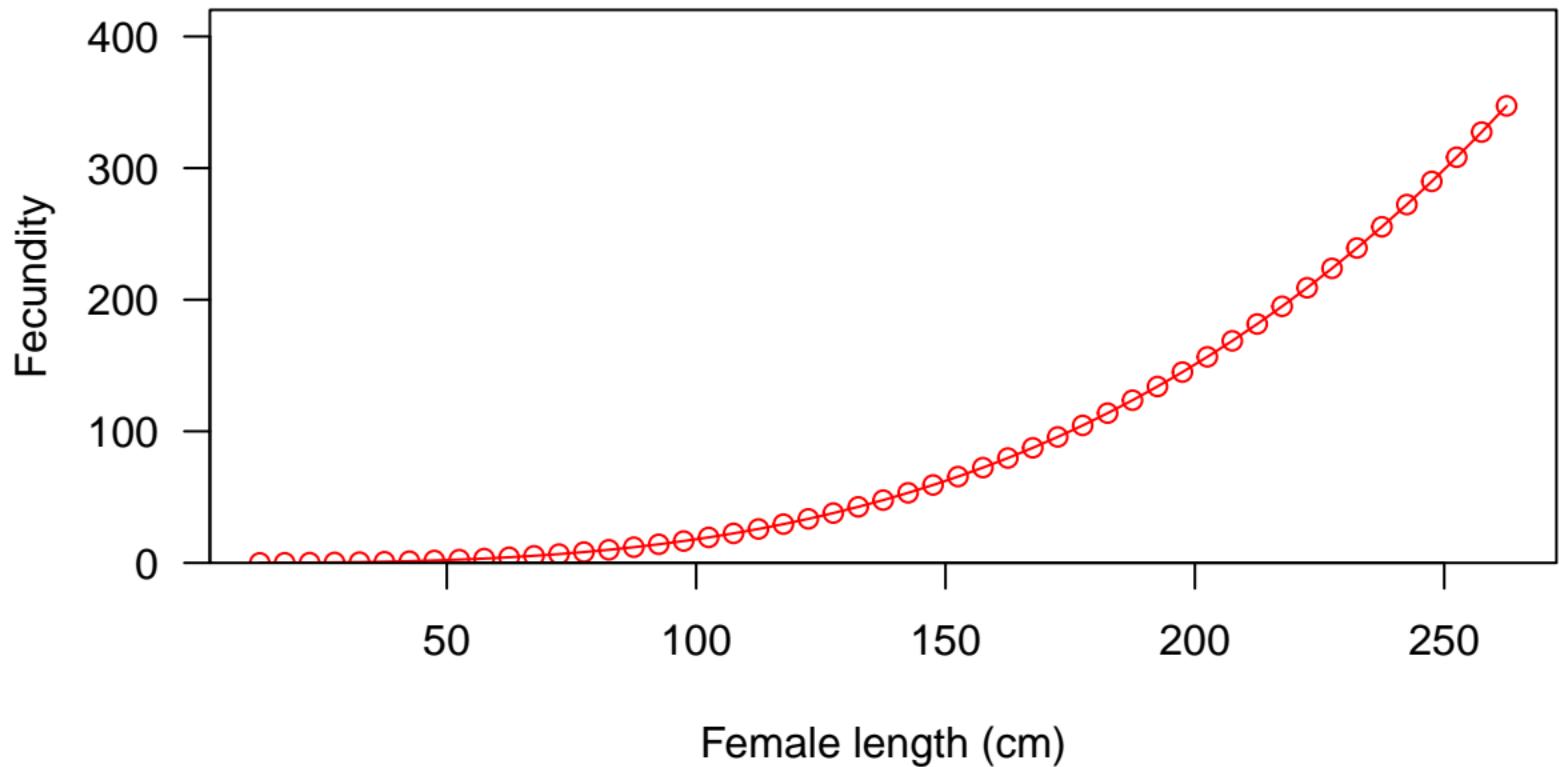


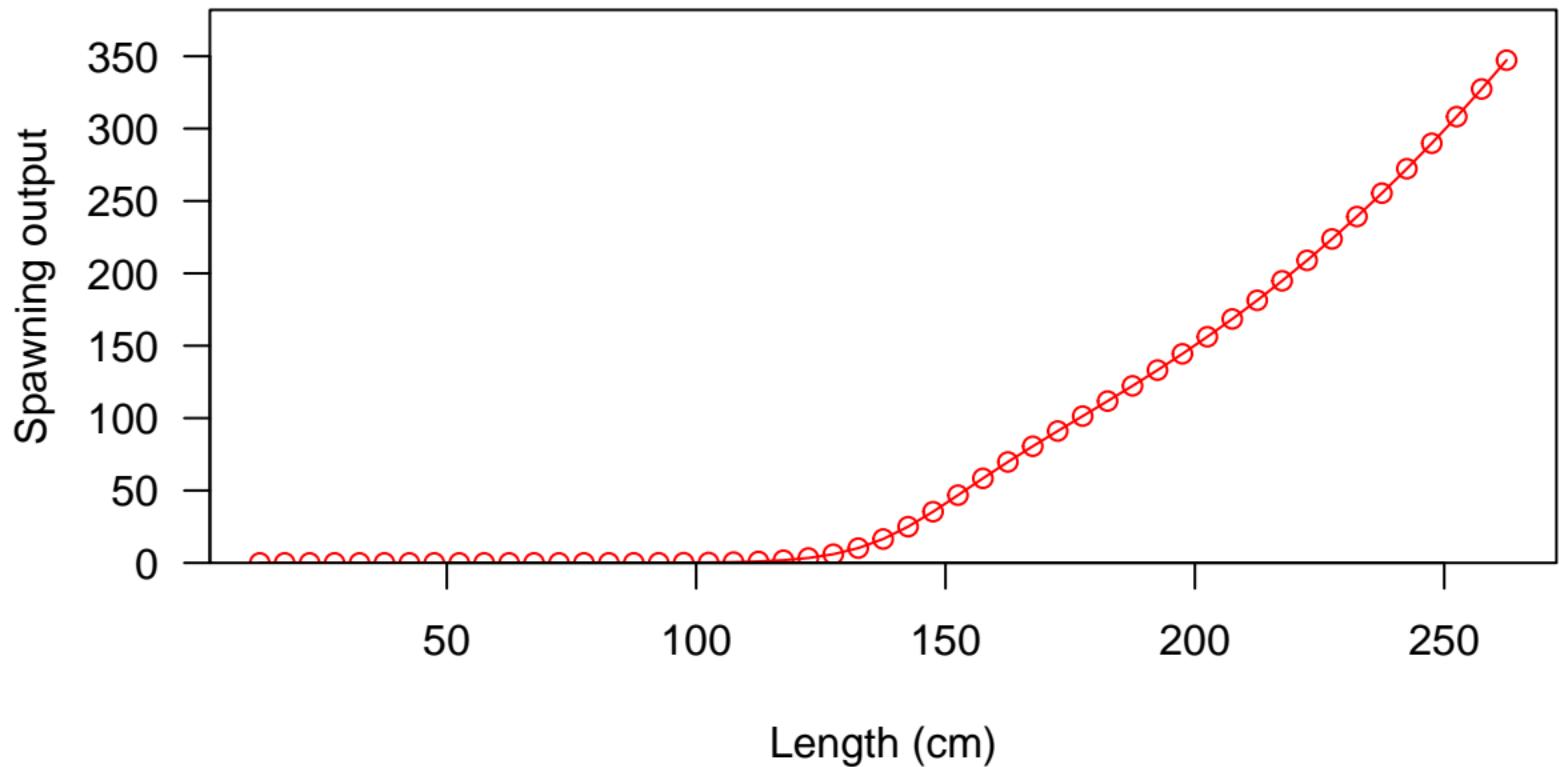


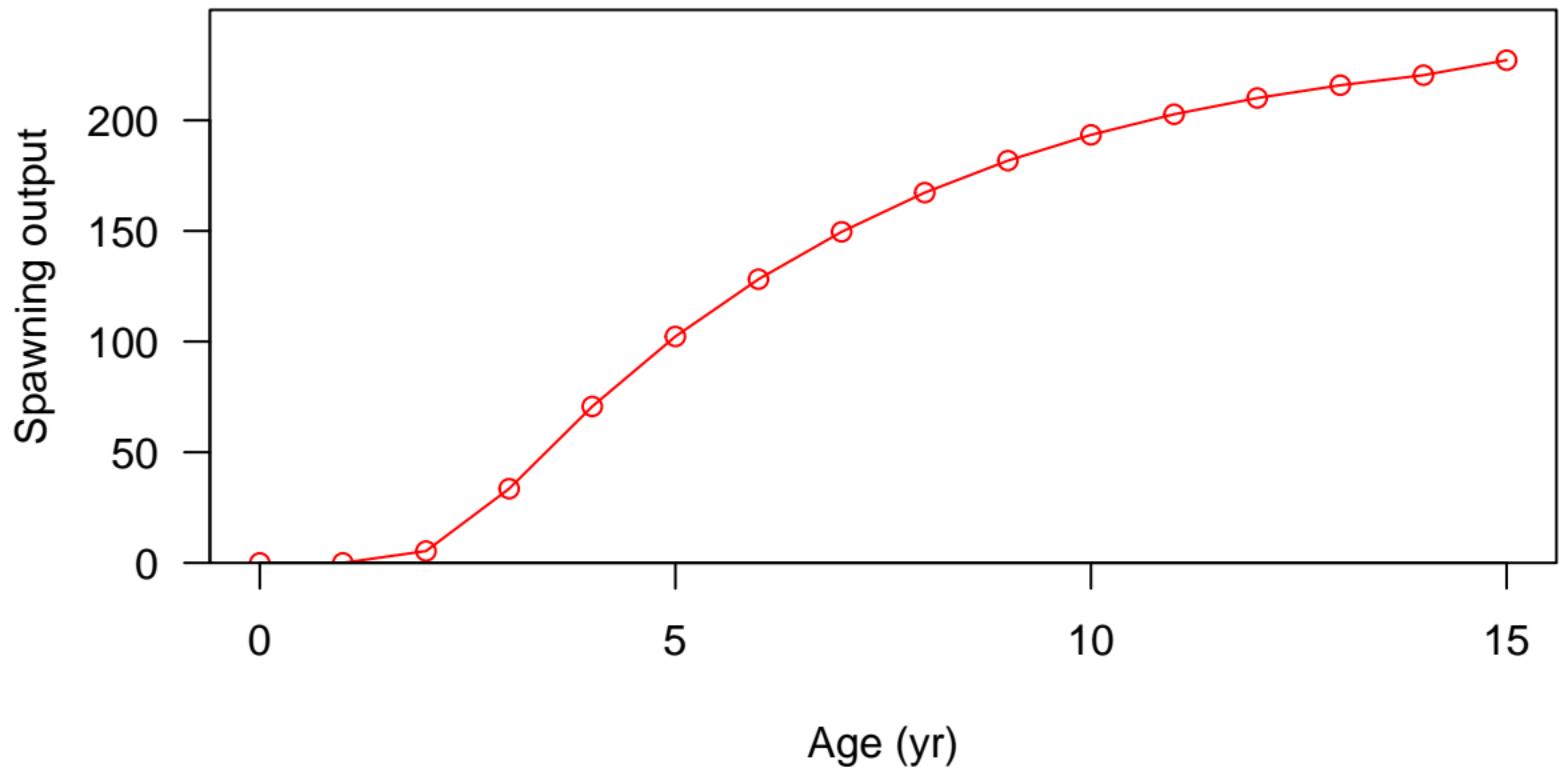


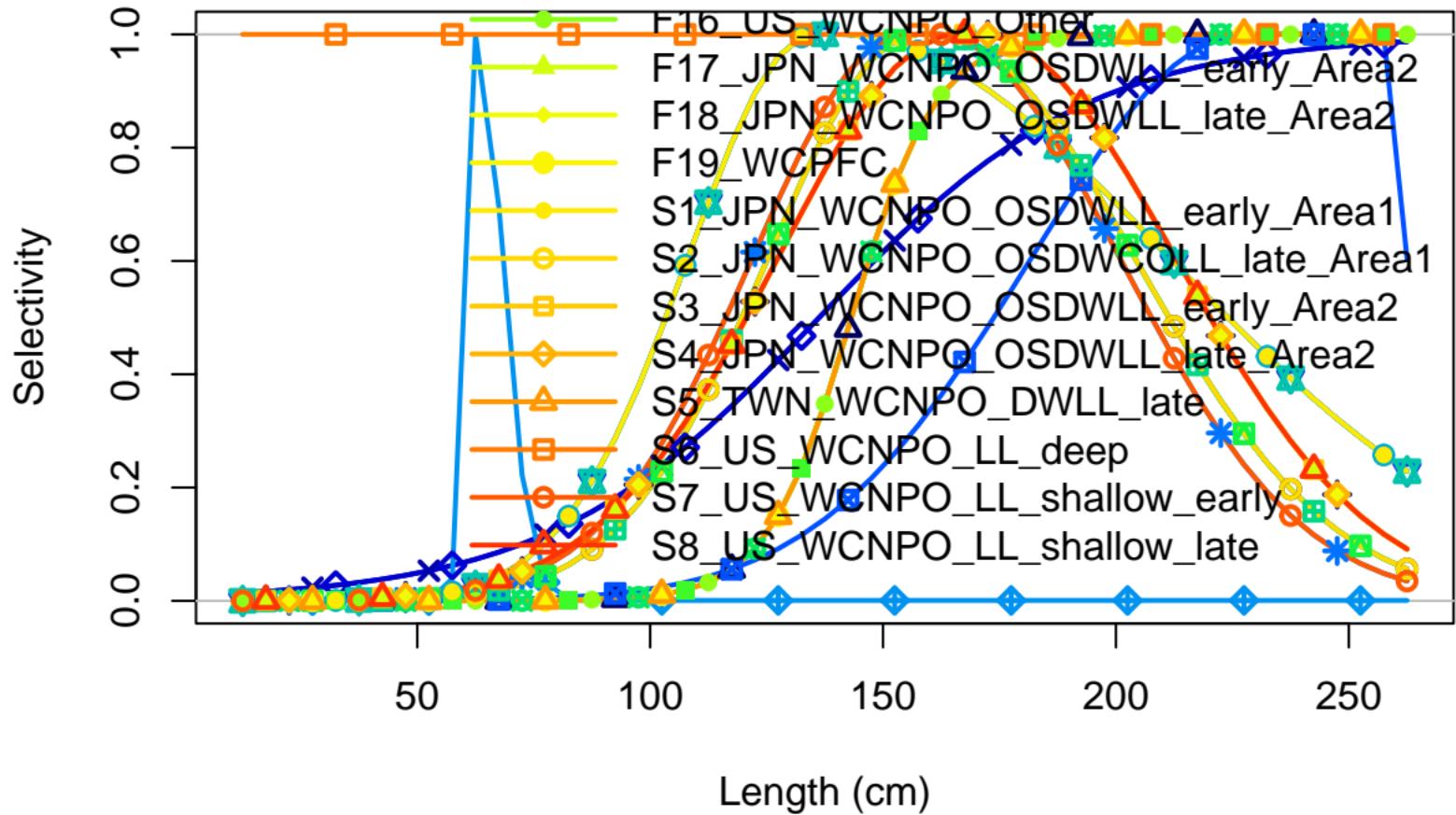


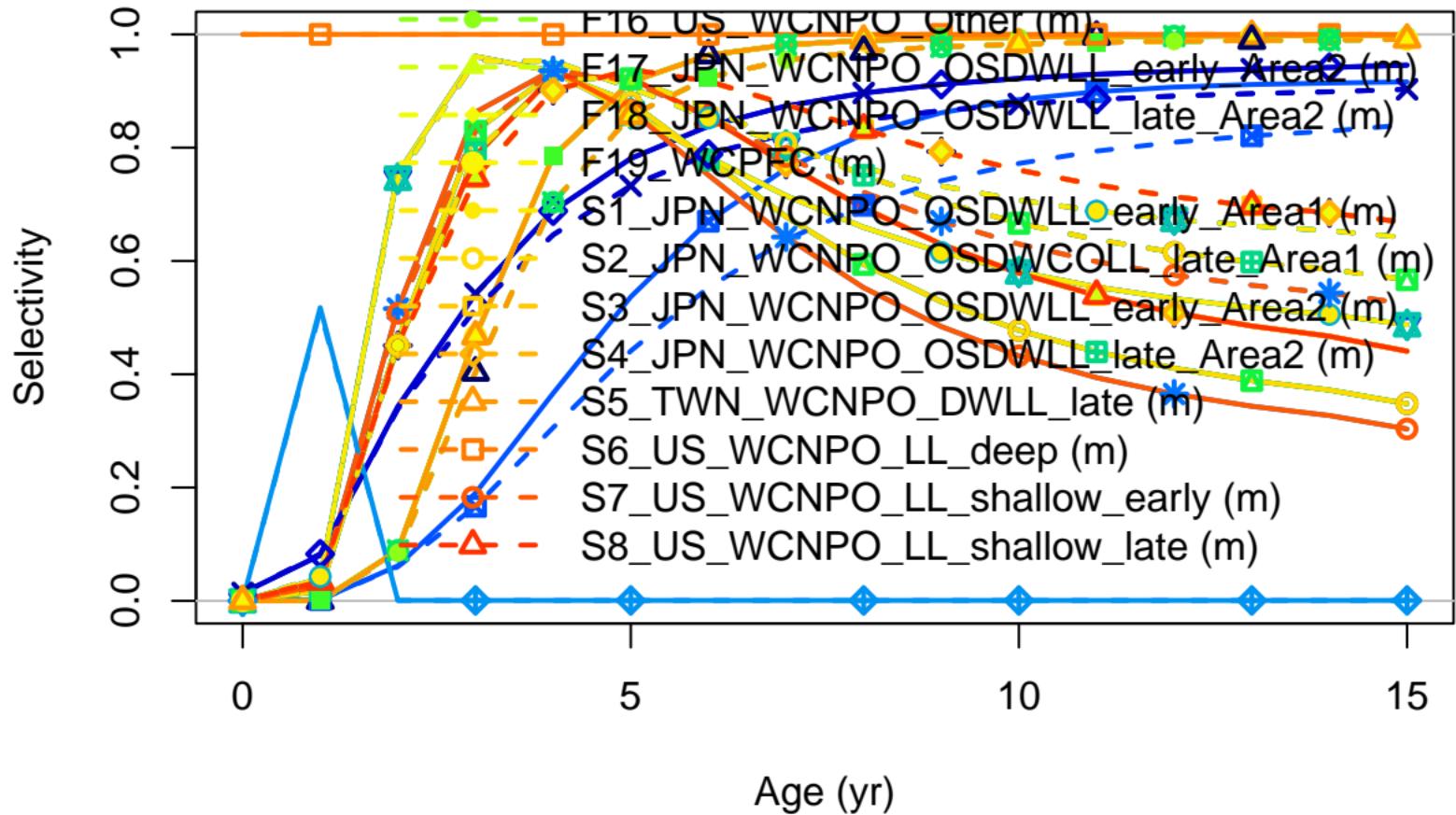


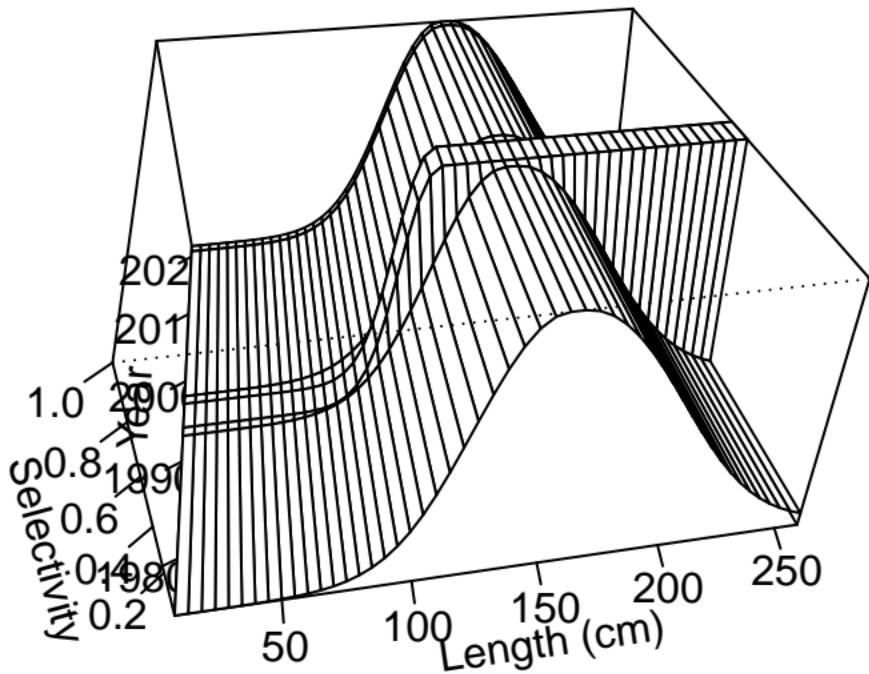


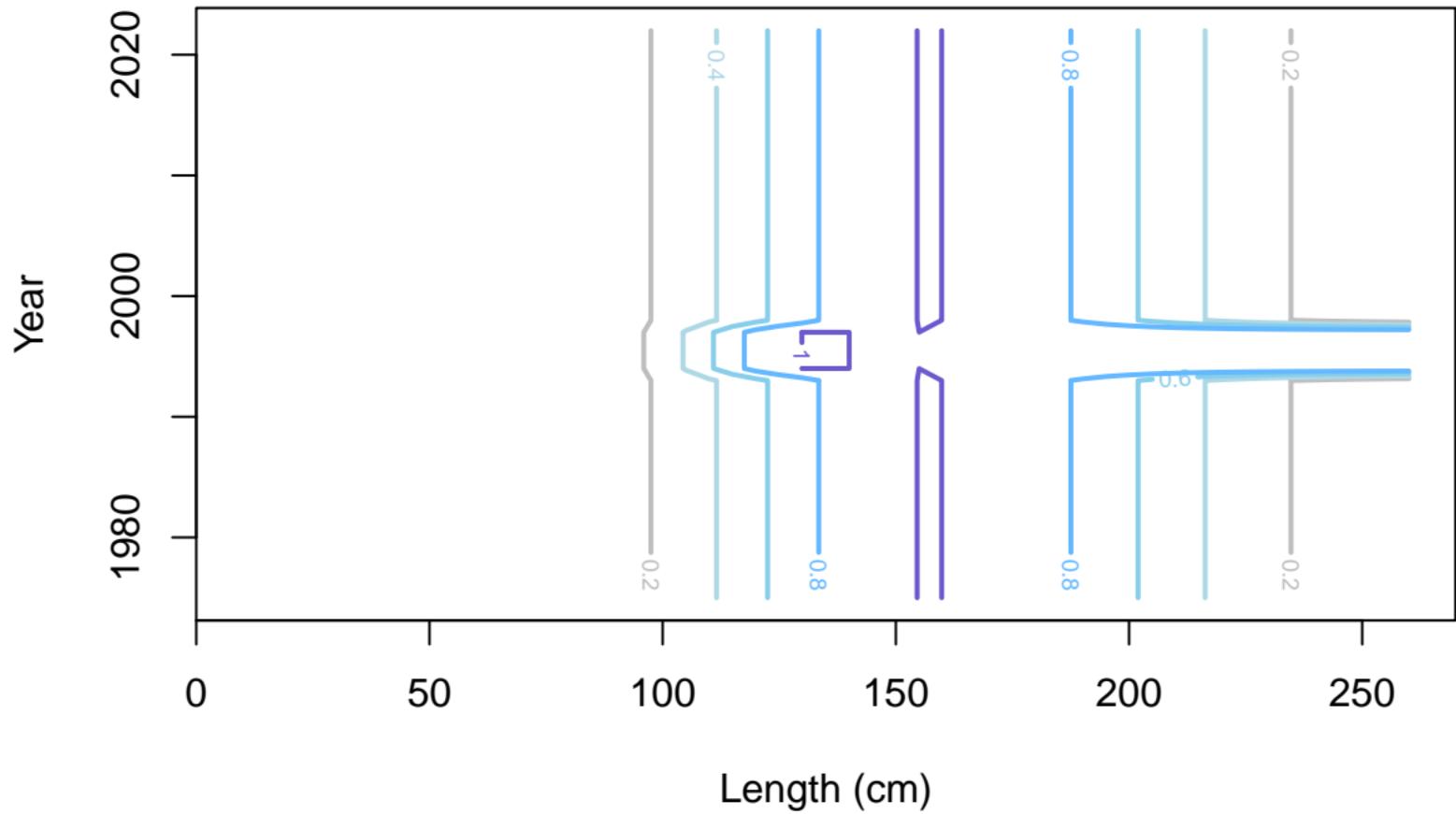


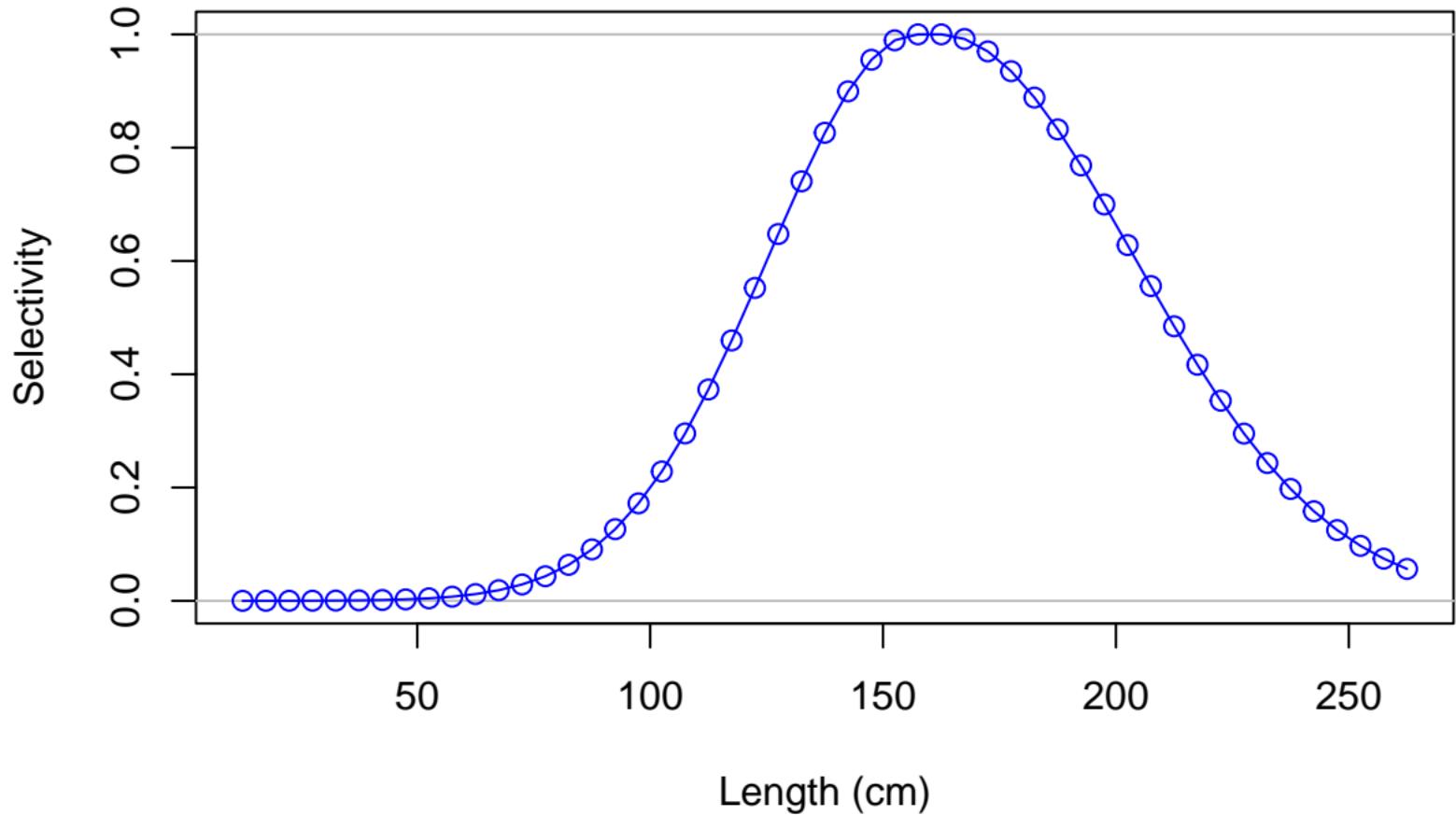


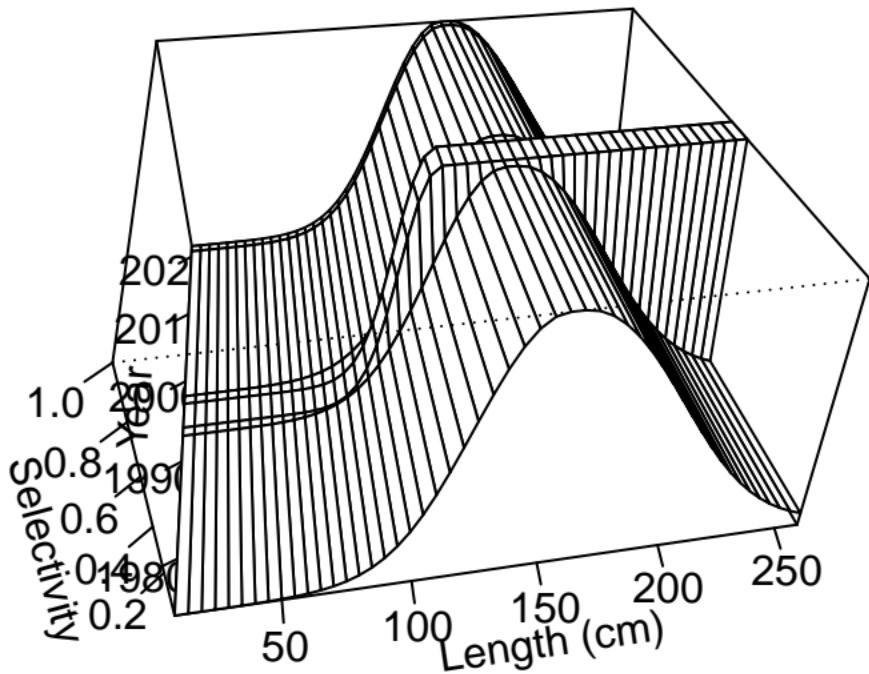


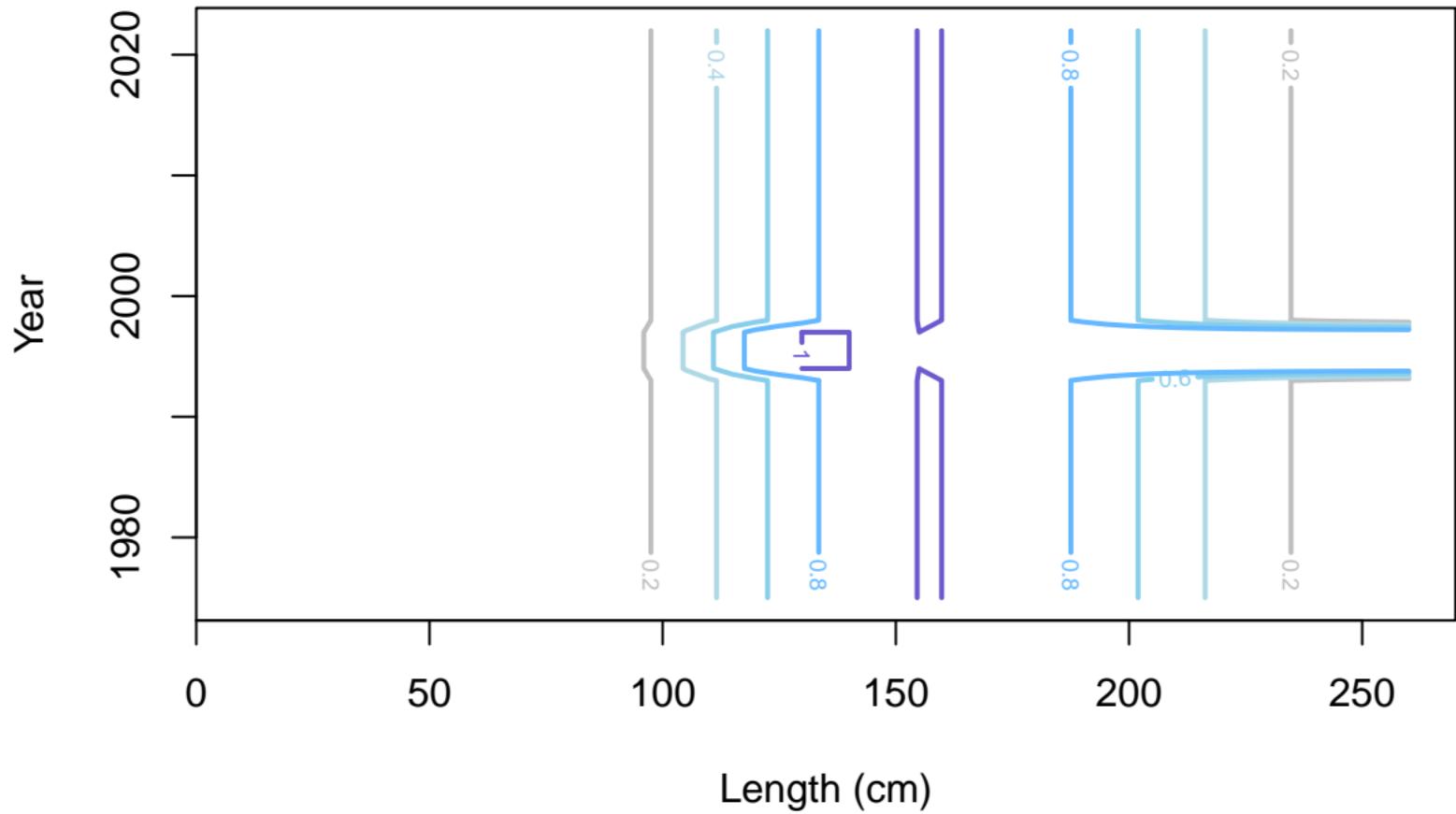


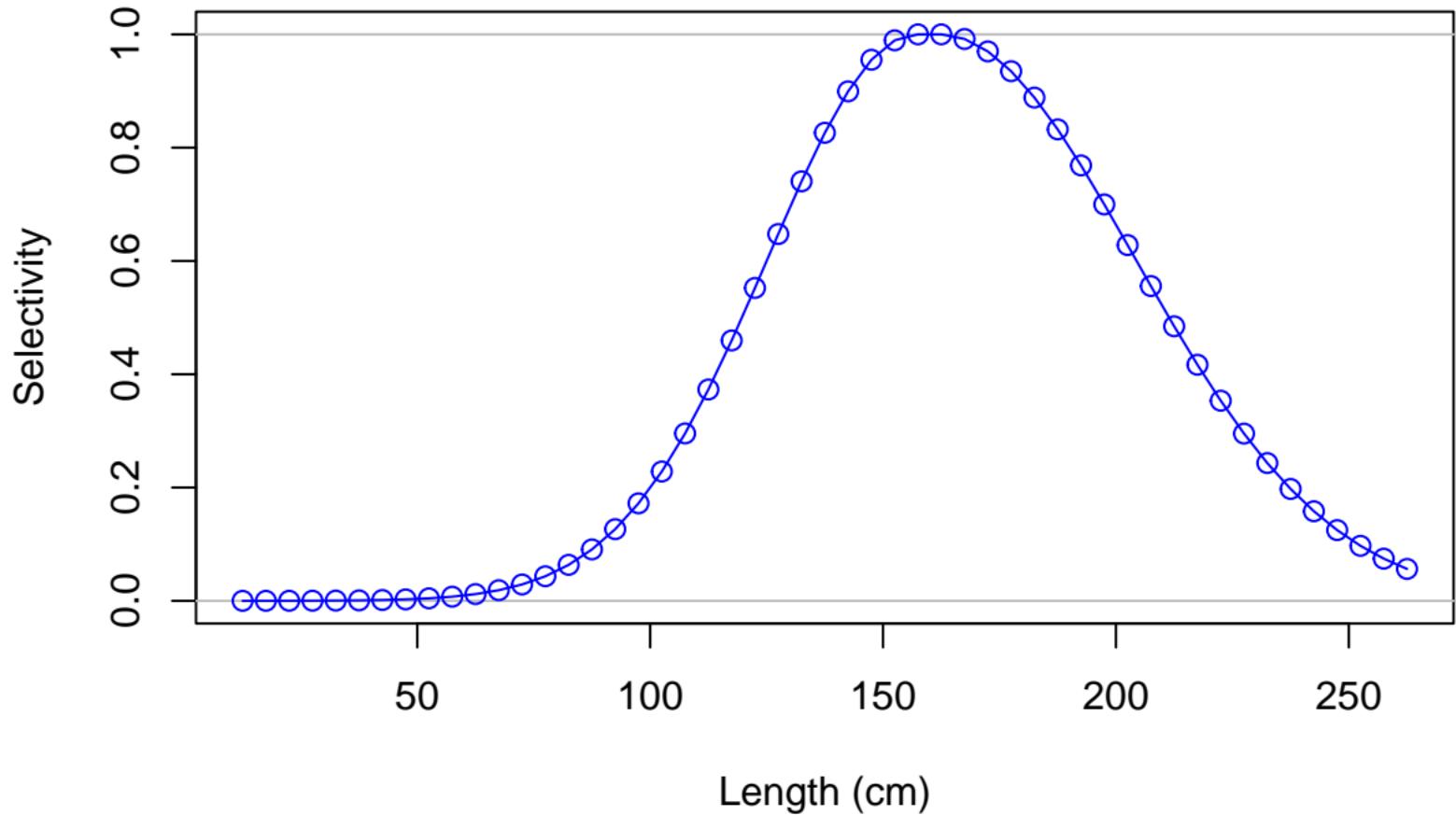


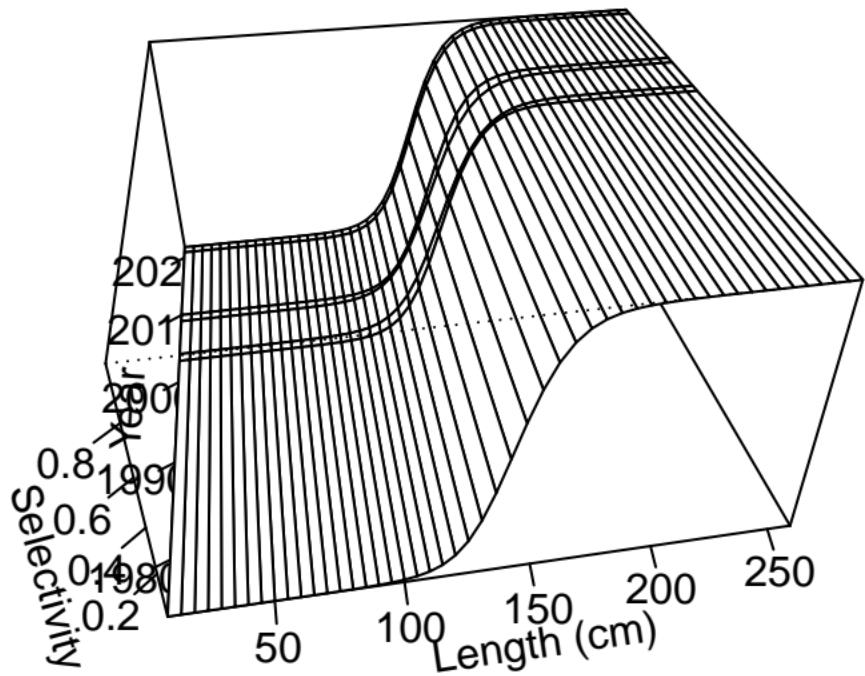


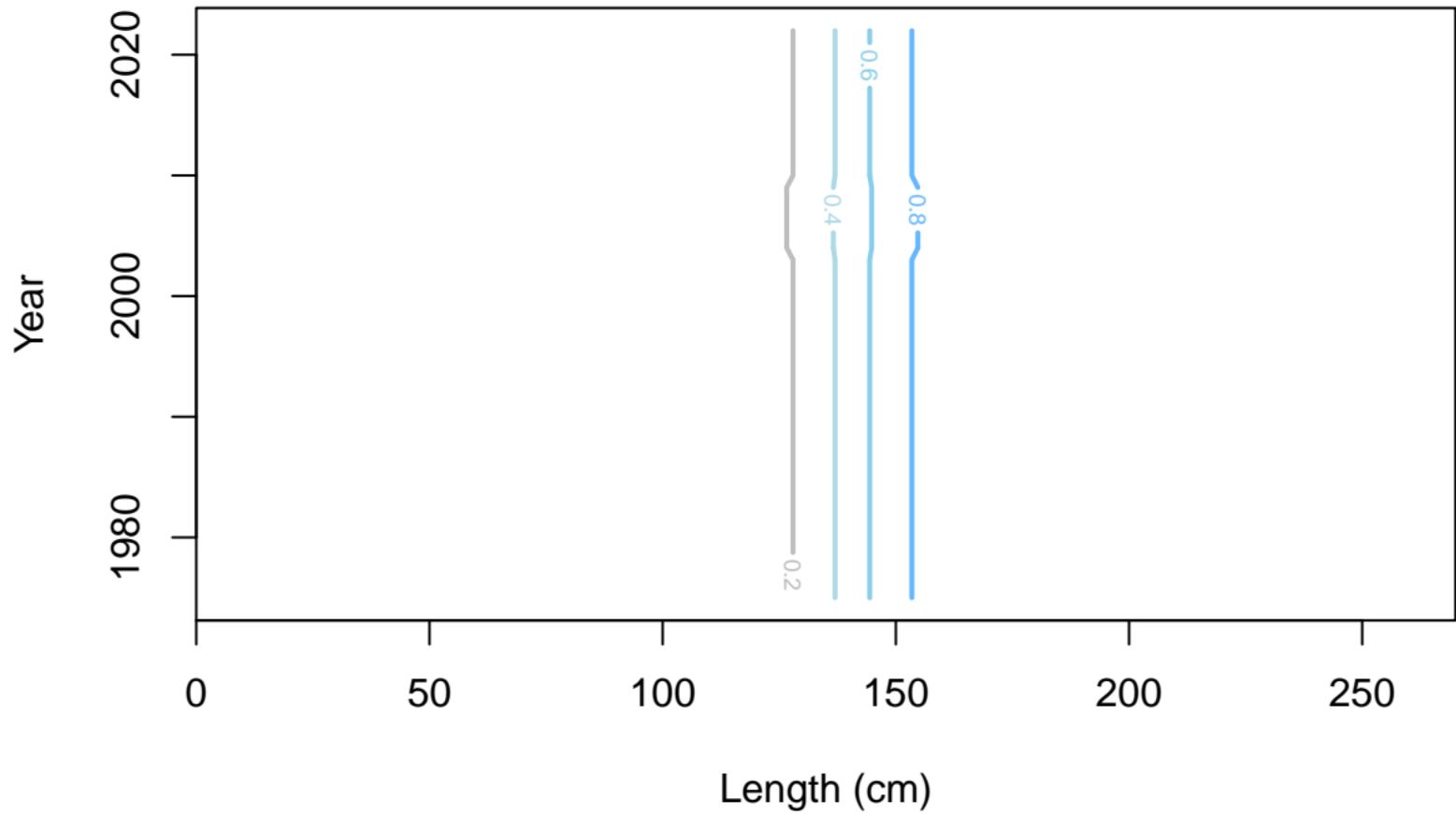


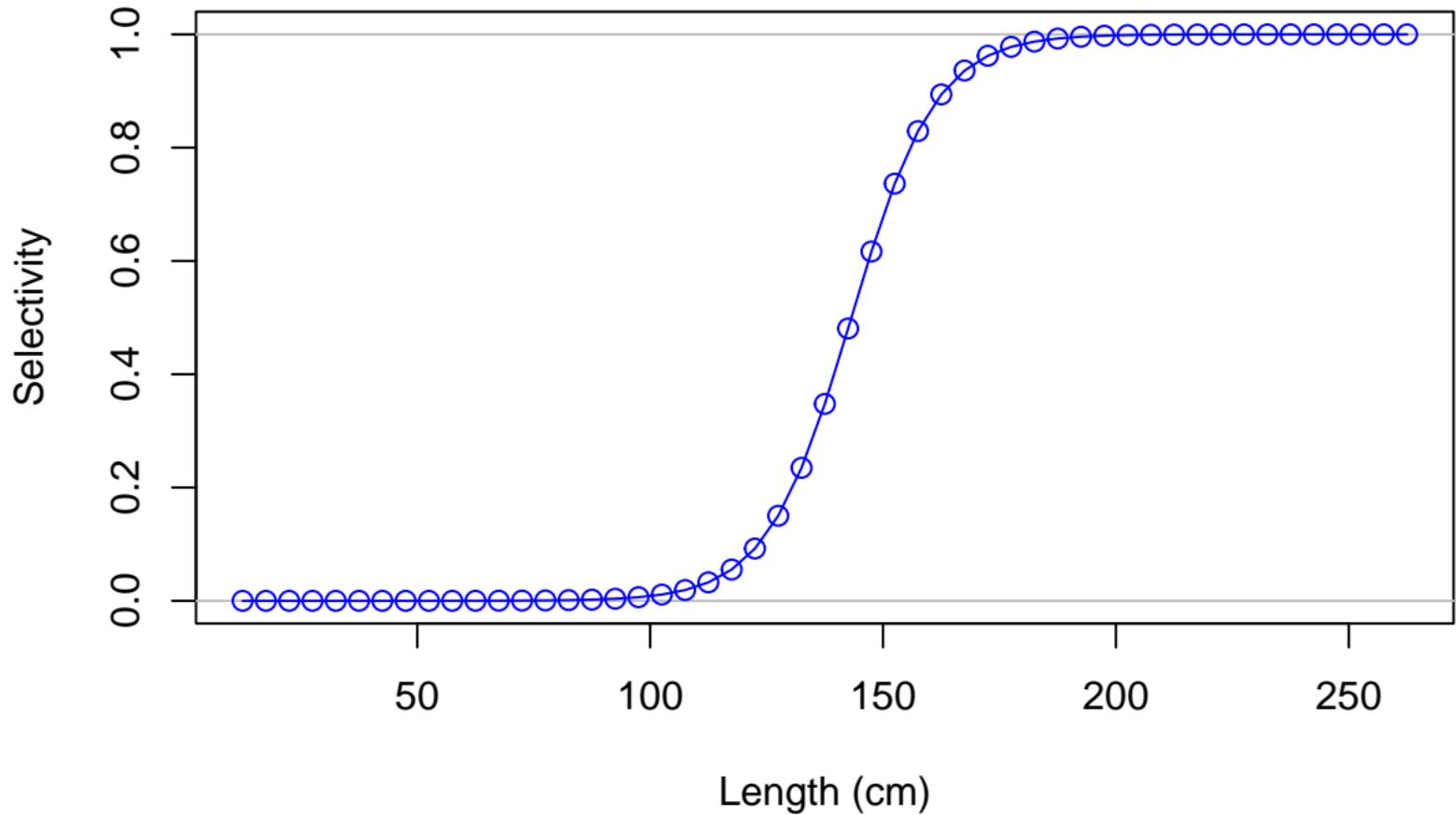


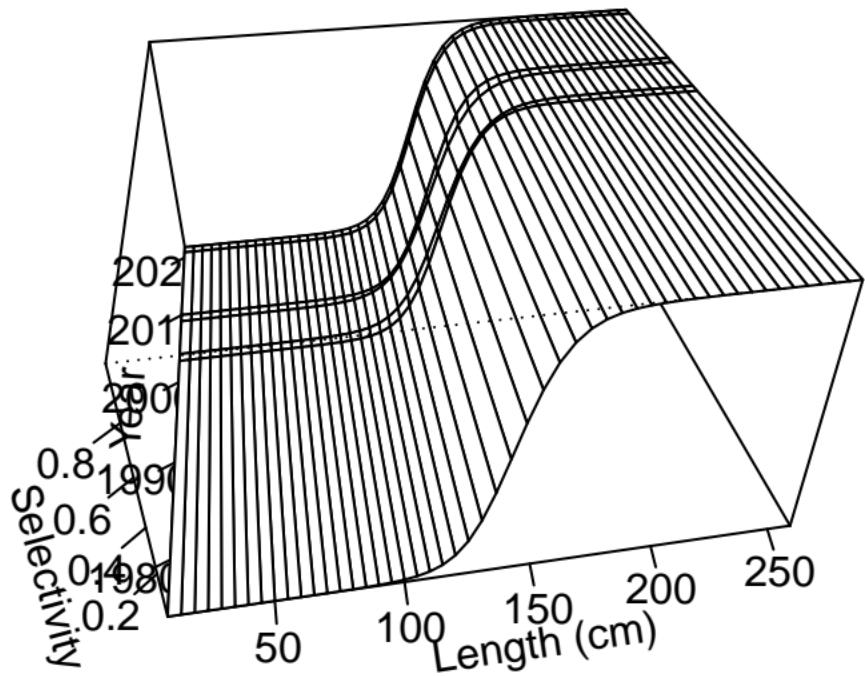


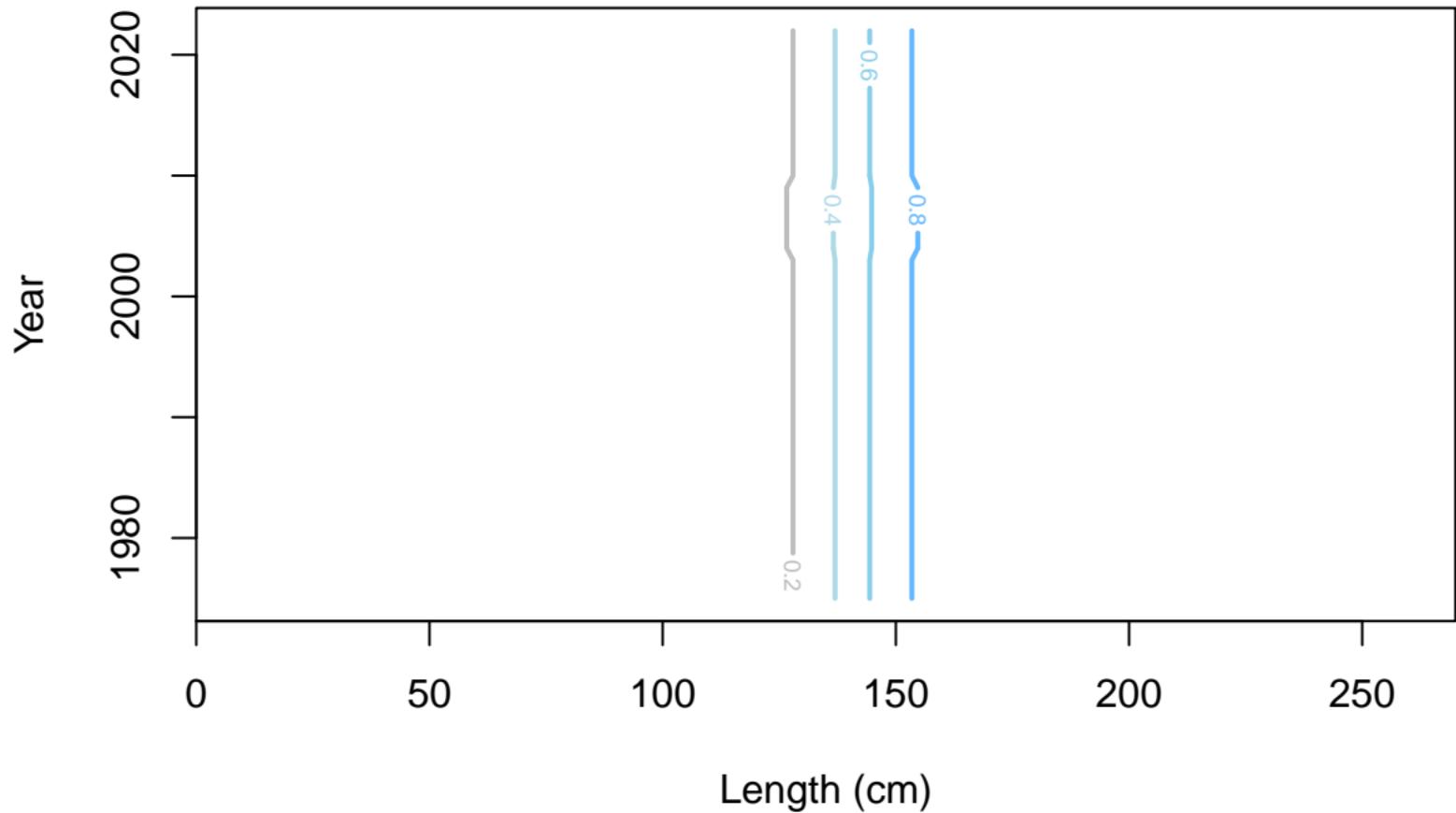


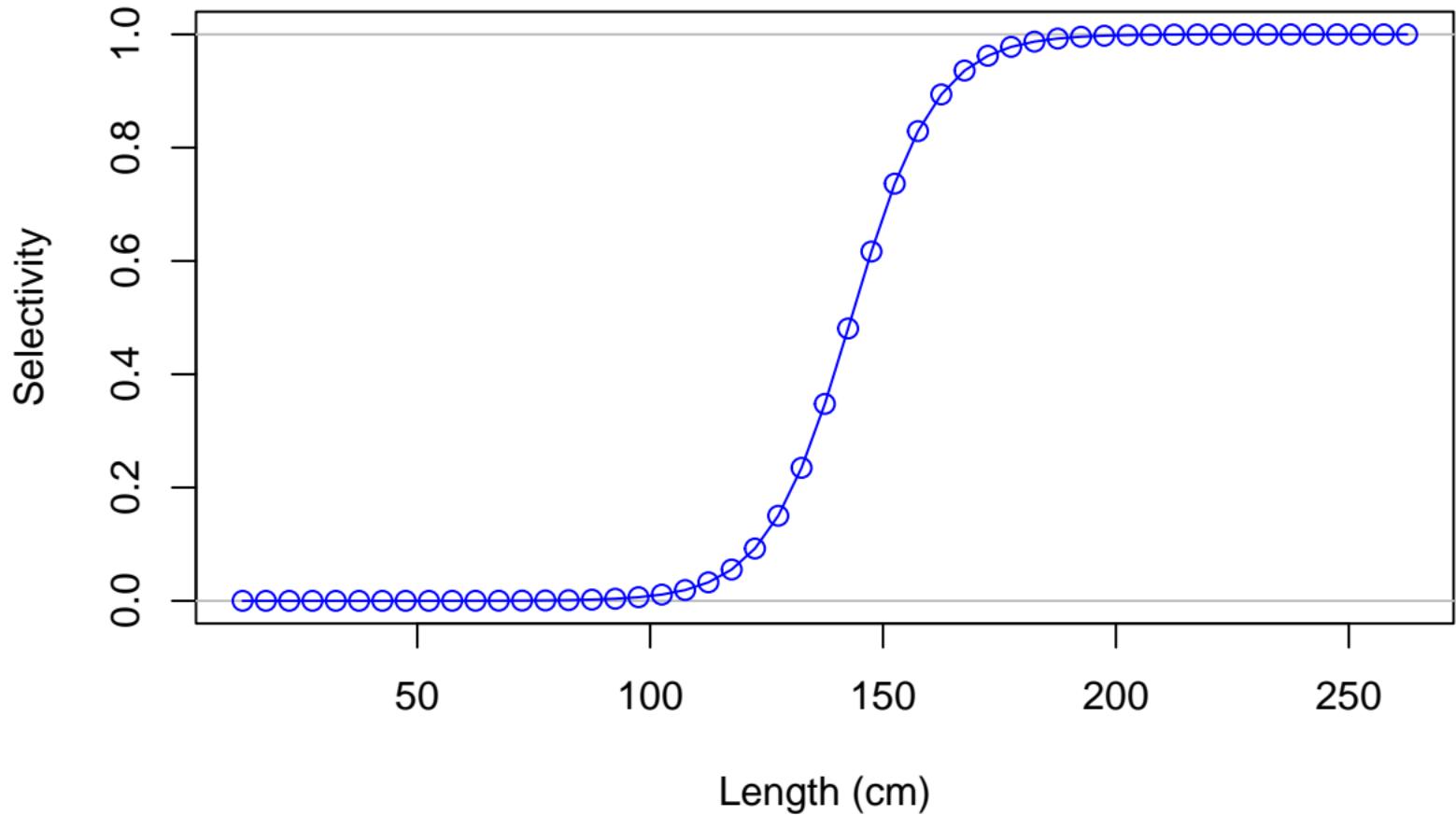


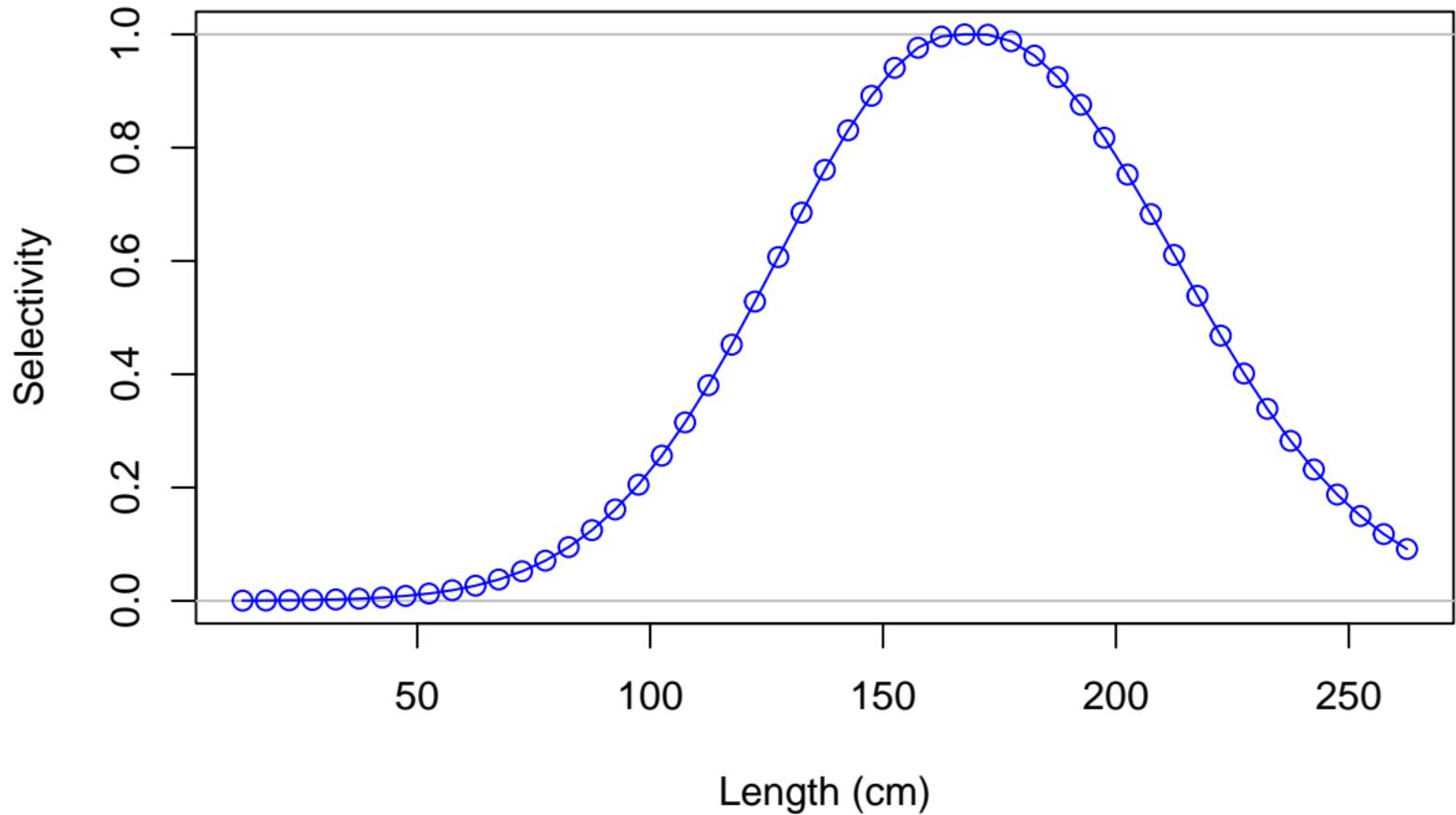


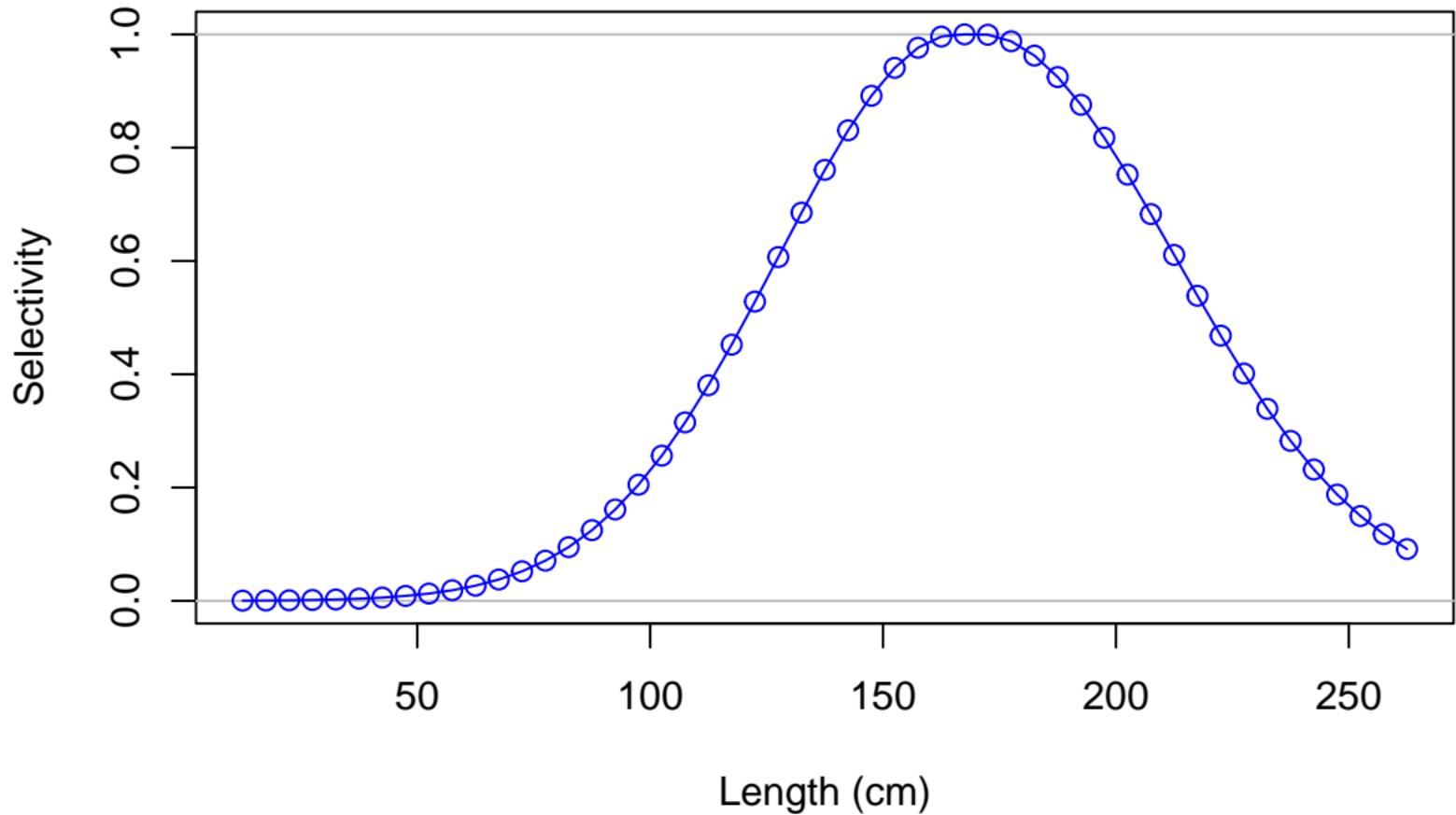


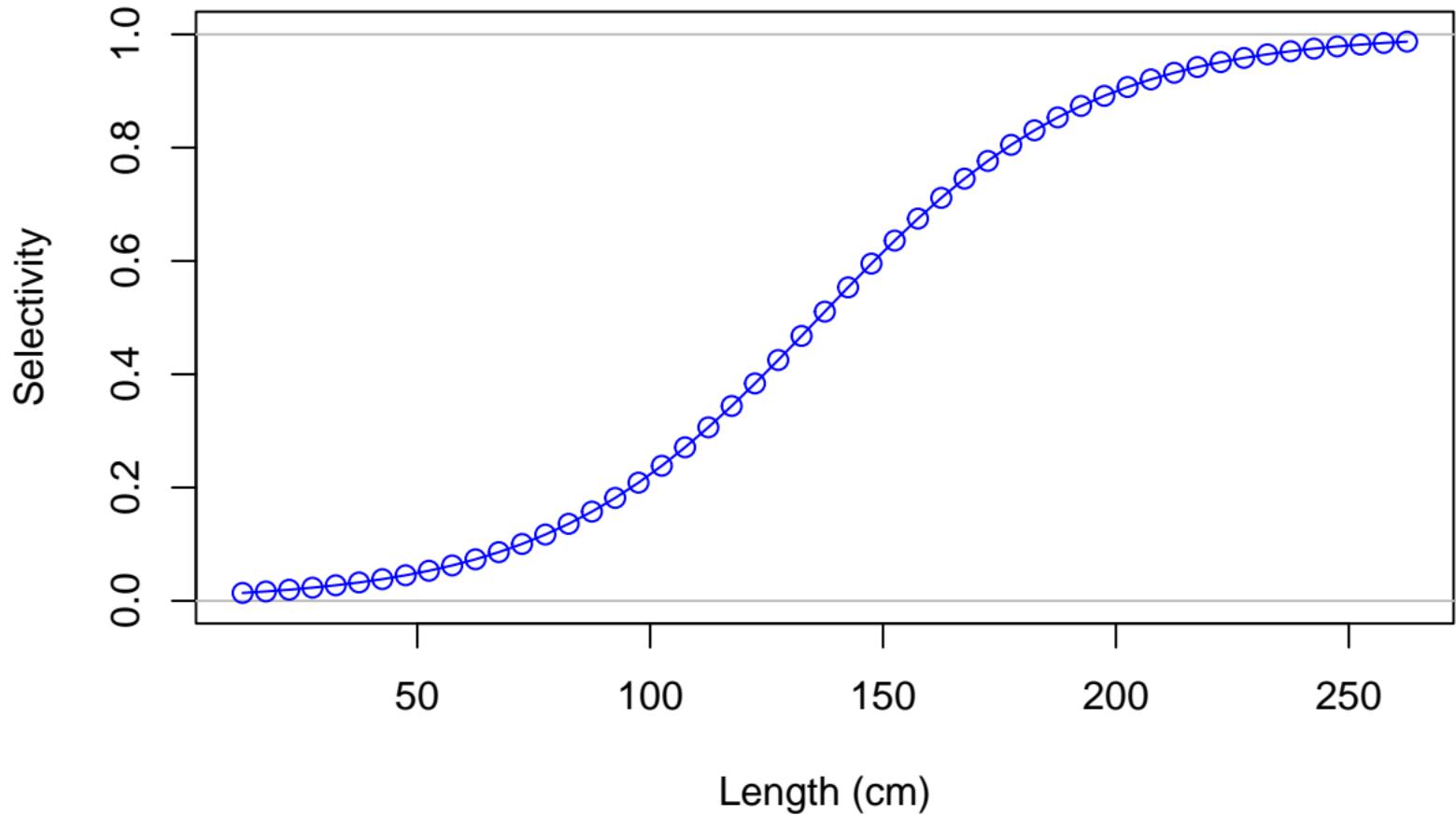


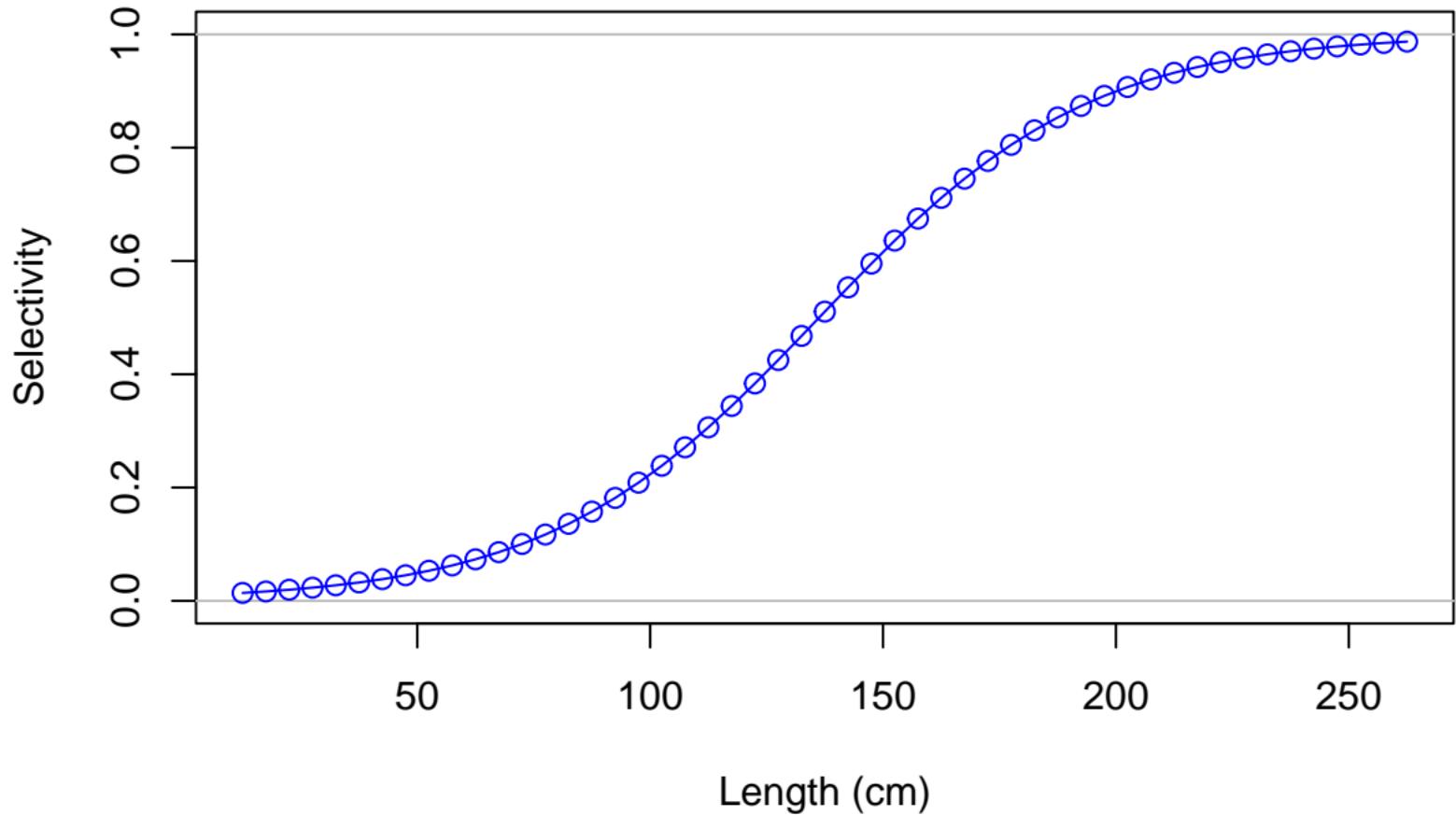


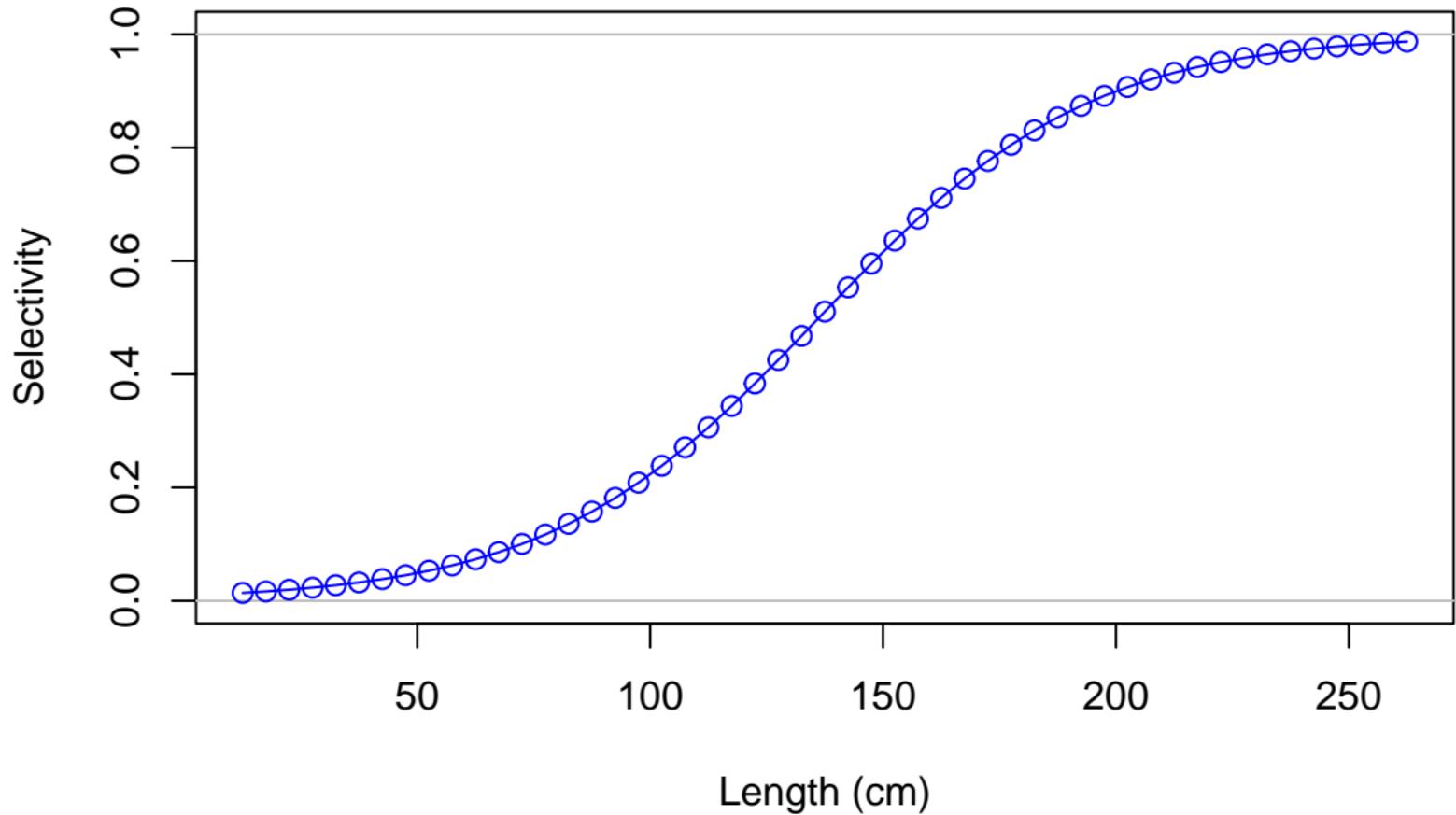


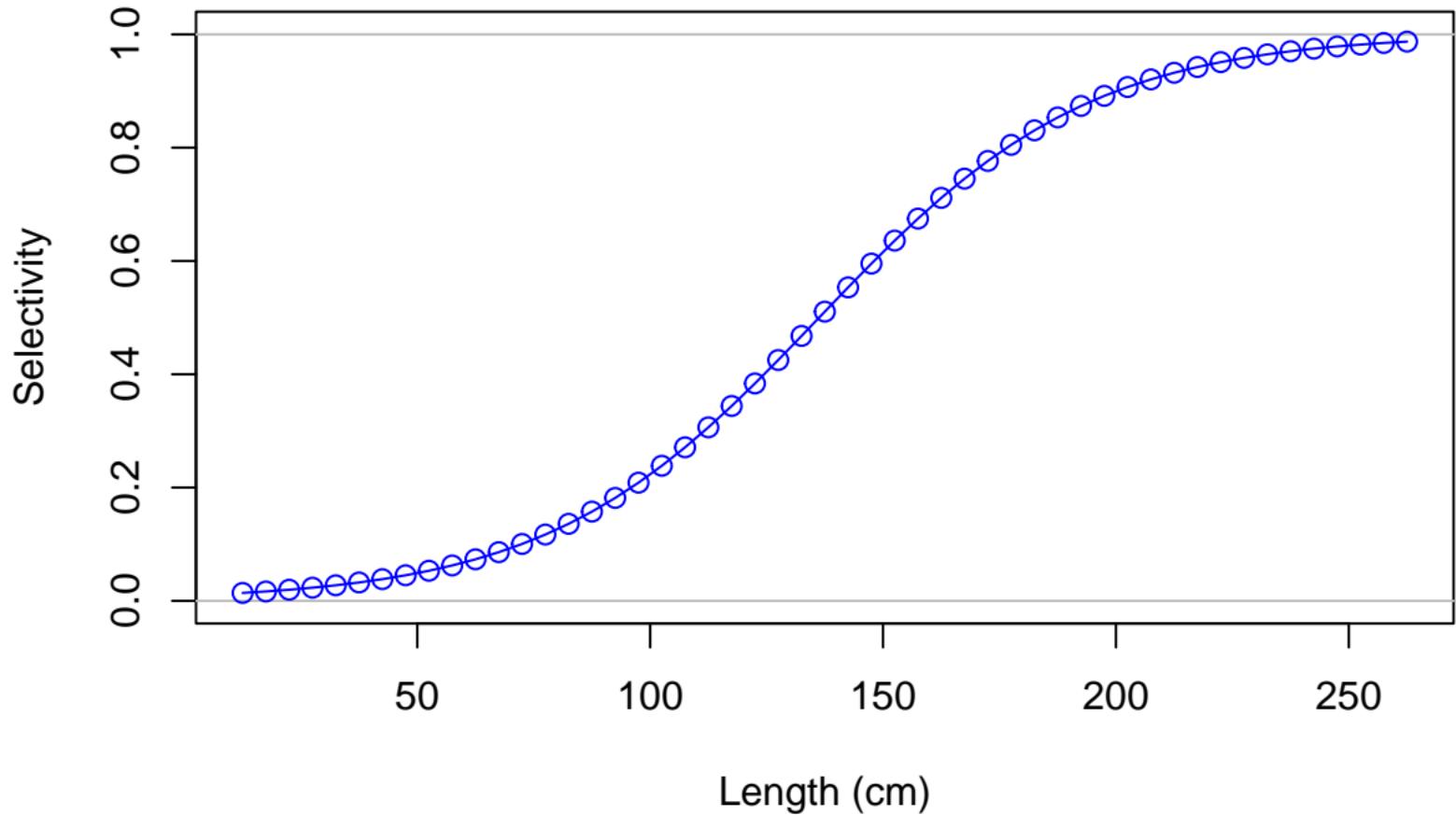


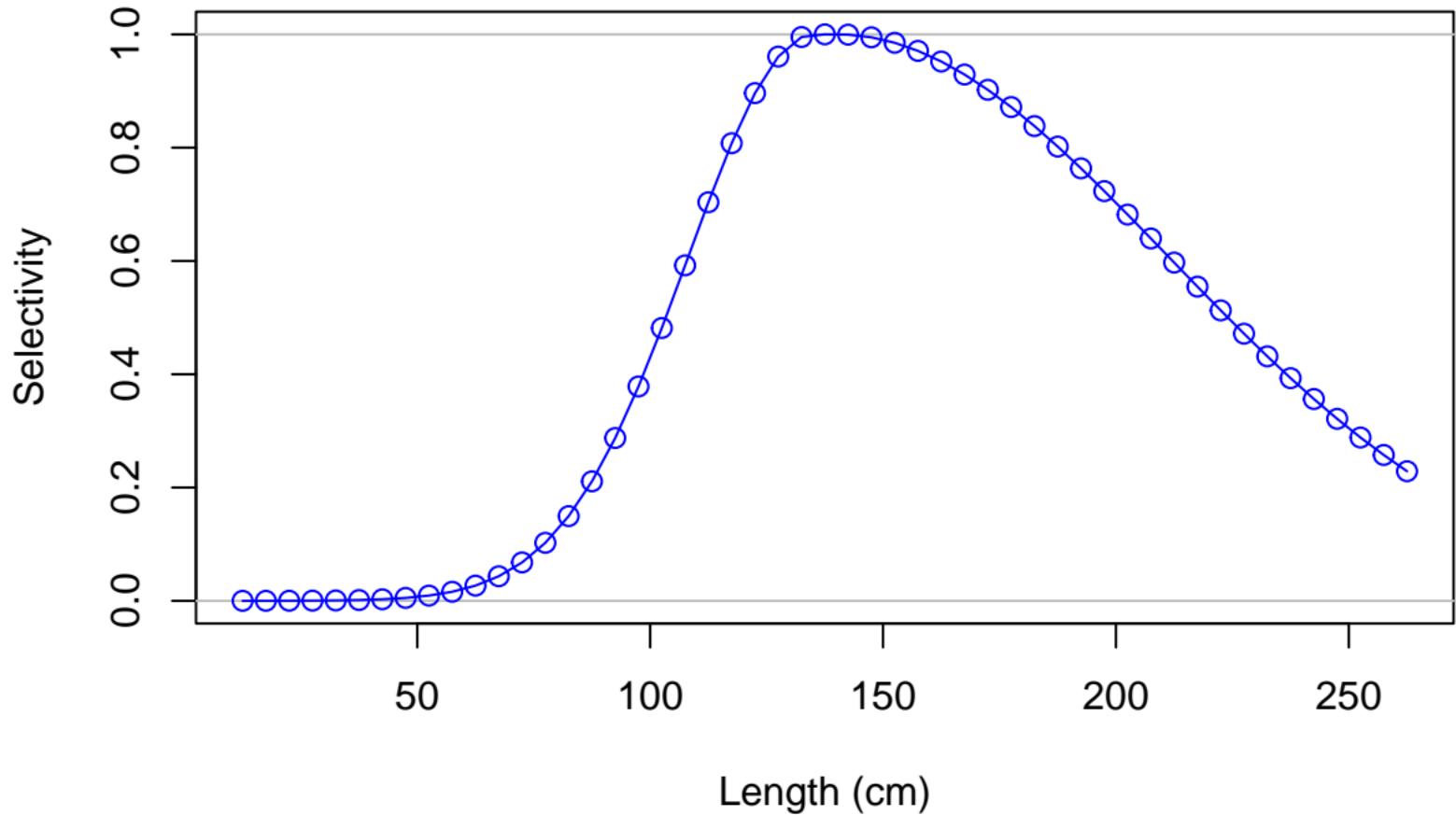


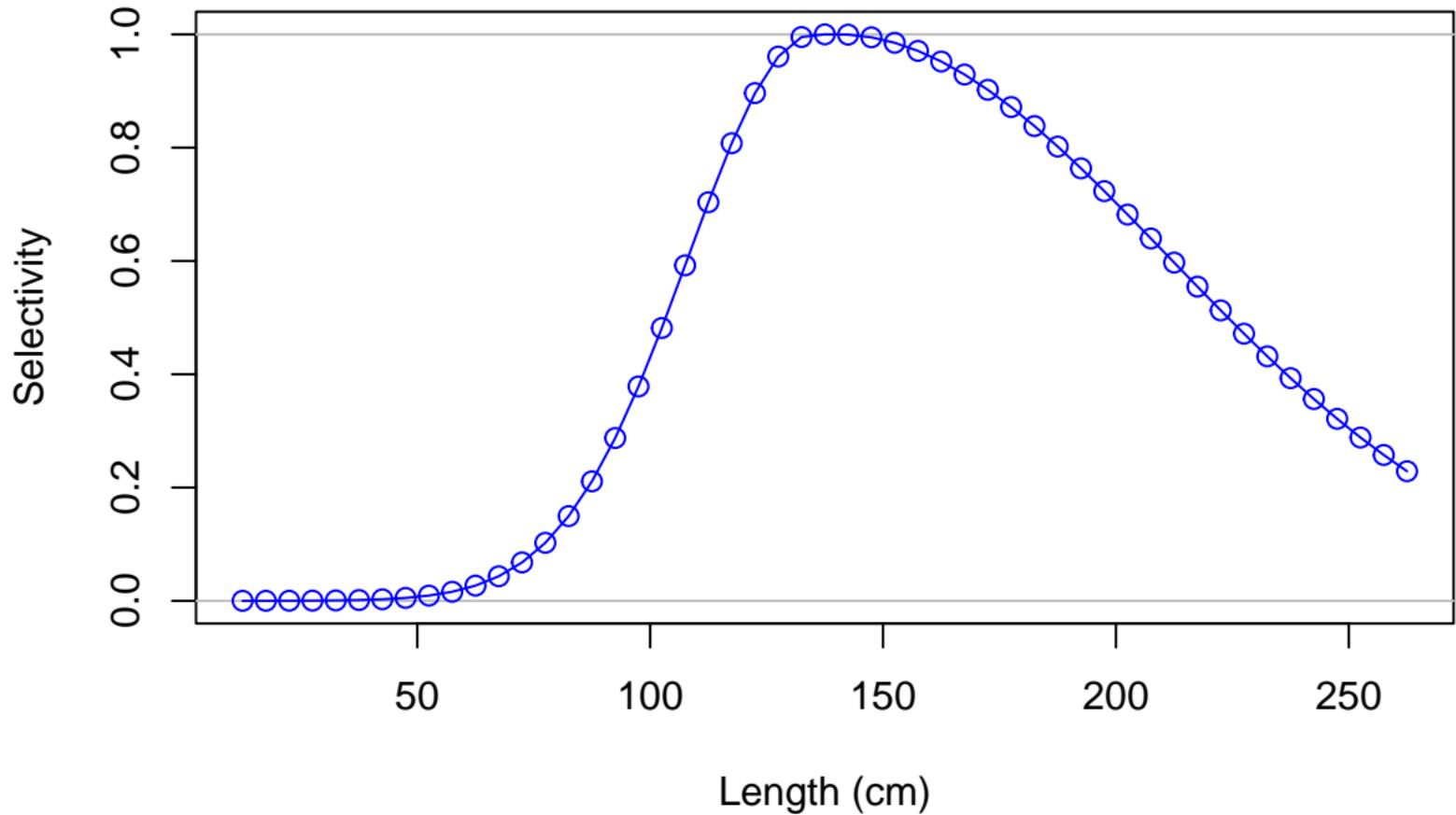


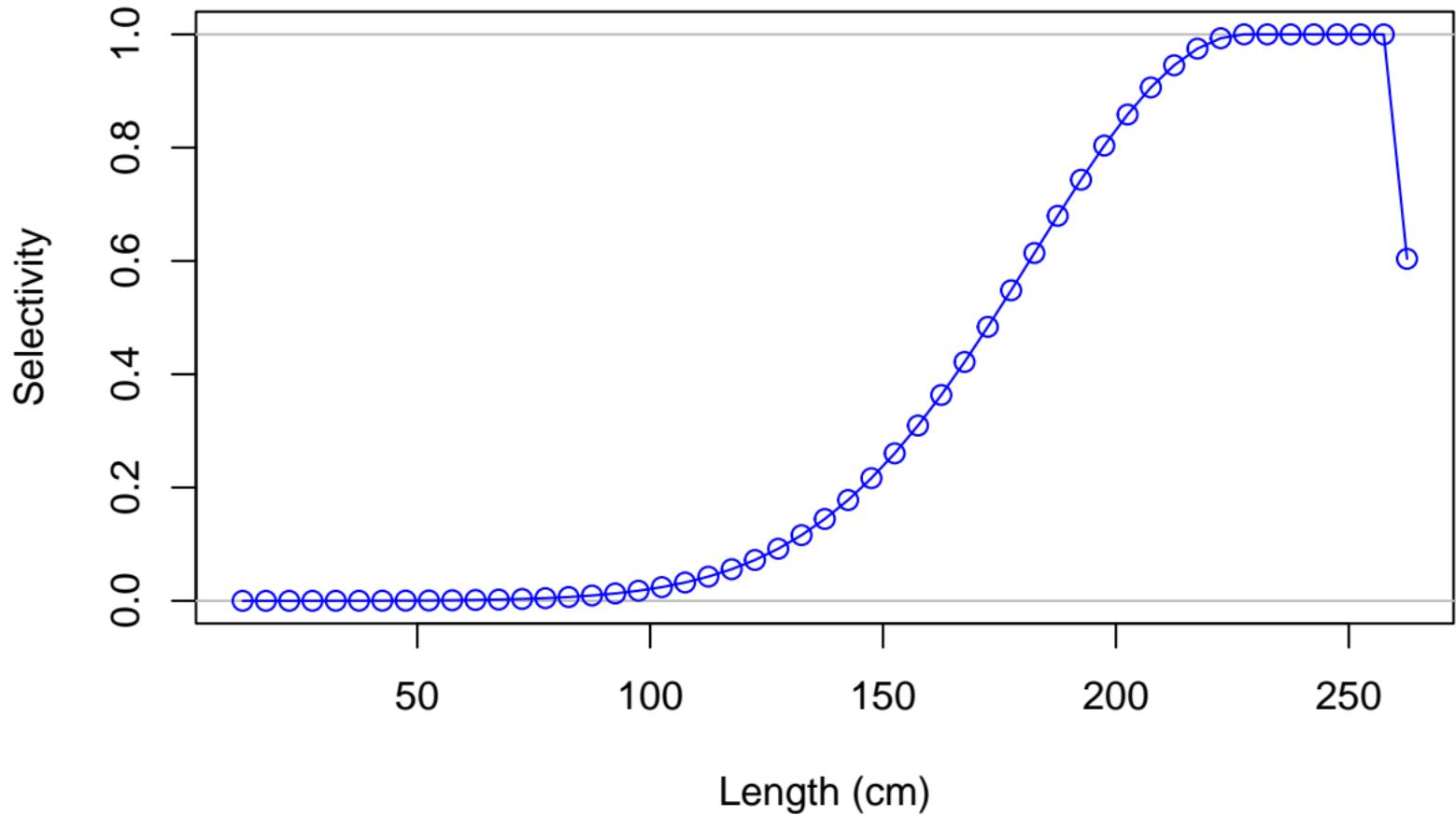


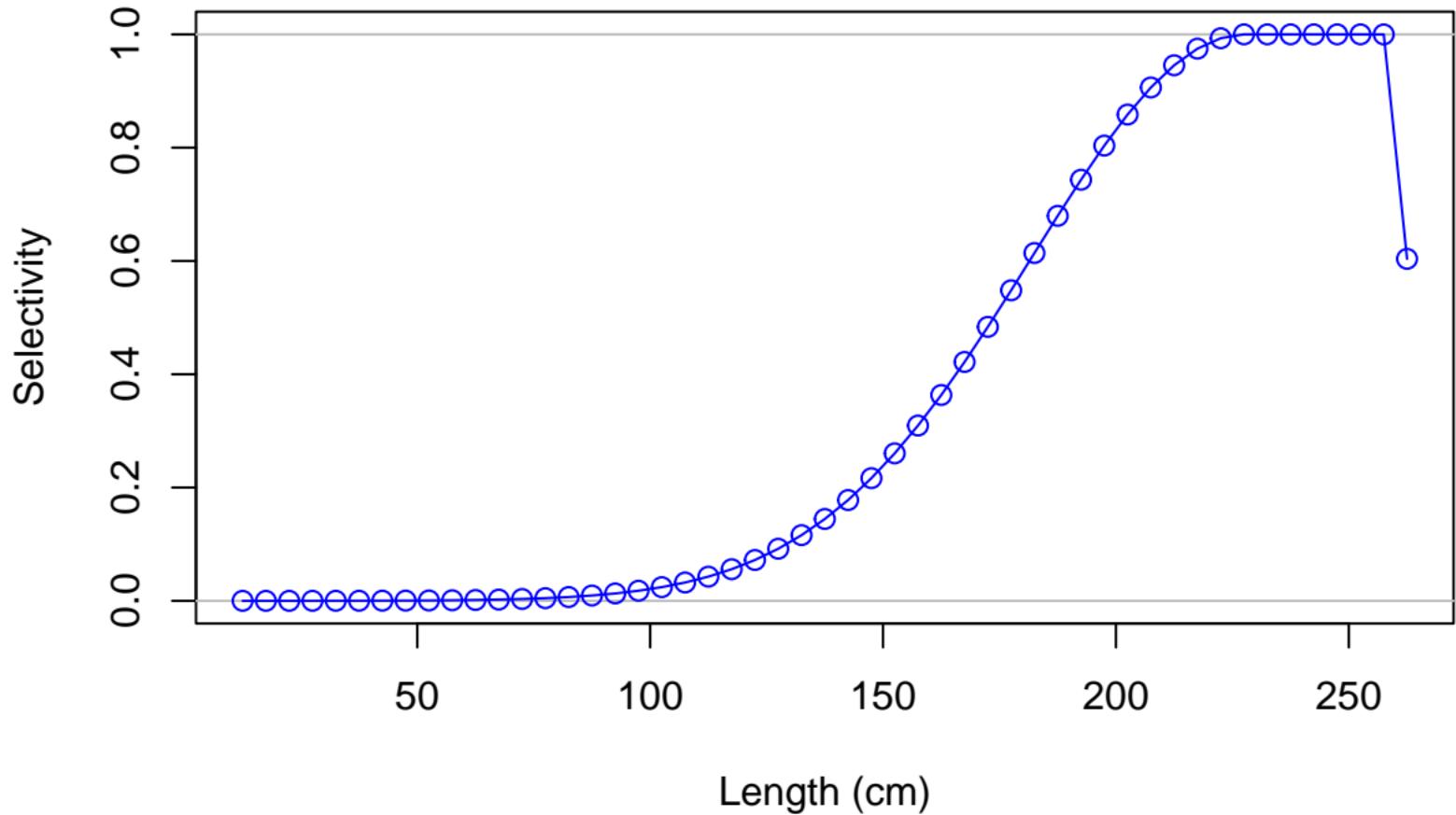


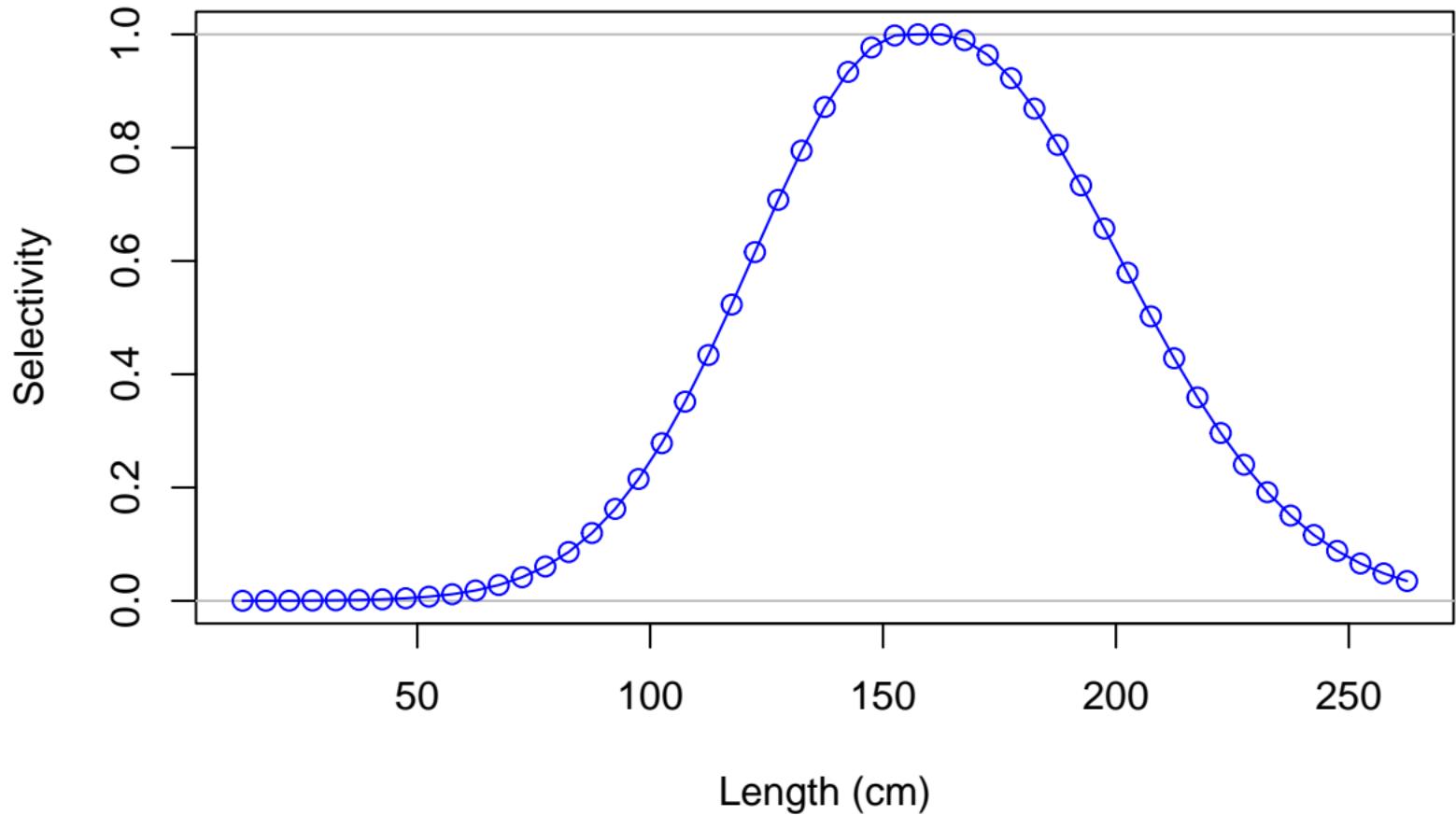


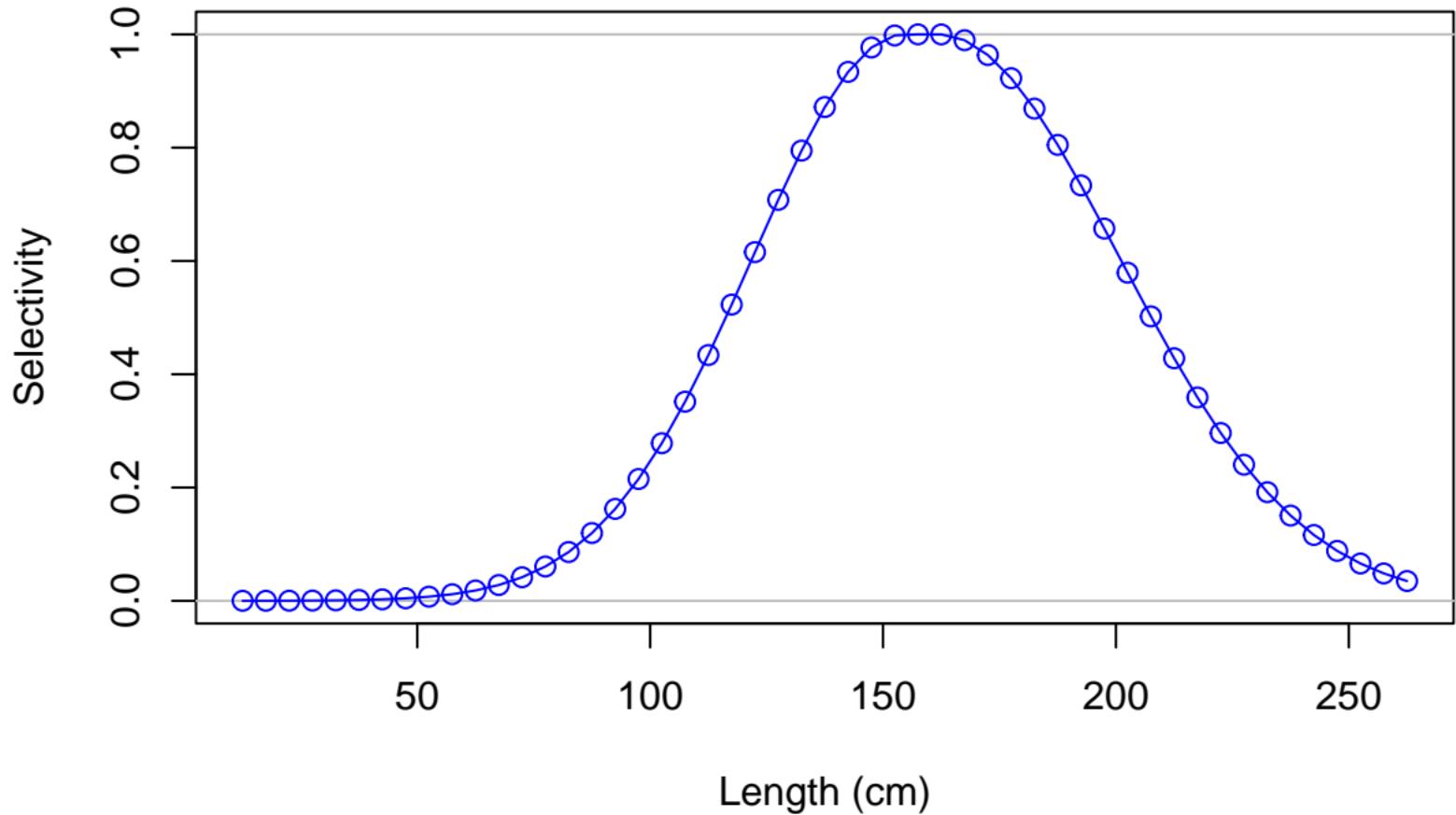


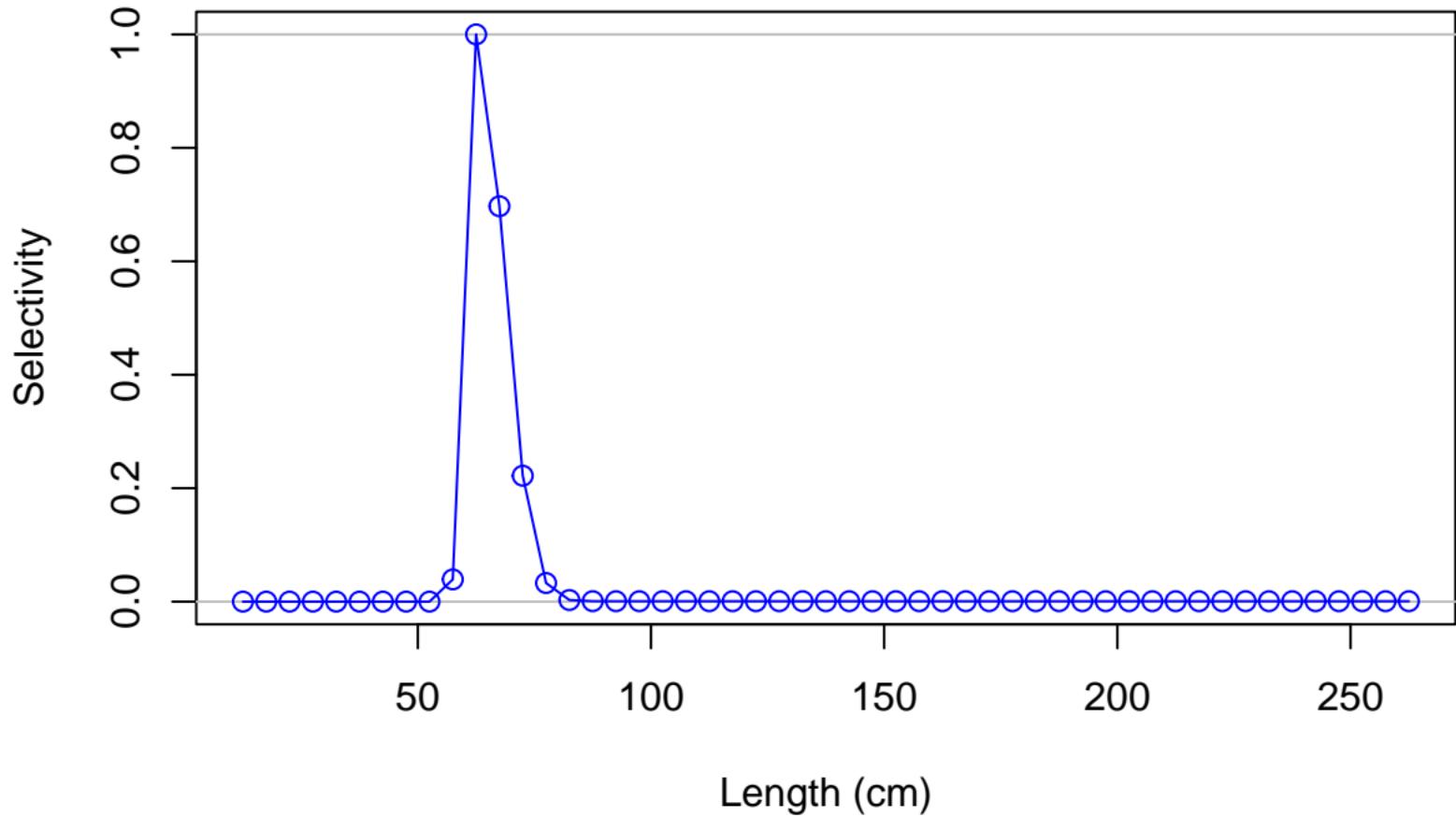


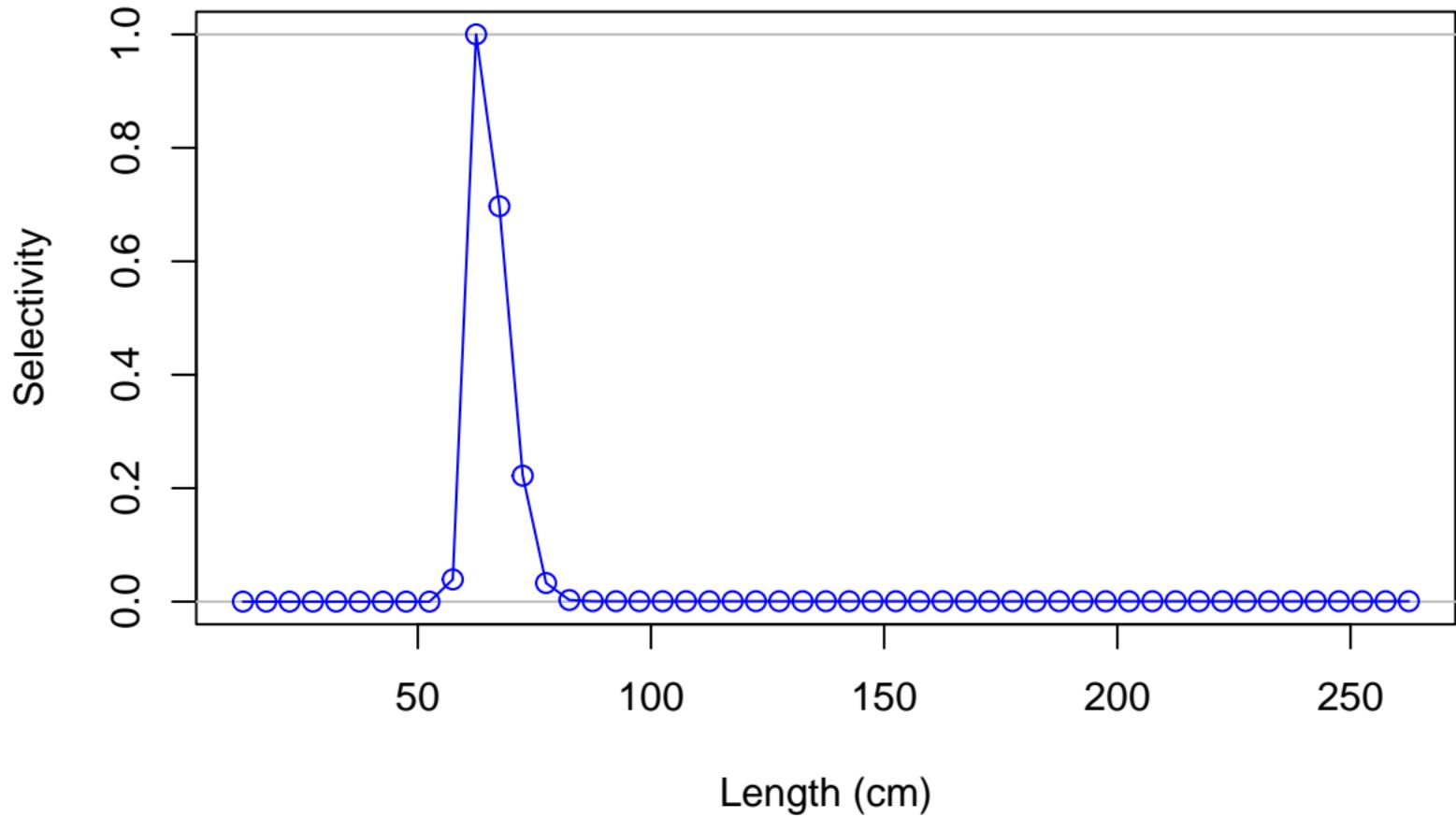


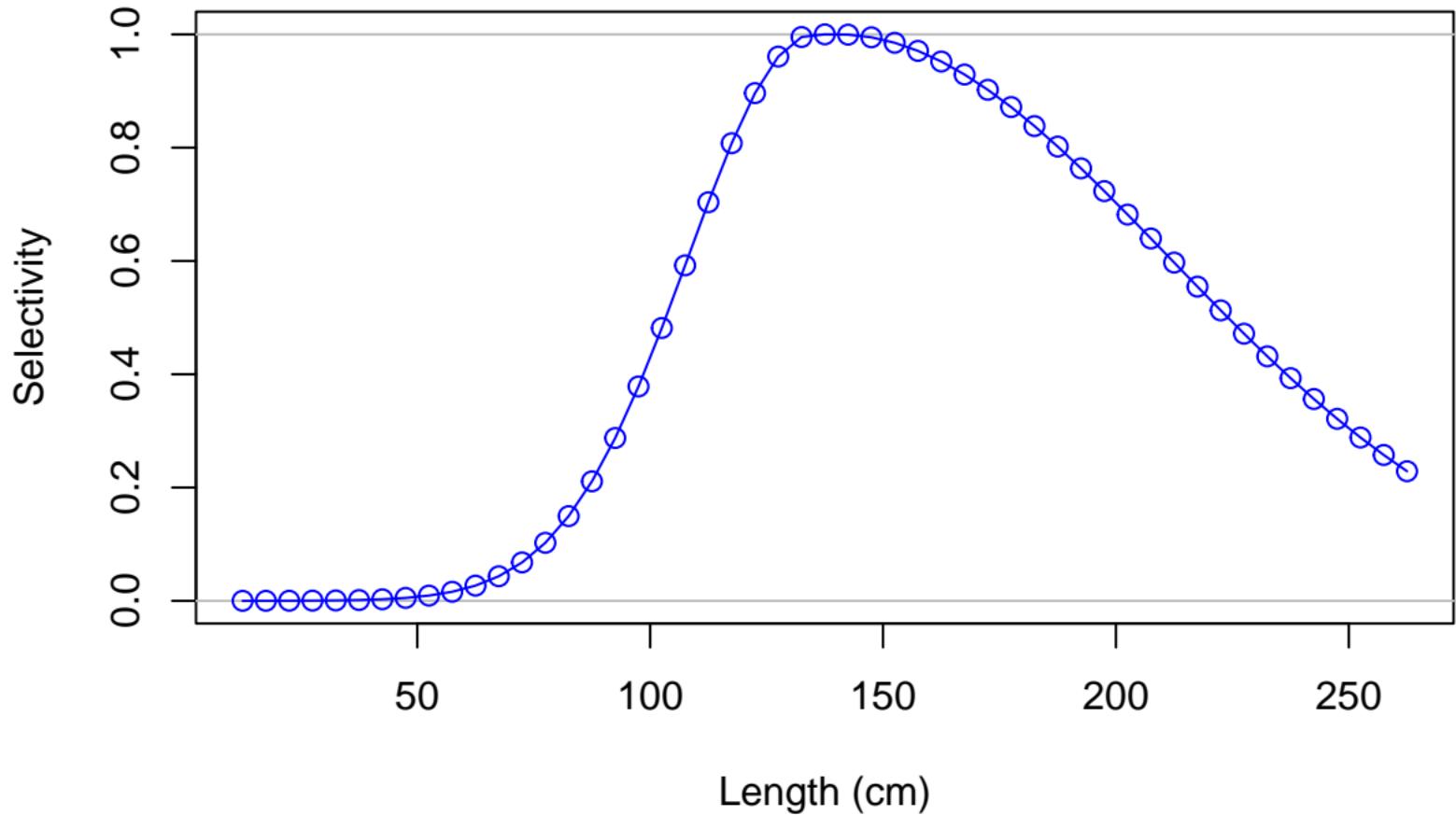


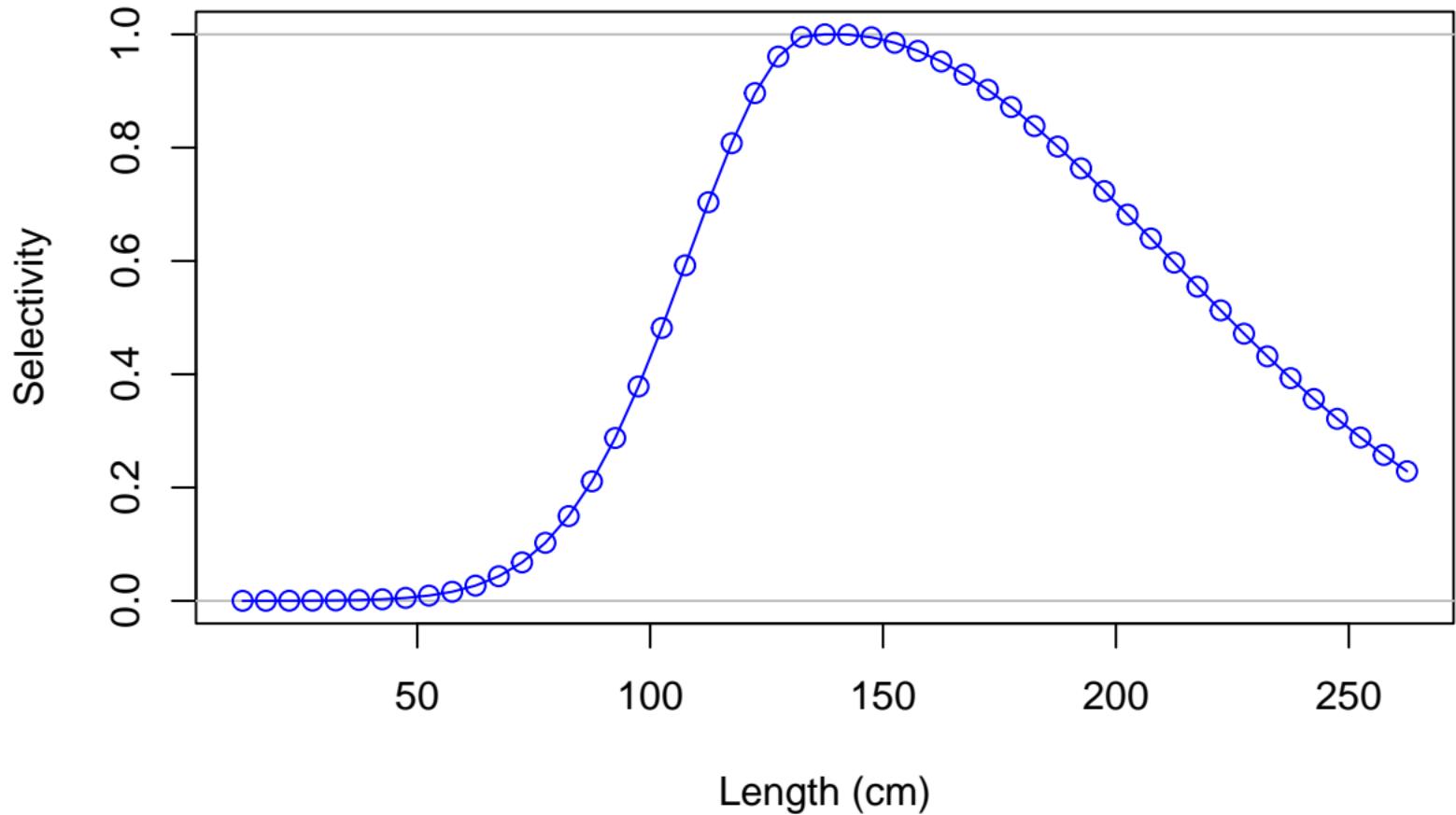


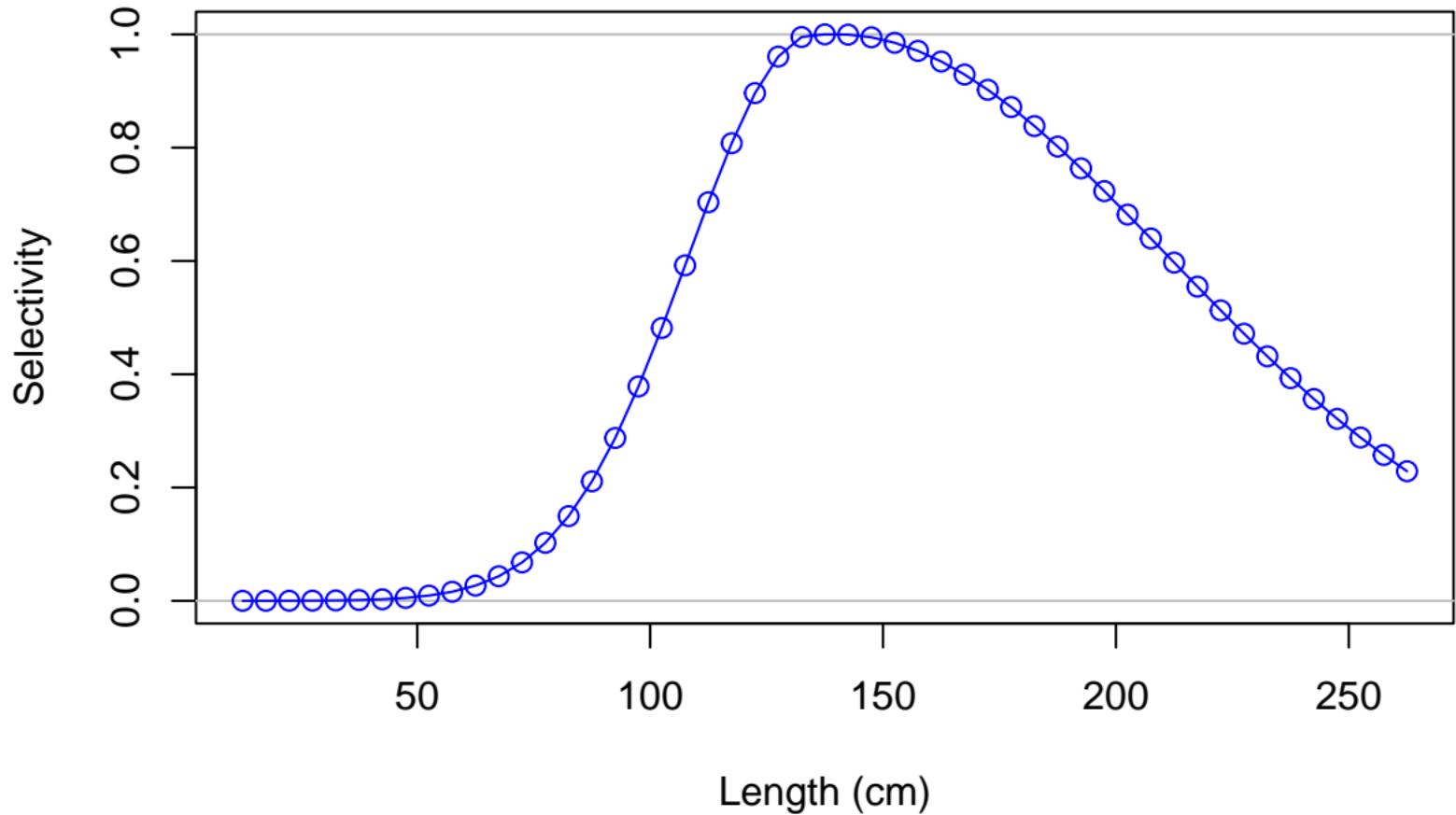


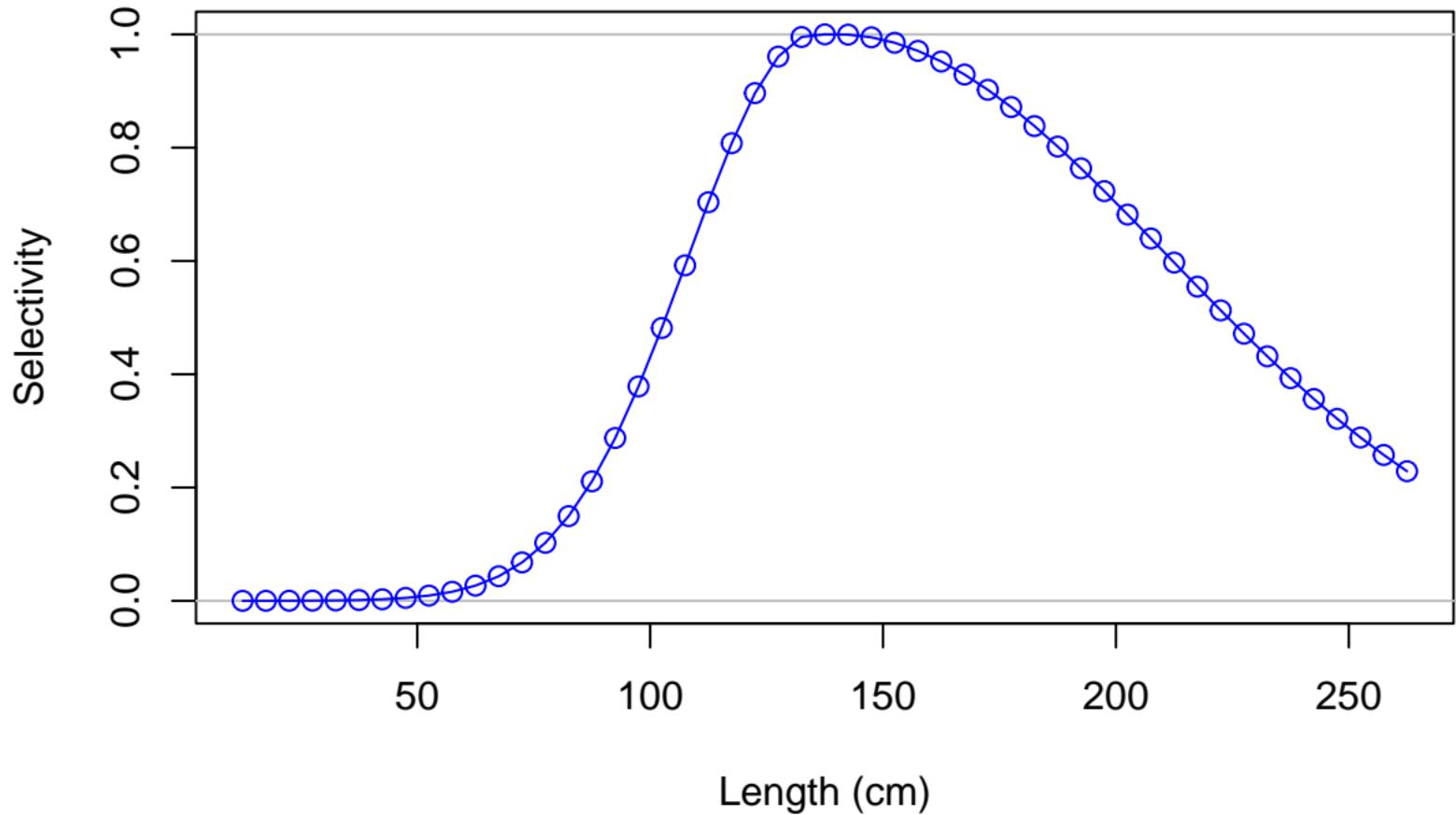


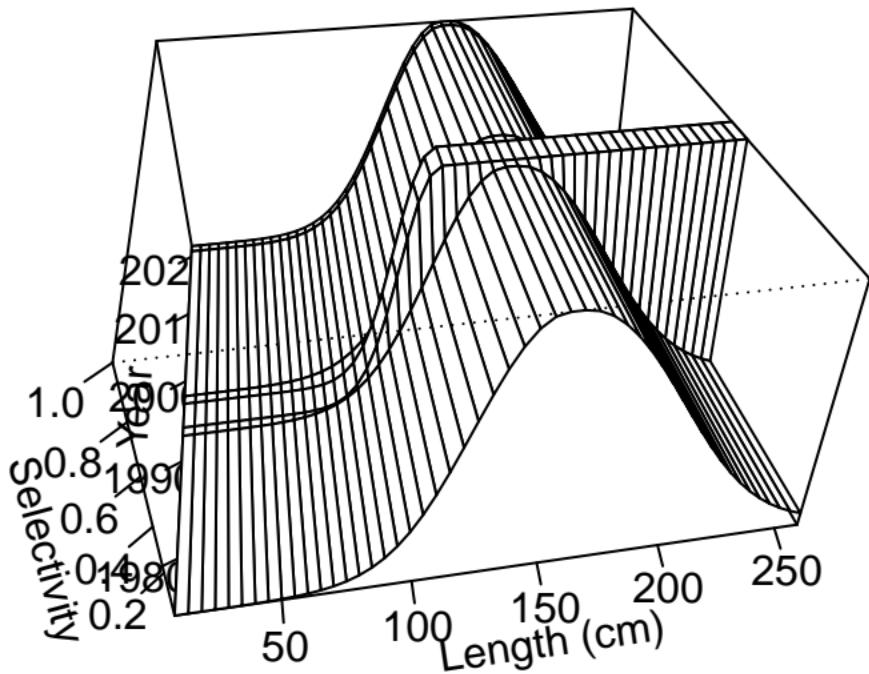


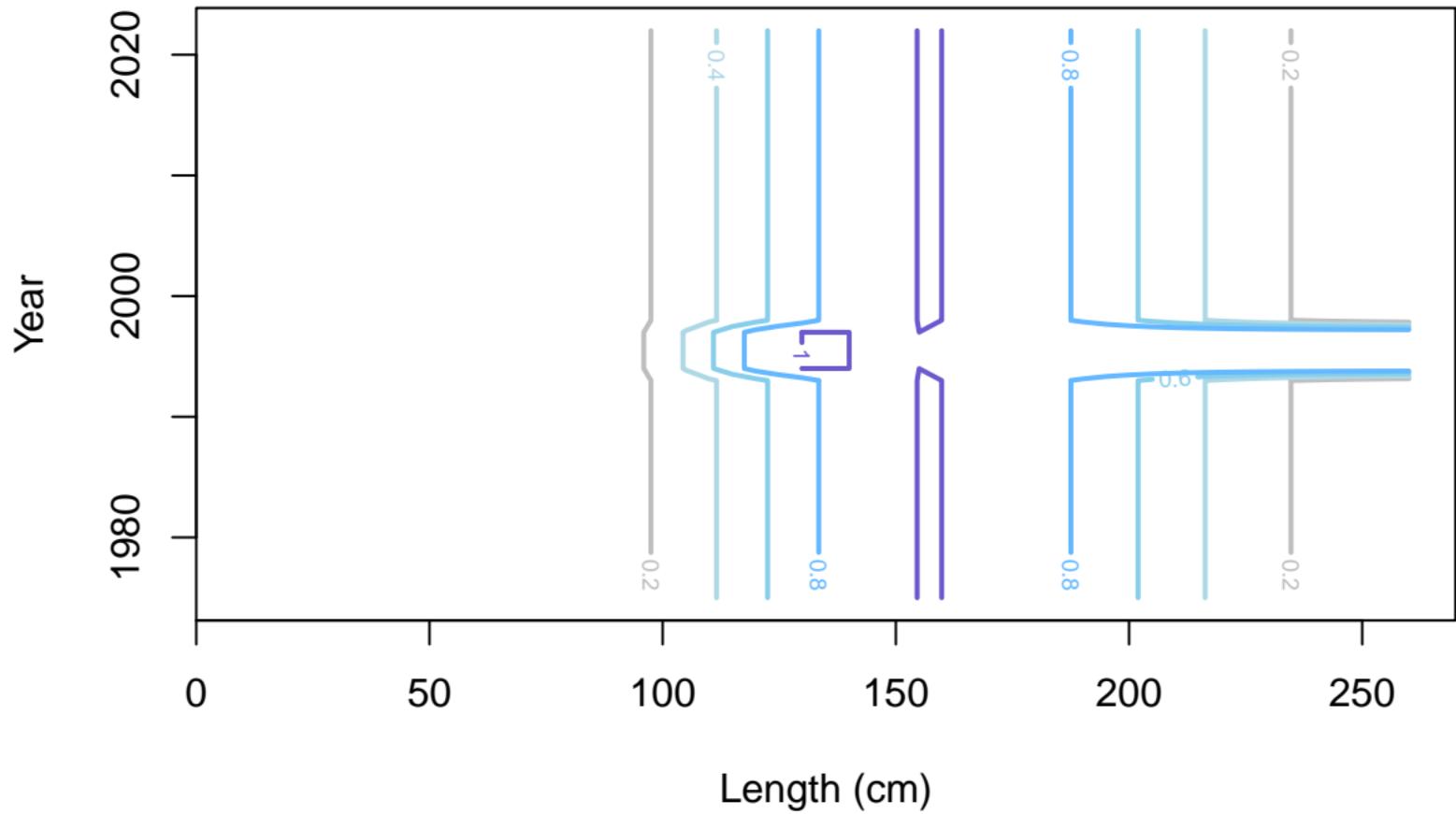


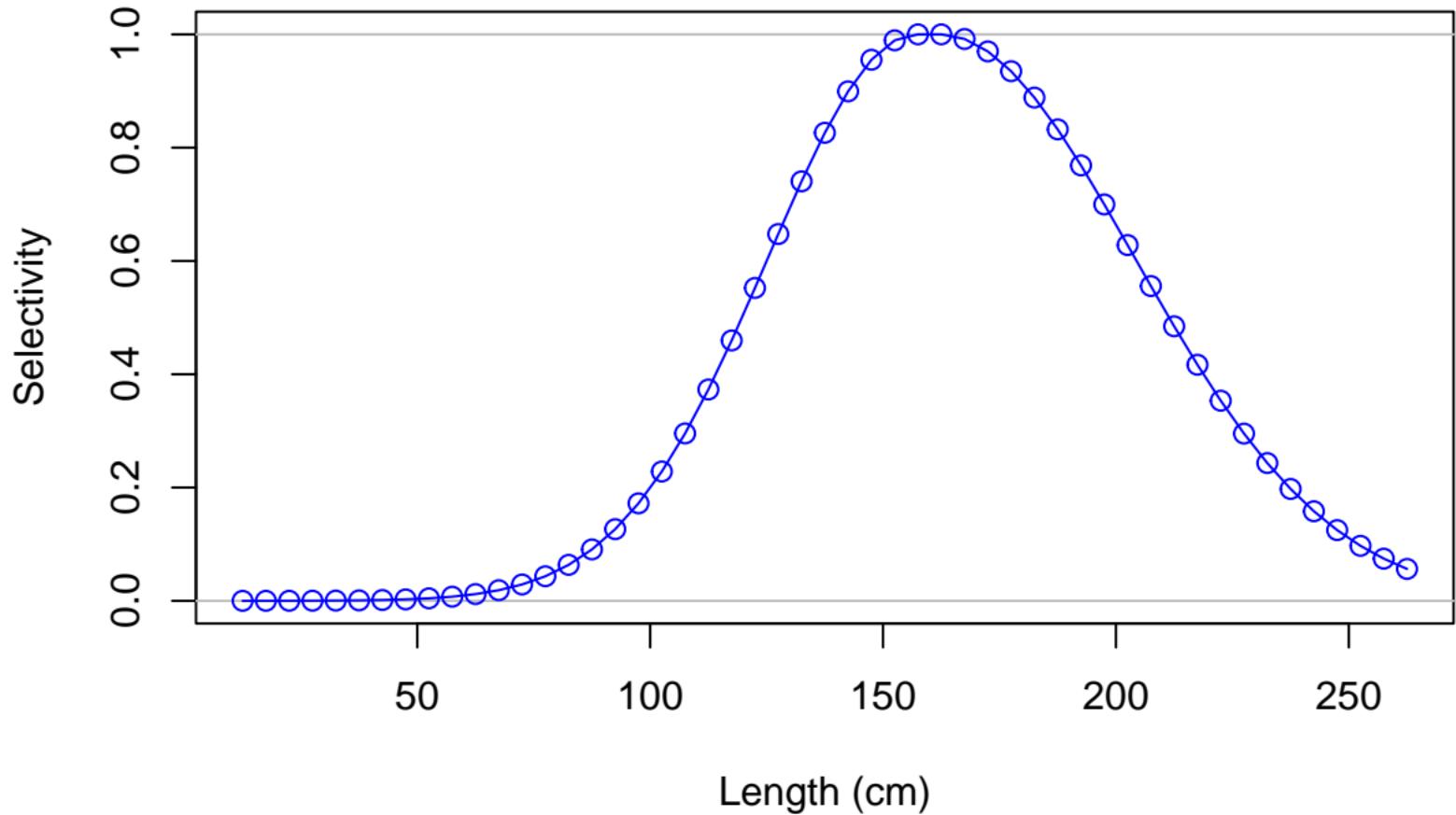


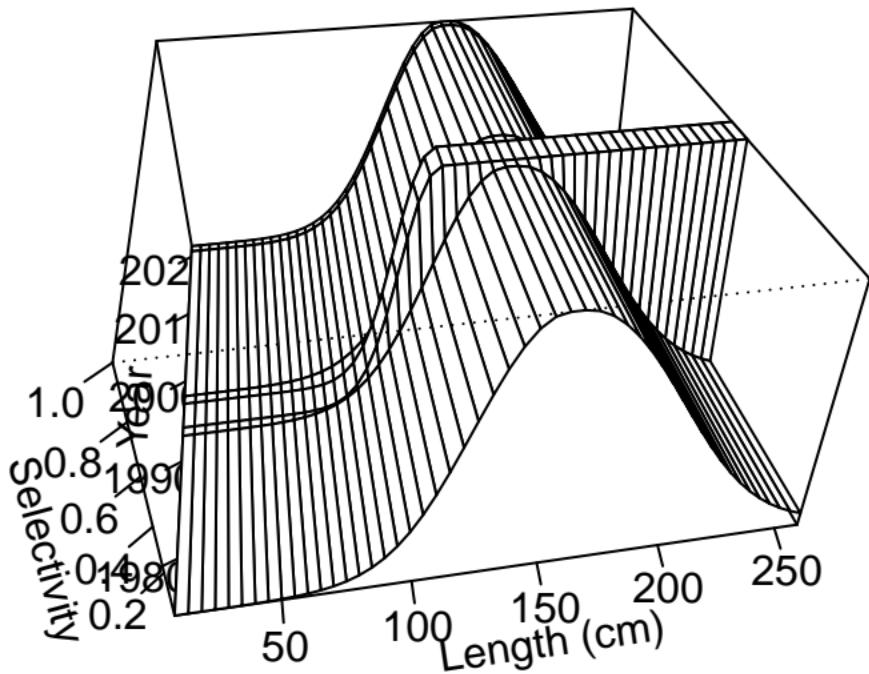


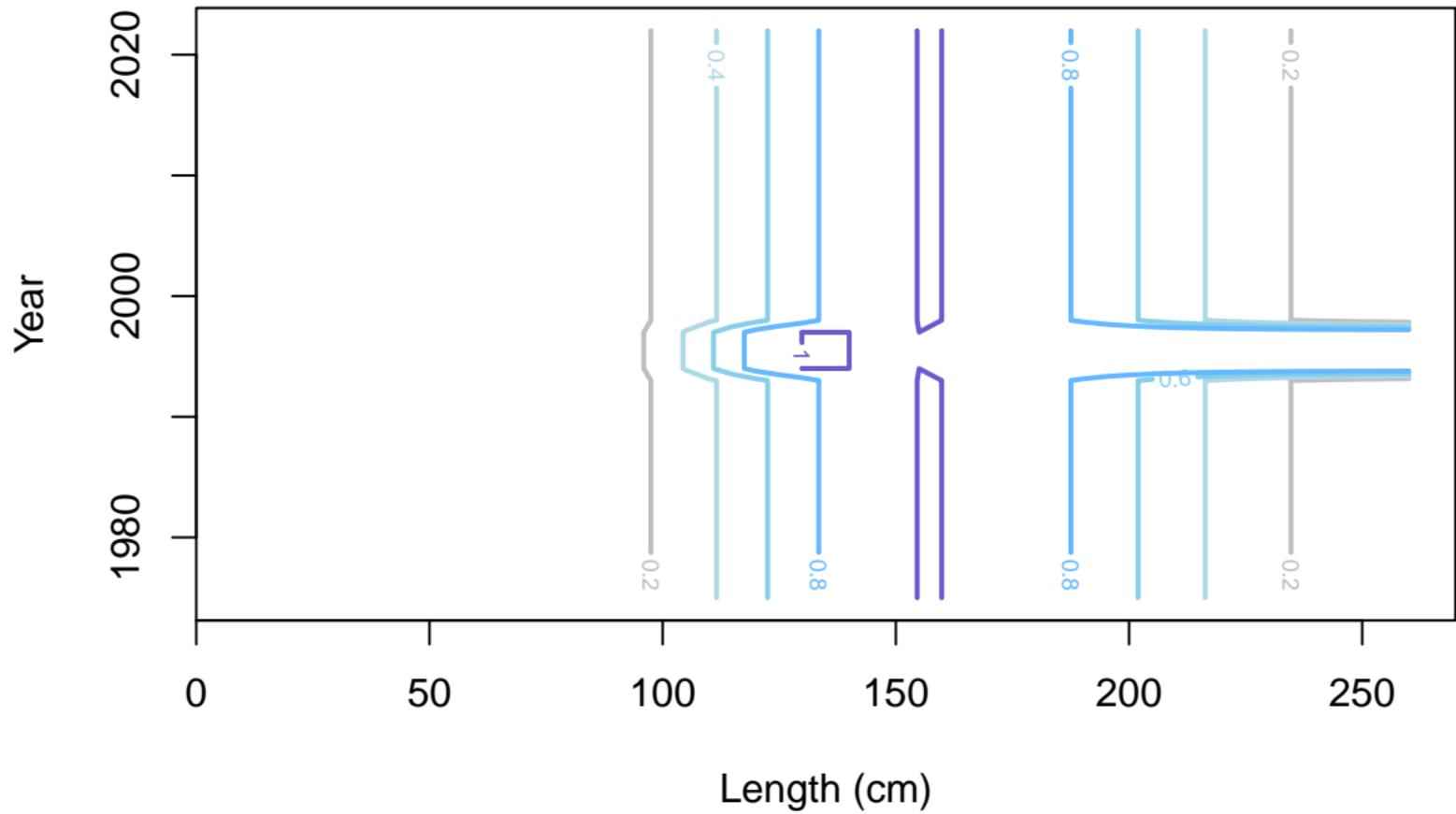


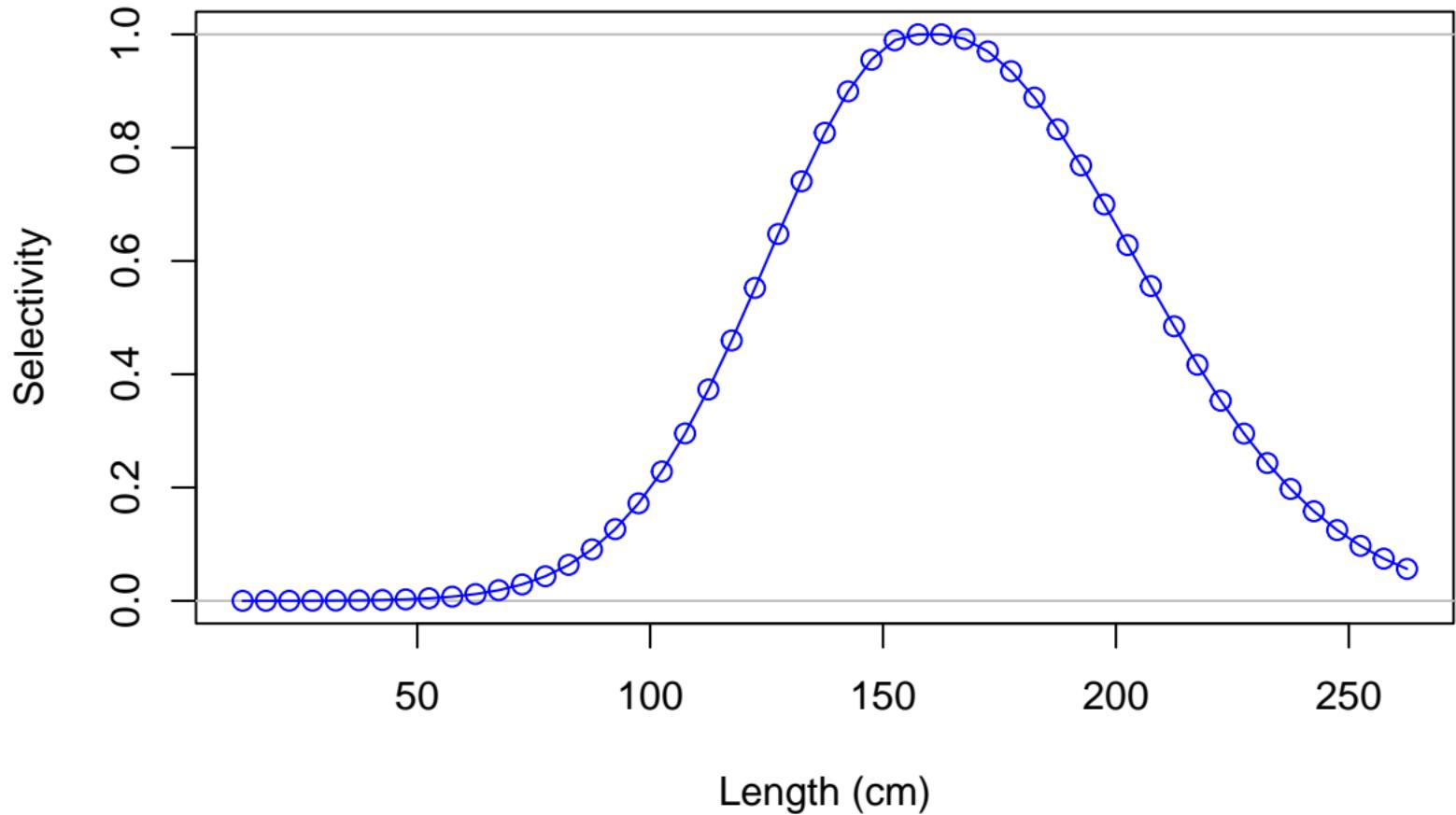


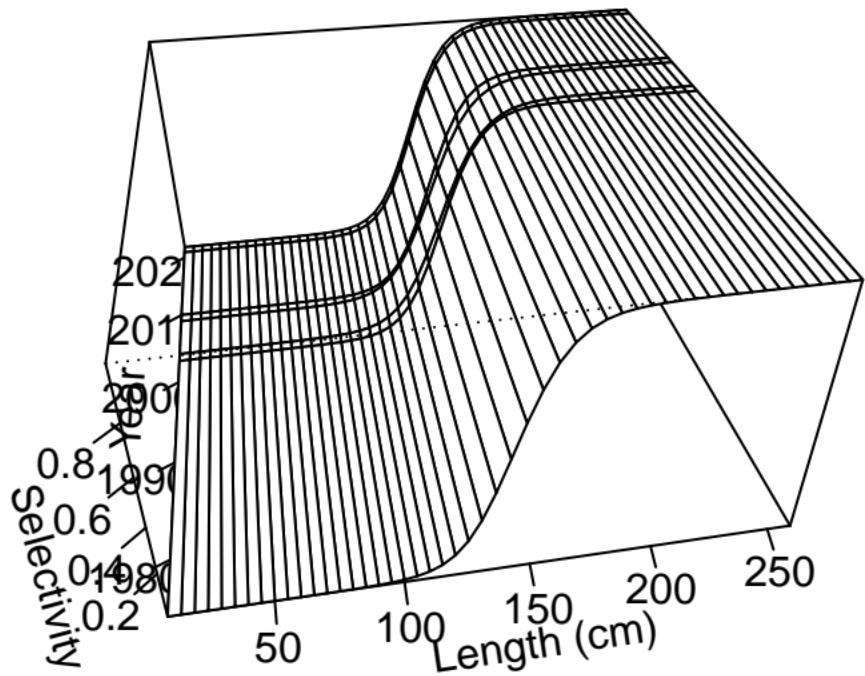


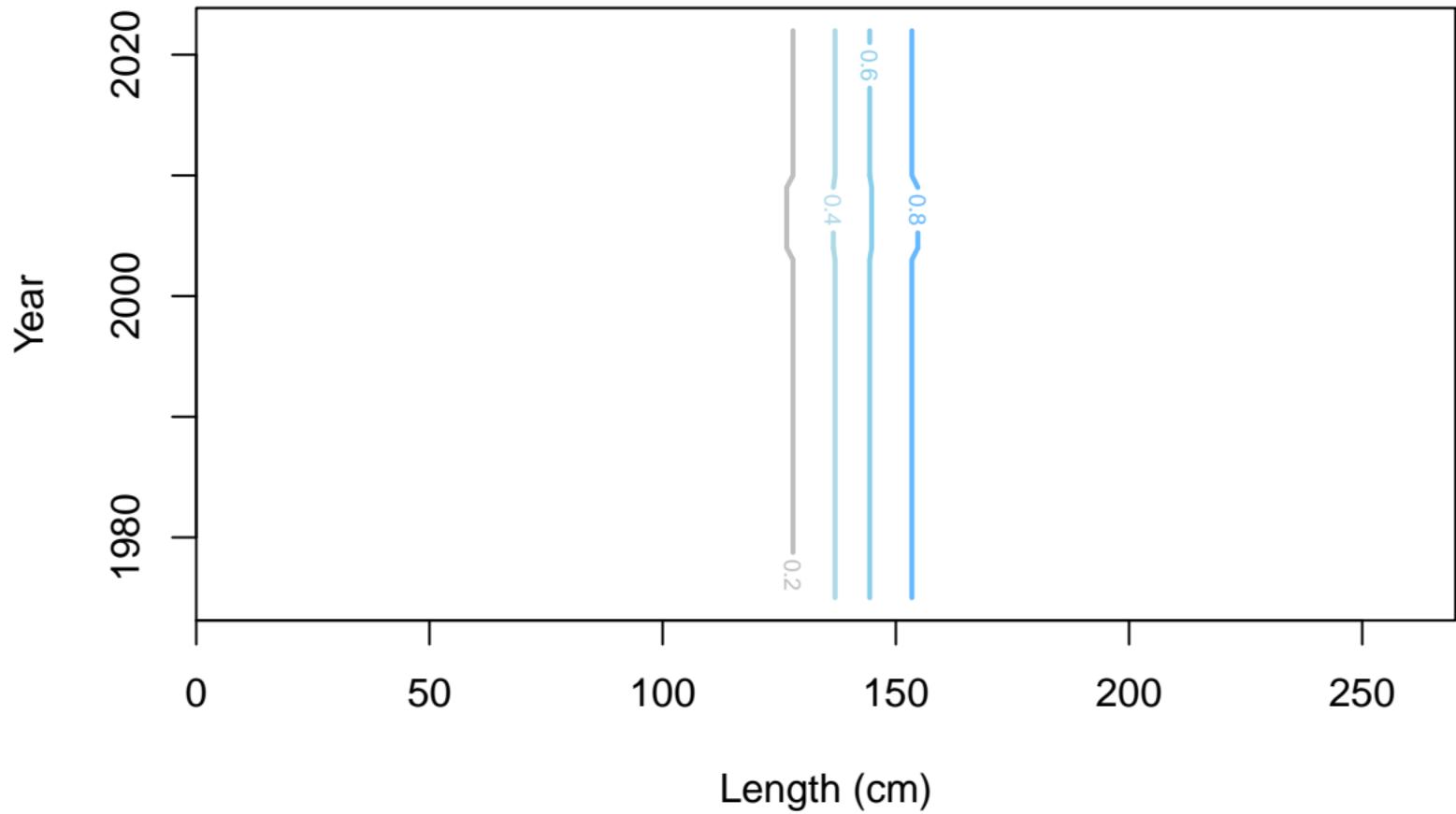


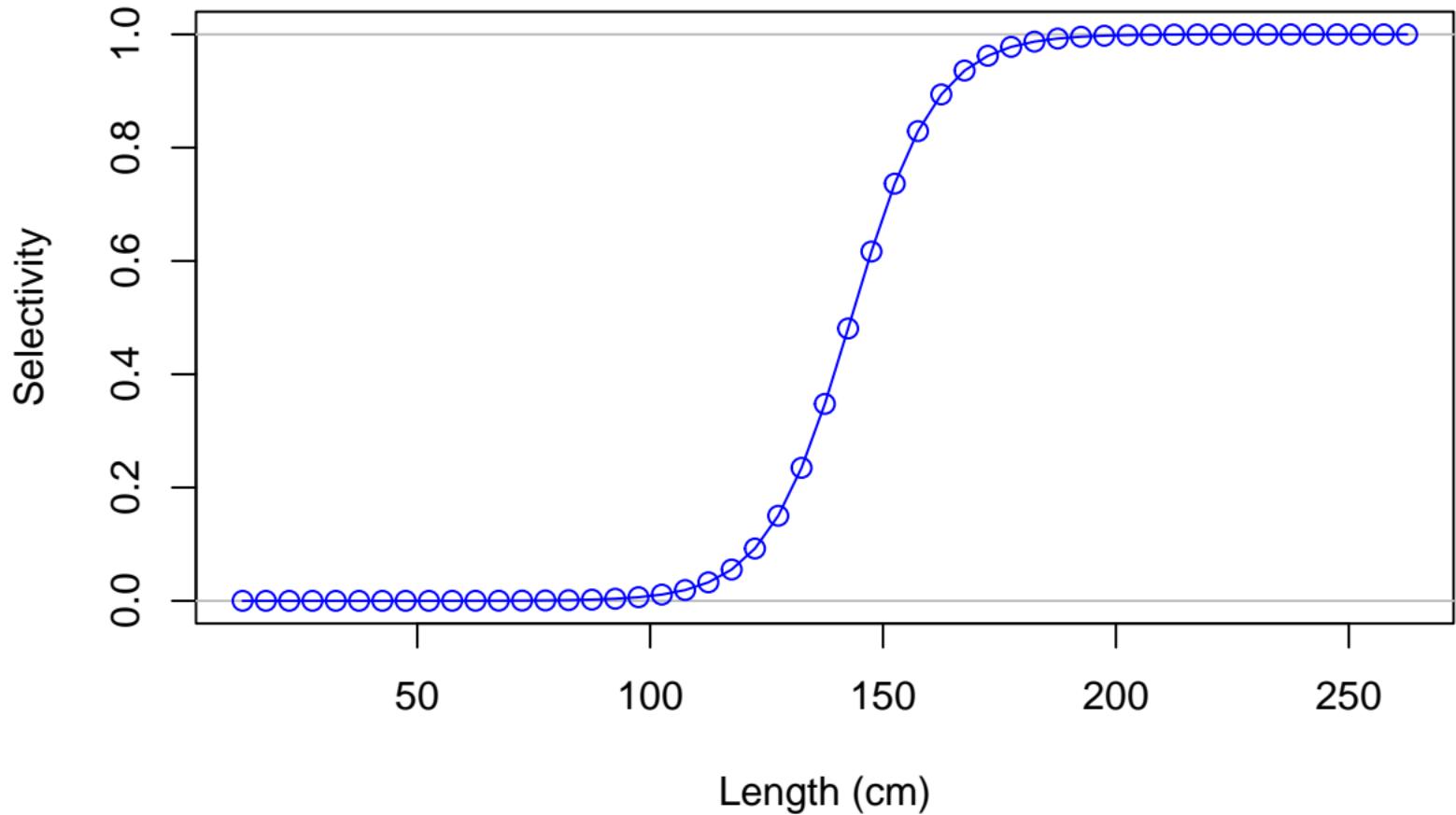


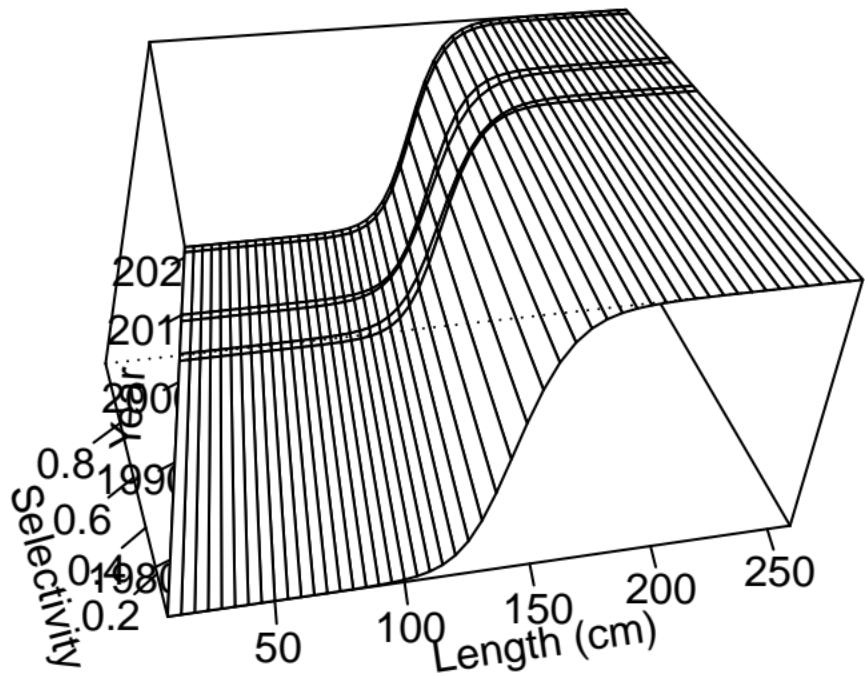


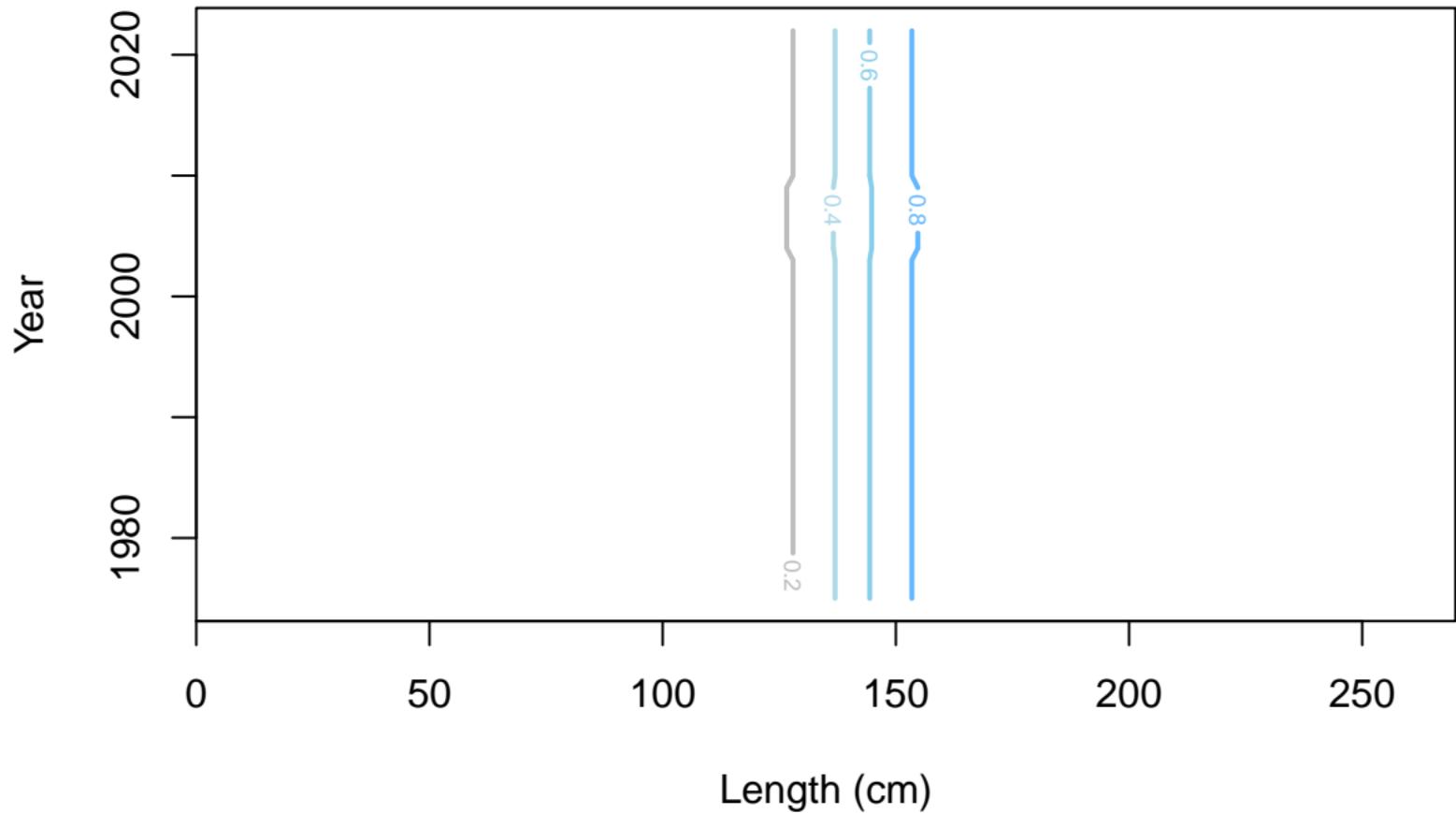


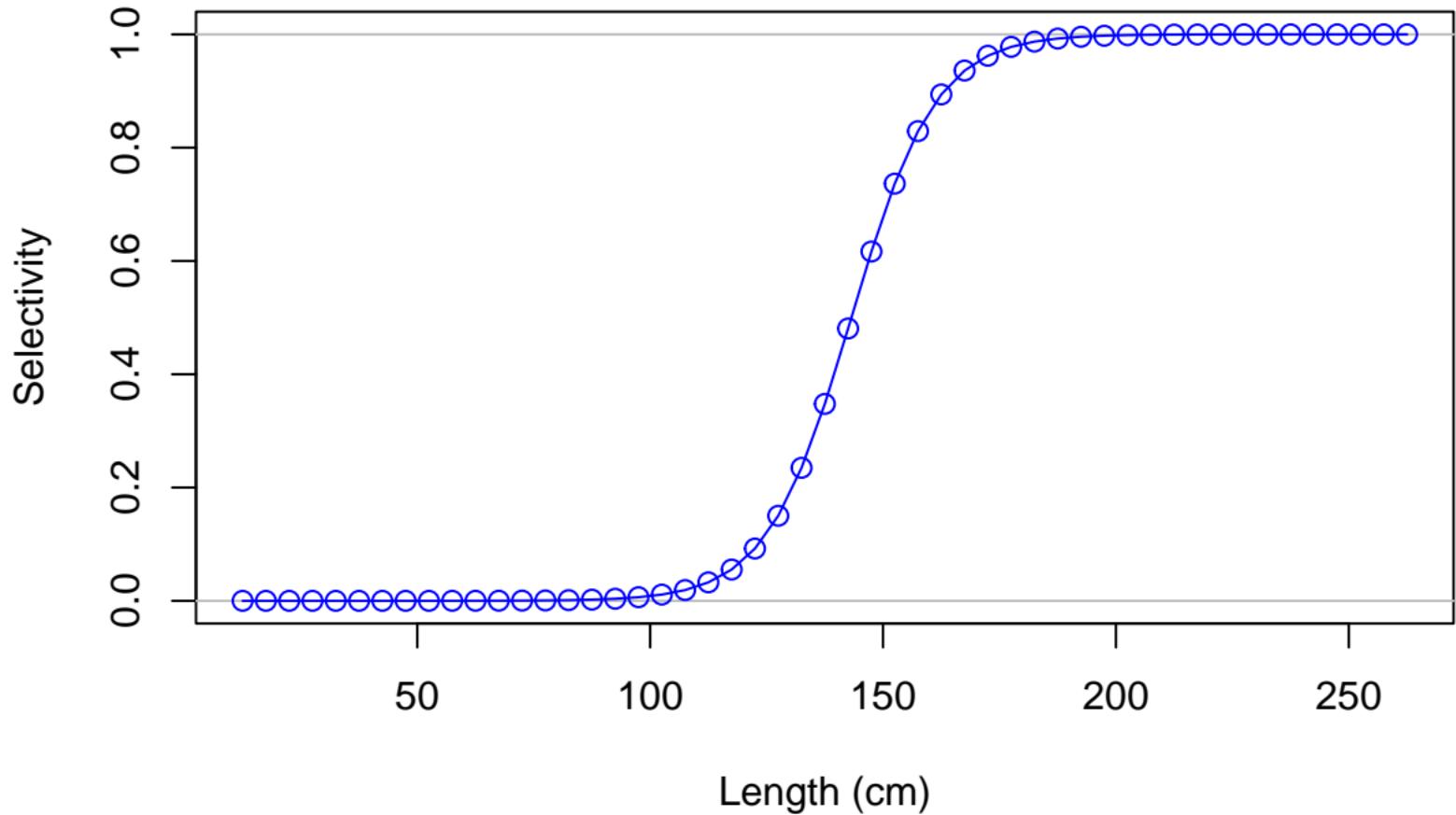


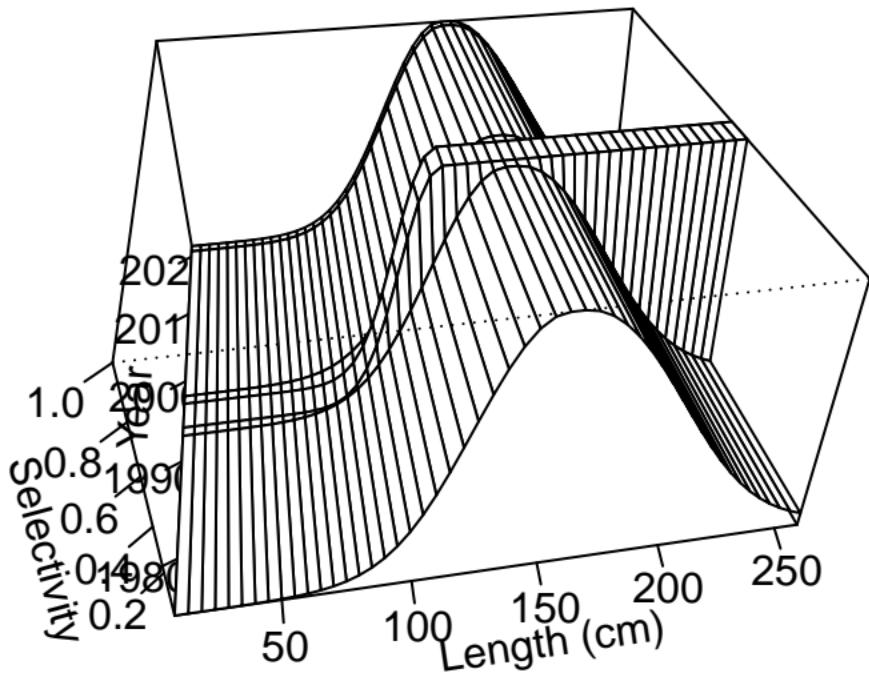


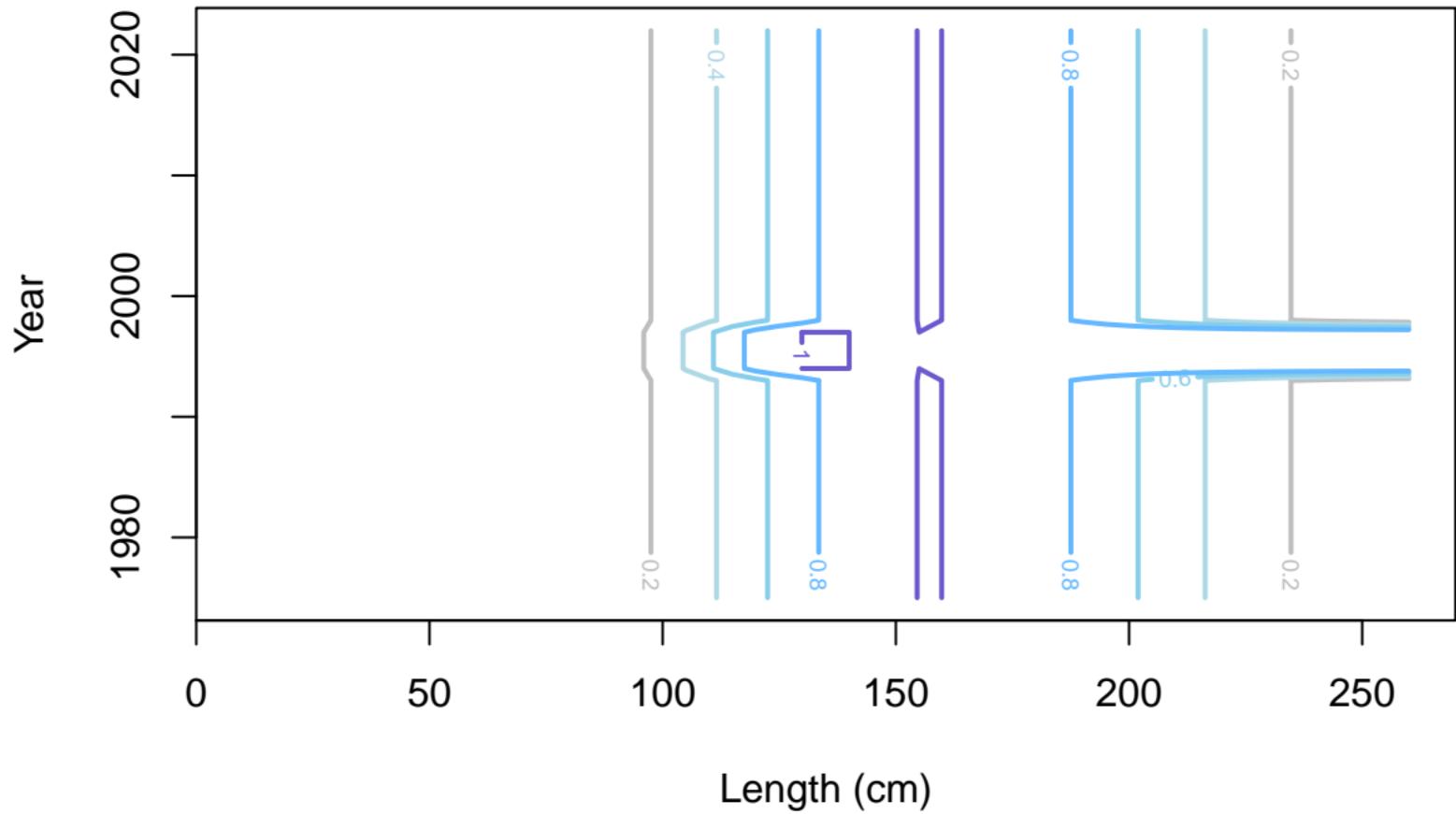


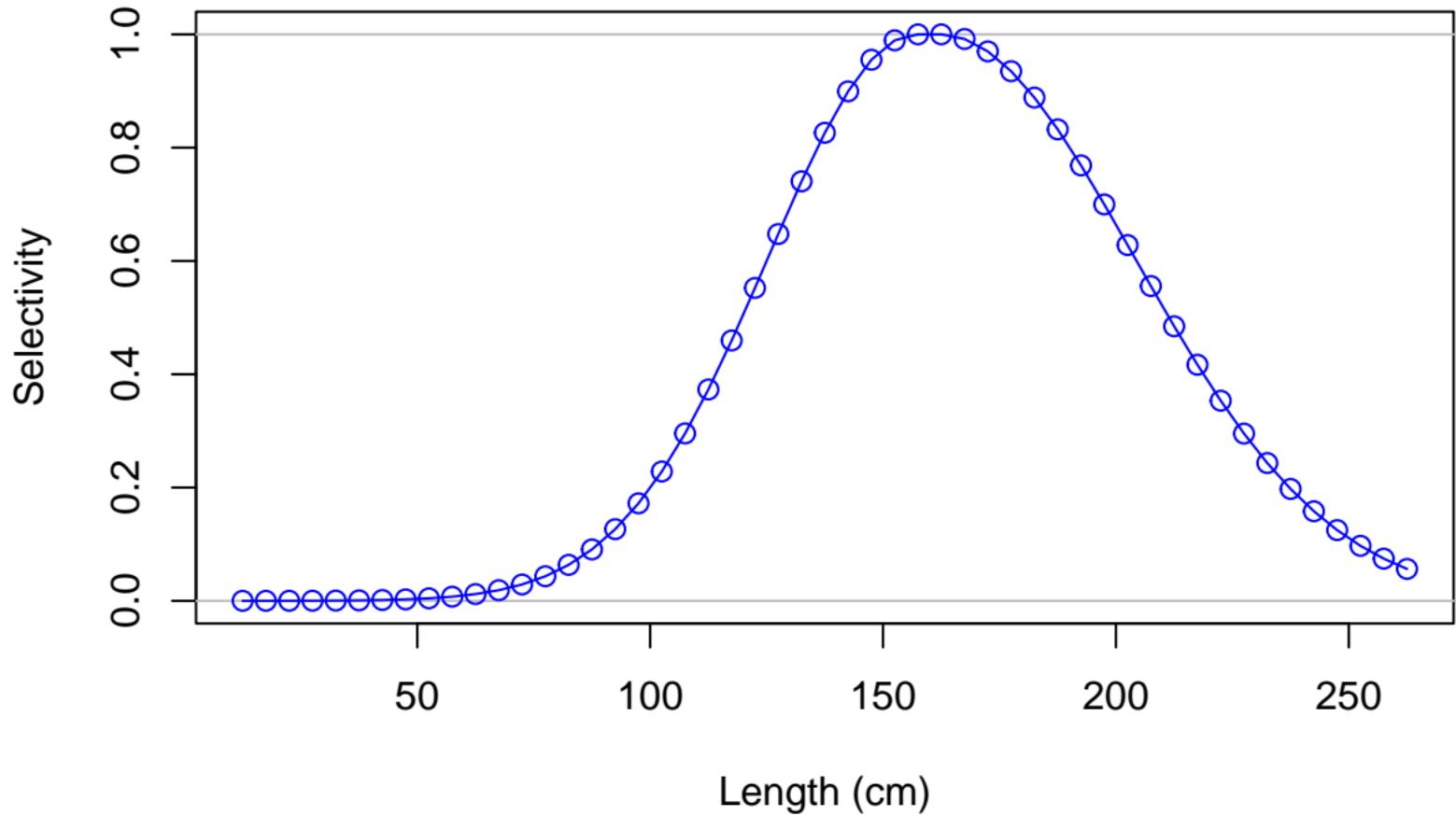


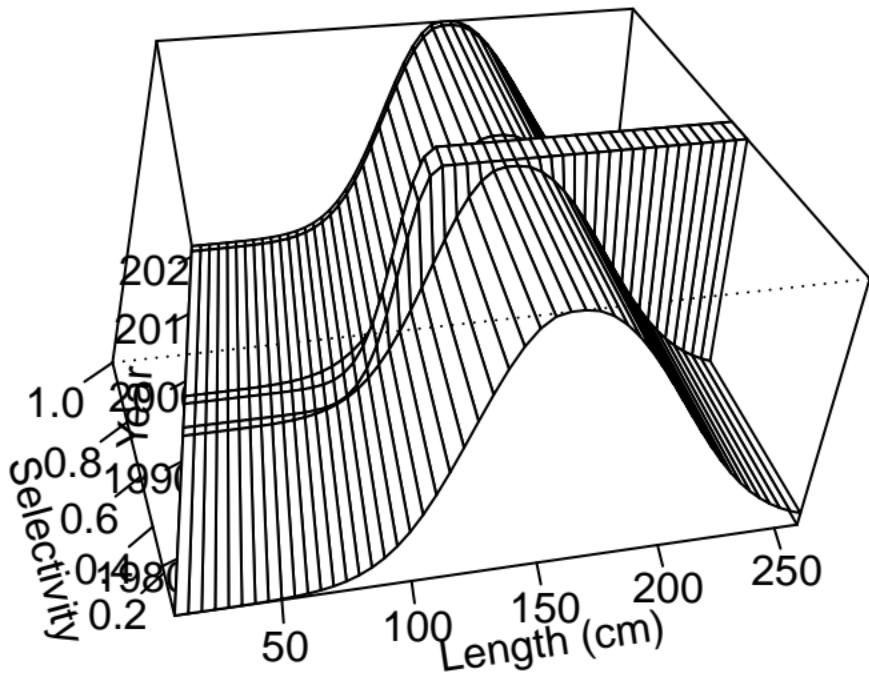


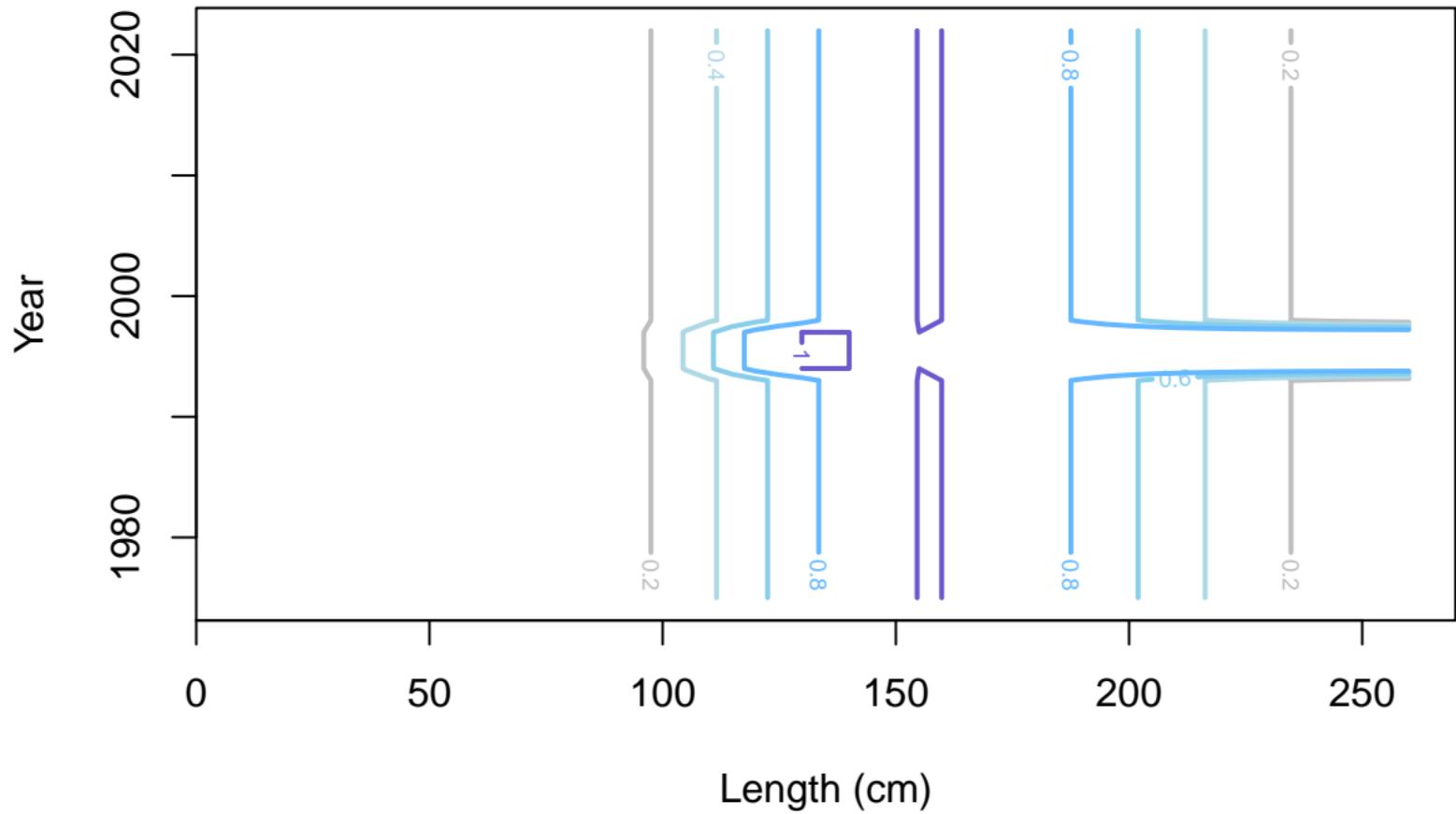


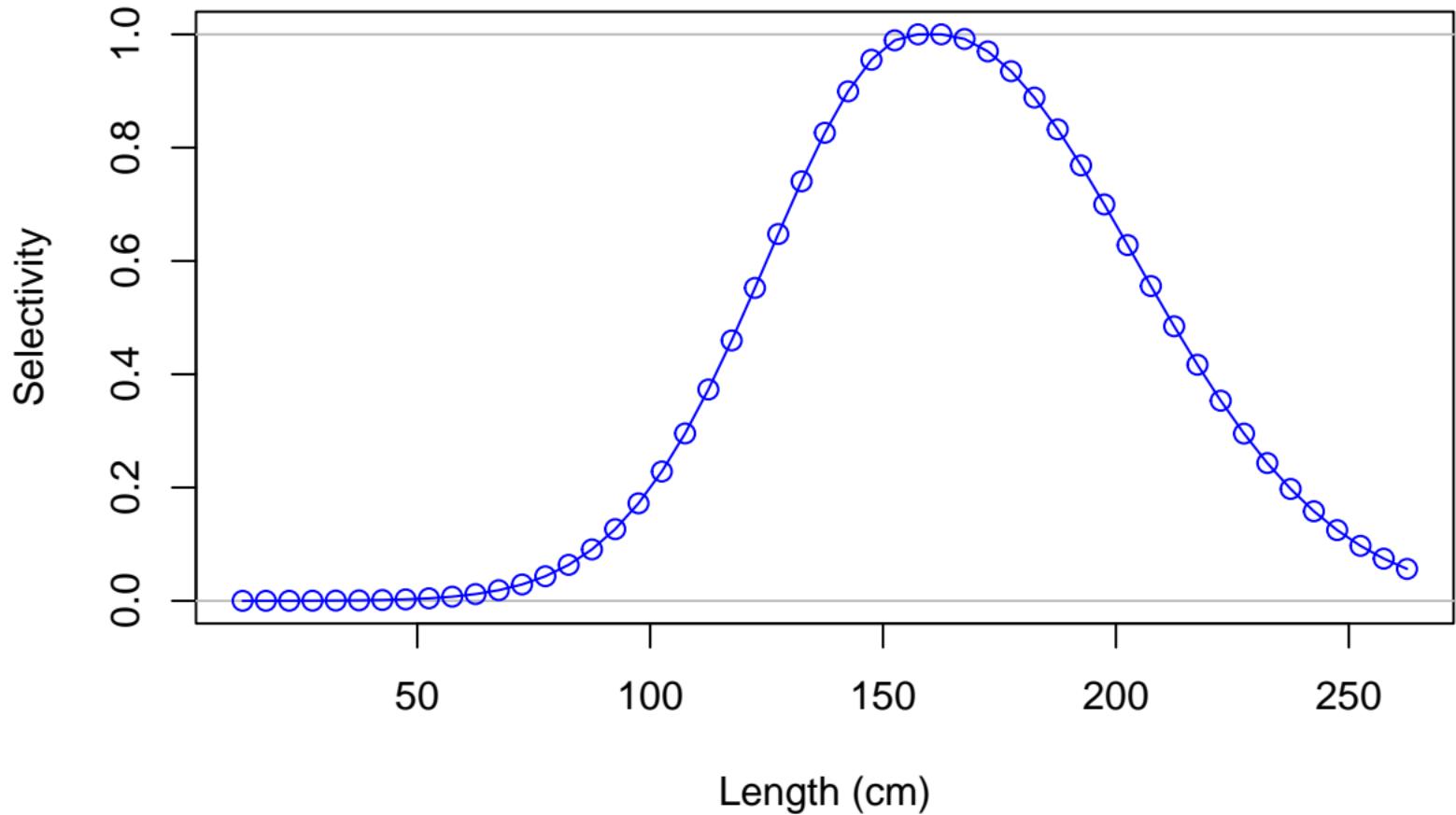


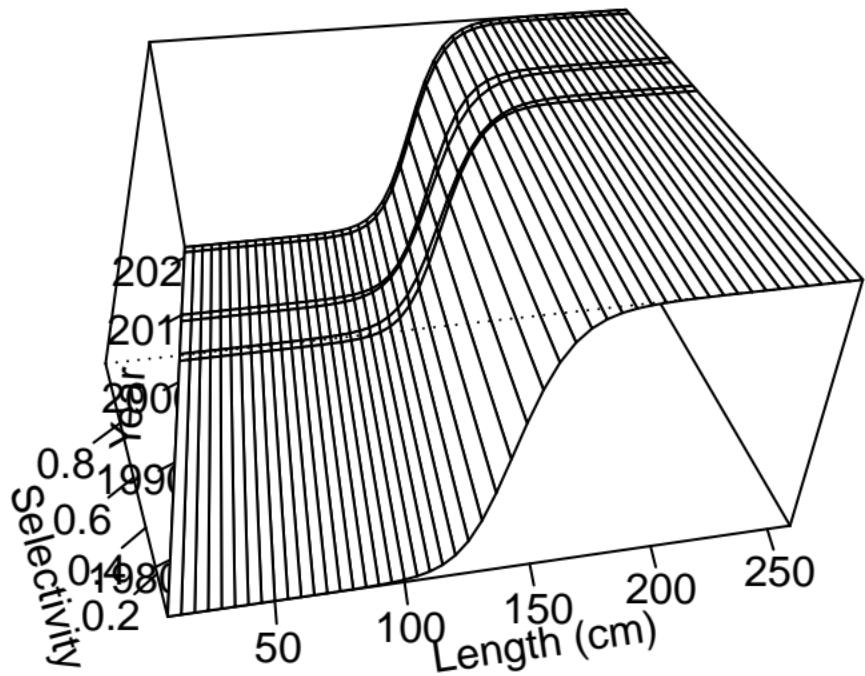


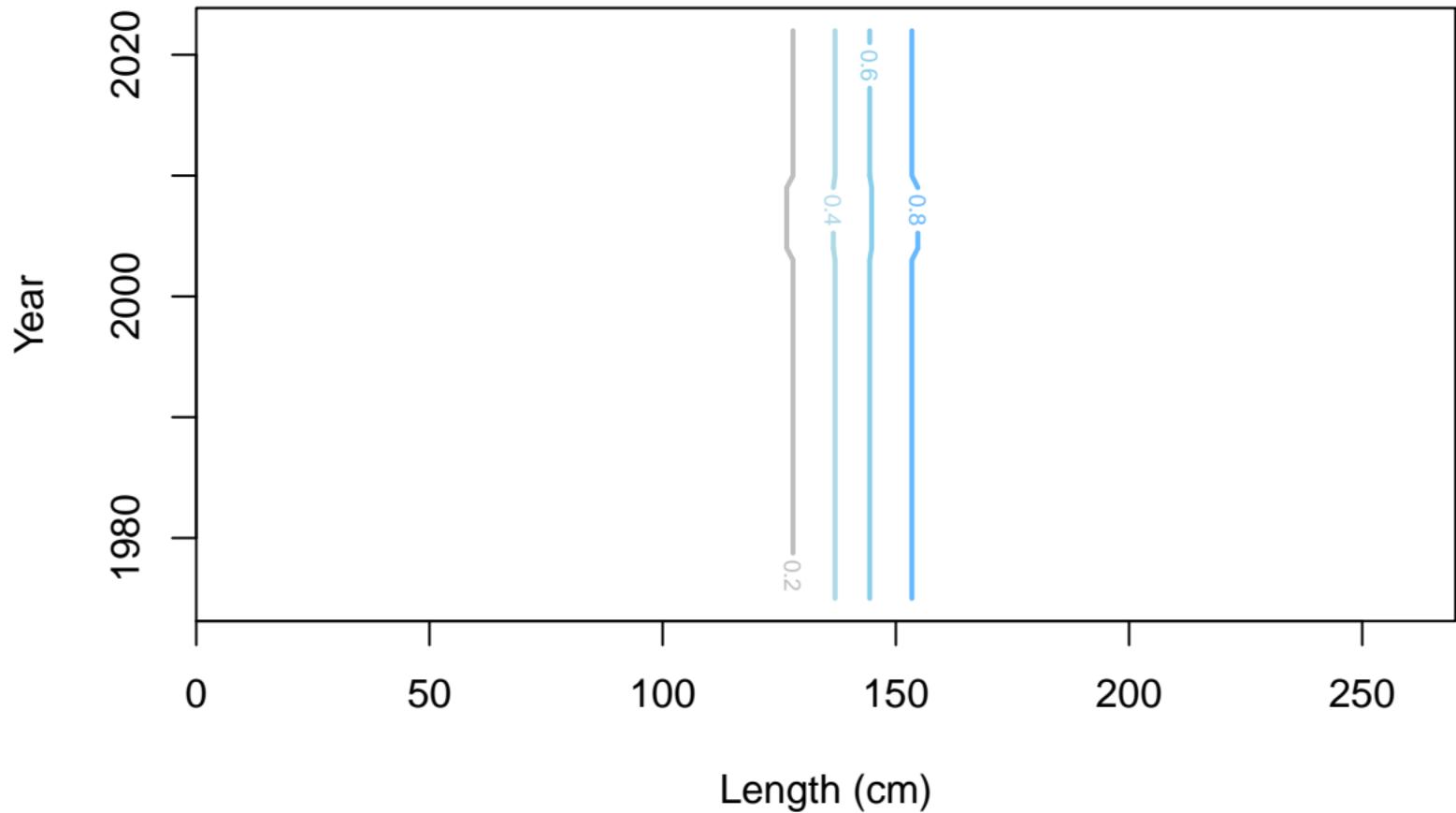


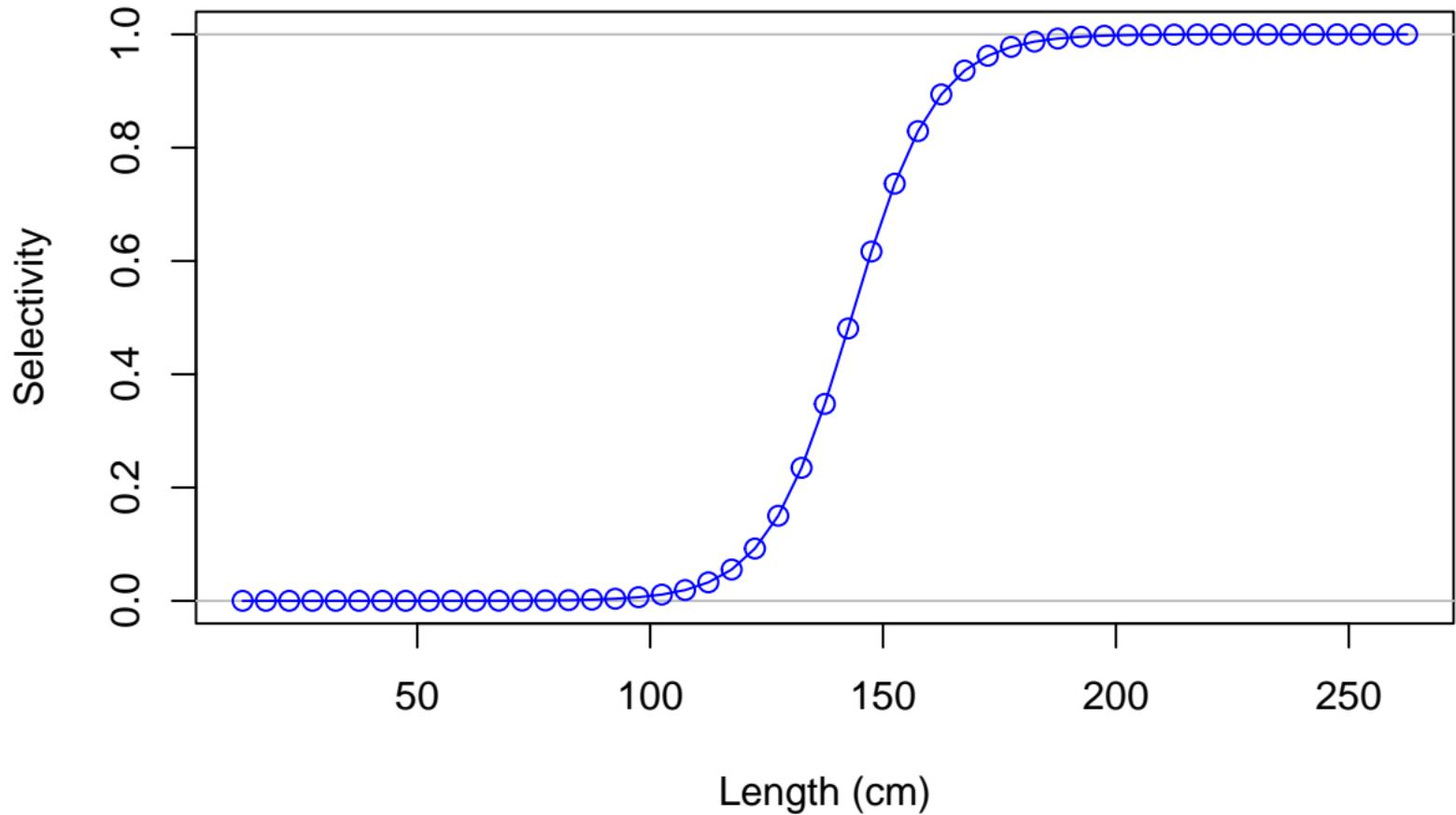


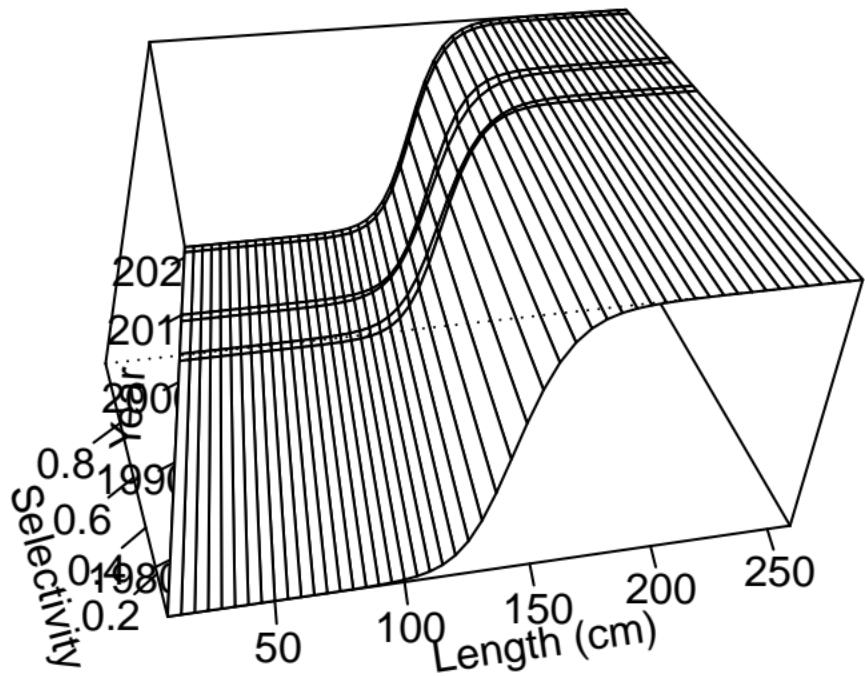


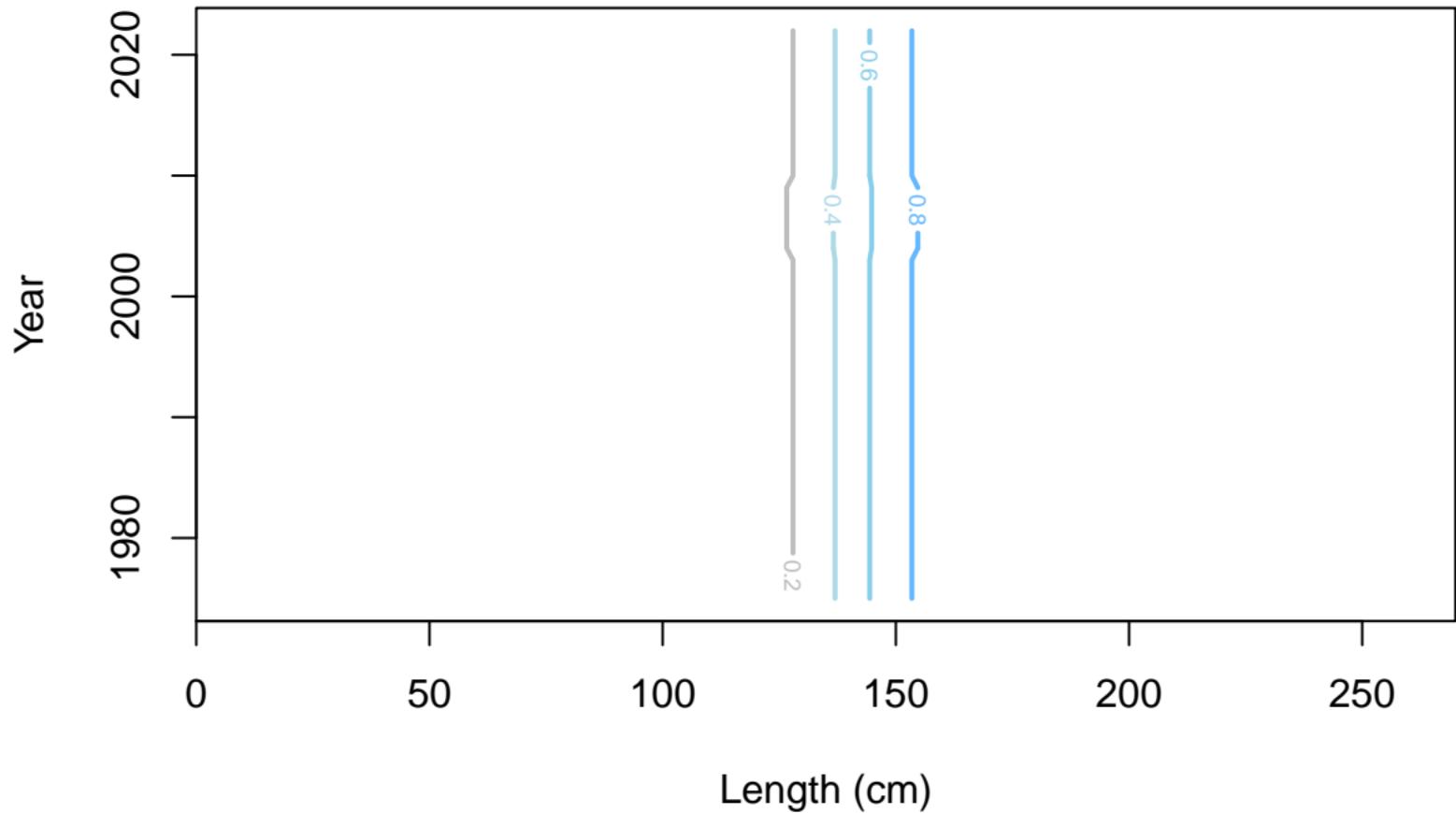


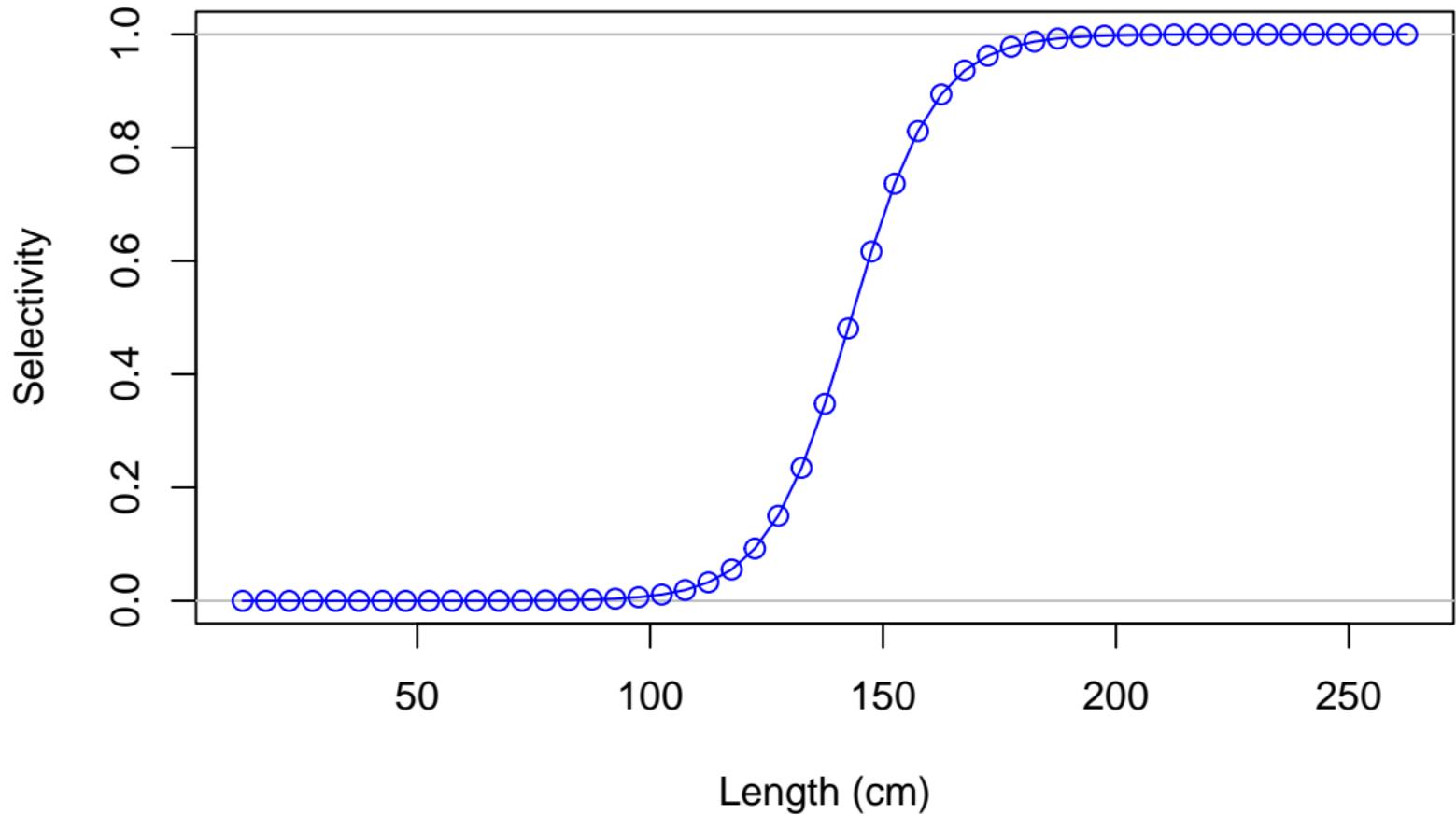


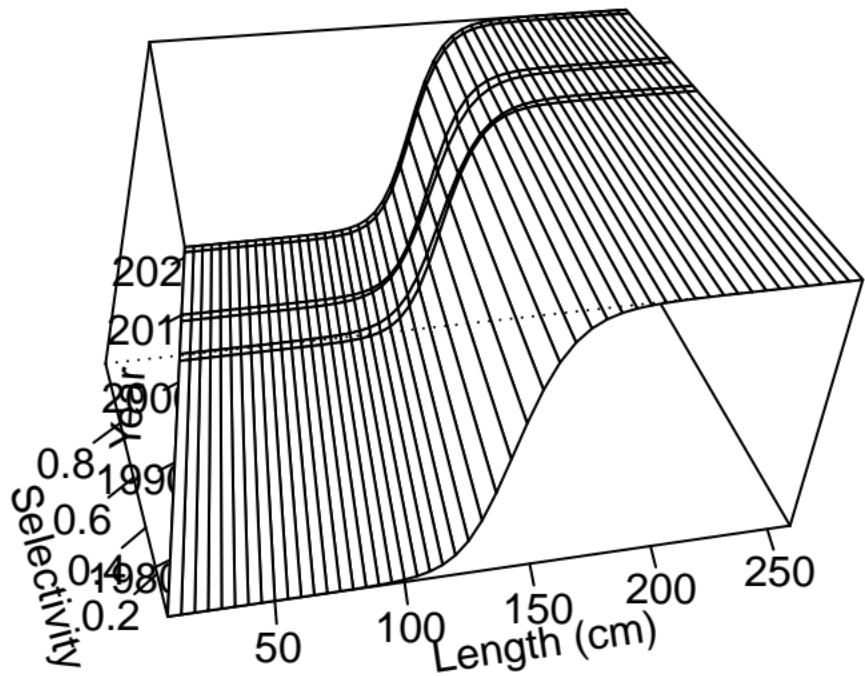


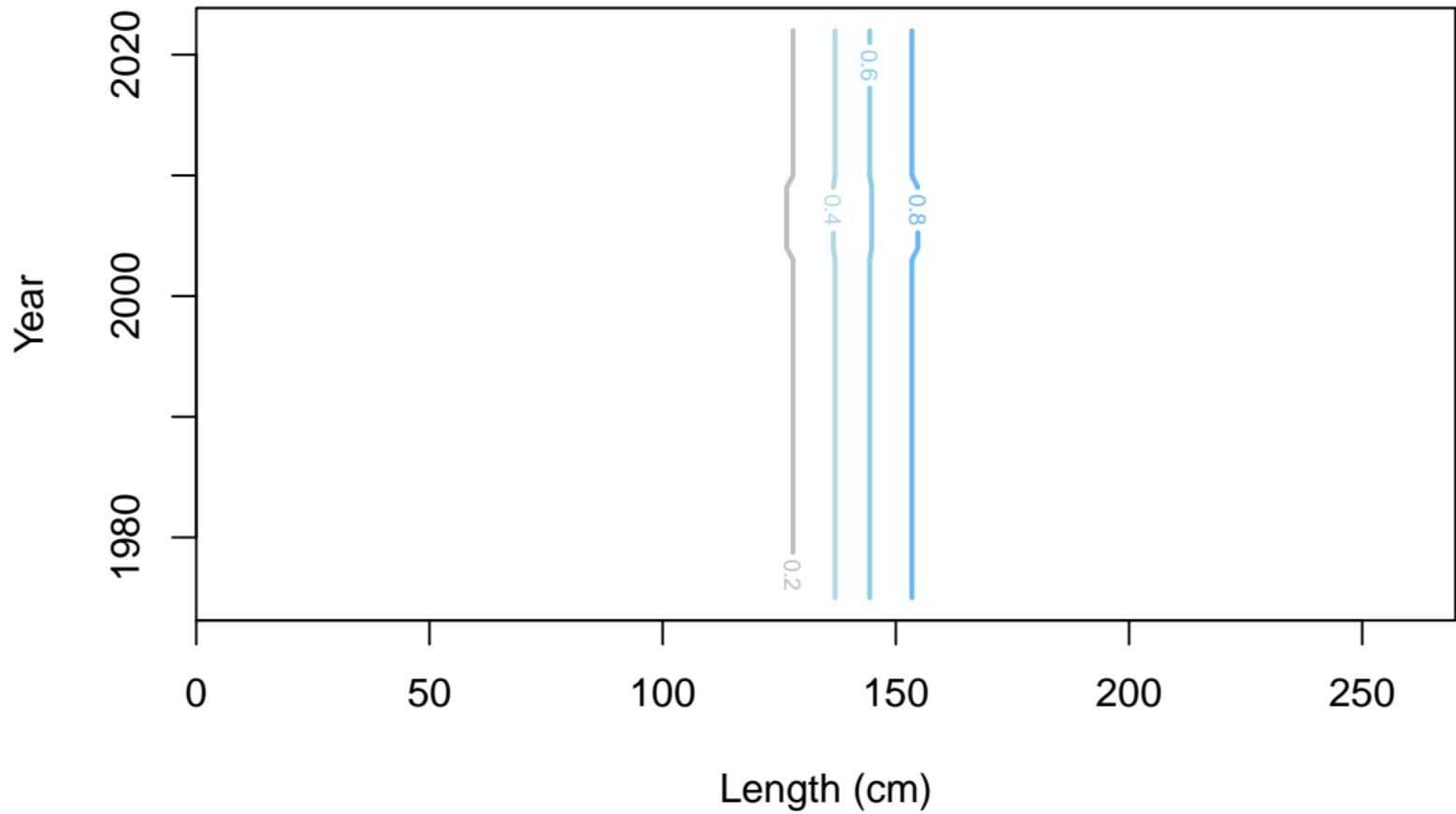


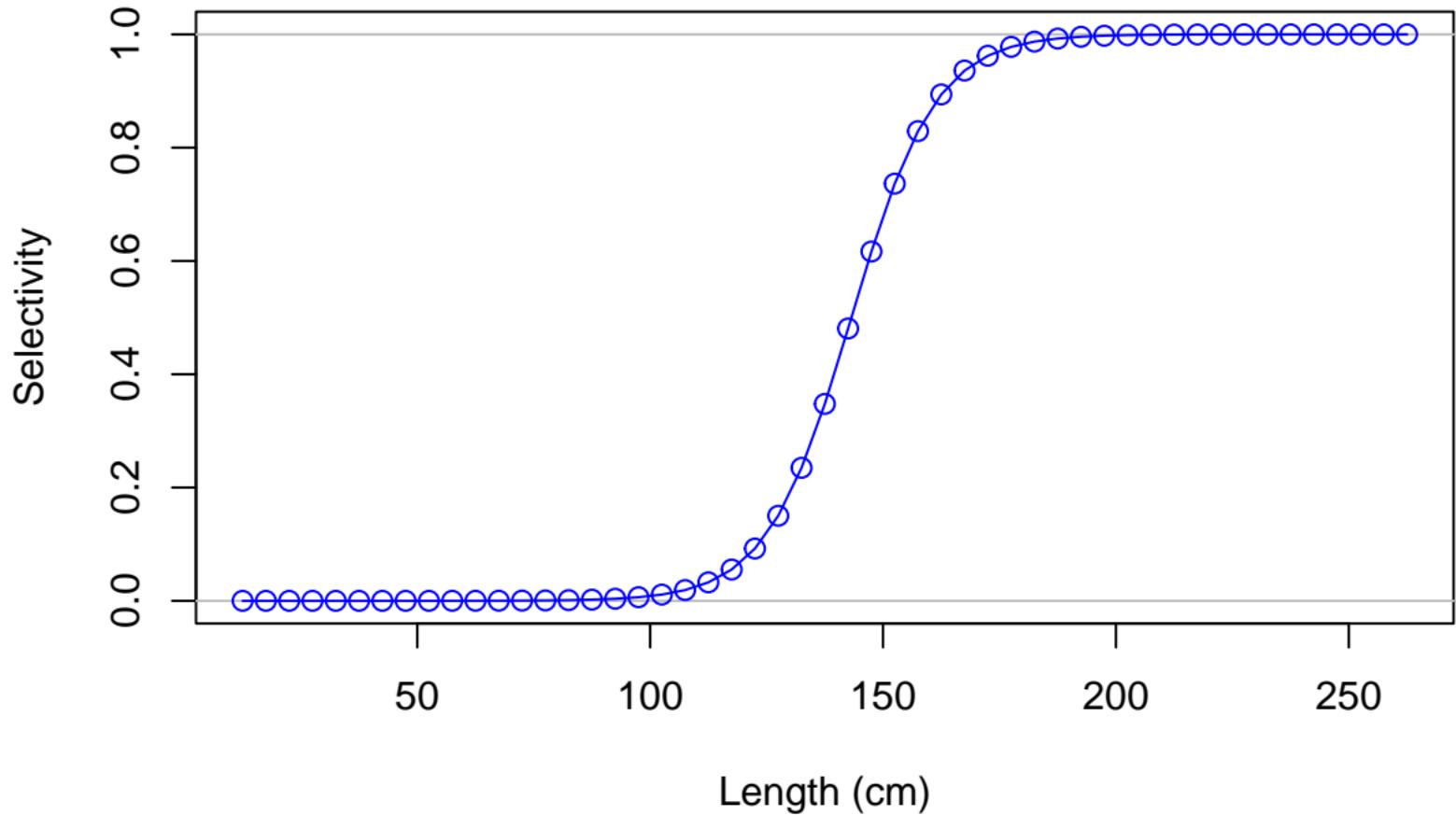


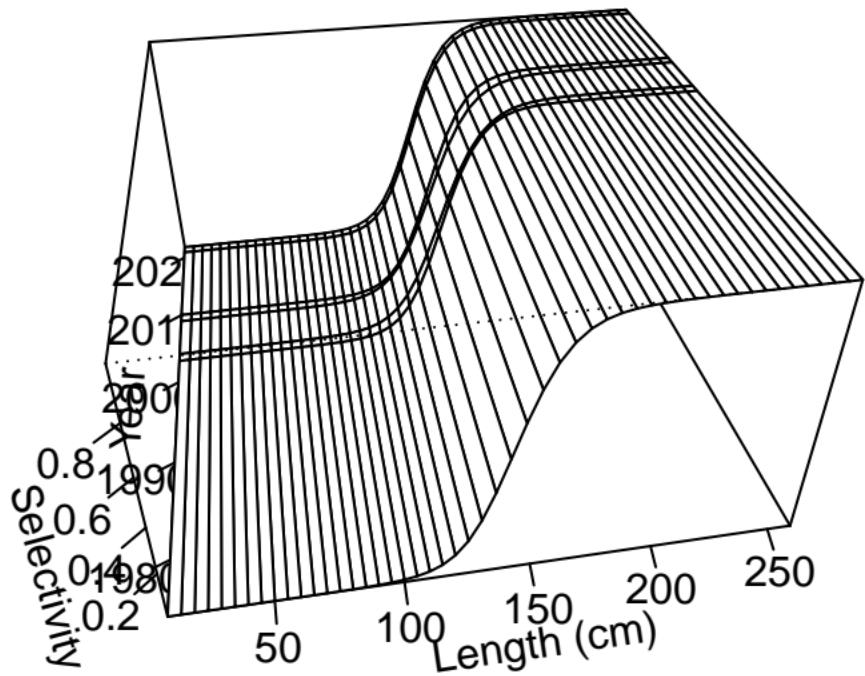


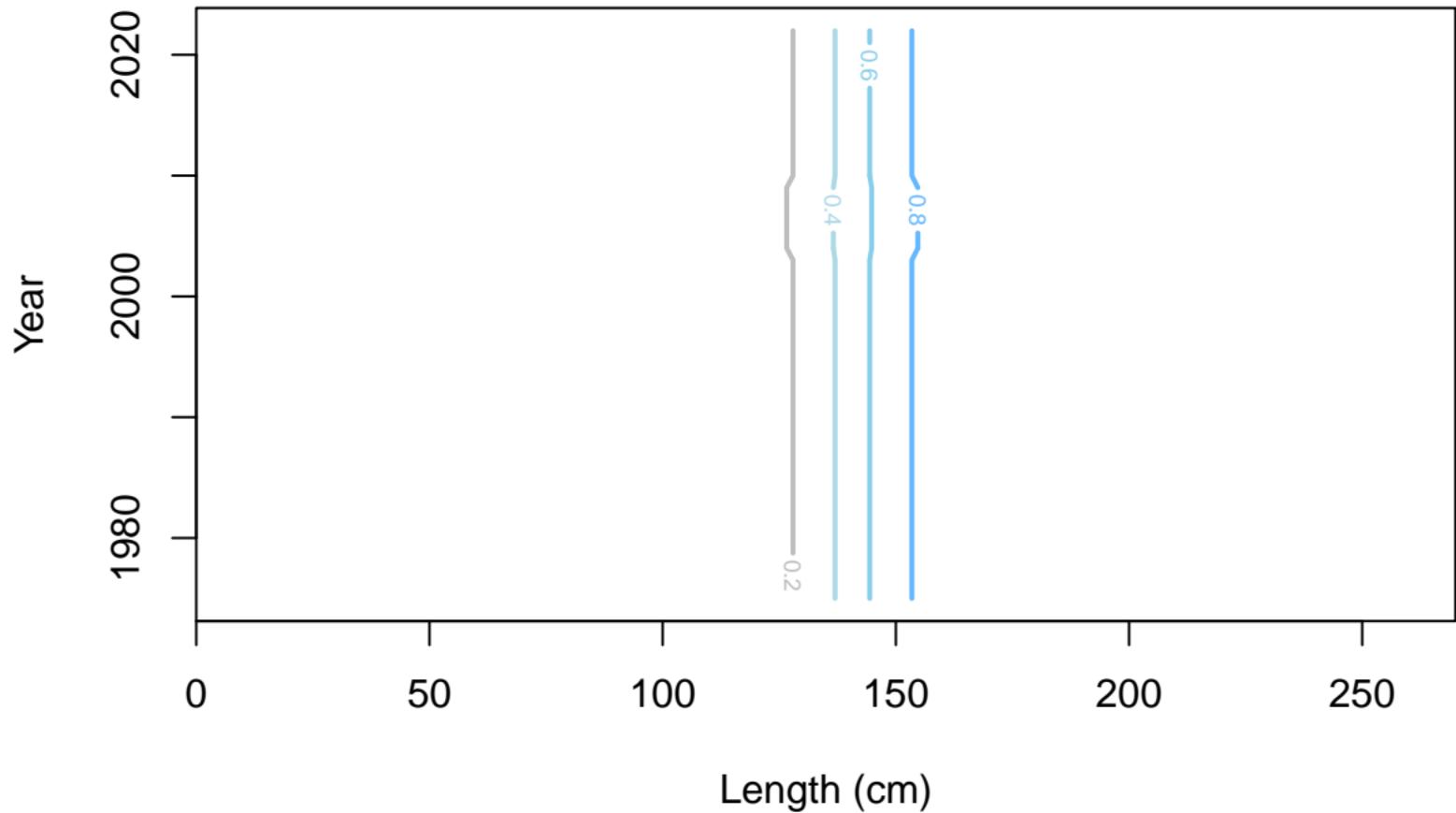


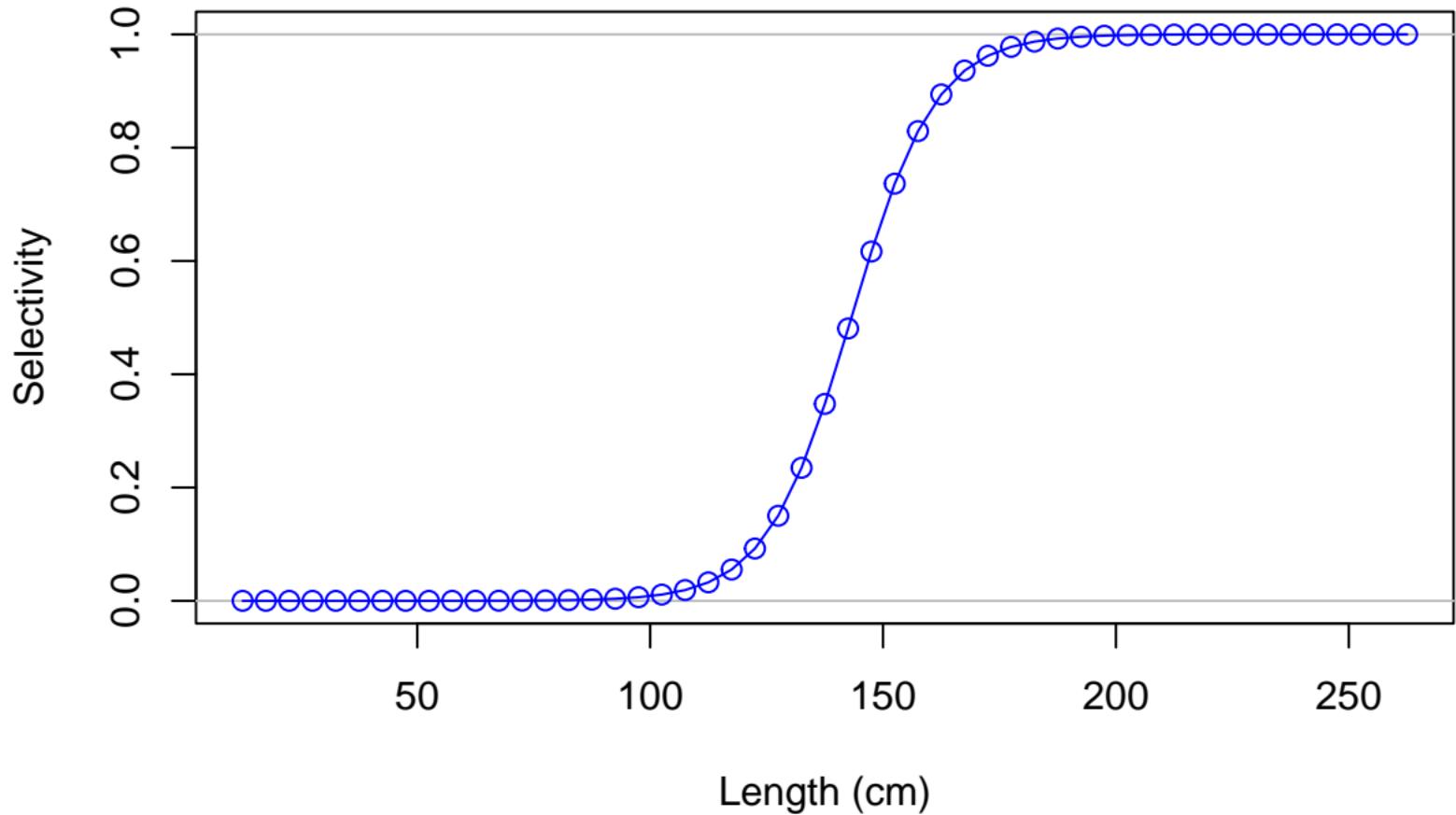


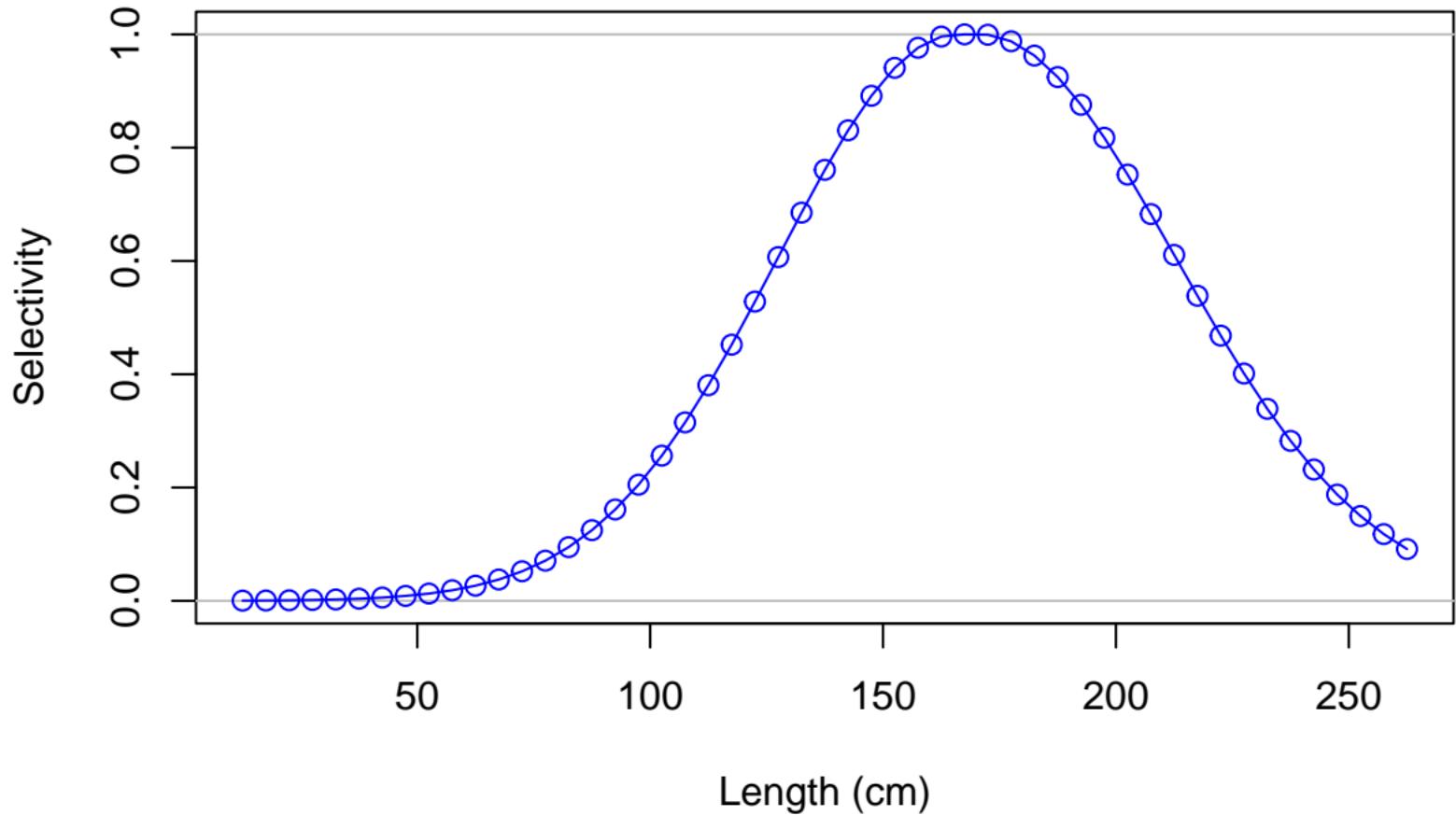


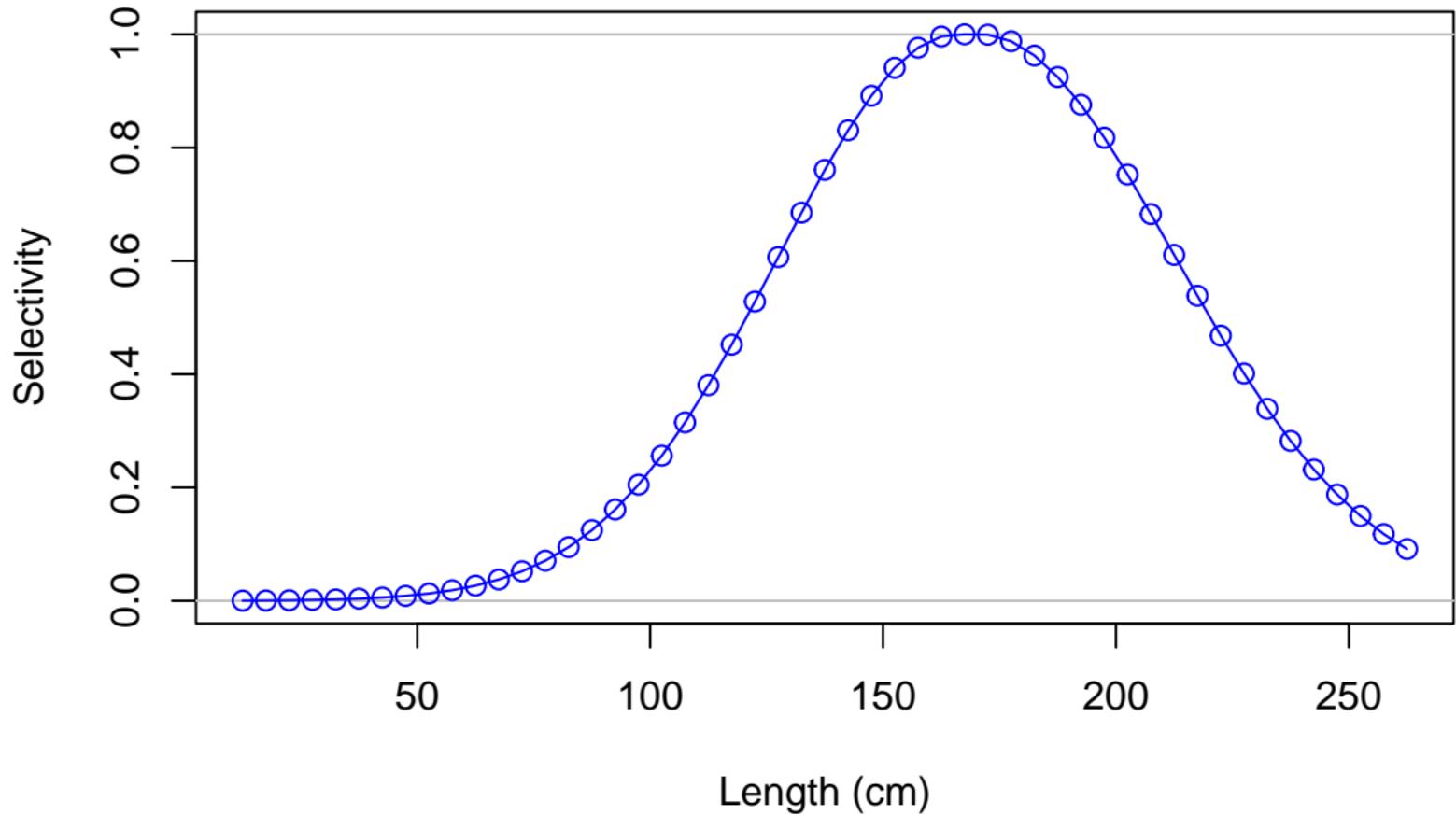


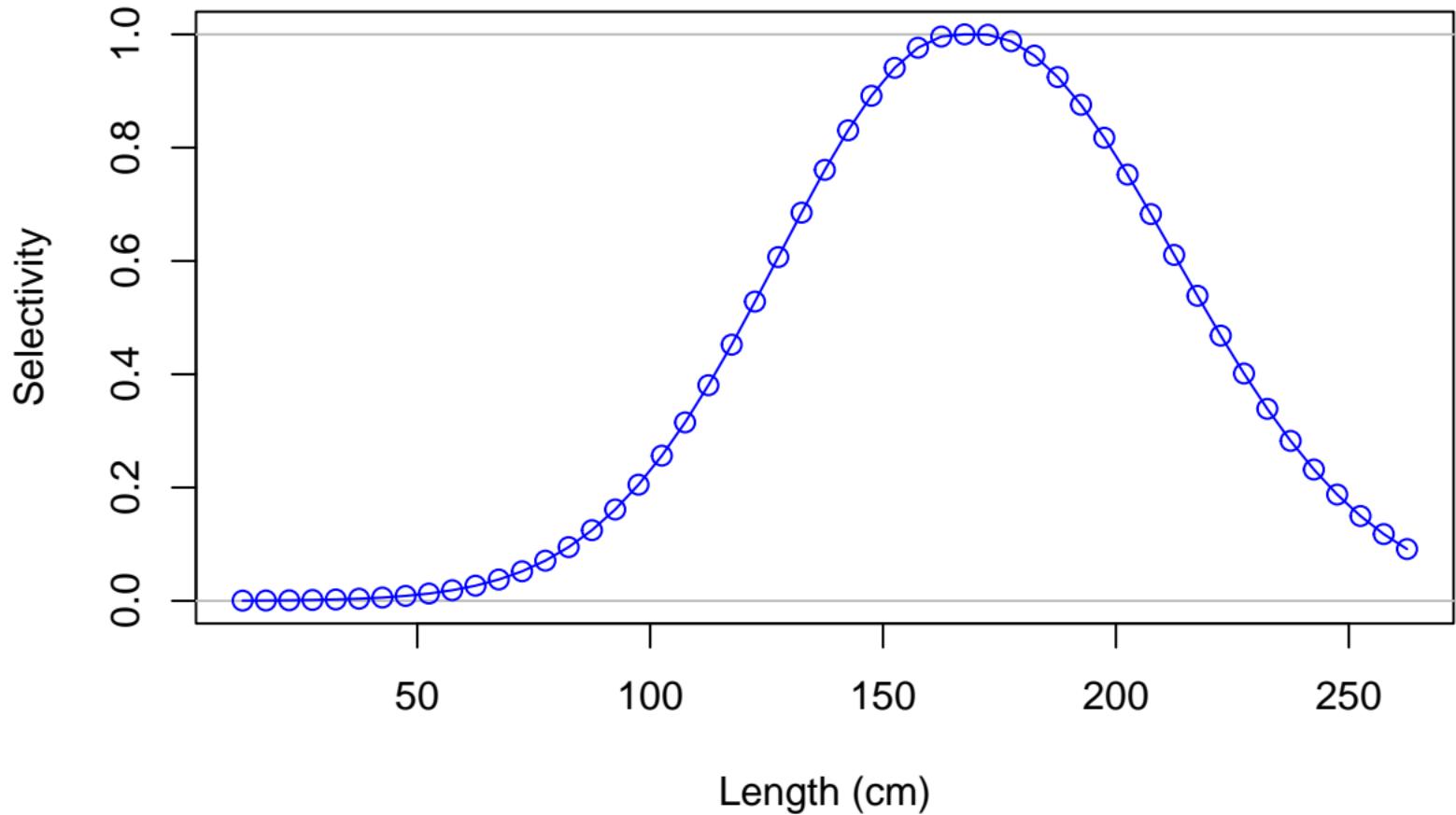


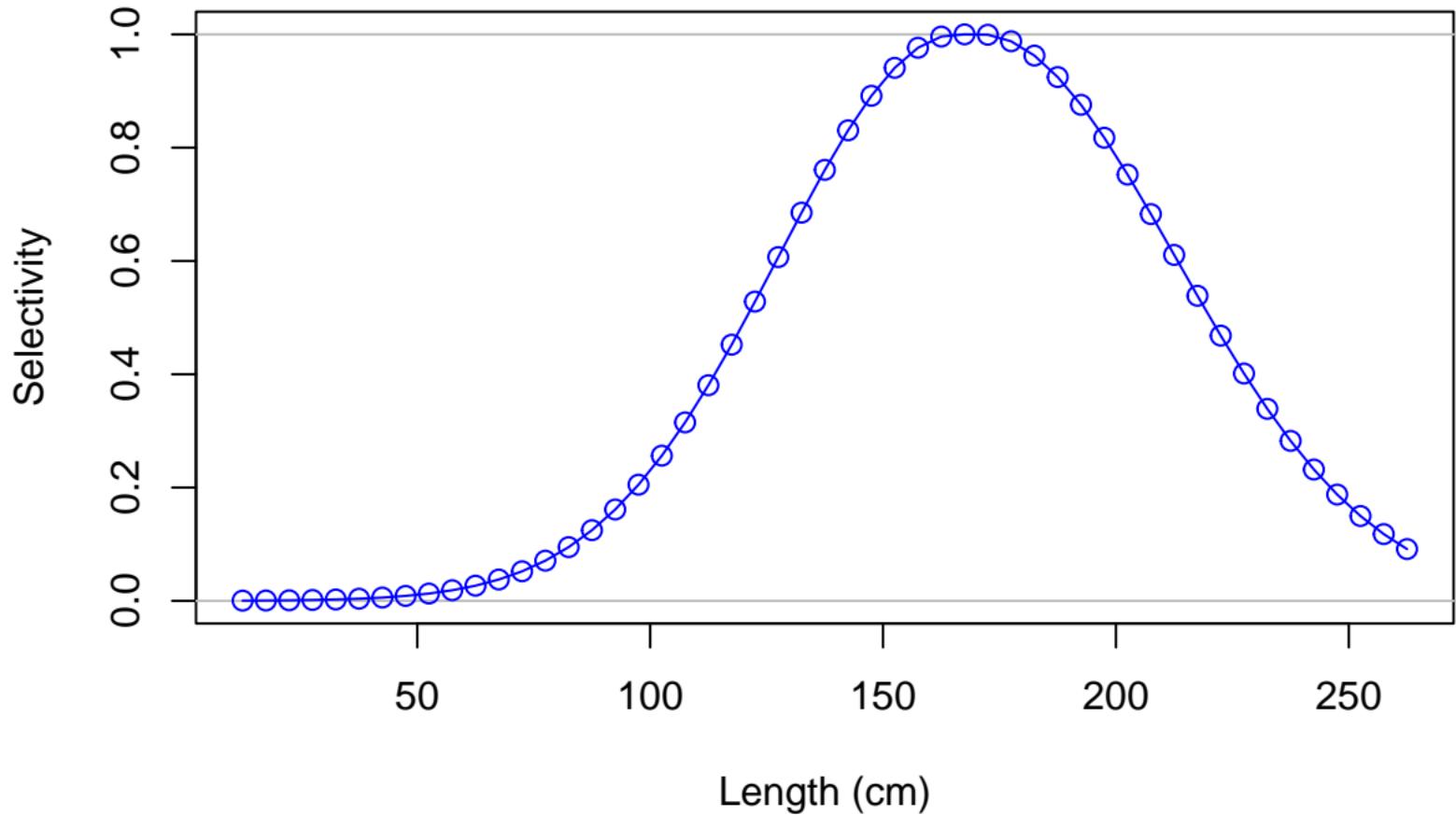


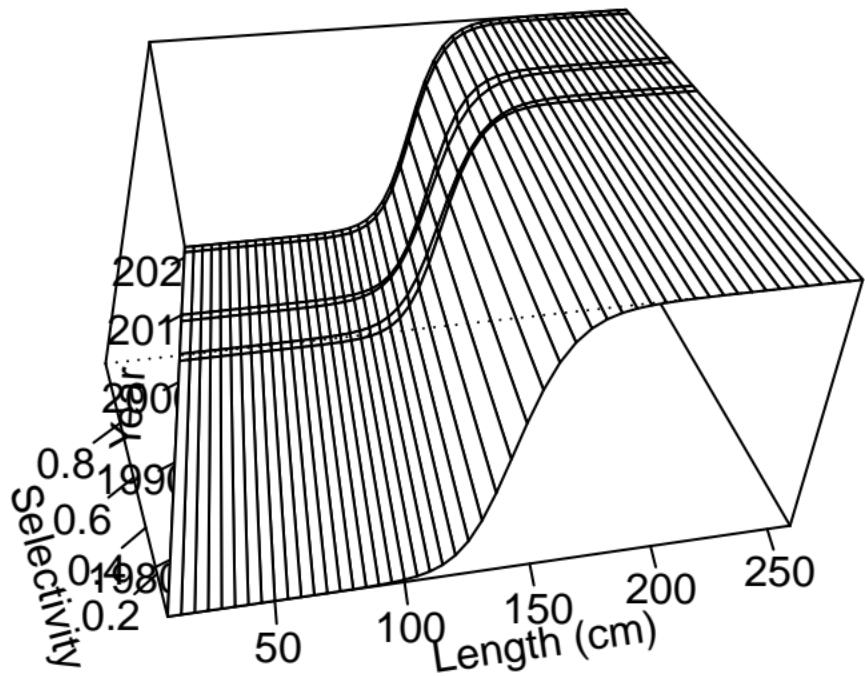


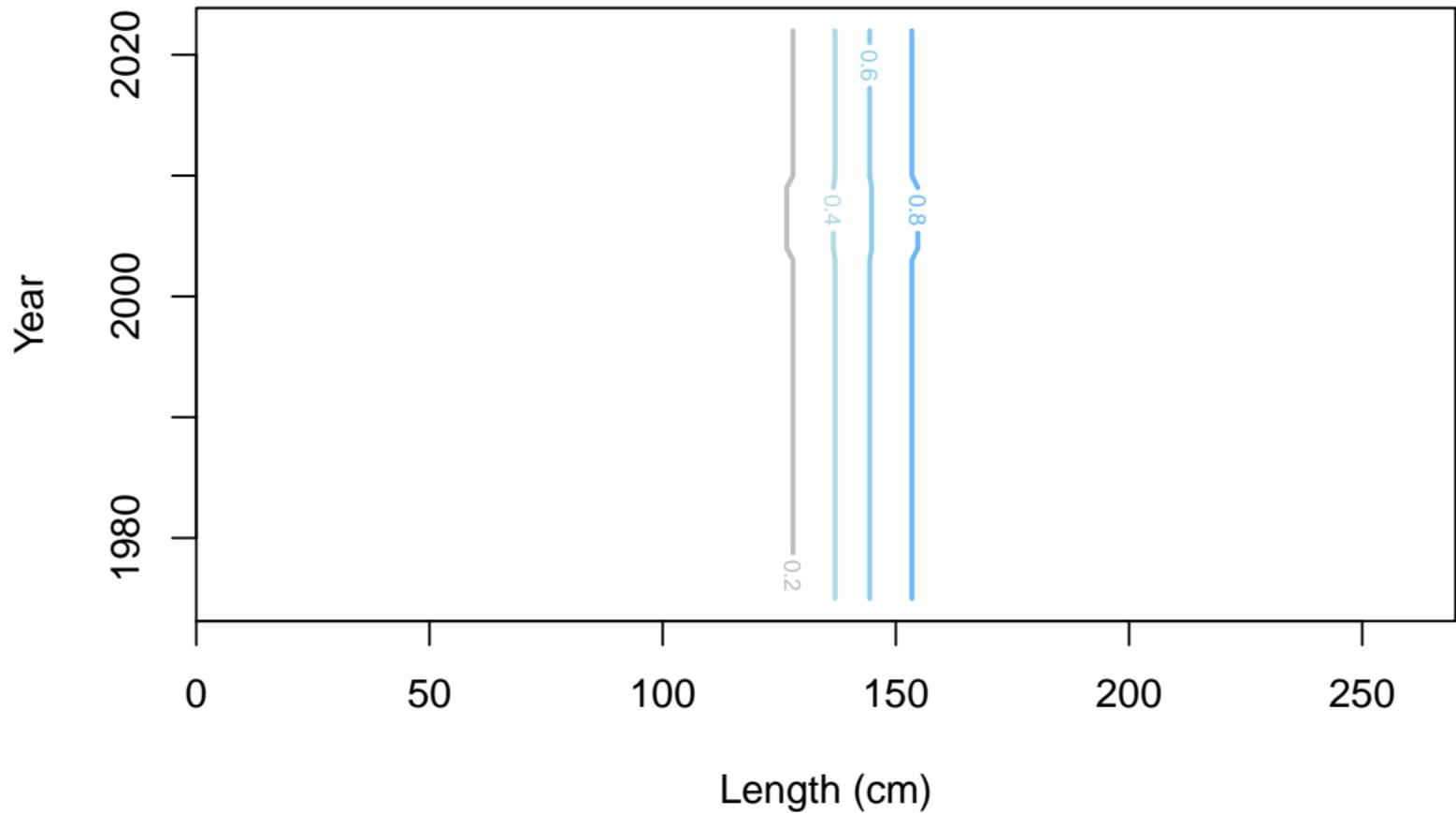


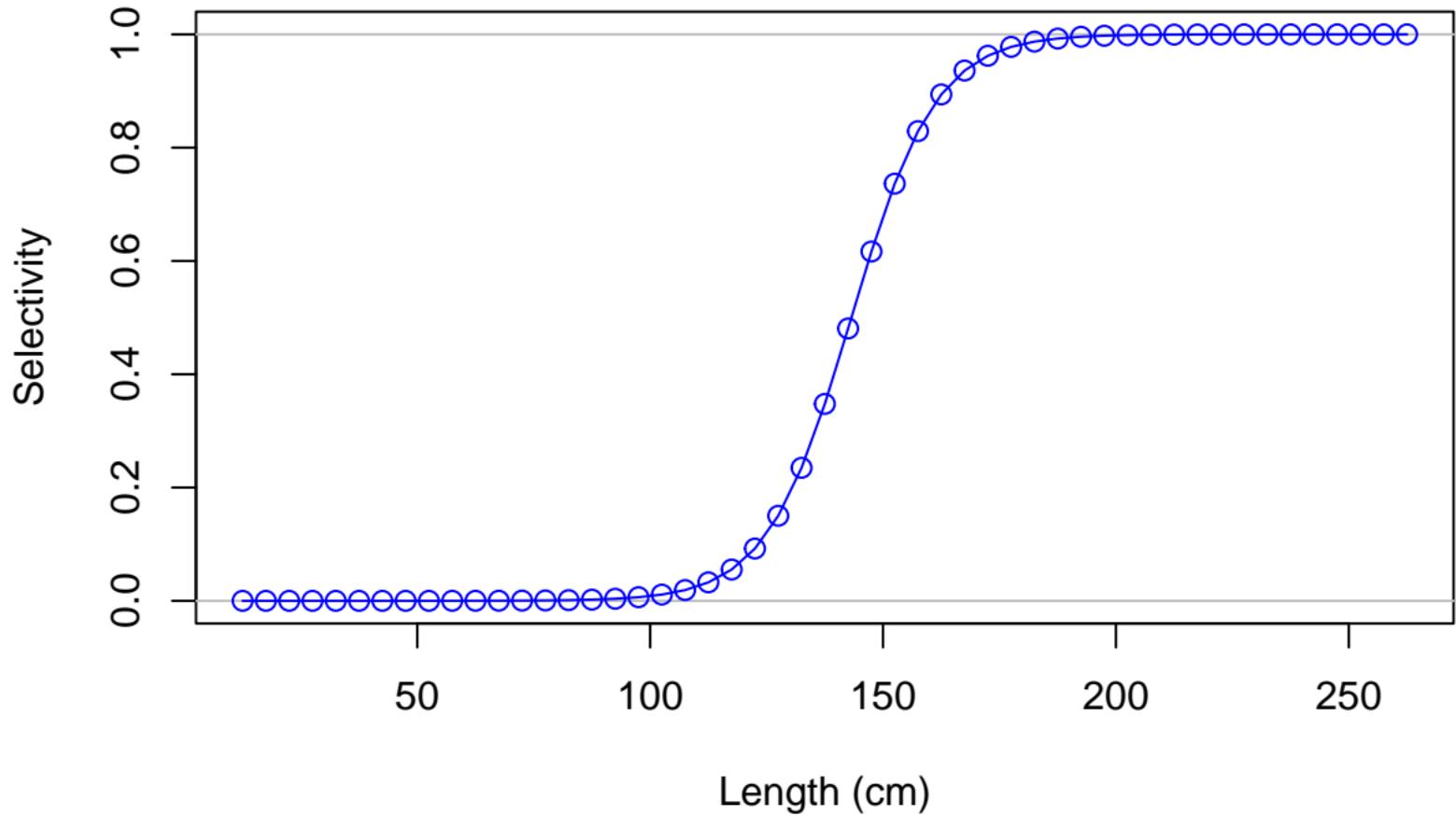


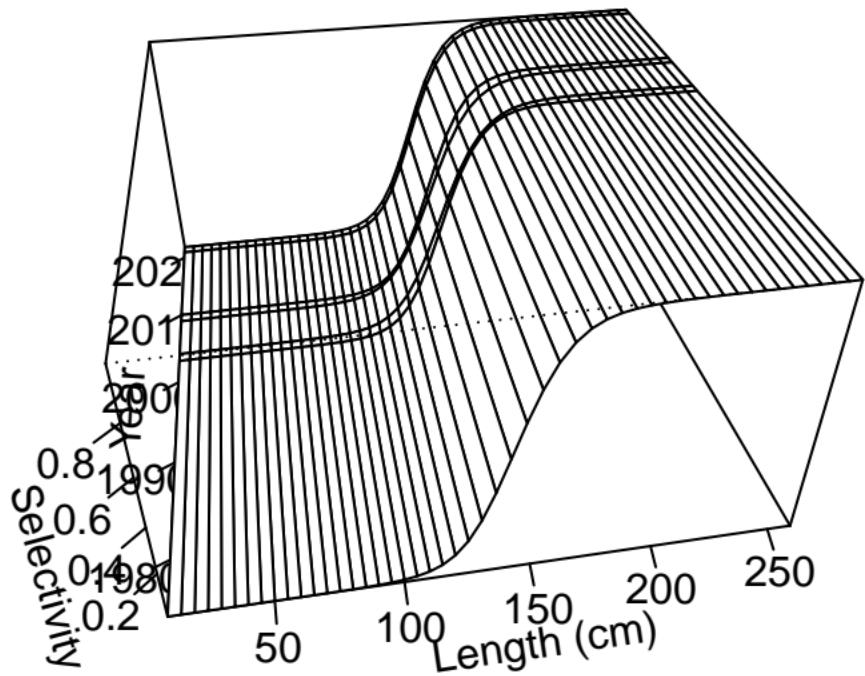


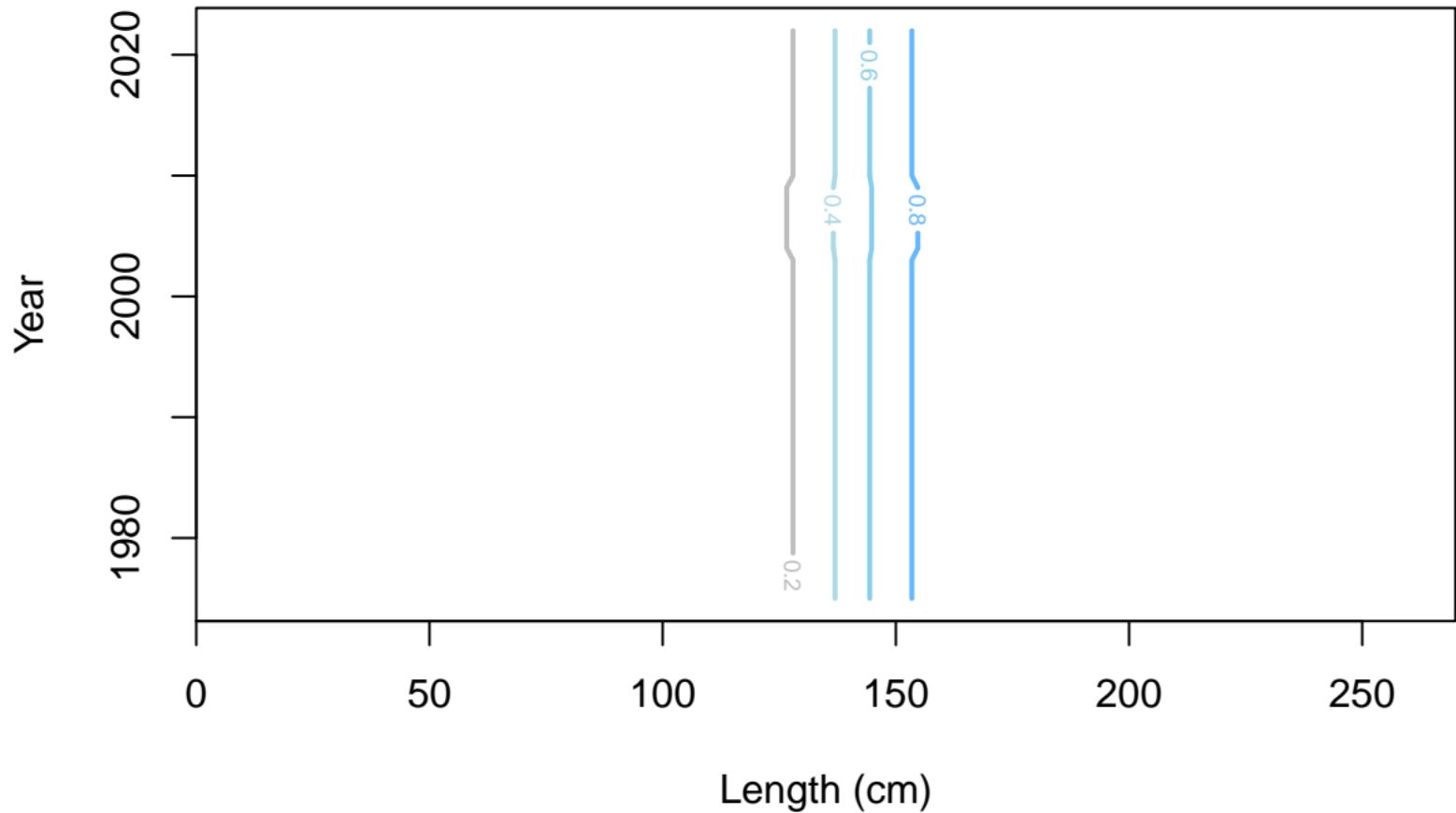


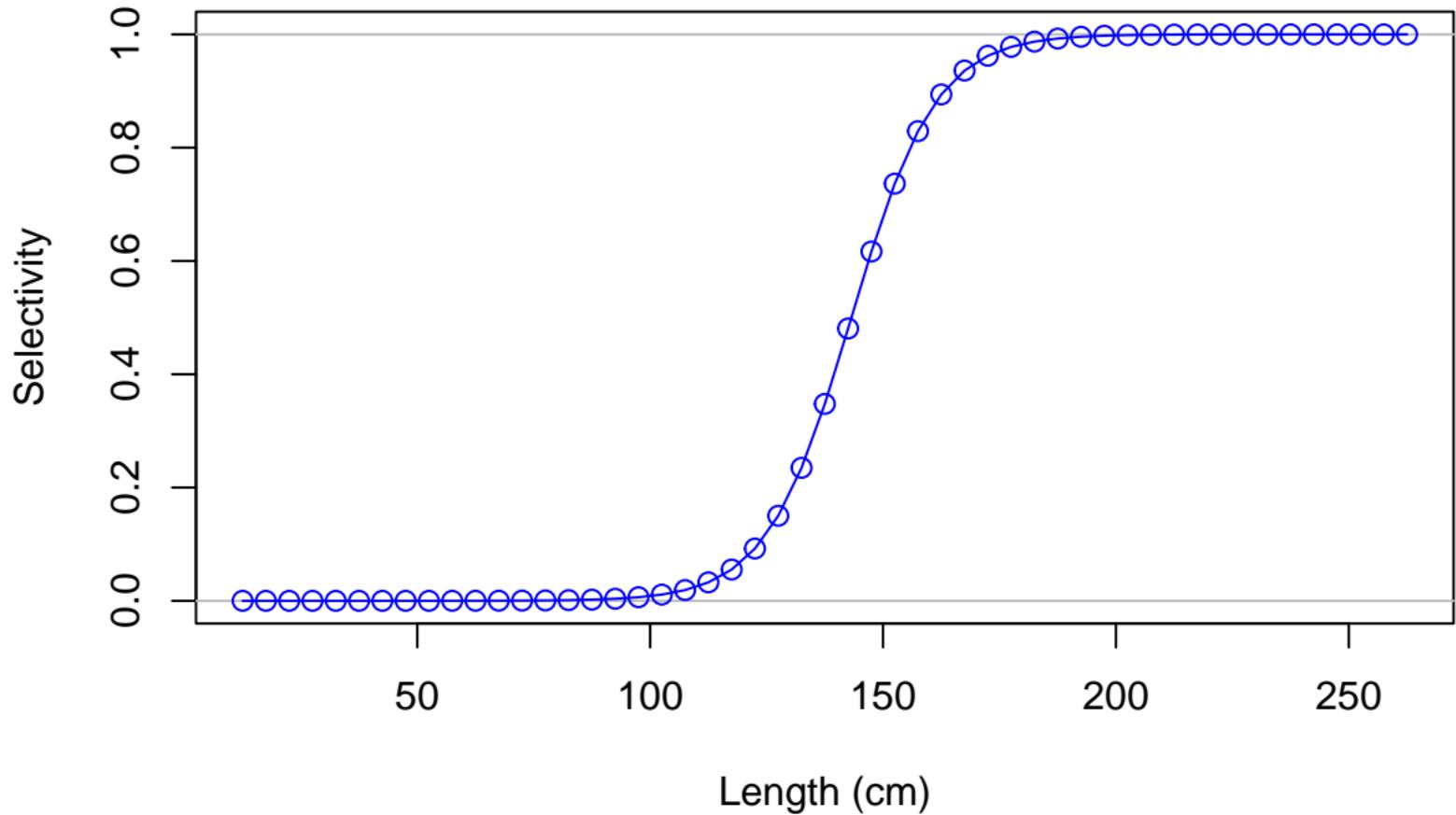


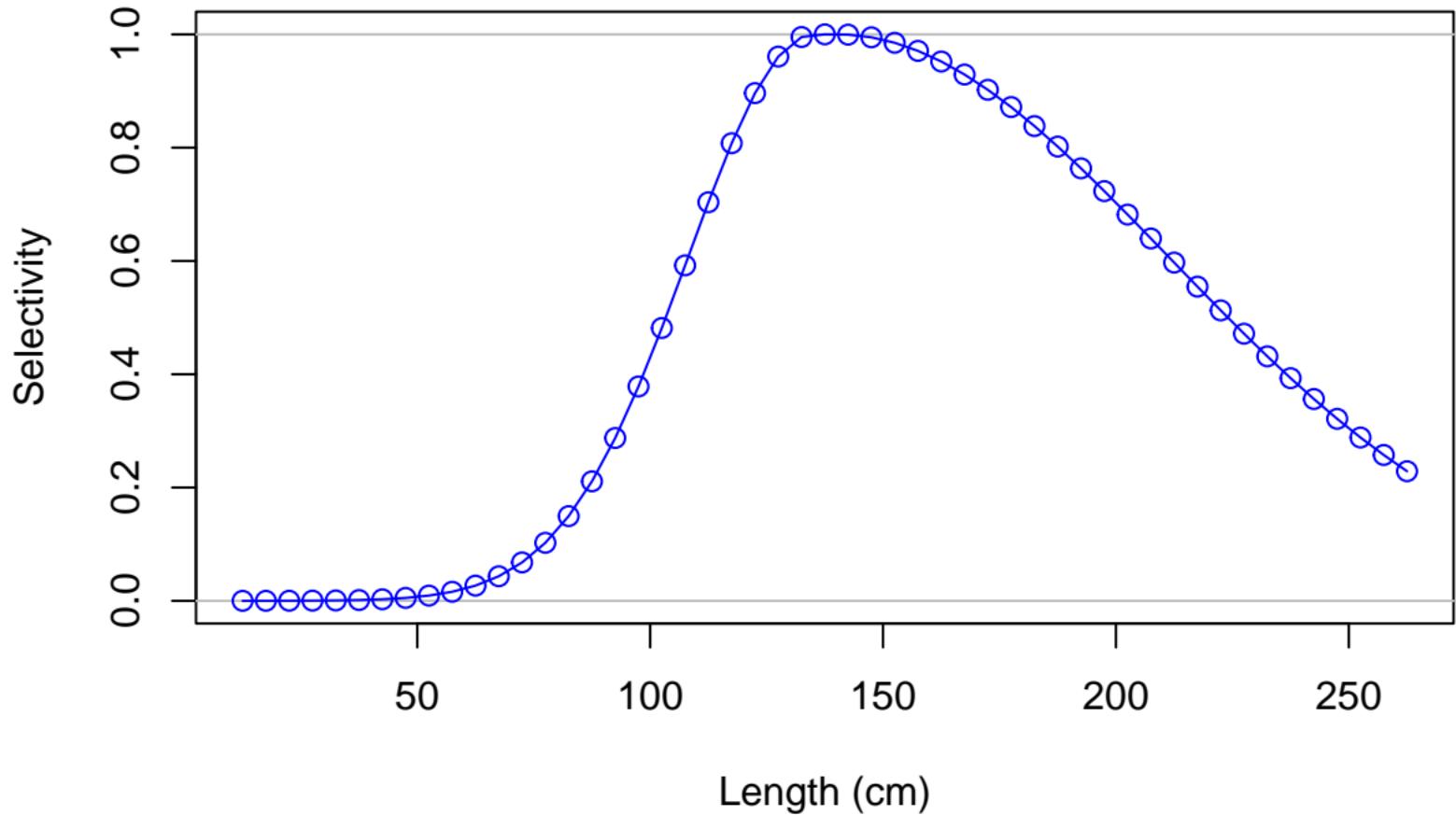


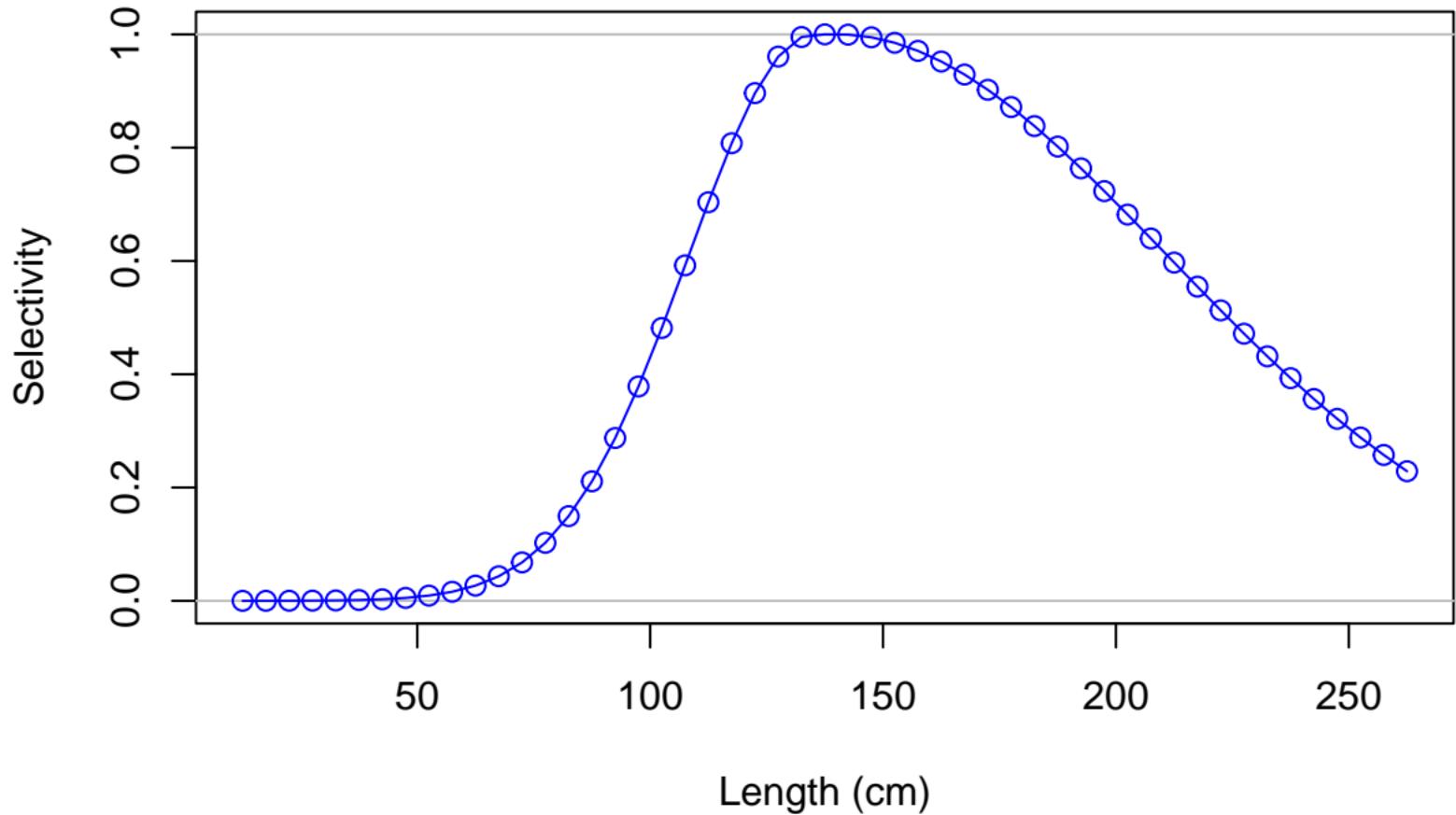


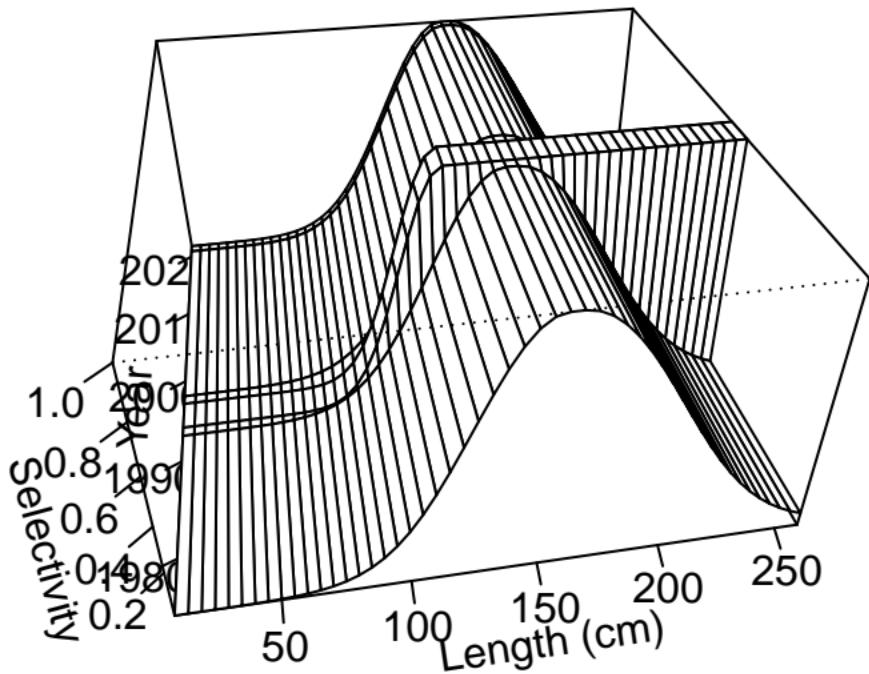


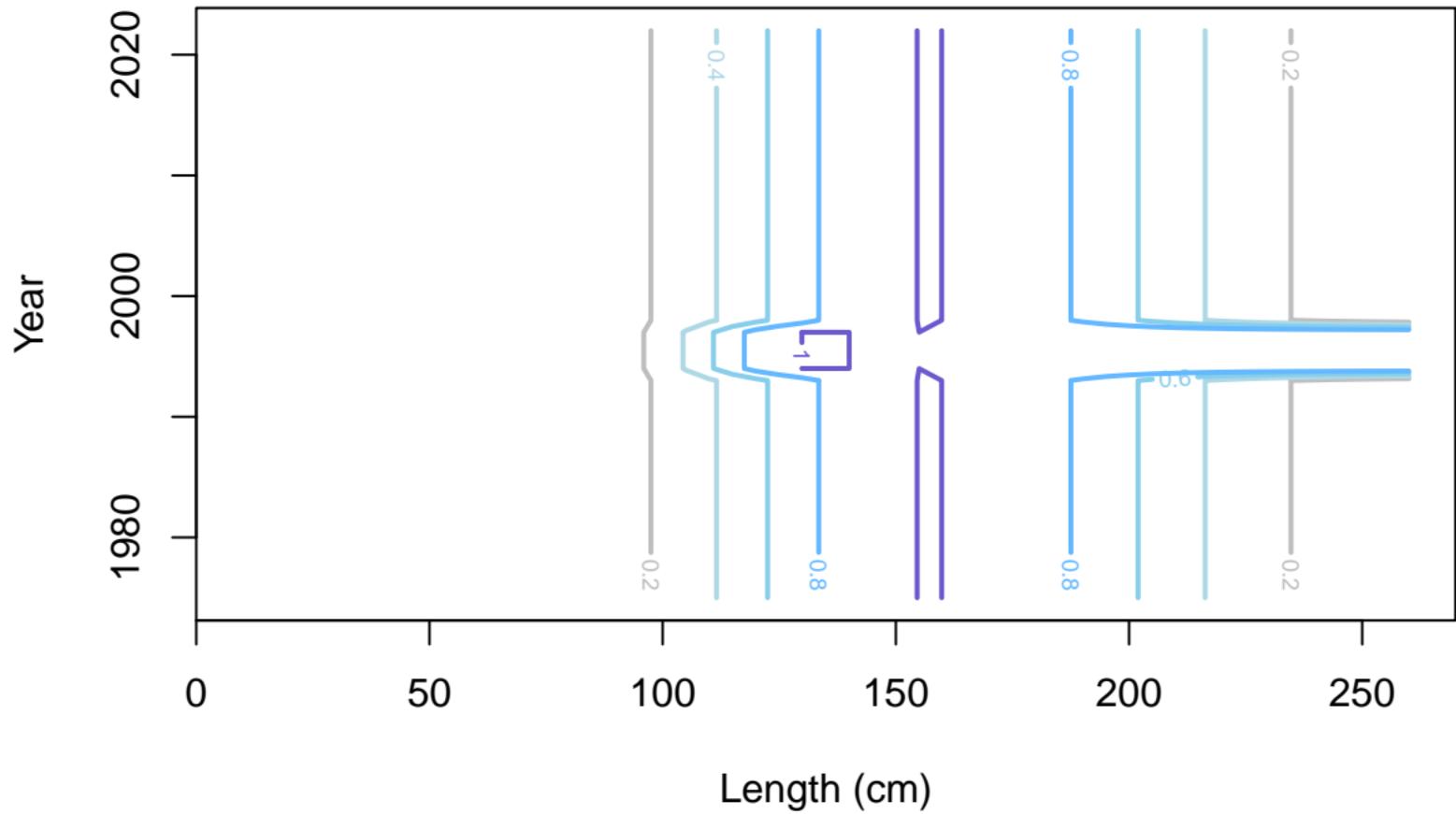


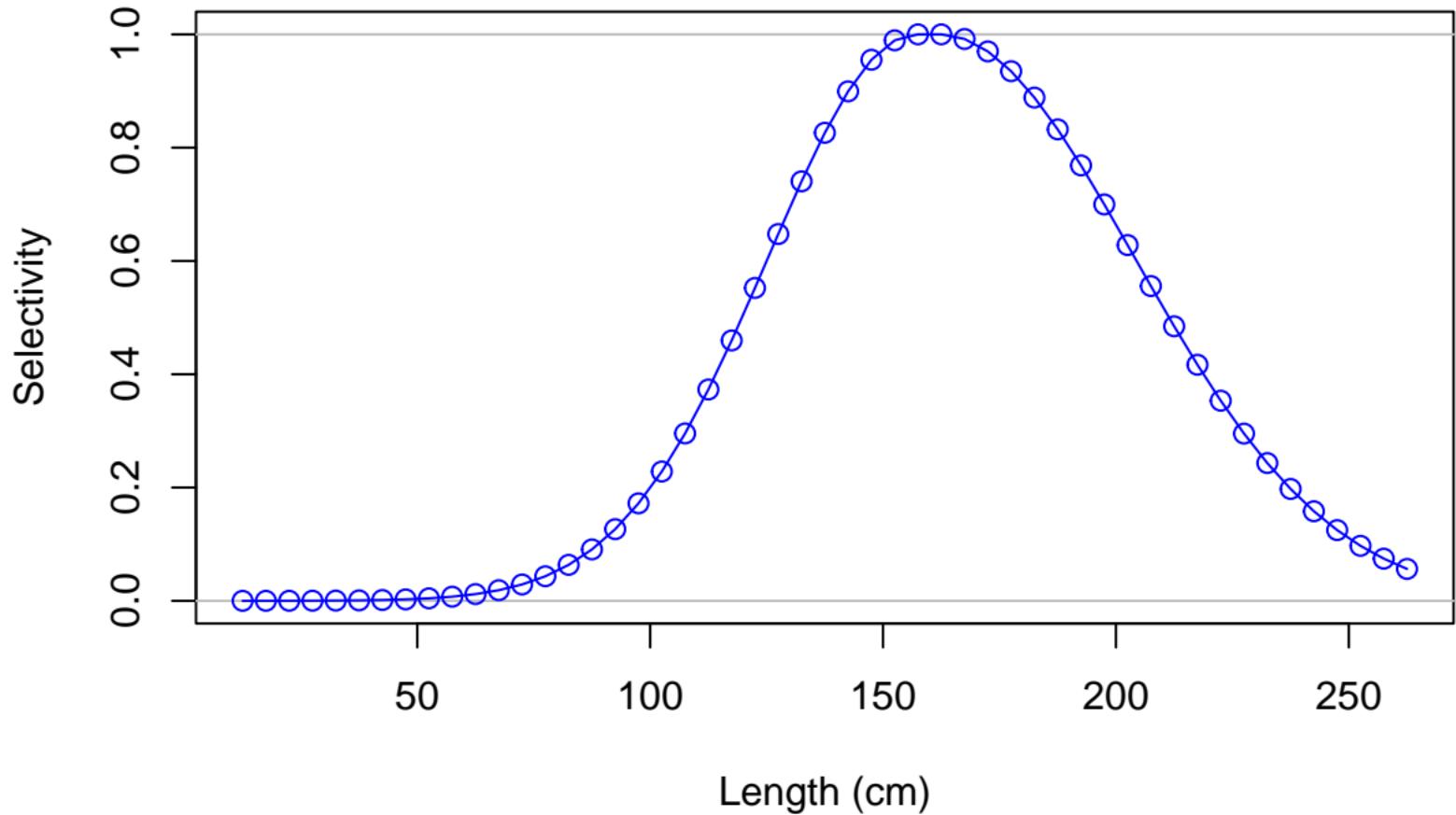


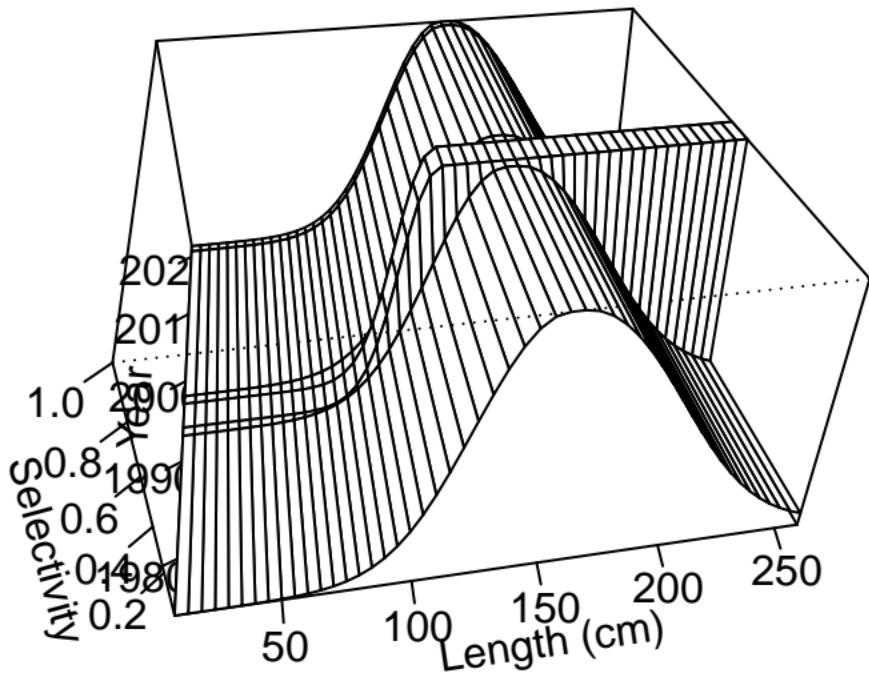


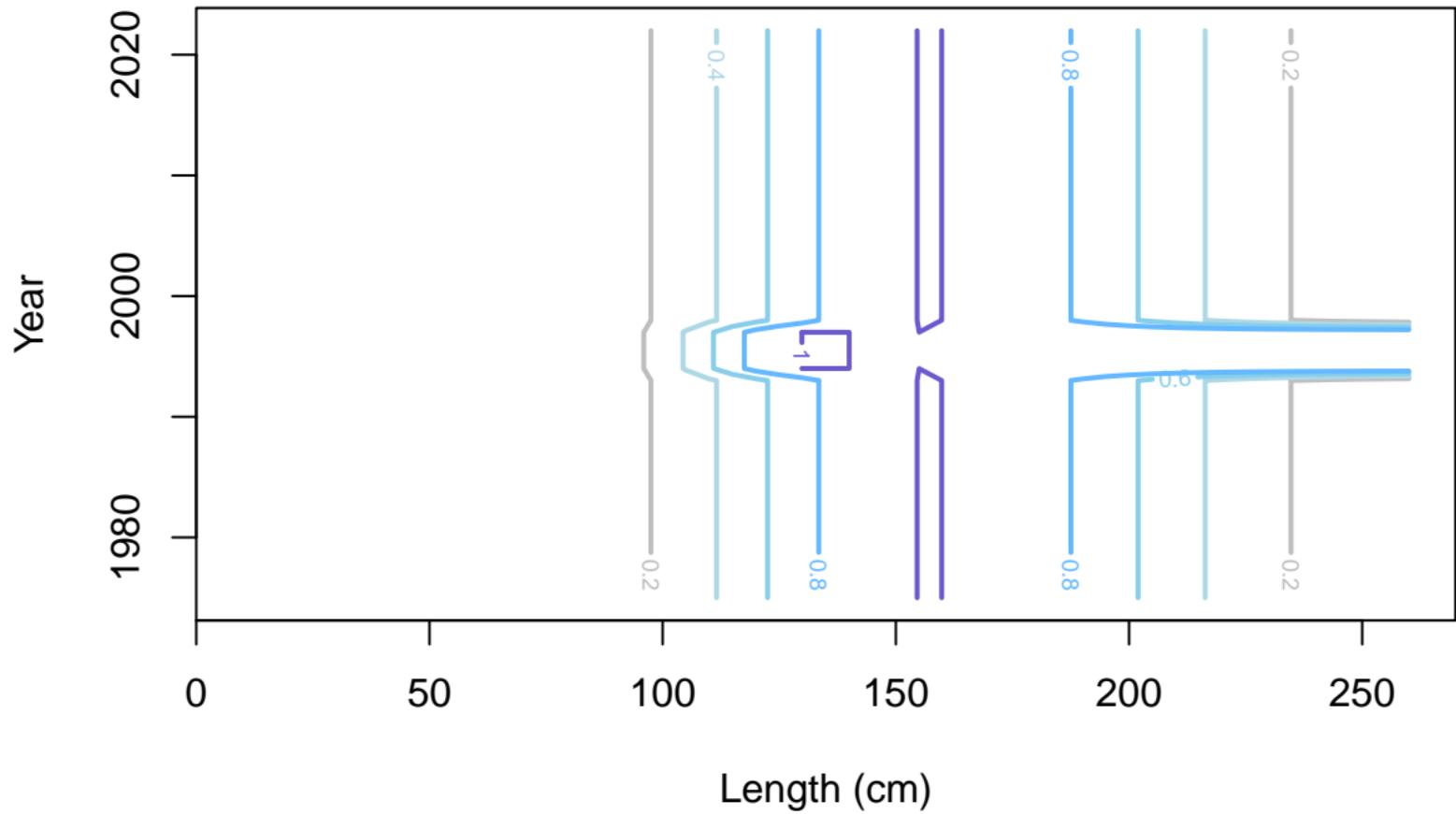


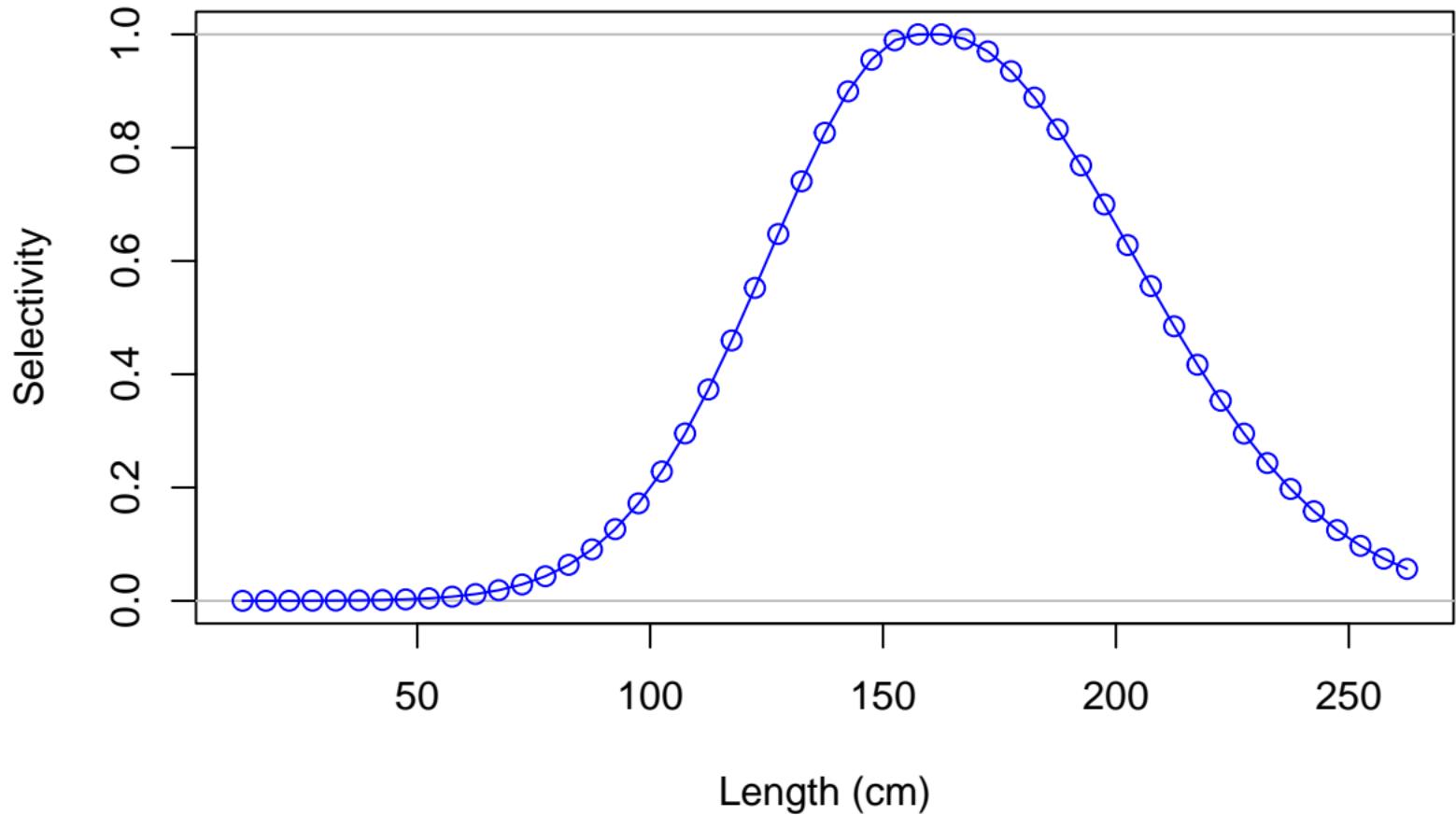


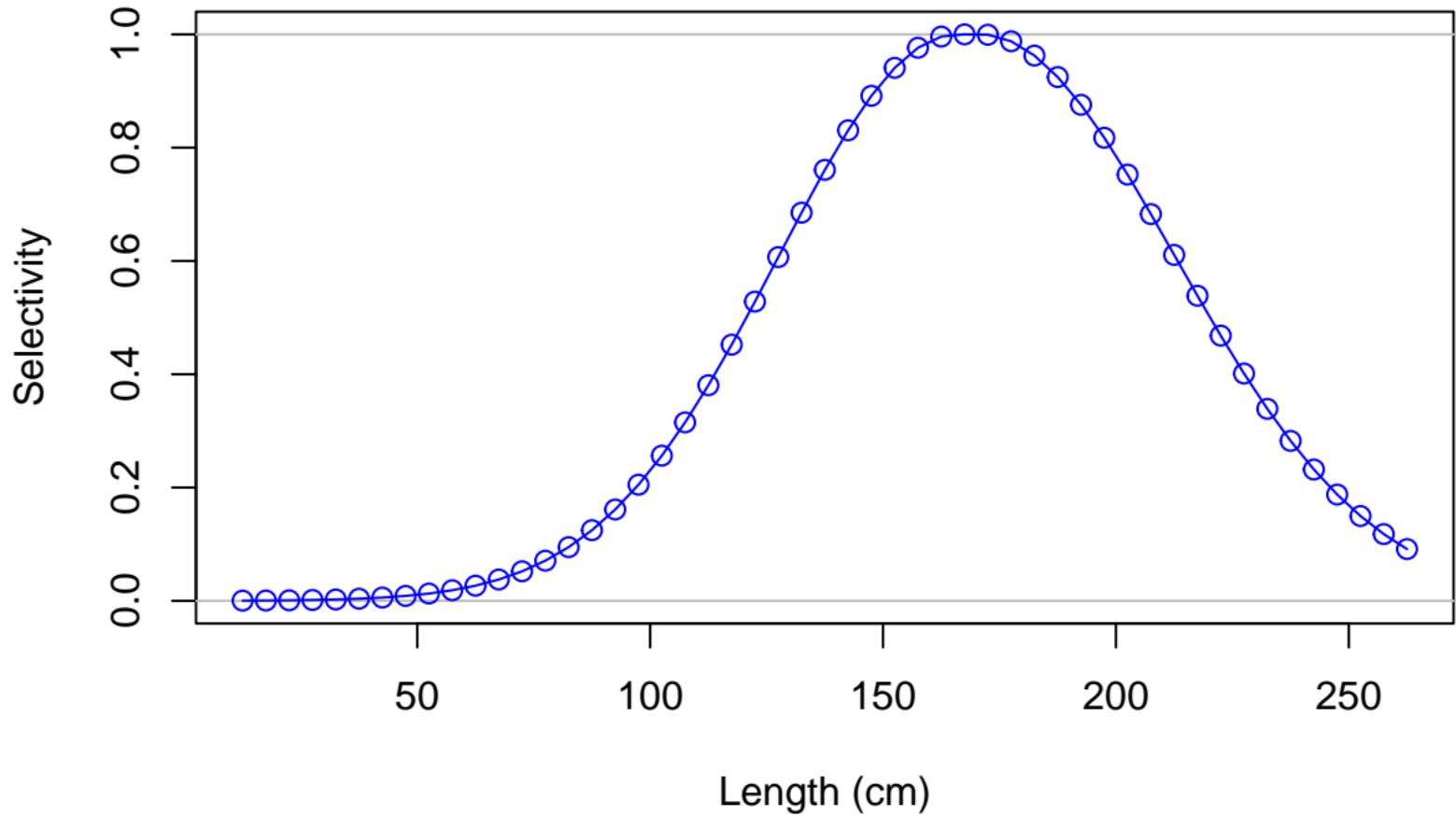


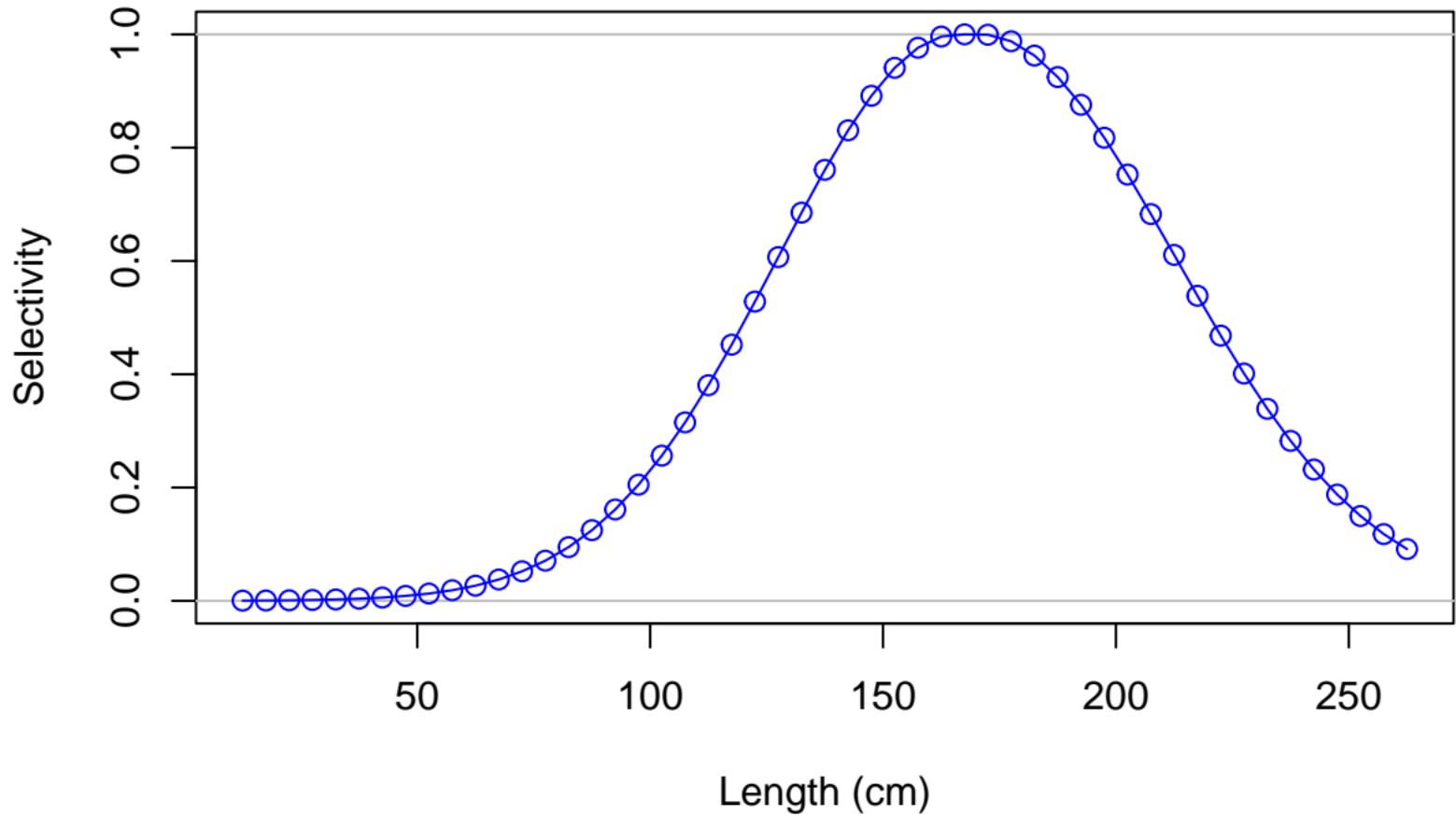


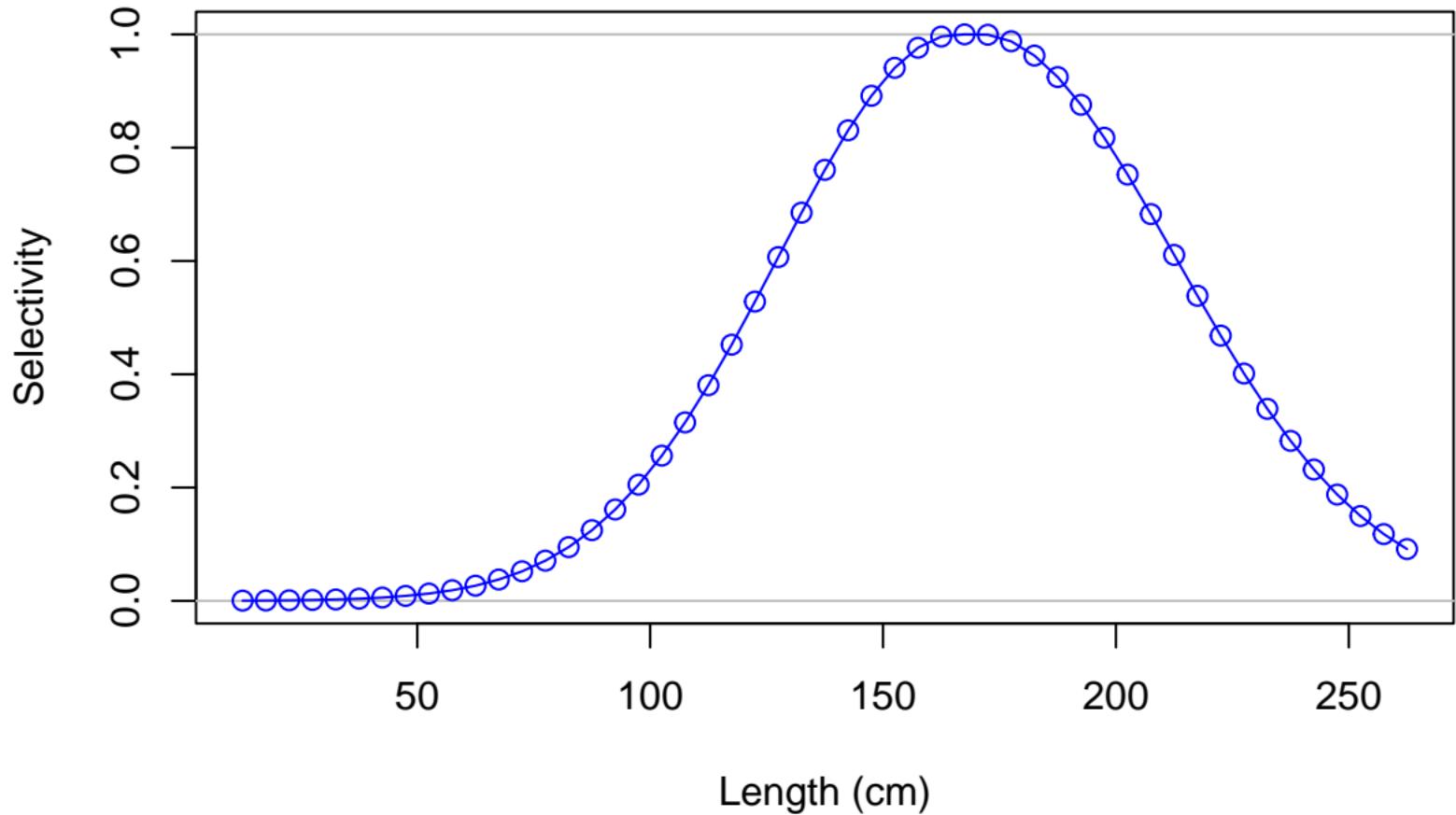


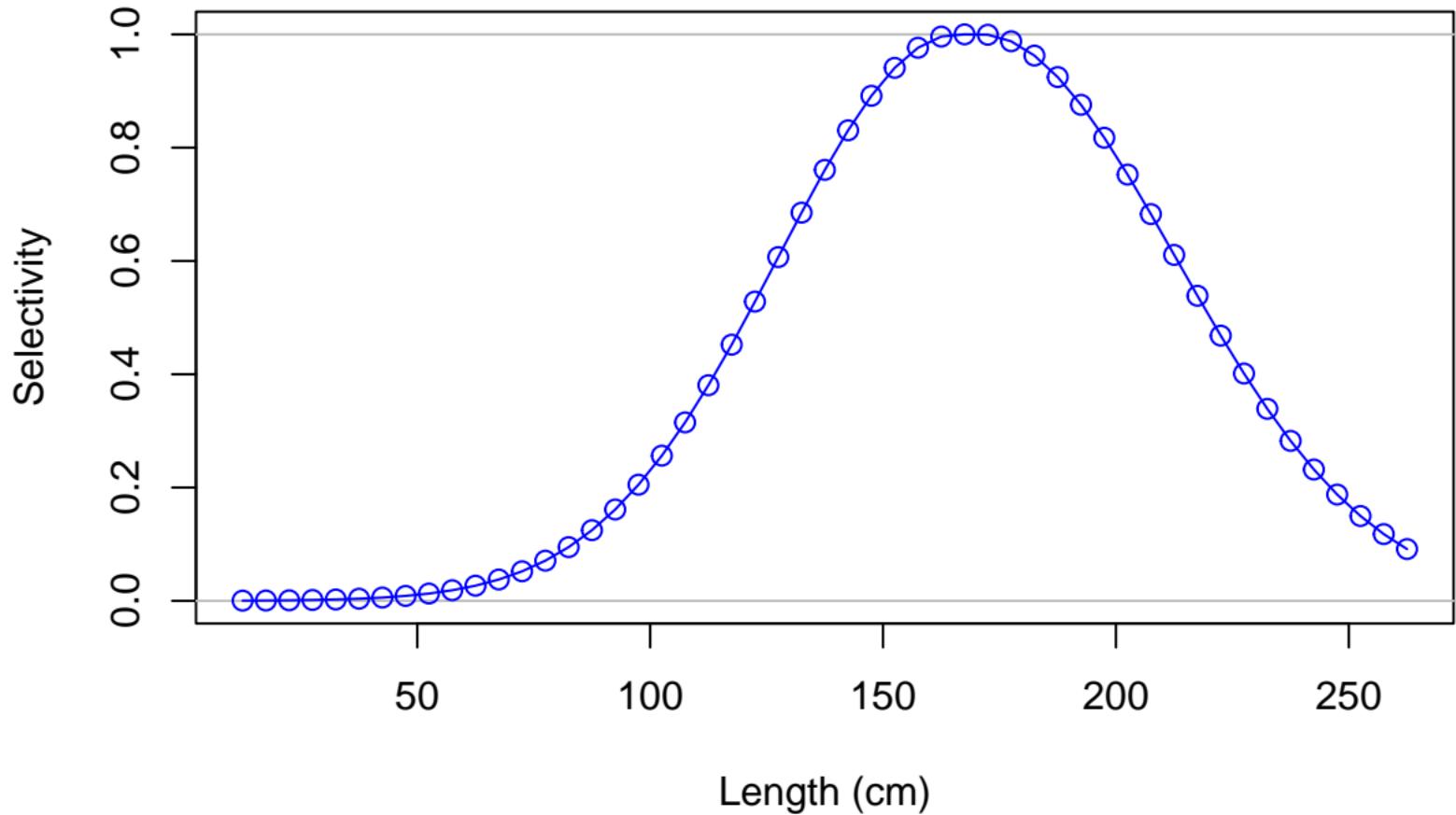


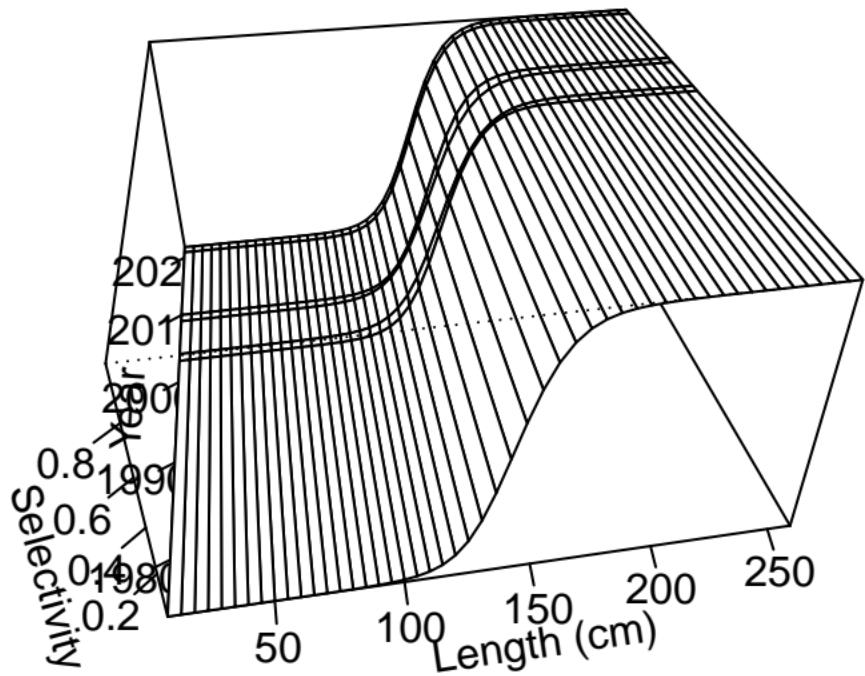


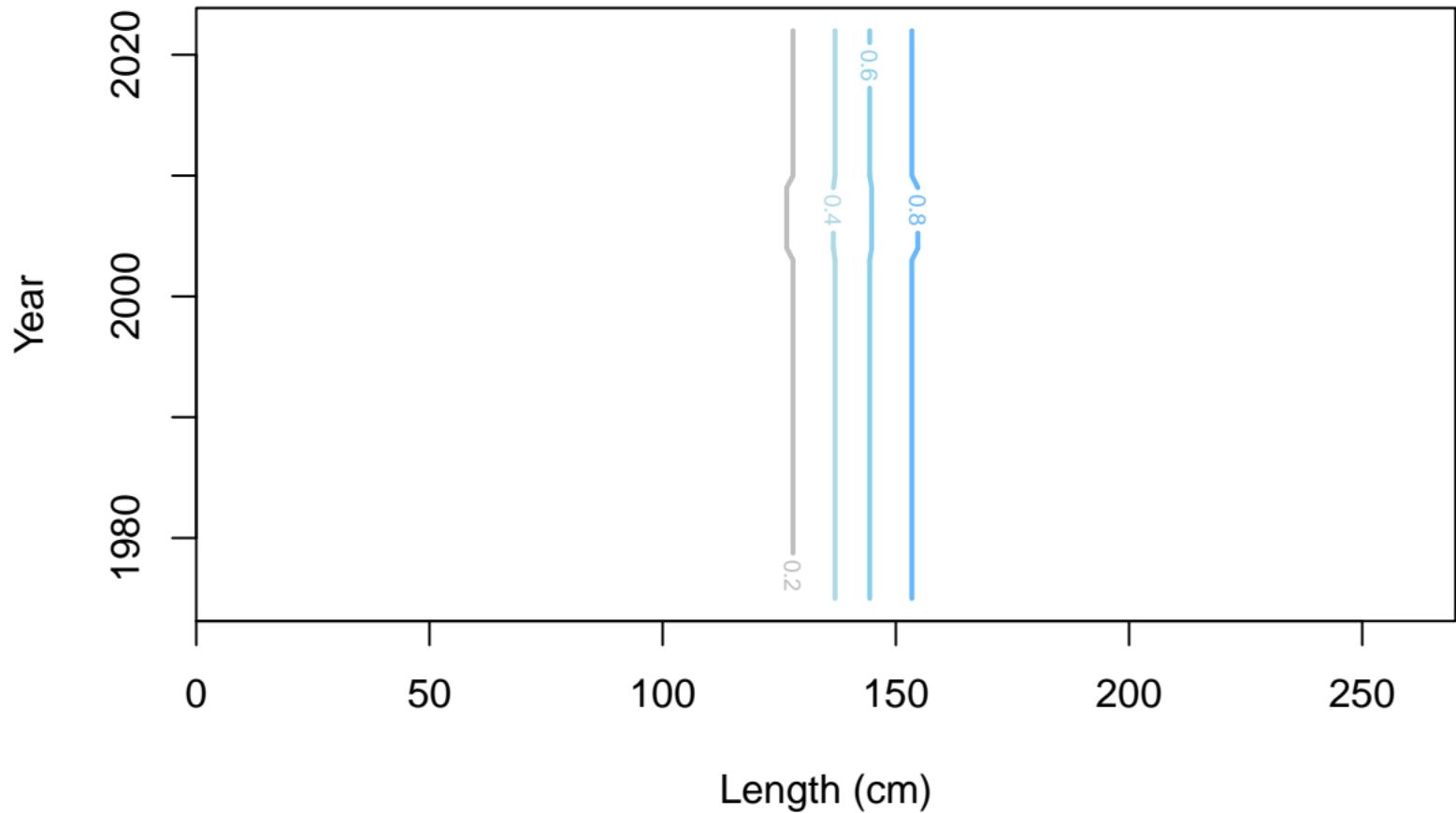


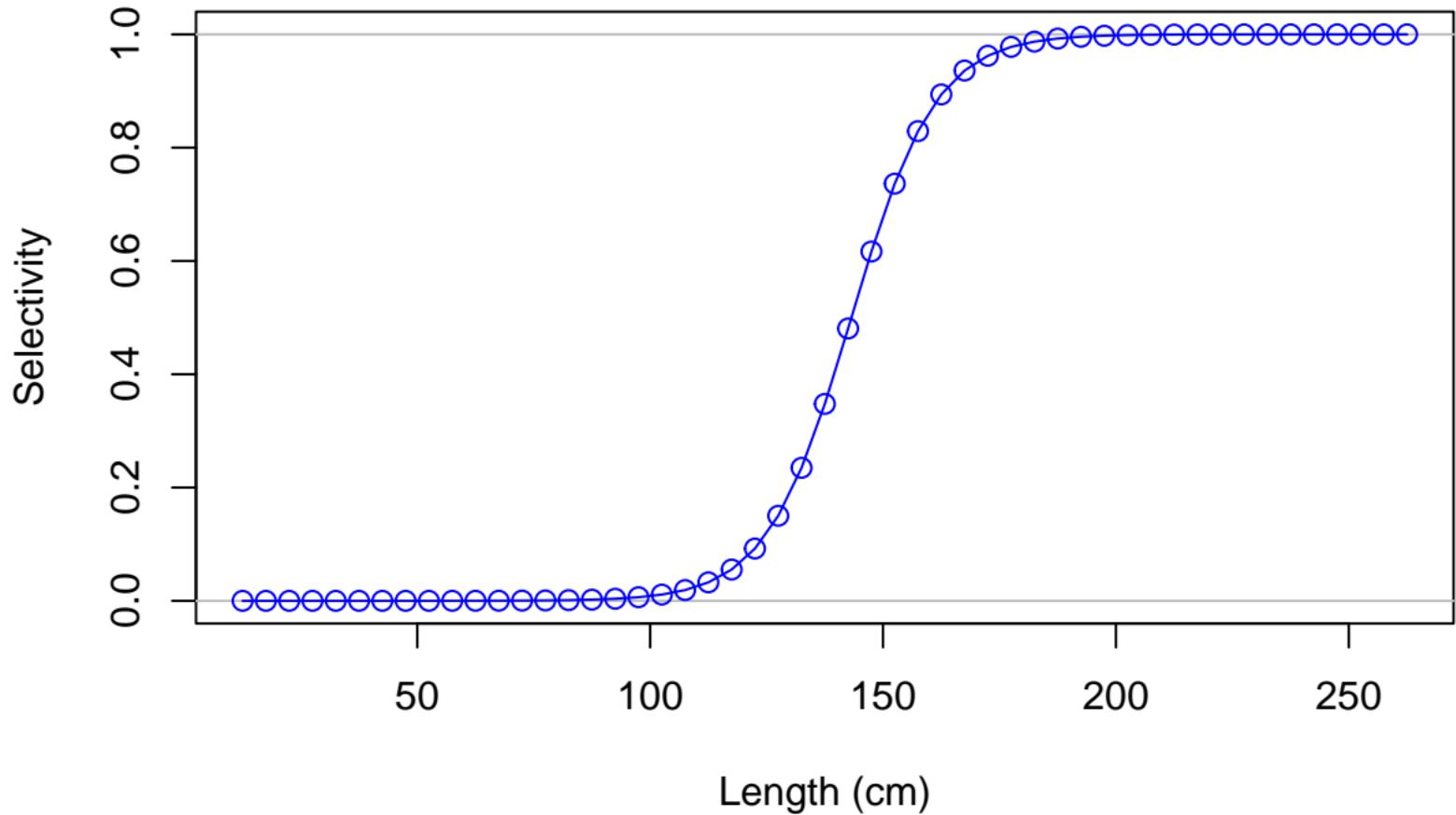


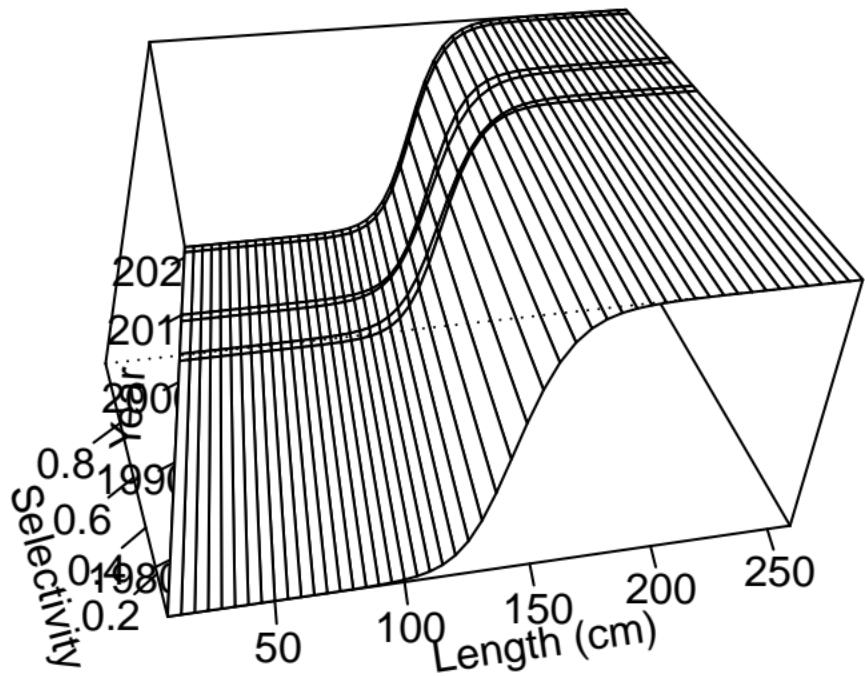


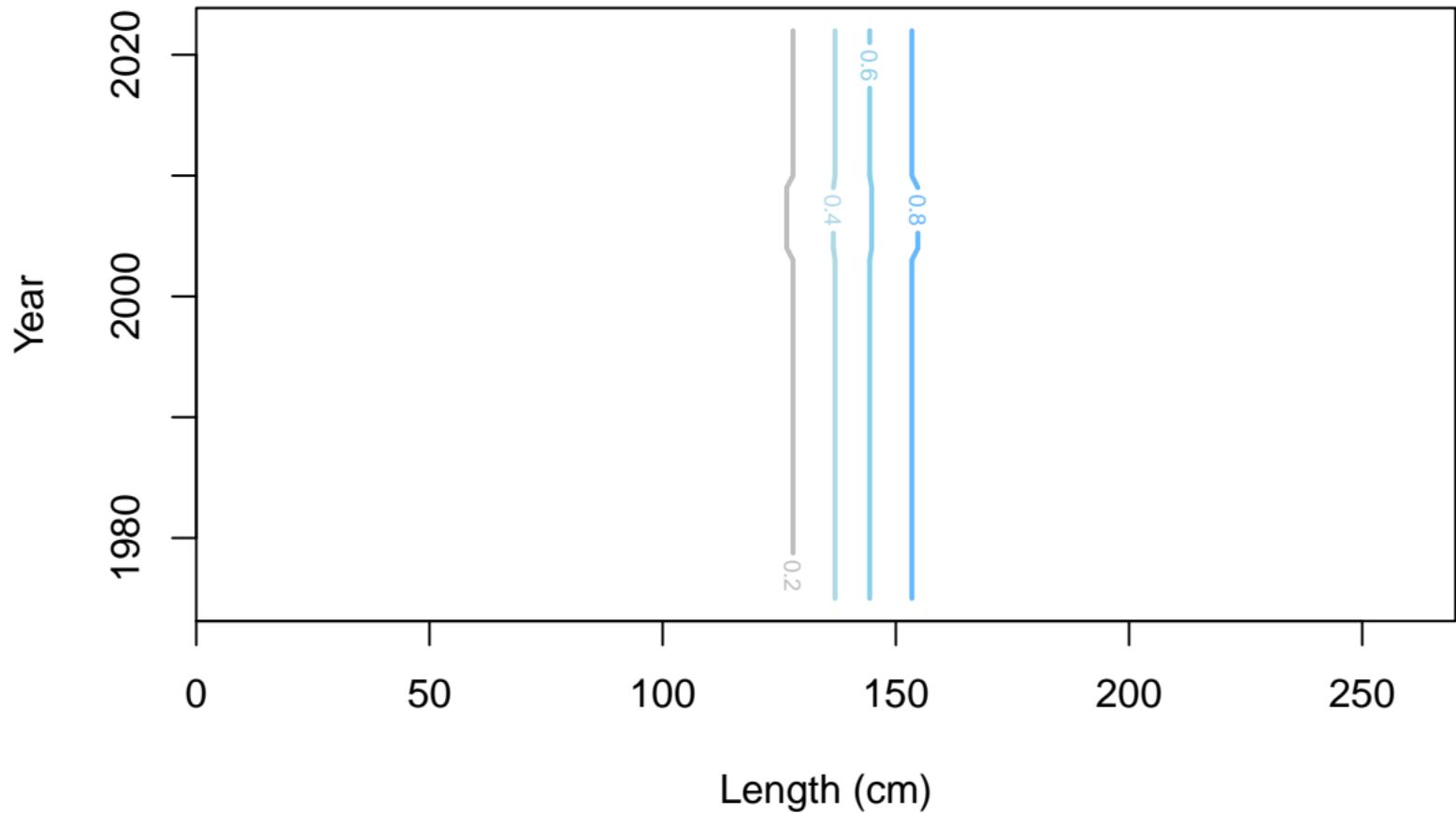


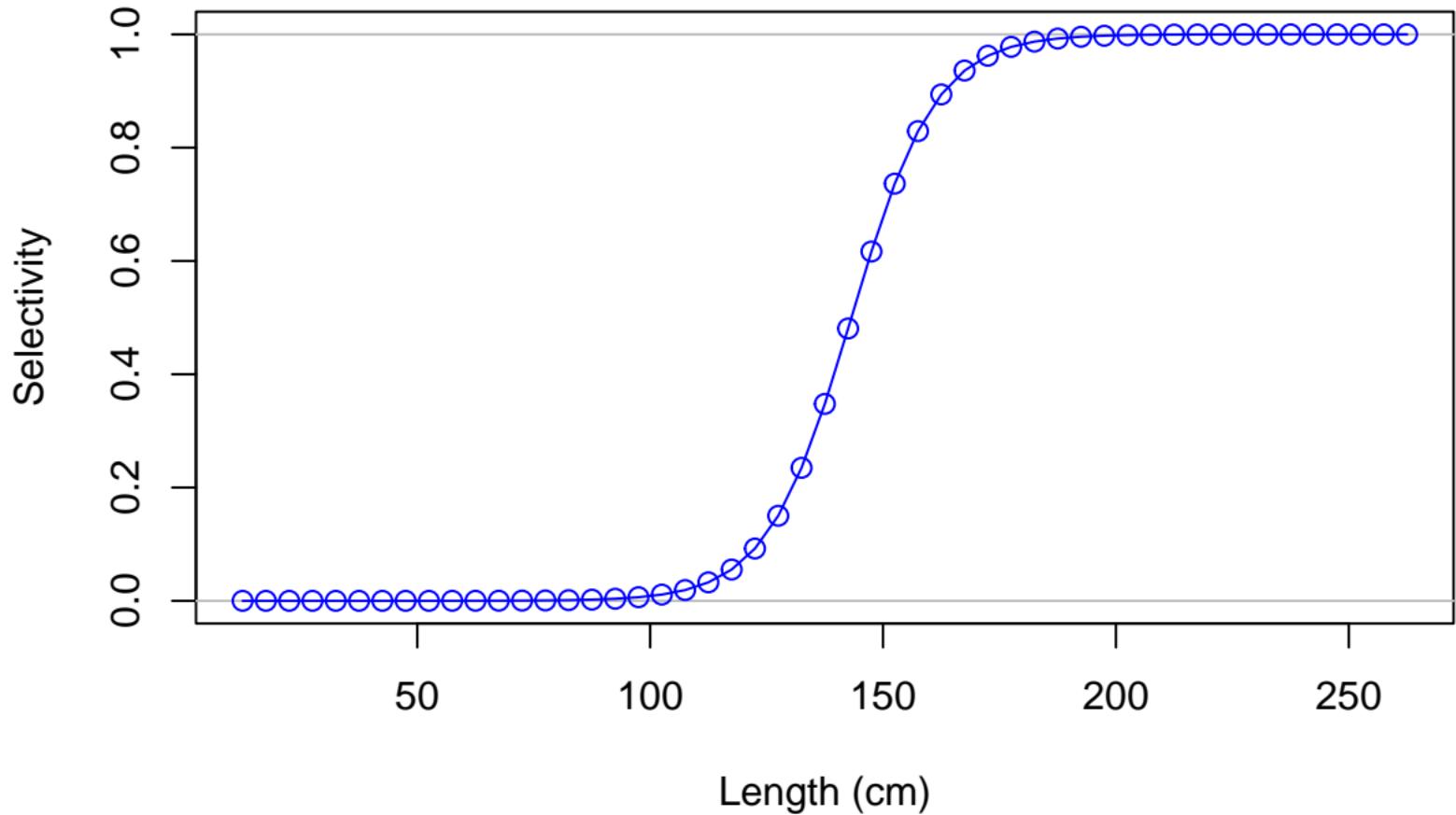


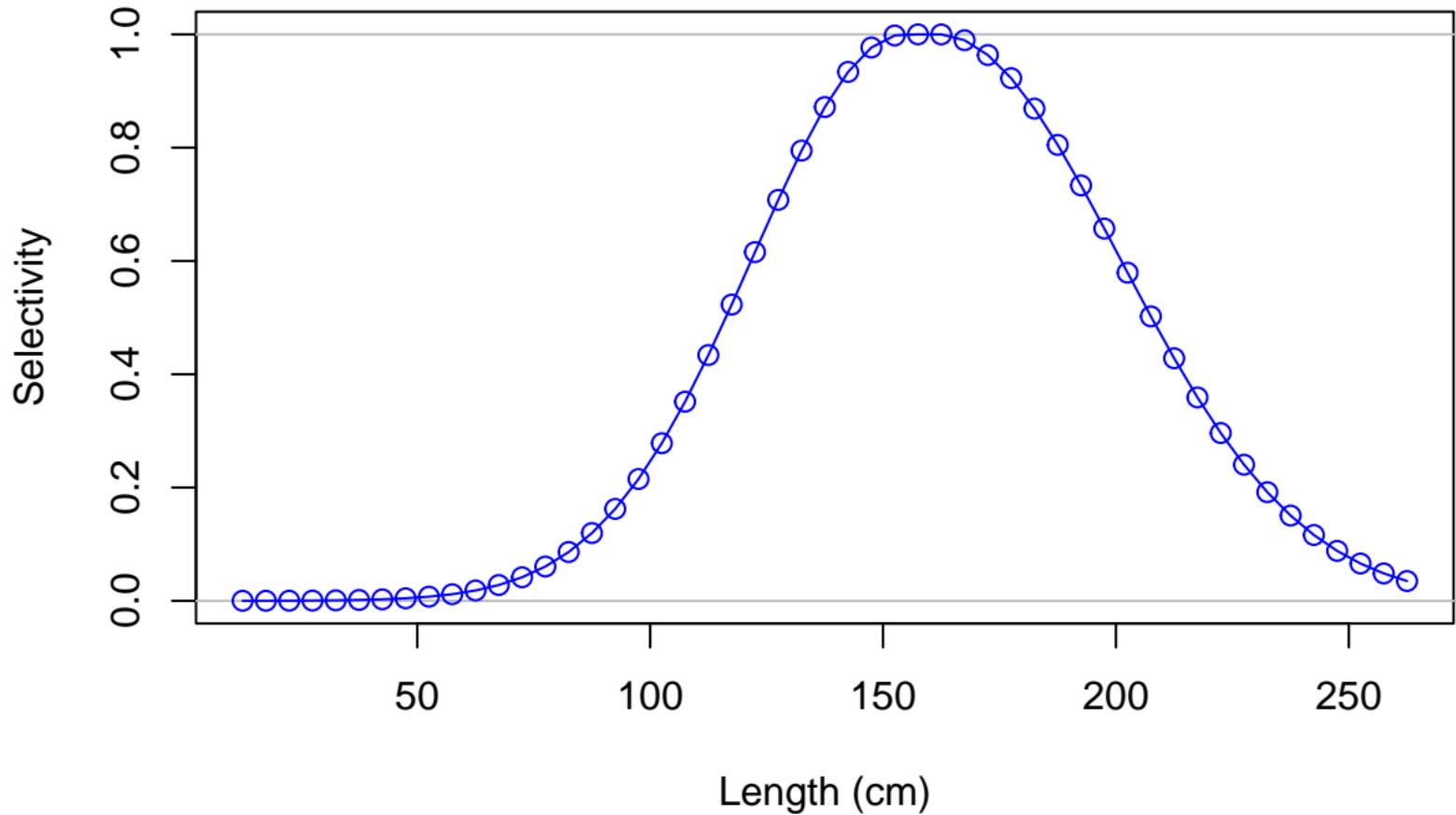


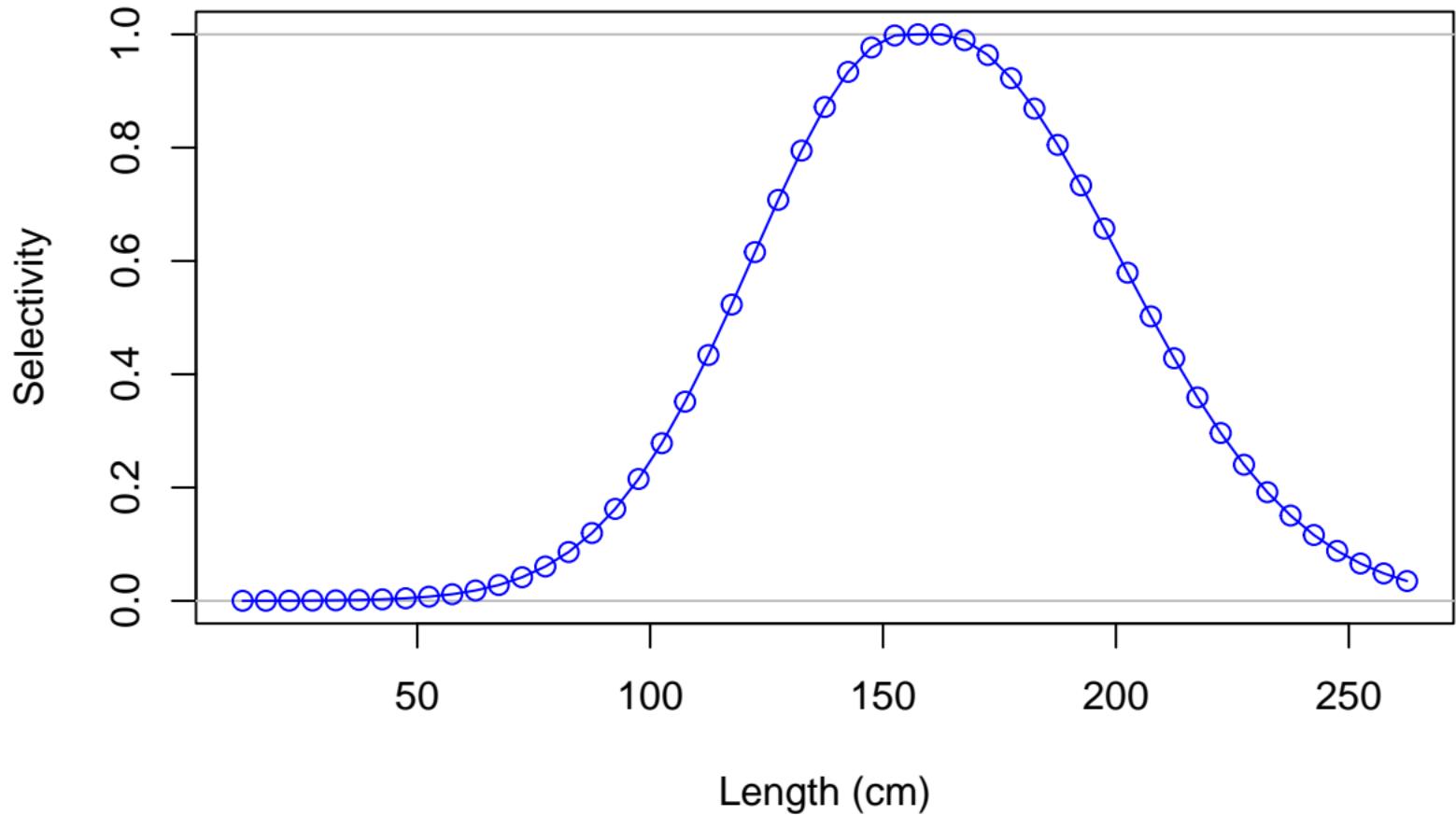


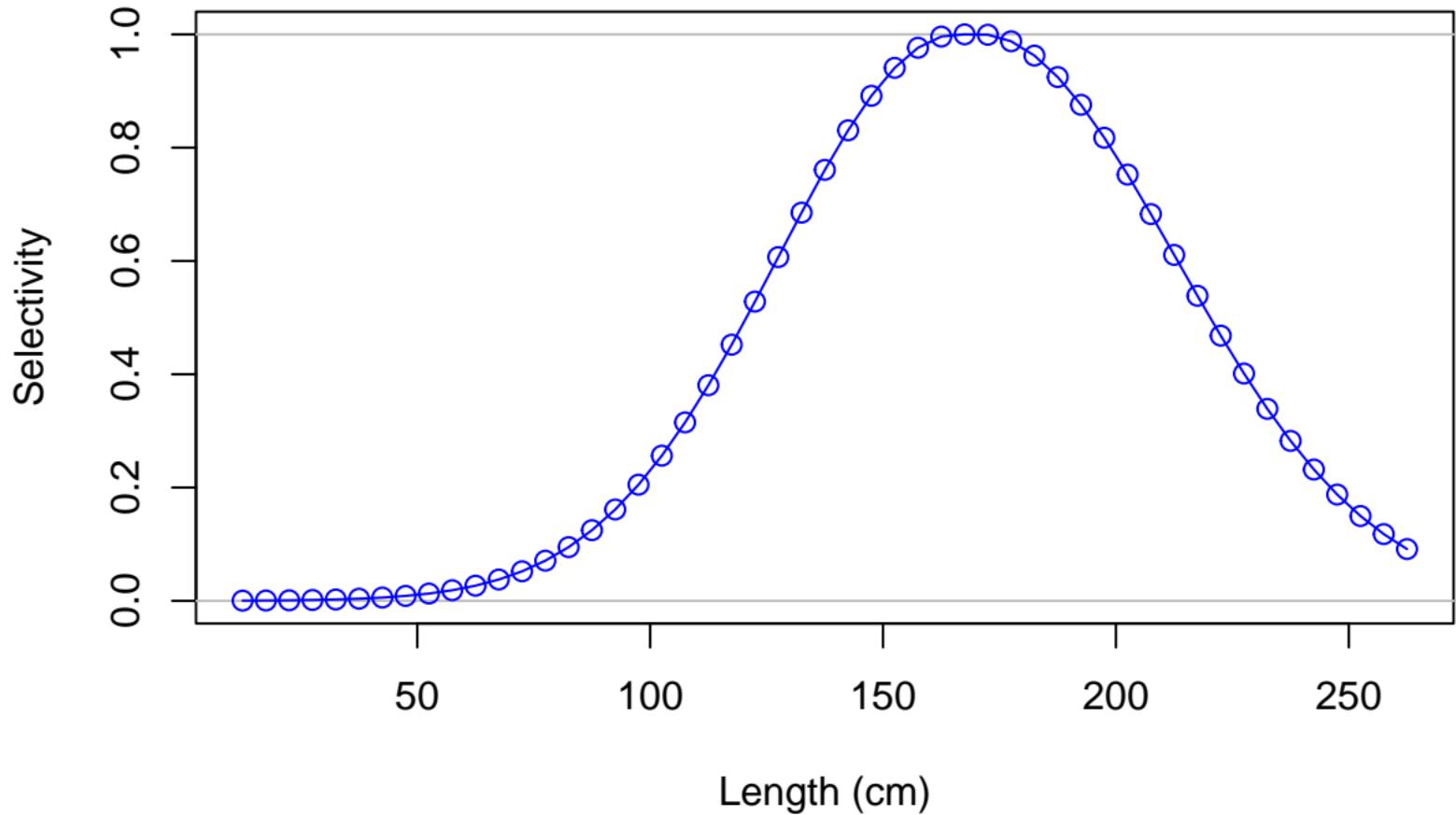


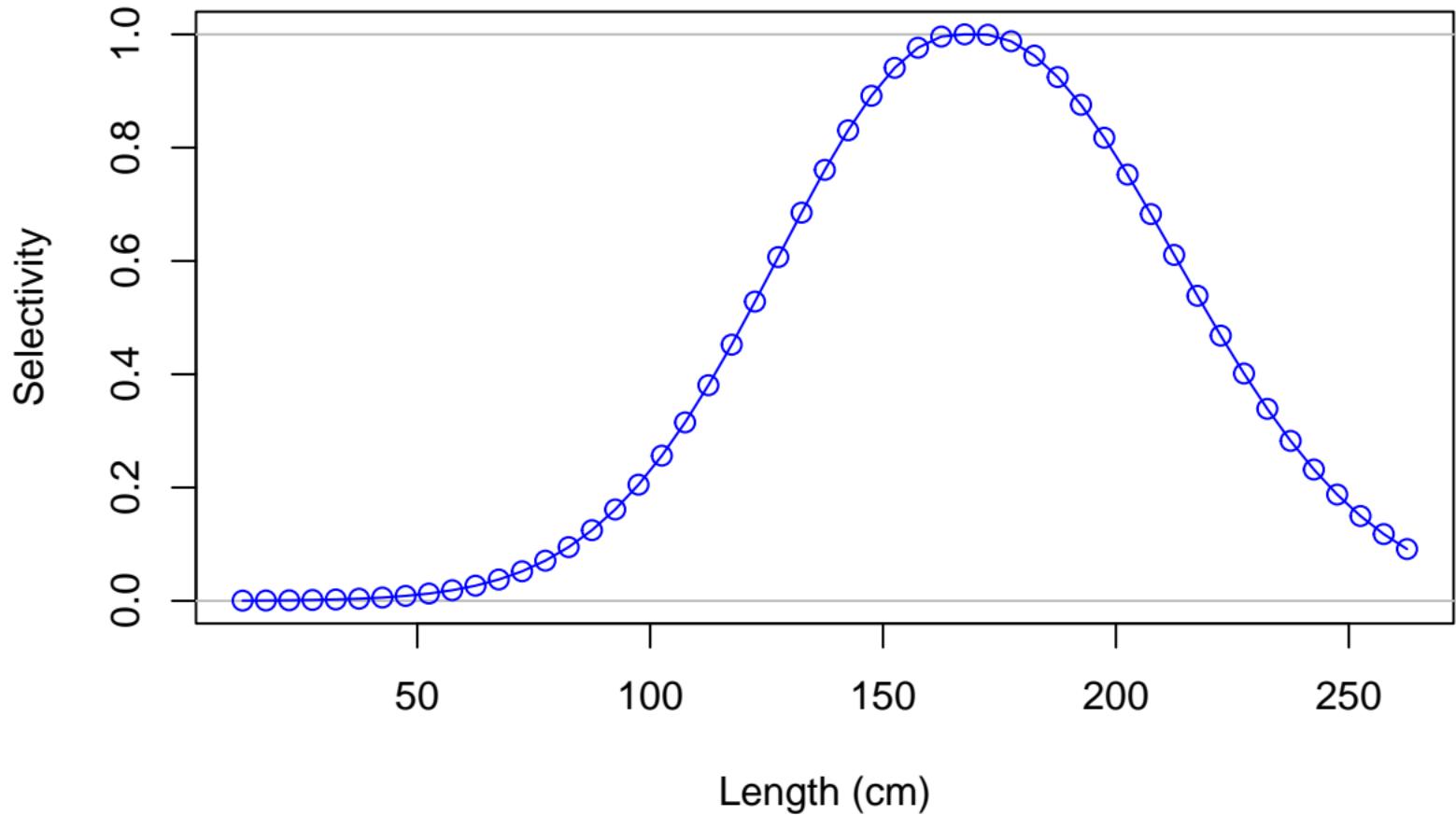


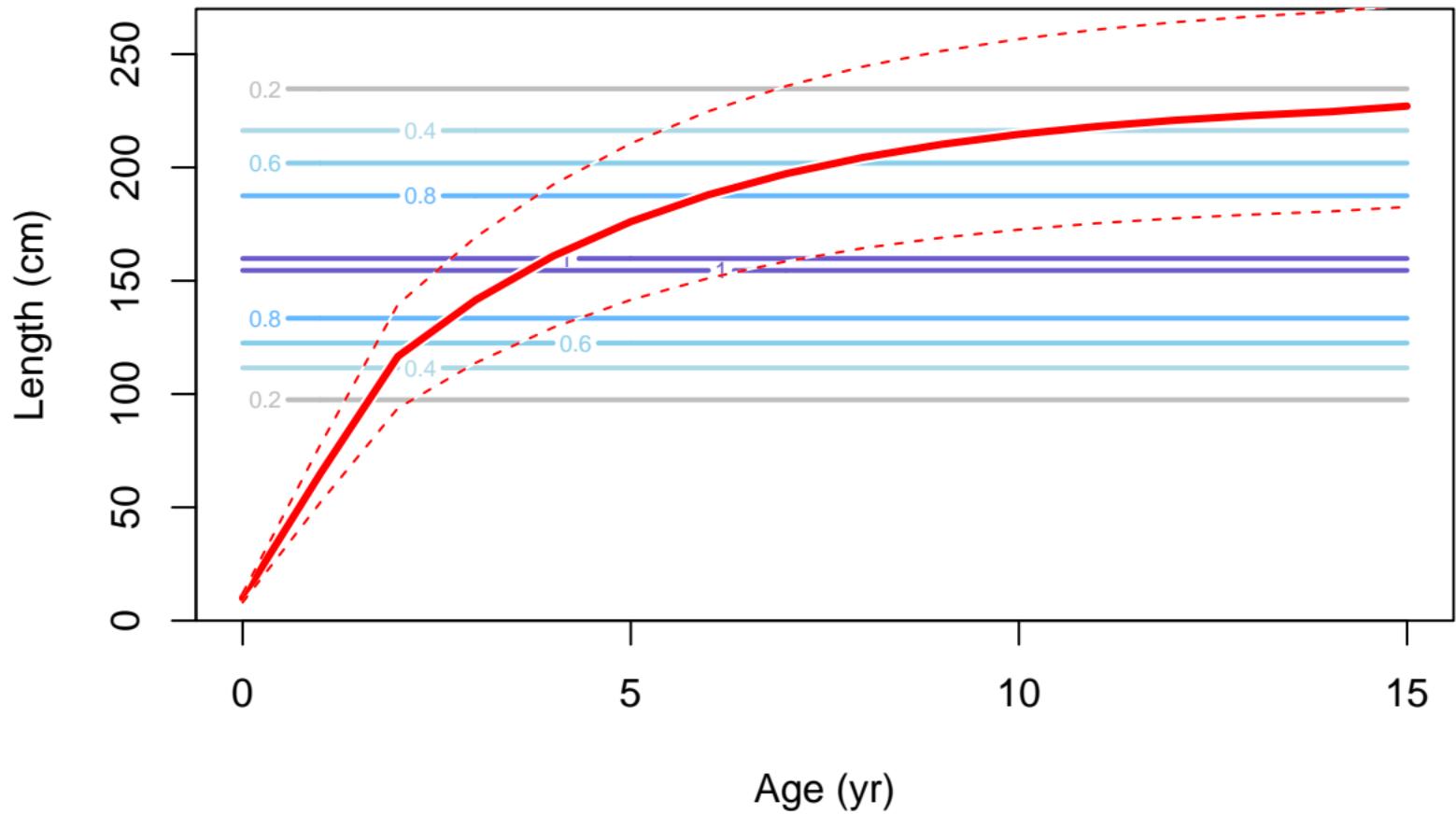


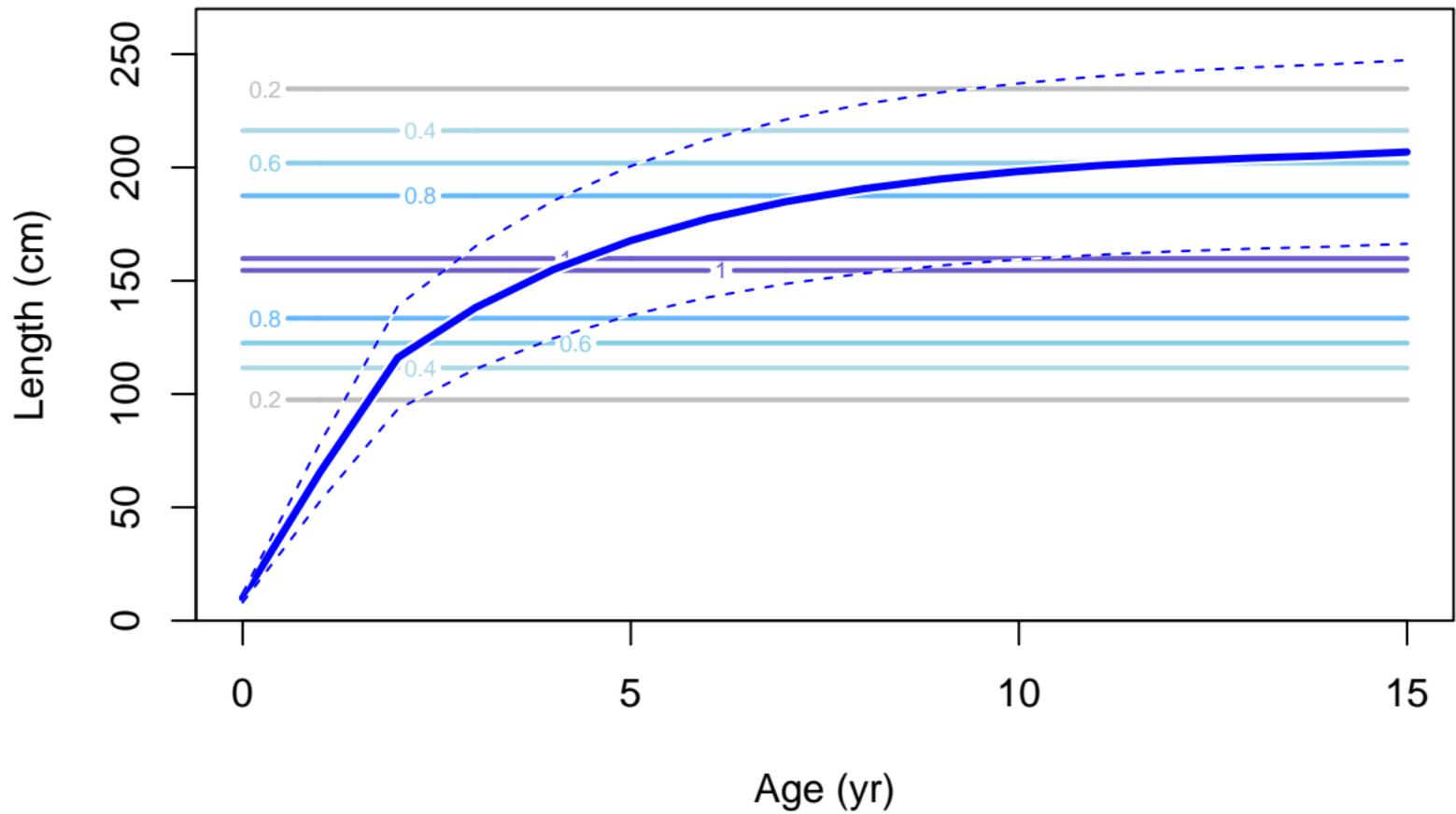


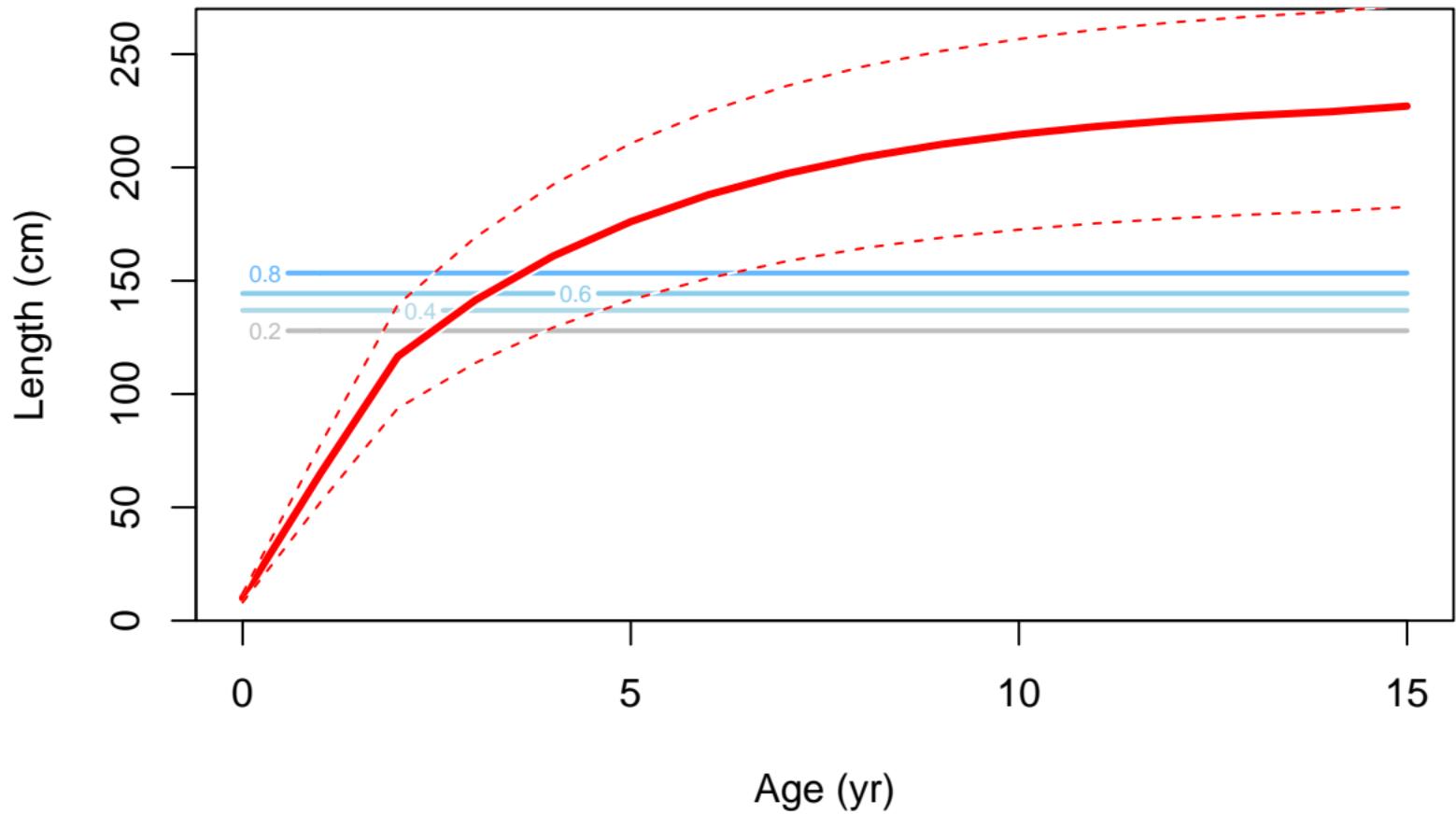


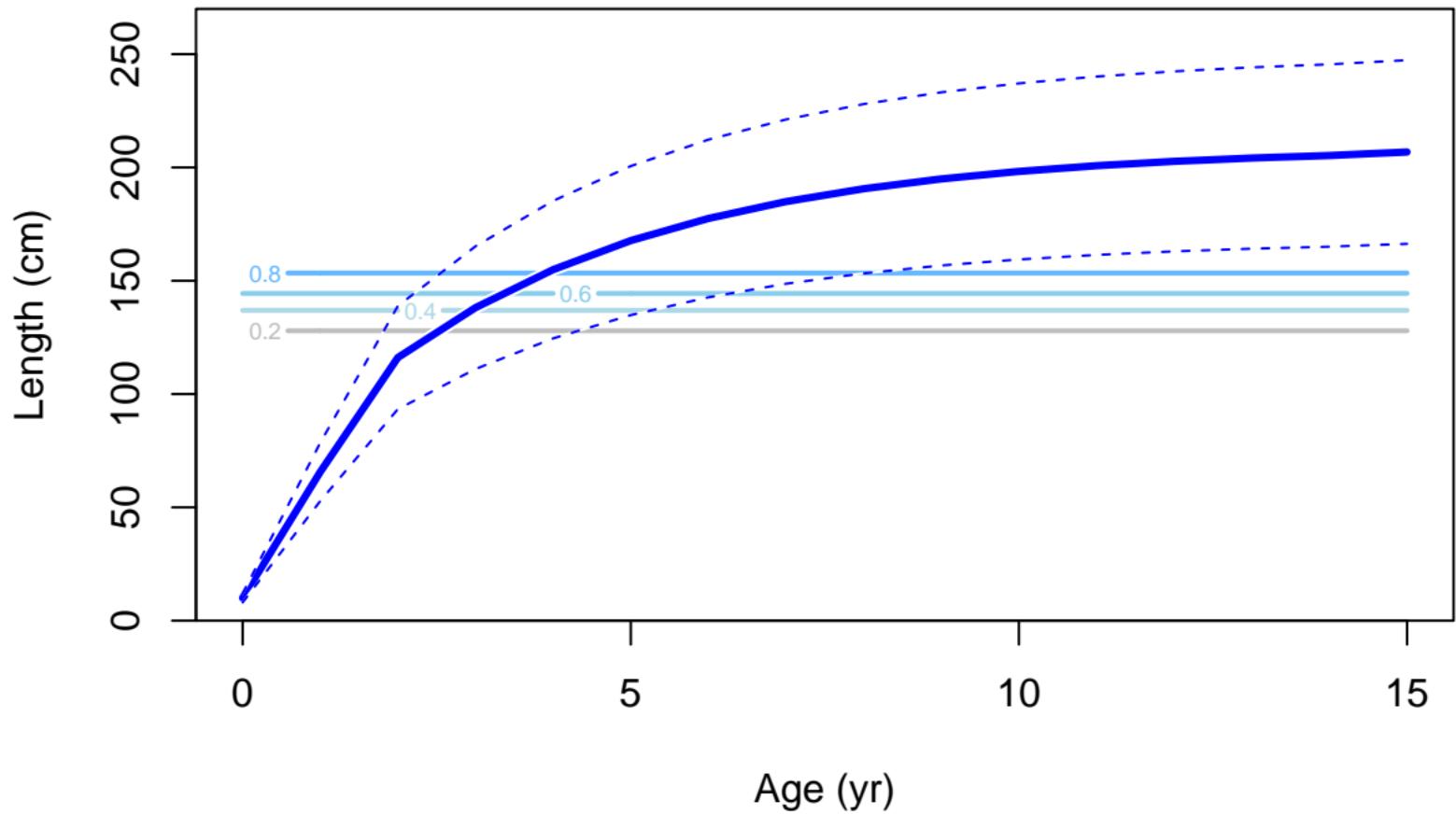


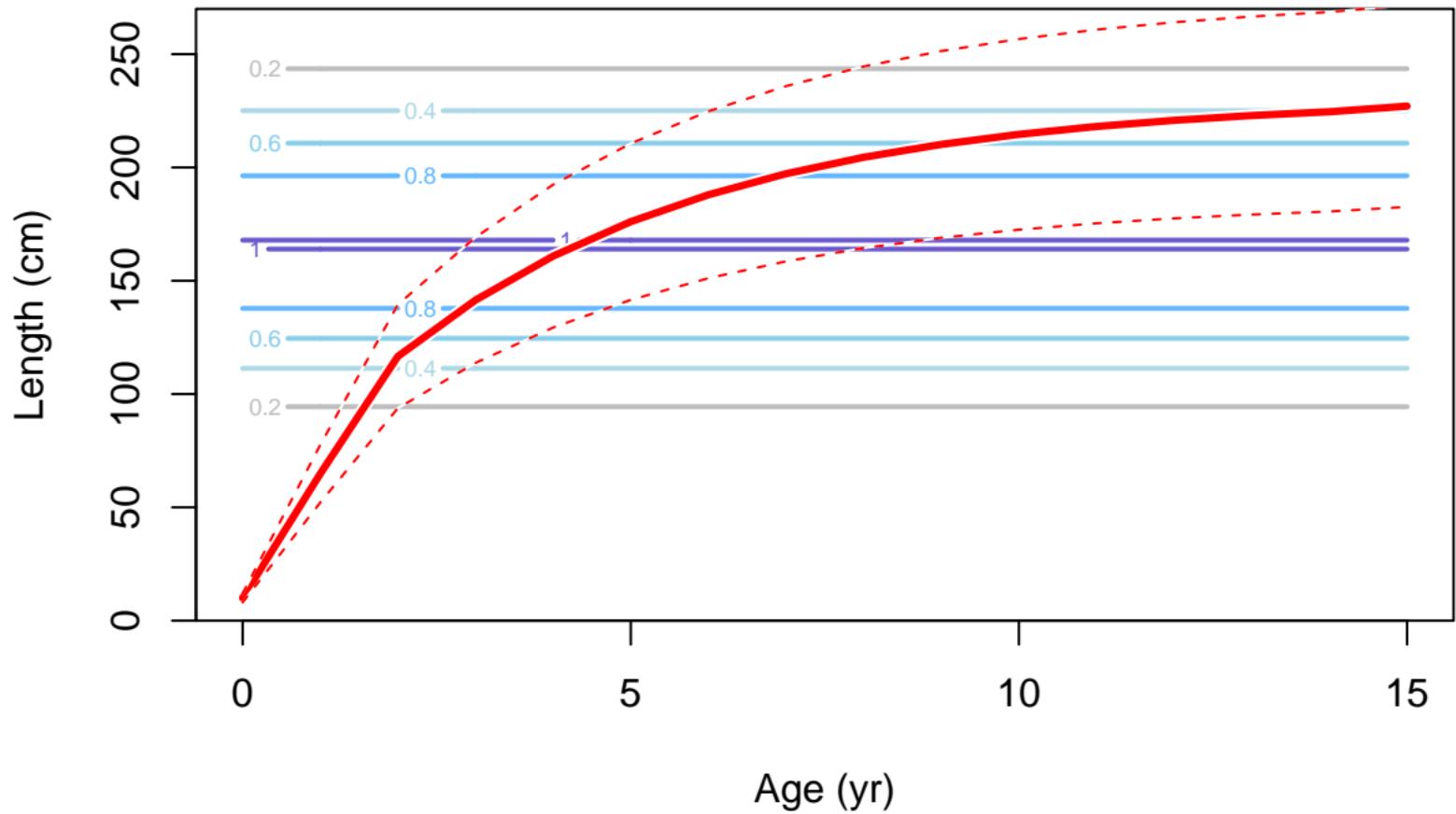


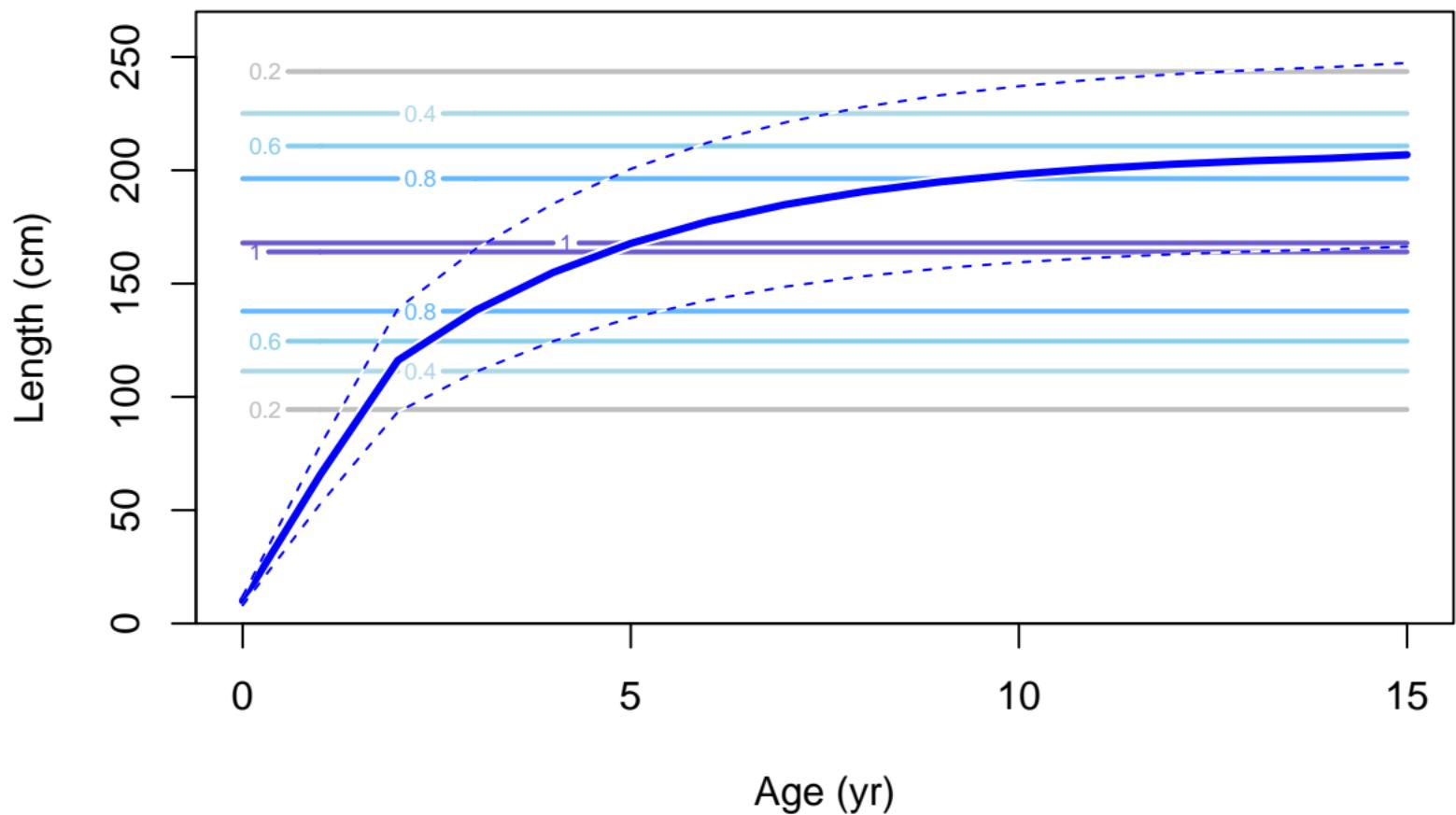


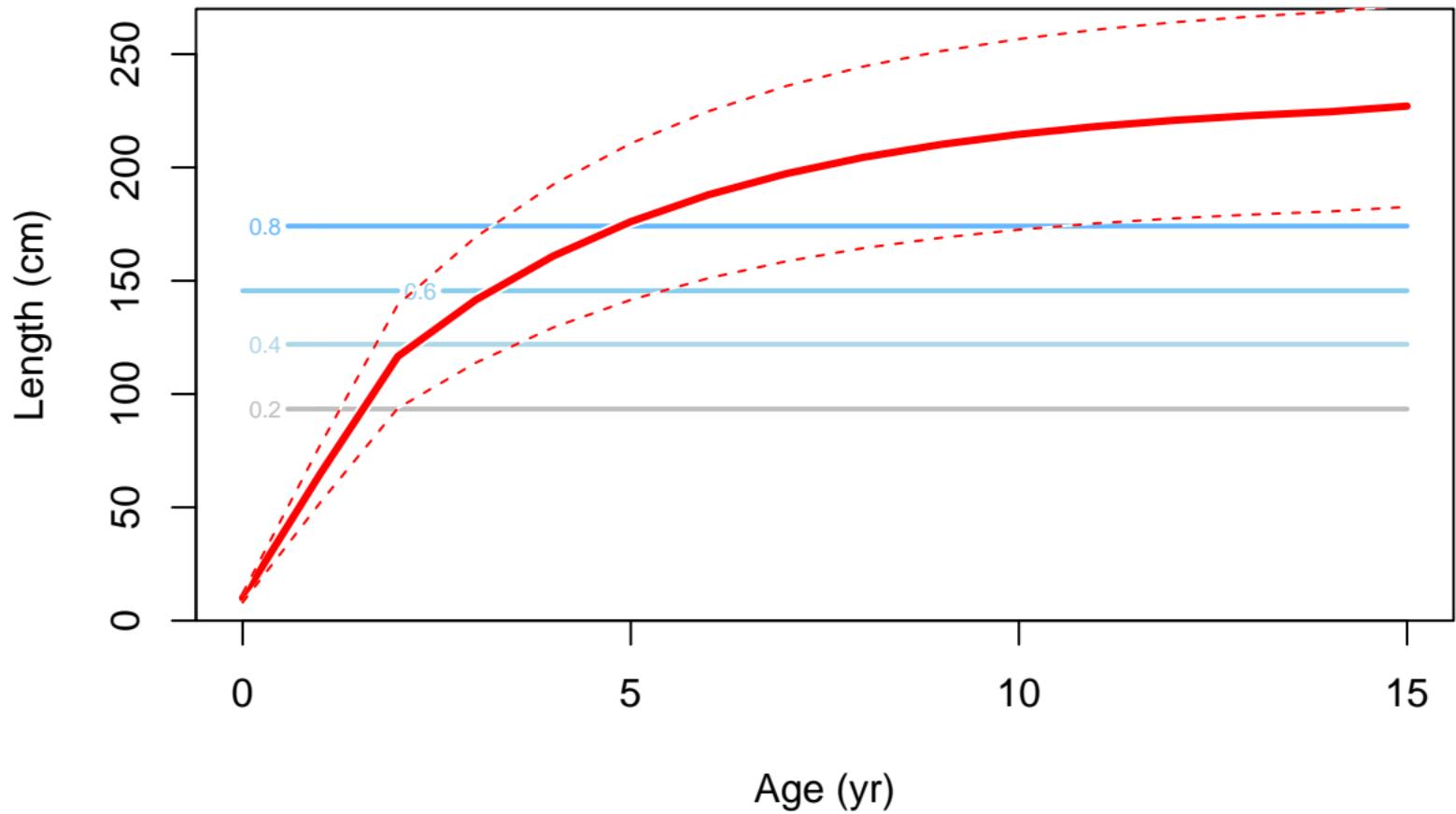


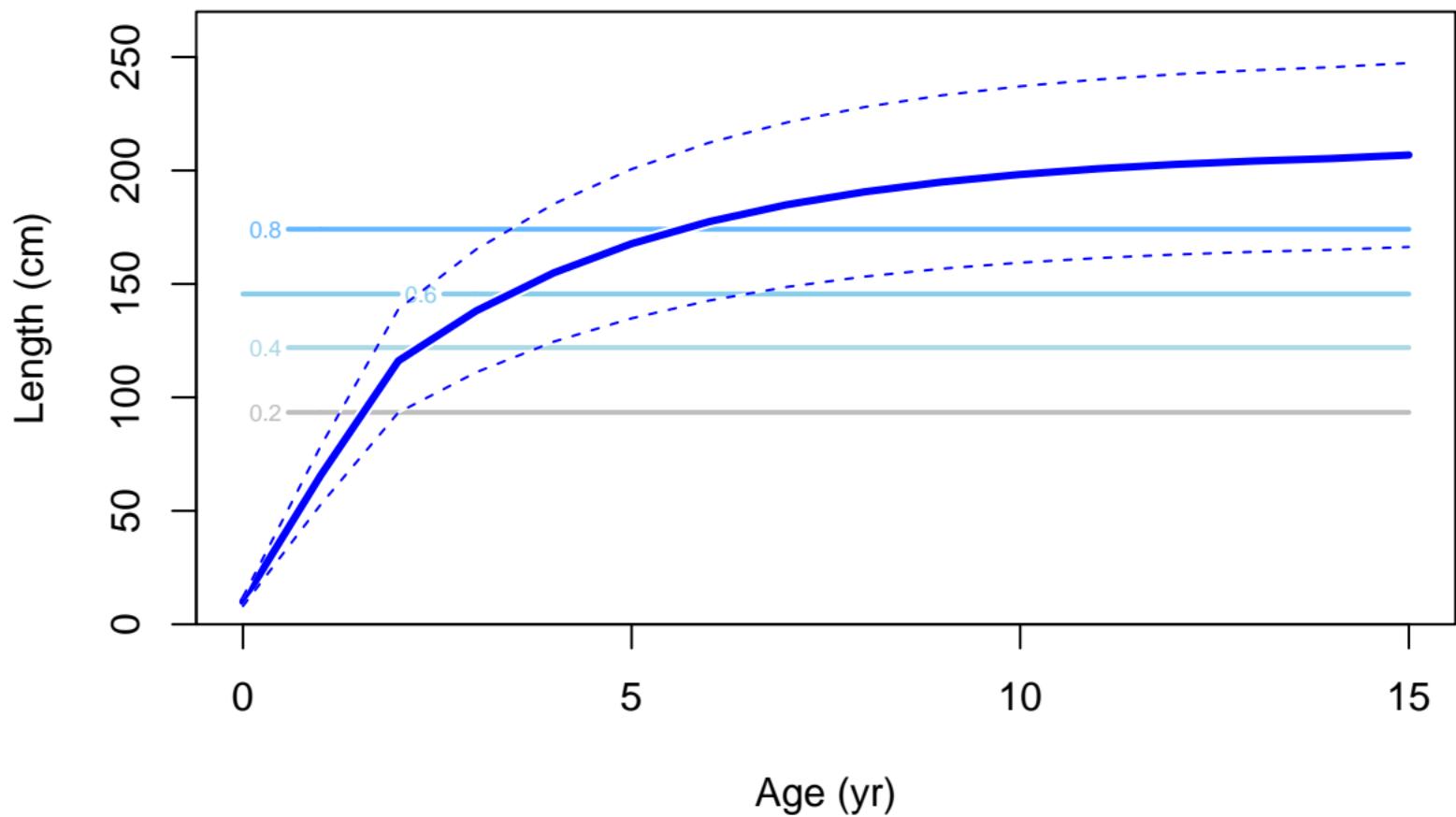


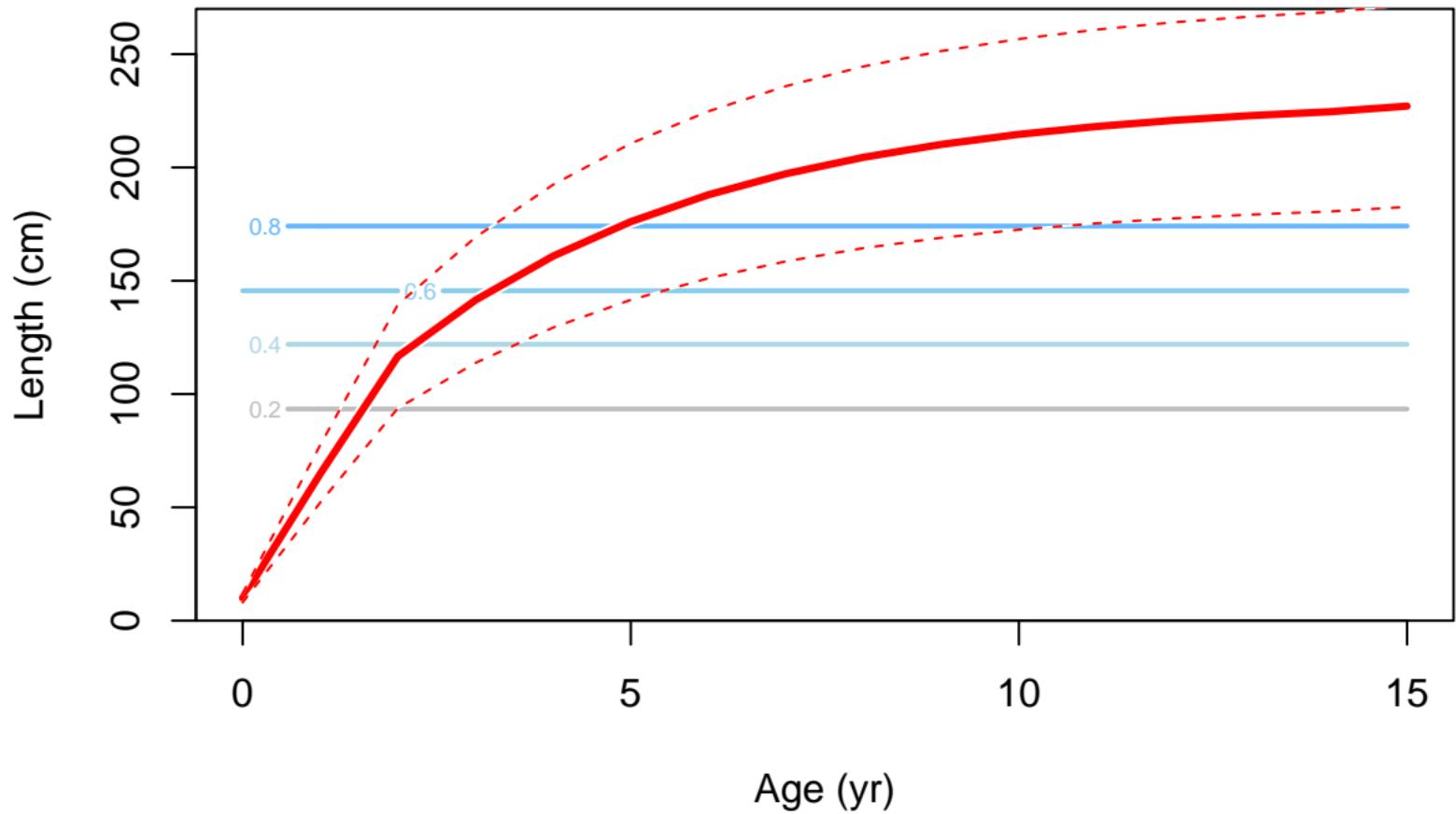


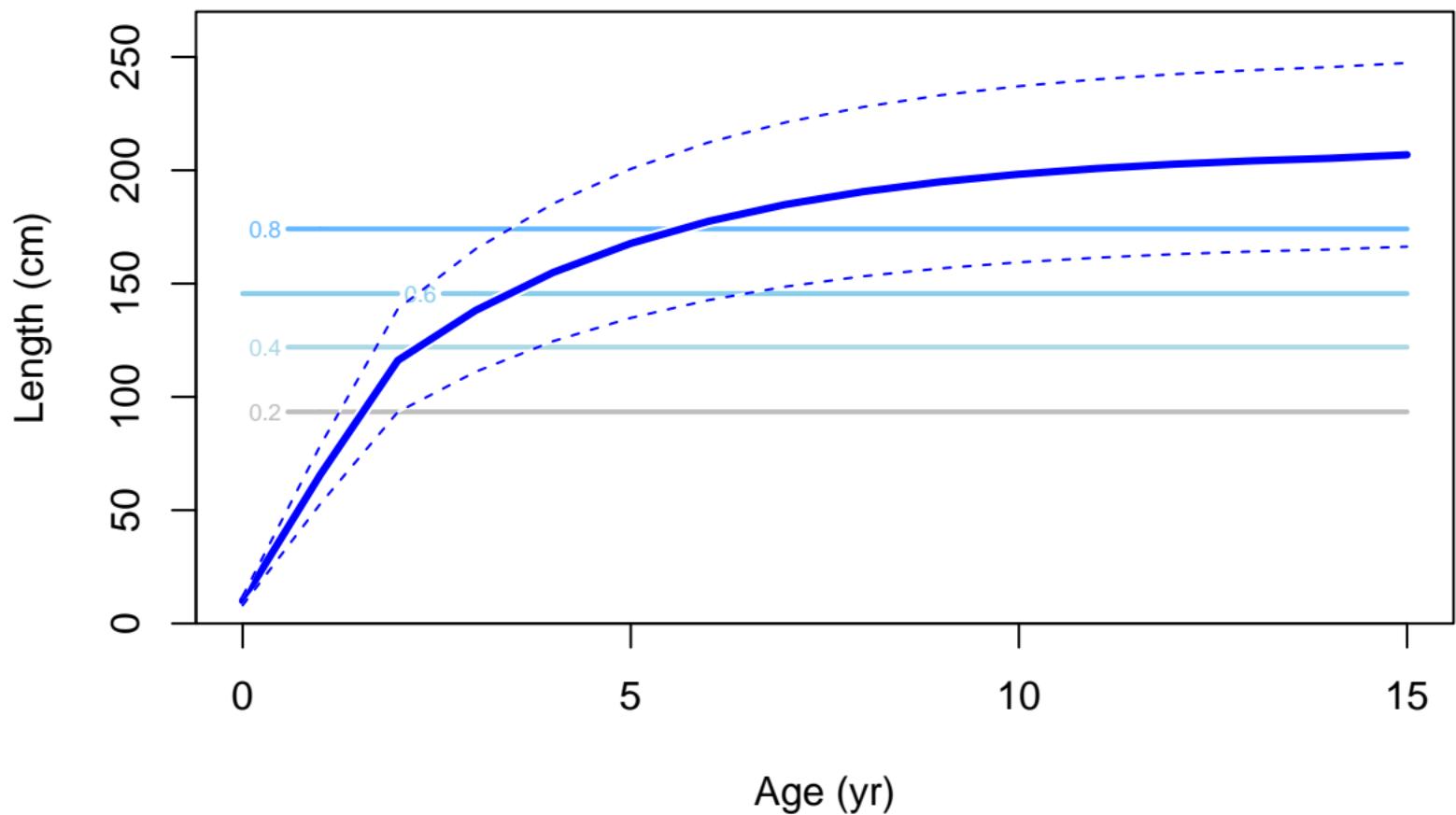


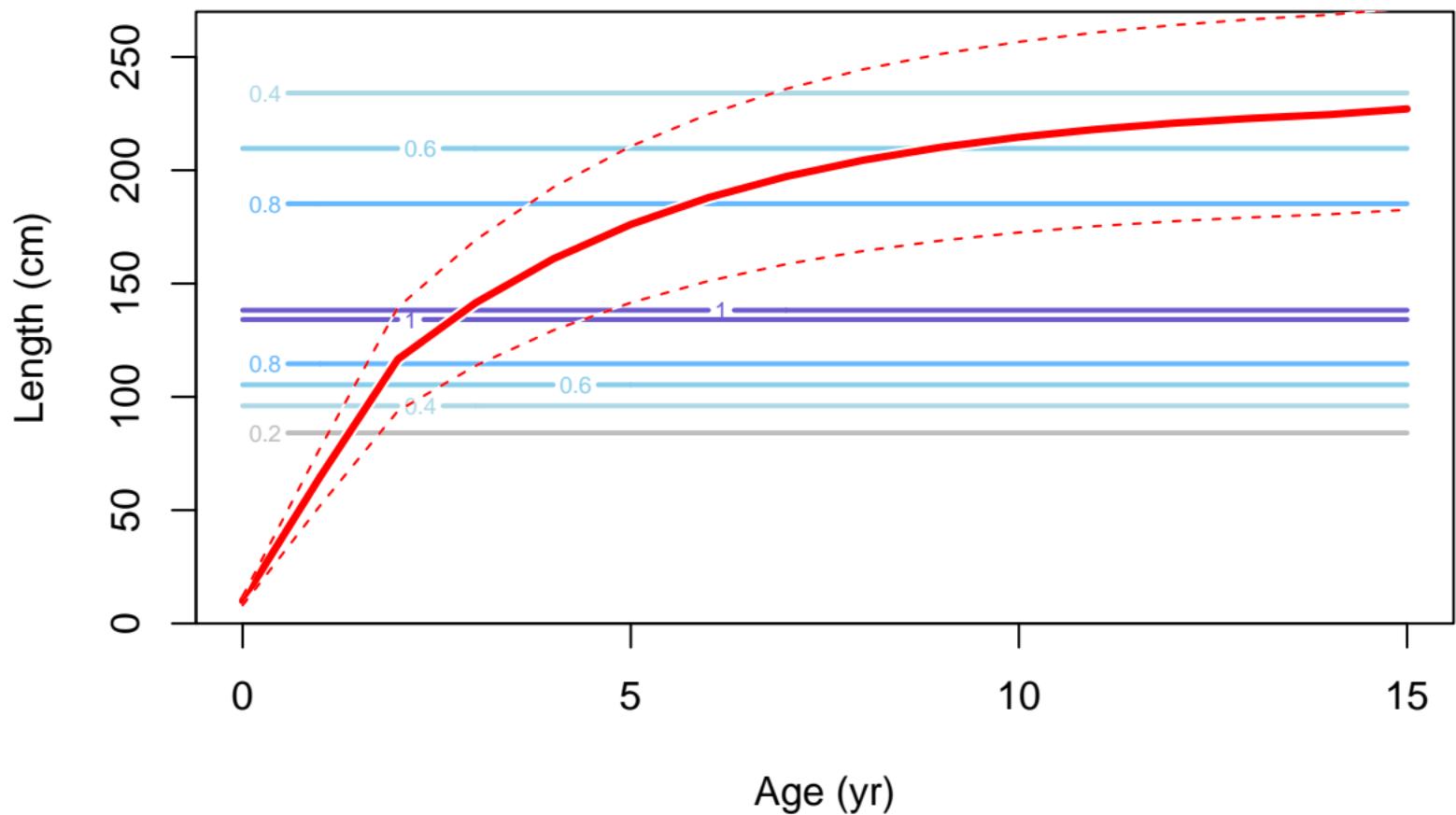


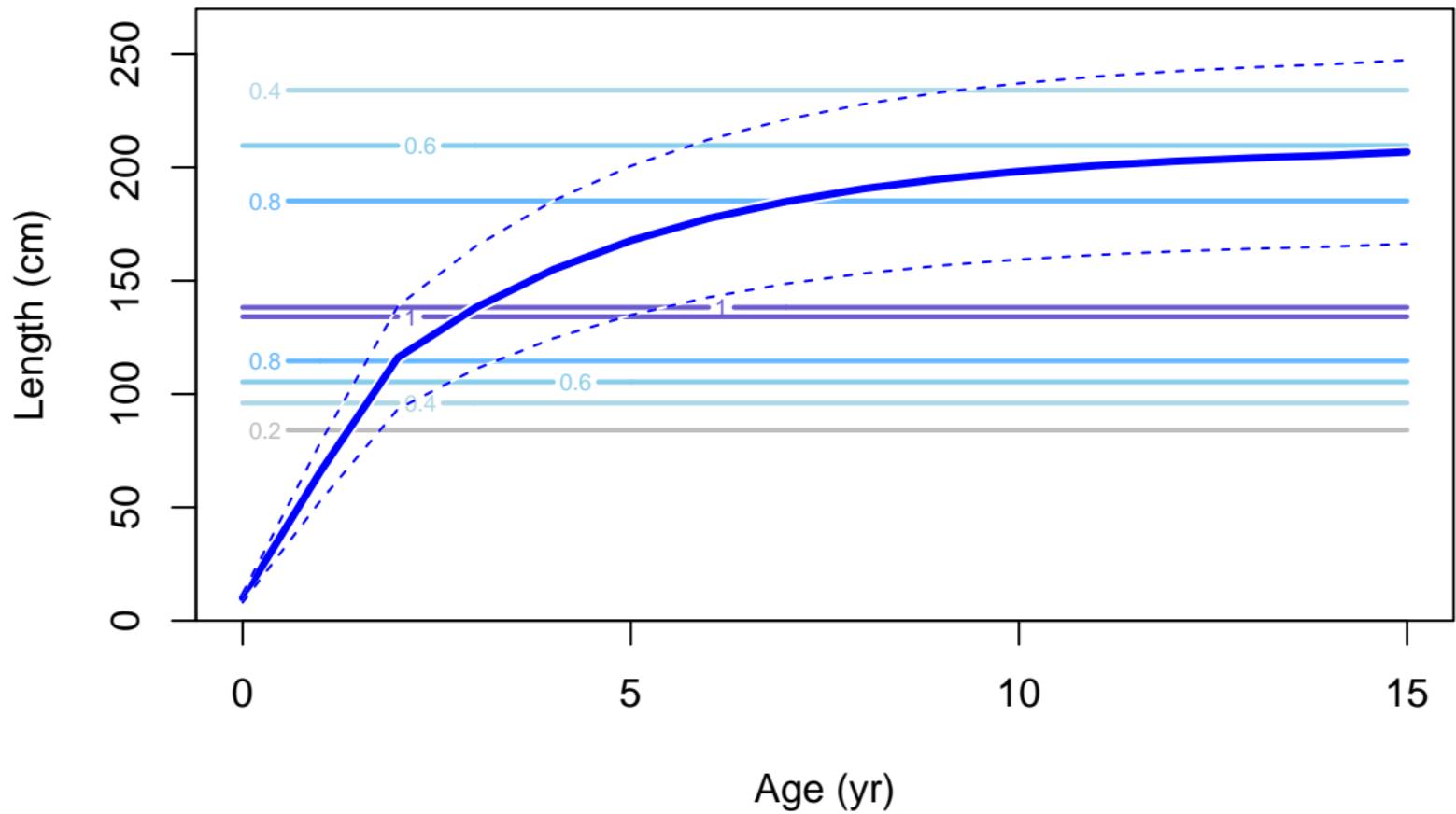


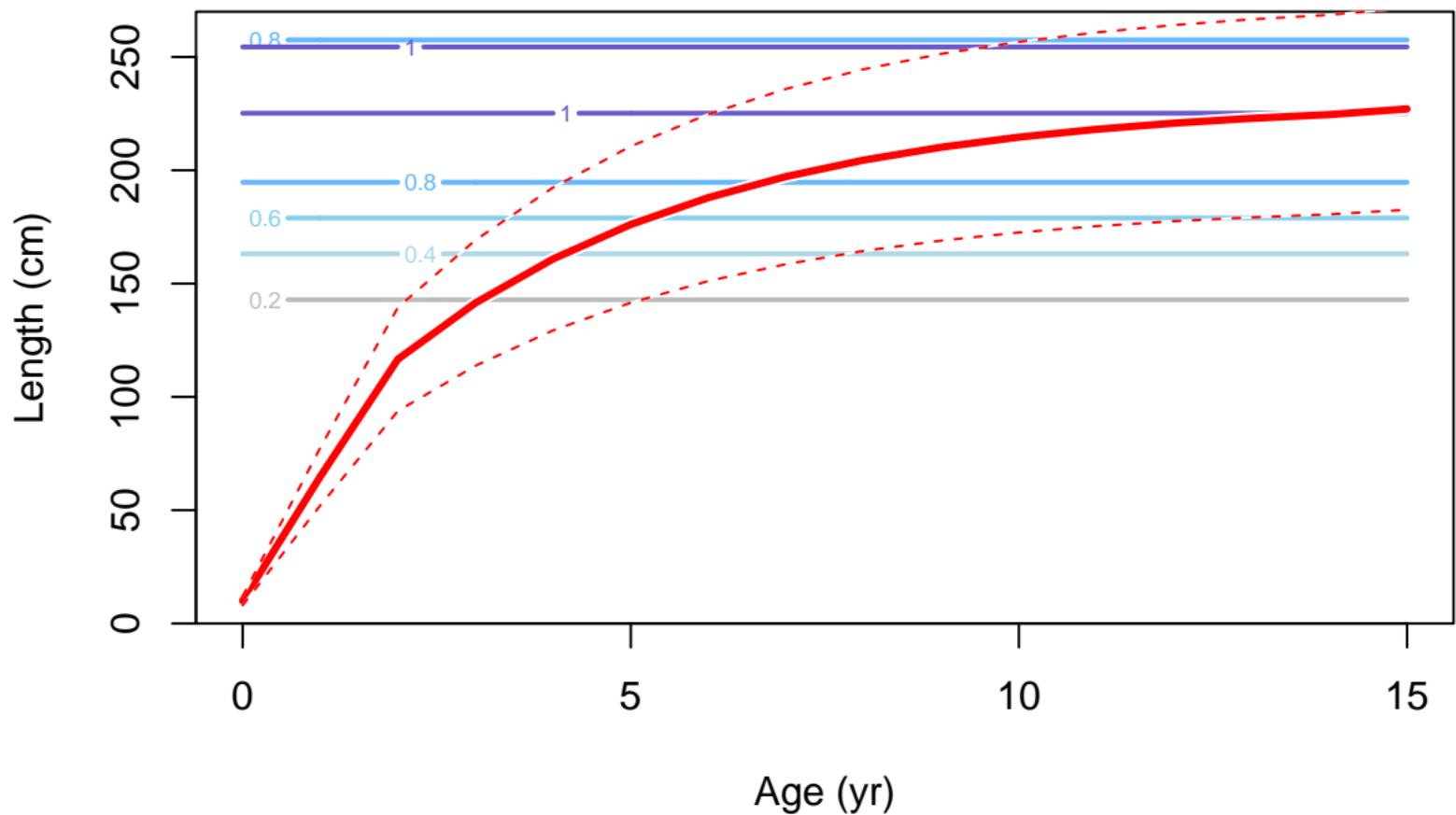


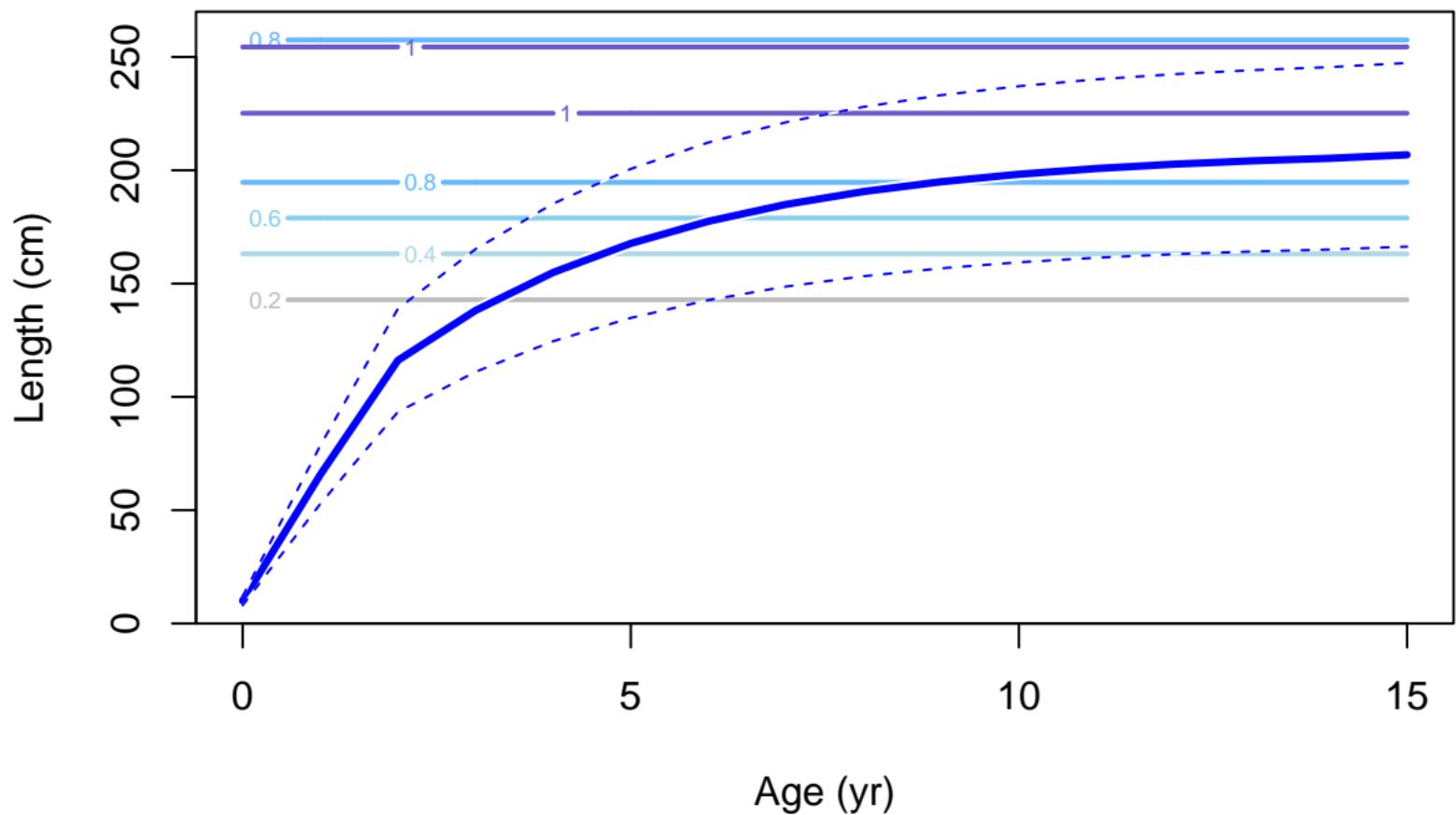


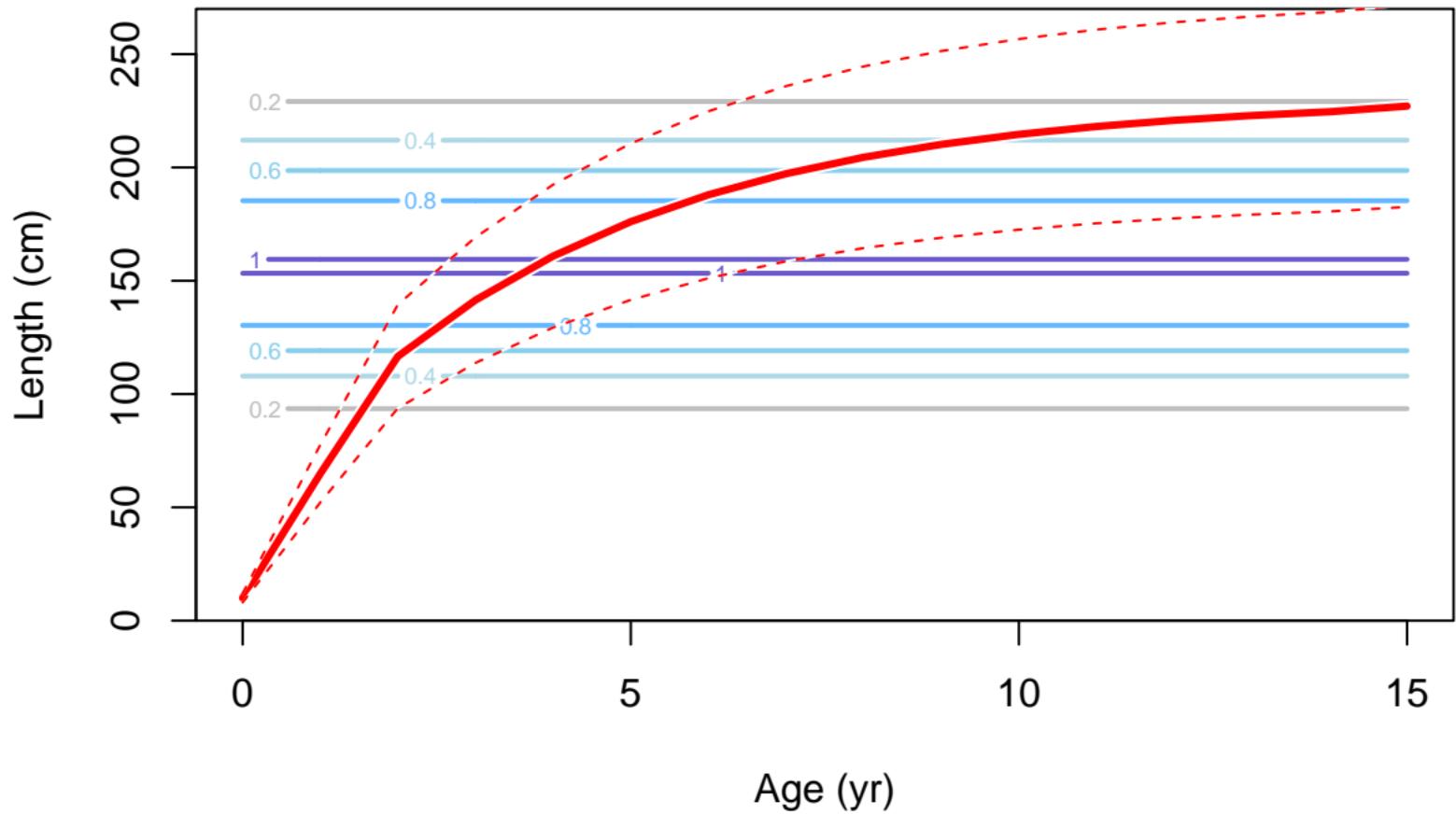


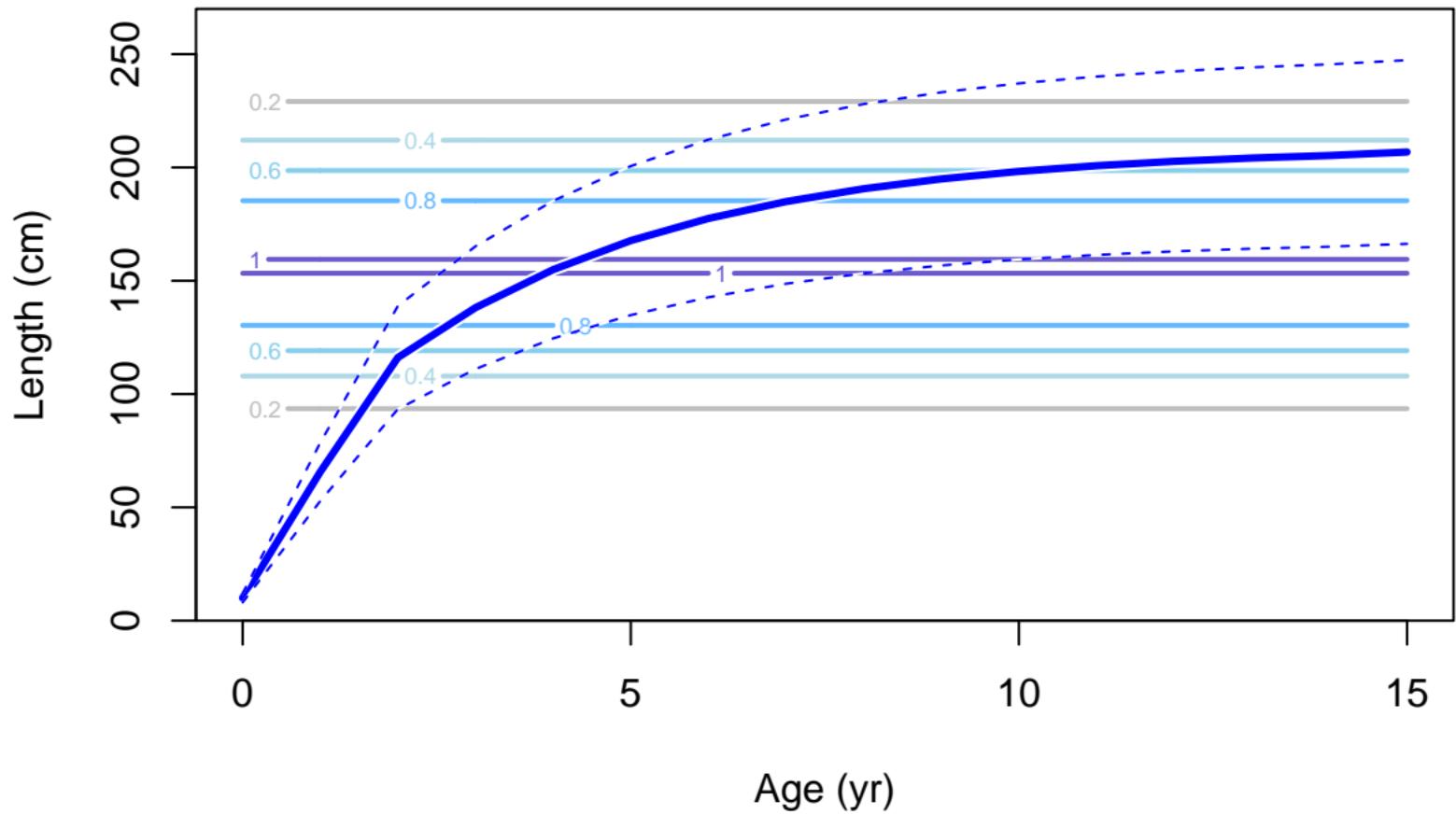


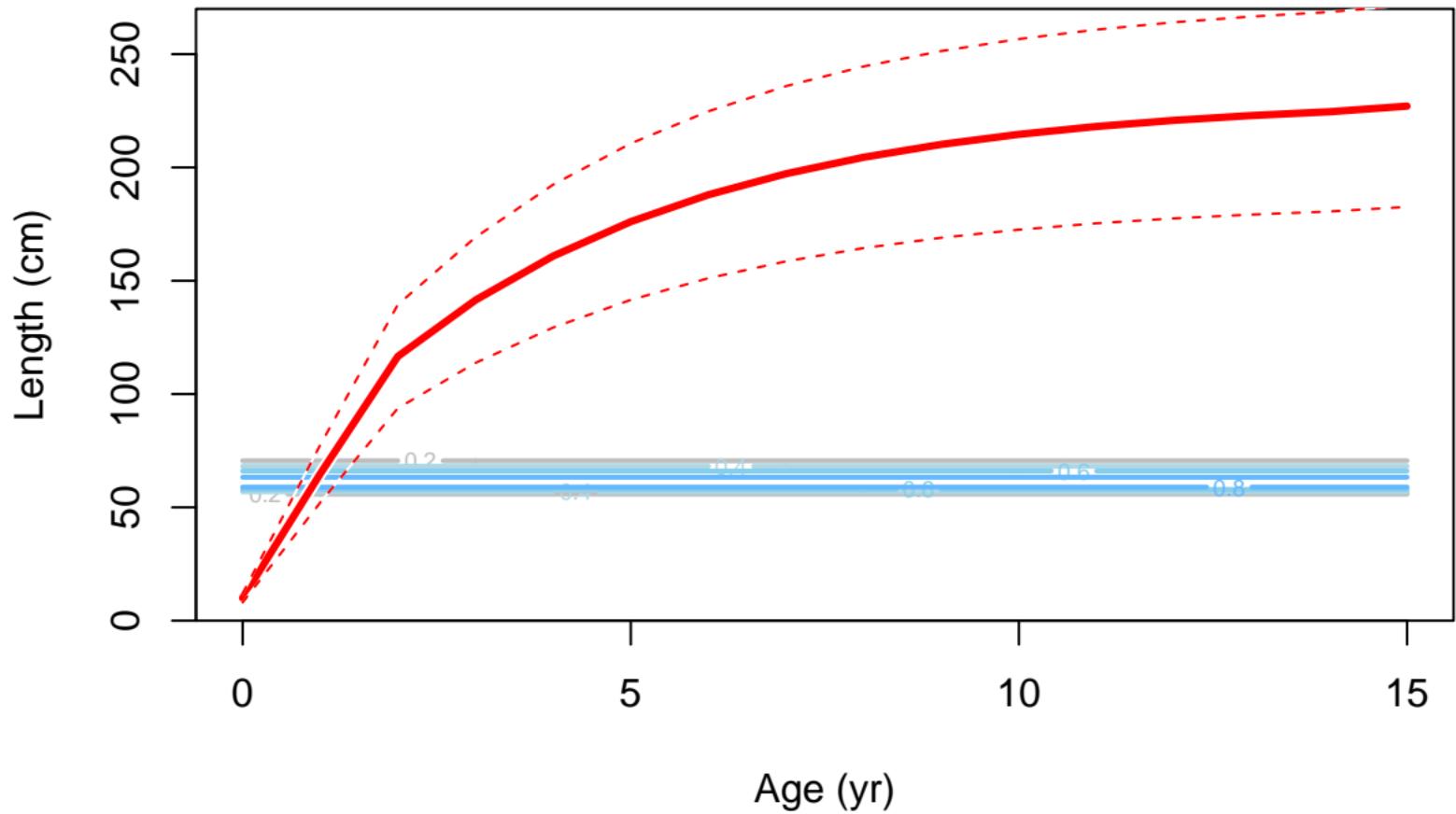


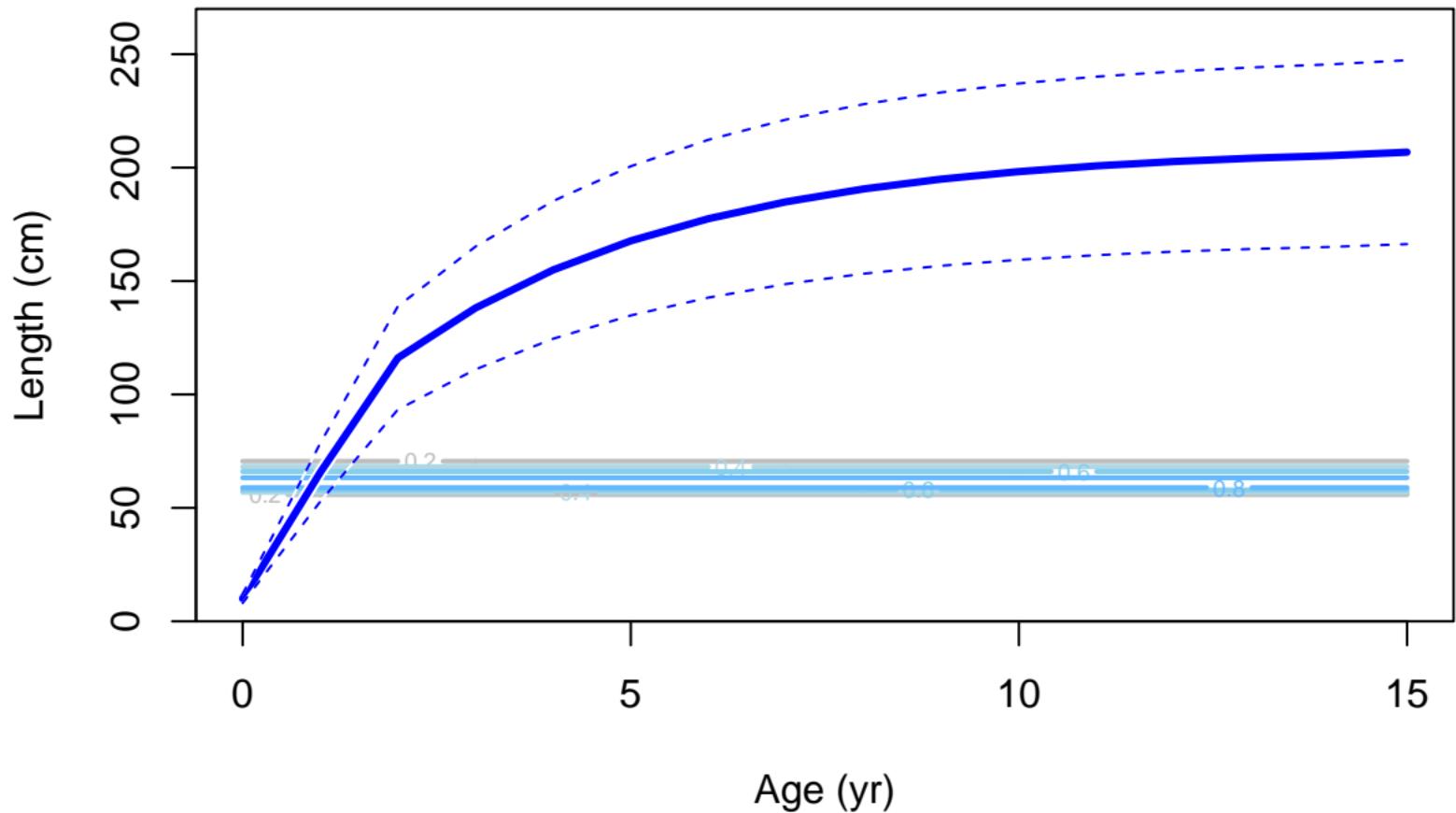


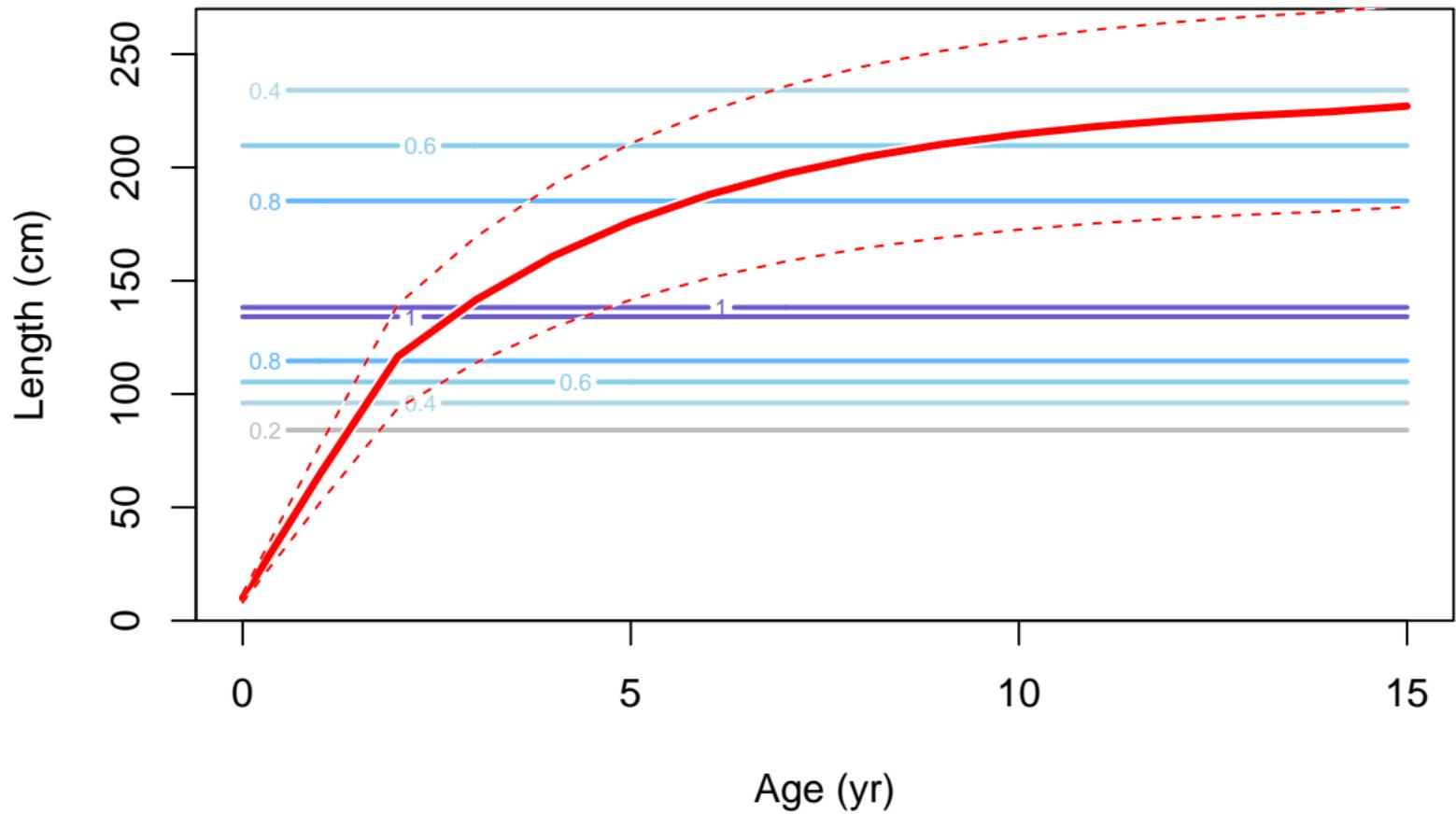


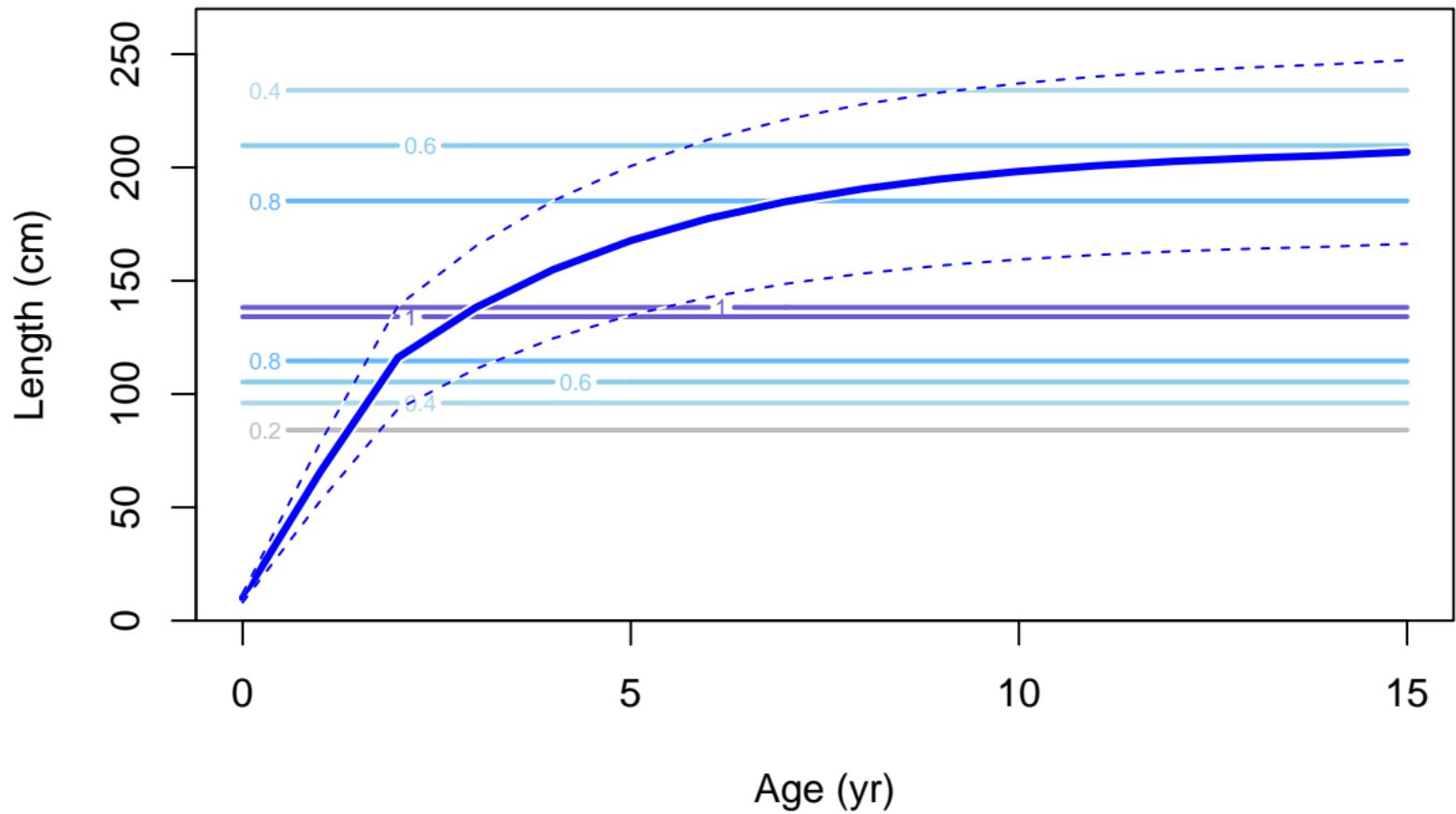


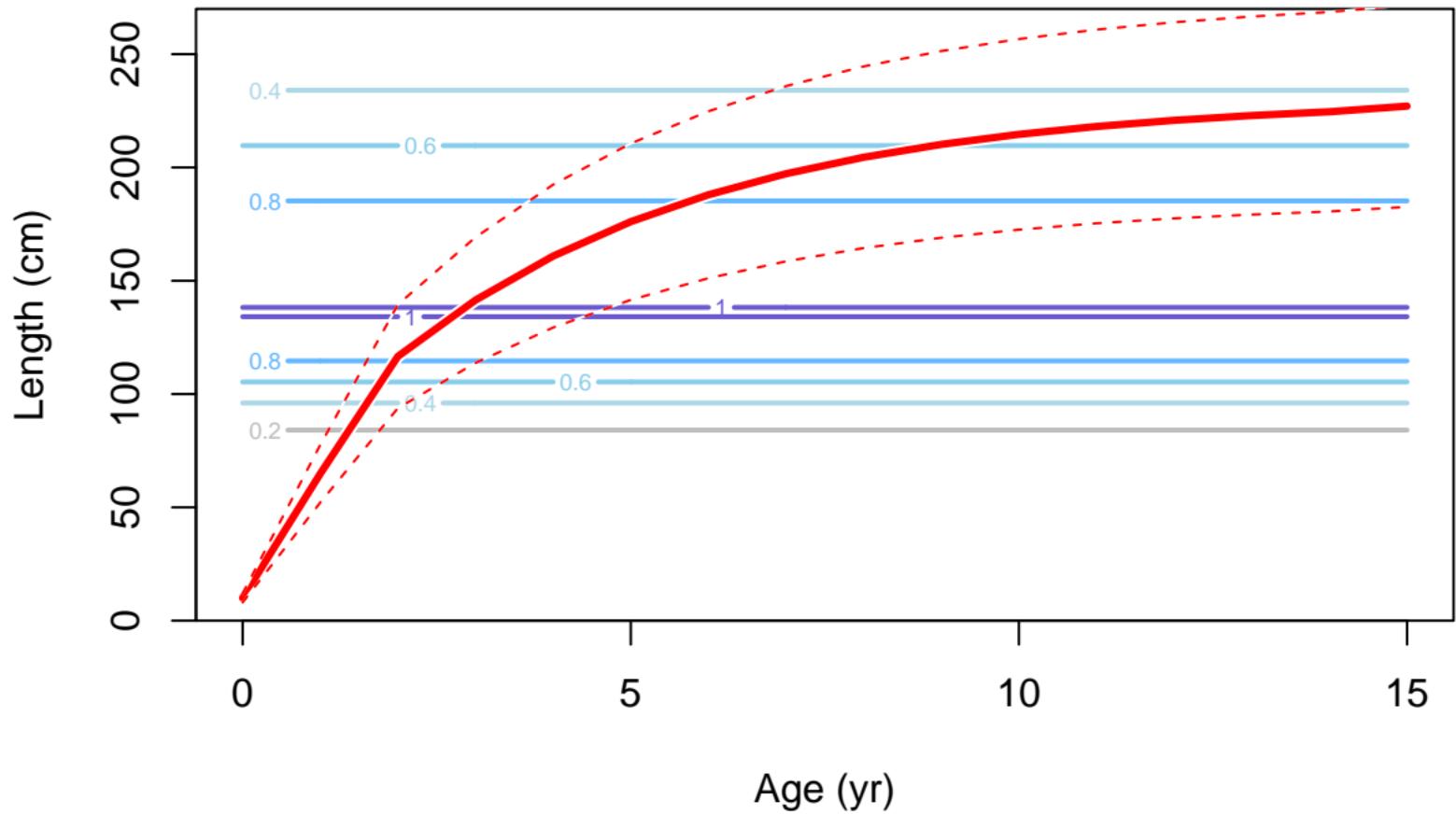


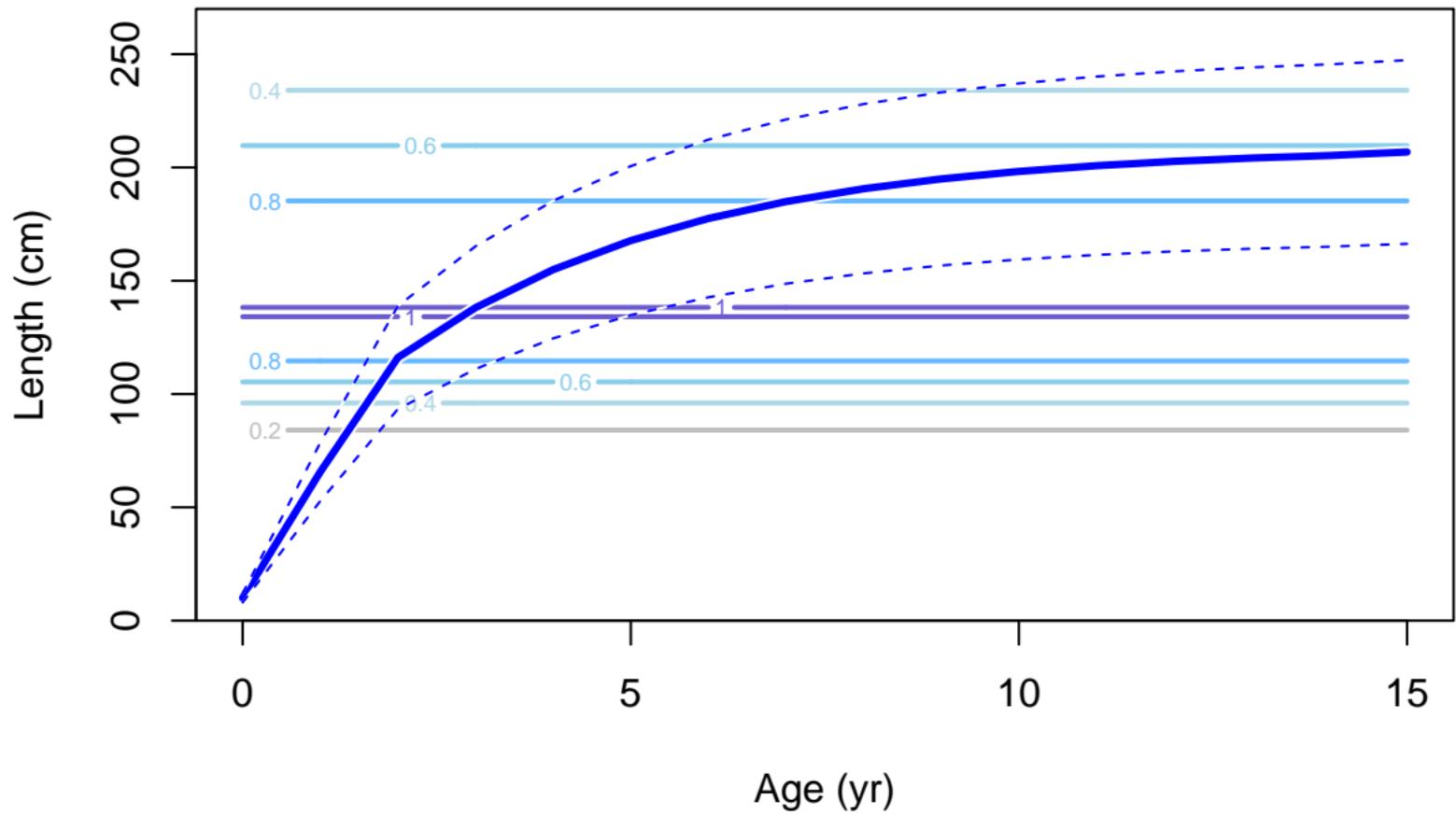


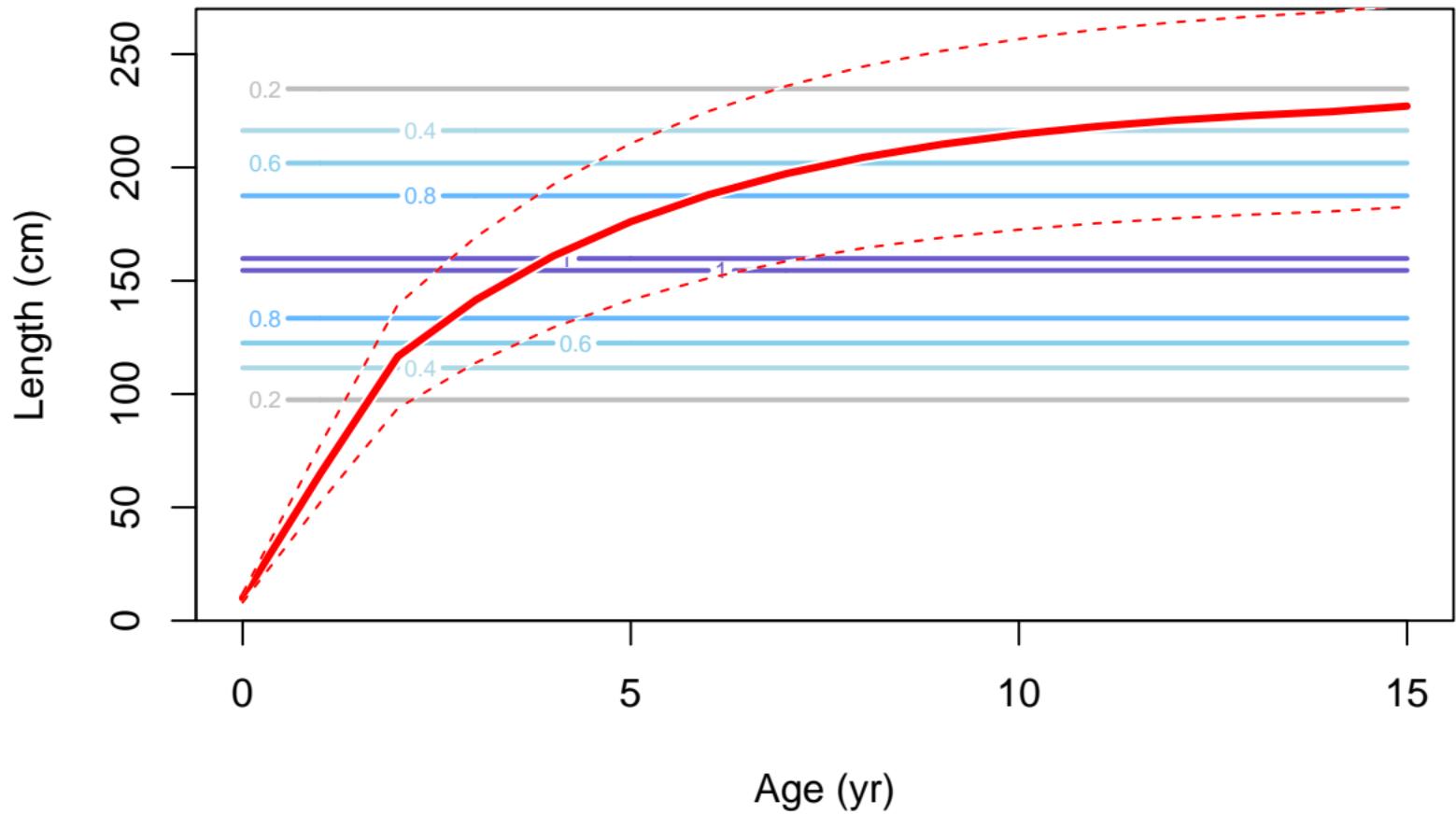


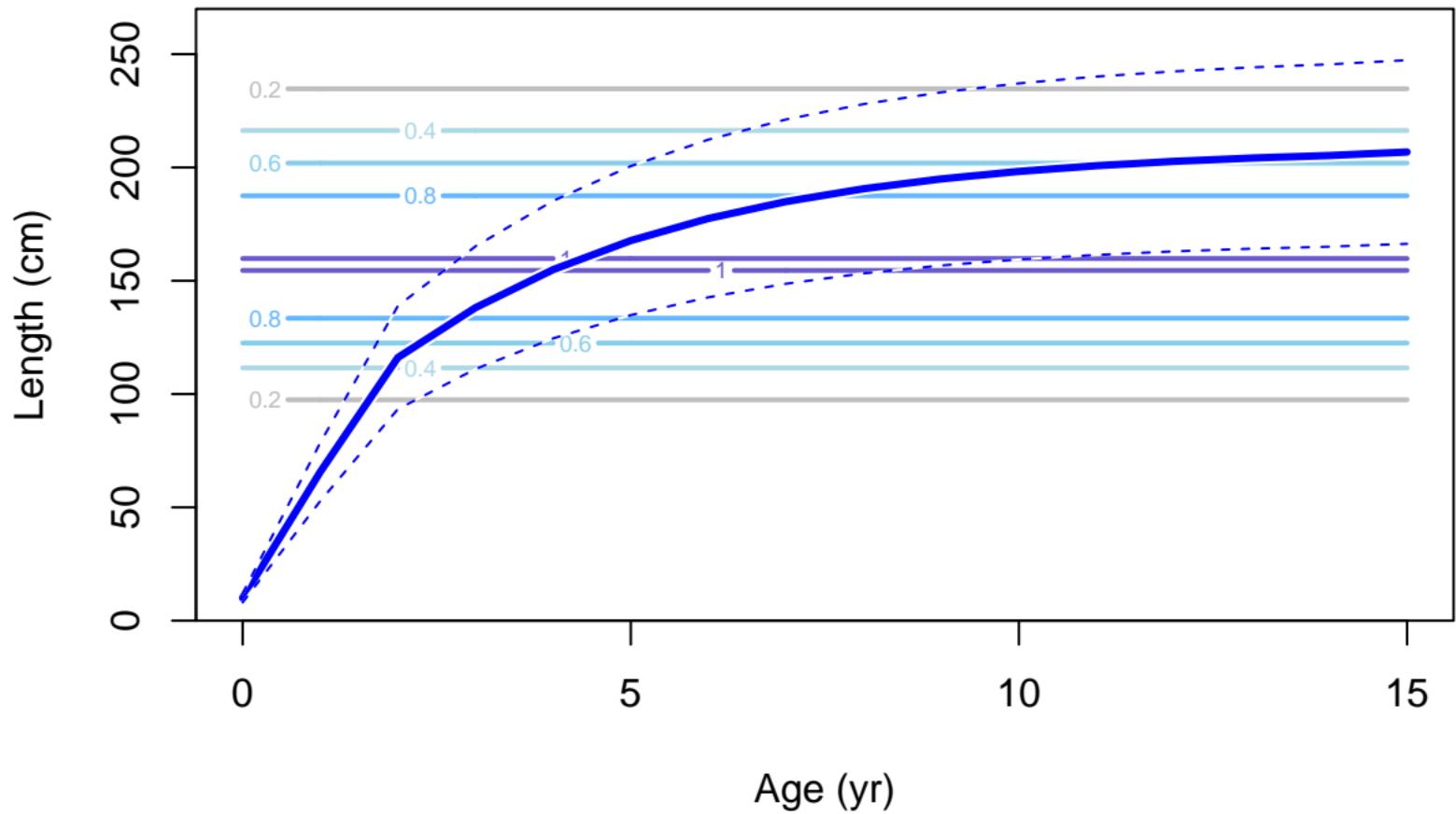


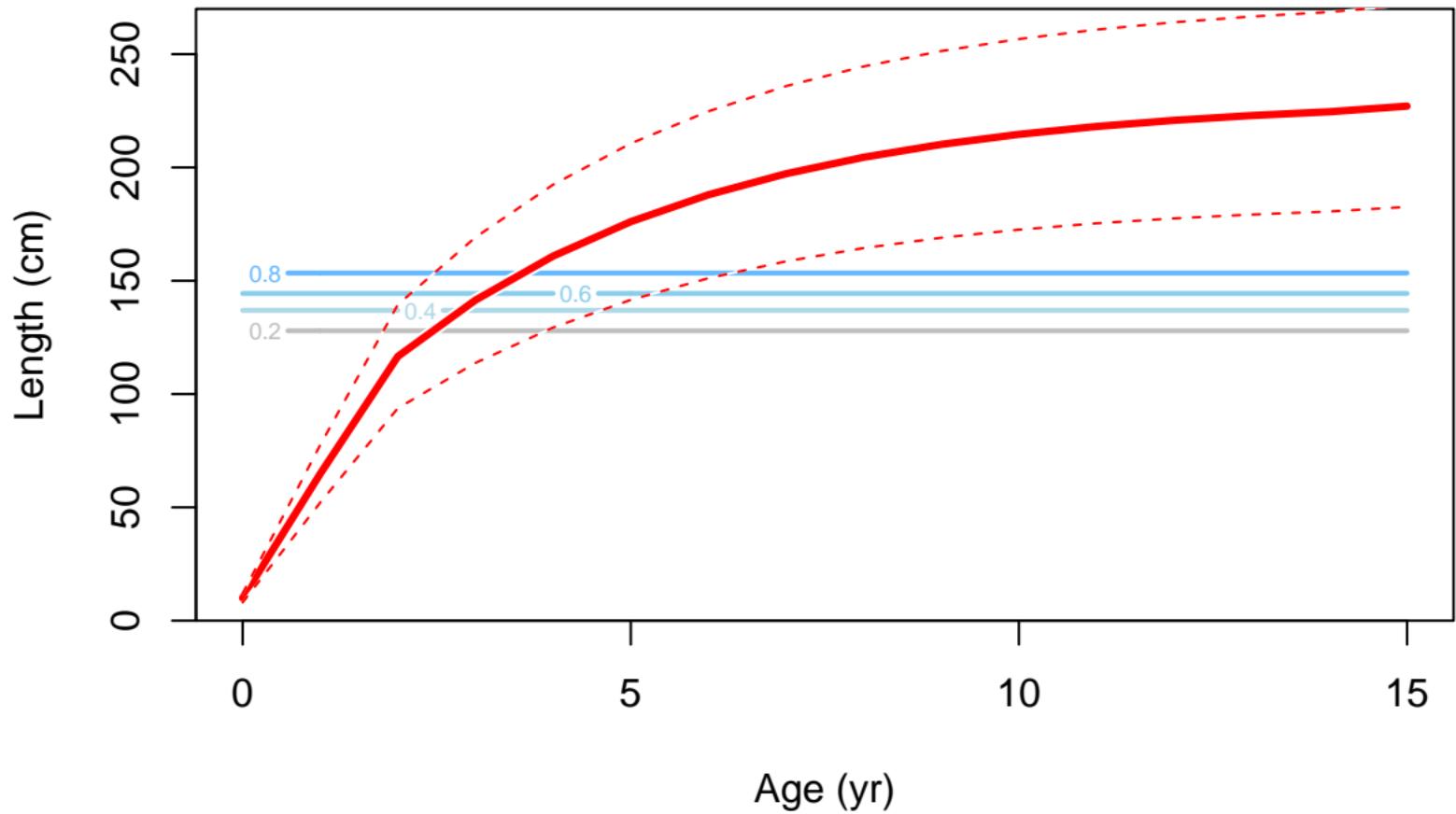


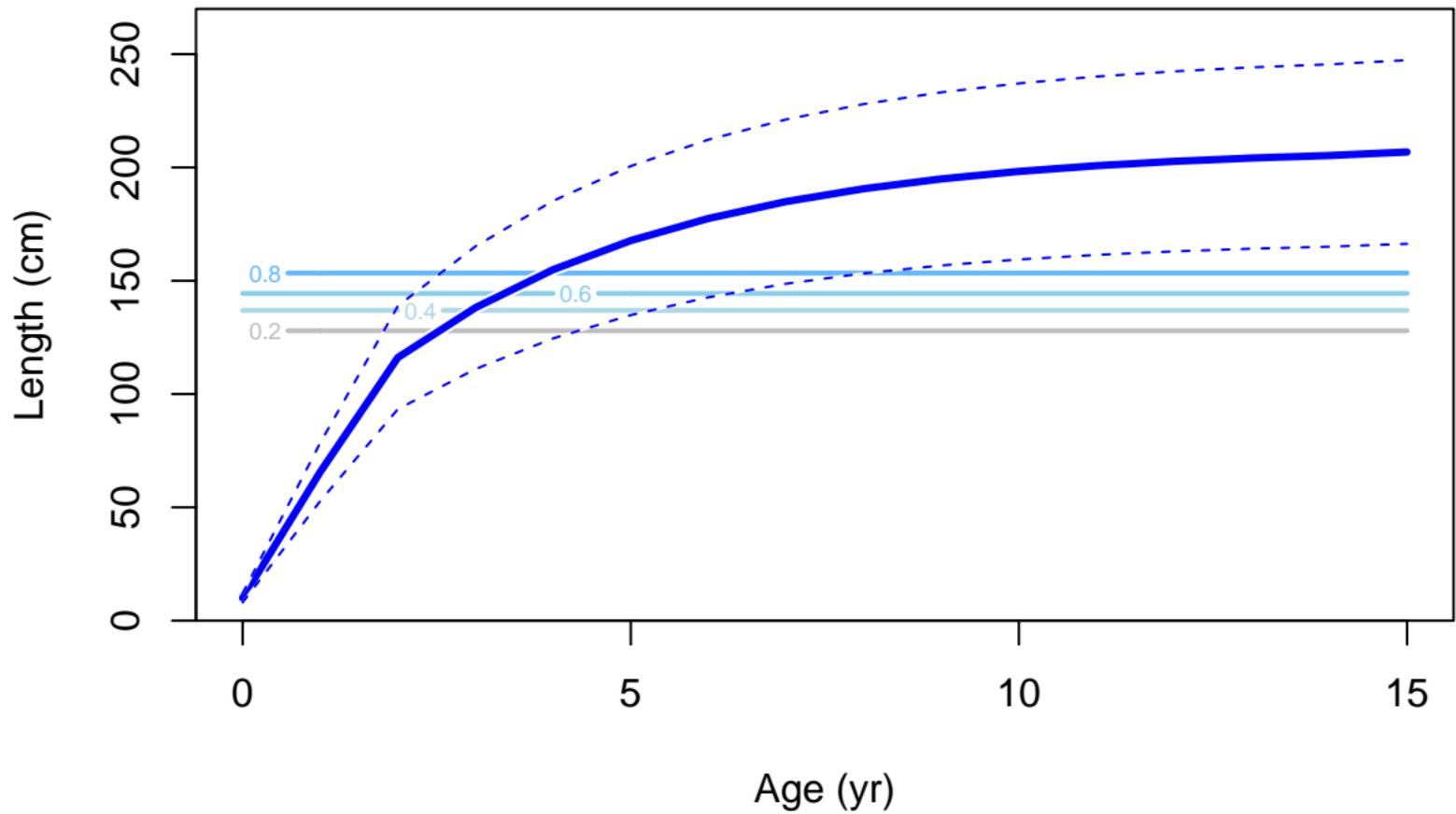


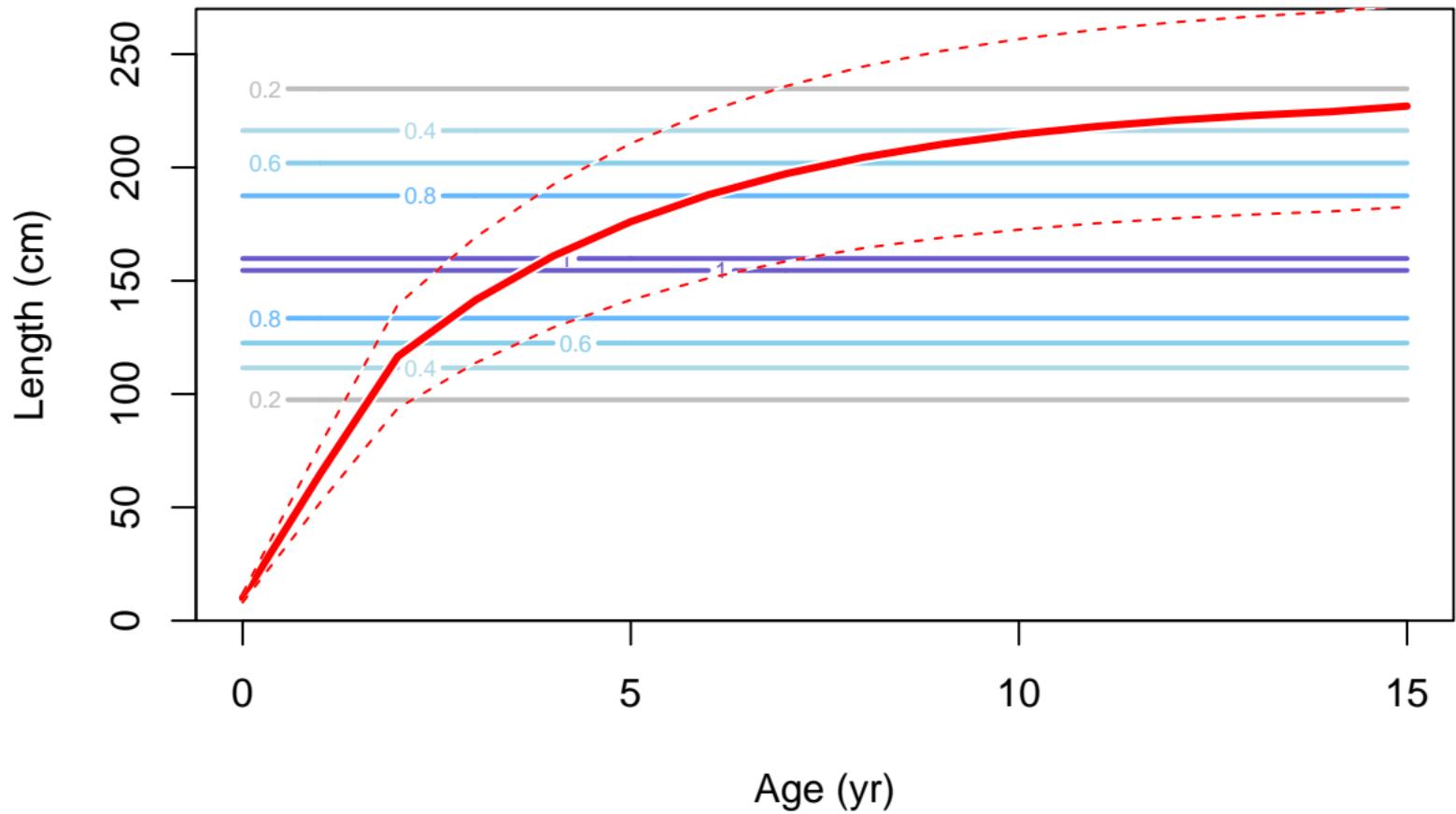


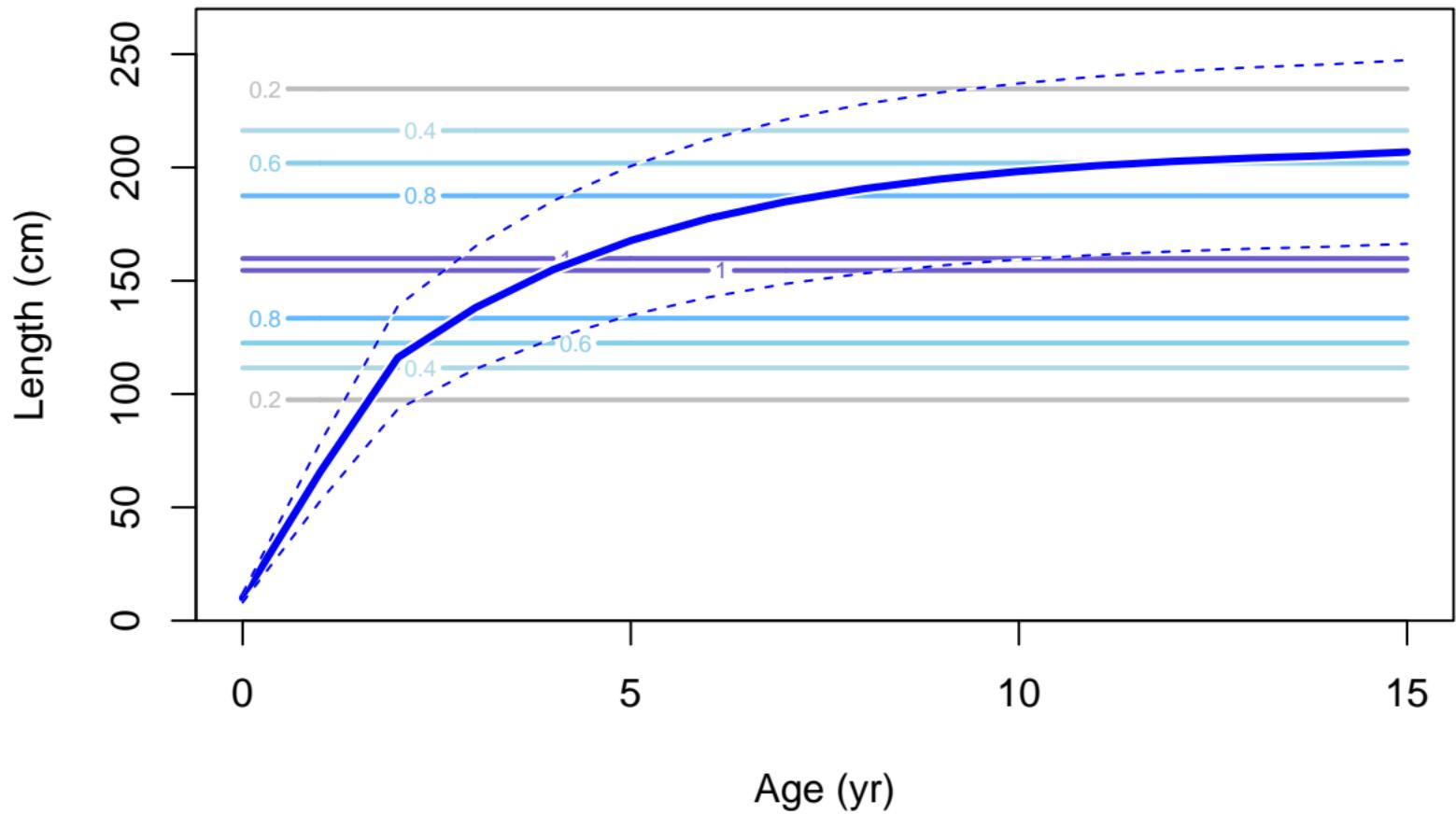


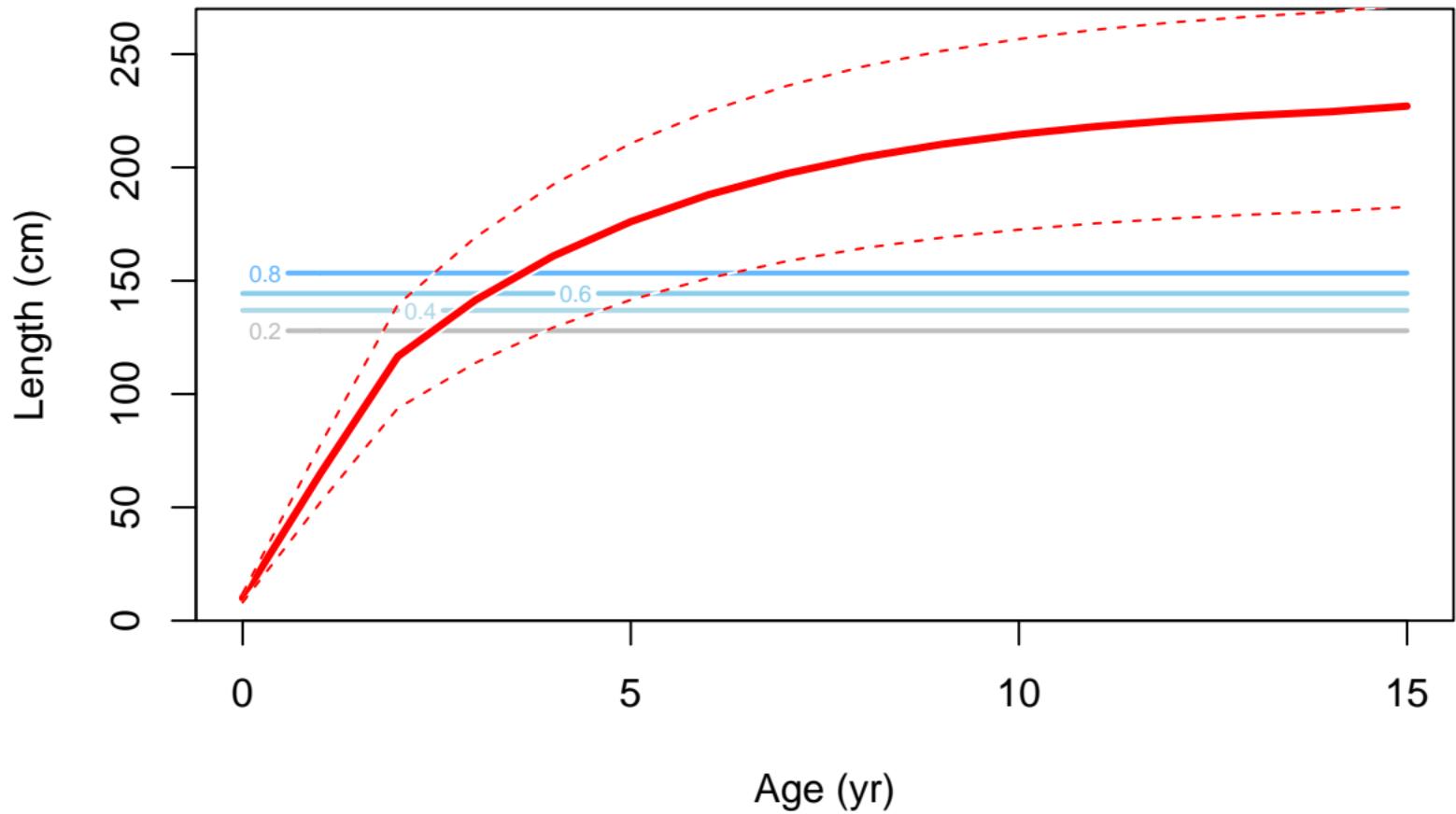


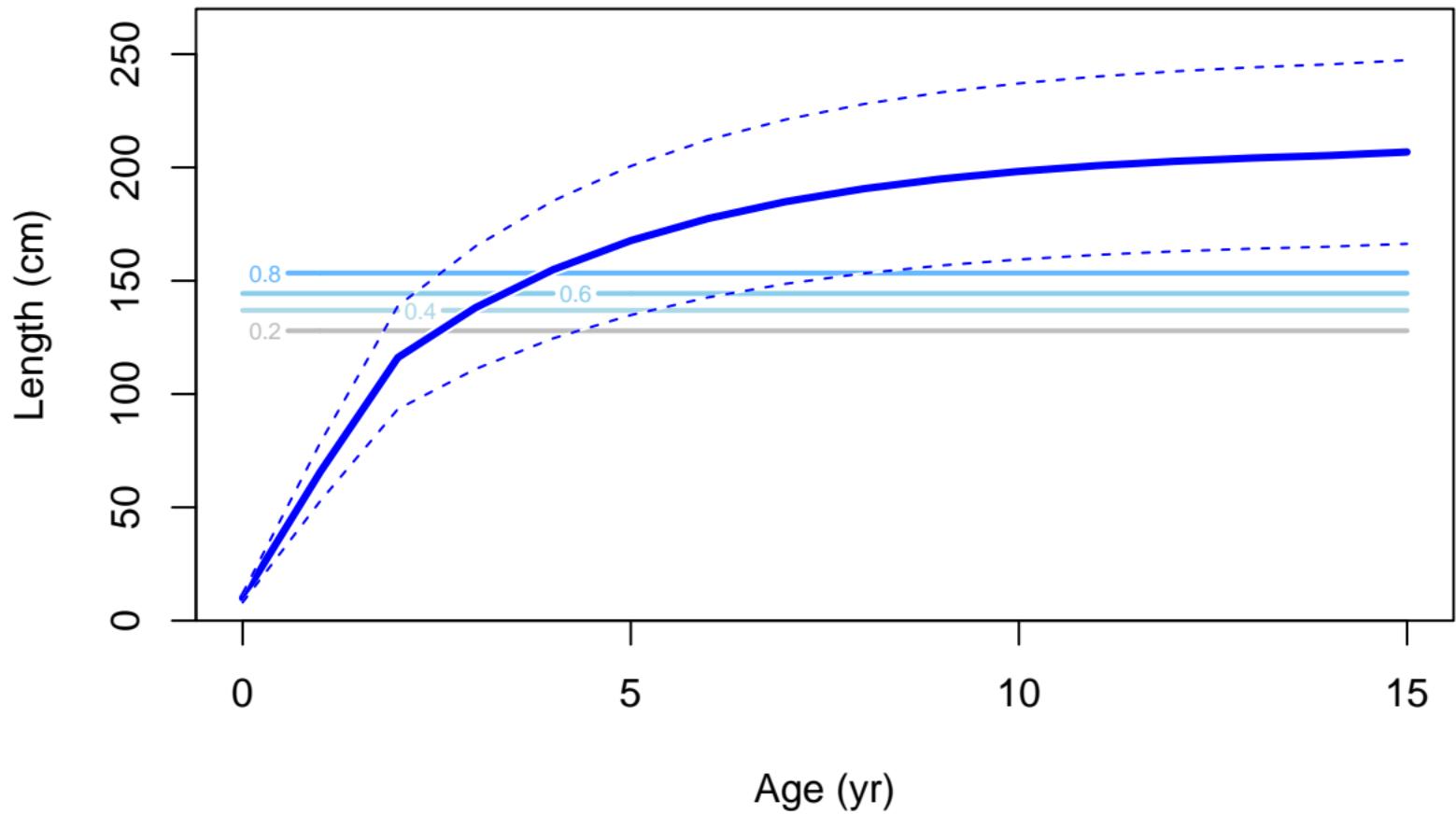


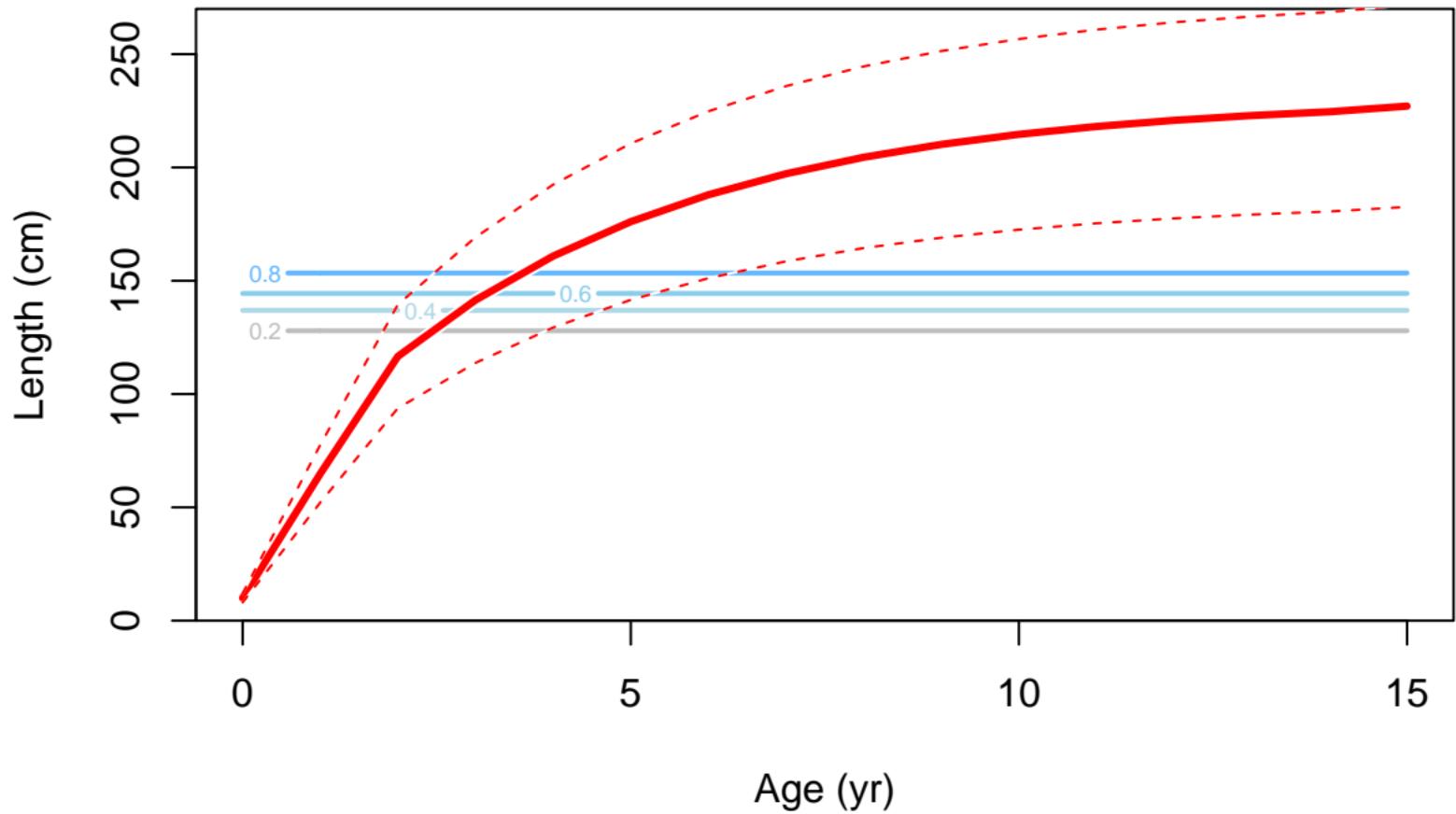


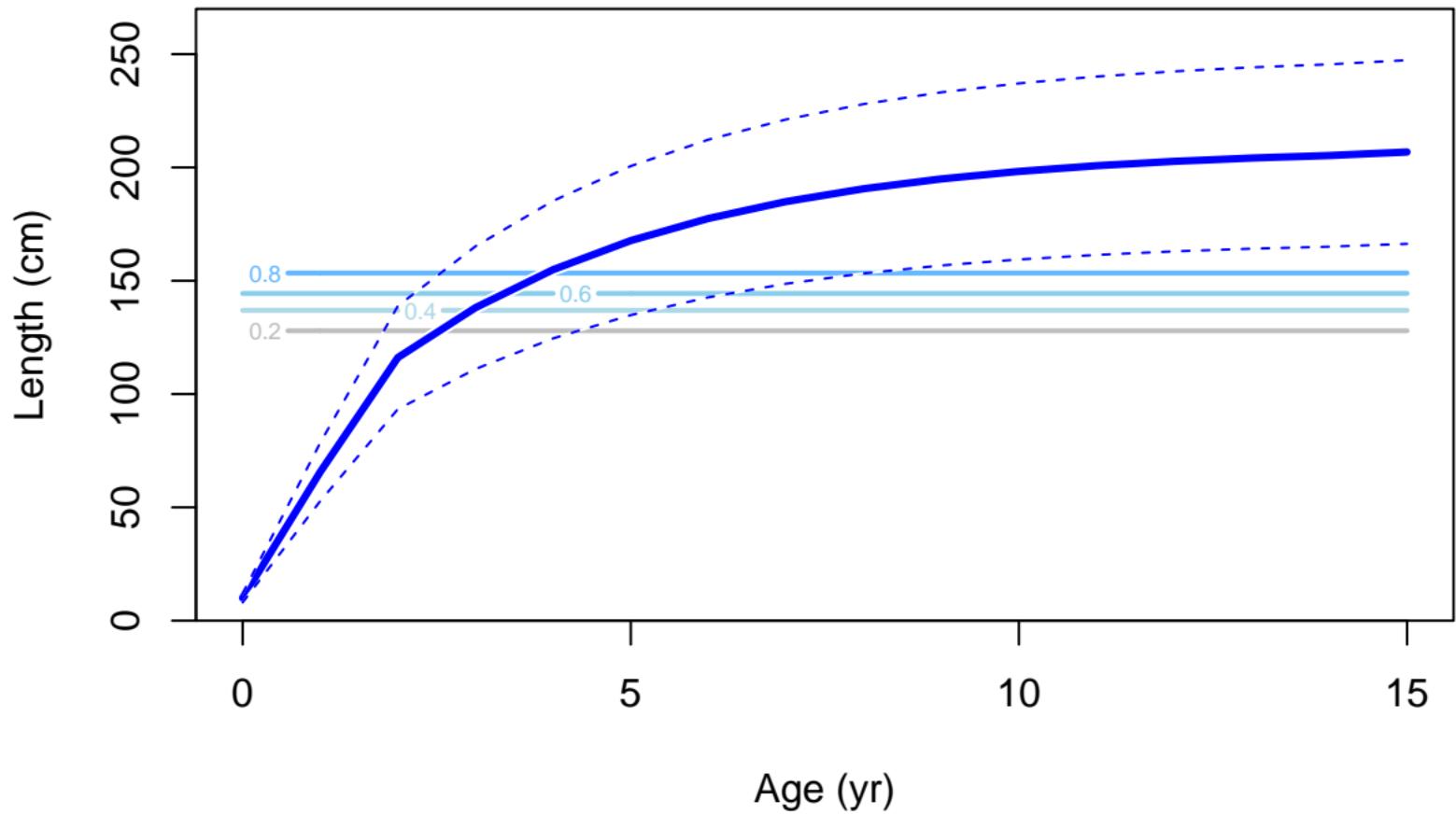


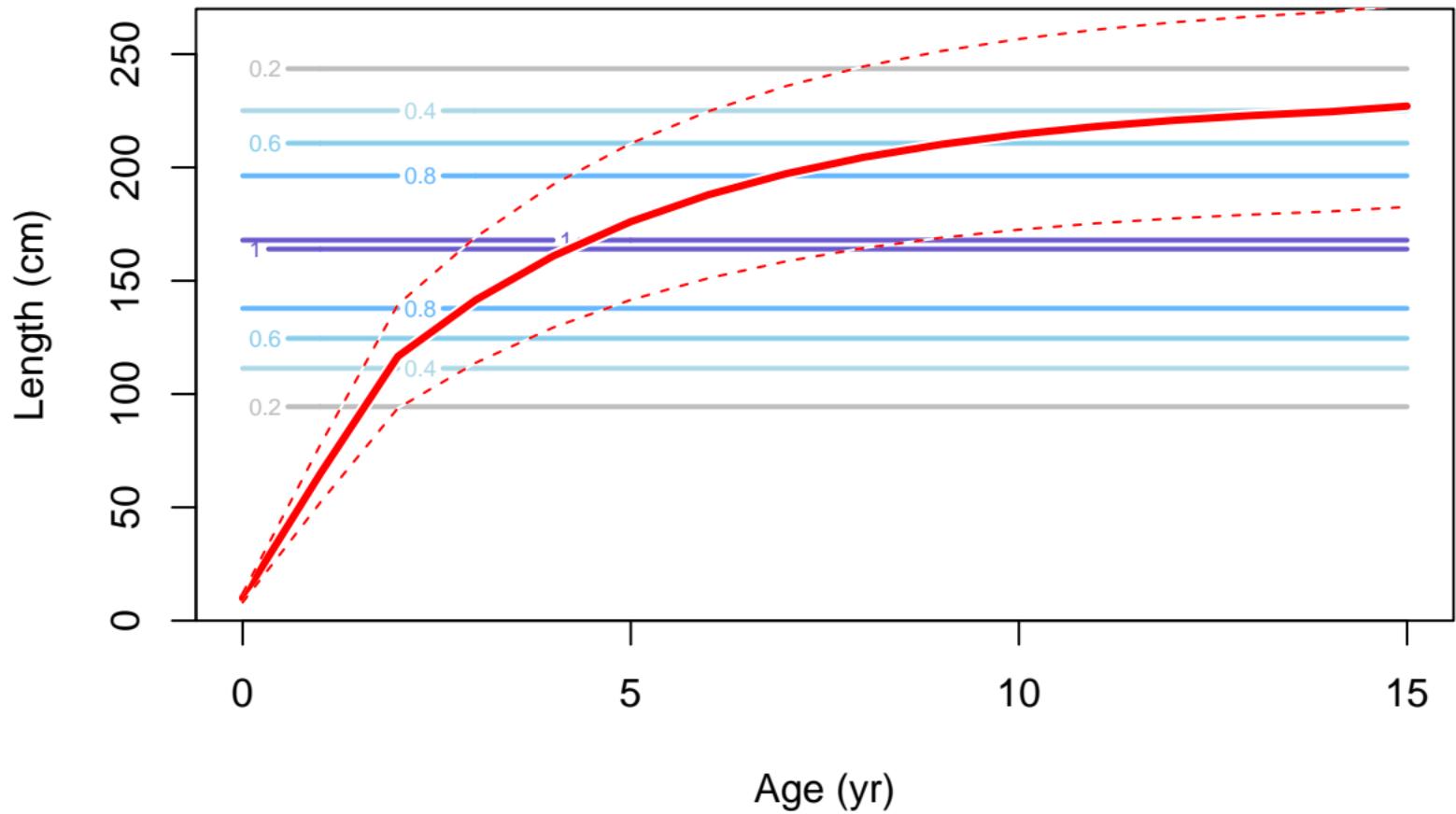


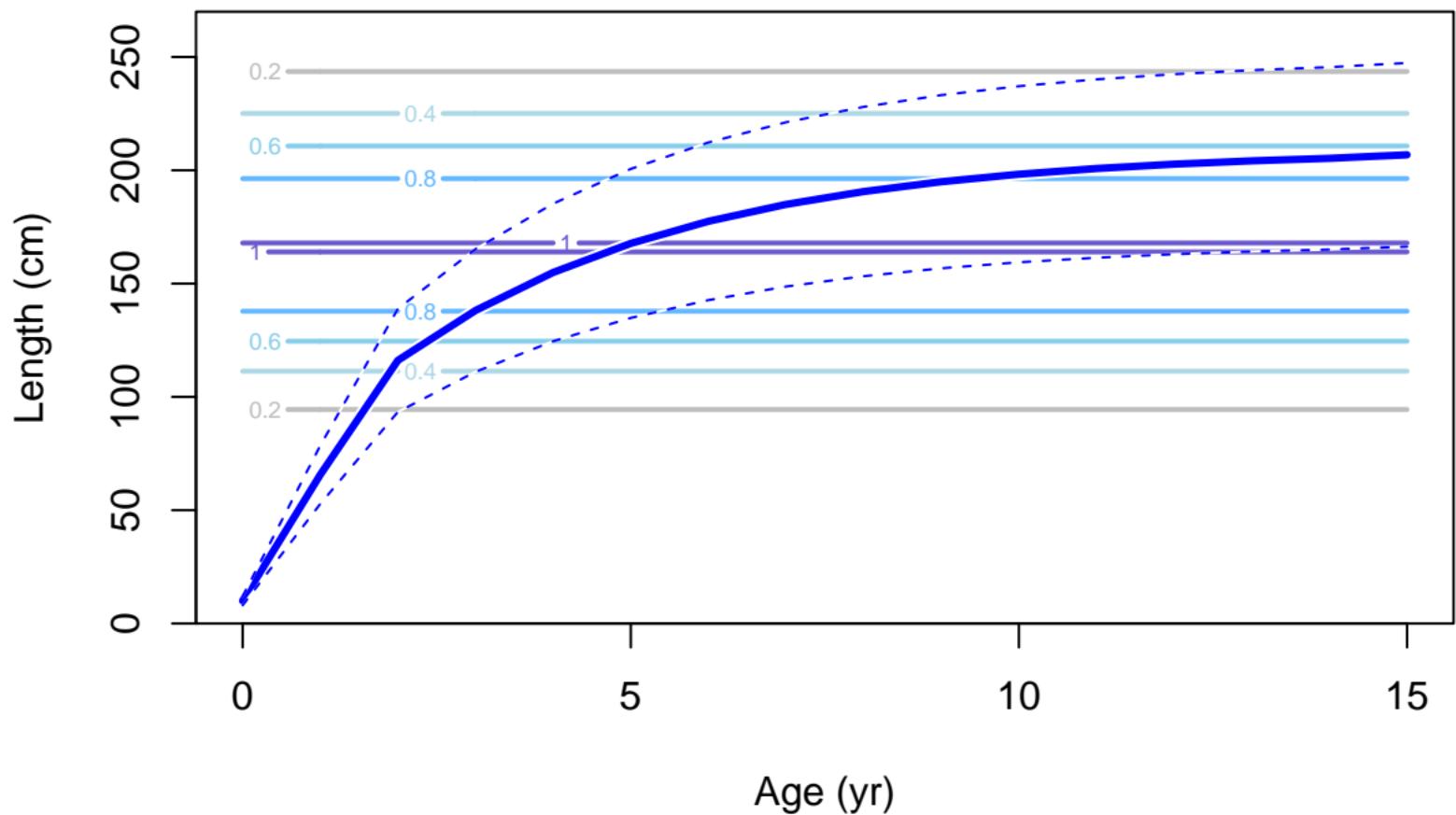


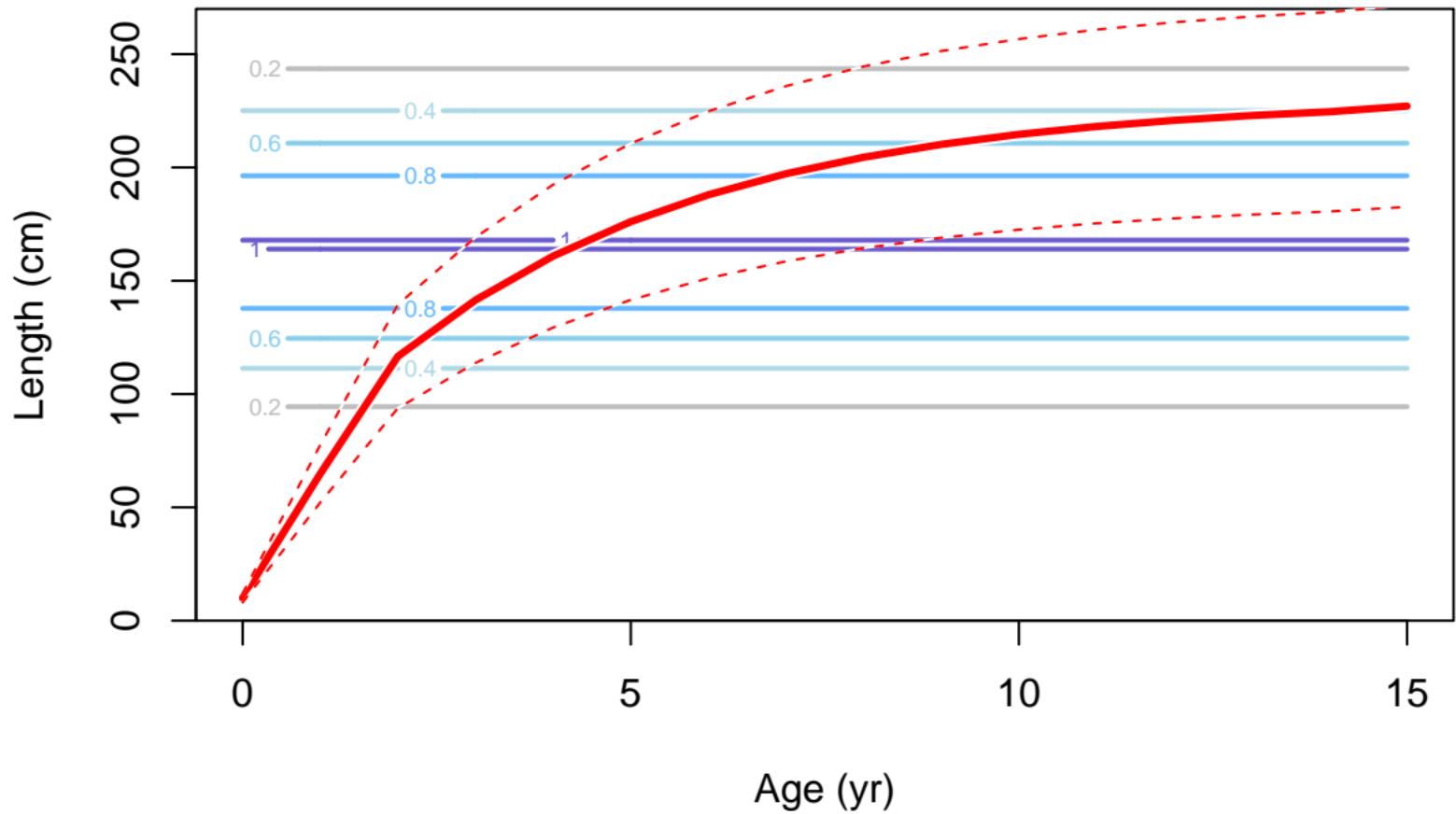


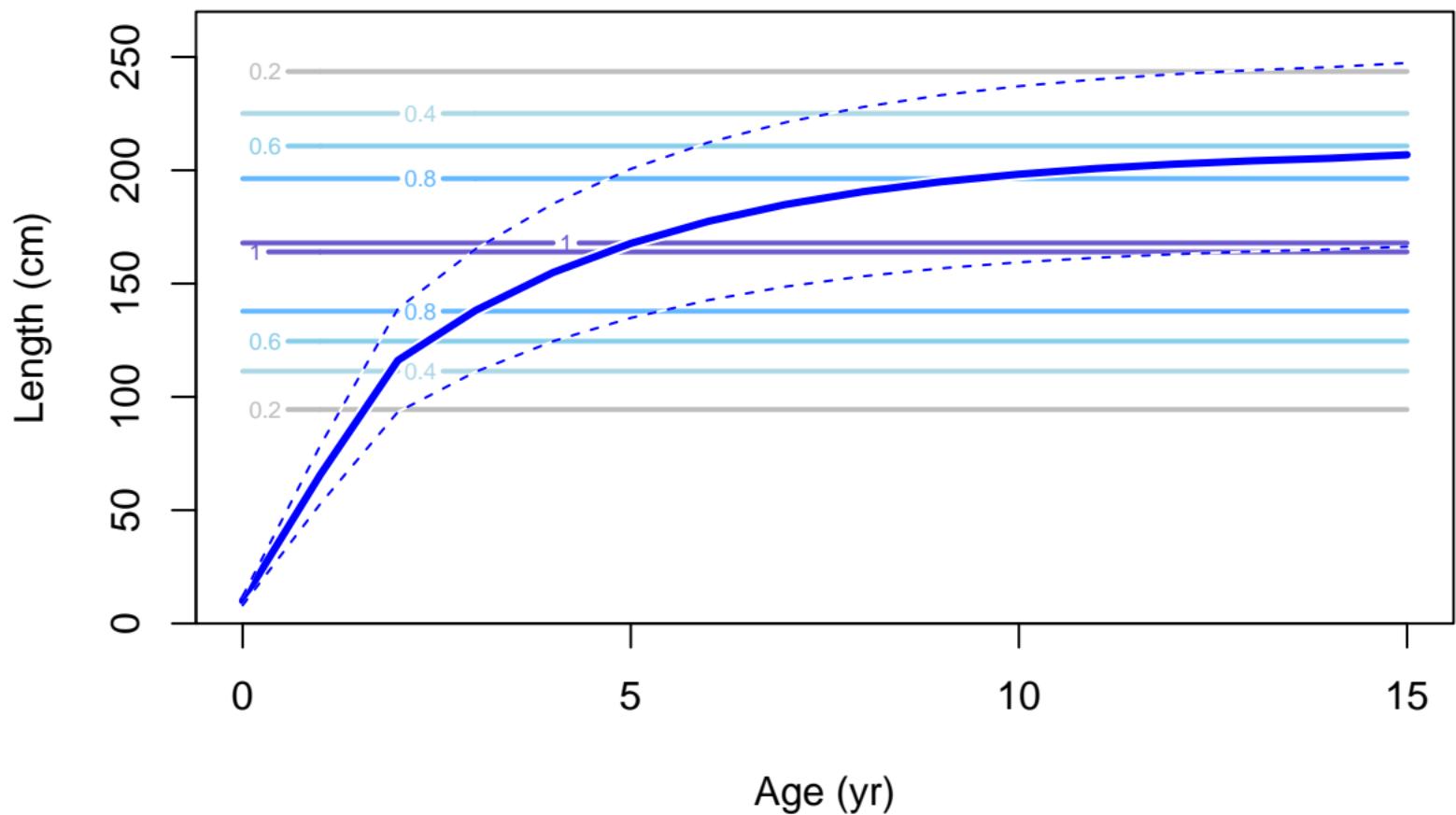


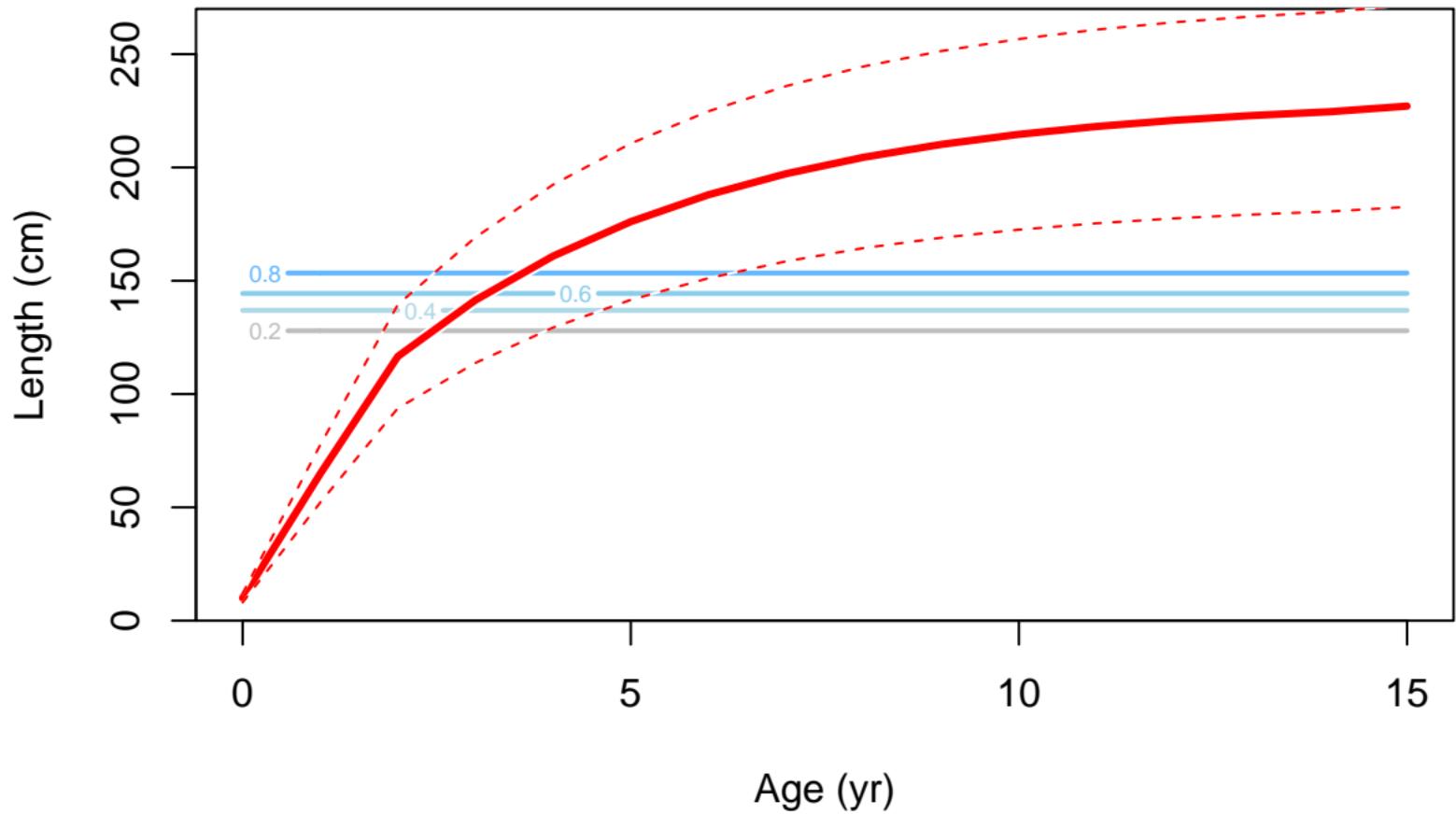


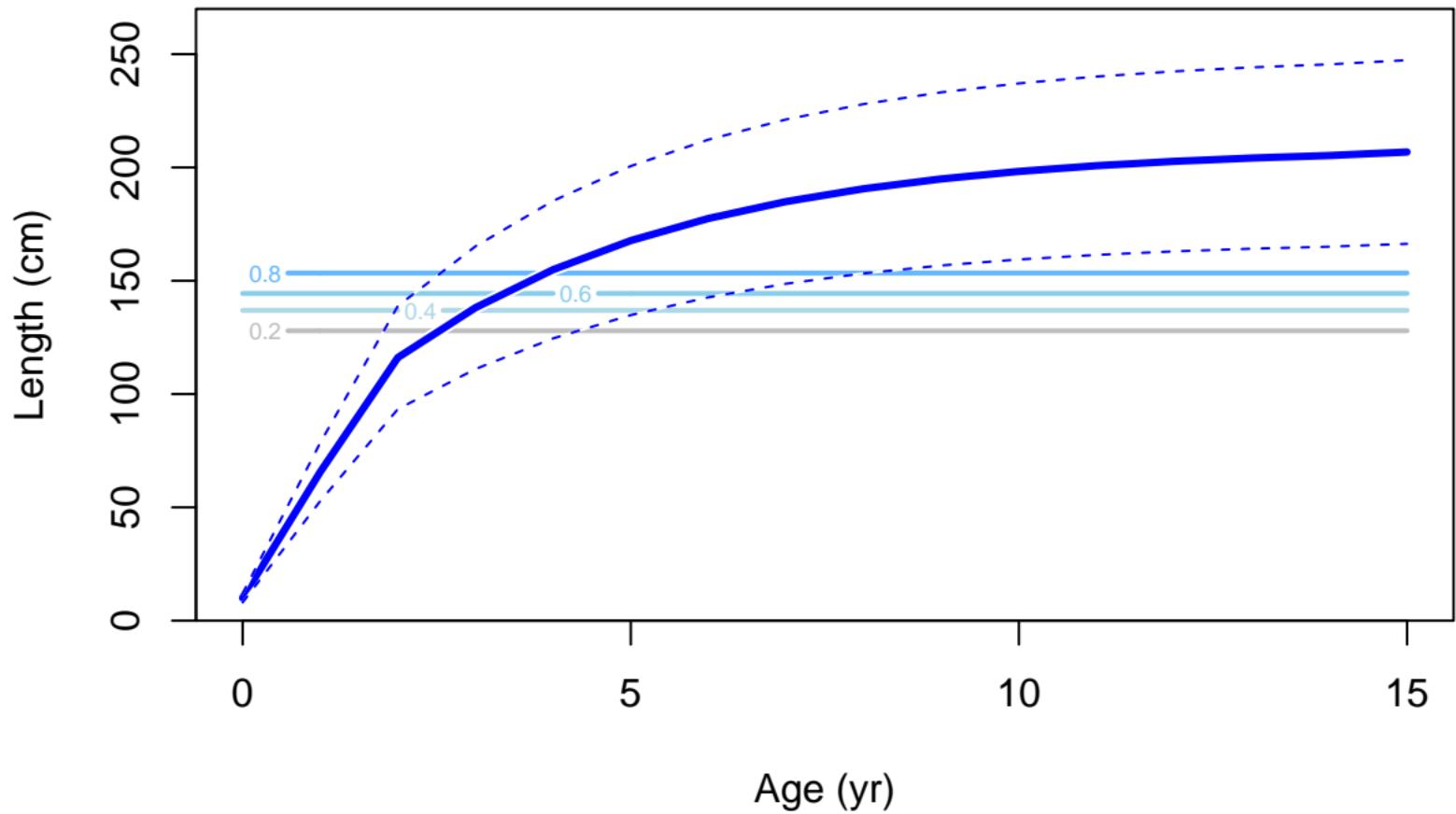


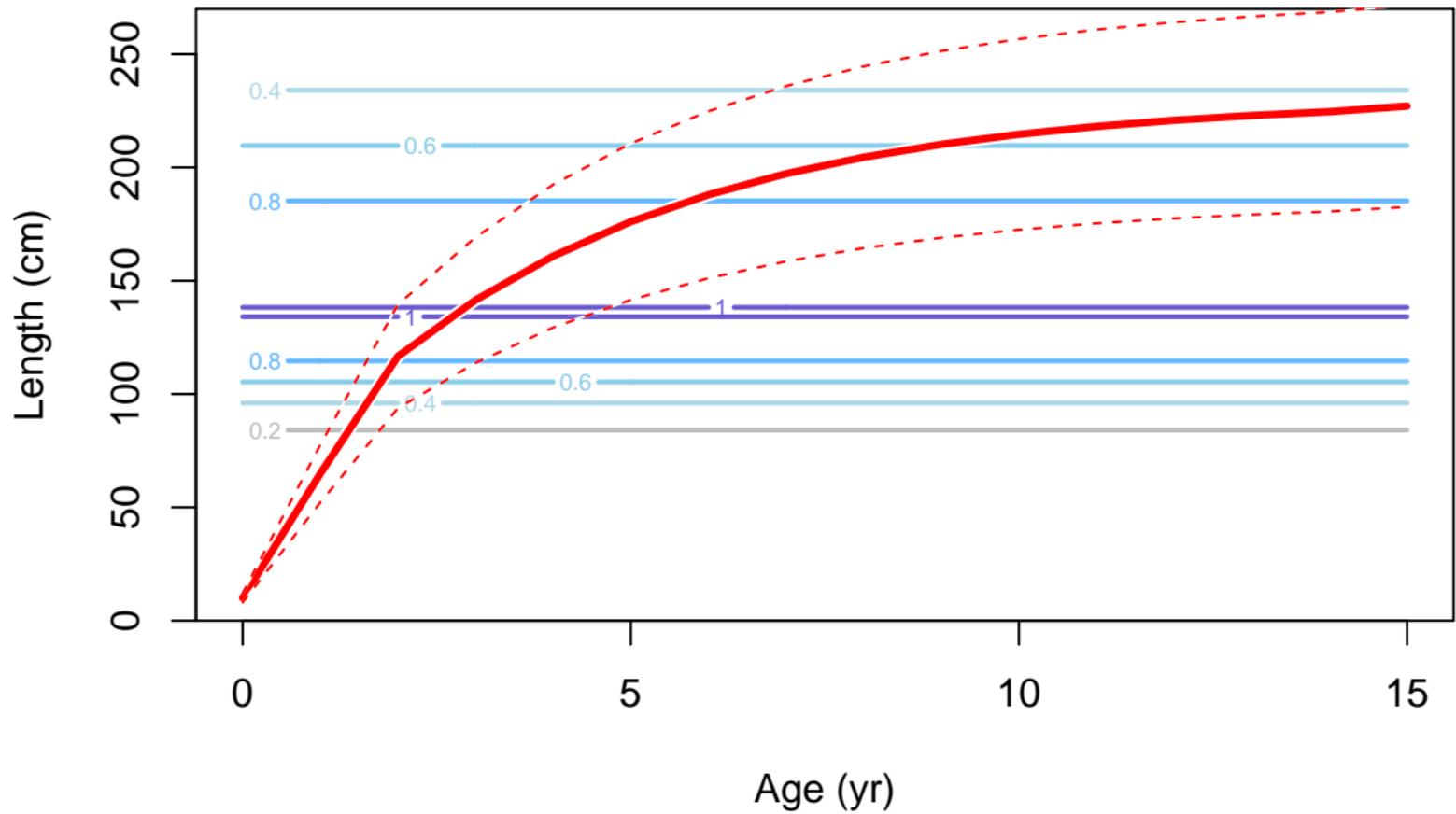


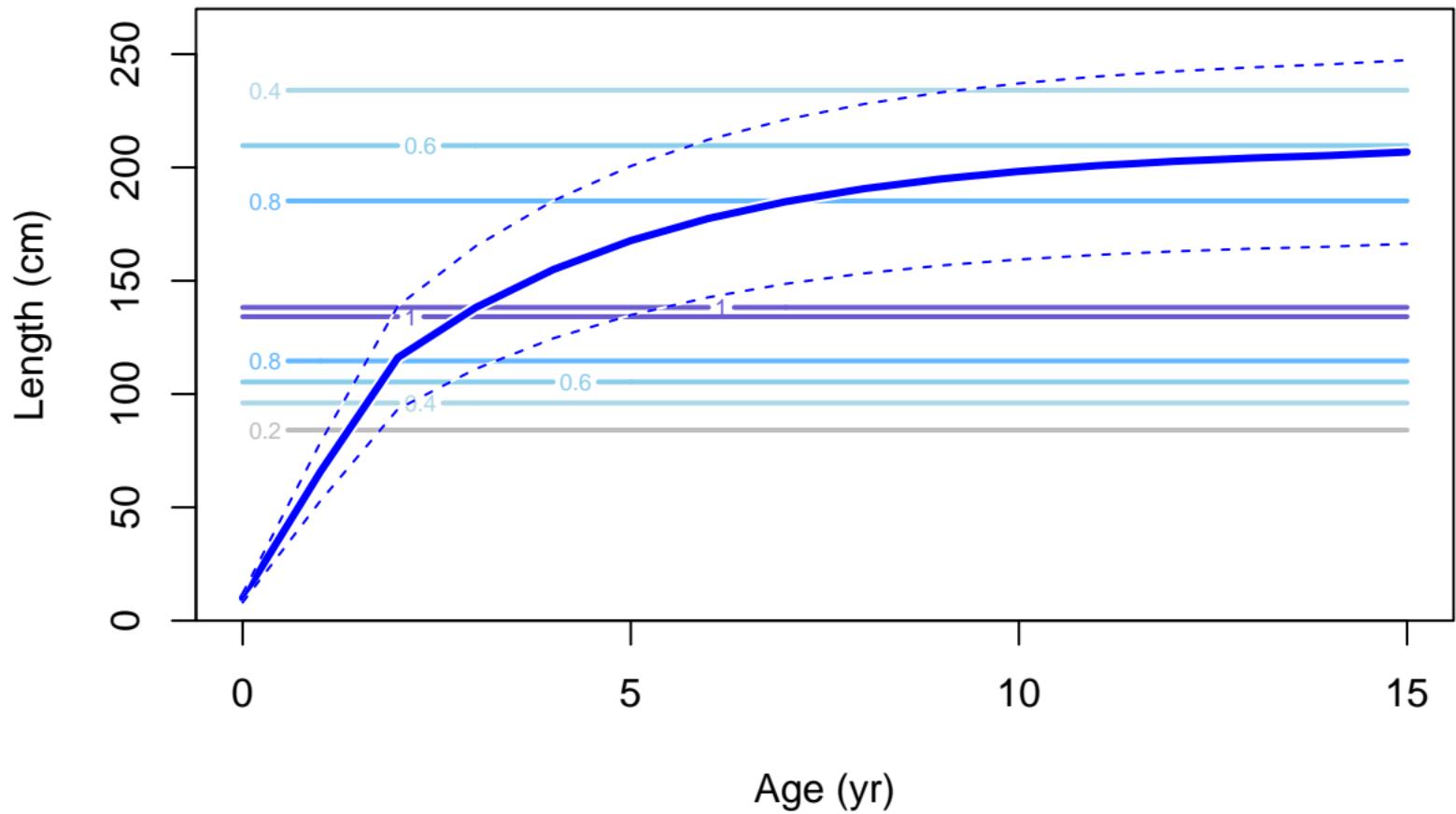


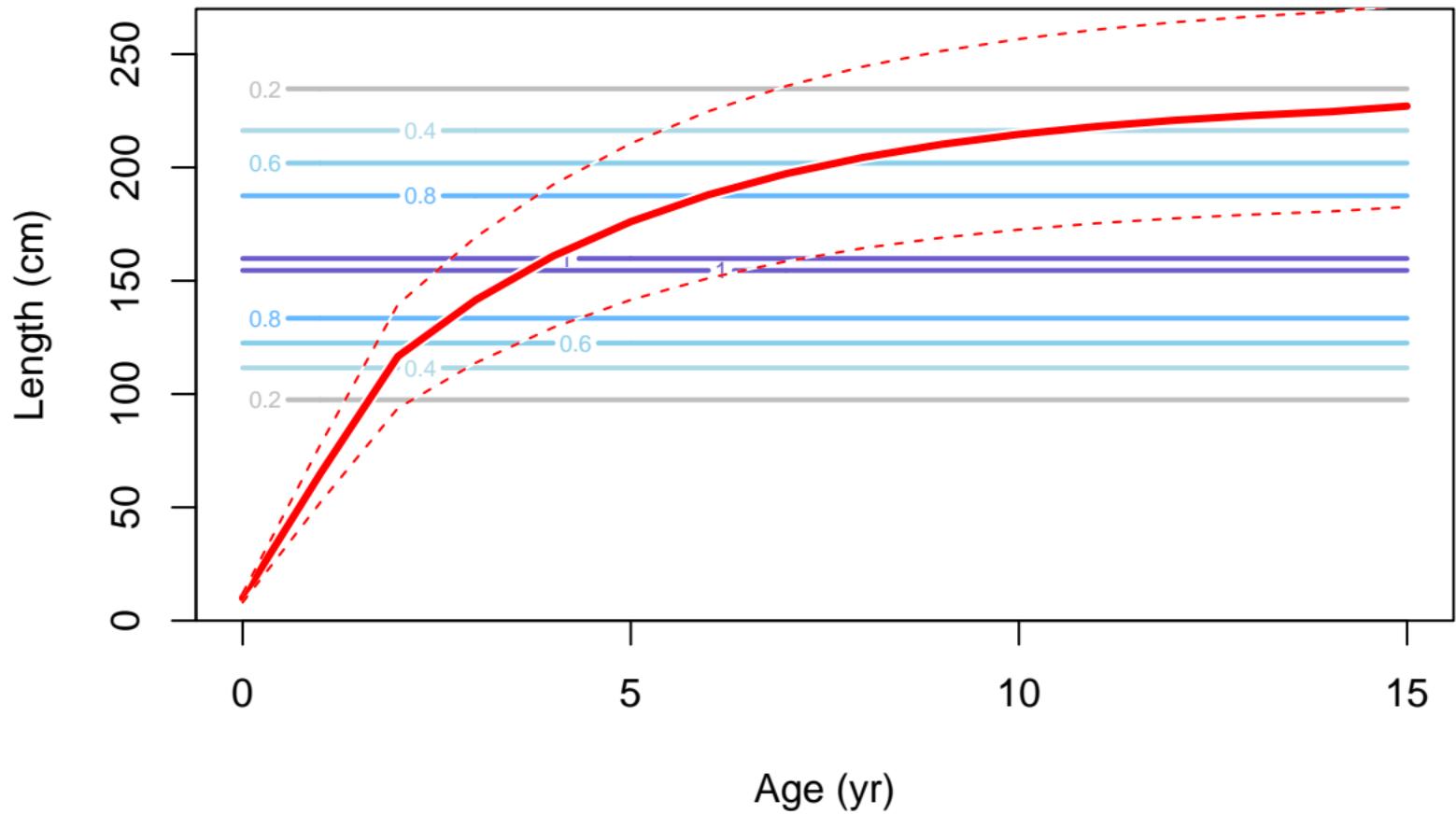


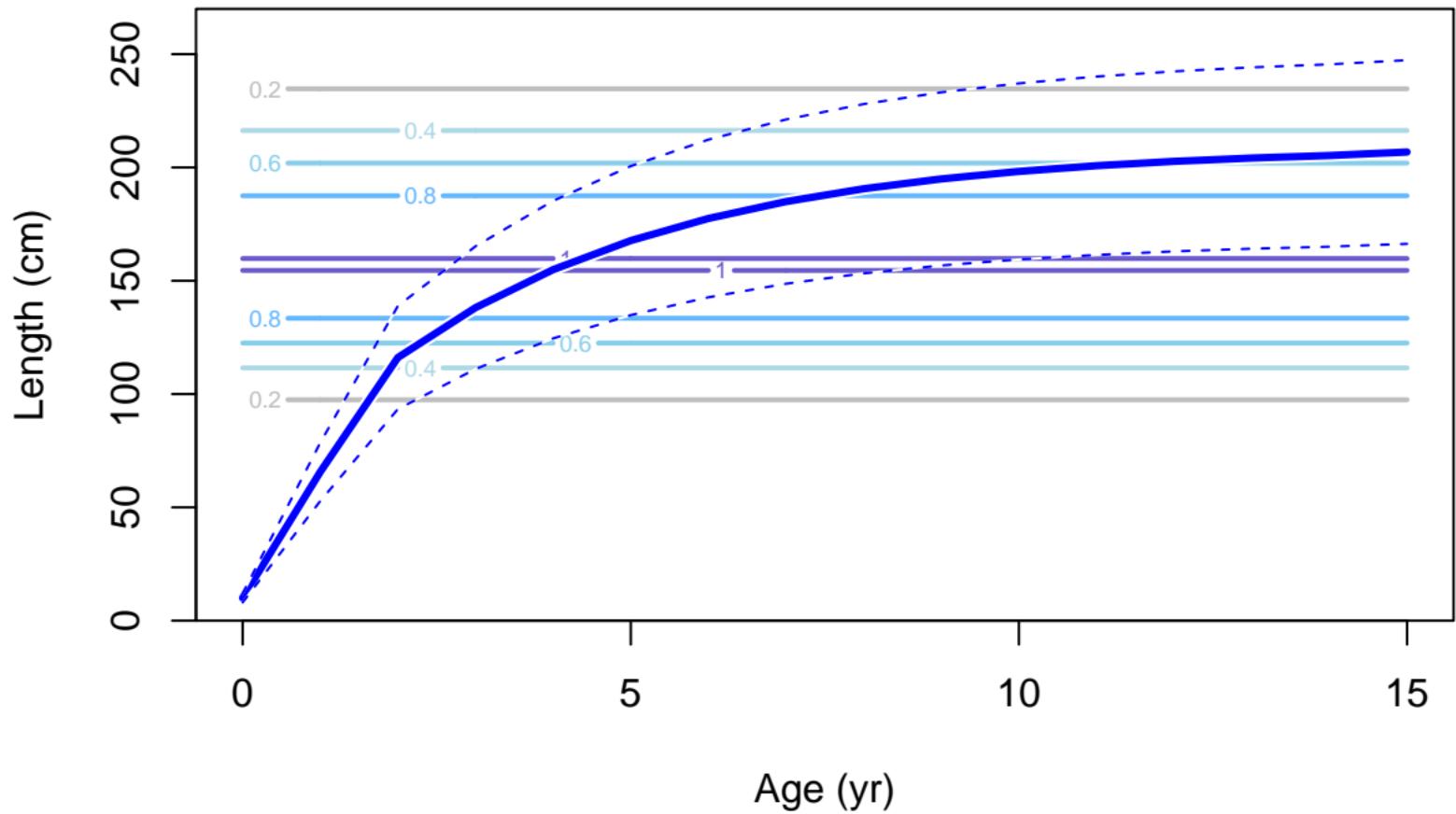


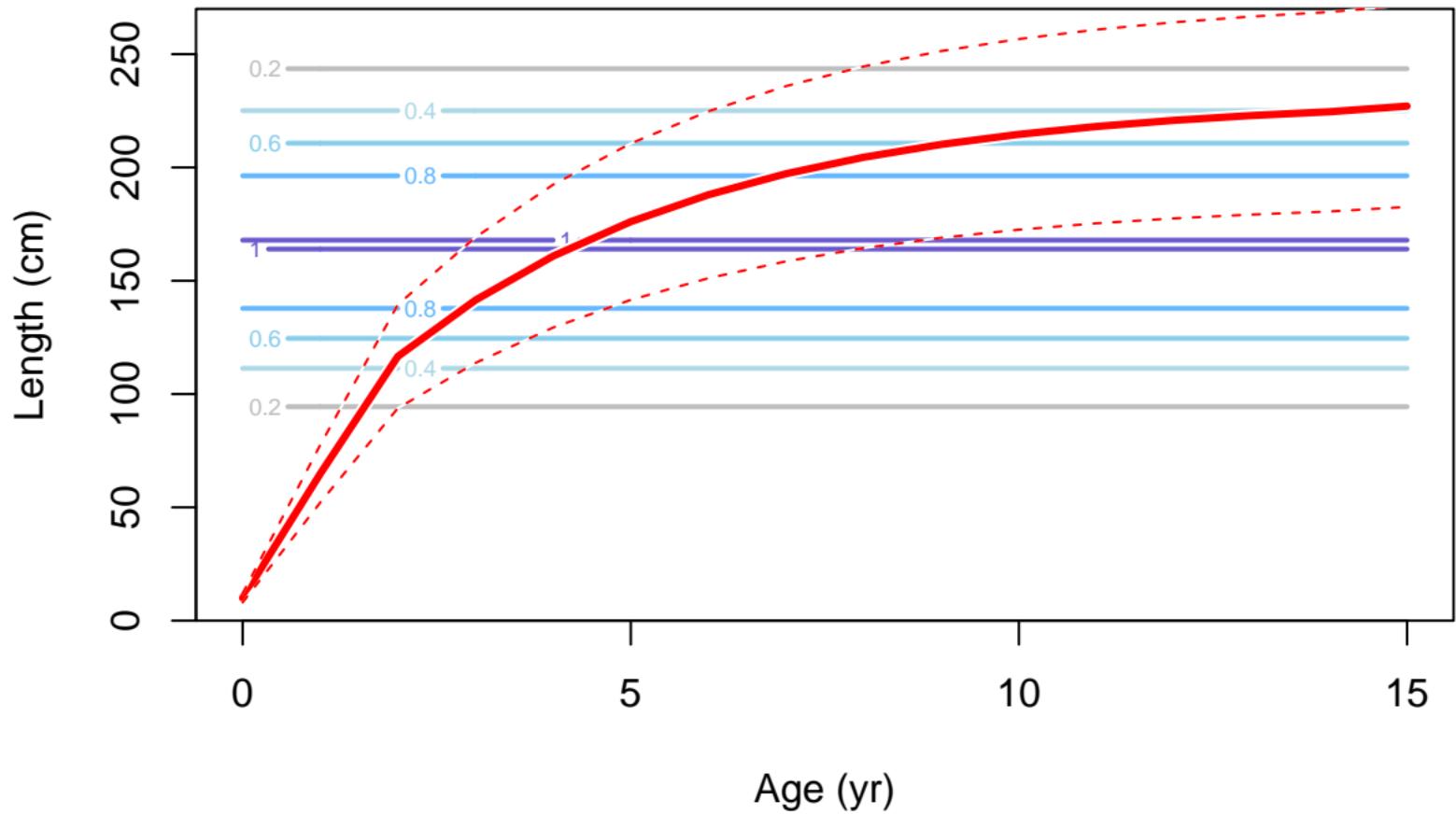


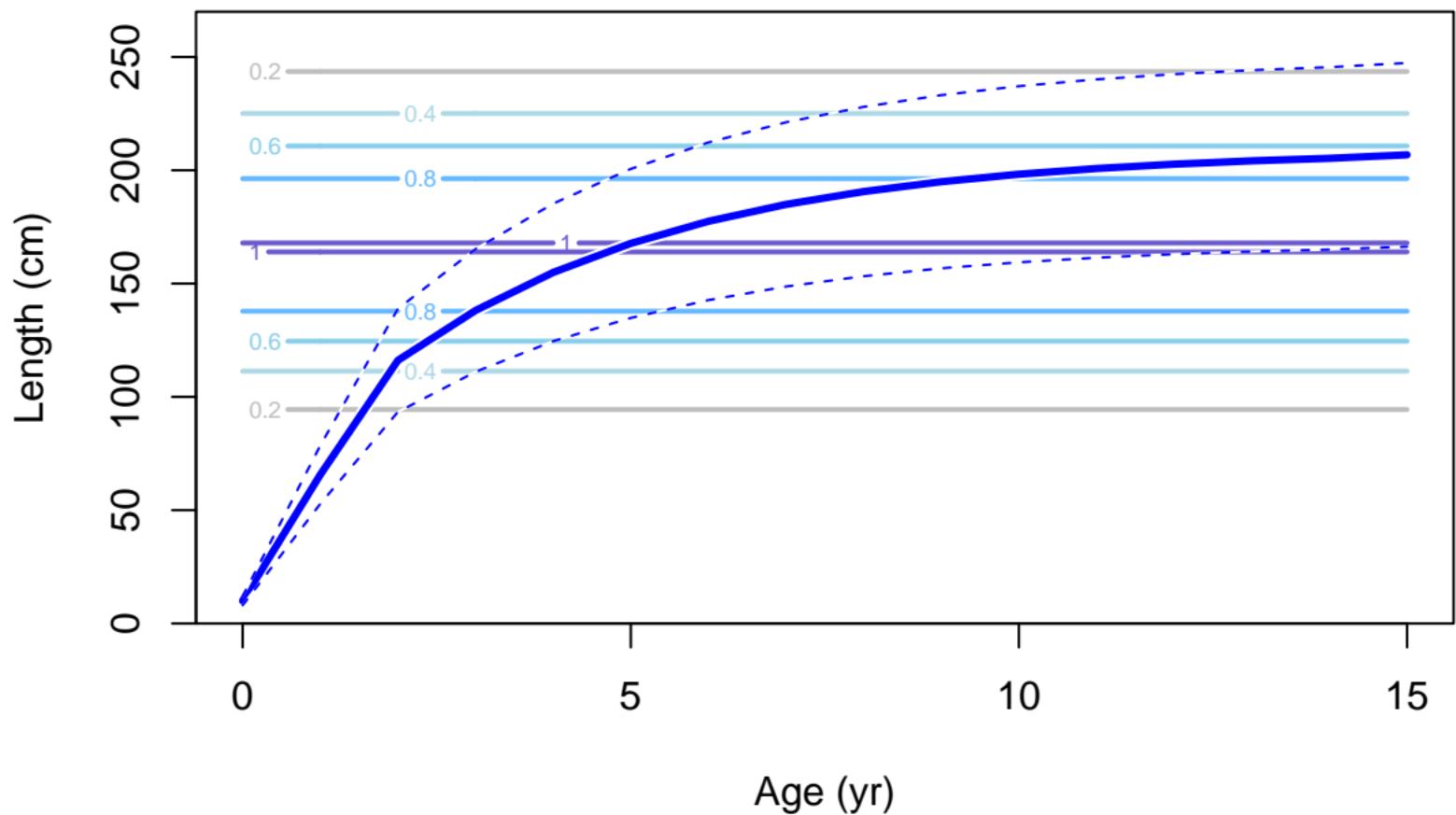


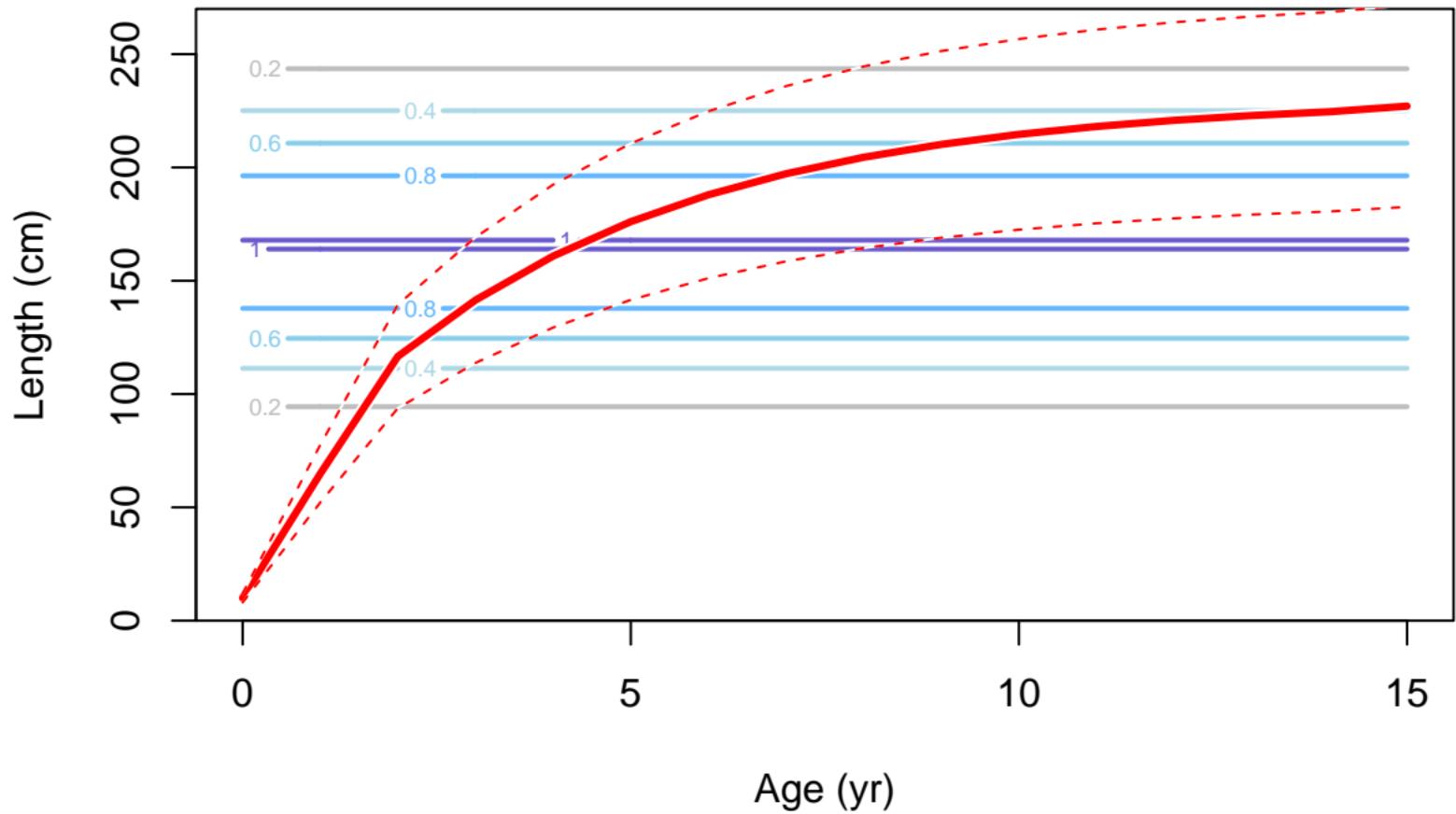


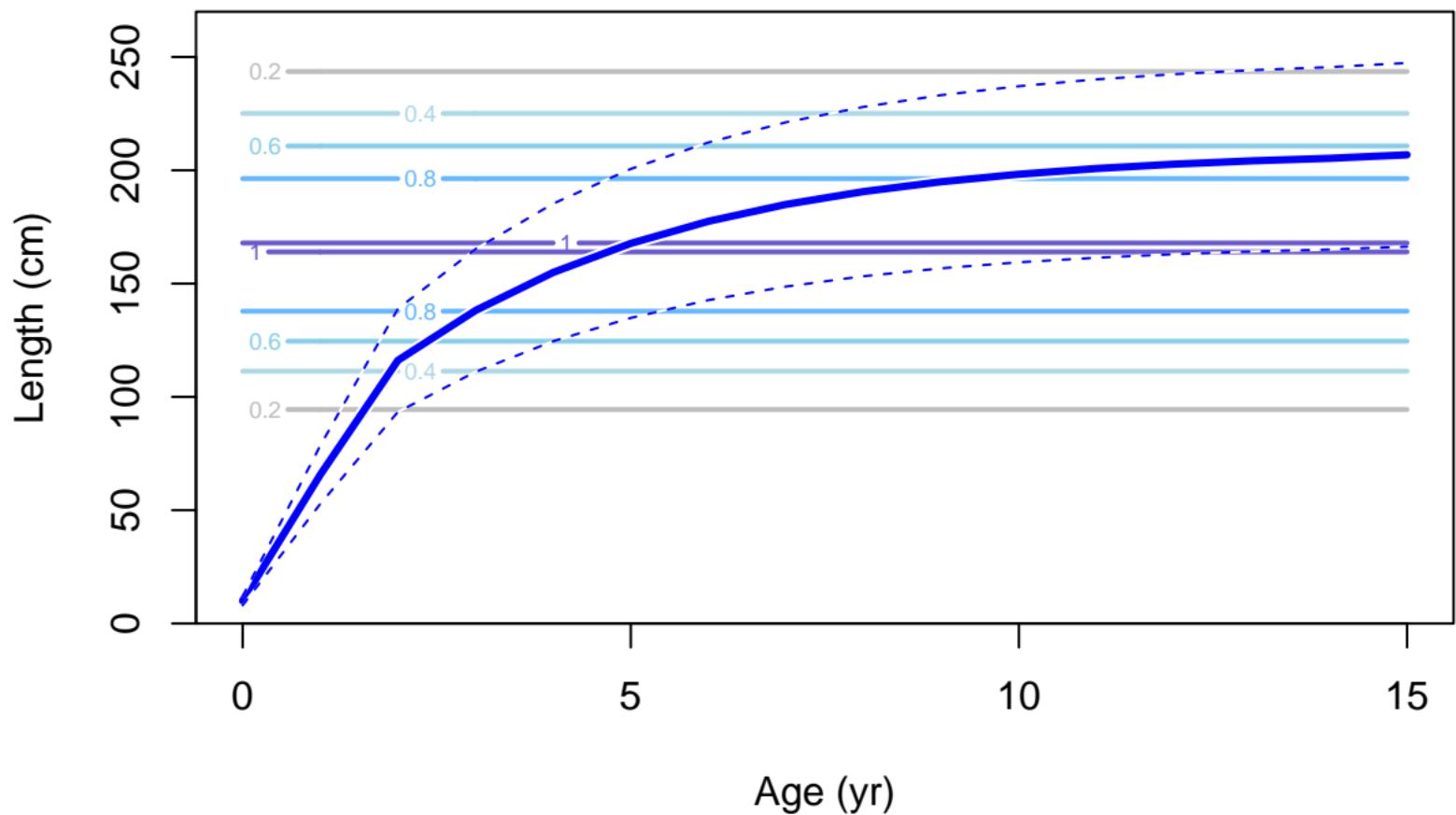


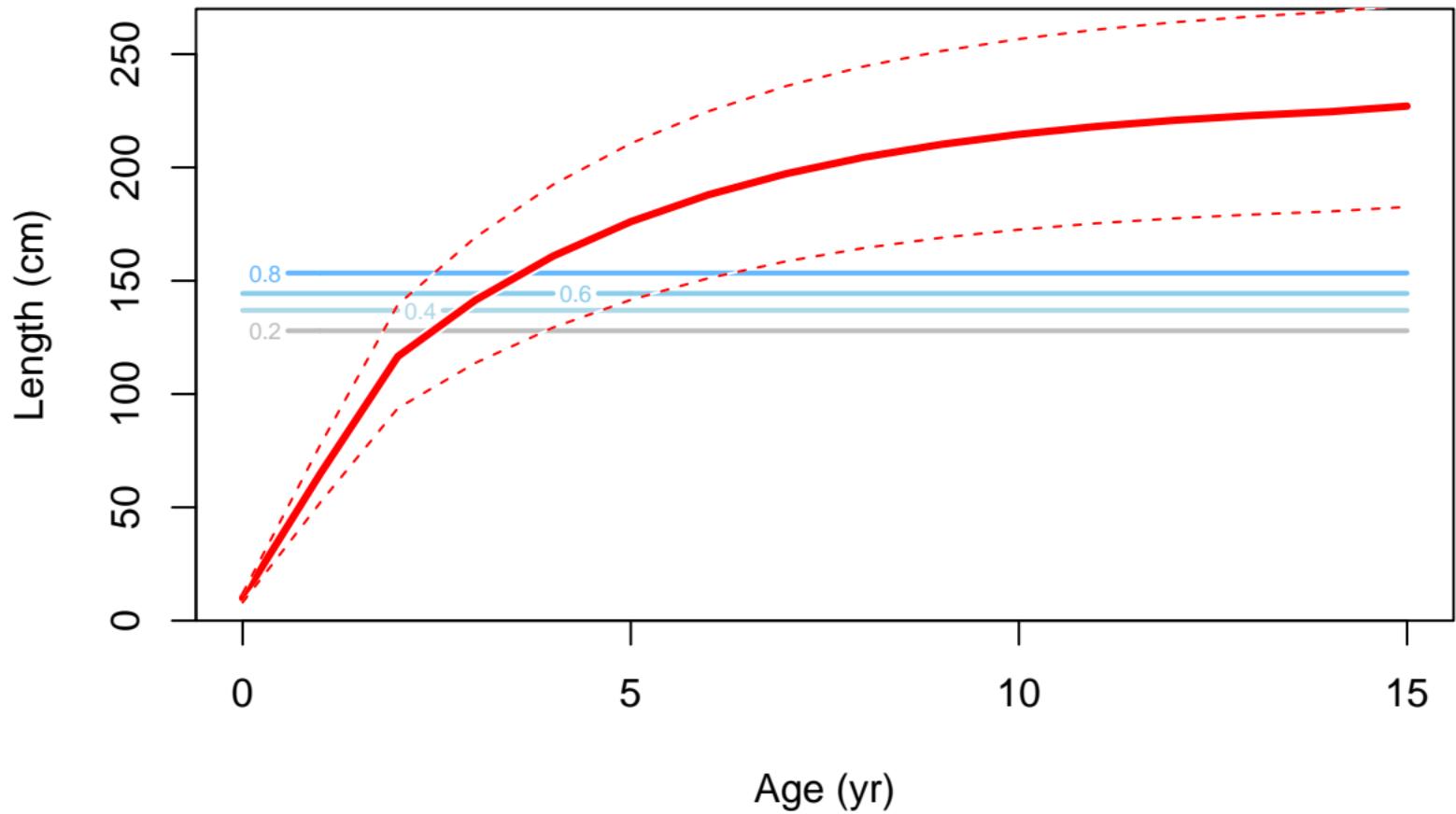


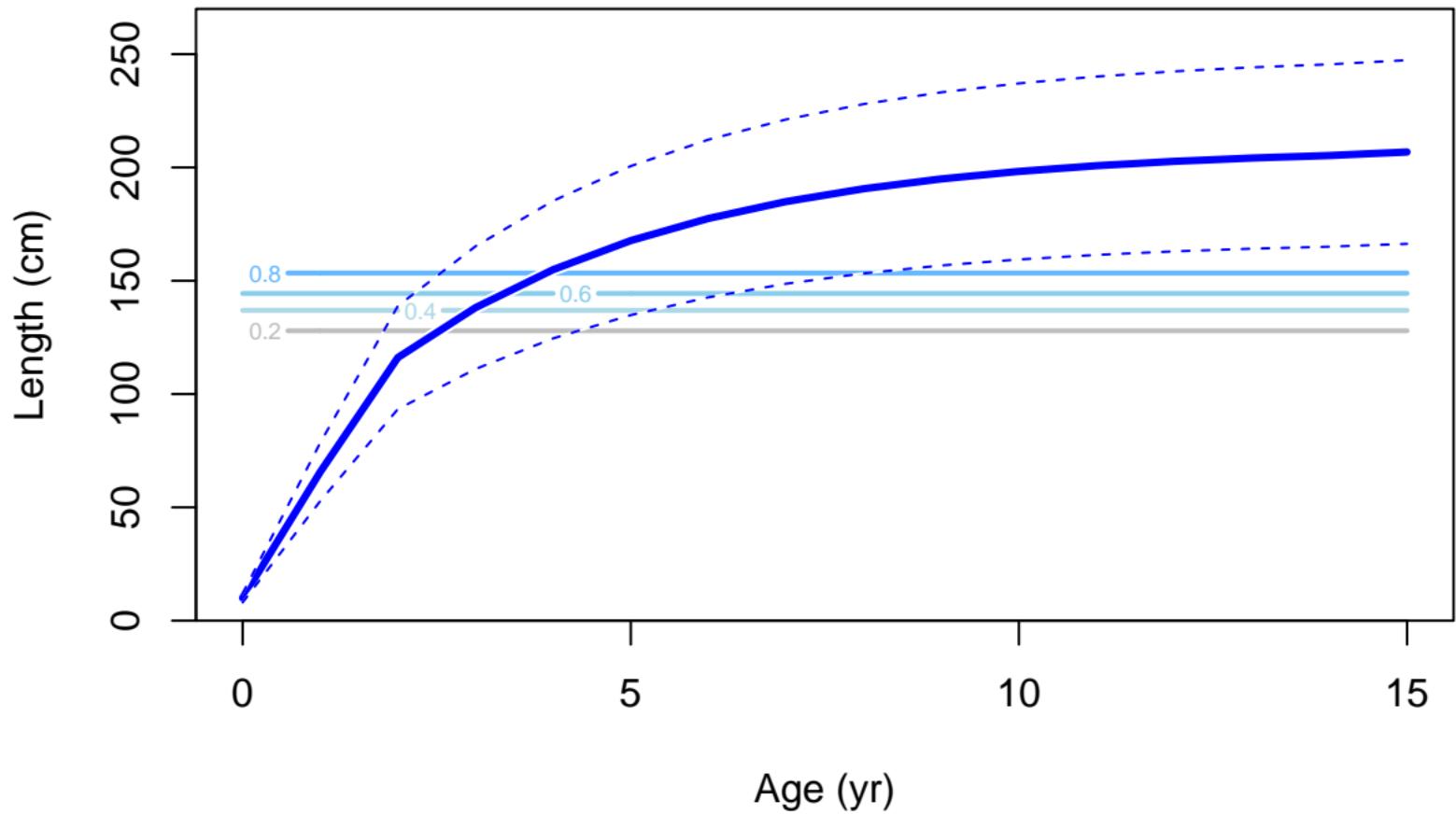


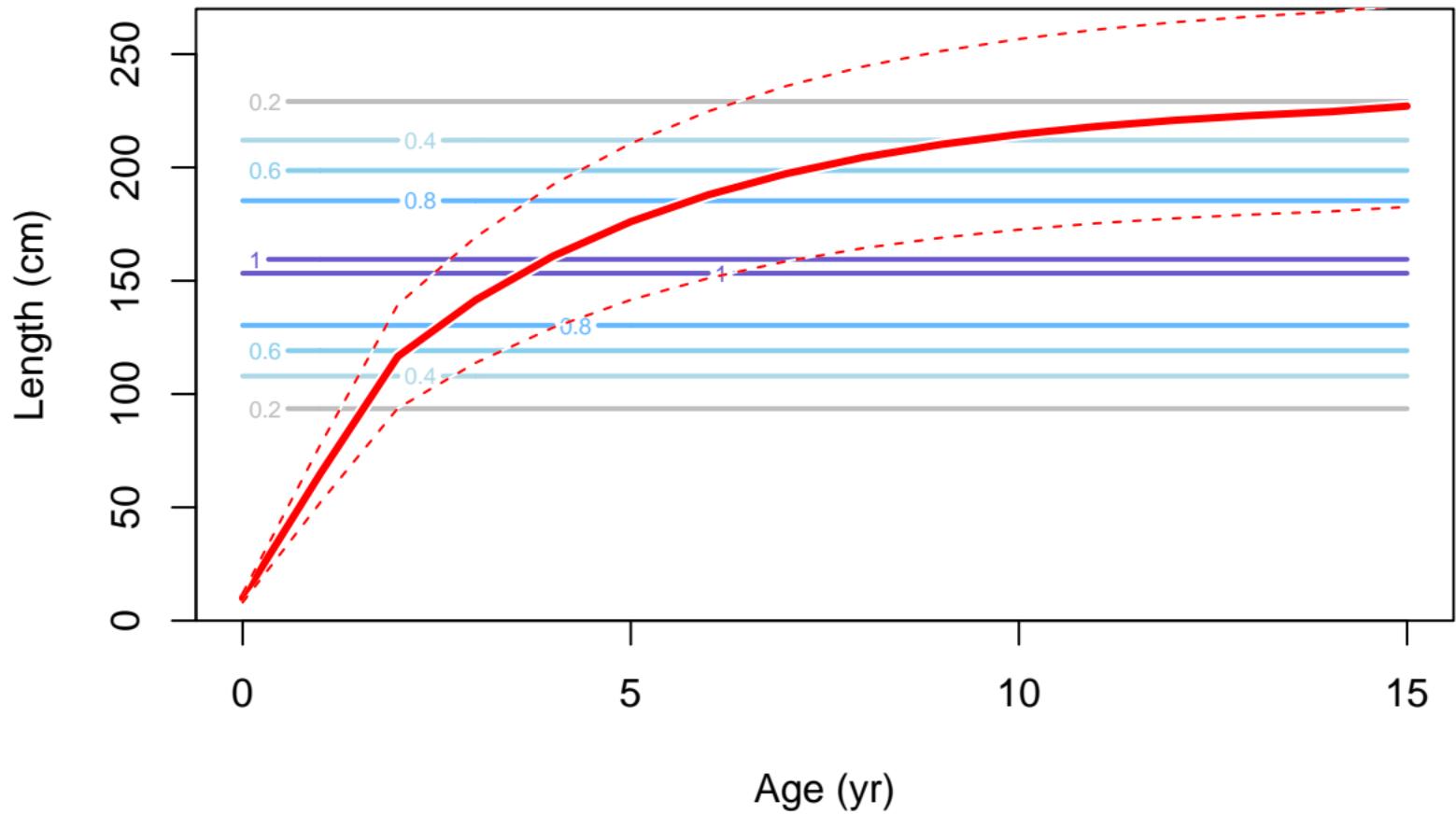


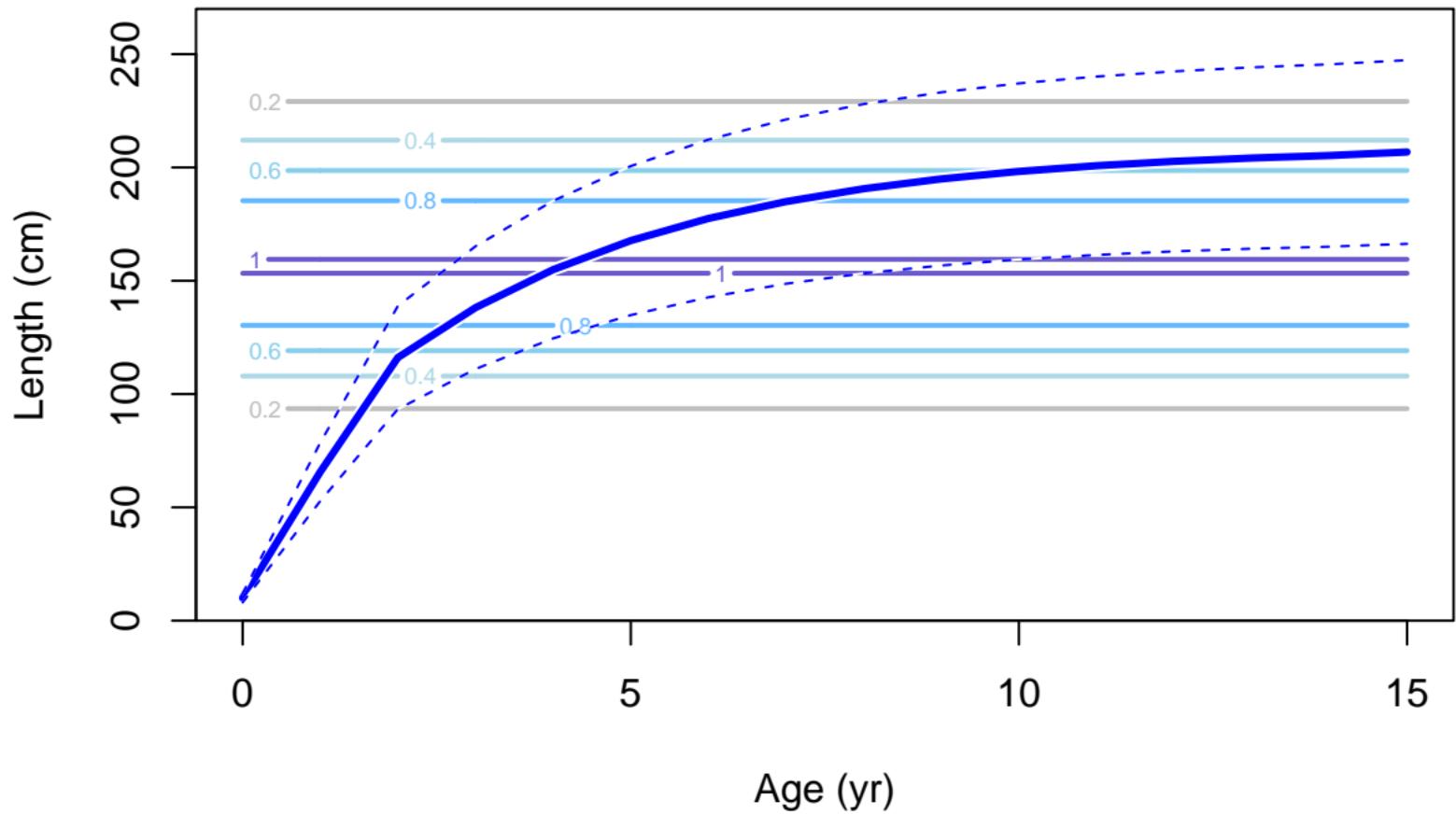


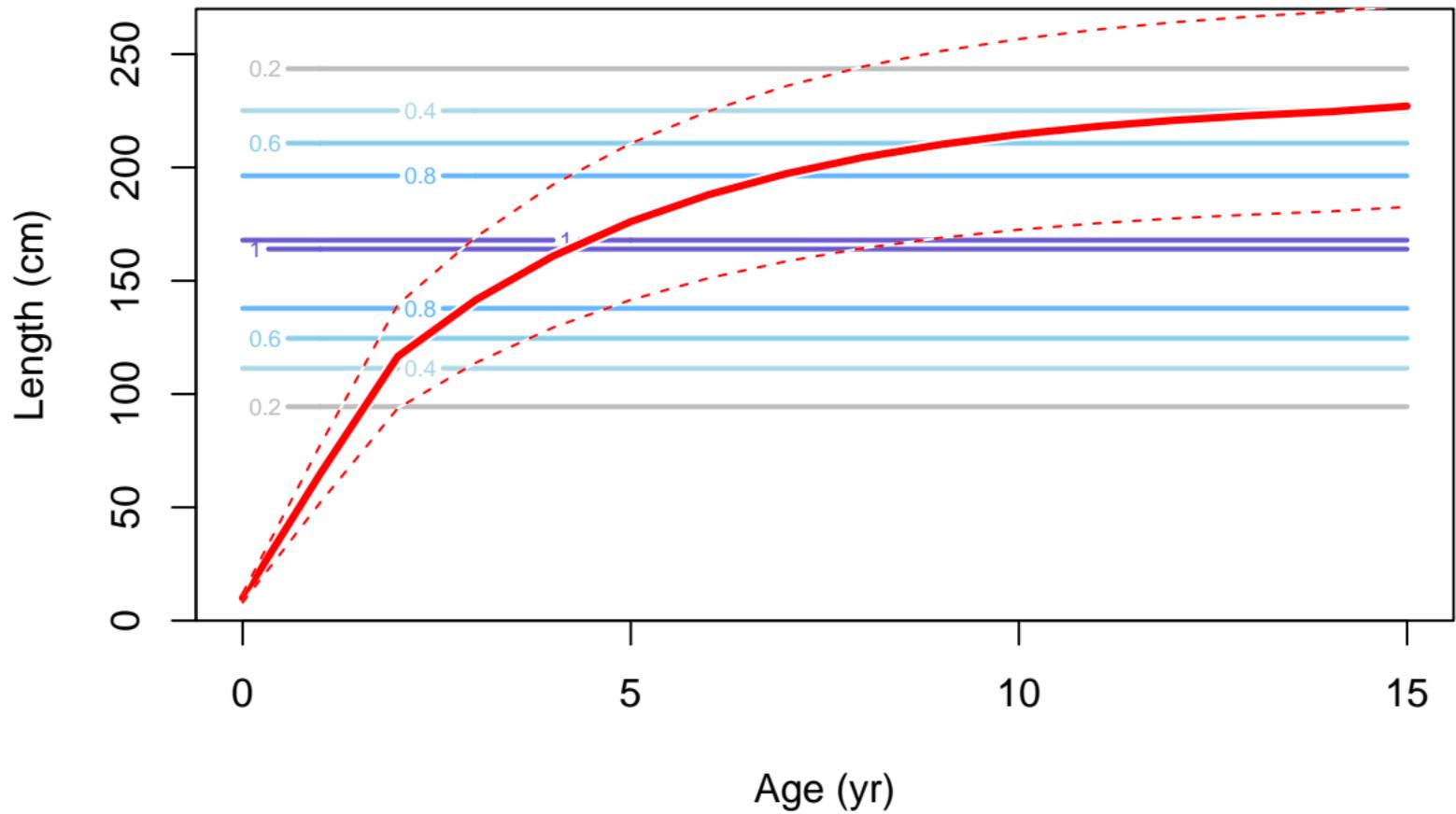


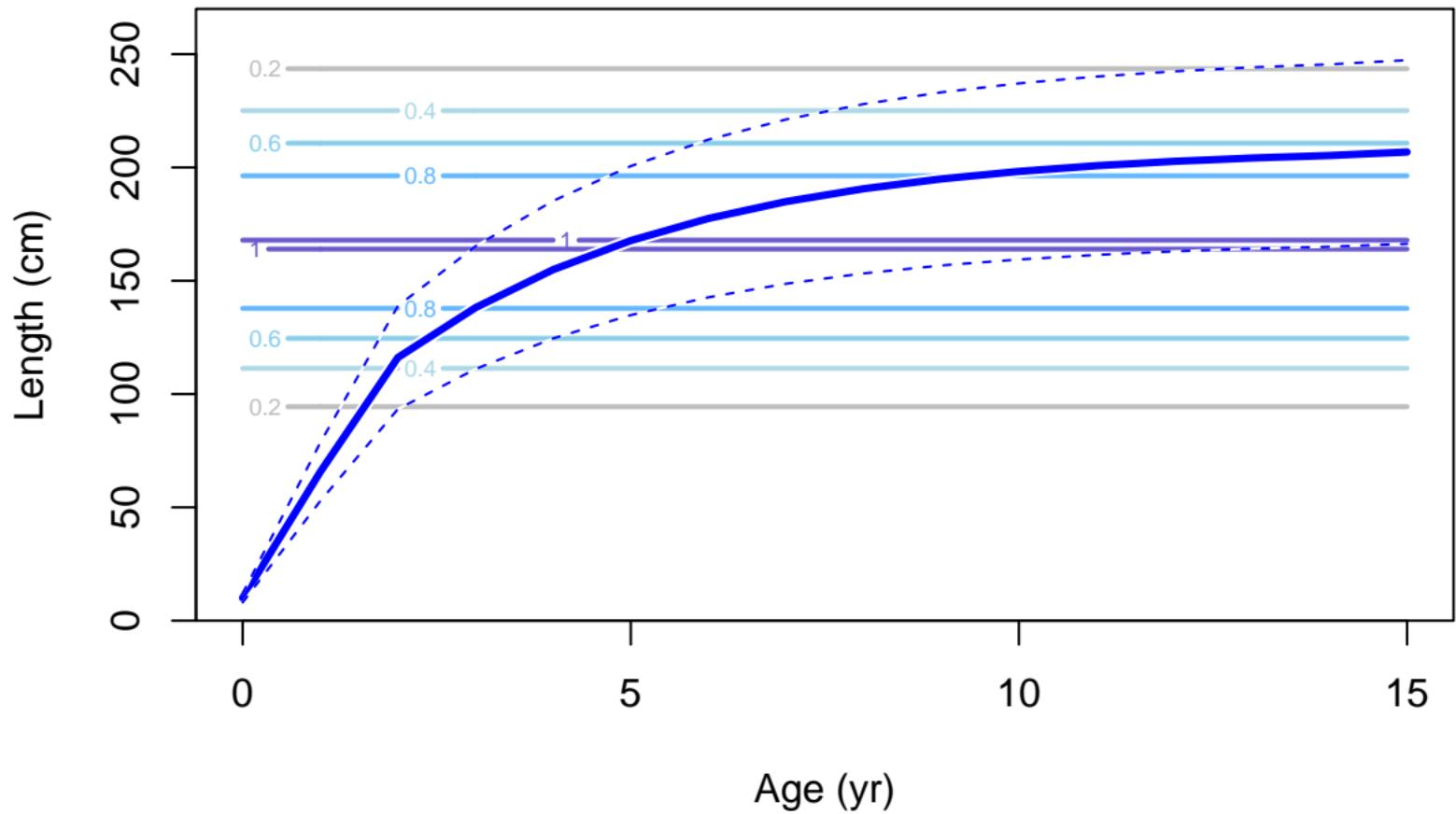


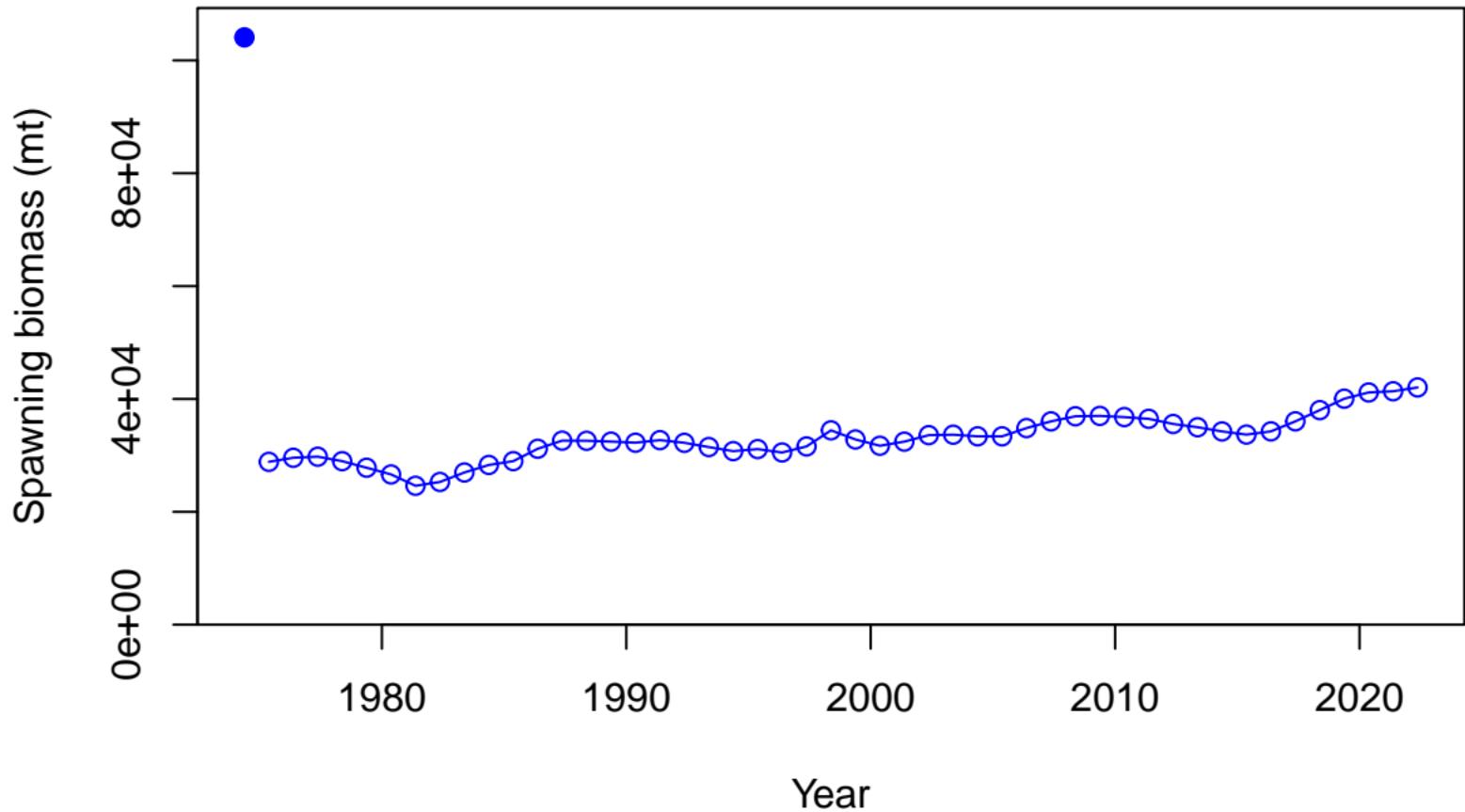


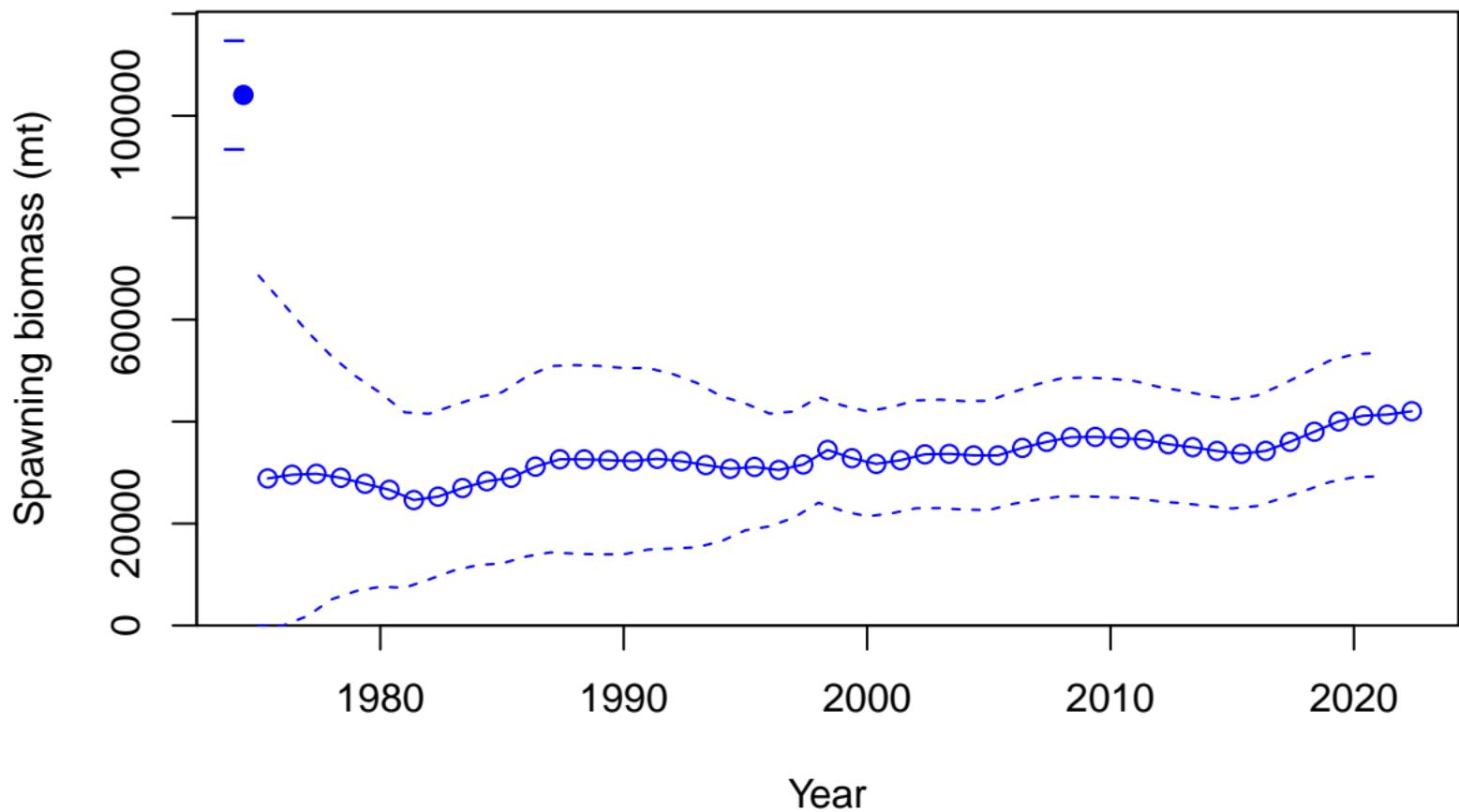




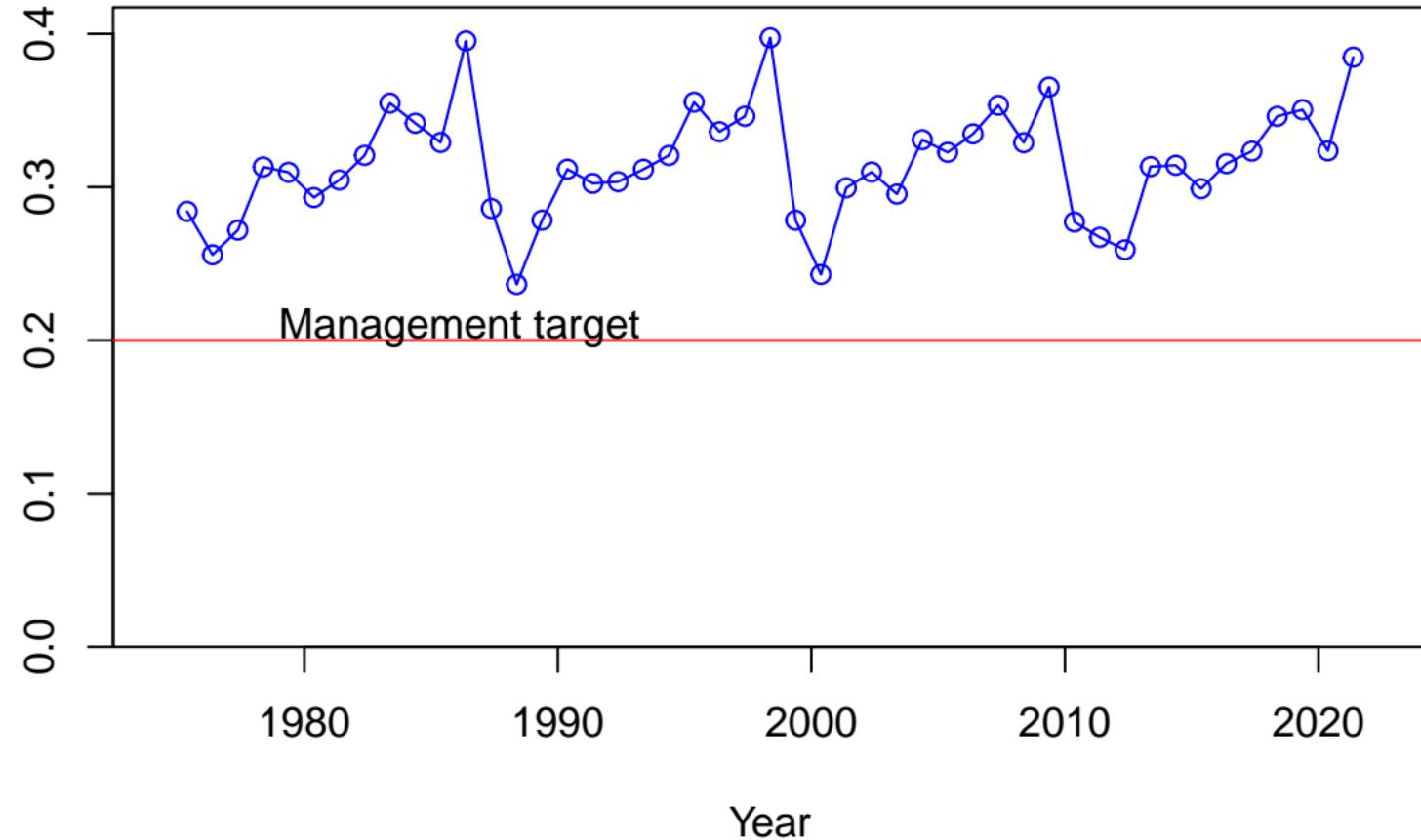




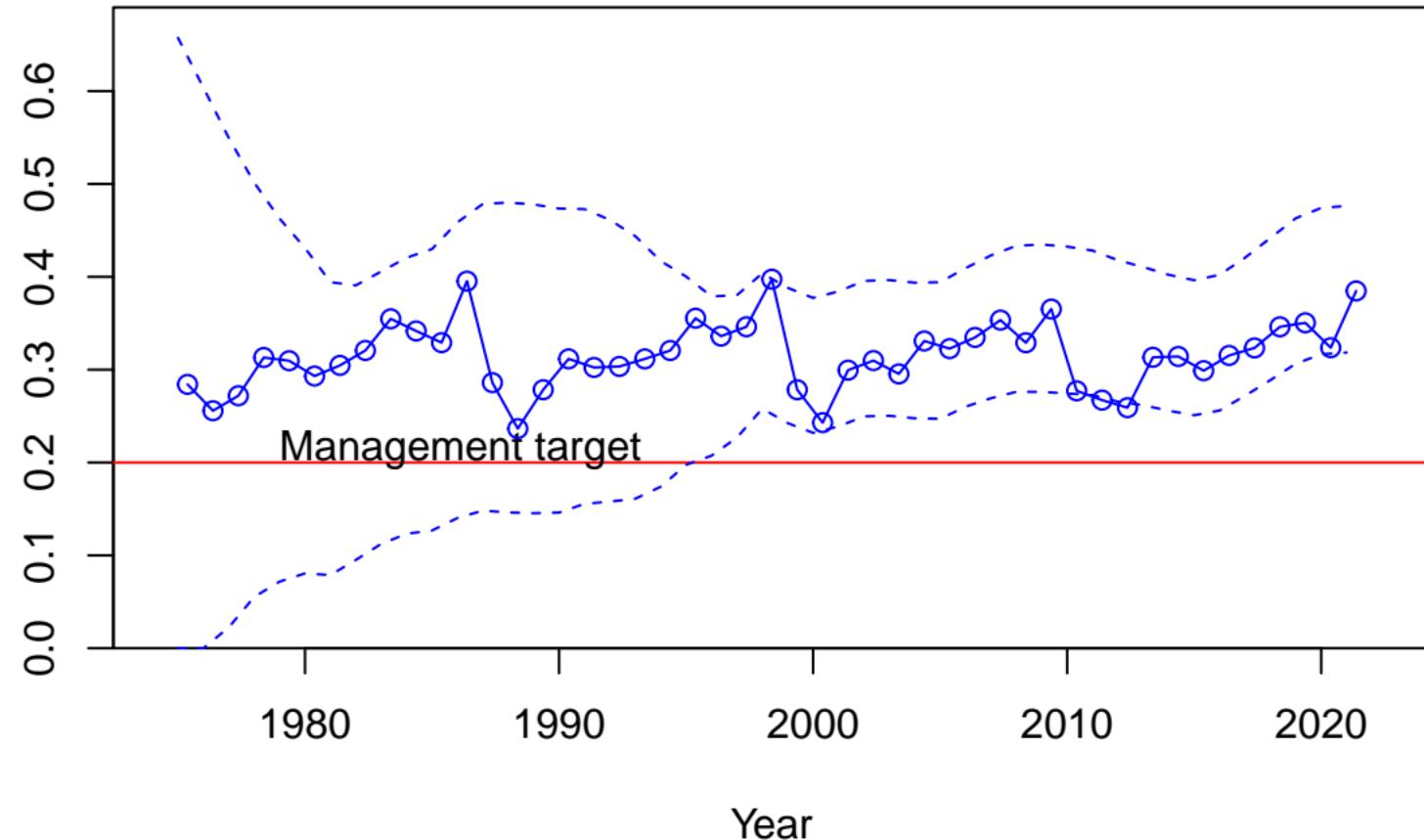


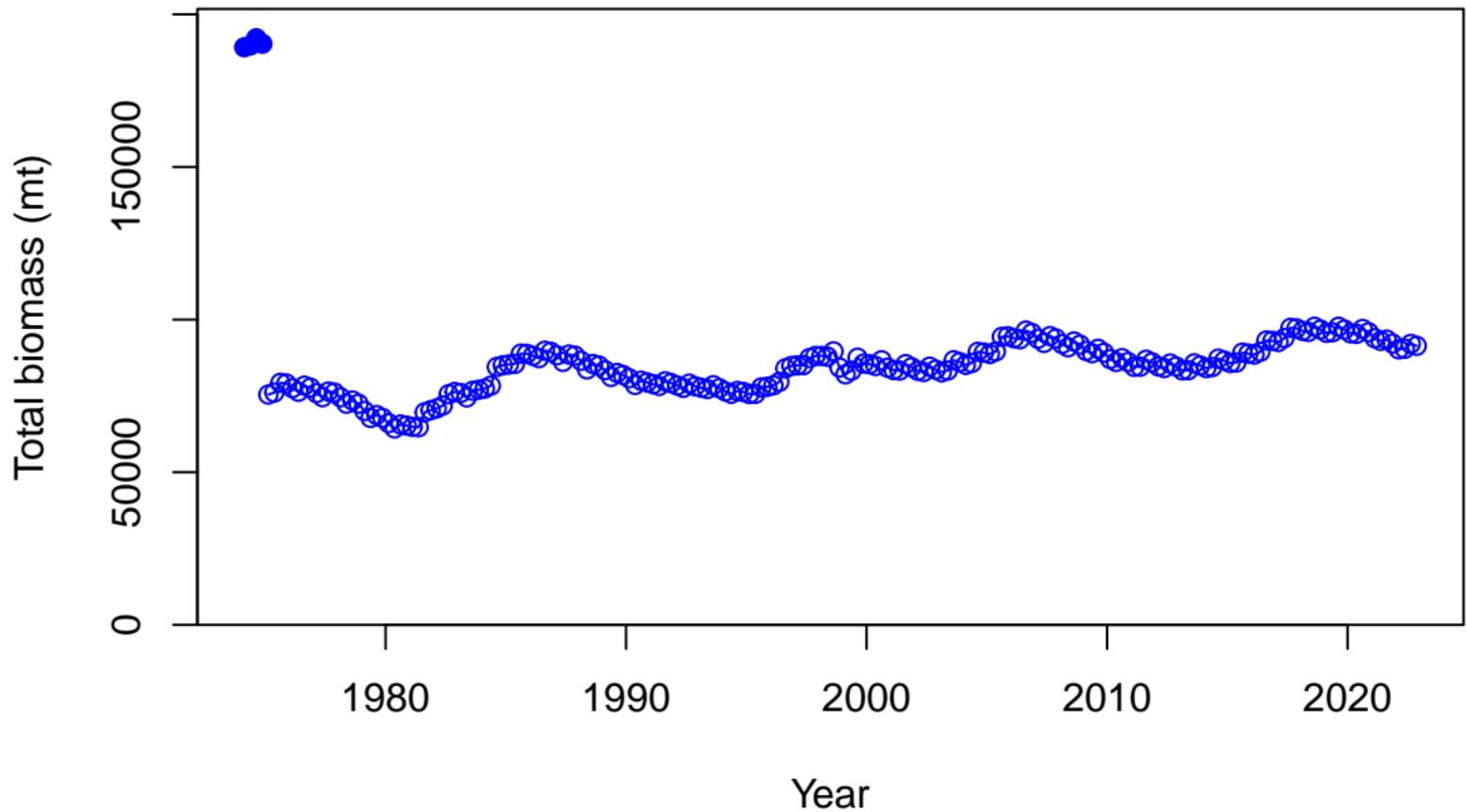


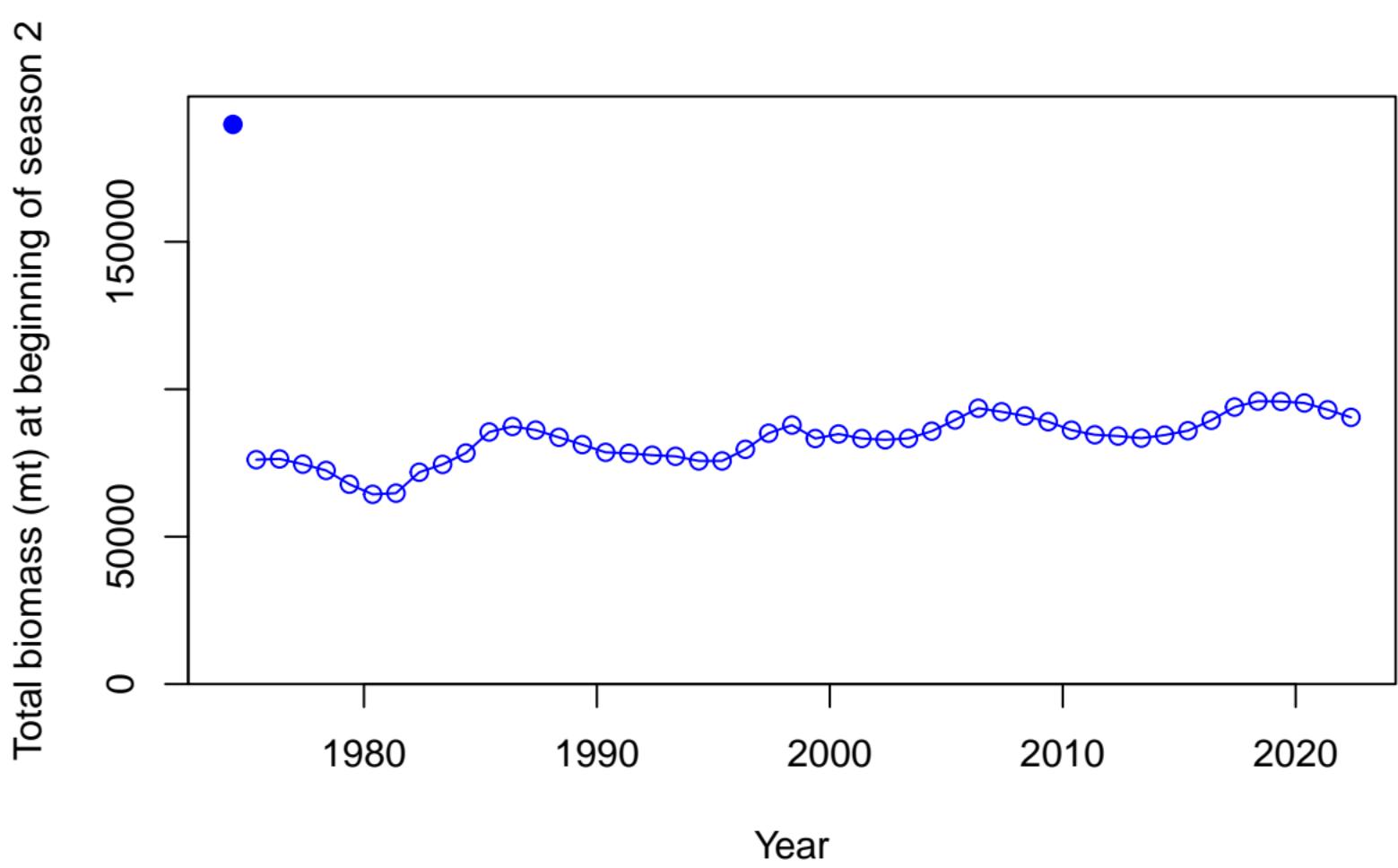
Relative spawning biomass: B/B_0

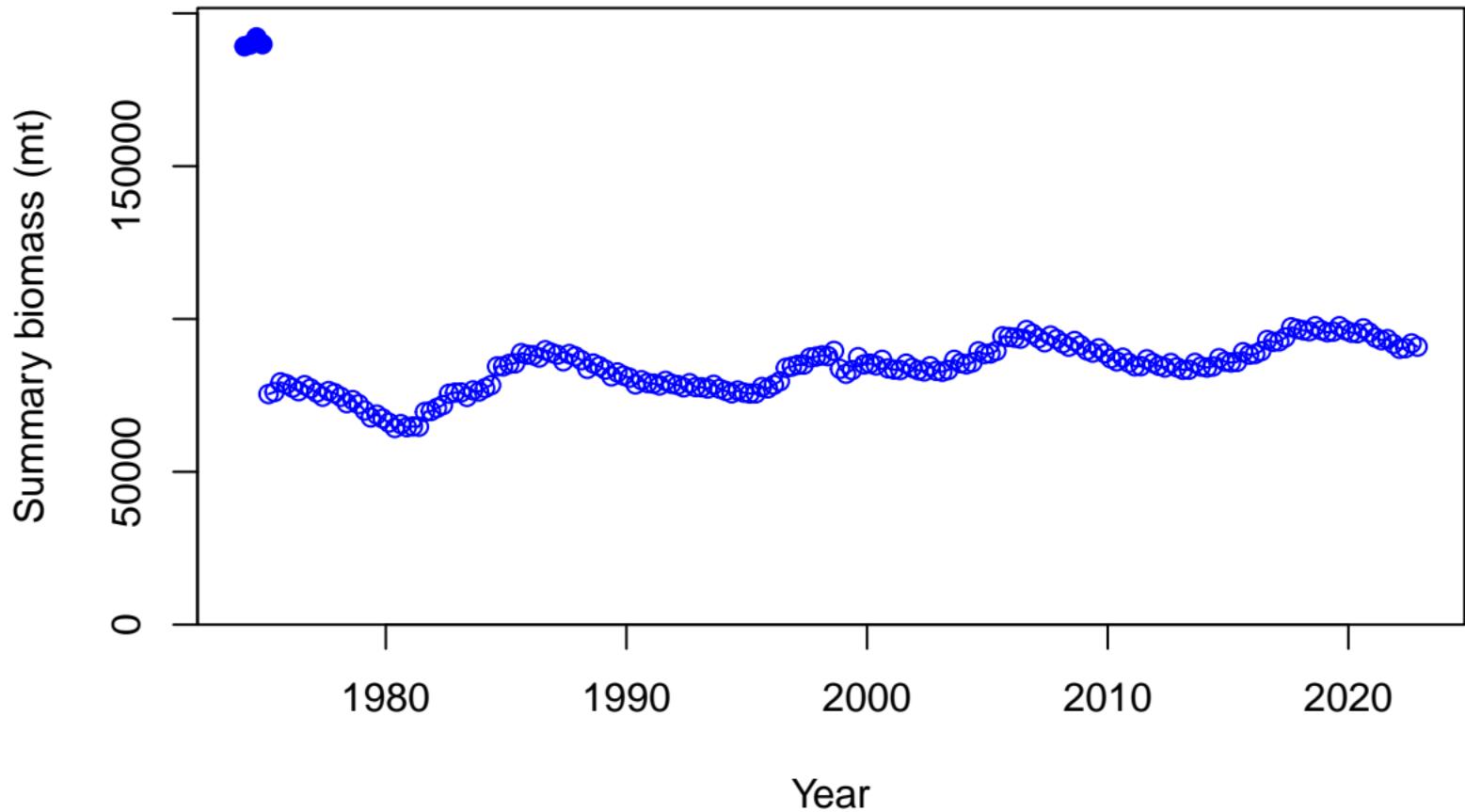


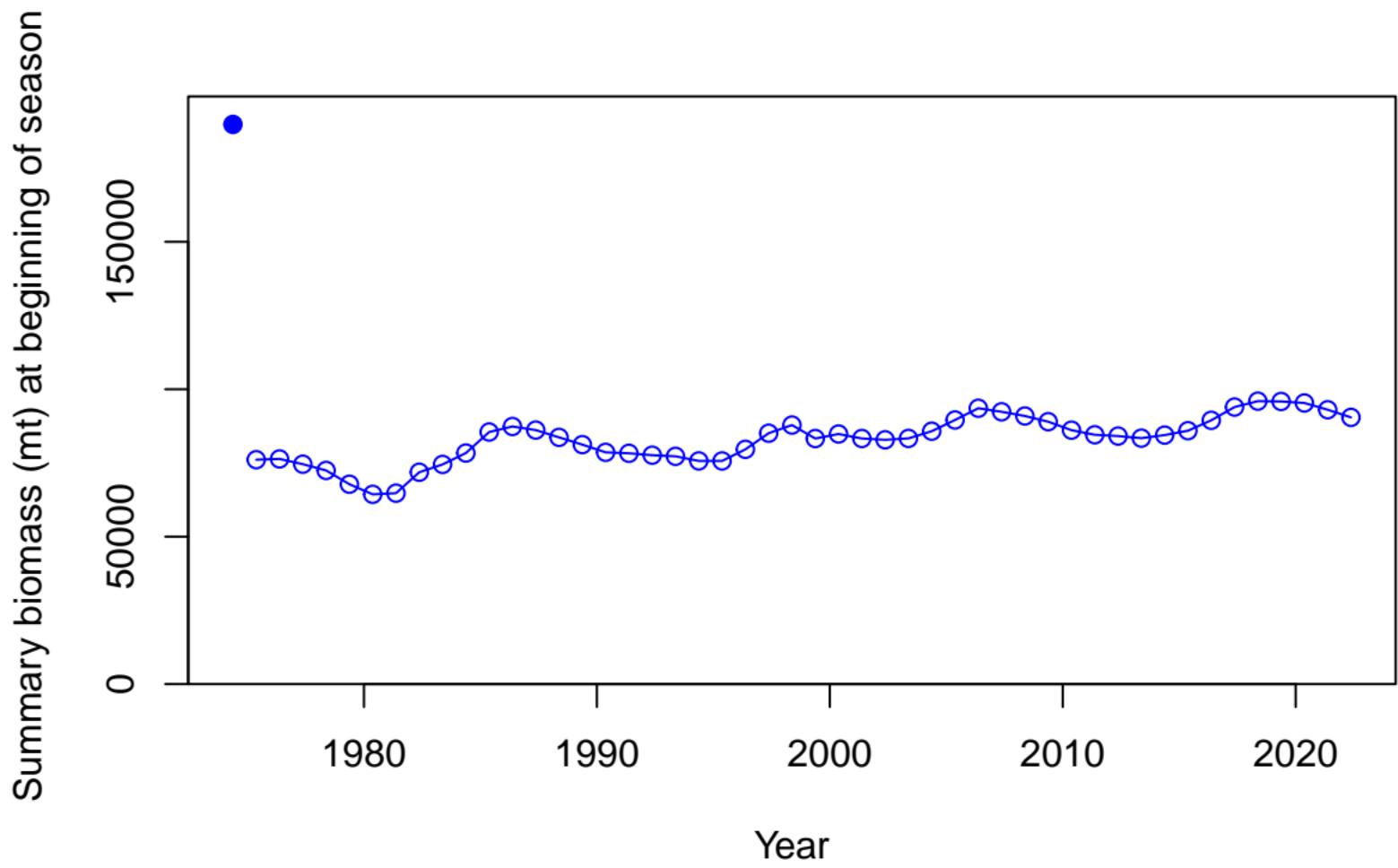
Relative spawning biomass: B/B_0

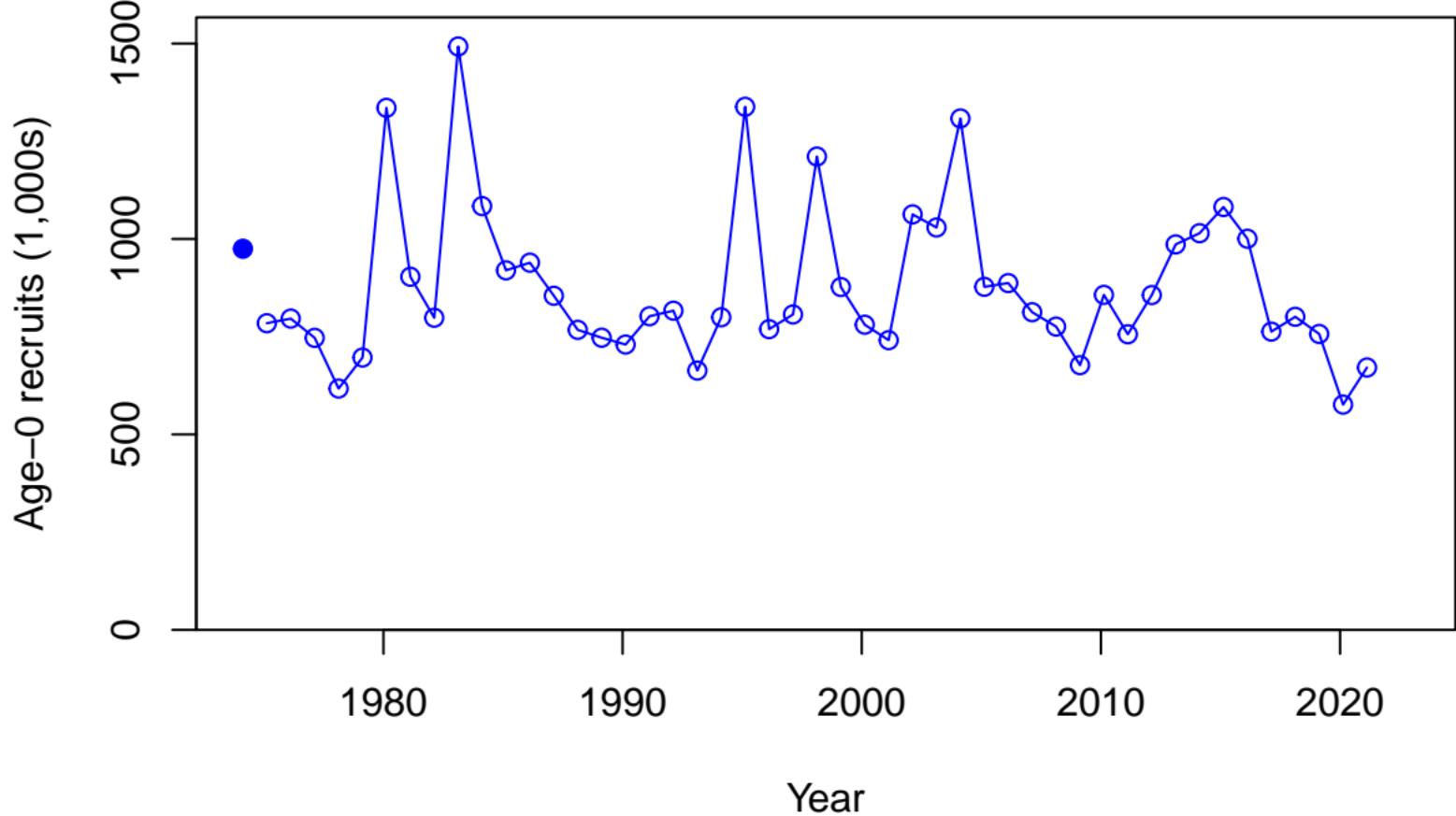


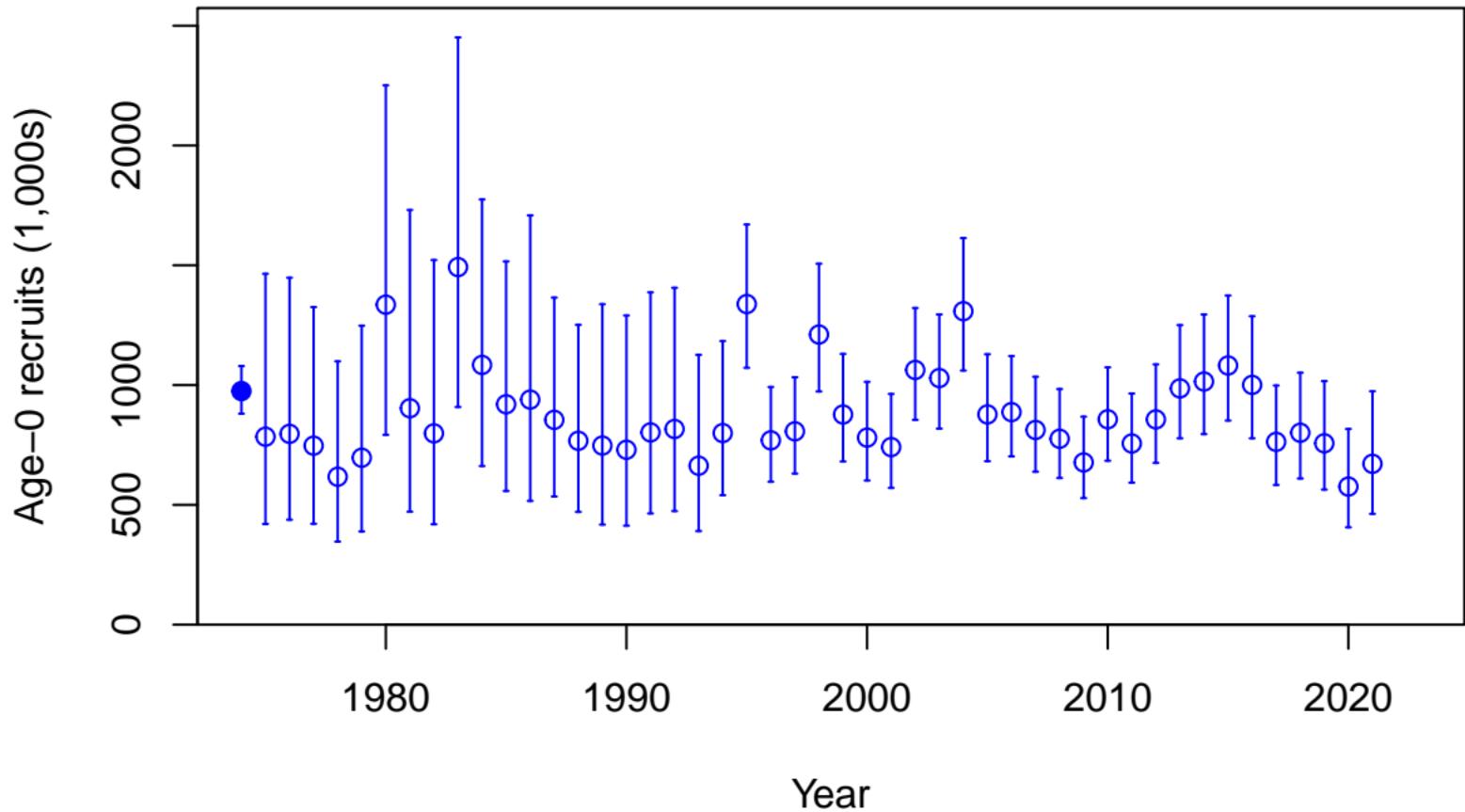


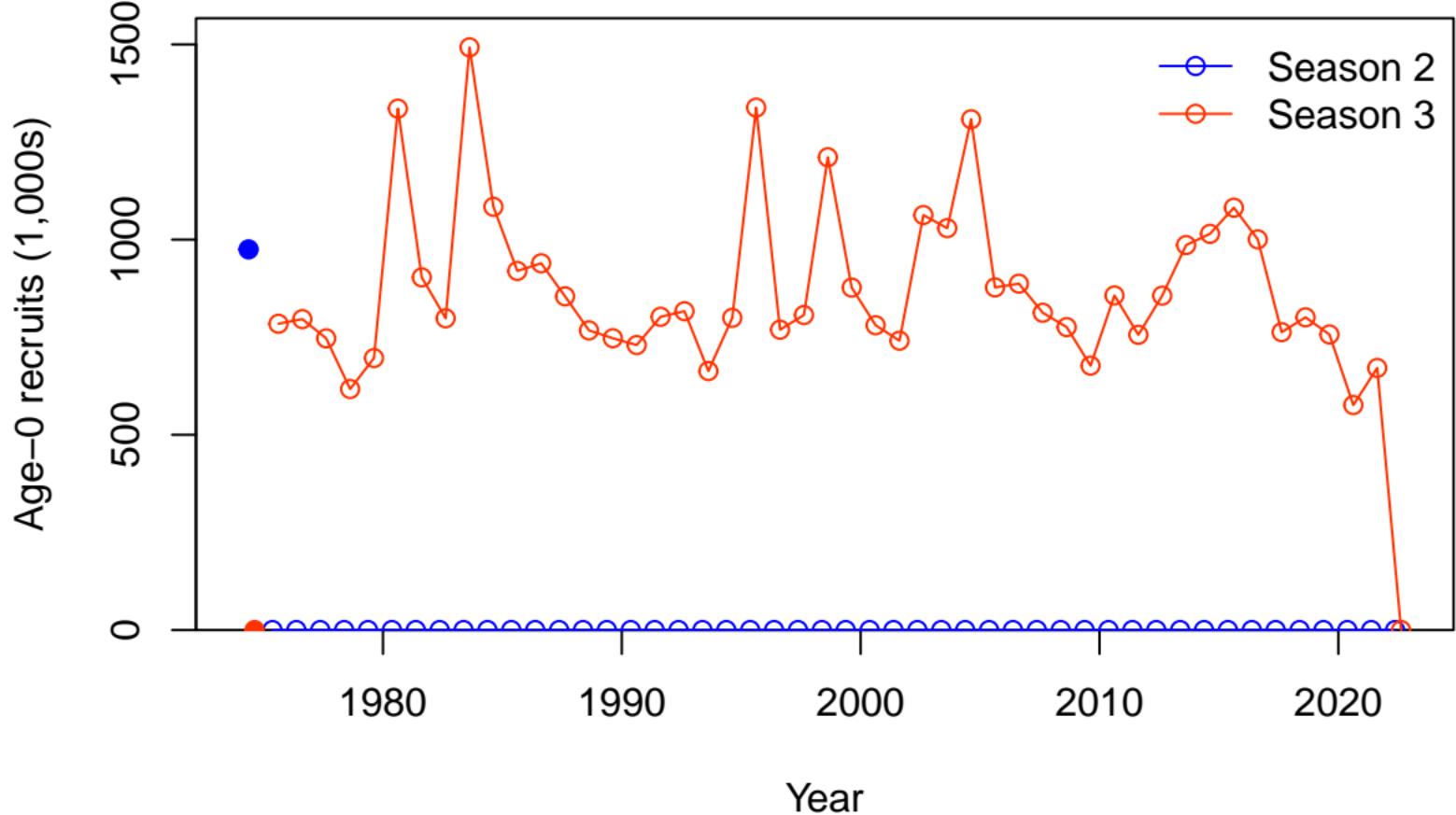




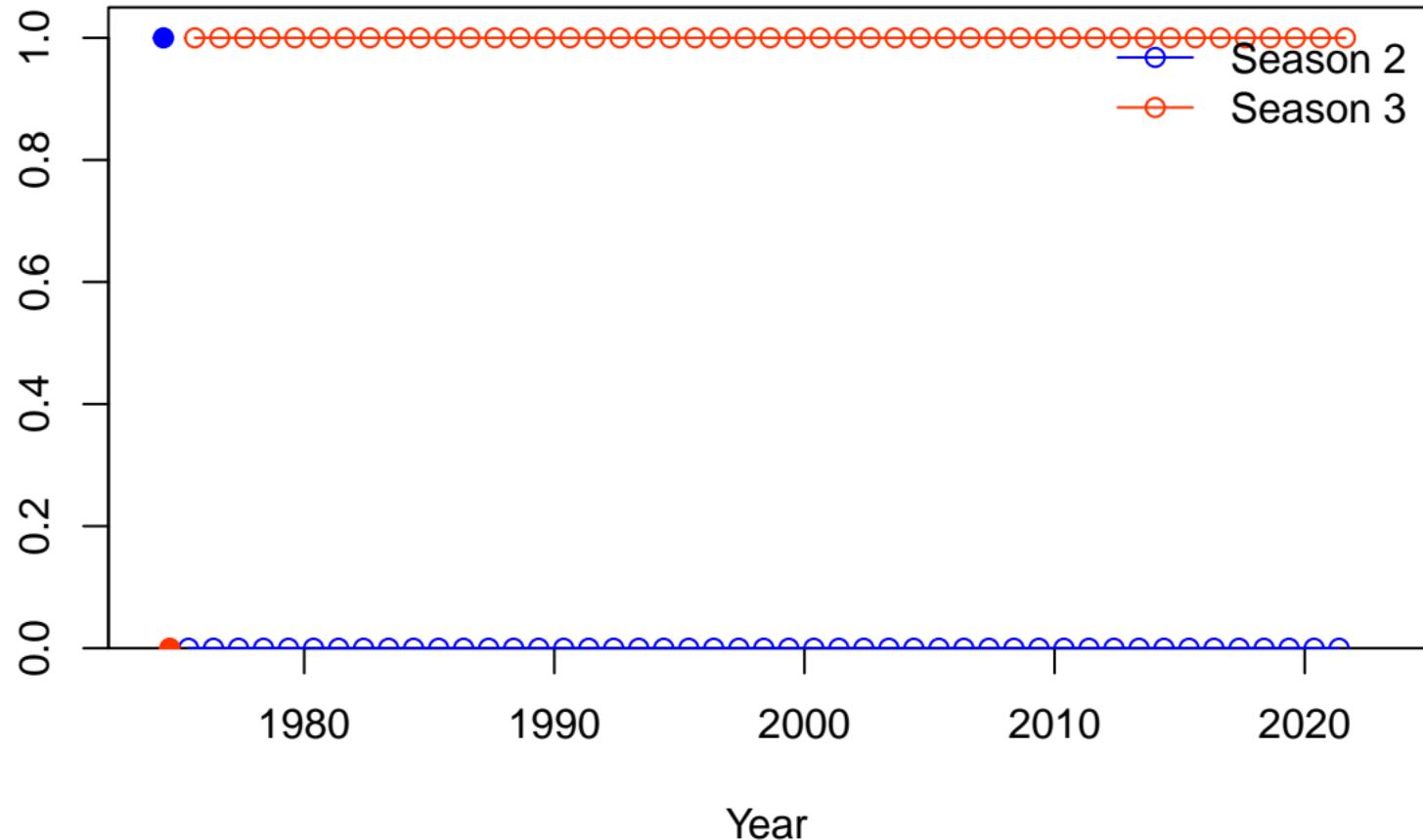




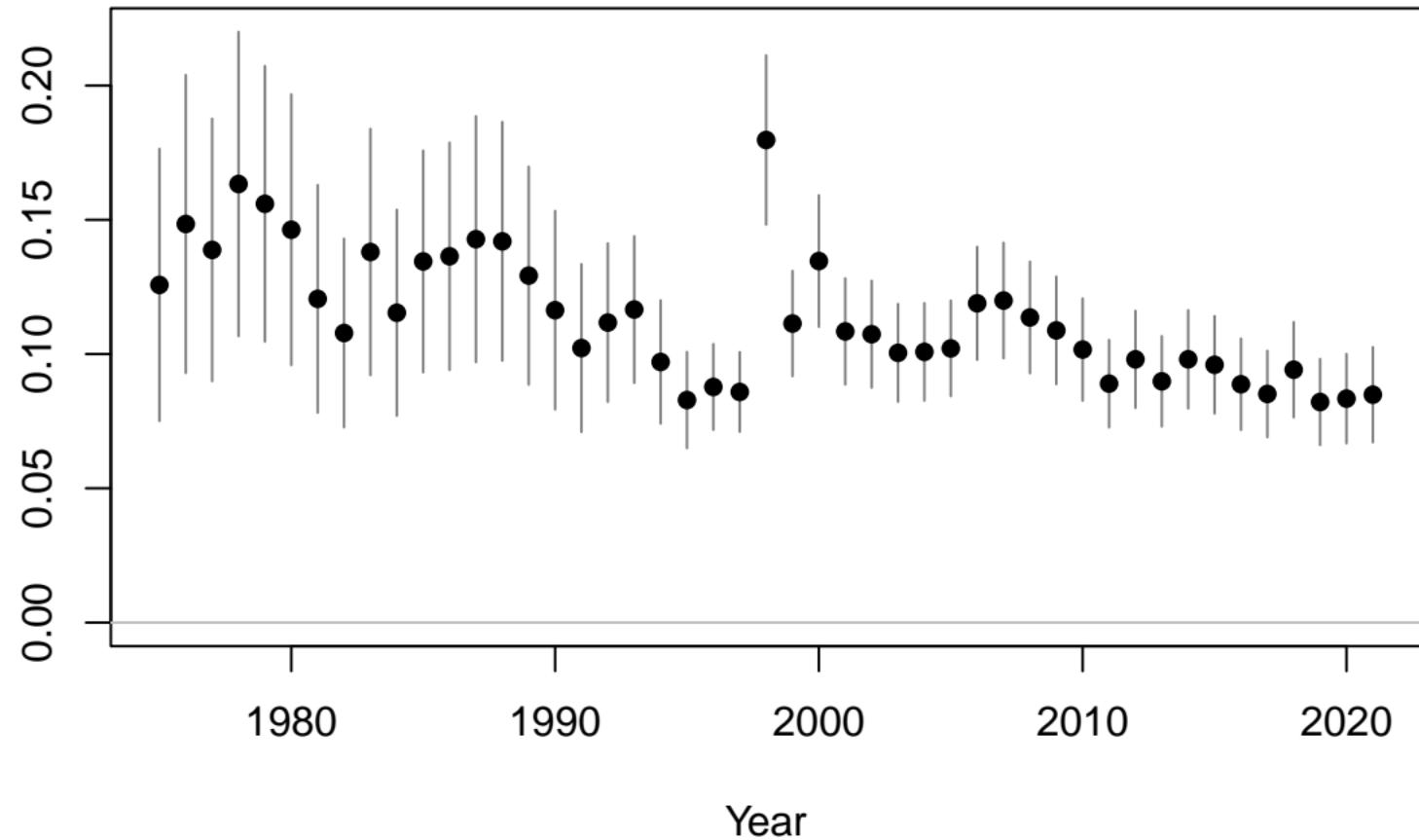


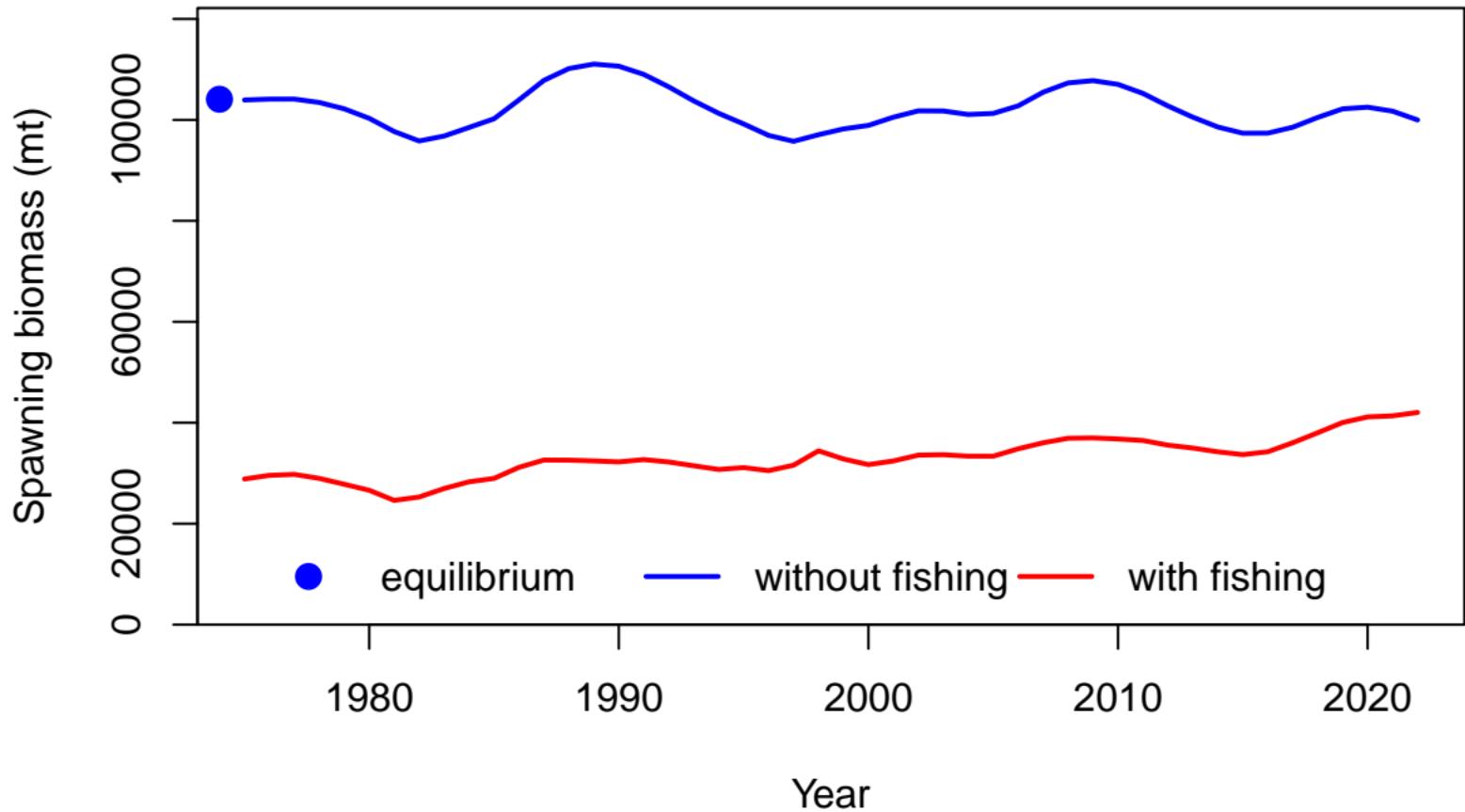


Fraction of total Age-0 recruits

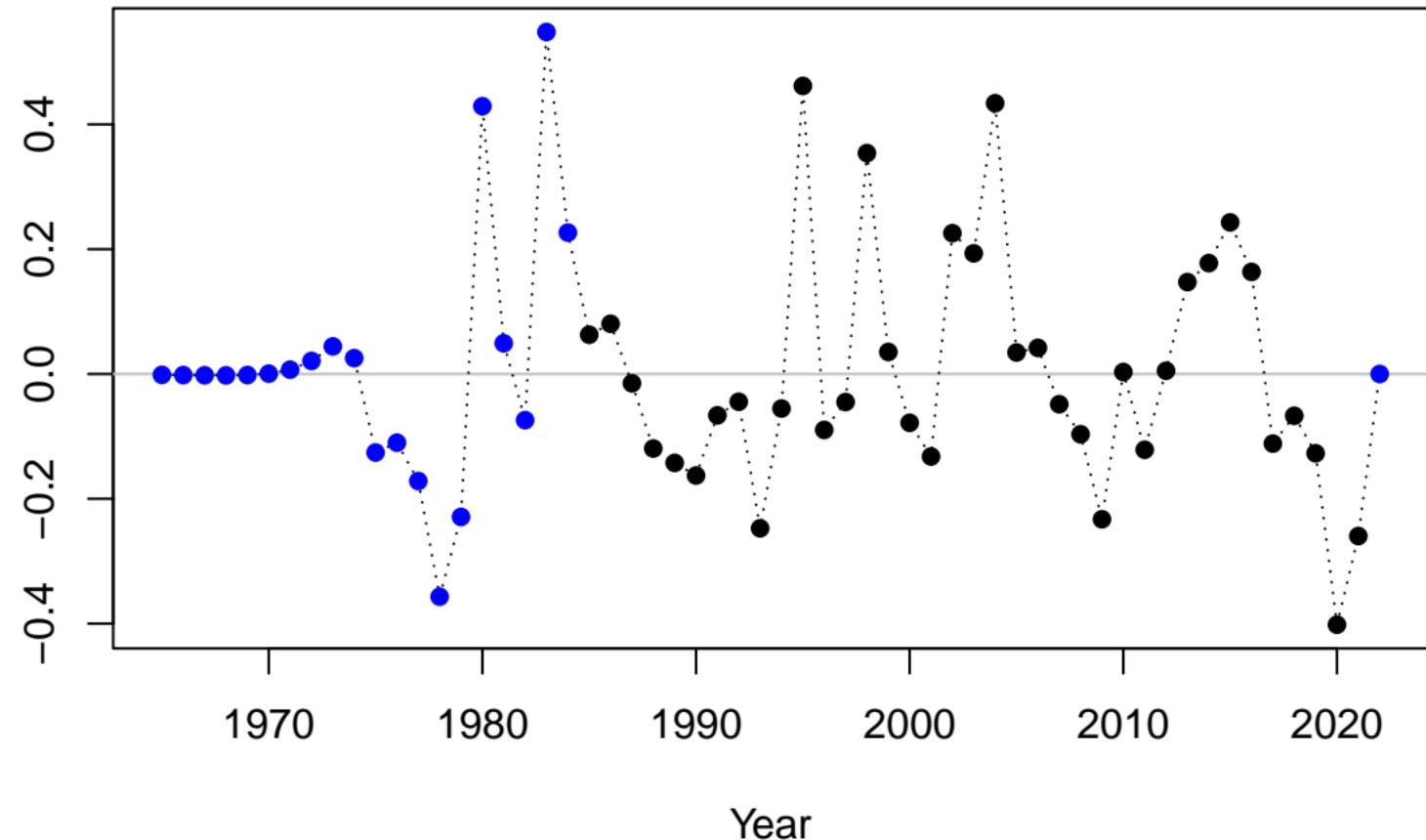


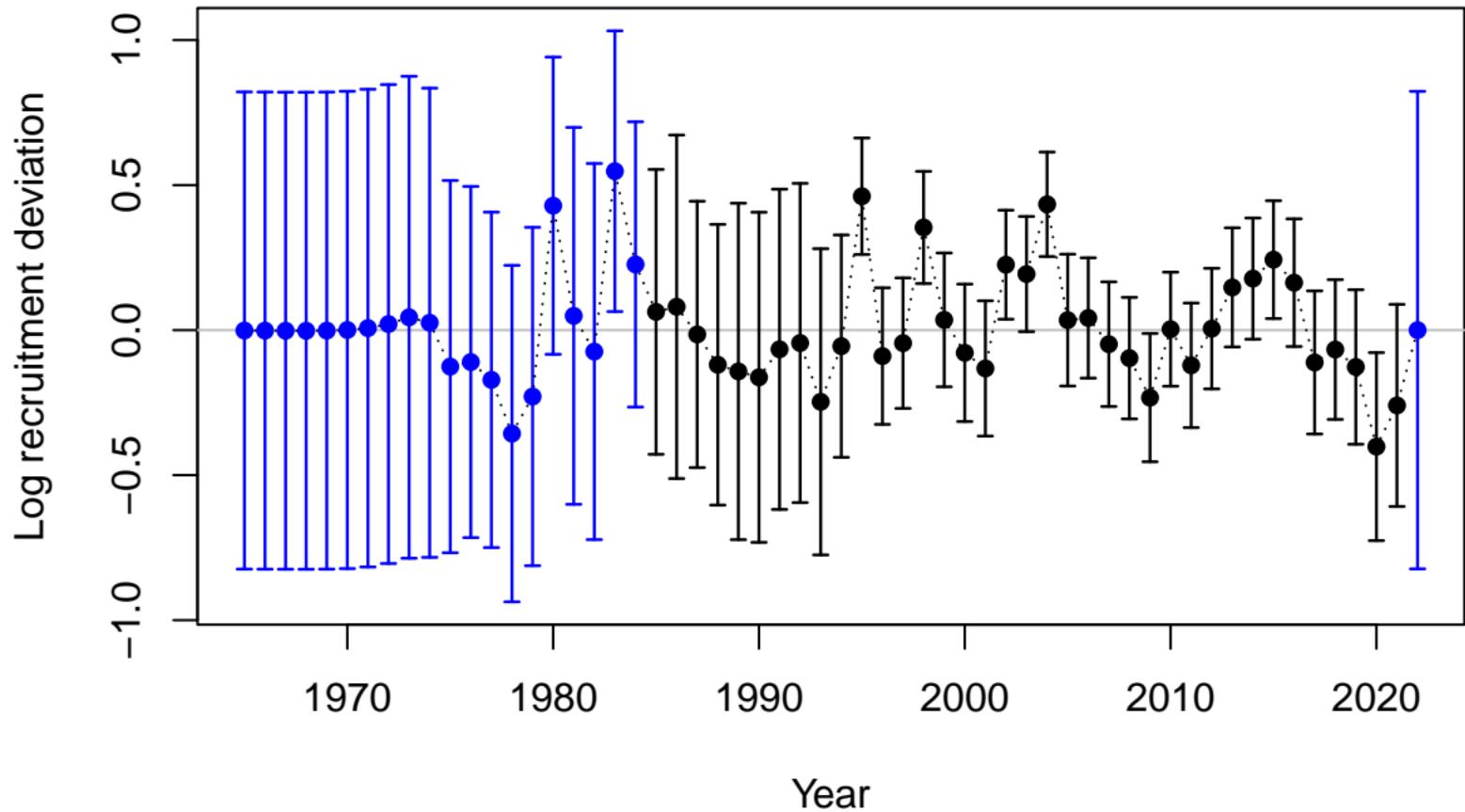
Summary Fishing Mortality



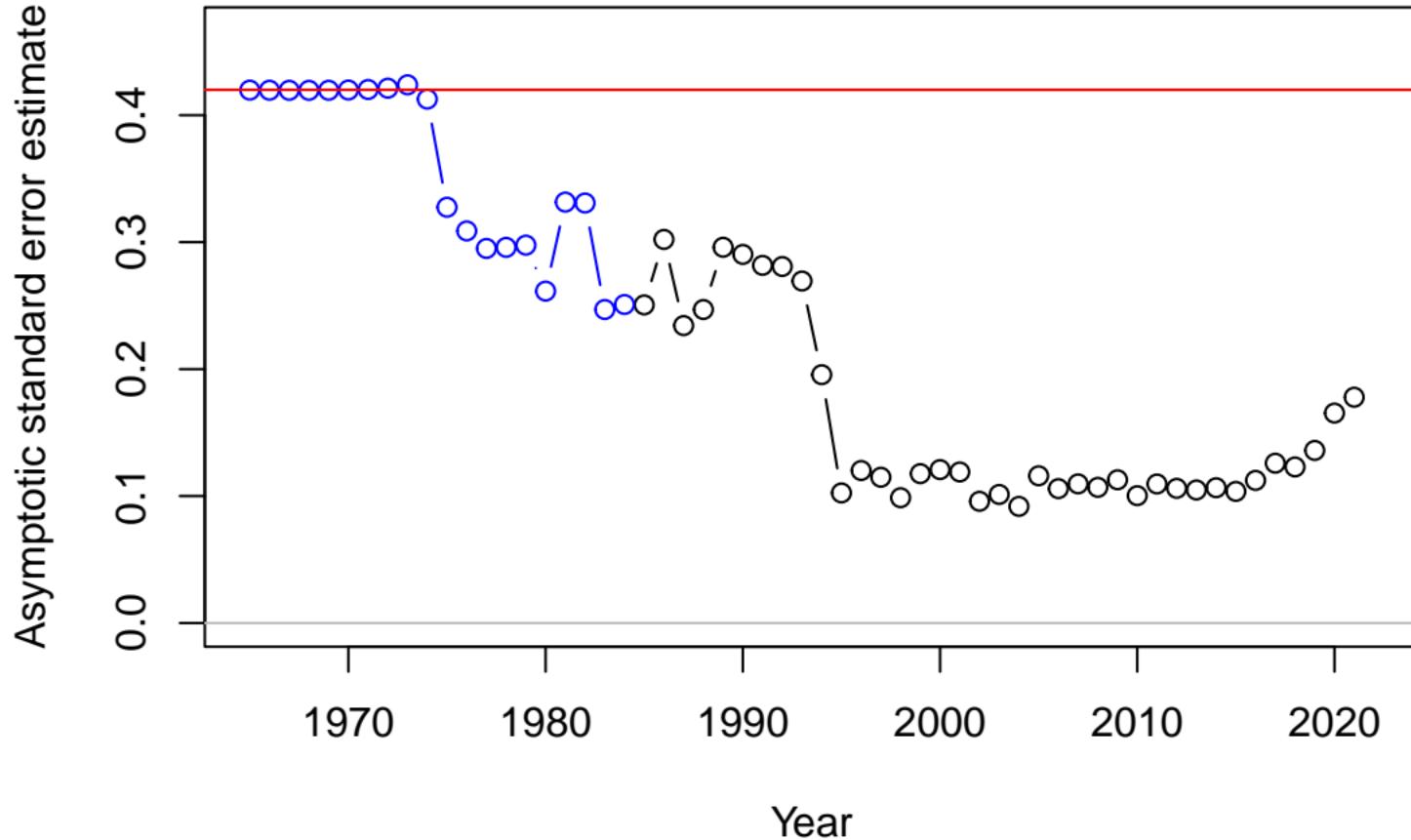


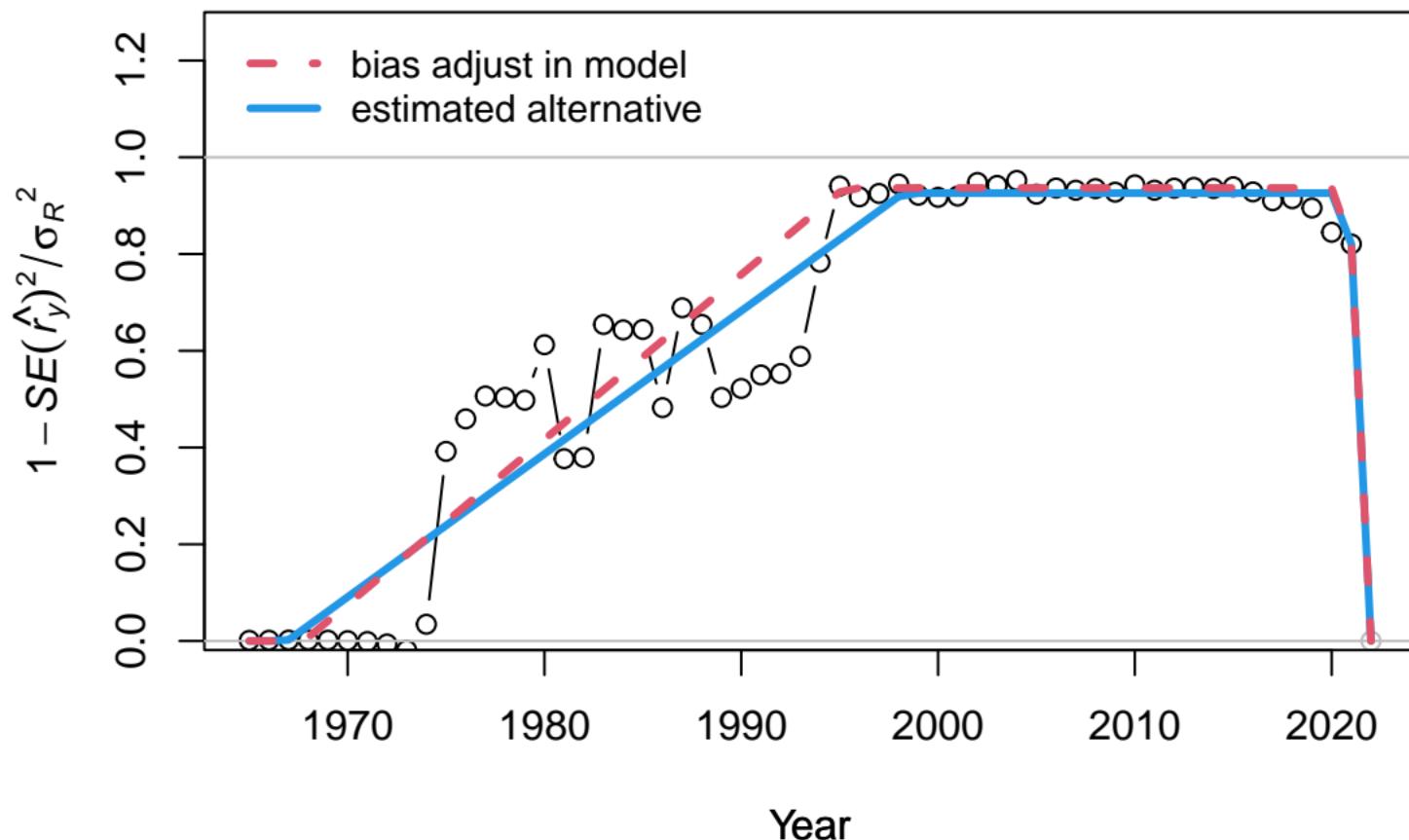
Log recruitment deviation

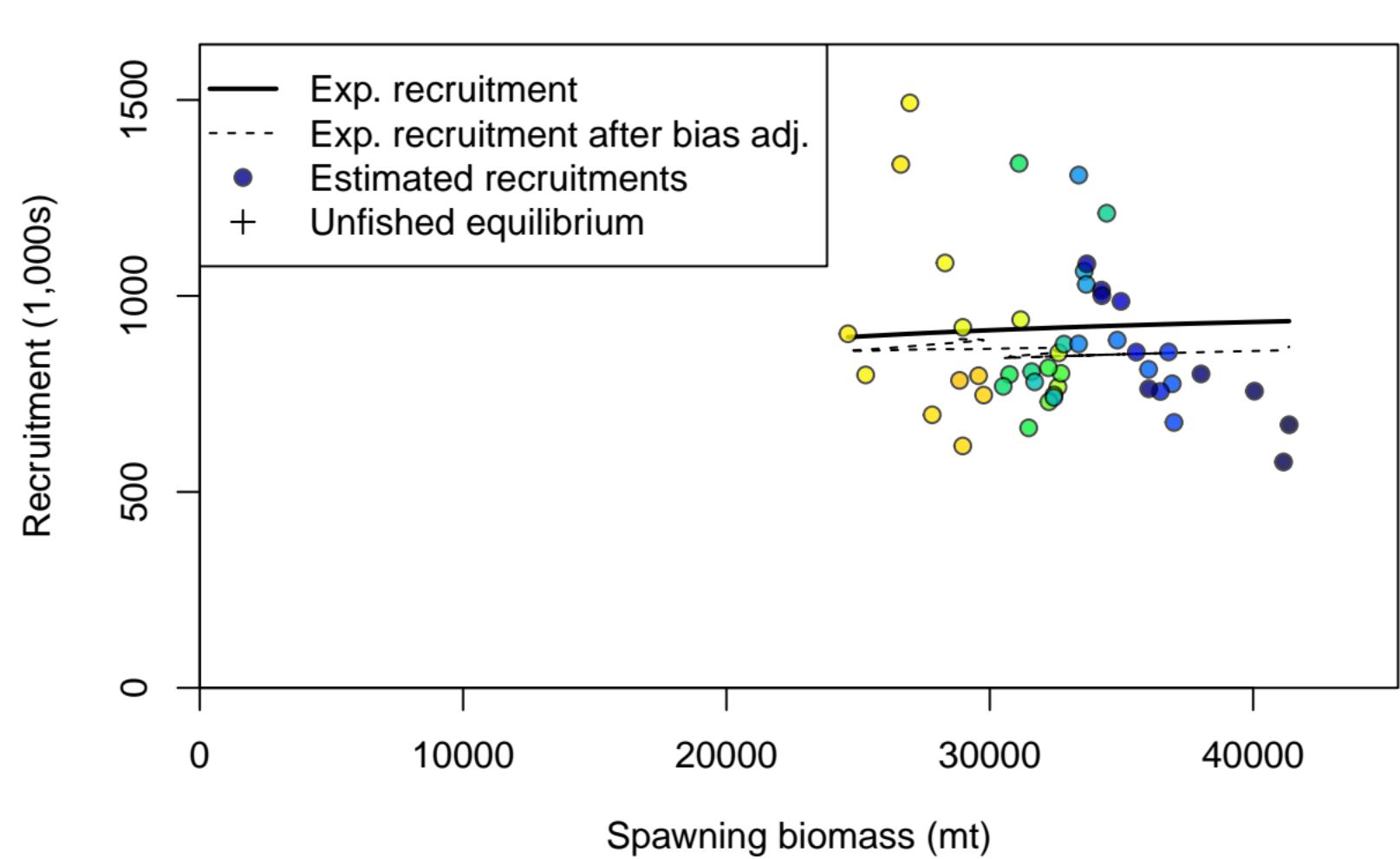


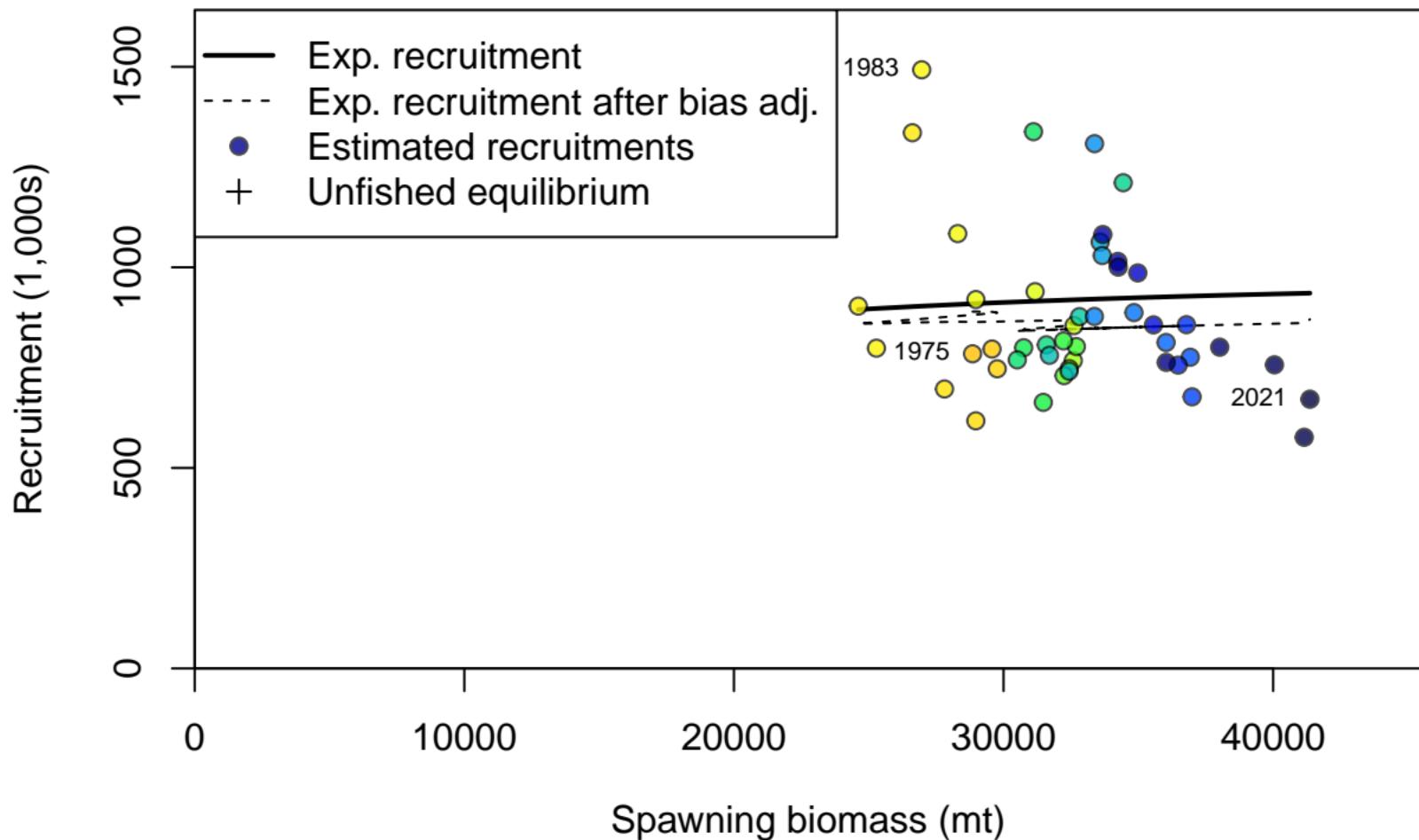


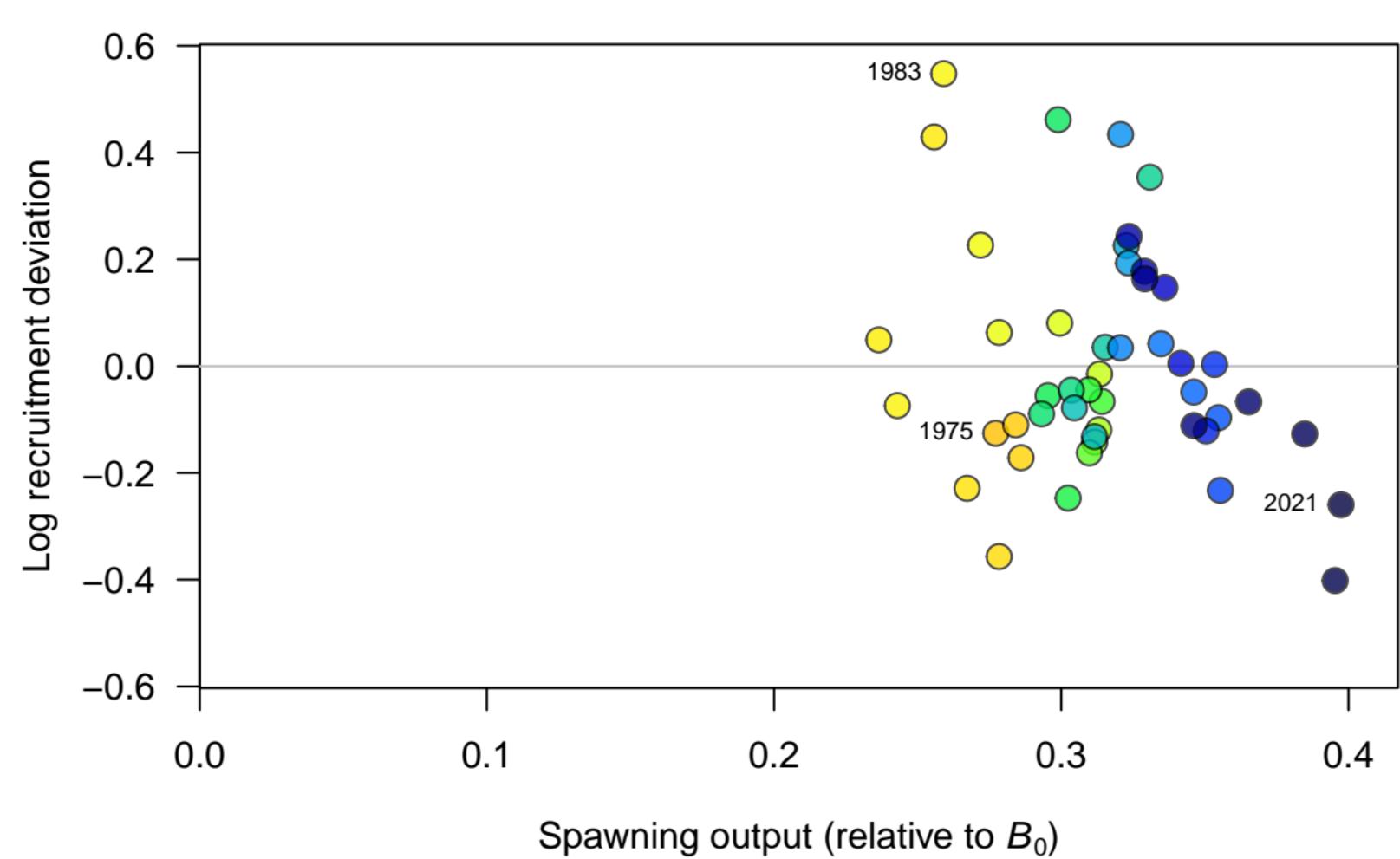
Recruitment deviation variance

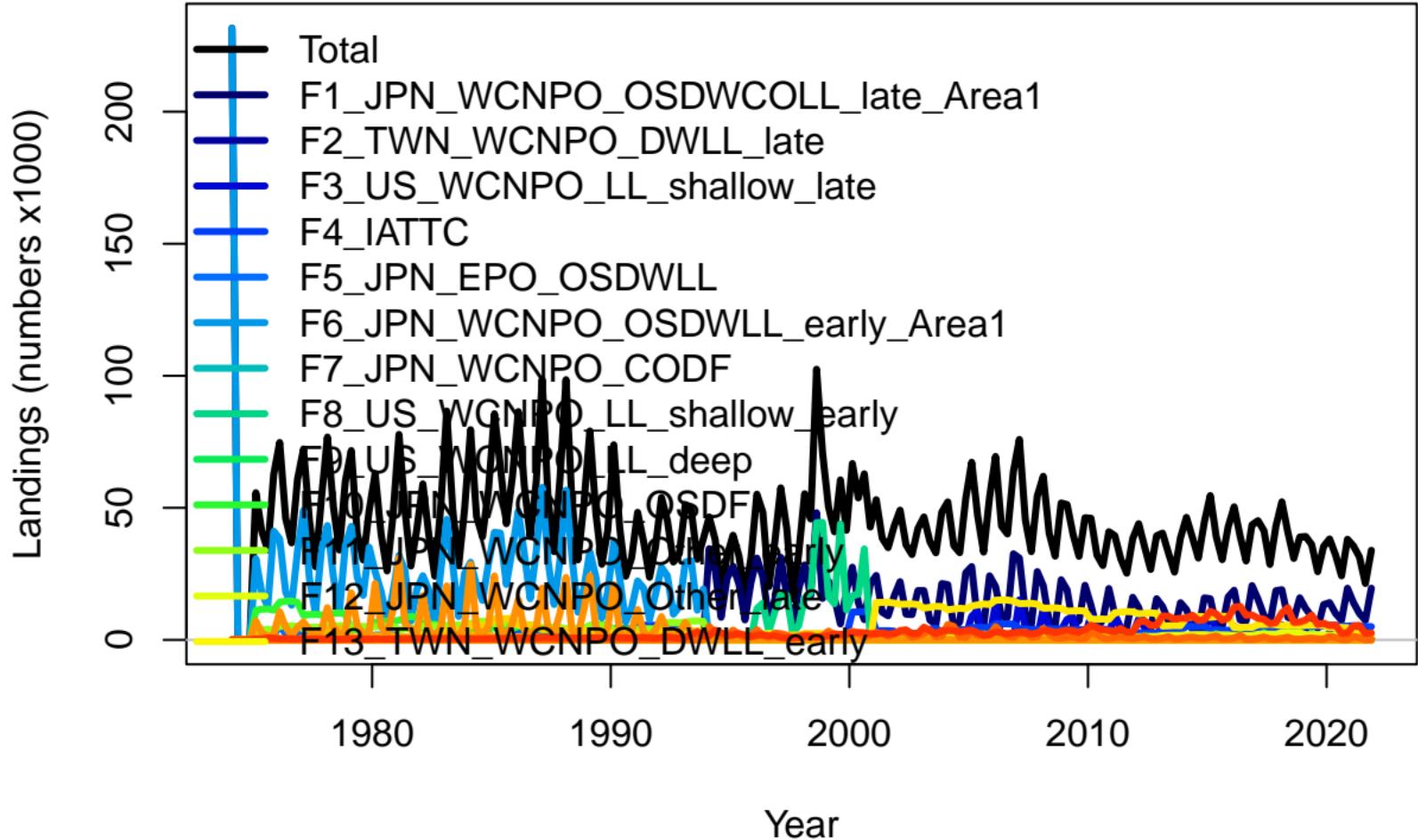


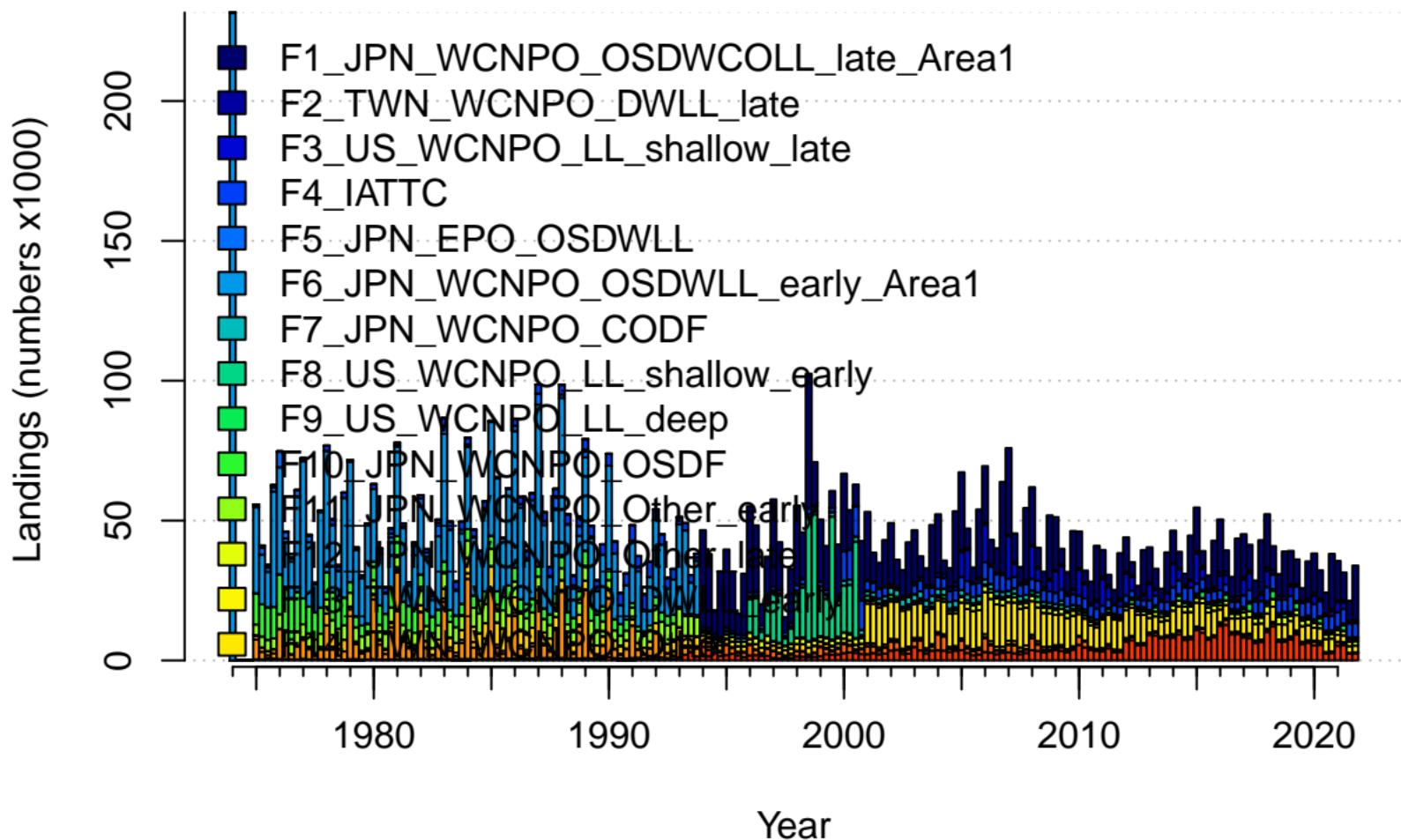


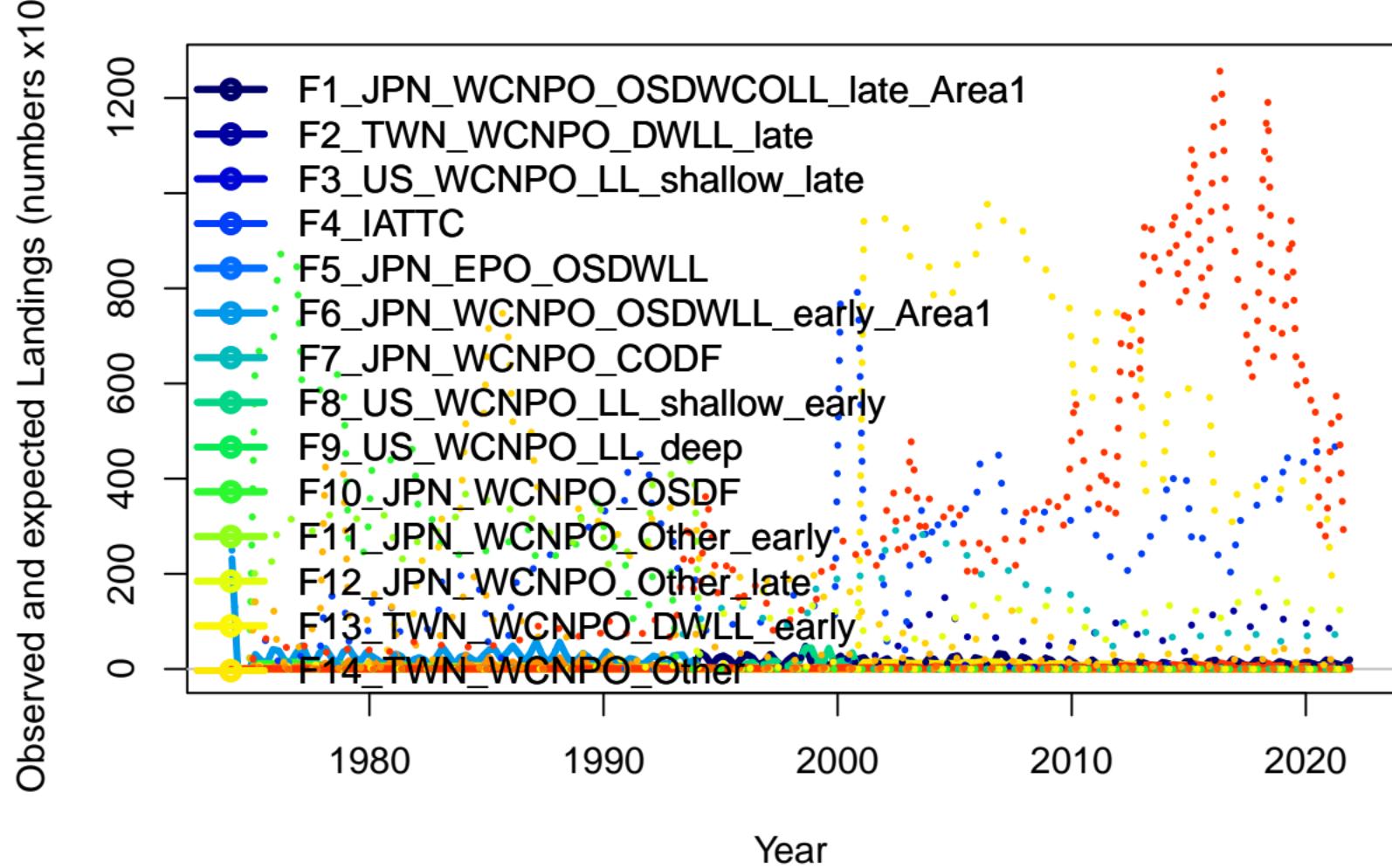


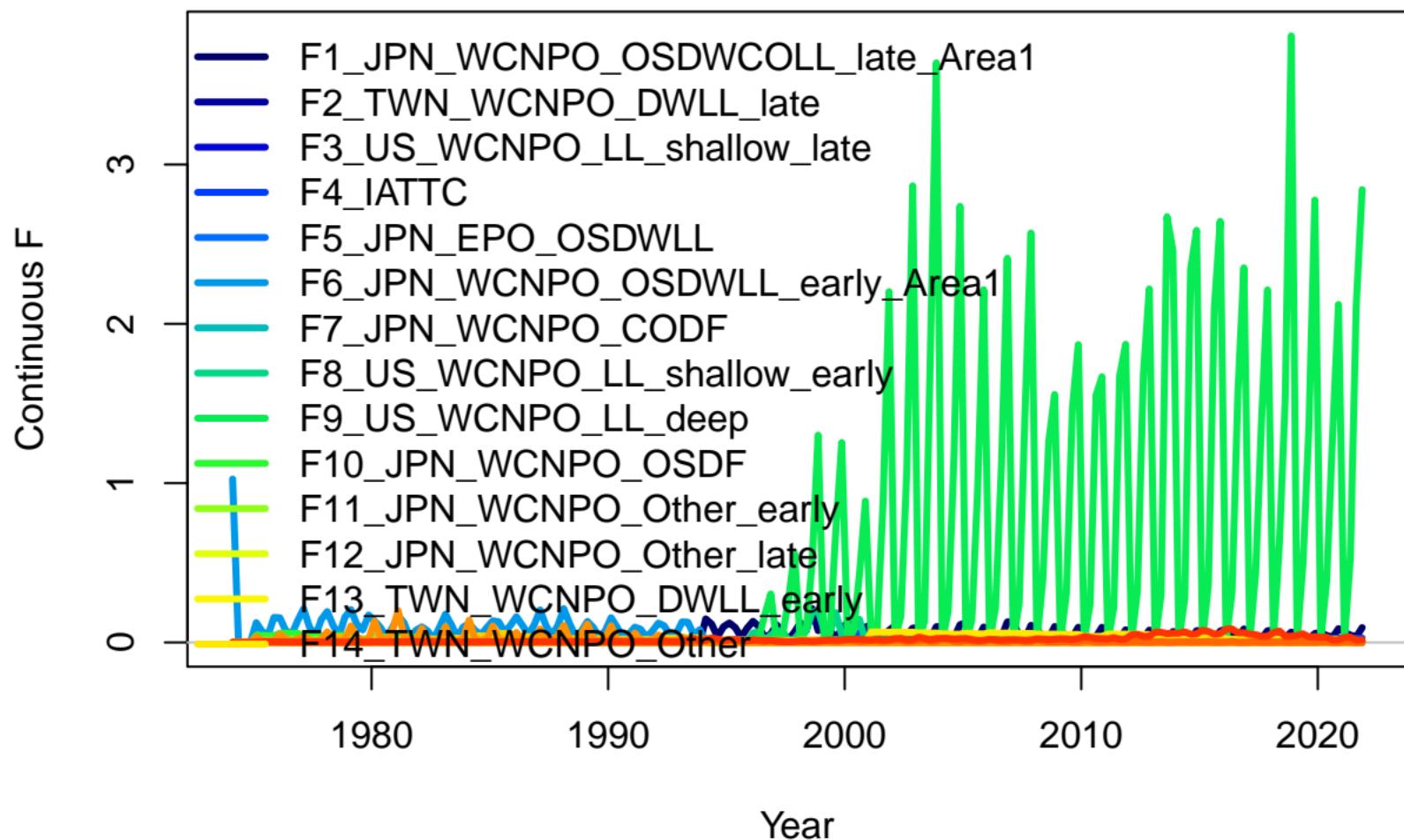


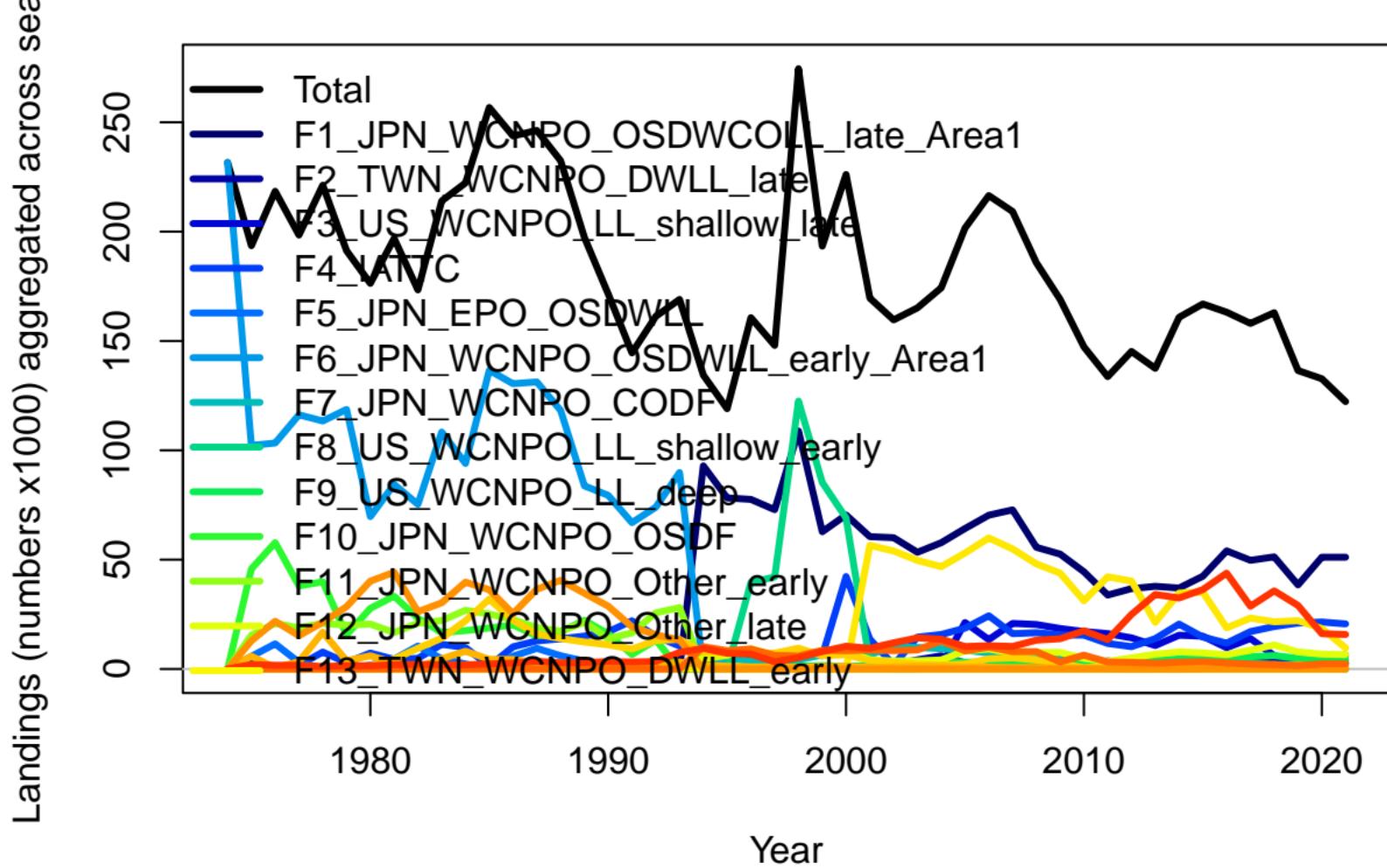


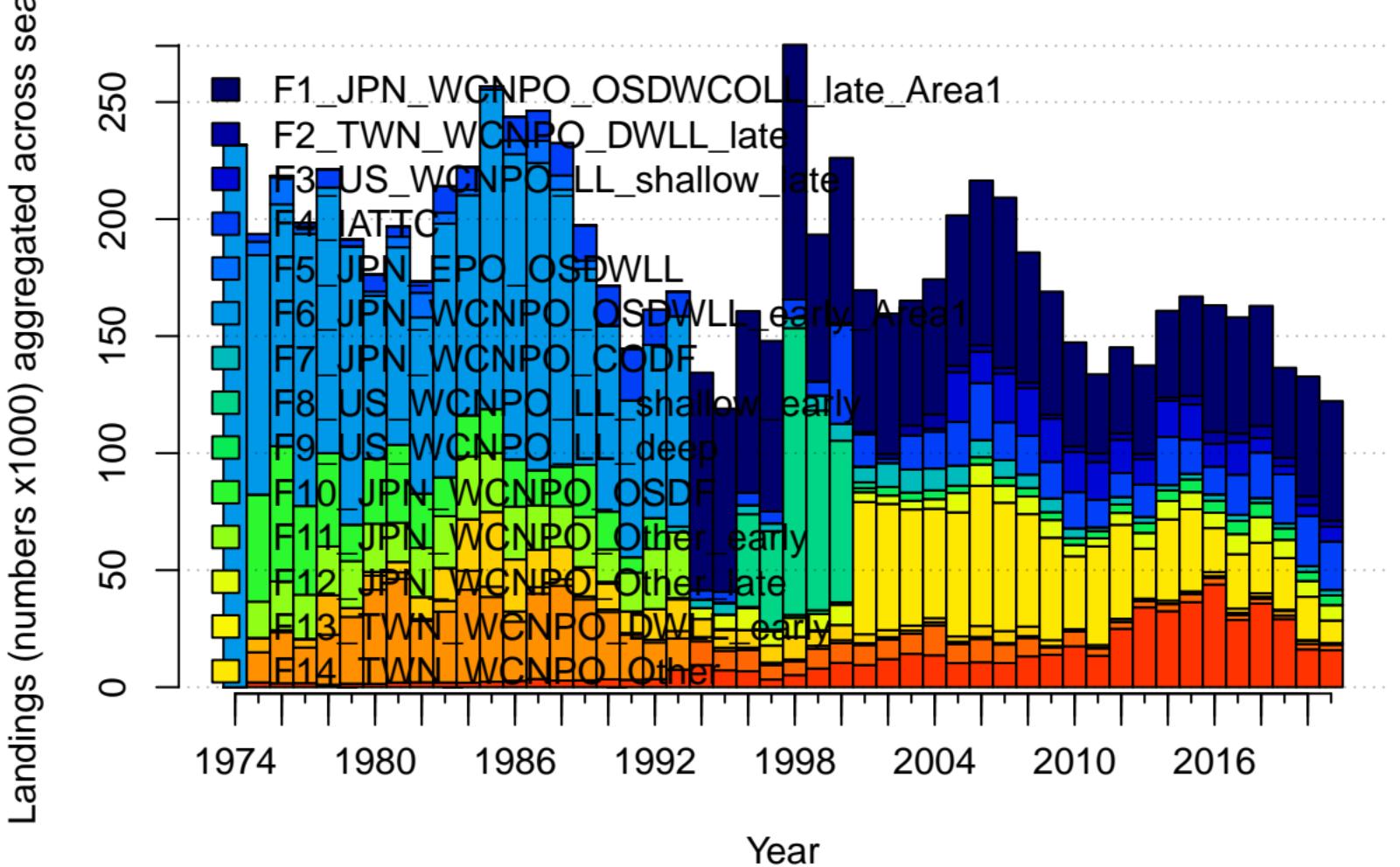




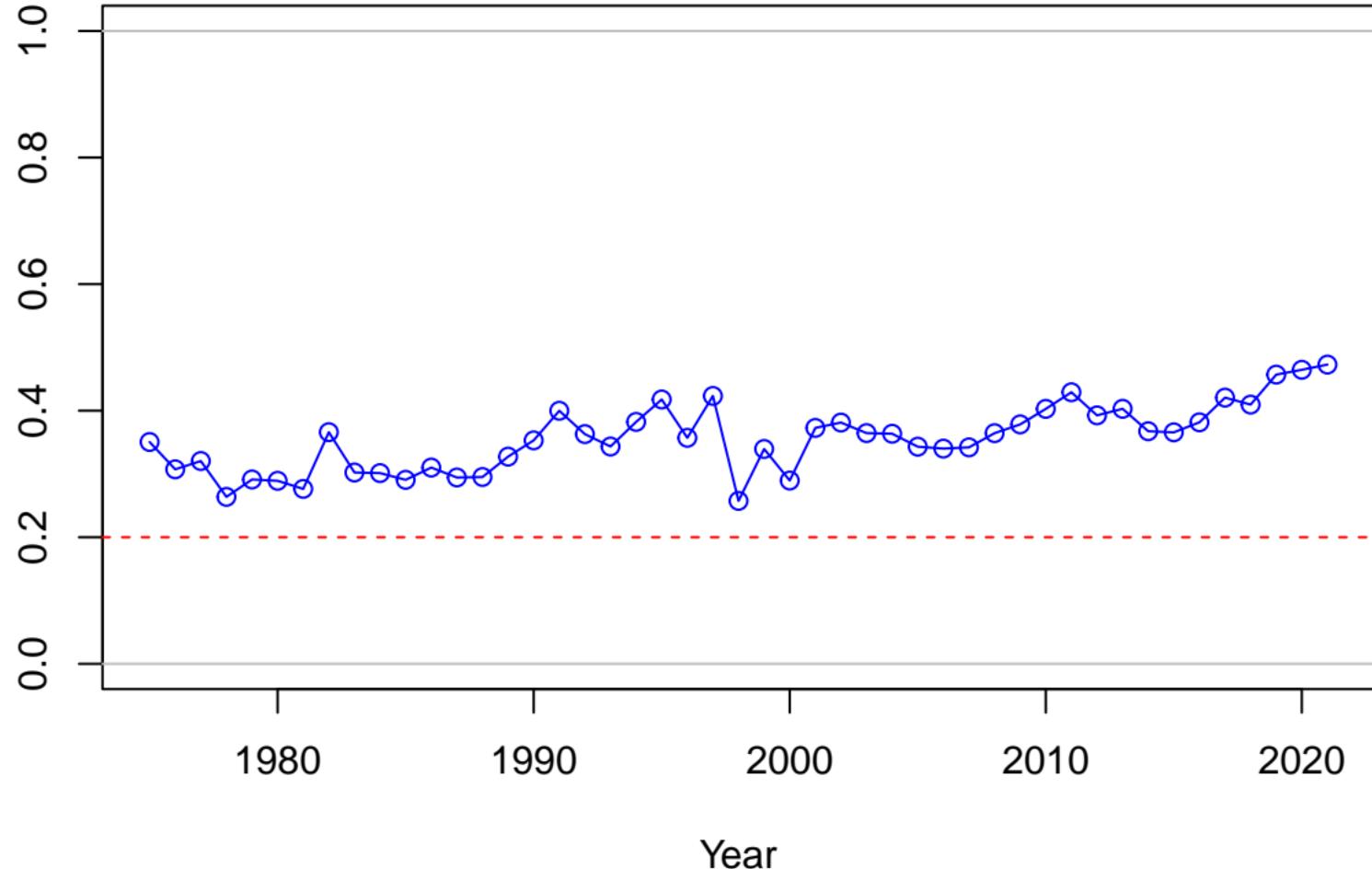




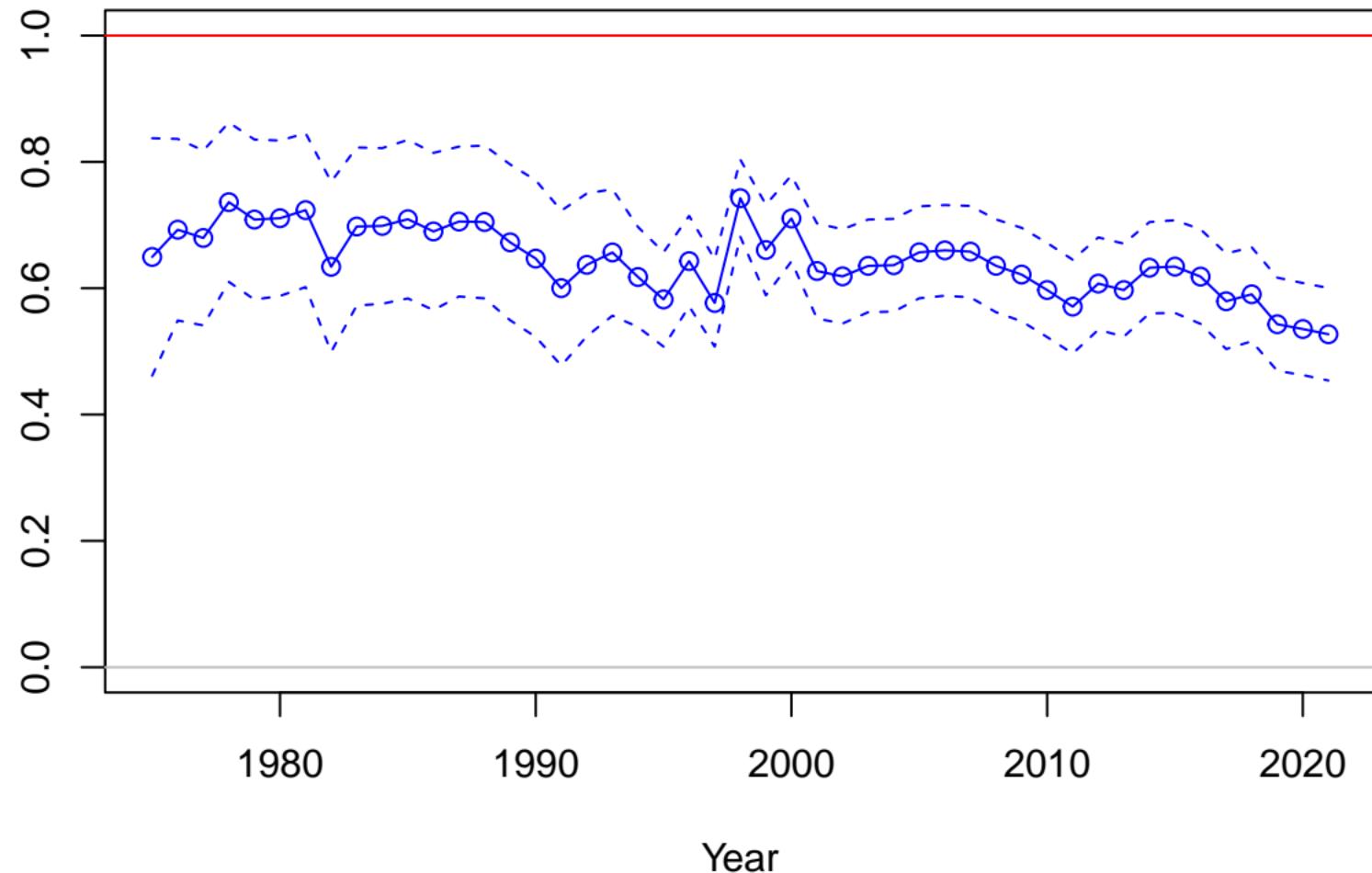




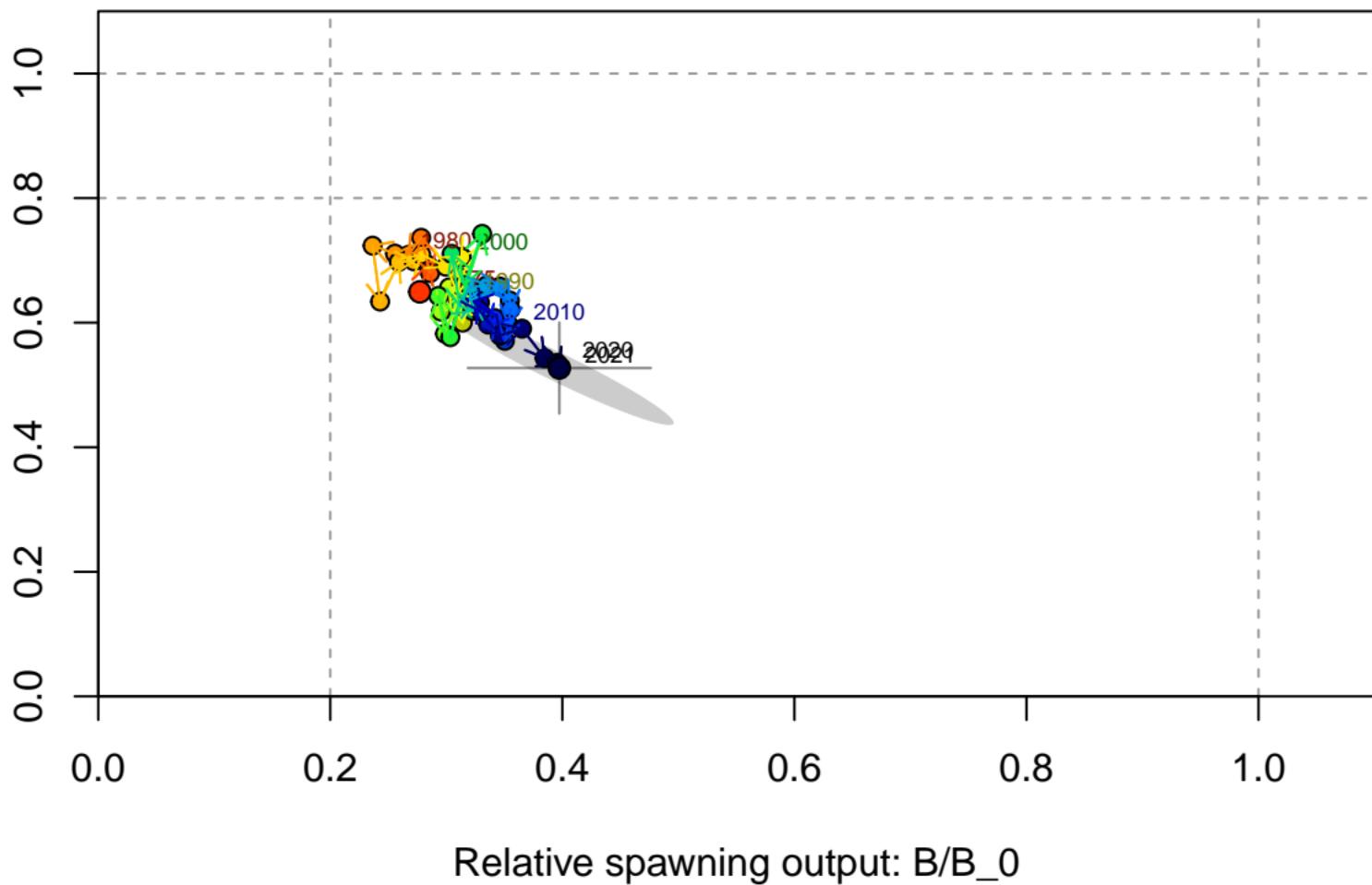
SPR

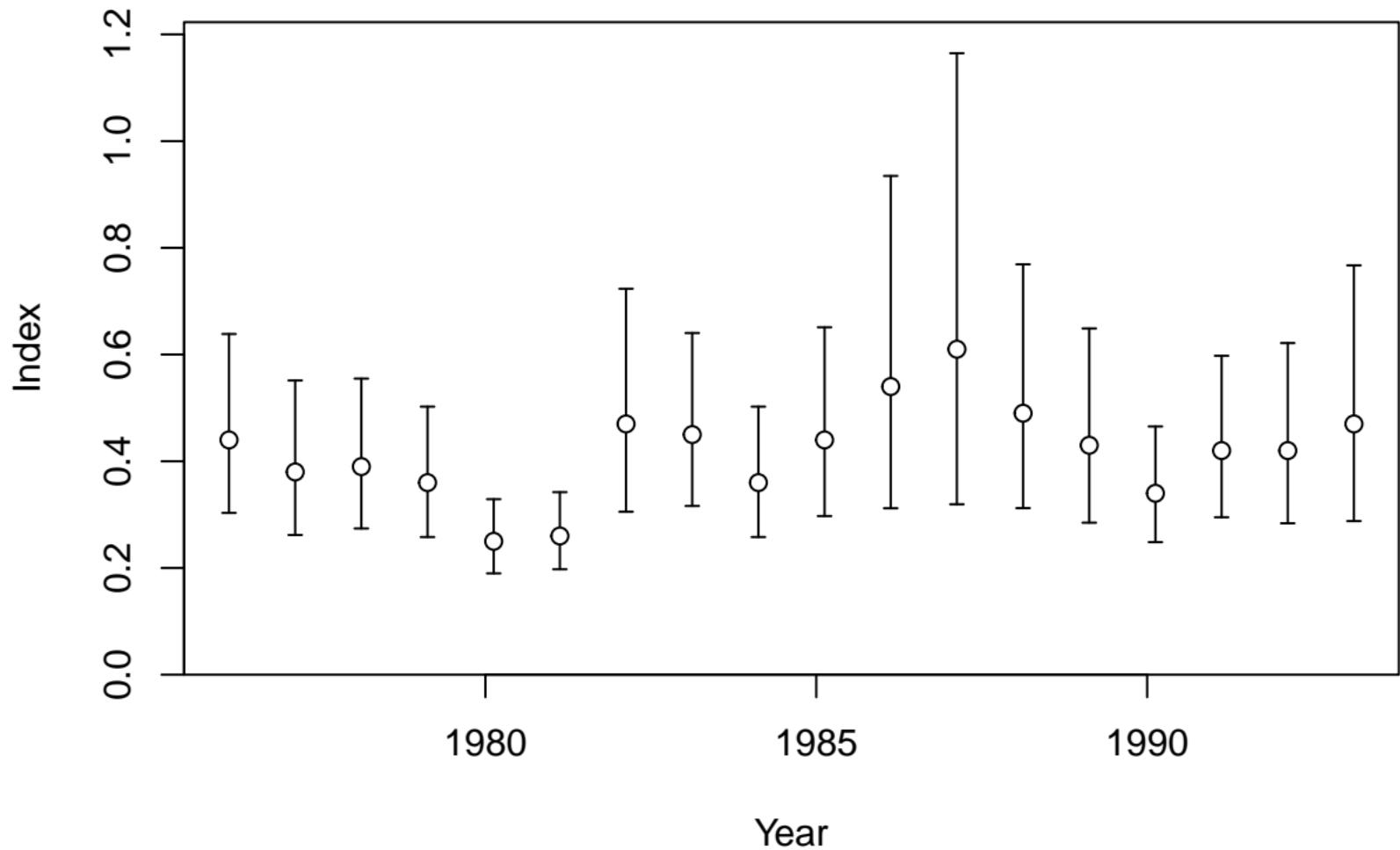


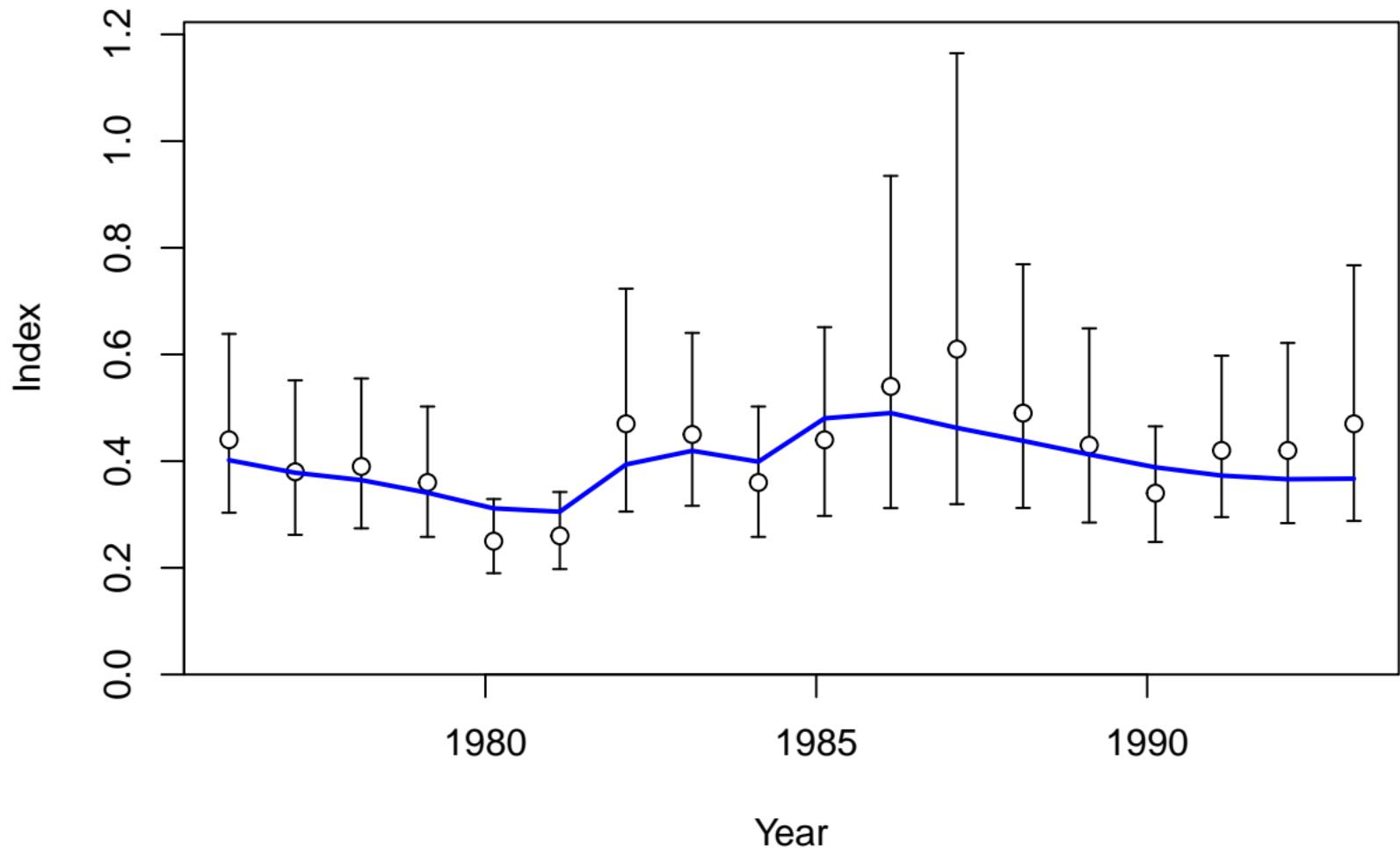
Fishing intensity: 1-SPR

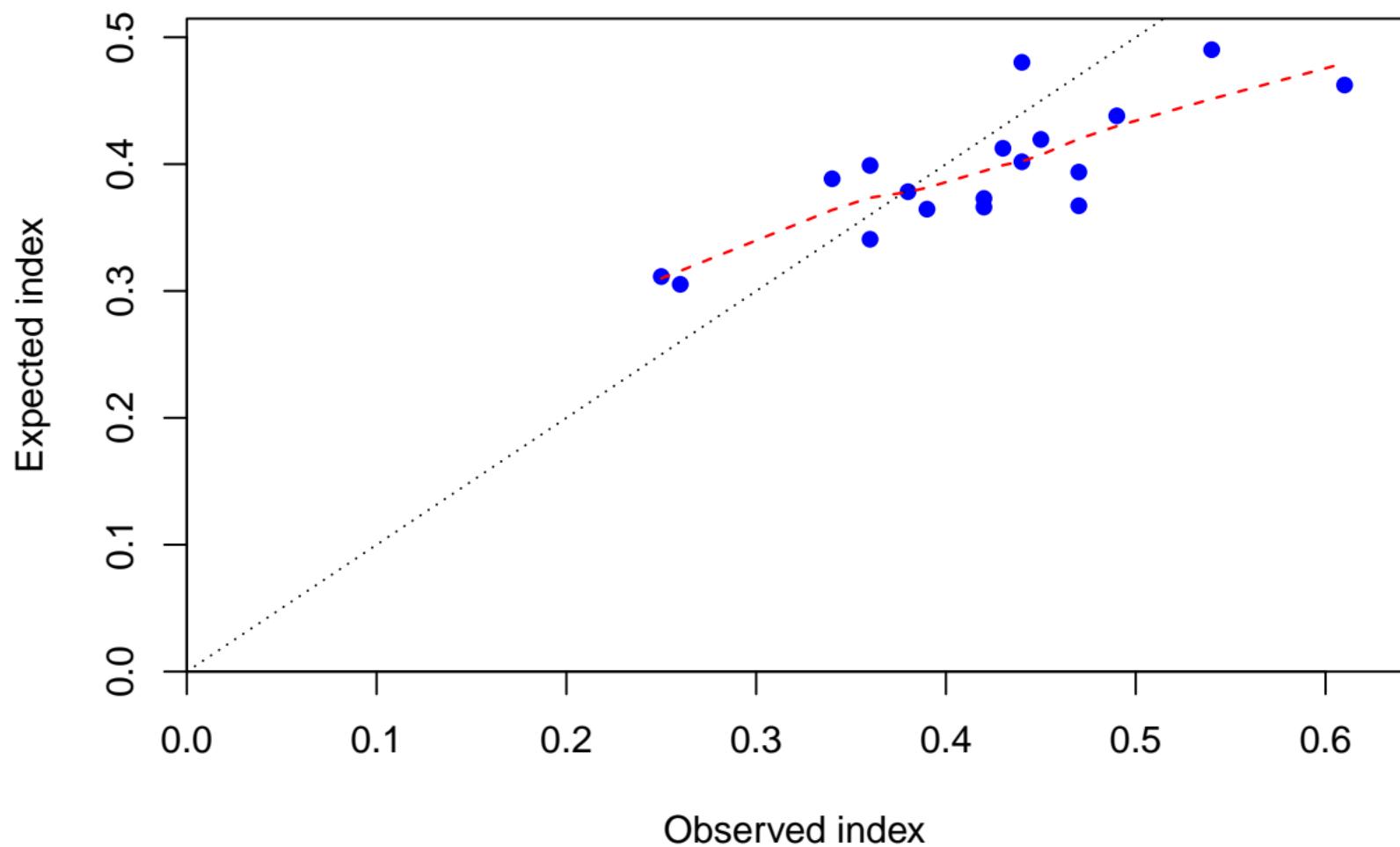


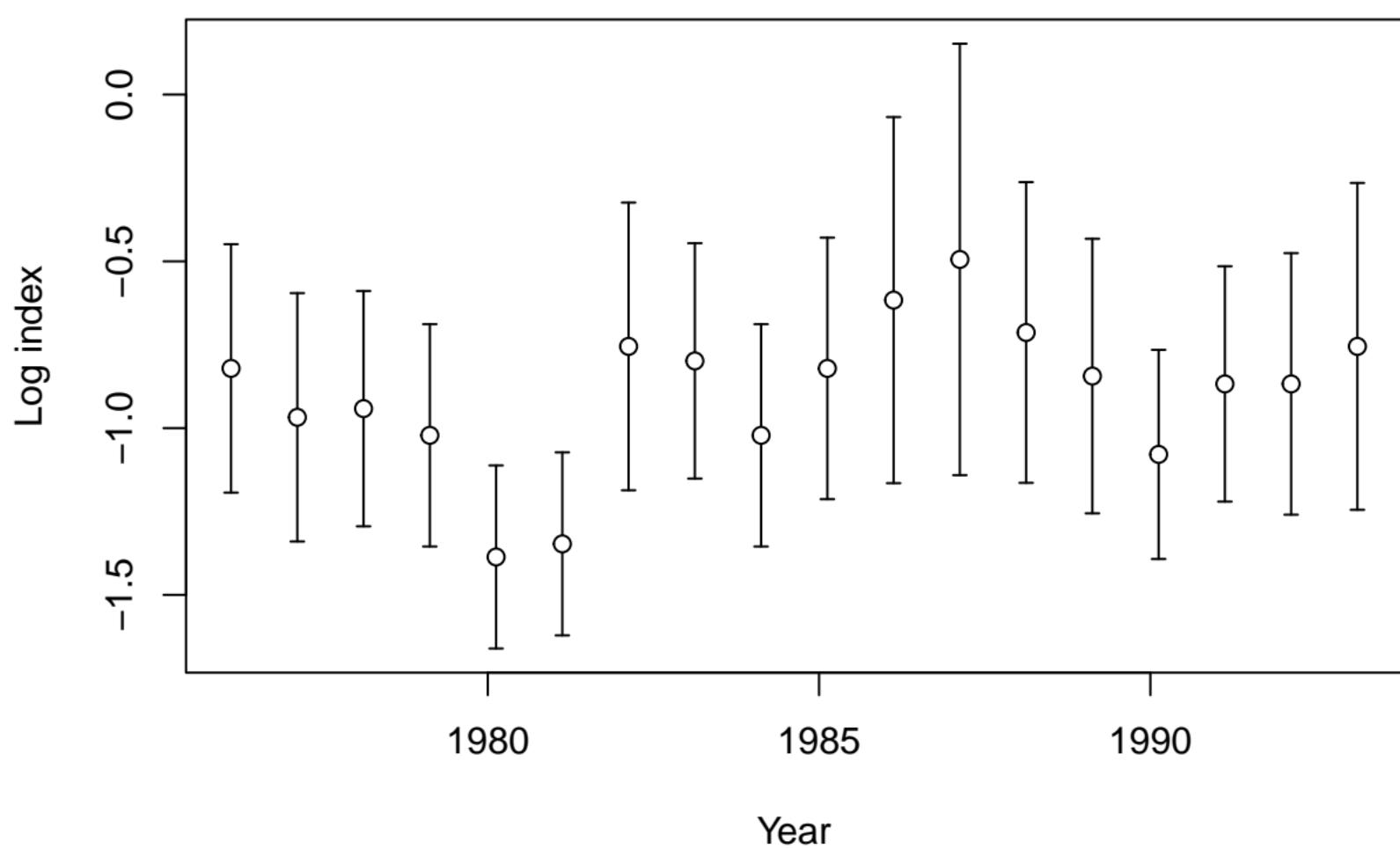
Fishing intensity: 1-SPR

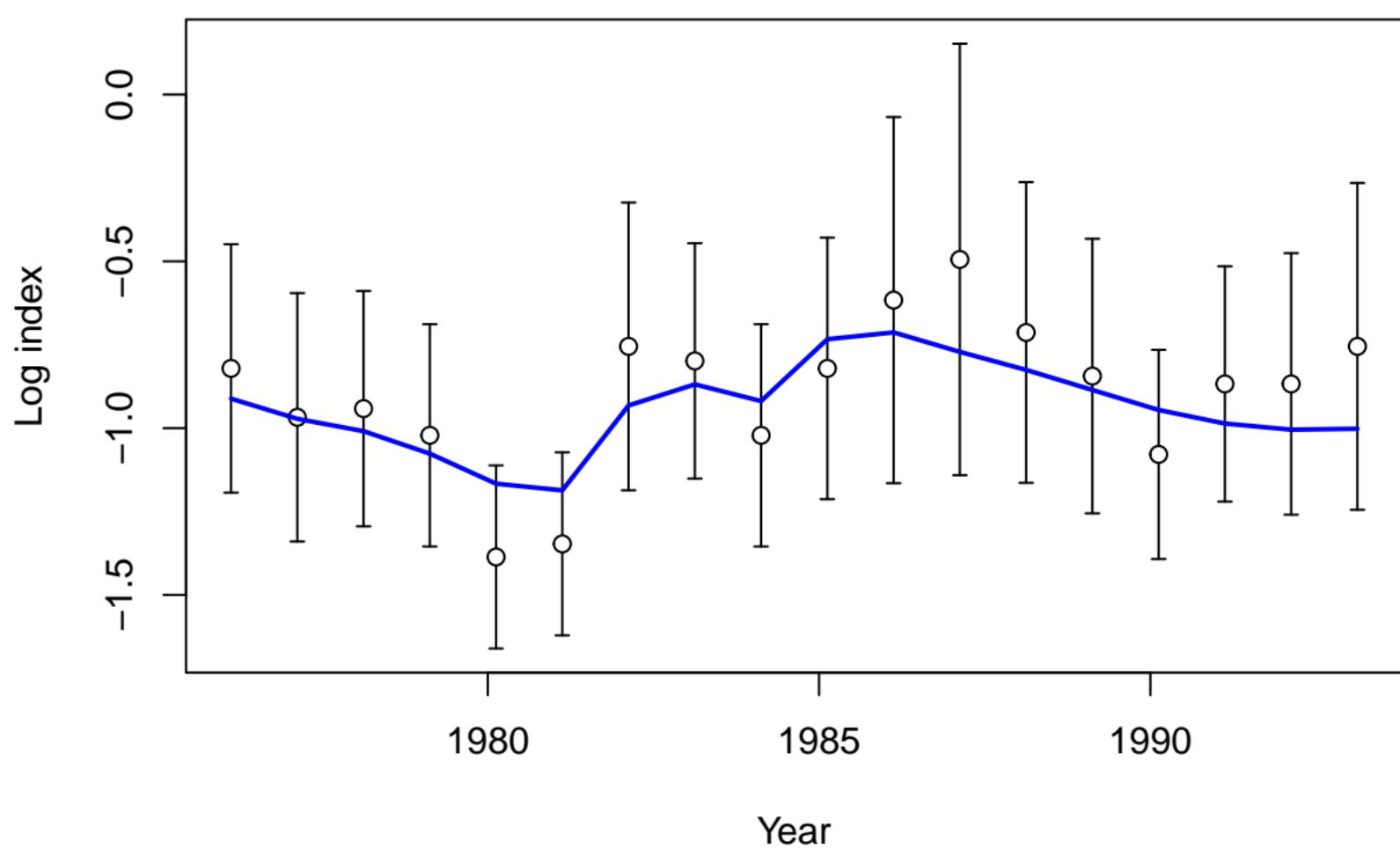


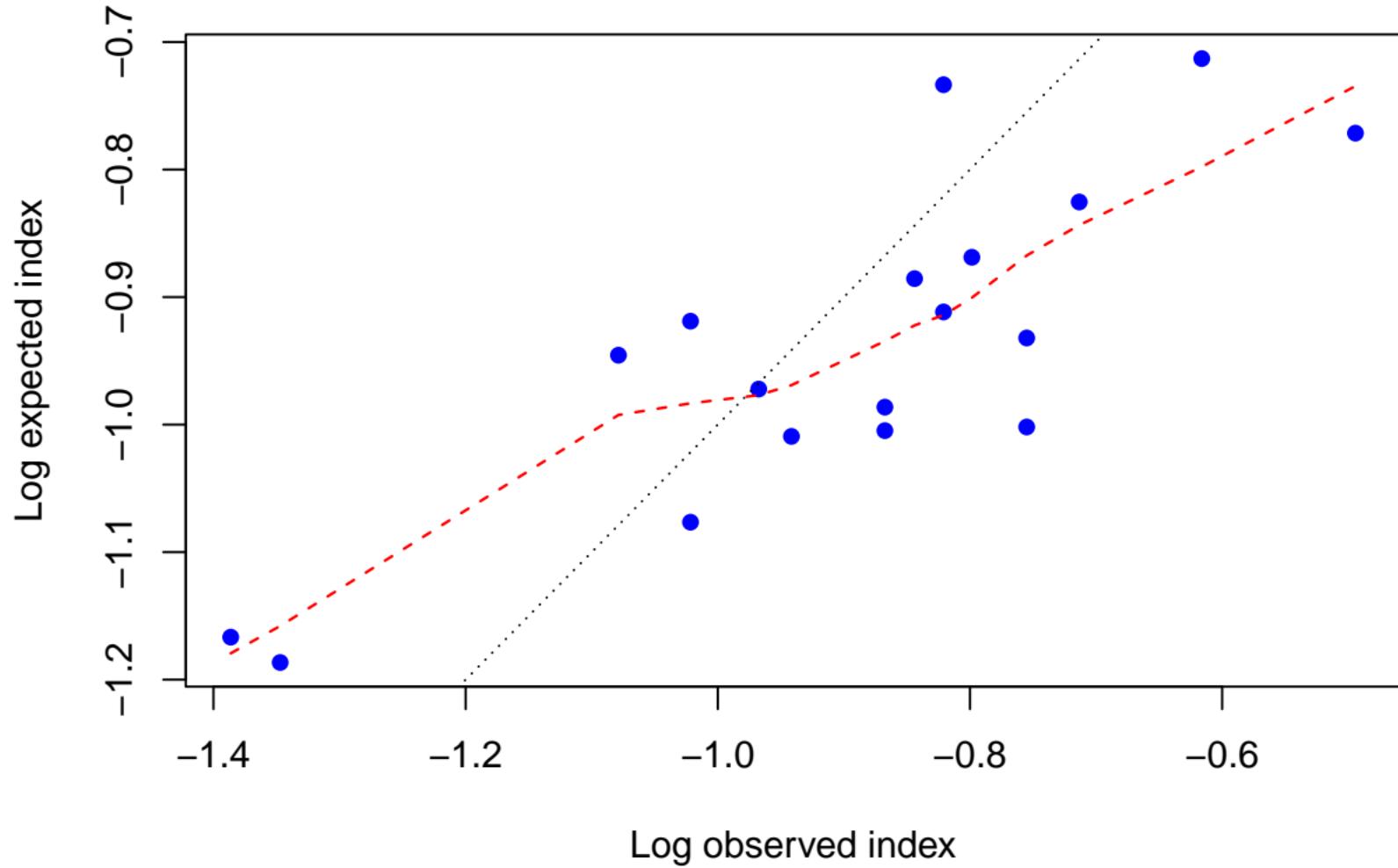


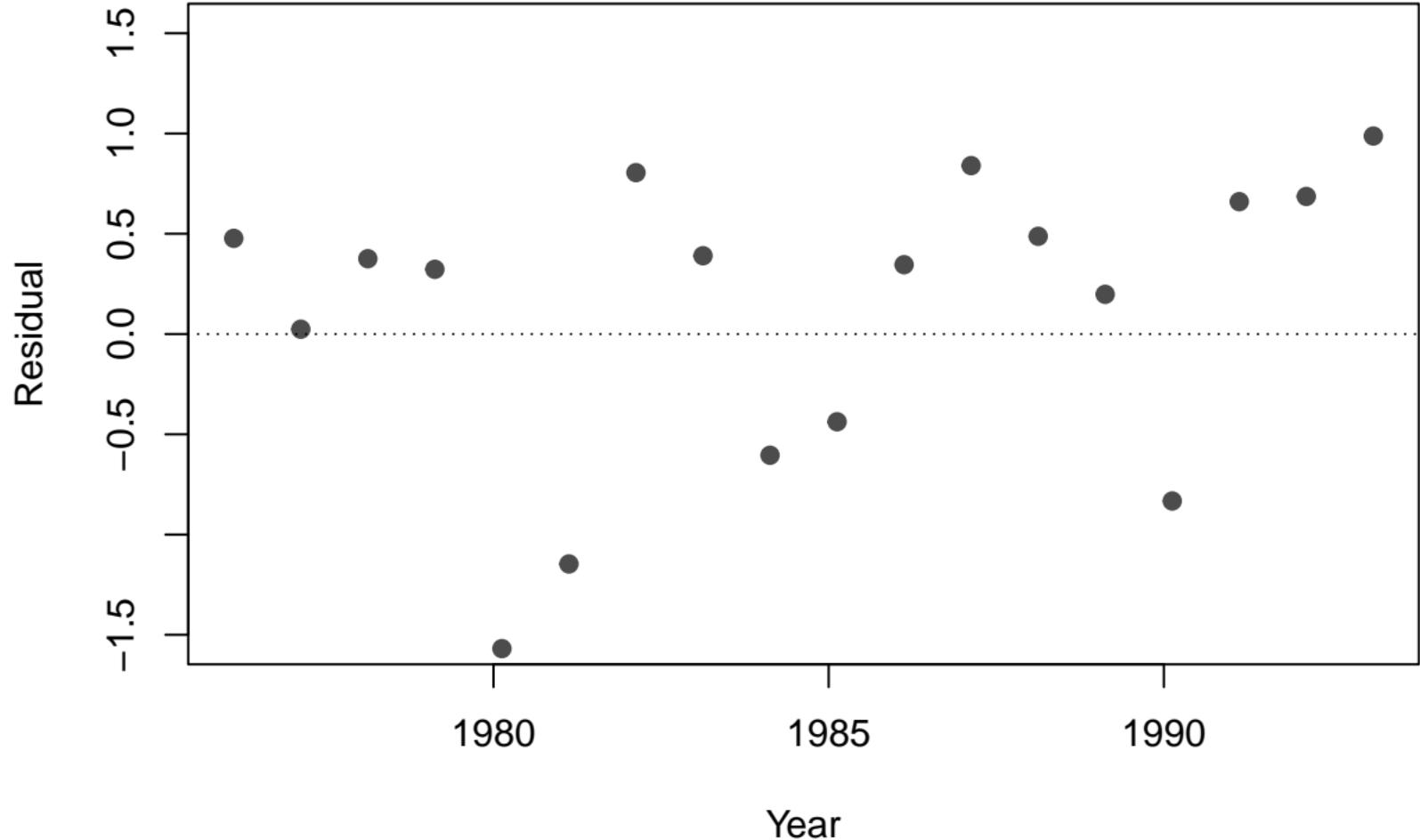


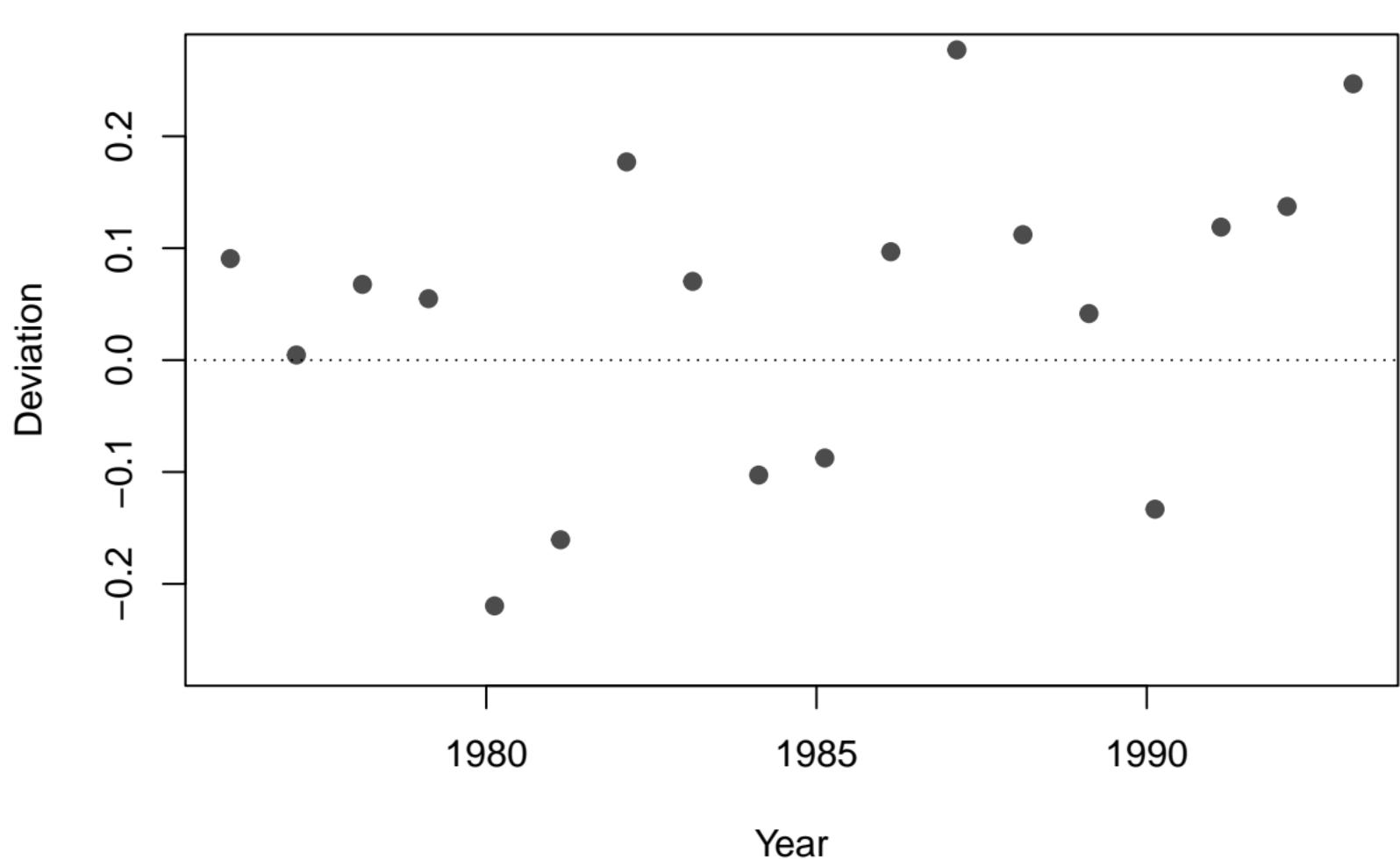


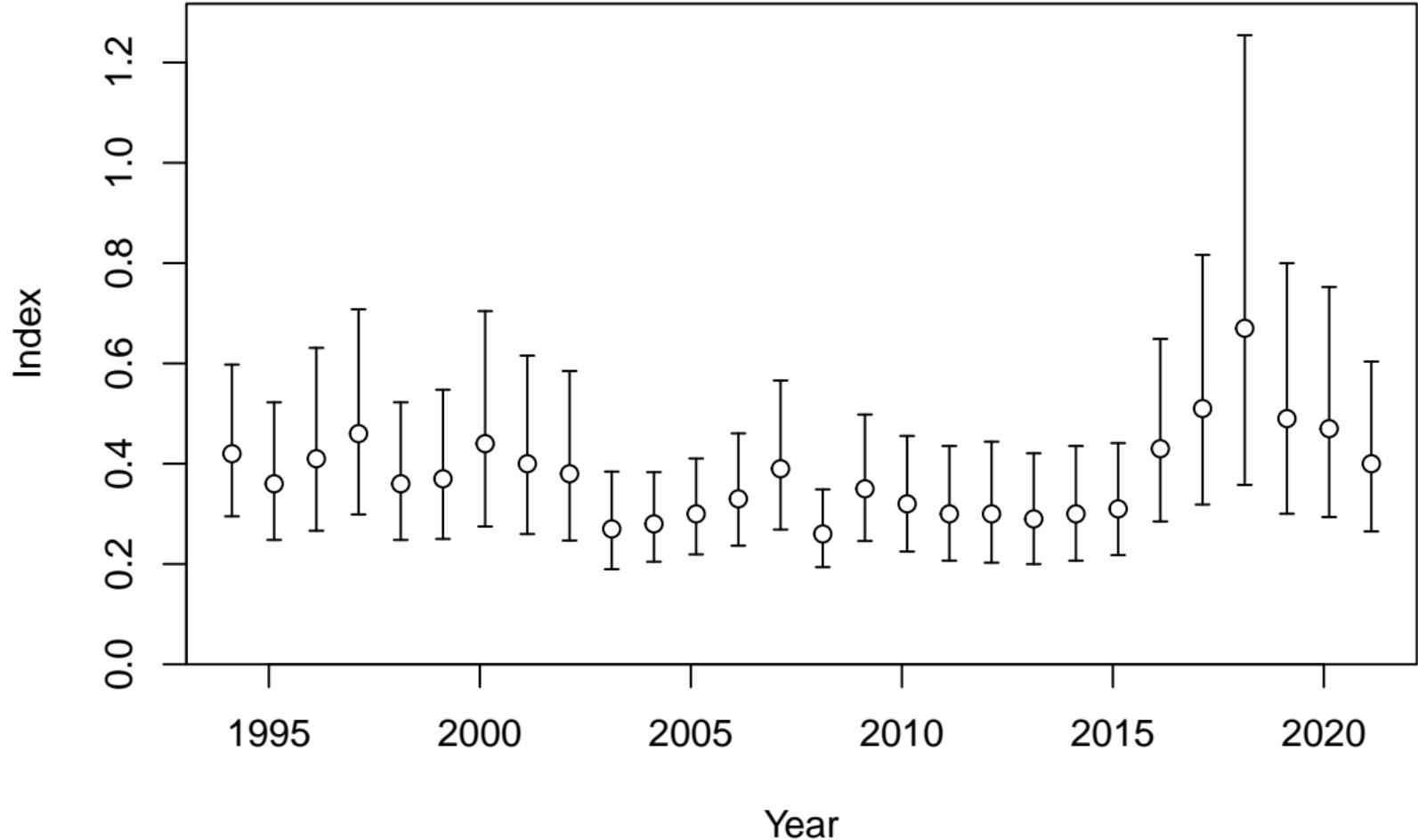


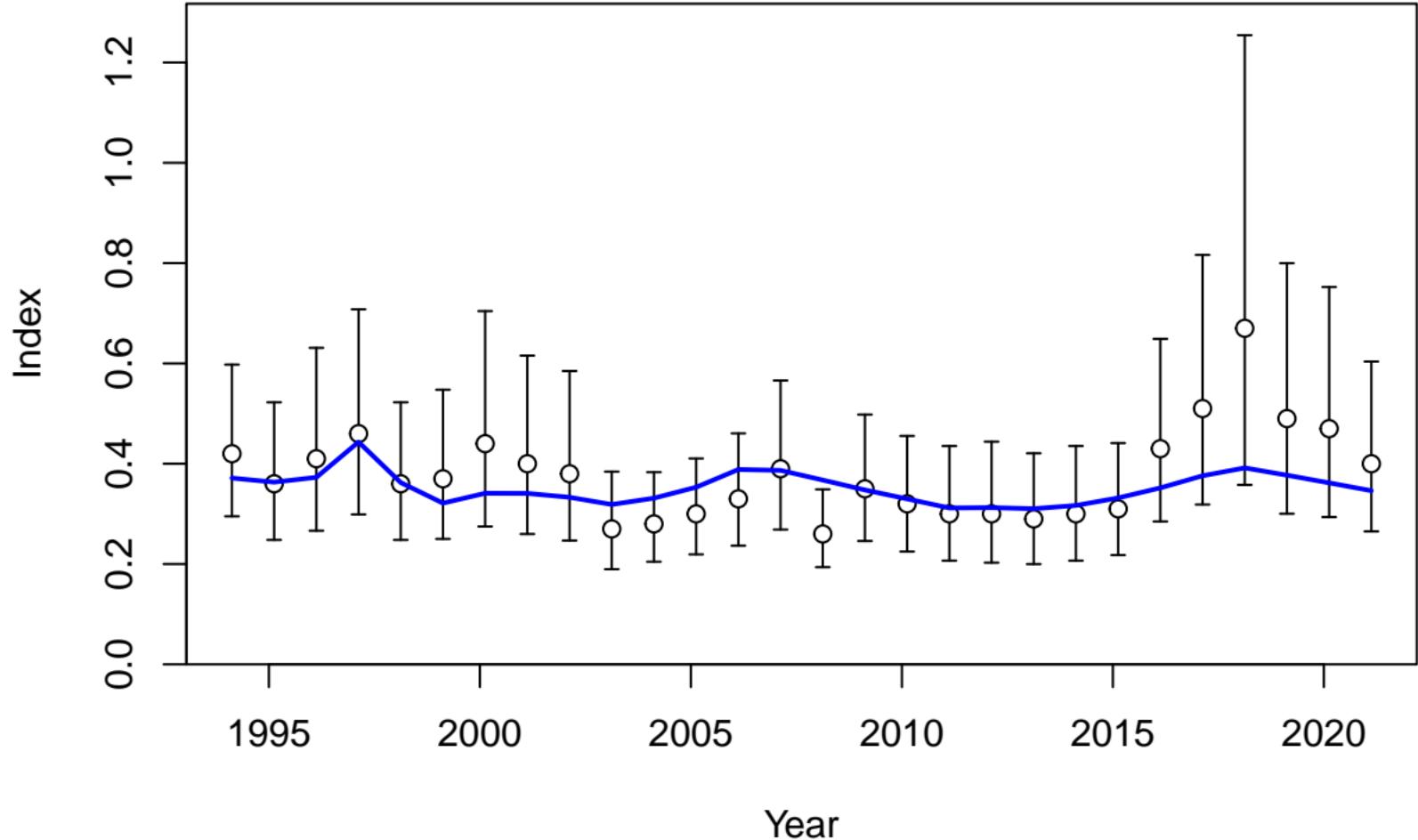










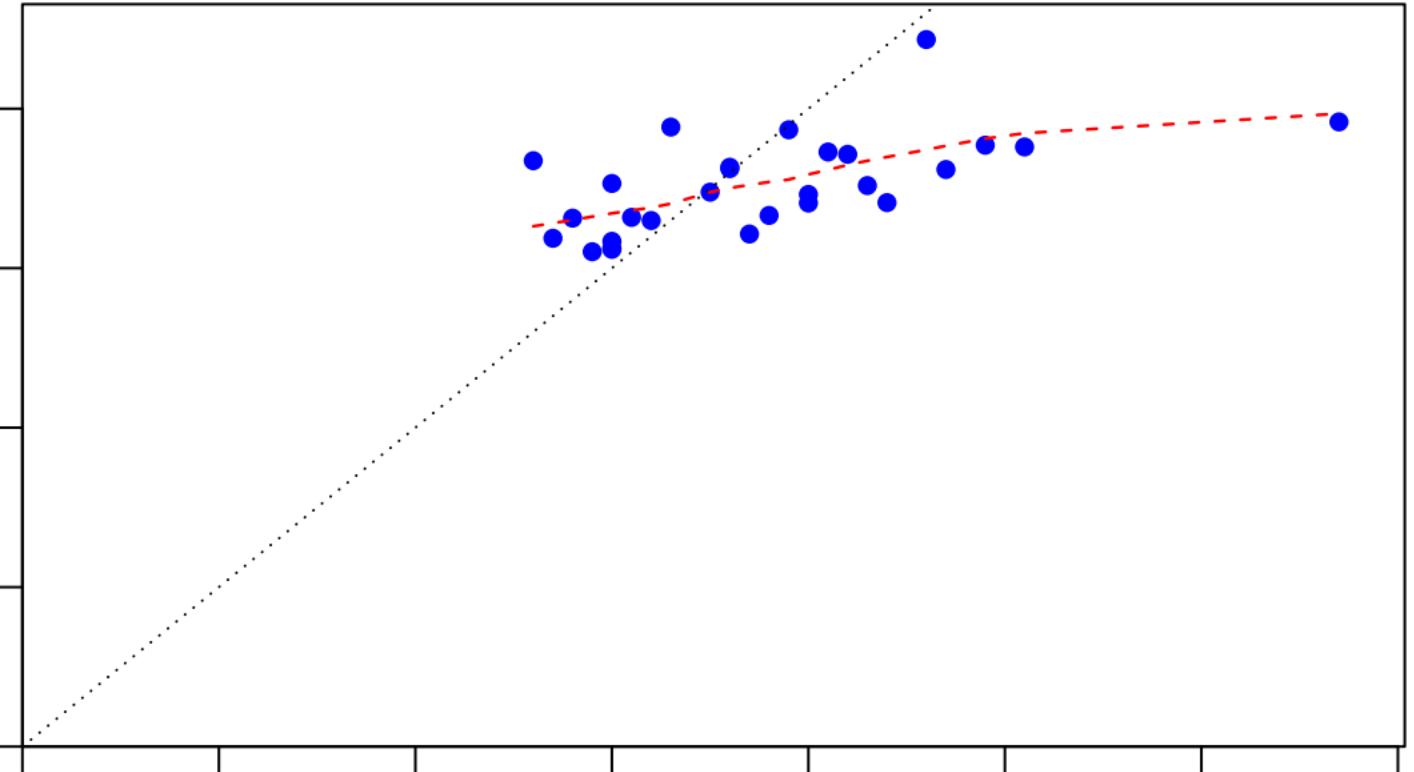


Expected index

0.4
0.3
0.2
0.1
0.0

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7

Observed index

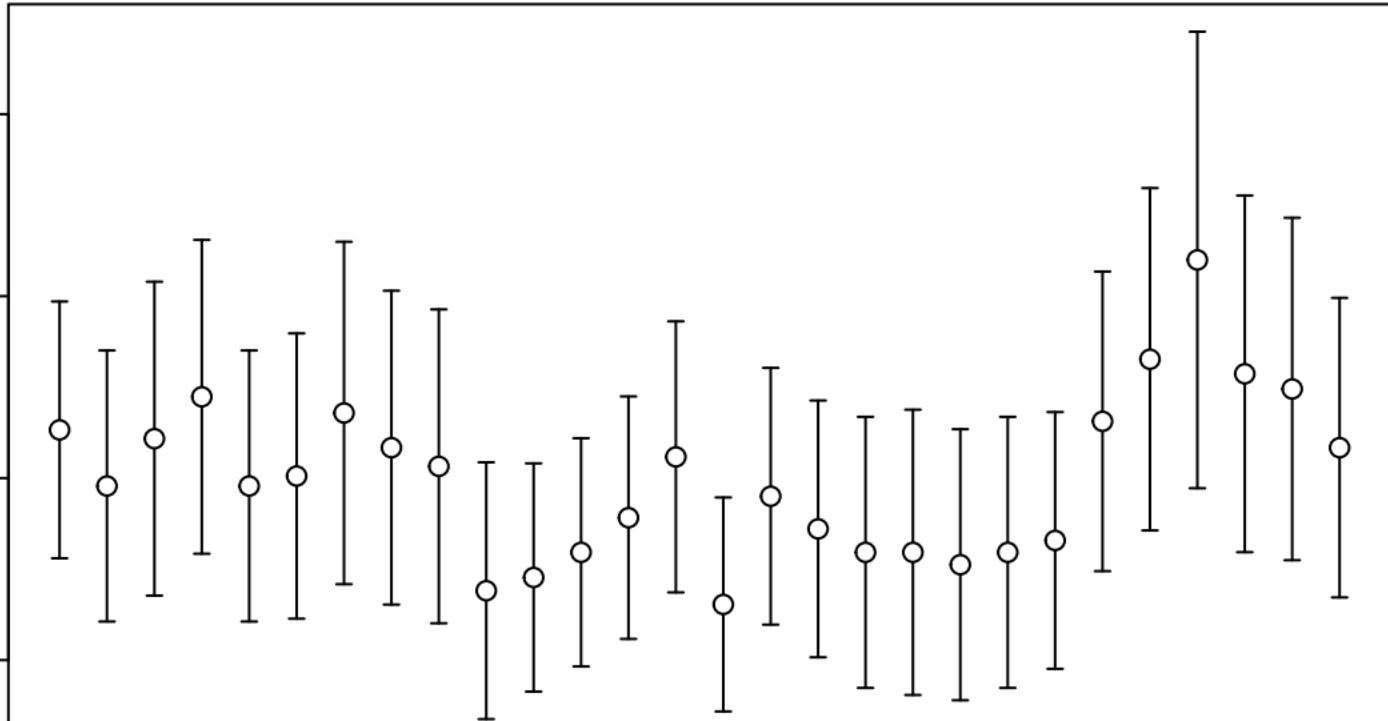


Log index

-1.5 -1.0 -0.5 0.0

1995 2000 2005 2010 2015 2020

Year

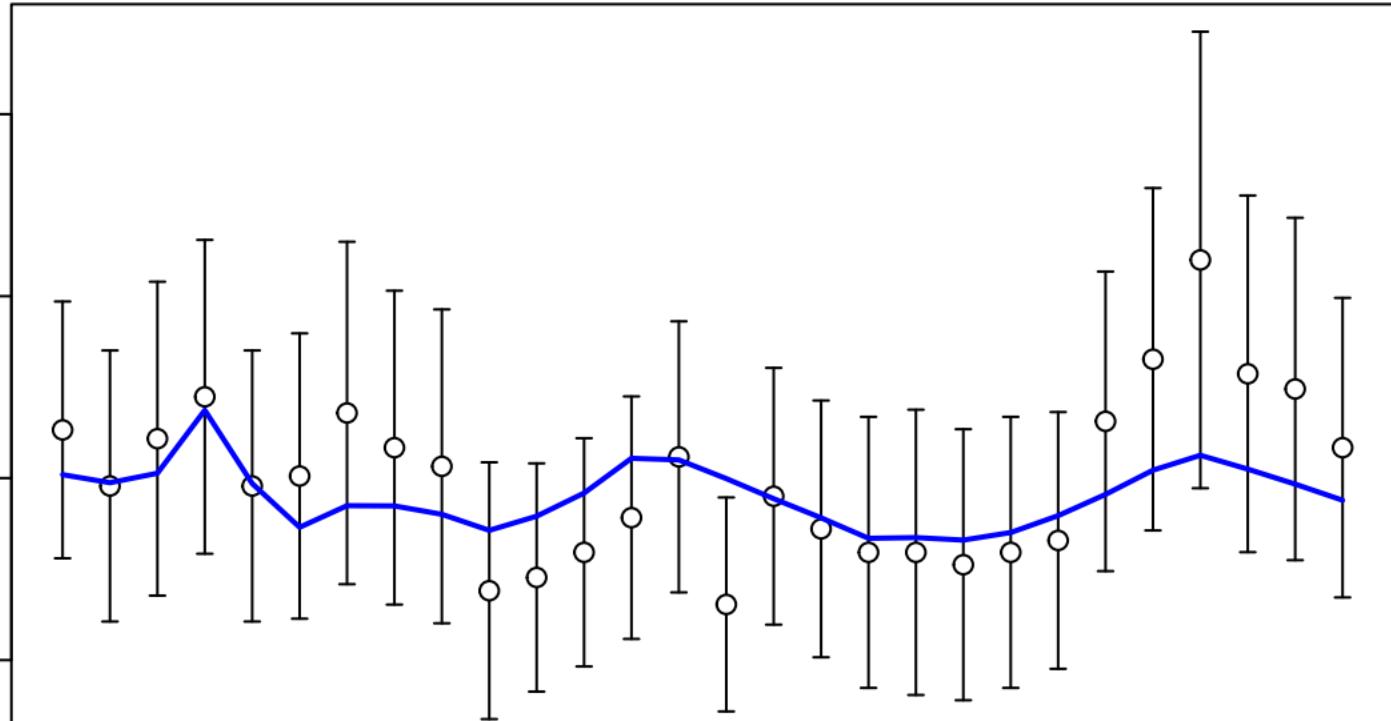


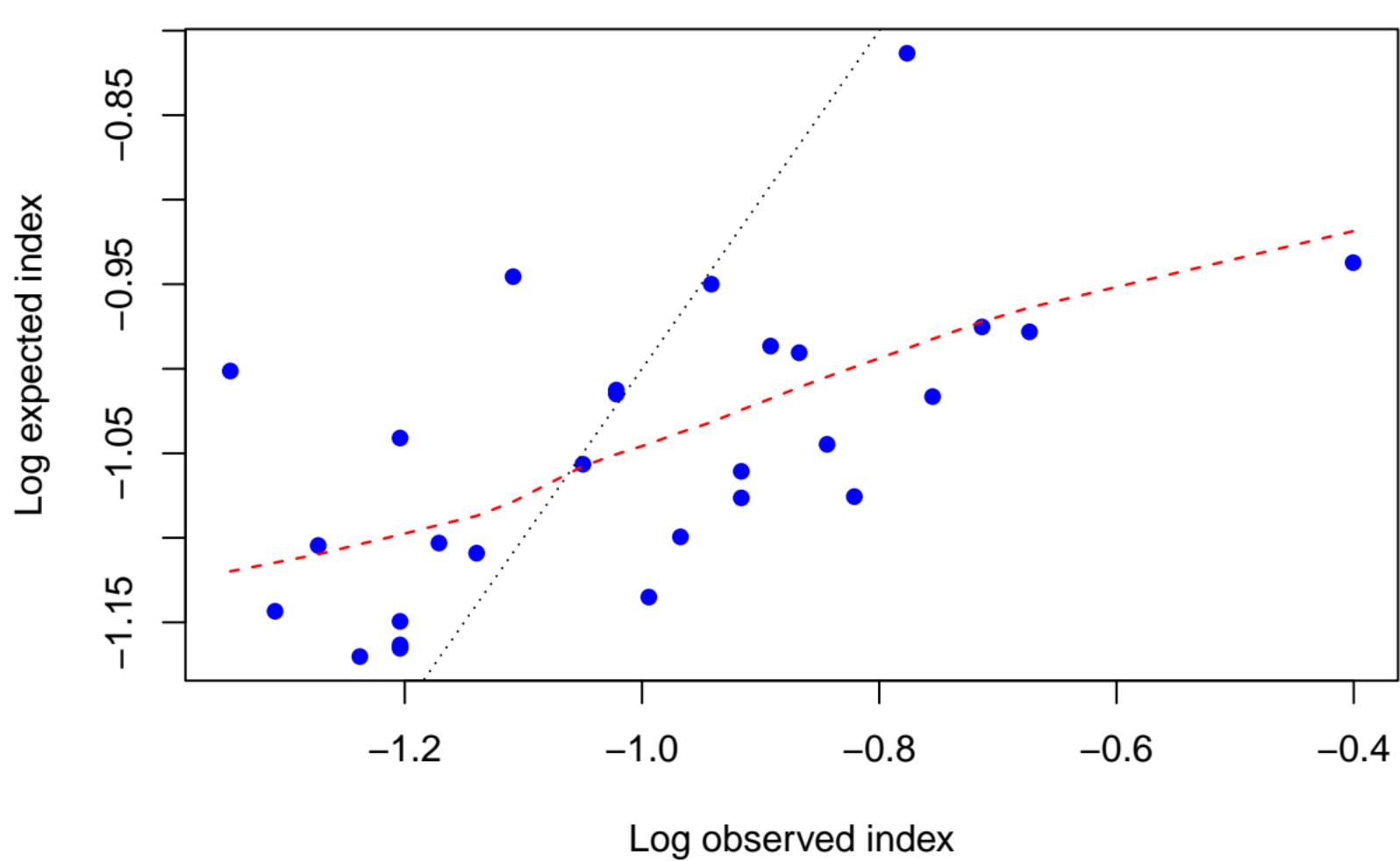
Log index

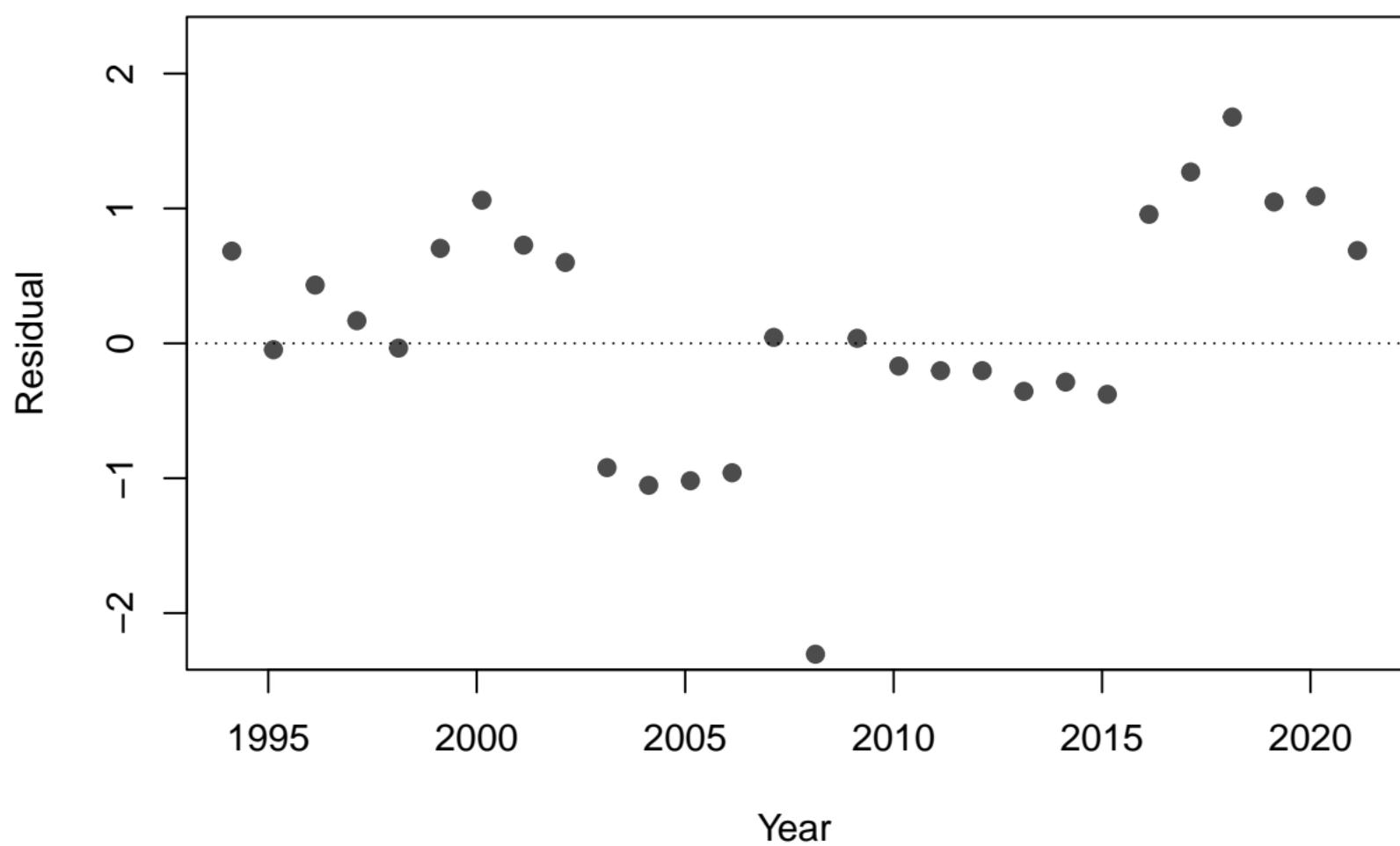
-1.5 -1.0 -0.5 0.0

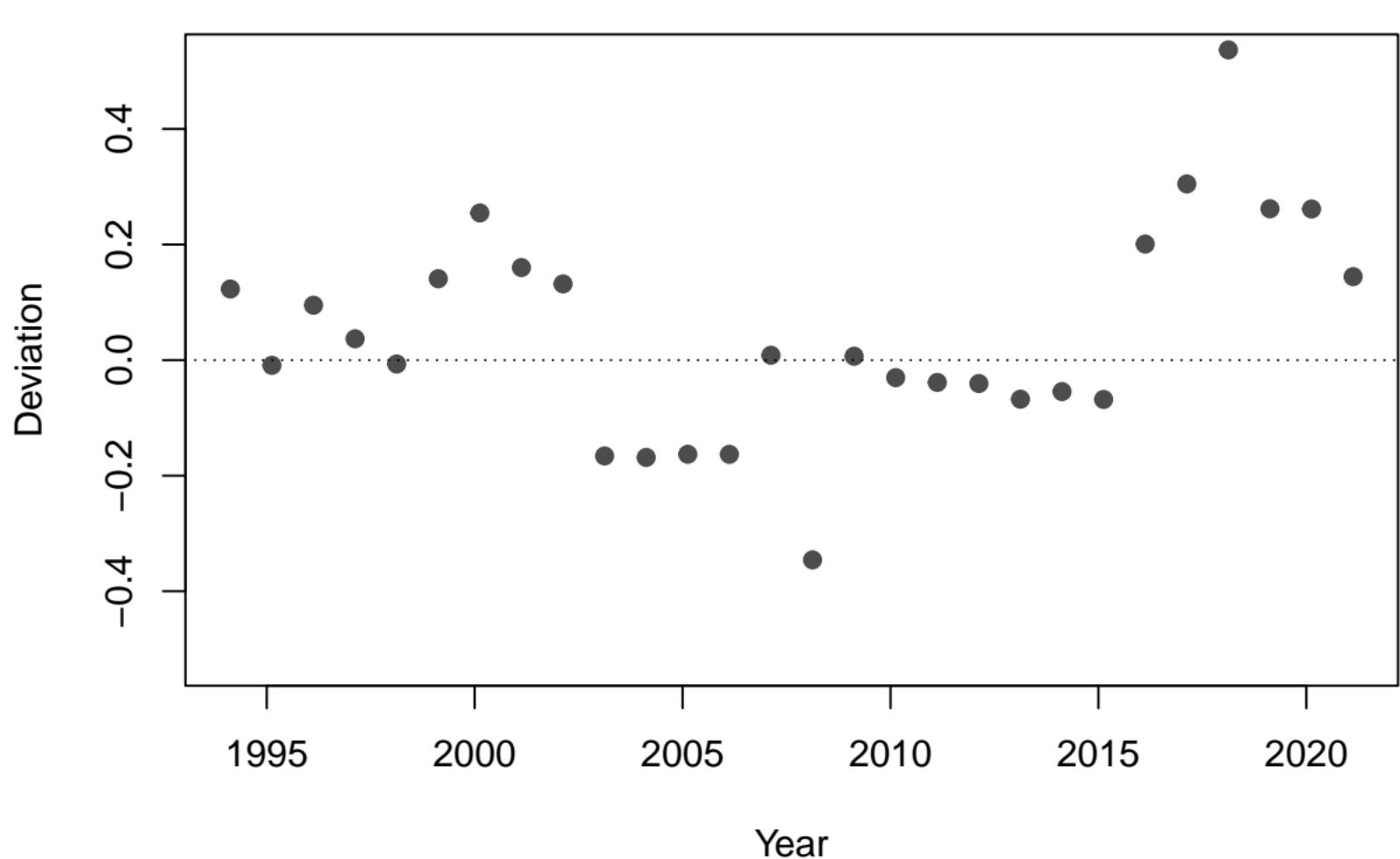
1995 2000 2005 2010 2015 2020

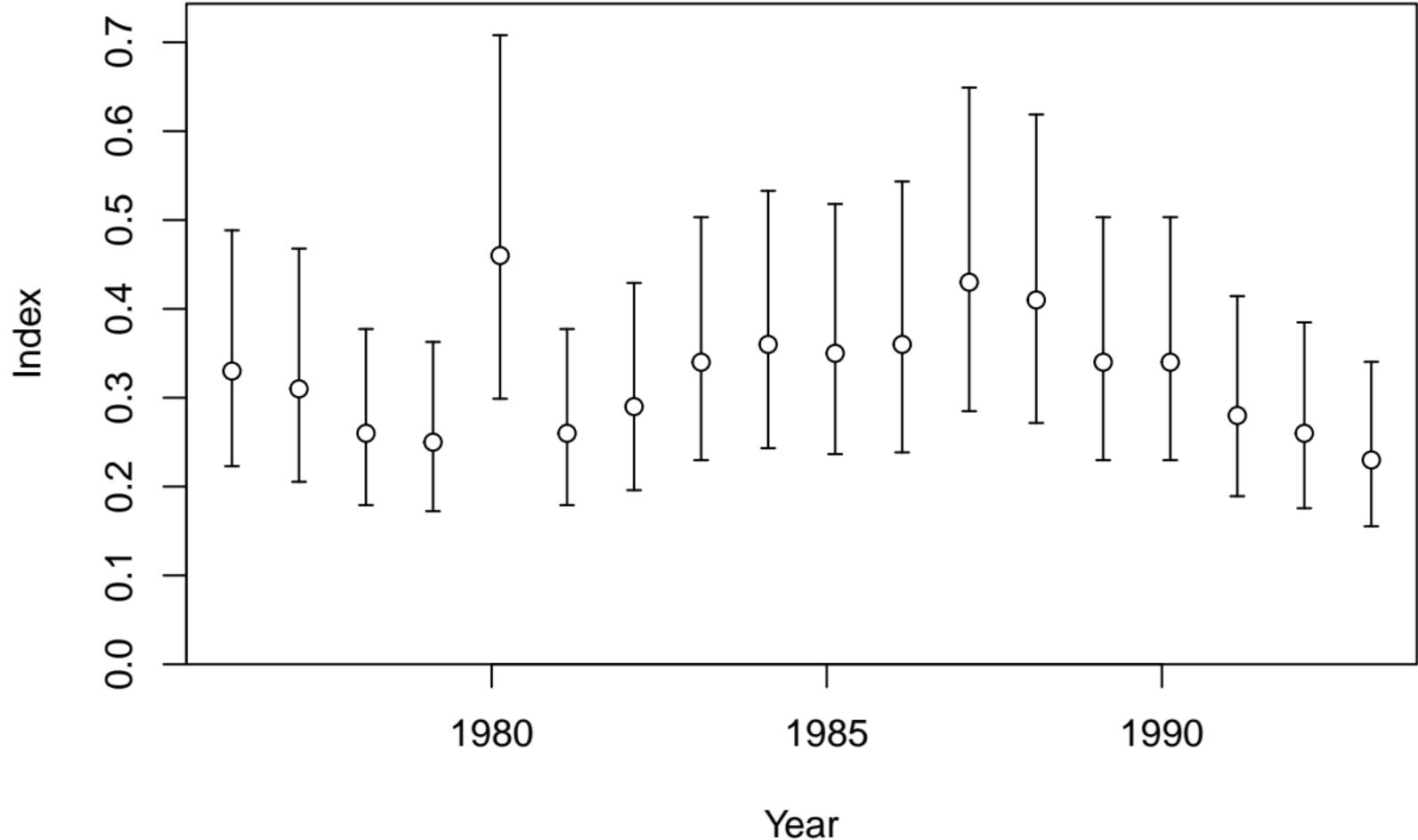
Year

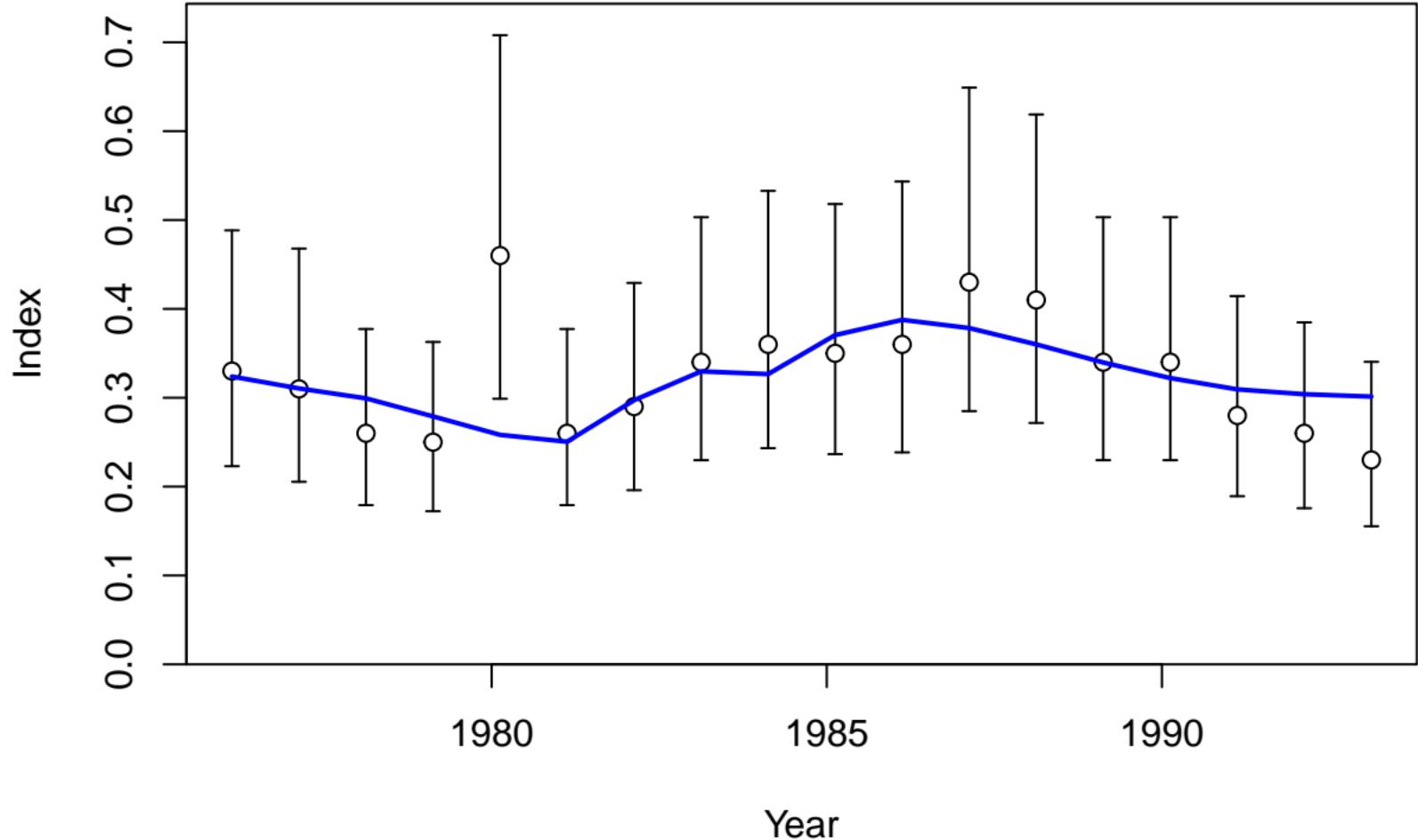


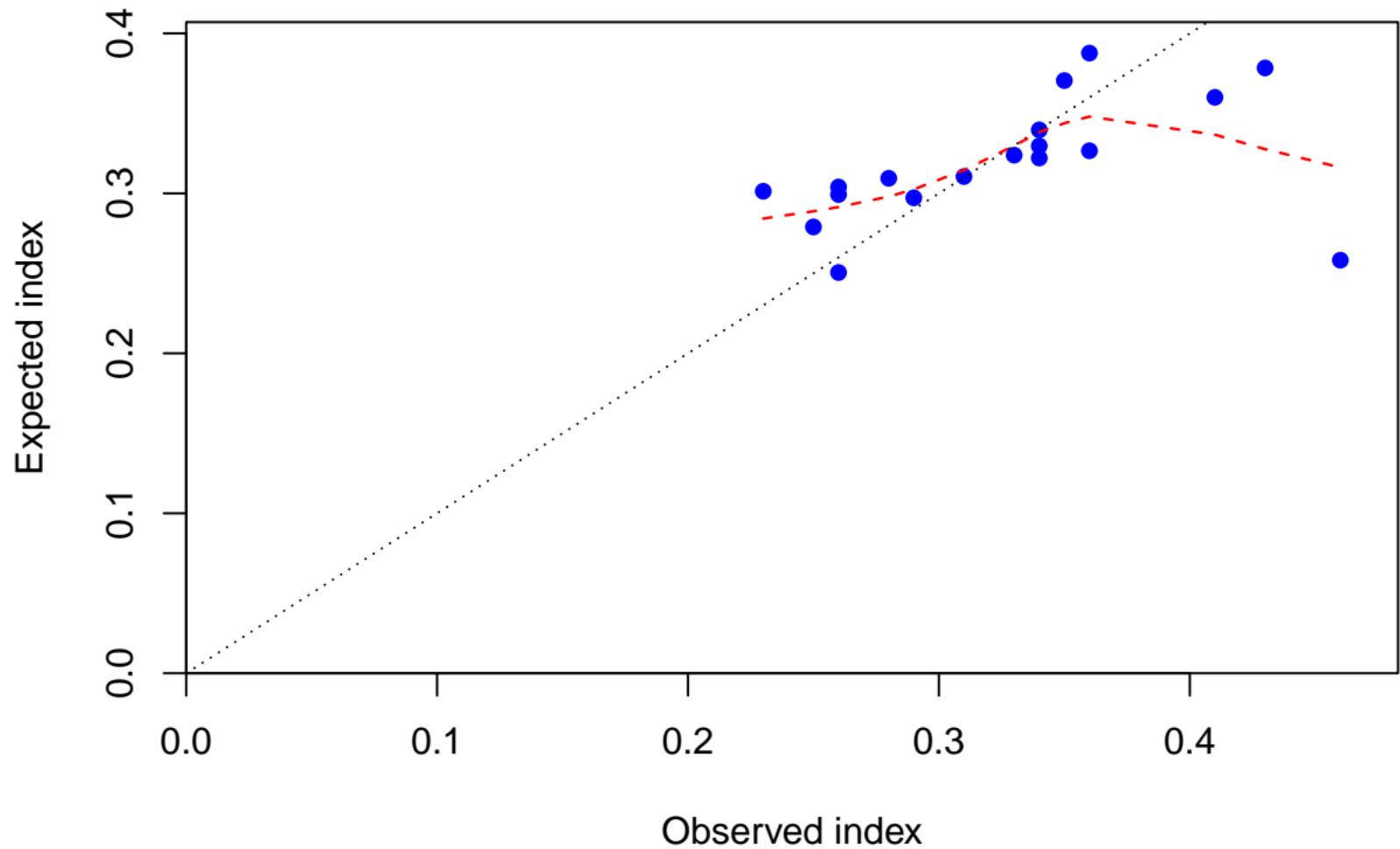






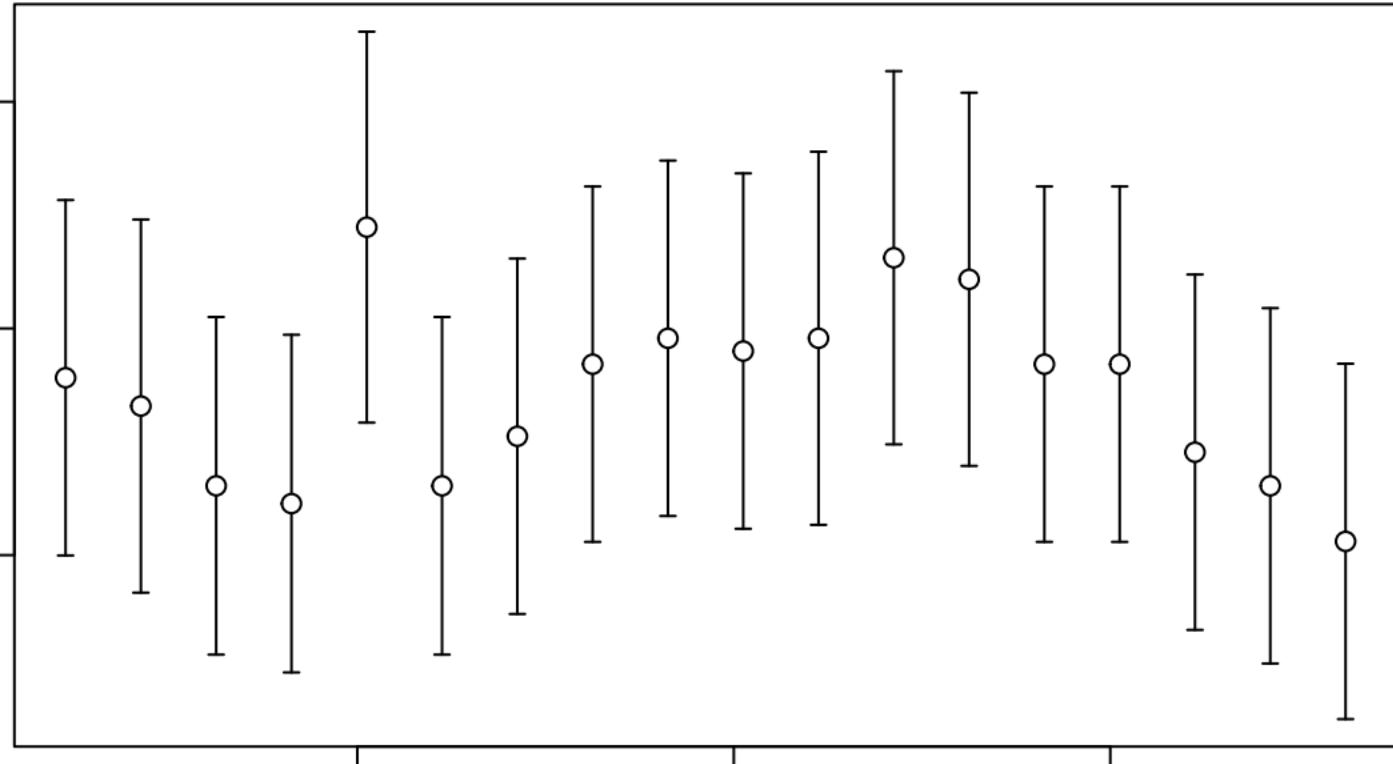






Log index

-0.5
-1.0
-1.5



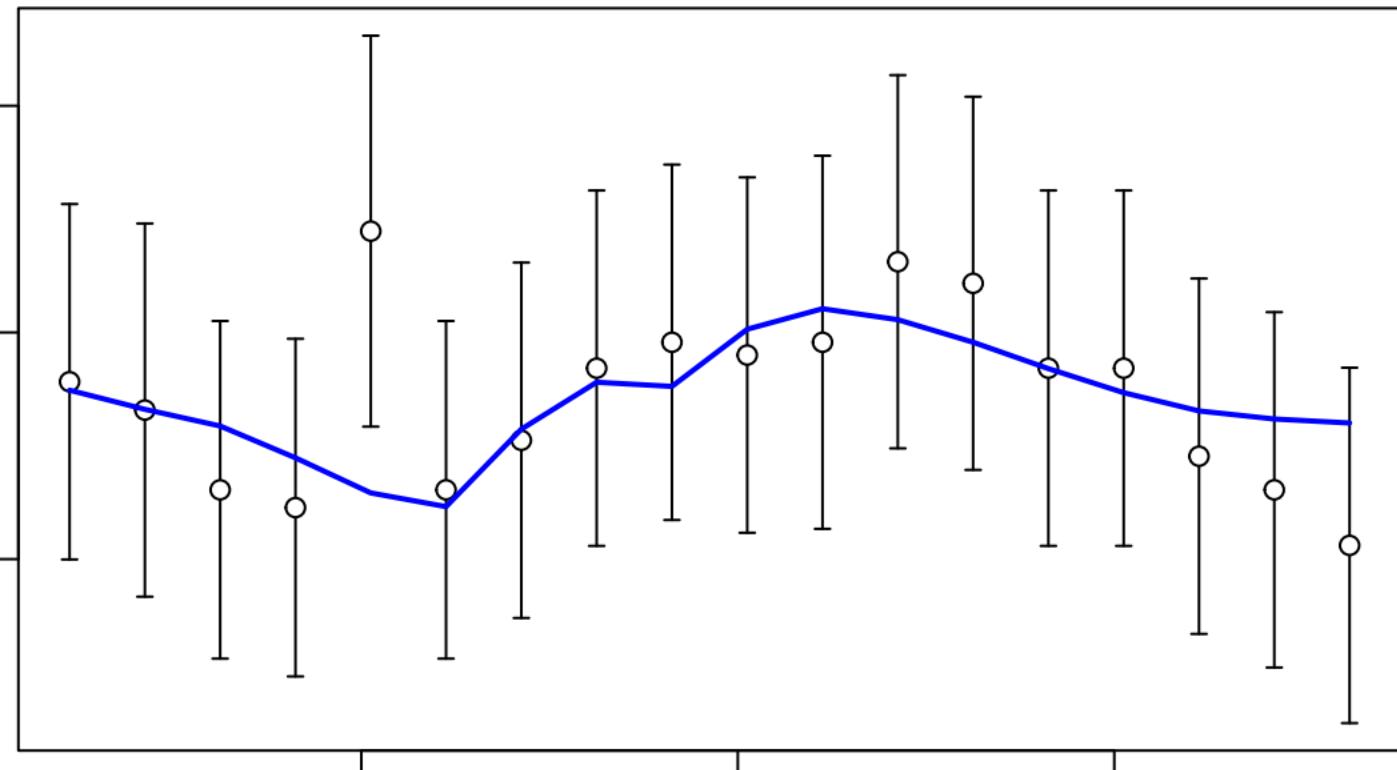
Year

Log index

-0.5
-1.0
-1.5

1980 1985 1990

Year

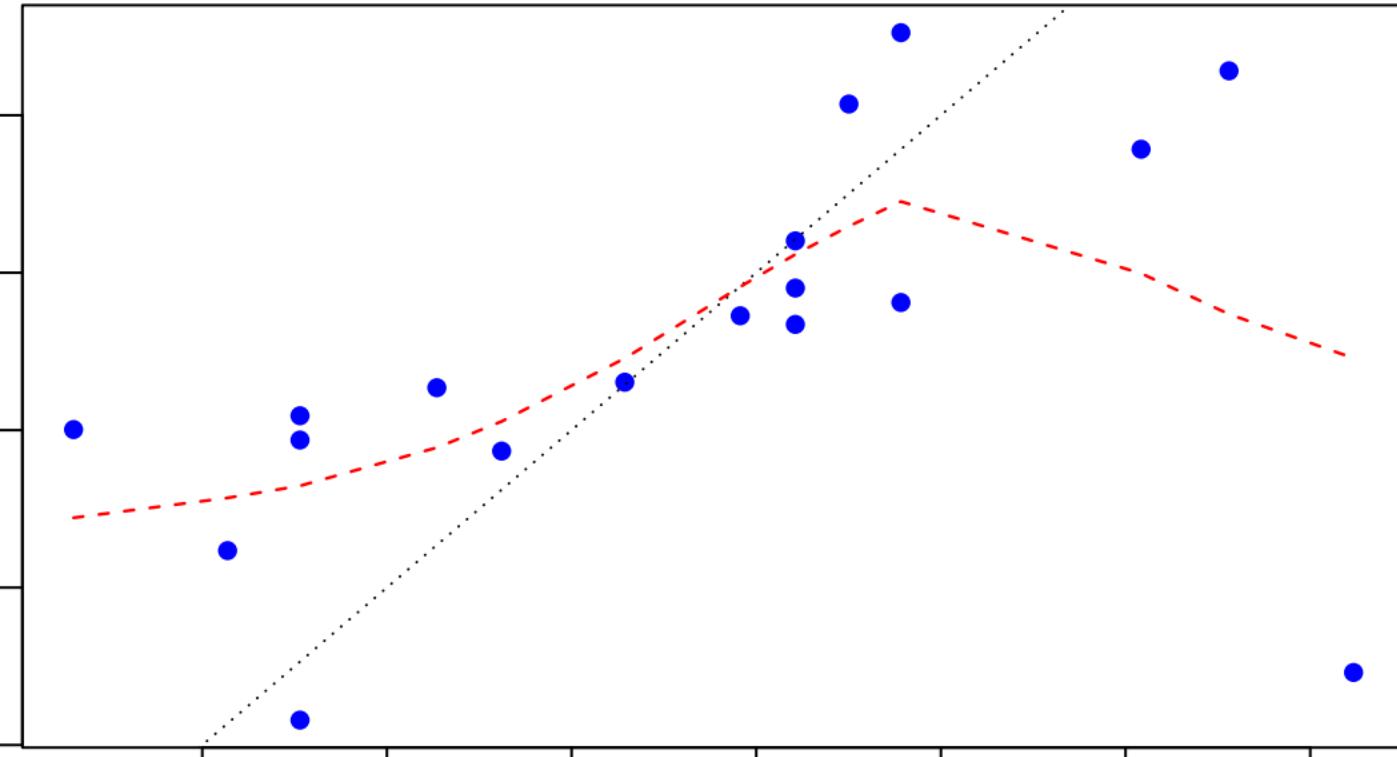


Log expected index

-1.4 -1.3 -1.2 -1.1 -1.0

-1.4 -1.3 -1.2 -1.1 -1.0 -0.9 -0.8

Log observed index



Residual

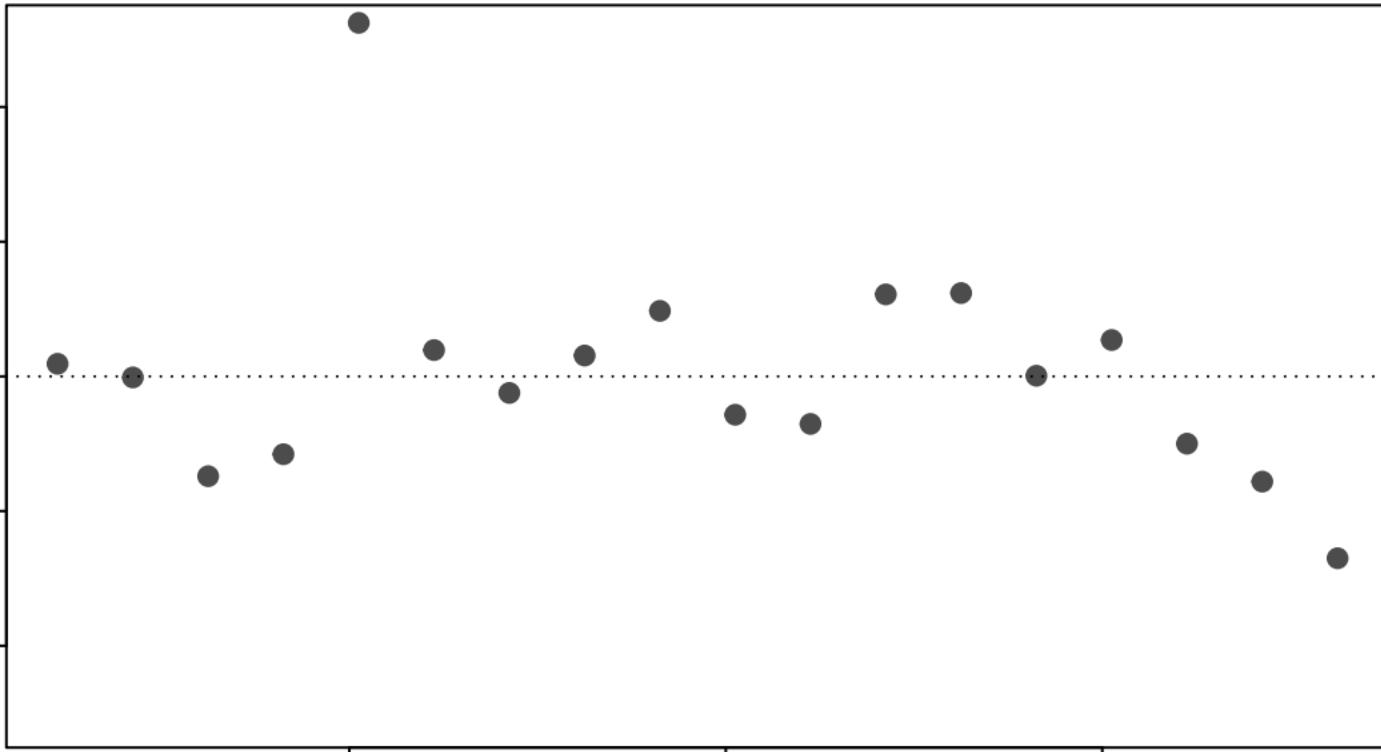
-2
-1
0
1
2

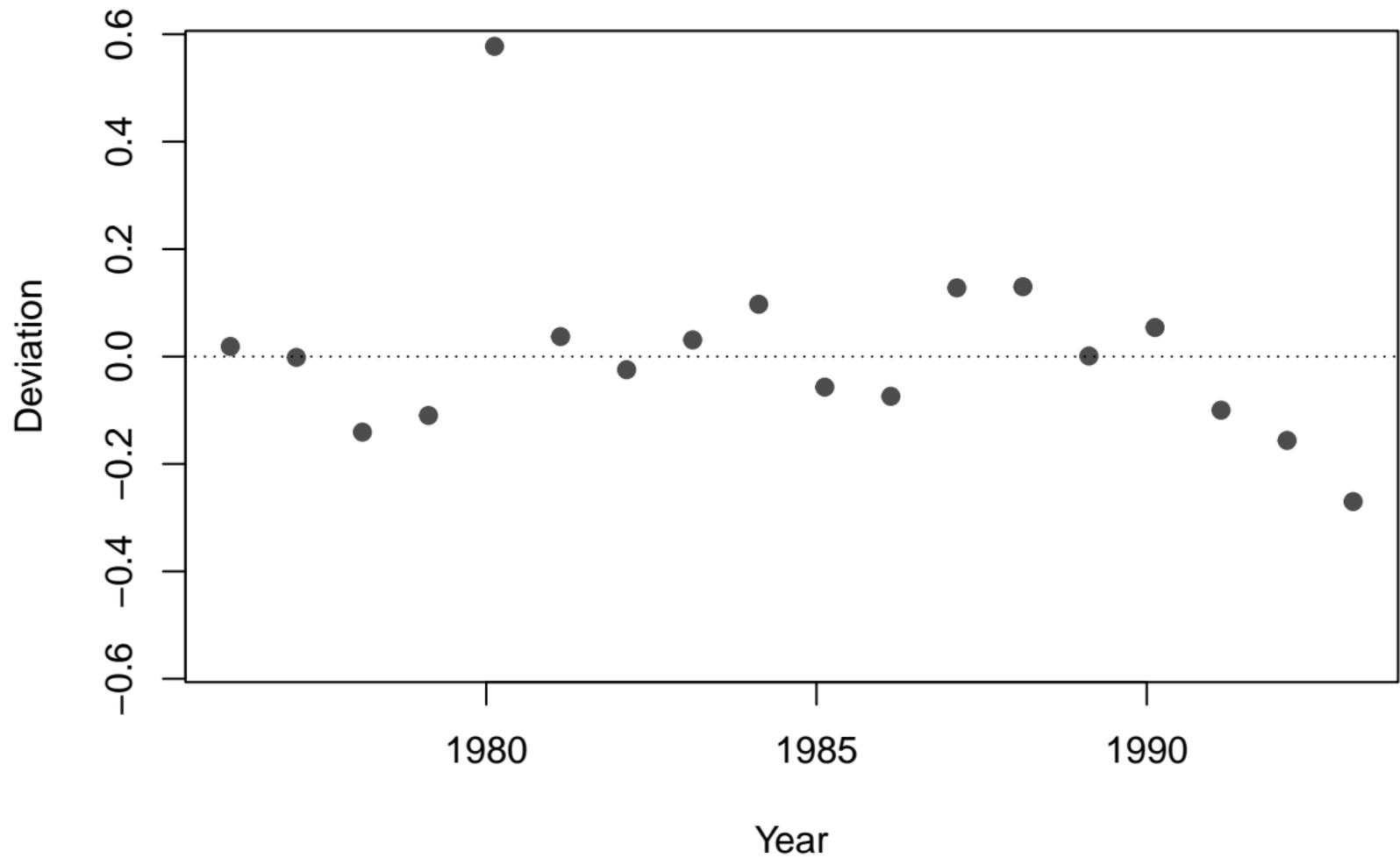
1980

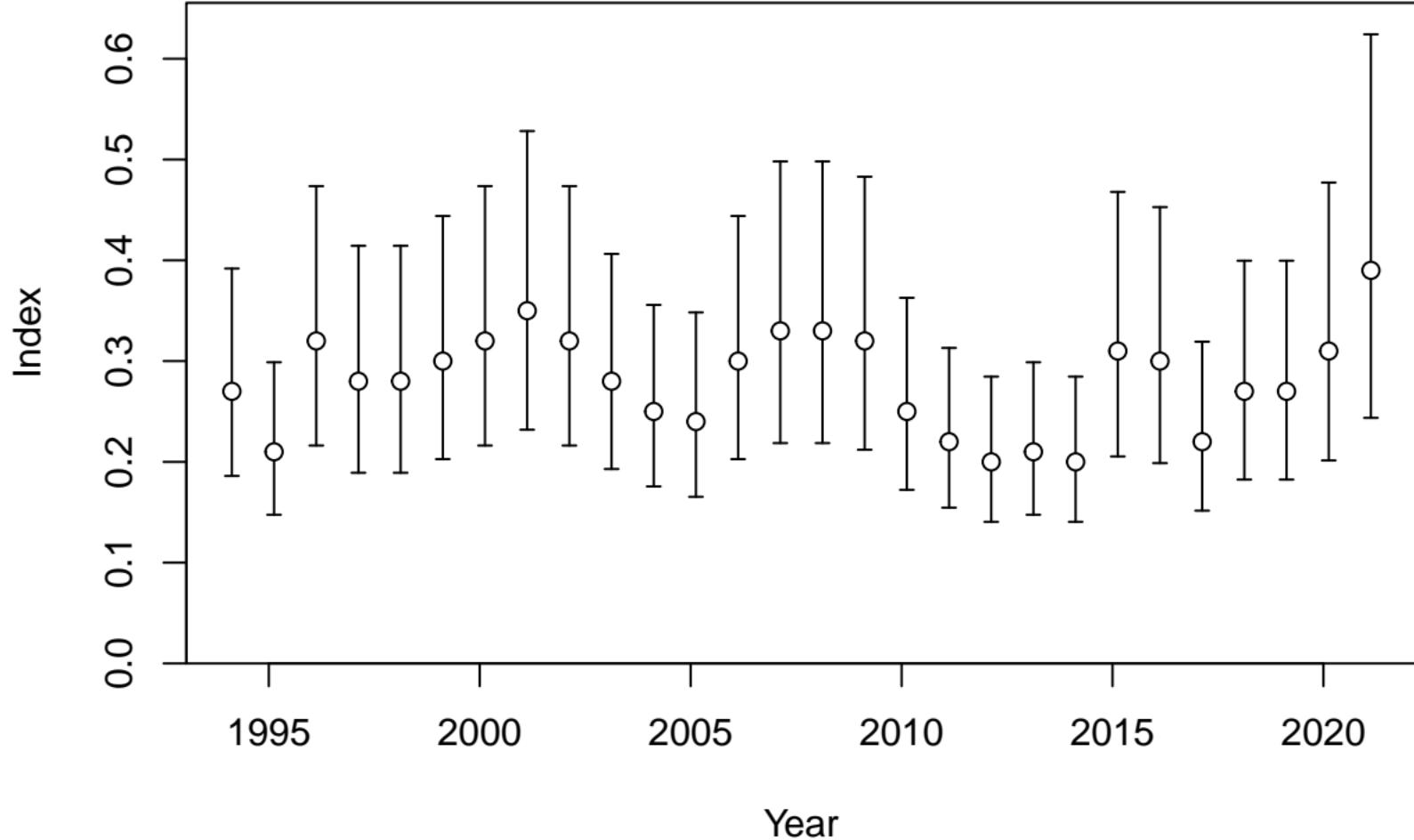
Year

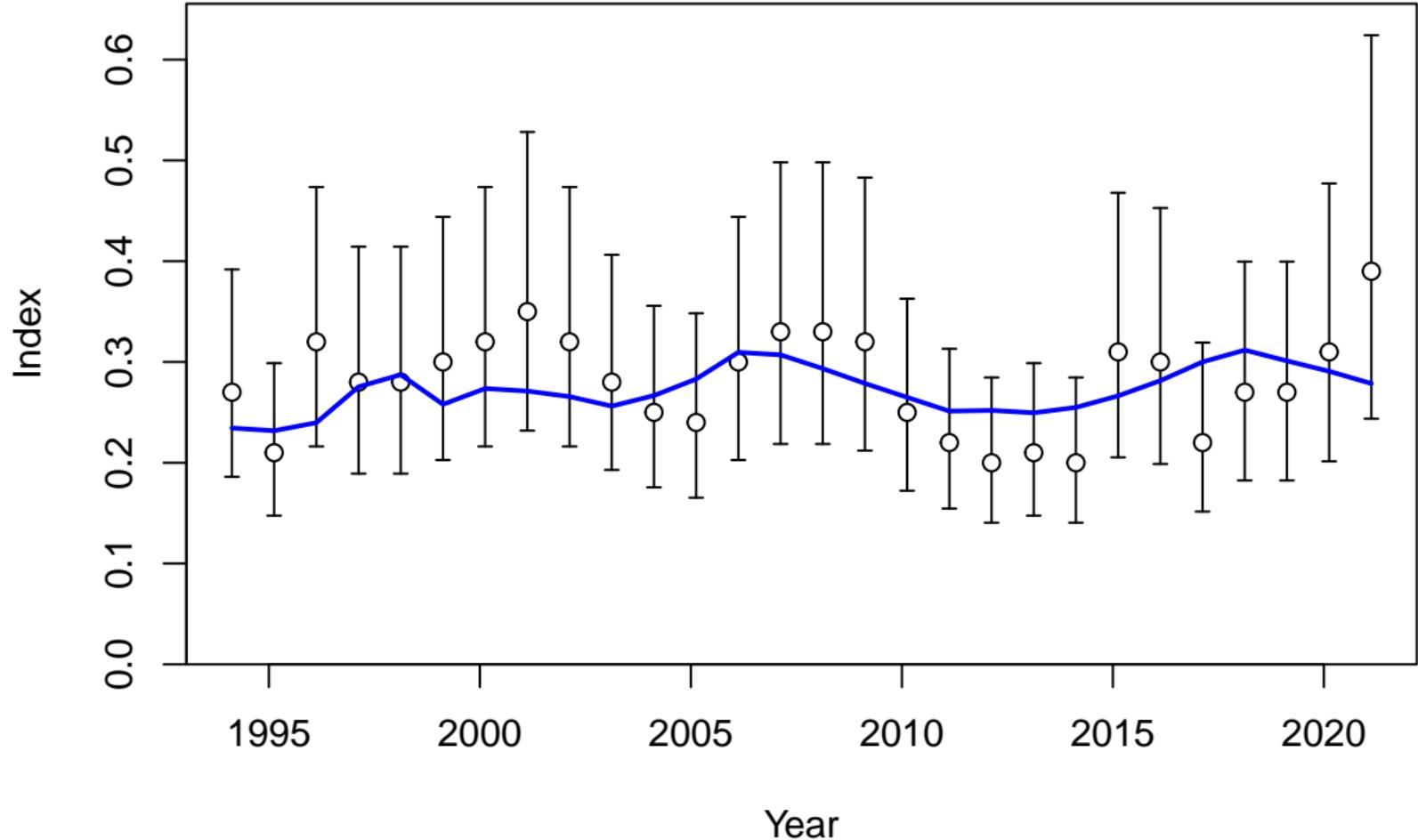
1985

1990







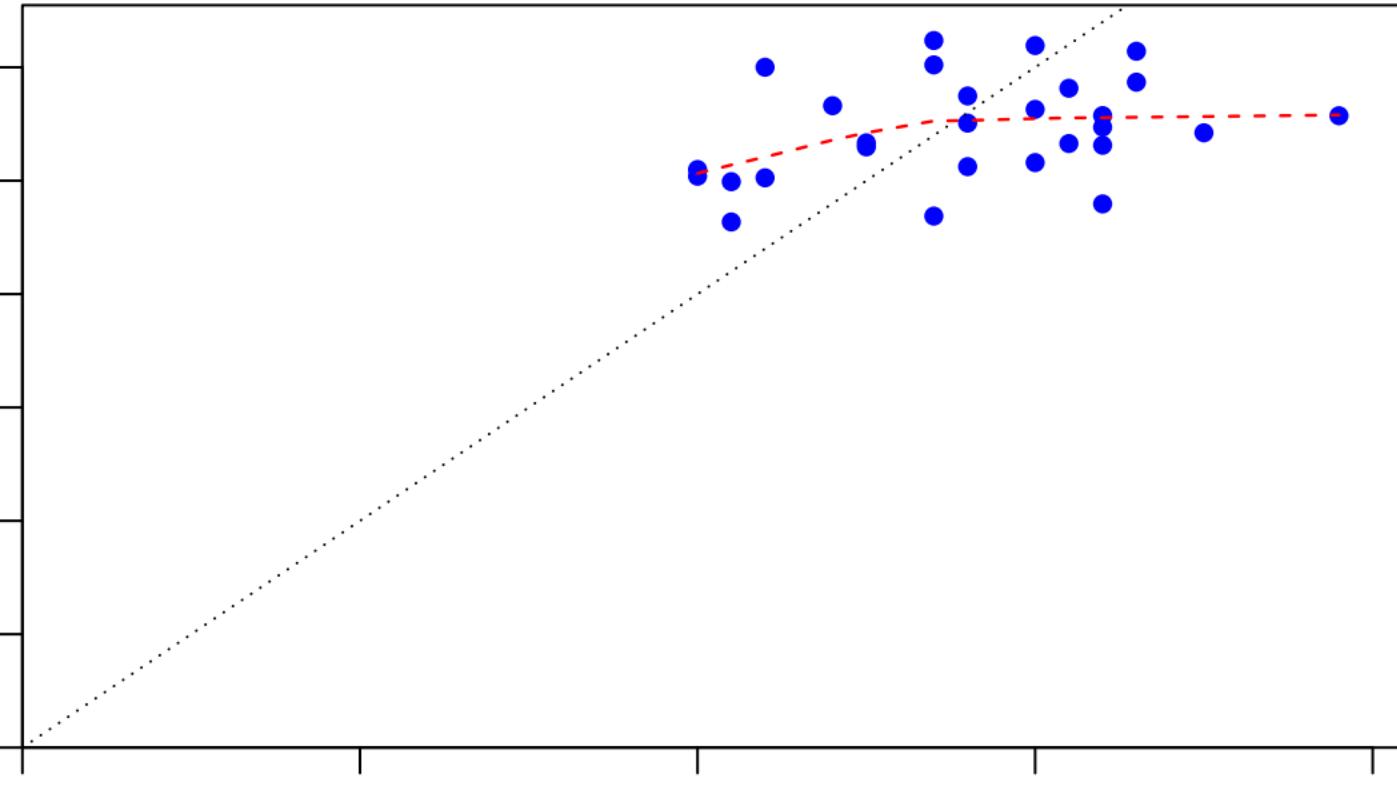


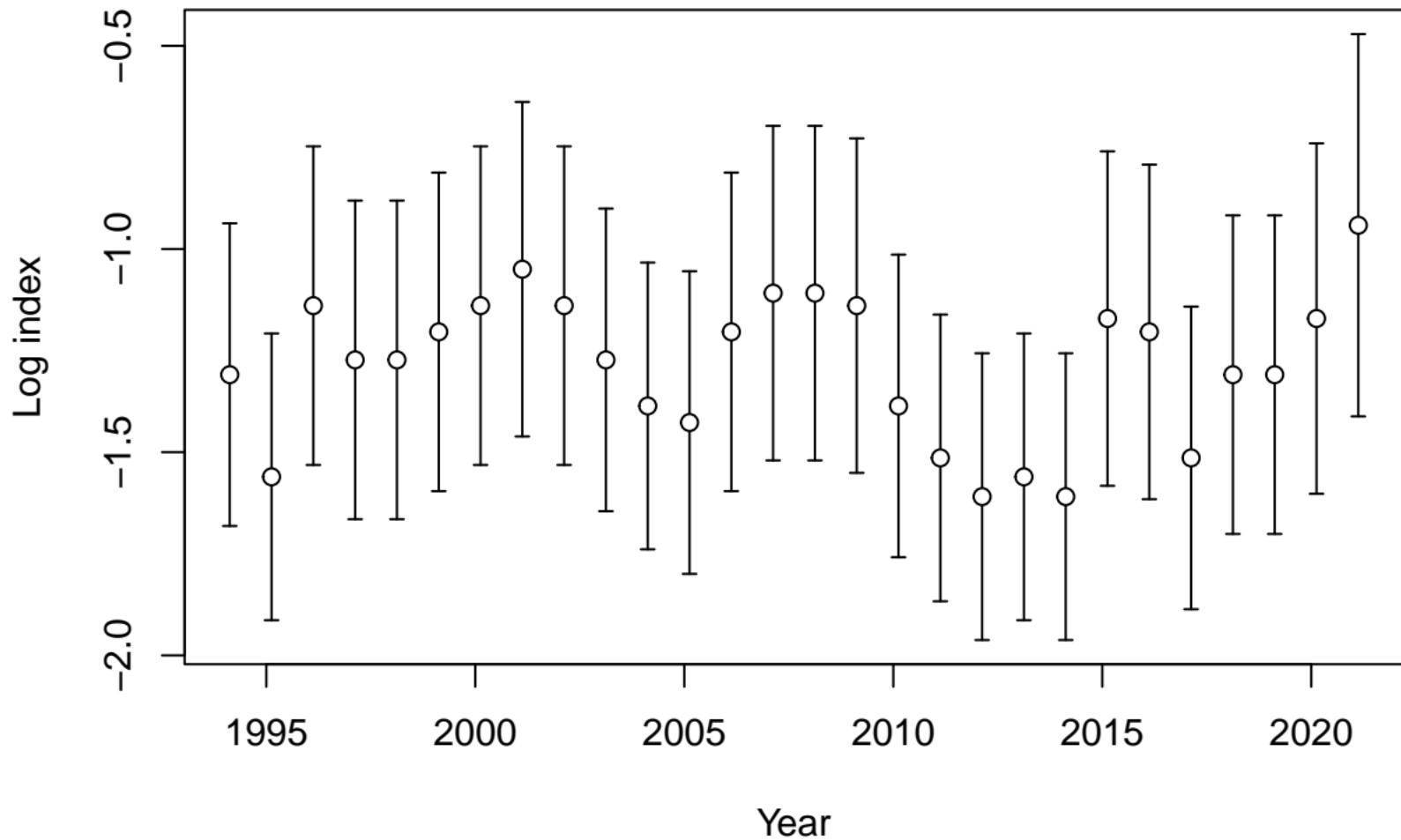
Expected index

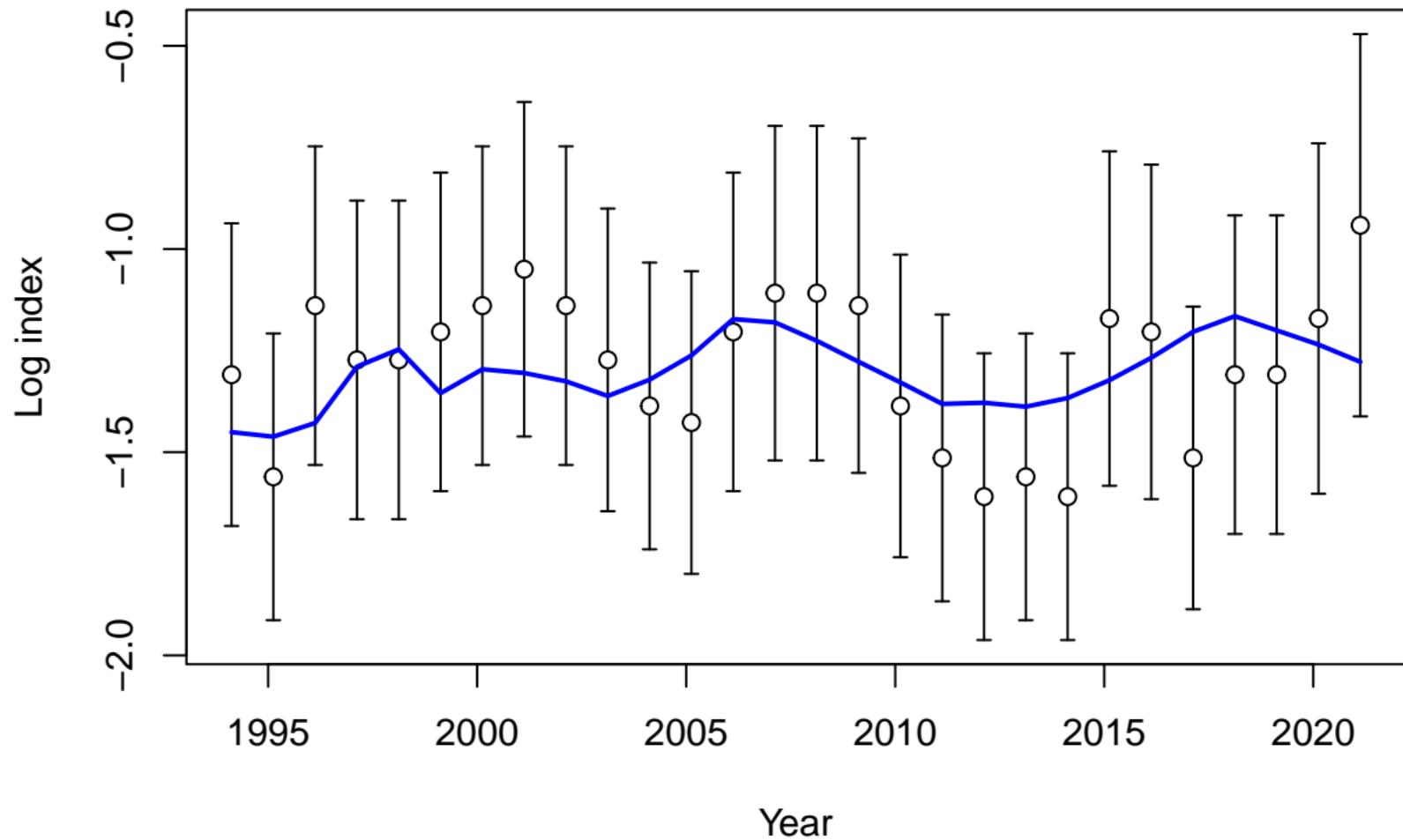
0.30
0.20
0.10
0.00

0.0 0.1 0.2 0.3 0.4

Observed index





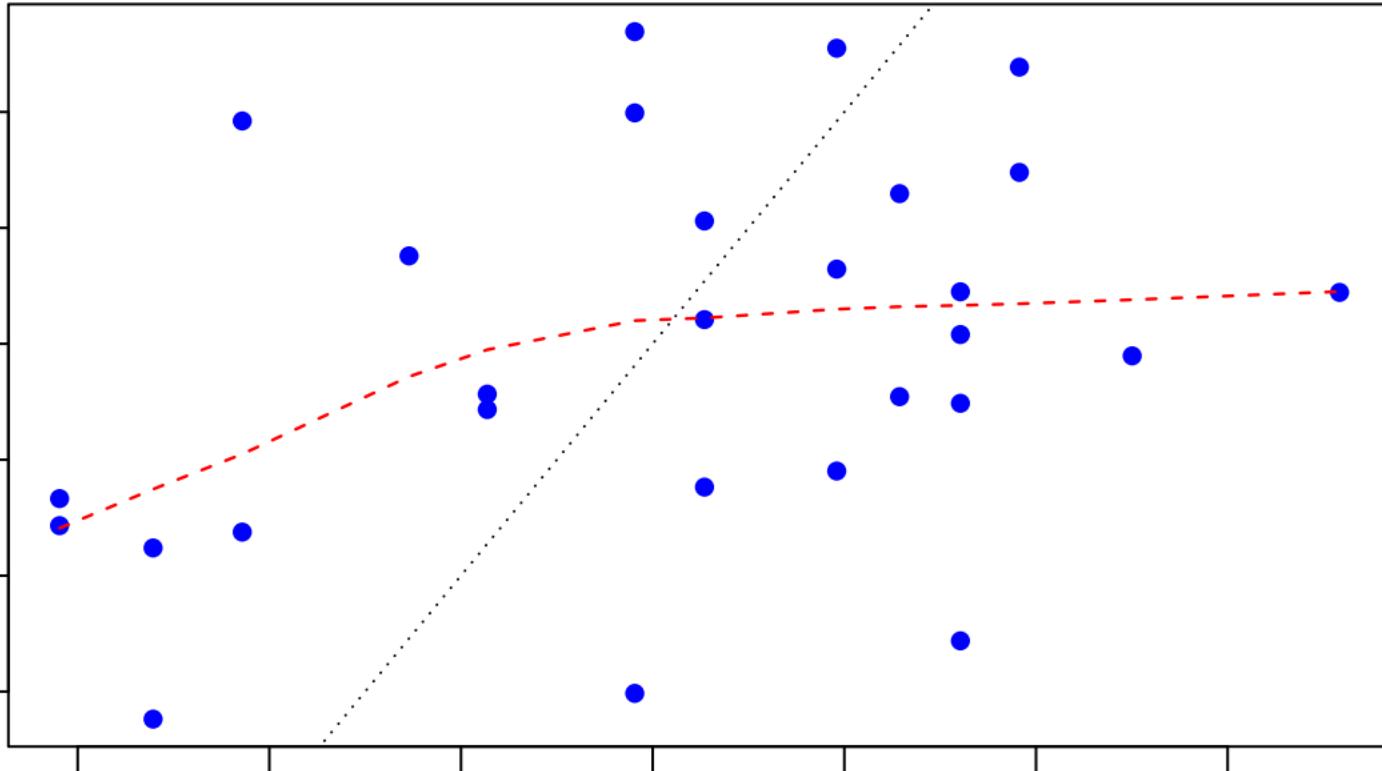


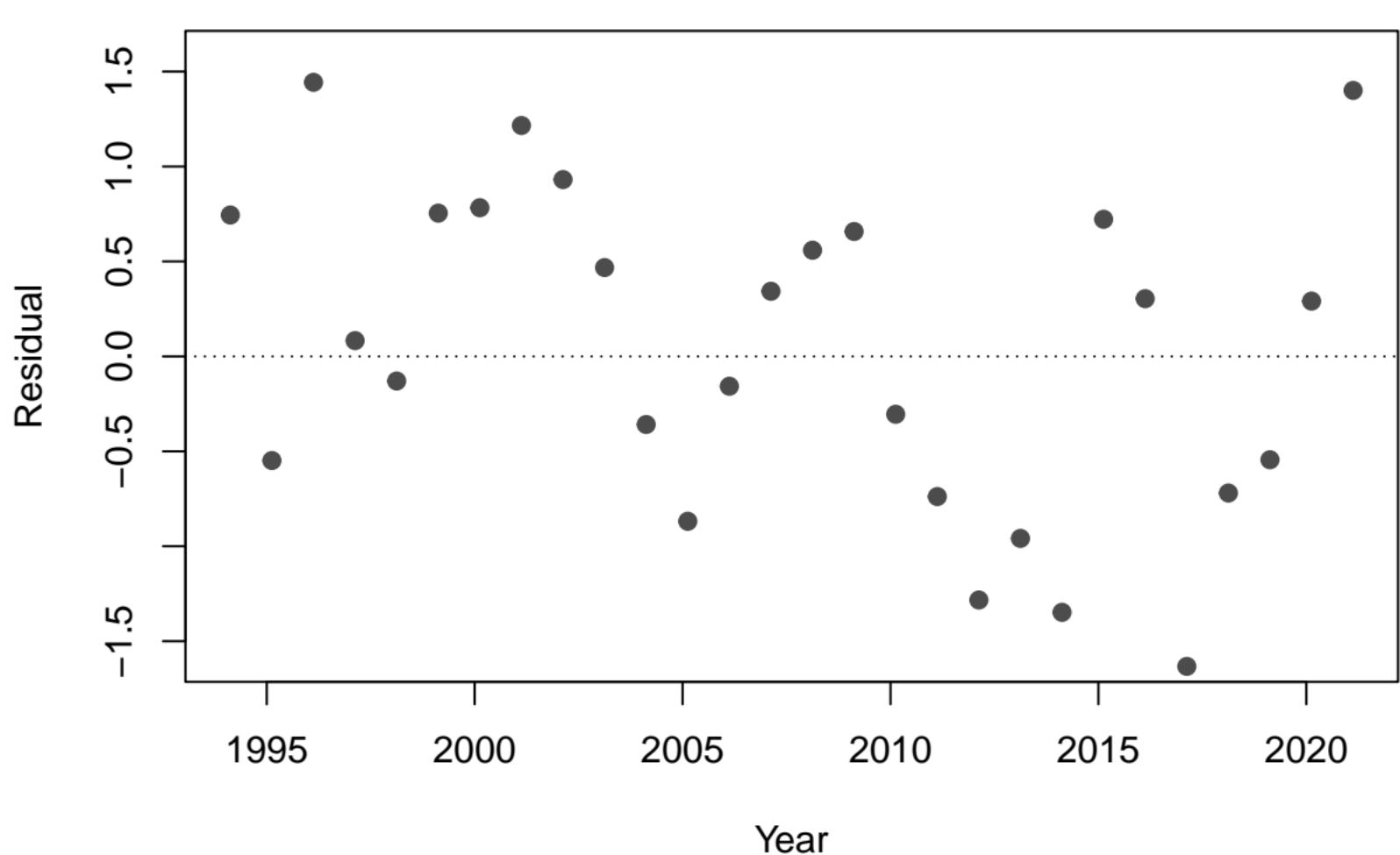
Log expected index

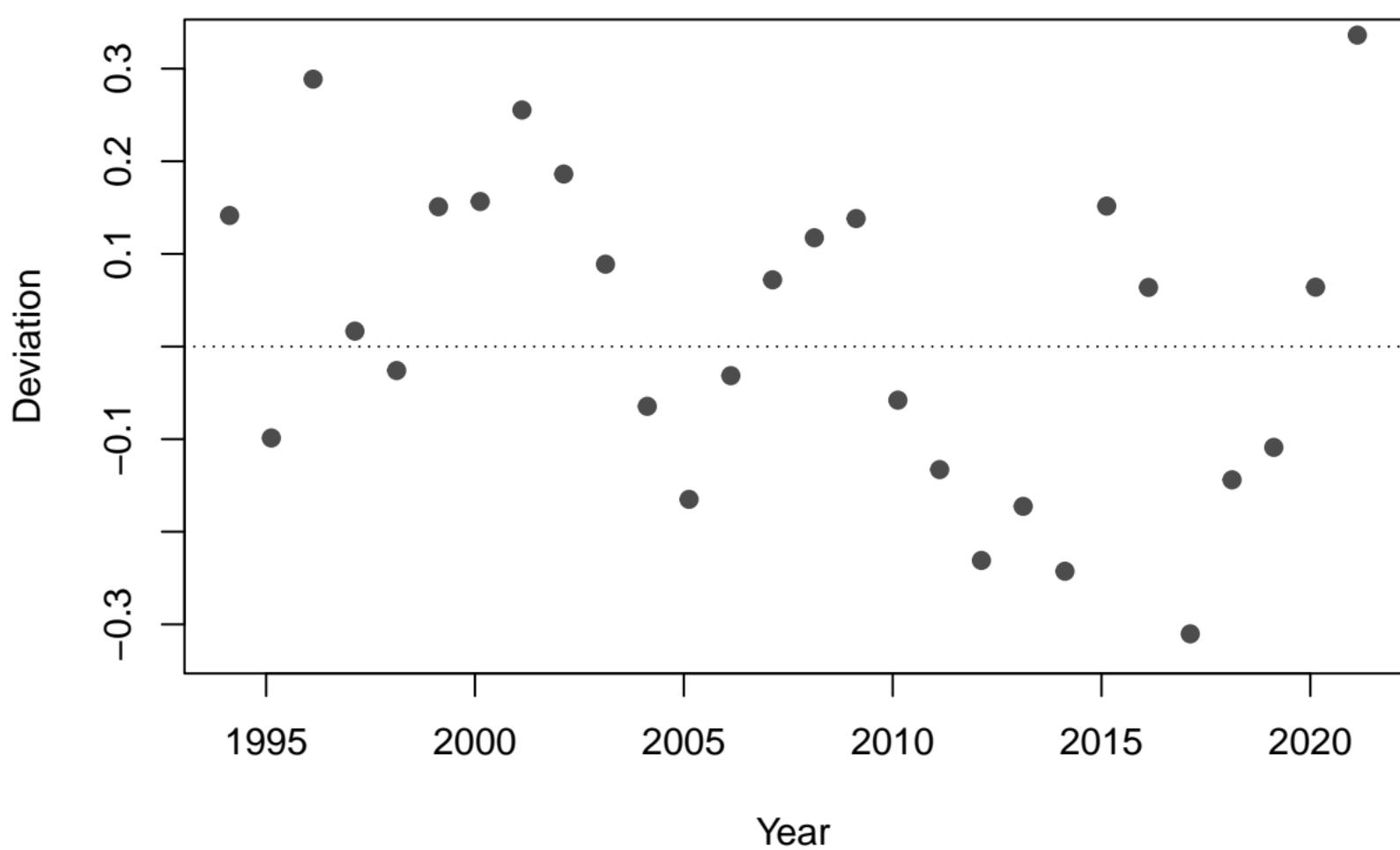
-1.45
-1.35
-1.25

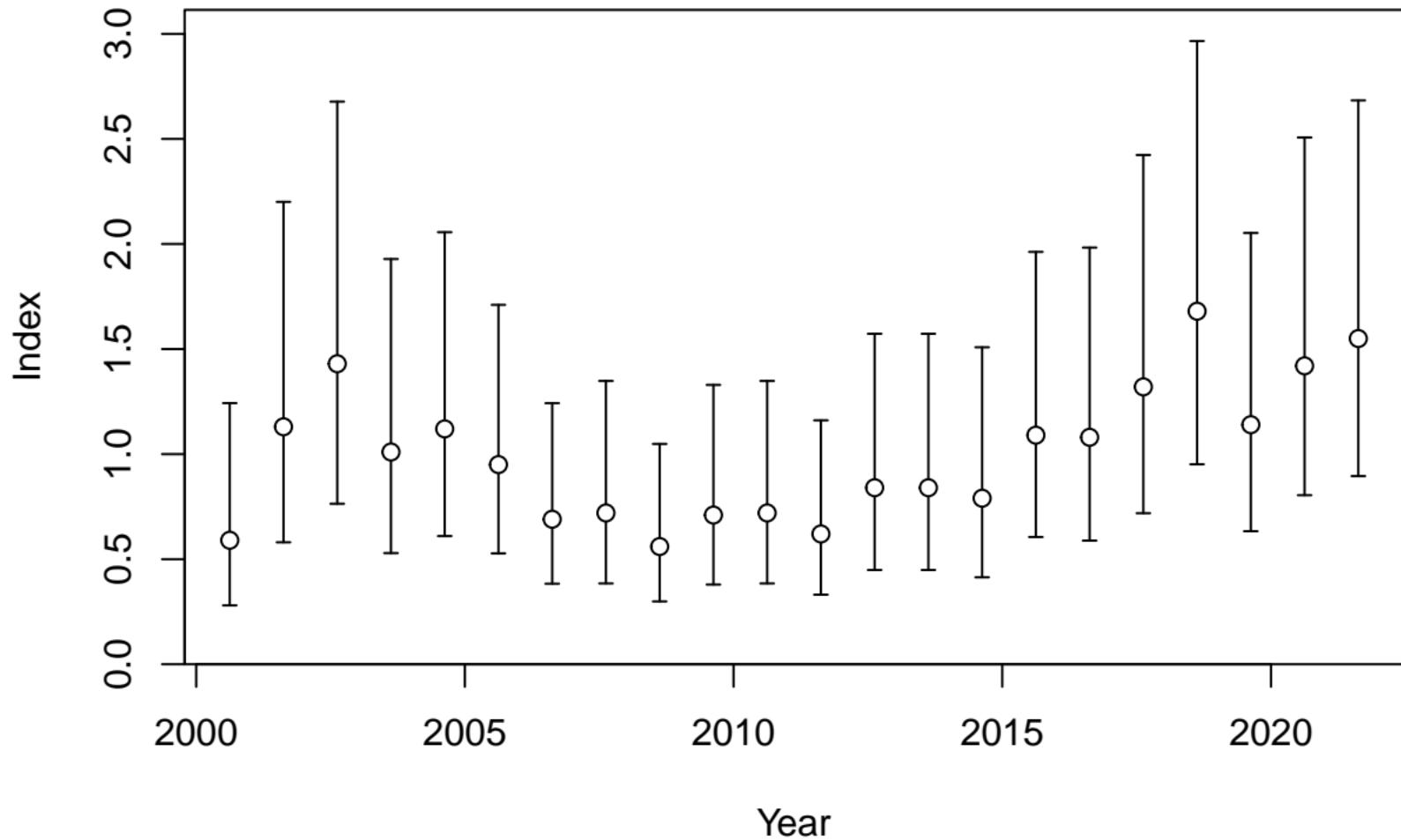
-1.6 -1.5 -1.4 -1.3 -1.2 -1.1 -1.0

Log observed index

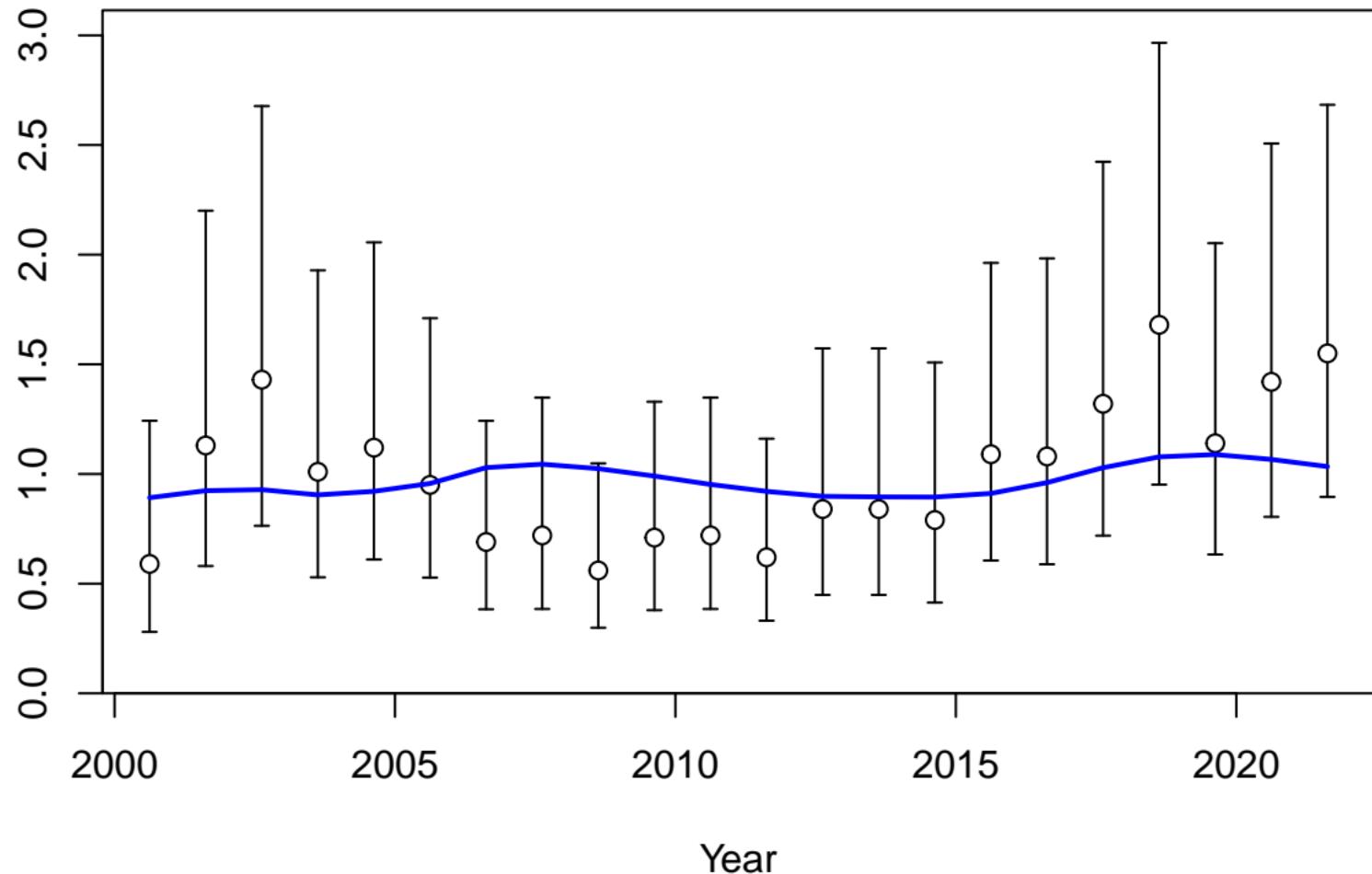








Index



Expected index

1.0
0.8
0.6
0.4
0.2
0.0

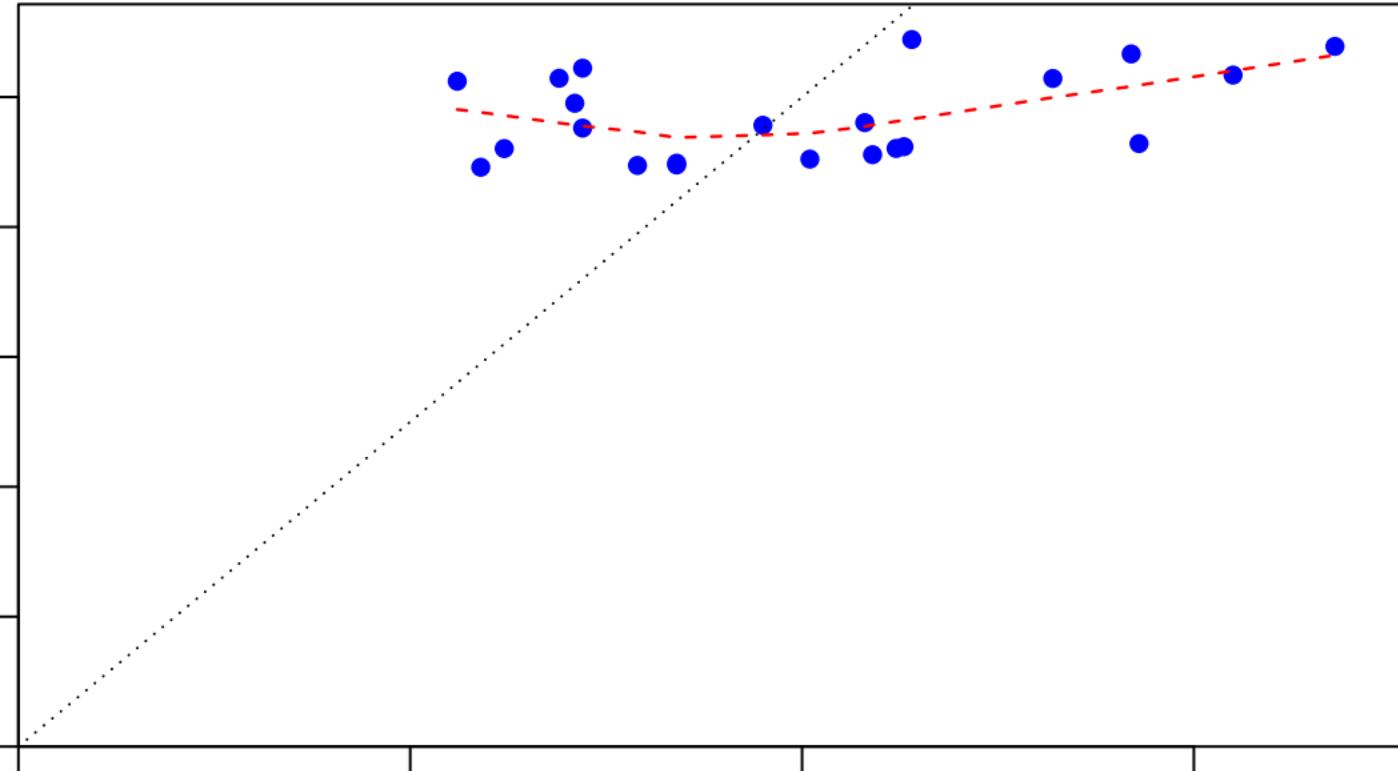
0.0

0.5

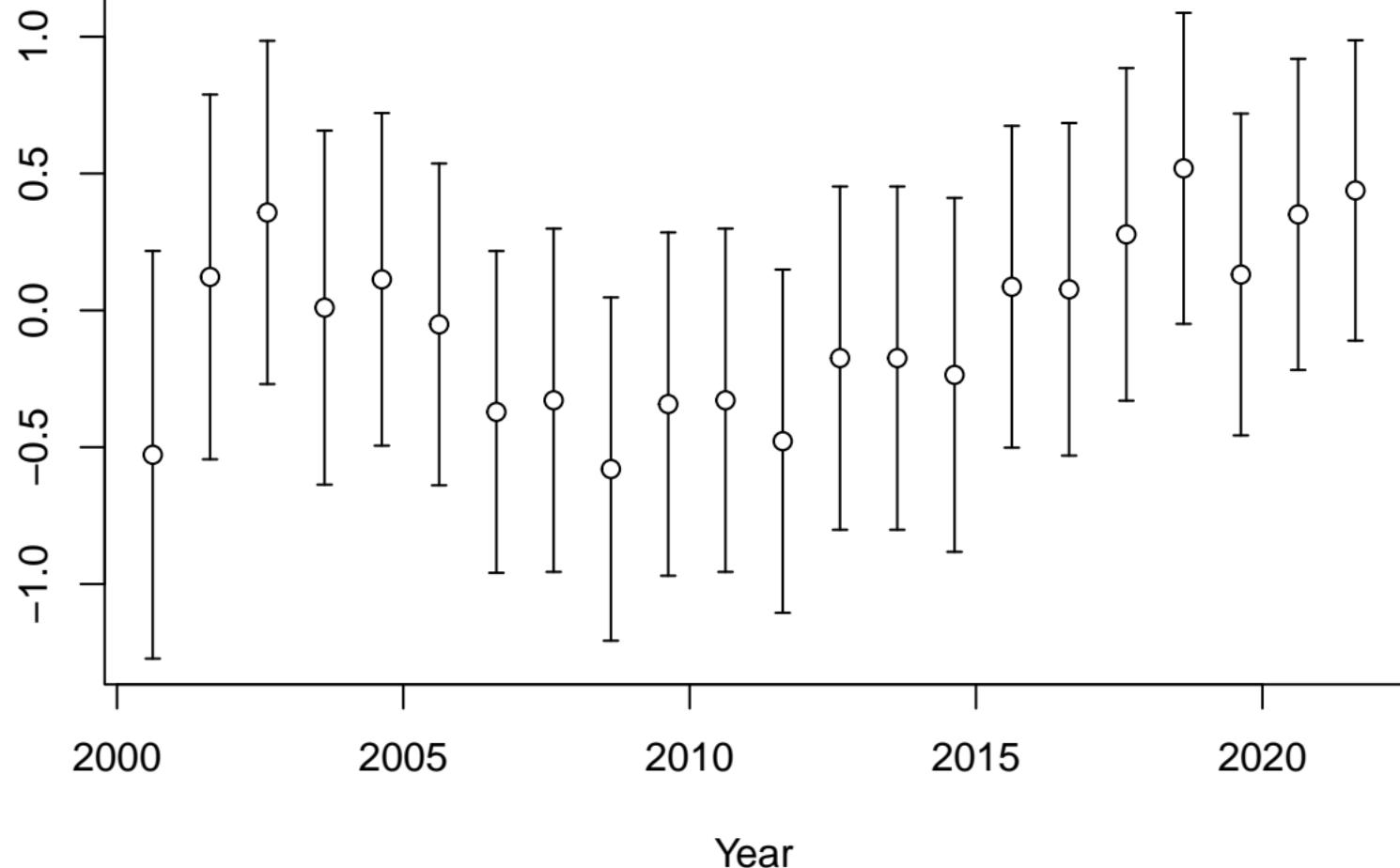
1.0

1.5

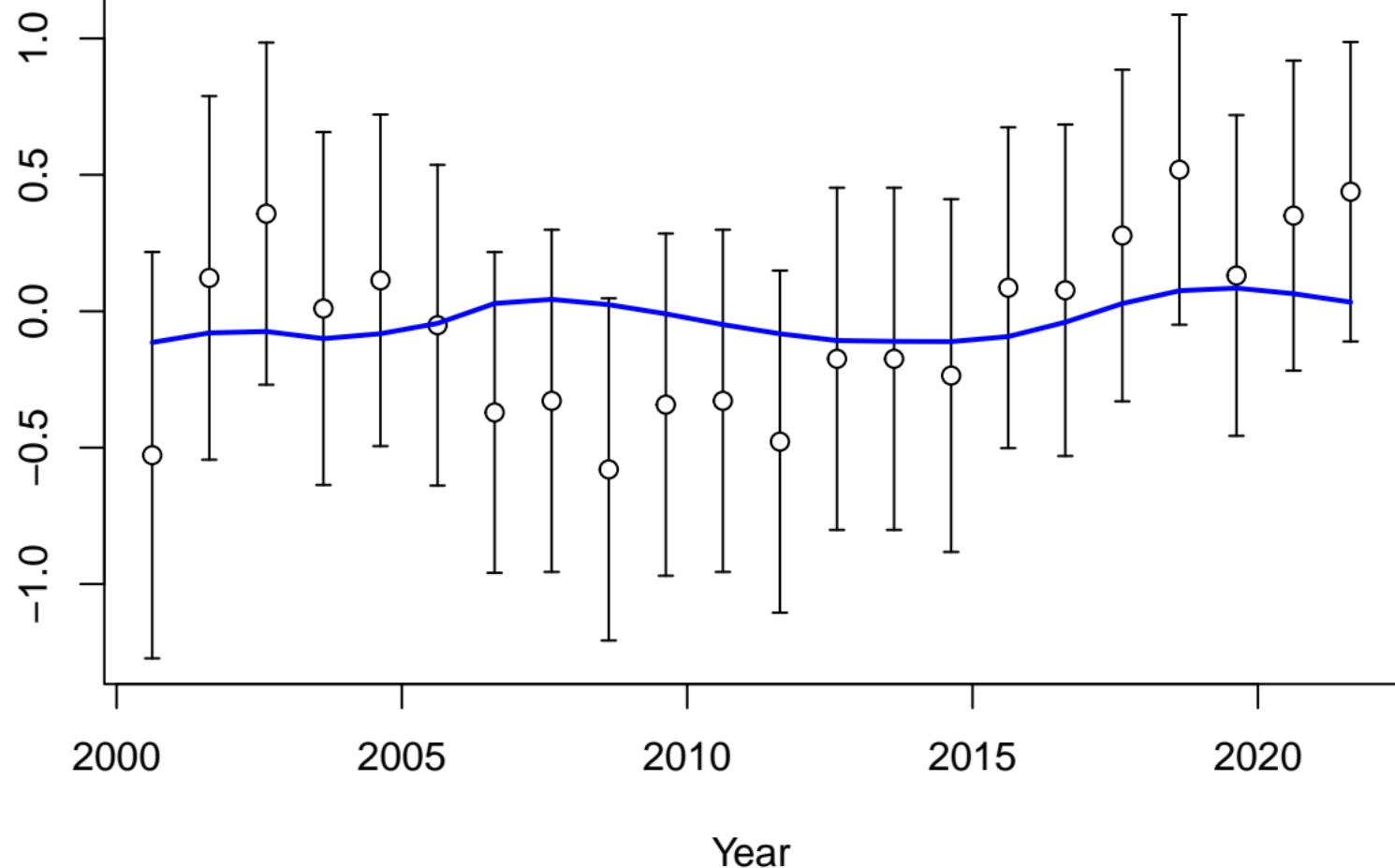
Observed index



Log index



Log index

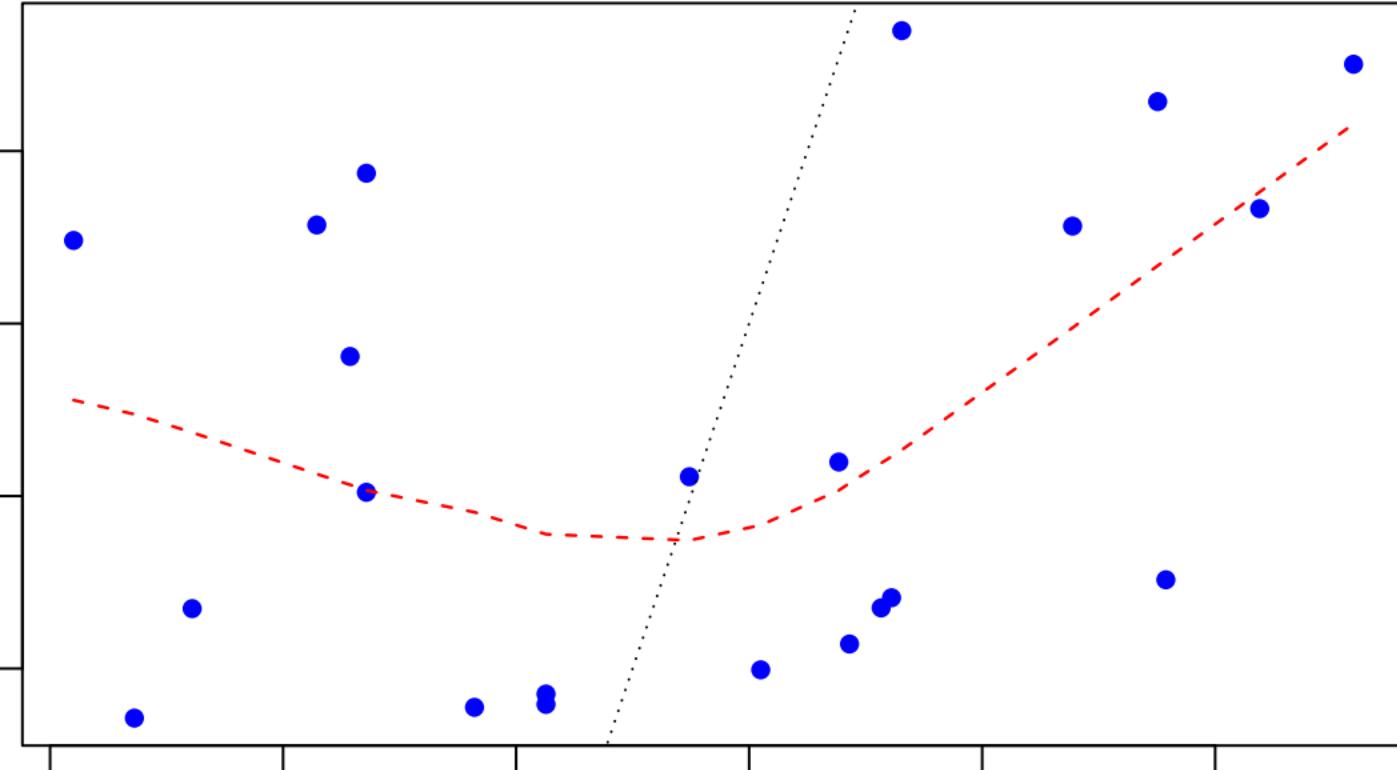


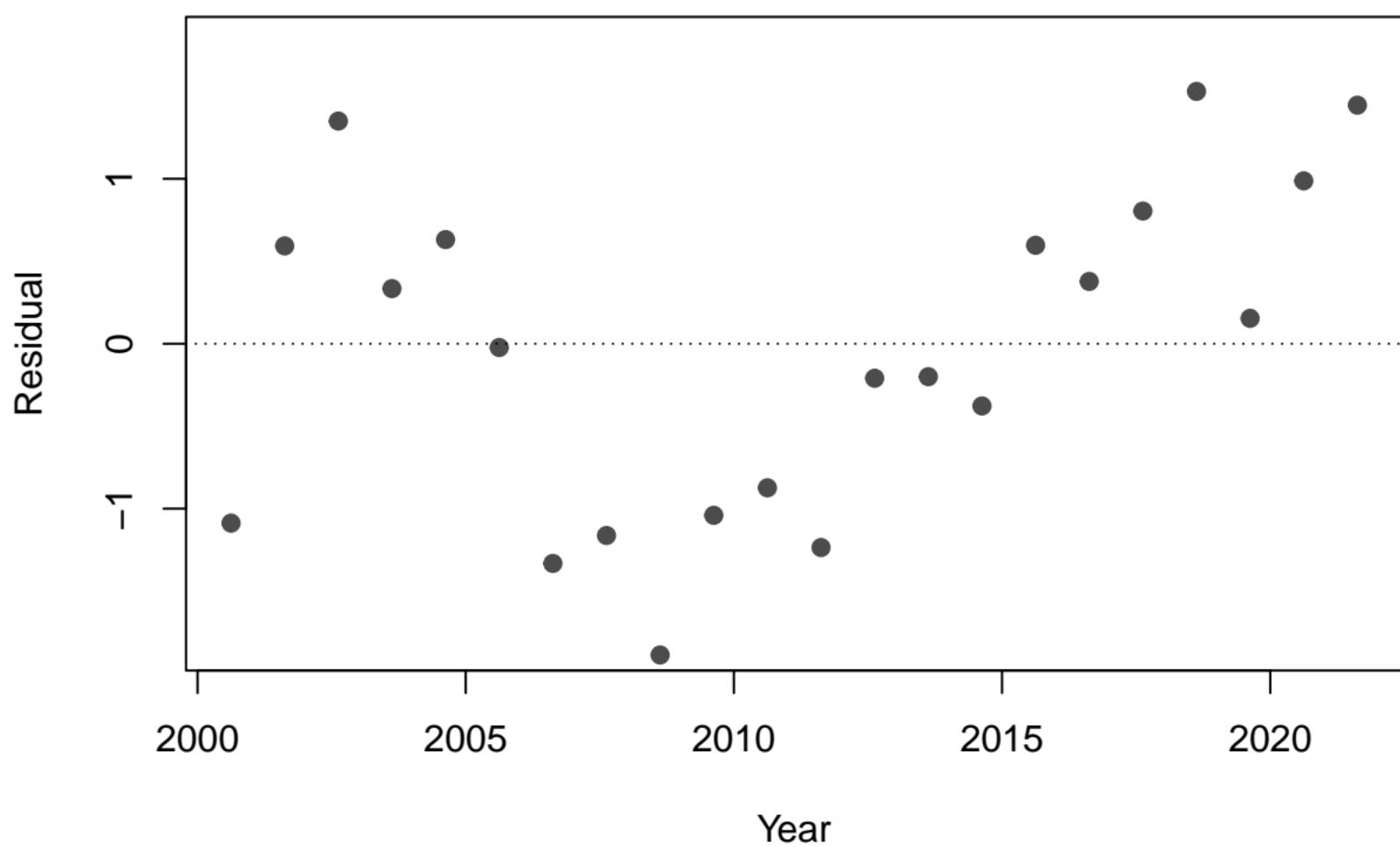
Log expected index

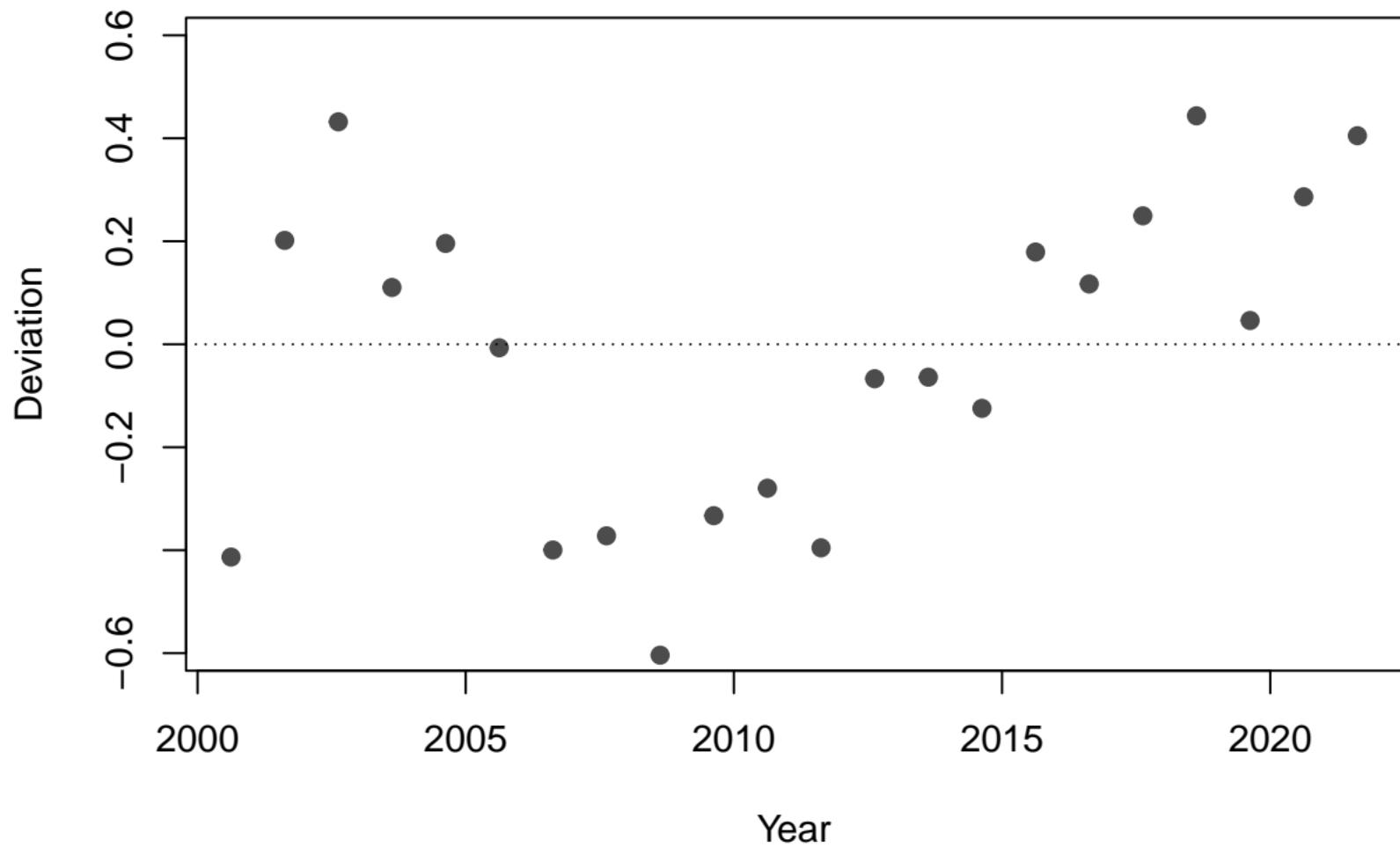
-0.10
-0.05
0.00
0.05

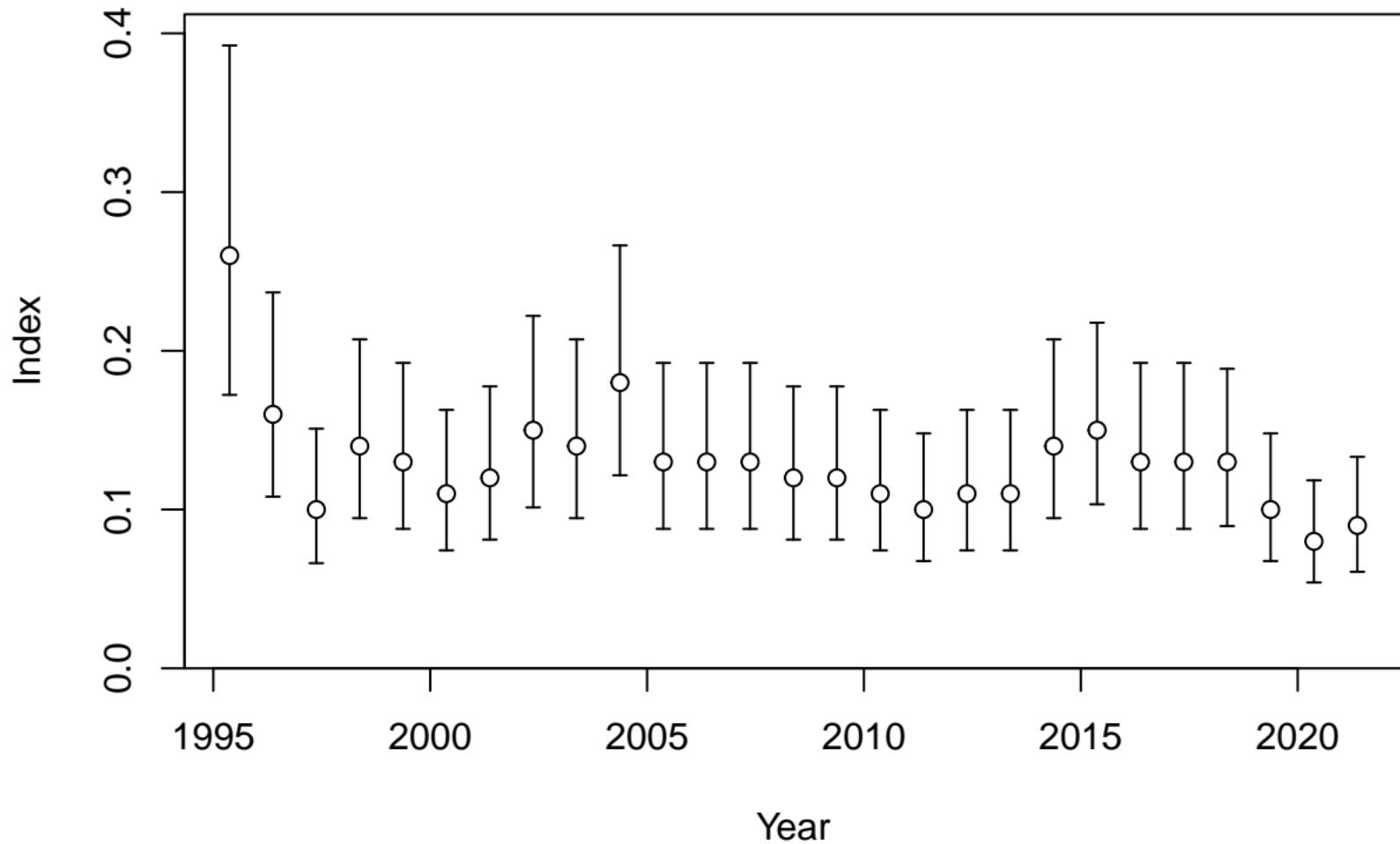
-0.6 -0.4 -0.2 0.0 0.2 0.4

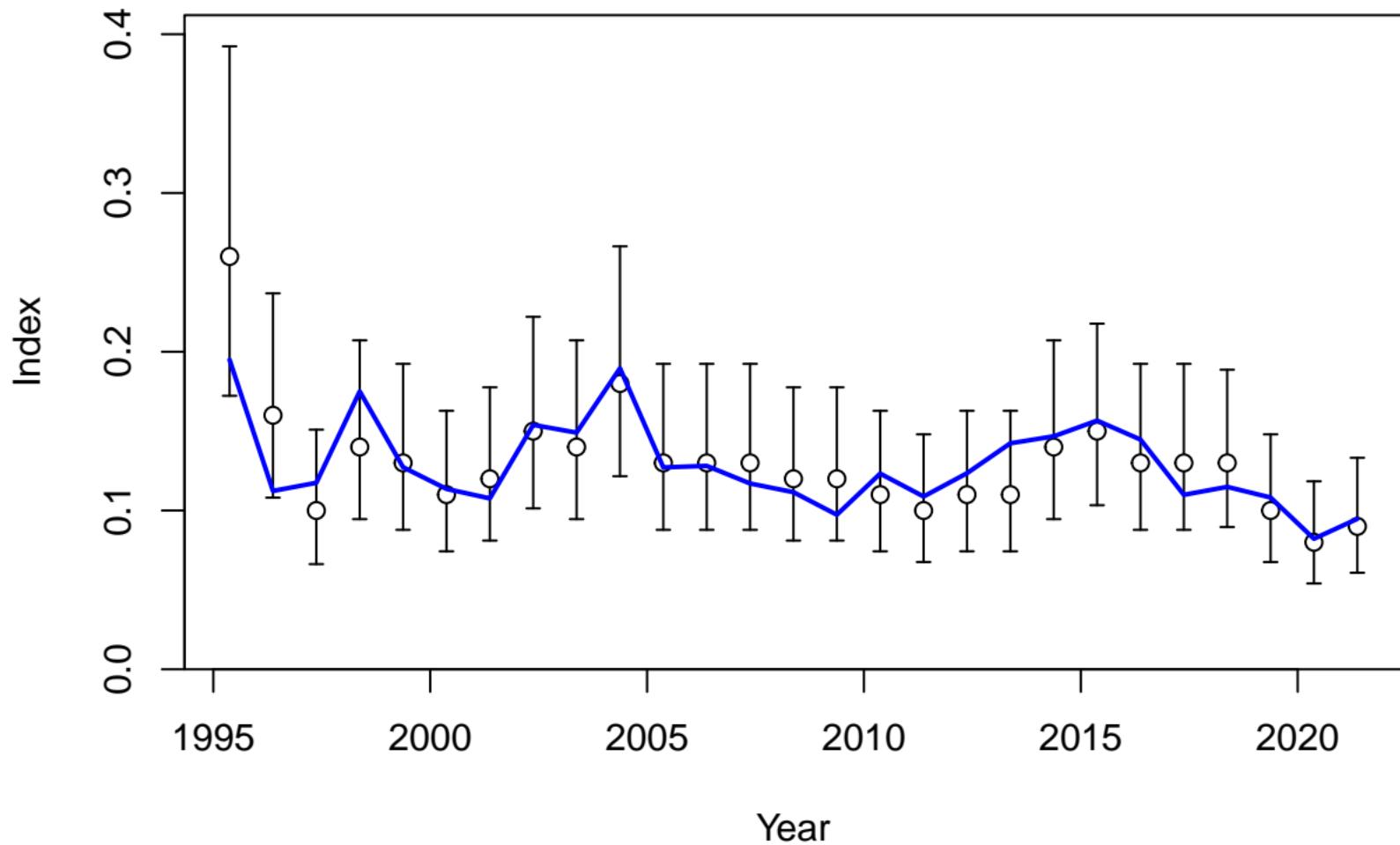
Log observed index

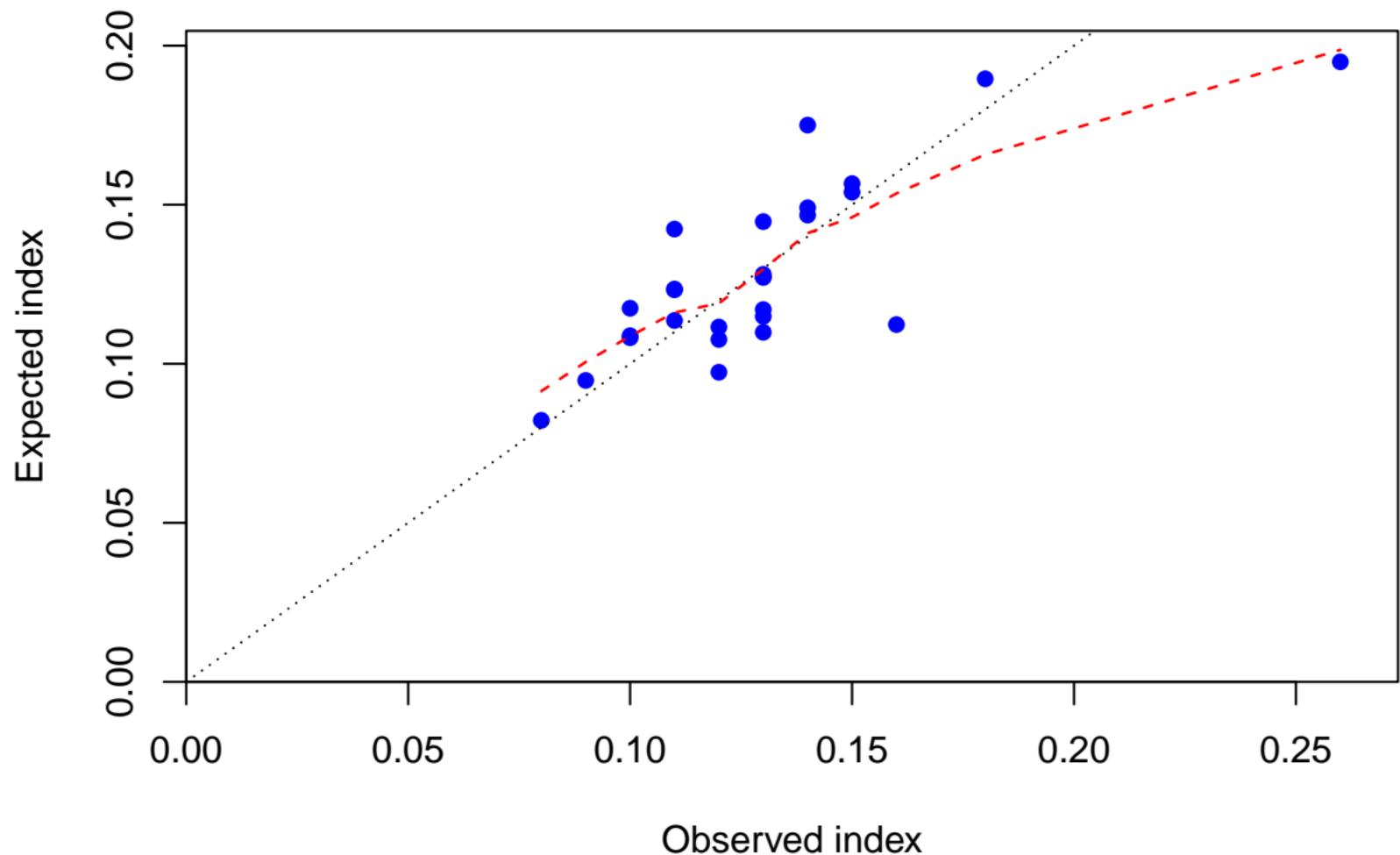




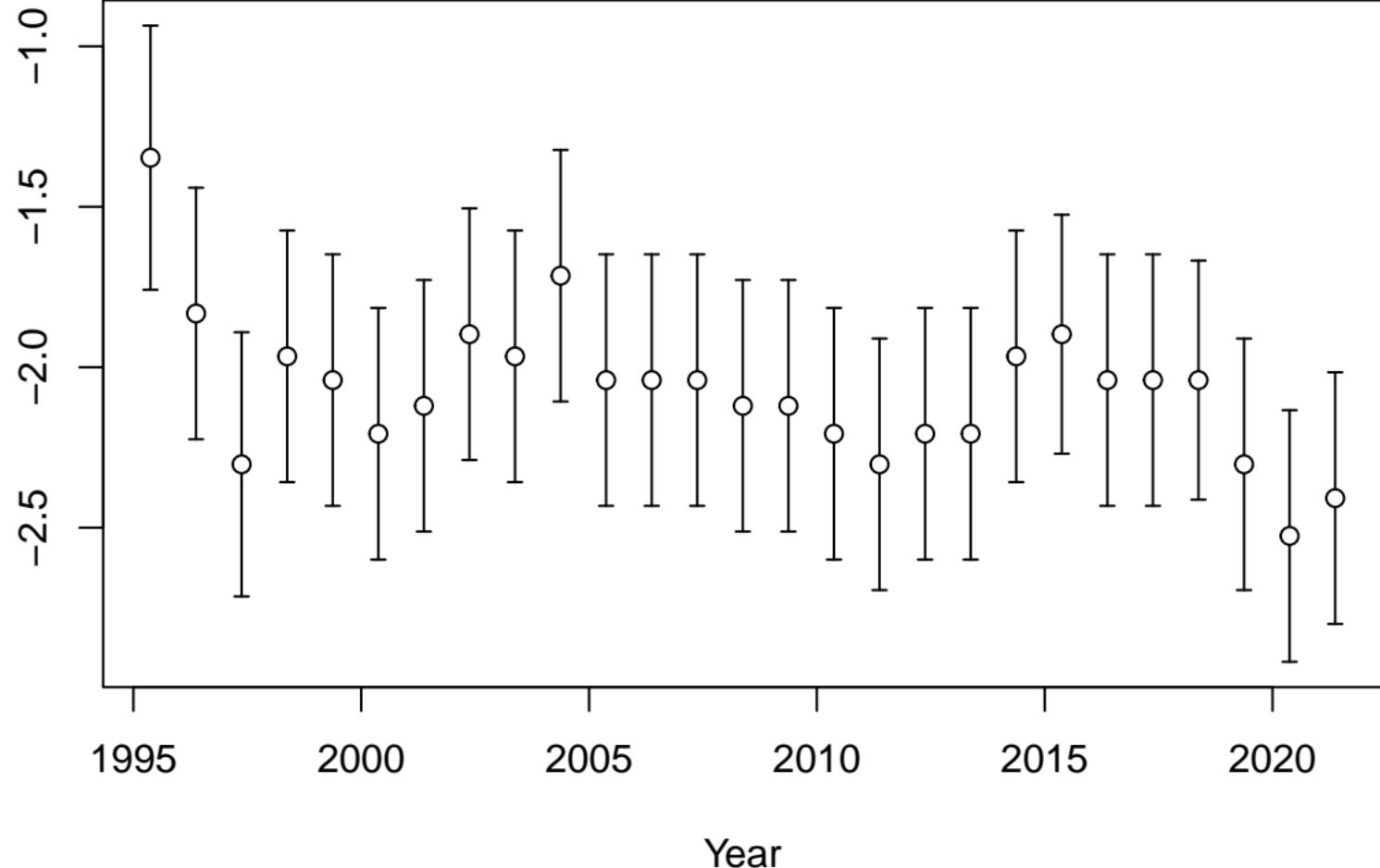


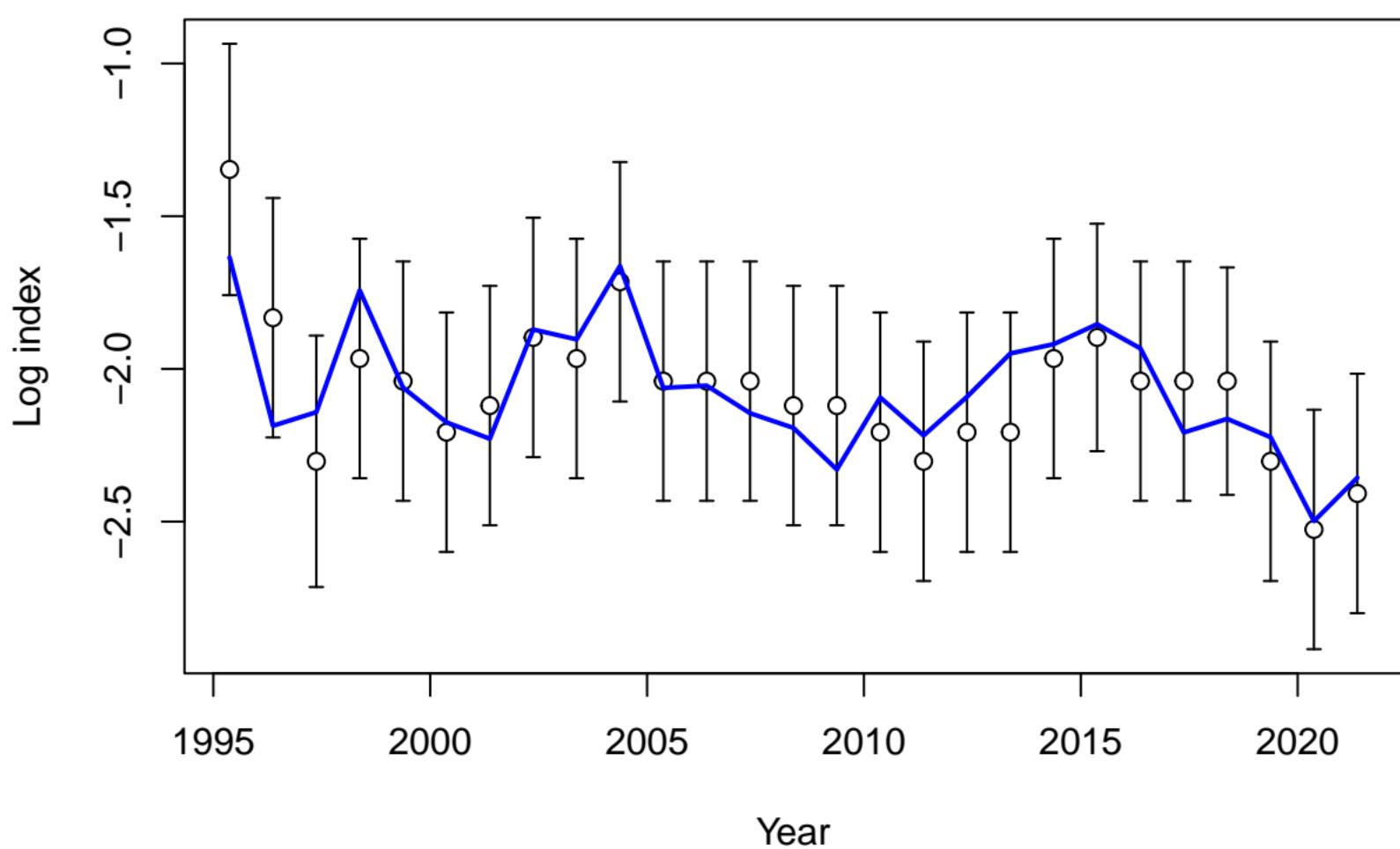






Log index





Log expected index

-2.4 -2.0 -1.8

—

—

—

-2.4

-2.2

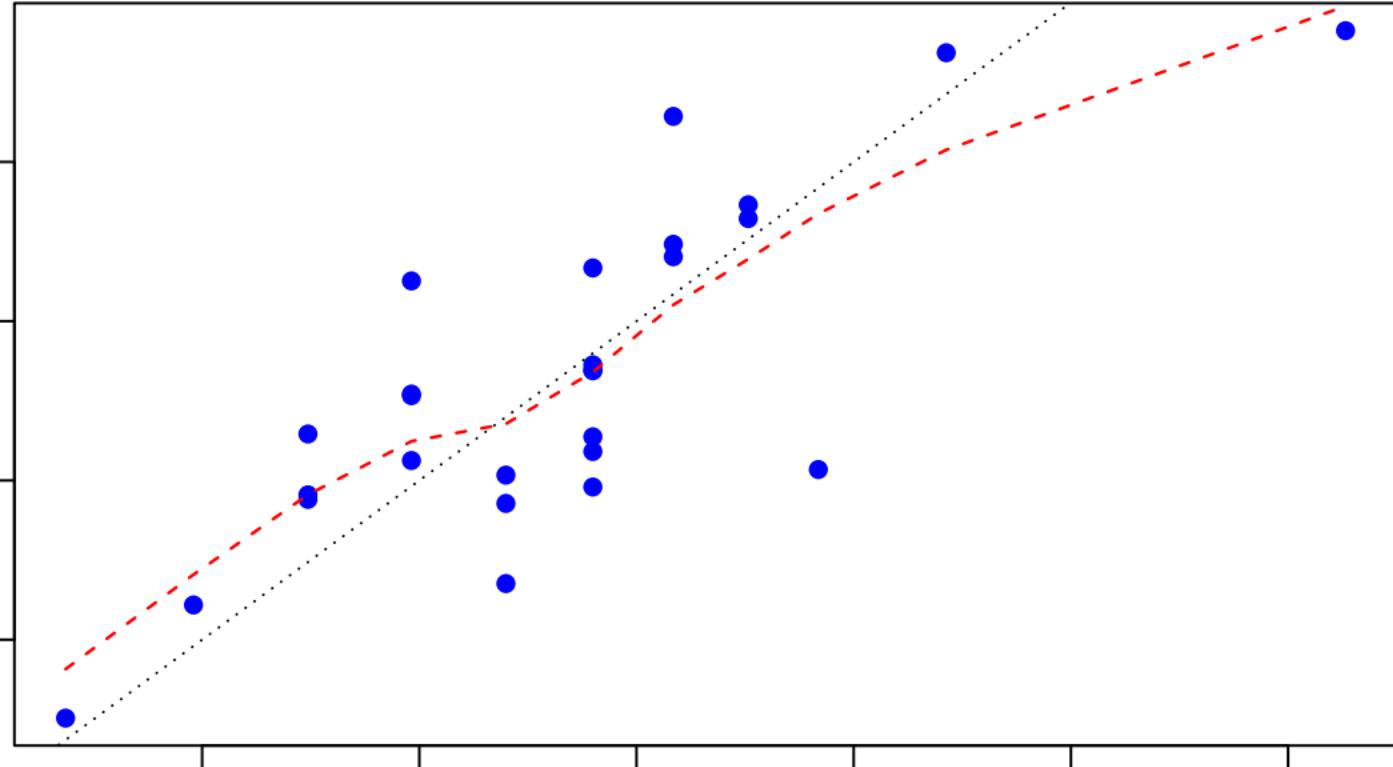
-2.0

-1.8

-1.6

-1.4

Log observed index

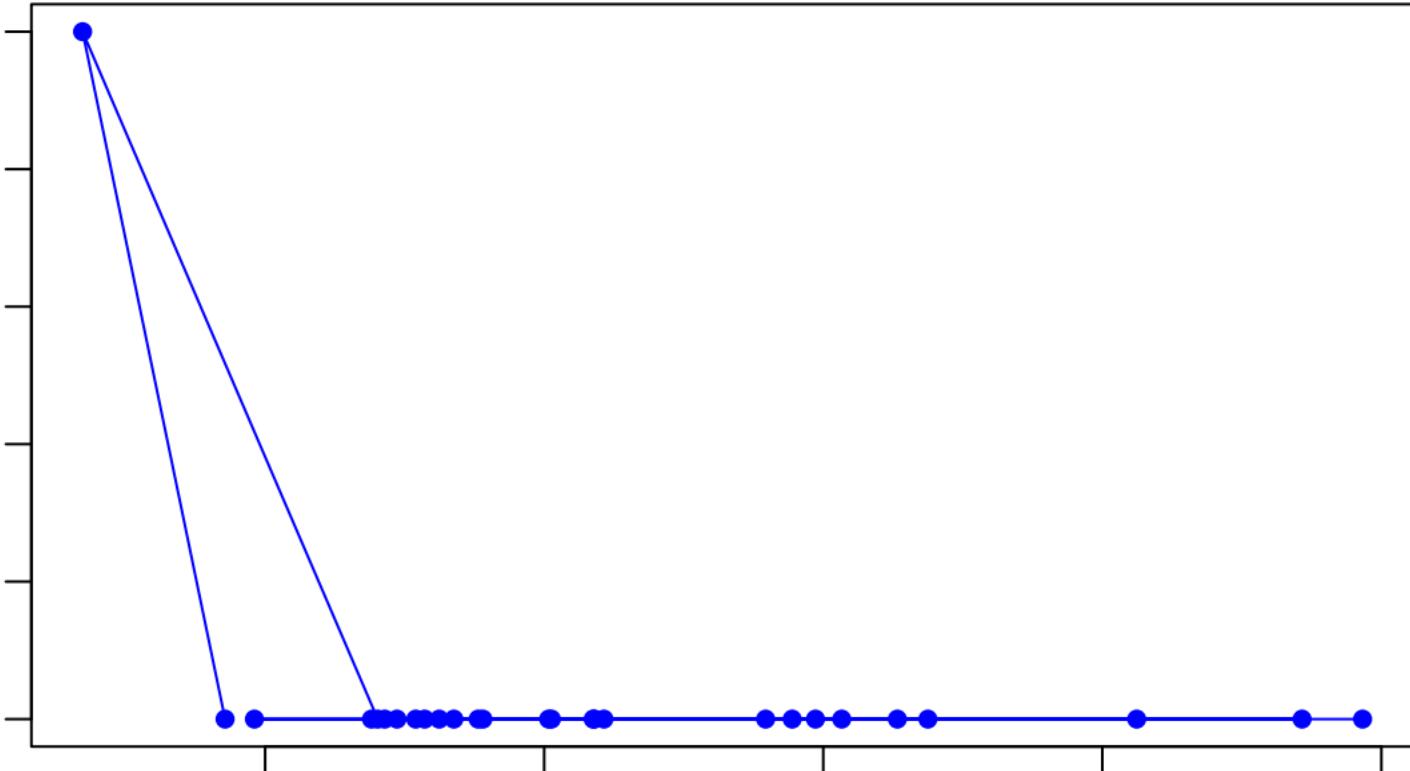


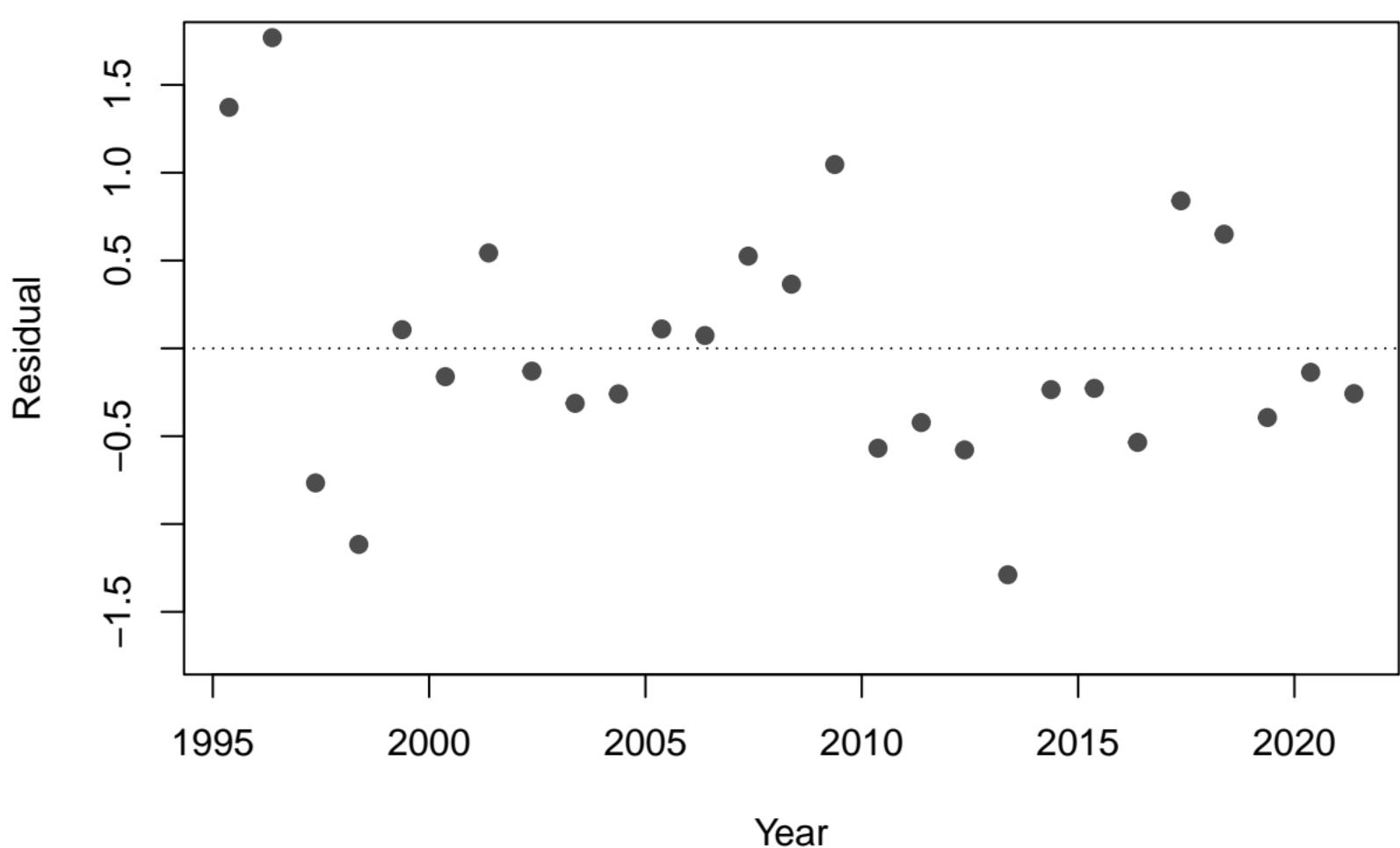
Effective catchability

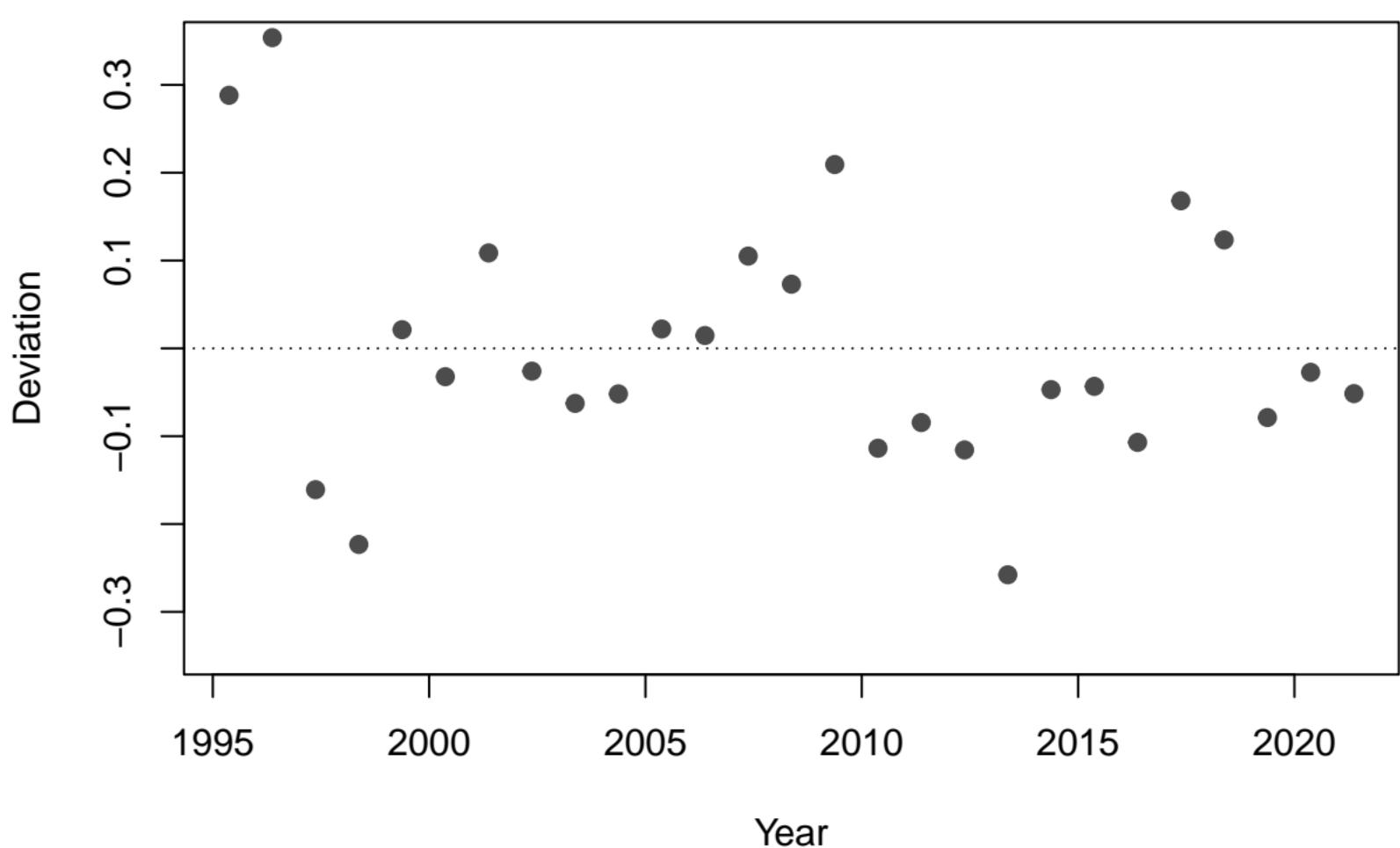
0.1228550 0.1228554 0.1228558

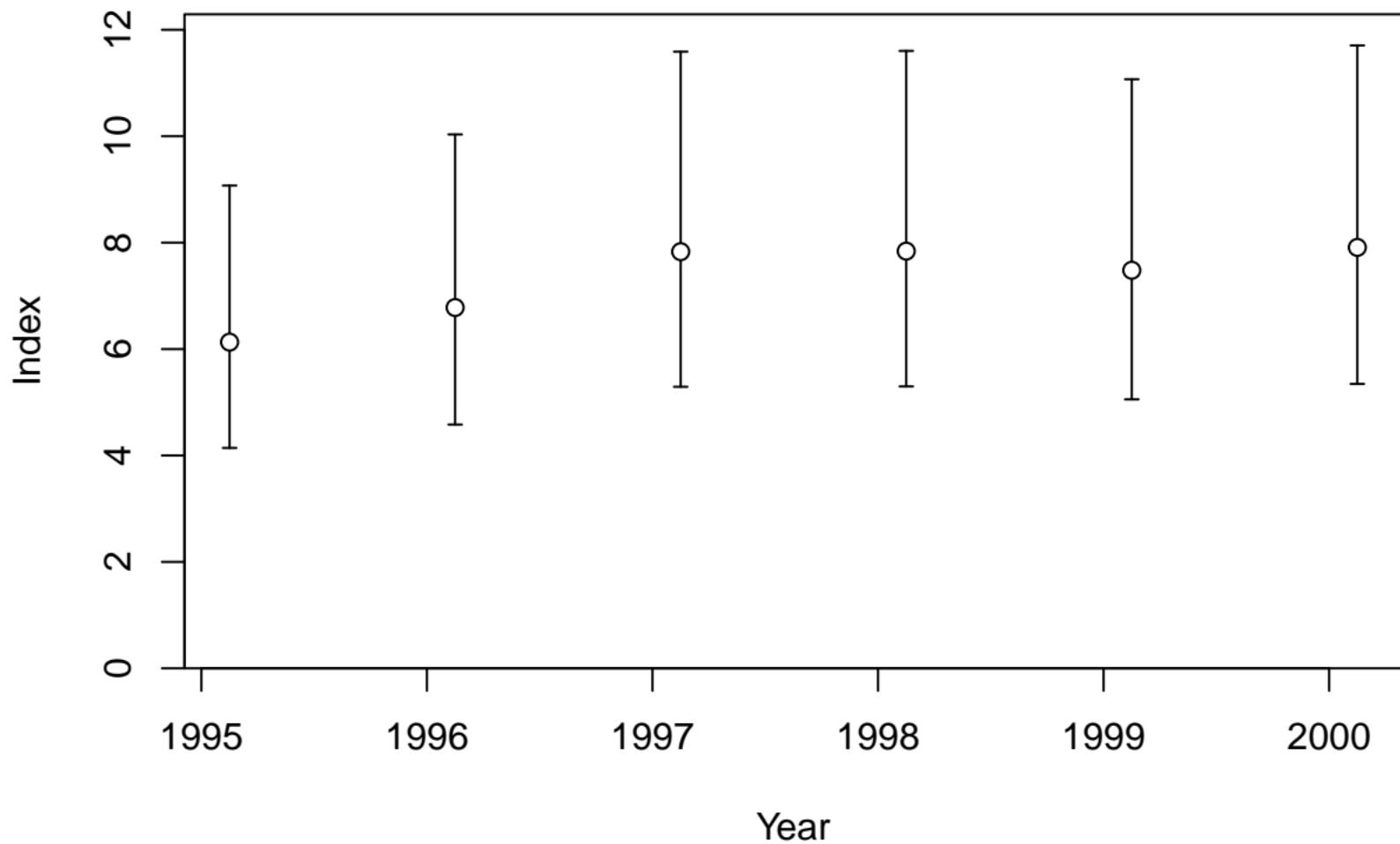
0.8 1.0 1.2 1.4 1.6

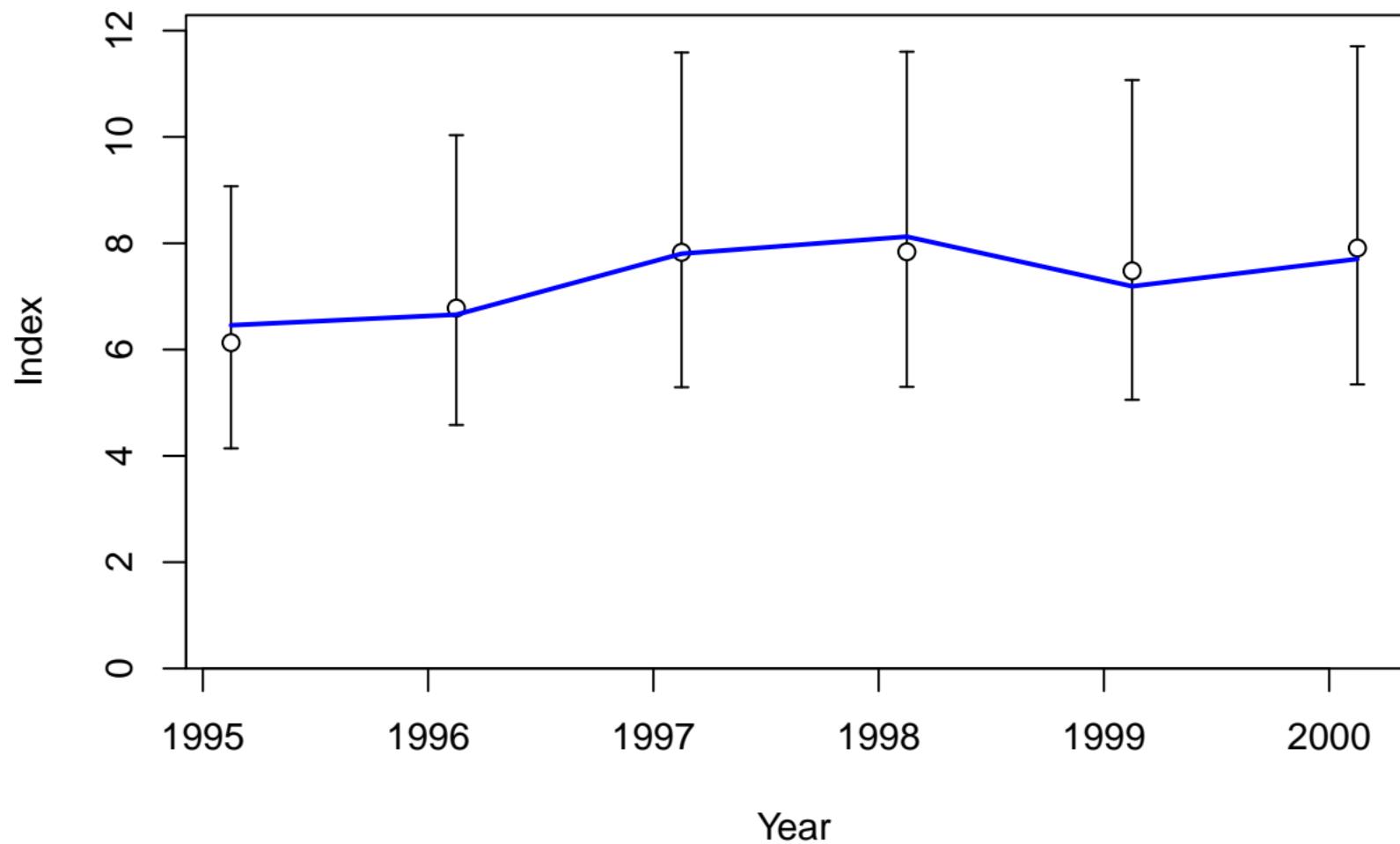
Vulnerable biomass











Expected index

8

6

4

2

0

0

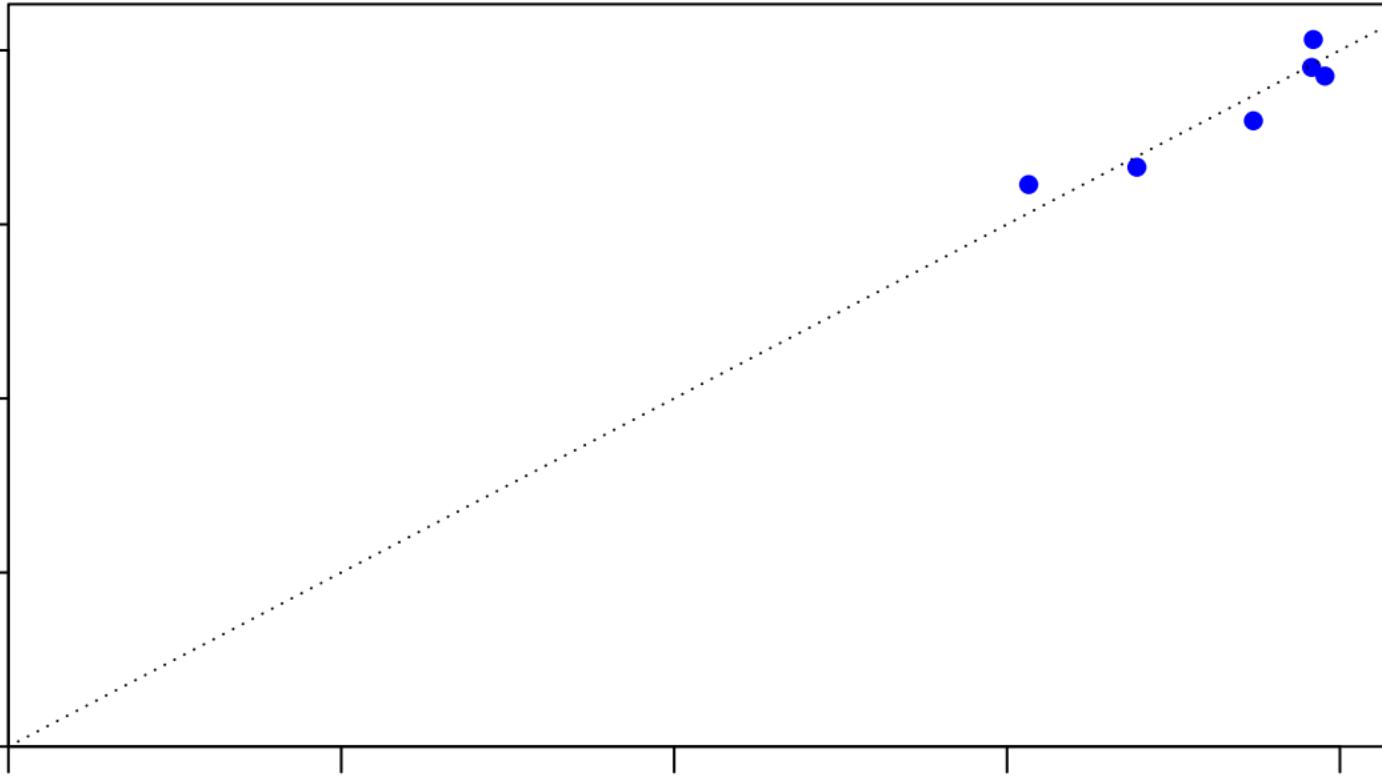
2

4

6

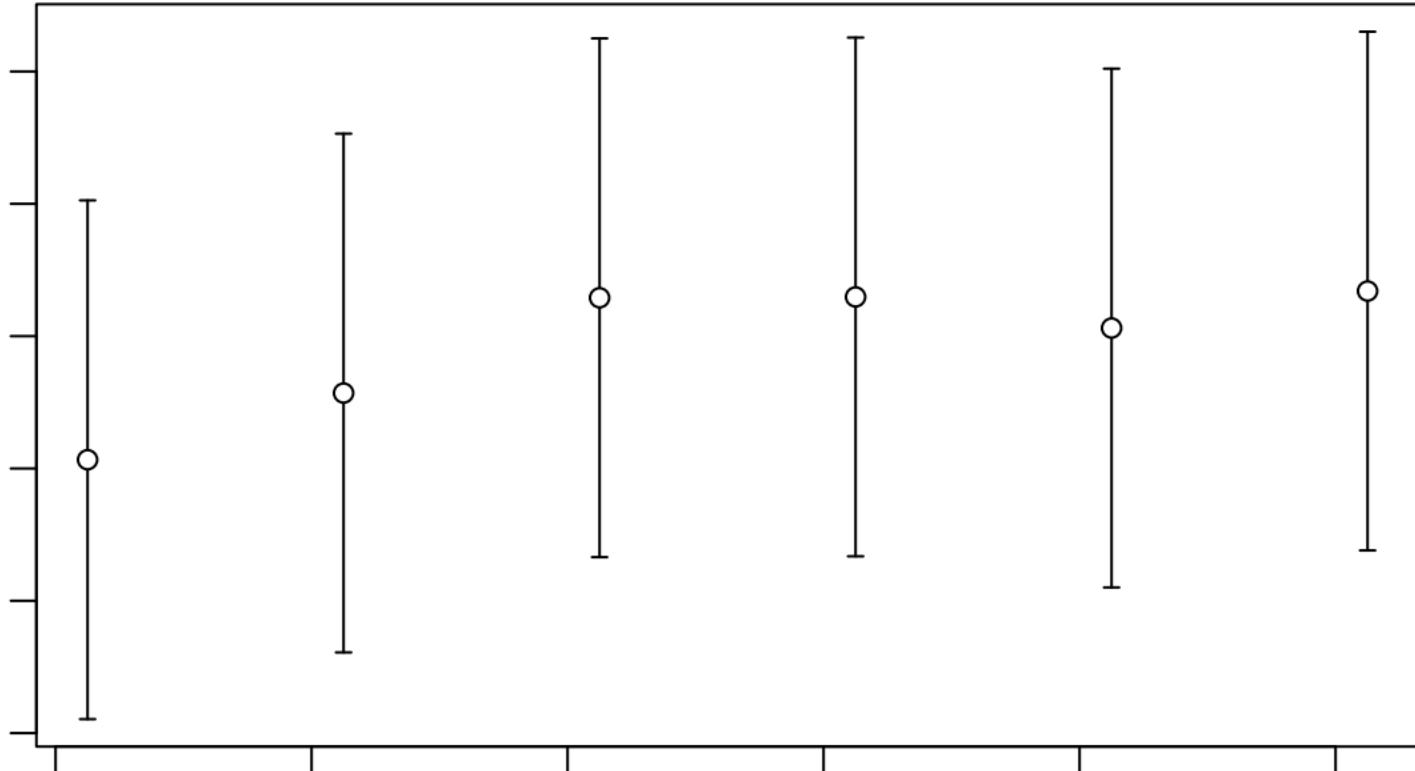
8

Observed index



Log index

1.4 1.6 1.8 2.0 2.2 2.4



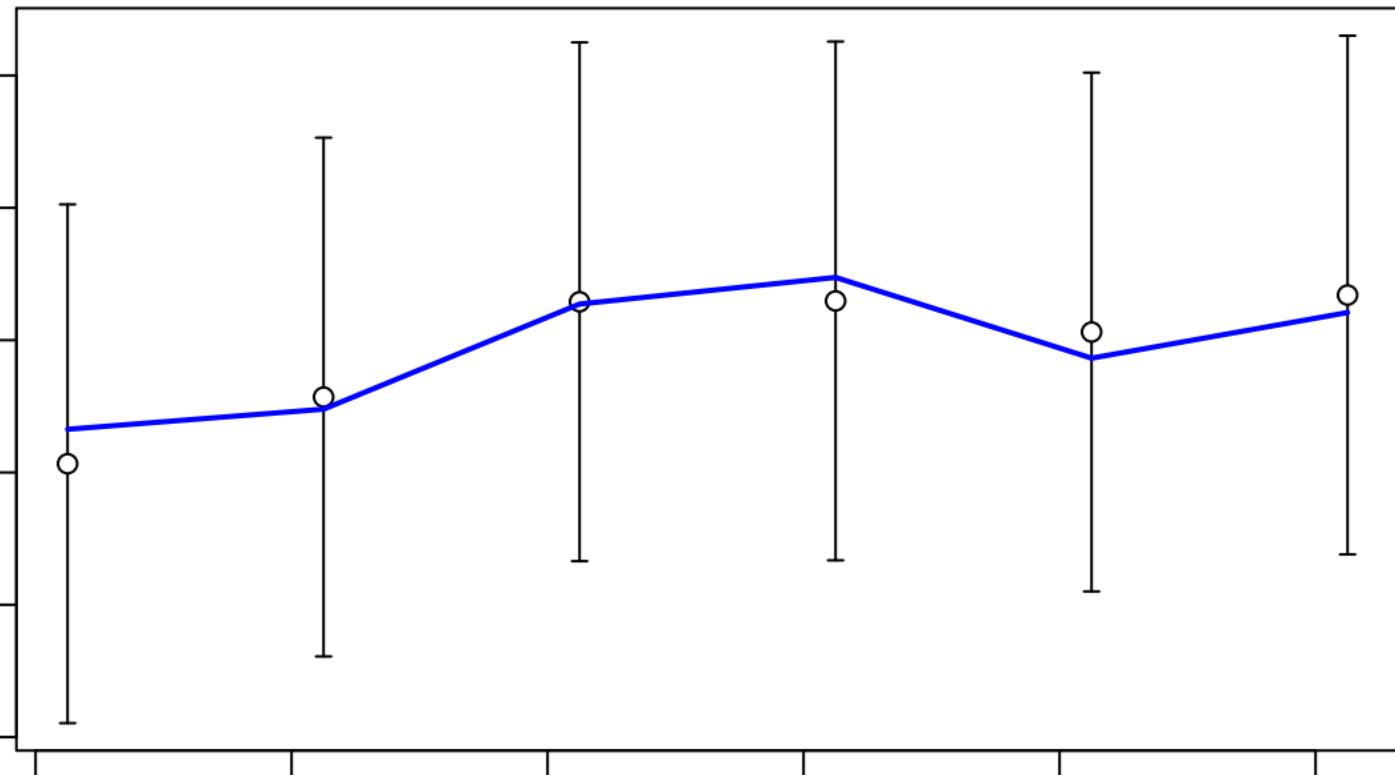
Year

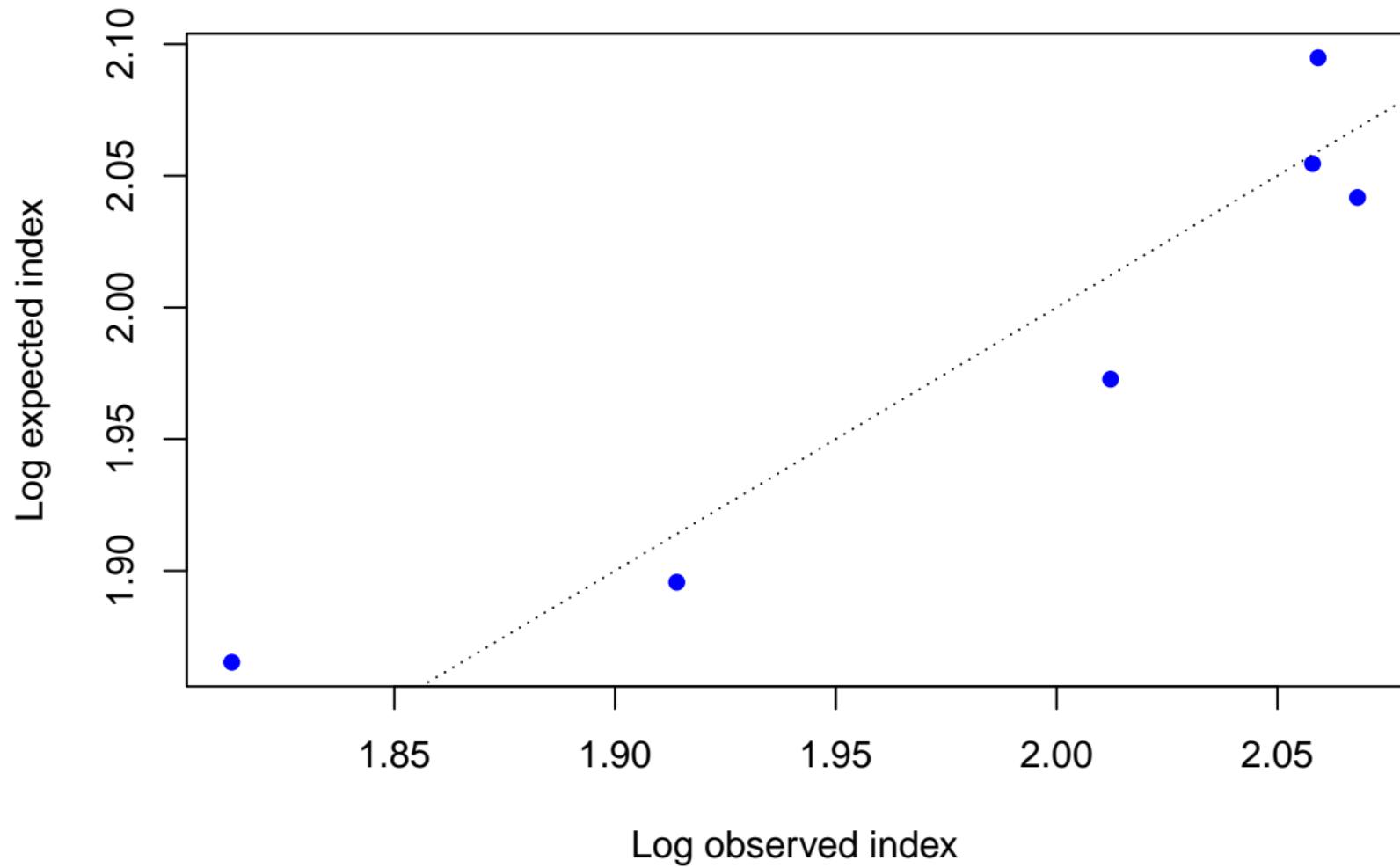
Log index

2.4
2.2
2.0
1.8
1.6
1.4

1995 1996 1997 1998 1999 2000

Year



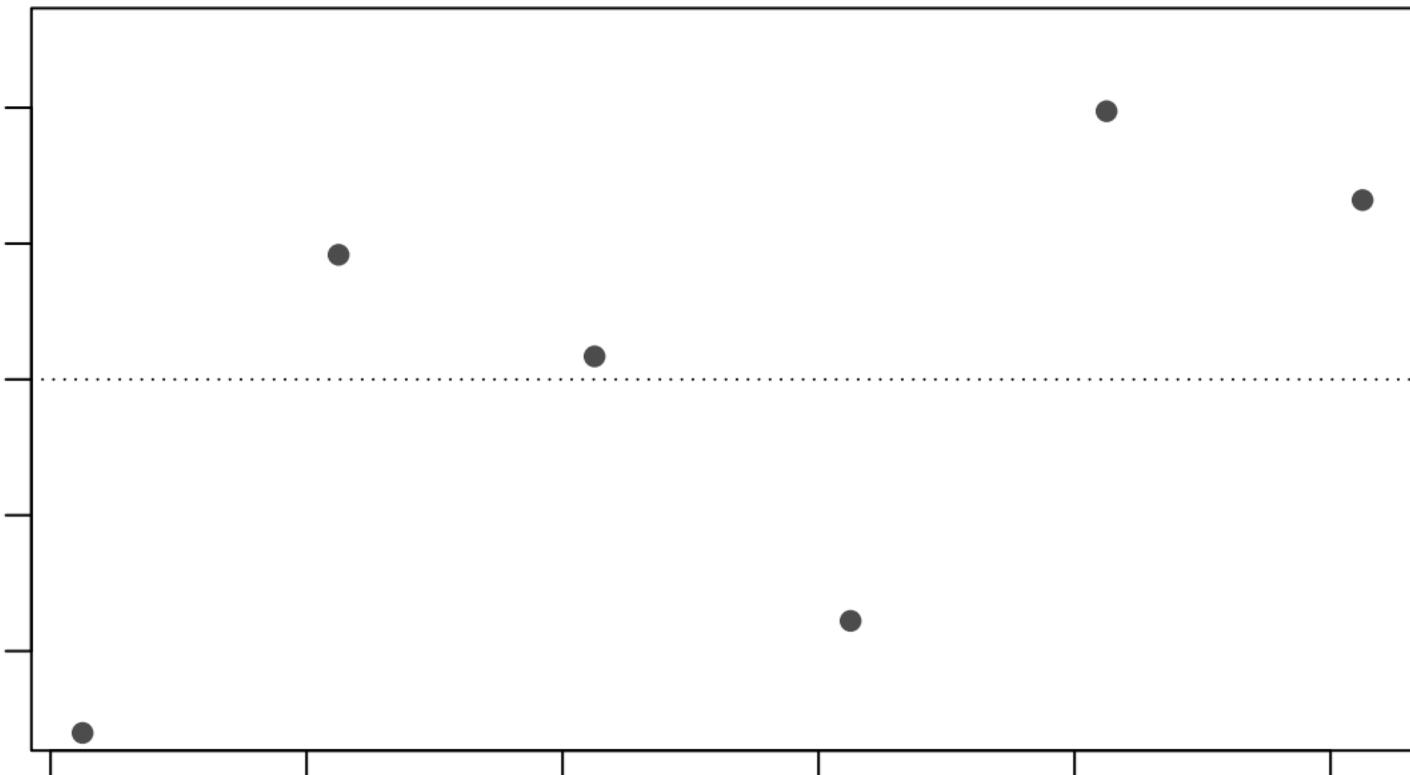


Residual

0.2
0.1
0.0
-0.1
-0.2

1995 1996 1997 1998 1999 2000

Year

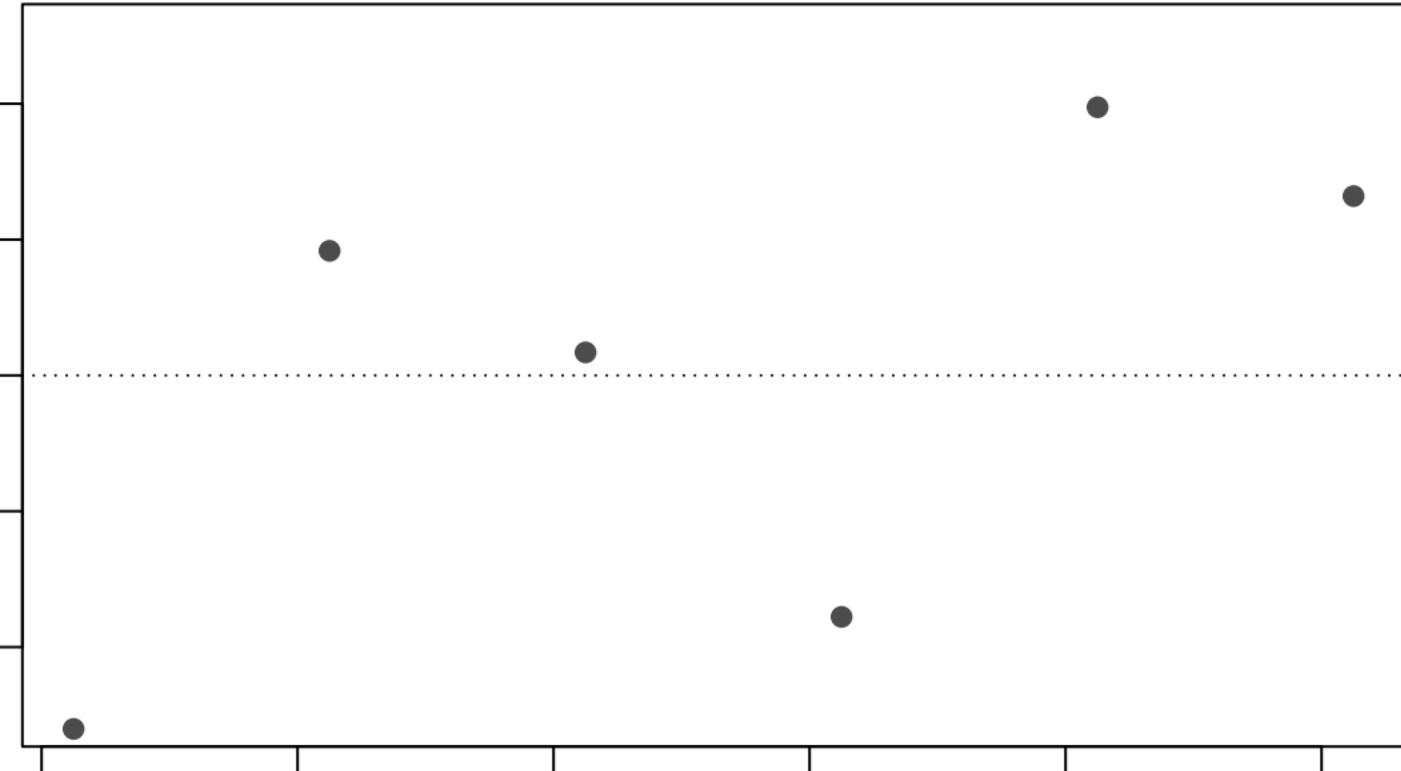


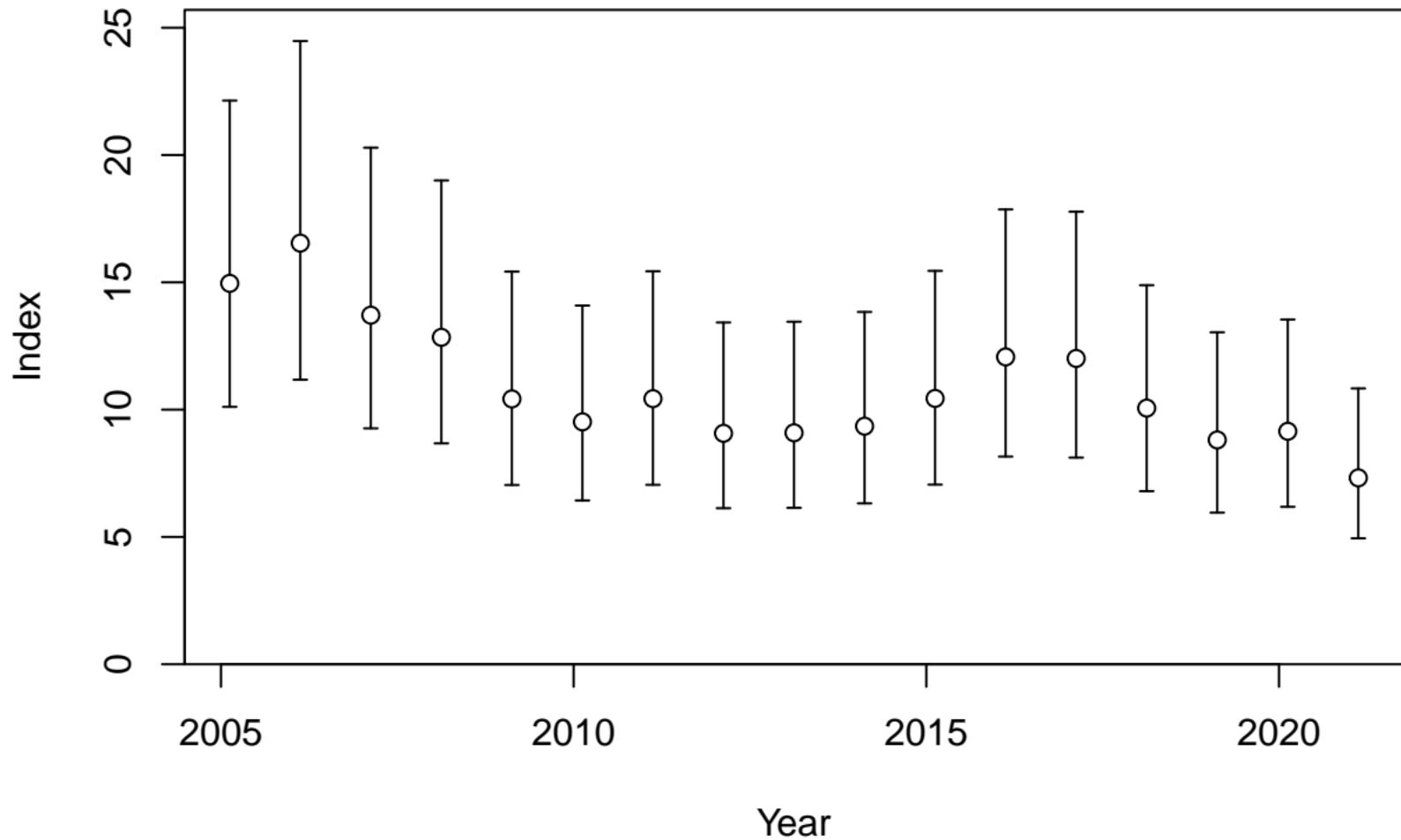
Deviation

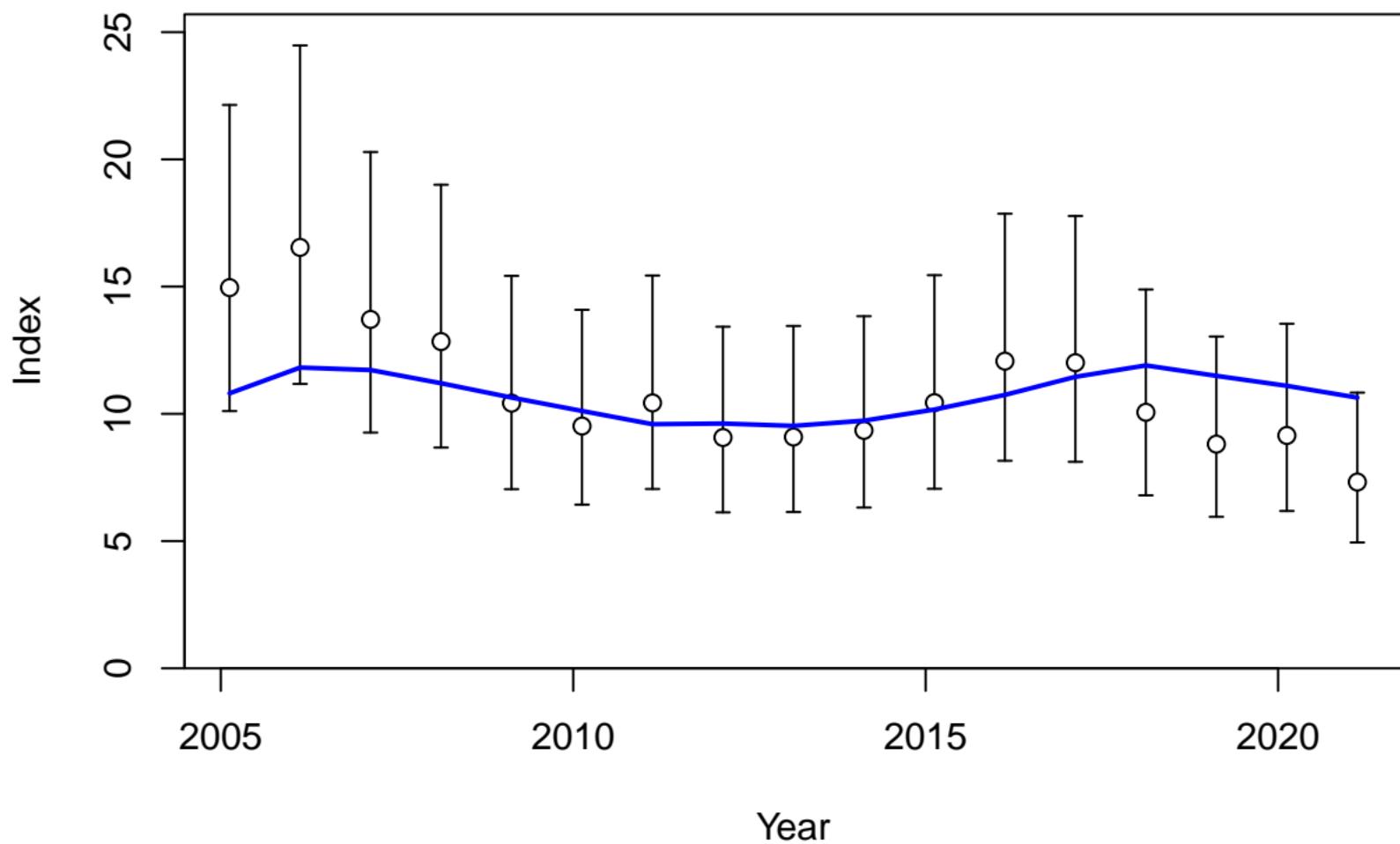
-0.04 -0.02 0.00 0.02 0.04

1995 1996 1997 1998 1999 2000

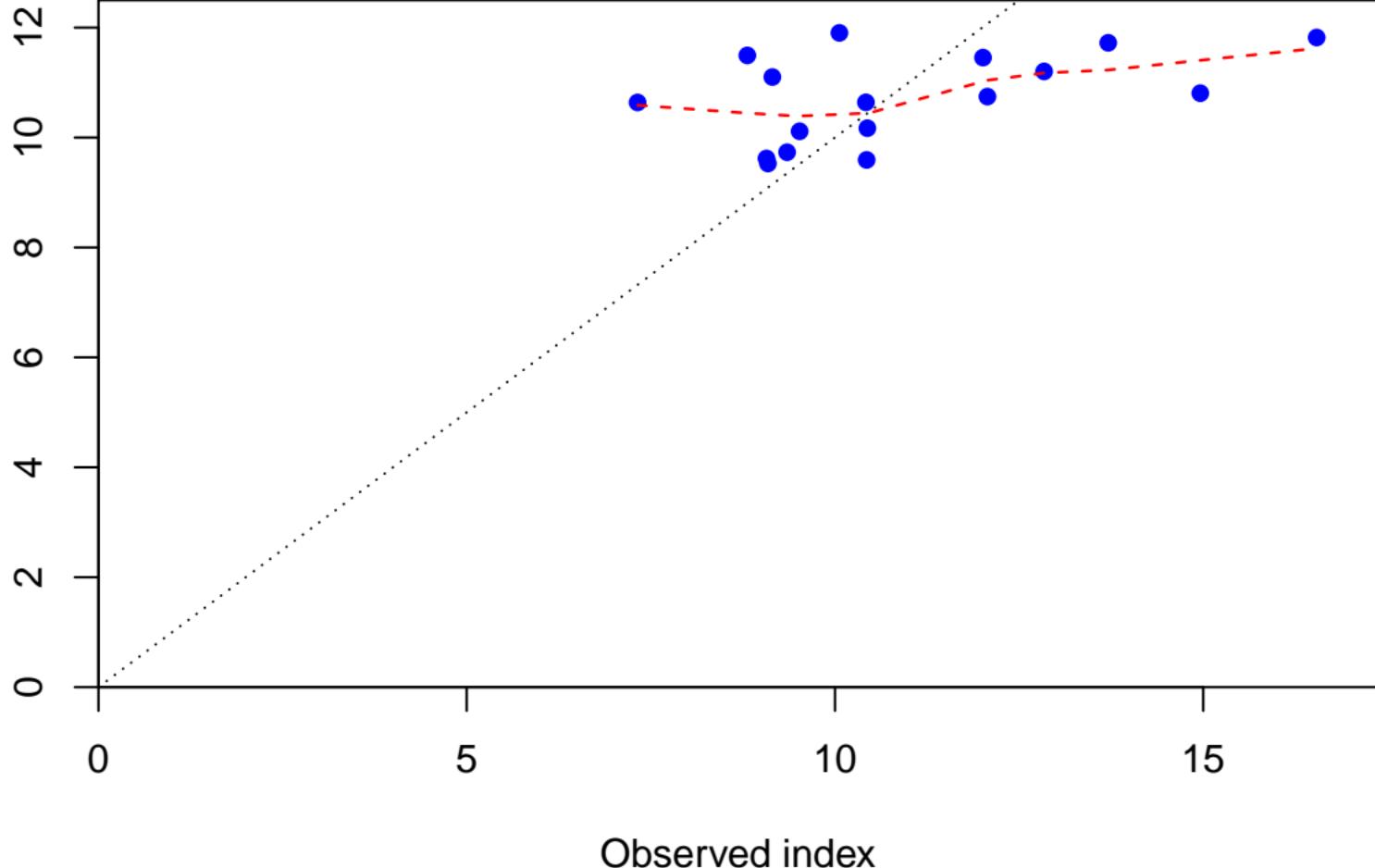
Year







Expected index



Log index

3.0
2.5
2.0

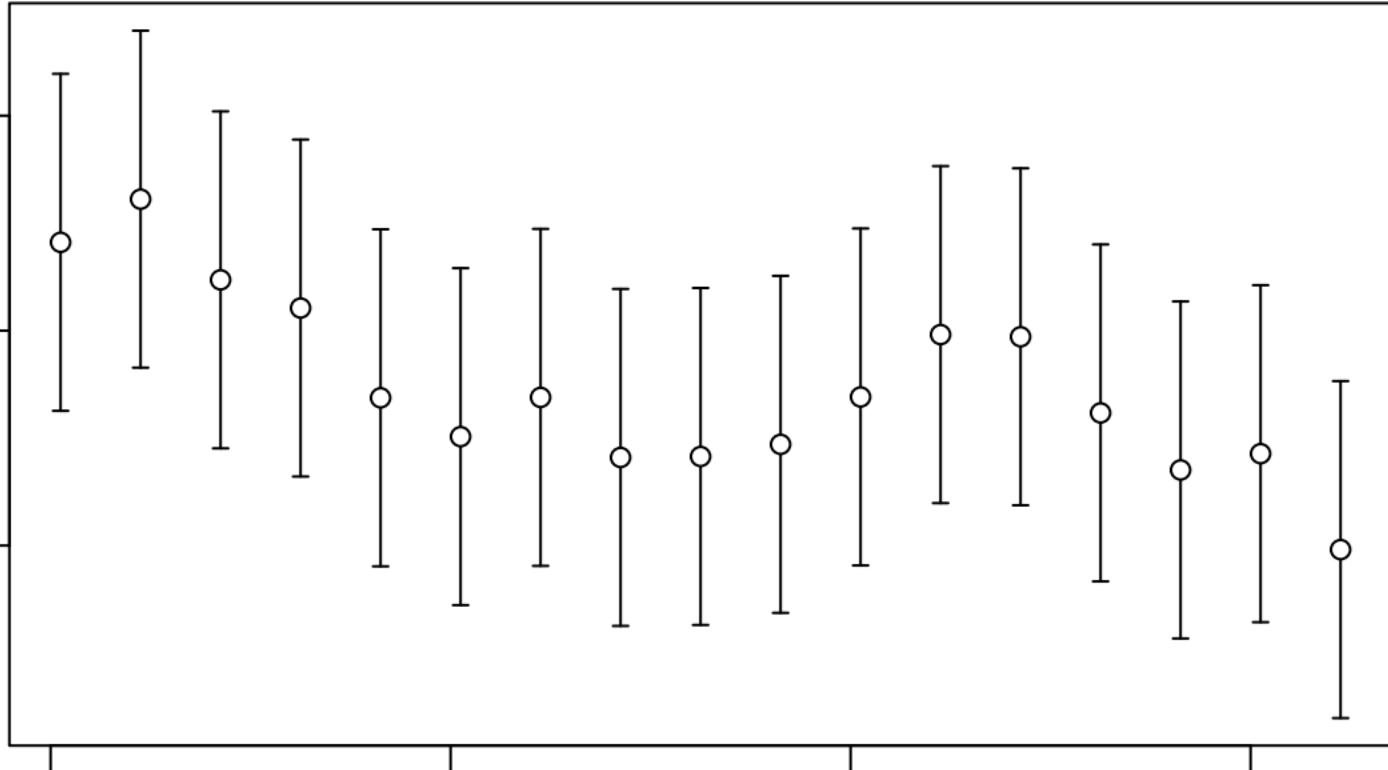
2005

2010

2015

2020

Year

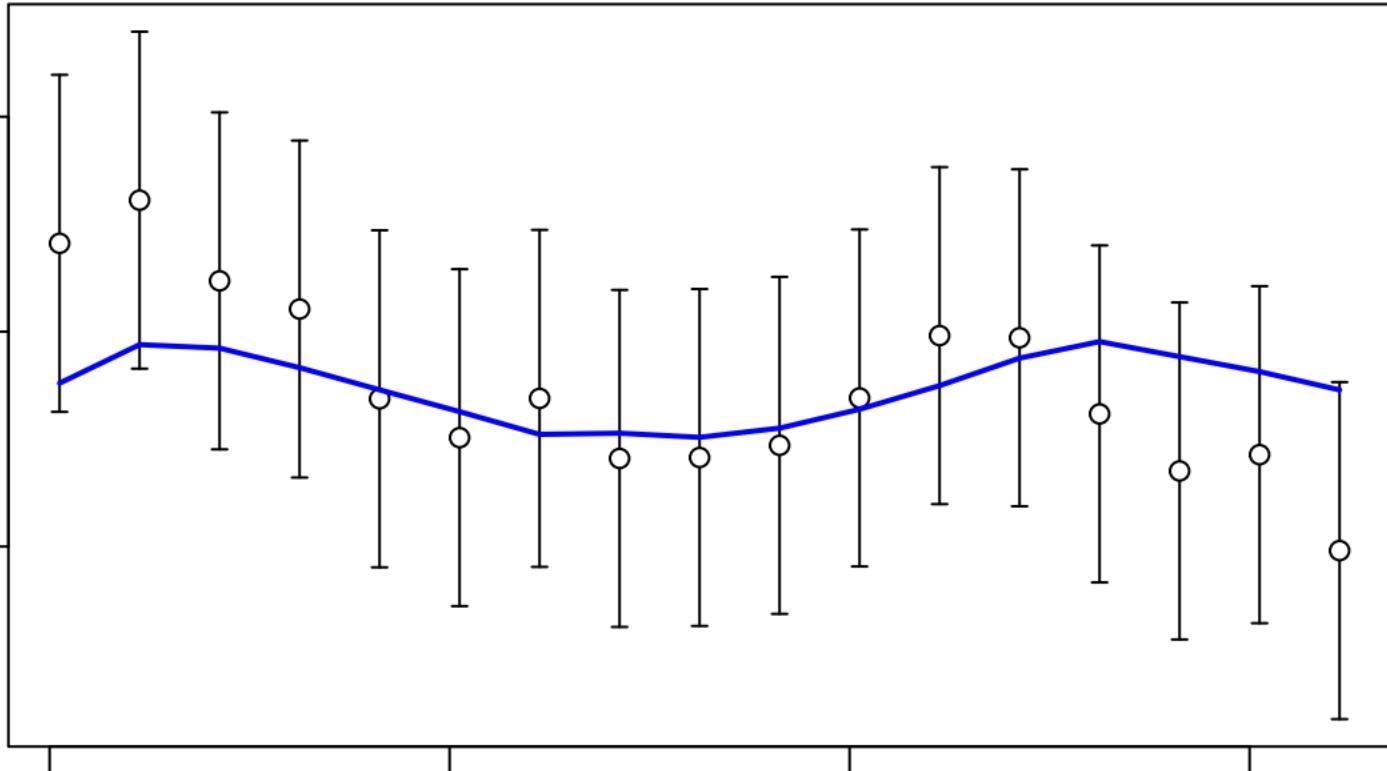


Log index

3.0
2.5
2.0

2005 2010 2015 2020

Year



Log expected index

2.25 2.30 2.35 2.40 2.45

2.0

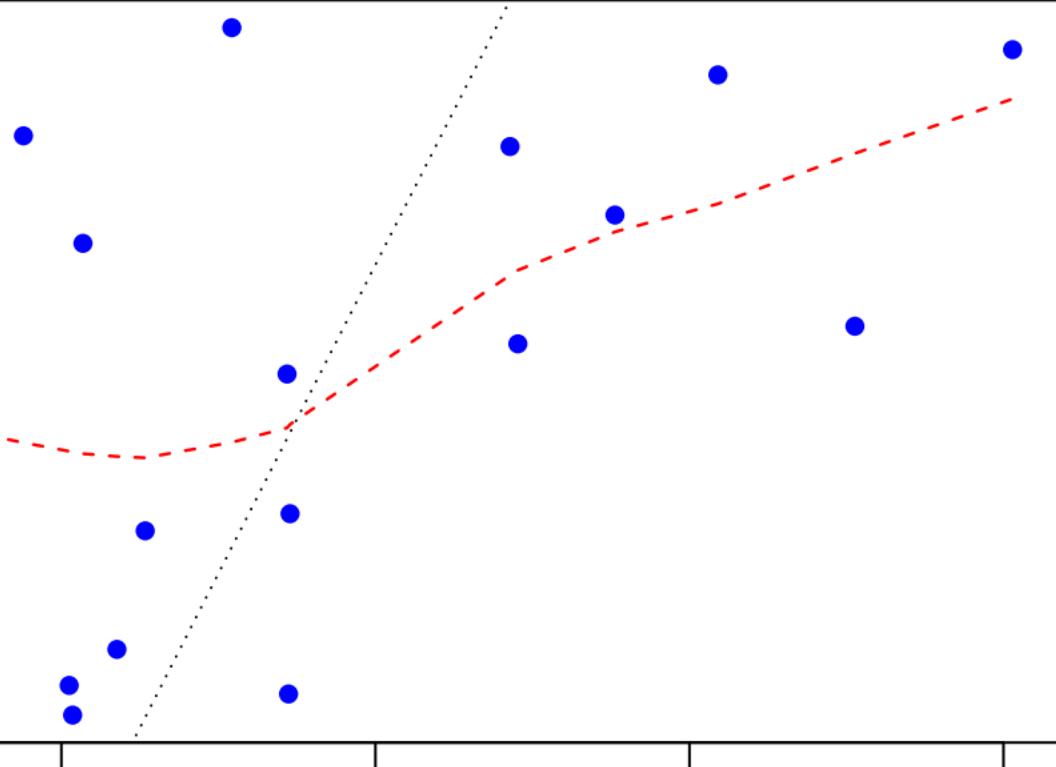
2.2

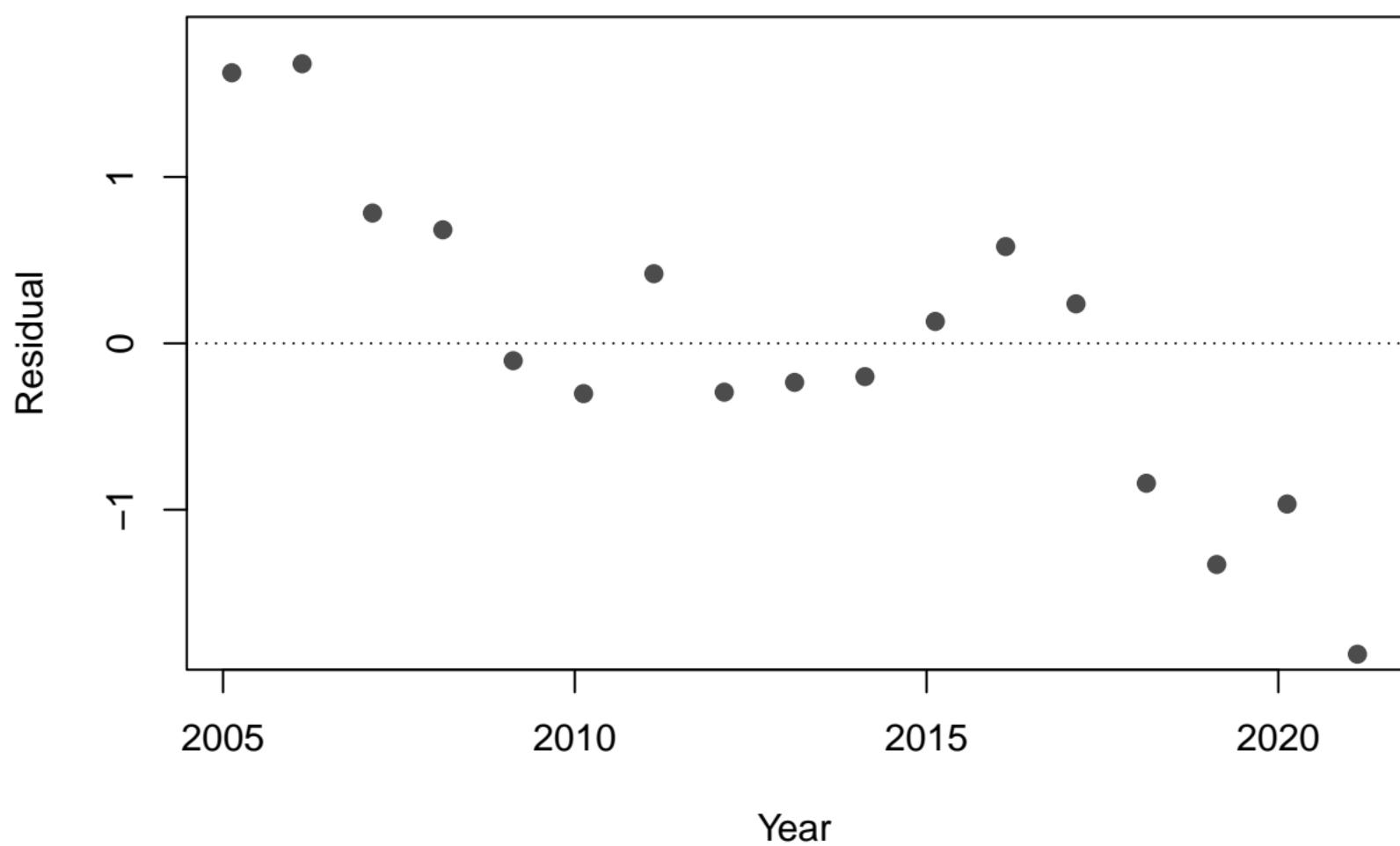
2.4

2.6

2.8

Log observed index



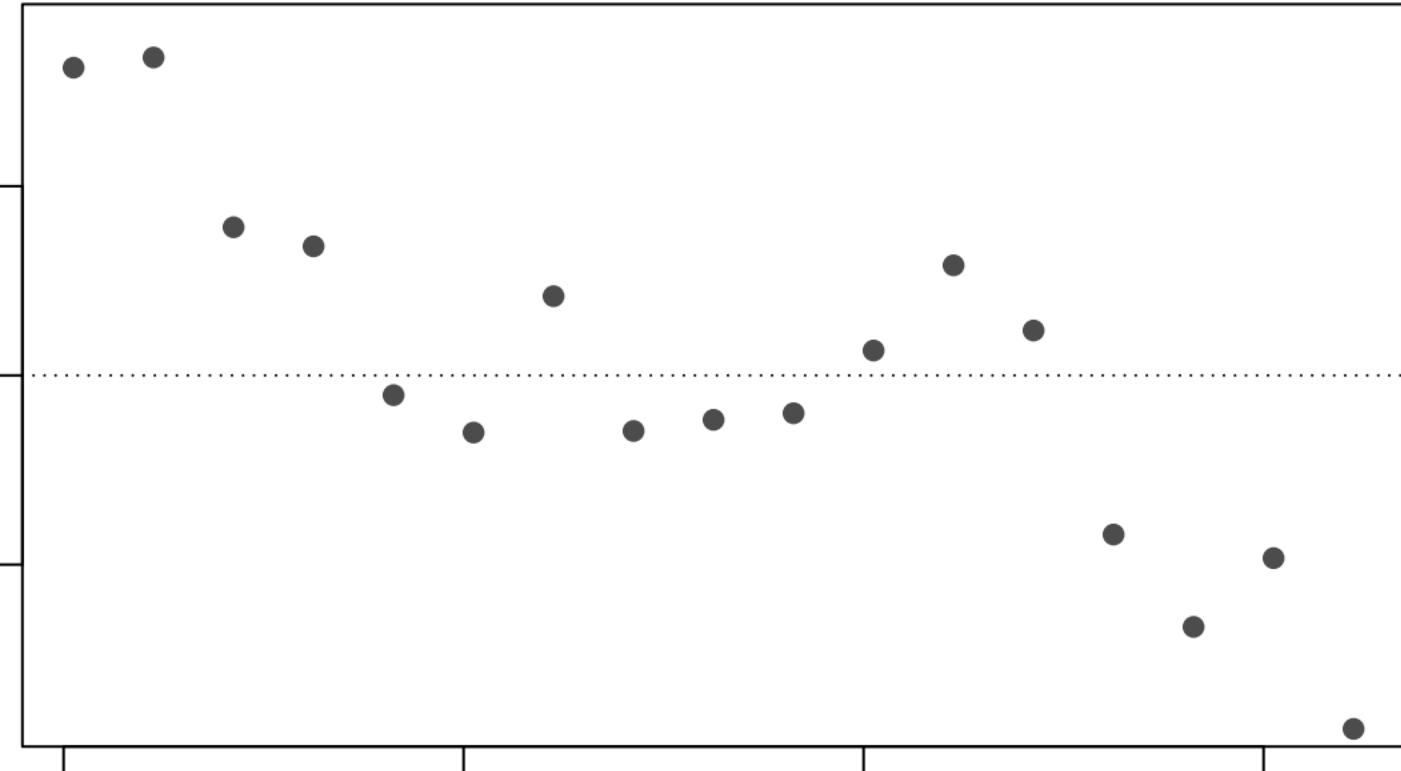


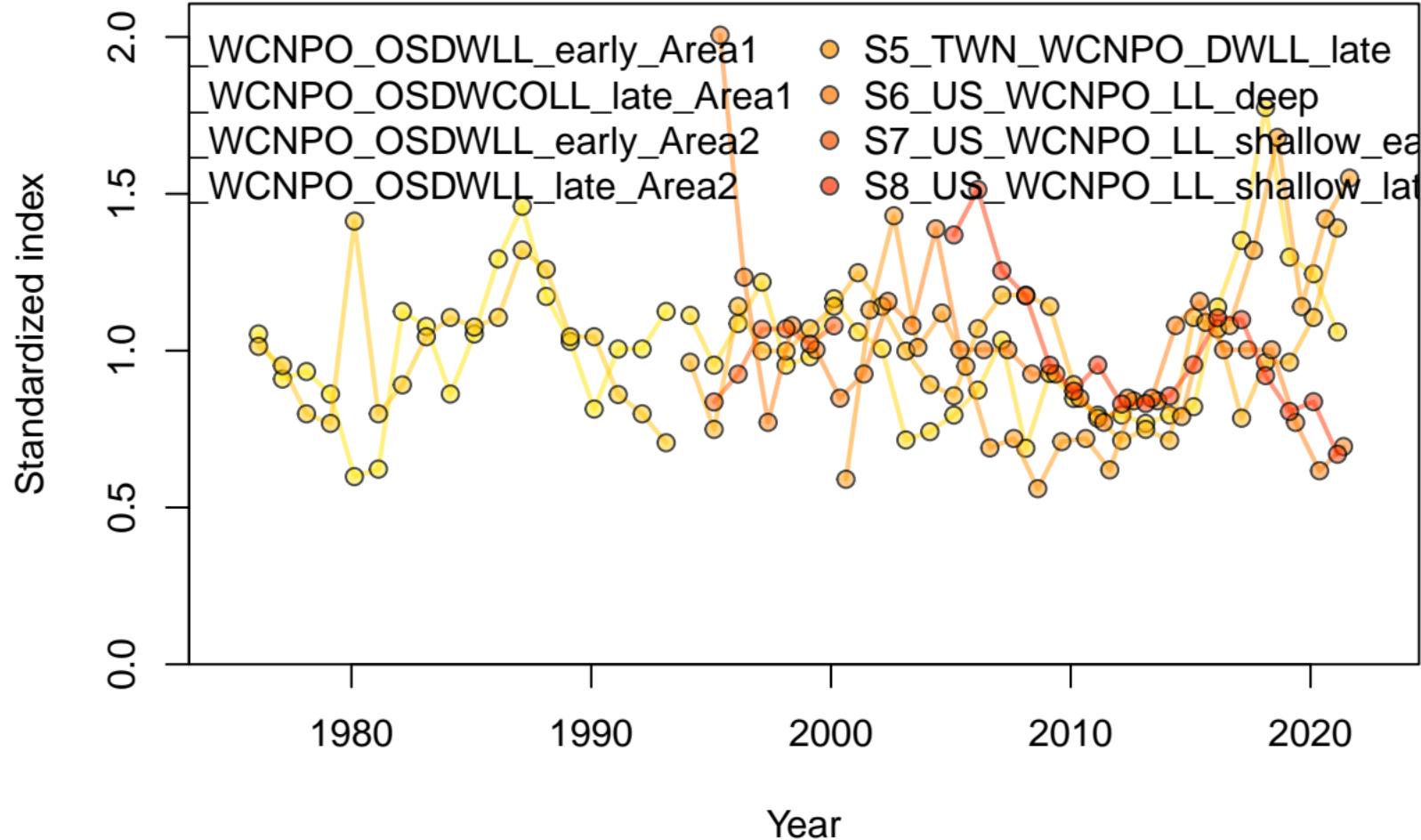
Deviation

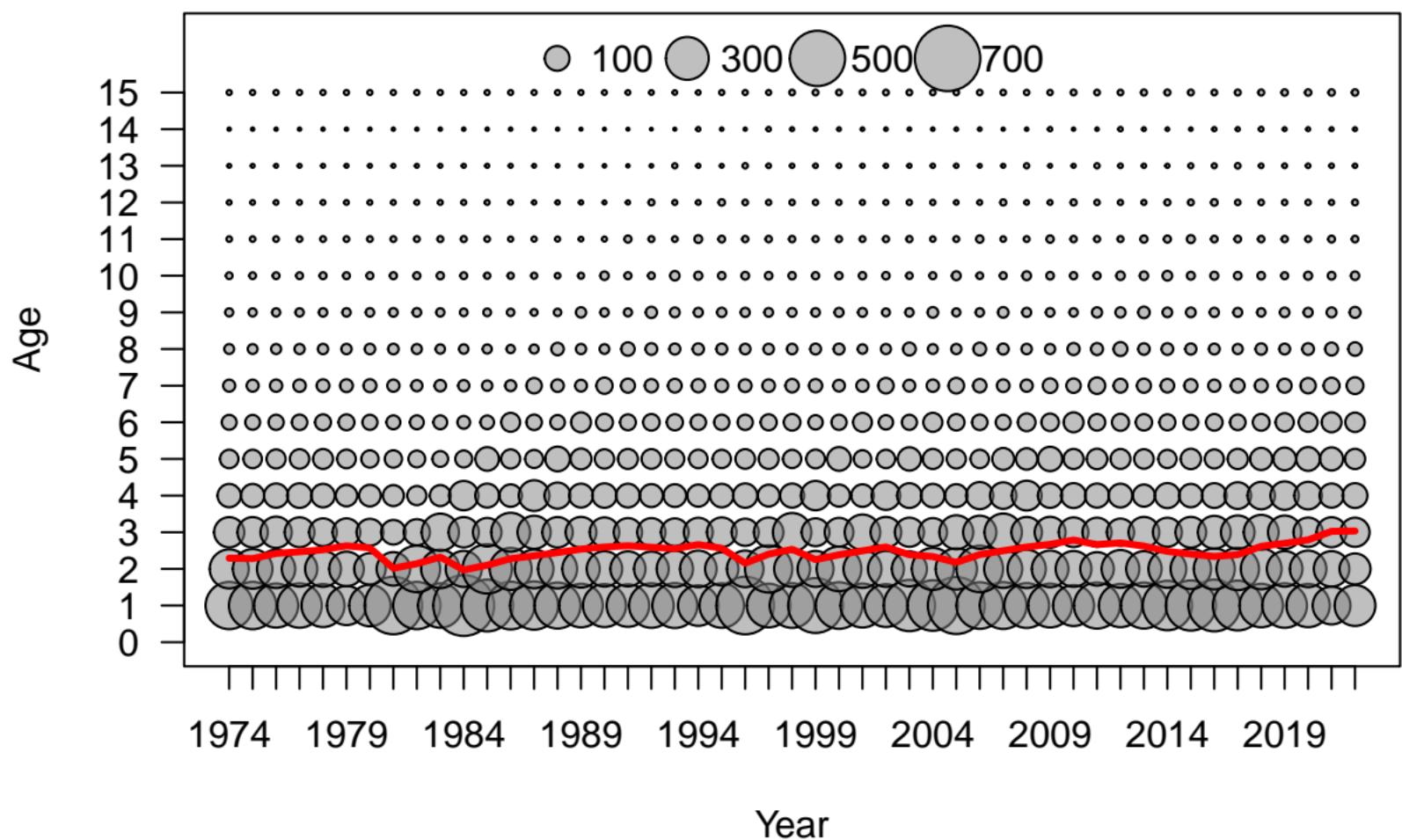
0.2
0.0
-0.2

2005 2010 2015 2020

Year







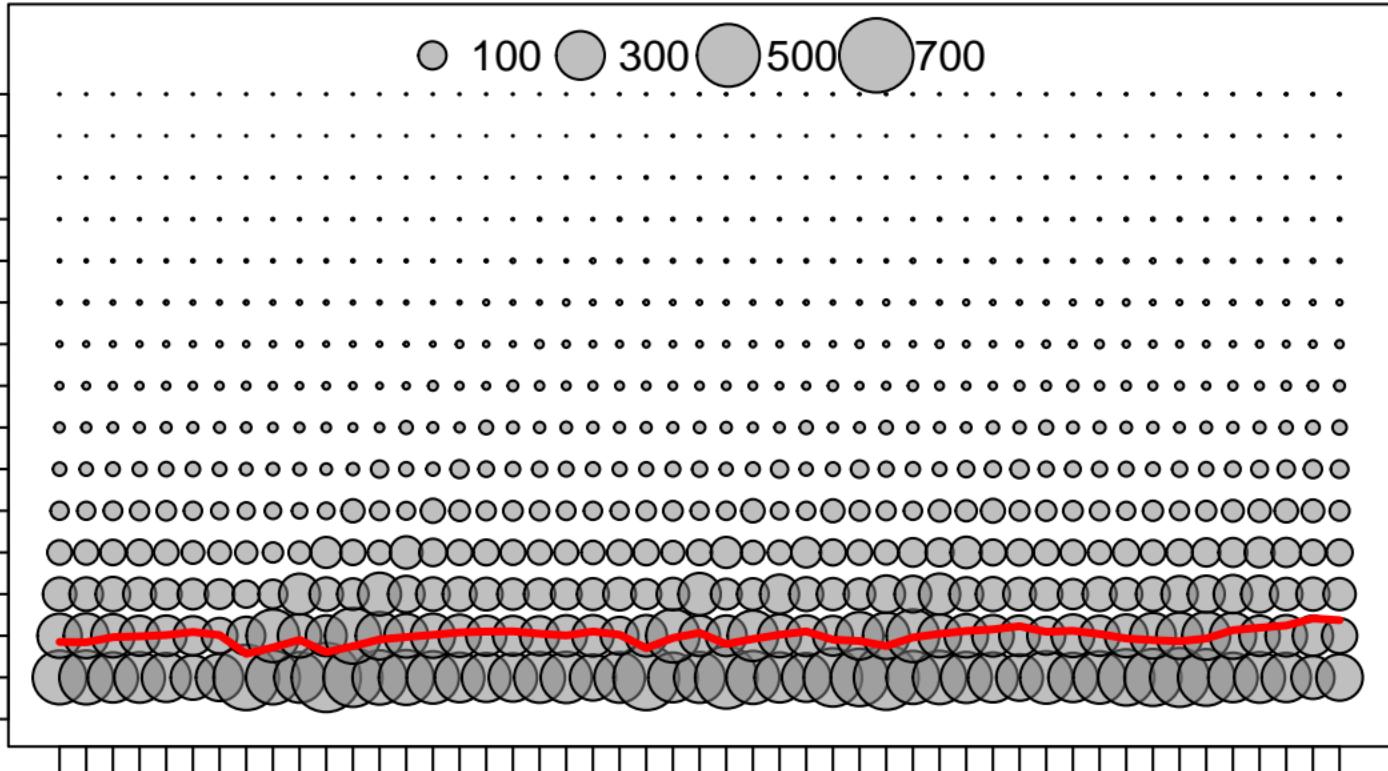
Age

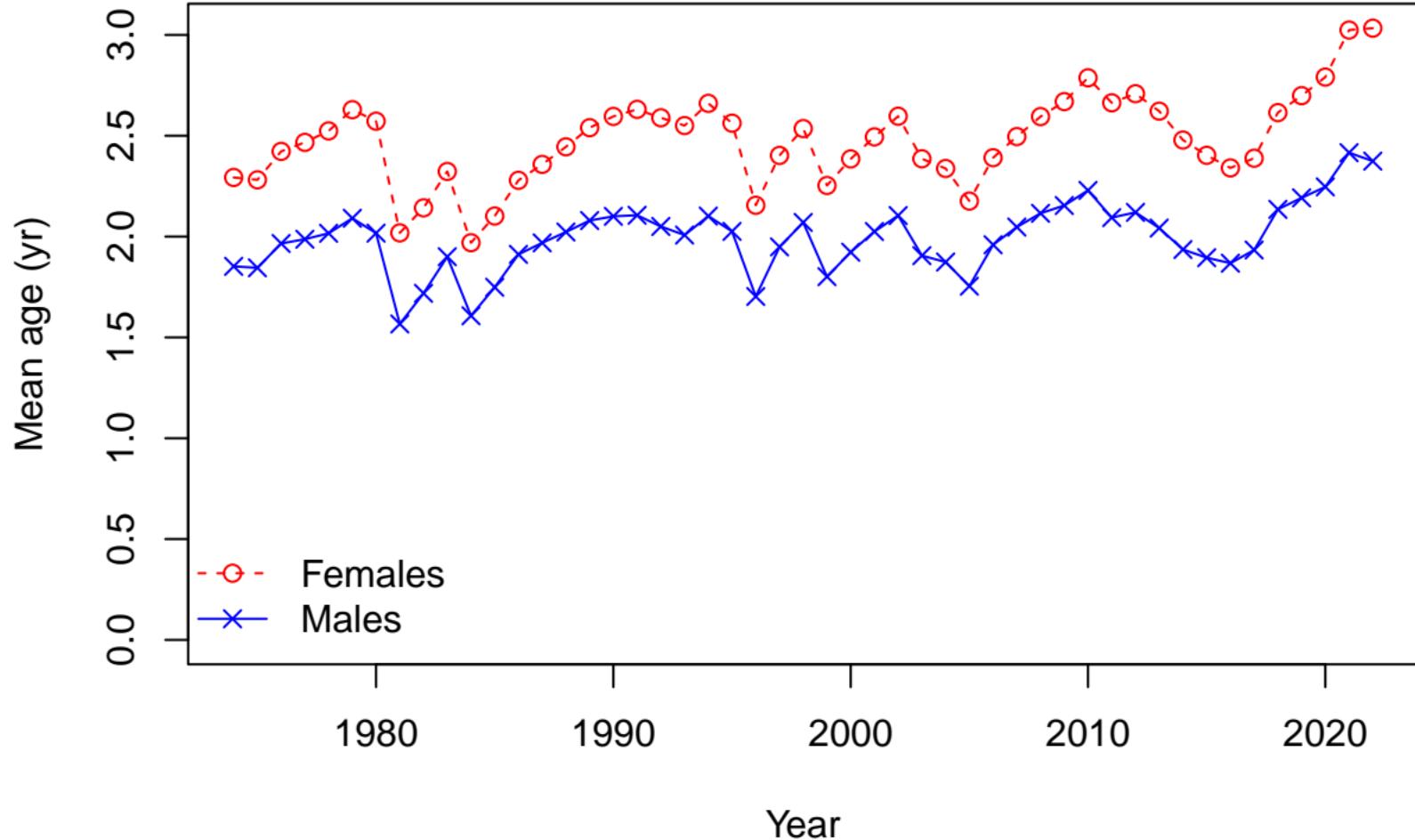
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0

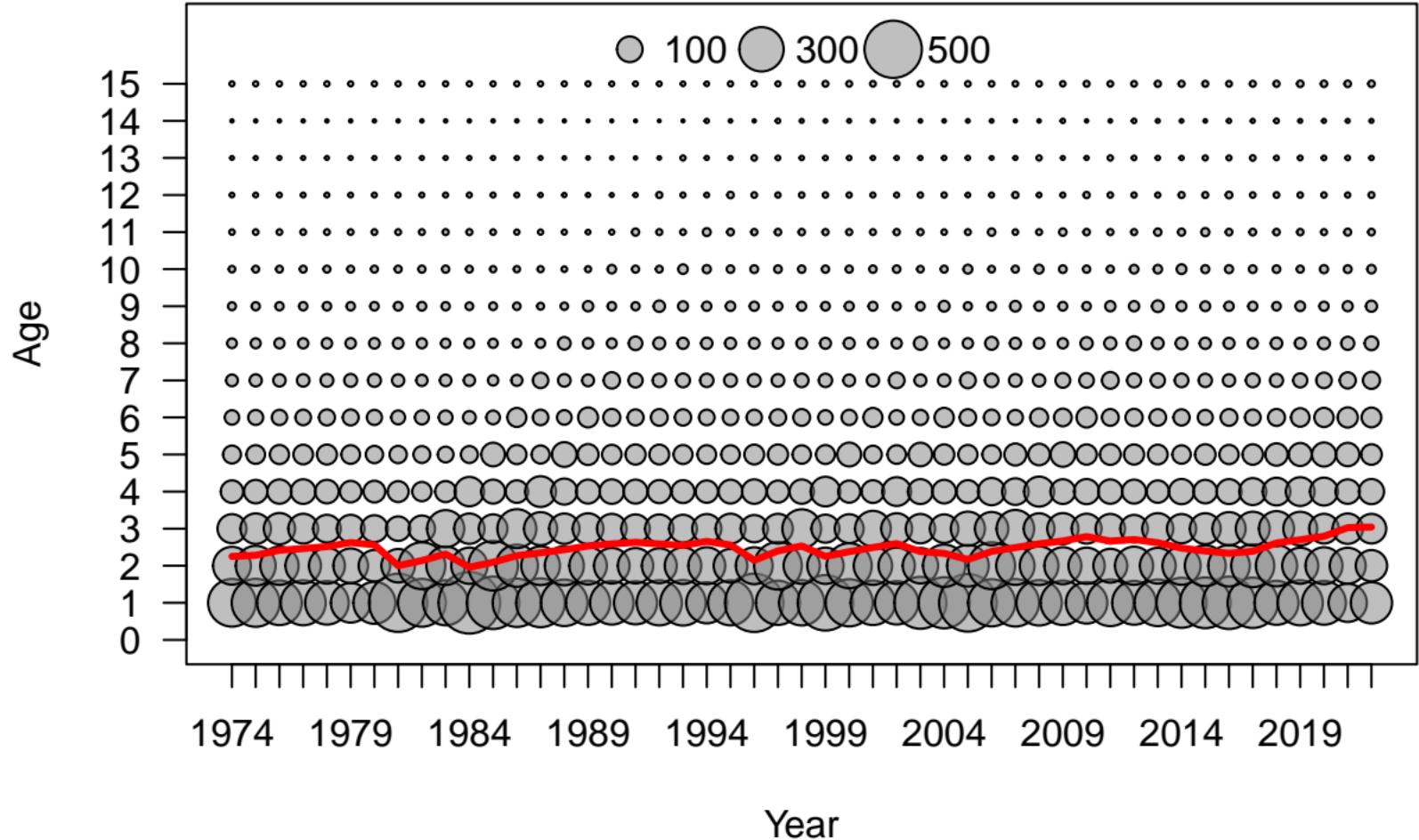
● 100 ● 300 ● 500 ● 700

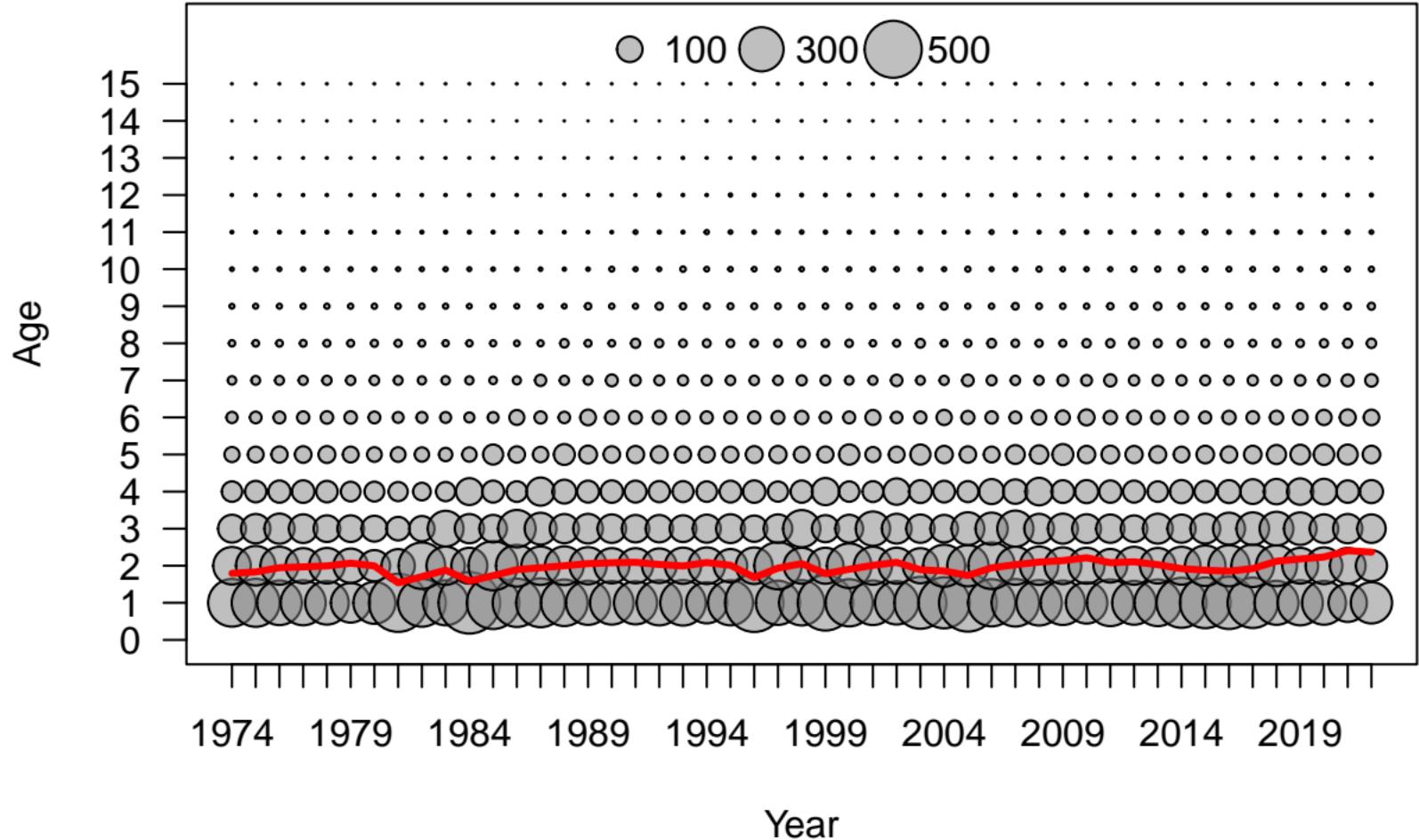
1974 1979 1984 1989 1994 1999 2004 2009 2014 2019

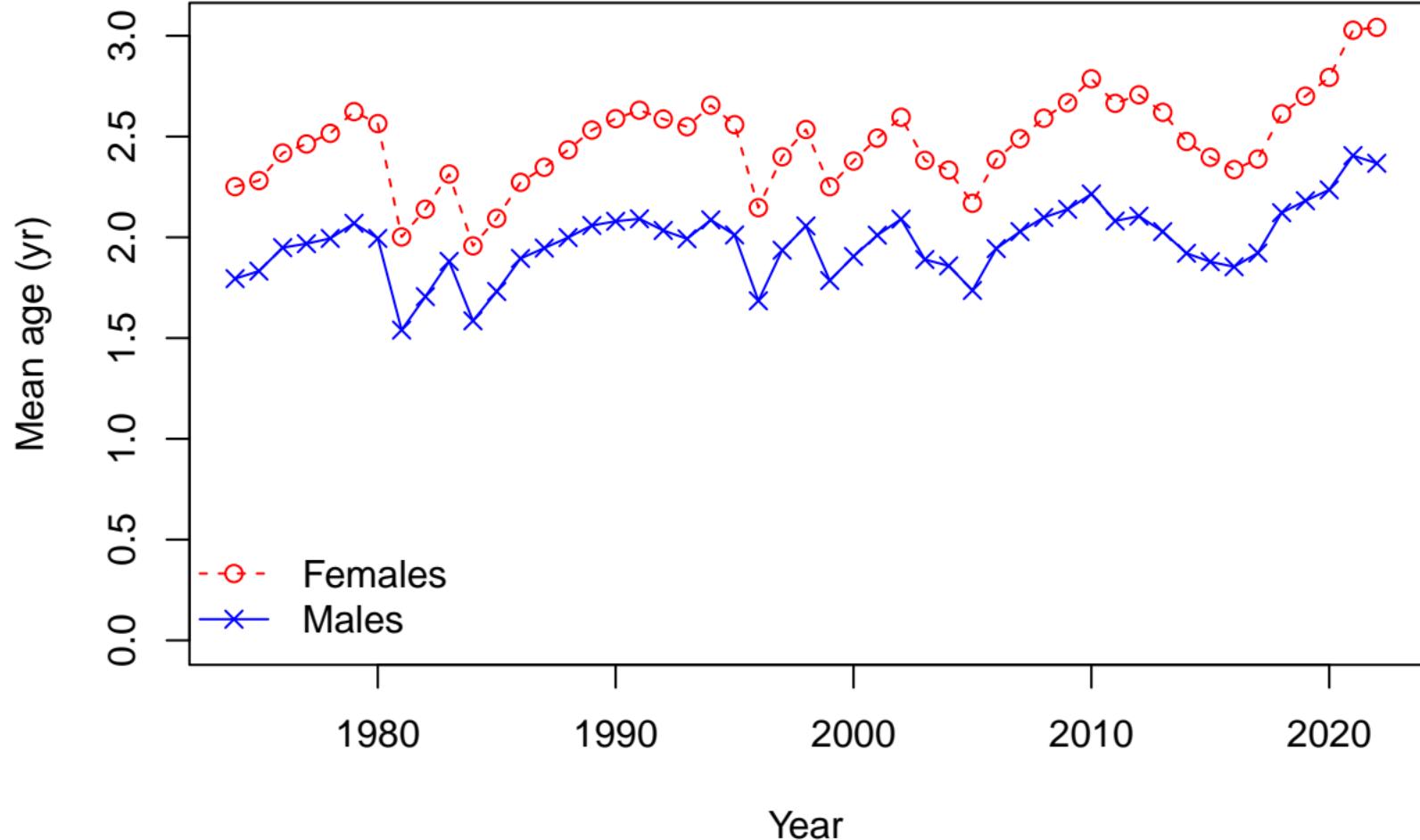
Year

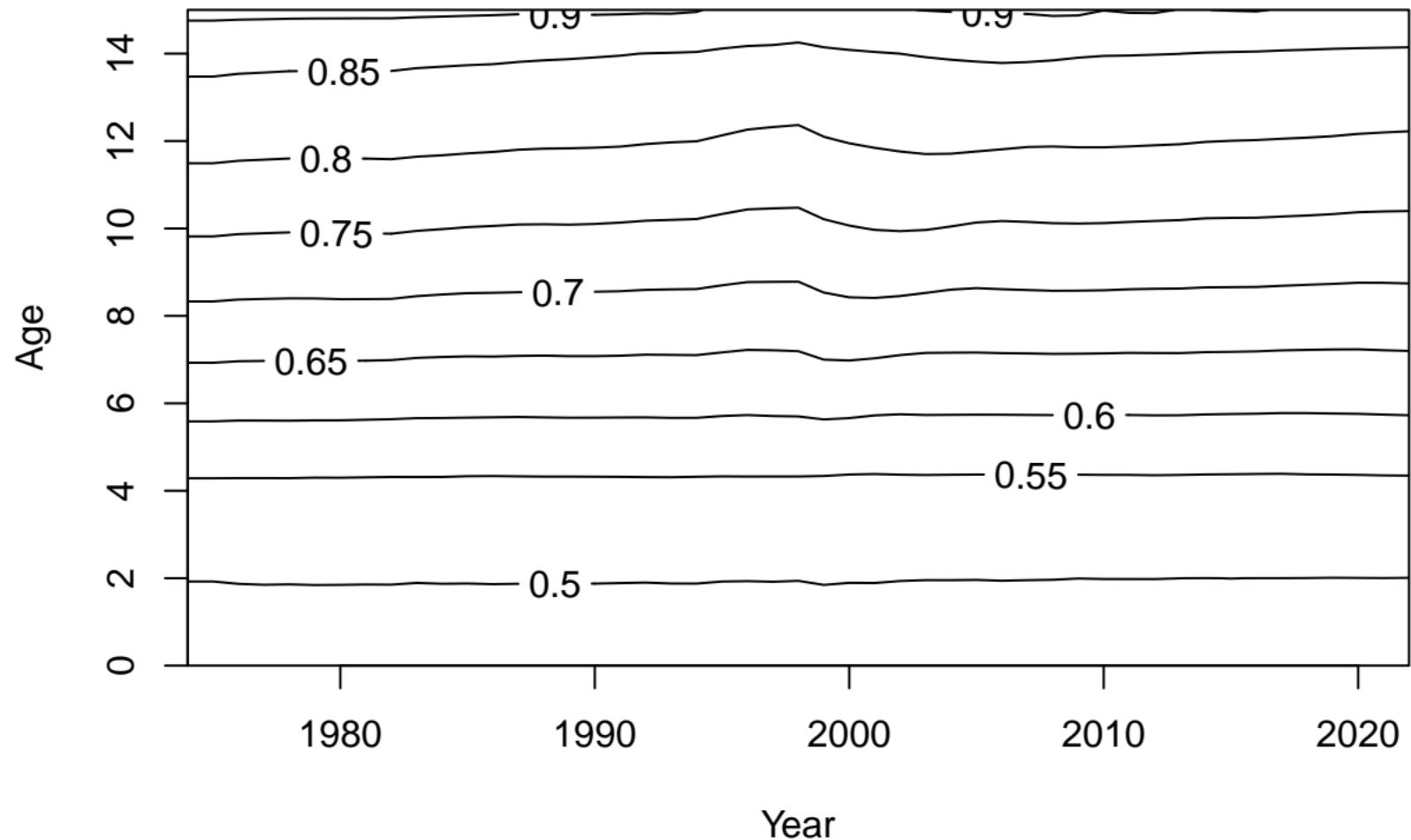


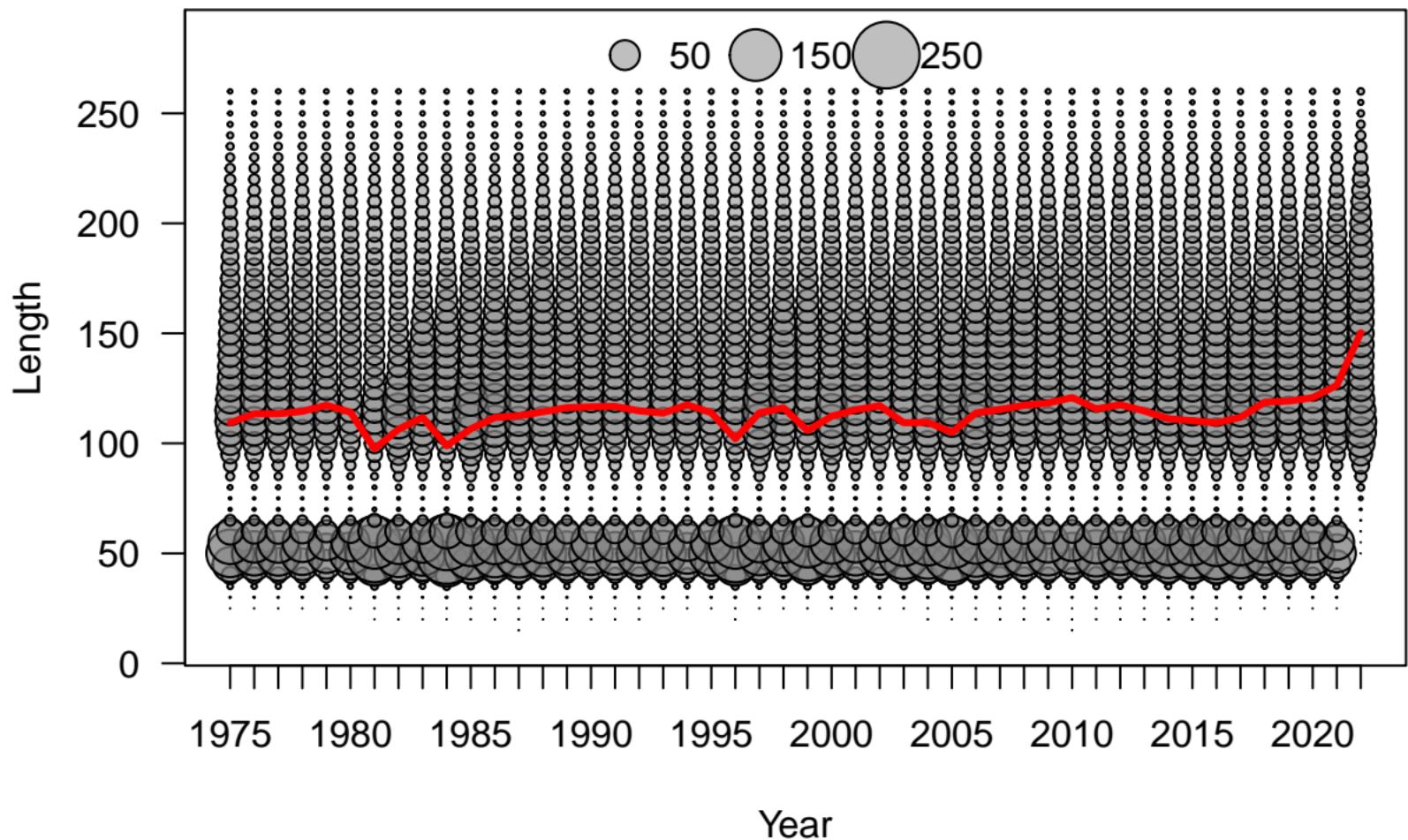


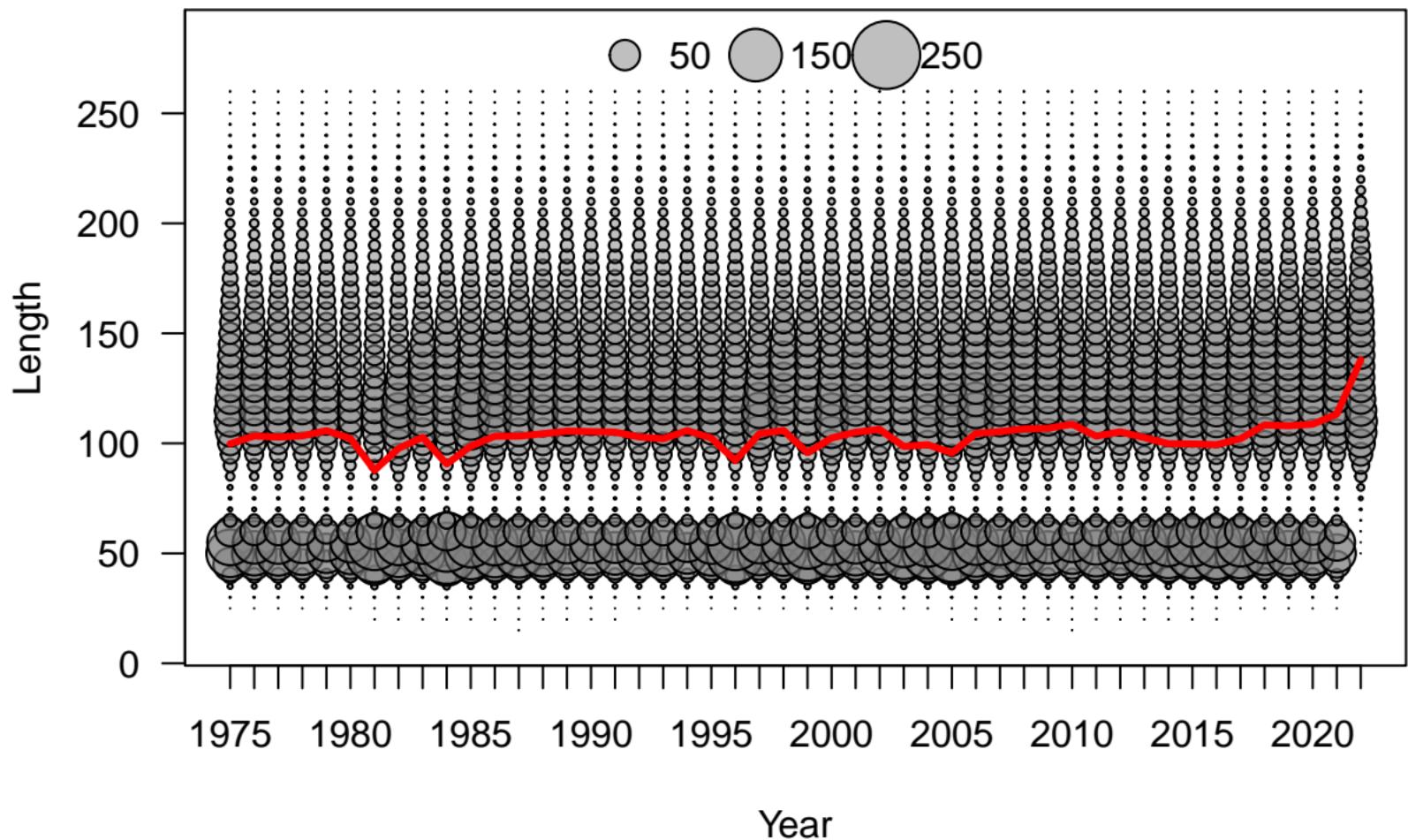


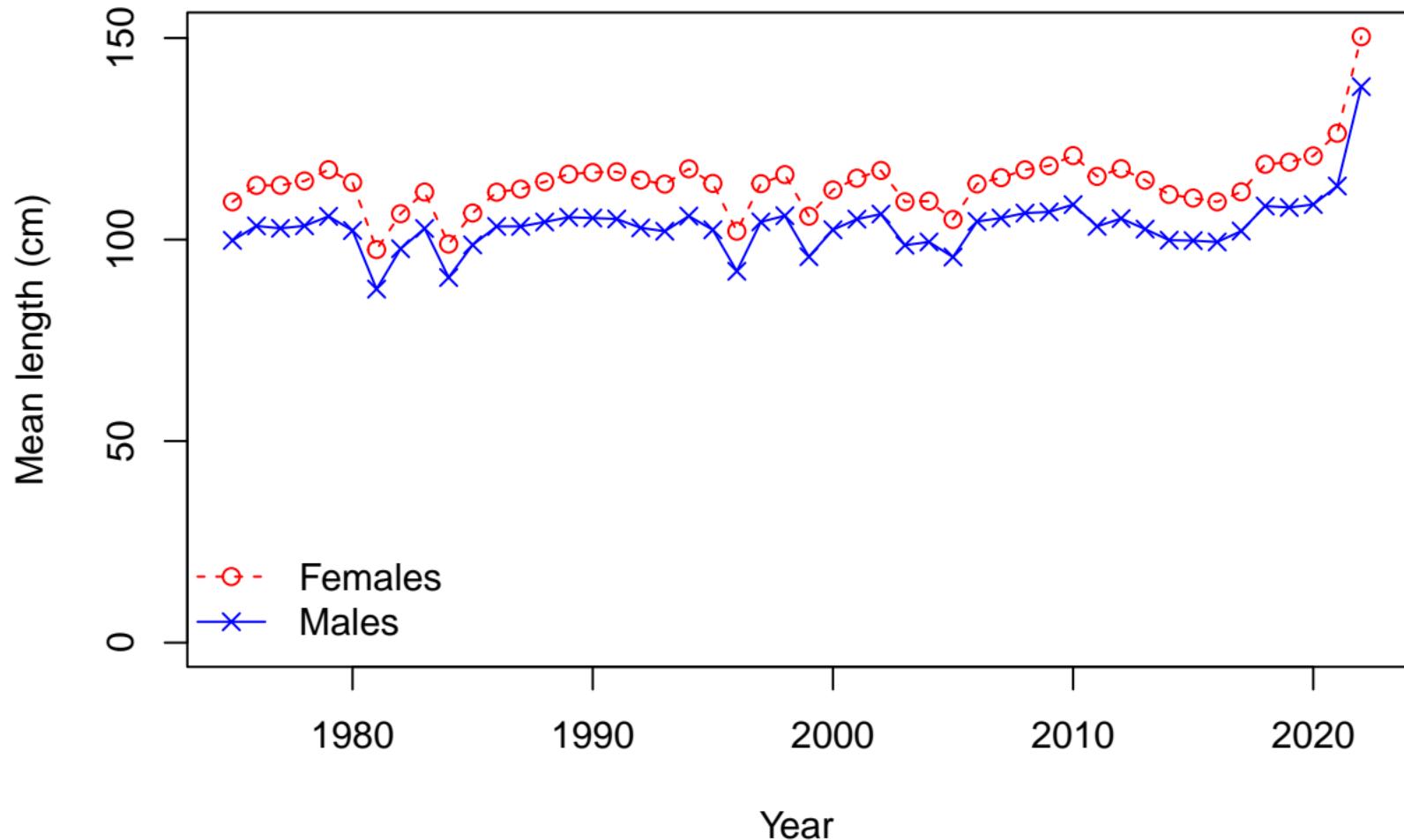


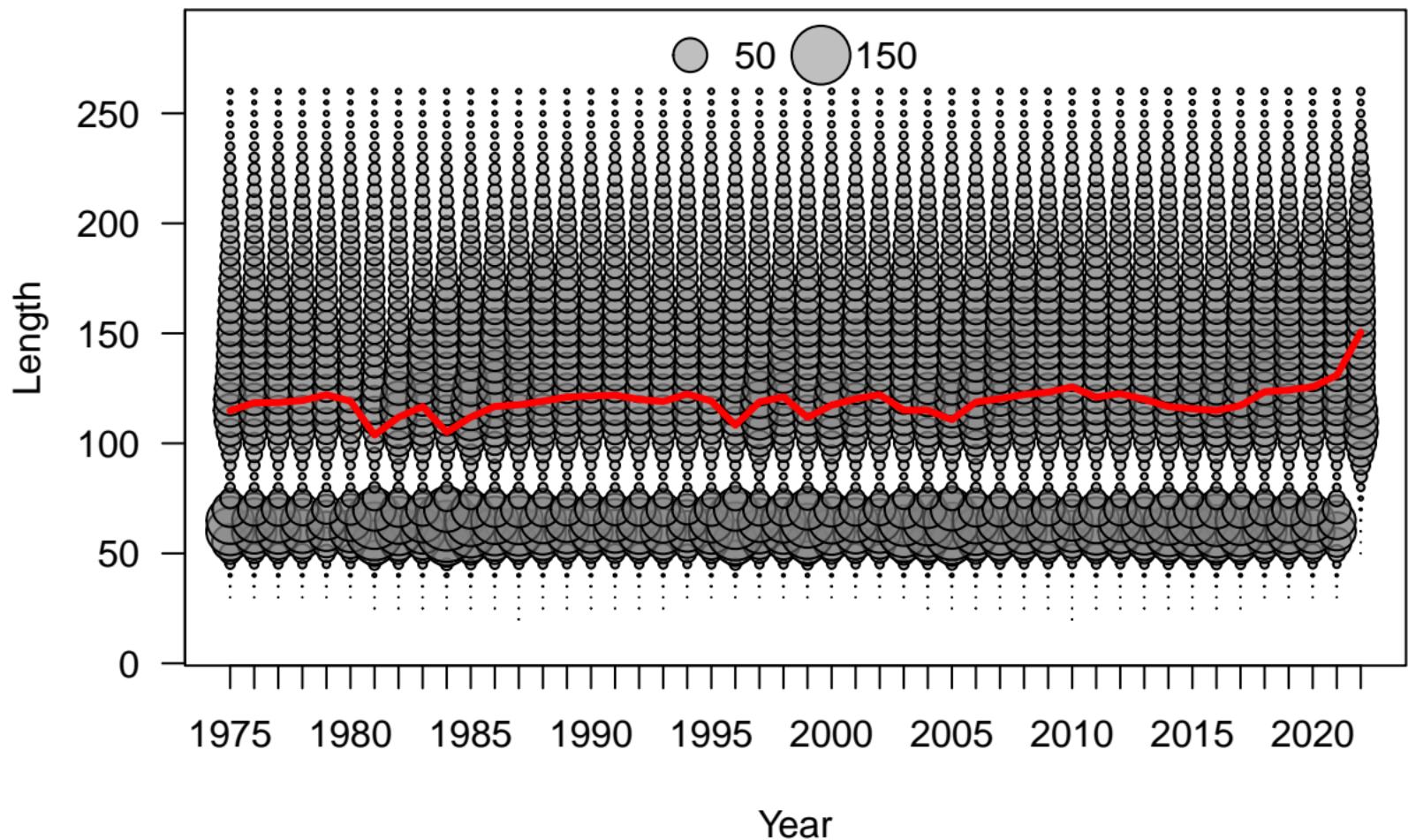


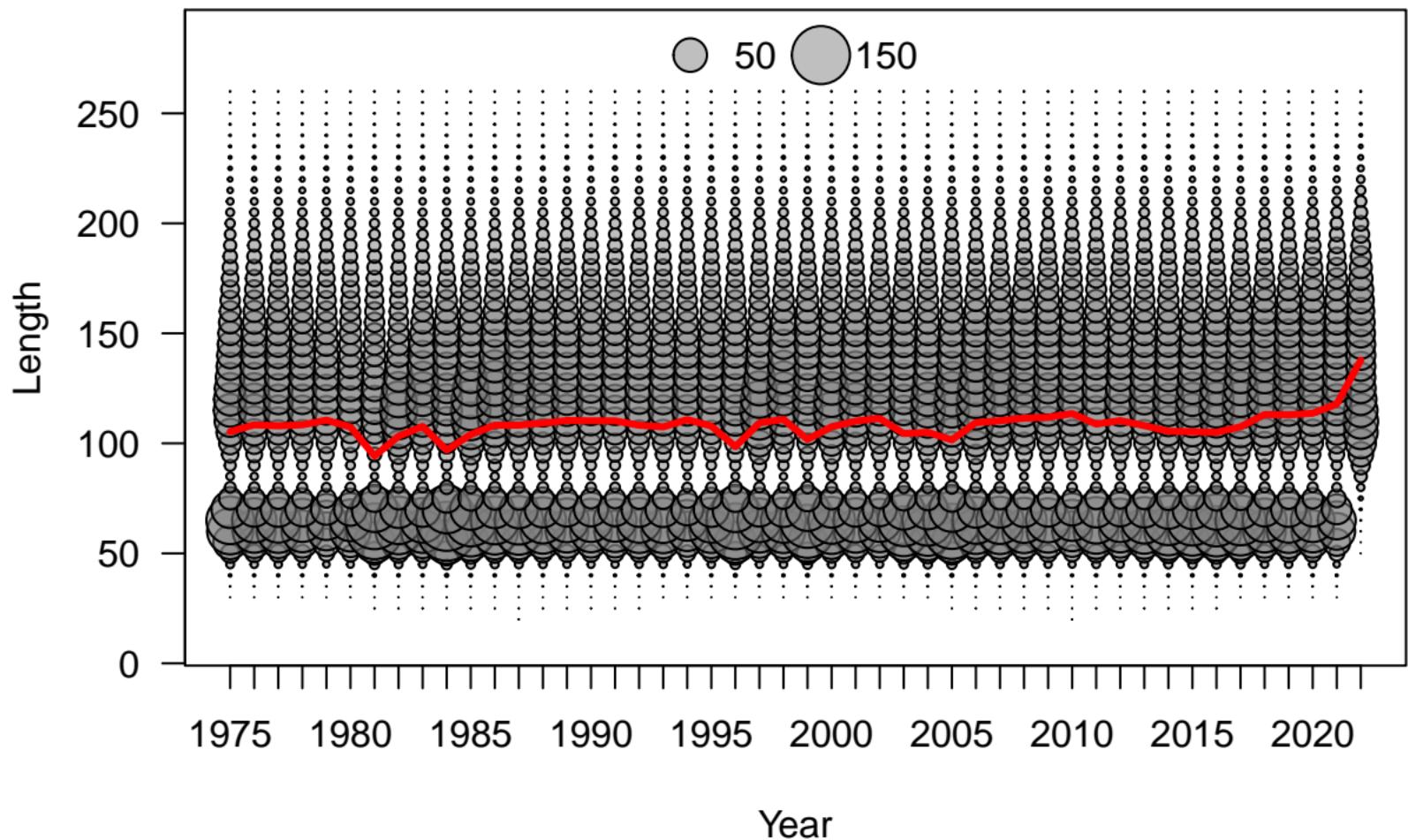


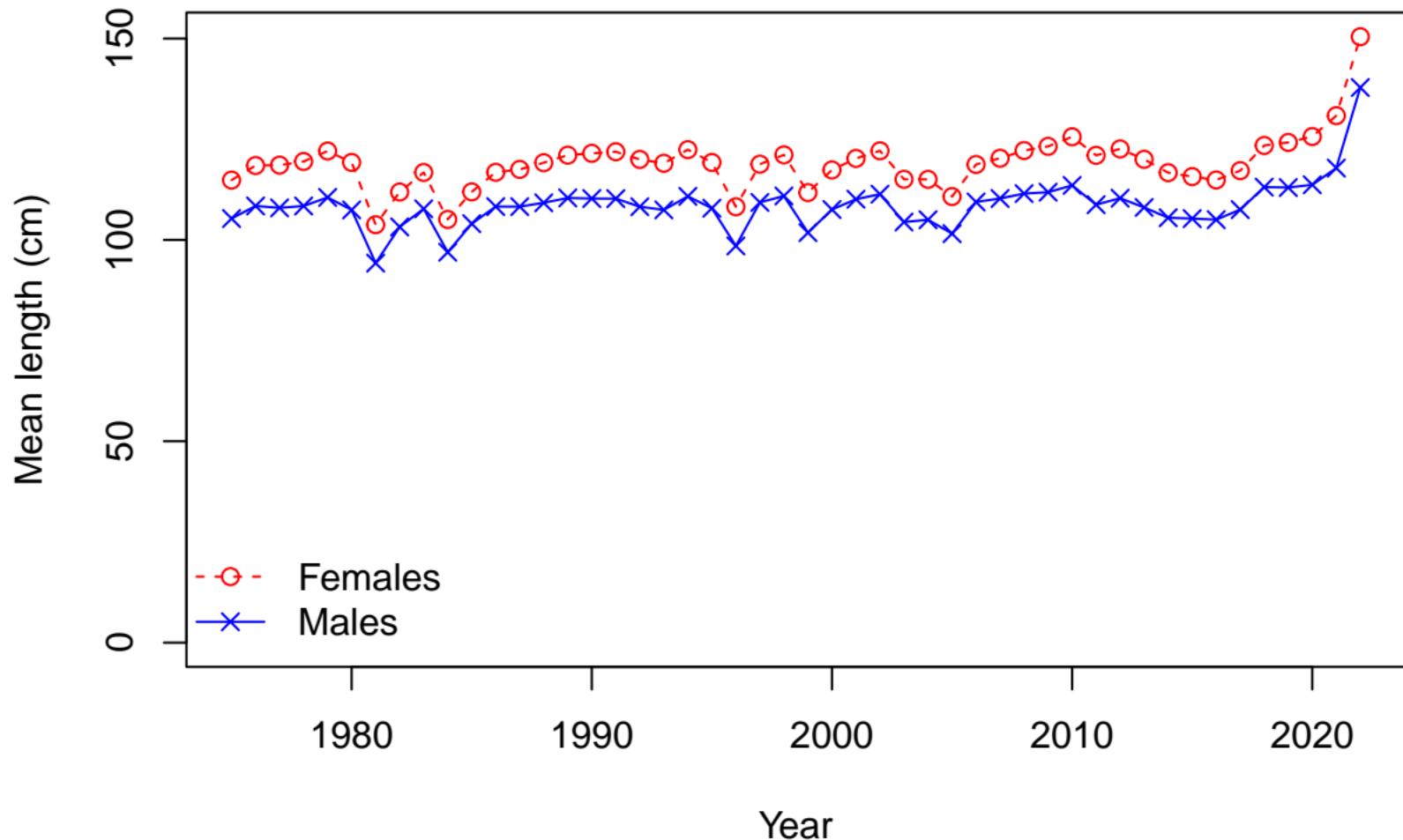


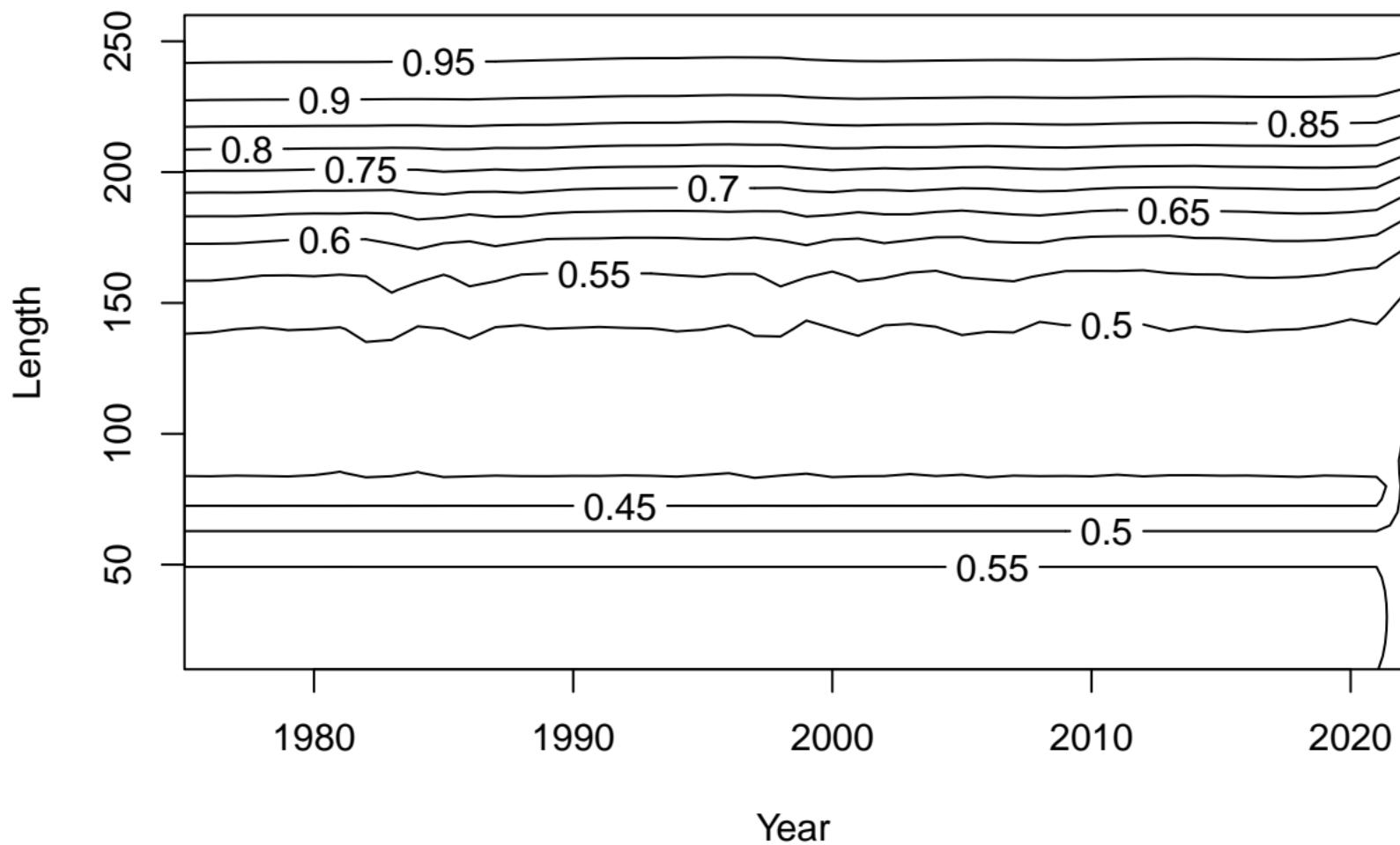


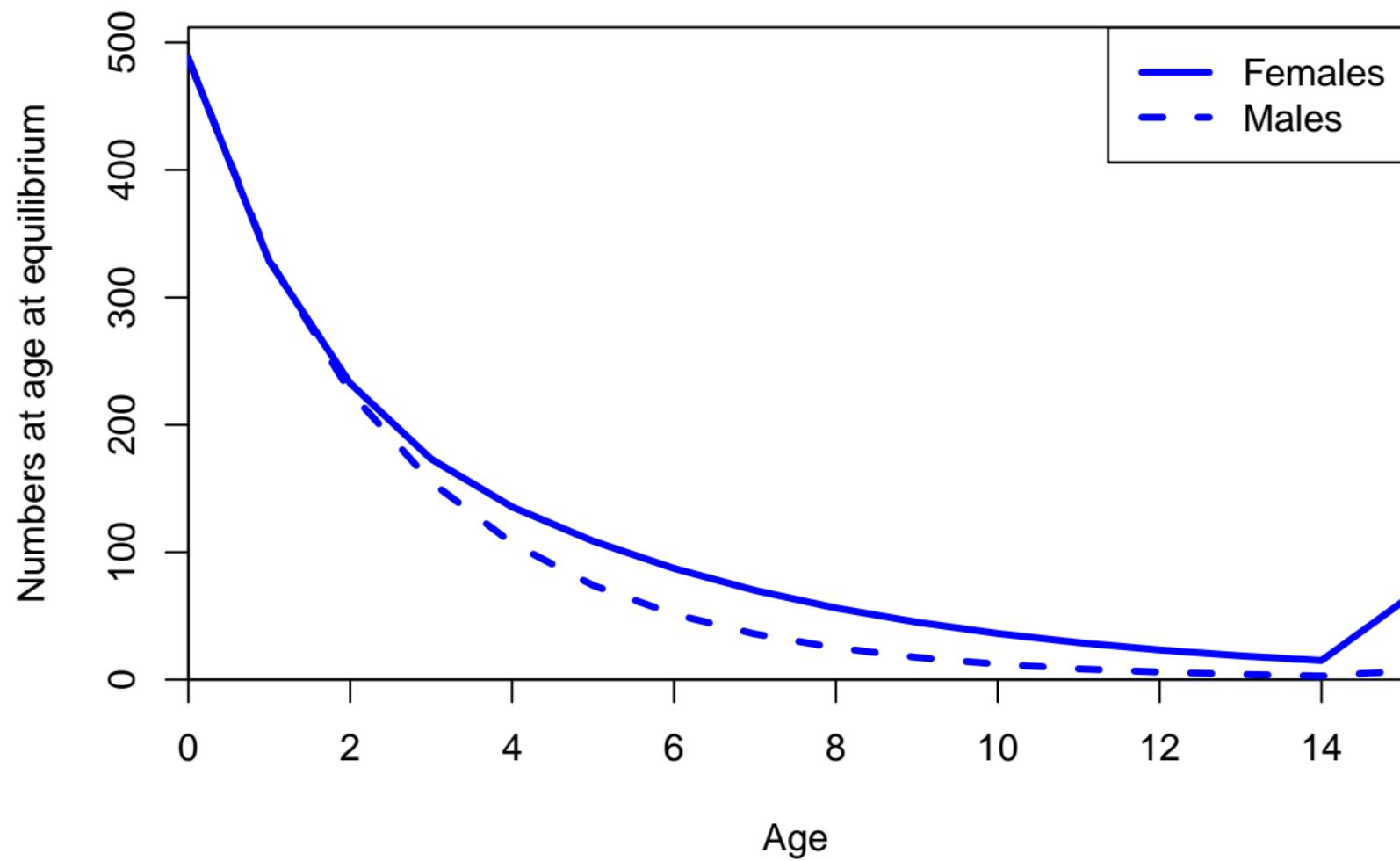




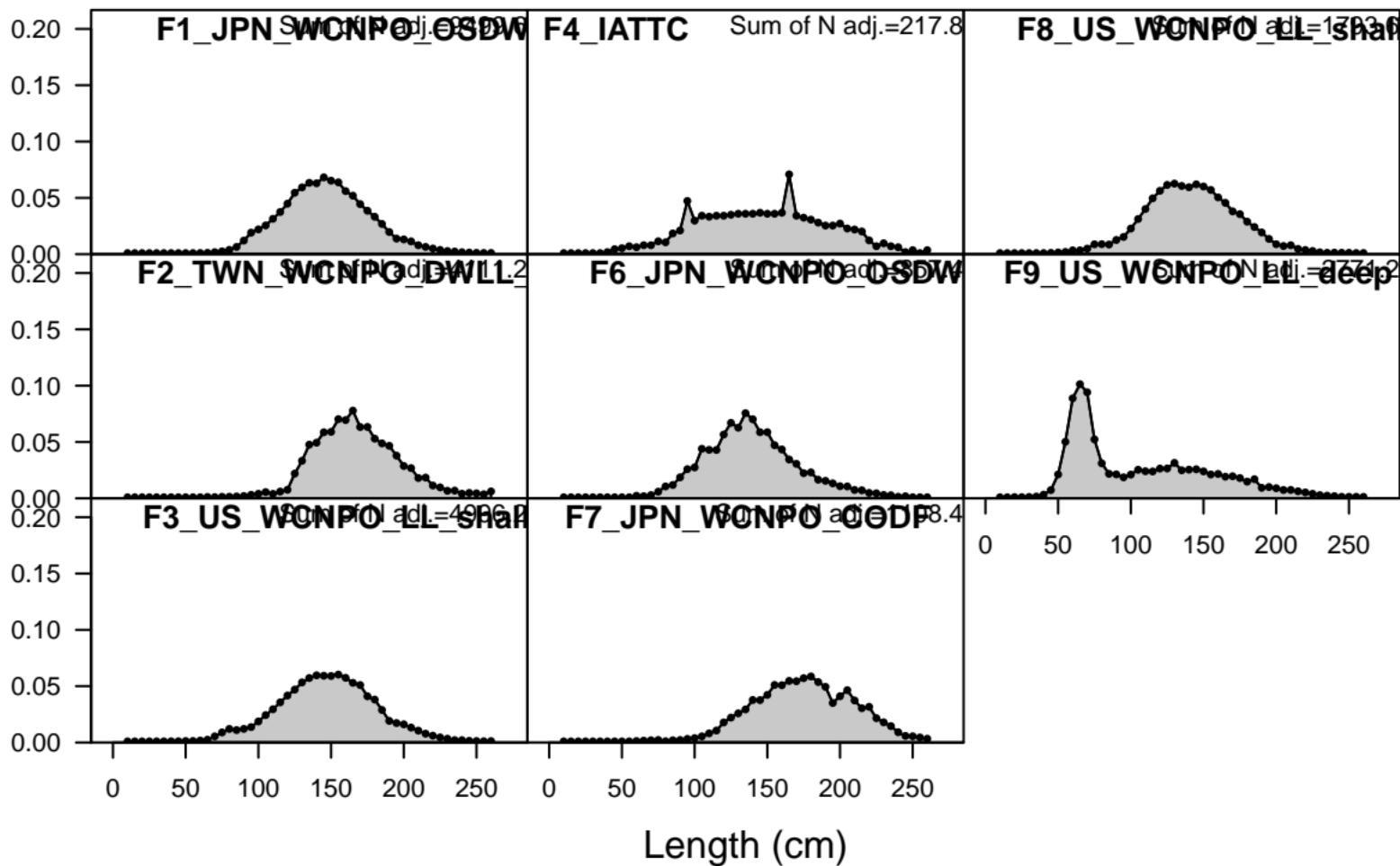


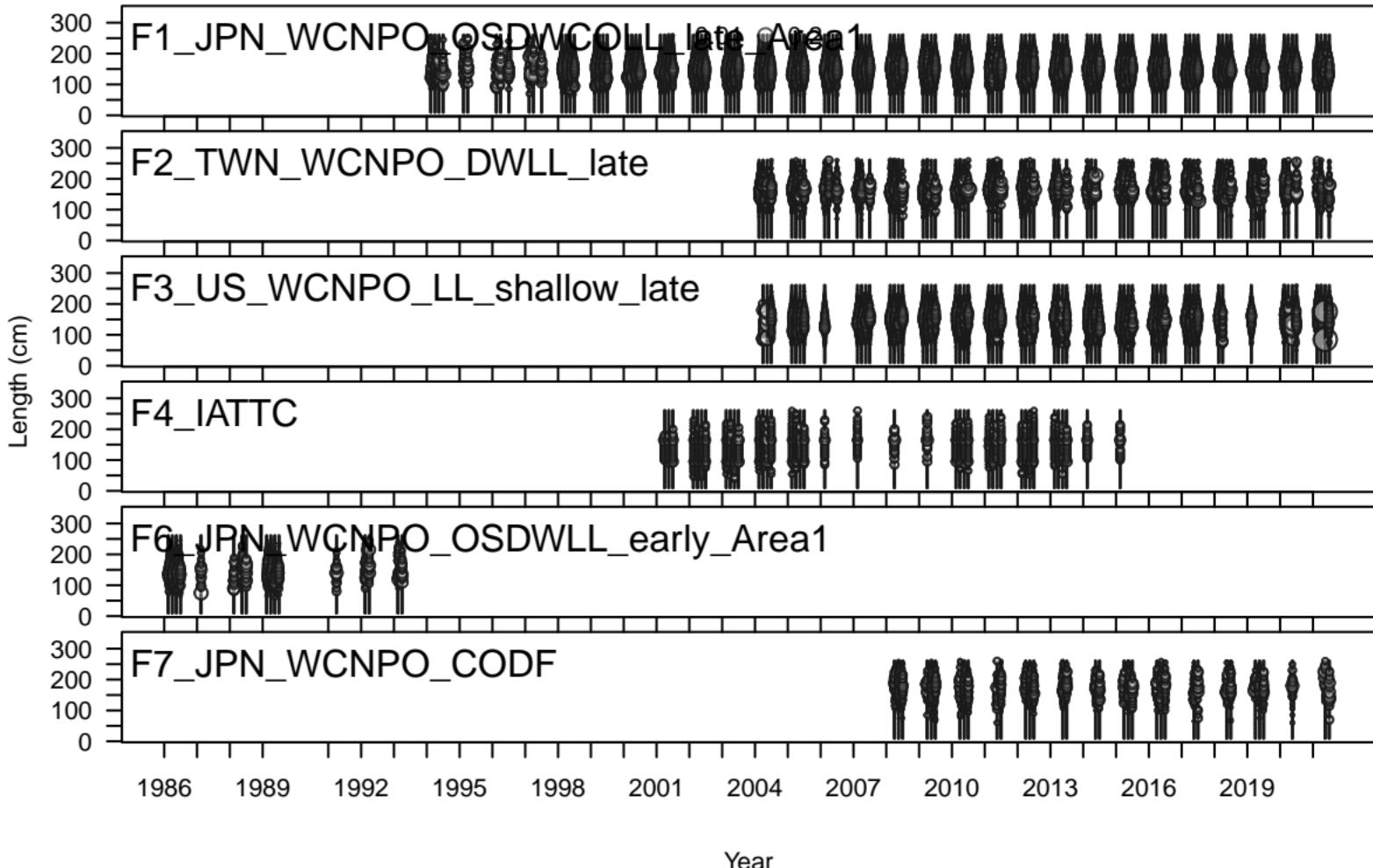


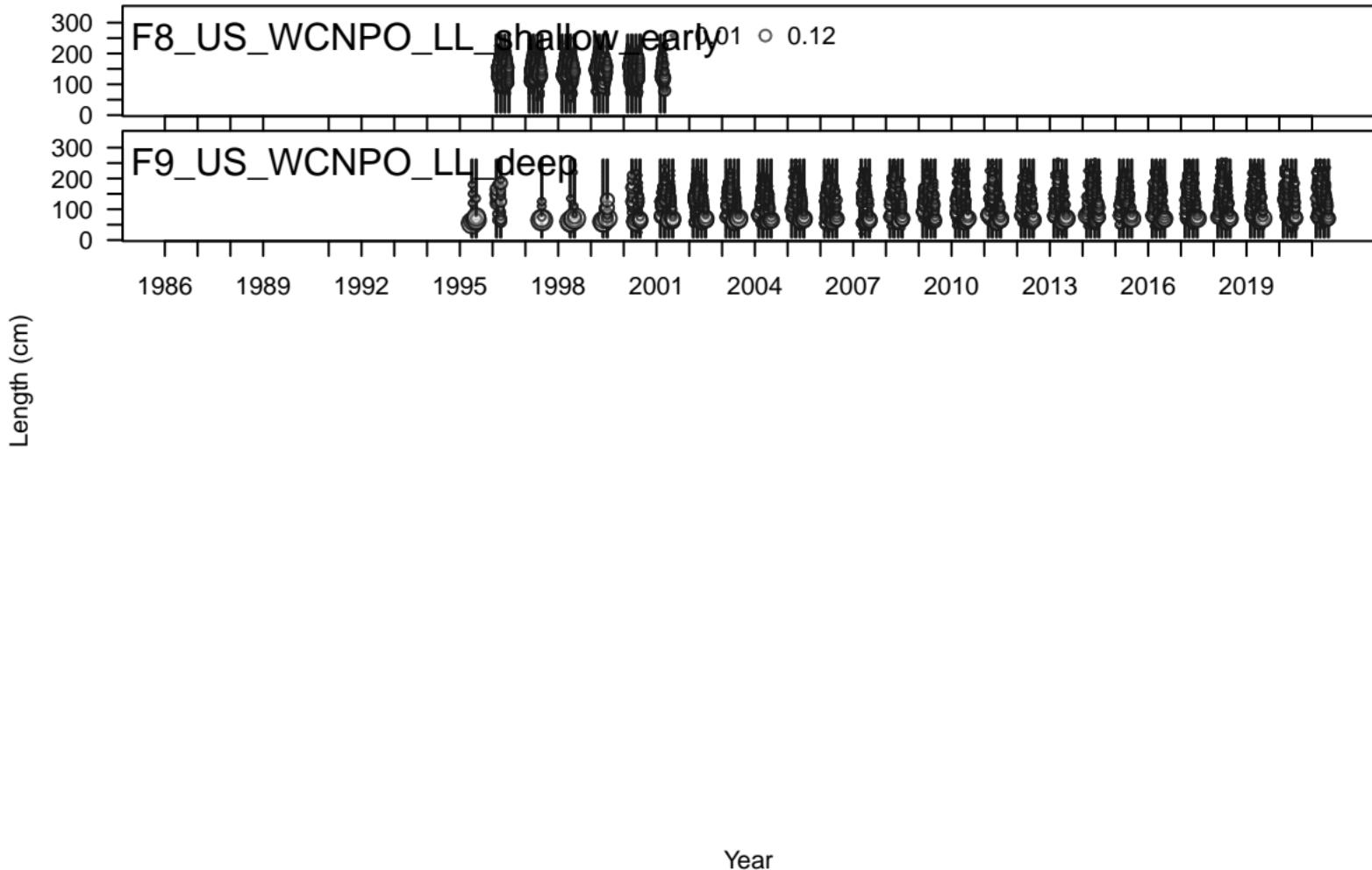




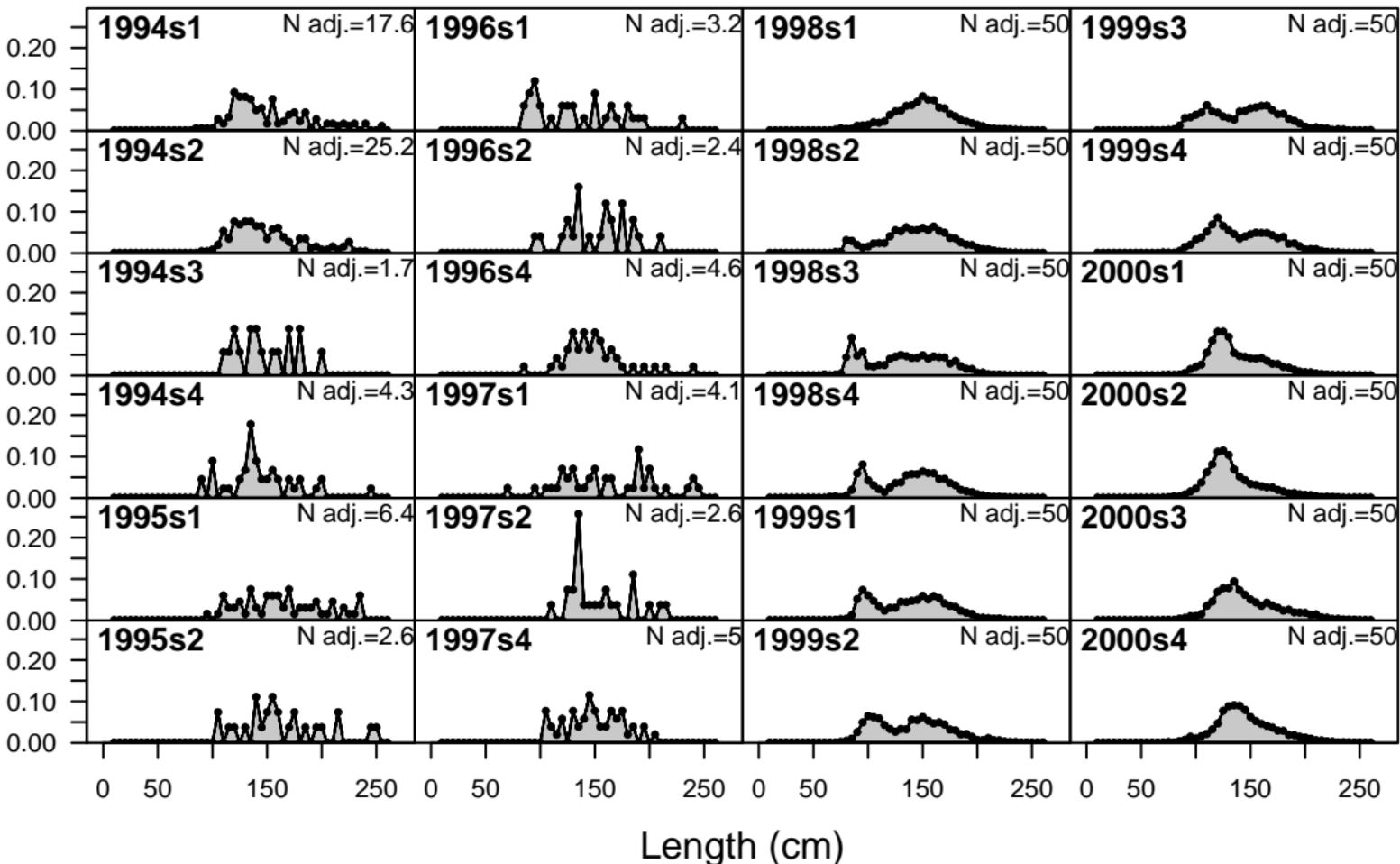
Proportion



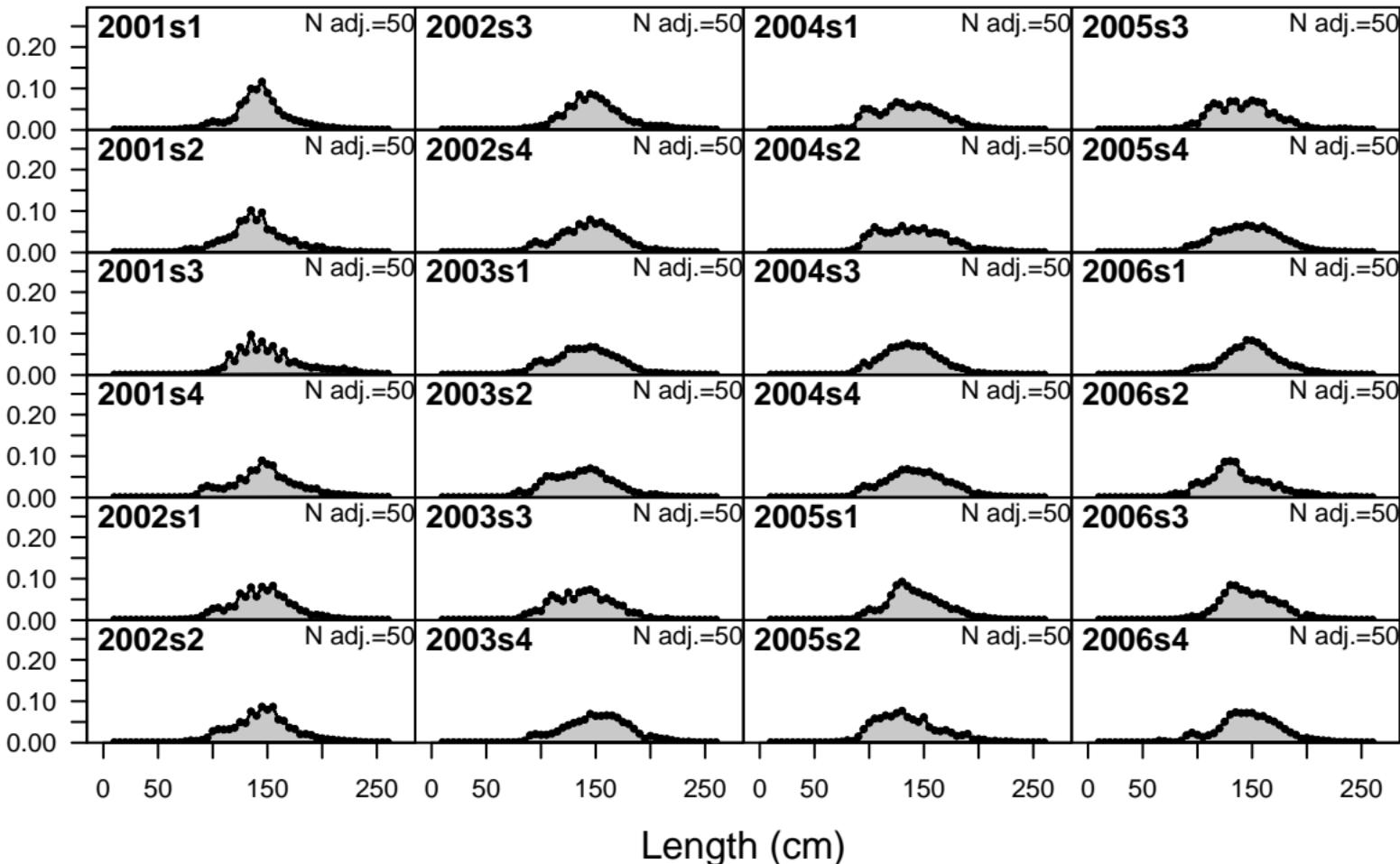




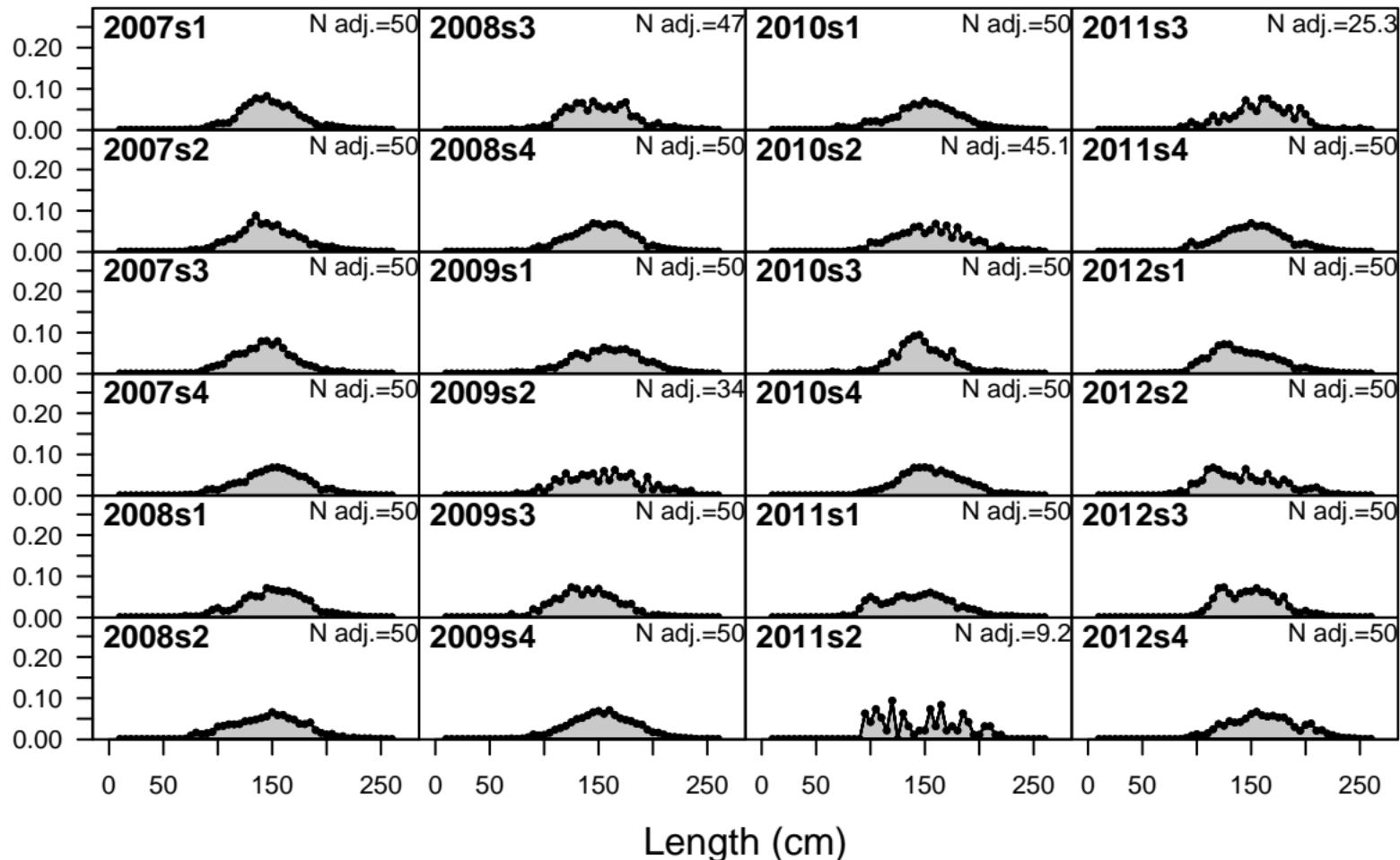
Proportion



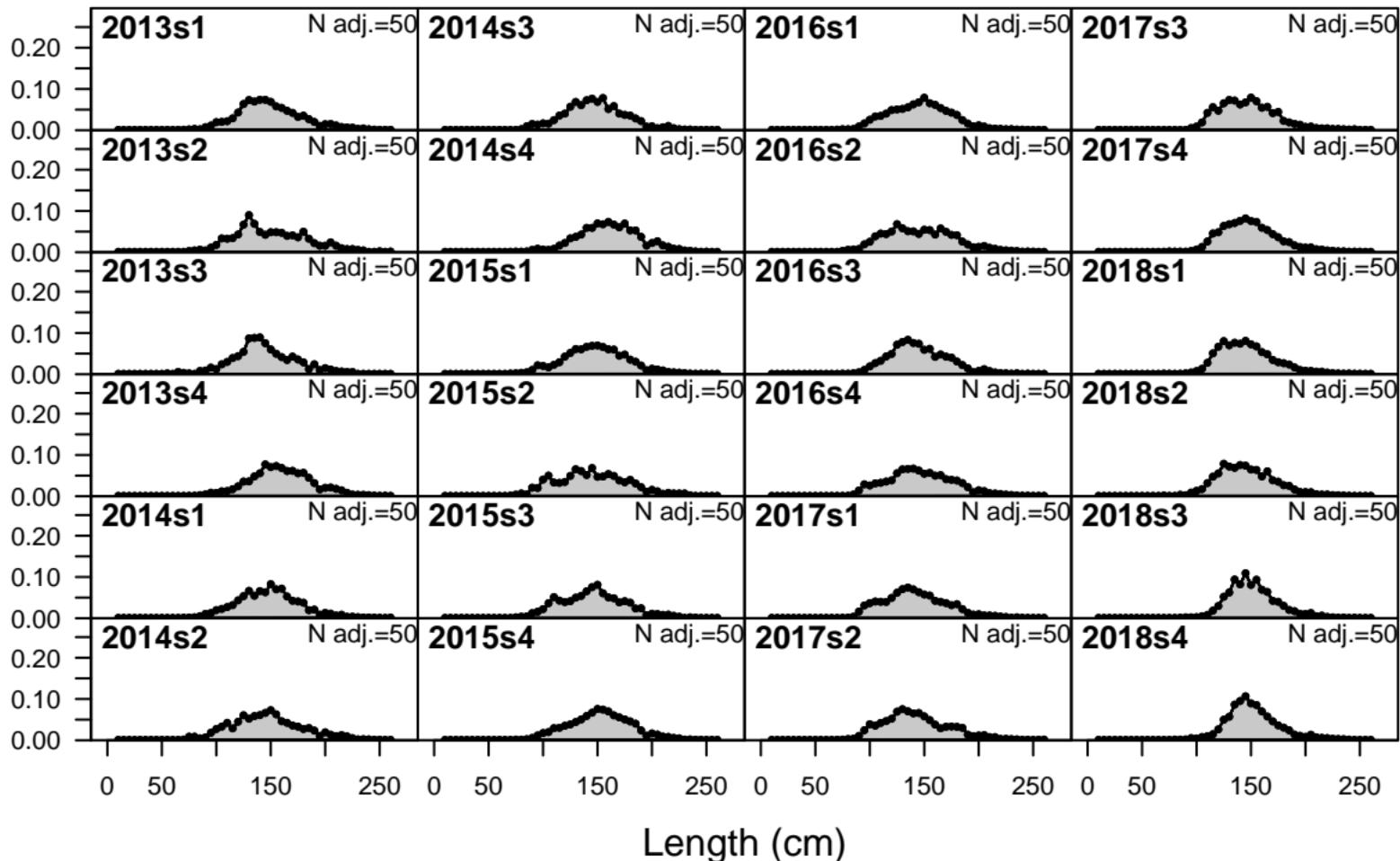
Proportion



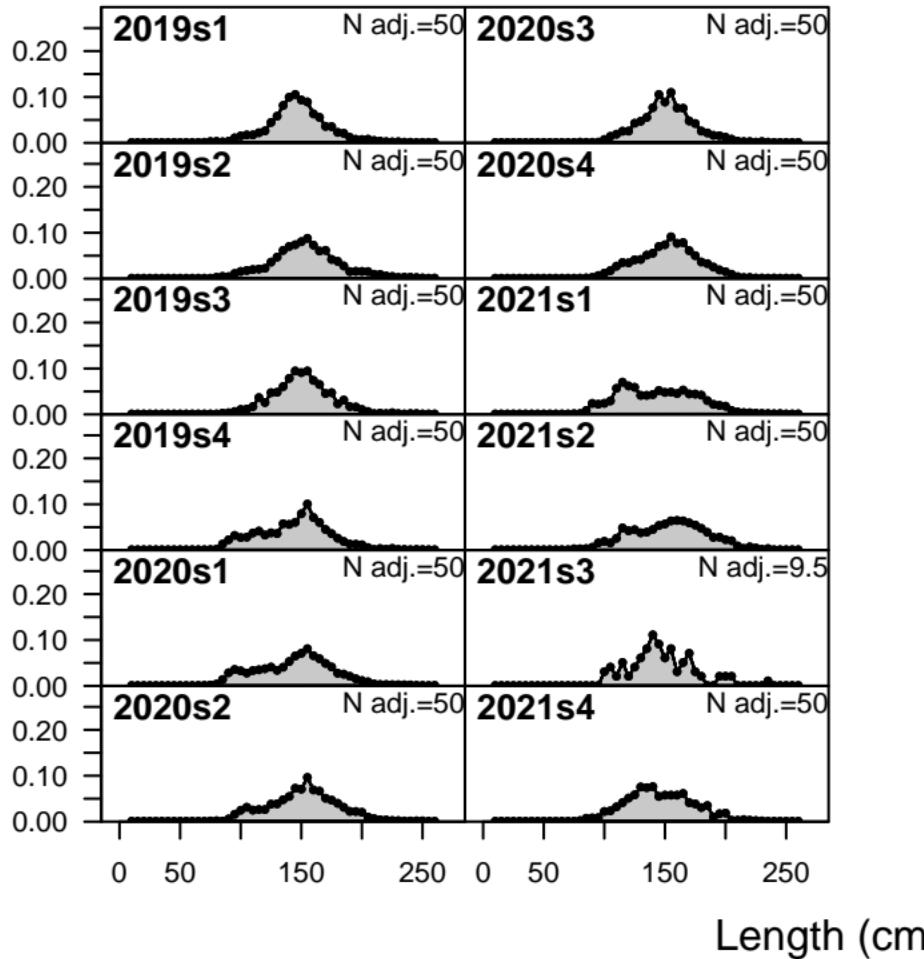
Proportion

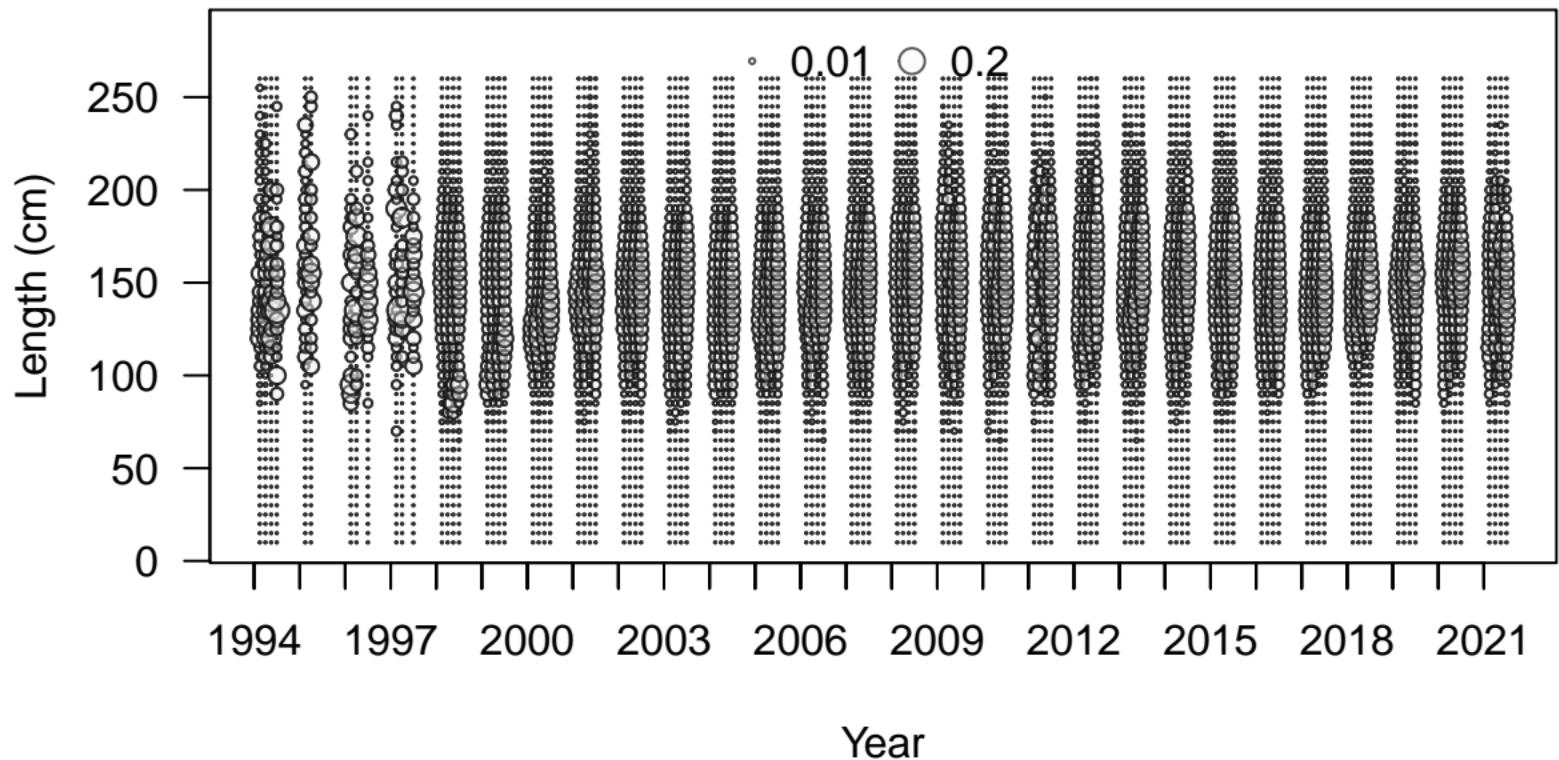


Proportion

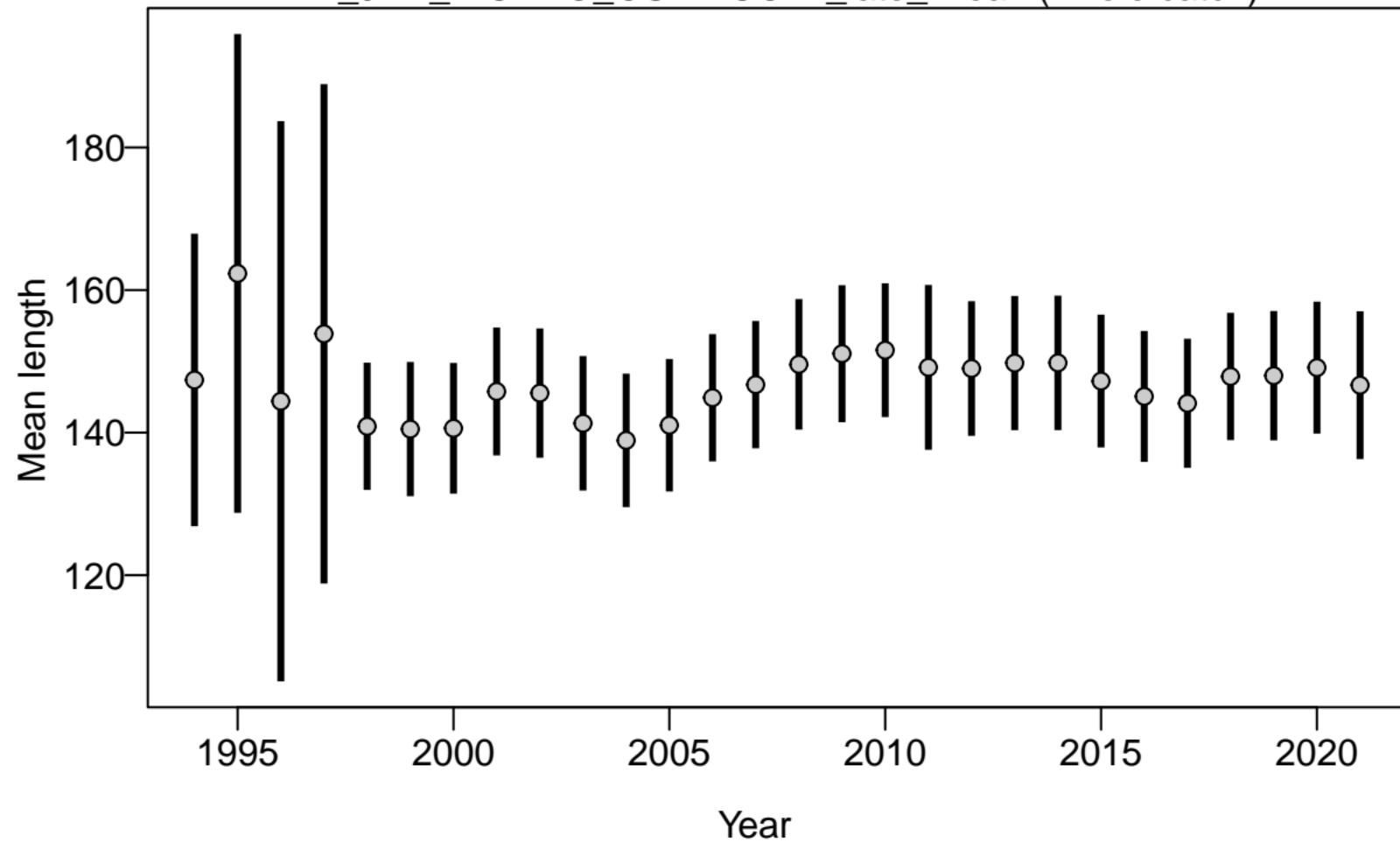


Proportion

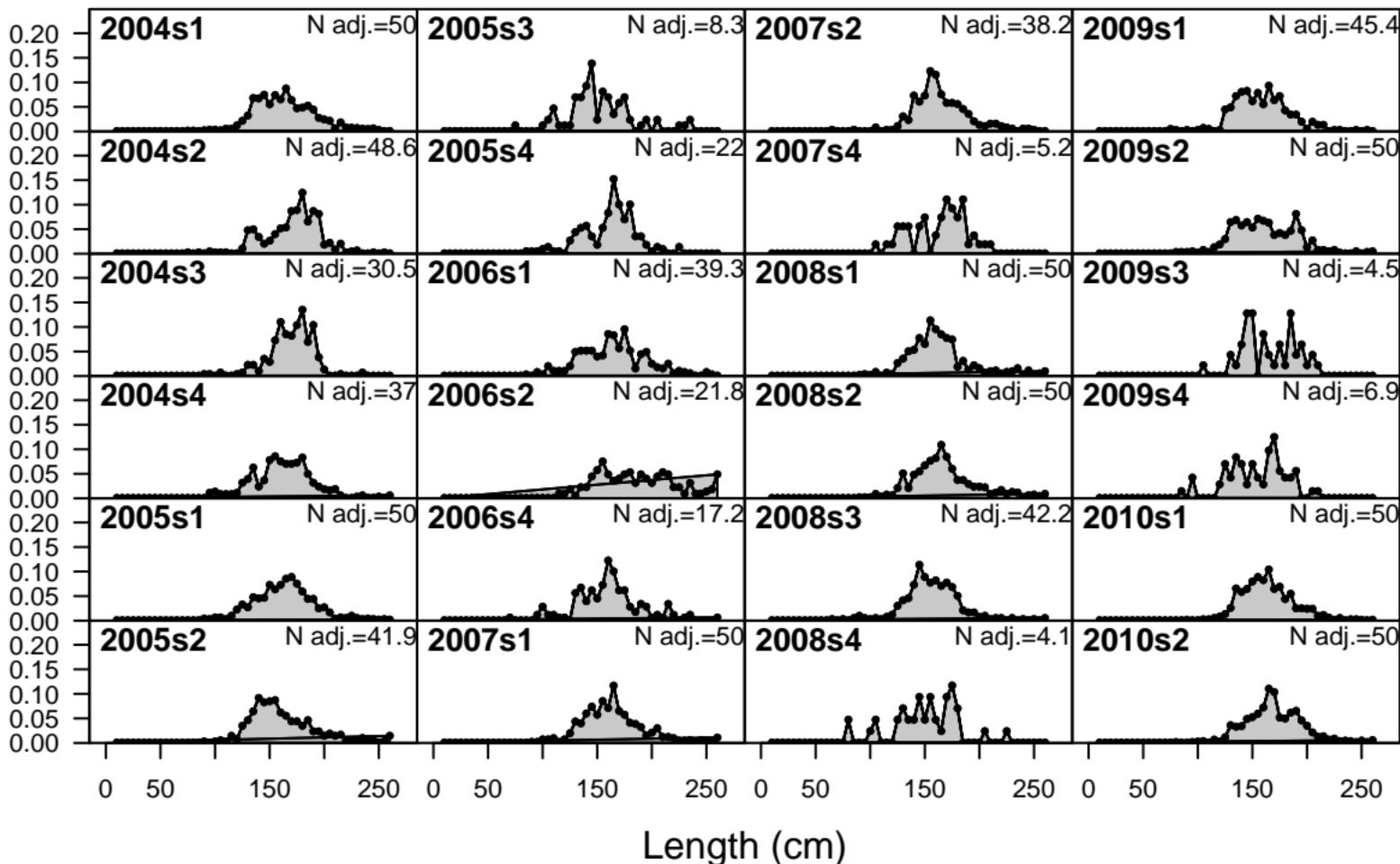




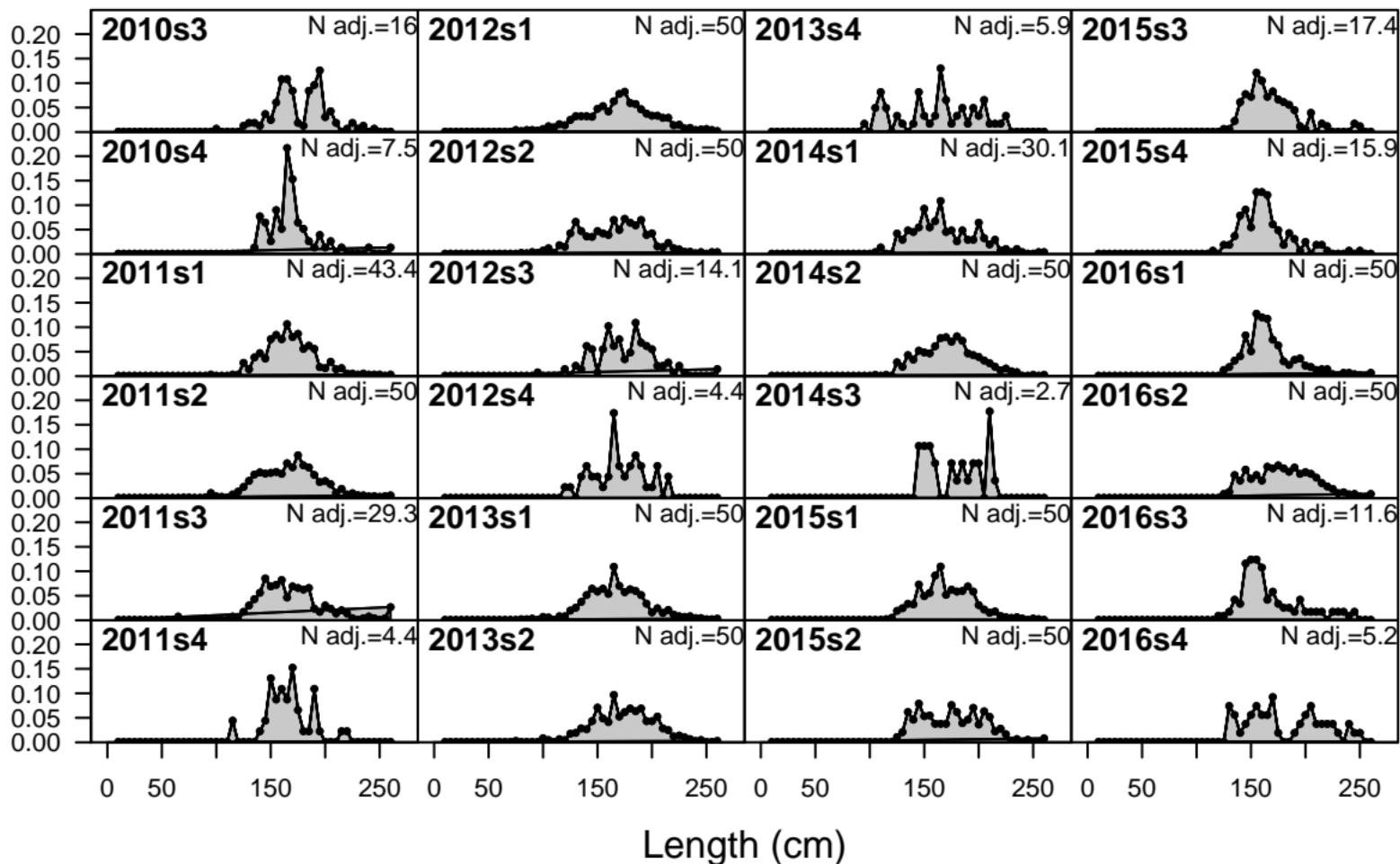
F1_JPN_WCNPO OSDWCOLL late Area1 (whole catch)



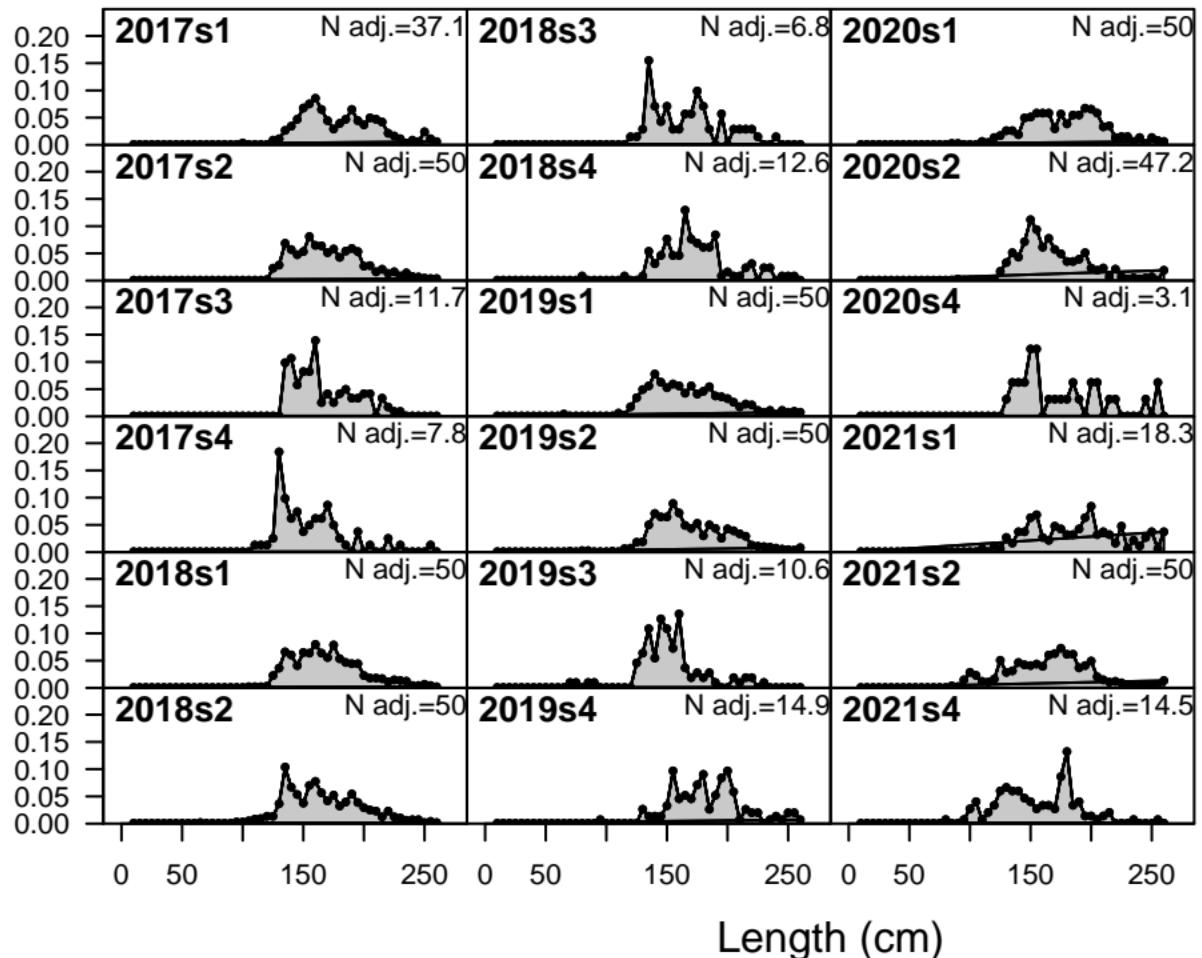
Proportion

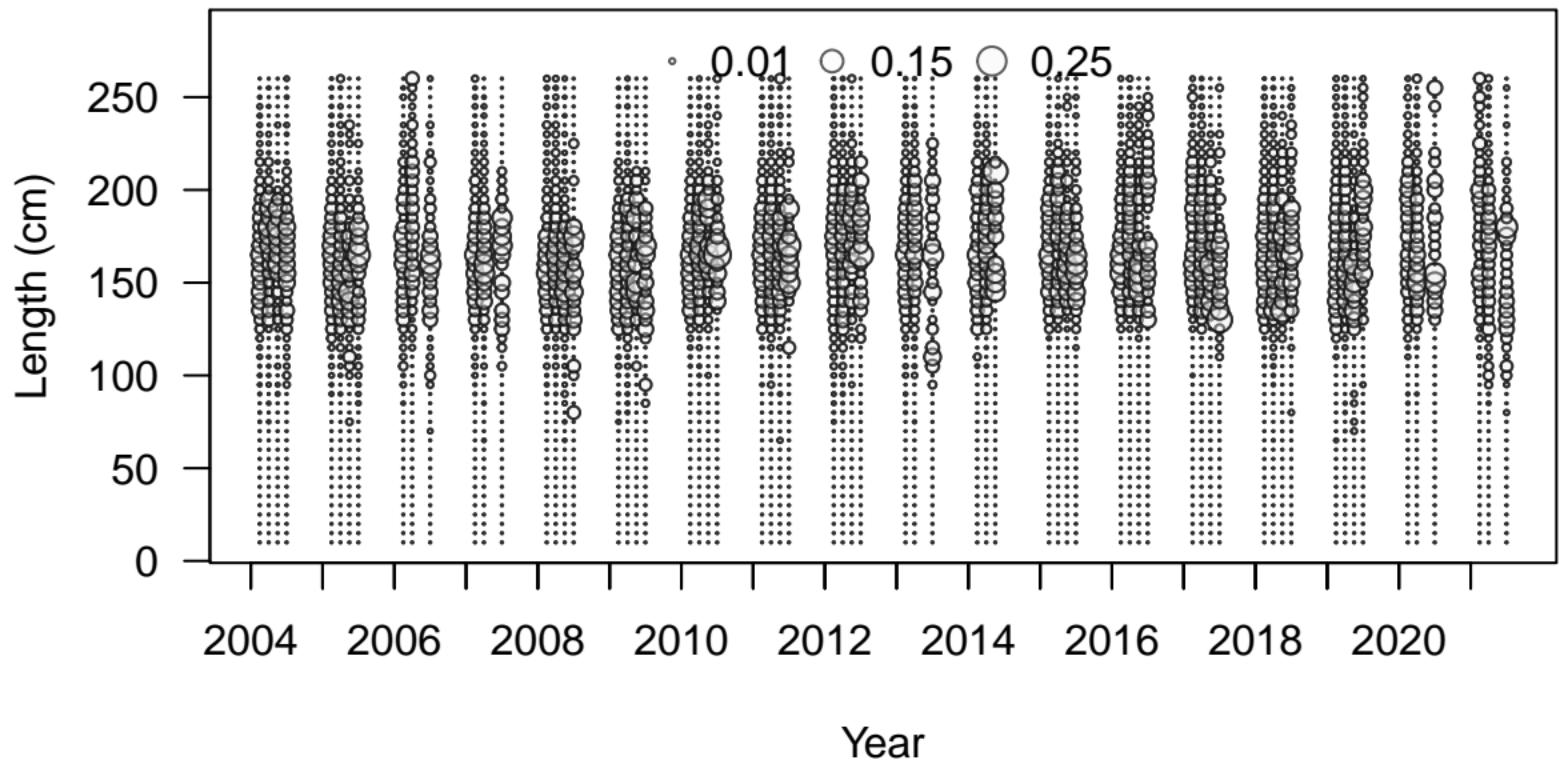


Proportion

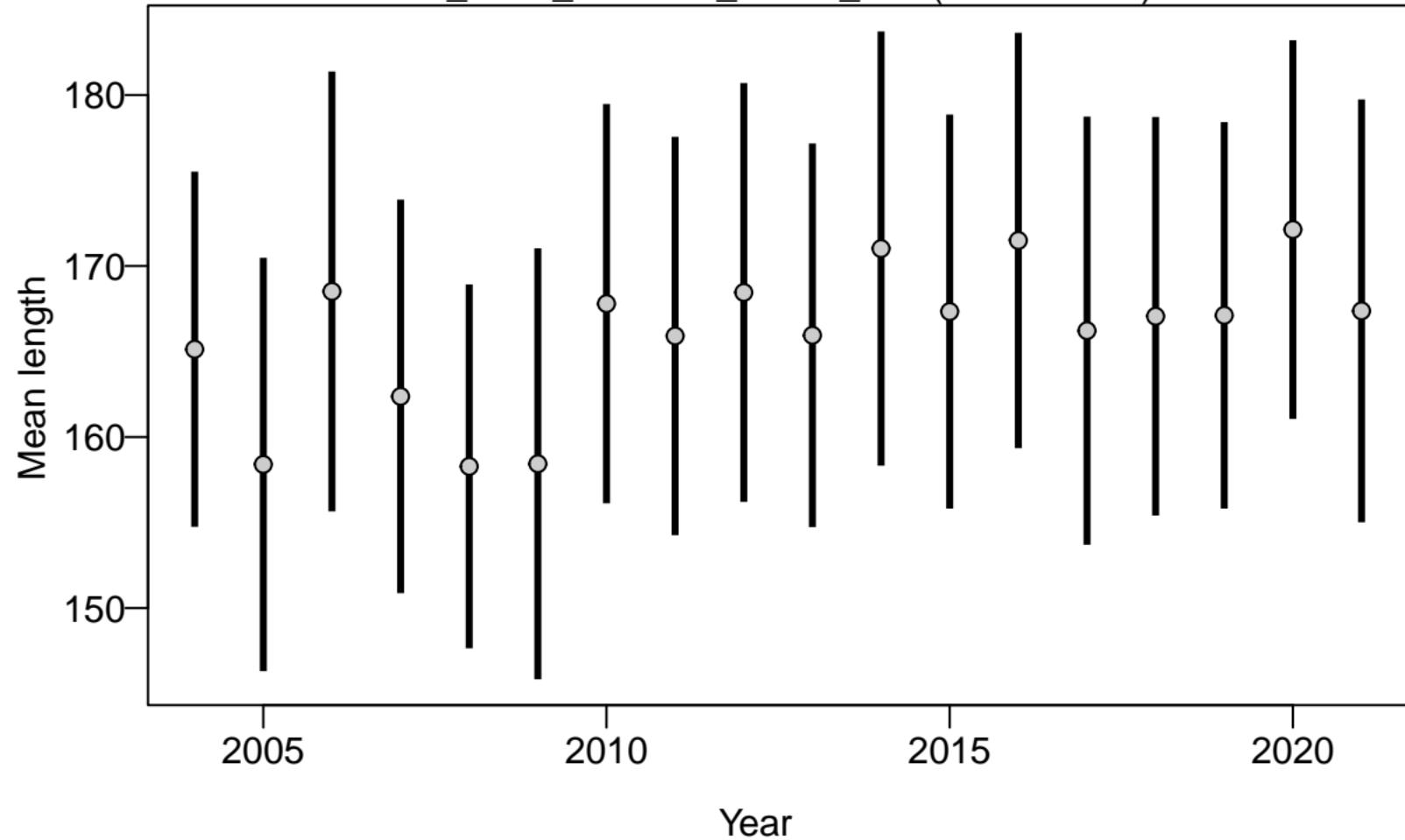


Proportion

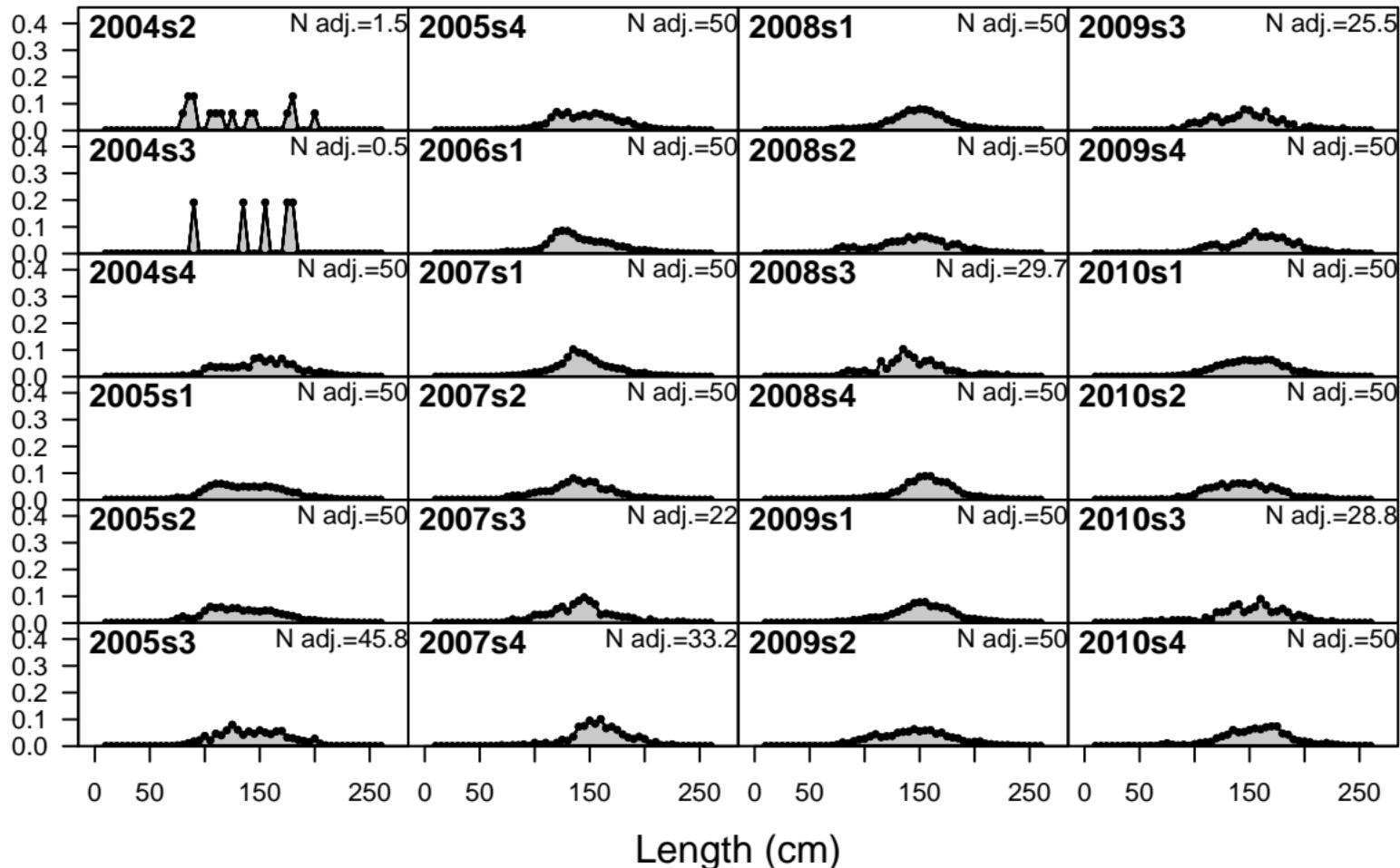




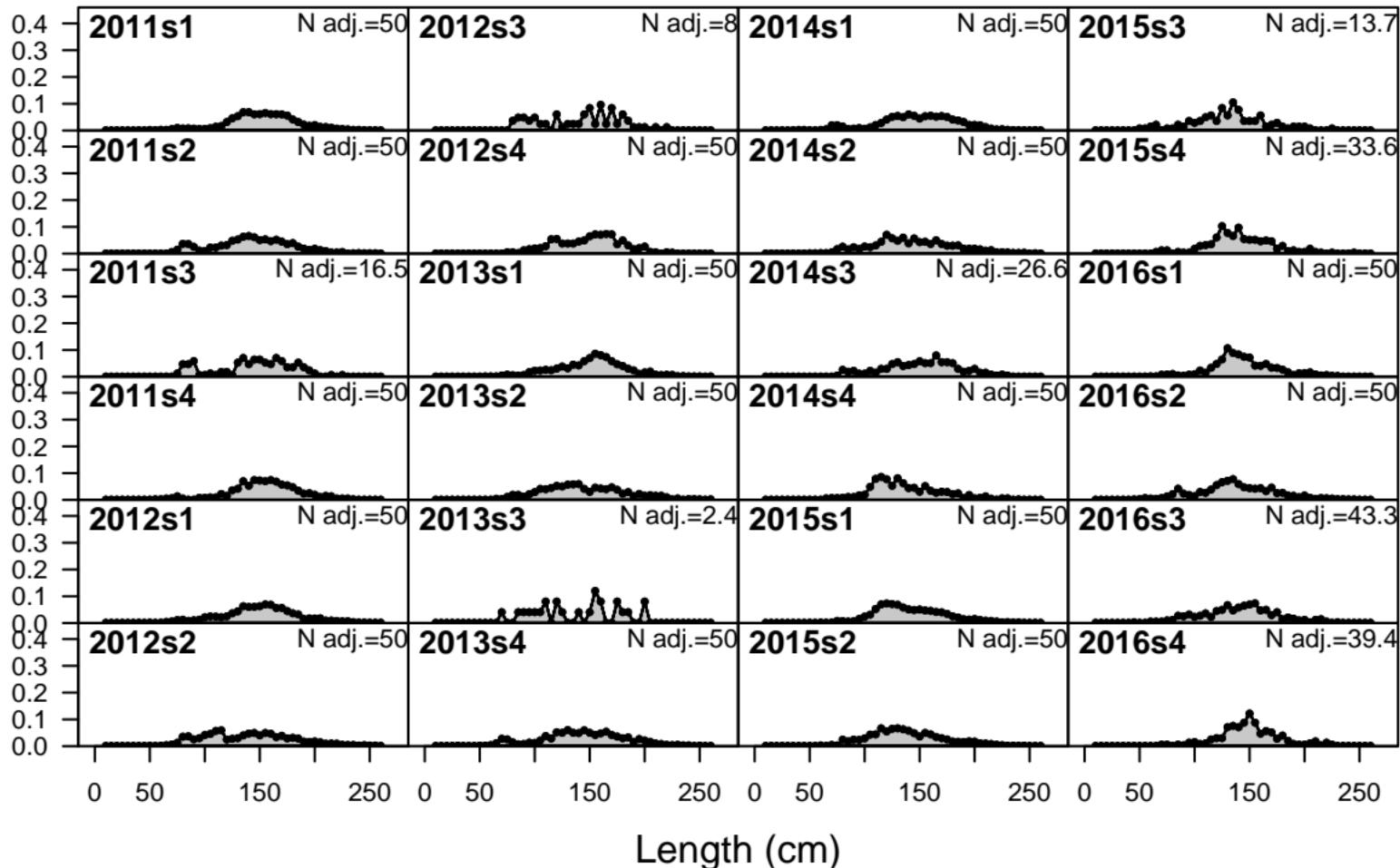
F2_TWN_WCNPO_DWLL_late (whole catch)



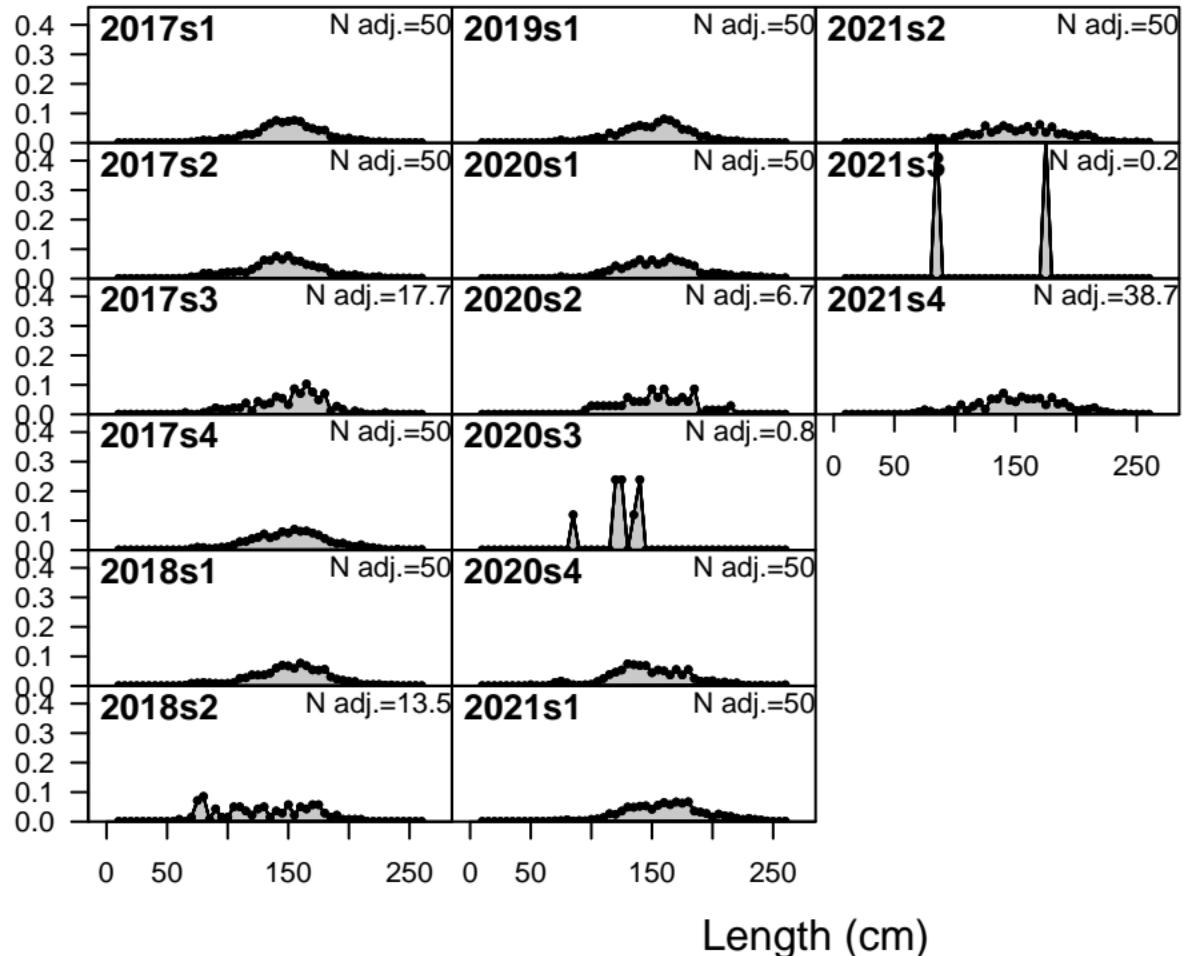
Proportion

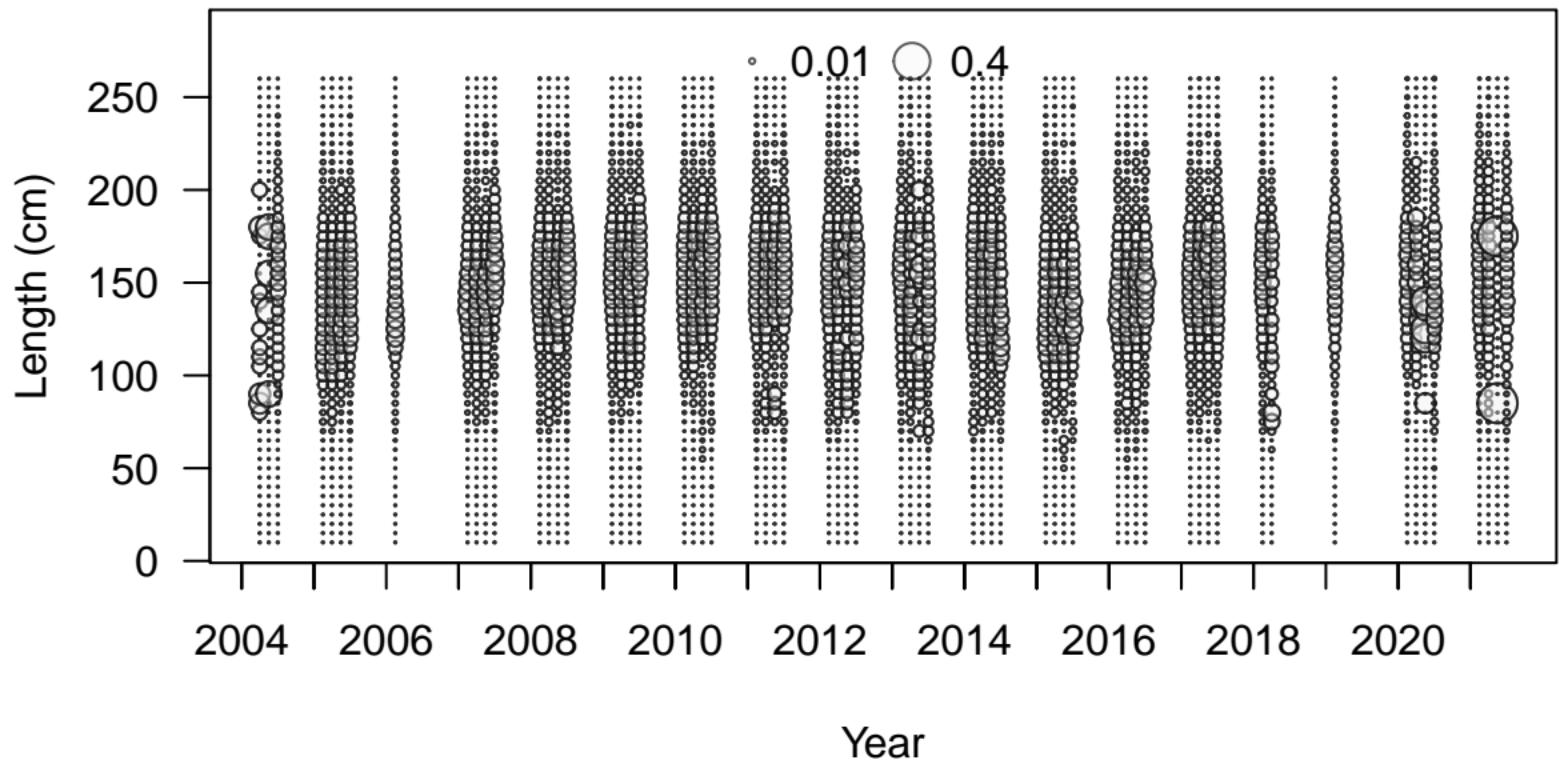


Proportion

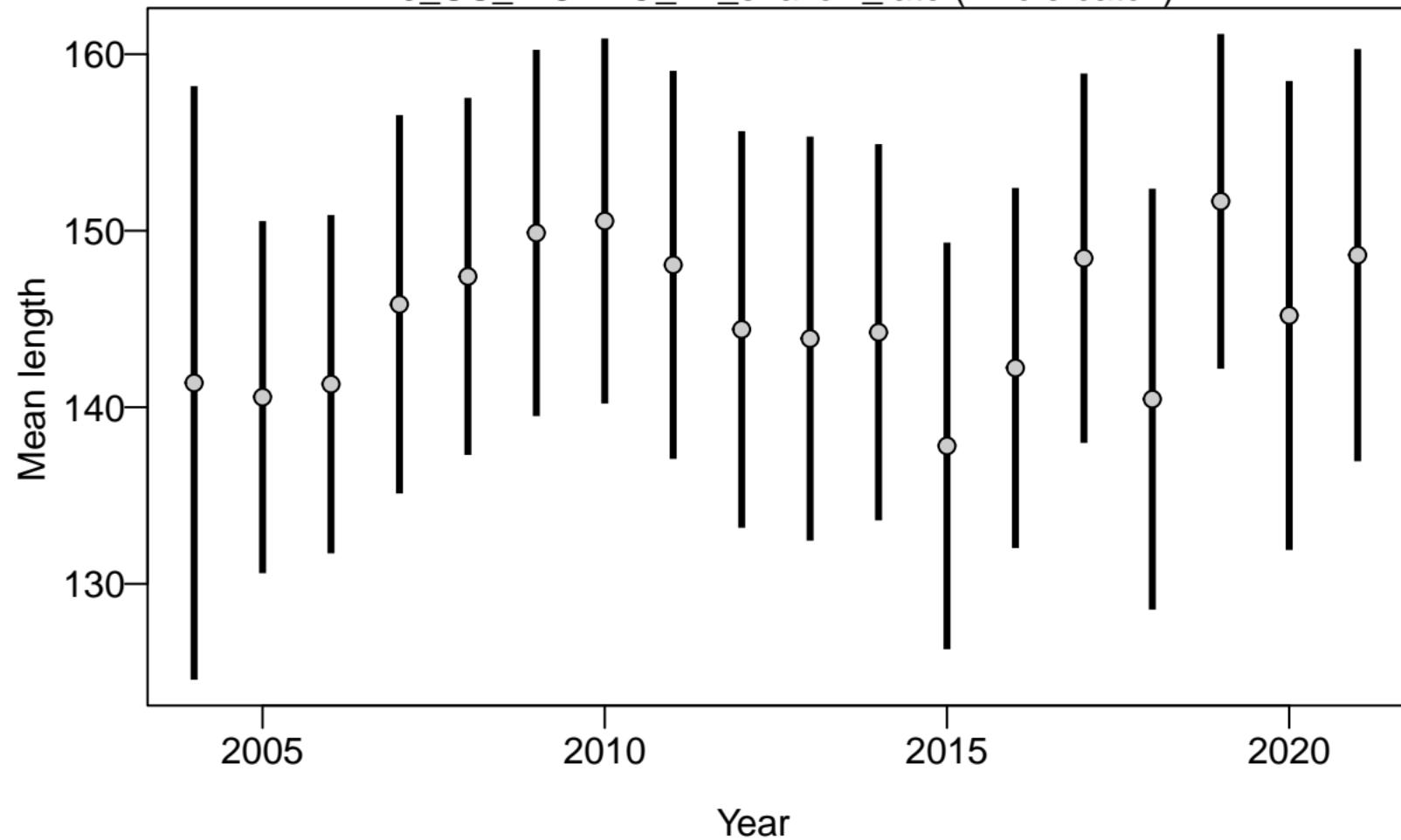


Proportion

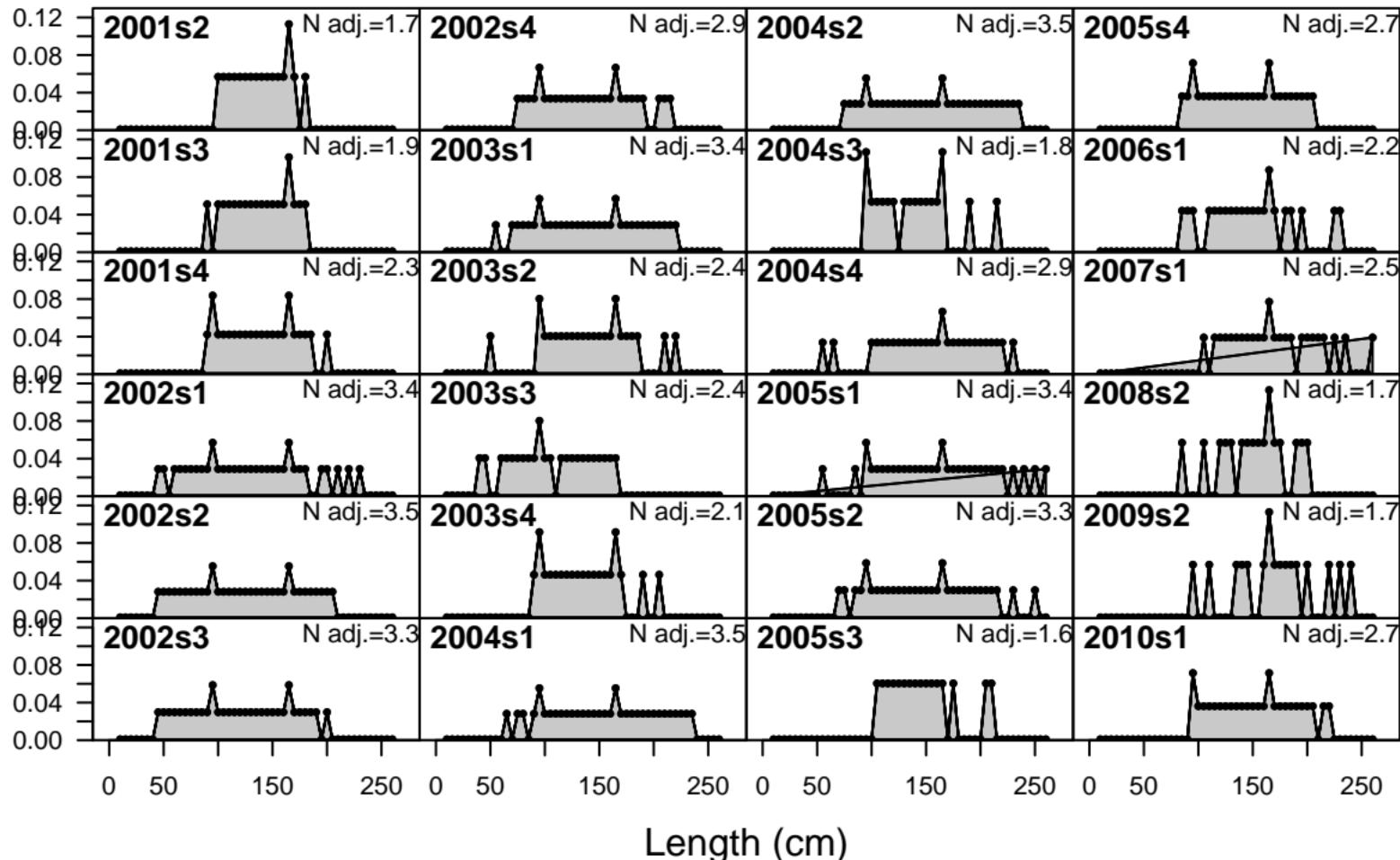




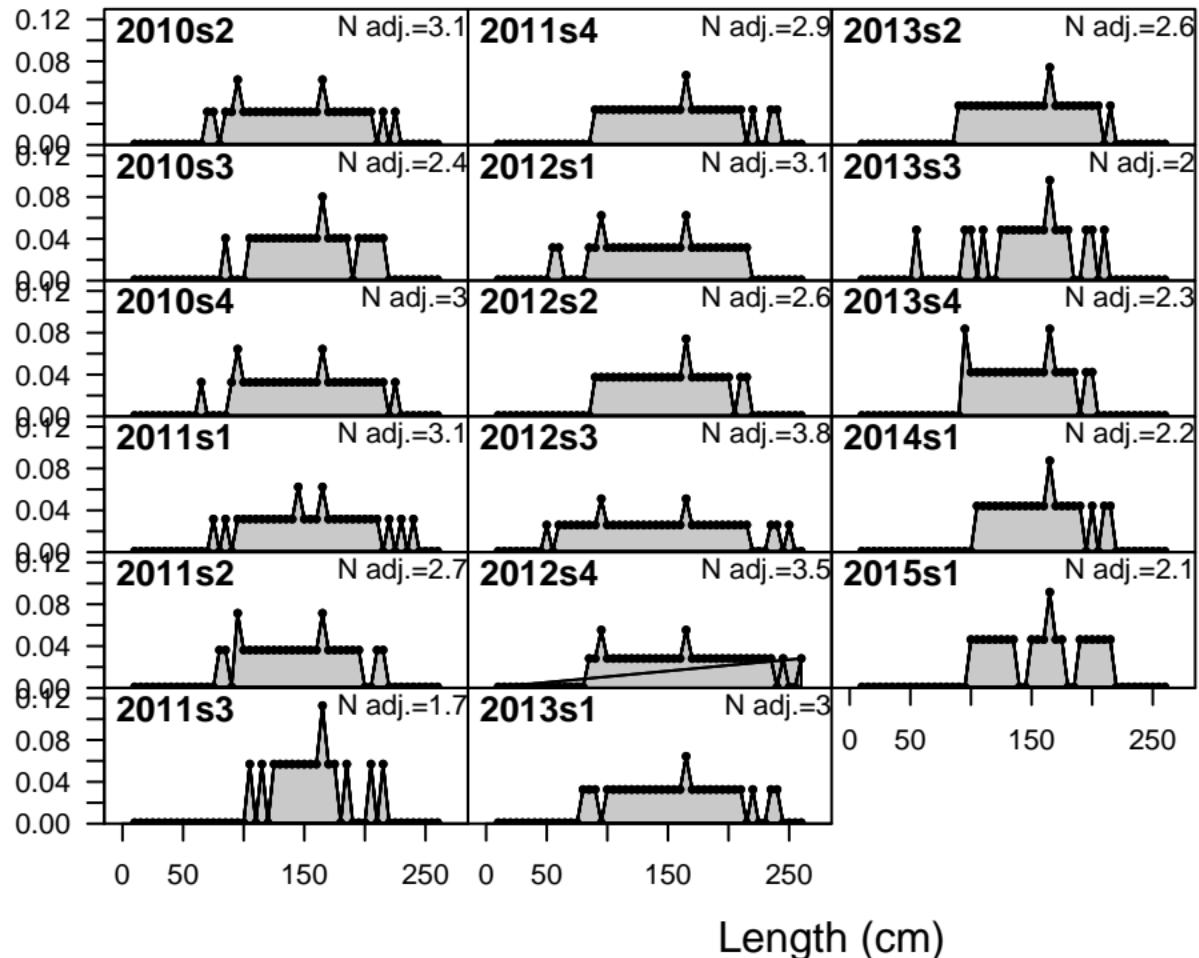
F3_US_WCNPO_LL_shallow_late (whole catch)

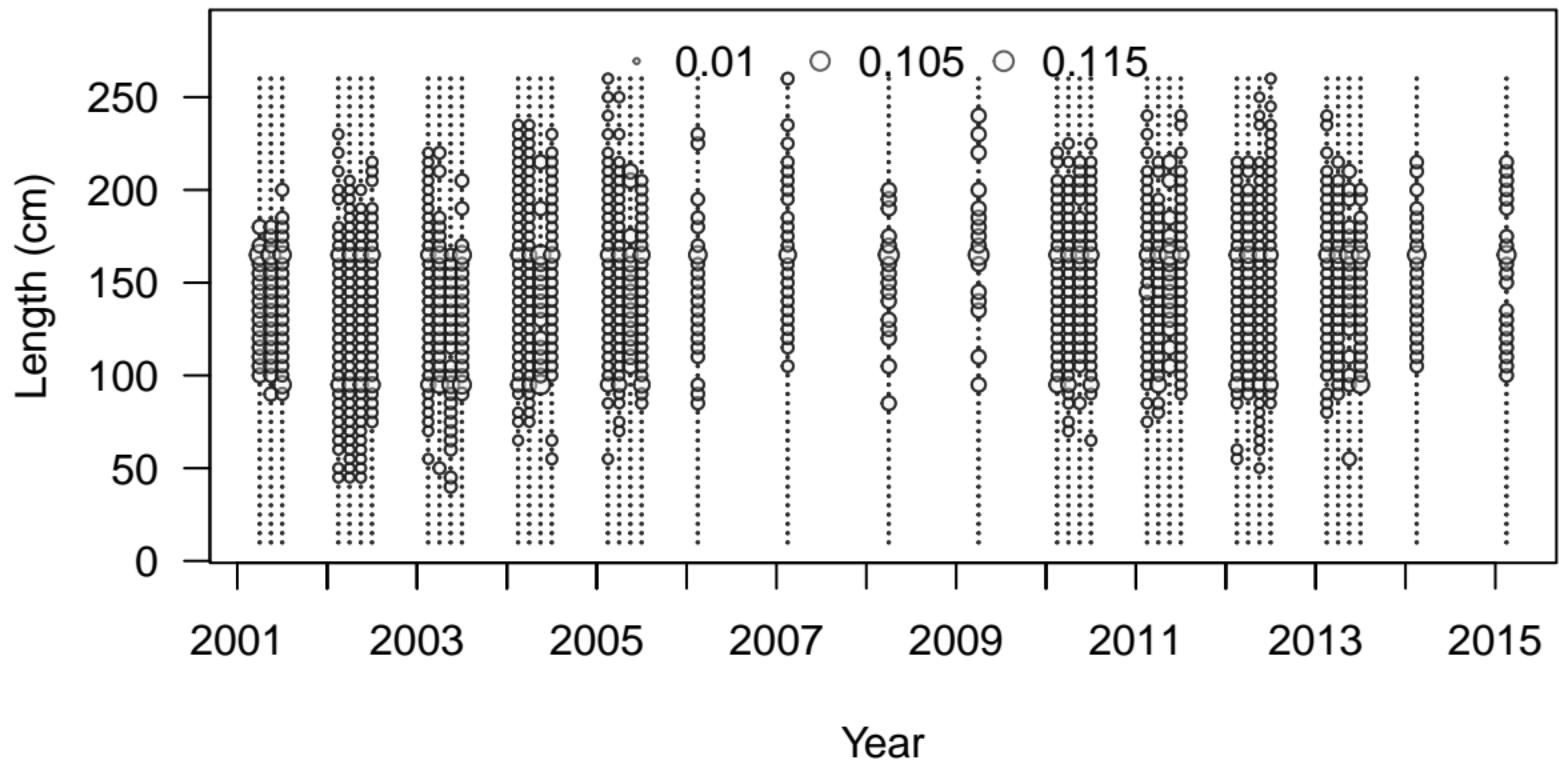


Proportion

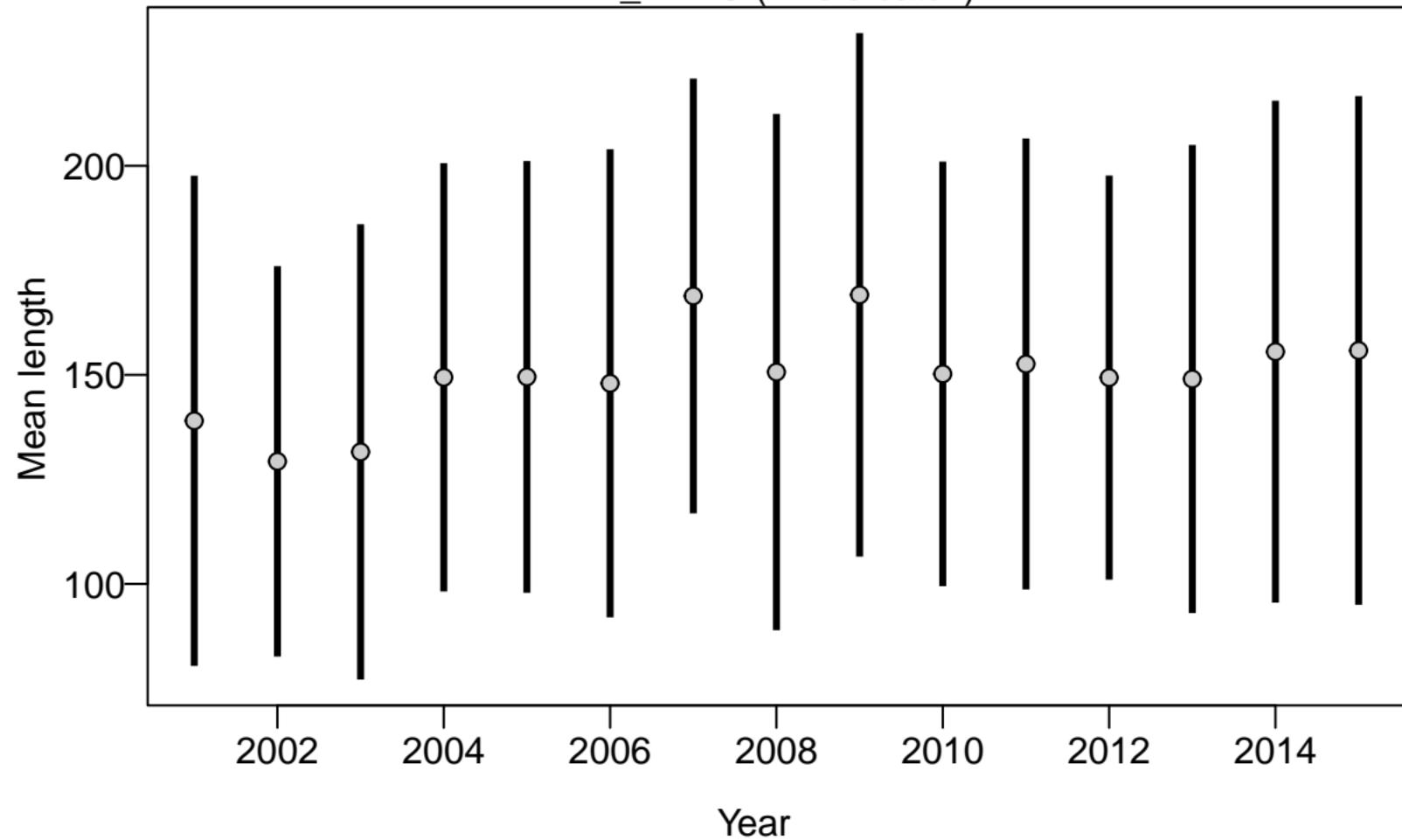


Proportion

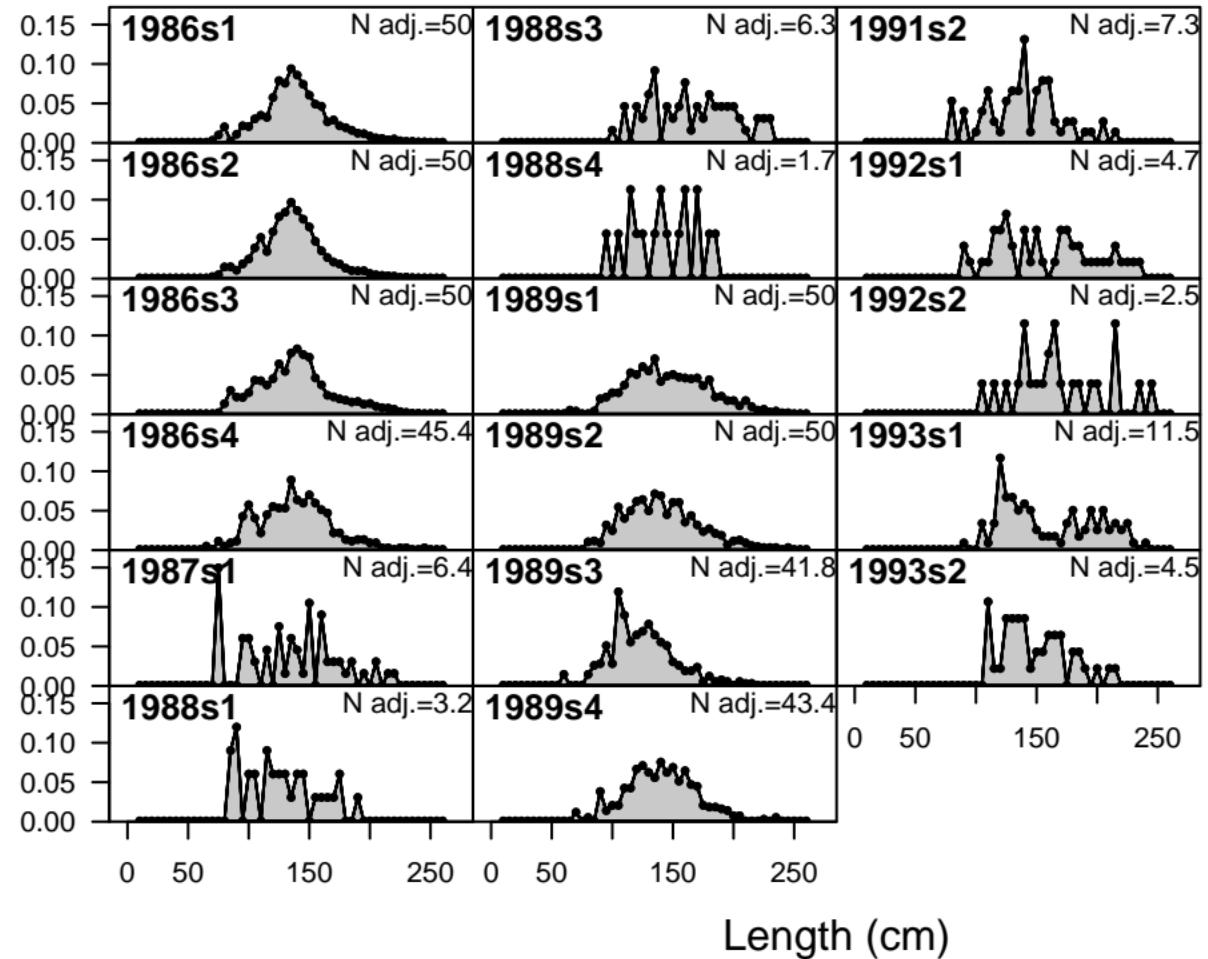


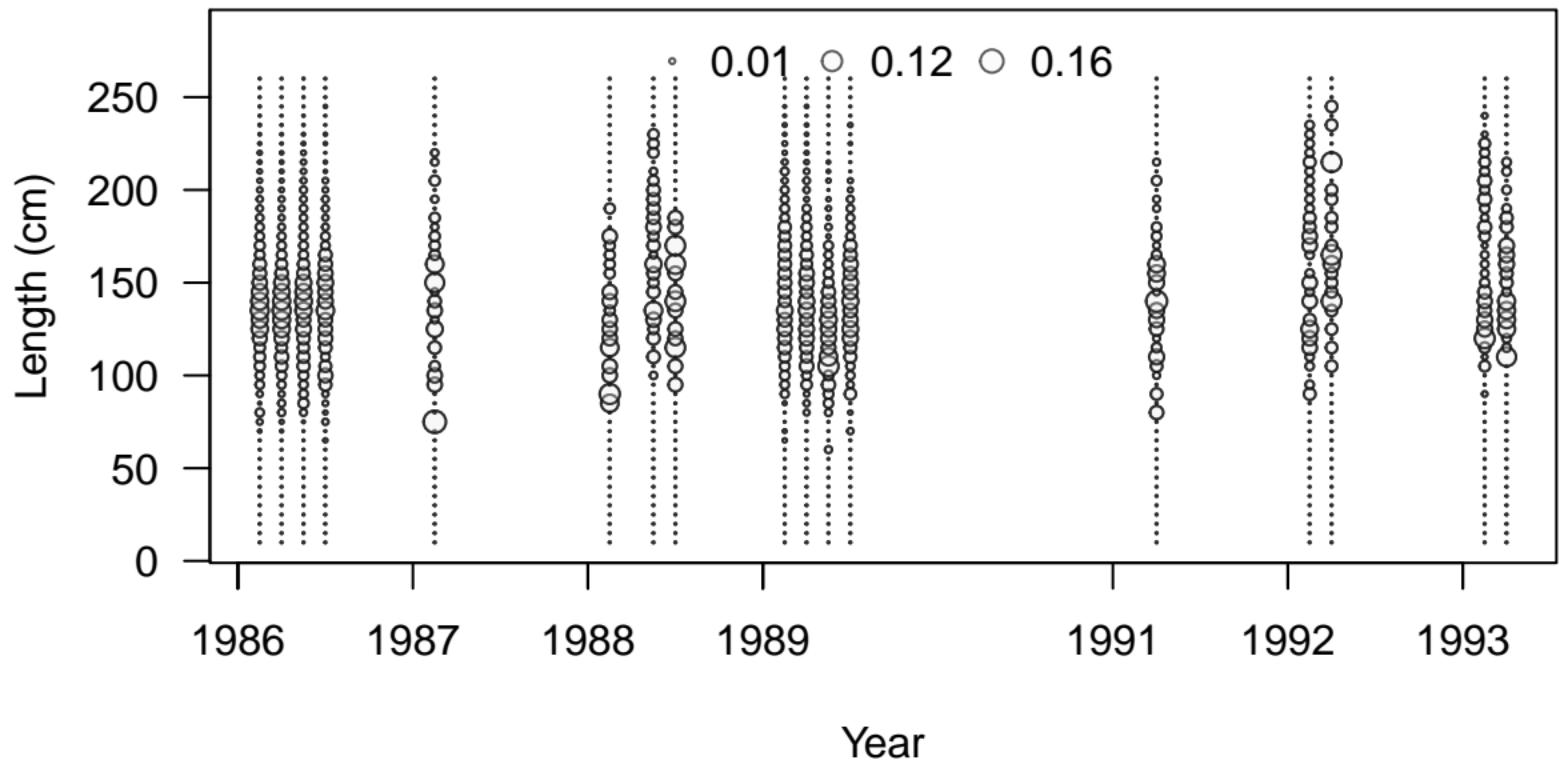


F4_IATTC (whole catch)

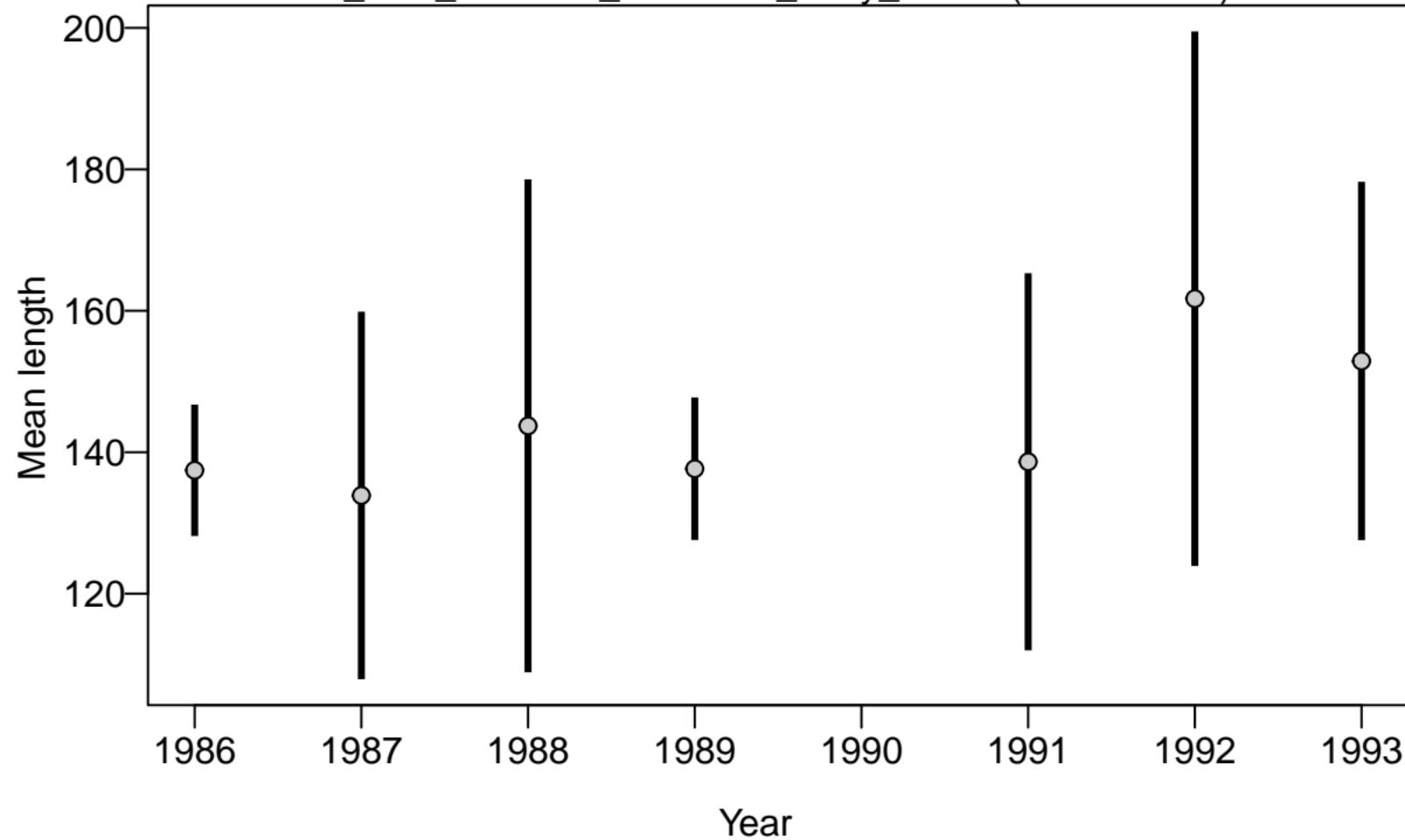


Proportion

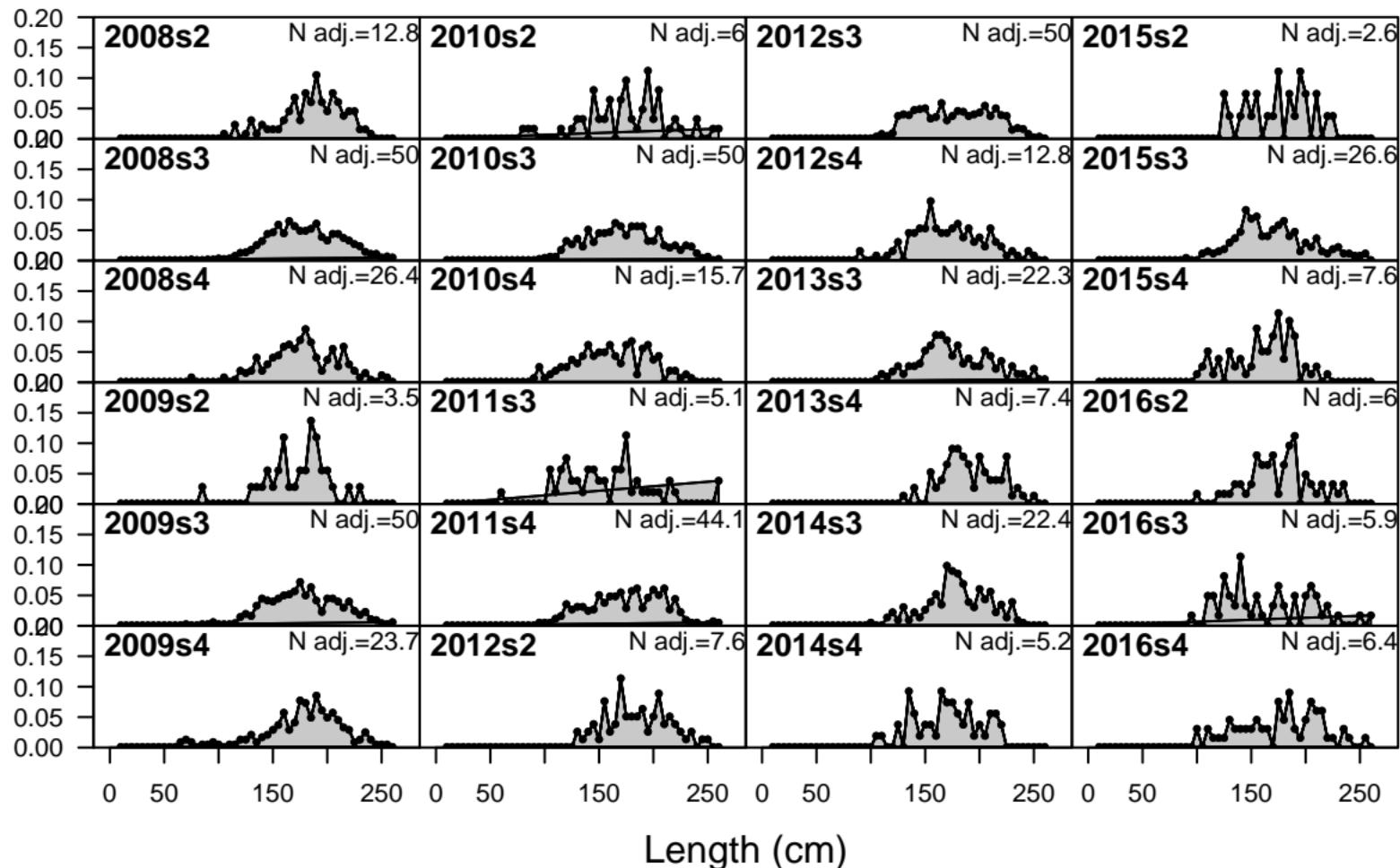




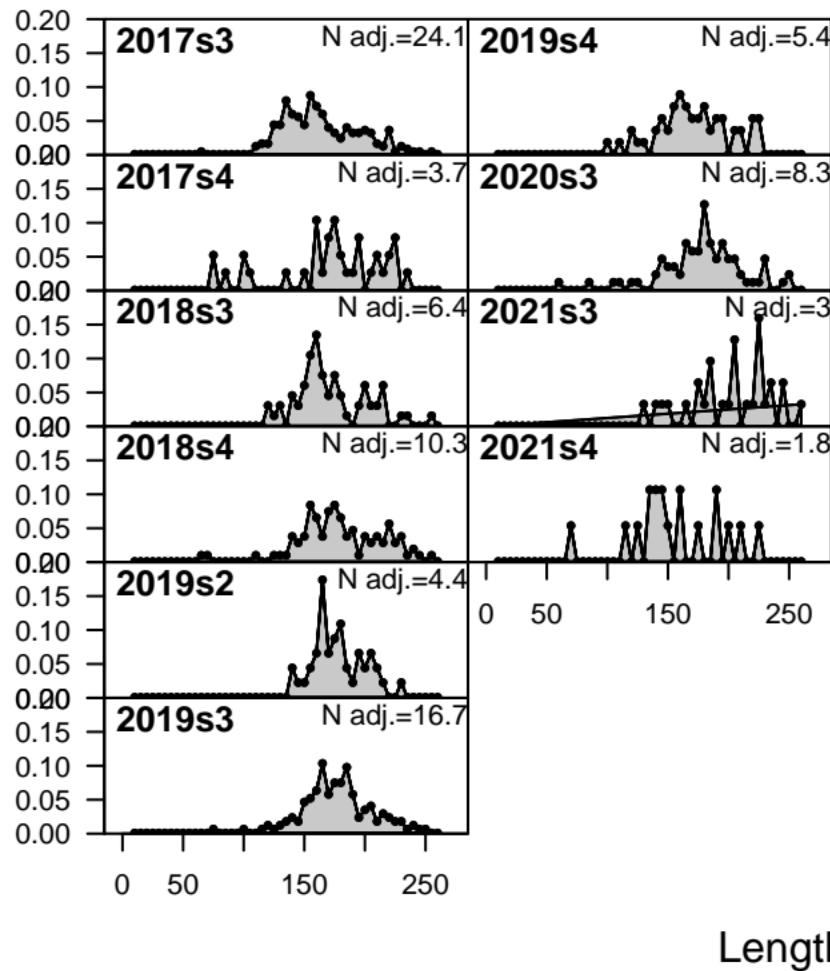
F6_JPN_WCNPO OSDWLL_early_Area1 (whole catch)

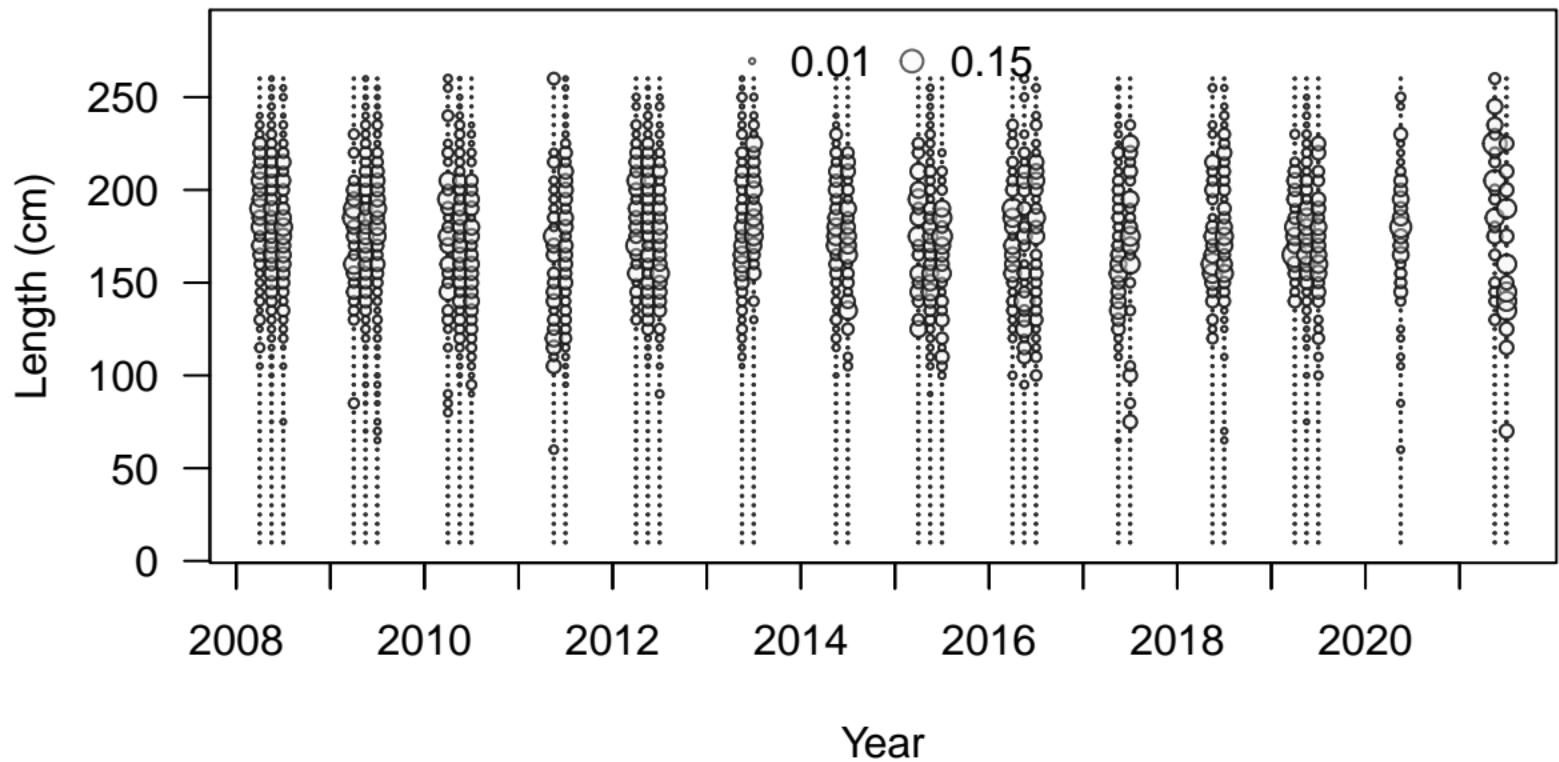


Proportion

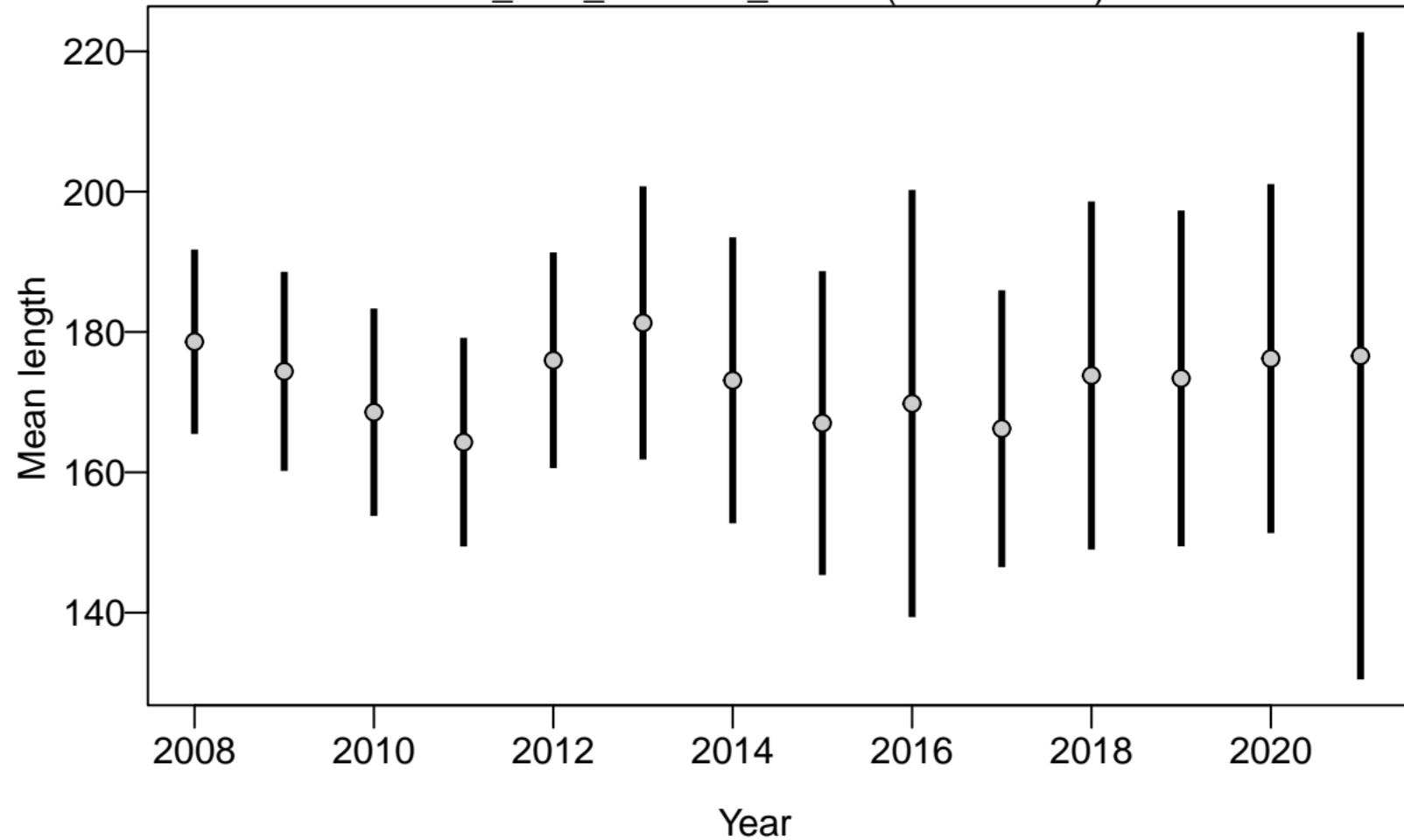


Proportion

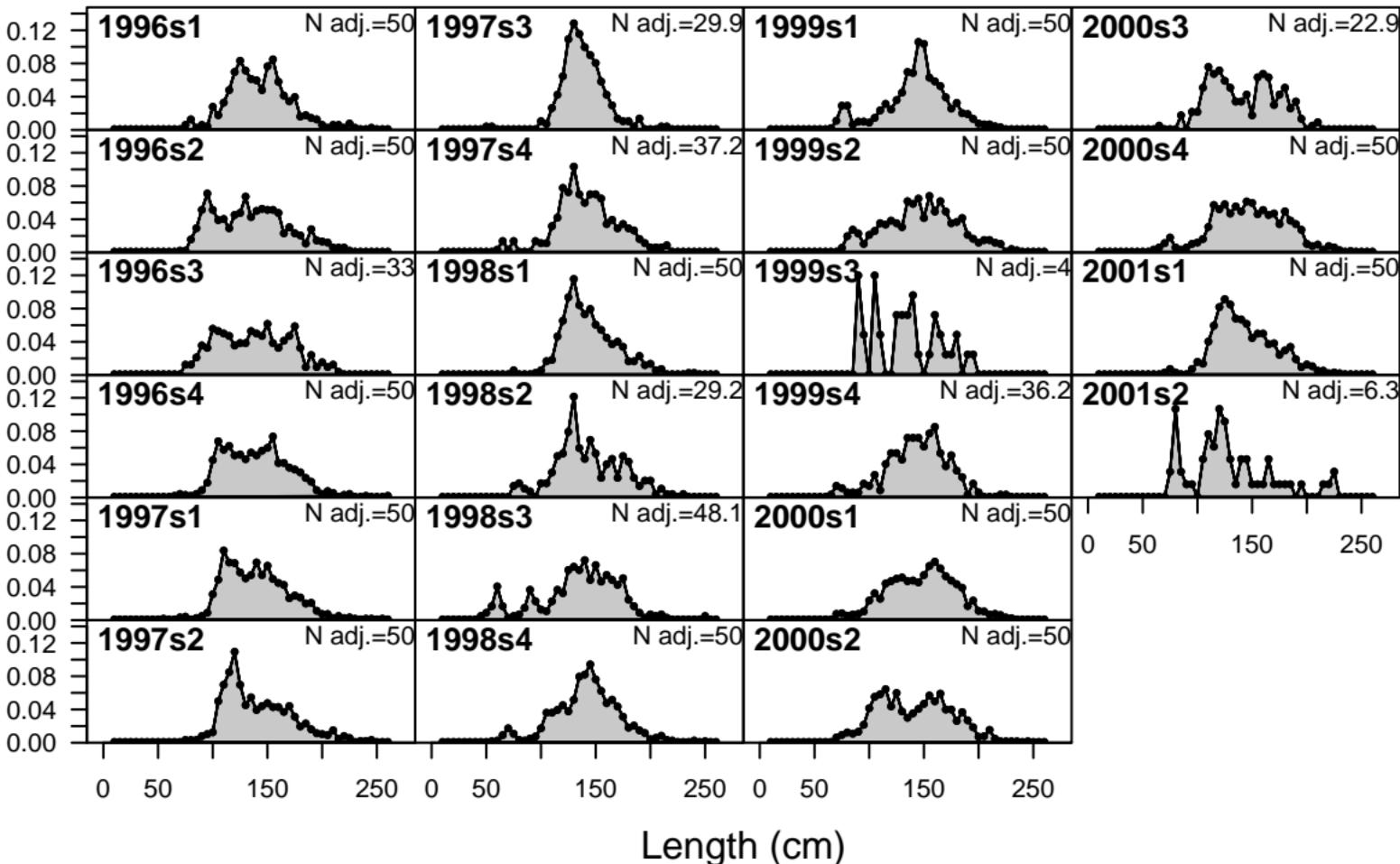


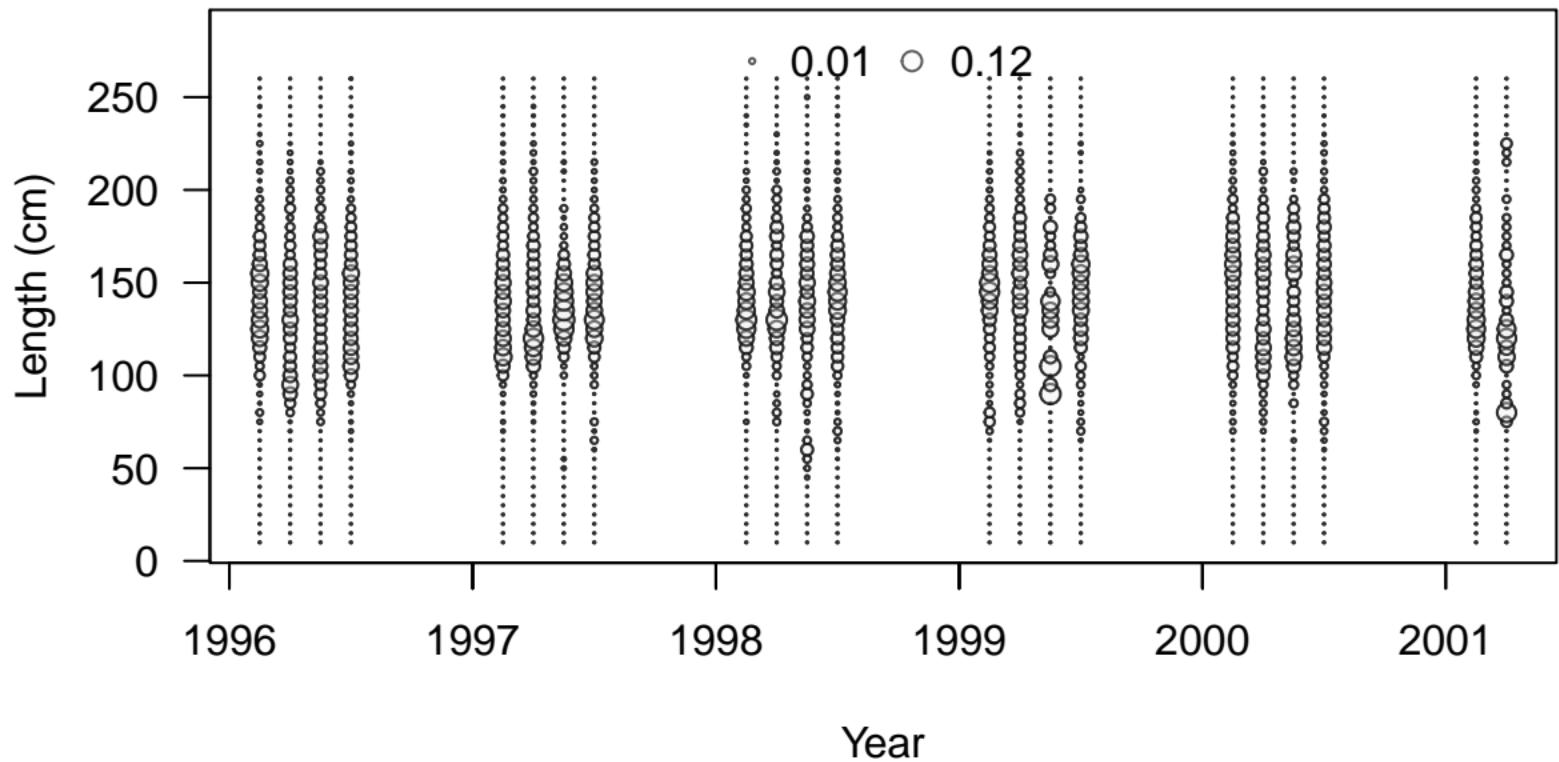


F7_JPN_WCNPO_CODF (whole catch)

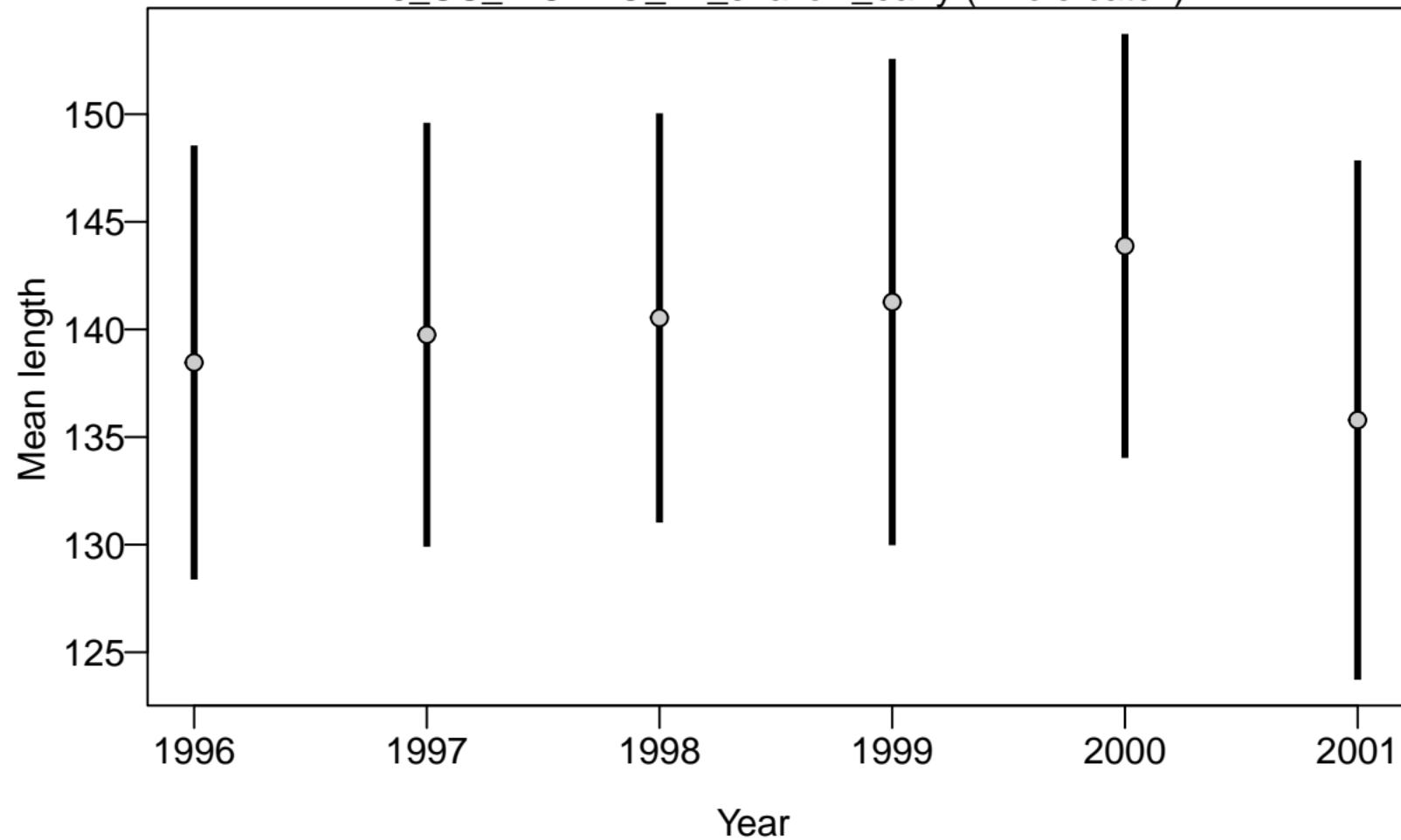


Proportion

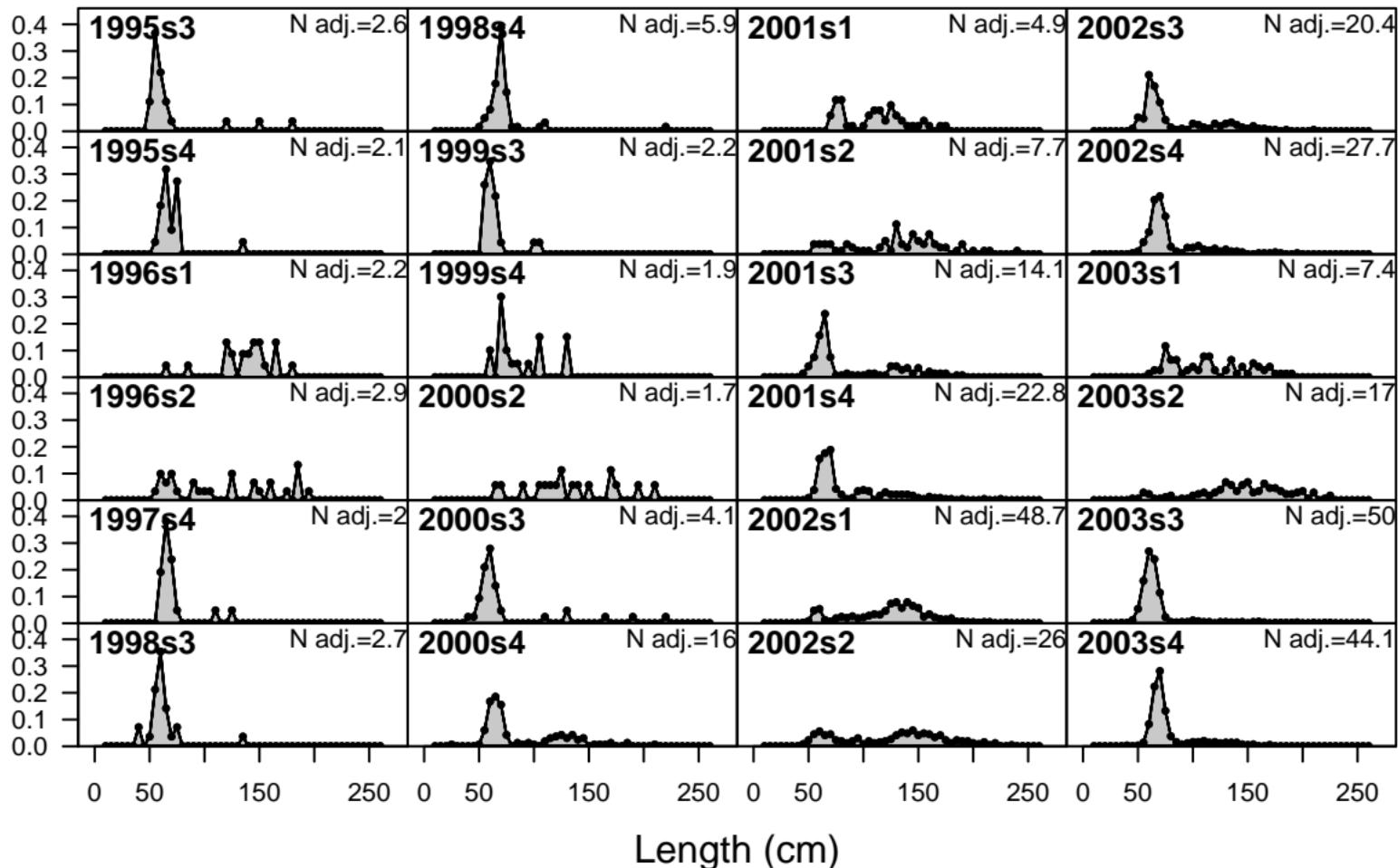




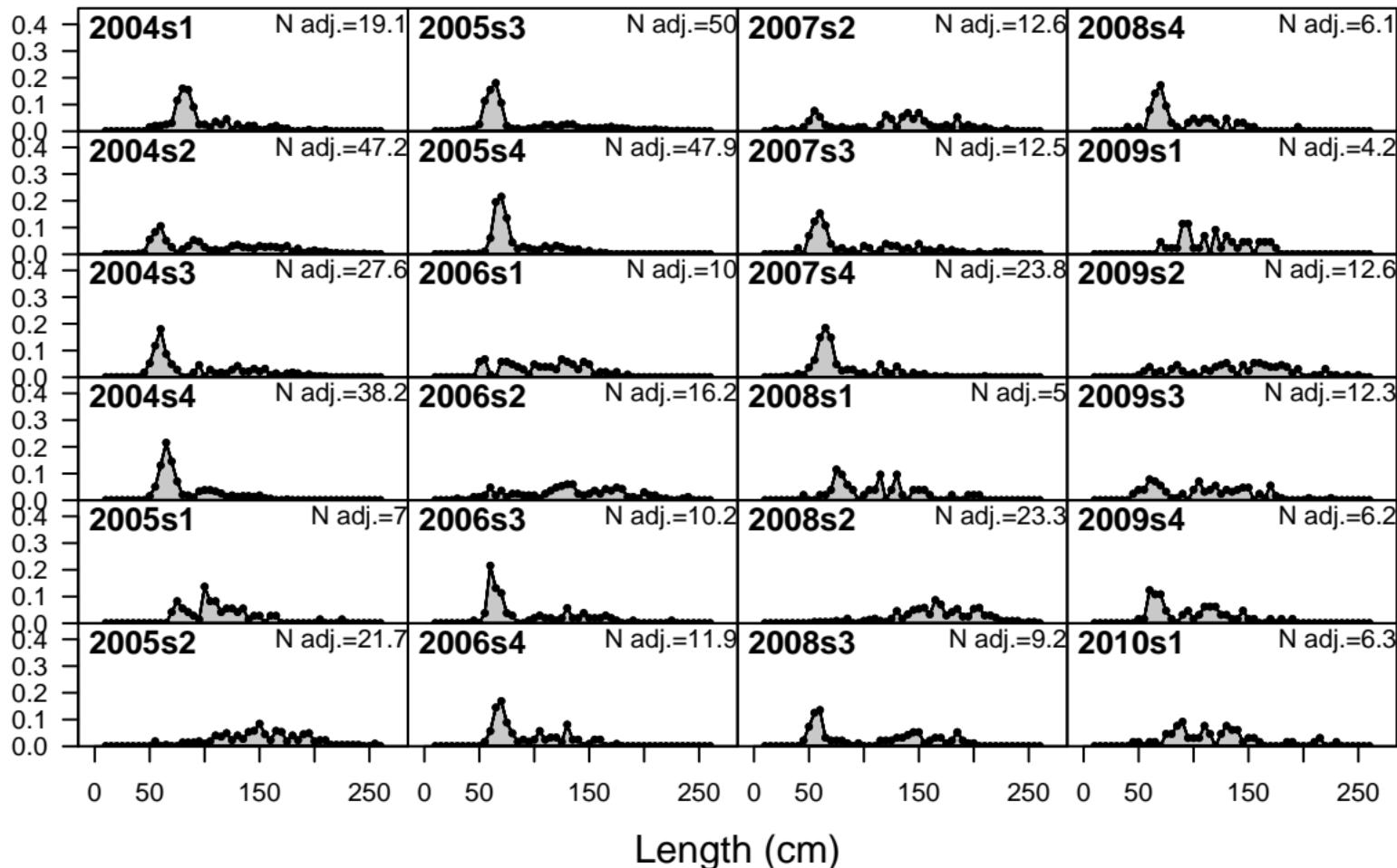
F8_US_WCNPO_LL_shallow_early (whole catch)



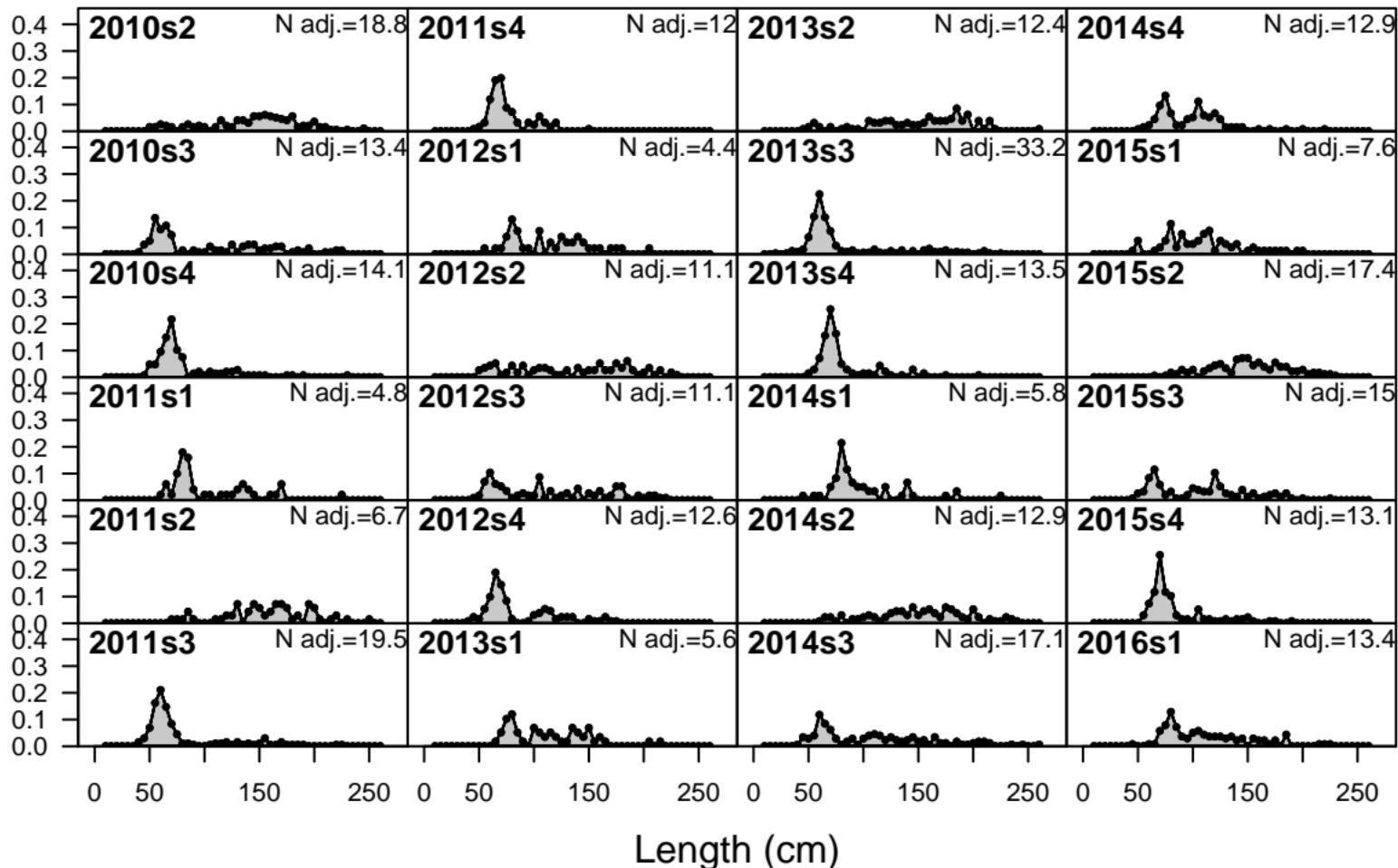
Proportion



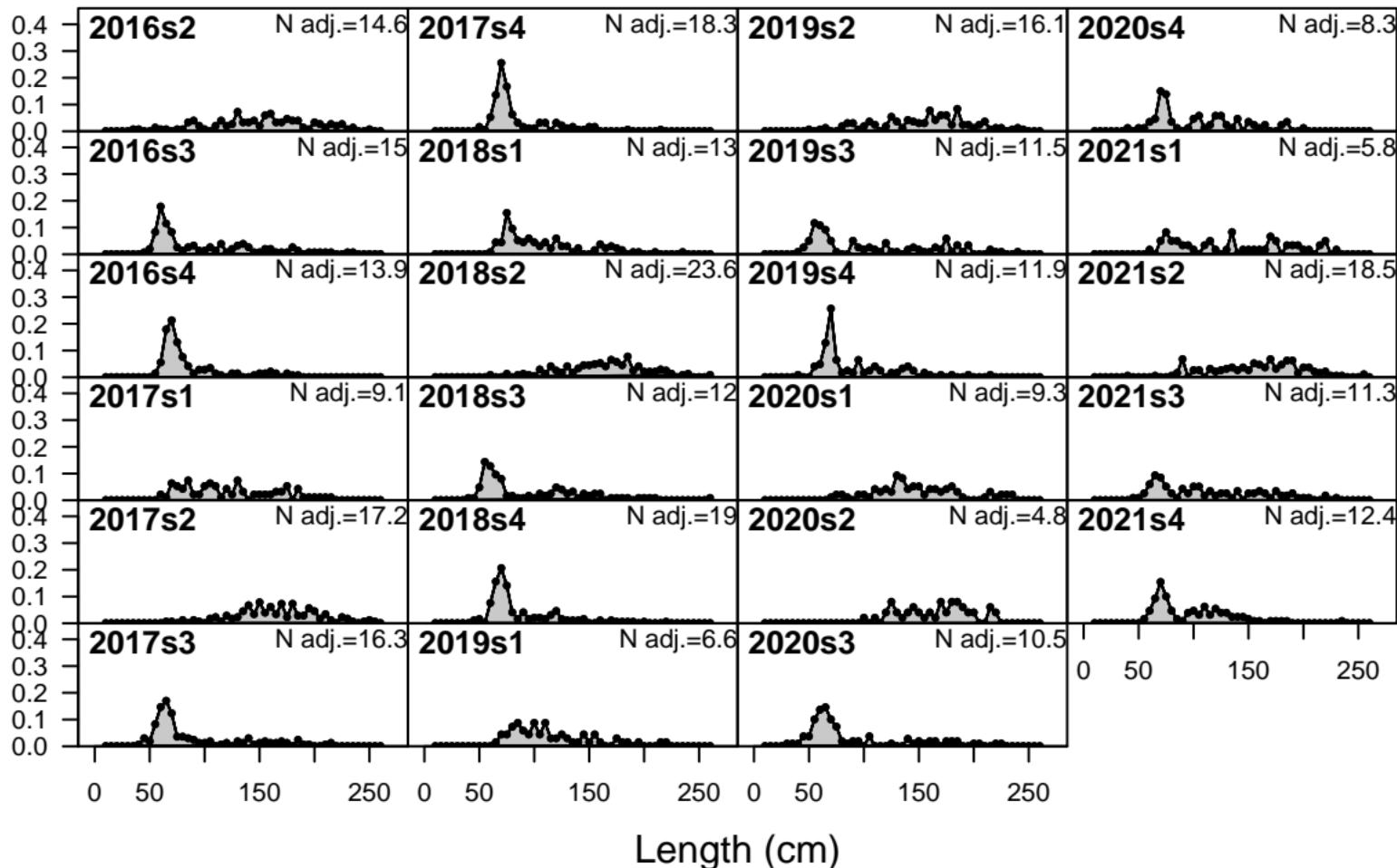
Proportion

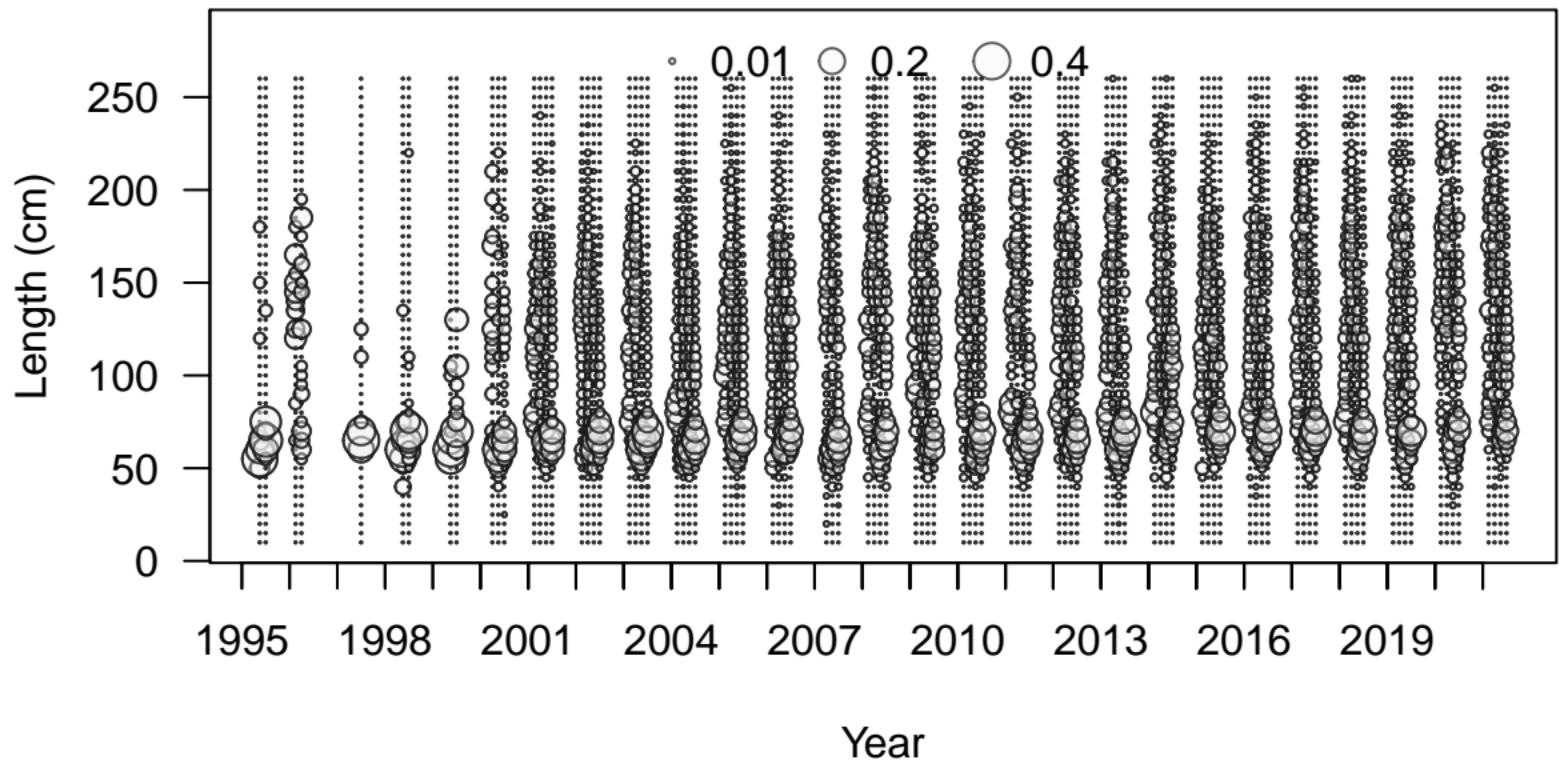


Proportion

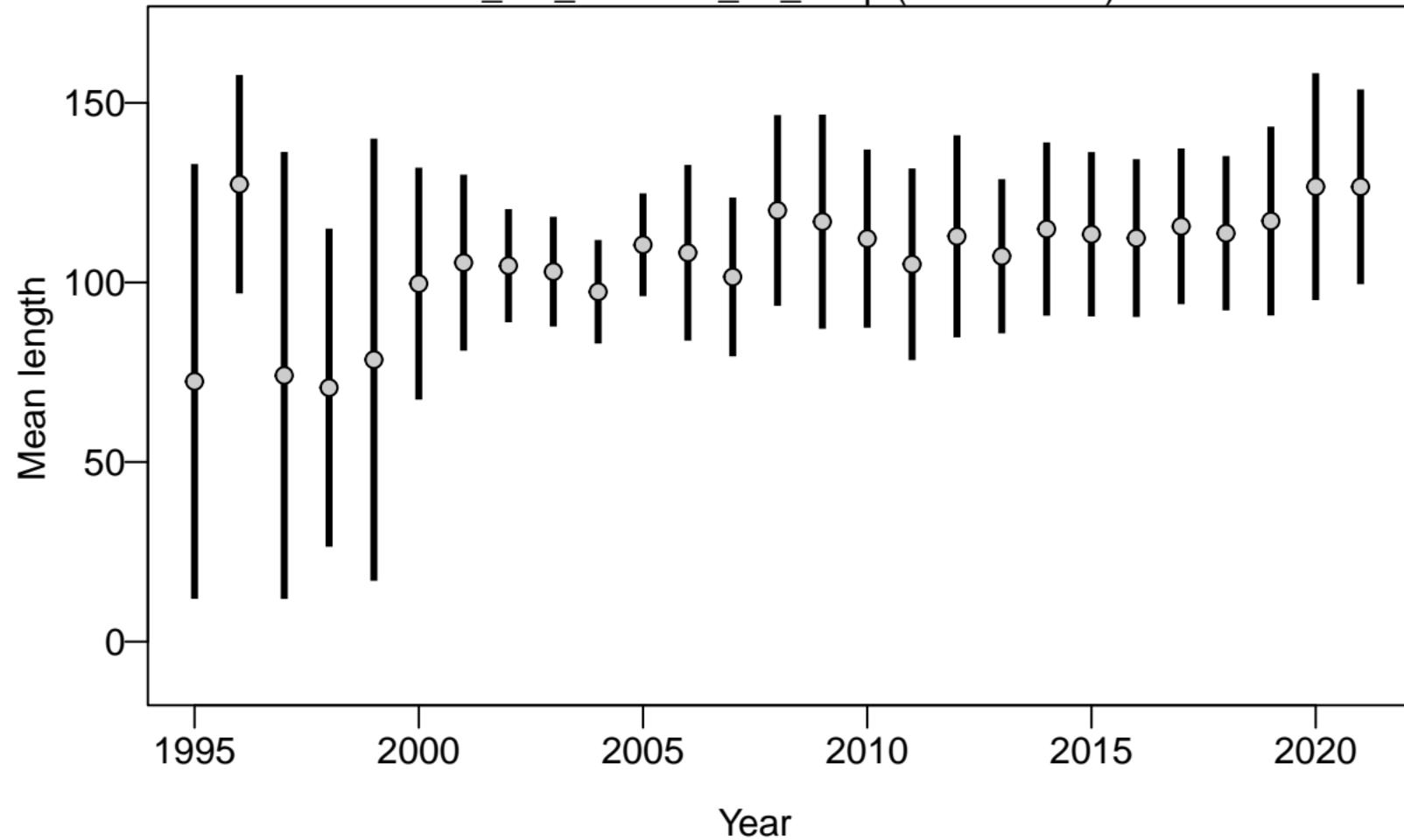


Proportion

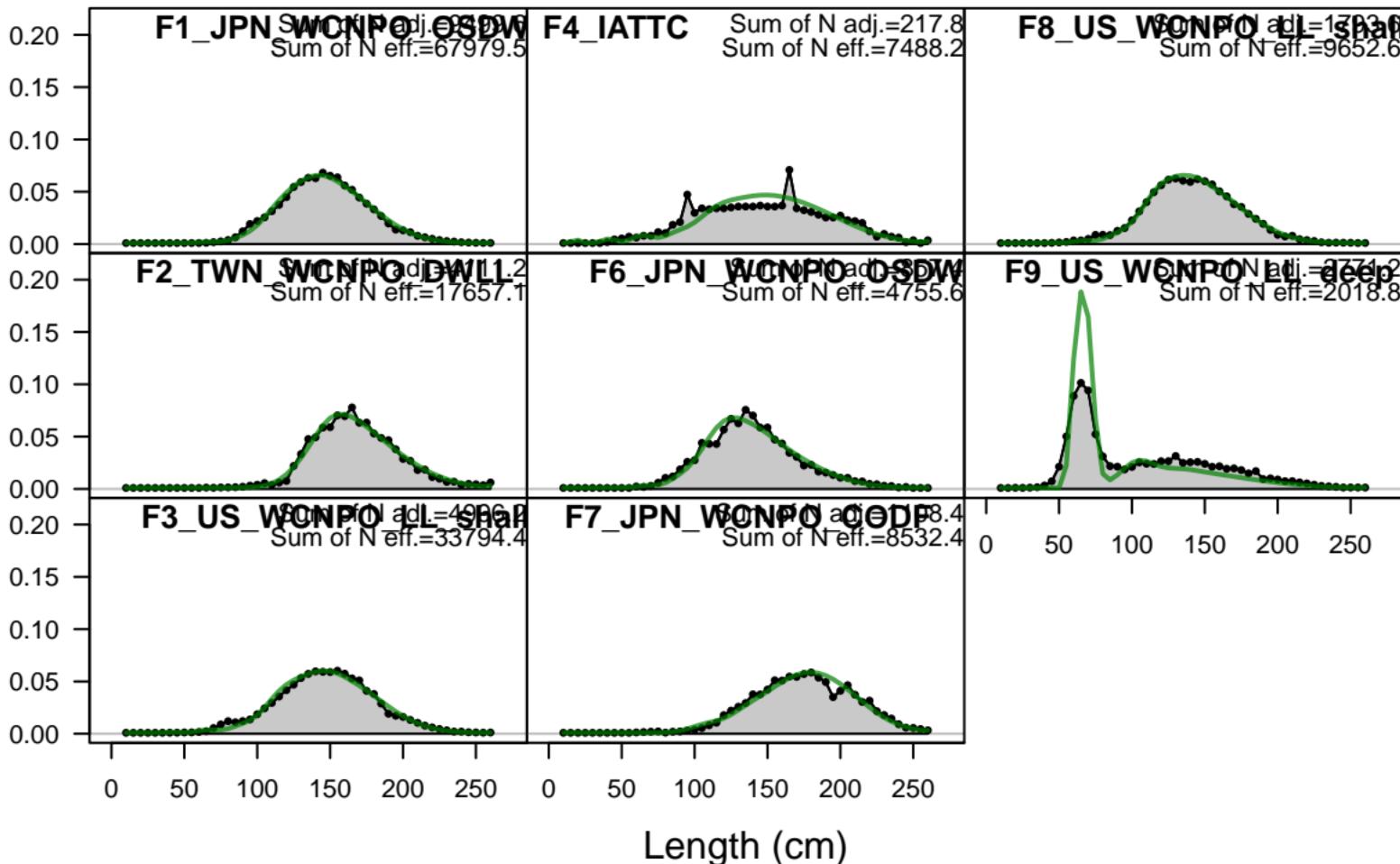


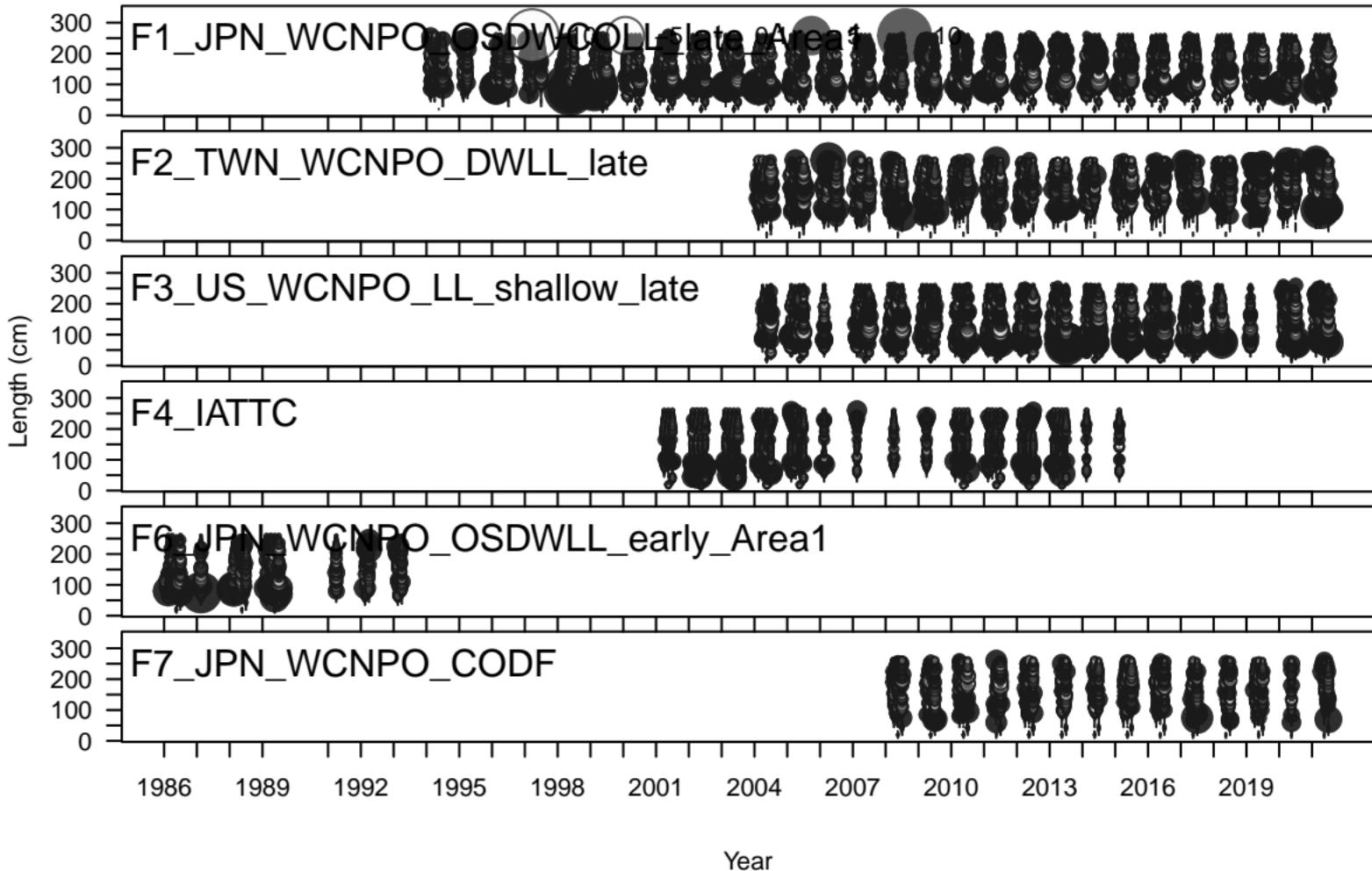


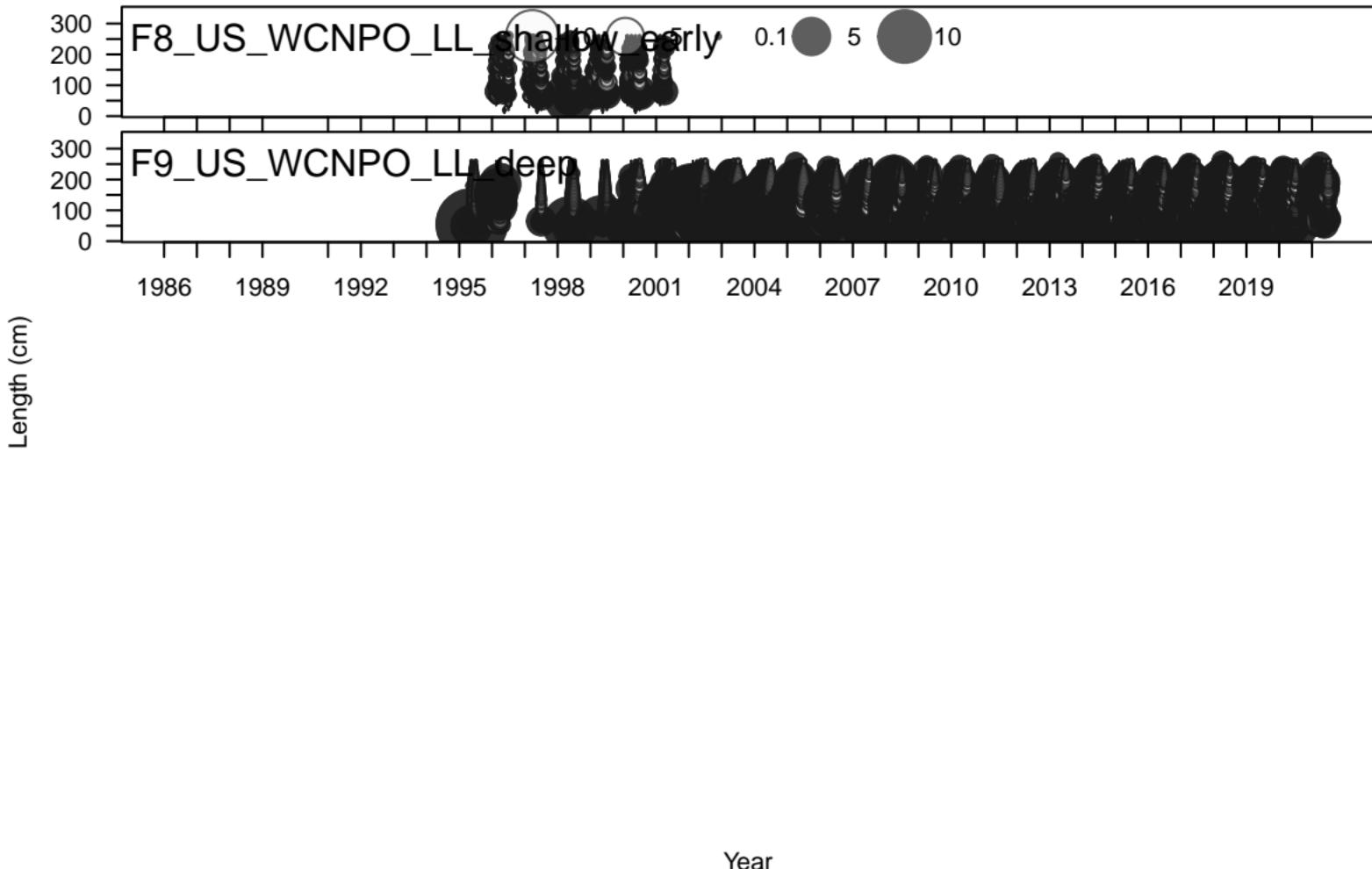
F9_US_WCNPO_LL_deep (whole catch)



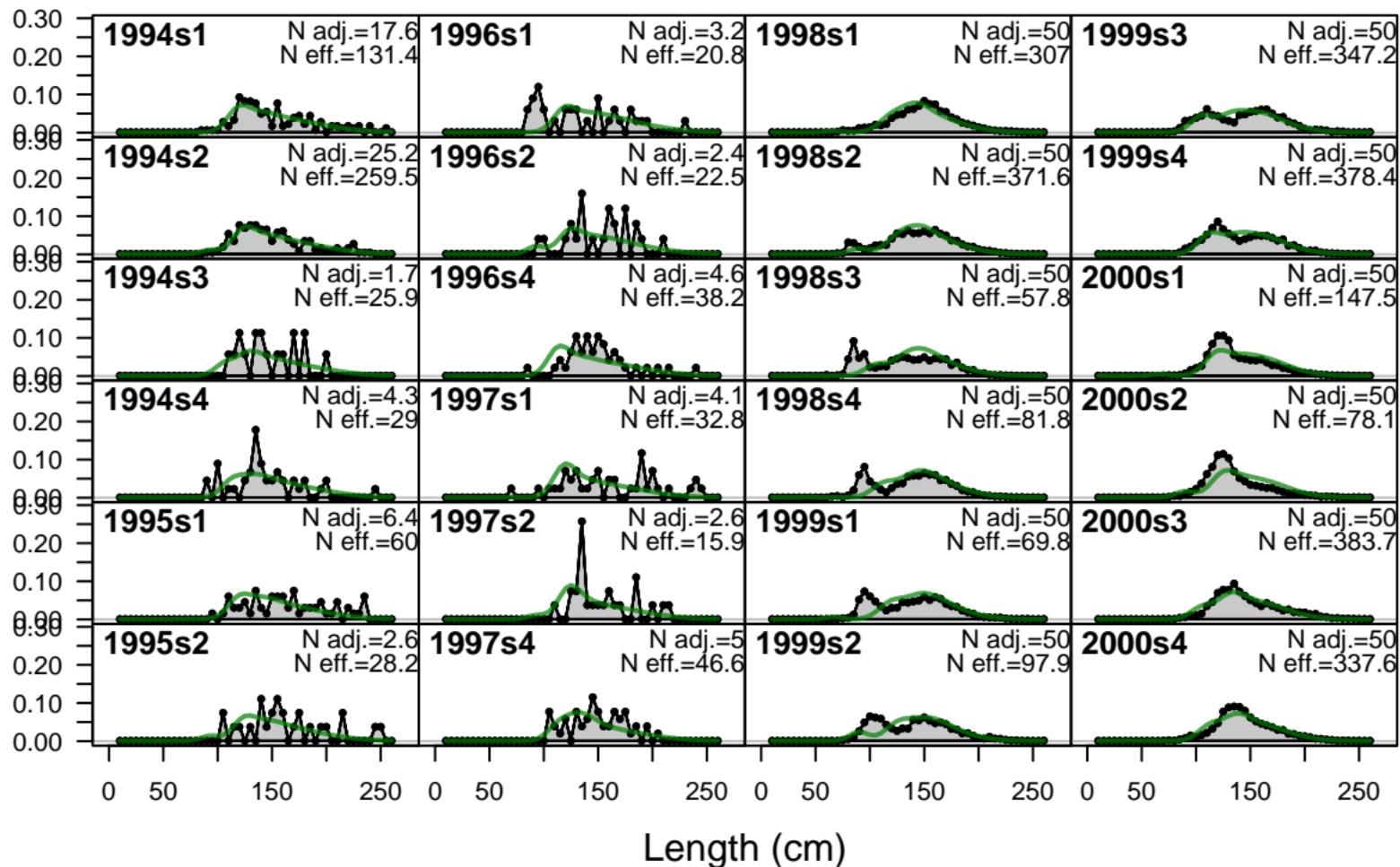
Proportion



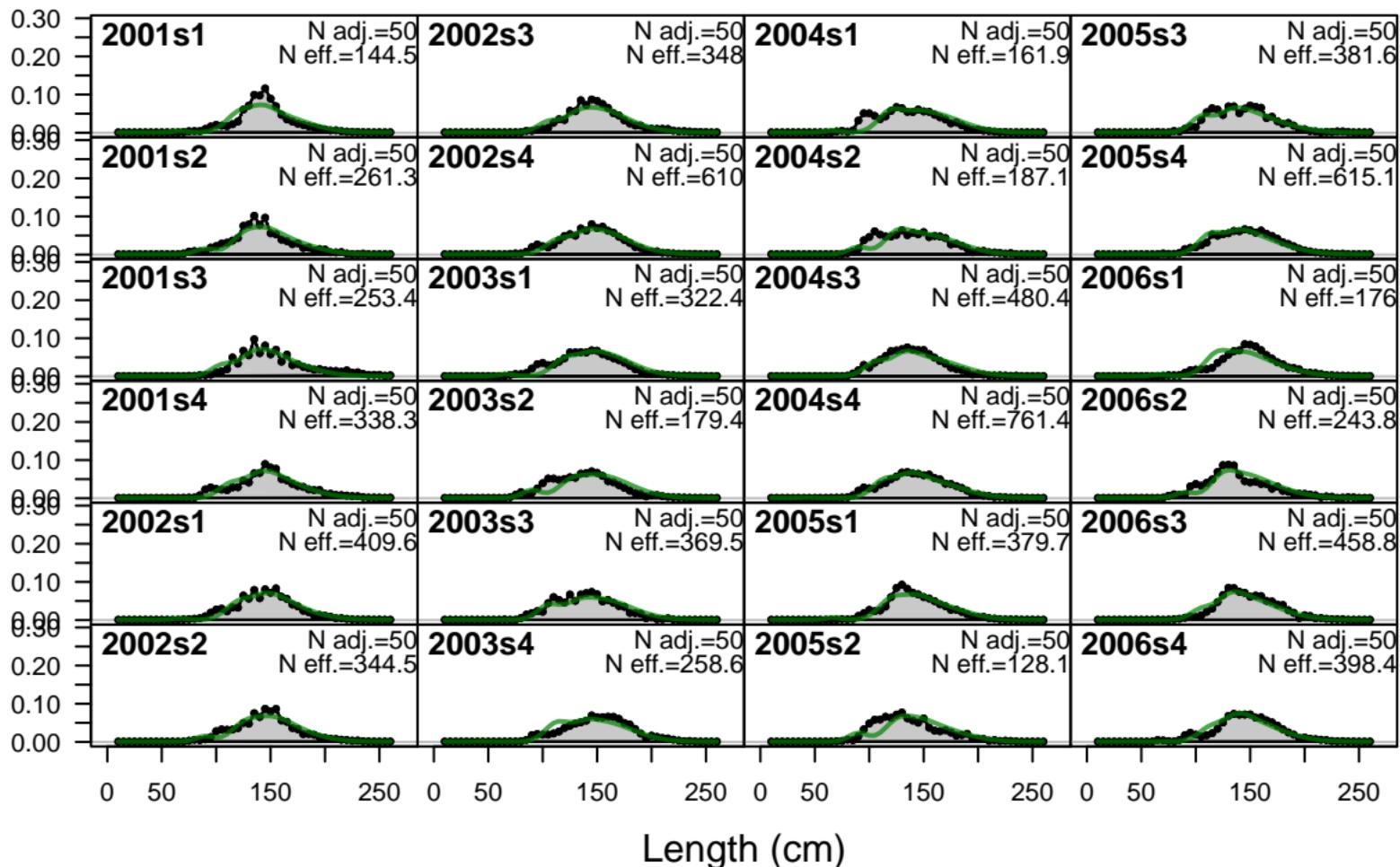




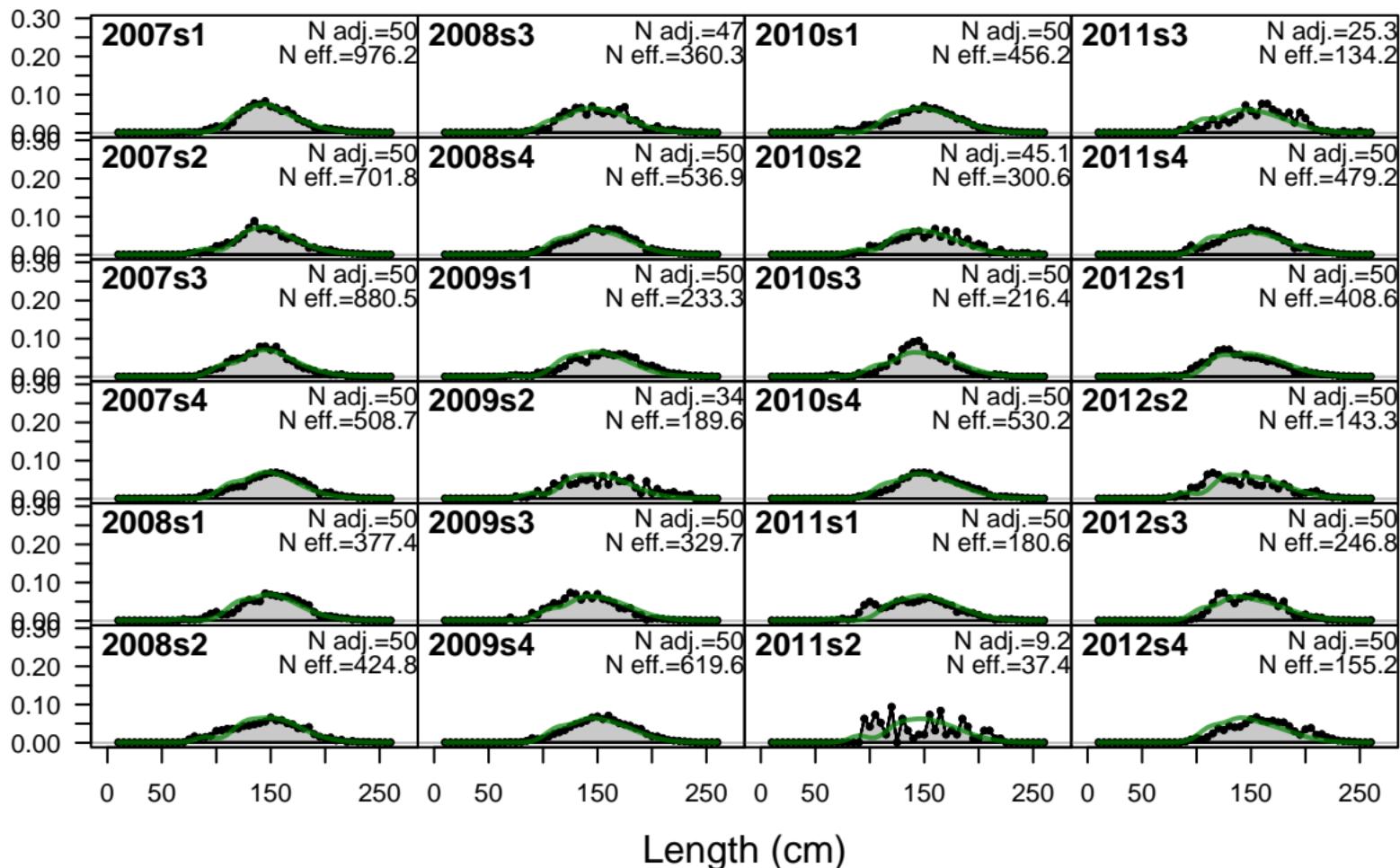
Proportion



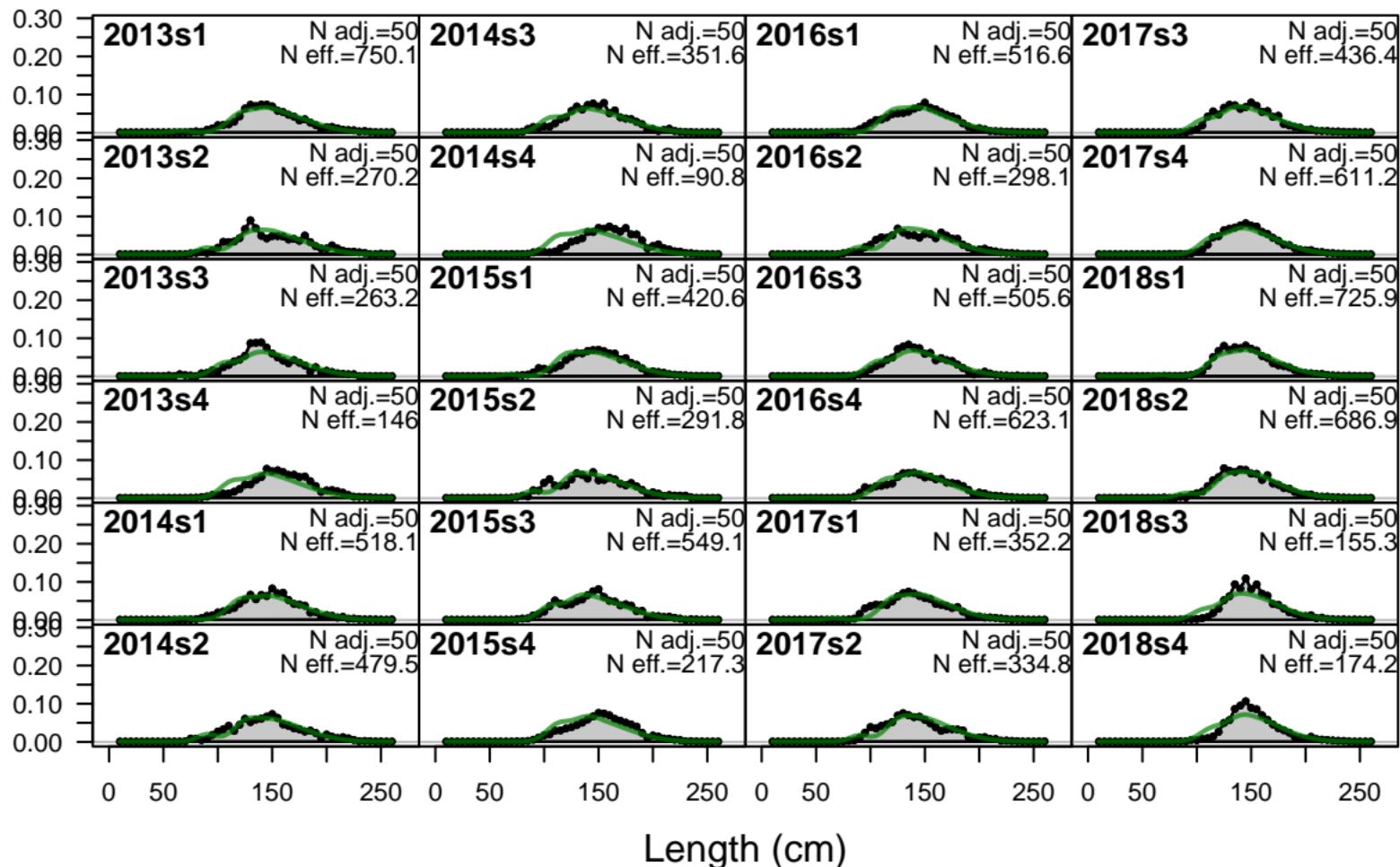
Proportion



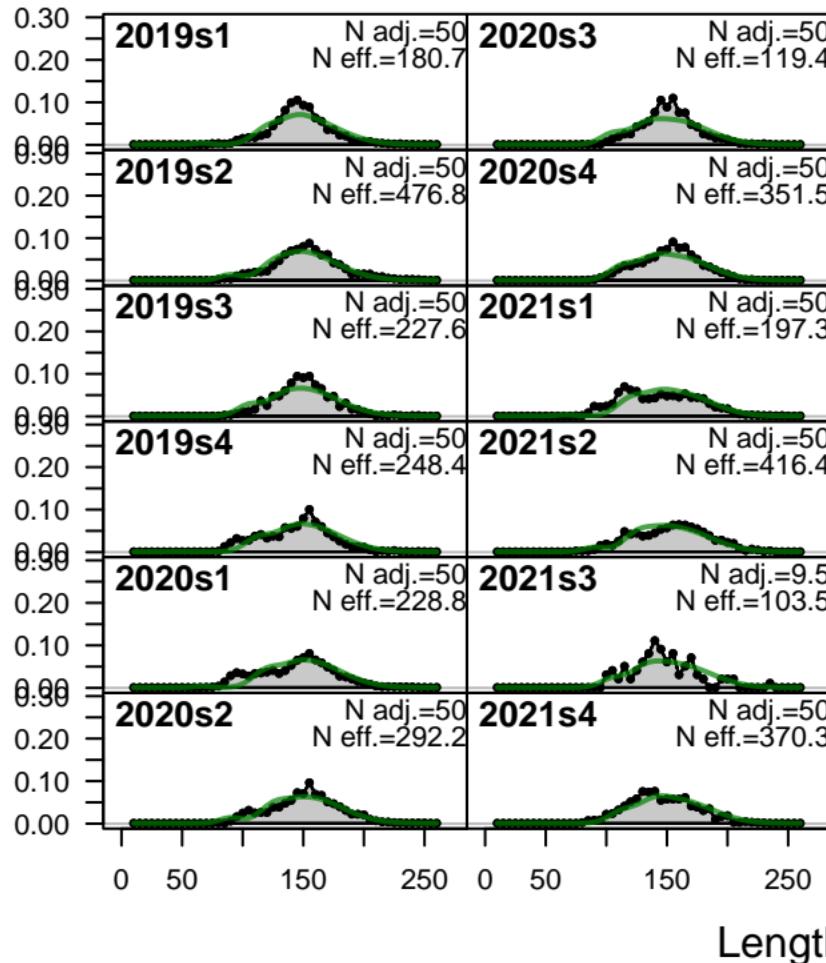
Proportion

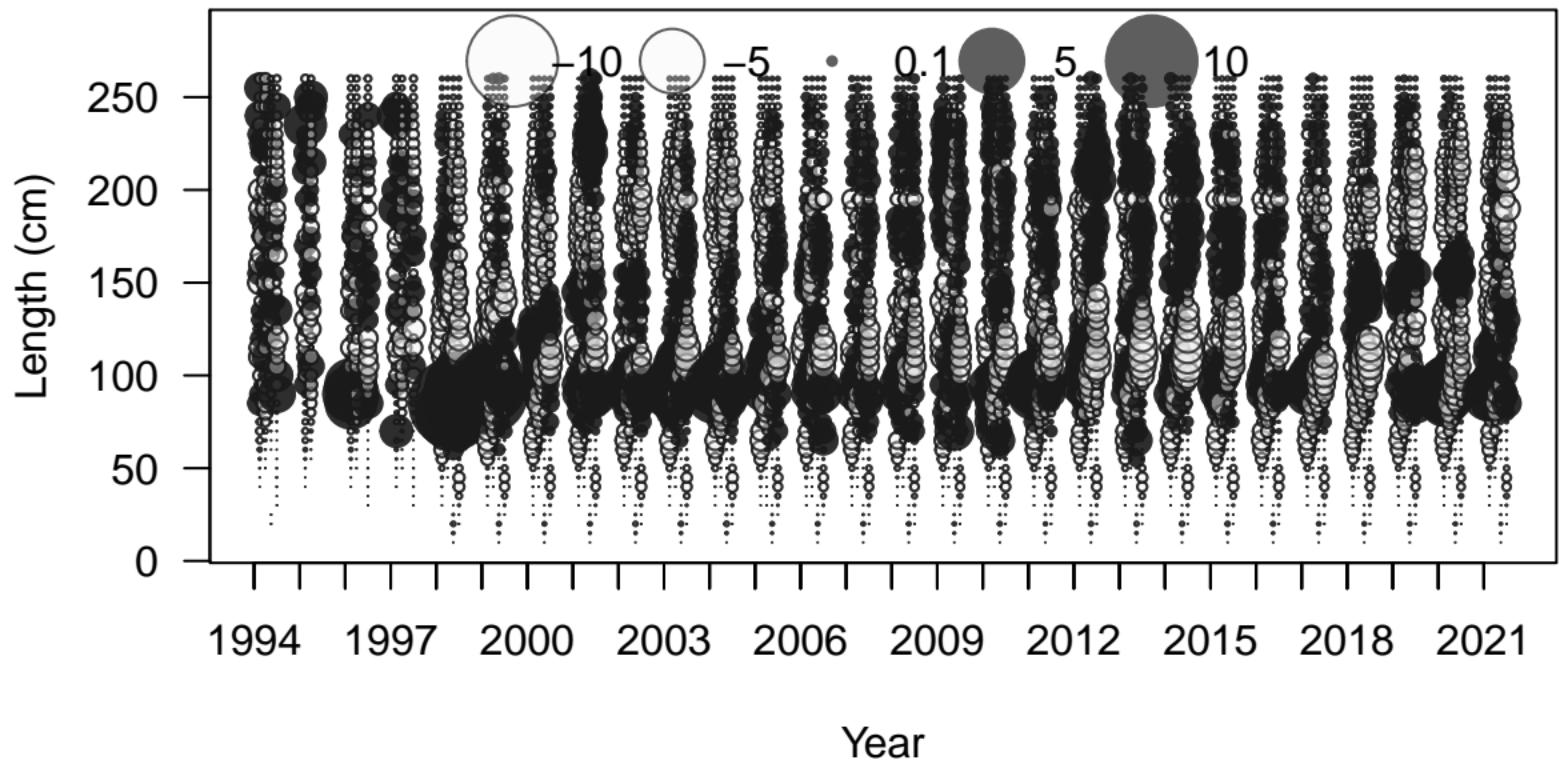


Proportion

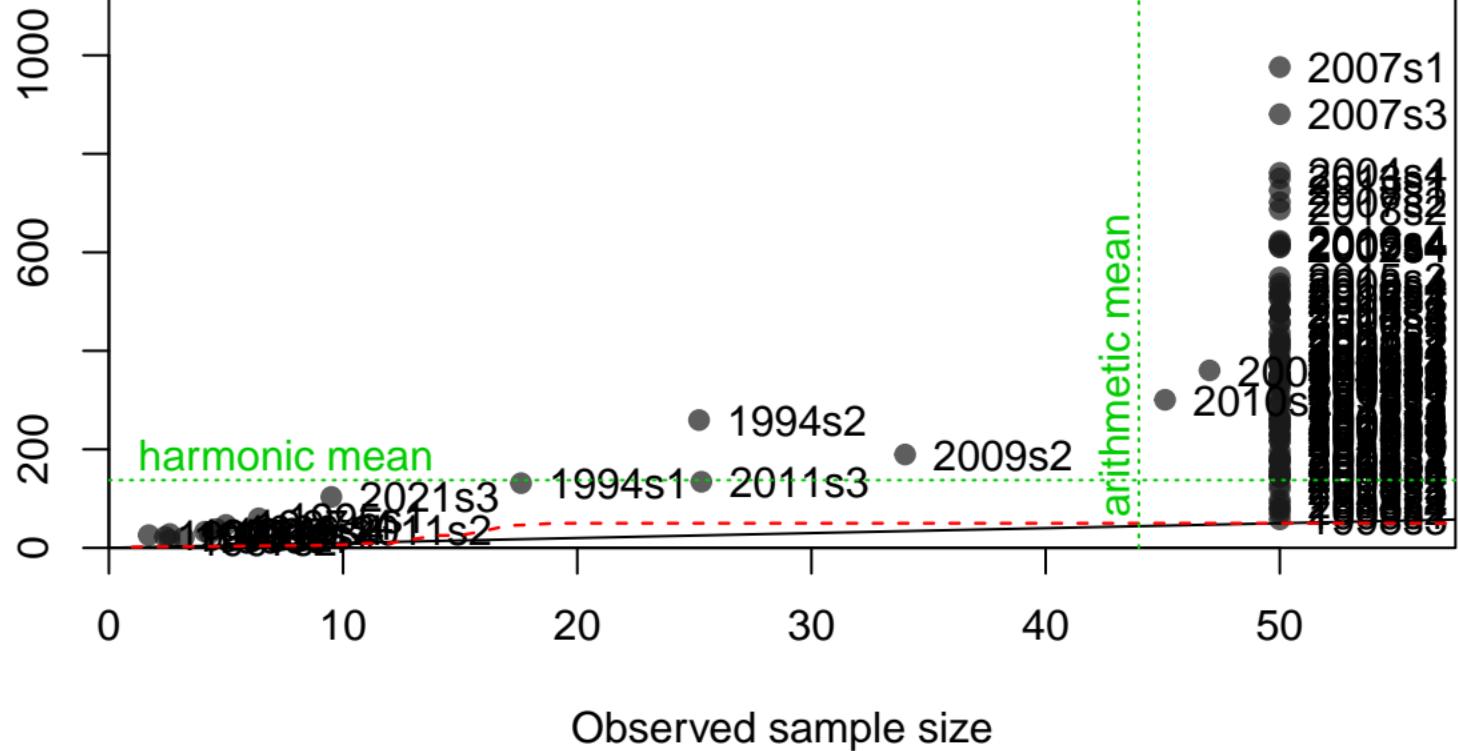


Proportion

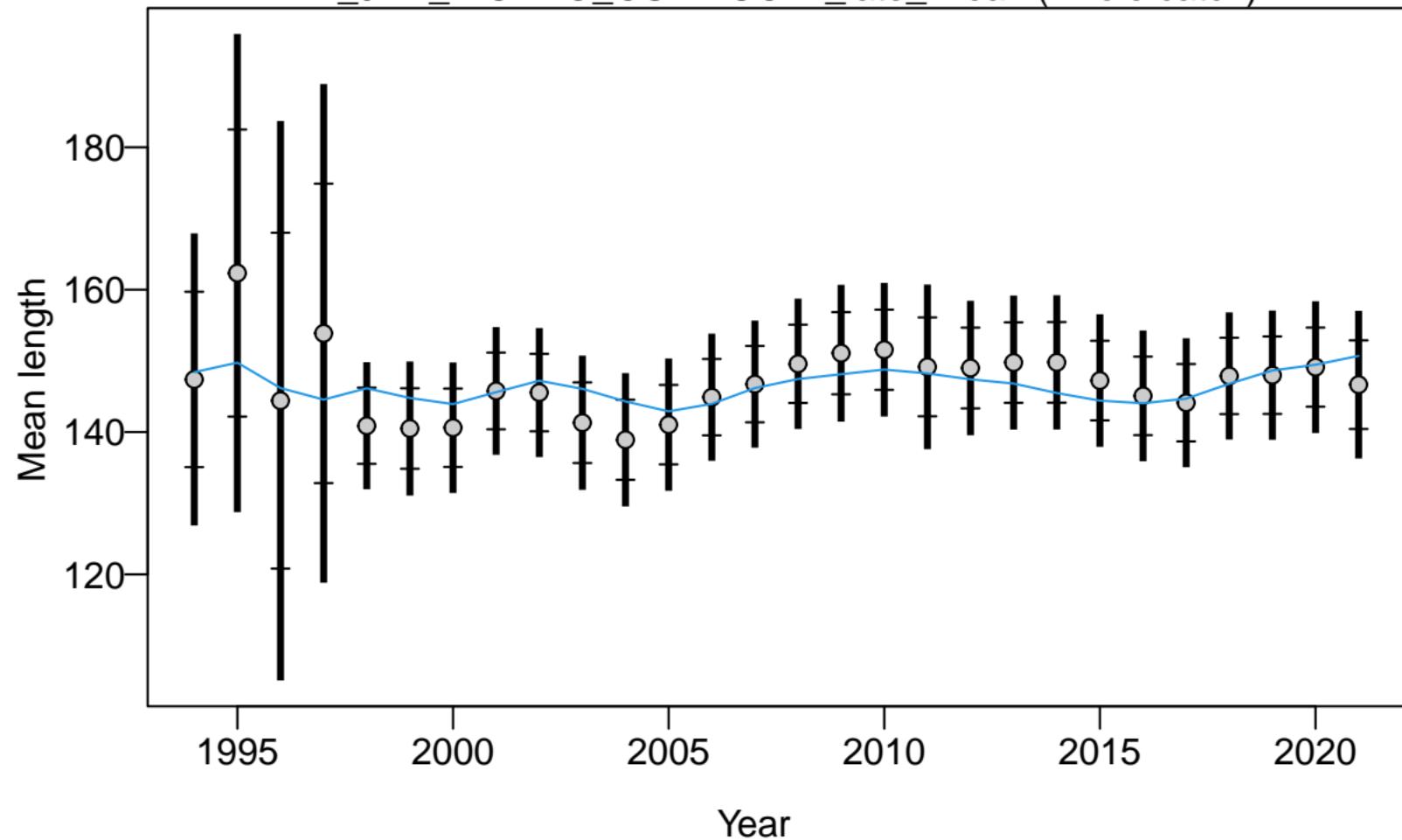




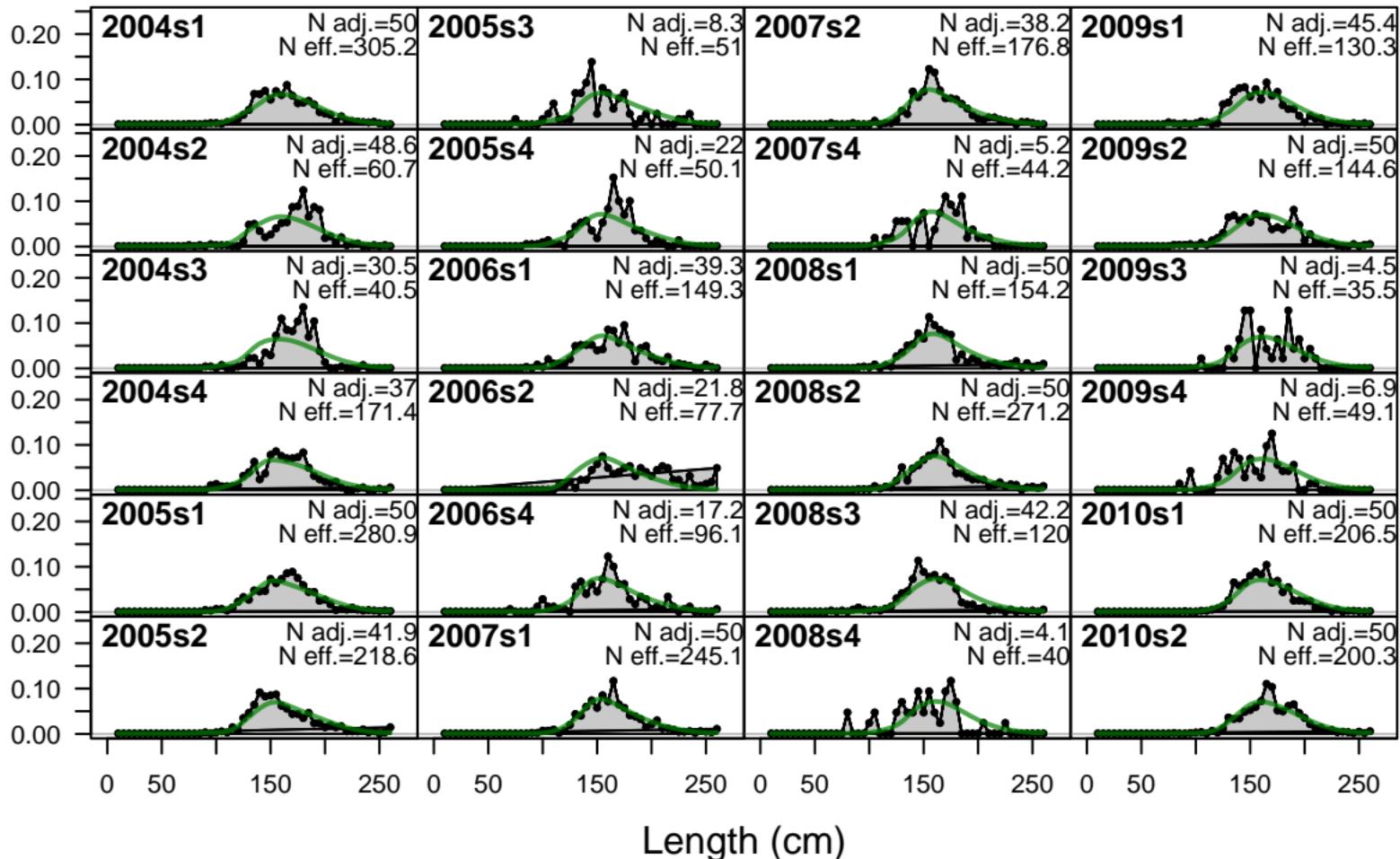
Effective sample size



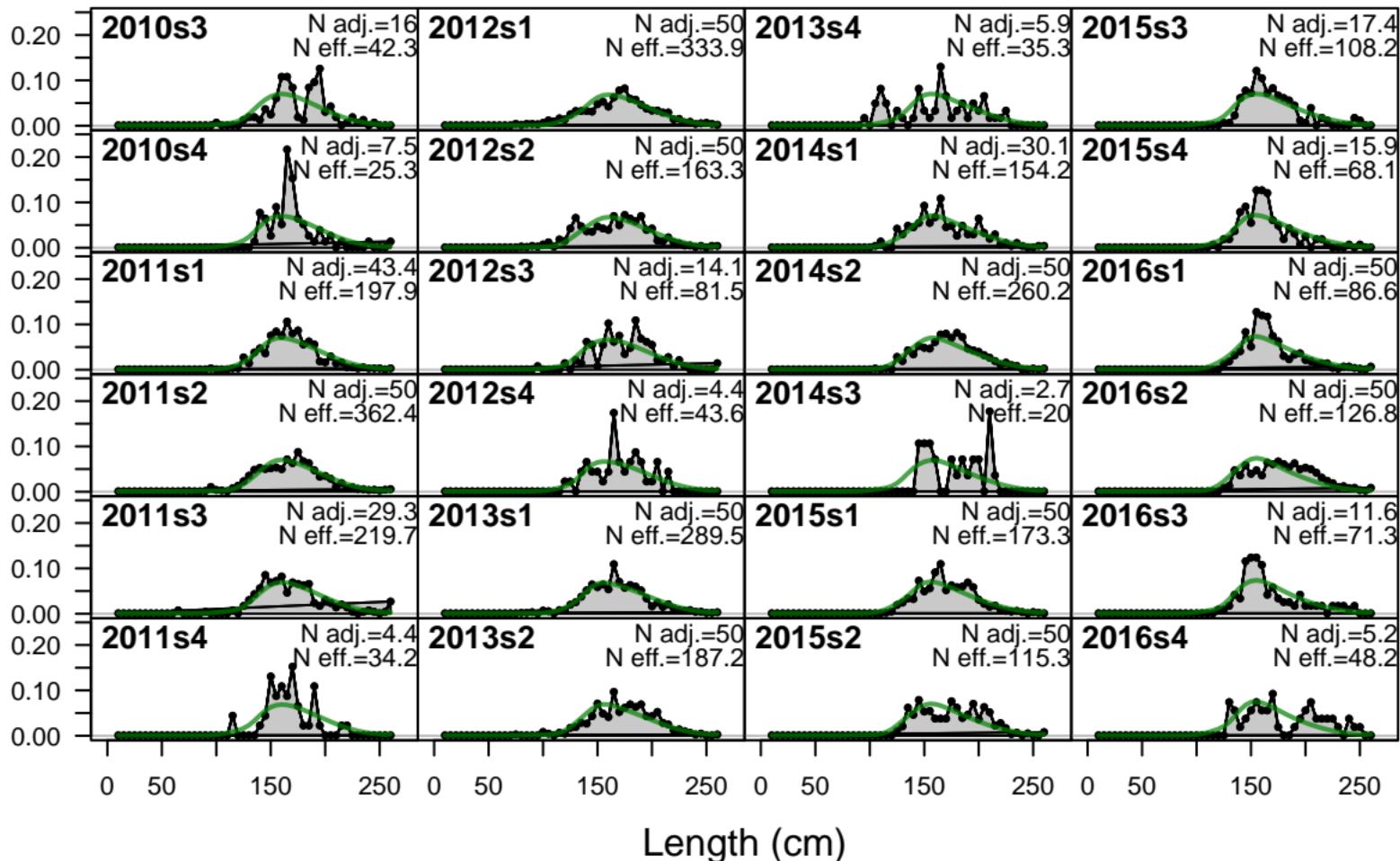
F1_JPN_WCNPO OSDWCOLL_late_Area1 (whole catch)



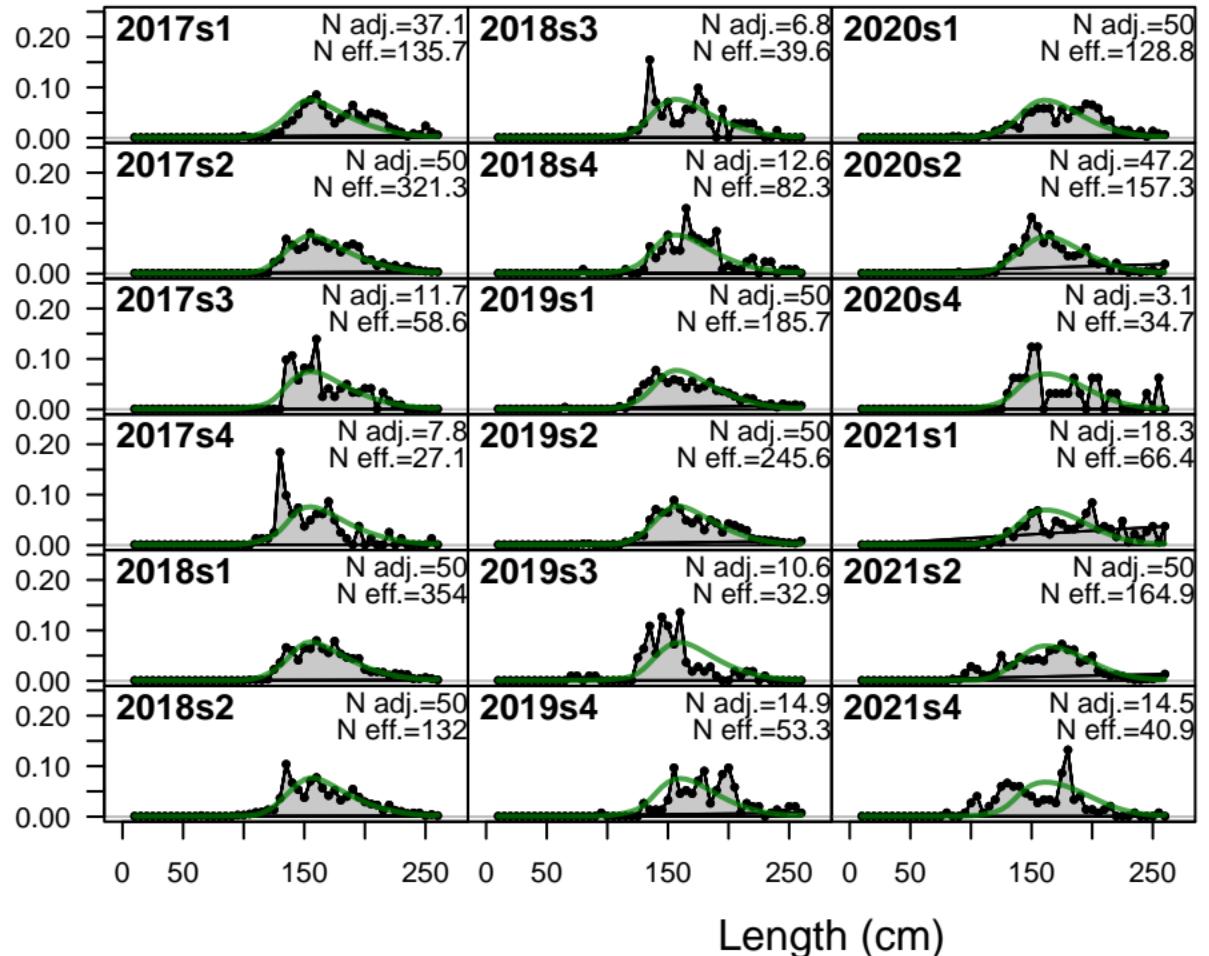
Proportion

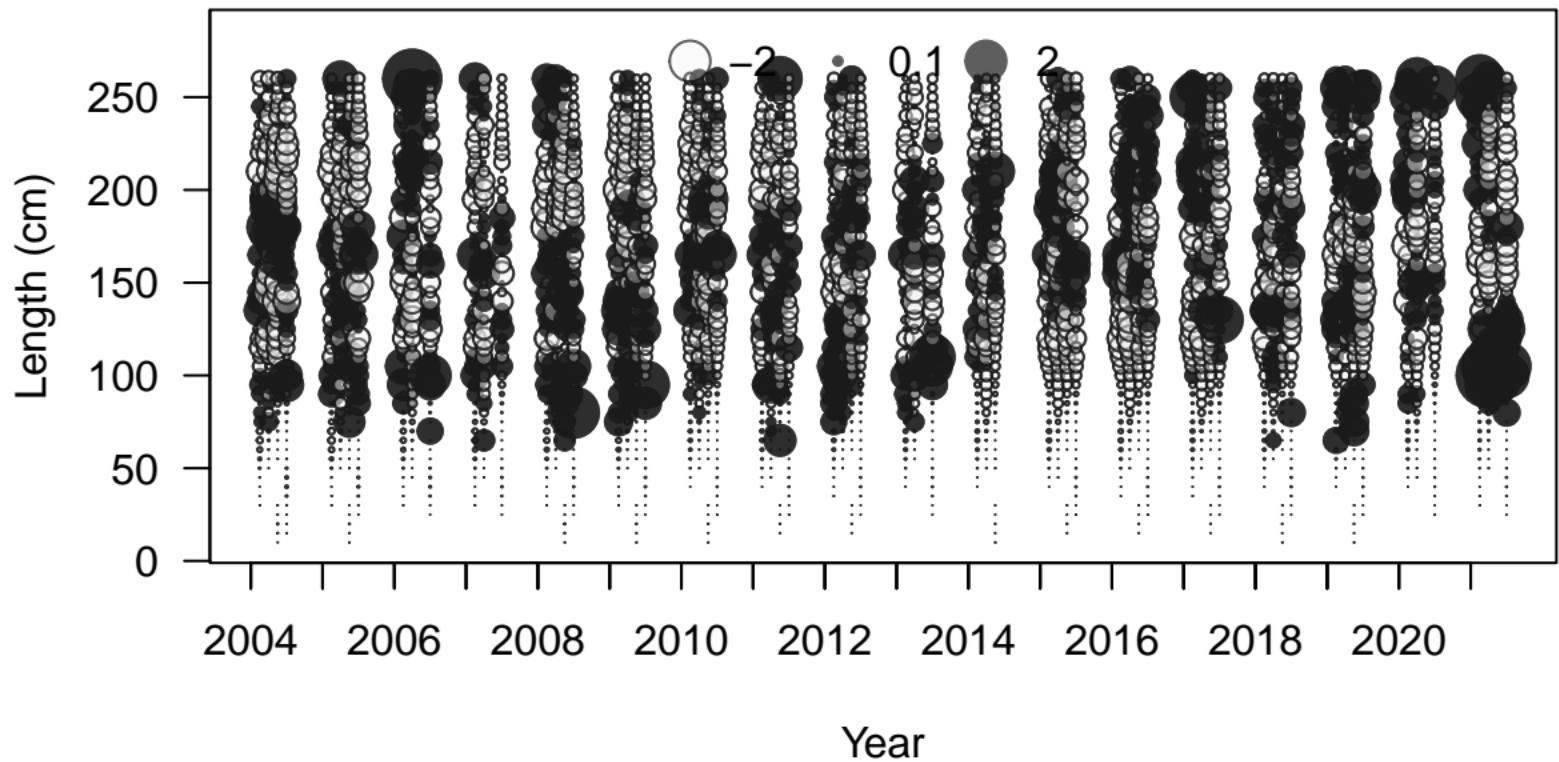


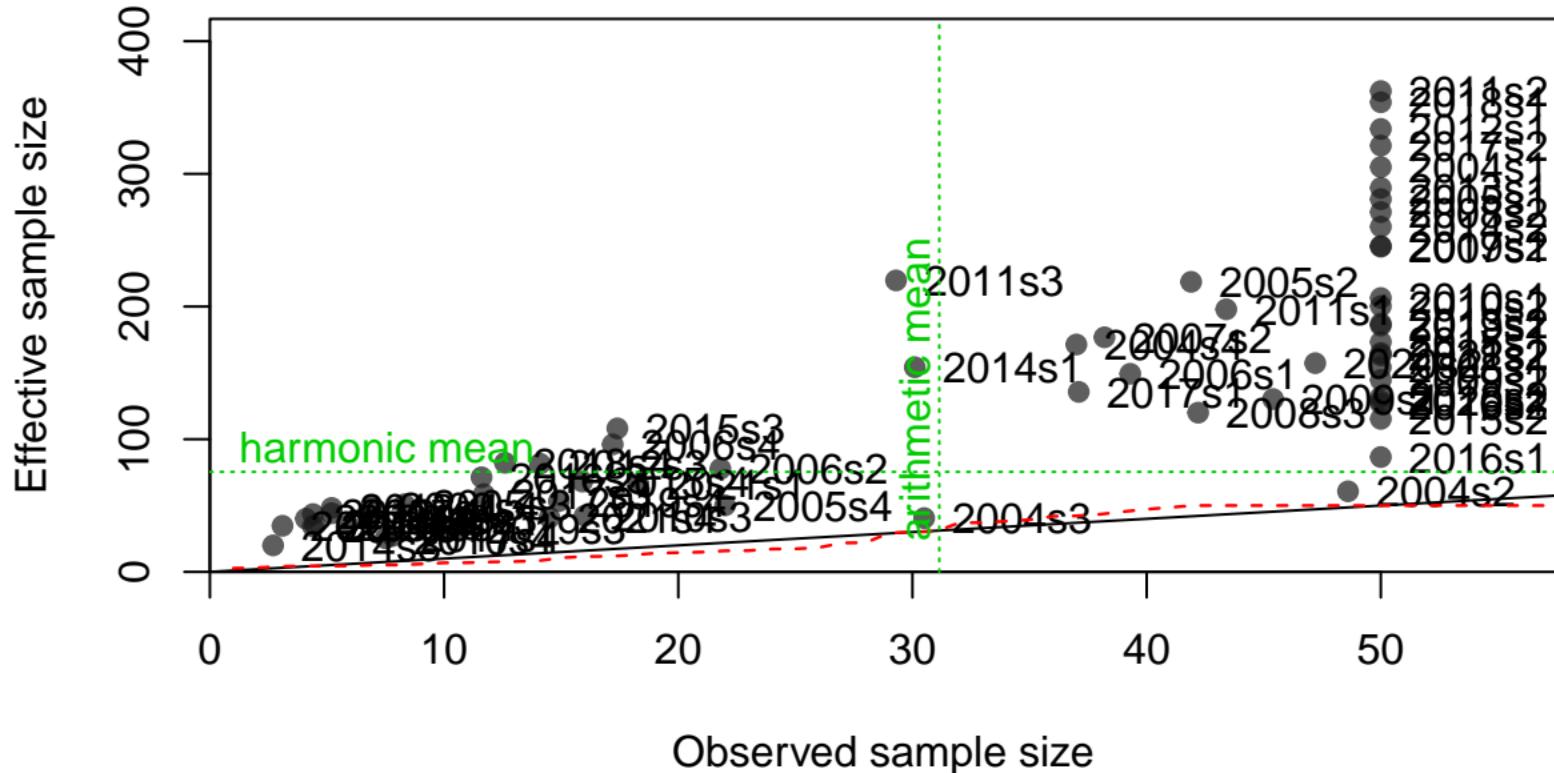
Proportion



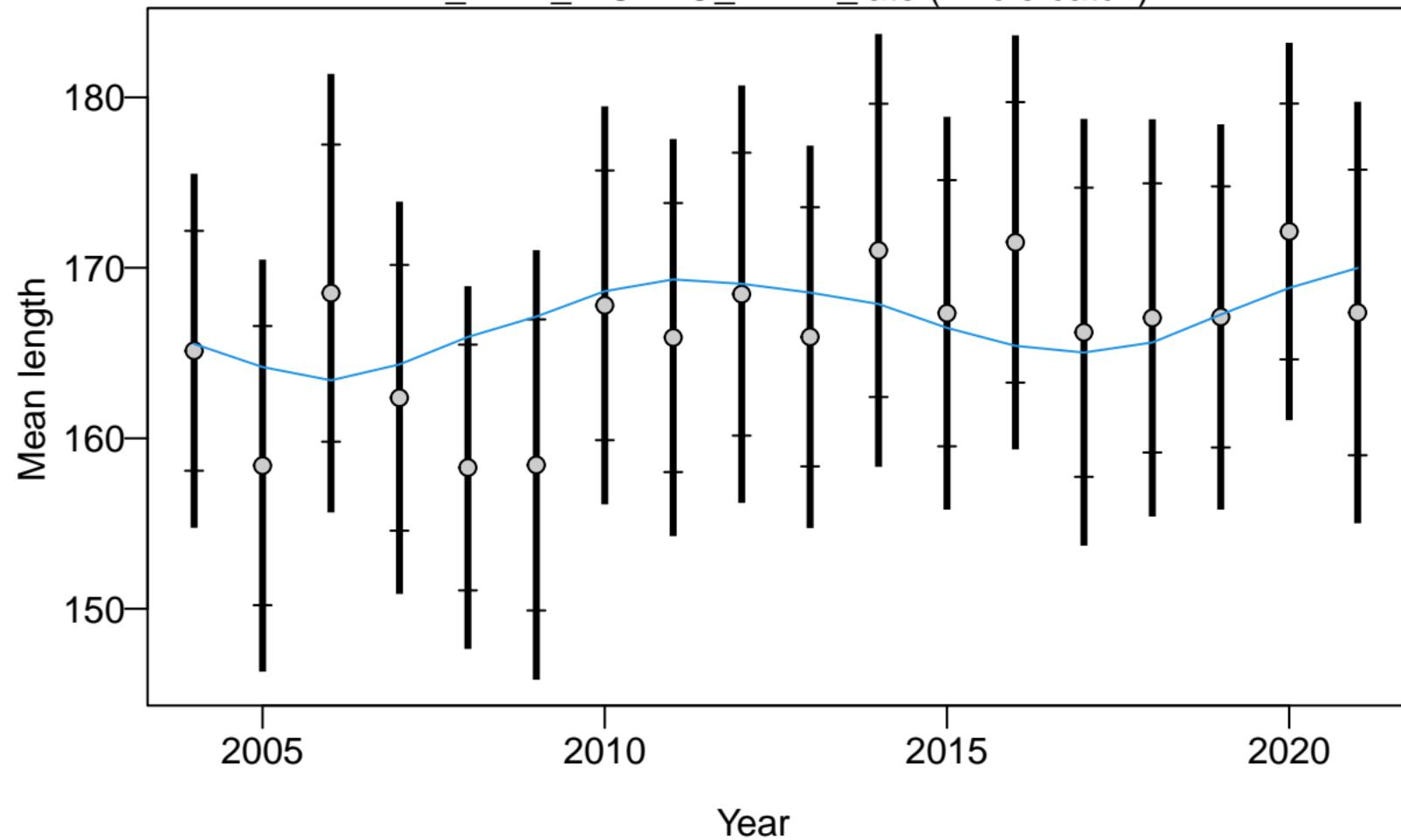
Proportion



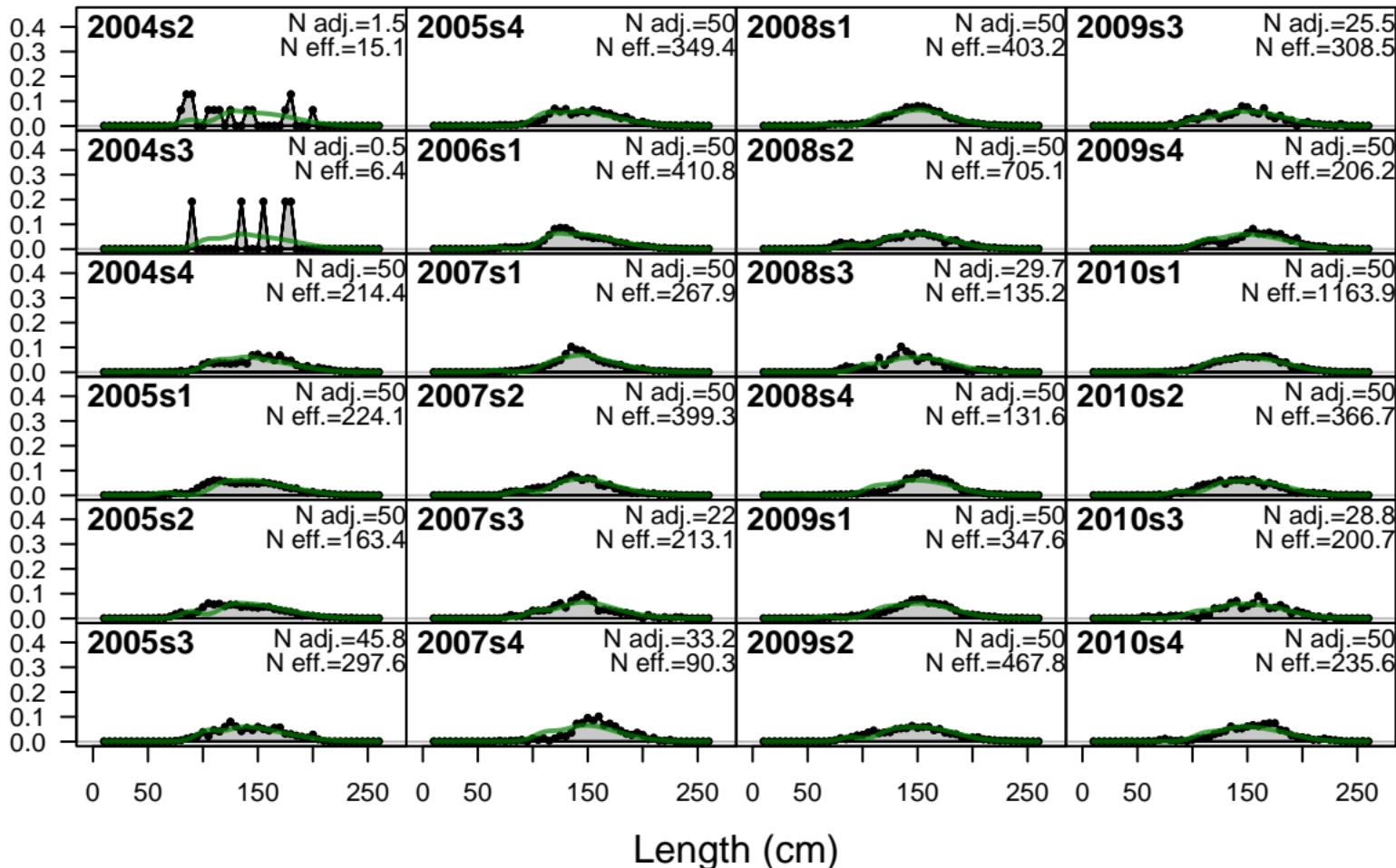




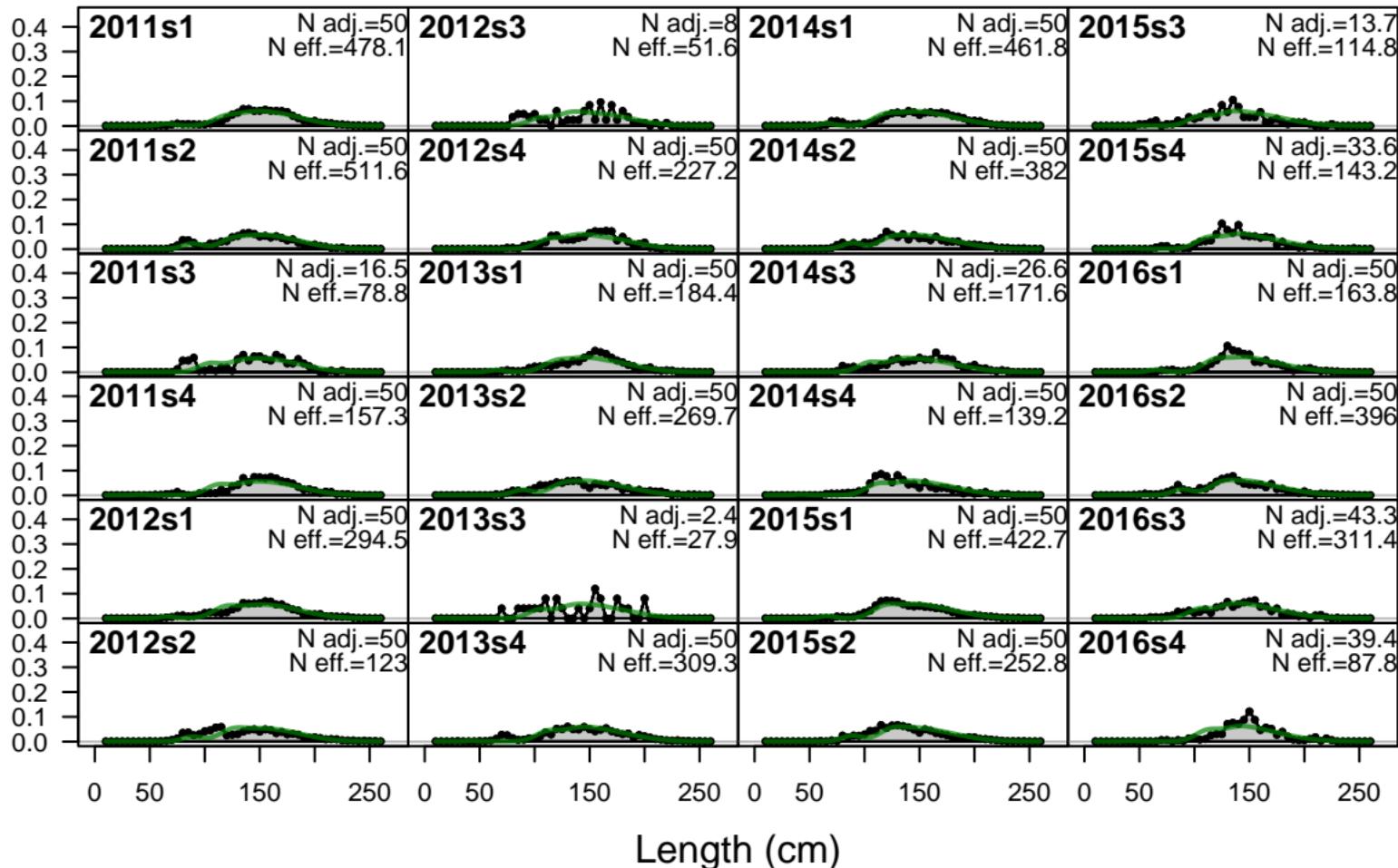
F2_TWN_WCNPO_DWLL_late (whole catch)



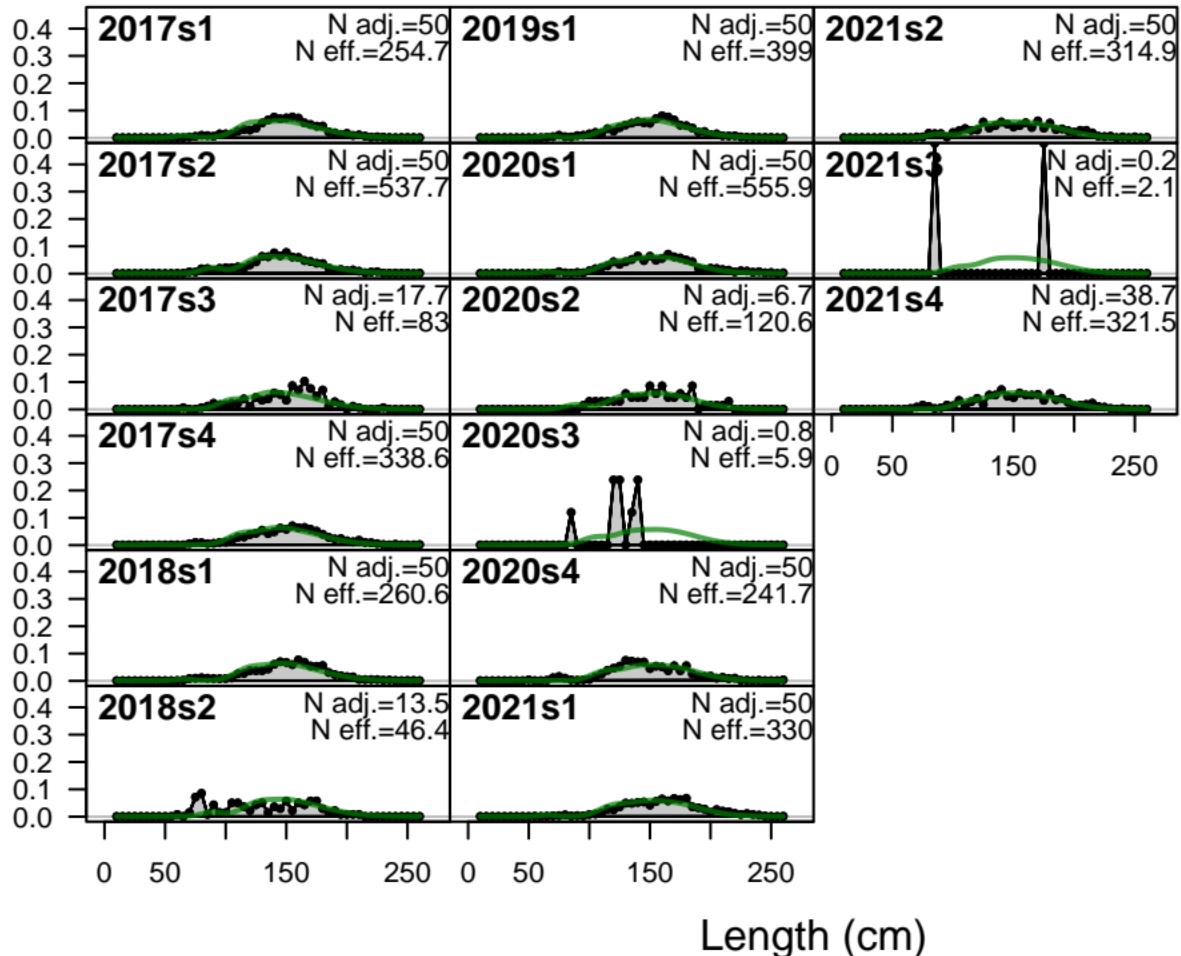
Proportion

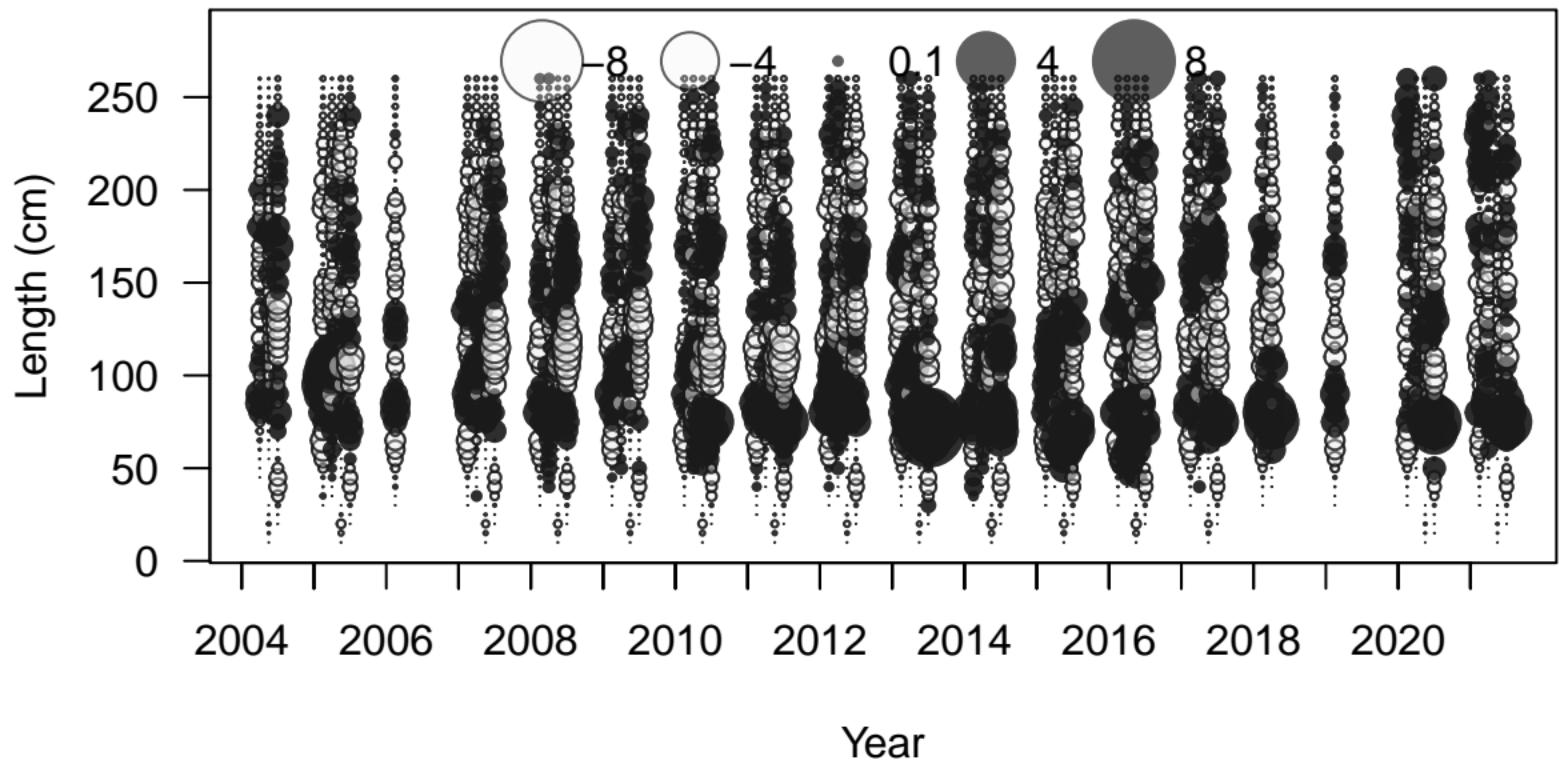


Proportion

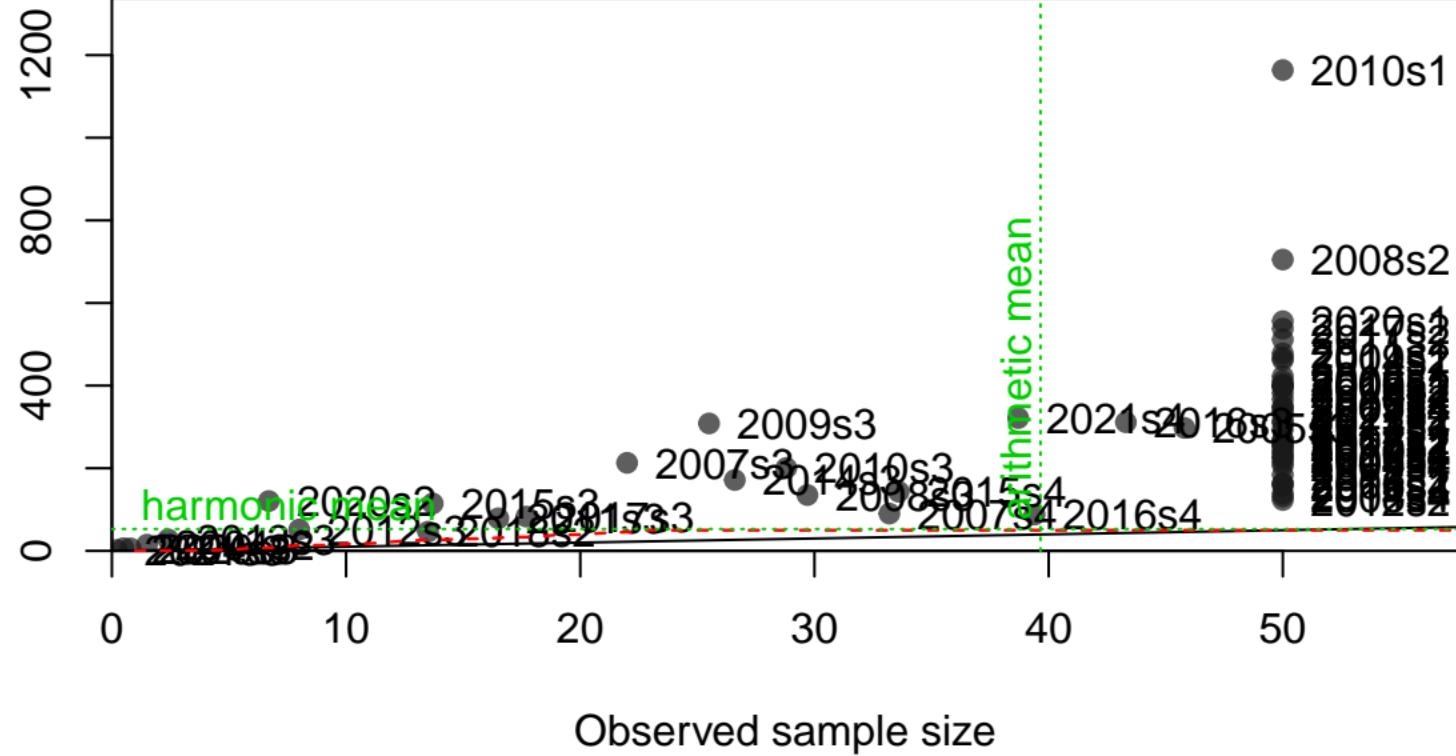


Proportion

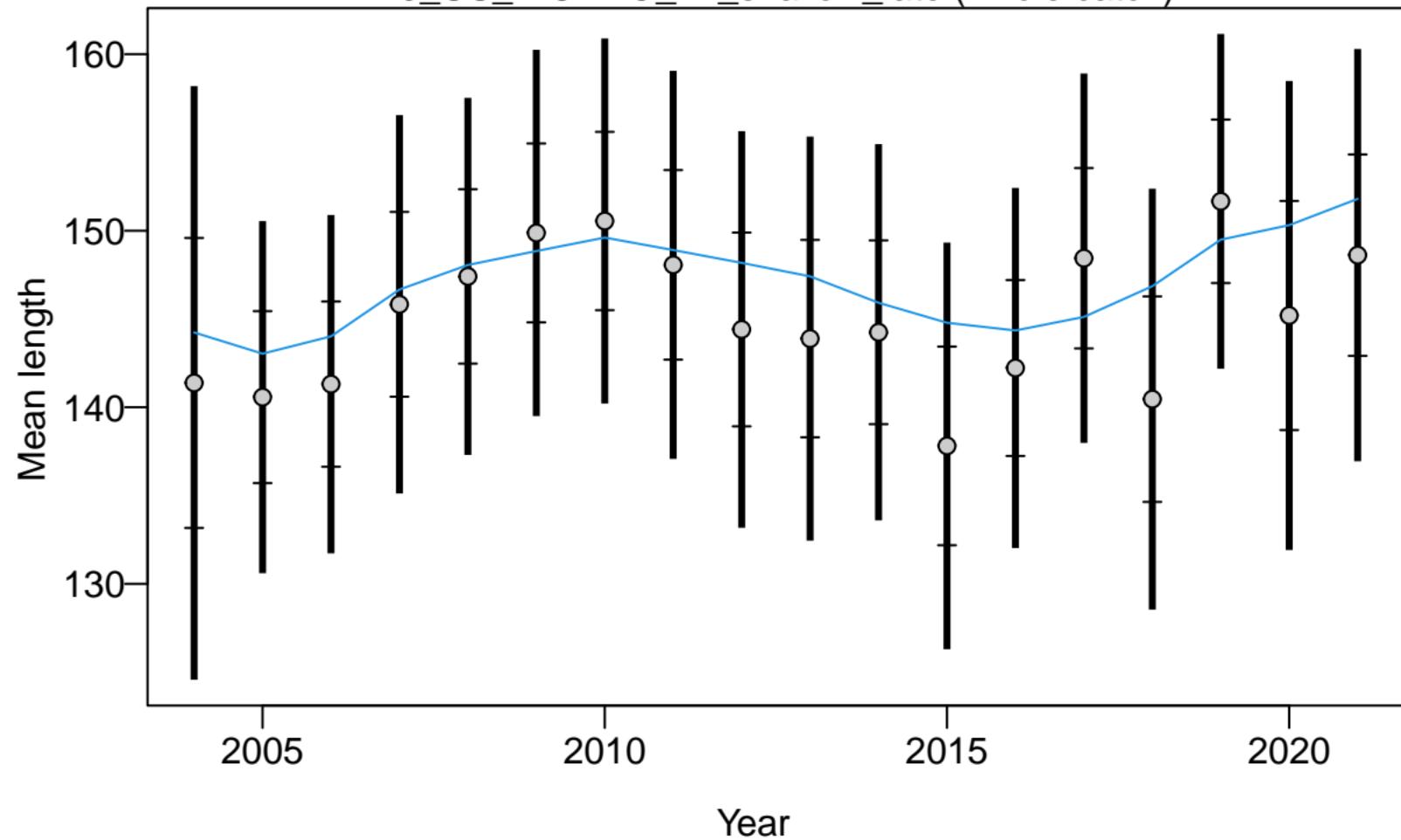




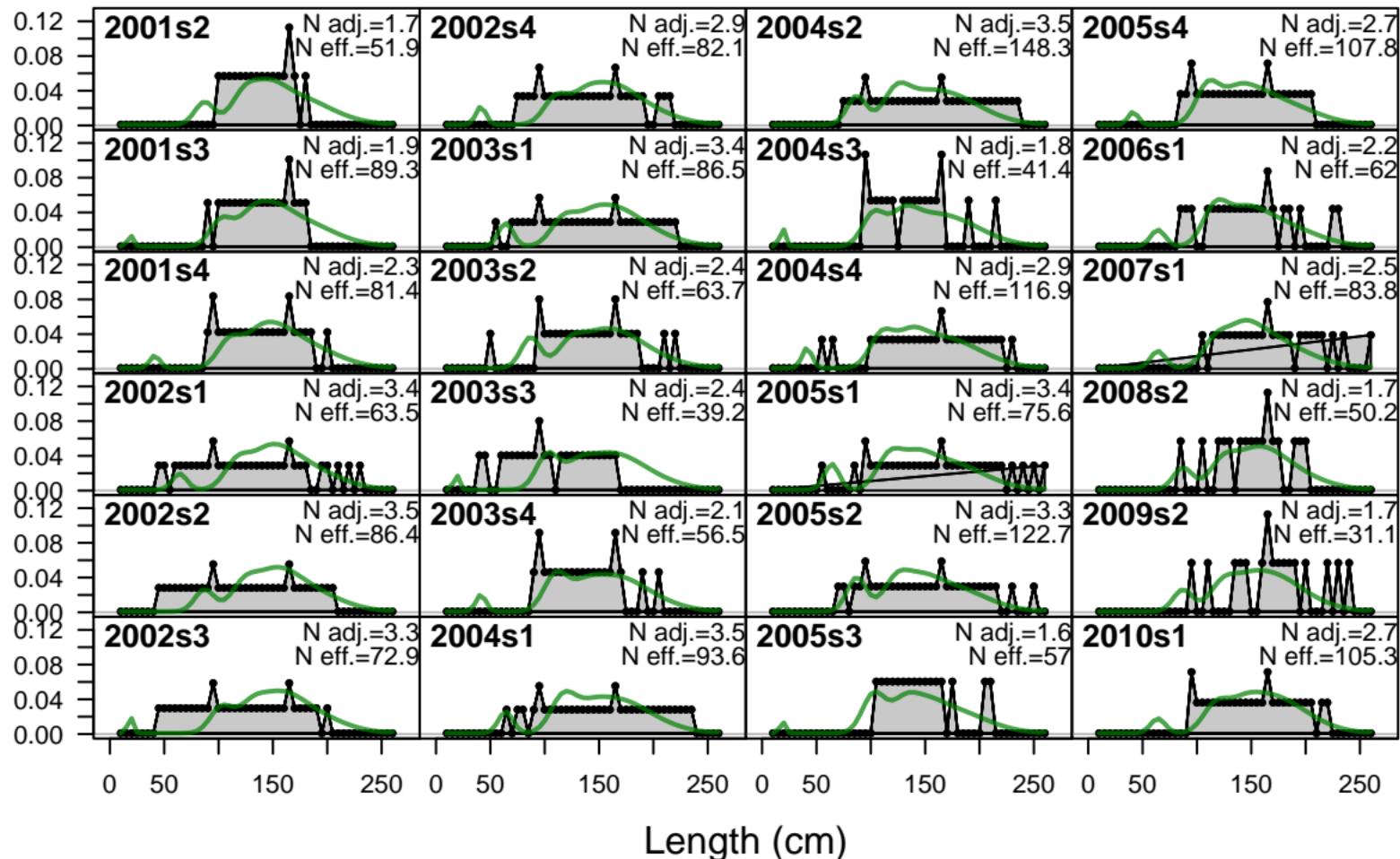
Effective sample size



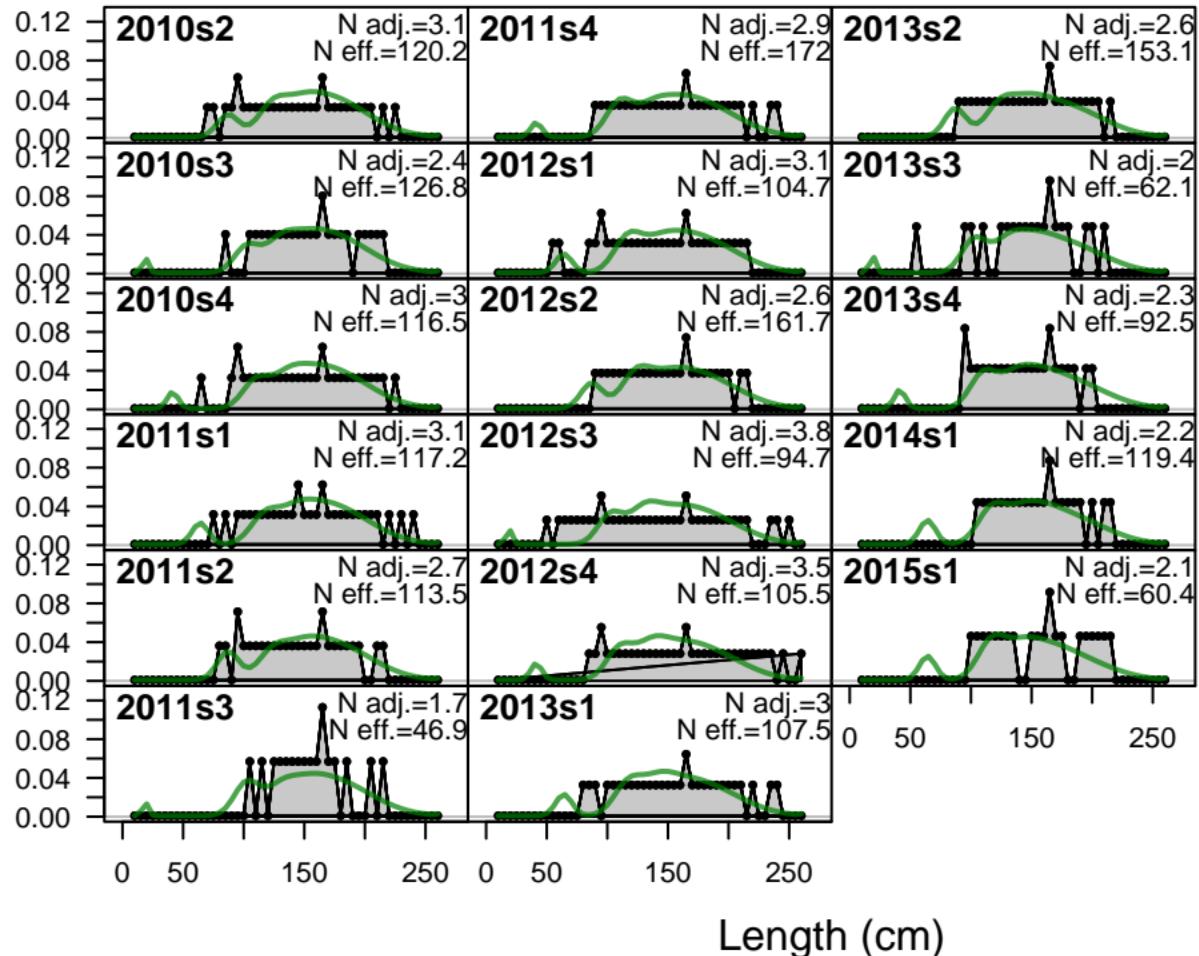
F3_US_WCNPO_LL_shallow_late (whole catch)

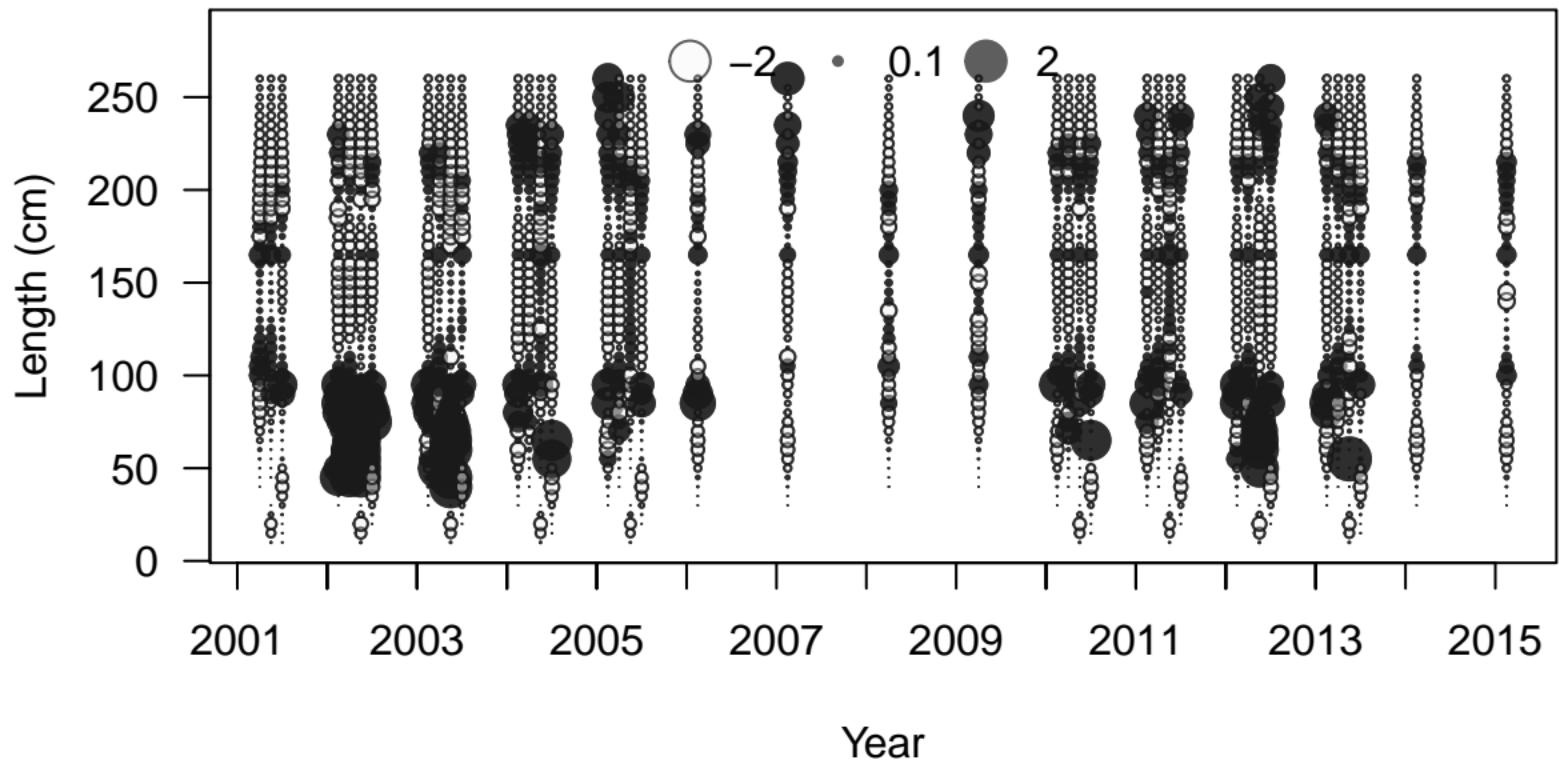


Proportion



Proportion





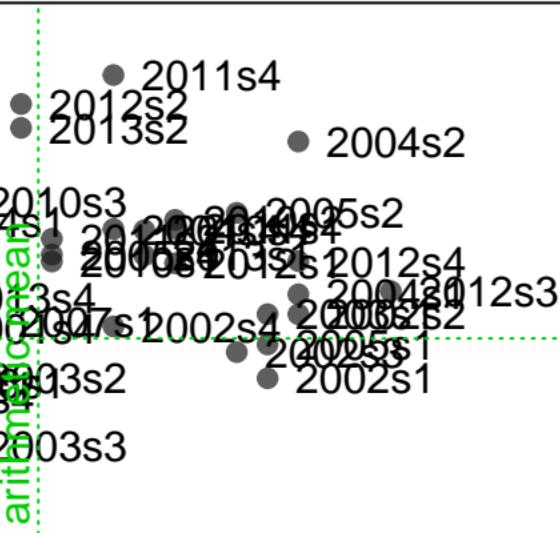
Effective sample size

150
100
50
0

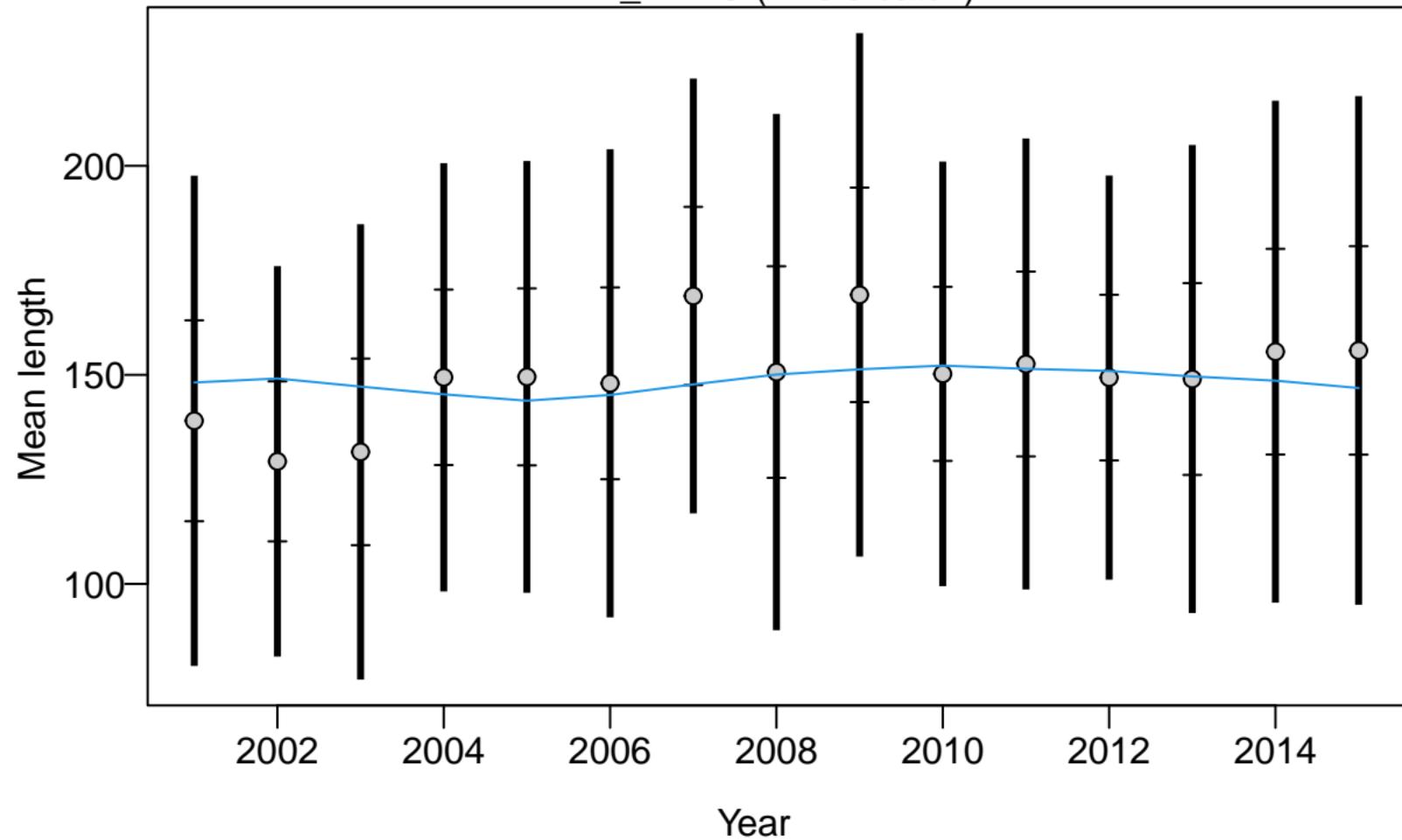
0 1 2 3 4

Observed sample size

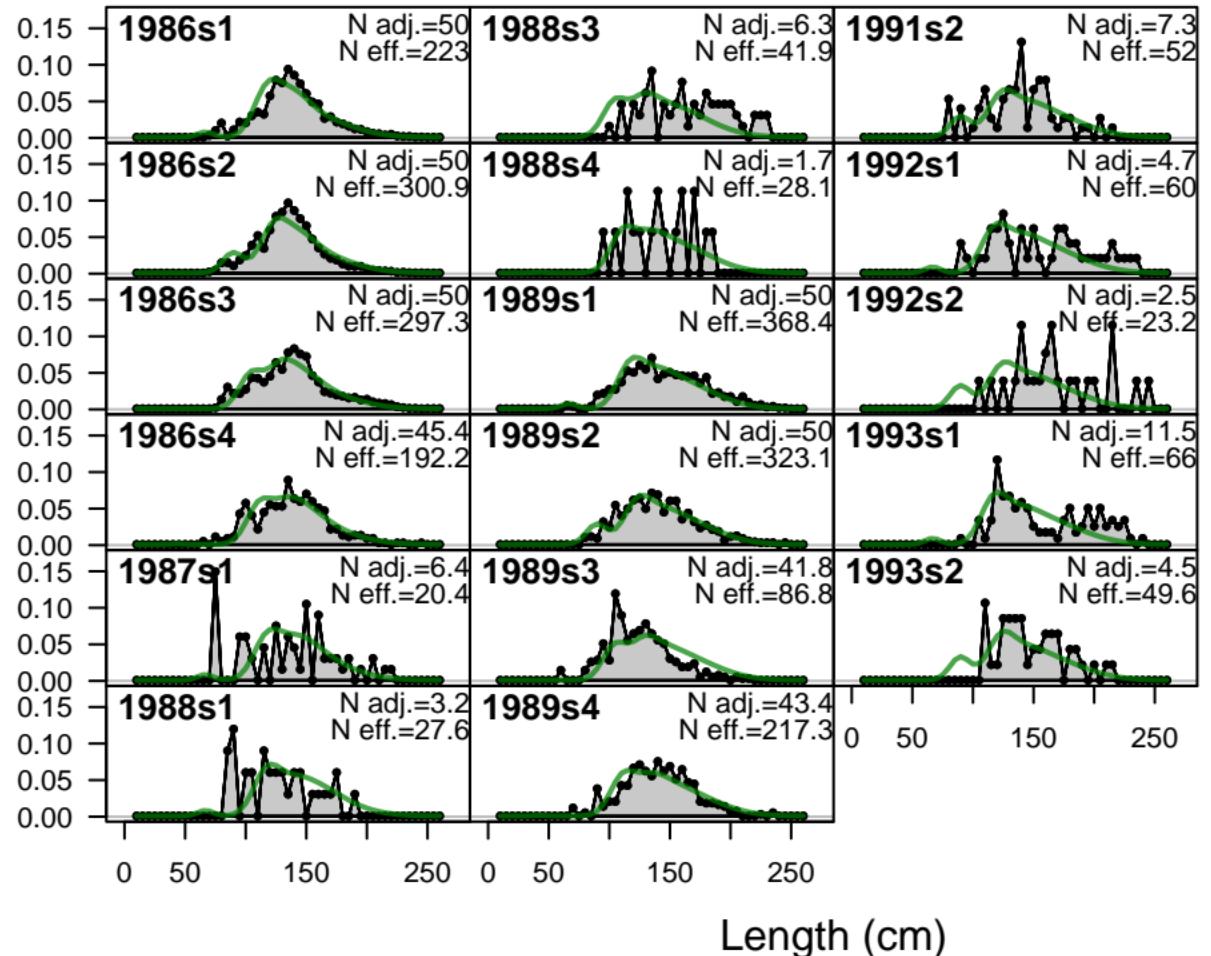
harmonic mean

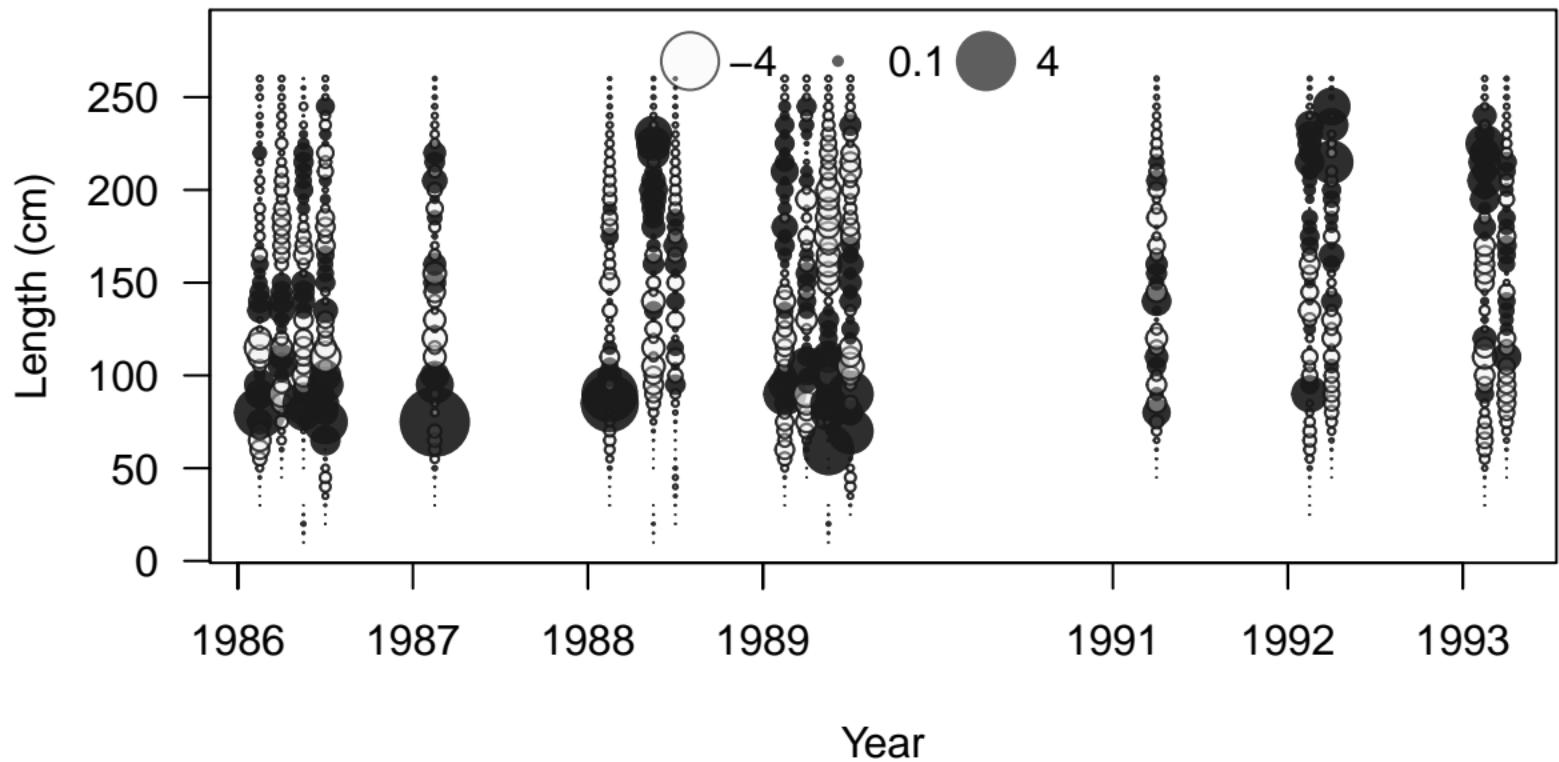


F4_IATTC (whole catch)

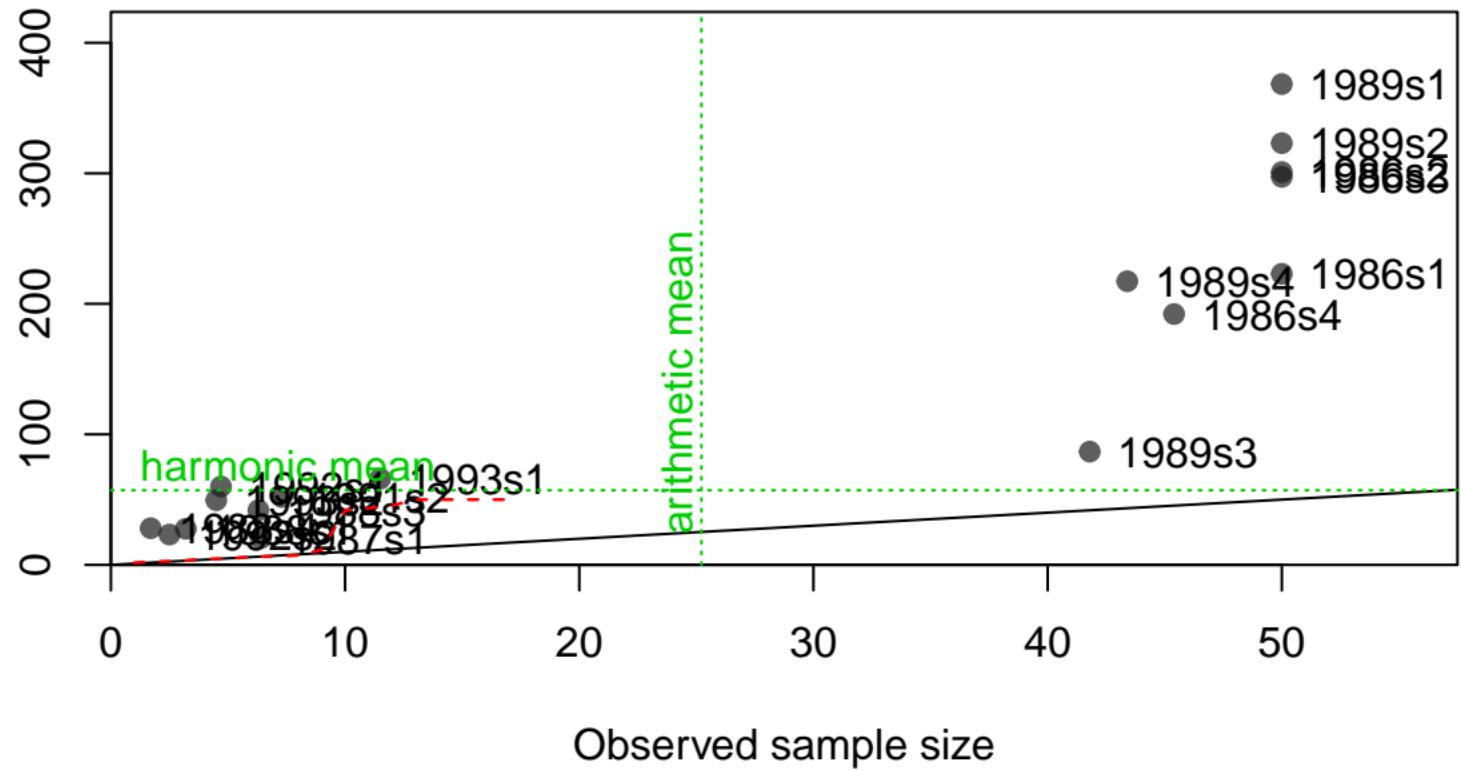


Proportion

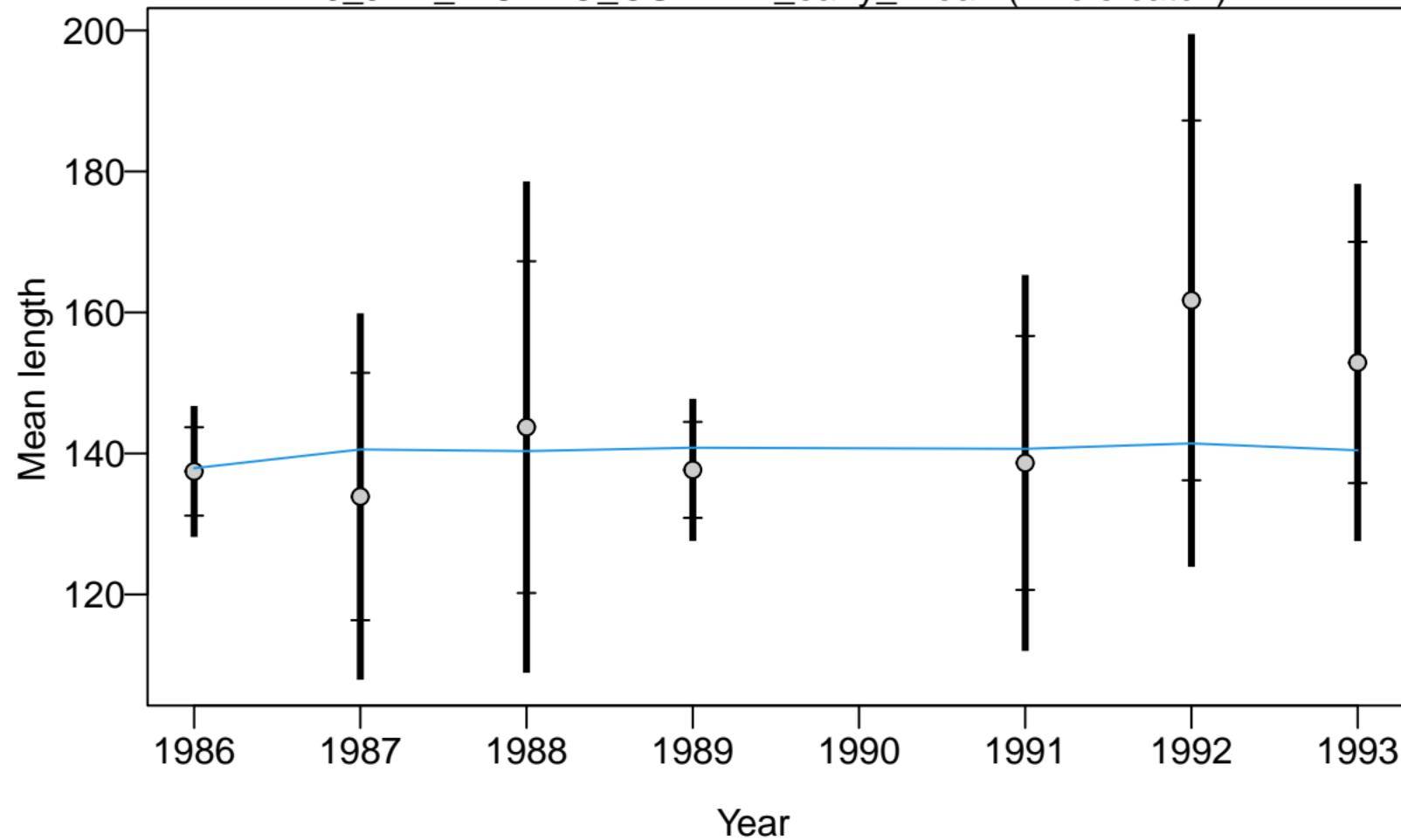




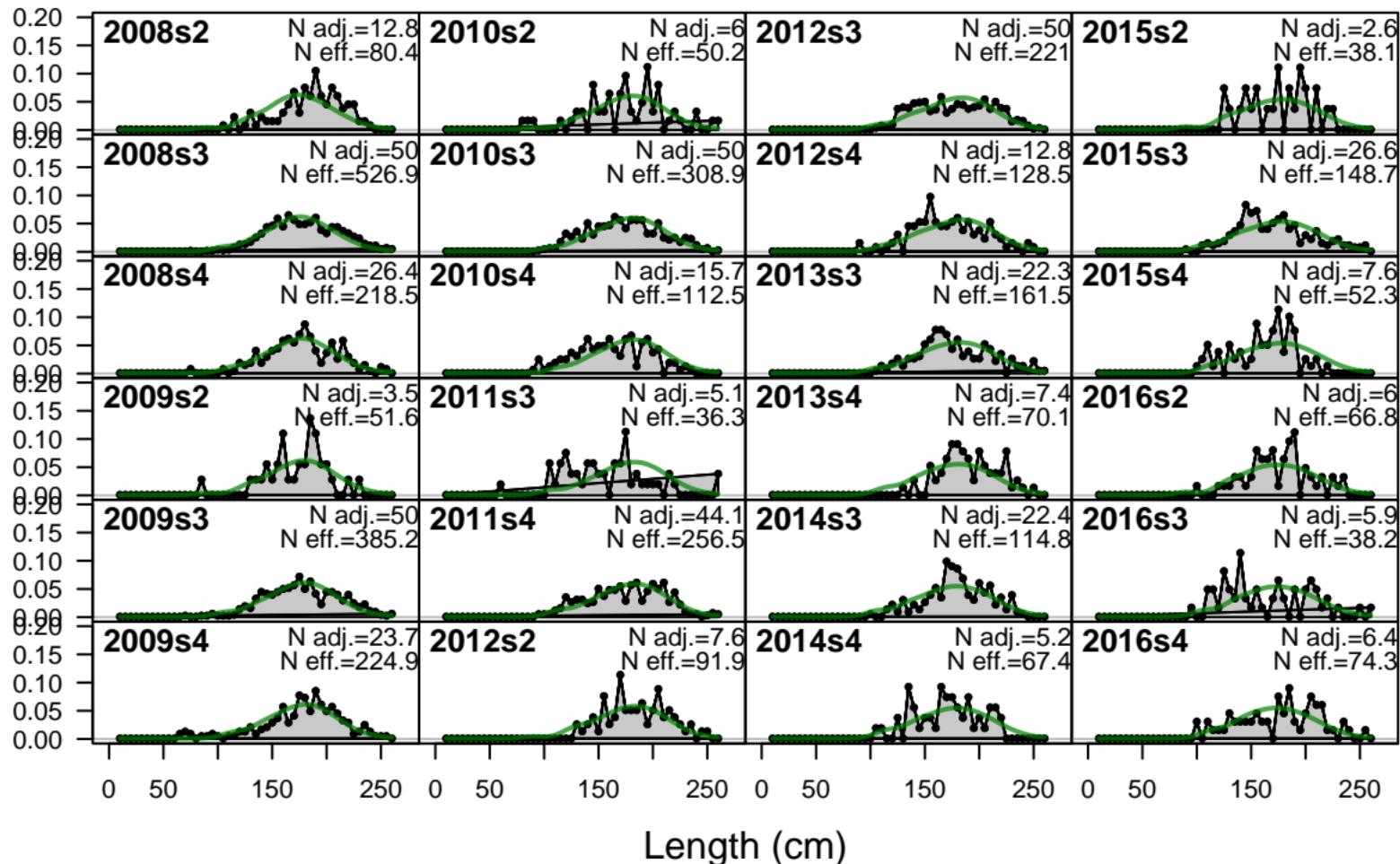
Effective sample size



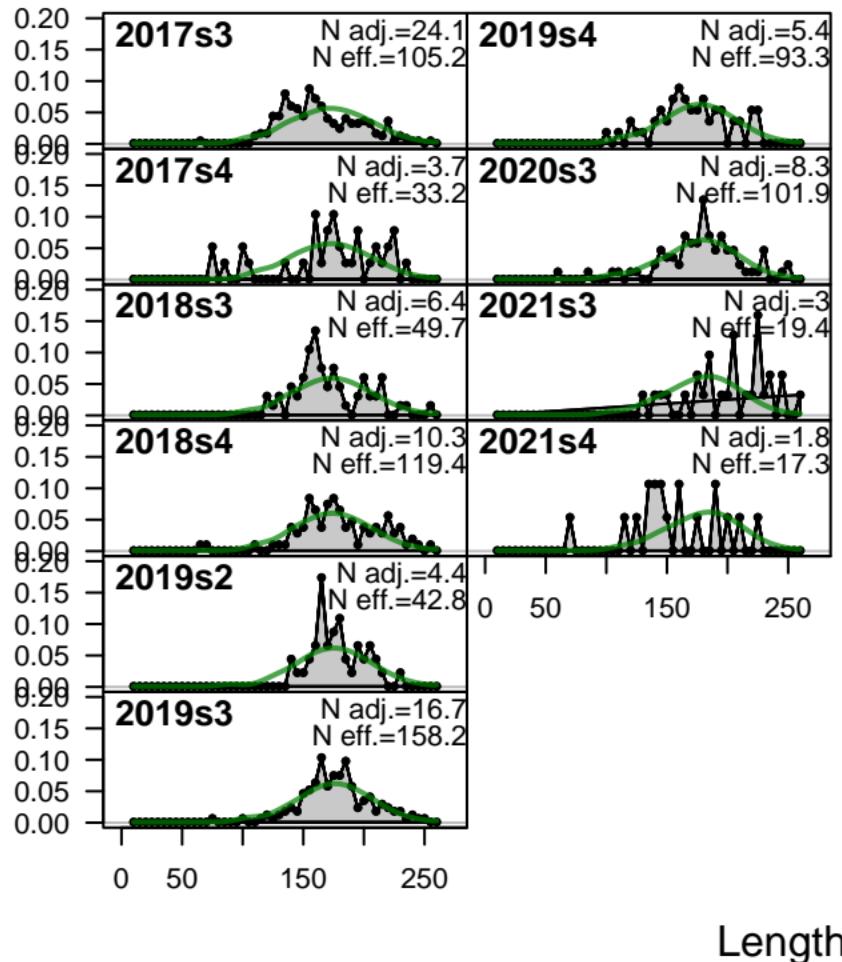
F6_JPN_WCNPO OSDWLL_early_Area1 (whole catch)

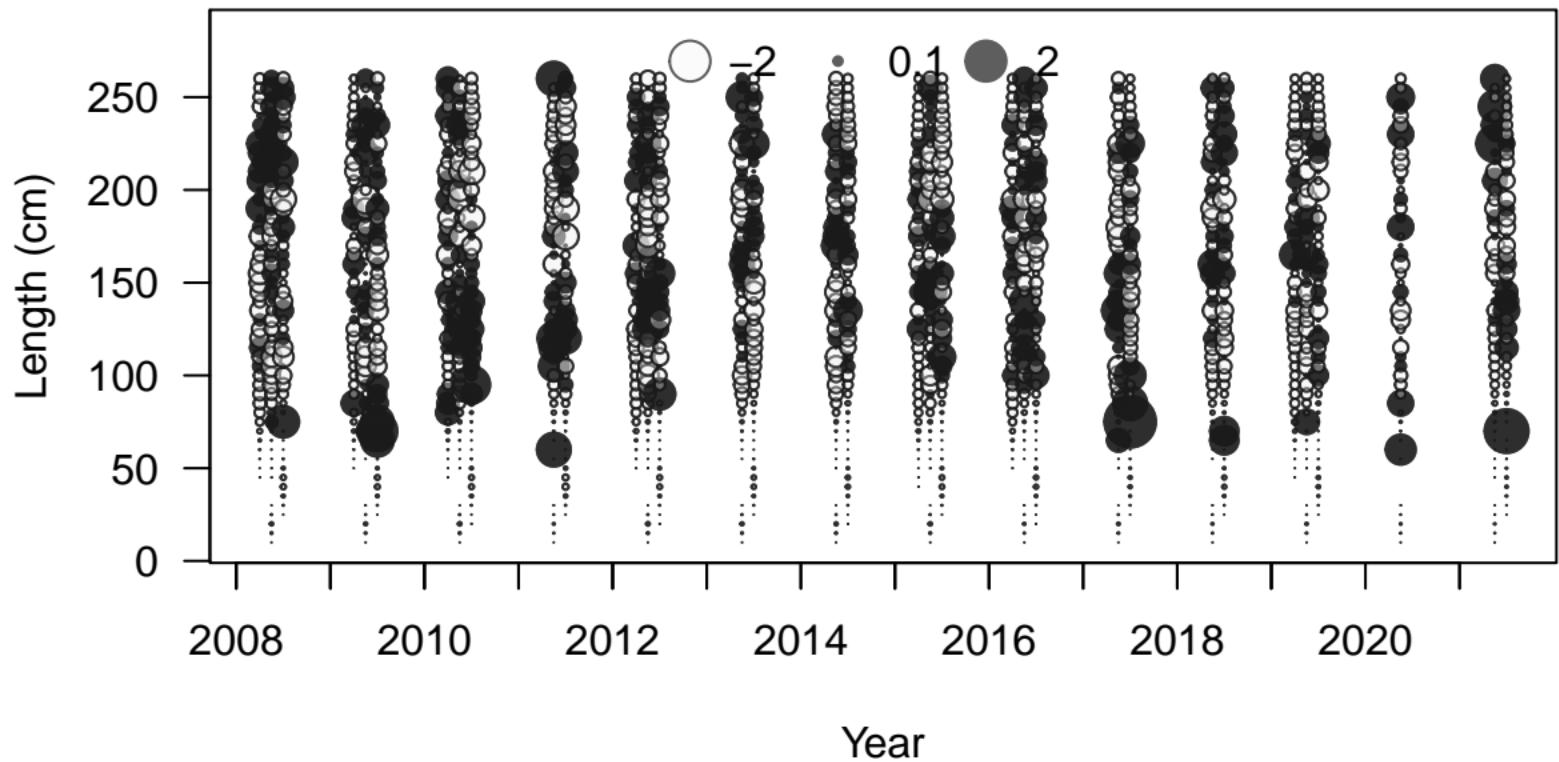


Proportion

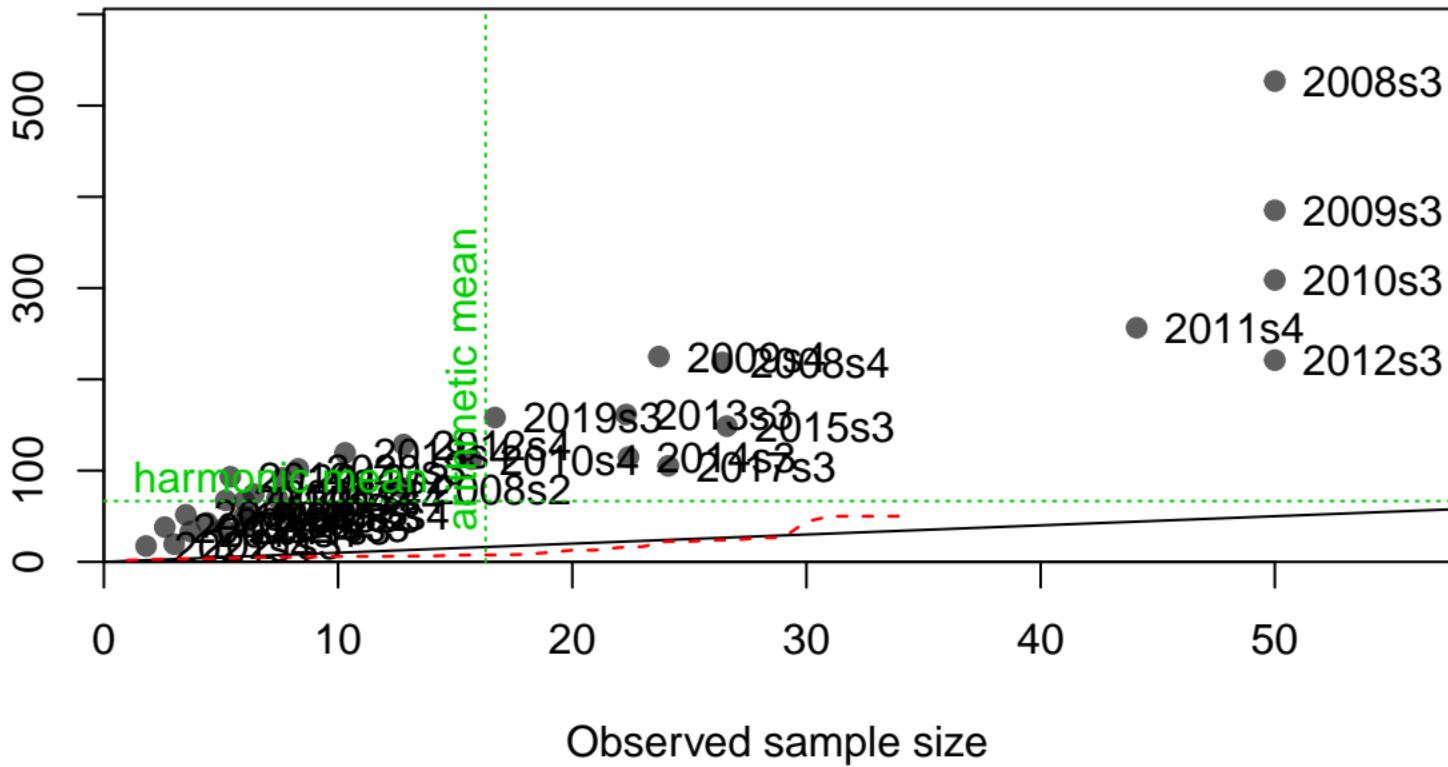


Proportion

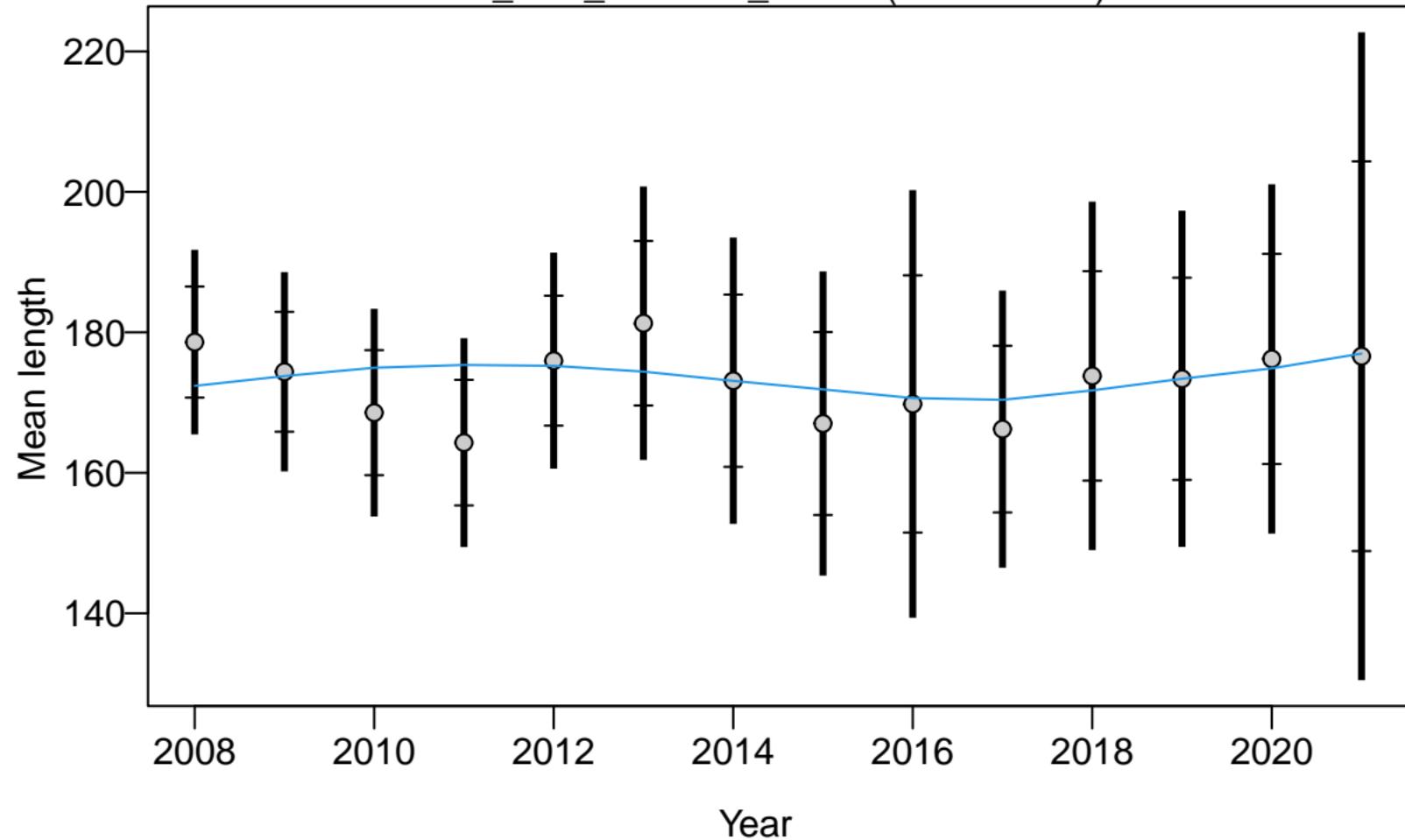




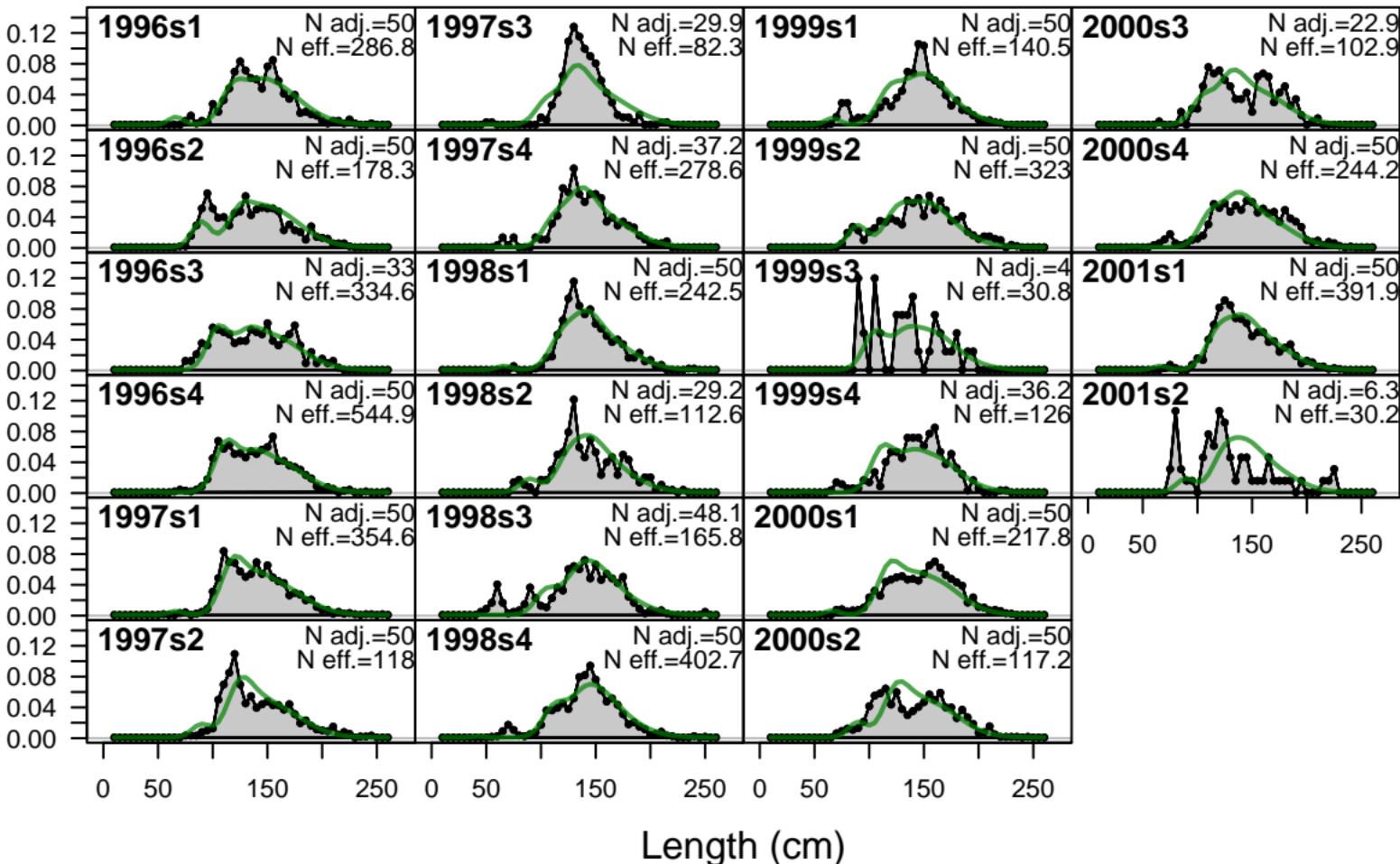
Effective sample size

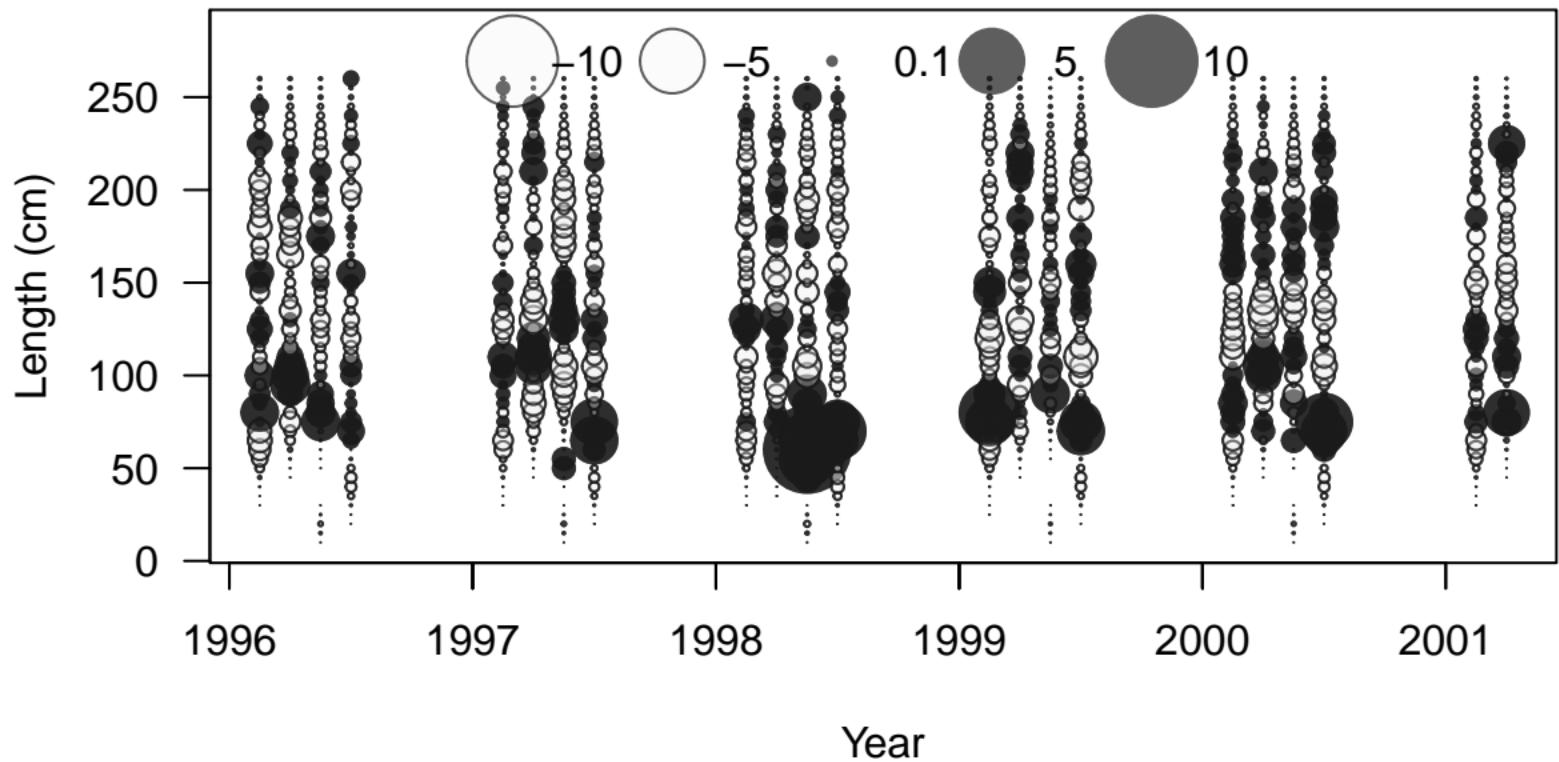


F7_JPN_WCNPO_CODF (whole catch)

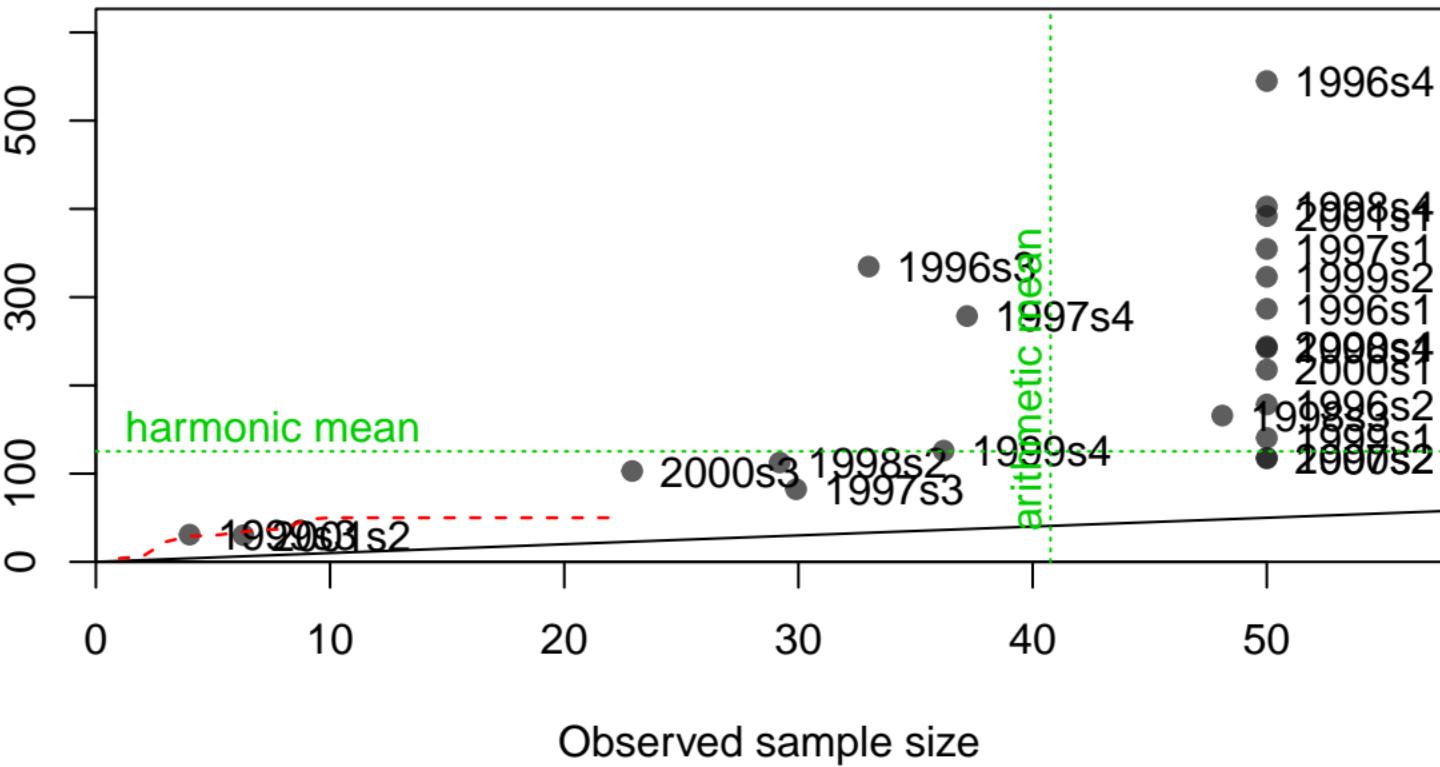


Proportion

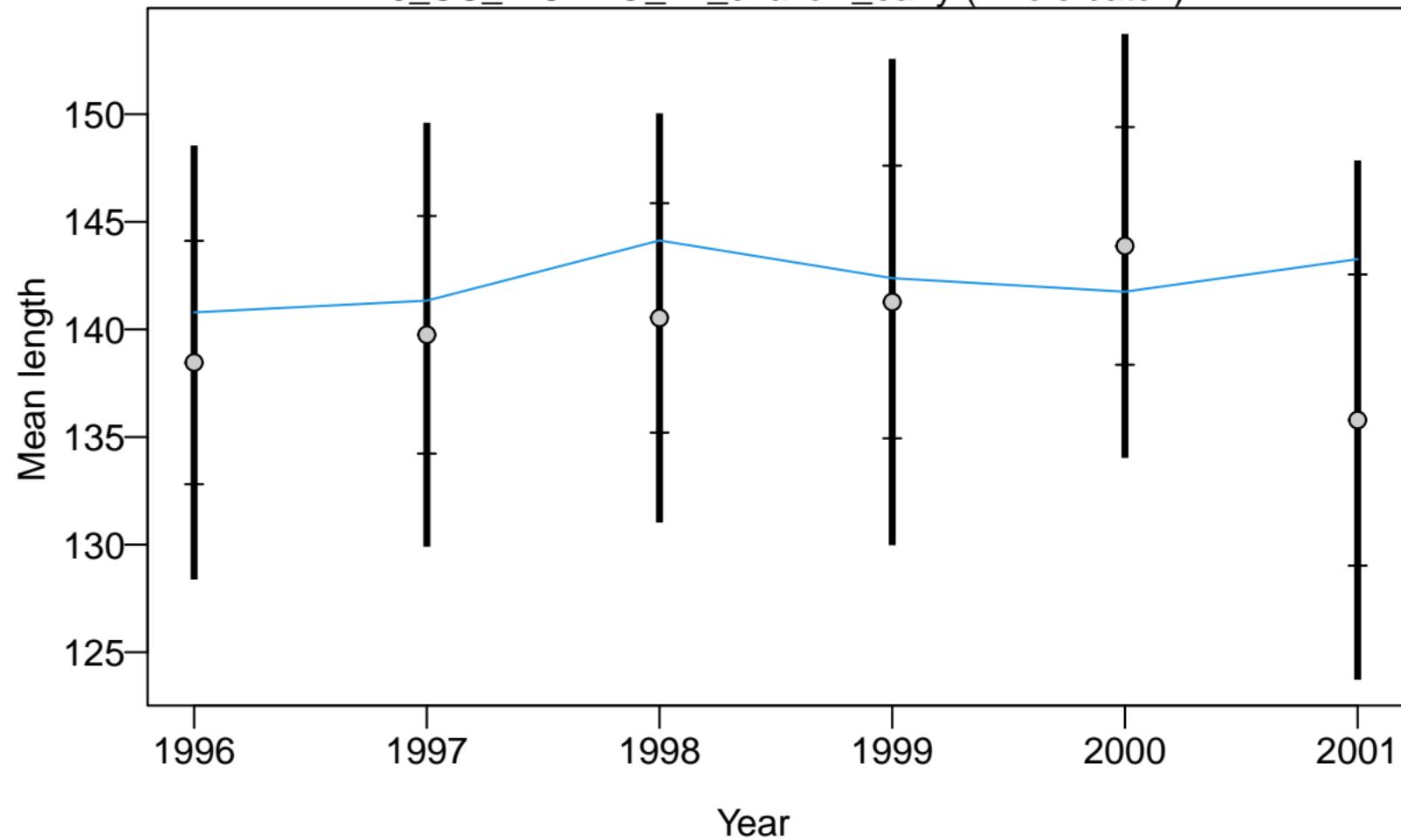




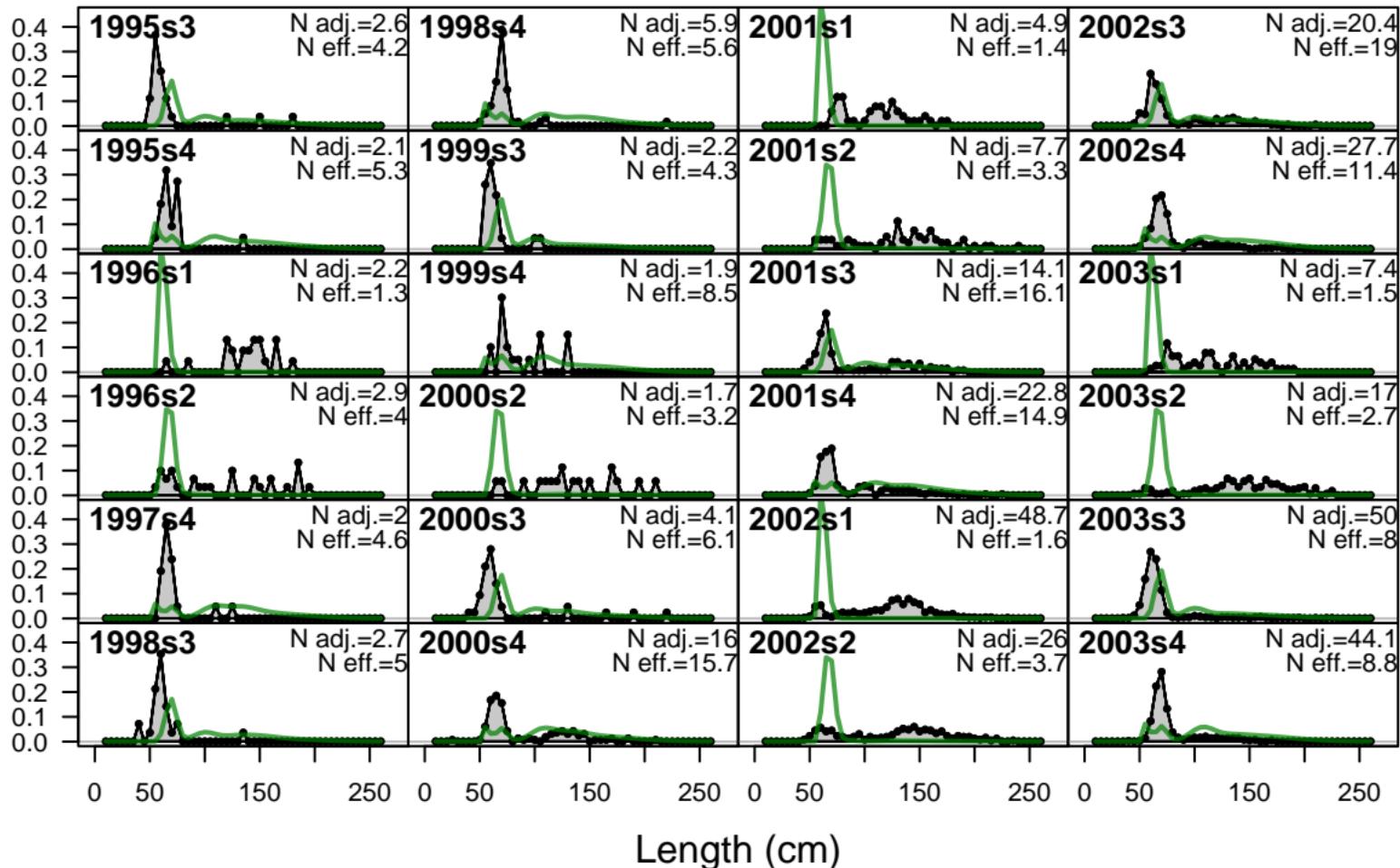
Effective sample size



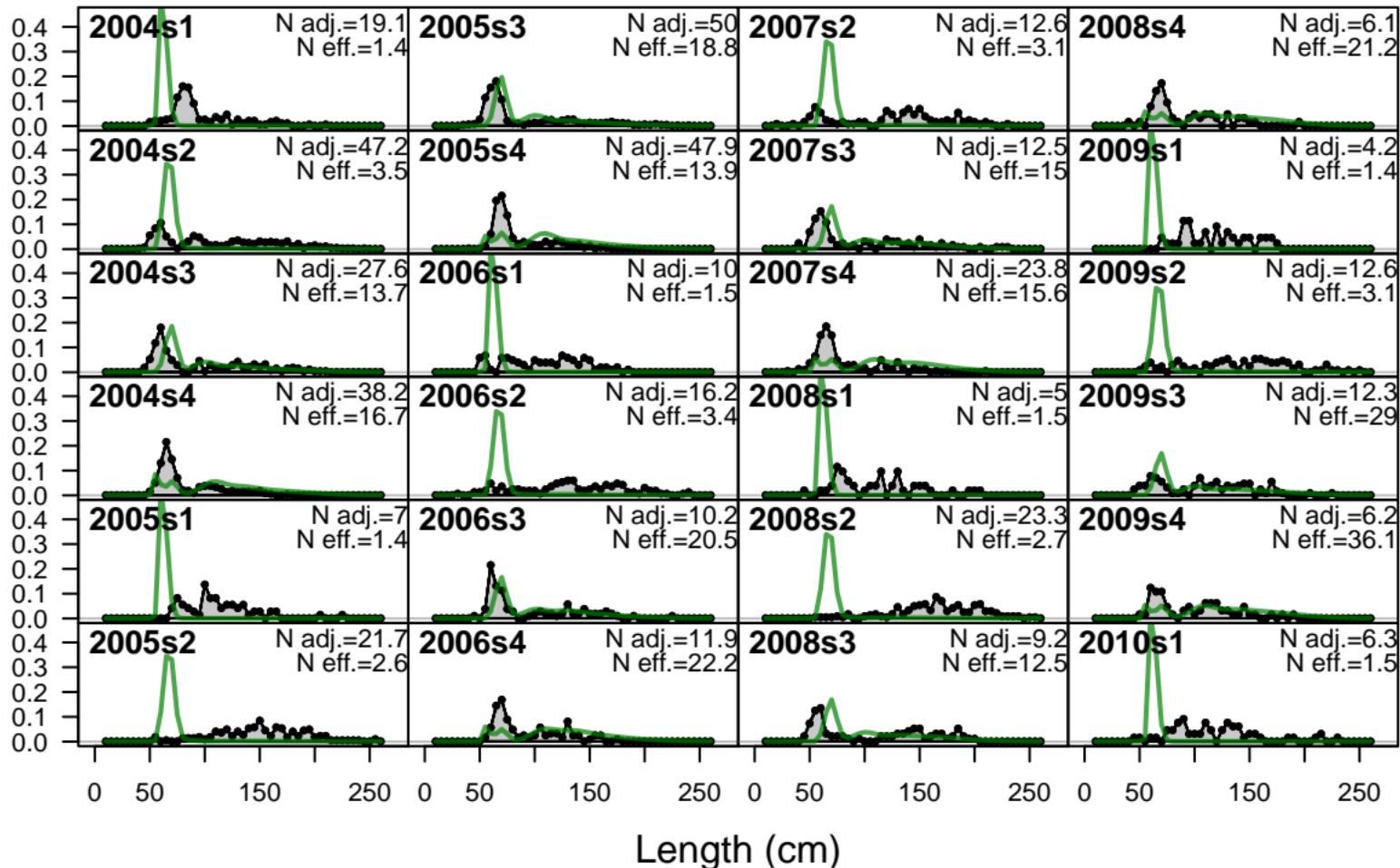
F8_US_WCNPO_LL_shallow_early (whole catch)



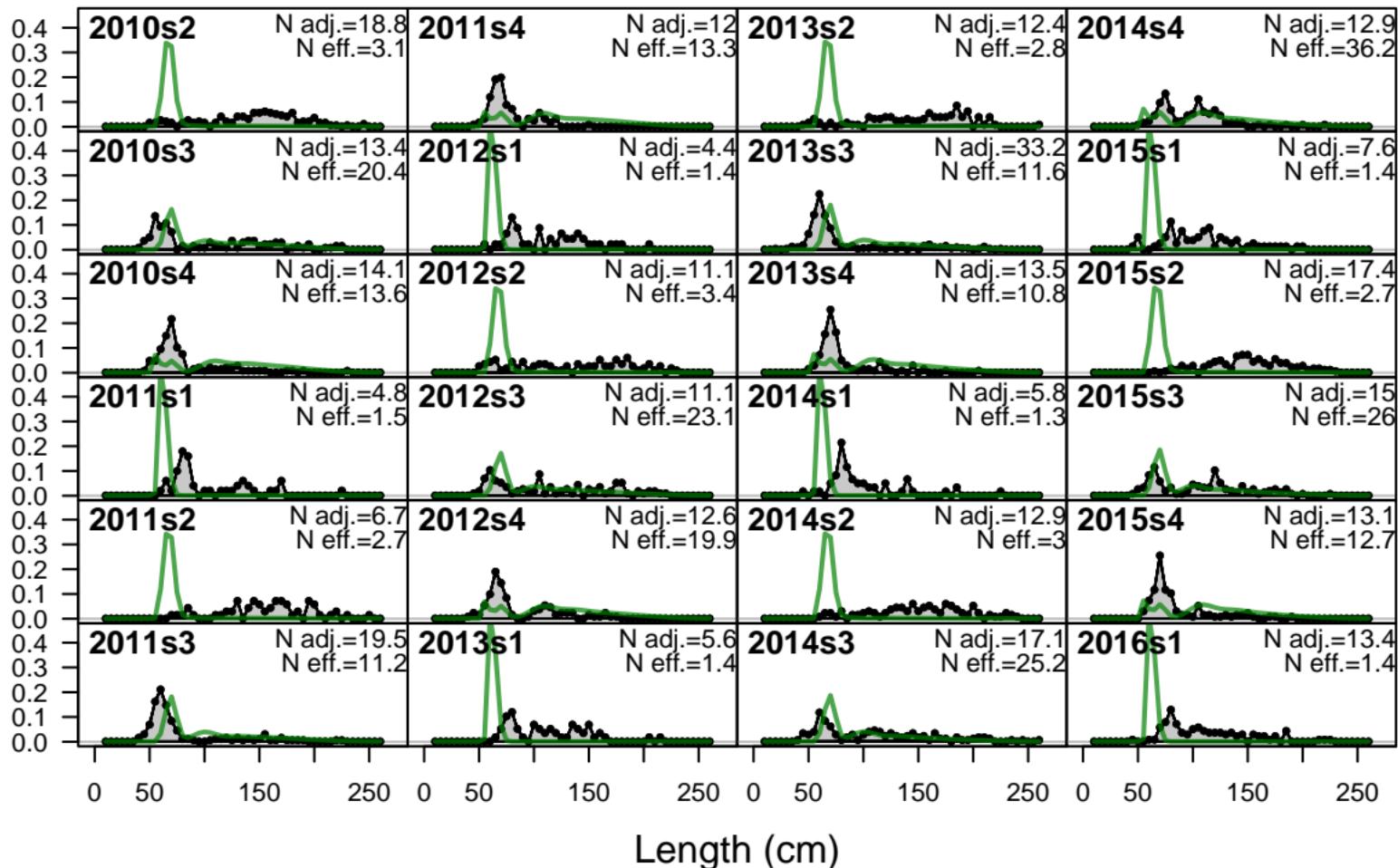
Proportion



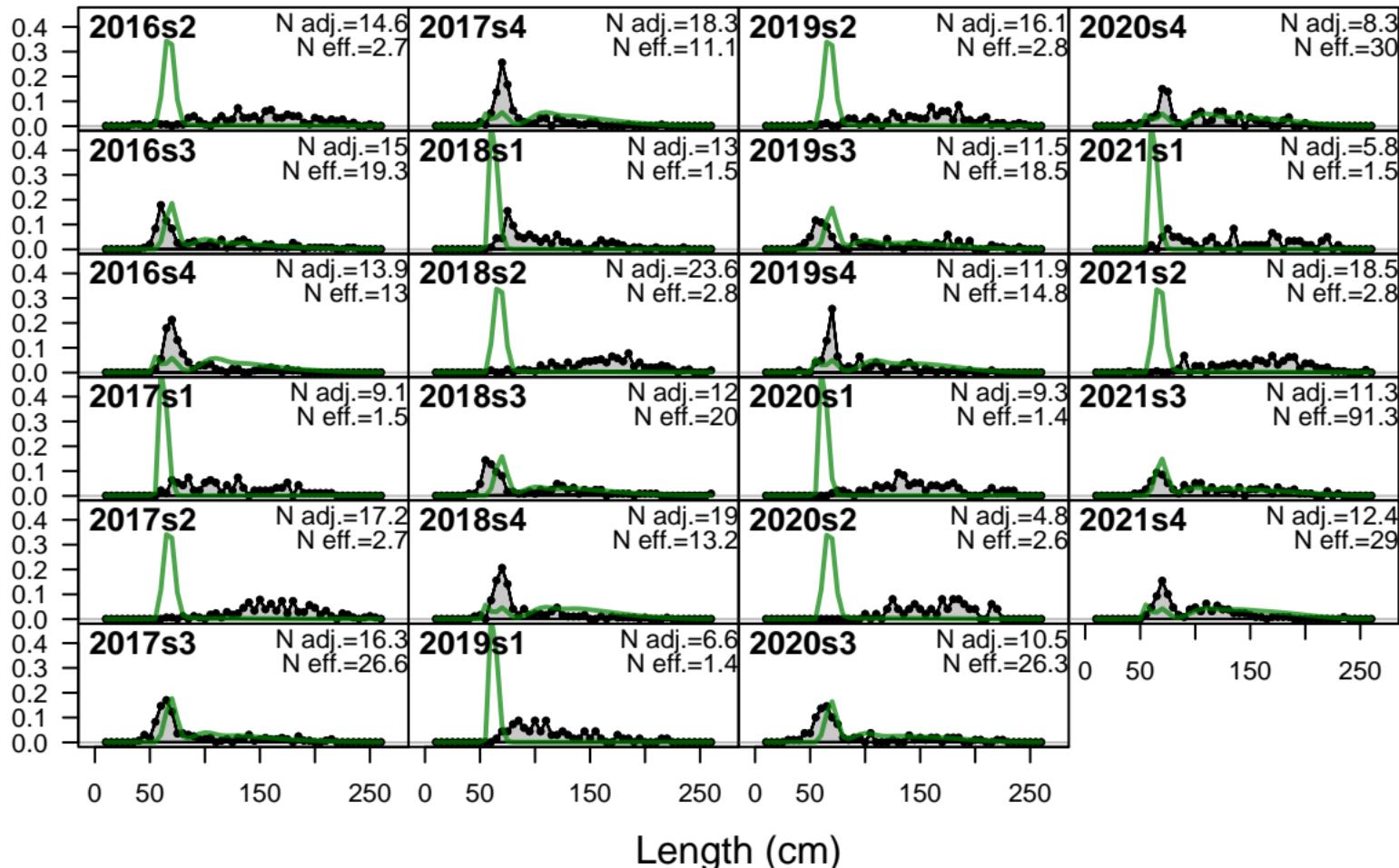
Proportion

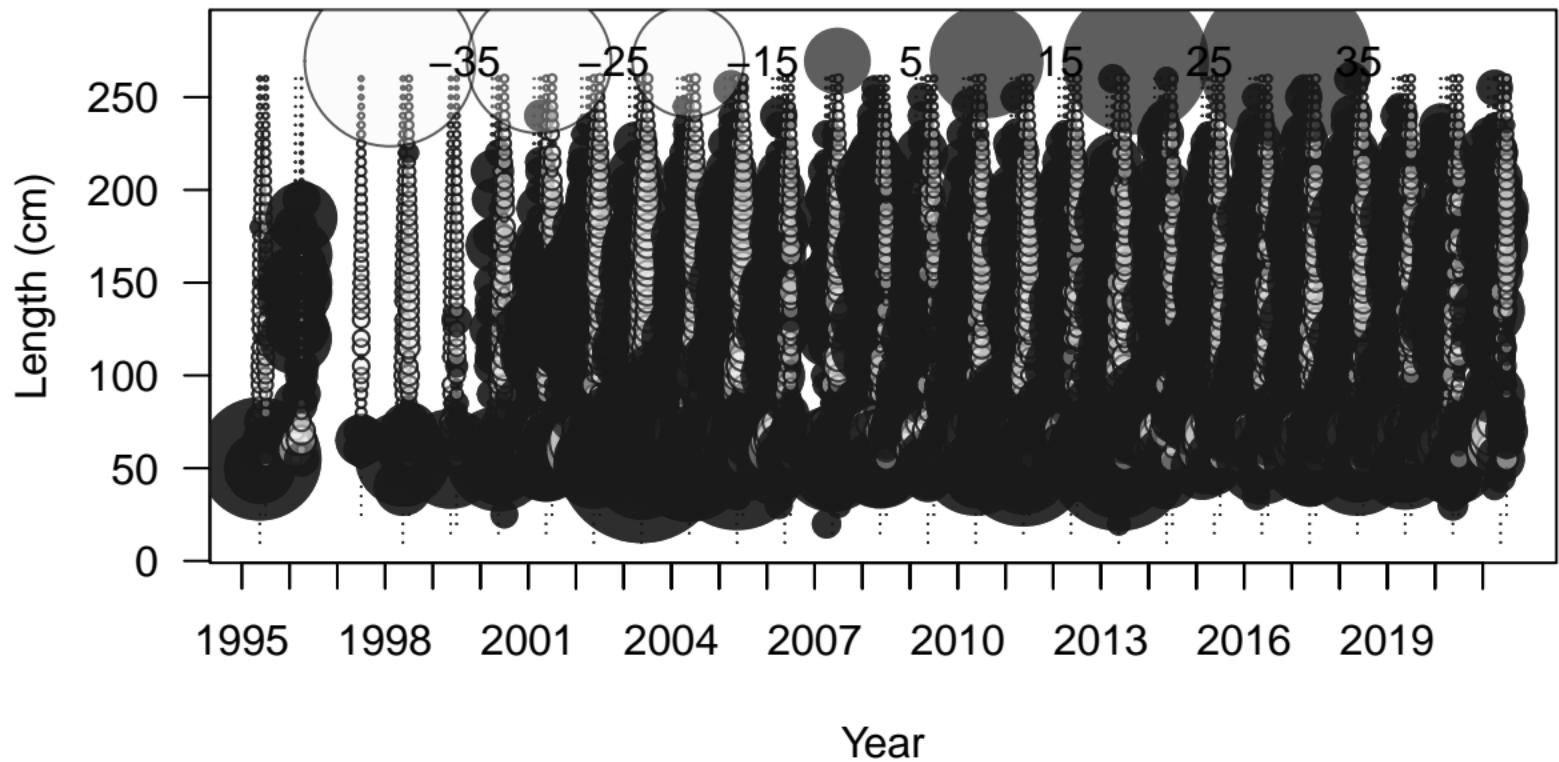


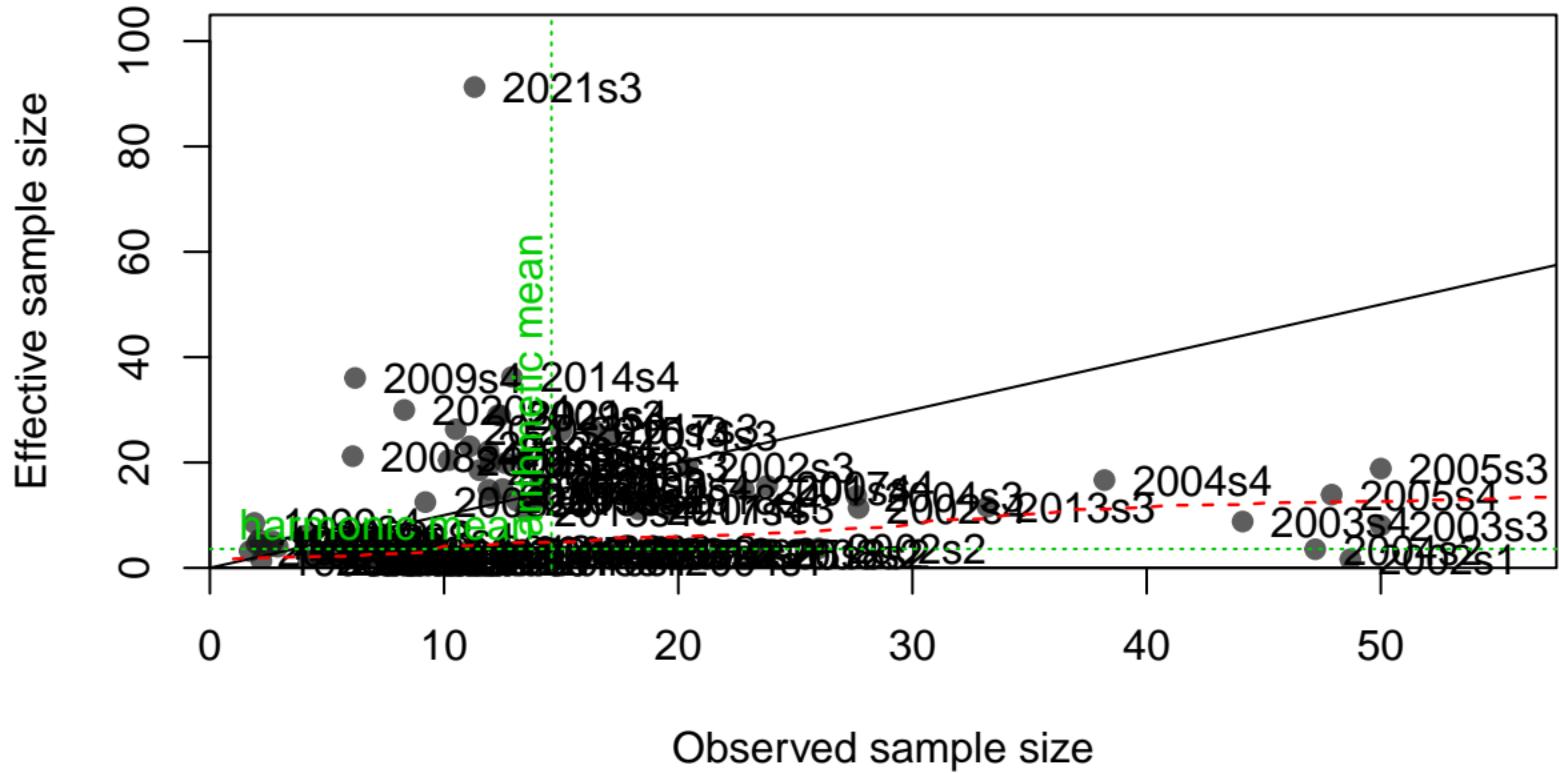
Proportion



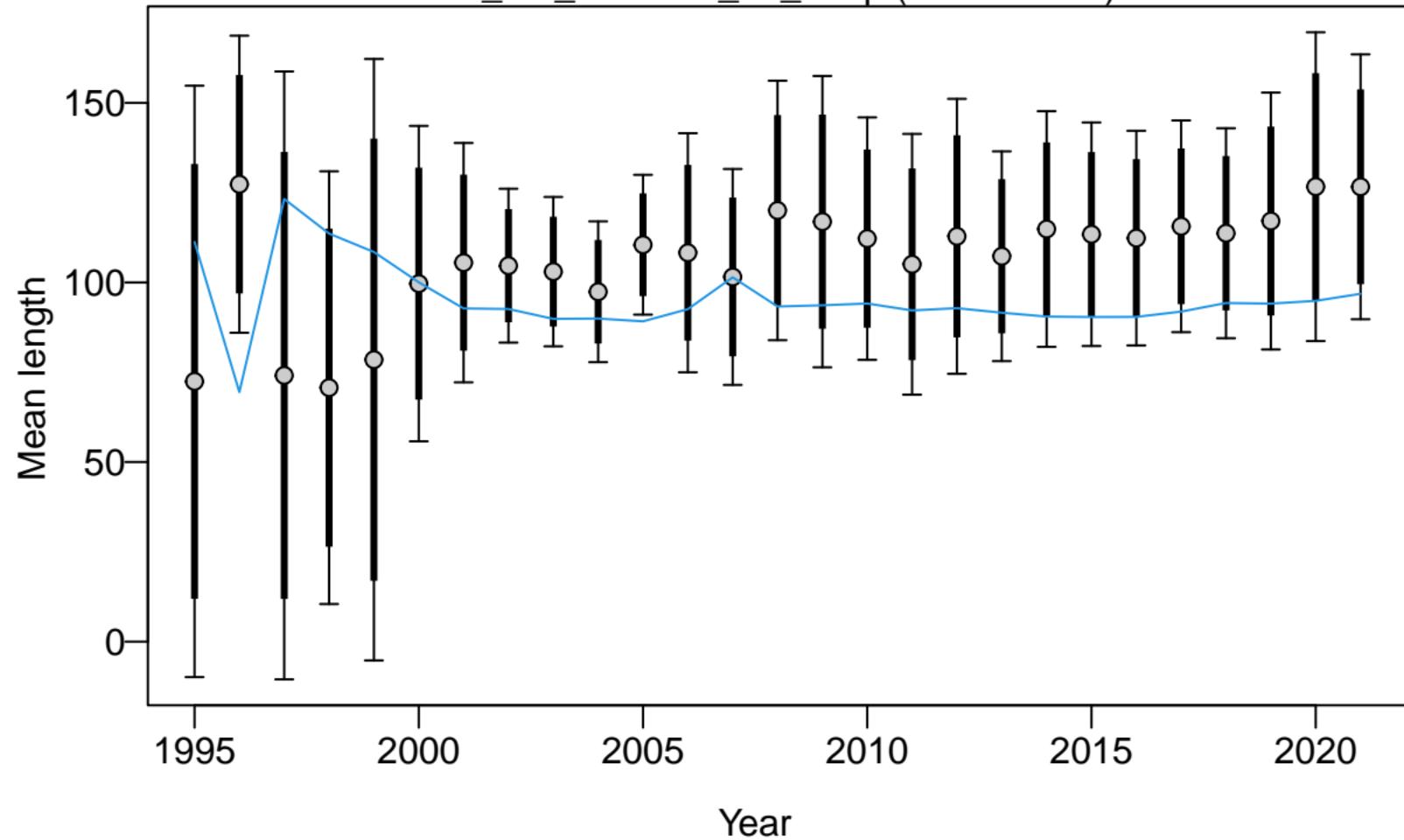
Proportion



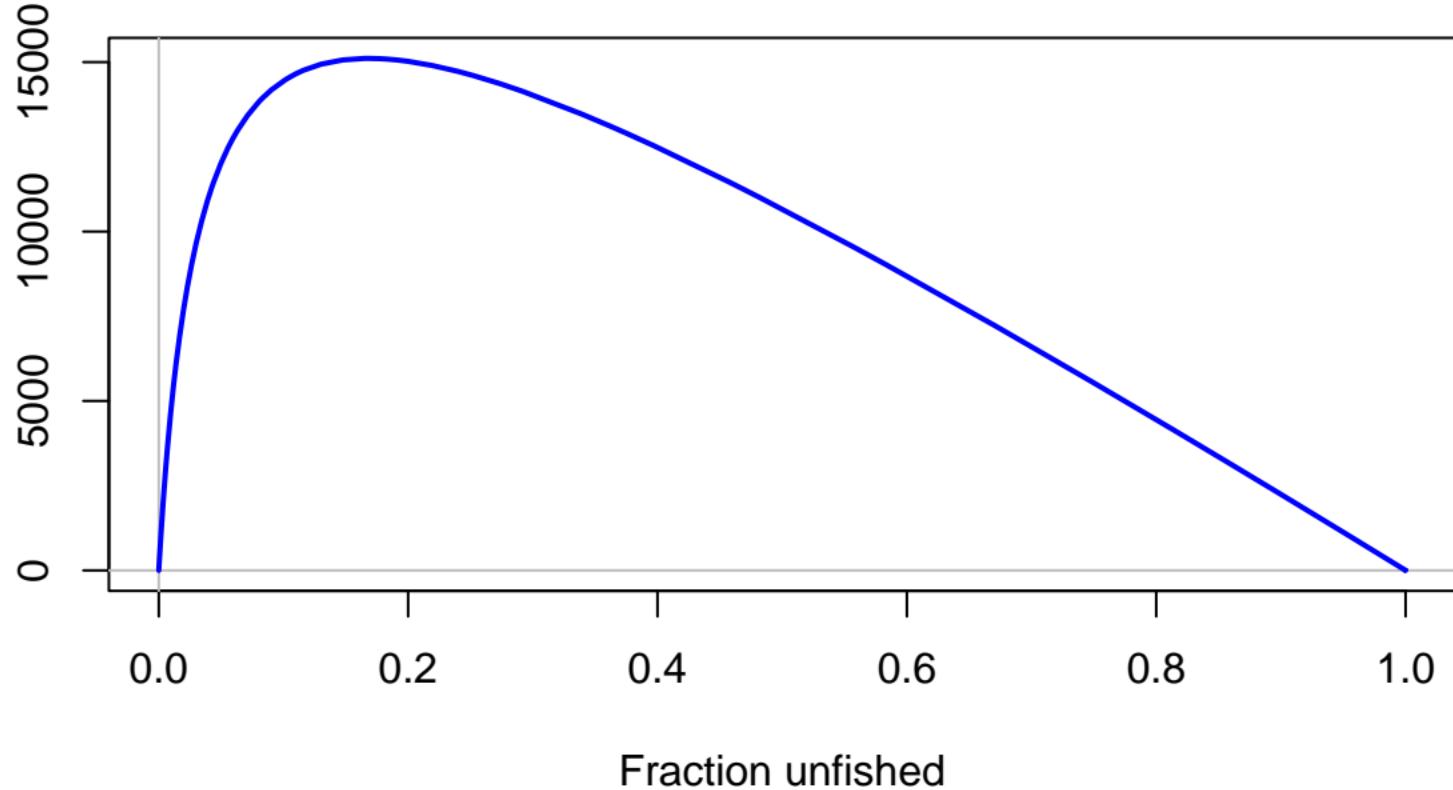


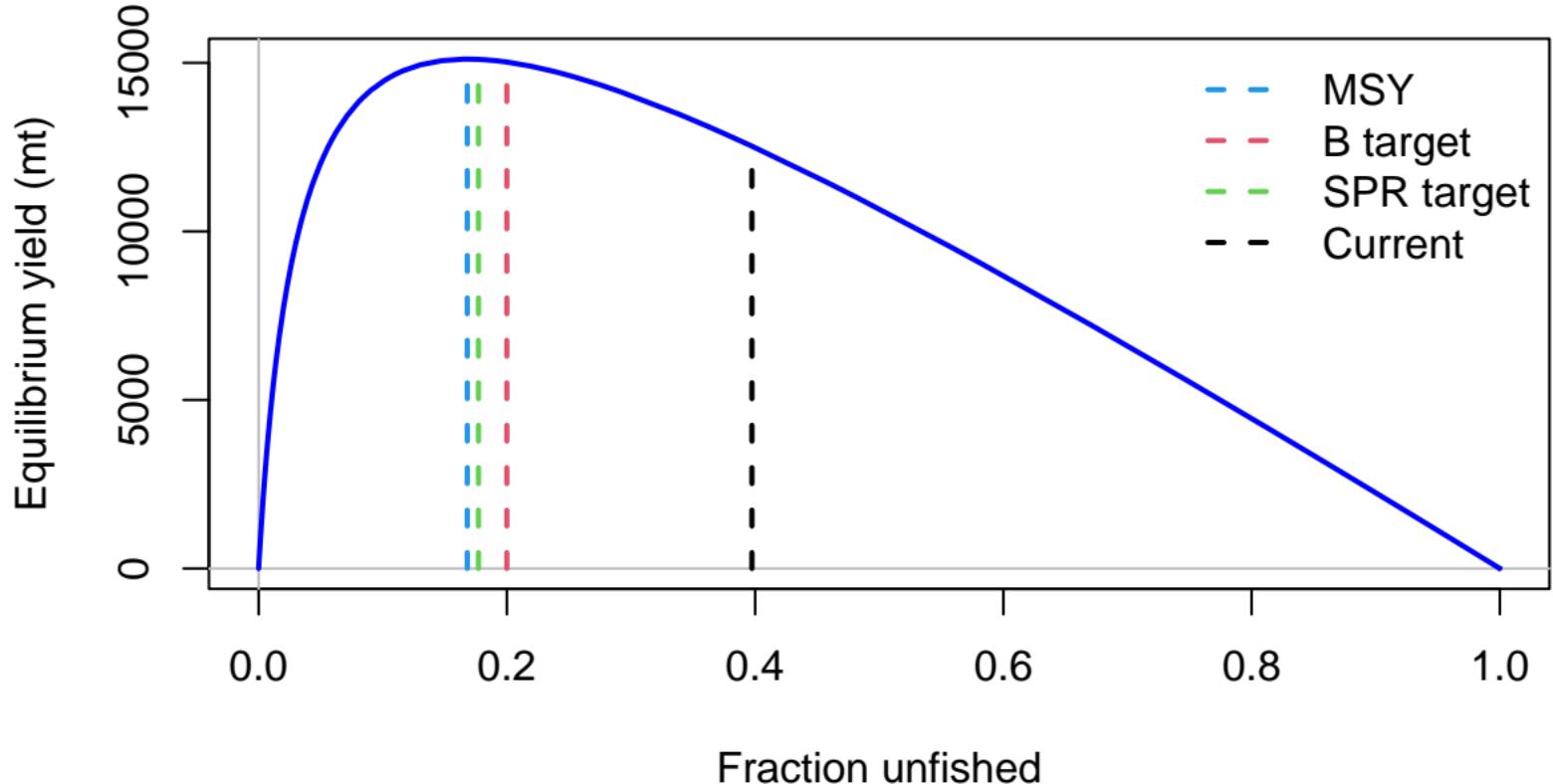


F9_US_WCNPO_LL_deep (whole catch)



Equilibrium yield (mt)



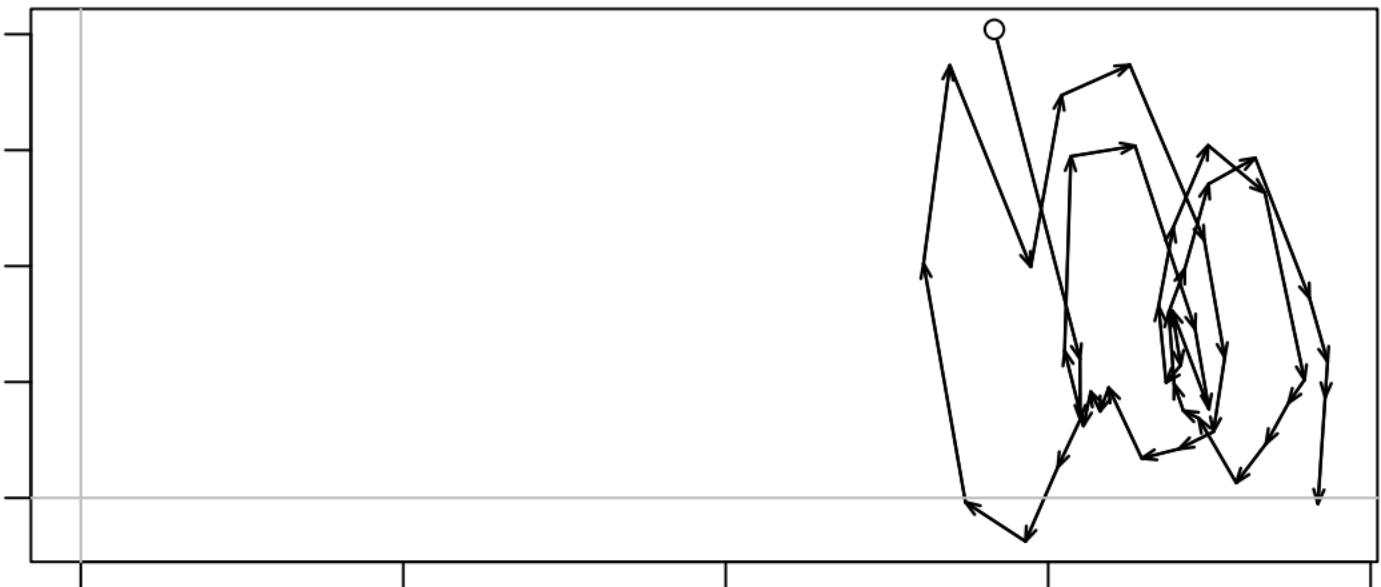


Surplus production (mt)

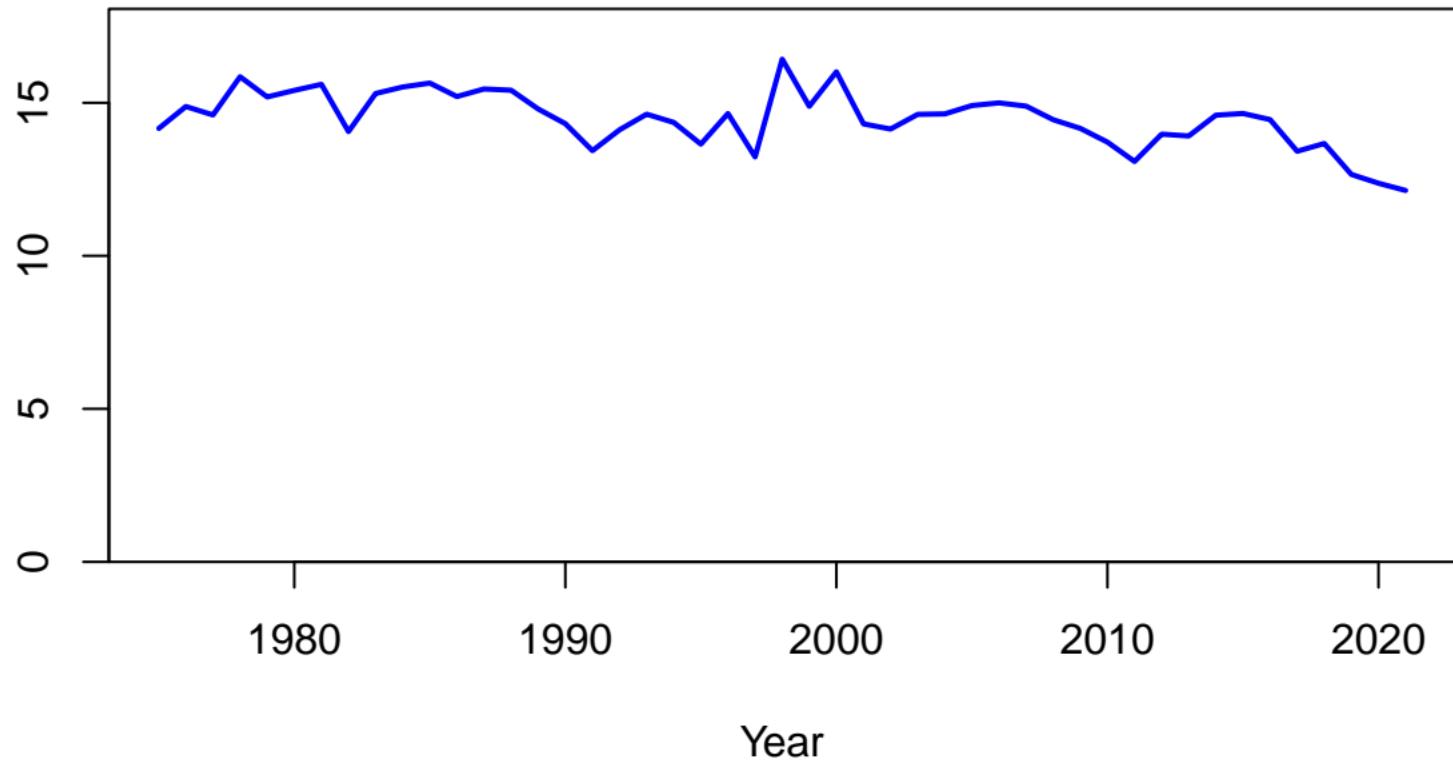
0 10000 30000

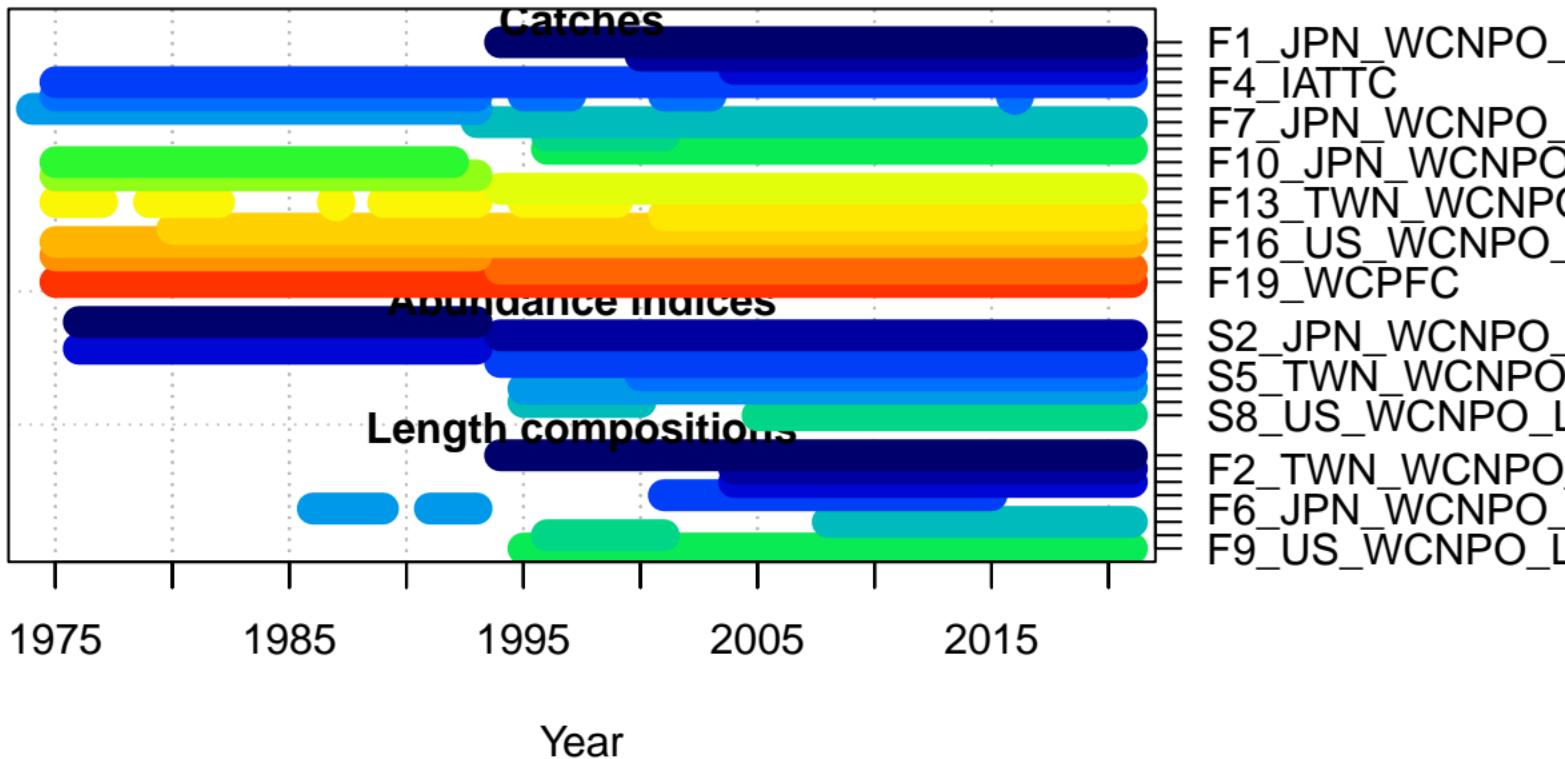
0e+00 1e+05 2e+05 3e+05 4e+05

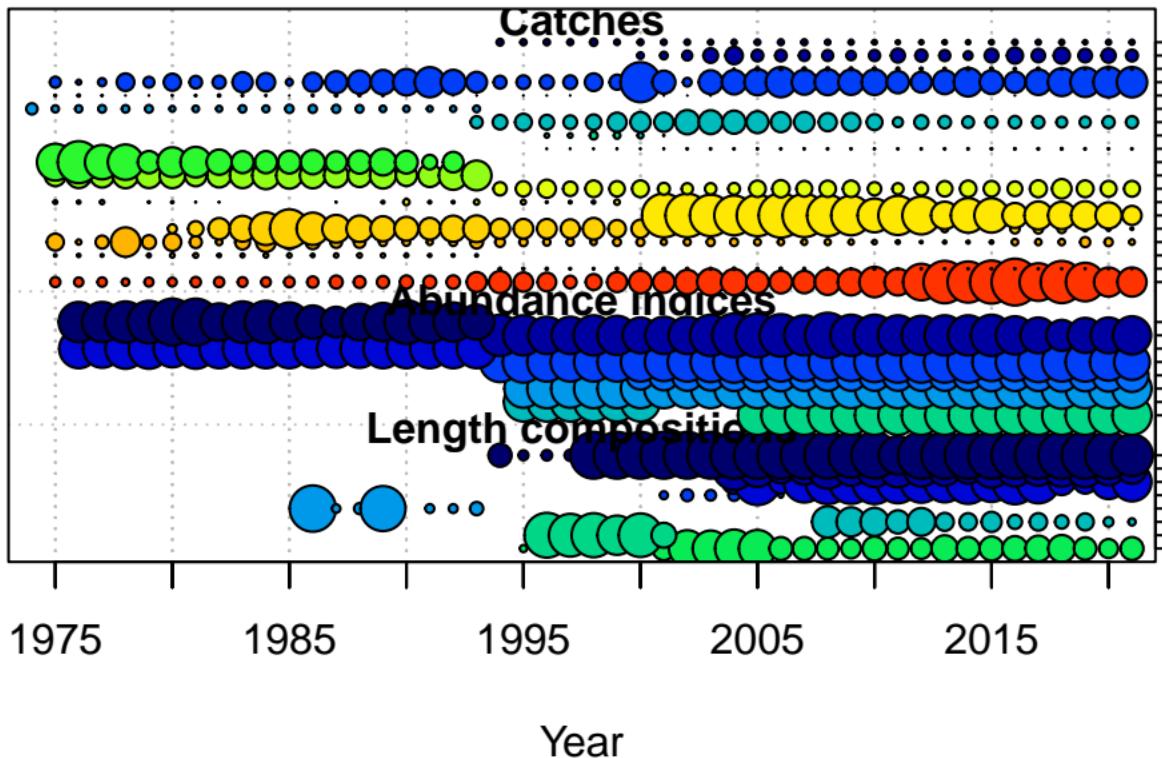
Total biomass (mt)



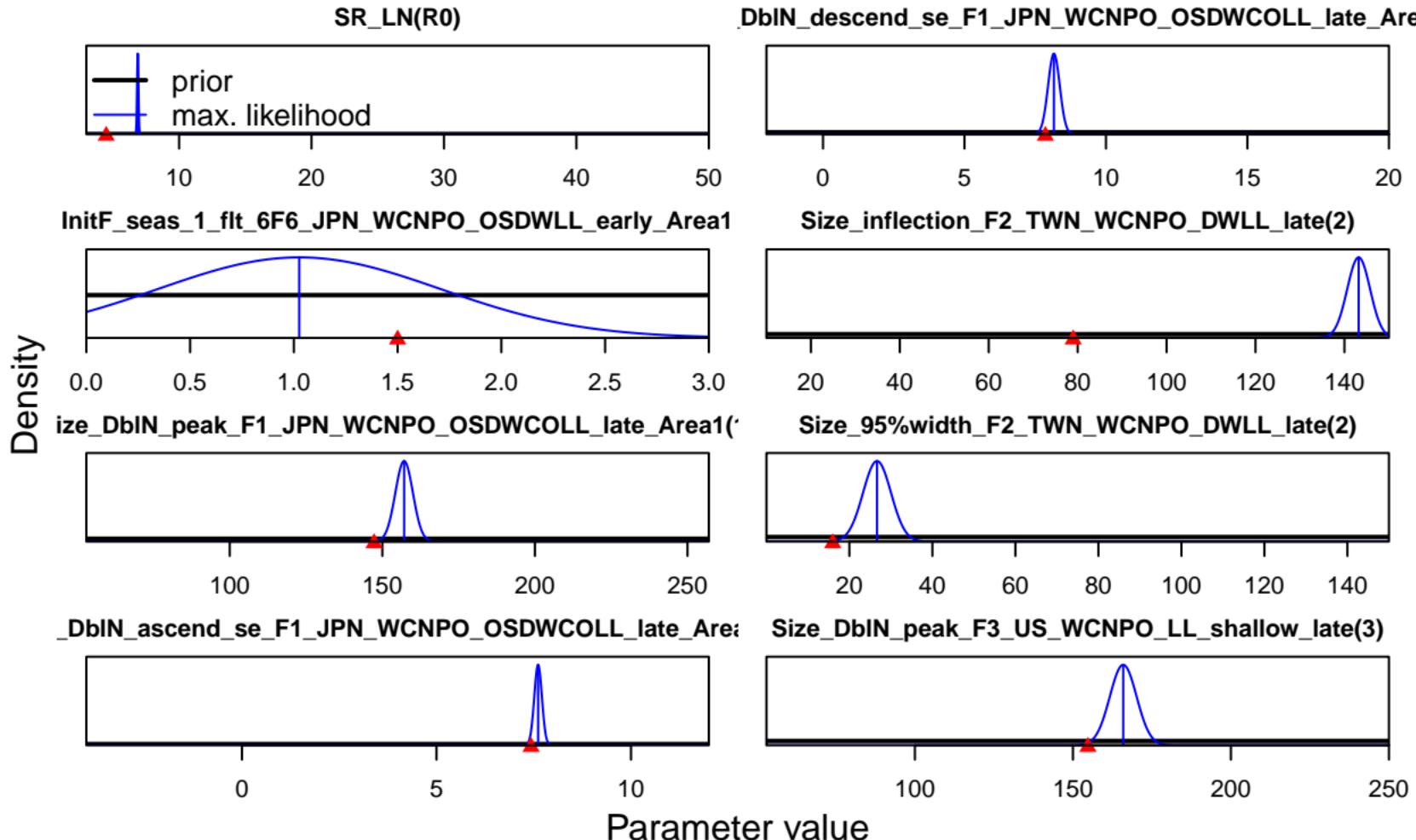
Yield per recruit (kg)

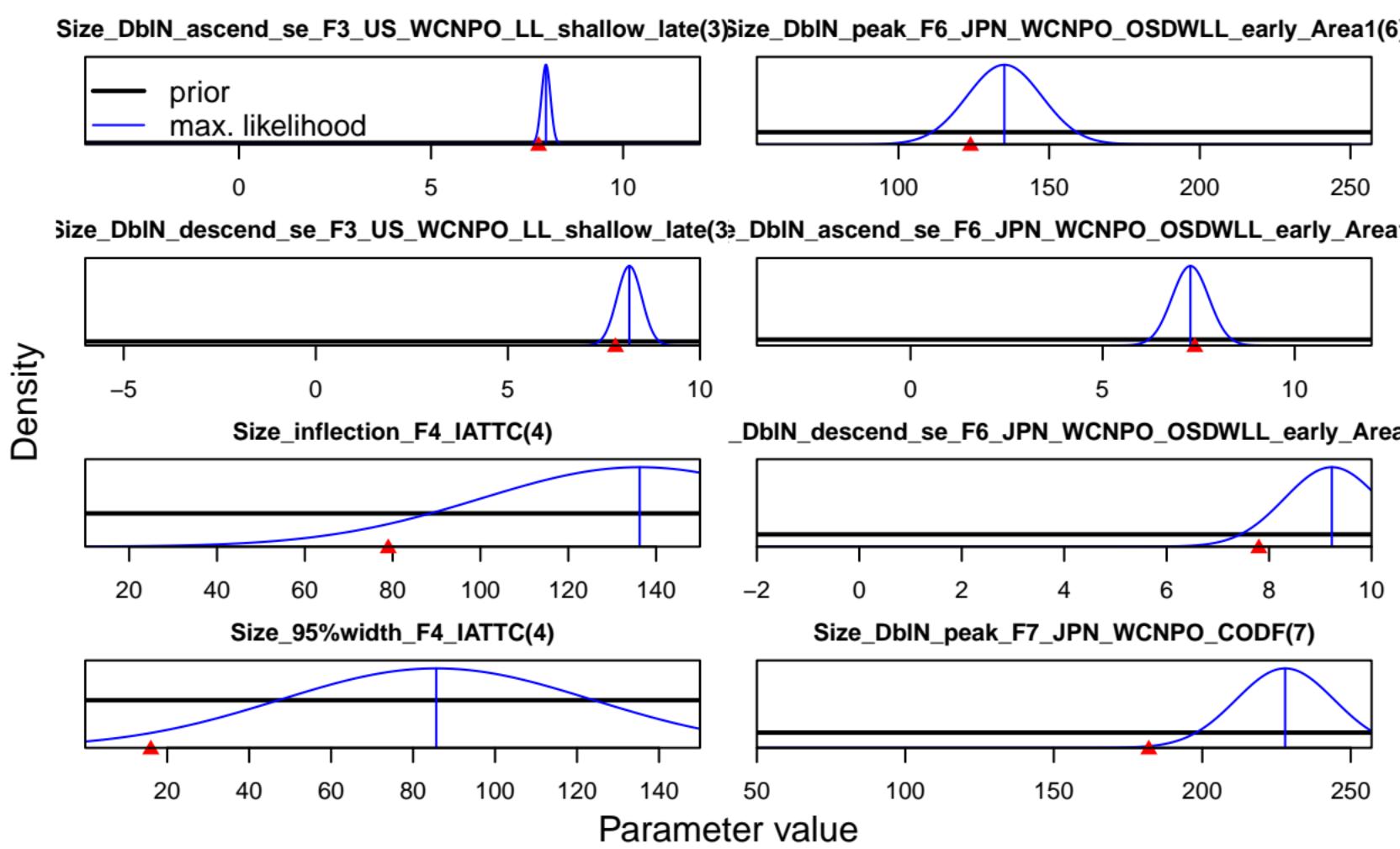






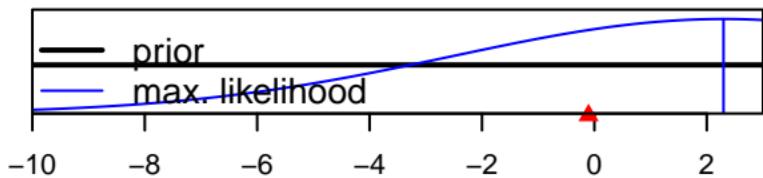
F1_JPN_WCNPO
F4_IATTC
F7_JPN_WCNPO
F10_JPN_WCNPO
F13_TWN_WCNPO
F16_US_WCNPO
F19_WCPFC
S2_JPN_WCNPO
S5_TWN_WCNPO
S8_US_WCNPO_L
F2_TWN_WCNPO
F6_JPN_WCNPO
F9_US_WCNPO_L



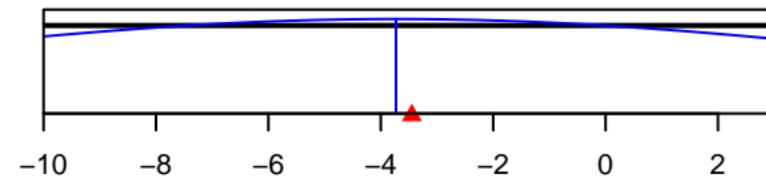


Density

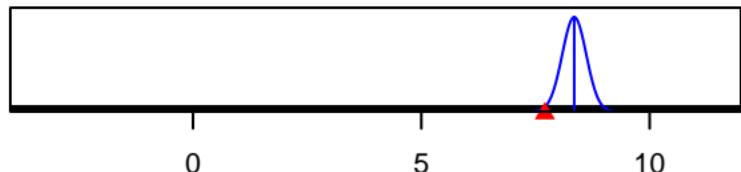
Size_DbIN_top_logit_F7_JPN_WCNPO_CODF(7)



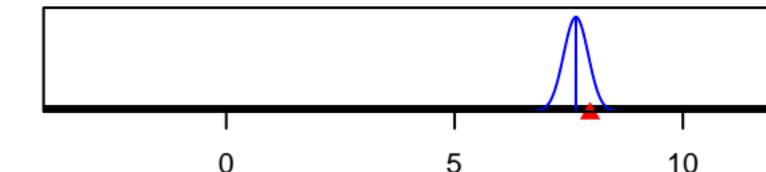
Size_DbIN_top_logit_F8_US_WCNPO_LL_shallow_early(8)



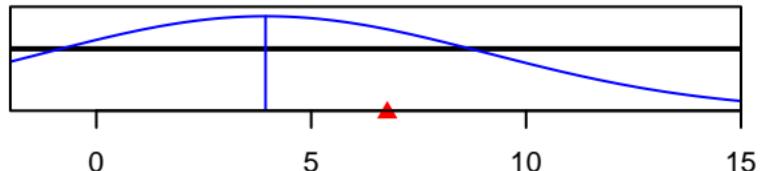
Size_DbIN_ascend_se_F7_JPN_WCNPO_CODF(7)



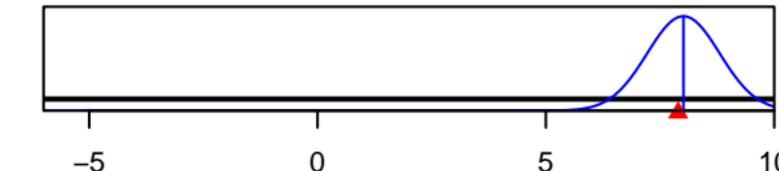
Size_DbIN_ascend_se_F8_US_WCNPO_LL_shallow_early(8)



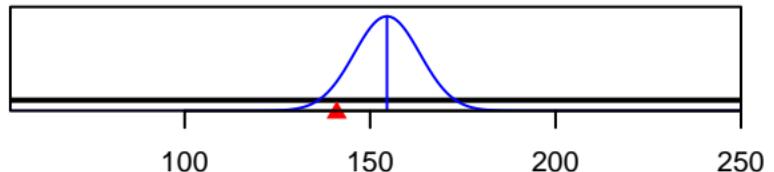
Size_DbIN_descend_se_F7_JPN_WCNPO_CODF(7)



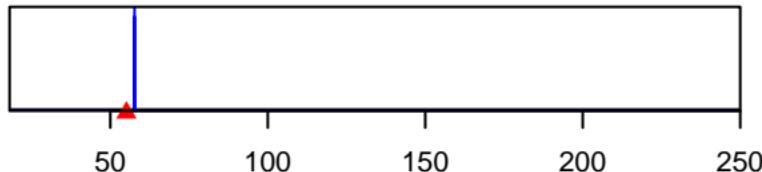
Size_DbIN_descend_se_F8_US_WCNPO_LL_shallow_early(8)



Size_DbIN_peak_F8_US_WCNPO_LL_shallow_early(8)



Size_DbIN_peak_F9_US_WCNPO_LL_deep(9)

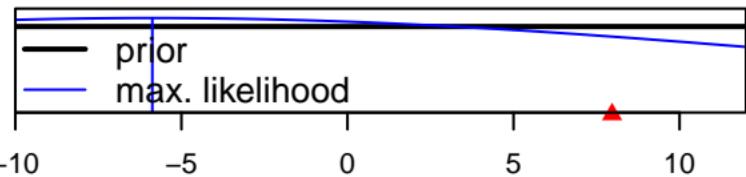


Parameter value

Density

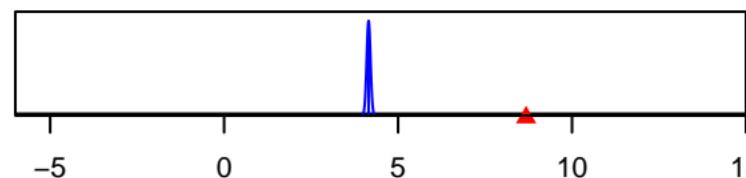
Size_DbIN_ascend_se_F9_US_WCNPO_LL_deep(9)

scend_se_F1_JPN_WCNPO OSDWCOLL_late_Area1(1)_BL



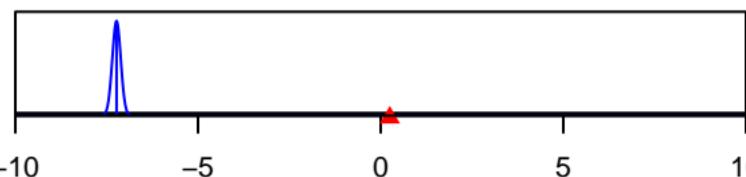
Size_DbIN_descend_se_F9_US_WCNPO_LL_deep(9)

scend_se_F1_JPN_WCNPO OSDWCOLL_late_Area1(1)_BL

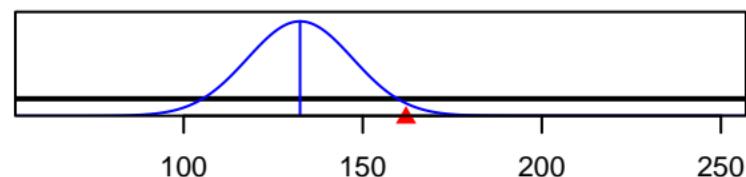


Size_DbIN_end_logit_F9_US_WCNPO_LL_deep(9)

e_inflection_F2_TWN_WCNPO DWLL_late(2)_BLK1repl_20



I_peak_F1_JPN_WCNPO OSDWCOLL_late_Area1(1)_BLK2e_95%width_F2_TWN_WCNPO DWLL_late(2)_BLK1repl_20



Parameter value

